

2011 Water Quality Management Plan Update

Upper Green Bay Basin, Wisconsin

December 2011

The Pemebonwon and Middle Menominee Rivers Watershed is situated in northeastern Marinette and southeastern Florence counties and includes 53 miles of the Menominee River. Also found in this watershed are the Pemebonwon and North Branch Pemebonwon rivers. Soils in the watershed are principally derived from weathering glacial deposits and consist primarily of well-drained sands.

Aurora Sanitary District, the Village of Niagara, Niagara of Wisconsin Paper Company, the Pembine Laundromat and ISP Minerals are point source dischargers in the watershed. Champion International Paper Company in Michigan also discharges to the Menominee River.

This watershed provides ample opportunities for recreation and an abundant and diverse fishery exists. White water rafting is popular on the Menominee River in the Piers Gorge area between Niagara, Wisconsin and Norway, Michigan, with sightseeing popular at Horseshoe Rapids, Piers Gorge, Long Slide Falls, and Smalley Falls.



Map 1: Pemebonwon and Middle Menominee Rivers Watershed



Contents

Watershed Details. 1
 Population and Land Use 1
 Hydrology 2
 Ecological Landscapes 2
 Historical Note 2

Watershed Condition 3
 Overall Condition 3
 River and Stream Condition 3
 Lake Health 5
 Wetland Health 13
 Groundwater 13
 Point & Nonpoint Pollution 14
 Waters of Note 15
 Trout Waters 15
 O/ERW Waters. 16
 Impaired Waters. 18
 Fish Consumption 18
 Aquatic Invasive Species 19
 Species of Special Concern 19
 State Natural and Wildlife Areas 19

Watershed Actions 20
 Grants and Projects 20
 Monitoring 22
 Basin/Watershed Partners. 23
 Recommendations 23
 Contributors 23
 Maps. 24

Watershed Details

Population and Land Use

Land use in the Pemebonwon and Middle Menominee Rivers Watershed is dominated by forest cover (63%), followed by wetlands with 23% of the watershed’s total area. Agriculture and open water encompass most of the remaining area with 7% and 6%, respectively. Grasslands make up a little over 1% of the watershed’s total area, while suburban and urban land use is minimal with half of a percent and one-tenth of a percent of the area, respectively.

Table 1: Pemebonwon and Middle Menominee Rivers Watershed Land Use

Land Use	Acres	Percent of Area
Forest	117,138.48	62.93%
Wetland	42,423.82	22.79%
Agriculture	12,741.00	6.84%
Open Water & Open Space	10,618.24	5.70%
Grassland	2,066.72	1.11%
Suburban	952.52	0.51%
Urban	195.04	0.10%
Barren	5.12	0.00%
Total Acres in Watershed	186,140.93	

Hydrology

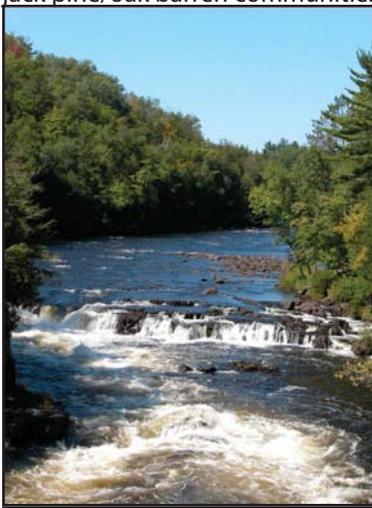
The Pemebonwon and Middle Menominee Rivers watershed is situated in a sandy glacial outwash plain interspersed with glacial moraines and steep outcropping of Precambrian bedrock. The combination of sandy soils and extensive forests and wetlands within the watershed create ideal conditions for precipitation to slowly infiltrate into the groundwater. This groundwater later emerges as cold seeps and springs that provide the base flow to the nearly 200 miles of trout streams within the watershed.

All of the streams and rivers in the watershed ultimately flow into the Menominee River and at areas where there are steep stream gradients the rivers have often been dammed for generation of hydropower. There are 25 dams in this watershed, seven dams on the middle Menominee itself. On the Menominee River more than 70% of river miles with a gradient greater than four feet per mile have been lost due to impoundments. This series of impoundments greatly alters the natural hydrograph of the river and leads to physical, chemical, and biological alterations of the system.

Ecological Landscapes

The Pemebonwon and Middle Menominee Rivers Watershed lies primarily in the Northeast Sands Ecological Landscape which occupies a relatively narrow, vertical band of land in northeast Wisconsin. This landscape formed in glacial outwash sand plains (some of them pitted), and has steep outcropping Precambrian bedrock knolls of basalt, rhyolite, or granite. Sandy ground moraines and end moraines are also interspersed in the landscape.

Historically, extensive oak/jack pine barrens and jack pine forests were found in the outwash sand portions of this ecological landscape. Moraines supported forests of hardwoods, red pine, and white pine. Outwash plains often contained pitted depressions, resulting in numerous wetlands and kettle lakes. Most of this ecological landscape is still forested; aspen predominates, followed by northern hardwoods. Jack pine remains on the outwash plains along with northern pin oak. There are several important occurrences of jack pine/oak barren communities. A small percentage of the Northeast Sands Ecological Landscape contains spruce-fir-cedar forest and lowland hardwood forest. The Brazeau Swamp is one of the best representations of large cedar swamp forests in northern Wisconsin.



Piers Gorge



Map 2: Pemebonwon and Middle Menominee Rivers Watershed Ecological Landscapes

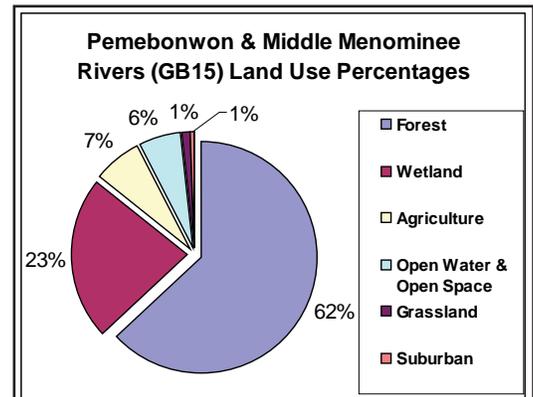


Figure 1: Pemebonwon and Middle Menominee Rivers Watershed Land Use Percentages Graph

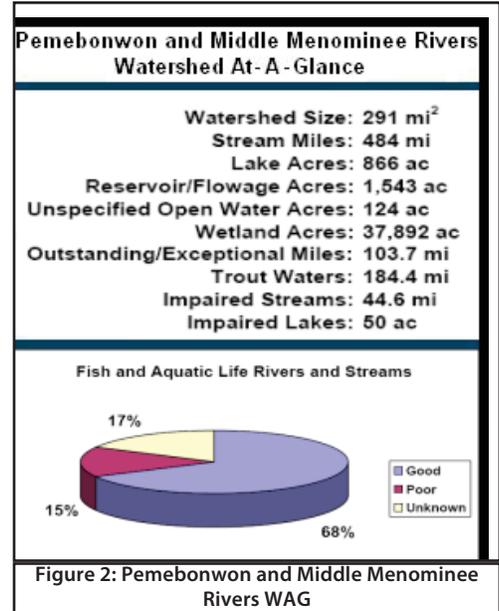
Historical Note

The City of Niagara is located in the watershed of the Pemebonwon and Middle Menominee Rivers. Originally named in the language of the Iroquois tribe, Niagara means "thundering waters". The Menominee River separates the states of Michigan and Wisconsin and has cut a deep dramatic gorge where the river, normally 300 feet wide, is constricted to a narrow 80-foot channel, creating powerful rapids as it rushes towards Green Bay. At Piers Gorge the river has created an extraordinarily beautiful place where steep-sided bedrock walls, up to 70 feet high, contain the rushing river for a mile and a half as it roars over a series of stone shelves in four distinct waterfalls.

Watershed Condition

Overall Condition

The overall health of the Pemebonwon and Middle Menominee Rivers Watershed is excellent with over 188 miles of cold water streams. Over 100 miles of these streams are classified as Class I trout streams. Another 65 miles of stream are considered Class II trout streams, and there are also about 15 miles of Class III trout streams. Fifty-two miles of stream are on the Exceptional Resource Water list, including segments of Anderson Spur, Bear, Brown Spur, Coates, Lindstrom, Mullaney, Rock Cut, Sand Lake Branch, and Squaw creeks along with many other unnamed creeks. Another 52 miles of streams in the watershed are considered Outstanding Resources Water along segments of the Little Silver, Miscauno, Spikehorn, and Sullivan Creeks together with the Little Popple River and the South Branch of the Pemebonwon River. Rivers and streams in the watershed are abundant with fish life. Naturally reproducing sturgeon populations can be found along stretches of Bear, McAllister, Squaw and Miscauno creeks, as well as parts of Menominee and Pemebonwon rivers. A combination of self reproduction and stocking support a musky population along segments of the Chalk Hills, White Rapids, and Kingsford flowages and sections of the Menominee River, as well. Large portions of the Pemebonwon and Menominee Rivers also support small mouth bass fisheries. A 45-mile section of the Menominee River has been listed as impaired by PCBs and mercury since 1998. Sand Lake is also on the 303(d) impaired waters list for mercury.



River and Stream Condition

Table 2: Designated Use Support Summary for Pemebonwon and Middle Menominee Rivers Watershed Rivers and Streams (all values in miles)

Use	Supporting	Fully Supporting	Not Supporting	Not Assessed	Total Size
Fish Consumption	7.22			280.79	288.01
Fish and Aquatic Life	7.22	186.64	44.59	49.56	288.01
General				288.01	288.01
Public Health and Welfare				288.01	288.01
Recreation				288.01	288.01

According to the WDNR’s Register of Waterbodies (ROW) database, there are over 483 miles of streams and rivers in the Pemebonwon and Middle Menominee Rivers Watershed; 288 miles of which have been entered into the WDNR’s assessment database. Of these 186 miles, the majority (68%) are meeting Fish and Aquatic Life uses and are specified as in “good” condition; about 15 % of streams are considered to be in “poor” condition and are listed as impaired. The condition of the remaining third of these stream miles is not known or documented.

Additional uses for which the waters are evaluated include Fish Consumption, General Uses, Public Health and Welfare, and Recreation. As Table 2 shows, most of these uses have not been directly assessed for the watershed. However, a general fish consumption advisory for potential presence of mercury is in place for all waters of the state.

Coates Creek

A fish collection occurred in Coates Creek in 2010 and the Fish Index of Biological Integrity (fIBI) score (70) indicated good water quality capable of supporting a cold water fishery.

Crossett Creek

A fish collection occurred in the fall of 2008 on Crossett Creek and the resultant fIBI score showed good water quality.

Menominee River

The Menominee River originates just north of this watershed near Florence, WI, at the confluence of the Brule River (GB18) and Michigan's Michigamme River. The Menominee flows southerly for 118 miles before joining the waters of Green Bay. Hydroelectric development has been extensive along the Menominee River. Dams have converted 37% of the river mileage to impoundments, primarily in areas of higher gradient. More than 70% of river with a gradient greater than four feet per mile has been flooded by dam development. These high gradient reaches are the most productive in terms of aquatic insects and are important for fish spawning habitat. Losses of high gradient rapids in this watershed include: the Pemene Rapids, which drops 20 feet in two miles; the Chalk Hill Rapids, which drops eight feet in a half mile; and White Rapids, which drops 41 feet in four miles. A total of 6.75 miles of high gradient river, important as sport fish spawning areas, has been lost. Horse Race and Sturgeon Falls rapids have also suffered losses. Additionally, the river in this watershed experiences habitat degradation due to peaking in hydroelectric operations.



Lake sturgeon, walleye, largemouth bass, smallmouth bass, northern pike, muskellunge, yellow perch, panfish, suckers, bullhead, carp and forage species are found in the Menominee River. Low levels of dioxin have been detected in large carp in the Norway-Quinnesec area. Although levels are less than the current "state action level," the presence of these compounds is a concern. Fish taste and odor problems have also been reported from this area of the river and are seriously impacting sport fishing. Initial testing indicates that the Champion Mill at Quinnesec, Michigan may be responsible, but further testing is underway to ascertain the exact cause and nature of the problem. The Menominee River is managed as a boundary water by Wisconsin and Michigan. Specific fishing regulations apply to the river. Fish managers and law enforcement personnel from both states developed regulations to protect and conserve the aquatic resources of the river.

The 20 miles of river between Chalk Hills Flowage and Sturgeon Falls Dam is a beautiful and valuable resource. This section of river is mostly undeveloped with two natural water falls, Quiver Falls and Pemene Falls. Numerous rock outcrops, rapids, and deep pools make this one of the most scenic sections of the Menominee River. Most of the riparian property is owned by power companies. In the last century, sawmills deposited sawdust and slabwood directly in the river and in adjacent marshes. Many of these wastes are still present today. Dissolved oxygen levels below the five parts per million state water quality standard have been found below the White Rapids and Little Quinnesec hydroelectric dams.

Wisconsin and Michigan, with support and cooperation from local communities, the U.S. Environmental Protection Agency (EPA) and the International Joint Commission (IJC) of Canada and the United States are developing a remedial action plan (RAP) for the lower three miles of the Menominee River and adjacent Green Bay shoreline. The area has been designated by IJC as one of 43 Great Lakes Area of Concern, so identified because of use impairments due to water quality. The purpose of the plan is to address and eventually clean up contamination problems which persist in the river despite the considerable efforts and money already spent to remedy water pollution problems. Once the RAP is completed and formally approved, it will become an amendment to this WQM plan. Additional information on Great Lakes RAPS is available in the brochure Remedial Action Plans for Areas of Concern published by the International Joint Commission and available from DNR and in the 1992 Wisconsin Water Quality Assessment Report to Congress.

Impaired uses identified in the Lower Menominee River RAP include:

- * restricted dredging,
- * restricted fish consumption,
- * degraded fish and wildlife habitat,
- * degraded fish populations,
- * degraded communities of bottom-dwelling organisms, and
- * total and partial body contact restrictions.

Toxic pollutants in the sediments are a major concern in the lower Menominee River. The in-place pollutants in some of the sediment deposition zones in the river include arsenic, oil and grease, phosphorus, ammonia-nitrogen, cyanide, lead, manganese, cadmium, mercury, copper and zinc. Arsenic is found at elevated concentrations in the turning basin area of the river, adjacent to Ansul Fire Protection's property. A facility investigation and corrective measures study of the site are under development through the federal Resource Conservation and Recovery Act (RCRA) program. This program includes assessing the extent and impact of the contamination and, if necessary, implementing a corrective action plan.

North Branch Pemebonwon River

Seven fish collections occurred in North Branch Pemebonwon River between 2008 and 2009, the cold water FBI scores were as follows: one excellent score (90), two good scores (80, 80), three fair scores (40, 40, 50), and one poor score (10). The median score is 50 which would indicate fair water quality.

South Branch Pemebonwon River

Eleven fish collections and one macroinvertebrate collection has occurred in the South Branch Pemebonwon River since 2007. The macroinvertebrate IBI scored excellent, as did two of the cold water fish IBIs, there were also six good cold water FBI's and and three fair cold water FBI's. These results indicate good water quality in this river.

Lake Health

The WDNR's ROW database shows that there are over 1,542 acres of reservoirs and flowages, 866 acres of lakes and ponds, and 124 acres of unspecified open water in the Pemebonwon and Middle Menominee Rivers Watershed. Approximately 2,874 lake acres have been entered into the state's assessment database for the watershed. Over half (55%) of these waters are indicated as supporting Fish and Aquatic Life use, while 50 acres are not supporting this use. Over 1,254 acres have not been assessed for Fish and Aquatic Life use. Lindquist Lake is the largest lake in the watershed at about 73 acres. Reservoirs and flowages in the watershed include Rosebush Lake, Chalk Hill Flowage, Little Quinnesec Falls Flowage, Kingsford Flowage, Big Quinnesec Falls Flowage, Lake Shannon, Miscauno Pond, and McAllister Pond.

Table 3: Designated Use Support Summary for Pemebonwon and Middle Menominee Rivers Watershed Lakes (all values in acres)

Use	Supporting	Fully Supporting	Not Supporting	Not Assessed	Total Size
Fish Consumption			50	2,824.4	2,874.4
Fish and Aquatic Life	123.71	1,445.86	50	1,254.83	2,874.4
General				2,874.4	2,874.4
Public Health and Welfare				2,874.4	2,874.4
Recreation				2,874.4	2,874.4

Johnson and Beach Lake is considered a shallow headwater lake. Miscauno Pond is listed as a shallow lowland pond. Shallow seepage lakes include Headquarters, Smith, Woempner, and Young lakes. Bush Cotas, Echo, Fischer, Hord, Lindquist, Long, Twin Lakes, and West Pickerel Pond are all listed as deep headwaters. Deep seepage lakes include Back, Barnes, Camp, Hoskin, Shannon, Lundgren, Phillips, Sand, Scout, Timms, and West Twin Lakes. The following waterbodies are designated as small for their current use: Back, Barlow, Belgian, East Twin, Golden, Kimlark, Chapman, Downing, Luedevitz, Marm, Minnie, Mud, No Bottom, Otter, Rock, Thoeming, and Wolf lakes, along with McAllister, East Pickerel, are Monson ponds. Many lakes have not been assessed formally, yet, but the ones that have were found to be fully supporting their attainable use. The following water narratives summarize the most recent information available for lakes and flowages in the watershed.

Back Lake

Back Lake is a very soft water seepage lake having slightly acidic, clear water of moderate transparency. The littoral zone is predominantly muck (93 percent) with the remainder sand and gravel. The shoreline is 85% upland, consisting of mixed hardwoods and conifers, and 15% open bog wetland. Information on the fish population is lacking; however, conditions suggest the lake would support a population of largemouth bass and panfish. Waterfowl make limited use of this lake. The Town of Pembine provides public access without parking. One private trailer park is located on the

shoreline (Source: 1975, Surface Water Resources of Marinette County Back Lake, T36N, R20E, Section 6 Surface Acres-10.8, Secchi Disk-11 feet, Maximum Depth-22 feet).

Barlow Lake

Barlow Lake is a hard water spring pond having slightly alkaline, clear water of high transparency. The entire littoral zone is composed of silt. Approximately 70% of the shoreline is wetland, composed primarily of open meadow and bog and the remainder is upland consisting of hardwoods. The outlet flows to Spikehorn Creek. Forage fish species may be present but this has not been confirmed by field survey. This lake is of moderate value to migrating puddle ducks. The entire lake basin is less than three feet in depth. Wilderness public access is available by crossing county land. No dwellings are located on the shoreline (Source: 1975, Surface Water Resources of Marinette County Barlow Lake, T38N, R20E, Section 28 Surface Acres-6.0, Secchi Disk-greater than 2 feet, Maximum Depth-2 feet).

Barnes Lake

Barnes Lake is a medium hard water seepage lake having neutral, clear water of high transparency. The littoral zone is composed of 35% gravel, 35% sand, and 30% muck. The shoreline is entirely upland, consisting of hardwoods, conifers and pasture. Known fish species inhabiting this lake are largemouth bass, bluegill, and perch. Waterfowl make limited use of this lake. Submergent vegetation occupies 30% and floating vegetation 40% of the lake basin. There is no public access. Five dwellings are located on the shoreline (Source: 1975, Surface Water Resources of Marinette County Barnes Lake, T36N, R19E, Section 11, Surface Acres-27.3, Secchi Disk-13 feet, Maximum Depth-19 feet).

Belgian Lake

Belgian Lake is a hard water drainage lake having slightly alkaline, light brown water of moderate transparency. The littoral zone is composed of 83% muck, 10% sand, five percent gravel, and two percent rubble. The shoreline is 70% wetland, comprised primarily of shrub meadow, and 30% upland of mixed hardwoods and conifers. The outlet flows to the South Branch of the Pemebonwon River. Known fish species inhabiting this lake are northern pike, largemouth bass, bluegill and perch. There is no public access. Two dwellings are located on the shoreline (Source: 1975, Surface Water Resources of Marinette County Belgian Lake, T37N, R20E, Section 30, Surface Acres-8.2, Secchi Disk-6 feet, Maximum Depth-24 feet).

Bush Lake, North & South

Bush Lake is a medium hard water drainage lake having slightly alkaline, light brown water of moderate transparency. Littoral material consists of sand (40%), muck (40%), gravel (10%) and some rubble. Fish species inhabiting the lake are northern pike, perch, largemouth bass, bluegill, white sucker, and forage species. The outlet forms part of the headwaters of the Little Popple River. This lake receives limited use by waterfowl. A navigable channel provides for public access from Bush Lake (North). Three dwellings are present on the shoreline (Source: 1971, Surface Water Resources of Florence County Bush Lake (South), T38N, R17E, Section 24 Surface Acres-29.5, Secchi Disc-9 feet, Maximum Depth-19 feet).

Camp Lake

Camp Lake is a medium hard water seepage lake having neutral, clear water of moderate transparency. The littoral zone is composed primarily of sand, with lesser amounts of muck and gravel. The entire shoreline is upland, consisting of hardwoods, conifers, and cleared land. The lake occasionally winterkills and at present has a fish population of small perch and bluegill. Waterfowl make limited use of this lake. Submergent vegetation is dense over most of the lake basin. There is one organizational camp on the shoreline, but no public access (Source: 1975, Surface Water Resources of Marinette County Camp Lake, T36N, R19E, Section 23 Surface Acres-7.3, Secchi Disk-9 feet, Maximum Depth-14 feet).

Chalk Hill Flowage

Chalk Hill Flowage is a medium hard water drainage lake (impoundment) on the Menominee River having slightly acidic, light brown water of moderate transparency. The littoral zone is 35% sand, 30% silt, 20% rubble, and 15% gravel. The shoreline is 90% upland, consisting of mixed hardwoods and conifers and 10% wetland of the coniferous bog type. The known fish population includes northern pike, walleye, largemouth bass, bluegill, rock bass, perch, and white sucker. Waterfowl make moderate use of this flowage. The only public access is navigable water via the inlet; however, the Wisconsin Michigan Power Company maintains a landing for public use on the Michigan side. Two dwellings are located on the shoreline (Source: 1975, Surface Water Resources of Marinette County Chalk Hills Flowage, T35N, R22E, Section 7 Surface Acres-150.2, Secchi Disk-8 feet, Maximum Depth-35 feet).

Chapman Lake

Chapman Lake is a hard water drainage lake having neutral, light brown water of moderate transparency. The entire littoral zone is muck. The shoreline is 50% marsh and 50% upland. Information on the fish population is lacking, but the lake may contain forage species. Waterfowl make moderate use of this lake. Considerable emergent and submergent vegetation is present. There is no public access. Two dwellings are located on the shoreline. Sixty percent of the lake basin is less than three feet in depth. The outlet flows to Creek 17-4 (Source: 1975, Surface Water Resources of Marinette County Chapman Lake, T37N, R21E, Section 8 Surface Acres-7.0, Secchi Disk-greater than 5 feet, Maximum Depth-5, feet).

Cotas Lake

Cotas Lake is a hard water drainage lake having neutral, light brown water of moderate transparency. The littoral zone is 95% muck and five percent sand. The shoreline is 80% wetland, consisting of conifers, shrub and meadow, and 20% upland of mixed hardwoods and conifers. The outlet flows to the Pemebonwon River. Information is lacking on the fish population, but conditions suggest the lake would support a largemouth bass and panfish population. Floating and submergent vegetation each occupy 20% of the lake basin in moderate density. Waterfowl make limited use of this lake. There is no public access. No dwellings are located on the shoreline. The outlet forms the headwaters of Silver Creek (Source: 1975, Surface Water Resources of Marinette County Cotas Lake, T36N, R21E, Section 5 Surface Acres-11.4, Secchi Disk-8 feet, Maximum Depth-26 feet).

Downing Lake

Downing Lake is a hard water seepage lake having neutral, light brown water of moderate transparency. The littoral zone is composed of muck. The entire shoreline is bog wetland consisting of tamarack, black spruce, cedar, leatherleaf, and grasses. Information on the fish population is lacking, but due to shallow depth, the lake may not support game fish. Submergent vegetation is moderate in density over 80% of the lake basin. Waterfowl make limited use of this lake. There is no public access. No dwellings are located on the shoreline (Source: 1975, Surface Water Resources of Marinette County Downing Lake, T37N, R21E, Section 4 Surface Acres-4.6, Secchi Disk-9 feet, Maximum Depth-10 feet).

East Twin Lake

East Twin Lake is a very soft water seepage lake having acidic, light brown water of low transparency. The littoral material consists of muck. The shoreline is primarily upland (90%), consisting of mixed hardwoods and conifers, with a limited area of open bog wetland on the south end. The known fish population consists of largemouth bass, bluegill, and perch. Waterfowl make limited use of this lake. There is no public access. No dwellings are located on the shoreline (Source: 1975, Surface Water Resources of Marinette County East Twin Lake, T36N, R19E, Section 14 Surface Acres-6.9, Secchi Disk-4 feet, Maximum Depth-21 feet).

Echo Lake

Echo Lake is a hard water spring lake having slightly alkaline, light brown water of moderate transparency. Littoral materials consist of 10% sand, 10% muck and 80% marl. The shoreline is predominantly upland with some coniferous wetland. Fish inhabiting this lake are northern pike, largemouth bass, pumpkinseed, perch, and forage species. Waterfowl make limited use of this lake. Wilderness type public access is available by crossing county land. Three dwellings are located on the shoreline. The outlet flows to the North Branch of the Pemebonwon River (Source: 1975, Surface Water Resources of Marinette County Echo Lake, T37N, R21E, Section 14 Surface Acres-15.1, Secchi Disk-11 feet, Maximum Depth-45 feet).

Fisher Lake

Fisher Lake is a soft water drainage lake having slightly acidic, medium brown water of low transparency. Littoral materials consist of sand (50%), muck (4%), and gravel (10%). The shoreline is equally divided between upland and wetland of the shrub bog type. Fish known to inhabit the lake are largemouth bass, bluegill, bullhead, rainbow trout, and forage species. The outlet is tributary to Crossett Creek. Waterfowl make little use of this lake. The Town of Aurora provides a public access site with limited parking. Eight dwellings are located on the shoreline (Source: 1971, Surface Water Resources of Florence County Fisher Lake, T38N, R19E, Section 34 Surface Acres-23.3, Secchi Disc-4 feet, Maximum Depth-15 feet).

Golden Lake

Golden Lake is a medium hard water seepage lake having slightly acidic, medium brown water of low transparency. The littoral zone is composed of muck. The entire shoreline is wetland of coniferous swamp. Information is lacking on the fish population; however, forage species may be present. Waterfowl make limited use of this lake. There is no public access. No dwellings are located on the shoreline (Source: 1975, Surface Water Resources of Marinette County Golden Lake, T36N, R21E, Section 9 Surface Acres-1.8, Secchi Disk-2 feet, Maximum Depth-23 feet).

Headquarters Lake

Headquarters Lake is a medium hard water seepage lake having alkaline, light brown water of moderate transparency. This lake has been known to winterkill. The littoral zone is composed of silt (60%), muck (39%) and gravel. The shoreline is 60% wetland, consisting primarily of coniferous bog and 40% upland of mixed hardwoods and conifers. The known fish population consists of perch and minnows. Waterfowl make limited use of this lake. There is no public access. One dwelling is located on the shoreline (Source: 1975, Surface Water Resources of Marinette County Headquarters Lake, T36N, R20E, Section 11 Surface Acres-40.7, Secchi Disk-greater than 7 feet, Maximum Depth-7 feet).

Hord Lake

Hord Lake is a medium hard water drainage lake having slightly alkaline, light brown water of moderate transparency. Littoral materials consist primarily of muck (77%) and sand (20%) with small amounts of gravel and boulders. The shoreline is predominantly upland (90%) consisting of mixed hardwoods and conifers with some wetland of the meadow type. There is evidence of fishing pressure but information is lacking on the fish species present. Waterfowl make limited use of this lake. The outlet stream is tributary to the Little Popple River. There is no public access. No dwellings are located on the shoreline (Source: 1971, Surface Water Resources of Florence County Hord Lake, T38N, R18E, Section 22 Surface Acres-16.8, Secchi Disc-10 feet, Maximum Depth 17 feet).

Hoskin Lake

Hoskin Lake is a medium hard water seepage lake having slightly acidic, light brown water of moderate transparency. Littoral materials consist of muck (85%) and sand (15%). The shoreline is primarily shrub-bog wetlands with the balance upland. Forage species are the only fish known to inhabit this lake. Waterfowl make limited use of this lake. There is no public access. No dwellings are located on the shoreline (Source: 1971, Surface Water Resources of Florence County Hoskin Lake, T38N, R19E, Section 23 Surface Acres-14.7, Secchi Disc-6 feet, Maximum Depth-12 feet).

Johnson Beach and Lake

Johnson Beach and Lake is a hard water drainage lake having slightly alkaline, light brown water of moderate transparency. The entire littoral zone is muck. The shoreline is all wetland, consisting primarily of shrub bog. Information is lacking on the fish population, but forage fish are probably present. Waterfowl make limited use of this lake. Wilderness public access is available from county land surrounding the entire lake. No dwellings are located on the shoreline. Seventy percent of the lake is less than three feet deep. Both the inlet and outlet are a part of Crossett Creek (Source: 1975, Surface Water Resources of Marinette County Johnson Beach and Lake, T37N, R19E, Section 3 Surface Acres-13.6, Secchi Disk-greater than 7 feet, Maximum Depth-7 feet).

Kingsford Flowage

Kingsford Flowage is a medium hard water drainage lake (flowage) on the Menominee River having neutral, light brown water of moderate transparency. Littoral materials consist of sand (85%), rubble (8%), gravel (5%) and boulders. Known fish species inhabiting the lake are northern pike, walleye, largemouth bass, smallmouth bass, perch, bluegill, rock bass, pumpkinseed, white sucker, and forage species. Waterfowl make limited use of this impoundment. Public access is restricted to that of navigable water via the Menominee River. The Wisconsin-Michigan Power Company provides access to the public on the Michigan side. There are two dwellings located on the upper portion of the flowage. The flowage is maintained by a dam having a head of 29 feet and owned by the Wisconsin-Michigan Power Company (Source: 1971, Surface Water Resources of Florence County Kingsford Flowage-T39N, R19E, Section 33 Surface Acres-415.2, Secchi Disc-6 feet, Maximum Depth-33 feet).

Kimlark Lake

Kimlark Lake is a medium hard water seepage lake having slightly acidic, light brown water of high transparency. Littoral materials are probably mostly muck and some sand. The winter investigation limited these observations. The entire shoreline is upland consisting of mixed hardwoods and conifers. Information is lacking on the fish population, but the lake should support a population of largemouth bass and panfish. Waterfowl make limited use of this lake. Wilderness public access is available on the northeast corner of the lake. One dwelling is located on the shoreline (Source: 1975, Surface Water Resources of Marinette County Kimlark Lake, T37N, R21E, Section 23 Surface Acres-6.4, Secchi Disk-18 feet, Maximum Depth-32 feet).

Lindquist (Linquist) Lake

Lindquist Lake is a hard water drainage lake having slightly alkaline, clear water of high transparency. The littoral zone is composed of sand (60%), muck (40%), gravel (8%) and rubble. The shoreline is 85% upland of mixed hardwoods and conifers and 15% wetland of bog and shrub. Fish species inhabiting this lake are northern pike, largemouth bass, bluegill, pumpkinseed, black crappie, perch, and white sucker. The outlet flows to the South Branch of the Pemebonwon River. Waterfowl make limited use of this lake. A Town of Dunbar landing with parking provides public access on the southwest side of the lake. A picnic site and swimming beach are maintained by the Town of Pembine on the east side of the lake. Seventy-five percent of the lake basin is in excess of 20 feet deep. Twenty dwellings and one resort are located on the shoreline. Surface Acres-70.4, Secchi Disk-15 feet, Maximum Depth-58 feet (Source: 1975, Surface Water Resources of Marinette County Lindquist Lake, T36N, R19E, Section 1).

Little Quinnesec Falls Flowage (Impoundment)

Little Quinnesec Falls Flowage is a medium hard water drainage lake (impoundment) on the Menominee River having a slightly acidic, light brown water of moderate transparency Littoral materials consist of sand (50%), gravel (10%), and boulders (40%). The shoreline is 60% wetland, composed of conifer, shrub and hardwood, and 40% upland consisting of mixed hardwoods and conifers. Known fish species inhabiting this lake are northern pike, walleye, largemouth bass, bluegill, and perch. Puddle ducks and diving ducks make moderate use of this flowage on their spring and fall migrations. Navigable water type public access is available via the inlet. No dwellings are located on the shoreline. The dam is maintained by the Kimberly-Clark Paper Company and has a head of 68 feet. This flowage is boundary water with Michigan and the actual water area is listed in parentheses. Surface Acres-33.5 (67 total acres), Secchi Disk-7 feet, Maximum Depth-40 feet (Source: 1975, Surface Water Resources of Marinette County Little Quinnesec Falls Flowage, T38N, R20E, Section 10).

Long Lake

Long Lake is a hard water drainage lake having neutral, light brown water of moderate transparency. The shoreline is 80% upland, consisting primarily of conifers, and 20% wetland of mostly open meadow. The outlet flows to the North Branch of the Pemebonwon River. Northern pike are known to inhabit the lake, and largemouth bass and panfish are probably present as well. Waterfowl make limited use of this lake. A woods road provides unimproved or difficult public access on the east side of the lake. Two dwellings are located on the shoreline. The inlet and outlet are a part of Long Creek. Submergent and floating vegetation are moderate in density in the littoral zone (Source: 1975, Surface Water Resources of Marinette County Long Lake, T37N, R21E, Section 22 Surface Acres-8.5, Secchi Disk-7 feet, Maximum Depth-35 feet).

Luedevitz Lake

Luedevitz Lake is a hard water seepage lake having slightly alkaline, light brown water of moderate transparency. The littoral zone is composed entirely of silt. The shoreline is 90% wetland of conifers and 10% upland consisting of hardwoods and scattered conifers. Panfish and minnows are common. Waterfowl make limited use of this lake. There is no public access. Two dwellings are located on the shoreline (Source: 1975, Surface Water Resources of Marinette County Luedevitz Lake, T36N, R21E, Section 5 Surface Acres-8.2, Secchi Disk-7 feet, Maximum Depth-17 feet).

Lundgren Lake

Lundgren Lake is a medium hard water seepage lake having slightly acidic, light brown water of high transparency. The littoral zone is composed of sand (70%), muck (20%) and gravel (10%). The shoreline is 90% upland and 10% wetland. Fish species inhabiting this lake are northern pike, walleye, largemouth bass, smallmouth bass, perch, bluegill, rock bass, pumpkinseed, and white sucker. Waterfowl make limited use of this lake. Eighty-five percent of the lake basin is in

excess of 20 feet deep. Unimproved or difficult public access is available at the south end of the lake. Seventeen dwellings and one church camp are located on the shoreline (Source: 1975, Surface Water Resources of Marinette County Lundgren Lake, T36N, R20E, Section 6 Surface Acres-29.3, Secchi Disk-12 feet, Maximum Depth-62 feet).

Marm Lake

Marm Lake is a soft water seepage lake having slightly acidic, medium brown water of moderate transparency. Littoral material is composed entirely of muck. The shoreline is predominantly upland (85%) consisting of mixed hardwoods and red pine with the remainder wetland of the coniferous bog type. Information is lacking on the fish population but conditions suggest that largemouth bass and/or panfish may be suited for this lake. Waterfowl make limited use of this lake. A wilderness type public access exists across county land. No dwellings are located on the shoreline. The entire shoreline is in public ownership (Source: 1971, Surface Water Resources of Florence County Marm Lake, T38N, R18E, Section 9 Surface Acres-4.8, Secchi Disc-5 feet, Maximum Depth-29 feet).

Minnie Lake

Minnie Lake is a hard water seepage lake having slightly alkaline, light brown water of moderate transparency. The littoral zone is composed of muck. The shoreline is entirely wetland, consisting primarily of open bog. The fish population probably consists of forage species. Winterkill may occur. Waterfowl make limited use of this lake. There is no public access. No dwellings are located on the shoreline (Source: 1975, Surface Water Resources of Marinette County Minnie Lake, T36N, R19E, Section 1 Surface Acres-8.9, Secchi Disk-greater than 7 feet, Maximum Depth-7 feet).

Mud Lake

Mud Lake is a hard water drained lake having slightly acidic, light brown water of moderate transparency. The entire littoral zone is composed of silt. The shoreline is entirely wetland, consisting of bog (50%), conifer (40%) and shrub (10%). Although there is no information on the fish population the shallow depth suggests that forage species are the principle inhabitants. Waterfowl make limited use of this lake. There is no public access. No dwellings are located on the shoreline (Source: 1971, Surface Water Resources of Florence County Mud Lake, T38N, R19E, Section 34 Surface Acres-5.4, Secchi Disc-greater than 2 feet, Maximum Depth-2 feet).

No Bottom Lake

No Bottom Lake is a very soft water seepage lake having slightly acidic, light brown water of low transparency. The littoral zone is composed of muck. The entire shoreline is wetland of the coniferous-bog type. Perch are reported to be present. Waterfowl make limited use of this lake. There is no public access. No dwellings are located on the shoreline (Source: 1971, Surface Water Resources of Florence County No Bottom, T38N, R19E, Section 25 Surface Acres-3.4, Secchi Disc-4 feet, Maximum Depth-14 feet).

Otter Lake

Otter Lake is a hard water drainage lake having slightly alkaline, clear water of high transparency. The littoral zone is 95% muck and five percent sand. The shoreline is predominantly upland (90%), consisting primarily of hardwoods and meadow wetland. The fish population consists of northern pike, largemouth bass, and panfish. Waterfowl make limited use of this lake. There is no public access. No dwellings are located on the shoreline. The inlet and outlet are a part of Otter Creek (Source: 1975, Surface Water Resources of Marinette County Otter Lake, T37N, R21E, Section 21 Surface Acres-3.5, Secchi Disk-18 feet, Maximum Depth-38 feet).

Phillips Lake

Phillips Lake is a medium hard water seepage lake having slightly acidic, clear water of high transparency. The littoral zone is sand (50%), muck (40%), and gravel (10%). The entire shoreline is upland, consisting primarily of mixed hardwoods and conifers, with a limited area of cleared land on the east end. The known fish population consists of largemouth bass and bluegill. Waterfowl make limited use of this lake. There is no public access. No dwellings are located on the shoreline (Source: 1975, Surface Water Resources of Marinette County Phillips Lake, T36N, R19E, Section 23 Surface Acres-9.4, Secchi Disk-greater than 18 feet, Maximum Depth-18 feet).

Sand Lake

Sand Lake is a very soft water seepage lake having slightly acidic, clear water of high transparency. Littoral material is primarily sand with small amounts of gravel, rubble, and boulders. The shoreline is predominantly upland (65%) consisting of hardwoods and conifers with a wetland (35%) of coniferous bog. Known fish species inhabiting this lake are walleye, largemouth bass, perch, bluegill, pumpkinseed, green sunfish, black crappie, rainbow trout, white sucker, and forage species. The lake is managed primarily for rainbow trout. Waterfowl make limited use of this lake. The Town of Homestead provides public access with parking. Twelve dwellings are located on the shoreline (Source: 1971, Surface Water Resources of Florence County Sand Lake, T38N, R18E, Section 21 Surface Acres-51.6, Secchi Disc-15 feet, Maximum Depth-65 feet).

Scout Lake

Scout Lake is a very soft water seepage lake having slightly acidic, clear water of high transparency. Littoral materials consist of sand (70%), muck (25%) and some silt. The shoreline is 80% upland consisting of hardwoods and conifers with the remaining shoreline a wetland fringe. Known fish species present are largemouth bass, perch, and bluegill. Waterfowl make limited use of this lake. There is no public access. A Boy Scout organization has one dwelling and a campground on the lake (Source: 1971, Surface Water Resources of Florence County Scout Lake, T38N, R17E, Section 13 Surface Acres-27.0, Secchi Disc-17 feet, Maximum Depth-26 feet).

Shannon Lake

Shannon Lake is a hard water seepage lake having slightly alkaline, light brown water of moderate transparency. The littoral zone is composed of 85% muck, 10% sand and five percent gravel. The lake has an intermittent outlet. The shoreline is 80% upland, consisting of mixed hardwoods and conifers, and 10% wetland of coniferous swamp. The only known fish species inhabiting this lake is northern pike, although largemouth bass and panfish may be present. Waterfowl make limited use of this lake. There is no public access. One dwelling is located on the shoreline. Floating and submergent aquatic plants are moderate in density in some areas. An impounding structure at the outlet has a head of approximately seven feet (Source: 1975, Surface Water Resources of Marinette County Shannon Lake, T37N, R21E, Section 3 Surface Acres-47.0, Secchi Disk-11 feet, Maximum Depth-37 feet).

Smith Lake

Smith Lake is a hard water seepage lake having slightly alkaline, light brown water of moderate transparency. Littoral materials consist of sand (30%), muck (20%), and marl (50%). The shoreline is primarily upland (70%) consisting of mixed hardwoods and conifers and wetland (30%) of coniferous swamp. Information is lacking on the fish population, but largemouth bass and panfish may be present. Waterfowl make limited use of this lake. Public access of the wilderness type is available by crossing county land. Two dwellings are located on the shoreline (Source: 1975, Surface Water Resources of Marinette County Smith Lake, T37N, R21E, Section 30 Surface Acres-21.8, Secchi Disk-10 feet, Maximum Depth-11 feet).

Thoeming Lake

Thoeming Lake is a very soft water seepage lake having acidic, clear water of moderate transparency. The littoral zone is 97% muck and three percent sand. The shoreline is 80% upland, consisting of mixed hardwoods and conifers and 20% wetland of open bog. Largemouth bass and bluegill are known to be present. Waterfowl make limited use of this lake. There is no public access. No dwellings are located on the shoreline (Source: 1975, Surface Water Resources of Marinette County Thoeming Lake, T36N, R20E, Section 7 Surface Acres-6.8, Secchi Disk-10 feet, Maximum Depth-29 feet).

Timms Lake

Timms Lake is a medium hard water seepage lake having slightly alkaline, clear water of high transparency. The littoral zone is composed of sand (60%), gravel (10%) and muck (30%). The shoreline is 95% upland, consisting of mixed hardwoods and conifers and five percent coniferous wetland of black spruce and tamarack. The fish population includes walleye, largemouth bass, bluegill, black crappie, rock bass, green sunfish, perch, and forage species. Waterfowl make limited use of this lake. Twenty-three dwellings are located on the shoreline. Morgan Park provides a public swimming beach, picnic area, and boat launching ramp. A 36-unit campground is also available. The park is located on the east shore and is maintained by Marinette County. Surface Acres-30.0, Secchi Disk-14 feet, Maximum Depth-37 feet (Source: 1975, Surface Water Resources of Marinette County Timms Lake, T37N, R21E, Section 17).

Twin Lake

Twin Lake is a hard water drainage lake having slightly alkaline, light brown water of high transparency. The littoral zone is composed of muck (70%), sand (15%), rubble (10%) and boulder (5%). The shoreline is 65% upland, composed primarily of upland hardwoods and scattered conifers and 35% shrub bog wetland. The outlet flows to the North Branch of the Pemebonwon River. Known fish species inhabiting this lake include largemouth bass, northern pike, and pumpkinseed. Waterfowl make limited use of this lake. Wilderness public access is available at the north end of the lake. Navigable water access is also available from Lake 5-7. Two dwellings are located on the shoreline. Rock outcrops are found adjacent to the lake in several areas. Floating and submergent aquatic plants are moderate in density in some parts of the lake basin (Source: 1975, Surface Water Resources of Marinette County Twin Lake, T37N, R21E, Section 15 Surface Acres-20.5, Secchi Disk-14 feet, Maximum Depth-30 feet).

West Twin Lake

West Twin Lake soft water seepage lake having slightly acidic, clear water of high transparency. The littoral zone is composed of sand (60%), muck (35%) and gravel (9%). The shoreline is primarily upland (90%) consisting of mixed hardwoods, conifers, cultivated land, and cleared area. The remainder of the shoreline is primarily open bog wetland. The known fish population consists of largemouth bass, bluegill, and perch. Waterfowl make limited use of this lake. There is no public access. No dwellings are located on the shoreline. A navigable channel from Lake 14-3 is located on the north shore. (Source: 1975, Surface Water Resources of Marinette County West Twin Lake, T36N, R19E, Section 14 Surface Acres-15.9, Secchi Disk -greater than 15 feet, Maximum Depth-15 feet).

White Rapids

White Rapids is a medium hard water drainage lake (impoundment) on the Menominee River having neutral, light brown water of moderate transparency. The littoral zone is 70% sand, 20% silt and 10% boulders. The shoreline is 95% upland, consisting of mixed hardwoods and conifers, and five percent shrub wetland. The known fish species inhabiting this flowage include northern pike, walleye, largemouth bass, bluegill, rock bass, perch, and white sucker. Puddle ducks and diving ducks make moderate use of this lake on their spring and fall migrations. Five dwellings are located on the shoreline. Navigable water type public access is available via the inlet. The Wisconsin-Michigan Power Company maintains a boat landing with parking and a picnic area for public use. The dam is maintained by the Wisconsin-Michigan Power Company and has a head of 30 feet. About 30% of the flowage basin is less than three feet deep (Source: 1975, Surface Water Resources of Marinette County White Rapids Flowage, T35N, R22E, Section 19 Surface Acres-224.8, Secchi Disk-10 feet, Maximum Depth-32 feet).

Woempner Lake

Woempner Lake is a medium hard water seepage lake having slightly acidic, light brown water of moderate transparency. The littoral zone is composed of silt (50%), muck (40%), sand (9%) and gravel. The shoreline is 70% upland, consisting of hardwoods and scattered conifers, and 30% wetland of coniferous swamp. Northern pike, largemouth bass and perch are known to inhabit this lake. Waterfowl make limited use of the lake. There is no public access. One resort is located on the shoreline. Floating and submergent aquatic plants are in moderate density in certain areas, along with some scattered emergents. About 25% of the lake is less than three feet, deep. There is an intermittent inlet and outlet (Source: 1975, Surface Water Resources of Marinette County Woempner Lake, T36N, R19E, Section 11 Surface Acres-24.6, Secchi Disk-greater than 8 feet, Maximum Depth-8 feet).

Wolff Lake

Wolff Lake is a hard water seepage lake having slightly acidic, light brown water of moderate transparency. The littoral zone is composed entirely of muck. The shoreline is predominantly wetland (95%) consisting of conifers, and the upland (5%) is of mixed hardwoods and conifers. Information is lacking on the fish population, but winterkill is likely to occur. Waterfowl make limited use of this lake. There is no public access. No dwellings are located on the shoreline (Source: 1975, Surface Water Resources of Marinette County Wolff Lake, T38N, R21E, Section 33 Surface Acres-5.2, Secchi Disk-greater than 5 feet, Maximum Depth-5 feet).

Young Lake

Young Lake is a medium hard water seepage lake having slightly acidic, light brown water of low transparency. The littoral zone is comprised of muck (60%), sand (30%) and gravel (10%). The shoreline is 80% upland, consisting primarily of hardwoods and conifers, and 20% wetland of bog and meadow. Fish species inhabiting this lake include northern

pike, bluegill and black crappie. The lake is reported to have an occasional winterkill. Waterfowl make little use of this lake. There is no public access. Eight dwellings are located on the shoreline. Submergent aquatic vegetation is dense in a major part of the lake basin, and floating plants are moderate in some areas along with a scattering of emergents (Source: 1975, Surface Water Resources of Marinette County Young Lake, T36N, R19E, Section 1 Surface Acres-22.5 Secchi Disk-5 feet, Maximum Depth-13 feet).



Wetland Health

Wetland Status:

The Pemebonwon and Middle Menominee River watershed is located in northeastern Marinette and southeastern Florence counties. Approximately 22% of the current land uses in the watershed are wetlands. Currently, about 87% of the original wetlands in the watershed are estimated to exist. Of these wetlands, the majority include forested wetlands (79%), scrub (15%), and emergent wetlands (6%), which include marshes and wet meadows.

Wetland Condition:

Little is known about the condition of the remaining wetlands but estimates of reed canary grass infestations, an opportunistic aquatic invasive wetland plant, into different wetland types has been estimated based on satellite imagery. This information shows that reed canary grass dominates less than one acre total of wetlands in the watershed.

Wetland Restorability:

Of the 3,905 acres of estimated lost wetlands in the watershed, approximately 11% are considered potentially restorable based on modeled data, including soil types, land use, and land cover (Chris Smith, DNR, 2009).



Forested Wetlands (Photo courtesy of WDNR)

Groundwater

The following groundwater information is for Marinette and Florence counties (from Protecting Wisconsin's Groundwater through Comprehensive Planning website, <http://wi.water.usgs.gov/gwcomp/>), which roughly approximates to the Pemebonwon and Middle Menominee Rivers Watershed.

Niagara is the only municipal water system in the Pemebonwon and Middle Menominee Rivers Watershed that has a wellhead protection plan. Marinette County has adopted an animal waste management ordinance; while Florence County has not.

From 1979 to 2005, total water use in Marinette County has fluctuated from about 45.6 million gallons per day to 22.1 million gallons per day. The increase in total water use over this period until 1990 was due to industrial and aquaculture use increases, and the decrease in total water use after 1990 is due to a decrease in industrial use. The proportion of county water use supplied by groundwater has increased from about 8% to 48% during the period 1979 to 2000 and decreased to 35% in 2005.

From 1979 to 2005, total water use in Florence County has increased from about 280,000 gallons per day to about 540,000 gallons per day to 2000. Total water use in 2005 decreased to 320,000 gallons per day. The increase and decrease in total water use is due primarily to domestic use fluctuations. The proportion of county water use supplied by groundwater has remained at 100% except in 1995 when it was 98%.

Private Wells

Ninety-three percent of 210 private well samples collected in Marinette County and 100% of 26 private well samples collected in Florence County from 1990 through 2006 met the health-based drinking water limit for nitrate-nitrogen. Land use affects nitrate concentrations in groundwater. An analysis of over 35,000 Wisconsin drinking water samples found that drinking water from private wells was three times more likely to be unsafe to drink due to high nitrate in agricultural areas than in forested areas. High nitrate levels were also more common in sandy areas where the soil is more permeable. In Wisconsin's groundwater, 80% of nitrate inputs originate from manure spreading, agricultural fertilizers, and legume cropping systems.

A 2002 study estimated that 18% of private drinking water wells in the region of Wisconsin that includes Marinette and Florence counties contained a detectable level of an herbicide or herbicide metabolite. Pesticides occur in groundwater more commonly in agricultural regions, but can occur anywhere pesticides are stored or applied. A total of 2,599 acres of land in Marinette County are in atrazine prohibition areas. The vast majority (94%) of 52 private well samples collected in Marinette County and almost three quarters (74%) of 151 private well samples collected in Florence County met the health standard for arsenic.

Potential Sources of Contamination

There are no Concentrated Animal Feeding Operations (CAFOs) in the Pemebonwon and Middle Menominee Rivers Watershed; nor are there any licensed landfills or Superfund sites within the watershed.

WDNR's Remediation and Redevelopment (RR) Program oversees the investigation and cleanup of environmental contamination and the redevelopment of contaminated properties. The RR Program provides information about contaminated properties and other activities related to the investigation and cleanup of contaminated soil or groundwater in Wisconsin through its Bureau for Remediation and Redevelopment Tracking System (BRRTS) database (WDNR 2010e).

The database shows that there are two sites in the Pemebonwon and Middle Menominee Rivers Watershed that are specified as "open", meaning "contamination has affected soil, groundwater, or more and the environmental investigation and cleanup need to begin or are underway." These sites include a Leaking Underground Storage Tank (LUST) site at Jerry's Automotive in Niagara and an Environmental Repair (ERP) site at Schneiders Iron & Metal Incorporated in Aurora.

The Petroleum Environmental Cleanup Fund Award (PECFA) program was created in response to enactment of federal regulations requiring release prevention from underground storage tanks and cleanup of existing contamination from those tanks. PECFA is a reimbursement program returning a portion of incurred remedial cleanup costs to owners of eligible petroleum product systems, including home heating oil systems.

As of May 31, 2007, \$10,526,323 has been reimbursed by the PECFA program to clean up 115 petroleum-contaminated sites in Marinette County. This equates to \$244 per county resident, which is less than the statewide average of \$264 per resident. Over two million dollars has been spent on petroleum cleanup in Florence County from 18 leaking underground storage tank sites, which equates to \$511 per county resident.

Point and Nonpoint Pollution

Point sources of pollution in the watershed include the Aurora Sanitary District, the village of Niagara, Niagara of Wisconsin Paper Company, the Pembine Laundromat, and ISP Minerals. Champion International Paper Company in Michigan also discharges to the Menominee River. The Pemebonwon and Middle Menominee watershed has yet to be ranked for sources of nonpoint pollution.

Waters of Note

Trout Waters

Class I trout streams are high quality trout waters that have sufficient natural reproduction to sustain populations of wild trout, at or near carry capacity. Consequently, streams in this category require no stocking of hatchery trout. These

streams or stream sections are often small and may contain small or slow-growing trout, especially in the headwaters. Class II trout streams may have some natural reproduction, but not enough to utilize available food and space. Therefore, stocking is required to maintain a desirable sport fishery. These streams have good survival and carryover of adult trout, often producing some fish larger than average size. Class III trout waters are marginal trout habitat with no natural reproduction occurring. They require annual stocking of trout to provide trout fishing. Generally, there is no carryover of trout from one year to the next (<http://dnr.wi.gov/fish/species/trout/streamclassification.html>).

Pemebonwon and Middle Menominee Rivers Watershed contains over 184 miles of cold water streams. Over 100 miles of these streams are classified as Class I trout streams. Another 65 miles of stream are considered Class II trout streams, and there are also about 15 miles of Class III trout streams. The table below lists the waterbodies and stream segments (starting from the mouth at mile 0) where these trout waters can be found.

Table 4: Pemebonwon and Middle Menominee Rivers Watershed Trout Waters

WADRS ID	Official Waterbody Name	Local Waterbody Name	WBIC	Start Mile	End Mile	Trout Class	Trout ID	Counties
1501749	Unnamed	Creek 13-9 (T32N, R8E)	3000153	0	1.02	CLASS II	3529	Lincoln
1498456	Unnamed	Creek 27-16 (T33N, R9E)	1478900	0	0.99	CLASS II	2136	Langlade
1501933	Unnamed	Creek 34-5 (T32N, R8E)	3000192	0	1.53	CLASS II	3541	Lincoln
12543	East Branch Pratt Creek	East Branch Pratt Creek	1479300	0	3.38	CLASS II	2140	Langlade
12533	Little Oxbo Creek	Little Oxbo Creek	1477500	0	3.77	CLASS I	904	Lincoln
12544	Lloyd Creek	Lloyd Creek	1479500	0	5.93	CLASS II	2141	Langlade
12536	McCloud Creek	Mccloud Creek	1478600	0	8.18	CLASS II	2134	Langlade
12537	McCloud Creek	Mccloud Creek	1478600	8.18	13.73	CLASS I	906	Langlade
12530	North Branch Pine River	North Branch Pine River	1476800	0	16.53	CLASS II	2129	Langlade, Lincoln
12534	Oxbo Creek	Oxbo Creek	1477700	0	2.03	CLASS I	905	Lincoln
12527	Pat Smith Creek	Pat Smith Creek	1476000	0	4.39	CLASS II	2126	Lincoln
1497173	Unnamed	Pat Smith Creek	1476300	0	1.65	CLASS II	2127	Lincoln
12525	Pine River	Pine River	1475800	6.29	17.5	CLASS III	3035	Lincoln
12526	Pine River	Pine River	1475800	17.5	23.48	CLASS II	2125	Langlade
12542	Pratt Creek	Pratt Creek	1479200	0	7.46	CLASS II	2139	Langlade
12528	Rajek Creek	Rajek Creek	1476400	0	5.86	CLASS I	903	Lincoln
12531	Unnamed	Unnamed Creek (T32n, R8e, S12, Swne, 35)	1477100	0	2.05	CLASS II	2131	Lincoln
18377	Unnamed	Unnamed Creek 12-13 (T32n, R8e, S23, Sesw, 35)	1476900	0	1.84	CLASS II	2130	Lincoln
12548	Unnamed	Unnamed Creek 15-4 (T32n, R9e, S15, Sese, 34)	1479900	0	1	CLASS II	2145	Langlade
12538	Unnamed	Unnamed Creek 19-16 (T32n, R9e, S?, Sese,34)	1478700	0	0.62	CLASS II	2135	Langlade
12546	Unnamed	Unnamed Creek 22-8 (T32n, R9e, S22, Senw, 34)	1479700	0	2.92	CLASS II	2143	Langlade
12547	Unnamed	Unnamed Creek 23-3 (T32n, R9e, S23, Swne,34)	1479800	0	1.47	CLASS II	2144	Langlade

12545	Unnamed	Unnamed Creek 28-1 (T32n, R9e, S28, Nwnw, 34)	1479600	0	2.37	CLASS II	2142	Langlade
12532	Unnamed	Unnamed Creek 29-10 (T33n, R9e, S29, Nws, 34)	1477300	0	1.93	CLASS II	2132	Langlade
12540	Unnamed	Unnamed Creek 32-5 (T32n, R9e, S32, Senw, 34)	1479000	0	0.86	CLASS II	2137	Langlade
12541	Unnamed	Unnamed Creek 32-8 (T32n, R9e, S32, Senw, 34)	1479100	0	1.74	CLASS II	2138	Langlade
12535	Unnamed	Unnamed Creek 36-9 (T32n, R8e, S36, Nesw, 35)	1478400	0	2.26	CLASS II	2133	Lincoln
12529	Unnamed	Unnamed Creek 5-6 (T31n, R8e, S5, Nwnw, 35)	1476700	0	1.82	CLASS II	2128	Lincoln

Outstanding and Exceptional Resource Waters

Wisconsin has designated many of the state’s highest quality waters as Outstanding Resource Waters (ORWs) or Exceptional Resource Waters (ERWs). Waters designated as ORW or ERW are surface waters which provide outstanding recreational opportunities, support valuable fisheries and wildlife habitat, have good water quality, and are not significantly impacted by human activities. ORW and ERW status identifies waters that the State of Wisconsin has determined warrant additional protection from the effects of pollution. These designations are intended to meet federal Clean Water Act obligations requiring Wisconsin to adopt an “antidegradation” policy that is designed to prevent any lowering of water quality, especially in those waters having significant ecological or cultural value.

Outstanding Resource Waters (ORWs) typically do not have any point sources discharging pollutants directly to the water (for instance, no industrial sources or municipal sewage treatment plants), though they may receive runoff from nonpoint sources. New discharges may be permitted only if their effluent quality is equal to or better than the background water quality of that waterway at all times. No increases of pollutant levels are allowed. If a waterbody has existing point sources at the time of designation, it is more likely to be designated as an Exceptional Resource Water (ERW). Like ORWs, dischargers to ERW waters are required to maintain background water quality levels; however, exceptions can be made for certain situations when an increase of pollutant loading to an ERW is warranted because human health would otherwise be compromised (<http://dnr.wi.gov/org/water/wm/wqs/orwerw/>).

Fifty-two miles of stream within the Pemebonwon and Middle Menominee Rivers Watershed are on the Exceptional Resource Water list, including segments of Anderson Spur, Bear, Brown Spur, Coates, Lindstrom, Mullaney, Rock Cut, Sand Lake Branch, and Squaw creeks along with many other unnamed creeks. Another 52 miles of streams in the watershed are considered Outstanding Resources Water along segments of the Little Silver, Miscauno, Spikehorn, and Sullivan Creeks together with the Little Popple River and the South Branch of the Pemebonwon River.

Table 5: Pemebonwon and Middle Menominee Rivers Watershed Outstanding and Exceptional Resource Waters

WADRS ID	Official Waterbody Name	Local Waterbody Name	WBIC	ORW/ERW	ORW/ERW ID	Start Mile	End Mile	Code Reference	Counties
12115	Little Popple River	Little Popple River	648000	ORW	1523	16.61	19.19	102.10(1)(d)10	Florence
12109	Little Silver Creek	Little Silver Creek	643000	ORW	1510	0	2.65	102.10(1)(d)17	Marinette
947451	Miscauno Creek	Miscauno Creek	634800	ORW	1493	4.29	6.57	102.10(1)(d)17	Marinette
12095	North Branch Miscauno Creek	Miscauno Creek	635200	ORW	1493	0	3	102.10(1)(d)17	Marinette
12100	Silver Creek	Silver Creek	636400	ORW	1499	0	4.22	102.10(1)(d)17	Marinette
12096	South Branch Miscauno Creek	South Branch Miscauno Creek	635600	ORW	1496	0	5.32	102.10(1)(d)17	Marinette

12108	South Branch Pemebonwon River	South Branch Pemebonwon River	642900	ORW	1509	0	22.17	102.10(1)(d)17	Marinette
1453770	Spikehorn Creek	Spikehorn Creek	640000	ORW	1503	3.64	6.57	102.10(1)(d)17	Marinette
1453896	Sullivan Creek	Sullivan Creek	638800	ORW	1502	3.94	6.39	102.10(1)(d)17	Marinette
12105	Sullivan Creek	Sullivan Creek	638800	ORW	1502	0	3.94	102.10(1)(d)17	Marinette
12113	Anderson Spur Creek	Anderson Spur Creek	647600	ERW	1521	0	0.79	102.11(1)(a)	Marinette
12112	Bear Creek	Bear Creek	646700	ERW	1520	0	1.74	102.11(1)(a)	Marinette
12107	Brown Spur Creek	Brown Spur Creek	640600	ERW	1505	0	2.22	102.11(1)(a)	Marinette
12111	Coates Creek	Coates Creek	645300	ERW	1518	0	1.49	102.11(1)(a)	Marinette
1856067	Unnamed	Coates Creek	645800	ERW	1518	1.49	1.71	102.11(1)(a)	Marinette
947846	Unnamed	Creek 16-9	635150	ERW	1495	0	0.65	102.11(1)(a)	Marinette
1453907	Unnamed	Creek 16-13	638400	ERW	1500	0.29	2.8	102.11(1)(a)	Marinette
1454387	Unnamed	Creek 16-15	646000	ERW	1519	0	1.56	102.11(1)(a)	Marinette
1453954	Unnamed	Creek 19-12	641800	ERW	1506	0	0.7	102.11(1)(a)	Marinette
1454356	Unnamed	Creek 20-6	644650	ERW	1516	0	0.54	102.11(1)(a)	Marinette
1481798	Unnamed	Creek 22-3	649000	ERW	1526	0	0.88	102.11(1)(a)	Florence
947823	Unnamed	Creek 22-7	634900	ERW	1494	0.01	2.68	102.11(1)(a)	Marinette
1454491	Unnamed	Creek 22-10	642750	ERW	1508	0	1.55	102.11(1)(a)	Florence
947800	Unnamed	Creek 23-10 T36n R21e	634850	ERW	23	0	3.2	102.11(1)(a)	Marinette
1481866	Unnamed	Creek 24-1	650050	ERW	1529	0	1.13	102.11(1)(a)	Florence
948200	Unnamed	Creek 24-5	635650	ERW	1497	0	1.46	102.11(1)(a)	Marinette
1454543	Unnamed	Creek 24-5 (T37n R19e)	644800	ERW	1517	0	1.18	102.11(1)(a)	Marinette
1454517	Unnamed	Creek 24-5 (T37n R19e)	644800	ERW	1517	0	0.93	102.11(1)(a)	Marinette
1454240	Unnamed	Creek 31-1 T37n R20e	644100	ERW	1513	0	2.26	102.11(1)(a)	Marinette
1450129	Unnamed	Creek 34-14	619850	ERW	1437	0	1.56	102.11(1)(a)	Marinette
1454456	Unnamed	Creek 34-2	642200	ERW	1507	0	2.41	102.11(1)(a)	Florence
1481839	Unnamed	Creek 9-4	649200	ERW	1527	0	0.61	102.11(1)(a)	Florence
1453861	Unnamed	Genricks Creek	640500	ERW	1504	0	1.24	102.11(1)(a)	Marinette
12114	Lindstrom Creek	Lindstrom Creek (Creek 12-7 T38N R19E)	647900	ERW	1522	0	0.8	102.11(1)(a)	Florence
1453432	Mullaney Creek	Mullaney Creek	636100	ERW	1498	1.46	3.67	102.11(1)(a)	Marinette
12098	Mullaney Creek	Mullaney Creek	636100	ERW	1498	0	1.46	102.11(1)(a)	Marinette
1454304	Unnamed	Mussel Creek	644300	ERW	1514	0	0.64	102.11(1)(a)	Marinette
1454330	Unnamed	Paulson Creek	644600	ERW	1515	0	1.34	102.11(1)(a)	Marinette
12110	Rock Cut Creek	Rock Cut Creek	643100	ERW	1511	0	1.86	102.11(1)(a)	Marinette
18292	Sand Lake Br.	Sand Lake Branch	649800	ERW	1528	0	2.38	102.11(1)(a)	Florence
12091	Squaw Creek	Squaw Creek	634000	ERW	1492	0.24	4.42	102.11(1)(a)	Marinette
1458042	Unnamed	Unnamed Creek 13-8	648400	ERW	1525	0	0.91	102.11(1)(a)	Florence
1454189	Unnamed	Wildcat Creek	643200	ERW	1512	0	2.89	102.11(1)(a)	Marinette

Impaired Waters

A 45-mile section of the Menominee River has been listed as impaired by PCBs and mercury since 1998. Sand Lake has also been on the 303(d) impaired waters list for mercury since 1998.

Table 6: Pemebonwon and Middle Menominee Rivers Watershed Impaired Waters

Official Waterbody Name	Local Waterbody Name	Start Mile	End Mile	WBIC	County	Pollutant	Impairment	303 Status	Priority
Sand Lake	Sand Lake	-	-	591600	Florence	Mercury	Contaminated Fish Tissue	303(d) Listed	Low
Menominee River	Menominee River	43.21	87.8	609000	Marinette	Mercury	Contaminated Fish Tissue	Pollutant Removed	-
Menominee River	Menominee River	43.21	87.8	609000	Marinette	PCBs	Contaminated Fish Tissue	303(d) Listed	Low
Menominee River	Menominee River Above Pier's George	88.32		609000	Marinette	Mercury	Contaminated Fish Tissue	Water Delisted	Delisted 2008
Menominee River	Menominee River Above Pier's George	88.32		609000	Marinette	PCBs	Contaminated Fish Tissue	Water Delisted	Delisted 2008

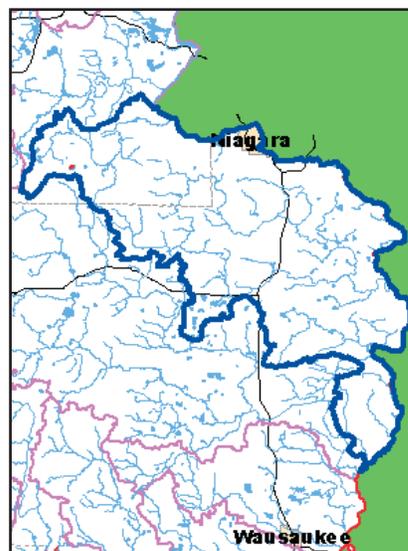
Fish Consumption

Wisconsin's fish consumption advisory is based on the work of public health, water quality and fisheries experts from eight Great Lakes states. Based on the best available scientific evidence, these scientists determined how much fish is safe to eat over a lifetime based on the amount of contaminants found in the fish and how those contaminants affect human health. Advisories are based on concentrations of the following contaminants along with angler habits, fishing regulations, and other factors.

Sand Lake in Florence County (T38 R18e S21) has had a specific fish consumption advisory in effect for Mercury since 2009. The Menominee River from Pier's Gorge to Lower Scott Flowage, including the Chalk Hill Flowage and White Rapids Flowage, has had a specific fish consumption advisory for polychlorinated biphenyls (PCBs) in effect since 2009, as well.

These contaminants differ in where they come from, where they accumulate in fish, and how they affect human health. Contaminants such as PCBs and mercury build up in the body over time. Studies indicate the people exposed to PCBs are at greater risk for a variety of health problems. Infants and children of women who have eaten a lot of contaminated fish may have lower birth weights and be delayed in physical development and learning. PCBs may affect reproductive function and the immune system and are also associated with cancer risk. Once eaten, PCBs are stored in body fat for many years. Each time you ingest PCBs the total amount of PCB in your body increases.

Mercury affects the human nervous system. Mercury can damage developing brains of children and may affect a child's behavior and ability to learn. While mercury can be eliminated from the body, frequent ingestion of fish with high levels of mercury results in bioaccumulation (Proposed Guidance For the Classification, Assessment, & Management of Wisconsin Surface Waters, Lowndes & Helmuth, March 12, 2007).



Map 3: Pemebonwon and Middle Menominee Rivers Watershed Impaired Waters (in red)

Aquatic Invasive Species

Eurasian water-milfoil have been documented along segments of Chalk Hill Flowage, Big Quinnesec Falls Flowage, Barnes Lake, and White Rapids Flowage. Rusty Crayfish have been verified and vouchered along stretches of the Little Pople River, Fischer Lake, South Branch Little Pople River, and Menominee River.

Species of Special Concern

The following species are federally-listed Threatened, Endangered, Proposed, and Candidate Species that have been observed in Marinette and Florence counties, in which the Pemebonwon and Middle Rivers Watershed is located.

Species	Status	Habitat	Taxa
Canada lynx (<i>Lynx canadensis</i>)	Threatened	While no resident populations are known from Wisconsin, the species occasionally occurs in northern forested areas, and counties listed are those with the highest likelihood of occurrence.	Mammal
Gray wolf (<i>Canis lupus</i>)	Endangered	Northern forested areas	Mammal
Kirtland's warbler (<i>Dendroica kirtlandii</i>)	Endangered	Young jack pine stands (5 to 25 years old). Confirmed breeding in Adams County, potential breeding in the other counties.	Bird
Piping plover (<i>Charadrius melodus</i>)	Endangered	Sandy beaches; bare alluvial and dredge spoil islands	Bird

State Natural and Wildlife Areas

Menominee River Natural Resources Area

The Menominee River Natural Resources Area is a 1,962-acre river corridor of towering pines, rock outcrops, and falls in northeast Wisconsin next to the Michigan border. This 1,962-acre property borders the west side of the Menominee River for about five miles. The property was donated to the Wisconsin Department of Natural Resources (DNR) in 2000 from the Richard King Mellon Foundation along with 2,530 acres to the Michigan Department of Natural Resources on the opposite side of the river, which is now part of the Escanaba State Forest. The river corridor with towering pines, rock outcrops, and falls are the primary biological and aesthetic features of the property. Management took this into consideration by placing a 200-foot buffer along the banks of the Menominee River. This buffer area and other designated forest stands total 700 acres of forest that have been designated to be managed toward old growth forest conditions. Some of the areas already exhibit older forest characteristics while the majority of stands need time and some management applications. These areas will provide habitat for wildlife species that require older forest habitat characteristics and a look into what the area may have looked like before settlement.

The remainder of the property is managed through sustainable forestry practices. Sustainable forestry is comprehensive management that combines the perpetual growing and harvesting of trees with the long term protection of wildlife, plants, soil, and water quality. A minimum of 900 acres of aspen is managed to provide various stages of maturity. This is beneficial to many species of wildlife and is particularly valuable to the property's primary game species, ruffed grouse, and whitetail deer.

Miscauno Cedar Swamp

Miscauno Cedar Swamp features a northern wet-mesic forest in a steep-sided basin along the South Branch of Miscauno Creek. The timber varies from nearly pure stands of pole-sized white cedar to mixtures of white cedar, balsam fir, and black spruce with black ash and elm along the stream. Tamarack snags indicate a former forest of this species, which was undoubtedly logged in the past. The surrounding uplands are mainly an aspen-oak and pine cutover forest.

The ground layer is rich in smaller orchid species along with one-flowered pyrola, bunchberry, American starflower, yellow blue-bead-lily, gaywings, Canada mayflower, and several ferns. In the numerous headwater springs is a rich flora of mosses and lichens. Breeding bird surveys have shown that such uncommon birds, such as ravens, hermit thrush, black and white warbler, pine warbler, scarlet tanager, and black-billed cuckoo are found during the nesting season. Although the lowlands have been logged they still retain natural conditions. The swamp was also the site of a 20-year

research study looking at the effects of cedar thinning. Miscauno Cedar Swamp is owned by the DNR and was designated a State Natural Area in 1971.

Spread Eagle Barrens

Spread Eagle Barrens protects an extensive landscape of bracken grassland and barrens dominated by scattered jack pine, red pine, scrub oak, and quaking aspen. The sandy soils support an understory of sedges, bracken and sweet fern, slender wheat grass, muhly grass, poverty oats, hazelnut, serviceberry, blueberry, and willows. A mosaic of six different communities, the natural area was established to protect the Pine Barrens community and associated flora and fauna that require large expanses of open vegetation. Frost pockets, treeless depressions where frost may occur at any time of year, punctuate the landscape. Sedges, lichens, and other plant species have adapted to this harsh microclimate and are able to dominate these low-lying areas. In contrast, bracken fern, jack pines, and other small trees dominate the uplands where they are interspersed with grasses. Many rare or declining species of large open landscapes live here including northern harrier (*Circus cyaneus*), and upland sandpiper (*Bartramia longicauda*). Other birds include northern raven, winter wren, eastern bluebird, warbling vireo, Nashville, chestnut-sided, pine, and mourning warblers, clay-colored sparrow, common nighthawk, eastern towhee, and Brewer's blackbird. Mammals include black bear, fisher, badger, coyote, red fox, and white-tailed deer. The lower reaches of the Pine River, a designated Wild River, traverse the site and the Menominee River forms the property's eastern boundary. Management activities such as timber harvest and prescribed burning help maintain the open landscape. Spread Eagle Barrens is owned by the DNR and WE Energies and was designated a State Natural Area in 1995.



Miscauno Cedar Swamp, Photo by Thomas Meyer (WDNR photo)

Watershed Actions

Grants and Projects

NPS Grant – Reggie Phillips Farm 01/01/2008– Proposed

State to cost-share design and installation of manure management and barnyard runoff practices to address farm operations not in compliance with the agricultural performance standards and prohibitions dealing with an unconfined manure pile in a water quality management area, prevention of unlimited livestock access to waters of the state, prevention of overflow from manure storage facilities, and prevention of direct runoff from a feedlot or stored manure into waters of the state under NR 151.08.

NPS Grant - Al Bjorkman Farm 01/01/2008 – Proposed

State to cost-share design and installation of manure management and barnyard runoff practices to address farm operations not in compliance with the agricultural performance standards and prohibitions dealing with manure and nutrient management, clean water diversions, and prevention of direct runoff from a feedlot or stored manure into waters of the state under NR 151.

Lake Protection Grant - Marinette County Lake Classification Project 09/01/2006 – Complete

Marinette Co. proposed to contact a project for Lake Classification Implementation to support their lakes by ensuring optimum program implementation at the county level. Description of project goals & objectives: Developed process for certifying contractors that work in water quality management areas; Entered photos and shoreline assessment data on riparian parcels in the County GIS; Produced & printed an updated, Marinette Co.- specific shoreland zoning brochure; Expanded the Citizen Lake Monitoring program in Marinette County and increased volunteerism; Analyzed water samples gathered by our Water Quality Investigation Program; Laid the groundwork for a monitoring effort to measure the long term impacts of shoreline development on fish, wildlife, insects, flora, etc. in at risk water bodies; Created a county wide manure spreading layer in the County GIS that ranks farms by need, for manure storage; Initiated compliance checking procedures for NR151 implementation strategy. Description of project products or deliverables: contractor training resulted in a list of earthmoving contractors certified for working in shoreland areas. An effort has

also made to revise their Shoreland/Wetland Zoning Ordinance to require that only trained, certified earthwork contractors work in Water Quality Management Zone; geodata base in the County GIS containing riparian parcels, pictorial data, & shoreline assessments; updated and improved shoreland zoning brochure; list of educated and motivated Lake Monitoring Volunteers and better relationships and coordination between environmental organizations; Water Quality Investigation reports on two Marinette County lakes; preliminary reports on results of biological impact monitoring of two lakes and two sections of the Peshtigo flowages; maps showing high hazard areas for winter spreading of manure in the GB07-10 watersheds; and maps and tables showing NR151 compliance status in the GB07-10 watersheds.

Lake Planning Grant - Marinette County Environmental Newsletter Development 04/01/2004 – Complete

This project involved developing an educational publication entitled the Northwoods Journal. This publication is a media for educating the public, lake associations, legislators and public officials regarding various environmental and management issues regarding lakes including exotics and the recently adopted Marinette County Lake Classification program revisions to shoreland zoning ordinance. Articles were solicited from various agencies and organizations to be included in the journal. Four editions from May 1, 2004 and September 1, 2004 were distributed through stores, restaurants, libraries, bait shops and electronically to a mailing list including decision makers and important stakeholders or anyone who was interested in receiving.

Lake Protection Grant - Marinette County Ordinance Development 07/01/2002 – Complete

Marinette County proposed to obtain County Board approval of a Shoreland/Wetland Zoning Ordinance. The existing shoreland zoning regulations didn't provide the level of protection necessary to prevent water quality degradation, fish and wildlife habitat destruction, and the reduction of natural scenic beauty. The County conducted a public outreach and information/education strategy to inform citizens about the need for changes to shoreland zoning, what those changes are and how the changes will affect riparian landowners. The County provided DNR with a final report of their project.

Lake Planning Grant - Town of Dunbar Lakes Assessment 10/01/2000 - Complete

The Town of Dunbar proposed to begin the development of a Lake Planning Assessment and Management Plan for their town. This project consisted of meetings with town residents to develop a vision statement, goals and objectives; collected available water quality data and made recommendations for continued collection; analyzed town demographics; identified existing land uses; and digitize GIS mapping. A final report was completed to summarize the findings, review initial goals and objectives; and recommendations made for future data collection, land use planning/zoning, public access and other policy and planning needs.

Lake Planning Grant - Town of Wausaukee 04/01/1999 – Complete

The Town of Wausaukee proposed this first step project to develop a comprehensive land use plan. It can be used as a pilot project that will be applied to similar lakes in Marinette that have a low rate of second home development and that are located in areas that are very rural in nature. This project collected and assessed the types of social, physical and regulatory data that are available for the lakes and their watersheds. The project identified deficiencies in data and made recommendations for additional data collection that will be the subject of future grant applications.

Lake Protection Grants - Florence County Land/Lake Use Plan 09/01/1998 –Complete

Florence County proposed to classify and analyze the types of social, physical and regulatory data that are available for the lakes and their watersheds in the county. The project identified deficiencies in data and made recommendations for additional data collection. The ultimate goal was to develop a long range plan that would protect and enhance lake quality in the County. Three distinct advisory committees were established and products included: extensive information and education efforts, identifying those areas most suitable for development and identifying wetlands, floodplains and lake shoreline that are least suitable for development, population characteristics and future trends in demographics will be addressed. Information was presented on various employment characteristics, employment sectors, and tourism aspects. Housing needs as well as age of housing, values, and types of housing units were assessed. A land use inventory to identify conflicts between existing zoning was also included and a digitized information data base was created using GIS. A transportation improvement program and outdoor recreation section are included along with existing public facilities. A findings and needs assessment was developed to address future land use and lake development. Policies were developed and a land use and lake protection plan was prepared.

Lake Protection Grants - Marinette County Lake Classification Project 04/01/1998 – Complete
Marinette County Lake & Water Conservation Department proposed to review its current lake and shoreland protection program efforts, develop a county-wide lake classification system and identify and recommend various lake protection and management tools including regulatory and non-regulatory. Many deliverables are included and specifically detailed in the Grant Award Agreement.

Monitoring

Lakes Baseline and Trends Monitoring

River Monitoring to comply with Clean Water Act implementation - water quality standards: use designations, criterion, permit issuance and compliance, assessments and impaired waters management.

Fisheries projects include a wide variety of “baseline” monitoring and targeted fieldwork to gain specific knowledge related to Wisconsin’s fish communities.

In close cooperation with UW Extension and Wisconsin Sea Grant, education efforts focus on working with resource professionals and citizens statewide to teach boaters, anglers, and other water users how to prevent transporting aquatic invasive species when moving their boats. Additional initiatives include monitoring and control programs.

Volunteer Monitoring

The Citizen Lake Monitoring Network, the core of the Wisconsin Lakes Partnership, involves over 1000 citizen volunteers statewide. The goals are to collect high quality data, to educate and empower volunteers, and to share this data and knowledge. Volunteers measure water clarity, using the Secchi Disk method, as an indicator of water quality. This information is then used to determine the lakes trophic state. Volunteers may also collect chemistry, temperature, and dissolved oxygen data, as well as identify and map plants, watch for the first appearance of Eurasian Water Milfoil near boat landings, or alert officials about zebra mussel invasions on Wisconsin lakes.

Monitoring work in this watershed consists of lake monitoring and surveys for water quality, aquatic plants, aquatic invasive species, and ice observations.

Stream Monitoring Volunteers in the Pemebonwon, Middle Menominee Watershed

There are no citizen monitors in the GB15-Pemebonwon, Middle Menominee Watershed. For information on how to become a Volunteer Stream Monitor, visit-<http://watermonitoring.uwex.edu/index.html>

Basin/Watershed Partners

The town of Wausaukee is developing a comprehensive land use plan with a goal of protection the water resources in the region. The town of Dunbar is developing a Lake Planning Assessment and Management Plan to protect lakes in its vicinity. Florence and Marinette Counties both have aquatic invasive species coordinators on staff.

Recommendations

- The hydroelectric dams in this watershed should be operated with run-of-river flows (Type C).
- District Water Resources Management (WRM) and Fisheries Management, Michigan DNR, Niagara of Wisconsin and Champion International should work cooperatively to investigate taste and odor problems in the Norway- Quinnesec area to identify the source of the problem and design corrective measures (Types A, B & C).
- Marinette County, WI and Dickinson and Menominee counties, MI should explore the development of zoning ordinances to protect undeveloped water frontage and preserve its scenic beauty and recreational qualities (Type C).
- DNR should consider the remaining open sections of the Menominee River for inclusion as wild and scenic rivers and/or outstanding resource waters (Types B & C).
- District WRM and Fisheries Management should collect and analyze redhorse from below the Niagara of Wisconsin and Champion International mills for PCB and dioxin contamination (Type B).
- Wisconsin Electric Power Company should continue to investigate depressed dissolved oxygen levels below the White Rapids dam and/or devise a strategy to maintain dissolved oxygen levels above the 5 parts per million (ppm)

pursuant to state water quality standards (Type A).

- District WRM should monitor Crossett Creek to determine if it is meeting its biological use potential (Type B).
- District WRM and Fisheries Management personnel should collect white suckers from the Menominee River for whole fish monitoring and wildlife impact assessment (Type B).
- Hydroelectric plant owners/operators, along with DNR, should explore opportunities to restore waterfalls and rapids to their original conditions (Types B & C).

Contributors

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Menominee River, Photo by Loon Lake Realty, Google Images

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DNR PUB WY-028 2011

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Wisconsin DNR's mission involves preserving, protecting, and restoring natural resources. Watershed Planning provides a strategic review of water condition to enhance awareness, partnership outreach, and the quality of natural resource management.

Pemebonwon and Middle Menominee Rivers Watershed