

Town of Wausaukee Lakes Planning Assessment

Marinette County, Wisconsin

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CHAPTER 1 - INTRODUCTION

CONTRACT WITH BLRPC

The Town of Wausaukee Board entered into a contract with the Bay-Lake Regional Planning Commission to prepare an assessment of the town and in particular the 22 lakes within the town, including Morgan, Island, Grass, Long and Wolf Lakes.

The Town Board worked jointly with the UW-Extension Agent, Marinette County Solid Waste and Zoning Administrator, and the Bay-Lake Regional Planning Commission to prepare the document. The Town Board provided important comment on the needs of the town and lakes as well as reviewing the information which was developed as a result of the Lake Planning Grant. Utilizing the information obtained from a nominal group survey process, the UW-Extension Agent identified important issues and concerns regarding the future development of the town of Wausaukee. The issues and concerns were used to develop the goals, objectives, and policies of the plan.

This project is a first step in the development of a comprehensive land use plan for the town of Wausaukee. It will be used as a pilot project that will be applied to similar lakes in Marinette County that have a low rate of second home development and that are located in areas that are very rural in nature. This project will collect and assess the types of social, physical and regulatory data that are available for the lakes and their watersheds. The project will identify deficiencies in data and make recommendations for additional data collection that will be the subject of future grant applications.

Plan Contents

This planning assessment contains five chapters: **Chapter 1:** Introduction, contains the goals and objectives of the report; **Chapter 2:** General Physical Setting, provides a description of the natural features, soils, climate and geology of the planning area; **Chapter 3:** Population, presents information on the population and housing characteristics of the town; **Chapter 4:** Land Use, contains a land use inventory for the town, inventory of existing land use controls in the town and county and develops a density of development for the five lakes pertinent to the assessment; **Chapter 5:** presents the findings of the planning assessment as well as recommendations based off of the findings in order to alleviate some of the citizen concerns derived through the nominal group process.

State Planning Enabling Legislation

Under §66.945 of Wisconsin State Statutes, regional planning commissions perform land use and thoroughfare studies as part of a regional master plan. The Bay-Lake Regional Planning Commission undertakes the development of comprehensive land use and master plans, zoning ordinances and impact studies as part of its regional master plan in an effort to provide planning and land use assistance to communities within the region. Recent examples of plans and studies completed by the Commission include: *Lakes Planning Assessment for the Spread Eagle Chain of Lakes, Florence County*; *Town of Peshtigo Comprehensive Land Use Plan*; *Wetland Protection Study, Town of Peshtigo and the Cities of Peshtigo and Marinette*; *Oconto West Shore Cumulative and Secondary Impacts Study*; *Town of Red River Land Use Plan*; and *Town of Abrams Comprehensive Land Use Plan*.

PAST PLANNING EFFORTS

The town of Wausaukee and Marinette County have been involved in a number of planning efforts and studies over the years. Listed below are past, and current plans and studies that contain information and recommendations for the town of Wausaukee. It is important to note that these plans, if available, should be revisited from time to time in order to check on their implementation progress, or to review their goals to see if they have been achieved.

Table 1. 1: Past Planning Efforts, Town of Wausaukee

YEAR	TITLE	AUTHOR
1992	Marinette County Resource Report - Menominee River Basin Study	US Dept. of Agriculture
1990	Marinette County Community Development Plan	Bay-Lake RPC
1979	Marinette County Farmland Preservation Plan	Community Research & Management, Inc.
1979	Marinette County Snowmobile Facility Plan 1979-1984	UW-Extension
1977	Marinette County Resources Conservation Program	Marinette Co. Soil & Water Conservation District
1971	Marinette County Outdoor Recreation Plan	Northeastern Wisconsin RPC
1970	Marinette County Sewer and Water Plan	Max Anderson Associates

Source: Bay-Lake Regional Planning Commission, 1999.

COMPREHENSIVE PLANNING PROCESS

With Wisconsin's new "Smart Growth Law", town plans should be undertaken in accordance with the definition of a comprehensive plan as contained in Wis. Stats. §66.0295 Comprehensive Planning. The Smart Growth Law requires that beginning January 1, 2010, any program or action of a local government unit that affects land uses shall be consistent with that local governmental unit's comprehensive plan, and that comprehensive plan must be prepared in accordance with §66.0295.

A comprehensive plan is an official public document adopted by a local government as a policy guide setting forth its major policies concerning desirable future physical development of the community. It includes all the functional elements of the community; summarizes policies and proposals and plans for potential problems and possibilities for the future. It includes an inventory of the existing natural, socioeconomic and developmental features of the community, a set of goals and objectives, and a list of recommendations to accomplish the community's goals and direct the future growth in an orderly, well thought out manner. The plan is based on the specific recommendations of municipal officials and citizens who have expressed their desires concerning how and where future development should take place in their community. The primary function is to look into the future and develop a long term growth plan for the community. The plan provides guidelines for zoning, developmental and public improvement decisions.

Preparation of a comprehensive plan is a four stage process. Initially, municipal officials and citizens develop a set of goals and priorities to define the future direction for the community. These goals and priorities provide the basic framework upon which the plan is developed.

The second stage, inventory and interpretation, begins with the collection of data on existing land use, socioeconomic conditions, municipal services and environmental features. The data is then analyzed and systematized to identify existing and potential problem areas.

Development of a sketch plan is the third stage. The results of the inventory and interpretation stage are combined with the community goals to create a long-range plan to guide the future

growth. This plan is presented to the public officials and citizens of the community for their review and comment. The comments are considered for inclusion in the final plan recommendations.

The fourth stage establishes the tools necessary for implementation of the plan. Regulatory techniques are utilized to insure that the intent of the plan will be achieved. Although this is listed as the final stage in the planning process, it is by no means the end.

Planning is a continual on-going process that is subject to change and modification in order to reflect existing trends and new concepts. Thus, there is no beginning or end to the planning process, but rather a continuum of events and responses to events.

This study will accomplish the first stage (goals) and the second stage (inventory and interpretation) providing the town of Wausaukee with two of the important parts of developing a comprehensive land use plan.

COMMUNITY GOALS AND OBJECTIVES

A major element of the planning process is the identification of community development goals and objectives. This identification is often difficult, as values held by citizens are highly elusive and complex. People vary widely in their choice of values and the degree to which they will accept or tolerate differing attitudes.

Goals and objectives each have a distinct and different purpose within the planning process:

- Goals describe desired situations toward which planning efforts should be directed. They are broad and long range. They represent an end to be sought, although they may never actually be fully attained.
- Objectives describe more specific purposes that should be sought in order to advance toward the achievement of the overall goals.
- Policies describe a specific approach to meeting an objective.

One of the best ways to identify a community's priorities for community development and natural resources to be addressed by a planning assessment is to perform a nominal group survey. The UW-Extension Agent conducted a nominal group survey at the beginning of the planning process on August 24, 1999 to identify key issues. The results of the nominal group survey identified the key issues listed below.

The nominal group survey was conducted during a workshop and was organized to identify the issues of the community and to generate policies to address them. The nominal group process identified four priority issues and needs of citizens of the town of Wausaukee. The following are the four issues that most concerned citizens at the time of the workshop:

- Need for more business development and industry to keep people in the town with higher wages.
- Need for law enforcement, fire protection and services to meet growth.
- Concern about impact of growth on taxes.
- Concern for controlling subdivision development and small lots.

Appendix A has the complete nominal group results.

There were three main goals that can be identified from the issues describe by the citizens in the nominal group:

1. Provide opportunities for economic growth for industry.
2. Provide means for controlling growth within the town.
3. Provide increased services and infrastructure without increasing taxes.

It should be noted that the nominal group session was attended by only a few people. Before proceeding with future planning, another session should be scheduled, or a town wide survey should be administered to get a better understanding of the town's issues and needs.

CHAPTER 2 - GENERAL PHYSICAL SETTING

INTRODUCTION

Statement of Purpose

This section is intended to provide an inventory of the existing physical and environmental features within the planning area. Builders, elected officials and property owners need to consider how these resources are affected by development in order to eliminate costly mistakes and a variety of construction or environmental problems. Some of the factors which need to be considered include: wetlands, floodways and floodplains, bedrock geology, scientific and natural areas, woodlands, unique wildlife habitats, areas of steep slope, and historic and archeological sites. Many of these features are found in corridors that are located along rivers, streams, shorelines and natural drainageways and are essential to the maintenance of an ecological balance and diversity, as well as for the preservation of the natural beauty of the area.

Description of the Town of Wausaukee Planning Area

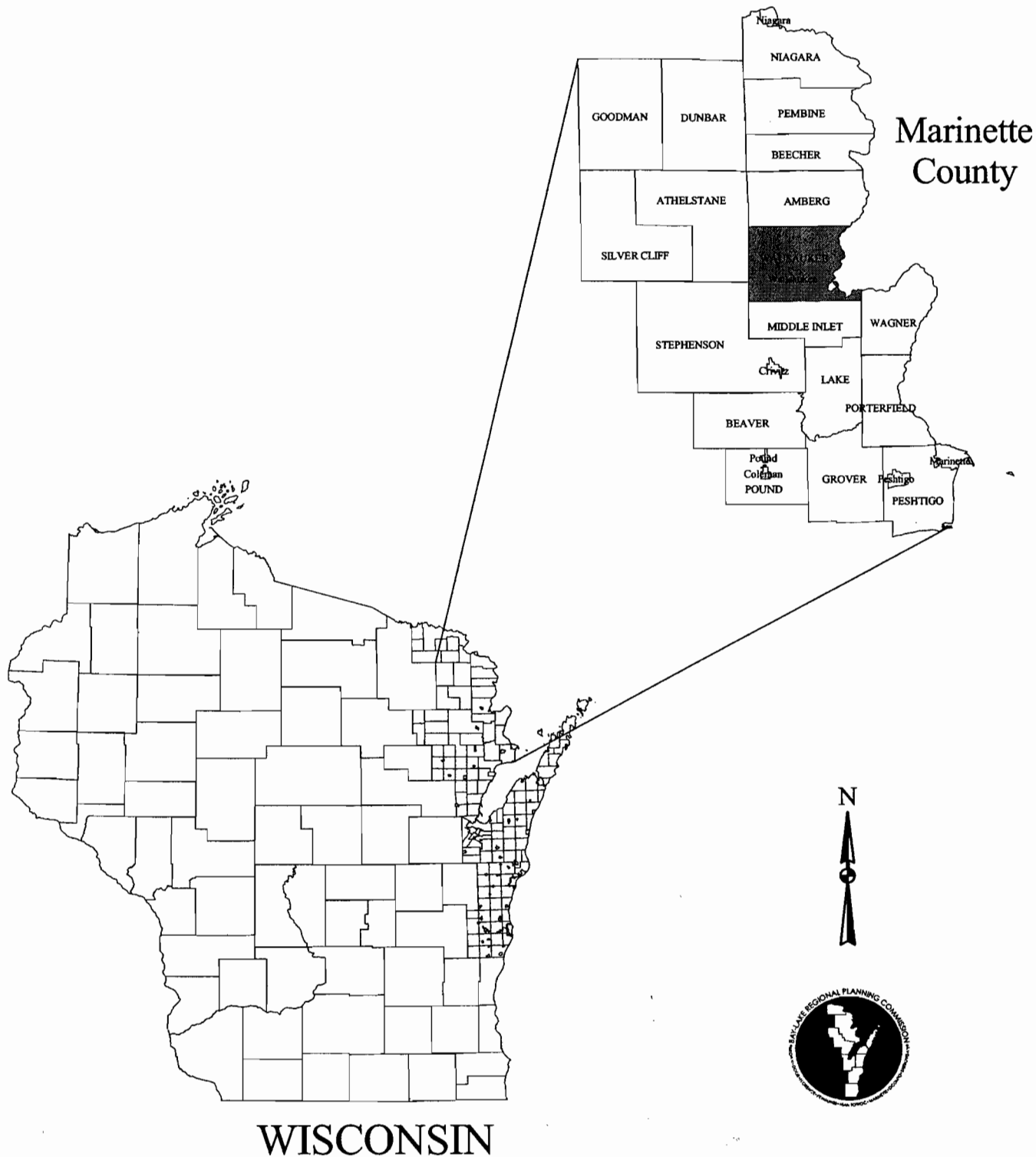
The town of Wausaukee is located in east central Marinette County along the Menominee River. All of the lakes have private access while only six lakes have some public access. The town's lakes have a total surface area of 555 acres and 21 miles of shoreline.

The town of Wausaukee is rectangular in shape, covering approximately 76 square miles, and had a 1999 estimated population of 1,133 persons. It is bounded by the town of Amberg to the north, the Menominee River to the east, the town of Middle Inlet to the south, and the towns of Athelstane and Stephenson to the west. The town encompasses approximately 49,500 acres of which the majority is within woodlands (Map 2.1). The incorporated village of Wausaukee lies near the center of the town along U.S. Highway 141 which splits both the town and village north to south. The town is situated approximately 25 miles northwest of the city of Marinette and 60 miles north of Green Bay, Wisconsin.

Location Map

Town of Wausaukee

Marinette County, Wisconsin



Source: Bay-Lake Regional Planning Commission, 2000.

PRINCIPAL PHYSICAL ELEMENTS

Geology

Bedrock Geology

The bedrock of Marinette County covers an area of transition from Cambrian sandstone and dolomite to Precambrian crystalline rocks. Precambrian igneous and metamorphic rocks form the bedrock surface in the northern and northwestern portions of the county, while Cambrian sandstone and dolomite are found in the southeastern portion of the county.

The town of Wausaukee, located in southeastern Marinette County, contains both Cambrian and Precambrian bedrock. The southern third of the town is sandstone and dolomite from the Upper Cambrian group of the Cambrian Era whereas the western and northwestern parts of the town are formed from Precambrian igneous and metamorphic rocks (Map 2.2). The town of Wausaukee is also split into two physiographic regions in Wisconsin. The northern and western portion of the town is part of the Northern Highland geomorphic region, the southeastern part of the town lies within the Eastern Ridges and Lowlands region.

Glacial Geology

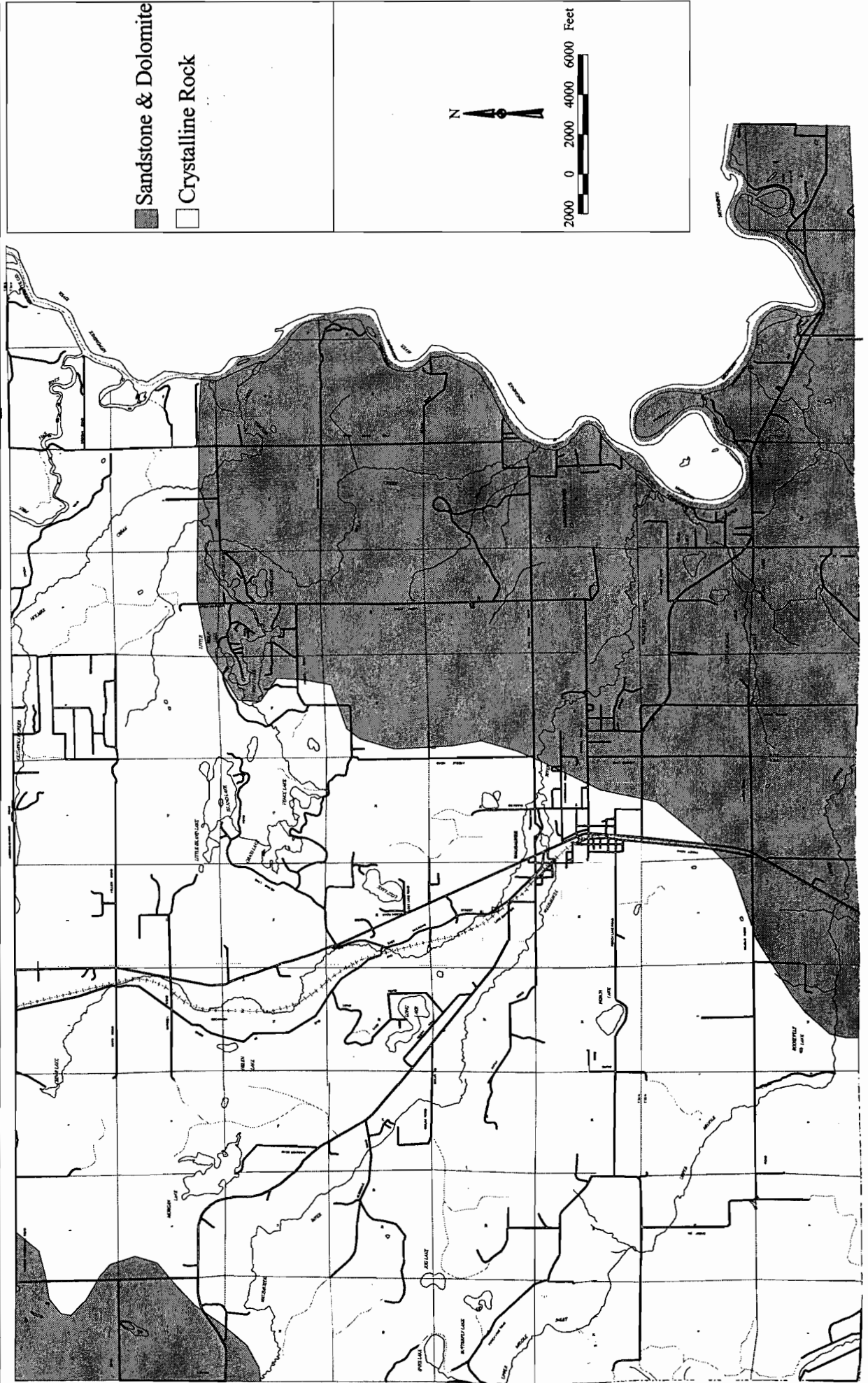
Marinette County is located in an area glaciated during the Pleistocene epoch. The Pleistocene geology in the town of Wausaukee is composed mostly of outwash and ice contact deposits. There are also two areas in the west central portion of the towns composed of ground moraines and one area at the southwestern edge of the town with an end moraine. (Map 2.3).

Bedrock Geology

Town of Wausaukee

Marinette County, Wisconsin

Map 2.2



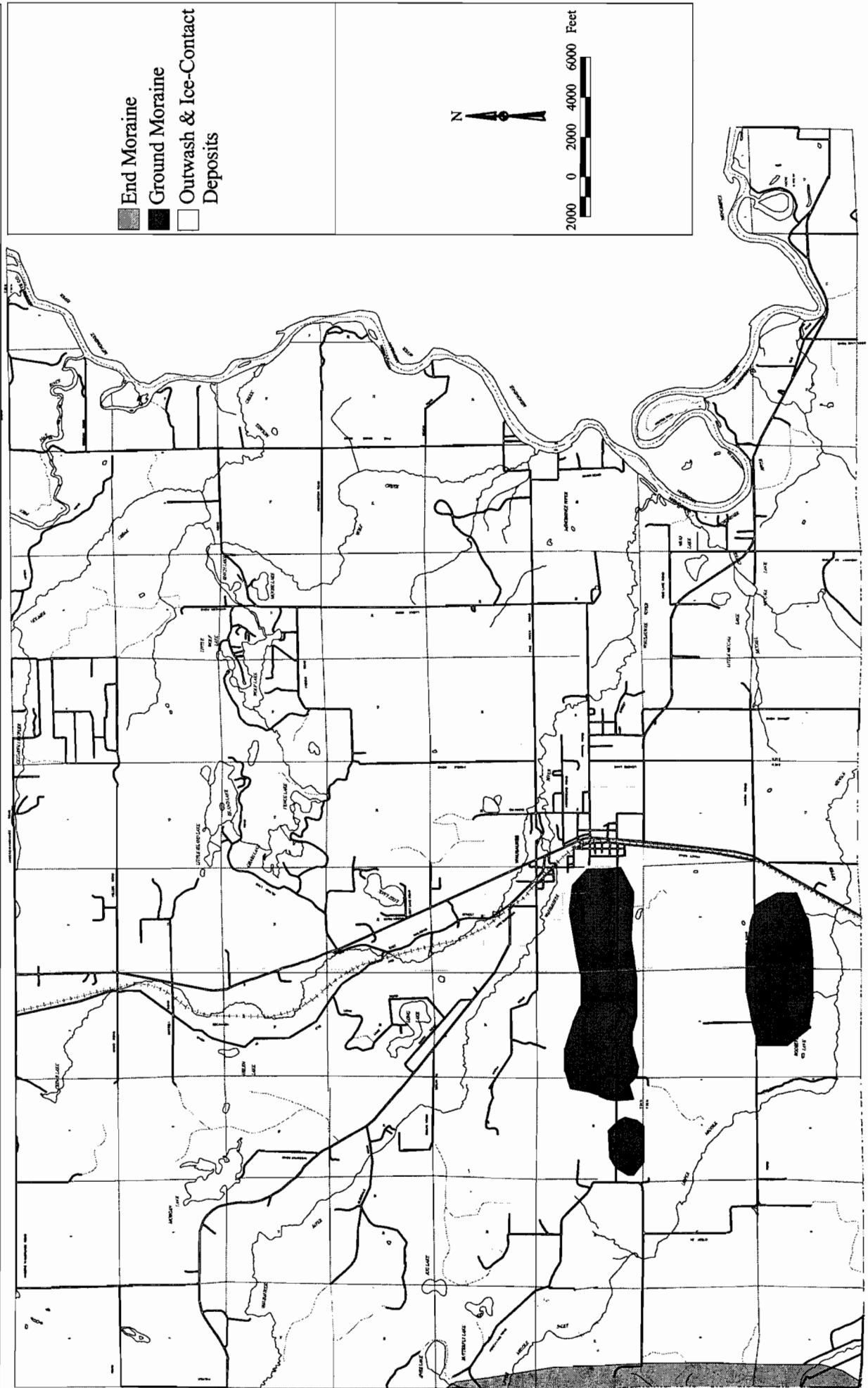
Source: U.S. Geological Survey, 1973; Bay-Lake Regional Planning Commission, 1999.

Pleistocene Geology

Town of Wausaukee

Marinette County, Wisconsin

Map 2.3



Source: U.S. Geological Survey, 1973; Bay-Lake Regional Planning Commission, 1999.

General Soil Limitations

The general soils within the town are made up of the sandy-loam Mancelona-Emmet-Menahga and the mucky Seelyeville-Markey associations.

Mancelona-Emmet-Menahga

The soils in this association are deep, soils found on end moraines that range from broad, flat areas to irregularly shaped ridges. The slopes range from 0 to 30 percent, and are well to excessively drained. Permeability ranges from moderately rapid in the subsoil to very rapid in the substratum. The available water capacity is low. Most areas of this association are used as woodland. The main concerns for management are the hazard of water erosion and equipment limitations on sandy or steeper slopes. Some areas of the Emmet association are used for crops or pasture. Controlling water erosion and maintaining fertility are the main concerns. The less sloping areas of these soils are suited to dwellings. The Mancelona and Menahga soils are poorly suited to septic tank absorption fields because of the poor filtering capacity and the danger of groundwater pollution. The less sloping Emmet soils are only moderately suited to septic tanks because of moderated permeability. Approximately 94 percent of the town is in this association.

Seelyeville-Markey

This association consists of soils on deep, nearly level, very poorly drained glacial lake basins, stream terraces, outwash plains and moraines. Slope is zero to one percent. Seelyeville soils are common in the center of wetlands, where the organic matter is the thickest. Permeability is slow to moderately rapid and the soil is very poorly drained. The available water capacity is very high. Markey soils are common around the edge of wetlands. Permeability is moderately slow to moderately rapid, and the available water capacity is very high. Some of the soils of minor extent in this association are the Au Gres, Crosswell, Dawson, Loxley, Menahga and Roscommon. Most areas of this association are used as woodlands. The main concerns in managing these soils are equipment limitations, which are caused by wetness and low soils strength, and seedling mortality and the hazard of windthrow, which are caused by wetness. The major soils are generally unsuitable as sites for dwellings and septic tanks, primarily because of ponding and subsidence.

Water Resources

Watersheds and Sub-Watersheds

Lakes, rivers, and streams comprise the surface water resources within the town of Wausaukee and are included within the Menominee River watershed. Drainage of the town's surface waters is typically west to east and flows into the Menominee River and eventually to the Bay of Green Bay. Although the surface water eventually all drain into the Menominee River, as a result of the many lakes, rivers and streams in the Wausaukee Study Area, there are 13 individual sub-watersheds of named water features. Refer to Map 2.4 for the watersheds in the town of Wausaukee and Maps 2.5 and 2.6 for the surface water features.

Surface Water Features - Lakes

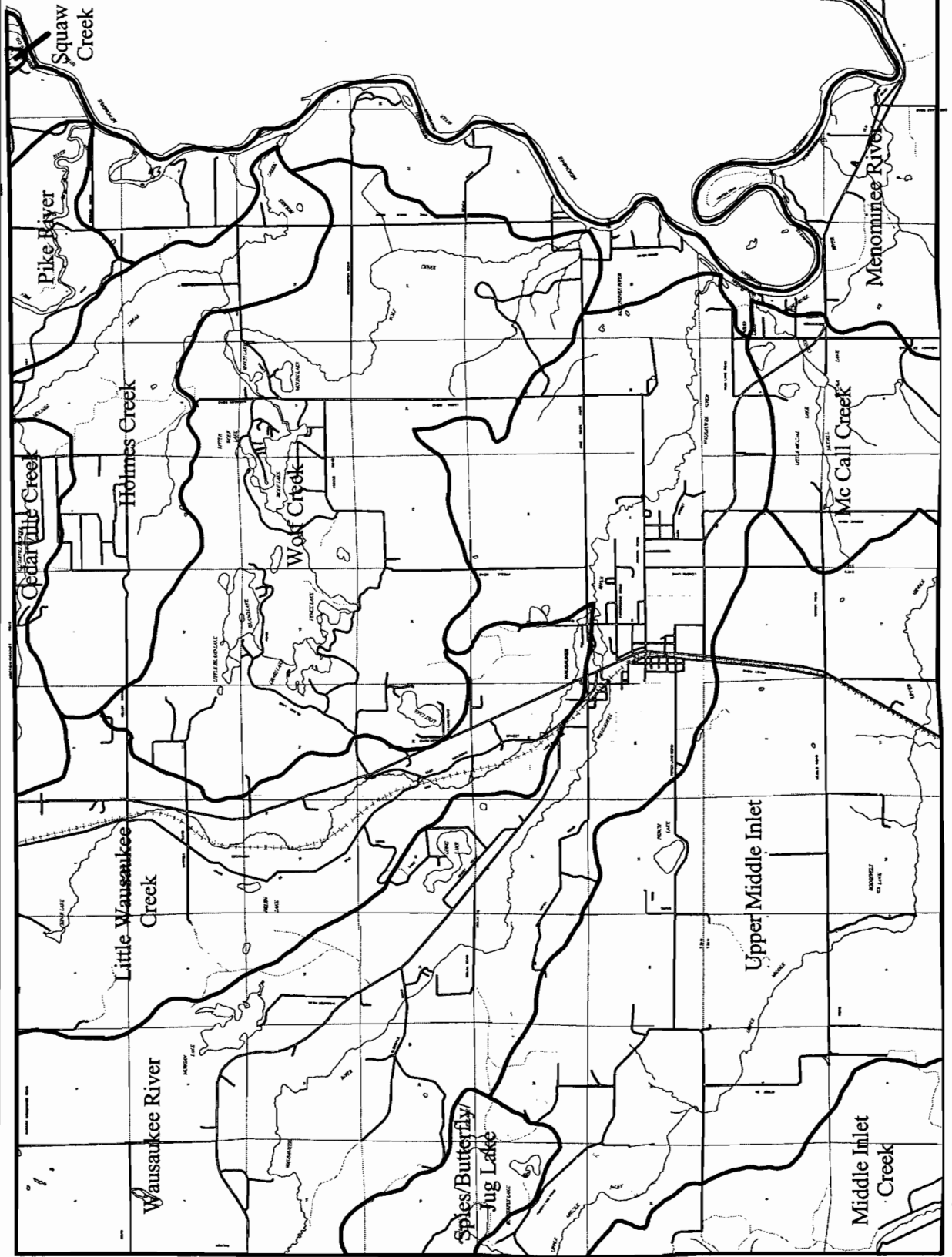
Birch Lake

Birch Lake has approximately 12 surface acres and a maximum depth of 22 feet. It is a hard water drainage lake having slightly alkaline, clear water of high transparency. The littoral zone is composed of muck (90 percent) and some marl. The shoreline is 80 percent wetland, consisting primarily of shrub bog, and 20 percent upland of mixed hardwoods and conifers. The known fish

Watersheds

Town of Wausaukee

Marinette County, Wisconsin

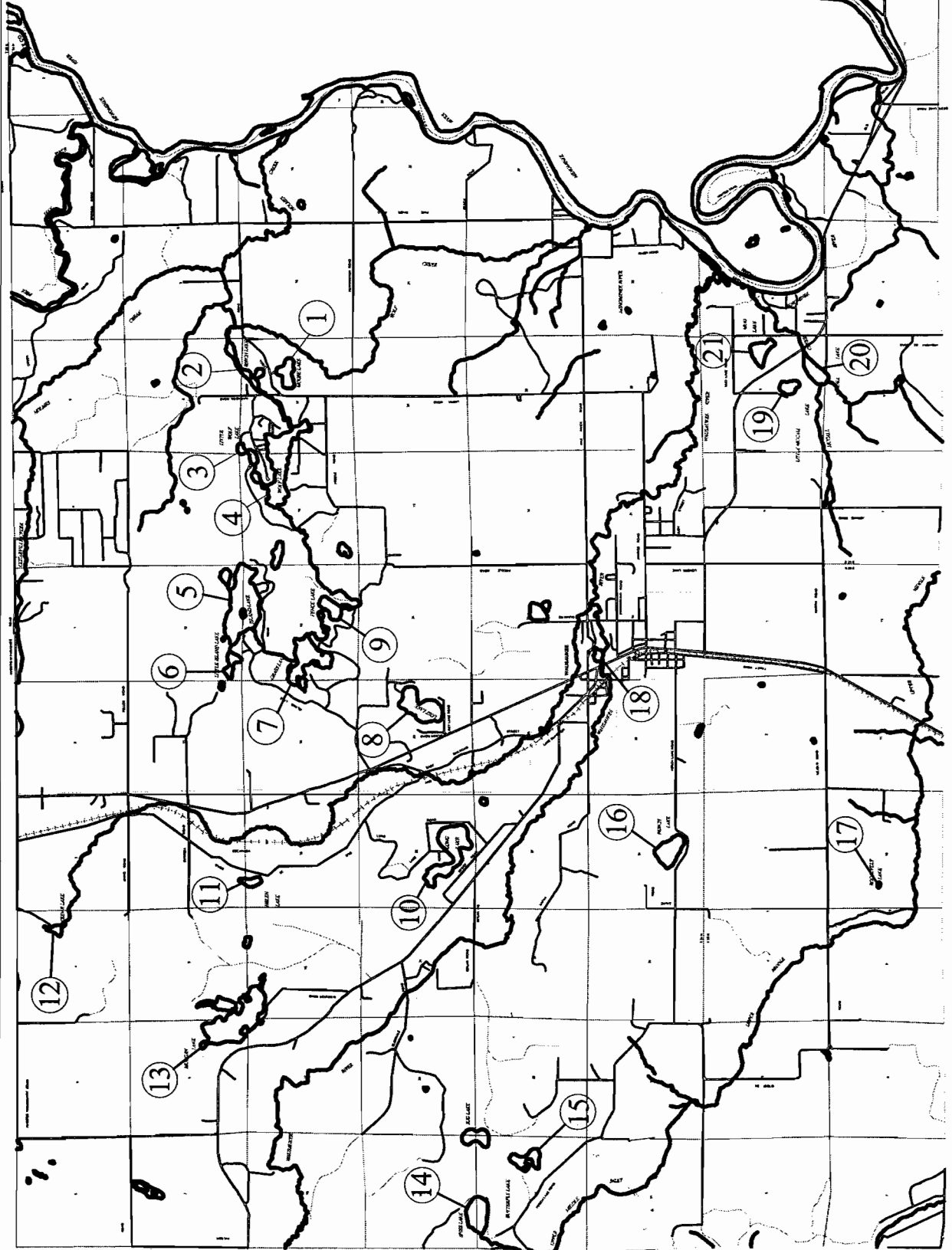


Surface Water Features - Lakes & Ponds

Map 2.5

Town of Wausaukee

Marinette County, Wisconsin



- 1- Moose Lake
- 2- Birch Lake
- 3- Little Wolf Lake
- 4- Wolf Lake
- 5- Island Lake
- 6- Little Island Lake
- 7- Grass Lake
- 8- Lost Lake
- 9- Fence Lake
- 10- Long Lake
- 11- Lake Helen
- 12- Cedar Lake
- 13- Morgan Lake
- 14- Spies Lake
- 15- Butterfly Lake
- 16- Perch Lake
- 17- Roosevelt Lake
- 18- Wausaukee Lake
- 19- Little McCall Lake
- 20- McCall Lake
- 21- Mud Lake
- 22- Poch de Noch



2000 0 2000 4000 6000 Feet

population includes northern pike and perch. Waterfowl make limited use of this lake. Floating and submergent vegetation are moderate in density over 35 to 40 percent of the basin. Navigable water public access is available via the inlet. The inlet and outlet are part of Wolf Creek.

Butterfly Lake

Butterfly Lake has approximately 6 surface acres and a maximum depth of 15 feet. It is a soft water seepage lake having slightly alkaline, light brown water of moderate transparency. The littoral zone is 98 percent muck and 2 percent sand. The shoreline is 90 percent upland, consisting of mixed hardwoods and conifers, and 10 percent wetland marsh. Bullhead and minnows are reported to be present. Waterfowl make limited use of this lake. There is no public access.

Cedar Lake

Cedar Lake has approximately 7 surface acres and a maximum depth of 7 feet. It is a hard water spring pond having neutral, clear water of high transparency. The littoral zone is composed of muck. The entire shoreline is wetland, primarily coniferous bog. Information regarding the fish population is lacking, but forage species are probably present. Sixty percent of the basin is less than three feet in depth. Waterfowl make limited use of this lake. There is no public access. The outlet flows to Little Wausaukee Creek.

Fence Lake

Fence Lake has approximately 14 surface acres and a maximum depth of 18 feet. It is a hard water drainage lake having slightly acid, light brown water of moderate transparency. The littoral zone is composed entirely of muck. The shoreline is 80 percent upland, consisting of mixed hardwoods and conifers, and 20 percent wetland of open bog. The outlet flows to Wolf Lake. Northern pike and minnows are reported to be present. Waterfowl make limited use of this lake. There is no public access.

Grass Lake

Grass Lake has approximately 43 surface acres and a maximum depth of 19 feet. It is a hard water drainage lake having slightly alkaline, clear water of high transparency. The littoral zone is composed of 80 percent marl and 20 percent muck. The shoreline is 50 percent upland, consisting of mixed hardwoods and conifers and 50 percent wetland of the open bog type. The fish population consists of northern pike, largemouth bass and bluegill. Moderately dense stands of bulrush occupy 30 percent of the lake area. Waterfowl make limited use of this lake during their spring and fall migrations. Seventy-five percent of the lake basin is less than three feet in depth. There is no public access. The inlet and outlet are a part of Wolf Creek. About 75 percent of the lake is less than 3 feet deep.

Island Lake

Island Lake has approximately 80 surface acres and a maximum depth of 42 feet. It is a hard water drainage lake having slightly alkaline, clear water of high transparency. The littoral zone is 90 percent marl and 10 percent silt. The shoreline is 60 percent upland consisting of mixed hardwoods and conifers and 40 percent wetland primarily of open marsh. The outlet flows to Grass Lake. The fish population includes northern pike, largemouth bass, bluegill, pumpkinseed and perch. Puddle ducks and diving ducks make use of this lake on their spring and fall migrations. There is no public access. About 50 percent of the lake basin is less than 3 feet deep. A small island in the lake is state-owned.

Lake Helen

Lake Helen has approximately 8 surface acres and a maximum depth of 11 feet. It is a hard water spring lake (Impoundment) having neutral, light brown water of high transparency. The littoral zone is composed of 80 percent sand, 10 percent gravel, 5 percent rubble and 5 percent silt. The shoreline is entirely upland consisting of mixed hardwoods and conifers. The fish population is composed of rainbow trout and forage species. Waterfowl make limited use of this lake. There is no public access. The outlet flows to Little Wausaukee Creek.

Little Island Lake

Little Island Lake has approximately 8 surface acres and a maximum depth of 23 feet. It is a hard water drainage lake having neutral, light brown water of moderate transparency. The littoral zone is composed of 95 percent muck and 5 percent marl. The shoreline is 95 percent wetland of coniferous bog and 5 percent upland consisting of mixed hardwoods and conifers. The outlet stream flows to Island Lake. Bluegill and forage species were observed. Waterfowl make limited use of this lake. There is no public access.

Little McCall Lake

Little McCall Lake has approximately 9 surface acres and a maximum depth of 21 feet. It is a medium hard water seepage lake having slightly acid, clear water of high transparency. The littoral zone is 65 percent sand, 25 percent silt and 10 percent muck. The shoreline is primarily upland (97 percent) consisting of hardwoods and conifers with the remainder a shrub bog wetland. The fish population includes northern pike, largemouth bass, bluegill, pumpkinseed, black crappie and perch. Waterfowl make limited use of this lake. There is no public access.

Little Wolf Lake

Little Wolf Lake has approximately 7 surface acres and a maximum depth of 31 feet. It is a hard water spring lake having slightly alkaline, light brown water of high transparency. The littoral zone is composed entirely of muck. The shoreline is 80 percent wetland, consisting primarily of conifers and 20 percent upland of mixed hardwoods and conifers. The fish population includes northern pike, largemouth bass and perch. Waterfowl make limited use of this lake. Navigable water type public access is available from Wolf Lake. The outlet flows to Wolf Lake.

Long Lake

Long Lake has approximately 57 surface acres and a maximum depth of 6 feet. It is a soft water seepage lake having neutral, light brown water of moderate transparency. The littoral zone is 95 percent muck, 3 percent sand and 2 percent gravel. The shoreline is 80 percent upland, consisting of mixed hardwoods and conifers and 20 percent wetland marsh. The fish population includes largemouth bass, northern pike and probably panfish. Waterfowl make limited use of this lake. A Town of Wausaukee landing provides public access with parking. Emergent and submergent aquatic vegetation is moderate in density throughout the lake basin. Winterkill may be a problem.

Lost Lake

Lost Lake has approximately 40 surface acres and a maximum depth of 18 feet. It is a very soft water seepage lake having neutral, clear water of high transparency. The littoral zone is composed of 70 percent muck and 30 percent sand. The shoreline is 50 percent wetland of shrub bog and 50 percent upland of mixed hardwoods and conifers. The fish species present are largemouth bass and panfish. Waterfowl make limited use of this lake. A Town of Wausaukee boat landing provides public access with parking. Submergent and floating vegetation are

present over most of the littoral zone.

McCall Lake

McCall Lake has approximately 16 surface acres and a maximum depth of 22 feet. It is a hard water drainage lake having slightly acid, medium brown water of moderate transparency. The littoral zone is 90 percent muck and 10 percent sand. The shoreline is 95 percent upland, consisting of mixed hardwoods and conifers, and 5 percent wetland primarily of bog. The fish population consists of northern pike, largemouth bass, bluegill, pumpkinseed and perch. Unimproved or difficult public access is provided by the Town of Wausaukee. The outlet flows to the Menominee River.

Moose Lake

Moose Lake has approximately 16 surface acres and a maximum depth of 36 feet. It is a medium hard water seepage lake having slightly alkaline, clear water of very high transparency. The littoral zone is 90 percent muck and 10 percent sand. The shoreline is primarily upland (90 percent) consisting of mixed hardwoods and conifers, with limited areas of coniferous bog wetland. The known fish population consists of largemouth bass and bluegill. Waterfowl make limited use of this lake.

Morgan Lake

Morgan Lake has approximately 83 surface acres and a maximum depth of 22 feet. It is a hard water seepage lake having slightly alkaline, clear water of high transparency. The littoral zone is composed of 45 percent sand, 40 percent silt, 8 percent muck, 5 percent rubble and 2 percent gravel. The shoreline is primarily upland (95 percent), consisting of mixed hardwoods and conifers and there is a small wetland area of open meadow. Fish species inhabiting this lake include largemouth bass, bluegill, black crappie, pumpkinseed and perch. Trout are also reported to be present. Waterfowl make limited use of this lake. There is no public access. Approximately 30 percent of the lake basin is less than 3 feet deep. Submergent aquatic vegetation is dense throughout most of the lake basin.

Mud Lake

Mud Lake has approximately 19 surface acres and a maximum depth of 8 feet. It is a medium hard water seepage lake having slightly acid, light brown water of moderate transparency. The littoral zone is composed of 60 percent sand, 19 percent silt, 20 percent muck and 1 percent rubble. The shoreline is primarily upland (95 percent), consisting of hardwoods, conifers and cleared land. The wetland is open marsh. Information is lacking on the fish population; however, due to the shallowness of the lake, winterkill is likely. Waterfowl make use of this lake on their spring and fall migrations. There is no public access. Submergent aquatic plants are moderate in density in most of the lake basin.

Perch Lake

Perch Lake has approximately 27 surface acres and a maximum depth of 15 feet. It is a hard water spring lake having slightly alkaline, clear water of moderate transparency. The littoral zone is 98 percent marl and 2 percent muck. The shoreline is 60 percent coniferous wetland and 40 percent upland of mixed hardwoods and conifers. The outlet flows to Upper Middle Inlet Creek. The known fish population consists of largemouth bass and bluegill. Waterfowl make limited use of this lake. There is no public access. About 40 percent of the lake basin is less than 3 feet deep. Submergent aquatic vegetation is moderate in density in a substantial part of the lake basin.

Poche de Noche

Poche de Noche has approximately 7 surface acres and a maximum depth of 11 feet. It is a medium hard water drainage lake having slightly acid, light brown water of moderate transparency. The lake occupies a meander scar on the Menominee River. The littoral zone is 50 percent sand, 30 percent muck and 20 percent detritus. The shoreline is upland composed of hardwoods. Fish species reported to inhabit this lake are northern pike, walleye, largemouth bass, bluegill, pumpkinseed, perch and yellow bullhead. Waterfowl make limited use of this lake. An unimproved or difficult public access is available from a town road. About 50 percent of the lake basin is less than 3 feet deep. Floating and submergent aquatic plants are moderate in density. The lake level fluctuates with the level of the Menominee River, about 5 feet.

Roosevelt Lake

Roosevelt Lake is less than one surface acre and has a maximum depth of 3 feet. It is a hard water spring pond having slightly acid, light brown water of moderate transparency. The littoral zone is composed entirely of muck. The entire shoreline is a coniferous bog wetland. The outlet flows to Upper Middle Inlet. Information is lacking on the fish population, although forage species are probably present. Waterfowl make limited use of this lake. There is no public access.

Spies Lake

Spies Lake has approximately 27 surface acre and a maximum depth of 5 feet. It is a hard water drainage lake having slightly alkaline, light brown water of moderate transparency. The littoral zone is composed of muck. The shoreline is 80 percent upland, consisting of hardwoods and conifers, with the remainder being coniferous wetland. Waterfowl make limited use of this lake. Pumpkinseed, bullhead and minnows are reported to be present. There is no public access. The lake is the headwaters of Upper Middle Inlet, which is tributary to Middle Inlet. Submergent and floating vegetation is moderate in part of the basin. Ninety-five percent of the lake basin is less than three feet deep.

Wausaukee Lake

Wausaukee Lake has approximately 5 surface acre and a maximum depth of 6 feet. It is a hard water drainage lake (impoundment) on the Wausaukee River having slightly acid, light brown water of moderate transparency. The littoral zone is 80 percent sand and 20 percent silt. The entire shoreline is upland consisting of mixed hardwoods, conifers and cleared land. Brown trout and brook trout are reported to inhabit this lake. Waterfowl make limited use of the lake. The lake is located in the Village of Wausaukee, and hunting is prohibited. Eighty percent of this lake is less than three feet deep. The Town of Wausaukee provides a park area with swimming facilities. The Village of Wausaukee maintains the dam which has a head of 8 feet. About 80 percent of the lake basin is less than 3 feet deep.

Wolf Lake

Wolf Lake has approximately 73 surface acres and a maximum depth of 51 feet. It is a hard water drainage lake having slightly alkaline, light brown water of high transparency. The littoral zone is 90 percent marl and 10 percent muck. The shoreline is 70 percent wetland, consisting primarily of shrub bog, and 30 percent upland of hardwoods and conifers. The known fish population consists of northern pike, perch, largemouth bass and bluegill. Splake have been stocked, but apparently have not survived. Waterfowl make limited use of this lake. The Town of Wausaukee provides public access with limited parking. Wolf Creek and a channel from Lake 18-1 are inlets to this lake. The outlet flows to the Menominee River. Submergent aquatic vegetation is moderate in density, as are floating and emergent plants in some areas.

Rivers and Streams

Cedarville Creek

This creek is approximately 4 miles in length and has an average width of 4 feet. It is a hard water stream having neutral, clear water. Cedarville Creek is tributary to Holmes Creek. A native brook trout population inhabits the entire stream. Wildlife values are limited due to its small size. Public access is available at four road crossings and on 0.9 miles of public frontage. The watershed is wooded and wild.

Holmes Creek

This creek is approximately 9 miles in length and has an average width of 12 feet. It is a hard water stream having neutral, light brown water. Holmes Creek is tributary to the Menominee River. Brook trout inhabit this stream and provide an excellent fishery. Furbearers make moderate use of this stream, but it is of little value to waterfowl because of its small size. Public access is available at four road crossings and from 4.1 miles of public frontage. The watershed is primarily wooded, with limited areas of agriculture.

Little Wausaukee Creek

This creek is approximately 8 miles in length and has an average width of 9 feet. It is a hard water stream having slightly alkaline, clear water. It is tributary to the Wausaukee River. This stream has an excellent native brook trout population. Wildlife make limited use of this stream due to its small size. Public access is available at ten road crossings. The watershed is primarily forested.

McCall Creek

This creek is approximately 4 miles in length and has an average width of 8 feet. It is a hard water stream having slightly alkaline, light brown water. The creek flows through McCall Lake and is tributary to the Menominee River. Information is lacking on the fish population. Wildlife values are limited due to small size. Public access is available at four road crossings. The watershed is primarily forested.

Menominee River

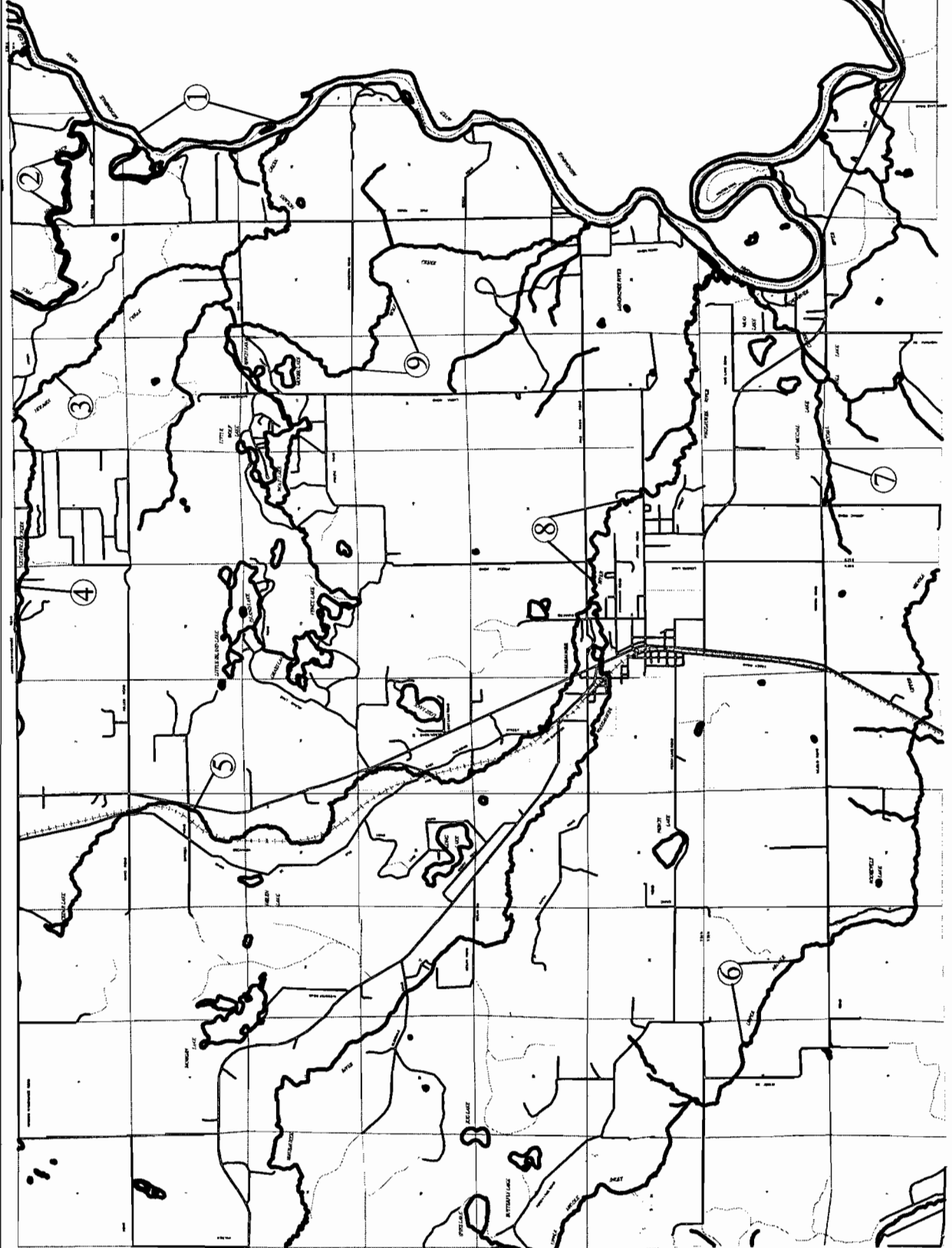
This river is approximately 84 miles in length and has an average width of 475 feet. It is a hard water stream having slightly alkaline, light brown water. This river, which forms the boundary of Marinette County with upper Michigan, flows into Green Bay. This is the largest body of water in Marinette County, and it provides excellent recreational opportunities. Fast boating is limited due to hazards, but canoeing is good on most of the river. A fishery consisting of lake sturgeon, walleye, largemouth bass, smallmouth bass, northern pike and panfish provide the angler with a diversified catch on most of the river. Other fish inhabiting the river are bullhead, carp, suckers, redhorse and many forage minnow species. From Lower Scott Flowage to Green Bay, spawning runs of walleye, northern pike, smelt, brown trout, rainbow trout, coho salmon and chinook salmon provide exceptional fishing opportunities. Furbearers, including beaver, muskrat and mink are common along this stream. Waterfowl use this river extensively on their spring and fall migrations and puddle ducks use it for nesting. Eight road crossings, two boat landings with parking, one county park, one wayside and 1.4 miles of public frontage provide public access. In addition, public boat landings are available on several of the river's impoundments. The watershed is primarily forested, with scattered areas of agriculture. A paper mill at Niagara, and several industries in Marinette, Wisconsin and Menominee, Michigan discharge polluting effluent into the river. Being a boundary water, the acreage denoted reflects only the Wisconsin part of the river.

Surface Water Features - Rivers & Streams

Map 2.6

Town of Wausaukee

Marinette County, Wisconsin



- 1- Menominee River
- 2- Pike River
- 3- Holmes Creek
- 4- Cedarville Creek
- 5- Wausaukee Creek
- 6- Upper Middle Inlet Creek
- 7- Mc Call Creek
- 8- Wausaukee River
- 9- Wolf Creek



2000 0 2000 4000 6000 Feet



Pike River

This river is approximately 15 miles in length and has an average width of 75 feet. It is a hard water stream having slightly alkaline, clear water. It is tributary to the Menominee River. The Pike River and its tributaries are designated as a State Wild River System. This river provides a challenge to the expert canoeist with many falls and white water areas. A population of brown and brook trout provides a good sport fishery. Where the Pike River nears the Menominee River, the fishery consists primarily of northern pike, walleye and smallmouth bass,. Furbearers and waterfowl make moderate use of this river. Public access is available at four road crossings and from 5.7 miles of public frontage. A county park at Dave's Falls provides a picnic site and a footpath to the falls. A total of nine falls and rapids are present.

Upper Middle Inlet Creek

This creek is approximately 16 miles in length and has an average width of 13 feet. It is a hard water stream having slightly alkaline, light brown water. It is tributary to Middle Inlet Creek. The fish population consists of brook and brown trout and forage species. Furbearers make moderate use of this stream. Waterfowl values are limited due to its small size. Five road crossings provide public access. The watershed is primarily forested.

Wausaukee River

This river is approximately 22 miles in length and has an average width of 17 feet. It is a hard water stream having neutral, light brown water. It is tributary to the Menominee River. The gamefish population consists primarily of brook and brown trout. Furbearers make moderate use of this river and it receives little use by waterfowl because of its small size. Public access is available at 12 road crossings and from 11.8 miles of public frontage. The watershed is primarily forested, with scattered areas of agriculture.

Wolf Creek

This creek is approximately 7 miles in length and has an average width of 31 feet. It is a hard water stream having slightly alkaline, clear water. Wolf Creek is tributary to the Menominee River. The fish population consists of warm water gamefish and forage species. Furbearers make moderate use of this stream, but waterfowl values are limited due to its small size. Public access is available at two road crossings and from 0.5 miles of public frontage. The watershed is primarily forested.

Floodplains

Floodplains are often viewed as valuable recreational and environmental resources. These areas provide for storm water retention, ground water recharge, and habitat for various kinds of wildlife unique to the water.

Development permitted to take place in these areas is susceptible to storm damage and can have an adverse effect on water quality and wildlife habitat. In addition, it can also result in increased development and maintenance costs such as: providing floodproofing, repairing damage associated with flooding and high water, increased flood insurance premiums, extensive site preparation, and repairing water related damage to roads, sewers, and water mains.

As a result, the state of Wisconsin requires that counties, cities and villages adopt shoreland/floodplain zoning ordinances to address the problems associated with development in floodplain areas. Development in shoreland areas is generally permitted, but specific design techniques must be considered. Development in floodplain areas is strictly regulated and in some instances is not permitted. For planning and regulatory purposes, the floodplain is normally

defined as those areas, excluding the stream channel, that are subject to inundation by the 100-year recurrence interval flood event. This event has a one percent chance of occurring in any given year. Because of this chance of flooding, development in the floodplain should be discouraged and the development of park and open space in these areas encouraged.

The authority to enact and enforce these types of zoning provisions in counties is set forth in Chapter 59.97 of the Wisconsin Statutes and Wisconsin Administrative Code NR 116. This same authority is also vested to cities and villages in Chapter 62.23 of the Wisconsin Statutes.

Within the town of Wausaukee, there are approximately 5,257 acres of floodplains (Map 2.7). The floodplains are located adjacent to many of the major lakes, rivers and streams within the town and include: the Menominee River, the Pike River, Holmes Creek, Cedarville Creek, Wolf Creek and Wolf Lake, Wausaukee River, Little Wausaukee Creek, Upper Middle Inlet, McCall Creek and Lake, as well as Morgan and Long Lakes. The largest areas of floodplain are in the southeastern portion of the town along the Menominee River oxbows.

Wetlands

Wetlands are areas where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophilic vegetation and which has soils indicative of wet conditions. Wetlands are important for groundwater recharge and provide habitat for a variety of plants and animals. They also provide natural open space, help maintain both surface and groundwater quality, and provide water storage areas for periods of flooding and high water. Whenever possible, wetlands should be left unaltered. Filling or draining of wetlands is also quite costly, destroys the productive capacity of the ecosystem and can adversely affect surface water quality and drainage.

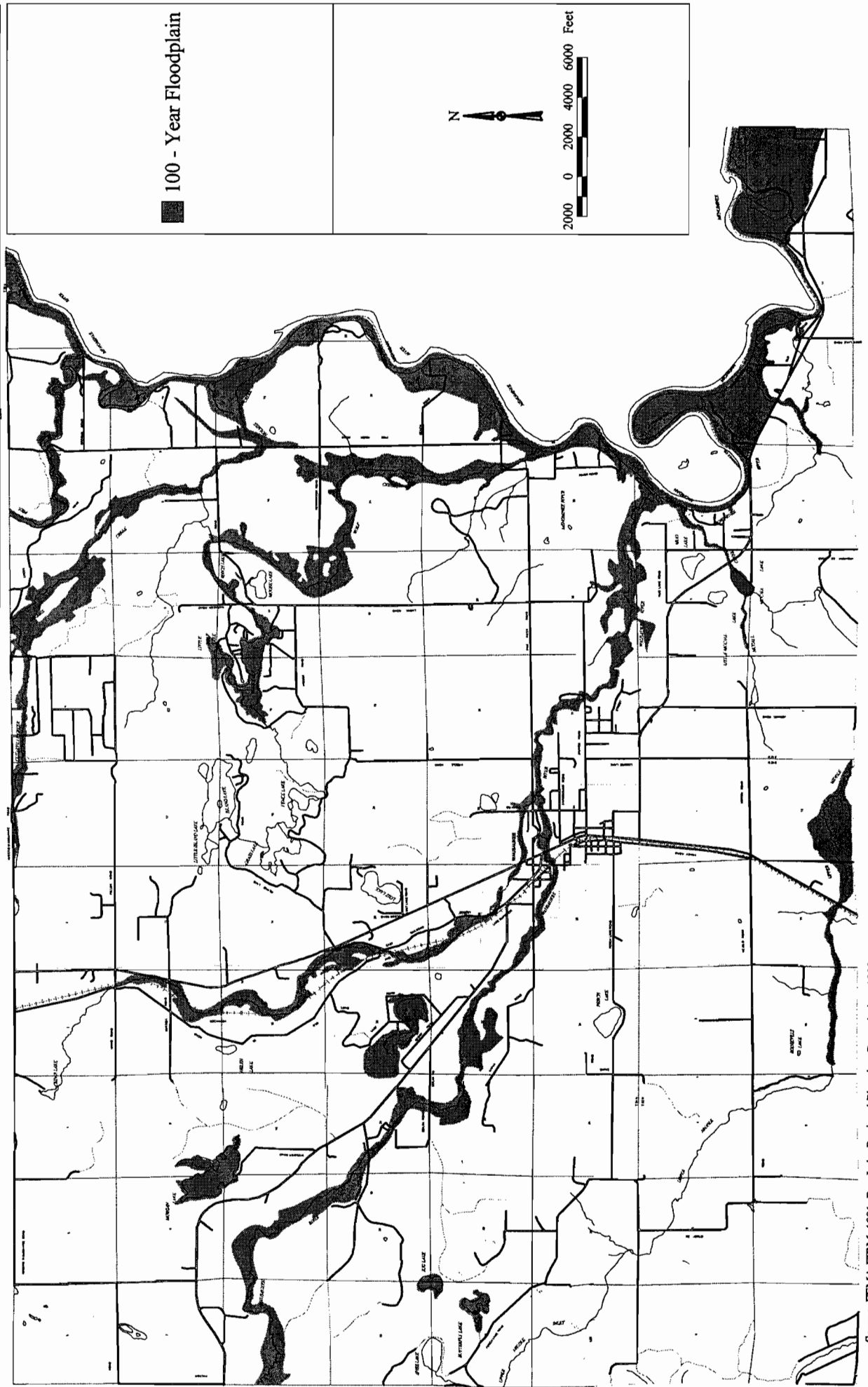
In 1972, Congress passed the Federal Water Pollution Control Act Amendments, also known as the Clean Water Act, "to restore and maintain the chemical, physical, and biological integrity" of the nation's waters. The Act defined "navigable waters" as "waters of the United States." Section 404 of the Clean Water Act established a permit program regarding discharges of dredged and filled material. In 1977, the U.S. Army Corps of Engineers issued final regulations on the Section 404 program and explicitly included "isolated wetlands and lakes, intermittent streams, prairie potholes, and other waters that are not part of a tributary system to interstate waters or to navigable waters of the United States, the degradation or destruction of which could affect interstate commerce." The basic premise of the program is that permits are required for the discharge of dredged or fill material into waters of the United States including wetlands. If a practicable alternative exists that is less damaging to the aquatic environment or if the nation's waters would be significantly degraded a permit may be denied. Activities that are regulated under this program include fills for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and conversion of wetlands to uplands for farming and forestry. When a permit is applied for in conjunction with any of these activities, the applicant must show that he has: 1) taken steps to avoid wetland impacts where practicable, 2) minimized potential impacts to wetlands, and 3) provided compensation for any remaining unavoidable impacts through activities to restore or create wetlands. The permit process is often accompanied by a field review of the site.

Wisconsin Administrative Codes NR 115 and NR 117 fall under the jurisdiction of the Wisconsin Department of Natural Resources and mandate that shoreland wetlands be protected in both the rural and urban areas of the state. In the unincorporated areas, NR 115 provides the legislation to protect wetlands of five acres or more that are within the jurisdiction of county shoreland zoning ordinances. This wetland provision would be applicable in the town of

Floodplains

Town of Wausaukee

Marinette County, Wisconsin



Wausaukee. To protect wetlands in the incorporated areas, NR 117 was enacted in 1983 and requires that all shoreland wetlands of five acres or more be protected.

As a result of NR 115 and 117, many of the wetlands that remain today will be protected from future development.

Within the town of Wausaukee, there are approximately 12,950 acres of wetlands as identified by the Wisconsin Department of Natural Resources. Those wetlands identified within the town are distributed throughout the planning area, with large complexes located in the south central, southwestern and eastern parts of the town. These wetlands reflect the large number of water features in the town (Map 2.8).

Steep Slope

In order to determine where areas of steep slope (greater than 12 percent slope) exist within the town of Wausaukee, the Commission used the Soil Survey of Marinette County, Wisconsin as produced by the Natural Resource Conservation Service. The town has approximately 9,310 acres of steep slope, primarily located in the western half of the town. The areas of steep slope reflect the different geologic and physiographic regions of the county (Map 2.9).

Woodlands

The town is heavily forested, approximately 90 percent, with a mix of hardwoods and conifers. There are 37,455 acres of woodlands in the town of Wausaukee (Map 2.10). Of these wooded areas, the majority are upland (63 percent) while the rest are lowland coniferous swamps. Many tree species are present including hardwoods such as sugar maple, paper and yellow birch, red maple, black cherry, northern pin oak and others. Some common coniferous species are eastern hemlock, white pine, jack pine, red pine (planted and native), balsam fir, white spruce, black spruce and white cedar.

Wildlife Habitat

The fauna that lives within the planning area is quite diverse. Many mammals such as the white-tailed deer, bald eagle, grouse, porcupine, beaver, muskrat, gray and red squirrel, and chipmunks are some of the more well known species found in the area. The surface waters sustain a diverse community of fish providing many opportunities for sport fishing for locals and tourists alike. Migratory fowl also frequent the area during the summer months utilizing the lakes and streams to raise their young. Much of the land is relatively pristine and thus very receptive to sustaining a diverse ecological system.

Historic and Archeological Sites

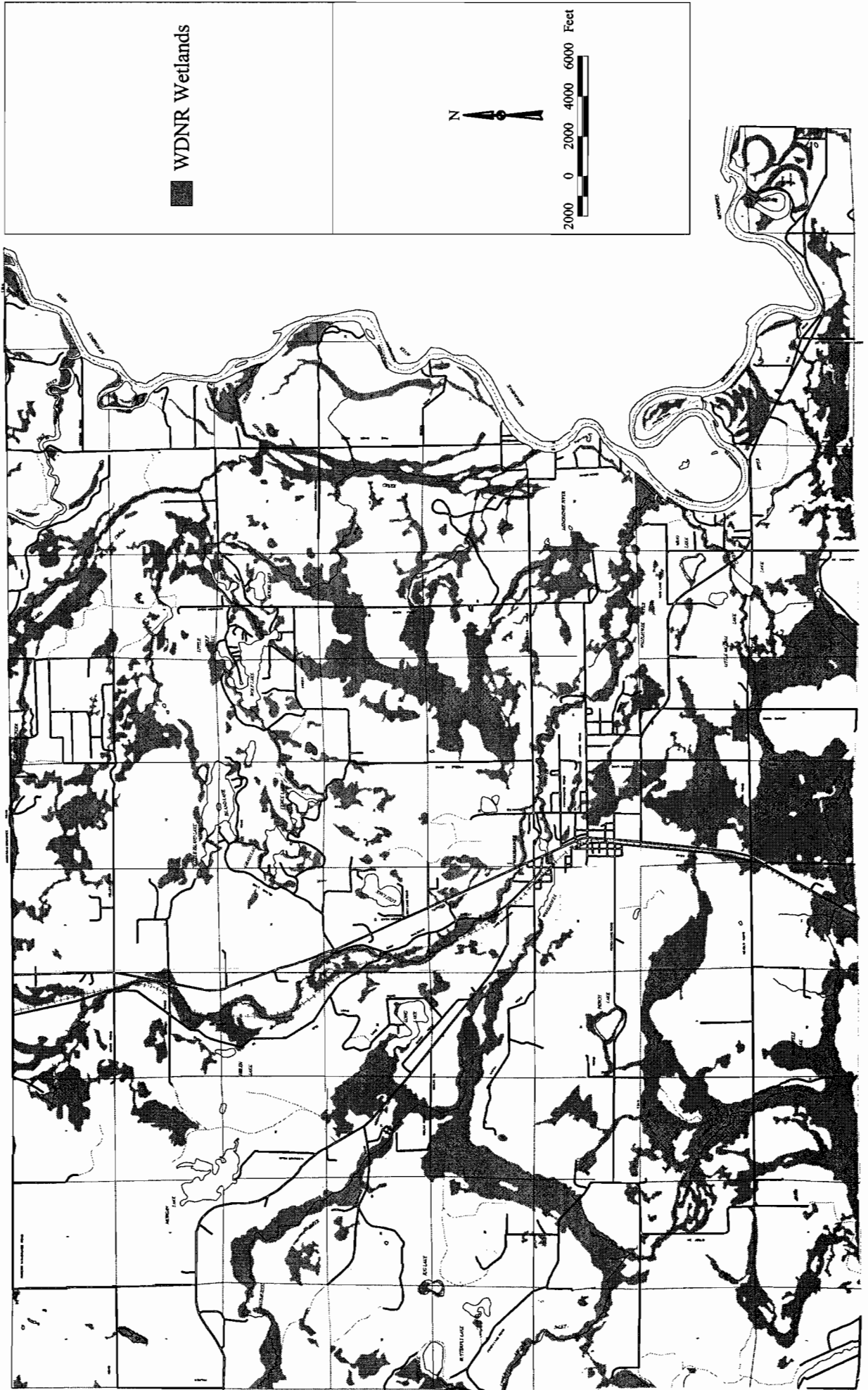
There are three historic sites within the town of Wausaukee. The first one is the Wausaukee Station located in the Village of Wausaukee. This storage building is owned by the DNR and was built in 1932. There is a historic cemetery and square located south of the oxbow on the Menominee River, south of STH 180. The old Indian Trading Post is located east of STH 141, about one mile southeast of Cedarville, and four miles north of the Village of Wausaukee. This building dates back to at least 1927 and is privately owned. The last historic site is an iron truss bridge that spans 60 feet across the Pike River on Pike River Road. The bridge, built by the Worden-Allen Company, was constructed at an angle to the direction of the road to take advantage of a shortened span and granite outcroppings.

There are several areas of archeological importance located on privately owned land within the town of Wausaukee. One is a village site with Indian gardens, and a few burials located near

Wetlands

Town of Wausaukee

Marinette County, Wisconsin

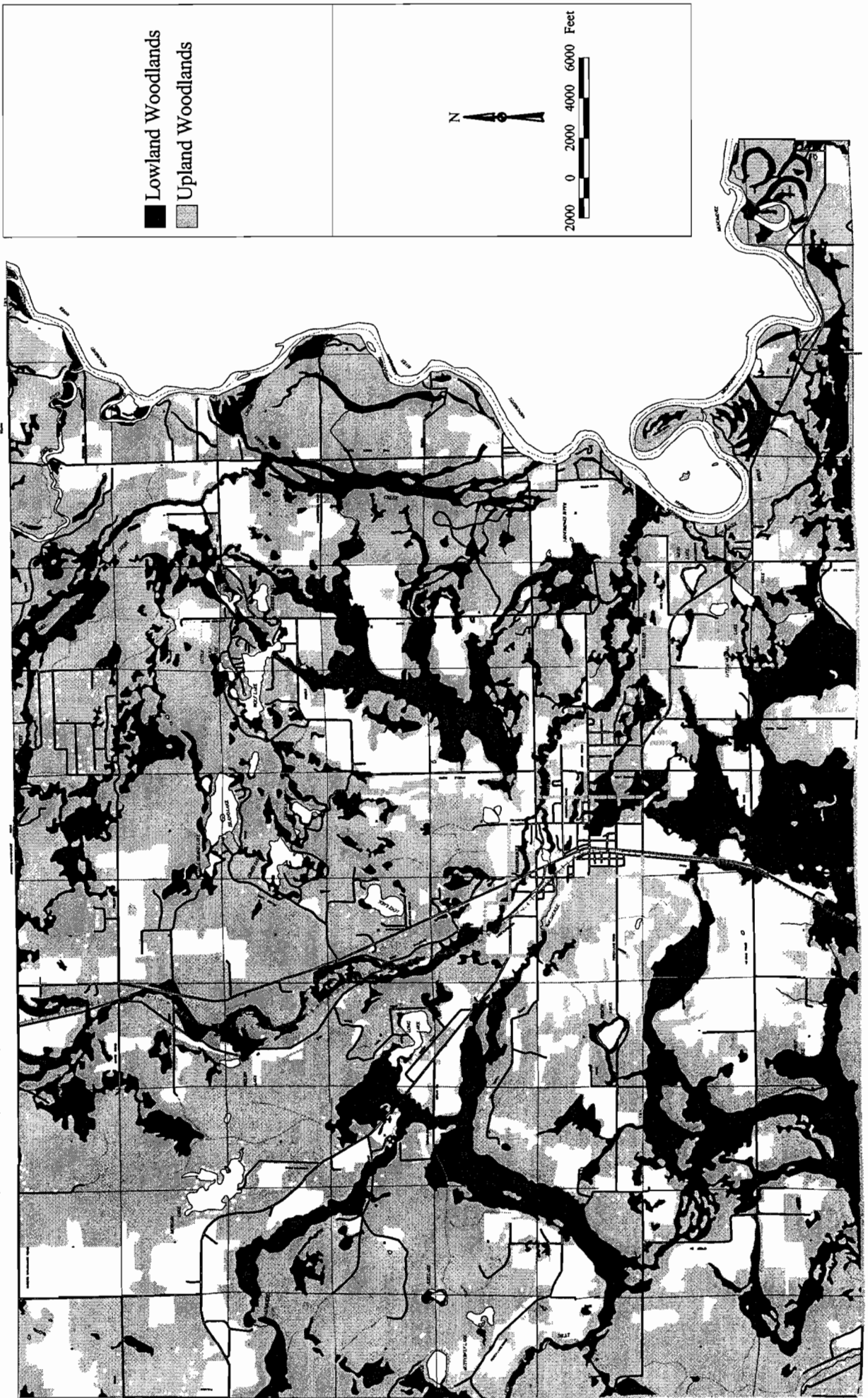


Woodlands

Town of Wausaukee

Marinette County, Wisconsin

Map 2.10



Source: WDNR, 1991; Bay-Lake Regional Planning Commission, 1999.

Poche de Noche. Another site is located about a quarter of a mile upstream on the Menominee River from the mouth. Care should be taken when excavation is done within the town, since there is the possibility of disturbing a historical or archeological site. The State of Wisconsin requires any findings of human bones to be reported (*Wisconsin Statute 157.70*) so an investigation can be done by the State Historical Society. Also, land developers trying to obtain state permits from the Wisconsin Department of Natural Resources or any development involving federal monies, are required to be in compliance with Section 106 of the National Historic Preservation Act and 36 CFR Part 800: Protection of Historic Properties.

Environmental Corridors and Isolated Natural Areas.

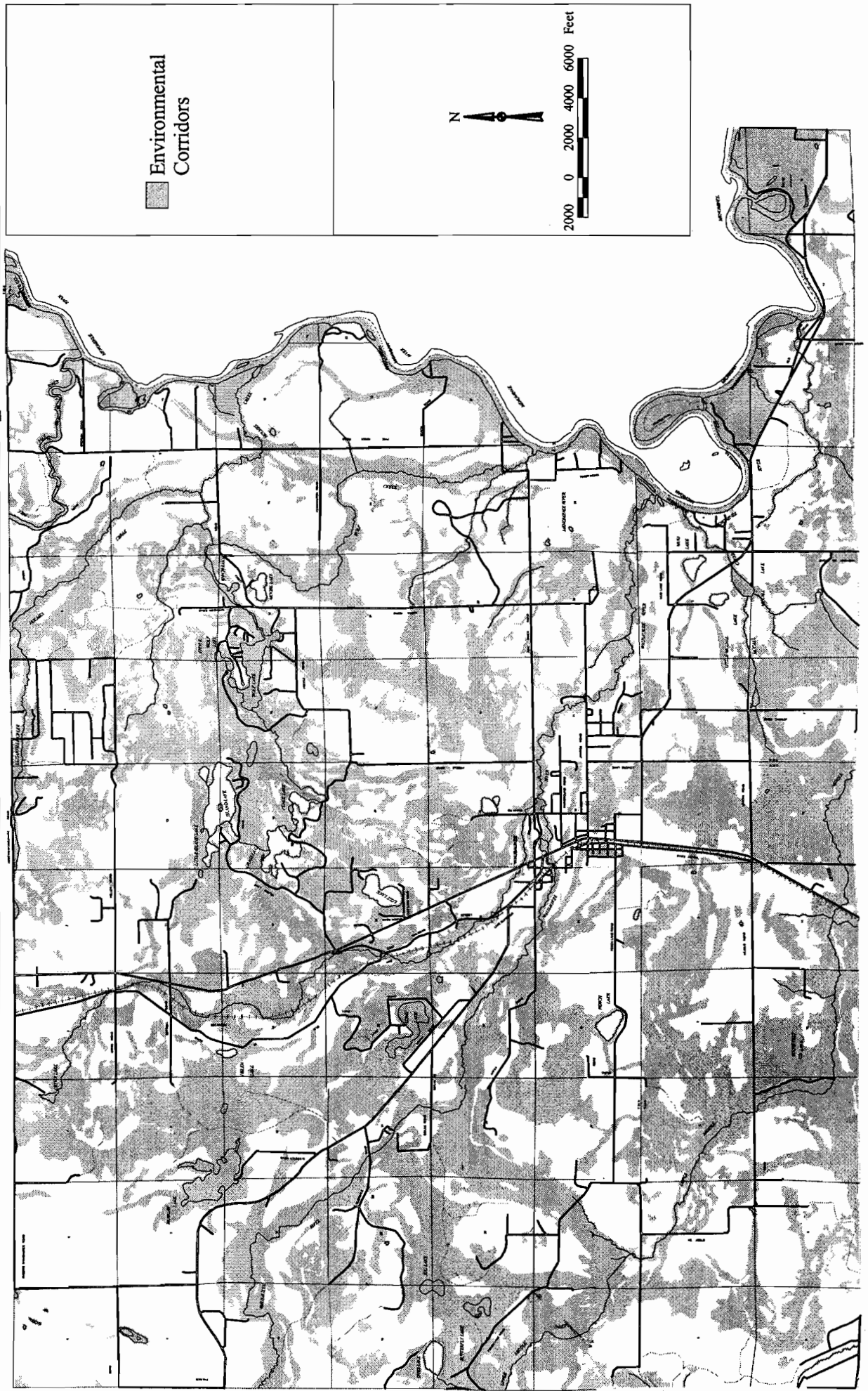
Environmental Corridors

Many of the Commission's planning activities require delineation of environmental corridors (comprehensive plans, watershed plans, sewer service area plans, etc.). Environmental corridors protect local water quality and wildlife habitat through identification and preservation of environmentally sensitive areas. They can be used as a means of controlling, moderating, and storing floodwaters while providing nutrient and sediment filtration. Environmental corridors can provide fish and wildlife habitat, recreational opportunities, and serve as buffers between land uses while improving the aesthetics of the community. Typically, environmental corridors contain wetlands, water features, floodplains, natural and scientific areas, woodlands, parks and recreation areas, areas of steep slope, and other unique natural features which overlap or are contiguous. The concept of a corridor is based on the delineation of environmental features adjacent to waterways and water related resources.

The Commission has identified environmental corridors for the Wausaukee planning area to help in identifying areas that have the greatest need for protection. These corridors (Map 2.11) were delineated through the use of the Commission's Geographic Information System (GIS) to overlay a variety of features. The environmental corridors total 23,683 acres of land within the study area and include: wetlands, areas of steep slope (having a slope greater than 12 percent), surface water resources, a 75-foot setback from water resources, and the 100-year floodplain.

Environmental Corridors

Town of Wausau
Marinette County, Wisconsin



Source: WDNR, 1991; FEMA FIRM 1991; Bay-Lake Regional Planning Commission, 1999.

Town of Wausaukee Water Quality Data Inventory

The Marinette County Land & Water Conservation Department (LWCD) has collected data about lakes for a county wide lake classification projects. In the past year the LWCD has inventoried about seventy lakes in the county. Characteristics of the lakes inventoried included: total phosphorus, Secchi disk depths, developed lots, flora species present, and Trophic Status Index (TSI) numbers based on total phosphorus and secchi disk. Twenty-two lakes in the town of Wausaukee have been looked at. Only lakes greater than five acres were inventoried. Some lakes could not be tested for all criteria because permission was not granted by the landowners surrounding the lake. The complete results are located in Appendix B. A more detailed description of the more developed lakes (Little McCall, Little Wolf, Long, Lost, Morgan and Wolf) are listed below in table form with a short description of what each element means to the overall quality of the lakes. Where data was not available a “-” is used.

Trophic Classification of a Lake

Lakes can be divided into three general categories based upon their fertility: oligotrophic (low fertility) mesotrophic (medium fertility) and eutrophic (high fertility). Oligotrophic lakes are generally cold, clear and free of weeds or large algae blooms. Although they do not generally support large fish populations, they do have an efficient food chain supporting a desirable fishery of predatory fish. Mesotrophic lakes are an intermediary stage between oligotrophic and eutrophic lakes. The bottoms of these lakes generally lake oxygen during the later months of summer, limiting cold water fish. Eutrophic lakes are high in naturally occurring sediments such as nitrogen and phosphorous. They are likely to be weedy and/or experience large algae blooms. They support large fish populations, but are susceptible to “winterkill” due to a lack of dissolved oxygen in the later winter months.

The Trophic Status Index (TSI) numbers provide general indicators of a lake’s trophic class. There are three types of TSIs. TSI (TP) is an indicator based on the total amount of phosphorus available in the lake as indicated by lake monitoring. TSI (CHL) is an indicator based on the amount of Chlorophyll a, a measure of the amount of algae present, and TSI (SD) is a measure based on the Secchi depth, and indicator of water clarity.

Table 2. 1: TSI Values, Water Chemistry, and Trophic State

TSI	Secchi (ft.)	Total Phosphorus (mg/l)	Chlorophyll a (mg/l)	Trophic State
0	210	0.75	0.04	Oligotrophic
10	105	1.5	0.12	
20	52	3	0.34	
30	26	6	0.94	
40	13	12	2.6	Mesotrophic
50	7	24	6.4	
60	3	48	20	Eutrophic
70	1.6	96	56	
80	0.83	192	154	
90	0.42	384	427	
100	0.21	768	1183	

Source: Bay-Lake Regional Planning Commission, 2000; Carlson, 1977.

Dissolved Phosphorus

Dissolved Phosphorus is the form of phosphorus that is dissolved in the water and is readily available for aquatic plant uptake. Phosphorus is a vital element that contributes to both the fertility and growth of plants in lakes. None of the lakes within the town of Wausaukee have been tested for dissolved phosphorous.

Total Phosphorus

Total phosphorus is the total phosphorus available in a lake for aquatic plant growth. It is the sum of dissolved phosphorus and the phosphorus contained in suspended plant and animal material in the water. The concentration of phosphorus varies widely over the year, due to such things as thermal stratification and settling of organic matter from the lake surface to the bottom. In addition to naturally occurring in nature, phosphorus enters lakes through many human activities. These include livestock wastes, sewage effluents and applications of agricultural fertilizers.

Table 2. 2: Water Quality Index by Total Phosphorus

Water Quality Index	Total Phosphorous (mg/l)
Very Poor	>150
Poor	55-150
Fair	32-55
Good	16-32
Very Good	2-16
Excellent	<2

Source: MMA, Inc., Bay-Lake Regional Planning Commission, 2000.

Within the town of Wausaukee, fourteen lakes have been tested for the total phosphorus available in the water. The table below list the total phosphorus found in the six most developed lakes and the TSI number that corresponds to it.

Table 2. 3: Total Phosphorus, Water Quality Index and TSI

Lake	Total Phosphorus (mg/l)	Water Quality Index	Total Phosphorous Trophic Status Index (TP)
Little McCall	6	very good	39.6
Little Wolf	9	very good	45.2
Long	10	very good	46.0
Lost	26	good	53.4
Morgan	12	very good	47.5
Wolf	7	very good	43.3

Source: Marinette County LWCD, 1999; Bay-Lake Regional Planning Commission, 2000.

Chlorophyll a Pigment Concentration

This parameter is used as an estimation of algae, or phytoplankton biomass, in lakes. Lakes that appear to be clear or blue will generally have chlorophyll levels less than 10 micrograms per liter (mg/l). Within the state of Wisconsin, the average concentration of chlorophyll a in lakes was 14.8 mg/l with sixty-five percent of the lakes having a value of less than 10 mg/l. None of the lakes in Wausaukee have been tested for chlorophyll a levels.

Secchi Depth

Secchi depth is a good indicator of a lake's overall water quality. It measures color and turbidity while taking into account algae growth as well.

Table 2. 4: Secchi Depth and Water Quality

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

Source: MMA, Inc., Bay-Lake Regional Planning Commission, 1998.

Twelve of the lakes in the town have been tested for secchi disk depth. Below are the results of six of those lakes, including the water clarity interpretation and the TSI number that corresponds to it.

Table 2. 5: Secchi Depth, Town of Wausaukee

Lake	Feet	Interpretation	Secchi Depth Trophic Status Index (SD)
Little McCall	13.5	Good	39.6
Little Wolf	12.5	Good	40.7
Long	-	-	-
Lost	6.2	Fair	50.8
Morgan	13.5	Good	39.6
Wolf	15.5	Good	37.6

Source: Marinette County LWCD, 1999; Bay-Lake Regional Planning Commission, 1999. All of the lakes in the town of Wausaukee have a good Secchi disk reading, except for Lost Lake, which has a "fair" reading, and Long Lake which was not inventoried at the time of sampling.

pH

pH is a measure of the hydrogen ion concentration in lakes. This parameter has been shown to have important consequences in aquatic ecosystems. Different pH values will support different compositions of both plant and animal species in a lake. Some factors that affect the pH of lakes include bedrock composition and acid rain. A pH less than 7 is considered acidic; a pH of 7 is considered neutral and more than 7 is considered alkaline. The lakes within the town of Wausaukee were not sampled for pH.

Table 2. 6: Effects of Acidity on Fish

pH	Effect
6.5	Walleye spawning inhibited
5.8	Lake trout spawning inhibited
5.5	Smallmouth bass disappear
5.2	Walleye, lake trout disappear
5.0	Spawning inhibited in many fish
4.7	Northern pike, suckers, sunfish disappear
4.5	Perch spawning inhibited
3.5	Perch disappear
3.0	Toxic to all fish

Source: Olszyk, 1980; Bay-Lake Regional Planning Commission, 2000.

Fecal Coliform

Fecal coliform are coliform bacteria originating from animal feces. A high count of fecal coliform (greater than 200 colonies per 100 ml sample) usually indicates raw sewage is entering the lake. There is currently no data on the amount of fecal coliform entering any of the lakes within the town of Wausaukee.

Color

The color of the lake is dependent on the amount of material dissolved in the water. For the most part, concern over color is mainly aesthetic. However, color also can affect heat absorbency and light penetration of lakes, therefore affecting the depth at which plants can grow. In the following table the range and color content of lakes is described. The lower the color, the less brown the water is.

Table 2. 7: Lake Color, Town of Wausaukee Lakes

Lake	Color
Little McCall	Clear
Little Wolf	Light Brown
Long	Light Brown
Lost	Clear
Morgan	Clear
Wolf	Light Brown

Source: WDNR 1971; Bay-Lake Regional Planning Commission, 1999.

Turbidity

The turbidity of a lake is the measure of the amount of organic and inorganic matter that is suspended in the water. Turbidity directly affects heat absorbency and light penetration of lakes, therefore affecting the depth at which plants can grow and thereby decreasing the amount of dissolved oxygen in the water. The level of turbidity can be measured using either Jackson Turbidity Units (JTU) or Nephelometric Turbidity Units (NTU). The two measurements can be assumed to be the same. The average level of turbidity in Wisconsin lakes has been measured at 3.1 JTU. There is no available data on turbidity for the lakes within the town of Wausaukee.

Dissolved Oxygen (D.O.)

Dissolved oxygen is vital for both fish and other aquatic life. It is the amount of oxygen in the water that is available to these species. Most sport fish species cannot survive long with D.O. levels below 5 mg/l. Few fish tolerate levels below 2 mg/l. The total amount of oxygen that water holds inversely varies with the temperature of the water. For example, water at 33 degrees Fahrenheit contains approximately 14.2 mg/l at saturation, while water at 75 degrees is saturated at 8.4 mg/l. Lakes acquire oxygen from two sources, exchange with the atmosphere and oxygen production by aquatic plants. This means oxygen is produced only in the upper area of the lake. In stratified lakes this oxygen rich layer gets circulated to the bottom every spring and fall. This is called turnover. More nutrient (eutrophic) stratified lakes suffer oxygen depletion at a much faster rate than less nutrient (oligotrophic) lakes (Marinette County LWCD, 1999). The lakes within the town of Wausaukee were not sampled for dissolved oxygen.

The purpose of gathering lake water quality data is to assign a trophic class level to the lakes in order to determine the best means of managing the lake.

Table 2. 8: Trophic Class, Town of Wausaukee Lakes

Lake	Trophic Class (Secchi Disk)	Trophic Class (Total Phosphorus)
Little McCall	Mesotrophic	Mesotrophic
Little Wolf	Mesotrophic	Mesotrophic
Long	Mesotrophic	Mesotrophic
Lost	Mesotrophic	Mesotrophic
Morgan	Mesotrophic	Mesotrophic
Wolf	Oligotrophic	Mesotrophic

Source: WDNR 1980, 1993; Bay-Lake Regional Planning Commission, 1998.

Based on numbers in Table 2.1, a trophic class can be predicted for each of the lakes.

Little McCall Lake

This lake had a secchi disk reading of 13.5 feet and a TSI(SD) of 39.6. These numbers are on the border between being mesotrophic and oligotrophic. The total phosphorus in lake was measured at 6 mg/l, and the TSI(TP) was 39.6, which also falls on the border of mesotrophic and oligotrophic. This lake has moderate to low nutrient levels to support fish and plant life. The lake is unlikely to have much more development, and measures should be taken to keep the remaining undeveloped shoreline natural, and to restore as much shoreline as possible to reduce nutrient loading into the lake.

Little Wolf Lake

Little Wolf Lake had a secchi reading of 12.5 feet and a TSI(SD) of 40.7. These numbers border between mesotrophic and oligotrophic. Total phosphorus was at 9 mg/l, with a TSI(TP) of 45.2. These numbers indicate the lake being mesotrophic. Half of the shoreline is developed, and steps should be taken to keep the remaining shoreline undisturbed, and restoring the developed shoreline to reduce runoff into the lake.

Long Lake

No secchi disk reading was taken at Long Lake, but the total phosphorus was 10 mg/l, and the TSI(TP) was 46. This indicates a mesotrophic lake. The lake is fairly developed (65%), and has public access via a boat ramp. The combination of these two factors indicate that there could be future water quality issues to deal with.

Lost Lake

Both the secchi disk (6.2 feet, TSI of 50.8) and total phosphorus (26 mg/l, TSI of 53.4) readings for Lost Lake indicate that the lake is on the border of being mesotrophic and eutrophic. This lake has a higher nutrient level compared to the other lakes. Half of the shoreline is developed, and there is public access via a boat ramp. Shoreline restoration should be considered to reduce runoff and other developmental impacts.

Morgan Lake

Morgan Lake had a Secchi disk reading of 13.5 feet and a TSI(SD) of 39.6. These numbers border the line between being oligotrophic and mesotrophic. On the other hand, total phosphorus was 12 mg/l, and the TSI(TP) was 47.5 which borders between mesotrophic and eutrophic. These higher phosphorus numbers may indicate phosphorus loading from the surrounding development. Morgan Lake is the most developed (89%), lake in the town, and measures should be taken soon to minimize nutrient input.

Wolf Lake

The secchi disk readings for Wolf Lake was 15.5 feet and TSI(SD) of 37.6, which indicates an oligotrophic lake. The total phosphorus was 7 mg/l, and the TSI(TP) was 43.3. These numbers are on the border between mesotrophic and oligotrophic. The shoreline of Wolf Lake is very developed (77 percent), but it seems for now that nutrient input from development is minimal. Care should still be taken to minimize any further development, both residential, and recreational.

The data previously listed, where available for the town of Wausaukee lakes, was obtained from the following resources:

Marinette County Land & Water Conservation Department, Lake Classification Study-Draft Reports, 1999.

Wisconsin Department of Natural Resources. 1975. Surface Water Resources of Marinette County. Madison, Wisconsin.

Data Needs

In order to determine what is happening to the lakes within the town of Wausaukee in terms of water quality, basic water quality information is needed in order to determine a trend in water quality. In the majority of the lakes, the data available is either dated or non-existent. The Wisconsin Department of Natural Resources has developed criteria for developing a long term trend lake monitoring program.

At a minimum the WDNR recommends testing surface total phosphorous five times per year, with one being during the spring turnover; Secchi disk readings as much as possible, but a minimum of five times per year; and test for chlorophyll a four times per year. These tests will allow for a Trophic State Index (TSI) to be developed and approximate the relative age of a lake, as well as provide a base level of information to determine water quality trends over a period of time. Table 2.X lists the entire process for long term monitoring of a lake, as prescribed by the Wisconsin Department of Natural Resources:

Table 2. 9: Long Term Trends Lake Monitoring Methods Summary

Parameter	Approximate Date of Collection					Remarks
	Spring Turnover	Mid June	Mid July	Mid August	February	
Complete water chemistry	X					Two depths: 1 foot from the water surface and 2 feet above the lake bottom. Eighteen constituents: NO ₂ -N + NO ₃ -N, NH ₃ -N, KJN-N, Cl, Org.N, Dissolved P, Ca, Mg, Na, K, pH, SO ₄ , total alkaline, Fe, Mn, color, turbidity, total dissolved solids, volatile solids, and suspended solids.
Total Phosphorous	X**	X***	X***	X***	X**	** = 2 depths: 1 foot below water surface and 2 feet above the lake bottom. *** = Third additional depth at the top of the hypolimnion
Water Temperature, dissolved oxygen, pH and specific conductance	X	X	X	X	X	Profile - 1 foot below water surface and proceed to lake bottom using 3-6 foot intervals, depending on existing conditions and/or total lake depth. pH and conductance dependent on meter availability.
Chlorophyll a	X	X	X	X	X	One depth - 1 foot below water surface and at depth of observed metalimnion oxygen maxima
Secchi disk depth	X	X	X	X		Minimum frequency - Weekly by local observer is better
Lake water level	X	X	X	X		Minimum frequency - Weekly by local observer is better
Fish survey						Netting during spawning season, boom shocking after September 1. Shocking every other year. Gill netting every sixth year
Perch (Hg)				X		
Macrophyte			X	X		Survey every third year (general abundance and location by species)
Phytoplankton	X	X	X	X	X	Water collected at 1 foot depth with Kemmerer (identification and general abundance).
Zooplankton	X	X	X	X	X	One vertical tow with a plankton net (identification and general abundance).
Macroinvertebrates					X	Late winter sampling in lake and in stream.

Source: Wisconsin Department of Natural Resources, 1998.

INTRODUCTION

The purpose of this study is to inventory the existing natural features and land use and based on that determine the needs for water quality data. The following findings and recommendations will help future planning and proper management of the land and water based natural resources. Based on the information contained within this report, recommendations regarding future development and planning activities have been developed which, if implemented, should assist in lessening any negative impacts on the water quality associated with increased shoreline development. These recommendations are broken down into several categories with specific recommendations contained below them.

Water Quality Data Needs

The Marinette County Land and Water Conservation Department has a good start in obtaining complete, up-to-date data on the lakes within the county. Other data that should be collected include pH, fecal coliform, chlorophyll a, and turbidity. If possible, data should be gathered four to five times a year, as indicated by the DNR. The most complete data set to be gathered is listed in the Chapter 2, Long Term Trends Lake Monitoring Chart. If all of the data within the table cannot be gathered then at a minimum Secchi disk readings, temperature, chlorophyll a, total phosphorous and dissolved oxygen should be obtained as much as possible. In time, this data will show trends, so that any developmental impact on water quality within the town can be identified early. This will allow ample time to try to fix any problems that might have occurred.

In order to maintain the water quality within the town of Wausaukee, the county should use the U.S. Forest Service's Best Management Practices in conjunction with the Shoreland/Wetland Ordinance Permitting Process to control shoreline erosion.

Land Use and Zoning Recommendations

Comprehensive Land Use Planning

The town of Wausaukee should initiate a long-term Comprehensive Land Use Plan. Such a plan should incorporate the requirements of the state of Wisconsin's comprehensive planning 'Smart Growth' legislation and address, at a minimum, the following nine elements:

- A discussion of issues and opportunities;
- A housing element;
- A transportation element;
- A utilities and community facilities element;
- An agricultural, natural and cultural resources element;
- An economic development element;
- An intergovernmental cooperation element;
- A land use element;
- and, an implementation element

The town has already begun to address these elements through the development of this lake

assessment which inventories the land use and the agricultural, natural and cultural resources of the town.

Ordinances

- Local and county-wide ordinances should be periodically reviewed and updated on a regular basis to reflect changes in the physical, social, and economic trends;
- Continue education efforts with regard to the water quality benefits of the 75-foot building setback from the town's shorelines;
- Encourage residents to maintain more than the minimum vegetative screening as called for in the Marinette County Shoreland/Wetland Ordinance.
- Provide consideration to a setback area around wetlands for development, to maintain or improve the water quality of the lakes in the town of Wausaukee.

Public Access Recommendations

- Continue routine maintenance on the boat landings and improve as necessary;

Future Planning Needs

- The town should conduct a town-wide survey to gather information on issues of concern for the citizens.
- The town of Wausaukee should develop a vision for the next twenty years in the form of a comprehensive land use plan.

APPENDIX B - WATER QUALITY DATA INVENTORY

Lake Name	Ownership	Lake Type	Maximum Depth	Average Depth	Surface Area	Watershed Area	Shoreline Length	Miles of Shoreline	Shoreline Dev. Factor
Birch	Private (3)	dg	22 ft.	9.1 ft	16.5 ac	2145 ac	7065	1.34	2.3
Butterfly	Private (4)	se	15.0	7.5	13.8	90.1	4578	0.87	1.7
Cedar	Private (1)	sp	17.0	7.9	14.5	79.5	6665	1.26	2.4
Fence	Private (1)	dg	18.0	7.7	24.8	1180.7	4508	0.85	1.2
Grass	Private (6)	dg	19.0	8.0	68.2	984.5	8256	1.56	1.4
Helen	Private (2)	sp	11.0	5.5	10.7	252.1	3693	0.70	1.5
Island	Private-Many	dg	42.0	16.2	91.5	679.4	9081	1.72	1.3
Jug	Private (4)	se	-	-	13.2	81.7	3677	0.70	1.4
Little Island	Private (3)	dg	23.0	9.5	10.3	534.8	3284	0.62	1.4
Little McCall	Private-Many	se	21.0	9.4	9.9	35.6	2584	0.49	1.1
Little Wolf	Private-Many	sp	28.0	12.4	17.5	74.1	3000	0.57	1.0
Long	Private-Many	se	6.0	4.7	71.7	458.3	11,524	2.18	1.8
Lost	Private-Many	se	18.0	8.4	42.6	73.1	6578	1.25	1.4
McCall	Private-Many	dg	22.0	9.1	18.2	1665.6	3721	0.70	1.2
Moose	Private (1)	se	36.0	14.0	17.1	27.5	3715	0.70	1.2
Morgan	Private-Many	se	21.0	9.4	94.2	447.1	16,425	3.11	2.3
Mud	Private (3)	se	8.0	5.3	23.1	77.5	4387	0.83	1.2
Perch	Private (2)	sp	16.0	7.5	25.8	192.9	4147	0.79	1.1
Poche de Noch	Private (2)	dg	11.0	5.2	26.3	289.2	9114	1.73	2.4
Spies	Private-Many	dg	6.0	3.4	25.8	365.6	4355	0.82	1.2
Wausaukee	Private	dg	6.0	3.4	4.7	22464.0	2059	0.39	1.3
Wolf	Private-Many	dg	51.0	19.4	78.5	1874.7	12,934	2.45	2.0

Lake Name	Stratification Factor	Flushing Index	Drainage Basin/ Lake Area Ratio	Soil Erodibility	Septic Suitability	Public Shoreline	Wet Shoreline	Public Access
Birch	21.8	14.3	130.0	0%	0%	0 ft.	5820 ft.	NW
Butterfly	17.1	0.9	6.5	100	100	0	0.0	-
Cedar	18.5	0.7	5.5	0	0	0	4649.0	-
Fence	16.1	6.2	47.6	80	100	0	900.0	-
Grass	12.8	1.8	14.4	0	0	0	4721.0	-
Helen	15.1	4.3	23.6	35	40	0	455.0	-
Island	23.7	0.5	7.4	95	100	0	1987.0	-
Jug	-	-	6.2	100	100	0	0.0	-
Little Island	27.2	5.5	51.9	40	100	0	2190.0	-
Little McCall	25.6	0.4	3.6	0	0	0	0.0	-
Little Wolf	26.1	0.3	4.2	0	0	0	2235.0	NW
Long	5.7	1.4	6.4	0	0	66	6190.0	B
Lost	13.8	0.2	1.7	0	0	0	1524.0	B
McCall	21.0	10.1	91.5	0	56	66	2083.0	B
Moose	32.8	0.1	1.6	0	0	0	952.0	-
Morgan	12.9	0.5	4.7	0	0	0	0.0	-
Mud	9.2	0.6	3.4	0	0	0	248.0	-
Perch	14.5	1.0	7.5	0	0	0	3098.0	-
Poche de Noch								
Noch	10.9	2.1	11.0	0	0	66	0.0	R
Spies	7.4	4.2	14.2	0	0	0	1459.0	-
Wausaukee	15.6	1404.1	4779.6	74	0	2059	0.0	T
Wolf	29.3	1.2	23.9	0	0	66	2295.0	B

Lake Name	Phosphorus	Secchi Disk	Alkalinity	TSI/tp	TSI/sd	Developed Lots	Undeveloped Shoreline
Birch	12mg/L	10.5 ft.	-	47.5	43.2	1	6865 ft.
Butterfly	-	-	-	-	-	-	-
Cedar	16.0	11.2	-	49.7	42.3	1	6465
Fence	-	-	-	-	-	0	4508
Grass	16.0	15.0	-	49.7	38.1	4	6814
Helen	-	-	-	-	-	-	-
Island	-	-	-	-	-	-	-
Jug	-	-	-	-	-	0	3677
Little Island	-	-	-	-	-	0	3284
Little McCall	6.0	13.5	-	42.1	39.6	8	450
Little Wolf	9.0	12.5	-	45.2	40.7	8	1606
Long	10.0	-	-	46.0	-	27	3980
Lost	26.0	6.2	-	53.4	50.8	14	3300
McCall	50.0	4.0	-	58.5	57.1	1	3500
Moose	9.0	15.5	-	45.2	37.6	2	3515
Morgan	12.0	13.5	-	47.5	39.6	40	1820
Mud	25.0	4.5	-	53.1	55.4	3	3573
Perch	8.0	16.0	-	44.3	37.1	0	4147
Poche de							
Noch	0.0	-	-	-	-	1	8500
Spies	20.0	-	-	51.4	-	9	2540
Wausaukee	-	-	-	-	-	1C	900
Wolf	7.0	15.5	-	43.3	37.6	46	2967

Source: Marinette County Land & Water Conservation Department, 1999.

Key to Abbreviations:

Lake Type:

dg Drainage
se Seepage
sp Spring

Public Access:

B Boat
NW Navigable Waterway
R Road
T Trail

Note: Shoreline density was measured by taking the shoreline length in miles and dividing it by the number of developed lots.