

CHAPTER 4: REGIONAL GEOGRAPHY & RESOURCES

INTRODUCTION

The geographic location, climate, physiographic conditions and resources within the East Central Wisconsin Region play a part in molding the region's economy. The following chapter will provide the context in which the region's economy is built upon.

POLITICAL GEOGRAPHY

Comprised of ten counties (Calumet, Fond du Lac, Green Lake, Marquette, Menominee, Outagamie, Shawano, Waupaca, Waushara, and Winnebago counties) encompassing approximately 5,900 square miles, the East Central Wisconsin Region, as its name implies, lies in the east central part of Wisconsin (Map 10). Nestled in the Midwestern United States, Wisconsin is bordered by Iowa to the southwest, Illinois to the south, Michigan to the northeast, and Minnesota to the northwest. Lake Michigan provides the state's eastern border, while Lake Superior borders to the north.

The region contains two distinct geographical areas: urban and rural. Portions of the four eastern counties (Calumet, Outagamie, Winnebago, and Fond du Lac) form an urbanized area around Lake Winnebago. The Fox Cities, which straddle the lower Fox River, and urban areas around Lake Winnebago make up one of the largest metropolitan areas in the state, and comprise approximately 75 percent of the region's population. These four urban counties contain three Metropolitan Statistical Areas (MSA) defined by the U.S. Census Bureau. As of December 2005, the former Appleton-Oshkosh-Neenah MSA was divided into the Appleton MSA and the Oshkosh-Neenah MSA. Fond du Lac is the third MSA within the region.

The rural area of the region is comprised of six rural counties: Green Lake, Marquette, Menominee, Shawano, Waupaca and Waushara, as well as outlying portions of the four urban counties. The northern and western counties contain many lakes, forested and agricultural areas.

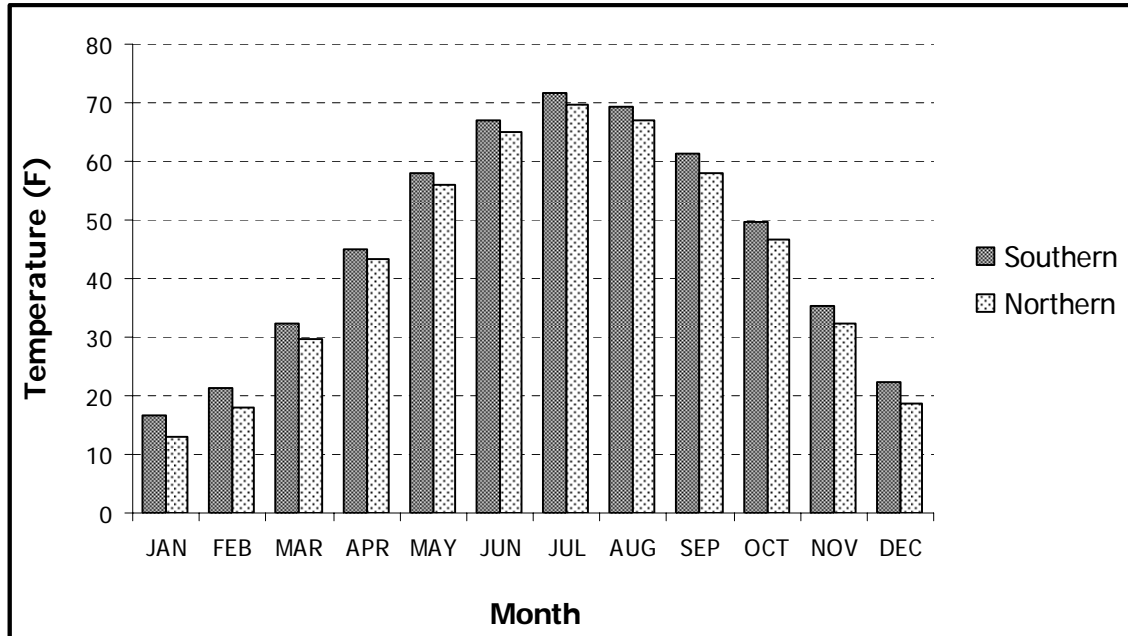
CLIMATE

The East Central Wisconsin Region is located within the humid continental climate zone. Characteristics of this zone include large seasonal variances in weather (e.g. four seasons), and variable weather patterns resulting from conflicting polar and tropical air masses.

Figure 11 depicts average monthly temperatures for northern (N) and southern (S) portions of the region, while Figure 12 depicts average monthly precipitation for the same areas. Average temperatures range from a low of 13 (N) to 17 (S) degrees Fahrenheit in January, to 70 (N) to 72 (S) degrees Fahrenheit in July. Average monthly precipitation range from a low of around 1 (N and S) inch of rain in February to a high of around 4 inches (N and S) in August.

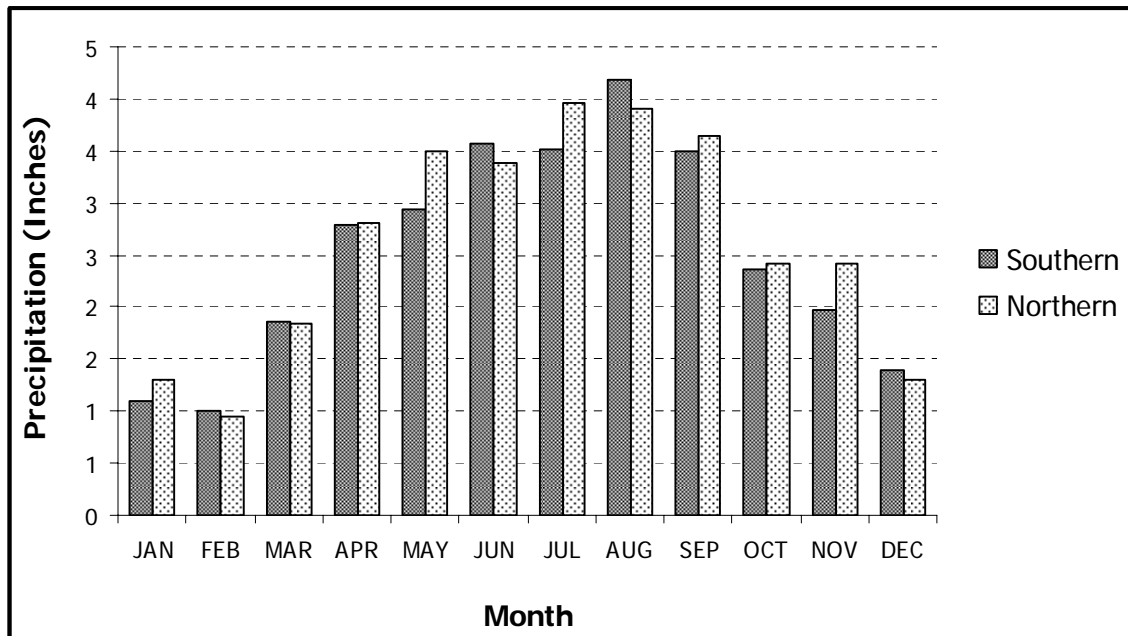
The region's natural climate is well suited for agricultural production. In southern portions of the region, the growing season lasts approximately 166 days, whereas in the north, it lasts approximately 98 days.

Figure 11. Average Monthly Temperature at Northern and Southern Extent of Region (1970-2000)



Source: NOAA, Monthly Station Normals (1971-2000); Station IDs: Fond du Lac 049; Shawano: 142

Figure 12. Average Monthly Precipitation at Northern and Southern Extent of Region (1970-2000)



Source: NOAA, Monthly Station Normals (1971-2000); Station IDs: Fond du Lac 049; Shawano: 142

MAP 10.

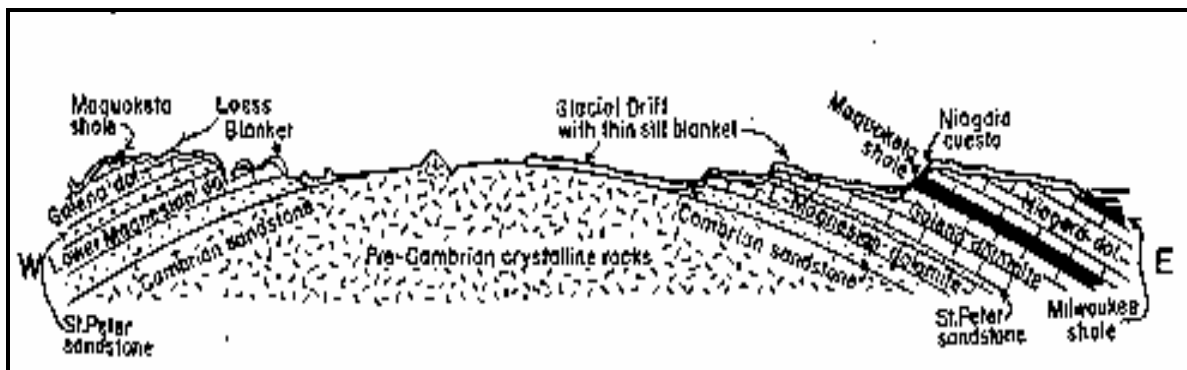
Regional Context

GEOLOGIC RESOURCES

The bedrock and glacial geology of the region is quite complex and plays a crucial role in development of the region (Figure 13). Ancient rocks of Precambrian age form the base of the region and, in places, are over two billion years old. These rocks were commonly altered from their original appearance, and represent the deposits of ancient seas, volcanoes, and underground bodies of liquid material called magma. Between 500,000 and 200,000 years ago, during the late part of the Cambrian Period, a shallow inland sea spread across much of Wisconsin and many layers of sedimentary materials covered the bottom of this sea. These deposits are represented by beds of sandstone, shale, and limestone.

During the Pleistocene period, between 15,000 and 25,000 years ago, several separate glacial advances and retreats took place over northeastern and central Wisconsin. These glaciers not only scoured and shaped some of the upper levels of bedrock, but also deposited numerous unsorted tills, and stratified gravel, sand and clay materials throughout the region. These deposits contain not only fragments of local limestone, shale and sandstones, but also igneous and metamorphic rocks imported into the region by the ice sheets. Further erosional action from the glacial melt-waters continued to shape the landscape in terms of topography and drainage patterns. Numerous unique landscapes and landforms were created as a result of the glaciers and include formations such as escarpments, outwash plains, lake plains, terminal moraines, ground moraines, and drumlins. More subtle features such as eskers, kames, and sand dunes are also a result of glaciation. Each of these features has its own unique qualities that need to be considered in terms of development, including: structural suitability, groundwater interaction, and the provision of non-metallic minerals to serve the needs of the urbanizing landscape of the region.

Figure 13. Geological Cross-Section of Wisconsin



Metallic & Non-Metallic Mining

No active metallic mining activities occur within the region as metallic minerals are not present in high quantity, although some commercially limited deposits of copper and other base metals may be present in northwestern Shawano County. The bedrock geology of the region does, however, lend itself well to the production of building and crushed stone.

Numerous areas exist within the Silurian and Prairie du Chien (dolomite) formations to provide high quality limestone that is accessible from the surface. These areas are located primarily in

the eastern and central portions of the region where the overlying glacial deposits are shallow. Much of this material is utilized for either crushed stone or as an exterior building material.

Extensive deposits of sand and gravel are found in virtually every county, principally in glacial outwash formations. These formations are at the surface or may be buried beneath subsequent glacial debris and, in some cases, drumlins, eskers, and river sediments also contain valuable deposits. The active and inactive non-metallic mine sites are essential for the future development of the region.

In 2000, NR135 became part of the Wisconsin Administrative Code. This legislation allows communities and/or regional planning commissions to develop ordinances establishing requirements for reclamation of non-metallic mines, such as quarries and gravel pits. The Commission acts as the regulatory authority in administering the regulations set forth in the legislation, by agreement with the following counties: Calumet, Outagamie, Shawano, Waupaca, and Winnebago. As part of these agreements, the Commission is charged with issuing permits and performing review and approvals of reclamation plans. Mining sites permitted under the NR135 program, and administered by the Commission, are depicted in Map 11.

MAP 11.

Mining Areas

ECOLOGICAL LANDSCAPE

As depicted in Map 12, The region is classified as being part of seven (out of sixteen) distinct ecological landscape types that cover the state based on a system of land classification developed by the WDNR which is a modification of the National Hierarchical Framework of Ecological Units (NHFEU). This system divides the state into ecological units based on combinations of biotic and environmental factors, which include climate, physiography, soils, hydrology, and vegetation. Each of these ecological units has additional, better defined 'natural communities'. These natural communities, in turn are associated with certain types of common and rare plant and animal species. A general description of each ecological unit is given below:

- ***Northern Lake Michigan Coastal:*** This landscape is influenced by the Lake Michigan climate and contains gently rolling to flat topography with clay and loam soils; land cover now dominated by agriculture in the south and mixed conifer-hardwood forest in the north.
- ***Central Lake Michigan Coastal:*** This landscape is influenced by the Lake Michigan climate and is characterized by generally flat topography with clay and silt loam soils; land cover now primarily urban and agricultural; some remnant northern hardwood forest with maple, beech, and some hemlock, plus conifer swamps, hardwood swamps, and riverine marshes.
- ***Southeast Glacial Plains:*** This landscape is characterized by gently rolling to flat topography with clay or silt loam-textured soils on till plain; land cover now primarily urban and agricultural; small remnant oak openings, oak forest, tallgrass prairie, and sugar maple-basswood forest.
- ***Northeast Sands:*** This landscape historically supported extensive oak and pine barrens and jack pine forests. Northern hardwood and red and white pine forests were interspersed throughout the landscape. Now, most of this landscape is forested, predominantly with aspen and paper birch. Jack pine stands remain on the outwash plains along with northern pin oak. Several important remnants of oak-pine barrens remain. The outwash plains include many pitted depressions, which frequently contain wetlands and kettle lakes.
- ***Forest Transition:*** In pre-settlement times, this landscape was almost entirely covered with mesic to wet-mesic forests of hemlock and sugar maple, with some yellow birch, red pine, and white pine. There were pockets of conifer swamps, often near the headwaters of streams, containing white cedar, black spruce and tamarack. With a combination of productive soils and more moderate climate, this band across the state marks the northern extent of predominantly agricultural use of land. Remaining forests tend to occur as fragments and are often quite small. Soils are diverse and range from sandy loam to loam and shallow silt loam (both poorly drained and well drained). At the eastern end of this landscape, which was covered by the Green Bay lobe of the last glacier, many lakes occur, the soil is not as favorable for farming, and more forests are present.
- ***Central Sand Plains:*** The dominant feature in this landscape is the vast, remarkably flat, sandy plain that was once the bed of Glacial Lake Wisconsin – the enormous body of water fed primarily by glacial runoff. This lake, ringed by the Driftless Area to the southwest and the glacier to the north and east, was 70 to 150 feet deep and covered over 1,800 square miles. Streams and rivers draining from the glacier into the lake carried enormous loads of sand, silt, and clay that settled onto the lake bottom.

- ***Central Sand Hills:*** This ecological landscape is located at the eastern edge of the old Glacial Lake Wisconsin and contains a series of glacial moraines that were later partially covered by glacial outwash. Pre-settlement vegetation consisted of oak forest, oak savanna, and a variety of prairie types in the uplands. Fens, wet prairies, and rare coastal plain marshes occurred in the lowlands. Soils throughout the landscape have a significant sand component. A mixture of farmland, woodlots, and a variety of wetlands now characterizes the area. Agriculture is successful in the sandy areas with the use of center pivot irrigation but there is a considerable amount of less productive and idle agricultural land.

MAP 12.

Regional Physiographic Features

LAND USE

Map 13 depicts regional land use patterns. In general, residential, commercial and industrial uses are most concentrated in the region's urban areas (e.g. areas surrounding Lake Winnebago), while agricultural is concentrated in southeastern parts of the region, and forests are located in the northwest. Table 25 provides acreage counts for each land use, by county, according to the Commission's land use definitions. As the Commission has not created land use acreage counts for Green Lake and Marquette counties, regional totals are presented as percentage of total. The following sections provide a more detailed look at specific land uses throughout the region.

Residential

Residential land uses have consumed approximately 4.6 percent of the region's total land. As can be expected, higher rates of consumption occurred in the region's urban counties (5.9 percent). Among counties with data, Fond du Lac County has the largest share of land in residential (5.6 percent), while Menominee County has the lowest (0.7 percent).

Commercial & Industrial

Commercial and Industrial land uses account for 0.5 percent of the region's total land. Like residential, the greatest concentrations are within the region's urban counties (0.8 percent). Among counties with data, Fond du Lac, Outagamie, and Winnebago each have the largest share of land in commercial and industrial uses (0.7 percent), while Menominee County has the least (0.01 percent). Chapter 3, "Transportation and Regional Infrastructure" contains a more detailed discussion of commercial and industrial park acreage availability.

Agriculture

Agricultural uses account for over 43 percent of the region's total acreage. Although at first counterintuitive, urban counties have a greater percentage of land in agriculture (48.9 percent) than rural counties (37.0 percent). As is evident in Map 13, the majority of agricultural lands lie within Calumet, Fond du Lac, Outagamie, and Winnebago Counties. This fact is a reminder that, as one of many tools, wise land use planning can help preserve the region's agricultural resources. The region's rural counties lie at the "tension zone", where agricultural lands transition to forests; this, in part, contributes to the fact they have a lower percent of acreage in agriculture.

Agriculture is an important natural, economic and cultural resource within the region. Physical characteristics, primarily soils and drainage, dictate the type of and potential for agriculture uses. Agriculture production and local economic significance varies throughout the region. Existing land use and development pressures impact farm operations and agricultural economics. The Census on Agriculture provides evidence that the amount of land dedicated to agriculture within the region has been declining.

Table 25. Land Use, 2004

	Residential	Industrial	Commercial	Active Quarry	Parks / Outdoor Recreation	Irrigated & Non Irrigated Cropland	Planted & Unplanted Woodlots	Institutional Facilities	Utilities	Airports & Transport- ation	Other Open Land	Water Features	Total Acres
Region (%)	4.6%	0.2%	0.3%	0.2%	0.6%	43.4%	32.0%	0.2%	0.1%	3.4%	11.6%	3.3%	100.0%
Urban Counties (%)	5.2%	0.3%	0.4%	0.3%	0.6%	48.9%	13.4%	0.3%	0.1%	3.5%	11.6%	3.3%	100.0%
Rural Counties (%)	3.8%	0.1%	0.2%	0.2%	0.5%	37.0%	53.9%	0.2%	0.1%	3.4%	11.6%	3.3%	100.0%
Calumet	11,278	529	858	429	2,397	132,342	28,119	616	373	8,179	16,998	2,777	204,895
% Total	5.5%	0.3%	0.4%	0.2%	1.2%	64.6%	13.7%	0.3%	0.2%	4.0%	8.3%	1.4%	100.0%
Fond du Lac	26,193	1,491	1,973	1,390	2,817	274,984	58,775	1,797	362	16,870	72,308	6,855	465,813
% Total	5.6%	0.3%	0.4%	0.3%	0.6%	59.0%	12.6%	0.4%	0.1%	3.6%	15.5%	1.5%	100.0%
Green Lake													
Marquette													
Menominee	160	7	4	3	11	30	20,453	15	25	326	178	476	21,689
% Total	0.7%	0.0%	0.0%	0.0%	0.1%	0.1%	94.3%	0.1%	0.1%	1.5%	0.8%	2.2%	100.0%
Outagamie	26,417	1,526	2,517	1,874	2,392	205,585	88,201	1,042	735	16,857	41,194	7,288	582,006
% Total	4.5%	0.3%	0.4%	0.3%	0.4%	35.3%	15.2%	0.2%	0.1%	2.9%	7.1%	1.3%	100.0%
Shawano	14,633	496	911	864	2,076	199,048	291,497	680	271	16,664	40,731	14,134	395,629
% Total	3.7%	0.1%	0.2%	0.2%	0.5%	50.3%	73.7%	0.2%	0.1%	4.2%	10.3%	3.6%	100.0%
Waupaca	22,798	695	1,256	1,076	3,441	168,900	205,895	830	271	15,595	48,815	19,810	489,382
% Total	4.7%	0.1%	0.3%	0.2%	0.7%	34.5%	42.1%	0.2%	0.1%	3.2%	10.0%	4.0%	100.0%
Waushara	12,944	224	784	271	1,405	117,689	190,179	769	193	12,148	62,364	8,644	407,613
% Total	3.2%	0.1%	0.2%	0.1%	0.3%	28.9%	46.7%	0.2%	0.0%	3.0%	15.3%	2.1%	100.0%
Winnebago	15,916	1,187	988	996	1,942	141,235	31,921	602	324	11,631	48,008	33,752	288,504
% Total	5.5%	0.4%	0.3%	0.3%	0.7%	49.0%	11.1%	0.2%	0.1%	4.0%	16.6%	11.7%	100.0%

Source: ECWRPC, 2004

*ECWRPC has not created land use data for Marquette and Green Lake counties, therefore, regional totals exclude these two counties.

MAP 13.

Regional Land Use

The US Department of Agriculture's Census on Agriculture, conducted every five years, uses a different methodology for determining agricultural land use; thus, total acreage counts do not match exactly with ECWRPC estimates. The Census on Agriculture has not yet released estimates for 2007; therefore, 1997 and 2002 data is presented below.

Farmland losses within the region follow state and national trends (Table 26 and 27). There has been a steady decline in the number of farms and farmland acreage. In fact, over just a five year period, 2.15 percent of total farmland was lost, and the number of farms decline by 5.31 percent. Shawano County experienced the greatest decline in total acres (9.2 percent). Waushara County lost the highest number of farms (10.7 percent), but lost very few acres (.92 percent), most likely caused by the consolidation of farms. Despite the loss in agriculture land, agricultural sales (crop and livestock), have increased slightly at the regional level (Table 28). The region also experienced an increase in the value of sales per farm. These values have not been adjusted for inflation.

Table 26. Farmland Acreage, 1997 and 2002

	1997 Acres	2002 Acres	Change in Acres	% Change
United States	954,752,502	938,279,056	-16,473,446	-1.73%
Wisconsin	16,232,744	15,741,552	-491,192	-3.03%
Region	1,974,966	1,932,420	-42,546	-2.15%
Calumet County	149,835	150,316	481	0.32%
Fond du Lac County	345,829	344,286	-1,543	-0.45%
Green Lake County	144,332	147,916	3,584	2.48%
Marquette County	140,001	145,552	5,551	3.96%
Menominee County	n/a	n/a	n/a	n/a
Outagamie County	269,027	263,485	-5,542	-2.06%
Shawano County	297,840	270,534	-27,306	-9.17%
Waupaca County	253,264	247,351	-5,913	-2.33%
Waushara County	194,370	192,576	-1,794	-0.92%
Winnebago County	180,468	170,404	-10,064	-5.58%

Source: U.S. Department of Agriculture 1997, 2002 Census of Agriculture

Table 27. Total Farms, 1997 and 2002

	1997 Farms	2002 Farms	Change in Farms	% Change
United States	2,215,876	2,128,982	-86,894	-3.92%
Wisconsin	79,541	77,131	-2,410	-3.03%
Region	10,180	9,634	-546	-5.36%
Calumet County	814	733	-81	-9.95%
Fond du Lac County	1,727	1,634	-93	-5.39%
Green Lake County	695	670	-25	-3.60%
Marquette County	552	624	72	13.04%
Menominee County	n/a	n/a	n/a	n/a
Outagamie County	1,533	1,430	-103	-6.72%
Shawano County	1,604	1,465	-139	-8.67%
Waupaca County	1,409	1,398	-11	-0.78%
Waushara County	803	717	-86	-10.71%
Winnebago County	1,043	963	-80	-7.67%

Source: U.S. Department of Agriculture 1997 and 2002 Census of Agriculture

Table 28. Market Value of Farm Production, 1997 and 2002

	Crop Sales		Livestock Sales		Average per Farm	
	1997	2002	1997	2002	1997	2002
United States	\$ 98,055,656,000	\$ 95,151,954,000	\$ 98,808,993,000	\$ 105,494,401,000	\$ 102,970	\$ 94,245
Wisconsin	\$ 1,640,283,000	\$ 1,690,071,000	\$ 3,939,578,000	\$ 3,933,320,400	\$ 85,056	\$ 72,906
Region	\$ 230,542,000	\$ 243,101,000	\$ 565,710,000	\$ 595,239,000	\$ 83,409	\$ 86,122
Calumet County	\$ 12,978,000	\$ 14,903,000	\$ 63,007,000	\$ 66,954,000	\$ 108,086	\$ 111,674
Fond du Lac County	\$ 38,510,000	\$ 41,482,000	\$ 112,630,000	\$ 124,695,000	\$ 101,573	\$ 101,700
Green Lake County	\$ 16,632,000	\$ 19,884,000	\$ 28,624,000	\$ 25,873,000	\$ 77,493	\$ 68,294
Marquette County	\$ 17,286,000	\$ 17,717,000	\$ 14,996,000	\$ 19,840,000	\$ 72,870	\$ 60,188
Menominee County	n/a	n/a	n/a	n/a	\$ 2,506	n/a
Outagamie County	\$ 33,765,000	\$ 31,732,000	\$ 108,419,000	\$ 114,743,000	\$ 110,563	\$ 102,431
Shawano County	\$ 12,704,000	\$ 13,081,000	\$ 113,830,000	\$ 117,034,000	\$ 94,640	\$ 88,816
Waupaca County	\$ 22,579,000	\$ 18,042,000	\$ 63,602,000	\$ 68,180,000	\$ 76,334	\$ 61,675
Waushara County	\$ 56,512,000	\$ 66,800,000	\$ 18,489,000	\$ 19,079,000	\$ 118,298	\$ 119,776
Winnebago County	\$ 19,576,000	\$ 19,460,000	\$ 42,113,000	\$ 38,841,000	\$ 71,731	\$ 60,541

Source: U.S. Department of Agriculture 1997 & 2002 Census of Agriculture

Forests

The natural woodland pattern of the region has been greatly modified by human activity. Virgin forest lands are almost non-existent and much of the once-forested land, especially in the eastern portions of the region, has been replaced by urban, industrial and agricultural development.

In total, over 32 percent of the region's total acreage is forested. The vast majority of woodlands are concentrated in rural counties (53.9 percent), located in the northern and western portions of the region. Menominee County leads among counties, with 94.3 percent of their total acreage in forest.

Two state-level programs regarding forests and woodlands exist which can be used to gauge the commercial level of forest use within the region, the Forest Crop Law (FCL), and the Managed Forest Law (MFL). The Forest Crop Law was enacted by the Legislature in 1927 and is a voluntary program, which encourages sound forestry practices. The law allows landowners to pay taxes on timber only after harvesting, or when the contract is terminated. Enrollment in the FCL program was terminated in 1987 and renewals are not allowed. FCL lands are open to the public for fishing and hunting activities as part of the contract agreement. The Managed Forest Law, enacted in 1985, combined the FCL program and a companion law, the Woodland Tax Law (WTL). The purpose of the MFL is to encourage the growth of future commercial crops through sound forestry practices while recognizing individual property owner's objectives and society's need for compatible recreational activities, forest aesthetics, wildlife habitat, erosion control and the protection of endangered resources. As of January 1, 2000, approximately 43,845.8 acres of land within the region were enrolled as 'open lands' in these programs (Table 29).

Table 29. Enrolled 'Open' Forest Program Lands within the Region, 2000

	Acres Enrolled in:		Total Acres
	Forest Crop Law	Managed Forest Law	
East Central Region	27,662	16,184	43,846
Calumet	340	-	340
Fond du Lac	40	91	131
Green Lake	-	-	-
Marquette	754	848	1,602
Menominee	-	319	319
Outagamie	378	526	904
Shawano	14,573	11,425	25,998
Waupaca	9,167	1,281	10,448
Waushara	2,371	1,556	3,927
Winnebago	40	137	177

Source: WDNR, 2000

Wetlands

The region's wetlands, depicted in Map 14, are a critical part of its broad ecological system and perform many important functions with respect to water quality, flood control, and wildlife habitat, as well as social functions such as open space, recreation and aesthetics. A wetland's physical and biological components are driven, for the most part, by the surface and groundwater flows (hydrology) within the area. The dominant characteristics of wetlands are a combination of wet soils, hydrology, and vegetation¹.

Prior to European settlement, Wisconsin had an estimated 10 million acres of wetlands. Today, Wisconsin has slightly more than 5.3 million acres remaining based on the Wisconsin Wetlands Inventory statewide wetlands mapping effort. According to data obtained from the WDNR, and illustrated in Table 30 and Map 14, the region's wetlands totaled over 672,000 acres, with most of the acreage being located in Shawano and Waupaca counties.

These wetland areas are not distributed evenly throughout the region and are somewhat dependent on the glaciation patterns, soils, surface drainage, and groundwater characteristics. Some of the larger wetland complexes in the basin are the El Dorado Marsh in Fond du Lac County, the White-Puchyan wetlands complex in Marquette and Green Lake counties, Germania Marsh in Marquette County, Grand River Marsh in Green Lake County and the Rush Lake wetlands in Winnebago County, and the Wolf. In addition to these, there are numerous other smaller wetland complexes, usually next to streams and lakes in the watershed.

¹ Wisconsin 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 (s.23.32(1) Wis. Stats.)

Table 30: DNR Wetland Acreages

County	Total Surface Area (Acres)	Acres of Wetland	% of County	Wetlands as % of State	Minimum Map Unit Size (Acres)
State	34,760,750	5,385,290		15.50%	
Region	3,558,071	672,971	18.90%	12.60%	
Calumet	204,714	24,736	12.10%	0.50%	5
Fond du Lac	462,704	69,128	14.90%	1.30%	5
Green Lake	226,755	58,816	25.90%	1.10%	5
Marquette	291,541	68,881	23.60%	1.30%	5
Menominee	229,117	33,545	14.60%	0.60%	5
Outagamie	409,849	74,221	18.10%	1.40%	5
Shawano	571,244	127,778	22.40%	2.40%	5
Waupaca	480,729	112,761	23.50%	2.10%	5
Waushara	400,695	58,725	14.70%	1.10%	2
Winnebago*	280,723	44,380	15.80%	0.80%	2

*Winnebago County acreage based on 1986 aerial photography; all other wetland acreage is based on 1978-79 aerial photography

Source: WDNR 2001

Historically, the greatest threat to wetlands in Wisconsin has been from agricultural drainage and urban development. A review of the U.S. Department of Agriculture soil survey maps for any of the counties in the region shows thousands of acres of hydric soils¹ which have been drained and converted to farmland. Other areas of hydric soils have been either drained or filled for roads and urban development, particularly near Lake Winnebago. In coming years, wetland filling will continue to be an increasing threat to wetland areas as the pressures of non-agricultural land use become more intensive. This will be especially true in areas where urban growth is occurring. Exotic plant species which invade wetlands are also of concern in the region.

MAP 14.

Regional Wetlands

OPEN SPACE AND RECREATION

Open Space & Public Lands

Many of the previously described resources are components of the region's overall open space network and need to be considered as such from environmental, recreation, and aesthetic perspectives. This section focuses specifically on those areas not previously mentioned which also contribute to the open space and passive recreation needs of the region. Areas described here are considered to be regional in nature and many are in public or quasi-public ownership. Many of the region's open space and recreational areas are depicted on Map 15.

Not counting these local community parks and recreational facilities, as of 2002 there were nearly 125,000 acres of publicly owned land available for outdoor recreational pursuits in the region (Table 31). This regional open space serves many purposes, but a prime reason that many of these areas exist in public ownership is to ensure that important scenic features, natural and cultural resources, and habitat areas are preserved for the enjoyment of both present and future generations of Wisconsin residents. With minor exception, the vast majority of this acreage is virtually undeveloped, providing opportunities for passive (less intensive) forms of recreation; i.e., activities such as hunting, fishing, and hiking, which typically do not seriously tax the resource base.

Table 31: Public Lands & Open Space Acreage within the East Central Region

	FEDERAL		STATE					COUNTY			PRIVATE
	Wildlife Areas	Other	State Parks	State Forests	State Wildlife/Fisheries	State Habitat Areas	Natural Areas (SNA)	County Parks	Forests, Hunting, Etc.	School Forests	Natural Areas (SNA)
Region	2,854	322	2,121	10,249	91,701	5,398	3,449	5,155	802	1,419	973
Calumet	-	-	1,145	-	9,758	-	20	428	-	70	-
Fond du Lac	1,700	-	-	10,249	8,807	3,892	412	809	-	-	1
Green Lake	-	-	-	-	16,515	-	242	314	-	-	-
Marquette	1,008	-	-	-	10,213	127	712	240	-	320	820
Menominee	-	-	-	-	-	-	-	-	-	-	-
Outagamie	-	50	-	-	7,439	-	900	939	-	447	-
Shawano	-	-	-	-	13,485	-	80	970	481	-	-
Waupaca	-	-	976	-	5,882	-	423	105	200	98	20
Waushara	-	272	-	-	13,782	-	660	686	-	429	-
Winnebago	146	-	-	-	5,820	1,379	-	664	121	55	132

Source: WDNR and ECWRPC 2002

There are over 3,000 acres of federally owned open space in the region. The northern tip of the Horicon National Wildlife Refuge east of Waupun and the Fox River National Wildlife Area south of Montello comprise the bulk of this acreage. Public access is not permitted on the Fox River project, which serves as a crane nesting and staging area.

Over 90 percent of the regional open space is owned by the WDNR and many of its holdings are tracts of several thousand acres or more. Depending on parcel size, character, and other factors that led to its purchase, the WDNR manages each parcel consistent with an approved site-specific management plan containing specific management objectives. These management

objectives provide a basis for the scope of development the project property is designed to accommodate and define its ultimate size and types of recreational opportunities that are allowed.

Only two state parks, High Cliff near Sherwood and Hartman Creek near Waupaca, are located with the region. Both receive heavy use, with High Cliff generally ranking third among all state parks in attendance and Hartman Creek ranking in the top ten. Each park offers over 100 campsites and provides a variety of other recreational opportunities. Over 10,000 acres of the 29,000-acre Northern Unit of the Kettle Moraine State Forest is located in southeastern Fond du Lac County. Portions of the state forest are components of the Ice Age National Park and Trail.

Collectively totaling over 91,000 acres, the WDNR's state wildlife and fisheries areas provide almost 75 percent of the public open space within the region. With the exception of Menominee County, at least 5,800 acres are available in each of the region's ten counties. The largest single property is the 14,581-acre Navarino State Wildlife Area, located primarily in southern Shawano County. The primary management objective of these properties is wildlife and fishery habitat enhancement. Most of the state wildlife areas protect the region's largest habitat-rich wetlands. The state fisheries areas are concentrated along the headwater streams in the western portion of the region, many of which are naturally reproducing trout waters. Since fishery areas follow watercourses, they tend to be more linear and less contiguous than the blocks of land common to the wildlife areas.

Scattered sites totaling over 5,000 acres in southern Winnebago County and western Fond du Lac County comprise part of DNR's Glacial Habitat Restoration Area. This project, which also extends into adjacent counties south of the region, reflects an effort begun by the WDNR about ten years ago to acquire a goal of 38,600 acres for permanent grassland nesting cover and to restore 11,000 acres of wetlands to replicate pre-settlement habitat conditions.

Sites designated by the WDNR as State Natural Areas (SNAs) are another important component of regional open space. SNAs are jewels of the landscape that have been selected on the basis of their unique biotic and/or physiological features. They are offered a high degree of protection from human impact because they often provide the only or best remaining example of specific types of ecosystems to be found in the state and, for some sites, the plant communities or species are so rare that public access is restricted. There presently are 47 designated SNAs in the region and they collectively total almost 11,000 acres. Although many of the SNAs are located within other DNR project properties, over half of the SNAs in the region are "stand-alone" sites, including 21 sites totaling over 3,400 acres that are owned by the WDNR. Four SNAs are under county ownership and an additional five are owned by private interests.

County-owned open space totals nearly 6,000 acres regionwide. Although most of this acreage is in the form of county parks, it also includes county forests and hunting areas as well as a range of specialized facilities including nature centers, fairgrounds, golf courses, and ice arenas. Each county has its own philosophy related to the operation and funding of its park system. In general, the region's three urban counties tend to provide a more diverse and intensively developed range of facilities. Many sites classified as county parks are primarily public boat landings with little or no facility development. A trend during the past 25 years has been the

incorporation of recreational trails into the region's county park systems. Today, over 100 miles of multi-use recreation trails can be found in the region.

The Ice Age National Scenic Trail, which is designed as a footpath, also passes through the region (Map 15). Developed portions of the trail exist in Fond du Lac, Waupaca, and Waushara counties, and planning efforts are underway to complete the Waushara County segment of the trail as well as to extend it southward through Marquette County.

School district lands contribute over 1,400 acres of regional open space. Most of this land is maintained as school forest with little or no development, but Seymour and Oshkosh school districts maintain environmental centers. Quasi-public open space is also provided by Fallen Timbers (Seymour) and Sullivan's Woods (Oshkosh), as well as eight other environmental centers which exist within the region. The management of these environmental centers is diverse, ranging from DNR (Kettle Moraine), county (Mosquito Hill, Ledgeview, and Navarino), local (1000 Islands and Heckrodt), and private (Bubolz and Brillion). A combination of public and private sources is commonly used to fund and staff these centers.

The region's surface water also contributes valuable open space and recreational opportunities. The region's lakes alone occupy 219,000 acres and include Lake Winnebago, Wisconsin's largest lake at 137,708 acres, and a handful of other lakes in excess of 5,000 acres. Overall, the region's lakes have a high degree of public access; only eight of its 63 lakes over 100 acres do not have public access and six of these are in Menominee County, where circumstances for public access differ because of the county's status as an Indian reservation. Access to the region's major and minor streams is generally good and many of the trout streams have extensive amounts of shoreline owned or leased by DNR.

Land Legacy Places

Recently, additional efforts have been made in considering the importance of the region's resources as part of the WDNR's Land Legacy Program. Beginning in 1999, a three year state-wide public process was initiated to gather public input and information on places that would be included in the 2006 WDNR *Wisconsin Land Legacy Report*, which included 'Legacy Places' identified throughout Wisconsin. Table 32 highlights those identified areas within the region. According to the report, these places vary in size, harbor both common and rare species, and offer outdoor recreation, conservation and environmental values of varying significance. The report does not draw boundaries around any of the places, does not identify current ownership or how and when these places should be protected, or who should help protect them.

Table 32: Land Legacy Places in the East Central Region

County	General Location
Calumet	Niagara Escarpment Corridor
	Manitowoc-Branch River Corridor
Fond du Lac	Niagara Escarpment Corridor
	Glacial Habitat Restoration Area
	Kettle Moraine State Forest
	Milwaukee River (headwaters)
	Horicon Marsh
	Campbellsport Drumlins
	Manitowoc River Corridor
	Upper Sheboygan River Marshes
Green Lake	Grand River Marsh & Lake Puckaway
	White River Marsh & Uplands
Marquette	Comstock-Germania Marshes
	Grand River Marsh & Lake Puckaway
	Montello Area Coastal Plain Marshes
	Neenah Creek
	Portage to Buffalo Lake Corridor
	Sand Country Trout Streams
	White River Marsh & Uplands
	Oxford Savanna
Menominee	Menominee County Forests
	Red River
	Upper Wolf River
Outagamie	Lower Wolf River Bottomlands
	Duck Creek & Burma Swamp
Shawano	Comet Creek & Woodlands
	North Branch Embarrass River
	Oconto River
	Red River
	Lower Wolf River Bottomlands
Waupaca	Comet Creek and Woodlands
	Hartman and Emmons Creeks
	Lower Wolf River Bottomlands
	Sand Country Trout Streams
Waushara	Lakes of the Winnebago Pool
	Sand Country Trout Streams
Winnebago	Glacial Habitat Restoration Area
	Lakes of the Winnebago Pool
	Lower Wolf Bottomlands
	Rush Lake

Source: WDNR, 2008

MAP 15.

Natural Resources and Recreational Opportunities

Tourism

Much of the region's tourism expenditures can be attributed to visits related to natural/scenic beauty, among a host of other things. Protection of the region's natural resources will help ensure the ability to attract and promote eco-tourists.

Regionally, tourism expenditures increased over 17 percent between 2000 and 2007, just higher than the state (15.7 percent). Among counties, Marquette (65.7 percent) and Calumet (42.2 percent) experienced the largest growth in tourism expenditures. Table 33 provides more detailed information on tourism expenditures.

Table 33. Tourism Expenditures, 2000-2007

	2000	2001	2002	2003	2004	2005	2006	2007	% Change '00-'07
State	\$ 11,046,539,344	\$ 11,446,494,522	\$ 11,565,804,289	\$ 11,709,866,089	\$ 11,781,228,510	\$ 11,950,050,300	\$ 12,825,549,905	\$ 12,775,536,291	15.7%
Region	\$ 1,001,439,385	\$ 1,004,695,460	\$ 1,027,522,156	\$ 1,042,706,254	\$ 1,046,285,253	\$ 1,104,677,347	\$ 1,175,465,498	\$ 1,173,152,593	17.1%
Calumet	\$ 27,245,654	\$ 27,269,083	\$ 29,143,946	\$ 33,300,192	\$ 34,438,796	\$ 35,782,317	\$ 39,765,470	\$ 38,744,926	42.2%
Fond du Lac	\$ 135,646,917	\$ 131,396,124	\$ 128,488,972	\$ 130,413,814	\$ 128,604,710	\$ 132,616,794	\$ 142,745,866	\$ 144,424,500	6.5%
Green Lake	\$ 74,235,278	\$ 75,530,219	\$ 80,693,424	\$ 83,412,081	\$ 84,531,872	\$ 82,502,701	\$ 81,694,859	\$ 81,962,932	10.4%
Marquette	\$ 44,150,693	\$ 42,531,978	\$ 47,890,444	\$ 48,295,834	\$ 48,991,692	\$ 47,761,972	\$ 69,894,934	\$ 73,165,070	65.7%
Menominee	\$ 11,853,282	\$ 11,566,205	\$ 11,385,750	\$ 11,431,093	\$ 11,657,364	\$ 11,966,625	\$ 12,144,216	\$ 12,673,877	6.9%
Outagamie	\$ 294,655,091	\$ 289,240,392	\$ 288,449,076	\$ 288,248,640	\$ 283,343,492	\$ 316,849,730	\$ 343,647,462	\$ 355,812,437	20.8%
Shawano	\$ 71,913,042	\$ 69,104,988	\$ 72,616,543	\$ 73,371,468	\$ 73,317,961	\$ 81,669,966	\$ 88,164,347	\$ 87,774,897	22.1%
Waupaca	\$ 90,096,937	\$ 96,822,040	\$ 94,568,313	\$ 97,174,168	\$ 98,128,332	\$ 102,206,388	\$ 111,417,733	\$ 108,301,515	20.2%
Waushara	\$ 53,385,357	\$ 53,278,161	\$ 58,266,651	\$ 58,332,126	\$ 60,643,277	\$ 62,856,338	\$ 71,210,039	\$ 68,011,013	27.4%
Winnebago	\$ 198,257,134	\$ 207,956,270	\$ 216,019,037	\$ 218,726,838	\$ 222,627,757	\$ 230,464,516	\$ 214,780,572	\$ 202,281,426	2.0%

Source: Wisconsin Department of Tourism, 2008