

Chapter 5: Great Lakes

Wisconsin's 1,017 miles of Great Lakes shoreline provide a vast reservoir of fresh water and much of the special character of the state. Rugged Great Lakes bluffs have inspired artists' enclaves in places like Door County—called the New England of the Midwest; and have provided exceptional recreational opportunities, commercial fishing and shipping. About a third of our state's 11 million acres of land, and 10,122 river miles, drain to our two bordering Great Lakes, Superior and Michigan. And along this shoreline resides the highest density of our urban populations and the majority of the state's industrial base. Wisconsin has long recognized the value of its unique resources and has established criteria to help protect waters draining to the Great Lakes. In partnership with other state, national and international efforts Wisconsin has committed significant resources to help protect and restore the water quality of all the Great Lakes.



Lake Michigan

Lake Michigan, the second largest of the Great Lakes, covers 22,300 square miles and has a retention time of 99 years. It is the only Great Lake entirely within the borders of the United States. Lake Michigan is an important national resource supplying drinking water for 10 million people, providing important sport and recreational fishing opportunities and valuable recreational uses. It has also experienced profound changes in its aquatic ecosystem over the last 140 years and is threatened by toxic pollutants that bioaccumulate in the food chain and persist in the environment. Lake Michigan is a system under stress due to loss of fish and wildlife habitat, a decline in biological diversity and the introduction of invasive species. Efforts are underway to address these problems. Through Remedial Action Plans and Lakewide Area Management Plans, strategies are being developed to reduce the loading of critical pollutants to Lake Michigan and integrate environmental protection and natural resource management efforts.

Lake Superior

Lake Superior is a unique and vast resource of freshwater covering 31,700 square miles. It is the largest freshwater lake in the world by surface area and can hold the water from all the other Great Lakes along with three additional Lake Eries. Lake Superior has not experienced the same level of development, urbanization and pollution as the other Great Lakes. Although Lake Superior is the cleanest and most healthy of all the Great Lakes, it is still threatened by toxic pollutants that bioaccumulate in the food chain and persist in the environment. These substances can be transported long distances in the atmosphere and end up in the lake. Local sources contribute pollutants to air and water, adding to the pollutant load entering Lake Superior. Toxic pollutants are generated in the production of energy and the handling of wastes and they are found in the products we use. Because of its long retention time (191 years), pollutants entering Lake Superior can remain in the lake for over a century before draining to the lower Great Lakes. Through the RAP and LaMP processes, the problems associated with toxic pollutants, as well as other environmental problems, are being addressed.

Great Lakes Charter — Annex 2001

The Great Lakes Charter Annex was signed June 18, 2001. The original Great Lakes Charter (1985) set guiding principles for the U.S. governors and Canadian premiers to maintain and strengthen the Great Lakes ecosystem. While significant progress has been made, the ecosystem is still at risk from pollution and poor water management practices. The purpose of the annex is to recommit the governors and premiers to the principles of the charter and its enforcement, as well

as to enhance water management systems to protect, conserve, restore and improve the Waters and Water-Dependent Natural Resources of the Great Lakes Basin.

The Annex contains six directives to guide the governors and premiers toward their goal of an improved Great Lakes region. The Annex calls for (developing a new set of binding agreements; (developing a broad-based public participation program; (establishing a new decision making standard; (a project review under the Water Resources Development Act of 1986(amended 2000); (developing a decision support system that ensures the best available information; and (further commitments to implementing and monitoring the charter and annex.

The Council of Great Lakes Governors is overseeing the implementation of Annex 2001. The Water Management Working Group has been created to complete this task. Each state and province had representatives appointed to this group by their respective governors and premiers. The Water Management Working Group had the second of its bi-monthly meetings on November 15, 2001. It was agreed to form sub-groups to work on (the structure of the compact; (the decision making standard; and (the provincial agreement. The sub-groups will then offer their proposals to the Working Group for discussion and final decision.

Additionally, an advisory committee is being formed to offer the opportunity for public input. It will be made up primarily of regional organizations representing industry, the environment, utilities, etc. Wisconsin is also putting together its own list of organizations and legislators who are interested in being kept up-to-date on the actions of the Working Group.

Wisconsin supports the need for a binding agreement and hopes to help develop a reasonable standard that focuses on real threats to the Great Lakes, while not making it impossible to access lake water in necessary situations. It is important to work on specific policy details with respect to standards and thresholds to help eliminate the current atmosphere of confusion amongst the Great Lakes states. A uniform policy needs to be agreed upon which will put to an end to debates between parties on issues like what constitutes a diversion.

Assessment Summary

Table 25. Summary of Fully Supporting, Threatened, and Impaired Great Lakes Waters
Size: Shoreline Miles

Degree of Use Support	Evaluated	Monitored	Total
Size Fully Supporting All Assessed Uses:	0.00	0.00	0.00
Size Fully Supporting All Assessed Uses but Threatened for at Least One Use:	0.00	0.00	0.00
Size Impaired for One or More Uses:	0.00	1017.00	1017.00
Size Not Attainable for Any Use and Not Included in the Line Items Above :	0.00	0.00	0.00
Total Assessed:	0.00	1017.00	1017.00

Table 26. Individual Use Support – Great Lakes Waters
Size: Shoreline Miles

Use	Size Assessed	Size Not Supporting
Aquatic Life Support	NA	NA
Fish Consumption	1,017.00	1,017.00

Table 27. Summary of National Causes Impairing Great Lakes Waters
Size: Shoreline Miles

Cause/Stressor Category	Total Size (Miles)
Priority organics	NA
PCB's	NA
Metals	NA
Mercury	1017.00
Nutrients	1017.00
Other habitat alterations	NA
Exotic species	1017.00

Table 28. Summary of National Sources Impairing Great Lakes Waters
Size: Shoreline Miles

Source Category	Total Size (Miles)
Industrial Point Sources	NA
Municipal Point Sources	NA
Agriculture	NA
Crop-related Sources	NA
Grazing related Sources	NA
Intensive Animal Feeding Operations	NA
Urban Runoff/Storm Sewers	NA
Hydromodification	NA
Channelization	NA
Habitat Modification (other than Hydro)	NA
Contaminated Sediments	NA
Sources outside State Borders	NA

Great Lakes Ecosystem Restoration

Key Issues

Wisconsin's active involvement in programs and projects designed to address key Great Lakes issues demonstrate its commitment to the restoration of these valuable resources. Key issue areas within which many Great Lakes projects fall include:

- **River Restoration/Removal of dams**—Restoring free-flowing streams and providing additional habitat for anadromous fishes. Coupled with removal projects, projects may involve assessment and remediation of contaminated sediments accumulated above the dams.
- **Habitat Restoration**—Improving the habitat in tributary streams for spawning and nursery areas and projects promoting the enhancement of habitat on a large scale.
- **Pollutant Reduction and Prevention**—Reduction of critical pollutants to levels identified in TMDL analyses for the lakes. Sediment remediation, reduction of atmospheric loadings and nonpoint source controls are needed to eliminate fish consumption advisories.
- **Exotic Species**—Prevent and where possible control populations of exotic species from becoming more established in the Great Lakes. These issues are regional to international in scope and must be dealt with at a national level to ensure that consistent across the board measures are employed for the management of exotic species.

Identification of these key areas has allowed local projects to move forward. However, some particularly difficult issues, such as regional atmospheric deposition of mercury, require coordination of regional solutions from U.S. EPA and other national partners.

Great Lakes Projects

Many Great Lakes projects are implemented through the Great Lakes Protection Fund, the Coastal Zone Management Program, the Lake Superior Binational Program and Lakewide Management Plan (LaMP), and the Lake Michigan LaMP. The completion of the LaMPs for both Lakes Superior and Michigan has accelerated the development of implementation strategies. Interagency cooperation and commitment of the LaMP workgroups have resulted in moving forward with many projects designed to restore or protect the beneficial uses of the Great Lakes ecosystem as outlined in the plans. Likewise, work to alleviate problems identified in Remedial Action Plans is also underway for the state's five areas of concern at Duluth/Superior, Marinette, WI/ Menominee, MI, Green Bay, Sheboygan and Milwaukee. On a two-year basis, either through the State of the Great Lakes Ecosystem Conference (SOLEC) process or the International Joint Commission (IJC) biennial meeting, the governments should provide updates on Great Lakes Project implementation through LaMP or RAP reporting.

Funding Sources

Projects designed to improve and enhance the resources of the Great Lakes and the goals and objectives of the RAPs, LaMPs and Binational Program are supported by federal grants from EPA, ACOE, the Coastal Management Program and the Wisconsin share of the Great Lakes Protection Fund. These funds are provided to individuals, universities, local and state government and groups to implement the projects that further the goals of preserving and enhancing the Great Lakes.

Project Descriptions

Below selected projects currently ongoing in the Great Lakes Basin in Wisconsin are summarized:

River Restoration/Removal of dams

Several dam removal projects on the Milwaukee and Sheboygan Rivers, tributaries to Lake Michigan, have experienced substantial progress in the past two years. These projects have included habitat improvement goals to reestablish fish and wildlife. Additional dam removal projects are in the planning or implementation stages within the basin (see Milwaukee RAP below and Dam Removals in Chapter 3: Rivers and Streams)

Habitat restoration

In the Lake Michigan basin projects are underway for biota and habitat enhancement in Green Bay with the Cat Island Chain Restoration Project and the Green Bay Marina Project.

Green Bay Marina Project

Habitat structures being built at the new marina. In Green Bay, construction of cribs around the McDonald Marina, Green Bay will enhance spawning substrate. This project includes more than walleye spawning habitat. Wildlife use is expected along the headland to the east of the spawning area. The breakwater has been constructed. The headlands construction and spawning substrate will be done in the fall/winter of 2001-2002.

Other projects include a Northern Pike habitat restoration project using buffer strips, wetland restoration projects, streambank stabilization using buffer strips and innovative erosion control techniques. Special efforts are underway to implement recommendations for restoration of the lake sturgeon and Lake Superior brook trout populations.

Wetland Restoration is occurring throughout the basin. Fifty percent of wetlands in Sheboygan Basin have been lost; there has also been a loss of water quality and wildlife habitat for waterfowl, shorebirds, songbirds, pheasants, some mammals. The project involves restoring 10 to 15 wet-

lands and adjacent grasslands to improve water quality, aquatic habitat, and to provide nesting cover and improved/ increased habitat for food and shelter for wetland and grassland dependent wildlife species Partnerships include: private landowners, NRCS, County Land Conservation Departments, USFWS, etc., and local conservation and environmental groups. The photos below show wetland and grassland sites restored in 2001 in the Sheboygan wetland/grassland project. Both sites were wetland restorations with the rest of the field planted to native prairie grasslands. One site is private and one is public. Wetland vegetation will come up in the next few years also. See below.



In the Lake Superior Basin, WDNR, the USGS and UW-Madison Engineering School are developing the use of submerged vanes to stabilize erosion on steep sandy slopes on North Fish Creek, a tributary to Chequamegon Bay. Increased runoff from agriculture and logging practices on areas with clayey soils has increased flood magnitudes and the erosion potential/transport capacity of the streams. Most of the creek's sediment load originates from the erosion of 17 large bluffs. The creek contains important recreational fisheries potentially limited by the loss of aquatic habitat from deposition of sediment on spawning beds. Currently submerged vanes are installed in the streambed at two sites on Fish Creek in Ashland. These vanes are designed to divert the water's energy forces away from the eroding bluff thus reducing sedimentation to the stream. Controlling erosion will improve the streambed, enhancing spawning of migratory fish from Lake Superior.

The use of buffer strips along waterways to help improve water quality by trapping sediments and nutrients also has the added benefit of providing habitat for both aquatic and terrestrial species. Special funding for the establishment of buffer strips along critical waterways is being used to increase their use. WDNR is working with counties, NRCS and other groups to combine resources and information to work with farmers and landowners to have more buffer strips installed especially in critical watersheds. The state is pursuing opportunities through the CRP continuous buffer sign-ups to enroll tributary stream banks to restore and protect important spawning areas for Great Lakes fish.

Pollutant Reduction and Prevention

Sediment Remediation

Historic wastewater discharges have left a legacy of contaminants that have restricted the human consumption of Great Lakes fish. Sediment Remediation involves big projects with expensive solutions but new ideas and approaches are being advanced and through collective public-private efforts progress is being made. Projects include Hayton Millpond, Newton Creek and Hog Island Inlet, Fox River, and the Milwaukee River (for more information, see Contaminated Sediment Projects, Chapter 3). A related project involves a new technology for sediment disposal. For the Lower Fox, Minergy Corporation proposed that a vitrification (melting) technology might be more effective and appropriate for dealing with contaminated sediments than some of the options in the Fox River RI/FS. Minergy prepared a multi-phased study to determine the cost effectiveness of this technology and the effectiveness of this technology to destroy organic contaminants (primarily PCB) and immobilize inorganic contaminants (primarily heavy metals). Partners in this project include the Great Lakes National Program Office and WDNR. The project also involves an independent evaluation of the contaminants' fate; WDNR requested assistance from US EPA's Superfund Innovative Technology Evaluation (SITE) Program.

Combined Sewer Overflows/Elevated Bacteria Levels

Progress is being made with local communities to find ways to reduce Combined Sewer Overflows and local community sewage bypassing following heavy rains. Studies of local beaches and public health effects are underway to determine the correlation between the bypasses and beach closings due to bacterial levels. In 2000 City of Racine north beaches were closed due to high E.coli levels 66 percent, and zoo beaches were closed 41 percent of the season. Elevated levels did not always correlate with wet weather events. The Racine Beach Study investigates the possibility that the interstitial zone or wet sand zone may provide a reservoir for E.coli. This data may provide a valuable predictive model for E.coli levels. The City of Racine is conducting is also evaluating storm water discharges, wastewater bypass events and waterfowl as possible sources.

Mercury and Other Persistent Chemical Reduction

Reduction of mercury and other persistent chemicals from the environment through proper disposal and education is a high priority in improving the water quality of lakes and streams. These efforts have included Agricultural Clean Sweeps in cooperation with the Department of Agriculture, Trade and Consumer Protection (DATCP) to removed hundreds of pounds of agricultural chemicals from the environment in the Great Lakes Counties by offering farmers a no cost option for proper disposal of their unused farm chemicals. Additional grants were offered to counties in the Great Lakes basins through the Great Lakes Protection Fund. In 1999, over 150,000 pounds of chemicals were collected in 17 counties participating in clean sweeps (12 of which were in the Great Lakes Basin), including 5,700 pounds of target chemicals.

Similar programs for household hazardous waste are also offered around the state. In particular an EPA Grant (X985901-01-2) offered a mobile household and agricultural waste clean sweep program in the Lake Superior basin. This program covered a four county area and provided a mobile service that traveled to various communities to pick up chemical waste. This program is designed to minimize travel of the individual homeowners and farmers by bringing the collection facility to them. It also reduced cost by having one program for all four counties eliminating duplication of efforts in a large area. There was also a very strong public awareness and outreach component to this grant to educate of the dangers of improper disposal of chemicals into the environment.

A project offering the removal of mercury manometer for dairies and replacement with a mechanical gage resulted in the collection and proper disposal of more than 312 pounds of mercury from 416 farm operations. This project was funded from Great Lakes National Program Office and Wisconsin Great Lakes Protection fund grants. The success of this project greatly reduces the further introduction of mercury into the atmosphere, food chain, lakes and streams.

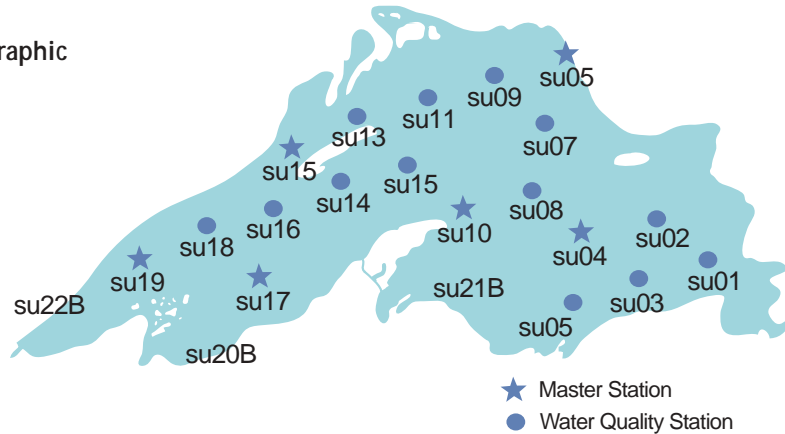
Educational efforts were developed for a wide variety of topical areas to inform people of the environmental damage that results from everyday activities like using burn barrels, old or improperly designed wood stoves, improper disposal of chemicals, runoff from construction sites, etc. Though videos, public service announcements, ad campaigns and educational programs aimed at school aged children, local officials and homeowners, people are learning how the effects of their daily lives impact water quality, fish consumption advisories, and other environmental problems. The Great Stove Buy Out was a project undertaken with the North Central Hearth Products Association to eliminate the use of old poorly designed wood burning stoves by offering a rebate incentive on a new wood burning stove designed to minimize pollution emissions. For the 6 months the program was in affect 436 new stoves were purchased and the old stoves were taken out of use eliminating harmful emission to the environment.

Mercury Reduction, Focus: Lake Superior

WDNR, the University of Wisconsin - Water Resources Institute, and Lake Superior State University (Sault Ste. Marie, MI) continue to work on a comprehensive mercury study of Lake Superior. With financial support from USEPA and the Wisconsin Sea Grant Institute, the study is revealing the biogeochemical cycle of mercury in the open waters of Lake Superior and its tributaries. Water, plankton, and sediments were sampled for total and methyl mercury at sites throughout the Lake. Total mercury concentrations were consistently below 1 ng/L throughout the Lake and as illustrated in Figure 25 the methyl mercury concentrations were around 5 pg/L at both the surface and deep waters. Tentative results suggest that the sediments of Lake Superior are not

a source of biogenic methyl mercury production. Surprisingly, however, methyl mercury has been measured in wet deposition around the Lake. Future efforts will be made to evaluate the dynamics of methyl mercury inputs from tributaries to the Lake and interactions at the mixing zones with the near-shore waters.

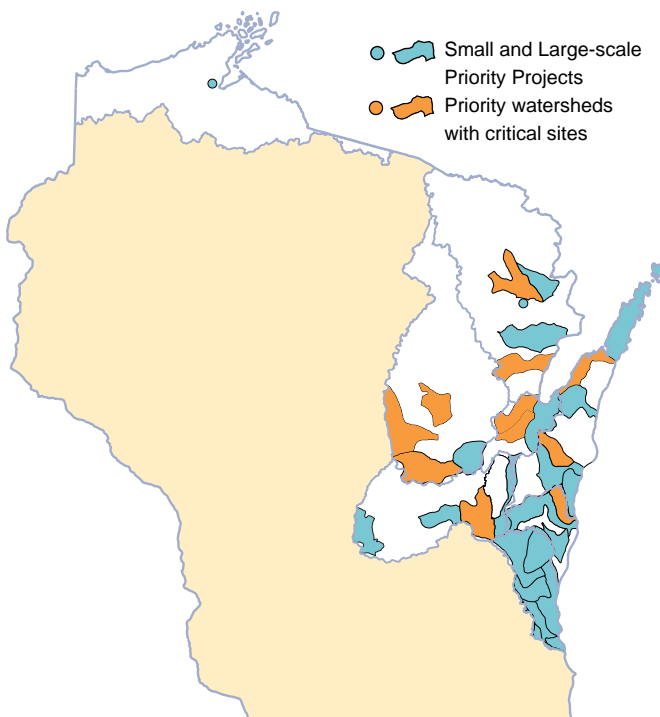
Figure 25. Mercury Graphic



Exotic Species

Projects funded through the Great Lakes Program to control exotic species from spreading to uninfested waterbodies have included educational outreach projects to inform the public how their actions impact the spread of exotic species. These projects, aimed at changing boaters' behavior to clean their boats before leaving the launching sites, include Public Service Announcements (PSA) broadcast during sporting events, a special publication in the Natural Resources Magazine on the impacts of exotics on our fisheries, tourism and local economy, and a video to be used by sporting groups, lake associations and others at meetings and special events. Specific control structures were also funded, like the construction of lamprey barriers on the Brule River in the Lake Superior Basin.

Coastal Zone Program



As a coastal state, Wisconsin is required to develop and implement a nonpoint source management program under the provisions of Section 6217 of the 1990 Coastal Zone Act Reauthorization Amendments. The program requires “enforceable policies” to regulate compliance with U.S. EPA for six categories of nonpoint source activities including agricultural, urban, forestry, wetlands, hydromodifications and marinas. The specific management measures involve programs administered by the Departments of Natural Resources; Administration; Agriculture, Trade and Consumer Protection; and Commerce and Transportation. The management area under section 6217 includes virtually all of the Great Lakes drainage area in Wisconsin except the portion of the Wolf and Upper Fox Basins upstream of the outlet of Lake Winnebago. Wisconsin has targeted many nonpoint source activities in this management area, including over 22 priority watershed projects (Figure 26). Nearly all of the urban areas will come under U.S. EPA’s recently promulgated Storm Water Phase 2 regulations. Forestry activities are managed through use of best management practices contained in the WDNR published manual. Wetland protection and regulation of hydromodifications are statewide programs.

Figure 26. PWS projects in Great Lakes Basin

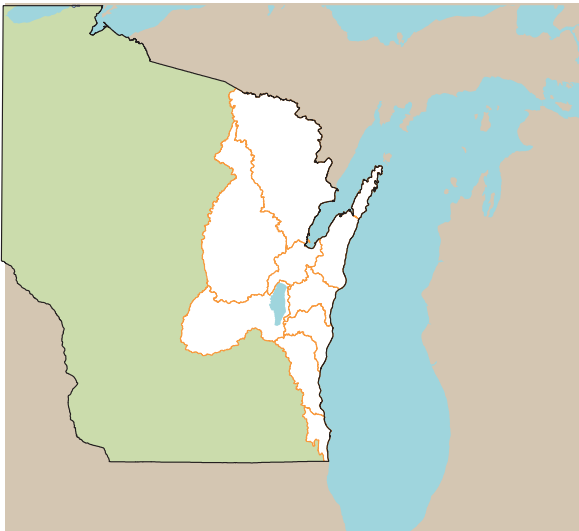
Lake Michigan Lakewide Area Management Plan (LaMP)

The Lake Michigan Lakewide Management Plan (LaMP), originally published in April 2000, outlines a vision, goals and ecosystem objectives for Lake Michigan (Figure 27). The following are broad goals identified in the report:

- All persons can eat any fish.
- All persons can all drink the water.
- All persons can swim in the water.
- All habitats are healthy, naturally diverse and sufficient to sustain viable biological communities.
- Public access to open space, shoreline and natural areas is abundant and provides enhanced opportunities for human interaction with the Lake Michigan ecosystem.
- Land use, recreation and economic activities are sustainable and support a healthy ecosystem.

For each of these goals, LaMP 2000 includes indicators and monitoring recommendations for lake ecosystem health, status, and stressor sources and loads, and recommends actions or “next steps” for remediation, restoration or other necessary work.

Figure 27. Map of the Lake Michigan Basin



LaMP Update

Wisconsin is currently working with EPA, the other Lake Michigan states, and other interested parties to revise the LaMP. A number of different committees have been established to systematically update the document. In the area of critical pollutants, both an initial review and the establishment of a standardized procedure for future review of the list of ‘critical pollutants’ included in LaMP 2000 are taking place.

The Habitat Committee has developed a “Habitat and Land Use Management Tool Box” that includes a description of habitat and land use management resources and where to locate them. It also includes information regarding funding sources available to support implementation of best management practices, Brownfields redevelopment, for the prevention and control of air pollution, Clean Water Act Funds, Great Lakes Coastal Projects and aquatic habitat conservation and restoration. The Education and Outreach Committee is promoting Lake Michigan through a Boat Tour, conferences

and educational material for the public.

In addition to the committee work described above, parties involved in the LaMP 2002 update are identifying specific actions to that both support the goals of the LaMP and that are consistent with the Great Lakes Strategy, an overall framework with goals and objectives for management of the Great Lakes. For example, a proposed action in the current draft indicates that by 2004, a TMDL Strategy will be developed for Lake Michigan, which is consistent with the USEPA’s Great Lakes Strategy.

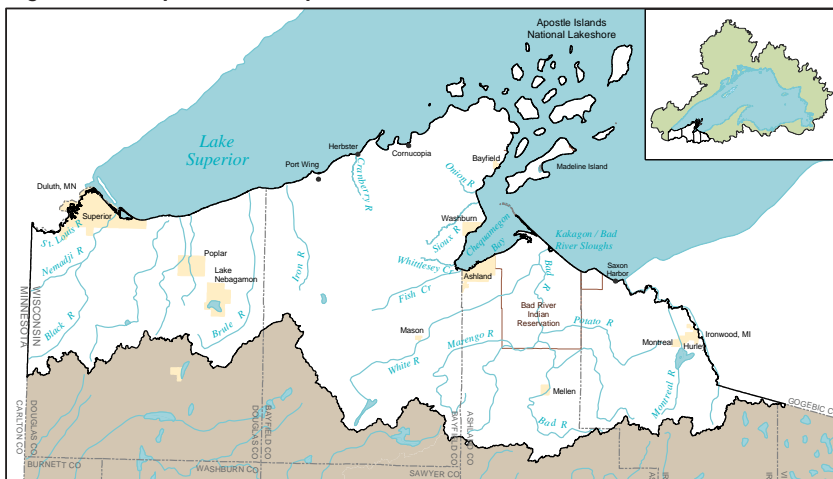
Barriers or issues that need to be addressed to achieve the goals of the LaMP include a national emphasis on the need to reduce the level of contamination in fish to a degree that the fish consumption advisories are no longer necessary. This would require a national and international effort to reduce atmospheric deposition of pollutants, additional resources and technical knowledge regarding contaminated sediments and coordination and support from EPA with the areas of concern and remedial action plans. There is also a need for support for ecological monitoring programs and a need for additional resources to access the public health risks from bacteria at our public beaches.

Lake Superior LaMP and BiNational Program

The Wisconsin DNR is one of the partner agencies in the 1991 Binational Program to Protect and Restore the Lake Superior Basin. Known as the “Binational Program,” it was formed by agreement signed by the governors of Wisconsin, Minnesota, Michigan, and by representatives of the U.S. EPA, Environment Canada and the Province of Ontario. The program includes a zero discharge demonstration program for Lake Superior as well as a broader program of coordinated ecosystem management. The Binational Program is often held up as a model of inter-jurisdictional resource planning and management (Figure 28).

The Lake Superior Lakewide Management Plan (LaMP) reports progress on the Lake Superior Binational Program as well as the Great Lakes Water Quality Agreement. Stages 1 and 2 of the Lakewide Management Plan for Lake Superior came out in 1995 and 1999 respectively. These

Figure 28. Map of Lake Superior Basin



stages focused primarily on chemical pollutants. In 2000, a more comprehensive LaMP was developed, which includes strategies for pollutant reductions as well as strategies addressing issues of habitat, aquatic and terrestrial communities, human health, and sustainability. Following LaMP 2000, implementation projects have been the major focus in Wisconsin. The Wisconsin DNR is working with Lake Superior basin communities and citizen groups on watershed and habitat protection efforts and community-based pollution prevention. Another major implementation push in Wisconsin is to pursue resources for contaminated sediment remediation. The St. Louis River and

estuary is the largest U.S. tributary to Lake Superior, and the only Area of Concern in Wisconsin waters of Lake Superior. Many of the implementation projects underway in Wisconsin serve to meet the goals of the St. Louis River Remedial Action Plan as well as the Lakewide Management Plan for Lake Superior.

Zero Discharge Demonstration Program – 10 years



The Lake Superior Zero Discharge Demonstration Program is unique in the Great Lakes. The goal is to get rid of sources of the “nasty nine” critical pollutants in the Lake Superior basin by the year 2020. The key to zero discharge and zero emission is pollution prevention. This is an experimental program to see if we can find ways to prevent these chemicals from being used in processes or products to prevent their release in the Lake Superior Basin.

Why zero discharge for Lake Superior?

Lake Superior is vulnerable to toxic substances. Water stays in the Lake for over 150 years, on average. Although it is the cleanest of the Great Lakes, toxic pollutants accumulate in Lake Superior’s fish and wildlife. People feel strongly about protecting the Lake Superior basin, one of the world’s great places. The idea of a Lake Superior “zero discharge” demonstration came from public support in the 1980s. The 1991 Binational Program agreement stresses voluntary pollution prevention, but acknowledges that enhanced controls and regulations may be necessary.

Children are most at risk from toxic substances.

Progress

Community Pollution Prevention

Many communities around the basin are working on ways to prevent these pollutants, particularly mercury, from getting into the Lake Superior environment. Consumer and commercial products can be a significant source of mercury. Mercury-containing products can include thermometers, switches, dental amalgams, thermostats, button batteries, and fluorescent lamps. Industrial raw materials can also contain unwanted mercury. Many communities around the basin are working to find alternatives to products and processes that use mercury. By working with its wastewater customers and using hazardous waste collections, Western Lake Superior Sanitary District (WLSSD) in Duluth, MN demonstrated that they could significantly reduce mercury coming out of the plant. They developed a “Blueprint for Mercury Elimination” Guidance for Wastewater Treatment Plants in 1997.



Photo courtesy of City of Superior.

The community-based approach has caught on around the basin and many of the communities are working together. The City of Superior, Wisconsin has become a regional leader in community mercury reduction work. Currently in Wisconsin, Superior, Ashland, and the Red Cliff Tribe of Lake Superior Chippewa, are working together on community pollution prevention and outreach. They are also working with Lake Superior communities in Michigan, Minnesota, and Ontario. Collaborative projects include: pollution prevention workshops and projects with hospitals, clinics, dentists, contractors, and municipalities.

In 2001, Wisconsin provided \$150,000 to support pollution prevention projects in the Wisconsin Lake Superior basin. City of Superior and WDNR work together to promote upgrades to energy

efficient thermostats and proper disposal/recycling of mercury containing thermostats. This includes a state-wide recognition program for participating contractors. The City of Superior is working with auto dealers to replace mercury switches in cars with non-mercury alternatives. They are instituting a recognition program for mercury-free auto dealers. A new Wisconsin federally-funded project is working with the salvage industry state-wide to remove mercury switches from autos prior to crushing.

In 2000-2001, several partners, including City of Superior, Northwest Clean Sweep and WDNR conducted an outreach, collection, education, and recognition program called, “Mercury Shake-Down, Northwest Wisconsin Mercury Free Schools.” This project continued into 2002.

In 2001, both the City of Superior and Douglas County, Wisconsin, passed ordinances banning the sale of mercury thermometers.



Students in Superior, Wisconsin conduct a thermometer exchange in the City-County complex.

Photo by Diane Thompson, City of Superior

Hazardous Waste Collections: household, agricultural, small business

Over the past decade, agricultural and household waste collections or “sweeps” have netted thousands of pounds of DDT, chlordane, dieldrin, toxaphene, and other pesticides in the Lake Superior Basin. Federal, state, and local funding has been used to support Northwest Wisconsin Clean Sweep mobile collection program for household, agricultural, and small business hazardous waste. In 2001, a special outreach project was funded to focus on the collection of mercury containing products. In 2001, the Northwest Wisconsin Regional Planning Commission also received state funding for small business hazardous waste “milk run” collections, which allows local business to use economy of scale to achieve cost effective collection of mercury and other hazardous waste.

Dioxin – a burning issue:

In 1990, small inefficient incinerators were a major source of dioxin emissions in the basin. Air emission requirements in the 1990s in large part have controlled this dioxin source. Burn barrels or backyard garbage burning is a continuing challenge in the rural Lake Superior basin. This practice produces dioxin that enters the environment and human food sources, posing health risks.

WI participates in regional cooperative work on burn barrel education. In addition, a statewide television public service announcement was produced and aired in 2001. In 2001, WI awarded a grant to the Northwest Wisconsin Regional Planning Commission to develop a video for town and county government officials in the WI L. Superior basin on state regulations and local ordinance options, as well as health and environmental effects of backyard garbage burning

Industry and Economic Changes

Elsewhere in the Lake Superior basin, facility closures in the mining sector resulted in reduced mercury emissions in the basin, but at a large economic cost to the region. Wisconsin has seen the closure of forest product industry facilities in the Lake Superior basin in recent years. Wisconsin's Lake Superior basin is facing growing development pressures as it becomes increasingly an area of second homes and recreational property. Sustainability is an important issue for the economic and environmental health of the Lake Superior region.

Continuing Challenges

Long-range transport of pollutants in the atmosphere

The zero discharge demonstration program focuses on air emissions, water discharges, and the use or formation of the nine critical chemicals within the Lake Superior drainage basin. However, sources outside of the basin greatly affect Lake Superior. Lake Superior with its large surface area receives a relatively high deposition of airborne toxics. Actions on a national and international level have an extremely important role in protecting Lake Superior. Actions on a state-wide basis are also important for protecting Lake Superior. In 2001, the WI DNR initiated rulemaking for a mercury emission regulatory program. This regulatory initiative is being pursued in advance of federal regulation of mercury emissions.

Mercury research

University of Wisconsin and the Department of Natural Resources, together with several other organizations continue research on the sources and fate of mercury in the Lake Superior ecosystem. In particular, they are investigating the pathways in the Lake Superior ecosystem, through which mercury deposited from the atmosphere is converted to the form (methyl mercury) that bioaccumulates in fish and wildlife. Wisconsin DNR research is showing that mercury levels which are common in northern Wisconsin fish are affecting loon reproductive success.

Contaminated Bottom Sediment

Although Lake Superior is the cleanest of the Great Lakes, its history of heavy industry in its harbor communities has left a legacy of contaminated bottom sediment. Polluted bottom sediments can serve as source areas for contaminants to bioaccumulate in Lake Superior fish and wildlife. These harbors and bays should be productive shallow water habitat, the biological engines for the Lake Superior ecosystem. Considerable funding is required to clean up contaminated sites and restore this important aquatic habitat.

In the St. Louis River Area of Concern, WDNR is working with partners to pursue resources for clean up at the Newton Creek / Hog Island inlet site in Superior. The ultimate goal is to restore this area of valuable shallow water habitat of Superior Bay. In addition, site investigation continues at a wood preserving facility in Superior, Wisconsin that used pentachlorophenol in the past.

The Ashland Coal Tar Site includes a 10-acre area with high concentrations of PAHs in bottom sediments and degraded aquatic habitat off the City of Ashland's Kreher Park in Chequamegon Bay. The contamination originates from the on-land location of



Cleanup of Ashland Coal Tar Site seep.

Photo by Jim Bishop, DNR

a former manufactured gas plant. Clean up options are being considered and weighed by all the affected parties, including the public. In one on-land area of the Ashland city park however, highly contaminated ground water was “seeping” to the surface, posing a significant human health risk. In 2001, Wisconsin DNR cleaned up the seep using Great Lakes Protection Fund money. The U.S. EPA recently scored the Ashland Coal Tar Site as a Superfund site. The total price tag for site clean up will run into several million dollars.

Partnerships

Wisconsin Lake Superior Public Advisory Team

The Wisconsin Lake Superior Public Advisory Team is a 40 member stakeholder group established in 1998 by the Wisconsin Department of Natural Resources to advise state government on Lake Superior issues and to work with the state on Binational Program implementation. This group represents a broad cross section of basin citizens in Wisconsin, including municipal and county elected officials, business and industry, and citizen groups. Main areas of concern for the group have been mercury reduction, maintenance of hazardous waste collection programs, land use, funding issues, and special designations for Lake Superior. In 2000, the group endorsed a Wisconsin Lake Superior Basin Mercury Reduction Campaign. The initiative focuses on pollution prevention in many sectors, including medical, dental, schools, contractors, and the public. It is largely being carried out through the work of communities in the basin. In 2000-2001, the Advisory Team helped put into place a new state funding program for Lake Superior basin projects. Over the past year, the group has been working on special designations for Lake Superior.

The 2001 Wisconsin Lake Superior Protection Fund

In 2000-2001 the Wisconsin DNR began a new competitive grant program to support environmental protection and restoration projects to implement the Binational Program in Wisconsin's Lake Superior basin. The Wisconsin Lake Superior Public Advisory Team worked with the DNR to set funding criteria and priorities for 2001. They set mercury reduction and small planning grants as the priorities for the \$250,000 available for 2001. Funds for this new Lake Superior grant program come from the Great Lakes Protection Fund, an endowment established by the Great Lakes states. Each year a portion of the earnings returns to each state for environmental cleanup and protection.

In 2001, the grants were awarded to ten organizations, area governments or tribes, schools, and individuals that are preventing pollution in the Lake Superior basin. The recipients will continue or begin efforts to prevent toxic pollution, reduce erosion, and increase public awareness of the issues facing the basin. The grants will expand and support community mercury reduction and other pollution prevention projects in several communities in the Lake Superior basin in Wisconsin. The grants will support public education and outreach on mercury and other Lake Superior issues and help tackle non-point source pollution and stream degradation problems.



Figure 29. Map of RAP Sites

Remedial Action Plans (RAPs) for Water Quality Restoration

Wisconsin is responsible for implementing remedial action plans (RAPs) at five Great Lake sites, four on Lake Michigan and one on Lake Superior (Figure 29). At two of the RAP sites, implementation is a shared responsibility with adjoining states. For the Menominee RAP, Michigan and Wisconsin share responsibility for implementation. For the St. Louis and Duluth/Superior Harbor RAP, both Minnesota and Wisconsin are implementing recommendations that pertain to their authorities.

All of the five RAP sites are in the process of implementing the recommendations contained in the stage I & II planning documents. Actions are being implemented at each of the RAP sites that are aimed at restoring and

protecting the designated uses in the Areas of Concern. What follows is a description of what activities are occurring and the progress that has been achieved over the last four years in meeting the goals and objectives established for Wisconsin's RAP sites. At all sites work toward restoration of beneficial uses has become incorporated into the routine planning process and regular work activities of the basins/geographic management units in which the AOC is located.

Lower Green Bay and Fox River

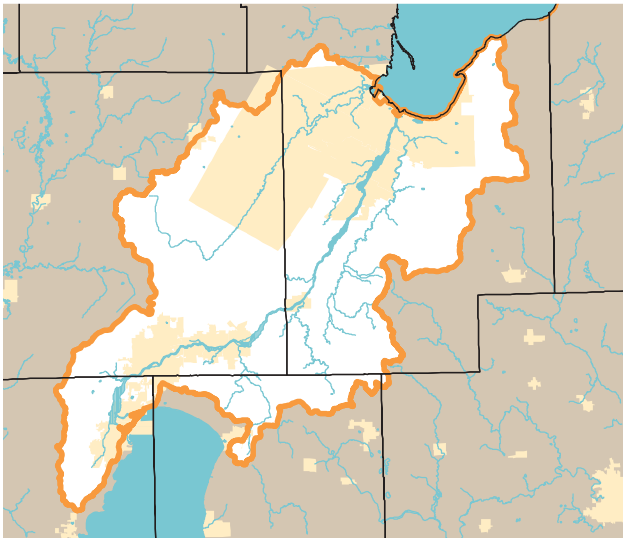


Figure 30. Lower Fox Basin/AOC

Table 29. Use Impairments in the Lower Fox AOC

- Restrictions on fish and wildlife consumption.
- Tainting of fish and wildlife flavor.
- Degradation of fish and wildlife populations.
- Fish tumors or other deformities.
- Bird or animal deformities or reproductive problems.
- Degradation of benthos.
- Restrictions on dredging activities.
- Eutrophication or undesirable algae.
- Restrictions on drinking water consumption, or taste and odor.
- Beach closings.
- Degradation of aesthetics.
- Degradation of phytoplankton and zooplankton populations.
- Added cost to agriculture and industry.
- Loss of fish and wildlife habitat.

Description

The Lower Green Bay and Fox River Area of Concern (AOC) consists of the lower 11.2 kilometers of the Fox River below DePere Dam and a 55 square kilometer area of southern Green Bay out to Point au Sable and Long Tail Point. The drainage area encompasses portions of eighteen counties in Wisconsin and 40 watersheds of the Upper Fox River, Wolf River and the Lower Fox River Basins, including the largest inland lakes in Wisconsin, Lake Winnebago and its pool lakes (Figure 30). While water quality problems and public use restrictions are most severe in the AOC, water resources of the entire basin are affected by runoff pollution from rural and urban areas, municipal and industrial wastewater discharges and degraded habitats.

Eleven use impairments have been documented and two are suspected of being impaired for the Lower Green Bay and Fox River AOC through the Remedial Action Plan (RAP) process (see Table 29). Ecosystem services and human uses such as fishing, boating, swimming, hunting and passive recreation have been impaired. Soil erosion and runoff pollution cause most use impairments from upstream tributaries, persistent bioaccumulative contaminants in river and bay sediments, and habitat losses. Turbid, algae-laden waters degrade aquatic habitats and restrict swimming. Consumption advisories warn against eating mallard ducks and twelve species of fish. Shipping and navigation are impaired by sediment loading from soil erosion and the high cost of dredging and disposing contaminated sediments.

Stages I and II of the RAP were completed in 1987 and adopted as part of Wisconsin's Water Quality Management Plan in 1988. The RAP was updated in 1993. Since 1993, thirty-eight of the 120 recommended remedial actions have been implemented.

Substantial progress has been made in developing the RAP and implementing recommended actions. Nearly one-third of the plan's 120 recommended actions has been implemented and another one-third initiated. However, despite incremental improvements to prevent water pollution, restore habitats, improve public access and further define the causes of impaired uses, none of the problems in the AOC have been completely solved. Recommendations are being implemented sequentially with the easiest ones having been completed and the more difficult and costly actions yet to be implemented. Full RAP implementation continues into the future.

Highlights

The Green Bay RAP Science and Technical Advisory Committee remains active. Community leaders have established additional nonprofit organizations to promote implementation of nonpoint source pollution controls and to determine the most cost-effective actions to meet the nutrient and suspended solids objectives of the RAP.

The following are remaining priority actions to be implemented:

- PCB contaminated sediment remediation in 39 miles of the Lower Fox River (see below)
- Nonpoint source abatement/pollution and prevention including comprehensive watershed projects to abate runoff pollution, TMDLs for phosphorus and suspended solids in the Fox-Wolf basin, and riparian buffers throughout the Fox-Wolf basin are ongoing.
- Habitat protection and restoration that involve restoring an eroded chain of barrier islands and associated aquatic habitats (Cat Island archipelago), restoring littoral habitats, and protecting remaining wetlands
- Exotic species prevention
- Stewardship and sustainability which includes the Sustainable Green Bay Initiative
- Education and outreach
- Research and monitoring including the State of the Bay Report
- Public access enhancement

Fox River Remediation

The Remedial Action Plan states that thirteen of the fourteen use impairments are either “present” or “suspected” in the Area of Concern. It furthermore links ten of these use impairments, at least in part, to contaminated sediment. Since the RAP was originally completed in 1985, several studies have been conducted to assess the severity, extent and impact of the contamination. The result of these studies is the conclusion that sediments are the source of PCBs that continue to cause the impairments, and which cause exceedance of the state water quality criteria and issuance of fish and waterfowl consumption advisories.

In 1998, DNR in cooperation with the U.S. EPA initiated a formal remedial investigation and feasibility study to develop a remediation plan to address the PCB contamination at this site. The site is not listed on the National Priority List, however the work is being conducted in accordance with the laws and rules associated with the Superfund Program. In February, 1999 a draft RI/FS was issued by the DNR and a multitude of public comments were received. In addition, peer reviews were conducted on several aspects of this work to solicit critical analyses of basic approaches that were used. In October, 2001 the Department, with EPA's concurrence release a revised RI/FS and Proposed Remedial Action Plan to the public for their review and comment. The goal of the plan is to present a recommendation, to the public and to the Potentially Responsible Parties, for actions that will reduce the risks to humans and the environment caused by the PCBs in the ecosystem. The following is a brief description of the major components of the plan.

For the purposes of assessment and planning, the river was segmented into four reaches, and the bay of Green Bay was considered a separate management area. Each of these areas has been described in Superfund jargon as an “Operable Unit” or “OU.” OU-1 is the six-mile stretch of river immediately below Lake Winnebago. OU-2 is a twenty-mile long stretch of the river from Appleton to the Little Rapids Dam that does not contain very much PCB mass. OU-3 and OU-4 comprise the last thirteen miles of the river, before it discharges into Green Bay. As previously mentioned, OU-5 is Green Bay. The plan calls for dredging, and off-site landfilling of all sediment that exceeds 1 ppm PCBs for OU-1, OU-3 and OU-5 and for Monitored Natural Recovery (MNR) in OU-2 and OU-5. MNR includes the monitoring of the environment to assess the extent of various natural processes such as contaminant dispersion, burial and degradation over time to monitor risk reduction over time. In developing the plan, it was determined that although there is a significant amount of PCB mass in the bay, there is little expectation that the risks could be reduced, even with extensive work being done. Monitoring of the system will allow regulators to continually assess the risk and maintain public awareness of the risk to protect them from exposure to the PCBs.

At the time of this report, the comment period on these documents has just closed. The department and EPA will be assessing the comments received in order to prepare a responsiveness summary and to prepare the final documents that will be included in the Record of Decision. The agencies expect to be able to prepare the ROD during the summer of 2002. The ROD will then be the basis for discussions with the PRP to initiate the remedial action.

Milwaukee Estuary

Description

The Milwaukee Estuary Area of Concern (AOC) encompasses about 14,000 acres (22 square miles) and includes: the Milwaukee River downstream of 35th Street; the Kinnickinnic River downstream of Chase Avenue; the Inner and Outer Milwaukee Harbor; and the near shore areas of Lake Michigan from Sheridan Park to the south, to the City of Milwaukee's Linnwood water filtration plant to the north (Figure 31). The AOC is at the end of a basin draining more than 850 square miles (the AOC is only 2.5% of the entire drainage basin), cleaning up the AOC also means correcting upstream problems too.

Figure 31. Milwaukee Basin



The 1995 Remedial Action Plan emphasizes the basin approach to correcting problems in the AOC. The plan further defined problems and made 32 recommendations to help meet the goals defined by the RAP committees. To date, substantial progress has been made on 30 recommendations (93%). The following is a brief progress report on meeting the RAP recommendations and on the contaminated sediment management strategy, a cornerstone of the RAP effort.

Highlights

The external partnership team for the Milwaukee River Basin is operational, providing a link to the public, businesses and organizations throughout the Milwaukee Basin. Many of the representatives on the partnership team are familiar with the RAP. The partnership team has included the objective to implement the Milwaukee RAP as one of their goals.

Milwaukee River Basin Environmental Indicators Project

The Milwaukee River Basin Environmental Indicators Project was initiated by the Wisconsin Department of Natural Resources (WDNR) with financial support from the U.S. Environmental Protection Agency (U.S. EPA). The main objective of this project was to use a public process to determine the most useful measures, in the public's point of view, to describe ecosystem conditions on a natural geographic basis. Focus groups and a work group were enlisted to determine the most important priorities for developing indicators. A consultant facilitated all public participation and was able to ensure enthusiasm for the project.

In addition to the success of public involvement in the early development process, much was gained through communication with other natural resource professionals within the community and the WDNR. The data identification process allowed contact with professionals across all media in the WDNR as well as contact with other professionals in the community. The common theme running through conversations with WDNR staff was a need for more comprehensive monitoring strategies to get at the heart of the data needed for indicator development. This project did not have a new data collection component, but rather relied on data collected through prior studies (legacy data).

In many cases throughout the indicator development process, we found that legacy data did not exist, or were not sufficient to develop the indicator. This is a common problem. Data are often collected with a short-term objective in mind, or are not collected with the frequency needed to develop meaningful indicators. Instead of over-generalizing limited data the work group agreed that we would report the indicator ideas with information about data sufficiency. In other cases where data were considered sufficient the information required extensive and time-consuming data management.

The biggest lessons learned from this project were not to count on prior collected data to develop strong environmental indicators unless data were collected using the same standard methods, and were at a frequency sufficient to determine trends. Higher level indicators that use biological community assemblages compared to reference conditions provide more information than water chemistry grab samples.

The WDNR recently established (1999) baseline monitoring protocols for streams and lakes that use biological and habitat measures rather than water chemistry to evaluate resource conditions. This look into streams and lakes give the Water Resource Biologists valuable insight into current conditions, and also provide insight into emerging problems.

This report has been shared widely throughout the WDNR and other interested parties and is available on the WDNR Internet site at <http://www.dnr.state.wi.us/org/gmu/milw/indicators.html>.

Dam Removals

Dam removal projects completed or ongoing within the last 2 years:

- Menomonee River Drop Structure Removed
- Falk Dam Removed
- Chair Factory Dam Removed (see below)
 - New Fane Dam Removed
 - Waubeka Dam breached
 - Schweitzer Dam removal in planning stages (see below)

Figure 32. Milwaukee Dam Removals



Contaminated Sediment Strategy

This strategy is the cornerstone of the Milwaukee RAP. Contaminated sediments affect every ecosystem component. The RAP committee designed a strategy to effectively manage the sediments throughout the Milwaukee River Basin that includes the following:

- Continuing work on the Estabrook Impoundment PCB deposit investigation and pre-remediation design project. Sample collection began Fall 2001 and will be complete Summer 2002. Data gathered from this project should provide information needed to estimate costs and methods to remove this deposit (See Estabrook Sediment Project below)
- We continue to investigate ways to accomplish contaminated sediment removal projects in the AOC in partnership with local landowners, the City of Milwaukee Seaway Port Authority and the Army Corps of Engineers.

Estabrook Sediment Project

The Estabrook Impoundment on the Milwaukee River holds over 100,000 cubic yards of sediment contaminated with an estimated 5,200 Kg of polychlorinated biphenyls (PCBs). Previous work on the Milwaukee River system shows that remediation of this sediment deposit would result in a long-term reduction in PCB mass transport of up to 70% (Baird & Associates, 1997). The Milwaukee Remedial Action Plan (RAP) Technical and Citizen's Advisory Committees recognized contaminated sediment as the major contributor to use impairments within the area of concern (AOC). The contaminated sediment management strategy of the RAP (WDNR, 1995) identified remediation of upstream sources of contaminated sediments as a top priority.

This project will generate the data needed to conduct a conceptual remediation design for the sediment deposit. Specifically, this project will generate data reflecting the physical and chemical properties of the sediments, produce a more accurate estimate of contaminated sediment volumes, and confirm whether there is continued PCB transport from upstream areas. In addition, this project will generate data to satisfy the requirements of Wisconsin Administrative Code NR 347, which specifies sampling requirements for potential sediment dredging projects.

Thirty-two of the approximately 60 cores were collected during fall 2001 prior to the Estabrook Dam gates opening. Sampling will continue through spring and summer 2002 to collect the remaining samples and possibly resample some other areas to increase sediment recovery depth. In the fall sampling we obtained about 1.5-2.5 feet of recovery with the hand-powered push corer. The contamination horizon may extend below this layer. Next spring (2002) we will attempt to obtain samples from several areas using a vibracorer device.

Habitat Restoration

MMSD Conservation/Restoration Project

The Milwaukee Metropolitan Sewerage District (MMSD) hired The Conservation Fund and several consulting firms to prepare a conservation plan for the Menomonee River, Oak Creek and Root River Watersheds (October, 2001). The main objective of the plan was to identify parcels within these flood-prone Lake Michigan drainage watersheds that should be protected or restored as floodplains, riparian habitats, and environmental corridors or isolated natural areas. While

protection from flooding was a major consideration for this plan, the MMSD also recognized that protecting parcels from development for flood prevention would also provide important ecological benefits.

Over 7,000 acres of lands in the three watersheds were identified as high priority sites for conservation acquisition. Most of the high priority acres (5,000) are in the Menomonee River Watershed. Sixty-one percent of the high priority sites have entities (land trusts, local governments, and other non-profit entities) definitely interested in partnering with MMSD for acquisition. MMSD has earmarked \$15 million for project costs. Because of the variable nature of land prices in these urban watersheds, estimates of total acreage of lands that may be purchased with this money were not made for the Conservation Plan.

Public Information and Education

The Milwaukee River Basin Land and Water Partnership, the Revitalization Foundation and the WDNR co-hosted a Three Rivers Summit to highlight issues and projects concerning the Milwaukee, Menomonee and Kinnickinnic Rivers. One highlight of the summit was a debate with some of the candidates for governor. Tom Barrett, Kathleen Falk and Gary George shared their views on the connections between government and the environment.

Sheboygan River and Harbor

Description

The Sheboygan River Area of Concern includes the Sheboygan Harbor and 14 miles of the river up to the Sheboygan Falls Dam (Figure 33). The Sheboygan River, a tributary to Lake Michigan, was designated as a Superfund Site by U.S. EPA in 1985 because of PCB contaminated sediments. Tecumseh Products Company, Thomas Industries and Kohler Company have been identified as potentially responsible parties.

In May 2000, the Record of Decision for the Sheboygan River Superfund project was signed.

About 4,300 cubic yards of contaminated sediment that had been previously dredged from the stretch of the Sheboygan River that runs from the area known as the "Upper River" and placed in steel storage facilities on the Tecumseh Products Company's Sheboygan Falls property, was shipped off site in September 2001. The implementation phase of this project will usher in the long-awaited sediment remediation of the Sheboygan River. WDNR staff is working with fellow trustees from U.S. Fish and Wildlife and National Oceanic and Atmospheric Administration (NOAA) to determine the Natural Resources Damage Assessment for the restoration phase of the Sheboygan River Superfund Site.

Under a legal agreement signed earlier this year between the U.S. Environmental Protection Agency (U.S. EPA) and Tecumseh, polychlorinated biphenyl (PCB)-contaminated sediment was loaded onto trucks lined with heavy plastic and hauled to the company's New Holstein plant. From there, it was loaded into railcars and shipped to a licensed landfill in Tulsa, OK. This sediment was disposed of in Tulsa because it contained over 50 parts per million (ppm) PCBs and a landfill in Wisconsin was not available. The tanks were demolished after being decontaminated. After sections of the tank were removed, they were transported to a local recycling facility.

U.S. EPA has been communicating with Tecumseh officials for the past year hoping to reach an agreement that would commit the company to the cleanup of the upper river, which extends from the Tecumseh facility in Sheboygan Falls to Walderhaus Dam. Once the consent decree is lodged in federal court, the Department of Justice will begin a 30-day comment period by posting an announcement in the Federal Register. After the Department of Justice responds to the comments, it will ask that a judge enter the consent decree in federal court to finalize the agreement. Characterization and design of the cleanup components could proceed in 2002 with cleanup activities beginning soon after.

Figure 33. Sheboygan Basin/AOC



Highlights

Franklin Dam

In the autumn of 2000, the Franklin Dam on the Sheboygan River was removed. The impoundment was first drawn down and seeded to stabilize the sediments over the winter, prior to removal. The Franklin Fire Department, the dam owner, notified adjacent landowners that they intended to deed the flowed lands to each landowner at the conclusion of the restoration work. The dam required either extensive repair or removal, and the owner did not have the funds needed to repair the dam.

Volunteer and DNR Monitoring

There continues to be a strong volunteer monitoring base in the Sheboygan area. The Ellwood H. May Environmental Center of Maywood established a pilot web site with WDNR and UW-Extension to manage volunteer water quality monitoring efforts.

WDNR is also conducting stream assessments in and around the Area of Concern as part of the baseline monitoring efforts.

Additional Activities during 2000-20001

- Implementation of canoe launch planning activity for the Sheboygan River commenced and a site plan was developed for one launch. Private funding has been obtained and canoe launch construction is anticipated on the Sheboygan River in 2002.
- DNR increased the frequency of long-term water quality monitoring in Sheboygan River from quarterly to monthly, added low-level metals and triazine monitoring, beginning Summer 2001;
- Initiation of two stream restoration projects in the headwaters of the Onion River which is tributary to the Sheboygan River (see discussion below):
- Removal of former fish ponds and re-establishing the stream channel – ongoing;
- Stream restoration of a historically channelized stream reach – ongoing;
- The *Broughton Sheboygan Marsh Strategic Management Plan 2001* was completed in 2001 and approved by the Sheboygan County Resources Committee in February 2002. This plan outlines mutually agreed upon responsibilities between the different units of government responsible for resource management throughout the marsh. A broad public process with representatives from local and county government, non-profit organizations, the WDNR and citizens at large were responsible for completing the plan. One key element to the plan was to have periodic complete drawdowns of the marsh to improve the biological diversity of the marsh and to stabilize cattails.
- Sheboygan County has a stream buffer initiative that has resulted in the establishment of buffers (see discussion below);
- The Sheboygan River Superfund Record of Decision was signed in May, 2000;
- A sediment transport model was developed for the Sheboygan River Lower River and Inner Harbor reaches of the Superfund site to provide more information regarding the potential for scour of PCB contaminated sediment; this is an ongoing effort with EPA, ACOE and Baird;
- Two Brownsfield sites have being remediated along the Sheboygan River in the City of Sheboygan:
- Camp Marina – a former coal gasification site. The land portion of this remediation began in 2000;
- C. Reiss Coal – A remedial action plan has been developed for the vacant multiple use industrial site, 2001;
- Under Wisconsin's Source Water Assessment Program funded by EPA as part of the Safe Drinking Act (1996), assessments are being conducted for groundwater and surface water systems and include inventories of significant potential sources of contaminants to these system – ongoing;
- The State of the Sheboygan River Basin report was published in October, 2001. This document lists accomplishments, challenges and objectives for the basin;
- The Sheboygan County Land and Water Conservation Department installed 20 acres or 16,000 feet of stream buffers in Sheboygan County;
- The Sheboygan River Partners Team (comprised of DNR and interested public) created a map depicting recent conservation activities in the Sheboygan River Basin.

Onion River Stream Restoration Projects

The streams in the upper Onion River Watershed originate from numerous groundwater discharge points and have the ability to produce high quality water with temperatures suitable to support cold water species. Water quality in these cold headwater streams has declined since settlement because of agricultural operations, aquaculture (fish farming) and recreation. Two stream restoration projects in headwater areas of the Onion River Watershed are underway to correct water quality problems and enhance habitat for fish and wildlife.

Onion River Relocation Project

This project is located directly on the upper portions of the Onion River adjacent to a dairy operation. The stream was rerouted and straightened in the early 1970s to allow for expansion of a dairy operation. The modified channel had poor habitat for fish and other aquatic life and received significant runoff from the agricultural operations. The state threatened slippershell mussel is present at this site, but at low population levels. The Sheboygan County Land and Water Conservation Department, Lakeshore Chapter of Trout Unlimited, WDNR and the adjacent landowner have teamed up to restore this stretch of river.

This project entails relocating about 1000 feet of the Onion River away from the dairy operation, installing high quality in-stream habitat and creating a wetland filter area to intercept runoff from adjacent lands. A perpetual easement was purchased to allow for the channel relocation and provide additional buffer space from the dairy, row crop and pasture activities.

Silver Springs Restoration

This project involves restoring a series of trout rearing and recreation ponds to a free-flowing river condition on Mill Creek, a headwater tributary to the Onion River. The WDNR purchased 135 acres of land that included several ponds that were dug out from natural springs. Several of the ponds are "on line" with Mill Creek and have a detrimental effect on water temperature. This project will drain 15 ponds and restore about 1000 feet of cold-water river suitable for trout and other cold water species. About four acres of shallow marsh/shrub carr wetland will also be created.

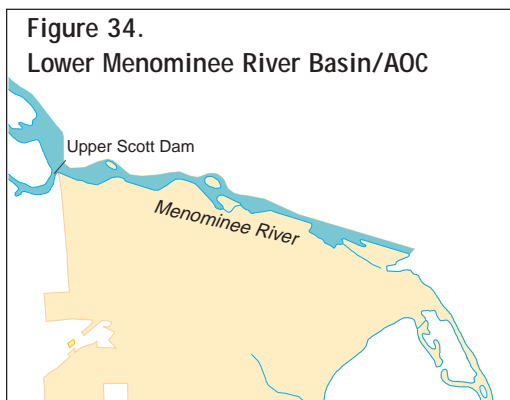
Sheboygan County Stream Buffer Initiative

The Sheboygan County Land and Water Conservation Department is implementing the County's first Water Quality Improvement Program. Since the project began in 2000, the Land and Water Conservation Department has contracted with 27 landowners and installed nearly 11 miles (62 acres) of buffer strips that reduce the amounts of sediment and agricultural runoff from entering streams.

Sheboygan Marsh Management Plan

The *Broughton Sheboygan Marsh Strategic Management Plan 2001* was completed in 2001. This plan outlines mutually agreed upon responsibilities between the different units of government responsible for resource management throughout the marsh. A broad public process with representatives from local and county government, non-profit organizations, the WDNR and citizens at large were responsible for completing the plan.

Lower Menominee River



Description

The Menominee River is a boundary water between Wisconsin and the Upper Peninsula of Michigan that drains to Green Bay. The Menominee River Area of Concern includes the lower three miles of the river from the upper Scott Paper Company dam to the river mouth and approximately three miles north and south of the adjacent shoreline of Green Bay (Figure 34). The Area of Concern includes portions of Marinette County in Wisconsin and Menominee County in Michigan.

The Lower Menominee River RAP, updated in 1996 by the WDNR, the Michigan Department of Environmental Quality and a citizen's advisory committee, addressed water quality concerns in the Area

of Concern. Implementation of this long range planning strategy continues. Some of the conditions contributing to the ecological impairments have been remediated and other actions are either ongoing or part of a long- term remediation strategy.

Highlights

A paint sludge contamination site on the shoreline of Green Bay in Menominee, Michigan, was cleaned up and wastewater treatment systems in Marinette (bypassing) and Menominee (combined sewer overflows) have been completed. An ecologically important shoreline in Marinette was designated and is protected as a Natural Area and a bulkhead line designation on the river shoreline in Marinette was removed. A coal tar contamination site has been included on the WDNR coal tar cleanup list.

Sediment Cleanup Efforts

Remediation of arsenic contamination at one of the primary contamination sites in the Area of Concern was started in 1999 and is scheduled to continue in the larger ship turning basin as part of an U.S. EPA Resource Conservation and Recovery Act (RCRA) consent order. The U.S. EPA has issued an Administrative Order of Consent requiring remediation of arsenic contamination in the Lower Menominee River Area of Concern. Ansul was required and has met the condition to remove all soft sediments from the Eighth Street Slip behind the cofferdam by the end of 1999. For a more detailed discussion of the cleanup efforts, refer to the "Contaminated Sediment Management Section."

Arsenic contamination of soil, sediment, groundwater, surface water and exposed biota was identified as a primary ecological problem within the Area of Concern. The source of arsenic was a former herbicide manufacturing facility at the site, which was identified as the greatest single source of arsenic to Lake Michigan. Ansul produced arsenic-based herbicides from 1957 to 1977. Processed wastes, including arsenic salts, were stored next to the river, and some of the wastes were discharged directly into the river. At one time an estimated 95,000 tons of waste salt were stored on site.

St. Louis River and Duluth Superior Harbor

Description

The St. Louis River and Duluth-Superior Harbor area of concern includes 39 miles of the St. Louis River below Cloquet, Minnesota, the river estuary, Duluth-Superior Harbor and the lower Nemadji River. The area of concern straddles the Minnesota-Wisconsin border (Figure 35). Minnesota has the lead for RAP coordination.



Figure 35. St. Louis River/Duluth Superior Harbor AOC

Stage 1 of the RAP, developed through a collaborative effort among the Minnesota Pollution Control Agency, the WDNR, and the Citizens Advisory Committee, identified nine of 14 beneficial uses as being impaired. Some impairments were associated with the physical loss and degradation of habitat, and with the loss of an estimated 7,700 of 12,000 acres of wetland and open water habitat in the estuary since settlement. Other problems were related more to pollution and toxicity. For years, the

river smelled bad from industrial discharges. That changed in 1978, when the Western Lake Superior Sanitary District wastewater treatment plant began operation. Nevertheless, pollution continues to come from sources such as contaminated sediments, abandoned hazardous waste sites, poorly designed or leaky landfills, airborne deposition, industrial discharges, chemical spills, improperly sewered wastes and surface runoff.

Highlights

Contaminated sediments are an important priority in the AOC. Studies conducted by state and federal agencies in the late 1990s have provided a good understanding of the type, severity and location of contaminated sediments. These studies include work done at two Superfund sites on the Minnesota side. Some upland clean-up efforts have occurred. Remediation of contaminated sediments is expected to be underway at sites on both sides of the state line by 2005.

Mercury is a contaminant of particular concern in the St. Louis River. The St. Louis River Watershed TMDL Partnership will develop a total maximum daily load (TMDL) for mercury. The TMDL process is designed to improve impaired waters like the St. Louis River, where all facilities with discharge permits are operating within their permitted limits, but have pollutant levels exceeding state standards. This process will complement the mercury-reduction efforts that are already ongoing in the watershed.

Habitat restoration and protection are also important priorities. Even though the estuary has suffered extensively from habitat loss and degradation, it also retains tremendous habitat value. Because habitat issues are such a high priority, a comprehensive habitat plan is being developed to enhance the biological diversity and ecological integrity of the lower St. Louis River. The project will provide an estuary-wide vision for resource management and conservation. It will also provide a consensus list of conservation and management objectives, targets and actions along with a project that is ready to submit for funding.

Public involvement and outreach have always been important components of this RAP. A host of partners are working together to improve the St. Louis River. These include the U.S. EPA, Minnesota Pollution Control Agency, Minnesota DNR, WDNR, local and tribal governments, Minnesota and Wisconsin universities and Sea Grant Programs, the St. Louis River Citizens Action Committee, River Watch Project, River Quest, Harbor Technical Advisory Committee, U.S. Army Corps of Engineers and numerous private businesses and individuals.

Exotic Species

WDNR has an active role in the development of strategies to research, monitor, and control nuisance (exotic) aquatic species in Wisconsin's waterways. The WDNR in partnership with the *University of Wisconsin Sea Grant Institute and UW Extension*, and through the assistance of volunteers have developed a monitoring program that includes primarily Eurasian Water Milfoil and zebra mussels.

Beyond reporting and tracking the presence of some of the more troublesome exotic species, the DNR actively participates in projects to study their effects on the ecosystem as well as develop strategies for their control. Wisconsin has developed a DRAFT *Comprehensive State Management Plan* to deal with this issue. The plan, developed in response to the National Invasive Species Act of 1996, provides the framework for a comprehensive state program to address the problems caused by invasive nuisance species. The scope of the activities are broad and aimed at preventing new introductions, controlling the spread of existing populations, and implementing abatement strategies to safeguard public health and the environment. The state will be submitting this plan to the national Aquatic Nuisance Species Task Force for their approval, which would also provide funding for the state's ANS program.

Specific initiatives involving exotics include development of ballast water management practices and standards, development of a rapid response initiative, a dispersal barrier project, and control of intentional introductions. These initiatives are designed to keep exotics from entering the Great Lakes ecosystem.

Species of Concern in Wisconsin Great Lakes Basin

Species exclusively of concern in the Great Lakes Basin are indicated with an (*).

Round Goby (*Neogobius melanostomus*)*



Round Goby

The round goby, *Neogobius melanostomus*, is a bottom dwelling fish with a large head, resembling a tadpole, which can grow to be 250 mm (10 inches). First discovered in Lake St. Clair in 1990 after being introduced via ballast water from transoceanic vessels, the round goby has spread to lakes Erie, Michigan and Superior. Round gobies are thriving in the Great Lakes Basin because they are aggressive, voracious feeders which can forage in total darkness. The round goby takes over prime spawning sites traditionally used by native species, competing with native fish for habitat and changing the balance of the ecosystem. Of primary concern is their ability to prey on the eggs of other fish, particularly Lake Trout, thus impacting their numbers.

Sea Lamprey (*Petromyzon marinus*)*

Sea lamprey, *Petromyzon marinus*, are predaceous, eel-like fish native to the coastal regions of both sides of the Atlantic Ocean. They entered the Great Lakes through the Welland Canal about 1921. They contributed greatly to the decline of whitefish and lake trout in the Great Lakes. The sea lamprey has had a devastating impact on lake trout and whitefish. By the 1960s, a sea lamprey control program had reduced their abundance by 90% to the point where lake trout and whitefish could once again thrive in the Great Lakes.



Sea Lamprey

Rusty crayfish (*Orconectes rusticus*)

Rusty crayfish, *Orconectes rusticus*, are native to streams in the Ohio, Kentucky, and Tennessee region. Spread by anglers who use them as bait, rusty crayfish are prolific and can severely reduce lake and stream vegetation, depriving native fish and their prey of cover and food. They also reduce native crayfish populations. Rusty crayfish populations are limited to northern Wisconsin lakes.



White Perch

White Perch*

Native to Atlantic coastal regions, white perch invaded the Great Lakes through the Erie and Welland canals in 1950. Prolific competitors of native fish species, white perch are believed to have the potential to cause declines of Great Lakes walleye populations. White perch have been found to eat the eggs of walleye, *Stizostedion vitreum*, white bass, *Morone chrysops*, other white perch and possibly other species as well. Another concern is that white perch, actually a species of the bass genus (*Moronidae*), have hybridized with native white bass in western Lake Erie. These hybrids were first noted in western Lake Erie in the early 1980s, the same time when white perch were increasing in abundance in this area. An excellent panfish highly regarded as a food fish in the Eastern United States, it is not often exploited as a game fish and generally is regarded as undesirable, especially when over-population in fresh waters causes the species to become stunted.

Flowering rush (*Botumus umbellatus*)

Flowering rush, *Botumus umbellatus*, is a perennial plant from Europe and Asia that was introduced in the late 1800s in the ballast water of ships and has been repeatedly introduced in the Midwest as an ornamental plant. It grows in shallow areas of lakes as an emergent and as a submersed form in water up to 10 feet deep. Its dense stands crowd out native species like bulrush. The emergent form has pink umbellate-shaped flowers, and is 3 feet tall with triangular shaped stems.

Curly-leaf pondweed (*Potamogeton crispus*)

Curly leaf pondweed, *Potamogeton crispus*, is an exotic plant that forms surface mats that interfere with aquatic recreation. The plant usually drops to the lake bottom by early July. Curly-leaf pondweed was the most severe nuisance aquatic plant in the Midwest until Eurasian watermilfoil appeared. It was accidentally introduced along with the common carp. Curly-leaf pondweed is frequently present at nuisance levels on some inland Wisconsin lakes. It can be controlled with mechanical harvesting or chemical treatment.

Zebra mussel (*Dreissena polymorpha*)

The zebra mussel (*Dreissena polymorpha*) is a tiny (1/8-inch to 2-inch) bottom-dwelling clam native to Europe. The mussel takes its name from its striped shell. Zebra mussels were introduced into the Great Lakes system in 1985 or 1986 and first turned up in Lake St. Clair. They have spread throughout the Great Lakes and Mississippi drainage systems. Zebra mussels were first found in Wisconsin waters of Lake Michigan in 1990.



Zebra mussel

Since that time, zebra mussel populations have expanded their range in Wisconsin to include: the nearshore areas of Lake Michigan from Racine to Washington Island, Green Bay, Superior Harbor, the Mississippi River, 30 inland lakes in nine counties, the Lower Fox River, a portion of the Bark River in southeastern Wisconsin, and a number of rivers that are tributary to Lake Michigan. Figure 36 shows how zebra mussels have expanded their range in Wisconsin from 1994 to 2002. Zebra mussel populations are highest in

Green Bay where densities are approaching levels found in Lake Erie. Resource managers are particularly concerned about the potential impacts to the food chain, native clams and fisheries in Wisconsin's waters.

Another area of concern is the Mississippi River where the population of zebra mussels is steadily increasing to over several thousand per square meter in some portions of the river. Unusually low dissolved oxygen concentrations in the range of 3-4 mg/L were observed in portions of the Mississippi River during the early summer periods of 1997 and 1998. High concentrations of zebra mussels were likely contributing to the low dissolved oxygen levels. Water clarity improved

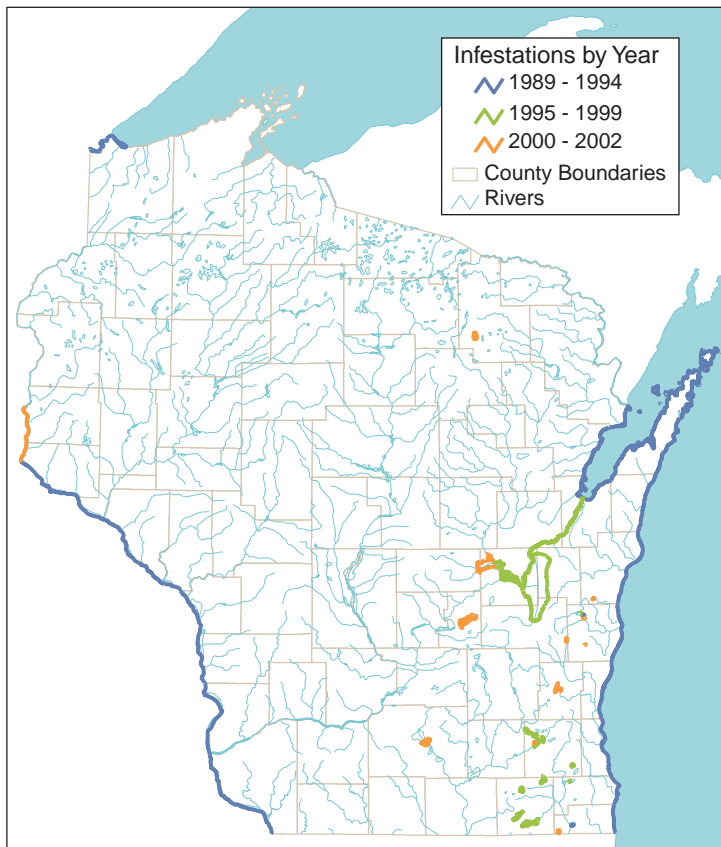
dramatically in some part of the Mississippi River in the late summer of 1997 which was likely influenced by the filter feeding activity of zebra mussels. These results are consistent with findings in other riverine systems where zebra mussels are present.

Zebra mussels are also negatively impacting native mussel populations in the Mississippi River. Native mussels are being smothered by high concentrations of mussels that attach themselves to their shells. A recent survey by the Corps in the East Channel of the Mississippi River at Prairie du Chien has revealed a substantial reduction in the diversity and density of native mussels. The decline was likely the result of zebra mussels whose densities reached over 10,000 per square meter in 1998. The East Channel was one of the best mussel beds in the Upper Mississippi River. Future efforts are being considered to relocate native mussel beds to other waters that are less likely to be impacted by zebra mussels.

Financial impacts have been significant to Wisconsin's water utilities (about \$4 million based on 1993 figures) and to power plants (approximately \$1 million in 1993). Although some costs have also been incurred by the lock and dam operators on the Mississippi River, these costs have been substantially less than for the raw water users. The environmental costs of the zebra mussel invasion to water resources

are more difficult to quantify, and in most cases, are unknown. The long-term costs, however, are likely to be significant. Ecological studies have recently been completed on two inland Wisconsin lakes where zebra mussels first invaded in 1994. The results of these studies should provide more information on the ecological impacts.

Figure 36. Zebra Mussel Infestations 1989-2002





Eurasian watermilfoil

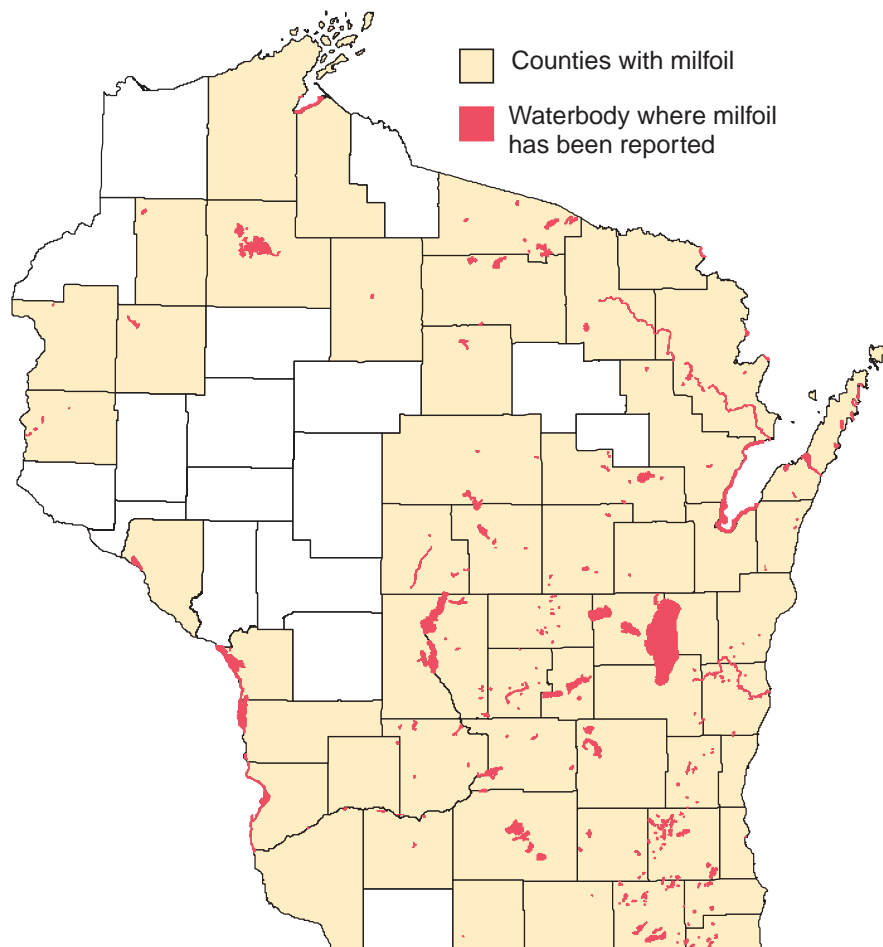
Eurasian watermilfoil (*Myriophyllum spicatum*)

Eurasian water milfoil (*Myriophyllum spicatum*) is a submersed aquatic plant native to Europe, Asia and northern Africa. It is one of eight milfoil species found in Wisconsin and the only one non-native to the state. Generally, the plant goes unnoticed until it has established itself in a lake and become a nuisance.

Eurasian watermilfoil first showed up in Wisconsin's counties in the 1960's. In the past three decades, this exotic species has significantly expanded its range to about 310 lakes in 54 of Wisconsin's 72 counties. The range of Eurasian watermilfoil has expanded in Wisconsin. Because of its potential for explosive growth and its incredible ability to regenerate, Eurasian watermilfoil can successfully out-compete most native aquatic plants, especially in disturbed areas. In a number of Wisconsin lakes, Eurasian watermilfoil has formed huge monoculture stands with vast mats of

surface foliage that shade-out native aquatic plants and diminish the aesthetic beauty. Recreational activities like swimming, boating and sport fishing are also diminished on Wisconsin lakes infested with Eurasian watermilfoil. A variety of techniques have emerged for controlling Eurasian watermilfoil populations on Wisconsin's lakes. These techniques include mechanical cutting and harvesting in open areas, limited use of herbicide treatments and more recently the introduction of weevils as a biological control agent. A 1992 WDNR report to the Wisconsin Legislature on Eurasian watermilfoil provides more details on how Wisconsin has, and will continue to deal with this aquatic nuisance species.

Figure 37. Eurasian Watermilfoil Infestations 2002





Ruffe (*Gymnocephalus cernuus*) *

The Eurasian ruffe may pose a threat to water environments and commercial and sport fishing due to its competing with native fish for food and habitat. First reported in 1986 in Lake Superior, the ruffe population has increased in the St. Louis River at Duluth-Superior and spread to rivers and bays along the south shore of western Lake Superior. Ruffe competes specifically with walleye, yellow perch and a number of small forage fish that are currently threatened by expansion of the ruffe's range.

Spiny Water Flea (*Bythotrephes cederstoemi*) *

The spiny tailed *Bythotrephes* is a crustacean that invaded North America in the 1980s and is now established in all the Great Lakes. This small shrimp-like animal grows to an average of 10 millimeters in length and feeds on other small aquatic animals. This zooplankton has the potential to have a profound effect on the balance of the Great Lakes fisheries.

Fish Hook water flea (*Cercopagis pengoi*)

This tiny crustacean is related to shrimp, crayfish, and the spiny water flea. It becomes tangled on fishing lines, creating problems for anglers. Also, its rapid reproduction rate may pose an ecosystem threat due to potentially high densities in the system, resulting in the decline of native zooplankton species.



Purple Loosestrife

Purple Loosestrife (*Lythrum salicaria*)

This highly aggressive wetland plant invades marshes and lakeshores, replacing cattails and other native plants by forming dense, impenetrable stands that do not provide good habitat or shelter. Purple Loosestrife places many wetland plants and animals at risk. One adult plant can disperse 3 million seeds annually, and is able to re-sprout from roots and broken stems that fall to the ground or into the water. There are currently no known North American predators of Purple Loosestrife.

Daphnia lumholzi

This exotic zooplankton species appears to be poised to invade Lake Michigan through the series of locks, dams and artificial canals on the Illinois River. This species of *Daphnia* is larger and has more spines than the North American *Daphnia*, which make it difficult for young fish to consume. This protection may lead the non-native *Daphnia* to replace native species, potentially reducing survivorship of young sport and food fishes in lakes, rivers and fish hatcheries.