



## Rapid Watershed Assessment Wolf River Watershed

Rapid watershed assessments provide initial estimates of where conservation investments would best address the concerns of landowners, conservation districts, and other community organizations and stakeholders. These assessments help landowners and local leaders set priorities and determine the best actions to achieve their goals.

## Contents

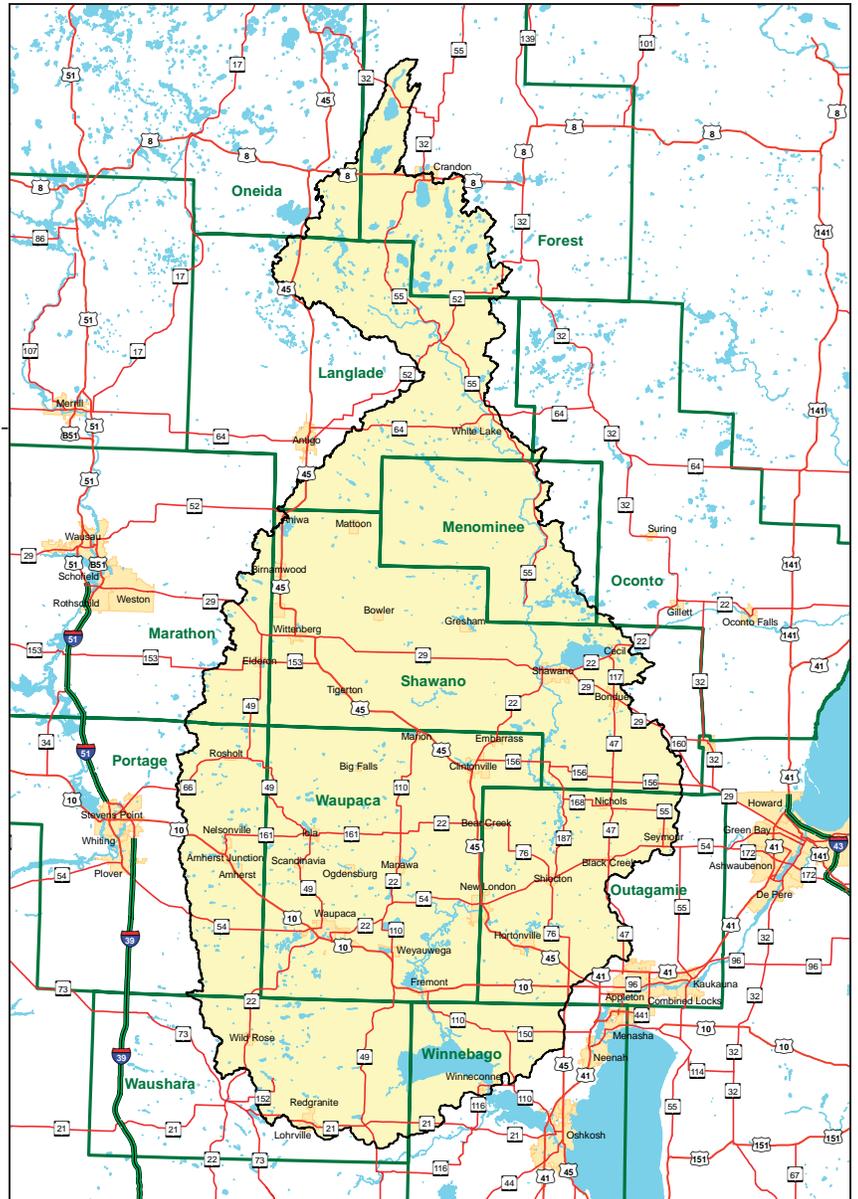
INTRODUCTION	1
COMMON RESOURCE AREAS	3
SOILS	6
DRAINAGE CLASSIFICATION	7
FARMLAND CLASSIFICATION	8
HYDRIC SOILS	9
LAND CAPABILITY CLASSIFICATION	10
RESOURCE CONCERNS	11
PRS PERFORMANCE MEASURES	11
CENSUS AND SOCIAL DATA (RELEVANT)	12
URBAN POPULATION	13
POPULATION ETHNICITY	13
ECOLOGICAL LANDSCAPES	14
WATERSHED ASSESSMENT	15
PARTNER GROUPS	16
WATERSHED PROJECTS, STUDIES, MONITORING, ETC.	16
FOOTNOTES/BIBLIOGRAPHY	17

## INTRODUCTION<sup>1</sup>

The Wolf River watershed encompasses nearly 2.4 million acres in northeast Wisconsin, beginning near Crandon in Forest County and flowing south to Lake Butte des Morts at Winneconne in Winnebago County. The watershed literally has hundreds of stream segments and water bodies, including the Wolf River itself, that are designated Outstanding or Exceptional Resource Waters by the Wisconsin Department of Natural Resources (WDNR). Major tributaries include the Little Wolf, Waupaca, Embarrass and Red Rivers. There are also hundreds of lakes in the watershed, with Legend Lake, Shawano Lake and Lake Poygan being among the largest.

The two largest land uses are agriculture, at nearly 43% of the watershed, and forestland at 37%. Wetlands and open water make up the majority of the remaining area. Farms consist of dairy, cash grain, beef and some vegetable operations. Major crops include corn, soybeans, alfalfa and grass hay. A significant area of the watershed is tribal, including lands of the Forest County Potawatomi, Menominee Indian Tribe of Wisconsin, Sokaogon Chippewa (Mole Lake) Community of Wisconsin and the Stockbridge-Munsee Community of Wisconsin. The Menominee are well known for their exceptional sustained yield forest management on 220,000 acres in Menominee County.

While near some larger cities, the watershed is largely rural with many small towns. The largest cities in the watershed are Shawano, with 8,441 residents, and New London with a population of 6,926. Agriculture, outdoor recreation, tourism and the timber industry are large components of the regional economy.



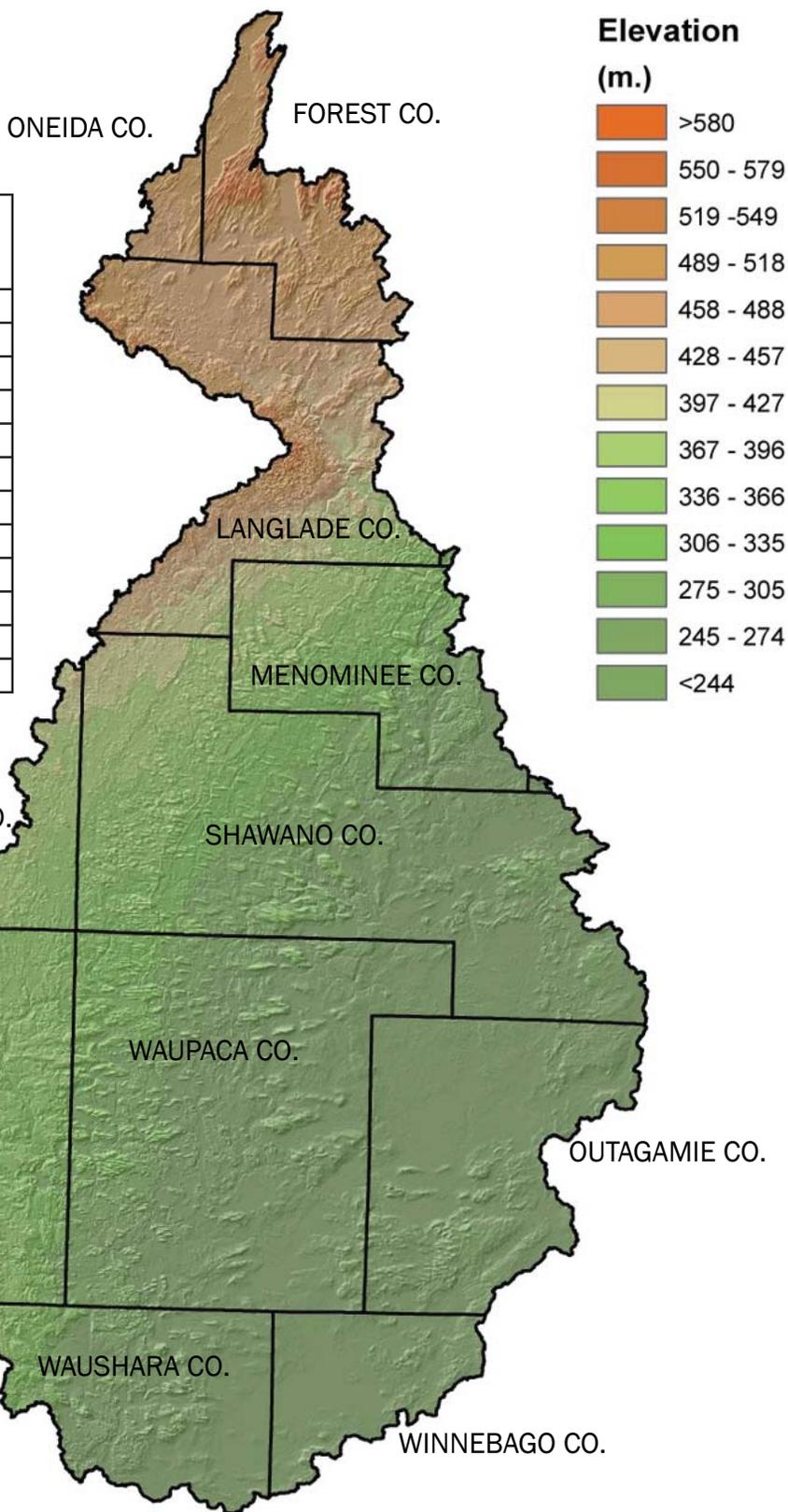
Location Map



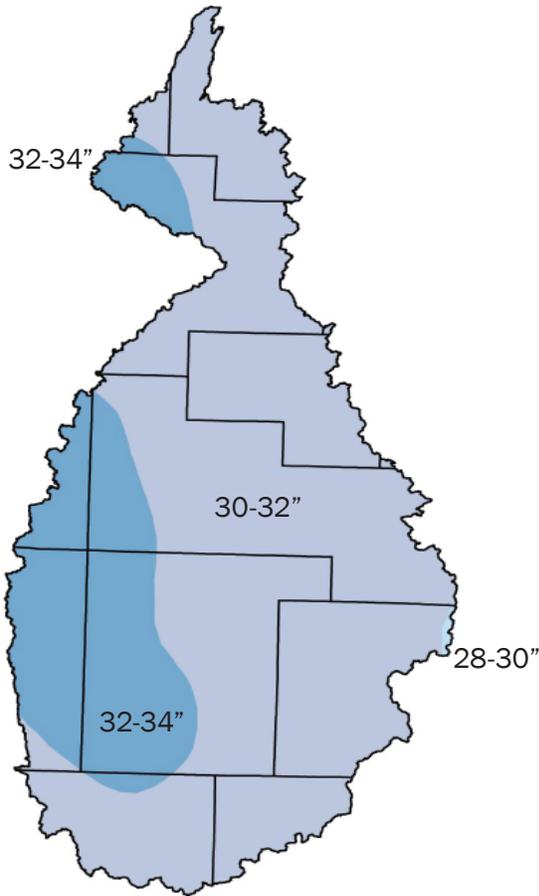
Wisconsin Watershed Map

**Acreage in the Wolf River Watershed**

County	County Acres	Acres in HUC	% of HUC from County	% of County in HUC
Forest	669406	129813	5	19.4
Langlade	567855	255557	11	45.0
Marathon	1008025	66654	3	6.6
Menominee	233448	188827	8	80.9
Oconto	649971	2107	0	0.3
Oneida	790716	24711	1	3.1
Outagamie	412381	253235	11	61.4
Portage	526336	165595	7	31.5
Shawano	581736	513260	22	88.2
Waupaca	489276	489276	21	100.0
Waushara	407694	188921	8	46.3
Winnebago	370345	105864	4	28.6



Elevation Map<sup>3</sup>.



## COMMON RESOURCE AREAS<sup>2</sup>

Common Resource Area delineations are defined as a geographical areas where resource concerns, problems and treatment needs are similar. Common Resource areas are a subdivision of an existing Major Land Resource Area (MLRA). Landscape conditions, soil, climate and human considerations are used to determine the boundary of Common Resource Areas.

### 90A.1 NORTHERN WISCONSIN GROUND MORAINE

Nearly level to moderately steep, loamy, sandy, and organic soils. Mixed deciduous and coniferous forest, common lakes and wetlands. Scattered cropland and pasture.

### 90A.3 NORTHERN GREEN BAY LOBE MORAINE

Gently sloping to moderately steep moraine. Loamy and organic soils. Deciduous and coniferous forest, cropland, pasture, scattered wetlands.

### 94B.1 NORTHEAST SANDY DRIFT

Gently sloping to moderately steep sandy, loamy, and organic soils, underlain by bedrock in some areas. Mostly deciduous and coniferous forest with some areas of cropland and pasture. Many wetlands, common lakes.

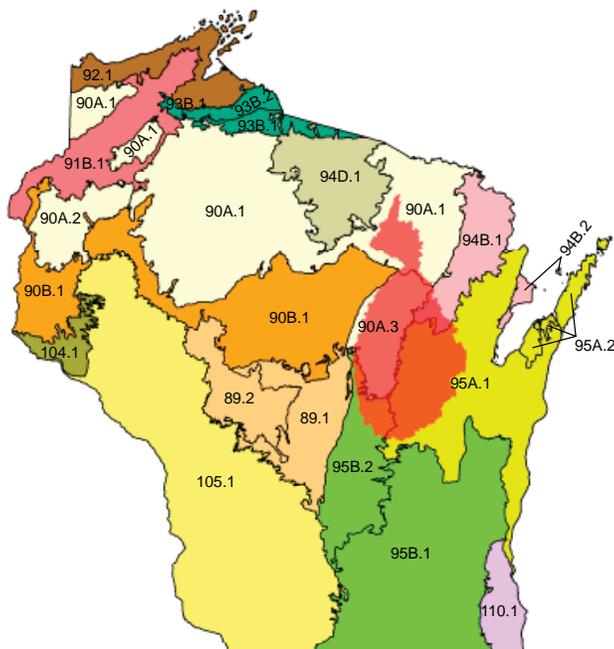
### 95B.1 SOUTHERN WISCONSIN TILL PLAIN

Nearly level to strongly sloping, drumlinized till plain. Silty, loamy, and organic soils. Mostly cropland and pasture with scattered deciduous forest, lakes, and marshes. Kettle-Moraine, Horicon Marsh. Madison, Janesville, and Beloit urban areas.

### 95B.2 SOUTHERN GREEN BAY LOBE MORAINE

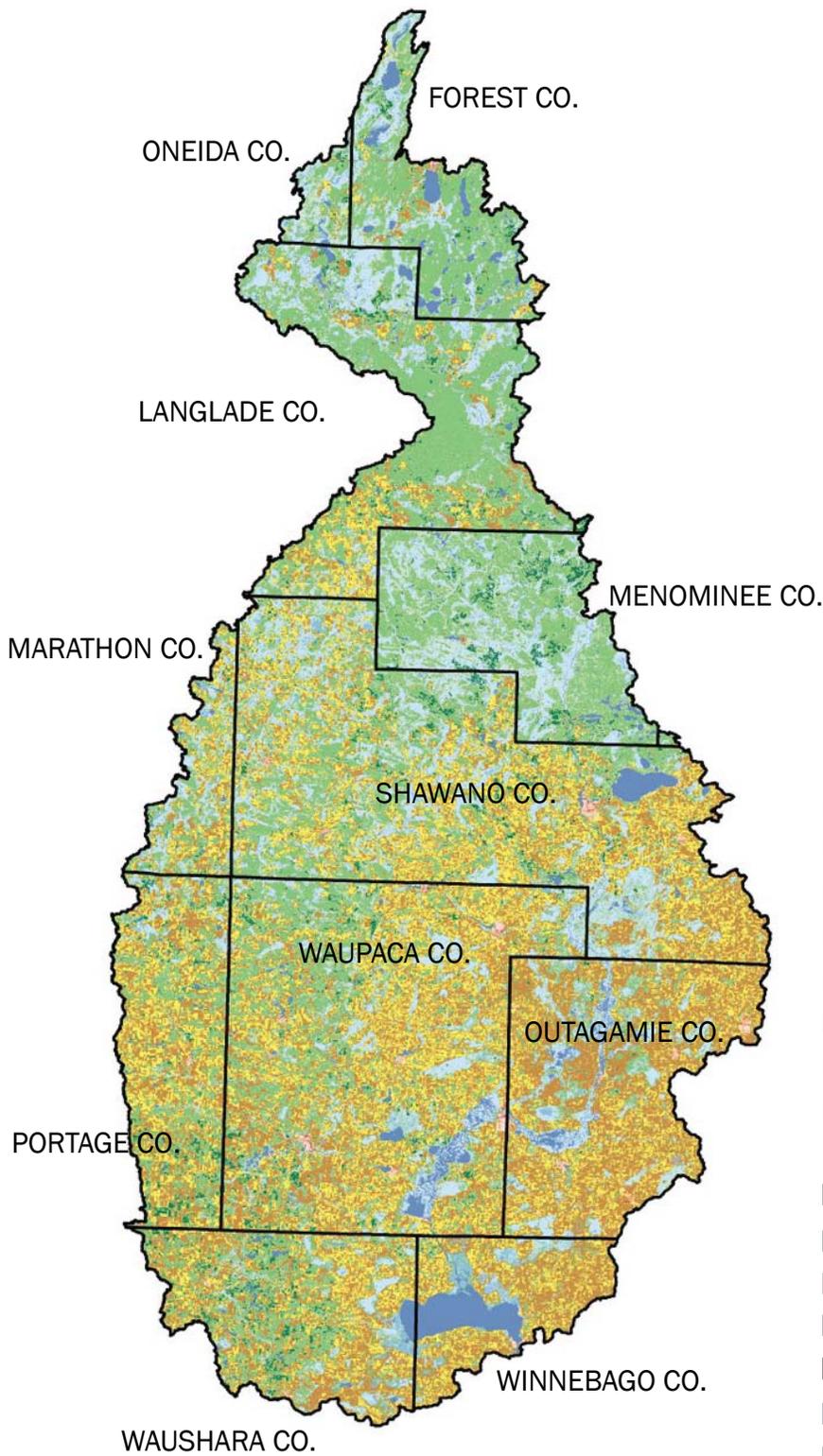
Gently sloping to moderately steep moraine. Loamy, clayey, sandy, and organic soils. Cropland, pasture, and deciduous forest. Wisconsin River valley, eastern Baraboo Hills, scattered wetlands.

Average Annual Precipitation Map (inches)<sup>4</sup>



Common Resource Area Map





Land Cover Map 5.

	Acres	Percent
 Pasture Hay	410,848	17.2
 Deciduous Forest	671,702	28.2
 Row Crops	608,269	25.5
 Open Water	77,354	3.2
 Woody Wetlands	296,725	12.4
 Small Grains	0	0
 Emergent Herbaceous Wetlands	46,971	2.0
 Commercial/Industrial / Transport	6,491	0.3
 Grasslands / Herbaceous	38,896	1.6
 Low Intensity Residential	6,389	0.3
 High Intensity Residential	1,873	0.1
 Evergreen Forest	88,405	3.7
 Mixed Forest	126,836	5.3
 Transitional	65	0
 Urban / Recreational Grasses	2,775	0.1
 Quarries / Strip Mines, Gravel Pits	435	0
 Bare Rock / Sand / Clay	0	0.0
<b>Total Acres</b>	<b>2,384,034</b>	<b>100</b>

ASSESSMENT OF WATERS <sup>6</sup>

Section 303(d) of the Clean Water Act states that water bodies that are not meeting their designated uses (fishing, swimming), due to pollutants, must be placed on this list. The 303(d) impaired Waters List is updated every two years. Wisconsin is required to develop TMDLs, Total Maximum Daily Loads, for water bodies on this list. Exceptional Resource Waters (ERW) provide valuable fisheries, hydrologically or geologically unique features, outstanding recreational opportunities, unique environmental settings, and which are not significantly impacted by human activities may be classified as exceptional resource waters. Outstanding Resource waters (ORW) and ERW differ in that ORW do not have an associated point source discharge, where ERWs do.



Listed Waters Map

- Listed Waters
- 303(d) Listed
  - Exceptional Resource Waters
  - Outstanding Resource Waters
  - Sub Watersheds
  - Streams / Rivers

Due to the size and scale of the Wolf River Watershed, individual creek, stream, and river names cannot be displayed.

For more information on the EPA list of impaired waters within the Wolf River Watershed, visit: [http://iaspub.epa.gov/tmdl/waters\\_list.control?state=WI&p\\_cycle=2006&huc=04030202](http://iaspub.epa.gov/tmdl/waters_list.control?state=WI&p_cycle=2006&huc=04030202)

For more information on waters designated as Exceptional or Outstanding Resources waters, visit: <http://dnr.wi.gov/org/water/wm/wqs/orwerw/>

## SOILS <sup>7</sup>.

The soils in this watershed have formed on a variety of different landforms and from a variety of different parent materials.

The western and far northern part of the watershed is a complex system of end moraines, drumlins, and outwash plains of both the Copper Falls Formation (Langlade Lobe) in the far north and of the Holy Hill Formation (Green Bay Lobe) in the south, both deposited during the Late Wisconsinan Glaciation. The undulating to hilly moraines and drumlins have soils that formed in brown non-calcareous sandy loam to loamy sand till and have surface textures that include sandy loam and silt loam (loess). These till soils range from well drained to somewhat poorly drained and typically have perched water tables. They have moderate to slow permeability and moderate available water capacity. Fragipans are common in the far northern drumlin soils. The Outwash plains have soils that formed in silty or loamy alluvium over acid sand and gravel outwash, or they formed entirely in outwash, and have surface textures that include silt loam, sandy loam, and loamy sand. These outwash soils are generally well drained, but range from excessively drained to somewhat poorly drained, and typically have apparent water tables. They have moderate to very rapid permeability and moderate to low available water capacity.

The eastern part of the watershed is a complex of end moraines, ground moraines, and lake plains of the Kewaunee Formation (Green Bay Lobe) deposited during the Late Wisconsinan Glaciation. The undulating to rolling moraines have soils that formed in reddish-brown calcareous sandy loam to clay loam till and have surface textures that include silt loam and loam. These till soils range from well drained to somewhat poorly drained and typically have perched water tables. They have moderately slow to slow permeability and moderate to high available water capacity. The nearly level lake plains are the result of settling and deposition of lake and off-shore sediments forming old glacial lakebeds, beach terraces, and beach ridges. Wind forces across these lake plains deposited eolian sands that formed dunes. The soils of these lake plains formed in calcareous clayey to silty lacustrine deposits, non-calcareous to calcareous loamy to sandy lacustrine deposits, or eolian sand. They typically have surface textures that range from silty clay loam to loamy fine sand. These soils range from well drained to poorly drained and have both perched and apparent water tables. They have very slow to rapid permeability and high to low available water capacity.

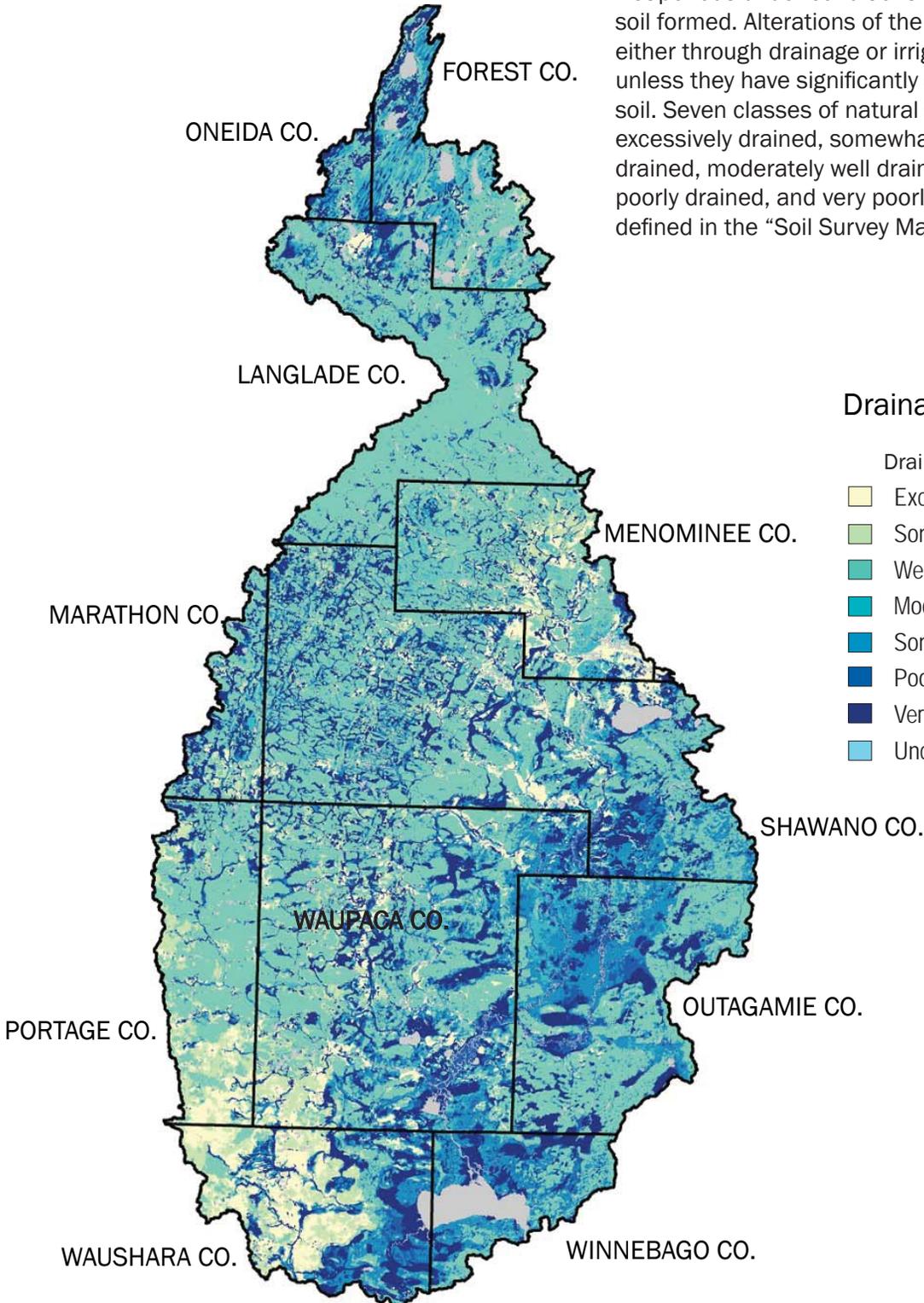
An outwash plain occupies the area around the City of Shawano that includes soils that formed in acid sandy outwash. These soils range from excessively to somewhat poorly drained and typically have apparent water tables. They have rapid to very rapid permeability and low to very low available water capacity.

Scattered throughout the watershed are small to large wetlands with soils that formed in very poorly drained and poorly drained non-acid organic deposits, loamy till, silty or loamy lacustrine, or loamy outwash. The major river valleys have soils formed in sandy to clayey alluvium, range from moderately well drained to very poorly drained, and have areas subject to periodic flooding.



### DRAINAGE CLASSIFICATION

Drainage class (natural) refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the “Soil Survey Manual.”



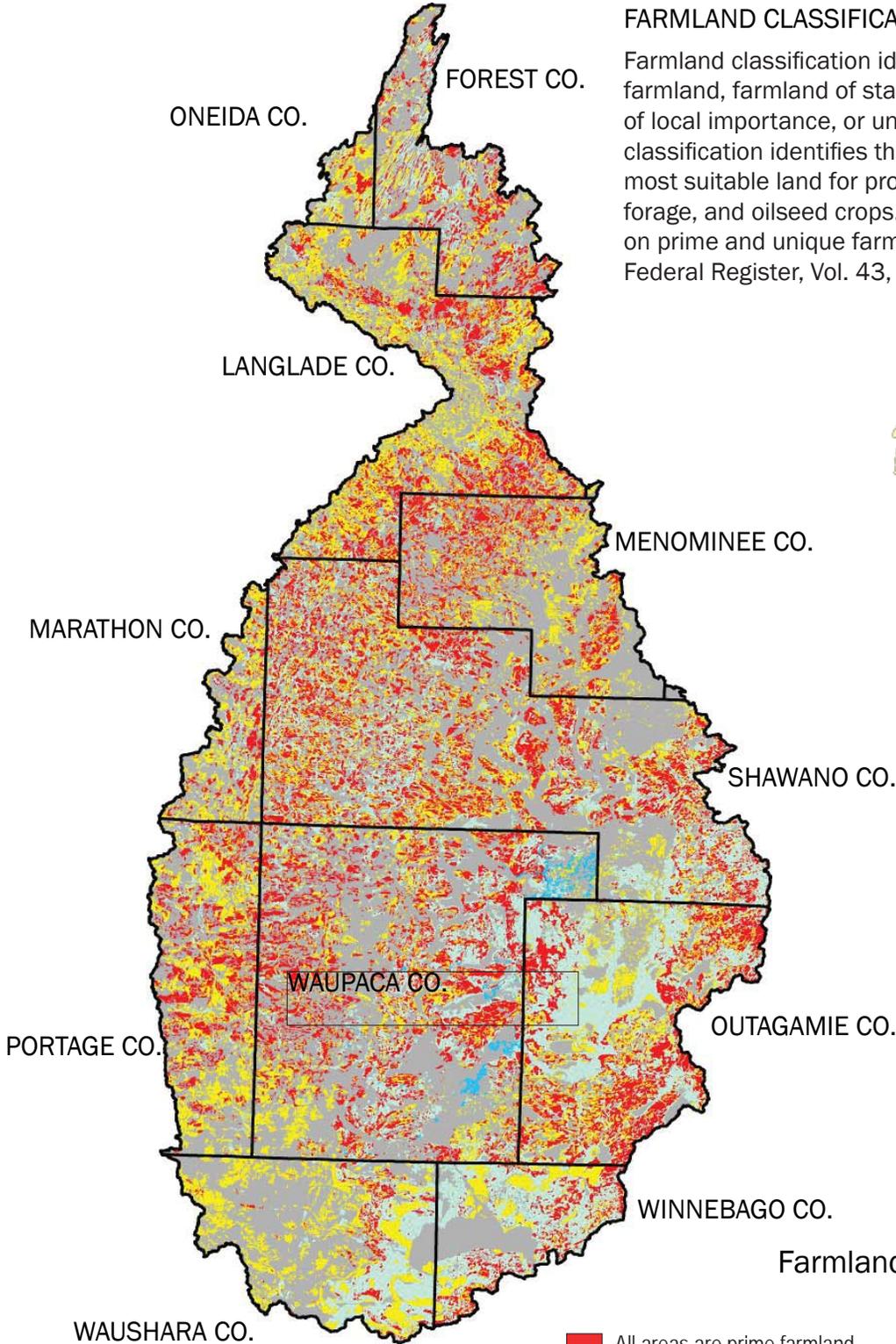
Drainage Classification Map

Drainage Classification	% Area
Excessively drained	8.7
Somewhat excessively drained	6.5
Well drained	40.0
Moderately well drained	6.7
Somewhat poorly drained	12.4
Poorly drained	7.0
Very poorly drained	15.5
Unclassified	3.3



**FARMLAND CLASSIFICATION**

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. Farmland classification identifies the location and extent of the most suitable land for producing food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the Federal Register, Vol. 43, No 21, January 31, 1978.



**Farmland Classification Map**

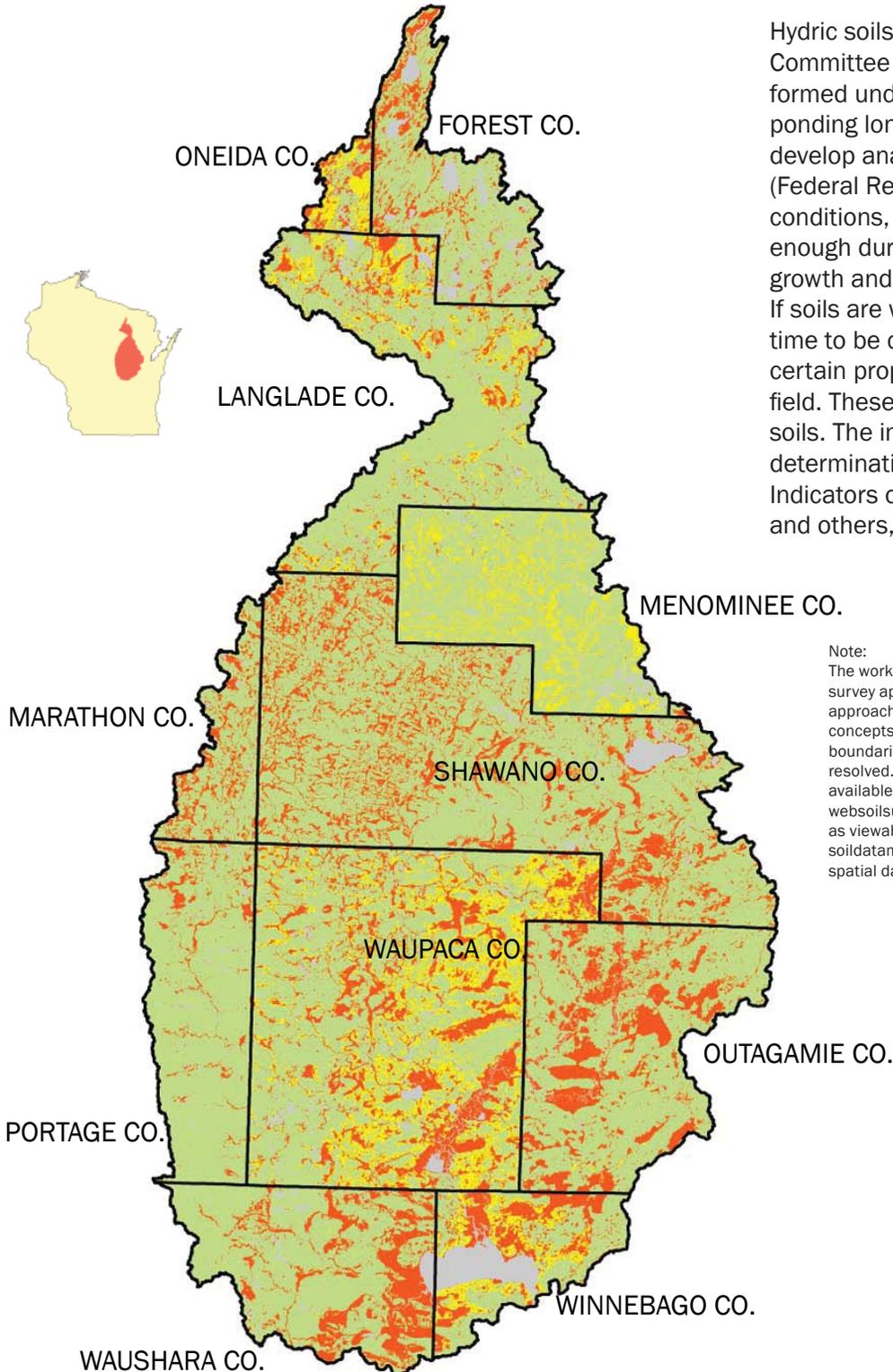
	Acres	Percent
 All areas are prime farmland	558,229	23.4
 Farmland of statewide importance	456,231	19.1
 Prime farmland if drained	314,406	13.2
 Not Prime farmland	1,048,792	44
 Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	6,292	0.3

## HYDRIC SOILS

This rating provides an indication of the proportion of the map unit that meets criteria for hydric soils. Map units that are dominantly made up of hydric soils may have small areas, or inclusions of non-hydric soils in the higher positions on the landform, and map units dominantly made up of non-hydric soils may have inclusions of hydric soils in the lower positions on the landform.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register 1994). These soils, under natural conditions, are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation. If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make on site determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and others, 2002).

Note:  
The work to resolve inconsistencies brought on by the county based soil survey approach by implementing the Major Land Resource Area soil survey approach is currently underway. By typifying soil series and mapunit concepts across similar geographic areas instead of by political boundaries, the inconsistencies between counties that exist now will be resolved. Updated soil survey information will be continually made available and can be obtained through the Web Soil Survey at <http://websoilsurvey.nrcs.usda.gov> for official and current USDA soil information as viewable maps and tables. Visit the Soil Data Mart at <http://soildatamart.usda.gov> to download SSURGO certified soil tabular and spatial data.

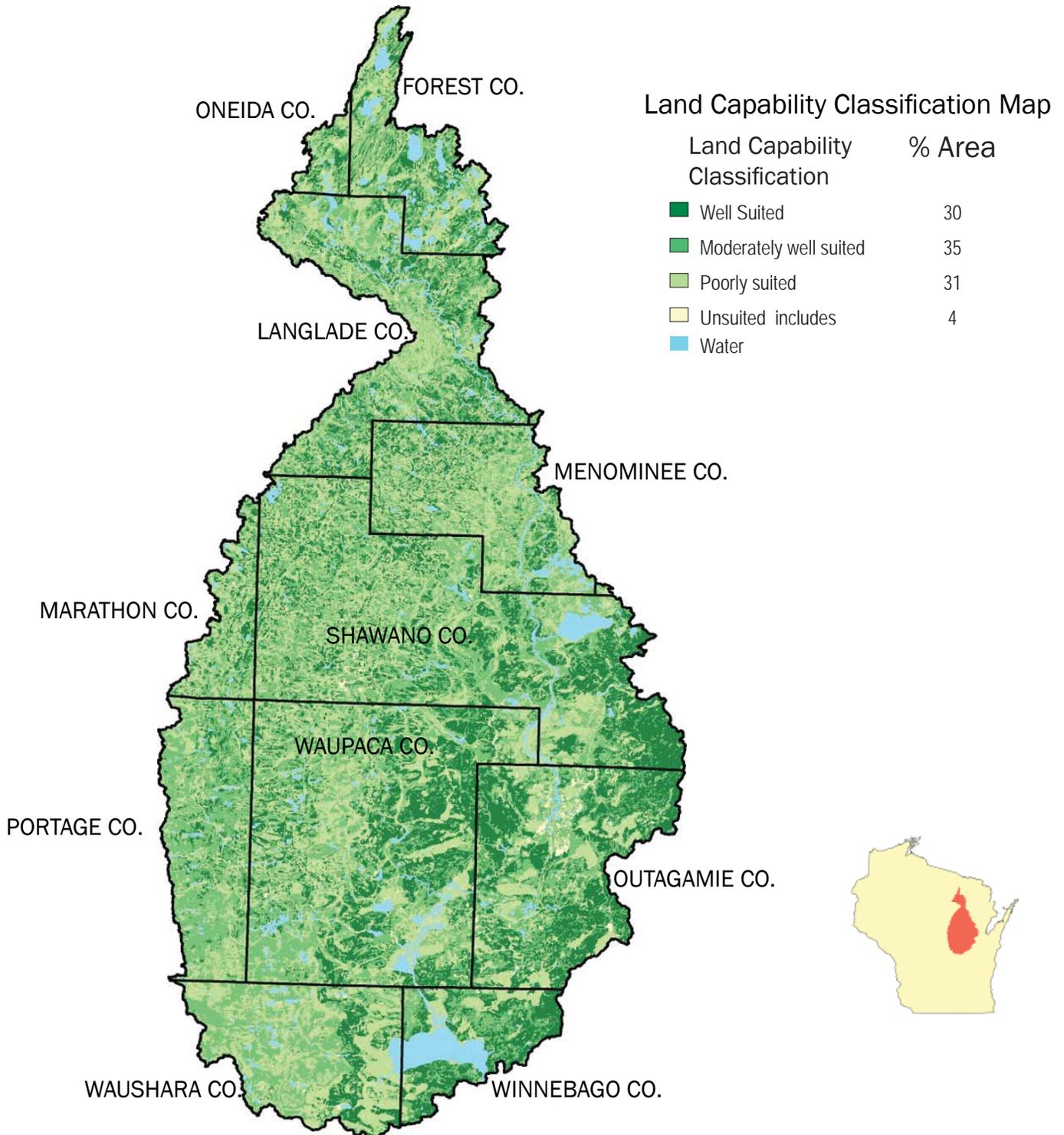


**Hydric Soils Map**

Hydric Classification	% Area
Not hydric	69.8
Partially hydric	5.6
All hydric	21.5
UNKNOWN	3.1

### LAND CAPABILITY CLASSIFICATION

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive land forming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forestland, or for engineering purposes.



## RESOURCE CONCERNS

The major resource concerns from production lands in the watershed include sheet and rill erosion and turbidity, suspended solids and excessive nutrients in surface water. Some best management practices well-suited to address these concerns include mulch-till and no-till planting, nutrient management and cover crops. Shoreline development, and resulting loss of habitat, is also a large resource concern due to the large number of lakes in streams in the watershed. As in other parts of Wisconsin, aquatic and terrestrial invasive species are also a concern.

## PRS AND OTHER DATA <sup>8</sup>.

The following table is a product of the NRCS Performance Results System (PRS) and reflects progress made over the past several years on several key areas of conservation. The PRS provides support for reporting the development and delivery of conservation programs, analyzing and reporting progress, and management applications by NRCS and conservation partners. The public can generate additional reports by visiting the following link: <http://ias.sc.egov.usda.gov/prsreport2006/>

### PRS PERFORMANCE MEASURES

PRS Performance Measures	FY99	FY00	FY01	FY02	FY03	FY04	FY05	TOTAL
Total Conservation Systems Planned (acres)	0	2,101	3,087	478	2,052	N/A	1,279	8,997
Total Conservation Systems Applied (acres)	0	1,109	1,692	478	234	N/A	824	4,337
<b>Conservation Practices</b>								
Total Waste Management (313) (numbers)	0	0	2	1	0	0	0	3
Riparian Forest Buffers (391) (acres)	0	967	1,788	0	0	0	0	2,755
Erosion Control Total Soil Saved (tons/year)	1	0	283	149	143	N/A	N/A	576
Total Nutrient Management (590) (Acres)	199	0	95	0	0	0	349	643
Pest Management Systems Applied (595A) (Acres)	0	750	1,194	0	0	0	0	1,944
Prescribed Grazing 528a (acres)	0	0	415	0	19	0	36	470
Tree & Shrub Establishment (612) (acres)	0	83	41	122	32	1	46	325
Residue Management (329A-C) (acres)	0	123	0	0	0	0	0	123
Total Wildlife Habitat (644 - 645) (acres)	13	33	189	962	719	0	0	1,916
Total Wetlands Created, Restored, or Enhanced (acres)	0	1	1	1	200	0	0	203
<b>Acres enrolled in the Farm Bill programs</b>								
Conservation Reserve Program	0	68	0	17	0	N/A	0	85
Wetlands Reserve Program	0	0	0	0	0	N/A	0	0
Environmental Quality Incentives Program	0	918	1,267	0	130	N/A	788	3,103
Wildlife Habitat Incentive Program	0	0	0	0	0	N/A	0	0
Farmland Protection Program	0	0	0	0	0	N/A	0	0

CENSUS AND SOCIAL DATA (RELEVANT) <sup>9</sup>.

There are 5,032 farms in the watershed, covering a total of 985,256 acres. Average farm size in the watershed is 194 acres compared to a statewide average of 201 acres in Wisconsin. Please refer to the tables below for more detailed information or visit the web site of the Wisconsin Office of the National Agricultural Statistics Service at: [http://www.nass.usda.gov/Statistics\\_by\\_State/Wisconsin/index.asp](http://www.nass.usda.gov/Statistics_by_State/Wisconsin/index.asp)

2002 Ag Census Data	Forest	Langlade	Marathon	Memominee	Oconto	Oneida	Outagamie	Portage	Shawano	Waupaca	Wauslara	Winnebago	Total
Farms (number)	32	244	191	3	3	6	878	377	1292	1398	332	275	5,032
Land in farms (acres)	6524	63490	35063	286	657	1581	161780	92014	238611	247351	89163	48736	985,256
Total cropland (acres)	2740	39401	22528	268	463	608	135644	66535	165571	171522	63327	39397	708,005
Irrigated land (acres)	0	6860	424	0	2	88	103	29084	135	8478	22649	59	7,284
Principal operator by primary occupation - Farming (number)	13	152	120	0	2	3	542	211	889	820	195	167	3,114
Farms by size - 1 to 10 acres	3	12	12	0	0	0	75	27	39	72	17	17	274
Farms by size - 11 to 49 acres	4	42	37	2	1	1	247	77	266	327	79	73	1157
Farms by size - 50 to 179 acres	12	101	76	0	1	2	299	150	525	563	113	113	1956
Farms by size - 180 to 499 acres	8	61	54	1	1	1	185	89	376	336	88	50	1250
Farms by size - 500 to 999 acres	3	18	8	0	0	0	52	21	70	79	19	15	286
Farms by size - 1,000 acres or more	0	10	3	0	0	0	20	13	17	21	17	7	108
Livestock and poultry - Cattle and calves inventory (farms)	17	104	104	1	2	1	414	186	771	694	113	92	2,499
Livestock and poultry - Cattle and calves inventory - Beef cows (farms)	13	43	29	1	1	1	81	70	198	187	38	21	682
Livestock and poultry - Cattle and calves inventory - Milk cows (farms)	1	40	56	0	1	0	205	71	441	340	43	41	1,240
Livestock and poultry - Hogs and pigs inventory (farms)	3	13	5	1	0	0	22	12	35	47	17	7	163
Livestock and poultry - Sheep and lambs inventory (farms)	0	9	5	0	0	0	21	11	29	37	12	5	129
Livestock and poultry - Layers 20 weeks old and older inventory (farms)	3	13	11	1	0	1	24	26	61	81	28	9	257
Livestock and poultry - Broilers and other meat-type chickens sold (farms)	0	3	3	0	0	0	10	8	18	23	8	4	78
Selected crops harvested - Corn for grain (acres)	48	2654	4036	0	108	5	34286	11083	36106	45961	12072	10900	6,737
Selected crops harvested - Corn for silage or greenchop (acres)	89	2035	2400	0	46	2	14652	2940	21267	15586	2235	2422	63,674
Selected crops harvested - Wheat for grain, all (acres)	0	1162	154	0	17	0	5508	104	2707	1157	536	2176	13,522
Selected crops harvested - Wheat for grain, all - Winter wheat for grain (acres)	0	0	145	0	0	0	5420	43	0	0	536	0	6,144
Selected crops harvested - Wheat for grain, all - Spring wheat for grain (acres)	0	0	9	0	0	0	88	61	0	0	0	0	158
Selected crops harvested - Oats for grain (acres)	75	4889	595	0	7	51	2199	1125	5301	3754	450	555	19,001
Selected crops harvested - Barley for grain (acres)	0	320	181	0	1	0	166	104	1111	505	55	5	2,449
Selected crops harvested - Soybeans for beans (acres)	5	2434	1748	0	35	0	26104	3023	11305	17477	6184	9206	77,521
Selected crops harvested - Forage - land used for all hay and all haylage, grass silage, and greenchop (see text) (acres)	1464	12488	9648	0	144	118	32055	17495	67325	58941	9273	7763	216,713
Selected crops harvested - Vegetables harvested for sale (see text) (acres)	0	704	256	0	16	0	2404	14140	1840	3672	13884	275	37,191
Selected crops harvested - Land in orchards (acres)	0	19	4	0	0	0	70	11	28	58	9	16	216

URBAN POPULATION <sup>11.</sup>

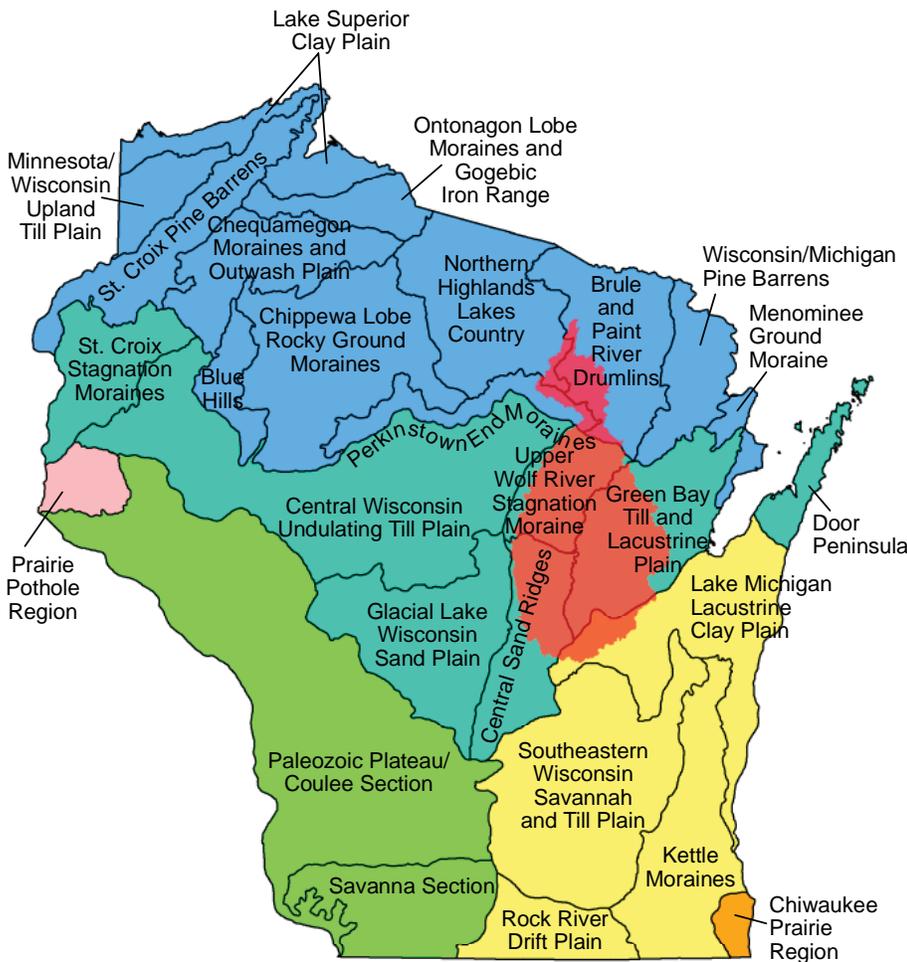
Name	1990	2000	2004	Median Income*
Allouez	14,431	15,443	14,875	55,850
Amherst	792	964	973	40,125
Amherst Junction	269	305	334	44,500
Aniwa	249	272	268	28,542
Antigo	8,276	8,560	8,282	29,548
Appleton	65,695	70,087	70,217	47,285
Ashwaubenon	16,376	17,634	16,911	48,353
Bear Creek	418	415	397	39,375
Big Falls	75	85	82	31,806
Birnamwood	693	795	779	37,813
Black Creek	1,152	1,192	1,224	42,946
Bonduel	1,210	1,416	1,390	39,625
Bowler	279	343	336	34,167
Cecil	373	466	528	38,958
Clintonville	4,351	4,736	4,399	33,947
Combined Locks	2,190	2,422	3,000	53,125
Crandon	1,958	1,961	1,867	27,125
De Pere	16,569	20,559	23,375	50,282
Eland	247	251	245	37,917
Elderon	175	189	175	38,125
Embarrass	461	399	467	42,500
Fremont	632	666	687	41,250
Gillett	1,303	1,256	1,188	36,667
Green Bay	96,466	102,313	101,203	38,820
Gresham	515	575	585	26,635
Hortonville	2,029	2,357	2,630	51,635
Howard	9,874	13,546	15,912	51,974
Iola	1,125	1,298	1,232	32,829
Kaukauna	11,982	12,983	14,656	43,980
Kimberly	5,406	6,146	6,230	46,370
Little Chute	9,207	10,476	10,870	49,500
Lohrville	368	408	412	34,479
Manawa	1,169	1,330	1,333	34,500
Marion	1,242	1,297	1,241	32,344
Mattoon	431	466	446	34,375
Menasha	14,711	16,331	16,306	39,936
Merrill	9,860	10,146	10,145	33,098
Neenah	23,219	24,507	24,596	45,773
Nelsonville	171	191	177	41,875

Name	1990	2000	2004	Median Income*
New London	6,658	7,085	6,926	37,491
Nichols	254	307	300	36,042
Oconto	4,474	4,708	4,564	34,589
Oconto Falls	2,584	2,843	2,729	34,884
Ogdensburg	220	224	212	36,667
Oshkosh	55,006	62,916	63,485	37,636
Park Ridge	546	488	451	57,031
Plover	8,176	10,520	11,256	51,238
Pulaski	2,200	3,060	3,540	43,017
Redgranite	1,009	1,040	2,243	26,726
Rosholt	512	518	483	42,750
Rothschild	3,310	4,970	5,096	50,543
Scandinavia	298	349	353	42,500
Schofield	2,415	2,117	2,160	38,158
Seymour	2,782	3,335	3,432	44,135
Shawano	7,598	8,298	8,441	31,546
Shiocton	913	954	920	36,528
Stevens Point	23,006	24,551	24,298	33,178
Suring	626	605	563	26,023
Tigerton	815	764	744	25,278
Waupaca	4,957	5,676	5,877	31,095
Wausau	37,060	38,426	37,292	36,831
Weston	n/a	12,079	12,921	46,063
Weyauwega	1,665	1,806	1,772	34,556
White Lake	304	329	335	29,722
Whiting	1,838	1,760	1,691	42,381
Wild Rose	676	765	756	30,655
Winneconne	2,059	2,401	2,445	44,886
Wittenberg	1,145	1,177	1,123	29,926

POPULATION ETHNICITY <sup>10.</sup>

Total Population = 164,428  
 Urban population = 35,173  
 Rural Population = 129,253  
 White alone = 154,253  
 Hispanic or Latino = 1,973  
 Two or more races = 1,555  
 Black or African American alone = 285  
 Some other race alone = 832  
 American Indian and Alaska Native alone = 6,821  
 Asian Alone = 658  
 Native Hawaiian and Other Pacific Islander alone = 32

ECOLOGICAL LANDSCAPES<sup>12</sup>.  
GENERAL DESCRIPTIONS



**BRULE AND PAINT RIVER DRUMLINS**

The Brule and Paint Rivers Drumlins ecoregion has extensive eskers and drumlinized ground moraines, pitted and unpitted outwash, wetlands, large glacial lakes, and a lower density of lakes than in adjacent Northern Highlands Lake Country ecoregion. Lake trophic state is low, with a higher percentage of oligotrophic and mesotrophic lakes than most Level IV ecoregions in the Northern Lakes and Forests. Soils of the region range from fine to coarse, poor to well drained, and loamy and silty with extensive organic deposits, differing from the sandy, more acid soils in adjacent ecoregions. The potential natural vegetation is sugar-maple/basswood forest and hemlock/sugar-maple forest, as compared to the more coniferous forests of Northern Highlands Lake Country and the pine and oak barrens of Wisconsin/Michigan Pine and Oak Barrens.

**PERKINSTOWN END MORAINES**

The Perkinstown End Moraine ecoregion is characterized by hilly to rolling collapsed moraines with outwash sand and gravel and Precambrian intrusive rocks. Relief in this ecoregion is greater than in surrounding regions. The soils are coarse, loamy, and moderate to well drained, over till, in contrast to the more rocky and poorly drained soils of Chippewa Lobe Rocky Ground Moraine region to the south. In addition, this ecoregion has fewer lakes than adjacent level IV ecoregions in the Northern Lakes and Forests.

**UPPER WOLF RIVER STAGNATION MORAINES**

The Upper Wolf River Stagnation Moraine ecoregion is characterized by the hummocky ground and end moraines and pitted outwash, in contrast to the level till plains of Green Bay Till and Lacustrine Plain ecoregion to the east and the irregular till plain of Central Wisconsin Undulating Till Plain ecoregion to the west. This region supports a potential natural vegetation mosaic of hemlock/beechn/sugar-maple, wetland vegetation, and mixed conifers, as compared to the predominantly oak forests of the Central Sand Ridges to the south. Land use is mixed agriculture/woodland with a larger area of extensive forest than adjacent level IV ecoregions in the North Central Hardwoods Forests. This is due to land use practices within the Menominee Indian Reservation; more forest cover is still intact, and agricultural practices are less significant. The lake trophic state in this ecoregion is generally higher than in the Central Sand Ridges to the south.

### *Green Bay Till and Lacustrine Plain*

Green Bay Till and Lacustrine Plain is a transitional ecoregion characterized by wetlands, a mix of outwash and loamy recessional moraines, with many areas of outwash plains in the northwest, lake plains and ground moraines in the south, and ground moraines throughout the rest of the region. The potential natural vegetation of the region represents a shift from the predominantly northern hardwoods and conifer swamps along the lake shore to the maple/basswood/oak forests and oak savanna to the south. The red sandy, loamy soils of this ecoregion are similar to some southern areas in the northern Wisconsin/Michigan Pine Barrens, however, due to the generally milder climate (because of proximity to Lake Michigan), the growing season is more favorable and much of the area has been cleared of natural vegetation and replaced by agriculture.

### *Central Sand Ridges*

The Central Sand Ridges ecoregion has the highest density of lakes with the lowest trophic states of all level IV ecoregions in the North Central Hardwood Forests. Pitted glacial outwash with extensive eskers and drumlins, ice contact deposits, rolling ground moraines, and steep end moraines distinguish this region from the flat lake plain of adjacent Glacial Lake Wisconsin Sand Plain ecoregion. The dry, sandy, and loamy till soils of the region support a potential natural vegetation of oak savanna (white oak, black oak, and bur oak) with areas of sedge meadows, unlike the wetland vegetation and pine or oak barrens of Glacial Lake Wisconsin Sand Plain ecoregion and the mosaic of hemlock/beechn/maple forests and mixed conifers of the Upper Wolf River Stagnation Moraine to the north

### *Lake Michigan Lacustrine Clay Plain*

The Lake Michigan Lacustrine Clay Plain ecoregion is characterized by red calcareous clay soil, lacustrine and till deposits, and a flat plain. The topography is flatter than ecoregions to the south, and there are fewer lakes, but the lakes have generally higher trophic states than in adjacent level IV ecoregions of the Northern Lakes and Forests and North Central Hardwood Forests. Soils are generally silty and loamy over calcareous loamy till, with muck and loamy lacustrine soils in low-lying areas. This ecoregion has prime farmland with a longer growing season and more fertile soils than surrounding ecoregions. Agriculture has a different mix of crops, with more fruits and vegetables, than that of the Southern Wisconsin Savannah and Till Plain ecoregion. The potential natural vegetation of this region is beech/sugar maple/basswood/red and white oak forests with a greater concentration of beech than other ecoregions in the Southeastern Wisconsin Till Plain.

### *Northern Highlands Lake Country*

The Northern Highlands Lakes Country is distinguished from surrounding ecoregions by pitted outwash, extensive glacial lakes (many of which are shallow), and wetlands. In contrast to other ecoregions in the Northern Lakes and Forests ecoregion, This region contains a higher density of lakes of generally lower trophic state and lower alkalinity values (hence, greater sensitivity to acidification). The region's soils developed in deep, acidic drift are gravelly, sandy, and well to excessively drained. Unlike the predominantly hardwood forests of surrounding ecoregions, this region supports a potential natural vegetation of white and red pine forests, some pine barrens, and jack pine to the south.

## WATERSHED ASSESSMENT

To assess a watershed's agricultural nonpoint pollution potential, a model was used to generate a watershed assessment score relative to other 8-digit watersheds in Wisconsin. Factors used in the model include acres of cropland, acres of highly erodible land (HEL), and the number of animal units in the watershed. Scores ranged from 0.0 (lowest conservation need) to 24.2 (highest conservation need). The scores may be useful in determining funding allocations on a watershed basis for agricultural nonpoint pollution control initiatives. The model does not attempt to measure pollution levels and does not reflect pollution potential from point sources of pollution or other nonpoint pollution sources beyond the above criteria.

The watershed assessment score for the Wolf River Watershed is 15.1.

## WATERSHED PROJECTS, STUDIES, MONITORING, ETC.

Since 1990 there have been four Wisconsin Department of Natural Resources (WDNR) Priority Watershed projects in the Wolf River watershed. These projects provide cost-sharing and technical assistance to landowners for the implementation of BMPs. The Arrowhead River-Daggets Creek and Tomorrow River-Waupaca River projects are complete while sign-up continues through 2008 for the Little Wolf River and Pine-Willow River projects. The watershed projects are carried out through county land/soil and water conservation departments and other partners. In addition, a two-year USDA-Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) priority watershed sign-up is complete for the Pigeon River watershed.

Large areas of the southern two-thirds of the watershed are within the eligible area of the Conservation Reserve Enhancement Program (CREP). CREP is a local, state, and federal partnership effort that builds upon the USDA Conservation Reserve Program (CRP). Practices such as filter strips, riparian buffers, and grassed waterways are available to landowners who agree to a fifteen year agreement that involves installation, practice, and annual payments with the option of a perpetual easement.

The Discovery Farms Program also has an active BMP and water quality monitoring program in the watershed on a farm in northwest Winnebago County.

The WDNR conducts water quality monitoring in the watershed each year. The WDNR Surface Water Data Viewer (SWDV) is an online interactive mapping tool with multiple water-related datasets. (<http://dnrmaps.wisconsin.gov/imf/imf.jsp?site=SurfaceWaterViewer>)

## PARTNER GROUPS

- Forest County Potawatomi <http://www.fcpotawatomi.com/>
- Fox-Wolf Watershed Alliance <http://www.fwwa.org/index.htm>
- Menominee Indian Tribe of Wisconsin <http://www.menominee-nsn.gov/>
- River Alliance of Wisconsin <http://www.wisconsinrivers.org/>
- Sokaogon Chippewa (Mole Lake) Community of Wisconsin <http://www.sokaogonchippewa.com/>
- Stockbridge-Munsee Community of WI <http://www.mohican.com/>
- Sturgeon for Tomorrow
- Trout Unlimited <http://www.wisconsintu.org/chapters.htm>
  - o Antigo Chapter
  - o Central Wisconsin Chapter [www.cwtu.org](http://www.cwtu.org)
  - o Fox Valley Chapter [www.FoxValleyTU.org](http://www.FoxValleyTU.org)
  - o Northwoods Chapter
  - o Shaw-Paca Chapter
  - o Wolf River Chapter
- USDA Farm Service Agency <http://www.fsa.usda.gov/wi/news/default.asp>,
- US Fish and Wildlife Service <http://www.fws.gov/midwest>
- USDA-Natural Resources Conservation Service <http://www.wi.nrcs.usda.gov>
- University of Wisconsin Cooperative Extension <http://www.uwex.edu/ces/> and <http://basineducation.uwex.edu>
- Wisconsin Department of Agriculture, Trade, and Consumer Protection <http://www.datcp.state.wi.us>
- Wisconsin Department of Natural Resources <http://dnr.wi.gov/>
- Wisconsin Land and Water Conservation Association (County Land Conservation Committee organization) [www.wlwca.org](http://www.wlwca.org)
  - o Land and Water Conservation Directory <http://datcp.state.wi.us/arm/agriculture/land-water/conservation/pdf/ar-pub-119-2007.pdf>

## FOOTNOTES/BIBLIOGRAPHY

### Sources:

1. "The State of the Wolf Basin" August 2001, WDNR <http://www.dnr.state.wi.us/org/gmu/>  
"All data is provided "as is." There are no warranties, express or implied, including the warranty of fitness for a particular purpose, accompanying this document. Use for general planning purposes only.
2. Common Resource Area (CRA) Map delineations are defined as geographical areas where resource concerns, problems, or treatment needs are similar. It is considered a subdivision of an existing Major Land Resource Area (MLRA) map delineation or polygon. Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographic boundaries of a Common Resource Area. Online linkage: <http://soils.usda.gov/survey/geography/cra.html>.
3. The relief map was created using the National Elevation Dataset (NED) 1 arc second, approximately 30 meters, digital elevation model (DEM) raster product assembled by the U.S. Geological Survey (USGS). A hillshade grid was derived from the 30m DEM and draped over the DEM to symbolize the map and create a 3-D effect. The data was downloaded from the NRCS Geospatial Data Gateway <http://datagateway.nrcs.usda.gov/>. For more information about NED visit <http://ned.usgs.gov/>.
4. Average Annual Precipitation data was originated by Chris Daly of Oregon State University and George Taylor of the Oregon Climate Service at Oregon State University and published by the Water and Climate Center of the Natural Resources Conservation Service in 1998. Annual precipitation data was derived from the climatological period of 1961-1990. Parameter-elevation Regressions on Independent Slopes Model (PRISM) derived raster data is the underlying data set from which the polygons and vectors were created. For more information about PRISM visit [http://www.ocs.orst.edu/prism/prism\\_new.html](http://www.ocs.orst.edu/prism/prism_new.html). Precipitation data was downloaded from the NRCS Geospatial Data Gateway <http://datagateway.nrcs.usda.gov/>.
5. The Land Use/Land Cover data was generated from the National Land Cover Dataset (NLCD) compiled from Landsat satellite TM imagery (circa 1992) with a spatial resolution of 30 meters and supplemented by various ancillary data (where available). The data was assembled by the USGS and published in June of 1999. The analysis and interpretation of the satellite imagery was conducted using very large, sometimes multi-state image mosaics. For more information about NLCD visit <http://edcwww.cr.usgs.gov/programs/lccp/nationallandcover.html>. The data was downloaded from the NRCS Geospatial Data Gateway <http://datagateway.nrcs.usda.gov/>.
6. 303(d) listed streams were derived from the Water Quality Standards Section of the Wisconsin Department of Natural Resources (WDNR) website: [http://dnr.wi.gov/org/water/wm/wqs/303d/Lists303d/Approved\\_2004\\_303\(d\)\\_list.pdf](http://dnr.wi.gov/org/water/wm/wqs/303d/Lists303d/Approved_2004_303(d)_list.pdf). For more information about the individual sub-watersheds visit <http://dnr.wi.gov/org/gmu/gpsp/gpbasin/index.htm>. For a list and explanation of Outstanding and Exceptional Resource Waters visit: <http://dnr.wi.gov/org/water/wm/wqs/orwerw/>.
7. Soil Survey Geographic Database (SSURGO) tabular and spatial data were downloaded for the following surveys:
  - Forest Co. WI (WI041) Published 20061020
  - Langlade Co., WI (WI067) Published 20061213
  - Marathon Co. WI (WI073) Published 20061019
  - Menominee Co., WI (WI078) Published 20061020
  - Oconto Co., WI (WI083) Published 20061128
  - Oneida Co., WI (WI085) Published 20061020
  - Outagamie Co., WI (WI087) Published 20060120
  - Portage Co., WI (WI097) Published 20061019

Shawano Co. WI (WI115) Published 20061020  
Waupace Co. WI (WI135) Published 20060120  
Waushara Co., WI (WI137) Published 20060120  
Winnebago Co., WI (WI139) Published 20061019

Metadata and SSURGO data for the aforementioned surveys were downloaded from the NRCS Soil Data Mart at <http://soildatamart.nrcs.usda.gov>. Component and layer tables from the tabular data were linked to the spatial data to derive the soil classifications found in this section. Visit the online Web Soil Survey at <http://websoilsurvey.nrcs.usda.gov> for official and current USDA soil information as viewable maps and tables.

8. Performance Results System (PRS) data was extracted from the PRS homepage by year, conservation systems and practices and Hydrologic Unit Code (HUC) level. HUC level reporting was not available where N/A is listed. For more information on these and other performance reports visit <http://ias.sc.egov.usda.gov/prshome/>.

9. Ag Census data were downloaded from the National Agricultural Statistics Service (NASS) Website and the data were adjusted by percent of HUC in the county. For more information on individual census queries visit the NASS website at <http://www.nass.usda.gov/>.

10. Population ethnicity data were extracted from the Census 2000 Summary File 3 compiled by the U.S. Census Bureau. The data were adjusted by Block Group percentage in the HUC. Population items were selected from the SF30001 table. For more information on census data and definitions visit <http://www.census.gov/Press-Release/www/2002/sumfile3.html>.

11. Urban population and median household income data were derived from the American FactFinder assembled by the U.S. Census Bureau. American FactFinder is a quick source for population, housing, income and geographic data. For other census items and trends visit [http://factfinder.census.gov/home/saff/main.html?\\_lan](http://factfinder.census.gov/home/saff/main.html?_lan)

12. Level III and IV Ecoregions Regions of Wisconsin map and descriptions were derived from electronic coverages available from Wisconsin DNR, Bureau of Integrated Science Services Branch in cooperation with the U.S Environmental Protection Agency. For more information visit [ftp://ftp.epa.gov/wed/ecoregions/wi/wi\\_eco\\_pg.pdf](ftp://ftp.epa.gov/wed/ecoregions/wi/wi_eco_pg.pdf)

