

# ***EAGLE LAKE WATERSHED MANAGEMENT PLAN 2017 – 2026***



# Eagle Lake Watershed Planning Project

This plan was prepared by the Land Conservation Division of the Racine County Public Works and Development Services Department in 2017 as requested by the Eagle Lake Management District and herein authorized by Jonathan Delagrave, Racine County Executive and the Racine County Board of Supervisors.

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# Eagle Lake Management Plan (2017 – 2026)

## Table of Contents

	Page No.
I. Report Summary	5
II. Planning Background	6
III. The Lake, Watershed, and Subwatersheds	8
IV. Eagle Lake Water Quality Conditions and Priorities	12
V. Watershed Characteristics	14
Watershed Geology and Soils	14
Topography	14
Climate	15
Environmental Corridors	15
Eagle Lake Dam	15
Wetlands	17
Perennial and Intermittent Waterways	17
Land Use	18
VI. Water Pollution from Nonpoint Sources	23
Identifying Sources of Runoff Pollution	24
Nonpoint Agricultural Pollution	24
Cropland Erosion and Sediment Delivery	24
Animal Waste	24
Livestock Siting Facility	25
Agricultural Nonpoint Source Assessment Procedures	27
Agricultural Erosion and Sediment Delivery Results	27
Sediment Generated from Gully Erosion	28
Gully Erosion Assessment Procedures	30
Inventory Results – Gully Erosion	30
Animal Waste Inventory	32
Pasture Runoff Inventory	32
Barnyard Runoff Inventory	32
Urban Nonpoint Pollution Sources	32
Urban Nonpoint Source Assessment Procedures	32
Urban Inventory Results	33
Road Right of Way Maintenance	35
Streambank and Lakeshore Sedimentation	36
Streambank-Lakeshore Erosion and Assessment Procedures	36
Streambank Inventory Results	36
Legacy Sediment	37
Other Sources of Runoff Pollution	37
Assessment Procedures	37
Inventory Results	37

<b>VII.</b>	<b>Wisconsin Lake Modeling Suite</b>	<b>38</b>	
<b>VIII.</b>	<b>Accomplishments in the Watershed</b>	<b>43</b>	
<b>IX.</b>	<b>Nonpoint Source Control Needs</b>	<b>50</b>	
	<b>Agricultural Land</b>	<b>50</b>	
	<b>Streambank Erosion</b>	<b>50</b>	
	<b>Two Stage Channel</b>	<b>51</b>	
	<b>Shoreline Buffers</b>	<b>53</b>	
	<b>Wetland Restoration</b>	<b>53</b>	
	<b>Urban Pollution Control</b>	<b>54</b>	
	<b>Other Pollution Sources</b>	<b>54</b>	
	<b>Land Resource Management Recommendations</b>	<b>55</b>	
	<b>Sub-watershed Priority Ranking</b>	<b>55</b>	
	<b>Priority Projects</b>	<b>55</b>	
	<b>Secondary Recommendations</b>	<b>57</b>	
<b>X.</b>	<b>Information and Education Activities</b>	<b>59</b>	
	<b>Goals and Objectives</b>	<b>59</b>	
<b>XI.</b>	<b>Programs, Agencies and Environmental Groups</b>	<b>61</b>	
	<b>Land Use and Development</b>	<b>61</b>	
	<b>Shoreland Protection</b>	<b>61</b>	
	<b>Erosion Control Ordinance</b>	<b>63</b>	
	<b>Racine County Agencies</b>	<b>63</b>	
	<b>Wisconsin Agencies</b>	<b>63</b>	
	<b>Federal Agencies</b>	<b>63</b>	
	<b>Environmental Groups</b>	<b>64</b>	
 <b>Maps</b>			
	<b>Map 1</b>	<b>Watershed Boundary</b>	<b>10</b>
	<b>Map 2</b>	<b>Sub-Watershed Boundaries</b>	<b>11</b>
	<b>Map 3</b>	<b>Environmental Corridors</b>	<b>16</b>
	<b>Map 4</b>	<b>Land Use 2007 to 2017</b>	<b>20</b>
	<b>Map 5</b>	<b>Wetlands</b>	<b>21</b>
	<b>Map 6</b>	<b>Floodplains</b>	<b>22</b>
	<b>Map 7</b>	<b>Cropland with Potential Gully Erosion</b>	<b>31</b>
	<b>Map 8</b>	<b>Zoning Districts</b>	<b>41</b>
	<b>Map 9</b>	<b>Cropland in the Watershed</b>	<b>47</b>
	<b>Map 10</b>	<b>Cropland Delivering Sediment</b>	<b>48</b>
	<b>Map 11</b>	<b>Best Management Practices Accomplishments</b>	<b>49</b>
	<b>Map 12</b>	<b>Shoreland Zoning Jurisdiction</b>	<b>62</b>
	<b>Map 13</b>	<b>Livestock Siting Facility</b>	<b>26</b>
 <b>Figures</b>			
	<b>Figure 1</b>	<b>Trophic Classification of Aquatic Ecosystems</b>	<b>13</b>
	<b>Figure 2</b>	<b>Chlorophyll &amp; Trophic Status Index</b>	<b>39</b>
	<b>Figure 3</b>	<b>Eagle Lake Watershed Non-Point Data – Using WiLMS</b>	<b>37</b>
	<b>Figure 4</b>	<b>Two Stage Channel vs Traditional Channel</b>	<b>51</b>

## Tables

<b>Table 1</b>	<b>Eagle Lake Watershed Land Use</b>	<b>18</b>
<b>Table 2</b>	<b>Eagle Lake Sub-watersheds- Land Use</b>	<b>19</b>
<b>Table 3</b>	<b>Typical Urban Land Use Pollutants</b>	<b>40</b>
<b>Table 4</b>	<b>Summary of Annual Sediment Delivery</b>	<b>40</b>
<b>Table 5</b>	<b>Sediment and Nutrient Delivery</b>	<b>42</b>
<b>Table 6</b>	<b>Best Management Practices Installed since 2007</b>	<b>46</b>
<b>Table 7</b>	<b>Best Management Practices Needed</b>	<b>56</b>

<b>Acronyms and Glossary</b>	<b>65</b>
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<b>Appendices</b>	<b>68</b>
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<b>Appendix A</b>	<b>Correspondence</b> <ul style="list-style-type: none"><li><b>-Request letter from Eagle Lake Management District to Racine County</b></li><li><b>-Professional Services Agreement between Eagle Lake Management District and Racine County</b></li><li><b>-Racine County Resolution No. 2016-112</b></li></ul>
<b>Appendix B</b>	<b>Ordinances, Rules, and Administrative Codes</b> <ul style="list-style-type: none"><li><b>- Erosion Control Ordinance – Town of Dover</b></li><li><b>- Livestock Siting Ordinance – Racine County</b></li><li><b>- Animal Waste Mgt Ordinance – Racine County</b></li><li><b>- NR 115 WI Shoreland Protection Prgrm – WI DNR</b></li><li><b>- NR 151 Runoff Management – WI DNR</b></li><li><b>- NR 243 Animal Feeding Operations – WI DNR</b></li></ul>
<b>Appendix C</b>	<b>Shoreland Stewardship Series</b> <ul style="list-style-type: none"><li><b>- A Fresh Look at Shoreland Restoration</b></li><li><b>- Protecting and Restoring Shorelands</b></li><li><b>- Protecting Our Living Shores</b></li></ul>
<b>Appendix D</b>	<b>Eagle Lake Sewer Utility District</b> <ul style="list-style-type: none"><li><b>- Compliance Maintenance Annual Report</b></li></ul>

## Report Summary

The Eagle Lake Management District received a watershed planning grant from the Wisconsin Department of Natural Resources to update the original study from 2007. The purpose of the update is to identify, quantify, and prioritize the sources of runoff pollution in the watershed and recommend ways to protect the watershed and Eagle Lake. This update was completed in 2007 by the Racine County Land Conservation Division.

On October 26, 2016, Racine County received a request from the Eagle Lake Management District for a second update to the original watershed plan. This update will compare previous plans (1997 and 2007) to the current conditions of the watershed. It will identify updates in land use, erosion sources, livestock operations, and use the most recent phosphorus and sediment loading programs to evaluate results compared to previous modeling.

The plan will identify much of the work that has been accomplished within the watershed over the past ten years. This plan will include new technologies used by the rural and urban communities as well as new state and local regulations put in place to reduce negative impacts of resource concerns within the watershed. Finally, this update includes “priorities for action” on pages 55 – 60. Citizens can utilize the listed priorities as a guide to improving the water quality draining to Eagle Lake.

Eagle Lake is retained in its present condition by a dam and has a surface water area of 531 acres. The lake is classified as eutrophic, but can support full recreational use and a warm water fishery.

The watershed covers approximately 4,225 acres of land in the Town of Dover, Racine County. Agriculture is the dominant land use, including some livestock operations, but much of the agricultural land is used for cash grain. Woodlands and wetlands cover approximately 18% of the watershed. Eagle Lake receives runoff from its direct watershed and tributary watersheds. Most of the channels carrying runoff to the Lake have been historically deepened, widened and relocated.

Sediment that has eroded from upland slopes over past decades, during years of intensive land clearing, agriculture and construction has altered and continues to impair the hydrologic, biologic, aquatic, riparian, and water quality functions of pre-settlement conditions. These depositions have been identified as “Legacy Sediment”. The legacy sediment often accumulated in flat, low flow environments, resulting in thick accumulations of fine grained sediment that contains significant amounts of nutrients.

To achieve the pollution reduction targets and improve the water quality within Eagle Lake, legacy sediment must be addressed. The natural process to remove sediment that has been in the tributaries for decades may take many years. The sediment may need to be inventoried, identified and removed to more quickly enhance water quality and the biodiversity that will come with a more natural tributary system. This will also prevent sediment from moving further downstream and into Eagle Lake.

A variety of Best Management Practices (BMP's) must be used by farmers, urban residents and units of government. The cost to implement these practices in the Eagle Lake Watershed remains significant, but is crucial to the overall water quality of Eagle Lake.

The objectives of an information and education program recommended for the Eagle Lake Watershed include:

- 1) Encouraging the reduction of sediment, phosphorus and other nutrients from running off agricultural and urban land.
- 2) Informing lake citizens about legacy sediment, and promote the identification of areas containing large volumes of this high nutrient material and recommend removal.
- 3) Introduce newer agricultural techniques to farmers, such as soil health, cover crops, and bio-treatments for drain tiles.
- 4) Requiring builders, developers and contractors to use and maintain erosion control measures on construction sites.
- 5) Educating lake property owners, elected officials, business owners, visitors and children about the value of Eagle Lake and identify different ways all individuals can participate to protect Eagle Lake.

This Watershed Plan's success is not possible without the efforts and cooperation of many people and programs. This plan recommends a variety of sources of technical and financial assistance to help "clean-up" the watershed and protect Eagle Lake.

## **Planning Background**

The Lake Management Planning Grant program was used to help the Eagle Lake Management District gather water quality data and plan actions to improve the water quality and recreational use of the Lake.

In 1997, an original watershed plan was developed to determine the urban and agricultural needs to manage runoff and improve the quality of the Lake. In 2007, the Eagle Lake Management District was awarded this Grant to revisit the study of the Eagle Lake drainage basin. The goal of this study is to identify and quantify the sources of sediment and other pollutants flowing into the Eagle Lake from the watershed. This planning project recommended specific actions needed to prevent and reduce sources of runoff pollution in the Eagle Lake watershed. In 2016, the Eagle Lake Management District requested a more comprehensive study with larger and more specific recommendations to revisit the watershed, continue analysis, and identify resource concerns. This plan will identify new technologies, programs and regulations that have been identified since the last plan. This plan will identify specific best management practices that have been installed according to recommendations in the previous plan

and quantify how much sediment and phosphorus load reduction has resulted from the project installations.

Non-point sources of water pollution include eroding cropland, streambanks, shorelines, roadside ditches and construction sites. Barnyards, industrial yards, parking lots, lawns and roadways can also generate pollutants that enter the lake during rainfall events. Each of these entities on its own release small amounts of polluted runoff, but together, these sources can contribute to poor water quality conditions in Eagle Lake. Water quality improvements can be achieved through improving the way the land is used and by protecting environmentally sensitive lands and corridors throughout the watershed. This plan has been developed to achieve these actions.

Through 1997 Wisconsin Act 27 (1997-1999 Budget Bill), the State Legislature required the Wisconsin Department of Natural Resources (DNR) and the Wisconsin Department of Agriculture Trade and Consumer Protection (DATCP) to develop performance standards. The Minimum State Performance Standards have been developed for agricultural and non-agricultural sources of pollution. These standards have been drafted and adopted by the WDNR as Chapter NR151 and by DATCP as Chapter ATCP 50 of the Wisconsin Administrative Code.

The DNR recently revised NR 115 Wisconsin's Shoreland Protection Program, which regulates runoff within 1000 feet of Eagle Lake (see Map 12, page 62) and within 300 feet of Eagle Creek. The addition of impervious surfaces to a property are regulated in NR 115.

In 2012, Racine County adopted an Animal Waste Management Ordinance to regulate waste produced by livestock in agricultural areas throughout the county. This ordinance primarily regulates animal waste storage structures, alterations to animal waste storage structures, proper abandonment of unused structures, storage of animal waste in an unconfined manure pile, and spreading manure or nutrients as regulated in the WI NRCS Nutrient Management Standard (590).

Racine County has adopted the Land and Water Resource Management Plan Revision (Racine County LWRMP 2013 - 2022), that identifies potential impaired natural resources within the County, along with recommends goals to improve those resources. The Eagle Lake Management District can utilize this plan, which includes the Minimum State Performance Standards to be followed by Racine County residents.

This Eagle Lake watershed inventory utilized the initial resource data from the Eagle Lake Watershed Planning Project 1997. In 2007, the re-inventoried data was collected by the Racine County Land Conservation Division at the request of the Eagle Lake Management District. Additional information and data used in planning this project were supplied by the DNR, DATCP, the Southeastern Wisconsin Regional Planning Commission (SEWRPC), the United States Department of Agriculture (USDA), Eagle Lake Sewer Utility District (ELSUD), the Town of Dover, and the United States Geological Survey (USGS). In 2016, the watershed inventory was reviewed by Racine County Land Conservation staff to determine changes in land use, the impacts of best management practices installed, and new modeling techniques to determine changes that have occurred in the watershed.



## The Lake, Watershed, and Sub-watersheds

Eagle Lake is a shallow lake located in the Town of Dover, Racine County, Wisconsin. The lake is an important recreational resource within the Illinois-Fox River Basin. The lake was formed in the glacial drift and an existing dam allows the lake to retain its present configuration and water surface covering 531 acres. The longest axis of Eagle Lake is approximately 6,672 feet in length and lies in a west to east direction. The lake has a maximum depth of 15 feet and a mean depth of 7 feet. Approximately 215 acres of the lake are less than 3 feet deep. The lake shoreline is 23,000 feet in length or approximately 4.4 miles.

Eagle Lake provides a variety of recreational opportunities for the local community and the region, including boating, swimming and fishing. The lake is also used extensively for a variety of passive recreational uses such as picnicking, bird watching, and walking. A Racine County park located on the northern shore provides public access to the lake.

A major source of water to Eagle Lake comes from rainfall runoff and snowmelt flowing from the 4,228 acre drainage area located entirely in the Town of Dover. The total watershed area-to-lake ratio is 8:1. This is a high watershed lake to area ratio that suggests land use within the watershed tributary area to Eagle Lake has a direct impact on lake water quality.

Eagle Lake receives rainfall runoff from two major drainage areas: a tributary drainage area, and; a direct drainage area. The tributary drainage area is located in the eastern part of the watershed area and includes a network of man-made channels and ditches traversing the watershed, collecting and transporting surface water runoff from the land to the lake. The tributary channels also serve to collect and transport water for crop production. The tributary channels and ditches maintain a continuous flow of water throughout the year during years of normal rainfall. Surface water runoff from the direct



*Dam located on the west side of Eagle Lake has a spillway elevation at 795.57 feet.*

drainage basin to Eagle Lake flows in overland flow and enters the lake directly or is detained or stored in wetlands located directly adjacent to the lake. The direct drainage basin includes the lakeshore areas. Surface water leaves Eagle Lake over a dam on the western border of the lake and flows through a constructed channel, named Eagle Creek, and eventually flows into the Fox River, just south of the Village of Rochester.

Groundwater discharge to the surface was observed in several locations throughout the watershed. This observation would suggest that Eagle Lake receives groundwater discharges or discharges from perched water tables throughout the year.

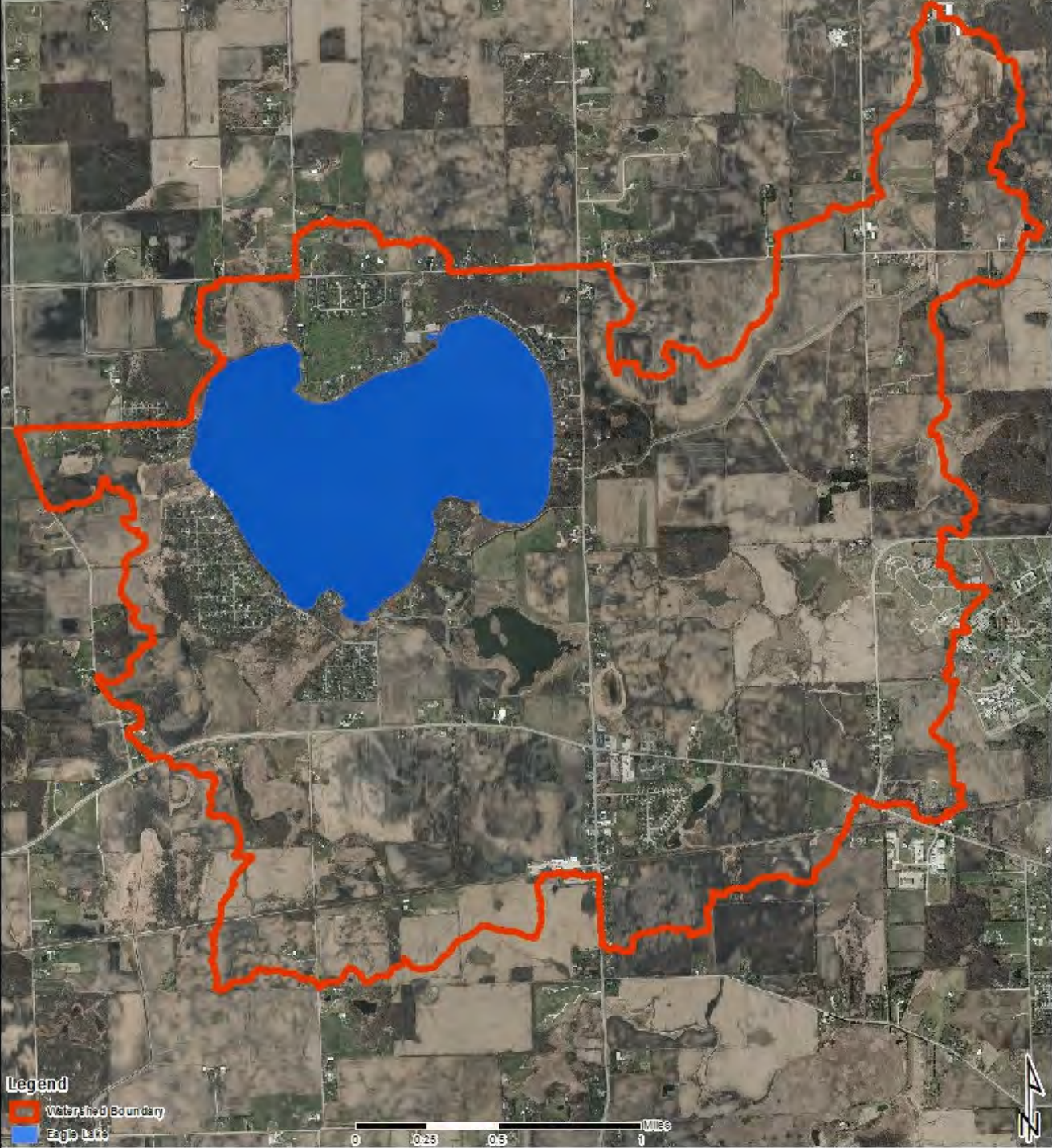
The Eagle Lake Watershed Basin is divided into five sub-watershed basins to identify different potential pollutants and the quantity entering the lake. The sub-watershed drainage basin is defined as all land draining surface water and snow melt into a main stream or ditch which drains directly into Eagle Lake. The sub-watershed basins could be thought of as a funnel that directs the surface water to one outlet and leads to the Lake.

The land surface area of each of the sub-watershed basins were outlined based on topographic (elevation) delineation. Each of the five sub-watersheds is divided by a ridge or hill that causes the surface water to flow one direction or the other. In the 2007 plan revision, two-foot contour topography maps were used from 1978 to delineate the watershed. Some areas appear to have surface water drain in one direction, outside of the watershed, while the drain tiles seem to flow in the other direction toward Eagle Lake. The Racine County Land Conservation Division re-evaluated the watershed boundary in some of the questionable areas. Our staff used 2013 LiDar (Light Detection and Ranging) data to determine surface flows of natural depressions within the watershed. Typically, in clay soils, the depressions fill with water, but are drawn down by drain tile systems. In determining the watershed boundary, our staff did not take subsurface drainage into consideration. The boundary in this plan specifically relates to surface flow. Subsurface drainage toward the lake will still be considered for runoff and pollutant load, but these figures will be minimal if the surface drainage pattern does not use the same path.

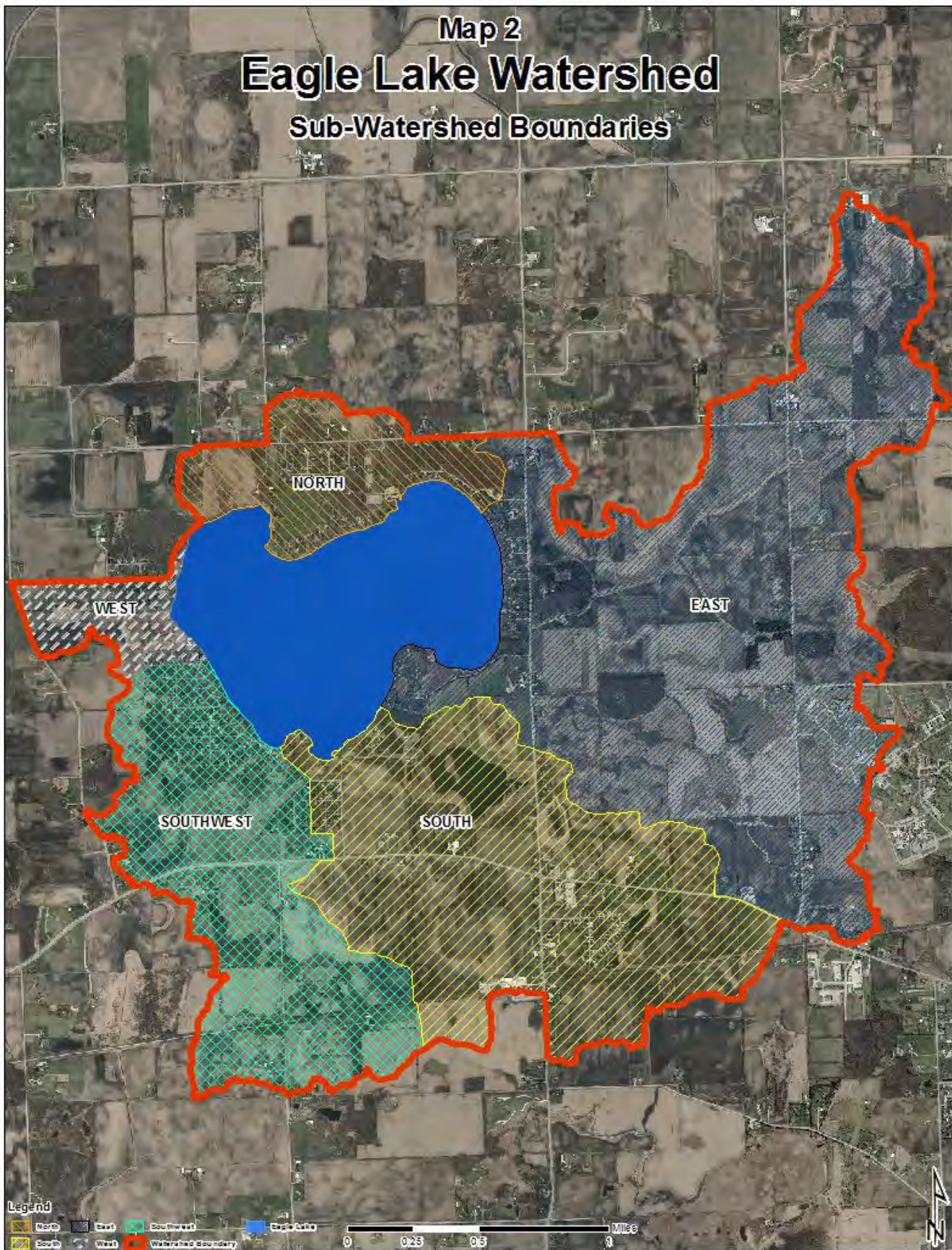
Each of the five sub-watersheds with different land uses have been evaluated by the Wisconsin Lake Modeling Suite (WiLMS) pollutant model program for the quantity of potential pollutants being delivered to Eagle Lake.

The Spreadsheet Tool for Estimating Pollutant Loads (STEPL) calculates pollutant load reductions based on the installation of best managements practices and summarizes reduction of runoff being delivered to the lake. STEPL not only calculates load levels at the source, but also can calculate loading at a watershed level. STEPL also can efficiently calculate the use of more than one best management practice on once source to accurately identify the load reduction.

Map 1  
**Eagle Lake Watershed**  
Watershed Boundary



Map 2  
**Eagle Lake Watershed**  
Sub-Watershed Boundaries



## Eagle Lake Water Quality Conditions and Priorities

The USGS and the Eagle Lake Management District have monitored the water quality of Eagle Lake from 1993 to 2012. The monitoring program recorded a variety of water quality measurements, including: dissolved oxygen, temperature, pH, specific conductance, water clarity, total phosphorus concentration and the chlorophyll-a concentration. The water quality can vary from year to year and is dependent on a variety of in-lake and external environmental factors. Therefore, it is important to monitor the lake for several years so that fluctuations in the factors can be averaged and water quality trends can be analyzed.

The results of the water quality monitoring program from 1993 to 2012 includes the following summary:

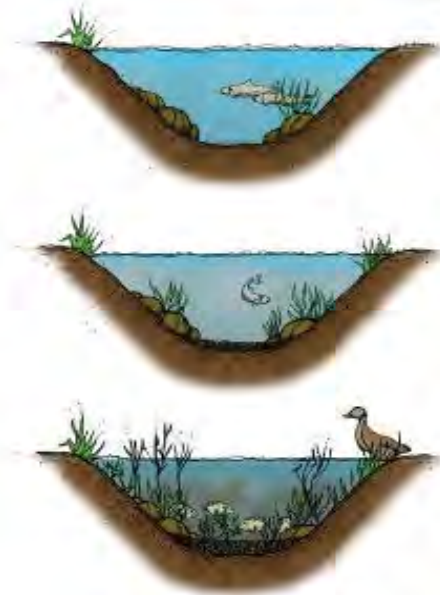
- The water quality of Eagle Lake was moderate to poor.
- The lake can be classified as eutrophic.
- The lake exhibited higher than average phosphorus levels and chlorophyll levels, which indicates that there is a higher probability of algae blooms occurring.
- The average Secchi disk reading depth was 4 feet.

A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds, was completed in December, 2007, with a plan amendment in May 2013. The plan recommends that the water quality of Eagle Lake support full recreational uses and a warm water fishery. To achieve this water quality goal, a maximum spring in-lake surface water phosphorus concentration of 0.02 mg/l must be achieved for Eagle Lake. Phosphorus loads to Eagle Lake need to be reduced by about 60% to achieve this surface water phosphorus concentration of 0.02 mg/l.

Quantitative data and qualitative observations from the users of Eagle Lake form the basis for initiating a management plan for the lake watershed. Complaints about turbid water quality condition and excessive exotic weed growth are common. These conditions interfere with the use and enjoyment of the lake by the community. The lake residents and users desire a high level of water quality protection for the lake they use for recreation and enjoy as their home.

## Trophic Classification of Aquatic Ecosystems

- Oligotrophic – Low levels of organic matter – tend to be deep and clear , oxygen rich bottom supports cold water fish such as trout , Phosphorus is limiting
- Mesotrophic – more organic matter, oxygen level in lake bottom is low
- Eutrophic- High levels of organic matter – abundant plant growth , poor clarity , stratified with oxygen poor bottoms
- A dead zone is an area where oxygen levels fall below 2 ppm



Trophic Level	TSI	Secchi Depth (in feet)	Total Phosphorous (ug/L)	Chlorophyll (ug/L)
Oligotrophic	0	>12	<3	<2
	40	8	10	5
Mesotrophic	41	6	18	8
	50	6	27	10
Eutrophic	51	5	30	11
	100	< 4	>50	>15

## **Watershed Characteristics**

### **Watershed Geology and Soils**

Glaciations have largely determined the physiology, topography and the soils of the Eagle Lake Watershed. The most recent glacial stage is believed to have had the most effect on the topography and the soils present in the watershed. The watershed is covered by gently-sloping moraine. Ground moraines were formed beneath the ice and left deposits of unsorted or heterogeneous materials with irregular thickness.

The soils found in the Eagle Lake Watershed originate from four major sources; glaciation, bedrock weathering, wind, and fluvial action. The soils in the watershed range from those that well-drained to those that are poorly drained. Two general soil associations are found in the watershed, as defined by the USDA, Natural Resources Conservation Service (NRCS). A soil association is usually comprised of one or more major soil types and at least one minor type. The soils associations found in the Eagle Lake Watershed are Varna-Elliot-Ashkum Associations and the Hebron-Montgomery-Aztalan Association.

The nature of the soils within the watershed affects the rate, amount and quality of surface water runoff exported from the land in the Eagle Lake watershed. Soil composition, slope and cover are important characteristics that affect the rate, amount and quality of the surface water runoff entering Eagle Lake. The soil texture, structure, and organic matter content will influence the permeability, infiltration rate and erosion potential of the soil. Soils within the tributary drainage area to Eagle Lake are categorized into four hydrological soil groupings. The classification of soils, by hydrological soil group, is an indication of a soil's runoff potential and its ability to resist erosion when saturated. The watershed to Eagle Lake consists of soil mapping units that are classified as Group A, or well-drained soil, resistant to erosion when saturated; Group B, or moderately drained soils and moderately resistant to erosion; Group C, poorly drained, with high runoff potential or Group D, very poorly drained soils with very high runoff potential. Approximately 2,185 acres or 51% of the watershed are covered with soils that are well drained or classified as soils in Hydrological Soil Group A.

### **Topography**

The lake watershed has very little variation in relief and is typical of a ground moraine. The watershed rises from approximately 796 feet above sea level at the surface of Eagle Lake to approximately 850 feet above sea level in the northeastern portion of the watershed. Most of the watershed area rises only 10 feet. Slowly draining fields, low gradient drainage channels and wetlands are scattered throughout the watershed and are typical of watersheds with little variation or relief.

Topographic features of a watershed have a direct influence on the potential for soil erosion and sediment movement and deposition to Eagle Lake and its tributaries. In the Eagle Lake Watershed slope length, rather than slope steepness, causes soil erosion, sediment transportation and deposition. Land under cultivation or construction with long slope lengths is likely to impact the surface water quality when used without soil conservation practices or runoff management control systems.

## **Climate**

The frequency, duration and amount of precipitation, influences the quantity and the quality of surface water runoff in the watershed. Eagle Lake lies in the continental zone which is characterized by winters which are long and relatively cold and snowy and summers which are mostly warm with periods of hot, humid conditions. Frost conditions usually occur from October to May. The average annual precipitation in the drainage basin is 30.94 inches. June through September are the wettest months when more than 14 inches of rainfall occurs. Approximately 50 rainfall events per year occur in the watershed. A rainfall event is defined as a distinct period when precipitation is equal to or greater than 0.1 inch. Most of the runoff occurs in March and April when over 8 inches of precipitation can occur and the land surface is frozen or thawing, soil moisture is high and little soil infiltration occurs. Runoff from agricultural land and open land is relatively low throughout the growing season, when crops use soil moisture and cover the soil surface.

## **Environmental Corridors**

Environmental corridors include those areas of the watershed that have the highest concentration of natural, recreational, historical, aesthetic and scenic resources and should be preserved and protected. Environmental corridors include one or more of the following elements: 1) Lakes, streams, and associated shore-land and floodplains; 2) wetlands; 3) woodlands; 4) prairies; 5) wildlife habitat area; 6) areas covered by wet, poorly drained or organic soils; and 7) rugged terrain and high relief topography.

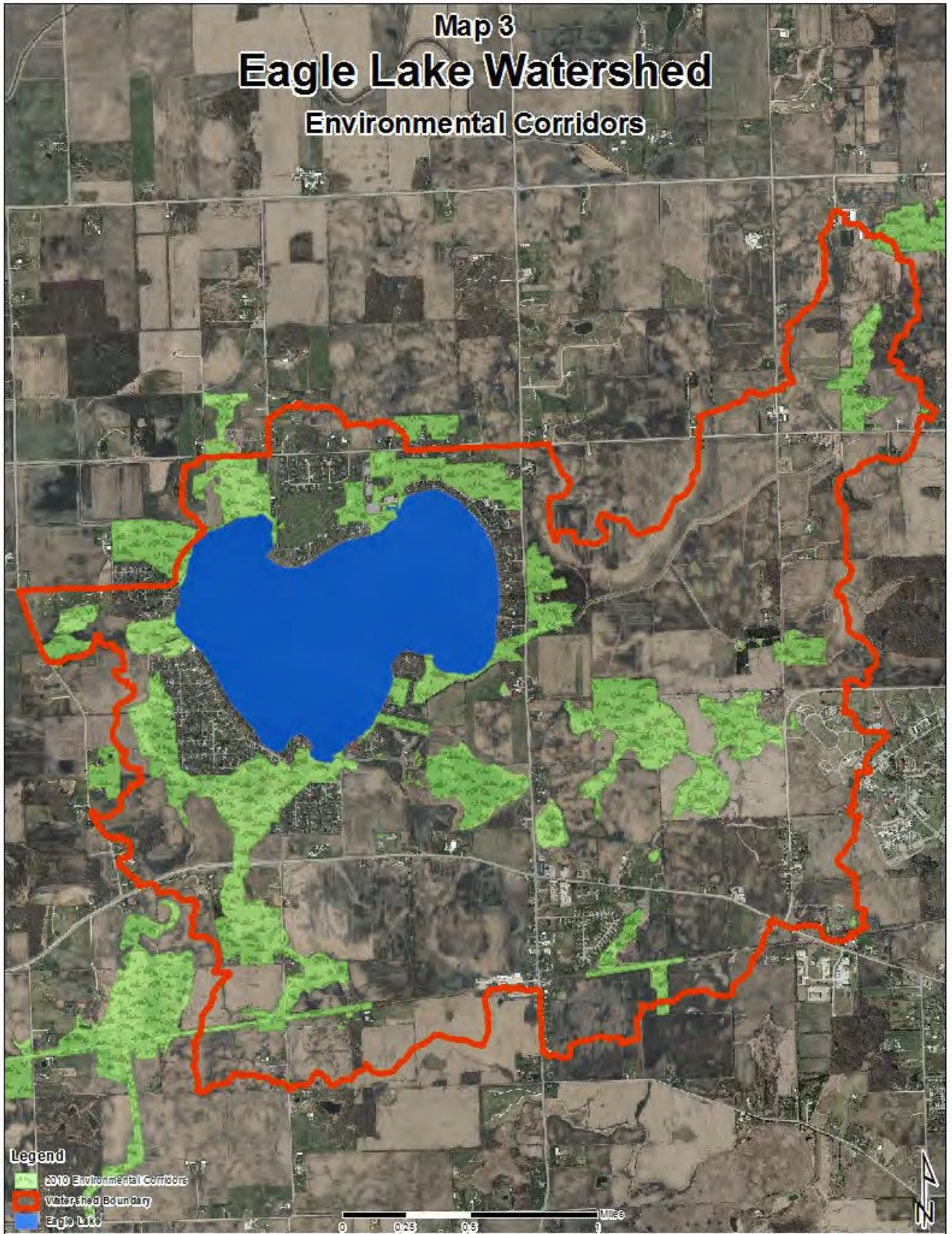
SEWRPC has defined and delineated the environmental corridors in the Eagle Lake Watershed (Map 3, page 16). Approximately 1,155 acres of Environmental Corridors are present in the Eagle Lake Watershed. Environmental Corridors are the most important elements or the natural resource base in the Eagle Lake Watershed. In addition to providing the watershed with wildlife habitat, natural diversity and aesthetic scenic values, the environmental corridors serve to buffer the impact of land use in relation to surface and groundwater quality.

## **Eagle Lake Dam**

The Eagle Lake dam, owned by Racine County, is considered a low hazard dam by the Wisconsin DNR. The dam receives an in-depth inspection once every ten years. This inspection is scheduled for 2017. The DNR approved the Inspection, Operation, and Maintenance (IOM) plan in March 2013. The IOM plan is for Racine County staff to follow. The dam is inspected at least once per week for debris removal and functionality. The debris that accumulates in the grate and is removed and properly disposed by Racine County Public Works staff. The debris removal includes lake weeds, tree branches, garbage and other items as needed. Periodic mowing occurs on each side of the dam to not allow brush or trees to grow against the dam abutments and destroy the integrity of the structure. The dam is inspected daily when large rain events and flooding occur in the County.



Map 3  
**Eagle Lake Watershed**  
Environmental Corridors



## **Wetlands**

Wetlands are defined by the WDNR as areas where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which have soils indicative of wet conditions.

Wetlands are some of the most valuable natural resource features in the Eagle Lake watershed. In the natural conditions, wetlands in the watershed provide many benefits and functions including:

1. Filtering pollutants, nutrients and sediments: wetlands help protect water quality within the watershed.
2. Storing runoff from heavy rains and snow melts: wetlands reduce flood damage.
3. Providing essential habitat for fish, waterfowl and a variety of other animals: wetlands provide for recreational opportunities.
4. Acting as a shoreline buffer: wetlands protect against erosion from waves and currents.
5. Providing open space: wetlands enhance the quality of life and habitat.

In the past, wetlands in the Eagle Lake Watershed were not recognized for their important values and functions and therefore many have been drained and converted to agricultural use or filled for construction of houses, commercial sites, and highways. Approximately 85 acres of wetlands are farmed when conditions are dry. Approximately 1,632 acres of wetlands have been drained to accommodate crop production and more than 180 acres have been filled for urban development, recreational use or road construction. Approximately 515 acres of wetlands remain viable in the watershed and perform valuable functions in the Eagle Lake watershed.

## **Perennial and Intermittent Waterways**

Eagle Creek is the major waterway entering Eagle Lake. This creek has been relocated, straightened and enlarged to accommodate adjacent agricultural land uses. Waterways classified as navigable are subject to Racine Counties Shoreland Protection Ordinance. Shoreland includes any land lying within 1,000 feet of a lake or 300 feet of a navigable creek, stream or channel. Racine County regulates land use within the shoreland area and enforces construction standards in order to protect water quality of the adjacent waterway. Counties are required to place all wetlands within the jurisdictional shoreland area in a conservation zoning district. A review of the zoning maps for the County and Town of Dover found that shoreland-wetland zoning districts have been assigned to most, but not all wetlands with the jurisdictional shoreland areas.

## Land Use

Land use in the Eagle Lake watershed has a profound impact on the lake water quality. The type, intensity and distribution of the land uses and activities in watershed determine the quantity and quality of surface water entering Eagle Lake.

The Eagle Lake Watershed is 4,228 acre drainage basin located entirely in the Town of Dover in Racine County. The Eagle Lake watershed includes 725 acres of land used for urban purposes, such as residential and commercial uses. The remaining 2,969 acres of land are rural land uses, such as cropland, pasture, woodlands and wetlands. Residential construction in the watershed has occurred at a slower rate over the last ten years, compared to historic urban development. The residential construction trend will likely increase within the watershed over the next decade. The largest land use change will likely be the construction of single family residential homes.

Public sanitary sewer service is provided by the Eagle Lake Sewer Utility District. The Sanitary District is servicing approximately 1,225 residents in the watershed and covers about 0.6 square miles. Private on-site wastewater treatment systems are used on the remainder of residential uses in the watershed.

**Table 1**  
**Eagle Lake Watershed**

<b>Land Use</b>	<b>2007</b>	<b>2016</b>	<b>Difference (+/-)</b>
<b>Rural Land Use</b>	<b>Acres</b>	<b>Acres</b>	
Cropland	2,570	1,959	-611
Pasture	67	63	-4
Grasslands	129	108	-21
Woodlands	305	281	-24
Wetlands	496	515	+19
Farmsteads	35	49	+14
<b>Total</b>	<b>3,602 Acres</b>	<b>2,969 Acres</b>	
<b>Urban Land Use</b>	<b>Acres</b>	<b>Acres</b>	
Residential	507	445	-62
Commercial	35	28	-7
Industrial	2	1	-1
Transportation	150	93	-57
Utilities	4	4	0
Institutional Gov't	75	66	-9
Recreation	68	88	-20
<b>Total</b>	<b>841 Acres</b>	<b>725 Acres</b>	

\*The watershed boundary was re-examined in 2016, impacting the acres above.

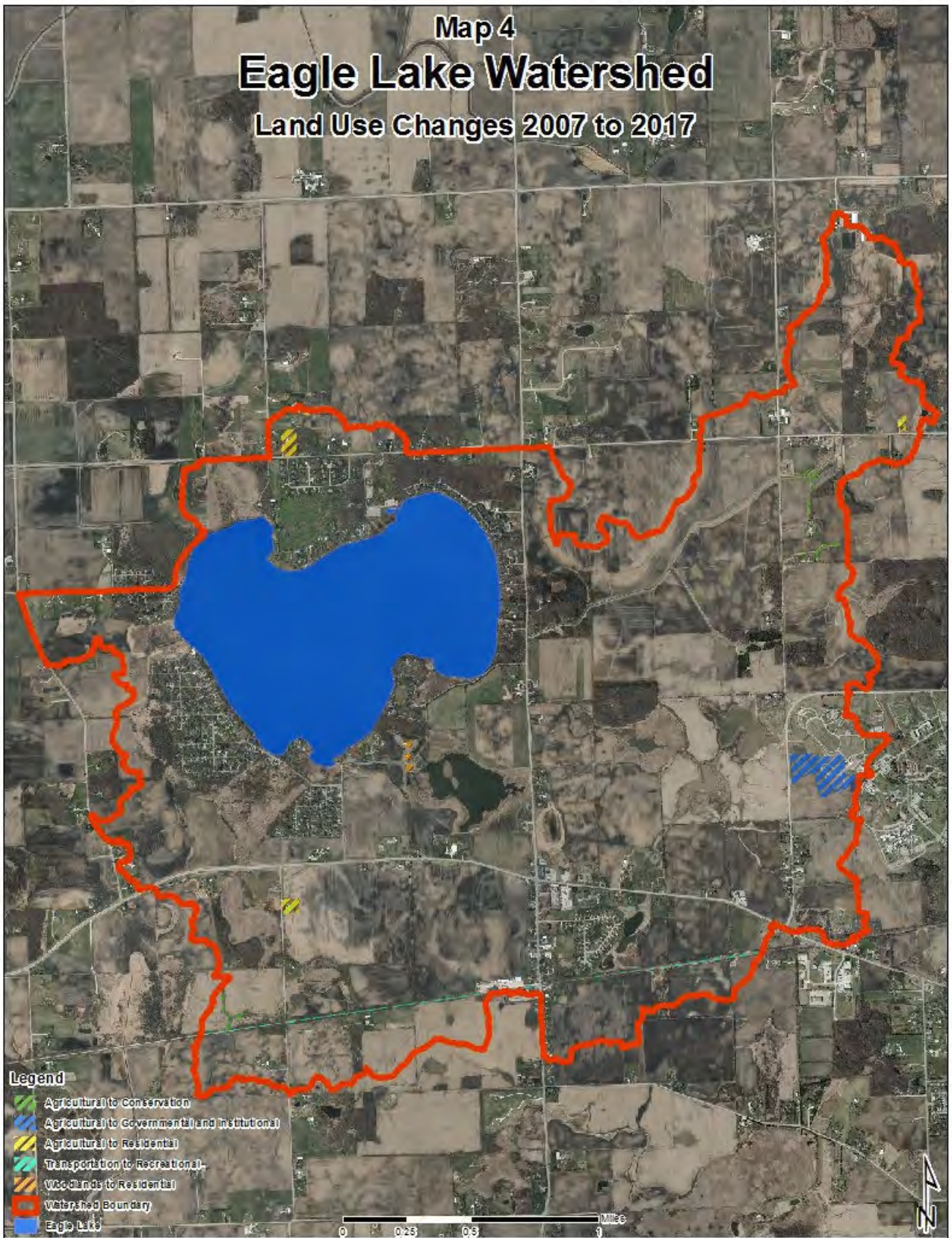
**Table 2**  
**Eagle Lake Sub-Watersheds**  
**Land Use (in acres) – 2016**

	<u>North</u>	<u>East</u>	<u>South</u>	<u>Southwest</u>	<u>West</u>
Agriculture	41	1,093	615	391	38
Woodlands	46	154	35	35	11
Wetlands	32	186	109	159	28
Residential	76	126	135	72	36
Commercial/Industry	0	3	26	0	0
Transportation/Utility	16	28	28	19	6
Gov't/Instituinal/Rec	<u>61</u>	<u>55</u>	<u>24</u>	<u>13</u>	<u>0</u>
	<b>272</b>	<b>1,646</b>	<b>973</b>	<b>684</b>	<b>119</b>

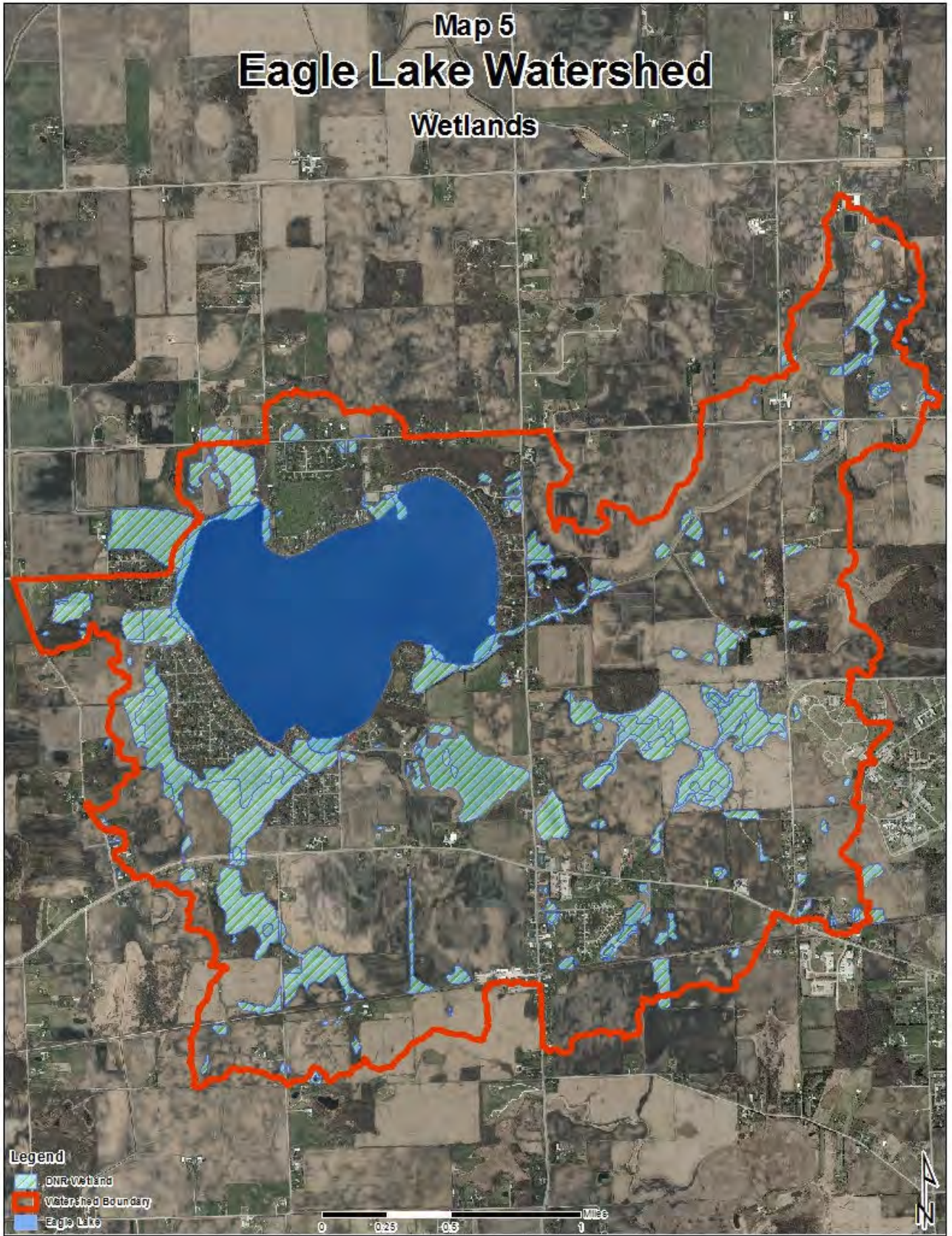


*Eagle Lake in April 2017*

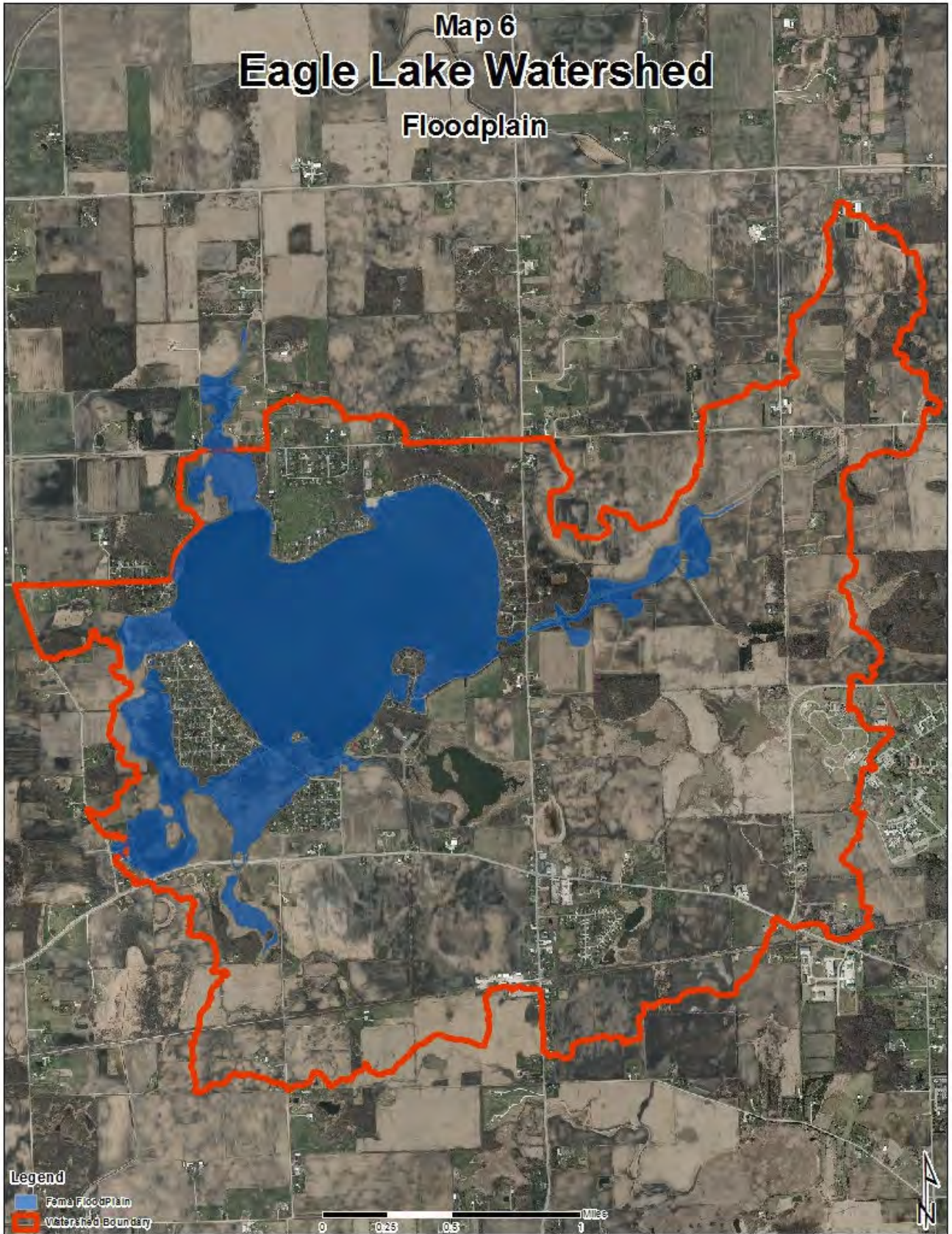
Map 4  
**Eagle Lake Watershed**  
Land Use Changes 2007 to 2017



Map 5  
**Eagle Lake Watershed**  
Wetlands



Map 6  
**Eagle Lake Watershed**  
Floodplain



## **Water Pollution from Nonpoint Sources**

Nonpoint source water pollution (NPS) is runoff pollution that occurs when rain washes pollutants off the land, out of the air, and runoff carries these pollutants into a water body. Nonpoint sources of pollution are difficult to trace, isolate, quantify and correct.

The pollutants carried in runoff originate from a variety of activities occurring throughout the watershed. Nonpoint sources of pollution come from both urban and rural land uses. Some activities contribute pollutants each time it rains, while others occur seasonally, annually or only during a rainfall event.

Everyone creates pollution as they live, work, and play in the watershed or when they drive through the watershed. Sources of runoff pollution must be prevented or controlled to improve the water quality of Eagle Lake. There is no simple solution.

Communities within the watershed must change the way they grow and the way they care for the land. The first step in cleaning up runoff requires a widespread education effort to explain the sources and cause of the problem.

### **Pollutants from Nonpoint Sources**

The most common runoff pollutants entering Eagle Lake include:

- Sediment – Soil from construction sites, eroding agricultural land, streambanks, and poorly maintained yards carries a high concentration of suspended solids which cause adverse conditions to the lake. Sediment causes increased turbidity, reduce light infiltration and smother fish and aquatic communities in the lake. In addition to filling the lake, sediments are carriers of pollutants that are released into the lake.
- Nutrients – Nitrogen and phosphorus from fertilizers applied to farm fields and lawns, and leached from leaves and grass clippings are carried in runoff and transported to the lake. Nutrients in runoff are in soluble forms and contribute to the over-fertilization of the lake, leading to the growth of aquatic plants and algae.
- Bacteria – Bacteria and other pathogens from failing septic systems, pet waste and garbage wash off of the land and into the lake.
- Toxic chemicals – Hydrocarbons from auto exhaust, zinc from tires and galvanized metal, pesticides from lawns and farm fields, phenols from wood preservatives and mercury from scrap metal piles, among other metals and synthetic chemicals, are often found in runoff.
- Chlorides – Chloride levels in snowmelt can be high. Salt applied to de-ice roads, parking lots, walkways and steps is very soluble and most that is used ends up in runoff or groundwater. High concentrations of chlorides can be toxic to the aquatic life in the lake.



## Identifying Sources of Runoff Pollution

This plan identifies source of runoff pollution entering Eagle Lake. A detailed study needed to be completed to identify the types of pollution, their spatial distribution and their magnitude.

Eagle Lake was divided into 5 sub-watersheds to better assess the sources and amounts of pollutants entering specific perennial and intermittent stream segments flowing to Eagle Lake.

There are three primary areas of nonpoint source pollution within the watershed. They are from: **Agricultural nonpoint pollution, Urban nonpoint pollution, and streambank/shoreline erosion.**

### Nonpoint Agricultural Pollution

Agricultural nonpoint pollution can be divided into two sources.

1. **Cropland erosion and sediment delivery**
2. **Animal waste**

#### Cropland erosion and sediment delivery

Runoff flowing from farm fields can export excessive amounts of sediment, fertilizers, pesticides and bacteria. Eroding croplands can deliver significant quantities of sediment to channels and ditches flowing to the lake.

Most of the sediment delivered to the stream networks originates from sheet and rill erosion occurring on crop fields. The majority of farm fields within the watershed are used for corn, soybeans, wheat, or hay. The use of annual cash crops, such as corn and soybeans, is more susceptible to high runoff events due to tillage and poor soil residue cover. Without the use of conservation and best management practices, the annual sediment and phosphorus delivery will exceed tolerable runoff amounts and pollute Eagle Lake.

#### Animal waste

Livestock operations within the Eagle Lake Watershed are limited and discharge few pollutants to the stream network system tributary to Eagle Lake. Three barnyards and one pastured field were inventoried in the watershed. The farms containing livestock are located where they will not have a significant impact on water quality in Eagle Lake or the watershed.

## **Livestock Siting Facility**

The watershed contains one facility regulated under the Racine County Livestock Siting Ordinance. The ordinance, adopted by Racine County in November of 2006, regulates animal waste storage, manure management and spreading, odor management, runoff management, property line and road setbacks. The ordinance applies to all new livestock facilities with greater than 500 Animal Units (AU) or facilities expanding more than 20% to 500 or more Animal units.

The livestock facility is on the extreme northeast border of the watershed. The livestock facility has approximately 700 Guernsey milk cows and 95 heifers. The facility has two large free stall barns to house the animals, with a state of the art milking parlor. The livestock produce 7.2 million gallons of liquid manure and 45 tons of solid waste annually. The manure flows through a gravity system to a storage lagoon, where it is then injected into the fields identified in the nutrient management plan. The manure is injected at rates recommended by the soil tests completed every four years. Injecting the manure reduces odor compared to surface spreading. The livestock facility spreads on 745 acres of land, of which 55 acres are located within the watershed.

Staff completes an annual review for the farm to retrieve updates (if any) on the number of livestock, nutrient management plans, soil test results, best management practices installed, and any other issues regarding the livestock siting permit.



*Livestock Siting Facility partially located within the Eagle Lake Watershed*



***Livestock Siting Facility – Land south (below) the orange line lies within the Watershed***

## **Agricultural Nonpoint Source Assessment Procedures**

Each cropped field within the Eagle Lake Watershed was delineated using GIS and crop information collected from the USDA's Farm Service Agency, (FSA). A detailed inventory of each parcel was conducted and specific data for each cropland parcel was collected. This information included:

1. Soil type
2. Slope of land
3. Slope Length
4. Agricultural Use (cropland, pasture)
5. Crop Rotation
6. Crop Tillage
7. Conservation Practices used (if applicable)
8. Distance of the parcel from a stream, wetland or lake
9. Gully erosion inventory

The erosion and sediment delivery rate from each cropland field to a stream segment flowing to Eagle Lake was estimated using the WDATCP Environmental Benefits Index. This model estimates sediment delivery from sheet and rill erosion. Data collection and loading analysis was completed by the Racine County Land Conservation Division.

## **Agricultural Erosion and Sediment Delivery Results**

Approximately 1,900 acres of the watershed are used to produce corn, soybeans, hay or other cash crops. An inventory was completed on all 100 crop fields. The inventory was put into erosion and sediment delivery models to determine annual sediment delivery and phosphorus loading. The model revealed 220 tons of sediment and approximately 475 pounds of phosphorus are delivered to Eagle Lake annually.

Most of the sediment delivered to the Lake originates from sheet and rill erosion occurring on cropland fields. A majority of the soils covering the fields used for cropland in the tributary watershed have soil texture and structure that cause low infiltration and excessive runoff. There is widespread use of annual crops, such as corn and soybeans in this watershed. Poor soil cover and protection during high runoff periods in the early spring was observed. Even untilled soybean fields were excessively rilled during spring rain.

## **Sediment Generated from Gully Erosion**

Eroding gullies are a significant source of sediment within the Eagle Lake Watershed. Gullies form in areas where concentrated surface runoff flow through and off of unseeded or poorly vegetated fields. Concentrated flows can gain high velocities as they flow over fields not protected with erosion resistant surfaces.



***GULLY EROSION IN FIELD #2403***



**EXCAVATOR AND BULLDOZER GRADING IN THE GRASSED WATERWAY #2403**



**GRASSED WATERWAY INSTALLED IN 2012 TO ELIMINATE EROSION FIELD #2403**

## **Gully Erosion Assessment Procedures**

The presence of gullies was determined during the cropland sheet and rill erosion inventory. The USDA, (NRCS), Land Inventory Monitoring Program method for surveying and measuring gully erosion was used. Data collected on each potential gully observed and included:

1. Length of gully
2. Approximate depth of gully
3. Top and bottom width
4. Degradation rate
5. Soil conditions

## **Inventory Results – Gully erosion**

There are 30 potentially active gullies eroding in the Eagle Lake watershed. The total length of all eroding gullies was approximately 24,124 feet. The approximate sediment generated from the active gullies in the watershed was estimated at 234 tons per year. Phosphorus generated from gully erosion in the watershed is approximately 613 pounds per year. The phosphorus is delivered to tributaries draining to Eagle Lake as well as the wetlands within the watershed. Estimates determine that grassed waterways can be installed on 50% of the gullies. The remaining gullies can be corrected by changing crop rotations, direction of planting, using no-till, cover crops, or not disturbing the cropland in the concentrated flow area.

Although significant gully erosion remains within the watershed, many gullies deliver sediment to the lower portion of a farm field or to a wetland rather than directly to Eagle Lake. Wetlands may accumulate with runoff, causing them to fill in with sediment. This create less open water and more plant grow with cattails or reed canary grass in many instances within the watershed.

Gully erosion results vary from year to year. The inventoried results are based on an annual average based on crop rotation; tillage used, and average annual rainfall. Many cases of gully erosion can be corrected by simply adding hay to the crop rotation, planting cover crops, or using no-till. In these specific cases, grassed waterways may not be needed.

# Map 7 Eagle Lake Watershed Cropland with Potential Gully Erosion





## **Animal Waste Inventory**

The animal waste inventoried in the watershed comes from 3 locations.

1. Pastures
2. Barnyards
3. Manure spreading on fields

## **Pasture Runoff Inventory**

Livestock operations within the Eagle Lake Watershed are limited and discharge few pollutants to the stream network system to Eagle Lake. One pastured field was inventoried and shows insignificant runoff to Eagle Lake.

## **Barnyard Runoff Inventory**

Barnyard data gathered within the watershed did not discharge significant amounts of pollutants directly to the surface waters within the watershed. Barnyards with significant pollutants can be modeled by runoff programs to determine needed BMP's.

## **Urban Nonpoint Pollution Sources**

The pollutants carried in urban runoff include most of the same pollutants found in runoff from agricultural lands and include sediment, fertilizers, pesticides and bacteria. Sediment leaves eroding construction sites, poorly managed yards or aging pavement. Nutrients, pesticides, and fertilizers runoff lawns and are leached from grass clippings and other yard debris. Pet waste and failing septic systems can add bacteria to runoff. Heavy metals and organic compounds are found in urban runoff originating from residential and commercial land, industrial yards, and pavement.

The urban areas in the drainage basin transport a wider array of pollutants more efficiently and directly to the lake than do other land uses. Rain water and snowmelt pick up speed and pollutants as it moves over pavement or other impervious urban surfaces. Roadside channels or gutters and storm sewers collect and transport the polluted runoff directly to the lake with little treatment.

## **Urban Nonpoint Source Assessment Procedures**

The assessment of urban nonpoint sources in the Eagle Lake watershed consisted of three components:

1. A land use inventory delineating and describing the urban land uses in the Eagle Lake watershed.
2. An audit of construction sites in the watershed to determine the effectiveness of construction erosion control measures used.
3. A detailed field inventory of specific urban land uses and other sources of nonpoint pollution sources.

The land use categories were delineated and quantified on 2015 aerial photographs available on Racine County's Web-Based Geographic Information System. The urban land use categories in the Eagle Lake watershed inventory included: residential, commercial, industrial, transportation/utilities, and recreation.

Pollutant loadings from urban land uses within the watershed were estimated using a very simple method referred to as "Unit-Area Loading Analysis." This method assigns an annual pollutant export value for each specific urban land use within the watershed. The amount of sediment, phosphorus, and zinc exported in runoff from the urban land in the Eagle Lake watershed was calculated on an annual average basis from each delineated land use. Typical pollutant generation rates from urban land uses are shown on Table 3, page 40. Most heavy metals concentrations will be expected to rise as more land is paved within the watershed.

Construction activities in the watershed were monitored for compliance with their respective construction site erosion control ordinances. Less than 5 acres of land were under construction during the planning project period. Technical audits were conducted to evaluate the construction site erosion control methods. The audit determined if acceptable design, placement and maintenance was acceptable to meet the minimum standards and specifications.

Excessive use of fertilizers on lawns or recreational areas near lakeshore areas is not accurately accounted for in this method due to the lack of modeling tools.

### **Urban Inventory Results**

The estimated annual sediment load from existing urban land uses in the Eagle Lake watershed is 68/ tons/year and the estimated phosphorus load is 178 pounds per year. An audit of construction sites and activities throughout the watershed indicated that although filter fabric and straw bale fences are most common used on construction sites, they did not trap or filter small particle sizes of sediment. The audit also revealed that many filter fences and barriers were not installed properly. Also, many of these erosion control devices were not maintained or replaced when necessary. The estimated sediment load to Eagle Lake from construction sites in the watershed is 12 tons annually. The annual phosphorus generated from construction sites are estimated to be 26 pounds annually.

Urban Land uses with the greatest amount of pavement or other impervious surfaces are the primary sources of metal and other toxic pollutants in runoff with the greatest concentration originating from industrial yards, commercial parking lots and highways. The severity of environmental impacts in urban watersheds is directly related to the amount of impervious surface in the watershed. As urban land uses expand and the amount of impervious surfaces grow, the concentration of urban pollutants will increase and have a greater impact on the water quality of the lake.



***Silt fence improperly installed on Eagle Lake, not closed at the hill bottom.***



***Silt fence improperly installed on Eagle Lake construction, not trenched into ground***



*Sediment in culvert that leads to Eagle Creek on Hwy 75*



*Sediment from cropland in catch basin and culvert – needs to be cleaned out*

**Road Right of Way Maintenance**

Culvert and outfall inspections can take place after storm events to determine if maintenance or clean out is needed to prevent sediment from moving downstream during the next storm event.

## **Streambank and Lakeshore Sedimentation**

Over 9,600 feet of channels collect and move runoff from the land to Eagle Lake. Eroding, slumping and trampled streambanks deliver sediment directly to the stream or Lake. The physical features of the channels carrying runoff are under constant change. Some of these changes occur naturally, but others are a result of changes in characteristics to land in the watershed. Upstream channels have been realigned to accommodate agricultural uses and reconfigured to efficiently collect and move water downstream. This results in channel bottom degradation in some channel reaches and bank erosion in other reaches. The channel attempts to adjust its cross-section by eroding to accommodate these hydraulic modifications occurring in the watershed.

The lakeshore of Eagle Lake was also inventoried to identify and quantify lakeshore erosion.

## **Streambank and Lakeshore Erosion and Assessment Procedures**

A field survey of the perennial and intermittent streams in the lake watershed and lakeshore of Eagle Lake was conducted to identify and quantify streambank erosion. The method used to survey streambanks was a modified version of the method used by the USDA (NRCS), in their Land Inventory and Monitoring Program.

Data from each stream and lakeshore reach considered to be a problem was collected and included:

- 1) Length of the eroded stream or shore reach
- 2) Height of the eroded stream or shore reach
- 3) Lateral recession rate of the eroded stream reach
- 4) Soil characteristics of the eroded reach
- 5) Recommended treatment

## **Streambank Inventory Results**

Active streambank erosion was identified as a significant contributor to the sediment load. An estimated 2,900 feet of streambank are actively eroding in the lake watershed generating approximately 28 tons of sediment and 150 pounds of phosphorus.

Most of Eagle Creek has been altered by straightening, deepening and widening to accommodate drainage and adjacent land use. This has caused stream bottom degradation and bank instability in many stream reaches.

Approximately 144 feet of lakeshore is actively eroding and generating approximately 10 tons of sediment and 80 pounds of phosphorus per year.

## **Legacy Sediment**

A source of runoff pollution which has accumulated in Eagle Creek and other tributaries flowing to Eagle Lake is known as legacy sediment. Legacy sediment has been eroded from upland areas since the arrival of early settlers. Over 150 years of intensive land uses have deposited sediment into floodplains, wetlands, stream corridors and Eagle Lake. This accumulation alters and continues to impair the hydrologic, biologic, aquatic, riparian and water quality functions of the pre-settled environment. Legacy sediment often accumulates in low flow ditches and channels, which lead to Eagle Lake. The removal of legacy sediment is one of the recommended priorities to improve water quality (page 55).

## **Other Sources of Runoff Pollution**

Additional sources of pollutants flowing to Eagle Lake include those that were identified during field reconnaissance surveys but were not quantified. These sources include:

- 1) Activation of legacy sediment existing lake watershed.
- 2) Existing basins or ponds in the watershed.

## **Assessment Procedures**

Existing basins and channels in the watershed were inspected and observations were made regarding:

- 1) Trap efficiency or stored sediment
- 2) Maintenance
- 3) Improvements needed

## **Inventory Results**

Excessive amounts of legacy sediment were observed in several channel segments throughout the watershed. During periods of heavy rains, these sediments are suspended into the water column and moved downstream with stream flow.

Recent studies in Wisconsin have determined that most of the legacy sediment is between 25 and 75 years old. The sediment contains rich nutrients that are impairing water quality.

Further cross sections of Eagle Creek and the Oakcrest Inlet can be taken to determine the approximate amount of sediment needed to be removed.

**Wisconsin Lake Modeling Suite**  
(Wisconsin DNR PUBL-WR-363-94)

The Wisconsin Lake Modeling Suite (WiLMS) model is a lake water quality-planning tool. The model uses the annual step and predicts spring overturn (SPO), growing season mean (GSM) and annual average (ANN) total phosphorus concentration in lakes. WiLMS should not be used for time steps other than one year.

The WiLMS model structure is organized into four principle parts, which include the front-end, phosphorus prediction, internal loading and trophic response. The front-end portion or model setup includes Lake Characteristics, watershed loading calculation inputs and the observed in-lake TP. Both the phosphorus prediction and internal load estimator use the front-end portion of the model for lake and watershed inputs. The internal loading estimation portion contains 4 methods to estimate and bracket a lake's internal loading. The trophic response portion contains only Wisconsin trophic response relationships while the expanded contains Wisconsin regressions plus other commonly used regressions.

The models used in WiLMS are empirical methods developed via statistical analysis of lake and reservoir systems. The lake models themselves have an uncertainty associated with them, which WiLMS combines with the loading uncertainty to obtain the total prediction uncertainty. The results may vary due to the uncertainty of the data, inputs, model assumptions, and responses.

Lake Data were gathered by Kathy Aron, Heidi Bunk, and other personnel between 2000 and 2012. The observed data were used in the Lake Prediction Models to compare forecast data and observed data.

After using Eagle Lake and watershed inputs into the WiLMS model, it indicated the loading level for phosphorus was more accurately shown on the "lowest likely" end of the calculated results. The "lowest likely" results were more accurately comparable with the observed lake data when used to calculate expected in-lake phosphorus concentrations. These results also compare favorably with the sum total of the UAL-derived loadings described above, which suggest about 1,500 pounds of phosphorus is produced from land use practices in the watershed: WiLMS suggest that between 1,000 pounds and about 2,500 pounds of phosphorus is conveyed to the lake, based on the "lowest likely" and "most likely" loading, respectively.

The results from the WiLMS model indicate Eagle Lake as a eutrophic lake. The east subwatershed provides the majority of the sediment and phosphorus loading to the lake. Best management practices can be used to reduce the loading levels.

**Figure 2  
Eagle Lake Chlorophyll and Trophic Status Index**

**LEAP - Lake Eutrophication Analysis Procedure**

<b>Lake Name:</b> Eagle Lake	<b>Ecoregion:</b> Southeast Wisconsin Till Plain
<b>Watershed Area:</b> 3717 Acres	<b>Surface Area:</b> 531 Acres
<b>Mean Depth:</b> 7 ft	<b>TP Load:</b> 376 kg/yr
<b>Lake Outflow:</b> 4 AF/yr	<b>Avg TP Inflow:</b> 105 ug/L
<b>Residence Time:</b> 1.3 years	<b>P Retention Coef:</b> 0.61
<b>Areal Water Load:</b> 1.67 m/yr	

Variable	Observed	Predicted	Std Error	Residual	T-test
TP (ug/L)	72	41	13	0.24	1.59
Chlr a (ug/L)	23.6	14.9	8.6	0.20	0.72
Secchi (m)	0.7	1.6	0.6	-0.32	-1.80

Note: Residual = Log10(Observed/Predicted)

T-test for significant difference between observed & predicted

**Chlorophyll A Interval Frequencies (%)**

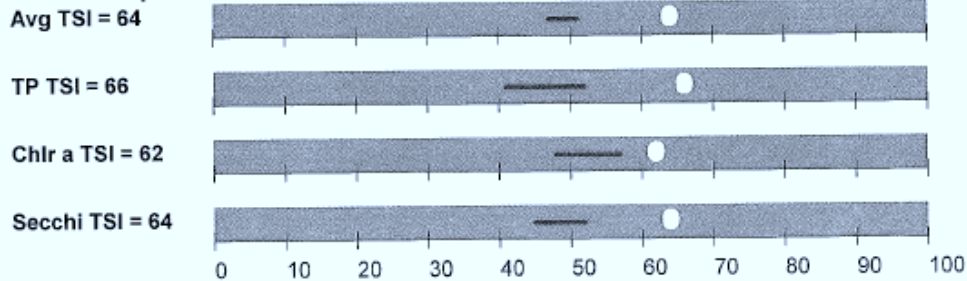
ppb	Observed	Case A	Case B	Case C
10	94%	72%	71%	64%
20	54%	20%	22%	30%
30	23%	5%	6%	15%
60	1%	0%	0%	3%

Case A = within year variation considered

Case B = within year + year-to-year variation

Case C = Case B + Model Error

**Carlson's Trophic Status Index**





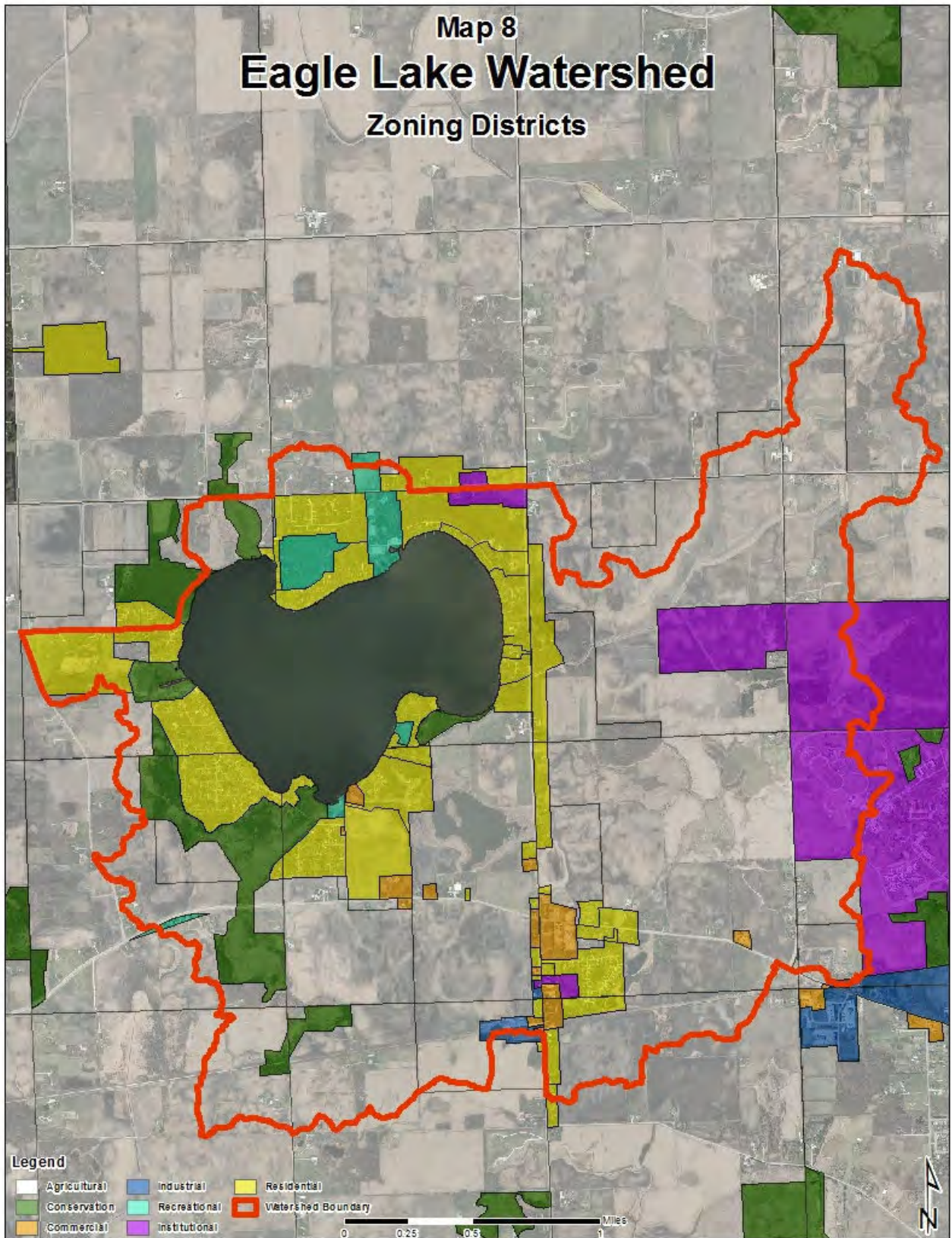
**TABLE 3****Typical Pollutant Generation Rates  
On Urban Land Use (using 2017 data)**

Land Use	Unit Area Load (pounds/acre/year)			
	Sediment	Phosphorus	Zinc	Other Concerns
Highways/Streets	1201	1.4	2.8	Volatile Organics
Industrial	1050	1.7	2.6	Volatile Organics
Commercial	1145	1.6	2.2	Volatile Organics
Shopping Centers	440	0.5	0.6	Volatile Organics
High Density Residential	420	1	0.7	Pesticides
Medium Density Residential	315	0.4	0.4	Pesticides
Low Density Residential	28	0.07	1.1	Pesticides
Parks	3	0.03	0	Pesticides

**TABLE 4****Summary of Annual Sediment Delivery- Eagle Lake Watershed**

<u>Source</u>	<u>Tons of Sediment per Year</u>
Cropland (Sheet and Rill Erosion)	220
Gully Erosion	234
Streambank Erosion	28
Lakeshore Erosion	4
Existing Urban Land uses	68
Construction Sites	<u>12</u>
Total Annual Sediment Load to Eagle Lake	566 Tons/Year
*Legacy Sediment (Estimated – Not Inventoried)	2240 Tons Total

Map 8  
**Eagle Lake Watershed**  
Zoning Districts



**Table 5  
Sediment and Nutrient Delivery**

**Sub-Watersheds**

Field #	Destination	<u>Sediment Delivery</u> (in tons)			<u>Phosphorus Delivery</u> (in pounds)			<u>Nitrogen Delivery</u> (in pounds)			
		No Buffer	30 ft	75 ft	No Buffer	30 ft	75 ft	No Buffer	30 ft	75 ft	
<b>North</b>											
2101	Wetland	7.4	2.6	1.1	16.2	7.1	3.2	8.8	3.9	1.8	
	Subtotal	<b>7.4</b>	<b>2.6</b>	<b>1.1</b>	<b>16.2</b>	<b>7.1</b>	<b>3.2</b>	<b>8.8</b>	<b>3.9</b>	<b>1.8</b>	
<b>West</b>											
2102	Wetland	3.7	1.3	0.6	8.1	3.6	1.6	4.4	2.0	0.9	
2103	Wetland	5.0	1.8	0.8	11.1	4.9	2.2	6.1	2.7	1.2	
n2105	Wetland	3.2	1.1	0.5	6.9	3.1	1.4	3.8	1.7	0.8	
	Subtotal	<b>11.9</b>	<b>4.2</b>	<b>1.8</b>	<b>26.2</b>	<b>11.6</b>	<b>5.2</b>	<b>14.3</b>	<b>6.3</b>	<b>2.9</b>	
<b>Southwest</b>											
s2105	Wetland	7.0	2.5	1.0	15.3	6.9	3.1	8.3	3.8	1.7	
2801	Wetland	7.2	2.6	1.1	16.0	7.2	3.2	8.7	4.0	1.7	
2802	Wetland	6.4	2.3	1.0	14.1	6.3	2.8	7.7	3.4	1.5	
2805	Wetland	10.6	3.7	1.6	23.4	10.3	4.7	12.8	5.6	2.6	
2806	Wetland	10.8	3.9	1.6	23.9	10.8	4.8	13.0	5.9	2.6	
2807	Wetland	5.0	1.8	0.7	10.9	4.9	2.2	5.9	2.7	1.2	
2809	Wetland	7.2	2.6	1.1	16.0	7.2	3.2	8.7	4.0	1.7	
2810	Wetland	2.1	0.8	0.3	4.6	2.2	0.9	2.5	1.2	0.5	
	Subtotal	<b>56.3</b>	<b>20.2</b>	<b>8.4</b>	<b>124.2</b>	<b>55.8</b>	<b>24.9</b>	<b>67.6</b>	<b>30.6</b>	<b>13.5</b>	
<b>South</b>											
s2701	Wetland	2.1	0.8	0.3	4.6	2.2	0.9	2.5	1.2	0.5	
2702	Wetland	4.0	1.5	0.6	8.9	4.0	1.8	4.9	2.2	1.0	
s2703	Wetland	4.8	1.7	0.7	10.6	4.8	2.1	5.8	2.6	1.2	
2704	Wetland	5.0	1.7	0.7	10.9	4.8	2.2	5.9	2.6	1.2	
2705	Ditch	12.0	4.2	1.8	26.5	11.7	5.3	14.5	6.4	2.9	
2707	Wetland	6.2	2.1	0.9	13.6	6.0	2.7	7.4	3.3	1.5	
2708	Wetland	8.1	2.9	1.2	17.8	8.1	3.6	9.7	4.4	1.9	
	Subtotal	<b>61.9</b>	<b>21.8</b>	<b>9.3</b>	<b>136.1</b>	<b>60.6</b>	<b>27.2</b>	<b>74.2</b>	<b>32.8</b>	<b>14.8</b>	
<b>East</b>											
1306	Wetland	7.0	2.5	1.0	15.3	6.9	3.1	8.3	3.8	1.7	
1308	Canal	3.2	1.1	0.5	7.0	3.1	1.4	3.8	1.7	0.8	
1309	Wetland	4.0	1.4	0.6	8.7	3.9	1.7	4.7	2.1	0.9	
2203	Wetland	2.4	1.1	0.4	5.2	2.7	1.0	2.8	1.5	0.6	
<b>2303</b>	<b>Canal</b>	<b>19.9</b>	<b>7.5</b>	<b>3.0</b>	<b>42.7</b>	<b>19.2</b>	<b>8.5</b>	<b>23.3</b>	<b>10.5</b>	<b>4.7</b>	
<b>2304</b>	<b>Canal</b>	<b>12.2</b>	<b>4.4</b>	<b>1.8</b>	<b>26.8</b>	<b>12.1</b>	<b>5.4</b>	<b>14.6</b>	<b>6.6</b>	<b>2.9</b>	
2305	Wetland	7.0	2.5	1.1	15.4	6.8	3.1	8.4	3.7	1.7	
<b>2306</b>	<b>Canal</b>	<b>6.4</b>	<b>2.3</b>	<b>1.0</b>	<b>14.0</b>	<b>6.3</b>	<b>2.8</b>	<b>7.6</b>	<b>3.4</b>	<b>1.5</b>	
<b>2307</b>	<b>Canal</b>	<b>10.6</b>	<b>3.7</b>	<b>1.6</b>	<b>23.3</b>	<b>10.3</b>	<b>4.7</b>	<b>12.7</b>	<b>5.6</b>	<b>2.5</b>	
<b>2308</b>	<b>Canal</b>	<b>4.2</b>	<b>1.4</b>	<b>0.6</b>	<b>9.4</b>	<b>4.1</b>	<b>1.9</b>	<b>5.1</b>	<b>2.2</b>	<b>1.0</b>	
2309	Wetland	3.7	1.3	0.6	8.1	3.6	1.6	4.4	2.0	0.9	
2310	Wetland	4.5	1.6	0.7	9.9	4.4	2.0	5.4	2.4	1.1	
2401	Canal	3.7	1.3	0.6	8.1	3.6	1.6	4.4	2.0	0.9	
2402	Canal	3.6	1.3	0.5	7.8	3.5	1.6	4.3	1.9	0.9	
<b>2404</b>	<b>Canal</b>	<b>7.3</b>	<b>2.6</b>	<b>1.1</b>	<b>16.1</b>	<b>7.3</b>	<b>3.2</b>	<b>8.8</b>	<b>4.0</b>	<b>1.8</b>	
<b>2405</b>	<b>Canal</b>	<b>3.6</b>	<b>1.3</b>	<b>0.6</b>	<b>8.1</b>	<b>3.6</b>	<b>1.6</b>	<b>4.4</b>	<b>2.0</b>	<b>0.9</b>	
n2701	Wetland	3.8	1.5	0.6	8.3	4.0	1.7	4.5	2.2	0.9	
n2703	Wetland	3.4	1.2	0.5	7.5	3.4	1.5	4.1	1.8	0.8	
	Subtotal	<b>110.5</b>	<b>40.0</b>	<b>16.8</b>	<b>241.7</b>	<b>108.8</b>	<b>46.8</b>	<b>131.6</b>	<b>59.4</b>	<b>26.5</b>	
	<b>TOTAL</b>	<b>270</b>	<b>96</b>	<b>41</b>	<b>593</b>	<b>265</b>	<b>119</b>	<b>323</b>	<b>145</b>	<b>65</b>	

RED - Buffers installed since 2007 plan

## **Accomplishments in the Watershed since the last plan in 2007**

Field's #2303, #2304, #2306, #2307, #2308 have added 50' to 60' wide grassed buffers installed along Eagle Creek. The buffers have reduced phosphorus by approximately 80 pounds per year or 70% of the previous phosphorus loading to Eagle Creek.

See photo below:



*Grassed Buffers along north side of Eagle Creek (photo taken from Church Road, looking west)*



*Grassed Buffers along south side of Eagle Creek (photo taken from Church Road, looking west)*

Field's #2401, #2404, #2405 have installed 30' to 50' wide grassed buffers along Eagle Creek. The buffers have reduced sediment by 25 pounds of phosphorus per year or 60% of the previous loading to Eagle Creek.



***BEFORE: Field #2405 winter wheat planted before grassed buffer installed***



***AFTER: Field #2405 after grassed buffer installed (photo in 2016 from Church Road looking east)***



***AFTER: Field #2405 immediately after grassed buffer was established in 2012***

Nutrient management plans were put into place on 1,243 acres of land within the watershed. Nutrient management involves soil testing and assessing the crops nutrient needs to determine fertilizer application rates. Another aspect of nutrient management requires the cropland to be at or below tolerable soil loss rates.

The ELMD utilized the Lake Protection grant to complete native plantings, rock riprap, and biologs along 868 linear feet of shoreline. Shoreline protection prevents sediment from entering the lake due to the lateral recession caused by fetch, ice or wave action. The native plantings filter runoff from uplands and provide a natural looking shoreline.

A rain garden located in the Island Community will reduce direct stormwater runoff and allow for infiltration during smaller storm events.

Legacy Oaks installed 3 detention basins within the subdivision. The basins will provide storage for stormwater and hold sediment. Maintenance plans will need to be followed for continued success of the basins.



***Eagle Creek facing east from Hwy 75 with existing 25 foot grassed buffer on south side***

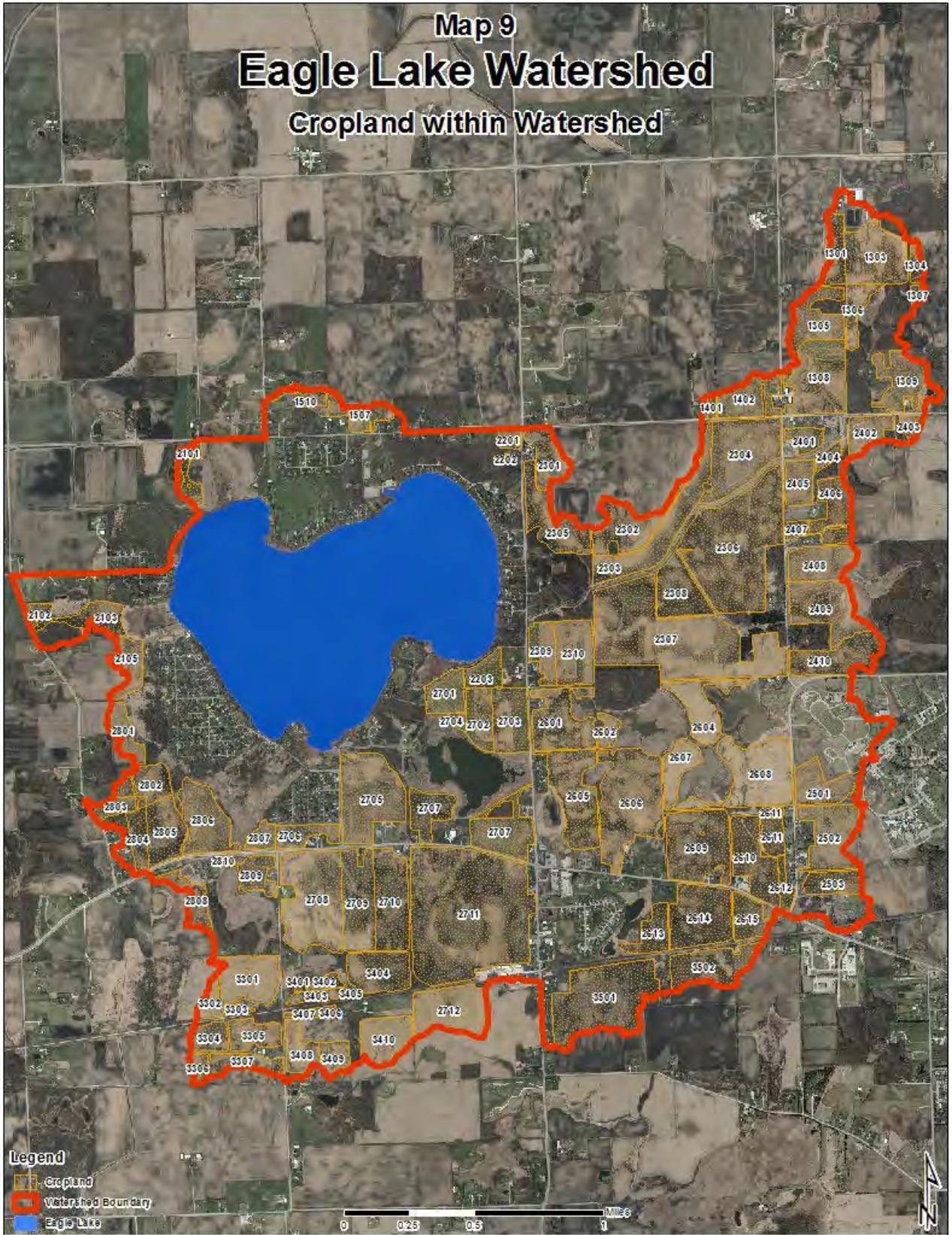
**Table 6**

**BEST MANAGEMENT PRACTICES INSTALLED SINCE 2007**

Practice Name	Funding Source	Units of Measure	#'s of Phosphorus	Tons of Sediment
			Reduction	Reduction
Grassed Buffers – (Mills)	Landowner	7.0 Acres	81 lbs/yr	45 tons/yr
Grassed Buffers - (Ehrhardt)	CREP	1.7 Acres	14 lbs/yr	10 tons/yr
Grassed Waterway - (Ehrhardt)	CREP	0.4 Acres	145 lbs/yr	110 tons/yr
Grassed Waterway - (Ament)	CRP/LWRM	0.7 Acres	27 lbs/yr	21 tons/yr
Shoreline Stabilization – (Lietzke)	LWRM	60 feet	6 lbs/yr	2 tons/yr
Nutrient Management (Walker)	Landowner	745 Acres	Unknown	NA
Nutrient Management (Mills)	Landowner	498 Acres	Unknown	NA
Grassed Buffers – (Archibald)	Landowner	1.2 Acres	20 lbs/yr	9 tons/yr

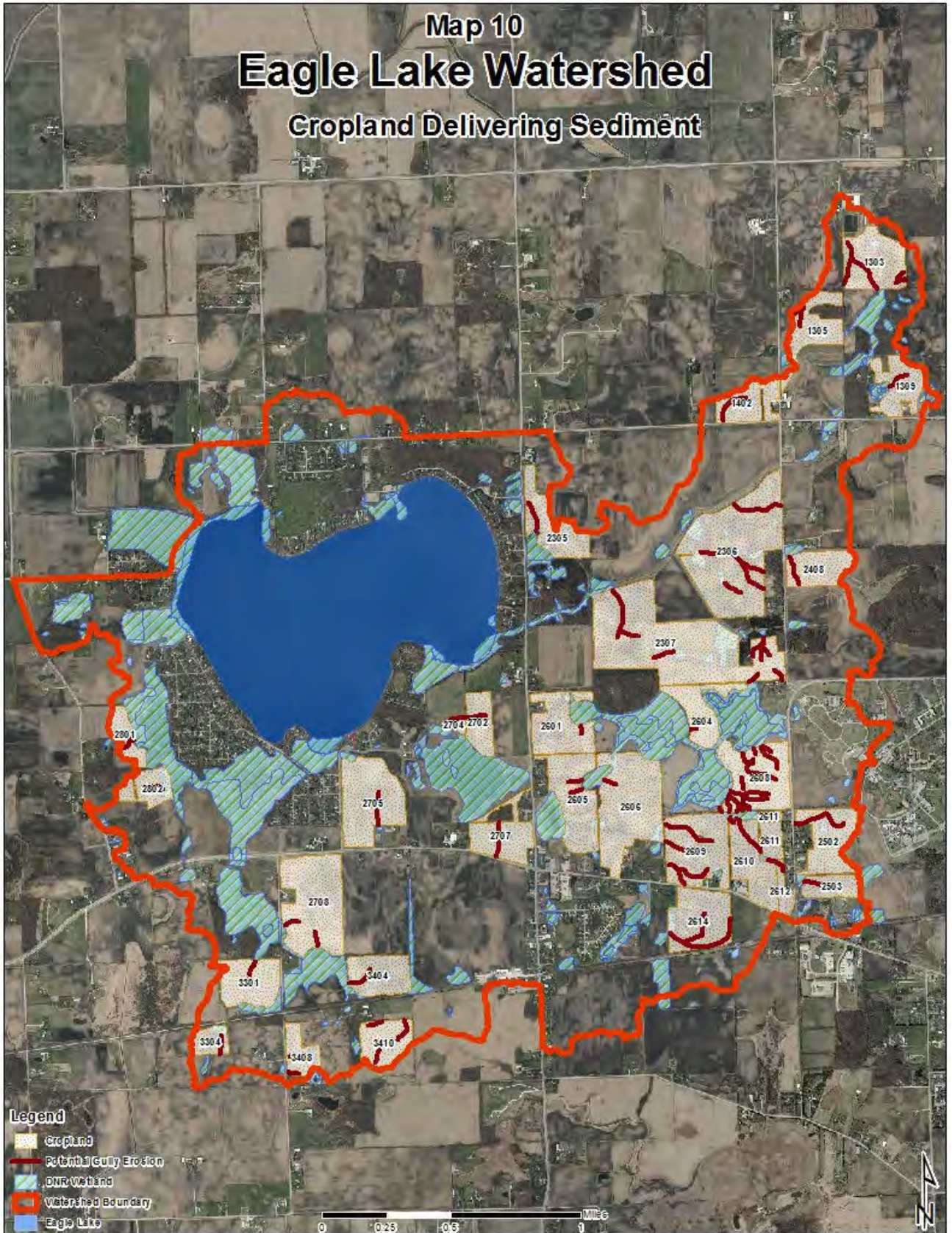
CREP, CRP and EQIP Acronyms and Definitions on Page 62, 63

# Map 9 Eagle Lake Watershed Cropland within Watershed





# Map 10 Eagle Lake Watershed Cropland Delivering Sediment



Map 11  
**Eagle Lake Watershed**  
**Best Management Practices Installed**



## **Nonpoint Source Control Need**

The water quality goals for improving water quality in Eagle Lake include controlling the sources of nonpoint source pollution. These include reducing the levels of sediment, phosphorus, bacteria, and other pollutants carried in the runoff to Eagle Lake. When these pollutants are carried to the tributaries and channels leading to the Lake, the water quality is degraded and recreational use is restricted. Removing or inactivating pollutants in the lake is a short-term, costly endeavor. Keeping the pollutants out of the runoff is the most effective action that can be undertaken to improve Eagle Lake. The water quality goal is to remove 60% of the phosphorus entering the lake for watershed sources.

Best management practices (BMP's) can be used to prevent and control non-point source pollution. Properly installed BMP's can be simple non-structural soil conservation measures or complex structural treatment facilities. The recommended list of Best Management Practices needed in the Eagle Lake Watershed is shown on Table 7. The completion of these practices is needed to achieve the pollutant load reduction goal and achieve the water quality goals and recreational use planned for Eagle Lake.

### **Agricultural Land**

Cropland erosion is a significant source of sediment. A sediment reduction can be achieved by a reduction in the total erosion rate, stabilization of gullies, and establishment of permanent grassed buffers at the lower edge of the cropped fields along perennial and intermittent streams.

Soil conservation practices can also be used: crop residue management, conservation tillage, no-till, vegetative filter strips and cover crops can be used to reduce overall erosion rates. The appropriate conservation methods must be customized to each individual farming operation. Approximately 1500 acres of cropland need soil conservation and best management practices that result in the reduction of sediment and phosphorus.

Runoff management practices, such as grassed waterways and filter strips, are recommended to correct localized erosion problems. Approximately 12,960 feet of grassed waterways may be needed within the watershed.

Pasture management and barnyard runoff control methods should be used on all livestock operation within the watershed.

### **Streambank Erosion**

Streambanks with moderate to severe rates of lateral recession should be targeted for protection with a combination of biological and hard practices. Biological practices include grading and planting native grasses on the bank, while hard practices include stabilizing the streambank toe with riprap. To completely restore the entire agricultural ditch, a two-stage channel will create a more natural and less erosive conveyance for storm water.

## Two-Stage Channel

Agricultural ditches and channels have long been used to provide important drainage and flood control. Historically, many of these drainageways are designed following threshold design techniques and result in a large trapezoidal cross section. The primary purpose of the constructed channel is to convey water from agricultural fields.

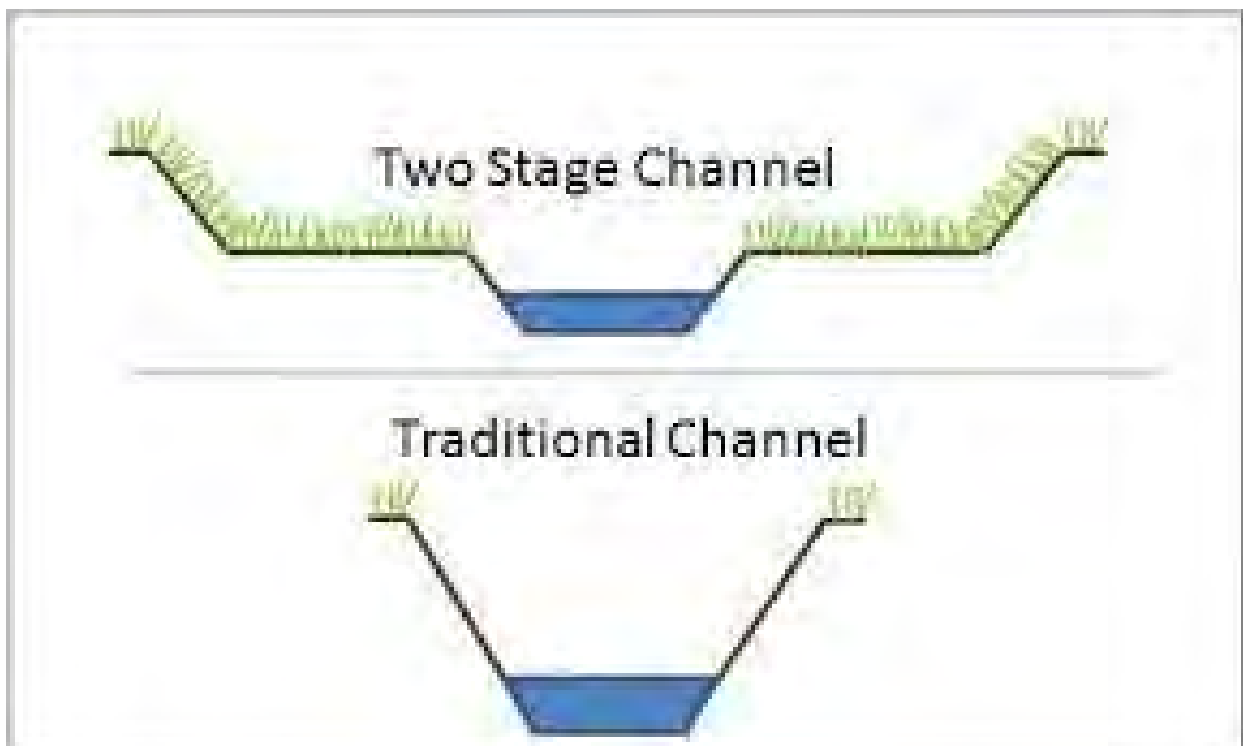
However, when the waterway behaves like an alluvial channel, the ditch can become entrenched and have an over widened bed. As deposition occurs, bank stability becomes an issue as sediment deposits force flow into one bank or the other. This can cause streambank failure which leads to further erosion and sediment deposition.

A two-stage channel approach provides improved physical and ecological performance. The fluvial processes at work in a conventional, trapezoidal channel system tends to try to develop a flood plain that consists of low benches. The two-stages consist of:

- A dominant discharge or channel-forming discharge channel
- A flood plain bench or flood plain channel

The two-stage channel design is applicable to low gradient ditches and agricultural channels that have long been used primarily for drainage and flood control. The two-stage channel will convey water in the same manner, but in a less erosive pattern. The small bank full channel will slightly meander within the ditch. See traditional channels (such as Eagle Creek and Oakcrest Ditch), compared to a two-stage channel below.

**Figure 4**





***During construction of a 2 stage channel on the Pike River in Racine County (above)***



***Construction completed with riprap on potential streambank erosion and erosion netting***

## **Shoreline Buffers**

Shoreline buffers should be established along the perennial tributaries to buffer the land use from the adjacent areas. Several federal and state programs are available to provide technical assistance and cost-sharing to help establish buffers.

## **Wetland Restoration**

Wetlands are important resources for the ecological health and diversity within the watershed. Wetlands form the transition between surface, groundwater and land resources. Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency, and with duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally occur in depressions and near the bottom of slopes, particularly along lakeshores, streambanks, and on large land areas that are poorly drained. Wetlands may, however, under certain conditions, occur on slopes and even on hilltops. In effect, they provide essential breeding, nesting, sanctuary, and feeding grounds, as well as offer escape for many forms of fish and wildlife. In addition, wetlands perform an important set of natural fluctuations which include: water quality protection, stabilization of lake levels and stream flows, reduction in stormwater runoff by providing areas for floodwater impoundment and storage; and protection of shorelines from erosion. (Racine County LWRMP 2013-2022.)

Wetland restorations can include multiple best management practices, including: Tile breaks, ditch plugs, shallow ponds, and embankments.



*Wetland Restoration completed in 2007*

## Urban Pollution Control

Existing urban and residential areas should consider these management opportunities to improve water quality:

- Direct roof gutter downspouts to grassy, pervious areas. Rain barrels and rain gardens can also be used to collect the runoff.
- Re-establish road ditches and channels in the watershed with vegetation that has a high sediment filtering and infiltration capacity.
- Reduce the amount of lawn fertilizers and pesticides to minimal use. Use fertilizers that do not contain Phosphorus. Dispose of leaves and grass clippings into mulch or compost, or dispose at a community compost site.
- Increase street sweeping to once a week on urban/residential streets.
- Pet waste should be picked up and flushed or buried.

Planned urban areas should follow the following management alternatives:

- All roof gutter downspouts should be directed to pervious areas, rain barrels, or rain gardens.
- Use grassed channels and ditches to convey runoff, rather than direct runoff in storm sewers.
- Detain or treat runoff for all new residential, commercial or industrial land using stormwater ponds or the equivalent, with the goal of removing 90% of the pollutants during and after construction.
- Improve the procedures to enforce and inspect the construction site erosion control practices that are put in place by Racine County ordinance and Town of Dover.
- Establish natural buffers between construction areas and surface waters or wetland. This can be done through easements and planning.

## Other Pollution Sources

Stabilize or remove existing legacy sediment and selectively remove invasive vegetation to improve water quality and habitat. Any dredging of ditches or channels within the watershed will likely need WDNR permits. Any excavation or dredging should be done using sediment traps or other methods to intercept sediment during construction.

**Refer to the Shoreland Stewardship Series (Appendix C) for more information about what you can do as a Lake Homeowner to improve your property and the protect Eagle Lake!**

## Land Resource Management Recommendations

The following land resource management programs and policies should be implemented to protect the lake, wetlands, surface waters, environmentally sensitive areas and environmental corridors.

### Sub-watershed Priority Ranking:

**First Priority: East and South Sub-watersheds**

**Second Priority: Southwest, North, and West Sub-watersheds**

The East Sub-watershed delivers 60 percent of the total sediment and phosphorus to Eagle Lake. The East sub-watershed delivers approximately 85% of the agricultural sediment to Eagle Lake.

### Priority Projects (no particular order or ranking)

- The Oakcrest Inlet along the north side of field #2705, is a low flowing channel that contains legacy sediment, streambank erosion, beaver dam blockages, invasive species (buckthorn, honeysuckle, etc.), dead, diseased, and downed trees. Overall, the site can be improved to a more natural state. To do this, the dead, diseased or invasive trees need to be removed. Then, legacy sediment should be excavated from the channel and properly disposed of in a manner to not run off. Finally, a two-stage channel can be created and maintained to provide a more natural stream that will flow in stage one during normal base line storm event, but utilize the secondary stage during heavy rain or flood events. The site could then be seeded with a native seed mix with erosion control netting to stabilize the site. A conservation easement can potentially be placed on this stretch of land to be held by the ELMD or ELIA, along with a long-term maintenance agreement to control weeds, prevent the regrowth of invasive woody species, and overall maintain the site from beaver dams and other blockages to provide a clean stream flow to Eagle Lake.
- The Oakcrest Inlet to Eagle Lake on the west side of Eagle Road could be dredged after applying for and receiving a DNR permit. The Oakcrest Inlet contains a large tree which can be removed as well as many cubic yards of legacy sediment. This would eliminate much of the nutrient rich legacy sediment currently at this location.
- Gully erosion is occurring in Field #2705. The sediment from this erosion leads to the Oakcrest Inlet and eventually into Eagle Lake. A grassed waterway is being proposed to the landowner from the pond behind the fire station down to the end of the erosion in this field. Our staff is currently working with the landowner, Town of Dover and the Fire Chief to install a grassed waterway to resolve this erosion issue.
- Legacy sediment can be inventoried in Eagle Creek from Church Road down to Hwy 75. A cross-section inventory can determine the volume of legacy sediment in the existing drainage system. Once inventoried, determinations can be made to remove sediment that has accumulated in Eagle Creek. Based on potential cost, a plan can be put together to target the largest accumulations of sediment or prioritize removing all sediment on the entire stretch. An



inventory, sediment removal determination, construction plan, permitting, bidding and construction will need to occur to improve the overall quality of Eagle Creek.

- While legacy sediment is being inventoried, failing streambanks along the same stretch from Church Road down to Highway 75 can be inventoried and corrected utilizing grade stabilization or streambank protection installation.
- The section of Eagle Creek from Highway 75 down to the lake can be inventoried for streambank restoration sites, dead and downed tree removal, and inventory legacy sediment to determine if dredging is necessary through this stretch of Eagle Creek.
- All cropland with gully erosion potential should be inventoried and impacts discussed with the landowner/farmer to make improvements. The best management practices to reduce the erosion include grassed waterways, grassed diversions, grassed buffers, sediment control basins, wetland restorations, hay rotations, cover crops, and no till. Fields #2306, #2307, and #2705 are priority fields to inventory and determine best management practices.
- Farming can be very intensive when cropland is tilled annually causing less infiltration and more runoff. By farming using soil health principles and systems that include no-till, cover cropping and diverse rotations, more farmers are increasing their soil's organic matter and improving microbial activity. As a result, farmers are sequestering more carbon, increasing water infiltration, improving wildlife and pollinator habitat-all while harvesting better profits and often better yields.
- Cover crops may be cost-shared at \$62 to \$73 per acre rate if the farmer applies for this conservation practice through the USDA-NRCS field office in Union Grove. Please contact their office at 262-878-1243 ext 3 to speak with a technician about possible participation in the program.
- In January 2017, the Chapter NR 151 – Runoff Management revisions were finalized and adopted by the State of Wisconsin. Subchapter II includes the Agricultural Performance Standards required to be met by all Wisconsin farmers. Subchapter III details the Non-Agricultural Performance Standards related to new construction sites and areas of redevelopment. A copy of NR 151 is available in Appendix B of this plan.
- Environmental corridors within the watershed should be protected through the use of shoreland zoning. The last of these natural areas can be preserved through planned unit developments and cluster homes to protect the natural resource features on development sites. Racine County uses environmental corridors around Eagle Lake as a method to prevent clear-cutting trees in areas for home construction.
- All wetlands outside of the shoreland area should be acquired or protected through restrictive zoning, easements, or other standards.
- All lake homeowners should consider rain barrels and/or rain gardens to reduce the amount of runoff entering the lake. Studies have shown that runoff from

lawn clippings and fallen leaves have a significant amount of phosphorus. Cut lawn grasses and leaves should not be put into the lake or near storm sewers leading to the lake.

- Water quality testing is recommended at the Oakcrest Inlet, the point Eagle Creek crosses Hwy 75 and the deep hole in Eagle Lake. It is recommended that regular testing of phosphorus levels be done at these locations.
- Conservation crop rotations utilizing hay and other crops that do not necessarily demand tillage in clay soils can be used to hold the soil in place. This creates soil structure and promotes soil health while reducing runoff.

### **Secondary Recommendations**

- Although Eagle Lake is classified as a “Low Energy” Lake by the DNR, reducing lakeshore erosion is important along the shoreline. The entire lake can be inventoried and areas of erosion identified and corrected. The use of bio-engineering, riprap or a combination of these practices is needed to stabilize the immediate erosion and sedimentation around the lake. The use of bio-logs has been relatively unsuccessful due to fetch and ice movement.
- A wetland restoration east of Hwy 75, in field #2305 north of Eagle Creek will reduce the amount of sediment and nutrients entering Eagle Lake. The land currently floods out during spring and may be converted to wetlands. Soil investigations, tile locations, drainage, and lake protection value would need to be engineered to make final determinations on the scope and viability of the project.
- The section of land between Hwy 11 and field #2605. There are a few options to improve drainage or create a more effective stormwater system to reduce flooding near Hwy 11 and erosion down the slope.
- An additional 18,800 feet of gully erosion may exist within cropland boundaries or drain to existing wetlands. The erosion in these areas is a secondary priority, but can be completed to reduce sedimentation and filling of wetlands within the watershed. In the remainder of the Eagle Lake Watershed, gullies can also be corrected utilizing the same programs.
- Properly abandoning unused wells within the watershed protects groundwater resources from contamination. Wells should be identified and abandoned. Federal, State and County programs may provide cost-sharing for landowners.
- Easements or Land Acquisitions may be needed to protect environmentally sensitive areas on the Lake and around the watershed.
- The legacy sediment can be soil sampled to determine how much nutrients are in the sediment. The sampling may lead to prioritization of potential projects listed in these recommendations.

**Table 7**

**Best Management Practices Needed  
Eagle Lake Watershed, Racine County**

<u>Best Management Practice</u>	<u>Number</u>	<u>Cost</u>	<u>Total Cost</u>
High Residue Management	1500 Acres	\$18.00/Ac	\$ 27,000.00
Cover Crops (1)	1500 Acres	\$62.50/Ac	\$ 93,750.00
Crop Rotation Change	570 Acres	N/A	\$ 0.00
Contour Cropping	320 Acres	N/A	\$ 0.00
Rotational Grazing	250 Acres	\$7/Ac/Yr	\$ 1,750.00
Grassed Waterways (2)(3)	3,300 feet	\$7.00/ft	\$ 23,100.00
Grade Stabilization (2)	5 structures	\$7,000/ea	\$ 35,000.00
Critical Area Stabilization (2)	3 Acres	\$3,000/Ac	\$ 9,000.00
Vegetative Riparian Buffers (1)(3)	15 Acres	\$200.00/Ac	\$ 45,000.00
Contour Buffer Strips (1)	5 Acres	\$200.00/Ac	\$ 1,000.00
Nutrient Management Plans (1)	1500 Acres	\$28.00/Ac	\$ 42,000.00
Pest Management Plans (1)	500 Acres	\$12.00/Ac	\$ 6,000.00
Well Abandonment (1)(2)	15 wells	\$800.00/ea	\$ 12,000.00
Wetland Restoration (2)(3)	40 acres	\$4,000/acre	\$160,000.00
Lakeshore Erosion protection (2)	500 feet	\$100.00/ft	\$ 50,000.00
Streambank Stabilization/Seeding (2)	3000 feet	\$25.00/ft	\$ 75,000.00
Bio-Engineering	400 feet	\$150.00/ft	\$ 60,000.00
Legacy Sediment Removal	9,600 feet	\$10.00/ft	\$ 96,000.00
Two Stage Channel Creation	9,600 feet	\$12.00/ft	\$115,200.00
Conservation Easements	20 acres	\$5,000/Ac	\$100,000.00
Land Acquisition for Protection (4)	40 acres	\$7,000/Ac	<u>\$280,000.00</u>
<b>Total Cost of BMP's</b>			<b>\$1,230,200.00</b>

- 1 Cost Share may be available at a Flat Rate
- 2 Cost-share rates may be available (50%, 70%, 75%)
- 3 Cost is over a 15-year period (includes rental rates)
- 4 Appraisals required

\*The total includes installation, engineering, program rental rates, easements acquisitions and associated costs.

## **Information and Education Activities**

### **Goal**

The goal of planning information and education activities in the Eagle Lake Watershed is to help achieve the pollution reduction goals by using the best management practices recommended in the watershed planning project.

### **Objectives**

1. The farmers in the Watershed will reduce sediment, phosphorus and runoff from farming activities by using the best management practices.

#### Activities

- One-on-one farmer contacts by professional conservation technicians.
- Presentations to farmers at organizational meetings.
- Watershed tours
- Field days – demonstration sites/projects

2. Lakeshore residents will reduce sediment, phosphorus and other forms of pollutants from lakeshore properties.

#### Activities

- Newsletters and articles
- Lawn care workshops
- Lawn soil testing programs
- Display materials promoting lake protection
- Complying with the Town phosphorus ordinance

3. Developers, builders, and contractors will use and maintain construction erosion control methods to prevent the discharge of sediment from construction sites.

#### Activities

- Construction site erosion control workshops
- One-on-one contacts
- Display information materials in Town, County buildings
- Newspaper press releases

4. Elected officials, business owners, visitors, residents, and children will have opportunities to learn about the value of Eagle Lake. Some of the following activities are currently being utilized.

#### Activities

- Voluntary Lake Monitoring Program
- Newsletter articles
- Signs at County Parks
- School Programs
- Presentations at local civic meetings
- Display at Town, County
- Lake clean-up days
- Student contests
- Sponsor a Lake Fair

5. Residents in the Watershed have opportunities to learn about the ways to protect the Eagle Lake Watershed.

#### Activities

- Watershed tours
- Displays at the County Park, Town Hall and Local businesses
- Newsletter articles
- Press release to newspapers
- Celebrate Earth Day, Arbor Day and National Wetland Week, etc
- Watershed Clean-up day

## **Programs, Agencies and Environmental Groups to Help Protect Eagle Lake**

Protecting Eagle Lake through watershed management is dependent on cooperative and coordinating actions by Racine County, the Town of Dover and some federal and State units of government. Implementation of the Best Management Practices and the information and educational activities recommended in this plan require qualified technical staff support. Table 8 lists the types of activities and cost of the required technical assistance needed in the Eagle Lake Watershed.

The following agencies direct programs and policies targeted at watershed protection and resource management and may provide some level of support to the recommendations of this plan.

### **Land Use and Development**

Protecting the Eagle Lake Watershed can only come with the proper development and management of land. The type and location of land uses in the watershed determines the type and amount of distribution of non-point sources of pollution. The Regional Land Use Plan for Southeastern Wisconsin: 2035, prepared and adopted by the SEWRPC, should serve as a blue print to guide development in the Eagle Lake Watershed. This plan defines some key standards which should be used to protect the water quality of Eagle Lake. They include:

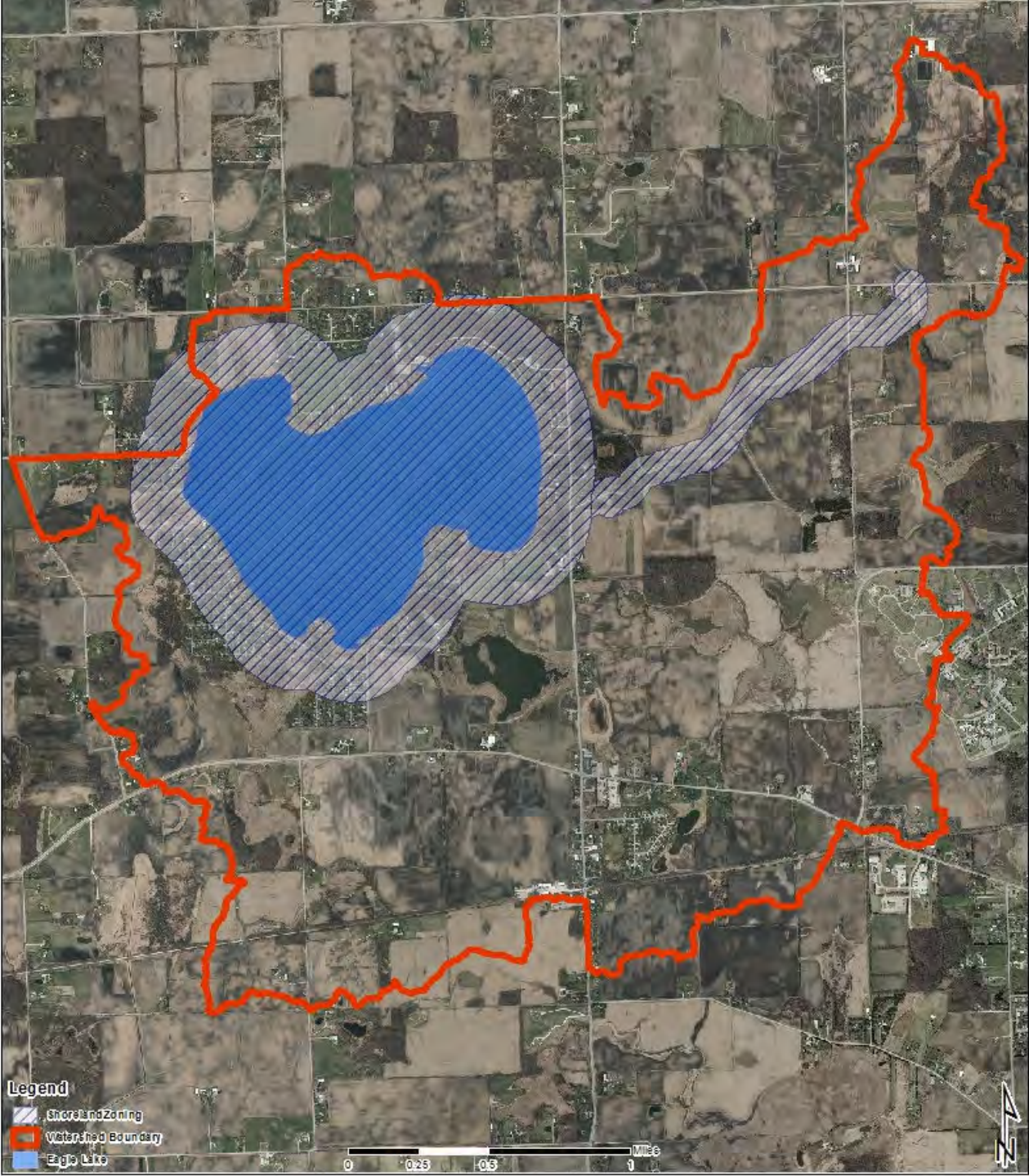
1. Urban land uses should only be permitted in areas served by a centralized sanitary sewage facility.
2. No development should occur within the environmental corridors or on lands that are environmentally sensitive.
3. Agricultural lands should be preserved with the appropriate agricultural zoning designation.

*A Land Use Plan for the Town of Dover 2020* was adopted in 1999. This plan is incorporated into the land management recommendations of this plan.

### **Shoreland Protection**

Racine County is required by Wisconsin State Statutes to regulate shoreland zoning. The shoreland includes those areas within 1,000 feet of any lake or 300 feet of any navigable waterway or the landward side of the floodplain (see Map 12, page 62).

Map 12  
**Eagle Lake Watershed**  
Shoreland Zoning



## **Erosion Control Ordinance**

The Town of Dover enacted an erosion control ordinance under the authority granted by Wisconsin Statutes Sections 60.10(209c), 60.22(3), 61.334 (1), 92.07, 101.65 and 236. (Ord. 97-35 & 9.05(A)). It is the purpose of the ordinance codified in this chapter to preserve the natural resources; to protect the quality of the waters of the state and to protect and promote the health, safety and welfare of the people, to the extent practicable by minimizing the amount of sediment and other pollutants carried by runoff or discharged from construction sites to lakes, streams and wetlands. This chapter applies to land disturbing and land development activities on lands within the boundaries and jurisdiction of the municipality except for one- and two-family dwellings as indicated in the Uniform Dwelling Code. (Ord. 97-35 & 9.05(C)). (Appendix B).

## **Racine County Agencies**

Racine County Development Services Department provides assistance in the protection of Eagle Lake and the surrounding watershed by enacting and enforcing the current County ordinances. Activities under the shoreland zoning ordinance are regulated by Racine County. (See Map 12)

Racine County Land Conservation Division (LCD) provides assistance in the protection of the soil and water resources in Racine County. The Land Conservation staff provides technical, financial and educational assistance to landowners under a variety of locally administered State and Federal funded programs. Racine County Land Conservation Committee (LCC) has adopted over the years the Agricultural Soil Erosion Control Plan in the 1980's, the Racine County Land and Water Resource Management Plan in 2000, updated in 2007 and 2013.

## **Wisconsin Agencies**

The WDATCP provides cost share assistance to the local Land Conservation Departments for implementing several programs. This includes the cost share dollars to implement conservation practices through the Land & Water Resource Management Program and the Conservation Reserve Enhancement Program (CREP).

WDNR has the authority to protect and manage the surface waters of the State, including wetlands. The many state laws, rules, and programs provide the means to protecting the water quality of the surface waters, wetlands and other sensitive lands including the Lakes Planning and Protection Grant Programs.

## **Federal Agencies**

The United States Congress provides protection of certain wetlands around the nation. The two regulatory programs are found in Section 404 of the Federal Pollution Control Act of 1972, as revised by the Clean Water Act. The Army Corps of Engineers (USCOE) and the EPA regulate the placement of dredged and fill material into the waters of the United States which includes the wetlands.



The USDA administers several federal programs aimed at protecting the wetlands, water quality and soil resources. These programs are revised every 5 years under the Federal Farm Bill. Several federal programs administered by the FSA and the NRCS, could assist in the advancement of watershed protection for Eagle Lake. These are the Conservation Reserve Program (CRP), Wetland Reserve Program (WRP), Environmental Quality Incentive Program (EQIP) and the Wildlife Habitat Incentives Program (WHIP). The US Fish & Wildlife Agency (USF&W) can also assist in wetland development.

### **Environmental Groups**

Eagle Lake Management District, Eagle Lake Improvement Association and the Wisconsin Lakes organization provide lake protection and management. The groups can raise funds and apply for grants to implement this plan. Lake protection grants can assist in advancing the overall goals of land management as recommended in this plan.

# ACRONYMS AND GLOSSARY

## ACRONYMS

AU	Animal Units
BMP	Best Management Practice
BARNY	Barnyard Modeling Program
CREP	Conservation Reserve Enhancement Program
DATCP	Department of Agriculture, Trade and Consumer Protection
EDLUPC	Economic Development & Land Use Planning Committee
ELSUD	Eagle Lake Sewer Utility District
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
FSA	USDA-Farm Service Agency
GIS	Geographical Information System
I&E	Information and Education
LCC	Land Conservation Committee
LCD	Land Conservation Division
LWRMP	Land & Water Resource Management Plan
NPS	Nonpoint Source Pollution
NRCS	USDA -Natural Resources Conservation Service
PWDS	Public Works and Development Services
SEWRPC	Southeastern Wisconsin Regional Planning Commission
STEPL	Spreadsheet Tool for Estimating Pollutant Load
“T”	Tolerable Soil Loss Rate
USACOE	United States Army Corp of Engineers
USDA	United States Department of Agriculture
USF&W	United States Fish and Wildlife Service
USGS	United States Geological Survey
WAL	Wisconsin Association of Lakes
WDNR	Wisconsin Department of Natural Resources

## GLOSSARY

**ATCP 50** – The chapter of *Wisconsin's Administrative Code* that implements the Land and Water Resource Management Program as described in Chapter 92 of the *Wisconsin Statutes*.

**Animal Units (AU)** – A unit of measure to determine the total number of single animal types or combination of animal types at an animal feeding operation based on DNR-NR243.

**BARNY** - NRCS “Evaluation System to Rate Feedlot Pollution Potential”. A computer model that predicts nutrient runoff from animal lots.

**Best Management Practices (BMPs)** – The most effective practice or combination of practices for reducing nonpoint source pollution to acceptable levels.

**Chapter 92** – Portion of the *Wisconsin Statutes* outlining the soil and water conservation, agricultural shoreland management, and animal waste management laws and policies of the State.

**Conservation Plan** – A record of decisions and intentions made by land users regarding the conservation of the soil, water and related natural resources of a particular unit of land.

**Conservation Reserve Program (CRP)** – A provision of the Federal Farm Bill that takes eligible cropland out of production and puts that land into grass or tree cover for 10 to 15 years.

**Conservation Reserve Enhancement Program (CREP)** – An add-on to the CRP program which expands offers extra incentives and bonuses in 15 year or perpetual contracts.

**Department of Agriculture, Trade and Consumer Protection (DATCP)** – The State agency responsible for establishing statewide soil and water conservation policies and administering the State's soil and water conservation programs. The DATCP administers State cost-share funding for a variety of LWCC operations, including support for staff, materials and conservation practices.

**Development Services**– The Racine County office responsible for zoning administration, land conservation, land use planning, land information and GIS.

**Environmental Protection Agency (EPA)** – The agency of the Federal government responsible for carrying out the nation's pollution control laws. It provides technical and financial assistance to reduce and control air, water, and land pollution, and is responsible for administering the Clean Water Act.

**Environmental Quality Incentives Program (EQIP)** – Federal program to provide technical and cost-sharing assistance to landowners for water quality protection. The program focuses on whole farm planning to reduce nonpoint source pollution.

**Eutrophication** – The process by which a body of water becomes enriched in dissolved nutrients (such as phosphorus) that stimulate the growth of aquatic plant life usually resulting in the depletion of dissolved oxygen.

**Geographic Information Systems (GIS)** – A computerized system of maps and layers of data about land including soils, land cover, topography, field boundaries, roads and streams, zoning and land use, etc.

**Land Conservation Committee (LCC)** – The portion of the County government that is empowered by Chapter 92 of the *Wisconsin Statutes* to conserve and protect the County's soil, water and related natural resources.

**Natural Resources Conservation Service (NRCS)** – The NRCS is under the direction of the United States Department of Agriculture (USDA) and is responsible for soil survey inventory and information, farm conservation planning, and providing technical assistance to landowners regarding best management practices.

**Nonpoint Source Pollution (NPS)** – Pollution resulting from many small and diffuse sources, unlike point source pollution, which results from one identifiable source. Soil erosion, livestock waste, stormwater runoff, nutrients such as nitrogen and phosphorus, and other pollutants are all examples of nonpoint source pollution.

**Southeastern Wisconsin Regional Planning Commission (SEWRPC)** – Governmental organization providing regional scale planning services to the seven-county Southeastern Wisconsin Region. These services include land use planning, transportation, environmental (wetlands, engineering, soils, and lake management), economic development, and GIS.

**Tolerable Soil Loss (T)** – Tolerable soil loss refers to the maximum allowable soil loss rate (tons/acre/year) for individual soil types. This rate refers to the amount of soil loss that can occur annually while the soil still remains agriculturally productive. It does not refer to the time it takes to naturally regenerate the soil.

**United States Department of Agriculture (USDA)** – Branch of Federal government with responsibilities in the areas of food production, forestry, and wildlife and fisheries.

**Watershed** – The geographic area which drains to a particular river, stream, or waterbody.

**Wisconsin Department of Natural Resources (WDNR)** – The State agency responsible for managing State owned lands and protecting public waters of the State. The WDNR also administers programs to regulate, guide and assist land conservation programs within individual counties, as well as landowners in managing land, water, fish, and wildlife.

# Appendix A





## Eagle Lake Management District

PO Box 221 ~ Kansasville ~ WI 53139

October 26, 2016

Julie Anderson, Director  
Racine County Public Works and Development Services  
14200 Washington Avenue  
Sturtevant, WI 53177

Dear Ms. Anderson:

The Eagle Lake Management District and the Eagle Lake community have gotten significant value from the "Eagle Lake Watershed Planning Project 2008 – 2017" study and related report that Chad Sampson of your team prepared for us in 2007. Based on the high quality of the report's contents, we have worked with various landowners in the Eagle Lake watershed to implement recommendations and reduce phosphorus and sediment running off into the Lake.

However, there is more work to be done. Phosphorus levels continue to be high in Eagle Lake. Therefore, the Eagle Lake Management District, in concert with the Eagle Lake Property Owners Improvement Association and the Town of Dover, has re-instituted the Eagle Lake Watershed Task Force to examine ways to further reduce phosphorus entering Eagle Lake from the Watershed.

The purpose of this letter is to request an update to the previous Watershed study and to ask that Chad Sampson be allowed to work on this task force, as he did on the original task force. Ten years have passed, certain changes have occurred in the watershed, there is a broader awareness – here and nationally – about the growing challenge of phosphorus in our lakes and rivers, and there may be new ideas and approaches to the phosphorus problem.

Specifically, we are seeking to:

1. Verify the boundaries of the watershed
2. Update the land usage patterns in the watershed, including gulley erosion and other known problems
3. Assess the impact of the new ownership and operation of the major dairy farm in the northeast corner of the watershed.
4. Identify any new issues in the watershed affecting Eagle Lake
5. Identify new technologies and approaches to use in the phosphorus reduction effort
6. Re-run the phosphorus and sediment "loading" models using the latest available modeling tools
7. Articulate another set of "priorities for action" based on the new information available.

2016/2017 Commissioners:

Ed Furey, Chairman  
Don Hermes  
Jay Golla  
Mario Denoto  
Doug McLemore  
Tom Roanhouse  
Tom Lembcke

RECEIVED

OCT 31 2016

RACINE COUNTY

Page 2

Brian Younger, President of ELPOIA, will be chairman of the task force. Please direct any questions you might have to his attention with a copy to myself. Any out of pocket expenses will be shared equally by ELMD and ELPOIA. Thank you for your consideration of this request

Sincerely,



Ed Furey, Chairman  
Eagle Lake Management District



**Exhibit "A"**

**PROFESSIONAL SERVICES AGREEMENT**

This agreement made this 20th day of December, 2016, by and between Eagle Lake Management District (hereinafter referred to as "DISTRICT") and Racine County, Wisconsin on behalf of the Racine County Public Works and Development Services- Land Conservation Division located at 14200 Washington Avenue, Sturtevant, Wisconsin 53177, (hereinafter referred to as "COUNTY"). This agreement is to be effective for the period of the project described below, but no later than July 31, 2017.

**WITNESSETH:**

**FOR GOOD AND VALUABLE CONSIDERATION**, the parties agree that this contract shall cover the authorization and payment for services provided by the Land Conservation Division of Public Works and Development Services to the DISTRICT as follows:

1. That COUNTY warrants that it has, through the Land Conservation Division of the Public Works and Development Services Department, the experience and ability to perform the services, as contemplated by this agreement, and that it will perform the services in a professional and competent manner, and makes no other representations and warranties, whether expressed or implied.
2. That DISTRICT desires the COUNTY to:
  - a. Verify the boundaries of the watershed.
  - b. Update the land usage patterns in the watershed, including gully erosion and other known problems.
  - c. Assess the impact of the new ownership and operation of the major dairy farm in the northeast corner of the watershed.

- d. Identify any new issues in the watershed affecting Eagle Lake.
  - e. Identify new technologies and approaches to use in the phosphorus reduction effort
  - f. Re-run the phosphorus and sediment "loading" models using the latest available modeling tools.
  - g. Articulate another set of "priorities for action" based on the new information available.
3. DISTRICT agrees to pay COUNTY \$5,000.00 within thirty (30) days after their submission to DISTRICT of the updated watershed study.
  4. COUNTY may terminate this agreement by giving written notice of intent to terminate at least thirty (30) days prior to the date of termination. DISTRICT may terminate this agreement only for material breach by the COUNTY of any of the terms contained herein and by giving written notice of intent to terminate at least sixty (60) days prior to the date of termination

**RACINE COUNTY**

BY: *Johanna Anderson* DATE: 01/03/2017

BY: *Wendy M. Christensen* DATE: 12/29/16  
 Wendy M. Christensen  
 Racine County Clerk

**EAGLE LAKE MANAGEMENT DISTRICT**

**Russell A. Clark**  
 Racine County Board Chairman

BY: *Edward C. Furey* DATE: 1/3/2017  
~~Wendy M. Christensen~~ *RAC* 12-29-16  
 Racine County Clerk

REVIEWED BY FINANCE DIRECTOR

*Alexandra Tillman* 12/27/16  
 Sign Date

Date 12/28/16  
 Certified to be correct as to form

By *[Signature]*  
 Racine County Corporation Counsel

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ECON. DEV.

November 29, 2016

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**RESOLUTION NO. 2016-112**

**RESOLUTION BY THE ECONOMIC DEVELOPMENT AND LAND USE PLANNING COMMITTEE AUTHORIZING RACINE COUNTY (LAND CONSERVATION DIVISION) TO ENTER INTO A PROFESSIONAL SERVICES AGREEMENT WITH EAGLE LAKE MANAGEMENT DISTRICT**

To the Honorable Members of the Racine County Board of Supervisors:

**BE IT RESOLVED** by the Racine County Board of Supervisors that the Public Works and Development Services Department is authorized to enter into a professional services agreement with Eagle Lake Management District for services that are enumerated in "Exhibit A," that is attached hereto.

**BE IT FURTHER RESOLVED** by the Racine County Board of Supervisors that Corporation Counsel is authorized to prepare contracts with all necessary and appropriate terms and conditions.

**BE IT FURTHER RESOLVED** by the Racine County Board of Supervisors that any two of the County Executive, the County Clerk and/or County Board Chairman are authorized to execute any contracts, agreements or other documents necessary to carry out the intent of this resolution.

Respectfully submitted,

1st Reading 11-29-16

2nd Reading 12-20-16

**BOARD ACTION**

Adopted yes

For \_\_\_\_\_

Against \_\_\_\_\_

Absent \_\_\_\_\_

**VOTE REQUIRED:** Majority

Prepared by:  
Public Works  
& Development Services Dept.

**ECONOMIC DEVELOPMENT AND LAND USE  
PLANNING COMMITTEE**

David J. Cooke  
David J. Cooke, Chairman

Robert D. Grove  
Robert D. Grove, Vice-Chairman

\_\_\_\_\_  
Thomas E. Roanhouse, Secretary

\_\_\_\_\_  
Mark M. Gleason

Thomas Pringle  
Thomas Pringle

\_\_\_\_\_  
Monte G. Osterman

\_\_\_\_\_  
Tom Hincz

# Appendix B

**Town of Dover**

**Chapter 16.44**

**Erosion Control Ordinance**

Sections:

- 16.44.010 Authority.
- 16.44.020 Findings and purpose.
- 16.44.030 Applicability.
- 16.44.040 Definitions.
- 16.44.050 Design criteria, standards and specifications for best management practices.
- 16.44.060 Maintenance of best management practices.
- 16.44.070 Erosion control plan content and permit application submittal and approval.
- 16.44.080 Control of erosion and pollutants during land disturbance and development activities.
- 16.44.090 Fee schedule.
- 16.44.100 Inspection.
- 16.44.110 Enforcement.
- 16.44.120 Appeals.
- 16.44.010 Authority.

This chapter is adopted under the authority granted by Wisconsin Statutes Sections 60.10(2)(c), 60.22(3), 61.34(1), 92.07, 101.65 and 236. (Ord. dated 12/13/06 (part))

16.44.020 Findings and purpose.

It is the purpose of the ordinance codified in this chapter to preserve the natural resources; to protect the quality of the waters of the state and to protect and promote the health, safety and welfare of the people, to the extent practicable by minimizing the amount of sediment and other pollutants carried by runoff or discharged from construction sites to lakes, streams and wetlands. (Ord. dated 12/13/06 (part))



16.44.030 Applicability.

This chapter applies to land disturbing and land development activities on lands within the boundaries and jurisdiction of the municipality except for one- and two-family dwellings as indicated in the Uniform Dwelling Code. (Ord. dated 12/13/06 (part))

16.44.040 Definitions.

As used in this chapter, the following terms are defined:

“Agent” means authorized agent(s) as designated by elected official of the town to administer this chapter.

“Agricultural land use” means use of land for planting, growing, cultivating and harvesting of crops for human or livestock consumption and pasturing or yarding of livestock, including sod farms and tree nurseries.

“Applicant” means the landowner or one of the landowners and/or land user(s), their agent, or contractor responsible for submitting and carrying out the requirements of this chapter.

“Best management practice” means a practice or combination of practices to control erosion and attendant pollution.

“Commercial land use” means use of land for the retail or wholesale sale and manufacturing of goods or services.

“County shoreland and floodland jurisdiction protection ordinance” means the adopted ordinance by Racine County.

“Erosion” means the detachment and movement of soil, sediment or rock fragments by water, wind, ice or gravity.

“Erosion control plan” means a written description and detailed site plan of best management practices designed to meet the requirements of this chapter submitted by the applicant for review and approval.

“Land development activity” means the construction of buildings, roads, parking lots, paved and unpaved storage areas, patios, seawalls and similar facilities, but not including general maintenance of parking lots and drives.

“Land disturbing activity” means any manmade change of the land surface including removing vegetative cover, demolition, excavating, filling and grading but not including agricultural land uses such as planting, growing, cultivating and harvesting of crops; growing and tending of gardens; and harvesting of trees and tree nurseries.

“Landowner” means any person holding title to or having an interest in land.

“Land user” means any person operating, leasing, renting or having made other arrangements with the landowner by which the landowner authorizes use of his or her land.

“Municipality” means the city, village, town or county which has adopted the ordinance and has jurisdiction over the activity of lands within the boundaries.

“Runoff” means the rainfall, snowmelt, dewatering or irrigation water flowing over the ground surface.

“Site” means the entire area of land disturbing or land development activity included in but not limited to the legal description of the subject land.

“Stabilize” means to make the site steadfast or firm, minimizing soil movement by mulching and seeding, sodding, landscaping, concrete, gravel or other measure.



“Surface waters” means all lakes, bays, rivers, streams, springs, ponds, wells, impounding reservoirs, wetlands, marshes, watercourses, drainage systems and other surface water or groundwater, natural or artificial, public or private.

“Working day” means a calendar day, except Saturdays, Sundays and state recognized legal holidays. (Ord. dated 12/13/06 (part))

16.44.050 Design criteria, standards and specifications for best management practices.

All best management practices required to comply with this chapter shall meet the design criteria, standards and specifications in the latest edition of the “Wisconsin Construction Site Best Management Practice Handbook” as published by the State of Wisconsin Department of Natural Resources. Design criteria, standards and specifications for best management practices not contained in the “Wisconsin Construction Site Best Management Practice Handbook” shall not be permitted unless approved by the agent. Deviations from standards noted above can be approved by the agent. (Ord. dated 12/13/06 (part))

16.44.060 Maintenance of best management practices.

All best management practices necessary to meet the requirements of this chapter shall be maintained consistent with the maintenance standards contained in the “Wisconsin Construction Site Best Management Practice Handbook.” The applicant and subsequent landowner shall be responsible for maintaining the best management practices during the period of land disturbing activity and land development activity of the site in a satisfactory manner to ensure adequate performance and to prevent off-site damage, maintenance standards for best management practices not contained in the “Wisconsin Construction Site Best Management Practice Handbook” shall not be permitted unless approved by the agent. (Ord. dated 12/13/06 (part))

16.44.070 Erosion control plan content and permit application submittal and approval.

No person may commence a land disturbing or land development activity subject to this chapter without receiving prior approval of an erosion control plan for the site and a permit from the agent. At least one landowner or land user controlling or using the site and desiring to undertake a land disturbing or land development activity subject to this chapter shall submit an application for a permit, erosion control plan and pay a fee. By submitting an application, the applicant is authorizing the agent to enter the site to obtain information required for the review of the erosion control plan.

A. Content of Erosion Control Plan For Sites of Land Disturbance or Land Development of One Acre or Less. The erosion control plan for sites of land disturbing activity or land development activity of one acre or less shall contain the following information:

1. The location of existing and proposed buildings and improvements with respect to the property lines;





2. The direction of slopes before and after land disturbance or land development on the site and the size of the upslope drainage areas prior to and after construction. The proposed surface water runoff shall not be diverted so as to concentrate flow directly onto adjacent property or adversely affect adjoining property;

3. All temporary best management practices required by Section 16.44.080(B). Other best management practices shall be implemented during construction as deemed necessary by the agent;

4. The name, address and daytime telephone number of the applicant, contractor and landowner;

5. Any addition all information requested by the agent.

B. Content of the Erosion Control Plan For Sites Where Land Disturbing Activity or Land Development Activity is Occurring on More Than One Acre.

1. Existing Site Map. A map on a scale of at least one inch equals one hundred (100) feet showing the following existing conditions and immediate adjacent areas:

a. Site boundaries and adjacent lands which accurately identify site location;

b. Lakes, ponds, streams, wetlands, channels, ditches and other water courses on and immediately adjacent to the site;

c. One hundred-year floodplains, and floodways;

d. Vegetative cover, types and location;

e. Location of natural drainage patterns on the site and immediately adjacent to the site and the size, slope and land cover of the upslope and downslope drainage areas, including peak, discharge, velocities, direction and destination of flows;

f. Locations and dimensions of utilities, structures, roads, highways and paving;

g. Site topography at a minimum contour interval of two feet;

h. Name, address and daytime telephone number of applicant;

i. Any additional information requested by the agent;

j. Soil types.

2. Site Development Plan. A site development plan including:

a. Locations and dimensions of all proposed land disturbing and land development activities;

b. Locations and dimensions of all temporary soil or dirt stockpiles;

c. Locations and dimensions of all best management practices necessary to meet the requirements of this chapter;



d. Schedule of anticipated starting and completion date of each land disturbing or land development activity including the installation of site best management practices needed to meet the requirements of this chapter;

e. Provisions for maintenance of the best management practices during construction;

f. Description of vegetation and other materials to be used to stabilize the site including a schedule for installation and maintenance;

g. Location and dimensions of storm water management measures including but not limited to past development peak flows, drainage system dimensions and computations. Provide all computations, designs and final construction by a registered professional engineer.

C. Erosion Control Plan Review and Permitting Process.

1. Within thirty (30) days of receipt of the application for a permit and erosion control plan, and fee for sites of more than one acre of land disturbance or land development or within ten days of receipt of the application and erosion control plan and fee for sites of one acre or less of land disturbance or land development, the agent shall review the application and erosion control plan to determine if the requirements of this chapter are met. The agent may request comments from other departments or agencies. If the requirements of this chapter are met, the agent shall approve the plan, and issue a permit to the applicant. If the requirements of the chapter are not met, the agent may inform the applicant in writing of what additional information is needed to meet the requirements of the chapter.

2. Duration. Permits and erosion control plan approvals shall be valid for a period of one hundred eighty (180) days or the length of the building permit or other construction authorizations, whichever is longer from the date of issuance. The agent may extend the period one or more times for a total of twelve (12) months. The agent may require additional best management practices as a condition of the extension if they are necessary to meet the requirements of this chapter.

3. Financial Guarantee. As a condition of approval, the agent may require the applicant to submit a letter of credit, bond or cashier's check in the amount not less than the cost of constructing and installing the erosion and sediment control practices.

4. Erosion Control Plan Conditions. All permits and approved erosion control plans shall require the applicant to:

a. Notify the agent within one working day of commencing any land disturbing or land development activity;

b. Notify the agent of completion of any control measures within one working day after their installation;

c. Notify the agent within one working day after completion of backfilled/rough grading;

d. Notify the agent within two working days when site is stabilized;



- e. Obtain permission in writing from the agent prior to modifying the erosion control plan;
- f. Install all best management practices as identified in the approved erosion control plan;
- g. Maintain all road drainage systems and tracking provisions, storm water drainage systems, control measures and other facilities identified in the erosion control plan;
- h. Repair any siltation or erosion damage to adjoining surfaces and drainageways resulting from land development or disturbing activities;
- i. Inspect the best management practices after each rain of one-half inches or more and at least once each week and make needed repairs;
- j. Allow the agent to enter the site for the purpose of inspecting compliance with the erosion control plan or for performing any work necessary to bring the site into compliance with the erosion control plan;
- k. Keep a copy of the erosion control plan on site;
- l. Notify agent when all necessary corrections have been completed regarding any notice of noncompliance issuance;
- m. File a notice of intent with DNR when necessary and copy to the town engineer. (Ord. dated 12/13/06 (part))

16.44.080 Control of erosion and pollutants during land disturbance and development activities.

A. Applicability. This section applies to any of the following sites of land development or land disturbing activities; any activity that falls within these perimeters will require an erosion control permit before activity commences:

- 1. Sites requiring a road and/or drainage system to be constructed in conjunction with a land division;
- 2. Sites involving grading, removal of protective ground cover or vegetation, demolition, excavation, land filling or other land disturbing activity affecting a surface area of four thousand (4,000) square feet or more or on one hundred (100) cubic yards or more;
- 3. Those sites involving street, highway, road or bridge construction, except state funded or conducted construction activities meeting requirements contained in the Department of Transportation, Department of Natural Resources Cooperative Agreement Memorandum of Understanding on Erosion Control;
- 4. Those sites involving the laying, repairing, replacing or enlarging of an underground water, sanitary or storm sewer for a distance of three hundred (300) feet or more.

B. Erosion and Other Pollutant Control Requirements. The following requirements shall be met on all sites described in subsection A of this section:



1. Site Stabilization. The disturbed area shall be stabilized by seeding, sodding or other permanent means.

2. Tracking Prevention and Cleanup. Each site shall have gravelled roads, access drives and parking areas of sufficient width and length to prevent sediment from being tracked on to public or private roadways. Sediment reaching a public or private road shall be removed by street cleaning before the end of each work day. Flushing may not be used unless the sediment will be controlled by a filter fabric barrier, sediment trap, sediment basin or equivalent best management practices. Prior approval of the agent in writing.

3. Drain Inlet Protection. Downslope storm drain inlets shall be protected.

4. Site Dewatering. Water pumped from the site shall be treated by an appropriately sized filter fabric barrier, sediment trap, sediment basin or equivalent best management practices. Water may not be discharged in a manner that causes erosion or damage of the site, adjacent properties or receiving channels.

5. Sediment Cleanup. All off-site sediment deposits shall be cleaned up by the end of the next work day unless environmental damage will occur, in which case cleanup shall occur at the direction of the agent. All other off-site sediment deposits occurring as a result of construction activities shall be cleaned up at the end of the work day.

6. Waste and Material Management and Disposal. All waste and unused building materials shall be properly managed and disposed of to prevent pollutants and debris from being carried by runoff off the site.

7. Soil or Dirt Storage Piles. Soil or dirt storage piles shall be located at least twenty-five (25) feet from any downslope road, lake, stream, wetland, ditch, channel or other watercourse and protected in accordance with Section 16.44.080(B). Piles located in the street or within twenty-five (25) feet of any downslope road, lake, stream, wetland, ditch, channel, floodplain or other watercourse shall require the use of additional best management practices. (Ord. dated 12/13/06 (part))

16.44.090 Fee schedule.

The fees referred to in other sections of this chapter shall be established by the municipality and may from time to time be modified by administrative function. The purpose of these fees is to offset the costs of administering the provisions of this chapter. (Ord. dated 12/13/06 (part))



16.44.100 Inspection.

At any reasonable time and purpose, the agent is authorized to enter upon any land and make inspections to determine conformance with the terms of this chapter and any permits or plan approvals pursuant to the provisions of Wisconsin Statutes Sections 101.65 and 236. (Ord. dated 12/13/06 (part))

16.44.110 Enforcement.

A. The agent may post a stop-work order if:

1. Any land disturbing or land development activity regulated under this chapter is occurring without a permit and an approved erosion control plan;

2. The approved control plan is not being implemented in a good faith manner;  
or

3. The conditions of the permit and approved erosion control plan are not being complied with.

B. If the applicant does not cease the activity or comply with the control plan or permit conditions within ten days, the agent may revoke the permit.

C. If the landowner or land user where no permit has been issued does not cease the activity within ten days, the agent may request the municipal attorney to obtain a cease and desist order.

D. After posting a stop-work order, the agent may issue a notice of intent to the applicant or landowner or land user of its intent to perform work necessary to comply with this chapter. If conditions are likely to result in sediment from the site damaging adjacent properties or reaching surface waters, the agent may enter the land and take emergency actions necessary to prevent sediment or other pollutants from damaging adjacent properties or reaching surface waters, public rights-of-way and storm sewers. The costs incurred by the agent plus interest and legal costs shall be billed to the owner of title of the property. In the event an owner of title of the property fails to pay the amount due, the clerk in conjunction with the treasurer shall enter the amount due on the tax rolls and collect as a special charge against the property pursuant to Wisconsin Statutes Section 66.60(16).

E. Any individual who violates this chapter, the conditions of the permit, or permits erosion, sediment deposits, tracking or deposition of soil on adjacent land, public rights-of-way or surface waters shall be deemed to be in violation of this chapter and subject to the penalties provided in this section.

1. See general penalty clause in Section 1.08.010. (Ord. dated 12/13/06 (part))

16.44.120 Appeals.

A. Town Board. The town board shall be responsible for the following:

1. Shall hear and decide appeals where it is alleged that there is error in any order, decision or determination made by the agent in administering this chapter.



2. Upon appeal, may authorize variances from the provisions of this chapter which are not contrary to the public interest and where owing to special conditions a literal enforcement of the provisions of the chapter will result in unnecessary hardship.

3. Shall use the rules, procedures, duties and powers authorized by statute in hearing and deciding appeals and authorizing variances.

B. Who May Appeal. Any applicant, permittee, landowner, or land user may appeal any order, decision or determination made by the agent in administering this chapter. (Ord. dated 12/13/06 (part))



**Racine County**

**Sec. 20-1167**

**Procedures for  
Livestock Siting Facilities**

## Sec. 20-1167. - Procedures for siting livestock facilities.

- (a) These procedures apply to livestock facilities that require a conditional use permit under this chapter which are all new or expanded livestock facilities that will have five hundred (500) or more animal units.
- (b) *Permits for existing livestock facilities.*
  - (1) A permit is required for the expansion of a pre-existing or previously approved livestock facility if the number of animal units kept at the expanded livestock facility will exceed all of the following:
    - a. The applicable size threshold for a conditional use permit established in the zoning district where the facility is located.
    - b. The maximum number previously approved or, if no maximum number was previously approved, a number that is twenty (20) percent higher than the number kept on May 1 2006, or on the effective date of the permit requirement, whichever date is later.
  - (2) A permit is not required for livestock facility that existed before May 1, 2006, or before the effective date of the permit requirement in this division, except as provided in subsection (1).
  - (3) A permit is not required for livestock facility that was previously issued a conditional use permit or other local approval, except as provided in subsection (1). A prior approval for the construction of a livestock facility implies approval for the maximum number of animal units that the approved livestock facility was reasonably designed to house, except as otherwise clearly provided in the approval. Prior approval of a single livestock structure, such as a waste storage structure, does not constitute prior approval of an entire livestock facility.
- (c) *Application procedures.* In addition to the standard conditional use application requirements of [section 20-1161](#), a livestock operator must complete the application and worksheets prescribed by § ATCP 51, including any authorized local modifications. The application requirements specified in § ATCP 51, Wis. Adm. Code, are incorporated by reference, without reproducing them in full. The application form and worksheets establish compliance with the standards in ATCP 51 and this division.

The operator must file four (4) duplicate copies of the § ATCP 51 application form, including worksheets, maps and documents (other than engineering design specifications) included in the application.
- (d) *Application fee.* In addition to the standard conditional use filing fee, a non-refundable § ATCP 51 application fee as established by board of supervisors resolution shall accompany an application.
- (e) *Application review procedure.*
  - (1) Within forty-five (45) days after the planning and development department receives an application, it shall notify the applicant whether the application is complete. If the application is not complete, the notice shall describe the additional information needed. Within fourteen (14) days after the applicant provides all of the required information, the department shall notify the applicant that the application is complete. This notice does not constitute an approval of the proposed livestock facility.
  - (2)



Within fourteen (14) days after the department notifies an applicant that the application is complete, the department shall notify adjacent landowners of the application. The department shall use the approved notice form in § ATCP 51, and mail a written notice to each adjacent landowner.

- (3) The economic development and land use planning committee shall grant or deny an application within ninety (90) days after the notice of a complete application is provided as required by subsection (2) above. The economic development and land use planning committee may extend this time limit for good cause, including any of the following:
  - a. The committee needs additional information to act on the application.
  - b. The applicant materially modifies the application or agrees to an extension. The committee shall give written notice of any extension. The notice shall specify the reason for the extension, and the extended deadline date by which the committee will act on the application.
- (f) *Public hearing.* The economic development and land use planning committee will schedule a public hearing on the application within ninety (90) days after issuing notice of a complete application.
- (g) *Standards.* The standards for issuing a permit are as follows:
  - (1) The state livestock facility siting standards adopted under § ATCP 51, Wis. Adm. Code. These standards are incorporated by reference, without reproducing them in full.
  - (2) Setbacks authorized by this chapter.
- (h) *Criteria for issuance of a permit.*
  - (1) A permit shall be issued if the application for the proposed livestock facility contains sufficient credible information to show, in the absence of clear and convincing information to the contrary, that the proposed livestock facility meets the standards specified in the ordinance. Note: If the application and worksheets prescribed by ATCP 51 are properly completed, there is a rebuttable presumption that the applicant has met the application requirements.
  - (2) A permit may be denied if any of the following apply:
    - a. The application, on its face, fails to meet the standard for approval.
    - b. The political subdivision finds, based on other clear and convincing information in the record, that the proposed livestock facility does not comply with applicable standards in this division.
    - c. Other grounds authorized by W.S.A., § 93.90, that warrant disapproving the proposed livestock facility.
  - (3) No conditions may be imposed on the permit other than the standards provided in this chapter.
- (i) *Record of decision.*
  - (1) The economic development and land use planning committee shall issue its decision in writing. Its decision shall be based on written findings of fact supported by evidence in the record.
  - (2) In the event that a permit is approved, the applicant shall receive a duplicate copy of the approved application, marked "approved." The duplicate copy must include worksheets, maps and other documents (other than engineering specifications) included in the application.

- (j) *Notice to the department of agriculture, trade and consumer protection.* Racine County, as required by § ATCP 51.34(5), within thirty (30) days of the county decision on the application shall do all of the following:
- (1) Give the department of agriculture, trade, and consumer protection written notice of the county decision.
  - (2) File with the ATCP a copy of the final application granted or denied, if the county has granted or denied an application under this ordinance. (The copy shall include all of the worksheets, maps and other attachments included in the application, except that it is not required to include the engineering design specifications).
  - (3) If the county has withdrawn a local approval under this division, file with the department a copy of the county final notice or order withdrawing the local approval.
- (k) *Expiration of permit.* A permit remains in effect regardless of the amount of time that elapses before the livestock operator exercises the authority granted under the permit, and regardless of whether the livestock operator exercises the full authority granted by the approval. However, the political subdivision may treat a permit as lapsed and withdraw the permit if the permit holder fails to do all of the following within two (2) years after the issuance of the permit:
- (1) Begin populating the new or expanded livestock facility.
  - (2) Begin constructing all of the new or expanded livestock housing or waste storage structures proposed in the permit application.
- (l) *Permit modifications.* The operator may make reasonable changes that maintain compliance with the standards in this division, and the county shall not withhold authorization for those changes. It is Racine County's responsibility to determine what changes are reasonable.
- (m) *Compliance monitoring.* The county shall monitor compliance with the chapter as follows:
- (1) Upon notice to the livestock facility owner, request the right of the zoning administrator to personally view the permitted facility at a reasonable time and date to ensure that all commitments of the application as approved are being complied with.
  - (2) If the livestock facility owner refuses the zoning administrator the right to view the permitted facility, the zoning administrator may request the assistance of the sheriff or deputy sheriff to obtain an inspection warrant from the circuit court to inspect the permitted facility for the purpose of protection of the public health and safety under W.S.A., § 66.0119.
  - (3) If a permitted facility is found not to be in compliance with the commitments made in the approved application, the zoning administrator shall issue a written notice to the livestock facility owner stating the conditions of non-compliance and directing that compliance of the commitments of the approved application be complied with in a reasonable amount of time stated in this notice.
  - (4) If non-compliance of the permit conditions as described in the written notice given by the zoning administrator continue past the stated reasonable time to comply, the zoning administrator may take further action as provided in this division, including, but not limited to, issuance of a citation or

seeking of injunctive relief.

- (5) If the livestock facility owner disputes that the conditions of the permit have not been complied with, the livestock facility owner may request a hearing in writing within five (5) days of receipt of the notice of non-compliance. The economic development and land use planning committee shall schedule a hearing within five (5) days to determine if the conditions of the permit have been complied with or whether non-compliance of the commitments of the approved application and local approval exists. The date of the hearing shall be based on the economic development and land use planning committee's published hearing schedule.
- (n) *Terms of the permit.* A permit and the privileges granted by a permit issued under this chapter are conditioned on the livestock operator's compliance with the standards in this chapter and with commitments made in the application for a permit. Racine County is authorized to suspend a permit or seek other redress provided in this division for non-compliance.
- (o) *Transferability.*
  - (1) A permit and the privileges granted by the permit run with the land and remain in effect, despite a change in ownership of the livestock facility, as long as the new operator does not violate the terms of the local approval. An applicant may record with the register of deeds, at the applicant's expense, the duplicate copy of the approved application.
  - (2) Upon change of ownership of the livestock facility, the new owner of the facility shall file information with the county clerk providing pertinent information, including, but not limited to, such information as the name and address of the new owner and date of transfer of ownership.

(Ord. No. 2006-91, 10-26-06; Ord. No. 2008-127, 2-10-09)

**Racine County**

**Article XIII**

**Animal Waste  
Management Ordinance**

ARTICLE XIII. - ANIMAL WASTE MANAGEMENT<sup>[21]</sup>*Footnotes:**... (21) ...**Editor's note—Ord. No. 2012-24, adopted June 26, 2012, set out provisions intended for use as Art. XII. Inasmuch as there were already provisions so designated, these provisions have been included as Art. XIII, §§ 20-1701—20-1721, at the direction of the county.*

## Sec. 20-1701. - Authority.

This article is adopted under authority granted by W.S.A., §§ 59.02, 59.70(1), 92.07, 92.15, and 92.16.

(Ord. No. 2012-24, 6-26-12)

## Sec. 20-1702. - Title.

This article shall be known as, referred to, and may be cited as the Racine County Animal Waste Management Ordinance and is hereinafter referred to as the article.

(Ord. No. 2012-24, 6-26-12)

## Sec. 20-1703. - Findings and declaration of policy.

The county board of supervisors finds that unregulated animal waste storage facilities not meeting current technical design and construction standards may cause pollution of the surface water and groundwater of Racine County, and may result in actual or potential harm to the health of county residents, transients, livestock, aquatic life and other animals and plants and decrease the property tax base of Racine County. The county board of supervisors also finds that improper management of animal waste storage facilities and utilization of animal wastes, including but not limited to the land application of animal waste, may cause pollution of the surface water and groundwater of Racine County. The county board of supervisors further finds that the technical standards developed by the United States Department of Agriculture - Natural Resources Conservation Service and adopted by the county economic development and land use planning committee provide effective, practical and environmentally safe methods of storing and managing animal waste.

(Ord. No. 2012-24, 6-26-12)

## Sec. 20-1704. - Purpose.

The purpose of this article is to regulate the location, design, construction, installation, operation, alteration, closure and use of animal waste storage facilities; the transfer systems that convey waste into an animal storage facility; and the abandonment of an idle animal waste storage facility in order to prevent

water pollution, and thereby protect the health and safety of residents and transients, prevent the spread of disease, and promote the prosperity and general welfare of the citizens of Racine County. It is also intended to provide for the administration and enforcement of the article and to provide penalties for its violation.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1705. - Interpretation.

The provisions of this article shall be considered to be minimum requirements and shall be liberally construed in favor of Racine County, and not be deemed a limitation or repeal of any other power granted by the Wisconsin Statutes.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1706. - Applicability.

This article shall apply to all unincorporated areas of Racine County and to all animal waste storage facilities constructed therein. Animal waste storage facilities shall comply with all federal, state, and local laws, rules, and regulations.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1707. - Definitions.

The following definitions shall apply to this article, and for purposes of this article only, shall supersede any definition in section 20-1 that is inconsistent with the definitions in this section.

*Animal waste* shall mean excreta from livestock, poultry, and other materials such as bedding, rain, or other water, soil, hair, feathers, and other debris normally included in animal waste handling operations.

*Animal waste storage facility* shall mean a concrete, steel, or otherwise fabricated structure, excavated pit or earthen impoundment, or any structure used to temporarily store, manure, waste water, and contaminated runoff.

*Applicant* shall mean any person who applies for a permit under this article.

*Closure* shall mean removal and proper disposal of accumulated wastes and proper abandonment of an animal waste storage facility.

*Direct runoff* shall mean a discharge of a significant amount of pollutants to waters of the state.

*Land conservation committee* shall mean the sub-committee of the economic development and land use planning committee, who by authority of W.S.A., ch. 92, is responsible for county-wide soil and water conservation activities conducted by the land conservation division. The sub-committee shall be referred to hereinafter as "LCC."

*Land conservation division* shall mean the division of the public works and development services department which is responsible for administering and enforcing this article. The division shall be referred to hereinafter as "LCD."

*Livestock* shall mean domestic animals such as cattle, horses, sheep, hogs, goats, poultry, fish, etc., or exotic animals such as llamas, ostriches, etc.

*Livestock operation* shall mean a feedlot or other facility or a pasture where animals are fed, confined, maintained, or stabled.

*Milking center waste* shall mean all wastewater, cleaning ingredients, and waste milk that is discharged from a milkhouse or milking parlor.

*Nutrient management plan* shall mean a plan that balances the nutrient needs of a crop with the nutrients available from legume crops, manure, fertilizer or other sources. Management includes the rate, method, and timing of application of all sources of nutrients to minimize the amount of nutrients entering surface and groundwater. The requirements for a nutrient management plan are as established in ATCP 50.04(3).

*Permit* shall mean the signed, written statement issued by the LCD under this article.

*Permittee* shall mean any person to whom a permit is issued under this article.

*Substantially altered* shall mean a change to a structure or facility that results in relocation or a significant change in size, depth or configuration including; replacement of a liner, an increase in the volumetric capacity by greater than twenty (20) percent, or a change in livestock management from one (1) species of livestock to another, such as cattle to horses.

*Technical standards* shall mean the Wisconsin version of the United States Department of Agriculture, Natural Resources Conservation Service field office Technical Guide as adopted by the LCC.

*Unconfined manure pile* shall mean a quantity of manure, at least one hundred seventy-five (175) cubic feet in volume that covers the ground surface to a depth of at least two (2) inches and is not confined within a manure storage facility, livestock housing facility or barnyard runoff control facility.

*Water pollution* shall mean contaminating or rendering unclean or impure the ground or surface waters of the state, or making the same injurious to public health, harmful for commercial or recreational use, or deleterious to fish, bird, animal, or plant life.

*Water quality management areas* shall mean the area within one thousand (1,000) feet from the ordinary high water mark of navigable waters that consist of lake, pond or flowage; the area within three hundred (300) feet from the ordinary high water mark of navigable waters that consist of a river or stream; and a site that is susceptible to groundwater contamination, or that has the potential to be a direct conduit for contamination to reach groundwater.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1708. - Activities subject to regulation.

- (a) *General requirement.* Any person who locates, installs, moves, reconstructs, extends, enlarges, converts, substantially alters or changes use of an animal waste storage facility or parts thereof; or who employs another to do the same, on land subject to this article, shall be subject to the provisions of this article.
- (b) *Compliance with permit requirements.* A person is in compliance with this article, who receives review and a permit from the land conservation division before commencing activities subject to regulation under this section, and complies with the requirements of the permit. If construction is not completed within twelve (12) months, a permit will be required under this article to continue construction. Repair, enlargement, alteration, abandonment, or temporary abandonment of pre-existing facilities requires a permit that is subject to all terms of this article.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1709. - Standards.

- (a) *Standards for animal waste storage facilities.* The standards for design and construction of animal waste storage facilities and or abandonment/closure are those found in technical standards 313 (waste storage facility), 360 (waste facility closure) and 634 (waste transfer) of the technical guide as it existed on the date of the adoption of this article including any and all future standards amended thereto.
- (b) *Standards for animal waste management and utilization.* The standards for management of animal waste storage facilities and utilization of animal waste are those in technical standard 590 (nutrient management) of the technical guide, including any and all existing and future standards amended thereto.
- (c) *Septage.* Human waste and associated wastewater shall not be discharged into animal waste storage facilities unless permitted by applicable federal, state, or local regulations for the disposal of human waste and wastewater.
- (d) *Standards for implementing prohibitions.* Prior to issuance of a permit under this article, compliance with the prohibitions, as identified in W.S.A., § 281.16(3), and any amendments thereto, shall be addressed. The prohibitions are:
  - (1) A livestock operation may have no overflow of an animal waste storage structure.



- (2) A livestock operation may have no unconfined manure pile in a water quality management area.
  - (3) A livestock operation may have no direct runoff from a feedlot or stored manure into the waters of the state.
  - (4) A livestock operation may not allow unlimited access by livestock to waters of the state in a location where high concentrations of animals prevent the maintenance of adequate sod cover.
- (Ord. No. 2012-24, 6-26-12)

Sec. 20-1710. - Application for and issuance of permits.

- (a) *Permit required.* Except as hereinafter provided, no person may undertake activity subject to this article without first obtaining a new animal waste storage facility permit, a substantially altered facility permit, or a closure of existing facility permit from the county LCD.
- (b) *Exception to permit requirement.* Emergency minor repairs such as fixing a broken pipe or equipment, leaking dikes, or the removal of stoppages may be performed without a permit. If such repairs alter the original design and construction of the facility, work shall be reported to the LCD as soon as possible for a determination on whether a permit will be required for any additional alteration or repair to the facility.
- (c) *Permit fees.* The fee for a permit under this article shall be determined annually by the LCC during the annual LCD budget development cycle. The fee shall be nonrefundable and payable in advance to the LCD. Temporary abandonment of an animal waste storage facility is exempt from the fee schedule.
- (d) *Animal waste storage facility and nutrient management plan required.* Each application for a permit under this article shall include an animal waste storage facility plan. The plan shall include:
  - (1) The number and kinds of animals for which storage is provided.
  - (2) A sketch of the facility and its location in relation to buildings within two hundred fifty (250) feet and homes within five hundred (500) feet of the proposed facility. The sketch will be drawn to scale, with a scale no smaller than one (1) inch equals one hundred (100) feet. Include the scale of the drawing and north arrow.
  - (3) The structural details, including dimensions, cross sections, and concrete thickness.
  - (4) The location of any wells within three hundred (300) feet of the facility.
  - (5) The soil test pit locations and soil descriptions to a depth of at least three (3) feet below the planned bottom of the facility.
  - (6) The elevation of groundwater or bedrock if encountered in the soil profile and the date of any such determinations.
  - (7) Provisions for adequate drainage and control of runoff to prevent pollution of surface water and ground water. If a navigable body of water lies within five hundred (500) feet of the facility, the location and distance to the body of water shall be shown.
  - (8) A time of schedule for construction of the proposed facility.

- (9) A description of the method in transferring animal waste into and from the facility.
  - (10) A nutrient management plan which meets the 590 technical standard and the agricultural performance standards as listed under section 20-1709.
  - (11) An unconfined manure pile may not be located within twenty (20) feet of a neighboring property line. A greater distance may be required depending on slope, soil type and runoff potential as determined by the LCD.
- (e) *Substantially altered facility permit.* Each application for a permit under this article shall include the facility alteration plan as listed in section 20-1710.
- (f) *Closure of existing facility permit.* Each application for a permit under this article shall include the facility closure plan as listed in section 20-1710.
- (g) *Review of application.* The LCD shall receive and review all permit applications. The LCD shall determine if the proposed facility meets the required standards set forth in section 20-1709. Within thirty (30) days after receiving the completed application and fee, the LCD shall inform the applicant in writing whether the permit application is approved or disapproved. If additional information is required, the LCD shall so notify the permit applicant. The LCD has thirty (30) days from the receipt of the additional information to approve or disapprove the application. If the LCD fails to approve or disapprove the permit application in writing with thirty (30) days of receipt of the permit application or additional information, as appropriate, the application shall be deemed approved and the applicant may proceed as if the permit had been issued.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1711. - Permit conditions.

All permits issued under this article shall be subject to the following conditions and requirements:

- (1) Animal waste storage facility design, construction, modification, closure and management shall be carried out in accordance with the construction plan or closure plan and applicable standards specified in this article.
- (2) Any person applying for an animal waste storage facility permit or substantially altered facility permit under this article must develop a nutrient management plan as part of the application process to demonstrate their ability to utilize animal waste in an environmentally safe manner. This condition may require the applicant to hire a crop consultant to prepare the nutrient management plan.
- (3) The permittee must certify in writing that all other local, city, county, state, or federally required permits have been or will be obtained from the appropriate authorities. The LCD may require proof of any permit known to be needed prior to issuing an animal waste storage facility permit, substantially altered facility permit, or closure of existing facility permit.
- (4)

Any change to an approved permit shall be approved in writing by the LCD. Written approval shall occur only after a registered professional engineer, DATCP engineer, or local agency staff having the appropriate engineering certification, has reviewed and approved the proposed modifications.

- (5) The permittee shall give no less than two (2) days notice before starting any construction activity authorized by the permit.
- (6) Activities authorized by this permit shall be completed within two (2) years from the date of issuance after which such permit shall expire.
- (7) The permittee shall certify in writing, by a registered professional engineer, DATCP engineer, or local agency staff having the appropriate engineering certification that the animal waste storage was installed or closed as planned. A copy of the certification sheet shall be given to the LCD within one (1) month of completion of installation, alteration or closure. Any approved changes made to the design shall be specified in the certification. LCD personnel may conduct site inspections during and following construction to determine that the facility was installed, altered or closed as planned and designed.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1712. - Permit revocation.

The LCD may revoke the permit issued under this article if the holder of the permit has misrepresented any material fact in the permit application or plans, or if the holder of the permit violates any conditions of the permit.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1713. - Delegation of authority.

The county board hereby designates the county land conservation division to administer and enforce this article.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1714. - Administrative duties.

In the administration and enforcement of this article, the LCD shall:

- (1) Keep an accurate record of all permit applications, animal waste facility plans, nutrient management plans, alteration plans, closure plans, extensions issued and other official actions.
- (2) Review permit applications and issue permits in accordance with sections 20-1710—20-1712.
- (3) Periodically inspect animal waste storage facility construction to insure the facility is being constructed, altered or closed according to plan specifications.

- (4) Investigate complaints relating to compliance with this article.
- (5) Perform other duties as specified in this article.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1715. - Inspection authority.

The LCD is authorized to enter upon any lands affected by this article to inspect the land prior to or after permit issuance to determine compliance with this article. If permission cannot be received from the applicant or permittee, entry shall be according to W.S.A., § 66.0119. Refusal to grant permission to enter lands affected by this article for purposes of inspection may be grounds for denial of a permit or revocation thereof.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1716. - Enforcement authority.

The LCD is authorized to post an order stopping work upon land that has had a permit revoked or on land currently undergoing activity in violation of this article. Notice is given by both posting upon the land where the violation occurs one or more copies of a poster stating the violation, and by mailing a copy of the order by certified mail to the person whose activity is in violation of this article. The order shall specify that the activity must cease or be brought into compliance.

Any permit revocation or order stopping work shall remain in effect until retracted by the LCD, or by a court of general jurisdiction. The LCD is authorized to refer any violation of this article or of an order stopping work issued pursuant to this article, to the county corporation counsel for commencement of further legal proceedings.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1717. - Violations.

- (a) *Penalties.* Any person who violates, neglects, or refuses to comply with or resists the enforcement of any of the provisions of this article shall be subject to a forfeiture of not less than two hundred dollars (\$200.00) and costs of prosecution for each violation. An unlawful violation includes failure to comply with any standard of this article or with any condition or qualification attached to the permit. Each day that a violation exists shall be a separate offense.
- (b) *Enforcement by injunction.* As a substitute for or an addition to forfeiture actions, the county may seek enforcement of any part of this article by court actions seeking injunctions or restraining orders.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1718. - Appeals.

Under the authority of W.S.A., ch. 68, the county land conservation committee, created under W.S.A., § 59.878, and acting as an appeal authority under W.S.A., § 68.09(2), is authorized to hear and decide appeals where it is alleged that there is error in any order, requirement, decision, or determination by the LCD in administering this article.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1719. - Procedure.

The rules, procedures, duties, and powers of the LCC and provisions of W.S.A., ch. 68, shall apply to this article.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1720. - Who may appeal.

Appeals may be taken by any person having a substantial interest which is adversely affected by the order, requirement, decision, or determination made by the LCD.

(Ord. No. 2012-24, 6-26-12)

Sec. 20-1721. - Variances.

The LCC may upon appeal authorize a variance from the requirements of this article. The granting of a variance shall:

- (1) Be consistent with the spirit and purpose of this chapter as stated in section 20-1704.
- (2) Not permit an activity or practice that may fail structurally or otherwise and cause significant water pollution or other offsite impacts.
- (3) Be due to unique circumstances and not to the general conditions of the area.
- (4) Not be granted unless it is shown that the variance will not be contrary to the public interest and will not be damaging to the rights of other persons.
- (5) Not be granted solely on the basis of economic gain or loss.
- (6) Not be granted solely on the fact that certain conditions existed prior to the effective date of the ordinance from which this article is derived.

The LCC may consider decisions made by the LCD, in accordance with local ordinance provisions, when making its determination whether to accept or deny the variance.

(Ord. No. 2012-24, 6-26-12)

# **APPENDIX C**



# The Shoreland Stewardship Series

Number 1

## Which Tradition?

Owners of shoreland property often bring with them traditional landscaping ideas centered on the conventional residential yard. Sometimes that means a manicured lawn extending to the water's edge. Unfortunately, that carpet of green can cause serious problems for the adjacent lake.

A natural shoreline is a bridge between two worlds. Studies show that there can be as much as 500% more diversity of plant and animal species along a natural shoreline compared to upland areas. When we change a natural shoreline to a lawn, we damage more than that rich mosaic of life. We could also be contributing to water pollution. Building a home and establishing a lawn can cause seven times the amount of phosphorus and 18 times the amount of sediment to enter the water compared to a natural shoreline.

**Lakeshore property owners can help** prevent these negative effects by rethinking the idea of tradition. Instead of transplanting urban traditions to the natural lakeshore getaway, why not retain the traditional Wisconsin lakeshore by leaving a buffer of natural vegetation along the shore?



Compared to a conventional residential yard, a naturally landscaped yard can be better for the waterway and less work to maintain.

## A Fresh Look at Shoreland Restoration

**S**horeland restoration, as its name implies, is the practice of restoring the healthy transition between land and water. Typically, a plan will include a shoreland buffer zone – an area of native vegetation along the water's edge. It can extend both onto the land and into the water. The goal of creating or restoring native vegetation in a buffer zone is to bring back the healthy habitats that are reduced or lost by traditional lawns.

Shoreland restoration differs somewhat from the traditional gardening approach. Rather than modifying the site with garden fertilizers and continuous, long-term cultivation, the restoration approach seeks to re-establish native vegetation that once grew with the existing soil, moisture and sunlight conditions. Once established, native plants are superior to non-native plants for the conditions found along your shoreline.

Vegetative buffers can return or maintain many desirable features to your shoreline. At a minimum, shoreland buffers present a seasonal array of colors, textures, aromas and wildlife activity. They can maintain or restore the natural qualities that keep us so strongly attracted to our living shores. ■

## A Fresh Look at Shoreland Restoration



What is the best way to restore shoreland to protect water and wildlife? There are a number of ways, depending on site characteristics and desires of the property owner. At right are some points to consider:

### No-Mow Zone

Creating a buffer zone by simply not mowing along the shoreline is the easiest and least expensive method. Turf grasses will grow 12-24 inches tall before going to seed. Creating a curving edge that separates the buffer from your lawn and any pathways to the water will also give your shoreland a pleasing, natural appearance. Over time, shrubs and trees will naturally fill in and provide a more diverse plant cover.

### Keep it in the Family

Native wildflowers, groundcovers and trees along the shore add seasonal color and diversity. Native vegetation, once established, will discourage undesirable, exotic species such as purple loosestrife from overtaking your property and can deter Canada geese from loitering on your lawn. Properly placed, native plants will frame views, muffle the noise of lake activities, protect water quality and wildlife, and restore the natural beauty of native shorelands.

## Reviving your shore

Restoring all the functions of natural buffers takes time and effort. By far the best solution is to **protect natural shorelands** whenever possible. This includes leaving logs and beneficial vegetation in the water as well as protecting upland areas from mowing and other continuous disturbances that compact soil or eliminate groundcover plants, shrubs and trees.

When looking to create a view of the lake, consider only **selective removal** of branches, trees, shrubs and groundcover. A path with an opening for your dock or swimming area may be all that you need. As times change and your use of the lake evolves, you may consider

letting vegetation spread and grow on its own. This option requires less maintenance and provides additional habitat benefits.

In the water, aquatic vegetation can quickly recolonize sites previously cleared or disturbed, once the disturbance is eliminated or reduced.

- Consider docking or boating activities that allow portions of the shallow water areas to remain relatively undisturbed.
- If possible, observe what is growing in the shoreland zone at undeveloped sites near your property. These lush, natural sites provide good examples to follow when restoring your own shoreline.



Much can be done to enhance the natural characteristics of areas that are currently mowed lawns. However, areas of full sun and well-established lawns often require substantially more effort to restore. In these areas, expect serious turf competition. A technique called **accelerated recovery** can be used on these sites





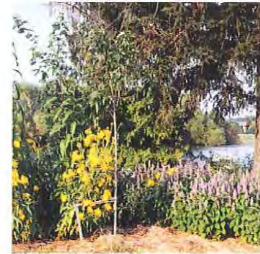
### **Roll Up Your Sleeves!**

“Do-it-yourselfers” no longer have to wonder where to start. Many local nurseries and garden centers carry native plant stock and can recommend the best plants for your site. Local University of Wisconsin-Extension or Department of Natural Resources offices, and some county zoning and land conservation offices also have excellent information on how to go about the job.



### **Hire a Pro**

Shoreland restoration is a rapidly growing field among landscape professionals. Combined with better availability of native plant stocks, many landscape nurseries are now able to provide waterfront property owners with full-service shoreline restorations. Waterfront property owners can expect this service to include a detailed site analysis, a resulting site plan developed with the owner, and professionally installed (and even maintained) plantings.



A well-planned landscape with natural vegetation and fiber logs along the shore can reduce soil erosion, preserve the views and allow access to the water.

to jump-start natural vegetation. This approach may include controlling the existing turf and planting plants, rootstock or live stakes. For information on the process of accelerated recovery, refer to *Lakescaping for Wildlife and Water Quality* (listed on the back of this publication).

If the area is shaded or very damp, remnants of natural vegetation are likely present and will begin to re-establish if the site is left alone. Eliminating mowing, foot traffic or other disturbance in these areas may be all that is needed to establish the process of natural recovery.

### **Nature Abounds**

Perhaps the most compelling reason for restoring our shorelands to their natural splendor can be found among the living plants and animals. Although shorelands are relatively small parcels of land, they host an incredible number of species which depend on us to protect their habitat.

Quite often, our attention is focused on the larger, more visible members of the lake community, such as deer and eagles. However, a complete view of the lake environment includes the smaller but more numerous members, which provide the foundation for those higher up the food chain. Tiny plants and animals called plankton provide food for insects, which in turn become food for fish, frogs and birds. The living members of our lakeshores exist in an interdependent web. Removal of one will likely affect the lives of others. Indeed, when shorelands are altered or cleared, this whole idyllic scene undergoes subtle changes that are hard to detect at first, yet the effects become devastatingly obvious as time goes by. ■

# A Fresh Look at Shoreland Restoration



Our canoe glides over the shallow waters of a bay, passing by dozens of saucer-sized nests excavated in the sandy bottom. Each nest houses bluegills guarding the eggs that hold their unborn young. The distinctive cry of an eagle fills the air and a great blue heron dips its beak into the clear water. A splash along the shore reveals a family of otters bobbing along the lakeshore in search of entertainment and a meal. The canoe continues slicing through the calm waters, past a log crowded with painted turtles competing for space to catch the morning sun. As the sun rises higher, the trilling of American toads gives way to the banjo-like strum of green frogs seeking attention from suitable mates. A gentle popping sound is evidence of fish inhaling a breakfast of insects off the water's surface. Near the shore a cluster of delicate blue flowers emerges on stalks surrounded by the glossy leaves of pickerelweeds. Beyond this splash of color, a stand of bulrushes and cattails marks the meandering shoreline. The breeze softly rustles through the maples that overlook the bay.

## Make a Difference – Restore Your Shore

Sights and sounds such as these reflect the spectrum of life typically found on a healthy lake or river. Here, natural shorelands provide food, clean water and habitat. Fortunately, waterfront property owners can restore or maintain many

of the ecological functions of their lakeshore if a shoreland buffer zone is established or maintained. These areas not only protect our lakes, they can actually solve many problems for homeowners. As an added bonus, this rich mosaic of vegetation, water

and wildlife creates a highly desired landscape that inspires our affections and increases property values. Our lakes are a place to live or vacation – for us they are a chosen landscape. For the wildlife that live there, however, our lakes are their only home. ■

### Additional Resources

*Landscaping for Wildlife and Lakescaping for Wildlife and Water Quality* – Minnesota Dept. of Natural Resources, 1-800-657-3757.

*Life on the Edge: Owning Waterfront Property* – Wisconsin Lakes Partnership, (715) 346-2116.

*The Water's Edge: Helping fish and wildlife on your waterfront property* – UWEX Publication GWQ040 available from county UW-Extension offices or Cooperative Extension Publications 877-947-7827, and DNR publication WT-FH-428 available from local DNR service centers.

*Rain Gardens, a Household Way to Improve Water Quality in Your Community* – UWEX Publication GWQ034 available from county UW-Extension offices or Cooperative Extension Publications 877-947-7827, and DNR publication WT-731 available from local DNR service centers.

*Through the Looking Glass: A Field Guide to Aquatic Plants* – available from UW-Extension Lakes 715/346-2116

Restore Your Shore website – [www.dnr.state.mn.us/restoreyourshore](http://www.dnr.state.mn.us/restoreyourshore)

### Shoreland Stewardship Series:

This is the first fact sheet in the shoreland stewardship series. The entire series is available from county UW-Extension offices or Cooperative Extension Publications 877-947-7827 and online at [learningstore.uwex.edu](http://learningstore.uwex.edu), and it is available from DNR Service Centers.

A publication of University of Wisconsin-Extension, Wisconsin Lakes Partnership, Wisconsin Department of Natural Resources, the Wisconsin Lakes, and The River Alliance of Wisconsin. The Wisconsin Department of Natural Resources acknowledges the Great Lakes Protection Fund and the Environmental Protection Agency's Region V (through Section 319 of the Water Quality Act) for their involvement in the partial funding of this publication.

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UWEX PUB - GWQ027 DNR PUB-FH-429 2014

Text developed by Carmen Wagner, John Haack, and Robert Korth. Photos courtesy of Jeffery Baylis, Robert Korth, J. Nehls, Robert Queen, Jeffrey J. Strobel, Carmen Wagner, and DNR file photos.

Editing and design by the UW-Extension Environmental Resources Center



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The Wisconsin Lakes Partnership



College of Natural Resources  
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# The Shoreland Stewardship Series

Number 2

## We All Live 'Near the Water'



In a sense, we are all 'waterfront landowners' because we all live in a watershed – even that storm drain at the end of the driveway or street eventually leads to a waterway. Storm water flowing over roads, lawns and yards picks up dirt, lawn fertilizers, pesticides, herbicides, toxic heavy metals, pet waste and other pollutants that do not belong in our lakes and rivers.

Whether you own property on a large lake or a small stream, the water and shorelands are altered by what happens on your home turf. When natural shorelands are replaced, an important filtering system is lost, allowing polluted runoff to flow directly into the lake or stream.

## Protecting & Restoring Shorelands

**D**id you know that many of the pleasurable aspects of your favorite lake or river are dependent on healthy, well-vegetated shorelands? The next time you're out in the boat fishing, swimming on a hot July afternoon, or just listening to loons calling over a still lake, consider the central role shorelands play in maintaining these activities.

Natural shorelands contain a lush mixture of native grasses, flowers, shrubs and trees that help to filter polluted runoff and provide important habitat for animals in the water and on the land. Flourishing shorelands provide some of the most effective protection for water resources in Wisconsin. Literally, without shorelands and their diversity, the 'nature show' cannot go on.

### Natural Shorelands: What They Prevent

It's a fact: natural, thriving shorelands can solve many water quality problems on lakes and waterways. The loss of natural shorelands is not only a threat to water quality, it also can create other troubles. For example:

- **Erosion:** Removing shoreland vegetation destabilizes the shoreline and can lead to loss of land. Shorelines must stand up to scouring currents, fluctuating

water levels, moving ice, flooding, surface runoff from higher ground, boat wakes and wind-driven waves.



- **Flooding:** Land development leads to increased runoff from impervious surfaces such as roofs, roads, driveways and parking lots. More water reaching lakes and rivers at faster rates can cause flooding during heavy rains.
- **Unsightly algae blooms:** Just as fertilizers make your lawn green, they make your lake or river green by feeding algae and aquatic weeds.
- **Damage to fisheries:** Clearing trees exposes water to more sunlight, raising water temperatures, lowering oxygen levels and stressing fish and their food supplies.
- **Loss of habitat:** The water's edge is prime real estate for birds and other wildlife. Backyard bird feeders are no substitute for good plant cover and natural food.
- **Loss of privacy:** Boaters, anglers, water-skiers, jet-skiers and swimmers all love Wisconsin's lakes and rivers. Shoreland vegetation screens homes from public view and helps to reduce noise from boats and jet-skis on the water. ■

# The Shoreland Tour

**N**atural shorelands can benefit shoreland homeowners in significant ways. But how do they benefit the natural world? The following section gives a quick tutorial on the precise ways that natural shorelands work with the entire lake or river system. And yes, that includes people.

## Water Quality

Shoreland vegetation traps and filters sediment and debris from rainfall and snow melt. Depending on the size (length and depth) and complexity of the shoreland, 50%-100% of the solid particles can settle out because plants slow sediment-laden runoff. In general, shorelands with more depth are more effective than narrower shorelands, and trees, shrubs and grasses are more effective than just grass. For slopes less than 15%, most sediment-settling occurs within the first 35 feet. Greater depth is needed on steeper slopes or where sediment loads are particularly high. To filter fine-grained sediments such as silt or clay, additional depth may be needed.

## Flood Control

By slowing the flow of runoff, shoreland vegetation allows water to soak into the soil and replenish the groundwater supply. Groundwater reaches lakes and rivers at a much slower and constant rate than surface runoff. This helps limit flooding and maintain water flows during the driest times of the year. If you build on a floodplain, not only is the natural ability of the floodplain to absorb high waters reduced, but you are also risking damage to your property. By preserving the natural vegetation found on floodplains, the severity of floods may be reduced.



Fiber logs are one option for stabilizing the shore.

## Shoreline Stability

Native plants can help stabilize shorelines and reduce erosion. In the water, aquatic plants such as water lilies and pickerel weed help protect shorelines by deflecting and absorbing the cutting action of waves, ice and boat wakes. As you move onto the land, the deep root systems of native plants provide a framework that helps hold banks together. Plant stems also protect banks by slowing storm water runoff, allowing more time for the runoff to soak into the soil and preventing erosion. If there is active slope or bank erosion, at least 30 feet of natural vegetation may be necessary to address erosion from upland runoff. Severe bank erosion usually requires an engineered solution to stabilize and rehabilitate the bank – but this engineering can incorporate plants.



## Aquatic Habitat

Shorelands protect aquatic habitat by improving the quality of adjacent waters through shading, filtering and moderating water flow. For cold-water fisheries such as trout streams, trees or tall grasses shade the stream channel. Shade maintains cooler, more constant temperatures, especially on small streams. Cooler water holds more oxygen, and reduces stress on fish and other aquatic creatures. A few degrees difference in temperature can have a major effect on their survival. Warm-water fisheries do not require as much shade, but the fish and aquatic insects still benefit from the cleaner water filtered through natural shorelands. Most game fish in Wisconsin are sight feeders and do best in clean water.

Leaves, twigs and other organic matter from shoreland vegetation are both lunch and breeding grounds for aquatic insects. These insects in turn feed many others up the food chain. Besides providing insects with the food and cover they need, trees supply woody cover (also known as “fish sticks”) in lakes and streams, such as fallen logs and branches that fish use for places to rest and hide from predators. Birds and turtles also use the woody cover along the shore as resting places and basking spots.



The rich diversity of emergent, floating and submergent plants found just offshore provide important habitat for aquatic animals. Some fish, like bluegills, graze directly on the leaves and stems of these aquatic plants, while other fish feed off the bugs and other delicacies found living on or beneath the plants. These shallow plant beds are also important spawning areas for a number of fish including bass, bluegills and northern pike.

Aquatic plants also offer food, shelter and nesting materials for waterfowl, shorebirds and aquatic mammals such as mink and muskrats. Beds of aquatic plants hide young ducklings from predators and provide protection from wave action. Common loons also depend on these plants to build their mounded nests.



### **Upland Wildlife Habitat**

Shorelands are a place of transition where all manner of creatures from land, air and water live together. This area has the unique ability to support species from both adjacent uplands and waterways. As roads and houses creep into shoreland areas, the behavior, reproduction and survival of animals can be affected as human activities and structures degrade the surrounding wildlife habitat. Although researchers have estimated that animal habitat can be affected up to 1,500 feet away from human activities and structures, it may not be realistic to provide such a wide berth. But preserving and restoring shoreland vegetation can help limit the impact of these disturbances, which might include subtle changes in vegetation and animal travel patterns. In other words, how you manage your shoreline will determine how attractive it is to birds, frogs, turtles and other wildlife.

Recommendations on shoreland habitat widths vary, depending on the animal and its needs. General recommendations to preserve wildlife habitat vary from 30 feet to over 300 feet, with some recommendations exceeding 1,500 feet. If you look at needs of specific animals, 30 feet will suffice for muskrats feeding and denning,

while at least 100 feet to more than 300 feet will satisfy most of the needs of frogs and turtles. For wood ducks, 250 to 600 feet will provide nesting area. Wood duck nests, on average, are located about 250 feet from water.

Size is not the only factor limiting the use of shorelands by wildlife. The quality of the shoreland – the vegetation structure and composition – is also important. Wood ducks, for example, use trees with a minimum diameter of 14 inches (at breast height) for nesting, but prefer trees between 24 and 30 inches in diameter, while kingfishers use shrub cover along the water to conceal their broods. If these vital shoreland habitats are not protected, many shoreland-dependent species, including birds, frogs, mammals and reptiles, will disappear and can eventually be lost from entire lake and river systems.

### **Recreation and Aesthetics**

Shoreland vegetation can be especially valuable in providing a “green screen” along waterways, blocking views of nearby development, and allowing privacy for waterfront property owners. Shoreland buffers can enhance such recreational activities as bird watching, hiking and camping. They can also provide the time to enjoy these hobbies because natural shorelands require less maintenance than traditional lawns and gardens. They can also act as a noise buffer to a certain degree.



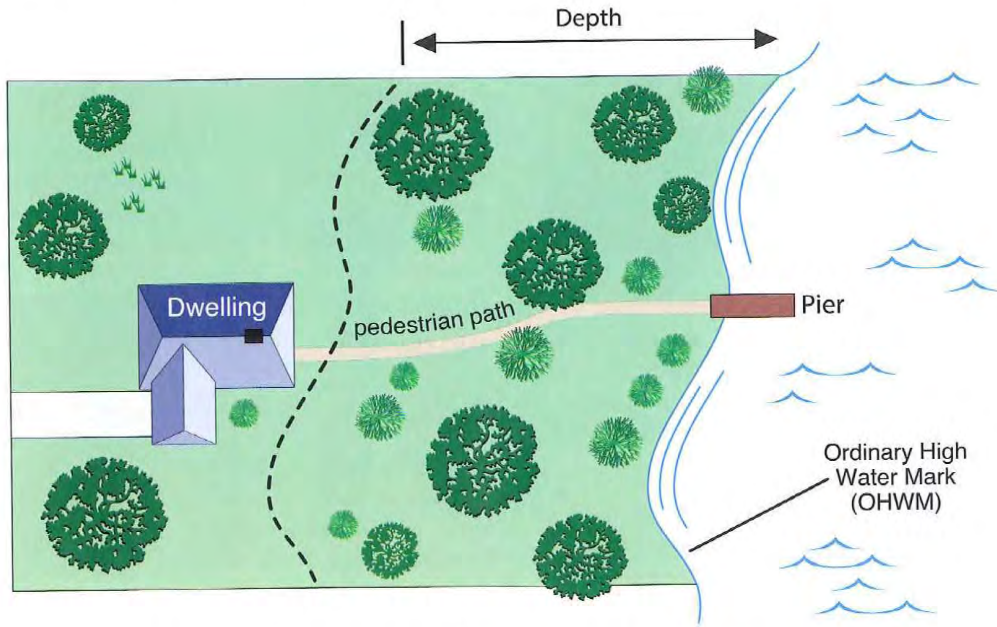
### **Property Values**

Restored shorelands increase property values. One study found that home values near stream restoration projects were 3% to 13% higher than similar homes on unrestored streams. The perceived value of the restored streams included the enhanced shoreland buffer, wildlife habitat and recreation opportunities resulting from the restoration. Another study found that good water quality, which natural shorelands help to protect, added as much as \$200 per frontage foot to the value of shoreland properties. ■

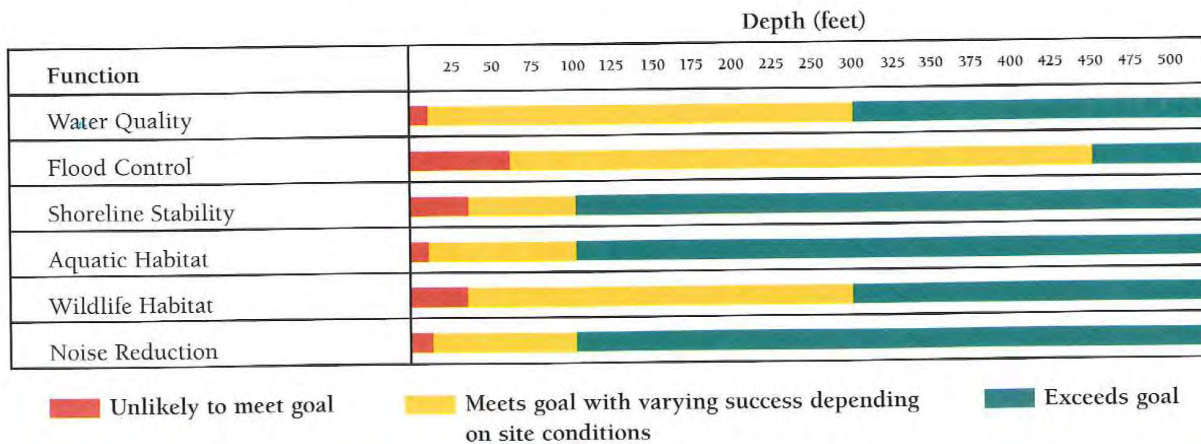
# Putting Shorelands to Work

**H**ow much of the shoreland needs to be protected? It depends on what you want the shoreland to be. There is not a “one-size-fits-all” depth that will keep the water clean, stabilize the bank, protect fish and wildlife and satisfy human demands on the land. Many localities have a minimum width

requirement – be sure to check with your local planning or zoning office to find out if one applies to your property. The minimum depth should provide acceptable levels of all needed benefits at an acceptable cost. However, any amount of natural shoreland is better than none. ■



***How well a shoreland works depends on slope, soil, natural vegetation and other factors.***



# Shoreland Restorations:

## The Influence of Site Characteristics

**W**hether you are interested in erosion control, wildlife habitat, or visual screening, the size and quality of shorelands are affected by the conditions found on your property. It's a good idea to learn about the unique features of your site before undertaking any restoration plan.

### Topography

The topography, or terrain, of your site – slopes, depressions or hills – will direct where water runs when it rains or snow melts. If water quality protection is your main concern, preserving natural vegetation is important in areas that collect runoff and deliver it to lakes and rivers, and less critical on land that slopes away from the water. Generally the steeper the hills, the more speed the water gains. As water gains speed, it can eat away soil, creating gullies and eroding banks. As water moves faster, it can also carry more sediment. As a result, steeper slopes usually need a larger area of vegetation to slow runoff, capture sediments and allow water to soak into soil.

### Water Movement & Soil

Soil's ability to remove pollutants and nutrients from surface and ground water depends on the type of soil, its depth, and relation to the water table. Soil contains pore spaces, or little holes, that can hold water. The size of these pores is dependent on the soil type. Pore size determines how much water the soil can hold and how quickly it drains away. Sandy soils generally have large pore spaces and drain very quickly. Heavy clay soils have very small pores and can remain saturated for a very long time after a rainstorm.

Compacted soil, where the pore spaces are squeezed smaller, can be a particular problem on some sites. Heavy equipment used during construction and even regular foot traffic can lead to compacted soils, preventing water from soaking into the soil.

The depth of the soil and the depth to the water table will also affect how much water the soil can hold. If your soil is only a foot or so deep, with bedrock underneath or on top of the water table, the soil will not be able to hold much water before all the pore spaces become filled. Once the pore spaces are filled, the water will just run off the surface.

If your site has compacted soils or shallow soils, it will be important to have enough area available for the soil to treat runoff. You may want to install rain gardens – small depressions landscaped with native wildflowers. They capture runoff, allowing more time for the water to soak into the soil, rather than running off into your lake or river.

### Wetlands

The native vegetation found in wetlands, such as tussock sedge and soft-stem bulrush, helps to slow runoff from roads, roofs and lawns, allowing sediments to settle out and water to soak in. Wetland plants also use nutrients in the runoff to feed their growth. The natural ability of wetlands to act as a “living filter” can be overwhelmed, however, if runoff is excessive.

To preserve the filtering functions of wetlands, as well as to prevent degradation of wildlife habitat, measure the recommended shoreland depth from the wetland boundary, rather than from the water's edge. ■

## Know Local, State & Federal Regulations: It's the Law

Local, state and federal authorities protect shorelands in several ways. Local ordinances often establish minimum setbacks for structures, septic systems and wells. Many communities regulate the removal of vegetation along the shoreland. Permits may also be needed for land disturbance activities, such as grading or filling, to ensure that proper soil erosion control plans and landscaping are implemented.



The State of Wisconsin regulates activities occurring below the ordinary high water mark of lakes and rivers. The ordinary high water mark is the point on the bank or shore where the water leaves a distinct mark and is often located above “normal” water levels. Large grading projects on the banks of lakes and rivers are also regulated by the state. Both the state and the United States Army Corps of Engineers can be involved in any wetland projects. Be certain to get all required permits before starting any work in shorelands, floodplains or wetlands.

# Restoring Your Shorelands: The First Steps

**C**urious how your shoreland is performing some of its functions? Or maybe you suspect that, with a little effort, you can maximize the performance of an already functioning shoreland.

- **Evaluating Runoff:** Spend some time outside during or immediately after a heavy rainstorm. Watch your property to see where the water goes. Shoreland vegetation does the best job of filtering runoff when the water spreads out like a sheet and does not flow in narrow rivulets straight into the lake or river. Look for opportunities to divert runoff into flatter areas where it can spread out and soak in. If your land receives runoff from a road, an engineer's advice may be useful.
- **Stabilize the Shoreline:** Evaluate the stability of your streambank or lakeshore, since shoreland vegetation can help protect unstable banks. Bioengineering, a new approach to address shoreline erosion problems, incorporates fiber logs, bundles of willow branches, and other natural materials into the shore protection design. Riprap and retaining walls are generally limited to areas where planting techniques cannot prevent significant loss of land. If you already have riprap, you can install some plants between the rocks to "soften" the shoreline. If you have a retaining wall or a seawall, when it comes time for repairs, it would be an ideal opportunity to replace the wall with an alternative protection design.

## *If Natural Vegetation Remains*

Consider retaining the natural beauty of the shoreland by preserving the native vegetation. You might like the carefree collection of native plants that already exist on the land. If that's what you have, the best option for you and wildlife is to leave nature alone.

## *If You Have Lawn to the Water's Edge*

To restore a shoreland, you can replant native trees, shrubs, grasses and wildflowers along your shoreline. Stop mowing around the edges of your lawn or at the water's edge. Add native plants to these unmowed islands to attract songbirds and butterflies. Allow these wildflower islands to expand until they create a continuous ribbon of natural growth along the water. You can create an appealing waterfront landscape while eliminating expensive and time-consuming lawn care and watering.

## *Access to the Water*

Take advantage of naturally occurring clearings for views and access to the water. Use the existing vegetation to frame your view of the water, or carefully prune some branches from trees if needed. If you want foot access to the water, lay out a curved path and plant around it. Building a raised walkway on steep slopes may be better than regrading the slope to construct a walking path.



## *Use Native Plants*

When restoring your shoreland, it is far better to use plants native to Wisconsin than non-natives from other regions or countries. Avoid aggressive exotics such as purple loosestrife and glossy buckthorn. Adding plants to a lake, river or wetland will also require a permit from the Department of Natural Resources.

Using native plants does not mean you have to settle for a dull shoreland. Many native plants are particularly attractive, with showy flowers, berries, interesting barks and branching habits, and they provide you with a number of other benefits.

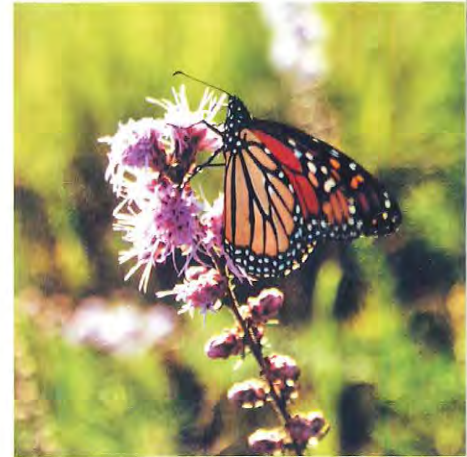
To begin selecting plants, visit some nearby natural areas to see what grows there. You are better off copying Mother Nature because these plants have proven that they can survive with little care, and are adapted to the local climate. Wildlife thrives on native plants as a source of food, shelter and cover.



Because developed shorelands act as a transition from the human to the natural world, the most successful shoreland plantings aim for a less manicured look than one might expect on the street side of the traditional suburban home. Group plants in a variety of clusters and repeat plants across the waterfront for a natural effect.

Ideally, plants should be nursery-grown by a responsible supplier. If you are thinking of using plants from the wild, keep in mind a few words of caution:

- First and most importantly, get the landowner's permission before transplanting. If you are thinking of removing (or planting) any plants in the water or in a wetland, contact your local DNR aquatic plant management specialist for advice and to determine if a permit is required.
- Then make sure you can identify the native plants and be certain that you are not bringing invasive species onto your property. Look around where you will be digging up plants, being careful not to choose species near exotics, since the seeds and roots of close-by plants can be easily transferred in your transplants.
- For the most success, transplant in the early or late part of the day, and in early spring or late fall. To find the plants, mark them with flags or ribbons when they are blooming, so it is easy to locate them when it comes time to transplant.
- When transplanting, make sure to leave enough plants behind to replace the ones taken. Never dig up rare or unusual plants – they often require very specific habitat needs that cannot be duplicated.



The only exception to these guidelines is if a property is slated for development and the plants would be lost regardless. Local land conservation departments are often good resources for assistance in naturalizing waterfronts and shorelands. They may also sponsor seminars or courses on shoreland restoration. ■

## ***Recognizing the Benefits of Native Shoreland Vegetation***

<b>Benefit</b>	<b>Grasses</b>	<b>Shrubs</b>	<b>Trees</b>
Stabilize shoreland	M	H	H
Filter sediment and the nutrients and pesticides bound to it	H	M	H
Filter nutrients, pesticides, and microbes from surface runoff	M	L	M
Protect against flooding	L	M	H
Improve aquatic habitat	L	M	H
Improve wildlife habitat for grassland animals	H	M	L
Improve habitat for forest animals	L	M	H
Provide visual interest	L	M	H

**L = Low, M = Moderate, H = High**  
*Adapted from Agroforestry Notes, AF Note 4 Jan 1997, USDA Forest Service/NRCS*

# Looking Long-term: What About Maintenance?

The best care is no care when it comes to shorelands. Resist the urge to tidy up. A natural forest floor, with its "litter" of fallen leaves and twigs, helps slow down runoff and soak up water. Raking or removing this "litter" only defeats the purpose of natural shoreland vegetation.

Fish utilize logs, branches, leaves and other woody cover that fall into the water and provide hiding places and resting

pools. If a large tree is threatening to fall from a steep bank, cut the tree if you are concerned it will pull the bank with it, (a permit may be required) but leave the root system in place to hold the soil. Plant a new tree to replace the one you cut down. Make sure to check with your local zoning office for permission to remove any vegetation from the shoreland zone.

*Native plants need less help from you so you can spend more time doing what you enjoy!*

Mulch with pine needles or bark chips in highly visible areas if you wish, and leave the rest alone or shield the forest floor with ferns and other herbaceous plants. Fresh wood chips should compost for six to twelve months before use. If you must fertilize near the water, use phosphorus-free fertilizers. Phosphorus is the middle number on bags of fertilizer (6-0-6). Slow-release fertilizer should be placed in the planting hole rather than broadcast over the shoreland.

## A Vision for the Future

Wisconsin's lakes, rivers and shorelands provide us with many benefits. Some are as simple as enjoying the view from the end of a pier, while others are more complex and less apparent, like protecting water quality and preventing shoreline erosion. Next time you take a trip to the water's edge, take a moment to appreciate the diversity and beauty found there. Whether you enjoy fishing, water-skiing or the simple beauty of a white water lily, protecting and restoring our shorelands will help ensure that clean water, abundant fish and wildlife and beautiful vistas are enjoyed for many years to come. ■

### Additional Resources

*Landscaping for Wildlife and Lakescaping for Wildlife and Water Quality* – Minnesota Dept. of Natural Resources, 1-800-657-3757.

*Life on the Edge: Owning Waterfront Property* – Wisconsin Lakes Partnership, (715) 346-2116.

*The Water's Edge: Helping fish and wildlife on your waterfront property* – UWEX Publication GWQ040 available from county UW-Extension offices or Cooperative Extension Publications 877-947-7827, and DNR publication WT-FH-428 available from local DNR service centers.

*Rain Gardens, a Household Way to Improve Water Quality in Your Community* – UWEX Publication GWQ034 available from county UW-Extension offices or Cooperative Extension Publications 877-947-7827, and DNR publication WT-731 available from local DNR service centers.

*Through the Looking Glass: A Field Guide to Aquatic Plants* – available from UW-Extension Lakes 715/346-2116

*Restore Your Shore* website – [www.dnr.state.mn.us/restoreyourshore](http://www.dnr.state.mn.us/restoreyourshore)

### Shoreland Stewardship Series:

This is the second fact sheet in the shoreland stewardship series. The entire series is available from county UW-Extension offices or Cooperative Extension Publications 877-947-7827 and online at [learningstore.uwex.edu](http://learningstore.uwex.edu), and it is available from DNR Service Centers.

A publication of University of Wisconsin-Extension, Wisconsin Lakes Partnership, Wisconsin Department of Natural Resources, the Wisconsin Lakes, and The River Alliance of Wisconsin. The Wisconsin Department of Natural Resources acknowledges the Great Lakes Protection Fund and the Environmental Protection Agency's Region V (through Section 319 of the Water Quality Act) for their involvement in the partial funding of this publication.

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UWEX PUB - GWQ038 DNR PUB-WT-748 2014

Text developed by Carmen Wagner, John Haach, and Robert Korth. Photos courtesy of Jeffery Baylis, Robert Korth, J. Nehls, Robert Queen, Jeffrey J. Strobel, Carmen Wagner, and DNR file photos.

Editing and design by the UW-Extension Environmental Resources Center



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The Wisconsin Lakes Partnership



College of Natural Resources  
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## The Shoreland Stewardship Series

Number 3

# Protecting Our Living Shores



Something amazing happens when land meets the water. The life force virtually blossoms into a level of diversity that is unparalleled on any parcel of upland. Shorelands can include uplands, wetlands and water, supporting plants and animals from all three areas, including many only found in shorelands. **In Wisconsin, 80% of endangered or threatened species spend all or part of their lives in shoreland areas.** You don't have to be an animal-lover or botanist to realize the significance of this biological panorama. By understanding how fish, waterfowl and other wildlife depend on shorelands, we can begin to work to protect Wisconsin's living shores.

### Life in the Water

*"... I have become satisfied that the destruction of trees bordering on these streams and the changed conditions of the banks produced thereby, has resulted in the destruction of the natural harbours or hiding places of the trout..."*

– J. F. Van Cleef, American Fisheries Society, 1885

As early as 1885, people were beginning to understand that fish and other aquatic life do not always adapt to changes on the land around their home. Replacing naturally vegetated shorelands with managed landscapes such as lawns, golf courses and cropland can harm water quality when runoff carries soil, pesticides and fertilizers into lakes and rivers.

One of the easiest ways to detect a change in water quality is to watch for a change in water clarity. When you notice a change, so will the fish. Many species of fish rely on sight to find their food, and if the water is dirty, it becomes difficult for some fish to find food.

As water quality decreases, insects and many other delicacies also begin to disappear. Among the first to go are caddisflies and mayflies, the favorite food of trout.

Rain water and snow melt can become nutrient-laden while flowing across lawns and gardens, picking up excess applied fertilizers. The nutrients can cause excessive aquatic weed growth that reduces the oxygen supply in lakes and rivers. This change favors populations of carp, catfish, suckers and other rough fish that are more tolerant of low-oxygen conditions. Oxygen levels can be lowered further as rough fish remove the oxygen-producing plants found on the beds of lakes and rivers and as people clear shoreland vegetation that shades the water.

Cooler water holds more oxygen and reduces stress on fish and other aquatic creatures. A few degrees difference in temperature can have a major effect on their survival. It's important to keep even tiny brooks – not big enough to hold fish – cooler because the cool water, rich in oxygen, eventually reaches fish downstream. ■

*(continued on page 2)*



Insects, the favorite food of many fish, are abundant in waters kept cool by water-front vegetation. Leaves, twigs, and other organic matter from shoreland vegetation that fall into the water provide both lunch and breeding grounds for aquatic insects. These insects in turn feed fish and many others up the food chain. Besides providing

insects with the food and cover they need, trees supply woody cover for lakes and rivers, such as fallen logs and branches. In Wisconsin lakes, over 15 different fish species at a time may inhabit a single downed tree. Birds and turtles can also be found using woody cover along the shore as resting places and basking spots.

The rich diversity of emergent, floating and submerged plants located just offshore provide important habitat for many aquatic animals. Some fish, like bluegills, graze directly on the leaves and stems of these aquatic plants, while other fish feed off the bugs and other critters found living on or beneath the plants. These shallow plant beds are important spawning areas for a number of fish including bass, bluegills and northern pike.

Besides helping fish, aquatic plants offer food, shelter and nesting materials for waterfowl, shorebirds and aquatic mammals such as mink and muskrats. Beds of aquatic plants hide young ducklings from predators and provide protection from wave action. Loons also depend on these plants to build their mounded nests.

As our shorelands become more developed, these important aquatic plants and the habitat they provide are vanishing. In Minnesota, researchers found that developed shorelands had on average 66% less floating and emergent plants than undeveloped shorelands. Researchers in Wisconsin recorded even more dramatic losses of plant species for developed shorelands – 83% to 92% fewer species than undeveloped shorelands. As the aquatic plants disappear, the fish and other animals that rely on them may not be too far behind.

## **Life on Land**

As roads and houses creep into shoreland areas, human activities and structures can degrade the surrounding wildlife habitat, affecting the behavior, reproduction and survival of animals. Although researchers have estimated that animal habitat can be affected up to 1,500 feet away from human activities and structures, it may not be realistic to provide such a wide berth. But preserving and restoring shoreland vegetation can help limit the impact of these disturbances, which might include subtle changes in vegetation and animal travel patterns. In other words, how you manage your shoreline will determine how attractive it is to birds, frogs, turtles and other wildlife.

Every spring and fall, migrating songbirds and waterfowl use the Wisconsin and Mississippi rivers as travel corridors, just as European settlers did when they migrated into the state. Migrating birds depend on shoreland corridors for food, cover and nesting areas. Many studies have confirmed that the key to preserving the diversity and abundance of birds is to preserve plant diversity. Most woodland birds, for instance, require several layers of vegetation, from groundcovers to shrubs to trees. Grassland and wetland birds need a diversity of native grasses, wildflowers and shrubs. Simply put,

more plants mean more foraging and nesting sites, thus more birds.



The structure of the habitat is important, as well. For example, some birds prefer trees with a certain diameter (24 to 30 inches at breast height for wood

ducks) for nesting, while birds such as kingfishers use shrub cover along the water to conceal their brood. Cavity trees are used by many kinds of birds for nesting, including wood ducks, hooded mergansers and owls. Osprey, kingfishers, flycatchers and other birds can often be found perching in dead trees, or snags, along the water watching for food. Bats roost under the loose bark of dying trees when they are not out catching



insects. A single bat can eat as many as 1,200 bugs during an evening – among them many mosquitoes.

Amphibians and reptiles such as salamanders, frogs and turtles are common along natural shorelands. They often require water or damp areas to reproduce, and may move into upland areas for portions of the year. Salamanders and frogs need unbroken shoreland corridors because they are often unable to safely cross even small areas of unsuitable habitat, such as roads and parking lots. To a salamander, whose life revolves around water, a cement curb or retaining wall might as well be the Great Wall of China.



Since so many different types of animals rely on shorelands, it is difficult to select a single width that can preserve shoreland habitat for all wildlife.

Recommendations vary depending on the animal and its needs. Some animals are more sensitive to human activities, and as a result, require more room. General recommendations to preserve wildlife habitat vary from 30 feet to over 300 feet wide, with some recommendations exceeding 1,500 feet.

Muskrats do fine with approximately 30 feet of natural shorelands but kingfishers, turtles and frogs prefer 100 feet to over 300 feet. Some animals, such as herons, scarlet tanagers and the American redstart may need over 400 feet to 600 feet of natural shorelands to successfully reproduce and grow.

It is often unrealistic to have widths of 600 feet or more of shorelands preserved for wildlife. However, narrower corridors of shorelands surrounding our lakes and rivers will still provide habitat for some wildlife. When shoreland development completely rings a lake or follows the twists and turns of a river, it is important to restore wildlife travel corridors to and from the water. These travel corridors can provide access to larger tracts of land when the habitat needs of some animals cannot be met at the water's edge. ■

## Shoreland Plants that Please



Columbine

To enhance the wildlife habitat along a shoreland or anywhere, restore a diverse mix of native grasses, wildflowers, shrubs and trees. There are many plants to choose from, but several of the easiest to find at local nurseries and greenhouses are listed here. Even if you are unable to restore your shoreland all at once, finding places for these and other native plants is a good starting point to help wildlife.

### Grasses

Switch Grass—

*Panicum virgatum*

Switch grass has delicate, airy seed-heads that follow any breeze. It can reach a height of 3 to 6 feet depending on the soil moisture available. In the fall, the grass turns a burnished

gold, providing color throughout the winter. It prefers full sun and can handle dry to moist soil conditions. In their caterpillar stage, many butterflies, such as the tawny-edged skipper and the Northern pearly eye, rely on switch grass and other grasses for food. Switch grass also provides important nesting habitat for many grassland birds.

#### Blue Joint Grass—

##### *Calamagrostis canadensis*

Blue joint grass grows in clumps with finely-textured leaves. It can grow 2 to 4 feet tall, and prefers full sun. It is often found in wet areas, but can tolerate occasional dry conditions. Blue joint grass is a cool-season grass that greens up earlier in the spring than most grasses. It is sometimes confused with reed canary grass, an invasive exotic plant, which should never be planted in shorelands.

#### Tussock Sedge—

##### *Carex stricta*

Tussock sedge is commonly found in sedge meadows with its slender arching leaves. It grows 2 to 3 feet tall and prefers full sun with moist soils. It favors areas with standing water, but will withstand occasionally drying conditions. Many different species of sedges capture nutrients from runoff to feed their growth, helping to protect water quality.

## Wildflowers

#### Columbine—

##### *Aquilegia canadensis*

Columbine has brilliant red and yellow flowers, providing a splash of color in early summer and drawing hummingbirds like a magnet. Its flower stalks can reach 1 to 3 feet tall, preferring medium to dry soils.

Columbine is common along woodland edges and in forests.

#### New England Aster—

##### *Aster novae-angliae*

New England aster provides rich magenta to deep purple blossoms every fall, growing 1 to 4 feet tall. It prefers full sun or partial shade, and will grow in medium to wet soils. In their caterpillar stage and as adults, butterflies use asters for food. The seeds also provide food for many songbirds in the fall and winter.

#### Marsh Milkweed—

##### *Asclepias incarnata*

Marsh milkweed has pink to magenta flowers and grows 1 to 4 feet tall. It prefers full sun and wet soils, tolerating an occasional flooding. Marsh milkweed is used by the monarch butterfly in all its life stages. Birds also use milkweeds when building their nests. Song sparrows line their nests with the fuzzy white “floss” from seed pods and Baltimore orioles use it in the construction of their hanging nests.

## Shrubs

#### Red Osier Dogwood—

##### *Cornus stolonifera*

Red osier dogwood, a native deciduous shrub, provides excellent shoreland protection. It favors wet soils and can grow in sun or partial shade. The striking red stems are especially attractive in winter against snow. Grouse, turkey, blue-birds thrushes, and other birds favor its distinctive white fruits.



Red Osier Dogwood

#### Highbush Cranberry—

##### *Viburnum opulus* L. subsp. *trilobum*

Highbush cranberry has showy white flowers that are followed by scarlet fruits that persist into winter, offering food to wildlife. Its leaves turn a deep red to purple in the fall. This very hardy deciduous shrub tolerates wet conditions, and grows in sun to part shade. Grouse, pheasant and small birds use the plant for cover, and bluebirds, cedar waxwings, cardinals and others eat the fruit. Avoid the potentially invasive improved or horticultural varieties of the highbush cranberry.

## Trees

#### Swamp White Oak—

##### *Quercus bicolor*

The swamp white oak can reach heights of 60 to 70 feet. It is common in wet soils along streams and swamps, and is tolerant of occasional flooding. Its acorns provide an important winter food source for many animals, including turkey and white-tailed deer.

#### Tamarack—

##### *Larix laricina*

Tamarack is a deciduous conifer, which means it produces new needles every spring. In the fall the needles turn a bright golden color before the tree sheds them. Tamarack can grow to heights of 90 feet, prefer sunny sites and do not tolerate shade. Tamarack is common in the wet, peaty soils of bogs and swamps, but can also be found in drier upland sites. Sharp-tail grouse, pine siskin and other birds will eat tamarack seeds from the cones. Snowshoe hares will also eat the bark and branches of tamarack. ■

# In-Depth Study: Smallmouth Bass

*Smallmouth benefit from woody cover, also known as “fish sticks”*

**S**mallmouth bass are commonly found in medium to large streams and in large, clearwater lakes throughout Wisconsin. Although considered a “warm water” fish, smallmouth bass actually prefer cool water. Unlike largemouth bass, which are found in the shallow, weedy areas of lakes and river backwaters, the smallmouth bass prefers moderately swift-flowing water in the rocky portions of streams, and deeper water in lakes over rocky bars and ledges.



In early summer when water temperature reaches about 62° F, the male smallmouth construct spawning nests in the shallow waters it normally shuns. Nests are built at depths of 1 foot to nearly 20 feet of water on rock, gravel and sandy surfaces. Shoreland development can limit the availability of nesting sites for smallmouth bass when soil from construction sites and eroding shores covers these preferred spawning areas. Nests are constructed next to large rocks or woody cover, such as fallen logs (also known as “fish sticks”), to provide protection from predators. A study conducted in northern Wisconsin and Upper Michigan suggests that the woody cover smallmouth bass and many other fish depend on is decreasing as residential development along shorelines increases. Another study of northern Wisconsin shorelands found that the average tree cover of 57% on undeveloped sites was reduced to 38% on developed sites.

Once hatched, the smallmouth’s diet consists of tiny crustaceans such as water fleas. As it matures, the smallmouth’s diet expands to include other fish, crayfish and various insect larvae and adults. Since bass depend on sight to find food, good water clarity is essential. Water clarity lessens when soil washes into lakes and rivers, and with excessive algae blooms. But natural shorelands can help protect water clarity by catching sediment and attached nutrients before the soil reaches the water. In Wisconsin, phosphorus is the key nutrient responsible for algae and weed growth in over 80% of the lakes. Testing soil to find correct fertilizer amounts for lawns and gardens can help reduce excess nutrients in runoff. Using low- or no-phosphorus fertilizer (the middle number on the fertilizer bag refers to phosphorus content) will help keep this nutrient out of our waters.

***Smallmouth bass are just one of many creatures found along our living shores. You can help to ensure that fish, turtles, loons and other wildlife thrive along Wisconsin’s shorelands by protecting natural shorelands and working to restore them. ■***

## ***Know Local, State & Federal Regulations: It’s the Law***

Local, state and federal authorities protect wildlife habitat along shorelands in several ways. Local ordinances often establish minimum setbacks for structures, septic systems and wells. Many communities regulate removal of vegetation along shoreland. Permits may also be needed for land-disturbance activities, such as grading or filling, to ensure that proper soil erosion control plans are implemented.



The State of Wisconsin regulates activities occurring below the ordinary high water mark of lakes and rivers. The ordinary high water mark is the point on the bank or shore where the water leaves a distinct mark and is often located above “normal” water levels. If you are thinking of removing (or planting) any plants in the water or in a wetland, contact your local DNR aquatic plant specialist for advice and to determine if a permit is required. Both the state and the United States Army Corps of Engineers can be involved in any wetland projects. Be certain to get all required permits before starting any work in shorelands, floodplains or wetlands.

# Managing for Wildlife



One of the easiest ways to maintain the quality of wildlife habitat is to minimize habitat alteration during and after construction. For example, the design of structures, trails and roads can blend into the natural landscape to minimize impacts. Shorelands should also be protected during construction. On developed properties, wildlife habitat can be easily enhanced with the reintroduction of native plants and restoration of shorelands.

If you're ready to enhance habitat, the first step is take a moment to look around your property. There may already be many natural features that are valuable to wildlife such as:

- Large, dead standing or cavity trees (nesting and roosting sites for wood ducks, hooded mergansers, owls, hawks, osprey and eagles, or dens for other animals)
- Large, dying trees (woodpeckers search for insects and bats roost under loose bark)
- Seasonal pools and ephemeral wetlands (used by amphibians for breeding)

- Berry "tangles" (cover for many species of wildlife)
- Logs and branches in the water (basking areas for turtles and cover for fish)
- Lakeshore and streambank burrows (homes of weasels, otters and muskrats)
- Sandy soils with good sun exposure (used by turtles for nesting areas)
- Rock piles (cover for snakes and small mammals)
- Large trees overhanging the water (feeding perches for flycatchers, kingfishers, osprey and other birds)
- Fallen logs on the land (preferred habitat for some salamanders)
- High, sandy banks (nesting sites for kingfishers, bank swallows and rough-winged swallows)

By protecting these natural features, you can provide a strong foundation for wildlife habitat on your property. Unlike native plants, which can be reintroduced to your property, it is often very difficult to replicate the habitat provided by the natural features listed above once they are lost. ■

## Additional Resources

*Landscaping for Wildlife and Lakescaping for Wildlife and Water Quality* – Minnesota Dept. of Natural Resources, 1-800-657-3757.

*Life on the Edge: Owning Waterfront Property* – Wisconsin Lakes Partnership, (715) 346-2116.

*The Water's Edge: Helping fish and wildlife on your waterfront property* – UWEX Publication GWQ040 available from county UW-Extension offices or Cooperative Extension Publications 877-947-7827, and DNR publication WT-FH-428 available from local DNR service centers.

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*Through the Looking Glass: A Field Guide to Aquatic Plants* – available from UW-Extension Lakes 715/346-2116

*Restore Your Shore* website – [www.dnr.state.mn.us/restoreyourshore](http://www.dnr.state.mn.us/restoreyourshore)

*Wisconsin Native Plant Nurseries* – [dnr.wi.gov/files/pdf/pubs/er/er0698.pdf](http://dnr.wi.gov/files/pdf/pubs/er/er0698.pdf)

## Shoreland Stewardship Series:

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UWEX PUB - GWQ039      DNR PUB-WT-764 2014

Text developed by Carmen Wagner, John Haack, and Robert Korth.  
Photos courtesy of Jeffery Baylis, Robert Korth, J. Nehls, Robert Queen, Jeffrey J. Strobel, Carmen Wagner, and DNR file photos.

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# Appendix D

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 2015

## Influent Flow and Loading

### 1. Monthly Average Flows and (C)BOD Loadings

1.1 Verify the following monthly flows and (C)BOD loadings to your facility.

Outfall No. 701	Influent Monthly Average Flow, MGD	x	Influent Monthly Average (C)BOD Concentration mg/L	x	8.34	=	Influent Monthly Average (C)BOD Loading, lbs/day
January	0.2155	x	126	x	8.34	=	226
February	0.1834	x	132	x	8.34	=	202
March	0.2858	x	109	x	8.34	=	260
April	0.3754	x	69	x	8.34	=	217
May	0.2809	x	95	x	8.34	=	223
June	0.3343	x	88	x	8.34	=	245
July	0.2304	x	136	x	8.34	=	261
August	0.1687	x	150	x	8.34	=	212
September	0.2218	x	154	x	8.34	=	285
October	0.1786	x	141	x	8.34	=	210
November	0.3119	x	121	x	8.34	=	314
December	0.4978	x	60	x	8.34	=	247

### 2. Maximum Month Design Flow and Design (C)BOD Loading

2.1 Verify the design flow and loading for your facility.

Design	Design Factor	x	%	=	% of Design
Max Month Design Flow, MGD	.62	x	90	=	0.558
		x	100	=	.62
Design (C)BOD, lbs/day	680	x	90	=	612
		x	100	=	680

2.2 Verify the number of times the flow and (C)BOD exceeded 90% or 100% of design, points earned, and score:

	Months of Influent	Number of times flow was greater than 90% of	Number of times flow was greater than 100% of	Number of times (C)BOD was greater than 90% of design	Number of times (C)BOD was greater than 100% of design
January	1	0	0	0	0
February	1	0	0	0	0
March	1	0	0	0	0
April	1	0	0	0	0
May	1	0	0	0	0
June	1	0	0	0	0
July	1	0	0	0	0
August	1	0	0	0	0
September	1	0	0	0	0
October	1	0	0	0	0
November	1	0	0	0	0
December	1	0	0	0	0
Points per each		2	1	3	2
Exceedances		0	0	0	0
Points		0	0	0	0
<b>Total Number of Points</b>					<b>0</b>

0

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 2015

### 3. Flow Meter

3.1 Was the influent flow meter calibrated in the last year?

Yes Enter last calibration date (MM/DD/YYYY)

No

If No, please explain:

### 4. Sewer Use Ordinance

4.1 Did your community have a sewer use ordinance that limited or prohibited the discharge of excessive conventional pollutants ((C)BOD, SS, or pH) or toxic substances to the sewer from industries, commercial users, hauled waste, or residences?

Yes

No

If No, please explain:

4.2 Was it necessary to enforce the ordinance?

Yes

No

If Yes, please explain:

### 5. Septage Receiving

5.1 Did you have requests to receive septage at your facility?

Septic Tanks	Holding Tanks	Grease Traps
--------------	---------------	--------------

Yes

Yes

Yes

No

No

No

5.2 Did you receive septage at your facility? If yes, indicate volume in gallons.

Septic Tanks

Yes  gallons

No

Holding Tanks

Yes  gallons

No

Grease Traps

Yes  gallons

No

5.2.1 If yes to any of the above, please explain if plant performance is affected when receiving any of these wastes.

### 6. Pretreatment

6.1 Did your facility experience operational problems, permit violations, biosolids quality concerns, or hazardous situations in the sewer system or treatment plant that were attributable to commercial or industrial discharges in the last year?

Yes

No

If yes, describe the situation and your community's response.

6.2 Did your facility accept hauled industrial wastes, landfill leachate, etc.?

Yes

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
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<ul style="list-style-type: none"><li>• No</li></ul> <p>If yes, describe the types of wastes received and any procedures or other restrictions that were in place to protect the facility from the discharge of hauled industrial wastes.</p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div>	
---	--

<b>Total Points Generated</b>	0
<b>Score (100 - Total Points Generated)</b>	100
<b>Section Grade</b>	<b>A</b>

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
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## Effluent Quality and Plant Performance (BOD/CBOD)

### 1. Effluent (C)BOD Results

1.1 Verify the following monthly average effluent values, exceedances, and points for BOD or CBOD

Outfall No. 001	Monthly Average Limit (mg/L)	90% of Permit Limit > 10 (mg/L)	Effluent Monthly Average (mg/L)	Months of Discharge with a Limit	Permit Limit Exceedance	90% Permit Limit Exceedance
January	20	18	3	1	0	0
February	20	18	3	1	0	0
March	20	18	3	1	0	0
April	20	18	4	1	0	0
May	20	18	5	1	0	0
June	20	18	4	1	0	0
July	20	18	3	1	0	0
August	20	18	4	1	0	0
September	20	18	5	1	0	0
October	20	18	2	1	0	0
November	20	18	4	1	0	0
December	20	18	4	1	0	0

\* Equals limit if limit is <= 10

Months of discharge/yr	12		
Points per each exceedance with 12 months of discharge		7	3
Exceedances		0	0
Points		0	0
<b>Total number of points</b>			<b>0</b>

NOTE: For systems that discharge intermittently to state waters, the points per monthly exceedance for this section shall be based upon a multiplication factor of 12 months divided by the number of months of discharge. Example: For a wastewater facility discharging only 6 months of the year, the multiplication factor is  $12/6 = 2.0$

1.2 If any violations occurred, what action was taken to regain compliance?

### 2. Flow Meter Calibration

2.1 Was the effluent flow meter calibrated in the last year?

Yes

Enter last calibration date (MM/DD/YYYY)

No

If No, please explain:

### 3. Treatment Problems

3.1 What problems, if any, were experienced over the last year that threatened treatment?

### 4. Other Monitoring and Limits

4.1 At any time in the past year was there an exceedance of a permit limit for any other pollutants such as chlorides, pH, residual chlorine, fecal coliform, or metals?

Yes

No

If Yes, please explain:

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 2015

<p>4.2 At any time in the past year was there a failure of an effluent acute or chronic whole effluent toxicity (WET) test?</p> <p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p> <p>If Yes, please explain:</p> <p>_____</p> <p>4.3 If the biomonitoring (WET) test did not pass, were steps taken to identify and/or reduce source(s) of toxicity?</p> <p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p><input checked="" type="radio"/> N/A</p> <p>Please explain unless not applicable:</p> <p>_____</p>
---

<b>Total Points Generated</b>	<b>0</b>
<b>Score (100 - Total Points Generated)</b>	<b>100</b>
<b>Section Grade</b>	<b>A</b>

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 2015

## Effluent Quality and Plant Performance (Total Suspended Solids)

### 1. Effluent Total Suspended Solids Results

1.1 Verify the following monthly average effluent values, exceedances, and points for TSS:

Outfall No. 001	Monthly Average Limit (mg/L)	90% of Permit Limit >10 (mg/L)	Effluent Monthly Average (mg/L)	Months of Discharge with a Limit	Permit Limit Exceedance	90% Permit Limit Exceedance
January	20	18	3	1	0	0
February	20	18	3	1	0	0
March	20	18	3	1	0	0
April	20	18	4	1	0	0
May	20	18	5	1	0	0
June	20	18	8	1	0	0
July	20	18	3	1	0	0
August	20	18	5	1	0	0
September	20	18	6	1	0	0
October	20	18	3	1	0	0
November	20	18	3	1	0	0
December	20	18	5	1	0	0

\* Equals limit if limit is <= 10

Months of Discharge/yr	12		
<b>Points per each exceedance with 12 months of discharge:</b>		<b>7</b>	<b>3</b>
Exceedances		0	0
Points		0	0
<b>Total Number of Points</b>			<b>0</b>

NOTE: For systems that discharge intermittently to state waters, the points per monthly exceedance for this section shall be based upon a multiplication factor of 12 months divided by the number of months of discharge.

Example: For a wastewater facility discharging only 6 months of the year, the multiplication factor is  $12/6 = 2.0$

1.2 If any violations occurred, what action was taken to regain compliance?

No violations

<b>Total Points Generated</b>	0
<b>Score (100 - Total Points Generated)</b>	100
<b>Section Grade</b>	<b>A</b>

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 **2015**

## Effluent Quality and Plant Performance (Ammonia - NH3)

1. Effluent Ammonia Results									
1.1 Verify the following monthly and weekly average effluent values, exceedances and points for NH3									
Outfall No. 001	Monthly Average NH3 Limit (mg/L)	Weekly Average NH3 Limit (mg/L)	Effluent Monthly Average NH3 (mg/L)	Monthly Permit Limit Exceedance	Effluent Weekly Average for Week 1	Effluent Weekly Average for Week 2	Effluent Weekly Average for Week 3	Effluent Weekly Average for Week 4	Weekly Permit Limit Exceedance
January	13		.063846154	0					
February	13		.066666667	0					
March	13		.046923077	0					
April	12		.069285714	0					
May	2.7		.175	0					
June	2.7		.116153846	0					
July	2.7		.135	0					
August	2.7		.1175	0					
September	2.7		.16	0					
October	12		.052307692	0					
November	13		.306666667	0					
December	13		.083333333	0					
Points per each exceedance of Monthly average:									10
Exceedances, Monthly:									0
Points:									0
Points per each exceedance of weekly average (when there is no monthly average):									2.5
Exceedances, Weekly:									0
Points:									0
<b>Total Number of Points</b>									<b>0</b>
NOTE: Limit exceedances are considered for mothly OR weekly averages but not both. When a monthly average limit exists it will be used to detect exceedances and generate points. This will be true even if a weekly limit also exists. When a weekly average limit exists and a monthly limit does not exist, the weekly limit will be used to detect exceedances and gernate points.									
1.2 If any violations occurred, what action was taken to regain compliance?									
No violations									

<b>Total Points Generated</b>	0
<b>Score (100 - Total Points Generated)</b>	100
<b>Section Grade</b>	<b>A</b>



# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 **2015**

## Effluent Quality and Plant Performance (Phosphorus)

### 1. Effluent Phosphorus Results

1.1 Verify the following monthly average effluent values, exceedances, and points for Phosphorus

Outfall No. 001	Monthly Average phosphorus Limit (mg/L)	Effluent Monthly Average phosphorus (mg/L)	Months of Discharge with a Limit	Permit Limit Exceedance
January	3.2	1.4	1	0
February	3.2	1.4	1	0
March	3.2	1.0	1	0
April	3.2	0.8	1	0
May	3.2	1.1	1	0
June	3.2	1.2	1	0
July	3.2	1.7	1	0
August	3.2	2.4	1	0
September	3.2	2.0	1	0
October	3.2	2.1	1	0
November	3.2	1.4	1	0
December	3.2	0.9	1	0

Months of Discharge/yr	12	
<b>Points per each exceedance with 12 months of discharge:</b>		<b>10</b>
Exceedances		0
<b>Total Number of Points</b>		<b>0</b>

NOTE: For systems that discharge Intermittently to waters of the state, the points per monthly exceedance for this section shall be based upon a multiplication factor of 12 months divided by the number of months of discharge.  
Example: For a wastewater facility discharging only 6 months of the year, the multiplication factor is  $12/6 = 2.0$

1.2 If any violations occurred, what action was taken to regain compliance?

No violations

<b>Total Points Generated</b>	<b>0</b>
<b>Score (100 - Total Points Generated)</b>	<b>100</b>
<b>Section Grade</b>	<b>A</b>

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 **2015**

## Biosolids Quality and Management

### 1. Biosolids Use/Disposal

1.1 How did you use or dispose of your biosolids? (Check all that apply)

- Land applied under your permit
- Publicly Distributed Exceptional Quality Biosolids
- Hauled to another permitted facility
- Landfilled
- Incinerated
- Other

NOTE: If you did not remove biosolids from your system, please describe your system type such as lagoons, reed beds, recirculating sand filters, etc.

1.1.1 If you checked Other, please describe:

### 2. Land Application Site

2.1 Last Year's Approved and Active Land Application Sites

2.1.1 How many acres did you have?

43 acres

2.1.2 How many acres did you use?

0 acres

2.2 If you did not have enough acres for your land application needs, what action was taken?

2.3 Did you overapply nitrogen on any of your approved land application sites you used last year? 0

Yes (30 points)

No

2.4 Have all the sites you used last year for land application been soil tested in the previous 4 years?

Yes

No (10 points)

N/A

### 3. Biosolids Metals

Number of biosolids outfalls in your WPDES permit:

3.1 For each outfall tested, verify the biosolids metal quality values for your facility during the last calendar year.

#### Outfall No. 002 - Hauled Sludge

Parameter	80% of Limit	H.Q. Limit	Ceiling Limit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	80% Value	High Quality	Ceiling
Arsenic		75	41													<5.8	0	0
Cadmium		85	39													2.2	0	0
Copper		4300	1500													360	0	0
Lead		840	300													22	0	0
Mercury		57	17													<.62	0	0
Molybdenum																26	0	0
Nickel	336		420													23	0	0
Selenium	80		100													13	0	0
Zinc		7500	2800													730	0	0

3.1.1 Number of times any of the metals exceeded the high quality limits OR 80% of the limit for molybdenum, nickel, or selenium = 0

Exceedence Points

0 (0 Points)

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 **2015**

<p> <input type="radio"/> 1-2 (10 Points)  <input type="radio"/> &gt; 2 (15 Points)            3.1.2 If you exceeded the high quality limits, did you cumulatively track the metals loading at each land application site? (check applicable box)  <input type="radio"/> Yes  <input type="radio"/> No (10 points)  <input type="radio"/> N/A - Did not exceed limits or no HQ limit applies (0 points)  <input checked="" type="radio"/> N/A - Did not land apply biosolids until limit was met (0 points)            3.1.3 Number of times any of the metals exceeded the ceiling limits = 0            Exceedence Points  <input checked="" type="radio"/> 0 (0 Points)  <input type="radio"/> 1 (10 Points)  <input type="radio"/> &gt; 1 (15 Points)            3.1.4 Were biosolids land applied which exceeded the ceiling limit?  <input type="radio"/> Yes (20 Points)  <input checked="" type="radio"/> No (0 Points)            3.1.5 If any metal limit (high quality or ceiling) was exceeded at any time, what action was taken?            Has the source of the metals been identified?  <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div> </p>	0																				
<p> <b>4. Pathogen Control (per outfall):</b>            4.1 Verify the following information. If any information is incorrect, Contact Us.           <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr><td style="width: 40%;">Outfall Number:</td><td></td></tr> <tr><td>Biosolids Class:</td><td></td></tr> <tr><td>Bacteria Type and Limit:</td><td></td></tr> <tr><td>Sample Dates:</td><td style="text-align: center;">-</td></tr> <tr><td>Density:</td><td></td></tr> <tr><td>Sample Concentration Amount:</td><td></td></tr> <tr><td>Requirement Met:</td><td style="text-align: center;">No</td></tr> <tr><td>Land Applied:</td><td style="text-align: center;">No</td></tr> <tr><td>Process:</td><td></td></tr> <tr><td>Process Description:</td><td></td></tr> </table> <p>           4.2 If exceeded Class B limit or did not meet the process criteria at the time of land application.            4.2.1 Was the limit exceeded or the process criteria not met at the time of land application?  <input type="radio"/> Yes (40 Points)  <input checked="" type="radio"/> No            If yes, what action was taken?  <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div> </p> </p>	Outfall Number:		Biosolids Class:		Bacteria Type and Limit:		Sample Dates:	-	Density:		Sample Concentration Amount:		Requirement Met:	No	Land Applied:	No	Process:		Process Description:		0
Outfall Number:																					
Biosolids Class:																					
Bacteria Type and Limit:																					
Sample Dates:	-																				
Density:																					
Sample Concentration Amount:																					
Requirement Met:	No																				
Land Applied:	No																				
Process:																					
Process Description:																					
<p> <b>5. Vector Attraction Reduction (per outfall):</b>            5.1 Verify the following information. If any of the information is incorrect, Contact Us.           <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr><td style="width: 40%;">Outfall Number:</td><td></td></tr> <tr><td>Method Date:</td><td></td></tr> <tr><td>Option Used To Satisfy Requirement:</td><td></td></tr> <tr><td>Requirement Met:</td><td style="text-align: center;">No</td></tr> <tr><td>Land Applied:</td><td style="text-align: center;">No</td></tr> <tr><td>Limit (if applicable):</td><td></td></tr> <tr><td>Results (if applicable):</td><td></td></tr> </table> </p>	Outfall Number:		Method Date:		Option Used To Satisfy Requirement:		Requirement Met:	No	Land Applied:	No	Limit (if applicable):		Results (if applicable):								
Outfall Number:																					
Method Date:																					
Option Used To Satisfy Requirement:																					
Requirement Met:	No																				
Land Applied:	No																				
Limit (if applicable):																					
Results (if applicable):																					

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 2015

<p>5.2 Was the limit exceeded or the process criteria not met at the time of land application?</p> <p><input type="radio"/> Yes (40 Points)</p> <p><input checked="" type="radio"/> No</p> <p>If yes, what action was taken?</p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div>	0
<p>6. Biosolids Storage</p> <p>6.1 How many days of actual, current biosolids storage capacity did your wastewater treatment facility have either on-site or off-site?</p> <p><input checked="" type="radio"/> &gt;= 180 days (0 Points)</p> <p><input type="radio"/> 150 - 179 days (10 Points)</p> <p><input type="radio"/> 120 - 149 days (20 Points)</p> <p><input type="radio"/> 90 - 119 days (30 Points)</p> <p><input type="radio"/> &lt; 90 days (40 Points)</p> <p><input type="radio"/> N/A (0 Points)</p> <p>6.2 If you checked N/A above, explain why.</p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div>	0
<p>7. Issues</p> <p>7.1 Describe any outstanding biosolids issues with treatment, use or overall management:</p> <div style="border: 1px solid black; padding: 2px;">none</div>	

<b>Total Points Generated</b>	0
<b>Score (100 - Total Points Generated)</b>	100
<b>Section Grade</b>	<b>A</b>

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 **2015**

## Staffing and Preventative Maintenance (All Treatment Plants)

<p>1. Plant Staffing</p> <p>1.1 Was your wastewater treatment plant adequately staffed last year?</p> <ul style="list-style-type: none"> <li><input checked="" type="radio"/> Yes</li> <li><input type="radio"/> No</li> </ul> <p>If No, please explain:</p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div> <p>Could use more help/staff for:</p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div> <p>1.2 Did your wastewater staff have adequate time to properly operate and maintain the plant and fulfill all wastewater management tasks including recordkeeping?</p> <ul style="list-style-type: none"> <li><input checked="" type="radio"/> Yes</li> <li><input type="radio"/> No</li> </ul> <p>If No, please explain:</p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div>	
<p>2. Preventative Maintenance</p> <p>2.1 Did your plant have a documented AND implemented plan for preventative maintenance on major equipment items?</p> <ul style="list-style-type: none"> <li><input checked="" type="radio"/> Yes (Continue with question 2)</li> <li><input type="radio"/> No (40 points)</li> </ul> <p>If No, please explain, then go to question 3:</p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div> <p>2.2 Did this preventative maintenance program depict frequency of intervals, types of lubrication, and other tasks necessary for each piece of equipment?</p> <ul style="list-style-type: none"> <li><input checked="" type="radio"/> Yes</li> <li><input type="radio"/> No (10 points)</li> </ul> <p>2.3 Were these preventative maintenance tasks, as well as major equipment repairs, recorded and filed so future maintenance problems can be assessed properly?</p> <ul style="list-style-type: none"> <li><input checked="" type="radio"/> Yes             <ul style="list-style-type: none"> <li><input type="radio"/> Paper file system</li> <li><input checked="" type="radio"/> Computer system</li> <li><input type="radio"/> Both paper and computer system</li> </ul> </li> <li><input type="radio"/> No (10 points)</li> </ul>	0
<p>3. O&amp;M Manual</p> <p>3.1 Does your plant have a detailed O&amp;M Manual that can be used as a reference when needed?</p> <ul style="list-style-type: none"> <li><input checked="" type="radio"/> Yes</li> <li><input type="radio"/> No</li> </ul>	
<p>4. Overall Maintenance /Repairs</p> <p>4.1 Rate the overall maintenance of your wastewater plant.</p> <ul style="list-style-type: none"> <li><input checked="" type="radio"/> Excellent</li> <li><input type="radio"/> Very good</li> <li><input type="radio"/> Good</li> <li><input type="radio"/> Fair</li> <li><input type="radio"/> Poor</li> </ul> <p>Describe your rating:</p> <div style="border: 1px solid black; padding: 2px;">Maintenance is done on time as scheduled.</div>	

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 **2015**

<b>Total Points Generated</b>	<b>0</b>
<b>Score (100 - Total Points Generated)</b>	<b>100</b>
<b>Section Grade</b>	<b>A</b>

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 2015

## Operator Certification and Education

<p>1. Operator-In-Charge</p> <p>1.1 Did you have a designated operator-in-charge during the report year?</p> <ul style="list-style-type: none"> <li>● Yes (0 points)</li> <li>○ No (20 points)</li> </ul> <p>Name <input type="text" value="JEFFREY A BRATZ"/></p> <p>Certification No: <input type="text" value="17996"/></p>	<b>0</b>																																																																																							
<p>2. Certification Requirements</p> <p>2.1 In accordance with Chapter NR 114.56 and 114.57, Wisconsin Administrative Code, what level and subclass(es) were required for the operator-in-charge (OIC) to operate the wastewater treatment plant and what level and subclass(es) were held by the operator-in-charge?</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Sub Class</th> <th rowspan="2">SubClass Description</th> <th>WWTP</th> <th colspan="2">OIC</th> </tr> <tr> <th>Basic</th> <th>OIT</th> <th>Basic</th> <th>Advanced</th> </tr> </thead> <tbody> <tr> <td>A1</td> <td>Suspended Growth Processes</td> <td>X</td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>A2</td> <td>Attached Growth Processes</td> <td></td> <td>X</td> <td></td> <td></td> </tr> <tr> <td>A3</td> <td>Recirculating Media Filters</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>A4</td> <td>Ponds, Lagoons and Natural</td> <td></td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>A5</td> <td>Anaerobic Treatment Of Liquid</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>B</td> <td>Solids Separation</td> <td>X</td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>C</td> <td>Biological Solids/Sludges</td> <td>X</td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>P</td> <td>Total Phosphorus</td> <td></td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>N</td> <td>Total Nitrogen</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>D</td> <td>Disinfection</td> <td></td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>L</td> <td>Laboratory</td> <td>X</td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>U</td> <td>Unique Treatment Systems</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>SS</td> <td>Sanitary Sewage Collection</td> <td>X</td> <td>NA</td> <td>NA</td> <td>NA</td> </tr> </tbody> </table> <p>2.2 Was the operator-in-charge certified at the appropriate level and subclass(es) to operate this plant? (Note: Certification in subclass SS, N and A5 not required in 2015 - 2016; subclass SS is basic level only.)</p> <ul style="list-style-type: none"> <li>● Yes (0 points)</li> <li>○ No (20 points)</li> </ul>	Sub Class	SubClass Description	WWTP	OIC		Basic	OIT	Basic	Advanced	A1	Suspended Growth Processes	X			X	A2	Attached Growth Processes		X			A3	Recirculating Media Filters					A4	Ponds, Lagoons and Natural				X	A5	Anaerobic Treatment Of Liquid					B	Solids Separation	X			X	C	Biological Solids/Sludges	X			X	P	Total Phosphorus				X	N	Total Nitrogen					D	Disinfection				X	L	Laboratory	X			X	U	Unique Treatment Systems					SS	Sanitary Sewage Collection	X	NA	NA	NA	<b>0</b>
Sub Class			SubClass Description	WWTP	OIC																																																																																			
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U	Unique Treatment Systems																																																																																							
SS	Sanitary Sewage Collection	X	NA	NA	NA																																																																																			
<p>3. Succession Planning</p> <p>3.1 In the event of the loss of your designated operator-in-charge, did you have a contingency plan to ensure the continued proper operation and maintenance of the plant that includes one or more of the following options (check all that apply)?</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> One or more additional certified operators on staff</li> <li><input type="checkbox"/> An arrangement with another certified operator</li> <li><input type="checkbox"/> An arrangement with another community with a certified operator</li> <li><input type="checkbox"/> An operator on staff who has an operator-in-training certificate for your plant and is expected to be certified within one year</li> <li><input type="checkbox"/> A consultant to serve as your certified operator</li> <li><input type="checkbox"/> None of the above (20 points)</li> </ul> <p>If "None of the above" is selected, please explain:</p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<b>0</b>																																																																																							
<p>4. Continuing Education Credits</p> <p>4.1 If you had a designated operator-in-charge, was the operator-in-charge earning Continuing Education Credits at the following rates?</p> <p>OIT and Basic Certification:</p>																																																																																								

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 2015

<ul style="list-style-type: none"> <li><input type="radio"/> Averaging 6 or more CECs per year.</li> <li><input type="radio"/> Averaging less than 6 CECs per year.</li> </ul> <p>Advanced Certification:</p> <ul style="list-style-type: none"> <li><input checked="" type="radio"/> Averaging 8 or more CECs per year.</li> <li><input type="radio"/> Averaging less than 8 CECs per year.</li> </ul>	
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<b>Total Points Generated</b>	0
<b>Score (100 - Total Points Generated)</b>	100
<b>Section Grade</b>	<b>A</b>



# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 **2015**

## Financial Management

<p>1. Provider of Financial Information</p> <p>Name: <input type="text" value="Jeff Bratz"/></p> <p>Telephone: <input type="text" value="(262) 534-5910"/> (XXX) XXX-XXXX</p> <p>E-Mail Address (optional): <input type="text" value="eaglelake@tds.net"/></p>																									
<p>2. Treatment Works Operating Revenues</p> <p>2.1 Are User Charges or other revenues sufficient to cover O&amp;M expenses for your wastewater treatment plant AND/OR collection system ?</p> <p><input checked="" type="radio"/> Yes (0 points)</p> <p><input type="radio"/> No (40 points)</p> <p>If No, please explain:</p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div> <p>2.2 When was the User Charge System or other revenue source(s) last reviewed and/or revised? Year: <input type="text" value="2015"/></p> <p><input checked="" type="radio"/> 0-2 years ago (0 points)</p> <p><input type="radio"/> 3 or more years ago (20 points)</p> <p><input type="radio"/> N/A (private facility)</p> <p>2.3 Did you have a special account (e.g., CWFPP required segregated Replacement Fund, etc.) or financial resources available for repairing or replacing equipment for your wastewater treatment plant and/or collection system?</p> <p><input checked="" type="radio"/> Yes (0 points)</p> <p><input type="radio"/> No (40 points)</p>	0																								
<p><b>REPLACEMENT FUNDS [PUBLIC MUNICIPAL FACILITIES SHALL COMPLETE QUESTION 3]</b></p>																									
<p>3. Equipment Replacement Funds</p> <p>3.1 When was the Equipment Replacement Fund last reviewed and/or revised? Year: <input type="text" value="2015"/></p> <p><input checked="" type="radio"/> 1-2 years ago (0 points)</p> <p><input type="radio"/> 3 or more years ago (20 points)</p> <p><input type="radio"/> N/A</p> <p>If N/A, please explain:</p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div>																									
<p>3.2 Equipment Replacement Fund Activity</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;"><b>3.2.1 Ending Balance Reported on Last Year's CMAR</b></td> <td style="width: 5%;"></td> <td style="width: 5%; text-align: right;">\$</td> <td style="width: 30%; text-align: right;"><input type="text" value="79,050.90"/></td> </tr> <tr> <td>3.2.2 Adjustments - if necessary (e.g. earned interest, audit correction, withdrawal of excess funds, increase making up previous shortfall, etc.)</td> <td style="text-align: center;">+</td> <td style="text-align: right;">\$</td> <td style="text-align: right;"><input type="text" value="0.00"/></td> </tr> <tr> <td>3.2.3 Adjusted January 1st Beginning Balance</td> <td></td> <td style="text-align: right;">\$</td> <td style="text-align: right;"><input type="text" value="79,050.90"/></td> </tr> <tr> <td>3.2.4 Additions to Fund (e.g. portion of User Fee, earned interest, etc.)</td> <td style="text-align: center;">+</td> <td style="text-align: right;">\$</td> <td style="text-align: right;"><input type="text" value="10,151.10"/></td> </tr> <tr> <td>3.2.5 Subtractions from Fund (e.g., equipment replacement, major repairs - use description box 3.2.6.1 below*)</td> <td style="text-align: center;">-</td> <td style="text-align: right;">\$</td> <td style="text-align: right;"><input type="text" value="0.00"/></td> </tr> <tr> <td>3.2.6 Ending Balance as of December 31st for CMAR Reporting Year</td> <td></td> <td style="text-align: right;">\$</td> <td style="text-align: right;"><input type="text" value="89,202.00"/></td> </tr> </table>	<b>3.2.1 Ending Balance Reported on Last Year's CMAR</b>		\$	<input type="text" value="79,050.90"/>	3.2.2 Adjustments - if necessary (e.g. earned interest, audit correction, withdrawal of excess funds, increase making up previous shortfall, etc.)	+	\$	<input type="text" value="0.00"/>	3.2.3 Adjusted January 1st Beginning Balance		\$	<input type="text" value="79,050.90"/>	3.2.4 Additions to Fund (e.g. portion of User Fee, earned interest, etc.)	+	\$	<input type="text" value="10,151.10"/>	3.2.5 Subtractions from Fund (e.g., equipment replacement, major repairs - use description box 3.2.6.1 below*)	-	\$	<input type="text" value="0.00"/>	3.2.6 Ending Balance as of December 31st for CMAR Reporting Year		\$	<input type="text" value="89,202.00"/>	
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# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 2015

All Sources: This ending balance should include all Equipment Replacement Funds whether held in a bank account(s), certificate(s) of deposit, etc.

3.2.6.1 Indicate adjustments, equipment purchases, and/or major repairs from 3.2.5 above.

No adjustments

3.3 What amount should be in your Replacement Fund? \$ 89,000.00

Please note: If you had a CWFP loan, this amount was originally based on the Financial Assistance Agreement (FAA) and should be regularly updated as needed. Further calculation instructions and an example can be found by clicking the HELP link under Info in the left-side menu.

3.3.1 Is the December 31 Ending Balance in your Replacement Fund above, (#3.2.6) equal to, or greater than the amount that should be in it (#3.3)?

- Yes
- No

If No, please explain.

## 4. Future Planning

4.1 During the next ten years, will you be involved in formal planning for upgrading, rehabilitating, or new construction of your treatment facility or collection system?

- Yes - If Yes, please provide major project information, if not already listed below.
- No

Project #	Project Description	Estimated Cost	Approximate Construction Year
1	Additional treatment will need to be added due our new permit. I have no idea where this money will come from, we have a large loan for the plant upgrade now.	2000000	2023

## 5. Financial Management General Comments

<b>Total Points Generated</b>	0
<b>Score (100 - Total Points Generated)</b>	100
<b>Section Grade</b>	<b>A</b>

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 2015

## Sanitary Sewer Collection Systems

### 1. CMOM Program

1.1 Do you have a Capacity, Management, Operation & Maintenance (CMOM) requirement in your WPDES permit?

- Yes
- No

1.2 Did you have a documented (written records/files, computer files, video tapes, etc.) sanitary sewer collection system operation & maintenance (O&M) or CMOM program last calendar year?

- Yes (Continue with question 1)
- No (30 points) (Go to question 2)

1.3 Check the elements listed below that are included in your O&M or CMOM program.

Goals

Describe the specific goals you have for your collection system:

Keep the collection system in good operation condition. Reduce the I&I in the system and continue to rehab any areas that are found to be defective.

Organization

Do you have the following written organizational elements (check only those that apply)?

- Ownership and governing body description
- Organizational chart
- Personnel and position descriptions
- Internal communication procedures
- Public information and education program

Legal Authority

Do you have the legal authority for the following (check only those that apply)?

- Sewer use ordinance Last Revised Date (MM/DD/YYYY) 07/14/2015
- Pretreatment/industrial control Programs
- Fat, oil and grease control
- Illicit discharges (commercial, industrial)
- Private property clear water (sump pumps, roof or foundation drains, etc.)
- Private lateral inspections/repairs
- Service and management agreements

Maintenance Activities (provide details in question 2)

Design and Performance Provisions

How do you ensure that your sewer system is designed and constructed properly?

- State plumbing code
- DNR NR 110 standards
- Local municipal code requirements
- Construction, inspection, and testing
- Others:

Overflow Emergency Response Plan:

Does your emergency response capability include (check only those that apply)?

- Alarm system and routine testing
- Emergency equipment
- Emergency procedures
- Communications/notifications (DNR, internal, public, media, etc.)

Capacity Assurance:

How well do you know your sewer system? Do you have the following?

- Current and up-to-date sewer map

# Compliance Maintenance Annual Report

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6/15/2016 2015

<input checked="" type="checkbox"/> Sewer system plans and specifications <input checked="" type="checkbox"/> Manhole location map <input checked="" type="checkbox"/> Lift station pump and wet well capacity information <input checked="" type="checkbox"/> Lift station O&M manuals Within your sewer system have you identified the following? <input checked="" type="checkbox"/> Areas with flat sewers <input checked="" type="checkbox"/> Areas with surcharging <input checked="" type="checkbox"/> Areas with bottlenecks or constrictions <input checked="" type="checkbox"/> Areas with chronic basement backups or SSOs <input checked="" type="checkbox"/> Areas with excess debris, solids, or grease accumulation <input type="checkbox"/> Areas with heavy root growth <input checked="" type="checkbox"/> Areas with excessive infiltration/inflow (I/I) <input type="checkbox"/> Sewers with severe defects that affect flow capacity <input checked="" type="checkbox"/> Adequacy of capacity for new connections <input checked="" type="checkbox"/> Lift station capacity and/or pumping problems <input checked="" type="checkbox"/> Annual Self-Auditing of your O&M/CMOM Program to ensure above components are being implemented, evaluated, and re-prioritized as needed <input checked="" type="checkbox"/> Special Studies Last Year (check only those that apply): <input checked="" type="checkbox"/> Infiltration/Inflow (I/I) Analysis <input type="checkbox"/> Sewer System Evaluation Survey (SSES) <input type="checkbox"/> Sewer Evaluation and Capacity Management Plan (SECAP) <input type="checkbox"/> Lift Station Evaluation Report <input type="checkbox"/> Others: <div style="border: 1px solid black; height: 20px; width: 100%;"></div>	0
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2. Operation and Maintenance

2.1 Did your sanitary sewer collection system maintenance program include the following maintenance activities? Complete all that apply and indicate the amount maintained.

Cleaning	5	% of system/year
Root removal	0	% of system/year
Flow monitoring	100	% of system/year
Smoke testing	0	% of system/year
Sewer line televising	5	% of system/year
Manhole inspections	25	% of system/year
Lift station O&M	12	# per L.S./year
Manhole rehabilitation	0	% of manholes rehabbed
Mainline rehabilitation	0	% of sewer lines rehabbed
Private sewer inspections	0	% of system/year
Private sewer I/I removal	0	% of private services

Please include additional comments about your sanitary sewer collection system below:

We have identified some areas where there is lateral clear water intrusion and are planning lateral televising this year in those areas.

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

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6/15/2016 **2015**

### 3. Performance Indicators

3.1 Provide the following collection system and flow information for the past year.

38.72	Total actual amount of precipitation last year in inches
35.5	Annual average precipitation (for your location)
14	Miles of sanitary sewer
4	Number of lift stations
0	Number of lift station failures
0	Number of sewer pipe failures
0	Number of basement backup occurrences
0	Number of complaints
.244	Average daily flow in MGD (if available)
.434	Peak monthly flow in MGD (if available)
	Peak hourly flow in MGD (if available)

3.2 Performance ratios for the past year:

0.00	Lift station failures (failures/year)
0.00	Sewer pipe failures (pipe failures/sewer mile/yr)
0.00	Sanitary sewer overflows (number/sewer mile/yr)
0.00	Basement backups (number/sewer mile)
0.00	Complaints (number/sewer mile)
1.8	Peaking factor ratio (Peak Monthly:Annual Daily Avg)
0.0	Peaking factor ratio (Peak Hourly:Annual Daily Avg)

### 4. Overflows

#### LIST OF SANITARY SEWER (SSO) AND TREATMENT FACILITY (TFO) OFERFLOWS REPORTED \*\*

Date	Location	Cause	Estimated Volume (MG)
None reported			

\*\* If there were any SSOs or TFOs that are not listed above, please contact the DNR and stop work on this section until corrected.

### 5. Infiltration / Inflow (I/I)

5.1 Was infiltration/inflow (I/I) significant in your community last year?

Yes

No

If Yes, please describe:

5.2 Has infiltration/inflow and resultant high flows affected performance or created problems in your collection system, lift stations, or treatment plant at any time in the past year?

Yes

No

If Yes, please describe:

5.3 Explain any infiltration/inflow (I/I) changes this year from previous years:

No changes

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

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6/15/2016 2015

5.4 What is being done to address infiltration/inflow in your collection system?	
We are televising areas where I&I have been identified and will fixed the areas found to be an issue.	

<b>Total Points Generated</b>	0
<b>Score (100 - Total Points Generated)</b>	100
<b>Section Grade</b>	<b>A</b>

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 2015

## Grading Summary

WPDES No: 0031526

SECTIONS	LETTER GRADE	GRADE POINTS	WEIGHTING FACTORS	SECTION POINTS
Influent	A	4	3	12
BOD/CBOD	A	4	10	40
TSS	A	4	5	20
Ammonia	A	4	5	20
Phosphorus	A	4	3	12
Biosolids	A	4	5	20
Staffing/PM	A	4	1	4
OpCert	A	4	1	4
Financial	A	4	1	4
Collection	A	4	3	12
<b>TOTALS</b>			<b>37</b>	<b>148</b>
<b>GRADE POINT AVERAGE (GPA) = 4.00</b>				

Notes:

- A = Voluntary Range (Response Optional)
- B = Voluntary Range (Response Optional)
- C = Recommendation Range (Response Required)
- D = Action Range (Response Required)
- F = Action Range (Response Required)

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 2015

## Resolution or Owner's Statement

Name of Governing

Body or Owner:

Eagle Lake Sewer Utility District Commission

Date of Resolution or  
Action Taken:

6/13/2016

Resolution Number:

2016-01

Date of Submittal:

### ACTIONS SET FORTH BY THE GOVERNING BODY OR OWNER RELATING TO SPECIFIC CMAR SECTIONS (Optional for grade A or B. Required for grade C, D, or F):

Influent Flow and Loadings: Grade = A

Effluent Quality: BOD: Grade = A

Effluent Quality: TSS: Grade = A

Effluent Quality: Ammonia: Grade = A

Effluent Quality: Phosphorus: Grade = A

Biosolids Quality and Management: Grade = A

Staffing: Grade = A

Operator Certification: Grade = A

Financial Management: Grade = A

Collection Systems: Grade = A

(Regardless of grade, response required for Collection Systems if SSOs were reported)

### ACTIONS SET FORTH BY THE GOVERNING BODY OR OWNER RELATING TO THE OVERALL GRADE POINT AVERAGE AND ANY GENERAL COMMENTS

(Optional for G.P.A. greater than or equal to 3.00, required for G.P.A. less than 3.00)

G.P.A. = 4.00



# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 2015

## DNR Response to Resolution or Owner's Statement

Name of Governing  
Body or Owner:

Eagle Lake Sewer Utility District Commission

Date of Resolution or  
Action Taken:

6/13/2016

Resolution Number:

2016-01

Date of Submittal:

6/15/2016

### ACTIONS SET FORTH BY THE GOVERNING BODY OR OWNER RELATING TO SPECIFIC CMAR SECTIONS (Optional for grade A or B. Required for grade C, D, or F):

Influent Flow and Loadings: Grade = A

**Permittee Response:**

**DNR Response:**

Effluent Quality: BOD: Grade = A

**Permittee Response:**

**DNR Response:**

Effluent Quality: TSS: Grade = A

**Permittee Response:**

**DNR Response:**

Effluent Quality: Ammonia: Grade = A

**Permittee Response:**

**DNR Response:**

Effluent Quality: Phosphorus: Grade = A

**Permittee Response:**

**DNR Response:**

Biosolids Quality and Management: Grade = A

**Permittee Response:**

**DNR Response:**

Staffing: Grade = A

**Permittee Response:**

**DNR Response:**

# Compliance Maintenance Annual Report

Eagle Lake Sewer Utility

Last Updated: Reporting For:  
6/15/2016 **2015**

Operator Certification: Grade = A <b>Permittee Response:</b>  <b>DNR Response:</b> <input type="text"/>
Financial Management: Grade = A <b>Permittee Response:</b>  <b>DNR Response:</b> <input type="text"/>
Collection Systems: Grade = A (Regardless of grade, response required for Collection Systems if SSOs were reported) <b>Permittee Response:</b>  <b>DNR Response:</b> <input type="text"/>
<b>ACTIONS SET FORTH BY THE GOVERNING BODY OR OWNER RELATING TO THE OVERALL GRADE POINT AVERAGE AND ANY GENERAL COMMENTS</b> (Optional for G.P.A. greater than or equal to 3.00, required for G.P.A. less than 3.00) <b>G.P.A. = 4</b> <b>Permittee Response:</b>  <b>DNR G.P.A. Response:</b> <input type="text"/>
<b>DNR CMAR Overall Response:</b> <input type="text"/> <p>Thank you for completing and submitting your 2015 CMAR. Based on the overall score of your facility, there are no other requirements at this time.</p> <p>CMOMs were to be completed and ready for implementation on August 1, 2016. To be in full compliance of the CMOM code NR 210.23, please be sure to review your CMOM to ensure it contains all the components and items under each component of the code.</p>
<b>DNR Reviewer:</b> Thompson, Timothy <b>Address:</b> 2300 N Dr Martin Luther King Jr Dr, Milwaukee, WI 53212 <b>Phone:</b> (414) 263-8525 <b>Date:</b> 8/12/2016