WR02

Pine River and Willow Creek

Priority Watershed Water Quality

Appraisal Monitoring Plan

Added to SWIMS 1/2015

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I. INTRODUCTION

The Pine River and Willow Creek watershed was selected as a priority watershed project in 1995 under the Wisconsin Nonpoint Source Pollution Abatement Program. Before implementation of nonpoint source pollution abatement measures, a water resources appraisal must be conducted to evaluate the condition of the water resources. This report provides a description of appraisal monitoring activities for the streams, lakes, and groundwater in the Pine River and Willow Creek watershed. Preliminary water resource objectives will be developed from this appraisal.

The Pine River and Willow Creek watershed ranked high priority for selection based on surface water quality and medium priority based on groundwater quality under the nonpoint source watershed selection process.

II. DESCRIPTION OF THE WATERSHED

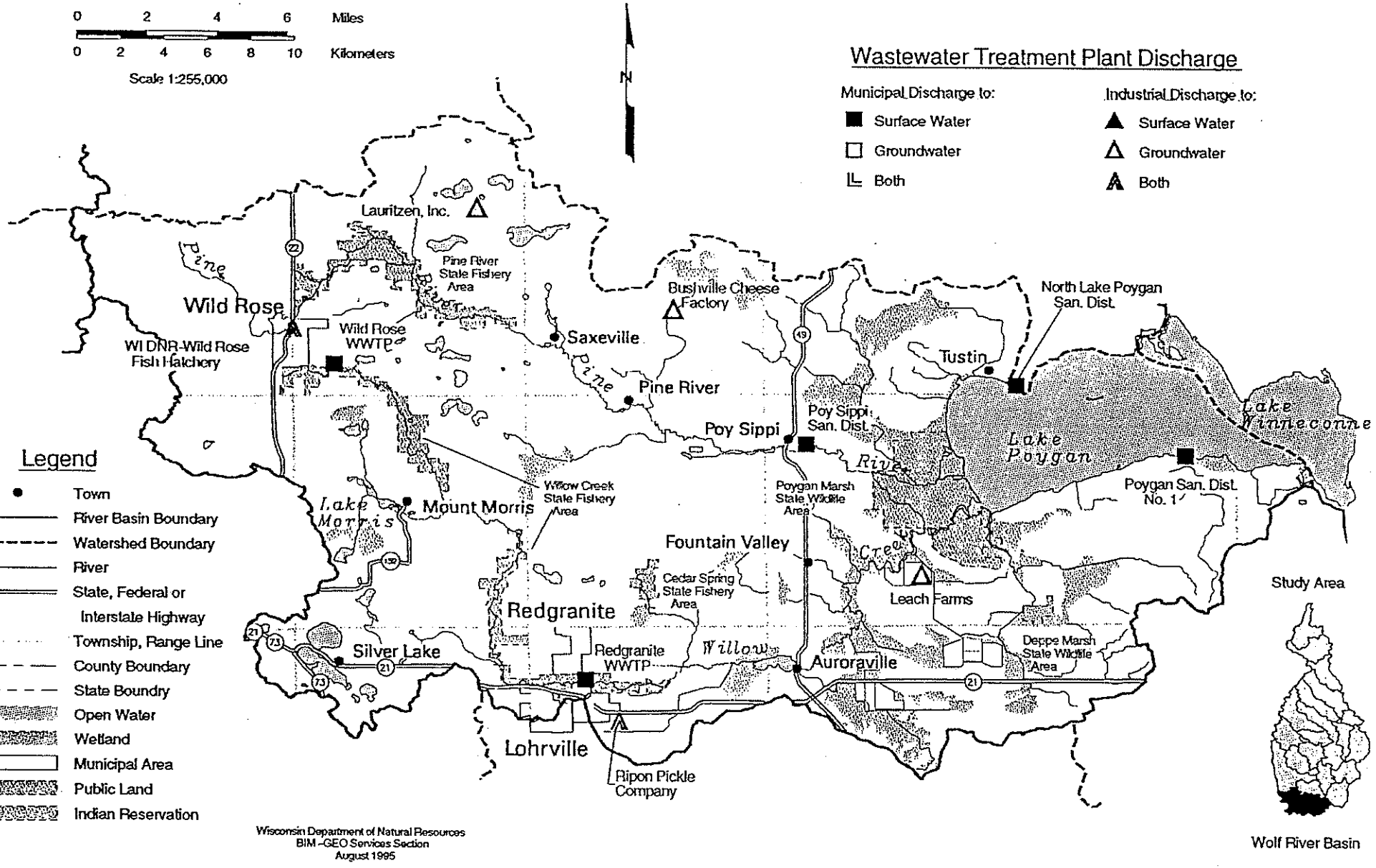
The Pine River and Willow Creek watershed (Figure 1) is 288 square miles and is located in Waushara (82%), Winnebago (14%), and Waupaca (4%) Counties. The Pine River and Willow Creek, including several tributaries to these systems, and several direct drainage tributaries to Lake Poygan make up the watershed drainage area.

Land use in the watershed consists of agriculture, forests, wetlands, and residential. Most of the watershed streams are cold water trout streams. Many are classified as exceptional resource waters. The watershed lakes are generally in good condition. The seepage lakes are generally hard water marl lakes with low ortho-phosphorus levels. The millponds are more likely to have aquatic plant and sedimentation problems. Groundwater quality is also generally good; however, it is very hard and locally high in iron.

III. SUMMARY OF EXISTING DATA

Appendix A contains a summary of existing water quality data for the Pine River and Willow Creek watershed. Fisheries data can be found in the fish management files located in the Wautoma and Oshkosh Area DNR field offices.

Figure 1. # Pine and Willow Rivers Watershed (WR02)



IV. MONITORING ACTIVITIES

A water resource appraisal was initiated for this project in fall 1995 and is scheduled for completion in winter 1996/97. This monitoring will help determine existing and potential conditions of the water resources. The results will be summarized in an appraisal report. This report will include water resource goals and objectives for the Pine River and Willow Creek priority watershed. Following is a summary of appraisal monitoring activities for the watershed project.

Macroinvertebrate

Aquatic macroinvertebrate samples were collected in fall 1995 at six locations in the watershed. Samples were collected at Willow Creek at Beaver Ave., Pine River at CTH A and CTH K, Humphrey Creek at CTH K, Little Silver Creek at 28th Court, and Kaminski Creek at CTH K. Samples will again be collected in spring 1996 at these same locations. Samples will be sent to UW-Stevens Point for sorting and identification. Sample results will be evaluated using Hilsenhoff Biotic Index (HBI) and the Ephemeroptera, Plecoptera, Tricoptera (EPT) index. The HBI provides a relative measure of organic loading to streams (Hilsenhoff, 1987). The EPT is the percent Ephemeroptera, Plecoptera, Trichoptera genera out of the total number of genera in a sample. These insect orders are generally known to be intolerant of pollution.

Habitat Evaluations

Stream habitat conditions will be evaluated at the same stream sites as the macroinvertebrate samples plus at several others locations throughout the watershed. A matrix is used to numerically rank habitat characteristics from excellent to poor to assess physical factors that may limit the quantity and quality of aquatic life (Ball, 1982).

Dissolved Oxygen and Temperature Monitoring

Dissolved oxygen and temperature will be spot checked at several locations throughout the watershed. In addition, continuous dissolved oxygen and temperature meters will be placed in Pumpkinseed Creek, Pine River, Willow Creek, Carpenter Creek, Cedar Springs Creek, and upstream and downstream of the Auroraville Millpond for two week periods in mid-summer. Wisconsin Administrative Code NR102 states that dissolved oxygen in cold water streams shall not be lowered to less than 6 mg/l so that trout populations are not adversely affected nor lower than 5 mg/l in warm water streams.

Water Chemistry Samples

Water samples will be collected during two runoff events in Pumpkinseed Creek, Carpenter Creek, and Bruce Creek. Samples will be analyzed for ammonia, nitrates, total and dissolved phosphorus, suspended solids, and biochemical oxygen demand. Stream flow will be collected at the same time. All samples will be collected and preserved following the Field Procedures Manual (1988).

Lake Monitoring

Water chemistry samples to determine trophic status will be taken on three drainage lakes in the watershed. Sampling will be done on Kristine Lake, Pine Lake, and Little Hills Lake which will be determined later. Internal phosphorus loading will be determined using computer models.

A shoreline inventory index will be developed and conducted on as many lake as possible in this watershed. This index will determine shoreline development and suitability of aquatic life habitat in the littoral area.

Baseline nitrate-nitrogen monitoring will be done in winter to link land use and groundwater discharge and surface water impacts. Thirty sites total on the Pine and Willow Rivers will be sampled one time. The primary water source for streams in winter is groundwater discharge in these highly permeable soils. Very little surface runoff influences these streams in winter. The information from the streams will be combined with existing lake nitrate-nitrogen data and plotted on a map of the watershed. High values, particularly if they are clustered, will indicate excessive use of nitrogen in the area of groundwater recharge.

Groundwater Monitoring

Waushara and Winnebago County Land Conservation Department staff will collect well water samples during inventorying. Samples will be analyzed for nitrates. The counties will be allotted up to one sample per square mile in the watershed. Monitoring procedures and guidelines will be provided to the county staff by Laura Chern.

Slides

Color slides of the surface water resources will be taken throughout the watershed in spring, summer, and fall. These slides can be used for information and education purposes throughout the planning, implementation, and evaluation phases of this project.

Fish Surveys

Fisheries surveys may be conducted in the watershed pending funding. Approximately 30 sites in the watershed will be monitored and assessed using methods described in Lyons (1992, Index of Biotic Integrity (IBI)). The IBI is an index based on attributes of fish assemblages used to assess biotic integrity and environmental health of the streams. In addition, most of the index stations located in the coldwater streams will also be sampled for trout abundance and condition factors. Habitat evaluations will be conducted.

V. REFERENCES

Wisconsin Department of Natural Resources, 1991. Wolf River Basin Water Quality Management Plan.

Hab → Ball, Joe, 1982. Stream Classification Guidelines for Wisconsin: Wisconsin Department of Natural Resources.

Wisconsin Department of Natural Resources, 1988. Field Procedures Manual. Draft 2nd Edition.

Wisconsin Department of Natural Resources. Lake Michigan District Water Quality Files.

Hilsenhoff, William, 1987. An Improved Biotic Index of Organic Stream Pollution.

Lyons, J., T.D. Simonson, and L. Wang. In Press. Development and Validation of an Index of Biotic Integrity for Coldwater Streams in Wisconsin. North American Journal of Fisheries Management.

Lyons, J., 1992. Using the Index of Biotic Integrity (IBI) to Measure Environmental Quality in Warmwater Streams in Wisconsin. U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station, General Technical Report NC-149.

Appendix A.

Summary of Existing Water Quality Data in the Pine River and Willow Creek Watershed

1. Wolf River Water Quality Management Plan - draft 1995. (See attached pages from the draft management plan for both streams and lakes information).

2. Surface Water Resources of Waushara County - DNR, 1970. (See attached copies from the report for stream information only).

3. Pollution Studies (reports in the Water Resources Management files):

   A. Lower Pine River Post-Operational Study conducted in 1991 and 1992 to determine water quality impacts of the Wild Rose Fish Hatchery and the Wild Rose Wastewater Facility and to determine background metals concentrations and possible impacts by the wastewater treatment facility. Study found there was relatively little change in physical, chemical, and biological characteristics of the Lower Pine River from previous studies and that the wastewater treatment facility is not significantly impacting the Lower Pine River in terms of metals loading.

   B. Point Source Impact Study of Willow Creek below the village of Redgranite Treatment Plant and Ripon Pickle Company by Michael Reif 1983.

   C. Pine River - Willow Creek Watershed Hilsenhoff Sampling spring and fall 1979 by Tim Doelger. Study to determine general water quality conditions throughout the watershed found:

      Upper Pine River - 17th Drive off CTH AA spring, good/very good; fall, very good water quality.
      Pine River - Apache Road - spring, excellent; fall, very good
      Pine River - off CTH A - spring, good/very good; fall, very good
      Willow Creek - Black Road - spring and fall, excellent
      Willow Creek - Redgranite Road - spring and fall, excellent
      Willow Creek - Auroraville - spring and fall, poor

   D. Water Quality Evaluation of Cedar Springs by Michael Reif in 1982. Study to determine general water quality of Cedar Springs - a 1.8 acre hard water brook trout spring pond which feed Cedar Springs Creek. It is located in a tamarack bog and was dredged in 1978. Study found excellent water quality.

E. Hatchery Effluent Effects Upon Humphrey Creek study in 1978 by Richard Greene, Peter Segerson, and Kurt Welke. Study found significant decline in water quality from the Wild Rose Hatchery using Hilsenhoff biotic index. The study also found concentrations of nitrogen and phosphorus were increased immediately below the hatchery and that the two settling ponds between sampling sites significantly reduced the nutrient load entering Humphery Creek.

F. Lower Pine River Diurnal Dissolved Oxygen Survey in 1989 by Tim Doelger. The study found the river to be capable of assimilating the discharge from the DNR hatchery in terms of oxygen demanding wastes, but the nutrients, particularly phosphorus, were causing an over abundance of macrophytes.

4. Basin assessment trend monitoring data - monthly water chemistry data for the Pine River at 28th Court and Willow Creek at CTH EE in 1995 along with macroinvertebrate data in both spring and fall.

5. The Winnebago Comprehensive Management Plan - DNR, 1989 ranked the Pine River and Willow Creek as high priority for selection as a priority watershed project based on substantial critical animal waste problems in the eastern half of the watershed. Soil erosion at rates above 2 T/A/YR combined with local animal waste delivery and instream erosion have resulted in accelerated deterioration of trophic status of mill ponds located on the Pine River and Willow Creek.

6. Northeast Wisconsin Waters For Tomorrow, Inc - 1993 estimated that the 1990 phosphorus loading from the Pine River and Willow Creek watershed was 2,375 pounds which is 3.6% of the total phosphorus loading from the entire Wolf River Basin. Total suspended solids loading was 16,038 pounds which is 4.6% of the total loading from the Wolf River Basin. These estimates were made using computer models and were not field verified.

7. Laura Chern (1/8/96) put together a summary of existing groundwater information for the watershed. This summary was passed out at our first workgroup meeting on 1/9/96. This watershed ranked medium priority for selection as a priority watershed based on groundwater contamination susceptibility and known groundwater problems.