Montello Lake, Wisconsin.

MONTELLO RIVER WATERSHED (UF13)

The watershed hosts high quality resources. Resource priorities include the need to address low trout densities and stream habitat issues due to lack of coarse substrate and excessive sand bed load. Stream restoration projects are a high priority.

A Watershed Report created by the Bureau of Water Quality in support of the Clean Water Act.

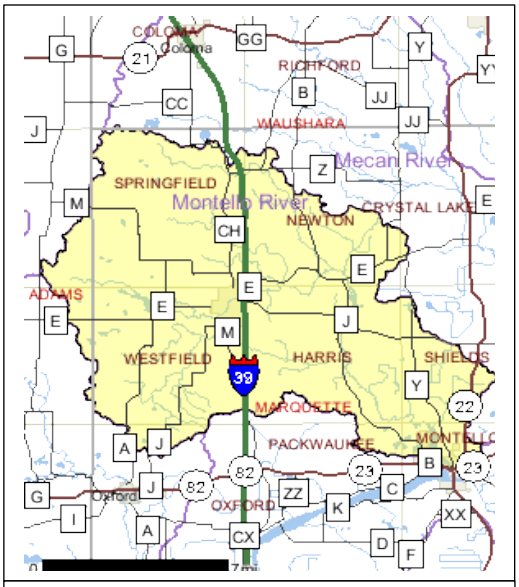
Contents

Watershed Details

About the Watershed

The Montello River Watershed is located in Adams, Marquette, and Waushara counties. The watershed is 86,079 acres in size and contains 148 miles of streams and rivers, over 1,400 acres of lakes and reservoirs, and 13,900 acres of wetlands. The watershed is dominated by forest (37%), agriculture (35%), and wetlands (16%), and is ranked high for nonpoint source issues affecting groundwater and medium for nonpoint source issues affecting streams.

As part of the Upper Fox River Basin this watershed ultimately drains into Lake Winnebago and then Lake Michigan. The last glaciation had a significant impact on the Montello River Watershed's topography and geology creating lateral moraines, ground moraines, glacio-fluvial landforms, outwash plains, and lake sediments. The diversity of the landscape and soils left by the retreating glaciers still play an important role in drainage patterns and water quality of the watershed today.



Map 1: Montello Watershed UF13

Population and Land Use

Land use in the Montello River Watershed is dominated by forest, which covers about 37% of the total area. Other land uses in the Montello River Watershed that cover a significant amount of the total area include agriculture (35%), wetlands (16%) and grasslands (4%). Suburban and urban environments are even scarcer in this watershed, with only one percent and one-fifth of one percent, respectively. The watershed is ranked high for nonpoint source issues affecting groundwater and medium for nonpoint source issues affecting streams.

Table 1: Montello River Watershed Land Use

Land Use	Acres	Percent of Area
Forest	31,465.98	36.55%
Agriculture	30,552.16	35.49%
Wetland	13,913.69	16.16%
Open Water & Open Space	5,387.07	6.26%
Grassland	3,426.21	3.98%
Suburban	1,132.88	1.32%
Urban	181.70	0.21%
Barren	20.24	0.02%
Total Acres in Watershed	86,079.93	

Hydrology

The hydrologic cycle describes the various ways water is exchanged from one form or location to another. In Wisconsin, precipitation, in the form of rain, snow, and everything in-between, falls onto the earth's

surface. It either soaks into the ground or flows across the land. The water that soaks into the ground recharges the groundwater table, or flows laterally through the ground into a lake or stream. The water that does not soak in, flows across the land until it reaches a lake or stream. Water moves from the land back into the air via evaporation and transpiration. Evaporation occurs when liquid water on the land changes into a gas in the atmosphere. Transpiration occurs when water evaporates from the leaves and stems of plants.

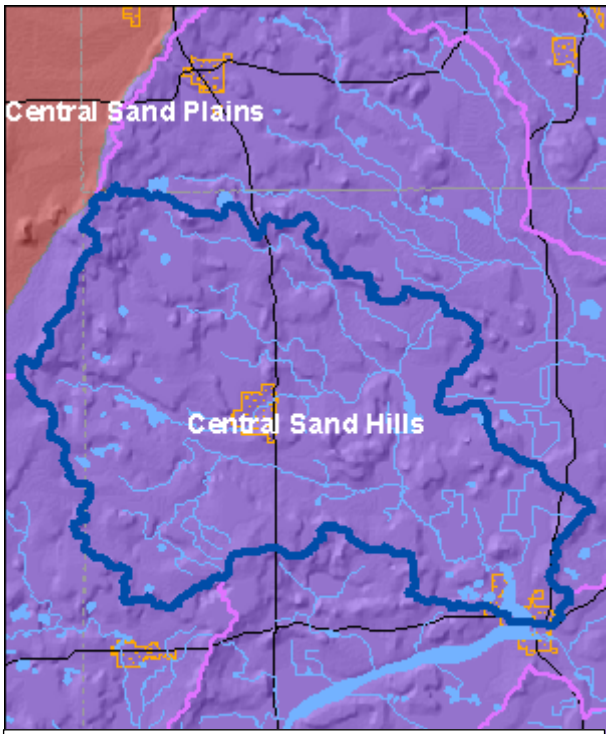
The path water takes before reaching a lake or impoundment has a strong influence on water quality. Lawrence Lake, Harris Pond, and Montello Lake receive the majority of their water from their respective tributaries. Lawrence Creek feeds Lawrence Lake, while Westfield Creek and Tagatz Creek flow into Harris Pond. The Montello River collects water from both of these lakes and flows into Montello Lake.

Water quantity and quality in impoundments is predominately controlled by upstream factors. While streams and rivers act as highways that transport water, sediment and nutrients, impoundments and lakes should be considered sinks. Water that is in motion has the capacity to carry more sediment than stationary water. When a stream “slows down” it deposits the materials it is carrying.

The climate of the Montello River Watershed has influenced the characteristics of the current landscape. The humid continental climate type consists of varying weather patterns and significant seasonal temperature changes (USDA Soil Survey). Average annual precipitation is 29 inches. Most of the precipitation occurs between April and September. Winter precipitation usually occurs as snow, which is released back into groundwater or surface water during spring thaws.

Ecological Landscapes

The Central Sand Hills Ecological Landscape is located in central Wisconsin at the eastern edge of what was once Glacial Lake Wisconsin. The landforms in this ecological landscape are a series of glacial moraines that were later partially covered by glacial outwash. The area is characterized by a mixture of farmland, woodlots, wetlands, small kettle lakes, and cold water streams, all on sandy soils. The mosaic of glacial moraine and pitted outwash throughout this ecological landscape has given rise to extensive wetlands in the outwash areas, and the headwaters of cold-water streams that originate in glacial moraines. The growing season is long enough for agriculture, but the sandy soils can limit agricultural productivity.



Map 2: Ecological Landscapes

Historic upland vegetation consisted of oak-forest, oak savanna, and tallgrass prairie. Fens were common in this ecological landscape and occurred along with wet-mesic prairie, wet prairie, and rare coastal plain marshes. Current vegetation is composed of more than one-third agricultural crops and almost one-fifth grasslands, with smaller amounts of open wetland, open water, shrubs, barren, and urban areas. The major forested type is oak-

hickory, with smaller amounts of white-red-jack pine, maple-basswood, lowland hardwoods, aspen-birch, and spruce-fir.

Historical Note

Westfield, a village in Marquette County, is located in the Montello River Watershed. Much of Marquette County's history has been captured and preserved at the Marquette County Historical Society Museum in Westfield, Wisconsin. Three buildings are dedicated to local history. The stately two-story Cochrane-Nelson House, built in 1903, has high ceilings and filigree woodwork and is furnished with antiques and collectibles. The house sits on land once owned by Robert Cochrane, who settled on the property around 1850. Members of the Nelson family lived in the house for more than 70 years until 1979, when the Cochrane-Nelson property became the Marquette County Historical Society Museum.

Montello River

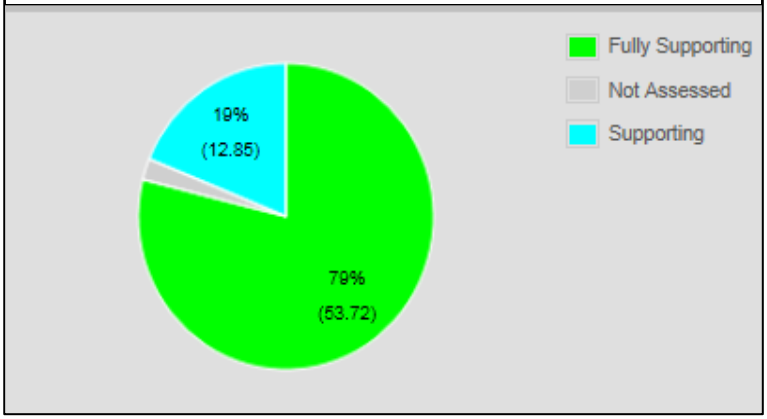
Watershed Condition

Overall Condition

Lawrence Creek and Tagatz Creek comprise 15 miles of Outstanding Resource Waters. Caves Creek and Lawrence Creek comprise another 13 miles of Exceptional Resource Waters. A total of 29 miles of Class I trout streams are present along portions of Caves, Lawrence, and Tagatz creeks. Klawitter Creek contributes another four miles of Class II trout streams. No impaired waters are listed for the watershed.

According to the Register of Waterbodies (ROW), there are 148 miles of streams and rivers in the Watershed; 68 miles of these have been entered into the assessment database. Of these 68 miles, about 98% are meeting Fish and Aquatic Life uses and are specified as in "good" condition. The condition of the remaining 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, 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.

Figure 1: Water Quality Standards Attainment, Rivers (Miles)



River and Stream Condition

A collaborative water quality study was conducted in the Montello River Watershed between January 2008 and January 2010. This study was a cooperative effort between the Marquette County Land and Water Conservation Department, the Montello River

Watershed Task Force, the Harris Pond Lake Association, the Lawrence Lake Association, the Montello Lake District, the Wisconsin Department of Natural Resources (WDNR), the United States Geological Survey (USGS) and the University of Wisconsin-Stevens Point (UWSP) Center for Watershed Science and Education (CWSE). The impetus for the study was to identify sources of water quality problems in the Montello River and Montello Lake by evaluating lake, stream, and river quality at 11 sites throughout the watershed. There were two sampling locations on Klawitter Creek, two on Westfield Creek, one on Tagatz Creek, and one on Unnamed Creek.

Table 2: Designated Use Support Summary for Montello River Watershed Rivers and Streams (all values in miles)

Use	Supporting	Not Assessed	Total Size
Fish Consumption		68.1	68.1
Fish and Aquatic Life	66.6	1.5	68.1
General		68.1	68.1
Public Health and Welfare		68.1	68.1
Recreation		68.1	68.1

Caves Creek

Caves Creek is a small tributary of moderate gradient to Westfield Creek. The stream originates in spring ponds and marshland north of Lawrence and flows generally southeasterly. Forage fishes and brook trout constitute the fishery. Fish and aquatic insect communities surveyed from 2010 through 2014 indicate Good to Excellent water quality in Caves Creek. The water is clear over sand and gravel in the headwaters and sand and silt downstream. Access is possible from several town, county and state roads, and along 1.87 miles of land owned publicly, or in permanent easement (From: Poff, Ronald J. and Threinen, C.W., 1963. Lake and Stream Classification Project. Surface Water Resources of Marquette County, Wisconsin Department of Natural Resources, Madison, WI. Caves Creek, T16N, R9E, Section 5, Surface Acres = 13.8, Miles = 11.4, Gradient = 9.3 feet per mile)

Klawitter Creek

Klawitter Creek is a 15 miles long stream of moderate gradient that originates from marsh drainages and springs. The water is light brown and the bottom is primarily silt. A pond with six-foot head exists on the headwaters. Downstream, the outlet of Christensen Lake contributes to the volume of flow. The entire waterway is managed for trout with brook and brown trout common. A small tributary originates from the marshland near Swamp Lake and is considered to have some natural trout reproduction. The collaborative Montello River Watershed study found that the dominate land use in the Klawitter Creek sub-watershed is cultivated cropland (42.7%) and that the agricultural production may be contribute to the elevated concentrations of total phosphorus and total nitrogen that were detected during the study.
(From: Poff, Ronald J. and Threinen, C.W., 1963. Lake and Stream Classification Project. Surface Water Resources of Marquette County, Wisconsin Department of Natural Resources, Madison, WI. Klawitter Creek, T16N, R9E, Section 22, Surface Acres = 21.3, Miles = 14.7, Gradient = 7.4 feet per mile).

Lawrence Creek

Lawrence Creek is a moderate-gradient stream which originates at the base of terminal moraine hills in Adams County and flows easterly to Lawrence Lake. Below Lawrence Lake the stream is considered as

Westfield Creek. Instream spring seepage and short spring feeders contribute significantly to the volume and quality of the stream. Fish and aquatic insect communities surveyed from 2010 through 2014 indicate Fair to Excellent water quality in Lawrence Creek. Brook trout constitute the fishery. There is a small population of rainbow trout also. The Conservation Department has conducted various research programs on this stream since 1952 and currently manages the fishery under a permit system. About 1.8 miles of stream are in public ownership as part of 824 acres owned by the Department (From: Poff, Ronald J. and Threinen, C.W., 1963. Lake and Stream Classification Project. Surface Water Resources of Marquette County, Wisconsin Department of Natural Resources, Madison, WI. Lawrence Creek, T16N, R8E, Section 5, Surface Acres = 5.5, Miles = 1.9, Gradient = 10.0 feet per mile).

Montello River

Montello River is the name given the water course between the Harris Pond and the Fox River below Buffalo Lake at Montello. The stream is light brown flowing over sand, gravel and clay. Dams at Harrisville and Montello collectively utilize a head of 30 feet for hydroelectric power. Largemouth bass, panfish, walleye, and northern pike constitute the fishery. Nearly one-half the river flows through timbered swamp. Immediately above Montello Lake, several old oxbow ponds remain in the meandering river channel. Only one road crossing provides access to the river. It may be reached by boat from Montello Lake, however. (From: Poff, Ronald J. and Threinen, C.W., 1963. Lake and Stream Classification Project. Surface Water Resources of Marquette County, Wisconsin Department of Natural Resources, Madison, WI. Montello River, TlSN, RIDE, Section 17, Surface Acres = 60.1, Miles = 13.4, Gradient = 2.4 feet per mile).

Tagatz Creek

Tagatz Creek is a long stream of moderate gradient which originates from ponds in the terminal moraine south of Pleasant Lake and drains southeasterly to the Montello River at Harrisville. Westfield Creek joins the stream just above the Harrisville Pond. Brook and brown trout are common and constitute a good fishery. About 0.55 miles of stream are in public ownership; 3.01 miles are under permanent easement. Access is also possible from several town road crossings. The collaborative Montello River Watershed study found that Tagatz Creek supported a cold water fish community and suffered from no obvious water quality concerns. (From: Poff, Ronald J. and Threinen, C.W., 1963. Lake and Stream Classification Project. Surface Water Resources of Marquette County, Wisconsin Department of Natural Resources, Madison, WI. Tagatz Creek, T17N, R9E, Section 35, Surface Acres = 31.1, Miles = 18.3, Gradient = 8.4 feet per mile).

Tagatz Creek

Unnamed Creek (WBIC 164400)

The collaborative Montello River Watershed study report notes that the Unnamed Creek (WBIC 164400) is the smallest tributary to the Montello River and that it flows directly into Montello Lake. The Unnamed Creek had the lowest pollutant loads of the study streams, and hence, the least impact on Montello Lake. However, the report stated that the Unnamed Creek had high phosphorus and nitrogen concentrations and high total suspended sediment yield relative to the size of the sub-watershed. Although the Unnamed Creek contributes a relatively low mass of phosphorus and sediment to Montello Lake, this sub-watershed was exporting a higher mass of phosphorus and sediment per acre than any other sub-watershed. The biotic integrity of the Unnamed Creek may also be hindered by high phosphorus, nitrogen, and sediment concentrations.

Westfield Creek

The collaborative Montello River Watershed study found that Westfield Creek has three main issues of concern; temperature, pollutant loads, and pollutant yields. The water temperature of Westfield Creek was found to be elevated at the sampling location just east of the town of Westfield. According to the temperature data this reach of Westfield Creek can only support warm water fish species; however, the creek's natural community is categorized as a cool-cold transition stream by the WDNR. The second issue is the pollutant loads. Pollutant loads are important to consider when assessing the impact a stream has on a downstream lake or impoundment. Westfield Creek is the largest tributary to the Montello River and contributes more phosphorus, sediment, and chloride to the downstream impoundments than any other stream. Pollutant yields, which are area-weighted loads, indicate which sub-watersheds are exporting the highest mass of phosphorus/sediment/chloride per unit area and are used to focus management efforts on areas of greatest concern. Westfield Creek had the second highest total suspended sediment yield and the highest chloride yield in the study.

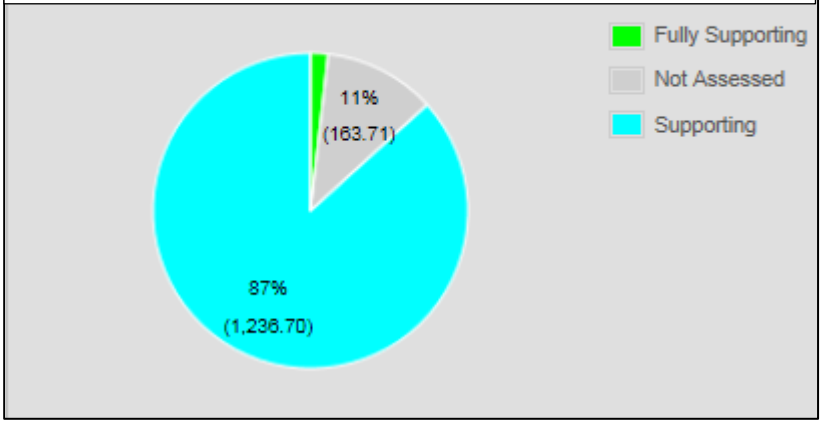
Two operational hydroelectric dams are present on Westfield Creek one at Lawrence (23-foot head) and one at Westfield (17-foot head). Panfish and northern pike are the principal fishes though some trout from a short tributary in Westfield reach the stream and are occasionally caught. This feeder originates at the Conservation Department's Westfield hatchery. The stream has two tributaries of significance, Caves Creek and an unnamed stream entering at T16N, R9E, Section 5. About 400 acres of timber swamp adjoin the stream below the entry of Caves Creek (From: Poff, Ronald J. and Threinen, C.W., 1963. Lake and Stream Classification Project. Surface Water Resources of Marquette County, Wisconsin Department of Natural Resources, Madison, WI. Westfield Creek, T17N, R9E, Section 34, Surface Acres: 45.3, Miles = 12.9, Gradient: 4.0 feet per mile).

Westfield Creek

Lake Health

The WDNR's ROW database shows that there are over 529 acres of lakes and ponds in the Montello River Watershed. Moon Lake and Mud Lake are the largest lakes in the watershed at over 50 acres in size, each. There are also over 772 acres of reservoirs and flowages and another 197 acres of unspecified open water in the watershed. Lake Montello, Lawrence Pond, and Harris (Harrisville) Pond are the largest reservoirs in the watershed.

Figure 2: Water Quality Standards Attainment, Lakes (Acres)



A total of 1,426 lake/reservoir acres has been entered into the state's assessment database. Of these 1,426 acres, almost 70% are indicated as supporting Fish and Aquatic Life uses; while another 19% are indicated as not supporting Fish and Aquatic Life uses. The remaining lake acres within the watershed have not been assessed for Fish and Aquatic Life use support. No lake acres have been assessed for any other use designation, either.

Water quality in lakes is assessed by measuring different characteristics including temperature, dissolved oxygen, water clarity, chlorophyll a, and water chemistry (particularly nutrients). In the Montello River Watershed study samples were collected from Lawrence Lake, Harris Pond, and Montello Lake once in the spring, fall, and winter and five times between May and September 2008 and 2009.

Table 3: Designated Use Support Summary for Montello River Watershed Lakes and Reservoirs (all values in acres)

Use	Supporting	Fully Supporting	Not Supporting	Not Assessed	Total Size
Fish Consumption				1,425.88	1,425.88
Fish and Aquatic Life	342.97	653	272	157.91	1,425.88
General				1,425.88	1,425.88
Public Health & Welfare				1,425.88	1,425.88
Recreation				1,425.88	1,425.88

Birch Lake (Moon Lake)

Birch Lake is a complex, landlocked basin in the terminal moraine west of Montello. The water is clear and moderately fertile. Largemouth bass and panfish constitute the fishery. Public access has recently been established through condemnation proceedings by the county. Waterfowl make extensive use of the lake and geese and swans are frequent spring visitors. The lakeshores are largely undeveloped for home sites (Source: 1963, Surface Water Resources of Marquette County Birch Lake, T15N, R9E, Section 1 Surface Acres = 84.0, S.D.F. = 2.51, Maximum Depth = 13 feet).

Christensen Lake
Christensen Lake is a small, spring-fed, marl lake with clear, moderately fertile water. Largemouth bass and panfish constitute the fishery. Weeds, stunted panfish, and fluctuating water levels are major use problems. A town road borders the lake and provides difficult access for light fishing boats. Waterfowl make limited use of the lake due to road and nearby farm disturbances (Source: 1963, Surface Water Resources of Marquette County Christensen Lake, T16N, R9E, Section 29 Surface Acres = 6.4, S.D.F. = 1.13, Maximum Depth = 11 feet).

Clear Water Lake
Clear Water Lake is a small, landlocked lake at the base of a terminal moraine. The water is clear and moderately fertile. Largemouth bass and panfish are sustained, save for occasional winterkill. Other use problems are weeds and fluctuating water levels. Public access is not available. Waterfowl are discouraged due to nearby highway disturbances (Source: 1963, Surface Water Resources of Marquette County Clear Water Lake, T15N, R9E, Section 1 Surface Acres = 11.8, S.D.F. = 1.50, Maximum Depth = 15 feet).

Dagner Lake (Mud Lake)
Dagner Lake is a shallow, elongated depression in the terminal moraine west of Montello. The lake is landlocked and receives seepage and runoff from a small drainage area. Largemouth bass and panfish provide a limited fishery. Occasional winterkill and fluctuating water levels are major use problems. Public access is not available, and the lake may be classed as wilderness. Waterfowl make some use of this area since several small lakes are in this complex and nearby Buffalo Lake, which lies along the Fox River, enjoys heavy use by fall migrants (Source: 1963, Surface Water Resources of Marquette County Dagner Lake, T15N, R9E, Section 1 Surface Acres = 10.2, S.D.F. = 1.56, Maximum Depth = 9 feet).

East Twin Lake
East Twin Lake is one of two small, shallow kettle lakes in the terminal moraine northwest of Lawrence. Under optimum rainfall conditions this lake may be connected with the West Twin Lake by a narrow strip of water; however, most of the time the lakes are only connected by an intermittent small channel. The water is light brown and moderately fertile. Winterkill, weeds, and fluctuating water levels are major use problems. Panfish may, at times, provide a fishery. Public access may be possible at high water from a town road bordering the lake. The lakeshore is undeveloped and in part, utilized by a girl's camp. Waterfowl make some use of the lake (Source: 1963, Surface Water Resources of Marquette County (East) Twin Lake, T17N, R8E, Section 30(2) Surface Acres = 24, S.D.F. = 1.31, Maximum Depth = 8 feet).

Echo Lake
Echo Lake is a small, landlocked kettle lake in the terminal moraine west of Lawrence. The lake has characteristic steeply sloping banks on all sides and a small fringe of emergent vegetation. The water is clear and a shallow thermocline is established each summer. Largemouth bass and panfish constitute the fishery. Fluctuating water level is a major use problem. Public access is not available and only one cottage occupies the lakeshore; thus, aesthetic values are high. Waterfowl make only limited use of the lake (Source: 1963, Surface Water Resources of Marquette County Echo Lake, T16N, R8E, Section 7 Surface Acres = 5.6, S.D.F. = 1.34, Maximum Depth = 25 feet).

Fenner Lake
Fenner Lake is a hard water seepage lake. The water is clear, alkaline, and has a moderate transparency. Bluegills, yellow perch, bullheads, and white suckers comprise the bulk of the fishery. Northern pike, while present, are scarce. There is public access at the east end of the lake. Periodic winterkill conditions occur.

There are no commercial facilities and there is one dwelling. Migrating waterfowl likely use the lake and mallard nesting has been reported (Source: 1966, Surface Water Resources of Adams County Fenner Lake, T16N, R7E, Section 13 Surface Acres = 46.6, S.D.F. = 1.27, Maximum Depth = 19 feet).

Harris Pond (Harrisville Pond)
Harris (Harrisville) Pond is a shallow, irregular impoundment on the Montello River at Harrisville. The pond was created by construction of a dam with a 15-foot head, currently owned by the Harrisville Light and Power Company and used to generate electric power for utilities. The water is light brown in color and moderately hard. Weeds are a major use problem with much of the lake choked in midsummer. Northern pike, panfish, and largemouth bass provide the fishery. Carp are present, though not in great numbers. A small village park and village roads provide access. Boat liveries and hunting is provided by fair numbers of fall migrants. A local ordinance prohibits the use of cars on the ice in winter.

The collaborative Montello River Watershed study found that the average total phosphorus concentration in Harris Pond was 73 ug/l, the average total nitrogen concentration was 1.1 mg/l and both rooted aquatic plants and algae growth appeared to reach nuisance levels. (Source: 1963, Surface Water Resources of Marquette County Harrisville Pond, T16N, R9E, Sections 2 and 11 Surface Acres = 245, S.D.F. = 3.28, Maximum Depth = 10 feet).

Kirby Lake
Kirby Lake is a small, landlocked lake in the terminal moraine immediately west of Montello. The water is clear and the lake is fairly fertile with a muck and sand bottom. Panfish, largemouth bass, and northern pike provide a fishery. A road end with limited parking area provides access to launch boats. Waterfowl are common to abundant in both spring and fall. The shore is largely developed for homesites (Source: 1963, Surface Water Resources of Marquette County Kirby Lake, T15N, R10E, Sections 6 and 7 Surface Acres = 50, S.D.F. - 1.21, Maximum Depth = 28 feet).

Lake Burnita (Lake Bumita)
Lake Burnita is a small landlocked kettle lake in a terminal moraine. The bottom is sand and the water color is light brown. Winterkill and fluctuating water levels are major use problems; however, the lake reportedly sustains bass and panfish some years. This was a wilderness lake without public access and with undeveloped shorelands, although recent subdivision of the area may provide some public use opportunities (Source: 1963, Surface Water Resources of Marquette County Bullhead Lake, (Also called Burnita Lake), T17N, R8E, Section 9 Surface Acres = 13.2, S.D.F. = 1.18, Maximum Depth = 8.0 feet).

Larch Lake
Larch Lake is a very small, landlocked kettle lake on the edge of an extinct glacial lake bed; bordered by marsh deposits and presently fringed with tamarack bog on all but one side. The water is light brown and only fairly fertile. A sharp thermocline develops at nine feet in midsummer. Panfish and bullheads, provide an occasional fishery subjected to winterkill, fluctuating water levels, and slow growth. Access is not available. Farmstead and highway activity prevent much use by waterfowl (Source: 1963, Surface Water Resources of Marquette County Larch Lake, T16N, R8E, Section 29 (15) Surface Acres = 2, S.D.F. = 1.10, Maximum Depth = 18 feet).

Lawrence Pond
Lawrence Pond is an irregular impoundment of Lawrence Creek, at the town of Lawrence. The dam maintains a 23-foot head used to provide electric power for the Pioneer Light and Power Company. The water is clear and fertile. Bass, panfish, and northern pike provide a fishery. Fluctuating water levels may be

a use problem. A public access site on the south shore provides somewhat difficult, though adequate, access for fishing boats. Snags and shallows are deterrents to high speed boating. This is an important waterfowl lake. Resorts and boat rental facilities afford additional use opportunities.
The collaborative Montello River Watershed study found that the average total phosphorus concentration in Lawrence Pond was 31ug/l, the average total nitrogen concentration was 1.6 mg/l and rooted aquatic plants are the dominate lake vegetation, but algal blooms due occasionally occur.
(Source: 1963, Surface Water Resources of Marquette County Lawrence Pond, T16N, R8E, Sections 5, 8 and 9 Surface Acres = 231, S.D.F. = 3.14, Maximum Depth = 12 feet).

Montello Lake
Montello Lake is an irregular impoundment of the Montello River created by a dam used to provide hydroelectric power. The lake is clear and fertile with a sand and muck bottom. Weeds are abundant and somewhat hinder fishing and boating. Bass, panfish, and northern pike constitute the fishery. A public swimming beach and road ends provide some access. This is an important waterfowl lake with ducks, geese and swans all common spring and fall visitors.

The collaborative Montello River Watershed study found that the average total phosphorus concentration in Montello Lake was 74ug/l, the average total nitrogen concentration was 0.7 mg/l and both rooted aquatic plants and algae growth appeared to reach nuisance levels. (Source: 1963, Surface Water Resources of Marquette County Montello Lake, T15N, R10E, Sections 5 and 8 Surface Acres = 286, S.D.F. = 2.83, Maximum Depth = 17 feet).

Ogle Pond
Ogle Pond is a small, landlocked basin in a terminal moraine north of Oxford. The water is light brown and moderately fertile. The bottom is primarily sand. Bass and panfish constitute the fishery; however, due to occasional winterkill and fluctuating water levels, there are periods when the lake has few fish of desirable size. This is a wilderness lake without public access. Waterfowl are generally present through the open water months (Source: 1963, Surface Water Resources of Marquette County Ogle Pond, T15N, R8E, Section 4 Surface Acres = 20, S.D.F. = 1.20, Maximum Depth = 15 feet).

Peters Lake (Echo)
Peters Lake is a small, landlocked kettle lake in the terminal moraine northwest of Montello. The water is clear and moderately fertile. A thermocline is established at about 14 feet below the surface each summer. Largemouth bass and panfish provide a fishery. Major use problems are weeds and fluctuating water levels. Public access is not available. No commercial facilities are present. All frontage is in one ownership and one home is the only dwelling on the lake. Waterfowl make limited use of the lake (Source: 1963, Surface Water Resources of Marquette County Peters Lake, T15N, R10E, Section 6 Surface Acres = 27, S.D.F. = 1.24, Maximum Depth = 18 feet).

Pine Lake
Pine Lake is a small, landlocked lake at the base of a terminal moraine in outwash deposits. The water is clear and fairly soft. Largemouth bass and bluegills constitute the fishery; the lake is noted for producing large bluegills. Carp have been captured here but are not a problem. Public access is not available. Camps are maintained by a church council and offer aquatic recreation for large numbers of people throughout the year. Fall migrations of waterfowl bring considerable numbers of birds to this lake (Source: 1963, Surface Water Resources of Marquette County Pine Lake, T17N, R8E, Section 20 Surface Acres = 37, S.D.F. = 1.17, Maximum Depth = 30 feet).

Rollers Lake
Rollers Lake is a clear, medium hard seepage lake that is alkaline and has a moderate transparency. This shallow lake winterkills and a survey in 1963 found no fish. There are no public access points, dwellings, or commercial facilities. Waterfowl and marsh furbearers are common residents (Source: 1966, Surface Water Resources of Adams County Rollers Lake, T16N, R7E, Section 12 Surface Acres = 27.2, S.D.F. = 1.15, Maximum Depth = 5 feet).

Sache Pond
Sache Pond is a small, landlocked lake in a terminal moraine north of Oxford. The lake exhibits severe water level fluctuations and in some years is nearly dry. The water is light brown and only moderately fertile. Waterfowl and marsh furbearers are common residents; frequent winterkill precludes establishment of a fish population. Public access is not available, though the lake is visible from a nearby road. There are no shore dwellings (Source: 1963, Surface Water Resources of Marquette County Sache Pond, T15N, R8E, Section 4 (13, 14) Surface Acres = 10.0, S.D.F. = 1.58, Maximum Depth = 6 feet)

Sandow Lake
Sandow Lake is a small, landlocked kettle lake in the terminal moraine near Lawrence. The water is clear, moderately fertile, and capable of supporting a fishery for largemouth bass and panfish. Winterkill, stunted panfish, and fluctuating water levels are major use problems. The Girl Scouts of America operate a camp on the south shore and provide waterfront facilities for their campers. Public access is not available (Source: 1963, Surface Water Resources of Marquette County Sandow Lake, T16N, R8E, Section 8 Surface Acres = 19.2, S.D.F. = 1.63, Maximum Depth = 20 feet).

School Section Lake
School Section Lake is a small, shallow, landlocked lake in the terminal moraine of northwestern Marquette County. The water is moderately fertile and light brown in color. Largemouth bass and panfish constitute the fishery, however, occasional winterkill is a problem. Algae, carp, and fluctuating water levels are additional use problems. All frontage is private and there are no commercial facilities. Waterfowl visit in spring and fall in fair numbers and broods of mallards and blue-winged teal may be produced here (Source: 1963, Surface Water Resources of Marquette County School Section Lake, T17N, R8E, Sections 9 and 16 Surface Acres = 37, S.D.F. = 1.42, Maximum Depth = 10 feet).

Silver Lake
Silver Lake is a small, irregular, landlocked basin in a terminal moraine. It has infertile, clear water which experiences considerable fluctuation in level. Winterkill and weeds are attendant use problems; however, under optimum conditions the lake supports panfish. Public access is not available. No commercial facilities are present. The lake enjoys some waterfowl usage and is hunted in the fall (Source: 1963, Surface Water Resources of Marquette County Silver Lake, T15N, R10E, Section 7 Surface Acres = 52, S.D.F. = 3.58, Maximum Depth = 10 feet).

Swamp Lake
Swamp Lake is a small, shallow lake occupying a marshy depression bounded by old glacial lake deposits to the north and terminal moraine to the south. The water is dark brown over muck bottom. Winterkill occurs annually; weeds and fluctuating water levels are added problems. This is a wilderness lake with no public access and only limited owner access through bordering wooded bog. This is an important waterfowl lake with several species observed nesting here (Source: 1963, Surface Water Resources of Marquette County Swamp Lake, T16N, R8E, Section 33 Surface Acres = 20, S.D.F. = 1.11, Maximum Depth = 7 feet).

West Twin Lake
West Twin Lake is a small kettle lake in terminal moraine deposits. The water is light brown and fairly fertile. The bottom is primarily muck and the immediate shore is sand. A thermocline is established at about 18 feet each summer. Largemouth bass and panfish provide a fishery. Carp are present but not in problem numbers. Fluctuating water levels are a major use problem. The lake is without public access, however, is fished by local residents to some extent. The girl's camp located on this and on East Twin Lake utilizes a small part of the lake for swimming and boating. Waterfowl make limited use of this lake (Source: 1963, Surface Water Resources of Marquette County (West) Twin Lake, T17N, R8E, Section 30 (16) Surface Acres = 15, S.D.F. = 1.29, Maximum Depth = 24 feet).

Westfield Pond
Westfield Pond is an impoundment of Westfield (Duck) Creek at Westfield, created by a dam of 17-foot head owned by the Westfield Milling and Electric Company. The pond is turbid, fairly fertile, and has a muck bottom. Much of the shoreline has been filled and is classed as commercial land. Largemouth bass and panfish may provide a fishery. Carp are abundant and present a major problem to management. The pond also receives effluent from nearby light industries. A village road provides unimproved access (Source: 1963, Surface Water Resources of Marquette County Westfield Pond, T16N, R8E, Section 12 Surface Acres = 32, S.D.F. = 2.52, Maximum Depth = 8 feet).

Wetland Health

Wetland Status:
The Montello River Watershed, situated within the Western Upper Fox Basin, is located in Adams, Marquette, and Waushara counties. An estimated 12% of the current land use in the watershed is wetlands. Only 73% of the original wetlands in the watershed are estimated to exist. Of these wetlands, the majority include forested wetlands (54%), scrub (23%), and emergent wetlands (22%), which include marshes and meadows (See Figures 5 & 6).

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 seven percent of the existing emergent wetlands and two percent of the remaining shrub wetlands. Reed canary grass domination inhibits successful establishment of native wetland species.

Wetland Restorability:
Of the 3,785 acres of estimated lost wetlands in the watershed, approximately 95% are considered potentially restorable based on modeled data, including soil types, land use, and land cover (Chris Smith, DNR, 2009).

Groundwater

The following groundwater information for Marquette County is from the Protecting Wisconsin's Groundwater through Comprehensive Planning website (http://wi.water.usgs.gov/gwcomp/), which roughly approximates to the Montello River Watershed.

Montello is the only municipal water systems in the Pine River watershed and it has a wellhead protection plan in place. Marquette, Adams, and Waushara counties have all adopted animal waste management ordinances.

From 1979 to 2005, total water use in Marquette County has increased from about 1.8 million gallons per day to 10.4 million gallons per day. Total water use increased substantially in 1995 due to increased commercial use and total water use increased substantially in 2000 due to increased agriculture and irrigation use. The proportion of county water use supplied by groundwater has decreased from over 99% to about 91% during the period 1979 to 2000 and increased to 96% in 2005.

Groundwater Quality

Ninety-one percent (91%) of 386 private well samples collected in Marquette County from 1990-2006 met the health-based drinking water limit for nitrate-nitrogen. Nitrogen is an important nutrient for plant and animal survival and growth. Elevated nitrogen concentrations can lead to abundant plant growth which can have negative effects on stream and lake ecosystems, affecting algae, aquatic plants, invertebrates, and fish. The increase in plant growth can affect the types of plants and ecological communities that are present. The decomposition of excess plant material may also deplete available oxygen. Depending on the form, excess nitrogen can be transported to rivers through groundwater and/or surface runoff. In the sandy soils of the Montello River Watershed nitrate not taken up by plants or degraded by microorganisms in the soil can leach to groundwater with relative ease. Nitrate can be transported great distances by groundwater until it is discharged to surface water. Organic nitrogen is often a particulate form of nitrogen that is associated with soil, sediment, and vegetation.

The United States Environmental Protection Agency (USEPA) estimated reference conditions for Total Nitrogen (TN) in streams in central Wisconsin to be between 0.46 and 0.71 mg/L. In a water quality study between January 2008 and January 2010, Nitrate+nitrate comprised the largest component of TN at all 11 sample sites throughout the watershed, including Lawrence and Montello lakes, Harris Pond, Taggitz Creek, Westfield Creek (2), Klawitter Creek (2), Montello River (3), and an unnamed stream (WBIC=164400). Median values at all the sites in the Montello River Watershed are well above natural conditions for this region with concentrations at the unnamed creek more than four times higher than natural conditions. The unnamed creek had higher maximum baseflow nitrate+nitrite concentrations (9.3 mg/L N, 8.6 mg/L N). These concentrations are very high for surface water and warrant concern for the private drinking water wells in this subwatershed. At every site, except the upstream Klawitter Creek site, the maximum observed baseflow nitrate concentrations were greater than the maximum runoff concentration, suggesting that nitrates are moving to the streams via groundwater. To reduce nitrogen transport to groundwater, in agricultural systems nutrient management that addresses the form and timing of nitrogen application should be developed and adhered to. Nitrogen should only be applied to lawns when indicated by soil tests and septic systems should be sighted as far from water bodies as possible (N. Turyk, M. Bruenig, P. McGinley. *Guidance for Improvement of Water Quality in the Montello River Watershed).*

A 2002 study estimated that 36% of private drinking water wells in the region of Wisconsin that includes the Montello River Watershed 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 7,807 acres of land in Marquette County and 28,817 acres of land in Adams County are in atrazine prohibition areas. About three quarters (74%) of 126 private well samples collected in Marquette County met the health standard for arsenic.

Potential Sources of Contamination

There is one concentrated animal feeding operation (CAFO) located within the Montello River Watershed. This dairy CAFO can be found in Westfield. No licensed landfills are located within the watershed, nor are there any 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 four sites in the Montello River 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 one Leaking Underground Storage Tank (LUST) site and three Environmental Repair (ERP) sites. A summary of these sites is included in the table below.

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, $5,378,434 has been reimbursed by the PECFA fund to clean up 54 petroleum-contaminated sites in Marquette County. This equates to $353 per county resident, which is greater than the statewide average of $264 per resident.

Table 4: Open-status Bureau for Remediation and Redevelopment Tracking System (BRRTS) sites Montello River Watershed

WDNR BRRTS #	Site Name, Location	Start Date	Activity Type	Remediation Activities	Waste Activities	Substance
0339548041	Westfield Motors Sales Row, Westfield	09/21/2006	LUST	1	0	Gasoline (Petroleum)
0239547167	Olsens Mill Inc. - Westfield, Township of Newton	08/11/2004	ERP	2	0	Unspecified (Transferred to DATCP)
0239283764	Montello Lodge (Former Econo Wash), Montello	11/26/2001	ERP	1	0	Chlorinated Solvents (VOC)
0239001676	Skrzypek Property, Montello	10/06/1995	ERP	1	0	Unspecified soil contamination

Point and Nonpoint Source Pollution

Rivers and Streams within the Montello River Watershed are ranked medium for nonpoint source pollution (NPS). The NPS ranking for groundwater and the watershed overall is high. Lakes in this watershed have not yet been ranked for NPS.

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 (http://dnr.wi.gov/fish/species/trout/streamclassification.html).

A total of 29 miles of Class I trout streams are present along stretches of Caves Creek, Lawrence Creek, Tagatz Creek, and Lawrence Creek. Klawitter Creek contributes about another four miles of Class II trout streams to the Montello River Watershed. The table below indicates where these trout waters are located along the streams, starting from the mouth at mile zero.

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 streams 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).

Table 5: Trout Waters Report: Bear Creek Watershed

Official Name	Local Name	WBIC	Start Mile	End Mile	Trout Class	Counties
Caves Creek	Caves Creek	166100	0	12.1	CLASS I	Marquette
Lawrence Creek	Lawrence Creek	167100	0	1.98	CLASS I	Marquette
Lawrence Creek	Lawrence Creek	167100	1.98	3.15	CLASS I	Adams
Tagatz Creek	Tagatz Creek	165800	1.52	14.99	CLASS I	Marquette
Klawitter Creek	Klawitter Creek	164900	0	3.75	CLASS II	Marquette

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/topic/SurfaceWater/orwerw.html).

Lawrence Creek and Tagatz Creek contain 15 miles of Outstanding Resource Waters. Caves Creek and Lawrence Creek contain another 13 miles of Exceptional Resource Waters.

Table 6: Montello River Watershed Outstanding and Exceptional Resource Waters

WADRS ID	Official Waterbody Name	WBIC	ORW/ERW	ORW/ ERW ID	Start Mile	End Mile	Counties
10716	Tagatz Creek	165800	ORW	411	1.52	14.99	Marquette
10720	Lawrence Creek	167100	ORW	424	0	1.98	Marquette
1496611	Lawrence Creek	167100	ERW	424	1.98	3.15	Adams
10718	Caves Creek	166100	ERW	419	0	12.1	Marquette

Impaired Waters

No Impaired Waters are listed for this watershed.

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.

There are currently no specific fish consumption advisories issued for waterbodies within the Montello River Watershed. However, a general fish consumption advisory for potential presence of mercury is in place for all waters of the state.

Aquatic Invasive Species

Banded mystery snails have been documented in Fenner Lake and Chinese mystery snails and a milfoil hybrid have been found in Montello Lake. Both lakes are also infested with curly-leaf pondweed. Eurasian water-milfoil has also invaded habitats in Birch Lake, School Section Lake, East and West Twin Lake, Lawrence Lake, Fenner Lake, and Pine Lake. Furthermore, rusty crayfish have been verified and vouchered in Montello River.

Species of Special Concern

The following table contains federally-listed Threatened, Endangered, Proposed, and Candidate species found in Adams, Marquette, and Waushara counties, in which the Montello River Watershed is located. A full list of special concern plants and animals for this watershed can be found on the state's Natural Heritage Inventory (NHI).

Table 7: Federally-Listed Threatened, Endangered, Proposed, and Candidate Species in Adams, Marquette, and Waushara Counties

Species	Status	Habitat	Taxa
Kirtland's warbler (Dendroica kirtlandii)	Endangered	Young jack pine stands (5 to 25 years old). Confirmed breeding in Adams county, potential breeding in the other counties.	Bird
Whooping crane (Grus americanus)	**Non-essential experimental population	Open wetlands and lakeshores, Whooping cranes have nests in Adams County	Bird
Karner blue butterfly (Lycaeides melissa samuelis)	Endangered	Prairie, oak savanna, and jack pine areas with wild lupine	Insect
Fassett's locoweed (Oxytropis campestris var. chartaceae)	Threatened	Open sandy lakeshores	Plant

**Whooping Crane - On June 26, 2001, a non-essential experimental population of the whooping crane was designated in a 20-state area of the eastern United States. The first release of birds occurred in Wisconsin in 2001, and the counties listed are those where the species has been observed to date. It is unknown at this time which counties the species will occupy in the future, as the birds mature and begin to exhibit territorial behavior. For purposes of section 7 consultation, this species is considered as a proposed species, except where it occurs within the National Wildlife Refuge System or the National Park System, where it is treated as a threatened species.

State Natural and Wildlife Areas

Caves Creek Fishery Area

Caves Creek Fishery Area is high quality trout water. The waters are generally crystal clear. There have been stream bank improvement projects throughout the system enhancing the already excellent fishing opportunities. The state ownership is 823 acres of fragmented parcels stretched along the stream's 14 mile corridor. Some of the acres are held in perpetual easement intended to protect the stream shorelines and provide access to fisherman. Caves Creek originates in northwestern Marquette County, five miles south of Coloma or one and half miles northwest of Westfield, and flows southeasterly until it joins Westfield Creek. U.S. Highway 51 runs through the center of the property.

The vegetative cover is rich with diversity with a large portion being lowland brush and swamp hardwoods to upland forests and grasslands. Additionally, many old agricultural fields have been abandoned and are reverting to natural vegetation; others have been planted into pine plantations, converted into native prairies, or continued to be farmed in share crop agreements. This unique mix of woods, water and fields provides prime habitat for a variety of game and non-game species, as well as offering a pleasant satisfaction to all who visit this natural and beautiful area.

Recreational opportunities are a year round occurrence and seemingly endless, from fishing and hunting to canoeing and snowshoeing. There exists numerous parking areas scattered about the entire stretch of the property providing ample access points.

John A. Lawton (Tagatz Creek) Fishery Area

John A. Lawton (Tagatz Creek) Fishery Area is a high quality trout water. The waters are generally crystal clear. There have been numerous stream bank improvement projects throughout the system enhancing the already excellent fishing opportunities. The state ownership is 208 acres of fragmented parcels stretched along the stream's 17 mile corridor. Most of the acres are held in perpetual easement intended to protect the stream shorelines and provide access to fisherman. The Tagatz Creek subwatershed, located in the northwestern quarter of Marquette County, originates approximately three miles south of Coloma from ponds in the terminal moraine south of Pleasant Lake and flows southeasterly until it joins Westfield Creek.

The vegetative cover is rich with diversity, with a large portion being lowland brush and swamp hardwoods to upland forests and grasslands. Additionally, many old agricultural fields have been abandoned and are reverting to natural vegetation; others have been planted into pine plantations, converted into native prairies, or continued to be farmed in share crop agreements. This unique mix of woods, water and fields provides prime habitat for a variety of game and non-game species, as well as offering a pleasant satisfaction to all who visit this natural and beautiful area. Recreational opportunities are a year round occurrence and seemingly endless, from fishing and hunting to canoeing and snowshoeing. There exists numerous parking areas scattered about the entire stretch of the property providing ample access points.

Lawrence Creek Fish and Wildlife Area

Lawrence Creek Fish and Wildlife Area is a 961-acre parcel surrounding the creek and its headwaters located in the northwestern part of Marquette County and east-central Adams County. The stream is a high quality trout water and is generally crystal clear. There have been various stream bank improvement projects within the stream, enhancing the already excellent fishing opportunities. The vegetative cover is rich with diversity with a large portion being lowland brush and swamp hardwoods to upland forests and grasslands. Additionally, many old agricultural fields have been abandoned and are reverting to natural vegetation; others have been planted into pine plantations, converted into native prairies, or continued to be farmed in share-crop agreements. This unique mix of woods, water, and fields provides prime habitat for a variety of game and non-game species, as well as offering a pleasant satisfaction to all who visit this natural and beautiful area. Recreational opportunities are a year round occurrence and seemingly endless, from fishing and

hunting to canoeing and snowshoeing. There exists numerous parking areas scattered about the entire stretch of the property providing ample access points.

Lawrence Lake

Lawrence Lake features an undeveloped wild lake surrounded by northern wet-mesic forest, bog, and shrubs. The 50-acre seepage lake has very soft, slightly acid, clear water. The area surrounding the lake is comprised of relatively steep terrain. The shoreline is ringed by a broad band of mixed hardwoods and conifers. Species include hemlock, black spruce, balsam fir, aspen, sugar maple, and red maple. The lake contains an expansive littoral zone with a well-developed aquatic plant community consisting of emergent, floating leaf, and submersed plants, including cat-tails, bulrush, smartweeds, and manna grass. This minimally disturbed area provides habitat for many amphibians, shorebirds, terrestrial and aquatic insects, and aquatic and semi-aquatic furbearers. Two rare crawling water beetles have been found here: Haliplus leopardus and H. pantherinus. Three kettle depressions with shallow wetlands are located on the south shore of the lake. The fishery includes northern pike, largemouth bass, black crappie, and perch. Lawrence Lake is owned by Langlade County and was designated a State Natural Area in 2003.

Upper Fox Headwaters

Upper Fox Headwaters State Natural Area contains three distinct units: Zinke Lake, Upper Chaffee Creek Meadow, and Caves Creek, which is located in the Montello River Watershed. Caves Creek contains spring seeps and runs, a two-acre spring pond, sedge meadow and tamarack swamp, and oak barrens. The spring seeps are floristically rich and are surrounded by a diversity of wetlands. The barrens lie on a south-facing slope and contain a good diversity of prairie species, including little blue-stem, June grass, flowering spurge, and bird's-foot violet. A state endangered species, western slender glass lizard (Ophisaurus attenuatus), has been found at the site. Upper Fox Headwaters is owned by the DNR and was designated a State Natural Area in 1998.

Fenner Lake

Montello River Watershed (UF13)

Watershed Actions

Grants and Projects

Project Name (Click for Details)	Year Awarded
MONTELLO LAKE P&R DISTRICT: Montello Lake AIS Control & Prevention	2012
WAUSHARA COUNTY: Waushara County Lakes Study and Plan (Group B Lakes)	2011
WAUSHARA COUNTY: Waushara County Shoreland Ordinance Revision Project	2010
ADAMS COUNTY: Adams AIS Specialist 2	2010
MARQUETTE COUNTY: Marquette County Shoreland Ordinance Revision Project	2010
WAUSHARA COUNTY: Waushara County Lake Classification Project (Group A Lakes)	2010
WAUSHARA COUNTY: Waushara County Lake Classification Project (Group B Lakes)	2010
WAUSHARA COUNTY: Waushara County Lake Classification Project Ph 2	2010
WAUSHARA COUNTY: Waushara County Lakes Welcome Project	2010
HARRIS POND LAKE ASSOCIATION: Harris Pond Lake Management Plan Ph 2	2009
HARRIS POND LAKE ASSOCIATION: Harris Pond Lake Management Plan Project Ph 1	2009
WAUSHARA COUNTY: Waushara County Lake Classification Project	2009
ADAMS COUNTY: Adams AIS Specialist 2	2008
ADAMS COUNTY: Adams Co. Lake Levels	2008
Aquatic Invasives County Coordinator - Adams County	2008
MARQUETTE COUNTY: Marquette County Lake Level Monitoring Project	2008
MONTELLO LAKE P&R DISTRICT: Montello Lake Diagnostic Feasibility Study	2007
WAUSHARA COUNTY: Waushara County AIS Specialist Project	2006
ADAMS COUNTY: Adams Co Lakes Class - Phase 3	2005
WAUSHARA COUNTY: Waushara County Lakes I&E Project	2005
ADAMS COUNTY: Adams Co. Lakes Class Phase 2	2004
LAWRENCE LAKE P & R DISTRICT: Lawrence Lake Aquatic Invasive Species Study	2004
MONTELLO LAKE P&R DISTRICT: Montello Lake Aquatic Invasive Species Protection	2004
ADAMS COUNTY: Adams Co Lakes Classification - Phase 1	2003
MONTELLO LAKE P&R DISTRICT: Montello Lake Drawdown Evaluation	2002
MONTELLO SCHOOL DISTRICT: Montello School Adopt A Lake NALMS Presentation	2002
TWIN LAKES CONSERVANCY INC: Twin Lakes Appraisal & Leader Dev Phase 1a	2002
TWIN LAKES CONSERVANCY INC: Twin Lakes Appraisal & Leader Dev Phase 1b	2002
ADAMS COUNTY: Adams County Shoreline Restoration Workshop for Professionals	2001
MONTELLO LAKE P&R DISTRICT: Montello Lake Nutrient Budgeting Study	2001
MONTELLO LAKE INLAND P & R DISTRICT: Montello Lake Comp Lake Mgmt. Plan	2000
MARQUETTE COUNTY: Marquette County-wide Shoreland Ordinance Evaluation	1999
WAUSHARA COUNTY: Waushara County Lakes Ordinance Study, Evaluation and Class	1998
ADAMS COUNTY: Adams County Lakes Shoreline Development Audit	1995
MONTELLO LAKE INLAND P & R DISTRICT: Montello Lake Aquatic Plant Mgmt. Plan	1994
LAWRENCE LAKE P & R DISTRICT: Lawrence Lake Management Planning	1993

Monitoring

Monitoring stations in Montello Creek Watershed have been evaluated through the projects identified below. These projects may be short term and local or long-term and statewide. To learn more about the projects, you can click on the interactive title link.

Table 8: Monitoring Projects in the Montello Watershed	
Central Sands Water Level & Flow Monitoring 2014	The goal of this project was to assess water quality in the headwaters of streams in the Central Sands Area of Waushara, Portage and Waupaca Counties (including Tagatz Creek in the Montello River Watershed) in July through September 2014. There have been rising concerns from County LWCDs and other biologists regarding the impacts to stream headwater water quality from groundwater withdrawal.
New Zealand Mudsnail Response Monitoring 2013	Response monitoring for New Zealand Mudsnail due to findings in Black Earth Creek. In October 2013, 1,080 New Zealand mudsnails (Potamopyrus antipodarum) were identified in benthic samples collected from a site near South Valley Road on Black Earth Creek west of the town of Black Earth in October 2012. In response to this discovery, benthic samples taken from the same site in December 2011/January 2012 were reexamined and identified 83 New Zealand mudsnails. New Zealand mudsnails are a non-native invasive species that could have negative impact on trout, but we are not sure what to expect. They primarily graze on algae and can displace the native benthic community, reducing food for fish. Mudsnails provide little nutrition to fish and western states have reported reduced body condition and abundance of trout. New Zealand mudsnails are very small (no more than 4-6 mm) and reproduce asexually. Each adult is born with about 230 juveniles in brood pouches. Their small size makes them very transferable. New Zealand mudsnails have broad physical and chemical thresholds. They can live out of water in a damp environment for up to 26 days. Black Earth Creek is a renowned trout stream in southern Wisconsin and is visited by transient anglers, researchers, and restoration contractors. Because Black Earth Creek receives many visitors and New Zealand mudsnails are very transferable, a strategic plan has been developed to determine their distribution throughout the state. This plan includes eDNA and benthic monitoring. Using eDNA as a monitoring tool will be explored to evaluate the distribution of New Zealand mudsnails within Black Earth Creek and possibly other popular trout streams. Regardless, physically sampling the benthic community using a well-established technique will immediately be carried out to assess the distribution of New Zealand mudsnails.
NER NC Stream Stratified Sites 2011-13	This project selects sites from all wadeable streams (83,500 miles, which includes ephemeral and macroinvertebrate streams). The random sites stratified by natural community (nc) and Region by Weigel. Two-hundred sites are sampled per year (approximately 25 sites per natural community per basin). This is a five year study. The sites are mapped on SWDV. April-October sampling for 1 fish IBI, one macroinvertebrate IBI, Qualitative Habitat, Temp, pH, D.O., conductivity, 1TP sample in June, July OR August.

Table 8: Monitoring Projects in the Montello Watershed	
NER Non-LTT RIVERS 6/5/2006 Active	Stream water quality monitoring covering primarily biological, chemical, and habitat related monitoring to determine ambient conditions at "pour point" locations for each of state's 330 watersheds.
NER Watershed Rotation Sites 7/1/2005 Complete	Stream water quality monitoring covering primarily biological, chemical, and habitat related monitoring to determine ambient conditions at "pour point" locations for each of state's 330 watersheds.
Upper Fox/Wolf Basin TMDL Monitoring 2009, 2010, 2011, 2012	Finish the monitoring requirements of the Upper Fox Basin. Second year of monitoring for the Wolf River Basin. NER biologists and CO SWAT will collect water samples from the Upper Fox Basin waterbodies of Fox River, Puchyan River, Fond du Lac River, Montello River, Waukau Creek, the Wolf Basin waterbodies of the Wolf River, Little Wolf River, Embarrass River, Waupaca River, and lakes Poygan, Winneconne, Butte des Morts, and Winnebago to be analyzed for TSS, Total Phosphorus, and Dissolved Phosphorus that will be used in modeling the sediment and phosphorus loads to Lake Winnebago. Results of the modeling will be used in developing a TMDL for Lake Winnebago to drive management practices in the Upper Fox Basin.

Volunteer Monitoring

The Water Action Volunteers Program involves citizen monitors in the process of collecting water quality data used by the DNR to assist in making management decisions. Goals of the program include collecting high quality data that can be used for management decisions, building relationships between DNR staff and citizen monitors, and assessing areas in need of additional monitoring, restoration and/or protection. Ultimately, volunteer participation in this project aids DNR staff by allowing for increased capabilities to monitor streams. Communities and the DNR can use this water quality information to make decisions that affect the management of streams throughout Wisconsin.

The UF13-Montello Watershed was monitored at the following streams by volunteer stream monitors.

- Tagatz Creek #2 - Upstream Of 7th Court Bridge
- Lawrence Creek at Eagle Ave
- Tagatz Creek at 4th Ave and Dakota Rd

Goals and Priority Issues

Goals

- Update trout angling regulations to category four waters to protect brook trout fisheries
- Identify water quality or habitat threats to protect rare species
- Reduce the sources of phosphorus within the entire watershed, namely Klawitter Creek, Westfield Creek, and the Unnamed Tributary (WBIC 164400), to maintain or meet NR 102 water quality criteria for streams
- Reduce the nitrate+nitrite concentrations in streams in the watershed as high nitrate concentrations in streams have been shown to have a negative impact on salmonid fish species
- Encourage best management practices and buffer zones to decrease erosion.

June 1, 2015

Montello River Watershed (UF13)

Priority Issues

- Low trout densities
- Stream habitat hindrance due to lack of coarse substrate and excessive sand bed load.

Recommendations

- Restore Wetlands to prevent altered food webs, a loss of biodiversity, and a poorly functioning ecosystem.
- Update trout angling regulations to category four waters to protect brook trout fisheries
- Identify water quality or habitat threats to protect rare species
- Encourage best management practices and buffer zones to decrease erosion and nutrient inputs to groundwater and surface waters within the watershed.

Lake Montello, Wisconsin. Photo by Julia Stagner

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WDNR PUB-WY-022-2015

Waters of the Watershed

Click on the water name to learn more. Named, monitored or assessed streams and lakes.

Official Name (Click for Details)	Local Name (Click for Map)	Start Mile	End Mile	Water Size	WBIC	County	Last Year Monitored	Fish & Aquatic Life Condition	Trout Class
Bear Creek	Bear Creek	0.00	1.50	1.5 Miles	2061900	Buffalo, Pepin	2013	Poor	
Bear Creek	Bear Creek	1.50	7.50	6.0 Miles	2061900	Buffalo, Pepin	2013	Poor	CLASS II
Bear Creek	Bear Creek	7.50	10.00	2.5 Miles	2061900	Buffalo, Pepin	2013	Poor	CLASS III
Bear Creek	Bear Creek	10.00	16.63	6.6 Miles	2061900	Buffalo, Pepin	2014	Poor	
Browning Lake	Browning Lake			22.9 Acres	2063300	Dunn, Pepin	2001	Unknown	
Buffalo Slough	Buffalo Slough	0.00	14.00	14.0 Miles	2047800	Buffalo	2010	Unknown	
By Golly Creek	By Golly Creek	0.00	4.40	4.4 Miles	2047600	Buffalo	2011	Excellent	
Center Creek	Center Creek	0.00	4.35	4.4 Miles	2048300	Buffalo	2011	Good	CLASS II
Chippewa River	Chippewa River	0.00	20.73	20.7 Miles	2050000	Buffalo, Chippewa, Dunn, Eau Claire, Pepin, Rusk, Sawyer	2012	Poor	
Chippewa River	Chippewa River	20.73	37.58	16.9 Miles	2050000	Buffalo, Chippewa, Dunn, Eau Claire, Pepin, Rusk, Sawyer	2001	Unknown	
Duck Lake	Duck Lake			52.6 Acres	2050900	Buffalo	2012	Unknown	
Duck Lake	Duck Lake			52.6 Acres	2050900	Buffalo	2012	Unknown	
Lake Pepin	Lake Pepin			25,502.8 Acres	731800	Buffalo, Pepin, Pierce	2014	Unknown	
Little Bear Creek	Little Bear Creek	0.00	4.35	4.4 Miles	2048000	Buffalo	2011	Poor	
Little Bear Creek	Little Bear Creek	4.35	13.17	8.8 Miles	2048000	Buffalo	2011	Fair	CLASS II
Little Bear Creek	Little Bear Creek	13.17	14.98	1.8 Miles	2048000	Buffalo		Unknown	
Little Buffalo Slough	Little Buffalo Slough	0.00	1.00	1.0 Miles	2049100	Buffalo		Unknown	

June 1, 2015

Montello River Watershed (UF13)

Official Name (Click for Details)	Local Name (Click for Map)	Start Mile	End Mile	Water Size	WBIC	County	Last Year Monitored	Fish & Aquatic Life Condition	Trout Class
North Branch Little Bear Creek	North Branch Little Bear Creek	0.00	5.40	5.4 Miles	2048400	Buffalo	2011	Fair	CLASS II
North Branch Little Bear Creek	North Branch Little Bear Creek	5.40	6.79	1.4 Miles	2048400	Buffalo		Good	CLASS II
Old Bear Creek	Old Bear Creek	0.00	1.00	1.0 Miles	2061100	Pepin		Unknown	
Shively Slough	Shively Slough	0.00	4.00	4.0 Miles	2047500	Buffalo		Unknown	
Spring Creek	Spring Creek	0.00	2.61	2.6 Miles	2049400	Buffalo	2011	Good	
Spring Creek	Spring Creek	2.61	5.49	2.9 Miles	2049400	Buffalo	2011	Excellent	CLASS II
Spring Creek	Unnamed Stream	5.50	7.89	2.4 Miles	2049400	Buffalo		Unknown	
Stump Lake	Stump Lake			47.5 Acres	2049300	Buffalo	2010	Unknown	
Tiffany Creek	Tiffany Creek	0.00	6.00	6.0 Miles	2062600	Buffalo	2014	Excellent	
Tiffany Creek	Unnamed Stream	3.70	4.29	0.6 Miles	2062600	Buffalo		Unknown	
Unnamed	Creek 1-3	0.00	1.00	1.0 Miles	2063000	Pepin		Unknown	CLASS II
Unnamed	Cascade Valley Ck (6-9) Trib. To Little Bear Ck.	0.00	1.00	1.0 Miles	2048100	Buffalo	2011	Suspected Poor	
Unnamed	Creek 8-13 (Trib. To Spring Creek)	0.00	1.00	1.0 Miles	2049600	Buffalo		Unknown	
Unnamed	Fox Valley Creek (31-1) Trib. To Bear Creek	0.00	1.30	1.3 Miles	2062100	Buffalo, Pepin		Unknown	
Unnamed	Creek 16-13 (Trib. To Tiffany Ck.)	0.00	1.30	1.3 Miles	2062700	Buffalo		Fair	
Unnamed	Unnamed Stream	0.00	1.33	1.3 Miles	5015991	Buffalo, Pepin		Unknown	
Unnamed	Unnamed Stream	0.00	1.35	1.4 Miles	5017198	Buffalo		Unknown	
Unnamed	Creed (23-3) Trib. To Norwegian	0.00	1.40	1.4 Miles	2048900	Buffalo		Unknown	

June 1, 2015

Montello River Watershed (UF13)

Official Name (Click for Details)	Local Name (Click for Map)	Start Mile	End Mile	Water Size	WBIC	County	Last Year Monitored	Fish & Aquatic Life Condition	Trout Class
	Valley Ck.								
Unnamed	Owen Valley Ck. (31-10) Trib. To North Branch Of Little Be	0.00	2.16	2.2 Miles	2048700	Buffalo	2011	Excellent	CLASS III
Unnamed	Unnamed Cr T24n R12w S5 (5-9)	0.00	3.27	3.3 Miles	2062400	Buffalo		Good	CLASS II
Unnamed	Newton Valley Creek (Shoe Creek)	0.00	4.27	4.3 Miles	2062200	Buffalo, Pepin	2013	Fair	CLASS II
Unnamed	Norwegian Valley Creek (2-14a) Trib. to Little Bear Creek	0.00	4.60	4.6 Miles	2048800	Buffalo	2011	Fair	
Unnamed	Weisenbeck Valley Creek T23n R13w S2 (2-3)	0.00	5.15	5.2 Miles	2048500	Buffalo	2013	Suspected Poor	CLASS II
Unnamed	Unnamed Cr T25n R13w S1 (1-30)	1.00	5.00	4.0 Miles	2063000	Pepin		Unknown	
Unnamed	Unnamed Stream	2.32	4.32	2.0 Miles	2062900	Buffalo, Pepin		Unknown	
Unnamed	Unnamed Stream	4.60	6.32	1.7 Miles	2048800	Buffalo		Unknown	
Unnamed	Unnamed Cr T25n R13w S1 (1-30)	5.00	6.00	1.0 Miles	2063000	Pepin		Unknown	
Unnamed	Un Lake			4.8 Acres	2063200	Pepin	2010	Unknown	
Unnamed	Unnamed			4.8 Acres	5582235	Buffalo	2012	Unknown	
Unnamed	Un Lake			26.5 Acres	3000001	Buffalo	2012	Unknown	