

DRAFT
FOR REVIEW ONLY

TOWN OF FLORENCE - SPREAD EAGLE
CHAIN OF LAKES PLANNING ASSESSMENT
Florence County, Wisconsin



December, 1998

BAY-LAKE REGIONAL PLANNING COMMISSION

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Green Bay, WI 54303 - Phone: (920) 448-2820

CHAPTER 1 - INTRODUCTION

CONTRACT WITH BLRPC

The Florence Town Board entered into a contract with the Bay-Lake Regional Planning Commission to prepare an assessment of the town and in particular the lakes within the Spread Eagle Chain of Lakes. The Town Board designated the Citizens' Advisory Committee to work jointly with the UW-Extension Agent and Bay-Lake Regional Planning Commission to prepare the document. The Advisory Committee 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 Spread Eagle Area. The issues and concerns were used to develop the town-wide survey that led to the establishment of the goals, objectives, and policies of the plan.

This project is the first step in the development of a comprehensive land use plan for the town of Florence. It will be used as a pilot project that will be applied to similar lakes in Florence County that have a low rate of second home development and that are located in areas that are very rural in nature and are primarily within the boundaries of the Nicolet National Forest. This study will collect and assess the types of social, physical and regulatory data that are available for the five lakes and their associated watersheds. In addition to collecting and assessing available data, the study will identify deficiencies in data and make recommendations for additional data collection where appropriate.

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 and town-wide survey.

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: the *Green Bay East Shore Cumulative and Secondary Impacts Study (Part 1)*, *Town of Peshtigo Comprehensive Land Use Plan*; *City of Sheboygan Falls Comprehensive 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 Zoning Ordinance; and Town of Abrams Comprehensive Land Use Plan.

PAST PLANNING EFFORTS

The town of Florence and Florence County have been involved in a number of planning efforts and studies over the years, which included the Spread Eagle Chain of Lakes. Listed below are past, and current plans and studies that contain information and recommendations for the Spread Eagle Lakes Area. 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 reached.

Table 1.1: Past Planning Efforts, Spread Eagle Area and Town of Florence

YEAR	TITLE	AUTHOR
1998	Lake Planning Study for West Lake	MMA, Inc.
1996	Lake Planning Study for North Lake	MMA, Inc.
1971	Florence County Natural Resource Inventory	Northeastern Wisconsin RPC
1971	Water and Natural Resources Study for Florence County	Northeastern Wisconsin RPC

Source: Bay-Lake Regional Planning Commission, 1998.

COMPREHENSIVE PLANNING PROCESS

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 Florence with two of the important parts of developing a comprehensive land use plan for the Spread Eagle area.

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 resource identification that are key issues to be addressed by a planning assessment is to perform a nominal group survey. The UW-Extension conducted a nominal group survey at the very outset of the planning process on June 9, 1998 to identify key issues. The results of the nominal group survey identified the key issues listed below, which were incorporated into a town wide survey.

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 seven priority issues and needs of citizens of the Spread Eagle area. The following are the top five issues, which most concerned citizens at the time of the workshop:

- Water Quality
- Boating Issues - review and revise boating regulations
- Regulations are too restrictive on individual land uses
- Publish book with regulations pertaining to Spread Eagle Chain

- How does shoreland development impact wildlife

Appendix A has the complete nominal group results. An outline on how a nominal group survey is to be conducted is included.

Spread Eagle Citizens Advisory Committee Goals and Objectives (RESERVED)

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 Spread Eagle Lakes Planning Area

The Spread Eagle Chain of Lakes Planning Area is located in the eastern portion of the town of Florence and Florence County and abuts the Wisconsin-Michigan state line along the Menominee River. The planning area is predominantly wooded with the Spread Eagle Chain of Lakes and Menominee River being the major water features in the area. The Chain is located 13 miles east of the county seat, Florence, Wisconsin, 7 miles west of Iron Mountain, Michigan and 111 miles north of Green Bay, Wisconsin.

Principal Physical Elements

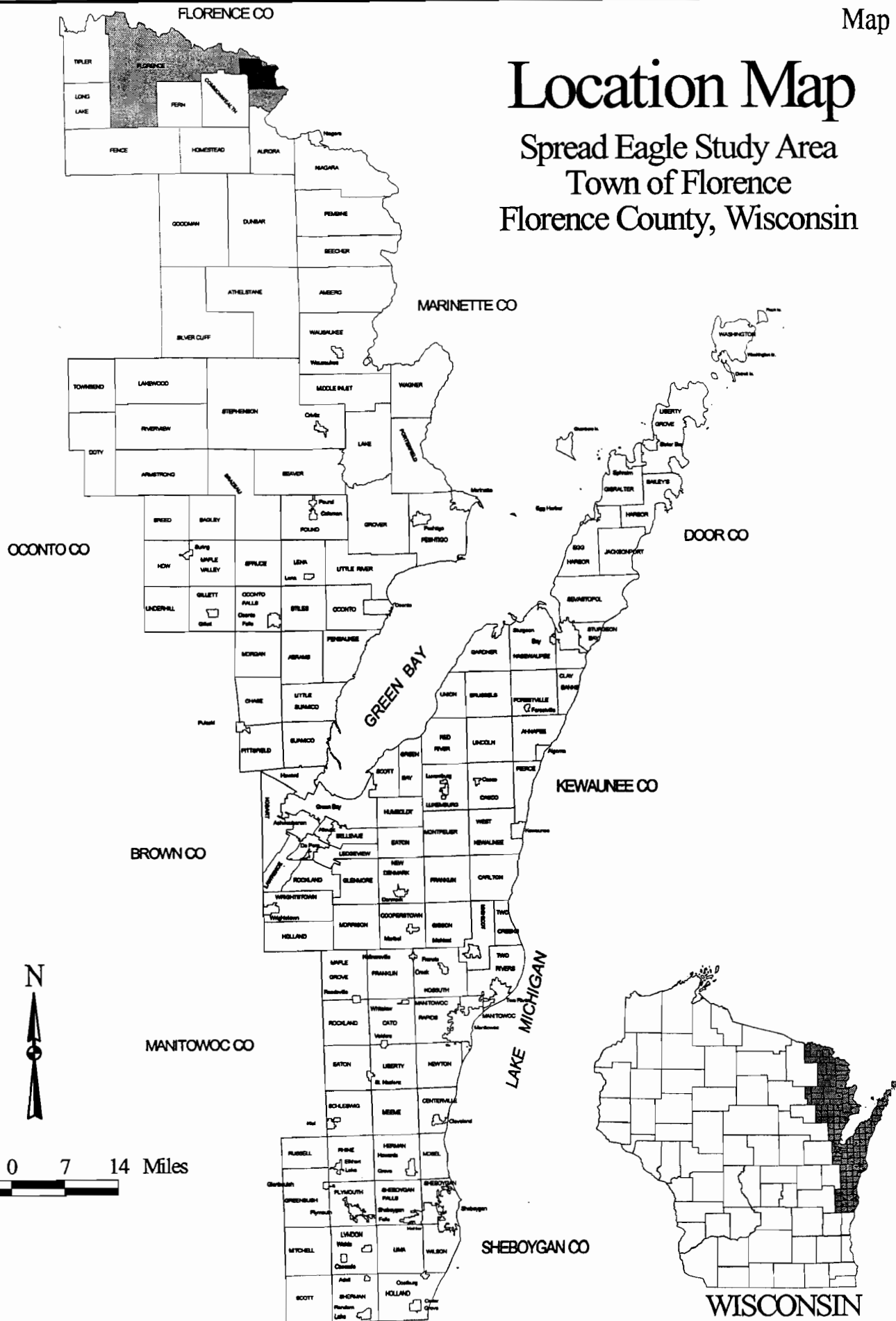
Geology

The bedrock in Florence County is a continuation of the Canadian Shield and consists of Lower Precambrian and Middle Precambrian Rocks. Crystalline and undifferentiated Precambrian rock are generally found within the southwest portion of the county, while Middle Precambrian rocks are found in the planning area and the north and eastern portion of the county. The Spread Eagle area is composed primarily of Badwater Greenstone, a Mafic rock unit formed in the Middle Precambrian Era.

The glacial geology of the Spread Eagle area is entirely composed of pitted outwash deposits. Pitted outwashes were formed from deposits from glacial meltwater and streams. The deposits are stratified and sorted consisting of sand and gravel. The topography of pitted outwash consists of knobs, kettles and minor ridges and in some cases is quite similar to end moraine. Across the hills and valleys created by the glacial action, winds deposited silty material which covered the glacial deposits and formed a basis for the original hardwood-conifer forests.

Location Map

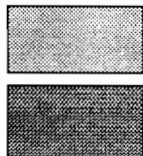
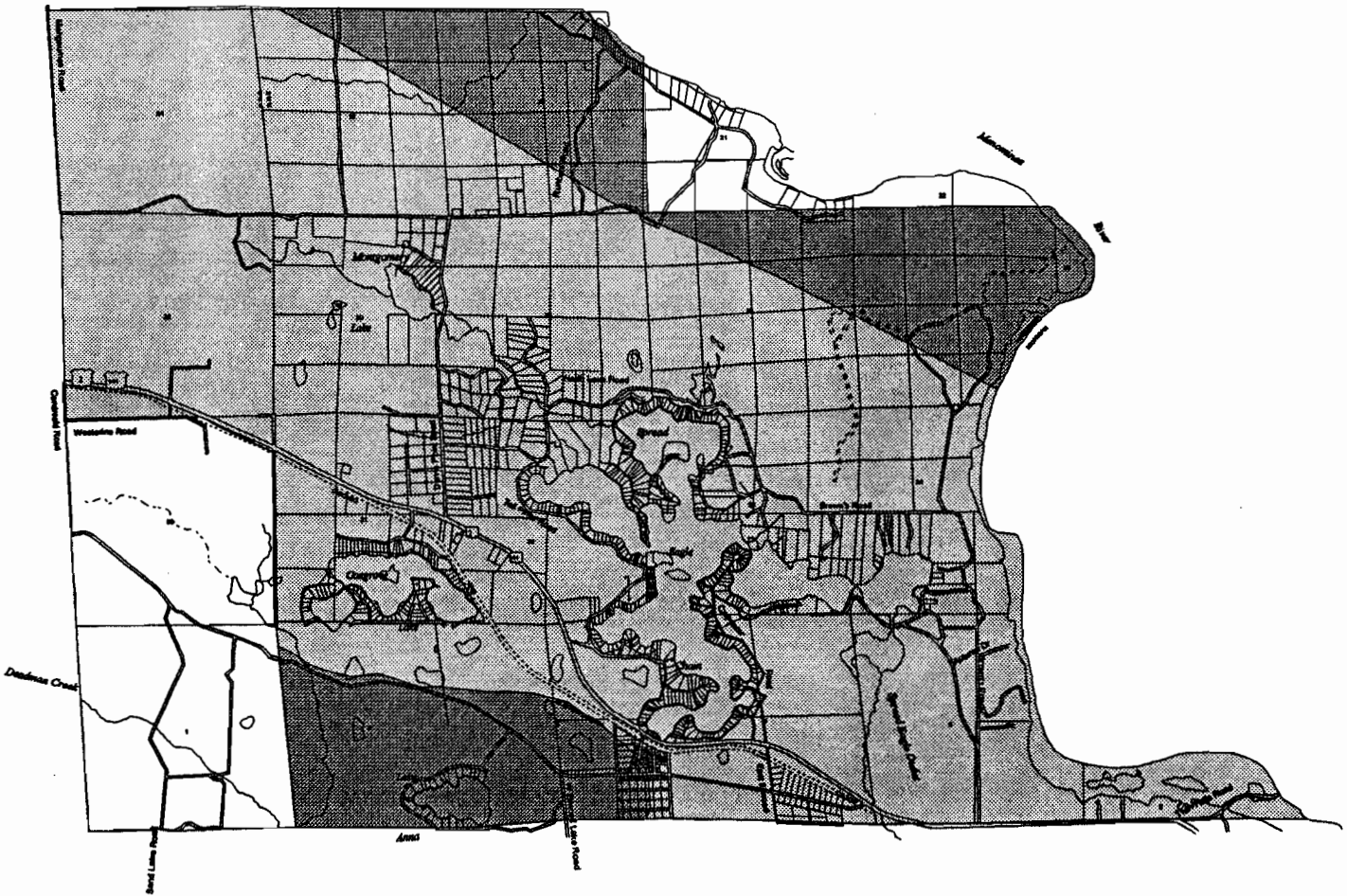
Spread Eagle Study Area Town of Florence Florence County, Wisconsin



Source: Bay-Lake Regional Planning Commission, 1998

Bedrock Geology

Spread Eagle Study Area
Florence County, Wisconsin



Mafic Rocks

Sedimentary Rocks

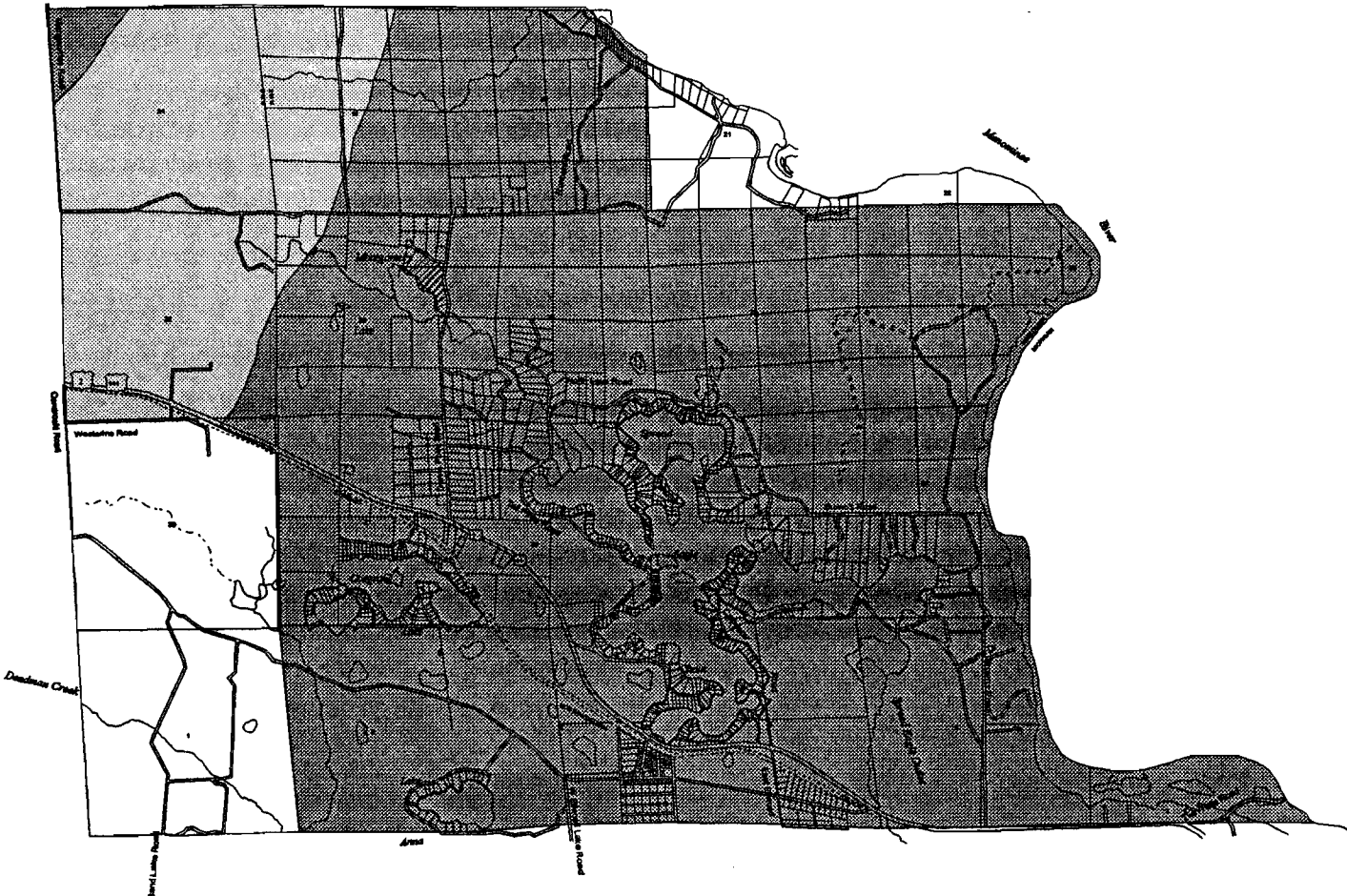




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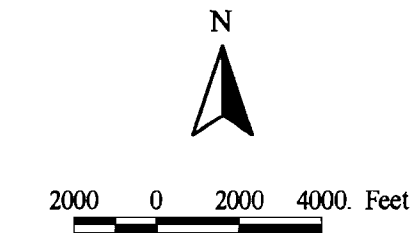
Source: Bedrock Geology Map of Wisconsin, Greenberg, J.K. & B.A. Brown, Bay-Lake Regional Planning Commission, 1998.

Pleistocene Geology

Spread Eagle Study Area
Florence County, Wisconsin



-  Ground Moraine
-  Pitted Outwash



Source: Bay-Lake Regional Planning Commission, 1998.

Soil Limitations (Florence County Farmland Preservation Plan)

The soils within the planning area are made up of Stambaugh silt loam and Vilas, Omega and Hiawatha loamy sand, sand and peat soils. Stambaugh silt loam covers an area roughly on a line cutting through the Long Lake/Middle Lake Channel, north around North Lake and northwest to the Menominee River. These soils have a nearly level slope ranging from zero to five percent although few exceed three percent. Underlying the Stambaugh Silt Loam is a thin loess and loamy coverings over acid sand and gravel and sandy loam glacial till. The Vilas, Omega and Hiawatha loamy soils are generally hilly to rolling uplands with slopes of zero to thirty percent although most range from six to thirty percent. The parent soil material is an acid loamy sand glacial till, outwash and inwash sand with some gravel and organic materials.

According to the 1982 *Florence County Farmland Preservation Plan*, the entire Spread Eagle Study Area has soils that are generally considered to have moderate limitations for the use of conventional septic systems. This classifications means that some soil properties are unfavorable but can be overcome by special planning and design techniques.

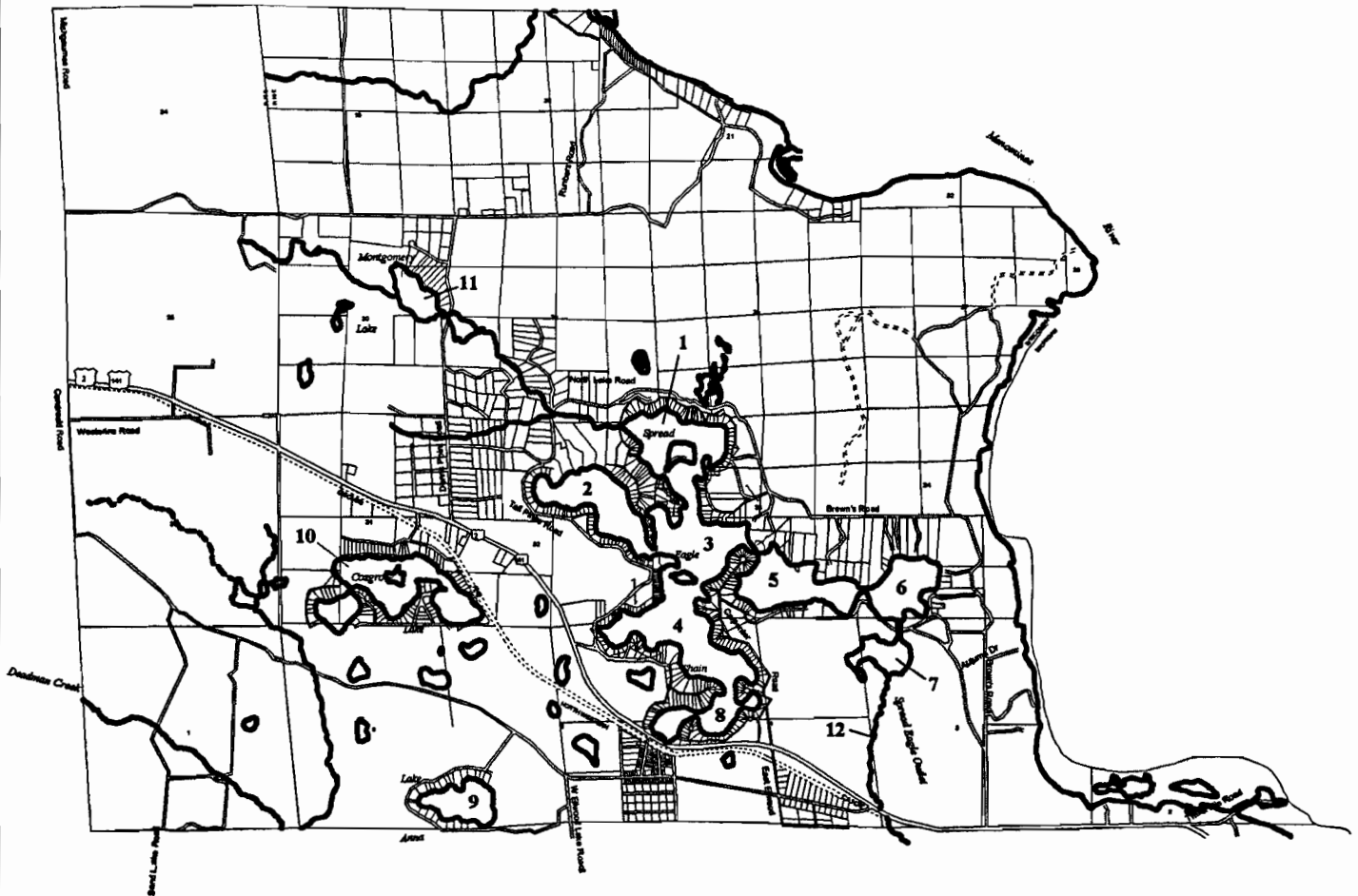
Water Resources

Watershed and Subwatersheds

Lakes, rivers, and streams comprise the surface water resources within the Spread Eagle Study Area. These surface water resources help comprise the subwatersheds of the Pine River Basin and the Brule/Menominee Rivers. The two watersheds in this case are separated by the USH 2-141 road grade from the western edge of the study area to just west of the unincorporated community of Spread Eagle, where the divide continues south to the confluence of the Pine and Menominee Rivers. Drainage of the area's surface waters is typically west to east and flows into the Menominee River and eventually to the Bay of Green Bay.

Surface Water Resources

Spread Eagle Study Area
 Florence County, Wisconsin



- | | |
|----------------|-------------------------|
| 1- North Lake | 7- South Lake |
| 2- West Lake | 8- Railroad Lake |
| 3- Middle Lake | 9- Lake Anna |
| 4- Bass Lake | 10- Cosgrove Lake |
| 5- Long Lake | 11- Montgomery Lake |
| 6- East Lake | 12- Spread Eagle Outlet |

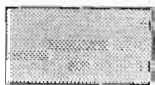
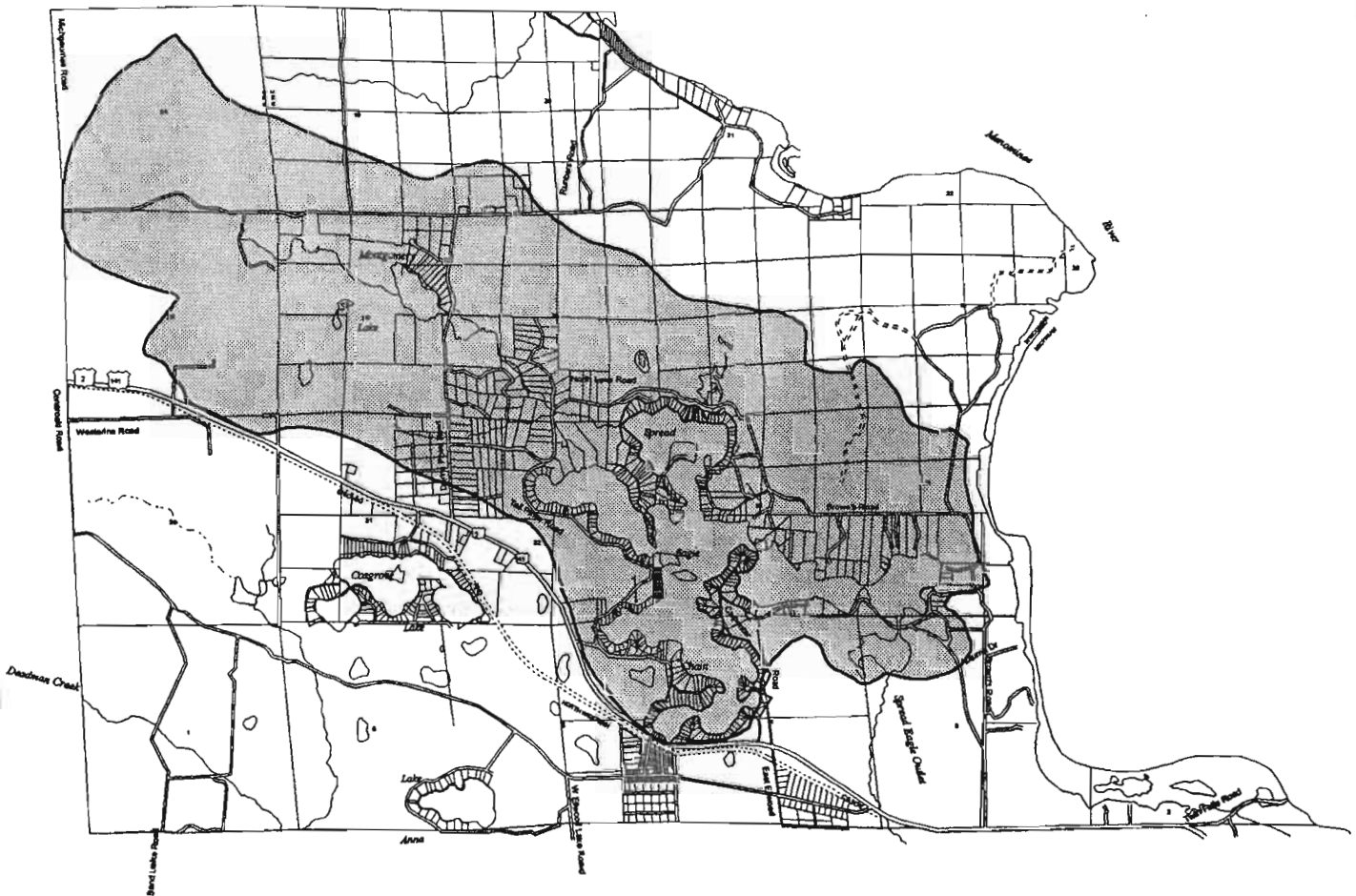


2000 0 2000 4000 Feet

Source: Bay-Lake Regional Planning Commission, 1998.

Spread Eagle Chain of Lakes Watershed

Spread Eagle Study Area
Florence County, Wisconsin



Spread Eagle Watershed



2000 0 2000 4000 Feet

Source: USGS, 1970; Bay-Lake Regional Planning Commission, 1998.

Surface Water Features - Lakes

North Lake

North Lake is located on the far northern end of the Spread Eagle Chain of Lakes, covering approximately 71 acres. The lake's deepest point is 43 feet, while littoral materials consist primarily gravel with the remainders being muck and sand. Fish species that inhabit the lake include northern pike, walleye, largemouth bass, smallmouth bass, perch, bluegill, black crappie, rock bass and forage species. The shoreline is predominantly upland and is heavily developed. North Lake has the only public access site located on the Spread Eagle Chain of Lakes.



Middle Lake

Middle Lake is located directly south of North Lake and is connected by a wide, shallow channel. The total surface area is approximately 75 acres. The majority of the littoral materials consist of sand and gravel with small amounts of muck and rubble. The deepest point in Middle Lake is located almost exactly in the center of the lake at 54 feet deep. The shoreline is heavily developed with residences, both seasonal and year-round. Public access is provided through the channel from North Lake. Fish species include northern pike, walleye, largemouth bass, perch, bluegill, black crappie, rock bass, pumpkinseed and forage species.

West Lake

West Lake is located directly west of Middle Lake and the two lakes are connected by a very narrow channel. Approximately 67 acres are covered by West Lake. Littoral materials are composed of almost equally muck, sand and gravel. West Lake is also heavily developed and public access is restricted to boat traffic traveling from the access point on North Lake to Middle Lake and into West Lake. Fish species found in the lake include northern pike, walleye, largemouth bass, smallmouth bass, perch, bluegill, black crappie, rock bass and forage species.

Bass Lake

Bass Lake is a hard water drainage lake having slightly acid, clear water of high transparency. Bass Lake has a maximum depth of 68 feet and is separated from Middle Lake by Bass Island. Littoral materials consist primarily of gravel, sand and rubble. Almost the entire shoreline is developed, with public access available via navigable water from North Lake. Fish species in the lake include northern pike, walleye, largemouth bass, smallmouth bass, perch, bluegill, pumpkinseed, black crappie, rock bass and forage species.

Long Lake

Long Lake has a maximum depth of 75 feet making it the deepest lake within the Spread Eagle Chain and covers approximately 73 acres. Long Lake is connected to Middle Lake by a narrow channel on the eastern shore of Middle Lake. It is a hard water drainage lake having slightly acid, clear water of high transparency. Littoral materials consist primarily of sand and gravel with smaller quantities of muck and rubble. The western shores of Long Lake are highly developed, but the central and eastern sides of the lake are not as densely developed. Public access is limited to the navigable water leading from Middle Lake. Fish species include northern pike, walleye, largemouth bass, smallmouth bass, perch, bluegill, black crappie, rock bass, pumpkinseed and forage species.

East Lake

East Lake is a hard water drainage lake having slightly acid, clear waters of high transparency. East Lake is accessible from a channel connecting it to the eastern shore of Long Lake. The maximum depth of 27 feet is located in the northwestern quarter of the lake, and the littoral zone consists primarily of sand, gravel and muck. Residential development on East Lake is limited to a few areas along the eastern shoreline of the lake. Fish species found in the lake include northern pike, walleye, perch, largemouth bass, smallmouth bass, bluegill, black crappie, rock bass, pumpkinseed and forage species. Public access is available from the public boat launch located on north lake.

South Lake

South Lake is a hard water drainage lake having neutral, clear water of high transparency, located south of East Lake. The deepest point on South Lake is 20 feet deep and is located in the eastern one-half of the lake. South Lake is connected to East Lake by an inlet located on the northeastern shoreline. Littoral materials consist primarily of muck with lesser amounts of gravel, rubble and boulders. Located on the southern shoreline is the Spread Eagle outlet, which flows into the Twin Falls Flowage on the Menominee River. Fish species inhabiting this lake include northern pike, largemouth bass, perch, bluegill, black crappie, yellow bullhead and forage species. The primary public access to South Lake is via navigable water from North Lake.

Railroad Lake

Railroad Lake is located at the southernmost end of the Spread Eagle Chain of Lakes. It is connected to Bass Lake by a wide channel at the northeastern quarter of the lake. Railroad Lake is adjacent to the unincorporated community of Spread Eagle on USH 141-2. The deepest point on Railroad Lake is approximately 68 feet, located just south of the inlet to Bass Lake. It is a hard water drainage lake having neutral, clear water of high transparency. Littoral materials consist primarily of muck with lesser amounts of sand, gravel, rubble and boulders. Fish species inhabiting this lake are northern pike, walleye, largemouth bass, smallmouth bass, perch, bluegill, black crappie, rock bass, pumpkinseed and forage species. The entire shoreline is developed with both residential and commercial uses.

Lake Anna

Lake Anna is 36 acre lake located in the southern portion of the Spread Eagle study area. Although it has a rather small surface area, it reaches a maximum depth of 61 feet. It is a very soft water seepage lake having slightly acid, clear water of very high transparency. Littoral materials are composed primarily of sand with the balance being gravel and rubble. Fish species inhabiting the lake include rainbow trout, largemouth bass,



bluegill, perch, rock bass and green sunfish. Public access without parking is provided on the western shoreline of the lake. Shoreline development is concentrated along the western three-quarters of the lake.

Cosgrove Lake

Cosgrove Lake is a medium hard water seepage lake having neutral, clear water of very high transparency, totaling approximately 80 acres. The littoral materials are primarily sand with some muck and gravel. Cosgrove Lake is connected to Lake 31-15 through a dug channel providing navigability and increasing the total lake area to 93 acres.



The maximum depth of the lake is approximately 27 feet and has a public access site located just west of the channel with Lake 31-15. Fish inhabiting the lake include walleye, perch, largemouth bass, smallmouth bass, bluegill, black crappie, rock bass and forage species. The shoreline is heavily developed, however there are few small areas of undeveloped shoreline remaining.

Montgomery Lake

Montgomery Lake is located within the Spread Eagle Watershed in the northeastern part of the study area. It is a hard water drainage lake having neutral, light brown water of moderate transparency. Sand is the major littoral material with some muck and rubble and the deepest point in the lake is 27 feet. Fish species inhabiting the lake include largemouth bass, bluegill, pumpkinseed, brook trout and forage species. Montgomery Lake has some development, however, the buildings are all set back at least 150 feet from the shoreline.



Rivers and Streams

Spread Eagle Outlet

Spread Eagle Outlet flows south out of South Lake and provides drainage from the Spread Eagle Chain of Lakes to the Twin Falls Flowage on the Menominee River. It is a warm water stream inhabited primarily by forage species. The length of the stream within the study area is entirely forested, except where USH 2-141 crosses it.

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 that is permitted to take place in these areas is susceptible to storm damages 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.

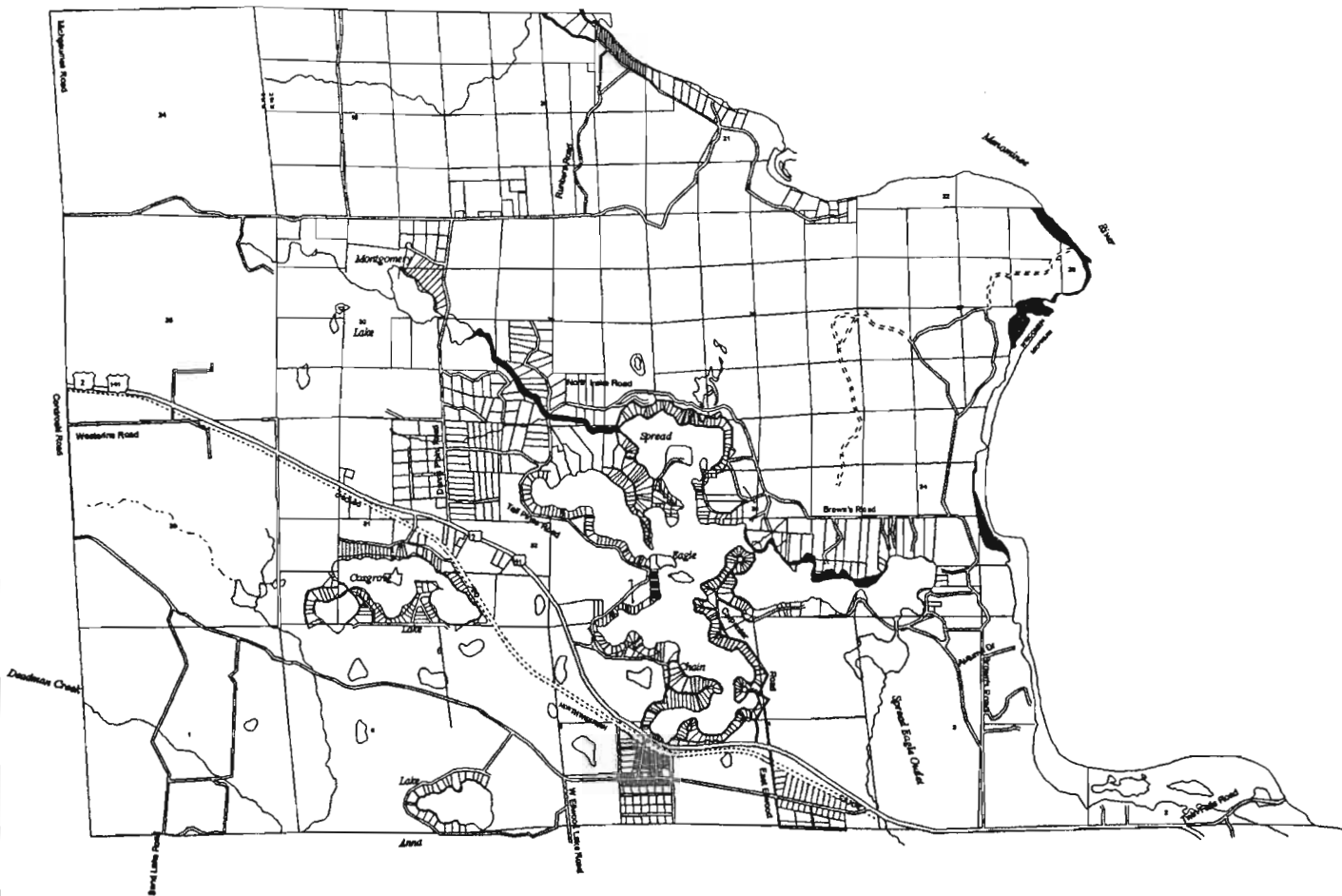
The authority to enact and enforce these types of zoning provisions in counties is set forth in Chapter 59.97 of the Wisconsin Statutes and Wisconsin Administrative Code NR 116. This same authority is also vested to cities and villages in Chapter 62.23 of the Wisconsin Statutes.

Floodplains were interpreted from Federal Emergency Management Flood Insurance Rate Maps for the Spread Eagle Area. Floodplains within the study are limited to a narrow area along the inlet to North Lake from Montgomery Lake, a narrow portion of shoreline along Bass and East Lakes, and a few areas along the Menominee River. Floodplains account for only approximately 65 acres of land within the Spread Eagle Study Area.

Floodplains

Spread Eagle Study Area

Florence County, Wisconsin



Floodplains



2000 0 2000 4000 Feet

Source: FEMA F.I.R.M.; Bay-Lake Regional Planning Commission, 1998.

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 no discharge or fill material can be permitted if a practicable alternative exists that is less damaging to the aquatic environment or if the nation’s waters would be significantly degraded. 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 Florence. 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 Spread Eagle Study Area, there are approximately 516 acres of wetlands as identified by the Wisconsin Department of Natural Resources. The wetlands are generally scattered throughout the study area, without a large wetland complex in the study area.

Slope

In order to determine where areas of steep slope (greater than 15% slope) exist within the Spread Eagle Study Area, the Commission used the recently released draft Soil Survey of Florence County, Wisconsin as produced by the Natural Resource Conservation Service. The study area has approximately 1,843 acres of steep slope, with the areas of steep slope primarily associated with the many water features throughout the study area (Map 2.7).

Woodlands

Florence County is predominantly covered by forests consisting largely of aspen and northern hardwoods, including sugar maple, elm, birch and basswood. Aspen forests dominate the eastern and northwestern towns, while northern hardwoods are the major forest type of the central and southwestern towns. Oak, pine and swamp conifers are in limited stands scattered throughout the county. The study area is heavily forested with 6,890 acres of woodlands. The Spread Eagle area is primarily covered by aspen with small pockets of pine located along the Menominee River and west side of the Chain of Lakes. The forested tracts are broken only by a few agricultural uses and the road network. The largest unbroken tract of woodland is located north of North Lake to the Menominee River.

Wildlife habitat

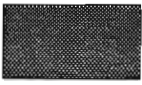
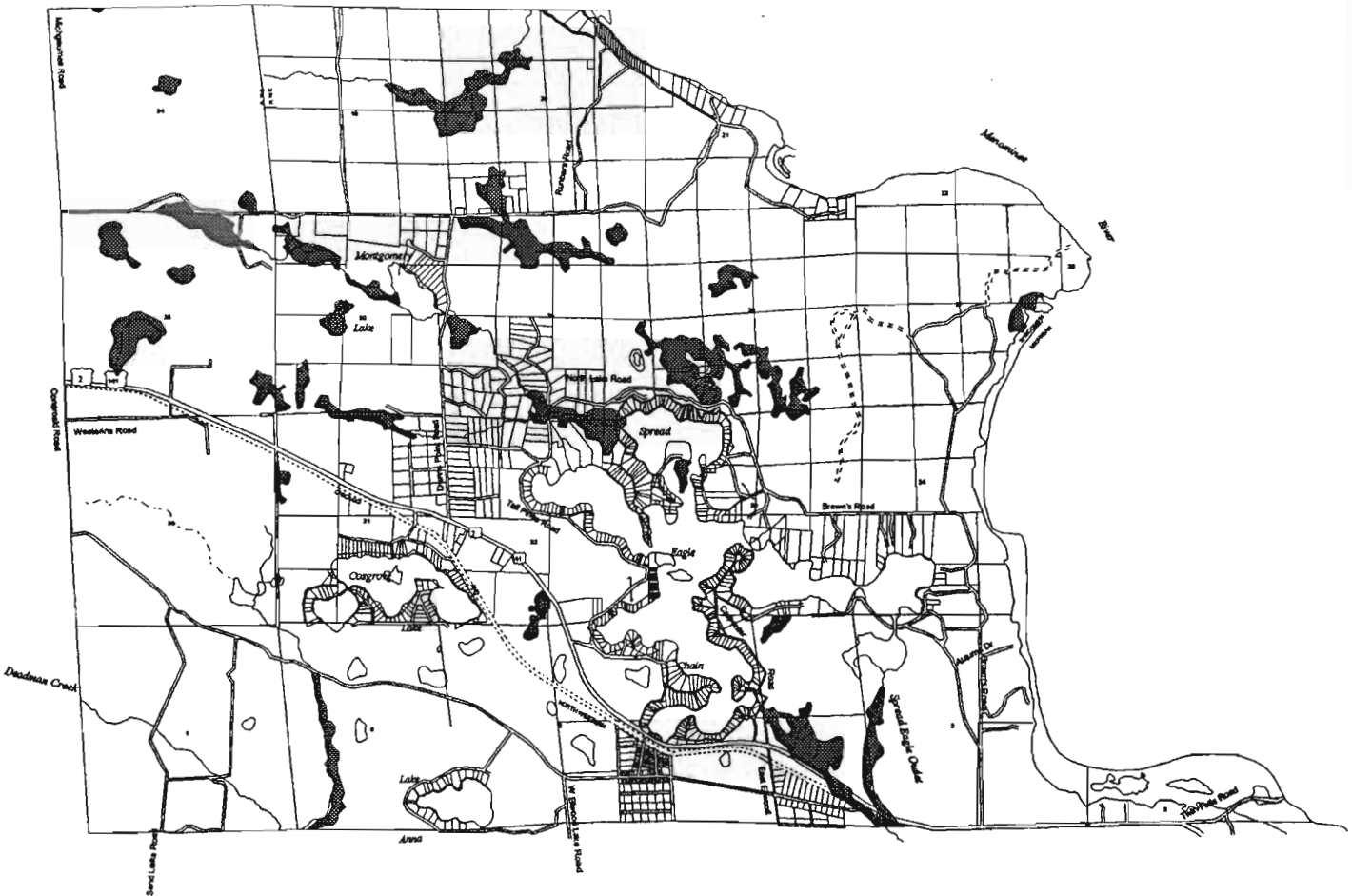
The fauna that lives within the planning area is quite diverse. Many mammals such as the white-tailed deer, black bear, bald eagle, grouse, coyote, gray wolf, porcupine, beaver, muskrat, gray and red squirrel, and chipmunks are some of the more well known species found in the area. The surface waters 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.

National, State & County Scientific and Natural Areas

State Natural Areas are designated by the WDNR Bureau of Endangered Resources as tracts of land in a natural or near natural state, which are managed to serve several purposes including scientific research, teaching of resource management, and preservation of rare native plants and ecological communities. There are not any designated scientific or natural areas within the Spread Eagle Study Area

WDNR Wetlands

Spread Eagle Study Area
Florence County, Wisconsin



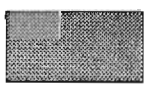
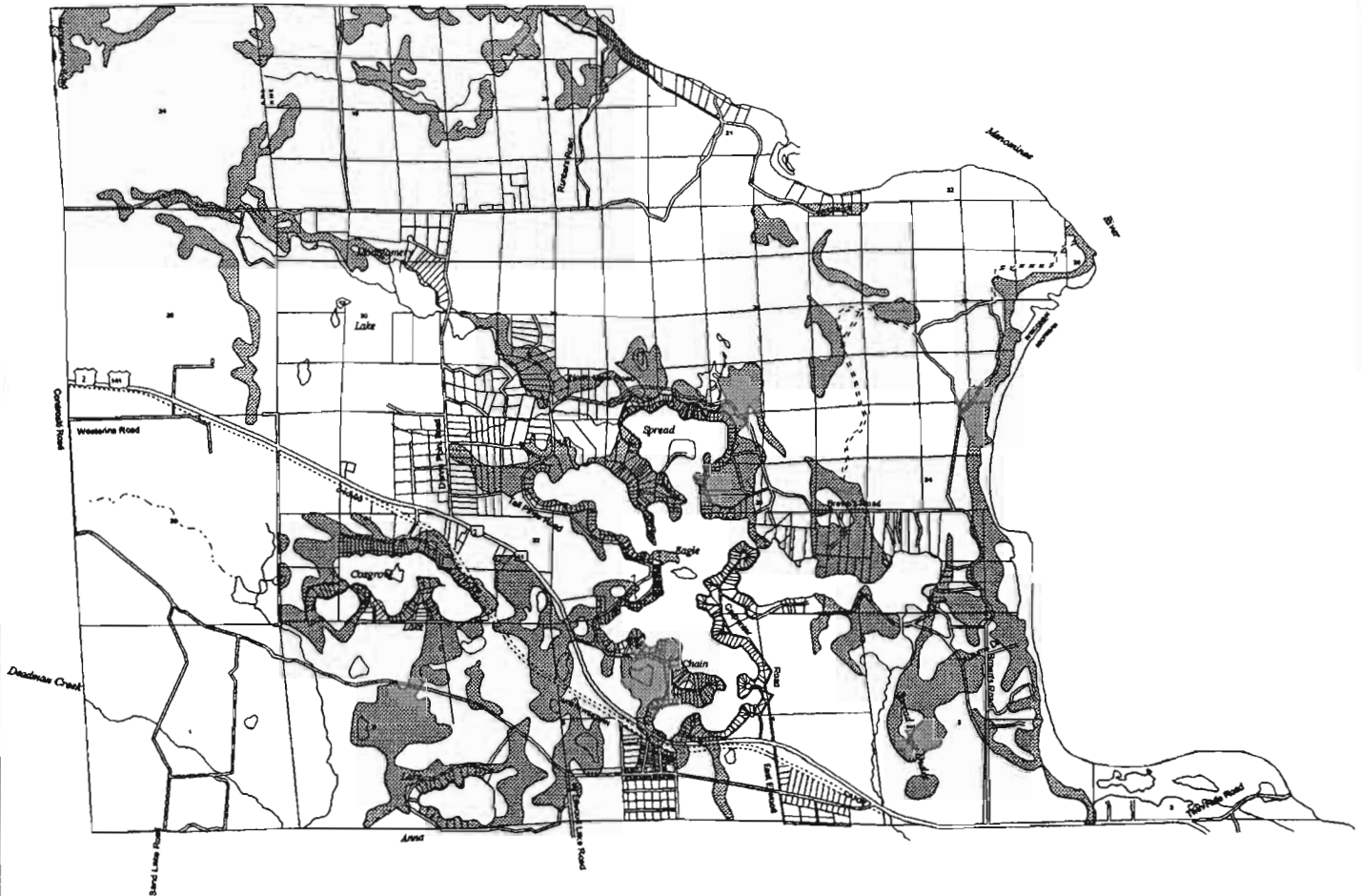
WDNR Wetlands



Source: Wisconsin Department of Natural Resources, 1993; Bay-Lake Regional Planning Commission, 1998.

Steep Slope

Spread Eagle Study Area
Florence County, Wisconsin



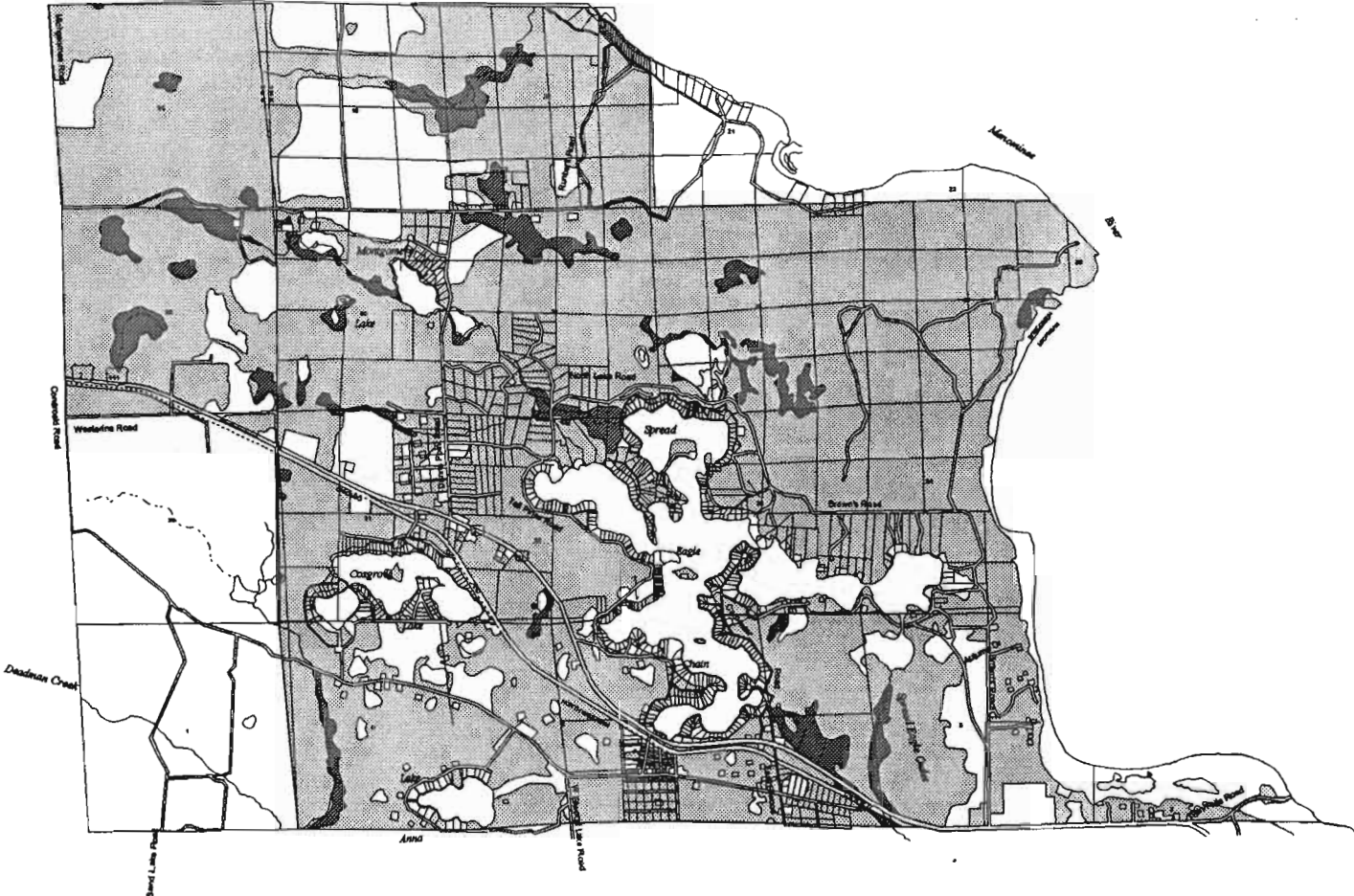
Slope > 15%





Source: National Resource Conservation Service, 1992,
Bay-Lake Regional Planning Commission, 1998.

Woodlands

Spread Eagle Study Area
Florence County, Wisconsin



 Lowland Woodlands
 Upland Woodlands



Source: Wisconsin Department of Natural Resources, 1993; Bay-Lake Regional Planning Commission, 1998.

Historic and Archeological Sites

Although there are not any historic or archeological sites listed on the state or federal registers of historic places, the Spread Eagle area is rich in history, as is the case with resorts that have come and gone in places such as Eagle Island and Bass Island. Existing structures and cultural features of the Spread Eagle area help to define the physical look and character of the community. When developments are proposed for the Spread Eagle area, care should be exercised and the sites should be reviewed carefully for potential state, regional or local historic or archeological significance.

Environmental Corridors and Isolated Natural Areas.

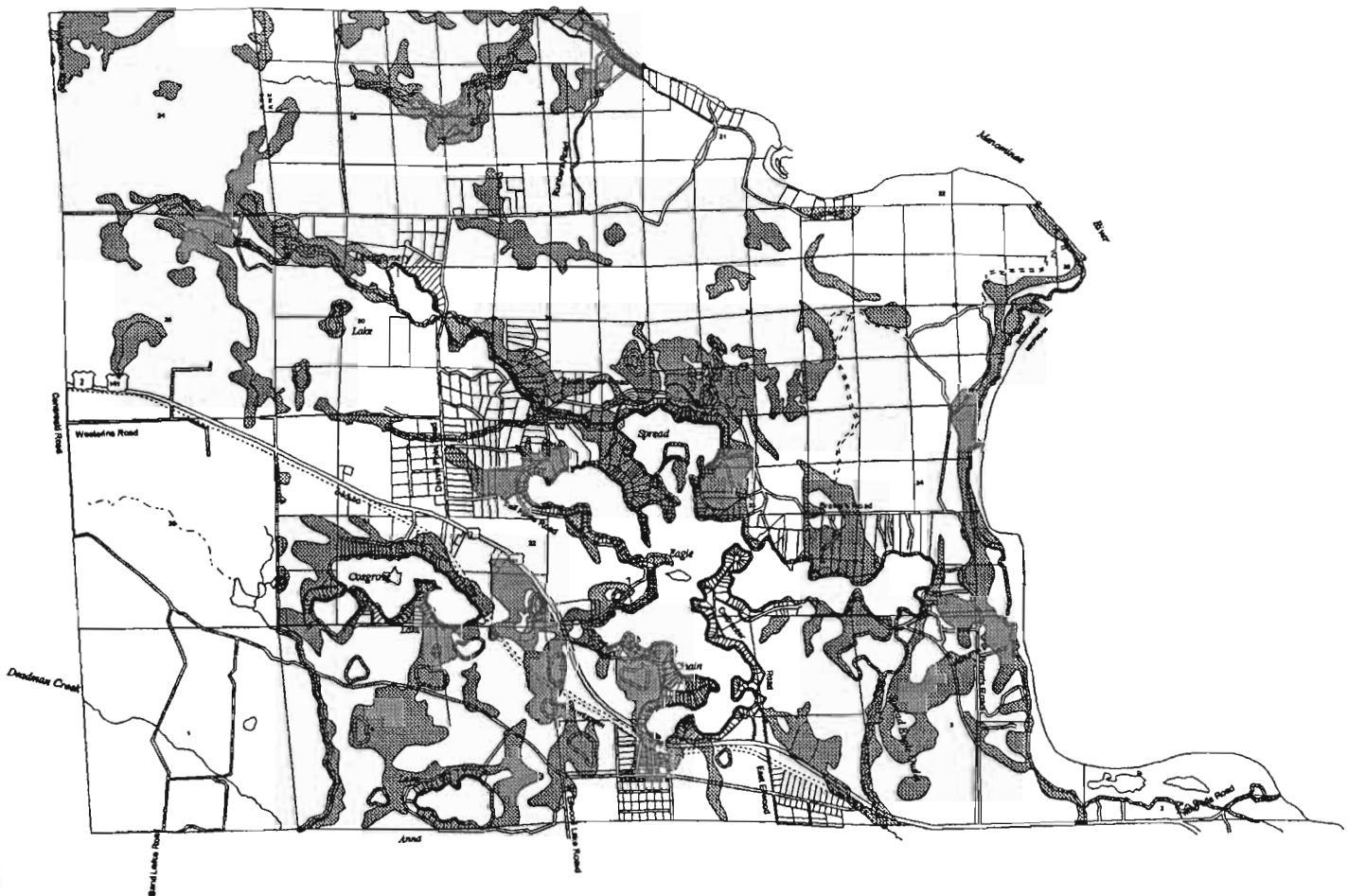
Environmental Corridors

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 Spread Eagle Watershed to help in identifying areas that have the greatest need for protection. These corridors (Map ---) were delineated through the use of the Commission's Geographic Information System (GIS) to overlay a variety of features. The environmental corridors total ----- acres of land within the planning area and include: wetlands, floodplains, areas of steep slope (having a slope greater than 12 percent), water resources and a 75-foot setback from these water resources.

Environmental Corridors

Spread Eagle Study Area
Florence County, Wisconsin



Environmental Corridors



2000 0 2000 4000 Feet

Source: WDNR, 1993; NRCS, 1992; Bay-Lake Regional Planning Commission, 1998.

Spread Eagle Water Quality Data Inventory

Inventory of existing data

In order to determine what data is currently available about the lakes in the Spread Eagle Chain of Lakes Area, a literature search was conducted. Characteristics of the lakes inventoried included: dissolved phosphorus, total phosphorus, chlorophyll a pigment concentration, Secchi disk depths, pH, fecal coliform counts, color, turbidity and whether the lake has been assigned a trophic classification. The results of the search 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 lack oxygen during the later months of summer, limiting cold water fish. Eutrophic lakes are high in naturally occurring sediments such as nitrogen and phosphorus. 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.

TSI values, water chemistry, and trophic state (adapted from Carlson, 1977)

TSI	Secchi (ft.)	Total Phosphorus (ug/l)	Chlorophyll a (ug/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	

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.

Lake (Testing Date)	Dissolved Phosphorus (ug/l)
North Lake (1995)	<2
West Lake (1996)	<2
Middle Lake	-
Long Lake	-
East Lake	-
South Lake	-
Bass Lake	-
Railroad Lake	-
Montgomery Lake	-
Cosgrove Lake	-
Lake Anna	-

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

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.

Water Quality Index	Total Phosphorous (ug/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, 1998.

Within the Spread Eagle Chain area, only North Lake, West Lake, and Long Lake have been tested for total phosphorus. For both North Lake and West Lake, the total phosphorus was within the very good range of 13 micrograms per liter. Long Lake, however, had 52 micrograms per liter of total phosphorus, which places at the far end of the fair category, just short of poor. None of the other lakes in the area have been tested for total phosphorus.

Lake (Testing Date)	Total Phosphorus (ug/l)
North Lake (1995)	13
West Lake (1996)	13
Middle Lake	-
Long Lake (1993)	52
East Lake	-
South Lake	-
Bass Lake	-
Railroad Lake	-
Montgomery Lake	-
Cosgrove Lake	-
Lake Anna	-

Source: MMA, Inc. 1995, 1996; WDNR, 1993; Bay-Lake Regional Planning Commission, 1998.

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 (ug/l). Within the state of Wisconsin, the average concentration of chlorophyll a in lakes was 14.8 ug/l with sixty-five percent of the lakes having a value of less than 10 ug/l.

Lake (Testing Date)	Chlorophyll a (ug/l) average
North Lake (1995)	1.91
West Lake (1996)	3.27
Middle Lake	-
Long Lake	-
East Lake	-
South Lake	-
Bass Lake	-
Railroad Lake	-
Montgomery Lake	-
Cosgrove Lake	-
Lake Anna	-

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

Only North Lake and West Lake have been tested for Chlorophyll a. Both lakes received very low scores of 1.91 and 3.27 micrograms per liter, respectively. The WDNR Lake Task Force Committee suggests that chlorophyll a scores less than 14 micrograms per liter indicate oligotrophic conditions.

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.

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.

The lakes in the Spread Eagle area have been tested for Secchi disk depth at varying times over the past 30 years, although the majority of the lakes (81 percent) have not been tested since 1971. North Lake and West Lake were the most recently tested as part of the lake planning studies, which took place in 1995 and 1996, respectively.

Lake (Testing Date)	Secchi Depth (ft.)
North Lake (1995)	17.9
West Lake (1996)	13.7
Middle Lake (1971)	19.0
Long Lake (1971)	19.0
East Lake (1971)	18.0
South Lake (1971)	18.0
Bass Lake (1971)	16.0
Railroad Lake (1971)	24.0
Montgomery Lake (1971)	11.0
Cosgrove Lake (1971)	23.0
Lake Anna (1971)	26.0

Source: MMA, Inc. 1995, 1996; WDNR, 1971; Bay-Lake Regional Planning Commission, 1998.

The lakes within the Spread Eagle Chain of Lakes range from a good (13.7 feet) depth in West Lake to very good (24.0 feet) depth in Railroad Lake. The lake with the deepest Secchi depth reading is not in the Spread Eagle Chain, instead it is Lake Anna, with a 26.0 depth. As is the case in most of the analysis of the lakes in the Spread Eagle Area, the most current lake data for Secchi depth is for North Lake and West Lake.

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.

Lake (Testing Date)	pH (average)
North Lake (1995)	7.1
West Lake (1996)	7.7
Middle Lake (1971)	6.8
Long Lake (1971)	6.8
East Lake (1971)	6.9
South Lake (1971)	7.0
Bass Lake (1971)	6.7
Railroad Lake (1971)	6.8
Montgomery Lake (1971)	7.0
Cosgrove Lake (1971)	7.0
Lake Anna (1971)	6.4

Source: MMA, Inc. 1995, 1996; WDNR, 1971; Bay-Lake Regional Planning Commission, 1998.

Both North Lake and West Lake have the most current pH values, which were measured in 1995 and 1996, respectively. The remaining lakes have not had their pH measured since 1971.

Effects of Acidity on Fish (Olszyk, 1980)

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

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.

Lake (Testing Date)	Colonies/100 mL sample
North Lake (1995)	<10
West Lake (1996)	<10
Middle Lake	-
Long Lake	-
East Lake	-
South Lake	-
Bass Lake	-
Railroad Lake	-
Montgomery Lake	-
Cosgrove Lake	-
Lake Anna	-

Source: MMA, Inc. 1995, 1996; Bay-Lake Regional Planning Commission, 1998.

The two lakes that have had fecal coliform tested are North Lake and West Lake, where coliform counts were both less than 10 colonies per 100mL, indicating very healthy lakes, in terms of fecal coliform. None of the other lakes have been tested for fecal coliform counts.

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.

Range	Color
0-40 Units	Low
40-100 Units	Medium
>100 Units	High

Source: MMA, Inc. 1995, 1996; WDNR, 1971; Bay-Lake Regional Planning Commission, 1998.

Lake (Testing Date)	Color Standard Units (SU) where available	Color
North Lake (1995)	10	Clear
West Lake (1996)	22.5	Clear
Middle Lake (1971)	-	Clear
Long Lake (1971)	-	Clear
East Lake (1971)	-	Clear
South Lake (1971)	-	Clear
Bass Lake (1971)	-	Clear
Railroad Lake (1971)	-	Clear
Montgomery Lake (1971)	-	Lt. Brown
Cosgrove Lake (1971)	-	Clear
Lake Anna (1971)	-	Clear

Source: MMA, Inc. 1995, 1996; WDNR, 1971; Bay-Lake Regional Planning Commission, 1998.

North Lake and West Lake, the two lakes that have been measured for color, received scores which indicate low color or clear water conditions. According to the 1971 *Surface Water Resources of Florence County* the remaining lakes in the study area all have clear water conditions, with the exception of Montgomery Lake, which had a light brown color.

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.

Lake	Level (NTU)
North Lake (1995)	0.75
West Lake (1996)	0.90
Middle Lake	-
Long Lake	-
East Lake	-
South Lake	-
Bass Lake	-
Railroad Lake	-
Montgomery Lake	-
Cosgrove Lake	-
Lake Anna	-

Source: MMA, Inc. 1995, 1996; Bay-Lake Regional Planning Commission, 1998.

North Lake and West Lake had their turbidity tested in 1995 and 1996 as part of their lake planning programs. Both lakes scored well below the average level of turbidity in Wisconsin lakes. The remaining lakes have not been tested for turbidity.

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.

Lake	Trophic Class
North Lake (1995)	Oligotrophic
West Lake (1996)	Oligotrophic
Middle Lake	-
Long Lake (1993)	Eutrophic
East Lake	-
South Lake	-
Bass Lake	-
Railroad Lake	-
Montgomery Lake	-
Cosgrove Lake	-
Lake Anna	-

Source: MMA, Inc. 1995, 1996; WDNR, 1993; Bay-Lake Regional Planning Commission, 1998.

Of the lakes within the Spread Eagle Chain of Lakes, three have been assigned trophic classes. Both North Lake and West Lake are classified as oligotrophic lakes, whereas Long Lake is classified as eutrophic. North Lake and West Lake were classified as part of the Lake Planning Studies done for both lakes in 1995 and 1996, respectively. Long Lake is classified as eutrophic as a result of it having at least three data points taken in the course of a year from May-September, and is contained in the 1993 *Upper Green Bay Basin Water Quality Management Plan*.

Inventory of existing data

MMA, Inc. 1996. Lake Planning Study for North Lake.

MMA, Inc. 1998 Lake Planning Study for West Lake.

Northeastern Wisconsin Regional Planning Commission. 1971. Water and Natural Resources Study for Florence County. Technical Report.

Wisconsin Department of Natural Resources. 1971. Surface Water Resources of Florence County. Madison, Wisconsin.

Wisconsin Department of Natural Resources. January 1993. Upper Green Bay Basin, Water Quality Management Plan - A Five Year Plan To Protect and Enhance our Water Resources. Wisconsin Water Quality Management Program.

Data Needs

In order to determine what is happening to the lakes within the Spread Eagle Study Area 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, with the exceptions being North Lake and West Lake, which had Lake Planning Studies done in 1996 and 1998, respectively. As part of the study, an exhaustive list of water quality indicators was inventoried and analyzed, as is apparent in the inventory of existing water quality data for the Spread Eagle Study Area. For those lakes that have not had a comprehensive lake planning study prepared, 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 test taken 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:

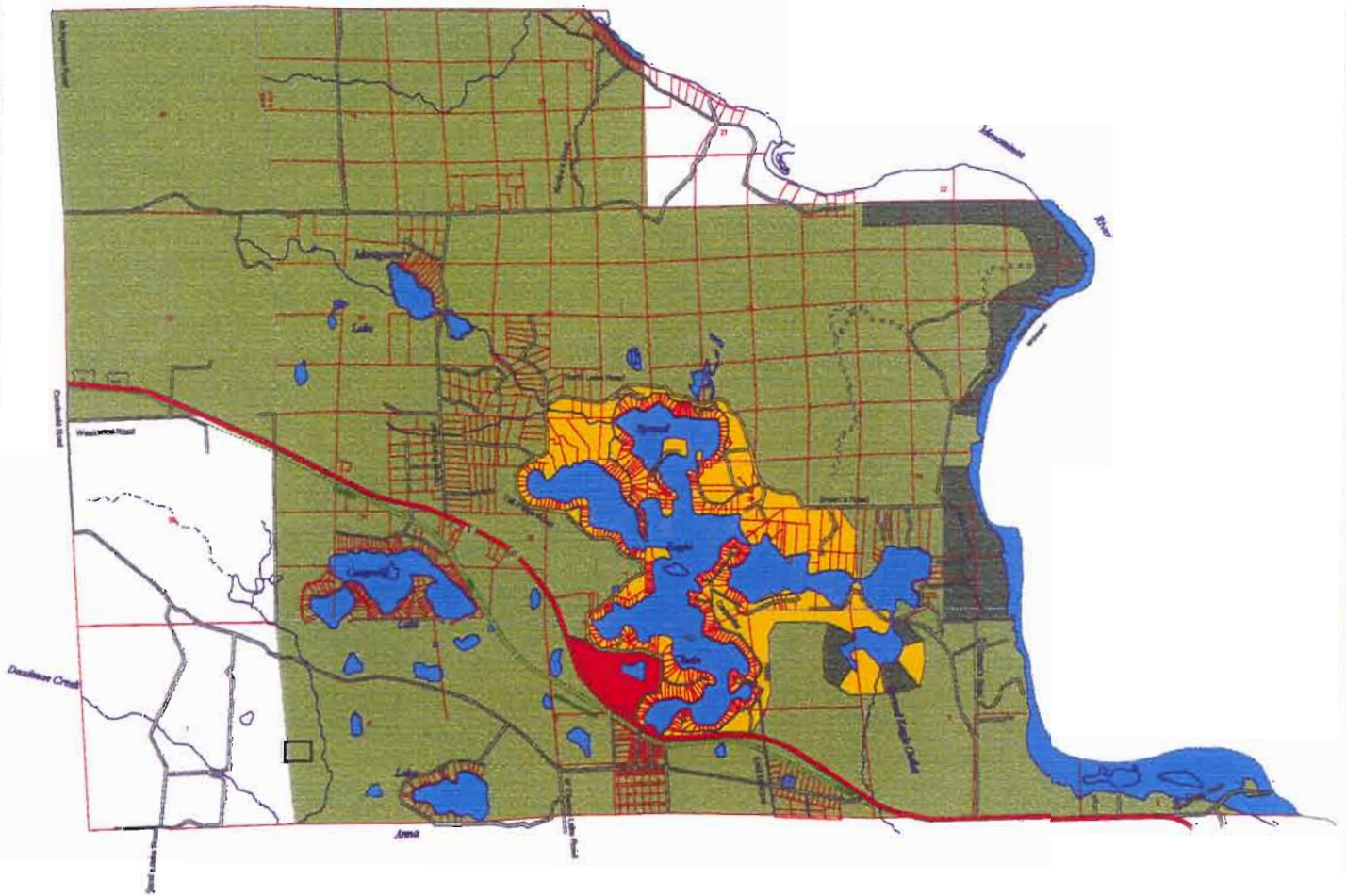
Long Term Trends Lake Monitoring Methods Summary

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; Bay-Lake Regional Planning Commission, 1998.

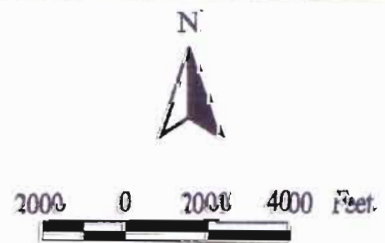
1990 Land Use Plan

Spread Eagle Study Area
Florence County, Wisconsin



- Agriculture/Forest/Vacant
- Commercial
- Environmental Corridor
- Parks
- Residential
- Industrial
- Recreational Development

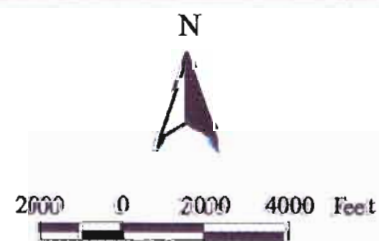
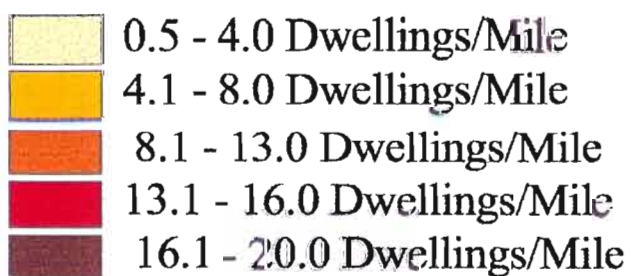
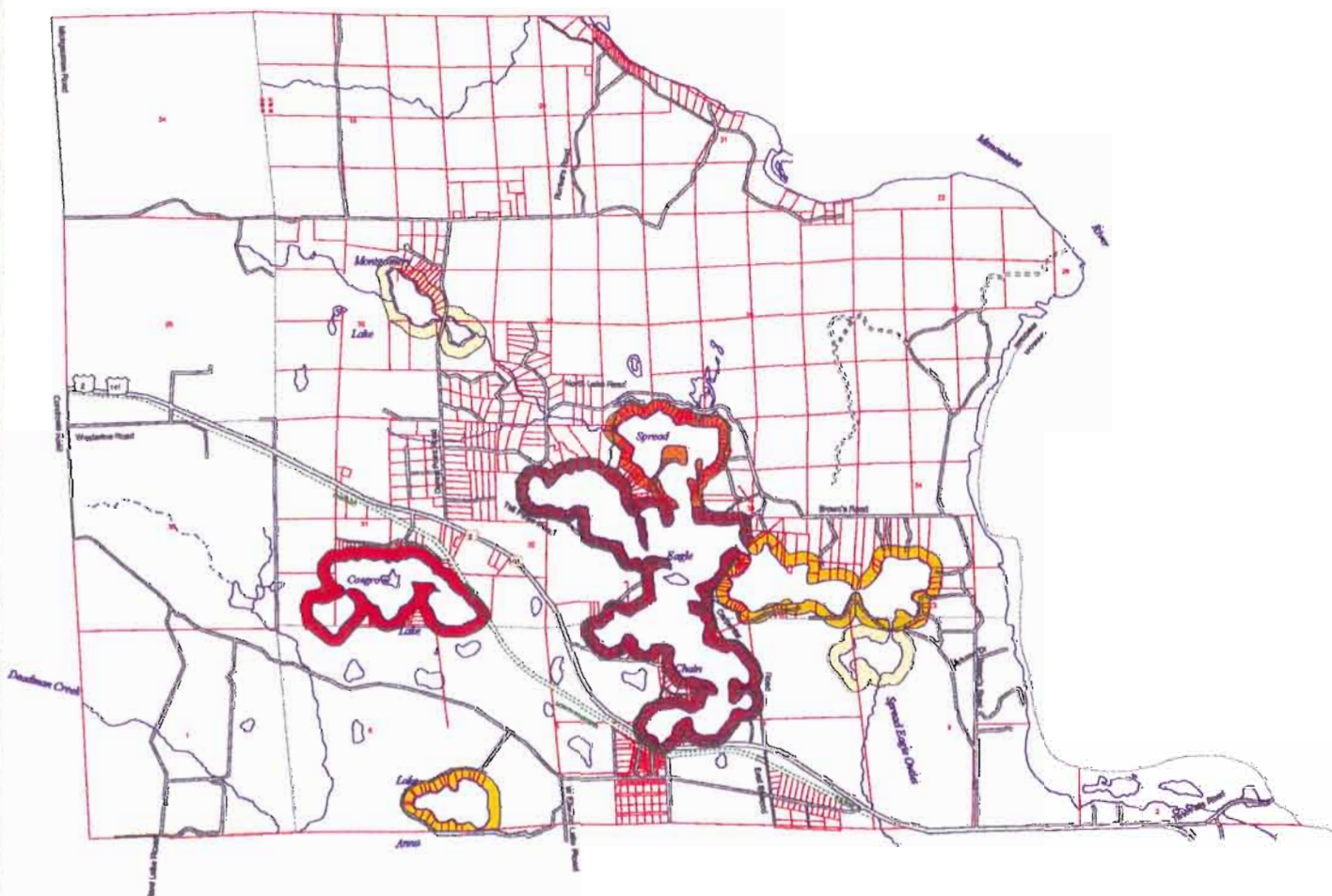
- Proposed Sanitary Landfill Site
- Proposed Neighborhood Facility
- Proposed School
- Proposed 4-Lane Highway



Source: NEWRPC, 1971; Bay-Lake Regional Planning Commission, 1998.

Shoreland Housing Density

Spread Eagle Study Area
Florence County, Wisconsin



Source: Bay-Lake Regional Planning Commission, 1998.

CHAPTER 5 - FINDINGS

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

In order to determine how to maintain good water quality or to improve poor water quality, first the current water quality must be ascertained. Both North Lake and West Lake have very comprehensive data sets as a result of the individual studies done for those lakes. These studies can serve as a model for a comprehensive set of lake data. As the Spread Eagle Chain of Lakes is interconnected by a series of channels, much of the lake data contained in the two reports is applicable throughout the Chain of Lakes. However, data gathered from each of the lakes may identify unique situations on the individual lakes as well, as is evidenced by the classification of Long Lake as a eutrophic lake, whereas both North Lake and West Lake are considered to be oligotrophic, even though these lakes are connected through Middle Lake. This difference indicates a need for each of the lakes to have a need for water quality data to be gathered, in order to determine the trophic state of all of the lakes, and apply according water quality improvement measures, if they are needed, as listed in Chapter 2. 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 order to maintain or improve the water quality within the Spread Eagle Area, the county should continue the use of 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 Florence should initiate a long-term *Comprehensive Land Use Plan* or Florence County should update their comprehensive plan. Such a plan should incorporate, at a minimum:

- An analysis of past/projected demographic trends;
- An inventory of existing natural features and current development patterns;
- An inventory of existing community facilities/public services
- A formally adopted land use plan for a 20 year period which is recommended to include measures to:
 - Promote logical contiguous development;
 - Avoid negative environmental impacts (identify conservancy areas);
 - Minimize conflicting land uses;
 - Establish housing development densities;
 - Promote rural cluster developments rather than sprawled/scattered single family homes on larger lots.
 - Provide public access to recreational/natural areas;
 - Provide for efficient transportation;

The local land use plan should be checked for consistency with county comprehensive plans as well as with land use plans for adjacent civil divisions.

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 and 150 foot setback on the Pine River.
- Encourage residents to maintain more than the minimum vegetative screening as called for in the Florence County Shoreland/Wetland Ordinance.

Public Access Recommendations

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

Future Planning Needs

- Future planning needs within the town of Florence include developing a vision for the next twenty years in the form of a comprehensive land use plan.