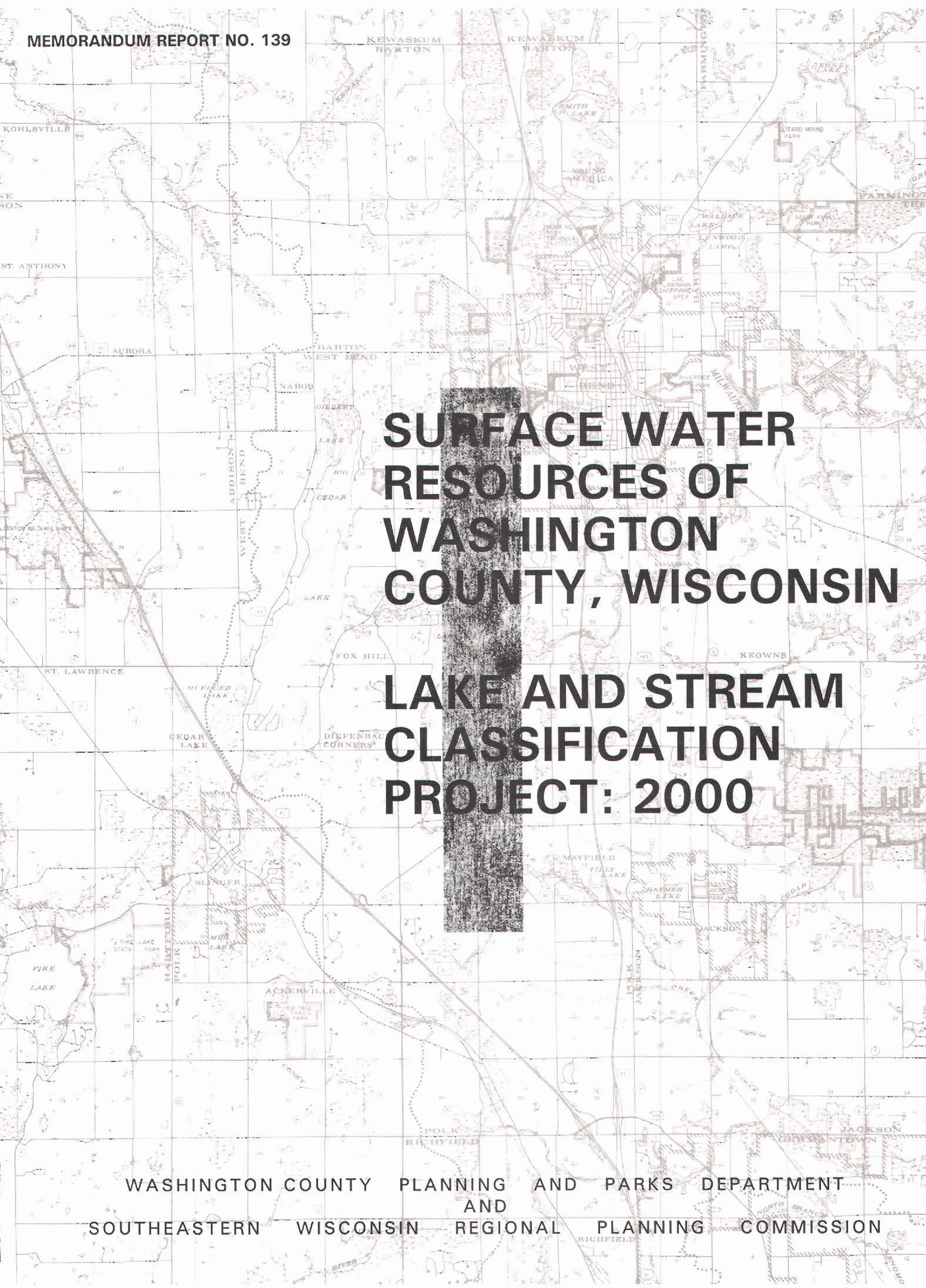
MEMORANDUM REPORT NO. 139



SURFACE WATER RESOURCES OF WASHINGTON COUNTY, WISCONSIN

LAKE AND STREAM CLASSIFICATION PROJECT: 2000

WASHINGTON COUNTY PLANNING AND PARKS DEPARTMENT
AND
SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

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The preparation of this report was a cooperative effort of the officials and staffs of the following agencies and units of government:

Southeastern Wisconsin Regional Planning Commission
Washington County Planning and Parks Department
Wisconsin Department of Natural Resources
University of Wisconsin-Extension

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Prepared by the

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Wisconsin Department of Natural Resources

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Chapter I

INTRODUCTION

BACKGROUND

In 1997, the Wisconsin Legislature created a lake classification grant program as described under Chapter NR 191 of the *Wisconsin Administrative Code*. This cost-share program was to be administered by the Wisconsin Department of Natural Resources (WDNR) as part of the existing Lake Protection Grant Program, and was intended to further the degree of protection of lakeshore areas within the State. Washington County successfully applied for funds under the Chapter NR 191 Lake Protection Grant Program during 1998 and, in cooperation with the WDNR, Southeastern Wisconsin Regional Planning Commission (SEWRPC), and University of Wisconsin-Extension (UWEX), initiated a program for the classification of the waterways within the County later in that year. The objective of the Washington County program was to develop criteria for determining the sensitivity of lakes and rivers within the County to disturbance from land-based activities. Specifically, these criteria were to be used to consider alternatives for updating and refining the County's shoreland and floodland ordinances to provide an added degree of protection for lake and stream shoreland areas and aquatic ecosystems, thereby maintaining ecosystem structure and function amid a changing landscape. The lake and stream classification process was fully integrated into a then ongoing review and refinement of the County's shoreland and floodplain ordinances. The combined project was implemented by the Washington County Land Use Code Revision Working Group, a duly constituted subcommittee of the Washington County Planning, Conservation, and Parks Committee. The composition of the Committee, Working Group, and related technical advisory and citizen review bodies that participated in this process is given in Appendix A.

Prior to establishing the lake classification grant program, the Legislature, in 1959, asked the then Wisconsin Conservation Department—now the Wisconsin Department of Natural Resources—to develop a program for classification of lakes and streams by use. In pursuit of this mandate, the Department prepared a series of water resources inventories to document the necessary basic data from which to formulate generalizations necessary for classification. These inventories were prepared on a County-by-County basis, with the summary of the surface water resources of Washington County being completed in June 1962.[1] Subsequently, updated data on the water resources of Washington County were developed as part of the comprehensive plans for the Fox,[2] Milwaukee,[3]

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[1] *Wisconsin Department of Natural Resources,* Surface Water Resources of Washington County, *1962, 65 pages.*

[2] *SEWRPC Planning Report No. 12,* A Comprehensive Plan for the Fox River Watershed, *Volume One,* Inventory Findings and Forecasts, *April 1969; Volume Two,* Alternative Plans and Recommended Plan, *February 1970.*

[3] *SEWRPC Planning Report No. 13,* A Comprehensive Plan for the Milwaukee River Watershed, *Volume One,* Inventory Findings and Forecasts, *December 1970; Volume Two,* Alternative Plans and Recommended Plan, *October 1971.*

and Menomonee[4] river watersheds and the regional water quality management plan[5] prepared by SEWRPC, and by ongoing subwatershed-level data collection and analysis by the WDNR, U.S. Geological Survey, and local agencies and units of government. These documents form the starting point for the inventories reported herein, and form the basis for the current waterbody classification program in Washington County.

The basic motivation for both of these classification programs was similar; namely, the realization that use of, and demand for, surface waters is increasing, and, as uses grow and intensify, conflicts of interests arise. Conflicts of interest occur among various user groups, ranging from irrigators to anglers to recreational boaters to riparian homeowners, among others. Such user conflicts can be destructive to both the fabric of water-focussed communities and the water resources themselves. Mechanisms are required to ensure the future, harmonious coexistence of water usage consistent with the capacities of the water resources to support such uses. In creating the lakes classification program in 1997, the Legislature noted that previously mandated, State-level mechanisms had not been completely successful in achieving the high degree of protection desired for the waterways of the State. They further indicated that additional measures were required to be developed at the local level to achieve the desired degree of protection and rehabilitation of the State's surface water resources.

As indicated above, this inventory is intended to update the surface water resources inventories previously completed by the WDNR and SEWRPC in order to provide a summary of the water quantity and quality characteristics of the surface waters of Washington County, both lakes and streams. This inventory also includes an assessment of current use potentials and methods of protection. Due cognizance is given to the adopted regional water quality management plan, and the water quality and water use objectives established therein.[6] It is intended to be used as a guide in planning for the wise use and good management of the waters of Washington County. Finally, while the basic geographical features of Washington County are presented in Chapter II, water resources data specific to the waterbody classification process are set forth by area within the County in Chapters III through XV to facilitate the transfer of information and enhance linkages with local level general zoning schemes and municipal master plans. The areas used correspond approximately to those of the townships comprising Washington County, within which, the various civil divisions are located, as shown on Map 1. Alternative approaches to waterbody classification in Washington County, set forth in Chapter XVI, complete this document.

SOURCES OF DATA FOR THIS COMPILATION

The data set forth in this inventory are intended to address the seven areas of water resources and watershed development identified by the Legislature in Section 281.69(5)(b) of the *Wisconsin Statutes*; namely, 1) the size, depth and shape of the waterbody, 2) the size of the watershed, 3) the quality of the water, 4) the potential for recreational use, 5) the potential for land development, 6) the potential for nonpoint source pollution, and 7) the type and size of the fish and wildlife populations in and around the waterbody. These data were gathered from many sources, and form an important element of this study, which collates and analyzes the findings and recommendations of previous studies relating to the water resources of Washington County. The principal sources of information are briefly set forth below.

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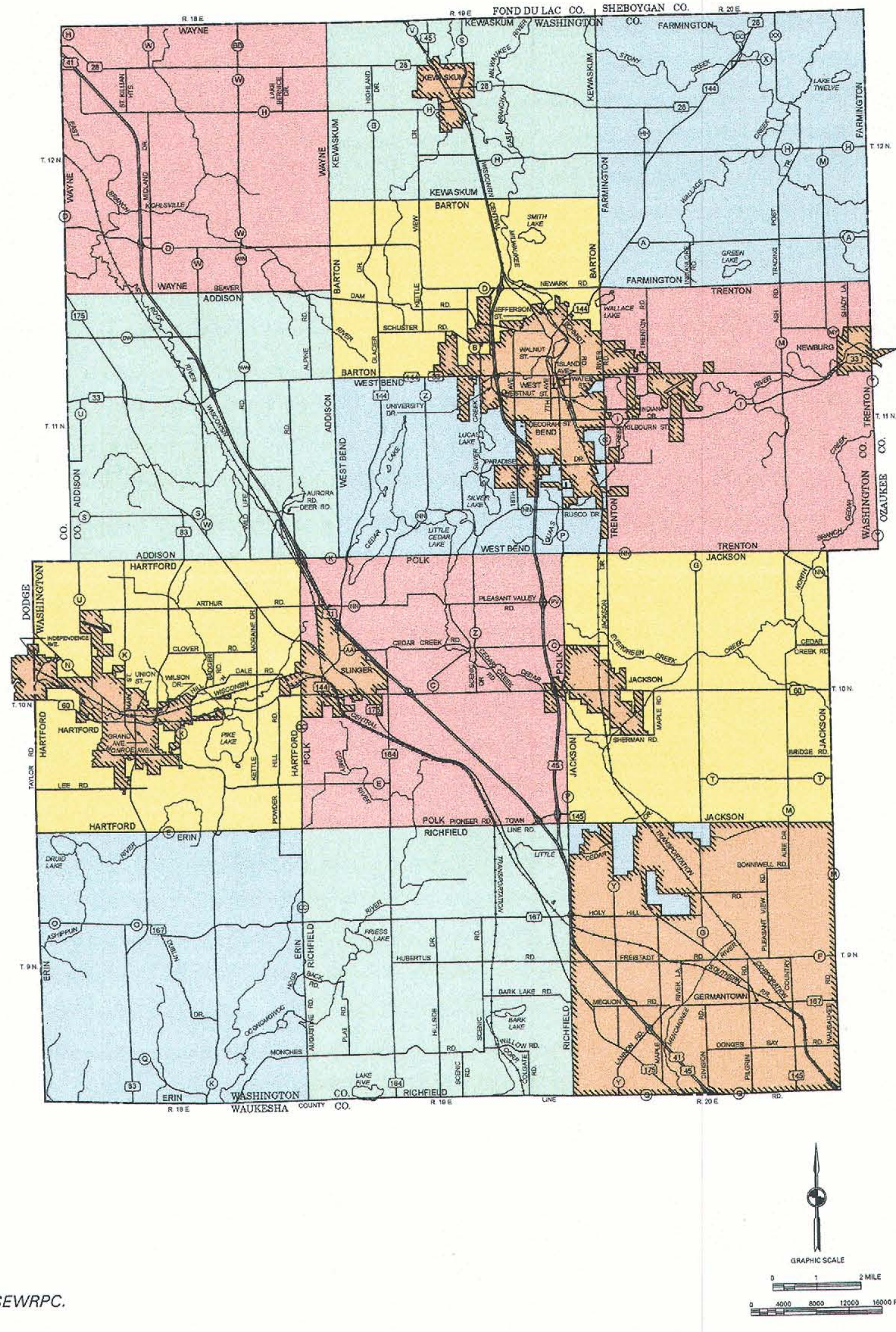
[4]*SEWRPC Planning Report No. 26,* A Comprehensive Plan for the Menomonee River Watershed, *Volume One,* Inventory Findings and Forecast, *October 1976; Volume Two,* Alternative Plans and Recommended Plan, *October 1976.*

[5]*SEWRPC Planning Report No. 30,* A Regional Water Quality Management Plan for Southeastern Wisconsin—2000, *Volume One,* Inventory Findings, *September 1978; Volume Two,* Alternative Plans, *February 1979; Volume Three,* Recommended Plan, *June 1979.*

[6]*SEWRPC Planning Report No. 30,* op. cit.; *SEWRPC Memorandum Report No. 93,* A Regional Water Quality Management Plan for Southeastern Wisconsin: Update and Status Report, *March 1995.*

Map 1

CIVIL DIVISION BOUNDARIES WITHIN WASHINGTON COUNTY: 1995



Source: SEWRPC.

1. Water resources management plans prepared by the WDNR and SEWRPC, including SEWRPC Planning Report No. 30, *A Regional Water Quality Management Plan for Southeastern Wisconsin—2000,* Volume One, *Inventory Findings*, published in September 1978; Volume Two, *Alternative Plans*, published in February 1979; and Volume Three, *Recommended Plan*, published in June 1979; SEWRPC Memorandum Report No. 93, *A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report*, published in March 1995; SEWRPC Community Assistance Planning Report No. 98, 2nd Edition, *A Water Quality Management Plan for Friess Lake, Washington County, Wisconsin*, published in November 1997; SEWRPC Memorandum Report No. 123, *A Lake Protection and Recreational Use Plan for Silver Lake, Washington County, Wisconsin*, published in September 1997; Wisconsin Department of Natural Resources Publication No. PUBL-WR-194-86, *A Nonpoint Source Control Plan for the Oconomowoc River Priority Watershed Project*, published in March 1986; Wisconsin Department of Natural Resources Publication No. PUBL-WR-255-90, *A Nonpoint Source Control Plan for the East and West Branches of the Milwaukee River Priority Watershed Project*, published in February 1989; Wisconsin Department of Natural Resources Publication No. PUBL-WR-253-90, *A Nonpoint Source Control Plan for the North Branch Milwaukee River Priority Watershed Project*, published in July 1989; Wisconsin Department of Natural Resources Publication No. PUBL-WR-336-93, *A Nonpoint Source Control Plan for the Cedar Creek Priority Watershed Project*, published in December 1991; Wisconsin Department of Natural Resources Publication No. PUBL-WR-320-93, *Upper Fox River Priority Watershed Project: A Nonpoint Source Control Plan*, published in November 1993; and Wisconsin Department of Natural Resources Publication No. PUBL-WR-190-95 REV, *Upper Rock River Basin Water Quality Management Plan*, published in July 1995.

2. Data contained in local lake management monitoring and planning program reports, including those programs that are not comprehensive lake management planning programs but that often constitute components of comprehensive plans and provide valuable water resources inventory data.

3. Data contained in the County land and water resources management plan.

4. SEWRPC ratioed and rectified 1995 aerial photographs available at a scale of one inch equals 400 feet, and related land use and natural areas plans prepared by SEWRPC, including SEWRPC Planning Report No. 45, *A Regional Land Use Plan for Southeastern Wisconsin: 2020*, published in December 1997; SEWRPC Planning Report No. 42, *A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin*, published in September 1997; SEWRPC Community Assistance Planning Report No. 136, 2nd Edition, *A Park and Open Space Plan for Washington County*, published in August 1997; and SEWRPC Community Assistance Planning Report No. 170, *Washington County Agricultural Soil Erosion Control Plan*, published in March 1989.

5. U.S. Geological Survey reports and maps, including the annual, through 1998 U.S. Geological Survey Open-File Reports, *Water-Quality and Lake-Stage Data for Wisconsin Lakes*, and U.S. Geological Survey Water-Data Reports, *Water Resources Data Wisconsin*.

6. Water resources files of the WDNR Southeast Region Headquarters, including data acquired through the WDNR Self-Help and Long-Term Trend monitoring programs, and SEWRPC, and other relevant data as collected and provided by various public inland lake protection and rehabilitation districts, lake associations, and other collaborating organizations.

The procedures utilized resulted in the compilation of a physical and chemical description and a resource value and use assessment for each waterbody inventoried. Available data on all of the major lakes with surface areas of 50 acres in areal extent or greater and the perennial streams were collected and analyzed during this process. In addition, data on many of the minor lakes and streams were also included in this inventory process.

Chapter II

PHYSICAL DESCRIPTION, CLIMATE AND NATURAL RESOURCE BASE

INTRODUCTION

Land form, precipitation, freeze-thaw cycles, and land cover and usage are important determinants of water quantity and quality, influencing not only the amount and rate of runoff but also the type and mass of contaminants carried by runoff into the surface and ground waters of the Region. Soil type, land slope, and land use and management practices are among the more important factors to be considered in planning for water quantity and quality conditions. Soil type, land slope, and vegetative cover affect the rate, amount, and quality of stormwater runoff as well as the rate of infiltration into the groundwater system. Land slopes are also important determinants of stormwater runoff rates, and of susceptibility to erosion. Thus, these geographic attributes are the basic components that determine the stream flow patterns, locations of lakes and wetlands, and quality and quantity of the surface water resources of Washington County. These elements, summarized herein, are reviewed in greater detail in the Washington County land and water resources management plan,[1] and in the afore-referenced adopted Washington County park and open space, regional natural areas and critical species habitat protection and management, and regional land use plans.[2]

TOPOGRAPHY, PHYSICAL GEOGRAPHY AND NATURAL SURFACE WATER DRAINAGE SYSTEMS

The topography of Washington County may be described as an undulating plain sloping to the southeast.[3] There are two major watershed drainage systems, and several subwatershed drainage systems, influencing the direction of surface water flow. Of the major watershed drainage systems, the Milwaukee River and its tributaries drains the central and eastern portions of the County to the southeast, where the River ultimately discharges into Lake Michigan and the Laurentian drainage system. The other major watershed drainage system is formed by the headwater streams of the Rock River drainage system, which drains the western portions of the County to the west, where the river ultimately discharges into the Mississippi River system. In addition, a small portion of the south central area of the County drains to the Mississippi River drainage basin through the Illinois Fox River drainage system, and a portion of the southeastern area of the County drains to Lake Michigan via the Menomonee River. These waterways are shown on Map 2.

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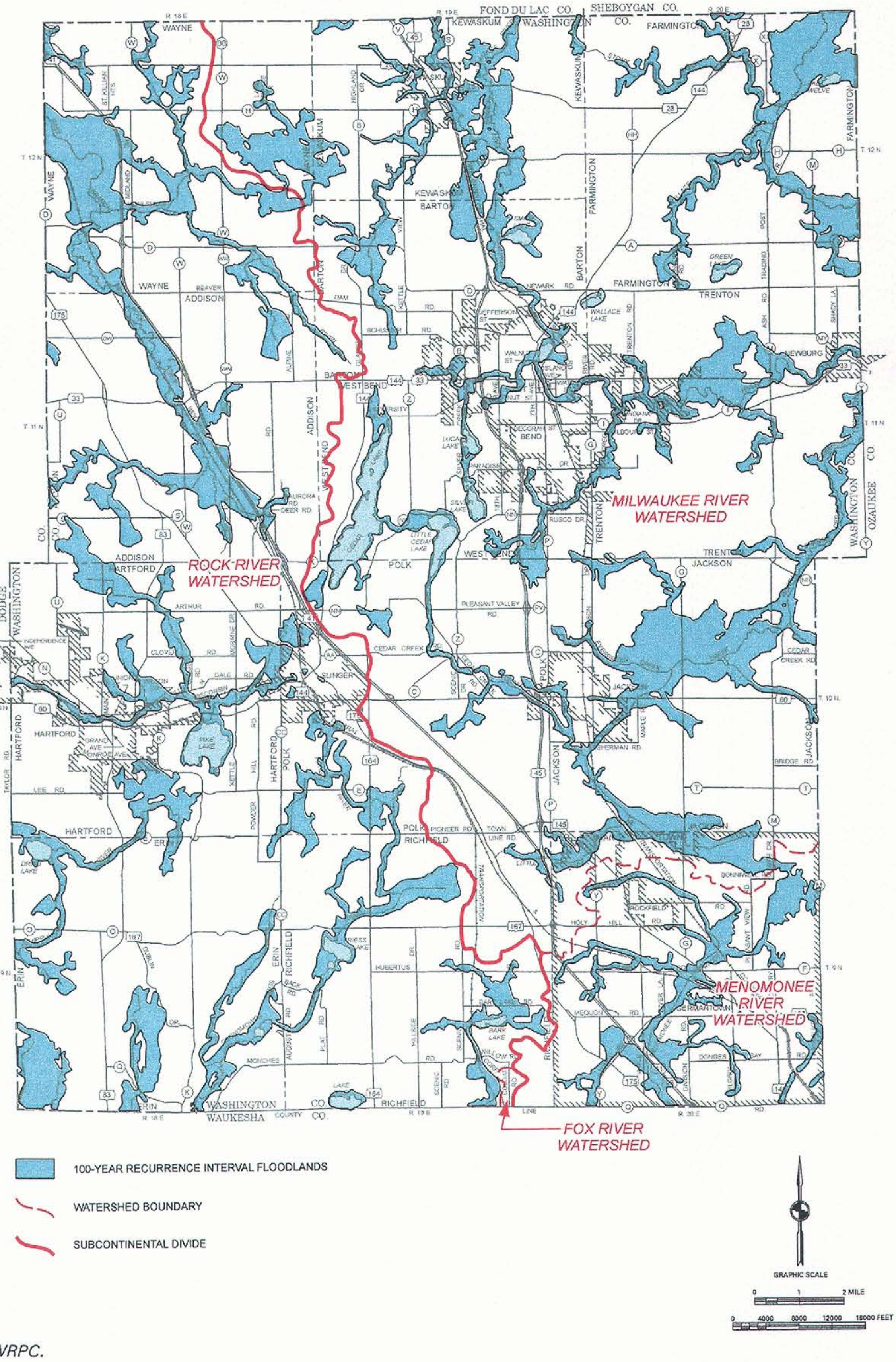
[1] *Washington County Land Conservation Department,* (Draft) Washington County Land and Water Resource Management Plan: 2000-2005, *August 2000.*

[2] *SEWRPC Planning Report No. 45,* A Regional Land Use Plan for Southeastern Wisconsin: 2020, *December 1997; SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997; SEWRPC Community Assistance Planning Report No. 136, 2nd Edition,* A Park and Open Space Plan for Washington County, *August 1997.*

[3] *S. Weidman, and A.R. Schultz,* The Underground and Surface Water Supplies of Wisconsin, *State of Wisconsin, 1915, pages 600-607.*

Map 2

WATER RESOURCES WITHIN WASHINGTON COUNTY: 1995



Source: SEWRPC.

A belt of drift hills occupies the western half of the County and provides one of "the best examples of the Kettle Moraine in Wisconsin."[4] The kettle moraine ranges are oriented generally in a northeast-to-southwest direction, having been formed as the interlobate moraine created by the Green Bay and Michigan glaciers. During the late Wisconsin stage of glaciation which occurred approximately 10,000 years before present, the Green Bay glacier moved in a southeasterly direction, and the Michigan glacier moved in a southwesterly direction, across what is now Washington County, Wisconsin. As a consequence, elevations of 800 feet above the National Geodetic Vertical Datum of 1929 (NGVD) in the valleys, and 1,000 feet above NGVD on the ridges, are typical in the eastern portions of the County. In the western portions of the County, elevations of between 900 feet and 1,000 feet above NGVD in the valleys, and 1,100 feet to 1,300 feet above NGVD on the ridges, are typical. Such variations in elevation result from the movement and deposition of glacially transported materials. Land surface slopes range from less than 0.1 percent to over 60 or 70 percent in the County, as shown on Map 3. In general, slopes of over 12 percent have limitations for urban residential development and, if developed, can present potential erosion and drainage problems.

GEOLOGY

The bedrock and the surfacial deposits overlying the bedrock directly and indirectly affect the quantity and quality of surface water and groundwater in Washington County. Water from within the surfacial glacial sand and gravel deposits supplies the shallow wells and springs that occur within the County. Underlying the unconsolidated surfacial deposits is the Niagara limestone (dolomite) formation that immediately underlies more than 90 percent of the surface area of the County. Fissures in the dolomite serve as water storage basins and are frequently tapped by moderately deep wells for water supply purposes. The Niagara dolomite is underlain by an impervious layer of Maquoketa shale. In some pre-Pleistocene valleys in the western portions of the County, however, the Niagara dolomite is absent and the uppermost bedrock unit is the Maquoketa shale. Beneath the Maquoketa shale are dolomite and sandstone formations that constitute the "deep sandstone aquifer." This latter aquifer is relatively unimportant in terms of its influence on the surface water resources of the County since it does not intersect the surface drainage.

The bedrock underlying Washington County is rich in available calcium and magnesium, and contributes to the presence of very fertile waters within the County. Nearly all of the major lakes in the County are, in part, spring- or seepage-fed, providing a direct point of entry into the surface waters for the mineral-rich groundwater. Streams in this kettle moraine area generally occur as a result of overflow from kettles, or as a result of overflow from blocked drainage lakes in the County. As a consequence, the stream systems of Washington County also reflect the fertile conditions of the lentic surface waterbodies.

SOILS

There are four distinct types of soils that constitute the soil mantle of Washington County: lacustrine, glacial, alluvial, and peat soils. Soils east of the Milwaukee River are heavily compacted and lacustrine in origin, while, over most of the remaining area, glacial soils containing clay, and silt and sand loams containing some coarse material, are common. Both deep and shallow peat soils are commonly located in the poorly drained kettles situated between the ridges of the moraines, while sandy, alluvial soils are found in the valleys of streams and at the base of the drainage lines that indicate the points of convergence of the two glaciers. The U.S. Natural Resources Conservation Service, formerly the U.S. Soil Conservation Service, under contract to SEWRPC, completed a detailed soil survey of the entire seven-county planning region, including Washington County in 1966.[5] The soil survey contained interpretations for planning and engineering applications and for suitability for various types of urban land uses, as well as for agricultural applications. Using this regional soil survey, an

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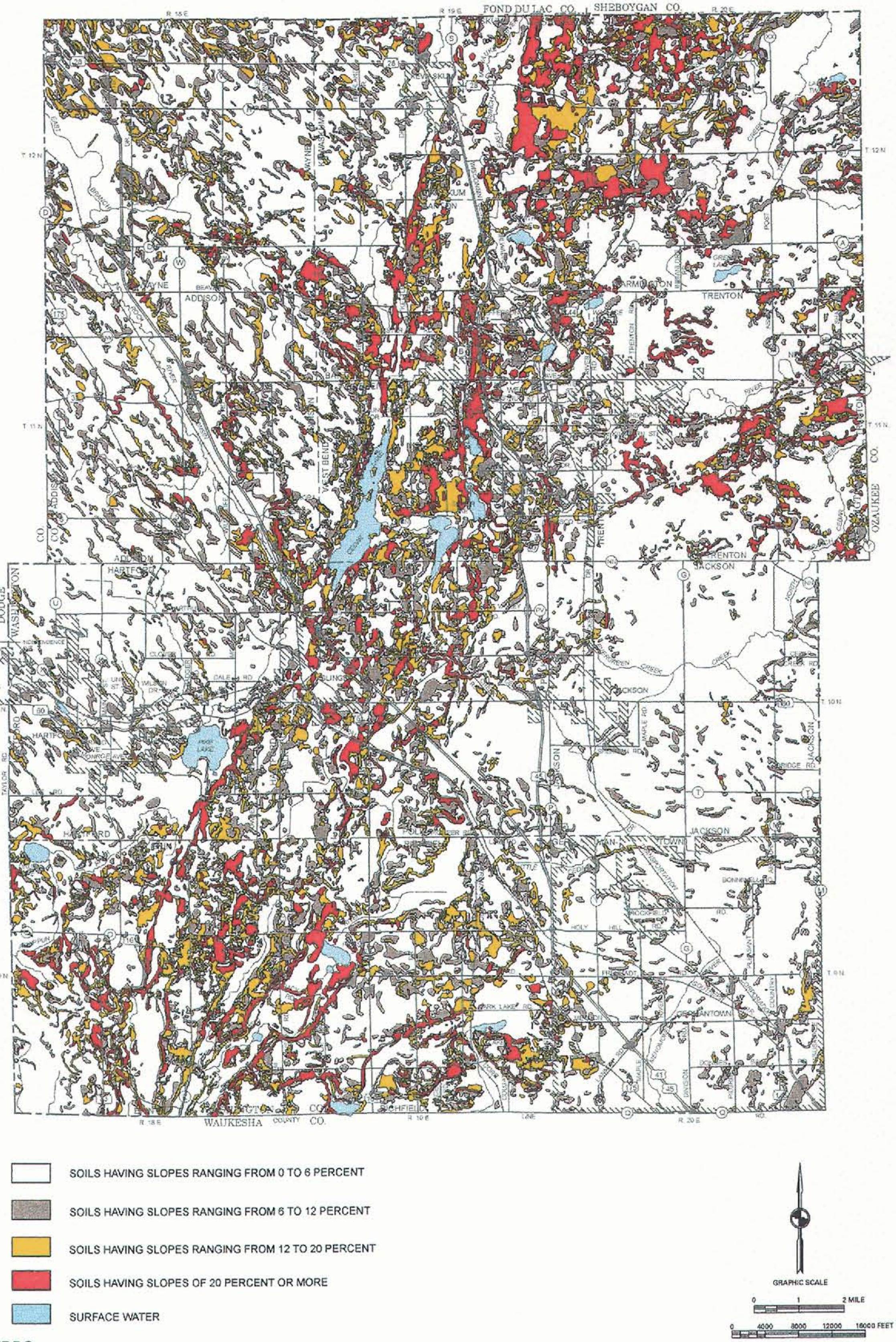
[4] *N.M. Fenneman,* Lakes of Southeastern Wisconsin, *State of Wisconsin, 1910, pages 130-139.*

[5] *See SEWRPC Planning Report No. 8,* The Soils of Southeastern Wisconsin, *June 1966.*

Map 3

LAND SURFACE SLOPES WITHIN WASHINGTON COUNTY



Source: SEWRPC.

assessment was made of hydrologic characteristics of the soils in Washington County. Soils within the County were categorized into four main hydrologic soil groups, as well as an "other" category, based upon their major soil groups or associations, as indicated on Map 4: moderately well-drained soils, well-drained, very poorly drained soils, or disturbed soils for which no hydrologic soil group could be determined.

CLIMATE

Long-term average monthly air temperature and precipitation values for the City of West Bend are set forth in Table 1. Table 1 also provides long-term runoff data derived from U.S. Geological Survey flow records for the Oconomowoc River at Afton in Jefferson County, Wisconsin.

The mean summer and winter temperatures of 65.1 °F and 24.9 °F at West Bend are similar to those of other recording locations in Southeastern Wisconsin. Mean annual precipitation at West Bend is 32.1 inches. More than half of the normal yearly precipitation falls during the growing season, from May through September. Evapotranspiration rates are high during this period because vegetation cover is abundant and soils are not frozen. Surface runoff is generally low, but intense summer storms occasionally produce higher percentages of runoff. Peak runoff usually occurs during winter and early spring when about 40 percent of the annual precipitation, in the form of snowmelt and/or rain, falls on frozen ground.

NATURAL RESOURCE BASE

Wetlands

Wetlands are defined by the Regional Planning Commission as, "areas that have a predominance of hydric soils and that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions." This definition, which is also used by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency, is essentially the same as the definition used by the U.S. Natural Resource Conservation Service.[6]

Another definition, which is applied by the Wisconsin Department of Natural Resources and which is set forth in Chapter 23 of the *Wisconsin Statutes*, defines a wetland as "an area where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation, and which has soils indicative of wet conditions." In practice, the Department definition differs from the Regional Planning Commission definition in that the Department considers very poorly drained, poorly drained, and some of the somewhat poorly drained soils as wetland soils meeting the Department "wet condition" criterion. The Commission definition only considers the very poorly drained and poorly drained soils as meeting the "hydric soil" criterion. Thus the State definition as actually applied is more inclusive than the Federal and Commission definitions in that the Department may include some soils that do not show hydric field characteristics as wet soils capable of supporting wetland vegetation, a condition which may occur in some floodlands.[7]

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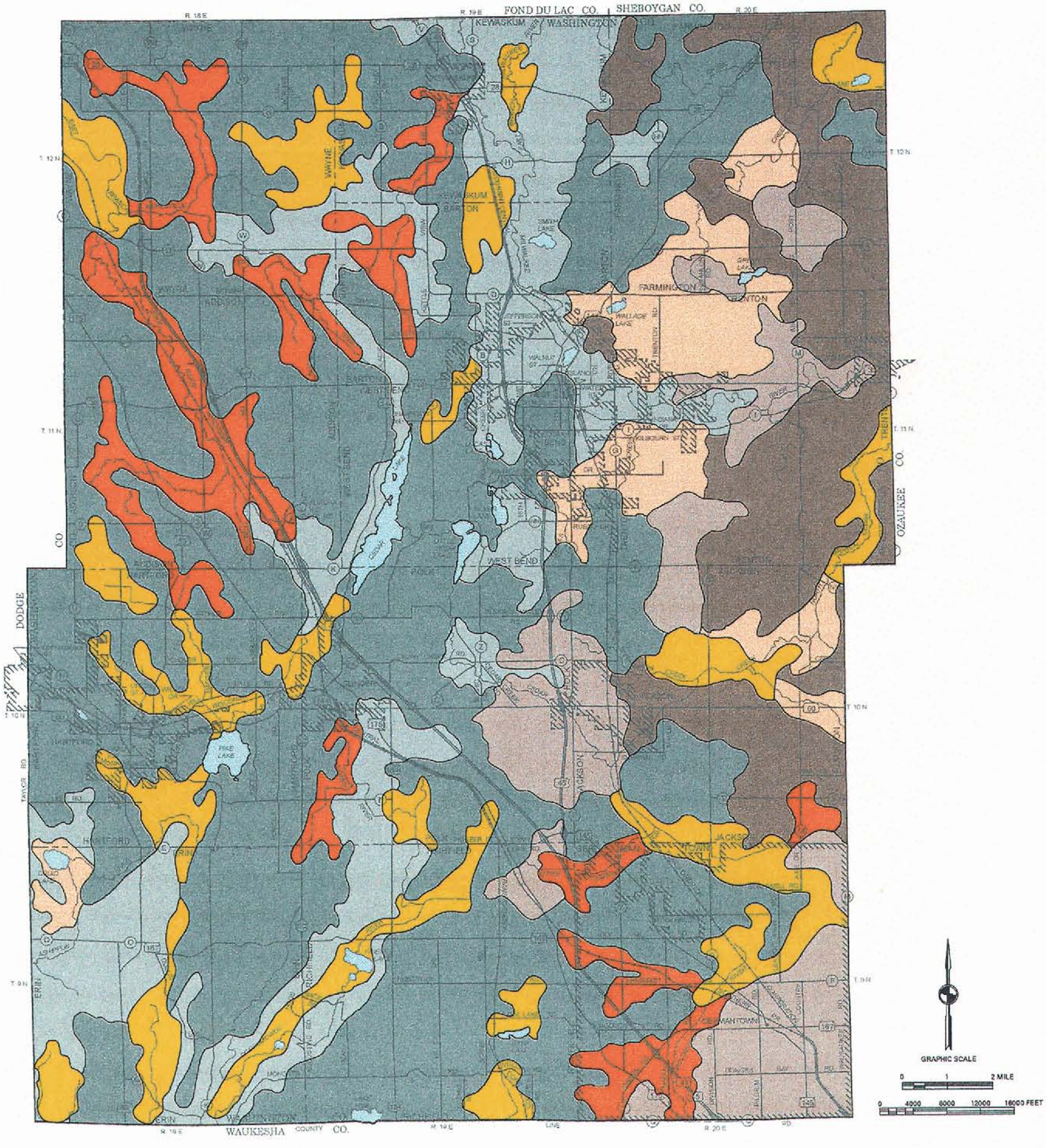
[6] *Lands designated as prior converted cropland, that is, lands that were cleared, drained, filled, or otherwise manipulated to make them capable of supporting a commodity crop prior to December 23, 1985, may meet the criteria of the U.S. Natural Resource Conservation Service wetland definition, but they would not be regulated under Federal wetland programs. If such lands are not cropped, managed, or maintained for agricultural production, for five consecutive years, and in that time the land reverts back to wetland, the land would then be subject to Federal wetland regulations.*

[7] *Although prior converted cropland is not subject to Federal wetland regulations unless cropping ceases for five consecutive years and the land reverts to a wetland condition, the State may consider prior converted cropland to be subject to State wetland regulations if the land meets the criteria set forth in the State wetland definition before it has not been cropped for five consecutive years.*

Map 4

HYDROLOGIC SOIL GROUPS WITHIN WASHINGTON COUNTY



CASCO-FOX-RODMAN ASSOCIATION: WELL-DRAINED TO EXCESSIVELY DRAINED SOILS THAT HAVE A SUBSOIL OF GRAVELLY SANDY LOAM TO CLAY LOAM; VERY SHALLOW TO MODERATELY DEEP OVER GRAVEL AND SAND, ON OUTWASH TERRACES

HOCHHEIM-THERESA ASSOCIATION: WELL-DRAINED SOILS THAT HAVE A SUBSOIL OF CLAY LOAM; FORMED IN LOESS AND THE UNDERLYING SANDY LOAM TO LOAM GLACIAL TILL, ON UPLANDS

OZAUKEE-MATINTON-SAYLESVILLE ASSOCIATION: WELL-DRAINED AND SOMEWHAT POORLY DRAINED SOILS THAT HAVE A SUBSOIL OF SILTY-CLAY LOAM TO CLAY; OVER SILTY CLAY LOAM GLACIAL TILL OR LAKE-LAID SILT AND CLAY, ON GROUND MORAINES AND LACUSTRINE BASINS

CASCO-HOCHHEIM-SISSON ASSOCIATION: WELL-DRAINED SOILS THAT HAVE A SUBSOIL OF LOAM TO CLAY LOAM; OVER LAKE-LAID SILT AND FINE SAND, IN GRAVEL AND SAND OUTWASH, OR IN SANDY LOAM GLACIAL TILL ON UPLANDS

COLWOOD-BOYER-SISSON ASSOCIATION: WELL-DRAINED AND POORLY DRAINED SOILS THAT HAVE A SUBSOIL OF SANDY LOAM OR SILTY CLAY LOAM; OVER LAKE-LAID SILT AND FINE SAND OR GRAVEL AND SAND OUTWASH, ON PLAINS AND DISSECTED TERRACES

BROOKSTON-PELLA-LAMARTINE ASSOCIATION: SOMEWHAT POORLY DRAINED AND POORLY DRAINED SOILS THAT HAVE A SUBSOIL OF CLAY LOAM OR SILTY CLAY LOAM; FORMED IN LOESS AND UNDERLYING LOAM TO SANDY LOAM GLACIAL TILL

HOUGHTON-PALMS-ADRIAN ASSOCIATION: VERY POORLY DRAINED ORGANIC SOILS ALONG DRAINAGEWAYS, IN DEPRESSIONS, AND IN OLD LAKEBEDS

Source: SEWRPC.

Table 1

LONG-TERM TEMPERATURE, PRECIPITATION, AND RUNOFF DATA FOR THE WEST BEND AREA OF WASHINGTON COUNTY

Temperature (1961–1999)													
Air Temperature Data (°F)	May	June	July	August	September	October	November	December	January	February	March	April	Mean
Long-Term Mean Monthly	55.9	64.9	70.3	69.3	59.4	50.1	37.0	23.3	17.5	21.9	32.8	44.7	45.6

Precipitation (1961–1999)													
Precipitation Data (inches)	May	June	July	August	September	October	November	December	January	February	March	April	Total
Long-Term Mean Monthly	2.9	3.6	3.8	3.8	4.1	2.6	2.4	1.8	1.3	0.9	2.0	2.9	32.1

Runoff (1914–1998)													
Runoff Data (inches)	May	June	July	August	September	October	November	December	January	February	March	April	Mean
Long-Term Mean Monthly	2.3	1.7	1.8	1.3	0.9	0.9	0.6	0.6	0.4	0.7	1.7	1.0	1.1

Source: National Oceanic and Atmospheric Administration and U.S. Geological Survey.

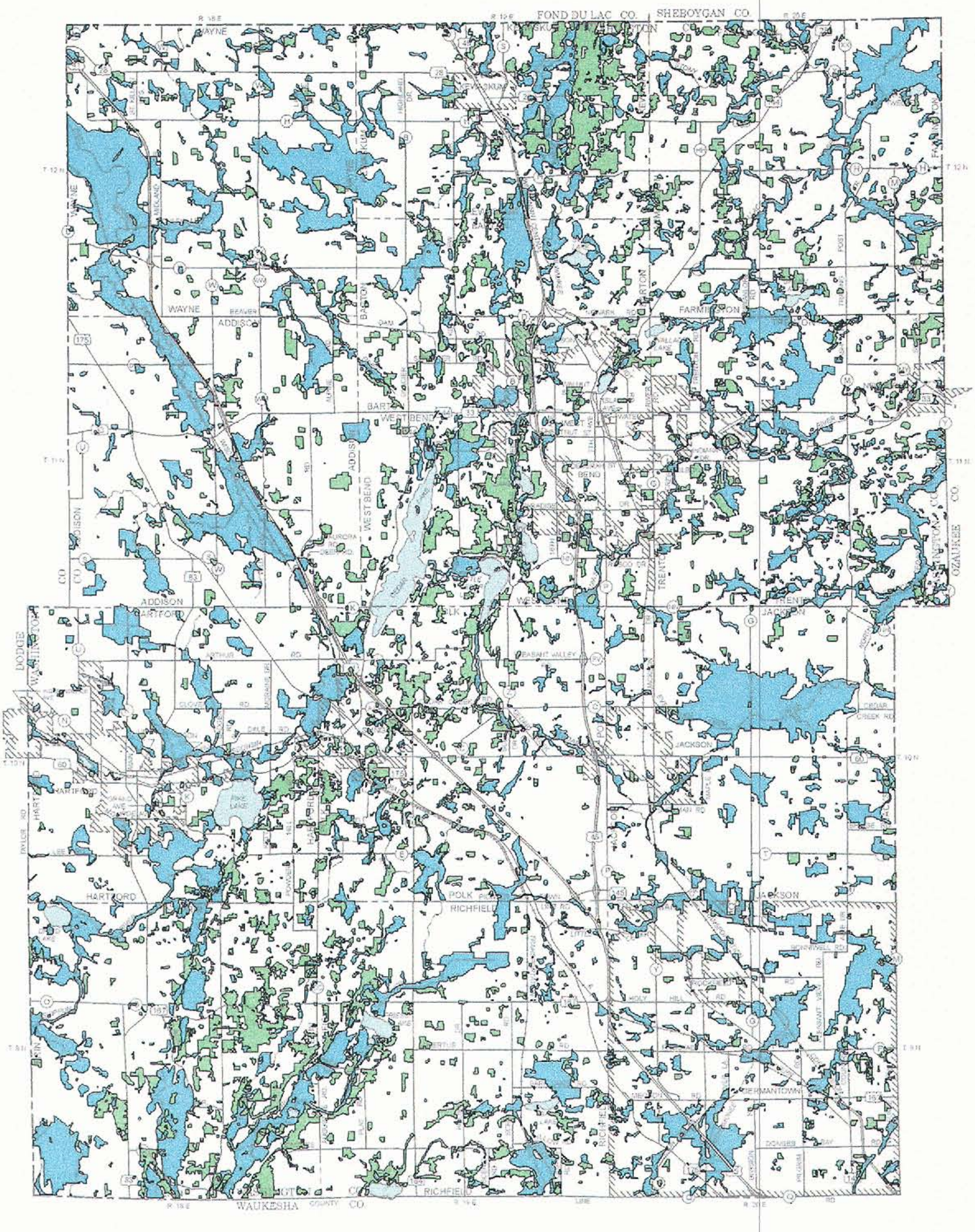
As a practical matter, experience has shown that application of the Wisconsin Department of Natural Resources, the U.S. Environmental Protection Agency and U.S. Army Corps of Engineers, and the Regional Planning Commission definitions, produce reasonably consistent wetland identifications and delineations in the majority of situations within the Southeastern Wisconsin Region. That consistency is due in large part to the provision in the Federal wetland delineation manual that allows for the application of professional judgement in cases where satisfaction of the three criteria for wetland identification is unclear.

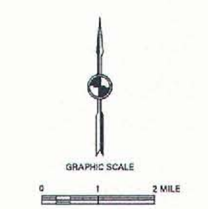
Wetlands in Southeastern Wisconsin are classified predominantly as deep marsh, shallow marsh, southern sedge meadow, fresh (wet) meadow, shrub carr, alder thickets, low prairie, fens, bogs, southern wet- and wet-mesic hardwood forest, and conifer swamp. Wetlands form an important part of the landscape in Washington County, as shown on Map 5, in that they perform an important set of natural functions that make them ecologically and environmentally invaluable resources. Wetlands affect the quality of water by acting as a filter or a buffer zone allowing silt and sediments to settle out. They also influence the quantity of water by providing water during periods of drought and holding it back during periods of flood. When located along shorelines of lakes and streams, wetlands help protect those shorelines from erosion. Wetlands also may serve as groundwater discharge and recharge areas in addition to being important resources for overall ecological health and diversity by providing essential breeding and feeding grounds, shelter, and escape cover for many forms of fish and wildlife.

Wetlands are poorly suited to urban use. This is due to the high soil compressibility and instability, high water table, low load-bearing capacity, and high shrink-swell potential of wetland soils, and, in some cases, to the potential for flooding. In addition, metal conduits placed in some types of wetland soils may be subject to rapid corrosion. These constraints, if ignored, may result in flooding, wet basements and excessive operation of sump pumps, unstable foundations, failing pavements, broken sewer and water lines, and excessive infiltration of clear water into sanitary sewerage systems. In addition, there are significant onsite preparation and maintenance costs associated with the development of wetlands, particularly as they relate to roads, foundations, and public utilities. The Regional Planning Commission maintains an inventory of wetlands within the Region that is updated every five years.

Map 5

WETLANDS AND WOODLANDS WITHIN WASHINGTON COUNTY: 1995





Source: SEWRPC.

Woodlands
Woodlands are defined by the Regional Planning Commission as those areas containing a minimum of 17 trees per acre with a diameter of at least four inches at breast height (4.5 feet above the ground).[8] The woodlands are classified as dry, dry-mesic, mesic, wet-mesic, wet hardwood, and conifer swamp forests; the last three are also considered wetlands. The Regional Planning Commission also maintains an inventory of woodlands within the Region that is updated every five years.

The major tree species in Washington County include the black willow (*Salix nigra*), cottonwood (*Populus deltoides*), green ash (*Fraxinus pennsylvanica*), silver maple (*Acer saccharinum*), American elm (*Ulmus americana*), basswood (*Tilia americana*), northern red oak (*Quercus rubra*), and shagbark hickory (*Carya ovata*). Some isolated stands of tamarack (*Larix laricina*) also exist in the drainage area, together with such other upland species as the white oak (*Quercus alba*), burr oak (*Quercus macrocarpa*), black cherry (*Prunus serotina*), and sugar maple (*Acer saccharum*). The distribution of woodlands in Washington County is shown on Map 5.

Wildlife Habitat
Wildlife habitat areas remaining in the Region were inventoried by the Regional Planning Commission in 1985 in cooperation with the Wisconsin Department of Natural Resources. The five major criteria used to determine the value of these wildlife habitat areas are listed below:

1. Diversity—An area must maintain a high but balanced diversity of species for a temperate climate, balanced in such a way that the proper predatory-prey (consumer-food) relationships can occur. In addition, a reproductive interdependence must exist.

2. Territorial Requirements—The maintenance of proper spatial relationships among species, allowing for a certain minimum population level, can occur only if the territorial requirements of each major species within a particular habitat are met.

3. Vegetative Composition and Structure—The composition and structure of vegetation must be such that the required levels for nesting, travel routes, concealment, and protection from weather are met for each of the major species.

4. Location with Respect to Other Wildlife Habitat Areas—It is very desirable that a wildlife habitat maintain proximity to other wildlife habitat areas.

5. Disturbance—Minimum levels of disturbance from human activities are necessary, other than those activities of a wildlife management nature.

On the basis of these five criteria, the wildlife habitat areas in Washington County are categorized as either Class I, High-Value; Class II, Medium-Value; or Class III, Good-Value, habitat areas. Class I wildlife habitat areas contain a good diversity of wildlife, are adequate in size to meet all of the habitat requirements for the species concerned, are generally located in proximity to other wildlife habitat areas, and meet all five criteria listed above. Class II wildlife habitat areas generally fail to meet one of the five criteria in the preceding list for a high-value wildlife habitat. However, they do retain a good plant and animal diversity. Class III wildlife habitat areas are remnant in nature in that they generally fail to meet two or more of the five criteria for a high-value wildlife habitat, but may, nevertheless, be important if located in proximity to medium- or high-value habitat areas if they provide corridors linking wildlife habitat areas of higher value or if they provide the only available range in an area. Wildlife habitat areas in Washington County are shown on Map 6.

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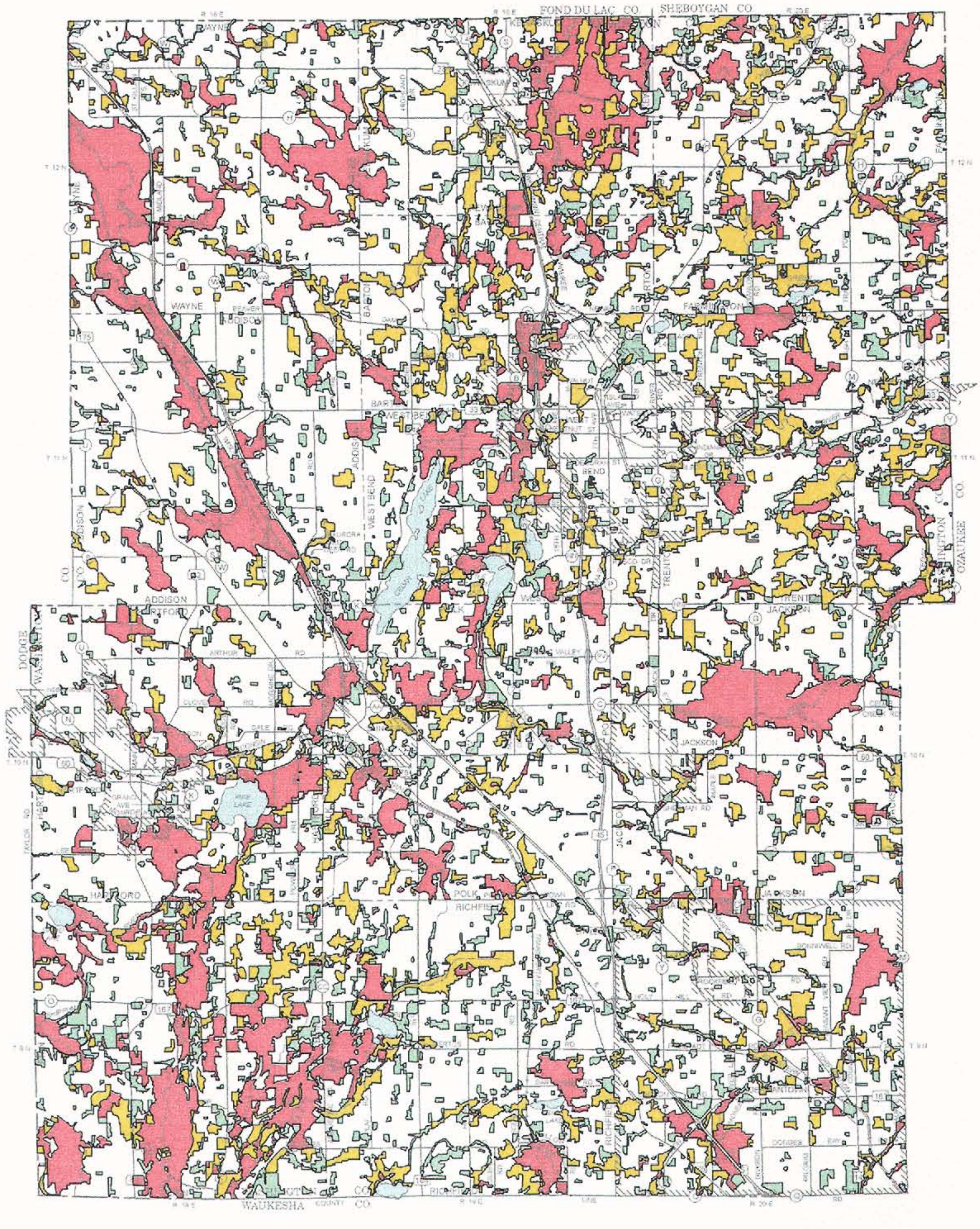
[8] *SEWRPC* Technical Record, *Vol. 4, No. 2, March 1981.*

Map 6

WILDLIFE HABITAT AREAS WITHIN WASHINGTON COUNTY: 1995

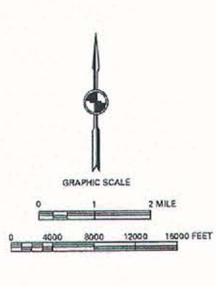


CLASS I WILDLIFE HABITAT AREA

CLASS II WILDLIFE HABITAT AREA

CLASS III WILDLIFE HABITAT AREA

SURFACE WATER



NOTE WILDLIFE HABITAT MAY BE LOCATED WITHIN SURFACE WATER FEATURES AND CONSISTS OF DEEP MARSH AREAS HAVING SUBMERGENT, EMERGENT, AND FREE-FLOATING VEGETATION.

Source: SEWRPC.

Environmental Corridors

One of the most important tasks undertaken by the Regional Planning Commission in its work program has been the identification and delineation of those areas of the Region having concentrations of natural, recreational, historic, aesthetic, and scenic resources and which, as such, should be preserved and protected in order to maintain the overall quality of the environment. Such areas normally include one or more of the following seven elements of the natural resource base which are essential to the maintenance of both the ecological balance and the natural beauty of the Region: 1) lakes, rivers, and streams and the associated undeveloped shorelands and floodlands, 2) wetlands, 3) woodlands, 4) prairies, 5) wildlife habitat areas, 6) wet, poorly drained, and organic soils, and 7) rugged terrain and high-relief topography. While the foregoing seven elements constitute integral parts of the natural resource base, there are five additional elements which, although not a part of the natural resource base per se, are closely related, to or centered on, that base and, therefore, are important considerations in identifying and delineating areas with scenic, recreational, and educational value. These additional elements are: 1) existing outdoor recreation sites, 2) potential outdoor recreation and related open space sites, 3) historic, archaeological, and other cultural sites, 4) significant scenic areas and vistas, and 5) natural and scientific areas.

In Southeastern Wisconsin, the delineation of these 12 natural resource and natural resource-related elements on maps results in an essentially linear pattern of relatively narrow, elongated areas which have been termed "environmental corridors" by the Commission. Primary environmental corridors include a wide variety of the aforementioned important resource and resource-related elements and are, by definition, at least 400 acres in size, two miles in length, and 200 feet in width. The primary environmental corridors identified in Washington County are contiguous with environmental corridors and isolated natural areas lying within Ozaukee, Washington and Waukesha Counties, and, consequently, meet these size and natural resource element criteria.

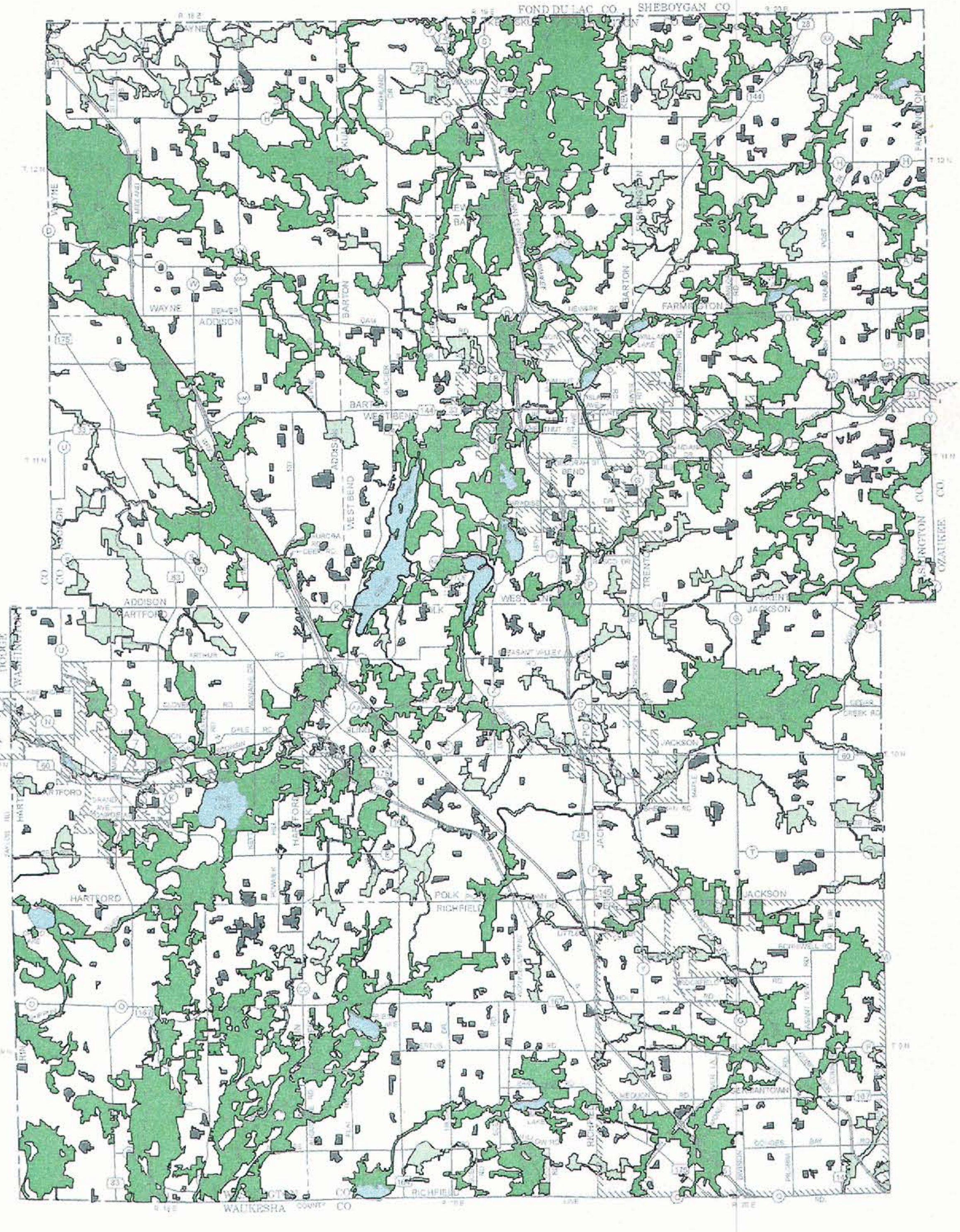
It is important to note here that, because of the many interlocking and interacting relationships between living organisms and their environment, the destruction or deterioration of one element of the total environment may lead to a chain reaction of deterioration and destruction. The drainage of wetlands, for example, may have far-reaching effects, since such drainage may destroy fish spawning grounds, wildlife habitat, groundwater recharge areas, and natural filtration and floodwater storage areas in interconnected lake and stream ecosystems. The resulting deterioration of surface water quality may, in turn, lead to a deterioration of the quality of the groundwater that serves as a source of domestic, municipal, and industrial water supplies and provides a basis for low flows in rivers and streams. Similarly, the destruction of woodland cover, which may have taken a century or more to develop, may result in soil erosion and stream siltation, and in more rapid runoff and increased flooding, as well as in the destruction of wildlife habitat. Although the effects of any one of these environmental changes may not in and of itself be overwhelming, the combined effects may lead eventually to the deterioration of the underlying and supporting natural resource base, and of the overall quality of the environment for life. The need to protect and preserve the remaining environmental corridors within Washington County, shown on Map 7, thus becomes apparent and critical.

Primary environmental corridors were first identified within the Region in 1963 as part of the original regional land use planning effort of the Commission and were subsequently refined under the Commission watershed studies and regional park and open space planning programs. The primary environmental corridors in Southeastern Wisconsin generally lie along major stream valleys and around major Lakes and contain almost all the remaining high-value woodlands, wetlands, and wildlife habitat areas, and all the major bodies of surface water and related undeveloped floodlands and shorelands.

Environmental corridors are subject to urban encroachment because of their desirable natural resource amenities. Unplanned or poorly planned intrusion of urban development into these corridors not only tends to destroy the very resources and related amenities sought by the development, but also tends to create severe environmental and developmental problems as well. These problems include, among others, water pollution, flooding, wet basements, failing foundations for roads and other structures, and excessive infiltration of clear water into sanitary sewerage systems. The preservation of as yet undeveloped corridors is one of the major ways in which the water quality can be protected and perhaps improved at relatively little additional cost to the taxpayers of the area.

Map 7

ENVIRONMENTAL CORRIDORS AND ISOLATED NATURAL FEATURES WITHIN WASHINGTON COUNTY: 1995

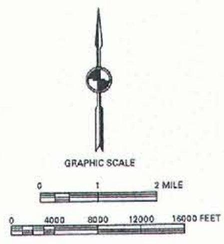


PRIMARY ENVIRONMENTAL CORRIDOR

SECONDARY ENVIRONMENTAL CORRIDOR

ISOLATED NATURAL RESOURCE AREA

SURFACE WATER



Source: SEWRPC.

The riverbanks and lakeshores located within the environmental corridors should be candidates for immediate protection through proper zoning or through public ownership. Of the areas not already publicly owned, the remaining areas of natural shoreline, and riparian wetland areas, are perhaps the most sensitive areas in need of greatest protection. In this regard, the regional natural areas and critical species habitat protection and management plan recommends public acquisition of specific lands.[9] Within the County, approximately 1,500 acres, is specifically recommended for acquisition, including the Germantown Swamp in the Village of Germantown, the Aurora Road Fen in the Town of Addison, Smith Lake and its associated wetlands in the Town of Barton, the Murphy-McConville Lake Wetland Complex in the Town of Erin, the Kewaskum Maple-Oak Woods State Natural Area and Milwaukee River Floodplain Forest State Natural Area in the Town of Kewaskum, and the Paradise Lake Fen in the Town of West Bend. In addition to these sites, the acquisition of a further 14,000 acres of lands of countywide or regional significance by both public agencies and private conservation organizations is recommended. These sites are shown on Map 8.

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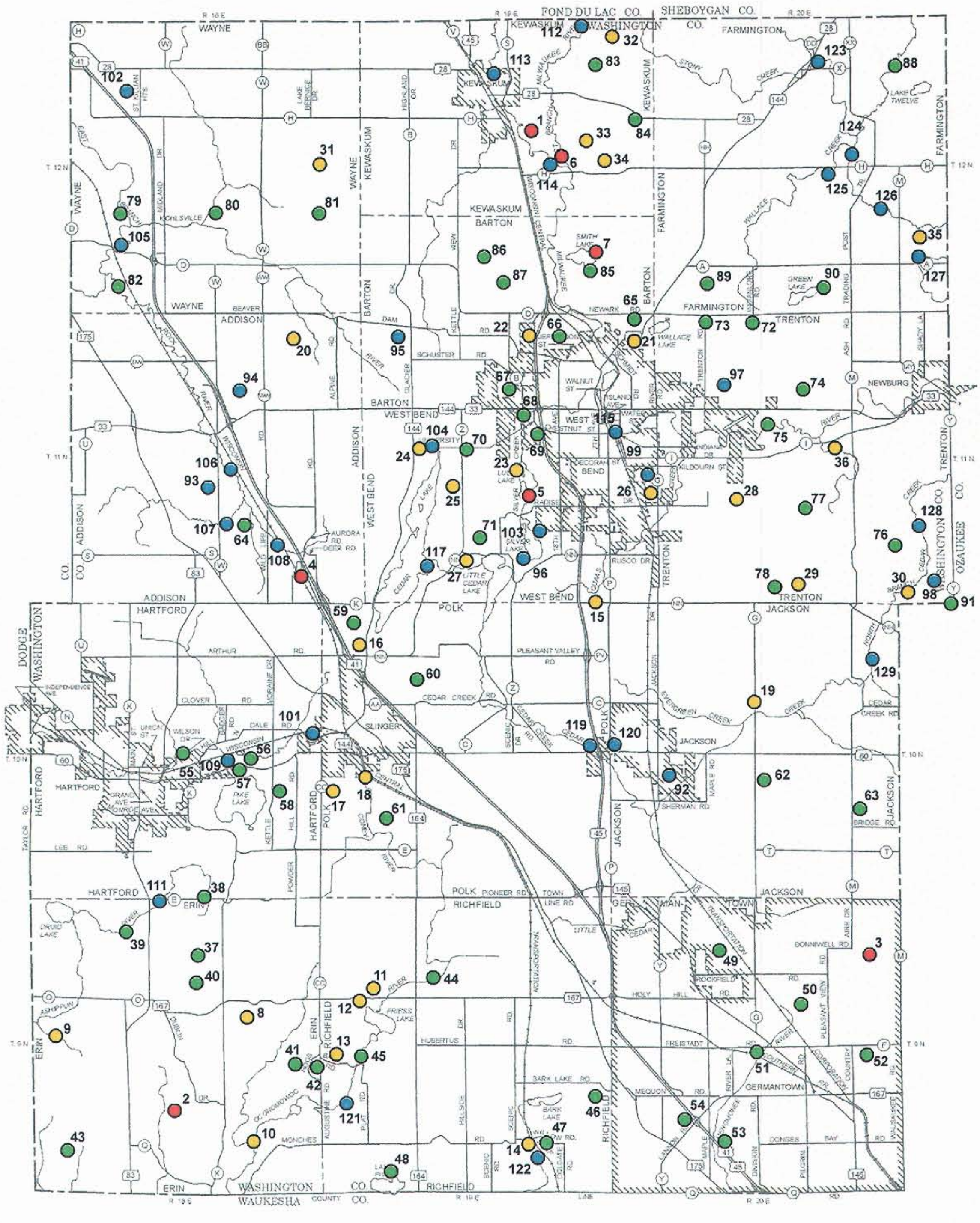
[9]*SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997.*

Map 8

NATURAL AREAS AND CRITICAL SPECIES HABITAT SITES WITHIN WASHINGTON COUNTY: 1994



NATURAL AREA SITE OF STATEWIDE OR GREATER SIGNIFICANCE (NA-1)

NATURAL AREA SITE OF COUNTYWIDE OR REGIONAL SIGNIFICANCE (NA-2)

NATURAL AREA SITE OF LOCAL SIGNIFICANCE (NA-3)

CRITICAL SPECIES HABITAT SITE

43 IDENTIFICATION NUMBER (SEE TABLE II-7)

GRAPHIC SCALE

0 1 2 MILE

0 4000 8000 12000 16000 FEET

Source: SEWRPC.

Chapter III

INVENTORY FINDINGS: ADDISON AREA

INTRODUCTION

This chapter presents the inventory findings relating to lakes and streams in the Addison area of Washington County. The Addison area is shown on Map 9 and includes all of U.S. Public Land Survey Sections 1 through 36, Town 11 North, Range 18 East. The area includes the entire Town of Addison. To the extent that data are available, relevant land use, recreational use, morphometric, water quality, and biological information upon which waterbody classifications are to be based pursuant to the requirements of Section 281.69(5)(b), *Wisconsin Statutes*, is presented for each waterbody inventoried. These data form the scientific and technical basis for the determination of the alternative and recommended waterbody classification schemes set forth in Chapter XVI.

LAND USE

The type, intensity, and spatial distribution of the various land uses within the Addison area are important determinants of water quality and recreational use demands. The current and planned future land use patterns, placed within the context of the historical development in the area, therefore, are important considerations in any waterbody management planning effort in the area.

While some settlement occurred prior to the mid-1900s, most urban development occurred in the Addison area in recent years. Nevertheless, the Town of Addison remains largely rural in character. Map 9 indicates the historic urban growth pattern in the Addison area, since 1850. Early development occurred in the south-central and central portions of the area, around the unincorporated settlements of Addison and Allenton. During the 1920s, development continued at a very limited rate through the early 1970s. Since the 1970s, there has been a more rapid increase in urban land use development in the area, with the most rapid growth occurring during the 1980s, when about 350 acres were converted from rural to urban land uses. As shown on Map 9, the majority of the urban development on lands within the area has occurred since the 1970s.

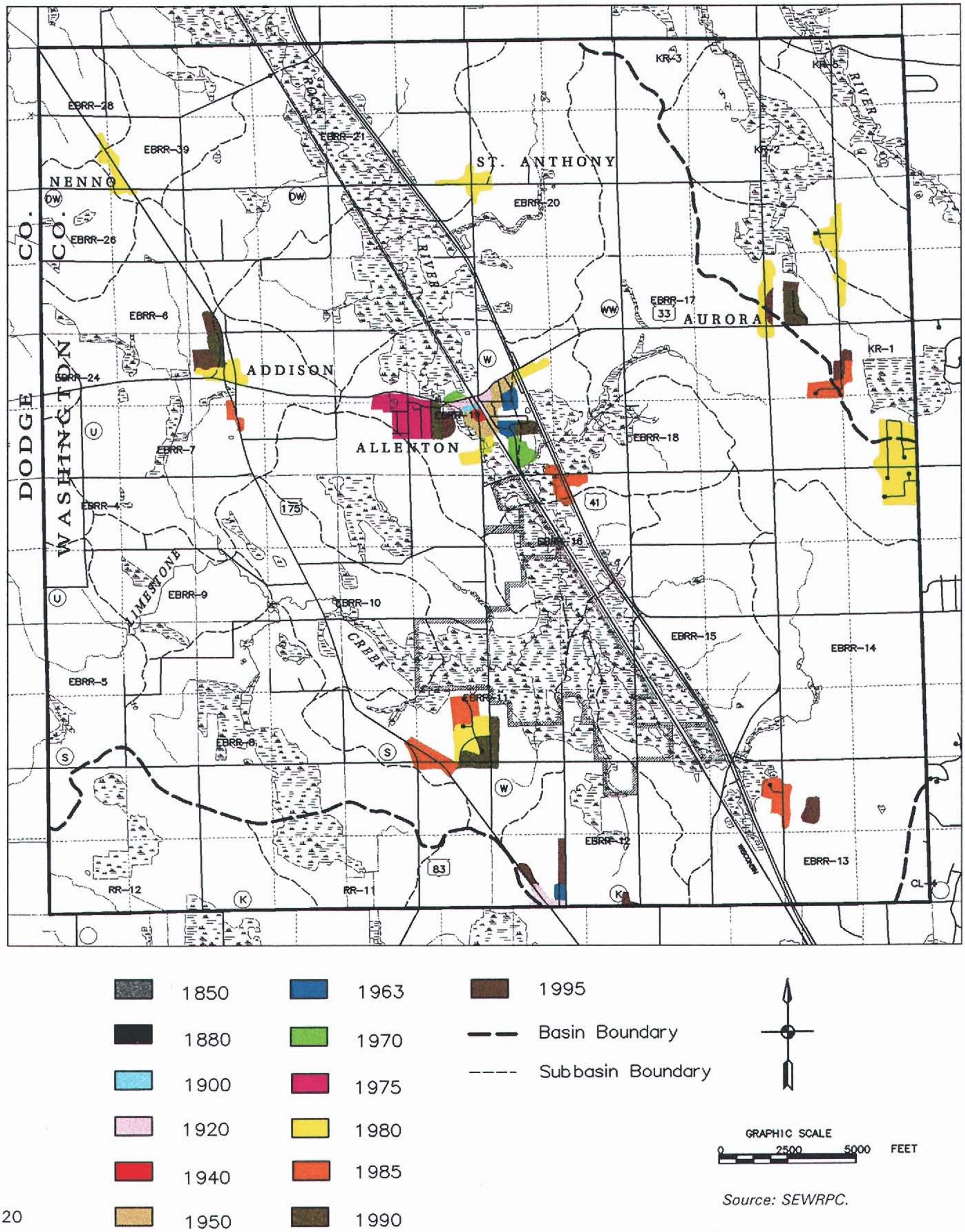
The existing land use pattern in the Addison area, as of 1995, is shown on Map 10, and is quantified in Table 2. As indicated in Table 2, about 1,900 acres, or about 8 percent of the area, were devoted to urban land uses. The dominant urban land uses were residential and transportation, encompassing about 1,800 acres, or about 93 percent of the area in urban use. As of 1995, about 21,100 acres, or about 92 percent of the area, were still devoted to rural land uses. About 16,100 acres, or about 76 percent of the rural area, were in agricultural land uses. Woodlands, wetlands, and surface water accounted for approximately 4,400 acres, or about 21 percent of the area in rural use. Future land use, based upon the recommendations set forth in the adopted 2020 regional land use plan shown on Map 11, is not anticipated to differ greatly from the current condition.

LAKES

There are no major lakes in the Addison area. Major lakes have been defined as those lakes within the Southeastern Wisconsin Region with a surface area of 50 or more acres in areal extent.

Map 9

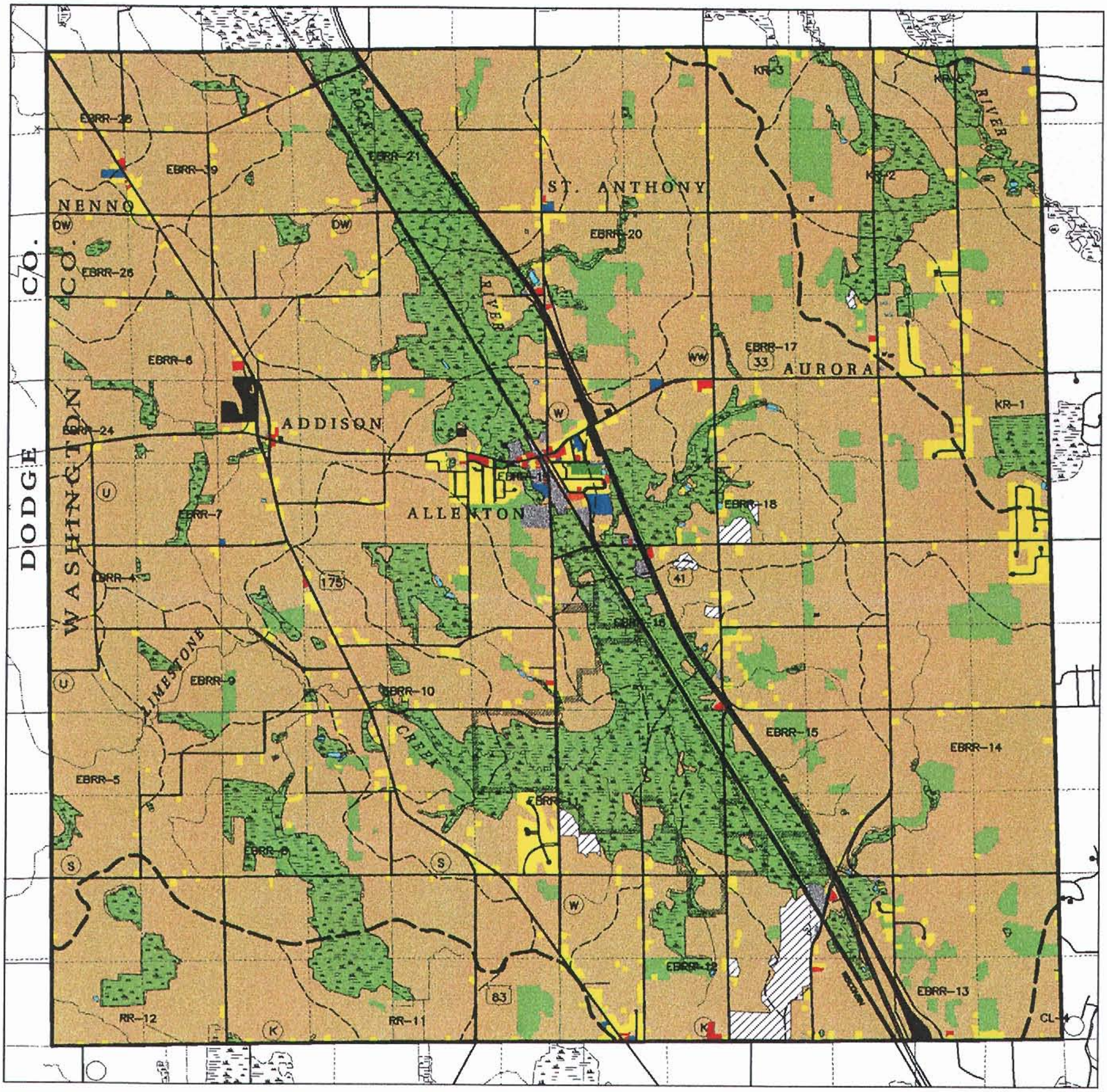
HISTORIC URBAN GROWTH WITHIN THE ADDISON AREA: 1850-1990



Source: SEWRPC.

Map 10

EXISTING LAND USE WITHIN THE ADDISON AREA: 1995



Single–family residential

Multi–family residential

Commercial

Industrial

Transportation, communications, and utilities

Government and institutional

Recreation

Surface water

Wetlands and woodlands

Agricultural, unused, and other open lands

Extractive and landfill

Basin Boundary

Subbasin Boundary

Source: SEWRPC.

Table 2

EXISTING LAND USE WITHIN THE ADDISON AREA: 1995

Land Use Categories	Acres	Percent of Major Category	Percent of Total Area
Urban			
Residential	835	43.2	3.6
Commercial	28	1.5	0.1
Industrial	60	3.1	0.3
Governmental and Institutional	27	1.4	0.1
Transportation and Utilities	961	50.0	4.2
Recreation	9	0.5	<0.1
Land under Development	13	0.3	<0.1
Subtotal	1,933	100.0	8.3
Rural			
Agricultural	16,110	76.2	69.8
Wetlands	3,370	16.0	14.7
Woodlands	1,034	4.9	4.5
Water	20	0.1	0.1
Extractive	170	0.8	0.7
Landfill	40	0.1	0.1
Other Open Lands	405	1.9	1.8
Subtotal	21,149	100.0	91.7
Total	23,082	- -	100.0

Source: SEWRPC.

STREAMS

Table 3 contains a summary of selected morphometric data available for named streams in the Addison area. The streamcourses are shown on Map 12, which also shows the hydrologic subbasins within the area. Wetlands within the Addison area are shown on Map 13. Descriptive paragraphs follow, providing a summary of available information on the physical description of each stream for the portion of the stream within Washington County, and of the existing uses and conditions, wildlife habitat, and fishery for the portion of the stream within the Addison area, to the extent that such information is available. Each of the paragraphs addresses one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69(5)(b) of the *Wisconsin Statutes*.

Allenton Creek

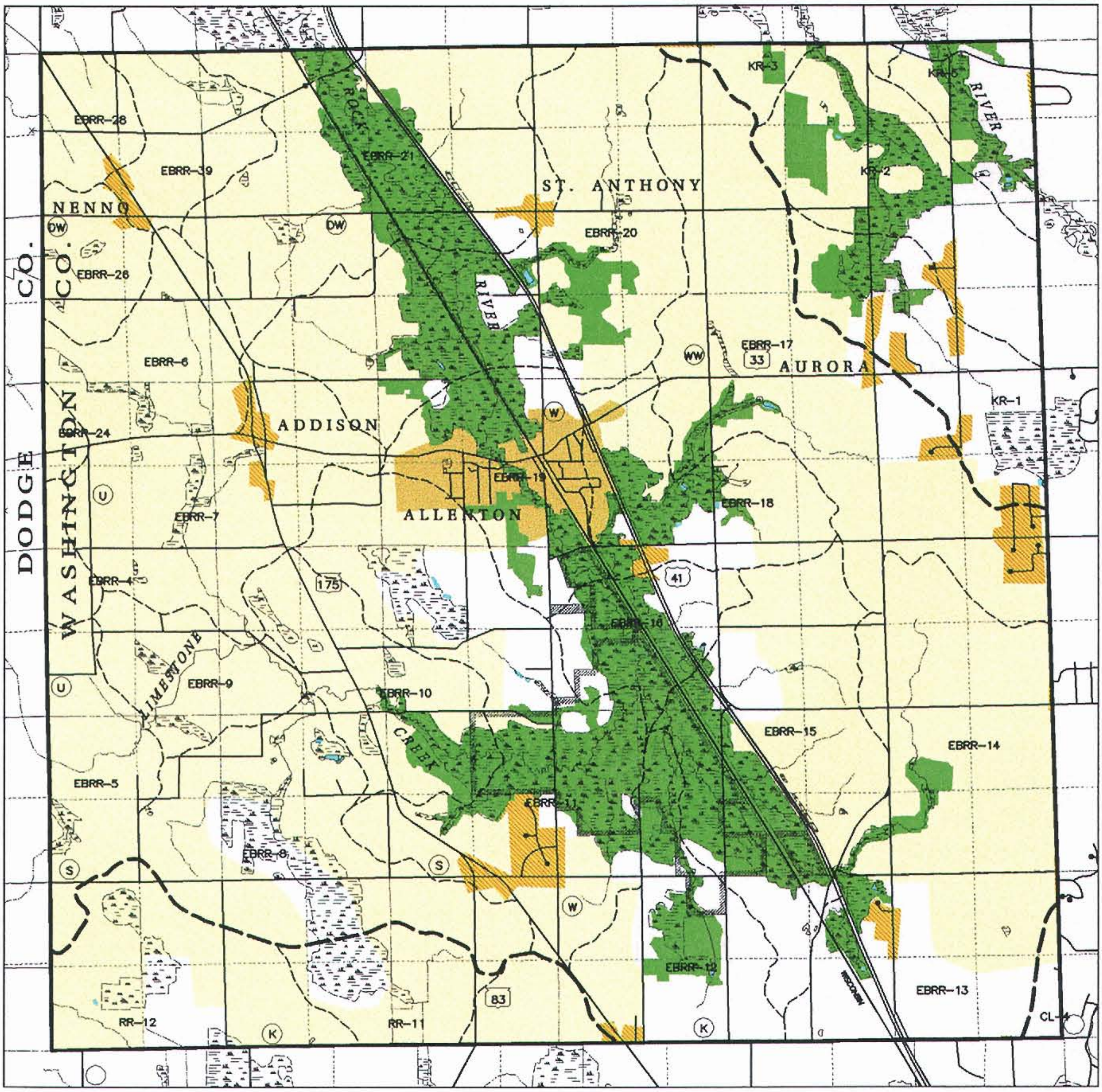
Stream Morphometry

Allenton Creek is located in the southeastern portion of the Addison area. The Creek has a surface area of about two acres and extends over a linear distance of about 2.5 miles with a gradient of approximately 15 feet per mile. The Creek flows northwest to become the East Branch of the Rock River, at its confluence with Limestone Creek, within the Allenton Wildlife Area. A narrow, fairly deep, clear water stream with a predominantly sand and rubble bottom, the Creek flows for about 1.2 miles within the Allenton Wildlife Area. Allenton Creek is included in the Upper Rock River Basin areawide water quality management planning area.[1]

[1] *Wisconsin Department of Natural Resources Publication No. PUBL-WR-190-88,* Upper Rock River Basin Areawide Water Quality Management Plan, *May 1989.*

Map 11

ADOPTED REGIONAL LAND USE PLAN FOR THE ADDISON AREA: 2020



Basin Boundary

Subbasin Boundary

Residential—suburban density

Residential—low density

Residential—medium density

Residential—high density

Commercial

Industrial

Extractive/Landfill

Transportation

Governmental and Institutional

Recreational

Agricultural

Primary Environmental Corridors

Secondary Environmental Corridors

Isolated Natural Resource Area

Surface water

Other Open Lands

GRAPHIC SCALE

0 2500 5000 FEET

Source: SEWRPC.

Table 3

PHYSICAL CHARACTERISTICS OF STREAMS WITHIN THE ADDISON AREA, WASHINGTON COUNTY[a]

Stream or Watercourse	Length (miles)	Average Width (feet)	Average Depth (feet)	Surface Area (acres)	Drainage Area (square miles)	U.S. Public Land Survey			Subwatershed	Major Watershed
						Town	Range	Section		
Allenton Creek	2.5	6	1.04	1.8	4.5	11	18	22	East Branch Rock	Rock
Kohlsville River	7.9	12	1.00	11.5	21.5	12	18	29	East Branch Rock	Rock
Limestone Creek..............	5.8	17	0.70	12.0	10.0	11	18	22	East Branch Rock	Rock
East Branch Rock River	15.5	33	2.00	62.0	58.5	12	18	18	East Branch Rock	Rock

[a]Stream data are for the portion of the stream within Washington County only. The U.S. Public Land Survey Township, Range, and Section designation included in each description locates the mouth of the stream at its confluence with another named stream or at the point at which it exists the County.

Source: Wisconsin Department of Natural Resources and SEWRPC.

Recreational Use

Allenton Creek has limited navigability, and is generally navigable only by canoe or similar watercraft. Public recreational boating access is available through the Allenton Wildlife Area.

Development Potential

As of 1995, land use within the Allenton Creek drainage area consisted of agricultural and open space uses, with agriculture comprising about 60 percent of the land cover in the drainage area. Wetlands and woodlands comprised about 20 percent and about 10 percent of the land cover, respectively. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Allenton Creek drainage area are primarily agricultural.

Fish and Wildlife Populations

Managed its entire length for brown trout, Allenton Creek is the only designated trout stream in Washington County.[2] A fish survey conducted in 1973 reported the fish population of the Creek to be comprised of pearl, blacknose, and southern redbelly dace; creek chub; mottled sculpin; northern pike; green sunfish; brook and rainbow trout; brook stickleback; central mudminnow; pumpkinseed; and white sucker.[3] The Southeastern Wisconsin Regional Planning Commission (SEWRPC) also has reported the occurrence of the least darter, a State species of special concern.[4] Seasonally filled waterfowl impoundments on the public land provide additional water resources adjacent to the stream course during some seasons.

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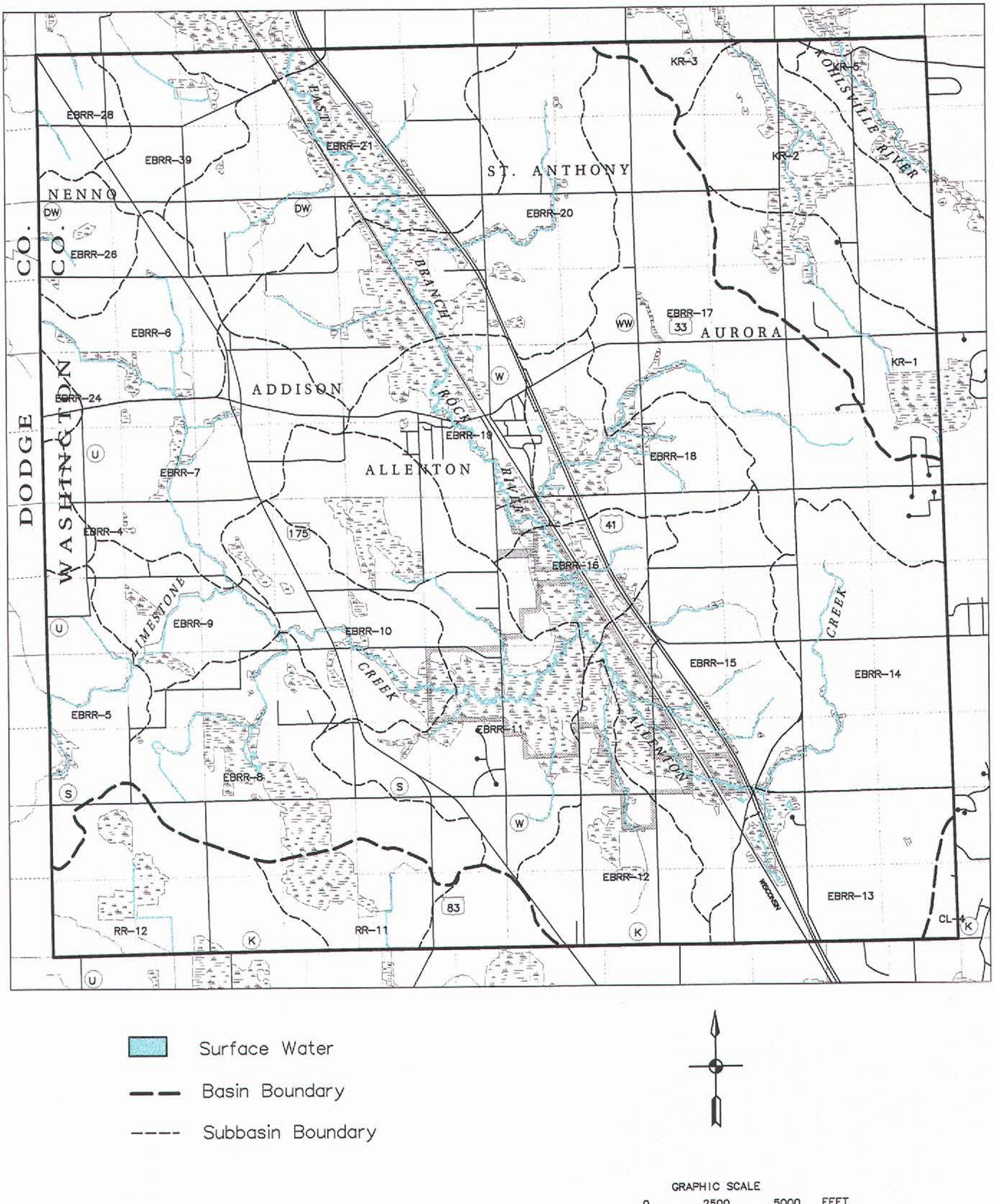
[2]*Wisconsin Department of Natural Resources Publication No. PUB-0FH-302-00REV,* Wisconsin 2000-2001 Trout Fishing Regulations and Guide, *March 2000.*

[3]*D. Fago, Wisconsin Department of Natural Resources Research Report No. 148,* Retrieval and Analysis System Used in Wisconsin's Statewide Fish Distribution Survey, Second Edition, *December 1988.*

[4]*SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997.*

Map 12

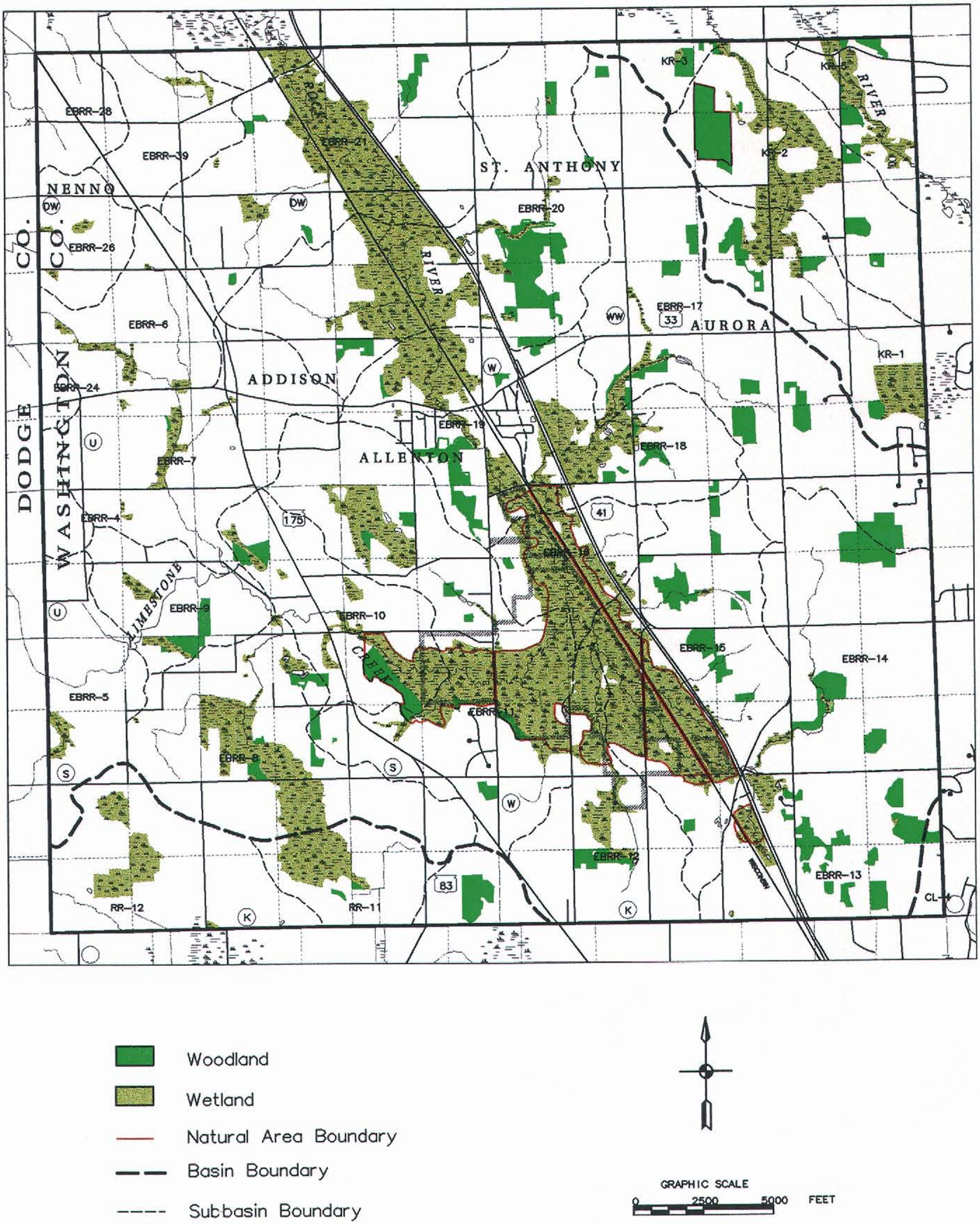
SURFACE WATER RESOURCES WITHIN THE ADDISON AREA: 1995



Source: SEWRPC.

Map 13

WETLANDS AND WOODLANDS WITHIN THE ADDISON AREA: 1995



Source: SEWRPC.

Kohlsville River

Stream Morphometry

The Kohlsville River is located in the extreme northeastern corner of the Addison area. The River has a surface area of about 12 acres and extends over a linear distance of about 7.9 miles with a gradient of approximately 17 feet per mile. The River flows northwesterly from the Addison area into the Town of Wayne and through the Theresa Marsh Wildlife Area to its confluence with the Rock River. A high gradient, gravelly stream, the River is impounded at the Village of Kohlsville. The Kohlsville River is included in the Upper Rock River Basin areawide water quality management planning area.[5]

Recreational Use

The Kohlsville River has limited navigability, and is generally navigable only by canoe or similar watercraft.

Development Potential

As of 1995, the primary land use within the Kohlsville River drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 65 percent of the land cover in the drainage area. Wetlands and other open lands comprised about 20 percent and 10 percent of the land cover, respectively. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the Kohlsville River drainage area are primarily agricultural.

Fish and Wildlife Populations

In 1963,[6] the River supported forage fishes only, due to its generally shallow condition. In 1972,[7] the fish population of the River was reported to be comprised of bluegill, brook stickleback, central mudminnow, green sunfish, and northern redbelly dace.

Limestone Creek

Stream Morphometry

Limestone Creek is located in the west-central portion of the Addison area. The Creek has a surface area of about 12 acres and extends over a linear distance of about 5.8 miles with a gradient of approximately 13 feet per mile. The Creek originates as a ditch, draining small wetland pockets in Dodge County before flowing easterly through the west-central portion of the Town of Addison into the Allenton Wildlife Area. The Creek flows east to become the East Branch of the Rock River at its confluence with Allenton Creek within the Allenton Wildlife Area. The streambed is primarily silt with gravel-bottomed riffles in a high gradient stretch below the ditched portion. Limestone Creek is included in the Upper Rock River Basin areawide water quality management planning area.[8]

Recreational Use

Limestone Creek has limited navigability, and is generally navigable only by canoe or similar watercraft. Public recreational boating access is available through the Allenton Wildlife Area.

Development Potential

In 1995, the primary land use within the Limestone Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 65 percent of the land cover in the drainage area. Wetlands and

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[5] *Wisconsin Department of Natural Resources, PUBL-WR-190-88.*

[6] *Wisconsin Conservation Department,* Surface Water Resources of Washington County, *1963.*

[7] *D. Fago,* op. cit.

[8] *Wisconsin Department of Natural Resources, PUBL-WR-190-88.*

other open lands comprised about 20 percent and about 10 percent of the land cover, respectively. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Limestone Creek drainage area are primarily agricultural.

Fish and Wildlife Populations

In 1963,[9] the fish population was reported to be primarily rough fishes and forage fishes: central mudminnow, white sucker, bluntnose and fathead minnow, johnny and least darter, blackstripe topminnow, central stoneroller, creek chub, black bullhead, common carp, tadpole madtom, northern redbelly dace, pumpkinseed, rock bass, and common, redfin and golden shiner. Fish surveys were conducted annually from 1971 through 1975,[10] and reported the fish population of the Creek to be comprised of central mudminnow, central stoneroller, tadpole madtom, northern pike, pumpkinseed, black and yellow bullhead, bluntnose and fathead minnow, brook stickleback, common carp, common and redfin shiner, fantail and johnny darter, Iowa and least darter, green sunfish, white sucker, bluegill, and blacknose, pearl and northern redbelly dace. In addition, SEWRPC reported the occurrence of the redfin shiner, a State-designated threatened species, and the least darter, a State species of special concern.[11]

East Branch of the Rock River

Stream Morphometry

The East Branch of the Rock River is originates in the central portion of the Addison area. Within Washington County, the River has a surface area of about 62 acres and extends over a linear distance of about 15.5 miles with a gradient of approximately three feet per mile. The River is the major stream system in northwestern Washington County, flowing northwesterly out of the County within a wetland valley formed by the ground moraine created by the Green Bay glacier. The River originates at the junction of Allenton and Limestone Creeks and has two other major tributaries downstream, Nolan Creek and the Kohlsville River, which join the River in the Town of Wayne. Within the Theresa Wildlife Area in the Town of Wayne, there are about 4.9 miles of stream with public frontage, with a further approximately 0.8 miles of stream with public frontage within the Allenton Wildlife Area within the Town of Addison. The East Branch of the Rock River is included in the Upper Rock River Basin areawide water quality management planning area.[12]

Recreational Use

The River has limited navigability, and is generally navigable only by canoe or similar watercraft. Public recreational boating access is available through the Allenton Wildlife Area.

Development Potential

In 1995, the primary existing land use within the East Branch Rock River basin consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the land cover in the basin. Wetlands and other open lands comprised about 20 percent and 10 percent of the land cover, respectively. The drainage area is partially located within an area planned for urban development in the regional land use plan, in the vicinity of the unincorporated hamlet of Allenton.

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[9] *Wisconsin Conservation Department,* op. cit.

[10] *D. Fago,* op. cit.

[11] *SEWRPC Planning Report No. 42,* op. cit.

[12] *Wisconsin Department of Natural Resources, PUBL-WR-190-88.*

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the East Branch Rock River basin are primarily agricultural.

Fish and Wildlife Populations
In 1963,[13] the fishery consisted of forage fishes, primarily creek chub and white sucker. Fish surveys conducted between 1971 and 1975 reported black bullhead, blackside darter, blackstripe topminnow, bluegill, bluntnose minnow, brook stickleback, central mudminnow, common carp, common shiner, creek chub, emerald shiner, fathead minnow, golden shiner, green sunfish, Iowa darter, johnny darter, largemouth bass, northern pike, pumpkinseed, redfin shiner, rock bass, southern redbelly dace, white crappie, white sucker, yellow perch, and longear sunfish.[14] Tadpole madtom were reported in the surveys of 1972 and 1973. SEWRPC also has reported that the occurrence of the longear sunfish and the redfin shiner, State-designated threatened species.[15]

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[13]*Wisconsin Conservation Department,* op. cit.

[14]*D. Fago,* op. cit.

[15]*SEWRPC Planning Report No. 42,* op. cit.

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Chapter IV

INVENTORY FINDINGS: BARTON AREA

INTRODUCTION

This chapter presents the inventory findings relating to lakes and streams in the Barton area of Washington County. The Barton area is shown on Map 14 and includes all of U.S. Public Land Survey Sections 25 through 36, Town 12 North, Range 19 East and all of Sections 1 through 12, Town 11 North, Range 19 East. The area includes the entire Town of Barton and the north-central portions of the City of West Bend. To the extent that data are available, relevant land use, recreational use, morphometric, water quality, and biological information upon which waterbody classifications are to be based pursuant to the requirements of Section 281.69(5)(b), *Wisconsin Statutes*, is presented for each waterbody inventoried. These data form the scientific and technical basis for the determination of the alternative and recommended waterbody classification schemes set forth in Chapter XVI.

LAND USE

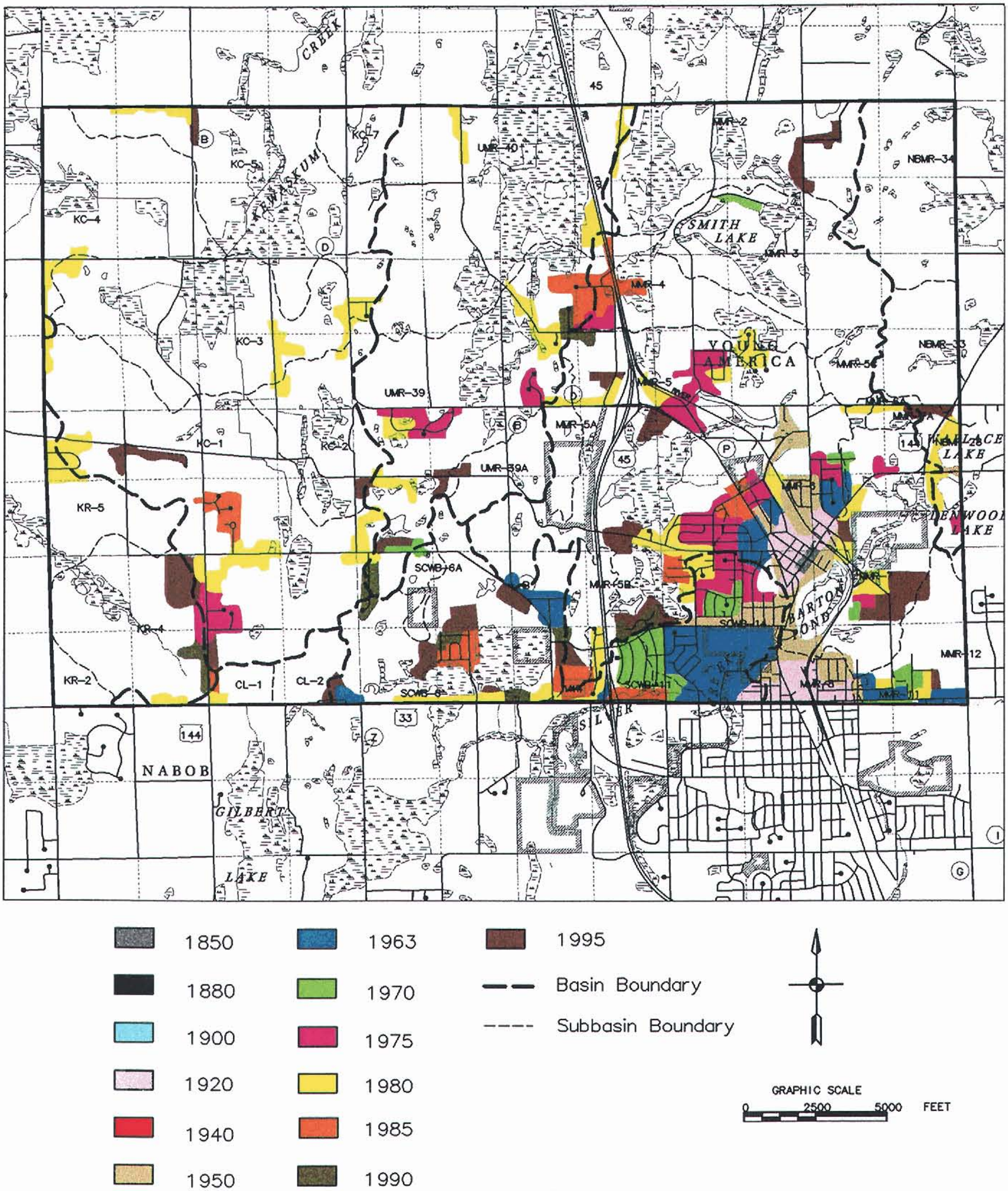
The type, intensity, and spatial distribution of the various land uses within the Barton area are important determinants of water quality and recreational use demands. The current and planned future land use patterns, placed within the context of the historical development in the area, therefore, are important considerations in any waterbody management planning effort.

While some settlement occurred prior to the mid-1900s, most urban development occurred in the Barton area in recent years. The Town of Barton remains largely rural in character, although the portion of the area within the City of West Bend has been significantly developed. Map 14 indicates the historic urban growth pattern in the Barton area since 1850. Early development occurred in the southeastern portions of the area, around Barton Pond in what is now the City of West Bend, during the 1920s. Between the 1920s and 1950s, urban growth in the area remained static. However, since the 1950s, urban land use development in the area has proceeded rapidly, extending outwards from the incorporated areas of the City of West Bend that form the southeastern portions of the area. As shown on Map 14, the urban development of the lands in the Town has largely occurred since the 1970s.

The existing land use pattern in the Barton area, as of 1995, is shown on Map 15, and is quantified in Table 4. As indicated in Table 4, about 3,000 acres, or about 19 percent of the area, were devoted to urban land uses. The dominant urban land use was residential, encompassing about 1,500 acres, or about 50 percent of the area in urban use. As of 1995, about 12,300 acres, or about 81 percent of the area, were still devoted to rural land uses. About 7,400 acres, or about 60 percent of the rural area, were in agricultural land uses. Woodlands, wetlands, and surface water, including the surface area of the lakes in the area, accounted for approximately 3,800 acres, or about 31 percent of the area in rural use. Future growth in urban land use, based upon the recommendations set forth in the adopted 2020 regional land use plan shown on Map 16, is anticipated in the southeastern portion of the area, within and adjacent to the currently incorporated area of the City of West Bend, and limited infilling and development in the north central portion of the area, west of Smith Lake. Elsewhere, however, land usage is not anticipated to differ greatly from the current condition.

Map 14

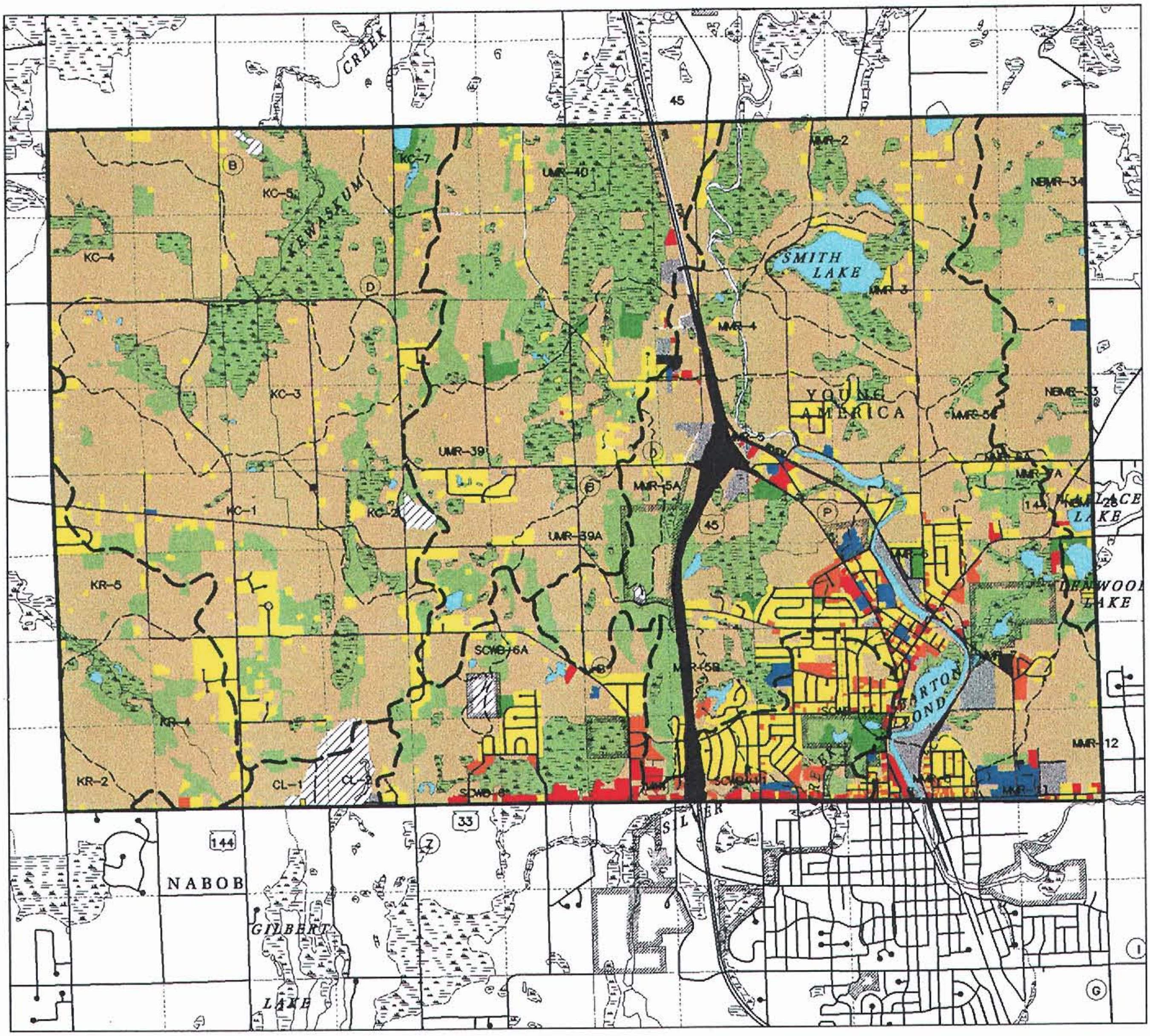
HISTORIC URBAN GROWTH WITHIN THE BARTON AREA: 1850-1990



Source: SEWRPC.

Map 15

EXISTING LAND USE WITHIN THE BARTON AREA: 1995



Single–family residential

Multi–family residential

Commercial

Industrial

Transportation, communications, and utilities

Government and institutional

Recreation

Surface water

Wetlands and woodlands

Agricultural, unused, and other open lands

Extractive and landfill

Basin Boundary

Subbasin Boundary

GRAPHIC SCALE

0 2500 5000 FEET

Source: SEWRPC.

Table 4

EXISTING LAND USE WITHIN THE BARTON AREA: 1995

Land Use Categories	Acres	Percent of Major Category	Percent of Total Area
Urban			
Residential	1,575	53.2	10.3
Commercial	91	3.1	0.6
Industrial	102	3.4	0.7
Governmental and Institutional	75	2.5	0.5
Transportation and Utilities	973	32.9	6.4
Recreation	112	3.9	0.7
Land under Development	29	1.0	0.2
Subtotal	2,957	100.0	19.4
Rural			
Agricultural	7,441	60.5	48.8
Wetlands	1,974	16.0	12.9
Woodlands	1,570	12.8	10.3
Water	301	2.4	2.0
Extractive	141	1.1	0.9
Landfill	29	0.3	0.2
Other Open Lands	844	6.9	5.5
Subtotal	12,300	100.0	80.6
Total	15,257	- -	100.0

Source: SEWRPC.

LAKES

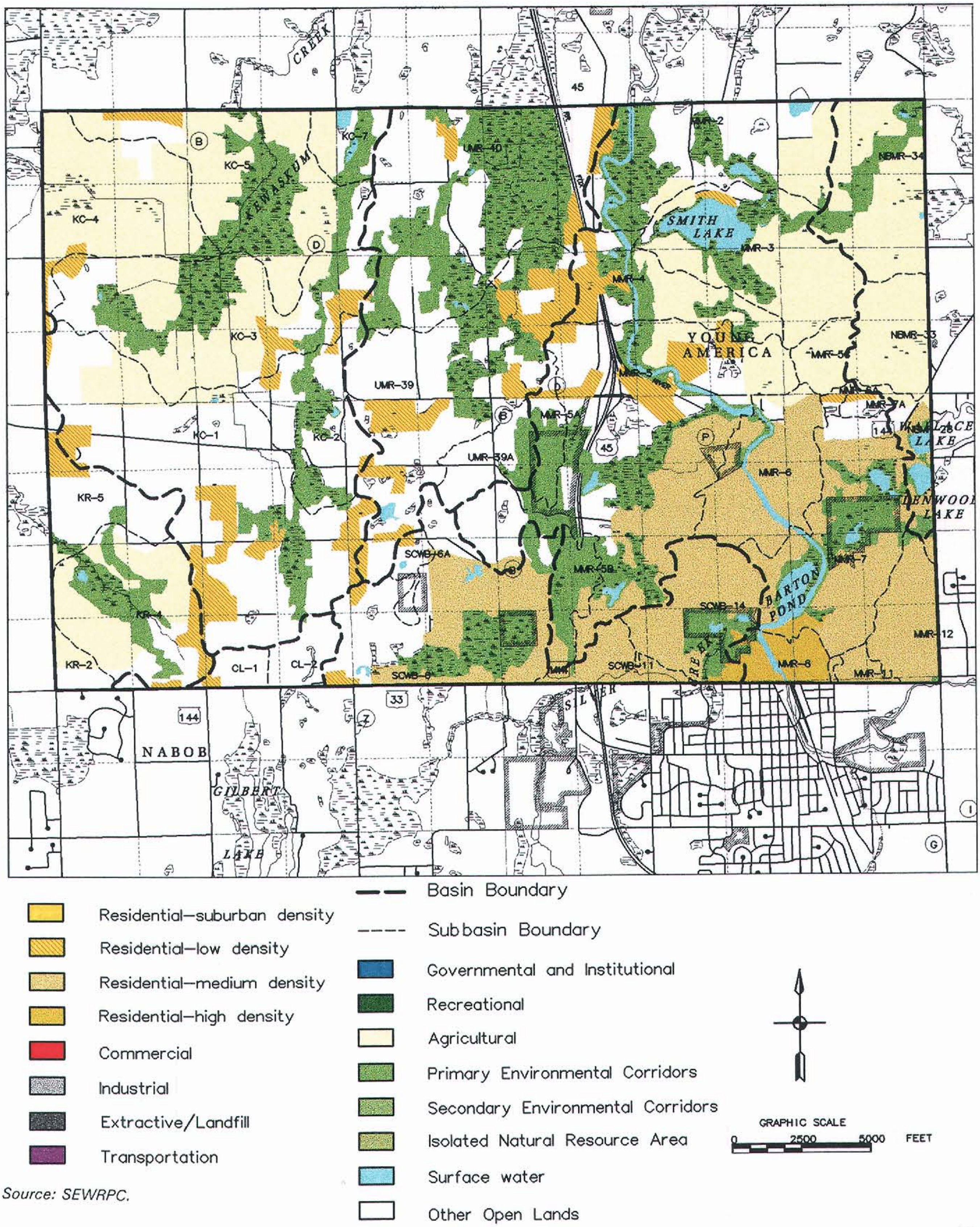
Table 5 contains a summary of selected morphometric data available for the major lakes within the Barton area. Major lakes are defined as those lakes within the Southeastern Wisconsin Region having a surface area of 50 or more acres in areal extent. These lakes are shown on Map 17. Where available, similar summary data are provided for minor lakes because of the importance of these smaller waterbodies as a water resource. In some cases, these waterbodies, in which water levels fluctuate markedly, may be classed as deep-water marshes or wetlands. Wetlands within the Barton area are shown on Map 18. The lakes inventoried are further described below with information set forth in paragraphs which address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69(5)(b) of the *Wisconsin Statutes*. Information on the origins of these lakes is based upon detailed geological information provided in various published survey reports[1] and maps of surfacial deposits.[2]

[1]*C. Juday,* The Inland Lakes of Wisconsin, The Hydrography and Morphometry of the Lakes, *State of Wisconsin, 1914, pp. 84-88; L. Martin,* The Physical Geography of Wisconsin, 2nd Edition, *State of Wisconsin, 1932, pp. 235-293.*

[2]*W.C. Alden,* Map Showing the Surficial Deposits of Southeastern Wisconsin, *Wisconsin Geological Survey, 1918; H.L. Young and W.G. Batten, Wisconsin Geological and Natural History Survey Information Circular No. 38,* Ground-Water Resources and Geology of Washington and Ozaukee Counties, Wisconsin, *University of Wisconsin-Extension, February 1980, 37 pages.*

Map 16

ADOPTED REGIONAL LAND USE PLAN FOR THE BARTON AREA: 2020



Source: SEWRPC.

Table 5

HYDROLOGY AND MORPHOMETRY OF LAKES WITHIN THE BARTON AREA, WASHINGTON COUNTY

Lake	Surface Area (acres)	Subwatershed Area (acres)	Volume (acre-feet)	Water Residence Time (years)	Maximum Length of Lake (miles)	Length of Shoreline (miles)	Maximum Width of Lake (miles)	Shoreline Development Factor[a]	Maximum Depth (feet)	Mean Depth (feet)
Allis (Leinberger)[b]...	9	44,120	--[c]	--[c]	0.30	0.50	0.10	1.18	34	--[c]
Barton Pond[b]	67	44,120	189	0.01	0.50	1.20	0.20	1.20	5	3
Brickyard[b]	1	44,120	--[c]	--[c]	0.05	0.13	0.04	1.04	4	--[c]
Little Drickens	9	860	180	0.29	0.20	0.40	0.10	1.43	20	7
Smith	86	630	252	0.56	0.70	1.70	0.40	1.38	5	3
Wallace	52	370	558	3.16	0.50	1.20	0.20	1.72	35	11

[a]*Shoreline Development Factor is the ratio between the actual circumference of a lake and the circumference of a circle with the same radius. A circular lake would have a Shoreline Development Factor of 1.0, while a dendritic lake would have a Shoreline Development Factor in excess of 1.0.*

[b]*These lakes fall within a common subwatershed, Subbasin MMR-7.*

[c]*No data available.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Allis Lake (Leinberger Lake, Glenwood Lake)

Lake Morphometry

Allis Lake is located in U.S. Public Land Survey Section 1, Township 11 North, Range 19 East, Town of Barton. The Lake has a surface area of about nine acres, a maximum depth of about 34 feet, and a shoreline development factor of 1.18. The Lake is currently referred to as Allis Lake by the Wisconsin Department of Natural Resources (WDNR),[3] but has also been called locally Leinberger Lake and Glenwood Lake. The Lake is a small, landlocked basin in the Lake Michigan terminal moraine, bordering the bed of a former glacial lake. It is possible that this basin and several nearby lakes may be remnant depressions of an original glacial lakebed formed during the last glaciation.

Recreational Use

Public access is not available. The Lake is considered to have some local aesthetic value, being adjacent to a residential development.

Development Potential

During the early- to mid-1960s, the lands riparian to the Lake were developed as homesites within the Glenwood Subdivision in the Town of Barton. As of 1995, the primary land use within the drainage area tributary to Allis Lake consisted of urban residential uses. The drainage area is located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Allis Lake are primarily urban.

Fish and Wildlife Populations

The Lake was managed as a private fish hatchery from 1952 through 1959. Prior to this, the Lake was privately stocked with 500 brook trout. In 1954,[4] the Lake was chemically treated to remove undesirable, stunted panfish, although this treatment was reported to be unsuccessful. As of 1995,[5] the WDNR reported that the lake fishery

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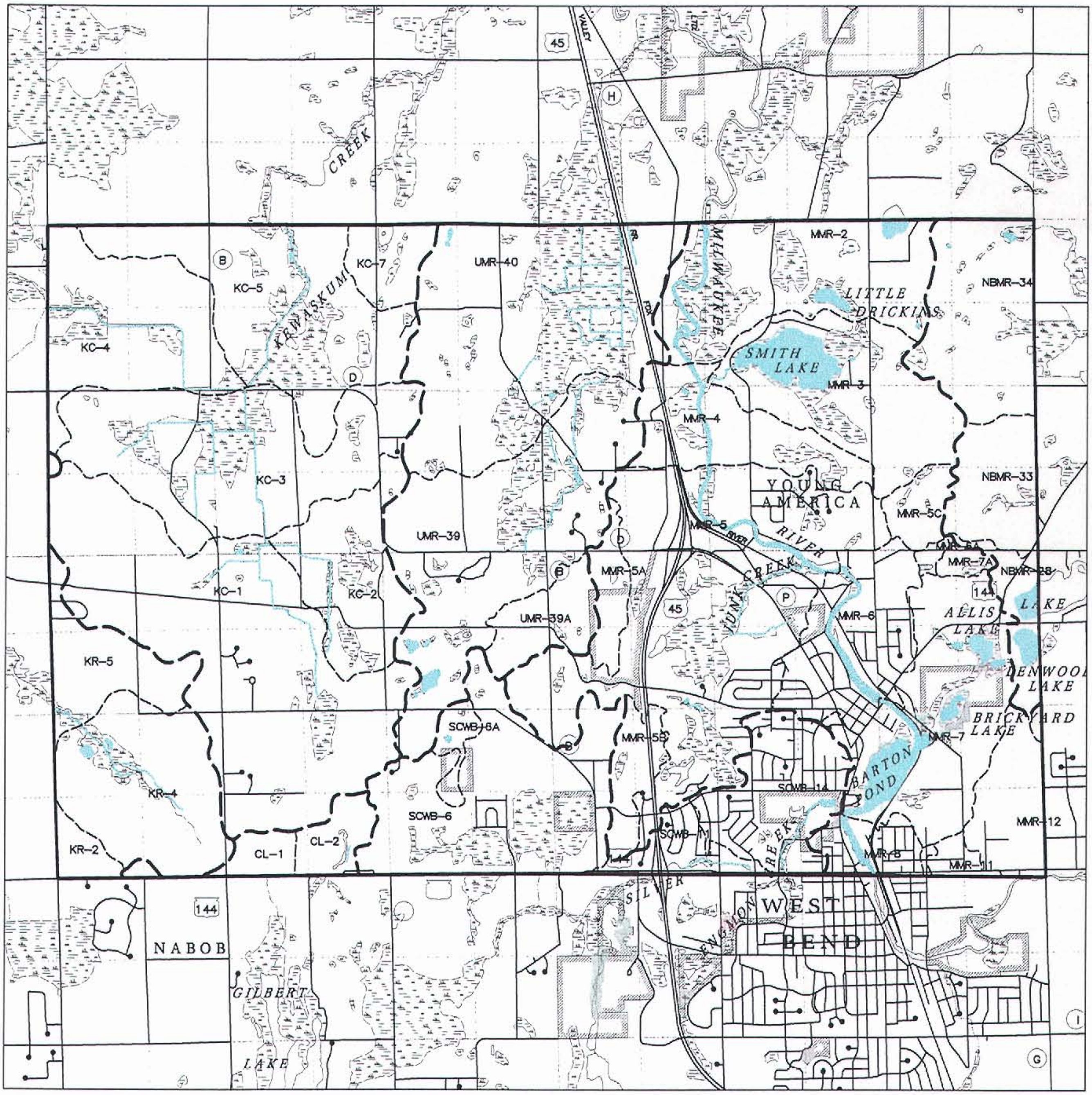
[3]*Wisconsin Department of Natural Resources Publication No. PUBL-FM-800 95REV,* Wisconsin Lakes, *1995.*

[4]*Wisconsin Conservation Department,* Surface Water Resources of Washington County, *1963.*

[5]*Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Map 17

SURFACE WATER RESOURCES WITHIN THE BARTON AREA: 1995



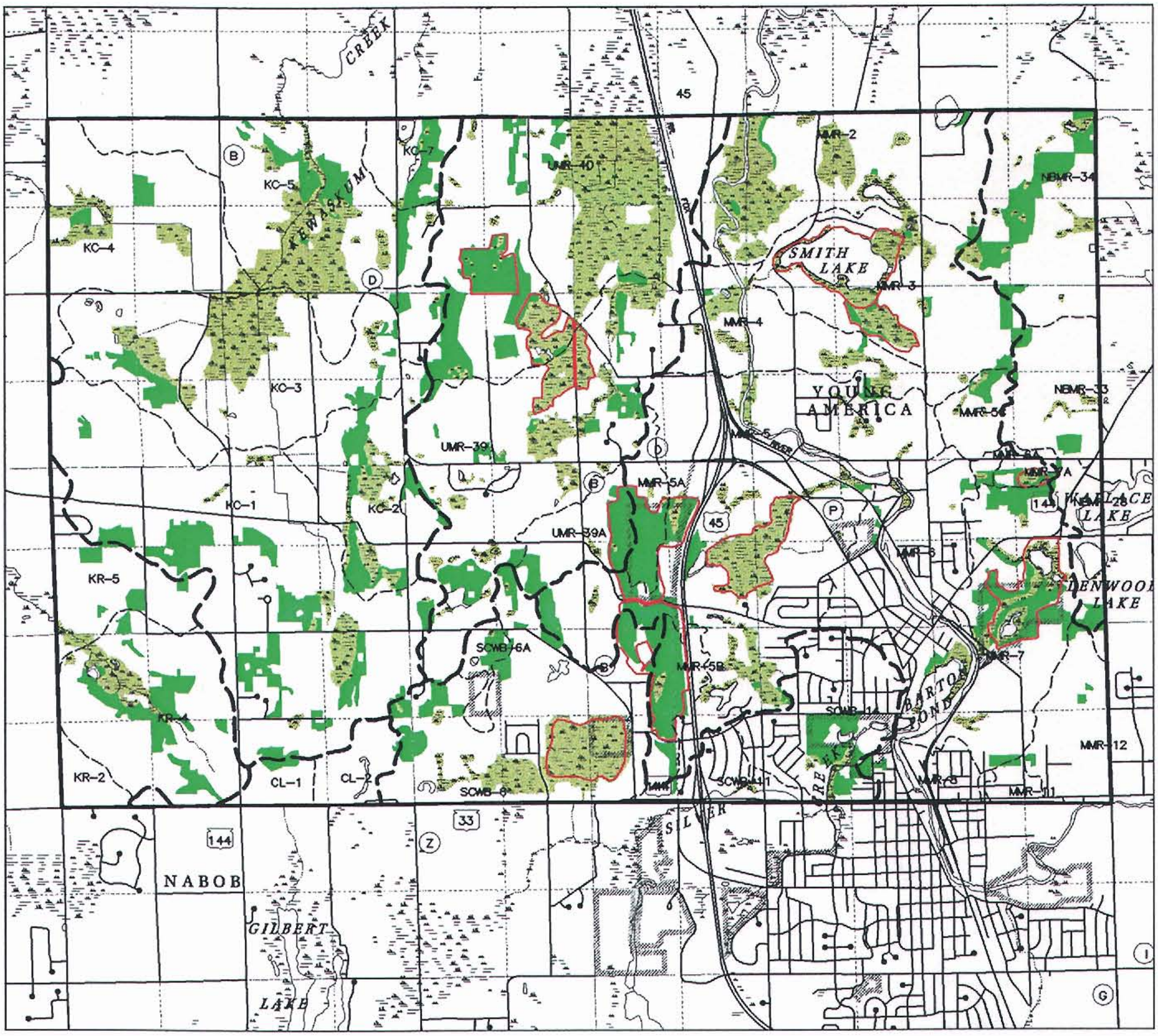
(blue box)	Surface Water
— —	Basin Boundary
----	Subbasin Boundary

Source: SEWRPC.

GRAPHIC SCALE
0 2500 5000 FEET

Map 18

WETLANDS AND WOODLANDS WITHIN THE BARTON AREA: 1995



Woodland

Wetland

Natural Area Boundary

Basin Boundary

Subbasin Boundary

GRAPHIC SCALE
0 2500 5000 FEET

Source: SEWRPC.

included an abundant panfish population. Largemouth and smallmouth bass and northern pike were reported to be present. Waterfowl were infrequent visitors and have not been observed to nest here.

Barton Pond

Lake Morphometry

Barton Pond is located in U.S. Public Land Survey Section 11, Township 11 North, Range 19 East, City of West Bend. The Pond, created by an impoundment on the Milwaukee River, has a surface area of about 67 acres, a maximum depth of about five feet, and a shoreline development factor of 1.20. The Milwaukee River was originally impounded at this point by a stone and timber dam to provide power to run a feed and flour mill. The bathymetry of Barton Pond is shown on Map 19. The impoundment is extremely shallow and subject to excessive growths of aquatic plants.

Recreational Use

Public access to Barton Pond is provided via the rights-of-way of City streets adjoining the Pond, and through two City of West Bend park and open space sites; namely, the North Point Bay Wildlife Area on the northern shore and Regner Park to the west of the Pond.

Development Potential

As of 1995, land use within the drainage area tributary to Barton Pond consisted largely of agricultural and open space uses, comprising about 30 percent of the land cover in the drainage area, which includes the entire Milwaukee River basin upstream of the Pond. While about 15 percent of the drainage area consisted of urban residential development, most of the drainage area directly tributary to the Lake is well developed for urban use. The drainage area is located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Barton Pond include both agricultural and urban runoff.

Fish and Wildlife Populations

In 1963,[6] the WDNR reported that the Pond was managed for panfish and largemouth bass, although the Pond contained a large rough fish population. According to the WDNR, northern pike were reported to be common in 1995,[7] with largemouth bass and panfish being present. Waterfowl make limited migrational use of the area.

Brickyard Lake

Lake Morphometry

Brickyard Lake is located in U.S. Public Land Survey Section 1, Township 11 North, Range 19 East, Town of Barton. The Lake acquired its name from a nearby brick kiln that is no longer in operation. The Lake has a surface area of about 0.8 acre, a maximum depth of about four feet, and a shoreline development factor of 1.04. Brickyard Lake is a small, landlocked, shallow depression basin, surrounded by wetland.

Recreational Use

Public access is not available. The Lake is considered to have some local aesthetic and passive recreational value, being within the privately operated Lake Lenwood Recreation Park.

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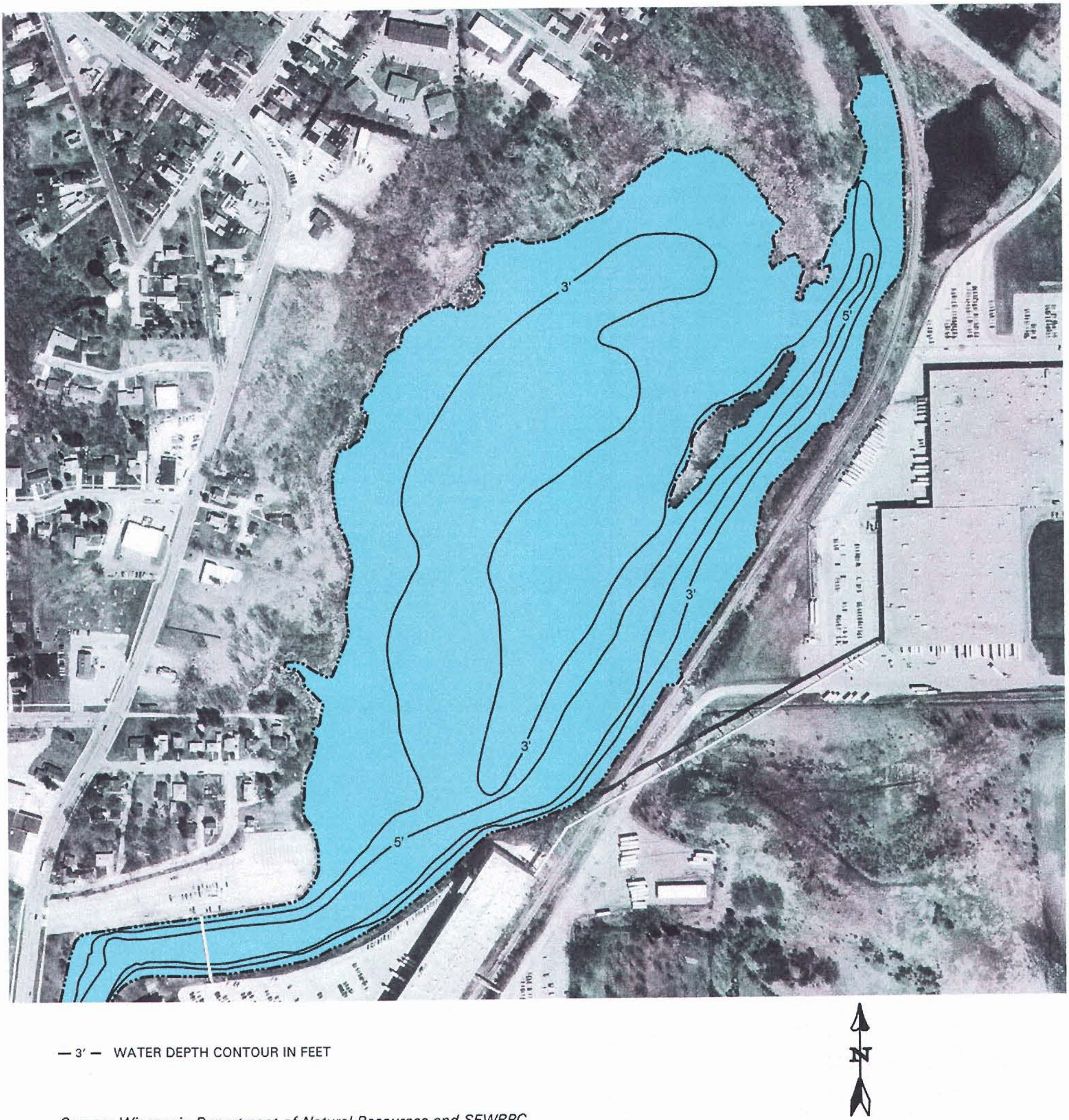
[6] *Wisconsin Conservation Department,* op. cit.

[7] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Map 19

BATHYMETRIC MAP OF BARTON POND



Source: Wisconsin Department of Natural Resources and SEWRPC.

Development Potential
As of 1995, the land use within the drainage area tributary to Brickyard Lake consisted of open space uses including woodland and wetlands, comprising about 42 percent of the land cover in the drainage area and urban residential development comprised about 20 percent of the land cover. The drainage area is located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Brickyard Lake include both agricultural and urban runoff.

Fish and Wildlife Populations
In 1963,[8] winterkill was reported to occur annually but management of the fish population was not considered to be warranted at that time. By 1995, largemouth bass and panfish were reported to be present. Its small size and proximity to the City of West Bend detract from its waterfowl value.

Little Drickens Lake
Lake Morphometry
Little Drickens Lake is located in U.S. Public Land Survey Section 26, Township 12 North, Range 19 East, Town of Barton. The Lake has a surface area of about nine acres, a maximum depth of about 20 feet, and a shoreline development factor of 1.43. The Lake is a small, marsh-fringed kettle basin on the terminal moraine of the Lake Michigan glacier. The Lake is spring- and seepage-fed and drains to Smith Lake through about 120 acres of sedge marsh and tamarack bog.

Recreational Use
Public access is not available. The Lake is used for fishing by surrounding residents.

Development Potential
As of 1995, the land use within the drainage area tributary to Little Drickens Lake consisted of agricultural and open space uses, comprising about 35 percent of the land cover to the drainage area. Wetlands and other open lands each comprised about 25 percent of the land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Little Drickens Lake are primarily agricultural.

Fish and Wildlife Populations
In 1963,[9] the WDNR reported that the fishery was comprised of largemouth bass and panfish. This small, deep pond was presumed to have the ability to withstand winterkill, and was considered as a possible source of fishes that annually "reseeded" Smith, or Drickens, Lake; the latter having been reported to frequently experience winterkills. According to the WDNR, panfish, largemouth bass and northern pike were reported to be present in the Lake in 1995.[10] The lands adjoining the south side of the Lake have been developed since the mid-1960s, and spoils from a beach dredging project on Smith Lake are known to have been deposited in some of the adjoining marshlands. The general area, including Smith Lake, the Milwaukee River, and nearby wetlands, are considered to be of prime importance in both production and migration of waterfowl.

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[8] *Wisconsin Conservation Department,* op. cit.

[9] Ibid.

[10] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Smith Lake (Dickens Lake, Drickens Lake)

Lake Morphometry

Smith Lake is located in U.S. Public Land Survey Section 26, Township 12 North, Range 19 East, Town of Barton. The Lake has a surface area of about 86 acres, a maximum depth of about five feet, and a shoreline development factor of 1.38. The Lake is a shallow marshy depression in the terminal moraine of the Lake Michigan glacier. A small stream enters Smith Lake from Little Drickens Lake immediately to the north, and the outlet flows westerly to the Milwaukee River. The bathymetry of Smith Lake is shown on Map 20.

Recreational Use

Public access is provided via the right-of-way of an unimproved town road adjoining the Lake on the east shore. As of 2000, the Wisconsin Department of Natural Resources was constructing a public recreational boating access site at this Lake. Smith Lake is designated for nonmotorized watercraft only.

Development Potential

The northern shore of the Lake was altered for subdivision and home construction beginning in the mid-1960s. As of 1995, approximately 50 percent of the drainage area tributary to Smith Lake remained in agricultural use. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Smith Lake include both urban and agricultural runoff.

Fish and Wildlife Populations

In 1963,[11] the WDNR reported that winterkill occurred frequently, although the largemouth bass, panfish, and northern pike fishery reported to exist at that time was considered to be maintained through annual "reseeding" of the Lake from the Milwaukee River and adjoining Little Drickens Lake. Fish surveys conducted in 1972 and 1978 reported black crappie, green sunfish, pumpkinseed, yellow perch, white sucker, largemouth bass, bluegill, common carp, and Iowa darter, largemouth bass, and bluegill, respectively.[12] According to the WDNR, panfish and largemouth bass remained abundant in 1995,[13] and northern pike were reported to be common. There are over 40 acres of wetland adjoining the lake. The Lake is considered of prime importance in waterfowl production and migration. Large numbers of both puddlers and divers are common fall residents.

Wallace Lake

Lake Morphometry

Wallace Lake is located in U.S. Public Land Survey Section 1, Township 11 North, Range 19 East, Town of Barton and U.S. Public Land Survey Section 6, Township 11 North, Range 20 East, Town of Trenton. The Lake has a surface area of about 52 acres, a maximum depth of 35 feet, and a shoreline development factor of 1.72. Wallace Lake is a small, kettle lake in the terminal moraine of the Lake Michigan glacier. The Lake has a small inlet draining from the upstream Lenwood Lake, but the waterbody is primarily spring fed. The outflow from Wallace Lake drains into a small stream tributary to the Milwaukee River. A screened concrete structure was placed on the outlet in 1959 to prevent interchange of fishes between the lake and stream. The bathymetry of Wallace Lake is shown on Map 21.

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[11] *Wisconsin Conservation Department,* op. cit.

[12] *D. Fago, Wisconsin Department of Natural Resources Research Report No. 148,* Retrieval and Analysis System Used in Wisconsin's Statewide Fish Distribution Survey, Second Edition, *December 1988.*

[13] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Map 20

BATHYMETRIC MAP OF SMITH LAKE

— 5' — WATER DEPTH CONTOUR IN FEET

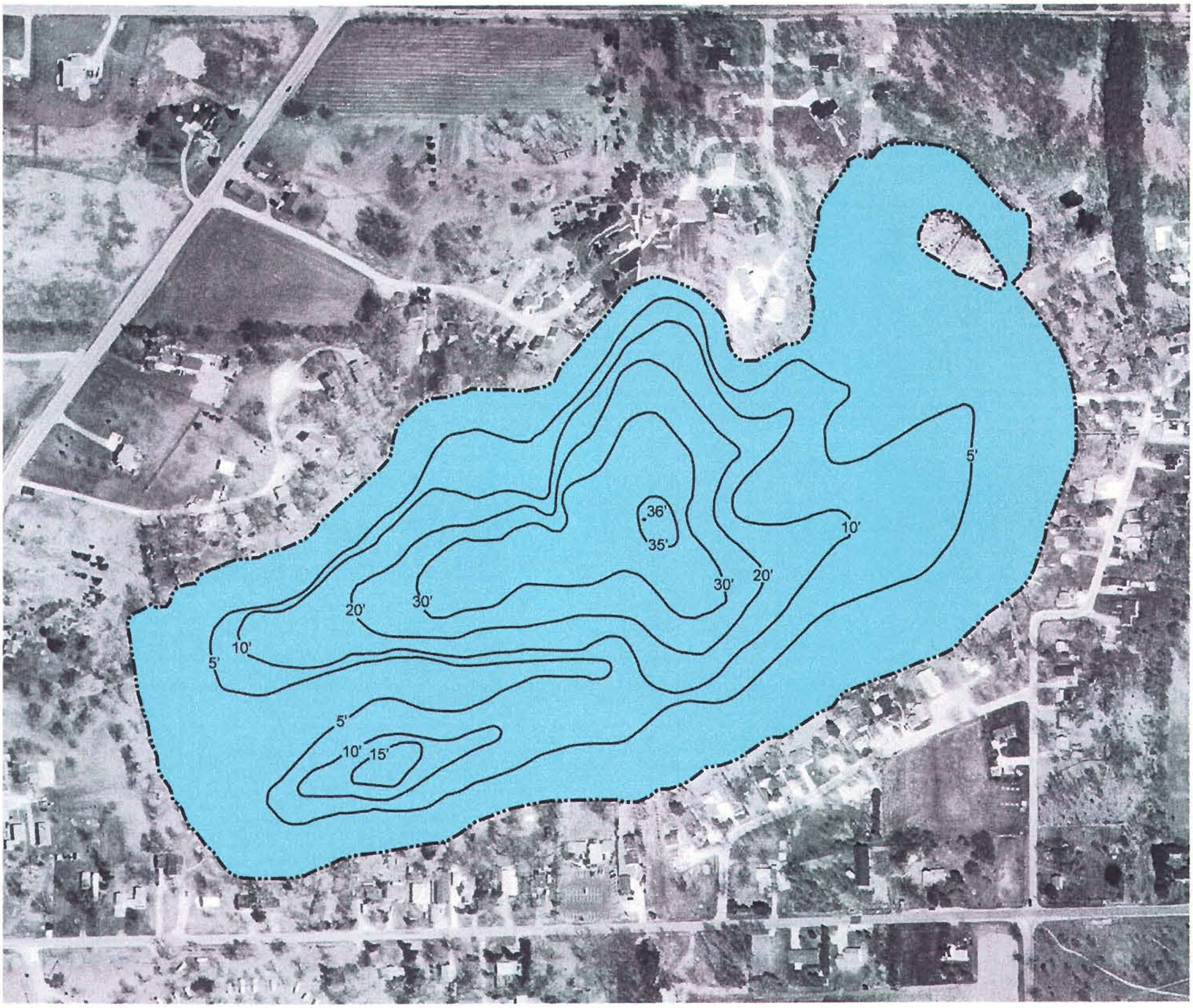
N

GRAPHIC SCALE
0 250 500 FEET

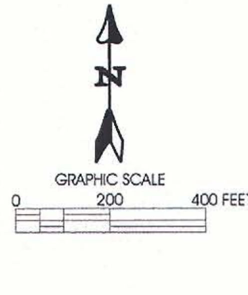
Source: Wisconsin Department of Natural Resources and SEWRPC.

Map 21

BATHYMETRIC MAP OF WALLACE LAKE



—20'— WATER DEPTH CONTOUR IN FEET



Source: Wisconsin Department of Natural Resources and SEWRPC.

Recreational Use
Public access is provided via the right-of-way of a town road that has been fashioned into a boat ramp where it adjoins the Lake. In 1963, parking at this site was not considered adequate.

Development Potential
As of 1995, land use within the drainage area tributary to Wallace Lake consisted largely of other open land uses, comprising about 25 percent of the land cover in the drainage area. About 20 percent of the drainage area consisted of agricultural lands. The drainage area is partially located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Wallace Lake are primarily agricultural.

Fish and Wildlife Populations
In 1963,[14] the WDNR reported that fisheries management centered on trout, although, previously, the Lake was considered to be better suited for largemouth bass, panfish, and northern pike. A fish survey, conducted in 1978, reported black crappie, yellow perch, largemouth bass, and bluegill. According to the WDNR, largemouth bass were reported to be abundant in 1995,[15] panfish and northern pike were common, and walleyed pike and catfish were present. The nearly complete development of the shoreland for home sites is considered to detract from any possible value for waterfowl.

STREAMS

Table 6 contains a summary of selected morphometric data available for named streams in the Barton area. The streamcourses are shown on Map 17, which also shows the hydrologic drainage areas within the area. Descriptive paragraphs follow, providing a summary of available information on the physical description of each stream for the portion of the stream within Washington County, and of the existing uses and conditions, wildlife habitat, and fishery for the portion of the stream within the Barton area, to the extent that such information is available. Each of the paragraphs address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69(5)(b) of the *Wisconsin Statutes*.

Junk Creek

Stream Morphometry
Junk Creek is located in the southeastern portion of the Town of Barton. The Creek has a surface area of less than one acre and extends over a linear distance of about 0.8 mile with a gradient of approximately 20 feet per mile. The Creek is a very small, intermittent, high-gradient tributary to the Milwaukee River.

Recreational Use
Junk Creek has limited navigability and is generally navigable only by canoe or similar watercraft.

Development Potential
As of 1995, land use within the Junk Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 35 percent of the land cover in the drainage area. Urban residential development comprised about 30 percent of the land cover. The drainage area is partially located within an area planned for urban development in the regional land use plan, in the vicinity of the northwestern and north-central portions of the City of West Bend.

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[14] *Wisconsin Conservation Department,* op. cit.

[15] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Table 6

PHYSICAL CHARACTERISTICS OF STREAMS WITHIN THE BARTON AREA, WASHINGTON COUNTY[a]

Stream or Watercourse	Length (miles)	Average Width (feet)	Average Depth (feet)	Surface Area (acres)	Drainage Area (square miles)	U.S. Public Land Survey			Subwatershed	Major Watershed
						Town	Range	Section		
Junk Creek	0.8	3	0.50	0.3	1.0	12	19	35	East-West Branches Milwaukee	Milwaukee
Kewaskum Creek......	6.4	12	0.85	9.3	11.0	12	19	9	East-West Branches Milwaukee	Milwaukee
Kohlsville River.........	7.9	12	1.00	11.5	21.5	12	18	29	East Branch Rock	Rock
Milwaukee River.......	25.8	83	1.50	259.5	130.0	12	20	25	East-West Branches Milwaukee	Milwaukee
Silver Creek	4.0	9	0.50	4.4	8.0	11	19	11	East-West Branches Milwaukee	Milwaukee

[a]*Stream data are for the portion of the stream within Washington County only. The U.S. Public Land Survey Township, Range, and Section designation included in each description locates the mouth of the stream at its confluence with another named stream or at the point at which it exits the County.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution in the Junk Creek drainage area are both urban and agricultural.

Fish and Wildlife Populations
In 1963,[16] the WDNR reported that Junk Creek had little fisheries significance, given the level of urban development and stream modification in this subbasin.

Kewaskum Creek
Stream Morphometry
Kewaskum Creek originates in the northwest portion of the Town of Barton. The Creek has a surface area of about nine acres and extends over a linear distance of about 6.4 miles with a gradient of approximately 14 feet per mile. The Creek rises as part of a large system of ditches within the Town of Barton to the south of the Town of Kewaskum, and discharges to the Milwaukee River. The Creek flows through the ground moraine, and has fair stretches of sand and gravel bottom. In 1963, it was reported to have fluctuating flows. Kewaskum Creek is included within the Milwaukee River Priority Watershed project area.[17]

Recreational Use
Kewaskum Creek has limited navigability and is generally navigable only by canoe or similar watercraft, due to fluctuating flows and water levels.

Development Potential
As of 1995, land use within the Kewaskum Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the land cover in the drainage area. Wetlands and other open

[16]*Wisconsin Conservation Department,* op. cit.

[17]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-255-90,* A Nonpoint Source Control Plan for the East and West Branches of the Milwaukee River Priority Watershed Project, *February 1989; Wisconsin Department of Natural Resources Publication No. PUBL-WR-229-89,* Milwaukee River Basin Integrated Management Plan, *February 1989.*

lands each comprised about 10 percent of the land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution in the Kewaskum Creek drainage area are primarily agricultural.

Fish and Wildlife Populations
According to the WDNR, forage fishes, dace, darters, and minnows were reported to be the primary fishes in the Creek in 1963.[18] In 1978,[19] the fish population of the Creek was reported to be comprised of pearl, blacknose, and southern redbelly dace; bluntnose and fathead minnow; blacknose and common shiner; yellow perch; fantail and johnny darter; central stoneroller; white sucker; creek chub; central mudminnow; and brook stickleback.

Kohlsville River
Stream Morphometry
The Kohlsville River is located in the extreme southwest corner of the Town of Barton. Originating in the Town of Barton, the River has a surface area of about 12 acres and extends over a linear distance of about 7.9 miles with a gradient of approximately 17 feet per mile. The River flows northwest through the northeastern portion of the Town of Addison and the Theresa Marsh Wildlife Area to its confluence with the Rock River in the Town of Wayne. The Kohlsville River is included in the Upper Rock River basin areawide water quality management planning area.[20]

Recreational Use
The Kohlsville River has limited navigability and is generally navigable only by canoe or similar watercraft.

Development Potential
As of 1995, land use within the Kohlsville River drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 65 percent of the land cover within the drainage area. Wetlands and other open lands comprised about 15 percent and 10 percent of the land cover, respectively. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution in the Kohlsville River drainage area are primarily agricultural.

Fish and Wildlife Populations
In 1963,[21] the WDNR reported that the River supported only forage fishes due to its generally shallow nature.

Milwaukee River
Stream Morphometry
The Milwaukee River is located in the eastern portions of the Town of Barton and flows south through the City of West Bend. Formed by the confluence of the East and West Branches of the Milwaukee River and their tributary streams, the River has a surface area of about 260 acres and extends over a linear distance of 25.8 miles with a gradient of six feet per mile within Washington County. The Milwaukee River is the largest river in Washington

[18] *Wisconsin Conservation Department,* op. cit.

[19] *D. Fago,* op. cit.

[20] *Wisconsin Department of Natural Resources Publication No. PUBL-WR-190-88,* Upper Rock River Basin Areawide Water Quality Management Plan, *May 1989.*

[21] *Wisconsin Conservation Department,* op. cit.

County, both in width and length, and, in the past, has provided a major source of water power in the City of West Bend metropolitan area. The Milwaukee River is included within the Milwaukee River Priority Watershed project area.[22]

Recreational Use
Public access to the Milwaukee River is afforded through numerous public parks and private access sites located along the streamcourse. The River is frequently used for recreational boating, fishing, and scenic viewing.

Development Potential
As of 1995, land use within the Milwaukee River basin consisted largely of agricultural and open space uses, with agriculture comprising about 45 percent of the land cover in the basin. Wetlands and urban residential development comprised about 15 percent and 10 percent of the land cover, respectively. The basin is partially located within an area planned for urban development in the regional land use plan, in the vicinity of the City of West Bend.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution in the Milwaukee River basin include both urban and agricultural runoff. The Milwaukee River basin was included within the Milwaukee River Priority Watershed planning area,[23] that identified urban sources as nonpoint pollution sources of special concern within the Town of Barton and City of West Bend.

Fish and Wildlife Populations
In 1963,[24] the WDNR reported that the fishery of the Milwaukee River was limited by an undesirable rough fish population, although northern pike were reported to be present in the River during the spring of the year. The several impoundments located on the River[25] were considered to act as sources of panfish and limited numbers of largemouth bass within the River at that time. In 1972,[26] the fish population of the River in the Barton area was reported to be comprised of common carp, northern pike, white sucker, black crappie, pumpkinseed, bluntnose minnow, and common and sand shiner. In 1978,[27] the fish population was reported to be comprised of creek and hornyhead chub; blacknose dace; greater and golden redhorse; largemouth and rock bass; northern pike; bluegill; green and longear sunfish; common carp; fantail, johnny, and blackside darter; yellow perch; tadpole madtom; pumpkinseed; stonecat; central stoneroller; black and yellow bullhead; white sucker; and common shiner. In addition, the Southeastern Wisconsin Regional Planning Commission (SEWRPC) has reported the occurrence of the greater redhorse, a State-designated threatened species.[28]

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[22]*Wisconsin Department of Natural Resources, PUBL-WR-255-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

[23]Ibid.

[24]*Wisconsin Conservation Department,* op. cit.

[25]*In 1963, there were five dams on the Milwaukee River within Washington County.*

[26]*D. Fago,* op. cit.

[27]Ibid.

[28]*SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997.*

Silver Creek

Stream Morphometry

Silver Creek is located in the extreme southern portion of the Town of Barton and the west-central portion of the City of West Bend. Originating in the Town of West Bend, the Creek has a surface area of about four acres and extends over a linear distance of about four miles with a gradient of approximately 23 feet per mile. The Creek is a tributary to the Milwaukee River, originating in Silver Lake within the Town of West Bend and flowing through Hackbarth and Lucas Lakes to its confluence with the Milwaukee River in the City of West Bend. Silver Creek is included within the Milwaukee River Priority Watershed project area.[29]

Recreational Use

Silver Creek has limited navigability and is generally navigable only by canoe or similar watercraft.

Development Potential

As of 1995, land uses within the Silver Creek drainage area consisted largely of urban and agricultural uses, and wetlands in approximately equal areas, each comprising about 20 percent of the land cover in the drainage area. The drainage area is located within an area planned for urban development in the regional land use plan, within the City of West Bend.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Silver Creek drainage area include both urban and agricultural runoff.

Fish and Wildlife Populations

In 1963,[30] the WDNR reported that the fishery consisted primarily of forage species and pan fish from the several lakes. In 1985,[31] the fish population of the Creek within the Town of Barton was reported to be comprised of blacknose shiner, bluegill, central mudminnow, white sucker, central stoneroller, blacknose dace, creek chub, and fantail darter.

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[29] *Wisconsin Department of Natural Resources, PUBL-WR-255-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

[30] *Wisconsin Conservation Department,* op. cit.

[31] *D. Fago,* op. cit.

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Chapter V

INVENTORY FINDINGS: ERIN AREA

INTRODUCTION

This chapter presents the inventory findings relating to lakes and streams in the Erin area of Washington County. The Erin area is shown on Map 22 and includes all of U.S. Public Land Survey Sections 1 through 36, Town 9 North, Range 18 East. The area includes the entire Town of Erin. To the extent that data are available, relevant land use, recreational use, morphometric, water quality, and biological information upon which waterbody classifications are to be based pursuant to the requirements of Section 281.69(5)(b), *Wisconsin Statutes*, is presented for each waterbody inventoried. These data form the scientific and technical basis for the determination of the alternative and recommended waterbody classification schemes set forth in Chapter XVI.

LAND USE

The type, intensity, and spatial distribution of the various land uses within the Erin area are important determinants of water quality and recreational use demands. The current and planned future land use patterns, placed within the context of the historical development in the area therefore, are important considerations in any waterbody management planning.

While some settlement occurred prior to the late 1800s, most urban development occurred in the Erin area in recent years. The Town of Erin remains largely rural in character. Map 22 indicates the historic urban growth pattern in the Erin area, since 1850. Early development occurred at Druid Lake, during the 1950s, but the most rapid increase in urban land use development in the Town occurred, primarily along the STH 83 corridor in the west-central portions of the Town, between 1975 and 1980, when about 870 acres were converted from rural to urban land uses. As shown on Map 22, the urban development of the lands in the Town has largely occurred since 1970.

The existing land use pattern in the Erin area, as of 1995, is shown on Map 23, and is quantified in Table 7. As indicated in Table 7, about 2,500 acres, or about 11 percent of the area, were devoted to urban land uses. The dominant urban land use was residential, encompassing about 1,600 acres, or about 65 percent of the area in urban use. As of 1995, about 20,600 acres, or about 89 percent of the area, were still devoted to rural land uses. About 11,000 acres, or about 50 percent of the rural area, were in agricultural land uses. Woodlands, wetlands, and surface water, including the surface area of the lakes in the area, accounted for approximately 8,000 acres, or about 40 percent of the area in rural use. Planned land use as set forth in the adopted 2020 regional land use plan is shown on Map 24. Based upon that plan and the draft Town of Erin land use plan,[1] new development in the Town is expected to be residential development at rural densities, potentially using cluster designs, and to infilling of current developed areas. Urban development would be limited to a proposed mixed-use "town center" area which would be of small scale in keeping with the overall rural character of the Town.

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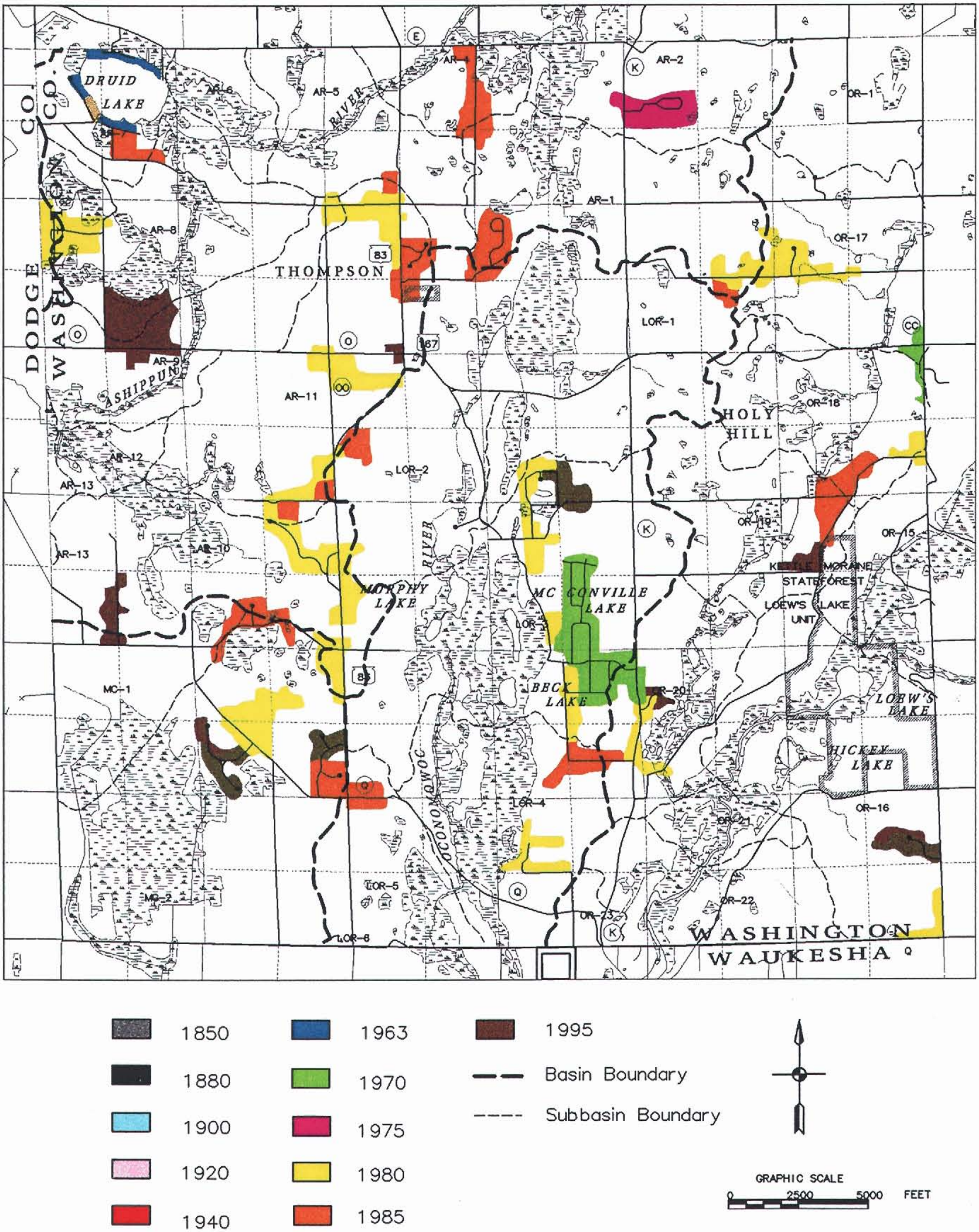
[1]*Town of Erin,* Erin Township Land Use Policy Plan, *draft, May 1999.*

Map 22

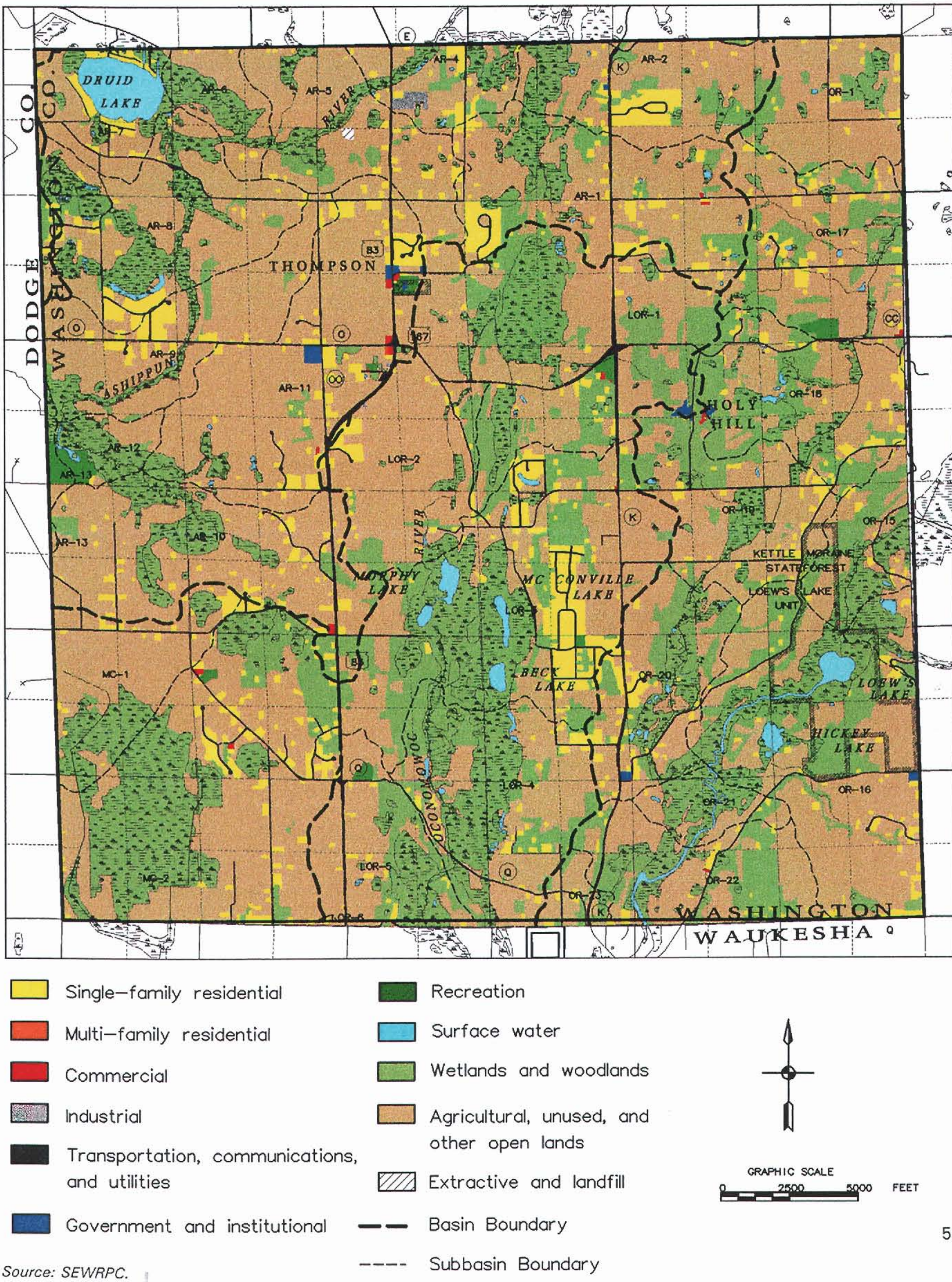
HISTORIC URBAN GROWTH WITHIN THE ERIN AREA: 1850-1990



Source: SEWRPC.

Map 23

EXISTING LAND USE WITHIN THE ERIN AREA: 1995



Source: SEWRPC.

Table 7

EXISTING LAND USE WITHIN THE ERIN AREA: 1995

Land Use Categories	Acres	Percent of Major Category	Percent of Total Area
Urban			
Residential	1,593	63.2	7.0
Commercial	16	0.6	0.1
Industrial	18	0.7	0.1
Governmental and Institutional	23	0.9	0.1
Transportation and Utilities	744	29.5	3.1
Recreation	104	4.1	0.5
Land under Development	24	1.0	0.1
Subtotal	2,522	100.0	11.0
Rural			
Agricultural	11,017	53.5	47.6
Wetlands	4,237	20.6	18.3
Woodlands	3,510	17.0	15.2
Water	331	1.6	1.4
Extractive	4	<0.1	<1.0
Landfill	- -	- -	- -
Other Open Lands	1,511	7.3	6.5
Subtotal	20,610	100.0	89.0
Total	23,132	- -	100.0

Source: SEWRPC.

LAKES

Table 8 contains a summary of basic lake morphometric data available for the major lakes within the Erin area. Major lakes are defined as those lakes within the Southeastern Wisconsin Region having a surface area of 50 or more acres in areal extent. These lakes are shown on Map 25. Where available, similar summary data are provided for minor lakes because of the importance of these smaller waterbodies as a water resource. In some cases, these waterbodies, in which water levels fluctuate markedly, may be classed as deep water marshes or wetlands. Wetlands within the Erin area are shown on Map 26. The lakes inventoried are further described below with information set forth in paragraphs which address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69(5)(b) of the *Wisconsin Statutes*. Information on the origins of these lakes is based upon detailed geological information provided in various published survey reports[2] and maps of surfacial deposits.[3]

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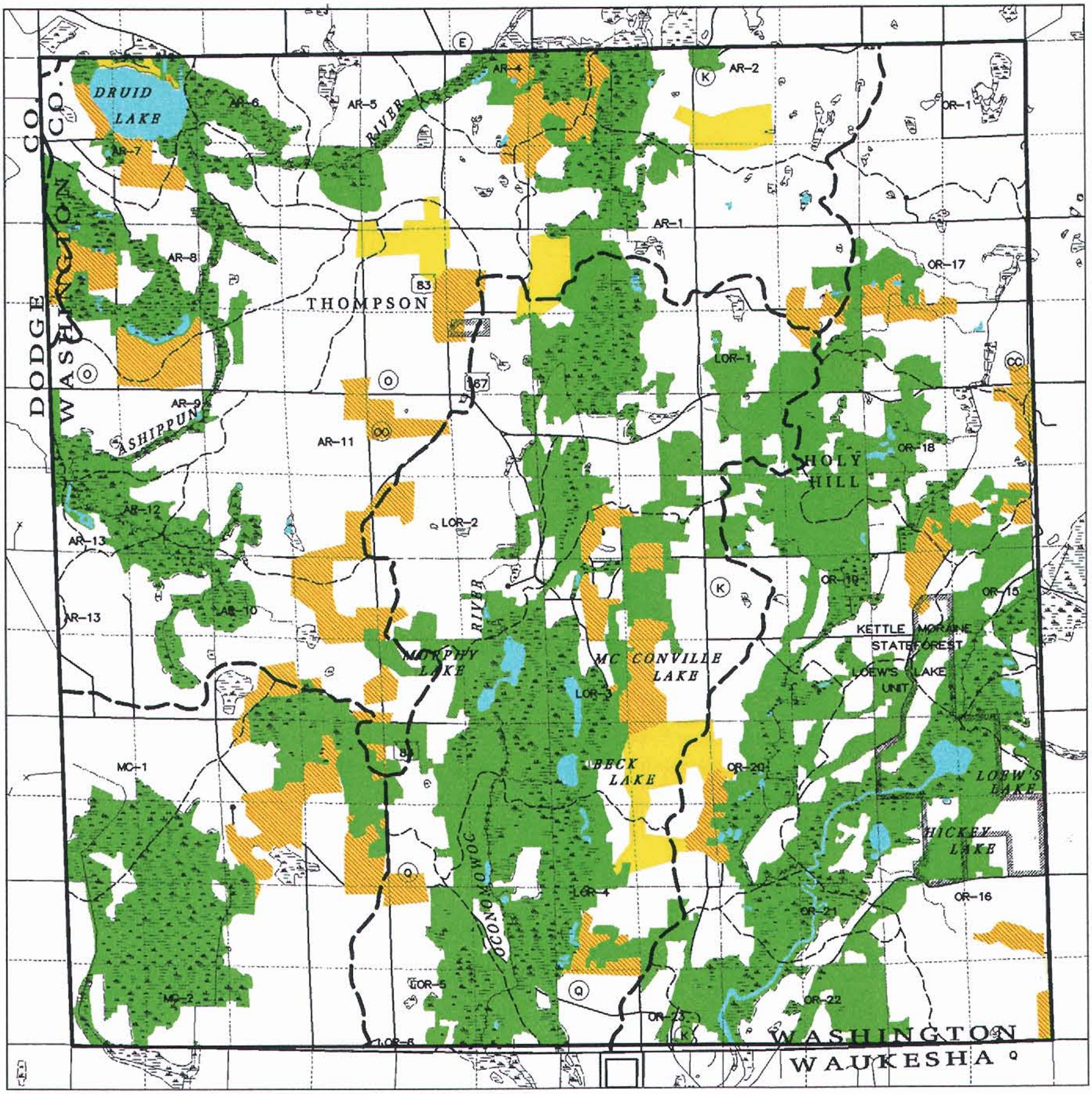
[2]*C. Juday,* The Inland Lakes of Wisconsin, The Hydrography and Morphometry of the Lakes, *State of Wisconsin, 1914, pp. 84-88; L. Martin,* The Physical Geography of Wisconsin, 2nd Edition, *State of Wisconsin, 1932, pp. 235-293.*

[3]*W.C. Alden,* Map Showing the Surficial Deposits of Southeastern Wisconsin, *Wisconsin Geological Survey, 1918; H.L. Young and W.G. Batten, Wisconsin Geological and Natural History Survey Information Circular No. 38,* Ground-Water Resources and Geology of Washington and Ozaukee Counties, Wisconsin, *University of Wisconsin-Extension, February 1980, 37 pages.*

Map 24

ADOPTED REGIONAL LAND USE PLAN FOR THE ERIN AREA: 2020



Residential–suburban density	Basin Boundary
Residential–low density	Subbasin Boundary
Residential–medium density	Governmental and Institutional
Residential–high density	Recreational
Commercial	Agricultural
Industrial	Primary Environmental Corridors
Extractive/Landfill	Secondary Environmental Corridors
Transportation	Isolated Natural Resource Area
	Surface water
	Other Open Lands

GRAPHIC SCALE
0 2500 5000 FEET

Source: SEWRPC.

Table 8

HYDROLOGY AND MORPHOMETRY OF LAKES WITHIN THE ERIN AREA, WASHINGTON COUNTY

Lake	Surface Area (acres)	Subwatershed Area (acres)	Volume (acre-feet)	Water Residence Time (years)	Maximum Length of Lake (miles)	Length of Shoreline (miles)	Maximum Width of Lake (miles)	Shoreline Development Factor[a]	Maximum Depth (feet)	Mean Depth (feet)
Beck[b]	16	4,150	- -[c]	0.42	0.3	0.6	0.2	1.07	8	- -[c]
Druid	120	6,870	3,000	0.61	0.6	1.7	0.4	1.09	53	25
Hickey	10	2,200	140	0.09	0.1	0.5	0.1	1.12	14	3
Lowes	23	14,150	253	0.03	0.4	0.9	0.3	1.31	23	11
Malloy[b]	5	4,150	- -[c]	0.01	0.2	0.4	0.1	1.28	24	- -[c]
McConville[b]	14	4,150	124	0.42	0.4	0.8	0.1	1.52	37	20
Murphy[b]	16	4,150	- -[c]	0.42	0.3	0.7	0.1	1.24	37	- -[c]

[a]*Shoreline Development Factor is the ratio between the actual circumference of a lake and the circumference of a circle with the same radius. A circular lake would have a Shoreline Development Factor of 1.0, while a dendritic lake would have a Shoreline Development Factor in excess of 1.0.*

[b]*These lakes fall within a common subwatershed, Subbasin LOR-3.*

[c]*No data available.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Beck Lake

Lake Morphometry

Beck Lake is located in U.S. Public Land Survey Section 27, Township 9 North, Range 18 East, Town of Erin. The Lake has a surface area of about 16 acres, a maximum depth of eight feet, and a shoreline development factor of 1.07. The Lake is a small, alkaline, bog lake in a marshy depression in the Green Bay terminal moraine. Beck Lake has a marshy outlet to the Little Oconomowoc River and is bordered by an encroaching shrubby bog, which already covers over half the original lake basin. A channel connects Beck Lake with McConville Lake, which occupies the north end of the same elongate basin, and has deeper water.

Recreational Use

Public access is not available. The Nature Conservancy controls the riparian frontage of the Lake and has maintained wild rice beds to entice migrating and nesting waterfowl.

Development Potential

As of 1995, the land use within the drainage area tributary to McConville and Beck Lakes consisted of agricultural uses, comprising about 33 percent of the land cover in the drainage area. Woodlands and other open spaces comprised about 37 percent of the land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Beck Lake are primarily agricultural.

Fish and Wildlife Populations

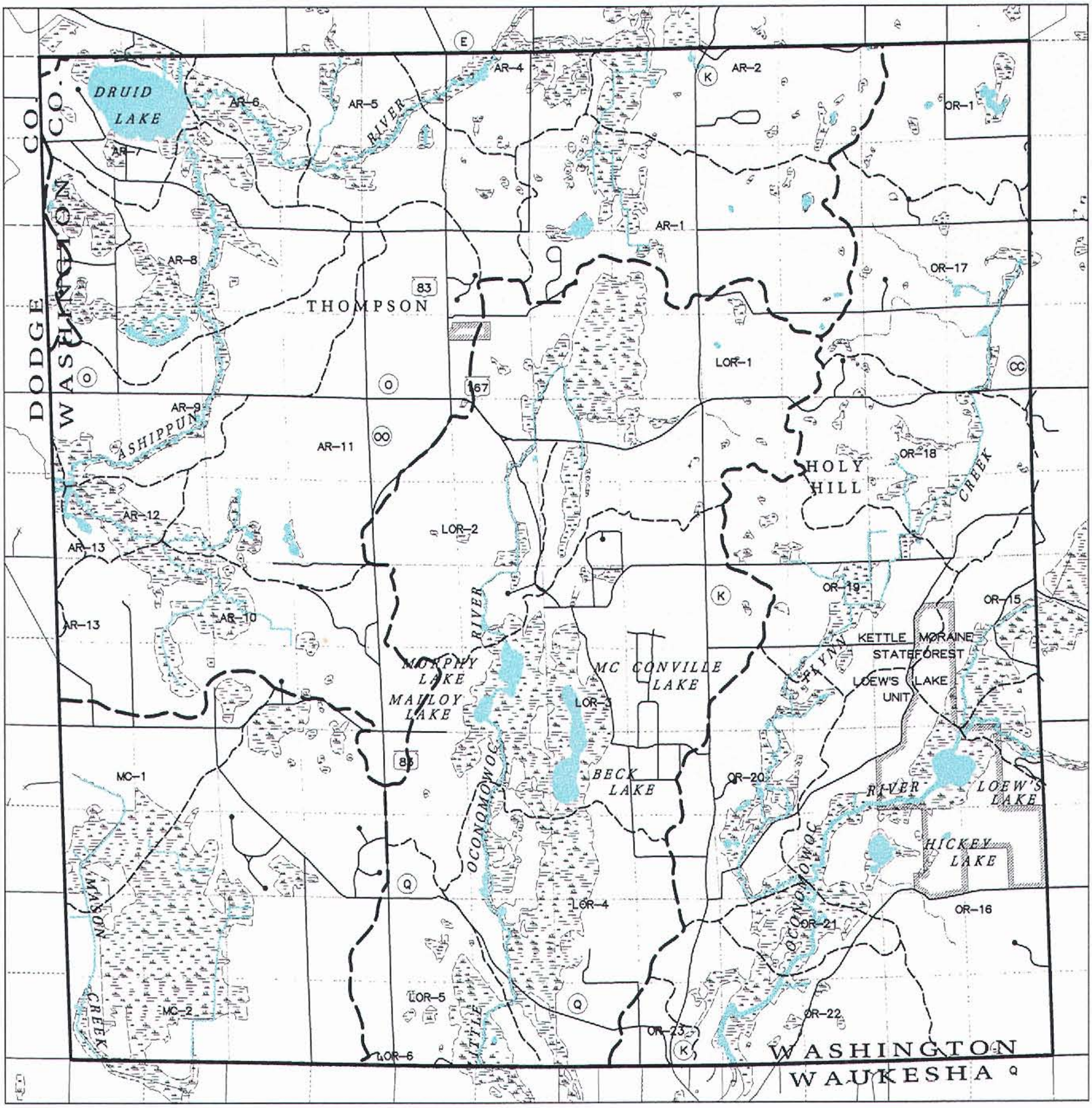
In 1963,[4] the Wisconsin Department of Natural Resources (WDNR) reported that Beck Lake was managed for largemouth bass, panfish, and northern pike, and that no problems with winterkill had been reported, probably due to the ability of the fish community to move to deeper water through the aforementioned channel. By 1995,[5] the

[4]*Wisconsin Conservation Department,* Surface Water Resources of Washington County, *1963.*

[5]*Wisconsin Department of Natural Resources Publication PUBL-FM-800 95REV,* Wisconsin Lakes, *1995.*

Map 25

SURFACE WATER RESOURCES WITHIN THE ERIN AREA: 1995



Surface Water

Basin Boundary

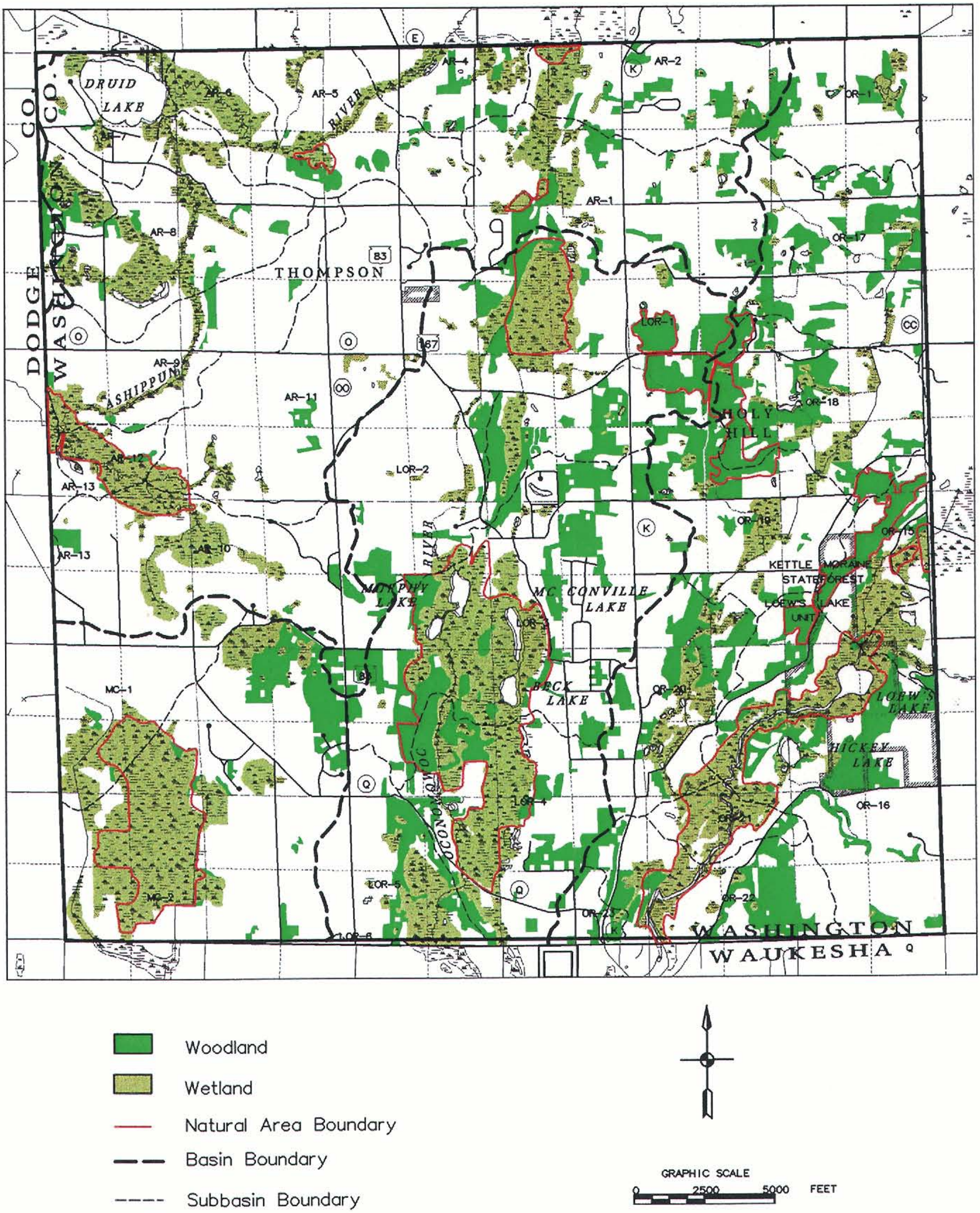
Subbasin Boundary

GRAPHIC SCALE
0 2500 5000 FEET

Source: SEWRPC.

Map 26

WETLANDS AND WOODLANDS WITHIN THE ERIN AREA: 1995



Source: SEWRPC.

WDNR indicated that northern pike and panfish were common, and largemouth bass were present. Extensive growths of aquatic plants were the only known major problem, somewhat impairing fishing and navigation. Mallards, blue-winged teal, and black ducks are reported to nest in this waterbody and environs.

Druid Lake

Lake Morphometry

Druid Lake is located in U.S. Public Land Survey Section 6, Township 9 North, Range 18 East, Town of Erin. The Lake has a surface area of about 120 acres, a maximum depth of 53 feet, a mean depth of 25 feet, and a shoreline development factor of 1.09. The Lake is a shallow, drainage lake in a marshy valley in the Green Bay terminal moraine. The bathymetry of Druid Lake is shown Map 27. The Ashippun River drains into and out of the Lake at the eastern end.

Lake Water Quality

Available water quality data indicate that the Lake is moderately fertile, with a Wisconsin Trophic State Index value[6] of about 54.[7] The Lake water was generally turbid, with a Secchi disk transparency of between 4.6 feet and 13.5 feet, a total phosphorus concentration of between 19 and 517 micrograms per liter (μg/l), and a chlorophyll-a concentration of between five and 15 μg/l throughout the summer.[8]

Recreational Use

Public access is provided by a narrow, graveled town road with limited parking space. The Lake is considered to have adequate public recreational boating access pursuant to Chapter NR 1 of the *Wisconsin Administrative Code.*

Development Potential

As of 1995, the land use within the drainage area tributary to Druid Lake consisted of largely of agricultural and open space uses, with agriculture comprising about 50 percent of the land cover within the drainage area. Residential development is located along the northern and southwestern shoreline of the Lake. Wetlands and other open spaces use comprised about 21 percent of the land cover.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Druid Lake are primarily agricultural.

Fish and Wildlife Populations

In 1963,[9] the WDNR reported that panfish and walleyed pike constituted the principal recreational fishery, although carp were reported to be abundant and considered a major problem at that time. During the period from 1973 through 1978, six fisheries surveys were conducted by the WDNR.[10] In 1973, 14 species of fishes were recorded, including the common and emerald shiners; largemouth and rock bass; the johnny, Iowa, and fantail darters; yellow perch; brook silverside; bluegill; northern pike, bluntnose minnow; pumpkinseed; and black

[6] *R.A. Lillie, S. Graham, and P. Rasmussen, "Trophic State Index Equations and Regional Predictive Equations for Wisconsin Lakes," Wisconsin Department of Natural Resources Research Findings No. 35, May 1993.*

[7] *SEWRPC Memorandum Report No. 93,* A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report, *March 1995.*

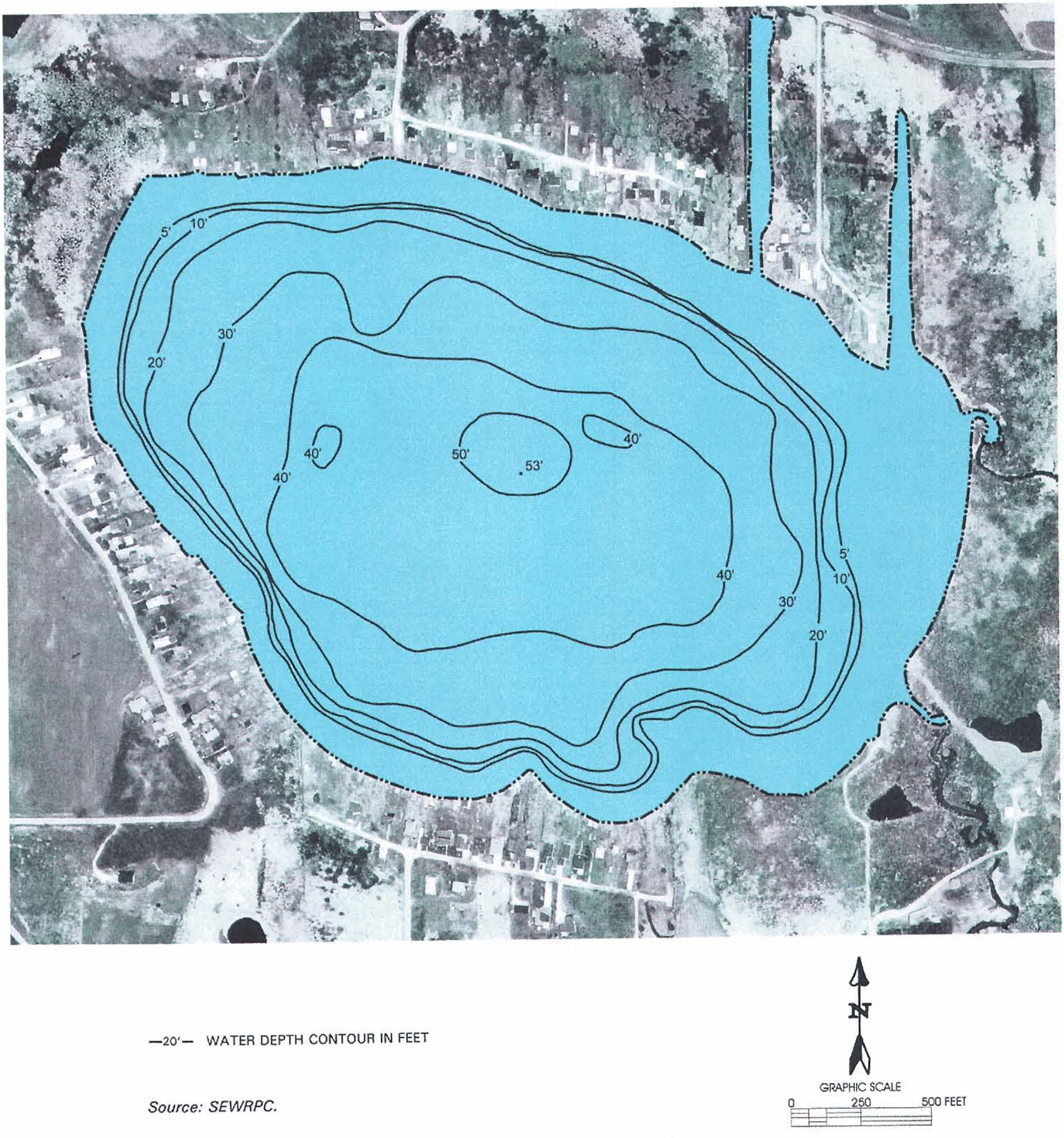
[8] *U.S. Geological Survey Open-File Report 97-123,* Water-Quality and Lake-Stage Data for Wisconsin Lakes, Water Year 1996, *1997.*

[9] *Wisconsin Conservation Department,* op. cit.

[10] *D. Fago, Wisconsin Department of Natural Resources Research Report No. 148,* Retrieval and Analysis System Used in Wisconsin's Statewide Fish Distribution Survey, Second Edition, *December 1988.*

Map 27

BATHYMETRIC MAP FOR DRUID LAKE



—20'— WATER DEPTH CONTOUR IN FEET

Source: SEWRPC.

crappie. In 1975, 11 species of fishes were recorded, including bullheads, crappies and black crappies, bluntnose minnow, brook silverside, common shiner, northern pike, walleyed pike, rock bass, white sucker, yellow perch, pumpkinseed, and johnny darter. In 1976, 12 species of fishes were recorded, including black and yellow bullheads, crappies, common carp, largemouth and rock bass, central mudminnows, bluegill, common shiner, northern pike, and white sucker. In 1978, five species of fishes were recorded, including largemouth and white bass, white sucker, northern pike, and walleyed pike. In 1995,[11] the WDNR reported panfish to be abundant, with northern pike, walleyed pike, and largemouth bass being present. A belt of wetland forms the lakeshore contiguous to the Ashippun River both above and below the Lake. Limited numbers of puddle ducks have been reported to visit the Lake in the autumn.

Hickey Lake

Lake Morphometry

Hickey Lake is located in U.S. Public Land Survey Sections 25 and 26, Township 9 North, Range 18 East, Town of Erin. The Lake has a surface area of about 10 acres, a maximum depth of 14 feet, and a shoreline development factor of 1.12. The Lake is a small, seepage-fed, landlocked pond in the floodplain of the Oconomowoc River. This is a medium, hard water lake surrounded by alder bog.

Recreational Use

Public access is not available, although a portion of the lakeshore is in public ownership. The other two owners had piers and an access road for personal use. There are three structures located along the lakeshore set well back from the shoreline, at a distance of between about 200 and 350 feet. A portion of the Lake was dredged in 1960. However, soft bottom materials reportedly reentered the dredged area.

Development Potential

As of 1995, land use within the drainage area tributary to Hickey Lake consisted largely of agriculture uses comprising about 57 percent of the land cover of the drainage area. Forest and other open space use comprised about 19 percent of the drainage area. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Hickey Lake are primarily agricultural.

Fish and Wildlife Populations

In 1963,[12] the WDNR reported that the owner maintained a largemouth bass population through periodic stocking, and pumpkinseed are found in abundance. The WDNR reported largemouth bass and panfish to be common in the Lake in 1995.[13]

Lowes Lake

Lake Morphometry

Lowes Lake, also known as Lowe Lake, is located in U.S. Public Land Survey Section 25, Township 9 North, Range 18 East, Town of Erin. The Lake has a surface area of about 23 acres, a maximum depth of 23 feet, and a shoreline development factor of 1.31. The Lake is a small, kettle basin in the marshy valley of the Oconomowoc River. There is no impounding structure, and access to the Lake is through the inlet and outlet, both of which are navigable. The bathymetry of Lowes Lake is shown on Map 28.

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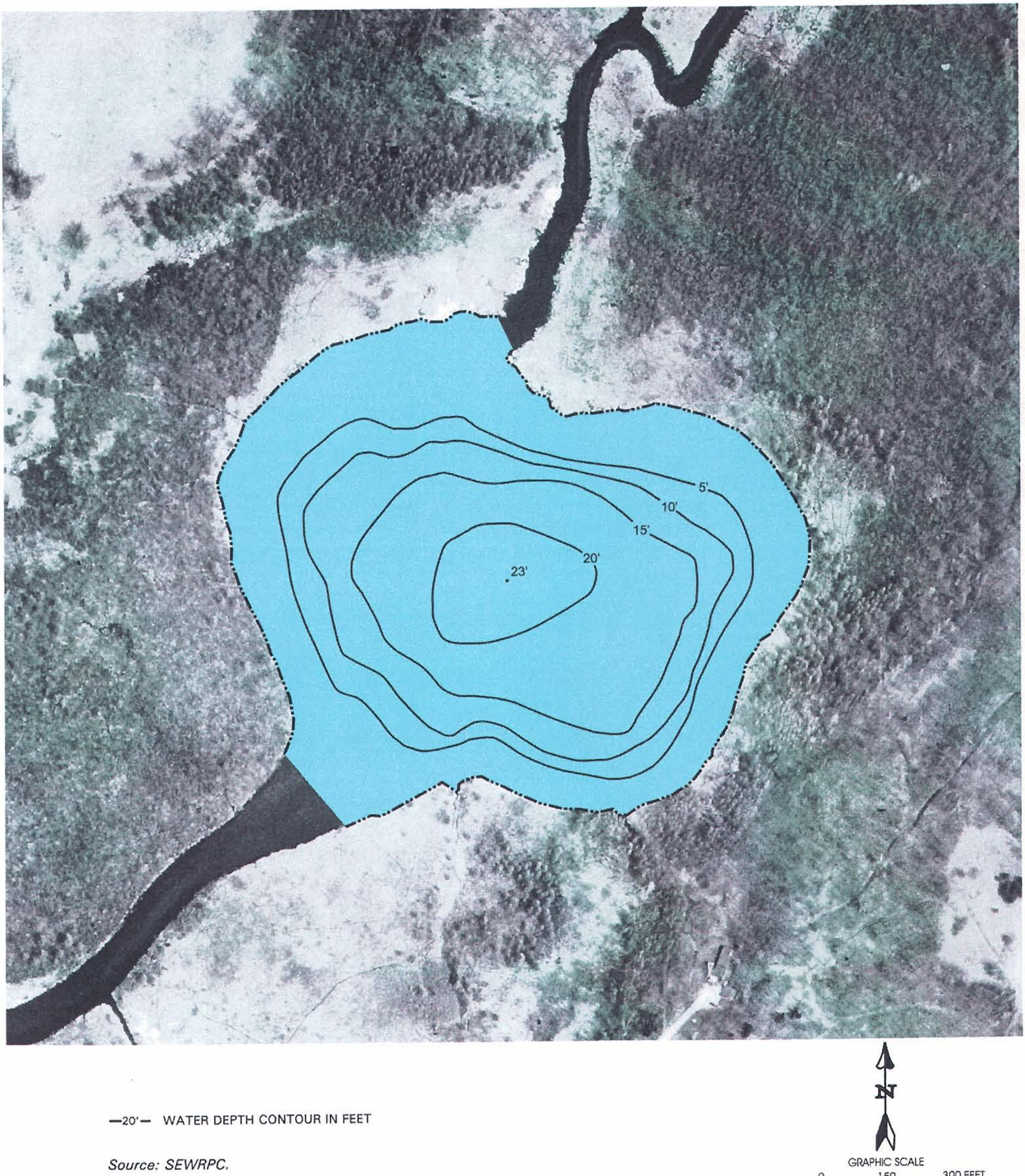
[11] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

[12] *Wisconsin Conservation Department,* op. cit.

[13] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Map 28

BATHYMETRIC MAP FOR LOWES LAKE



—20'— WATER DEPTH CONTOUR IN FEET

Source: SEWRPC.

Recreational Use
Public access is not available, although the public can access the Lake by water through the tributary stream system. As of 1995, the entire Lake frontage was in public ownership and the only dwelling was a lodge set well back from the Lake on nearby high ground.

Development Potential
As of 1995, land use within the drainage area tributary to Lowe Lake consisted of agricultural uses, comprising about 33 percent of the land cover of the drainage area. Wetlands and other open space use comprised about 36 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Lowe Lake are primarily agricultural.

Fish and Wildlife Populations
In 1963,[14] the WDNR reported that Lowe Lake was managed for panfish and largemouth bass, with an abundance of carp presenting a major use problem. In 1995,[15] the WDNR reported panfish to be common in the Lake, with northern pike and largemouth bass being present. Limited numbers of both puddlers and divers frequent the Lake in the autumn.

Malloy Lake
Lake Morphometry
Malloy Lake is located in U.S. Public Land Survey Section 21, Township 9 North, Range 18 East, Town of Erin. The Lake has a surface area of about five acres, a maximum depth of 24 feet, and a shoreline development factor of 1.28. Malloy Lake is one of a group of small marsh lakes occupying a basin in the kettle moraine. The Lake is connected to Murphy Lake by the Little Oconomowoc River, which is navigable at this point.

Recreational Use
Public access is not available. However, access for fishing and picnicking purposes has been permitted by the landowner. The Lake has undeveloped shores with the exception of one homestead set well back, approximately 1,000 feet, from the lakeshore. Malloy Lake and its connected lakes collectively have great aesthetic value in that these lakes have retained their natural shorelines and present a wilderness appearance.

Development Potential
As of 1995, the land use within the drainage area tributary to Malloy Lake consisted largely of agricultural uses, comprising about 51 percent of the land cover of the drainage area. Forest and other open space uses comprise about 19 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Malloy Lake are primarily agricultural.

[14] *Wisconsin Conservation Department,* op. cit.

[15] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Fish and Wildlife Populations
In 1963,[16] the WDNR reported that the Lake was managed for largemouth bass and panfish, with northern pike making an additional contribution to the creel. In 1995,[17] the WDNR reported northern pike, largemouth bass, and panfish to be present in the Lake. Mallards, and blue-winged teal nest in this area.

McConville Lake
Lake Morphometry
McConville Lake is located in U.S. Public Land Survey Sections 22 and 27, Township 9 North, Range 18 East, Town of Erin. The Lake has a surface area of about 14 acres, a maximum depth of 37 feet, and a shoreline development factor of 1.52. The Lake is an elongate, seepage-fed, alkaline, bog lake in the marshy basin through which the Little Oconomowoc River flows. The Little Oconomowoc River links Malloy, Murphy and McConville Lakes, while a narrow, artificially maintained channel connects McConville Lake with Beck Lake to the south.

Recreational Use
Public access is not provided, although the public can access the Lake by water through the inlet and outlet. The one structure situated along the shoreline is set well back, approximately 750 feet, from the lakeshore.

Development Potential
As of 1995, land use within the McConville Lake drainage area largely consisted of agricultural uses, comprising about 51 percent of the land cover of the drainage area. Forest and other open space uses comprised about 19 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to McConville Lake are primarily agricultural.

Fish and Wildlife Populations
In 1963,[18] the WDNR reported that McConville Lake was managed for largemouth bass, panfish, and northern pike, with carp being common. In 1995,[19] the WDNR reported panfish to be abundant, largemouth bass to be common, and northern pike to be present in the Lake. Winterkill has not been reported in this Lake, and is probably avoided due to the depth of the Lake. Fish taking refuge in this Lake are thought to reseed adjoining Beck Lake. A tamarack bog surrounds the Lake, which is bordered by shrubby swamp, and the general area surrounding the Lake presents a wilderness appearance and has great aesthetic value. A portion of the southern shore of the Lake is owned by The Nature Conservancy and is maintained for conservation purposes. Waterfowl make some use of the area for nesting and resting.

Murphy Lake
Lake Morphometry
Murphy Lake is located in U.S. Public Land Survey Section 21, Township 9 North, Range 18 East, Town of Erin. The Lake has a surface area of about 16 acres, a maximum depth of 37 feet, and a shoreline development factor of 1.24. Murphy Lake is one of a chain of small marsh lakes in the kettle moraine valley of the Little Oconomowoc River.

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[16] *Wisconsin Conservation Department,* op. cit.

[17] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

[18] *Wisconsin Conservation Department,* op. cit.

[19] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Recreational Use
Public access is not available, although the Lake is accessible by water from Malloy Lake. There is substantial aesthetic value to these lakes in this valley. The one structure present along the lakeshore was set well back, approximately 1,000 feet, from the Lake.

Development Potential
As of 1995, land use within the drainage area tributary to Murphy Lake consisted largely of agricultural uses, comprising about 51 percent of the land cover of the drainage area. Forest and other open space uses comprised about 19 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Murphy Lake are primarily agricultural.

Fish and Wildlife Populations
In 1963,[20] the WDNR reported that largemouth bass, panfish, and northern pike comprised the fishery. Carp were reported to be common, but presented only a minor use problem. By 1995,[21] the WDNR reported that panfish were abundant, largemouth bass were common, and northern pike were present in the Lake. The wooded surrounding, undeveloped shorelines, and relative inaccessibility characterize this lake as a wilderness lake. Mallards and blue-winged teal are reported to nest in the vicinity of the Lake.

STREAMS

Table 9 contains a summary of selected stream morphometric data available for named streams in the Erin area. The streamcourses are shown on Map 25, which also shows the hydrologic drainage areas within the area. Descriptive paragraphs follow, providing a summary of available information on the physical description of each stream for the portion of the stream within Washington County, and of the existing uses and conditions, wildlife habitat, and fishery for the portion of the stream within the Erin area, to the extent that such information is available. Each of the paragraphs address one or more factors required to be considered in the waterbodies classification process pursuant to Section 281.69(5)(b) of the *Wisconsin Statutes*.

Ashippun River
Stream Morphometry
The Ashippun River is located in the northwestern portion of the Erin area. Within Washington County, the River has a surface area of about 13 acres and extends over a linear distance of about 9.6 miles with a gradient of approximately six feet per mile. The River flows southwest through Druid Lake to the Rock River. The Ashippun River is included in the Upper Rock River Basin areawide water quality management planning area.[22]

Recreational Use
The Ashippun River is navigable by canoe only.

Development Potential
As of 1995, land use within the Ashippun River subwatershed consisted of largely agricultural and open space uses, with agriculture comprising about 45 percent of the land cover in the subwatershed. Other open lands

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[20]*Wisconsin Conservation Department,* op. cit.

[21]*Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

[22]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-190-88,* Upper Rock River Basin Areawide Water Quality Management Plan, *May 1989.*

Table 9

PHYSICAL CHARACTERISTICS OF STREAMS WITHIN THE ERIN AREA, WASHINGTON COUNTY[a]

Stream or Watercourse	Length (miles)	Average Width (feet)	Average Depth (feet)	Surface Area (acres)	Drainage Area (square miles)	U.S. Public Land Survey			Subwatershed	Major Watershed
						Town	Range	Section		
Ashippun River	9.6	11	1.25	12.8	18.5	9	18	18	Ashippun	Rock
Flynn Creek	4.5	12	0.85	6.6	5.5	9	18	26	Oconomowoc	Rock
Little Oconomowoc River	2.5	13	0.85	3.9	9.0	9	18	33	Oconomowoc	Rock
Mason Creek	1.7	4	0.50	0.8	3.5	9	18	31	Oconomowoc	Rock
Oconomowoc River	9.1	15	1.30	16.5	48.5	9	18	34	Oconomowoc	Rock

[a]*Stream data are for the portion of the stream within Washington County only. The U.S. Public Land Survey Township, Range, and Section designation included in each description locates the mouth of the stream at its confluence with another named stream or at the point at which it exits the County.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

comprised about 25 percent, while wetlands cover about 15 percent of the land cover respectively. A small portion of the subwatershed is located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Ashippun River subwatershed are primarily agricultural.

Fish and Wildlife Populations

In 1963,[23] the WDNR managed this river for forage fishes, though it seasonally supported a run of northern pike, and may have had a small population of smallmouth bass. The WDNR fisheries surveys were conducted in 1973 and 1975 within the Erin area.[24] In 1973, the WDNR reported 19 species of fishes, including johnny, fantail, and rainbow darter; green sunfish; hornyhead and creek chub; northern pike; largemouth and rock bass; stonecat; central mudminnow; bluntnose and fathead minnow; stonerollers; common shiner; pumpkinseed; white sucker; southern redbelly dace; and yellow bullhead. In 1975, the WDNR reported 26 species of fishes, including johnny, fantail, least and rainbow darter; green sunfish; hornyhead and creek chub; northern pike; largemouth and rock bass; stonecat; central mudminnow; bluntnose and fathead minnow; largescale and central stoneroller; bluegill; green sunfish; common carp; common shiner; pumpkinseed; white sucker; southern redbelly dace; yellow perch; and black and yellow bullhead. The Southeastern Wisconsin Regional Planning Commission (SEWRPC) reports the least darter as a State species of special concern.[25]

The waters of the Ashippun River are generally slightly humic, being a light brown in color, and, although the bottom is largely silt, no problems with sedimentation have been identified.[26] Though the stream flows through

[23]*Wisconsin Conservation Department,* op. cit.

[24]*D. Fago,* op. cit.

[25]*SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997.*

[26]*SEWRPC Memorandum Report No. 93,* op. cit.

Druid Lake, there are no apparent barriers to fish movement and the stream is considered to have a high carp population.

Flynn Creek

Stream Morphometry

Flynn Creek is located in the southeastern portion of the Erin area. The Creek has a surface area of about seven acres and extends over a linear distance of about 4.5 miles with a gradient of approximately 23 feet per mile. The Creek rises as part of a ditch system that becomes a navigable stream one mile above its confluence with the Oconomowoc River. In this area, springs contribute to the flow and the bottom changes to predominantly sand and gravel. This stream is also referred to as Chipmunk Creek. Flynn Creek is included in the Oconomowoc River Priority Watershed project area.[27]

Recreational Use

Flynn Creek has limited navigability, and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential

As of 1995, land use within the Flynn Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 40 percent of the land cover within the drainage area. Forest and other open land uses comprised about 25 percent of the land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Flynn Creek drainage area are primarily agricultural.

Fish and Wildlife Populations

Forage fishes were reported by the WDNR to constitute the fishery in 1963.[28] Two fisheries surveys conducted by the WDNR during 1975[29] indicated that there were 16 species of fishes present in the Creek, including johnny and Iowa darter, fathead and bluntnose minnow, common and golden shiner, black and yellow bullhead, blacknose dace, central stoneroller, pumpkinseed, green sunfish, creek chub, central mudminnow, brook stickleback, and white sucker.

Little Oconomowoc River

Stream Morphometry

The Little Oconomowoc River is located in the southwestern portion of the Erin area. Within Washington County, the River has a surface area of about four acres and extends over a linear distance of about 2.5 miles with a gradient of approximately seven feet per mile. The River originates in a basin occupied by Malloy and Murphy Lakes, and flows south to its confluence with the Oconomowoc River in Waukesha County. The stream has outstanding aesthetic value since most of its watershed, situated within the Kettle Moraine, is either woodland or wetland. The Little Oconomowoc River is included in the Oconomowoc River Priority Watershed project area.[30]

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[27] *Wisconsin Department of Natural Resources Publication No. PUBL-WR-194-86,* A Nonpoint Source Control Plan for the Oconomowoc River Priority Watershed Project, *March 1986.*

[28] *Wisconsin Conservation Department,* op. cit.

[29] *D. Fago,* op. cit.

[30] *Wisconsin Department of Natural Resources, PUBL-WR-194-86.*

Recreational Use
The Little Oconomowoc River has limited navigability, and is generally navigable only by canoe or similar watercraft, with some difficulty.

Development Potential
As of 1995, land use within the Little Oconomowoc River drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 50 percent of the land cover within the drainage area. Wetlands and woodlands comprised about 25 percent of the land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution in the Little Oconomowoc River drainage area are primarily agricultural.

Fish and Wildlife Populations
In 1963,[31] the WDNR reported that panfish and forage fishes comprised the fishery.

Mason Creek
Stream Morphometry
Mason Creek is located in the extreme southwestern corner of the Erin area. The Creek has a surface area of about one acre and extends over a linear distance of about 1.7 miles with a gradient of approximately six feet per mile. The Creek is comprised of a system of narrow ditches that drain a flat valley of marsh deposits southward to the Oconomowoc River. In 1963, the width of the Creek averaged only four feet and the depth was four to eight inches, and the flow was reported to cease entirely during drought years. Mason Creek is included in the Oconomowoc River Priority Watershed project area.[32]

Recreational Use
Mason Creek has limited navigability, and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential
As of 1995, land use within the Mason Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 50 percent of the land cover in the drainage area. Wetlands and other open space use comprised about 30 percent of the land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution in the Mason Creek drainage area are primarily agricultural.

Fish and Wildlife Populations
The ditches were reported to support only limited numbers of forage minnows in 1963.[33]

Oconomowoc River
Stream Morphometry
The Oconomowoc River is located in the southeastern corner of the Erin area. Within Washington County, the River has a surface area of 16 acres and extends over a linear distance of about 9.1 miles with a gradient of

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[31] *Wisconsin Conservation Department,* op. cit.

[32] *Wisconsin Department of Natural Resources, PUBL-WR-194-86.*

[33] *Wisconsin Conservation Department,* op. cit.

approximately six feet per mile. The River is a large stream draining one of the marshy valleys of the Lake Michigan glacial terminal moraine. One tributary to the stream, the Coney River, is ditched and drains an extensive system of wetlands. Another tributary, Flynn Creek, is also ditched, but, in addition, receives spring water. The Oconomowoc River and its major tributary streams are included in the Oconomowoc River Priority Watershed project area.[34]

Recreational Use
The Oconomowoc River has limited navigability, and is generally navigable only by canoe or similar watercraft. Though there are two lakes on the River within Washington County, Friess Lake and Little Friess Lake, there is only one low-level, temporary impounding structure located between Friess Lake and Little Friess Lake where a natural sill limits passage by deeper draft watercraft. The portion of the River downstream from Little Friess (Bony) Lake warrants consideration as part of a canoe trail.

Development Potential
As of 1995, land use within the Oconomowoc River subwatershed consisted largely of agricultural and open space uses, with agriculture comprising about 35 percent of the land cover within the subwatershed. Forest and wetlands comprised about 25 and 15 percent of the land cover, respectively. The subwatershed is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution in the Oconomowoc River subwatershed are primarily agricultural.

Fish and Wildlife Populations
In 1963,[35] the WDNR reported the fishery to be primarily comprised of forage fish species. Fish species reported to be present in the River in 1902 included pearl dace, lake chubsucker, least darter, and weed shiner. The lake chubsucker and the least darter have been identified as State of Wisconsin designated special concern species. The River has a good biotic index[36] rating with no reported water quality problems.[37]

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[34] *Wisconsin Department of Natural Resources, PUBL-WR-194-86.*

[35] *Wisconsin Conservation Department,* op. cit.

[36] *Wisconsin Department of Natural Resources Technical Bulletin No. 132,* Using a Biotic Index to Evaluate Water Quality in Streams, *1982.*

[37] *SEWRPC Memorandum Report No. 93,* op. cit.

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Chapter VI

INVENTORY FINDINGS: FARMINGTON AREA

INTRODUCTION

This chapter presents the inventory findings relating to lakes and streams in the Farmington area of Washington County. The Farmington area is shown on Map 29 and includes all of U.S. Public Land Survey Sections 1 through 36, Town 12 North, Range 20 East. The area includes the entire Town of Farmington. To the extent that data are available, relevant land use, recreational use, morphometric, water quality, and biological information upon which waterbody classifications are to be based pursuant to the requirements of Section 281.69(5)(b), *Wisconsin Statutes*, is presented for each waterbody inventoried. These data form the scientific and technical basis for the determination of the alternative and recommended waterbody classification schemes set forth in Chapter XVI.

LAND USE

The type, intensity, and spatial distribution of the various land uses within the Farmington area are important determinants of water quality and recreational use demands. The current and planned future land use patterns, placed within the context of the historical development in the area, therefore, are important considerations in any waterbody management planning effort.

While some settlement occurred prior to the mid-1900s, most urban development occurred in the Farmington area in recent years. The Farmington area remains largely rural in character. Map 29 indicates the historic urban growth pattern in the Farmington area since 1850. Early development occurred in the east-central and north-central portions of the area during the period between 1900 and 1920, in the vicinity of the unincorporated hamlets of Boltonville and Filimore. Between the 1920s and 1970s, urban growth was relatively static, although some urban-density growth continued to occur in the vicinity of Boltonville and Filimore and around Green Lake. However, since the 1970s, limited additional urban land use development in the area has occurred in scattered subdivisions. As shown on Map 29, the urban development of the lands in the area has largely occurred since 1975.

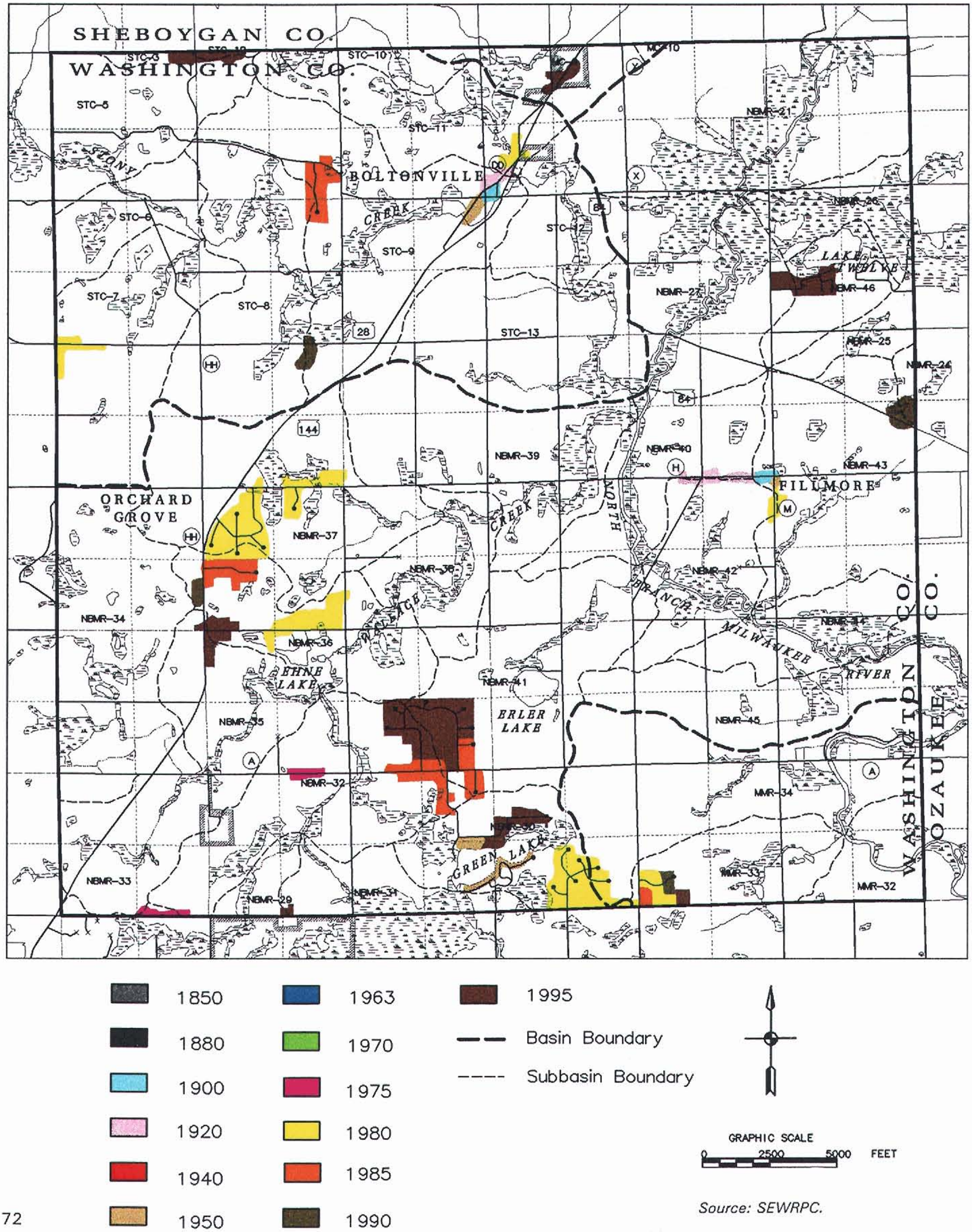
The existing land use pattern in the Farmington area, as of 1995, is shown on Map 30, and is quantified in Table 10. As indicated in Table 10, about 2,200 acres, or about 9 percent of the area, were devoted to urban land uses. The dominant urban land use was residential, encompassing about 1,200 acres, or about 56 percent of the area in urban use. As of 1995, about 21,400 acres, or about 91 percent of the area, were still devoted to rural land uses. About 14,700 acres, or about 69 percent of the rural area, were in agricultural land uses. Woodlands, wetlands, and surface water, including the surface area of the lakes in the area, accounted for approximately 5,600 acres, or about 26 percent of the area in rural use. Future land use, based upon the recommendations set forth in the adopted 2020 regional land use plan shown on Map 31, is not anticipated to differ greatly from the current condition.

LAKES

Table 11 contains a summary of selected morphometric data available for the major lakes of the Farmington area. Major lakes are defined as those lakes within the Southeastern Wisconsin Region having a surface area of 50 or more acres in areal extent. These lakes are shown on Map 32. Where available, similar summary data are

Map 29

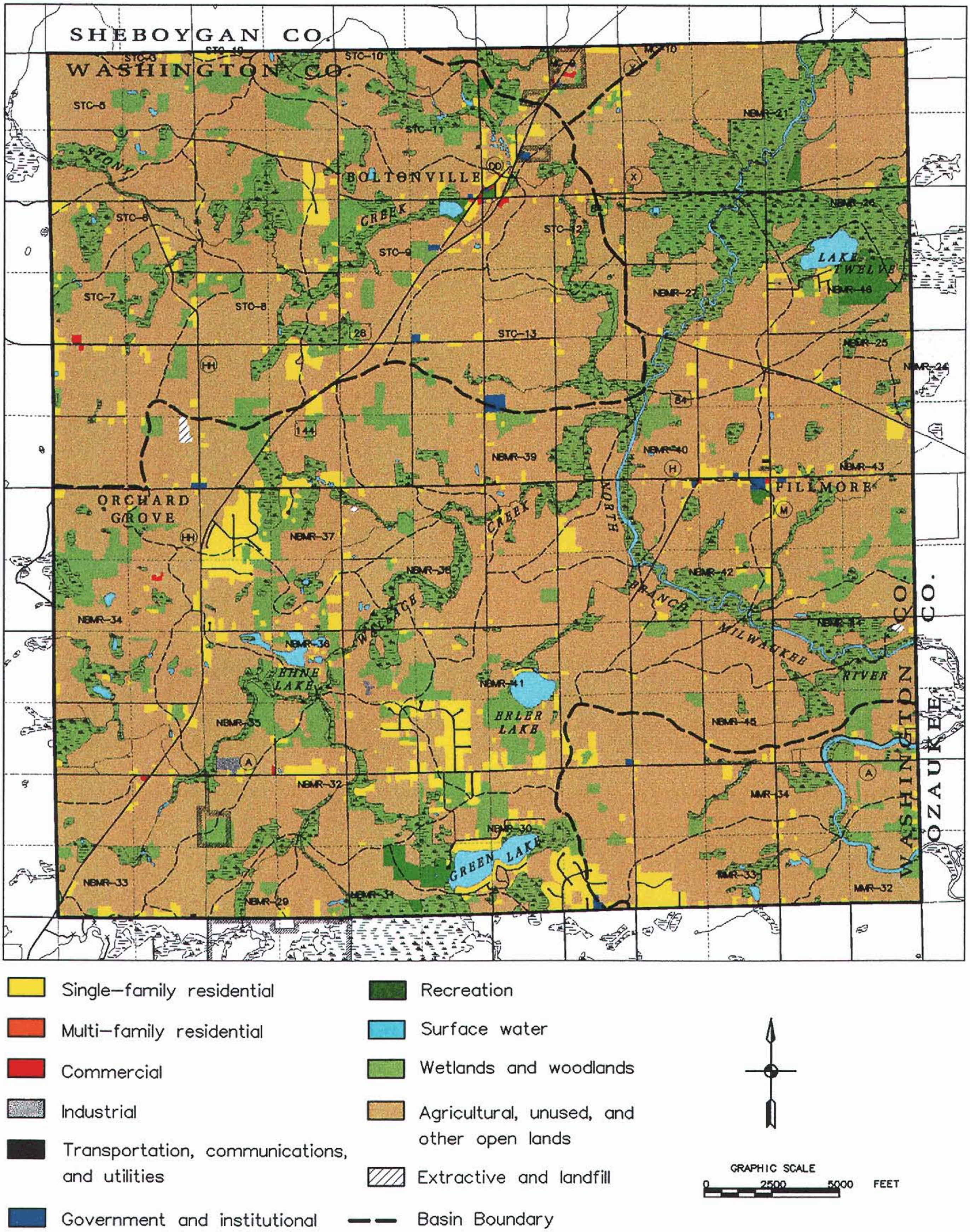
HISTORIC URBAN GROWTH WITHIN THE FARMINGTON AREA: 1850-1990



Source: SEWRPC.

Map 30

EXISTING LAND USE WITHIN THE FARMINGTON AREA: 1995



Source: SEWRPC.

Table 10

EXISTING LAND USE WITHIN THE FARMINGTON AREA: 1995

Land Use Categories	Acres	Percent of Major Category	Percent of Total Area
Urban			
Residential	1,211	55.7	5.2
Commercial	10	0.5	<0.1
Industrial	16	0.7	<0.1
Governmental and Institutional	34	1.5	0.1
Transportation and Utilities	714	32.8	3.0
Recreation	161	7.4	0.7
Land under Development	30	1.4	0.1
Subtotal	2,176	100.0	9.2
Rural			
Agricultural	14,690	68.7	62.4
Wetlands	3,303	15.5	14.0
Woodlands	1,965	9.2	8.3
Water	372	1.7	1.6
Extractive	12	<0.1	<0.1
Landfill	- -	- -	- -
Other Open Lands	1,036	4.8	4.4
Subtotal	21,378	100.0	90.8
Total	23,554	- -	100.0

Source: SEWRPC.

provided for minor lakes and unnamed ponds because of the importance of these smaller waterbodies as a water resource. In some cases, these waterbodies, in which water levels fluctuate markedly, are classed as deep water marshes or wetlands. Wetlands within the Farmington area are shown on Map 33. The lakes inventoried are further described below with information set forth paragraphs which address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69(5)(b) of the *Wisconsin Statutes*. Information on the origins of these lakes is based upon detailed geological information provided in various published survey reports[1] and maps of surfacial deposits.[2]

Ehne Lake

Lake Morphometry

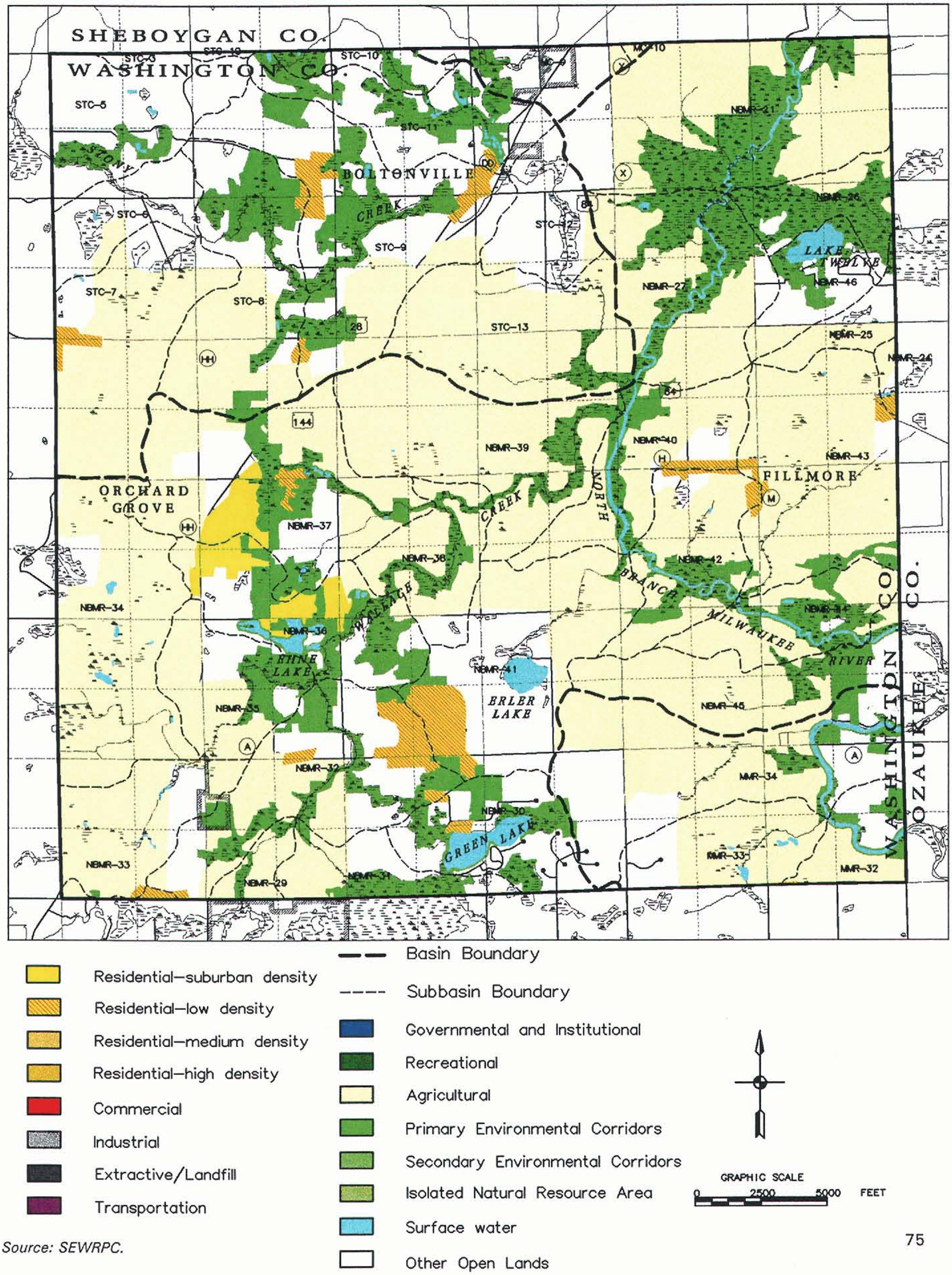
Ehne Lake is located in U.S. Public Land Survey Section 29, Township 12 North, Range 20 East, Town of Farmington. The Lake has a surface area of about 18 acres, a maximum depth of 15 feet, and a shoreline

[1]*C. Juday,* The Inland Lakes of Wisconsin, The Hydrography and Morphometry of the Lakes, *State of Wisconsin, 1914, pp. 84-88; L. Martin,* The Physical Geography of Wisconsin, 2nd Edition, *State of Wisconsin, 1932, pp. 235-293.*

[2]*W.C. Alden,* Map Showing the Surficial Deposits of Southeastern Wisconsin, *Wisconsin Geological Survey, 1918; H.L. Young and W.G. Batten, Wisconsin Geological and Natural History Survey Information Circular No. 38,* Ground-Water Resources and Geology of Washington and Ozaukee Counties, Wisconsin, *University of Wisconsin-Extension, February 1980, 37 pages.*

Map 31

ADOPTED REGIONAL LAND USE PLAN FOR THE FARMINGTON AREA: 2020



Source: SEWRPC.

Table 11

HYDROLOGY AND MORPHOMETRY OF LAKES WITHIN THE FARMINGTON AREA: 1995

Lake	Surface Area (acres)	Subwatershed Area (acres)	Volume (acre-feet)	Water Residence Time (years)	Maximum Length of Lake (miles)	Length of Shoreline (miles)	Maximum Width of Lake (miles)	Shoreline Development Factor[a]	Maximum Depth (feet)	Mean Depth (feet)
Ehne	18	715	90	0.18	0.2	1.0	0.2	1.68	15	5
Erler	37	1,080	518	0.67	0.3	0.9	0.3	1.02	34	14
Green	71	550	1,207	3.03	0.7	1.8	0.3	1.65	37	17
Miller	3	- -[b]	- -[b]	- -[b]	- -[b]	- -[b]	- -[b]	1.32	16	- -[b]
Twelve	53	320	318	1.35	0.4	1.3	0.3	1.05	20	6

[a]*Shoreline Development Factor is the ratio between the actual circumference of a lake and the circumference of a circle with the same radius. A circular lake would have a Shoreline Development Factor of 1.0, while an dendritic lake would have a Shoreline Development Factor in excess of 1.0.*

[b]*No data available.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

development factor of 1.68. The Lake is a small, spring-fed impoundment at the head of a small tributary to the North Branch of the Milwaukee River.

Recreational Use
Public access is not available.

Development Potential
As of 1995, land use within the drainage area tributary to Ehne Lake consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the total land cover within the drainage area. Medium-density urban development comprised about 15 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Ehne Lake include both urban and agricultural runoff.

Fish and Wildlife Populations
In 1963,[3] the Wisconsin Department of Natural Resources (WDNR) reported that Ehne Lake was managed for smallmouth bass by the owner, and operated as a private fish hatchery (Private Fish Hatchery License No. 141). According to the WDNR, in 1995,[4] largemouth bass were reported to be present in the Lake.

Erler Lake
Lake Morphometry
Erler Lake is located in U.S. Public Land Survey Section 27, Township 12 North, Range 20 East, Town of Farmington. The Lake has a surface area of about 37 acres, a maximum depth of 34 feet, and a shoreline development factor of 1.02. The Lake is a small, natural, kettle lake in the morainic deposits of the Lake Michigan glacier. The Lake is spring fed and has a water level control structure maintaining a four-foot head. This head was reported to have been used originally to supply waterpower for a sulfur match factory.[5] The bathymetry of Erler Lake is shown on Map 34.

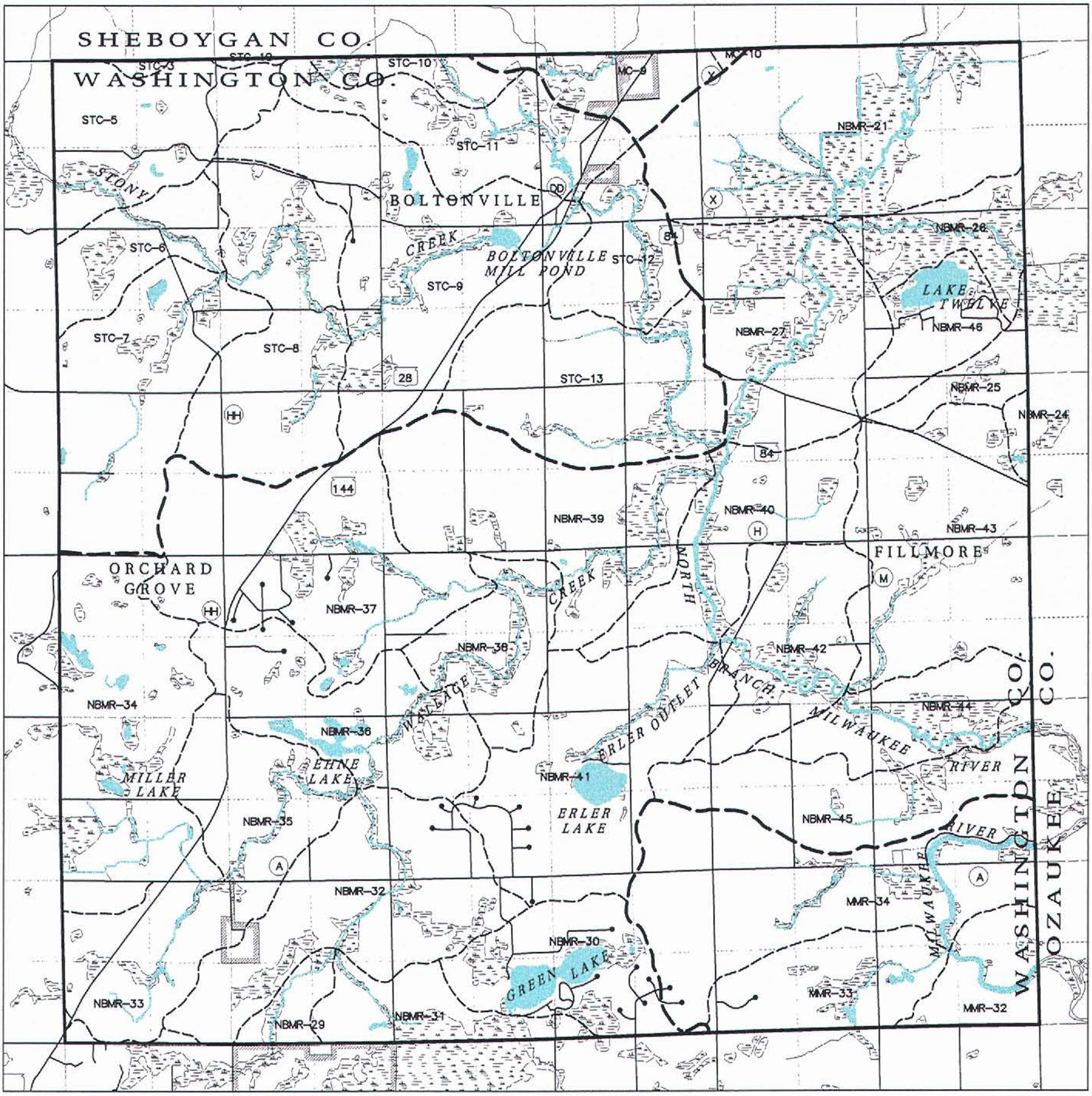
[3]*Wisconsin Conservation Department,* Surface Water Resources of Washington County, *1963.*

[4]*Wisconsin Department of Natural Resources Publication No. PUBL-FM-800 95REV,* Wisconsin Lakes, *1995.*

[5]*Wisconsin Conservation Department,* op. cit.

Map 32

SURFACE WATER RESOURCES WITHIN THE FARMINGTON AREA: 1995



Surface Water

Basin Boundary

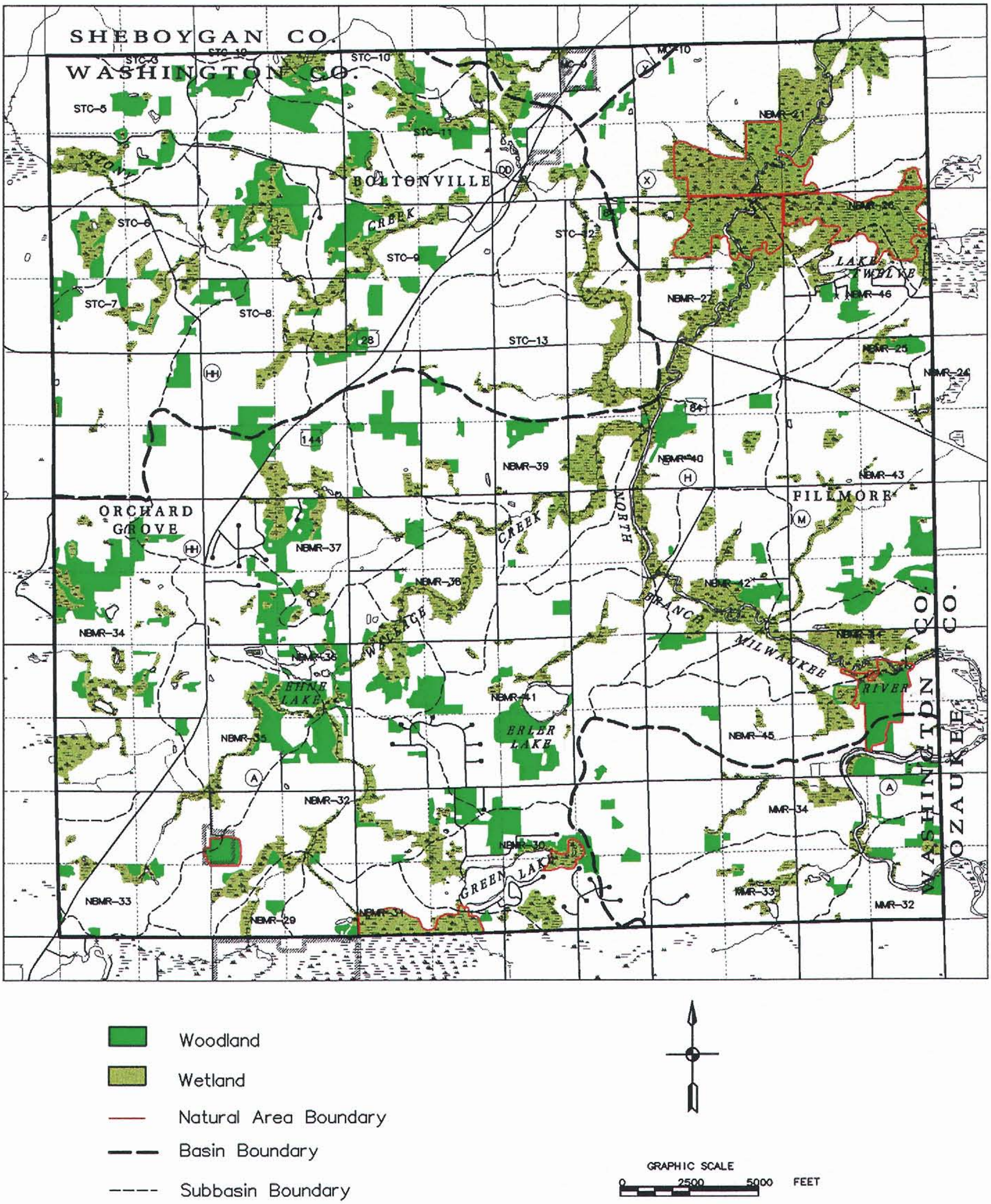
Subbasin Boundary

GRAPHIC SCALE
0 2500 5000 FEET

Source: SEWRPC.

Map 33

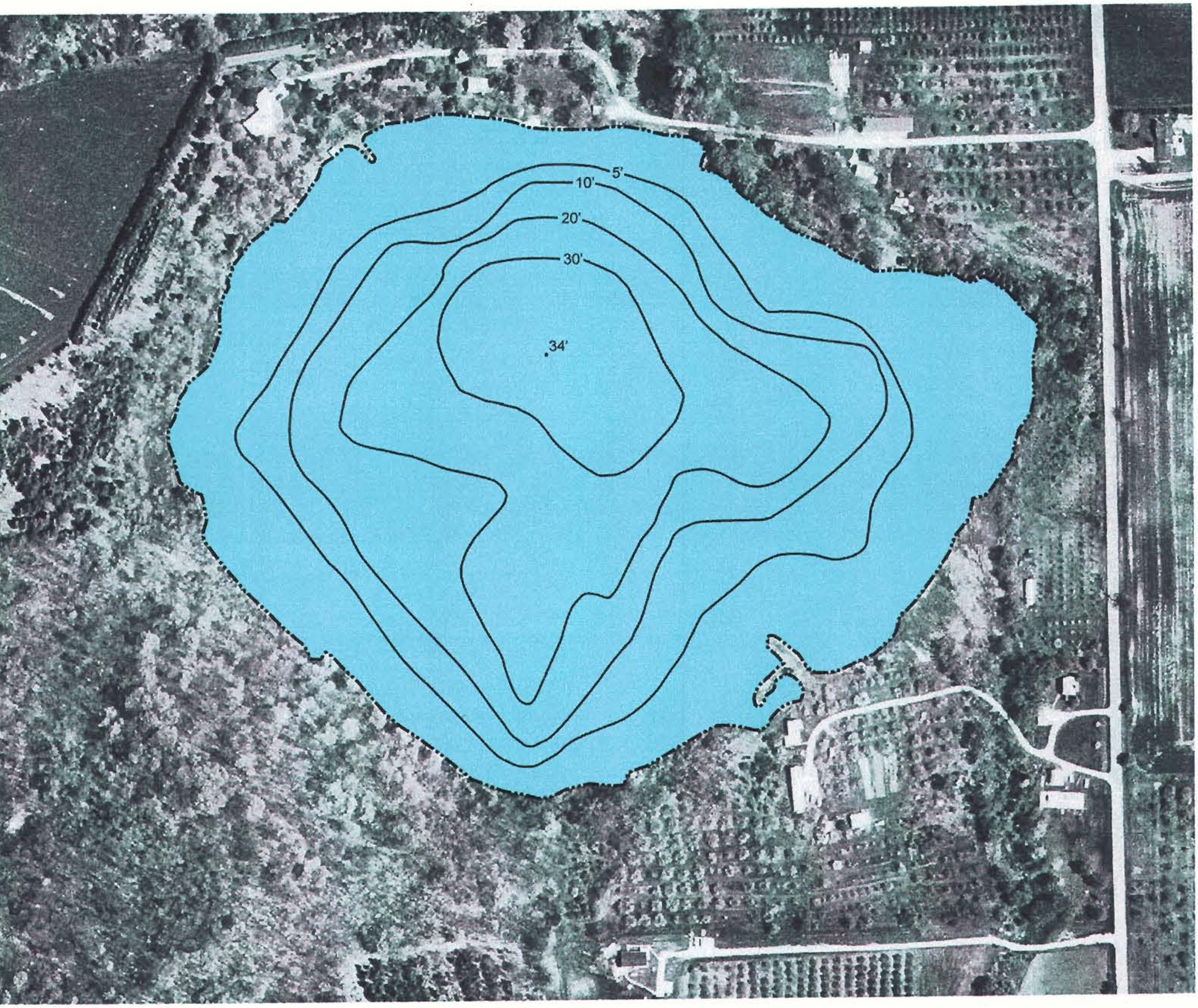
WETLANDS AND WOODLANDS WITHIN THE FARMINGTON AREA: 1995



Source: SEWRPC.

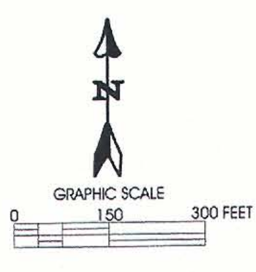
Map 34

BATHYMETRIC MAP OF ERLER LAKE



—20'— WATER DEPTH CONTOUR IN FEET

Source: SEWRPC.



Recreational Use
There is no public access. However, as of 2000, Washington County was constructing a public recreational access site at this Lake.

Development Potential
As of 1995, land use within the drainage area tributary to Erler Lake largely consisted of agricultural and open space uses, with agriculture comprising about 70 percent of the total land cover within the drainage area. Woodlands and other open space uses comprised about 10 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Erler Lake are primarily agricultural.

Fish and Wildlife Populations
The lake is surrounded by private land and was managed for largemouth bass and panfish in 1963,[6] according to the WDNR. At that time, investigations indicated that the Lake had a stunted panfish population. In 1995,[7] the WDNR reported that largemouth bass and panfish were common. There are no adjoining wetlands, save for a narrow fringe of shrub marsh; however, mallard and black ducks nest here and frequent the Lake during spring and fall migrations.

Green Lake
Lake Morphometry
Green Lake is located in U.S. Public Land Survey Sections 33 and 34, Township 12 North, Range 20 East, Town of Farmington. The Lake has a surface area of about 71 acres, a maximum depth of 37 feet, and a shoreline development factor of 1.65. A small, elongate, landlocked basin, Green Lake is a remnant of a large glacial lake in the area of Lake Michigan terminal moraine. The bathymetry for Green Lake is shown is shown on Map 35.

Recreational Use
Public recreational boating access is provided by a boat ramp at one site. Access for a fee is provided at two additional sites. A privately owned campground is located on the western shore of the Lake.

Development Potential
As of 1995, land use within the drainage area tributary to Green Lake consisted largely of agriculture and open space uses, with agriculture comprising about 40 percent of the total land cover within the drainage area. Medium-density urban development comprised about 20 percent of the total land cover. Portions of the drainage area are located within an area planned for limited urban development in the regional land use plan. This development is limited to new development envisioned to consist primarily of infilling within existing platted lots in existing, partially developed areas.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Green Lake include both urban and agricultural runoff.

Fish and Wildlife Populations
The WDNR reported that the Lake was managed for largemouth bass, panfish, and northern pike since the 1960s,[8] with an abundance of stunted panfish. The Lake was determined to be populated by yellow bullhead, blackchin

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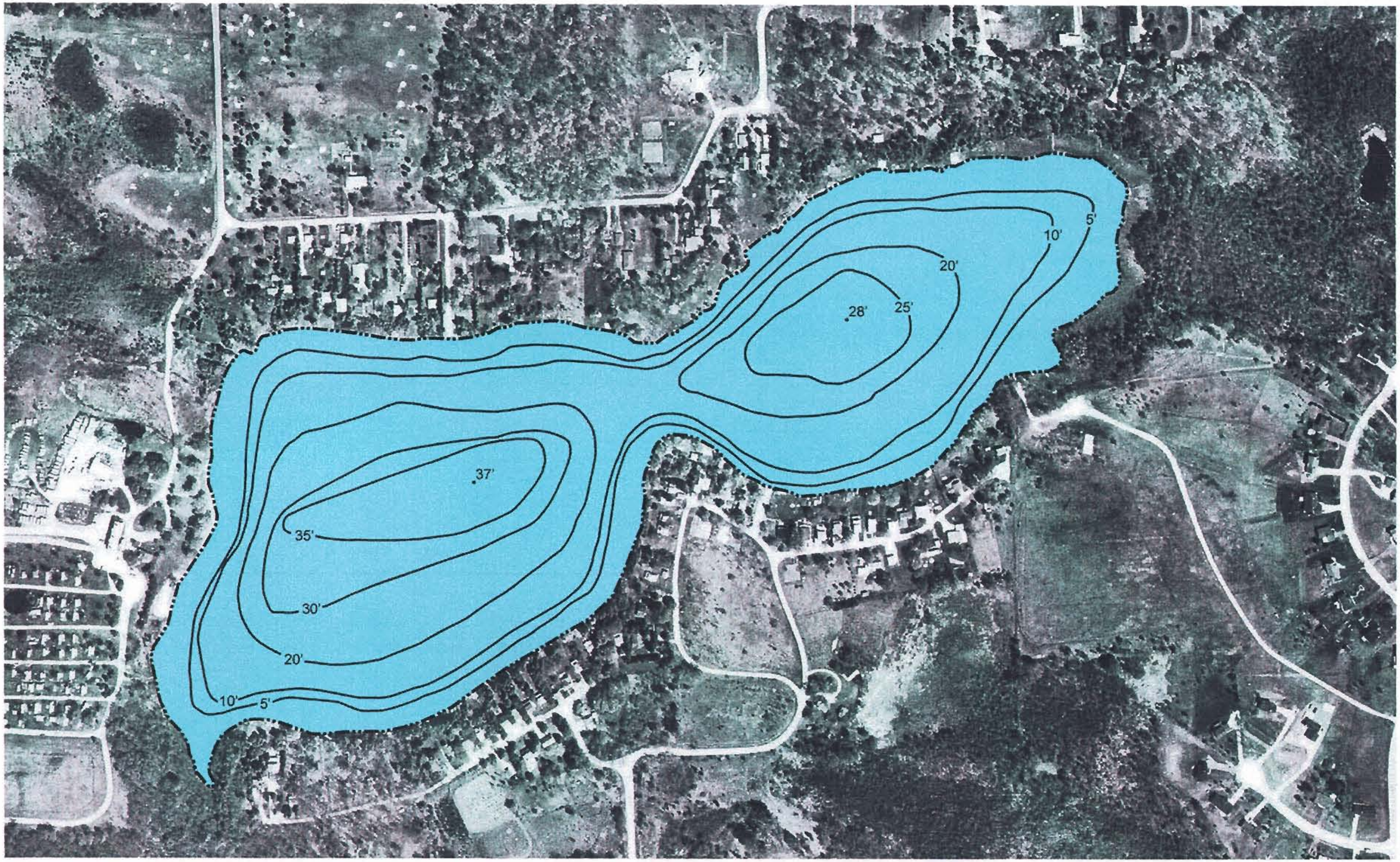
[6] *Wisconsin Conservation Department,* op. cit.

[7] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

[8] *Wisconsin Conservation Department,* op. cit.

Map 35

BATHYMETRIC MAP OF GREEN LAKE



—20'— WATER DEPTH CONTOUR IN FEET

Source: SEWRPC.

N

GRAPHIC SCALE
0 250 500 FEET

and blacknose shiner, pumpkinseed, least and Iowa darter, yellow perch, largemouth bass, green sunfish, bluegill, and bluntnose minnow in 1978; by bluntnose minnow, emerald shiner, silver redhorse, black crappie, pumpkinseed, brown and yellow bullhead, common carp, white sucker, northern pike, green sunfish, largemouth bass, yellow perch, and bluegill in 1980; and by walleyed pike, northern pike, largemouth bass, yellow perch, green sunfish, black crappie, and bluegill in 1984.[9] According to the WDNR, in 1995,[10] largemouth bass and panfish were reported to be common, with northern pike and walleyed pike being present. The Southeastern Wisconsin Regional Planning Commission (SEWRPC) reported the least darter as a State species of special concern.[11] About 60 acres of woody marshland adjoin the southwest corner of the Lake, forming part of a much larger area of marshy deposits occupying part of the old lakebed and restricting residential development to only about 60 percent of the shore. This is an important resting and feeding area, especially for diving ducks. Mallards, blue-winged teal, and Florida gallinule have been noted nesting here.

Miller Lake

Lake Morphometry

Miller Lake is located in U.S. Public Land Survey Section 30, Township 12 North, Range 20 East, Town of Farmington. The Lake has a surface area of about three acres, a maximum depth of 16 feet, and a shoreline development factor of 1.32. The Lake is a small, marsh-fringed remnant basin on the edge of an old glacial lakebed with a seasonal outlet that flows southeast to join a branch of the Milwaukee River.

Recreational Use

Public access is not available.

Development Potential

As of 1995, land use within the drainage area tributary to Miller Lake consisted largely of agricultural and open space uses, with agriculture comprising about 70 percent of the total land cover within the drainage area. Forest and other open space uses comprised about 15 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Miller Lake are primarily agricultural.

Fish and Wildlife Populations

In 1963,[12] the WDNR reported that the fishery consisted of panfish and largemouth bass, though stunted panfish were reported to be a major use problem. According to the WDNR, in 1995,[13] panfish and largemouth bass were reported to be present. A small plot of lowland hardwood forest borders the west shore.

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[9] *D. Fago, Wisconsin Department of Natural Resources Research Report No. 148,* Retrieval and Analysis System Used in Wisconsin's Statewide Fish Distribution Survey, Second Edition, *December 1988.*

[10] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

[11] *SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997.*

[12] *Wisconsin Conservation Department,* op. cit.

[13] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Lake Twelve

Lake Morphometry

Lake Twelve is located in U.S. Public Land Survey Section 12, Township 12 North, Range 20 East, Town of Farmington. The Lake has a surface area of about 53 acres, a maximum depth of 20 feet, and a shoreline development factor of 1.05. A shallow, depression basin in the ground moraine of the Lake Michigan glacier, Lake Twelve is spring fed, with marshy seepage outflow to a small stream tributary to the North Branch of the Milwaukee River. The bathymetry of Lake Twelve is shown on Map 36.

Recreational Use

Public access is available through a carry-in access site maintained by the Wisconsin Department of Natural Resources. A large church camp occupies the southeast shore and provides water-oriented activities for up to 200 campers during the summer.

Development Potential

As of 1995, land use within the drainage area tributary to Lake Twelve consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the total land cover within the drainage area. Surface water comprised about 15 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Lake Twelve are primarily agricultural.

Fish and Wildlife Populations

According to the WDNR, largemouth bass, panfish, and northern pike constituted the fishery in 1963,[14] and carp were identified as a major use problem. In 1995,[15] the WDNR reported that panfish were abundant, largemouth bass common, and northern pike present. The entire north shore is composed of woodlands and wetlands, about 130 acres in areal extent. Mallards and blue-winged teal have been reported to frequent the Lake.

STREAMS

Table 12 contains a summary of selected morphometric data available for named streams in the Farmington area. The streamcourses are shown on Map 32, which also shows the hydrologic drainage areas within the area. Descriptive paragraphs follow, providing a summary of available information on the physical description of each stream for the portion of the stream within Washington County, and of the existing uses and conditions, wildlife habitat, and fishery for the portion of the stream within the Farmington area, to the extent that such information is available. Each of the paragraphs address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69(5)(b) of the *Wisconsin Statutes*.

Erler Lake Outlet

Stream Morphometry

The Erler Lake outlet originates in the southeast portion of the Farmington area. The outlet has a surface area of about two acres and extends over a linear distance of about 1.3 miles with a gradient of approximately 28.5 feet per mile. The outlet is a small, seasonally intermittent tributary to the North Branch of the Milwaukee River. The outlet arises at the Erler Lake dam, and flows northeasterly to the Milwaukee River. In drought years, the stream

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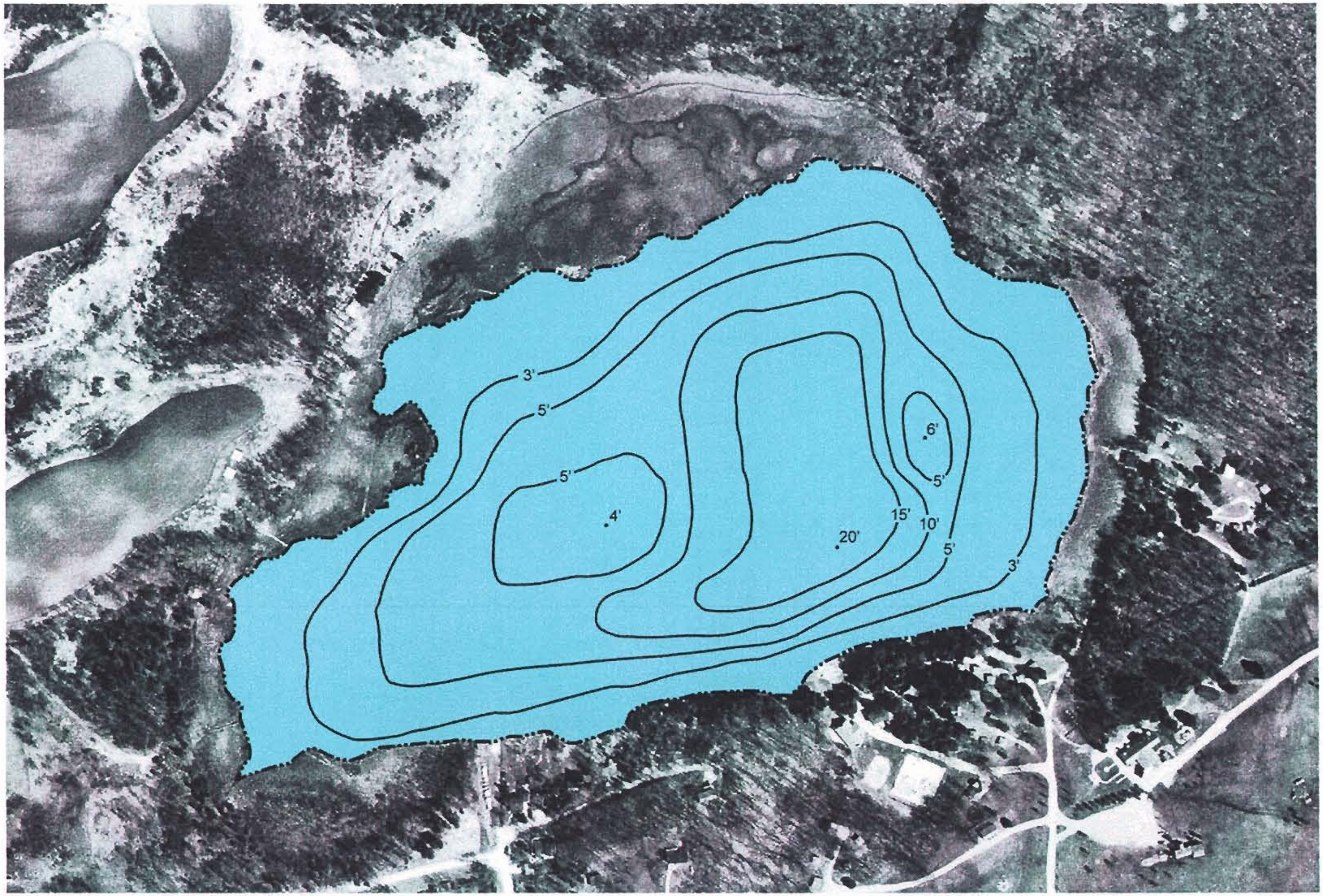
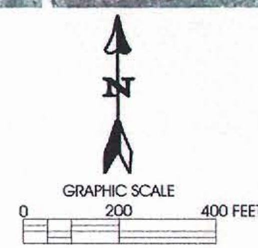
[14] *Wisconsin Conservation Department,* op. cit.

[15] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Map 36

BATHYMETRIC MAP OF LAKE TWELVE





— 5' — WATER DEPTH CONTOUR IN FEET

Source: SEWRPC.

Table 12

PHYSICAL CHARACTERISTICS OF STREAMS WITHIN THE FARMINGTON AREA, WASHINGTON COUNTY[a]

Stream or Watercourse	Length (miles)	Average Width (feet)	Average Depth (feet)	Surface Area (acres)	Drainage Area (square miles)	U.S. Public Land Survey			Subwatershed	Major Watershed
						Town	Range	Section		
Erler Lake Outlet.......	1.3	10	1.25	1.6	1.5	12	20	22,23	North Branch Milwaukee	Milwaukee
Milwaukee River.......	25.8	83	1.50	259.5	130.0	12	20	25	East-West Branches Milwaukee	Milwaukee
North Branch of the Milwaukee River....	8.3	53	4.00	53.3	41.0	12	20	25	North Branch Milwaukee	Milwaukee
Stony Creek............	9.4	11	0.55	12.5	16.0	12	20	14	North Branch Milwaukee	Milwaukee
Wallace Creek........	8.6	12	1.30	12.5	15.0	12	20	14	North Branch Milwaukee	Milwaukee

[a]Stream data are for the portion of the stream within Washington County only. The U.S. Public Land Survey Township, Range, and Section designation included in each description locates the mouth of the stream at its confluence with another named stream or at the point at which it exits the County.

Source: Wisconsin Department of Natural Resources and SEWRPC.

has been observed to cease flowing as the water level of the Lake drops below the level of the overflow structure of the Lake. The Erler Lake outlet is included within the Milwaukee River Priority Watershed project area.[16]

Recreational Use

The Erler Lake outlet has limited navigability, and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential

As of 1995, land use within the Erler Lake outlet drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 70 percent of the total land cover within the drainage area. Woodlands and other open space uses comprised about 10 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to the Erler Lake Outlet are primarily agricultural.

Fish and Wildlife Populations

In 1963,[17] the WDNR reported that forage fishes were the principle occupants of the stream, although northern pike were reported to spawn in the marshy areas near the mouth of the stream.

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[16]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-253-90,* A Nonpoint Source Control Plan for the North Branch Milwaukee River Priority Watershed Project, *July 1989; Wisconsin Department of Natural Resources Publication No. PUBL-WR-229-89,* Milwaukee River Basin Integrated Management Plan, *February 1990.*

[17]*Wisconsin Conservation Department,* op. cit.

Milwaukee River

Stream Morphometry

The Milwaukee River is located in the far southeastern portion of the Farmington area. Within Washington County, the river has a surface area of about 260 acres and extends over a linear distance of about 25.8 miles with a gradient of approximately six feet per mile. The Milwaukee River is the largest stream in Washington County, both in width and length, and, in the past, has provided a major source of water power, especially in the Barton-West Bend area. In 1963, there were five dams on the River in Washington County, although the one in the Town of West Bend, West Bend Millpond, was removed in the 1980s. The Milwaukee River is included within the Milwaukee River Priority Watershed project area.[18]

Recreational Use

The Milwaukee River is navigable by boat or canoe; however, limited public access is available within Washington County.

Development Potential

As of 1995, land use within the Milwaukee River watershed consisted largely of agricultural and open space uses, with agriculture comprising about 45 percent of the total land cover within the watershed. Wetlands and other open space uses comprised about 15 percent of the total land cover. Medium-density urban development also comprised about 10 percent of the total land cover. Portions of the Milwaukee River drainage area are within areas planned for limited urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the Milwaukee River watershed include both urban and agricultural runoff.

Fish and Wildlife Populations

A fish survey conducted in 1924 reported bluntnose and fathead minnow, central mudminnow, redfin shiner, blackside darter, creek and hornyhead chub, johnny darter, largescale stoneroller, rock bass, longear sunfish, southern redbelly dace.[19] In 1978,[20] the fish population in the Farmington area was reported to be comprised of golden redhorse, green sunfish, common carp, yellow and black bullhead, blackside darter, bluntnose minnow, longear sunfish, stonecat, spotfin and common shiner, sand shiner, rock bass, logperch, and white sucker. The redfin shiner has been identified as a State-designated threatened species. SEWRPC reported the longear sunfish as a State-designated threatened species.[21]

North Branch of the Milwaukee River

Stream Morphometry

The North Branch of the Milwaukee River is in the eastern portion of the Farmington area. Within Washington County, the River has a surface area of about 53 acres and extends over a linear distance of about 8.3 miles with a gradient of approximately two feet per mile. The North Branch of the Milwaukee River is a major tributary to the

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[18]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-255-90,* A Nonpoint Source Control Plan for the East and West Branches of the Milwaukee River Priority Watershed Project, *February 1989; Wisconsin Department of Natural Resources, PUBL-WR-253-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

[19]*D. Fago,* op. cit.

[20]Ibid.

[21]*SEWRPC Planning Report No. 42,* op. cit.

Milwaukee River, draining the northeastern corner of Washington County. The Milwaukee River is included within the Milwaukee River Priority Watershed project area.[22]

Recreational Use
The North Branch Milwaukee River is navigable by boat or canoe; however, there is limited public access available within Washington County.

Development Potential
As of 1995, land use within the North Branch of the Milwaukee River drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 65 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 20 percent of the total land cover. Portions of the drainage area are located within areas planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution in the North Branch of the Milwaukee River drainage area are primarily agricultural.

Fish and Wildlife Populations
In 1963,[23] the WDNR reported that smallmouth bass inhabited about four miles of the River below its confluence with Stony Creek; elsewhere suckers and smaller forage fishes were reported to constitute the fishery. In 1973 and 1978,[24] the fish population was reported to be comprised of white sucker; black crappie; blackside and fantail darter; brook stickleback; mottled sculpin; southern redbelly and blacknose dace; johnny darter; bluntnose minnow; hornyhead and creek chub; common shiner; stonerollers; and bluntnose minnow; central mudminnow; stonecat; hornyhead chub; largemouth and rock bass; pumpkinseed; yellow perch; creek chub; black crappie; spotfin, common, sand, and redfin shiner; yellow, brown, and black bullhead; common carp; bluegill; green sunfish; northern pike; golden and greater redhorse; johnny darter; and white sucker; respectively. In 1987,[25] the fish population was reported to be comprised of fantail and blackside darter; largemouth, smallmouth, and rock bass; yellow perch; black and yellow bullhead; greater redhorse; bluntnose minnow; northern pike; black crappie; logperch; southern redbelly dace; white sucker; central mudminnow; spotfin and common shiner; johnny darter; green sunfish; pumpkinseed; golden redhorse; common carp; hornyhead chub; and bluegill. In 1989,[26] the fish population was reported to be comprised of blackside darter, central mudminnow, johnny darter, logperch, smallmouth and rock bass, southern redbelly dace, white sucker, yellow perch, black crappie, black bullhead, northern pike, green sunfish, bluntnose minnow, greater redhorse, pumpkinseed, golden redhorse, sand and spotfin shiner, bluegill, creek and hornyhead chub, and common carp. In 1990,[27] the fish population was reported to be comprised of bluegill; green sunfish; rock bass; yellow and black bullhead; white sucker; northern pike; hornyhead chub; sand, common, and spotfin shiner; pumpkinseed; golden and greater redhorse; and common

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[22] *Wisconsin Department of Natural Resources, PUBL-WR-255-90; Wisconsin Department of Natural Resources, PUBL-WR-253-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

[23] *Wisconsin Conservation Department,* op. cit.

[24] *D. Fago,* op. cit.

[25] Ibid.

[26] Ibid.

[27] Ibid.

carp. In 1991 and 1992,[28] the fish population was reported to be comprised of white sucker, greater and golden redhorse, common carp, and redhorses and common carp, respectively. In 1993,[29] the fish population was reported to be comprised of bigmouth and spotfin shiner; golden and greater redhorse; stonecat; black and yellow bullhead; bluegill; central mudminnow; largemouth, smallmouth, and rock bass; green sunfish; black crappie; blackside darter; sand and common shiner; pumpkinseed; bluntnose minnow; logperch; northern pike; common carp; johnny darter; hornyhead chub; and white sucker. SEWRPC reported the greater redhorse and the redfin shiner as State-designated threatened species.[30] There are several perennial feeder streams draining to the River; namely, Stony Creek, Erler Lake outlet, Wallace Creek, and the ditched outlet stream from the marshy basin of Lake Twelve. In all, they constitute about 25 miles of tributary stream.

Stony Creek

Stream Morphometry

Stony Creek is located in the northern portion of the Farmington area. The Creek has a surface area of about 13 acres and extends over a linear distance of about 9.4 miles with a gradient of approximately 10 feet per mile. The Creek is a tributary to the North Branch of the Milwaukee River, originating at Haack Lake in Sheboygan County. The stream is impounded by the Boltonville Millpond at the unincorporated hamlet of Boltonville. Stony Creek is included within the Milwaukee River Priority Watershed project area.[31]

Recreational Use

Stony Creek has limited navigability, and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential

As of 1995, land use within the Stony Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 65 percent of the total land cover within the drainage area. Woodlands and other open space uses comprised about 15 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the Stony Creek drainage area are primarily agricultural.

Fish and Wildlife Populations

In 1924,[32] the fish population of this Creek was reported to be comprised of brook stickleback, largescale stoneroller, southern redbelly and blacknose dace, hornyhead and creek chub, largemouth bass, fantail and johnny darter, fathead and bluntnose minnow, white sucker, and common shiner. According to the WDNR, smallmouth bass constituted a major fishery in 1963.[33] Upstream of Boltonville, forage fish were reported to be dominant in

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[28]Ibid.

[29]Ibid.

[30]*SEWRPC Planning Report No. 42,* op. cit.

[31]*Wisconsin Department of Natural Resources, PUBL-WR-253-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

[32]*D. Fago,* op. cit.

[33]*Wisconsin Conservation Department,* op. cit.

1963. In 1978,[34] the fish population of the Creek was comprised of common, spotfin, and striped shiner; blacknose and southern redbelly dace; fantail and johnny darter; black bullhead; brook stickleback; pumpkinseed; logperch; green sunfish; northern pike; hornyhead and creek chub; and white sucker. SEWRPC reported the striped shiner as a State-designated endangered species.[35]

Wallace Creek

Stream Morphometry

Wallace Creek is located in the southwestern portion of the Farmington area. The Creek has a surface area of about 13 acres and extends over a linear distance of about 8.6 miles with a gradient of approximately 11 feet per mile. The Creek is a tributary to the North Branch of the Milwaukee River originating in a wooded wetland complex located west of Green Lake. The Creek also serves as an intermittent outlet to Wallace Lake. A complex of ponds, including Einey Lake, was managed as a private fish hatchery in 1963, and provided a major source of water to the Creek. Wallace Creek is included within the Milwaukee River Priority Watershed project area.[36]

Recreational Use

Wallace Creek has limited navigability, and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential

As of 1995, land use within the Wallace Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 75 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 10 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the Wallace Creek drainage area are primarily agricultural.

Fish and Wildlife Populations

In 1963,[37] the WDNR reported that forage fishes constituted the fishery in the Creek. In 1978,[38] the fish population of the Creek was reported to be comprised of blacknose and southern redbelly dace; bluegill; central mudminnow; least, Iowa, fantail, and johnny darter; common, redfin, and spotfin shiner; stonecat; tadpole madtom; yellow perch; pumpkinseed; mottled sculpin; fathead and bluntnose minnow; green sunfish; yellow bullhead; black crappie; rock and largemouth bass; northern pike; creek and hornyhead chub; and white sucker. In 1986,[39] the fish population was reported to be comprised of white sucker, central mudminnow, and creek chub. SEWRPC reported the presence of the redfin shiner, a State-designated threatened species, and the least darter, a State species of special concern.[40]

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[34]*D. Fago,* op. cit.

[35]*SEWRPC Planning Report No. 42,* op. cit.

[36]*Wisconsin Department of Natural Resources, PUBL-WR-253-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

[37]*Wisconsin Conservation Department,* op. cit.

[38]*D. Fago,* op. cit.

[39]Ibid.

[40]*SEWRPC Planning Report No. 42,* op. cit.

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Chapter VII

INVENTORY FINDINGS: GERMANTOWN AREA

INTRODUCTION

This chapter presents the inventory findings relating to lakes and streams in the Germantown area of Washington County. The Germantown area is shown on Map 37 and includes all of U.S. Public Land Survey Sections 1 through 36, Town 9 North, Range 20 East. The area includes the entire Town of Germantown, the Village of Germantown, and a very small (less than 0.05 square mile) potion of the City of Milwaukee. To the extent that data are available, relevant land use, recreational use, morphometric, water quality, and biological information upon which waterbody classifications are to be based pursuant to the requirements of Section 281.69(5)(b), *Wisconsin Statutes*, is presented for each waterbody inventoried. These data form the scientific and technical basis for the determination of the alternative and recommended waterbody classification schemes set forth in Chapter XVI.

LAND USE

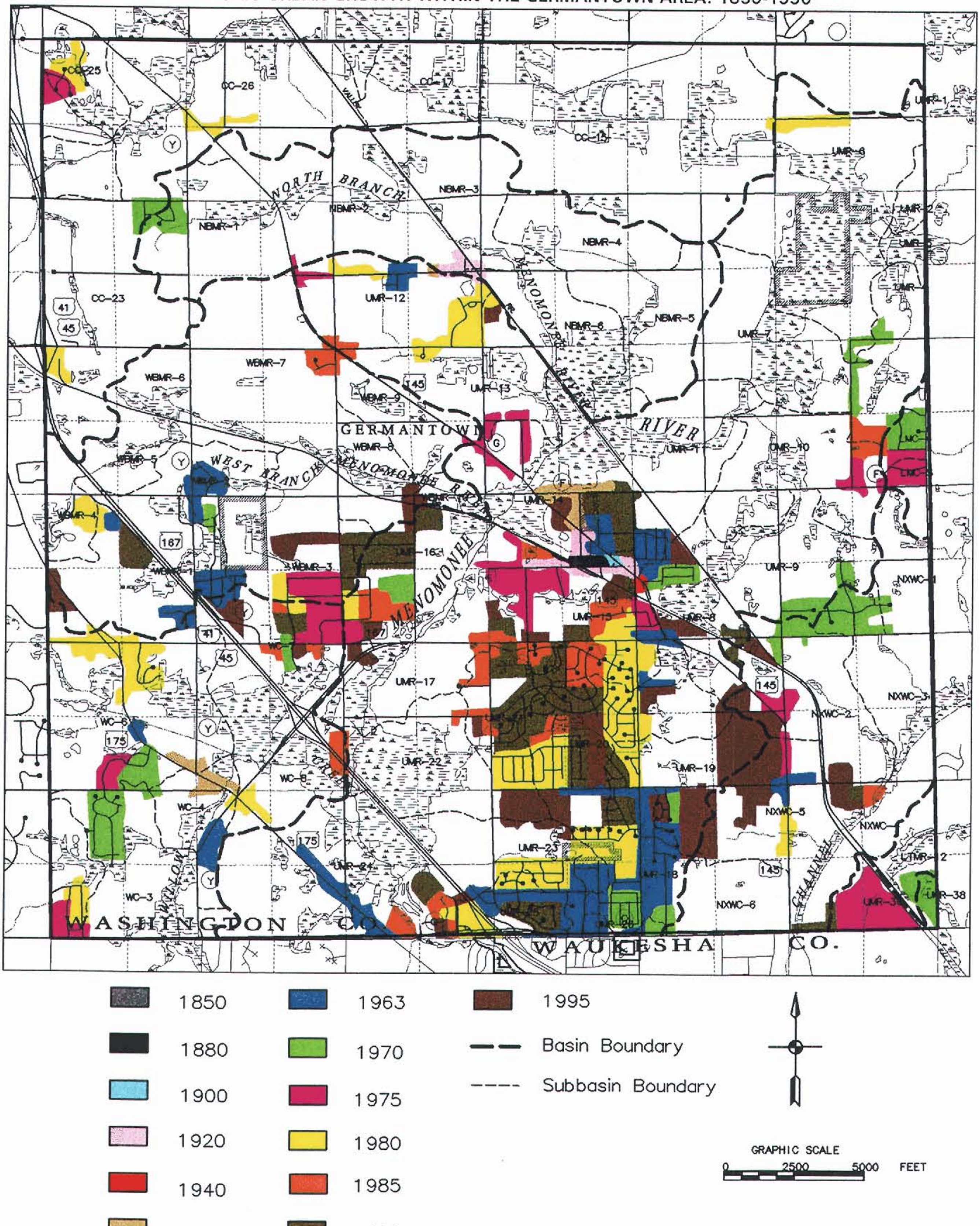
The type, intensity, and spatial distribution of the various land uses within the Germantown area are important determinants of water quality and recreational use demands. The current and planned future land use patterns, placed within the context of the historical development in the area, therefore, are important considerations in any waterbody management planning.

While some settlement occurred prior to 1940, most urban development occurred in the Germantown area since 1940. The Germantown area remains largely rural in character, although the south-central portion of the area within the Village of Germantown has been significantly developed. Map 37 indicates the historic urban growth pattern in the Germantown area since 1850. Some early development occurred in the central portions of the area, during the 1800s and early 1900s. However, since the 1950s, urban land use development in the area has proceeded rapidly, extending outwards within the incorporated areas of the Village of Germantown in the south-central portions of the area. As shown on Map 37, the urban development of the lands in the area has largely occurred since the mid-1950s.

The existing land use pattern in the Germantown area, as of 1995, is shown on Map 38, and is quantified in Table 13. As indicated in Table 13, about 5,700 acres, or about 25 percent of the area, were devoted to urban land uses. The dominant urban land use was residential, encompassing about 2,800 acres, or about 50 percent of the area in urban use. As of 1995, about 17,500 acres, or about 75 percent of the area, were still devoted to rural land uses. About 11,400 acres, or about 65 percent of the rural area, were in agricultural land uses. Woodlands, wetlands, and surface water, including the surface area of the lakes in the area, accounted for approximately 4,700 acres, or about 27 percent, of the area in rural use. Future growth in urban land use, based upon the recommendations set forth in the adopted 2020 regional land use plan shown on Map 39, is anticipated in the southern and central portions of the area, within the currently incorporated area of the Village of Germantown. Elsewhere, however, future land use is not anticipated to differ greatly from the current condition.

Map 37

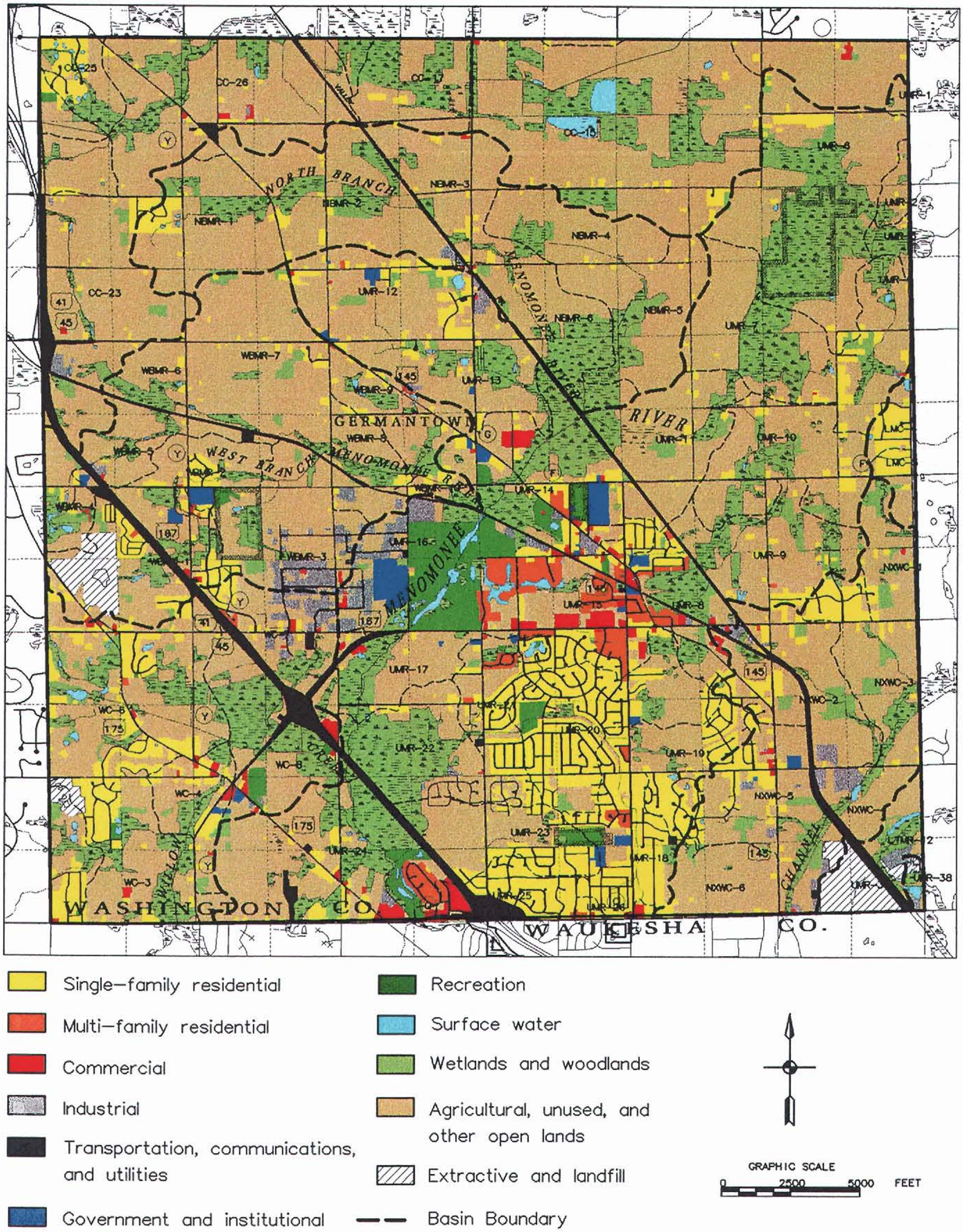
HISTORIC URBAN GROWTH WITHIN THE GERMANTOWN AREA: 1850-1990



Source: SEWRPC.

Map 38

EXISTING LAND USE WITHIN THE GERMANTOWN AREA: 1995



Source: SEWRPC.

Table 13

EXISTING LAND USE WITHIN THE GERMANTOWN AREA: 1995

Land Use Categories	Acres	Percent of Major Category	Percent of Total Area
Urban			
Residential	2,833	50.0	12.2
Commercial	131	2.2	0.6
Industrial	265	4.7	1.2
Governmental and Institutional	141	2.5	0.6
Transportation and Utilities	1,848	32.6	8.0
Recreation	384	6.8	1.6
Land under Development	72	1.2	0.3
Subtotal	5,674	100.0	24.5
Rural			
Agricultural	11,372	64.9	49.0
Wetlands	3,813	21.8	16.4
Woodlands	685	3.9	3.0
Water	173	1.0	0.7
Extractive	156	0.9	0.7
Landfill	112	0.6	0.5
Other Open Lands	1,209	6.9	5.2
Subtotal	17,520	100.0	75.5
Total	23,194	- -	100.0

Source: SEWRPC.

LAKES

There are no major lakes in the Germantown area. Major lakes are defined as those lakes within the Southeastern Wisconsin Region having a surface area of 50 or more acres in areal extent. However, one minor lake, Rockfield Quarry Pond, is located within the Germantown area, and is illustrated on Map 40. Table 14 contains selected morphometric data that is available for the pond. Wetlands within the Germantown area are shown on Map 41.

Rockfield Quarry Pond

Lake Morphometry

Rockfield Quarry Pond is located in U.S. Public Land Survey Section 9, Township 9 North, Range 20 East, Village of Germantown. The pond has a surface area of about three acres, a maximum depth of 27 feet, and a shoreline development factor of 1.20. The pond is formed from a Niagara limestone quarry within the Village limits.

Lake Water Quality

The water is highly alkaline and green algal blooms are common throughout the summer.

Recreational Use

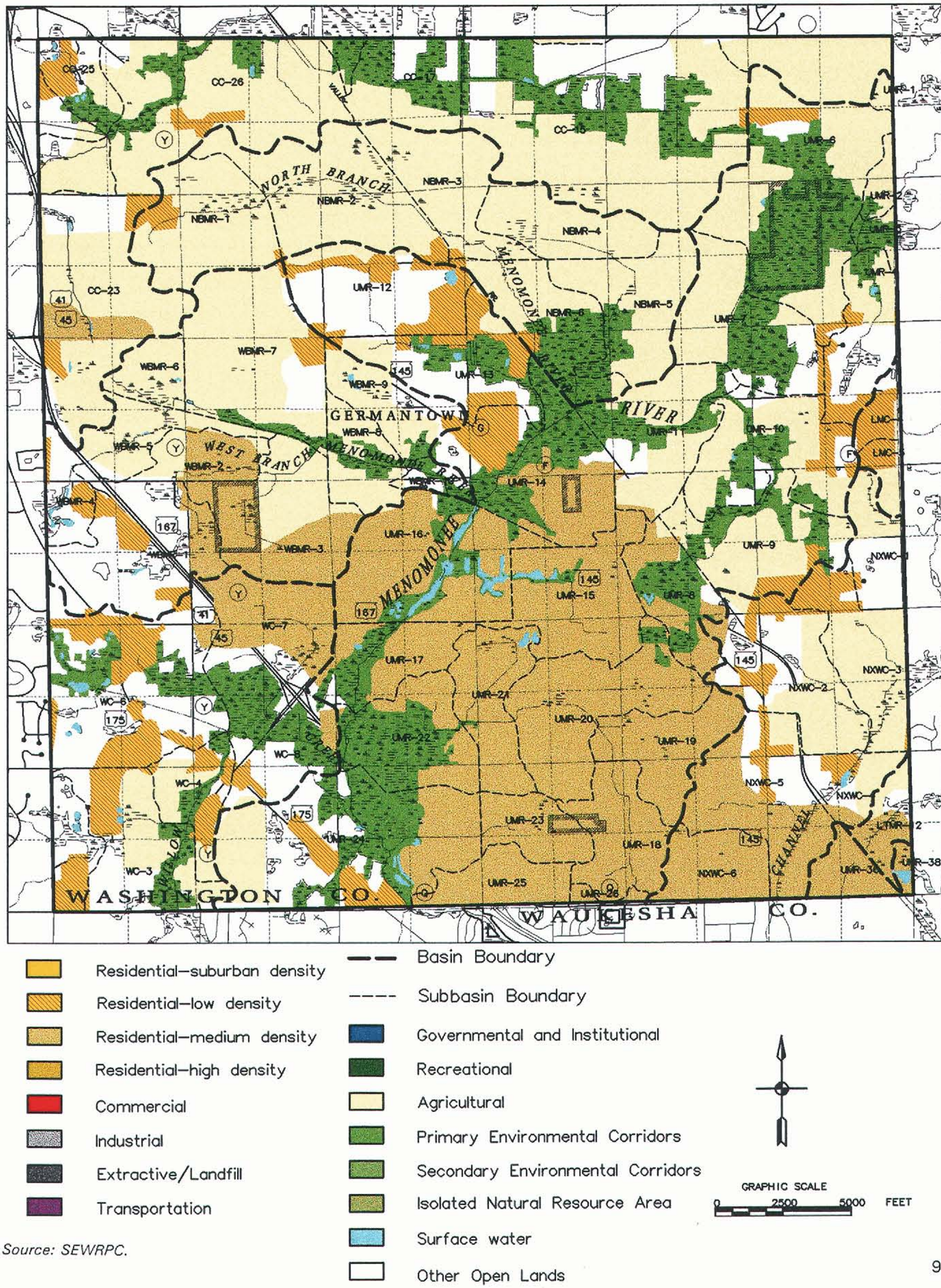
The quarry pond is presently a Village park, but swimming is discouraged since the banks are very steep and the mean depth over 18 feet.

Development Potential

As of 1995, land use within the drainage area tributary to Rockfield Quarry Pond consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the total land cover within the drainage area.

Map 39

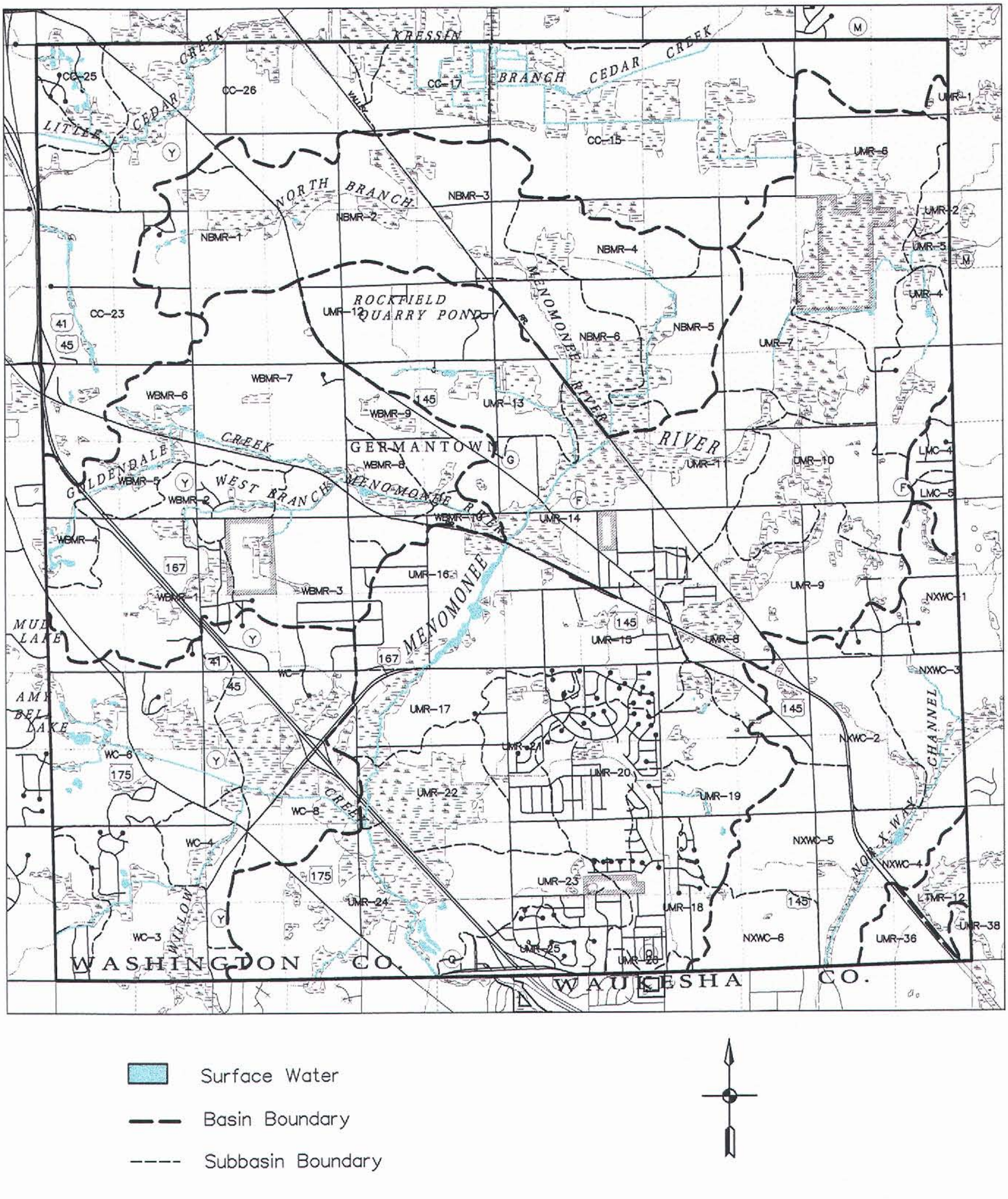
ADOPTED REGIONAL LAND USE PLAN FOR THE GERMANTOWN AREA: 2020



Source: SEWRPC.

Map 40

SURFACE WATER RESOURCES WITHIN THE GERMANTOWN AREA: 1995



Source: SEWRPC.

Table 14

HYDROLOGY AND MORPHOMETRY OF LAKES WITHIN THE GERMANTOWN AREA, WASHINGTON COUNTY

Lake	Surface Area (acres)	Subwatershed Area (acres)	Volume (acre-feet)	Water Residence Time (years)	Maximum Length of Lake (miles)	Length of Shoreline (miles)	Maximum Width of Lake (miles)	Shoreline Development Factor[a]	Maximum Depth (feet)	Mean Depth (feet)
Rockfield Quarry.....	3	--[b]	--[b]	--[b]	0.2	0.3	0.2	1.20	27	>18

[a]*Shoreline Development Factor is the ratio between the actual circumference of a lake and the circumference of a circle with the same radius. A circular lake would have a Shoreline Development Factor of 1.0, while a dendritic lake would have a Shoreline Development Factor in excess of 1.0.*

[b]*No data available.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Medium-density urban development comprised about 20 percent of the total land cover. The drainage area is partially located in an area planned for low density urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Rockfield Quarry Pond include both agricultural and urban runoff.

Fish and Wildlife Populations
In 1963,[1] the quarry owner leased the pond to a bait dealer who harvested minnows, and, possibly, privately stocked bullheads and panfish. As of 1995,[2] panfish were common and largemouth bass were present.

STREAMS

Table 15 contains a summary of selected morphometric data available for named streams in the Germantown area. The streamcourses are shown on Map 40, which also shows the hydrologic drainage areas within the area. Descriptive paragraphs follow, providing a summary of available information on the physical description of each stream for the portion of the stream within Washington County, and of the existing uses and conditions, wildlife habitat, and fishery for the portion of the stream within the Germantown area, to the extent that such info is available. Each of the paragraphs address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69(5)(b) of the *Wisconsin Statutes*.

Kressin Branch of Little Cedar Creek
Stream Morphometry
The Kressin Branch of Little Cedar Creek, also known as Kressin Creek, is located in the northern portion of the Germantown area. The Creek has a surface area of about seven acres and extends over a linear distance of about 4.7 miles with a gradient of approximately two feet per mile. The Kressin Branch of Little Cedar Creek is a system of ditches tributary to Little Cedar Creek. Kressin Creek is included within the Cedar Creek Priority Watershed project area.[3]

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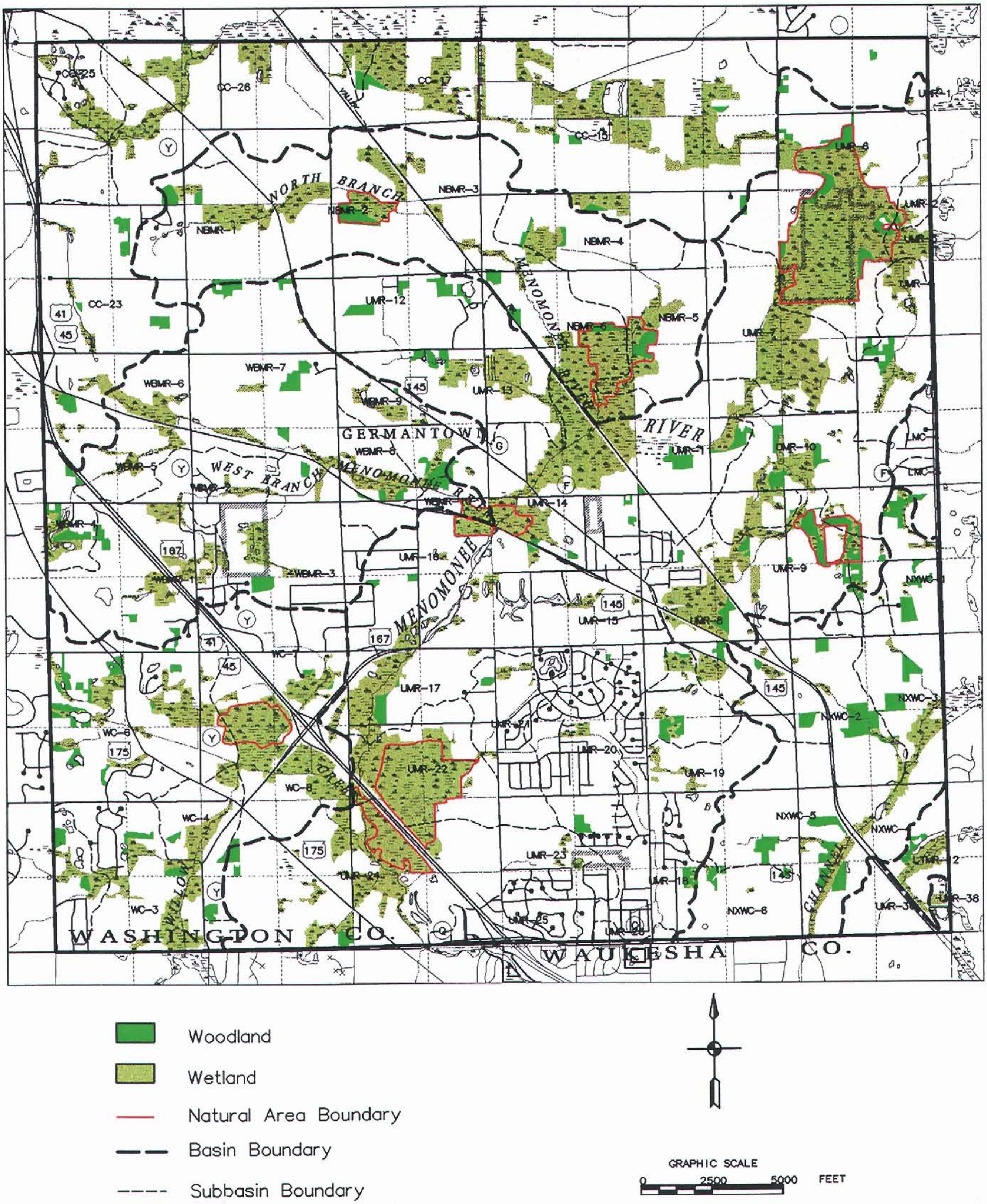
[1]*Wisconsin Conservation Department,* Surface Water Resources of Washington County, *1963.*

[2]*Wisconsin Department of Natural Resources Publication No. PUBL-FM-800 95REV,* Wisconsin Lakes, *1995.*

[3]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-336-93,* A Nonpoint Source Control Plan for the Cedar Creek Priority Watershed Project, *December 1991.*

Map 41

WETLANDS AND WOODLANDS WITHIN THE GERMANTOWN AREA: 1995



Source: SEWRPC.

Table 15

PHYSICAL CHARACTERISTICS OF STREAMS WITHIN THE GERMANTOWN AREA, WASHINGTON COUNTY[a]

Stream or Watercourse	Length (miles)	Average Width (feet)	Average Depth (feet)	Surface Area (acres)	Drainage Area (square miles)	U.S. Public Land Survey			Subwatershed	Major Watershed
						Town	Range	Section		
West Branch of the Menomonee River (Goldendale Creek)	2.0	8	0.50	1.9	5.5	9	20	22	Menomonee (West Branch)	Menomonee
Menomonee River	6.2	18	1.85	13.5	33.0	9	20	33	Upper Menomonee River	Menomonee
Willow Creek	2.3	12	0.50	3.3	4.5	9	20	33	Upper Menomonee River	Menomonee
Kressin Branch	4.7	12	2.00	6.8	6.0	10	20	32	Cedar Creek	Milwaukee
Little Cedar Creek	6.0	9	0.67	6.5	16.0	10	20	30	Cedar Creek	Milwaukee

[a]Stream data are for the portion of the stream within Washington County only. The U.S. Public Land Survey Township, Range, and Section designation included in each description locates the mouth of the stream at its confluence with another named stream or at the point at which it exits the County.

Source: Wisconsin Department of Natural Resources and SEWRPC.

Recreational Use

The Kressin Branch of Little Cedar Creek has limited navigability and is generally navigable only by canoe or similar watercraft with difficulty.

Development Potential

As of 1995, land use within the Kressin Branch drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 70 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 20 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the Kressin Branch drainage area are primarily agricultural.

Fish and Wildlife Populations

In 1963,[4] the Wisconsin Department of Natural Resources (WDNR) reported that the Kressin Branch had little value other than for drainage and forage fish production. A fish survey conducted in 1978 reported the fish population to be comprised of largemouth bass, bluntnose and fathead minnow, golden shiner, pumpkinseed and green sunfish, black bullhead, johnny darter, central mudminnow, and white sucker.[5]

Little Cedar Creek

Stream Morphometry

Little Cedar Creek is located in the northwestern portion of the Germantown area. The Creek has a surface area of about six acres and extends over a linear distance of about six miles with a gradient of approximately 18 feet per

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[4]*Wisconsin Conservation Department,* op. cit.

[5]*D. Fago, Wisconsin Department of Natural Resources Research Report No. 148,* Retrieval and Analysis System Used in Wisconsin's Statewide Fish Distribution Survey, Second Edition, *December 1988.*

mile. Little Cedar Creek is a small stream originating at the base of the interlobate moraine system and flowing easterly to Cedar Creek. Little Cedar Creek is included within the Cedar Creek Priority Watershed project area.[6]

Recreational Use
Little Cedar Creek has limited navigability and is generally navigable only by canoe or similar watercraft with difficulty.

Development Potential
As of 1995, land use within the Little Cedar Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 40 percent of the total land cover within the drainage area. Woodlands and other open space uses comprised about 20 percent of the total land cover. The drainage area is partially located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the Little Cedar Creek drainage area are primarily agricultural.

Fish and Wildlife Populations
Much of the Creek is ditched and the WDNR reported that fishery values were limited in 1963[7] by seasonal fluctuations in flow. Fisheries surveys were conducted in 1975 and 1978.[8] In 1975, fish populations were reported to be comprised of white sucker, brook stickleback, green sunfish, tadpole madtom, rock bass, common and central stoneroller, johnny and fantail darter, creek and hornyhead chub, bluntnose minnow, central mudminnow, blackstripe topminnow, blacknose dace, black crappie, northern pike, bluegill, and common and golden shiner.

Menomonee River
Stream Morphometry
The Menomonee River is located in the central portion of the Germantown area. Within Washington County, the River has a surface area of about 14 acres and extends over a linear distance of about 6.2 miles with a gradient of approximately two feet per mile. The headwater portion of this River drains a broad valley of marshy soils. The River has two tributaries in Washington County; namely, the West Branch of the Menomonee River, previously discussed, and Willow Creek. The Menomonee River, and its major tributary streams, is included within the Menomonee River Priority Watershed project area.[9]

Recreational Use
The Menomonee River is navigable only by canoe.

Development Potential
As of 1995, land use within the Menomonee River subwatershed consisted largely of agricultural and open space uses, with agriculture comprising about 30 percent of the total land cover within the subwatershed. Wetlands and other open spaces comprised about 20 percent of the total land cover. The subwatershed is partially located within an area planned for urban development in the regional land use plan.

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[6] *Wisconsin Department of Natural Resources, PUBL-WR-336-93.*

[7] *Wisconsin Conservation Department,* op. cit.

[8] *D. Fago,* op. cit.

[9] *Wisconsin Department of Natural Resources Publication No. PUBL-WR-244-92,* A Nonpoint Source Control Plan for the Menomonee River Priority Watershed Project, *March 1992; Wisconsin Department of Natural Resources Publication No. PUBL-WR-229-89,* Milwaukee River Basin Integrated Management Plan, *February 1990.*

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the Menomonee River subwatershed include both agricultural and urban runoff.

Fish and Wildlife Populations

In 1963,[10] forage fishes were most common, with limited numbers of common carp and white sucker in the spring of each year. An early fish survey conducted in 1924 reported the fish population to be comprised of least, fantail, and johnny darter; pearl, southern redbelly, and blacknose dace; central mudminnow; creek chub; brook stickleback; and white sucker.[11] In 1973,[12] the fish population in the Germantown area was reported to be comprised of brassy, bluntnose, and fathead minnow; golden shiner; largemouth bass; creek chub; johnny darter; white sucker; black bullhead; brook stickleback; pumpkinseed; green sunfish; and central mudminnow. In 1984,[13] the fish population was comprised of common carp, black bullhead, largemouth bass, golden shiner, johnny darter, bluntnose minnow, white sucker, and central mudminnow. The least darter has been identified as a State-designated threatened species.

West Branch of the Menomonee River

Stream Morphometry

The West Branch of the Menomonee River is located in the western portion of the Germantown area. Within Washington County, the River has a surface area of about two acres and extends over a linear distance of about two miles with a gradient of approximately 20 feet per mile. The River is formed by a ditched drainage system originating in intermittent channels near the unincorporated hamlet of Goldendale (Goldenthal) and flowing eastward to the Menomonee River. The West Branch of the Menomonee River, Goldenthal subwatershed, is included within the Menomonee River Priority Watershed project area.[14]

Recreational Use

The West Branch of the Menomonee River has limited navigability, and is generally navigable only by canoe or similar watercraft with difficulty.

Development Potential

As of 1995, land use within the West Branch of the Menomonee River subwatershed consisted largely of agricultural and open space uses, with agriculture comprising about 75 percent of the total land cover within the subwatershed. Wetlands and other open space uses comprised about 10 percent of the total land cover. The subwatershed is partially located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the West Branch of the Menomonee River subwatershed are primarily agricultural.

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[10] *Wisconsin Conservation Department,* op. cit.

[11] *D. Fago,* op. cit.

[12] Ibid.

[13] Ibid.

[14] *Wisconsin Department of Natural Resources, PUBL-WR-244-92; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

Fish and Wildlife Populations

In 1963,[15] the River had very limited fishery value and served chiefly as a drainage system. A fish survey conducted in 1973 reported the fish population to be comprised of johnny darter, creek chub, white sucker, northern redbelly and pearl dace, blacknose dace, green sunfish, fathead minnow, brook stickleback, and central mudminnow.[16] In 1984,[17] the fish population of the Creek was comprised of blacknose dace, hornyhead and creek chub, fathead and bluntnose minnow, central mudminnow, central stoneroller, white sucker, johnny darter, and green sunfish.

Willow Creek

Stream Morphometry

Willow Creek is located in the southwest portion of the Germantown area. The Creek has a surface area of about three acres and extends over a linear distance of about 2.3 miles with a gradient of approximately four feet per mile. The Creek is a system of generally intermittent ditches tributary to the Menomonee River, draining lowland marsh deposits and ground moraines.

Recreational Use

Willow Creek has limited navigability, and is generally navigable only by canoe or similar watercraft with difficulty.

Development Potential

As of 1995, land use within the Willow Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 30 percent of the total land cover within the drainage area. Wetlands and other open space uses comprise about 15 percent of the total land cover. Medium-density urban development also comprises about 20 percent of the total land cover. The drainage area is partially located within an area planned for limited urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the Willow Creek drainage areas include both agricultural and urban runoff.

Fish and Wildlife Populations

In 1963,[18] there was reported to be limited fishery value, with the Creek being inhabited primarily by bait minnows. In 1973,[19] the fish population was comprised of fathead and bluntnose minnow, fantail and johnny darter, pearl and blacknose dace, green sunfish, central mudminnow, white sucker, brook stickleback, and creek chub. In 1984,[20] the fish population was comprised of fathead and bluntnose minnow, johnny darter, pearl dace, bluegill, central mudminnow, white sucker, brook stickleback, black bullhead, largemouth bass, and creek chub.

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[15] *Wisconsin Conservation Department,* op. cit.

[16] *D. Fago,* op. cit.

[17] Ibid.

[18] *Wisconsin Conservation Department,* op. cit.

[19] *D. Fago,* op. cit.

[20] Ibid.

Chapter VIII

INVENTORY FINDINGS: HARTFORD AREA

INTRODUCTION

This chapter presents the inventory findings relating to lakes and streams in the Hartford area of Washington County. The Hartford area is shown on Map 42 and includes all of U.S. Public Land Survey Sections 1 through 36, Town 10 North, Range 18 East. The area includes the entire Town of Hartford, the entire portion of the City of Hartford within Washington County, and the extreme western portions of the Village of Slinger. To the extent that data are available, relevant land use, recreational use, morphometric, water quality, and biological information upon which waterbody classifications are to be based pursuant to the requirements of Section 281.69(5)(b), *Wisconsin Statutes*, is presented for each waterbody inventoried. These data form the scientific and technical basis for the determination of the alternative and recommended waterbody classification schemes set forth in Chapter XVI.

LAND USE

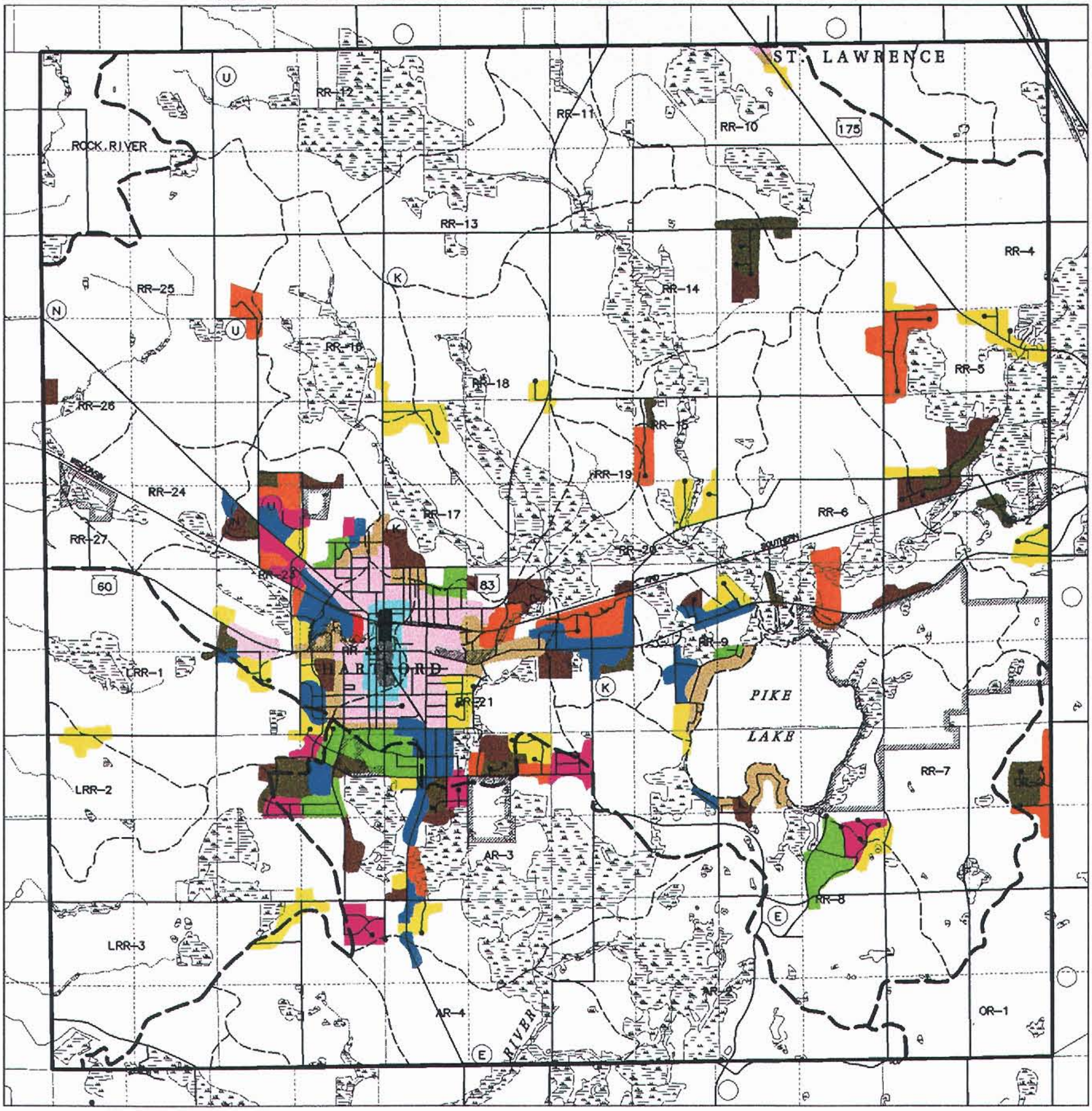
The type, intensity, and spatial distribution of the various land uses within the Hartford area are important determinants of water quality and recreational use demands. The current and planned future land use patterns, placed within the context of the historical development in the area, therefore, are important considerations in any waterbody management planning effort.

While settlement began in the Hartford area during the late 1800s, significant urban development has occurred in the Hartford area since 1900. The Town of Hartford remains largely rural in character, although the portion of the area within the City of Hartford has been significantly developed. Map 42 indicates the historic urban-growth pattern in the Hartford area since 1850. Early development occurred in the west-central portions of the area, that later became incorporated as the City of Hartford in 1883. Growth continued around the City through the early 1920s. Between the 1920s and 1950s, urban growth in the area remained static. However, since the 1940s, urban land use development in the area has proceeded more rapidly, extending outward from the incorporated areas of the City of Hartford and in selected other areas, including portions of the shoreline of Pike Lake.

The existing land use pattern in the Hartford area, as of 1995, is shown on Map 43, and is quantified in Table 16. As indicated in Table 16, about 3,800 acres, or about 16 percent of the area, were devoted to urban land uses. The dominant urban land use was residential, encompassing about 1,800 acres, or about 47 percent of the area in urban use. As of 1995, about 19,700 acres, or about 84 percent of the area, were still devoted to rural land uses. About 13,600 acres, or about 69 percent of the rural area, were in agricultural land uses. Woodlands, wetlands, and surface water, including the surface area of the lakes in the area, accounted for approximately 5,000 acres, or about 25 percent of the area in rural use. Future growth in urban land use, based upon the recommendations set forth in the adopted 2020 regional land use plan shown on Map 44, is anticipated in the central and western portions of the area, within and adjacent to the currently incorporated area of the City of Hartford, and north of Pike Lake. Elsewhere, however, land use is not anticipated to differ greatly from the current condition.

Map 42

HISTORIC URBAN GROWTH WITHIN THE HARTFORD AREA: 1850-1990



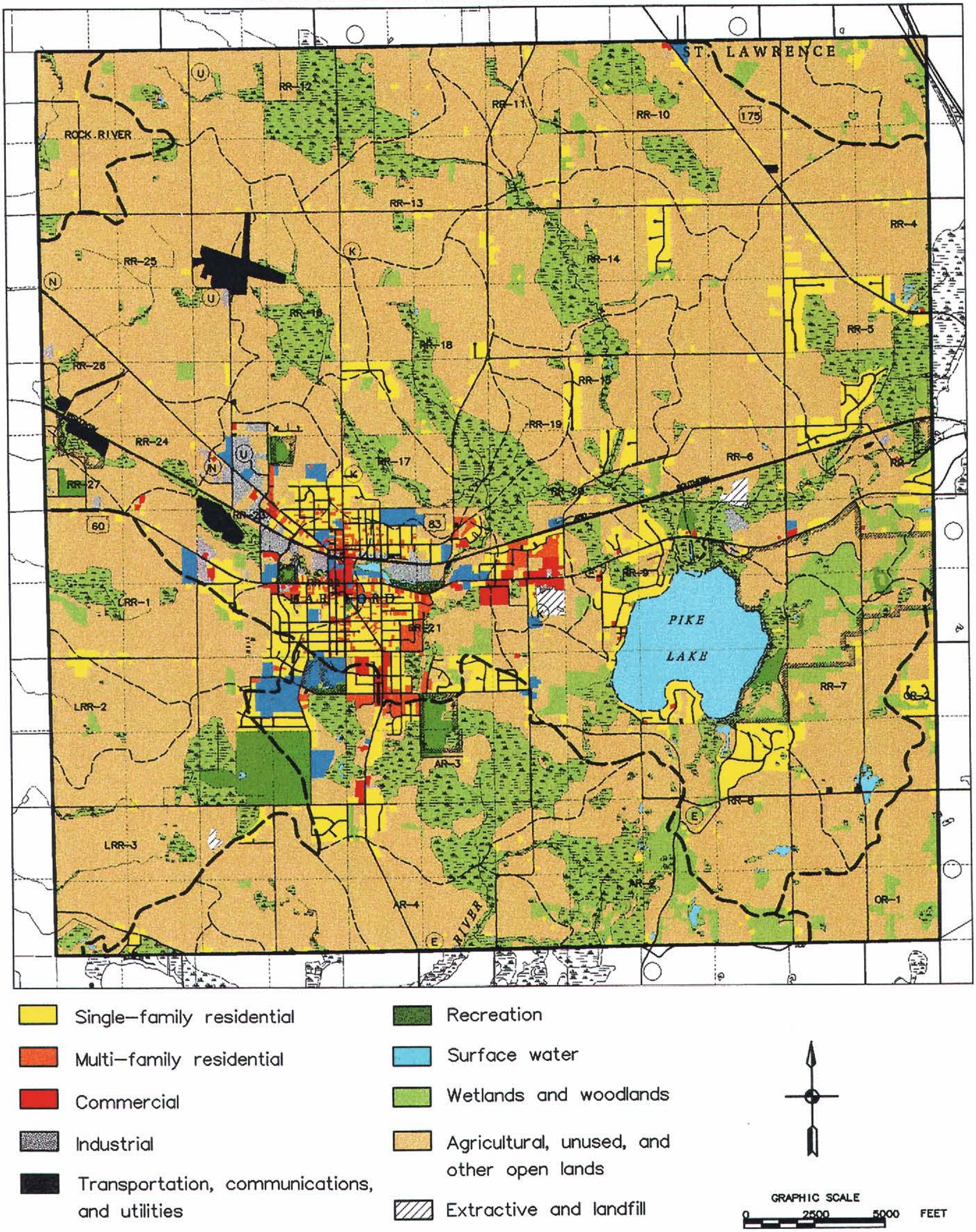
1850
1880
1900
1920
1940
1950
1963
1970
1975
1980
1985
1990
1995
Basin Boundary
Subbasin Boundary

GRAPHIC SCALE
0 2500 5000 FEET

Source: SEWRPC.

Map 43

EXISTING LAND USE WITHIN THE HARTFORD AREA: 1995



Source: SEWRPC.

Table 16

EXISTING LAND USE WITHIN THE HARTFORD AREA: 1995

Land Use Categories	Acres	Percent of Major Category	Percent of Total Area
Urban			
Residential	1,763	46.6	7.5
Commercial	81	2.1	0.3
Industrial	136	3.6	0.6
Governmental and Institutional	190	5.0	0.8
Transportation and Utilities	1,268	33.4	5.4
Recreation	309	8.1	1.3
Land under Development	48	1.2	0.2
Subtotal	3,795	100.0	16.1
Rural			
Agricultural	13,590	68.9	57.8
Wetlands	3,452	17.5	14.7
Woodlands	1,013	5.1	4.3
Water	531	2.7	2.3
Extractive	42	0.2	0.2
Landfill	- -	- -	- -
Other Open Lands	1,091	5.6	4.6
Subtotal	19,719	100.0	83.9
Total	23,514	- -	100.0

Source: SEWRPC.

LAKES

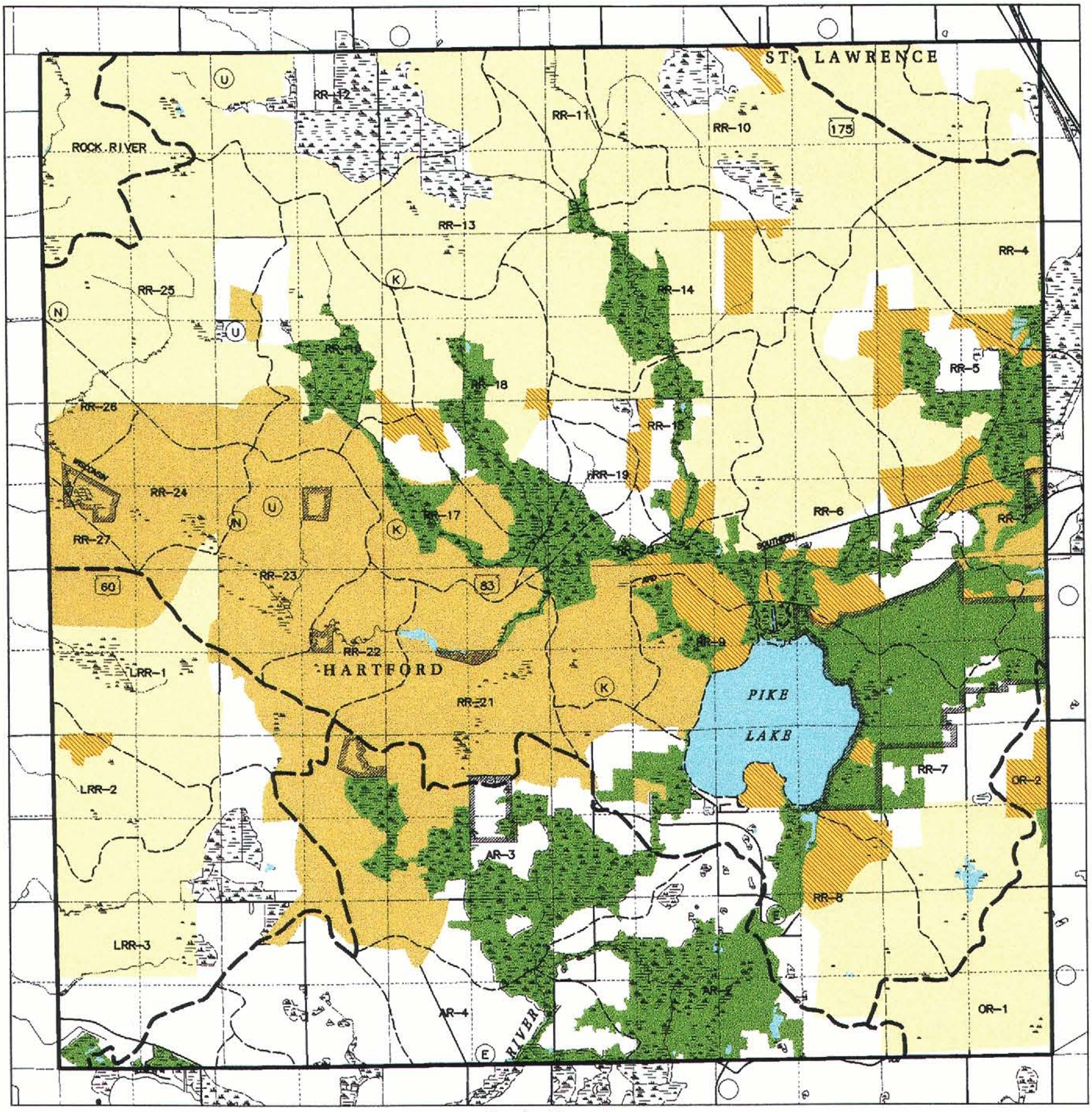
Table 17 contains a summary of selected morphometric data available for the major lakes within the Hartford area. Major lakes are defined as those lakes within the Southeastern Wisconsin Region having a surface area of 50 or more acres in areal extent. These lakes are shown on Map 45. Where available, similar summary data are provided for minor lakes because of the importance of these smaller waterbodies as a water resource. In some cases, these waterbodies, in which water levels fluctuate markedly, may be classed as deep-water marshes or wetlands. Wetlands within the Hartford area are shown on Map 46. The lakes inventoried are further described below with information set forth in paragraphs which address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69(5)(b) of the *Wisconsin Statutes*. Information on the origins of these lakes is based upon detailed geological information provided in various published survey reports[1] and maps of surfacial deposits.[2]

[1] *C. Juday,* The Inland Lakes of Wisconsin, The Hydrography and Morphometry of the Lakes, *State of Wisconsin, 1914, pp. 84-88; L. Martin,* The Physical Geography of Wisconsin, 2nd Edition, *State of Wisconsin, 1932, pp. 235-293.*

[2] *W.C. Alden,* Map Showing the Surficial Deposits of Southeastern Wisconsin, *Wisconsin Geological Survey, 1918; H.L. Young and W.G. Batten, Wisconsin Geological and Natural History Survey Information Circular No. 38,* Ground-Water Resources and Geology of Washington and Ozaukee Counties, Wisconsin, *University of Wisconsin-Extension, February 1980, 37 pages.*

Map 44

ADOPTED REGIONAL LAND USE PLAN FOR THE HARTFORD AREA: 2020



Residential–suburban density

Residential–low density

Residential–medium density

Residential–high density

Commercial

Industrial

Extractive/Landfill

Transportation

Basin Boundary

Subbasin Boundary

Governmental and Institutional

Recreational

Agricultural

Primary Environmental Corridors

Secondary Environmental Corridors

Isolated Natural Resource Area

Surface water

Other Open Lands

GRAPHIC SCALE

0 2500 5000 FEET

Source: SEWRPC.

Table 17

HYDROLOGY AND MORPHOMETRY OF LAKES WITHIN THE HARTFORD AREA, WASHINGTON COUNTY

Lake	Surface Area (acres)	Subwatershed Area (acres)	Volume (acre-feet)	Water Residence Time (years)	Maximum Length of Lake (miles)	Length of Shoreline (miles)	Maximum Width of Lake (miles)	Shoreline Development Factor[a]	Maximum Depth (feet)	Mean Depth (feet)
Hartford Millpond....	11	17,250	88	0.01	0.4	0.9	0.1	1.94	8	7
Lohr Pond.............	7	--[b]	--[b]	--[b]	0.2	0.5	0.1	1.27	8	--[b]
Pike Lake...............	522	8,100	2,349	4.03	1.2	3.8	1.1	1.19	45	5
Werner Pond..........	9	--[b]	--[b]	--[b]	0.3	0.7	0.2	1.66	8	--[b]

[a]*Shoreline Development Factor is the ratio between the actual circumference of a lake and the circumference of a circle with the same radius. A circular lake would have a Shoreline Development Factor of 1.0, while a dendritic lake would have a Shoreline Development Factor in excess of 1.0.*

[b]*These lakes are within the Pike Lake drainage area. No data available.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Hartford Millpond

Lake Morphometry

Hartford Millpond is located in U.S. Public Land Survey Section 21, Township 10 North, Range 18 East, City of Hartford. The pond has a surface area of about 11 acres, a maximum depth of eight feet, and a shoreline development factor of 1.94. The pond is a small, elongate impoundment of the Rubicon River in Hartford, created originally for waterpower to operate a flour mill.

Recreational Use

Public access is provided through a city park of 10.5 acres and three city streets which end at the park.

Development Potential

As of 1995, land use within the drainage area tributary to Hartford Millpond consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 20 percent of the total land cover. The drainage area is located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Hartford Millpond include both agricultural and urban runoff.

Fish and Wildlife Populations

In 1963,[3] the Wisconsin Department of Natural Resources (WDNR) reported that the Hartford Millpond was managed as a children's fishing pond, with a large population of carp and panfish. According to the WDNR, panfish, trout, northern pike and largemouth bass were present in the pond in 1995.[4] Major use problems in 1963 were reported to be winterkill, excessive aquatic plant growth, carp, and fluctuating water levels. The pond is entirely within the city limits, and has very little value for waterfowl and fur bearers.

Lohr Pond

Lake Morphometry

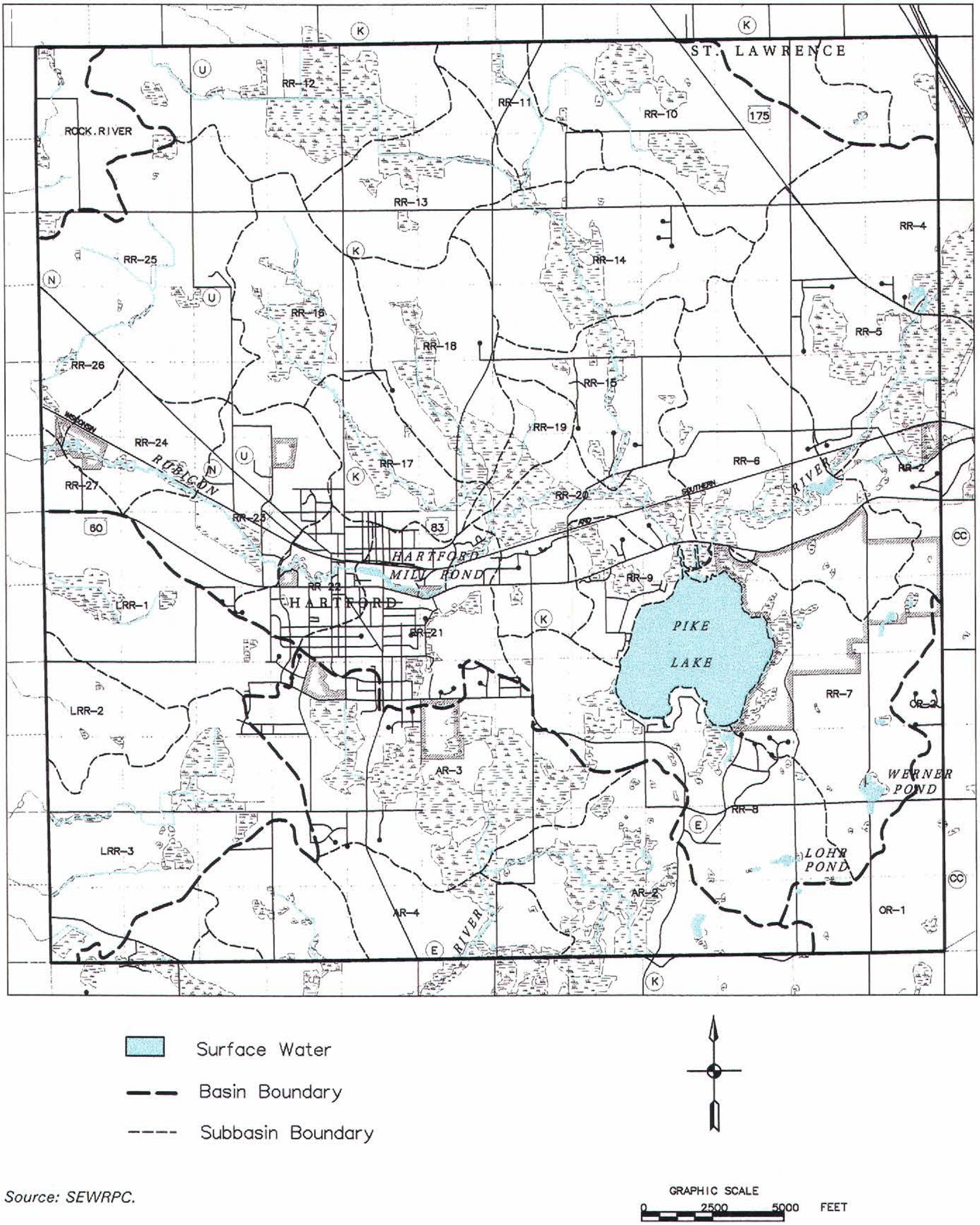
Lohr Pond is located in U.S. Public Land Survey Section 35, Township 10 North, Range 18 East, Town of Hartford. The pond has a surface area of about seven acres, a maximum depth of eight feet, and a shoreline

[3]*Wisconsin Conservation Department,* Surface Water Resources of Washington County, *1963.*

[4]*Wisconsin Department of Natural Resources Publication No. PUBL-FM-800 95REV,* Wisconsin Lakes, *1995.*

Map 45

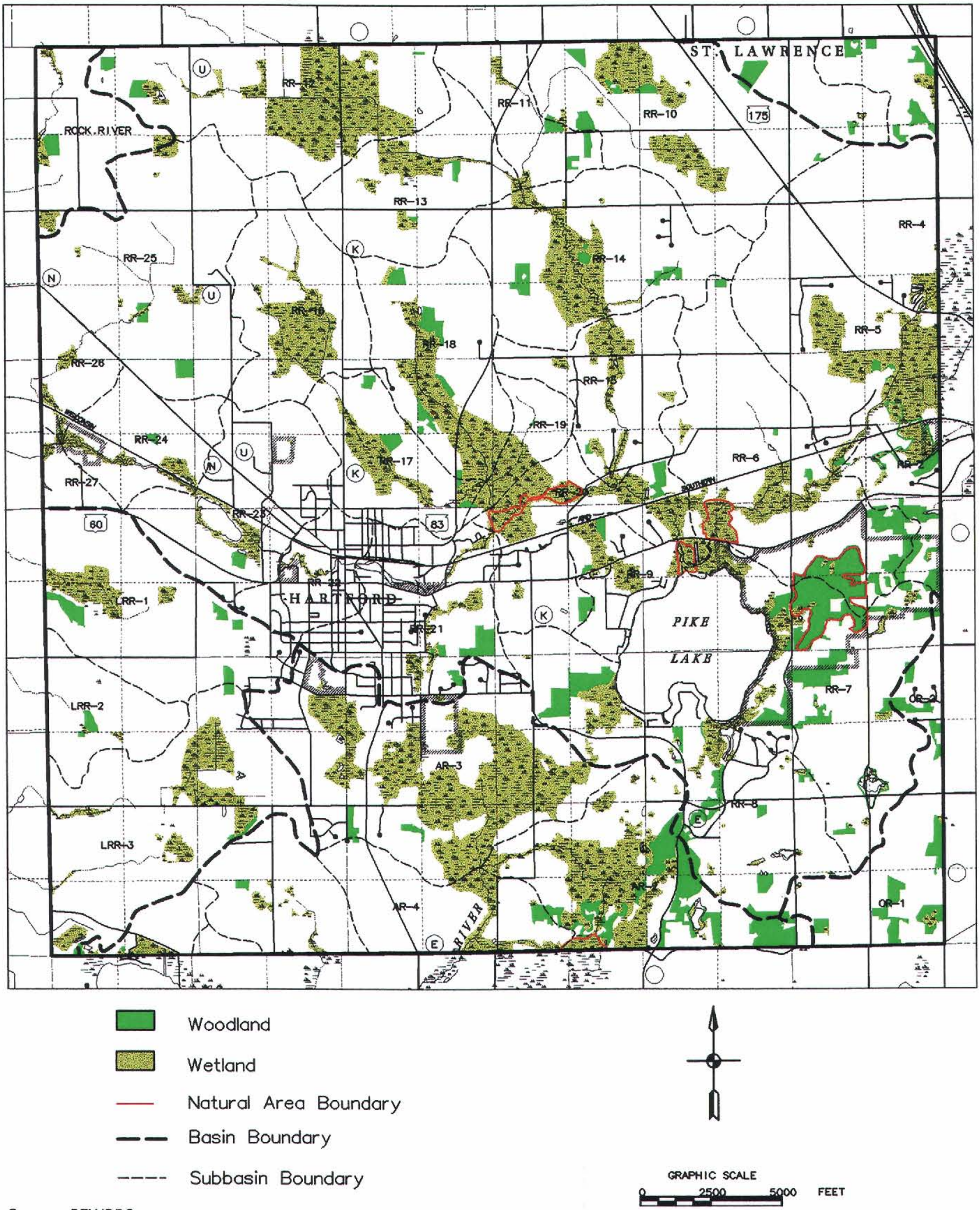
SURFACE WATER RESOURCES WITHIN THE HARTFORD AREA: 1995



Source: SEWRPC.

Map 46

WETLANDS AND WOODLANDS WITHIN THE HARTFORD AREA: 1995



Source: SEWRPC.

development factor of 1.27. The pond is a small, shallow, drift depression in the kettle moraine that is landlocked and primarily drainage fed.

Recreational Use
Public access is not available.

Development Potential
As of 1995, land use within the drainage area tributary to Lohr Pond consisted largely of agricultural and open space uses, with agriculture comprising about 40 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 50 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Lohr Pond are primarily agricultural.

Fish and Wildlife Populations
As of 1963,[5] the WDNR reported that winterkill occurred annually. However, according to the WDNR as of 1995,[6] largemouth bass were reported to be present in the pond. Waterfowl may visit the pond during fall migration, but have not been observed to nest here.

Pike Lake
Lake Morphometry
Pike Lake is located in U.S. Public Land Survey Section 23, Township 10 North, Range 18 East, Town of Hartford. The Lake has a surface area of about 522 acres, a maximum depth of 45 feet, and a shoreline development factor of 1.19. The Lake is a large depression basin on the last drainage line of the Green Bay glacier. The Lake is generally shallow with one deep basin, presumably the result of the presence of an ice block following glacial recession. The bathymetry of Pike Lake is shown on Map 47. The Rubicon River drains into and out of the Lake at the northern end.

Recreational Use
Public access is provided for boat launching by town roads ending on the west shore; however, parking is difficult, being prohibited by town ordinance. Recreational boating access is provided under a Chapter NR 1, *Wisconsin Administrative Code*, private provider agreement concluded between the State and a private access-site owner in 1998. Public bathing and picnicking areas are available at the 1,192-acre Pike Lake State Park, which occupies the eastern shore of the Lake.

Development Potential
As of 1995, land use within the drainage area tributary to Pike Lake consisted largely of agricultural and open space uses, with agriculture comprising about 55 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 15 percent of the total land cover. A small portion of the drainage area is located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Pike Lake are primarily agricultural.

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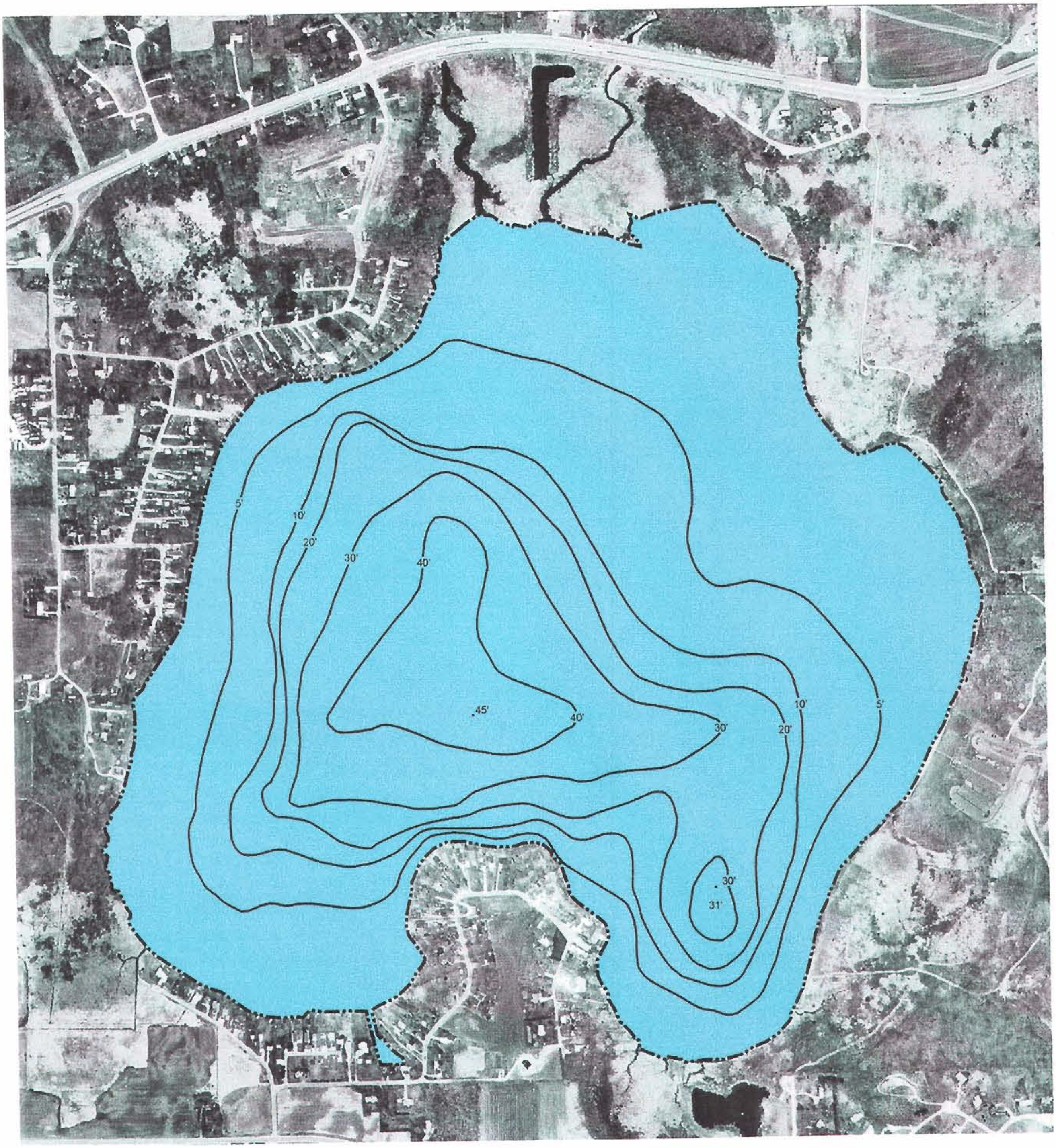
[5] *Wisconsin Conservation Department,* op. cit.

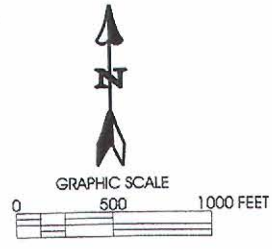
[6] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Map 47

BATHYMETRIC MAP OF PIKE LAKE



—20'— WATER DEPTH CONTOUR IN FEET



Source: SEWRPC.

Fish and Wildlife Populations

In 1963,[7] the WDNR reported that the Lake was managed for panfish and walleyed pike, with yellow perch the principle game fish. Carp were reported to be common in the shallow areas, but were not considered to constitute a management problem. In 1974,[8] a fisheries survey reported the following fish species: rock, smallmouth, and largemouth bass; bowfin; common carp; johnny, Iowa, and least darter; blackchin, blacknose, pugnose, and golden shiner; white sucker; northern pike; walleyed pike; bluntnose and fathead minnow; banded killifish; and yellow perch. In 1975,[9] a fisheries survey reported, rock, smallmouth, and largemouth bass; bowfin; common carp; golden shiner; white sucker; northern pike; walleyed pike; and yellow perch. According to the WDNR, as of 1995,[10] Pike Lake was reported to have an abundant walleyed pike population, with northern pike, largemouth and smallmouth bass, and panfish being present. A fish consumption advisory had been issued for this Lake. The Southeastern Wisconsin Regional Planning Commission (SEWRPC) reports the pugnose shiner as a State-designated threatened species, and the least darter as a State species of special concern.[11]

The Rubicon River both enters and leaves the Lake on its north shore in a cattail and sedge marsh. About 40 percent of the shoreline is marsh associated with the riverine inflow and outflow portion of the Lake; an estimated 180 acres of wetland adjoin the stream. A fish refuge has been established on the channel above the dam and the Rubicon River below the dam for a distance of about 0.5 mile as protection for walleyed and northern pike during spawning runs. Modification of the inlet and outlet of the Lake was completed in 1993 in order to permit high flows to bypass the Lake in the expectation of minimizing nutrient loading to Pike Lake.

Werner Pond

Lake Morphometry

Werner Pond is located in U.S. Public Land Survey Section 25, Township 10 North, Range 18 East, Town of Hartford. The pond has a surface area of about nine acres, a maximum depth of eight feet, and a shoreline development factor of 1.66. The pond is a small, landlocked, depression lake in the kettle moraine, southeast of Pike Lake. A county trunk highway, CTH E, crosses the southern half of the pond separating it into two basins.

Recreational Use

Public access is provided by CTH E. Werner Pond has some aesthetic value.

Development Potential

As of 1995, land use within the drainage area tributary to Werner Pond consisted largely of agricultural and open space uses, with agriculture comprising about 65 percent of the total land cover within the drainage area. Woodlands and other open space uses comprised about 15 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

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[7] *Wisconsin Conservation Department,* op. cit.

[8] *D. Fago, Wisconsin Department of Natural Resources Research Report No. 148,* Retrieval and Analysis System Used in Wisconsin's Statewide Fish Distribution Survey, Second Edition, *December 1988.*

[9] Ibid.

[10] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

[11] *SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997.*

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Werner Pond include both urban and agricultural runoff.

Fish and Wildlife Populations
In 1963,[12] the WDNR reported that winterkill occurred annually, although bullheads apparently managed to survive during milder winters. According to the WDNR, as of 1995,[13] panfish and largemouth bass were reported to be present in the pond. The pond has little value for waterfowl, except for fall resting, because of the highway which crosses it and nearby farm buildings.

STREAMS

Table 18 contains a summary of selected morphometric data available for named streams in the Hartford area. The streamcourses are shown on Map 45, which also shows the hydrologic drainage areas within the area. Descriptive paragraphs follow, providing a summary of available information on the physical description of each stream for the portion of the stream within Washington County, and of the existing uses and conditions, wildlife habitat, and fishery for the portion of the stream within the Hartford area, to the extent that such information is available. Each of the paragraphs address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69 (5)(b) of the *Wisconsin Statutes.*

Ashippun River
Stream Morphometry
The Ashippun River is located in the southeastern portion of the Hartford area. Within Washington County, the River has a surface area of about 13 acres and extends over a linear distance of about 9.6 miles with a gradient of approximately six feet per mile. The River flows southwest through Druid Lake to the Rock River. The Ashippun River is included in the Upper Rock River Basin areawide water quality management planning area.[14]

Recreational Use
The Ashippun River is navigable by canoe or similar watercraft.

Development Potential
As of 1995, land use within the Ashippun River subwatershed consisted largely of agricultural and open space uses, with agriculture comprising about 70 percent of the total land cover within the subwatershed. Wetlands and other open space uses comprised about 15 percent of the total land cover. A small portion of the subwatershed is partially located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the Ashippun River subwatershed are primarily agricultural.

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[12]*Wisconsin Conservation Department,* op. cit.

[13]*Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

[14]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-190-88,* Upper Rock River Basin Areawide Water Quality Management Plan, *May 1989.*

Table 18

PHYSICAL CHARACTERISTICS OF STREAMS WITHIN THE HARTFORD AREA, WASHINGTON COUNTY[a]

Stream or Watercourse	Length (miles)	Average Width (feet)	Average Depth (feet)	Surface Area (acres)	Drainage Area (square miles)	U.S. Public Land Survey			Subwatershed	Major Watershed
						Town	Range	Section		
Ashippun River	9.6	11	1.25	12.8	18.5	9	18	18	Ashippun	Rock
Rubicon River	5.7	17	1.17	11.7	28.5	10	18	18	Rubicon	Rock

[a]Stream data are for the portion of the stream within Washington County only. The U.S. Public Land Survey Township, Range, and Section designation included in each description locates the mouth of the stream at its confluence with another named stream or at the point at which it exits the County.

Source: Wisconsin Department of Natural Resources and SEWRPC.

Fish and Wildlife Populations

In 1963,[15] the WDNR managed this river for forage fishes, though it seasonally supported a run of northern pike, and may have had a small population of smallmouth bass. WDNR fisheries surveys[16] were conducted in 1973 and 1975 within the Town and City of Hartford. In 1973, the WDNR reported 19 species of fishes, including johnny, fantail, and rainbow darter; green sunfish; hornyhead and creek chub; northern pike; largemouth and rock bass; stonecat; central mudminnow; bluntnose and fathead minnow; stonerollers; common shiner; pumpkinseed; white sucker; southern redbelly dace; and yellow bullhead. In 1975, the WDNR reported 26 species of fishes, including johnny, fantail, least, and rainbow darter; green sunfish; hornyhead and creek chub; northern pike; largemouth and rock bass; stonecat; central mudminnow; bluntnose and fathead minnow; largescale and central stoneroller; bluegill; green sunfish; common carp; common shiner; pumpkinseed; white sucker; southern redbelly dace; yellow perch; and black and yellow bullhead. SEWRPC reports the least darter as a State species of special concern.[17] The waters of the Ashippun River are generally slightly humic, being a light brown in color, and, although the bottom is largely silt, no problems with sedimentation have been identified.[18] Though the stream flows through Druid Lake, there are no apparent barriers to fish movement and the stream is considered to have a large carp population.

Rubicon River

Stream Morphometry

The Rubicon River is located in the central portion of the Hartford area. Within Washington County, the River has a surface area of about 12 acres and extends over a linear distance of about 5.7 miles with a gradient of approximately nine feet per mile. The River is a tributary to the Rock River in Dodge County and originates in ditching upstream of Pike Lake, then flows through Pike Lake and the City of Hartford where it is impounded. A fish refuge is maintained on one-half mile of stream just below Pike Lake as protection for northern pike and walleyed pike prior to the opening of the general fishing season. The River is dammed with a two-foot head at

[15]*Wisconsin Conservation Department,* op. cit.

[16]*D. Fago,* op. cit.

[17]*SEWRPC Planning Report No. 42,* op. cit.

[18]*SEWRPC Memorandum Report No. 93,* A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report, *March 1995.*

Pike Lake and a 14-foot head in the City of Hartford. The Rubicon River is included in the Upper Rock River Basin areawide water quality management planning area.[19]

Water Quality
The Village of Slinger discharges treated wastewater to the headwaters, and the City of Hartford contributes effluent immediately below its city limits.

Recreational Use
The Rubicon River is navigable by canoe or similar watercraft.

Development Potential
As of 1995, land use within the Rubicon River subwatershed consisted largely of agricultural and open space uses, with agriculture comprising about 75 percent of the total land cover within the subwatershed. High-density urban development comprised about 10 percent of the total land cover. A small portion of the subwatershed is partially located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the Rubicon River subwatershed include both agricultural and urban runoff.

Fish and Wildlife Populations
In 1963,[20] the WDNR reported that the fishery consisted of rough fishes and forage species, with some panfish reported upstream of the Hartford Millpond. A 1973 fish survey reported that the fish population was comprised of green sunfish, creek chub, bluntnose and fathead minnow, white sucker, central mudminnow, and brook stickleback.[21] In 1975,[22] in addition to the foregoing species, a fish survey of the River reported bigmouth, blacknose, blackchin, golden, and common shiner; Iowa, johnny, least, rainbow, and fantail darter; southern redbelly dace; black, brown, and yellow bullhead; pumpkinseed; rock bass; tadpole madtom; yellow perch; bluegill; northern pike; central stoneroller; banded killifish; and blackstripe topminnow. SEWRPC reports the least darter as a State species of special concern.[23]

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[19] *Wisconsin Department of Natural Resources, PUBL-WR-190-88.*

[20] *Wisconsin Conservation Department,* op. cit.

[21] *D. Fago,* op. cit.

[22] Ibid.

[23] *SEWRPC Planning Report No. 42,* op. cit.

Chapter IX

INVENTORY FINDINGS: JACKSON AREA

INTRODUCTION

This chapter presents the inventory findings relating to lakes and streams in the Jackson area of Washington County. The Jackson area is shown on Map 48 and includes all of Sections 1 through 36, Town 10 North, Range 20 East. The area includes the entire Town of Jackson and nearly all of the Village of Jackson. To the extent that data are available, relevant land use, recreational use, morphometric, water quality, and biological information upon which waterbody classifications are to be based pursuant to the requirements of Section 281.69(5)(b), *Wisconsin Statutes*, is presented for each waterbody inventoried. These data form the scientific and technical basis for the determination of the alternative and recommended waterbody classification schemes set forth in Chapter XVI.

LAND USE

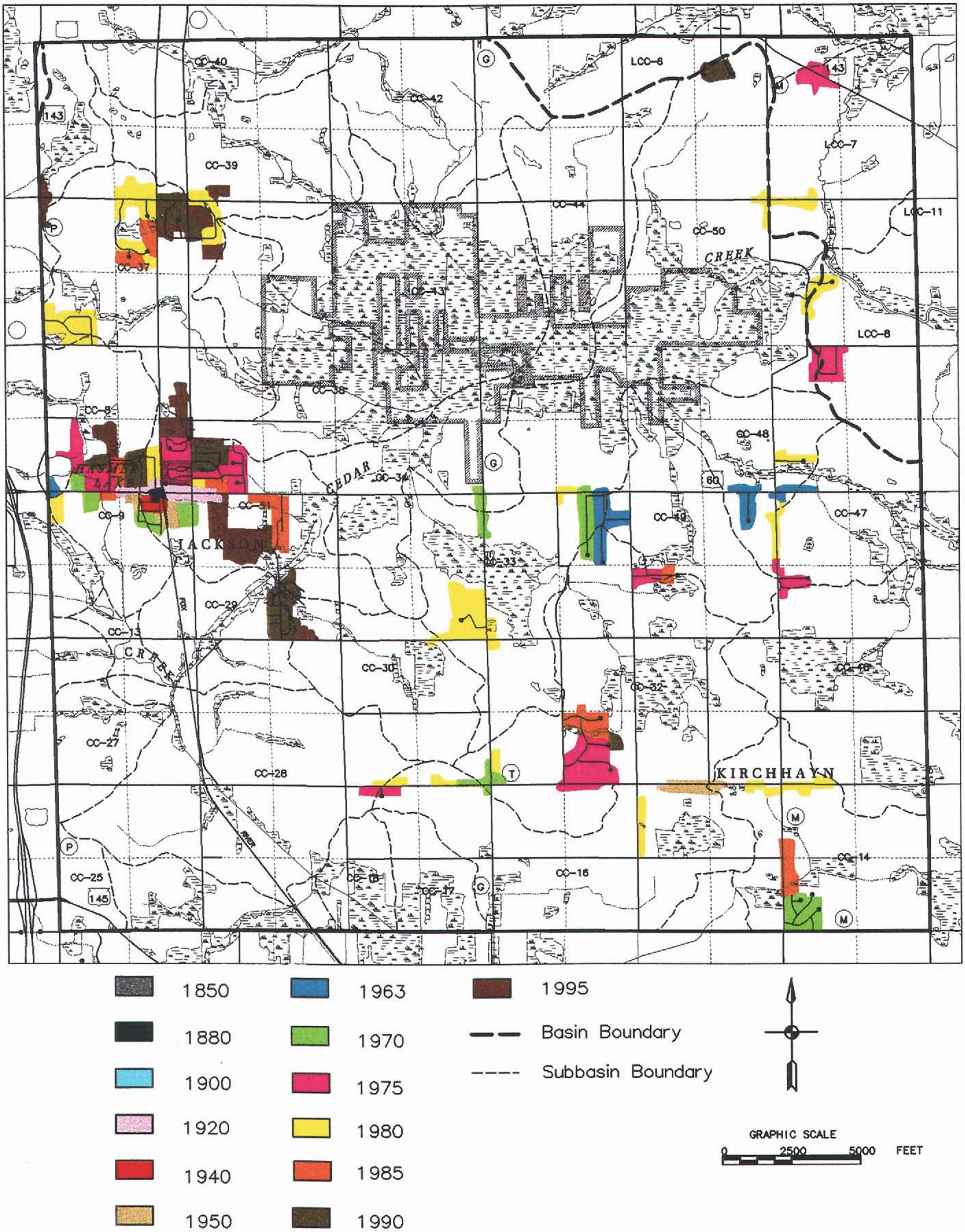
The type, intensity, and spatial distribution of the various land uses within the Jackson area are important determinants of water quality and recreational use demands. The current and planned future land use patterns, placed within the context of the historical development in the area, therefore, are important considerations in any waterbody management planning effort.

While some settlement occurred prior to the 1920s, most urban development occurred in the Jackson area in recent years. The Jackson area remains largely rural in character, although a portion of the area within the Village of Jackson has been significantly developed. Map 48 indicates the historic urban-growth pattern in the Jackson area since 1850. Early development occurred in the west-central portions area that later became incorporated as the Village of Jackson in 1912. Since the 1940s, limited urban development also occurred in the vicinity of the unincorporated hamlet of Kirchhayn and other scattered urban enclaves. As shown on Map 48, the urban development of the lands in the area has largely occurred since the 1970s.

The existing land use pattern in the Jackson area as of 1995, is shown on Map 49, and is quantified in Table 19. As indicated in Table 19, about 2,600 acres, or about 11 percent of the area, were devoted to urban land uses. The dominant urban land use was residential, encompassing about 1,400 acres, or about 55 percent of the area in urban use. As of 1995, about 20,800 acres, or about 89 percent of the area, were still devoted to rural land uses. About 15,300 acres, or about 74 percent of the rural area, were in agricultural land uses. Woodlands, wetlands, and surface water, including the surface area of the lakes in the area, accounted for approximately 5,000 acres, or about 24 percent of the area in rural use. Future growth in urban land use, based upon the recommendations set forth in the adopted 2020 regional land use plan shown on Map 50, is anticipated in the west-central portion of the area, within and adjacent to the currently incorporated area of the Village of Jackson. Elsewhere, however, land use is not anticipated to differ greatly from the current condition.

Map 48

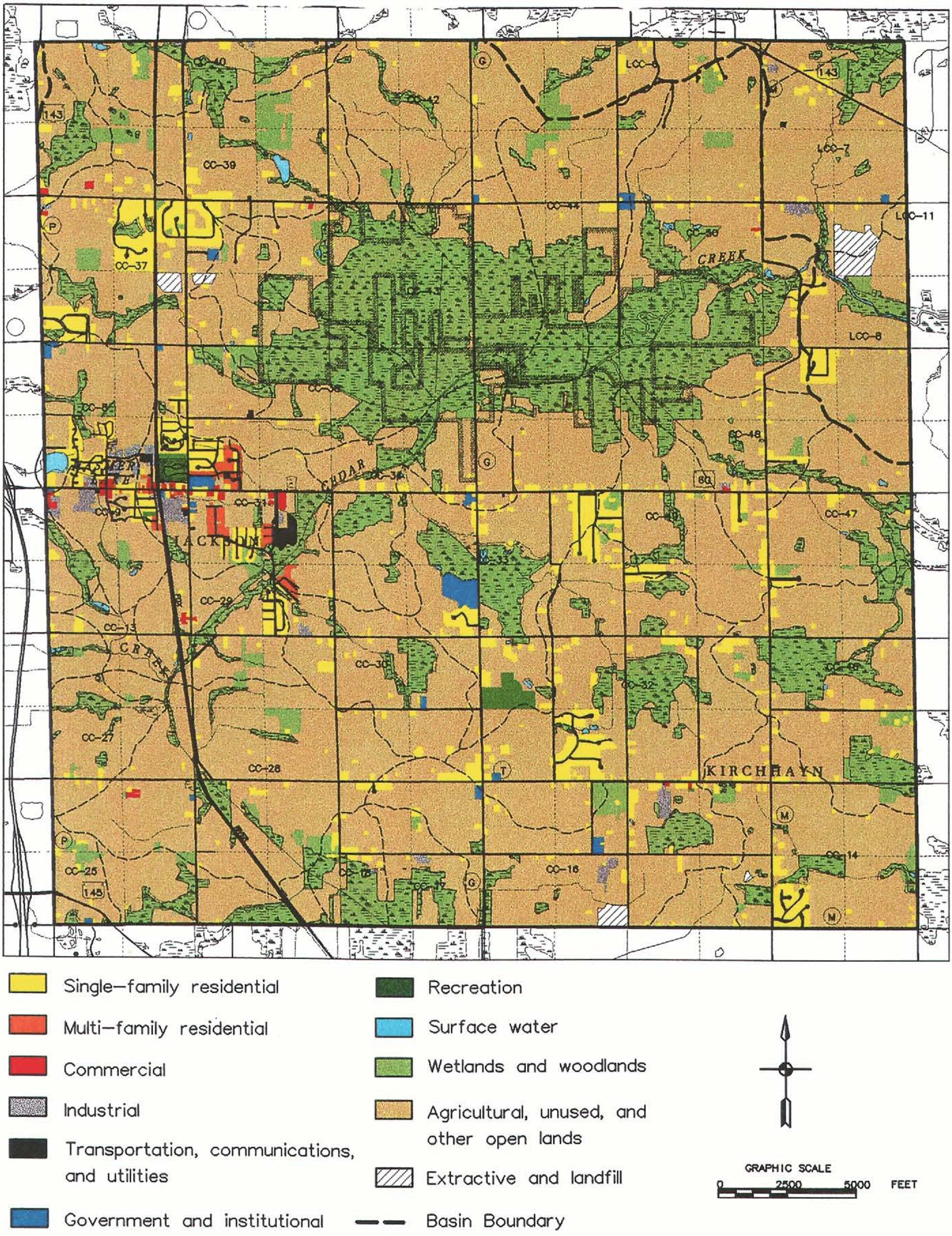
HISTORIC URBAN GROWTH WITHIN THE JACKSON AREA: 1850-1990



Source: SEWRPC.

Map 49

EXISTING LAND USE WITHIN THE JACKSON AREA: 1995



Source: SEWRPC.

Table 19

EXISTING LAND USE WITHIN THE JACKSON AREA: 1995

Land Use Categories	Acres	Percent of Major Category	Percent of Total Area
Urban			
Residential	1,393	54.5	5.9
Commercial	26	1.0	0.1
Industrial	91	3.6	0.4
Governmental and Institutional	70	2.7	0.3
Transportation and Utilities	885	34.5	3.8
Recreation	66	2.6	0.3
Land under Development	28	1.1	0.1
Subtotal	2,559	100.0	10.9
Rural			
Agricultural	15,298	73.5	65.4
Wetlands	4,421	21.2	18.9
Woodlands	558	2.6	2.4
Water	62	0.3	0.3
Extractive	99	0.5	0.4
Landfill	- -	- -	- -
Other Open Lands	389	1.9	1.7
Subtotal	20,827	100.0	89.1
Total	23,386	- -	100.0

Source: SEWRPC.

LAKES

There are no major lakes in the Jackson area. Major lakes are defined as those lakes within the Southeastern Wisconsin Region having a surface area of 50 or more acres in areal extent. However, one minor lake, Hasmer Lake, is located within the Village of Jackson, and is illustrated on Map 51. Table 20 contains selected morphometric data that is available for the Lake. Wetlands within the Jackson area are shown on Map 52.

Hasmer Lake

Lake Morphometry

Hasmer Lake is located in U.S. Public Land Survey Section 19, Township 10 North, Range 20 East, Village of Jackson, and Section 13, Township 10 North, Range 19 East, Town of Polk. The Lake has a surface area of about 15 acres, a maximum depth of 34 feet, and a shoreline development factor of 1.19. Hasmer Lake is a small drainage lake occupying a depression in the ground moraine of the Lake Michigan glacier. There is an inflow from a tributary which is the outlet of Tily Lake and an outlet tributary to Cedar Creek. The bathymetry of Hasmer Lake is shown on Map 53.

Recreational Use

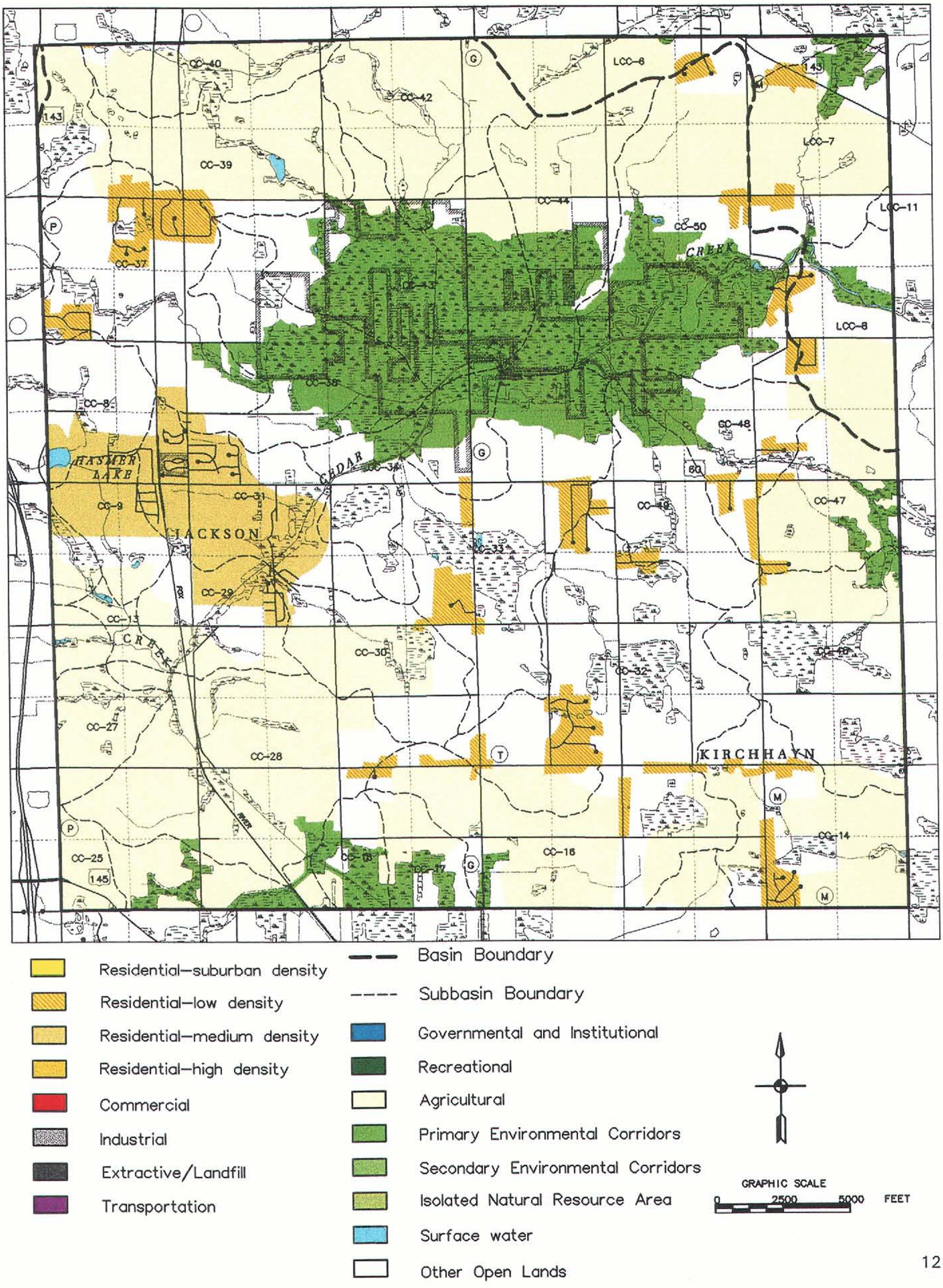
Public access is provided. Additionally, a commercial facility provides boats and a beach. Historically, the Lake has had relatively turbid water, detracting from the Lake's value as a recreational resource.

Development Potential

As of 1995, land use within the drainage area tributary to Hasmer Lake consisted largely of agricultural and open space uses, with agriculture comprising about 75 percent of the total land cover within the drainage area. High-density urban development comprised about 10 percent of the total land cover. The drainage area is located within an area planned for urban development in the regional land use plan.

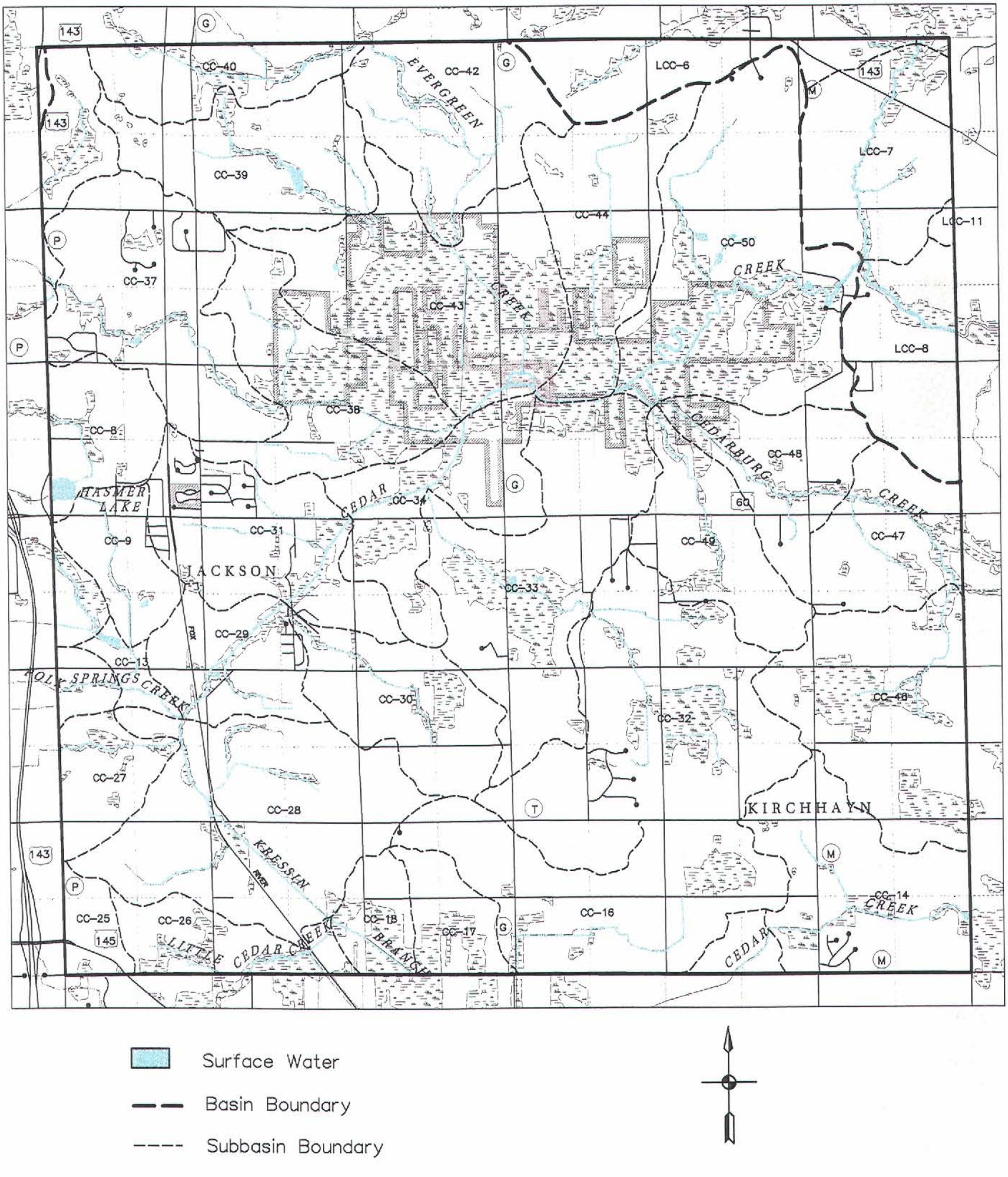
Map 50

ADOPTED REGIONAL LAND USE PLAN FOR THE JACKSON AREA: 2020



Map 51

SURFACE WATER RESOURCES WITHIN THE JACKSON AREA: 1995



Source: SEWRPC.

Table 20

HYDROLOGY AND MORPHOMETRY OF LAKES WITHIN THE JACKSON AREA, WASHINGTON COUNTY

Lake	Surface Area (acres)	Subwatershed Area (acres)	Volume (acre-feet)	Water Residence Time (years)	Maximum Length of Lake (miles)	Length of Shoreline (miles)	Maximum Width of Lake (miles)	Shoreline Development Factor[a]	Maximum Depth (feet)	Mean Depth (feet)
Hasmer..................	15	900	255	0.89	0.2	0.6	0.2	1.19	34	17

[a]*Shoreline Development Factor is the ratio between the actual circumference of a lake and the circumference of a circle with the same radius. A circular lake would have a Shoreline Development Factor of 1.0, while a dendritic lake would have a Shoreline Development Factor in excess of 1.0.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Hasmer Lake include both agricultural and urban runoff.

Fish and Wildlife Populations

In 1963,[1] the Wisconsin Department of Natural Resources (WDNR) reported that largemouth bass, panfish, and northern pike constituted the fishery, however, there was also a large carp population. In 1975,[2] the fish population in the Lake consisted of common carp, common and golden shiner, bullheads, lake chubsucker, bluntnose minnow, largemouth bass, white sucker, yellow perch, pumpkinseed, crappies, and green sunfish. The Southeastern Wisconsin Regional Planning Commission (SEWRPC) reports the lake chubsucker as a State-designated threatened species.[3] According to the WDNR, as of 1995,[4] largemouth bass were abundant, northern pike common, and panfish present. The shoreline is bordered by a band of marsh, providing for nesting habitat of mallards and divers.

STREAMS

Table 21 contains a summary of selected morphometric data available for named streams in the Jackson area. The streamcourses are shown on Map 51, which also shows the hydrologic drainage areas within the area. Descriptive paragraphs for each stream follow, providing a physical description of each stream for the portion of the stream within Washington County, and of the existing uses and conditions, wildlife habitat, and fishery for the portion of the stream within the Jackson area, to the extent that such information is available. Each of the paragraphs address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69 (5)(b) of the *Wisconsin Statutes.*

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[1]*Wisconsin Conservation Department,* Surface Water Resources of Washington County, *1963.*

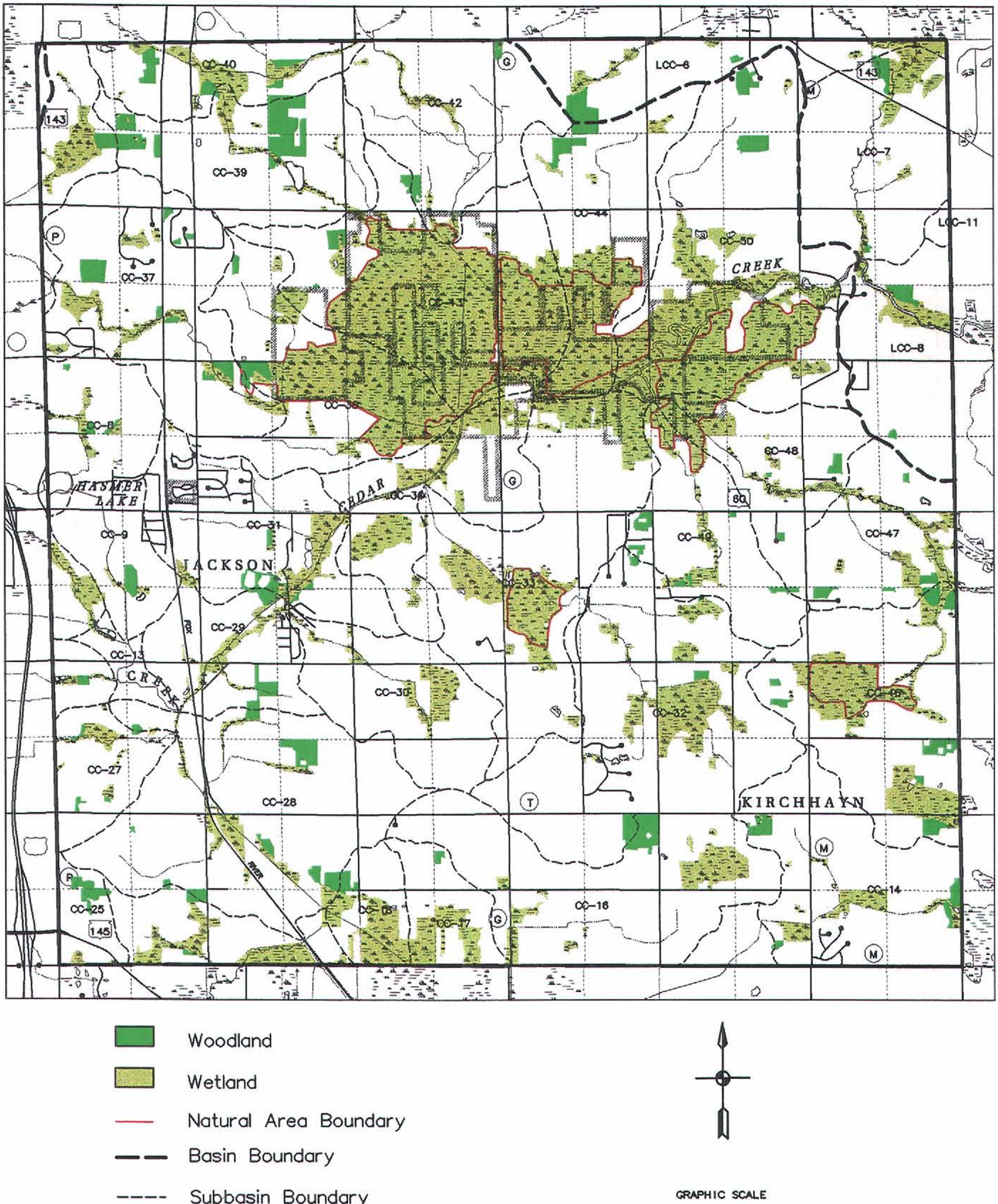
[2]*D. Fago, Wisconsin Department of Natural Resources Research Report No. 148,* Retrieval and Analysis System Used in Wisconsin's Statewide Fish Distribution Survey, Second Edition, *December 1988.*

[3]*SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997.*

[4]*Wisconsin Department of Natural Resources Publication No. PUBL-FM-800 95REV,* Wisconsin Lakes, *1995.*

Map 52

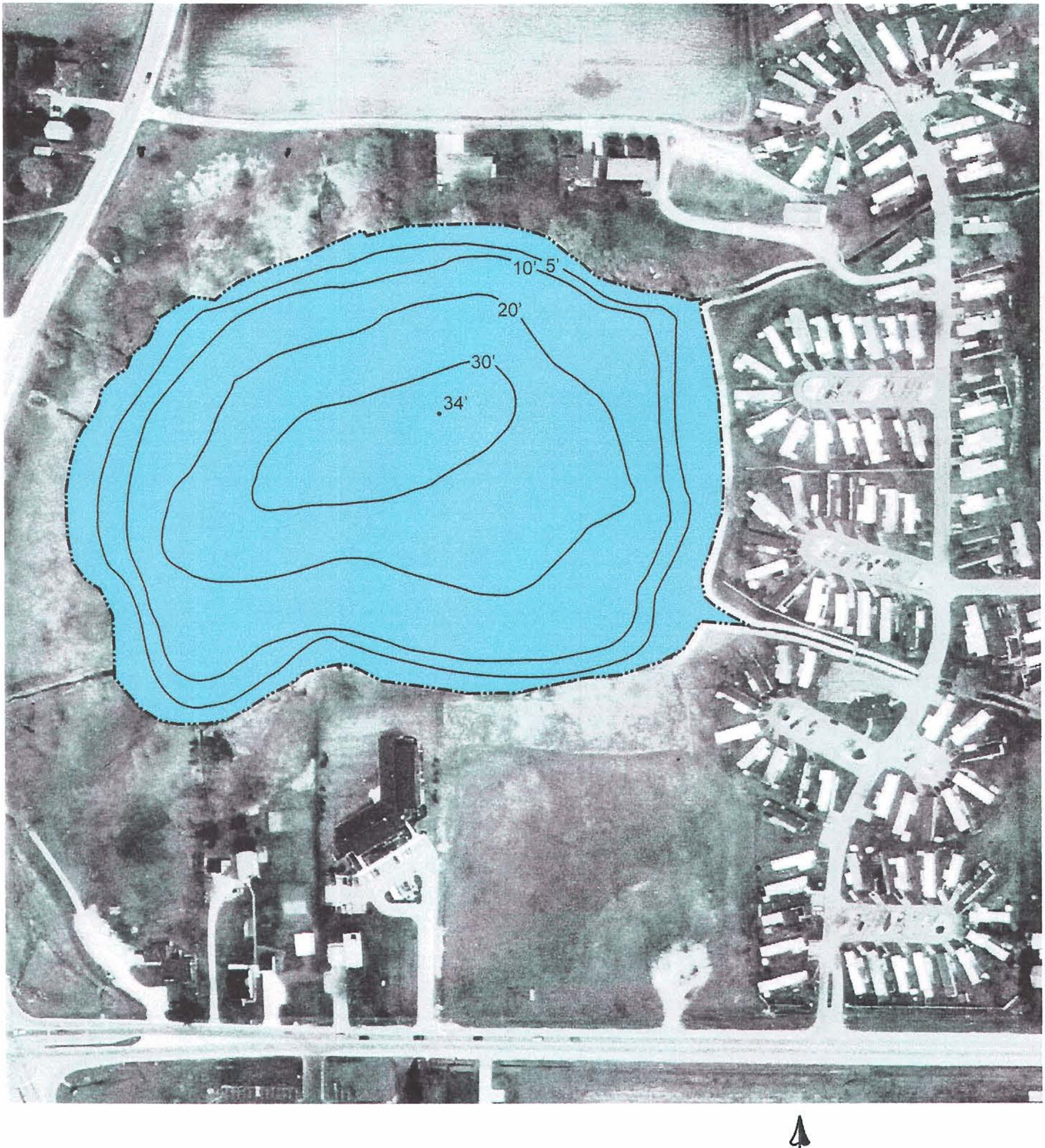
WETLANDS AND WOODLANDS WITHIN THE JACKSON AREA: 1995



Source: SEWRPC.

Map 53

BATHYMETRIC MAP OF HASMER LAKE



—20'— WATER DEPTH CONTOUR IN FEET

Source: SEWRPC.

Table 21

PHYSICAL CHARACTERISTICS OF STREAMS WITHIN THE JACKSON AREA, WASHINGTON COUNTY[a]

Stream or Watercourse	Length (miles)	Average Width (feet)	Average Depth (feet)	Surface Area (acres)	Drainage Area (square miles)	U.S. Public Land Survey			Subwatershed	Major Watershed
						Town	Range	Section		
Cedar Creek	15.8	32	1.75	61.3	93.0	10	20	12	Cedar	Milwaukee
Cedarburg Creek	3.0	7	1.25	2.5	5.0	10	20	15	Cedar	Milwaukee
Evergreen Creek	4.9	4	0.17	2.4	7.0	10	20	15	Cedar	Milwaukee
Kressin Branch	4.7	12	2.00	6.8	6.0	10	20	32	Cedar	Milwaukee
Little Cedar Creek	6.0	9	0.67	6.5	16.0	10	20	30	Cedar	Milwaukee
North Branch Cedar Creek	6.3	10	1.00	7.6	11.5	10	20	12	Cedar	Milwaukee
Polk Springs Creek	1.6	Intermittent	- -	3.7	2.0	10	20	30	Cedar	Milwaukee

[a]Stream data are for the portion of the stream within Washington County only. The U.S. Public Land Survey Township, Range, and Section designation included in each description locates the mouth of the stream at its confluence with another named stream or at the point at which it exits the County.

Source: Wisconsin Department of Natural Resources and SEWRPC.

Cedar Creek

Stream Morphometry

Cedar Creek is located in the southwest and northeastern portions of the Jackson area. Within Washington County, the Creek has a surface area of about 61 acres and extends over a linear distance of about 15.8 miles with a gradient of approximately 13 feet per mile. This Creek is the major waterway in the central portion of Washington County, originating at Big Cedar Lake, and flowing eastward to the Milwaukee River. A unique characteristic of this stream is its high gradient and concentration of fall in a 2.5-mile stretch east of the unincorporated hamlet of Cedar Creek. There were six dams in this area formerly, but only two remained as of 1963, none of which produced power. Additional impounding structures existed at Big Cedar Lake and Little Cedar Lake. These structures were low-head structures designed to prevent outlet erosion and maintain water levels. Cedar Creek is included within the Cedar Creek Priority Watershed project area.[5]

Recreational Use

Cedar Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty. Public recreational boating access is available through public lands within the Jackson Marsh and Wildlife Area.

Development Potential

As of 1995, land use within the Cedar Creek subwatershed consisted largely of agricultural and open space uses, with agriculture comprising about 70 percent of the total land cover within the subwatershed. Wetlands and other open space uses comprised about 15 percent of the total land cover. Portions of the drainage area are included within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the Cedar Creek subwatershed are primarily agricultural.

Fish and Wildlife Populations

The WDNR reported that the lower four miles of the Creek in Washington County provided a fishery for smallmouth bass during 1963,[6] while the remaining stream mileage supported panfish and forage fishes. A sucker

[5]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-336-93,* A Nonpoint Source Control Plan for the Cedar Creek Priority Watershed Project, *December 1991.*

[6]*Wisconsin Conservation Department,* op. cit.

fishery of some importance historically existed on much of the Creek. Fish surveys conducted in the Creek during 1924 identified 17 species of fish, including creek and hornyhead chub; rosyface and blacknose shiner; fantail, least, and johnny darter; tadpole madtom; largescale stoneroller; rock and largemouth bass; green sunfish; brook stickleback; northern pike; central mudminnow; southern redbelly dace; and bluntnose minnow.[7] In 1973,[8] the fish population of Cedar Creek was reported to be comprised of black and yellow bullhead, largemouth and rock bass, fathead and bluntnose minnow, hornyhead and creek chub, banded killifish, green sunfish, pumpkinseed, golden and sand shiner, common shiner, johnny and fantail darter, stonecat, white sucker, yellow perch, tadpole madtom, central mudminnow, and blacknose dace. In 1975,[9] the WDNR made several fish population estimates along the course of Cedar Creek in the Town of Jackson. About 10 species were observed at each site sampled, including common carp, black and yellow bullhead, pumpkinseed, green sunfish, hornyhead chub, johnny darter, bluntnose minnow, largemouth and rock bass, common and golden shiner, northern pike, bluegill, white sucker, and blackstripe topminnow. These same species made up the fish populations sampled in subsequent surveys in 1978 and 1981.[10] In 1991, up to 25 species were reported from this reach of Cedar Creek, including fathead and brassy minnow, redfin and sand shiner, creek chub, fantail and Iowa darter, yellow perch, stonecat, central mudminnow, black crappie, and brook stickleback, in addition to those reported from the Creek in 1981.[11] The redfin shiner has been identified as a State-designated threatened species, and the least darter has been identified as a State species of special concern. About one mile of stream flows through the State-owned portion of the Jackson Marsh.

North Branch of Cedar Creek

Stream Morphometry

The North Branch of Cedar Creek is located in the northeastern portion of the Jackson area. Within Washington County, the Creek has a surface area of about eight acres and extends over a linear distance of about 6.3 miles with a gradient of approximately five feet per mile. The North Branch of Cedar Creek is a small, low-gradient stream originating in a marshy lake in Ozaukee County and flowing southwesterly to its confluence with Cedar Creek in the Town of Jackson. Nearly the entire streamcourse is bordered by woody wetland. The North Branch of Cedar Creek was included within the Cedar Creek Priority Watershed project area.[12]

Recreational Use

The North Branch of Cedar Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential

As of 1995, land use within the North Branch of Cedar Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 70 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 15 percent of the total land cover. The drainage area is not included within an area planned for urban development in the regional land use plan.

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[7]*D. Fago,* op. cit.

[8]Ibid.

[9]Ibid.

[10]Ibid.

[11]Ibid.

[12]*Wisconsin Department of Natural Resources, PUBL-WR-336-93.*

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the North Branch of Cedar Creek drainage area are primarily agricultural.

Fish and Wildlife Populations
In 1963,[13] the WDNR reported that fluctuating flows detracted from the stream's potential as a warmwater fishery. SEWRPC reports the least darter as a State-designated threatened species as occurring in the fishery.[14]

Cedarburg Creek
Stream Morphometry
Cedarburg Creek is located in the northwestern portion of the Jackson area. Within Washington County, the Creek has a surface area of about three acres and extends over a linear distance of about three miles with a gradient of approximately seven feet per mile. Cedarburg Creek is a low-gradient, primarily ditched stream originating in a gravel pit and swampy lowland in Ozaukee County, and flowing westerly to join Cedar Creek within the Jackson Marsh area of the Jackson area in Washington County. The creek bottom is mostly gravel. Cedarburg Creek is included within the Cedar Creek Priority Watershed project area.[15]

Recreational Use
Cedarburg Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential
As of 1995, land use within the Cedarburg Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 20 percent of the land cover. Medium-density urban development also comprised about 10 percent of the land cover. The drainage area is not located in an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the Cedarburg Creek drainage area are primarily agricultural.

Fish and Wildlife Populations
In 1963,[16] the WDNR reported that the stream supported limited numbers of forage fishes. A fish survey conducted in 1975 identified black bullhead, northern pike, largemouth bass, brook stickleback, green sunfish, white sucker, golden shiner, and central mudminnow as comprising the fish population of the Creek within the Jackson area.[17]

Evergreen Creek
Stream Morphometry
Evergreen Creek is located in the northwestern portion of the Jackson area. The Creek has a surface area of about two acres and extends over a linear distance of about 4.9 miles with a gradient of approximately 17 feet per mile.

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[13] *Wisconsin Conservation Department,* op. cit.

[14] *SEWRPC Planning Report No. 42,* op. cit.

[15] *Wisconsin Department of Natural Resources, PUBL-WR-336-93.*

[16] *Wisconsin Conservation Department,* op. cit.

[17] *D. Fago,* op. cit.

The Creek is a small stream rising near the unincorporated hamlet of Keowns and flowing south to Cedar Creek. There were two impoundments in the drainage area in 1963, and the stream experienced some intermittency during dry periods. Evergreen Creek is included within the Cedar Creek Priority Watershed project area.[18]

Recreational Use
Evergreen Creek has limited navigability and is generally navigable only by canoe similar watercraft, with difficulty.

Development Potential
As of 1995, land use within the Evergreen Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 80 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 10 percent of the total land cover. The drainage area is located largely beyond the area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the Evergreen Creek drainage are primarily agricultural.

Fish and Wildlife Populations
In 1963,[19] the WDNR reported that the Creek was principally a forage fishery. Fish surveys in 1975 and 1978 reported brook stickleback; southern redbelly, northern redbelly, and blacknose dace; white sucker; creek chub; fathead minnow; and central mudminnow; and common and golden shiner, fathead minnow, common carp, central stoneroller, pumpkinseed, central mudminnow, northern redbelly dace, black bullhead, brook stickleback, green sunfish, creek chub, and white sucker, respectively.[20] The stream looses its identity in the marshlands of the Jackson Wildlife Area adjoining Cedar Creek.

Little Cedar Creek
Stream Morphometry
Little Cedar Creek is located in the southwestern portion of the Jackson area. The Creek has a surface area of about six acres and extends over a linear distance of about six miles with a gradient of approximately 18 feet per mile. Little Cedar Creek is a small stream originating at the base of the interlobate moraine system and flowing easterly to Cedar Creek. Little Cedar Creek is included within the Cedar Creek Priority Watershed project area.[21]

Recreational Use
Little Cedar Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential
As of 1995, land use within the Little Cedar Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 40 percent of the total land cover within the drainage area. Woodlands and other open space uses comprised about 20 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

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[18] *Wisconsin Department of Natural Resources, PUBL-WR-336-93.*

[19] *Wisconsin Conservation Department,* op. cit.

[20] *D. Fago,* op. cit.

[21] *Wisconsin Department of Natural Resources, PUBL-WR-336-93.*

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the Little Cedar Creek drainage area are primarily agricultural.

Fish and Wildlife Populations
Much of the Creek is ditched and the WDNR reported that fishery values were limited in 1963 by seasonal fluctuations in flow.[22] A fish survey conducted in 1978 reported that the fish community in the Creek was comprised of common carp, white sucker, green sunfish, tadpole madtom, rock bass, johnny darter, creek and hornyhead chub, bluntnose minnow, central mudminnow, blackstripe topminnow, black bullhead, black crappie, northern pike, and common and golden shiner.[23]

Kressin Branch of Little Cedar Creek
Stream Morphometry
The Kressin Branch of Little Cedar Creek, also known as Kressin Creek, is located in the southeastern and southwestern portions of the Jackson area. The Creek has a surface area of about seven acres and extends over a linear distance of about 4.7 miles with a gradient of approximately two feet per mile. The Kressin Branch of Little Cedar Creek is a system of ditches tributary to Little Cedar Creek. Kressin Creek is included within the Cedar Creek Priority Watershed project area.[24]

Recreational Use
The Kressin Branch of Little Cedar Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential
As of 1995, land use within the Kressin Branch drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 70 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 20 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the Kressin Branch drainage area are primarily agricultural.

Fish and Wildlife Populations
In 1963,[25] the WDNR reported that the Kressin Branch had little value other than for drainage and forage fish production. A fish survey conducted in 1978 reported the fish population to be comprised of green sunfish, black bullhead, northern pike, central mudminnow, and white sucker.[26]

Polk Springs Creek
Stream Morphometry
Polk Springs Creek is located in the southwestern portion of the Jackson area. The Creek has a surface area of about 3.7 acres and extends over a linear distance of about 1.6 miles with a gradient of approximately 20 feet per mile. The Creek is a short, spring-fed tributary to Cedar Creek arising at the base of Lake Michigan terminal

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[22] *Wisconsin Conservation Department,* op. cit.

[23] *D. Fago,* op. cit.

[24] *Wisconsin Department of Natural Resources, PUBL-WR-336-93.*

[25] *Wisconsin Conservation Department,* op. cit.

[26] *D. Fago,* op. cit.

moraine. During dry periods, the Creek is nearly intermittent. Polk Springs Creek is included within the Cedar Creek Priority Watershed project area.[27]

Recreational Use
Polk Springs Creek has limited navigability and generally is navigable only by canoe or similar watercraft, with difficulty.

Development Potential
As of 1995, land use within the Polk Springs Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 75 percent of the total land cover within the drainage area. Medium-density urban development comprised about 10 percent of the total land cover. Wetlands also comprised about 5 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the Polk Springs Creek drainage area are primarily agricultural.

Fish and Wildlife Populations
As of 1963,[28] the WDNR reported that during drought years stream flow diminishes nearly to intermittency and only small forage fishes were considered to be present in the stream.

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[27] *Wisconsin Department of Natural Resources, PUBL-WR-336-93.*

[28] *Wisconsin Conservation Department,* op. cit.

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Chapter X

INVENTORY FINDINGS: KEWASKUM AREA

INTRODUCTION

This chapter presents the inventory findings relating to lakes and streams in the Kewaskum area of Washington County. The Kewaskum area in shown on Map 54 and includes all of Sections 1 through 24, Town 12 North, Range 19 East. The area includes the entire Town of Kewaskum and the entire Village of Kewaskum. To the extent that data are available, relevant land use, recreational use, morphometric, water quality, and biological information upon which waterbody classifications are to be based pursuant to the requirements of Section 281.69(5)(b), *Wisconsin Statutes*, is presented for each waterbody inventoried. These data form the scientific and technical basis for the determination of the alternative and recommended waterbody classification schemes set forth in Chapter XVI.

LAND USE

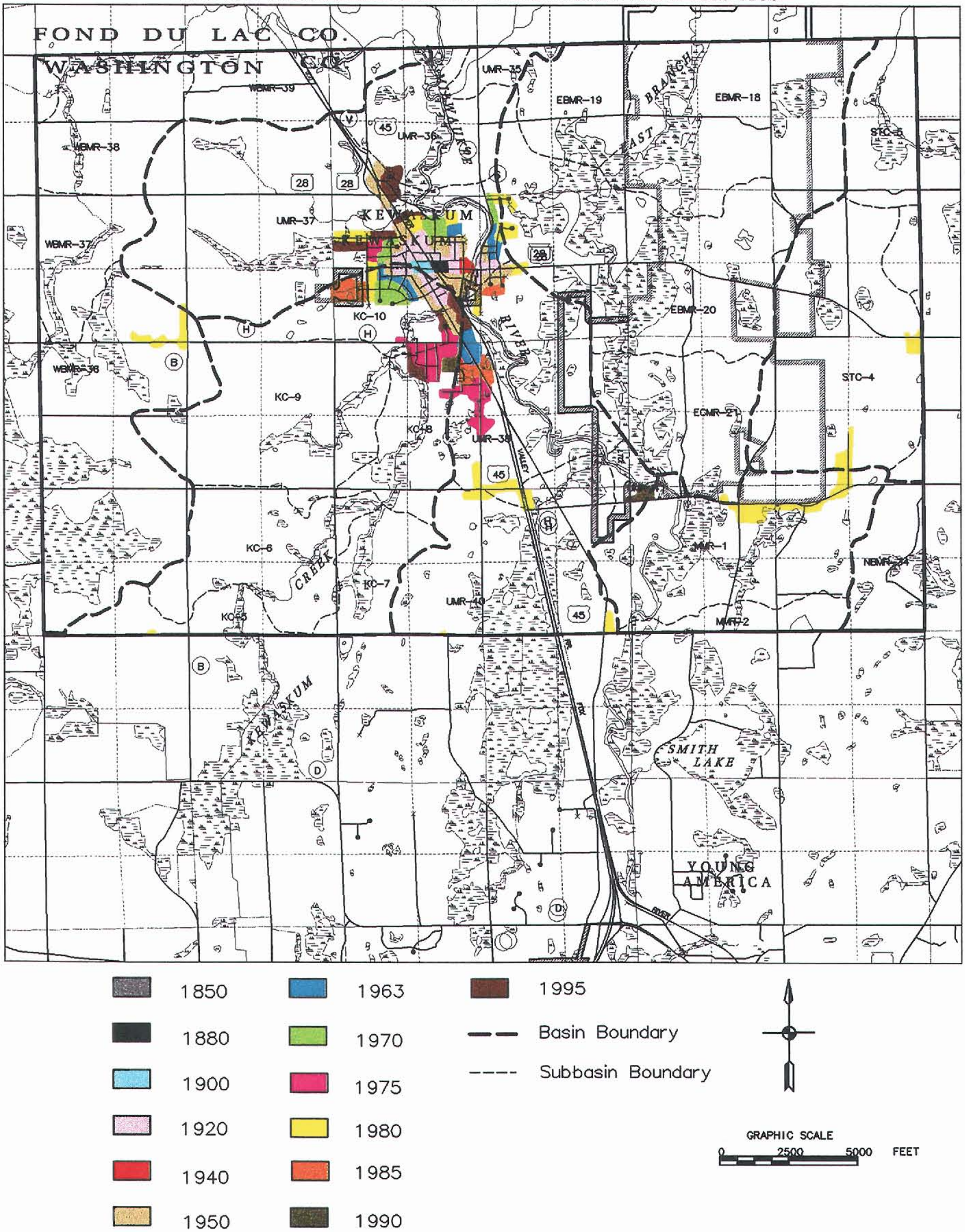
The type, intensity, and spatial distribution of the various land uses within the Kewaskum area are important determinants of water quality and recreational use demands. The current and planned future land use patterns, placed within the context of the historical development in the area, therefore, are important considerations in any waterbody management planning effort.

While some settlement occurred prior to the 1880s, most urban development occurred in the Kewaskum area in recent years. The Kewaskum area remains largely rural in character, although the portion of the area within the Village of Kewaskum has been significantly developed. Map 54 indicates the historic urban-growth pattern in the Kewaskum area, since 1850. Early development occurred in the north-central portions of the area, that later became incorporated as the Village of Kewaskum in 1895. Between the 1920s and 1950s, urban growth in the area remained relatively static. However, since the 1950s, urban land use in the area has proceeded rapidly, extending outwards from the incorporated areas of the Village of Kewaskum.

The existing land use pattern in the Kewaskum area, as of 1995, is shown on Map 55, and is quantified in Table 22. As indicated in Table 22, about 1,500 acres, or about 10 percent of the area, were devoted to urban land uses. The dominant urban land uses were residential and lands used for transportation corridors and utility installations, encompassing about 1,100 acres, or about 76 percent of the area in urban use. As of 1995, about 14,000 acres, or about 90 percent of the area, were still devoted to rural land uses. About 7,800 acres, or about 56 percent of the rural area, were in agricultural land uses. Woodlands, wetlands, and surface water, including the surface area of the lakes in the area, accounted for approximately 5,000 acres, or about 36 percent of the area in rural use. Future growth in urban land use, based upon the recommendations set forth in the adopted 2020 regional land use plan shown on Map 56, is anticipated in the central portion of the area, within and adjacent to the currently incorporated area of the Village of Kewaskum.

Map 54

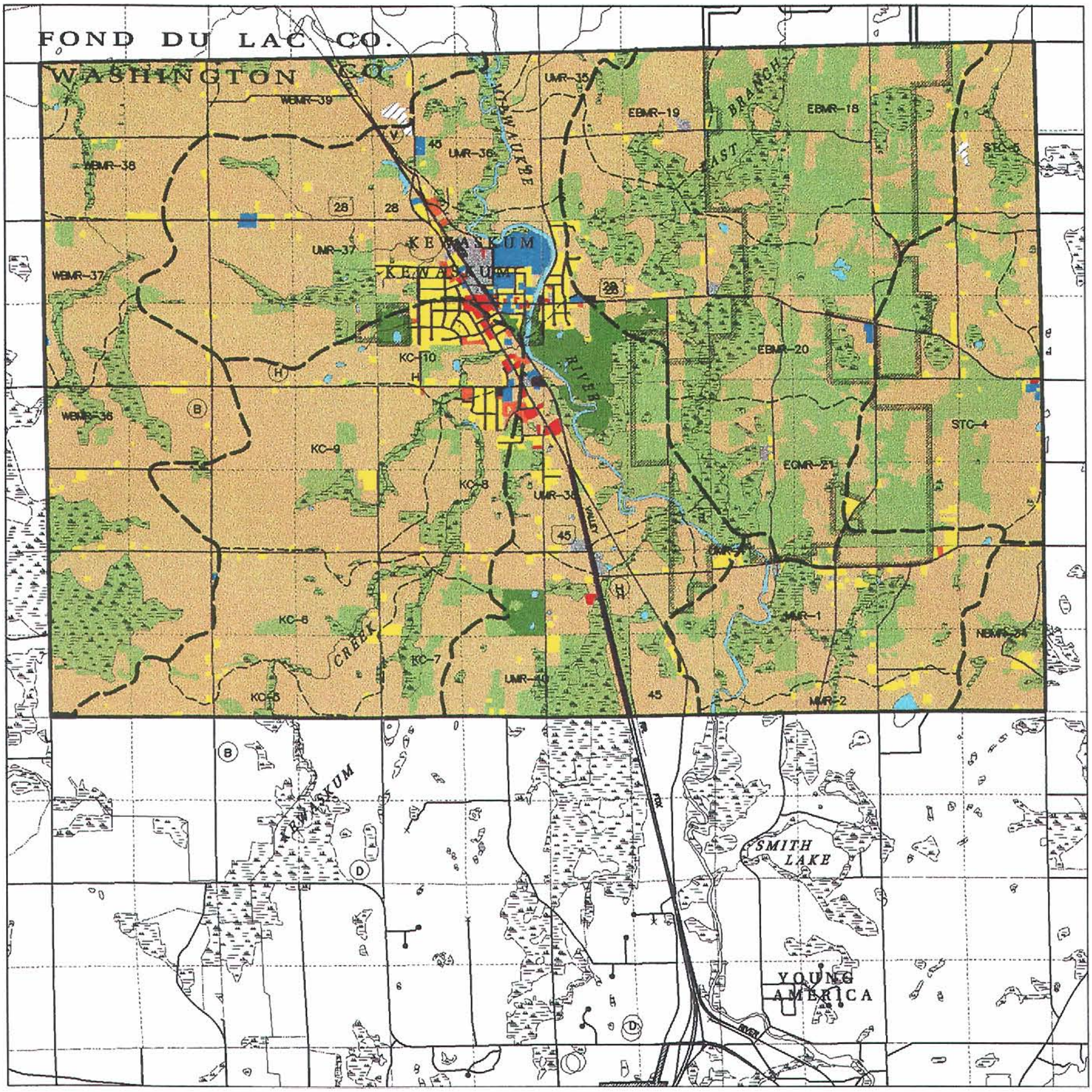
HISTORIC URBAN GROWTH WITHIN THE KEWASKUM AREA: 1850-1990



Source: SEWRPC.

Map 55

EXISTING LAND USE WITHIN THE KEWASKUM AREA: 1995



Single-family residential

Multi-family residential

Commercial

Industrial

Transportation, communications, and utilities

Government and institutional

Recreation

Surface water

Wetlands and woodlands

Agricultural, unused, and other open lands

Extractive and landfill

Basin Boundary

Subbasin Boundary

GRAPHIC SCALE

0 2500 5000 FEET

Source: SEWRPC.

Table 22

EXISTING LAND USE WITHIN THE KEWASKUM AREA: 1995

Land Use Categories	Acres	Percent of Major Category	Percent of Total Area
Urban			
Residential	558	36.0	3.6
Commercial	24	1.5	0.1
Industrial	42	2.7	0.3
Governmental and Institutional	76	4.9	0.5
Transportation and Utilities	612	39.6	3.9
Recreation	226	14.6	1.4
Land under Development	10	0.7	0.1
Subtotal	1,548	100.0	9.9
Rural			
Agricultural	7,850	56.0	50.5
Wetlands	2,426	17.3	15.6
Woodlands	2,589	18.5	16.6
Water	128	0.9	0.8
Extractive	12	<0.1	0.1
Landfill	4	<0.1	<0.1
Other Open Lands	998	7.1	6.4
Subtotal	14,007	100.0	90.1
Total	15,555	- -	100.0

Source: SEWRPC.

LAKES

There are no major lakes in the Kewaskum area. Major lakes are defined as those lakes within the Southeastern Wisconsin Region having a surface area of 50 or more acres in areal extent. However, one minor lake, Kewaskum Millpond, is located within the Village of Kewaskum and is illustrated on Map 57. Table 23 contains selected morphometric data that is available for the pond. Wetlands within the Kewaskum area are shown on Map 58.

Kewaskum Millpond

Lake Morphometry

Kewaskum Millpond is located in U.S. Public Land Survey Section 9, Township 12 North, Range 19 East, Village of Kewaskum. The pond has a surface area of about five acres, a maximum depth of eight feet, and a shoreline development factor of 3.07. The millpond is an impoundment on the Milwaukee River, originally intended to provide power for a grist mill. Although the mill no longer exists, a hydraulic head of 10 feet is still maintained. The impoundment is narrow and may be considered as little more than a widened, deeper portion of the river.

Recreational Use

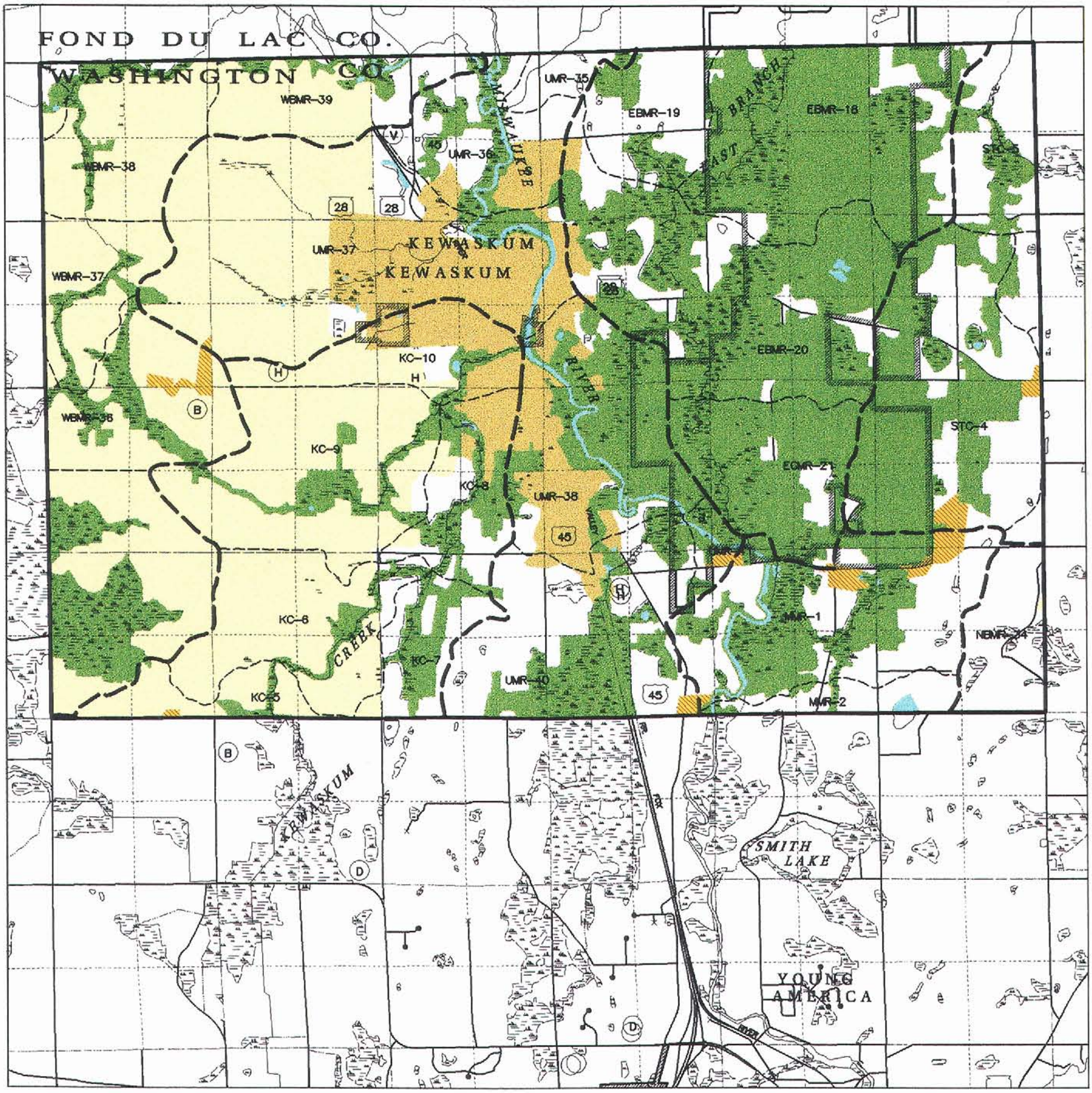
Public access is provided through the navigable waters of the river and through a small town park and road. Swimming is a common activity throughout the summer.

Development Potential

As of 1995, land use within the drainage area tributary to Kewaskum Millpond consisted largely of agricultural and open space uses, with agriculture comprising about 55 percent of the total land cover within the drainage area.

Map 56

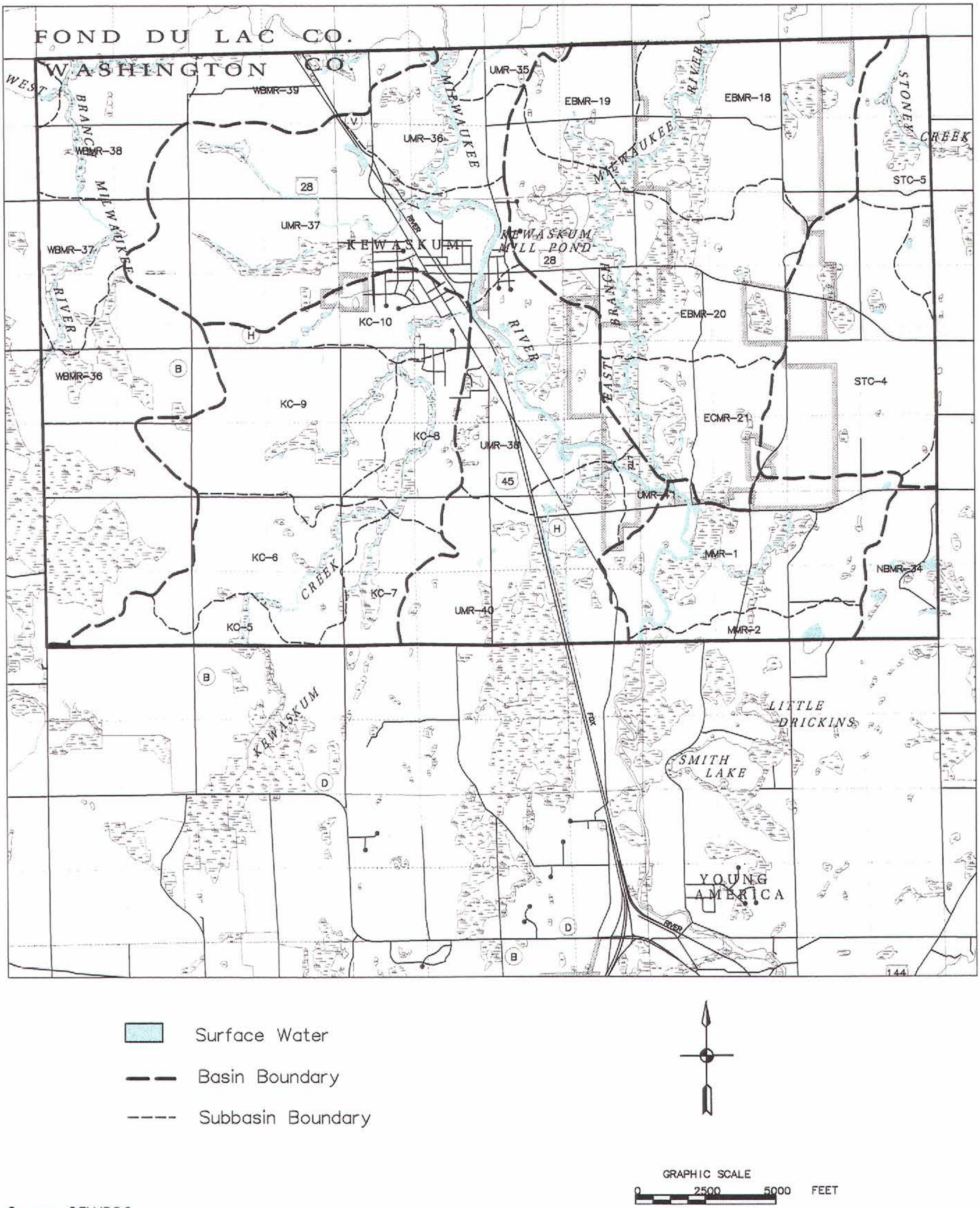
ADOPTED REGIONAL LAND USE PLAN FOR THE KEWASKUM AREA: 2020



Source: SEWRPC.

Map 57

SURFACE WATER RESOURCES WITHIN THE KEWASKUM AREA: 1995



Source: SEWRPC.

Table 23

HYDROLOGY AND MORPHOMETRY OF LAKES WITHIN THE KEWASKUM AREA, WASHINGTON COUNTY

Lake	Surface Area (acres)	Subwatershed Area (acres)	Volume (acre-feet)	Water Residence Time (years)	Maximum Length of Lake (miles)	Length of Shoreline (miles)	Maximum Width of Lake (miles)	Shoreline Development Factor[a]	Maximum Depth (feet)	Mean Depth (feet)
Kewaskum Millpond.....	5	- -[b]	- -[b]	0.01	0.5	1.0	0.1	3.1	8	- -[b]

[a]*Shoreline Development Factor is the ratio between the actual circumference of a lake and the circumference of a circle with the same radius. A circular lake would have a Shoreline Development Factor of 1.0, while a dendritic lake would have a Shoreline Development Factor in excess of 1.0.*

[b]*No data available.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Urban development comprised about 20 percent of the total land cover. A small portion of the drainage area, within and adjacent to the Village of Kewaskum, is located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Kewaskum Millpond include primarily agricultural runoff, with limited urban runoff.

Fish and Wildlife Populations

In 1963,[1] the Wisconsin Department of Natural Resources (WDNR) reported that largemouth bass, northern pike, and panfish comprised the fishery. Carp were considered to present a major use problem. In 1975,[2] the fish population was reported to consist of green sunfish, pumpkinseed, brown bullhead, common carp, shorthead redhorse, rock bass, northern pike, and white sucker. According to the WDNR, as of 1995,[3] northern pike, largemouth bass, and panfish were reported to be present. Waterfowl make very limited use of this pond.

STREAMS

Table 24 contains a summary of selected morphometric data available for named streams in the Kewaskum area. The streamcourses are shown on Map 57, which also shows the hydrologic drainage areas within the area. Descriptive paragraphs for each stream follow, providing a physical description of each stream for the portion of the stream within Washington County, and of the existing uses and conditions, wildlife habitat, and fishery for the portion of the stream within the Kewaskum area, to the extent that such information is available. Each of the paragraphs address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69 (5)(b) of the *Wisconsin Statutes.*

Kewaskum Creek

Stream Morphometry

Kewaskum Creek is located in the southwestern portion of the Kewaskum area. The Creek has a surface area of about nine acres and extends over a linear distance of about 6.4 miles with a gradient of approximately 14 feet per mile. Kewaskum Creek includes a large system of ditches and is tributary to the Milwaukee River within the

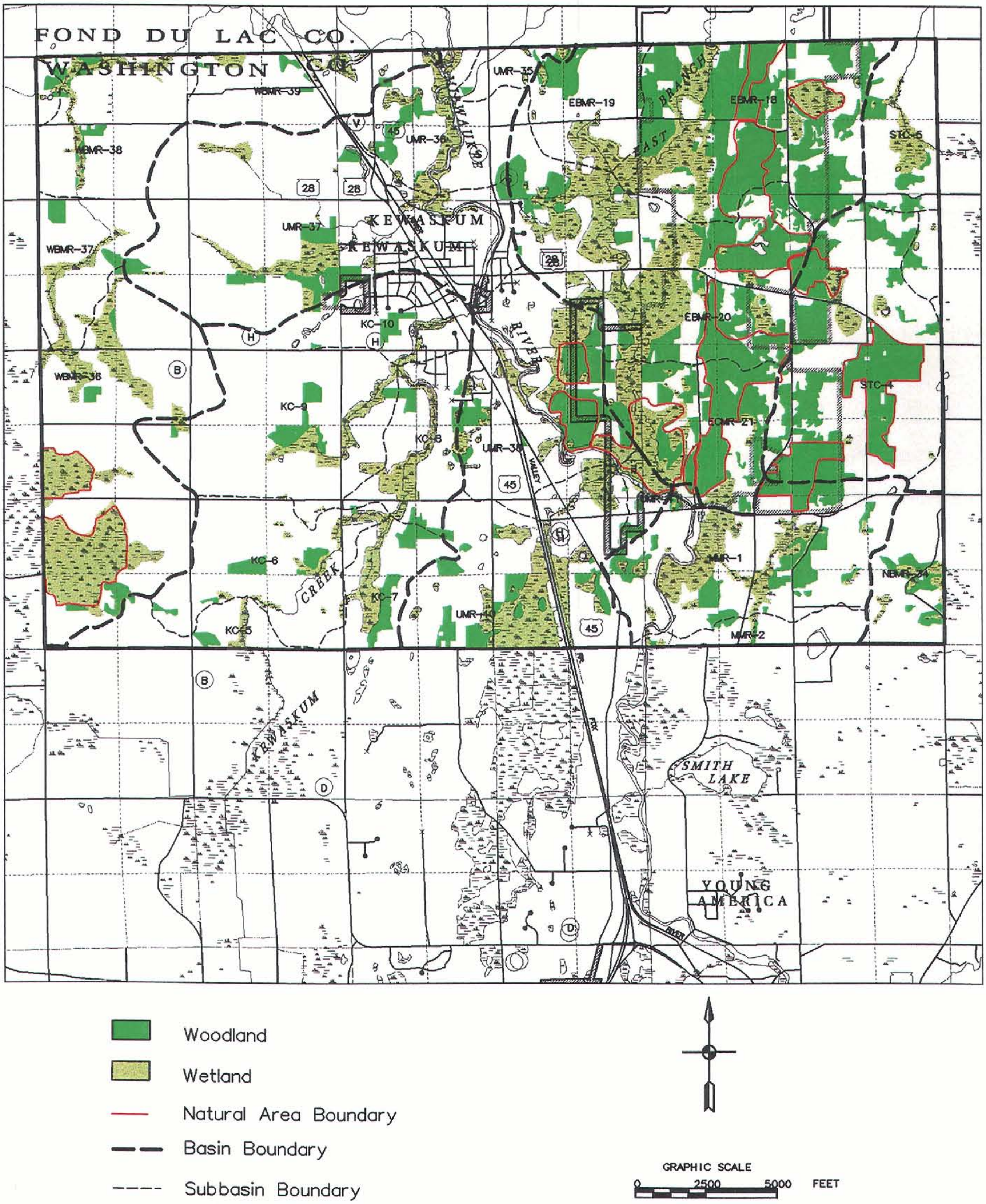
[1]*Wisconsin Conservation Department,* Surface Water Resources of Washington County, *1963.*

[2]*D. Fago, Wisconsin Department of Natural Resources Research Report No. 148,* Retrieval and Analysis System Used in Wisconsin's Statewide Fish Distribution Survey, Second Edition, *December 1988.*

[3]*Wisconsin Department of Natural Resources Publication No. PUBL-FM-800 95REV,* Wisconsin Lakes, *1995.*

Map 58

WETLANDS AND WOODLANDS WITHIN THE KEWASKUM AREA: 1995



Source: SEWRPC.

Table 24

PHYSICAL CHARACTERISTICS OF STREAMS WITHIN THE KEWASKUM AREA, WASHINGTON COUNTY[a]

Stream or Watercourse	Length (miles)	Average Width (feet)	Average Depth (feet)	Surface Area (acres)	Drainage Area (square miles)	U.S. Public Land Survey			Subwatershed	Major Watershed
						Town	Range	Section		
Kewaskum Creek......	6.4	12	0.85	9.3	11.0	12	19	9	East-West Branches Milwaukee	Milwaukee
Milwaukee River.......	25.8	83	1.50	259.5	130.0	12	20	25	East-West Branches Milwaukee	Milwaukee
East Branch of the Milwaukee River....	6.0	42	2.00	30.5	4.0	12	19	14	East Branch Rock	Milwaukee
West Branch of the Milwaukee River and Tributary.........	4.5	8	0.50	4.4	13.0	12	19	4	East-West Branches Milwaukee	Milwaukee
Stony Creek............	9.4	11	0.55	12.5	16.0	12	20	14	East-West Branches Milwaukee	Milwaukee

[a]*Stream data are for the portion of the stream within Washington County only. The U.S. Public Land Survey Township, Range, and Section designation included in each description locates the mouth of the stream at its confluence with another named stream or at the point at which it exits the County.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Village of Kewaskum. The stream flows through a ground moraine, and has fair quantities of sand and gravel as substrate for the bottom. However, in 1963, the Creek was reported to suffer from fluctuating flows. Kewaskum Creek is included within the Milwaukee River Priority Watershed project area.[4]

Recreational Use
Kewaskum Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty. Within the village limits of the Village of Kewaskum, development has occurred adjacent to the floodplain along the stream frontage.

Development Potential
As of 1995, land use within the Kewaskum Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 70 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 10 percent of the total land cover. The drainage area is partially located in an area planned for limited urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the Kewaskum Creek drainage area are primarily agricultural.

Fish and Wildlife Populations
In 1963,[5] the WDNR reported that forage fishes, dace, darters, minnows, were the primary occupants of the Creek at that time. Subsequent fishery surveys conducted during 1985 reported black bullhead, blacknose and common shiner, bluegill, central mudminnow, greater redhorse, johnny and fantail darter, stonecat, bullhead minnow,

[4]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-255-90,* A Nonpoint Source Control Plan for the East and West Branches of the Milwaukee River Priority Watershed Project, *February 1989; Wisconsin Department of Natural Resources Publication No. PUBL-WR-229-89,* Milwaukee River Basin Integrated Management Plan, *February 1990.*

[5]*Wisconsin Conservation Department,* op. cit.

central and common stoneroller, blacknose and southern redbelly dace, green sunfish, hornyhead and creek chub, and white sucker.[6] The Southeastern Wisconsin Regional Planning Commission (SEWRPC) reports the greater redhorse as a State-designated threatened species.[7]

Milwaukee River

Stream Morphometry

The Milwaukee River is located in the central portion of the Kewaskum area. Within Washington County, the River has a surface area of about 53 acres and extends over a linear distance of about 8.3 miles with a gradient of approximately six feet per mile. The Milwaukee River is the largest River in Washington County, both in width and length, and, in the past, has been a major source of water power in the Barton-West Bend area. The Milwaukee River is included within the Milwaukee River Priority Watershed project area.[8]

Recreational Use

The Milwaukee River is navigable by boat or canoe. Public access is provided on a limited basis.

Development Potential

As of 1995, land use within the Milwaukee River drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 45 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 15 percent of the total land cover. A small portion of the drainage area is located within an area planned for limited urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the Milwaukee River drainage area include primarily agricultural runoff, with some urban runoff.

Fish and Wildlife Populations

In 1963,[9] the WDNR reported that the fishery was limited by an undesirable rough fish population, although northern pike were present in the River during spring and the several impoundments constructed on the River acted as sources of panfish and limited numbers of largemouth bass. A 1965 fish survey reported blackside darter, common carp, common shiner, hornyhead chub, walleyed pike, largemouth and rock bass, yellow perch, white sucker, bluegill, northern pike, and black bullhead to be present in the River.[10] In 1972,[11] the fish population in the Kewaskum area was comprised of hornyhead chub, pumpkinseed, white sucker, yellow perch, largemouth bass, tadpole madtom, johnny darter, and common shiner. In 1978,[12] the fish population was comprised of black

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[6]*D. Fago,* op. cit.

[7]*SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997.*

[8]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-253-90,* A Nonpoint Source Control Plan for the North Branch Milwaukee River Priority Watershed Project, *July 1989; Wisconsin Department of Natural Resources, PUBL-WR-255-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

[9]*Wisconsin Conservation Department,* op. cit.

[10]*D. Fago,* op. cit.

[11]Ibid.

[12]Ibid.

bullhead, largemouth bass, green and longear sunfish, and common shiner. In 1981,[13] the fish population was comprised of hornyhead chub, johnny darter, northern pike, golden redhorse, black bullhead, common carp, common shiner, and white sucker. By 1985,[14] the fish population was reported to be comprised of bluegill, rock and largemouth bass, stonecat, pumpkinseed, white crappie, johnny darter, shorthead redhorse, white sucker, central mudminnow, common carp, and green sunfish. SEWRPC reports the longear sunfish as a State-designated threatened species.[15]

East Branch of the Milwaukee River

Stream Morphometry

The East Branch of the Milwaukee River is located in the eastern portion of the Kewaskum area. Within Washington County, the River has a surface area of about 30 acres and extends over a linear distance of about six miles with a gradient of approximately two feet per mile. The East Branch of the Milwaukee River is a major tributary to the Milwaukee River, originating in Sheboygan County, that is situated wholly within the boundaries of the Kettle Moraine State Forest in Washington County. About 4.5 miles of stream are in public ownership. The East Branch of the Milwaukee River is included within the Milwaukee River Priority Watershed project area.[16]

Recreational Use

The East Branch Milwaukee River is navigable by canoe.

Development Potential

As of 1995, land use within the East Branch Milwaukee River drainage area consisted largely of woodland and other open space uses comprising about 60 percent of the total land cover within the drainage area. Wetlands comprised about 25 percent of the total land cover. The drainage area is partially located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the East Branch of the Milwaukee River drainage area are primarily agricultural.

Fish and Wildlife Populations

In 1963,[17] the WDNR reported that the fishery was limited to forage species. A subsequent survey conducted during 1972 reported hornyhead chub, pumpkinseed, white sucker, yellow perch, largemouth bass, tadpole madtom, johnny darter, and common shiner.[18] SEWRPC reports the longear sunfish as a State-designated threatened species.[19]

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[13]Ibid.

[14]Ibid.

[15]*SEWRPC Planning Report No. 42,* op. cit.

[16]*Wisconsin Department of Natural Resources, PUBL-WR-255-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

[17]*Wisconsin Conservation Department,* op. cit.

[18]*D. Fago,* op. cit.

[19]*SEWRPC Planning Report No. 42,* op. cit.

West Branch of the Milwaukee River and Unnamed Tributary

Stream Morphometry

The West Branch of the Milwaukee River and its tributary stream are located in the northwestern portion of the Kewaskum area. Within Washington County, the Rivers have a combined surface area of about nine acres, approximately 4.5 acres each, and extend over a linear distance of about 0.6 mile with a gradient of approximately 13 feet per mile. Only a short stretch of this stream flows in Washington County. However, an unnamed tributary of about 3.9 miles in length adds much to its drainage area. The West Branch of the Milwaukee River and its tributary stream is included within the Milwaukee River Priority Watershed project area.[20]

Recreational Use

The West Branch of the Milwaukee River is navigable by canoe.

Development Potential

As of 1995, land use within the West Branch of the Milwaukee River drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 30 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the West Branch of the Milwaukee River are primarily agricultural.

Fish and Wildlife Populations

In 1963,[21] the WDNR reported that forage fishes constituted the West Branch of the Milwaukee River fishery. In 1978 and 1985 the fishery in the unnamed tributary consisted of blacknose and pearl dace, bluegill, brook stickleback, creek chub, fantail darter, fathead minnow, southern and northern redbelly dace, johnny darter, central mudminnow, central stoneroller, common shiner, hornyhead chub, bullheads, stonerollers, white sucker and blackside darter, yellow and black bullhead, fantail darter, northern pike, pumpkinseed, central stoneroller, hornyhead chub and fathead minnow, respectively.[22]

Stony Creek

Stream Morphometry

Stony Creek is located in the northeastern portion of the Kewaskum area. The Creek has a surface area of about 13 acres and extends over a linear distance of about 9.4 miles with a gradient of approximately 10 feet per mile. The Creek is a tributary to the Milwaukee River (North Branch) originating at Haack Lake in Sheboygan County. Stony Creek is included within the Milwaukee River Priority Watershed project area.[23]

Recreational Use

Stony Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty.

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[20] *Wisconsin Department of Natural Resources, PUBL-WR-255-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

[21] *Wisconsin Conservation Department,* op. cit.

[22] *D. Fago,* op. cit.

[23] *Wisconsin Department of Natural Resources, PUBL-WR-253-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

Development Potential

As of 1995, land use within the Stony Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 65 percent of the total land cover within the drainage area. Woodlands and other open space uses comprised about 15 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the Stony Creek drainage area are primarily agricultural.

Fish and Wildlife Populations

The stream was impounded at the unincorporated hamlet of Boltonville, where the WDNR reported that smallmouth bass constituted a major fishery in 1963.[24] Upstream of Boltonville, forage fishes were reported to dominate the fishery in 1963. A 1978 fish survey reported central mudminnow as the sole species captured.[25]

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[24]*Wisconsin Conservation Department,* op. cit.

[25]*D. Fago,* op. cit.

Chapter XI

INVENTORY FINDINGS: POLK AREA

INTRODUCTION

This chapter presents the inventory findings relating to lakes and streams in the Polk area of Washington County. The Polk area is shown on Map 59 and includes all of U.S. Public Land Survey Sections 1 through 36, Town 10 North, Range 19 East. The area includes the entire Town of Polk, a small western portion of the Village of Jackson, and nearly all of the Village of Slinger. To the extent that data are available, relevant land use, recreational use, morphometric, water quality, and biological information upon which waterbody classifications are to be based pursuant to the requirements of Section 281.69(5)(b), *Wisconsin Statutes*, is presented for each waterbody inventoried. These data form the scientific and technical basis for the determination of the alternative and recommended waterbody classification schemes set forth in Chapter XVI.

LAND USE

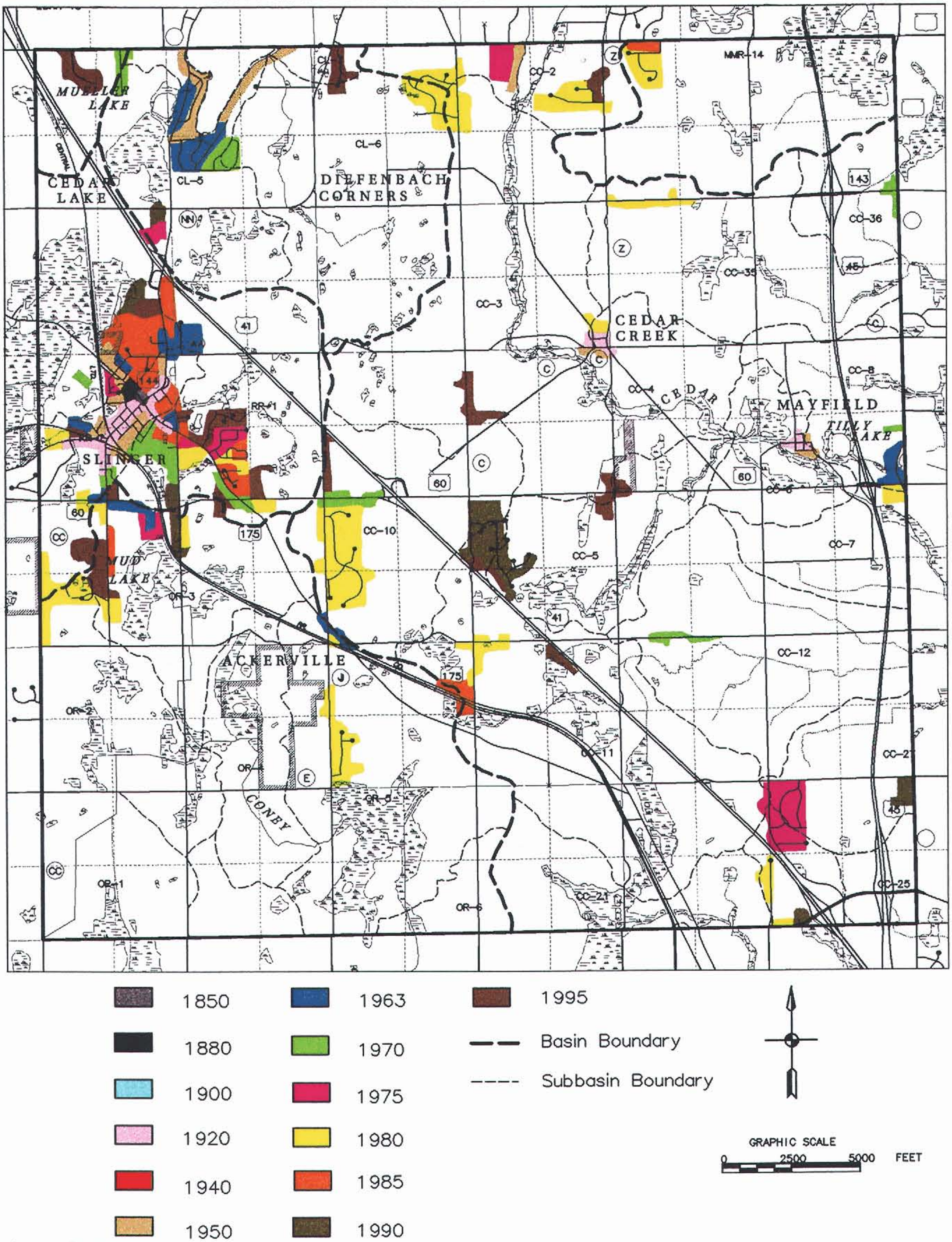
The type, intensity, and spatial distribution of the various land uses within the Polk area are important determinants of water quality and recreational use demands. The current and planned future land use patterns, placed in context of the historical development in the area are, therefore, important considerations in any waterbody management planning effort in the area.

While some settlement occurred in the Polk area prior to the 1880s, most urban development occurred in the Polk area in recent years. The Town of Polk remains largely rural in character, although the portion within the Villages of Slinger and Jackson have been significantly developed. Map 59 indicates the historic urban growth pattern in the Town of Polk, Washington County, since 1850. Early development occurred in the west-central portions of the area, that later became incorporated as the Village of Slinger in 1869. The majority of the urban growth within the area has taken place since the 1950s, centered primarily in the vicinity of the Village of Slinger with isolated scattered subdivisions throughout the Town.

The existing land use pattern in the Polk area, as of 1995, is shown on Map 60, and is quantified in Table 25. As indicated in Table 25, about 3,750 acres, or about 16 percent of the area, including the Village of Slinger, were devoted to urban land uses. The dominant urban land uses were residential, and transportation and utility uses, encompassing about 3,300 acres, or about 88 percent of the area in urban use. As of 1995, about 19,400 acres, or about 84 percent of the area, were still devoted to rural land uses. About 12,750 acres, or about 66 percent of the rural area, were in agricultural land uses. Woodlands, wetlands, and surface water, including the surface area of the lakes in the area, accounted for approximately 4,800 acres, or about 24 percent of the area in rural use. Future growth in urban land use, based upon the recommendations set forth in the adopted 2020 regional land use plan shown on Map 61, is anticipated in the west-central portion of the area, within and adjacent to the currently incorporated area of the Village of Slinger, and in the east-central portion of the area within and adjacent to the currently incorporated area of the Village of Jackson. Elsewhere, however, land use is not anticipated to differ greatly from the current situation.

Map 59

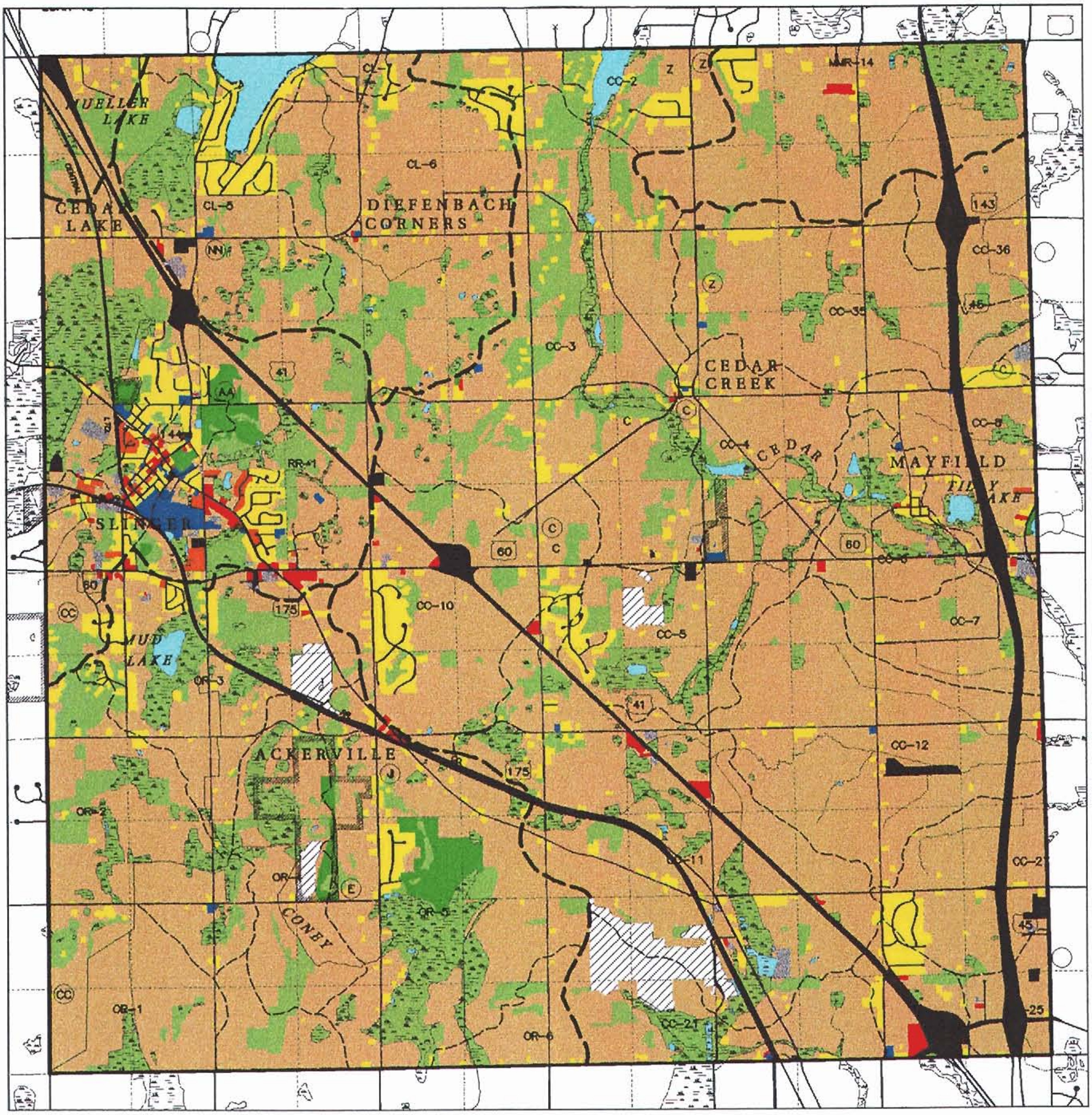
HISTORIC URBAN GROWTH WITHIN THE POLK AREA: 1850-1990



Source: SEWRPC.

Map 60

EXISTING LAND USE WITHIN THE POLK AREA: 1995



Single–family residential

Multi–family residential

Commercial

Industrial

Transportation, communications, and utilities

Government and institutional

Recreation

Surface water

Wetlands and woodlands

Agricultural, unused, and other open lands

Extractive and landfill

Basin Boundary

Subbasin Boundary

GRAPHIC SCALE

0 2500 5000 FEET

Source: SEWRPC.

Table 25

EXISTING LAND USE WITHIN THE POLK AREA: 1995

Land Use Categories	Acres	Percent of Major Category	Percent of Total Area
Urban			
Residential	1,615	43.1	7.0
Commercial	66	1.8	0.3
Industrial	70	1.9	0.3
Governmental and Institutional	69	1.8	0.3
Transportation and Utilities	1,683	44.7	7.3
Recreation	208	5.6	0.9
Land under Development	40	1.1	0.1
Subtotal	3,751	100.0	16.2
Rural			
Agricultural	12,752	65.9	55.3
Wetlands	2,074	10.7	9.0
Woodlands	2,447	12.6	10.7
Water	266	1.4	1.1
Extractive	247	1.3	1.1
Landfill	50	0.3	0.2
Other Open Lands	1,530	7.8	6.4
Subtotal	19,366	100.0	83.8
Total	23,117	- -	100.0

Source: SEWRPC.

LAKES

Table 26 contains a summary of selected morphometric data available for the major lakes within the Polk area. Major lakes are defined as those lakes within the Southeastern Wisconsin Region having a surface area of 50 or more acres in areal extent. These lakes are shown on Map 62. Where available, similar summary data are provided for minor lakes because of the importance of these smaller waterbodies as a water resource. In some cases, these waterbodies, in which water levels fluctuate markedly, may be classed as deep-water marshes or wetlands. Wetlands within the Polk area are shown on Map 63. The lakes inventoried are further described below with information set forth in paragraphs which address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69(5)(b) of the *Wisconsin Statutes*. Information on the origins of these lakes is based upon detailed geological information provided in various published survey reports[1] and maps of surfacial deposits.[2]

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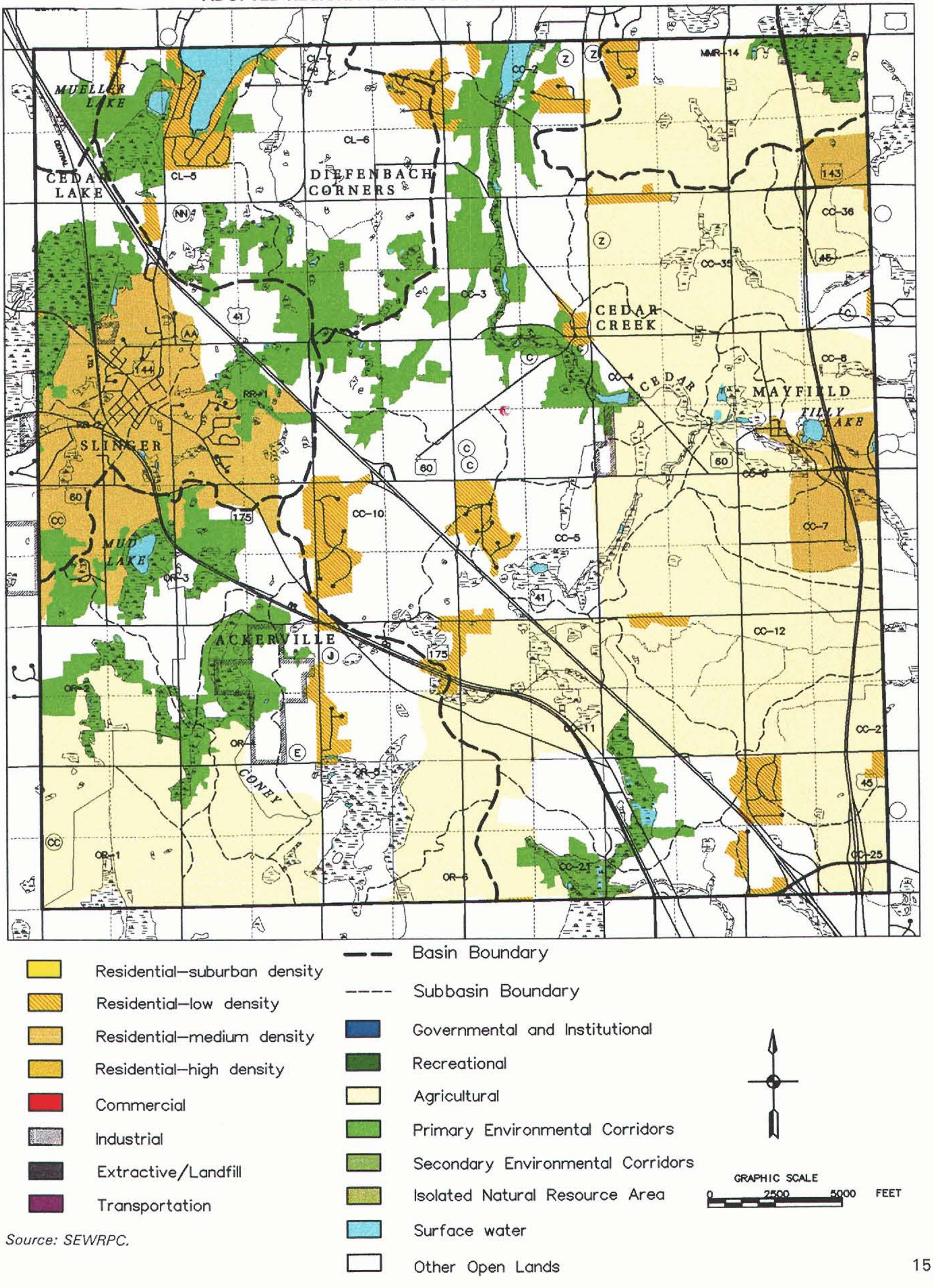
[1]*C. Juday,* The Inland Lakes of Wisconsin, The Hydrography and Morphometry of the Lakes, *State of Wisconsin, 1914, pp. 84-88; L. Martin,* The Physical Geography of Wisconsin, 2nd Edition, *State of Wisconsin, 1932, pp. 235-293.*

[2]*W.C. Alden,* Map Showing the Surficial Deposits of Southeastern Wisconsin, *Wisconsin Geological Survey, 1918; H.L. Young and W.G. Batten, Wisconsin Geological and Natural History Survey Information Circular No. 38,* Ground-Water Resources and Geology of Washington and Ozaukee Counties, Wisconsin, *University of Wisconsin-Extension, February 1980, 37 pages.*

Map 61

ADOPTED REGIONAL LAND USE PLAN FOR THE POLK AREA: 2020



Source: SEWRPC.

Table 26

HYDROLOGY AND MORPHOMETRY OF LAKES WITHIN THE POLK AREA, WASHINGTON COUNTY

Lake	Surface Area (acres)	Subwatershed Area (acres)	Volume (acre-feet)	Water Residence Time (years)	Maximum Length of Lake (miles)	Length of Shoreline (miles)	Maximum Width of Lake (miles)	Shoreline Development Factor[a]	Maximum Depth (feet)	Mean Depth (feet)
Big Cedar[b]	932	6,641	31,983	5.52	3.8	11.0	0.7	2.57	105	34
Hasmer	15	900	255	0.89	0.2	0.6	0.2	1.19	34	17
Lehner	3	748	45	0.08	0.1	0.6	0.1	2.14	22	9
Lent	8	10,025	88	0.01	0.1	--[c]	0.1	--[c]	7	--[c]
Little Cedar	246	7,565	3,198	0.59	1.3	4.0	0.5	1.77	56	13
Mayfield	8	10,025	--[c]	0.01	0.3	0.6	0.1	1.48	4	--[c]
Mud	23	929	15	0.02	0.3	0.8	0.2	1.19	5	1
Mueller[b]	14	5,565	210	--[c]	0.2	0.5	0.1	1.20	33	15
Tily	13	900	567	0.89	0.2	0.5	0.2	1.03	48	24

[a]*Shoreline Development Factor is the ratio between the actual circumference of a lake and the circumference of a circle with the same radius. A circular lake would have a Shoreline Development Factor of 1.0, while a dendritic lake would have a Shoreline Development Factor in excess of 1.0.*

[b]*These lakes fall within a common subwatershed, Subbasin CL-5.*

[c]*No data available.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Big Cedar Lake

Lake Morphometry

Big Cedar Lake is situated in U.S. Public Land Survey Section 5, Township 10 North, Range 19 East, Town of Polk; and Sections 17, 19, 20, 29, 30, 31 and 32, Township 11 North, Range 19 East, Town of West Bend. The Lake has a surface area of about 932 acres, a maximum depth of 105 feet, and a shoreline development factor 2.57. The Lake is a large, elongate, glacial lake, occupying a valley between two high ridges left by the retreating Green Bay glacier. The lake consists of a deep southern basin connected by a broad shallow terrace to a shallower northern basin. The bathymetry of Big Cedar Lake is shown on Map 64. Springs and seepage are major water sources and Cedar Creek originates here.

Water Quality

Available water quality data indicate that Big Cedar Lake is a mesotrophic, or moderately enriched, waterbody, with a Trophic State Index rating of approximately 46. Since 1970, water quality conditions in Big Cedar Lake have improved as a consequence of management actions implemented within the drainage area tributary to the Lake by the Big Cedar Lake Protection and Rehabilitation District, Cedar Lakes Conservation Foundation, the Town of Polk, and Washington County, in partnership with the Big Cedar Lake community. Figure 1 shows the trends in water quality within Big Cedar Lake during the period 1990 through 1998. A lake water quality protection and stormwater management plan was completed for the Lake by the Southeastern Wisconsin Regional Planning Commission (SEWRPC) in 1999.[3] In addition, the Lake Protection and Rehabilitation District has been very active in planning for, and implementation of, lake management and protection programs.

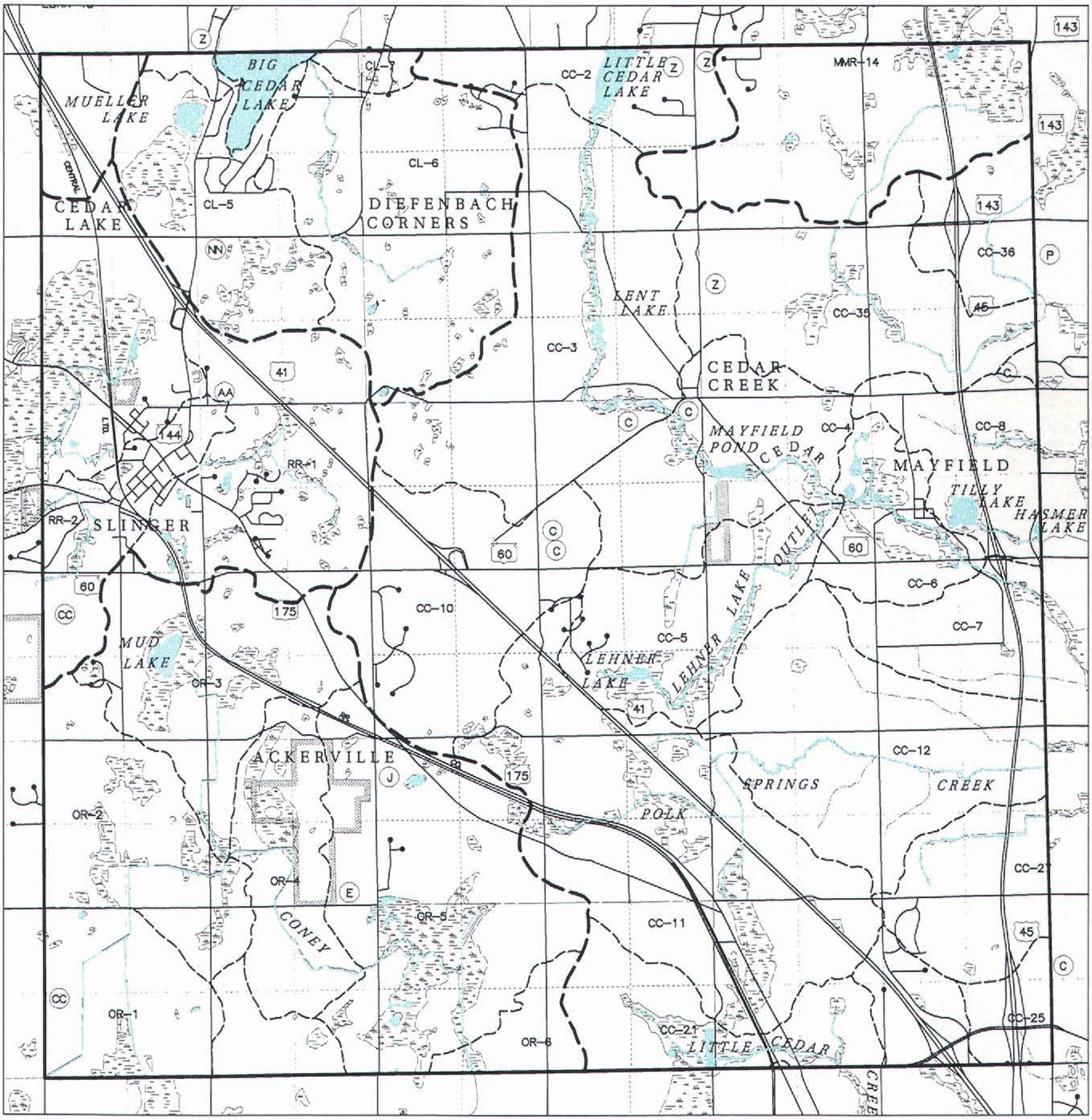
Recreational Use

Big Cedar Lake is the largest lake in Washington County. The Lake currently has public access.

[3]*SEWRPC Memorandum Report No. 137,* A Water Quality Protection and Stormwater Management Plan for Big Cedar Lake, Washington County, Wisconsin, *Volume One,* Inventory Findings and Water Quality Analyses, *August 2001; and Volume Two,* Stormwater Management Plans for Three Pilot Subbasins, *August 2001.*

Map 62

SURFACE WATER RESOURCES WITHIN THE POLK AREA: 1995



Surface Water

Basin Boundary

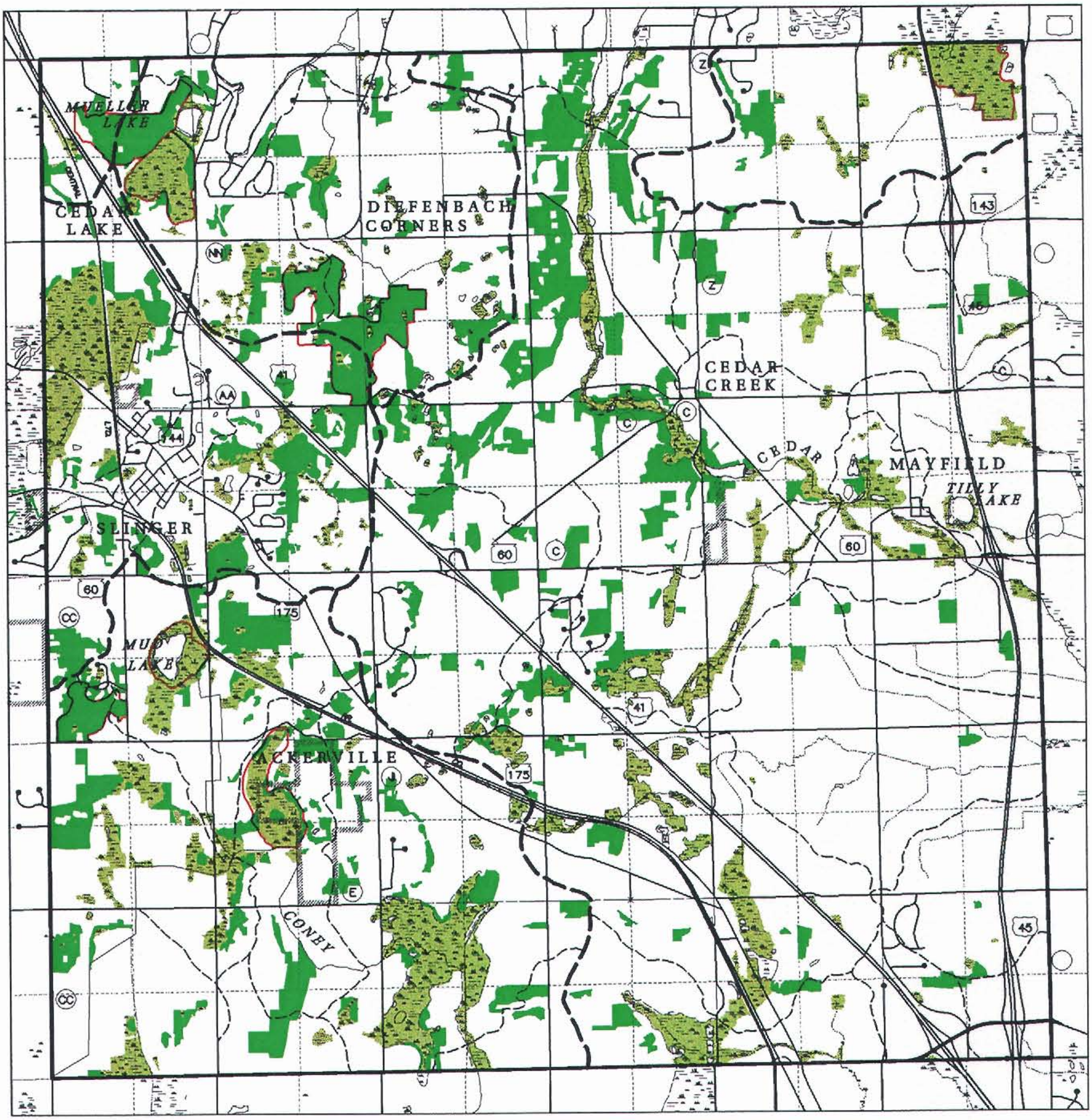
Subbasin Boundary

GRAPHIC SCALE 0 2500 5000 FEET

Source: SEWRPC.

Map 63

WETLANDS AND WOODLANDS WITHIN THE POLK AREA: 1995



Woodland

Wetland

Natural Area Boundary

Basin Boundary

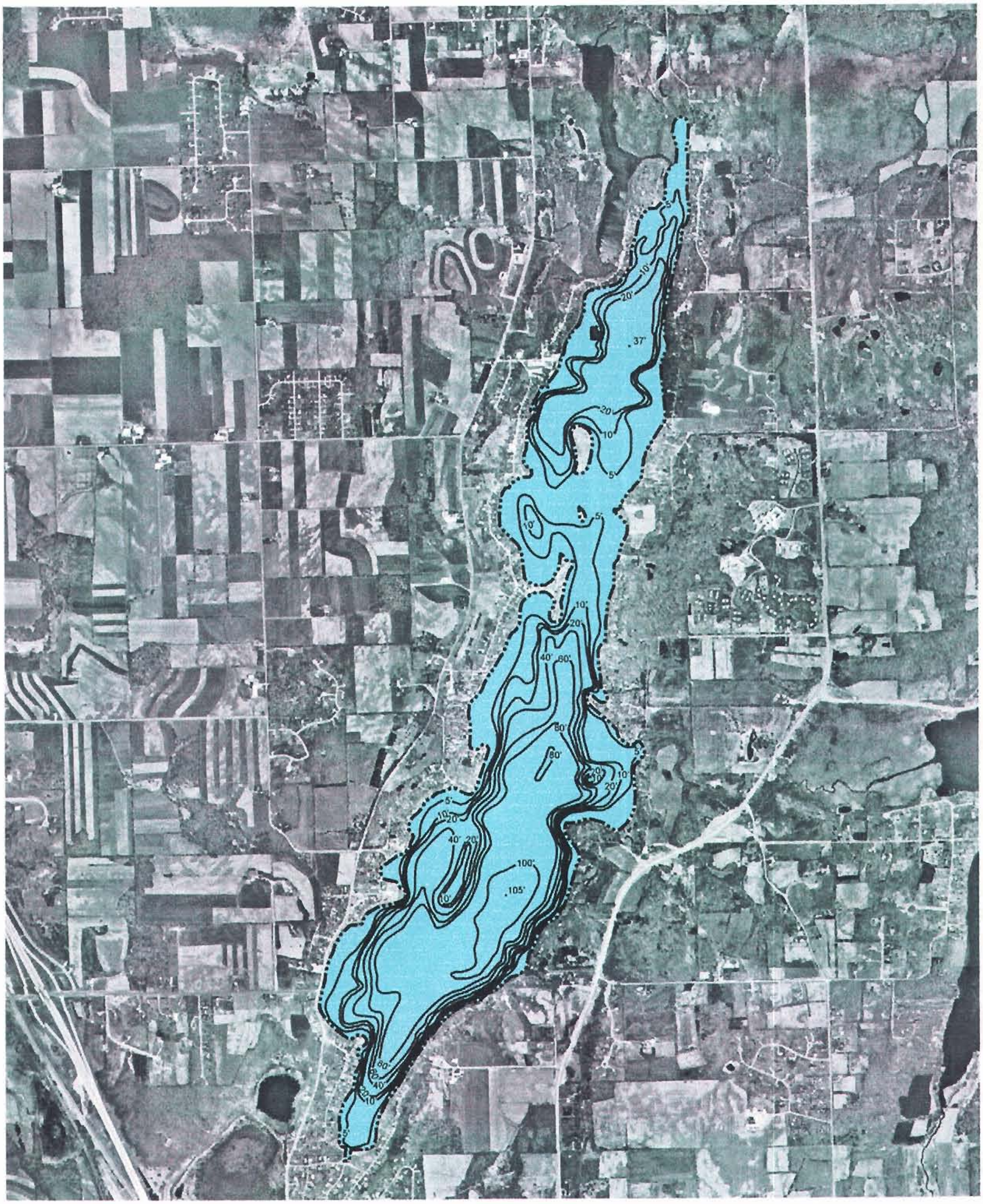
Subbasin Boundary

GRAPHIC SCALE
0 2500 5000 FEET

Source: SEWRPC.

Map 64

BATHYMETRIC MAP OF BIG CEDAR LAKE



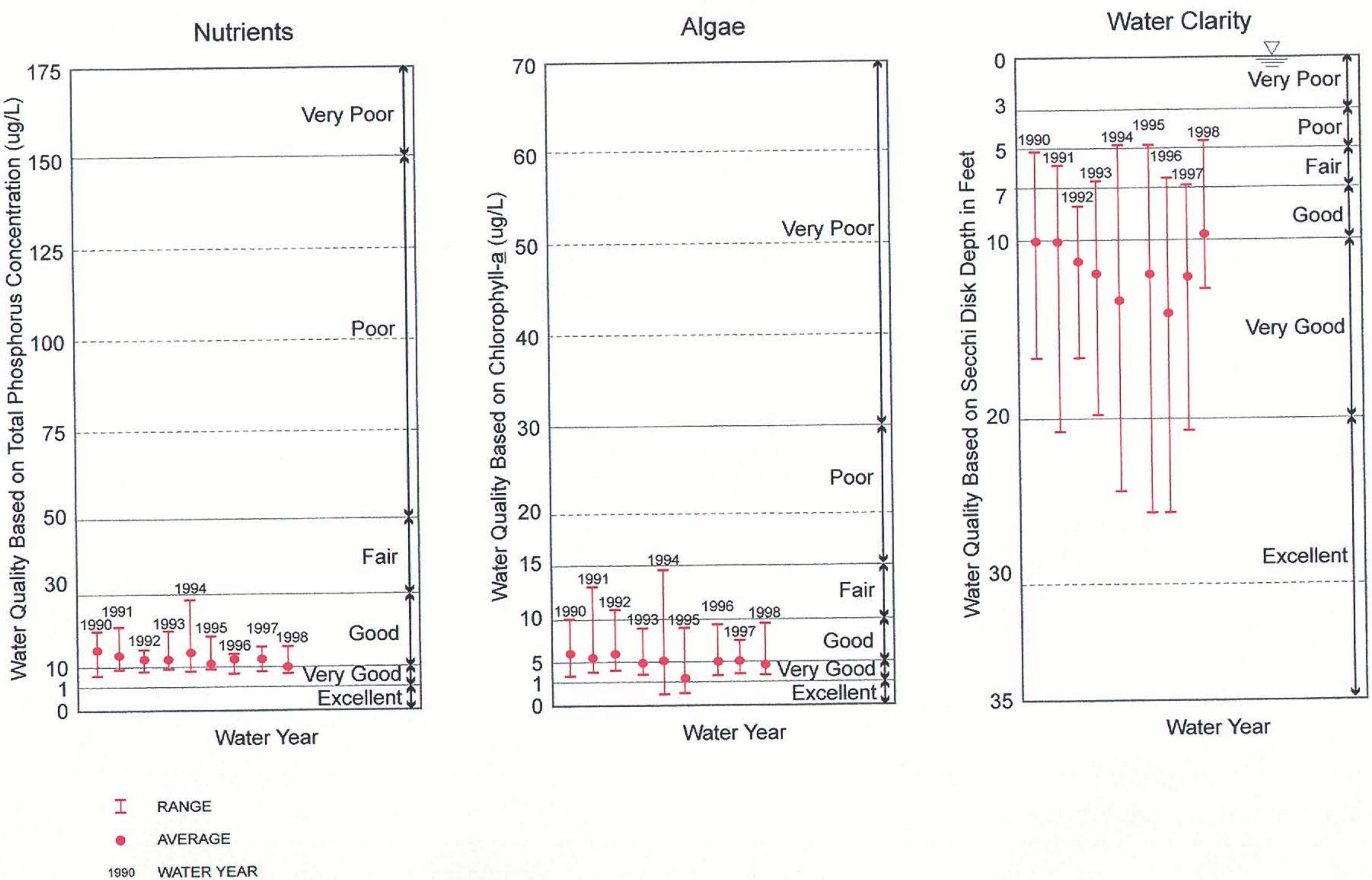
—20'— WATER DEPTH CONTOUR IN FEET

GRAPHIC SCALE
0 1500 3000 FEET

Source: SEWRPC.

Figure 1

BIG CEDAR LAKE PRIMARY WATER QUALITY INDICATORS:1990-1998



Source: Wisconsin Department of Natural Resources and SEWRPC.

Development Potential
As of 1995, land use within the drainage area tributary to Big Cedar Lake consisted largely of agricultural and woodland uses, comprising about 65 percent of the land cover in the drainage area. The undeveloped lands within the drainage area are recommended to remain largely in rural use with some residential development at rural densities.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Big Cedar Lake include agricultural runoff.

Fish and Wildlife Populations
In 1963,[4] the Lake was managed for largemouth and smallmouth bass, northern pike, panfish, and cisco. Yellow perch, bluegill, and black crappie were the most abundant species of panfishes. A sturgeon was caught in the Lake in 1961 and a fantail darter was reported from the Lake in 1900. During 1954 and 1955, trout were stocked on an experimental basis, but an inadequate harvest and lack of suitable public access resulted in the discontinuation of the stocking program in subsequent years. Aquatic plant growth and stunted panfish were identified as major use problems in 1963. Fish surveys were conducted during 1974 and 1978.[5] In 1974, the Lake was reported to be populated by walleyed pike, white sucker, rock and largemouth bass, common carp, pumpkinseed, crappie, northern pike, johnny and Iowa darter, pugnose shiner, bluntnose minnow, green sunfish, bluegill, and yellow perch. In 1978, blackchin, blacknose, golden, and mimic shiner; green sunfish; bluegill; yellow perch; pumpkinseed; johnny darter; banded killifish; largemouth bass; and bluntnose minnow were reported from the Lake. In 1995,[6] largemouth bass were reported to be abundant, northern pike and panfish as common, and walleyed pike as present. SEWRPC reports the pugnose shiner as a State-designated threatened species.[7] About 100 acres of grass and tamarack marsh adjoin the Lake at its northern end, encircling neighboring Gilbert Lake.[8] Mallards, blue-winged teal, wood ducks, and Florida gallinule have been observed to nest here, and both puddle and diving ducks are common sights in spring and fall migration. High development of the shoreline for home sites and increased spring and summer boating activity have reduced use of the Lake for nesting in recent years.

Hasmer Lake

Lake Morphometry
Hasmer Lake is situated in U.S. Public Land Survey Section 13, Township 10 North, Range 19 East, Town of Polk and Section 19, Township 10 North, Range 20 East, Village of Jackson. The Lake has a surface area of about 15 acres, a maximum depth of 34 feet, and a shoreline development factor of 1.19. Hasmer Lake is a small drainage lake occupying a depression in the ground moraine of the Lake Michigan glacier. There is an inflow from a tributary which is the outlet of Tily Lake, and an outlet tributary to Cedar Creek.

Recreational Use
Public access is available and a commercial facility provides boats and a beach.

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[4]*Wisconsin Conservation Department,* Surface Water Resources of Washington County, *1963.*

[5]*D. Fago, Wisconsin Department of Natural Resources Research Report No. 148,* Retrieval and Analysis System Used in Wisconsin's Statewide Fish Distribution Survey, Second Edition, *December 1988.*

[6]*Wisconsin Department of Natural Resources Publication No. PUBL-FM-800 95REV,* Wisconsin Lakes, *1995.*

[7]*SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997; SEWRPC Memorandum Report No. 131,* Environmental Analysis of the Lands at the Headwaters of Gilbert Lake and Big Cedar Lake, *March 1999.*

[8]*SEWRPC Memorandum Report No. 131,* op. cit.

Development Potential

As of 1995, land use within the drainage area tributary to Hasmer Lake consisted of agricultural, urban, and open space land uses comprising about 75 percent of the land cover in the drainage area. The drainage area is located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Hasmer Lake include both urban and agricultural runoff.

Fish and Wildlife Populations

In 1963,[9] largemouth bass, panfish, and northern pike constituted the fishery, while a large carp population and extremely turbid water detracted from the Lake's value as a recreational resource. In 1975,[10] the fish population in the Lake consisted of common carp, common and golden shiner, bullheads, lake chubsucker, bluntnose minnow, largemouth bass, white sucker, yellow perch, pumpkinseed, crappies, and green sunfish. SEWRPC reports the lake chubsucker as a State-designated threatened species.[11] In 1995,[12] largemouth bass were abundant, northern pike common, and panfish present. The shoreline is partially bordered by a band of wetlands, providing for some nesting of mallards and divers.

Lent Lake

Lake Morphometry

Lent Lake is situated in U.S. Public Land Survey Section 10, Township 10 North, Range 19 East, Town of Polk. The Lake has a surface area of about eight acres, and a maximum depth of seven feet. Lent Lake is an impoundment of Cedar Creek, occupying part of a basin of an older millpond. Remnants of the older impoundment structure are still evident downstream.

Recreational Use

Public access is not available.

Development Potential

As of 1995, the land use within the drainage area tributary to Lent Lake consisted of agricultural, woodland, and other open land uses, comprising about 85 percent of the land cover in the drainage area. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Lent Lake include agricultural runoff.

Fish and Wildlife Populations

In 1963,[13] the Wisconsin Department of Natural Resources (WDNR) reported the fishery to consist of limited panfish and abundant carp. Migrating waterfowl populations were common including mallards, bluewing teal, and wood ducks inhabiting the surrounding wetlands.

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[9] *Wisconsin Conservation Department,* op. cit.

[10] *D. Fago,* op. cit.

[11] *SEWRPC Planning Report No. 42,* op. cit.

[12] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

[13] *Wisconsin Conservation Department,* op. cit.

Little Cedar Lake

Lake Morphometry

Little Cedar Lake is situated in U.S. Public Land Survey Section 3, Township 10 North, Range 19 East, Town of Polk, and Section 33, Township 11 North, Range 19 East, Town of West Bend. The Lake has a surface area of about 246 acres, a maximum depth of 56 feet, and a shoreline development factor of 1.77. Little Cedar Lake is an elongate lake of glacial origin occupying an undrained trough between two ridges of the kettle moraine. Cedar Creek enters the Lake at its north end and leaves at the south end over a low-head dam. The bathymetry of Little Cedar Lake is shown on Map 65.

Recreational Use

Public access became available in 1999 when Washington County acquired facilities to provide recreational boating opportunities on the Lake. The Lake is considered to have adequate public recreational boating access pursuant to Chapter NR 1 of the *Wisconsin Administrative Code.*

Development Potential

As of 1995, the land uses within the drainage basin tributary to Little Cedar Lake consisted of agricultural and open land uses, comprising about 40 percent of the land cover in the drainage area. Wetlands comprised about 20 percent of the land cover. Much of the shoreline of Little Cedar Lake is developed for residential use. The undeveloped portions of the drainage area are not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Little Cedar Lake are primarily agricultural.

Fish and Wildlife Populations

In 1963,[14] the Lake was managed for largemouth bass, panfish, and walleyed pike, and an abundance of carp was identified as the major use problem. The Wisconsin Department of Natural Resources had entered into a cooperative carp removal agreement with the Little Cedar Lake Advancement Association in 1961. As of 1971,[15] the fish population of Little Cedar Lake consisted of largemouth, rock, and white bass; black crappie; bluegill; golden shiner; green sunfish; northern pike; pumpkinseed; walleyed pike; yellow bullhead; and yellow perch. Common carp were recorded in the Lake at that time. In 1978,[16] black and yellow bullhead, bluegill, tadpole madtom, yellow perch, green sunfish, bluntnose minnow, pumpkinseed, and largemouth and rock bass comprised the fishery. By 1995,[17] largemouth bass were reported to be abundant, walleyed pike and panfish to be common, and northern pike to be present. About 120 acres of wooded wetlands border the Lake, especially at the inlet of Cedar Creek. Fair numbers of waterfowl frequent the area, and broods of mallard, black duck, blue-winged teal, and wood duck have been observed.

Mud Lake

Lake Morphometry

Mud Lake is situated in U.S. Public Land Survey Section 19, Township 10 North, Range 19 East, Town of Polk and Village of Slinger. The Lake has a surface area of about 23 acres, a maximum depth of five feet, and a

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[14]Ibid.

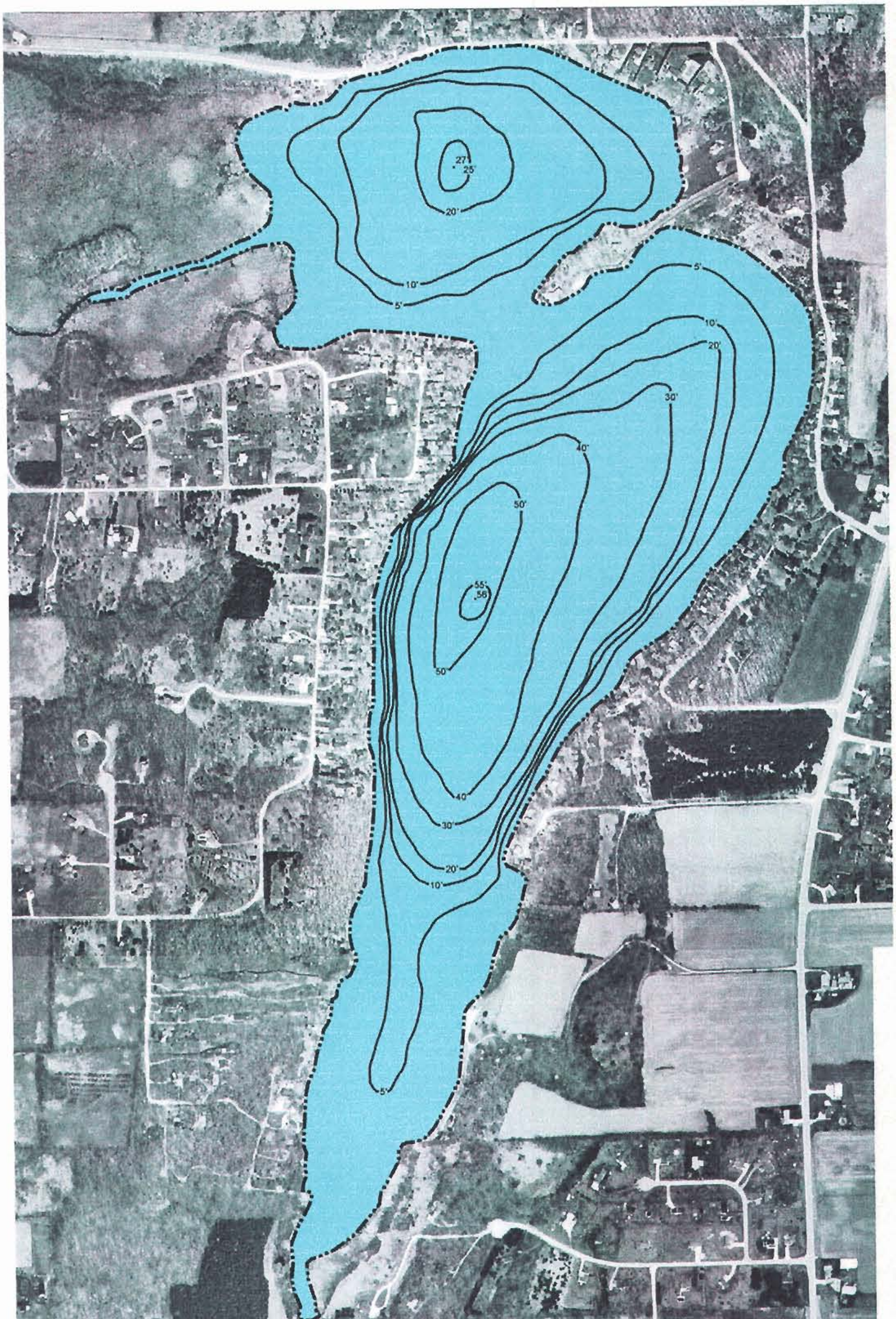
[15]*D. Fago,* op. cit.

[16]Ibid.

[17]*Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Map 65

BATHYMETRIC MAP OF LITTLE CEDAR LAKE



—20'— WATER DEPTH CONTOUR IN FEET

N

GRAPHIC SCALE

0 300 600 FEET

Source: SEWRPC.

shoreline development factor of 1.19. Mud Lake is a small, shallow, landlocked kettle basin in the terminal moraine of the Lake Michigan glacier. As of 1963, the Lake was rapidly being encroached upon by its fringing wetlands.

Recreational Use
No public access is available.

Development Potential
As of 1995, the land uses within the drainage area tributary to Mud Lake consisted of agricultural and open land uses, comprising about 50 percent of the land cover in the drainage area. Wetlands comprised about 15 percent of the land cover. The drainage area is partially located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Mud Lake are primarily agricultural.

Fish and Wildlife Populations
Winterkill was reported to be common in Mud Lake, primarily as a consequence of the shallow nature of the Lake and its ability to provide nesting and resting cover for waterfowl. This function was anticipated to diminish as a result of the continued urban growth within and adjacent to the Village of Slinger. About 90 acres of wetland adjoin the Lake, providing fall nesting habitat for mallards, blue-winged teal, and coots.

Mueller Lake (Millers Lake)
Lake Morphometry
Mueller Lake is situated in U.S. Public Land Survey Sections 5 and 6, Township 10 North, Range 19 East, Town of Polk. The Lake has a surface area of about 14 acres, a maximum depth of 33 feet, and a shoreline development factor of 1.20. Mueller Lake is a small, landlocked pothole lake in the kettle moraine near Big Cedar Lake. A small stream drains to the south, but loses its identity in a 70-acre grassy marsh. The Lake occupies a marshy depression, and has soft acid waters that are somewhat unique in this area of commonly hard water lakes.

Recreational Use
Public access is not available.

Development Potential
As of 1995, land use within the drainage area tributary to Mueller Lake consisted of agricultural and woodland uses, comprising about 50 percent of the land cover within the drainage area. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Mueller Lake are primarily agricultural.

Fish and Wildlife Populations
In 1963,[18] the Lake was managed for largemouth bass, panfish, and northern pike. In 1995,[19] the Lake fishery contained northern pike, largemouth bass, and panfish, all of which were reported as being present.

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[18] *Wisconsin Conservation Department,* op. cit.

[19] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Tily Lake (Jackson Lake, Tilly Lake)

Lake Morphometry

Tily Lake is situated in U.S. Public Land Survey Section 13, Township 10 North, Range 19 East, Town of Polk. The Lake has a surface area of about 13 acres, a maximum depth of 48 feet, and a shoreline development factor of 1.03. The Lake is a small, circular, deep kettle lake in the ground moraine of the Lake Michigan glacier. The Lake is spring fed and is the source of a small stream tributary to Cedar Creek.

Recreational Use

Public access is not available.

Development Potential

As of 1995, the land uses within the drainage area tributary to Tily Lake consisted of agricultural and open land uses, comprising about 70 percent of the land cover in the drainage area. Urban-density residential development comprised about 15 percent of the land cover. The drainage area is located within an area planned for urban development in the regional land use plan, in the vicinity of the Village of Jackson.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Tily Lake are both urban and agricultural.

Fish and Wildlife Populations

In 1963,[20] the fishery consisted of largemouth bass, panfish, and northern pike. Trout were reported to be privately stocked in 1958. In 1975,[21] the fishery consisted of common carp, golden shiner, white sucker, largemouth bass, bluntnose minnow, lake chubsucker, yellow perch, green sunfish, pumpkinseed, bluegill, and crappies. SEWRPC reports the lake chubsucker as a State-designated threatened species.[22] Trout were reported to be common in 1995, as were largemouth bass.[23] Panfish were abundant, and northern pike were present in the Lake. Few waterfowl frequent the lake.

STREAMS

Table 27 contains a summary of selected morphometric data available for named streams in the Polk area. The streamcourses are shown on Map 62, which also shows the hydrologic drainage areas within the area. Descriptive paragraphs follow, providing a summary of available information on the physical description of each stream for the portion of the stream within Washington County, and of the existing uses and conditions, wildlife habitat, and fishery for the portion of the stream within the Polk area, to the extent that such information is available. Each of the paragraphs address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69(5)(b) of the *Wisconsin Statutes*.

Cedar Creek

Stream Morphometry

Cedar Creek is located in the northeast portion of the Polk area. Originating in the Polk area, within Washington County, the Creek has a surface area of about 61 acres and extends over a linear distance of 15.8 miles with a

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[20] *Wisconsin Conservation Department,* op. cit.

[21] *D. Fago,* op. cit.

[22] *SEWRPC Planning Report No. 42,* op. cit.

[23] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Table 27

PHYSICAL CHARACTERISTICS OF STREAMS WITHIN THE POLK AREA, WASHINGTON COUNTY[a]

Stream or Watercourse	Length (miles)	Average Width (feet)	Average Depth (feet)	Surface Area (acres)	Drainage Area (square miles)	U.S. Public Land Survey			Subwatershed	Major Watershed
						Town	Range	Section		
Cedar Creek	15.8	32	1.75	61.3	93.0	10	20	12	Cedar	Milwaukee
Coney River	6.2	2	0.33	1.5	9.5	9	19	9	Oconomowoc	Rock
Lehner Lake Outlet	2.0	7	0.85	1.7	2.0	10	19	14	Cedar	Milwaukee
Polk Springs Creek	1.6	Intermittent	- -	3.7	2.0	10	20	30	Cedar	Milwaukee

[a]Stream data are for the portion of the stream within Washington County only. The U.S. Public Land Survey Township, Range, and Section designation included in each description locates the mouth of the stream at its confluence with another named stream or at the point at which it exits the County.

Source: Wisconsin Department of Natural Resources and SEWRPC.

gradient of 13 feet per mile. The Creek is a major waterway of central Washington County, originating at Big Cedar Lake, and flowing southerly and eastward to the Milwaukee River. Cedar Creek is included within the Cedar Creek Priority Watershed project area.[24]

Watershed Characteristics

About one mile of Cedar Creek flows through the State-owned portion of Jackson Marsh in the Town of Jackson. Cedar Creek has a high gradient with the largest portion of that fall occurring in a 2.5-mile stretch east of the unincorporated hamlet of Cedar Creek. This is an area of "boulder rapids where the river breaks through the terminal moraine" (Smith, 1908). There were six dams in this area, of which only two remain: at Lent Lake and Mayfield Pond. Neither of the remaining impoundments currently produce power. Additional impounding structures exist at Big Cedar Lake and Little Cedar Lake. These are low-head structures designed to prevent outlet erosion and maintain water levels.

Recreational Use

Cedar Creek has limited navigability and is generally navigable by canoe or similar watercraft.

Development Potential

As of 1995, the land uses within the Cedar Creek subbasin consisted largely of agricultural and open land uses, comprising about 70 percent of the land cover in the drainage area. Wetlands comprise about 15 percent of the land cover. A small portion of the drainage area is partially located within an area planned for urban development in the regional land use plan, primarily in the vicinity of the Village of Jackson.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Cedar Creek subbasin are primarily agricultural.

Fish and Wildlife Populations

That portion of Cedar Creek situated between Big Cedar Lake and Little Cedar Lake is maintained as a fish refuge during spring spawning runs, while the remaining stream mileage, excluding the lower four miles of the Creek

[24]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-336-93,* A Nonpoint Source Control Plan for the Cedar Creek Priority Watershed Project, *December 1991.*

that provided a smallmouth bass fishery, supported panfish and forage fishes in 1963.[25] Prior to 1963, a sucker fishery of some importance existed on much of the Creek; a 1924 fish survey reported black bullhead, blacknose and southern redbelly dace, largescale stoneroller, stonecat, brook stickleback, hornyhead and creek chub, white sucker, bluntnose minnow, fantail darter, and common shiner in this reach of the Creek.[26] Subsequent surveys in 1975 and 1978 indicated that the fish population of this reach was comprised of black bullhead, central stoneroller, fathead minnow, largemouth and rock bass, yellow perch, brown trout, walleyed pike, common carp, black crappie, stonecat, creek and hornyhead chub, bluegill, pumpkinseed, green sunfish, golden and common shiner, fantail darter, and white sucker and black and yellow bullhead; blacknose dace; pumpkinseed; golden shiner; Iowa, fantail, and johnny darter; tadpole madtom; central stoneroller; creek and hornyhead chub; bluegill; green sunfish; common carp; northern pike; white sucker; yellow perch; largemouth bass; and brassy, fathead and bluntnose minnow, respectively.[27]

Coney River

Stream Morphometry

The Coney River is located in the southwest portion of the Polk area. Originating in the Polk area, within Washington County, the River has a surface area of about two acres and extends over a linear distance of 6.2 miles with a gradient of 15 feet per mile. The River rises as a system of drainage ditches near Mud Lake within the Town of Polk, and discharges to the Oconomowoc River in the Town of Richfield. The stream was impounded to form Mayer Millpond, which formerly provided power for a feed mill. Although the dam had been removed, as of 2000, the mill site is being restored as an historical site. The Coney River is included in the Oconomowoc River Priority Watershed project area.[28]

Recreational Use

The Coney River has limited navigability, being navigable by canoe or similar watercraft only.

Development Potential

As of 1995, land use within the Coney River subbasin consisted largely of agricultural and open land uses. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Coney River subbasin are primarily agricultural. Some agricultural best management measures were implemented as a result of practices installed under the Chapter NR 120 Wisconsin Nonpoint Source Pollution Abatement Program on the Oconomowoc River.[29]

Fish and Wildlife Populations

In 1963,[30] the River was considered to have little fishery value, since the stream flow was intermittent.

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[25] *Wisconsin Conservation Department,* op. cit.

[26] *D. Fago,* op., cit.

[27] Ibid.

[28] *Wisconsin Department of Natural Resources Publication No. PUBL-WR-194-86,* A Nonpoint Source Control Plan for the Oconomowoc River Priority Watershed Project, *March 1986.*

[29] *Wisconsin Department of Natural Resources, PUBL-WR-194-86.*

[30] *Wisconsin Conservation Department,* op. cit.

Lehner Lake Outlet

Stream Morphometry

The Lehner Lake outlet, also known as Lehner Creek, is situated in west-central portion of the Polk area, draining in a northeasterly direction to its confluence with Cedar Creek. The outlet has a surface area of about two acres and extends over a linear distance of two miles with a gradient of about 27 feet per mile. It is a small, high-gradient stream, originating in spring-fed Lehner Lake and discharging to Cedar Creek west of the unincorporated hamlet of Mayfield. Lehner Creek was included within the Cedar Creek Priority Watershed project area.[31]

Recreational Use

Lehner Lake outlet has limited navigability, being navigable by canoe or similar watercraft only with difficulty.

Development Potential

As of 1995, the land uses within the Lehner Lake outlet drainage area consisted of agricultural and open land uses, comprising about 65 percent of the land cover within the drainage area. Wetlands comprised about 15 percent pasture of the land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Lehner Lake Outlet drainage area are primarily agricultural.

Fish and Wildlife Populations

Since the stream is not impounded, it was reported as of 1963 to be managed by the riparian landowner for trout.[32] As of 1963, it was assumed that trout may inhabit parts of the stream. Forage fishes were the primary occupants of the outlet, however. A fish survey conducted during 1978 reported the fish population in the Creek to be comprised of central mudminnow, fathead minnow, brook stickleback, blacknose dace, and creek chub.[33]

Polk Springs Creek

Stream Morphometry

Polk Springs Creek is situated in the southeastern portion of the Polk area and drains in an easterly direction to its confluence with Cedar Creek in the Town of Jackson. Originating in the Polk area, the Creek has a surface area of about 37 acres and extends over a linear distance of 1.6 miles with a gradient of 20 feet per mile. The Creek is a short, spring-fed tributary to Cedar Creek arising at the base of Lake Michigan terminal moraine. During drought years flow diminishes nearly to intermittent. Polk Springs Creek is included within the Cedar Creek Priority Watershed project area.[34]

Recreational Use

Polk Springs Creek has limited navigability and is generally navigable only by canoe or similar watercraft due to fluctuating flows and water levels.

Development Potential

As of 1995, land use within the Polk Springs Creek drainage area consisted of agricultural and open land uses, with agriculture comprising about 75 percent of the land cover in the drainage area. Residential land uses and

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[31] *Wisconsin Department of Natural Resources, PUBL-WR-336-93.*

[32] *Wisconsin Conservation Department,* op. cit.

[33] *D. Fago,* op. cit.

[34] *Wisconsin Department of Natural Resources, PUBL-WR-336-93.*

wetlands each comprised about 5 percent of the land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Polk Springs Creek drainage area are primarily agricultural.

Fish and Wildlife Populations

As of 1963,[35] only small forage fishes were considered to be able to successfully inhabit the Creek. A fish survey conducted in 1986 reported the fish population of the Creek to be comprised of common shiner, brook trout, fantail darter, blacknose dace, and creek chub.[36]

[35] *Wisconsin Conservation Department,* op. cit.

[36] *D. Fago,* op. cit.

Chapter XII

INVENTORY FINDINGS: RICHFIELD AREA

INTRODUCTION

This chapter presents the inventory findings relating to lakes and streams in the Richfield area of Washington County. The Richfield area is shown on Map 66 and includes all of U.S. Public Land Survey Sections 1 through 36, Town 9 North, Range 19 East. The area includes the entire Town of Richfield. To the extent that data are available, relevant land use, recreational use, morphometric, water quality, and biological information upon which waterbody classifications are to be based pursuant to the requirements of Section 281.69(5)(b), *Wisconsin Statutes*, is presented for each waterbody inventoried. These data form the scientific and technical basis for the determination of the alternative and recommended waterbody classification schemes set forth in Chapter XVI.

LAND USE

The type, intensity, and spatial distribution of the various land uses within the Richfield area are important determinants of water quality and recreational use demands. The current and planned future land use patterns, placed within the context of the historical development in the area are, therefore, important considerations in any waterbody management planning effort.

While some settlement occurred in the early 1900s, most urban development occurred in the Richfield area in recent years. The Richfield area remains largely rural in character, although the area has taken on a more suburban residential character in recent years. Map 66 indicates the historic urban-growth pattern in the Richfield area since 1850. Early development occurred in the northeastern and east-central portions of the area and around Lake Five, during the 1920s. However, since the 1950s, urban land use development in the area has proceeded rapidly throughout most of the Town. As shown on Map 66, the urban development of the lands riparian to the named lakes in the area has largely occurred since the 1940s.

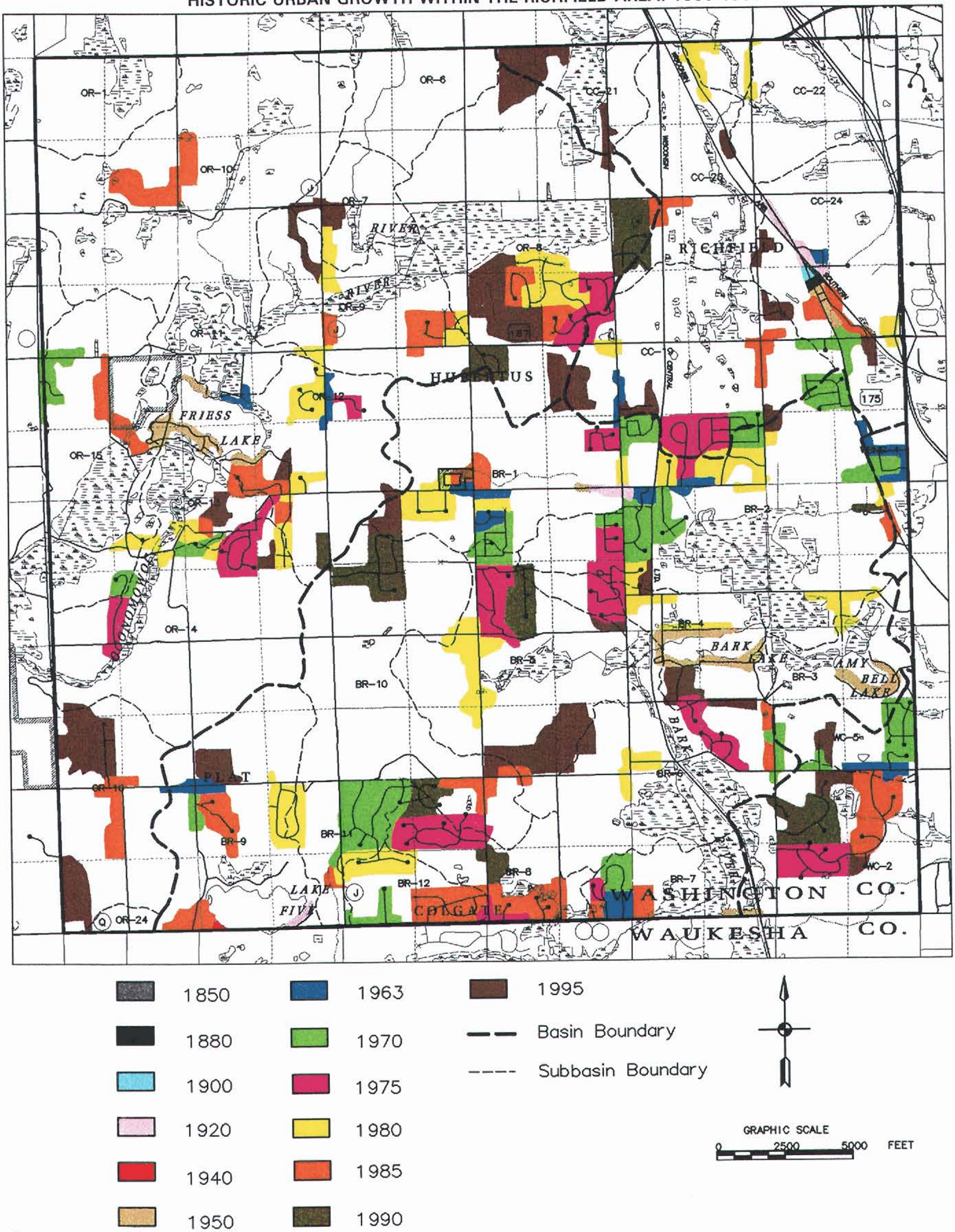
The existing land use pattern in the Richfield area, as of 1995, is shown on Map 67, and is quantified in Table 28. As indicated in Table 28, about 6,000 acres, or about 26 percent of the area, were devoted to urban land uses. The dominant urban land use was for residential development that encompassed about 4,000 acres, or about 66 percent of the land areas in urban use. As of 1995, about 17,300 acres, or about 74 percent of the area, were still devoted to rural land uses. About 10,400 acres, or about 60 percent of the rural area, were in agricultural land uses. Woodlands, wetlands, and surface water, including the surface area of the lakes in the area, accounted for approximately 5,100 acres, or about 30 percent of the area in rural use. Future growth in urban land use, based upon the recommendations set forth in the adopted 2020 regional land use plan shown on Map 68, would be limited and include infilling within and adjacent to existing areas of urban residential density.

LAKES

Table 29 contains a summary of selected morphometric data available for the major lakes within the Richfield area. Major lakes are defined as those lakes within the Southeastern Wisconsin Region having a surface area of 50 or more acres in areal extent. These lakes are shown on Map 69. Where available, similar summary data are provided for minor lakes because of the importance of these smaller waterbodies as a water resource. In some

Map 66

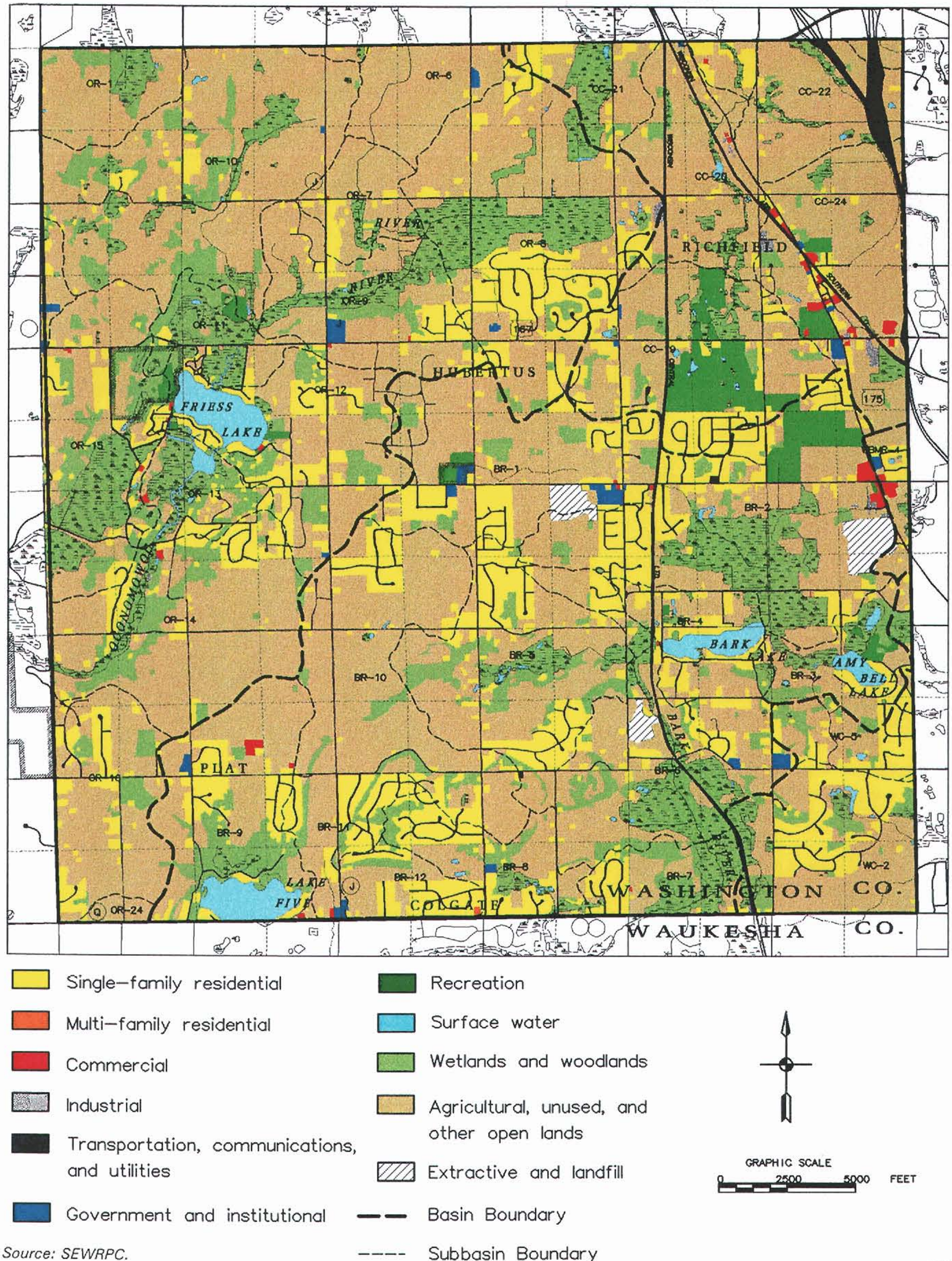
HISTORIC URBAN GROWTH WITHIN THE RICHFIELD AREA: 1850-1990



Source: SEWRPC.

Map 67

EXISTING LAND USE WITHIN THE RICHFIELD AREA: 1995



Source: SEWRPC.

Table 28

EXISTING LAND USE WITHIN THE RICHFIELD AREA: 1995

Land Use Categories	Acres	Percent of Major Category	Percent of Total Area
Urban			
Residential	3,957	66.2	17.0
Commercial	43	0.6	0.2
Industrial	23	0.4	0.1
Governmental and Institutional	83	1.4	0.3
Transportation and Utilities	1,286	21.6	5.5
Recreation	460	7.7	2.0
Land under Development	124	2.1	0.5
Subtotal	5,976	100.0	25.6
Rural			
Agricultural	10,416	60.1	44.9
Wetlands	2,428	14.1	10.4
Woodlands	2,273	13.2	9.8
Water	401	2.3	1.7
Extractive	140	0.7	0.6
Landfill	- -	- -	- -
Other Open Lands	1,642	9.5	7.0
Subtotal	17,296	100.0	74.4
Total	23,276	- -	100.0

Source: SEWRPC.

cases, these waterbodies, in which water levels fluctuate markedly, may be classed as deep-water marshes or wetlands. Wetlands within the Richfield area are shown on Map 70. The lakes inventoried are further described below with information set forth in paragraphs which address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69(5)(b) of the *Wisconsin Statutes*. Information on the origins of these lakes is based upon detailed geological information provided in various published survey reports[1] and maps of surfacial deposits.[2]

Amy Bell Lake

Lake Morphometry

Amy Bell Lake is located in U.S. Public Land Survey Section 25, Township 9 North, Range 19 East, Town of Richfield. The Lake has a surface area of about 26 acres, a maximum depth of about 37 feet, and a shoreline development factor of 1.28. The Lake is a small, landlocked, seepage lake situated at the head of a marshy valley

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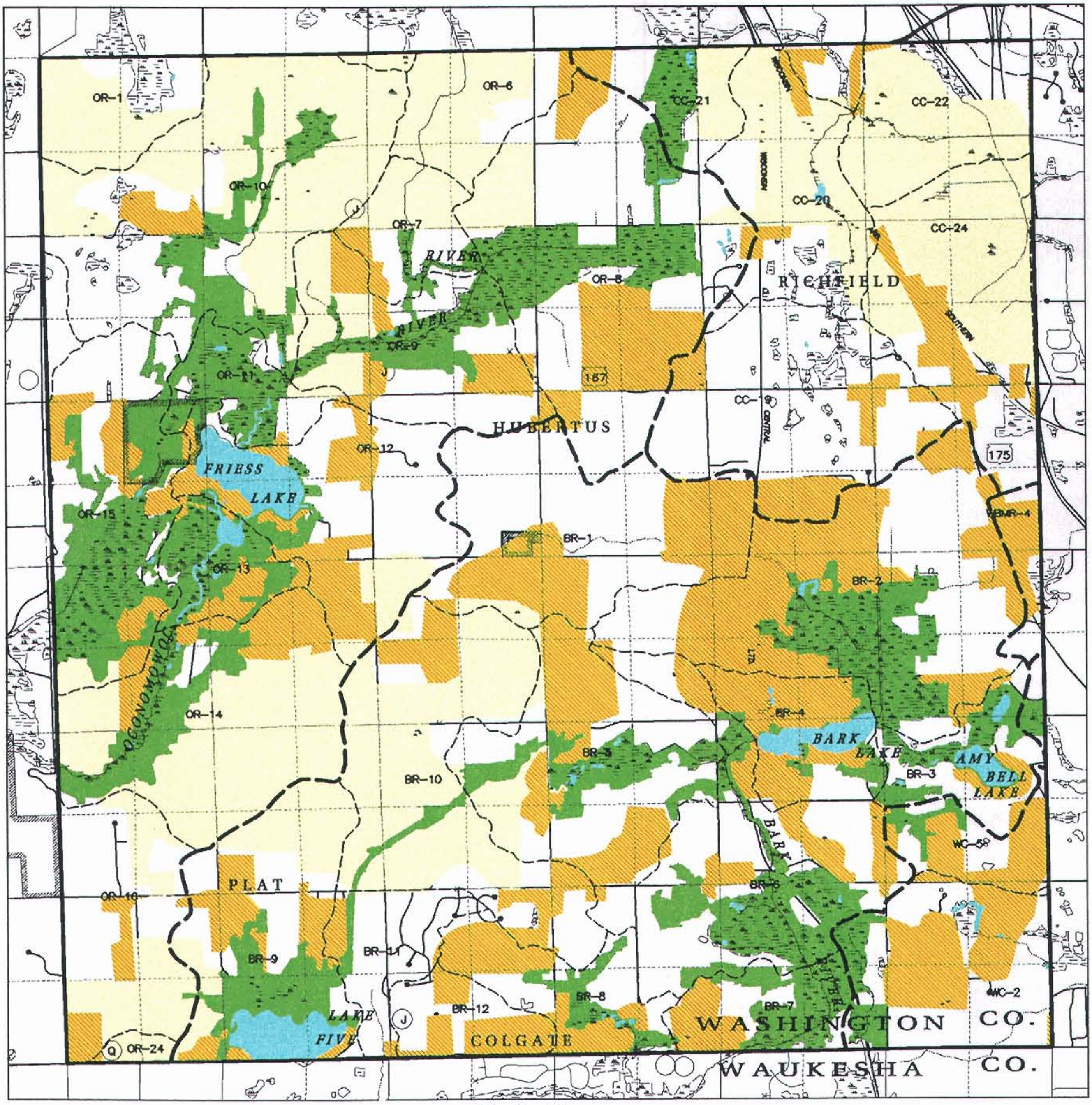
[1]*C. Juday,* The Inland Lakes of Wisconsin, The Hydrography and Morphometry of the Lakes, *State of Wisconsin, 1914, pp. 84-88; L. Martin,* The Physical Geography of Wisconsin, 2nd Edition, *State of Wisconsin, 1932, pp. 235-293.*

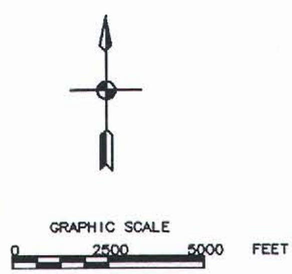
[2]*W.C. Alden,* Map Showing the Surficial Deposits of Southeastern Wisconsin, *Wisconsin Geological Survey, 1918; H.L. Young and W.G. Batten, Wisconsin Geological and Natural History Survey Information Circular No. 38,* Ground-Water Resources and Geology of Washington and Ozaukee Counties, Wisconsin, *University of Wisconsin-Extension, February 1980, 37 pages.*

Map 68

ADOPTED REGIONAL LAND USE PLAN FOR THE RICHFIELD AREA: 2020



Residential–suburban density	Basin Boundary
Residential–low density	Subbasin Boundary
Residential–medium density	Governmental and Institutional
Residential–high density	Recreational
Commercial	Agricultural
Industrial	Primary Environmental Corridors
Extractive/Landfill	Secondary Environmental Corridors
Transportation	Isolated Natural Resource Area
	Surface water
	Other Open Lands



Source: SEWRPC.

Table 29

HYDROLOGY AND MORPHOMETRY OF LAKES WITHIN THE RICHFIELD AREA, WASHINGTON COUNTY

Lake	Surface Area (acres)	Subwatershed Area (acres)	Volume (acre-feet)	Water Residence Time (years)	Maximum Length of Lake (miles)	Length of Shoreline (miles)	Maximum Width of Lake (miles)	Shoreline Development Factor[a]	Maximum Depth (feet)	Mean Depth (feet)
Amy Bell[b]	26	298	520	2.39	0.3	1.0	0.1	1.28	37	20
Bark	62	3,043	868	0.40	0.7	1.8	0.1	1.59	34	14
Friess	119	12,374	3,102	0.39	0.6	2.3	0.3	1.51	48	26
Lake Five	102	930	1,100	3.48	0.7	1.9	0.4	1.35	23	11
Little Friess	24	11,579	240	0.03	0.2	0.5	0.2	1.03	34	10
Mayer Millpond[c]	--	--	--	--	--	--	--	--	--	--
Mud[b]	5	--[d]	--[d]	--[d]	0.2	0.5	0.1	1.41	10	3

[a]*Shoreline Development Factor is the ratio between the actual circumference of a lake and the circumference of a circle with the same radius. A circular lake would have a Shoreline Development Factor of 1.0, while a dendritic lake would have a Shoreline Development Factor in excess of 1.0.*

[b]*These lakes fall within a common subwatershed, Subbasin BR-3.*

[c]*The dam that created the Mayer Millpond was removed.*

[d]*No data available.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

within a depression along the Lake Michigan Glacier terminal moraine. The bathymetry of Amy Bell Lake is shown on the Map 71.

Recreational Use
Public access is not provided. However, a youth camp operates during the summer on the north shore and makes extensive use of the Lake for sailing, rowing, canoeing, and swimming.

Development Potential
As of 1995, land use within the drainage area tributary to Amy Bell Lake consisted of open space uses, including agriculture, wetlands, and woodlands, comprising about 55 percent of the total land cover in the drainage area. The drainage area is partially located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution in the drainage area tributary to Amy Bell Lake are primarily agricultural.

Fish and Wildlife Populations
In 1963,[3] the Wisconsin Department of Natural Resources (WDNR) reported that Amy Bell Lake was managed for largemouth bass and panfish, with northern pike common to the fishery. According to the WDNR, as of 1995,[4] largemouth bass and panfish were abundant, and northern pike were common. The western end of the Lake borders several acres of wetland providing habitat for small numbers of waterfowl that use the Lake during the fall migration.

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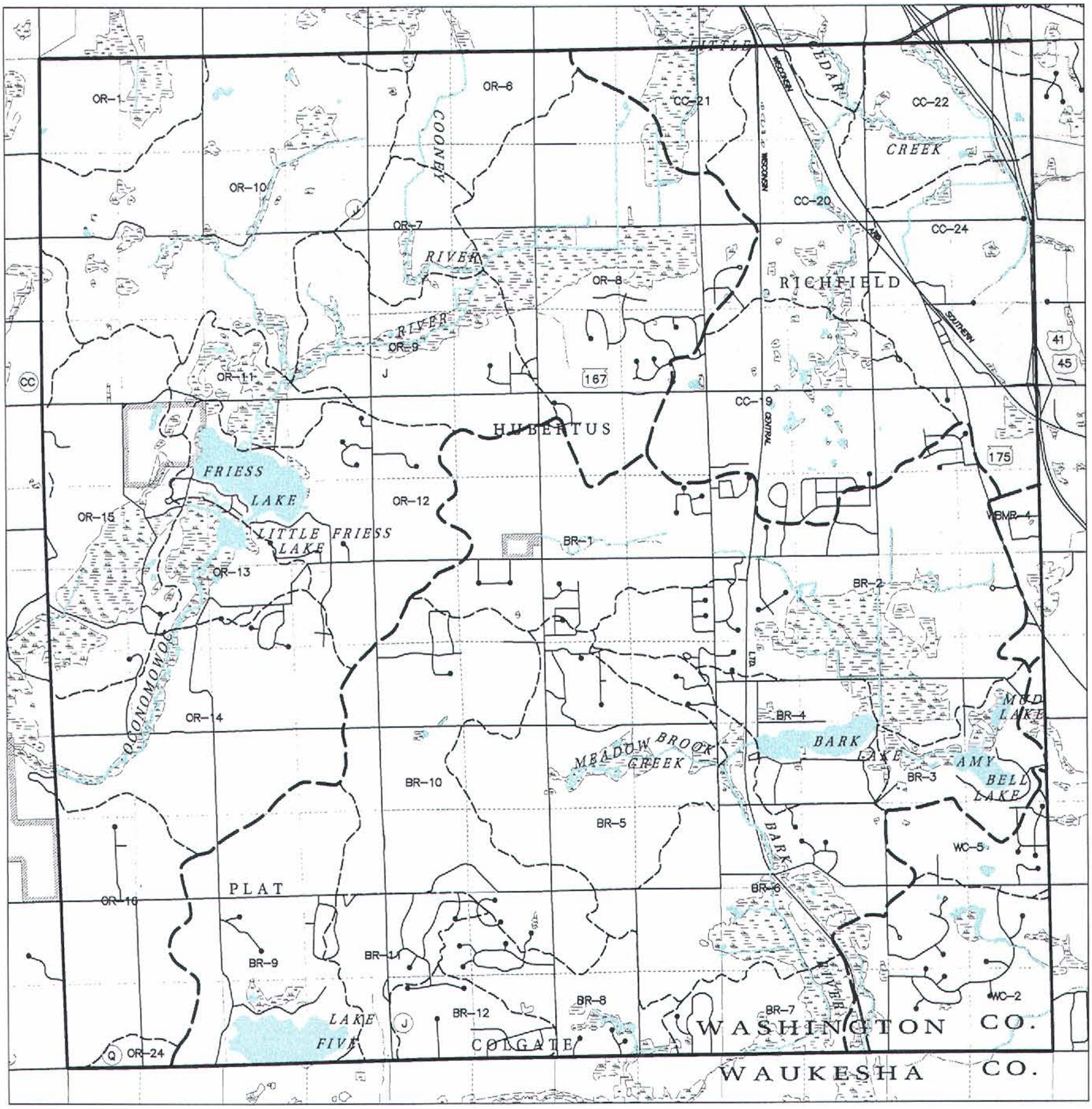
[3]*Wisconsin Conservation Department,* Surface Water Resources of Washington County, *1963.*

[4]*Wisconsin Department of Natural Resources Publication No. PUBL-FM-800 95REV,* Wisconsin Lakes, *1995.*

Map 69

SURFACE WATER RESOURCES WITHIN THE RICHFIELD AREA: 1995



Surface Water

Basin Boundary

Subbasin Boundary

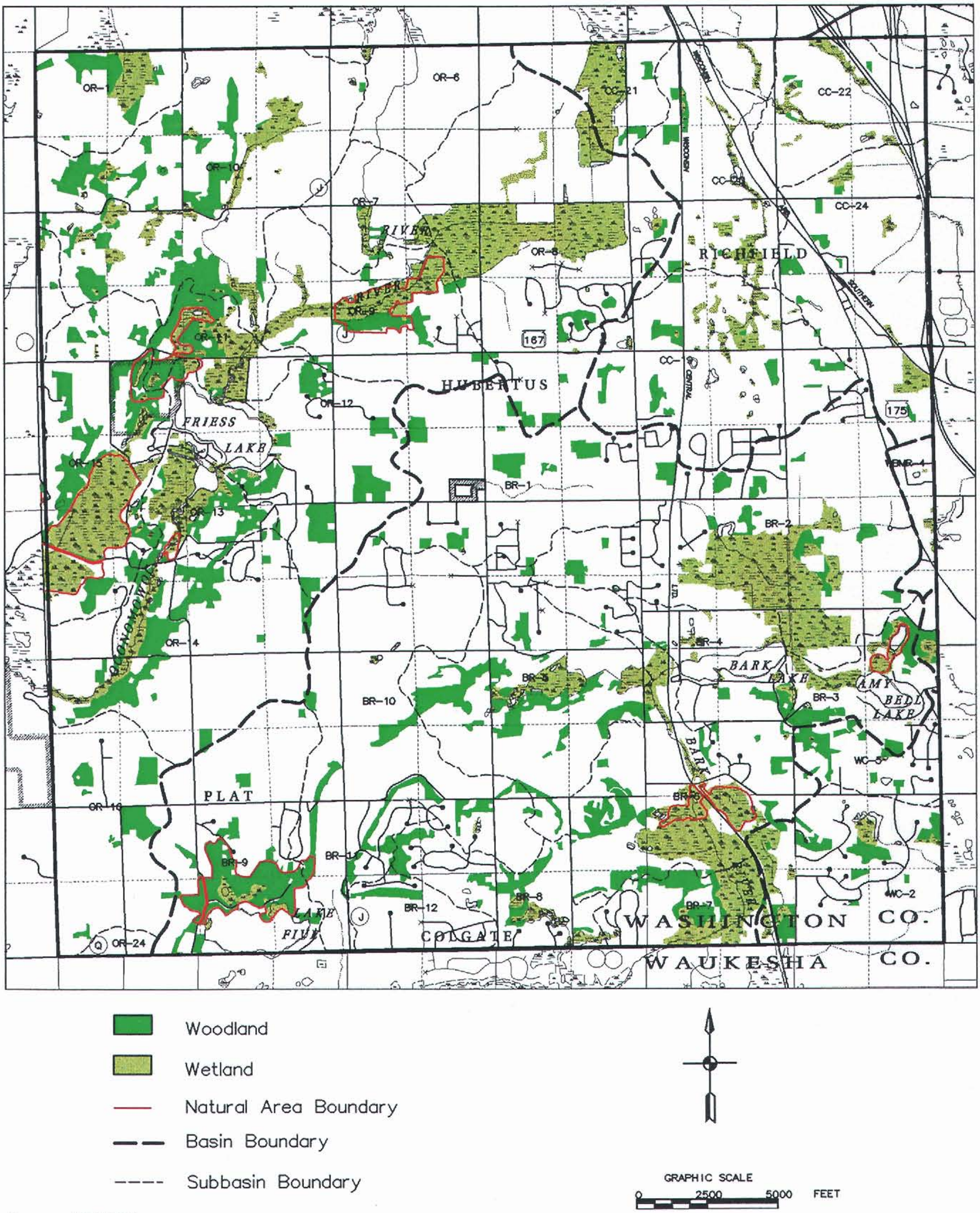
GRAPHIC SCALE

0 2500 5000 FEET

Source: SEWRPC.

Map 70

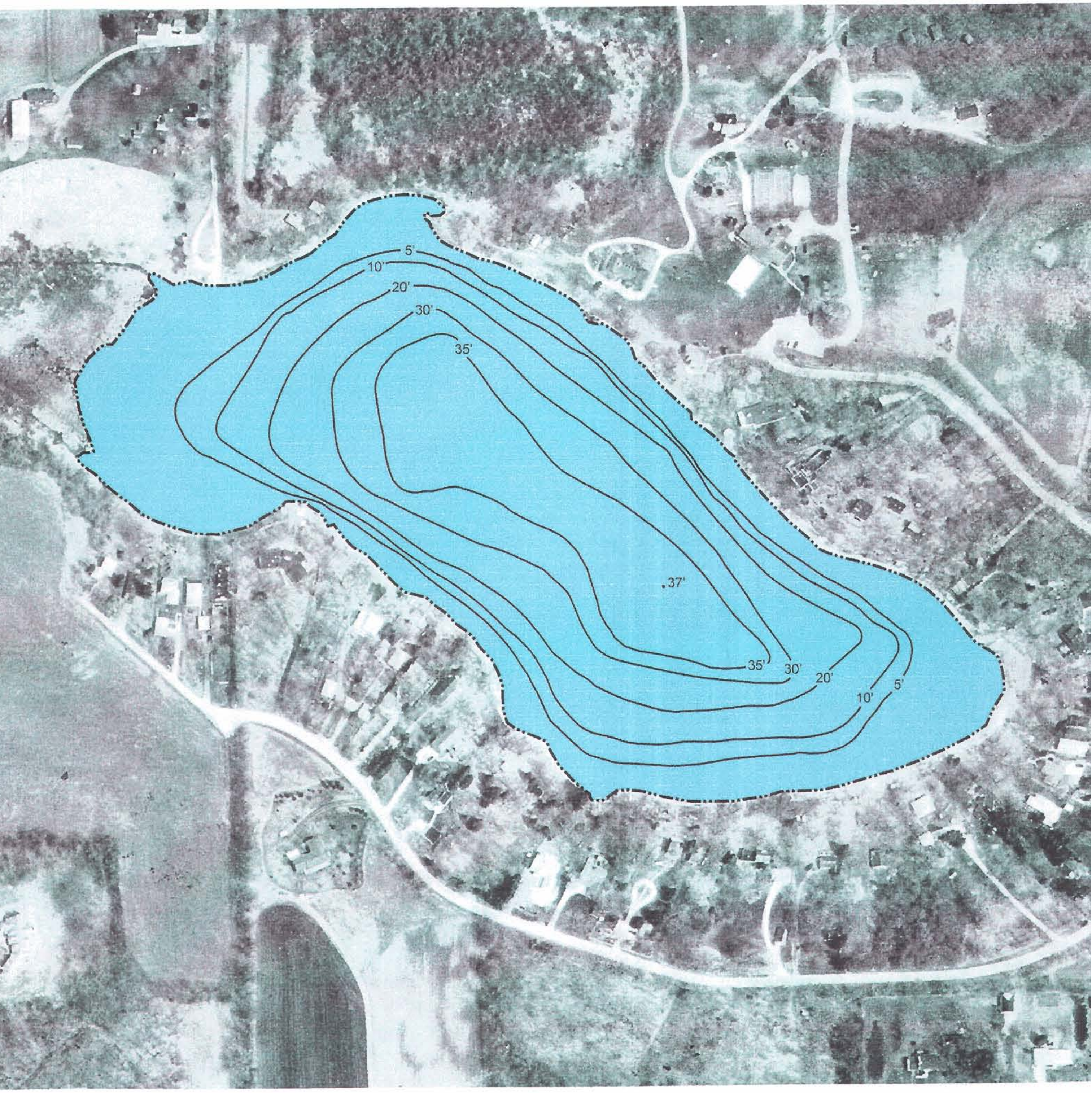
WETLANDS AND WOODLANDS WITHIN THE RICHFIELD AREA: 1995



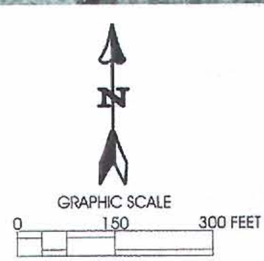
Source: SEWRPC.

Map 71

BATHYMETRIC MAP OF AMY BELL LAKE



—20'— WATER DEPTH CONTOUR IN FEET



Source: SEWRPC.

Bark Lake

Lake Morphometry

Bark Lake is located in U.S. Public Land Survey Section 26, Township 9 North, Range 19 East, Town of Richfield. The Lake has a surface area of about 62 acres, a maximum depth of 34 feet, and a shoreline development factor of 1.59. Bark Lake is a small drainage lake situated within a wetland complex and is generally considered as the headwaters of the Bark River. The bathymetry of Bark Lake is shown on Map 72.

Recreational Use

Public access is provided by undeveloped public right-of-way along the west shore and by fire lanes.

Development Potential

As of 1995, land use within the drainage area tributary to Bark Lake consisted largely of agricultural and open space uses, with agriculture comprising about 50 percent of the total land cover of the drainage area. Medium-density urban development comprised about 25 percent of the total land cover. The drainage area is located in an area planned where some additional low density residential development is envisioned in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Bark Lake include both urban and agricultural runoff.

Fish and Wildlife Populations

In 1963,[5] the WDNR reported that Bark Lake was managed for largemouth bass and panfish, but also had a small population of northern pike. Northern pike, black crappie, pumpkinseed, and bluegill were reported in the Lake in 1971.[6] In 1973,[7] the fish census indicated that black crappie, bluegill, bowfin, brown and yellow bullhead, common carp, golden shiner, green sunfish, largemouth and rock bass, longnose gar, northern pike, pumpkinseed, white sucker, and yellow perch were present. A large woodland and wetland adjoins the eastern end of the Lake and offer some nesting of mallards and black ducks.

Lake Five

Lake Morphometry

Lake Five is located in U.S. Public Land Survey Section 32, Township 9 North, Range 19 East, Town of Richfield. The Lake has a surface area of about 102 acres, a maximum depth of 23 feet, and a shoreline development factor of 1.35. Lake Five is a small, landlocked seepage lake on outwash deposits at the base of terminal moraine of the Lake Michigan glacier. The water is clear and much of the bottom is gravelly. The bathymetry of Lake Five is shown on Map 73.

Recreational Use

Public access is not available. However, a commercial access site provides limited opportunity for the public to rent and launch watercraft on the Lake.

Development Potential

As of 1995, land use within the drainage area tributary to Lake Five consisted largely of agricultural, woodland, and other open land uses, comprising about 55 of the total land cover of the drainage area. Urban residential

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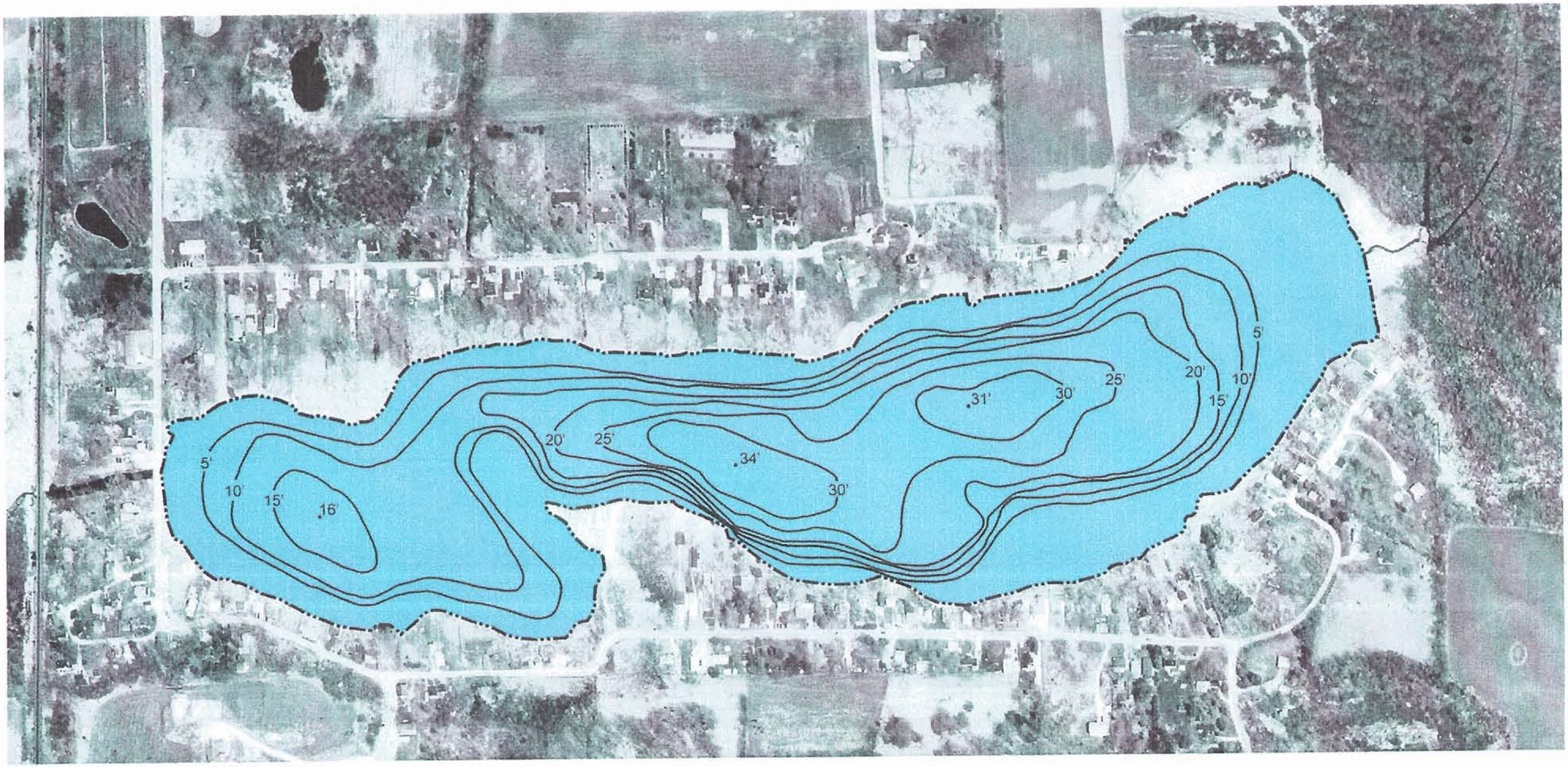
[5] *Wisconsin Conservation Department,* op. cit.

[6] *D. Fago, Wisconsin Department of Natural Resources Research Report No. 148,* Retrieval and Analysis System Used in Wisconsin's Statewide Fish Distribution Survey, Second Edition, *December 1988.*

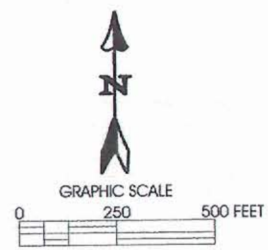
[7] Ibid.

Map 72

BATHYMETRIC MAP OF BARK LAKE



—20'— WATER DEPTH CONTOUR IN FEET



Source: SEWRPC.

Map 73

BATHYMETRIC MAP OF LAKE FIVE

—20'— WATER DEPTH CONTOUR IN FEET

N

GRAPHIC SCALE

0 250 500 FEET

Source: SEWRPC.

development comprised 20 percent of the total land cover. The drainage area is located within an area planned for limited low density residential development, primarily by infilling within existing developed areas, in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Lake Five include both urban and agricultural runoff.

Fish and Wildlife Populations
In 1963,[8] the WDNR reported that Lake Five was managed for largemouth bass and panfish, primarily bluegills. Major use problems were reported to be occasional partial winterkills, excessive aquatic plant growth, and stunted panfish. In 1975,[9] four surveys were conducted on the Lake which reported bluntnose minnow, yellow perch, golden and blackchin shiner, green sunfish, white sucker, common carp, largemouth bass, northern pike, bluegill pumpkinseed, yellow bullhead, grass pickerel, and crappies. According to the WDNR, as of 1995,[10] largemouth bass were common and panfish and northern pike were present. Waterfowl make limited use of the Lake. Mallards and black ducks nest here.

Friess Lake
Lake Morphometry
Friess Lake is located in U.S. Public Land Survey Sections 17 and 18, Township 9 North, Range 19 East, Town of Richfield. The Lake has a surface area of about 119 acres, a maximum depth of 48 feet, and a shoreline development factor of 1.51. Friess Lake is a small, blocked-drainage lake lying across the marshy valley of the upstream portion of the Oconomowoc River. The bathymetry of Friess Lake is shown Map 74.

Water Quality
Available water quality data indicate that Friess Lake is a meso-eutrophic, or moderately enriched, waterbody, with a Trophic State Index rating of approximately 60. Figure 2 shows the trends in water quality within Friess Lake during the period 1987 through 1994. A lake management plan was completed for the Lake by the Southeastern Wisconsin Regional Planning Commission (SEWRPC) in 1983, and updated as a second edition in 1997.[11]

Recreational Use
Public access is provided through five-foot right-of-way access sites. Additionally, two commercial access sites provide limited opportunities for the public to launch watercraft on the Lake. A County Park, Glacier Hills County Park, is located on the northwestern shoreline of the Lake.

Development Potential
As of 1995, land use within the drainage area tributary to Friess Lake consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the total land cover of the drainage area. Wetlands comprised 10 percent of the total land cover. The drainage area is located within an area planned for only limited low density residential development, primarily by infilling within existing developed areas, in the regional land use plan.

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[8] *Wisconsin Conservation Department,* op. cit.

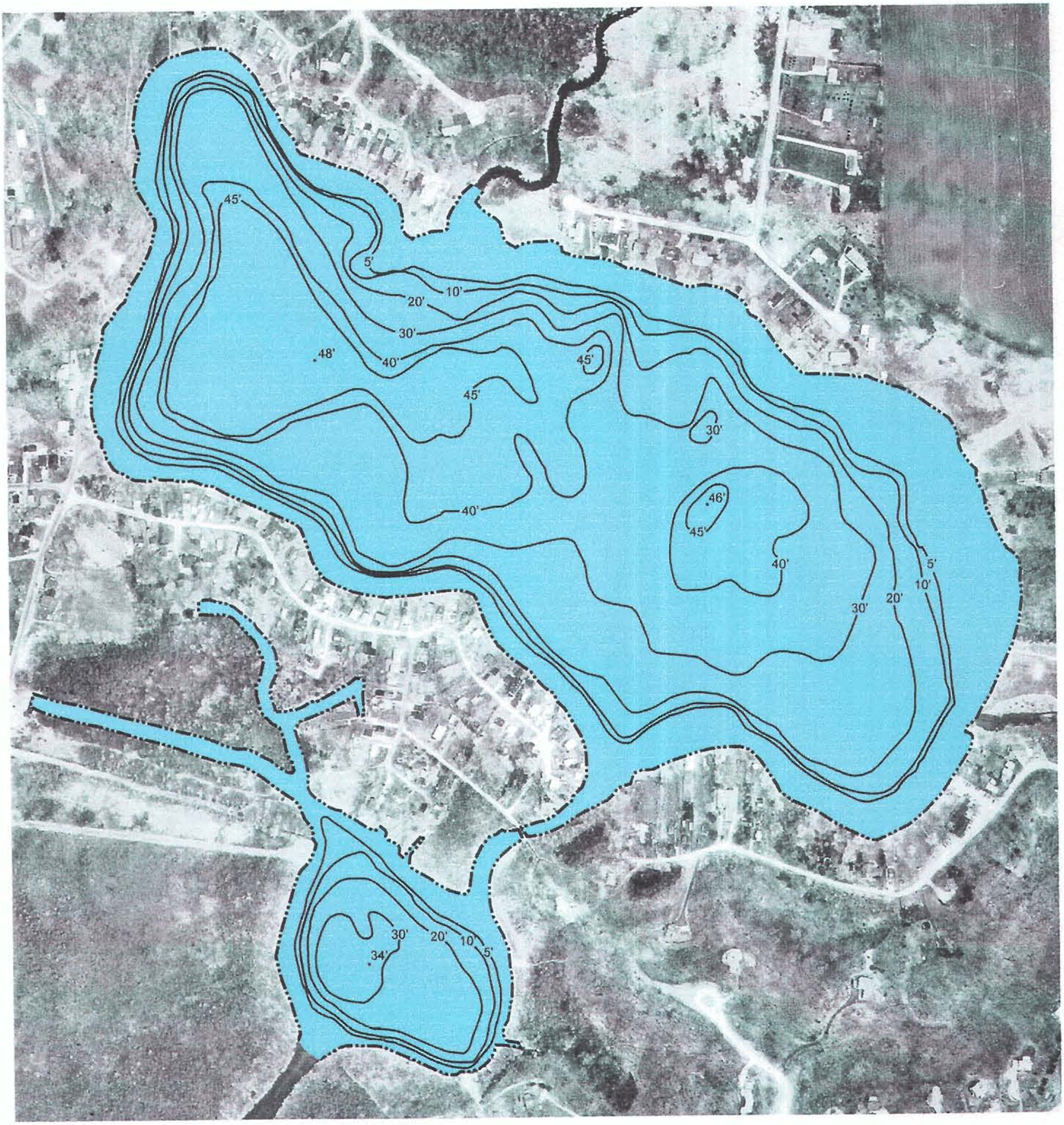
[9] *D. Fago,* op. cit.

[10] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

[11] *SEWRPC Community Assistance Planning Report No. 98, 2nd Edition,* A Water Quality Management Plan for Friess Lake, Washington County, Wisconsin, *November 1997.*

Map 74

BATHYMETRIC MAP OF FRIESS AND LITTLE FRIESS LAKES

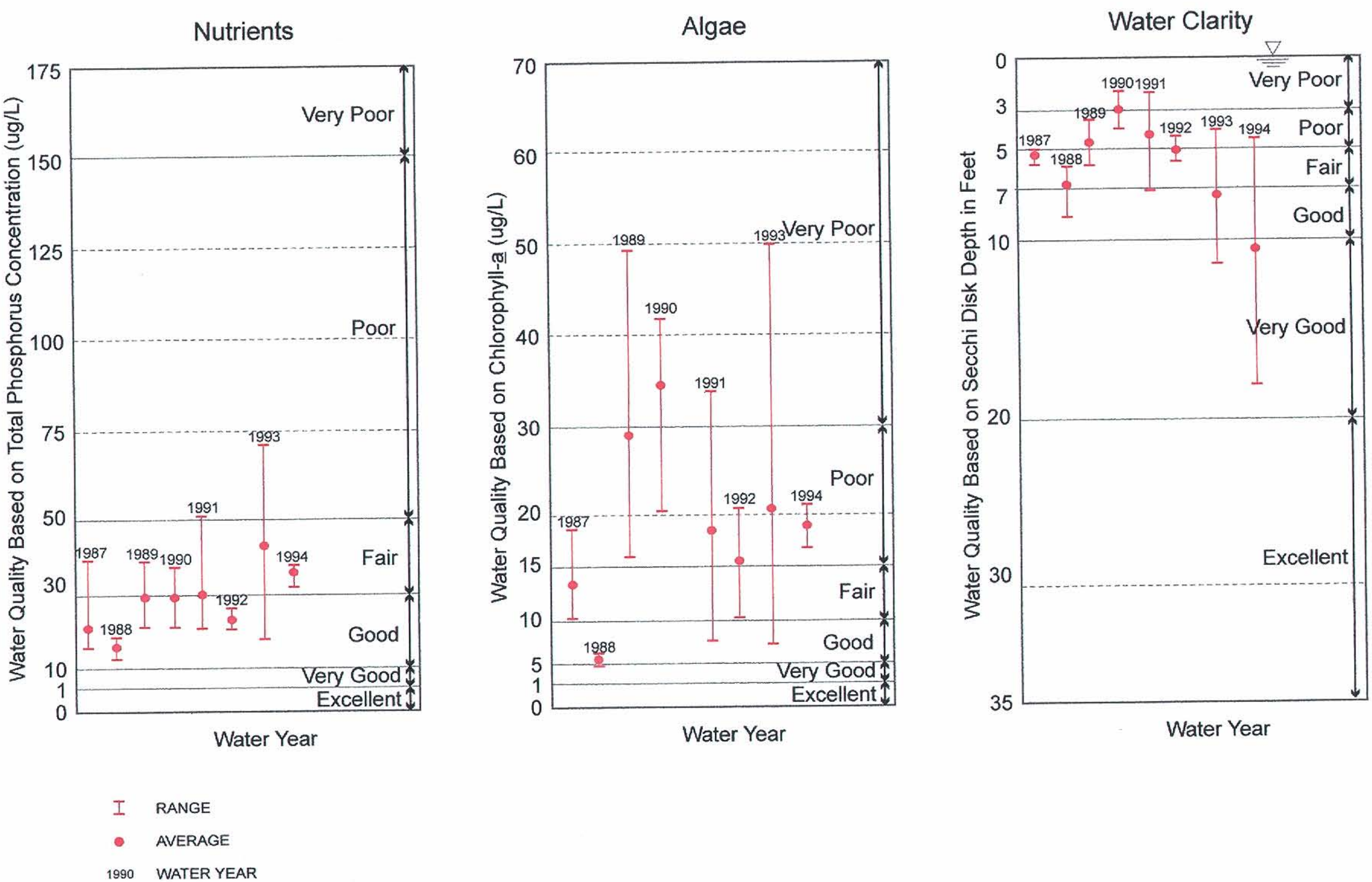


—20'— WATER DEPTH CONTOUR IN FEET

Source: SEWRPC.

Figure 2

FRIESS LAKE PRIMARY WATER QUALITY INDICATORS:1987-1994



Source: Wisconsin Department of Natural Resources and SEWRPC.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Friess Lake are primarily agricultural.

Fish and Wildlife Populations

In 1963,[12] the WDNR reported that Friess Lake was managed for trout, largemouth bass, and panfish, with carp present in sufficient numbers to present a use problem. Rainbow and cutthroat trout had been stocked by a local sportsmen's group in 1959, and, in 1964, rainbow trout were restocked. Walleyed pike, white sucker, yellow bullhead, pumpkinseed, largemouth bass, black crappie, johnny darter, yellow perch, green sunfish, brook silverside, bluegill, and bluntnose minnow were reported in the Lake during 1969. Tadpole madtom, johnny darter, yellow perch, bluntnose minnow, brook silverside, central mudminnow, channel catfish, creek chub, common carp, common shiner, rainbow trout, northern pike, black and brown bullhead, rock and largemouth bass, green sunfish, walleyed pike, pumpkinseed, black crappie, yellow perch, bluegill, and white sucker were reported in 1975.[13] In 1976,[14] common shiner, creek chub, green sunfish, northern pike, yellow and brown bullhead, bluegill, yellow perch, black crappie, largemouth bass, white sucker, and pumpkinseed were reported. According to the WDNR, largemouth bass were common in 1995,[15] and panfish, northern pike, and walleyed pike were present. Mallards, black ducks, and blue-winged teal have been observed to nest here. Large numbers of diving ducks and moderate numbers of coots and dabblers are reported to be present during the spring and fall migrations.

Little Friess Lake (Bony Lake)

Lake Morphometry

Little Friess Lake is located in U.S. Public Land Survey Section 17, Township 9 North, Range 19 East, Town of Richfield. The Lake has a surface area of about 15 acres, a maximum depth of 34 feet, and a shoreline development factor of 1.03. Little Friess Lake is a small, marsh-fringed basin on the Oconomowoc River just downstream from Friess Lake, separated from the main basin of Friess Lake by a rocky sill. The outlet stream, the Oconomowoc River, is not impounded and there are no structural barriers to navigation either above or below the lake. The bathymetry of Little Friess Lake also is shown Map 73.

Recreational Use

Public access is limited to a town road adjacent to a canal. However, boats launched at this site can access upstream Friess Lake, provided their draft is shallow enough to allow passage over the rocky sill separating the two waterbodies.

Development Potential

As of 1995, land use within the drainage area tributary to Little Friess Lake consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the total land cover of the drainage area. Wetlands and woodlands comprised the major land use in the portion of the drainage area directly tributary to Little Friess Lake. The drainage area is located within an area planned for only limited low density residential development, primarily by infilling within existing developed areas, in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Little Friess Lake include both urban runoff.

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[12] *Wisconsin Conservation Department,* op. cit.

[13] *D. Fago,* op. cit.

[14] Ibid.

[15] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Fish and Wildlife Populations

In 1963,[16] the WDNR reported that Little Friess Lake was managed for largemouth bass and panfish, with the overall fish population composition similar to that of Friess Lake. According to the WDNR, as of 1995, largemouth bass were common, with panfish, northern pike, and walleyed pike reported as present.[17] A large area of woodland and wetland adjoins the Lake, providing habitat for waterfowl. This Lake is considered to be part of the Freiss Lake waterfowl complex.

Mayer Millpond

Lake Morphometry

Mayer Millpond was located in U.S. Public Land Survey Section 9, Township 9 North, Range 19 East, Town of Richfield. The pond, which had a surface area of about two acres and a maximum depth of four feet, was a small pond on Coney Creek near the headwaters of the Oconomowoc River that, at one time, provided waterpower to operate a feed mill. The mill is still in existence, although the dam has since been removed. The mill site was being developed as an historical area as of late 2000.

Mud Lake

Lake Morphometry

Mud Lake is located in U.S. Public Land Survey Sections 24 and 25, Township 9 North, Range 19 East, Town of Richfield. The Lake has a surface area of about five acres, a maximum depth of ten feet, and a shoreline development factor of 1.41. The Lake is a small, landlocked, kettle lake in a marshy pocket adjoining Amy Bell Lake. The bathymetry of Mud Lake is shown Map 75.

Recreational Use

Public access is not provided. The Lake is bordered by wetlands and woodlands and is considered by the Wisconsin Department of Natural Resources to have high aesthetic value.

Development Potential

As of 1995, land use within the drainage area tributary to Mud Lake consisted largely of agricultural and open space uses, with agriculture comprising about 50 percent of the total land cover of the drainage area. Wetlands comprised about 15 of the total land cover. The drainage area is not located in an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the drainage area tributary to Mud Lake are primarily agricultural.

Fish and Wildlife Populations

In 1963,[18] the WDNR reported that winterkill occurred annually, with only a few bullheads and panfish surviving. Part of the shoreline is within the bounds of a game refuge which covers 104 acres of the adjoining land.

STREAMS

Table 30 contains a summary of selected morphometric data available for named streams in the Richfield area. The streamcourses are shown on Map 69, which also shows the hydrologic drainage areas within the area. Descriptive paragraphs for each stream follow, providing a physical description of each stream for the portion of

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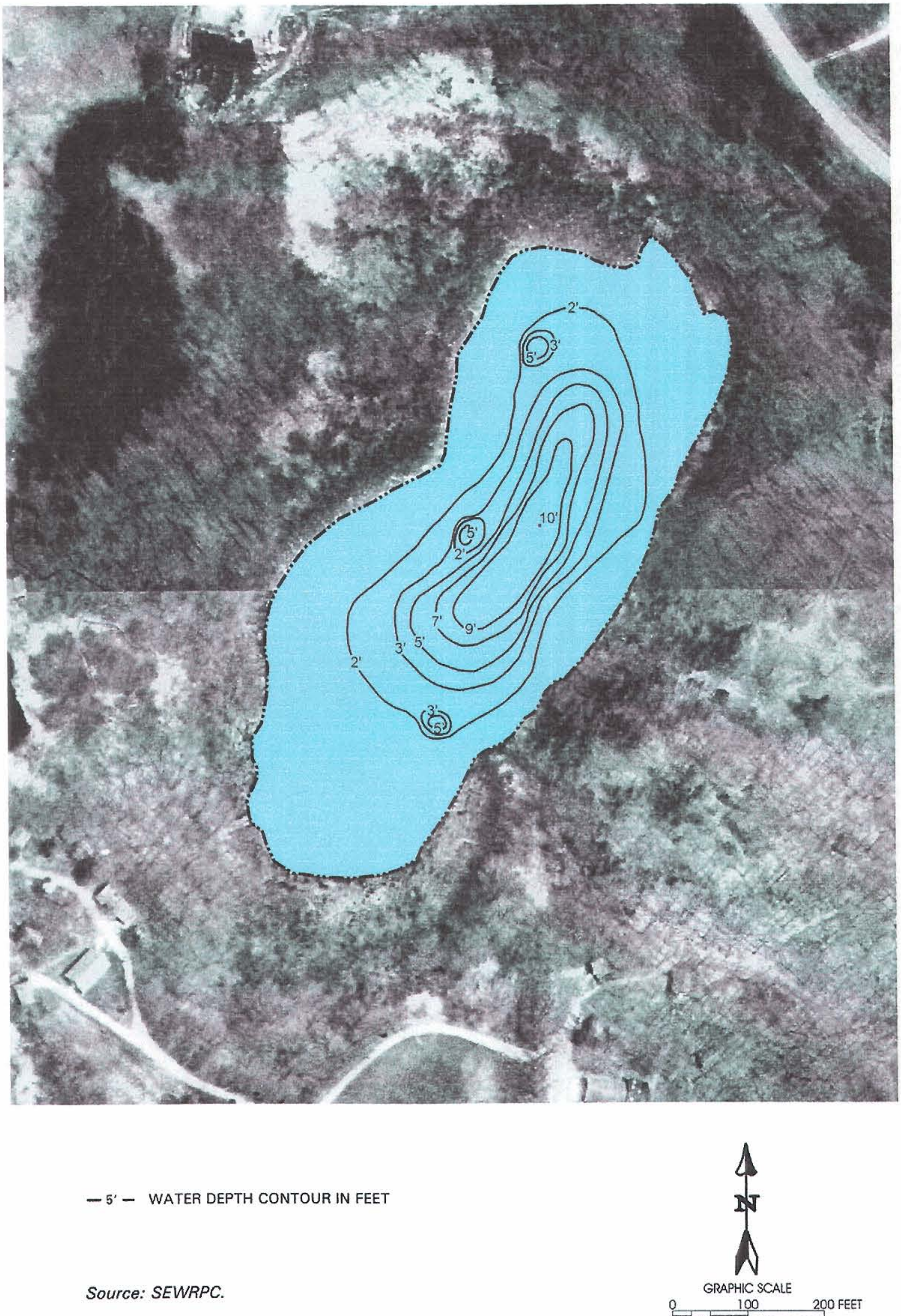
[16] *Wisconsin Conservation Department,* op. cit.

[17] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

[18] *Wisconsin Conservation Department,* op. cit.

Map 75

BATHYMETRIC MAP OF MUD LAKE



Source: SEWRPC.

Table 30

PHYSICAL CHARACTERISTICS OF STREAMS WITHIN THE RICHFIELD AREA, WASHINGTON COUNTY[a]

Stream or Watercourse	Length (miles)	Average Width (feet)	Average Depth (feet)	Surface Area (acres)	Drainage Area (square miles)	U.S. Public Land Survey			Subwatershed	Major Watershed
						Town	Range	Section		
Bark River	2.5	12	1.50	3.6	19.0	9	19	35	Bark	Rock
Coney River	6.2	2	0.33	1.5	9.5	9	19	9	Oconomowoc	Rock
Little Cedar Creek	6.0	9	0.67	6.5	16.0	10	20	30	Cedar	Milwaukee
Meadow Brook Creek	1.0	20	1.00	2.4	4.0	9	19	26	Bark	Rock
Oconomowoc River	9.1	15	1.30	16.5	48.5	9	18	34	Oconomowoc	Rock

[a]*Stream data are for the portion of the stream within Washington County only. The U.S. Public Land Survey Township, Range, and Section designation included in each description locates the mouth of the stream at its confluence with another named stream or at the point at which it exits the County.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

the stream within Washington County, and of the existing uses and conditions, wildlife habitat, and fishery for the portion of the stream within the Richfield area, to the extent that such information is available. Each of the paragraphs address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69 (5)(b) of the *Wisconsin Statutes.*

Bark River

Stream Morphometry

The Bark River is located in the southwestern portion of the Richfield area. Within Washington County, the River has a surface area of about four acres and extends over a linear distance of about 2.5 miles with a gradient of approximately two feet per mile. The River flows south from Bark Lake through Waukesha County to the Rock River. The Bark River is included in the Lower Rock River Basin water quality management planning area.[19]

Recreational Use

The Bark River has limited navigability, and is generally navigable only by canoe or similar watercraft.

Development Potential

As of 1995, land use within the Bark River drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 50 percent of the total land cover of the drainage area. Urban-density residential development comprised about 20 percent of the total land cover. The drainage area is partially located within an area planned for limited low density urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Bark River drainage area include both urban and agricultural runoff.

Fish and Wildlife Populations

In 1963,[20] the WDNR reported that the River supported primarily forage fishes, though panfish and predator fishes from Bark Lake were reported to frequent the stream. The River was characterized as a dark water,

[19]*Wisconsin Department of Natural Resources Publication No. PUBL-WT-280-98 REV,* Lower Rock River Basin Water Quality Management Plan, *October 1998.*

[20]*Wisconsin Conservation Department,* op. cit.

predominantly sandy-bottomed stream. Fish surveys were conducted during 1968, 1972, 1973, and 1975 in this reach of the River.[21] In 1968, the fish community was comprised of least and fantail darter, white sucker, bluntnose minnow, common shiner, central mudminnow, and creek chub. In 1972, the fish population was comprised of fathead minnow, central stoneroller, common shiner, central mudminnow, white sucker, green sunfish, and creek chub. In 1973, the fish population was comprised of bluntnose and fathead minnow, central mudminnow, common shiner, creek chub, fantail darter, green sunfish, northern pike, and white sucker. Black bullhead, white sucker, northern pike, and central mudminnow were reported in this reach in 1975. SEWRPC reports the least darter as a State species of special concern.[22]

Coney River

Stream Morphometry

The Coney River is located in the northwestern portion of the Richfield area. The River has a surface area of about two acres and extends over a linear distance of about 6.2 miles with a gradient of approximately 15 feet per mile. The River originates as a system of drainage ditches arising in the vicinity of Mud Lake in the Polk area, and flows to the Oconomowoc River upstream of Friess Lake. The stream was impounded by the Mayer Millpond and used to provide power for a feed mill. During dry periods, the stream is intermittent. The Coney River was included in the Oconomowoc River Priority Watershed project area.[23]

Recreational Use

The Coney River has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty. The mill site is being developed as an historical area as of late 2000.

Development Potential

As of 1995, land use within the Coney River drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 70 percent of the total land cover of the drainage area. Wetlands comprised about 15 percent of the total land cover. The drainage area is partially located in an area planned for limited low density residential development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Coney River drainage area are primarily agricultural.

Fish and Wildlife Populations

In 1963,[24] the WDNR reported that the River was considered to be little value to the fishery since the stream flow was intermittent. A fish survey conducted in 1975 reported brassy and fathead minnow; Iowa and fantail darter; central mudminnow; pumpkinseed; creek chub; brook stickleback; white sucker; common shiner; central stoneroller; blacknose, pearl, and southern redbelly dace; green sunfish; and yellow perch as present in the Coney River.[25]

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[21]*D. Fago,* op. cit.

[22]*SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997.*

[23]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-194-86,* A Nonpoint Source Control Plan for the Oconomowoc River Priority Watershed Project, *March 1986.*

[24]*Wisconsin Conservation Department,* op. cit.

[25]*D. Fago,* op. cit.

Little Cedar Creek

Stream Morphometry

Little Cedar Creek is located in the northeast portion of the Richfield area. The Creek has a surface area of six acres and extends over a linear distance of about six miles with a gradient of approximately 18 feet per mile. Much of the stream is ditched. The Creek discharges into the Kressin Branch of Cedar Creek in the Town of Jackson. Little Cedar Creek is included within the Cedar Creek Priority Watershed project area.[26]

Recreational Use

Little Cedar Creek has limited navigability and is generally navigable by canoe or similar watercraft, with difficulty.

Development Potential

As of 1995, land use within the Little Cedar Creek drainage area consisted largely of agricultural and woodland uses, comprising about 60 percent of the total land cover of the drainage area. The drainage area is partially located in an area planned for limited low density residential development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Little Cedar Creek drainage area are primarily agricultural.

Fish and Wildlife Populations

In 1963,[27] the WDNR reported that the fishery values were considered to be limited due to seasonal fluctuations in flow.

Meadow Brook Creek

Stream Morphometry

Meadow Brook Creek is located in the southeastern portion of the Richfield area. The Creek has a surface area of about two acres and extends over a linear distance of about one mile with a gradient of approximately one foot per mile. The Creek is a short, ditched tributary to the Bark River. The Creek originates in a small marshy pond and has very little flow most of the year. Meadow Brook Creek is included in the Lower Rock River Basin water quality management planning area.[28]

Recreational Use

Meadow Brook Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential

As of 1995, land use within the Meadow Brook Creek drainage area consisted of agricultural and urban-density residential uses, each comprising about 25 percent of the total land cover of the drainage area. The drainage area is partially located in an area planned for limited low density residential development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Meadow Brook Creek drainage area are primarily agricultural.

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[26] *Wisconsin Department of Natural Resources Publication No. PUBL-WR-336-93,* A Nonpoint Source Control Plan for the Cedar Creek Priority Watershed Project, *December 1991.*

[27] *Wisconsin Conservation Department,* op. cit.

[28] *Wisconsin Department of Natural Resources, PUBL-WT-280-98 REV.*

Fish and Wildlife Populations

In 1963,[29] the WDNR reported that forage fishes and small panfish were common.

Oconomowoc River

Stream Morphometry

The Oconomowoc River is located in the southwestern portion of the Richfield area. Within Washington County, the River has a surface area of about 16 acres and extends over a linear distance of about 9.1 miles with a gradient of approximately six feet per mile. The River is a large stream draining one of the marshy valleys of the Lake Michigan glacial terminal moraine. One tributary to the stream, the Coney River in the Richfield area, is ditched and drains an extensive system of wetlands. Another tributary, Flynn Creek in the Erin area, is also ditched, but, in addition, receives spring water. The Oconomowoc River, and its major tributary streams, is included in the Oconomowoc River Priority Watershed project area.[30]

Recreational Use

The Oconomowoc River is navigable by canoe. The portion of the River downstream from Little Friess (Bony) Lake was identified by the WDNR for consideration as part of a canoe trail. Though there are three lakes on the River within Washington County, there is only one low-level, temporary impounding structure located between Friess Lake and Little Friess Lake where a natural sill limits passage by deeper draft watercraft.

Development Potential

As of 1995, land use within the Oconomowoc River subwatershed consisted largely of agricultural and woodland uses, comprising 75 percent of the total land cover in the subwatershed. The subwatershed is partially located in an area planned for limited low density urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Oconomowoc River subwatershed are primarily agricultural.

Fish and Wildlife Populations

In 1963,[31] the WDNR reported the fishery to be primarily comprised of forage fish species. [32] Fish surveys conducted on this reach of the River in 1973 and 1975 reported golden and common shiner, hornyhead chub, pumpkinseed, green sunfish, largemouth and rock bass, brook silverside, banded killifish, blackstripe topminnow, bluntnose and fathead minnow, and bluegill and brassy, bluntnose, Mississippi silvery, and fathead minnow; spotfin, golden, and common shiner; banded killifish; green sunfish; slender madtom; yellow perch; central mudminnow; johnny darter; rock bass; white sucker; blackstripe topminnow; hornyhead chub; and yellow bullhead, respectively.[33] Annual fish surveys conducted from 1993 through 1995 reported fathead and bluntnose minnow; central mudminnow; Iowa, fantail, rainbow, and johnny darter; emerald, golden, and common shiner; green sunfish; slender madtom; central stoneroller; black bullhead; bluegill; pumpkinseed; brook stickleback; northern pike; black crappie; white sucker; creek and hornyhead chub; yellow perch; and largemouth and rock

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[29] *Wisconsin Conservation Department,* op. cit.

[30] *Wisconsin Department of Natural Resources, PUBL-WR-194-86.*

[31] *Wisconsin Conservation Department,* op. cit.

[32] *A previous WDNR fish survey conducted at two sites along this stream within the Town of Richfield in 1902 reported pearl dace and lake chubsucker as being present in this stream.*

[33] *D. Fago,* op. cit.

bass. During the period of 1996, 1997, and 1998 six fisheries surveys were conducted.[34] In 1996, 26 species of fishes were recorded, including central mudminnow; central stoneroller; common carp; hornyhead and creek chub; emerald, common, spotfin, and mimic shiner; bluntnose and fathead minnow; white sucker; yellow bullhead; slender madtom; blackstripe topminnow; rock and largemouth bass; green sunfish; pumpkinseed; bluegill; black crappie; rainbow, Iowa, fantail, and johnny darter; and yellow perch. In 1997, 18 species of fishes were recorded, including hornyhead and creek chub; emerald and common shiner; bluntnose and fathead minnow; white sucker; yellow bullhead; slender madtom; blackstripe topminnow; rock bass; green sunfish; pumpkinseed; black crappie; rainbow, fantail, and johnny darter; and yellow perch. In 1998, 22 species of fishes were recorded, including central mudminnow; central stoneroller; hornyhead and creek chub; emerald and common shiner; bluntnose and fathead minnow; white sucker; black and yellow bullhead; slender madtom; blackstripe topminnow; rock bass; bluegill; black crappie; rainbow, Iowa, fantail, and johnny darter; yellow perch; and walleyed pike. SEWRPC reports the slender madtom as a State-designated threatened species.[35] The River has a good biotic index[36] rating with no reported water quality problems.[37]

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[34]Ibid.

[35]*SEWRPC Planning Report No. 42,* op. cit.

[36]*Wisconsin Department of Natural Resources Technical Bulletin No. 132,* Using a Biotic Index to Evaluate Water Quality in Streams, *1982.*

[37]*SEWRPC Memorandum Report No. 93,* A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report, *March 1995.*

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Chapter XIII

INVENTORY FINDINGS: TRENTON AREA

INTRODUCTION

This chapter presents the inventory findings relating to lakes and streams in the Trenton area of Washington County. The Trenton area is shown on Map 76 and includes all of U.S. Public Land Survey Sections 1 through 36, Town 11 North, Range 20 East. The area includes the entire Town of Trenton, the northeastern portions of the City of West Bend, and the western portions of the Village of Newburg. To the extent that data are available, relevant land use, recreational use, morphometric, water quality, and biological information upon which waterbody classifications are to be based pursuant to the requirements of Section 281.69(5)(b), *Wisconsin Statutes*, is presented for each waterbody inventoried. These data form the scientific and technical basis for the determination of the alternative and recommended waterbody classification schemes set forth in Chapter XVI.

LAND USE

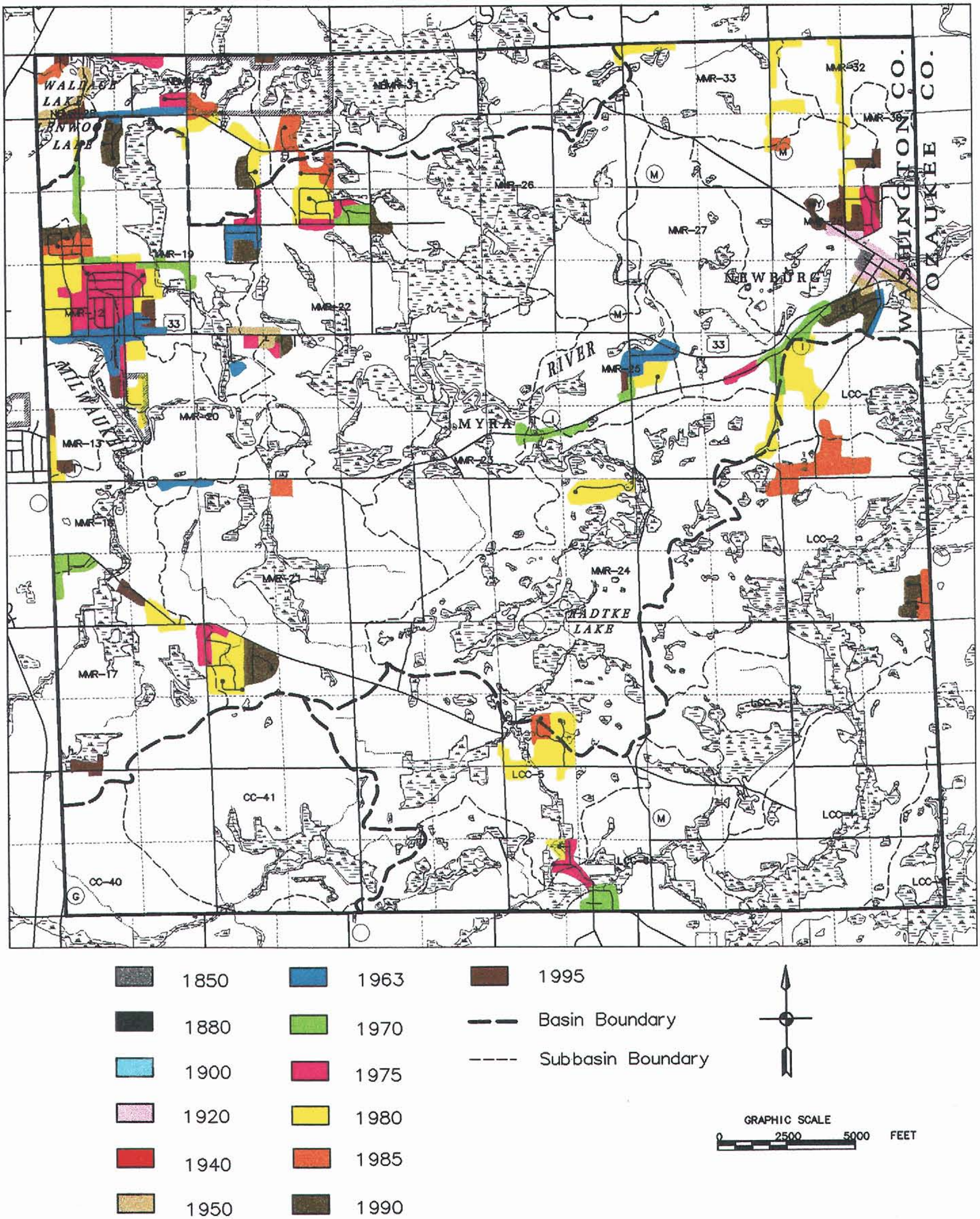
The type, intensity, and spatial distribution of the various land uses within the Trenton area are important determinants of water quality and recreational use demands. The current and planned future land use patterns, placed within the context of the historical development in the area, therefore, are important considerations in any waterbody management planning effort.

While some settlement occurred in the area prior to the 1920s, most urban development occurred in the Trenton area in recent years. The Trenton area remains largely rural in character, although the portions of the area within and adjacent to the City of West Bend and the Village of Newburg have been significantly developed. Map 76 indicates the historic urban-growth pattern in the Trenton area since 1850. Prior to 1940, urban growth in the area was very limited. However, since the 1950s, urban land use development in the area has proceeded, extending outward from the incorporated areas of the City of West Bend, incorporated in 1885, that form the northwestern portion of the area, and from the incorporated areas of the Village of Newburg, incorporated in 1973, that form the northeastern portion of the area. In addition, limited scattered residential development has occurred throughout the area.

The existing land use pattern in the Trenton area, as of 1995, is shown on Map 77, and is quantified in Table 31. As indicated in Table 31, about 2,900 acres, or about 12 percent of the area, were devoted to urban land uses. The dominant urban land use was residential, encompassing about 1,600 acres, or about 55 percent of the land area in urban use. As of 1995, about 20,300 acres, or about 88 percent of the area, were still devoted to rural land uses. About 12,700 acres, or about 62 percent of the rural area, were in agricultural land uses. Woodlands, wetlands, and surface water, including the surface area of the lakes in the area, accounted for approximately 6,100 acres, or about 30 percent of the area in rural use. Future growth in urban land use, based upon the recommendations set forth in the adopted 2020 regional land use plan shown on Map 78, is anticipated in the northwestern and west-central portions of the area and in the east-central portion of the area, within and adjacent to the currently incorporated areas of the City of West Bend and Village of Newburg, respectively. Elsewhere, however, land use is not anticipated to differ greatly from the current situation.

Map 76

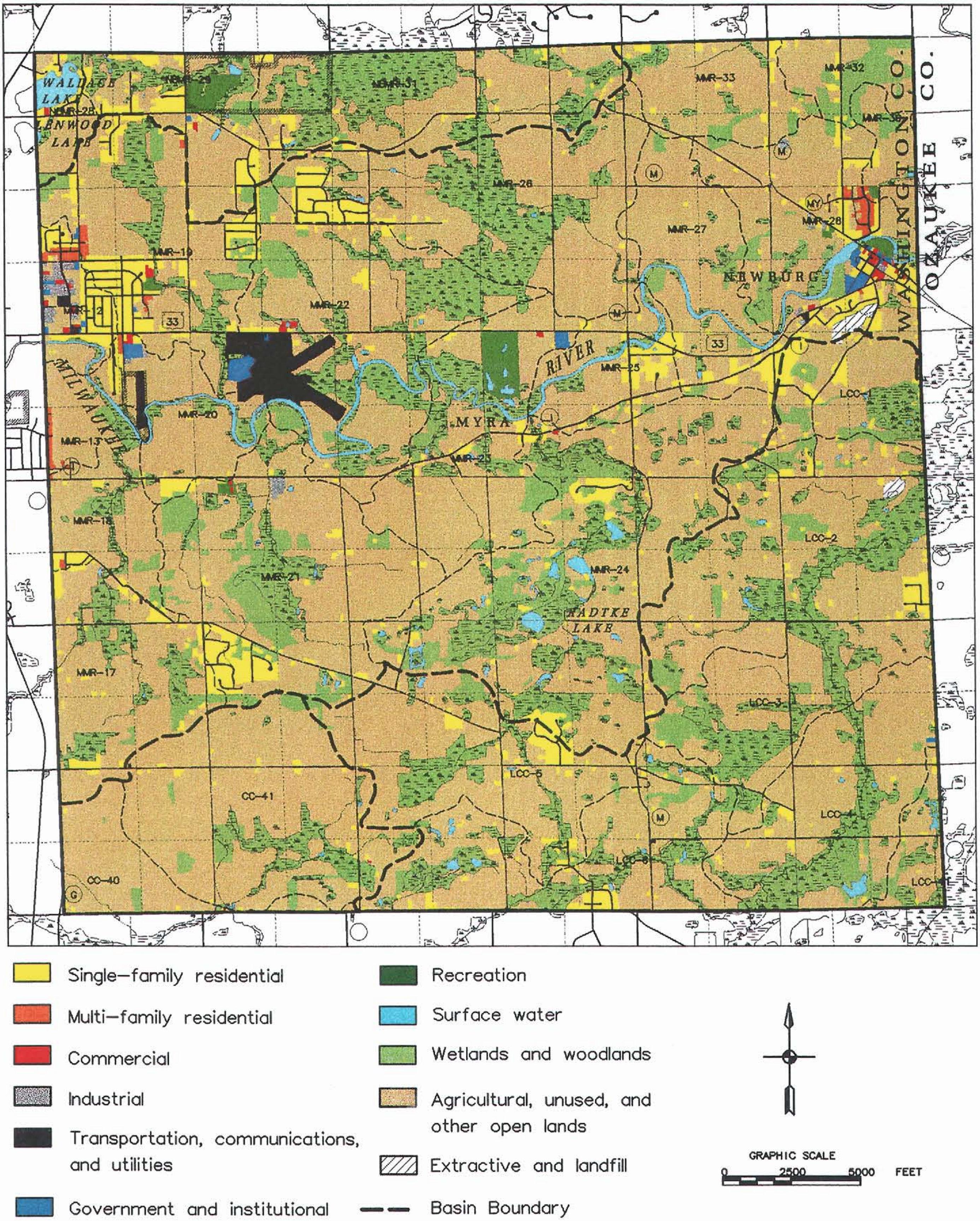
HISTORIC URBAN GROWTH WITHIN THE TRENTON AREA: 1850-1990



Source: SEWRPC.

Map 77

EXISTING LAND USE WITHIN THE TRENTON AREA: 1995



Source: SEWRPC.

Table 31

EXISTING LAND USE WITHIN THE TRENTON AREA: 1995

Land Use Categories	Acres	Percent of Major Category	Percent of Total Area
Urban			
Residential	1,558	53.4	6.7
Commercial	23	0.8	0.1
Industrial	39	1.4	0.2
Governmental and Institutional	52	1.8	0.2
Transportation and Utilities	960	33.0	4.2
Recreation	266	9.1	0.6
Land under Development	15	0.5	<0.1
Subtotal	2,913	100.0	12.1
Rural			
Agricultural	12,656	62.4	55.1
Wetlands	3,912	19.3	16.9
Woodlands	1,814	8.9	7.8
Water	334	1.7	1.4
Extractive	32	0.2	0.1
Landfill	- -	- -	- -
Other Open Lands	1,525	7.5	6.6
Subtotal	20,273	100.0	87.9
Total	23,186	- -	100.0

Source: SEWRPC.

LAKES

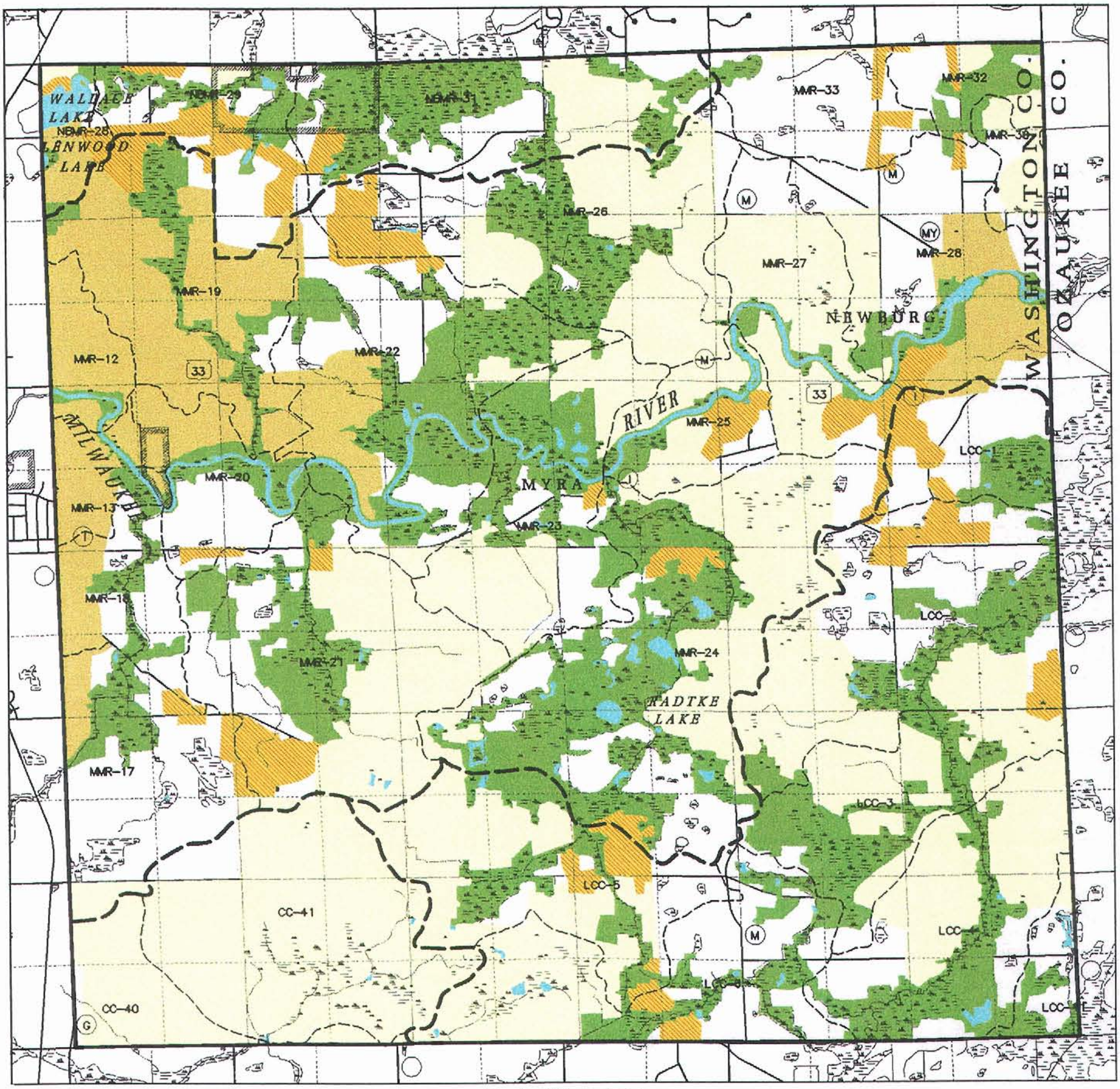
Table 32 contains a summary of selected morphometric data available for the major lakes within the Trenton area. Major lakes are defined as those lakes within the Southeastern Wisconsin Region having a surface area of 50 or more acres in areal extent. These lakes are shown on Map 79. Where available, similar summary data are provided for minor lakes because of the importance of these smaller waterbodies as a water resource. In some cases, these waterbodies, in which water levels fluctuate markedly, may be classed as deep-water marshes or wetlands. Wetlands within the Trenton area are shown on Map 80. The lakes inventoried are further described below with information set forth in paragraphs which address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69(5)(b) of the *Wisconsin Statutes*. Information on the origins of these lakes is based upon detailed geological information provided in various published survey reports[1] and maps of surfacial deposits.[2]

[1]*C. Juday,* The Inland Lakes of Wisconsin, The Hydrography and Morphometry of the Lakes, *State of Wisconsin, 1914, pp. 84-88; L. Martin,* The Physical Geography of Wisconsin, 2nd Edition, *State of Wisconsin, 1932, pp. 235-293.*

[2]*W.C. Alden,* Map Showing the Surficial Deposits of Southeastern Wisconsin, *Wisconsin Geological Survey, 1918; H.L. Young and W.G. Batten, Wisconsin Geological and Natural History Survey Information Circular No. 38,* Ground-Water Resources and Geology of Washington and Ozaukee Counties, Wisconsin, *University of Wisconsin-Extension, February 1980, 37 pages.*

Map 78

ADOPTED REGIONAL LAND USE PLAN FOR THE TRENTON AREA: 2020



- Residential–suburban density
- Residential–low density
- Residential–medium density
- Residential–high density
- Commercial
- Industrial
- Extractive/Landfill
- Transportation
- Basin Boundary
- Subbasin Boundary
- Governmental and Institutional
- Recreational
- Agricultural
- Primary Environmental Corridors
- Secondary Environmental Corridors
- Isolated Natural Resource Area
- Surface water
- Other Open Lands

Source: SEWRPC.

Table 32

HYDROLOGY AND MORPHOMETRY OF LAKES WITHIN THE TRENTON AREA, WASHINGTON COUNTY

Lake	Surface Area (acres)	Subwatershed Area (acres)	Volume (acre-feet)	Water Residence Time (years)	Maximum Length of Lake (miles)	Length of Shoreline (miles)	Maximum Width of Lake (miles)	Shoreline Development Factor[a]	Maximum Depth (feet)	Mean Depth (feet)
Hawthorn	8	1,016	96	0.13	0.2	0.5	0.1	1.26	12	10
Keown	1	1,326	15	0.02	0.1	0.2	0.2	1.68	15	7
Lenwood	15	365	285	3.16	0.2	0.6	0.1	1.15	38	19
Newburg	7	50,632	56	0.01	0.5	1.0	0.1	2.78	8	2
Proschinger[b]	6	2,100	24	0.14	0.2	0.4	0.1	1.19	23	4
Radtke[b]	10	2,100	208	0.14	0.2	0.5	0.1	1.12	14	7
Wallace	52	370	857	3.16	0.5	1.2	0.2	1.72	35	11

[a] *Shoreline Development Factor is the ratio between the actual circumference of a lake and the circumference of a circle with the same radius. A circular lake would have a Shoreline Development Factor of 1.0, while a dendritic lake would have a Shoreline Development Factor in excess of 1.0.*

[b] *These lakes fall within a common subwatershed, Subbasin MMR-24.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Hawthorn Lake

Lake Morphometry

Hawthorn Lake is located in U.S. Public Land Survey Section 36, Township 11 North, Range 20 East, Town of Trenton. The Lake has a surface area of about eight acres, a maximum depth of 12 feet, and a shoreline development factor of 1.26. The Lake is an impoundment created by a 150-foot dike across the base of a marshy valley adjacent to Cedar Creek. During wet periods, water from the Creek enters the tamarack bog through the riverine floodplain along the Creek.

Recreational Use

Public access is not available.

Development Potential

As of 1995, land use within the drainage area tributary to Hawthorne Lake consisted largely of agricultural and open space uses, with agriculture comprising about 65 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 25 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Hawthorne Lake are primarily agricultural.

Fish and Wildlife Populations

In 1963,[3] the Wisconsin Department of Natural Resources (WDNR) reported that the Lake supported a fishery of bullheads and bluegills, but had a history of frequent winterkills. According to the WDNR, as of 1995, panfish and largemouth bass were reported to be present in the Lake.[4] Mallards and blue-winged teal may nest at, and frequent, the Lake during fall.

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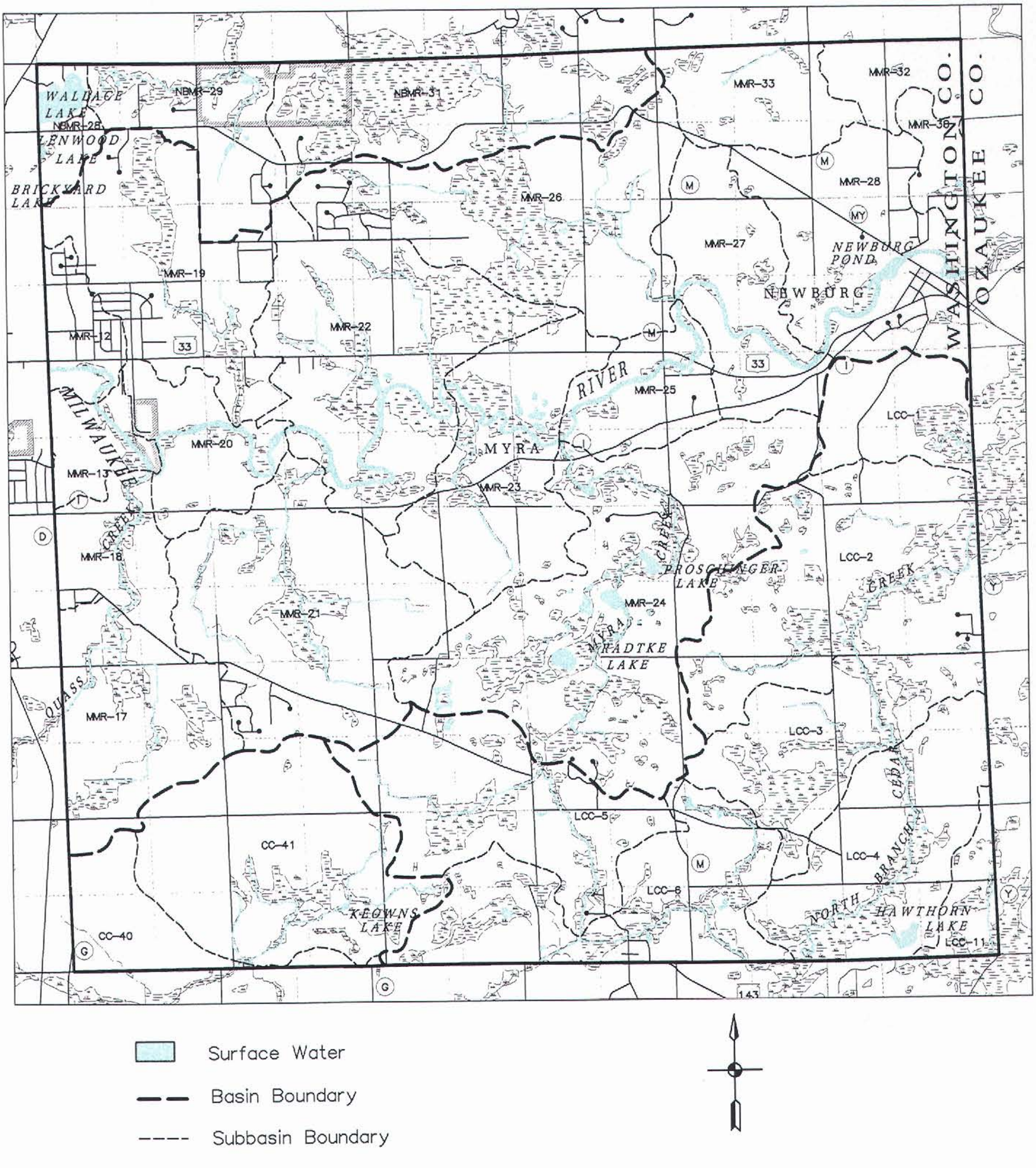
[3] *Wisconsin Conservation Department,* Surface Water Resources of Washington County, *1963.*

[4] *Wisconsin Department of Natural Resources Publication No. PUBL-FM-800 95REV,* Wisconsin Lakes, *1995.*

Map 79

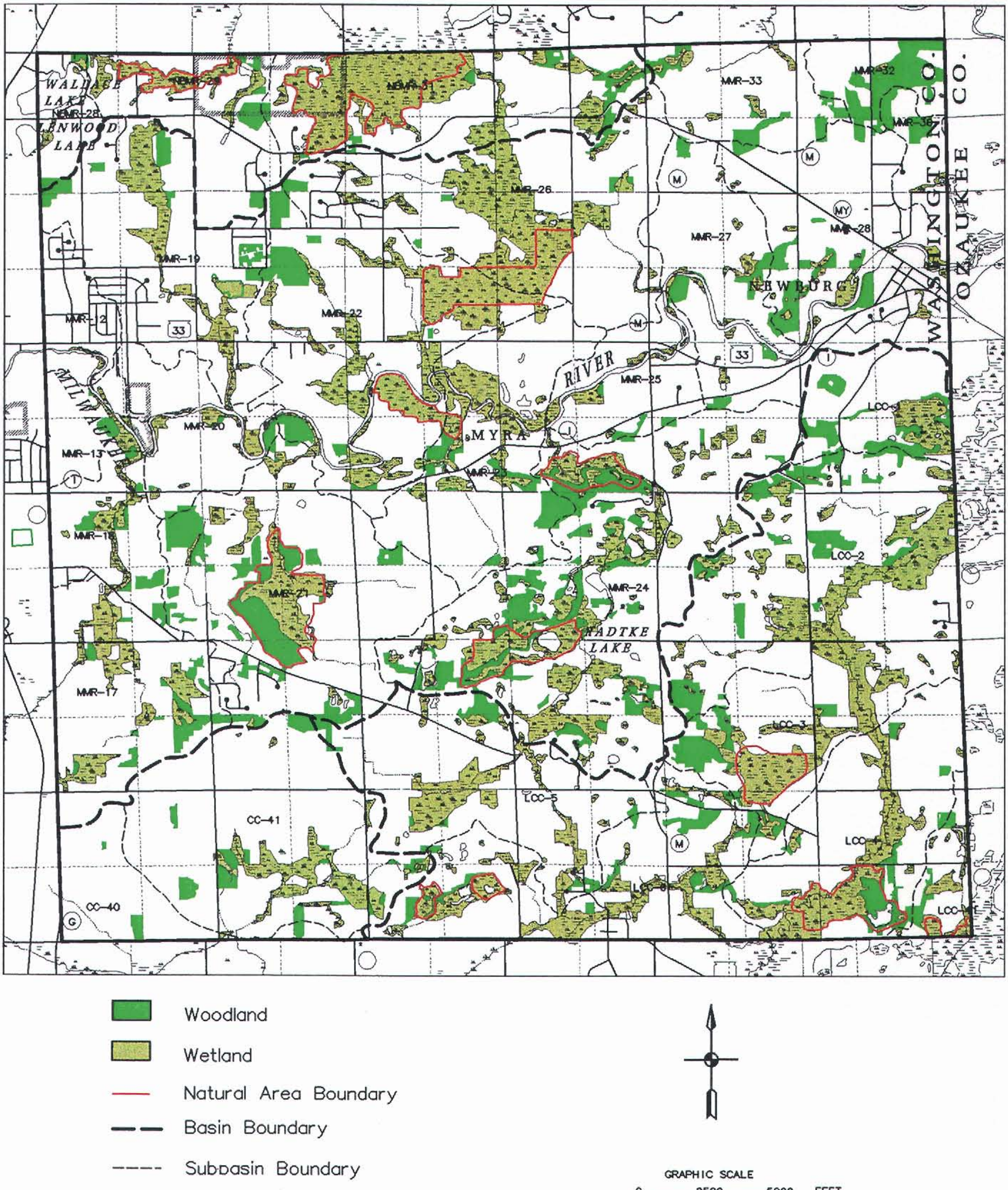
SURFACE WATER RESOURCES WITHIN THE TRENTON AREA: 1995



Source: SEWRPC.

Map 80

WETLANDS AND WOODLANDS WITHIN THE TRENTON AREA: 1995



Source: SEWRPC.

Keown Lake (Keowns Pond)

Lake Morphometry

Keown Lake is located in U.S. Public Land Survey Section 32, Township 11 North, Range 20 East, Town of Trenton. The Lake has a surface area of about one acre, a maximum depth of 15 feet, and a shoreline development factor of 1.68. The Lake is a very small spring pond on a stream tributary to Cedar Creek.

Recreational Use

Public access is not available.

Development Potential

As of 1995, land use within the drainage area tributary to Keown Lake consisted largely of agricultural and open space uses, with agriculture comprising about 75 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 15 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Keown Lake are primarily agricultural.

Fish and Wildlife Populations

As of 1963,[5] the lands around the Lake were in one ownership and the WDNR reported that the Lake had been privately stocked with brown trout. At times, the Lake was stocked with yellow perch, rock bass, bluegills, and other fishes. According to the WDNR, as of 1995, largemouth bass, panfish, and trout were reported to be present in the Lake.[6]

Lenwood Lake (Benike Lake)

Lake Morphometry

Lenwood Lake is located in U.S. Public Land Survey Section 6, Township 11 North, Range 20 East, Town of Trenton, and Section 1, Township 12 North, Range 19 East, Town of Barton. The Lake has a surface area of about 15 acres, a maximum depth of 38 feet, and a shoreline development factor of 1.15. Lenwood Lake is a small, kettle lake set in the Lake Michigan glacier terminal moraine deposits, bordering the bed of an ancient glacial lake. Springs and groundwater seepage are the major water sources flowing into the Lake and a small outlet flows to nearby Wallace Lake. A concrete structure at the outlet maintains the water level.

Recreational Use

Public access is not available. A privately owned campground is located on the northern and eastern shores of the Lake.

Development Potential

As of 1995, land use within the drainage area tributary to Lenwood Lake consisted largely of agricultural and open space uses, with agriculture comprising about 45 percent of the total land cover within the drainage area. Water resources comprised about 20 percent of the total land cover. The drainage area is located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Lenwood Lake are primarily agricultural.

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[5] *Wisconsin Conservation Department,* op. cit.

[6] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Fish and Wildlife Populations
As of 1963,[7] the WDNR reported that the Lake was privately managed for largemouth bass, panfish, and trout, with an unauthorized introduction of muskellunge having occurred at some time prior to the 1963 inventory. According to the WDNR, as of 1995, largemouth bass were common and northern pike and panfish were present.[8]

Newburg Pond
Lake Morphometry
Newburg Pond is located in U.S. Public Land Survey Section 12, Township 11 North, Range 20 East, Village of Newburg. The pond has a surface area of about seven acres, a maximum depth of eight feet, and a shoreline development factor of 2.78. Newburg Pond is an impoundment on the Milwaukee River, originally constructed in 1850 to supply power for a feed mill and a sawmill. The original timber dam has undergone partial repair as recently as 1958.

Recreational Use
Public access is provided. However, the WDNR has reported that siltation has decreased the depth of water in the pond, limiting its principle value to aesthetic use.

Development Potential
As of 1995, land use within the drainage area tributary to Newburg Pond consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the total land within the drainage area in Washington County. Medium-density urban development comprised about 15 percent of the total land cover. The drainage area is located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Newburg Pond are primarily agricultural runoff, with some urban contributions.

Fish and Wildlife Populations
As of 1963,[9] the WDNR reported that the fishery consisted of stream fishes, with carp present in large numbers. According to the WDNR, panfish, largemouth bass, and northern pike were reported to be present in the pond in 1995.[10] About 12 acres of grassy marsh adjoin the upstream end of the pond. Local residential use limits the pond's potential use by waterfowl for nesting and resting.

Proschinger Lake
Lake Morphometry
Proschinger Lake is located in U.S. Public Land Survey Section 22, Township 11 North, Range 20 East, Town of Trenton. The Lake has a surface area of about six acres, a maximum depth of 23 feet, and a shoreline development factor of 1.19. The Lake is a small, kettle lake in the terminal moraine of the Lake Michigan glacier. The Lake lies in the swampy valley of a small stream tributary to the Milwaukee River. Its inlet and outlet flow through a hardwood wetland.

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[7] *Wisconsin Conservation Department,* op. cit.

[8] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

[9] *Wisconsin Conservation Department,* op. cit.

[10] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Recreational Use
Public access is not available. In 1963, the Lake was reported to have outstanding aesthetic value and was considered by the Wisconsin Department of Natural Resources as being worthy of preservation.

Development Potential
In 1995, land use within the drainage area tributary to Proschinger Lake consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the total land cover in the drainage area. Wetlands and other open space uses comprised about 20 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Proschinger Lake are primarily agricultural.

Fish and Wildlife Populations
In 1963,[11] the WDNR reported that largemouth bass, panfish, and northern pike comprised the fishery, and the presence of a large carp population was considered to be a major use problem. Few ducks frequent the Lake.

Radtke Lake

Lake Morphometry
Radtke Lake is located in U.S. Public Land Survey Section 27, Township 11 North, Range 20 East, Town of Trenton. The Lake has a surface area of about 10 acres, a maximum depth of 14 feet. Radtke Lake has a shoreline development factor of 1.12. The Lake is a small, kettle lake in the terminal moraine of the Lake Michigan glacier. The Lake is landlocked, but adjoins a tamarack marsh from which a small stream flows to the Milwaukee River. The bathymetry of Radtke Lake is shown on Map 81.

Recreational Use
Public access is not provided. However, a youth camp operates during the summer on the north shore and makes extensive use of the Lake for sailing, rowing, canoeing, and swimming.

Development Potential
As of 1995, land use within the drainage area to Radtke Lake consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the total land cover of the drainage area. Wetlands and other open space uses comprised about 20 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Radtke Lake are primarily agricultural.

Fish and Wildlife Populations
The WDNR reported that largemouth bass and panfish comprised the fishery in 1963 and carp were considered to present a major use problem.[12] According to the WDNR, panfish remained abundant as of 1995 and largemouth bass were reported to be common.[13] Limited numbers of puddle ducks frequent the Lake in fall.

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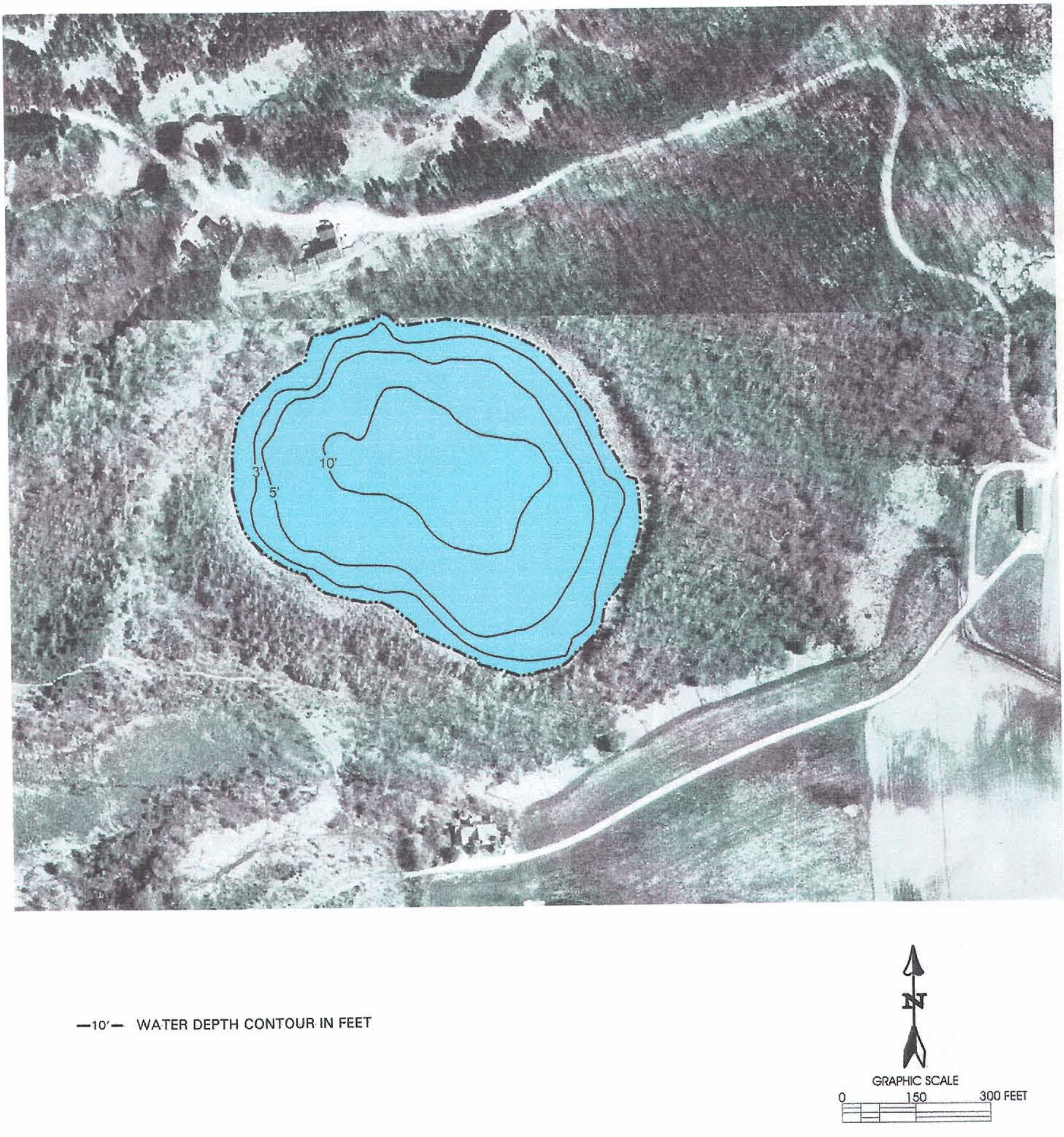
[11] *Wisconsin Conservation Department,* op. cit.

[12] Ibid.

[13] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Map 81

BATHYMETRIC MAP OF RADTKE LAKE



Source: SEWRPC.

Wallace Lake

Lake Morphometry

Wallace Lake is located in U.S. Public Land Survey Section 6, Township 11 North, Range 20 East, Town of Trenton. The Lake has a surface area of about 52 acres, a maximum depth of 35 feet, and shoreline development factor of 1.72. Wallace Lake is a small, kettle lake in the terminal moraine of the Lake Michigan glacier. The Lake has a small inlet draining from the upstream Lenwood Lake, but the waterbody is primarily spring fed. The outflow from Wallace Lake drains into a small stream tributary to the Milwaukee River. A screened concrete structure was placed on the outlet in 1959 to prevent interchange of fishes between the Lake and stream. The bathymetry of Wallace Lake is shown on Map 82.

Recreational Use

Public access is provided by a town road that has been fashioned into a boat ramp at its abutment with the Lake.

Development Potential

As of 1995, land use within the drainage area tributary to Wallace Lake consisted largely of agricultural and open space use, with agriculture comprising about 50 percent of the total land cover within the drainage area. Water resources comprised about 20 percent of the total land cover. Most of the shoreline is developed for residential use, and the drainage area is located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage tributary to Wallace Lake are primarily agricultural.

Fish and Wildlife Populations

In 1963,[14] the WDNR reported that fisheries management centered on trout, although, previously, the Lake was considered to contain largemouth bass, panfish, and northern pike. In 1978,[15] the fishery was comprised of black crappie, yellow perch, largemouth bass, and bluegill. According to the WDNR, largemouth bass were abundant in 1995, panfish and northern pike were common, and walleyed pike and catfish were present.[16] Nearly complete development of the shore for home sites detracts from any possible value for waterfowl.

STREAMS

Table 33 contains a summary of selected morphometric data available for named streams in the Trenton area. The streamcourses are shown on Map 79, which also shows the hydrologic drainage areas within the area. Descriptive paragraphs for each stream follow, providing a physical description of each stream for the portion of the stream within Washington County, and of the existing uses and conditions, wildlife habitat, and fishery for the portion of the stream within the Trenton area, to the extent that such information is available. Each of the paragraphs address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69 (5)(b) of the *Wisconsin Statutes.*

North Branch of Cedar Creek

Stream Morphometry

The North Branch of Cedar Creek is located in the southeastern portion of the Trenton area. The Creek has a surface area of about eight acres and extends over a linear distance of about 6.3 miles with a gradient of

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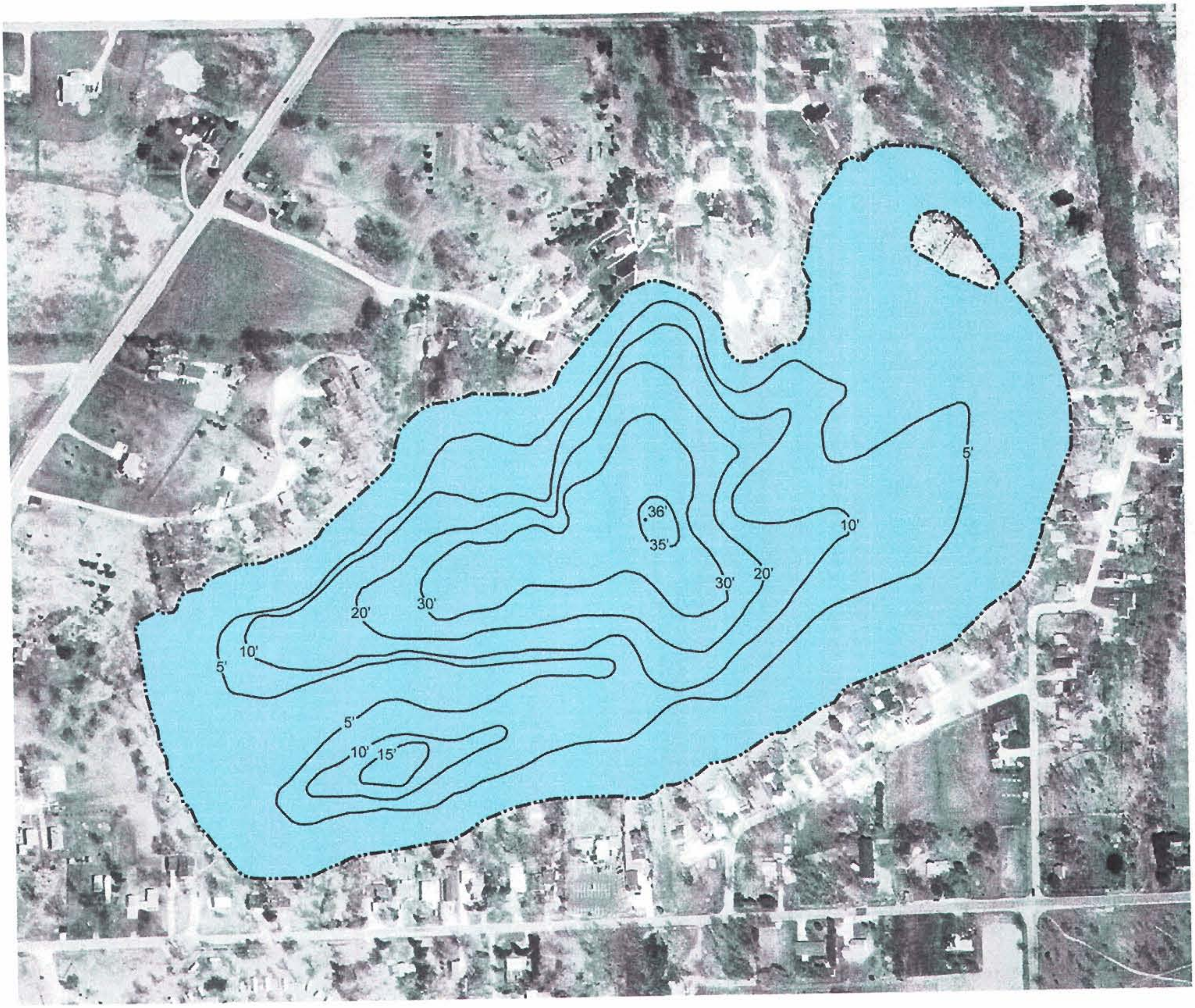
[14] *Wisconsin Conservation Department,* op. cit.

[15] *D. Fago, Wisconsin Department of Natural Resources Research Report No. 148,* Retrieval and Analysis System Used in Wisconsin's Statewide Fish Distribution Survey, Second Edition, *December 1988.*

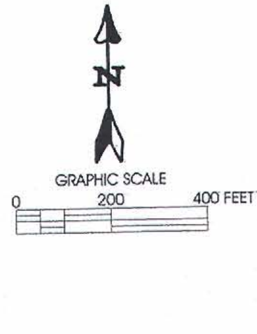
[16] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Map 82

BATHYMETRIC MAP OF WALLACE LAKE



—20'— WATER DEPTH CONTOUR IN FEET



Source: Wisconsin Department of Natural Resources and SEWRPC.

Table 33

PHYSICAL CHARACTERISTICS OF STREAMS WITHIN THE TRENTON AREA, WASHINGTON COUNTY[a]

Stream or Watercourse	Length (miles)	Average Width (feet)	Average Depth (feet)	Surface Area (acres)	Drainage Area (square miles)	U.S. Public Land Survey			Subwatershed	Major Watershed
						Town	Range	Section		
North Branch Cedar Creek	6.3	10	1.00	7.6	11.5	10	20	12	Cedar	Milwaukee
Evergreen Creek	4.9	4	0.17	2.4	7.0	10	20	15	Cedar	Milwaukee
Milwaukee River	25.8	83	1.50	259.5	130.0	12	20	25	East-West Branches Milwaukee	Milwaukee
Myra Creek	2.6	6	0.55	2.6	2.5	11	20	15	East-West Branches Milwaukee	Milwaukee
Quaas Creek	5.9	11	0.67	7.9	7.5	11	20	18	East-West Branches Milwaukee	Milwaukee
Wallace Creek	8.6	12	1.30	12.5	15.0	12	20	14	North Branch Milwaukee	Milwaukee

[a]*Stream data are for the portion of the stream within Washington County only. The U.S. Public Land Survey Township, Range, and Section designation included in each description locates the mouth of the stream at its confluence with another named stream or at the point at which it exits the County.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

approximately five feet per mile. The Creek is a small, low-gradient stream that originates in a marshy lake in Ozaukee County. Nearly the entire streamcourse is bordered by woody swamp. The North Branch of Cedar Creek is included within the Cedar Creek Priority Watershed project area.[17]

Recreational Use

The North Branch of Cedar Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential

As of 1995, land use within the North Branch of Cedar Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 70 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 15 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the North Branch of the Cedar Creek drainage area are primarily agricultural.

Fish and Wildlife Populations

Fluctuating flows detracts from the stream's potential for a warm water fishery. In 1978,[18] the fish population was reported to be comprised of bluegill, johnny darter, lake chubsucker, white sucker, fantail and Iowa darter, green

[17]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-336-93,* A Nonpoint Source Control Plan for the Cedar Creek Priority Watershed Project, *December 1991.*

[18]*D. Fago,* op. cit.

sunfish, brook stickleback, and central mudminnow. The Southeastern Wisconsin Regional Planning Commission (SEWRPC) reports the lake chubsucker as a State-designated threatened species.[19]

Evergreen Creek

Stream Morphometry

Evergreen Creek is located in the southwestern portion of the Trenton area. The Creek has a surface area of about two acres and extends over a linear distance of about 4.9 miles with a gradient of approximately 17 feet per mile. Evergreen Creek is a small stream, originating near the unincorporated hamlet of Keown, which flows south to Cedar Creek. There are two impoundments in the watershed, including Keown Millpond. The stream can become intermittent during dry periods. Evergreen Creek is included within the Cedar Creek Priority Watershed project area.[20]

Recreational Use

Evergreen Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential

As of 1995, land use within the Evergreen Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 85 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 5 percent of the total land cover. The drainage area is partially located within an area planned for urban development in the regional land use plan, in the vicinity of the southwestern portions of the City of West Bend.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the Evergreen Creek drainage area are primarily agricultural.

Fish and Wildlife Populations

In 1963,[21] the WDNR reported that the Creek was considered only of value for forage fish. A fish survey conducted in 1975 reported blacknose, southern redbelly, and northern redbelly dace; fathead minnow; brook stickleback; central mudminnow; creek chub; and white sucker.[22] A subsequent survey in 1978 reported creek chub, fathead minnow, white sucker, common and golden shiner, common carp, central and common stoneroller, pumpkinseed, central mudminnow, northern redbelly dace, black bullhead, brook stickleback, and green sunfish.[23] The Creek loses its identity within the marshlands of the Jackson Wildlife Area adjoining Cedar Creek.

Milwaukee River

Stream Morphometry

The Milwaukee River is traverses the central portions of the Trenton area. Within Washington County, the River has a surface area of about 260 acres and extends over a linear distance of about 25.8 miles with a gradient of approximately six feet per mile. The Milwaukee River is the largest River in Washington County, both in width and length, and, in the past, has been a major source of water power in the Barton-West Bend area. In 1963, there

[19]*SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997.*

[20]*Wisconsin Department of Natural Resources, PUBL-WR-336-93.*

[21]*Wisconsin Conservation Department,* op. cit.

[22]*D. Fago,* op. cit.

[23]Ibid.

were five dams on the River within the County. The Milwaukee River is included within the Milwaukee River Priority Watershed project area.[24]

Recreational Use
Public access to the Milwaukee River is afforded through numerous public parks and private access sites located along the streamcourse. The River is frequently used for recreational boating, fishing, and scenic viewing.

Development Potential
As of 1995, land use within the Milwaukee River watershed consisted largely of agricultural and open space uses, with agriculture comprising about 45 percent of the total land cover with the watershed. Wetlands and other open space uses comprised about 15 percent of the total land cover. The drainage area is partially located within an area planned for urban development in the regional land use plan, within and adjacent to the City of West Bend and Village of Newburg.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution in the Milwaukee River watershed include both urban and agricultural runoff.

Fish and Wildlife Populations
In 1963,[25] the WDNR reported that the fishery was limited to undesirable rough fish, although northern pike were reported in the spring and the several impoundments acted as sources of panfish and limited numbers of largemouth bass. Fish surveys conducted in 1924 indicated that johnny darter, stonecat, and fathead minnow were present in this portion of the River. These fishes were also reported in a 1978 survey, which also reported bluntnose minnow, northern pike, yellow perch, bluegill, largemouth and rock bass, black and yellow bullhead, common shiner, green sunfish, common carp and white sucker.[26] Annual surveys conducted from 1989 through 1993 in the Trenton area reported bluegill; bluntnose minnow; greater and golden redhorse; largemouth, smallmouth, and rock bass; pumpkinseed; largescale stoneroller; blacknose, sand, spotfin, and common shiner; northern pike; pumpkinseed; stonecat; black and yellow bullhead; johnny and blackside darter; northern pike; creek and hornyhead chub; logperch; green sunfish; common carp; and white sucker.[27] SEWRPC reports the greater redhorse as a State-designated threatened species.[28]

Myra Creek
Stream Morphometry
Myra Creek is located in the southeastern portion of the Trenton area. The Creek has a surface area of about three acres and extends over a linear distance of about 2.6 miles with a gradient of approximately 11 feet per mile. The Creek is a small, gravelly stream, originating in woody swamp adjoining Ratdke Lake, and flows through

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[24]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-255-90,* A Nonpoint Source Control Plan for the East and West Branches of the Milwaukee River Priority Watershed Project, *February 1989; Wisconsin Department of Natural Resources Publication No. PUBL-WR-253-90,* A Nonpoint Source Control Plan for the North Branch Milwaukee River Priority Watershed Project, *July 1989; Wisconsin Department of Natural Resources Publication No. PUBL-WR-229-89,* Milwaukee River Basin Integrated Management Plan, *February 1990.*

[25]*Wisconsin Conservation Department,* op. cit.

[26]*D. Fago,* op. cit.

[27]Ibid.

[28]*SEWRPC Planning Report No. 42,* op. cit.

Proschinger Lake and the basin of a former millpond at Myra, to the Milwaukee River. Myra Creek is included within the Milwaukee River Priority Watershed project area.[29]

Recreational Use
Myra Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential
As of 1995, land use within the Myra Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the total land cover of the drainage area. Wetlands and other open space uses comprised about 20 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution in the Myra Creek drainage area are primarily agricultural.

Fish and Wildlife Populations
As of 1963,[30] the WDNR reported that northern pike entered the Creek in spring from the Milwaukee River. In 1963, carp were observed as far upstream as the outlet of Proschinger Lake, although forage fishes were the principle inhabitants of the Creek at that time. A fishery survey conducted in 1978 reported black bullhead, creek chub, pumpkinseed, johnny darter, largemouth bass, bluegill, northern pike, white sucker, and central mudminnow.[31]

Quaas Creek (Quas Creek)
Stream Morphometry
Quaas Creek is located in the southwestern and northwestern portions of the Trenton area. The Creek has a surface area of about eight acres and extends over a linear distance of about 5.9 miles with a gradient of approximately 22 feet per mile. The Creek originates as a drainage stream from Quaas Lake and a nearby swampy basin before discharging to the Milwaukee River east of the City of West Bend. In 1963, the Creek was reported by the Wisconsin Department of Natural Resources to be a shallow, sand and gravel-bottomed stream, lacking instream cover. Since then some restoration activities have been carried out to create fish habitat. Quaas Creek is included within the Milwaukee River Priority Watershed project area.[32]

Recreational Use
Quaas Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential
As of 1995, land use within the Quaas Creek drainage area consisted largely of agricultural and open space uses, with urban development occurring in the middle reaches in the vicinity of the City of West Bend. Agriculture comprises about 60 percent of the total land cover within the drainage area. Wetlands and other open space uses

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[29] *Wisconsin Department of Natural Resources, PUBL-WR-255-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

[30] *Wisconsin Conservation Department,* op. cit.

[31] *D. Fago,* op. cit.

[32] *Wisconsin Department of Natural Resources, PUBL-WR-255-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

comprised about 15 percent of the total land cover. The drainage area is located partially within an area planned for urban development in the regional land use plan, in the vicinity of the City of West Bend, with the middle reaches of the Creek experiencing an upsurge in the growth of commercial enterprises during the late 1990s.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Quaas Creek drainage area are primarily agricultural, with a shift toward urban sources of water pollution in recent years.

Fish and Wildlife Populations

In 1963,[33] the WDNR reported that Quaas Creek supported little other than forage fishes and crayfish; however, northern pike and carp were reported to have been observed in the downstream reaches of the Creek during spring. As early as 1900, largemouth bass were reported from this Creek, with a diverse fish community being observed in 1924, comprised of largescale stoneroller, green sunfish, smallmouth bass, fantail and johnny darter, blacknose dace, white sucker, bluntnose minnow, and creek chub. A fish survey conducted in 1978 also reported a diverse community comprised of blacknose and southern redbelly dace, blacknose and common shiner, central mudminnow, green sunfish, northern pike, central stoneroller, hornyhead and creek chub, common carp, johnny and fantail darter, and white sucker.[34] In 1983,[35] the fish community was reported to include common carp, northern pike, northern redbelly and blacknose dace, central mudminnow, bullhead minnow, creek chub, common shiner, central stoneroller, fantail and johnny darter, and white sucker in the headwater reach of the Creek, with, in addition, mottled sculpin, southern redbelly and pearl dace, and brook stickleback at the Town of West Bend-Town of Trenton town line.

Wallace Creek

Stream Morphometry

Wallace Creek is located in the northwestern portion of the Trenton area. The Creek has a surface area of about 13 acres and extends over a linear distance of about 8.6 miles with a gradient of approximately 11 feet per mile. The Creek is a tributary to the North Branch of the Milwaukee River originating in wooded wetlands west of Green Lake, and as an intermittent outlet of Wallace Lake. Wallace Creek is included within the Milwaukee River Priority Watershed project area.[36]

Recreational Use

Wallace Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty. Swimming facilities are provided at the Sandy Knoll County Park.

Development Potential

As of 1995, land use within the Wallace Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the total land cover within the drainage area. Wetlands and other open space uses comprised about 15 percent of the total land cover. The drainage area is partially located within an area planned for urban development in the regional land use plan, in the vicinity of the City of West Bend.

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[33] *Wisconsin Conservation Department,* op. cit.

[34] *D. Fago,* op. cit.

[35] Ibid.

[36] *Wisconsin Department of Natural Resources, PUBL-WR-253-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution in the Wallace Creek drainage area are primarily agricultural.

Fish and Wildlife Populations
In 1963,[37] the WDNR reported that a complex of ponds drained by Wallace Creek, including Einey Lake, were managed as private fish hatcheries and provided a major water source for the stream. At that time, forage fishes constituted the fishery. A fishery survey conducted in 1986 reported white sucker, central mudminnow, and creek chub.[38]

[37] *Wisconsin Conservation Department,* op. cit.

[38] *D. Fago,* op. cit.

Chapter XIV

INVENTORY FINDINGS: WAYNE AREA

INTRODUCTION

This chapter presents the inventory findings relating to lakes and streams in the Wayne area of Washington County. The Wayne area is shown on Map 83 and includes all of U.S. Public Land Survey Sections 1 through 36, Town 12 North, Range 18 East. The area includes the entire Town of Wayne. To the extent that data are available, relevant land use, recreational use, morphometric, water quality, and biological information upon which waterbody classifications are to be based pursuant to the requirements of Section 281.69(5)(b), *Wisconsin Statutes*, is presented for each waterbody inventoried. These data form the scientific and technical basis for the determination of the alternative and recommended waterbody classification schemes set forth in Chapter XVI.

LAND USE

The type, intensity, and spatial distribution of the various land uses within the Wayne area are important determinants of water quality and recreational use demands. The current and planned future land use patterns, placed within the context of the historical development in the area, therefore, are important considerations in any waterbody management planning effort.

While some settlement occurred prior to the mid-1900s, the majority of the limited urban development in the Wayne area occurred in recent years. The Wayne area remains almost entirely rural in character. Map 83 indicates the historic urban growth pattern in the Wayne area, since 1850. Early development occurred in the northern and north-central portions of the area, in the vicinity of the unincorporated hamlets of St. Killian and Wayne during the 1920s. Between the 1920s and 1980s urban growth in the area remained relatively static. However, since the 1950s, urban land use development in the area has recurred, principally in the vicinity of the unincorporated hamlet of Kohlsville in the southern portion of the area.

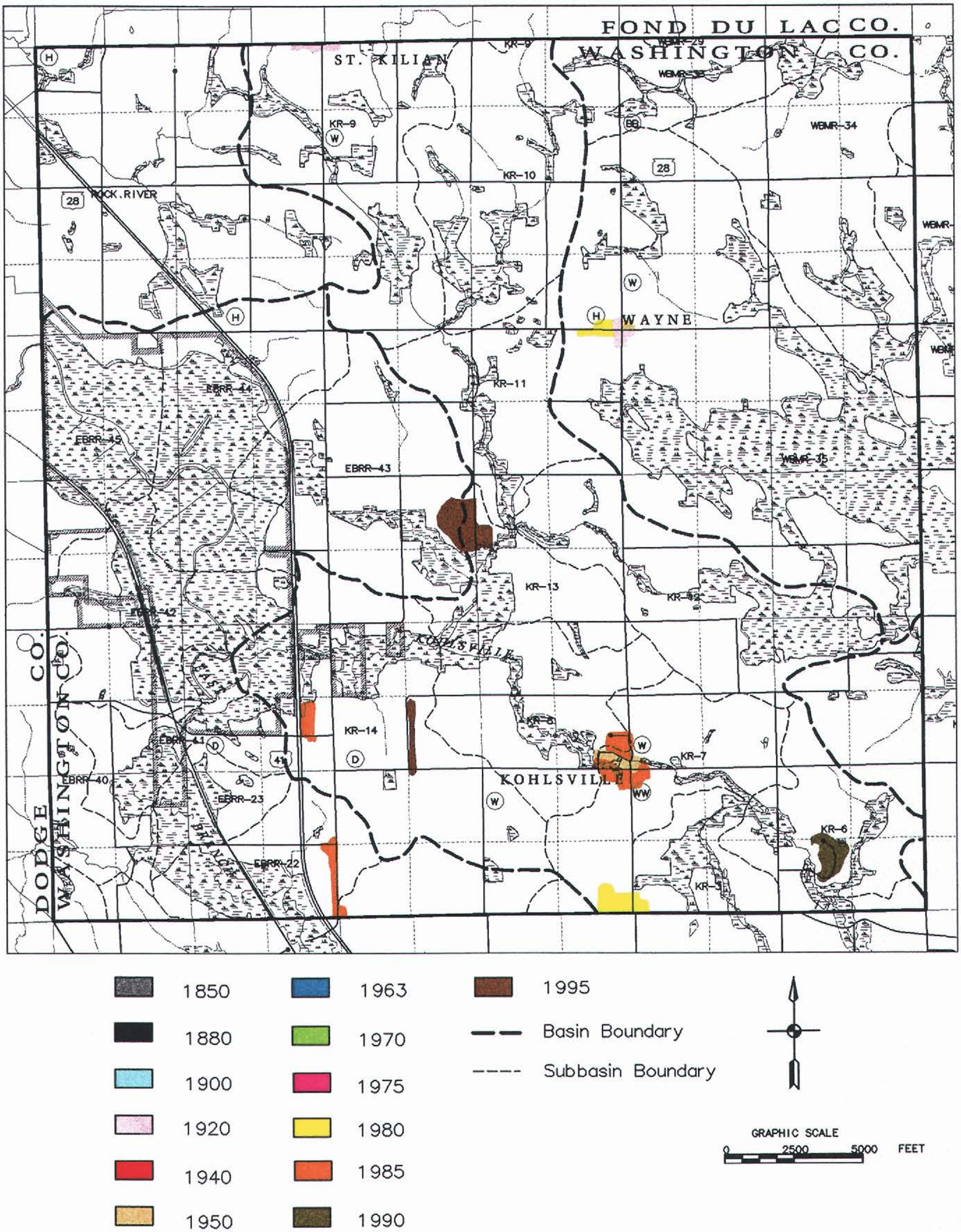
The existing land use pattern in the Wayne area, as of 1995, is shown on Map 84, and is quantified in Table 34. As indicated in Table 34, about 1,400 acres, or about 6 percent of the area, were devoted to urban land uses. The dominant urban land use is related to transportation corridors and utility installations, encompassing about 800 acres, or about 58 percent of the area in urban use. Residential land uses encompassed about 500 acres, or about 38 percent of the land area in urban use. As of 1995, about 21,600 acres, or about 94 percent of the area, were still devoted to rural land uses. About 14,500 acres, or about 68 percent of the rural area, were in agricultural land uses. Woodlands, wetlands, and surface water, including the surface area of the lakes in the area, accounted for approximately 6,700 acres, or about 31 percent of the area in rural use. Future growth in urban land use, based upon the recommendations set forth in the adopted 2020 regional land use plan shown on Map 85, is not anticipated, although limited infilling could occur throughout the area within and adjacent to existing areas of urban residential density.

LAKES

There are no major lakes in the Wayne area. Major lakes are defined as those lakes within the Southeastern Wisconsin Region having a surface area of 50 or more acres in areal extent. However, one minor lake, the

Map 83

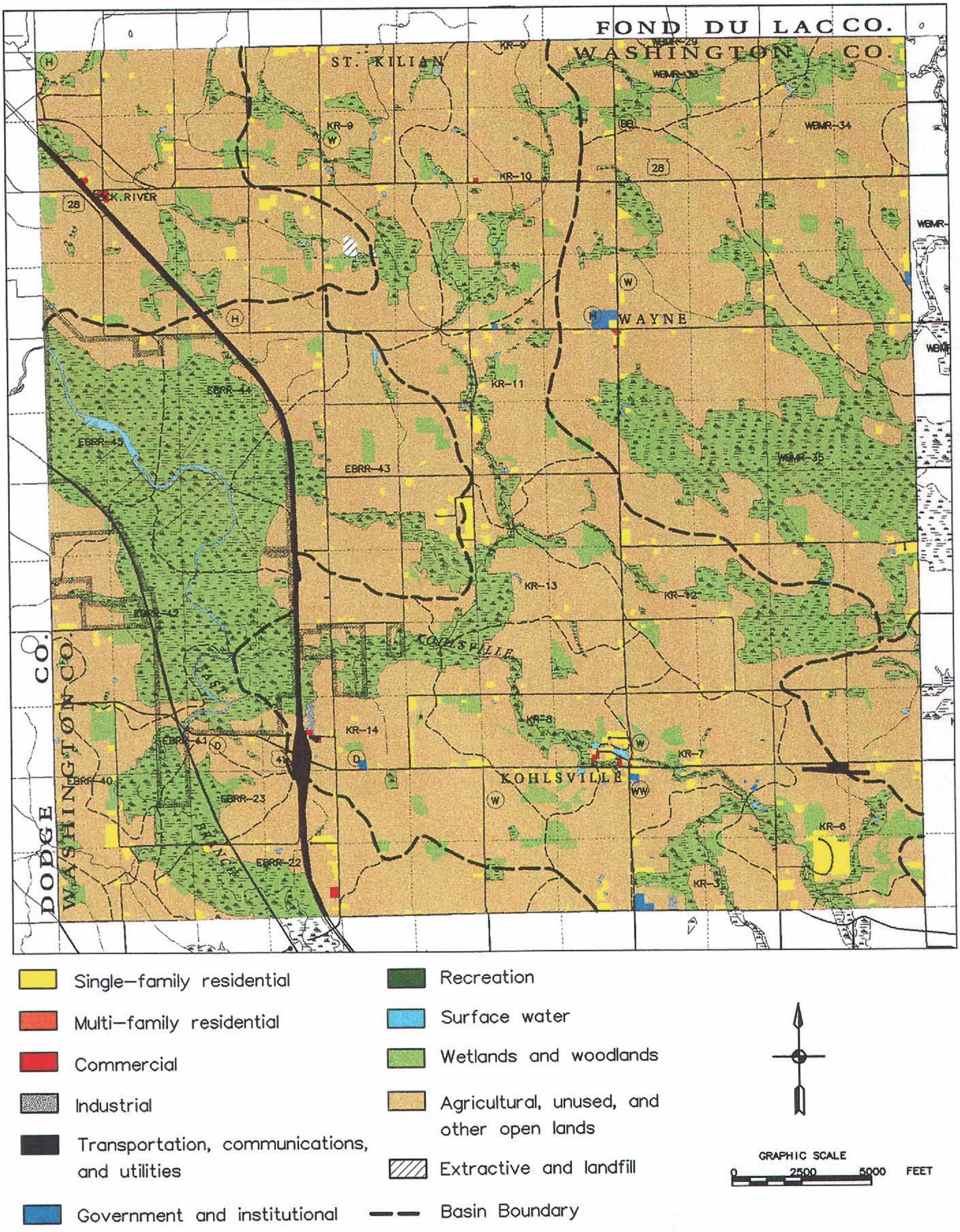
HISTORIC URBAN GROWTH WITHIN THE WAYNE AREA: 1850-1990



Source: SEWRPC.

Map 84

EXISTING LAND USE WITHIN THE WAYNE AREA: 1995



Source: SEWRPC.

Table 34

EXISTING LAND USE WITHIN THE WAYNE AREA: 1995

Land Use Categories	Acres	Percent of Major Category	Percent of Total Area
Urban			
Residential	521	38.0	2.3
Commercial	7	0.5	<0.1
Industrial	16	1.2	0.1
Governmental and Institutional	26	1.9	0.1
Transportation and Utilities	792	57.8	3.4
Recreation	- -	- -	- -
Land under Development	8	0.6	<0.1
Subtotal	1,370	100.0	5.9
Rural			
Agricultural	14,545	67.5	63.5
Wetlands	5,607	26.0	24.5
Woodlands	1,035	4.8	4.5
Water	81	0.4	0.4
Extractive	10	<0.1	<0.1
Landfill	- -	- -	- -
Other Open Lands	273	1.3	1.2
Subtotal	21,551	100.0	94.1
Total	22,921	- -	100.0

Source: SEWRPC.

Kohlsville Millpond, is located within the unincorporated hamlet of Kohlsville, as shown on Map 86. Table 35 contains selected morphometric data that is available for that Pond. Wetlands within the Wayne area are shown on Map 87.

Kohlsville Millpond

Lake Morphometry

Kohlsville Millpond is located in U.S. Public Land Survey Section 27, Township 12 North, Range 18 East, Town of Wayne. The pond has a surface area of about six acres, a maximum depth of seven feet, and a shoreline development factor of 1.18. The pond is an impoundment on the Kohlsville River. The stream has a high gradient at this point and the impounding structure consists of a dike and two dams.

Recreational Use

Public access is available through a town park and a road that borders the pond.

Development Potential

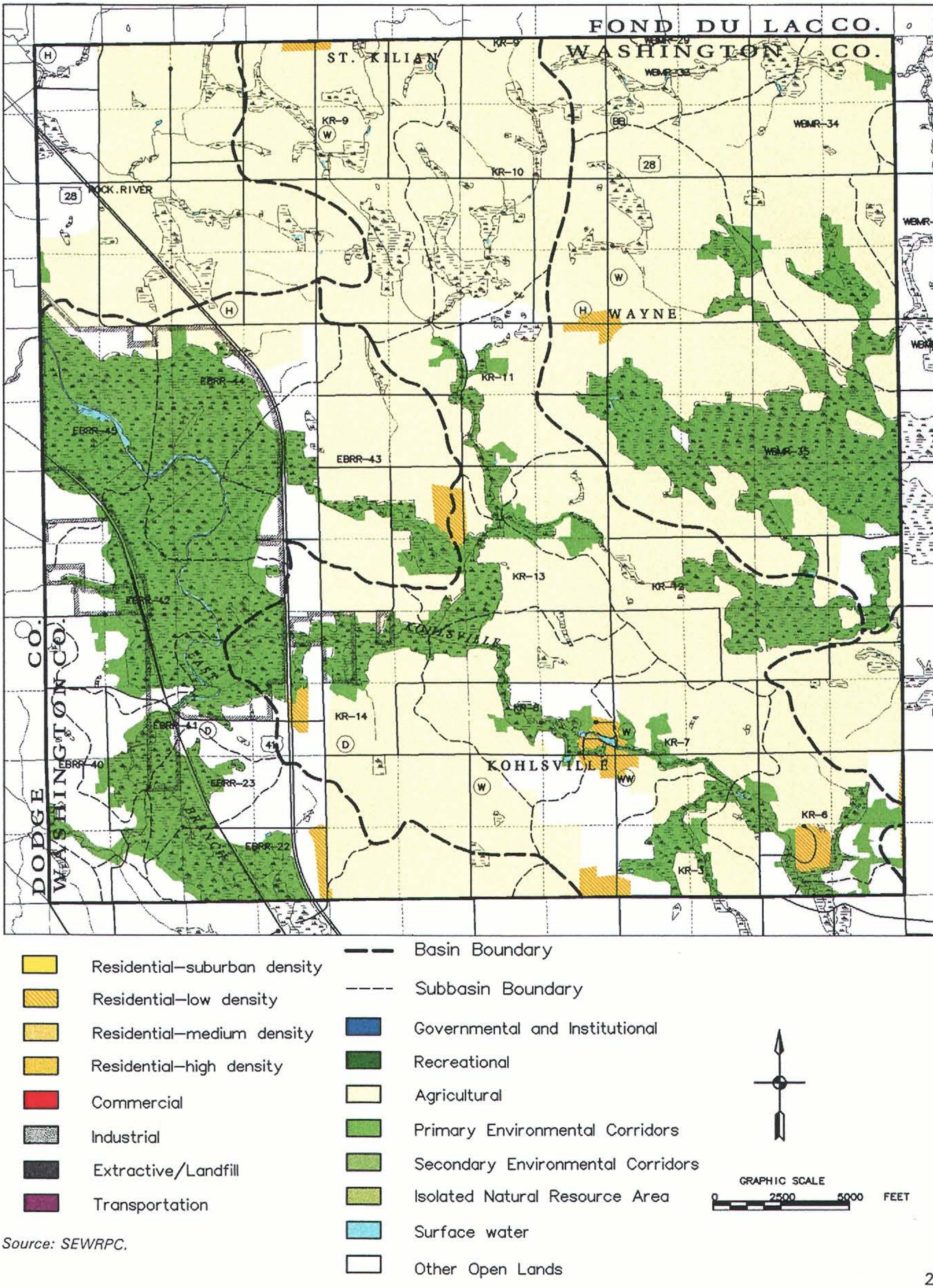
As of 1995, the land use within the drainage area tributary to Kohlsville Millpond consisted largely of agricultural and open space uses, with agriculture comprising about 65 percent of the total land cover within the drainage area. Wetlands comprised about 20 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Kohlsville Millpond are primarily agricultural.

Map 85

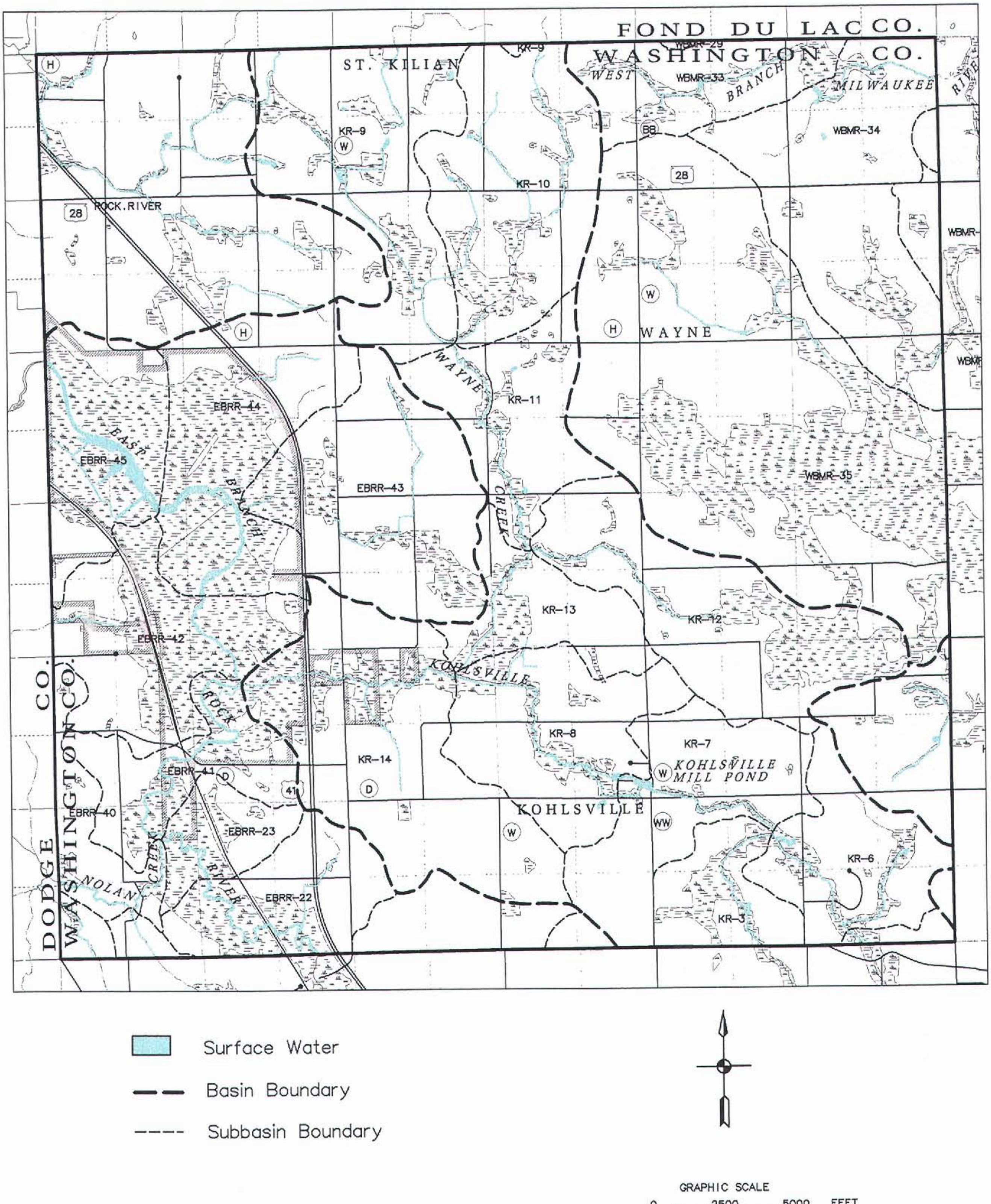
ADOPTED REGIONAL LAND USE PLAN FOR THE WAYNE AREA: 2020



Source: SEWRPC.

Map 86

SURFACE WATER RESOURCES WITHIN THE WAYNE AREA: 1995



Source: SEWRPC.

Table 35

HYDROLOGY AND MORPHOMETRY OF LAKES WITHIN THE WAYNE AREA, WASHINGTON COUNTY

Lake	Surface Area (acres)	Subwatershed Area (acres)	Volume (acre-feet)	Water Residence Time (years)	Maximum Length of Lake (miles)	Length of Shoreline (miles)	Maximum Width of Lake (miles)	Shoreline Development Factor[a]	Maximum Depth (feet)	Mean Depth (feet)
Kohlsville Millpond....	6	5,398	42	0.01	0.1	0.3	0.1	1.18	7	3

[a]*Shoreline Development Factor is the ratio between the actual circumference of a lake and the circumference of a circle with the same radius. A circular lake would have a Shoreline Development Factor of 1.0, while a dendritic lake would have a Shoreline Development Factor in excess of 1.0.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Fish and Wildlife Populations

In 1963,[1] the Wisconsin Department of Natural Resources (WDNR) reported that the pond was managed for largemouth bass and panfish, with carp commonly recorded in the fish population. In 1981,[2] the fishery consisted of pumpkinseed, black crappie, black bullhead, common carp, largemouth bass, yellow perch, bluegill, and white sucker. According to the WDNR, as of 1995, panfish were reported to be abundant, and largemouth bass as common.[3] There are wetlands immediately adjoining the pond, although the stream above and below the pond is bordered by meadow.

STREAMS

Table 36 contains a summary of selected morphometric data available for named streams in the Wayne area. The streamcourses are shown on Map 86, which also shows the hydrologic drainage areas within the area. Descriptive paragraphs for each stream follow, providing a physical description of each stream for the portion of the stream within Washington County, and of the existing uses and conditions, wildlife habitat, and fishery for the portion of the stream within the Wayne area, to the extent that such information is available. Each of the paragraphs address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69 (5)(b) of the *Wisconsin Statutes.*

Kohlsville River

Stream Morphometry

The Kohlsville River is located in the southern portion of the Wayne area. Within Washington County, the River has a surface area of about 12 acres and extends over a linear distance of about 7.9 miles with a gradient of approximately 17 feet per mile. The River flows northwest to the Rock River in the Theresa Marsh Wildlife Area, and has one major tributary, Wayne Creek. The River is a high-gradient, gravelly stream, impounded at the Village of Kohlsville to form the Kohlsville Millpond. The Kohlsville River is included in the Upper Rock River Basin areawide water quality management planning area.[4]

[1]*Wisconsin Conservation Department,* Surface Water Resources of Washington County, *1963.*

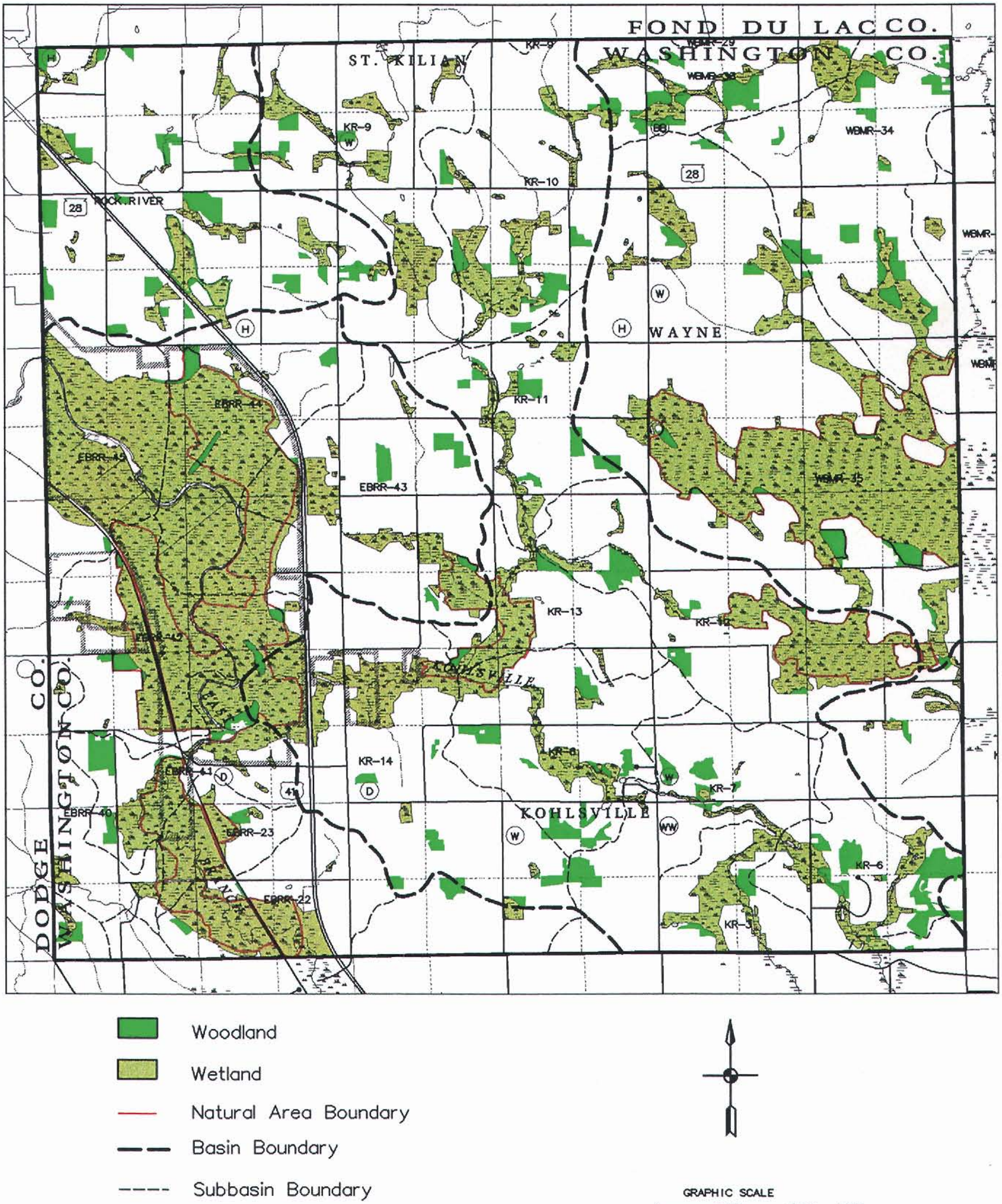
[2]*D. Fago, Wisconsin Department of Natural Resources Research Report No. 148,* Retrieval and Analysis System Used in Wisconsin's Statewide Fish Distribution Survey, Second Edition, *December 1988.*

[3]*Wisconsin Department of Natural Resources Publication No. PUBL-FM-800 95REV,* Wisconsin Lakes, *1995.*

[4]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-190-88,* Upper Rock River Basin Areawide Water Quality Management Plan, *May 1989.*

Map 87

WETLANDS AND WOODLANDS WITHIN THE WAYNE AREA: 1995



Source: SEWRPC.

Table 36

PHYSICAL CHARACTERISTICS OF STREAMS WITHIN THE WAYNE AREA, WASHINGTON COUNTY[a]

Stream or Watercourse	Length (miles)	Average Width (feet)	Average Depth (feet)	Surface Area (acres)	Drainage Area (square miles)	U.S. Public Land Survey			Subwatershed	Major Watershed
						Town	Range	Section		
Kohlsville River	7.9	12	1.00	11.5	21.5	12	18	29	East Branch Rock	Rock
Milwaukee River.............	25.8	83	1.50	259.5	130.0	12	20	25	East-West Branches Milwaukee	Milwaukee
West Branch Milwaukee River and Tributary.......	4.5	8	0.50	4.4	13.0	12	19	4	East-West Branches Milwaukee	Milwaukee
Nolan Creek....................	1.4	10	0.55	1.7	4.0	12	18	31	East Branch Rock	Rock
East Branch Rock River....	15.5	33	2.00	62.0	58.5	12	18	18	East Branch Rock	Rock
Wayne Creek	5.6	9	0.67	6.1	9.5	12	18	28	East Branch Rock	Rock

[a]Stream data are for the portion of the stream within Washington County only. The U.S. Public Land Survey Township, Range, and Section designation included in each description locates the mouth of the stream at its confluence with another named stream or at the point at which it exits the County.

Source: Wisconsin Department of Natural Resources and SEWRPC.

Recreational Use

The Kohlsville River has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential

As of 1995, land use within the Kohlsville River drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 70 percent of the total land cover of the drainage area. Wetlands comprised about 20 percent of the total land cover. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Kohlsville River drainage area are primarily agricultural.

Fish and Wildlife Populations

In 1963,[5] the WDNR reported that the River supported only forage fishes due to generally shallow conditions. Fisheries surveys were conducted during 1972, 1973 and 1975 at various sites along the River.[6] The 1972 survey reported brown trout; northern pike; white sucker; bluntnose and fathead minnow; creek chub; northern redbelly, blacknose, and pearl dace; brook stickleback; green sunfish; and central mudminnow. The 1973 survey reported central mudminnow, brook stickleback, creek chub, pearl and blacknose dace, and American brook lamprey. The 1975 survey reported blacknose and pearl dace, creek chub, central mudminnow, white sucker, central stoneroller, largemouth bass, johnny darter, and yellow bullhead.

West Branch of the Milwaukee River and Unnamed Tributary

Stream Morphometry

The West Branch of the Milwaukee River and its tributary stream are located in the northeastern portion of the Wayne area. Within Washington County, the West Branch and its tributary stream have a combined surface area of about nine acres, approximately 4.5 acres each, and extend over a linear distance of about 0.6 mile with a gradient of approximately 13 feet per mile. Only a short stretch of this stream flows in Washington County;

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[5]*Wisconsin Conservation Department,* op. cit.

[6]*D. Fago,* op. cit.

however, an unnamed tributary of 3.9 miles length adds much to its drainage area. The West Branch of the Milwaukee River, and its unnamed tributary stream, is included within the Milwaukee River Priority Watershed project area.[7]

Recreational Use
The West Branch of the Milwaukee River and it's unnamed tributary have limited navigability and are generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential
As of 1995, land use within the West Branch of the Milwaukee River and its unnamed tributary drainage areas largely consisted of agricultural and open space uses, with agriculture comprising about 60 percent of the total land cover within the drainage area. Wetlands and other open spaces comprised about 30 percent of the total land cover. The drainage area is not located within an area planned for urban development within the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution in the West Branch of the Milwaukee River and it's unnamed tributary are primarily agricultural.

Fish and Wildlife Populations
In 1963,[8] the WDNR reported that forage fishes constituted the fishery.

Nolan Creek

Stream Morphometry
Nolan Creek is located in the extreme southwestern portion of the Wayne area. The Creek has a surface area of about two acres and extends over a linear distance of about 1.4 miles with a gradient of approximately 12 feet per mile. The Creek is a drainage stream with most of its length in Dodge County where it is ditched and drains extensive wetlands. Water flow varies considerably with the seasons.

Recreational Use
Nolan Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential
As of 1995, land use within the Nolan Creek drainage area largely consisted of wetlands, comprising about 60 percent of the total land cover of the drainage area. Agricultural uses comprised about 35 percent of the total land cover. The drainage area is not located within an area planned for urban development within the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution in the Nolan Creek drainage area are primarily agricultural.

Fish and Wildlife Populations
In 1963,[9] the WDNR reported that forage fishes were the primary occupants of the stream system. A fishery survey conducted in 1974 reported green sunfish, brook stickleback, northern pike, pumpkinseed, white sucker,

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[7] *Wisconsin Department of Natural Resources Publication No. PUBL-WR-255-90,* A Nonpoint Source Control Plan for the East and West Branches of the Milwaukee River Priority Watershed Project, *February 1989; Wisconsin Department of Natural Resources Publication No. PUBL-WR-229-89,* Milwaukee River Basin Integrated Management Plan, *February 1990.*

[8] *Wisconsin Conservation Department,* op. cit.

[9] Ibid.

bluegill, black bullhead, central mudminnow, fathead and bluntnose minnow, creek chub, johnny darter, and common carp.[10]

East Branch of the Rock River

Stream Morphometry

The East Branch of the Rock River is located in the western portion of the Wayne area. Within Washington County, the River has a surface area of about 62 acres and extends over a linear distance of about 15.5 miles with a gradient of approximately three feet per mile. The River is the major stream in northwestern Washington County, flowing northwest out of the County within a wetland valley in the ground moraine of the Green Bay glacier. The River originates at the junction of Allenton and Limestone Creeks and has two other major tributaries downstream, Nolan Creek and the Kohlsville River. The East Branch of the Rock River and its major tributary streams is included in the Upper Rock River Basin areawide water quality management planning area.[11]

Recreational Use

The East Branch of the Rock River is navigable by canoe or similar watercraft. There are 4.9 miles of public frontage within the Theresa Wildlife Area, and there are 0.8 mile of public frontage within the Allenton Wildlife Area.

Development Potential

As of 1995, land use within the East Branch of the Rock River subwatershed largely consisted of agricultural and open space uses, with agriculture comprising about 70 percent of the total land cover in the subwatershed. Wetlands comprised about 20 percent of the total land cover. The subwatershed is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the East Branch of the Rock River subwatershed are primarily agricultural.

Fish and Wildlife Populations

In 1963,[12] the WDNR reported that the fishery consisted of forage fishes, primarily creek chub and common white sucker. In 1971,[13] the fishery consisted of blackside darter, brook stickleback, central mudminnow, creek chub, fathead minnow, stonecat, bluegill, fantail and johnny darter, common and redfin shiner, yellow bullhead, pumpkinseed, central stoneroller, rock bass, northern pike, bluntnose minnow, white sucker, blackstripe topminnow, green sunfish, black bullhead, and common carp. In 1972,[14] the fishery consisted of bluntnose minnow, channel catfish, rainbow trout, white sucker, bullheads, central mudminnow, black bullheads, northern pike, yellow perch, and pumpkinseed. In 1973,[15] the fishery consisted of fathead minnow, yellow bullhead, yellow perch, channel catfish, stonerollers, green sunfish, pearl dace, pumpkinseed, creek chub, bluegill, central mudminnow, northern pike, bullheads, black bullhead, and white sucker. In 1975,[16] the fishery consisted of brown

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[10] *D. Fago,* op. cit.

[11] *Wisconsin Department of Natural Resources, PUBL-WR-190-88.*

[12] *Wisconsin Conservation Department,* op. cit.

[13] *D. Fago,* op. cit.

[14] Ibid.

[15] Ibid.

[16] Ibid.

bullhead, stonerollers, stonecat, fathead minnow, green sunfish, tadpole madtom, bluegill, northern pike, pumpkinseed, black bullhead, central mudminnow, creek chub, white sucker, yellow bullhead, blackside darter, golden and common shiner, banded and johnny darter, brook silverside, blackchin and blacknose shiner, blackstripe topminnow, bluntnose minnow, emerald and spotfin shiner, rock bass, and southern redbelly dace. In 1976,[17] the fishery consisted of bluegill, creek chub, emerald shiner, rock bass, pumpkinseed, green sunfish, white sucker, northern pike, bullheads, johnny darter, blackstripe topminnow, and central mudminnow. The Southeastern Wisconsin Regional Planning Commission (SEWRPC) reports the redfin shiner as a State-designated threatened species.[18]

Wayne Creek

Stream Morphometry

Wayne Creek is located in the central portion of the Wayne area. The Creek has a surface area of about six acres and extends over a linear distance of about 5.6 miles with a gradient of approximately 25 feet per mile. The stream originates in a drumlin complex in the northern portion of the Wayne area, and drains several small marshy pockets. The Creek is a small gravel-bottomed stream feeding the Kohlsville River below the unincorporated hamlet of St. Killians. Wayne Creek is included in the Upper Rock River Basin areawide water quality management planning area.[19]

Recreational Use

Wayne Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential

As of 1995, land use within the Wayne Creek drainage area, consisted largely of agricultural and open space uses, with agriculture comprising about 70 percent of the total land cover in the drainage area. Wetlands comprised about 20 percent of the total land cover. The drainage area is not located within an area planned for urban development within the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the Wayne Creek drainage area are primarily agricultural.

Fish and Wildlife Populations

In 1963,[20] the WDNR reported that warm summer temperatures and seasonal flow fluctuations limited the fisheries value of the stream. Fish surveys conducted in 1972, 1973, and 1975 reported a diverse community comprised of brook stickleback, blacknose and pearl dace, northern pike, central mudminnow, mottled sculpin, creek chub, bluntnose minnow, johnny and fantail darter, white sucker, and common stoneroller; northern pike, brook stickleback, central mudminnow, pearl and blacknose dace, mottled sculpin, creek chub, fathead minnow, fantail darter, common stoneroller, and largemouth bass; and central stoneroller, brook stickleback, fantail and johnny darter, northern redbelly, pearl and blacknose dace, fathead minnow, largemouth bass, mottled sculpin, central mudminnow, creek chub, and white sucker, respectively.[21]

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[17]Ibid.

[18]*SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997.*

[19]*Wisconsin Department of Natural Resources, PUBL-WR-190-88.*

[20]*Wisconsin Conservation Department,* op. cit.

[21]*D. Fago,* op. cit.

Chapter XV

INVENTORY FINDINGS: WEST BEND AREA

INTRODUCTION

This chapter presents the inventory findings relating to lakes and streams in the West Bend area of Washington County. The West Bend area is shown on Map 88 and includes all of U.S. Public Land Survey Sections 13 through 36, Town 11 North, Range 19 East. The area includes the entire Town of West Bend and the southern, southwestern and western portions of the City of West Bend. To the extent that data are available, relevant land use, recreational use, morphometric, water quality, and biological information upon which waterbody classifications are to be based pursuant to the requirements of Section 281.69(5)(b), *Wisconsin Statutes*, is presented for each waterbody inventoried. These data form the scientific and technical basis for the determination of the alternative and recommended waterbody classification schemes set forth in Chapter XVI.

LAND USE

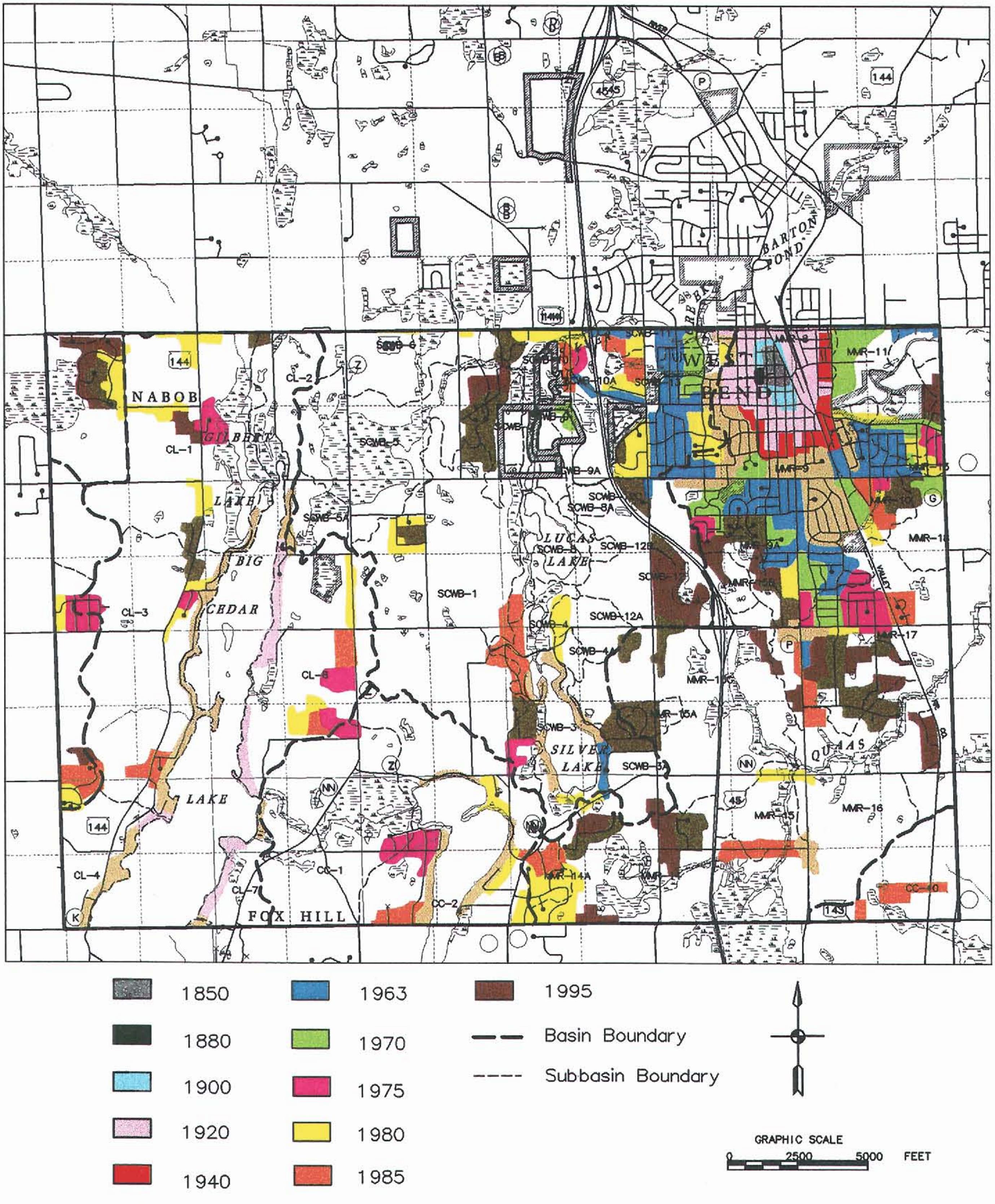
The type, intensity, and spatial distribution of the various land uses within the West Bend area are important determinants of water quality and recreational use demands. The current and planned future land use patterns, placed within the context of the historical development in the area are, therefore, important considerations in any waterbody management planning effort.

While settlement has occurred since the mid-1800s, significant urban development occurred in the West Bend area in recent years. Much of the West Bend area remains largely rural in character, although the portion of the area within and adjacent to the City of West Bend, as well as the major lake shorelines, has been significantly developed. Map 88 indicates the historic urban growth pattern in the West Bend area since 1850. Early development occurred in the northeastern portion of the area, adjacent to the Milwaukee River, that later became incorporated as the City of West Bend in 1885. Additional urban development had occurred steadily in the West Bend area during the 1900s. Since the 1920s, urban land use development in the area has proceeded rapidly, extending outwards from the incorporated areas of the City of West Bend that form the northeastern portion of the area, and also in the western and central portions of the area, principally the shorelands around Big Cedar Lake, Little Cedar Lake, and Silver Lake.

The existing land use pattern in the West Bend area, as of 1995, is shown on Map 89, and is quantified in Table 37. As indicated in Table 37, about 5,000 acres, or about 32 percent of the area, were devoted to urban land uses. The dominant urban land use was residential encompassing about 2,400 acres, or about 49 percent of the land areas in urban use. As of 1995, about 10,600 acres, or about 68 percent of the area, were still devoted to rural land uses. About 4,600 acres, or about 43 percent of the rural area, were in agricultural land uses. Woodlands, wetlands, and surface water, including the surface area of the lakes in the area, accounted for approximately 4,800 acres, or about 45 percent of the area in rural use. Future growth in urban land use, based upon the recommendations set forth in the adopted 2020 regional land use plan shown Map 90, is anticipated in the northeastern portion of the area, within and adjacent to the currently incorporated area of the City of West Bend. Infilling and large-lot residential development is also anticipated within the Town of West Bend.

Map 88

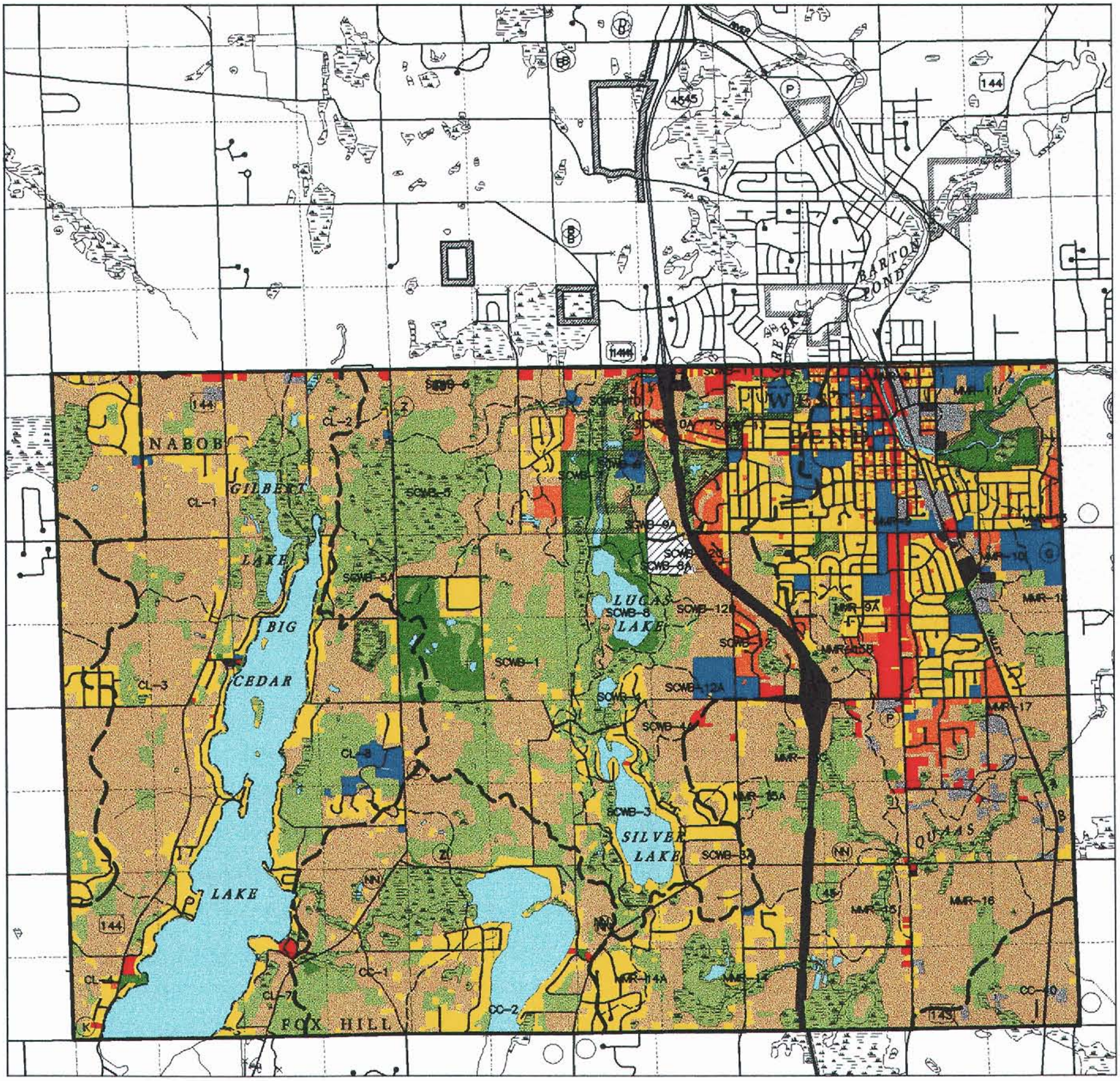
HISTORIC URBAN GROWTH WITHIN THE WEST BEND AREA: 1850-1990



Source: SEWRPC.

Map 89

EXISTING LAND USE WITHIN THE WEST BEND AREA: 1995



- Single–family residential
- Multi–family residential
- Commercial
- Industrial
- Transportation, communications, and utilities
- Government and institutional
- Recreation
- Surface water
- Wetlands and woodlands
- Agricultural, unused, and other open lands
- Extractive and landfill
- Basin Boundary
- Subbasin Boundary

GRAPHIC SCALE
0 2500 5000 FEET

Source: SEWRPC.

Table 37

EXISTING LAND USE WITHIN THE WEST BEND AREA: 1995

Land Use Categories	Acres	Percent of Major Category	Percent of Total Area
Urban			
Residential	2,429	49.1	15.6
Commercial	155	3.1	1.0
Industrial	141	2.9	0.9
Governmental and Institutional	313	6.3	2.1
Transportation and Utilities	1,496	30.2	9.6
Recreation	377	7.6	2.4
Land under Development	41	0.8	0.3
Subtotal	4,952	100.0	31.9
Rural			
Agricultural	4,555	42.9	29.2
Wetlands	1,341	12.6	8.6
Woodlands	2,033	19.1	13.0
Water	1,377	13.0	8.8
Extractive	57	0.5	0.4
Landfill	- -	- -	- -
Other Open Lands	1,270	11.9	8.1
Subtotal	10,633	100.0	68.1
Total	15,585	- -	100.0

Source: SEWRPC.

LAKES

Table 38 contains a summary of selected morphometric data available for the major lakes within the West Bend area. Major lakes are defined as those lakes within the Southeastern Wisconsin Region having a surface area of 50 or more acres in areal extent. These lakes are shown on Map 91. Where available, similar summary data are provided for minor lakes because of the importance of these smaller waterbodies as a water resource. In some cases, these waterbodies, in which water levels fluctuate markedly, may be classed as deep-water marshes or wetlands. Wetlands within the West Bend area are shown on Map 92. The lakes inventoried are further described below with information set forth in paragraphs which address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69(5)(b) of the *Wisconsin Statutes*. Information on the origins of these lakes is based upon detailed geological information provided in various published survey reports[1] and maps of surfacial deposits.[2]

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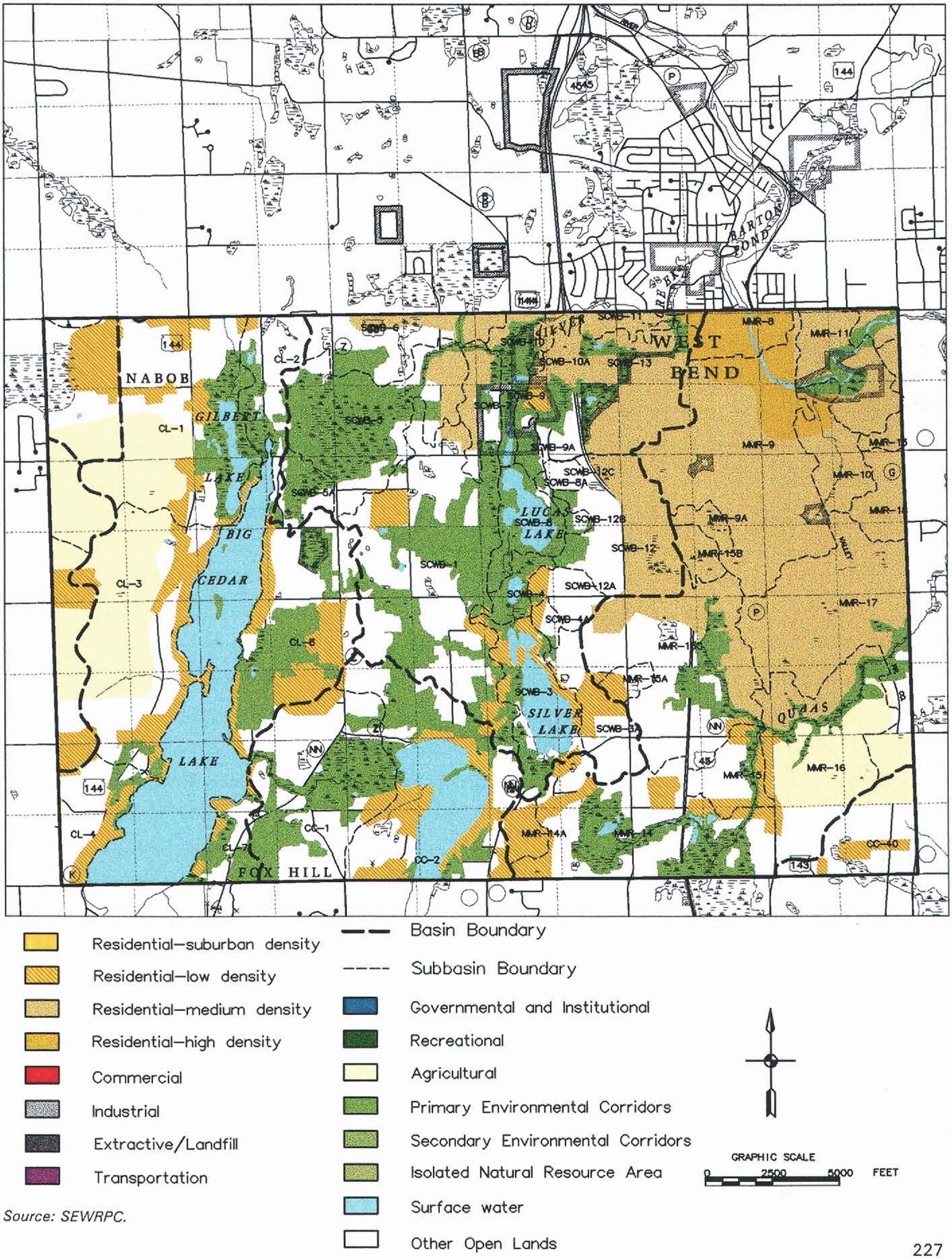
[1]*C. Juday,* The Inland Lakes of Wisconsin, The Hydrography and Morphometry of the Lakes, *State of Wisconsin, 1914, pp. 84-88; L. Martin,* The Physical Geography of Wisconsin, 2nd Edition, *State of Wisconsin, 1932, pp. 235-293.*

[2]*W.C. Alden,* Map Showing the Surficial Deposits of Southeastern Wisconsin, *Wisconsin Geological Survey, 1918; H.L. Young and W.G. Batten, Wisconsin Geological and Natural History Survey Information Circular No. 38,* Ground-Water Resources and Geology of Washington and Ozaukee Counties, Wisconsin, *University of Wisconsin-Extension, February 1980, 37 pages.*

Map 90

ADOPTED REGIONAL LAND USE PLAN FOR THE WEST BEND AREA: 2020



Source: SEWRPC.

Table 38

HYDROLOGY AND MORPHOMETRY OF LAKES WITHIN THE WEST BEND AREA, WASHINGTON COUNTY

Lake	Surface Area (acres)	Subwatershed Area (acres)	Volume (acre-feet)	Water Residence Time (years)	Maximum Length of Lake (miles)	Length of Shoreline (miles)	Maximum Width of Lake (miles)	Shoreline Development Factor[a]	Maximum Depth (feet)	Mean Depth (feet)
Big Cedar[b]	932	6,641	31,983	5.52	3.8	11.0	0.7	2.57	105	34
Gilbert[b]	44	420	132	0.43	0.8	1.8	0.2	2.03	30	3
Hackbarth	9	385	315	1.15	0.2	0.4	0.1	1.07	35	33
Little Cedar	246	7,565	3,198	0.59	1.3	4.0	0.5	1.77	56	13
Lucas	78	560	468	1.15	0.7	2.8	0.3	2.33	15	7
Quaas	7	1,855	84	0.06	0.2	0.5	0.1	1.07	12	5
Silver	118	305	2,306	4.47	1.0	2.7	0.4	1.70	47	20
West Bend Millpond[c]	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

[a]*Shoreline Development Factor is the ratio between the actual circumference of a lake and the circumference of a circle with the same radius. A circular lake would have a Shoreline Development Factor of 1.0, while a dendritic lake would have a Shoreline Development Factor in excess of 1.0.*

[b]*These lakes fall within a common subwatershed, Subbasin CL-1.*

[c]*The dam that created the West Bend Millpond was removed as of 1989.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Big Cedar Lake

Lake Morphometry

Big Cedar Lake is located in U.S. Public Land Survey Section 5, Township 10 North, Range 19 East, Town of Polk; and Sections 17, 19, 20, 29, 30, 31, and 32, Township 11 North, Range 19 East, Town of West Bend. The Lake has a surface area of about 932 acres, a maximum depth of 105 feet, and a shoreline development factor 2.25. The Lake is a large, elongate glacial lake, occupying a valley between two high ridges left by the retreating Green Bay glacier. The Lake consists of a deep southern basin connected by a broad shallow terrace to a shallower northern basin. Springs and seepage are major water sources and Cedar Creek originates here. The bathymetry of Big Cedar Lake is shown on Map 93.

Water Quality

Available water quality data indicate that Big Cedar Lake is a mesotrophic, or moderately enriched, waterbody, with a Trophic State Index rating of approximately 46. Since 1970, water quality conditions in Big Cedar Lake have improved as a consequence of management actions implemented within the drainage area tributary to the Lake by the Big Cedar Lake Protection and Rehabilitation District, Cedar Lakes Conservation Foundation, the Town of West Bend, and Washington County, in partnership with the Big Cedar Lake community. Figure 3 shows the trends in water quality within Big Cedar Lake during the period 1990 through 1998. A lake water quality protection and stormwater management plan was completed for the Lake by the Southeastern Wisconsin Regional Planning Commission (SEWRPC) in 1999.[3] In addition, the Lake Protection and Rehabilitation District has been very active in planning for, an implementation of, lake management and protection programs.

Recreational Use

Big Cedar Lake is the largest lake in Washington County. Big Cedar Lake currently has adequate public access pursuant to Chapter NR 1 of the *Wisconsin Administrative Code.*

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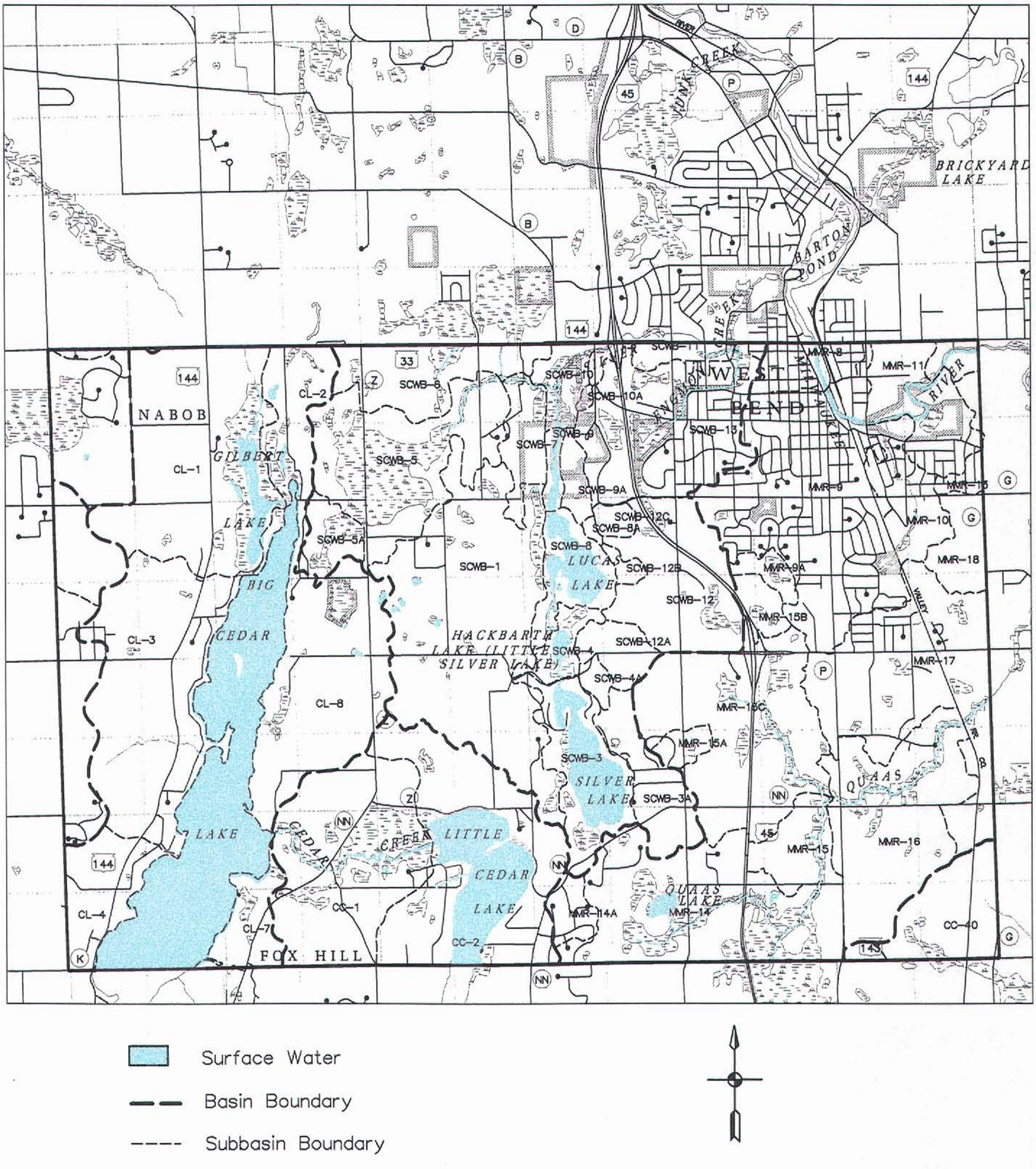
[3]*SEWRPC Memorandum Report No. 137, Draft,* A Water Quality Protection and Stormwater Management Plan for Big Cedar Lake, Washington County, Wisconsin, *Volume One,* Inventory Findings and Water Quality Analyses, *December 1999; SEWRPC Memorandum Report No. 137, Draft,* A Water Quality Protection and Stormwater Management Plan for Big Cedar Lake, Washington County, Wisconsin, *Volume Two,* Stormwater Management Plans for Three Pilot Subbasins, *August 2000.*

Map 91

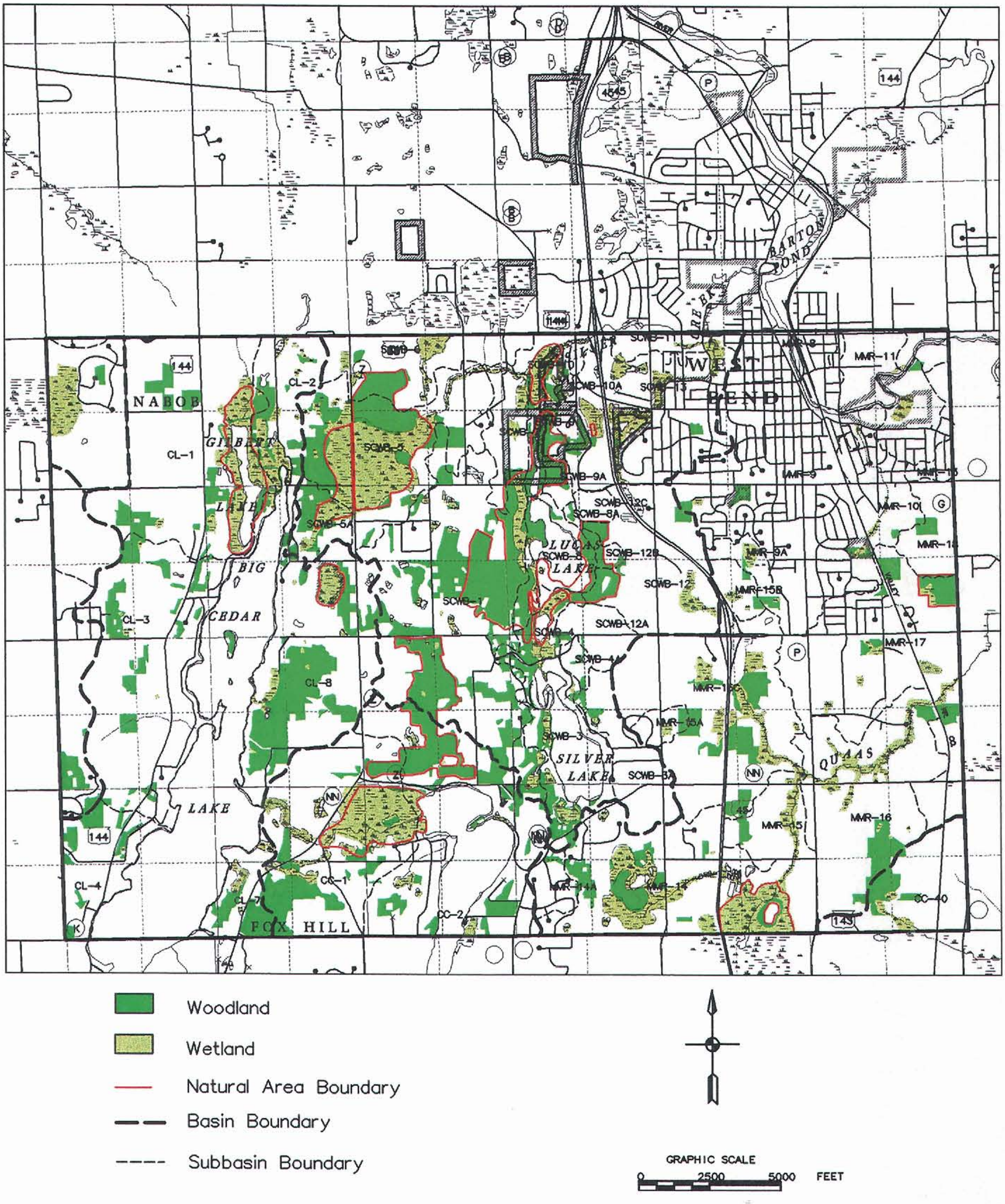
SURFACE WATER RESOURCES WITHIN THE WEST BEND AREA: 1995



Source: SEWRPC.

Map 92

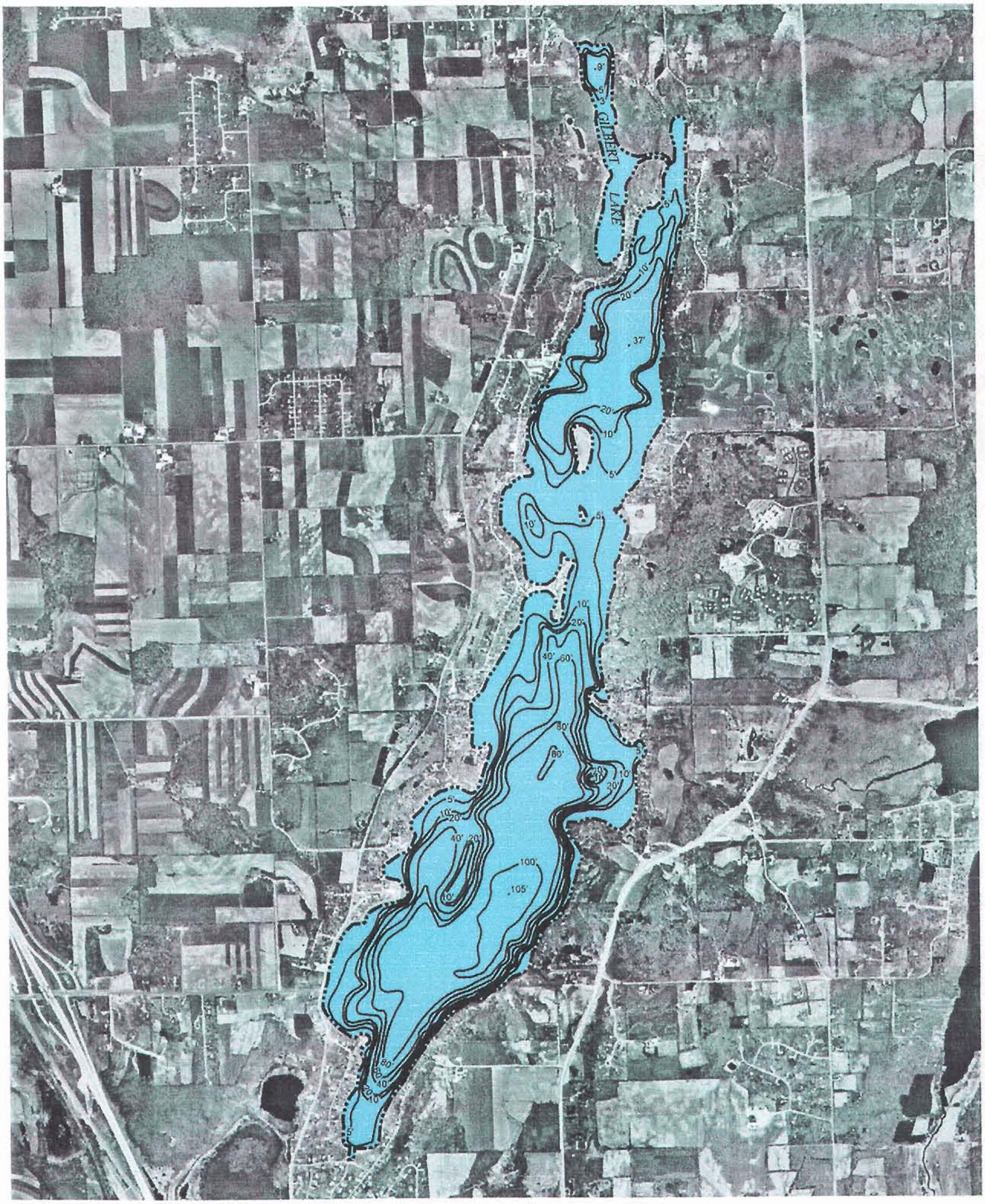
WETLANDS AND WOODLANDS WITHIN THE WEST BEND AREA: 1995



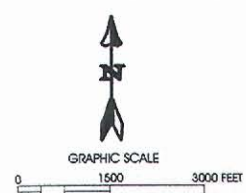
Source: SEWRPC.

Map 93

BATHYMETRIC MAP OF BIG CEDAR AND GILBERT LAKES



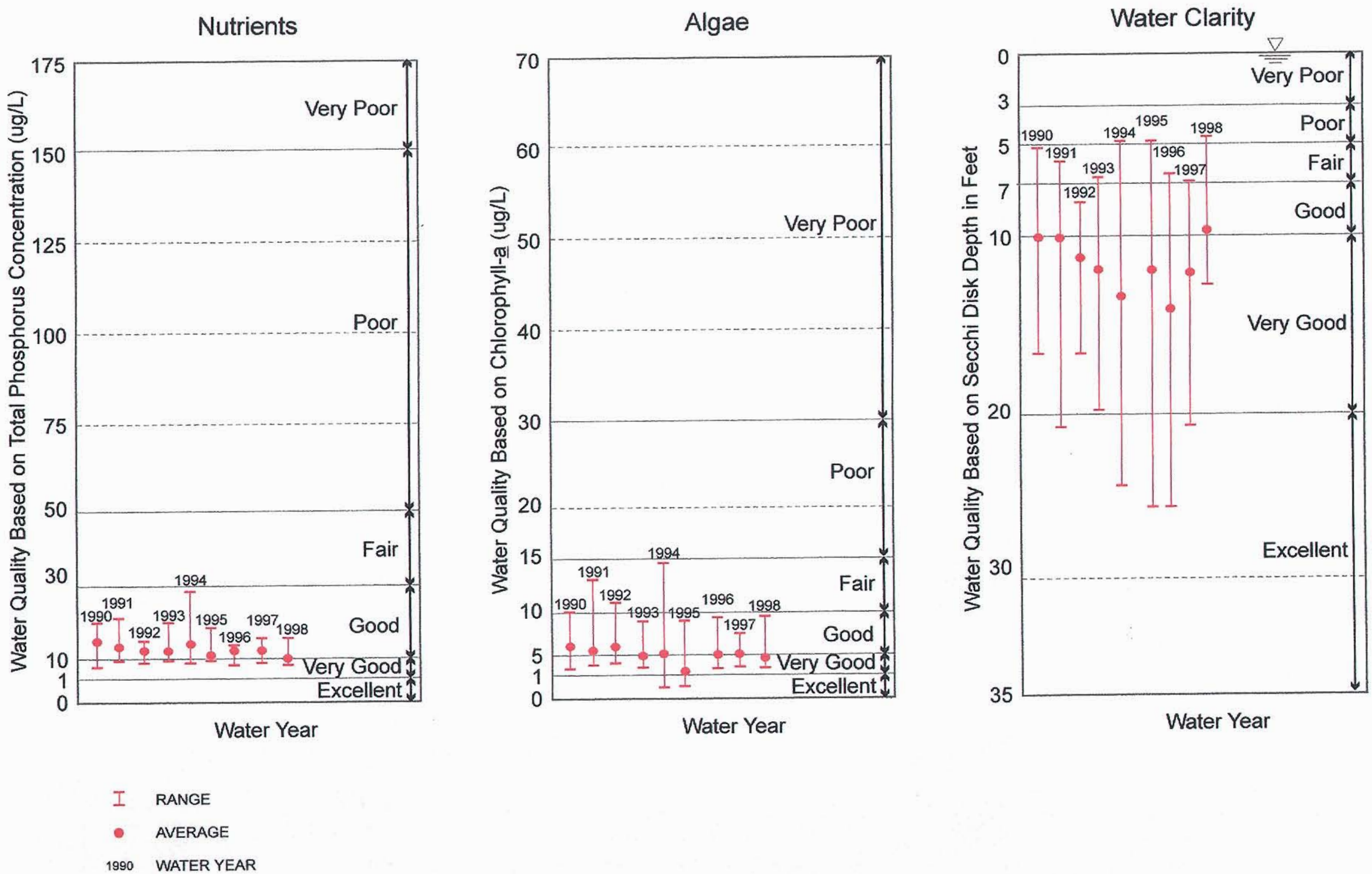
—20'— WATER DEPTH CONTOUR IN FEET



Source: SEWRPC.

Figure 3

BIG CEDAR LAKE PRIMARY WATER QUALITY INDICATORS:1990-1998



Source: Wisconsin Department of Natural Resources and SEWRPC.

Development Potential
As of 1995, land use within the drainage area tributary to Big Cedar Lake consisted largely of agricultural and woodland uses, comprising about 65 percent of the land cover in the drainage area. The undeveloped lands within the drainage area are recommended to remain largely in rural use with some residential development at rural densities.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Big Cedar Lake are primarily agricultural.

Fish and Wildlife Populations
In 1963,[4] the Lake was managed for largemouth and smallmouth bass, northern pike, panfish, and cisco. Yellow perch, bluegill, and black crappie were the most abundant species of panfishes. A sturgeon was caught in the Lake in 1961, and a fantail darter was reported from the Lake in 1900. During 1954 and 1955, trout were stocked on an experimental basis, but an inadequate harvest and lack of suitable public access resulted in the discontinuation of the stocking program in subsequent years. Aquatic plant growth and stunted panfish were identified as major use problems in 1963. Fish surveys were conducted during 1974 and 1978.[5] In 1974, the Lake was reported to be populated by walleyed pike, white sucker, rock and largemouth bass, common carp, pumpkinseed, crappie, northern pike, johnny and Iowa darter, pugnose shiner, bluntnose minnow, green sunfish, bluegill, and yellow perch. In 1978, blackchin, blacknose, golden, and mimic shiner; green sunfish; bluegill; yellow perch; pumpkinseed; johnny darter; banded killifish; largemouth bass; and bluntnose minnow were reported from the Lake. In 1995,[6] largemouth bass were reported to be abundant, northern pike and panfish as common, and walleyed pike as present. SEWRPC reports the pugnose shiner as a State-designated threatened species.[7] About 100 acres of grass and tamarack marsh adjoin the Lake at its northern end, encircling neighboring Gilbert Lake.[8] Mallards, blue-winged teal, wood ducks, and Florida gallinule have been observed to nest here, and both puddle and diving ducks are common sights during spring and fall migration. High development of the shoreline for home sites and increased spring and summer boating activity have reduced use of the Lake for nesting in recent years.

Gilbert Lake
Lake Morphometry
Gilbert Lake is located in U.S. Public Land Survey Sections 17 and 20, Township 11 North, Range 19 East, Town of West Bend. The Lake has a surface area of about 44 acres, a maximum depth of 30 feet, and a shoreline development factor of 2.03. Originally part of Big Cedar Lake, Gilbert Lake is separated from the main basin of Big Cedar Lake by two small islands. Currents subsequently formed bars of sills between the islands isolating the Gilbert Lake basin from Big Cedar Lake. Aquatic and marsh vegetation was reported to be encroaching into the

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[4] *Wisconsin Conservation Department,* op. cit.

[5] *D. Fago, Wisconsin Department of Natural Resources Research Report No. 148,* Retrieval and Analysis System Used in Wisconsin's Statewide Fish Distribution Survey, Second Edition, *December 1988.*

[6] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

[7] *SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997; SEWRPC Memorandum Report No. 131,* Environmental Analysis of the Lands at the Headwaters of Gilbert Lake and Big Cedar Lake, Washington County, Wisconsin, *March 1999.*

[8] *SEWRPC Memorandum Report No. 131,* op. cit.

Lake from the shore, and debris and plant materials accumulating on the lake bottom were reported to be diminishing the depth of Lake. A narrow, but navigable, channel continues to provide access from Big Cedar Lake. The bathymetry of Gilbert Lake is shown on Map 93.

Recreational Use
Public access is provided through a narrow, but navigable, channel between Gilbert Lake and Big Cedar Lake.

Development Potential
As of 1995, land use within the drainage area tributary to Gilbert Lake, also part of the Big Cedar Lake drainage area, consisted largely of agricultural and woodland uses, comprising about 50 percent of the total land cover in the drainage area. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Gilbert Lake are primarily agricultural.

Fish and Wildlife Populations
Gilbert Lake has considerable value as spawning grounds for northern pike, largemouth bass, and panfish, and the Lake has been managed as a fish refuge since 1925. In 1967,[9] the fishery of the Lake was comprised of black and white crappie, bluegill, brown and yellow bullhead, common carp, green sunfish, largemouth bass, northern pike, pumpkinseed, white sucker, and yellow perch. Fisheries surveys conducted in 1978, 1984, and 1985 were reported to be comprised of rock, smallmouth, and largemouth bass; white sucker; cisco; lake chubsucker; northern pike; Iowa and johnny darter; black, and yellow bullhead; green sunfish; pumpkinseed; bluegill; redhorse; golden and pugnose shiner; yellow perch; bluntnose minnow; black crappie; and walleyed pike.[10] SEWRPC reports the pugnose shiner as a State-designated threatened species and the lake chubsucker as a State species of special concern.[11] As of 1995,[12] northern pike, largemouth bass, and panfish were reported to be common. Waterfowl nesting records include mallards, black duck, blue-winged teal, wood ducks, and coots. Both puddlers and divers are abundant in fall.

Hackbarth Lake (Little Silver Lake, Paradise Valley Lake)
Lake Morphometry
Hackbarth Lake is located in U.S. Public Land Survey Sections 22 and 27, Township 11 North, Range 19 East, Town of West Bend. The Lake has a surface area of nine acres, a maximum depth of 35 feet, and a shoreline development factor of 1.07. Hackbarth Lake is a small, marshy kettle lake on the last drainage line of the Lake Michigan glacier. It is one in a series of pools along the course of Silver Creek.

Recreational Use
Public access is not available. Access can be gained through Silver Creek, which has limited navigability. Both the inlet and outlet have steep gradients and are not considered traversable for boat access. However, a youth camp operates during the summer on the north shore and makes extensive use of the Lake for sailing, rowing, canoeing, and swimming.

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[9]*D. Fago,* op. cit.

[10]Ibid.

[11]*SEWRPC Planning Report No. 42,* op. cit.; *SEWRPC Memorandum Report No. 131,* op. cit.

[12]*Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

Development Potential

As of 1995, land use within the drainage area tributary to Hackbarth Lake consisted largely of woodlands and wetlands, comprising about 65 percent of the total land cover of the drainage area. The drainage area is not located in an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the drainage area tributary to Hackbarth Lake are limited to primarily background levels of runoff.

Fish and Wildlife Populations

In 1963,[13] the WDNR reported that the Lake contained fishable populations of largemouth bass, panfish, and northern pike. As of 1995,[14] largemouth bass and panfish remained common in the Lake and northern pike were reported to be present in the Lake. Mallards and black ducks make some use of the Lake and surrounding shoreline for nesting and resting.

Little Cedar Lake

Lake Morphometry

Little Cedar Lake is located in U.S. Public Land Survey Section 33, Township 11 North, Range 19 East, Town of West Bend and Section 3, Township 10 North, Range 19 East, Town of Polk. The Lake has a surface area of about 246 acres, a maximum depth of 56 feet, and a shoreline development factor of 1.77. Little Cedar Lake is an elongate lake of glacial origin occupying an undrained trough between two ridges of the kettle moraine. Cedar Creek enters the Lake at its north end and leaves at the south end over a low-head dam. The bathymetry of Little Cedar Lake is shown on Map 94.

Recreational Use

Public access became available in 1999 when Washington County acquired facilities to provide recreational boating opportunities on the Lake. This Lake is considered to have adequate public recreational boating access pursuant to Chapter NR 1 of the *Wisconsin Administrative Code.*

Development Potential

As of 1995, land use within the drainage area tributary to Little Cedar Lake consisted largely of agricultural and open space uses, with agriculture comprising about 40 percent of the total land cover of the drainage area. Wetlands comprised about 20 percent of the total land cover. Much of the shoreline of Little Cedar Lake is developed for residential use. The undeveloped portions of the drainage area are not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Little Cedar Lake are primarily agricultural.

Fish and Wildlife Populations

In 1963,[15] the WDNR reported that the Lake was managed for largemouth bass, panfish, and walleyed pike, and an abundance of carp was identified as the major use problem. The Wisconsin Department of Natural Resources had entered into a cooperative carp removal agreement with the Little Cedar Lake Advancement Association in

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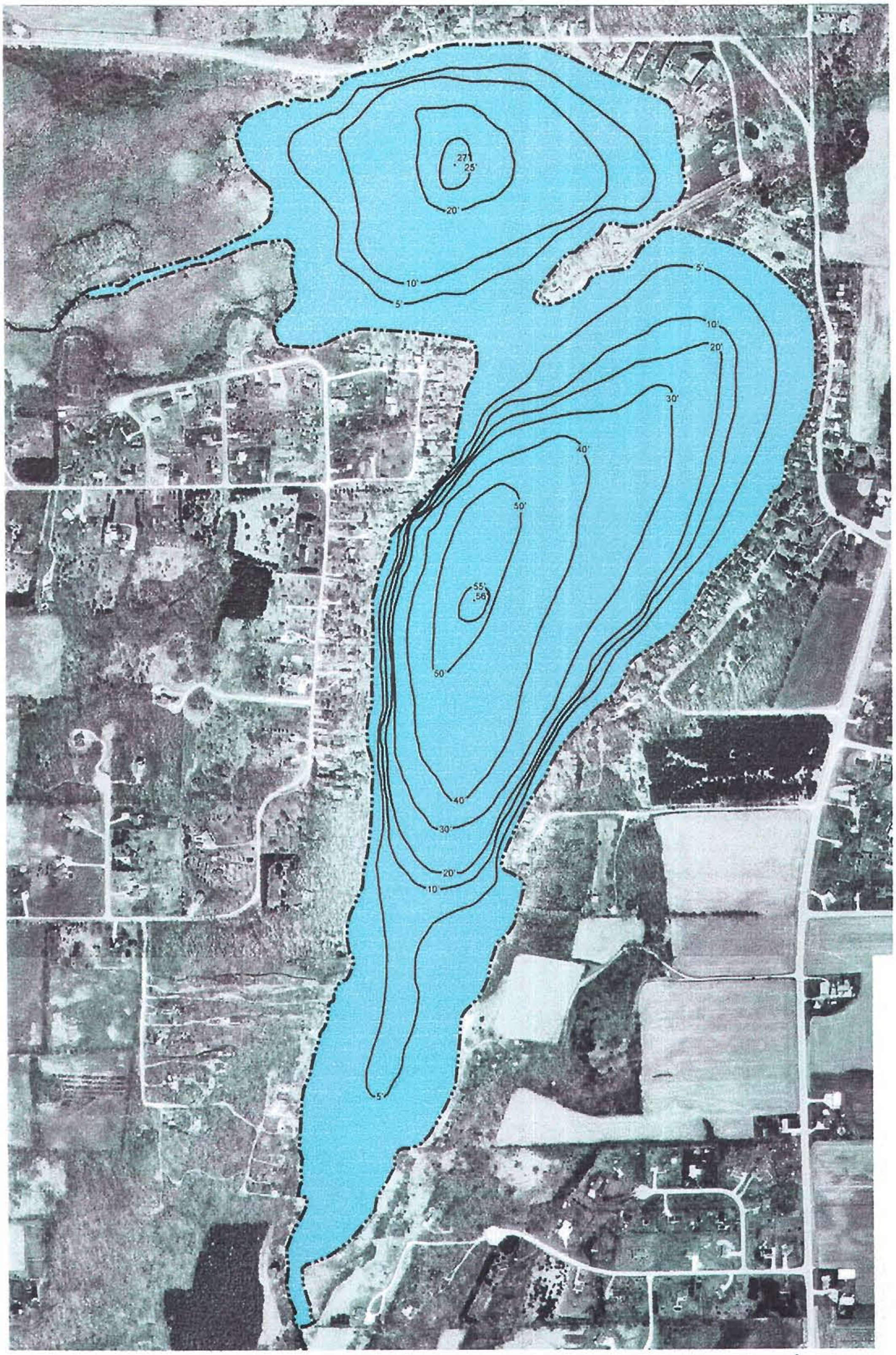
[13] *Wisconsin Conservation Department,* op. cit.

[14] *Wisconsin Department of Natural Resources Publication PUBL-FM-800 95REV.*

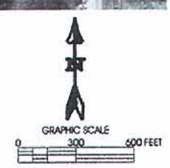
[15] *Wisconsin Conservation Department,* op. cit.

Map 94

BATHYMETRIC MAP OF LITTLE CEDAR LAKE



—20'— WATER DEPTH CONTOUR IN FEET



Source: SEWRPC.

1961. In 1971,[16] the fish population of Little Cedar Lake consisted of largemouth, rock, and white bass; black crappie; bluegill; common carp; golden shiner; green sunfish; northern pike; pumpkinseed; walleyed pike; yellow bullhead; and yellow perch. In 1978,[17] black and yellow bullhead, bluegill, tadpole madtom, yellow perch, green sunfish, bluntnose minnow, pumpkinseed, and largemouth and rock bass comprised the fishery. As of 1995,[18] largemouth bass were reported to be abundant, walleyed pike and panfish to be common, and northern pike to be present. Fair numbers of waterfowl frequent the area, and broods of mallard, black duck, blue-winged teal, and wood duck have been observed.

Lucas Lake

Lake Morphometry

Lucas Lake is located in U.S. Public Land Survey Sections 15 and 22, Township 11 North, Range 19 East, Town of West Bend. The Lake has a surface area of about 78 acres, a maximum depth of 15 feet, and a shoreline development factor of 2.33. Lucas Lake is an elongate, drainage lake along the course of Silver Creek. It is the farthest downstream of a series of pools, comprised of Silver Lake, Hackbarth Lake, and Lucas Lake, occupying the last drainage line of the Lake Michigan glacier. A dam maintains a seven-foot head at the outlet of the Lake. The bathymetry of Lucas Lake is shown on Map 95.

Recreational Use

Public access is not provided. However, a youth camp operates on the Lake and makes extensive use of the Lake for water-based recreation during the summer.

Development Potential

As of 1995, land use within the drainage area tributary to Lucas Lake consisted largely of agricultural and woodland uses, comprising about 45 percent of the total land cover of the drainage area. The drainage area is not located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Lucas Lake are primarily agricultural.

Fish and Wildlife Populations

In 1963,[19] the WDNR reported that largemouth bass and panfish constituted the fishery. In 1978,[20] the fish community was reported to include blacknose, blackchin, and pugnose shiner; bluegill; pumpkinseed; green sunfish; northern pike; largemouth bass; bluntnose minnow; and banded killifish. As of 1995,[21] northern pike, largemouth bass, and panfish were reported to be present in the Lake. SEWRPC reports the pugnose shiner as a State-designated threatened species.[22] A small wetland adjoins the lake on the northwest shore.

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[16]*D. Fago,* op. cit.

[17]Ibid.

[18]*Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

[19]*Wisconsin Conservation Department,* op. cit.

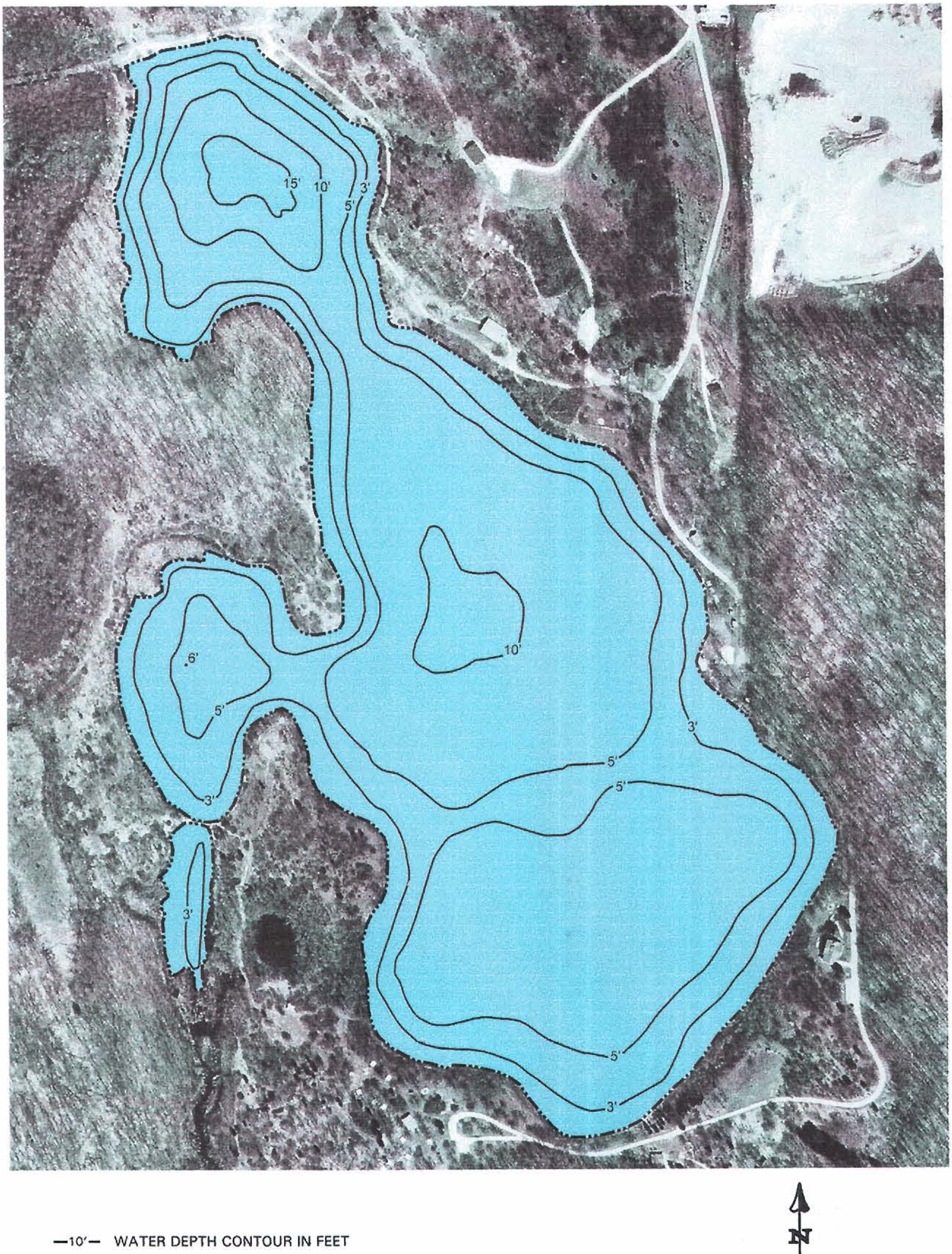
[20]*D. Fago,* op. cit.

[21]*Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

[22]*SEWRPC Planning Report No. 42,* op. cit.

Map 95

BATHYMETRIC MAP OF LUCAS LAKE



Source: SEWRPC.

Quaas Lake

Lake Morphometry

Quaas Lake is located in U.S. Public Land Survey Section 34, Township 11 North, Range 19 East, Town of West Bend. The Lake has a surface area of about seven acres, a maximum depth of 12 feet, a shoreline development factor of 1.07. Quaas Lake is a small, shallow depression lake in the terminal moraine of the Lake Michigan glacier. The Lake is spring and seepage fed and drains through a culvert on its south shore to Quaas Creek, a tributary stream to the Milwaukee River.

Recreational Use

Public access is not available.

Development Potential

As of 1995, land use within the drainage area tributary to Quaas Lake consisted largely of agricultural and open space uses, with agriculture comprising about 60 of the total land cover in the drainage area. Wetlands comprised about 15 percent of the total land cover. The drainage area is partially located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the drainage area tributary to Quaas Lake are primarily agricultural.

Fish and Wildlife Populations

In 1963,[23] the WDNR reported that winterkill occurred periodically and precluded management for anything other than panfish. As of 1995,[24] panfish and largemouth bass were reported to be present in the Lake. A variety of ducks make use of the Lake, primarily during fall migration.

Silver Lake (Paradise Valley Lake)

Lake Morphometry

Silver Lake is located in U.S. Public Land Survey Section 27, Township 11 North, Range 19 East, Town of West Bend. The Lake has a surface area of about 118 acres, a maximum depth of 47 feet, and a shoreline development factor of 1.70. Silver Lake is an elongated lake occupying the last drainage line of the Lake Michigan glacier. The depth of the Lake is attributed to the presence of ice blocks buried in the deposits left by the retreating glacier. There are no inlets; the Lake is spring and seepage fed and constitutes the origin of Silver Creek. A low-head dam prevents outlet cutting and maintains the water level. The bathymetry of Silver Lake is shown on Map 96.

Water Quality

Available water quality data indicate that Silver Lake is a mesotrophic, or moderately enriched, waterbody, with a Trophic State Index rating of approximately 45. Water quality in the Lake improved following the sewering of the lakeshore in 1993, with WTSI values decreasing from 49 in 1976 to about 45 in 1996. A lake protection plan completed for the Lake by the Regional Planning Commission in 1997.[25]

Recreational Use

Public recreational boating access will be provided through a County park to be constructed on the eastern shore of the Lake. The park site was acquired by the County in 1999. This Lake is considered to have adequate public recreational boating access pursuant to Chapter NR 1 of the *Wisconsin Administrative Code.*

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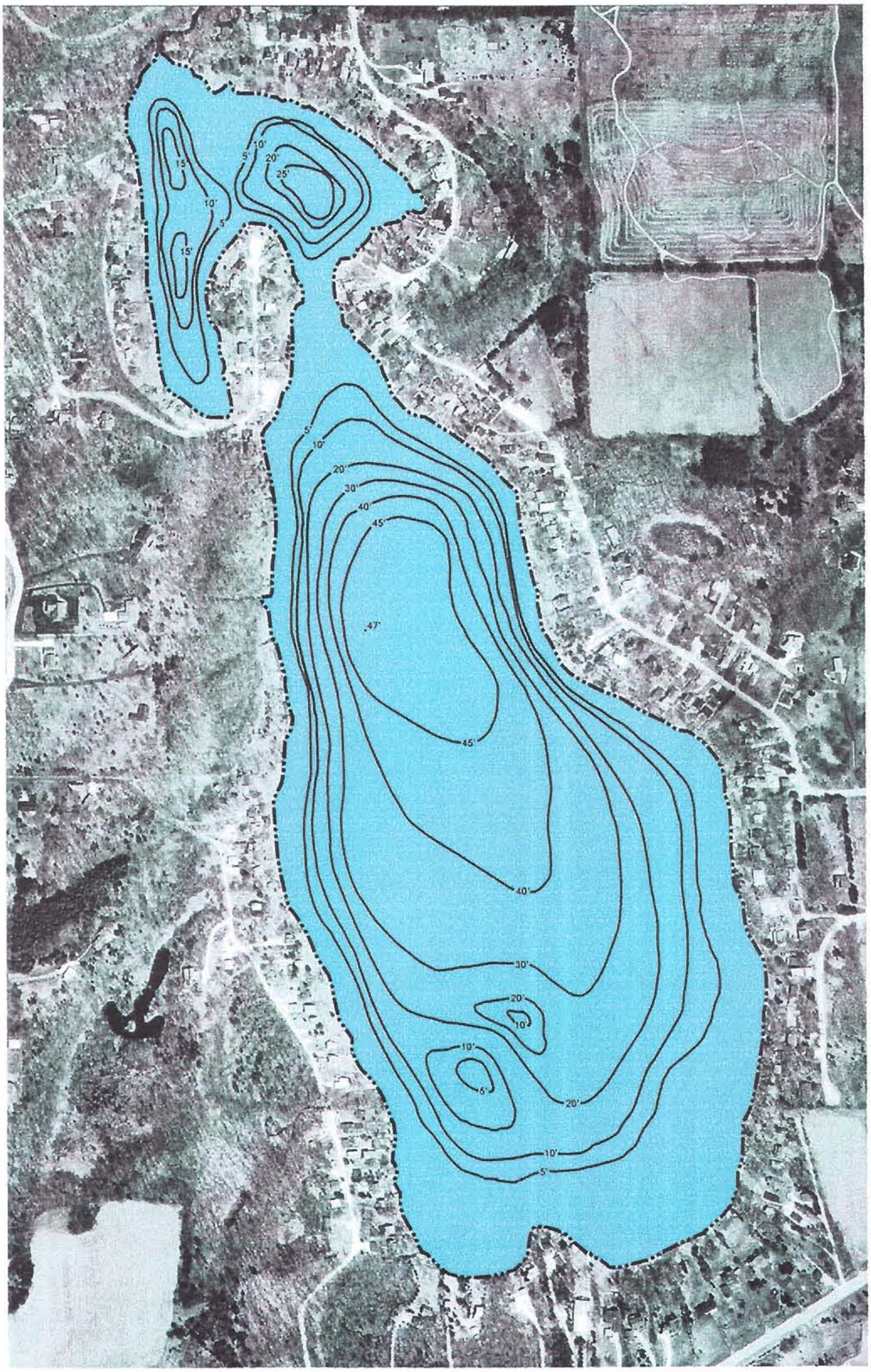
[23] *Wisconsin Conservation Department,* op. cit.

[24] *Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

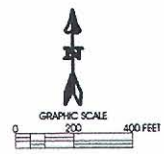
[25] *SEWRPC Memorandum Report No. 123,* A Lake Protection and Recreational Use Plan for Silver Lake, Washington County, Wisconsin, *September 1997.*

Map 96

BATHYMETRIC MAP OF SILVER LAKE



—20'— WATER DEPTH CONTOUR IN FEET



Source: SEWRPC.

Development Potential
As of 1995, land use within the drainage area tributary to Silver Lake consisted largely of urban-density residential development and woodland uses, comprising about 40 percent of the total land cover in the drainage area. The shoreland is largely developed for residential use. The drainage area is partially located within an area planned for urban development in the regional land use plan. New development is expected to consist primarily of large lot residential land uses.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the drainage area tributary to Silver Lake are primarily urban.

Fish and Wildlife Populations
In 1963,[26] the WDNR reported that the fishery consisted of largemouth bass, northern pike, panfish, and walleyed pike. For several years the Lake was also managed for trout and received annual stocking; however, lack of public access prior to 1999 necessitated the discontinuation of this practice. Pumpkinseed, rock bass, bluegill, and creek chub were reported from the Lake in 1944. Except for the creek chub, these species were also reported from the Lake in 1978, in addition to the least darter, pugnose and blacknose shiner, yellow perch, banded killifish, largemouth bass, green sunfish, and bluntnose minnow.[27] SEWRPC reports the pugnose shiner as a State-designated threatened species and the least darter as a State species of special concern.[28]

West Bend Millpond
Lake Morphometry
West Bend Millpond was located in U.S. Public Land Survey Section 13, Township 11 North, Range 19 East, City of West Bend. This pond, which had a surface area of about 73 acres and a maximum depth of nine feet, was formed by an impoundment on the Milwaukee River within the City of West Bend. The dam was removed from the watercourse in the late-1980s. Access to the restored river at the site of the former impoundment is afforded through a city park.

STREAMS

Table 39 contains a summary of selected morphometric data available for named streams in the West Bend area. The streamcourses are shown on Map 91, which also shows the hydrologic drainage areas within the area. Descriptive paragraphs for each stream follow, providing a physical description of each stream for the portion of the stream within Washington County, and of the existing uses and conditions, wildlife habitat, and fishery for the portion of the stream within the West Bend area, to the extent that such information is available. Each of the paragraphs address one or more of the factors required to be considered in the waterbody classification process pursuant to Section 281.69 (5)(b) of the *Wisconsin Statutes.*

Cedar Creek
Stream Morphometry
Cedar Creek is located in the southern portion of the West Bend area. Within Washington County, the Creek has a surface area of about 61 acres and extends over a linear distance of about 15.8 miles with a gradient of approximately 13 feet per mile. Cedar Creek is a major waterway of central Washington County and originates at Big Cedar Lake. The Creek flows eastward to the Milwaukee River. Impounding structures on the Creek exist at

[26]*Wisconsin Conservation Department,* op. cit.

[27]*D. Fago,* op. cit.

[28]*SEWRPC Planning Report No. 42,* op. cit.

Table 39

PHYSICAL CHARACTERISTICS OF STREAMS WITHIN THE WEST BEND AREA, WASHINGTON COUNTY[a]

Stream or Watercourse	Length (miles)	Average Width (feet)	Average Depth (feet)	Surface Area (acres)	Drainage Area (square miles)	U.S. Public Land Survey			Subwatershed	Major Watershed
						Town	Range	Section		
Cedar Creek	15.8	32	1.75	61.3	93.0	10	20	12	Cedar	Milwaukee
Engmon Creek	1.5	5	0.50	0.9	1.0	11	19	14	East-West Branches Milwaukee	Milwaukee
Milwaukee River	25.8	83	1.50	259.5	130.0	12	20	25	East-West Branches Milwaukee	Milwaukee
Quaas Creek	5.9	11	0.67	7.9	7.5	11	20	18	East-West Branches Milwaukee	Milwaukee
Silver Creek	4.0	9	0.50	4.4	8.0	11	19	11	East-West Branches Milwaukee	Milwaukee

[a]Stream data are for the portion of the stream within Washington County only. The U.S. Public Land Survey Township, Range, and Section designation included in each description locates the mouth of the stream at its confluence with another named stream or at the point at which it exits the County.

Source: Wisconsin Department of Natural Resources and SEWRPC.

Big Cedar Lake and Little Cedar Lake. These are low-head structures designed to prevent outlet erosion and maintain water levels. Cedar Creek is included within the Cedar Creek Priority Watershed project area.[29]

Recreational Use

Cedar Creek has limited navigability and is generally navigable only by canoe or similar watercraft.

Development Potential

As of 1995, land use within the Washington County portions of the Cedar Creek subwatershed consisted largely of agricultural and open space uses, with agriculture comprising about 70 percent of the total land cover in the subwatershed. Wetlands comprised about 15 percent of the total land cover. The subwatershed is partially located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the Cedar Creek subwatershed are primarily agricultural.

Fish and Wildlife Populations

In 1963,[30] the WDNR reported that the part of the Creek between Big Cedar and Little Cedar Lakes was maintained as a fish refuge during spring spawning runs. The lower four miles in the County provide a fishery for smallmouth bass, the remaining stream mileage supports panfish and forage fishes. A sucker fishery of some importance used to exist on much of the stream. In 1978,[31] the fish community was report to include black and yellow bullhead, blacknose dace, pumpkinseed, golden shiner, lake chubsucker, bluntnose minnow, central

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[29]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-336-93,* A Nonpoint Source Control Plan for the Cedar Creek Priority Watershed Project, *December 1991.*

[30]*Wisconsin Conservation Department,* op. cit.

[31]*D. Fago,* op. cit.

mudminnow, Iowa and johnny darter, rock and largemouth bass, bluegill, creek chub, white sucker, yellow perch, and green sunfish. SEWRPC reports the lake chubsucker as a State species of special concern.[32]

Engmon Creek (Engmann Creek)

Stream Morphometry

Engmon Creek is located in the northeastern portion of the West Bend area. The Creek is a very small, spring-fed tributary to Silver Creek in the City of West Bend, and has a surface area of about one acre and extends over a linear distance of about 1.5 miles with a gradient of approximately 16 feet per mile. Engmon Creek is included within the Milwaukee River Priority Watershed project area.[33]

Recreational Use

Engmon Creek has limited navigability and is generally navigable only by canoe or similar watercraft.

Development Potential

As of 1995, land use within the Engmon Creek drainage area consisted largely of urban-density residential land uses, comprising about 65 percent of the total land cover of the drainage area. Agricultural uses comprised about 15 percent of the total land cover. The drainage area is located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution in the Engmon Creek drainage area are primarily urban.

Fish and Wildlife Populations

At one time the stream was stocked with trout and supported a small native population. However, by 1963,[34] the WDNR reported that the Creek had deteriorated greatly with the expansion of the City, and was considered to support little more than a forage fish population. In 1986,[35] the fish survey reported largemouth bass, fantail darter, white sucker, blacknose dace, creek chub, and mottled sculpin in the Creek.

Milwaukee River

Stream Morphometry

The Milwaukee River is located in the northeast portion of the West Bend area. Within Washington County, the River has a surface area of about 260 acres and extends over a linear distance of about 25.8 miles with a gradient of approximately six feet per mile. The Milwaukee River is the largest stream in Washington County, both in width and length, and, in the past, has provided a major source of water power, especially in the Barton-West Bend area. In 1963, there were five dams on the River in Washington County, although the one, the West Bend

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[32] *SEWRPC Planning Report No. 42,* op. cit.

[33] *Wisconsin Department of Natural Resources Publication No. PUBL-WR-255-90,* A Nonpoint Source Control Plan for the East and West Branches of the Milwaukee River Priority Watershed Project, *February 1989; Wisconsin Department of Natural Resources Publication No. PUBL-WR-229-89,* Milwaukee River Basin Integrated Management Plan, *February 1990.*

[34] *Wisconsin Conservation Department,* op. cit.

[35] *D. Fago,* op. cit.

Pond, was removed in the 1980s. The Milwaukee River is included within the Milwaukee River Priority Watershed project area.[36]

Recreational Use
The Milwaukee River is navigable by canoe or similar watercraft. Public access to the Milwaukee River is afforded through numerous public parks and private access sites located along the streamcourse.

Development Potential
As of 1995, land use within the Washington County portions of the Milwaukee River watershed consisted largely of agricultural and urban-density residential uses, comprising about 55 percent of the total land cover in the watershed. Wetlands comprised about 15 percent of the total land cover. A small portion of the watershed is located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution in the Milwaukee River watershed include both urban and agricultural runoff.

Fish and Wildlife Populations
In 1963,[37] the WDNR reported that the fishery was limited by an undesirable rough fish population, although northern pike were reported to use the River for breeding during spring and the several impoundments provided habitat for panfish, and limited numbers of largemouth bass. Fish surveys conducted in 1900 and 1924 reported largescale stoneroller, and black crappie, blackside and johnny darter, creek chub, white sucker, yellow and log perch, pumpkinseed, bluntnose minnow, and largemouth bass, respectively. In 1988,[38] the fish population was reported to be comprised of blacknose dace; northern pike; bluegill; yellow bullhead; blacknose, spotfin, sand, and common shiner; greater and golden redhorse; creek and hornyhead chub; logperch; largescale and central stoneroller; pumpkinseed; johnny and blackside darter; stonecat; smallmouth and rock bass; green sunfish; common carp; bluntnose minnow; and white sucker. In 1989,[39] the fish population in the West Bend area was reported to be comprised of largescale stoneroller; northern pike; smallmouth and rock bass; black crappie; blackside darter; golden redhorse; pumpkinseed; bluegill; bluntnose minnow; white sucker; green sunfish; spotfin, sand, and common shiner; and common carp. In 1990,[40] the fish community was reported to be comprised of bluegill; hornyhead chub; sand, spotfin, and common shiner; rock and smallmouth bass; white sucker; bluntnose minnow; and common carp. In 1991 and 1992,[41] the fish population was reported to be comprised of greater and golden redhorse, white sucker, and common carp. In 1993,[42] blackside and johnny darter; sand, spotfin, and common shiner; bluegill; yellow bullhead; hornyhead chub; stonecat; golden redhorse; northern pike;

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[36]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-253-90,* A Nonpoint Source Control Plan for the North Branch Milwaukee River Priority Watershed Project, *July 1989; Wisconsin Department of Natural Resources, PUBL-WR-255-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

[37]*Wisconsin Conservation Department,* op. cit.

[38]*D. Fago,* op. cit.

[39]Ibid.

[40]Ibid.

[41]Ibid.

[42]Ibid.

pumpkinseed; rock and smallmouth bass; log perch; white sucker; largescale stoneroller; common carp; and green sunfish. SEWRPC reports the greater redhorse as a State-designated threatened species.[43]

Quaas Creek

Stream Morphometry

Quaas Creek is located in the southeastern portion of the West Bend area. The Creek is a drainage stream originating from Quaas Lake in the Town of West Bend and a nearby swampy basin. The Creek enters the Milwaukee River east of the City of West Bend. The Creek has a surface area of about eight acres and extends over a linear distance of about 5.9 miles with a gradient of approximately 22 feet per mile. In 1963, the Creek was reported by the Wisconsin Department of Natural Resources to be a shallow, sand and gravel-bottomed stream, lacking instream cover. Since then some restoration activities have been carried out to create fish habitat. Quaas Creek is included within the Milwaukee River Priority Watershed project area.[44]

Recreational Use

Quaas Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty.

Development Potential

As of 1995, land use within the Quaas Creek drainage area consisted largely of agricultural and open space uses, with agriculture comprising about 60 percent of the total land cover of the drainage area. Wetlands comprised about 15 percent of the total land cover. The drainage area is partially located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution

Nonpoint sources of water pollution within the Quaas Creek drainage area are primarily agricultural.

Fish and Wildlife Populations

In 1963,[45] the WDNR reported that Quaas Creek supported little other than forage fishes and crayfish. During spring, northern pike and carp were noted in the downstream area. A fish survey conducted in 1978 also reported a diverse community comprised of blacknose, pearl, and northern redbelly dace; blackchin, blacknose and common shiner; central mudminnow; green sunfish; central stoneroller; creek chub; johnny and fantail darter; mottled sculpin; largemouth bass; banded killifish; northern pike; brook stickleback; and white sucker.[46] In 1983,[47] the fish community was reported to include northern redbelly and blacknose dace, central mudminnow, bullhead minnow, creek chub, common shiner, fantail darter, mottled sculpin, and white sucker.

Silver Creek

Stream Morphometry

Silver Creek is located in the central portion of the West Bend area. The Creek has a surface area of about four acres and extends over a linear distance of about four miles with a gradient of approximately 23 feet per mile. The Creek is a tributary to the Milwaukee River, originating in Silver Lake and flowing through Hackbarth Lake and

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[43]*SEWRPC Planning Report No. 42,* op. cit.

[44]*Wisconsin Department of Natural Resources, PUBL-WR-255-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

[45]*Wisconsin Conservation Department,* op. cit.

[46]*D. Fago,* op. cit.

[47]Ibid.

Lucas Lake to its confluence with the Milwaukee River in the City of West Bend. A dam, with a 7-foot head, impounds Lucas Lake, and impedes fish migrations, as does a low-head structure on Silver Lake, which is also considered an impediment to fish migrations. There are two ponds and a private impoundment that contribute to a total water head of 20 feet along this relatively short stream. Silver Creek is included within the Milwaukee River Priority Watershed project area.[48]

Recreational Use
Silver Creek has limited navigability and is generally navigable only by canoe or similar watercraft, with difficulty. Angling opportunities are provided at the Ridge Run County Park.

Development Potential
As of 1995, land use within the Silver Creek drainage area consisted of urban-density residential and agricultural uses, comprising about 40 percent of the total land cover in the drainage area. Wetlands comprised about 15 percent of the total land cover. The drainage area is partially located within an area planned for urban development in the regional land use plan.

Nonpoint Sources of Water Pollution
Nonpoint sources of water pollution within the Silver Creek drainage area include both urban and agricultural runoff.

Fish and Wildlife Populations
In 1963,[49] the WDNR reported that the fishery in Silver Creek consisted primarily of forage species and panfishes from the several lakes. In 1978,[50] a fish surveys reported blacknose, blackchin, golden, and common shiner; central mudminnow; bluntnose and fathead minnow; central stoneroller; least, johnny, Iowa, and fantail darter; largemouth and rock bass; yellow perch; brook stickleback; black bullhead; pumpkinseed; bluegill; green sunfish; banded killifish; white sucker; and creek chub. SEWRPC reports the least darter as a State species of special concern.[51]

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[48]*Wisconsin Department of Natural Resources, PUBL-WR-255-90; Wisconsin Department of Natural Resources, PUBL-WR-229-89.*

[49]*Wisconsin Conservation Department,* op. cit.

[50]*D. Fago,* op. cit.

[51]*SEWRPC Planning Report No. 42,* op. cit.

Chapter XVI

ALTERNATIVE SURFACE WATER CLASSIFICATION SCHEMES

INTRODUCTION

This chapter sets forth the statutory criteria required to be considered in the classification of waterbodies pursuant to Section 281.69(5) of the *Wisconsin Statutes*, summarizes the inventory data set forth in the preceding chapters, and presents alternative methodologies for the classification of lakes and streams within Washington County. The purpose of these alternative waterbody classification methodologies is to serve as a "sorting mechanism" to systematically divide types of surface waterbodies within the County into regulatory classes that reflect the sensitivity of the water resources to human impacts. The alternatives were developed pursuant to the requirements of Section 281.69, *Wisconsin Statutes*, and were derived from the statistical analysis of the scientific and technical inventory data presented heretofore.

WATERBODY CLASSIFICATION CRITERIA

Section 281.69(5)(b) of the *Wisconsin Statutes* directed the Wisconsin Department of Natural Resources (WDNR) to establish guidelines for lake classification based upon consideration of certain specific minimum criteria to be used in a classification project. These minimum criteria included seven parameters commonly used to describe a lake and its watershed:

1. The size, depth, and shape of the lake.
2. The size of the lake's watershed.
3. The quality of the water in the lake.
4. The potential of the lake to be overused for recreational purposes.
5. The potential for the development of lands surrounding the lake.
6. The potential of the lake to suffer from nonpoint source water pollution.
7. The type and size of the fish and wildlife population in and around the lake.

These criteria were subsequently embodied in an amendment of Chapter NR 191 of the *Wisconsin Administrative Code*, the provisions of which governed the analyses underlying the development of a waterbody classification scheme for Washington County. Each of these criteria is set forth in more detail below.

Size, Depth, and Shape

Surface Area

Surface area is a measure of the size of a waterbody, describing the areal extent of a waterbody within the landscape. This criterion has relevance to the recreational use of lakes, being the criterion used in Chapter NR 1 of the *Wisconsin Administrative Code* to determine maximum and minimum public recreational boating access standards. In addition, this criterion is related to water quality as smaller lakes are generally more likely to be susceptible to water pollution than the larger lakes within Washington County. Surface area also is used in the calculation of waterbody volume, mean depth, and water retention time. Surface area data were abstracted from the adopted regional water quality management plan, surface water inventories, lake management reports, and lake use reports for the Milwaukee River basin.[1]

Maximum Depth

The maximum depth of a waterbody is a measure of the depth of water at the deepest point within a waterbody. This criterion is related to the ability of a waterbody to assimilate pollutants as shallow waterbodies are generally more susceptible to pollution than deeper waterbodies within Washington County. Maximum depth also is used in the calculation of lake volume. Maximum depth is generally considered as a separate criterion to another lake depth descriptor, mean depth, that is the dividend of lake volume divided by lake surface area. Maximum depth data were abstracted from the adopted regional water quality management plan, surface water inventories, lake management reports, and lake use reports for the Milwaukee River basin.[2]

Mean Depth

The mean depth of a waterbody is a measure of the average depth of water within a waterbody. As with the closely related criterion of maximum depth, this criterion is related to the ability of a waterbody to assimilate pollutants, as shallow waterbodies are generally more susceptible to pollution than deeper waterbodies within Washington County. However, mean depth is generally considered as a separate criterion to maximum depth. Mean depth is determined as the dividend of lake volume divided by lake surface area. Mean depth data were abstracted from the adopted regional water quality management plan, surface water inventories, lake management reports, and lake use reports for the Milwaukee River basin.[3]

Shoreline Development Factor (SDF)

Shoreline development factor is a measure of the shape of a waterbody, describing the ratio of the shoreline length of a lake to the circumference of a circle with the same area as the lake surface area. A higher number indicates a more irregular lakeshore as the shoreline length is greater than the circular reference. The lower the number, the more circular a lake is in shape. SDF is related to the amount of shoreline available for development, with more irregular shorelines offering more shoreline length along which development could occur. SDF also is related to water quality and shoreline habitat, as both of these can be negatively affected by urban development. Shoreline development factor data were abstracted from the adopted regional water quality management plan, surface water inventories, lake management reports, and lake use reports for the Milwaukee River basin.[4]

Stream Length, Width, and Depth

Stream systems consist of reaches having a range of characteristics. Many streams consist of a series of pools and riffles or rapids linking the pools. Generally, only artificial channels, such as agricultural drainageways, have standard dimensions throughout their length. Thus, to estimate stream width and depth, a series of measurements

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[1]*SEWRPC Memorandum Report No. 93,* A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report, *March 1995; Wisconsin Conservation Department,* Surface Water Resources of Washington County, *1963; SEWRPC-WDNR Lake Use Reports Nos. ML-1,* Big Cedar Lake, *1972; ML-3,* Little Cedar Lake, *1973; ML-8,* Silver Lake, *1973; ML-11,* Smith Lake, *1970; ML-13,* Lucas Lake, *1970; ML-14,* Green Lake, *1970; ML-16,* West Bend Pond, *1974; ML-19,* Lake Twelve, *1970; and ML-20,* Wallace Lake, *1970.*

[2]Ibid.

[3]Ibid.

[4]Ibid.

are obtained over a known length of stream. These values are averaged and reported as average width and average depth. Average width, when multiplied by stream length, provides an estimate of stream surface area. Stream surface area, when multiplied by average depth, provides as estimate of stream volume. The ratio of stream width to stream depth provides information on the shape of the stream channel, which, in turn, is related to the type of habitat provided within a stream reach. In general, water in narrower stretches of stream flows at higher velocities than water in broader stream reaches. Stream length, width, and depth data were abstracted from the adopted regional water quality management plan, priority watershed studies, and surface water inventories.[5]

Size of the Watershed
Watershed Area
Watershed area, or the surface area of the drainage basin tributary to the waterbody, is a measure of the areal extent of the land surface surrounding the waterbody and draining into it. Larger watersheds generally result in a higher pollutant load, given comparable land uses within the watershed, as land use activities within a watershed are directly correlated to the generation and delivery of contaminants. Watershed area is used in the calculation of water residence times and flushing rates. Watershed areas were determined by the Southeastern Wisconsin Regional Planning Commission based upon subbasin delineations prepared by Commission staff for the adopted regional water quality management plan and selected lake management plans.[6]

Quality of the Water
Trophic State Index (TSI)
The Trophic State Index is an empirical means of comparing the water quality of lakes. It is based upon a scale of 1 to 100, where values of less than 50 indicate an oligotrophic, or nutrient poor, state or mesotrophic state, and where values of greater than 50 indicate a eutrophic, or nutrient rich, state. Two forms of the TSI equation are used in Wisconsin: namely, the Carlson TSI which is based upon equations developed in Ohio lakes,[7] and the Wisconsin TSI (WTSI) which is based upon equations developed specifically for Wisconsin conditions, taking into consideration the humic character of Wisconsin lakes versus the clearer water character of Ohio lakes.[8] Both

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[5]*SEWRPC Memorandum Report No. 93,* op. cit.; *Wisconsin Conservation Department,* op. cit.; *Wisconsin Department of Natural Resources Publications No. PUBL-WR-194-86,* A Nonpoint Source Control Plan for the Oconomowoc River Priority Watershed Project, *March 1986; PUBL-WR-255-90,* A Nonpoint Source Control Plan for the East and West Branches of the Milwaukee River Priority Watershed Project, *February 1989; PUBL-WR-253-90,* A Nonpoint Source Control Plan for the North Branch Milwaukee River Priority Watershed Project, *July 1989; PUBL-WR-336-93,* A Nonpoint Source Control Plan for the Cedar Creek Priority Watershed Project, *December 1991; PUBL-WR-320-93,* Upper Fox River Priority Watershed Project: A Nonpoint Source Control Plan, *November 1993; PUBL-WR-190-95 REV,* Upper Rock River Basin Water Quality Management Plan, *July 1995.*

[6]*SEWRPC Memorandum Report No. 93,* op. cit.*; SEWRPC Community Assistance Planning Report No. 98, 2nd Edition,* A Lake Management Plan for Friess Lake, Washington County, Wisconsin, *November 1997; SEWRPC Memorandum Report No. 123,* A Lake Protection and Recreational Use Plan for Silver Lake, Washington County, Wisconsin, *September 1997; SEWRPC Memorandum Report No. 137, Draft,* A Water Quality Protection and Stormwater Management Plan for Big Cedar Lake, Washington County, Wisconsin, *Volume One,* Inventory Findings and Water Quality Analyses, *December 1999; SEWRPC Memorandum Report No. 137, Draft,* A Water Quality Protection and Stormwater Management Plan for Big Cedar Lake, Washington County, Wisconsin, *Volume Two,* Stormwater Management Plans for Three Pilot Subbasins, *August 2000.*

[7]*R.E. Carlson, "A Trophic State Index for Lakes,"* Limnology and Oceanography, *Vol. 22, No. 2, 1977.*

[8]*R.A. Lillie, S. Graham, and P. Rasmussen, "Trophic State Index Equations and Regional Predictive Equations for Wisconsin Lakes,"* Research and Management Findings, *Wisconsin Department of Natural Resources Publication No. PUBL-RS-735 93, May 1993.*

indices are based upon Secchi disk transparency measurement, and total phosphorus and chlorophyll-*a* concentrations. This index serves as a well-established indicator of the productivity of a lake. The greatest potential impact of recreational activities will occur on mesotrophic and oligotrophic lakes which are characterized as having sparse to moderate aquatic plant growth and low to moderate nutrient concentrations and relatively good water quality. If a lake is eutrophic, the impact from recreational activities may be obscured by other factors, rendering the effects from motorized watercraft insignificant. TSI data were determined by the Southeastern Wisconsin Regional Planning Commission staff using data provided through the WDNR Self-Help Monitoring Program, the WDNR Long-Term Trends Lake Monitoring Program, unpublished WDNR data compiled for the preparation of WDNR Priority Watershed Nonpoint Source Pollution Control plans and basin plans, and U.S. Geological Survey data published annually as water-data reports,[9] and from the adopted regional water quality management plan and selected lake management plans.[10]

Potential to Be Overused for Recreational Purposes

Public Recreational Boating Access

Chapter NR 1 of the *Wisconsin Administrative Code* sets maximum and minimum public recreational boating access standards based upon lake surface area. Existing public recreational boating opportunities were compared to these standards, based upon records maintained by the WDNR Southeast Region headquarters. The Washington County Planning and Parks Department has actively acquired potential public recreational boating access sites on many of the larger named lakes in the County in recent years. However, few such sites have been developed to date. In general, public recreational boating access to the major lakes of Washington County has been through private launch sites operated as "for profit" businesses. In order to estimate peak lake use by lakeshore householders, the lakeshore development index, set forth below, was also calculated using the lake surface area divided by the number of platted lots, the dividend being equal to the area of lake surface per lot. This area could be compared to the areal standards used to develop the maximum and minimum access standards set forth in Chapter NR 1.

Potential for the Development of Lands

Lakeshore Development Index

In order to estimate the degree of lakeshore development, an urban lakeshore development index was developed. This index is defined as the number of platted lots per unit of shoreline length. Lakeshore development is related to water quality in that human activities on the land surface generate and mobilize phosphorus and other contaminants that can enter the aquatic environment. Lakeshore development indices were determined by the Washington County Department of Planning and Parks based upon shoreline length and lot data provided by County staff from the County's land inventory data base. A variant of this index was derived by dividing the lake surface area by the number of platted lots. This index allowed comparison of the lake surface area per homesite and the maximum and minimum recreational boating standards, converted to lake surface area, set forth in Chapter NR 1 of the *Wisconsin Administrative Code*. Such a comparison is based upon an assumption that each household could potentially operate one watercraft on a lake during peak-use periods.

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[9]*Wisconsin Department of Natural Resources, PUBL-WR-194-86; Wisconsin Department of Natural Resources, PUBL-WR-255-90; Wisconsin Department of Natural Resources, PUBL-WR-253-90; Wisconsin Department of Natural Resources, PUBL-WR-336-93; Wisconsin Department of Natural Resources, PUBL-WR-320-93; Wisconsin Department of Natural Resources, PUBL-WR-190-95 REV; U.S. Geological Survey Water-Data Reports WI-90-1 through WI-99-1,* Water Resources Data – Wisconsin, Water Year 1990 *through* Water Year 1999, *published annually, March 1991 through March 2000; U.S. Geological Survey Open-File Reports 95-190, 96-168, 97-123, 98-78, 99-98 and 00-89,* Water-Quality and Lake-Stage Data for Wisconsin Lakes, Water Year 1994 *through* Water Year 1999, *published annually, 1995 through 2000.*

[10]*SEWRPC Memorandum Report No. 93,* op. cit.*; SEWRPC Community Assistance Planning Report No. 98, 2nd Edition,* op. cit.*; SEWRPC Memorandum Report No. 123,*op. cit.*; SEWRPC Memorandum Report No. 137, Draft, Volume One,* op. cit.*; SEWRPC Memorandum Report No. 137, Draft, Volume Two,* op. cit.

Potential for Nonpoint Source Pollution

Hydrologic Lake Type

Lake type designations are related to the primary source of the water flowing into a lake. Lake type data were abstracted from WDNR inventories.[11] The WDNR uses four lake type categories: namely, 1) seepage lakes, 2) drainage lakes, 3) spring lakes, and 4) drained lakes:

1. **Seepage lakes** are primarily rainwater-fed waterbodies, having neither an inlet nor an outlet stream. Rainwater enters these lakes either directly as precipitation onto the lake surface or indirectly as interflow, or groundwater flow, from rainfall onto and percolating through the surrounding land area. These lakes have small to very small watersheds and low flushing rates, long water residence times, that make these lakes hypersensitive to pollutant loadings. Pollutants entering these waterbodies tend to remain in these waterbodies. These lakes share many of the same characteristics as spring lakes and are often indistinguishable from such lakes.

2. **Drainage lakes** are those waterbodies that most people would visualize as lakes. They have a permanent inlet and outlet, and are primarily stream-fed. They tend to have large to very large watersheds and higher flushing rates, shorter water residence times, that make these lakes less sensitive to pollutant loadings. Pollutants entering these waterbodies are rapidly flushed through these waterbodies.

3. **Spring lakes** are primarily groundwater-fed waterbodies. Some spring lakes have an outlet that flows intermittently as a result of high lake levels overflowing a low section of lakeshore. Spring lakes have relatively small watersheds and low to moderate flushing rates, moderate water residence times, that make these lakes relatively sensitive to pollutant loadings. Pollutants entering these waterbodies tend to remain in these waterbodies, although some flushing can occur. These lakes share many of the same characteristics as seepage lakes and are often indistinguishable from such lakes.

4. **Drained lakes** are waterbodies having a defined outlet with perennial stream flow; however, the lakes lack a defined inflow. Drained lakes are generally associated with headwater streams. Drained lakes have small to moderately sized watersheds and moderate flushing rates, moderate water residence times, make them relatively insensitive to pollutant loadings. Pollutants entering these waterbodies can be flushed through these waterbodies over time.

Phosphorus Sensitivity

Phosphorus sensitivity is a measure of the degree to which a waterbody is likely to experience increased aquatic plant growth as a result of increases in the in-lake phosphorus concentration. Phosphorus tends to be the primary nutrient limiting the growth of aquatic plants in northern temperate lakes. That is, the addition of phosphorus to most lake systems will stimulate additional algal growth. Phosphorus sensitivity is related to aquatic habitat and water quality. If there is abundant phosphorus, there is likely to be abundant algal or aquatic plant growth that can result in nuisance conditions for recreational users. Phosphorus sensitivity is generally estimated as a function of the flushing rate-water residence time.[12] For purposes of this study, phosphorus sensitivity is expressed as the areal loading rate of phosphorus to a lake, using the mass of phosphorus estimated to be entering a lake from its watershed divided by lake surface area. There is a strong positive correlation between both shoreline development and land use within the watershed and the levels of phosphorus in a waterbody. As shoreline development and intensity of land use increases, so to do the concentrations of phosphorus in the waterbody.

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[11] *Wisconsin Department of Natural Resources Publication No. PUBL-FM-800 95REV,* Wisconsin Lakes, *1995.*

[12] *Organization for Economic Cooperation and Development-OECD,* Eutrophication of Waters: Monitoring, Assessment and Control, *OECD, Paris, 1982.*

Flushing Rate

Flushing rate is an estimate of the number of times per year a volume of water equal to the total volume of a lake is enters the lake. The converse of flushing rate is water residence time, that is an estimate of the length of time a volume of water equal to the total volume of the lake remains in the lake. Lakes with low flushing rates, long water residence time, are more susceptible to pollutant loadings as the pollutants remain in the waterbody for a longer period, increasing the length of exposure of lake organisms to potentially deleterious affects or the length of availability of nutrients and other elements that cause increased biological responses, such as aquatic plant growth. Water residence time is calculated as the volume of the waterbody divided by the volume of water entering the waterbody on an annual basis. Flushing rate in the inverse of this dividend. For the purposes of this study, flushing rate was calculated from long-term average annual rainfall data using the algorithms set forth within the Wisconsin Lake Model Spreadsheet (WILMS), version 2.00.[13]

Type and Size of Fish and Wildlife Populations

Threatened and Endangered Species and Species of Special Concern

The biological condition of a waterbody includes both the types and abundance of aquatic plant species, fish species, and wildlife species that utilize the lake and surrounding habitat. As levels of enrichment increase, the likelihood of less desirable changes in the composition of the flora and fauna increases; generally, enriched or polluted systems contain large numbers of few species, particularly those species considered as "rough" fish or nuisance plants. As waterbodies age, these types of changes occur. Humans can accelerate these changes through modifications to the watershed. Paved surfaces, for example, limit groundwater recharge and increase surface runoff, warming the water and increasing the ability and nature of the runoff to carry contaminants. Such changes can alter a coldwater fishery to a warmwater fishery. As development has taken place, fewer coldwater system remain. In many cases, these changes result in the plant and animal species living with these systems becoming threatened or endangered. Hence, the presence of one of these species indicates a potential for a high-quality resource. Further, a number of species have been identified as being at risk; a declining trend in species abundance has been observed and there is a real danger that the plants or animals could become threatened or endangered. For this reason, the species of special concern should also be considered in an assessment of plant and animal populations types and numbers. Fisheries data were abstracted from records maintained by the WDNR,[14] while other wildlife and fisheries information was obtained from the adopted regional natural areas and critical species habitat protection and management plan.[15]

Biotic Indices

In an effort to better integrate the biological communities and the habitat conditions conducive to specific community types, a number of biological indices have been created. The WDNR has adopted the Hilsenhoff Biotic Index (HBI) as an integrated assessment tool for benthic, or bottom-dwelling, organisms.[16] Benthic organisms include insect larvae, microcrustaceans, and other organisms that form the food base for fish communities in flowing water environments. Fish communities are also evaluated using a biological index. The Index of Biotic Integrity (IBI), like the HBI, provides an integrated assessment of the fish community and habitat

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[13]*Wisconsin Department of Natural Resources Publication No. PUBL-WR-363-96 REV,* Wisconsin Lake Model Spreadsheet Version 2.00 User's Manual, *June 1994.*

[14]*D. Fago, Wisconsin Department of Natural Resources Research Report No. 148,* Retrieval and Analysis Used in Statewide Fish Distribution Survey, *Second Edition, December 1988; Wisconsin Department of Natural Resources, PUBL-FM-800 95REV.*

[15]*SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997.*

[16]*Wisconsin Department of Natural Resources Technical Bulletin No. 132,* Using a Biotic Index to Evaluate Water Quality in Streams, *1982.*

characteristics of a flowing water environment.[17] The warmwater IBI has been adopted by the WDNR for stream assessments and is the most widely used version of this index. A coldwater community IBI has also been proposed, and a lake version of this index has been considered for development, but both are still in the conceptual stage. Data on the HBI and IBI ratings of streams in Washington County were abstracted from the Wisconsin Department of Natural Resources files and the adopted regional water quality management plan, and from the data base maintained by the College of Natural Resources at the University of Wisconsin-Stevens Point.[18]

SUMMARY OF INVENTORY FINDINGS

General Characteristics of the Surface Waters of Washington County

The water resources within Washington County have their origin during the late Wisconsin stage of the last glaciation approximately 10,000 years before present. Washington County was included in the interlobate area between the Green Bay and Lake Michigan glaciers. This geographic positioning created an area of moraine separating two major drainage systems and forming the headwaters of numerous minor tributary drainage systems. The manner of creation of these drainage systems has created a remarkable uniformity in the surface water resources of Washington County. Lakes and streams formed in the valleys between the moraines. These lakes and streams are fed by rainfall, overland flow, and groundwater. Again, the similarity of these sources of water results in not only a physical similarity, but also in a similarity of water quality, which has contributed to a general similarity in the biotic elements of the waters of Washington County. The similarities within the data set are reflected in the limited ranges observed in the published data, as shown in Figures 4 and 5.

Because of the similarity in source area geology and commonality of source water, the surface waters of Washington County show few differences in water quality across the County. Those differences that exist within the data set, in large measure, reflect localized variations in human influence. Major contributors to water quality degradation in the County include the change in land use from natural prairie to agriculture, and, more recently, from agriculture to urban uses within drainage areas.[19] While some point sources of pollutants have been reduced or eliminated, many waterways remain on the list of threatened or impaired waters compiled by the Wisconsin Department of Natural Resources as Section 303(d)-listed waters in the State. Section 303(d)-listed waters within Washington County include Evergreen Creek, Flynn Creek, Kohlsville River, Lehner Creek, North Branch Wayne Creek, Jackson Creek, and Wayne Creek, and Pike Lake.

Lakes

Given the similar origins of most natural lakes in Washington County, the data presented herein show that these lakes are similar in most respects with reference to their physical, biological, and chemical characteristics. countywide, the larger lakes, having larger surface areas, tend to be the deeper lakes as well. The relationship between surface area and maximum depth has a correlation factor of 72 percent, suggesting that the larger surface areas set are associated with the larger depths about three-quarters of the time. Maximum depth is also correlated with all other recorded physical, chemical, and biological attributes of lakes in Washington County with an average correlation factor of about 40 percent. This suggests that maximum depth would be a useful attribute to use in lake classification. Big Cedar Lake, with a surface acreage of 932 acres and a maximum depth of 105 feet is paradigmatic of the surface area:maximum depth correlation.

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[17] *U.S. Department of Agriculture, Forest Service General Technical Report No. NC-149,* Using the Index of Biotic Integrity (IBI) to Measure Environmental Quality in Warmwater Streams of Wisconsin, *April 1992.*

[18] *SEWRPC Memorandum Report No. 93,* op. cit.*; College of Natural Resources, University of Wisconsin-Stevens Point,* DNR Biotic Index Database, Version 6.01, *November 1999.*

[19] *P.J. Garrison and R.S. Wakeman, "Use of Paleolimnology to Document the Effect of Lake Shoreland Development on Water Quality,"* Journal of Paleolimnology, *in press, 2000.*

Figure 4

FREQUENCY DISTRIBUTIONS FOR SELECTED CHARACTERISTICS OF LAKES WITHIN WASHINGTON COUNTY FOR USE IN LAKE CLASSIFICATION

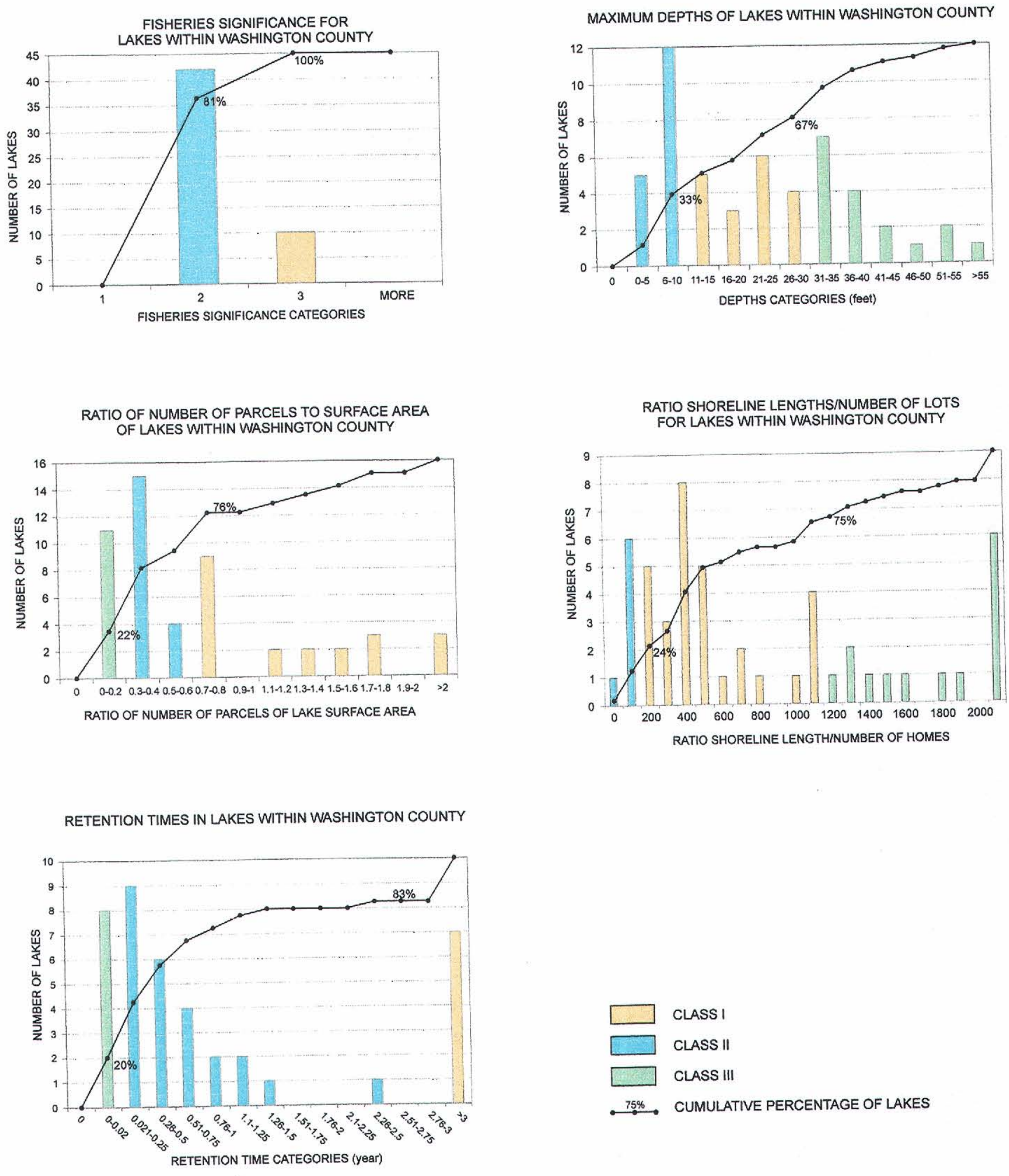
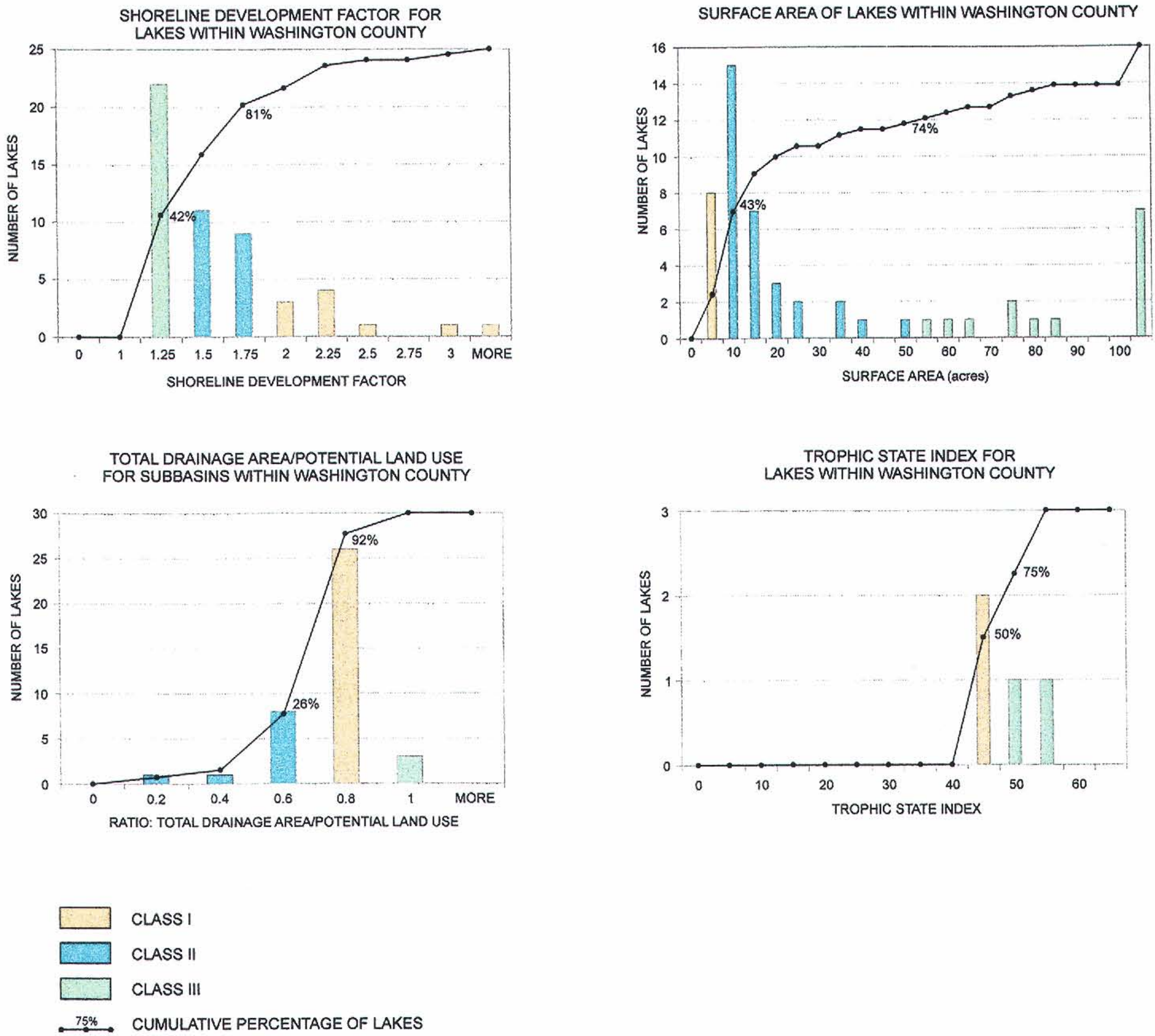


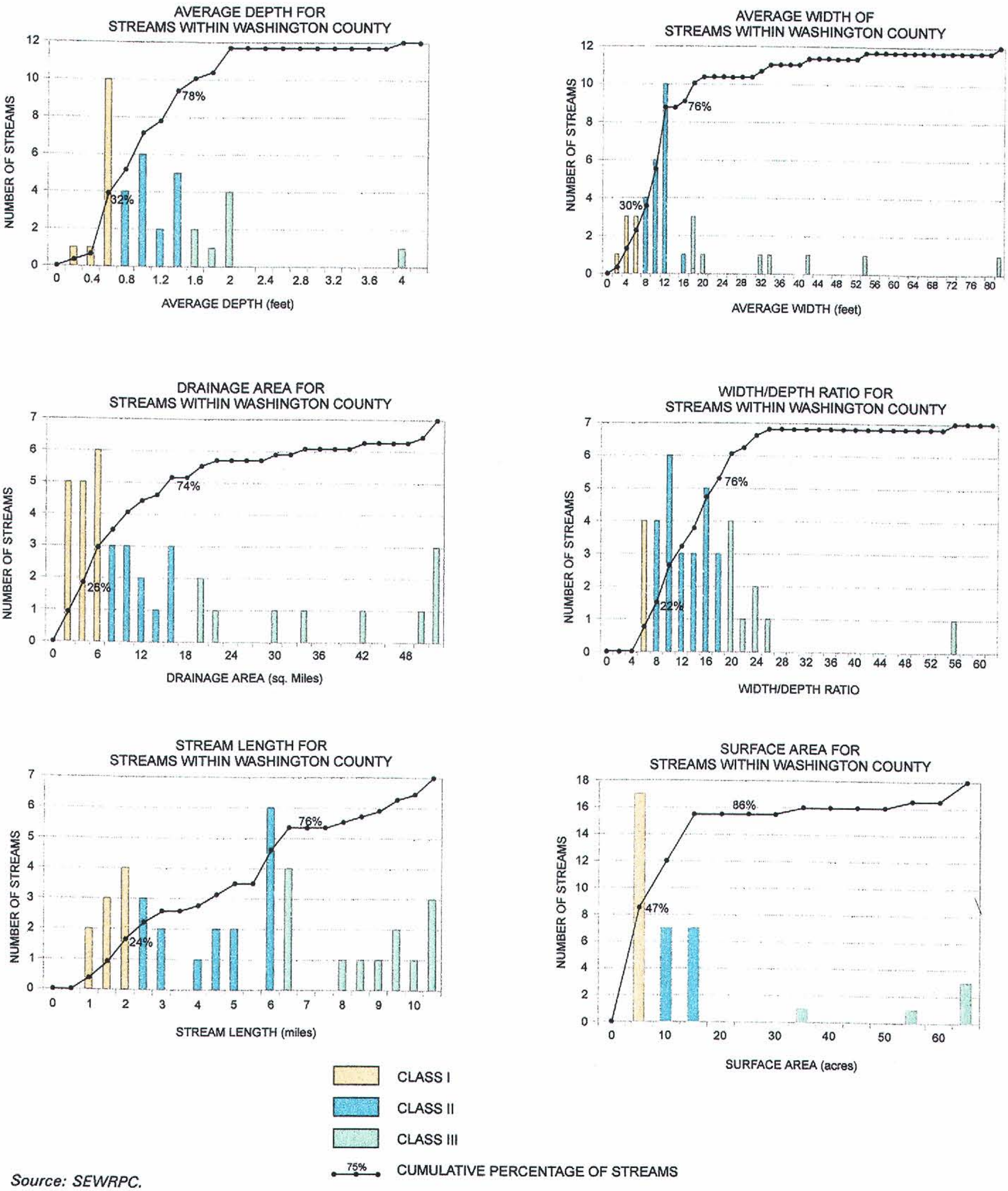
Figure 4 (continued)



Source: SEWRPC.

Figure 5

FREQUENCY DISTRIBUTIONS FOR SELECTED CHARACTERISTICS OF STREAMS WITHIN WASHINGTON COUNTY FOR USE IN STREAM CLASSIFICATION



Source: SEWRPC.

Notwithstanding, there are some exceptions to this tendency. For example, many of the medium-sized lakes can be very deep in proportion to their surface acreage. Amy Bell Lake, for example, with a surface acreage of 26 acres and a maximum depth of 37 feet, is one of the deeper lakes in the County. Likewise, constructed waterbodies such as Barton Pond, Newburg Pond, and Kewaskum Millpond, because they are generally located within urban settings, are at greater risk of degradation due to development impacts and large drainage areas which contribute to higher nonpoint pollution loadings. These waterbodies also receive a higher level of recreational use due to the presence of shoreland parks and public access sites.

While point sources of water pollution to lakes in Washington County have been virtually eliminated, except for permitted discharges, nonpoint source pollution remains a concern. Based upon current development trends, however, the nature of the nonpoint sources of pollution is likely to include consideration of pollution loadings from urban development as well as from agriculture. For this reason, both urban and rural stormwater management practices have been highlighted as a concern in the Washington County land and water management plan.

Streams

As in the case of lakes, streams in Washington County also have similar physical, chemical, and biological characteristics. Most of the streams within the County are tributary to the two larger river systems, the Milwaukee and Rock Rivers. Because these waterbodies also share the same source waters as the lakes, variations in their water quality and biology are also relatively slight. Nevertheless, the average width of the streams within Washington County varies considerably, and results in discrete distinctions between stream segments, distinguishing the larger rivers from the smaller tributary streams. The average correlation between average width and all other stream criteria is 75 percent.

Stream morphometry within Washington County is related to the glacial origins of the major river systems. Streams flow from the ground moraines of the Green Bay and Lake Michigan glacial lobes, running in the valleys adjacent to the moraines. The eastern and central portions of the County drain into Lake Michigan and the western portions of the County drain into the Mississippi River drainage basin. The Great Lakes drainage basin within Washington County includes the Milwaukee River watershed and its tributary Menomonee River watershed. The Mississippi River drainage basin within Washington County includes the Rock River watershed and its tributary Bark and Oconomowoc River watersheds. Although draining to these different basins, the commonality of the source waters results in both major river systems having a similar water quality and similar biological characteristics within Washington County.

Relationships between Characteristics

In this section, the available data on waterbodies in Washington County are subjected to statistical analysis in order to develop elements of the alternative waterbody classification schemes to be considered by the Washington County Code Revision Working Group. Correlation matrices are used to show the relationships between criteria which are scaled to be independent of the unit of measurement. These relationships are described by correlation factors (r), expressed as percentages, with the higher percentages, or those closer to 100 percent, being indicative of strong positive correlations, while percentages closer to zero indicate weaker relationships between the data sets. Correlations are either positive, indicating that an increase in one parameter will be related to an increase in another, or negative, indicating that an increase in one parameter will be related to a decrease in the another. In analyzing these data sets, all of the statutorily required criteria, set forth in Section 281.69(5)(b) of the *Wisconsin Statutes* and summarized above, have been considered. Based upon the outcome of this analysis, specific criteria are identified for use within a waterbody classification system for Washington County.

Lakes

Table 40 shows the information gathered and used in these analyses. Correlations between all available data were computed to determine the overall interrelatedness of the data used in the classification process. These correlations create a basis upon which to determine a classification scheme for lakes in Washington County. Table 41 presents the correlations between the available data for lakes in Washington County.

Table 40

DATA COLLECTED FOR LAKES WITHIN WASHINGTON COUNTY

Lake	Surface Acres	Shoreline Miles	Maximum Depth (feet)	Mean Depth (feet)	Flushing Rate (years)	Retention Time (years)	Shoreline Development Factor	Ratio: Number of Parcels to Lake Surface Area	Ratio: Lake Total Drainage Area to Potential Land Use	Ratio: Shoreline Length to Number of Homes	Trophic State Index (TSI)	Fisheries Classification Rank
Allis	9	0.5	34	--[a]	--[a]	--[a]	1.18	0.13	--[a]	2,640.00	--[a]	2
Amy Bell	26	1.0	37	20	0.42	2.39	1.28	1.29	0.62	132.00	--[a]	2
Bark	62	1.8	34	14	2.50	0.40	1.59	1.75	0.55	83.37	--[a]	2
Barton Pond	67	1.2	5	3	155.59	0.01	1.20	--[a]	0.56	--[a]	--[a]	2
Beck	16	0.6	8	--[a]	2.4	0.42	1.07	0.13	--[a]	1,584.00	--[a]	2
Big Cedar[b]	932	11.0	105	34	0.18	5.52	2.57	0.57	0.61	91.83	44	3
Boltonville Millpond	10	--[a]	10	5	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]	2
Brickyard	1	0.1	4	--[a]	--[a]	--[a]	1.04	1.25	--[a]	228.80	--[a]	2
Druid	120	1.7	53	25	1.63	0.61	1.09	0.74	0.63	97.57	50	2
Ehne	18	1.0	15	5	5.69	0.18	1.68	0.72	0.69	406.15	--[a]	2
Erler	37	0.9	34	14	1.49	0.67	1.02	0.14	0.78	950.40	--[a]	2
Five	102	1.9	23	11	3.48	0.36	1.35	0.25	0.64	271.14	47	2
Friess	119	2.3	48	26	2.54	0.39	1.51	0.36	0.73	60.12	55	2
Gilbert	44	1.8	30	3	--[a]	0.43	2.03	1.70	--[a]	413.22	--[a]	2
Green	71	1.8	37	17	0.33	3.03	1.65	0.58	0.45	126.00	50	2
Hackbarth	9	0.4	35	33	0.87	1.15	1.07	1.07	0.46	301.71	--[a]	2
Hartford Millpond	11	0.9	8	7	138.94	0.01	1.94	0.78	0.68	365.54	--[a]	2
Hasmer	15	0.6	34	17	1.13	0.89	1.19	1.18	0.69	1,056.00	--[a]	2
Hawthorn	8	0.5	12	10	7.52	0.13	1.26	0.23	0.70	528.00	--[a]	2
Hickey	10	0.5	14	3	11.21	0.09	1.12	0.63	0.75	1,320.00	--[a]	2
Keown	1	0.2	15	7	62.63	0.02	1.68	0.20	0.85	158.40	--[a]	2
Kewaskum Millpond	5	1.0	8	--[a]	--[a]	--[a]	3.10	8.75	--[a]	406.15	--[a]	2
Kohlsville Millpond	6	0.3	7	3	91.1	0.01	1.18	2.41	0.74	1,742.40	--[a]	2
Lehner	3	0.6	22	9	11.79	0.08	2.14	0.11	0.73	3,168.00	--[a]	3
Lent	8	--[a]	7	--[a]	80.72	0.01	--[a]	0.64	0.83	0.00	--[a]	2
Lenwood	15	0.6	38	19	0.32	3.16	1.15	0.61	0.53	352.00	--[a]	2
Little Cedar	246	4.0	56	13	1.69	0.59	1.77	0.33	0.57	134.52	46	2
Little Drickens	9	0.4	20	7	3.4	0.29	1.43	0.71	0.61	704.00	--[a]	2
Little Friess	24	0.5	34	10	34.19	0.03	1.03	0.15	0.38	279.84	--[a]	2
Lowes	23	0.9	23	11	39.63	0.03	1.31	0.16	0.68	1,188.00	--[a]	2
Lohr Pond	7	0.5	8	--[a]	--[a]	--[a]	1.27	0.11	--[a]	2,428.80	--[a]	2
Lucas	78	2.8	15	7	0.87	1.15	2.33	0.20	0.53	1,848.00	43	2
Malloy	5	0.4	24	--[a]	--[a]	0.01	1.28	3.18	--[a]	2,112.00	--[a]	2
Mayer Millpond[c]	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]
Mayfield Pond	8	0.6	4	--[a]	80.72	0.01	1.48	0.29	0.83	1,056.00	--[a]	2
McConville	14	0.8	37	20	2.4	0.42	1.52	1.56	0.70	1,056.00	--[a]	2
Miller	3	--[a]	16	--[a]	--[a]	--[a]	1.32	0.37	--[a]	348.48	--[a]	2
Mud	5	0.5	10	3	--[a]	--[a]	1.41	0.40	0.63	422.40	--[a]	2
Mud	23	0.8	5	1	--[a]	0.02	1.19	0.43	--[a]	1,214.40	--[a]	2
Mueller	14	0.5	33	15	--[a]	--[a]	1.20	0.56	--[a]	699.60	--[a]	2
Murphy	16	0.7	37	--[a]	2.4	0.42	1.24	0.71	0.70	410.67	--[a]	2

Table 40 (continued)

Lake	Surface Acres	Shoreline Miles	Maximum Depth (feet)	Mean Depth (feet)	Flushing Rate (years)	Retention Time (years)	Shoreline Development Factor	Ratio: Number of Parcels to Lake Surface Area	Ratio: Lake Total Drainage Area to Potential Land Use	Ratio: Shoreline Length to Number of Homes	Trophic State Index (TSI)	Fisheries Classification Rank
Newburg Pond	7	1.0	8	2	640.52	0.01	2.78	0.25	0.67	1,087.68	--[a]	2
Pike	522	3.8	45	5	0.25	4.03	1.19	0.17	0.61	155.53	52	2
Proschinger	6	0.4	23	4	7.19	0.14	1.19	0.14	0.69	2,164.80	--[a]	2
Quaas	7	0.5	12	5	15.67	0.06	1.07	0.40	0.65	2,112.00	--[a]	2
Radtke	10	0.5	14	7	7.19	0.14	1.12	0.38	0.69	660.00	--[a]	2
Rockfield Quarry Pond	3	0.3	27	>18	--[a]	--[a]	1.20	1.50	--[a]	1,425.60	--[a]	2
Silver	118	2.7	47	20	0.1	4.47	1.70	0.35	0.18	77.12	44	2
Smith	86	1.7	5	3	1.79	0.56	1.38	0.67	0.63	332.44	49	2
Tily	13	0.5	48	24	1.13	0.89	1.03	0.34	0.69	330.00	--[a]	2
Twelve	53	1.3	20	6	0.74	1.35	1.05	0.25	0.66	305.68	45	2
Wallace	52	1.2	35	11	0.32	3.16	1.72	1.78	0.53	71.19	59	2
Werner Pond	9	0.7	8	--[a]	--[a]	--[a]	1.66	0.33	--[a]	1,232.00	--[a]	2
West Bend Millpond[d]	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]

[a] *No data available.*

[b] *Indicates lakes listed under NR 102 Outstanding Resource Waters (ORW) or Exceptional Resource Waters (ERW), or Class I or Class II Trout Streams by the Wisconsin Department of Natural Resources.*

[c] *The dam that created Mayer Millpond was removed.*

[d] *The dam that created West Bend Millpond was reomoved.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Table 41

CORRELATION BETWEEN ALL AVAILABLE DATA FOR LAKES WITHIN WASHINGTON COUNTY

Item	Surface Area (acres)	Maximum Depth (feet)	Retention Time (years)	Trophic State Index	Ratio: Shoreline Length to Number of Homes	Shoreline Development Factor	Fisheries Significance
Surface Area (acres)	1.00	- -	- -	- -	- -	- -	- -
Maximum Depth (feet)	0.72	1.00	- -	- -	- -	- -	- -
Retention Time (years)	0.61	0.62	1.00	- -	- -	- -	- -
Trophic State Index.........	-0.15	-0.19	-0.07	1.00	- -	- -	- -
Ratio: Shoreline Length to Number of Homes	-0.09	-0.12	-0.02	-0.11	1.00	- -	- -
Shoreline Development Factor.........................	0.20	-0.03	0.20	-0.99	0.43	1.00	- -
Fisheries Significance......	0.40	0.32	0.49	0.00	-0.11	0.24	1.00

Source: SEWRPC.

As previously noted, the relationships between the physical characteristics of waterbodies within Washington County are very strong. For example, surface area and maximum depth are about 70 percent correlative. Likewise, maximum depth is about 60 percent correlative with retention time. Although there are many positive correlations between physical characteristics, negative correlations are also present. For example, maximum depth and TSI have a negative correlation factor of about 15 percent, indicating that the larger values of the one parameter are associated with the smaller values of the other. Likewise, the correlation factor between TSI and shoreline development factor is also negative and about 99 percent. Notwithstanding the relationships between physical and chemical water quality indicators, the relationships between physical and biological indicators are generally positively correlated. The correlation between surface area and fisheries significance is about 40 percent. Other notable examples include the correlations between retention time and fisheries significance, which is about 50 percent, and maximum depth and fisheries significance, which is about 30 percent.

Some of the relationships indicated are relatively weak. For example, the ratio of the number of platted lots to the surface area of a lake is less strongly correlated to criteria like surface area, maximum depth, and retention time than it is to the shoreline development factor. In effect, the relationship between shoreline development factor and the ratio of number of parcels per surface acre of lake are statistically similar. Thus, the similarities between the criteria can focus of the lake classification system by identifying key criteria to be considered in developing a lake classification system that is relevant and unique to Washington County. The interrelationships between criteria suggest that the criteria adopted for use in the classification of waterbodies in Washington County could be rather narrowly focused.

Streams

Table 42 shows the information gathered and used in these analyses. Correlations between all available data were computed to determine the overall interrelatedness of the data used in the classification process. These correlations create a basis upon which to determine a classification scheme for streams in Washington County. Table 43 illustrates the correlations between the available data for streams in Washington County.

As previously noted, the relationships between the characteristics of streams within Washington County are strong. For example, the correlation between stream length and drainage area is about 90 percent. Other notable examples include correlations of about 80 percent between surface area and average width and between surface area and average depth. There are generally strong positive correlations between most of the physical characteristics measured, although there was almost no correlation between the ratio of width to depth and average depth. The correlation between these two measures was negative and less than 10 percent. With this exception, there were few negative correlations.

Table 42

DATA COLLECTED FOR STREAMS WITHIN WASHINGTON COUNTY

Stream or Watercourse	Length (miles)	Average Width (feet)	Average Depth (feet)	Width/Depth Ratio (acres)	Surface Area (acres)	Drainage Area (square miles)
Allenton Creek	2.5	6	1.04	5.77	1.8	4.5
Ashippun River	9.6	11	1.25	8.80	12.8	18.5
Bark River	2.5	12	1.50	8.00	3.6	19.0
Cedar Creek	15.8	32	1.75	18.29	61.3	93.0
Cedarburg Creek	3.0	7	1.25	5.60	2.5	5.0
Coney River	6.2	2	0.33	6.06	1.5	9.5
East Branch Milwaukee River	6.0	42	2.00	21.00	30.5	4.0
East Branch Rock River	15.5	33	2.00	16.50	62.0	58.5
Engmon Creek	1.5	5	0.50	10.00	0.9	1.0
Erler Lake Outlet	1.3	10	1.25	8.00	1.6	1.5
Evergreen Creek[a]	4.9	4	0.17	23.53	2.4	7.0
Flynn Creek[a]	4.5	12	0.85	14.12	6.6	5.5
Junk Creek	0.8	3	0.50	6.00	0.3	1.0
Kewaskum Creek	6.4	12	0.85	14.12	9.3	11.0
Kohlsville River[a]	7.9	12	1.00	12.00	11.5	21.5
Kressin Branch	4.7	12	2.00	6.00	6.8	6.0
Lehner Lake Outlet[a]	2.0	7	0.85	8.24	1.7	2.0
Limestone Creek	5.8	17	0.70	24.29	12.0	10.0
Little Cedar Creek	6.0	9	0.67	13.43	6.5	16.0
Little Oconomowoc River	2.5	13	0.85	15.29	3.9	9.0
Mason Creek	1.7	4	0.50	8.00	0.8	3.5
Meadow Brook Creek	1.0	20	1.00	20.00	2.4	4.0
Menomonee River	6.2	18	1.85	9.73	13.5	33.0
Milwaukee River	25.8	83	1.50	55.33	259.5	130.0
Myra Creek	2.6	6	0.55	10.91	2.6	2.5
Nolan Creek	1.4	10	0.55	18.18	1.7	4.0
North Branch Cedar Creek	6.3	10	1.00	10.00	7.6	11.5
North Branch Milwaukee River	8.3	53	4.00	13.25	53.3	41.0
Oconomowoc River	9.1	15	1.30	11.54	16.5	48.5
Polk Springs Creek	1.6	- -	- -	- -	3.7	2.0
Quaas Creek	5.9	11	0.67	16.42	7.9	7.5
Rubicon River[b]	5.7	17	1.17	14.53	11.7	28.5
Silver Creek	4.0	9	0.50	18.00	4.4	8.0
Stony Creek	9.4	11	0.55	20.00	12.5	16.0
Wallace Creek	8.6	12	1.30	9.23	12.5	15.0
Wayne Creek[b]	5.6	9	0.67	13.43	6.1	9.5
West Branch Menomonee River	2.0	8	0.50	16.00	1.9	5.5
West Branch Milwaukee River	4.5	8	0.50	16.00	4.4	13.0
Willow Creek	2.3	12	0.50	24.00	3.3	4.5

[a]*Indicates streams and watercourses placed on the 303(d) list by the Wisconsin Department of Natural Resources as waters not in attainment of current water quality standards.*

[b]*Indicates streams and watercourses listed under NR 104 as variance waters by the Wisconsin Department of Natural Resources.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

ALTERNATIVE CLASSIFICATION SYSTEMS

Eight alternatives for the classification of waterbodies in Washington County were identified. These alternatives are set forth and described below. The advantages and disadvantages of each alternative are presented, and examples of waters classed using each of these alternative classification systems are provided.

Alternative I: Status Quo

Under this alternative, the current, basic ordinance requirements for the protection of lakes and streams would be maintained. However, some modification of the current requirements may be considered, such as the elimination

Table 43

CORRELATION BETWEEN ALL AVAILABLE DATA FOR STREAMS WITHIN WASHINGTON COUNTY

Item	Stream Length (miles)	Average Width (feet)	Average Depth (feet)	Width to Depth Ratio	Surface Area (acres)	Total Drainage Area (square miles)
Stream Length (miles)	1.00	- -	- -	- -	- -	- -
Average Width (feet)	0.77	1.00	- -	- -	- -	- -
Average Depth (feet)	0.38	0.65	1.00	- -	- -	- -
Width to Depth Ratio	0.63	0.77	-0.00	1.00	- -	- -
Surface Area (acres)	0.27	0.82	0.78	0.16	1.00	- -
Total Drainage Area (square miles)	0.92	0.80	0.44	0.61	0.39	1.00

Source: SEWRPC.

of set back averaging. Other implementation and administrative factors may also be revisited. Under this alternative, all lakes and streams would be in a single class for zoning purposes, even though the Wisconsin Department of Natural Resources may have differentiating classifications assigned pursuant to Chapter NR 104 of the *Wisconsin Administrative Code.*

Positive aspects of this alternative are that implementation of the program is facilitated under the existing administrative structure of the County. Refinements of the *status quo* may be easily understood by the general public, as well as by the administrators of the policy. The County ordinance would not require significant amendment to incorporate the new policy initiatives, and the waters within Washington County stand to potentially benefit from the more effective administration of a familiar management tool. The application of a uniform approach reduces the possibility of erroneous application of standards and human error. Maintaining the *status quo* also reduces the potential for opposition due to changes in the Code.

Negative aspects of this system include maintaining the existing inconsistencies between waterbody condition and the Washington County Code. These inconsistencies arise from current conditions that reflect historic land and lake uses, and conflicting visions of appropriate land and lake uses among communities and municipal entities. The inconsistencies inherent in the existing system would be carried forward into the classification process, limiting the ability of the system to assimilate new entrants into the regulatory arena in a meaningful manner.

As the waterbody classification project was initiated and publicly supported based upon the desire of the citizenry to refine the existing standards to make them more site-specific in their application, the Washington County Code Revision Working Group determined that this alternative would not be recommended for further consideration.

Alternative II: Single-Criterion Method

This alternative uses a single criterion to discriminate between classes of waterbodies. Based on the analysis of the available data on Washington County surface waters, these criteria have been identified. In the case of lakes, this criterion is maximum depth, while, in the case of the streams, this criterion is average width. The measurement of maximum lake depth is taken at "normal" lake levels, and, likewise, the measurement of stream width is taken at normal flow levels. Three classes of waters were defined under this system using categories defined by statistical analysis of the available data. The classes are defined by the 25 percent and 75 percent quartiles of the frequency distributions of lake depth and stream width reported for the County, with the shallow lakes and narrow streams, typically headwater lakes and streams, being proposed for protection. Class I waters are proposed to be provided with the highest level of protection under this alternative, while Class III waters are proposed to be provided with a lower level of protection. The data presented in Tables 44 and 45 present examples of waterbodies classified under this system.

Table 44

EXAMPLES OF WASHINGTON COUNTY LAKES CLASSIFIED USING THE SINGLE-CRITERION ALTERNATIVE

Lake	Maximum Depth (feet)	Class Rank[a]
Amy Bell	34	2
Big Cedar	105	3
Erler	34	2
Green	37	2
Lucas	15	1
Pike	45	2

[a]*Class I lakes are lakes with a maximum depth of less than 15 feet, Class II lakes are lakes with a maximum depth of 15 to 40 feet, and Class III lakes are lakes with a maximum depth of greater than 40 feet.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Table 45

EXAMPLES OF WASHINGTON COUNTY STREAMS CLASSIFIED USING THE SINGLE-CRITERION ALTERNATIVE

Streams	Average Width (feet)	Class Rank[a]
Cedar Creek	32	3
East Branch Milwaukee River	42	3
Menomonee River	18	3
Oconomowoc River	15	2
Quaas Creek	11	2
Wayne Creek	9	2

[a]*Class I streams are streams with an average width of less than eight feet, Class II streams are streams with an average width of eight to 16 feet, and Class III streams are streams with an average width of greater than 16 feet.*

Source: Wisconsin Department of Natural Resources and SEWRPC.

Positive aspects of this alternative include its easily understandable nature, its defensibility, its ability to assimilate new entrants into the classification system based upon a measurement that is relatively insensitive to time of year, and its efficiency, created by avoiding time consuming and costly field investigations. The correlations between maximum lake depth and average stream width and other physical, chemical, and biological lake and stream attributes underlie this alternative. The method could be easily explained in a chart or table showing the criteria and the correlation between the data presented. This system would facilitate incorporation of new entrants into the system, with the classification of individual waters being done on a site-specific basis. Field investigations for data collection could be completed easily at almost any time of the year. Timely and precise responses to permit applications could be provided as a result. From an administrative perspective, the simplicity of this method promotes efficiency and understanding and provides ready answers to questions that may arise from stakeholders, enhancing the ability of the County to respond to citizen concerns.

Negative aspects of this system include the limitations inherent in taking physical measurements only. This limits the consideration of biological and chemical aspects of lakes and streams in the classification process. In addition, factors, such as flushing rate or water residence time, are not well or explicitly reflected in the analysis. This may limit the ability of this system to adequately recognize waters of exceptional water quality and biological community composition.

Because of the lack of specific consideration of water quality and biological communities, the Washington County Code Revision Working Group determined that this alternative would not be recommended for further consideration.

Alternative III: Single-Class Method

Under this alternative, all waterbodies are placed into a single class. A refinement of this single-class approach would apply regulations based upon the type of aquatic system being regulated; namely, lakes, streams, or wetlands. In many respects, this alternative is a refinement of the *status quo*, recognizing the value of all waters in Washington County and providing intensified, but equal, protection of all waters under the law. The classification of waters under this alternative would be facilitated.

Positive aspects of this alternative include the fact that field investigations to determine the class rank of the waters would not be required and its similarity to the currently adopted ordinance and regulatory framework, making this alternative easy to implement and administer in the County. Despite being similar to the current regulatory framework, this alternative is envisioned as limiting the granting of variances, encouraging, instead, a consistent, across-the-board treatment of the surface water resources of the County.

Negative aspects of this alternative include potential inflexibility and the lack of enforcement by the regulatory agency. This alternative would also be subject to question by the public in situations where public opinion might indicate either too much or too little protection being afforded to specific waterbodies. Such a situation could polarize public opinion and may contribute to a loss of credibility, in addition to poor or selective enforcement. While this system would strengthen the protections of all waters in the County, it suffers from a lack of site-specificity. Tables 46 and 47 present examples of waterbodies classified under this alternative.

As the waterbody classification project was initiated and publicly supported based upon the desire of the citizenry to make zoning standards more site-specific in their application, the Washington County Code Revision Working Group determined that this alternative would not be recommended for further consideration.

Alternative IV: Selected-Criteria Method

This alternative uses multiple criteria to discriminate between classes of waterbodies. However, not all of the statutory criteria are utilized for this purpose. Based upon an analysis of the available data for Washington County waterbodies, specific criteria that best reflect the distinguishing characteristics of the waterbodies in the County are proposed to be used to discriminate between classes. Based upon a review of the data presented above, six criteria were identified as a basis for determining lake class: lake surface area; shoreline development factor; water residence time or flushing rate as determined using the Wisconsin Lake Management Spreadsheet model, WILMS; the lakeshore development index or average shoreline length per platted lot; the maximum depth of the lake; and the type of fishes present, coldwater fishes, threatened or endangered species and species of special concern, or warmwater sportfishes. Three criteria were identified as a basis for determining stream class: average width; depth; and type of fishes present, coldwater fishes, threatened or endangered species and species of special concern, or warmwater sportfishes. Tables 48 and 49 present examples of waterbodies classified under this alternative.

Under this alternative, relevant criteria were selected from the list of criteria outlined in Section 281.69(5)(b), *Wisconsin Statutes*. These criteria were assigned point scores based upon the characteristics of Washington County waterbodies. Points were then awarded to each waterbody based upon the reported physical, biological, and chemical characteristics of that waterbody. The class rank of each waterbody was determined by the aggregate score. The criteria selected more narrowly focus the classification system on the specific characteristics of waters in Washington County than the more general list of physical, chemical, and biological characteristics required to be considered by the *Statutes*. Characteristics considered to be most relevant to Washington County by the Washington County Code Revision Working Group included: surface area, maximum depth, retention time, shoreline development factor, the ratio of shoreline length to number of platted lots, and fisheries significance.

Points were awarded to waterbodies based upon a three-point scale, with the highest point values being awarded to those waterbody classes considered to require the highest levels of protection under ordinance. For each criterion, point scores were assigned on the basis of the statistical analysis of the data. For purposes of this system, three classes were established based upon ranges determined by either the mean value of the criterion within the Washington County data set, plus or minus the standard deviation of the criterion, or the division of the data set based on quartile ranges. The selection of the particular method of analysis was determined by the range of the data. As noted, classification of a waterbody under this system was based upon the total point scores for each waterbody. Class I waters were considered to be those waters falling into the 90th percentile or greater. Class II waters were considered to be those waters falling between the 60th and 90th percentiles. Class III waters were considered to be those waters falling below the 60th percentile. Class I waters are proposed to be provided with the highest level of protection under this alternative, while Class III waters are proposed to be provided with a lower level of protection.

Table 46

EXAMPLES OF WASHINGTON COUNTY LAKES CLASSIFIED USING THE SINGLE-CLASS ALTERNATIVE

Lake	Class Rank
Amy Bell	Lake
Big Cedar	Lake
Erler	Lake
Green	Lake
Lucas	Lake
Pike	Lake

Source: SEWRPC.

Table 47

EXAMPLES OF WASHINGTON COUNTY STREAMS CLASSIFIED USING THE SINGLE-CLASS ALTERNATIVE

Stream	Class Rank
Cedar Creek	Stream
East Branch Milwaukee River	Stream
Menomonee River	Stream
Oconomowoc River	Stream
Quaas Creek	Stream
Wayne Creek	Stream

Source: SEWRPC.

Table 48

EXAMPLES OF WASHINGTON COUNTY LAKES CLASSIFIED USING THE SELECTED-CRITERIA ALTERNATIVE

Lake	Surface Area Score[a]	Maximum Depth Score[b]	Retention Time Score[c]	Shoreline Development Factor Score[d]	Shoreline Length: Platted Lots Score[e]	Fisheries Significance Score[f]	Total Score[g]	Class Rank[h]
Amy Bell	2	2	1	2	2	1	10	3
Big Cedar	1	1	1	3	1	3	10	3
Erler	2	2	2	1	2	2	11	3
Green	1	2	1	2	2	2	10	3
Lucas	1	2	1	3	3	2	12	2
Pike	1	2	1	1	2	2	9	3

[a]*Surface area point score criteria: three points for lakes with less than 10 acres of surface area; two points for lakes with 10 to 50 acres; and one point for lakes with greater than 50 acres of surface area.*

[b]*Maximum depth point score criteria: three points for lakes with a maximum depth of greater than 50 feet; two points for lakes with 10 to 50 feet; and one point for lakes with less than 10 feet maximum depth.*

[c]*Retention time point score criteria: three points for lakes with greater than one-year retention time; two points for lakes with 0.02- to one-year retention time; and one point for lakes with less than 0.02-year retention time.*

[d]*Shoreline development factor (SDF) point score criteria: three points for lakes with an SDF of greater than 1.75; two points for lakes with an SDF of 1.25 to 1.75; and one point for lakes with an SDF of less than 1.25.*

[e]*Ratio of shoreline length:number of platted lots point score criteria: three points for lakes with a ratio of less than 0.02; two points for lakes with a ratio of 0.02 to 0.75; and one point for lakes with a ratio of greater than 0.75.*

[f]*Fisheries significance point score criteria: three points for fisheries with existing or potential coldwater species; two points for fisheries with endangered, threatened, and species of special concern; and one point for warmwater sport fisheries.*

[g]*Total point score equals the aggregate of all point scores for each specific lake.*

[h]*Class rank is determined on a scale of 16 to 18 as Class I waters; 12 to 15 as Class II waters; and less than 12 as Class III waters.*

Source: SEWRPC.

Table 49

EXAMPLES OF WASHINGTON COUNTY STREAMS CLASSIFIED USING THE SELECTED-CRITERIA ALTERNATIVE

Streams	Average Width Score[a]	Average Depth Score[b]	Fisheries Significance Score[c]	Total Score[d]	Class Rank[e]
Stony Creek	2	3	3	8	1
Allenton Creek	3	2	3	8	1
Oconomowoc River	2	2	3	7	2
Rubicon River	1	2	3	6	2
East Branch Rock River	1	1	3	5	3
Cedar Creek	1	1	3	5	3

[a]*Average width point score criteria: three points for streams with an average width of less than eight feet; two points for streams with an average width of eight to 16 feet; and one point for streams with an average width of greater than 16 feet.*

[b]*Average depth point score criteria: three points for streams with an average depth of less than 0.6 foot; two points for streams with an average depth of 0.6 to 1.4 feet; and one point for streams with an average depth of greater than 1.4 feet.*

[c]*Fisheries significance point score criteria: three points for streams with listed under NR 102,* Wisconsin Administrative Code *as outstanding and exceptional resource waters and trout fisheries within Washington County per the Department of Natural Resources trout fishing regulations for 2000 to 2001 and two points for waters classified as warmwater sport fish.*

[d]*Total point score equals the aggregate of all point scores for each stream.*

[e]*Class rank is determined on a scale of eight to nine as Class I waters; seven as Class II waters; and less than seven as Class III waters.*

Source: SEWRPC.

Positive aspects of this alternative include inclusion of additional physical, biological, and chemical data not included in any of the aforementioned alternatives. This alternative, therefore, better addresses the capacity of a waterbody to assimilate point and nonpoint source pollutants without being considered degraded.

Negative aspects of this alternative include the indirect weighting of the criteria. The metrics selected for use in this alternative are inherently weighted as a consequence of being selected from a pool of criteria available for use in the analysis. For example, the selection of shoreline development factor as a criterion, rather than of the ratio of length of shoreline miles to the number of platted lots abutting the shoreline, may influence the aggregate score and shift a waterbody between classes. However, analysis of the available data has shown that the outcomes of this analysis were within an acceptable degree of statistical significance.

The Washington County Code Revision Working Group determined that this alternative should be considered further in the determination of a Washington County waterbody classification system.

Alternative V: Weighted Selected-Criteria Method

Under this alternative, multiple criteria are used to discriminate between classes of waterbodies. As in Alternative IV, not all of the statutory criteria are utilized for this purpose. This system can be differentiated from that in Alternative IV on the basis of the weighting given to specific components of the classification scheme that reflects the relative importance of each criterion within Washington County. For example, because of concerns regarding the development of lakefront properties, additional weighting could be attached to the criterion used to assess the sensitivity of the waterbody to development, with that factor being weighted by a factor of two or three relative to the other criteria used. The worked example below shows the effect of weighting shoreline development factor relative to the other criteria used in this alternative. Specific criteria that best reflect the distinguishing characteristics of the waterbodies in the County, based upon a review of the available data for Washington County, could be used to discriminate between classes of waterbodies. Tables 50 and 51 present examples of waterbodies classified under this alternative.

Points are awarded to waterbodies based upon a three-point scale. Certain point totals are augmented by granting the criteria which they represent additional weight; for selected criteria, the point total would be multiplied by a factor or two or three. These adjusted scores are then summed to obtain a total point score for the waterbody. In a variation of this methodology, score are totaled by category, based upon physical, chemical, and biological criteria categories, which are then weighted to produce an aggregate score. In both schemes, the total number of points is summed to establish the waterbody class. Classes were assigned based upon a statistical analysis of the total scores determined, with each of three classes being defined by the quartile ranges of the data set. Class I waters are proposed to be provided with the highest level of protection under this alternative, while Class III waters are proposed to be provided with a lower level of protection.

Positive aspects of this alternative include the ability of generate scores that more closely resemble the value placed upon waterbodies within the County. For example, by weighting the scores for biological criteria, this alternative can better reflect the value placed by communities on WDNR-designated trout streams, outstanding or exceptional resources waters, or waters containing threatened and endangered species. Likewise, by weighting the scores for chemical criteria, additional weight can be given to high quality waters in the County.

Negative aspects of this alternative include the subjective nature of the weighting system, which compounds the weighting already introduced into the system through the choice of criteria from among those required to be considered pursuant to Section 281.69(5), *Wisconsin Statutes*. The subjective nature of the weighting skews the analysis in favor of a selected criterion or set of criteria.

Given the subjectivity, and the compounding influence inherent in the weighting and selection of criteria, the Washington County Code Revision Working Group determined that this alternative would not be recommended for further consideration.

Alternative VI: Multi-Criteria Method

This alternative uses the totality of available data to discriminate between classes of waterbodies. Where specific data are not available, default values, generally considered to be the most restrictive, are used in lieu of site-specific rankings. This system would place waterbodies into the most protective class in the absence of data. Waterbodies for which data are available are classed based upon their physical, chemical, and biological characteristics. This alternative employs all seven of the statutorily identified variables, pursuant to Section 281.69(5), *Wisconsin Statues*. Tables 52 and 53 present examples of waterbodies classified under this alternative.

Points are awarded to waterbodies based upon a three-point scale. These point scores are summed and an aggregate total is calculated to determine the class ranking of a particular waterbody. Weighting occurs when default values are entered in the absence of data on a given waterbody. These values are generally the values that would result in the more restrictive classification, but they also could be the mean value or middle value score. In the case of the example set forth in Tables 52 and 53, the middle value score of "2" was used. As in previous alternatives, Class I waters are proposed to be provided with the highest level of protection under this alternative, while Class III waters are proposed to be provided with a lower level of protection.

Positive aspects of this alternative include the comprehensive utilization of available data on the biological, chemical, and physical characteristics of the waterbodies, and the inclusion of all seven of the statutory criteria. The utilization of a comprehensive data set in the determination of waterbody class under this alternative ensures that the regulatory approach adopted is based upon as full an understanding of the resource being regulated as possible. Both the stakeholders, as well as the regulators implementing regulations pursuant to this classification system, would be required to have in-depth knowledge of the system being regulated.

Table 50

EXAMPLES OF WASHINGTON COUNTY LAKES CLASSIFIED USING THE WEIGHTED SELECTED-CRITERIA ALTERNATIVE

Lake	Surface Area Weighted Score[a]	Maximum Depth Weighted Score[b]	Retention Time Weighted Score[c]	Shoreline Development Factor Weighted Score[d]	Shoreline Length: Platted Lots Weighted Score[e]	Fisheries Significance Weighted Score[f]	Total Weighted Score[g]	Class Rank[h]
Amy Bell	2	2	1	4	2	1	12	2
Big Cedar	1	1	1	6	1	3	13	2
Erler	2	2	2	2	2	2	12	2
Green	1	2	1	4	2	2	12	2
Lucas	1	2	1	6	3	2	15	1
Pike	1	2	1	2	2	2	10	3

[a] *Surface area point score criteria: three points for lakes with less than 10 acres of surface area; two points for lakes with 10 to 50 acres; and one point for lakes with greater than 50 acres of surface area.*

[b] *Maximum depth point score criteria: three points for lakes with a maximum depth of greater than 50 feet; two points for lakes with 10 to 50 feet; and one point for lakes with less than 10 feet maximum depth.*

[c] *Retention time point score criteria: three points for lakes with greater than one-year retention time; two points for lakes with 0.02- to one-year retention time; and one point for lakes with less than 0.02 year retention time.*

[d] *Shoreline development factor (SDF) point score criteria: three points for lakes with an SDF of greater than 1.75; two points for lakes with an SDF of 1.25 to 1.75; and one point for lakes with an SDF of less than 1.25.*

[e] *Ratio of shoreline length: number of platted lots point score criteria: three points for lakes with a ratio of less than 0.02; two points for lakes with a ratio of 0.02 to 0.75; one point for lakes with a ratio of greater than 0.75.*

[f] *Fisheries significance point score criteria: three points for fisheries with existing or potential coldwater species; two points for fisheries with endangered, threatened, and species of special concern; and one point for warmwater sport fisheries.*

[g] *Total point score equals the aggregate of all point scores for each specific lake.*

[h] *Class ranks determined on a scale of 15 to 18 as Class I waters; 12 to 14 as Class II waters; and less than 12 as Class III waters.*

Source: SEWRPC.

Negative aspects of this alternative include the data intensive nature of the scheme requiring extensive and costly field investigations. Depending on the criteria used, systematic inefficiencies, such as cost, the need for multiple field investigations, and need for a variety of analytical tools, would make this alternative unwieldy to use in practice. It would impose significant difficulties on staff and citizens bringing previously unclassified waters into the system.

The influence of the physical characteristics of the waterbodies introduced through the use of all seven statutory criteria resulted in a weighting of these parameters that essentially created a two-class system that was not consistent with the three-class system adopted by the Washington County Code Revision Working Group. Hence, the Washington County Code Revision Working Group determined that this alternative would not be recommended for further consideration.

Table 51

EXAMPLES OF WASHINGTON COUNTY STREAMS CLASSIFIED USING THE WEIGHTED SELECTED-CRITERIA ALTERNATIVE

Streams	Average Width Weighted Score[a]	Average Depth Weighted Score[b]	Fisheries Significance Weighted Score[c]	Total Weighted Score[d]	Class Rank[e]
Allenton Creek	6	2	3	11	1
Stony Creek	4	3	3	10	1
Oconomowoc River	4	2	3	9	2
Rubicon River	2	2	3	7	2
East Branch Rock River	2	1	3	6	3
Cedar Creek	2	1	3	6	3

[a]*Average width point score criteria: three points for streams with an average width of less than eight feet; two points for streams with an average width of eight to 16 feet; and one point for streams with an average width of greater than 16 feet.*

[b]*Average depth point score criteria: three points for streams with an average depth of less than 0.6 foot; two points for streams with an average depth of 0.6 to 1.4 feet; and one point for streams with an average depth of greater than 1.4 feet.*

[c]*Fisheries significance point score criteria: three points for streams with listed under NR 102,* Wisconsin Administrative Code *as outstanding and exceptional resource waters and trout fisheries within Washington County per the Department of Natural Resources trout fishing regulations for 2000 to 2001; and two points for waters classified as warmwater sport fish.*

[d]*Total point score equals the aggregate of all point scores for each specific stream.*

[e]*Class rank is determined on a scale of nine to 12 as Class I waters; four to eight as Class II waters; and less than four as Class III waters.*

Source: SEWRPC.

Alternative VII: Weighted Multi-Criteria Method

This alternative is similar to Alternative VI in that it uses the totality of available data to discriminate between classes of waterbodies. Likewise, where data are not available, a default value is used in lieu of a site-specific score. As with Alternative VI, this system would place waterbodies into the most protective class in the absence of data, while waterbodies for which data are available would be classified based upon their physical, chemical, and biological characteristics. This system can be differentiated from that in Alternative VI on the basis of certain physical, chemical, or biological components of the classification scheme being given unequal weights, reflecting additional societal values considered with respect to certain waterbody characteristics. Each of the three characteristic types, physical, biological, and chemical, could be individually weighted or weighted as a group, in a similar manner as weights were assigned in Alternative V. Points are awarded based upon a three-point scale, with classes being distinguished based upon the quartile ranges of the data set. As in previous alternatives, Class I waters are proposed to be provided with the highest level of protection under this alternative, while Class III waters are proposed to be provided with a lower level of protection. Tables 54 and 55 present examples of waterbodies classified under this alternative.

Positive aspects of this alternative include consideration of all seven statutory criteria. The ability to weight the individual waterbody characteristics to reflect societal values can enhance community acceptance of this

Table 52

EXAMPLES OF WASHINGTON COUNTY LAKES CLASSIFIED USING THE MULTI-CRITERIA ALTERNATIVE

	Physical Characteristics					Chemical Characteristics	Biological Characteristics		
Lake	Surface Area Score[a]	Maximum Depth Score[b]	Retention Time Score[c]	Shoreline Development Factor Score[d]	Shoreline Length: Platted Lots Score[e]	Trophic State Index (TSI) Score[f]	Fisheries Significance Score[g]	Total Score[h]	Class Rank[i]
Amy Bell	2	2	1	2	2	2[j]	1	12	3
Big Cedar	1	1	1	3	1	2	3	12	3
Erler	2	2	2	1	2	2[j]	2	13	2
Green	1	2	1	2	2	2	2	12	3
Lucas	1	2	1	3	3	3	2	14	2
Pike	1	2	1	1	2	1	2	11	3

[a]*Surface area point score criteria: three points for lakes with less than 10 acres of surface area; two points for lakes with 10 to 50 acres; and one point for lakes with greater than 50 acres of surface area.*

[b]*Maximum depth point score criteria: three points for lakes with a maximum depth of greater than 50 feet; two points for lakes with 10 to 50 feet; and one point for lakes with less than 10 feet maximum depth.*

[c]*Retention time point score criteria: three points for lakes with greater than one-year retention time; two points for lakes with 0.02- to one-year retention time; and one point for lakes with less than 0.02 year retention time.*

[d]*Shoreline development factor (SDF) point score criteria: three points for lakes with an SDF of greater than 1.75; two points for lakes with an SDF of 1.25 to 1.75; and one point for lakes with an SDF of less than 1.25.*

[e]*Ratio of shoreline length: number of platted lots point score criteria: three points for lakes with a ratio of less than 0.02; two points for lakes with a ratio of 0.02 to 0.75; one point for lakes with a ratio of greater than 0.75.*

[f]*Trophic State Index (Carlson Index)(TSI) point score criteria: three points for lakes with a TSI of less than 43; two points for lakes with a TSI of 44 to 49; one point for lakes with a TSI of greater than 50.*

[g]*Fisheries significance point score criteria: three points for fisheries with existing or potential coldwater species; two points for fisheries with endangered, threatened, and species of special concern; and one point for warmwater sport fisheries.*

[h]*Total point score equals the aggregate of all point scores for each specific lake.*

[i]*Class ranks determined on a scale of 18 to 21 as Class I waters; 13 to 17 as Class II waters; and less than 13 as Class III waters.*

[j]*Default values assessed to missing data.*

Source: SEWRPC.

alternative. Likewise, weighting can also reflect the value placed by communities on WDNR-designated trout streams, exceptional or outstanding resource waters of the State, or waters containing threatened or endangered species.

Negative aspects include the indirect and direct weighting of criteria, exacerbated in part by the use of default values in the absence of quantitative data on specific waterbodies, skewing the analysis. Indirect weighting occurs as a consequence of the more numerous physical attributes of waters contained within the statutory criteria. Direct weighting of individual criteria occurs through the more overt award of additional point values to those criteria perceived to be of greater importance, or to the aggregate total of the points for a given waterbody, in the assignment of the total score used to determine the class rank. For example, by weighting the score of the shoreline development factor by a factor of two or three, more waterbodies would fall into Class II and fewer into

Table 53

EXAMPLES OF WASHINGTON COUNTY STREAMS CLASSIFIED USING THE MULTI-CRITERIA ALTERNATIVE

Streams	Physical Characteristics			Biological Characteristics		
	Stream Length Score[a]	Average Width Score[b]	Average Depth Score[c]	Fisheries Significance Score[d]	Total Score[e]	Class Rank[f]
Allenton Creek	2	3	2	3	10	1
Stony Creek	1	2	3	3	9	1
Oconomowoc River	1	2	2	3	8	2
Rubicon River	2	1	2	3	8	2
East Branch Rock River	1	1	1	3	6	3
Cedar Creek	1	1	1	3	6	3

[a] *Stream length point score criteria: three points for streams with a total length of less than two miles; two points for streams with a stream length of 2.1 to seven miles; and one point for streams with a stream length of greater than seven miles.*

[b] *Average width point score criteria: three points for streams with an average width of less than eight feet; two points for streams with an average width of eight to 16 feet; and one point for streams with an average width of greater than 16 feet.*

[c] *Average depth point score criteria: three points for streams with an average depth of less than 0.6 foot; two points for streams with an average depth of 0.6 to 1.4 feet; and one point for streams with an average depth of greater than 1.4 feet.*

[d] *Fisheries significance point score criteria: three points for streams with listed under NR 102,* Wisconsin Administrative Code *as outstanding and exceptional resource waters and trout fisheries within Washington County per the Department of Natural Resources trout fishing regulations for 2000 to 2001; and two points for waters classified as warmwater sport fish.*

[e] *Total point score equals the aggregate of all point scores for each stream.*

[f] *Class rank is determined on a scale of nine to 12 as Class I waters; eight to nine as Class II waters; and less than eight as Class III waters.*

Source: SEWRPC.

Class I or Class III. Also, as previously noted, the use of all seven statutory criteria results in an alternative that is data intensive, increasing the time needed to, and cost involved in, acquire the data needed to rank new entrants to the classification scheme. This would impose significant difficulties on staff and citizens bringing previously unclassified waters into the system.

Given the apparent subjectivity inherent in the weighting and the complexity of the scheme, the Washington County Code Revision Working Group determined that this alternative would not be recommended for further consideration.

Alternative VIII: Waterbody-Specific-Criteria Method

Under this alternative, the seven criteria set forth in Section 281.69(5), *Wisconsin Statutes*, are applied in various combinations and given various weightings dependent upon the specific characteristics of each individual lake or stream segment classified. While this system can reflect the individuality of the waterbodies being classified, and allow for the determination of a classification that recognizes site-specific in-lake or instream differences within individual lakes or stream segments, the means by which classes are assigned lacks statistical rigor and may appear subjective to external observers. In addition, being based upon individually determined rankings, this alternative places a burden upon administrative staff and can be confusing for citizens who may not understand the nuances inherent in different rankings assigned to waterbodies that may appear to be externally identical. This alternative most closely resembles the designation of waters set forth under Chapters NR 102 and NR 104 of the *Wisconsin Administrative Code.*

Given the potential for this scheme to be viewed as subjective, the Washington County Code Revision Working Group determined that this alternative would not be recommended for further consideration.

Table 54

EXAMPLES OF WASHINGTON COUNTY LAKES CLASSIFIED USING THE WEIGHTED MULTI-CRITERIA ALTERNATIVE

	Physical Characteristics					Chemical Characteristics	Biological Characteristics		
Lake	Surface Area Score[a]	Maximum Depth Score[b]	Retention Time Score[c]	Shoreline Development Factor Score[d]	Shoreline Length: Platted Lots Score[e]	Trophic State Index (TSI) Score[f]	Fisheries Significance Score[g]	Total Score[h]	Class Rank[i]
Amy Bell	2	2	1	2	2	2[j]	1	12	3
Big Cedar	1	1	1	3	1	2	3	12	3
Erler	2	2	2	1	2	2[j]	2	13	2
Green	1	2	1	2	2	2	2	12	3
Lucas	1	2	1	3	3	3	2	14	2
Pike	1	2	1	1	2	1	2	11	3

[a]*Surface area point score criteria: three points for lakes with less than 10 acres of surface area; two points for lakes with 10 to 50 acres; and one point for lakes with greater than 50 acres of surface area.*

[b]*Maximum depth point score criteria: three points for lakes with a maximum depth of greater than 50 feet; two points for lakes with 10 to 50 feet; and one point for lakes with less than 10 feet maximum depth.*

[c]*Retention time point score criteria: three points for lakes with greater than one-year retention time; two points for lakes with 0.02- to one-year retention time; and one point for lakes with less than 0.02-year retention time.*

[d]*Shoreline development factor (SDF) point score criteria: three points for lakes with an SDF of greater than 1.75; two points for lakes with an SDF of 1.25 to 1.75; and one point for lakes with an SDF of less than 1.25.*

[e]*Ratio of shoreline length:number of platted lots point score criteria: three points for lakes with a ratio of less than 0.02; two points for lakes with a ratio of 0.02 to 0.75; one point for lakes with a ratio of greater than 0.75.*

[f]*Trophic State Index (Carlson Index)(TSI) point score criteria: three points for lakes with a TSI of less than 43; two points for lakes with a TSI of 44 to 49; one point for lakes with a TSI of greater than 50.*

[g]*Fisheries significance point score criteria: three points for fisheries with existing or potential coldwater species; two points for fisheries with endangered, threatened, and species of special concern; and one point for warmwater sport fisheries.*

[h]*Total point score equals the aggregate of all point scores for each specific lake.*

[i]*Class ranks determined on a scale of 18 to 21 as Class I waters; 13 to 17 as Class II waters; and less than 13 as Class III waters.*

[j]*Default values assessed to missing data.*

Source: SEWRPC.

ADOPTED[20] WATERBODY CLASSIFICATION SYSTEM FOR WASHINGTON COUNTY

The Washington County Code Revision Working Group reviewed the alternatives identified above and selected the alternative that, in their opinion, would best address the needs of Washington County, form the basis for

[20]*For the purposes of this report, the adopted waterbody classification system refers solely to that system recommended by the Washington County Code Revision Working Group for consideration by the Washington County Planning, Conservation and Parks Committee and adoption by the Washington County Board of Supervisors. Use of the term, adopted, does not constitute endorsement by the Washington County Planning, Conservation and Parks Committee nor does it constitute adoption by the Washington County Board of Supervisors. Subsequent to the preparation of this report, a public hearing on the proposed County Code refinements, incorporating waterbody classification as an element of the shoreland-wetland-floodland ordinance of the County, was held during December 2000, the minutes of which are appended hereto as Appendix B. The refined County Code adopted by the Washington County Board of Supervisors as Chapter 23, Shoreland, Wetland and Floodplain Zoning, of the Washington County Code of Ordinances during February 2001.*

Table 55

EXAMPLES OF WASHINGTON COUNTY STREAMS CLASSIFIED USING THE WEIGHTED MULTI-CRITERIA ALTERNATIVE

Streams	Physical Characteristics			Biological Characteristics		
	Stream Length Score[a]	Average Width Score[b]	Average Depth Score[c]	Fisheries Significance Score[d]	Total Score[e]	Class Rank[f]
Allenton Creek	2	3	2	3	10	1
Stony Creek	1	2	3	3	9	1
Oconomowoc River	1	2	2	3	8	2
Rubicon River	2	1	2	3	8	2
East Branch Rock River	1	1	1	6[g]	9[g]	1[g]
Cedar Creek	1	1	1	3	6	3

[a]*Stream length point score criteria: three points for streams with a total length of less than two miles; two points for streams with a stream length of 2.1 to seven miles; and one point for streams with a stream length of greater than seven miles.*

[b]*Average width point score criteria: three points for streams with an average width of less than eight feet; two points for streams with an average width of eight to 16 feet; and one point for streams with an average width of greater than 16 feet.*

[c]*Average depth point score criteria: three points for streams with an average depth of less than 0.6 foot; two points for streams with an average depth of 0.6 to 1.4 feet; and one point for streams with an average depth of greater than 1.4 feet.*

[d]*Fisheries significance point score criteria: three points for streams with listed under NR 102,* Wisconsin Administrative Code *as outstanding and exceptional resource waters and trout fisheries within Washington County per the Department of Natural Resources trout fishing regulations for 2000 to 2001; and two points for waters classified as warmwater sport fish.*

[e]*Total point score equals the aggregate of all point scores for each stream.*

[f]*Class rank is determined on a scale of nine to 12 as Class I waters; eight to nine as Class II waters; and less than eight as Class III waters.*

[g]*Denotes weighted value and subsequent changes in the classification of that stream from Class III to Class I.*

Source: SEWRPC.

ongoing consultations with stakeholders within the lake and stream resident and user communities, and provide the technical and scientific basis for developing ordinance language consistent with the statutory water resource protection goals. Two similar, but resource-specific, classification schemes were selected for classifying lakes and streams within the County. These waterbody classification systems, generally comprised of Alternative IV, are referred to herein as the adopted classification system. Notwithstanding, the adopted classification system is advisory only, and is subject to consideration by the Washington County Planning, Conservation and Parks Committee, whose recommendations with respect to waterbody classification and its incorporation into the Washington County Code are to be provided to the Washington County Board of Supervisors for approval and adoption.

Lakes

At their meeting of May 19, 2000, the Washington County Code Revision Working Group determined that Alternative IV, the selected-criteria method, was the most appropriate basis from which to determine classes of surface waters in Washington County. The criteria chosen by the Washington County Code Revision Working Group for the classification of lakes included both physical characteristics and biological characteristics. Chemical characteristics were not directly represented in the adopted classification system, although they are related, to some extent, to the physical aspects of the waterbodies. The criteria approved by the Washington County Code Revision Working Group include: surface area, maximum depth, retention time, shoreline development factor, the ratio of shoreline length to the number of platted lots, and fisheries significance.

One further biological characteristic was added to these criteria by the Washington County Code Revision Working Group, at their meeting of June 16, 2000. Based upon the adopted natural areas and critical species habitat protection and management plan, adopted by Washington County on December 9, 1997, additional points were awarded to those waterbodies that were wholly encompassed within areas designated as natural area or critical species habitat. This modification recognized current County policy as an additional element in the lake classification process insofar as the highest quality water resources in the County were concerned.

This adopted classification system establishes a classification system that separates lakes into three groups. Class I waters are those lakes to be protected or preserved as high-quality resource waters. These waters are generally small, shallow lakes with a high-quality fishery. These are the lakes that are most susceptible to severe water pollution problems. Class II waters are those lakes to be maintained in a currently good quality. Class III waters, comprising those waterbodies that have been historically heavily developed for residential and recreational use in the County, are those lakes in need of active management. These are generally large, deep waterbodies. Table 56 sets forth the classes into which the named lakes of the County are separated under this scheme.

Streams

At their meeting of June 16, 2000, the Washington County Code Revision Working Group determined that Alternative IV, the selected-criteria method, also was the most appropriate basis from which to determine classes of streams in Washington County. The criteria chosen included physical and biological characteristics, but, as in the case of lakes, did not include water chemistry. The criteria approved by the Washington County Code Revision Working Group include: average depth, average width, and fisheries significance.

This system establishes a classification system that separates streams into three classes. Class I waters are those streams to be protected or preserved as high-quality resource waters. These waters are generally headwater streams with a high-quality fishery and include Class I and Class II trout streams and streams designated as coldwater systems. Class II waters are those streams to be maintained in a currently good quality and include those streams designated as systems containing threatened or endangered species or species of special concern. Class III waters, comprising those streams that have been historically heavily developed for residential use and economic purposes in the County, are those streams in need of active management. Class III streams include those streams designated as warmwater systems. Table 57 sets forth the classes into which the named streams of the County are separated under this scheme. For ease of administration, and upon the advice of Wisconsin Department of Natural Resources staff, the named streams are considered to include all regulated tributary streams within the named stream reach.

Classes of Lakes and Streams

As an initial step in refining the adopted selected criteria classification method, a statistical analysis was undertaken to determine class intervals to be used in the classification scheme. Two methods of statistical analysis were used; the first based upon the standard deviation measured within the data set and the second based upon the distribution of the data as indicated by the 25 percent and 75 percent quartiles:

- In the case of maximum lake depth, three classes were defined based upon the mean value for maximum lake depth calculated for the named lakes in Washington County, plus and minus the standard deviation of the data set: less than 10 feet, 10 to 40 feet, and greater than 40 feet.

- In the case of average stream depth, three classes were defined based upon the quartile distribution of the data set: less than 0.6 foot, 0.6 foot to 1.3 feet, and greater than 1.3 feet.

- In the case of average stream width, three classes were defined based upon the quartile distribution of the data set: less than nine feet, nine to 16 feet, and greater than 16 feet.

Table 56

SELECTED CHARACTERISTICS AND DATA ON LAKES WITHIN WASHINGTON COUNTY FOR USE IN LAKE CLASSIFICATION

Lake	Surface Acres					Maximum Depth					Retention Time					Shoreline Development Factor				
	Surface Acres	Class I <10 Acres	Class II 10-50 Acres	Class III >50 Acres	Total Score	Maximum Depth	Class I <10 Feet	Class II 10-50 Feet	Class III >50 Feet	Total Score	Retention Time (years)	Class I ≤0.02 Years	Class II >0.02-1.0 Years	Class III >1.0 Years	Total Score	Shoreline Developm ent Factor	Class I <1.25	Class II 1.25-1.75	Class III >1.75	Total Score
Allis	9	3	- -	- -	3	34	- -	2	- -	2	- -	- -	- -	- -	2	1.18	1	- -	- -	1
Amy Bell	26	- -	2	- -	2	37	- -	2	- -	2	2.39	- -	- -	1	1	1.28	- -	2	- -	2
Bark	62	- -	- -	1	1	34	- -	2	- -	2	0.40	- -	2	- -	2	1.59	- -	2	- -	2
Beck	16	- -	2	- -	2	8	- -	- -	3	3	0.42	- -	2	- -	2	1.07	1	- -	- -	1
Big Cedar	932	- -	- -	1	1	105	1	- -	- -	1	5.52	- -	- -	1	1	2.57	- -	- -	3	3
Boltonville Millpond	10	- -	2	- -	2	10	- -	2	- -	2	- -	- -	- -	- -	2	- -	- -	- -	- -	2
Brickyard	1	3	- -	- -	3	4	- -	- -	3	3	- -	- -	- -	- -	2	1.04	1	- -	- -	1
Druid	120	- -	- -	1	1	53	- -	2	- -	2	0.61	- -	2	- -	2	1.09	1	- -	- -	1
Ehne	18	- -	2	- -	2	15	- -	- -	- -	2	0.18	- -	2	- -	2	1.68	- -	- -	- -	2
Erler	37	- -	2	- -	2	34	- -	2	- -	2	0.67	- -	2	- -	2	1.02	1	- -	- -	1
Five	102	- -	- -	1	1	23	- -	2	- -	2	3.45	- -	- -	1	1	1.35	- -	2	- -	2
Friess	119	- -	- -	1	1	48	1	- -	- -	1	0.39	- -	2	- -	2	1.51	- -	2	- -	2
Gilbert	44	- -	2	- -	2	30	- -	- -	3	3	0.43	- -	- -	- -	2	2.03	- -	- -	3	3
Green	71	- -	- -	1	1	37	- -	2	- -	2	3.03	- -	- -	1	1	1.65	- -	2	- -	2
Hackbarth	9	3	- -	- -	3	35	- -	2	- -	2	1.15	- -	- -	1	1	1.07	1	- -	- -	1
Hartford Millpond	11	- -	2	- -	2	8	- -	- -	3	3	0.01	3	- -	- -	3	1.94	- -	- -	3	3
Hasmer	15	- -	2	- -	2	34	- -	2	- -	2	0.89	- -	2	- -	2	1.19	1	- -	- -	1
Hawthorn	8	3	- -	- -	3	12	- -	2	- -	2	0.13	- -	2	- -	2	1.26	- -	2	- -	2
Hickey	10	- -	2	- -	2	14	- -	2	- -	2	0.09	- -	2	- -	2	1.12	1	- -	- -	1
Keown	1	3	- -	- -	3	15	- -	2	- -	2	0.02	3	- -	- -	3	1.68	- -	2	- -	2
Kewaskum Millpond	5	3	- -	- -	3	8	3	- -	- -	3	0.01	- -	2	- -	2	3.07	- -	- -	3	3
Kohlsville Millpond	6	3	- -	- -	3	7	- -	- -	3	3	0.01	3	- -	- -	3	1.18	1	- -	- -	1
Lehner	3	3	- -	- -	3	22	- -	2	- -	2	0.08	- -	2	- -	2	2.14	- -	- -	3	3
Lent	8	3	- -	- -	3	7	- -	- -	3	3	0.01	3	- -	- -	3	- -	- -	- -	- -	2
Lenwood	15	- -	2	- -	2	38	- -	2	- -	2	3.16	- -	- -	1	1	1.15	1	- -	- -	1
Little Cedar	246	- -	- -	1	1	55	1	- -	- -	1	0.59	- -	2	- -	2	1.77	- -	- -	3	3
Little Drickens	9	3	- -	- -	3	20	- -	2	- -	2	0.29	- -	2	- -	2	1.43	- -	2	- -	2
Little Friess	24	- -	2	- -	2	34	- -	2	- -	2	0.03	- -	2	- -	2	1.03	1	- -	- -	1
Lohr Pond	7	- -	- -	- -	2	8	- -	- -	3	3	- -	- -	- -	- -	2	1.27	- -	2	- -	2
Lowes	23	- -	2	- -	2	23	- -	2	- -	2	0.03	- -	2	- -	2	1.31	- -	2	- -	2
Lucas	78	- -	- -	1	1	15	- -	2	- -	2	1.15	- -	- -	1	1	2.33	- -	- -	3	3
Malloy	5	3	- -	- -	3	24	- -	2	- -	2	- -	- -	- -	- -	2	1.28	- -	2	- -	2
Mayer Millpond	2	3	- -	- -	3	4	- -	- -	3	3	0.01	- -	- -	- -	2	1.97	- -	- -	3	3
Mayfield Pond	8	3	- -	- -	3	4	- -	- -	3	3	0.01	3	- -	- -	3	1.48	- -	2	- -	2
McConville	14	- -	2	- -	2	37	- -	2	- -	2	0.42	- -	2	- -	2	1.52	- -	2	- -	2
Miller	3	3	- -	- -	3	16	- -	2	- -	2	- -	- -	- -	- -	2	1.32	- -	2	- -	2
Mud	23	- -	2	- -	2	5	- -	- -	3	3	0.02	- -	- -	- -	2	1.19	1	- -	- -	1
Mud	5	3	- -	- -	3	10	- -	- -	3	3	- -	- -	- -	- -	2	1.41	- -	2	- -	2
Mueller	14	- -	2	- -	2	33	- -	2	- -	2	- -	- -	- -	- -	2	1.20	1	- -	- -	1
Murphy	16	- -	2	- -	2	37	- -	2	- -	2	0.42	- -	2	- -	2	1.24	1	- -	- -	1
Newburg Pond	7	3	- -	- -	3	8	3	- -	- -	3	0.01	3	- -	- -	3	2.78	- -	- -	3	3
Pike	522	- -	- -	1	1	45	- -	2	- -	2	4.03	- -	- -	1	1	1.19	1	- -	- -	1
Proschinger	6	3	- -	- -	3	23	- -	2	- -	2	0.14	- -	2	- -	2	1.19	1	- -	- -	1
Quaas	7	3	- -	- -	3	12	- -	2	- -	2	0.06	- -	2	- -	2	1.07	1	- -	- -	1
Radtke	10	- -	2	- -	2	23	- -	2	- -	2	0.14	- -	2	- -	2	1.12	1	- -	- -	1
Rockfield Quarry Pond	3	3	- -	- -	3	27	- -	2	- -	2	0.02	3	- -	- -	3	1.20	1	- -	- -	1
Silver	86	- -	- -	1	1	47	- -	2	- -	2	4.47	- -	- -	1	1	1.70	- -	2	- -	2
Smith	77	- -	- -	1	1	5	- -	- -	3	3	0.56	- -	2	- -	2	1.38	- -	2	- -	2
Tily	13	- -	2	- -	2	48	- -	2	- -	2	0.89	- -	2	- -	2	1.03	1	- -	- -	1
Twelve	53	- -	- -	1	1	20	- -	2	- -	2	1.35	- -	- -	1	1	1.05	1	- -	- -	1
Wallace	52	- -	2	- -	2	35	- -	2	- -	2	3.16	- -	- -	1	1	1.72	- -	2	- -	2
Werner Pond	9	3	- -	- -	3	8	- -	- -	3	3	- -	- -	- -	- -	2	1.66	- -	2	- -	2

Table 56 (continued)

Lake	Ratio Shoreline Length to Number of Homes					Fisheries Significance (by classification rank)				Significant Natural Areas and Critical Species Habitat				Sum for Ordinance Classes			
	Ratio Shoreline Length to Number of Homes	Class I <100 Feet	Class II 100-250 Feet	Class III >250 Feet	Total Score	Class I Warmwater Sport Fish, Warmwater Forage Fish	Class II Endangered, Threatened, and Species of Special Concern	Class III Existing or Potential Coldwater Fisheries	Total Score	NA: 1	NA: 2	NA: 3 Critical Species Habitat	Total Score	Sum of Total Scores for Ordinance Classes	Class I >15	Class II 12-15	Class III <12
Allis	2,640.00	3	- -	- -	3	- -	2	- -	2	- -	2	- -	2	15	- -	2	- -
Amy Bell	132.00	- -	2	- -	2	- -	2	- -	2	- -	- -	- -	0	11	- -	- -	3
Bark	83.37	- -	- -	1	1	- -	2	- -	2	- -	- -	- -	0	10	- -	- -	3
Beck	1,584.00	3	- -	- -	3	- -	2	- -	2	3	- -	- -	3	13	- -	2	- -
Big Cedar	91.83	- -	- -	1	1	- -	- -	3	3	- -	- -	- -	0	10	- -	- -	3
Boltonville Millpond	- -	- -	- -	- -	2	- -	- -	- -	2	- -	- -	- -	0	12	- -	2	- -
Brickyard	228.80	- -	2	- -	2	- -	2	- -	2	- -	2	- -	2	13	- -	2	- -
Druid	97.57	- -	- -	1	1	- -	2	- -	2	- -	- -	- -	0	9	- -	- -	3
Ehne	406.15	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	13	- -	2	- -
Erler	950.40	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	12	- -	2	- -
Five	271.14	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	11	- -	- -	3
Friess	60.12	- -	- -	1	1	- -	2	- -	2	- -	- -	- -	0	9	- -	- -	3
Gilbert	413.22	3	- -	- -	3	- -	- -	3	3	- -	2	- -	2	16	1	- -	- -
Green	126.00	- -	2	- -	2	- -	- -	3	3	- -	- -	- -	0	11	- -	- -	3
Hackbarth	301.71	3	- -	- -	3	- -	2	- -	2	3	- -	- -	3	12	- -	2	- -
Hartford Millpond	365.40	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	16	1	- -	- -
Hasmer	1,056.00	3	- -	- -	3	- -	- -	3	3	- -	- -	- -	0	13	- -	2	- -
Hawthorn	528.00	3	- -	- -	3	- -	2	- -	2	- -	2	- -	2	14	- -	2	- -
Hickey	1,320.00	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	12	- -	2	- -
Keown	158.40	- -	2	- -	2	- -	2	- -	2	- -	- -	- -	0	14	- -	2	- -
Kewaskum Millpond	406.15	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	16	1	- -	- -
Kohlsville Millpond	1,742.40	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	15	- -	2	- -
Lehner	3,168.00	3	- -	- -	3	- -	- -	3	3	- -	- -	- -	0	16	1	- -	- -
Lent	0.00	- -	- -	- -	2	- -	2	- -	2	- -	- -	- -	0	15	- -	2	- -
Lenwood	352.00	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	11	- -	- -	3
Little Cedar	134.52	- -	2	- -	2	- -	2	- -	2	- -	- -	- -	0	11	- -	- -	3
Little Drickens	704.00	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	14	- -	2	- -
Little Friess	279.84	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	12	- -	2	- -
Lohr Pond	2,428.80	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	14	- -	2	- -
Lowes	1,188.00	3	- -	- -	3	- -	2	- -	2	- -	2	- -	2	13	- -	2	- -
Lucas	1,848.00	3	- -	- -	3	- -	- -	3	3	- -	2	- -	2	13	- -	2	- -
Malloy	2,112.00	3	- -	- -	3	- -	2	- -	2	3	- -	- -	3	14	- -	2	- -
Mayer Millpond	309.26	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	16	1	- -	- -
Mayfield Pond	1,056.00	3	- -	- -	3	- -	- -	3	3	- -	- -	- -	0	17	1	- -	- -
McConville	1,056.00	3	- -	- -	3	- -	2	- -	2	3	- -	- -	3	13	- -	2	- -
Miller	348.48	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	14	- -	2	- -
Mud	422.40	3	- -	- -	3	- -	2	- -	2	- -	2	- -	2	13	- -	2	- -
Mud	1,214.40	3	- -	- -	3	- -	2	- -	2	- -	- -	1	1	15	- -	2	- -
Mueller	699.60	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	12	- -	2	- -
Murphy	410.67	3	- -	- -	3	- -	2	- -	2	3	- -	- -	3	12	- -	2	- -
Newburg Pond	1,087.68	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	17	1	- -	- -
Pike	155.53	- -	2	- -	2	- -	- -	3	3	- -	- -	- -	0	10	- -	- -	3
Proschinger	2,164.80	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	13	- -	2	- -
Quaas	2,112.00	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	13	- -	2	- -
Radtke	660.00	3	- -	- -	3	- -	2	- -	2	- -	- -	1	1	12	- -	2	- -
Rockfield Quarry Pond	1,425.60	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	- -	14	- -	2	- -
Silver	77.12	- -	- -	1	1	- -	- -	3	3	- -	- -	- -	0	10	- -	- -	3
Smith	332.44	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	13	- -	2	- -
Tily	330.00	3	- -	- -	3	- -	- -	3	3	- -	- -	- -	0	13	- -	2	- -
Twelve	305.68	3	- -	- -	3	- -	2	- -	2	- -	- -	- -	0	10	- -	- -	3
Wallace	71.19	- -	- -	1	1	- -	2	- -	2	- -	- -	- -	0	10	- -	- -	3
Werner Pond	1,232.00	3	- -	- -	3	- -	2	- -	2	- -	- -	1	1	15	- -	2	- -

Source: SEWRPC.

Table 57

SELECTED CHARACTERISTICS AND DATA ON STREAMS WITHIN WASHINGTON COUNTY FOR USE IN STREAM CLASSIFICATION

Stream or Watercourse	Average Width (feet)	Class I <9 feet	Class II 9-16 feet	Class III >16	Total Score	Average Depth (feet)	Class I <0.6 feet	Class II 0.6-1.4 feet	Class III >1.4 feet	Total Score	Fisheries	Class I	Class II	Class III	Total Score	Sum of Total Scores for Ordinance Classes	Class I >7	Class II 6-7	Class III <6
Allenton Creek	6	3	--	--	3	1.04	--	2	--	2	1	3	--	--	3	8	1	--	--
Ashippun River	11	--	2	--	2	1.25	--	2	--	2	1	3	--	--	3	7	--	2	--
Bark River	12	--	2	--	2	1.50	--	--	1	1	1	3	--	--	3	6	--	2	--
Cedar Creek	32	--	--	1	1	1.75	--	--	1	1	1	3	--	--	3	5	--	--	3
Cedarburg Creek	7	3	--	--	3	1.25	--	2	--	2	2	--	2	--	2	7	--	2	--
Coney Creek	2	3	--	--	3	0.33	3	--	--	3	1	3	--	--	3	9	1	--	--
East Branch Milwaukee River	42	--	--	1	1	2.00	--	--	1	1	1	3	--	--	3	5	--	--	3
East Branch Rock River	33	--	--	1	1	2.00	--	--	1	1	1	3	--	--	3	5	--	--	3
Engmon Creek	5	3	--	--	3	0.50	3	--	--	3	1	3	--	--	3	9	1	--	--
Erler Lake Outlet	10	--	2	--	2	1.25	--	2	--	2	2	--	2	--	2	6	--	2	--
Evergreen Creek	4	3	--	--	3	0.17	3	--	--	3	1	3	--	--	3	9	1	--	--
Flynn Creek	12	--	2	--	2	0.85	--	2	--	2	1	3	--	--	3	7	--	2	--
Junk Creek	3	3	--	--	3	0.50	3	--	--	3	2	--	2	--	2	8	1	--	--
Kewaskum Creek	12	--	2	--	2	0.85	--	2	--	2	1	3	--	--	3	7	--	2	--
Kohlsville Creek	12	--	2	--	2	1.00	--	2	--	2	1	3	--	--	3	7	--	2	--
Kressin Branch	12	--	2	--	2	2.00	--	--	1	1	2	--	2	--	2	5	--	--	3
Lehner Lake Outlet	7	3	--	--	3	0.85	--	2	--	2	1	3	--	--	3	8	1	--	--
Limestone Creek	17	--	--	1	1	0.70	--	2	--	2	1	3	--	--	3	6	--	2	--
Little Cedar Creek	9	--	2	--	2	0.67	--	2	--	2	2	--	2	--	2	6	--	2	--
Little Oconomowoc River	13	--	2	--	2	0.85	--	2	--	2	--	--	2	--	2	6	--	2	--
Mason Creek	4	3	--	--	3	0.50	3	--	--	3	1	3	--	--	3	9	1	--	--
Meadow Brook Creek	20	--	--	1	1	1.00	--	2	--	2	--	--	--	--	2	5	--	--	3
Menomonee River	18	--	--	1	1	1.85	--	--	1	1	2	--	2	--	2	4	--	--	3
Milwaukee River	83	--	--	1	1	1.50	--	--	1	1	1	3	--	--	3	5	--	--	3
Myra Creek	6	3	--	--	3	0.55	3	--	--	3	2	--	2	--	2	8	1	--	--
Nolan Creek	10	--	2	--	2	0.55	3	--	--	3	2	--	2	--	2	7	--	2	--
North Branch Cedar Creek	10	--	2	--	2	1.00	--	2	--	2	1	3	--	--	3	7	--	2	--
North Branch Milwaukee River	53	--	--	1	1	4.00	--	--	1	1	1	3	--	--	3	5	--	--	3
Oconomowoc River	15	--	2	--	2	1.30	--	2	--	2	1	3	--	--	3	7	--	2	--
Polk Springs Creek	--	--	--	--	2	--	--	--	--	2	1	3	--	--	3	7	--	2	--
Quaas Creek	11	--	2	--	2	0.67	--	2	--	2	1	3	--	--	3	7	--	2	--
Rubicon River	17	--	--	1	1	1.17	--	2	--	2	1	3	--	--	3	6	--	2	--
Silver Creek	9	--	2	--	2	0.50	3	--	--	3	1	3	--	--	3	8	1	--	--
Stony Creek	11	--	2	--	2	0.55	3	--	--	3	1	3	--	--	3	8	1	--	--
Wallace Creek	12	--	2	--	2	1.30	--	2	--	2	1	3	--	--	3	7	--	2	--
Wayne Creek	9	--	2	--	2	0.67	--	2	--	2	1	3	--	--	3	7	--	2	--
West Branch Menomonee River	8	3	--	--	3	0.50	3	--	--	3	1	3	--	--	3	9	1	--	--
West Branch Milwaukee River	8	3	--	--	3	0.50	3	--	--	3	1	3	--	--	3	9	1	--	--
Willow Creek	12	--	2	--	2	0.50	3	--	--	3	2	--	2	--	2	7	--	2	--

Source: SEWRPC.

- In the case of flushing rate or water residence time, three classes were defined based upon the mean value, plus the standard deviation, with the minimum value being determined as the point at which algal populations within the waterbody would be flushed out of the system because of the rapidity at which water flowed through the lake: less than 0.02 year, 0.02 to three years, and greater than three years.

- In the case of shoreline development factor, three classes were defined based upon the quartile distribution of the data set: less than 1.25, 1.25 to 1.75, and greater than 1.75.

- In the case of the potential for the lakeshore to be developed, three classes were defined based upon the ratio of the length of shoreline to number of platted lots, which ratio was substituted for shoreline development factor, to define three classes based upon the quartile distribution of the data set: less than 100 feet, 100 to 250 feet, and greater than 250 feet.

- In the case of maximum lake depth, three classes were defined based upon the quartile distribution of the data set: less than 10 feet, 10 to 40 feet, and greater than 40 feet.

- In the case of fish species composition, pursuant to the rationale set forth in Chapters NR 102 and NR 104 of the *Wisconsin Administrative Code*, three classes of lakes and streams were defined: lakes and streams supporting a coldwater fishery, lakes and streams supporting threatened and endangered fishes or fish species of special concern, and lakes and streams supporting a warmwater fishery.

The resulting lake and stream classes, adopted for use in classifying the surface waters of Washington County, are summarized in Table 58 and Map 97. The application of these classes within the Washington County Code is illustrated in the flow chart presented as Figure 6.

Public Informational Programming
More than 400 individuals attended three series of five public informational meetings on the project over the two-year planning project period. The adopted alternative was presented to stakeholders within Washington County at the third in this series of public informational meetings, convened during August 2000. Approximately 150 citizens participated in this final series of public meetings, which indicated broad-based public support for the process and attendant directions being adopted by the Washington County Code Revision Working Group with respect to the management of watersheds in the County. A summary of public comments offered during these series of public informational meetings is appended hereto as Appendix C.

SUMMARY

The alternatives set forth within this chapter indicate a number of ways in which the waterbody classification process could be applied within Washington County as a mechanism to identify the likely sensitivity of waters within the County to land-based activities. While each alternative had both positive and negative aspects, Alternative IV was selected by the Washington County Code Revision Working Group as the most appropriate alternative for Washington County. This alternative was based upon a number of characteristics of lakes and streams in the County and provided an assessment of both the physical and biological attributes of the waters that reflected historic development patterns in a realistic manner. The characteristics were chosen to be consistent with those that distinguished types of waterbodies within the County based upon a statistical analysis of the available data set, and with those set forth in Section 281.69 of the *Wisconsin Statutes*. The selected criteria are summarized in Table 58.

Based on the proposals, the largest and most developed waterbodies in Washington County, including the Cedar Lakes, Pike, Silver, and Friess Lakes, and the Milwaukee River, would receive a lower level of protection. It is envisaged that this level of protection would approximate the current levels of protection afforded these lakes under existing *Wisconsin Statutes* and County ordinance. The majority of waterbodies within Washington County

Table 58

DISTINGUISHING CHARACTERISTICS OF WATERBODY CLASSES IN WASHINGTON COUNTY

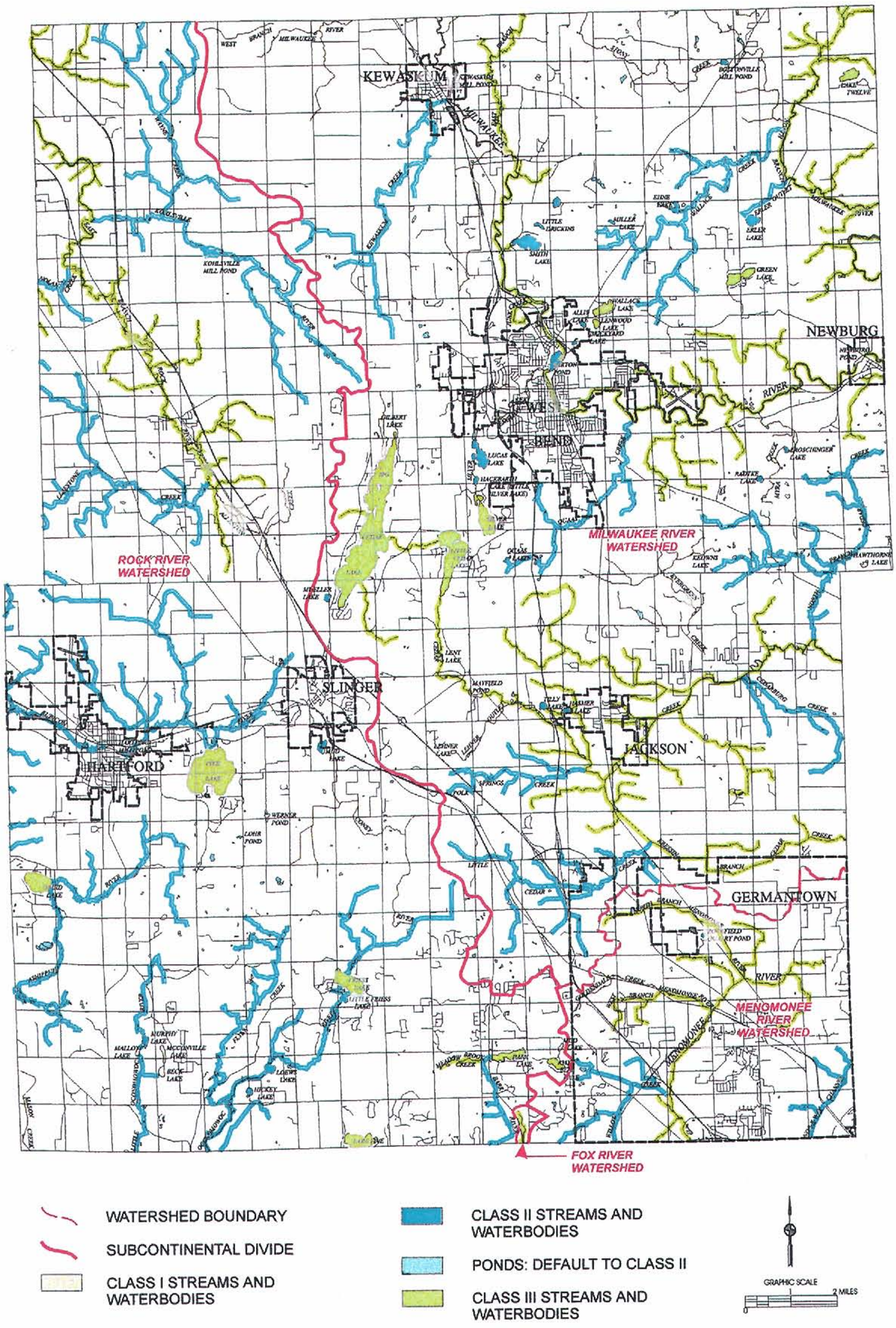
Waterbody Type	Characteristic	Class I Waters	Class II Waters	Class III Waters
Lakes	Surface area (acres)	<10	10-50	>50
	Shoreline development factor	>1.75	1.25-1.75	<1.25
	Water residence time (years)	>1.0	0.02-1.00	<0.02
	Shoreline length:number of platted lots (feet)	>250	100-250	<100
	Maximum depth (feet)	<10	10-40	>40
	Fishery	Coldwater	Threatened, endangered, or of special concern	Warmwater
Streams	Average width (feet)	<9	9-16	>16
	Average depth (feet)	<0.6 feet	0.6-1.3	>1.3
	Fishery	Coldwater	Threatened, endangered, or of special concern	Warmwater

Source: SEWRPC.

would be proposed to receive a somewhat higher degree of protection in order to maintain their existing water quality and habitat value, and a few waterbodies would be expected to receive a substantially higher degree of protection. These latter waterbodies would include Lenwood, McConville, Amy Bell, Hasmer, and Wallace Lakes, Kewaskum Pond, and Allenton and Stony Creeks. The waterbodies within each of the three lake and stream classes are summarized in Tables 56 through 57. While the exact degrees of protection remain to be defined by the Washington County Code Revision Working Group, staff have determined that the foregoing modifications to the adopted selected criteria classification scheme would provide a sound and feasible means of distinguishing those waters requiring higher degrees of protection from those waters requiring lesser degrees of protection. It should be noted that, in no case, would the level of protection from those waters be less than that provided under applicable *Wisconsin Statutes* and administrative code requirements, while the higher levels of protection could include provisions for mitigation or alternative means of achieving compliance with the enhanced code requirements.

Map 97

DRAFT CLASSIFICATION SYSTEM FOR SURFACE WATER RESOURCES WITHIN WASHINGTON COUNTY



Source: SEWRPC.

Figure 6

FLOW CHART FOR THE CLASSIFICATION OF LAKES AND STREAMS WITHIN WASHINGTON COUNTY

```
Navigable -----------------yes[a,b]------------- A < 10 acres -----------yes-------------> Class I
   Lake                                          SDF > 1.75
     |                                           Tw > 1.0 year
     |                                           SL:PL > 250 feet
     |                                           Z < 10 feet
     |                                           Fish = Coldwater
     |                                                  |
     |                                                  no
     |                                                  |
     |                                           A = 10-50 acres -----------yes------------> Class II
     |                                           SDF = 1.25-1.75
     |                                           Tw = 0.02-1.0 year
     |                                           SL:PL = 100-250 feet
     |                                           Z = 10-40 feet
     |                                           Fish = Threatened, Endangered
     |                                                  Special Concern
     |                                                  |
    no[a]                                               no
     |                                                  |
     |                                           A > 50 acres ------------yes--------------> Class III
     |                                           SDF < 1.25
     |                                           Tw < 0.02 year
     |                                           SL:PL < 100 feet
     |                                           Z = > 40 feet
     |                                           Fish = Warmwater
     |
     |
Non-navigable Pond:
NOT constructed between
1963 and 1988
      but   -----------------yes---------------> Class II
Ultimately Connected to
a Navigable Water
      and
A ≥ 5 acres
     |
     |
     no
     |
     |
Navigable-----------------yes[c]---------------> W < 9 feet -------------yes----------------> Class I
 Stream                                           D < 0.6 feet
     |                                            Fish = Coldwater
     |                                                  |
     |                                                  no
     |                                                  |
     |                                            W = 9-16 feet ---------yes----------------> Class II
     |                                            D = 0.6-1.3 feet
     |                                            Fish= Threatened, Endangered
     |                                                  Special Concern
     |                                                  |
     no                                                 no
     |                                                  |
     |                                            W > 16 feet ---------yes------------------> Class III
     |                                            D > 1.3 feet
     |                                            Fish = Warmwater
     |
     |
     |
 Shoreland --------------yes---------------> Wetland Area ----------yes----------------> Class IV[d]
  Wetland                                          ≥ 5 acres
Adjacent to Navigable                                 |
  Waterbody                                           |
     |                                                |
     no                                               no
     |                                                |
Waterbody not                                Wetland Area ------------yes---------------> Class V[d]
regulated by County                                < 5 acres
```

[a]If a lake falls within a SEWRPC-delineated natural area or critical species habitat area, additional point scores are assigned that may modify the class.
[b]A = surface area in acres, SDF = Shoreline Development Factor, Tw = water residence time in years, SL:PL = the ratio of shoreline length:number of platted lots, Z = maximum depth in feet, and Fish = NR 102-NR 104 assigned fisheries classification.
[c]W = average width in feet, D = average depth in feet, and Fish = NR 102-NR 104 assigned fisheries classification.
[d]Wetland classes are not defined within the proposed waterbody classification system, but are included herein as examples of a potential future refinement.

Source: SEWRPC.

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ACRONYMS AND GLOSSARY

ACRONYMS

A	Lake surface area in acres
BMPs	Best Management Practices
CTH	County Trunk Highway
D	Stream depth in feet
DATCP	Wisconsin Department of Agriculture, Trade and Consumer Protection
EPA	U.S. Environmental Protection Agency
°F	Temperature expressed in degrees Fahrenheit
GIS	Geographic Information System
HBI	Hilsenhoff Biotic Index
HEL	Highly Erodable Lands
IBI	Index of Biotic Integrity
IH	Interstate Highway
NGVD, NGVD-29	National Geodetic Vertical Datum of 1929
N:P	Nitrogen to Phosphorus concentration ratio, a determinant of nutrient limitation of aquatic plant communities
NPS	Nonpoint Source Pollution
NRCS	Natural Resources Conservation Service, formerly the Soil Conservation Service, of the U.S. Department of Agriculture
PCPC	Washington County Planning, Conservation and Parks Committee
SDF	Shoreline Development Factor
SEWRPC	Southeastern Wisconsin Regional Planning Commission
SL:PL	Shoreline Length to number of Platted Lots (ratio)
STH	State Trunk Highway
TMDL	Total Maximum Daily Load
TSI	Trophic State Index developed by Professor Robert E. Carlson
Tw	Water residence time in years
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
UWEX	University of Wisconsin-Extension

VOCs	Volatile Organic Compounds
W	Stream width in feet
WDNR	Wisconsin Department of Natural Resources
WILMS	Wisconsin Lake Model Spreadsheet, version 2.00
WTSI	Wisconsin Trophic State Index
WQMA	Water Quality Management Area
Z	Maximum lake depth in feet

GLOSSARY

Best Management Practices (BMPs) – The most effective practice or combination of practices for reducing nonpoint source pollution to acceptable levels, generally at a reasonable cost to the polluter, including:

> Conservation Tillage – The practice of leaving at least 30 percent residue from the preceding crop. This is typically accomplished though a variety of tillage methods, including, mulch tillage and no-tillage. this practice requires the use of a chisel plow or a no-till planter instead of a moldboard plow.
>
> Conservation Cropping – Planting crop rotations that minimize soil erosion. Examples include hay rotations with corn and oats, or adding small grains such as winter wheat to a corn-soybean rotation.
>
> Contour Farming – the practice of farming sloping soils, including planting, tillage, cultivation, and harvesting along the contour of the slope.
>
> Grassed Waterways – A natural or constructed channel that is shaped, graded, and established with vegetation to prevent erosion from occurring in concentrated flow areas.
>
> Diversions – Structural measures used to divert clean water around barnyards, barns, and other buildings.
>
> Nutrient Management – Managing and crediting nutrients from all sources, including legumes, manure, and soil reserves for the application of manure and commercial fertilizers. Management includes the rate, method and timing of the application of all sources of nutrients to minimize the amount of nutrients entering surface and groundwater. This practice includes manure nutrient testing, routine soil testing, and residual nitrogen soil testing.
>
> Rotational Grazing – Rotational grazing involves the short intensive use of paddocks, followed by a rest period from the animals for the forage to revegetate. Rotational grazing systems can correct existing pasturing practices that result in degradation and should replace the practice of summer dry-lots when this practice results in water quality degradation.
>
> Shoreline Buffers – A permanently vegetated area immediately adjacent to lakes, streams, channels, and wetlands designed and constructed to manage critical nonpoint sources or to filter pollutants from nonpoint sources.
>
> Street Sweeping – The municipal practice of physically or mechanically sweeping and collecting sediment and debris from the road surface.

Environmental Corridors – Areas of the Southeastern Wisconsin Region having concentrations of natural, recreational, historic, aesthetic, and scenic resources and which, as such, should be preserved and protected in order to maintain the overall quality of the environment.

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

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

Highly Erodible Land (HEL) – Lands that are over 6 percent in grade. According to the NRCS, a farm field is considered to be HEL if more than one-third of that field has land slopes that exceed 6 percent.

Lake – As used herein, the term lake means any natural or artificial lentic waterbody regulated under Chapter 30 of the *Wisconsin Statutes*, including lakes, ponds, millponds, flowages or reservoirs and impoundments, and other standing waters.

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

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

Section 303(d) List – The Section 303(d) list is prepared by the WDNR under requirements of Section 303(d) of the Federal Clean Water Act and identifies waters which are not currently meeting water quality standards, including both water quality criteria for specific substances or the designated fishable and swimmable uses.

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

Stream – As used herein, the term stream means any natural or artificial lotic waterbody regulated under Chapter 30 of the *Wisconsin Statutes*, including rivers, streams, brooks, creeks, ditches, and canals or channel, that flow at least periodically or intermittently within a defined bed or channel having banks and supporting fish or other aquatic life.

Total Maximum Daily Load (TMDL) – The maximum allowable concentration of a particular pollutant for an individual water resource as determined by the EPA.

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

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

U.S. Geological Survey (USGS) – The agency of the Federal government, within the Department of the Interior, responsible for data acquisition and analysis, mapping, and technical information dissemination. The U.S. Geological Survey assists local communities in lake water quality monitoring, stream gaging, and stream water quality monitoring, as well as groundwater modeling and monitoring.

University of Wisconsin-Extension – The outreach program of the University of Wisconsin that is responsible for formal and informal educational programs throughout the State.

Urban Land Use – Urban development is defined in the adopted regional land use plan as a concentration of residential, commercial, industrial, governmental or institutional buildings or structures, together with their associated yards, parking areas, and service areas, having a combined area of five acres or more. In the case of residential uses, the area must contain at least ten structures located in a relatively compact group, typically in a residential subdivision. In the case of residential uses located along a linear feature such as a roadway or lakeshore, the area must contain at least ten structures located within a distance of one-half mile.

Volatile Organic Compounds (VOCs) – Organic solvents such as tetrachloroethylene, trichloroethylene and chloroform that are used for degreasing, dry-cleaning, and other farm, industrial and domestic applications, many of which are considered to be carcinogens.

Water Quality Management Area (WQMA) – The area that is within 300 feet of a navigable stream or river or 1,000 feet from a lake. In addition WQMAs also include lands adjacent to ponds, or areas that are susceptible to groundwater contamination, such as a wetland, sinkhole, or an area that is shallow to bedrock.

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

Wetlands – Areas that have a predominance of hydric soils and that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions.

Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) – The State agency responsible for establishing statewide soil and water conservation policies and administering the State's soil and water conservation programs. The DATCP administers State cost-share funding for a variety of land and water conservation operations, including support for staff, materials and conservation practices. Programs administered by the DATCP include the Chapter ATCP 50 Land and Water Resource Management program.

Wisconsin Department of Commerce (WDOC) – The State agency responsible for, among other things, the administration of onsite sewage disposal systems under Chapter Comm 83 of the *Wisconsin Administrative Code.*

Wisconsin Department of Natural Resources (WDNR) – The State agency responsible for establishing statewide natural resource management policy and enforcement of environmental protection regulations. The WDNR manages State-owned lands and the public waters of the State. The WDNR also administers programs to regulate, guide and assist land conservation programs within individual counties, as well as landowners in managing land, water, fish, and wildlife. Programs administered by the WDNR include the Chapter NR 190 and 191 Lake Management Planning Grant and Lake Protection Grant programs, the Chapter NR 195 River Protection Grant program, the Chapter NR 120 Wisconsin Nonpoint Source Pollution Abatement program, the Chapter NR 50/51 Stewardship program, and the Chapter NR 7 Recreational Boating Facilities Grant program.

Woodlands – Areas containing a minimum of 17 trees per acre with a diameter of at least four inches at breast height (4.5 feet above the ground).

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APPENDICES

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Appendix A

WASHINGTON COUNTY LAND USE CODE REVISION WORKING GROUP AND ADVISORY COMMITTEES

WASHINGTON COUNTY BOARD OF SUPERVISORS

Kenneth F. Miller, Washington County Board Chairperson
Doug Johnson, Administrative Coordinator
Marilyn H. Merten, Washington County Clerk

WASHINGTON COUNTY PLANNING, CONSERVATION AND PARKS COMMITTEE

Maurice Strupp, Chairperson
David N. Radermacher, Vice-Chairperson
Robert W. Kratz, Secretary
Mary A. Krumbiegel
Daniel J. Rodenkirch
Patricia A. Strachota
Helmut Wagner

WASHINGTON COUNTY LAND USE CODE REVISION WORKING GROUP

Maurice Strupp, Chairperson
Stanley M. Blawas
Ann Enright
William K. Genthe
Peter L. Gonnering
Kent Schaefer
Donna Schneider
Gary Schneider
Frank Volpintesta

WASHINGTON COUNTY LAND USE CODE REVISION WORKING GROUP TECHNICAL ADVISORY COMMITTEE AND STAFF

Washington County
- Paul E. Mueller, Administrator, Planning and Parks Department
- Herbert F. Wolf, Assistant Administrator, Planning and Parks Department
- Debora Sielski, Assistant Administrator for Planning, Planning and Parks Department
- Phil Gaudet, Inspector-in-Charge
- Gary Kurer, Land Use Inspector
- David Lindner, Land Use Inspector
- David Seils, Land Use Inspector
- David Zuern, Land Use Inspector
- Joseph Steier III, Land Use Technician

Washington County (continued)
Brian W. Braithwaite, Real Property Lister
Kimberly A. Nass, County Attorney
Troy P. Kuphal, Land Conservation Department

Wisconsin Department of Natural Resources
Brent A. Binder
Ben Callan
Gary Heinrichs
Toni Herkert
Ruth C. Johnson
Susan Schumacher
Robert S. Wakeman
William G. Wawrzyn

Southeastern Wisconsin Regional Planning Commission
LeAnn S. Colburn, Senior Specialist
Bradley E. Dunker, Research Aide
Rachel E. Lang, Senior Biologist
Edward J. Schmidt, Research Analyst
Thomas M. Slawski, Senior Planner
Jeffrey A. Thornton, Principal Planner

University of Wisconsin-Extension
Gary K. Korb, University of Wisconsin-Extension Regional Planning Educator
Dan A. Wilson, University of Wisconsin-Extension Community, Natural Resources and Economic Development Educator

Town of Barton
Russell C. Abel, Chairperson
Gordon C. Hoffmann, Building Inspector

Village of Newburg
Brian Lennie, Bonestroo, Rosene, Anierlik & Associates, Engineer

Druid Lake Protection and Rehabilitation District
David Ebert, Chairperson

Silver Lake Protection and Rehabilitation District
John R. Behrens, Secretary

Big Cedar Lake Property Owners Association
Tod J. Maclay, President

Friends of the Milwaukee River
Robert B. Boucher

Green Lake Property Owners Association of Washington County, Inc.
Howard Lang, Secretary

Horicon Marsh Area Coalition
Dave Neuendorf, University of Wisconsin-Extension

Metropolitan Builders Association
J. Scott Mathie

River Alliance of Wisconsin
Todd Ambs, Executive Director

Rock River Coalition
Cindy Arbiture, President

Wisconsin Association of Lakes, Inc.
Susan Tesarik, Water Resources Coordinator

Milwaukee Journal Sentinel
Don Behm

West Bend Daily News
David Rank

WASHINGTON COUNTY LAND USE CODE REVISION WORKING GROUP ISSUE REVIEW GROUP

David Baldus
David Ebert
Richard Eierman
Ralph Eisenmann
Anita Hauske
Harry Hein
Dave King
Howard Lang
Terry Mergenthaler
Steve Musinsky
Mike Nelson
Eugenie and Ralph Olsen
Stephen Rothe
Carl Rowlands
Glenn Schapfel
Richard Schmidt
Marie Spors-Murphy
Jason Valerius

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Appendix B

WASHINGTON COUNTY PLANNING, CONSERVATION AND PARKS COMMITTEE MEETING MINUTES OF TUESDAY, DECEMBER 12, 2000

The meeting was called to order by Chairman Strupp at 6:30 p.m. at the West Bend High School. Those present included:

COMMITTEE MEMBERS:
Maurice Strupp, Chairperson
David Radermacher, Vice Chairperson
Robert Kratz, Secretary
Patricia Strachota
Daniel Rodenkirch
Mary Krumbiegel
Helmut Wagner

STAFF:
Paul Mueller
Herb Wolf
Phil Gaudet
Joanne Tarasoff
Debora Sielski

ALSO PRESENT:
Kim Nass, County Attorney
Dan Wilson, UW Extension
Jeff Thornton, SEWRPC

FIRST ORDER OF BUSINESS: Public Hearing: The petition of the Committee to repeal and recreate the zoning district maps relating to Chapter 23 of the Washington County Code "Shoreland/Wetland Zoning Ordinance for Washington County" and Chapter 26 of the Washington County Code "Floodplain Zoning Ordinance." These maps relate to all the unincorporated Townships of Washington County and are required by the State of Wisconsin.

Upon calling the meeting to order, Strupp read the Notice of Public Hearing. Strupp then provided a welcome to the public and brief description of tonight's proceedings.

At this time, Dan Wilson, Community Resource Development Educator, of the University of Wisconsin-Extension, gave a presentation regarding public participation process for this project. Described activities, various public information meetings, surveys, and public hearing(s), etc., over the past two and one-half years on this project. Described these activities per overhead (see enclosed). Wilson stated that there has been extensive public participation in this project.

Present: Matt Moroney with Metropolitan Builders Association. Thanked workgroup for their effort. Stated this has been a good process, and the Builders Association appreciates that. In general, the Builders Association is satisfied with this project. They are NOT opposed to this, as rumor has it. Discussed letter sent to Herb Wolf on Dec. 6.

Made comment on 4th classification. Would like some possible changes/clarifications on that. Stated that there needs to be clarification of what a "first tier" is. Question: stormwater facilities. Need some specific language regarding stormwater facilities near waterbodies. Discussed setbacks and clarification on that. Discussed mitigation based on point system. On Class II waterbodies, this may be a bit stringent and suggested three points instead of four. Offered a "hats off" to everyone who worked on this.

Present: Jeannine Peters, WBBA. Speaking on behalf of the West Bend Builders Association. Stated significant concerns regarding these regulations. Concerned about impact of these heavier regulations on smaller waterbodies. Stated major concerns re: statutory boundary agreements. There are concerns that no one could comply with this. Gave examples of scenarios where these concerns come into play. Stated they are also in agreement with the issues that the Metropolitan Builders Association brought up (Matt Moroney).

Present: Bill Genthe, Chairman of Big Cedar Lake District. Speaking in support of the ordinance. Has served with the task force on this project. In reviewing the feedback from public information meetings, the Lake District concluded that the criteria for lake classification is rational. Another significant addition to the ordinance is the introduction of mitigation to the ordinance. Finally, they were all impressed with the public information meetings. Stated that the information was well presented. The Big Cedar Lake District felt this was well done. Had some comments from residents on Big Cedar Lake regarding mapping concerns.

Present: Greg Knowles, new Village Administrator, Village of Slinger. Knowles thanked Wolf for sending him a draft to review. Stated concern of how we will relax regulation of PUD's. Stated he thinks municipalities want to have a stricter regulation. Concerns about lot sizes (widths) for nonconforming lots. Voiced support regarding boundary agreements. Discussed two different ways municipalities have been told to do boundary agreements. Stated he feels that boundary agreements can help you.

Present: John Capelle, Director of Community Development, City of West Bend. Commended the County for its effort to rewrite Chapter 23 and combine it with Chapter 26. By-in-large, the City of West Bend has not had problems with annexed lands being brought into the City. Would recommend that the County develop administrative based information on development of the code. (i.e., unclassed waterbodies, as well as review of tier two and tier three lots). The City is opposed to the boundary agreements in this code. Suggested that the County first set forth policies relevant to this prior to "jumping in" in this context. Would encourage the County to build flexibility into Chapter 23.02 (stormwater planning and erosion control). City has had these elements in place since 1985.

Present: Russ Abel, Chairman of the Towns Association, and Chairman of the Town of Barton. Commended the individuals involved as to how this was implemented and how this was handled this time (versus the last time a code revision was done). Stated that the Towns Association would take a stance to support this and again commended the County on the process.

Present: Stan Blawas. Serves with three hats: 1) On advisory group; 2) resident of Pike Lake; and 3) had worked on water for over 30 years when he was working at the Port of Milwaukee in Milwaukee County. Without water, nobody lives. Very supportive of doing something for the water quality of our lakes. With Pike Lake, he is also the Chairman of the Protection District. They have spent over $200,000 in an effort to clean up Pike Lake. In order to keep the water clean in any waterbody, we must continue to make efforts in that direction. If someone does not start it, the water quality will deteriorate. Blawas stated that he stands behind Washington County 100 percent in this project. When there are so many people living so close to the water, and there is so much pollution in the water, what is going to happen to it? Asked the Planning, Conservation and Parks Committee to approve what the Advisory Committee has set forth.

Present: Kent Schaefer, Hartford, Wisconsin. Has read draft III of the ordinance, and stated he feels it is an outstanding ordinance. Addresses the main intent of the ordinance. Stated there is one glaring omission. Single family vs. multi-family impact on the waterbodies. Displayed illustration on easel for Committee (see attached). Reviewed illustration. "Why lot size, setbacks, impervious limits in draft III do not address impact." Showed example of a Class I lake, with three tier development. Failure to address multi-family housing in Washington County could result in degradation of the shoreland in Washington County.

Present: David Bellin: Concerns stated regarding boundary agreements within this ordinance. Cannot understand why this has been included in a clean water act. Seems to be a "big thing" that this would be included in there.

Present: Dave Ebert, Chairman, Druid Lake Management District. Druid Lake people are strongly in favor of this. Worked with the Town of Erin and adopted a binding ordinance for Druid Lake residences. Have limited it to single-family homes. Felt that this ordinance was a tremendous attribute to work with the Town of Erin and getting ordinance adopted. Feels that this ordinance as written, is well written.

Present: Buddy Julius, Metropolitan Realtors Association. Appreciated the opportunity to review this draft ordinance. Commends Washington County on this project. This is in partnership with part of the Smart Growth Law which realtors are involved with. Stated a few concerns: 1) Urge language revisions to mirror smart growth legislation, 2) ordinance language should stay away from border agreements and annexation, and 3) Section 23.08 discussed. Concerns about treating certain individuals differently than others. Suggesting further review of this section, as well as 23.13. which is the section regarding nonconforming uses. Complimented the County for working this far on the project, and request to be part of further discussion.

Present: David Murphy, Director of Public Works, Village of Jackson. Stated general support of this project. Village would like to entertain that when property becomes part of the Village of Jackson, they would like to be able to govern this through the Village. Permit process would be part of the Village rather than the County, once a property becomes part of the Village. Would request that this be made more clear. Stated he was given this information by a Planning and Parks Department staff member.

Present: Steve Musinsky, Hartford, Wisconsin. Owns property on Pike Lake. Commended the Committee for the time and effort in pursuing water quality efforts. Stated that in reviewing this draft ordinance, it appears that as a homeowner, the ordinance appears to work quite well (as far as what an individual can do on their property regarding remodeling or building). Sees value in preserving lake views for future generations. Gave compliment on the public input opportunities provided and public information meetings.

Present: Susan Tesarik, Wisconsin Association of Lakes: Described who the Wisconsin Association of Lakes represents. Stated they support the more protective ordinances proposed in this waterbody classification, as well as larger lot sizes, and setbacks as proposed in these ordinances. Also support classification proposals protecting shoreland beauty and wildlife. Stated that several other counties are currently working on classification projects for waterbodies as well, which is good. It is up to individual counties to provide better lake protection.

No further public input at this time.

Request made for reading of comments from the Farm Bureau.

Wolf read comments/concerns as stated by the Farm Bureau regarding this project. (see enclosed).

Wolf stated there was another comment by Bob Boucher of Friends of Milwaukee River, however, this was not available tonight. Wished to go on record in support of the project. Letter will be coming in later in the week, as comments can be submitted until this Friday, December 15.

Strupp inquired if any Planning, Conservation and Parks Committee members had any comments.

Strupp read statement of opposition from Spaeth Carpentry.

Wollner Excavating letter stated concerns about how this will affect property values in the towns.

Radermacher stated he would like to ask the individual representing the Village of Jackson questioning status of multi-family unit, which roads he was referring to. Which roads was he referring to? Answer was: Corner of Sherman Road and Jackson Drive (NE corner).

Strupp stated Committee and staff will take comments and concerns into account before this is forwarded to the County Board.

Strupp closed the Public Hearing.

Public hearing ended at 7:50 p.m.

No other business was conducted, thus the meeting was adjourned.

Respectfully Submitted,

Paul E. Mueller, Administrator

Approved by ____________________________

Robert Kratz, Secretary

Date ________________________________

Appendix C

OVERVIEW OF PUBLIC COMMENTS ON WATERBODY CLASSIFICATION RECEIVED DURING PUBLIC INFORMATIONAL MEETINGS HELD DURING 1999 AND 2000

BACKGROUND

The State of Wisconsin, in recognition of the importance and value of the waterways of the State, determined that specific measures were needed to further protect and maintain these water resources. As a consequence, the Legislature, during 1997, established a lake classification program element within the Chapter NR 191 Lake Protection Grant Program administered by the Wisconsin Department of Natural Resources.

Washington County applied for and received funding through this program during 1998 to initiate the preparation of a planning program for the classification of waterways within the County. This program was carried out by the Washington County Planning and Parks Department between 1998 and 2001. The program was conducted in coöperation with other agencies, including the Southeastern Wisconsin Regional Planning Commission, the Wisconsin Department of Natural Resources, and University of Wisconsin-Extension (UWEX). The program was conducted as part of a general review and refinement of the Washington County Code of Ordinances, with the objective of including the consideration of the characteristics of the natural resources base more fully into the County shoreland, wetland, and floodland zoning ordinances. Important elements of this process were the establishment of criteria based upon the size of the waterbody, extent of current and future recreational uses, degree of current and future shoreland development, quality of the aquatic and wildlife habitat, sensitivity to contamination, and provision of public access opportunities.

The planning program included an extensive program of public participation. This program was designed to seek and utilize citizen input in the development of appropriate ordinance language that is relevant to prevailing conditions in Washington County. To this end, the Washington County Code Revision Working Group, under the auspices of the Washington County Planning, Conservation and Parks Committee (PCPC) and with the assistance of staff from the Washington County Planning and Parks Department and the Southeastern Wisconsin Regional Planning Commission, convened a series of public informational meetings. Beginning in March 1999, these meetings were designed to inform citizens of the waterbody classification project, seek citizen concerns and issues with respect to the surface water resources of Washington County, and identify concerned citizens willing to participate in the various work efforts to be included in the waterbody classification project.

Three series of public informational meetings were held, each series of meeting consisting of five sessions held in differing locations around the County. The presentations made to, and comments offered by, the citizens participating in thee public informational meetings are summarized herein. Afternoon and evening meetings were held in the Town of West Bend, and evening meetings were held in the Towns of Farmington and Richfield. During March 1999, the fifth meeting was held jointly with the annual local government seminar sponsored by the University of Wisconsin-Extension in the City of West Bend. Subsequently, during the second and third series of public informational meetings, the fifth session was held in the Town of Hartford. The dates, times and venues of these informational meetings were designed to accommodate the maximum number of attendees.

Between the first and second series of public informational meetings, the Washington County Code Revision Working Group constituted an Issues Review Group comprised of interested, self-selected individuals who attended the first series of informational meetings during 1999. The Issues Review Group met three times during July and August 2000 to further refine the potential, ordinance-related responses to the issues raised by the public at the first series of public informational meetings. The work of the Issues Review Group was recommendatory to the Working Group and instrumental in beginning the process of translating conceptual issues into ordinance language. The recommendations of the Issues Review Group were incorporated into the alternatives adopted by the Washington County Code Revision Working Group and presented to the public during the second series of public informational meeting during August 2000.

THE FIRST SERIES OF PUBLIC INFORMATIONAL MEETINGS: MARCH 1999

Attendance

Meetings were held in West Bend on the afternoon and evening of Thursday, March 18, 1999, and the morning of Saturday, March 20, 1999; in Richfield on the evening of Wednesday, March 24, 1999; and Farmington on the evening of Tuesday, March 30, 1999. Two hundred and thirty-four citizens attended the five informational meetings. Attendees ranged from riparian owners to elected and appointed officials. The majority of respondents to the surveys undertaken during these meetings were riparian residents living in towns in Washington County. Five hundred and seventy-three surveys, covering eight issue areas, were completed during this fact-finding process.

Program Notes

Each of the meetings was opened by staff of the University of Wisconsin-Extension, who welcomed attendees and explained the objectives and outline of the program. Mr. Robert S. Wakeman of the Wisconsin Department of Natural Resources introduced the concept of waterbody classification by providing a State perspective on the origins and performance of State shoreland zoning programs. Ms. Kim Nass of the Washington County Attorney's Office provided a County perspective, then reviewed the waterbody classification process as it is being undertaken in Washington County. Following these presentations, comments from the public were invited.

Review of Public Comments

Discussion at the first informational meeting centered on issues of water quality, setbacks, and enforcement of existing legislation. Questions were largely designed to obtain additional information on the extent and need for waterbody classification and the relationship between waterbody classification and local land use management.

Discussion at the second informational meeting centered on nonconforming uses, both past and present, and such uses as might become nonconforming under a revised zoning code that included waterbody classification. The relationship between County zoning and local or general zoning was explored. The issue of enforcement of current ordinances was discussed. In both cases, the need for clear ordinance language was agreed as this would lead to more clarity in terms of landowner commitments with respect to individual responsibilities and governmental procedures with respect to permitting.

Discussion at the third informational meeting, which coincided with the University of Wisconsin-Extension planning and zoning workshop, centered on mitigation and how continuity of mitigation measures could be ensured. The need to include mitigation measures in the land title deed through specific recording of such measures was considered. The concept of the riparian zone becoming a specific zoning category was mooted.

Discussion at the fourth informational meeting covered procedural aspects of the Code revision process, and then centered on the relationship between land use and water quality. Attendees questioned specific aspects of the criteria set forth in the *Wisconsin Statutes*, seeking to better understand the use of terms such as sensitivity and productivity. A watershed approach was endorsed.

Discussion at the fifth informational meeting centered on legal issues relating to shoreland land use, specifically nonconforming uses, and navigability. Attendees sought information on procedural issues relating to the classification process and future opportunities for public participation. Lake and land use issues were discussed in relation to waterbody classification and in relation to local regulation of recreational boating for lake protection.

Discussion at all five public informational meetings ranged considerably in content, but generally appeared to reflect local issues and concerns in the various parts of Washington County in which the meetings were held. Many attendees had specific concerns about how waterbody classification would proceed and how it could potentially influence their individual situations. The informal poster sessions included within the meeting formats provided opportunities for many of these specific questions to be answered. In general, there was some skepticism that waterbody classification was not already a "done deal," although, overall, attendees appeared to approach the meetings in an open-minded and constructive manner. Despite differing issues of specific concern, there was general agreement that existing rules had to be more clearly and openly applied at all levels of government, not solely at the County level. The general sentiment expressed by the majority of attendees was one of constructive engagement at this, the concept stage of the classification process. Many attendees indicated a willingness to serve on focus groups and most expressed a desire to be kept informed of the progress of the Washington County Code Revision Working Group.

Analysis of Public Input

Attendees at each public informational session were asked to provide their thoughts on eight issues that had been identified as issues of concern by the Washington County Code Revision Working Group. These issues, boathouses; design review; filling, grading, and excavating; mitigation; nonconforming structures and uses; setbacks; shoreline stabilization; and vegetative buffers, had been identified based upon a brief survey of public inland lake protection and rehabilitation districts within the County and a review of permit-related issues commonly addressed by County staff in recent years. Each issue area was briefly discussed through a poster presentation that set forth the past and current status of each issue area, concerns related to each issue area, and some alternatives for better addressing issues within each issue area. In each case, the alternatives included the status quo as well as provisions that were both more and less restrictive than the status quo. Likewise, an indication that other options exist was provided. Following the formal presentations and discussion session, attendees were asked to view the posters of their choice and offer their comments by means of questionnaire survey cards provided at each poster station.

As noted above, almost 575 of these survey cards were completed by attendees in the eight issue areas. Response rates varied between sessions from less than 20 percent for the Farmington meeting to more than 80 percent for the West Bend meeting held in conjunction with the UWEX planning and zoning workshop. Generally, between one-quarter and one-third of the attendees responded to the questionnaire surveys. Based upon the survey cards returned with notations of the respondent's identity, it would appear that most respondents who completed one questionnaire completed a set of survey cards. Hence, the response rate can be considered to closely parallel the percentage of individuals attending the informational meetings who chose to indicate a preference with regard to the issue areas identified. These responses are summarized below. In addition to their specific concerns, respondents were asked to provide some information about themselves, specifically as to whether or not they were riparian residents, elected or appointed officials, residents of incorporated or unincorporated municipalities, and residents of Washington County.

Numbers of responses ranged from 68 and 69 responses relating to vegetative buffers and design review, respectively, to 75 and 76 responses relating to mitigation and setbacks, respectively. While these differences are unlikely to be statistically significant, they do suggest that public concern was somewhat greater with respect to issues of greater immediacy, recognizable as such, than the more esoteric issues that are currently in the concept stage. Issues such as nonconforming structures and uses, and shoreline stabilization, together with land-modifying activities, also attracted public attention, with 74 responses being offered, while boathouses attracted 73 responses. Again, this level of interest would be consistent with public recognition of the subject matter as being a matter of some immediacy to riparian residents. Riparian residents generally responded at a rate of about twice that of elected or appointed officials in these surveys.

Only in terms of nonconforming structures and uses was there a clear majority response; namely, that improvements to properties should be permitted based upon consideration of the sensitivity of the resource. However, in each issue area, the largest number of responses typically opted for those alternatives that considered the sensitivity of the resource as an element to be considered in the permitting process. Exceptions to this generalization were boathouses, where the greatest number of responses suggested prohibiting such structures; land-modifying activities, where the greatest number of responses suggested permitting such activities consistent with established best management practices; and setbacks, where the greatest number of responses suggested permitting structures contingent upon mitigation. Notwithstanding, in each of these cases, permitting activities in a manner consistent with the sensitivity of the resource formed the next largest number of responses. In the case of vegetative buffers, respondents indicated a desire that buffer strips be required, and that the current Ordinance provisions be clarified. In summary, there appeared to be some agreement among respondents that the current Ordinance provisions should be modified, with the modifications allowing more site-specific determinations as the basis for the granting of building permits in riparian areas, with site-specific conditions being determined relative to resource sensitivity. Hence, based upon the responses received, it would appear that there would be support for continuing the waterbody classification process as a basis for: 1) determining resource sensitivity, and 2) ordinance refinements to incorporate such considerations into the permitting process.

Specific responses by the eight principle issues considered during these public informational meetings are set forth below. Respondents have been generally categorized as riparian residents or elected and appointed officials based upon their responses to the survey questions.

Boathouses
Seventy-three responses were offered, 36 of which were from riparian residents and 16 from elected or appointed officials. Of these responses, the largest number (26) indicated that the preferred option was not to allow boathouses; 17 respondents indicated that boathouses should be setback a distance from the shoreline corresponding to the sensitivity of the resource. These responses accounted for about 60 percent of the responses.

Design Review
Sixty-nine responses were offered, 32 of which were from riparian residents and 15 were elected or appointed officials. Of these responses, the largest number (31) indicated that the preferred option was requiring site planning and design review; 18 respondents indicated that requiring design review corresponding to the sensitivity of the resource was the preferred option. These related options accounted for greater than 75 percent of responses.

Filling, Grading, and Excavating
Seventy-four responses were offered, 32 of which were from riparian residents and 18 were elected or appointed officials. Of these responses, the largest number (28) indicated that the preferred option was requiring designs consistent with best management practices (BMPs). Nineteen respondents indicated that land-modifying activities could be permitted to an extent corresponding to the sensitivity of the resource. These responses accounted for about 65 percent of respondents.

Mitigation
Seventy-five responses were offered, 30 of which were from riparian residents and 15 were elected or appointed officials. Of these responses, the largest number (30) indicated that the use of mitigation against specific offsets was the preferred option, while 21 indicated that the use of mitigation corresponding to resource sensitivity was the preferred option. These responses accounted for greater than 65 percent of responses.

Nonconforming Structures and Uses
Seventy-four responses were offered, 35 of which were from riparian residents and 17 were elected or appointed officials. Of these responses, the majority (40) indicated that improvements to properties should be permitted based upon consideration of resource sensitivity. Thirteen respondents indicated that mitigation could be considered as an offset to property improvements. These responses accounted for approximately 70 percent of responses.

Setbacks
Seventy-six responses were offered, 35 of which were from riparian residents and 18 from elected or appointed officials. Of these responses, the largest number (22) indicated that variances to the 75-foot setback should be allowed with mitigation. Seventeen respondents indicated that setbacks should correspond to resource sensitivity. These responses accounted for greater than 50 percent of responses.

Shoreline Stabilization
Seventy-four responses were offered, 36 of which were from riparian residents and 19 from elected or appointed officials. Of these responses, the largest number (32) indicated that shoreline stabilization should be permitted based upon consideration of resource sensitivity. Approximately equal numbers indicated that "seawalls" should be prohibited (10 respondents), and that limitations should be placed upon shoreline structure designs (11 respondents). These responses accounted for over 70 percent of responses.

Vegetative Buffers
Sixty-eight responses were offered, 29 of which were from riparian residents and 18 from elected or appointed officials. Of these responses, the greatest number (21) indicated that buffer strips should be required along riparian developments. Slightly fewer respondents (19) indicated that the existing Ordinance should be clarified. These responses accounted for about 60 percent of responses.

THE SECOND SERIES OF PUBLIC INFORMATIONAL MEETINGS: AUGUST 2000

The outcome of the initial round of public informational meetings held during March 1999 was the identification of the eight principal issues of concern set forth above. These issues were: boathouses; design review; filling, grading and excavating; mitigation; legal nonconforming structures and uses; setbacks; shoreline stabilization; and vegetative buffers. Each of the issues relates to one or more of the provisions set forth within the existing County Code. Each addresses one or more of the statutorily required waterbody characteristics required to be considered in a waterbody classification project conduct pursuant to Section 281.69 (5) (b) of the *Wisconsin Statutes*. With respect to these issues of concern, the participants in the initial round of public informational meetings clearly expressed their desire that the County Code recognize the site-specific characteristics of the surface water resources of the County and permit activities consistent with the degree of sensitivity of the resource. To effect these varying levels of protection, maintenance, and restoration, the Washington County Code Revision Working Group proposed modifications to the Washington County Code that would address each of the eight issues identified by the citizens attending the initial round of informational meetings. In addition, the Working Group added a ninth issue, that being the placement of sand or pea gravel blankets on the beds of the waterbodies.

Based upon a review of the available inventory information on the surface water resources of Washington County during late 1999 and early 2000, the Washington County Code Revision Working Group, with the assistance of an Issues Review Group constituted as an outcome of the first series of public informational meetings held during March 1999, developed alternatives and an agreed waterbody classification scheme for lakes and streams in Washington County. These schemes included an adopted draft lake classification scheme, an alternative draft lake classification scheme, and an adopted draft stream classification scheme.

The schemes were predicated upon a three class system, wherein Class I waters were those waters generally considered to be in need of protection; Class II waters were those waters generally considered to be in need of maintenance; and Class III waters were those water generally considered to be in need of rehabilitation or restoration. Those waters in greatest need of protection were considered to be comprised of small, shallow waterbodies having a high-quality fishery. In the case of lakes, these waters are typically kettle lakes having long water residence times. In the case of streams, these waters are typically headwater streams that are the origins of the larger river systems in the Region. Both of these types of waters are sensitive to human-induced disturbances, and were considered to comprise those waters designated as Class I waters of Washington County. In contrast, those waters that have been traditionally most highly developed and heavily used, the larger lakes and streams, were considered to be Class III waters.

These schemes were presented to, and adopted for public discussion by, the Washington County Code Revision Working Group, and were refined through preliminary discussions with an Issues Review Group convened by the County and comprised of individuals drawn from volunteers that offered their services during the initial round of public informational meetings. These individuals represented a cross-section of the Washington County community, including professionals, lakeshore residents, and citizens residing along or near streamcourses in the County.

The adopted draft lake classification scheme included County-specific scores for both biological and physical characteristics of Washington County lakes: maximum depth, surface area, flushing rate, shoreline development factor or shape, average shoreline length per lot, and fishery composition. The alternative draft lake classification scheme added consideration of the adopted regional natural areas and critical species habitat protection and management plan-identified natural areas. Where the entire lake shore was encompassed within a designated natural area, additional points were awarded to the score determined under the adopted draft lake classification scheme, the net result of which was a higher number of lakes classed as Class I waters. Class III, or historically developed lakes, remained unchanged under this scheme. The adopted draft stream classification system included specific scores for both biological and physical characteristics of Washington County streams: maximum depth, average width, and fishery composition.

With respect to the proposed County Code refinements, for those waterbodies falling into the historically developed class, Class III, the proposed refinements were limited in scope. The proposed Code refinements retained many of the features and components currently set forth within the existing County Code. Some limited additional protections were proposed to be included within provisions that established a minimum setback distance of 50 feet, even if the zoning ordinances continued to permit setback averaging, and some requirements for mitigation and creation of vegetative buffers around certain types of development. The refinements proposed for Class II waterbodies were somewhat more stringent, including proposed requirements for greater setback distances, mandatory mitigation measures, and increased minimum lot sizes. The refinements proposed for Class I waterbodies were more rigorous, including proposed setbacks that exceed the State minimum requirements set forth in Chapter NR 115 of the *Wisconsin Administrative Code*, the elimination of certain discretionary activities, and increased requirements for screening, maintenance of land form, and natural shoreline protection measures.

Attendance
The second round of five public informational meetings was convened to present the preliminary draft waterbody classification schemes and possible County Code refinements to interested persons throughout the County. Meetings were held in West Bend on the afternoon and evening of Monday, August 21, 2000; in Hartford on the evening of Tuesday, August 22, 2000; in Richfield on the evening of Wednesday, August 23, 2000; and in Farmington on the evening of Thursday, August 24, 2000. One hundred and thirty-five citizens registered their attendance at the five informational meetings. Attendees ranged from riparian owners to elected and appointed officials. The majority of respondents to the questionnaires completed during these meetings were riparian residents. About 104 surveys, covering the nine issue areas and the three waterbody classification schemes, were completed by the participants during these informational meetings.

Program Notes
Each of the meetings was opened by staff of the University of Wisconsin-Extension, who welcomed participants and explained the objectives and outline of the program. UWEX staff then reviewed progress to date by the Washington County Code Revision Working Group. Staff of the Southeastern Wisconsin Regional Planning Commission briefly outlined the lake and stream classification schemes adopted by the Working Group. Staff of the Washington County Planning and Parks Department or Washington County Attorney's Office then discussed some proposed changes to the Washington County Code to give effect to the varying degrees of protection to the waterbodies identified in the classification schemes. Participants were asked to complete an interactive questionnaire during this presentation, and extensive discussion ensued. Following the presentations, additional comments from the public were invited.

Review of Public Comments
Discussion at the first public informational meeting centered on the relative jurisdictions and authority of the County and, particularly, the Town of West Bend. This discussion arose as a result of the Town of West Bend having enacted more stringent zoning requirements, under their general zoning authority, than the County, especially with respect to boathouses. Concerns were expressed about the application of the proposed County Code refinements, and the potential for these requirements to be applied to existing development. Shoreline issues were also discussed, including shoreline stabilization, access, including beaches and piers, and buffer strips, including the types of vegetation, ordinance requirements relative to clear cutting, and the dimensions of access corridors. Onsite and public sanitary sewers were also mentioned as issues.

Discussion at the second public informational meeting centered on the location of structures relative to the shoreline, including boathouses, primary structures, and secondary structures such as gazebos. Shoreline access was also an issue, especially aspects related to shoreland vegetation, buffer strips, and beaches. Jurisdictional issues were again voiced as a concern, especially where there was perceived to be overlapping permit authority at the state, County, and local levels. The nature of the proposed County Code refinements for Class III waters was discussed, with participants noting that there were few proposed changes in the County Code as applied to Class III waterbodies.

Discussion at the third public informational meeting centered on the local application of the proposed County Code refinements, with shoreland development issues, viewing and access corridors, shoreland vegetation and stabilization measures, and mitigation requirements, being of primary concern. There was significant interest in the provisions affecting legal nonconforming properties and structures, and the status of onsite sewerage systems under the refined County Code.

Discussion at the fourth public informational meeting centered initially on the technical aspects of shoreland management and classification scheme, including the manner in which the classification scheme dealt with rough fish and spring lakes, and the nature of the County Code refinements for Class III waters. Shoreland structures and their repair or replacement, setbacks and setback averaging, and legal nonconforming uses and structures were issues of concern, as were buffer strips, fertilization requirements of riparian properties, and access, including beaches, shoreline stabilization structures and materials, and planting of native flora. Recreational boating issues were also raised. Comments were also received regarding stream issues, especially related to the Oconomowoc River.

Discussion at the fifth public informational meeting centered on legal nonconforming structures and uses, shoreland vegetation, including fertilization, types of vegetation, and shoreline stabilization measures, and jurisdictional concerns, including perceived overlapping state and County permitting responsibilities. Concerns were expressed about the potential creation of additional nonconforming lots and structures under a refined County Code, and the implications of a refined County Code that distinguished between three classes of waterbodies, there was some discussion of strengthening current County Code requirements across the board, thereby creating a single, more restrictive class.

Discussion at all five public informational meetings ranged considerably in content, but generally appeared to reflect local issues and concerns from the various parts of Washington County in which the meetings were held. Nevertheless, there were a number of commonalities, particularly with respect to the potential impact of the proposed refinements to the Washington County Code. A general concern among participants was the degree to which existing structures and development patterns were likely to be affected by the proposed refinements. Staff indicated that, with some exceptions, the proposed refinements would apply to new development within the shoreland areas of the County. The exceptions largely were associated currently legal but nonconforming structures and uses. Additions or modifications to these legal nonconforming structures and uses may fall under the refined provisions of the County Code if they are initiated subsequent to the adoption of the refined Ordinance. One exception to this would be the statutorily permissible replacement or repair of structures within floodlands pursuant to Chapter 87 of the *Wisconsin Statutes*. Notwithstanding, the participants generally appeared to support the proposals, although some participants did indicate that more stringent proposals would not be unwelcomed. There was some difference in concept between comments offered in the northern portion of the County and those offered in the remainder of the County, with a slightly greater emphasis on individual property rights being voiced in the north.

Analysis of Public Comment

Participants in each of the public informational meetings reviewed preliminary draft County Code refinements in each of nine issue areas. These issues, boathouses; principal structures; legal nonconforming structures; vegetative buffers; filling, grading, and excavating; shoreline stabilization; design review; lot sizes; and sand and pea gravel blankets, had been identified at the initial round of public informational meetings held during 1999. Each issue was presented as a summary of the current County Code provisions with the proposed refinements set forth in adjacent columns under each waterbody class. Participants were asked to respond to these draft County Code refinements on a questionnaire survey instrument that paralleled the format of the summary form. Comments to amplify their responses were welcomed, and space was provided on the questionnaire for this purpose. The questionnaires were returned to the County staff at the conclusion of the meeting.

Over 100 questionnaire survey instruments were completed by the participants, with the majority of participants providing a response to each of the nine issues and three waterbody classes. The overall response rate was about 80 percent. While there was some variation in the nature of responses depending upon the particular location within Washington County, as noted above, there was general agreement that the proposed waterbody classification scheme and draft refinements to the Washington County Code were acceptable. Overall, about 50 percent of participants indicated agreement with the proposed classification scheme; a further 10 percent of participants indicated strong agreement with the proposed classification scheme. Similarly, overall, about 50 percent of participants indicated agreement with the proposed draft Code requirements; a further approximately 25 percent of participants indicated strong agreement with the proposed draft Code requirements. Slightly more respondents favored the adopted draft lake classification scheme (about 65 percent of respondents were agreed or strongly agreed) over the alternative draft lake classification scheme (about 60 percent of respondents were agreed or strongly agreed). About 60 percent of respondents were agreed or strongly agreed with the stream classification scheme.

Specific responses to the proposed County Code refinements in each of the nine issue areas considered at the public informational meetings are set forth below. Generally, participants indicating agreement or disagreement with the draft provisions for one waterbody class consistently indicated agreement or disagreement with the draft provisions for all three waterbody classes, although individual participants were sometimes divided in the degree of their responses between Class III waters, and Class I and Class II waters, respectively, as indicated in the preceding review of public comments.

Boathouses

Three hundred and fourteen responses were offered. A plurality of about 40 percent of participants indicated agreement with the proposed draft County Code provisions related to boathouses. A further approximately 30 percent of participants indicated strong agreement with the proposed draft County Code provisions.

Principal Structures

Three hundred and twenty-one responses were offered. A plurality of about 40 percent of participants indicated agreement with the proposed draft County Code provisions related to principal structures. A further approximately 35 percent of participants indicated strong agreement with the proposed draft County Code provisions.

Legal Nonconforming Structures

Three hundred and fifteen responses were offered. A plurality of about 45 percent of participants indicated agreement with the proposed draft County Code provisions related to legal nonconforming structures. A further approximately 25 percent of participants indicated strong agreement with the proposed draft County Code provisions.

Vegetative Buffers
Three hundred and sixteen responses were offered. A plurality of about 45 percent of participants indicated agreement with the proposed draft County Code provisions related to vegetative buffers. A further approximately 20 percent of participants indicated strong agreement with the proposed draft County Code provisions.

Filling, Grading, and Excavating
Three hundred and nine responses were offered. A majority of about 55 percent of participants indicated agreement with the proposed draft County Code provisions related to filling, grading, and excavating. A further approximately 20 percent of participants indicated strong agreement with the proposed draft County Code provisions.

Shoreline Stabilization
Three hundred and thirteen responses were offered. A majority of about 55 percent of participants indicated agreement with the proposed draft County Code provisions related to shoreline stabilization. A further approximately 25 percent of participants indicated strong agreement with the proposed draft County Code provisions.

Design Review
Two hundred and ninety-nine responses were offered. A majority of about 55 percent of participants indicated agreement with the proposed draft County Code provisions related to design review. A further approximately 20 percent of participants indicated strong agreement with the proposed draft County Code provisions.

Lot Sizes
Three hundred and nine responses were offered. A plurality of about 45 percent of participants indicated agreement with the proposed draft County Code provisions related to lot size. A further approximately 20 percent of participants indicated strong agreement with the proposed draft County Code provisions.

Sand Blankets and Pea Gravel
Three hundred and ten responses were offered. A majority of about 55 percent of participants indicated agreement with the proposed draft County Code provisions related to the placement of sand and pea gravel blankets. A further approximately 20 percent of participants indicated strong agreement with the proposed draft County Code provisions.

THE THIRD SERIES OF PUBLIC INFORMATIONAL MEETINGS: NOVEMBER 2000

Following the August 2000 series of public informational meetings and based upon comments received from the public during that series of meetings, the Washington County Code Revision Working Group further refined the proposed modifications to the Washington County Code. These modifications addressed the issues identified by the citizens attending the previous informational meetings held during 1999 and 2000. For those waterbodies falling into the historically developed class, Class III, the proposed refinements were limited in scope. The proposed Code refinements retained many of the features and components currently set forth within the existing County Code. Some limited additional protections were proposed to be included within provisions that established a minimum setback distance of 50 feet, even if the zoning ordinances continued to permit setback averaging, and some requirements for mitigation and creation of vegetative buffers around certain types of development. The refinements proposed for Class II waterbodies were somewhat more stringent, including proposed requirements for greater setback distances, mandatory mitigation measures, and increased minimum lot sizes. The refinements proposed for Class I waterbodies were more rigorous, including proposed setbacks that exceed the State minimum requirements set forth in Chapter NR 115 of the *Wisconsin Administrative Code*, the elimination of certain discretionary activities, and increased requirements for screening, maintenance of land form, and natural shoreline protection measures. The proposed refinements of the Washington County Code were reviewed at the third and final round of public informational meetings, prior to the December 2000 public hearing on the draft Code, convened during November 2000.

Attendance
Meetings were held in West Bend on the afternoon and evening of Monday, November 14, 2000; in Farmington on the evening of Tuesday, November 15, 2000; in Richfield on the evening of Wednesday, November 16, 2000; and in Hartford on the evening of Thursday, November 17, 2000. One hundred and forty-six citizens registered their attendance at the five informational meetings. Attendees ranged from riparian owners of elected and appointed officials. The majority of respondents to the questionnaires completed during these meetings were riparian residents. About 95 surveys, covering the nine issue areas and the three waterbody classification schemes, were completed by the participants during these informational meetings. More than one-half of the participants in this third round of public informational meetings indicated that they had not previously attended informational meetings held during the project period.

Program Notes
Each of the meetings was opened by staff of the University of Wisconsin-Extension, who welcomed participants and explained the objectives and outline of the program. UWEX staff then reviewed the progress to date by the Washington County Code Revision Working Group and the Issues Review Group. The Southeastern Wisconsin Regional Planning Commission staff briefly outlined the lake and stream classification schemes adopted by the Working Group. Staff of the Washington County Planning and Parks Department discussed some proposed draft code language for public review. Participants were asked to complete an interactive questionnaire during this presentation, and extensive discussion ensued. Following the presentations, additional comments from the public were invited.

Review of Public Comments
Discussion at the first public informational meeting centered on the effects of the County Code revisions on existing development. This arose, in part, as a result of the Town of West Bend having enacted more stringent zoning requirements for construction in the shoreland zone, under their general zoning authority, than the County, especially with respect to the prohibition of new boathouses. Concerns were expressed about the application of the new requirements to existing development. In particular, the potential for vegetative buffers to result in safety concerns with respect to children using the lake was discussed. Other shoreline issues were also discussed, including shoreline stabilization, view corridors, and the availability of an appeals process regarding issuance of permits from Washington County staff.

Discussion at the second public informational meeting also centered on the effects of the County Code revisions on existing development, including the relationship between the County Code and local zoning requirements, such as those of the Town of West Bend, which may be more stringent than the County, especially with respect to the prohibition of new boathouses. Concerns were expressed about the application of the new requirements to existing development and rebuilding of existing structures in floodplain areas in the case of natural disaster other than a flood event. The prohibition of any new boathouses on any waterbodies was also discussed.

Discussion at the third public informational meeting centered on waterbody mapping, or which waters were included in the waterbody classification scheme, vegetative buffers, and some administrative aspects of the proposed County Code refinements. The relationship between the County shoreland-floodland mapping project and the waterbody classification project was described.

Discussion at the fourth public informational meeting centered on the effects of the County Code revisions on mapping the floodplains and floodways of Washington County. This arose due to the adoption of new floodplain and floodway maps in accordance with the Washington County land and water resources management plan by the County Board during the summer of 2000. The availability of an appeals process was also discussed.

Discussion at the fifth public information meeting centered on the applicability of the new County Code in agricultural and incorporated municipal areas. With respect to agricultural areas, discussion centered specifically on the requirements for vegetative buffers, in relation to cropland within the shoreland area. This arose due to concerns about the applicability of the new County Code to existing development, agricultural lands, and areas likely to be annexed into cities and villages. Other issues that arose included the special zoning category created by the Town of Erin for shoreland areas, especially around Druid Lake, and the zoning requirements for properties that border more than one waterbody with different class rankings.

Analysis of Public Comment

Participants in each of the public informational meetings reviewed preliminary draft County Code refinements in each of issue areas. These issues, boathouses; principal structures; legal nonconforming structures; vegetative buffers; filling, grading, and excavating; shoreline stabilization; design review; lot sizes; and mitigation, had been identified at the initial round of public informational meetings held during 1999 and confirmed at the public informational meetings held during August 2000. Each issue was presented by summarizing the current County Code provisions with the proposed refinements set forth in adjacent columns under each waterbody class. Participants were asked to respond to these draft County Code refinements on a questionnaire survey instrument that paralleled the format of the summary form. Comments to amplify their responses were welcomed, and space was provided on the questionnaire for this purpose. The questionnaires were returned to the County staff at the conclusion of the meeting.

Approximately 100 questionnaire survey instruments were completed by the participants, with the majority of participants providing a response to each of the issues and three waterbody classes. Overall, the response rate was about 70 percent. While there was some variation in the nature of responses depending upon the particular location within Washington County, as noted above, there was general agreement that the proposed waterbody classification scheme and draft refinements to the Washington County Code were acceptable. Overall, about 60 percent of the participants indicated agreement with the proposed draft Code requirements; a further approximately 15 percent indicated strong agreement with the proposed draft Code requirements. An analysis of the comments received showed that approximately 75 percent of participants expressed agreement with the proposed draft Code requirements. This represents an increase in the numbers of participants who indicated agreement, a total of about 60 percent of respondents, with the preliminary draft Code refinements that were introduced during the second round of public informational meetings held during August 2000. Given the fact that many of the participants had not previously attended a public informational meeting, these numbers suggest continued support for the waterbody classification process, and the determination of more flexible County shoreland-floodland zoning requirements.

Specific responses to the proposed County Code refinements in each of the issue areas considered at the public informational meetings are set forth below. Generally, participants indicating agreement or disagreement with the draft provisions for one waterbody class did not necessarily indicate agreement or disagreement with the draft provisions for all three waterbody classes. This was most likely due to the differentiation between classes of waterbodies and the specific regulations assigned thereto.

Boathouses

Two hundred and seventy-four responses were offered. A plurality of about 45 percent of participants indicated agreement with the proposed draft County Code provisions related to boathouses. A further approximately 25 percent of participants indicated strong agreement with the proposed draft County Code provisions.

Principal Structures

Two hundred and seventy-four responses were offered. A majority of about 60 percent of participants indicated agreement with the proposed draft County Code provisions related to principal structures. A further approximately 20 percent or participants indicated strong agreement with the proposed draft County Code provisions.

Legal Nonconforming [Existing] Structures

Two hundred and seventy-nine responses were offered. A majority of about 60 percent of participants indicated agreement with the proposed draft County Code provisions related to legal nonconforming structures. A further approximately 15 percent indicated strong agreement with the proposed draft County Code provisions.

Vegetative Buffers
Two hundred and seventy-two responses were offered. A majority of about 55 percent of participants indicated agreement with the proposed draft County Code provisions related to vegetative buffers. A further approximately 15 percent indicated strong agreement with the proposed draft County Code provisions.

Filling, Grading, and Excavating
Two hundred and seventy-eight responses were offered. A majority of about 70 percent of participants indicated agreement with the proposed draft County Code provisions related to filling, grading, and excavating. A further 10 percent of participants indicated strong agreement with the proposed draft County Code provisions.

Shoreline Stabilization
Two hundred and seventy-three responses were offered. A majority of about 60 percent indicated agreement with the proposed draft County Code provisions related to shoreline stabilization. A further approximately 20 percent indicated strong agreement with the proposed draft County Code provisions.

Design Review
Two hundred and fifty-nine responses were offered. A majority of about 65 percent of participants indicated agreement with the proposed draft County Code revisions related to design review. A further approximately 20 percent indicated no opinion with respect to the proposed draft County Code provisions.

Lot Size
Two hundred and seventy-one responses were offered. A majority of about 70 percent of participants indicated agreement with the proposed draft County Code revisions related to lot size. A further approximately 15 percent indicated no opinion in regards to the proposed draft County Code provisions.

Mitigation
Two hundred and forty-six responses were offered. A majority of about 55 percent of participants indicated agreement with the proposed draft County Code revisions related to mitigation. A further approximately 15 percent indicated strong agreement with the proposed draft County Code provisions.