Preliminary Lake Watershed Management Plan For Mercer Lake

Iron County, Wisconsin

Prepared by:
MERCER LAKE ASSOCIATION

With assistance provided by:
Cedar Corporation
and
Wisconsin Department of Natural Resources

PRELIMINARY LAKE WATERSHED MANAGEMENT PLAN FOR MERCER LAKE

IRON COUNTY, WISCONSIN

Prepared For:

Mercer Lake Association

Funded By:

Mercer Lake Association
&
State of Wisconsin
Department of Natural Resources
Lake Planning Grant Program

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Cover: Postcard sent to Jamestown NY on August 20, 1910 with the notation "This is an ideal spot in front of our cottage".

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GLOSSARY

Best Management Practice (BMP): A practice or combination of practices that is determined to be most effective and practical (including technological, economic, and institutional considerations) means of controlling point and nonpoint pollutant levels compatible with environmental quality goals.

Catch Basin: An inlet to the storm drain system that typically includes a grate or curb inlet where stormwater enters the catch basin and a sump to capture sediment, debris and associated pollutants.

Drainage Basin: A geographic and hydrologic subunit of a watershed.

Dry Detention Ponds: A structural BMP or retrofit that consists of a large open depression that stores incoming storm water runoff while percolation occurs through the bottom and sides.

EPA: United States Environmental Protection Agency.

Groundwater: Subsurface water occupying the zone of saturation. In a strict sense, the term is applied only to water below the water table.

Heavy Metals: Metallic elements with high atomic weights (e.g. mercury, cadmium, etc.). They can damage living organisms at low concentrations and tend to accumulate in the food chain.

Impervious Surface: Hard surface that prevents and retards the entry of water into the soil mantle as natural conditions prior to development and/or a hard surface area that causes water to runoff the surface in greater quantities or at increased flow rates from the flow present under conditions prior to development. Common impervious surfaces include, but are not limited to rooftops, walkways, patios, driveways, parking lots, storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam, or other surfaces that similarly impede the natural infiltration of urban runoff.

Infiltration: The penetration of water through the ground surface into subsurface soil or the penetration of water from the soil into sewer or other pipes through defective joints, connections, or manhole walls.

Land Conversion: A change in land use, function or purpose.

Local Government: Any County, City, or Town having its own incorporated government for local affairs.

Nonpoint Source Pollution: Pollution whose sources cannot be traced to a single point such as a municipal or industrial wastewater treatment plant discharge pipe.

Pollution Prevention: A management measure to prevent and reduce nonpoint source loadings generated from a variety or everyday activities within urban areas. These can include turf management, public education, ordinances, planning and zoning, pet waste control, and proper disposal of oil.

Post-Development Peak Runoff: Maximum instantaneous rate of flow during a storm, after development is complete.

Pre-Development Maximum instantaneous rate of flow during a storm prior to development

Peak Runoff: activities.

Removal Efficiency: The capacity of a pollutant (sediment) control device to remove pollutants from wastewater or runoff.

Retrofit: The modification of an urban runoff management system in a previously developed area. This may include wet ponds, infiltration systems, wetland plantings, streambank stabilization, and other BMP techniques for improving water quality and creating aquatic habitat. A retrofit can consist of new BMP construction in a developing area, enhancing an older runoff management structure, or combining improvements and new construction.

Runoff: That part of precipitation, snow melt, or irrigation water that runs off the land into streams or other surface water. Runoff can carry pollutants into receiving waters.

Sedimentation Basins: Sediment storage areas that may consist of wet detention basins or dry detention basins. Excavated areas with storage depression below the natural ground surface; creek, stream, channel or drainageway bottoms properly engineered and designed to trap and store sediment for future removal.

Watershed: A drainage area or basin where all land and water areas drain or flow toward a central collector such as a creek, stream, river or lake at a lower elevation.

Wet Detention Ponds: A structural BMP or retrofit that consists of a single permanent pool of water that stores and treats incoming storm water. Wet detention ponds usually have three to seven feet of standing water, allowing pollutants to settle, with a defined siltation/sedimentation pond and outlet structure.

EXECUTIVE SUMMARY

In the spring of 2005, the Mercer Lake Association applied for two planning grants in an effort to develop a lake watershed management plan. The grants were awarded in the fall of that year and work began in January of 2006. Mercer Lake Association began developing their Lake Watershed Management Plan to protect water quality of Mercer Lake and other surface waters. Lake watershed management is a basic, yet complicated issue. Preparing this preliminary plan involved a significant amount of time and information from many sources.

The first component of the Plan (Chapter 1) discusses the general nature of stormwater runoff and emphasizes its effect on water quality. It is important to understand not only the quality of the water in runoff, but also the quantity as the quantity can have a significant effect on erosion. This chapter also summarizes the importance of stormwater management and outlines the components of an effective plan.

Chapter 2 reviews the basic components of the land in a watershed. The four main components that will have an effect on the natural landscape and how water flows over and through the soil are: Bedrock Geology, Geomorphology and Surface Geology, Hydrogeology, and Soils. Each of these topics is covered in general terms.

Chapter 3 Lake Water Quality goes over the principles and factors of water quality in general such as a lake's ecosystem, description of a watershed, oxygen cycle, and carbonate system. Then some of the real water quality data from Lake Mercer, that has already been collected either through this planning grant project, or the self help data, was discussed and analyzed ad the end of the chapter.

Chapter 4 discusses the physical factor of the watershed and how some of the problems can be attributed to the various land uses around Mercer Lake. One of the first steps in the planning process was to establish the watershed planning area by delineating the contributing watershed planning area. The watershed was delineated into sub-watersheds to identify and isolate problem areas in the watershed. The Town of Mercer urban area as well as the residential development close to the Lake has a definite impact on the water quality of Mercer Lake.

Chapter 5 applies the information discussed in Chapter 4 specifically to the watersheds in the planning area. This chapter also reviews the modeling results and analysis. The two pollutants that were modeled for this plan were Total Suspended Solids (TSS) and Phosphorus (P). TSS is used as an indicator of erosion and other pollutants that are coming off the contributing watershed. Phosphorus is a nutrient that causes nutrient loading problems in surface waters.

Chapter 6 identifies specific problems affecting the Lake's water quality as well as some general problems associated with most lakes. The chapter is split into nine different sections outlining the problems. Those sections include: urban stormwater runoff, boat landing, property owners, Town of Mercer urban area, erosion, sedimentation, aquatic plants, and past sewage treatment plant discharges.

A community survey was sent out to all property owners and businesses within the Mercer Lake watershed planning area. The results of that survey are summarized in Chapter 7, and Appendix B. This survey allowed the Mercer Lake Association to get a feel for how the local residents feel

about the Lake provided some good feedback on what the residents approve of and disapprove of.

Chapter 8 reviews and summarizes the existing documents written about Mercer Lake. The chapter also identifies some ordinances that the Mercer Lake Association should work with the Town of Mercer to adopt, as well as outlines the procedures for adopting them.

A plan is only useful if the recommendations are followed and the information provided is used. Chapter 9 identifies both structural and non-structural recommendations to improve the water quality of the Lake as well as the water that reaches the Lake. Structural projects include regional ponds in areas that contribute significant amounts of TSS and phosphorus, and specific locations that may require streambank restoration. Non-structural recommendations include stormwater related ordinances, public education, and street sweeping.

Each chapter of the Preliminary Lake Watershed Management Plan was written to assist the Association Board, members, and local residents in understanding the importance of water quality and stormwater to the Mercer Lake Association. Appendices at the end of the document include modeling data sheets, sociological survey and report, and the Mercer Lake Association committees and objectives.

CHAPTER 1: INTRODUCTION

Located in Northern Wisconsin, Mercer Lake is located in the Flambeau Flowage Watershed of the Upper Chippewa Basin.

The Upper Chippewa Basin
The Upper Chippewa Basin encompasses parts of the counties of Ashland, Barron, Bayfield, Iron, Polk, Price, Rusk, Taylor, Vilas and Washburn in northern Wisconsin. The basin has a total surface area of 4,680 square miles and 23 watersheds (DNR, 2002).

The Flambeau Flowage Watershed (UC-14)
The Flambeau Flowage Watershed is mostly in Iron County, but small portions of the watershed lie in Vilas County to the east and Price County to the south.

Mercer Lake
Mercer Lake in Iron County, Township 43 North, Range 3 East, Sections 35 and 36, and 22 is 184 acres with a maximum depth of 24 feet and mean depth of 11 feet. This is a soft water drainage lake with light brown water of moderate transparency. Mercer Lake is a drainage lake with two inlets and one outlet. The Little Turtle River from Grand Portage Lake and a small tributary from Lake Tahoe are the inlets and the Little Turtle River is the main outlet (USGS, 2004).

1.1. What is a "Watershed?"

Merriam-Webster's Dictionary defines a watershed as "a region or area bounded peripherally by a divide and draining ultimately to a particular water course or body of water." Watersheds are defined by those ridgelines and/or high points of land that separates lower land areas. The line that connects through the high points is the watershed boundary. Large watersheds are a combination of many smaller sub-watersheds.

With the watershed defined, soils and land use within the watershed can be compiled and with the evaluation of precipitation and run off calculations, an assessment of the impacts of land use on the water quality within the watershed can be made. The advent of high speed computers and complex mathematical algorithms accents this understanding by allowing the complex inter-relationship of water runoff and infiltration and nutrient (pollutant) loading to be calculated.

Accepting that man's imprint on the surface of the watershed affects the water quality draining from the watershed is a necessity in understanding the effects of water quality degradation in the water courses and basins receiving this water – our lakes, rivers and impoundments.

1.2. What is Runoff?

Rainfall and snow melt are generally termed "runoff" and either runs off the land or infiltrates into the subsurface. In the hydrologic cycle (Figure 1-1), runoff water is termed "overland flow." As land is developed, less land area is available for infiltration of storm water, thus runoff increases.

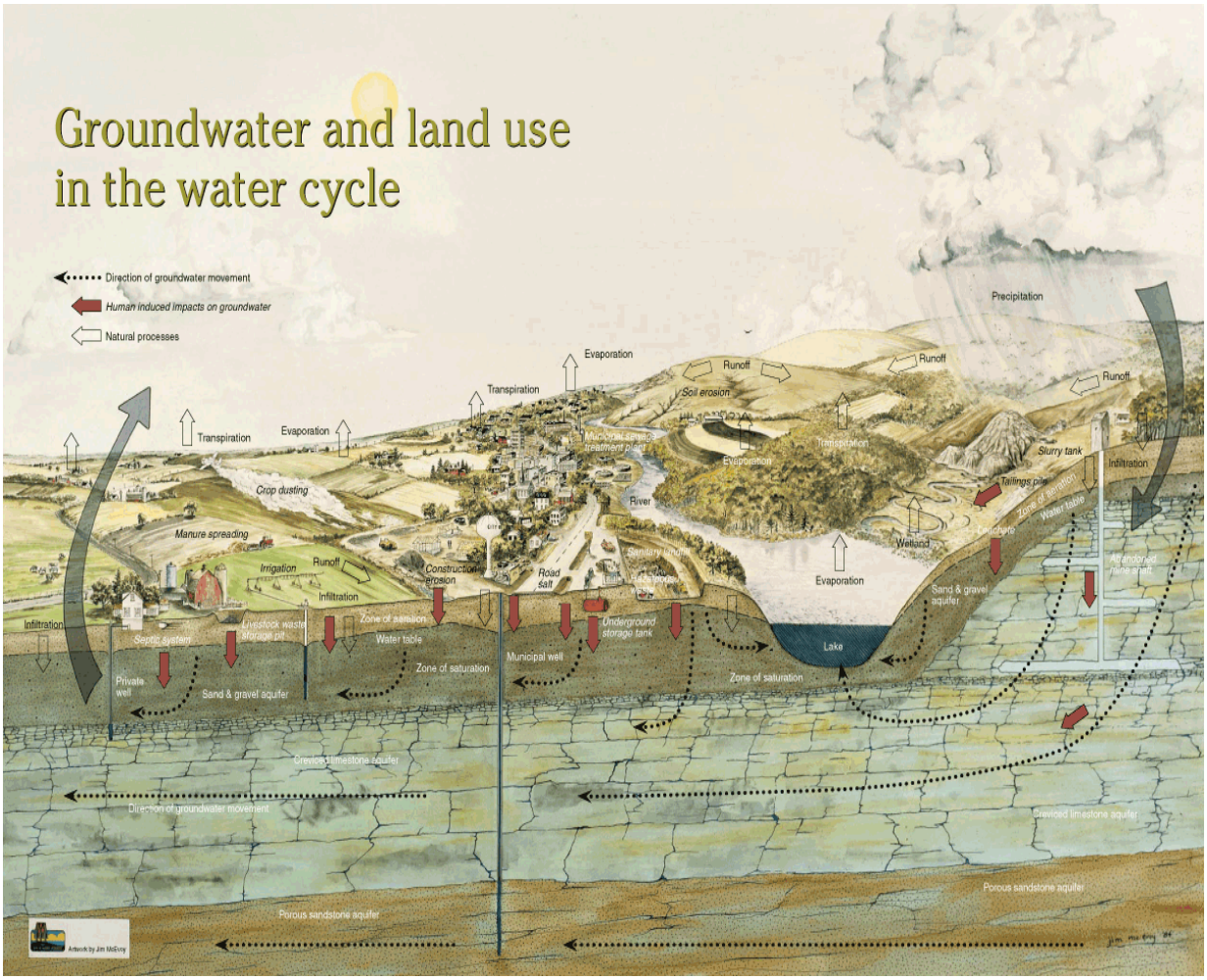


Figure 1-1: Hydrologic Cycle

Runoff water drainage systems are incorporated in developed areas as a preventive action to minimize localized flooding. These drainage systems may discharge through an individual or local outfall to a surface water body or swale, or may runoff the land as overland flow. Runoff water quality, however, has not been much of a concern until the last 15 years. Early in the 1990's, the U.S. Environmental Protection Agency (EPA) defined contaminated surface runoff water as one of the greatest threats to our ecology.

Initial concerns focused on the obvious areas of high population density. However, with continued investigations, the evaluation of runoff water quality in <u>all</u> developed and developing areas has become recognized as a major environmental concern. Nutrient and sediment contributions from developed areas in the Mississippi River basin are noted as the source of the 6,000 to 7,000 square mile dead zone found at the mouth of the Mississippi River in the Gulf of Mexico.

This huge area of low dissolved oxygen (less than 2 ppm) no longer supports typical aquatic life and is listed as the largest dead zone found in the world. The principal contamination that has caused this problem are sediments and nutrients in storm water runoff collected and discharged by the Mississippi watershed.

1.3. Runoff Water Regulation Driven by Water Quality

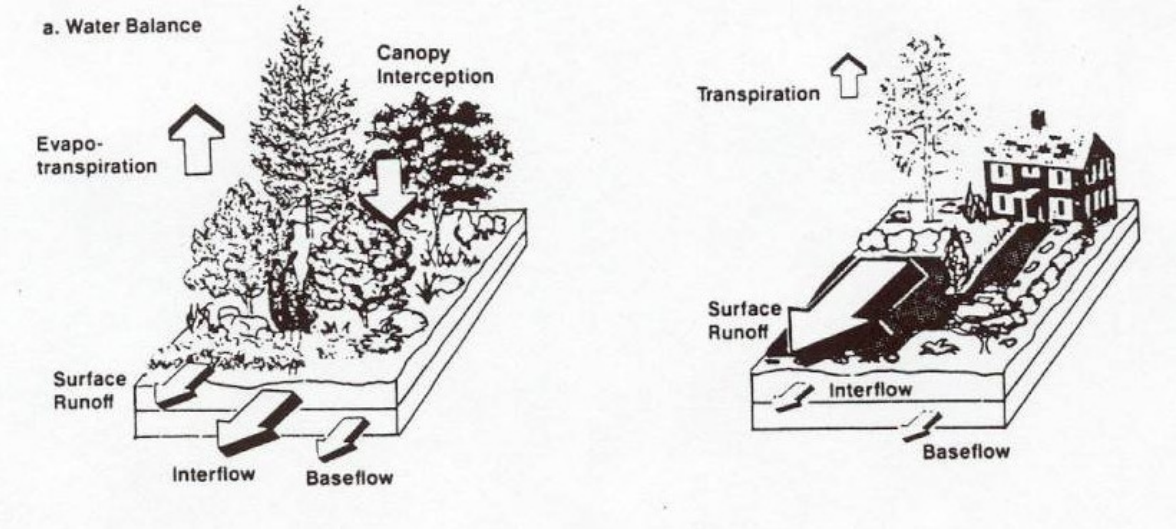
With runoff water targeted by the U.S. EPA as a major contributor to the degradation of surface water quality in our environment, the Wisconsin Department of Natural Resources (WDNR) introduced and now administers, through Wisconsin Administrative Code (WAC) NR 151 and NR 216, the quality of surface runoff water. Regulations for the discharge of storm water are already in place for larger municipal separate storm sewer systems (or MS4s) and have also been introduced in smaller "urban areas," which have been defined by EPA and WDNR as "an area with a population density of 1,000 or more per square mile, or an area of industrial or commercial uses, or an area that is surrounded by an area described in this definition" (WAC NR 155.12 (31)). Regulations for storm water runoff control are less defined for developments that also disturb one acre of land surface. Some counties are now enforcing these regulations for areas in excess of one-half acre.

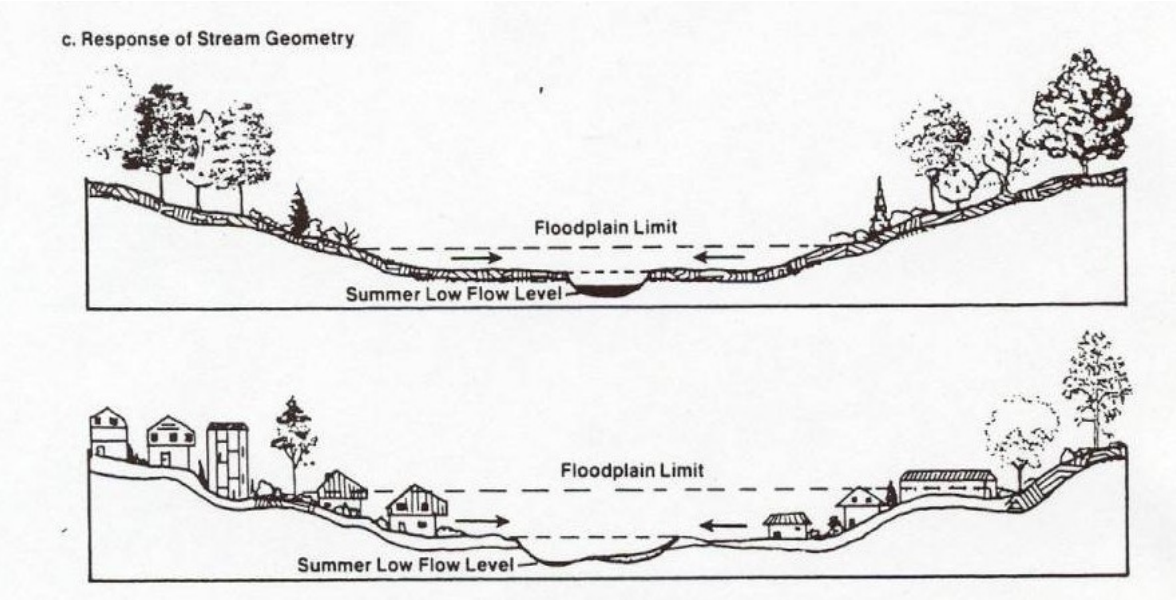
The Town of Mercer is currently not identified by the WDNR as a community that will be required to enact storm water management. However, in the interests of protecting and improving water quality in Mercer Lake, the Mercer Lake Association is pursuing this evaluation of watershed runoff water quality and its affects on the lake water quality. The results of this effort will be shared with the Town, Iron County, and other interested agencies in the watershed. The goal is to develop maintain and improve lake water quality through guidelines, ordinances, and water quality improvement projects.

1.4. Water Runoff Management

We have all seen drainage swales and streams swollen with brown turbid water after a storm. The sediment load in the runoff is the culprit that turns the water brown and is increasing nutrient loading in the lakes and decreasing water depth. Traditionally, the objective of runoff water management has been flood or water quantity control, that is, to transport runoff as quickly as possible through the drainage system to prevent flooding and protect lives and property. Although public health and safety are still the most important goals, other objectives, such as the preservation of water quality, groundwater, and natural habitat, must be considered. Existing flood and water quantity control methods are not always readily adaptable to meet these new requirements, because the historic methods contribute to increased downstream water quantity, generate water quality problems, and do not provide for habitat protection. Likewise, some recommended water quality and habitat solutions, such as naturally vegetated drainage ways, can contribute to upstream flooding problems by reducing the carrying capacity of the drainage conveyance. Figure 1-2 shows the impacts of urbanization throughout a watershed and the increase in water runoff reflects the change in waterways that flow through an urbanized area.

Figure 1-2: Water Balance, Stream Flow, and Stream Geometry; Source: Schueler, 1987





It is necessary to achieve a balance for both water quantity and water quality objectives. This balance is achievable through regional solutions, including effective land use planning to minimize impervious areas and preserve natural vegetation, and the protection of natural areas along streams and lakes. Local ordinances and codes can be enacted and enforced to reduce impervious areas and increase vegetation by limiting the extent to which a site can be developed. Education of watershed residents, governing bodies, developers and visitors about their concern will answer many questions why changing old habits is necessary. Water quantity and water quality goals can also be met at the local level through proper construction site planning and appropriate design that carefully considers the various impacts of development and application of BMPs (Best Management Practices) to minimize water quality impacts. BMPs are recognized administrative and engineering devices that minimize the impacts of polluted runoff on receiving waters. BMPs have been developed for many common problematic situations and are readily

incorporated into today's construction design plans. Examples include wet detention ponds, dry detention/retention basins, catch basins, shoreline restoration, and vegetative buffers.

1.4.a. Water Quantity

The quantity or volume of water runoff generated by varying land uses depends on three factors: (1) the intensity of a given runoff event (such as rainfall, snowmelt, and ice melt); (2) the duration of the event; and most importantly (3) the amount of impervious area present. Impervious surfaces include asphalt and concrete, building rooftops, compacted soils, etc. Lawns are considered semi-impervious as the reworked soil is more compacted than natural areas. As impervious surfaces increase with development, the quality and velocity of runoff water increases and the water quality decreases, and therefore the runoff from increasingly developed areas has a serious impact on receiving waters. As shown in Figure 1-2, the natural water balance is disrupted when an area is developed. Compacted soils, paved surfaces, and buildings replace vegetation that once intercepted runoff, allowed it to infiltrate into the ground, and returned water to the atmosphere through evapotranspiration. Compacted soil surfaces, such as well-used pastures and compacted lawns, also reduce the infiltration capacity of soils as does asphalt and concrete surfaces. Snowmelt and heavy rain events on these compacted surfaces increase the chance of flooding. As the volume and flow rate (velocity) of the runoff increases, water reaches streams and lakes more quickly. The higher runoff volumes and rates lead to overland erosion, scouring or undercutting of stream banks, flooding, and loss of habitat. Less obvious is the lack of replenishment of ground water. Reduced ground water volume reduces the quantity of groundwater to contribute base flow to streams, sustain lake levels, and maintain ground water elevation (essential for well supplies).

1.4.b. Water Quality

Land development practices adversely affect the quality of runoff water by increasing runoff volume which carries increased erosion and results in more rapid transfer of pollutants to receiving water. Pollutants include the many chemicals and metals we consider pollution as well as nutrients (phosphorous and nitrogen). Nutrient enhancement of surface water occurs through septic systems, effluent from wastewater treatment facilities, fertilizers on lawns, stormwater runoff from roads and other impervious surfaces, etc. The pollutants of concern include:

- *nutrients* such as phosphorus and nitrogen, which hasten the lake aging process (or eutrophication); this process naturally results in increased algae and plant growth
- *sediment* such as silt (fine particulates), sand, and gravel, which has the capacity to carry other pollutants and can smother fish eggs, and over time also results in shallower lake water
- *bacteria and viruses* from humans and animals
- *organic chemicals*, such as pesticides and hydrocarbons (dissolved in water or adsorbed to the sediment)

- *heavy metals* such as lead, copper, zinc and cadmium, among others, that are usually adsorbed on the grains of sediment are redistributed in ponds and lakes after high runoff events

Sources of runoff water pollutants from developed areas include, but are not limited to:

- automobiles and related surfaces – highways, roads, parking lots, service areas
- rooftop runoff
- residential impervious surfaces
- illegal discharges to storm sewer systems
- lawns and areas adjacent to lakes and streams
- septic system discharge
- construction and new development activities
- effluent from wastewater treatment plant
- atmospheric fallout from vehicle and industrial emissions
- dust from construction/logging/agricultural activities
- overuse and improper disposal of toxic chemicals, pesticides, herbicides, and fertilizers
- decaying plants and animal wastes from natural and agricultural sources
- disturbed or exposed soils
- highway road salts and chemicals

1.5. Objectives of Lake Watershed Management Planning

This Plan presents general *technical guidelines*. Specific conditions will require site-specific modifications of the practices described or an alternative practice that is approved by a local permitting authority. The Mercer Lake Association Lake Management Plan provides a discussion of existing conditions and recommendations for runoff water and lake water quality protection and improvements. The Plan is intended as a reference and a guide for water quality and water quantity professionals as the community continues to develop within and beyond the local Watershed. We say beyond because this Plan considers only the local Watershed for the Mercer Lake area. Also affecting water quality in these Lakes are Watershed activities upstream of the Mercer Lake area. This area, although less developed now, is potential for future development. The need for planning water quality improvements is now, such that future developments can be designed to improve future runoff water quantity and water quality to protect and preserve the character of these lakes and other surface waters.

There are several reasons why technical guidance regarding watershed water quality management is necessary:

Location: The Mercer Lake watershed is located in the Town of Mercer, Iron County.

Tourism: Mercer Lake has approximately 4 miles of shoreline to enjoy and a public boat access just south of the downtown commercial area. To maintain the attractiveness of the area, one of the most important tasks is to maintain and/or improve the quality of surface water in the area. A significant portion of the Town of Mercer economy depends on tourism.

Growth: Because of its natural beauty and numerous lakes, the Town of Mercer has and will continue to experience growth in both relocation and tourist activity. The population of this area is growing; 6.2% from 2000 to 2006 and it is projected to increase by over 10% by the year 2025. In addition to a steady growth of residents, the area attracts a large number of tourists. Tourists, who become seasonal visitors, and eventually permanent residents, are seen as the primary population growth. Although not all of the additional growth will be within the Mercer Lake Watershed, planning for proper runoff water management is necessary to address the anticipated increase in runoff water as land use development increases. Real estate values of the property on and around the Mercer Lake Watershed will be significantly impacted by water quality.

Development: This watershed is experiencing greater development pressure due to its natural beauty and its proximity to Highway 51, Mercer's urban area including Mercer's new industrial park. Population growth translates to land development, which is a recognized source of nonpoint source pollutions, or "polluted runoff." The Plan proposes BMPs (best management practices) to minimize the discharge of pollutants from developing areas, both during the construction phase and for the life of the development. In many cases, these BMPs can be used just as effectively to reduce polluted runoff from existing land development.

Water Quality Concerns: Many water bodies throughout the state are not in compliance with state water quality standards. Beneficial uses such as domestic and agricultural water supply, fishing, swimming, and boating, can be impaired due to excessive pollutants carried into the lakes and streams by storm water runoff. This Plan provides guidance for controls through the use of BMPs to reduce these pollutants, with special consideration for total phosphorus and total suspended sediments.

1.6. Components of Watershed Planning (from *The Wisconsin Storm Water Manual*)

The Mercer Lake Association is recommending the adoption of runoff water planning and controls with the presentation of this Plan to the local Township.

The adoption of this Plan will require:

- Land Use Planning
- Performance, Design Criteria, and Implementation for Runoff Water Best Management Practices (BMPs)
- Financing Mechanisms
- Storm Water, Nutrient, and Erosion Control Ordinances
- Further Investigation of Water Quality Factors

Before completing any component of the Plan, the Lake Association recommends the Township develop an outline for a Runoff Water Management Plan. There are four fundamental elements to consider when protecting human and environmental concerns:

- Flood Control
- Water Resource Protection
- Generic Nonpoint Source Pollutant Control

- Specific Nonpoint Source Pollutant Control

1.7. Updates to the Plan

The practice of lake watershed water quality management is quickly evolving and this Plan must be updated as new information is available. Design information for various BMPs (Best Management Practices) is expected to change as more people apply the practices and learn from their experience. New BMPs will be developed for specific situations that will improve runoff water quality. The Plan should be considered dynamic and regular updates incorporated. Updates to the plan include:

- Lake Protection Grant to be submitted in May of 2007 to further study the sedimentation of the Lake and develop a phosphorus and water budget.
- Information obtained from DOT Highway 51 and storm sewer project.
- Any future regional BMPs.
- Future watershed studies related to water quality that are currently unidentified.

Revisions to the plan will be made as needed as new information and data is collected. The plan should be updated after the DOT and USGS Lake Protection Grant projects are complete. Both projects will include a significant amount of data collection and should be completed by 2012 The year 2012 should be a good time for a major revision to take place on this preliminary plan.

CHAPTER 2: PHYSICAL ENVIRONMENT

Lake Watershed Management requires understanding the existing conditions and resources within the select watershed boundaries. Thus, understanding the physical environment and the history of the Mercer Lake Watershed is critical to determine the policies and standards that best protect the water resources of this Watershed while meeting the needs of local inhabitants.

Time, geologic processes (plate tectonics, glaciations, and erosion), and the biology of the region have defined the physical environment of the Mercer Lake Watershed over the course of the past 500 million years. The distribution of bedrock, unconsolidated (loose) sediments, landforms, and structural features in the watershed are the geologic backbone on which the biological and human environments exist. The characteristics of the physical environment ultimately determine the availability of natural resources, the susceptibility of resources to pollution, and success of organisms living in the watershed.

2.1. Bedrock Geology

Underlying the unconsolidated surficial sediment is bedrock. The bedrock in the Town of Mercer consists of Early Proterozoic Age sequences some 1630-1880 million years old. Specifically, two Early Proterozoic Age formations are found in the Mercer Lake Watershed. These are Archean gneisses and metavolcanic sequences.

2.2. Geomorphology and Surface Geology

The relief (variation in height and slope), or geomorphology, of the landscape establishes watershed drainage patterns and drives the local hydrologic (water) cycle. Erosion exacerbates the relief and varies the runoff rates. The Mercer Lake Area is the partially unconsolidated (loosely arranged or uncemented) sediments such as sand, loamy sands, gravel, cobbles, and boulders existing above the sub-surface bedrock interface. In some areas these unconsolidated sediments are quite thin (10 feet or less), yet in other areas, they are quite thick. The State of Wisconsin maps the overburden in this Watershed at thicknesses of 100 to 300 feet.

2.3. Hydrogeology

Ground water in the Mercer area is directly influenced by infiltration and the lakes and rivers and the tributaries that traverse the region. The primary regional hydrogeologic (ground water) divide in this region is Mercer and Grand Portage Lake. The Little Turtle River flows south from the southwestern edge of Mercer Lake and ground water in the project area is generally considered to be flowing towards the river and the Lake.

The sensitivity of the ground water contamination by surface activities is a function of the permeability of the surface soils, depth to ground water, depth to underlying bedrock, and the types of overlying soils/sediments. The Northwest Regional Planning Commission has mapped this region as moderate to highly susceptible to ground water contamination. Because the presence of near surface sandy soils provides a land surface that has a high capacity to infiltrate surface water and dissolved contaminants to the ground water. However, the sandy thicker deposits of unsaturated soils also act as an excellent filter to remove inorganic and organic

particulate matter (suspended solids) from the infiltrating surface waters and can be readily adapted to storm water infiltration areas with the addition of finer grained materials.

2.4. Soils

When bedrock and sediments are exposed on the Earth's surface, the rocks and minerals erode and decompose (weather).

Over time, soils develop horizons (a vertical differentiation based on observable physical and chemical properties).

- The **O Horizon** is an accumulation of organic material on the soil surface characterized by decomposing plant material with little mineral content.
- The **A Horizon** (or top soil) is an accumulation of organic material, with a loose or open texture, and is leached of dissolved chemicals and fine particles.
- The **E Horizon** is a light-colored layer characterized by leaching of iron and aluminum with a lower organic content.
- The **B Horizon** is the horizon where the material leached from the A and E Horizons tends to accumulate.
- The **C Horizon** is made up of slightly weathered parent material that has not undergone leaching or accumulation.

Depending on the soil forming factors acting on a surface, some of the horizons may be poorly developed or missing; and removing, compacting, and/or mixing soil horizons dramatically alters the soil's ability to sustain vegetation.

Soil descriptions are based on their physical and chemical properties. Soil classification systems are used to group soils of similar properties and to provide a systematic means of mapping. For the purposes of this Management Plan, the soils of the watershed are classified by their hydrologic soil group (HSG). This classification system is based on infiltration rates (water movement into soil) and transmission (water movement through soil) rates. The HSG classification of a soil describes the potential of that soil type to produce runoff. The four hydrologic soil groups as defined by USDA (1955) are:

- **Group A:** Well to excessively drained soils such as sands and gravels. High infiltration rate even when thoroughly wetted. Transmission >0.30 inches per hour.
- **Group B**: Moderately well to well-drained soils such as sandy silty soils. Moderate infiltration rates when thoroughly wetted. Transmission between 0.15 and 0.30 inches per hour.

- **Group C**: Soils with an impeding layer to downward movement such as silty sands and silts. Low infiltration rates when thoroughly wetted. Transmission between 0.05 and 0.15 inches per hour.

- **Group D**: Soils which are almost impervious at or near the surface such as clay. Very low infiltration rates when thoroughly wetted. Transmission between 0 and 0.05 inches per hour.

- **Note**: Soils that do not meet the criteria of Group A, B, C, or D may be saturated and therefore would not have an established rate of infiltration.

Soils in this region are typically mapped as Group A or B soils (Over 90%). Some less permeable soils are present but are typically found in low lying, wet areas.

Soil chemistry in this region has been evaluated by the EPA and others to contain significantly higher concentrations of phosphorous than soils west of the Mississippi. This could be a direct reflection of the high phosphorous content of the decomposing vegetable matter (leaves) on the forest floor over the past 10,000 years.

Glaciers have influenced the geology and soils in the southern third of Iron County and more specifically the Mercer Lake Watershed. The parent material for the soils around Mercer Lake is called, pitted glacial outwash plains. Glacial Outwash can best be explained by the following; when the glaciers formed, the ice sheets transported a great amount of rock debris called drift. As the ice sheets melted, the drift was reworked by running water. Large amounts of sand and gravel were deposited to form outwash plains. Pits were formed in the outwash where buried blocks of ice melted and many of these are now occupied by lakes.

The typical soil profile for the majority of the map units in the Mercer Lake Watershed would be a loamy sand surface ranging between 70-85% sand, underlain by either sand, gravelly sand or stratified very coarse sands. The high sand content in these soils will lead to high infiltration rates, lower water holding capacities, and drainage rates ranging from excessively well to moderately well drained. The surface horizon would have lower organic matter content making it difficult for new plants to establish readily because of the lower available nutrient capacity. The topography in this area ranges from flat to hilly with slopes between 0% and 30%. Jack pines, low sweet blueberries and sweetfern plants would be abundant in this watershed.

There are two map units 407A Seelyeville and Markey Soils and 418A Loxely and Dawson soils, that are organics in the concave topographic position and are very poorly drained. These organic soils will have an herbaceous mucky layer from the surface to approximately 50 to 80 inches in depth. At deeper depths sandy material will be encountered. The topography associated with these soils is concave and slope ranges form 0% to 1%. Vegetation associated with these map units include; sphagnum peat moss, tamaracks, leather leaf, cattails and tag alders.

CHAPTER 3 LAKE WATER QUALITY

An important tool in effective runoff water management is information of existing conditions, problems, and opportunities. This Lake Watershed Management Plan identifies local watershed and sub-watershed boundaries; and, natural and manmade drainage and storage features. The Plan describes the existing problems related to drainage, sedimentation, degradation of existing natural resources, and storm water quality. Based on existing and future land use conditions, the Plan proposes effective requirements for existing land uses, new developments, and remediation needs.

Strategies that address the area's unique climate, topography, natural resources, hydrogeology, and land use patterns are necessary. By making use of regulatory, land use planning, and educational approaches whenever feasible, rather than costly structural solutions, the Mercer Lake Watershed can greatly reduce the ultimate costs of implementing a Watershed Management Plan. Public education, policy, and programs can reduce discharges of nutrients, sediments, old motor oil, household wastes, litter, anti-freeze, deicing chemicals, agricultural herbicides, pesticides, and fertilizers. Education of the younger population will encourage the development of habits and practices that will continually improve storm water runoff quality into the future.

Management techniques are similar from one part of the Watershed to another, but are accomplished with different methodologies. In new developments or redevelopment areas, the program emphasizes land use planning approaches using site plan and subdivision review to require specific storm water management actions. In existing rural and developed areas, the use of police and regulatory powers to abate, enjoin, or criminalize illicit discharges and the dumping of pollutants into the storm water system is crucial.

3.1. Lake Ecosystem

Stable ecosystems have great diversity and habitat. Water quality in a lake without wetlands, marshes, near shore shallow areas, or deep open water is more unstable than a lake with this diversity. However, as the years change, season-by-season, the diversity of the ecosystem naturally changes. While land use changes in the watershed, the effects of these changes may not be immediately seen in the lakes. The effects may take years, decades, or more before the negative impacts are realized.

Wisconsin lake shorelines were once natural with lush vegetation. Shoreline dwellings were sparse and considerably less modern than today; oars and manpower controlled boats; and a crowded lake meant seeing another person on the lake. A desire to have a place on a lake of such scenery and serenity soon became the beginning of the recent rush to acquire that refuge over the last 40 years. This rush to acquire that piece of serenity has resulted in many of the concerns discussed in this Lake Watershed Management Plan.

Living organisms around and in lakes require a special balanced habitat that provides food, shelter, oxygen, and other specific needs. "The margin of our water is the place where all life comes together…a bridge between two worlds. It is a place essential for plants and creatures to survive. As many as 90 percent of the living things in our lakes and rivers are found along their shallow margins and shores." (Rideau Canal, Parks Canada). This littoral zone provides a nursery for fish, refuge from predators, and it intercepts nutrients.

3.2. Watershed Description

Wisconsin is blessed with the third largest concentration of fresh water glacial lakes on the planet; only Ontario and Alaska have more. About 75 percent of the precipitation that falls to our lakes and land re-enters back into the earth's atmosphere from evaporation and plant transpiration. On flat land or sandy areas, water infiltrates to the ground water and moves toward lakes and rivers and excess water runs off the land and enters the lakes and rivers. Lake levels fluctuate season-to-season in response to rainfall events, outside temperature, dams, etc. Such fluctuations are characteristic of normal lake systems.

Lake types are dependant upon the water source and types of outflow for the individual water body.

A. A lake fed by precipitation, with limited runoff and ground water, and has no stream outlet is called a seepage lake.

B. A lake fed by ground water, with limited precipitation and runoff, and has a stream outlet is called a ground water drainage lake.

C. A lake fed by precipitation, ground water, runoff, and is drained by a stream outlet is called a drainage lake.

D. A manmade lake created by damming a stream, which still allows it to drain, is called an impoundment.

Table 3-1 . Sub-Watershed Areas

Sub-Watershed	Acres
A	102
B	160
C	34
D	123
E	172
F	227
G	238
H	112
I	177

Mercer Lake is classified as a drainage lake. The Lake is fed by the Grand Portage Lake and the Little Turtle River to the north and its outlet is the Little Turtle River to the southwest which eventually leads to the Little Turtle Flowage.

The Mercer Lake Watershed that is directly contributing to the Lake is calculated to be 1,344 acres (land area) in size with 9 primary sub-watersheds as identified in Table 3-1. These acreages include the lake surface areas.

Figure 3-1 Subwatersheds of Mercer Lake Area

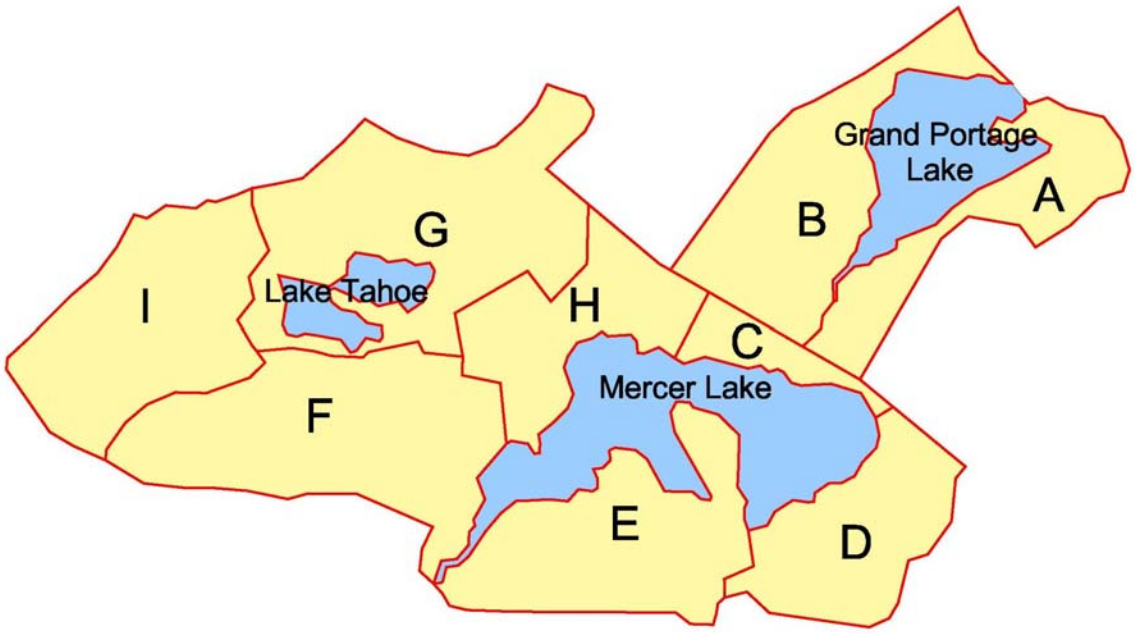


Table 3-2 lists the lakes within the sub-watershed study area and the surface area of each of those lakes: Runoff rates from natural landscapes are dependent on the slope of the topography, the absorption capacity of the soil and the evaporative uptake of lush vegetation. If best management practices are not in place, soil, water, nutrients, and other debris are collected by overland stormwater flow and carried to the lakes. The primary pollutant associated with forestry, agricultural, and development activities is eroding soil causing sedimentation. The secondary pollutants are nutrients, the increase of which in the lakes increases the viability of plant and algae life.

Table 3-2. Watershed Lakes

Lake Name	Acres (Surface Area)
Grand Portage Lake	180
Lake Tahoe	35
Mercer Lake	184

Grand Portage Lake is directly connected to Martha Lake to the north. Water upstream from Martha Lake does flow into Grand Portage Lake however we felt that this was a logical place to cut off the watershed study area due to the scope of the project and the topography of the area. The focus of the project is on the Mercer Lake Area and the drainage area of Martha Lake is flat and adding it to the watershed planning area would not alter the recommendations provided later in this management plan.

3.3. Oxygen Cycle

A healthy dissolved oxygen level for fish and plants is typically in the range of 7 to 11 mg/L (milligrams per liter). Dissolved oxygen (DO) refers to oxygen gas that is dissolved in water. Fish "breathe" oxygen just as land animals do. However, fish are able to absorb oxygen directly from the water into their bloodstream using gills, whereas land animals use lungs to absorb oxygen from the atmosphere. There are three main sources of oxygen in the aquatic environment: 1) direct diffusion from the atmosphere; 2) wind and wave action; and 3)

photosynthesis. Of these, photosynthesis by aquatic plants and phytoplankton is the most important.

Oxygen, derived from photosynthesis, is produced during the day when sunlight shines on the plants in the water. Oxygen levels drop at night because of respiration by plants and animals, including fish, and photosynthesis is not replenishing the oxygen level. These predictable changes in DO that occur every 24 hours are called the diurnal oxygen cycle.

In the fall, stratified lakes "turn over", mixing the lower and less oxygenated waters of the lake with the near surface higher oxygen content waters. With the onset of winter, lake water oxygen content will decline as decomposition of decaying plant life continues to absorb oxygen. If the ice is too thick and the decomposition rate is high, low DO levels can result in a high fish mortality.

3.3.a. Mixing

Mixing of water in the lakes by wave action increases dissolved oxygen concentrations. The depth, size, and shape of the lake controls the ability for water to mix which also controls the mixing of the nutrients. In the summer, wind action readily mixes those topographically unprotected shallow lakes. Because Mercer Lake is rather shallow, mixing in an important contributor to dissolved oxygen levels.

3.3.b. Stratification

Summer stratification in deeper lakes usually forms three layers. The warm surface layer is called the epilimnion, and oxygen is mixed from the atmosphere in this layer. The transition zone between warm surface water and cold, deep water is called the thermocline, or metalimnion. The cold bottom water is called the hypolimnion. Deeper lakes that do not mix usually have low oxygen levels in the hypolimnion as a result of decomposition of decaying matter. As the oxygen becomes used up, this layer tends to trap and concentrate nutrients dissolved from bottom sediments by anaerobic processes. These are deep lakes with well defined stratification.

3.3.c. Retention Time

A lake's size, water source, and watershed size determine the average length of time water remains in a lake, or the retention time. Another way to look at this would be to see how long it would take to fill a drained lake. The retention time for the Mercer Lake has yet to be calculated. However, considering the surface area, and depth of the lakes, and the outlet size and depth, one can readily conceive that the retention time is relatively long (months or perhaps years) in this lake. This means that suspended solids and nutrients will be retained in the lake, over longer periods, increasing the pollutant concentrations as additional nutrients and solids enter the lake.

3.4. Lake Water Quality

Lake water quality is almost synonymous with lake water clarity. The principal loading factors that results in decreased clarity are suspended solids and nutrients; increasing both factors

decreases water clarity and water quality. Water quality is, however, a multi-faceted parameter consisting of the inter-relationships of water clarity, nutrient and sediment contributions from watershed sources, and water chemistry (pH, hardness, and alkalinity). The following briefly describes the role and importance of these factors in water quality.

Two components determine water quality: materials dissolved in water and materials suspended in water (turbidity). Water quality can be relatively measured as water clarity. This measurement has been standardized (Table 3-3) with the use of a measuring device known as a Secchi disc. The standardized measurements are an indicator or measure of water clarity and can be compared to other chemical and physical properties of the lake and other lakes.

3.4.a. Water Clarity

A Secchi disc is an 8-inch diameter weighted, flat circular disc with four alternating black and white quadrants that can be lowered into a lake to visually measure water clarity. The depth at which the Secchi disc disappears can be related to the quantity of nutrients and type of algae present in the water column. Interpretation is relatively simple: the higher the readings, the clearer the lake. Cloud cover, sun's angle, and wave, action affect this reading, so it is recommended these measurements be performed on calm, sunny days between 10:00 a.m. and 2:00 p.m.

Table 3-3. Water Clarity Index

Water Clarity	Secchi Depth (ft)
Excellent	32
Very good	20
Good	10
Fair	7
Poor	5
Very Poor	3

Modified from: Understanding Lake Data, Table 2, WDNR

3.4. b. Nutrients

Runoff including stormwater discharge that contains high concentrations of phosphorus and nitrogen can lead to increased plant growth and algae blooms in the receiving waters. River impoundments have the greatest risk of increased rates of eutrophication as they have substantiated water input from upstream sources. In our region, phosphorus is typically the main nutrient controlling plant growth and algae blooms in water systems as nitrogen is typically available. Thus with only small concentrations of phosphorous, algae blooms are prevalent.

3.4.c. Trophic Status

Section 305b of the Clean Water Act requires each state to construct "fishable" and "swimmable" goals. Federal requirements in Section 314 of the Clean Water Act require all lakes of the nation be classified using a single criteria. Scientists have established criteria to evaluate the nutrient state of the lakes, since each is unique and at different levels of eutrophication.

Eutrophication is referred to as the process by which lakes are enriched with nutrients, accumulated sediments, productive aquatic plants, and algae. Table 3-4 below designates the TSI value/ranges and descriptions of the trophic state of the water and example lakes.

Table 3-4: Trophic State Index (TSI)		
TSI Value	**Water Quality Attributes**	**Fisheries, Recreation or Example Lakes**
<30	**Oligotrophic:** Clear water, oxygen through the year in the hypolimnion. Water supply may be suitable unfiltered.	Salmonid fisheries dominate.
30-40	Hypolimnia of shallower lakes may become anoxic during the summer.	Salmonid fisheries in deep lakes only. Example: Lake Superior (WDNR)
40-50	**Mesotrophic:** Water moderately clear but increasing probability of anoxia in hypolimnion during summer. Possible iron, manganese, taste and odor problems may worsen in water supply. Water turbidity requires filtration.	Walleye may predominate and hypolimnetic anoxia results in loss of salimonoids.
50-60	**Eutrophic:** Lower boundary of classic eutrophy. Decreased transparency, anoxic hypolimnion during the summer, macrophyte problems evident, warm water fisheries dominant.	Bass may dominate.
60-70	Dominance of blue-green algae, algal scums probable, extensive macrophyte problems. Possible episodes of severe taste and odor from water supply. Anoxic hypolimnion, water-water fisheries.	Nuisance macrophytes, algal scums and low transparency may discourage swimming and boating.
70-80	**Hypereutrophic:** Light limited productivity, dense algal blooms and macrophyte beds.	Lake Menomin & Tainter Lake, Dunn County, WI (WDNR).
>80	Algal scums, few macrophytes, summer fishery kills.	Dominant rough fish.

At present there are many opinions being presented that would alter the correlation between TSI and water quality. In this text, the table above, as presented by the WDNR, is used to describe the Trophic State of the Mercer Lake which is considered eutrophic with TSI values of 50 to 60.

3.5. Carbonate System

Biological productivity, lake acid buffering capacity, and solubility of toxic chemicals are affected by a lake's carbonate system. Many naturally occurring chemicals of this system constantly change with sunlight, temperature, each wave, and different biological activity.

3.5.a. Lake pH

An important aspect of the carbonate system is the acidity of pH of the lake. The pH indicates the amount of available hydrogen ions (H^+) in water. The more acid (pH less than 7) the water, the more hydrogen ions are present. Basic or alkaline water has less hydrogen ions (pH greater than 7). Neutral water has a pH of 7.

The pH in Wisconsin lakes ranges from 4.5 in reducing lakes to 8.4 in hard water lakes. Rainfall also varies in pH from 4.4 in southeast Wisconsin to 5.0 in northern Wisconsin (WDNR). These ranges are deceiving, as acid levels change 10 times for every pH unit. Therefore, a lake with a pH of 7 is 10 times more acidic than a lake with a pH of 8 because there are 10 times as many hydrogen ions.

Table 3-5 - Effects of Acidity on Fish Species	
Water pH	**Resulting Effect**
3.0	Toxic to all fish
3.5	Perch disappear
4.5	Perch spawning inhibited
4.7	Brown bullhead, northern pike, pumpkinseed, rock bass, sunfish and white sucker disappear
5.0	Spawning inhibited in many fish
5.2	Burbot, lake trout, & walleye disappear
5.5	Smallmouth bass disappear
5.8	Lake trout spawning inhibited
6.5	Walleye spawning inhibited

Source: Olszyk 1980

Most fish thrive in water within a range of 5 to 9 pH values. Moderately low pH doesn't usually harm fish, however, with lower pH concentrations; metals (aluminum, iron, mercury and zinc) become soluble and are released from the lake bottom sediments. Lakes that contain more acidic waters usually have tainted fish due to high levels of mercury or aluminum. When eagles, loons, osprey, or humans eat tainted fish, the metals accumulate in their bodies and can threaten their health. The relative affects of lake water acidity on fish species are given in Table 3-5. Note the sensitivity of the walleye fishery to a pH of 6.5 or less.

3.5.b. Alkalinity and Hardness

Alkalinity and hardness of lake water is affected by the quantities of impurities that dissolve or come in contact with lake water, soil minerals, and bedrock. Bicarbonate and carbonate are two alkaline compounds that act as acid buffers and are usually found combined with calcium (calcium carbonate: calcite or limestone) and magnesium (calcium magnesium carbonate: dolomite).

Much of northern Wisconsin contains glacial deposits that contain very little to no limestone. Therefore, these soils that have a higher sand content tend to have lower alkalinity and hardness values. However, if a lake receives groundwater through limestone bedrock, the water will have higher alkalinity and hardness. More fish and aquatic plants are produced in hard water lakes than soft water lakes.

Table 3-6 Hardness Categorization	
Total Hardness (mg/L $CaCO_3$)	**Hardness Level**
0-60	Soft
60-120	Moderately Hard
120-180	Hardness Level
> 180	Very Hard

3.6. Mercer Lake Water Quality

Lake water quality data (Secchi Depth, phosphorous concentration, temperature, and chlorophyll *'a'* data) has been collected from Mercer Lake for a few years. This data has been collected as

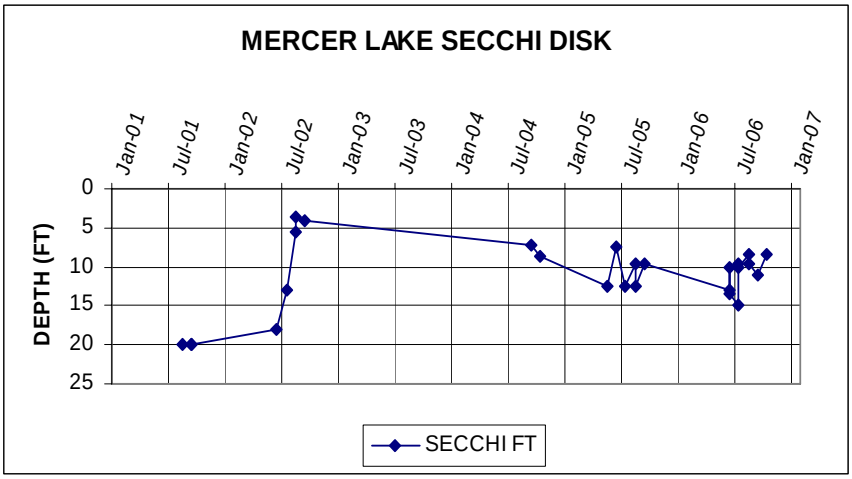
part of the Association's Self-Help Monitoring program and the WDNR Basin Management projects. The data is available on the Internet through the DNR Storet Lake Water Quality database.

The compiled data is included in Tables 3-7, 3-8, and 3-9 and Figure 3-2. Table 3-7 presents the water quality data collected in 2002, Table 3-8 the Secchi Disk data, and 3-9 the dissolved oxygen concentration and temperature data. Figure 3-2 is the graph depicting the Secchi Depth readings between 2002 and 2006.

Table 3-7 Water Quality Data Collected in 2002

PARAMETER	RESULT	UNITS
TEMPERATURE - FIELD	22.9	C
CLOUD COVER	80	%
COLOR	50	SU
CONDUCTIVITY FIELD	145	UMHOS/CM
CONDUCTIVITY AT 25C	147	UMHOS/CM
DISSOLVED OXYGEN	8.7	MG/L
PH FIELD	8.7	SU
PH LAB	8.54	SU
ALKALINITY TOTAL CACO3	57	MG/L
NITROGEN KJELDAHL TOTAL	0.43	MG/L
PHOSPHORUS TOTAL	18	ug/l
CALCIUM TOTAL RECOVERABLE	18.3	MG/L
MAGNESIUM TOTAL RECOVERABLE	5.3	MG/L
SAMPLE SIZE LITERS	1000	ML
CHLOROPHYLL A TRICHROMATIC UNCORRECTED	3.95	ug/l
SECCHI DEPTH - FEET	12.5	FT

Figure 3-2 Secchi Depth Readings



A review of Table 3-8 indicates Secchi values ranging from 22 to 4 for Secchi Depth. Secchi Depth values decrease (indicating increased turbidity in the lake) in the summer months. Secchi Depth averaged 8.0 to 8.8 in 2001, 2002, and 10.8 in 2005 and 2006.

Table 3-8 Secchi Disk Data

STORET STATION	SITE NAME	DATE	SECCHI FT	WATER LEVEL	CLARITY	COLOR
263126	DEEP HOLE	8/28/2001	20	Low	Clear	Blue
		9/14/2001	20	Low	Clear	Blue
		9/28/2001	20	Low	Clear	Blue
263126	DEEP HOLE	6/7/2002	18	Normal	Clear	Green
		7/9/2002	13	Normal	Clear	Green
		8/5/2002	5.5	Normal	Clear	Green
		8/29/2002	3.5	High	Murky	Green
		9/8/2002	4	High	Murky	Brown
263177	Home Base	9/10/2004	7.25	Low	Clear	Blue
		10/5/2004	8.75	Low	Clear	Blue
263177	Home Base	5/24/2005	12.5	Low	Clear	Blue
		6/30/2005	7.5	Normal	Clear	Blue
		7/14/2005	12.5	Low	Clear	Blue
		8/14/2005	9.5	Low	Clear	Blue
		8/31/2005	12.5	Low	Clear	Blue
		9/27/2005	9.5	Low	Clear	Blue
263126	DEEP HOLE	6/3/2006	13	Low	Clear	Blue
		6/26/2006	10	Low	Clear	Blue
		6/27/2006	13.5	Low	Clear	Blue
		7/13/2006	15	Low	Clear	Blue
		7/24/2006	9.5	Low	Clear	Blue
		7/29/2006	10	Low	Clear	Blue
		8/22/2006	8.5	Low	Clear	Blue
		8/30/2006	9.5	Normal	Clear	Blue
		9/15/2006	11	Normal	Clear	Blue
		10/15/2006	8.5	Low	Clear	Blue
The Secchi Dissk did not HIT BOTTOM during these measurements						

Table 3-9 Dissolved Oxygen and Temperature vs Depth

SAMPLE DATE	DEPTH [feet]	TEMPERATURE OF WATER [Deg. C]	DISSOLVED OXYGEN [mg/l]
6/26/2006	3	24	8
	6	23	6
	9	22	6
	12	20	6
	15	15	5
	18	13	3
	21	11	2
	24	10	2
7/24/2006	3	24	7.1
	6	24	7
	9	24	6.8
	12	24	6.6
	15	20	6.6
	18	16	3.5
	21	13	2.2
	24	11	
8/22/2006	3	23	8
	6	23	6
	9	23	6
	12	22	6
	15	21	5
	18	18	3
	21	14	2
	24	13	
10/15/2006	3	6	
	6	6	8
	9	6	8
	12	6	8
	15	6	8
	18	6	8
	21	6	8
	24	7	8

Presenting graphs of dissolved oxygen and temperature versus depth can be used to define the water layering or stratification discussed previously. Table 3-9 presents year 2006 profiles for Mercer Lake. The profiles are presented chronologically from top to bottom. The data presents multiple profiles representing summer, and fall measurements.

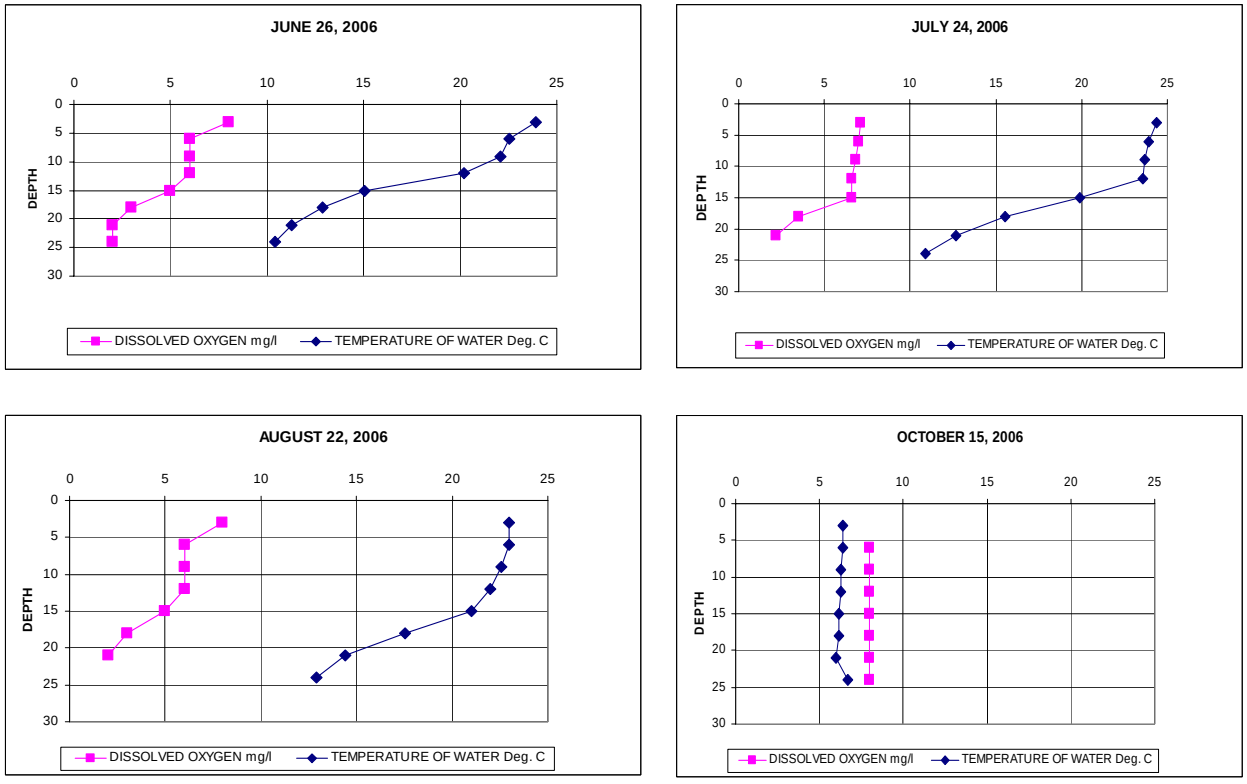
The early season measurements (June) presents stratified trends of DO and temperatures with increasing depth. The profiles of the measurements in the summer months reveal the development of stratification with a colder, near anoxic layer at depth in July, and August.

Anoxic is defined as DO with 0-1 mg/l. With the late summer/early fall turnover, one observes a return to a well mixed condition with similar temperatures with increasing depth and moderate (approximately 8 mg/L) dissolved oxygen concentrations as evidenced by the linear trends of DO and temperature with increasing depth in October.

It is during the low oxygen, low temperature periods that phosphorous, chemically bonded to lake sediments, is released into the lake water by anaerobic biological activity in the bottom detritus. The presence of the stratification observed in the 2006 data suggests that if bottom sampling is completed seasonally, and if water profile samples were collected from surface to the bottom of the lake, the concentrations of phosphorus would be reported at high concentrations in the bottom and deeper water samples in the summer months.

The presence of this phosphorus allows the lake to self fertilize during periods of turnover (typically in the fall), providing abundant nutrients for algae during the next growing season.

Figure 3-3 Dissolved Oxygen and Temperature Profiles for 2006



Water clarity suggests that Mercer Lake has moderate to good water clarity. However, their Secchi Depth measurements degrade from 20 to 10 feet (spring to summer) indicates that the phosphorus concentrations are high enough to support algae growth during the summer months.

Current phosphorus and chlorophyll-*a* measurements (18 mg/L and 3.95 mg/L) suggest that water quality is eutrophic (TSI between 50-60), so planning and protection at this stage is vital to achieve long term future water quality goals.

CHAPTER 4: LAND USES AND WATERSHED IMPACTS

4.1. General

A watershed is a land surface in which the overland runoff can be traced to a predicted outlet; thus, the entire area of one watershed drains to one location in that watershed. The Mercer Lake Watershed (1,651 acres including surface water) has been divided into sub-watersheds, five of which (668 acres) drain directly to Mercer Lake. The area is comprised of a few sub-watersheds; most of which ultimately outlet to ground water and/or Mercer Lake. The surface waters in this watershed comprise 307 acres of the watershed.

The land use in the Mercer Lake Watershed is primarily forest and rural residential with the balance in recreational, single- and multiple-family residential and commercial activities. There are few industrial sites. Each type of land use has different impacts on its portion of the watershed. Highly developed multi-residential, commercial, and industrial areas have a larger percentage of impervious surfaces which create a greater quantity of high velocity runoff than properties that are less developed. To a lesser degree but also with the ability to impact lake water quality are residential areas which have a percentage of impervious areas and lower rates of runoff water pollutants. Generally, these areas have been considered by many to have a low impact on water quality. However, when the majority of residential development is on the shoreline, directly adjacent to the water, residential land use can have a significant impact on water quality. Undeveloped woodland forests and grass lands create even less runoff than the developed areas due to greater infiltration and transpiration.

4.2. Statement of Problems

Runoff rates from natural landscapes such as wetlands, prairies, and woodlands are quite low due to the absorptive capacity of the soil and the evaporative uptake of lush vegetation. When surface runoff does occur, it is often temporarily stored in adjacent depressions and wetlands. During very wet periods, overland flow drains the landscape via small swales, ditches, and streams, eventually reaching large rivers and lakes.

Historically, many natural storage areas, swales, drainage ways, and wetlands have been completely eliminated by forestry and development practices. The net effect is increased downstream water volume, forcing more water into existing natural and constructed conveyance systems and floodplains. The effect of uncontrolled forestry and development practices is a substantial increase in the magnitude and duration of flooding and resultant flood damages. An increase in logging activities in the early 1900s is the most likely cause in an increase in sedimentation in Mercer Lake (Garrison, 2003). Increased runoff rates also promote the destabilization of downstream channels, causing stream bank erosion and increased water quality pollutant load discharges.

Forestry and agricultural runoff is typically contaminated with sediment, phosphorus, bacteria, and nutrients. Residential and urban runoff, especially from streets and parking lots, is contaminated with sediment, heavy metals, bacteria, nutrients, and petroleum byproducts. During construction, erosion from uncontrolled development sites contributes much larger quantities of sediment and pollutant discharges to storm water runoff. Storm water runoff

pollutants degrade receiving rivers, lakes, streams, and creeks by killing sensitive aquatic life, encouraging the growth of non-native invasive vegetation, impairing aesthetic conditions, and making water recreation undesirable.

Daily drainage and water quality discharge problems are often highly visible and the public concerns ensure that these problems receive immediate attention. Long-term drainage and water quality discharge problems, on the other hand, often go unnoticed. The problems tend to intensify over a long period of time, and appear suddenly as a flood or recognized deterioration of water quality.

The major problem areas relating to land use in the Mercer Lake Watershed Planning Area include the Mercer urban area, the effects of the old sewage treatment plant, the Midwest Timber site adjacent to Grand Portage Lake that flows into Mercer Lake, pollutants from stormwater runoff from U.S. Highway 51, and residential septic systems.

The downtown commercial area is a significant source of sediment from impervious surfaces, nutrients that attach to sediments, and oils as well as other pollutant residue from the roads and highways. Currently there is no manmade buffer and very little natural buffering between the downtown and the lakeshore. One of the Town's storm sewers drains directly into Mercer Lake without any treatment thereby conveying much of the stormwater that is carrying sediments from the impervious downtown areas. Other stormwater drains discharge into the Little Turtle River upstream or into other areas of the Mercer Lake Watershed. All discharges are untreated. The Wisconsin Department of Transportation (WDOT) has recently reviewed the storm sewer system of Mercer's urban area and has found some of the storm sewer pipes to be partially collapsed and plugged restricting the DOT's ability to properly televise the pipes.

The old Mercer sewage treatment plant has had a significant negative impact on Mercer Lake's water quality. Many residents believed the plant's discharge pipe along the lake bottom ruptured shortly after construction and spilled effluent directly into the main body of the lake. The sewage treatment plant's design was to carry the effluent away and dump it downstream of Mercer Lake. When the pipe ruptured it caused the effluent to spill into the middle of the lake increasing the sedimentation. Wastewater effluent contains high concentrations of nutrients and is probably one of the most significant factors in the water quality degradation of Mercer Lake from 1965-1995. The sewage treatment plant was also operated in violation of its environmental operating permit requirements. The sewage plant exceeded effluent limits 66 times for the treatment plant's discharge into the outlet of Mercer Lake from June through August of 1990 according to a letter from the DNR to the Sanitary District in the fall of 1990. Once the treatment plant was taken off line and moved down the Little Turtle River, water quality in Mercer Lake improved moderately, but a significant sedimentation problem continues to exist.

The Midwest Timber site is a large tract of land comprised of mostly compacted soil with no vegetative covering. There are no stormwater control structures to capture sediment carried by stormwater off this site. Erosion and possible contamination from this site is carried almost directly into Grand Portage Lake and the Little Turtle River with very little natural buffering. To our knowledge there hasn't been any testing completed on that site. Considering some of the toxic chemicals used in timber production, the site may contain hazardous or chemical waste

from former timber practices. Further studies will need to be completed to determine the possible effects this site has on the water quality of Mercer Lake.

Repair of this situation may be partially funded through a Targeted Runoff Management Grant if appropriate approvals are obtained.

4.3. Land Use

To evaluate the impacts of development, two planning periods were chosen to assess land use and related storm water runoff impacts. Land use characteristics were projected for both planning periods. The planning periods used correspond to Wiscland, 1993, for present land use (Figure 4-1) and the land use map for the Town of Mercer for future (2025) projected land use. The land use area and percentages for Current and Future Land Use are presented in Table 4-1 through Table 4-10.

4.3.a. Delineated Current Land Use (Year 1993/2004)

Existing land use conditions utilized in the preparation of the Mercer Lake Watershed Management Plan water quantity and water quality modeling analyses are based on Wiscland (1993) and the Town of Mercer Comprehensive Plan 2004. Figure 4-1 shows the Current Land Use (2004) for the watershed planning area.

4.3.b. Delineated Future Land Use (Year 2025)

Proposed future land use conditions utilized for the preparation of the Mercer Lake Watershed Management Master Plan water quantity and water quality modeling analyses were based on Town of Mercer Comprehensive Plan – Land Use Element and available information from Iron County. Figure 4-2 shows the Future Land Use for the watershed planning area.

Table 4-1 Sub-watershed A Land Use

Current				Future			
Watershed	**Land Use**	**Acreage**	**Percentage**	**Watershed**	**Land Use**	**Acreage**	**Percentage**
A	Agricultural	4.49	4.42%	A	Agricultural	4.49	4.42%
A	Commercial	0.78	0.77%	A	Commercial	0.78	0.77%
A	Forestland	57.58	56.62%	A	Forestland	43.84	43.11%
A	Grassland	7.45	7.33%	A	Grassland	7.45	7.33%
A	Residential	0.22	0.22%	A	Residential	0.22	0.22%
A	Rural Residential	22.22	21.85%	A	Rural Residential	35.96	35.36%
A	Wetlands	8.95	8.80%	A	Wetlands	8.95	8.80%
	Total	101.69	100.00%		Total	101.69	100.00%

Table 4-2 Sub-watershed B Land Use

Current				Future			
Watershed	**Land Use**	**Acreage**	**Percentage**	**Watershed**	**Land Use**	**Acreage**	**Percentage**
B	Agricultural	30.41	19.02%	B	Agricultural	30.41	19.02%
B	Commercial	24.76	15.48%	B	Commercial	24.76	15.48%
B	Forestland	18.68	11.68%	B	Forestland	18.68	11.68%
B	Grassland	14.07	8.80%	B	Grassland	14.07	8.80%
B	Residential	68.71	42.97%	B	Residential	68.71	42.97%
B	Wetlands	3.29	2.06%	B	Wetlands	3.29	2.06%
	Total	159.92	100.00%		Total	159.92	100.00%

Table 4-3 Sub-watershed C Land Use

Current				Future			
Watershed	**Land Use**	**Acreage**	**Percentage**	**Watershed**	**Land Use**	**Acreage**	**Percentage**
C	Agricultural	0.85	2.47%	C	Agricultural	0.85	2.47%
C	Commercial	1.84	5.34%	C	Commercial	1.84	5.34%
C	Grassland	2.94	8.53%	C	Grassland	2.94	8.53%
C	Residential	28.85	83.67%	C	Residential	28.85	83.67%
	Total	34.48	100.00%		Total	34.48	100.00%

Table 4-4 Sub-watershed D Land Use

Current				Future			
Watershed	**Land Use**	**Acreage**	**Percentage**	**Watershed**	**Land Use**	**Acreage**	**Percentage**
D	Commercial	8.33	6.79%	D	Commercial	8.33	6.79%
D	Forestland	77.77	63.37%	D	Forestland	62.70	51.09%
D	Grassland	17.64	14.37%	D	Grassland	17.64	14.37%
D	Residential	16.14	13.15%	D	Residential	16.14	13.15%
D	Wetlands	2.85	2.32%	D	Rural Residential	15.07	12.28%
	Total	122.73	100.00%	D	Wetlands	2.85	2.32%
					Total	122.73	100.00%

Table 4-5 Sub-watershed E Land Use

Current				Future			
Watershed	**Land Use**	**Acreage**	**Percentage**	**Watershed**	**Land Use**	**Acreage**	**Percentage**
E	Agricultural	0.99	0.58%	E	Agricultural	0.99	0.58%
E	Forestland	115.79	67.40%	E	Forestland	98.46	57.31%
E	Grassland	5.16	3.00%	E	Grassland	5.16	3.00%
E	Residential	22.41	13.04%	E	Residential	26.87	15.64%
E	Rural Residential	25.11	14.62%	E	Rural Residential	37.98	22.11%
E	Wetlands	2.34	1.36%	E	Wetlands	2.34	1.36%
	Total	171.80	100.00%		Total	171.80	100.00%

Table 4-6 Sub-watershed F Land Use

Current				Future			
Watershed	**Land Use**	**Acreage**	**Percentage**	**Watershed**	**Land Use**	**Acreage**	**Percentage**
F	Agricultural	1.17	0.52%	F	Agricultural	1.17	0.52%
F	Forestland	100.38	44.29%	F	Forestland	90.17	39.78%
F	Grassland	4.79	2.11%	F	Grassland	4.79	2.11%
F	Open Water	0.75	0.33%	F	Open Water	0.75	0.33%
F	Residential	4.30	1.90%	F	Residential	14.51	6.40%
F	Wetlands	115.27	50.86%	F	Wetlands	115.27	50.86%
	Total	226.66	100.00%		Total	226.66	100.00%

Table 4-7 Sub-watershed G Land Use

Current				Future			
Watershed	**Land Use**	**Acreage**	**Percentage**	**Watershed**	**Land Use**	**Acreage**	**Percentage**
G	Agricultural	2.39	1.01%	G	Agricultural	2.39	1.01%
G	Forestland	88.20	37.12%	G	Forestland	85.97	36.18%
G	Grassland	45.72	19.24%	G	Grassland	45.72	19.24%
G	Open Water	0.05	0.02%	G	Industrial	1.11	0.47%
G	Residential	20.94	8.81%	G	Open Water	0.05	0.02%
G	Wetlands	80.29	33.79%	G	Residential	22.06	9.28%
	Total	237.59	100.00%	G	Wetlands	80.29	33.79%
					Total	237.59	100.00%

Table 4-8 Sub-watershed H Land Use

Current				Future			
Watershed	**Land Use**	**Acreage**	**Percentage**	**Watershed**	**Land Use**	**Acreage**	**Percentage**
H	Agricultural	1.88	1.68%	H	Agricultural	1.88	1.68%
H	Commercial	5.98	5.33%	H	Commercial	5.98	5.33%
H	Forestland	49.77	44.38%	H	Forestland	36.75	32.77%
H	Grassland	2.32	2.07%	H	Grassland	2.32	2.07%
H	Residential	17.79	15.86%	H	Residential	17.79	15.86%
H	Rural Residential	3.51	3.13%	H	Rural Residential	16.53	14.74%
H	Wetlands	30.89	27.55%	H	Wetlands	30.89	27.55%
	Total	112.14	100.00%		Total	112.14	100.00%

Table 4-9 Sub-watershed I Land Use

Current				Future			
Watershed	**Land Use**	**Acreage**	**Percentage**	**Watershed**	**Land Use**	**Acreage**	**Percentage**
I	Agricultural	0.38	0.21%	I	Agricultural	0.38	0.21%
I	Forestland	108.25	61.10%	I	Forestland	105.56	59.58%
I	Golf Course	25.79	14.56%	I	Golf Course	25.79	14.56%
I	Grassland	23.27	13.13%	I	Grassland	23.27	13.13%
I	Residential	3.27	1.85%	I	Industrial	2.69	1.52%
I	Wetlands	16.21	9.15%	I	Residential	3.27	1.85%
	Total	177.17	100.00%	I	Wetlands	16.21	9.15%
					Total	177.17	100.00%

4.3.c. Future Growth

The most significant findings of the land use study are:

- Current land use shows the watershed is comprised of over 616 acres of forest.
- The principal development in the watershed is currently as single-family residential.
- Future land use indicates that only 12% of the forest lands will be developed in the next 2 decades.
- Future land use is anticipated to be almost all rural residential/single family homes.

The land uses are summarized in Table 4-10 for both current and future conditions for the entire watershed planning area.

Table 4-10 Watershed Summary for Current and Future Land Uses

Current Land Use	Acreage	Percentage	Future Land Use	Acreage	Percentage
Agricultural	42.56	3.17%	Agricultural	42.56	3.17%
Commercial	41.69	3.10%	Commercial	41.69	3.10%
Forest	616.42	45.86%	Forest	542.13	40.33%
Golf Course	25.79	0.00%	Golf Course	25.79	1.92%
Grassland	123.36	9.18%	Grassland	123.36	9.18%
Industrial	0.00	0.00%	Industrial	3.80	0.28%
Open Water	0.80	0.06%	Open Water	0.80	0.06%
Single Family	182.63	13.59%	Single Family	198.42	14.76%
Rural Residential	50.84	3.78%	Rural Residential	105.54	7.85%
Wetland	260.09	19.35%	Wetland	260.09	19.35%
Total	1344.18	100.00%	Total	1344.18	100.00%

4.4 Discussion

Using land use alone, one would consider that there is little need for development controls. However, one must consider that historic use of the region has resulted in increasing the rate of lake aging (eutrophication) by the concentration of nutrient rich soils in the lakes during and after the logging era. Continued development in the watersheds, particularly adjacent to the lakes has increased the impact of eutrophication on the lakes. And continued uncontrolled surface water runoff from the existing developed areas will continue to contribute to water quality degradation.

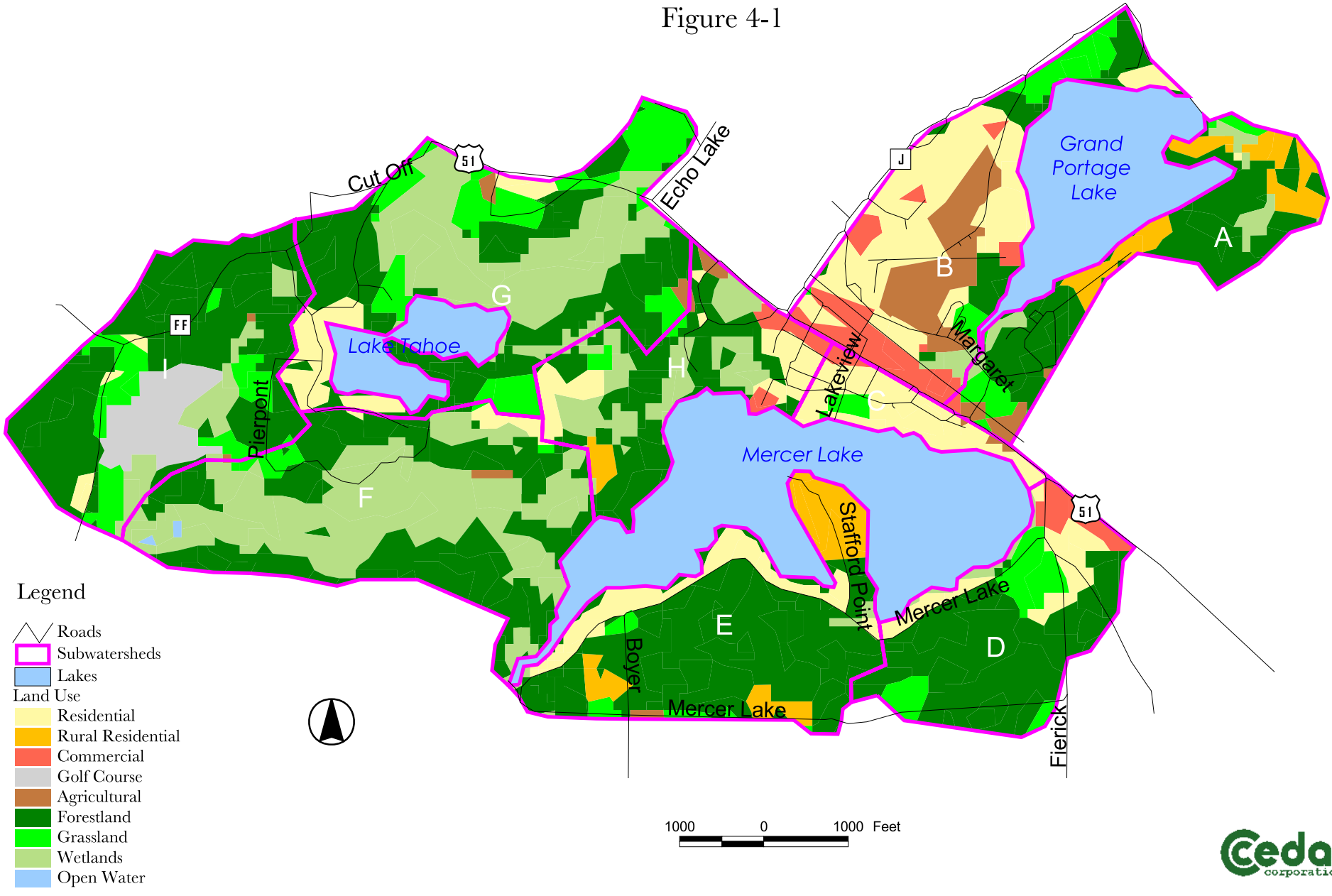
The two subwatersheds that are the most densely developed are B and C. Those two subwatersheds, account for over 60% of the commercial and over 50% of the single family residential land use of the entire watershed planning area. This area of the watershed planning area will have the greatest negative impact on water quality in regard to stormwater runoff.

CURRENT LAND USE 2004

MERCER LAKE ASSOCIATION

Iron County, Wisconsin

Figure 4-1

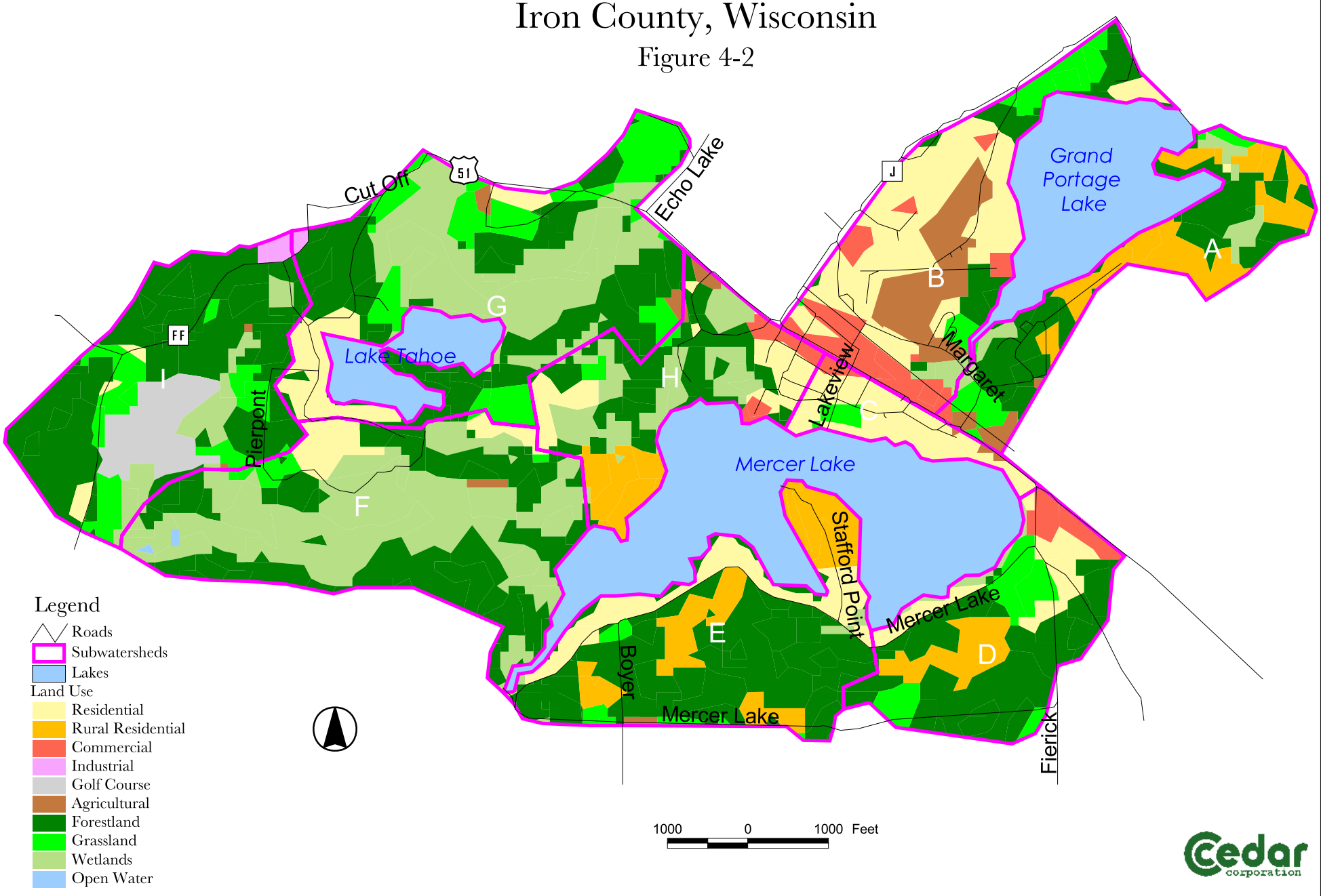


FUTURE LAND USE 2025

MERCER LAKE ASSOCIATION

Iron County, Wisconsin

Figure 4-2



CHAPTER 5: WATERSHED WATER MODELING

5.1 Storm Water Runoff Quantity

To provide a useful water quality planning document, an analysis using a computer model of the existing watershed system and existing conditions, and a model of the proposed future development must be conducted. The system analysis is a technical analysis of water quantity at given rates of precipitation and incorporating computer modeling of the land use, storm water runoff, storm water conveyance systems, overland drainage, wetlands, lakes, ponds, streams, channels, and water quality, and drainage ways. The analysis is accomplished using standard hydrologic and hydraulic modeling methodologies for storm water runoff quantity that includes components such as pipe flow, overland flow, drainage ways, and pond storage of storm water.

To calculate the runoff quantity, both manmade and natural features are considered. Land use, soils, overland drainage, and topography are modeled using "P-8 Urban Catchment System" version 2.4 to develop runoff quantity. P-8 stands for "Program for Predicting Polluting Particle Passage through Pits, Puddles, and Ponds", which more or less captures the basic features and functions of the model. P-8 is a computer aided design program designed to model the quality of storm water runoff and can also be used to estimate the quantity of stormwater runoff based on land use and soil types.

The procedure for calculating the storm water runoff quantity is as follows:

1. Delineate the overall lake watershed.
2. Delineate sub-watersheds for each lake that drains directly into the lake.
3. Identify existing and future land use within the watershed.
4. Identify the soils in the watershed.
5. Enter data into the P-8 model and calibrate the model.
6. Run the model for each sub-watershed to determine the quantity coming off the entire watershed planning area.

5.1.a. Watersheds

Nine sub-watersheds (labeled A-I as shown in Figure 5-1) delineated the area directly impacting the Mercer Lake. Hydrologic effects are influenced by tributary drainage areas, watershed shape, land use, soils, existing impoundment areas, and a variety of other factors.

The watershed delineation is based on a USGS topographic map with 10 foot contours. For modeling, the 10 foot contours were interpolated to a 2 foot contour interval. This means that existing smaller features in the landscape are not refined, and the modeling then is based on assumed contours and must be considered to provide generalized results.

5.1.b. Land Use

The land uses as defined in Chapter 4 are input into the water quantity models.

Although the future land use map for the Town of Mercer was used as a starting point, the information was modified to fit the criteria for a more accurate land cover analysis. Some areas that had one house on large tracts of forested land (greater than five acres) were still considered forested because the water runoff of these areas will more consistent to that of forestland than that of residential land.

Aside from land use, it is important to consider the housing density throughout the watershed, and more specifically along the lake shore. Higher density areas have more concentrated runoff that has an increased capacity to carry more nutrients and sediments into the lake. Because Mercer Lake is adjacent to a downtown commercial area, this area is also a major contributor to sediment and nutrient loading.

5.1.c. Soils

In order to estimate the effect soil type has on land use in the sub-watersheds, each observed soil type must be characterized to define its Hydrologic Soil Group (HSG) (Figure 5-2). The HSG (See page 2-2 for description of HSG soil types) distribution for soils in the Mercer Lake sub-watersheds is summarized in Table 5.1. The Mercer Lake sub-watersheds are dominated by sandy soils with high infiltration rates, which reduce the amount of pollutants transported to the lakes.

Table 5-1: HSG distribution for soils in the Mercer Lake Watershed Planning Area

Lake	HSG A [%]	HSG B [%]	HSG C [%]	HSG D [%]
Mercer Lake Watershed	44.5%	44.3%	0.0%	9.5%

Two P-8 models were completed: One for existing land use conditions (Year 2004) and one for future land use conditions (Year 2025). The results of the modeling are summarized in Table 5-2. The modeling results indicate some increase in watershed runoff from current to future development. This is to be expected as the predicted land use increase is of moderate impact (residential).

Table 5-2: Water Runoff Quantity for Each Sub-watershed

Current			Future		
WTR SHED	Area (Acres)	ACRE-FEET	WTR SHED	Area (Acres)	ACRE-FEET
A	101.69	19.99	**A**	101.69	20.78
B	159.92	62.43	**B**	159.92	62.43
C	34.48	8.91	**C**	34.48	8.91
D	122.73	31.33	**D**	122.73	32.20
I	171.80	26.03	**E**	171.80	27.02
F	226.66	90.99	**F**	226.66	91.58
G	237.59	74.48	**G**	237.59	76.02
H	112.14	41.37	**H**	112.14	42.12
I	177.17	31.64	**I**	177.17	31.30
Total	1,344.18	387.18	**Total**	1,344.18	392.34

The impact of this data is not always clear to those in the watershed. Suffice it to say that the sandy soils and low development pressure in this region have reduced the impacts on local surface water quality when compared to other more populated areas in Wisconsin. However, Mercer's urban area and lake shore property near the Lake has a negative effect on water quality.

5.2 Runoff Water Quality

Water quality modeling for this lake management plan is being completed to identify the annual contribution of nutrients and sediments to the lakes. It should be apparent that the larger watersheds will contribute greater loading if all other parameters are similar. We do not attempt to model the distribution of nutrients in the lake system itself. Additional, more involved studies of the nutrient and water balance such as the proposed USGS study (Assessment of the Hydrology, Water Quality, and Phosphorus Loading of Mercer Lake, Iron County, Wisconsin) outlined in Chapter 8 are necessary to understand this aspect of the system.

Modeling the quality of runoff water is completed using a combination of techniques. This rural area with little presence of agriculture and urban development and with a low forecast for such development requires less sophisticated modeling tools than more complexly developed areas.

To calculate the runoff water pollutant loads generated in the Mercer Lake watershed, two different methods were used:

Method 1: Compare the Mercer Lake watershed to similar watersheds where water quality data already exists.

Method 2: Use the WiLMS software to calculate phosphorus loads to Mercer Lake from the surrounding watersheds.

5.2.a. Method 1:

Water quality research has occurred in many watersheds. The Mercer Lake watershed was compared to such watersheds to identify the most similar watershed available. Results from research at Butternut Creek (Butternut Lake), Ashland/Price County [1] were used to estimate phosphorus and nitrogen loads from the watershed to the Lakes. Similarly, research from Little Balsam Creek, near Patzau, Douglas County [2] was used to estimate the sediment loads to the Lakes. Similar land use and soil types are the most important factor when deciding which basic watershed to use as a model for these calculations.

The research presents export coefficients (in terms of mass of pollutant per area per year) for the researched watersheds. These export coefficients were applied to the area of the Mercer Lake watershed to estimate the annual pollutant load to each lake. The results from Method 1 are presented in Table 5.3.

Table 5-3: Water Quality Results under Current Land Use Conditions from Method 1

Lake	**Total Phosphorus** [lb/yr]	**Total Nitrogen** [lb/yr]	**Total Suspended Solids** [lb/yr]
Mercer Lake	260	874	77,485

Table 5-4: Water Quality Results under Future Land Use Conditions from Method 1

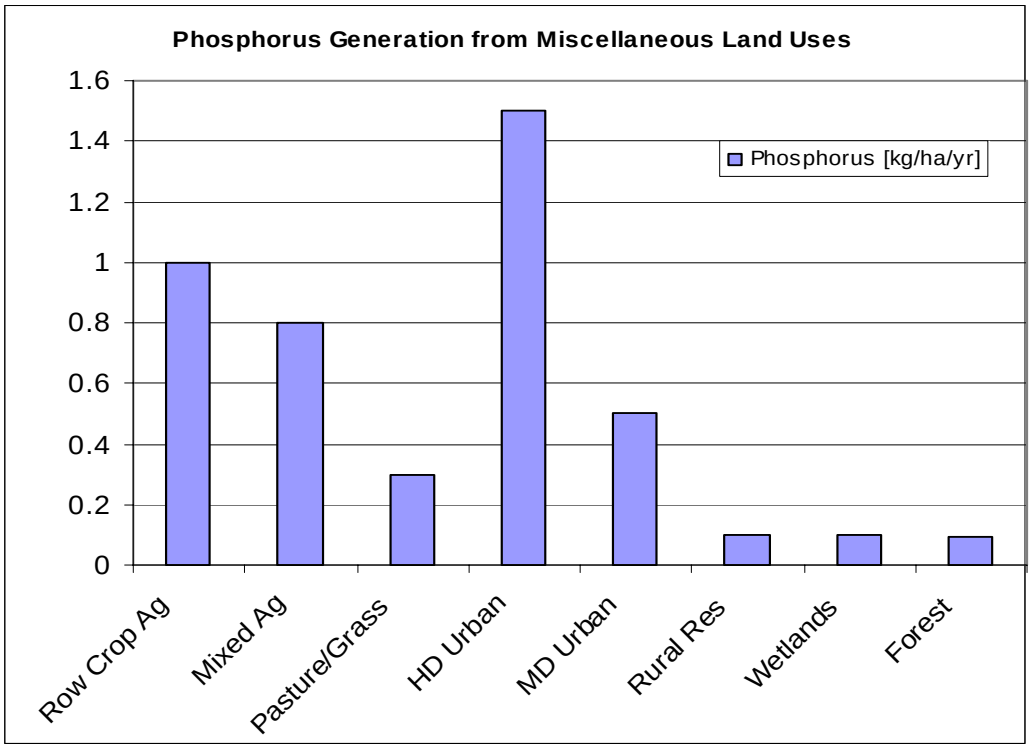
Lake	**Total Phosphorus** [lb/yr]	**Total Nitrogen** [lb/yr]	**Total Suspended Solids** [lb/yr]
Mercer Lake	276	948	82,665

5.2. b Method 2:

WiLMS (Wisconsin Lake Modeling Suite), a lake water quality-planning tool developed by WDNR, was also used to calculate the phosphorus load to the Lake. The model uses an annual time step to predict the average total phosphorus loading to the watershed discharge point (in this case, Mercer Lake). It is the latter output that we are interested in for this phase of the water quality modeling.

The model is suitable for rural settings as opposed to other programs such as P8 and WinSLAMM. Lake particulars, land use information, and WiLMS export coefficients are incorporated to calculate the phosphorus load to the Lake. Figure 5-3 illustrates the annual phosphorus loading from different land uses.

Figure 5-3: Phosphorus Generation from Miscellaneous Land Uses



Attempting to address each lake sub-watershed individually resulted in skewed results. Thus, we modeled the three sub-watersheds as one, with the lake surface areas representative of all lakes in the watersheds. The land uses presented in Table 4-1 Current were used in the modeling. The results are presented in Table 5-5, and the WiLMS data sheets are included in Appendix A.

The model input data uses the existing default data sets for precipitation for Iron County and the default export coefficients for specific land uses in the WiLMS model.

There are no point sources modeled in this watershed and by modeling all the lakes, we eliminate concerns about the nutrient mass transfer from one lake to the next, although it is tempting to do so, it is beyond the scope of this current project.

To estimate the contribution of septic systems, estimated numbers for septic systems, permanent residents, and seasonal residents were employed. Although there are a number of lakeshore residents on Mercer Lake, most of them are part of the sanitary district. Only about 11 homes fall outside of the sanitary district. A survey was also sent out during this Planning Grant project. Of those returned, only 40% identified themselves as permanent residents. We use this number to determine the number of permanent residents and seasonal residents. Using this information as a starting point, the following assumptions on septic system use are made.

The old sewage treatment plant was removed in 1995 and the new plant's discharge is located downstream of Mercer Lake on the Little Turtle River. It is therefore difficult to determine what the sewage treatment plant's phosphorus contribution is to the current water quality. It evidently has had some effect on water quality and sedimentation in the past and present. The sewage treatment plant effluent deposited in the lake likely was and still is a large source of sediment and nutrient load into the Lake. Information obtained from the upcoming USGS Lake Protection project, pertaining to the sewage treatment plant's effluent will be incorporated into future modeling efforts.

Assumption 1:	11 residences on Mercer Lake (not in sanitary district)
Assumption 2:	31 residences on Grand Portage Lake (not in sanitary district but flows directly into Mercer Lake)
Assumption 3:	17 permanent residences (total) 25 seasonal residences (total)
Assumption 4:	3 persons per permanent residence (most are retired)
Assumption 5:	4 persons per seasonal residence. Seasonal residents spend 0.4 years on site.

Septic System Per Capita Usage: 3 x 17 + 4 x 0.4 x 25 = 91 septic units (Mercer Lake)

Assumption 6: Future non-point source loading is estimated at 50% through future BMP implementation.

Table 5-5 presents the "most likely" phosphorous loading for the Mercer Lake.

Source	Current [lbs/yr]	Future [lbs/yr]
Non-point - Human Impact	94.8	94.8
Non-point - Natural	74.96	79.37
Lake Surface	44.09	44.09
Septic Tanks	10.03	13.01
	223.88	231.26

5.2.c. Conclusions

As WiLMS is assumed to provide a more accurate phosphorus loading estimate than Method 1, and since the actual land use in the Mercer Lake watershed is used in the WiLMS calculation, then the WiLMS phosphorus loading estimate should be used as a future reference in the Mercer Lake planning process. Table 5-6 presents the final results for annual pollutant loading to the Lakes. Note that the Total Phosphorous Loading reported here DOES NOT include the Lake Surface Precipitation of Phosphorous.

Table 5-6: Final water quality results for the Mercer Lake Watershed Planning Area.

Lake	**Total Phosphorus** [lb/yr]	**Total Nitrogen** [lb/yr]	**Total Suspended Solids** [lb/yr]
Mercer Lake	224	874	77,485

It should be noted that the water quality modeling is used here to predict the nutrient and sediment loading from the watershed to the lake. As Mercer Lake is connected, there will also be a transfer of "pollutant loads" from Grand Portage Lake (Little Turtle River Watershed) to Mercer Lake within the lake system. These affects are not taken into account in this modeling scenario as the purpose of this plan is to address watershed water quality concerns before they enter the lake system and not predict phosphorous concentrations in each lake. The impact of human development in the lakes watershed is estimated to be 34% of the phosphorous loading (runoff and septic system modeling) to the lakes. Caution must be applied in these conclusions. The watershed contribution modeling is at a very early stage and refinement of the model is warranted considering the limited data input at this time.

This modeling effort describes a significant contribution of watershed generated phosphorous to the Lakes. Effective measures are necessary to reduce this pollutant loading. These include the introduction of BMPs to reduce the overland non-point source runoff as well as address septic systems. The septic system contribution must be considered as an estimate at this time due to the numerous assumptions employed, therefore, we would recommend a Septic System survey to be completed to identify the

following for all lakes in this watershed. Once completed the phosphorous loading for the septic systems can be recalculated.

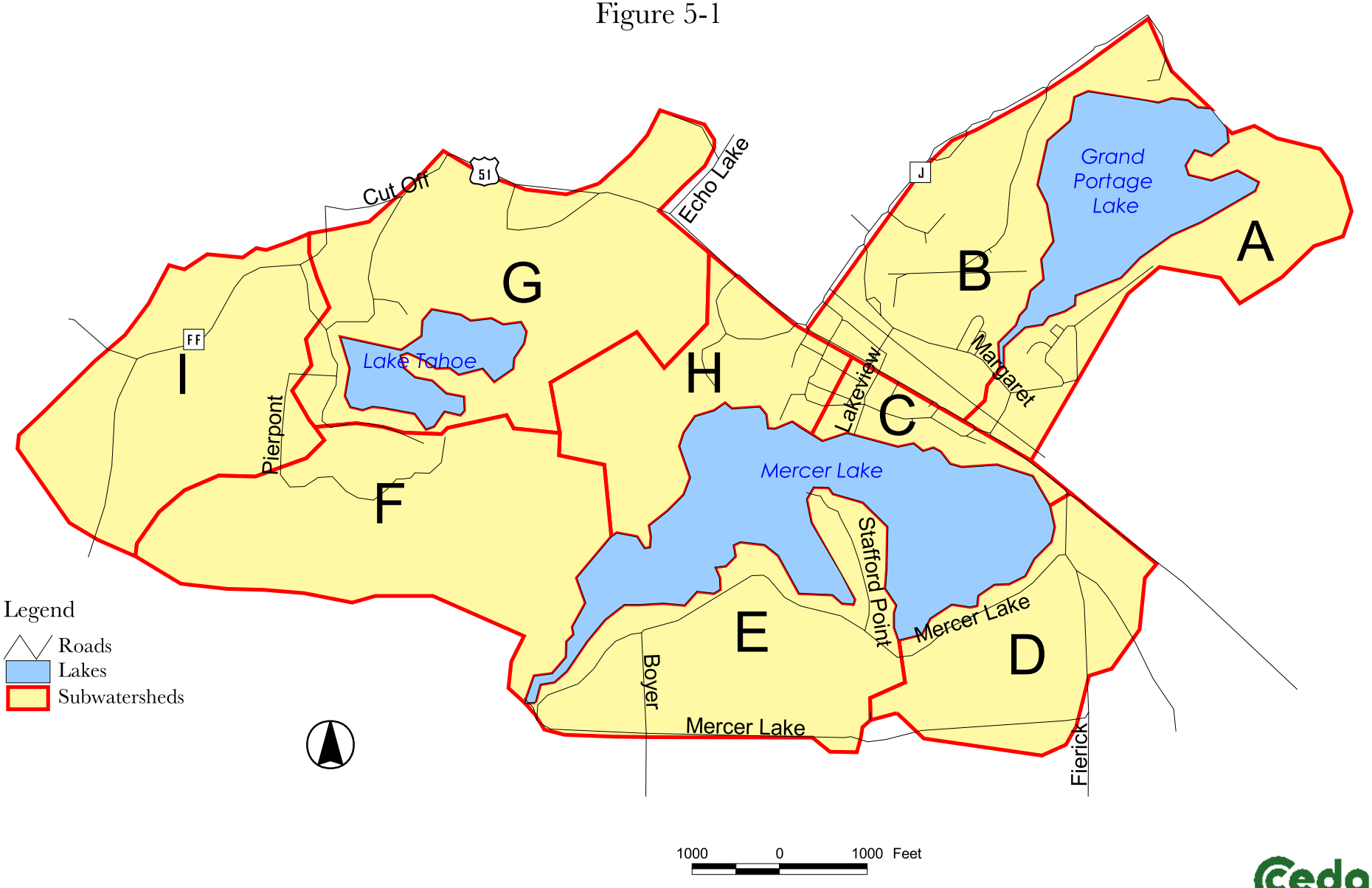
1. For Permanent and Seasonal residences alike per lake and on all lakes:
   Determine the number of persons per household, seasonal persons and time spent per year per resident.
2. Age of each septic system.
3. Determine the number of households within the sanitary district still using septic systems.
4. Develop phosphorous retention values based on soil type and septic system age.

SUBWATERSHEDS

MERCER LAKE ASSOCIATION

Iron County, Wisconsin

Figure 5-1

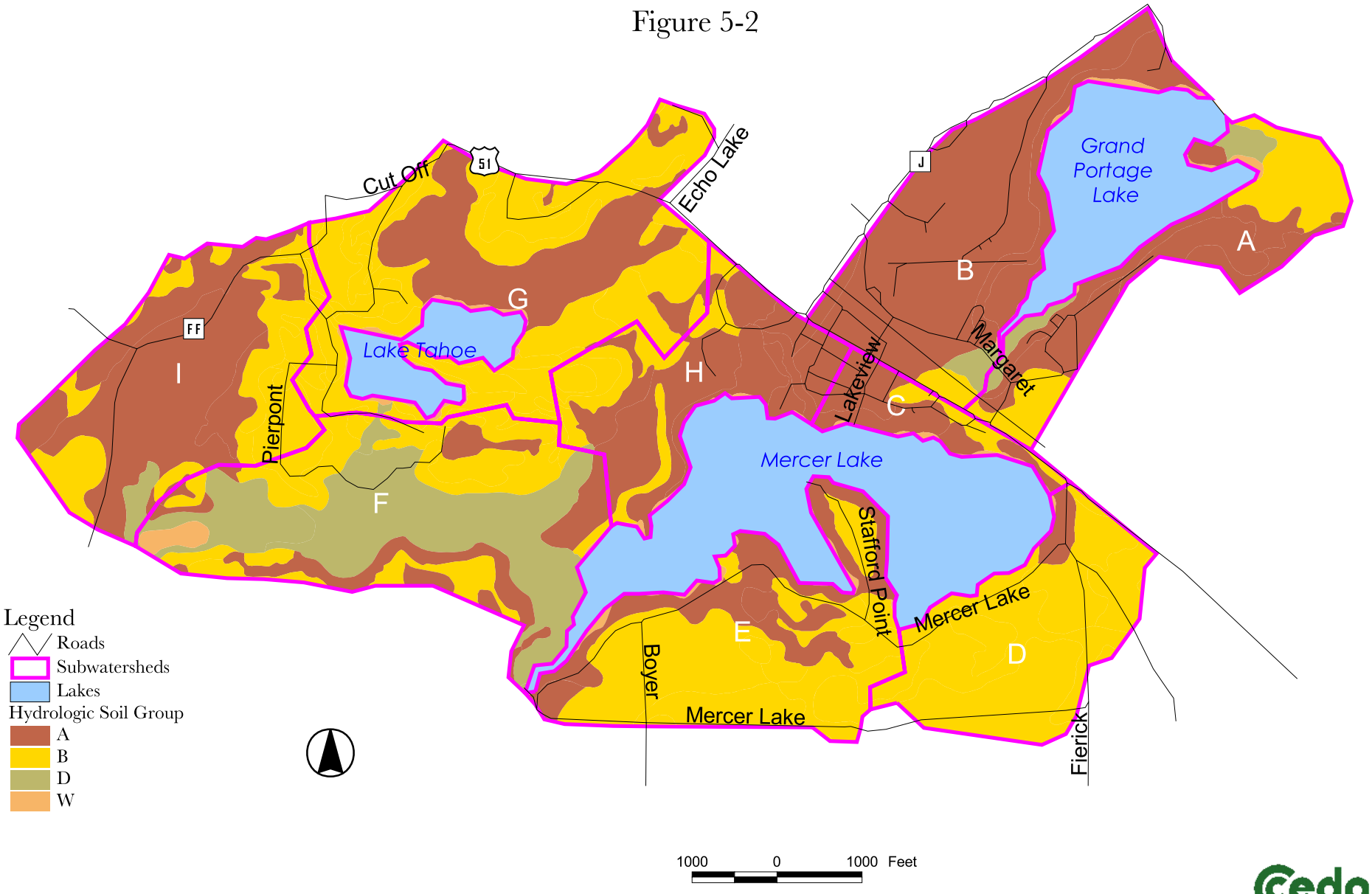


HYDROLOGIC SOIL GROUP

MERCER LAKE ASSOCIATION

Iron County, Wisconsin

Figure 5-2



CHAPTER 6: SOURCES OF PROBLEMS

6.1. Storm Sewer

Currently all of the major storm sewer outfalls are contributing the stormwater runoff from the downtown commercial area of Mercer directly into Mercer Lake or its watershed. Stormwater is not treated and whatever reaches the storm sewer inlets will be carried into the Lake. That includes oil sheen, fertilizers, pollutants from automobiles, sediments from erosion, and nutrients attached to those sediments. All of which are detrimental to the water quality of Mercer Lake. There is a lack of appropriate Best Management Practices (BMPs) throughout the Mercer Lake Watershed Planning Area. Generally, BMPs are accepted implementation methods that reduce the negative impact that stormwater runoff can have on surface waters. Examples of BMPs are discussed in greater detail in Chapter 9.

The storm sewer conveys stormwater runoff directly into Mercer Lake or its watershed without any BMPs, or treatment. The other problem with the storm sewer system is its age and the lack of information about its infrastructure. Until recently, there wasn't a map of the current system and little documentation of the conditions of those pipes. The WDOT recently tried to televise the storm sewer system and was unable to in some areas due to partially collapsed and plugged pipes. By 2012, the WDOT will have upgraded the storm sewer system and it will be important for the Town of Mercer, Mercer Lake Association, DNR, and WDOT to work together to implement appropriate BMPs at the outfalls of the pipes prior to the stormwater runoff reaching the Lake in order to limit further water quality degradation.

6.2. Boat Landing

The public boat landing was in terrible condition by the end of summer in 2006. There are very few parking spaces and the existing ramp is too narrow and doesn't extend far enough into the lake. The landing is somewhat steep and is a conveyance method for stormwater runoff to increase velocity and pick up sediment and nutrients that are left on the landing itself.

6.3. Sewage Treatment Plant

Lake water quality is considered eutrophic having occasional algal blooms and excessive weed growth. Recycling of accumulated phosphorus from bottom sediments, and loading from watershed and upstream sources are believed to be the major causes of the existing poor water quality. Mercer Lake area residents would like to improve the lake's water quality, which they feel was degraded by past sewage treatment plant discharge activities. Although a new plant has since been constructed down stream on the Little Turtle River, the actions of the past are having a negative effect on the present. Effluent from a sewage treatment plant on the northwest side of the lake was discharged directly into the lake from 1965 to 1995.

The practice of treated sewage effluent dumping to the lake ended in 1995. However, during the 30 years of operation, reduced water clarity and increased algae activity was noted (Garrison, Sediment Core Study). After 1995, a modest improvement in water clarity is observed, but this clarity has not improved over the past 10 years. It is suspected that in-lake nutrient levels are affected by either phosphorous release from the sediments and/or nutrient introduction from

watershed sources.

The old sewage treatment plant did have an effect the past and present water quality. According to the *Surface Water Resources of Iron County, 1970*, "Although this is treated effluent, increased nutrient levels can be anticipated in the discharge area. This probability may enhance the development of aquatic plants to even greater problem proportions." Before additional complications that resulted from the sewage treatment plant, the sewage effluent was expected to contribute to an increase in nutrient and plant growth. In addition, a letter from the DNR to the Sanitary District cited that the sewage treatment plant exceeded the discharge effluent permit limits 66 times between June 1990 and August of 1990. The sewage treatment plan ran in violation of the effluent limits thereby discharging more than the permitted amount of nutrient levels (which were already predicted to increase nutrient loads) into the Lake. Combine that with the pipe breaking and depositing the effluent in the middle of Mercer Lake, there certainly are some nutrient and sedimentation issues in the Lake currently in the Lake from past practices.

Residents also believe that the discharge pipe installed along the lake bottom may have ruptured soon after construction and spilled effluent directly into the main body of the lake until 1995. Littoral substrate materials were reported to be over 75% sand and rubble, with only 20% as muck, and that the lake was considered to have an aquatic weed problem (Wisconsin Department of Natural Resources, 1970). Presently, residents feel that the percent of muck has increased significantly, and that most of the substrate is now muck.

6.4. Property Owners

Issues that are primarily the result of residential development that affect the lake's water quality are described below:

6.4.a. Residences

Residential development, especially along the lakeshore, contributes to increased stormwater runoff. Stormwater flows over impervious surfaces such as rooftops, paths, and driveways. Impervious surfaces increase the velocity of stormwater and restrict infiltration. Most homes have rain gutters that channel the stormwater into a few drains increasing the runoff velocity which in turn increases the erosive force of the stormwater runoff.

6.4.b. Fertilizer Use

When property owners fertilize their lawns, especially lawns that are adjacent to the lakeshore, much of the nutrients from the fertilizer are carried away by stormwater runoff and deposited into the lake. These nutrients are a major source of water quality degradation often resulting in increased algae and decreased water clarity.

6.4.c. Shoreland Restoration

The principal impact on the watersheds occurred during the logging era and the erosion that followed included the removal of topsoils and organic matter by surface water runoff

and flooding which deposited these materials in the rivers and lakes. The reforestation came slowly along with limited residential and urban development. With development along the shorelines, the desire to view the pristine waters of the lakes resulted in a desire by residential developments that offered broad views of the lakes. These areas were typically dedicated to biological monocultures of grasses with some flowering plants and trees with removal of vital shoreline habitat. Lawn mowing and urban style landscaping has become the norm as has the application of fertilizers, herbicides, and pesticides.

Shorelines that were once anchored by littoral vegetation, fallen trees, and natural gravel deposits were also altered by removal of aquatic plants and woody debris to make way for docks, boat lifts, and boat houses. Gravel deposits were moved to create sandy bathing beaches. Removal of these materials has affected aquatic habitats that have altered the species and the diversity of the fauna in the lakes.

These activities further resulted in the ability of shoreland runoff waters to collect and deposit nutrients and sediments directly into the lakes. These pollutants are now causing siltation of once shallow bay areas and the growth of aquatic plants and algae in the lakes. The problem is exacerbated by the century old deposition of the organic matter in the lakes following the logging era which also provides additional nutrients in the lake during the summer months for the lake bottom sediments when the lakes are stratified. In Mercer Lake, sewage treatment plant nutrients compound the eutrophication process.

Shoreline buffers are recently being promoted as a restoration activity that can reduce the continued migration of sediment and nutrients from the shoreland to the lakes. There are a number of developed parcels along the shoreline that lack adequate vegetative cover.

6.4.d. Septic Systems

The Town of Mercer has a sanitary district which significantly reduces the amount of septic systems along the lakeshore. There are still approximately 11 or so identified residences on Mercer Lake that have septic systems. Additionally there are over 30 residences along Grand Portage Lake within the Watershed Planning Area not included in the sanitary district. Septic systems can contribute nutrients to the lake through ground water if a failure occurs, or if they are not properly maintained. According to the survey a majority of the septic systems are less than 10 years old. The newer systems were designed to meet today's stricter requirements, thus they likely provide a smaller contribution of the pollutants to the Lake than many of the older septic systems.

It is the requirement of the Sanitary District to have all homes within the District to be hooked up. Iron County has a program that requires pumping of all septic systems every three years. According to the Iron County Zoning Department, there aren't any non-compliance issues at this time.

6.5. Town of Mercer Urban Area

The Town of Mercer urban area contains a significant amount of impervious surface. As stated earlier, impervious surface is a major cause of water quality degradation. Some of the main

sources include runoff from Highway 51, the Midwest Timber site, the boat landing, local roads, rooftops and parking lots for buildings, and sidewalks. Currently there is very little protecting Mercer Lake from these sources of pollution as the stormwater conveyance system is constructed to quickly discharge the stormwater to the natural tributaries and lakes in the watershed.

6.6. Erosion and Sediment Control

In developed areas of Mercer, runoff water frequently contains substantial quantities of sediments. This is due to impervious surfaces, construction grading, and inadequate erosion control practices. Erosion in agricultural and logging areas and developments comes in the form of gullied waterways, riled and gullied slopes, undercut pavements and pipelines, and lost topsoil.

The natural processes of erosion, transport, and deposition of sediments have occurred throughout geological times and have shaped the landscape of the Watershed. Eroded soil is considered the largest pollutant of surface waters in the United States. Sediment transport affects water quality and its suitability for other uses, including: consumption, industrial use, recreation, wildlife and ecological sustainability. The source of most sediment transported by swales, channels, drainage ways, rivers, creeks, and storm sewers to receiving water bodies is soil eroded from upland areas. Erosion often causes serious damage to agricultural land by reducing the fertility and productivity of soils.

Problems associated with deposition of sediments vary. Sediment deposition in stream channels reduces the flood carrying capacity, which results in greater flood damage to adjacent properties. Receiving water bodies trap the incoming sediment load and flood risks increase due to aggregation upstream. Upstream aggradations depends on the stream slope, the sediment size distribution, and the water-level fluctuations in the receiving water body. Streams, drainage ways, and channels with minimal slopes carrying large quantities of sediment result in aggradations many miles upstream of the receiving water body. Receiving water body sedimentation results in loss of storage capacity for flood control.

Human activities typically increase the rate of erosion over the normal or geologic erosion rate. The erodibility of natural soils may be altered when the soil's natural condition is disturbed by plowing, tillage, and construction type activities. *Erosion rates accelerated due to human activities can be more than 100 times greater than geologic erosion rates of 0.10 ton/acre-year. Erosion rates of grazed areas can exceed 5-tons/acre-year, and we can expect average values of 30 to 50 tons/acre-year during urban construction development when the soil is not vegetated and it is consistently reworked.* Human activities also influence the natural characteristics of channel flows through channel stabilization and installed hydraulic structures.

6.6.a Sources of Sediment

i. Urban and Rural Areas

Both rural and urban areas contribute sediment loads. Soil erosion is one of the primary sources of sediment. Typically, older developed parts of the Mercer Lake Watershed Planning Area have less erosion than rural areas, since the land

consists of established homes, grass, and pavement. The concentration of sediment is generally lower in low and medium density residential urban runoff than in rural runoff. However, the total amount of sediment from low and medium density residential urban areas is comparable to rural areas since more water runs off man-made impervious surfaces in developed areas.

Besides the northwestern edge of the lake that consists of wetlands as well as the location of the former sewage treatment plant, much of the lakeshore is inhabited by residences. Just to the north of the lake is the downtown commercial area that is densely developed. The boat landing as it is designed is an impervious surface that acts as conveyance system carrying stormwater to Mercer Lake from a subwatershed in that area.

Highway 51 is a major concern as sediments, nutrients and other pollutants from the highway are carried directly into Mercer Lake via the storm sewer system.

ii. Construction and Manufacturing Sites

Although existing urban areas such as parking lots and street surfaces are important sources of sediment, by far the highest amounts of sediment come from areas under construction. Studies and research estimate that an average unprotected acre of land under construction delivers 60,000 pounds (30 tons) of sediment per year to downstream waterways. This is about 60 times more than any other land use.

Two factors account for the importance of construction sites as sediment sources:

1. High Erosion Rates
2. Rapid Delivery Rates

Typical erosion rates for unprotected construction sites are 30 to 50 tons per acre per year compared to one to three tons per acre per year for cropland or low density residential areas.

Construction sites have high erosion rates because they are typically stripped of vegetation and topsoil for long periods of time. More importantly, construction sites have higher delivery rates compared to cropland. During the first phase of construction, the land is graded and ditches or storm sewers are installed to provide good drainage ways. Unfortunately, this efficient drainage system does not allow sediments to settle out. While some of the sediment from croplands is filtered out by ground cover, or deposited in a low spot of on the next field downhill, most soil erosion from a construction site gets delivered directly to the wetlands, and Mercer Lake.

Most of the new residential development is taking place on Stafford Point which is the major peninsula on Mercer Lake. The other possible future development may take place on the northwest side of the lake beyond the former sewage

treatment plant location. During the construction processes it is vitally important that Best Management Practices are being followed to reduce the amount of potential erosion reaching Mercer Lake.

Another major area of concern in the Mercer Lake Watershed Planning Area is the Midwest Timber site on the northern edge of the urban area adjacent to Grand Portage Lake. As described in Chapter 4, this site is most likely contributing a significant amount of sediment to Grand Portage Lake due to the large amount of soil that is not vegetated, its close proximity to the lakeshore and the lack of natural or manmade buffering. There are no stormwater control structures to capture sediment carried by stormwater off this site. Erosion from this site is carried almost directly into Grand Portage Lake with very little natural buffering. To our knowledge there hasn't been any testing completed on that site. Considering some of the toxic chemicals used in timber production, the site may contain hazardous or chemical waste from former timber practices. Further studies will need to be completed to determine the possible effects this site has on the water quality of Mercer Lake.

Chapter 9 provides reference to a proposed Storm Water Management Ordinance for protection of the area's unique natural resources by minimizing the amount of sediment carried by runoff or discharged from construction sites to the drainage ways, perennial waters, and wetlands within the Mercer Lake Watershed Planning Area.

iii. Shoreline and Stream Channel Erosion

Shoreline erosion can be significant in lakes and watersheds with changes in flow volume. Shoreline erosion rates can be determined by comparison to earlier shoreline photographs. Shoreline erosion rates can be measured by comparing channel positions from a pair of recent aerial photographs to an old set of aerial photographs. Analysis of the paleoecological study as well as observations throughout the watershed has confirmed that a considerable amount of shoreline erosion is present in the Mercer Lake Watershed Planning Area. One area of stream channel erosion in particular is just north of Highway 51 where outlet from Grand Portage Lake follows a narrow channel and eventually flows into Mercer Lake. One of the tributaries (intermittent ditch) flowing into that channel is experiencing some significant undercutting contributing sediment to the channel. Stabilizing that tributary would reduce the amount of sediment being carried into that channel.

iv. Changes in Flow

From the beginning of farming and construction, urbanization and agricultural practices dramatically change the cycle of water movement. Clearing land removes much of the vegetated cover that intercepts rainfall before it reaches the ground. Once the trees and grasses are gone, less water is returned to the air

through evaporation or transpiration (loss of water vapor from plants). Instead, rain falls directly on the exposed soil.
As farming, construction, and land disturbing activity proceeds, soil conditions also change. During construction, topsoil is usually stripped away and heavy construction equipment compacts the remaining subsoil that limits infiltration. More water runs off the compacted subsoil rather than percolating down to recharge groundwater supplies. The elevation of the shallow ground water is significant because it supplies much of the base flow in drainage ways between storms.

Runoff water problems continue after developers and builders complete construction. Water runs off hard (impervious) surfaces such as compacted soils, parking lots, buildings, and streets, picking up speed and carrying sediments and pollutants along the way. Developers and builders can help mitigate potential damage by spreading topsoil and planting grass vegetation as soon as practical after land disturbing activities to allow the soil to regain its ability to soak up and infiltrate storm water runoff.

Sediment and pollutant loading will increase as the effects of development on storm water are realized. These effects include:

- Peak Discharge: After farming and development, peak stream flows are two to five times higher than they were before farming and development. Consequently, the frequency and severity of flooding and sedimentation increases. A stream that once overflowed its banks once every two years may now flood three or four times per year. When the banks overflow, sediments are deposited within the flood plain or transported downstream.

- Volume: The volume of runoff increases about 50 percent in a moderately developed or altered watershed.

- Timing: Urban and farm drainage systems are so efficient that the time required for runoff to reach the stream can decrease as much as 50 percent. This results in high flows compressed into a shorter period of time. The river, wetlands, creeks, drainage ways, and channels are “flashy” because water levels rise and fall very quickly in response to storms.

- Velocity: Flow velocity increases in the wetlands, creeks, drainage ways, river, and channels during storms because peak discharges are higher and new drainage systems are smooth and efficient.

- Base Flow: Stream flow is reduced by farming and development activities. Portions of channels and drainage ways that were once wet and flowed year-round become seasonally dry.

The dramatic flow changes in the drainage ways, channels, wetlands, creeks, rivers, and lakes, have extensive consequences in terms of flooding patterns, stream flow channel erosion, and ecological and wildlife habitat degradation.

6.7. Sedimentation

Sedimentation is a problem that has seen a significant increase in the last half century as stated in the sediment core report by Paul Garrison of the DNR, "At the present time the sedimentation rate is about 7 times higher than it was during pre-settlement times during the 1800s. This is a significant increase and is an indication that watershed activities may be adversely affecting the lake" (Garrison, Sediment Core Study).

There are numerous causes of sedimentation including sewage treatment plant effluent, runoff from urban areas, highways, and roads, storm sewer pipes directing stormwater directly into to the Lake, and residential runoff from lakeshore owners. Each of these issues should be addressed in order to reduce the negative impacts development has on water quality. Sedimentation often results in poor water quality, an increase in plant growth, shallow lakes, and smaller fish populations. Unless something is done to alter the current course of lake and surrounding watershed planning area, Mercer Lake will likely no longer be the desirable recreation and wildlife habitat that it is currently.

6.8. Aquatic Plant Growth

Plant growth has also seen an increase. The Aquatic Plant Survey for Mercer Lake states that "The 'problem' plant species appears to be cabbage, a high quality native plant" and recommends cutting in years that cabbage is a problem for navigation. Since the completion of the survey, weeds have been mechanically harvested each year due to excessive growth. As development has increased, so has aquatic plant growth. While certain levels of aquatic plants are desirable for water quality, the current level is excessive and seen as a nuisance. Mechanically cutting the plants is only a temporary fix and not the answer to controlling nuisance plants.

CHAPTER 7: COMMUNITY SURVEY

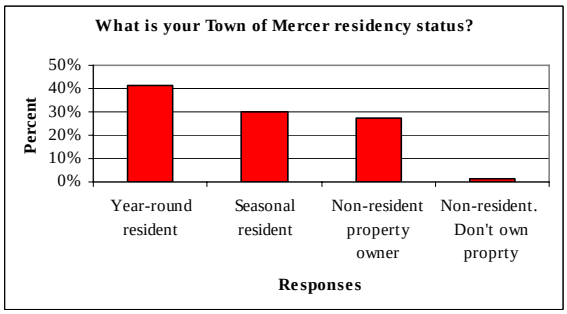
7.1 Mercer Lake Association Community Survey

The Mercer Lake Association and Cedar Corporation designed a community Sociological Survey to assess the area residents' perceptions of the Lake and solicit their comments. The survey was approved by the WDNR and is included in Appendix B along with Survey Report and Comments.

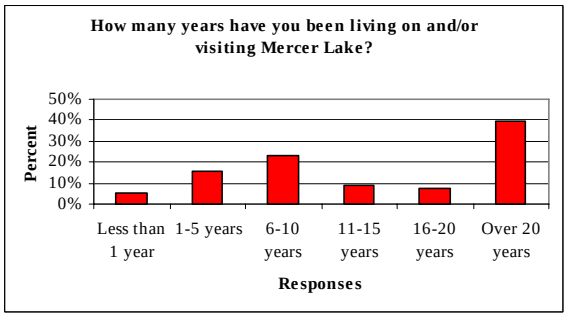
In summer of 2006 a Public Opinion Survey was sent to property owners, business and government officials within the Mercer Lake Watershed Planning Area. The survey was designed to assess landowner views and concerns about local lake issues. Approximately 369 surveys were sent out and 86 were returned (23% response rate).

Background Data

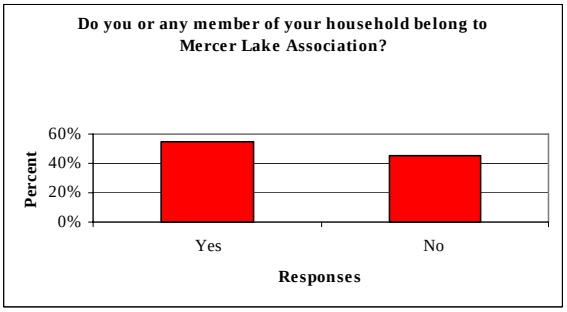
Just over 40% of the respondents are year-round residents on Mercer Lake.



Nearly 50% of the respondents have been living on or visiting the lake for over 15 years.

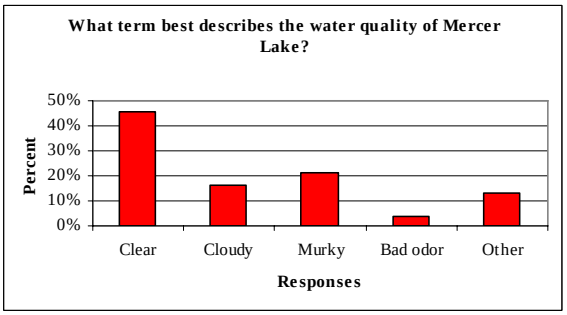


55% of the respondents said they belong to the Mercer Lake Association.

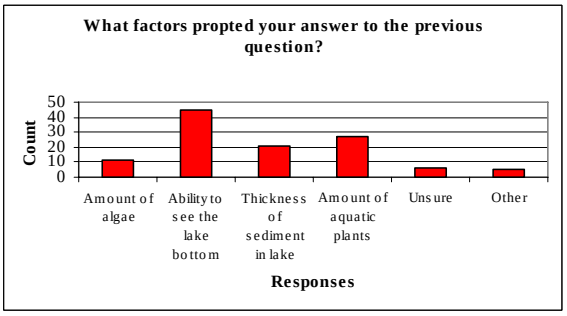


Water Quality

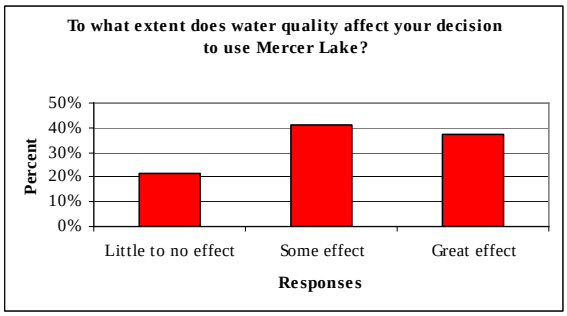
Fewer than half the respondents considered the water in Mercer Lake to be clear.



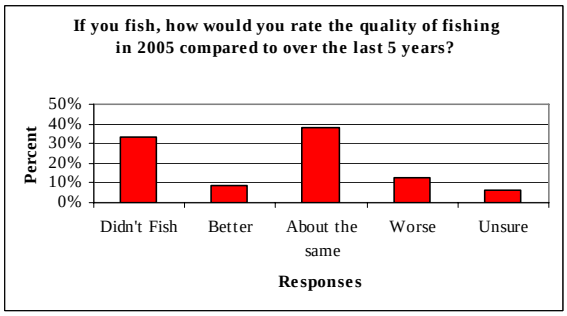
Of the respondents, 45 people felt the water wasn't clear do to the inability to see the lake bottom.



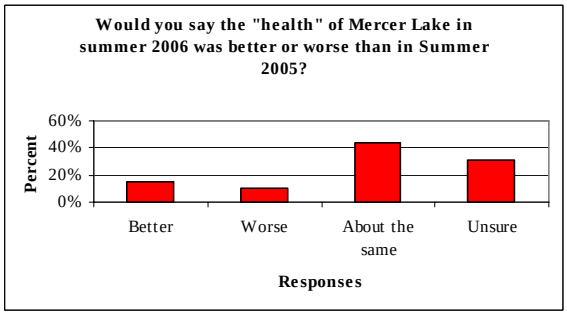
Nearly 80% of the people indicated that the quality of water affects their decision to use the Lake.



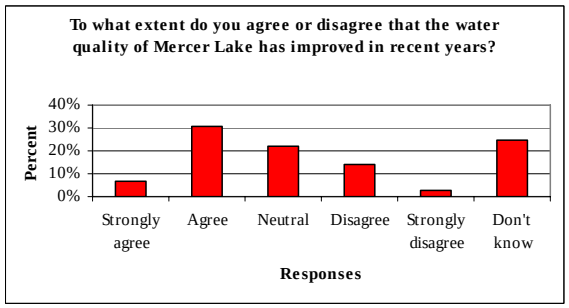
Of the people responding that fished, most of the people felt the quality of fishing was about the same in 2005 compared to the past 5 years.



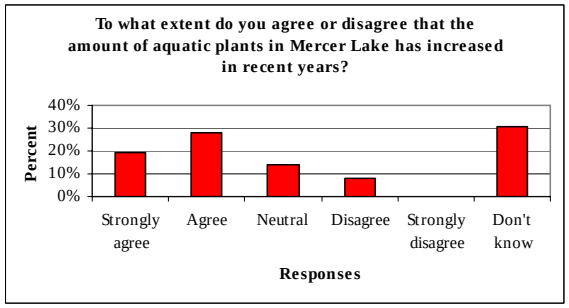
While 14% of the respondents felt that the "health" of Mercer Lake was better in 2006 than in 2005, over 40% felt it to be about the same.



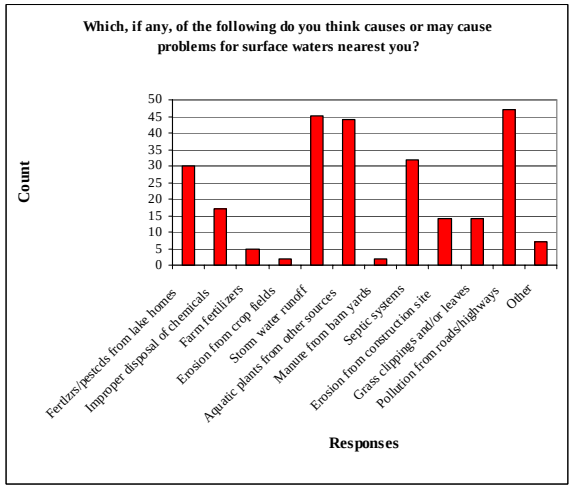
Over 1/3 of the respondents felt that the water quality of Mercer Lake has improved in recent years.



About half of the respondents (47%) felt that the amount of aquatic plants has increased in recent years.

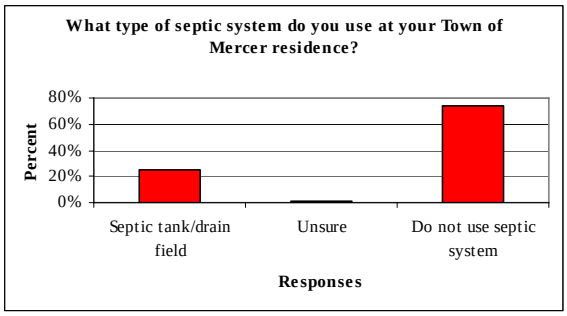


The three most popular responses to what causes problems for surface waters in the Mercer Lake Watershed Planning Area are pollution from highways (47 people), stormwater runoff (45 people), and aquatic plants from other sources (44 people).

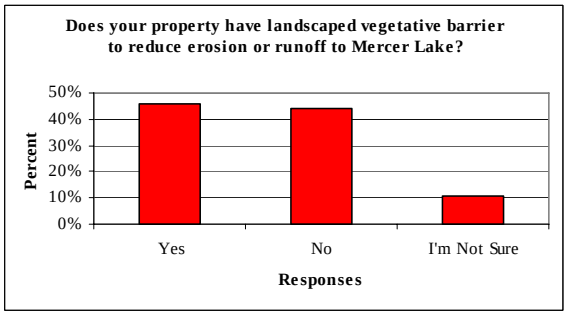


Property

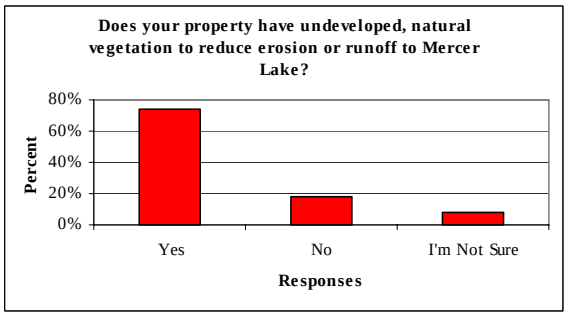
25% of the respondents within the Mercer Lake Watershed Planning area still have some form of septic system.



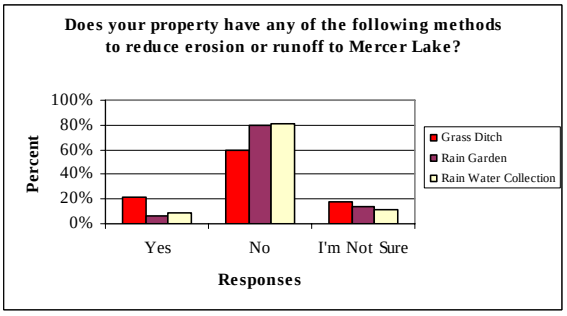
Respondents were pretty evenly split between those that have landscaped vegetative barriers (46%) and those that do not (44%).



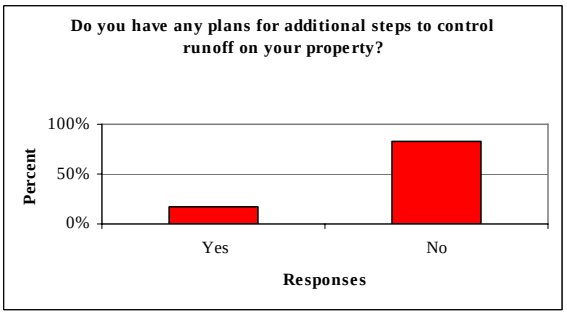
A majority of the respondents (74%) indicated that they have a natural barrier to reduce erosion and runoff on their property.



A majority of people did not have a grass drainage ditch (60%), rain garden (80%), or rain water collection system (80%) to reduce erosion and runoff from their property.

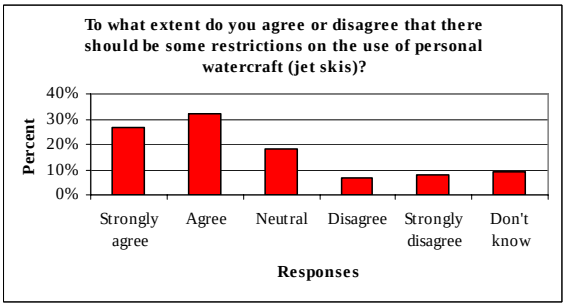


At the present time, most respondents (83%) do not have plans for additional methods to control runoff.

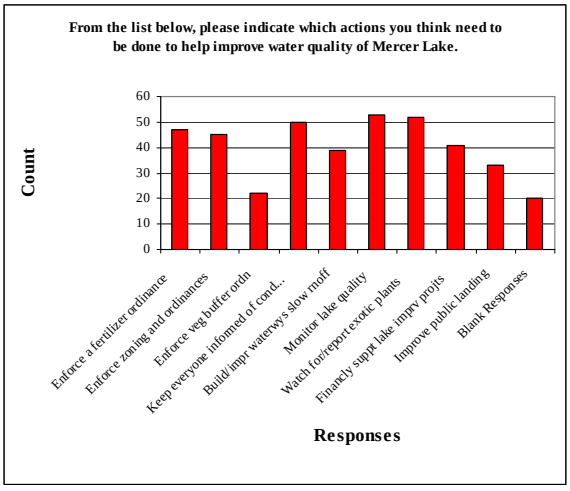


Enforcement and Responsibility

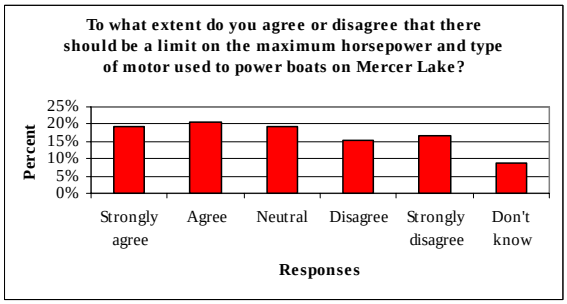
Over half (59%) feel that there should be some restrictions on personal watercraft (jet skis).



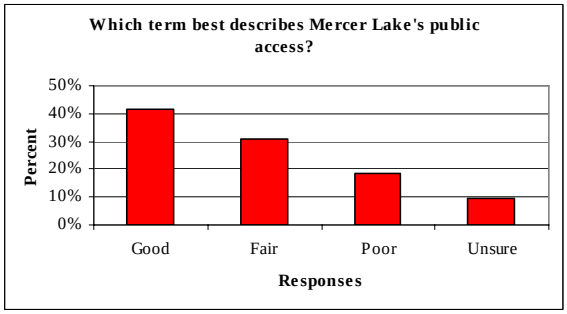
The three most popular responses to what the Mercer Lake Association should do to help improve water quality were monitor lake quality, watch for and report exotic plants, and keep everyone informed of conditions.



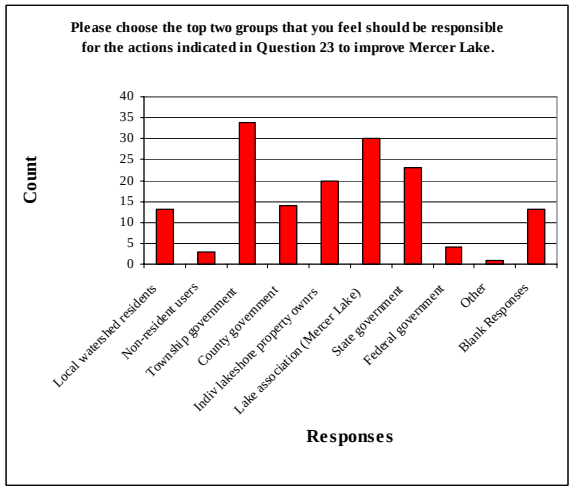
The answers were pretty evenly split when asked if there should be a limit on the maximum horsepower and type of motor that should be used on Mercer Lake.



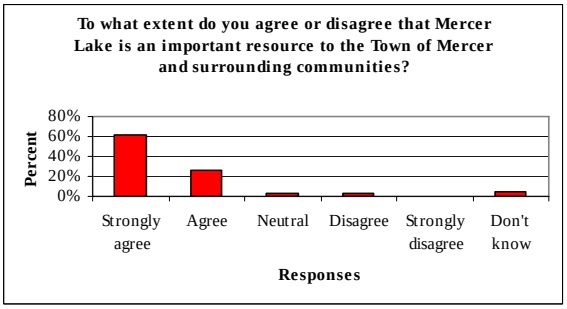
Overall, the majority of respondents (72%) feel the Lake's public access is fair to good.



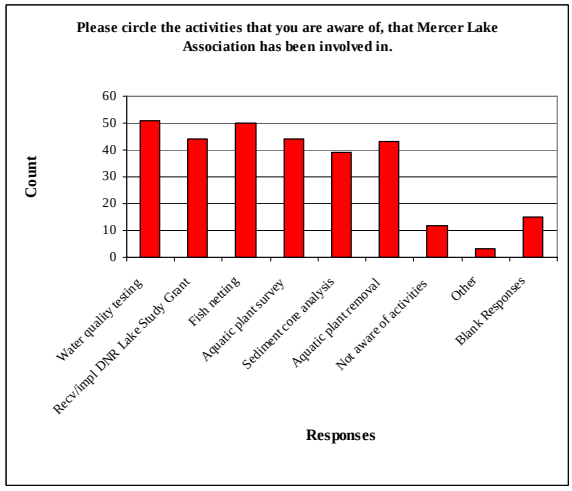
When asked who should be responsible for the actions above, the top two responses were the Town government and the Mercer Lake Association.



Nearly 90% of the respondents feel that Mercer Lake is an important resource to the Town.

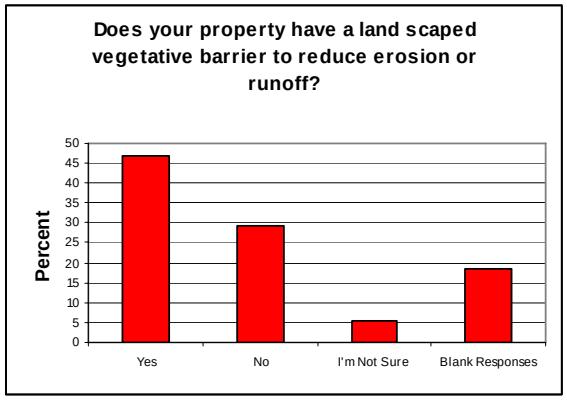


About half of the 86 respondents are aware of most of the activities that the Mercer Lake Association is involved in.

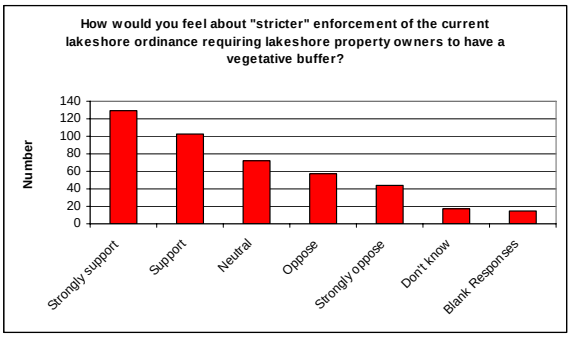


Lakeshore

Nearly 50% of respondents have some form of vegetative buffer to reduce runoff, however there were a high number of blank responses and almost 30% said they do not have a buffer. The balance or respondents are unsure or chose not to respond.

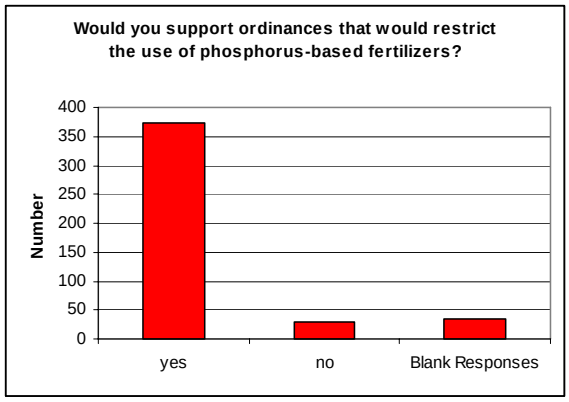


Over half of the respondents would support stricter enforcement of the lakeshore vegetative buffer ordinance.

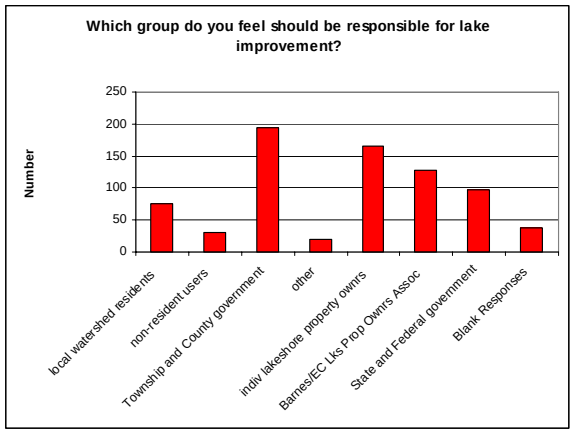


Lake Enforcement and Responsibility

Slightly over 85% of the respondents would support an ordinance restricting phosphorus-based fertilizers.



A large number of people feel the Town and County government should be responsible for lake improvement while over 40% of the respondents feel it's up to the individual property owner.



There are a significant number of residents in the Town of Mercer concerned about the future of lake water quality. Education of these individuals in developing runoff water quality and quantity control efforts will provide the Mercer Lake Watershed Planning Area with a significant resource to address current and future water quality issues.

CHAPTER 8: EXISTING PLANS AND ORDINANCES

8.1. Existing Plans

The Town of Mercer, the Wisconsin Department of Natural Resources, and the Mercer Lake Association all have planning documents in place that address water resource issues. Below these existing documents are described and summarized.

8.1.a. Town of Mercer Comprehensive Plan

In 2005, the Town of Mercer adopted its Comprehensive Plan. This plan is used as a guideline for growth and future planning. The Plan contains nine elements including Natural Resources, Transportation, and Utilities and Community Facilities. Each of these issues are relevant to water quality and stormwater issues. Below is a list of goals and actions in the Comprehensive Plan that pertain to surface waters such as Mercer Lake:

Natural, Agricultural, and Cultural Resources

- Goal 1: Protect, conserve, enhance, and maintain a high level of environmental quality of land and waters in Mercer.
- Goal 2: Preserve the natural and scenic qualities of lakes and shorelines in the Mercer area.
- Action 4 under Goal 2: Encourage the use of shoreland buffers and vegetative planting to reduce the impact of surface runoff.

Utilities and Community Facilities

- Action 2 under Goal 1: Improve the storm water sewers, sidewalks, street lighting, signage, and landscaping in Mercer's downtown area.
- Action 1 under Goal 4: Address the proper siting of on-site wastewater disposal systems and a storm water management plan.

Below is an excerpt directly from the Comprehensive Plan (pg, 4-2):

> *"**Stormwater Management***
> *The Town of Mercer has some curb and guttered areas that assist in the collection of stormwater. These include curb and gutter on Lake View Avenue, U.S. Highway 51, Vaughn Street, Railroad Street, Margaret Street, and in selected alleys off of U.S. Highway 51. Most stormwater is discharged directly into Mercer Lake. Stormwater also drains through a series of ditches and culverts along town roadways and dissipates to local lakes, rivers, streams, or filters through the ground. Stormwater runoff from development and roads may have negative impacts on lakes and streams as sediment and nutrient delivery increases resulting in water quality degradation. Managing storm water to increase infiltration and*

> *reduce or eliminate direct delivery to surface waters is one of the most important steps that can be taken to protect water quality.*
>
> *Over the planning horizon, stormwater management may become an issue in the Town of Mercer as development continues, especially in areas where natural drainage flows directly to lakes, rivers, and streams. The Town of Mercer must work cooperatively with the land conservation district, WDNR, and Iron County to mitigate the adverse impacts of stormwater runoff and ensure that environmental resources are adequately protected."*

Overall the Comprehensive Plan does address stormwater issues and emphasizes the importance of protecting natural resources. The Association may want to approach the Town in developing language that identifies and promotes specific actions to address stormwater issues as they relate to the water quality of Mercer Lake.

8.1.b. Surface Water Resources of Iron County

In 1970, the DNR began a program to provide an inventory of the surface water resources for each county in the State including Iron County. The information acquired during this program was to be used to classify the various lakes throughout Iron County. This inventory should be used to plan the proper management of the County's lakes and streams.

The first part of the document describes the general setting of the waters in Iron County. Subjects covered include: Land Use, Geography, Glacial Action, Geology, Soils, Climate, Runoff, Economy, and Population. The document then goes on to describe each lake and stream in a short narrative.

According to the text, Mercer Lake is a "medium hard water drainage lake having slight alkaline, light brown water of moderate transparency." There are two inlets, Lake Tahoe Creek and the Little Turtle River from Grand Portage Lake, and one outlet, Little Turtle River. Additional information such as the soil types, as well as animal and fish species that inhabit the lake are briefly discussed.

One concern described in the document is about the effluent from the sewage treatment plant increasing the nutrient levels near the discharge area and in turn causing an increase of aquatic plants and a degradation of water quality. Other information found in the Surface Waters of Iron County includes a complete summary of all of the data and maps depicting the location of the various lakes.

8.1.c. Aquatic Plant Surveys for Mercer Lake, Iron County, Wisconsin

An aquatic plant survey was conducted in Mercer Lake in July of 2003. The transect method was used taking 21 different locations (transects) at three depths for a total of 63 stations. The DNR Guidelines for Aquatic Plant Surveys now requires the grid method of conducting aquatic plant surveys and one of the recommendations in the following chapter are to conduct another macrophyte survey.

The aquatic plant survey, also called a macrophyte survey, revealed that in July of 2003, Mercer Lake had a total of 21 aquatic plant species. Total plant coverage was estimated at 51% (94 acres) of the entire lake area. The aquatic plant coverage is generally considered to be good with a good mix of emergent, (4) submerged (15), and floating (2) species.

8.1.d. Paleoecological Study of Mercer and Grand Portage Lakes, Iron County, Wisconsin

In July of 2003, a sediment core of Mercer Lake was taken to conduct a paleoecological study of the lake by the DNR. Taking a look at the sediment core allows the DNR to study what has taken place in the lake bed for the past 200 years.

According to this report, the mean sedimentation rate since the 1800's is one of the lowest in Wisconsin (0.003 g cm^{-2} yr^{-1}). In recent years however, that rate has increased seven fold (0.022 g cm^{-2} yr^{-1}). This is the result of shoreland development, runoff from the Town of Mercer, and the effluent from the sewage treatment plant. "At the present time the sedimentation rate is about 7 times higher than it was during pre-settlement times during the 1800s. This is a significant increase and is an indication that watershed activities may be adversely affecting the lake" (Garrison, Sediment Core Study)

Geochemical variables were analyzed to estimate the changes in the soil delivery of soil nutrients from the watershed. Some of the revealed trends from this analysis include low variables in the early 1800's with an increase in the 1880's likely due to development and logging. Another increase came after 1930 due to urban runoff and increase in soil erosion. After 1970, there was a decline in soil erosion and runoff, but in recent years, soil erosion has increased.

Aquatic organisms such as diatoms are also used as good indicators of the lakes chemical composition within the core sample. The lack of diatoms that float in open water indicates low nutrient levels and good water clarity. One significant trend was an increase in floating diatoms between 1965 through 1995, most likely the result of the sewage treatment plant discharge into the lake.

One additional item of importance mentioned in the report is the Secchi depth levels. In the late 1800's the readings were 11-12 feet. Between 1965 through 1995, the readings were at their lowest known reading at 7-8 feet. This again coincides with the timeframe that the sewage treatment plant was discharging into lake.

8.2. Ordinances and Regulations

Below are the regulations regulating activities that have an impact on the water quality of surface waters. These ordinances relate to land use activities, shoreline protection, and stormwater runoff control. Currently, Iron County does not have an ordinance regulating the use of fertilizers containing phosphorus.

8.2.a. Iron County Land Use and Shoreline Protection

The most common type of regulatory tool for a county is the zoning ordinance. Iron County has an extensive zoning ordinance that includes land use and shoreline protection. Below is a summary of the provisions of the ordinances that have an impact on surface water resources.

Shoreland Protection Overlay zone covers all lands within 1,000 feet of the ordinary high water mark of navigable lakes, ponds or flowages. The ordinance also covers land within 300 feet of the ordinary high water mark of navigable rivers and streams, or to the landward side of the floodplain which ever distance is greater. Any uses including accessory and conditional uses which are permitted or authorized in underlying districts also fall under the shoreline provision of this section of the ordinance.

Mercer Lake falls under the Class 1 Lake Classification. Therefore any future lots on Mercer Lake must meet the following dimensional requirements:

- Lot Size - 40,000 sq ft, or 80,000 sq ft for two family dwelling units
- Lot Width – 200 ft, or 400 ft for two family dwelling units
- Shoreline Setback – 75 ft
- Lot Depth – 200 ft
- Vegetation Removal – 30 ft corridor can be removed in the strip 35 feet inland from the ordinary high water mark
- Side Yard Setback for All Structures – 10 ft minimum

Boathouses or similar structures cannot extend closer than 6 feet from the ordinary high water mark and cannot be over 240 square feet in size or exceed 12 feet in maximum height.

A setback equal to the average setback of existing principal buildings within 500 feet of a proposed building site, shall be permitted where such existing buildings do not conform meet the 75 foot setback. A minimum setback of 40 feet shall be required in all such cases.

Any filling, grading, lagooning, dredging, ditching, and excavating shall require an Iron County Land Use Permit.

Permitted uses in Shoreland Wetland District for uses that do not require a zoning permit is limited excavating and filling necessary for the maintenance, repair, replacement, and reconstruction of existing town and county highways and bridges.

8.2.b. NR 151

NR 151.11 sets forth the construction site erosion control performance standards that construction projects that disturb more than 1 acre of land must follow. Primarily, it requires the following items be address:

1. A written erosion control plan must be prepared by the design engineer.
2. Reduce sediment load by 80%.
3. Prevent tracking from the construction site (install tracking pads).

4. Prevent discharge of sediment during de-watering operations (install filters in discharge lines).
5. Protect storm sewer inlets from sediment (install inlet protection).
   * Note: There are several exemptions, exceptions and exclusions that exist within the code.

NR 151.12 sets forth the post-construction performance standards that construction projects that disturb more than 1 acre of land must follow. Primarily, it requires the following items be addressed:

1. A written storm water management plan must be prepared by the design engineer.
2. Water Quality: Suspended solids removal of 80% (new development) or 40% (redevelopment).
3. Peak Discharge: Match post-construction peak discharge rate to the pre-development peak discharge rate for the 2-year storm event.
4. Infiltration: Infiltrate 25% of the 2-year storm event (residential) or 10% of the 2-year storm event (non-residential).
   * Note: There are several exemptions, exceptions and exclusions that exist within the code.

Until specifics of any construction project are known, primarily if they would meet any of the exemptions, exceptions and/or exclusions, specific requirements for the project are impossible to determine and will be established on a case by case basis and will depend greatly on the site of the project.

CHAPTER 9: WATERSHED WATER QUALITY RECOMMENDATIONS

A number of actions to slow or stop the degradation of water quality in the Mercer Lake are recommended. Perhaps the most difficult task is the ongoing development and continuation of an information and education program to promote and foster an awareness of water quality concerns among residents and non-residents of the region. Individuals, local government, and area businesses alike need to assume an increasing responsibility for protecting water quality of the area lakes.

This report documents that a variety of factors affect the water quality of lakes. These include nonpoint source pollutants – primarily sediments and nutrients (phosphorous and nitrogen), groundwater, precipitation, and background or natural sources. Similar lakes in this region have the appearance of being healthy BUT the lakes should be considered fragile. Water quality by visual inspection does not demonstrate an accurate level of water quality. Clearly, the water quality of Mercer Lake as a whole is considered eutrophic. Thus, the Association Board, its members, the surrounding populace, and visitors to the Lake all need to be sensitive to the existing water quality. Initially they should be encouraged to adopt those necessary measures to be protective of the water quality of Mercer Lake. If encouragement is not enough, then ordinances requiring water quality improvements must be enacted and enforced if the lake water quality is to be protected.

This is the preliminary lake management plan and is only as good as it is used and updated. The current plan has limited scope and will be revised as additional data is obtained through future studies. To measure the progress of lake improvement and to document achieved goals, it is encouraged to revisit the plan annually and update and discuss plan initiatives with local political groups. Continuing the on-going volunteer lake water quality monitoring program will help assist in this process.

Best Management Practices (BMPs) are measures intended to reduce or mitigate storm water runoff water quantity and water quality concerns to the maximum extent practical. Certain measures can help reduce impacts, but no BMP will reverse the damages caused by previous forestry and agricultural practices, residential construction, and urban development.

In general, BMPs to control runoff water quantity and quality include:

1. **Source control measures** focus on minimizing or mitigating the source of the pollution so that pollutants are prevented from contacting storm water runoff or from entering the drainage conveyance system.

2. **Treatment control measures** are designed to remove a percentage of the pollutants after they have entered storm water runoff. Treatment control measures tend to be more expensive than source control measures.

Most source control measures tend to be non-structural, that is regulatory in nature (setbacks, construction techniques, ordinances, etc.), and most treatment control BMPs tend to be structural in nature, although there can be exceptions.

Watershed wide non-structural best management source controls include:

- Balanced land use planning
- Education
- Ordinances and incentives to improve storm water runoff quality
- Construction site erosion control regulations and enforcement
- Leaf and lawn waste control
- Fertilizer and pesticide application control
- Pet and farm animal waste control
- Storm water management planning education
- Hazardous waste and spill prevention program

Best management treatment controls include:

- Shoreline Restoration and buffers
- Appropriate fertilizers and use of fertilizers
- Improve littoral zone habitat
- Stop lawn mowing down to the water's edge
- Divert shoreline property water runoff to rain gardens, infiltration basins, etc away from the lake
- Septic System Maintenance
- Wet detention sediment basins
- Construction site erosion control
- Long term storm water management for developments
- Constructed wetlands
- Dry detention/retention basins
- Sump storm sewer inlets
- Riprap
- Gabions or stone weeper berms
- Construction of grassed channels and drainage ways
- Silt fence
- Multi-Chambered Treatment Train (MCTT)
- Water quality pre-treatment box structure, i.e. Stormceptor,
- Straw bales and silt fence
- Catch basins

Using non-structural best management practices rather than using structural best management practices is considered most cost effective in gaining a large percentage of water quantity and quality control benefits. These controls require individuals and local government units to alter their habits and introduce changes in activities that will directly lead to improved water quality discharges. However, some structural controls must be provided in order to obtain the greatest amount of pollutant reduction and flood control within the Mercer Lake Watershed Planning Area.

Rural and developing areas allow for unique opportunities to incorporate creative BMPs into site design. The BMPs can be incorporated into natural areas serving as open spaces for community

enjoyment. This idea can be expanded into a fingerprinting concept that requires developments to duplicate BMPs to some extent at each site.

Another technique is for the local authorities, with assistance of WDNR grant programs, to purchase land next to a water resource and create a buffer strip (conservation area) around the area and construct structural BMPs. In certain cases, this may be the only way to protect a sensitive water body from further degradation, even with several structural and non-structural BMPs in place.

Chapter 6 outlines the sources of the existing and potential future water quality problems in Mercer Lake. The list below restates those problems:

- Town of Mercer Storm Sewer System
- Boat Landing
- Continuing Effects of the Old Sewage Treatment Plant
- Property Owners
- Town of Mercer Urban Area/U.S. Highway 51
- Erosion and Sediment Control
- Aquatic Plants

This chapter provides recommendations of BMPs and other various methods of addressing those problems.

9.1. Town of Mercer Storm Sewer System

The current Town of Mercer storm sewer system should be rerouted, or incorporate structural BMPs at the outlets of the pipes in order to limit the stormwater's negative impact on Mercer Lake's water quality. Both recommendations are costly, but through joint efforts with the Town of Mercer, DOT, EPA, and the DNR, funding assistance may be available through various mechanisms/programs outlined later in this chapter.

In 2006, the Mercer Lake Association approached the Town Board of Mercer regarding painting "No Dumping" signs near all storm sewer inlets, as all discharge into Mercer Lake. In addition, leadership also made a presentation to the Town of Mercer Planning Commission which unanimously approved a recommendation to the Town of Mercer Board of Supervisors to treat storm water runoff before it is discharged into the lake. The Mercer Lake Association has also made a request to the Town Board that the Town use BMPs to treat all stormwater runoff. This has resulted in a unanimous resolution by the Town Board of Supervisors to provide BMP treatment to the storm sewer system's discharges in the Mercer Lake Watershed.

Stormwater runoff will need to be considered as part of an upcoming highway and storm sewer project which has already been approved for the downtown area. The full timetable and scope of the project has yet to be worked out, but the Lake Association and Town of Mercer should be involved with the EPA, DNR, and DOT as the project unfolds so BMPs can be included in the final scope of the project.

The Wisconsin Department of Transportation (WDOT) has allocated funds (Project ID 1175-18-70), to upgrade U.S. Highway 51 through the Town of Mercer and adjacent to Mercer Lake. The Town has also recently requested additional funding to modify and rehabilitate the storm water system in the downtown area. This is the same system that currently discharges, without treatment, into Mercer Lake. Additionally, the Town received a grant from the United States Environmental Protection Agency (EPA) for a storm water sewer system for the newly constructed business park. The Town has recently requested that more than $800,000 of unused funding from this grant be transferred to modify and rehabilitate the Town storm water system.

In addition to the grants described above, the Mercer Lake Association has made presentations regarding the Wisconsin DNR Runoff Grant Programs to both the Town's Planning Commission and the Town Board of Supervisors. Under these programs, the Town could be eligible for up to $200,000 of grant funding to provide facilities to treat the effluent from its storm water systems. These grants provide funds for both the engineering design and construction of treatment and discharge facilities. Significant funding has already been obtained for modification and rehabilitation of the storm water sewer system under the WDOT funding and the EPA grant described above. Additionally, specific grant funds are available for the inclusion of Best Management Practice (BMP) treatment technology from the DNR. Providing state-of-the-art, BMP treatment for the Town runoff into the Mercer Lake watershed could be accomplished at no cost to the Town or its taxpayers.

Additionally, the inclusion of BMP treatment of the Town storm water system was reviewed and discussed by the Town of Mercer Planning Commission. On November 15, 2006, the Planning Commission unanimously approved recommending to the Board of Supervisors the inclusion of BMP treatment of the Town's storm water system in the upcoming projects.

The Mercer Lake Association has formally requested that the storm water sewer system and runoff discharges are re-designed and modified to provide BMP treatment capability before they are discharged into the Grand Portage Lake/Mercer Lake watershed and that the Town of Mercer Board of Supervisors pass a resolution to include BMP treatment practices of the Town storm water system discharge in the forth coming highway and storm sewer projects. The Town Board of Supervisors unanimously passed the resolution (2007-01) on April 19, 2007.

9.2. Boat Landing

The boat landing was in poor condition by the end of the summer in 2006. The leadership of the Mercer Lake Association has been working with the Town of Mercer and local DNR to rehabilitate the landing. Rehabilitation will include increasing the number of parking spots and widening and extending the launch ramp. The DNR has committed to provide the required labor and the Town has committed to provide the required materials for construction. The Association should continue its efforts working with the DNR and the Town on this project as well as maintain those working relationships for future projects. The boat landing rehabilitation is scheduled for June 18 – June 25, 2007.

9.3. Old Sewage Treatment Plant

Further study will be required to address the problems caused by the old sewage treatment plant. There are many unknowns regarding what is exactly in the sediment and what the appropriate methods are that can be taken to remove or neutralize it if feasible. It is believed that the effluent from the old sewage treatment plant has caused significant environmental damage. At this point in time, we don't know the full magnitude of the damage and believe further study is necessary. One initial step that should be taken in the future is additional core samples near the area where the leak is believed to have occurred and at its constructed discharge. This is being proposed as part of a future Lake Protection Project Grant through the DNR in conjunction with the USGS. The proposal for this study is discussed in more detail later in this chapter.

9.4. Property Owners

There are a number of issues that property owners could address on their own property. Below is a list of recommendations that property owners could follow to reduce their negative effect on the Lake. Education programs working in conjunction with the local school system could work towards improvement with respect to these issues.

9.4.a. Reduce/Change Fertilizer Usage

Soil test lawns and add only the necessary fertilizers. Encourage Iron County to implement by ordinance that only no or low phosphorous fertilizers can be used in the Mercer Lake Watershed Planning Area. Other communities have instituted such an ordinance and local stores only supply this type of fertilizer. For example, Minnesota currently has a 0% phosphorus regulation for the Twin Cities metro area and 3% phosphorus for all greater Minnesota. In Wisconsin, more counties and communities have ordinances that do not allow the sale of fertilizer containing phosphorus.

9.4.b. Shoreland Restoration

The reconstruction of the barren or monoculture shoreline with native plant life and infiltration areas is an important step in reducing the sediment and nutrient loading from shoreland properties. This is especially effective for those properties with steep slopes that lead to the lake. The management practice should be installed at the top of the slope where feasible. Implementing the County determined setback on existing properties dependent on the Lake Classification is considered one of the most important activities on the current state of the Lake. Protection of the lake water quality is, therefore, dependent on controlling erosion and water flow in the watershed.

Iron County's Land and Water Conservation Department is currently combined with Ashland, Bayfield and Douglas Counties to for the Ashland, Bayfield, Douglas, Iron County Land and Water Conservation Department (ABDI-LCD). Mary Jo Gingras is the shoreline specialist at the ABDI-LCD (1-800-682-1675 Ext. 122) who can assist lakeshore property owners with restoring their shoreline as well as provide education to lake shore property owners on what they can do to improve the water quality of their lake.

The current program for shoreline/streambank restoration and other implementations to improve the water quality of the lakes provides a 70% cost share to property owners. The funds are limited so not everyone that applies will be guaranteed funding. The projects should be submitted by Labor Day of each year. ABDI-LCD will then review and rank the projects based on water quality concerns. The program isn't funded until January 1st, of the following year, when the Land and Water Conservation Department finds out the program's budget and can allocate the funds accordingly. The Land and Water Conservation Department also provides engineering and design for the projects.

9.4.c. Septic Systems

Highly permeable sands and gravels allow the untreated nutrients in wastewater to migrate quickly through the sub surface to ground water. This is specifically the right soil conditions to support the use of septic systems. As ground water has little treatment or capture capability for nutrients, these pollutants migrate with ground water flow into local receiving waters (streams, tributaries, and lakes). Regular pumping of septic systems is recommended to improve its efficiency and to reduce overloading of the drain field with nutrients. An overlapping regulation to address the so-called "grandfathered" septic systems is highly recommended to address pumping and other maintenance issues.

It would be beneficial to lake users and property owners to encourage the extension of the district to all residential areas around the Lake. Due to cost, extending the sanitary system is unlikely to occur any time soon. One recommendation for the short term is to request Iron County to conduct a sanitary survey that would provide an inventory of the age of septic systems within the watershed planning area. The County does have a program that requires each septic system to be pumped every three years. According to the Iron County Zoning Office, all septic systems around the Mercer Lake Area are in compliance of that program.

9.4.d. Reduce Phosphate Soap Usage

Examine the labels of your household cleansers and reduce your reliance on those cleaners that have phosphates in them. For example, automatic dishwashing soap cubes contain as much as 9% phosphates for each application. The wastewater from your dish water that is directed to your septic system will discharge soluble phosphorous directly to ground water. Ground water enters the rivers and lake system and soon you observe increased algal growth. It will be important to educate residents and property owners within and around the Mercer Watershed Planning Area regarding the amount of phosphates in soaps and what types of soap have low or no amount of phosphate. The Mercer Lake Association should coordinate efforts with the Town to provide educational material through fliers, Town and County website, or encourage the local newspapers to run press releases regarding these and other issues that effect water quality.

9.4.e. Redirect Storm Water from Gutters, Driveways, and other Impervious Surfaces

Collecting water from impervious surfaces and directing it toward infiltration areas, such as rain gardens and forested areas. Considerable assistance in the forms of designs,

recommendations, and financial assistance is available from local greenhouses, County extensions, and others as you develop site specific shoreland runoff controls.

9.4.f. Shoreline Erosion

Protecting your shoreline from erosion is a state regulated activity. The erosion of the shoreline is most likely directly associated with the past removal of trees and shrubs, bushes, etc that were naturally protecting the bank from erosion. Re-establishing the shoreline buffer is an important step in stopping erosion, but continued wave action at the exposed lake bank may be causing bank slumping. Riprap placement along the shoreline is not only unattractive but dangerous. Winter ice movement will remove the riprap over time. Other tools are available to help reduce shoreline erosion. Many of these are manufactured of biological materials and include BioLogs, ShoreSox, among others.

9.4.g. Shoreline Inventory

It is recommended that a shoreline buffer survey be completed on Mercer Lake, Grand Portage Lake, Lake Tahoe, and Martha Lake. Having a shoreline buffer inventory for the entire watershed area would allow the property owners to see which areas may need additional vegetative buffers to assist in the protection of water quality.

9.4.h. Encourage Lake Shoreline Improvement Projects

Encourage shoreline improvement projects including demonstration plots, County or Town tax credits, etc. County and UW-Extension agents can provide assistance in demonstration of the appropriate techniques needed.

9.4.i. Control Residential Lawn Runoff

Direct runoff from well maintained and fertilized shoreland lawns is a key contributor to dissolved phosphorus concentrations in lakes. Development of runoff rain gardens, shoreland vegetation buffers, and redirecting storm water are important steps in residential runoff control.

9.5. Town of Mercer Urban Area

Rerouting and upgrading the storm sewer system and including BMPs in the treatment of storm sewer discharge for future construction projects will go a long way towards reducing the negative impacts that a dense commercial area such as the downtown commercial area of the Town of Mercer will have on future water quality. The Town of Mercer is currently working cooperatively with the Mercer Lake Association, WisDOT, USEPA, and the DNR on some projects and it will be beneficial to maintain a cooperative working relationship for future projects and issues that may arise down the road.

Education of business owners, residential land owners alike, and the public at large on stormwater issues is vital to the future improvement of Mercer Lake's water quality.

The Town should regularly clean out the storm sewer pipes in order to flush out the nutrients. Prior to the redesign of the storm sewer, a method would have to be developed to capture those nutrients from the outfalls before they reach the Lake.

One recommended BMP that should be considered is using a street sweeper focusing on areas near the lake and especially on the boat landing. Sweeping up sediments on the street prevents the sediments and the nutrients attached to it from reaching the Lake. Some ideal times to sweep are right after major storm events, once the snow melts in the spring, and after most of the leaves have fallen in the fall.
An additional BMP that should be considered is to implement both post-construction stormwater management and erosion control ordinances. These ordinances provide the local municipality the authority to set specific guidelines that address the needs of the area. Ordinances, properly enforced can be one of the most cost effective tools to protect water quality.

9.6. Erosion and Sediment Control

Controlling erosion is one method to reduce sediment. Reducing the amount of sediment that reaches the lake reduces the nutrients and thereby slows down the degradation of the lake's water quality. The following is a list of activities that can help prevent erosion in the Mercer Lake Watershed Planning Area, and reduce sediments.

9.6.a. Street Sweeping

Regularly scheduled street sweeping especially on U.S. Highway 51 at the Little Turtle River bridge area can aid in reducing sediment and pollutant loads originating from roads. Effectiveness is variable based primarily upon the efficiency of the sweeper and the frequency of sweeping operations. Currently, the Town sweeps once the snow melts and on average about every two weeks thereafter and around major events like the 4th of July. Street sweeping is done as late in to the fall as possible to pick up as many pine needles and leaves before the snow. Street sweeping is done mostly on streets with curb and gutter. In the future the focus of the street sweeping should include areas where existing pollutant loading is high as well as the boat landing (boat landing is currently brushed, but not picked up).

If there are sections of the street that aren't currently curb and gutter, the Association should approach the Town about requiring curb and gutter in all construction of new roads and reconstruction of old roads within the Mercer urban area once BMPs are in place.

9.6.b. Stormwater Ordinances

Stormwater related ordinances are non-structural BMPs. These are simple, cost effective ways to develop areas with appropriate considerations to stormwater management. Basically, enacting stormwater management ordinances provides an effective way to require private developers to manage stormwater verses the cost of the Town constructing a number of regional ponds.

There are two stormwater related ordinances that the Town could pass. The first one is the Construction Erosion Control Ordinance that requires a specific erosion preventative measures be installed on construction sites as development occurs. The second one is the Post Construction Stormwater Management Ordinance that requires property developers to control runoff from their property after it has been developed.

The ordinances encompass the construction and post-construction phases of new development and redevelopment areas, as well as certain requirements for developed urban areas. The standards are intended to protect water quality by minimizing the amount of sediment and other non-point source pollutants that enter waterways.

The standard for construction sites requires implementation of an erosion and sediment control plan using Best Management Practices (BMPs) that, by design, reduce to the maximum extent practicable (MEP) 80 percent of the sediment load on an average annual basis.

The post-construction site performance standards set a minimum level of control of runoff pollution from construction sites after construction is completed and final stabilization has occurred. They apply to sites subject to the construction site erosion control standard, with some specific exceptions. A written storm water management plan must be developed and implemented for each site and must incorporate the performance standards.

The following information lists some of the important highlights to consider for the Post Construction Stormwater Management Ordinance:

- Developer must have a written stormwater management plan for each post construction site for future development
- The Town Staff, with assistance from the Town Engineer, will review development to make sure they meet the guidelines of the ordinance
- For new development, TSS load should be reduced by 80% to the maximum extent practical compared to no runoff management controls
- For infill development, TSS load should be reduced by 40% to the maximum extent practical compared to no runoff management controls
- Ordinance will promote infiltration where available
- The Town Staff, with assistance from the Town Engineer, may establish on-site stormwater management requirements less stringent based on site specific situations
- There should be a maintenance and monitoring agreement between the developer and the Town
- Post-development flow must not exceed the runoff volume and peak flow rate for pre-development conditions for 2, 10, & 100 year specified rainfall events

The following steps outline the recommended steps to adopting any of the above water quality related ordinances:

- Develop a draft of the desired ordinance(s).

- Put ordinance review and possible action on the agenda for the Town Board of Mercer.
- At the Board meeting set a date for a public hearing regarding the ordinance(s) (The public hearing could take place at either the Plan Commission or the Town Board).
- Publish a class 1 notice 30 days prior to the public hearing.
- Invite experts such as DNR or County staff to come speak at the public hearing.
- Have a second informational meeting to allow additional public comment. (This meeting could be in conjunction with the Town Board Meeting/Planning Commission Meeting
- Prepare final draft of desired ordinance(s).
- Put discussion and possible adoption of ordinance(s) on agenda.
- Adopt ordinance(s).

The primary reason for developing this plan is to protect water quality. Many things can alter water quality including dumping of hazardous waste anywhere in the Mercer Watershed Area and having it reach Mercer Lake via stormwater runoff. This included contaminates that reach the groundwater or the Lake via the storm sewer system or overland flow. Although these issues aren't regulated under local ordinances, the EPA stipulates that it is illegal to dump such products as oil, paint thinner, pesticides, etc, down your drain or outside. Those chemicals can cause significant damage to both surface waters and ground water if not properly disposed of.

9.6.c. Wet Detention Ponds

Wet storm water detention ponds are the most effective and most commonly used best management practices to flooding, sedimentation, and numerous pollutants found in storm water runoff. They are reliable and attractive systems that control storm water quality and quantity. They are the most cost effective systems to operate and maintain. These systems consist of single or multiple permanent pools of water or a combination of a single permanent pool of water with a pretreatment sedimentation area (or sediment forebay). Wet detention ponds treat incoming storm water and discharge improved storm water quality to sensitive receiving water bodies and groundwater recharge areas. Wet detention basins are typically engineered with four to eight feet of standing static water levels, allowing sediments and pollutants to settle out to the bottom of the wet detention pond. Wet detention ponds should have a defined sedimentation basin forebay, and an outlet control structure.

9.6.d. Constructed Storm Water Treatment Wetlands

Constructed storm water wetland systems incorporate natural wetland functions to aid in peak flow reductions and pollutant removal from storm water runoff. These BMPs contain shallow pools that enhance growing conditions for marsh plants to maximize pollutant removal. Constructed storm water wetlands can also provide for quantity control of storm water by providing significant volume storage of ponded water above the permanent pool elevation. (This alternative will be impractical unless proper soils are present.)

9.6.e. Streambank Stabilization and Shoreline Rehabilitation

Streambank erosion has a negative impact on the quality of surface water. As erosion takes place, stream channels change, fish habitat is lost, banks become unstable and sediment is carried away. When stream banks erode, they can undercut the channel causing a much more rapid rate of erosion and destabilize the adjacent land. The stream water carries away the eroded sediment that can scar streambanks as it flows downstream and deposits the sediment downstream in areas where the stream's velocity slows down. Nutrients such as phosphorus and nitrogen attach themselves to sediment so as sediment is carried away, so are the nutrients (pollutant loads).

Downstream, sediment deposition can cause stream channels to become shallow. This reduces the velocity and increases the temperature of the water making it difficult for fish to survive and spawn.

Streambank erosion is a serious problem along many waterways in Wisconsin. There are two distinct aspects of the streambank that need to be addressed when considering rehabilitation. The first area is upland of the bank and usually requires re-vegetation to stabilize the banks. The second area is at the toe of the bank and usually requires slowing down the velocity of the water reaching the streambank.

Some of the symptoms of streambank erosion are falling or leaning trees, scouring on both banks, exposed tree roots, fracture lines along top of bank, and exposed infrastructure. Areas that exhibit these symptoms should be considered priority when looking into protecting the streambanks.

Techniques to stabilize streambanks work by either reducing the force (velocity) of the flowing water, increasing the resistance of the bank to erosional forces, using vegetation to stabilize and control erosion problems near streambanks and their immediate upslope, or combining options.

9.6.f. Catch Basin and Maintenance

Catch basin sump capture and removal of sediments from catch basins on a regular basis reduces the potential for pollutant discharges during rain events and thus reduces the potential for conveyance of urban storm water runoff particulates. Cleaning twice a year or more allows the catch basins to capture particulates for most rain events.

9.6.g. Infiltration Trenches

Infiltration facilities such as trenches are designed to intercept and reduce direct site surface storm water runoff rates and volume. They hold runoff long enough to allow it to enter the underlying soil. They can include layers of coarse gravel, sand or other filtering media to filter the runoff before it infiltrates the soil.

Infiltration trenches are shallow (three to eight feet deep) and constructed in relatively permeable soils that are backfilled with a sand filter, coarse stone, and lined with filter

fabric. The trench surface can be covered with grating and/or consist of stone, gabion, sand, or a grassed covered area with a surface inlet. Depending on the design, trenches allow for the partial or total infiltration of storm water runoff into the underlying soil. An alternative design is to install a pipe in the trench and surround it with coarse stone (French drain); this will increase the temporary storage capacity of the trench.

9.6.h. Infiltration Basin

Infiltration basins are also called Bioretention Basins. These Bioretention Basin BMPs are designed to normally contain the following components: a temporary ponding area, a mulch layer, a sandy or loamy planting soil, the plants, and, where necessary, under drains.

Most bioretention devices are off-line basins designed to infiltrate a portion or all of the flow up to the desired design storm event. However, bioinfiltration swales represent a cross between a biodetention basin and a vegetated swale. They are designed for conveyance as well as infiltration.

9.6.i. Dry Extended Detention (ED) Ponds

Dry ED storm water ponds are designed to intercept a rate and volume of storm water runoff and temporarily detain, pre-treat, and impound the water for gradual release to the receiving stream or storm sewer conveyance system. Another common name associated to the Dry ED pond is "detention ponds." Dry ED ponds are typically end-of pipe BMPs that are designed to completely empty after and between storm water runoff events, which allows for the control of storm runoff and provide some water quality treatment through infiltration.

Therefore, this BMP's benefits are primarily in its ability to reduce peak flows and reduce volume if soils are suitable. Stream bank erosion is minimized through the reduced peak discharges and water velocity.

Dry ED storm water ponds provide limited settling and capture of particulate matter. Portions of this particulate material can be resuspended by successive storm water runoff events. Consequently, this BMP should be used primarily for peak discharge shaving, or to reduce the peak discharge of storm water to receiving water bodies in order to mitigate downstream flooding and to provide downstream conveyance system erosion control protection.

9.6.j. Storm Water Ponds

Detention storm water pond BMPs capture storm water runoff and remove pollutants through settling and/or biological uptake. The BMPs presented in this Plan can reduce water quality pollutant discharges, stream bank erosion and flooding by temporarily detaining and controlling peak discharge rates and pretreating runoff before releasing it at flow rates and frequencies similar to those occurring under natural hydrologic and hydraulic conditions. Detention storm water ponds can be designed to enhance wildlife

habitat, provide an aesthetic amenity and satisfy some of the site landscape needs. In some areas, they may require appropriate designs to prevent groundwater contamination. Additionally, consideration should be made of the long-term maintenance and sediment disposal requirements of detention storm water pond BMPs before they are applied.

9.7. Aquatic Plants

The Mercer Lake Association did have an aquatic plant survey completed back in 2003. The survey was completed using the transect method. The DNR's guidelines for new aquatic plant management plans require the point-intercept method where the locations of samples points are taken with GPS. This allows the locations of the samples to be revisited during subsequent surveys. The Mercer Lake Association should consider updating their survey and developing an aquatic plant management plan to be up to date with current DNR guidelines. This will allow for the Mercer Lake Association to properly manage and to maintain a current inventory their aquatic vegetation.

9.8. Private Housekeeping Program

The County could encourage residents to implement local BMPs such as Rain Gardens, Swales, Filter Strips, Roof Runoff Diversions, etc. on their property by offering a tax credit for active BMPs that improve Lake Water quality. The Mercer Lake Association could provide educational material to the local property owners in order to inform them of the benefits of keeping their stormwater on site and allowing it to infiltrate. The Town, Lake Association, and County could work together to form a program to purchase rain barrels for local residents willing to use them on their property.

9.9. Association Activities

The Mercer Lake Association's goal to "improve, preserve and protect Mercer Lake and its surroundings" can only be accomplished with a large base to support those efforts. The following objectives were established to increase the base to help achieve those goals:

- Expanded membership and increased participation
- Development of a long range Lake Management Plan
- Expanded community involvement and support
- Targeted improvement efforts to enhance the quality and use of Mercer Lake

In order to spread out the workload and get more people involved in working towards the Association's goals, committee's were established and chairmen of those committees were assigned to recruit additional people to be on those committees. The following committees were established in October, 2006:

- Membership
- Civic
- Lake Weed Control
- Fish Management
- Water Quality, Monitoring and Testing

- Social
- Boating, Navigation and Safety
- Fundraising
- Finance
- Government Relations and Special Projects

The key objectives of this change are to focus more attention on areas of need and to increase participation through more opportunities to serve. Each of these committees has a list of designated functions, responsibilities and specific objectives to achieve (Appendix C). In the past, it was typically a person or two who was asked to carry the weight of the work which needed to be done. Going forward, each of these committees will consist of several members who the Chair will work with to accomplish the specified objectives. The Association believes that this new structure will increase active participation and expand our membership.

The Mercer Lake Association is investigating the possibility of forming a Lake District to help generate the necessary funds to protect the water quality of Mercer Lake from further degradation. Section 9.11.a. discusses this option in further detail.

It is the goal of the Association to expand the membership to include all potential members, defined as anyone who owns real estate or resides for at least one month per year within one mile of Mercer Lake and who subscribes to the purposes of the Association. A business sponsorship program is also under consideration.

9.9.a. Invasive Species Management

Invasive species are becoming more and more prevalent in Wisconsin Lakes. In order to protect against the possible introduction of invasive species, the Mercer Lake Association should consider the following:

- Assist Wisconsin DNR with aquatic invasive species inspections on the Lake and at boat landings.

- Develop an updated Aquatic Plant Management Plan that meets the latest criteria set by the DNR to describe problem species and areas of interest.

- Incorporate aquatic invasive species programs in the Aquatic Plant Management Plan.

9.9.b. Water Quality Study Programs

In order to effectively address water quality issues, the quality of the water will have to be studied so the information and data is current when future projects are considered.

- Continue an annual water quality monitoring program.

- Proceed with the USGS study to evaluate the nutrient balance and also of groundwater to determine the extent of groundwater contribution of phosphorus to the Mercer Lake.

- Study lake sediments for source and content and determine details of further action.

9.9.c. Government Policies

There are a number of governing entities that can have an effect on Mercer Lake. The Mercer Lake Association may want to consider approaching these entities to coordinate their efforts and reduce the possible negative impact they may have on the water quality of Mercer Lake. Below is a list of entities the Mercer Lake Association may want to consider approaching:

- As State, County, and Town transportation departments minimize the use of road salt, an increase in sand content is common. They should consider the use of alternative de-icing compounds in areas served by bridges over the Lakes, and related tributaries, swales, etc., boat landings, culverts or storm water outfalls, and other areas of high salt-use. Snow disposal areas should not drain into lakes or streams. The Wisconsin Department of Transportation should work with the Towns to explore the best method for ensuring safe roads, minimal salt usage, and minimum impact to the Lakes.

- Utility and Highway Corridors:
  - Proper route selection.
  - Encourage runoff from roads to be directed to sedimentation traps or water-quality pre-treatment ponds before runoff reaches the lakes.
  - Require Wisconsin DOT construction contractors to follow Wisconsin DNR NR 151 runoff management ordinances for future construction. Encourage the use of BMPs to trap road runoff for pretreatment before entering the Lakes.
  - Don't dump sand on the waterfront.
  - Local emergency officials should be prepared either as first responders or have readily available information to protect ground and surface water resources from spill contamination (i.e. gasoline, etc.). Spill preparedness should include adequate training and equipment, such as containment booms and spill absorbents. Emergency response consultants can assist fire fighters and emergency crews in spill contingency planning.

- Share information pertaining to water quality studies and activities with the Town of Mercer, Iron County, DNR, and WisDOT.

- Continue to look for ways to include the Town in watershed water quality improvement activities such as monitoring water quality, assisting with local BMPs, providing test areas and monitoring of various vegetative buffering techniques, and

9.9.d. Regional Partnerships

The Mercer Lake Association may want to consider working with various local groups to coordinate efforts regionally. Below is a list of groups and tasks the Mercer Lake Association may want to consider in the future:

- Work with groups and building more partnerships will help implement more BMP practices throughout the Mercer Lake Watershed Planning Area. Partnership development with Association members in the Lakes and adjoining watersheds is highly encouraged. Partnerships with related Townships and Counties, Natural Resource Conservation Service, UW-Extension, Wisconsin DNR Forestry and Water Quality, and others should be developed.

- Develop local, Town, and County ordinances to help reduce the degradation of the watershed waters from nonpoint source pollution. Ordinances provide the legal frame work for requiring suitable management practices to control nonpoint source pollution. Adopting erosion control and storm water management ordinances (these are Lake Protection grant eligible activities) can specify performance standards, specific BMP, or limit peak runoff flow. In future years, as more land is developed, managing runoff to protect water quality will become increasingly important and the ability to control runoff will be limited if the proper ordinances are not in effect.
- Various Wisconsin communities are using erosion control and storm water management ordinances to regulate pollution prevention for both water quality and water quantity objectives. A comprehensive storm water management ordinance can provide assurance that future growth will not be significantly detrimental to water resources in the lake watershed. To assist in ordinance creation, the Wisconsin DNR has developed model ordinances that can be adopted or used as a starting point in creation of Town's own ordinance. Ordinances will consider runoff volumes, property size, pollutant loads, etc.

- Financing ordinance administration to avoid over burdening taxpayers is recognized as a major concern in ordinance adoption. Developing financing alternatives and administrative strategies may reveal acceptable costs for enacting an erosion control and/or storm water management ordinance.

- Consider expanding Association to include Grand Portage and Martha Lake areas (Little Turtle River watershed).

9.9.e. Implementation Committee

Recommendations are an important aspect of lake planning. It can only be accomplished if there are people to implement the recommendations of the plan. Once the plan has been approved it is important to establish a committee to take on the responsibility of implementing the recommendations.

9.10. Forest Land Management

Protecting the forest lands in the Mercer Lake Watershed Planning Area is an important aspect of protecting the water quality. Trees have deep roots that can stabilize soils and uptake a lot of nutrients. If lands abundant with trees are deforested, especially near riparian areas, significant erosion can occur and deposit additional nutrients into the surface waters. Below is a list of what could be done to protect forested lands:

- Require reforestation of deforested lands.
- Follow Wisconsin DNR Forestry Best Management Practices.
- Leave timber on steep slopes.
- When crossing streams and gully areas, build bridges per Wisconsin DNR Forestry Best Management Practices and uphold NR 151 Runoff Management rules.
- Timber should be taken from steep slopes or lowland areas. Perform this work between January and March to ensure frozen ground conditions that will reduce erosion as a result of the logging activity. Leave the stumps to help maintain the soil texture and minimize erosion.

9.11. Additional Recommendations

9.11.a. Wisconsin DNR Lake Protection – USGS Study

The Mercer Lake Association has applied for a Lake Protection Grant to further study the environmental and water quality conditions of Mercer Lake and its watershed. The Association would work as part of a team in conjunction with the Town of Mercer, the U.S. Geologic Survey and Cedar Corporation to do a detailed water quality and sedimentation study of the lake and its watershed, produce a final USGS report of the study and develop an updated Lake Management Plan. The information will be significantly valuable in understanding what damage has been done to the lake and its watershed as well as determining what corrective actions can be taken to change and improve the current situation. The reports developed will serve as guides for the lake residents, the Town of Mercer and Iron County on how to deal with water quality improvements for not only the Mercer Lake watershed, but for other lakes in the area. The USGS report will document lake conditions for this and similar lakes in the region, but will also determine the effects of several types of lake water quality damage done by urbanization. It is hoped that this information will help provide answers and solutions for long term improvement and reversal to the degradation of water quality.

Lake-area residents and lake users desire to implement management or restoration steps to return the lake to a more natural, improved condition. Quantitative information on rates of phosphorus loading from various sources is not available to evaluate the significance of any specific loading source as a percentage of total loading to the lake. Before management decisions are made, a good understanding of the lake and watershed hydrology, nutrient loading by specific source, and internal recycling of nutrients is needed. In addition, the lake's likely response to incremental increases or decreases in phosphorus loading needs to be determined.

Water-quality data characterize the physical, chemical, and biological changes in our water resources in response to natural processes including climatic variations, storms, floods, droughts, and a variety of human activities that exert an influence on water-quality conditions. The data are useful in designing programs to manage watersheds, protect sensitive aquatic habitats, biota, and lakes from urban and agricultural runoff, sewage, and industrial wastes. This project will provide consistent water-quality data of lakes and accurate inputs and outputs to determine water and nutrient budgets and provide a better understanding of the hydrologic system. This proposed study will provide needed information to lake scientists and managers to better understand the lake for the planning, restoration, and management of Mercer Lake. The benefits of this project extend beyond those outlined for the local Mercer Lake area. Information from this study will improve our knowledge of how a northern drainage lake was affected by wastewater discharges and how lake water quality responds to changes in phosphorus loading.

Sedimentation in the Lake is a major concern as well. It is recommended that the USGS study take place to investigate the cause and the composition of the sedimentation in Mercer Lake. As stated earlier, much of this sedimentation is likely related to the effluent from the old sewage treatment plant. Understanding the composition of the sediment is the first vital step in determining the best methods to address the sedimentation problems. Once the USGS portion of the study is complete, the information will be utilized to form recommendations to address the problems, an action plan of how to implement the recommendations, and a comprehensive update of this preliminary lake watershed management plan.

9.12. Funding Options

Implementing projects to help improve the water quality and reduce the amount of further degradation can be a significant cost. There are a number of mechanisms in place to help ease the ease the financial burden on the local residents. The text below describes a variety of options the Mercer Lake Association may want to consider for required funding and when implementing projects to help protect the Lake.

9.12.a. Formation of a Lake District

Lake Associations have the authority to become lake districts. Lake districts have a unique blend of powers and governance provisions tailored to fit the needs of lake communities. Districts may be formed under Chapter 33 (Sub Chapter IV) of the Wisconsin Statutes to undertake protection, rehabilitation and recreational improvement of public inland lakes. Lake districts are established by town, county or village boards, or city councils, and usually based on a formal petition of lake area owners.

Currently, funding of Association activities is being backed by only those that voluntarily join and contribute to the Association. A significant amount of the home owners do not provide any financial support of lake and water quality improvement costs. A lake district could equitably spread the financial burden to all those who benefit from improvements rather than asking a few bear the costs of protecting Mercer Lake.

The Wisconsin Association of Lakes (WAL) has guidelines for forming a lake district. The Mercer Lake Association may want to appeal to the Town of Mercer to form a lake district where they could tax the local residents to help pay for some of the various projects necessary to improve and preserve the water quality of Mercer Lake.

9.12.b. Development Charges

As land is developed or built upon, surface stormwater runoff and pollution loading increases. Administrative and capital costs can be recovered at the time of building permit issuance or land development approval. A city, town, or village can require dedication of land for ponding or drainage purposes.

Impact fees are contributions paid by public facility users who create a need for increased capacity in the public facility. These fees are authorized under the requirements of Section 66.617 of Wisconsin State Statutes.

These charges are designed so developers will pay the "fair share" of the cost of constructing on-site and regional stormwater management BMP improvements. Stormwater management BMP improvements are characteristically designed to last twenty years or more. The requirement that owners of future developed properties enjoy the benefits of the improvements at no incremental cost is often considered inequitable. The use of system development charges can provide important revenue source flexibility.

9.12.c. Fee-In Lieu of On-site Detention/Retention and Other BMPs

In-lieu of fees are a regulatory requirement that provides developers the option to construct on-site stormwater runoff detention/retention facilities in accordance with the established design criteria or pay a fee into a fund dedicated to the construction of an off-site detention regional stormwater management facility serving multiple properties. The approach encourages the siting and construction of more regional versus on-site facilities. Fee-in-lieu of programs are effective in guiding development patterns within a watershed and are a tool to encourage comprehensive stormwater planning.
Fee-in-lieu of procedures have a downside. Since construction timing and cash flow are critical, the usual fee for a single development property may not be large enough to fund the construction of an entire regional facility. Therefore, either multiple developments must occur simultaneously in a given area to generate enough revenue to fund the construction of a regional facility, or the project must be funded up-front from other sources. Service charges and borrowing from other funds can provide the necessary initial resources for construction. These funds can then be repaid by future in-lieu of fees.

9.12.d. Grants

Historically, local governments have experienced infrastructure funding support from state and federal government agencies in the form of direct grants in aid, interagency loans, and more. It is important to assess likely trends regarding federal/state assistance for stormwater management financing. Future trends within our state and national budget

indicate that future available funding through the grant process is unknown; it is possible that these funding options could be eliminated due to state and federal budget issues.

The State of Wisconsin has reviewed the need to improve stormwater management and water quality need based projects under the Clean Water Fund. The review first led to projects that were under the Clean Water Fund low interest loan program. This program has been used for years to finance projects, such as sewage treatment plant upgrades.

The State has taken another step forward to improve stormwater management and water quality planning by developing the WAC NR 155 Urban Nonpoint Source and Stormwater Construction, Planning and Land Acquisition grant program. Currently, the WDNR is reviewing the WAC NR 216 to update various items, including the list of communities that will need a permit for stormwater discharges.

State grants are available to assist in surface water management and abatement of nonpoint source pollution. However, it is generally not good financial practice to rely totally on grants for a service program. This source of revenue is not dependable and requires constant speculation as to its availability. Grants are useful but should only be used to supplement a planned local revenue source.

Examples of some available grants include:

i. Wisconsin Department of Natural Resources (WDNR)

Additional information on the following programs can be found at http://www.dnr.state.wi.us/.

The Wisconsin DNR Lake Grants are influenced by the Wisconsin gas tax revenue. Despite the budgetary changes and cutbacks, the lake grant funding increased from $2.6 to $3.1 million dollars annually.

Aquatic Invasive Species Grants

The DNR has recently developed (2005) an Aquatic Invasive Species grant program to assist in a state/local partnership to control aquatic invasive species. These grants require a 50% local share match and are available to units of government and lake protection and rehabilitation districts, qualified lake associations, qualified river management organizations, nonprofit conservation organizations, and qualified school districts. Eligible planning project activities include:

- Education, Prevention, and Planning
- Early Detection and Rapid Response to control the spread of aquatic invasive species
- Controlling Established Infestations
- Watercraft inspections
- Investigation of control methods or prevention techniques.

Lake Planning Grants

Lake planning grants provide funding for the lake management planning process. Qualified applicants are Wisconsin counties, towns, villages, cities, qualified lake associations, town sanitary districts, lake districts, other governmental units as defined in Ch. 66.299, Wisconsin Statutes, tribal units of government, qualified nonprofit conservation organizations. These grants are offered twice annually (February 1 and August 1) for extensive studies and technical planning and there are large and small scale grants.

- Small scale lake planning grants of up to $3,000 are available for obtaining and disseminating basic lake information, conducting education projects, and developing management goals. These grants are ideal for applicants who are just beginning the planning process, education processes, or for activities that supplement an existing plan.

- Large scale lake planning grants up to $10,000 per project (maximum 2 projects per application cycle) are available for larger projects. The intent of a large-scale program is to conduct technical studies to help develop elements of or complete comprehensive management plans.

- The WDNR typically pays for 75% of the projects costs through grant cost share payments not to exceed $10,000 and the applicant local share is 25% (up to $3,333). These are competitive grants as they are typically over subscribed.

Lake Protection and Classification Grants

Lake protection grants provide funding for implementing the recommendations of a management plan. As one progresses from planning to implementation, the costs and the time involved increases. Because implementation is more expensive, protection grants are available for up to $200,000 per project, except that grants for regulation or ordinance development projects are limited to $50,000.

Grants are based on 75% of the total eligible project costs and capped at the maximum grant amount mentioned earlier. Grants are awarded annually and a priority project list is prepared each year on a state-wide basis. The grant deadline is May 1.

Activities that are acceptable for funding include purchasing property or easements which contribute to the protection or improvement of the natural ecosystem and water quality of a lake; restoring wetlands or lands draining to wetlands; and developing regulations and ordinances to protect lakes (stormwater and construction site erosion control) and the educational activities necessary for these regulations to be implemented.

Runoff Management Grants

The DNR offers financial assistance for local efforts to control nonpoint source pollution. These grants support both the implementation of source-area controls to prevent runoff contamination and the installation of treatment systems to remove pollutants from runoff. The main goal of these nonpoint grants is to improve the quality of Wisconsin's water resources by decreasing the impacts of nonpoint pollution. These grants are as follows:

- **Targeted Runoff Management (TRM) Grant Program**

  TRM grants are competitive financial awards to support small-scale, short-term projects that are completed by local governmental units within 24 months of the start of the grant period. Both urban and rural projects can be funded through a TRM Grant.

  Depending on eligibility of a project, the maximum cost-share rate available to TRM grant recipients is 70% of eligible costs, with the total of state funding not to exceed $150,000 in state funding.

- Project selection is competitive and is scored based on fiscal accountability, water quality priorities, local support, pollution control, and other factors. Some examples include: easements, land acquisitions, stream bank protection projects, wetland construction, detention ponds, design of BMP projects for construction, some cropland protection, and livestock waste management practices. Selected engineering design of structural practices are eligible for cost sharing.

Stewardship Grant Program

The WDNR provides funding for stewardship projects such as the following:

- Land acquisition
- Trails
- Restrooms
- Parking lots
- Picnic areas
- Handicap accessibility modifications

Application deadline is May 1 each year. Grants are extremely competitive. The WDNR uses a detailed point system to fund the project and land acquisition projects score the highest.

ii. **State Land Trusts and Stewardship Programs**

This voluntary program includes a stream bank component and an urban river component. Funds are available to public entities and provide non-profit

organizations for property purchases from willing sellers, fencing, easements and public fishing areas.

To date, Wisconsin's land trusts have been awarded $25 million in matching funds through the Warren Knowles-Gaylord Nelson Stewardship Fund. These funds have been matched dollar-for-dollar in federal and private funds and land donations from landowners. In addition, land trusts take on the permanent management responsibility of these lands and each project has clear public support in the community. The West Wisconsin Land Trust is an example of one in Western Wisconsin.

iii. River Country Resource Conservation & Development Council, Inc. (RC & D)

The council is a non-profit organization representing 12 counties in rural development issues. It consists of one individual from each county board and one at-large member. The council receives funding from a base grant from the USDA, however being a non-profit organization, RC & D is able to obtain monies from other grant sources. RC & D has limited matching funds available for erosion control projects. Most often these monies are administered through the county Soil and Water Conservation District. The team is currently focused on assisting the implementation of buffer strips to aid in erosion control projects.

iv. FEMA Funds

- Funding to re-map floodplains is available through FEMA, but funding is limited.

- If an area has been declared for emergency assistance through FEMA, the representatives will assist the communities through the special 406 Hazard Mitigation Funds.

v. Economic Development Grants

(1) TEA: Transportation and Economic Development Assistance (State of Wisconsin Department of Transportation)

- Must have a business creating or retaining jobs.
- Storm sewer improvements as part of a street project are eligible.
- 50% State funds; 50% community funds.

(2) CDBG-PFED: Community Development Block Grant-Public Facilities for Economic Development (State of Wisconsin Department of Commerce)

- A grant to the community of up to 75% for infrastructure to accommodate a new or expanding business.
- The business investment must equal the PFED funding.
- There are job creation requirements.

vi. **Public Facilities**

(1) CDBG: Community Development Block Grant program (administered by the Department of Commerce)

- Grant funds to construct storm sewer projects.
- Application deadline: continuous funding cycle. Pre-application is required.
- Community survey may be required.
- Low-to-moderate income requirements.
- Community usually provides 60%; the remainder of the cost is a grant.
- Competitive grant.

9.13. Information and Education

Public involvement and input is, quite possibly, the most important aspect of this plan. If the public does not understand the goals and reasoning behind the proposed recommendations and changes, the chance of sustained action and support for lake watershed management is reduced dramatically. Simply put, the success of the Mercer Lake Association to implement the recommendations herein relies almost solely on the effort to educate and involve the public on the issue of stormwater runoff management and other described issues.

9.13.a. Target Audiences

Many different groups need to be included in the Education and Information Program for it to be effective. Examples of groups that should be included are:

- Public Officials/Policy Making Bodies
- Residents
- Elementary/Middle/High School Students
- Business and Industry
- Homebuilders and Developers
- Property Owners

Each group has a different view of managing the watershed. Some may know very little about it, such as the elementary school students and layperson. Some may be initially against recommendations provided in this plan. The goal of this section of the plan is to incorporate all of the different approaches needed to properly address each group and educate them to the importance of lake watershed management and implementation of the recommendations herein.

9.13.b. Public Officials/Policy Making Bodies

The Town of Mercer has held a few of presentations and public information meetings regarding the Lake Watershed Management Plan during regularly scheduled Town Plan Commission Meetings. These public meetings were publicly noticed and open to the public and have allowed residents and public officials to begin to understand the intent

and benefits of the Lake Watershed Management Plan and how the conclusions and recommendations herein were determined.

In the future, the Association will present information regarding study results and other Association activities to the Town of Mercer and Iron County as that information becomes available.

9.13.c. Elementary, Middle and High School Students

Perhaps the most important audience for education is Elementary, Middle, and High School students. These groups can be the most willing to learn about stormwater runoff and experience shows that educated students will attempt to educate their parents and develop into education and information leaders.
Teachers could:

- Include lake watershed management into their lesson plans.
- Plan a visit from a Town official or other professional volunteer to discuss stormwater issues and how they pertain to water quality.
- Coordinate an outfall and stream sampling and monitoring program with the Town of Mercer.
- Utilize available educational programs on water quality to emphasize the need to sustain high quality surface and groundwater within the Town .

Students could:

- Participate in a stenciling program for which "No Dumping" is painted on all Town stormwater inlets.
- Create flyers or posters to be used in a community education campaign.
- Survey their parents and neighbors about their knowledge of watersheds and how they function and compile the information with their classmates.
- Write articles or letters to the editor highlighting the impact stormwater and various activities harm water quality.
- Assist the Town with long-term testing and monitoring program.

Of course, there are countless other creative options available to include students in the education and information phase of the plan implementation recommendations.

9.13.d. Residents

The primary concern of most adult residents will be the costs for implementation and the proposed creation of a Lake District as a funding source. Therefore, the primary information and educational campaign for this group should focus on the benefits of implementation of the recommended improvements, costs of improvements, and creative funding and financing sources available.

Some methods of informing adult residents would be:

- Letters or Flyers
- Inserts into Utility Bills
- Town of Mercer Newsletter

- Newspaper articles
- Surveys
- Public Meetings
- Seminars
- Demonstration Projects

9.13.e. Business and Industry

Businesses and industries are excellent locations to post information that will reach a large number of people. The Town of Mercer has a number of businesses located near Mercer Lake. It would be incredibly beneficial to post information regarding lake watershed management in a public location with high pedestrian traffic, such as at the lunch room or at the entrance or lobby of any retail or service business. This would expose the information to a large number of individuals without incurring high printing and postage costs.

Some communities have requested sellers of phosphorus-based fertilizer to post a "kind reminder" next to such products informing them of the non-phosphorus or organic-based choices. In the same vein, lawn care professionals might be a good means to distribute information about non-phosphorus and organic based fertilizers to their customers.

9.13.f. Homebuilders, Developers, and Real Estate Businesses

Professionals in the business of land development, real estate, and land disturbing activies are other main group that should be targeted for information purposes. Development and enforcement of a Construction Erosion Control Ordinance and proposed Stormwater Management Ordinance is vitally important to the success of the proposed Best Management Practices. For instance, a subdivision designed and constructed in strict accordance with the provisions herein can still be a major source of flooding and sedimentation downstream if construction erosion control and post construction stormwater management facilities are not properly designed and installed. Homebuilders may not know that silt fence, aggregate tracking pads, and other single site erosion control methods and properly designed and sited stormwater management facilities can be relatively inexpensive to install and maintain prior to home and building construction.

Methods of disseminating information to this group of individuals may include:

- Letters/Flyers
- Fact Sheets
- Newspaper articles
- Public Meetings
- Seminars
- Ordinances

9.13.g. Property Owners

It is important to have private land owners participate in protecting the water quality of Mercer Lake. It is important that everyone do their part to control the stormwater runoff coming from their property where feasible. There are a number of activities an individual land owner can do to mitigate much of the stormwater runoff issues coming off their property. Some stormwater runoff mitigation opportunities include planting a rain garden, using rain barrels, and raking and removal of grass clippings and leaves. These are just a few of the many options property owners have to help reduce the negative impacts that their property has on surface waters.

9.13.h. Summary

The Town of Mercer has a vested interest in ensuring the increased understanding and acceptance of lake water quality issues by watershed residents. In targeting various and diverse groups of public officials, staff, residents, businesses, farmers, and developers, it is hoped that all segments of the community are exposed to at least a portion of the educational material regarding the importance of lake watershed management benefits.

Appendix A
WiLMs Data Sheets

Date: 3/29/2007 Scenario: 23

Lake Id: Mercer Current

Watershed Id: UC14

Hydrologic and Morphometric Data

Tributary Drainage Area: 1344.2 acre
Total Unit Runoff: 14.00 in.
Annual Runoff Volume: 1568.2 acre-ft
Lake Surface Area <As>: 184.0 acre
Lake Volume <V>: 2024.0 acre-ft
Lake Mean Depth <z>: 11.0 ft
Precipitation - Evaporation: 7.0 in.
Hydraulic Loading: 1675.6 acre-ft/year
Areal Water Load <qs>: 9.1 ft/year
Lake Flushing Rate <p>: 0.83 1/year
Water Residence Time: 1.21 year
Observed spring overturn total phosphorus (SPO): 0.0 mg/m^3
Observed growing season mean phosphorus (GSM): 0.0 mg/m^3
% Phosphorus Reduction: 0%

NON-POINT SOURCE DATA

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High
	(ac)	Loading (kg/ha-year)				Loading (kg/year)		
Row Crop AG	0.0	0.50	1.50	3.00	0.0	0	0	0
Mixed AG	42.6	0.80	1.00	1.40	17.0	14	17	24
Pasture/Grass	123.4	0.10	0.30	0.50	14.8	5	15	25
HD Urban	41.7	1.00	1.30	2.00	21.7	17	22	34
MD Urban	182.6	0.40	0.09	0.80	6.6	30	7	59
Rural Residential	50.8	0.05	0.10	0.25	2.0	1	2	5
Wetlands	260.1	0.10	0.10	0.10	10.4	11	11	11
Forest	616.4	0.05	0.00	0.18	0.0	12	0	45
Recreation GC	25.8	0.10	0.30	0.80	3.1	1	3	8
Open Water	0.8	0.10	0.10	0.10	0.0	0	0	0
Lake Surface	184.0	0.10	0.27	1.00	19.9	7	20	74

POINT SOURCE DATA

Point Sources	Water Load (m^3/year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
User Defined 1	0.0	0.0	0.0	0.0	0.0
User Defined 2	0.0	0.0	0.0	0.0	0.0
User Defined 3	0.0	0.0	0.0	0.0	0.0
User Defined 4	0.0	0.0	0.0	0.0	0.0
User Defined 5	0.0	0.0	0.0	0.0	0.0
User Defined 6	0.0	0.0	0.0	0.0	0.0

SEPTIC TANK DATA

Description		Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)		0.30	0.50	0.80	
# capita-years	91				
% Phosphorous Retained by Soil		98.0	90.0	80.0	
Septic Tank Loading (kg/year)		0.55	4.55	14.56	4.5

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	216.7	223.1	661.2	100.0
Total Loading (kg)	98.3	101.2	299.9	100.0
Areal Loading (lb/ac-year)	1.18	1.21	3.59	
Areal Loading (mg/m^2-year)	132.02	135.89	402.79	

Date: 3/29/2007 Scenario: 24

Lake Id: Mercer Future
Watershed Id: UC14

Hydrologic and Morphometric Data

Tributary Drainage Area: 1344.2 acre
Total Unit Runoff: 14.00 in.
Annual Runoff Volume: 1568.2 acre-ft
Lake Surface Area <As>: 184.0 acre
Lake Volume <V>: 2024.0 acre-ft
Lake Mean Depth <z>: 11.0 ft
Precipitation - Evaporation: 7.0 in.
Hydraulic Loading: 1675.6 acre-ft/year
Areal Water Load <qs>: 9.1 ft/year
Lake Flushing Rate <p>: 0.83 1/year
Water Residence Time: 1.21 year
Observed spring overturn total phosphorus (SPO): 0.0 mg/m^3
Observed growing season mean phosphorus (GSM): 0.0 mg/m^3
% Phosphorus Reduction: 0%

NON-POINT SOURCE DATA

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High
	(ac)	Loading (kg/ha-year)				Loading (kg/year)		
Row Crop AG	0.0	0.50	1.50	3.00	0.0	0	0	0
Mixed AG	42.6	0.80	1.00	1.40	16.0	14	17	24
Pasture/Grass	123.4	0.10	0.30	0.50	13.9	5	15	25
HD Urban	41.7	1.00	1.30	2.00	20.4	17	22	34
MD Urban	198.4	0.40	0.09	0.80	6.7	32	7	64
Rural Residential	105.5	0.05	0.10	0.25	4.0	2	4	11
Wetlands	260.1	0.10	0.10	0.10	9.8	11	11	11
Forest	542.1	0.05	0.00	0.18	0.0	11	0	39
Recreation GC	25.8	0.10	0.30	0.50	2.9	1	3	5
Open Water	0.8	0.10	0.10	0.10	0.0	0	0	0
Lake Surface	184.0	0.10	0.27	1.00	18.7	7	20	74

POINT SOURCE DATA

Point Sources	Water Load (m^3/year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
User Defined 1	0.0	0.0	0.0	0.0	0.0
User Defined 2	0.0	0.0	0.0	0.0	0.0
User Defined 3	0.0	0.0	0.0	0.0	0.0
User Defined 4	0.0	0.0	0.0	0.0	0.0
User Defined 5	0.0	0.0	0.0	0.0	0.0
User Defined 6	0.0	0.0	0.0	0.0	0.0

SEPTIC TANK DATA

Description		Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)		0.30	0.50	0.80	
# capita-years	118				
% Phosphorous Retained by Soil		98.0	90.0	80.0	
Septic Tank Loading (kg/year)		0.71	5.90	18.88	5.5

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	225.2	237.3	682.2	100.0
Total Loading (kg)	102.2	107.6	309.4	100.0
Areal Loading (lb/ac-year)	1.22	1.29	3.71	
Areal Loading (mg/m^2-year)	137.20	144.55	415.55	

Appendix B
Sociological Survey and Report

MERCER LAKE SURVEY

The Mercer Lake Association is conducting a survey to assess the present uses and perceptions of Mercer Lake. The information gained from this survey will be used by the Mercer Lake Association and its supporters to help determine what improvements may be required to address the future recreational use of the lake and to preserve this natural resource. They want your input, too!

The Mercer Lake Association has hired Cedar Corporation of Menomonie to assist with this survey. In order to keep responses confidential, Cedar Corporation will tabulate the survey responses, and will provide the Mercer Lake Association with a summary of the anonymous responses. You can help our community a great deal by filling out this questionnaire and returning it in the enclosed postage-paid envelope by September 1st, 2006.

1. What is your Town of Mercer residency status? (Please circle **one** answer)

   a. Year-round resident (35) b. Seasonal resident. (25) c. Non-resident property owner. (23) d. Non-resident. Don't own property. (1)

2. Do you own property on Mercer Lake? (Please circle **one**) Yes (49) No (35)

3. How many years have you been living on and/or visiting Mercer Lake? (Please circle **one**)

   a. Less than 1 year (4)
   b. 1-5 years (12)
   c. 6-10 years (18)
   d. 11-15 years (7)
   e. 16-20 years (6)
   f. Over 20 years (31)

4. How would you rate the number of motorized vehicles used on Mercer Lake in the summer of 2005? (Please circle **one**)

   a. High number (2) b. Moderate number (30) c. Low number (26) d. Unsure (20)

5. How would you rate the number of non-motorized vehicles used on Mercer Lake in the summer of 2005? (Please circle **one**)

   a. High number (0) b. Moderate number (7) c. Low number (51) d. Unsure (21)

6. What term best describes the water quality of Mercer Lake? (Please circle **one**)

   a. Clear (34) b. Cloudy (12) c. Murky (16) d. Bad odor (3) e. Other: _____(10)

7. What factors prompted your answer to #6? (Please circle **all** that apply)

   a. Amount of algae (11)
   b. Ability to see the lake bottom (45)
   c. Thickness of the sediment (mud) on bottom of lake and in the water (21)
   d. Amount of aquatic plants (27)
   e. Unsure (6)
   e. f. Other: _____(5)

8. To what extent does water quality affect your decision to use Mercer Lake? (Please circle **one**)

   a. Little to no effect (17) b. Some effect (32) c. Great effect (29)

9. If you fish, how would you rate the quality of fishing this past season (2005) compared to the time periods shown below?

   a. Over the last 5 years: (Please circle **one**)

      1. Didn't Fish (26) 2. Better (7) 3. About the same (30)4. Worse (10) 5. Unsure (5)

   b. Over the last 10 years: (Please circle **one**)

      1. Didn't Fish (28) 2. Better (3) 3. About the same (23)4. Worse (11) 5. Unsure (10)

   c. Over the last 20 years: (Please circle **one**)

      1. Didn't Fish (28) 2. Better (2) 3. About the same (10)4. Worse (10) 5. Unsure (20)

10. Would you say the "health" of Mercer Lake in the summer of 2006 (from Memorial Day to Labor Day) was better or worse than it was in the following time frames?

    a. Summer 2005: (Please circle **one**)

       1. Better (11) 2. Worse (8) 3. About the same (33) 4. Unsure (24)

    b. In the past 5 years: (Please circle **one**)

       1. Better (11) 2. Worse (11) 3. About the same (26) 4. Unsure (25)

    c. In past 10 years: (Please circle **one**)

       1. Better (10) 2. Worse (11) 3. About the same (17) 4. Unsure (32)

    d. In the past 20 years: (Please circle **one**)

       1. Better (9) 2. Worse (11) 3. About the same (9) 4. Unsure (38)

11. Please list up to three things that you like most about Mercer Lake or its watershed surrounding the lake:

a. _____

b. _____

c. _____

12. Please list up to three things you don't like about Mercer Lake or its watershed surrounding the lake?

a. _____

b. _____

c. _____

13. Which term best describes Mercer Lake's public access? (Please circle **one**)

a. Good (31) b. Fair (23) c. Poor (14) d. Unsure (7)

Why? _____

14. What type of septic system do you use at your Town of Mercer residence? (Please circle **one**; **non-residents skip to question 17)**

a. Holding tank (0)
b. Privy/outhouse (0)
c. Septic tank/drain field (18)
d. Mound system (1)
e. Unsure (1)
f. Do not use septic system (Please **skip to question 17**) (53)

15. What best describes the age of your septic system? (Please circle **one**)

a. Less than 5 years old (6)
b. 6-10 years old (4)
c. 11-15 years old (2)
d. 16-25 years old (2)
e. More than 25 years old (2)
f. Unsure (4)

16. Please indicate how often your septic system is pumped. Once every _____ years.

17. Does your property have any of the following means to reduce erosion or runoff to Mercer Lake? (Place **one "x"** for **each** category)

Category	Yes	No	I'm Not Sure
Landscaped vegetative barrier	(26)	(25)	(6)
Undeveloped, natural vegetation	(48)	(12)	(5)
Grass drainage ditch	(11)	(30)	(9)
Rain garden	(3)	(36)	(6)
Rain water collection	(4)	(37)	(5)

18. Do you have any plans for additional steps to control runoff on your property? (Please circle **one**) Yes (11) - No (55)

If yes, please describe below:

_____

_____

_____

19. Which, if any, of the following do you think causes or may cause problems for surface waters nearest you? (Please circle **all** that apply)

a. Fertilizers/pesticides from lakeshore homes (30)
b. Improper disposal of household chemicals, paints, oils, etc. (17)
c. Farm fertilizers (5)
d. Erosion from crop fields (2)
e. Storm water running off house roofs, driveway or roads (45)
f. Aquatic plants introduced from other lakes on boats and trailers (44)
g. Manure from barn yards (2)
h. Septic systems (32)
i. Erosion from construction site (14)
j. Grass clippings and/or leaves (14)
k. Pollution from roads and highways (47)
l. Other: _____(7)

20. How would you feel about a vegetative buffer, a 35' or wider strip of native vegetation, along the shoreline? (Please circle **one**)

a. Strongly support (20) b. Support (14) c. Neutral (11) d. Oppose(13) e. Strongly oppose (12) f. Unsure (7)

21. How would you feel about using fertilizer that does not contribute to increased algae in Mercer Lake? (Please circle **one**)

a. Strongly support (32) b. Support (27) c. Neutral (4) d. Oppose(2) e. Strongly oppose (4) f. Unsure (8)

22. If you could change one thing about Mercer Lake to increase your enjoyment of the lake, what would you change?

_____

_____

_____

23. From the list below, please indicate which actions do you think need to be done to help improve water quality of Mercer Lake? (Please circle **all** that apply)

a. Enforce a fertilizer ordinance to limit algae (47)
b. Enforce zoning and township ordinances that affect the lake (45)
c. Enforce a vegetative buffer ordinance for lake shore owners (22)
d. Keep everyone in the watershed informed of the lake condition and what is being done (50)
e. Build and improve waterways that slow the runoff of silt into the lake (39)
f. Monitor lake quality (53)
g. Watch for and report exotic plants (52)
h. Financially support programs and projects to improve the lake (41)
i. Improve the public landing to reduce erosion (33)

Other: _____(20)

24. Please choose the top two groups you feel should be responsible for the actions to improve Mercer Lake from question 23. (Please circle a maximum of **two**)

a. Local watershed residents (13)
b. Non-resident users (3)
c. Township government (34)
d. County government (14)
e. Individual lakeshore property owners (20)
f. Lake association (Mercer Lake Association) (30)
g. State government (23)
h. Federal government (4)
i. Other: _____(1)

25. How often do you use Mercer Lake for the following activities: (Place **one "x"** for **each** activity)

Activity	1-5 times per year	6-10 times per year	11-20 times per year	More than 20 times per year
Entertaining friends	(32)	(10)	(2)	(6)
Fishing	(17)	(11)	(17)	(13)
Ice fishing	(20)	(3)	(4)	(1)
Snowmobiling	(10)	(6)	(3)	(1)
Swimming	(12)	(9)	(5)	(3)
Boating	(12)	(9)	(10)	(10)
Non-motorized boating (canoe/kayak)	(16)	(6)	(6)	(4)
Appreciating peace and tranquility	(10)	(4)	(6)	(32)
Observing wildlife	(10)	(6)	(4)	(30)
Campfires/picnics	(10)	(9)	(2)	(6)
Other	(6)	(0)	(0)	(4)

26. Please circle the activities that you are aware of, that Mercer Lake Association has been involved in:

a. Water quality testing (51)
b. Receiving and implementing DNR Lake Study Grant ($20,000) (44)
c. Fish netting (50)
d. Aquatic plant survey (44)
e. Sediment core analysis (39)
f. Aquatic plant removal (43)
g. Not aware of activities (12)
h. Other: _____(3)

27. Do you or any member of your household belong to Mercer Lake Association?

a. Yes (43) b. No (35)

28. If you chose "no" in Question #27, what prevents you from joining?

_____

_____

To what extent do you agree or disagree with statements 29-34? Please circle the corresponding letter.

29. I feel there is too much green algae on Mercer Lake:

a. Strongly agree (9) b. Agree (28) c. Neutral (12) d. Disagree (9) e. Strongly disagree (1) f. Don't know (18)

30. Mercer Lake is an important resource to the Town of Mercer and surrounding communities:

a. Strongly agree (48) b. Agree (21) c. Neutral (3) d. Disagree (2) e. Strongly disagree (0) f. Don't know (4)

31. I would like to see some restrictions on the use of personal watercraft (jet skis):

a. Strongly agree (21) b. Agree (25) c. Neutral (14) d. Disagree (5) e. Strongly disagree (6) f. Don't know (7)

32. I feel the water quality of Mercer Lake has improved in recent years:

a. Strongly agree (5) b. Agree (24) c. Neutral (17) d. Disagree (11) e. Strongly disagree (2) f. Don't know (19)

33. I feel the amount of aquatic plants in Mercer Lake has increased in recent years:

a. Strongly agree (15) b. Agree (22) c. Neutral (11) d. Disagree (6) e. Strongly disagree (0) f. Don't know (24)

34. On Mercer Lake there should be a limit on the maximum horsepower and type of motor used to power boats:

a. Strongly agree(15) b. Agree (16) c. Neutral (15) d. Disagree (12) e. Strongly disagree (13) f. Don't know (17)

35. What is the best way for Mercer Lake Association to communicate with you? (Please circle **all** that apply)

a. Meetings (22)
b. Phone call (7)
c. Newsletter (57)
d. Newspaper articles (20)
e. E-mail: _____(13)

36. Do you have special skills that could assist the Mercer Lake Association? (Please circle **one** answer)

a. No, I don't think so (65)
b. Yes, I believe so (7)
If YES, and you would like to be contacted please provide a telephone number or email where we can reach you._____

37. Would you be willing to volunteer for a role in the Mercer Lake Association?

a. No, I don't think so (53)
b. Yes, I believe so (18)
If YES, and you would like to be contacted please provide a telephone number or email where we can reach you._____

38. Additional comments:

_____

_____

_____

_____

_____

_____

_____

_____

_____

YOUR PARTICIPATION IN THIS SURVEY IS GREATLY APPRECIATED!

MERCER LAKE SURVEY COMMENTS

August 2006

6. What term best describes the water quality of Mercer Lake? Response to "Other:"

"Weedy."
"The water is clear, but the bottom is muck."
"Unsure."
"Unsure."
"Weeds."
"Don't know."
"Depends."
"Same algae bloom in season."
"Weedy; tan on stain."
"Very weedy."
"Weedy."
"Not sure."
"Stained."
"The water itself is clear, but the bottom is muddy and the shore is weedy."

7. What factors prompted your answer to #6? Response to "Other:"

"Smell."
"Water looks clear."
"Don't live there."
"Don't live there."
"Don't know."
"Took Secchi reads."
"Too much sediment; too many aquatic plants."
"Don't use."

11. Please list up to three things that you like most about Mercer Lake or its watershed surrounding the lake:

"Fishing; location to town; quiet."
"Muskie fishing; scenic beauty; little boat traffic."
"Size appears inviting; reputation for fishing, at least in past; convenient location relative to town."
"Close to my home; fishing is improving; river exiting lake."
"Muskies – big game fish; low recreational boating; the amount of wildlife – birds, otters."
"Not very busy; clear water; loons and eagles."
"quiet lake – not many jet skis, speed boats, etc.; all around fishing; not an overbuilt lake front."
"Boat landing keeps people off it; water on Mercer clean environment; little to no resort and commercial use of lake."
"Quiet; very moderate use; decent fishery."
"Tranquility and some good fishing spots."

"Quiet; shows slight improvement; fewer septic systems leaching into lake."

"Rural setting with city utilities."

"Weather be on the lake."

"Beauty; quiet most of time; wildlife."

"Nice homes; size."

"It's in town – close to store – restaurants; the right size; the fellow property owners."

"Little use of lake by others; nice fishing; clarity of water."

"Can use a motor to ski/tube if you want; variety of fish; swimmable."

"Rural; how nicely the lake has cleared up over the last 10 years; still a quiet lake for being right in town."

"Fishing; lake view from property."

"Relative lack of watercraft traffic; good fishing; water clarity."

"Not a lot of boats on water at any given weekend; that there are some weeds for fisherman; can do all water sports on lake."

"It's not all built up like some other lakes; it's quiet with relatively little boat traffic; the sewage system and absence of farms."

"Lake structure; boat landing; close in."

"Relatively quiet lake; fishing; diversity of wildlife."

"Amount of shoreline relatively undeveloped; variety of waterfowl and raptors that frequent the lake; absence of large resort or condominium development."

"Quiet lake; not over-built; clear water."

"Quiet, not overused by watercraft; fishing; fairly clean water."

"Low boat traffic; uninhabited shoreline; natural looking shoreline."

"Not too much water skiing or PWC; most of the lakeshore is tree lines; quiet."

"Location; number of different fish species; nice boat launch."

"Location; number of different fish species; nice boat launch."

"Build a dam to raise the level of the lake. Deeper water helps to prohibit the growth of weeds."

"Quiet lake; very few boaters and skiers."

"Wild end; fish; taste of fish."

"Trees to water's edge; low non-owner" usage; able to walk to stores, shops, eating places."

"Weed edges; rock bars; humps."

"Convenient to town."

"Not a lot of motorized vehicles; not a lot of fishing pressure; close to town."

"Clarity of the water; loons; variety of fish species."

"Natural lake front setting (looks like 100 years ago); vegetation; water quality; wildlife, birds, animals."

"Clear; weeds seem to be getting under control; not too crowded with jet skis and motor boats."

"Most homes are hard to see; concrete ramp on boat landing; fishing."

"City; nice ramp (boat)."

"The numbers of fish; the loons; little used."

"Closeness to my property and town."

"Homes and cottages are set back from shore; natural shoreline."

"Wildlife – we have seen bears, eagles, deer on our property – super exciting."

"The wildlife that lives around the lake; the quietness on the lake – not too many boats, etc."

"Size of lake; pan fish for kids; fishing pier."

"The lake offers good multiple fishing structure; easy access/close to where I live; multiple fish species available."

"Mostly natural shoreline."

"Scenic beauty; not overcrowded; lack of high powered boats and jet skis."

"The light amount of recreational boats and jet ski."
"Canoe rides; wildlife (loons, eagles, GBHs, etc.)."

12. Please list up to three things you don't like about Mercer Lake or its watershed surrounding the lake?

"The public pier accessibility; rocks above surface; launch ramp condition."
"don't like storm water runoff going directly into lake untreated; don't like excessive weed growth; don't like the condition of the boat landing."
"Weeds; sediment."
"Water skiing; jet skiing."
"Weed growth; runoff into lake."
"Too murky; too weedy; too muddy."
"Weeds; weeds; weeds."
"Excessive weeds; increased silting of lake – muddy bottom; because of (a) and (b) – you can't swim in it and don't want to."
"Lake low always – no dam controlling water; extreme weed growth; lack markings of dangerous areas on lake."
"Weeds; lake fluctuation."
"Increased weeds over past 40 years; boat landing is a rocky mess; is cesspool for storm sewers."
"Weeds."
"Jet skis; too many pontoon boats for size of lake."
"Way too many weeds; mucky bottom; can't get to Grand Portage Lake on creek."
"Mercer Lake receives all the storm sewer in the Town of Mercer; too many non-residents use our lake."
"Rocks; weeds; people cutting weeds and the weed cuts washing on shore."
"West side of lake too shallow – needs to be dredged; boat dock needs improvements; more stocking fish."
"Weeds."
"Heavy weed growth makes nearly half the lake inaccessible to boats with motors; continued development along northwest shoreline."
"There are too many weeds and too much muck; the rock piles are not adequately marked; the water frontage on all properties."
"The runoff of storm water from town into the lake."
"Fewer fish; poor conditions."
"Weeds, weeds, weeds."
"Weeds in lake; street runoff and storm sewer discharge into lake."
"No sandy beach; too many weeds."
"Weed/aquatic plant growth; sediment on bottom – layer of muck on sand; snails/too many small panfish."
"Sewer runoff; over abundance of weeds; bad boat landing."
"Weeds; muck; rocks."
"Heavy weed cover."
"Heavy weed cover."
"The present drainage into Mercer Lake from the streets of the town."
"Rock piles not marked in lake; boat ramp in bad condition; amount of weeds along shoreline and bays."
"Lights on piers; weed choked; laws mowed to lake."

"City storm drains empty into lake."
"Weed cutting; fertilized yards; jet skis."
"Weeds; clear shorelines."
"The amount of aquatic plants; silt bottom."
"Water skiing; jet skis; weeds."
"Ever-increasing building of high power homes, shrinking land; increasing use of high power boats, jet skis; very unbalanced times of quiet and low road noise."
"Rock piles (numerous and unmarked); some property owners cutting trees on lake front; dislike some of the surrounding run down homes, junk in yards."
"Jet skis – no cribs; not enough trees by some homes; non-native vegetation (invasive)."
"Old town treatment facility was located on lake; too much development."
"The weeds; the noise from town; the bridge at the outlet that makes it unnavigable by canoe or kayak."
"The town river – stormwater runoff outlet next to the public landing with all the litter empty into lake litter."
"Much too weedy/vegetative in spots; too mucky in spots."
"The weeds."
"No large fish; pier needs upkeep; no swimming."
"Due to my perception of the lakes history. I won't eat any fish from this lake at all. I haven't even fished it for several years."
"Weeds."
"Eroded shoreline."
"Weeds; slim and algae; mud bottom on south shore."
"Mucky bottom near our dock; weeds."

13. Which term best describes Mercer Lake's public access? Response to "Why?"

"Pretty good boat ramp compared to some lakes."
"One launch works for this small lake."
"Boat landing needs work."
"Boat ramp shot – holes will create problems steel rebar poor concrete deteriorating – town's responsibility."
"Boat launch is falling apart."
"Boat ramp."
"Because it is limited."
"Launch needs replacing."
"Not enough parking space."
"Uneven."
"Boat ramp needs repair."
"Small lake with one public boat ramp."
"Good turnaround and parking – poor concrete ramp – dock is hard to use and drop-off is shallow and weedy."
"Ramp for launch, dock, and too many weeds and muck."
"One small public access is proper for a lake this small."
"Town pier has helped."
"Have lousy ramp."
"Ramp is not well maintained – no diversion of runoff from long sloping approach."
"Reasonable boat landing."

"Poor landing and parking."
"Insufficient parking area."
"Except boat landing ramp needs repair."
"Ramp needs repair (drops off into deep water)."
"Landing needs work."
"Bad side to side slope at landing."
"Good boat landing."
"Good access, but steep incline allowing water debris into water."
"Pier and cement dock."
"Nice landing/poor parking on occasion."
"Nothing to divert storm runoff from entering lake."
"Boat landing right in town."
"Litter and maintenance or lack of maintenance."
"I feel one boat landing and public fishing pier is sufficient for our sized lake."
"Concrete ramp."
"It's an easy spot to get to and launch a boat."
"Good, paved access. Pier. I've been told the ramp is in poor shape."
"Location in town accessible; launch paved; open area."
"Terrible boat launch."

18. Do you have any plans for additional steps to control runoff on your property? If yes, please describe below:

"I do not live in Mercer Lake watershed."
"Finishing landscaping after new construction."
"Would like to install field stone at shoreline and plant more vegetation."
"Unsure – it will depend on what we build on the vacant lot."
"Trying to grow trees in a gulley previous users had for winter slide onto lake."
"I have a problem with water running off of the Highway (51) onto my property, down the driveway into the garage."
"Worked with DNR in 1992 and followed their requirements."
"Add ground cover on hill."
"Rain gardens."
"Plant more grass."
"We are working on 20 foot shore barrier."
"Rain garden/natural vegetation."
"We have a 50 foot buffer of natural vegetation."
"What steps does the town have to control storm sewer runoff? How many years will it take to correct this?"
"We would like to add trees (pines, willows, controllable bushes also) instead of the bush overgrowth."
"We are trying to plant flower gardens on the steep hill."
"We are building a new home and are interested in looking at all of the above categories."

19. Which, if any, of the following do you think causes or may cause problems for surface waters nearest you? Response to "Other:"

"Prior waste discharges from utility into the lake."

"City storm water system; Midwest Timber property site. Grand Portage Lake runoff; contaminants in the lake from old sewage treatment plant."

"The Town of Mercer storm sewage system dumps into Mercer Lake without a filter system."

"Weed cuttings:

"Former sewer plant."

"Excessive boat/jet ski traffic."

"Not sure."

22. If you could change one thing about Mercer Lake to increase your enjoyment of the lake, what would you change?

"Require businesses on Route 51 to eliminate (turn off) lighted advertising signs during all non-business hours. Can't see stars anymore."

"Eliminate storm water runoff which goes directly into it."

"Weed control."

"Ban water skiing. Lake is too small – causes great increase in nutrients in water column."

"Change the hour of personal watercraft to 10:00 a.m. to 7:00 p.m."

"Remove more of the weeds."

"Water and bottom quality (a swimmable lake)."

"The reduction of weeds."

"Reduce the number of weeds and eliminate the silt/contaminants that allows the weeds to grow and that covers what used to be a sandy (gravel) bottomed lake."

"Raise the water level of the lake."

"Reducing weeds."

"Control weeds."

"Get serious about damage from primary sewage treatment plant that dumped effluent into lake for years. Go after responsible parties to restore lake to pristine beauty.

"Weed control."

"Get the trumpet swans back."

"Get rid of most of the weeds."

"The number of people living on Mercer Lake."

"Have all lake residents on town sewer."

"Dredge west side of the lake."

"Remove some of the weeds and better mark the rock bars."

"Remove the weeds."

"Improve fishing."

"Water clarity and have a sand shoreline."

"Stop the stormwater runoff from the Town of Mercer and Route 51."

"Less weeds; less muck."

"Divert storm sewer discharge."

"Get rid of weeds for swimming."

"Increase water quality and reduce aquatic plants; continue to improve fishery; mark lake for roc and shallows to improve all for non-residents."

"Less weeds; better public landing; sewer runoff."

"More weed removal."

"Density of weeds, especially for walleye fishing."

"Density of weeds, especially for walleye fishing."

"The water depth."
"Weed control."
"Weeds."
"Rid the lake of water skiers and jet skis."
"Weeds."
"Reduction in aquatic plants just too many."
"Raise minimum fish size limits."
"No jet skis reduce speed limit of all motorized boats."
"Eliminate the weeds."
"Plants, trees, shrubs (natural vegetation) between homes and shoreline."
"The amount of weeds."
"Posting of signs re: littering on lake and surrounding area. We pick up plastic bottles and other garbage all the time. Gross."
"Big dock for public access after fishing on shore for children."
"I knew this is a fishing lake, but I wish we could get these weeds under better control. I wish I could use something (non-toxic to fish) just around my prime area to keep these weeds down."
"Get rid of the weeds."
"Currently the direction of the Lake Association is appropriate. Fish management starting to take effect. Weed cutting could be more organized."
"I don't really know enough yet to give a response to this question. We are very new to the area. We think it's very important to show respect for lake environments."
"The amount of weeds in the lake."
"The mucky bottom by our property."

23. From the list below, please indicate which actions do you think need to be done to help improve water quality of Mercer Lake? Response to "Other:"

"Enforce or establish and enforce."
"Continue annual weed cutting."
"What can be done about the silt build-up of the lake."
"Storm water runoff, clean-up area which used to be wood chip site."
"Prosecute sewage treatment plant parties."
"The DNR and the Town of Mercer caused the present pool water quality by dumping raw sewage into the lake for many years in the past and the DNR allowed it until recently. They should participate in the cost of correcting the problem. The town is still using Mercer Lake to dispose of their storm sewage without building a filter system before entering our lake."
"End sewer runoff – storm sewer."
"Stop storm sewer runoff."
"Weed cutting."

24. Please choose the top two groups you feel should be responsible for the actions to improve Mercer Lake from question 23. Response to "Other:"

"Water utility."
"We are paying high taxes for a reason."

25. How often do you use Mercer Lake for the following activities? Response to "Other:"

"Tubing."
"Spending time outdoors."

26. Please circle the activities that you are aware of that Mercer Lake Association has been involved in. Response to "Other:"

"Social activities."
"Picnics."
"Weed cutting."

28. If you chose "no" in Question #27, what prevents you from joining?

"Own on Tank Lake."
"We are on Grand Portage. I wish an association would get started on our lake."
"I don't live in water shed."
"Didn't know about it."
"Property on Spider and Grand Portage you need a community lake association."
"Time."
"We don't live on Mercer Lake. We are on Grand Portage which drains into Mercer Lake."
"Not on lake."
"I believe the people living on the lake should have the say of the lake."
"We were not aware that there was an association and we live off water."
"Not our lake."
"Do not live on lake."
"Own/run a 7-day/week business in Mercer (time is the issue)."
"Own/run a 7-day/week business in Mercer (time is the issue)."
"Live on Grand Portage Lake."
"Not on lake – I'm on Tank Lake."
"We don't live on Mercer Lake."
"Should be done by DNR."
"We are usually May-September residents."
"Not knowing about it."
"Time constraints on my schedule – lack of knowledge – lack of this being a primary concern in my daily life."
"I may be interested in joining in the future."
"Don't know."
"Lack of information."

38. Additional comments:

"I believe the town government and the local water utility should accept responsibility being a part of the improvement solution going forward. A big step forward in that direction would be working

cooperatively with the association to end direct storm water runoff (which originates in the town) from going into the lake."

"I feel that Mercer Lake Association is headed in the right direction. The town board needs to get off their duffs and help as many of the lake association's as possible where human impact is the greatest. Thank you for the survey."

"The restrictions on personal watercraft and skiing should be made longer."

"We do not live on Mercer Lake. We have a 3-season cabin on Grand Portage. Chris Dodge, 860 Sussex Drive, Janesville, WI 53546."

"Keep the lake use residential. No resorts. No commercial use. Make the Town of Mercer contribute financially to repair the damage they did to the lake over the years."

"Improve fishery. Enforce laws on books – we don't need any more. If personal watercraft have limited times, so should people who water ski. We have a beautiful lake that is improving every year but fishing seems to be getting tougher. Does it do any good to selectively cut shoreline weeds? Why not harvest the entire lake shore area with grant money."

"I don't have anything to do with Mercer Lake."

"We are senior citizens in our 80's. When we asked for help several times, we were told that this would be looked into for assistance. Needless to say, we dropped our membership 2-1/2 years ago still waiting for help. Also, 2006 lake has been very low and fun toys should have been restricted. They were not."

"Preserve wildlife."

"Like most of our association members, I feel that something has to be done regarding the storm sewer drainage into our lake and to fix the excessive weed problem due mostly from the former sewer plant discharges into the lake."

"I think the State of Wisconsin should go to every home close to a lake or stream – put a dye in the sewer system and monitor. It may take a few days and it would show up in lake or stream. This would solve 90% of our pollution problems. Sincerely, an old state citizen."

"Don't live there."

"We have enjoyed Mercer Lake since 1969 when my uncle purchased property there and spent summers up at the lake house. Our entire family has since purchased over six pieces of property in Mercer since then. We love the area and strongly support anything we can do to improve or maintain the lake."

"We have a vacant lot on the lake, so this affects many of our answers. However, from what I've heard, the stormwater runoff (from the Town and Rt. 51) is the problem which will hurt the lake the most. The Town of Mercer with the Association's assistance should build a retention pond on the east side of Rt. 51 to keep the stormwater runoff out of the lake. The property owners do not have the right to pollute the lake, but neither does the Town or the Wisconsin DOT by directing stormwater from the Town of Mercer and Rt. 51 into Mercer Lake."

"A very poor way to spend taxpayer's money! Taxes in Mercer are high enough."

"We really don't use our cabin very much."

"While there are many lakes in the Mercer area, Mercer Lake is the most visible. Fishing is excellent, close proximity to town (shopping and services) makes it desirable. A reputation as a weedy mucky lake affects the positive and property value."

"The Lake Association is very active and does a good job."

"As a business owner in Mercer, I'm grateful for all the active involvement the Mercer Lake Association does for its lake."

"I was very surprised to see that Question 14 made no mention of public sanitary district 2 or City (town) public water system."

"I don't visit Mercer often."

"Anybody who has come to Mercer Lake in the past 6-10 years cannot know what people know about the lake that have been here when the land was there for anyone (cost – taxes). It is more important what is outside than inside a large home. I own a piece of land and house on the water that ha snot changed in 100 years. If I were to sell it, it will never be the same again, and I highly doubt a new owner would do what I do. Actually, I would like it to be as it was 30 – 40 years ago (in my lifetime). Of course, this cannot happen, so your Corporation has the responsibility of convincing the new that the old is better for all. It really is more important what is outside than indoors. The balance of nature will only prevail without technology. Use your technology to create a good environment, like it used to be."

"I sell decals for the Lake Association."

"Again, we are May-September residents, but we would like to help."

"We do help the association as much as we can. Since we both work and only come up a few days a month, it's hard to get more involved. I was really happy with the weed cutting the first two years. This year in early July, it was really bad again. I'm wondering if the weed cutting is only a temporary fix for our lake."

"My wire and I recently purchased a home on Lake Tahoe. I know that Lake Tahoe is tied to Mercer Lake via a small stream. We think that its important to keep the eco system in tune along these lakes. I would be interested in learning more about the Mercer Lake Association. I someday plan to live in the area full time, but don't at this time. Thanks for the questionnaire."

"31 – at the present time, I feel the amount of jet ski traffic is very light. However, at a later date, as traffic increases, this should remain a high priority. 33 – I have noticed large clumps of aquatic plants in deeper water and coming to the top. 34 – The lake is only 187 acres. I fee that anything over 100 hp is too much. 13 – boat launch needs to be addressed ASAP."

"Sorry this is late, but it's been a busy summer."

Appendix C
Objectives for Mercer Lake Association Committees

Mercer Lake Association
Functions, Responsibilities and Objectives of Standing Committees

A. Membership

a. It is the responsibility of the membership committee to increase the number of both individual and business memberships. The committee does this through personal, written (letters or emails) or phone contacts with the active or prospective members.
b. The membership committee is responsible for assuring that last year's individual members renew their memberships for the current year.
c. The membership committee is responsible for getting past individual members to rejoin as members in the current year.
d. The membership committee is responsible for recruiting new members for the Association.
e. The committee is responsible for recruiting business' to become members of the Association.
f. The committee encourages membership through the education of Association benefits and objectives.
g. The oversight and coordination of the committee's efforts and activities is through the Committee Chairman. The Committee Chairman should recruit as many individual to be a part of the committee as necessary to achieve the desired membership results. The Committee Chairman is responsible to the Directors of the Association.
h. Membership information and collected dues should be forwarded to the Association Secretary and Treasurer, respectively.
i. The committee will work and coordinate with other committees on related issues.

B. Civic

a. The Civic Committee is responsible for organizing and managing community related service programs or project. The efforts of the committee can be focused at either Association specific efforts or broader community efforts.
b. The oversight and coordination of the committee's efforts and activities is through the Committee Chairman. The Committee Chairman should recruit as many individuals to be a part of the committee as necessary to achieve the desired results. The Committee Chairman is responsible to the Directors of the Association.
c. The Civic Committee is responsible for organizing and carrying out community service activities. Such activities could include: community watch programs, highway clean up programs or similar activities.
d. The committee will work and coordinate with other committees on related issues.

C. Lake Weed Control

a. The Lake Weed Control Committee is responsible for monitoring, organizing and managing activities that involve the lake weeds in Mercer Lake water shed and points

of introduction of invasive weeds into the water shed. The committee is responsible for weed control (including cutting/harvesting efforts) activities in the water shed.

b. The oversight and coordination of the committee's efforts and activities is through the Committee Chairman. The Committee Chairman should recruit as many individuals to be a part of the committee as necessary to achieve the desired results. The Committee Chairman is responsible to the Directors of the Association.
c. The committee is responsible for working with the Department of Natural Resources (lake management) and other agencies related to lake weed issues.
d. The committee is responsible for organizing, communicating and managing the weed cutting/harvesting program in the lake and water shed. The committee is responsible for establishing the program financial budget and individual cost and reviewing financial information with the Association Directors prior to executing the program. The committee is responsible to determine what “public" areas of the lake might require weed control and work to accomplish the required results.
e. The committee is responsible for monitoring the lake for invasive lake weed species. The committee is responsible for coordinating actives to combat invasive species if identified in the water shed.
f. The committee is responsible for organizing boat landing weed monitoring activities.
g. The committee is responsible for educational or awareness programs related to invasive lake weeds. The committee has the responsibility to report to the Association on lake weed, invasive lake weed and control issues.
h. The committee will work and coordinate with other committees on related issues.

Fish Management

a. The Fish Management Committee is responsible for monitoring, organizing and managing activities that involve fish management in Mercer Lake. The committee is responsible for activities and programs that will improve Mercer Lake as a recreational fishery and improve the quality of fish in the lake.
b. The oversight and coordination of the committee's efforts and activities is through the Committee Chairman. The Committee Chairman should recruit as many individuals to be a part of the committee as necessary to achieve the desired results. The Committee Chairman is responsible to the Directors of the Association.
c. The committee has the responsibility to report to the Association on fish management.
d. The committee is responsible for working with the Department of Natural Resources (lake/fish management) and other agencies related to fish management issues.
e. The committee is responsible for organizing and managing fish stocking and fish netting programs in Mercer Lake.
f. The committee will work and coordinate with other committees on related issues.

E. Water Quality, Monitoring and Testing.

a. The Water Quality, Monitoring and Testing Committee (WQMT) is responsible for organizing and managing activities that involve monitoring and improvement of water quality in Mercer Lake.
b. The oversight and coordination of the committee's efforts and activities is through the Committee Chairman. The Committee Chairman should recruit as many individuals to be a part of the committee as necessary to achieve the desired results. The Committee Chairman is responsible to the Directors of the Association.
c. The committee is responsible for working with the Department of Natural Resources and other local, county, state and federal agencies related to water quality issues.
d. The committee has the responsibility to report to the Association on water quality issues.
e. The committee is responsible for organizing, coordinating and managing water quality monitoring and testing activities. The committee is responsible for reporting test results to the appropriate agencies in a timely manner. The committee is responsible for documenting and maintaining test report information.
f. The committee will work and coordinate with other committees on related issues.

F. Social

a. The Social Committee is responsible for organizing and managing activities that involve promoting improved social relationships between the members of the Mercer Lake Association.
b. The oversight and coordination of the committee's efforts and activities is through the Committee Chairman. The Committee Chairman should recruit as many individuals to be a part of the committee as necessary to achieve the desired results. The Committee Chairman is responsible to the Directors of the Association.
c. Activities of the committee could include: an annual member picnic, participation in the July 4th parade, participation in Loon Day events or Association booth or similar activities.
d. The committee has the responsibility to report to the Association on Association sponsored social activities. The committee is responsible for timely announcement of social activities.
e. The committee is responsible for establishing any activity financial budget and individual cost and reviewing financial information with the Association Directors prior to executing the activity.
f. The committee will work and coordinate with other committees on related issues.

G. Boating, Navigation and Safety

a. The Boating, Navigation and Safety Committee is responsible for organizing and managing activities that involve boating, navigation and navigation aids and safety on or in Mercer Lake. The committee is responsible for activities and programs that will monitor and improve Mercer Lake as a recreational asset and promote the safe use of the lake and its facilities.
b. The oversight and coordination of the committee's efforts and activities is through the Committee Chairman. The Committee Chairman should recruit as many individuals

to be a part of the committee as necessary to achieve the desired results. The Committee Chairman is responsible to the Directors of the Association.

c. The committee is responsible for annual installation, maintenance and removal of navigation aids and safety warning aids located in the lake. The committee is responsible for advising the Association on the need and location of additional similar devices. The committee is responsible for coordinating with the Town of Mercer and the Department of Natural Resources on related issues.
d. The committee is responsible for observing and reporting any safety issues related to the Mercer Lake public boat landing. Such safely related issues shall be forwarded to the Town of Mercer.
e. The committee will work and coordinate with other committees on related issues

H. Fund Raising

a. The Fund Raising Committee is responsible for organizing and managing activities that involve raising funds to support the operation and activities of the Mercer Lake Association. The committee is responsible for activities, events, programs and donations that will provide the financial support for the Association.
b. The oversight and coordination of the committee's efforts and activities is through the Committee Chairman. The Committee Chairman should recruit as many individuals to be a part of the committee as necessary to achieve the desired results. The Committee Chairman is responsible to the Directors of the Association.
c. The committee will plan activities, develop anticipated budgets for review and approval of the Directors and execute the fund raising activities.
d. The committee is responsible for reporting the status of fund raising activities to the Association.
e. The committee will work and coordinate with other committees on related issues.

Appendix D
History of the Mercer Lake Association

2001

- The Mercer Lake Association was started.

2002

- Weeds were a major concern.
- Association met with DNR representatives, Frank Koshere, and Jennifer Wudi to tour the lake and discuss solutions to the lake's aquatic plant problem. They suggested that we apply for the grant for the Aquatic Plant survey and management plan and also suggested paleocological (sediment core) study.
- Fish netting began by volunteers.

2003

- Aquatic Plant Management Plan was completed through a WDNR Lake Management Planning Grant (applied for grant in February and awarded in April). The grant was for $3,000. $750 share for Lake Association. Aquatic Plant Survey conducted.
- The paleocological study was completed through a WDNR Lake Management Planning Grant (applied for grant in February and awarded in April). The grant was for $10,000, but the actual cost to conduct the study was about $6,900. The Lake Association's share was $1,725.
- Applied for and received 501c3 making the Lake Association a tax-exempt, non-profit entity.
- Erected a sign down by the boat landing showing a map, rules and pictures of fish.
- Fish netting continued.

2004

- Aquatic Plant Management Plan was completed.
- Paul Garrison completed paleocological study.
- Self Help volunteer water quality testing.
- Started mechanically cutting weeds. Paid for privately. Approximately 20 residents have paid nearly $10,000 in the past three years.
- Fish netting continued.

2005

- Receiving and implementing DNR Lake Planning Grants ($20,000) that were applied for grants in August of 2005. The planning grants will be used to develop a Lake Management Plan and conduct a watershed wide community survey. The Lake Association's share will be 25% of the final project cost.
- Loon Ranger program started.
- Weed harvesting continued.
- Fish netting continued.
- Self Help volunteer water quality testing continued.

2006

- Survey to be sent out in August.
- Additional water quality monitoring started as part of the Lake Management Plan.
- Weed harvesting continued

- Survey to be sent out in August.
- Survey to be sent out in August.
- Fish netting continued.
- Loon Ranger program continued.
- Development of lake management plan continued.
- Self Help volunteer water quality testing continued.

The Association is also a member of Wisconsin Association of Lakes and the Iron County Lakes Alliance.