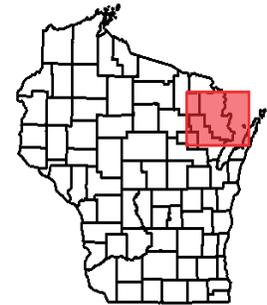


The Middle Inlet and Lake Noquebay Watershed encompasses approximately 156 mi² within the Upper Green Bay Basin in central Marinette County.

This watershed contains many water resources including streams, lakes, and wetlands. Specifically, there are 146 stream miles, 3,254 lake acres, and about 30,000 (over 49 mi²) of wetlands acres.



Map 1: Watershed Map



Plan Contents

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Watershed Details

Population and Land Use

Thirty-six percent (36%) of this watershed is comprised of lakes and wetland habitat. Lake Noquebay is the largest inland lake in the watershed as well as the entire Upper Green Bay Basin. Lake Noquebay’s Watershed also encompasses about 87% of the entire Middle Inlet and Lake Noquebay Watershed area. There are no large population centers in this watershed other than development surrounding Lake Noquebay.

The watershed has some agricultural activity along with wetlands and forest areas. Forests are the dominant land cover in this watershed (46%), followed by wetlands (29%) (Chart 1).

According to the 2009 Lake Noquebay Comprehensive Lake Plan, the number of active farms in the Lake Noquebay Watershed has declined from 40 to 25 in the last 15 years composing 14% of the watershed’s land use.

The cultivated cropland has also declined in the watershed. Grass-

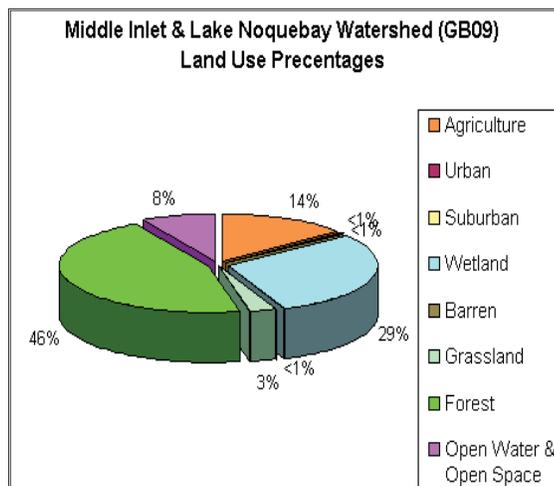


Chart 1: Land Use Middle Inlet, Lake Noquebay

lands (10%) make up majority of the remaining land uses. Urban, suburban, open and barren spaces collectively make up 5% of the landscape

Changes in urbanization since the last planning process have been minimal with only slight increases. The soils in the western half of the watershed are primarily organic, poorly drained adjacent to the major streams and well-drained, sandy and loamy in the remainder of the western half. Soils in the eastern half of the watershed are primarily poorly drained, mucky soils including the land areas immediately around Lake Noquebay.

Ecological Landscapes

The Middle Inlet and Lake Noquebay Watershed is located primarily within 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.



Map 2 Ecological Landscapes

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 this 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.

Hydrology

This relatively undeveloped watershed hosts tremendous water resources with numerous trout streams and other high quality resources. There are over 146 miles of streams, 3095 lake acres, and many thousands of acres of wetlands. Overall these are groundwater-fed coldwater streams and lakes with pockets of disturbance in specific areas. Beaver dam removal projects, started in 2001, have restored hydrologic flows in areas where water warming reduced salmonid and other cold water species' natural reproduction.

Historical Note

Lake Noquebay is the largest lake in the Middle Inlet and Lake Noquebay watershed. The lake covers more than 2,400 acres in Marinette County in northeastern Wisconsin. The name, Noquebay, as in Bay de Noc, is the French name for a sub-tribe of Menomunik Native Americans, predecessors of the Menominee. Very likely, this group inhabited the shores well before the arrival of white settlers. Although little has been written about the Lake Noquebay area in early years, archeologists have found remains of a Native American camp and burials near the east end of the lake, and the remnants of a mound on the outlet river.



Critical Habitat Area, Lake Noquebay

Lake Noquebay, or Noque, as locals often call it, has been a prime section of real estate in Marinette County since the mid 1800s. Lumbering and then farming were the occupations of most early settlers. It appears wild rice was harvested there before the 1900s. No doubt, fishing and hunting rounded out the diets of settlers.

The lake is a drainage lake, with water draining from Lake Mary, through Lake Julia and finally into Lake Noquebay. Three other small creeks, named Upper Inlet, Middle Inlet and Lower Inlet Creek, also add their volume to the lake. The only outlet, named Outlet Creek, flows into the Peshtigo River not far downstream.

Originally, the lake was three interconnected lakes, separated by barely submerged weed beds and sandbars part of the year. In 1929, an earthen dam was constructed across the outlet creek, raising the water level so the lakes became one continuous body of water. The result is a large lake, with a sandy bottom and gradually sloping floor, making it ideal for swimming at the County Park on the south shore. Small resorts have held residence on the shores and a few still remain, providing rental cottages to families and fishermen.

Watershed Condition

Priority Issues

Below are priority issues for the watershed listed from highest to lowest priority.

1. Non-Point Source Pollution
2. Shoreline Development Issues
3. Control of and monitoring for aquatic invasive species
4. Habitat Loss and Fragmentation of Habitat
5. Zoning and Zoning Enforcement
6. Resource Education
7. Comprehensive Land Use Planning and Mechanisms to Guide Implementation

Water Quality Goals

1. Investigate, reduce and prevent nonpoint source pollution the watershed through using proven practices, investigating and managing lake and watershed dynamics, and working with landowners and municipalities.
2. Work with local government and riparian owners to further protect shorelands and manage shoreline development to protect habitat and water quality.
3. Monitor and control aquatic invasive species (AIS) through citizen programs and state AIS and lakes grants and using science-based management techniques for containment and reduction goals.
4. Identify, restore and protect habitat through watershed inventory and restoration techniques funded through local, state and federal sources.
5. Encourage sound land use through partnership efforts including outreach and regulatory oversight.
6. Promote educational programs to address aquatic resource issues within the watershed.

Overall Condition

Overall, the water bodies in this watershed are in good condition (Chart 2) with only Lake Noquebay being listed under the 303(d) section of the Clean Water Act for a mercury advisory in fish. Restoration and rehabilitation projects on the waterways have reduced non-point source impacts. The stream fragmentation and water qual-

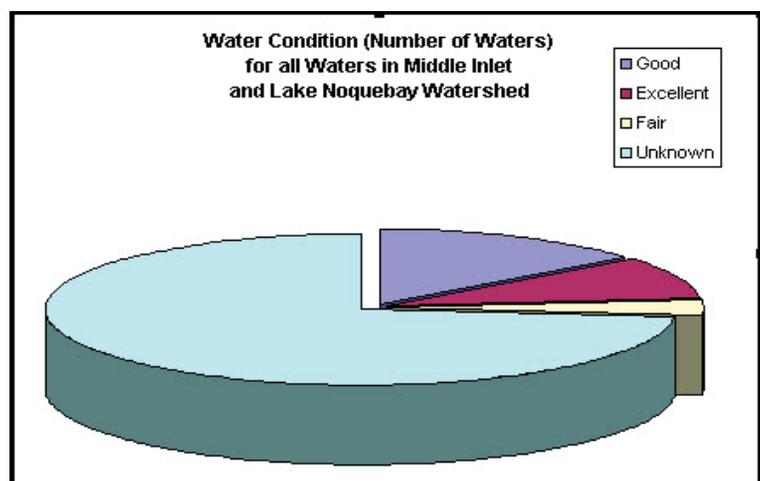


Chart 2: Overall Water Condition

ity impacts from the presence of beaver dams in the watershed's coldwater trout streams have been eliminated since the initiation of the beaver and beaver dam removal program in 2001. A beaver management program will continue into the future in priority streams. Phosphorus loading, sedimentation, residential development around lakes and infestations of aquatic invasive species are the biggest threats facing the water bodies within the watershed. There are no specific point sources discharging into this watershed at the present time.

Rivers and Streams

Peterman Brook

A stretch of Peterman Brook is currently listed as a class II trout stream from the middle of section 32 to the west side of section 32 T32NR21, which is about 1.1 stream miles of the total. The remainder of the stream is non-trout water, and the stream flows into the Peshtigo River. A fish survey report in 1994 described poor land practices and livestock pasturing along with beaver problems as the causes for sedimentation and deteriorated the stream ecosystem in Peterman Brook. The trout stream section contained brook trout, but its habitat was being threatened. The Index of Biological Integrity (IBI) calculated from the fish survey was 70 in 1994 and the Integrity Rating was good in the section of the stream classified as trout water.

- It is recommended that fish, macroinvertebrate and some basic water quality monitoring be done to determine whether Peterman Brook is meeting its current designated use and potential biological use.

Lake Health

Lake Noquebay

Lake Noquebay is a 2,406-acre drainage lake located in Marinette County, Wisconsin. Its 86,000 acre watershed encompasses a major portion of the 99,567 acres in the Middle Inlet and Lake Noquebay Watershed. There has been a significant amount of water quality data accumulated and studied over the past 30 years to help direct management decisions in the Lake Noquebay Watershed and water body. During the process of developing a Comprehensive Lake Management Plan/Aquatic Plant Management Plan which was completed in October 2009 by the Marinette County LWCD for the Lake District, the long-term trend in water quality was examined. The water quality is generally good.



Lake Noquebay, Wisconsin

The trophic state index (TSI) trends for the past 30 years used to determine a lake's nutrient enrichment status showed an improvement in water clarity and chlorophyll a (an indication of algae growth in the water) through the years. However, the total phosphorus trend in the lake has been slightly upward which needs to be investigated to determine the reason. This phosphorus trend is occurring despite a successful Lake Noquebay Priority Watershed Project completed in 2006. The 2009 Comprehensive Plan recommends maintaining summer total phosphorus concentrations in Lake Noquebay below 25 ug/l to prevent potential deterioration in the current water quality and lake ecosystem.

The major tributaries contributing nutrients to Lake Noquebay are the Smith Creek, Lower Middle Inlet, Upper Middle Inlet and Middle Inlet streams and their sub-watersheds. These waterbodies are all cold water trout streams located in the northern and western areas of the watershed.

The **Upper Inlet** is a major warmwater tributary at the east end of Lake Noquebay which has not been a significant source of nutrients or sediment. There are also probable sources of phosphorus generated from development and activities taking place directly around the lake. Known infestations of AIS in Lake Noquebay include zebra mussels and banded mystery snails. Refer to the 2009 Lake Noquebay Comprehensive Plan/Aquatic Plant Management Plan for further recommendations and discussion regarding the Lake Noquebay issues impacting the ecosystem.

Little Newton and Big Newton Lakes

Little and Big Newton Lakes are located directly adjacent to each other separated only by Newton Lake Road. Based on citizen monitoring data, both lakes appear to have good water quality. They both experience a great deal of use from non-riparian users, especially Little Newton Lake which has a public beach area. Little Newton Lake has also been experiencing an excessive geese problem in the lake. Eurasian water milfoil (EWM) was discovered in Little Newton Lake during 2007. An AIS control grant was approved for management of EWM in Little Newton Lake. The chemical treatment and other management efforts during 2008/2009 have reduced the EWM from 2 acres to where it was not detected near the end of 2009.



Sensitive Area, Lake Noquebay, Credit: Greg Sevenser 2010

Simpson Lake

Simpson Lake is a 13.1 acre spring lake that flows into Plumadore Creek which flows into Middle Inlet Creek. A study begun in 2006 to document changes to the shoreland area due to cutting of trees and shrubs and impacts from grading new developing lots has already noted losses to the shrub layer and ground cover vegetation. The parcels chosen for the study will continue to be monitored by the County in the future to further measure the impacts of riparian development on the local ecosystem.

- Since this small spring lake discharging to the Plumadore Creek is being developed, attention needs to be given to assure the development is done according to all local and state shore land zoning codes. Otherwise this small lake could become a source of impact to the Plumadore and Middle Inlet's water quality.

Wetland Health

Wetlands in this watershed are abundant and diverse (Table 1). Low human encroachment combined with naturally abundant wet areas result in a wide variety and large number of wetland habitat excellent for the broad array of wildlife dependent on this special habitat type.

Groundwater

Drinking water in the watershed is exclusively from groundwater sources. The community of Crivitz has its own municipal well. Approximately 46 new private wells have been installed in the watershed per year since 2006. Ground water impacts due to agriculture based fertilizers can be a concern for residents within parts of the watershed. One of Crivitz's municipal wells had to be closed due to impacts from nitrates, an agricultural fertilizer.

Waters of Note

Trout Waters

The Middle Inlet and Lake Noquebay Watershed is home to ten Class I trout streams and five Class II trout streams (Table 2).

Exceptional and Outstanding Resources 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

Table 1: Wetland Types

Wetland Type	acres
Riverine Wetlands	49.34
Deep Water Lake	50.48
Open Water	144.28
Emergent/wet Meadow/open water	83.85
Emergent/wet meadow	1,192.92
Scrub/shrub, Emergent/wet meadow	2,041.82
Scrub/shrub	1,207.36
Scrub/shrub, Open Water	16.71
Upland	1,644.71
Forested, General	19,458.14
Forested, Scrub/shrub	4,924.88
Forested, Emergent/wet meadow	943.97
Forested, Open Water	10.16
Total Wetland Acreage by Type	31,768.60

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.

ORW - 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. Outstanding Resource Waters in this watershed include, Meadow Brook, Middle Inlet above CTH X, Plumadore Creek, and Upper Middle Inlet above the middle of S18 T33N R21E (Table 3).

ERW - If a waterbody has existing point sources at the time of designation, it is more likely to be designated as an 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. Exceptional Resource Waters in this watershed include Elbow Creek, Lower Middle Inlet, Pine Creek, Smith Creek and three small unnamed creeks (Table 3).

Impaired and Related Waters in the watershed

Lake Noquebay is currently on Wisconsin’s impaired waters list as required by section 303(d) of the federal Clean Water Act due to a fish advisory for mercury. This is largely a result from atmospheric mercury deposition. Additionally, some lakes in the watershed are negatively impacted by aquatic invasive species (AIS) and phosphorus accumulation in the water body. See the “Rivers and Streams” and “Lake Health” for brief descriptions of the issues of concern in some of the lakes and streams in the watershed.



American Toad

Table 2 Trout Waters, Lake Noquebay Watershed

Waterbody Name	Start Mile	End Mile	Trout Class
Elbow Creek	0	2.93	CLASS I
Lower Middle Inlet	0	10	CLASS I
Meadow Brook	0	7	CLASS I
Middle Inlet	3.78	18.08	CLASS I
Middle Inlet	0	3.77	CLASS II
Peterman Brook	1.88	3	CLASS II
Pine Creek	0	1.14	CLASS I
Plumadore Creek	0	2	CLASS I
Roosevelt Creek	0	0.35	CLASS II
Creek 18-7	0	1.66	CLASS I
Creek 33-6	0	1.41	CLASS I
Creek 29-11	0.01	0.98	CLASS I
Creek 8-5	0	2.63	CLASS II
Upper Middle Inlet	7.45	14.37	CLASS I
Upper Middle Inlet	0	7.45	CLASS II

Table 3 ORW/ERWs, Lake Noquebay Watershed

Local Waterbody Name	ORW/ERW	Start Mile	End Mile	Code Reference
Elbow Creek	ERW	0	2.93	102.11(1)(a)
Lower Middle Inlet	ERW	0	10	102.11(1)(a)
Meadow Brook	ORW	0	7	102.10(1)(d)17
Middle Inlet	ORW	3.78	18.08	102.10(1)(d)17
Pine Creek	ERW	0	1.14	102.11(1)(a)
Plumadore Creek	ORW	0	2	102.10(1)(d)17
Smith Creek	ERW	0	10	102.11(1)(a)
Creek 33-6	ERW	0	1.41	102.11(1)(a)
Creek 18-7	ERW	0	1.66	102.11(1)(a)
Creek 29-11	ERW	0.01	0.98	102.11(1)(a)
Upper Middle Inlet	ORW	0	7.45	
Upper Middle Inlet	ORW	7.45	14.37	

Watershed Actions

Recommendations: Monitoring, Management & Cooperative Work

The recommendations for each of the Watershed Priorities are listed from highest priority to lower priority

1. Non-Point Source Pollution:

- A. Identify and implement strategies to buffer the effects of non-point source pollution impacting water quality and critical habitat in the watershed.
- B. Investigate the cause for the upward phosphorus trend in Lake Noquebay and implement practices to stabilize that increasing trend.
- C. Encourage landowners to follow storm water management plans and erosion control ordinances, etc.



Beach at Lake Noquebay

2. Shoreland Development Issues:

- A. Continue to work with local units of government and riparian owners to further protect shorelands and manage shoreline development to protect habitat and water quality.

3. Control of and monitoring for aquatic invasive species (AIS):

- A. Continue to promote the citizen monitoring programs including monitoring for AIS and clean boat/clean water program.
- B. Promote AIS control and whole lake management planning with the use of the State AIS control grant and lake planning grant programs.
- C. Implement a monitoring strategy in the Middle Inlet and Lake Noquebay Watershed to provide adequate information on the status and trends in the fishery and impact of management actions.
- D. Control or strive to contain AIS infestations in water bodies that have been determined to be detrimental according to NR40. Identify the populations, establish a target level, and reduce them to that level if feasible.
- E. Encourage the continuation of the AIS coordinator position at the county level or the elements of that position at the County level.

4. Habitat Loss and Fragmentation of Habitat:

- A. Identify and investigate the causes of habitat loss or impairment and take corrective actions in the Middle Inlet and Lake Noquebay Watershed.
- B. Identify and protect critical habitat in Middle Inlet and Lake Noquebay Watershed through basin planning and monitoring processes in concert with local citizens and partners.
- C. Locate, identify and prioritize degraded habitat areas on the watershed's trout streams and other sport fisheries for future restoration and improvement activities.
- D. Identify and prioritize wetlands as critical habitat areas in need of protection, restoration, and enhancement within the watershed.
- E. Inventory and repair culverts and other road and stream crossings that impede fish movement.
- F. Remove dams and improve the associated stream habitat where sport fisheries and aquatic diversity can be improved and the local communities are willing partners.
- G. Implement a monitoring strategy in the Middle Inlet and Lake Noquebay Watershed to provide adequate information on the status and trends in the fishery and impact of management actions.

5. Zoning and Zoning Enforcement:

- A. Work with towns, villages and counties to have them utilize their regulatory jurisdictions to promote sound land use planning, e.g. protect critical wetlands habitats
- B. Upgrade County shoreland zoning rules to meet the revisions promulgated in NR 115.
- C. Enforce the most current and appropriate shoreland zoning rules.

6. Resource Education:

A. Continue and strengthen educational programs to address aquatic resource issues within the Middle Inlet and Lake Noquebay Watershed.

7. Comprehensive Land Use Planning and Mechanisms to Guide Implementation:

A. Promote wise land use planning and address those concerns associated with urban sprawl.

B. Encourage implementation and updating of "Smart Growth" land use plans.

C. Encourage land use consideration in areas where drinking water well head protection is important.

Water Specific Recommendations:

- Develop a detailed nutrient budget for Lake Noquebay to guide phosphorus reduction efforts. This effort would include monitoring nutrient inputs and flow on all of the lake's tributaries, nutrient export and flow at the outlet, and tracking lake water quality and phosphorus release rates from the sediment.
- Inventory the septic systems around Lake Noquebay to determine the potential for inadequate system contributions to the phosphorus loading to the lake. Monitor water quality on a regular basis to track changes and evaluate management efforts. This could be done by using the citizen monitoring program.
- Further investigate phosphorus trends in Lake Noquebay and develop solutions to stabilize the phosphorus trend. A lake protection grant from the State could be used to fund the investigation and implement solutions.
- Initiate efforts to help prevent the spread of zebra mussels to other waters from Lake Noquebay and help prevent future introductions of new AIS to the lake via Clean Boats, Clean Waters programs
- Continue to track and manage EWM in Little Newton Lake as needed in the future. Continue to implement a Clean Boats, Clean Waters Program at Little Newton and Big Newton Lake boat landings.
- Develop an AIS Prevention, Monitoring and Management Plan for future use on Newton Lakes.
- Consider developing lake plans to deal with future issues threatening the water quality in Newton Lakes. The Newton Lake Properties Association could amend their by-laws to be eligible for sponsoring lake grants from the State program.
- Monitor fish, macro invertebrate and water quality in Peterman Brook to determine if the stream is meeting the classified biological use.

Educational Outreach Needs and Opportunities

- Educate the public concerning AIS and ways to reduce the spread of these via human activities.
- Inform the public of habitat loss and the impacts of those losses upon fish and wildlife populations, water quality, flood control and the quality of life.

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Sensitive Area, Lake Noquebay



DNR PUB WT- 948

UW
Extension
Basin Education Initiative

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.

Middle Inlet and Lake Noquebay