Wisconsin 2006

Water Quality Assessment

Report to Congress

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DEPT. OF NATURAL RESOURCES

Wisconsin Water Quality Report to Congress, 2006

Section 305(b) of the Federal Clean Water Act requires that states report an assessment of their water quality to Congress; these reports are referred to as "305b Reports" and provide a summary of water programs and resource condition on a statewide basis every two years.

The state's 2006 Water Quality Report to Congress is now available in electronic format. Previous reports were published in 2004, 2002, 2000, 1996, 1994, 1992, 1990, 1988, 1987 and earlier.

WDNR's earlier documents are available for review at the GEF II building, 101 S. Webster Street, Madison. Later versions are available electronically (see left column).

Bad River Bend, Wisconsin.
WDNR Photo

This 2006 Water Quality Report to Congress summarizes assessment progress and activities related to water quality protection during the past two years. This document is an online publication only. A limited number of physical copies are available for distribution.

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Letter to Citizens

Bass Lake, Wisconsin.
WDNR Photo

This 2006 Water Quality Report to Congress provides an overview of the status of Wisconsin's water resources and introduces you to the multiple initiatives underway in our state to manage and protect our resources. Recently much work has taken place to evaluate and improve the way water resources are understood and managed in Wisconsin. During the last four years, the Water Division of the Department of Natural Resources has conducted a critical evaluation of its underlying objectives, goals, and successes and set four strategic objectives related to the long-term protection and management of water. These objectives are not stand-alone words on paper -- they provide the framework for how the water program is organized and what the goals and performance measures for water-related resource integrity are for the Department and its many valued partners and customers. The over riding objectives for how Wisconsin's water resources are managed include:

- Protecting the Public Trust
- Implementing the Clean Water Act
- Sustaining Healthy Fisheries
- Providing Safe Drinking Water and Groundwater

This report responds to the Federal Environmental Protection Agency's guidelines for a report documenting the state of our state's water resources, but the information presented ties back to and is closely organized around these four fundamental strategic objectives. Without clean and abundant drinking water and groundwater, it would be difficult to restore and protect our state's extraordinary fisheries (many of our fisheries rely on the cold, clean baseflow that abundant groundwater provides). And, if we don't know about the health and welfare of our fisheries and other aquatic life, it is impossible to set meaningful biologically based goals for protecting the quality of rivers and lakes and implementing the Clean Water Act. And finally, underlying all the objectives articulated above, it is a fundamental directive of the agency to protect, restore, and provide access to our state's shared water resources through protecting the Public Trust -- ensuring that our public water resources are available in a quality state for the people of Wisconsin, and that they are protected in perpetuity.

Sincerely,

Todd Ambs, Water Division Administrator

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Executive Summary

This 2006 Water Quality Report to Congress describes the condition of our state's wealth of aquatic resources – 84,000 miles of streams, 1.2 million acres of freshwater inland lakes, abundant, diverse wetland communities, complex groundwater aquifers, nationally acclaimed Great Lakes shorelines and tributary rivers, and our historically and culturally rich Mississippi River. Wisconsin's wide variety and shear number of aquatic resources require strong leadership and strategic direction. Wisconsin's citizens recognize the value of our resources and continue to support quality management and protection of our many aquatic resources owned in trust for and by the "public" – each of us who live, work and play in Wisconsin.

In 2006, years of strategic planning culminated in a new direction for improving customer service and protecting and maintaining Wisconsin's water. During the January 2005 through December 2006 Clean Water Act reporting period, the Water Division realigned its management structure, which set into motion improved communication, heightened information sharing, stronger technical support structures, and improved resource-based management approaches. This strategic realignment refocused technical expertise in fisheries, groundwater, and watershed back to the primary business of monitoring, evaluating, and managing resources through science-based data gathering and decision making.

The Water Program's work is guided by four overarching objectives, corresponding goals, and work-specific performance measures. The Program's vision is to link activities conducted by each employee, external contractors, and joint projects with partners and the public to the four strategic objectives below.

Four Objectives of the Water Division

- Protect the waters of the state that are held in trust for all the people of the state through enforcement of the Public Trust Doctrine.
- Fully implement the Clean Water Act in order to achieve the goal of fishable and swimmable waters throughout Wisconsin.
- Protect drinking water and groundwater resources for both human and ecosystem health.
- Enhance and restore outstanding fisheries in Wisconsin's waters.

Use Designations, Assessments and Monitoring

Wisconsin has been given the privilege and the responsibility to implement the Clean Water Act. A primary component of this work involves designing a system for "classifying" water into meaningful categories necessary for protecting the quality of those waters. Water quality classifications or "use designations" are the fundamental basis of most all other Clean Water Act management actions. Use designations, along with water quality criteria and anti-degradation measures, form the three "legs" of the state's water quality standards program. During this reporting period, the state began the process of researching and designing updates to its water quality standards and assessment program to reflect new science and information.

Monitoring is the necessary companion to the use designation effort, for it is through the scientific analysis of water quality condition that resource managers make sound regulatory or other decisions. The state's monitoring strategy and assessment strategy are interlinked -- as we are able to generate more scientifically valid monitoring data, more options are available to the state for using that data in an improved assessment approach.

Conversely, national experts in USEPA and their partner agencies are advocating for increased use of biological data in the methodologies that states use to evaluate and target resources. This

leadership at the federal level is influencing the way our state is planning for and executing monitoring and assessments. There is awareness and an increased emphasis on paired biological and chemical monitoring, as well as more emphasis on analyzing fisheries, aquatic macroinvertebrate, and habitat data to determine waterbody potential and status.

The state's strategic monitoring plan, forged over years of hard work to find common ground and mutual activities, embraces efficiency and resource sharing. The strategy identifies three data sources for understanding our water: citizen based monitoring, agency based monitoring, and partner agency based efforts. Wisconsin relies heavily on the efforts of partner agencies (county health departments, USGS) and citizens to gather all the data necessary to understand our water resources. WDNR is uplifted and inspired by the valuable contributions of the state's citizen based stream and lakes monitors. In 2005-06 the Citizen Based Stream Monitoring Program joined our ever-growing group of 1200 Self-Help Lakes Volunteers. Throughout the state, water quality biologists forged new ground by regularly participating with citizens to better understand our waters through joint field efforts.

Water Condition

About one-third of Wisconsin's rivers, streams, lakes, and flowages have been assessed to determine if the quality of the water and aquatic life meet the Clean Water Act goal of "swimmable, fishable waters". Most waters in the state – ones that have been assessed – have faired moderately well. However, the vast majority of waters are affected to some extent by human activities including: agriculture and urban related polluted runoff, manure spills, loss of impervious surface areas, saturation of soil with excess phosphorus, hydrologic modifications and loss of in-stream and riparian habitat. The most affected of these waters are listed on Wisconsin's impaired waters list. Impaired waters are streams and lakes that are not meeting minimum level of quality and which require further analysis and management actions.

Water Management

Wisconsin's progressive underpinnings remain vibrant and strong in the state's ever-evolving search for providing higher quality, more accessible and scientifically sound, and more efficient ways to understand and manage water. As sources of water pollution have evolved, so has the state's approach to managing waters. During the reporting period, the state initiated a strategic analysis of level of effort expended for different types of regulatory work. While over time, the state's pool of point source discharges has grown due to the increases in population, businesses, and urban /suburban residences, the emphasis of DNR staff and resources with regard to point versus non-point issues has been shifted toward the non-point source issues.

The state is purposefully emphasizing innovative programs such as "Green Tier", where the state's 'clean players' receive regulatory relief in exchange for 'going that extra mile' to protect and manage resources – before damage is done. Alternatively, more emphasis is placed on regulating and preventing problems associated with large farms, manure spreading, and land spreading activities which may result in excess nutrients and other pollutants to our surface waters. Greater emphasis statewide is now also placed on recognizing and protecting surface water and groundwater interactions, as the state's Water Quantity legislation is fully implemented.

And finally, the entire water program – fisheries, watershed, and groundwater – continues to work together to provide stewardship of the state's valuable waters, aquatic life, recreational opportunities, and public health protection.

Combined, these actions help keep Wisconsin's waters healthy and vibrant, providing high quality resources for our next generation of… rafters, swimmers, anglers, congressional representatives, farmers, shopkeepers, parents, grandparents, children and others…

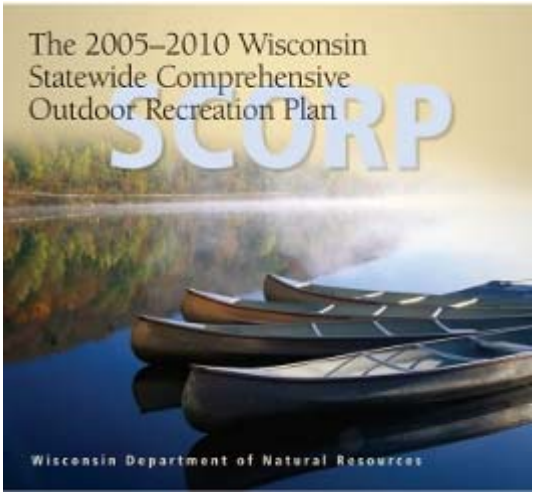
Introduction

Wisconsin residents are fortunate to live in a state bountiful with natural resources, including our many and varied lakes, streams, wetlands, aquifers, and springs. Every other year, the Wisconsin DNR reports on the quality of these water resources to the United States Environmental Protection Agency (USEPA), which in turn shares this information with the United States Congress. The information we provide is considered by federal legislators as rule making, budget appropriations, and programs are evaluated or considered.

The 2004 Water Quality Report emphasized Wisconsin's strategic monitoring efforts, including creation of tiered monitoring efforts, formal strategies, and emphasis on accountability. This 2006 report introduces Wisconsin's special efforts to evaluate and adopt new assessment approaches for fish and aquatic life, recreation, public health, and drinking water designated uses that reflect science and methods advocated by national experts and regional liaisons. The assessment work builds upon and influences the state's monitoring strategy. While the work products are under development, this work will be a significant element of Wisconsin's water quality planning and management program in the coming years.

A related high priority for WDNR's Water Program is the preservation and management of shorelines and sensitive waters throughout the state. Thousands of people each year visit our state's treasures. Many residents and visitors alike appreciate the beauty of dusk over a quiet lake in summer, with only a loon's call or the buzz of damselflies to stir the imagination in tranquil moments. Conversely, a growing number of visitors find pleasure in active water sports, as is evidenced by the emergence of creative new recreational craft used throughout the state.

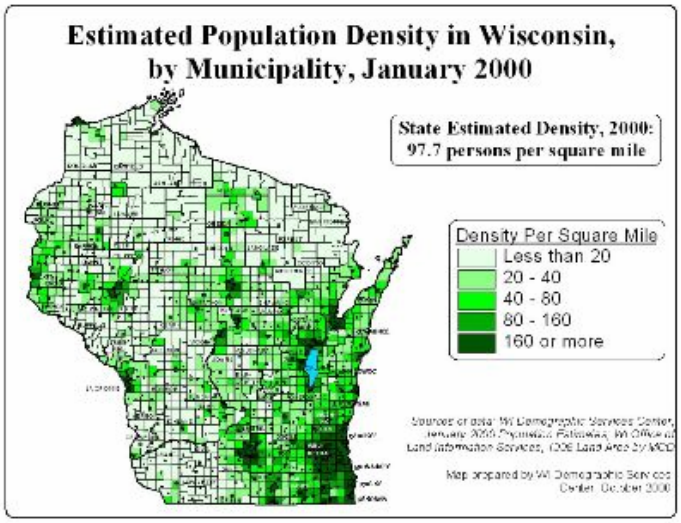
Regardless of the preferred water-based fun, it is clear that water recreation is a major theme in Wisconsin, providing an important component of our tax base , as well as a valuable incentive for better understanding, protecting and managing our water related resources. Travelers generated $11.5 billion in revenue in 2005 for the state, including over 300,000 full-time job equivalents. On the resource side, Hemken and Ivers (2005) evaluated adult recreational activities over a 10-year period (1992-2002), finding that rates of participation in hunting and fishing remained stable in Wisconsin, compared declines in other regions the United States.

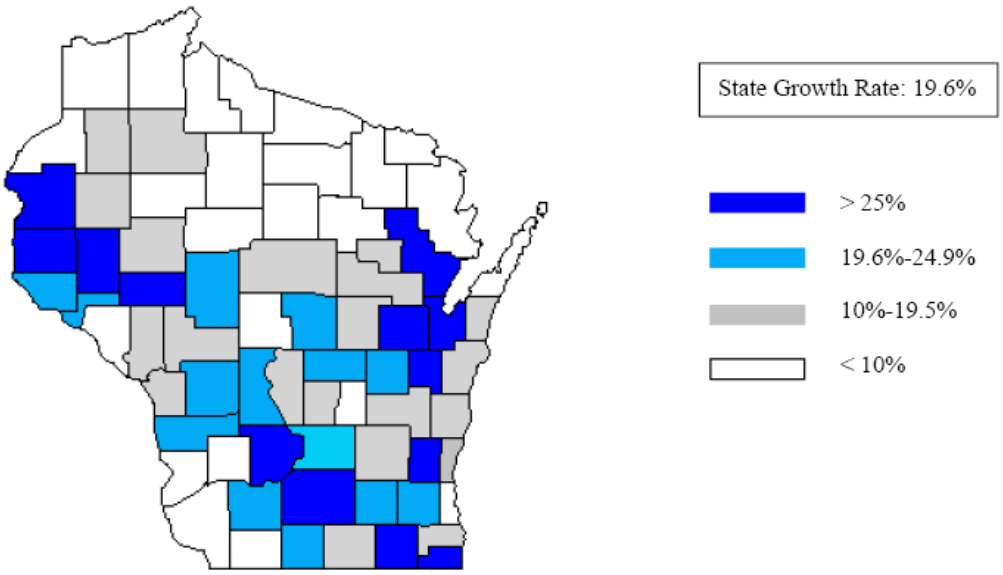


The trends we've seen in the past look like they will continue. Detailed projections of recreational uses, including water related outdoor activities (see: 2005-2010 Wisconsin Statewide Comprehensive Outdoor Recreation Plan (SCORP) indicate that water (and associated resources) is becoming increasingly valued for a wider variety of activities by a broader base of individuals.

Perhaps not coincidentally, this trend is clearly

emerging at the same time that water and land resources preserved in a natural state are becoming more scarce. Population density figures (2004) compiled by the Department of Administration illustrates the magnitude of human pressure exerted on natural resources, with growing pockets of high density (red areas) sprinkling the north and western portions of our once sparsely populated state. The maps at right shows dramatic forecasts for land use change, particularly in the north, as people have moved to "the North" for primary or secondary residences. A DOA Report in 2004 *(Wisconsin Population 2030, A Report on Projected State, County and Municipal Populations and Households for the Period 2000-2030)* projected the following county level growth rates below, showing heavy pressure in the northeast and northwest as well as the throughout the south and southeast corridor of the state.





Fastest Growing and Largest Counties

The University of Wisconsin's Applied Population Laboratory estimates that the number of housing units per square mile will continue to grow significantly in the North Woods; the places where housing unit density will remain low are dominated by national, state, or county forests.

Wisconsin leaders recognize this connection and have passed Smart Growth legislation to help address the need for thoughtful, considered growth especially near those areas that help define 'who we are' as a state.

Despite, *and* because of, these trends, Wisconsin is redoubling efforts to strategically manage water. The Water Division has identified four critical objectives and a series of goals and performance measures and a forum for describing successful steps taken ("Success Stories") to provide meaningful evaluation of our progress over time. This 2006 Water Quality Report describes the condition of our water today through the prism of existing knowledge, an eye on future trends, and strategies for protecting and preserving this irreplaceable resource.

Totogatic River, DNR Photo

Recommendations

Wisconsin will be providing recommendations for the 2006 Water Quality Report to Congress under separate cover. Recommendations will be developed through the Water Division's strategic water management framework and associated policy management teams.

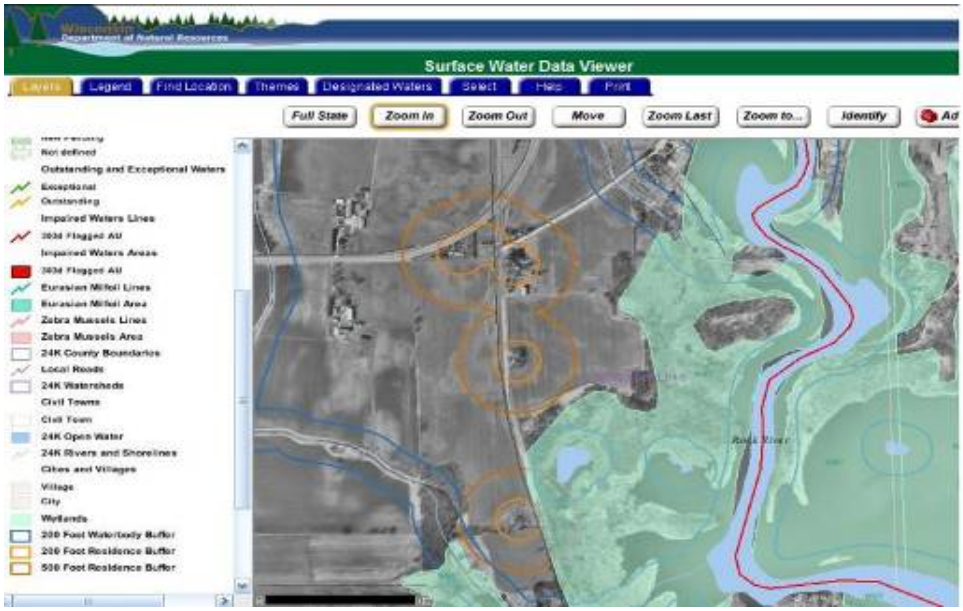
Allouez Bay, Bureau of Endangered Resources

Atlas Data

Wisconsin is a water rich state, with many thousands of streams stretching nearly 84,000 miles in length. Based on 1:24,000 scale USGS Topographic Quadrangle Maps (publish date varies), and GIS interpretation of those maps, Wisconsin has over 40,000 perennial stream miles and an equal number of intermittent miles.
The state's many inland lakes span over 1.2 million acres. Wisconsin also has over 1,000 miles of Great Lakes shoreline on lakes Michigan and Superior and over 5 million acres of wetlands. Groundwater in the state is similarly naturally rich, with human-induced stressors precipitating the need for increased management.

Historically the state has managed water over this expanse by dividing the task among 32 basins and 330 watersheds, with the watersheds roughly equivalent to the 10-digit HUC codes. Below are the water management units. To interactively view surface water resources, see the state's Surface Water Data Viewer.

Below is a map showing an example of what type of data you can obtain in the viewer. For more information, see: monitoring data. || water quality assessments. || water quality standards.



Science and Innovation

During 2004 and 2005, the WDNR's Science Services researchers advanced a number of projects that are helping define how resources are managed. Below are summaries of watershed and fisheries related research projects, as well as a set of links to websites with more information.

Watershed Studies

Development and Evaluation of Watershed Models for Predicting Potential Stream Condition and Making Land Use Decisions

The goal of this study is to develop and test models that quantify stream biological expectation and to predict how watershed land uses will influence the realization of this expectation. The approach used is to develop models that predict stream segment temperature, flow, and biological conditions based on climate, surficial geology, topography, soil, vegetation, and land uses for various regions of Wisconsin. These models are then linked to classify and map Wisconsin stream segments to explore how projected land-use changes may affect stream conditions for selected watersheds. Collection of field physical and biological data and developing GIS layers for watershed characteristics for this study is complete. The data modeling process has begun.

These models can be used to classify stream reaches that lack adequate fish data and to estimate how watershed land-use has influenced thermal regimes, flow patterns, and fish communities across broad regions. Fisheries managers will be able to compare the expectations for a specific watershed with its current condition to determine its potential for improvement and to establish more realistic fishery goals. Watershed managers and planners can use these models to predict biological conditions under different land use scenarios. Based on the stream classification, sampling and inventory efforts can be better allocated among watersheds and streams to maximize efficiency and statistical reliability for bioassessment. Currently, the Water Division is developing new protocols for assessing water resource potential. Managers are hoping to use this model to help with water quality standards' aquatic life use categorization work in the coming years.

Evaluation of the Wisconsin Priority Watershed Program for Improving Stream Habitat and Fish Communities

This project was designed to determine the extent to which installation of best management practices (BMPs) improves the quality of aquatic resources. The study design is to sample habitat and fish communities using standardized procedures with known accuracy and precision at treatment and reference streams several years before and several years after BMP installation. And two physical habitat (one for low and one for medium-high gradient) and two fish biological indices (one for coldwater and one for warmwater) have also been developed and tested. Fish and habitat data from 81 sites on 33 streams for five priority watersheds and their reference watersheds during the past 14 years have been stored in a centralized database.

The evaluation of the Spring Creek Watershed, which demonstrated significant habitat and fish community improvements after BMP implementation is complete and has been published. The Otter Creek completed watershed evaluation is in the publication process, but results indicate that improvements were less than anticipated. Habitat conditions improved in Otter Creek, but fish

communities did not. One reason the fish community may not have improved significantly could be because an adequate fish community was present prior to the project and implementation of BMPs that would most directly influence the fish community -- upland sediment control and riparian protection -- were not implemented at a level high enough to elicit a response in the fish community.

Impacts of Watershed Urban Land Use on Coldwater Streams

This study was designed to develop models that describe relations between watershed urban land use and biological communities and to answer the question "at what level of watershed urban development can a coldwater stream no longer support trout populations?" Thirty-nine (39) coldwater streams with different levels of watershed urban development for physical habitat, water temperature, base flow, fish, and macroinvertebrates were sampled. Urban land use in both riparian and watershed were digitized using GIS. This study is complete and published. Results indicate that stream base flow and biological indices decrease dramatically for watersheds with 7-11% impervious area, beyond which stream base flow is consistently low and biological indices are consistently poor. Trout were not found in streams with more than 11% impervious surface area.

The models developed from this study will be used to predict stream quality for projected urban development, which can be used by policymakers, resource managers, planners, and developers to design strategies to minimize the impacts of urban development on coldwater streams.

Monitoring & Management Studies

Impacts of Phosphorus and Nitrogen Concentrations on the Biological Integrity of Wisconsin Streams

The objective of this project is to determine what phosphorus and nitrogen concentrations impair stream biological integrity; to develop a database that can be used to refine the phosphorus criteria for Wisconsin streams; and to determine how watershed characteristics affect the relation between phosphorus, nitrogen, and biological communities. DNR has gathered data for nitrogen, phosphorus, other physical and chemical variables, periphyton, macroinvertebrates, fish, and physical habitat from 160 headwater streams, 80 larger but wadeable streams, and 40 nonwadeable streams/rivers. DNR gathered watershed land use and identified periphyton and macro- invertebrate community composition. Staff are now in the process of analyzing the data and the results will be available during this next reporting period. The results of this study will be used to help interpret Total Maximum Daily Load (TMDL) data and to refine nutrient criteria.

Status Assessment and Development of a Fish Index of Biotic Integrity (IBI) for Small Warmwater Streams

The objectives of this study are to evaluate fish and habitat status and to develop a fish IBI for very small and intermittent warmwater Wisconsin streams. Ninety-eight (98) small warmwater streams throughout the state with different levels of impairment (from least to highly impacted) were sampled for fish and habitat twice a year for two years. Watershed boundaries were delineated and land use information for these stream catchments was gathered. The results from this study will provide information on fish and habitat conditions for these small warmwater streams, which is currently unknown. The IBI developed here will provide a tool for setting regulatory criteria and bioassessment for these types of streams.

Comparison of Multi-level BMPs for Improving Stream Quality

This study is designed to evaluate if current levels of BMP installation improve stream habitat, fish, and macroinvertebrates and to examine if riparian buffer width has any influence on the upland BMPs effectiveness. Thirty-eight (38) small watershed streams with different levels of agricultural impairment and with different levels of BMP implementation (high impact - high BMP; high impact -low BMP; low impact - high BMP; low impact - low BMP) were sampled. Field data collection on fish, macroinvertebrates, and physical habitat is also complete. Riparian and watershed land use data was gathered and watershed BMP implementation information was assembled. The results from this study will help researchers and managers understand if large-scale, low-level BMP implementation will improve stream quality. With this knowledge, resources can then be allocated more effectively.

Development of a Probability-Based Stream Monitoring and Assessment Strategy

The purpose of this study is to find a cost-effective approach for better understanding the state's resource condition. This work will help stem the loss of stream resources and help improve understanding of factors impacting water so that the state can more effectively monitor, assess and manage resources. The resulting information will be used to guide and evaluate stream resource assessment and management activities, and educate the public and political policy makers.

This collaborative project is designed to:

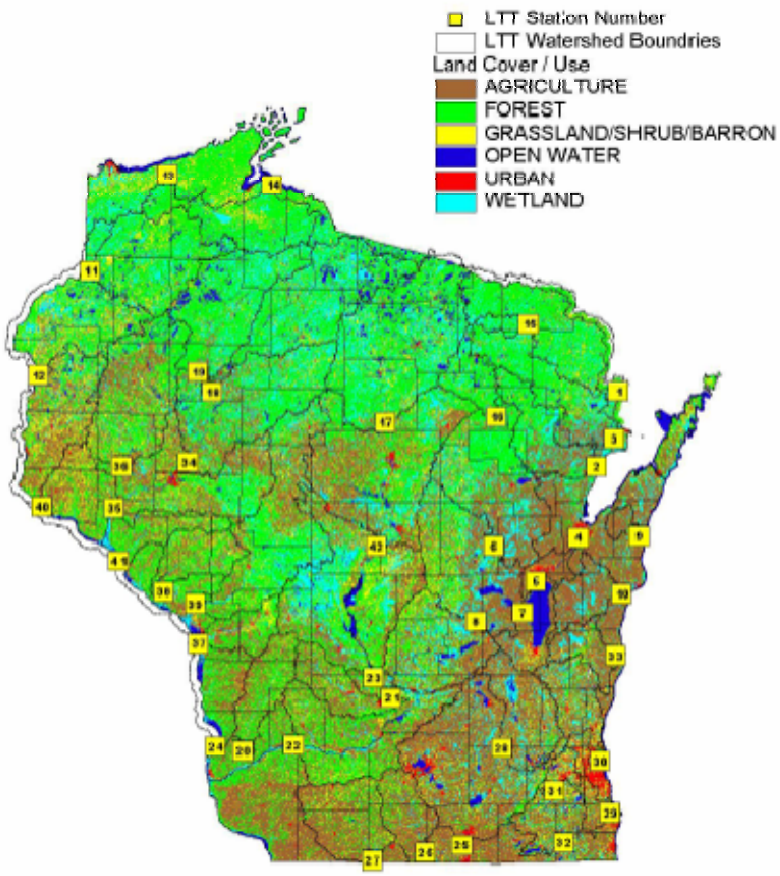
- determine whether three different methods used to select stream assessment sites significantly influence field data gathered to evaluate the condition of individual and populations of streams;
- investigate how large-scale catchment attributes affect riparian and in-stream habitat and water chemistry, which in turn influence the biological integrity of streams; and
- pilot the development of a multi-metric macroinvertebrate index for wadeable streams in the driftless region ecoregion in western Wisconsin, and subsequently apply this process to develop a macroinvertebrate index for the entire state. The results of this study will improve WDNR wadeable stream monitoring and assessment program and advance and institutionalize the use of probability based monitoring in Wisconsin.

Development and Validation of a Macroinvertebrate-Based Index of Biotic Integrity (IBI) for Low-Gradient Streams

Biotic assemblages in low-gradient streams are inherently different from those assemblages inhabiting medium to high gradient streams. Assessment tools developed through empirical modeling of data collected from medium to high gradient streams inaccurately score the ecological integrity of low-gradient systems. Therefore, we propose to tailor a macroinvertebrate-based IBI to low-gradient streams.

Fifty-nine (59) sites will be used to develop the index and twenty-two (22) sites were set aside for validation. Watershed, reach, and local scale variables will be used to determine environmental conditions at the sites independently of the biota. Macroinvertebrate metrics that correspond with the independent assessment of environmental condition will comprise the IBI. The macroinvertebrate-based IBI tailored for low-gradient streams is intended for use in Wisconsin's Baseline Monitoring Program. The table below contains links to reports on these and other DNR research activities.

WDNR Research Areas	
Topic Area	Link
Fisheries	Technical Bulletins- Fisheries and Aquatic Communities
Ecosystems	Technical Bulletins- Environmental Restoration Ecology
Contaminants	Technical Bulletins- Environmental Contaminants
Social Science	Technical Bulletins- Social Science and Recreation
Fisheries	Research Reports- Fisheries and Aquatic Communities
Fisheries	Research/Management Findings- Fisheries and Aquatic Communities
Fish and Habitat	Fish and Habitat
Fish and Habitat	Biological Indices



Water Management Programs

A broad range of programs contribute to improvements to water quality. Principle among them:

Runoff Management

Control of polluted runoff continues to be one of the most important challenges in the state's effort to protect the quality of Wisconsin's water resources. Three primary components of the WDNR's runoff management program include implementation of runoff management *grant programs, point source permitting of storm water and agricultural runoff sources, and implementation of state regulatory performance standards.*

Urban and rural land use activities are the source of runoff pollutants entering Wisconsin's lakes, streams, wetlands and groundwater. Common pollutants in runoff include the following:

- Sediment from construction sites, croplands, and other urban and rural sources;
- Nutrients and pesticides from both urban and rural sources;
- Oil, grease, heavy metals, and other toxic materials from impervious surfaces such as streets, highways, roof and parking lots; and
- Farm animal wastes from barnyards and pet wastes from urban areas.

The effects of polluted runoff can be seen in degraded fish habitat, fish kills, nutrient-loaded waters causing heavy weed growth, degradation of drinking water supplies, siltation of harbors and streams, diminished recreational uses, and changes in the natural hydrology of streams, rivers, and lakes.

To address these pollutant problems, water quality managers encourage landowners and municipalities to implement and install "best-management practices" (BMPs) in rural and urban areas. BMPs, such as buffer strips, nutrient management, manure storage facilities, or detention ponds, help to prevent movement of pollutants to surface water and groundwater.

The state's efforts to restore water resources affected by polluted runoff center around Wisconsin's runoff management program. The program is embodied in nine administrative rules promulgated in October 2002 to address urban and rural runoff pollution problems statewide; eight are administered by the WDNR and one is administered by the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP).

For more information about Manure Management, see: http://www.manuretaskforce.wi.gov/

Wisconsin has been recognized as a leading state in the effort to control polluted runoff. The runoff management program is a joint effort of the WDNR, the DATCP, county Land Conservation Departments (LCDs), and municipalities, with assistance from a variety of federal, state, and local agencies, particularly the USEPA, the USDA Natural Resources Conservation Service (NRCS), and the University of Wisconsin-Extension.

Runoff Grants

The WDNR's runoff management grant programs include the Priority Watershed/Lake Program, the Targeted Runoff Management (TRM) Grant Program, and the Urban Nonpoint Source and Storm Water Management (UNPS) Grant Program. Each of the grant programs offers cost-sharing assistance to local units of government who, in turn, assist landowners in the implementation and installation of BMPs to control nonpoint source pollution. The three programs are described in further detail below.

Priority Watershed/Lake Program

The Priority Watershed/Lake Program provides financial assistance to local units of government in selected watersheds to address land management activities, which contribute to urban and rural runoff. The WDNR issues grants for the implementation of watershed/lake projects through a cost-share approach. The grantees use the funds to reimburse costs to landowners for voluntarily installing BMPs. From the start of the program in 1978 through December 31, 2005, approximately $193 million in cost-share grants has been provided to the priority watershed/lake projects.

Since the program began, 86 of the state's watersheds and lakes were designated as priority watershed or lake projects. Twenty-nine of the 86 projects are currently active and in the implementation phase. All of the remaining projects are completed. In 1997, the Wisconsin legislature significantly changed the direction of the state's runoff grant management program. The 1997 Wisconsin Act 27 placed the Priority Watershed/Lake Program, into a multi-year phase-out period. Funding for ongoing watershed and lake projects will continue through 2009, and no additional projects will be started.

Priority Watershed/Lake Project goals focus on water quality improvements or protection resulting from reductions in pollutant levels delivered to streams, rivers, and lakes. Each year, project grantees submit reports to the WDNR, showing progress made towards meeting pollutant reduction goals in the watersheds/lakes. For a given project, information may be submitted as reductions in sediment/soil loss from uplands, streams, gullies, and phosphorus reductions from barnyards and croplands. Other projects are focused on protecting shoreline and habitat in a watershed or lake.

In 2004 and 2005, Priority Watershed/Lake cost sharing helped pay for agricultural BMPs that help reduce soil erosion, including: conservation tillage, cover crops, gully controls, grade stabilization structures, field diversions, waterway systems.

Cropland and Gully Erosion: Nearly all Priority Watershed projects inventoried sources of soil erosion and developed goals to control sediment resulting from cropland soil erosion. Many also set specific goals to control gully erosion. The total pollutant reduction goal for both cropland and gully erosion control was 781,531 tons per year (about 40% of the estimated load). By the end of

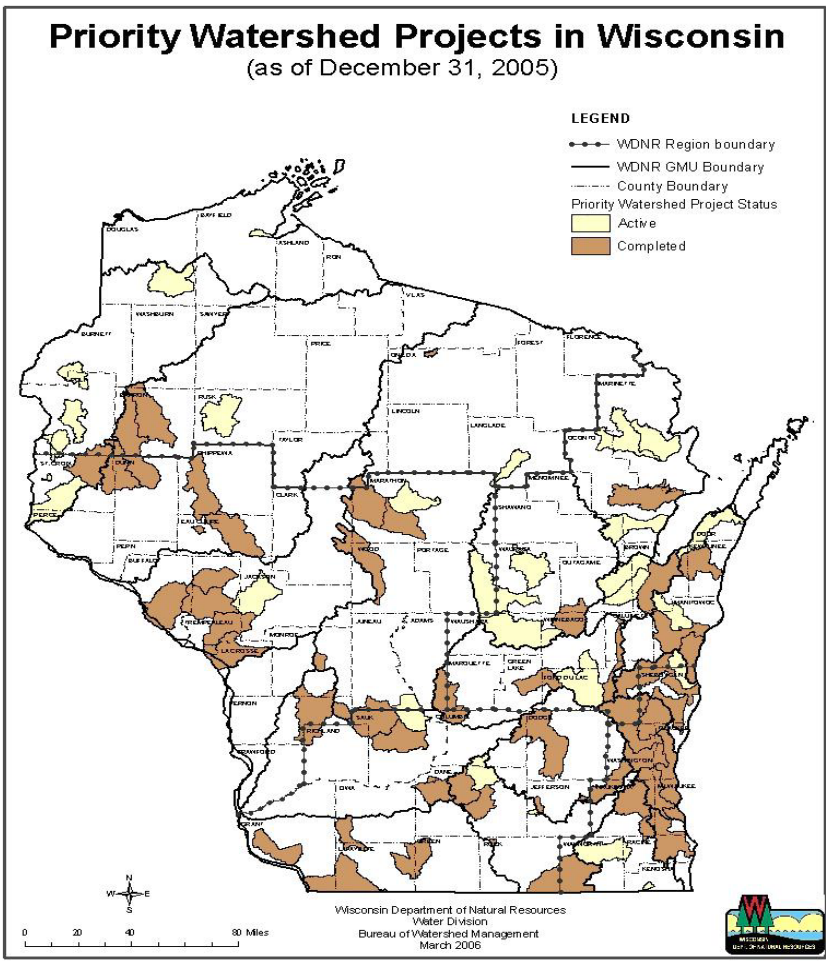
2004, sediment delivery to surface water had been reduced by 640,434 tons per year. This represents 82% of the projects' cropland erosion pollutant reduction goals.

In 2004 and 2005, landowners used Priority Watershed/Lake cost sharing to install manure management practices, including: manure storage structures and practices to control runoff from barnyards, feedlots and milk houses, rotational grazing and other practices to keep manure out of sensitive areas.

Almost all of the Priority Watershed and Lake Projects inventoried all barnyards and feedlots in the project areas and identified phosphorus from livestock manure in these areas as key water quality problems. Several projects also identified excess phosphorus problems related to improperly stored or applied manure and milk house waste, and developed reduction goals for those sources. Three projects tracked reductions in chemical oxygen demand (COD) from BMPs and management changes associated with barnyards and feedlots. Through 2004, these projects had achieved most of their nutrient reduction goals.

Priority Watershed/Lake cost sharing in 2004 and 2005 helped landowners pay for the installation streambank and shoreline protection practices, including stream crossings, rip-rapping, biological stabilization, and shoreline habitat restoration.

Streambanks and Shoreline Erosion: The majority of the Priority Watershed and Lake Projects established goals to reduce the amount of sediment that erodes from streambanks and shorelines by 95,970 tons per year based on total load estimates of 189,553 tons per year. By the end of 2004, those projects reported reductions of 78,219 tons per year, or 82% of the reduction goal of reducing sediment erosion from streambanks and shorelines.



Targeted Runoff Management Grant Program

The Targeted Runoff Management (TRM) Grant Program provides financial assistance to rural and urban governmental units to control polluted runoff. The maximum cost-share rate available to TRM grant recipients is 70% of eligible project costs, up to a maximum of $150,000 (total state share). Local governments that are awarded TRM grants may use the funds on lands they control or make the funds available to private landowners. Since the first grant cycle in 1999, TRM grants have funded construction of rural and urban best management practices. The projects last from two to four years.

During the calendar year 2004 and 2005 funding cycles, the TRM Grant Program awarded $5,697,318 in 57 grants to local units of government. As of December 31, 2005, WDNR provided $3,858,272 in reimbursements for completed BMP installations. Twenty-nine of the 57 projects are completed or closed. (Note: The CY 2005 grantees have until December 31, 2006 to complete their projects.) TRM grant funds from these two grant cycles have been used to install a variety of agricultural and urban BMPs (see sidebar, right).

Installed BMPs
2004-05 Targeted Runoff Management Grants

- Access Roads and Cattle Crossings
- Barnyard Runoff Control Systems
- Critical Area Stabilization
- Diversions
- Grade Stabilization
- Heavy Use Area Protection
- Manure Storage System Closure
- Manure Storage Systems
- Milking Center Waste Control Systems
- Relocation/Abandonment of Animal Feeding Operations
- Riparian Buffers
- Roof Runoff Systems
- Roofs for Animal Manure Storage Structures
- Shoreline Habitat Restoration for Developed Areas
- Streambank Shoreline Protection
- Underground Outlets
- Urban Detention Basins
- Waste Transfer Systems
- Waterway Systems
- Wetland Development or Restoration

Urban Nonpoint Source & Storm Water Management Grant Program

The Urban Nonpoint Source and Storm Water Management (UNPS) Grant Program focuses on financial assistance to governmental units in urban areas to control polluted runoff. To be eligible for a grant, urban areas should have a population density of at least 1,000 people per square mile, have a commercial land use, or include a non-permitted portion of a privately owned industrial site. UNPS Grants can be used to pay for a variety of activities. Eligible planning activity costs for storm water planning, related informational and educational activities, ordinance development and enforcement, training and design are cost-shared at 70%. Eligible best management practice construction costs may include such projects as storm water detention ponds, infiltration basins, streambank stabilization, and shoreline stabilization and are cost-shared at 50%. The funded projects last between two to three years.

During 2004 and 2005 funding cycles, the UNPS Grant Program awarded $2,834,900 in planning grants and $4,370,717 in BMP construction grants to local units of government. As of December 31, 2005, twelve of the fifty-six planning projects and twenty-two of the fifty-two BMP construction projects awarded grants were completed. (CY 2005 grantees have until December 31, 2006 to complete projects.) UNPS grant funds from these two grant cycles were used to install urban BMPs and develop stormwater management plans.

Projects Implemented
CY 2004 & 2005 Urban Nonpoint Source & Storm Water Management Grants

- Storm Water Management Plans
- Storm Water Utility Plans
- Storm Water Detention Systems
- Storm Water Infiltration Systems
- Streambank/Shoreline Protection

Local Conservation Success

Meeting the Performance Standards Challenge

The Washington County Land Conservation Department was faced with a challenge presented by a 535-acre farm with 3 livestock operations that were contributing a signification amount of pollutants to the East Branch of the Rock River and the Kohlsville River. The site also presented several floodplain, wetland and shoreland zoning restrictions that the county had to address.

Planning for this project started in 2001. With the passage of the performance standards rules, the county had more leverage, but addressing both feedlots would be expensive and funding was limited. For the farm to come into compliance with the performance standards, it needed an evaluation of cropland and a nutrient management plan. In addition, two of the three operations failed to meet the manure management prohibitions against direct runoff from a feedlot into waters of the state and unlimited access by livestock to waters of the state.

After years of planning, presenting options and discussions of pros and cons, the landowners agreed on a relocation project for both livestock operations into one total confinement system located at the main farmstead. The county received a Targeted Resource Management grant to install several BMPS in 2004-2005 to bring this operation into compliance including animal lot relocation and abandonment, riparian buffers, critical area stabilization, and construction of a manure storage facility. The farm now has both a conservation plan to "T", a nutrient management plan on all cropland acres and 8.3 acres of permanent deed restrictions on abandoned operations and pasture areas. There are also 5 acres of critical area stabilization, and a manure storage facility constructed for the new confinement operation. And one of the producers is now writing the nutrient management plan for the farm after becoming qualified at the county's Farmer Certification Workshop.

The BMPs were chosen to reduce the excess phosphorus and loss of sediment. The county's modeling estimates that the BMPs resulted in reductions of 112 pounds of phosphorus and 11 tons of sediment per year. In addition to the modeling, the county has been collecting water quality data above and below one of the feedlot relocation sites. Prior to the animals being removed from this site, data collected indicated that ammonia concentrations were 2.6 times higher below the feedlot during a storm event. Six months after the animals were removed from this site the county was still recording ammonia concentrations 40 percent higher below the feedlot, leaving them to believe that they are still encountering some residual nutrients in the stream and pasture area. County staff will continue to monitor the site for one more season. They estimate that levels will equalize in the near future.

Agricultural Runoff

Approximately 30,000 active livestock operations exist in Wisconsin. Manure from livestock operations contains organic materials, nitrogen, phosphorus and other water pollutants. Through Wisconsin Pollution Discharge Elimination System (WPDES) permits issued under ch. 283, Wis. Stats., and ch. NR 243, Wis. Adm. Code, the WDNR has helped to avoid many water quality impacts from larger-scale livestock operations. In addition, the WDNR has used the Notice of Discharge (NOD) program under ch. NR 243, Wis. Adm. Code, and the agricultural performance standards and prohibitions promulgated in ch. NR 151, Wis. Adm. Code, in October 2002 to address water quality impacts from many smaller-scale livestock operations in the state.

WPDES Permits for Large Farms

Water quality concerns associated with livestock operations with 1,000 animal units or more (also referred to as Concentrated Animal Feeding Operations or CAFOs) are addressed through the WPDES permit program. One thousand animal units are approximately equal to 700 milking cows, 1,000 beef cattle, 2,500 swine or 55,000 turkeys. These operations are required to obtain a WPDES permit that addresses storage, runoff, and land application of manure and other process wastewaters from these operations. There are about 150 CAFOs permitted under the WPDES program. (NOTE: One permit was issued to cover approximately 50 poultry operations owned or operated by the same company.) The WDNR has experienced a significant increase in the number of operations applying for permits in recent years, especially in the dairy sector. The WPDES permit program meets or exceeds federal NPDES requirements for livestock operations with 1,000 animal units or more, particularly in the areas of addressing groundwater quality impacts. U.S. EPA recently revised its regulations for CAFOs, and Wisconsin is in the process of modifying ch. NR 243, Wis. Adm. Code, to reflect changes at the federal level. To this end, the Department formed an advisory committee to provide input on revisions to ch. NR 243 which met from September of 2003 to February of 2005. Public hearings and informational sessions were held on the proposed revisions to NR 243 in August and September of 2005. The Department is currently reviewing and responding to comments and determining the need for changes to the proposed revised code. Modifications to ch. NR 243 are expected to be complete sometime in 2007.

Addressing Water Quality Impacts from Operations with Fewer than 1,000 Animal Units (AUs)

The WDNR regulates livestock operations with fewer than 1,000 animals units that have discharges that significantly affect water quality through the NOD Program. In addition, under ch. NR 243, operations with 301 to 999 animal units that have discharges that meet the federal definition of a “point source” are also required to apply for a WPDES permit. With the promulgation of agricultural performance standards and prohibitions under ch. NR 151, the WDNR has an additional tool to address impacts from smaller-scale livestock operations as well as impacts from crop production. The statutory authority under ch. 281, Wis. Stats., and the creation of ch. NR 151 also provide local governments (e.g., towns and counties) the authority to enforce the agricultural performance standards and prohibitions.

Notice of Discharge

Notices of Discharge (NODs) may be issued to smaller-scale livestock operations if an on-site investigation reveals the presence of a discharge to waters of the state. Technical assistance to control the discharge is typically available through the county Land Conservation Departments (LCDs) and cost-share financial assistance can be obtained through local, state and federal cost-share programs. If the water quality impact is not the result of a discharge that meets the federal definition of point source, cost sharing must be provided to cover at least 70% of eligible costs. Throughout the process of addressing impacts identified in an NOD, the WDNR may conduct follow-up investigations to monitor compliance. A livestock operator who fails to implement necessary corrective measures within a specified timeframe is subject to a loss of cost-share funding and may be required to obtain a WPDES permit from the WDNR. Historically, the NOD Program has been based on citizen complaints against livestock operations. The WDNR has changed to a targeted approach, investigating impacts from livestock in areas draining to impaired waters [federal 303(d) listed waters] and high quality waters (Wisconsin Outstanding and Exceptional Resource Waters) instead of relying solely on citizen complaints.

Since 1984, approximately 590 NODs have been issued. During this time, over $6.4 million in cost sharing, primarily from the state's Department of Agriculture, Trade and Consumer Protection (DATCP), has been provided to address the problems identified in the NOD. In addition, over $530,000 in technical assistance have been provided to smaller animal feeding operations to correct deficiencies identified in NODs. For all NODs where cost sharing was provided, the average grant amount was approximately $20,000 with a range of $144 to $179,121. About 55% of the livestock operations that received NODs from the WDNR received cost-share grants. Most livestock operations that received funding corrected their problem. About 9% of the livestock operators failed to take required actions under the NOD and have been issued WPDES permits or have a WDNR enforcement action pending.

The Department did not issue any NODs in 2004 or 2005. However, it did issue a number of notices of intent (NOIs) to issue an notice of discharge, which helped provide a better chance to receive cost sharing from the Department's competitive Targeted Runoff Management (TRM) Grant Program. The TRM Grant Program provided approximately $344,100 in the 2004 and 2005 grant cycles to address NODs and noncompliance with Agricultural Performance Standards under ch. NR 151, Wis. Adm. Code.

Manure Runoff Events

Contamination from manure runoff events is an ongoing concern, and one that the Department is working to address. The winter/spring of 2004-2005 brought weather patterns of freezing followed by a quick thaw and rain. This set the stage for disaster when liquid manure was spread on frozen ground which then turned into a torrent of snowmelt and runoff.


Manure kills more than 100 trout in Sugar River's West Branch

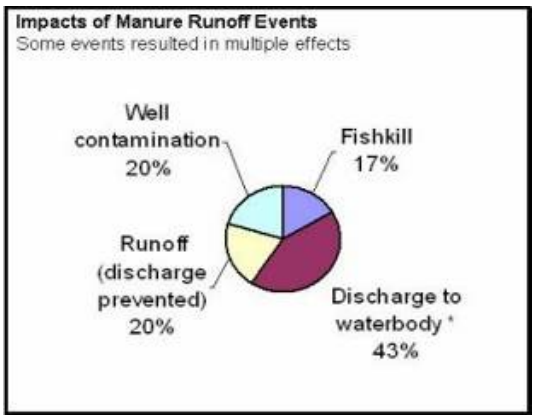
Well contamination addressed

Lake near Westby rendered useless for recreational purp

DNR seeks prosecution for fish kills

Newspapers were full of accounts of fish kills and well contaminations over and above the level seen in the past.

During the one-year time span of July 1, 2004 to June 30, 2005, there were 52 manure runoff events documented by the Department and it is expected that many more undocumented events also occurred. Of these 52 events, 17% caused fish kills, and 20% contaminated private drinking water wells. Most of the incidents happened in the months of February and March 2005, when 61% of the 52 events occurred. Although all regions of the state experienced some runoff events,

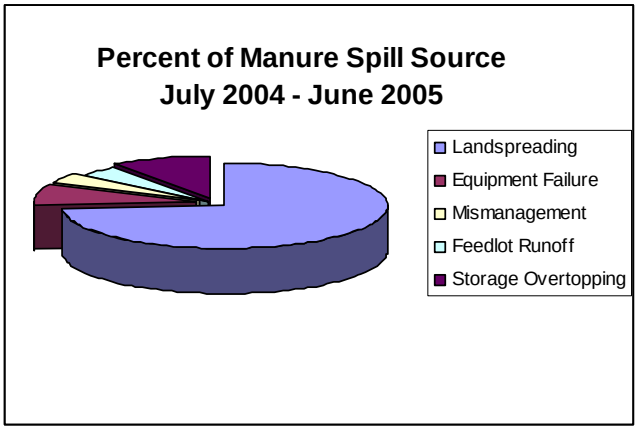


most occurred in the northeast and the south central regions. The most serious well contaminations took place in the northeast in areas with karst topography.

Overwhelmingly, the most frequent cause of the runoff events was land spreading of manure (74%). The next highest reason was storage overtopping at just 10%. The manure was in liquid form (60%) and solid form (25%). The remainder was unspecified. In 84% of the incidents, the land was frozen and/or snow-covered.

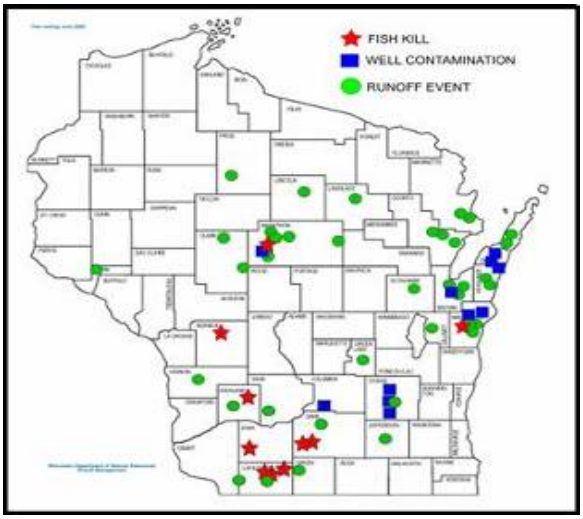
The WDNR spent a great deal of resources documenting these events and mitigating their impact whenever possible. Some of the impacts were associated with WPDES permitted operations while many of the events were associated with operations with fewer than 1,000 animal units. In addition to the programs outlined below, the WDNR has used other enforcement authority to address these events (e.g., spills law, citation authority). The result of these efforts ranged from the payment of a fine to cost-recovery for killed fish to referral to the state's Department of Justice for prosecution and payment of forfeitures.

Other chronic effects, such as algae blooms and decreased fisheries health over the long term also occurred. These chronic situations can have a serious impact on the health of people and the environment. To address this situation, the Department is in the process of revising its rule, ch. NR 243, that regulates the management and land spreading of manure from the 150 largest farms in the state. If the measures proposed in the revised rules are implemented, they would help to reduce impacts associated with land spreading manure and process wastewater, including impacts associated with frozen and snow-covered ground conditions. As part of the Department's ongoing efforts to promote proper manure management, many of the proposed revisions to ch. NR 243 are intended to address impacts from manure applied on frozen or snow-covered ground.



In response to the numerous manure spills, a "Manure Management Task Force" was convened, consisting of representatives from local government, the environmental community and livestock producers. The Department participated in the state's Manure Management Task Force from July 2005 to January 2006 to devise recommendations aimed at reducing manure-related impacts. These recommendations were delivered to the Secretaries of DNR and DATCP in March 2006, two of which have been implemented to date (*). The key preliminary recommendations to come out of the task force were:

- Increase use of winter spreading plans, hauling procedures and emergency response plans
- Improve data collection on manure runoff events
- Improve research efforts through better coordination of priorities
- Develop manure spreading advisory or notification system
- Increase cost sharing for nutrient management plans
- Improve emergency response with focus on farmer planning (*)



- License or certify manure haulers
- Well compensation for manure contamination (*)
- Pilot test limited enforcement program

As of March 2006, two of the recommendations have already been enacted. An emergency notification regarding risky weather patterns for manure spreading was put out to the media in March as conditions were quickly changing from frozen to rain. The state legislature approved compensation for wells contaminated from livestock causes.

Storm Water Management

In 2004 and 2005, Wisconsin's storm water management efforts focused on implementing EPA's Phase II requirements via the WPDES Program.

Construction Site Erosion, Dunn County. DNR Photo.

When rain falls and snow melts, water running across construction sites, yards, parking lots, driveways, streets and roof tops picks up soil, fertilizer, oil, pet waste and other pollutants and carries them into storm sewers that typically empty into lakes or rivers without treatment. Milwaukee, Shorewood and Superior are the only Wisconsin municipalities that have some of their storm water directed to a wastewater treatment plant through a combined sewer system.

Revised chapter NR 216, Wis. Adm. Code, became effective in August 2004. The state rule is consistent with federal rules that took effect March 10, 2003. It extends to smaller municipalities and to more than 2,000 smaller construction sites annually the same kinds of requirements Wisconsin's bigger cities and construction sites have faced for a decade. The law is primarily implemented through general permits and it requires construction site landowners and municipal separate storm sewer system operators to apply for permit coverage through submittal of a "notice of intent" or NOI to DNR. The general permits specify the site-specific plans and programs that must be developed and implemented to reduce the discharge of storm water pollution.

Construction Site Erosion Control

Since 2003 federal law has required that landowners of construction sites with one acre or more of land disturbance obtain construction site storm water permit coverage to address erosion control and storm water management.

The Department received over 1600 NOI (Notice of Intent) applications in year 2006 and has over 4000 construction sites covered under the construction site general permit. This general permit is expected to be reissued in 2007.

Landowners with projects disturbing one or more acres of land are required to get permit coverage under the new state rule. Previously, the threshold was five acres of land disturbance. The storm water construction site permit requires that a site-specific erosion control and storm water management plan be developed which details practices that must be followed to minimize soil from moving off the construction site, and to incorporate designs that once construction is done, allow rain or snowmelt to soak in on the site or be managed to settle or filter pollutants out of the runoff. Sediment from construction sites can destroy habitat by covering the stream bottom, and pollutants attached to the sediment can decrease the diversity of fish and other aquatic species. Because the technology of erosion control is continuously improving, Wisconsin has developed a series of technical standards for construction site erosion control and post-construction storm water management and made them available ad hoc on the Internet. The series of standards replaces the outdated Construction Site Best Management Practice Handbook and will be updated on a more regular basis as needed.

Construction Technical Standards

Construction Site Erosion & Sediment Control
Channel Erosion Mat
De-watering
Ditch Checks
Construction Site Diversion
Dust Control
Grading Practices for Erosion Control - Temporary
Interim Sediment Control: Water Application of Polymers
Land Application of Anionic Polyacrylamide
Mulching for Construction Sites
Non-channel Erosion Mat
Rip Rap
Sediment Bale Barrier
Sediment Basin
Sediment Trap
Seeding
Silt Fence
Silt Curtain
Stone Tracking Pad and Tire Washing
Storm Drain Inlet Protection for Construction Sites
Turbidity Barriers
Vegetative Buffer for Construction Sites

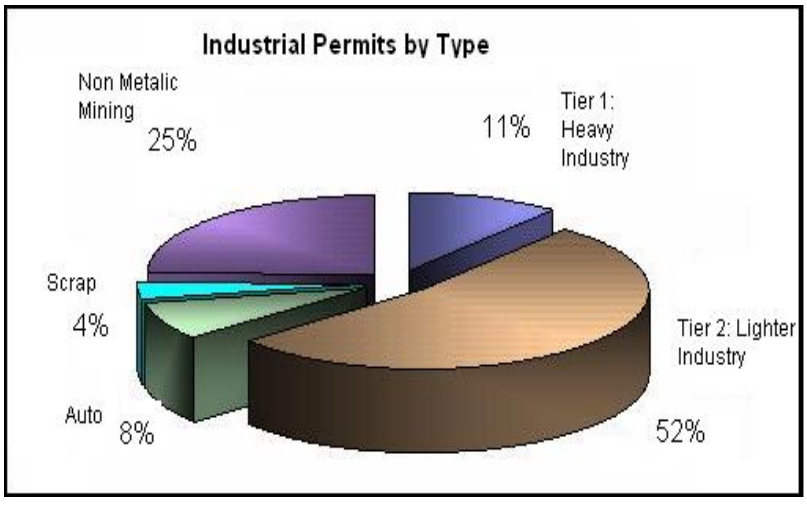
Post-Construction Storm Water Management
Bioretention for Infiltration
Compost
Infiltration Basin
Infiltration Trench
Site Evaluation for Storm Water Infiltration
Swales
Wet Detention Pond
Rain Gardens

Industrial Permits

About 5200 industrial facilities are regulated under one of five industrial general permits. Two of the industrial general permits (scrap and also auto parts recycling) will be reissued in 2007.

In addition to *Tier 1 (heavy industry)*and *Tier 2 (lighter industry)* general permits that cover groups of industrial facilities by standard industrial classification, there are three additional *industry-specific storm water general permits in Wisconsin:* auto dismantling, scrap recycling and non-metallic mining.

The auto dismantling and scrap recycling permittees are offered the choice to join a "Cooperative Compliance Program" (CCP), developed to establish industry-wide approaches to reducing or eliminating storm water contamination. The CCPs provide group training, foster information sharing, and promote best management practices. In December 2005, there were eight CCPs serving 344 facilities.



The Tier 3 industrial storm water general permit was discontinued and replaced by the "No Exposure Certification." Tier 3 permittees were notified of the need to either apply for coverage under the tier 2 general permit (lighter industry) or certify there is no discharge of contaminated storm water. They are required to recertify every five years.

Municipal Stormwater Permits

Wisconsin has been regulating "Municipal Separate Storm Sewer System" (MS4) discharges under individual permits since 1994. Currently, there are 62 MS4s regulated under individual permits in Wisconsin. Madison, Milwaukee, and 60 additional municipalities are currently covered; another 10 are expected to receive individual MS4 permit coverage.

Starting in starting in 2003, the federal government extended the requirements for MS4 coverage to many other smaller municipalities. To meet the federal requirements, an additional 150 municipalities - those that are part of an "urbanized area" or having a population of 10,000 and density of 1000 people per square mile - are expected to be covered under the MS4 general permit. In the permit application, municipalities must summarize the programs and practices they will implement to comply with the MS4 general permit. The Department issued its MS4 general permit in 2006; this permit will be used to regulate an additional 140+ MS4s.

Municipal stormwater permits are an integral part of implementing Wisconsin's comprehensive runoff management standards adopted in ch. NR 151, Wis. Adm. Code, in 2002 to reduce polluted runoff and storm water from entering lakes, streams, groundwater and wetlands. The developed urban area standard requires permitted MS4s to reduce the discharge of total suspended solids by 40% as compared to no storm water management controls.

Research on urban streams in Wisconsin has shown high concentrations of suspended solids, bacteria, heavy metals, oil and grease and polyaromatic hydrocarbons (PAHs) in the discharges from municipal storm water sewers, which empty directly into lakes and streams with no treatment.

The additional municipalities regulated under general permit (issued in January 2006) will be responsible for public education, involvement and outreach, detecting and eliminating illegal discharges to the sewer system, developing construction site erosion control and post-construction storm water management ordinances, practicing pollution prevention in their municipal operations, annual reporting, mapping areas contributing runoff to their storm water sewer systems, and locating outfalls where the storm water enters lakes and streams.

Performance Standards

Wisconsin’s approach to controlling polluted runoff from agricultural and urban land uses has included statewide performance standards and prohibitions since October 2002. Performance standards and prohibitions are required components of LWRM plans, Farmland Preservation Program and TRM grants. All planning activities funded with Urban Nonpoint Source grants must meet the non-agricultural performance standards.
Most of the best management practices cited in this report contribute toward meeting the performance standards and manure management prohibitions. In 2005 there was an increase in the number of counties that reported active engagement in performance standards implementation through development of processes to inventory, track, report and notify landowners of compliance. Several counties were developing Memorandums of Understanding with DNR to clearly identify implementation roles and responsibilities. Additionally, more local ordinances are being passed that include the performance standards and prohibitions. All counties have statutory authority to enforce the performance standards and prohibitions under local ordinances.

Nineteen counties reported on the status of compliance with the agricultural performance standards and prohibitions as of the end of 2005. Table 1 shows the amount of each performance standard and prohibition that was evaluated for compliance and how much of the evaluated amount was in compliance. The data include croplands, practices and facilities that at the time of review or inspection were either in compliance or were out of

compliance but brought into compliance by the end of 2005 through corrective measures. Additionally in 2005, about 1/3 of the counties reported active involvement with stormwater management and construction erosion control such as:

- review of over 1,400 sub-divisions, stormwater management and/or construction plans for compliance with performance standards
- technical services to many municipalities
- thousands of site inspections
- approval of over 440 permits.

In 2005 a local initiative was started between Marathon, Lincoln, and Langlade counties to collaboratively address the challenges of implementing the agricultural performance standards and prohibitions. The initiative, which involves local, state and federal agencies, focuses on customizing a 10-step implementation strategy developed by the Wisconsin Association of Land Conservation Employees (WALCE). This tri-county effort may serve as a model for other counties.

A multi-agency information and education team is working closely with the tri-county initiative to address statewide educational aspects of agriculture performance standards and prohibitions. The team is developing an education and outreach plan. Project outcomes will be piloted in the tri-county area.

2004	2005	Performance Standards Implementation
15	18	counties reporting implementation data
25		counties with in place or developing ordinances containing performance standards and/or prohibitions.
7		number of counties reporting enforcement activities
3	6	counties with signed memorandum of understanding with DNR
21		counties with tracking systems in place to document implementation
100		percent of revised LWRM plans that include performance standards/prohibitions
66		counties that have or are updating county soil and water standards to require Farmland Preservation Program participants to meet the performance standards/prohibitions.
	32	counties inventorying farms for compliance with performance standards
	24	counties reported providing stormwater and construction erosion control services.

Water Quality Standards

In Wisconsin surface waters are classified for the beneficial uses they are capable of supporting if controllable impacts to water quality are managed. Protections afforded surface waters are derived from a series of administrative codes, ranging from ch. NR102 through NR106, Wisconsin Administrative Codes. Ch. NR 102 provides the classification of waterbodies in the state. Water quality criteria for wetlands are provided in ch. NR 103. Ch. NR 104 identifies waterbodies that have specific water quality classifications other than warm water sport fish or forage fish communities (i.e., those that are outstanding or exceptional resource waters or those that are identified as limited forage fisheries or limited aquatic life communities). NR 105 provides standards for toxic substances and NR 106 details how to calculate water quality-based effluent limits (WQBELs) to meet standards found in NR 105.

Water Quality Classifications

NR 102 identifies water quality classifications for Wisconsin Surface Waters (see below). WDNR uses the state's fish and other aquatic life uses classification as the basis for its assessment procedures.

Fish and Other Aquatic Life Uses

Fish and other aquatic life uses are further subdivided in Wisconsin Administrative Code NR 102.04(3) in the following categories:

- Cold water communities: These are surface waters that are capable of supporting a community of cold water fish and other aquatic life or serving as a spawning area for cold water fish species and includes, but is not limited to, surface waters identified as trout waters [Wisconsin Trout Streams, publications 6-3600(80)].
- Warm water sport fish: These are surface waters capable of supporting a community of warm water sport fish or serving as a spawning area for warm water sportfish, such as bass.
- Warm water forage fish communities: These are surface waters capable of supporting an abundant, diverse community of forage fish and other aquatic life.
- Limited-forage fish communities: These are surface waters capable of supporting only a limited community of forage fish and other aquatic life due to low flow, naturally poor water quality, or poor habitat.
- Limited aquatic life: These are surface waters of severely limited capacity due to very low or intermittent flow and naturally poor water quality or habitat, capable of supporting only a limited community of aquatic life. Surface waters classified in the limited forage fishery or limited aquatic life subcategories are not capable of achieving Clean Water Act goals. These waters are listed in Wisconsin Administrative Code NR 104.05 to 104.10.

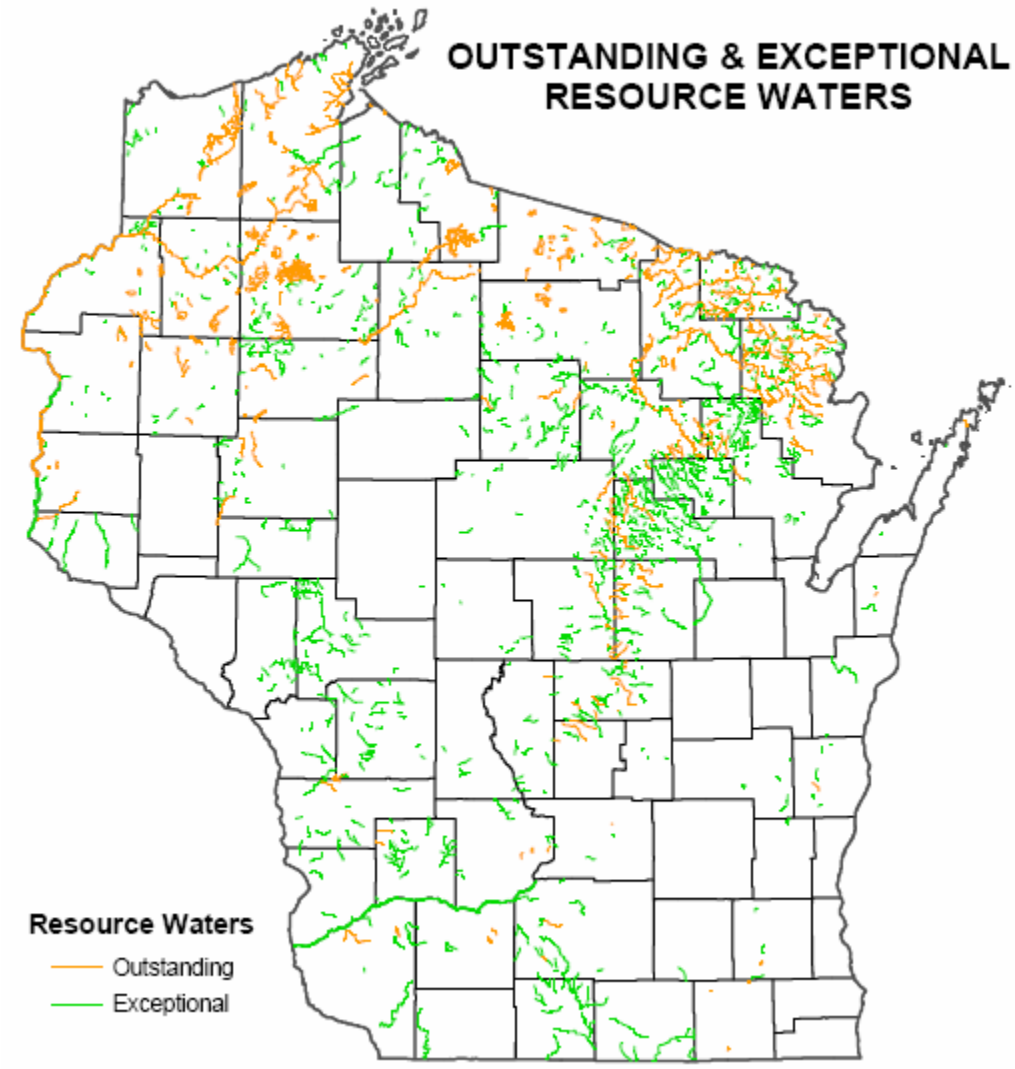
Making Use Designations More Accessible

In 2006, the Water Program developed tools to electronically archive use designation files and link those documents to existing use designations and assessment decisions in the state's datasystems. In Spring/Summer 2006, over 300 use designation files written from the early 1970s through the current year, were scanned, uploaded and documented by adding searchable key words or attiributes, making them easily found and "linkable" to future use assessment decisions.

Outstanding & Exceptional Resource Waters

Wisconsin has classified many of the state's highest quality waters as Outstanding Resource Waters (ORWs) or Exceptional Resource Waters (ERWs). Chapter NR 102 lists the ORWs and ERWs. The identification of ORWs was one of the requirements for federal approval of the antidegradation policy. In the early 1990s, WDNR conducted a statewide evaluation to determine which waters qualified for ORW and ERW classification. In 1993 and in 1996 waters were added to Chapter NR 102 as ORWs and ERWs after rigorous screening and public input processes.

In 2004, a number of organizations petitioned the Natural Resources Board (NRB) to add an additional 100 waters from Northern Wisconsin to the List of ORWs. In 2006 the WDNR evaluated these waterbodies and forwarded a proposal to the NRB for public hearings and approval to add an additional 44 waters to the list. Of those 44 waters, there were 62 discrete segment proposed to be added to ORW status and 18 discrete segments proposed for ERW status. Changes to the Administrative Code to implement these additions became effective on December 1, 2006. Below is map of the O/ERWs.



Recreational Use Waters

Surface waters in the fish and aquatic life use classifications may also be classified as recreational use waters. This classification assures standards protecting surface waters from fecal contamination. A bacterial examination of the water determines the suitability of a recreational use classification. As a result of this classification, municipal dischargers to recreational use waters may be required to disinfect their effluent.

Photo by Lisa Helmuth, WDNR

Public Health and Welfare

All surface waters shall meet the human threshold and human cancer criteria specified in Wisconsin Administrative Code NR 105. The applicable criteria vary depending on whether the surface water is used for public drinking water supplies and the designated aquatic life use subcategory. All surface waters that provide public drinking water supplies, or are classified as cold water or warm water sport fish communities must meet taste and odor criteria as specified in NR 102.

Wildlife

All surface waters shall be classified for wildlife uses and meet the wildlife criteria as specified in NR 105.

Water Quality Classification Revision Process

An extensive list of streams and their designated aquatic life uses were promulgated by WDNR in 1976. Use designations are defined in NR 102 and represent a classification system that considers the type of aquatic life community that may be supported by a surface water and its naturally occurring background chemical (i.e., dissolved oxygen, pH, etc.), physical (i.e., temperature, flow, habitat, etc.), and biological (i.e., species of fish and other aquatic life present) features. The WDNR is currently updating the aquatic life use designations and is making the rules more logical and user-friendly. Streams not meeting standards for fish and aquatic life, primarily due to natural conditions, were listed in NR104 in 1976. This system allowed the establishment of effluent limits in an efficient manner while also providing a level of water quality commensurate with the economic and cultural realities. Additional streams have been evaluated and their classifications will be included in a revised NR104. In addition, many of the classifications conducted in the 1970s have been reviewed and, based on new information, need to be reclassified to another Fish and Aquatic Life classification sub-category. These changes in classification typically cause a modification in water quality criteria and associated requirements (e.g., effluent limitations for point sources).

Fish and Aquatic Life (FAL) Designated Use Guidelines

Surface water sources throughout Wisconsin vary in size, quality, and utilization, and can be grouped according to common characteristics. These groupings enable the Department to properly protect the resource while allowing the use of the resource by parties with various interests. To preserve and enhance water quality throughout the state, the following use designations have been established by WDNR: Fish and Aquatic Life, Recreation, Public Health, Drinking Water, and Wildlife. Of these classifications, the Fish and Other Aquatic Life (FAL) classification is designed as a water quality management tool to qualitatively assess and designate fish and aquatic life uses for surface waters receiving waste discharges.

Within the FAL use designation, sub-categories of waterbodies based on temperature and physical characteristics have been proposed. A subteam of specialists are working on defining those categories and gathering information to characterize the range of biological, physical and chemical characteristics prevalent in these waterbodies.

If there are controllable impacts on a specific waterbody that can be eliminated or reduced (e.g., point source discharges, construction site runoff, or landfill leachate), a waterbody could potentially have an improved "potential" or "attainable" use. The designated (or potential) use of a waterbody is the use that is selected and promulgated as a management goal.

When surface water is evaluated for water quality classification, field data are collected and analyzed. These data include the assessment of existing information, fish communities, habitat, water quality, and macroinvertebrates. Collected data are interpreted, compared to reference sites, and a final use designation determination is made. This use designation, once promulgated, establishes the linkage to water quality criteria that are used to manage the discharge of pollutants into the waters of the state.

Waterbody Assessments

Wisconsin has conducted long-term trend monitoring for many years and similarly has gathered fish, macroinvertebrates and qualitative habitat (quick screens) and some quantitative habitat surveys in the field for many years. During the past eight years, however, the protocols for data gathering have been standardized allowing for more consistent decision making for assessments.

In 2005 Wisconsin began evaluating further formalizing and standardizing statewide assessments that incorporate biological metrics appropriate to the waterbody type. This work is closely connected to the refinement of use designation categories and attainment analyses that reflect new science, new data, and new guidance at the national level. A team of biologists and resource specialists are developing a proposal for how to use these new tools, including guidance on how to utilize a random stratified sample design in assessments and how to better integrate biological data in use designation and use attainability analysis decisions.

Read the 2006 Assessments, including information on impaired waters program.

Little Lake St. Germain, Wisconsin, Photo by Lisa Helmuth, WDNR

Wastewater Management

WPDES Permit Program

The WDNR regulates municipalities, industrial facilities, and significant animal waste operations discharging to surface waters or groundwater of the State of Wisconsin through the Wisconsin Pollution Discharge Elimination System (WPDES) Permit Program (See Section on Runoff Management for discussion of WPDES permits for stormwater). No person may legally discharge to surface waters or the groundwater of the state without a permit issued under this authority. Permits issued under the WPDES program can be either specific permits or general permits and may contain the following:

- Effluent limits for conventional pollutants and toxic substances in the discharge;
- Limitations on the quality and disposal practices for sludge (biosolids) and by-products solids;
- Pretreatment requirements, where applicable;
- Compliance schedules for facility improvements; and/or
- Monitoring and reporting requirements.

Specific permits are issued to individual facilities and general permits are issued to cover a group of facilities with similar discharges which may be located anywhere in the state. Coverage under a general permit is conferred to each individual facility. The WDNR makes a determination on whether a particular facility is appropriately covered by a general or specific permit. There are 17 general permits that may be used to cover applicable discharges ranging from non-contact cooling water to land application to non-metallic mining operations. General permits cover 22,000 facilities.

Permit Timeliness

Permits are issued for a 5-year term. The number of expired permits is a small fraction of the total number of WPDES permits that are in effect at any given time. The goal of the WPDES permit program is to ensure that the Department does not exceed a statewide backlog of more than 10% at any time. Since 1996, the backlog of industrial and municipal permits, including both surface and groundwater discharges, has continued to be under the 10% USEPA goal and below that of many other states. Under Wisconsin law, any permit that has expired continues in effect until it is reissued or revoked. Facilities with an expired permit, therefore, are restricted in the amount of pollutants they can discharge as if the permit has not expired.

Permits are not issued prior to the expiration date for several reasons including:

- requiring additional data from the permittee,
- public or other comment necessitates additional review,
- rules are inadequate to address concerns with the discharge, or
- a permittee is not in substantial compliance with the terms of the expired permit and enforcement action is underway.

In 2004 the Governor initiated a new permit tracking website for the public. It details both qualitative and quantitative WPDES permit issuance information.

Timeliness Details: The charts below show the state's permit backlog data on January 20th, 2006. As you can see the data is displayed in a variety of formats.

Municipal Permit Timeliness - 01/20/2006

Permitting Authority	Muni Minors	Expired Minors	Mun Majors	Expired Majors	Mun Total	Expired Total	** Expired GLI Permits	* Expired Permits in NonCompl	Behind%
Total	579	28	87	5	666	33	3	10	5.0%

* The permits that cannot be reissued due to significant noncompliance but are still counted in the backlog.

** The permits that cannot be reissued due to GLI Issues

The below are data for industrial permits. As discussed above, timeliness issues could be due to a variety of reasons. Variation may be related to the permit complexity, data availability, the volume of work, available resources or water quality issues.

Industrial Permit Timeliness - 01/20/2006

Permitting Authority	Ind Minors	Expired Minors	Ind Majors	Expired Majors	Ind Total	Expired Total	** Expired GLI Permits	* Expired Permits in NonCompl	Behind %
Totals	351	50	46	3	397	53	1	10	13.4%

* The permits that cannot be reissued due to significant noncompliance, but are still counted in the backlog.

** The permits that cannot be reissued due to GLI Issues

CAFO Permit Timeliness 01/20/2006

Permitting Authority	CAFO Permits	Expired Permits	Backlog %	Total Applics	*Backlog Applics	** Total Backlog	**** Expired Permits in NonCompl	*** Total Behind %
Totals	145	19	13.1%	1	0	19	7	13.0%

* The backlogged permit applications are those that have been inhouse more than 180 days.

** The total backlog is the expired permits plus the backlog applications.

*** The total backlog percent is the expired permits plus the backlogged applications divided by the number of permits and the total applications.

**** The permits that cannot be reissued due to significant noncompliance, but are still counted in the backlog.

Enforcement and Compliance Assistance

The WDNR monitors permitted discharges to assure permittees are complying with the terms and conditions of their permits. This “compliance assurance process” takes several forms and includes:

- Compliance maintenance—working with and assisting facilities to remain compliant.
- Compliance assessment—conducting inspections of facilities and on-site assessments, reviews of discharge monitoring reports and other reports for compliance, follow-up on self-reported violations.
- Enforcement—formal actions taken when a significant violation is identified including notification of a violation of a permit condition, formal enforcement conferences and/or contacts and referral to the state Department of Justice (DOJ).

Due to the compliance record of major permittees, the Department has revised its inspection strategy to allow it to focus greater attention on minor permittees who more frequently experience compliance difficulties. In June 2004, WDNR developed an updated enforcement strategy to assure there is appropriate and timely response to permit violations. The WDNR’s performance measure to respond (at a rate of 95%) to effluent limit exceedances within 90 days of when we become aware of the violations began in 2005. The program is improving in this measure and is currently at 54% follow-up within 90 days.

Effluent Limitations

Each permit contains effluent limitations based on the type of facility or water quality-based effluent limitations calculated to meet water quality standards. Effluent limitations may regulate the amount of biochemical oxygen demand, suspended solids, pH, phosphorus, ammonia, chlorine, other toxic substances, or other conditions depending on the type of facility and the water to which it is discharged. The need for whole effluent toxicity testing is evaluated for permits that discharge to surface waters. Further information on the results of toxicity testing of wastewater effluents is contained in this report under Ecosystem Health Assessment. Land application systems normally regulate the amount of nitrogen, chlorides, or other materials that may contaminate the groundwater.

Biosolids and Sludge Disposal

About 40% of the costs incurred to construct, operate and maintain a municipal wastewater treatment facility come from processing, handling and recycling the residues— the sludge or biosolids—that result from wastewater treatment. Most municipal and many industrial facilities in Wisconsin land apply their wastewater treatment sludge or biosolids on agricultural land as a soil conditioner or fertilizer. Approximately 98% of municipal sludge generators, for example, either ultimately apply it on farmland or distribute it for individual use. Of 406 municipal facilities which must remove sludge at least annually, 310 directly beneficially reuse it, 87 haul it to facilities who beneficially reuse it, two incinerate it, and six dispose of sludge at least part of the year in a licensed landfill.

There are an additional 243 permitted facilities which treat wastewater in lagoon systems or systems which only require removal of sludge on an infrequent basis (10 - 20 year cycles). These facilities almost universally land apply their sludge.

Regulations and permit conditions control the amount of sludge or biosolids that may be land-applied depending on the soil, slope, time of year, proximity to residences and wells and other factors. Application rates are limited to the agronomic needs of the crop to be grown and soil analyses are required at least every four years. Phosphorus levels in sludge have increased as Wisconsin has limited the amount of phosphorus that can be discharged directly to surface water in the effluent. Therefore, sludge must be managed in a way that will keep it on the land and minimize the potential for runoff to surface waters. The state also regulates all septage pumped from 698,000 septic systems (300,000 of them on required maintenance schedules) and 30,000 holding tanks. Septage must either be taken to a wastewater treatment plant for further treatment or directly land-applied. The same site criteria apply to septage as to sludge.

Pretreatment

Pretreatment dischargers are industrial facilities that do not discharge their wastewater directly to the waters of the state, but instead discharge into a municipal sewerage treatment plant. The WDNR has been delegated the authority to administer this federal program. Twenty-six municipal governments in the state are responsible for meeting state and federal requirements for implementation of pretreatment requirements. These “control authorities” regulate discharges to their systems through the issuance of permits and other local controls. Industrial discharges that are subject to the pretreatment requirements of the state, but are not within the systems of these municipal control authorities, must obtain permits directly from WDNR. There are a total of 165 facilities that receive permits directly from WDNR.

The WDNR is reviewing the Pretreatment Program to determine what actions are needed, if any, to assure the continued implementation of this program while at the same time reducing administrative overhead. In the past couple of years, the Department has added a pretreatment

component to the SWAMP system, thereby enhancing program management. This reduction is due to a variety of reasons including an increase in workload at the local level (municipalities stepping up their local programs), and reduced staff at the state level. In the past couple of years, however, the department has taken enforcement action against delegated municipalities for program violations. By implication, this indicates that the program is at a point of being so significantly reduced that it may be losing its effectiveness and relevance.

Waterway Shorelands

Shorelands and Shallows is a key initiative in the Water Division's new strategic objectives. A primary goal of the shoreland management program is to ensure clean water is available to be enjoyed for generations to come. In order to achieve that goal, minimum shoreland development standards were set in place to limit the amount of stormwater and pollutants reaching Wisconsin's lakes and rivers.

Current standards are intended to protect a 35-foot deep corridor of natural vegetation along the water's edge of lakes and rivers. This corridor provides an area to slow and soak up water as it runs off of roads, driveways, and roofs, and across lawns. Water flowing over these surfaces picks up dirt, lawn fertilizers, pesticides, herbicides, toxic heavy metals, pet waste and other pollutants[1] that do not belong in lakes and rivers.

Why Protect Shorelands?

A corridor of natural shoreland vegetation traps and filters sediment and debris from runoff. Depending on the size (length and depth) and complexity of the shoreland, 50% - 100% of the solid particles can settle out as plants slow sediment-laden runoff. When natural shorelands are replaced with lawn and houses, this important filtering system is lost, allowing polluted runoff to flow directly into the lake or stream. In general, deeper shorelands are more effective than shallow shorelands, and trees, shrubs, and grasses are more effective than just grass. Most studies recommend shoreland buffers be at least 35 to 100 feet deep to help protect water quality, fisheries and wildlife habitat. In certain cases, such as on steeply sloping sites, buffers greater than 100 feet may be required to slow and infiltrate runoff. Buffers less than 35 feet deep have been generally found to be inadequate to provide long-term water quality protection in most circumstances, and are not likely to provide more than very minimal habitat for most riparian wildlife.

Wisconsin Shorelands and Shallows

In 2004, the Water Division took on the task of developing a creative strategy to improving Wisconsin's waterways by protecting and restoring sensitive areas know as the shorelands and shallows zone - the areas where land meets water in lakes, rivers, streams and wetlands. Wisconsin has a long tradition of protecting these areas, because of their significant environmental sensitivity and important contributions to water quality and biodiversity - however Water Division staff and Wisconsin citizens observe an ongoing degradation of these sensitive areas. At the end of 2004 Water Division staff presented a draft strategy for internal review - highlighting several key areas: Shorelands and Shallows stewardship, the need for a scientific assessment tool, the importance of combining regulations, incentives and enforcement to protect these areas, and providing state agency leadership on DNR managed lands.

Overwhelming in the conclusion of the initial draft strategy was the need for broader engagement

with partners that impact and manage shorelands and shallows around the state. In June 2006, the Water Division co-hosted a Shorelands and Shallows Summit in Stevens Point with UW-Extension and the Wisconsin Lakes Association. This summit brought together approximately 80 representatives of state agencies, local government, conservation organizations, forestry, agriculture, recreation, tourism, humanities, real estate, and construction and focused on discussion of challenges and opportunities for enhancing shorelands and shallows. From this meeting the summit planning team has identified key goals and is recruiting partners to accomplish these ideas. Visit the UWEX website for details on the Summit, participation and key findings: UWEX Site: Shorelands and Shallows Summit Notes.

The following are some initial goals that the DNR strategy team developed in 2004.

1. Goal: Build common values and a sense of stewardship on shorelands and shallows by working with partners.

Performance Measures/Activities:

- Hold a Shorelands and Shallows Summit with participation from a diverse group of stakeholders.
  The Summit was held June 14, 2006 in Stevens Point. You can read about the event and join a discussion board set up to continue the conversation – please join in. UWEX Site: Shorelands and Shallows Summit Information.
- Engage DNR staff from all Divisions in planning the summit.
  The Summit had broad participation including from WDNR divisions. For more information, contact one of the initiative leads: Planning Team Members
- Complete an assessment of attitudes towards shorelands and shallows.
- Analyze and select a marketing approach to foster sustainable shoreline behaviors by landowners.

2. Goal: Support science-based decision-making for shorelands ands shallows.

Performance Measures/Activities:

- Working with the Monitoring Team, develop a shoreland assessment tool.
- Working with the Monitoring Team, ensure that all newly collected monitoring data is geo-referenced.

3. Goal: The WDNR should take a leadership role in shorelands and shallows restoration and protection on its properties and through its programs.

Performance Measures/Activities:

- Annually restore 5-10% of degraded WDNR-managed shorelands and shallows miles.
- Annually review 20% of WDNR grants programs and modify them to promote good shoreland stewardship.

Waterways & Wetlands

Waterway Regulations Work For You

You may also be interested in the Factsheet Index, Permit Partnership Information, the Waterway and Wetland Handbook, and the Waterway and Wetland Permit Query System.

How Water Regulations Work

If you enjoy fishing or boating on Wisconsin's lakes and streams, water regulations work for you. Maintaining water levels and flows, protecting habitat, and keeping streams free of obstructions help provide top quality water recreation.

If you farm, you might use Wisconsin's waterways for irrigation or drainage. Water regulations help make your water supply and drainage capacity more reliable while protecting the water rights of others.

If you own waterfront property, water regulations work for you. Regulating erosion control projects and dam or pier construction are a few of the programs which help people avoid dangers and unnecessary costs to themselves or other water users.

Why Water Regulations Work

Water regulations are needed because:

- Conflicts often arise between the many different users of Wisconsin's waterways.
- Water regulations are an alternative to going to court whenever we affect or are affected by our neighbors' water related activities.
- Clear lakes and free-flowing streams are necessary for healthy fish, wildlife and human populations.

The job of water regulation programs is to protect public rights and interest in our waterways, and to allow projects that will not cause harm. Water regulation means the protection of your water rights.

Changing Protection for Changing Water Needs

Since 1787, when the Northwest Ordinance was adopted to govern the Wisconsin Territory, the State's navigable waterways have been considered public - for the use of all citizens. Article IX of Wisconsin's Constitution provides that navigable waters are held in trust, and "forever free."

When most Wisconsinites' nearest neighbors were wolves and deer, small dams or bridges on streams had little effect on other water users. As lumbering, milling and farming drew settlers to Wisconsin, the variety of water uses and the number of users grew. By the 20th century, recreational hunting, fishing, boating and swimming increased the variety of water needs.

Over the years, the courts and state legislature have developed laws and rules for protecting the rights of waterfront property owners, as well as public rights. This body of law is known as the Public Trust Doctrine. First the Railroad Commission, then the Public Service Commission, and finally the Department of Natural Resources have been charged with the duty to protect the public trust in our navigable waters.

Today, the state helps protect your water rights as well as public safety by ensuring adequate planning and design of projects that may affect public waters. This is done through permit and plan approval requirements for individual projects.

Wisconsin Statutes, Chapter 30, "Navigable Waters, Harbors and Navigation" (PDF, Exit DNR), and Chapter 31, "Regulation of Dams and Bridges in Navigable Waters" (PDF, Exit DNR) establish the permit programs.

Sharing Responsibility for Water Protection

The DNR has an Aquatic Habitat Protection Coordinator in each of five regions and Water Management Specialists in Service Centers whose job is to help people understand their water rights, and to administer and enforce the laws which protect them. The Bureau of Watershed Management in Madison provides policy development and technical support for the field staff.

The U.S. Army Corps of Engineers may require permits for dams, dikes and other structures in federal navigable waters and for the discharge of dredged or fill material into waters and wetlands. The U.S. Coast Guard regulates the construction of bridges and causeways over federal navigable waters.

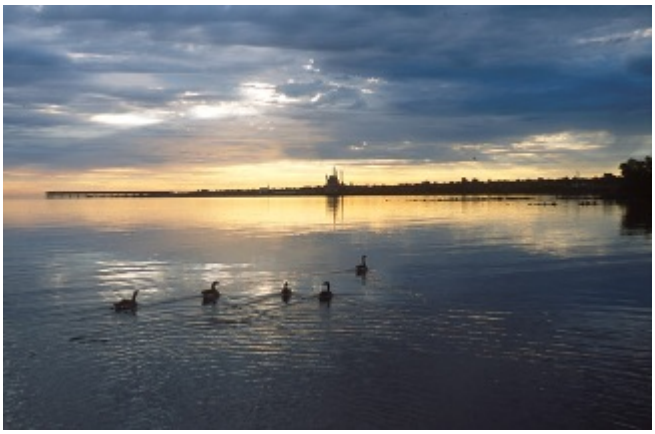
Local governments use floodplain and shoreland zoning to control development along lake shores and streams. Local zoning officials administer permit programs for buildings, land disturbance and other activities in shoreland and floodplain areas.

We are all responsible for water rights protection. You can protect water rights by following proper procedures and obtaining needed permits for activities in public waters. You can also report activities which may be in violation of laws so that damages can be avoided or corrected, and voice your opinions to state and local governments to help keep water rights protection up to date.

Aquatic macroinveretebrates help biologists assess impacts to instream water quality

Water Planning

Wisconsin's Water Quality Management Planning Program encompasses a number of activities:

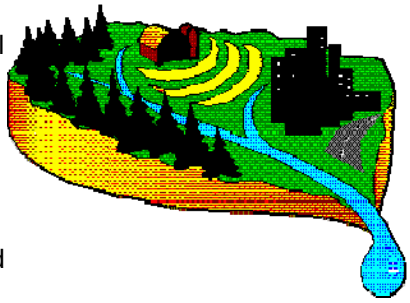


- Wisconsin Water Management
- Basin Planning
- Waterbody Assessments ("305b")
- Identification of impaired Waters (Clean Water Act 303(d))
- Waterbody Assessment Display and Reporting System (WADRS)
- Ranking nonpoint source areas
- Local Water Quality Aid Program
- Sewer Service Area Program

Wisconsin's Water Management

Wisconsin manages resources using two key concepts -- Ecosystem Management and the Watershed Approach. Ecosystem Management is based on the fundamental ecological concept of interconnectedness. The Watershed Approach applies that same concept to the presence, movement, and interaction of water in the landscape. DNR, in applying the Watershed Approach to protect and restore water quality, focuses on aquatic and landscape areas of ecoregions, basins, and watersheds.

Basins and watersheds are interconnected areas of land draining from surrounding ridge tops to a common point such as a lake or stream confluence with a neighboring land area. All lands and waterways can be found within one watershed or another. Picture a raindrop making its way from the very top of the mountain, through and over the land, joining more water on a journey down through gullies, streams and rivers to a lake. The land where all the water comes from is a watershed...it's easy to see that what the water picks up on its journey will affect the receiving waters -- lakes, rivers, and wetlands located downstream.



In the WDNR, these hydrologic areas are used for two purposes. First and foremost, the delineation of these areas identifies where surface waters drain across the land surface of the state. Based on the drainage areas, the WDNR then develops water quality management plans by Water Management Units for protecting our water resources. Secondly, these areas define the distribution of resource management work in the Watershed Management, Fisheries Management and Drinking Water and Groundwater Management Programs. Some hydrologic areas are modified to also follow political boundaries (e.g. county borders) in order to help define where work activities of WDNR staff begin and end. These units are referred to as Geographic Management Units (GMUs)

Other federal natural resource agencies have delineated hydrologic drainage areas as well. These areas are known as Hydrologic Unit Codes known or "HUCs". To the extent possible, state and federal agencies have tried to be consistent with each other. But for various management purposes, some differences in the hydrologic boundaries are necessary. Provided below is a list of hydrologic drainage areas the WDNR maintains, along with a purpose for their existence, a

map depicting their definitions and a description of how they are similar and/or different from the HUCs.

About WDNR Hydrologic Areas: Watersheds, Basins, WMUs and GMUs

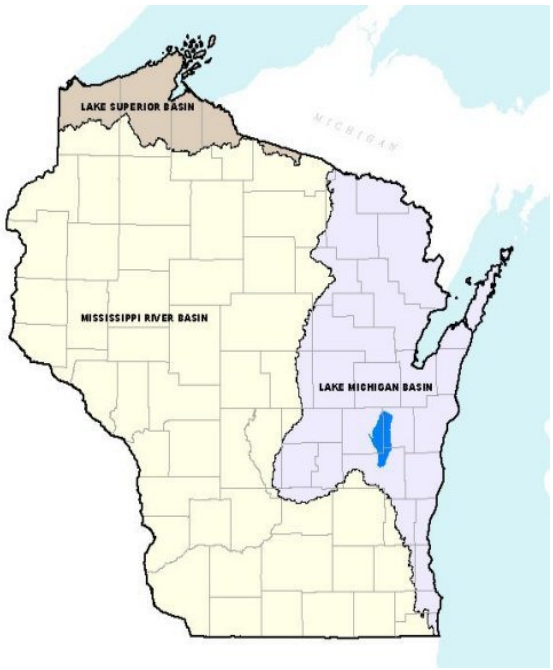
About WDNR's Hydrologic Areas:

Basins
Water Management Units (WMUs)
Watersheds

1. Major Basins

Purpose: To identify the major drainage patterns of Wisconsin. The state is divided into three major river basins each identified by the primary waterbody into which the basin drains. In Wisconsin, they are the Lake Superior Basin, Mississippi River Basin and the Lake Michigan Basin.

Relationship to HUCs (exit DNR): Closely resemble the HUC "Regions" (Level 1, 2-digit Hydrologic Unit Hierarchy HUC)).

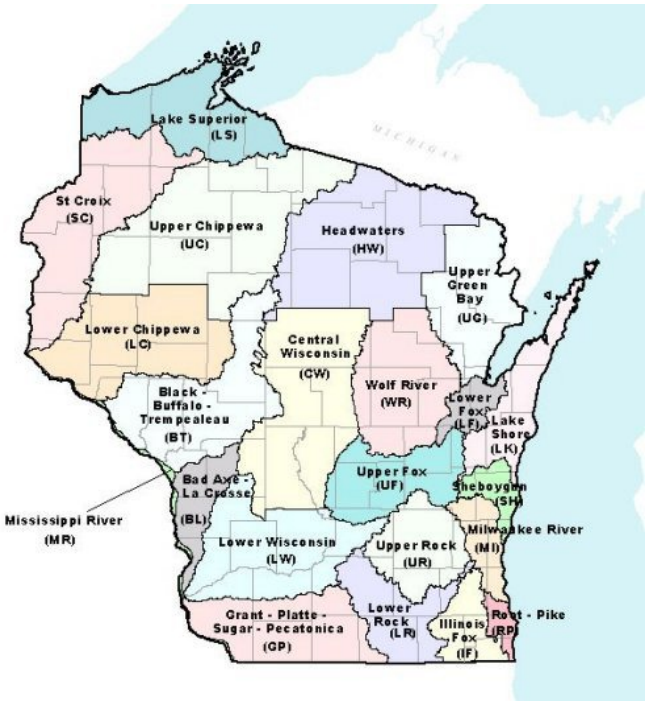


Map: Wisconsin Major Basins (Lake Superior, Lake Michigan and Mississippi River)

2. Water Management Units (WMUs)

Purpose: These areas are hydrologically based subdivisions of the larger Major Basins of the state. Wisconsin has 24 Water Management Units that were originally developed to support the old Water Quality Management Plans (a.ka. Basin Plans). Water Quality Management Plans are now being replaced by the State of the Basin Reports. In almost all cases of the State of the Basin Reports, the GMU boundaries are used (see #3 below). Exceptions are the Lower Chippewa, Central Wisconsin).

Relationship to HUCs (exit DNR): Approximately equivalent to "Regions" (Level 4, 8-digit Hydrologic Unit Hierarchy (HUC)).



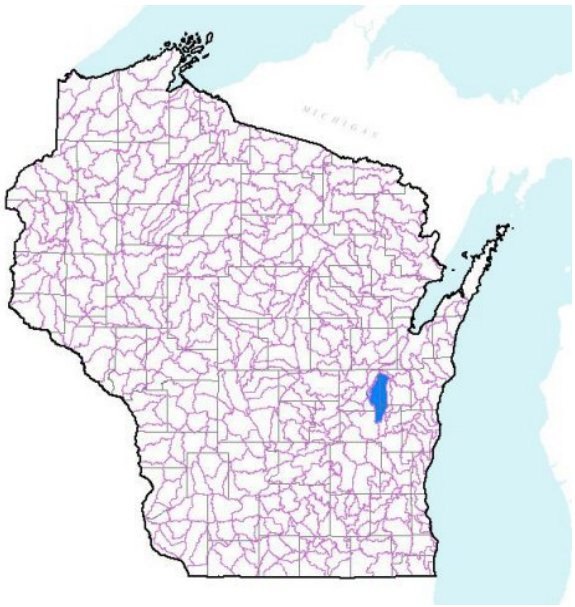
Map: The 24 Water Management Units

3. Watersheds

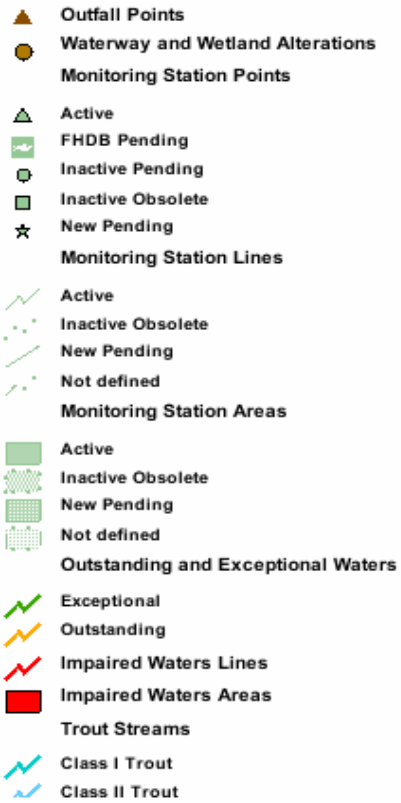
Purpose: Used primarily to prepare reference base maps for the DNR NPS Water Pollution Abatement Program, also generally know as the NPS Priority Watershed Program. They are a further hydrologic subdivision of the Water Management Units.

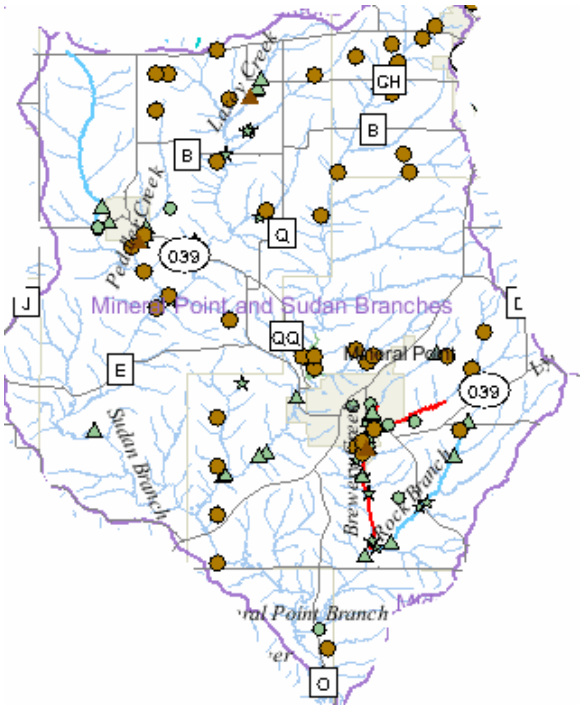
Relationship to HUCs (exit DNR): Approximately equivalent to HUC "Watershed" (Level 5, 10-digit Hydrologic Unit Hierarchy (HUC)).

Map: The 334 Watersheds



Land use and water management activities affect the quality of water in Wisconsin's 334 "local" watersheds.





Basin Planning

The State's 32 major rivers fall into roughly 23 water management basins. Management plans for these areas were developed during 2000-2001; this multi-step process involved external partners in the identification and prioritization of issues and identification of goals and objectives for ecosystem management. These plans were posted to the state's Gateway to the Basins website.

Basin planning is due to occur again based on the initial six-year update schedule. Water Program Managers are evaluating a number of alternatives for updating these plans. The grassroots, community-based approach for identifying basin issues and priorities provides an excellent mechansim for relating to local residents to help shape the future of resource management in their area. Basin or watershed planning will be addressed during the 2007-09 work cycle.

For more detail regarding basin planning, please refer to the 2004 Water Quality Planning Document. [PDF 467KB]

2006 Water Quality Assessment

Currently, waters in Wisconsin are primarily assessed for Fish and Aquatic Life use and Public Health (Fish Consumption). In the coming years, the state will broaden its focus to more evenly implement protocols for assessing Recreation and Drinking Water Supply, and to fill in gaps in areas of the state where Fish and Aquatic Life Uses and Public Health have not been fully evaluated.

The state has a variety of historical and current data. The challenge before researchers deal less with how or what to gather in a monitoring plan and more with how to apply the information gained through monitoring to properly assess resources and make management decisions. The assessment information below reflects historical protocols for assessing waterbodies. The 2008 Integrated Report will begin to provide assessments based on new protocols and the incorporation of extrapolated assessments based on random stratified sample design studies.

- Assessment Methodology
- Water Quality Assessment Summary, Rivers
- Water Quality Assessment Summary, Lakes
- Water Quality Assessment Summary, Wetlands
- Impaired Waters Program
- Category 5 Impaired Waters (303d List)
- Impaired Waters Categories (Listing Reason)
- Category 5 Waters newly listed, changed or delisted in 2006 - PDF file
- Approved TMDLs
- Sources of Pollutants/Impairments
- Pollutants/Impairments

Assessment Methodology

Chapter NR 102.04 (Wisconsin Administrative Code) establishes water quality standards for surface waters of the state and describes the designated use categories and the water quality criteria necessary to support these uses. The state is responsibile for assigning designated uses and conducting periodic assessments of these uses on individual waterbodies. Assessments result in a picture of the status of waterbodies for "305b" reporting, as well as background information to evaluate listing impaired waterbodies for possible Total Management Daily Load (TMDL) work based on evidence of impairment and written documentation. Wisconsin's current general assessment methodology and 303(d) Impaired Waters Listing Methodology (PDF, 78KB)

The state's current assessment methodology has supported the wastewater, point source and nonpoint source programs over the years, and has provided information for past and current USEPA Water Quality Reports to Congress. However, new information on biologically based use designation and assessment methods has prompted review of the state's current methodology. This review process includes how the state establishes designated uses for the key areas of Fish and Aquatic Life, Recreation, Drinking Water Supply and Public Health to all surface waters, as well as documentation standards and procedures for determining attainment and, relatedly, impairment.

The state's monitoring strategy and assessment strategy are interlinked -- as we are able to generate more scientifically valid monitoring data, more options are available to the state for using that data in an assessment approach. Conversely, national experts in USEPA and their partner agencies are advocating for increased use of biological data in the methodologies that states use to evaluate and target resources. This leadership at the federal level is influencing the way our state is planning for and executing monitoring. There is an awareness and an increased emphasis on paired biological and chemistry monitoring, as well as more emphasis on gathering and analyzing fisheries, aquatic macroinvertebrates, and habitat data to determine waterbody potential and status.

In 2007, the state intends make significant movement forward to initiate use of a new approach for assessing waterbodies for a variety of designated uses, including:

- Fish and Aquatic Life Uses: streams, lakes
- Drinking Water Supply: all surface waters
- Public Health (Fish Consumption): all surface waters
- Recreation: all surface waters

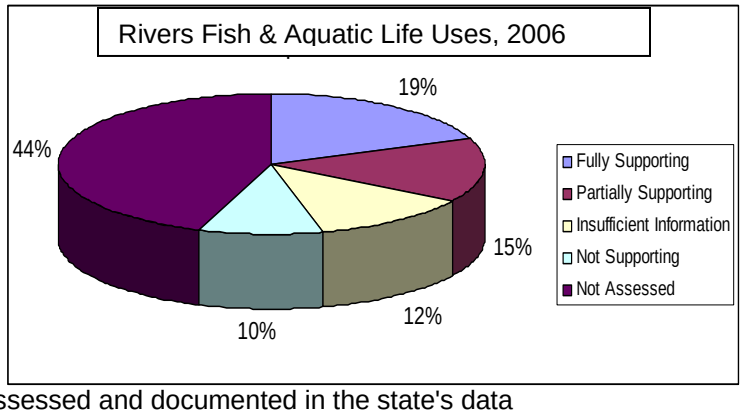
The primary focus for this initial effort to update use designation and assessment methods will be on the Fish and Aquatic Life (FAL) use designation for streams/rivers and lakes. Special issues relating to the Great Lakes and the Mississippi will be addressed during subsequent efforts. In addition, protocols and needed monitoring for Recreation, Public Health, and Drinking Water Supply designated use categories will also be addressed during the 2006-07 period. Future efforts will address additional designated use categories and specific water bodies, including wetlands.

More on Water Quality Standards...

Water Quality Assessment

Rivers and Streams

As the table below and the chart at right show, two designated uses have been assessed for Rivers in the state -- Fish and Aquatic Life (FAL) Use and Public Health (Fish Consumption). For FAL Use, of the state's approximately 80,000 stream miles, cumulatively only 33,000 have been assessed over the years using historical assessment procedures.



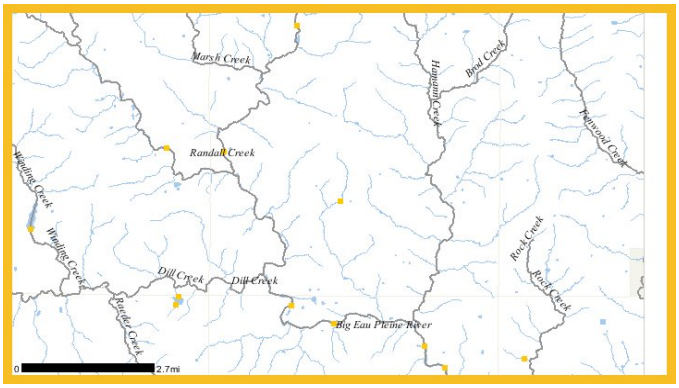
Of the waterbodies that have been individually assessed and documented in the state's data system, the majority are perceived as the most degraded or impaired, thus skewing the overall picture of statewide river and stream conditions.

Designated Use Support Summary
Type of Waterbody : RIVER
Note: All numbers are in MILES

Use	Fully Supporting	Partially Supporting	Insufficient Information	Not Supporting	Not Assessed	Total Miles
Fish and Aquatic Life	6524.22	5086.13	4119.03	3293.29	15147.76	34170.43
Public Health and Welfare	224.69	78.9	289.2	1805.22	31827.86	34225.87
Public Water Supply					34225.87	34225.87
Recreation					34225.87	34225.87

Random Stratified Sample Design

These figures illustrate the potential value of using a random stratified sample design for monitoring and assessment work. Many of the stream miles displayed are mainstem or higher order waterbodies. The map below depicts a visual of assessment units (AU's) in the WADRS system in a given area. This picture illustrates that many of our first and second order streams go unassessed unless they are specifically identified in a management plan or code. Future use of a random stratified sample design can help rectify this disparity by reducing the waterbody-to-assessed waterbody ratio.



By employing statistical techniques in sampling, the random stratified sample design allows managers to group waterbody types of similar condition, land use characteristics and ecoregions (ie., streams that naturally behave similarly) to make assumptions about their condition based on the similarity of these fundamental characteristics. Ascertaining how to use this approach at the waterbody level is a challenge for resource specialists in the coming years.

Freshwater Lakes and Impoundments

The charts below depict summary scores for three designated uses for inland Lakes and impoundments -- Fish and Aquatic Life Use, Public Health (Fish Consumption), and Recreation. Wisconsin has over 1.2 million acres of freshwater inland lakes and flowages. However, data in these tables are more than 10 years old and reflect outdated methodologies. Fish consumption advisory data and other recently generated impaired water data has been updated in the system. In the coming year, the state will employ the application of new metrics including summary data on plant communities such as the floristic quality index (FQI), which is part of the baseline lakes monitoring program. Thus, better summary statistics may be available for the 2008 Integrated Report.

Designated Use Support Summary

Type of Waterbody : FRESHWATER LAKE

Note: All numbers are in ACRES

Use	Fully Supporting	Partially Supporting	Insufficient Information	Not Supporting	Not Assessed	Total Acres
Fish and Aquatic Life	192632	2164	38767	368439	279390	881393
Public Health and Welfare			1564	10562	869310	881436
Public Water Supply					881436	881436
Recreation	285		8552	250	872349	881436

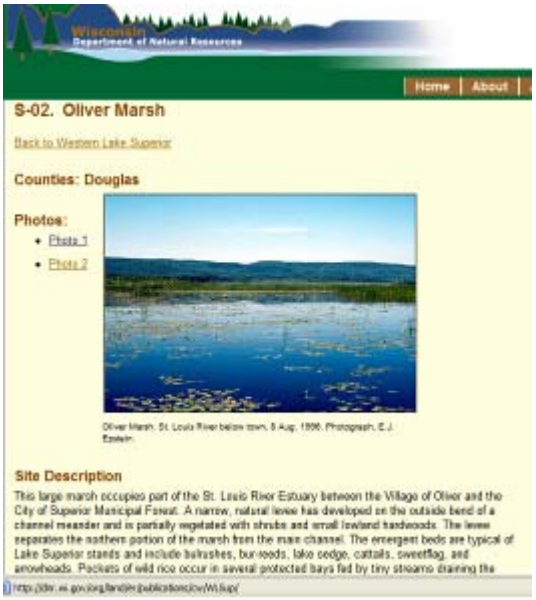
Type of Waterbody: IMPOUNDMENT/RESERVOIR

Use	Fully Supporting	Partially Supporting	Insufficient Information	Not Supporting	Not Assessed	Total Acres
Fish and Aquatic Life	170	47,624	145	59,423	7,379	114,741
Public Health and Welfare					114,741	114,741
Public Water Supply					114,741	114,741
Recreation			117		114,624	114,741

Wetlands

- Wisconsin Wetlands: Assessment and Monitoring
- Wetland Acreage
- Wetland Mapping
- Coastal Wetlands of Wisconsin's Great Lakes A Data Compilation and Assessment

While the state has yet to compile and institute a standardized methodology for assessing wetlands statewide a number of tools have been developed and improved information is available for coastal wetlands from the DNR's Endangered Resources Program. The snapshot at right is from the http://dnr.wi.gov/org/land/er/publications/cw/WLSup/



Sources of Water Quality Problems - Rivers

The chart below shows documented sources of water quality problems ("impairments") found on Wisconsin Rivers. These numbers are derived from the Waterbody Assessment Display and Reporting System (WADRS), the state's data system to store use designation and assessment data.

Type of Waterbody : RIVER (Name)	Total Size (MILES)	Percent (%) of assessed stream miles
Fish Advice General Chemistry Data	34129.71	48.06%
Physical substrate habitat alterations	10305.95	14.51%
Sediment	5176.49	7.29%
Temperature, water	3137.05	4.42%
Oxygen, Dissolved	2358.17	3.32%
Total Nitrogen as N	2346.02	3.30%
Total Phosphorus	2240.89	3.16%
Turbidity	2101	2.96%
Low flow alterations	1803.17	2.54%
Fish Barriers (Fish Passage)	1694.83	2.39%
Non-Native Fish/Shellfish/Zooplankton Species	1452.33	2.05%
Non-Native Aquatic Plants	899.07	1.27%
Total Coliform	665.53	0.94%
Escherichia coli	398.97	0.56%
Total Fecal Coliform	342.65	0.48%
Excess Algal Growth	247.67	0.35%
DDT	241.61	0.34%
Atrazine	241.61	0.34%
Chlorine dioxide (as ClO2)	228.93	0.32%
Ambient Bioassays -- Chronic Aquatic Toxicity	190.71	0.27%
Impairment Unknown	122.81	0.17%
Fish Kills	111.63	0.16%
PCB-1242	73.62	0.10%
Benthic-Macroinvertebrate Bioassessments (Streams)	68.86	0.10%
pH	64.39	0.09%
Cadmium	64.77	0.09%
Iron	55.34	0.08%
Nutrient/Eutrophication Biological Indicators	41.48	0.06%
Total	71001	100.00%

Pollutants/Impairments – Rivers

The chart below shows river miles affected by various sources of pollutants.

Type of Waterbody RIVER Name	Size (MILES)	Percent (%) of assessed stream miles
Atmospheric Deposition - Toxics	34285.91	33.74%
Non-Point Source	10918.52	10.75%
Livestock (Grazing or Feeding Operations)	9221.68	9.08%
Streambank Modifications/destablization	7955.61	7.83%
Loss of Riparian Habitat	4693.04	4.62%
Non-irrigated Crop Production	4438.05	4.37%
Impacts from Hydrostructure Flow Regulation/modification	3451.52	3.40%
Animal Feeding Operations (NPS)	3142.26	3.09%
Crop Production (Crop Land or Dry Land)	3035.69	2.99%
Discharges from Municipal Separate Storm Sewer Systems (MS4)	2547.26	2.51%
Municipal Point Source Discharges	1884.55	1.85%
Wildlife Other than Waterfowl	1802.35	1.77%
Site Clearance (Land Development or Redevelopment)	1563.97	1.54%
Contaminated Sediments	1348.41	1.33%
Freshettes or Major Flooding	1015.39	1%
Municipal (Urbanized High Density Area)	984.4	0.97%
Natual Conditions - Water Quality Standards Use Attainability Analyses Needed	974.75	0.96%
Channelization	962.52	0.95%
Source Unknown	916.93	0.90%
Dairies (Outside Milk Parlor Areas)	878.35	0.86%
Post-development Erosion and Sedimentation	792.42	0.78%
Industrial Point Source Discharge	643.83	0.63%
Grazing in Riparian or Shoreline Zones	608.17	0.60%
Speciality Crop Production	501.4	0.49%
Highways Roads Bridges Infrasturcture (New Construction)	431.94	0.43%
Silviculture Plantation Management	320.57	0.32%
Irrigated Crop Production	310.26	0.31%
Dredging (for Navigation Channels)	301.77	0.30%
Dam Construction (Other than Upstream Flood Control Projects)	251.07	0.25%
Highway/Road/Bridge Runoff (Non-construction Related)	217.95	0.21%
Package Plant or Other Permitted Small Flows Discharges	196.43	0.19%
Permitted Runoff from Confined Animal Feeding Operations (CAFOs)	190.92	0.19%
Flow Alterations from Water Diversions	161.59	0.16%
Landfills	162.06	0.16%
Upstream Source	72.85	0.07%
Non-metals Mining Discharges (Permitted)	49.01	0.05%
Sediment Resuspension (Contaminated Sediment)	49.85	0.05%
Septage Disposal	53.7	0.05%
Other	273	0.44%

Sources of Water Quality Problems – Lakes

The chart below shows documented sources of water quality problems ("impairments") found on Wisconsin Inland Lakes. These numbers are derived from the Waterbody Assessment Display and Reporting System (WADRS), the state's data system to store use designation and assessment data.

Summary of National Causes Impairing Waters
Type of Waterbody : FRESHWATER LAKE

Name	Total Size (ACRES)	Percent (%) of assessed lakes
Fish Advice General Chemistry Data	881,435.98	49.86%
Oxygen, Dissolved	194,089.11	10.98%
Physical substrate habitat alterations	192,451.22	10.89%
Excess Algal Growth	181,234.21	10.25%
Non-Native Fish/Shellfish/Zooplankton Species	70,246.13	3.97%
Turbidity	46,722.33	2.64%
Aquatic plants - Native	34,280.10	1.94%
Non-Native Aquatic Plants	34,280.10	1.94%
Total Phosphorus	31,996.84	1.81%
Sediment	25,280.51	1.43%
Eurasian Water Milfoil, Myriophyllum spicatum	24,338.21	1.38%
Nutrient/Eutrophication Biological Indicators	21,220.55	1.20%
Impairment Unknown	11,666.00	0.66%
Fish Barriers (Fish Passage)	6,923.56	0.39%
pH	3,863.61	0.22%
Sediment Bioassays -- Chronic Toxicity -- Freshwater	3,357.56	0.19%
Fish Kills	2,966.61	0.17%
Ambient Bioassays -- Chronic Aquatic Toxicity	1,038.84	0.06%

Pollutants/Impairments - Lakes

The chart on shows lake acres affected by various sources of pollutants or impairments. The data displayed below is over 10 years old. It has not been updated since the state has had various initiatives for monitoring the presence and spread of aquatic invasive plants or sensitive area designations.

Source Summary of Impairing Waters		
Type of Waterbody : FRESHWATER LAKE		
Name	Total Size (ACRES)	Percent (%) of assessed lakes
Atmospheric Deposition - Toxics	881,436	37.74%
Non-Point Source	514,338	22.02%
Contaminated Sediments	348,614	14.93%
Source Unknown	112,222	4.80%
Discharges from Municipal Separate Storm Sewer Systems (MS4)	109,051	4.67%
Crop Production (Crop Land or Dry Land)	83,449	3.57%
Site Clearance (Land Development or Redevelopment)	55,780	2.39%
Non-irrigated Crop Production	42,490	1.82%
Streambank Modifications/destablization	40,641	1.74%
Municipal (Urbanized High Density Area)	37,482	1.60%
Flow Alterations from Water Diversions	35,541	1.52%
Permitted Runoff from Confined Animal Feeding Operations (CAFOs)	26,457	1.13%
Grazing in Riparian or Shoreline Zones	14,742	0.63%
Channelization	14,113	0.60%
Livestock (Grazing or Feeding Operations)	7,520	0.32%
Internal Nutrient Recycling	5,800	0.25%
On-site Treatment Systems (Septic Systems and Similar Decencentralized Systems)	3,802	0.16%
Dam Construction (Other than Upstream Flood Control Projects)	1,441	0.06%
Total Retention Domestic Sewage Lagoons	163	0.01%
Transfer of Water from an Outside Watershed	145	0.01%
Silviculture Plantation Management	3	0.00%
Sediment Resuspension (Clean Sediment)	81	0.00%
Municipal Point Source Discharges	60	0.00%
Loss of Riparian Habitat	11	0.00%
Irrigated Crop Production	108	0.00%
Impacts from Hydrostructure Flow Regulation/modification	11	0.00%
Highways, Roads, Bridges, Infrasturcture (New Construction)	7	0.00%
Golf Courses	38	0.00%
Dairies (Outside Milk Parlor Areas)	108	0.00%
Animal Feeding Operations (NPS)	108	0.00%

Sources of Water Quality Problems - Flowages

The chart on below shows documented sources of water quality problems ("impairments") found on Wisconsin Rivers. These numbers are derived from the Waterbody Assessment Display and Reporting System (WADRS), the state's system to store use designation and assessment data.

Summary of National Causes Impairing Waters		
Type of Waterbody : IMPOUNDMENT/RESERVOIR		
Name	Total Size (ACRES)	Percent (%) of assessed impoundments
Fish Advice General Chemistry Data	112286.81	47.45%
Oxygen, Dissolved	43673.98	18.46%
pH	24287.94	10.26%
Non-Native Fish/Shellfish/Zooplankton Species	18922.92	8.00%
Excess Algal Growth	13756.08	5.81%
Physical substrate habitat alterations	12087.84	5.11%
Turbidity	3583.18	1.51%
Total Phosphorus	2191.77	0.93%
Fish Barriers (Fish Passage)	1756.5	0.74%
Fish Kills	1647.77	0.70%
Aquatic plants - Native	589.63	0.25%
Non-Native Aquatic Plants	589.63	0.25%
Eurasian Water Milfoil, Myriophyllum spicatum	473.63	0.20%
Ambient Bioassays -- Chronic Aquatic Toxicity	346.28	0.15%
Sediment	282.75	0.12%
Escherichia coli	64.55	0.03%
Other flow regime alterations	84	0.04%
Chlorine	6	0.00%

Pollutants/Impairments - Flowages

The chart on below shows river miles affected by various sources of pollutants.

Source Summary of Impairing Waters		
Type of Waterbody : IMPOUNDMENT/RESERVOIR		
Name	Total Size (ACRES)	Percent (%) of assessed impoundments
Upstream Source	136545	20.17%
Atmospheric Deposition - Toxics	112286.8	16.59%
Contaminated Sediments	94290.6	13.93%
Source Unknown	88182.15	13.03%
Non-Point Source	85195.11	12.59%
Crop Production (Crop Land or Dry Land)	38503.65	5.69%
Streambank Modifications/destablization	26011.23	3.84%
Site Clearance (Land Development or Redevelopment)	21076.18	3.11%
Grazing in Riparian or Shoreline Zones	20113	2.97%
On-site Treatment Systems	13841.08	2.04%
Municipal (Urbanized High Density Area)	10936.15	1.62%
Permitted Runoff from Confined Animal Feeding Operations (CAFOs)	7832.34	1.16%
Sanitary Sewer Overflows (Collection System Failures)	6591.08	0.97%

Flow Alterations from Water Diversions	6589.46	0.97%
Internal Nutrient Recycling	4943.31	0.73%
Sediment Resuspension (Clean Sediment)	2953.37	0.44%
Channelization	720.07	0.11%
Loss of Riparian Habitat	99.53	0.01%
Speciality Crop Production	99.53	0.01%
Discharges from Municipal Separate Storm Sewer Systems (MS4)	49.48	0.01%

Current Assessment Methods

Water quality standards define goals for a waterbody by:

- designating uses,
- setting criteria to protect those uses, and
- establishing provisions to protect water quality.

To evaluate the status or condition of a given waterbody, field staff look to the quantitative and qualitative criteria associated with a designated use. The following are *general guidelines* for different types of waters and what values are associated different levels of quality. Note that *these guidelines are informal* and they have evolved over time. Updates and formalization of assessment thresholds based on biological, chemical and physical elements are currently underway.

Also note that with the greater availability of portable devices, WDNR has greater access to continuous data rather than instantaneous data. Thus, for dissolved oxygen, a single instantaneous value of less 5 mg/l dissolved oxygen may not constitute a problem. However, continuous data showing repeated (frequency), very low (magnitude), and prolonged (duration) dissolved oxygen values would carry much more weight in determining that a water was not meeting its attainable use.

Fish and Aquatic Life, Rivers

All surface waters are considered appropriate for the protection of fish and other aquatic life. Surface waters vary naturally with respect to physical factors based on natural conditions that influence temperature, flow, and habitat, which, in turn, define biological potential. Wisconsin recognizes the following sub-categories of the fish and aquatic life use designation and informally uses the following guides to assess waters with the community listed:

Coldwater Community: Streams capable of supporting a cold water sport fishery, or serving as a spawning area for salmonids and other cold water fish species. Representative aquatic life communities associated with these waters require cold temperatures and concentrations of dissolved oxygen that remain above 6 mg/L. Since these waters are capable of supporting natural reproduction, a minimum dissolved oxygen concentration of 7 mg/L is required during times of active spawning and support of early life stages of newly-hatched fish.

Warmwater Sport Fish Community: Streams capable of supporting a warm water-dependent sport fishery. Representative aquatic life communities associated with these waters generally require cool or warm temperatures and concentrations of dissolved oxygen that do not drop below 5 mg/L.

Warmwater Forage Fish Community: Streams capable of supporting a warm water-dependent forage fishery. Representative aquatic life communities associated with these waters generally require cool or warm temperatures and concentrations of dissolved oxygen that do not drop below 5 mg/L.

Limited Forage Fish Community: Streams capable of supporting small populations of forage fish or macroinvertebrates tolerant of organic pollution. Typically limited due to naturally poor water quality or habitat deficiencies. Representative aquatic life communities associated with these waters generally require warm temperatures and concentrations of dissolved oxygen that remain above 3 mg/L.

Limited Aquatic Life Community: Streams capable of supporting macroinvertebrates or occasionally fish that are tolerant of organic pollution. Typically small streams with very low-flow and very limited habitat. Certain marshy ditches, concrete line-drainage channels, and other intermittent streams. Representative aquatic life communities associated with these waters are tolerant of many extreme conditions, but typically require concentrations of dissolved oxygen that remain above 1 mg/L.

Fish and Aquatic Life, Lakes

Fish and Aquatic Life Use status of Wisconsin Lakes is generally evaluated by trophic state index (TSI) scores derived from chemical, physical, and satellite data.

Public Health

Public Health and Welfare waters are indicated as not meeting potential uses if there is a specific advisory in place. For more information, refer to Fish Consumption Advisories

Recreation

Recreational Use – All surface waters are considered appropriate for recreational use unless a sanitary survey has been completed to show that humans are unlikely to participate in activities requiring full body immersion.

Drinking Water Supply

Public Health & Welfare – All surface waters are considered appropriate to protect for incidental contact by humans. Some are even protected further since they serve as a drinking water supply to nearby communities.

Read the 2006 Assessments, including information on impaired waters page .

Impaired Waters Program

The Department's Impaired Waters Program contains five key components:

- Assessment of Waterbodies (Use Designation)
- The 303(d) Impaired Waters List
- Total Maximum Daily Load (TMDL) Monitoring, Modeling, and Development
- TMDL Implementation
- Post-TMDL Monitoring (Re-assessment of Waterbodies)

Use Designation

The Use Designation portion of the Impaired Waters Program focuses on the Department's efforts to classify surface waters that display varied physical and chemical characteristics. Surface waters have the capacity to support a number of important uses including, but not limited to:

- The ability to supply water for commercial interests and human consumption
- The ability to sustain viable communities of fish and other aquatic life
- The ability to sustain viable communities of water-dependent wildlife
- The ability to provide for human recreational activities

Federal water quality standard regulations define existing uses as those currently being attained in a water body, and designated uses are those uses specified in water quality standards for each water body whether or not the designated use is being attained. The Department interprets the regulations to mean that use designations must be based on attainable uses, not necessarily existing uses.

Guidelines for designating fish and aquatic life uses in Wisconsin's surface waters were first developed in 1982 as a point source management tool to qualitatively assess uses for surface waters that received discharges from treatment plants under the Wisconsin Pollutant Discharge Elimination System permits. These guidelines focused on potential uses at that time because many streams were not fully attaining their uses due to point source pollution.

"Guidelines for Designating Fish and Aquatic Life Uses for Wisconsin Surface Waters" was published in December of 2004 (Publ-WT-807-04) by the Department to update and revise the original guidelines. This document addresses a wider range of environmental issues that face our surface waters such as agricultural runoff, stormwater runoff, and point source discharges. These guidelines apply only to fish and aquatic life communities and not to other used designations identified in Ch. NR 102, Wis.Adm.Code.

The 303(d) Impaired Waters List

Section 303(d) of the Clean Water Act requires states to list water bodies as impaired if they are not meeting water quality standards or use designations after application of technology-based standards. This list is due every two years. The Department is in the process of developing an Assessment Methodology to recommend new guidelines for listing and de-listing waters. The Department hopes to validate water bodies currently on the list by monitoring and restoring water quality on those on the list. In 2008, the 305(b) report and the 303(d) list will be integrated.
Wisconsin's 2004 approved 303(d) list of impaired waters contains 613 lakes and streams. The breakout by category is shown in the pie chart below

The 2006 303(d) list and current methodology is now available.

TMDL Monitoring, Modeling and Development

The development of a TMDL is required for 303(d) impaired waters. Technical guidance for developing a TMDL was developed as a three-tiered approach: simple, intermediate, and complex. Monitoring methods have been identified to provide a basic framework to assist staff in developing an integrated approach for TMDL development and work planning. The WDNR's TMDL Monitoring and Modeling Technical Guidance Document (2001) identifies pollutants to be monitored and the duration and frequency that samples are collected. The document creates a link between monitoring and modeling based on whether the simple, intermediate, or complex approach has been taken. This guidance will continue to be used in the future for TMDL development. Monitoring options were developed based on staff experience working on these types of projects and the DNR's monitoring strategy. However, each stream is unique, and an independent evaluation of each water body is required. Specific issues to be considered when determining the appropriate resource level of monitoring and modeling on a TMDL include:

- Accuracy needs
- Size of the waterbody/watershed
- Stakeholder interest and input
- Availability of funding
- Knowledge and types of pollutant sources
- Regulatory implications for dischargers

Monitoring is occurring statewide for development of TMDLs starting in summer of 2006. Since 1996, 132 TMDLs have been approved for Wisconsin. Of those, 117 have addressed sediment as the pollutant (see approval TMDL table). Because many of the waters on the list are impaired by complex, multi-source problems, restoration will occur over an extended period of time.

TMDL Implementation

The Department is currently developing a statewide TMDL Implementation Program. The program framework will outline the process for stakeholder involvement and the development of TMDL implementation plans, and it will identify the financial and regulatory tools necessary to effectively implement the plans. The framework will also establish the roles and responsibilities for WDNR staff and stakeholders and include a process for tracking implementation activities and evaluating program progress.

At this time, implementation activities to address impairments due to nonpoint source pollution are being administered largely through the WDNR's Runoff Management Program.

Post-TMDL Monitoring

Post-monitoring of the TMDL should occur on streams that have had best management practices installed, to assess the responsiveness of the stream to the practices.

List of Impaired Waters

Impaired waters, as defined by Section 303(d) of the federal Clean Water Act, are those waters that are not meeting the state's water quality standards (quantitative, numeric criteria or qualitative criteria including use designations). Every two years, states are required to submit a list of impaired waters to EPA for approval. In 2006, WDNR developed a proposed Impaired Waters List update -- this list has not been finalized by WDNR and USEPA.

Comments

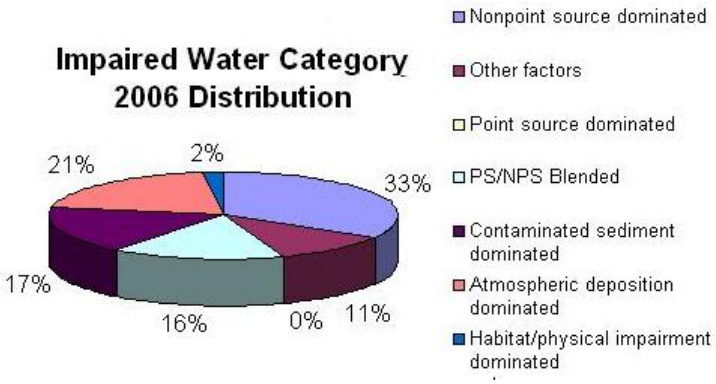
WDNR had an open comment period for the proposed 2006 303(d) list which closed on June 30, 2006. Questions about this program or the list can be submitted electronically to carolyn.betz@dnr.state.wi.us or by paper to Carolyn Betz, Wisconsin DNR, P.O. Box 7921, WT/2, Madison, WI 53707-7921.

Proposed 2006 303(d) List

List of additions, changes and de-listings for 2006 only (PDF, 32 KB) (subset of complete list below)

Complete list for 2006 (PDF, 93 KB), highlighting proposed additions, changes, and de-listings

Methodology used to develop the 2006 list. (PDF, 78KB)



Explanation of Categories on 303(d) List

The following discussion will provide definition to the various categories of factors causing impairment of water quality. Within each category is a description of the strategy the Department may use in development and implementation of TMDLs.

Point source dominated - Waters (usually waterbody segments) in which the impairment is present as a result of a current discharge from an existing point source. The WPDES program is implemented to assure the attainment of standards at the time of permit issuance. Existing law and rules including the water quality standards and WPDES permit rules preclude the issuance of a permit if it will not attain water quality standards. TMDLs in this category may also be implemented through the development of wasteload allocations under the provisions of NR 212.

Nonpoint source dominated - Waters in which the impairment is present primarily as a result of nonpoint source runoff or from the destruction of habitat caused by nonpoint sources. Many of these waters are headwater segments, or subwatershed areas. Others are large bodies of water at the downstream end of large drainage basins. All urban storm water sources are included as nonpoint sources for purposes of this list.

Point source and nonpoint source blend - Waters in which nonattainment of standards is substantially affected by both point source contributions and nonpoint source runoff, and in which both types of sources, each may be contributing to the failure to achieve water quality standards. Listing a water which is impacted by a point source does not imply that the source is not meeting all the requirements in its discharge permit, but only indicates that additional analyses are needed to determine relative contributions by the sources and what additional requirement, if any, might be needed.

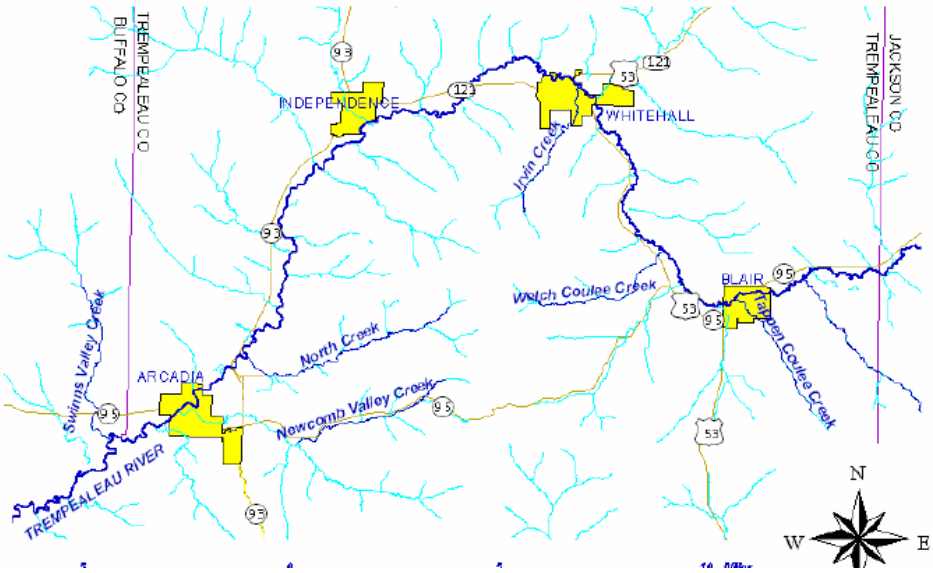
Contaminated sediment waters - Waters (usually segments of waterbodies) in which the impairment is present primarily as a result of toxic or other substances in the sediments which may be affecting either the ecology or uses of the site or moving off-site and affecting other uses of the water at locations beyond the boundary of the contaminated sediment. Contaminated sediments frequently are associated with the bioaccumulation of contaminants in fish and wildlife, thereby resulting in consumption advisories or harm to wildlife populations. The list of contaminated sediment waters originates from a list which was developed cooperatively by the Department's Remediation and Redevelopment and Watershed Management programs.

Atmospheric deposition dominated - Waters in which the impairment is present primarily as a result of atmospheric deposition of toxic substances (such as mercury) into the waterbody and sediments resulting in concentrations in fish tissue above levels safe to consume. Most of these waters are lakes and main stems of major rivers. Waters impaired by atmospheric deposition were identified using the state's fish consumption advisory list.

Habitat/physical impaired - Waters in which the impairment is present primarily as a result of destruction of habitat for aquatic organisms due to flow obstructions or physical barriers to the movement of water where aquatic organism populations are impacted by alterations in the natural flow of water at a particular site. These waters are usually stream segments or may be impoundments. (Note: Habitat impairment caused by point or nonpoint sources are not included in this category.) The Department is aware of concerns which exist regarding the impact of dams (including beaver dams and other impoundments), channelization, and other physical changes on water resources. However, the database for making consistent decisions regarding such impairments has not been fully developed to select sites for inclusion on this list. Waters listed under this category will be addressed in a variety of ways depending on the nature of the impairment and the program activities which are deemed best for the location; operations of dams which affect organism populations may be addressed through licensing of dams or other orders the Department may issue.

Other factors - Waters in this category primarily include large waters, involving basins, or multibasin areas, which may be impaired as a result of several different categories of impairment or there are uncertainties regarding the cause of impairment

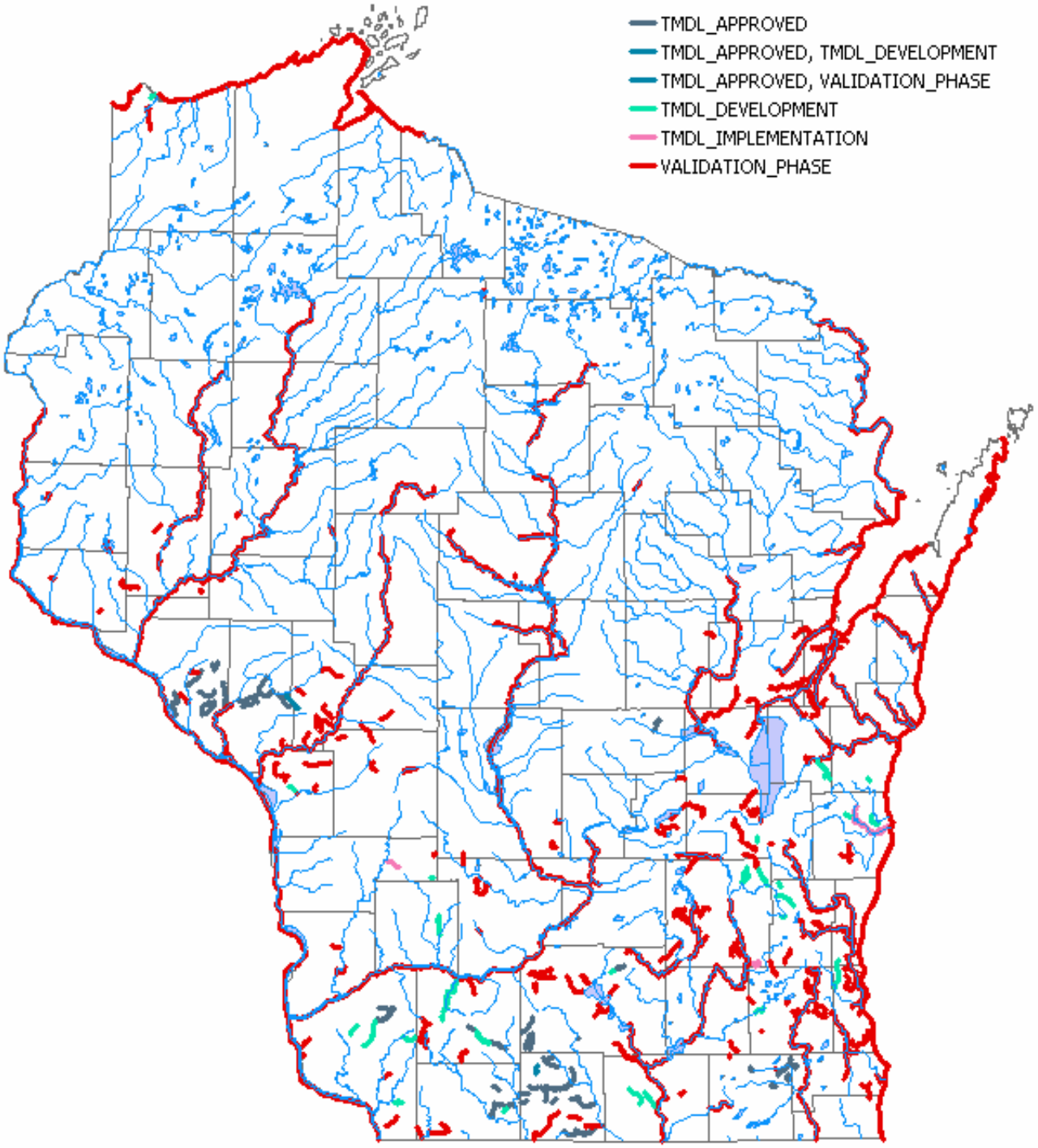
At right is a map from the Sediment TMDL Report for the streams of the Middle Trempealeau River Watershed, December 2002



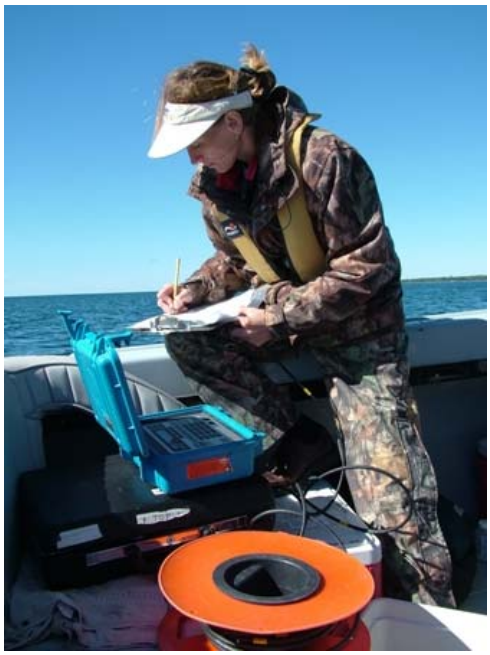
List of Approved TMDLs

Name	Location (County)	Pollutant	Approval Date
Gills Coulee Creek [PDF 4MB]	La Crosse	Sediment	9/26/06
Snowden Branch [PDF 1.1MB]	Grant	Sediment	9/22/06
Sediment Impaired Streams in the Waumandee Creek Watershed [PDF 573KB]	Buffalo	Sediment	11/05
Becky Creek [PDF 78KB]	Rusk	Sediment	09/27/05
Sediment Impaired Streams in the Sugar-Pecatonica River Basin [PDF 1278KB]	Dane, Rock, Lafayette, Green and Iowa	Sediment	08/24/05
Carpenter Creek [PDF 90KB]	Waushara	Sediment	12/14/04
Half Moon Lake [PDF 277KB]	Eau Claire	Phosphorus	09/08/04
Castle Rock (Fennimore) Creek and Gunderson Valley Creek [PDF 215KB]	Grant	Sediment Phosphorus	08/20/04
Trump Coulee Creek [PDF 96KB]	Jackson Trempeleau	Sediment	05/06/04
Silver Lake [PDF 179KB]	Manitowoc	Phosphorus	03/30/04
Cedar Lake [PDF 139KB]	Polk, St. Croix	Phosphorus	08/19/03
Eagle Creek [PDF 232KB]	Buffalo	Sediment	03/13/03
Joos Valley [PDF 232KB]	Buffalo	Sediment	03/13/03
Swinns Valley Creek [PDF 271KB]	Buffalo	Sediment	03/13/03
Irvin Creek [PDF 271KB]	Trempealeau	Sediment	03/13/03
Newcomb Valley Creek [PDF 271KB]	Trempealeau	Sediment	03/13/03
North Creek [PDF 271KB]	Trempealeau	Sediment	03/13/03
Welch Coulee Creek [PDF 271KB]	Trempealeau	Sediment	03/13/03
Tappen Coulee Creek [PDF 271KB]	Trempealeau	Sediment	03/13/03
Jug Creek [PDF 160KB]	Vernon	Sediment	03/13/03
Perennial Stream A (SPPI) [PDF 1427KB]	Walworth	Sediment	03/13/03
Perennial Stream B (TM2) [PDF 1427KB]	Walworth	Sediment	03/13/03
Perennial Stream D (B4) [PDF 1427KB]	Walworth	Sediment	03/13/03
Perennial Stream E (B5) [PDF 1427KB]	Walworth	Sediment	03/13/03
Spring Creek [PDF 1427KB]	Walworth	Sediment	03/13/03
North Branch Spring Brook [PDF 1427KB]	Walworth	Sediment	03/13/03
Token Creek [PDF 113KB]	Dane	Sediment Barrier	07/01/02
Squaw Lake [PDF 144KB]	St. Croix	Phosphorus	08/24/00

Wisconsin 2006 Impaired Waters Sites and TMDL Status



Monitoring Program



Wisconsin's water quality monitoring program is a Division level effort shared among the three Water Bureaus: Drinking Water and Groundwater, Fisheries, and Watershed Management. Recently, WDNR released an update to its comprehensive water monitoring strategy (July 2006), which is available online. Below are highlights from the strategy and links to various documents relevant to the statewide baseline assessment approach for rivers, streams, lakes, wetlands, and groundwater and Great Lakes shoreline miles.

Citizen Involvement in Water Monitoring

The DNR is committed to supporting citizen volunteers in gathering and providing valuable contributions to help meet our water monitoring needs. This interest in building our information resources through citizen volunteers is shared by DNR's nonprofit partners, local units of government, community-based water management organizations, and citizens across the state.

A proposal for a Citizen-Based Water Monitoring Network is currently being designed. Three levels of citizen monitoring have been defined for this Network.

Level 1 - Introductory (Educational)

The introductory level of monitoring is designed to introduce citizens to the basics of monitoring and educate them about the waterbody type they are monitoring and the connection between land use and the resulting effects on water quality. Data generated at this level may be used for generalized screening purposes but will not necessarily be used for making management decisions. Two existing programs that provide Level 1 Introductory Monitoring are the Water Action Volunteers (exit DNR in new window) program for streams, and the Citizen Lake Monitoring Network (formerly Self-Help Lakes). For wetlands, inland beaches, and groundwater, this level of monitoring will be new for the Department.

Level 2 – Status (one year) and Trends (three or more years)

Status and trends level monitoring will offer citizens a more intensive monitoring experience. Citizens will be asked to follow a specific monitoring schedule, including specific times and locations for monitoring. An orientation session and a formal training session will be provided to citizens who have chosen to commit to this Level and demonstrate the necessary skills. If citizens follow defined methodology and quality assurance procedures their data will be stored in a Department database and used in the same manner as any Department-collected data for status and trends monitoring defined in the Strategy. Because of the Department's limited monitoring budget, citizen organizations will need to obtain funding to collect this data through DNR grants or outside sources.

Level 3 – Special Projects/Sport Fisheries Assessments

Special projects are those within the Strategy that do not fit into generalized status and trends monitoring. Special projects are defined annually and will have a variety of focuses. In many cases this level of monitoring will require citizen monitors to assess the same parameters described in Level 2, but with specific focus of the monitoring effort (which would differ from status or trends monitoring). Orientation, training, and a skill level assessment are required. The Department will provide citizens with both funding for the work to be conducted and a report of how data were utilized.

WDNR Water Monitoring Team Members:

Membership of the Water Monitoring Team provides broad and equitable representation of the many programs dependent upon water monitoring data. Staff assigned to the Team are permanent, standing members. The Water Monitoring Team is comprised of the following types of Technical Sub-Teams:

- Streams
- Rivers
- Lakes
- Great Lakes
- Wetlands
- Groundwater
- Citizen Monitoring
- Data Management
- Water Quality

Great Lakes Beach Monitoring Program

The Federal Beaches Environmental Assessment and Coastal Health (BEACH) Act was passed in October of 2000, requiring States that border coastal or Great Lakes waters to develop beach monitoring and public notification programs. Under the BEACH Act, the U.S.EPA provides grants to States that have beaches bordering these coastal waters for the purpose of developing and implementing the monitoring and public notification programs.

Wisconsin was one of the first states to conduct a statewide beach monitoring program in 2003 and is held as a model for the BEACH Act program for other states. The beach monitoring effort is directed at the Great Lakes coastal waters, Lake Michigan and Lake Superior. View 2006 beaches to monitor. Funds are equitably distributed to coastal health departments to conduct the water sampling, analyses, and data entry. See also "Cladaphora".

Approximately 55 miles of public beach and a total of 192 coastal beaches were identified along the Lake Michigan and Superior. The definition of “beach” for the purpose of Wisconsin BEACH Act implementation is:

“A publicly owned shoreline or land area, not contained in a man-made structure, located on the shore of Lake Michigan or Lake Superior, that is used for swimming, recreational bathing or other water contact recreational activity.”

Wisconsin's Beach Monitoring Program was developed to reduce the risk of exposure of beach users to disease-causing microorganisms in water. Selected beaches along the Great Lakes are monitored in accordance with BEACH Act requirements.

Beaches are ranked and classified as "high," "medium" or "low" priority dependent on the following factors: beach usage, the potential for impacts from storm water runoff, bather and waterfowl loads, and the location of outfalls and farms. The priority of the beach determines how often a beach is sampled per week; high priority beaches are sampled 4 times/week, medium priority beaches 2 times/week, and low priority beaches once a week. Prompt notification is provided to the public whenever bacterial levels exceed EPA's established standards. An advisory is posted if E.coli levels exceed 235 CFU/100mL and a closure is posted if E.coli levels exceed 1000 CFU/100mL.

Notification methods for the program include: signs posted at the beaches, a Beach Hotline (discontinued in 2006 due to lack of funding), the Beach Health Website (www.wibeaches.us) and

an informational "Before you go to the beach" brochure. The website and data management is contracted through the United States Geological Survey (USGS). Wisconsin's beach season is approximately 14 weeks from Memorial Day Weekend through Labor Day Weekend. Summer 2006 marks the fourth season of a successful statewide coastal monitoring program in Wisconsin.

Wisconsin Beach Monitoring Program

The WDNR offers grant support to communities along Lake Michigan and Lake Superior to monitor beach water for elevated *E.coli* levels. This information helps the community health officials notify the public so beach visitors can make informed choices about how to use the beach! For more information about Wisconsin's Beach Program, visit the Beach Health Website.

2006 is the fourth year for the successful Wisconsin Beach Program. In 2003, the Wisconsin Department of Natural Resources, in cooperation and collaboration with local, state and federal authorities, began implementation of the federal BEACH (Beaches Environmental Assessment and Coastal Health) Act of 2000. The BEACH Act is an amendment to the Clean Water Act requiring all coastal states, including Great Lakes states, to develop programs for effective water quality monitoring and public notification at coastal recreational beaches. The US Environmental Protection Agency has made grants available to participating states to develop

and implement a statewide beach program. Wisconsin Beaches, Monitoring Priority: http://dnr.wi.gov/org/water/wm/watersummary/305b_2006/beacheslist.htm

Cladaphora

For the past five years, large quantities of decaying algae have been fouling Wisconsin's Lake Michigan shoreline. As the algae and organisms trapped in the alga rot, they generate a pungent septic odor that many people confuse with sewage. Nutrient (phosphorus) sources, zebra and quagga mussels, declining lake levels, and changing lake currents have been implicated in the recent increase in nuisance algae. The presence of rotting Cladophora on Lake Michigan beaches presents aesthetic and odor problems that impairs recreational use of Lake Michigan. This algae, a green algae, does not present a risk to human health (unlike blue-green algae that can produce toxins). However, the rotting algae may provide optimal conditions for bacterial growth and crustaceans deposited on the beach with the decaying Cladophora may attract large flocks of gulls resulting in increased bacteria concentrations from gull fecal material.

Decaying algae smother a Wisconsin Great Lakes Beach. WDNR Photo

Cladophora is a green algae found naturally along the Great Lakes coastlines. It grows on submerged rocks, logs or other hard surfaces. Because of Lake Michigan's water clarity it has been observed growing at well over 30 feet of water depth. Wind and wave action cause the algae to break free from the lake bottom and wash up on shore. Nuisance levels of Cladophora were also a problem in the 1960's and 1970's. Research linked these blooms to high phosphorus levels in the water, mainly as a result of human activities such as fertilizing lawns, poorly maintained septic systems, inadequate sewage treatment, agricultural runoff and detergents containing phosphorus. Due to tighter restrictions, phosphorus levels declined during the 1970's and Cladophora blooms were largely absent in the 1980's and 90's. Phosphorus levels in Lake Michigan continue to remain below the thresholds set in the 1970's, but recent research suggests that the invasion of zebra and quagga mussels in the Great Lakes are responsible for the increase in algae by increasing the availability of phosphorus for Cladophora in the nearshore zone and increasing water clarity.

In 2004 the Wisconsin DNR began an algae, zebra mussel, and nearshore nutrient monitoring program in Lake Michigan to understand the distribution and extent of the Cladophora problem. The Wisconsin DNR is currently working in collaboration with the UWM Cladophora research program to assist in data collection for the development of a Lake Michigan Cladophora growth model that will assist with management efforts. In addition the WDNR is developing guidance and a general permit for Cladophora removal and beach management activities. Because zebra and quagga mussel populations are not conrollable, the only long term management option available is to reduce phosphorus entering Lake Michigan. Reducing stormwater runoff, agricultural runoff and maintaining septic systems are all important to reducing phosphorus loads to Lake Michigan.

Impaired Waters Monitoring Program

Three different types of monitoring is conducted in relation to impaired waters. The initial monitoring to assess the waterbody, the impaired waters confirmation monitoring, and the ongoing detailed monitoring needed for pollutant modeling. Below are waters that were monitored for the purpose of impairment confirmation or TMDL development.

Waterbodies Monitored for TMDL Development in 2005

TMDL ID	Waterbody Name	WBIC	County
167	Gill Greek	861700	Dodge
168	Gills Coulee Creek	1652300	La Crosse
195	Irish Creek	861600	Dodge
225	Kummel Creek	863500	Dodge
226	Kummel Creek	863500	Dodge
267	Markham Creek	796400	Rock
268	Martin Branch	963400	Grant
269	Martinville Creek	955100	Grant
625	Otter Creek	56400	Sheboygan
611	Parson's Creek	136000	Fond du Lac
403	Rogers Branch	964300	Grant
404	Rogers Branch	964300	Grant
441	Snowden Branch	944600	Grant
660	Spring (Dorn)Creek	805600	Dane
469	Stevens Creek	796300	Rock

Waterbodies To Be Monitored for TMDL Development in 2006

TMDL ID	Waterbody Name	WBIC	County
21	Bark River	813500	Waukesha
115	Dougherty Creek	901000	Green
243	Little Willow Creek	1221300	Richland
268	Martin Branch	963400	Grant
269	Martinville Creek	955100	Grant
279	Melanchthon Creek	1232200	Richland
330	Otter Creek	1237100	Iowa
331	Otter Creek	1237100	Iowa
611	Parson's Creek	136000	Fond du Lac
403	Rogers Branch	964300	Grant
404	Rogers Branch	964300	Grant
660	Spring (Dorn) Creek	805600	Dane
513	West Twin River	8700	Kewaunee, Manitowoc

Cherokee Marsh, Madison, Wisconsin, in Winter
Photo by Lisa Helmuth, WDNR

Long-Term Trend River Monitoring

Wisconsin DNR has been monitoring water quality in rivers and streams throughout the State for more than 30 years. Site locations, sampling frequency and water quality measurements have changed over time due to funding constraints, program priorities and changing staff work assignments. The primary criterion for selecting monitoring sites was to provide broad statewide coverage to characterize the varied hydrology, geology and land use/cover of Wisconsin's river basins. The purpose of this monitoring effort is to provide information for assessing water quality conditions, changes with time (trends), point and non point source pollution impact evaluations, water quality-based permits and other water resource management needs.

In 2001, the Long Term Trends Water Quality Monitoring program for rivers was revised and efforts were implemented to re-establish a network of stations throughout the state. This report describes changes to the monitoring program, results of recent monitoring efforts, program evaluation and recommendations to improve the monitoring program. This monitoring program evaluation covers the four year period from July 2001 to June 2005.

A network of 42 monitoring sites was established on rivers throughout the state with roughly half sampled monthly and the rest quarterly during winter, spring, summer and autumn seasons. Field measurements typically included dissolved oxygen, temperature and pH. Water samples were sent to the Wisconsin State Laboratory of Hygiene in Madison, Wisconsin for chemical analysis including nutrients, solids, heavy metals, bacteria, chlorophyll, triazine herbicides and other water quality measurements. This monitoring effort resulted in the collection of approximately 1000 samples during the four year assessment period. In order to simplify the assessment, water quality data for each site were considered in aggregate and not evaluated on a seasonal basis. Monitoring data were grouped by WDNR administrative regions to facilitate a broad comparison between different geographic areas of the State.

Water quality in Wisconsin's rivers differed noticeably between DNR Administrative Regions and sometimes within these geographic areas. These differences in quality were related to major changes in land use/cover, bedrock geology, topography and major point source inputs (urban areas) and other factors. In particular, *the percentage of land cover in agriculture land was a dominant factor affecting stream water quality*. In general, total suspended solids, phosphorus, nitrogen and bacteria levels increased as the percentage of agricultural land cover increased.

In contrast, rivers draining the heavily forested watersheds in Northern and Northeast Wisconsin usually exhibited very good water quality with low concentrations of these pollutants. Monitoring sites below the large urban areas in the Southeast generally had elevated concentrations of chloride, heavy metals, nitrite+nitrate nitrogen and were attributed to increased point source pollutant contributions and nonpoint source urban runoff.

We found few exceedances of Wisconsin's water quality standards. The only exception was mercury, which exceeded the wildlife criterion of 1.3 ng/L in about 70% of the samples collected, though sampling for this metal was limited to about a dozen sites. Median fecal coliform concentrations in some rivers were high (> 300 counts/100 ml) in the Baraboo, Sugar and Trempealeau Rivers in South Central and West Central Wisconsin. However, bacteria sampling could not be directly tied to standards for recreational use because this monitoring program had insufficient sampling frequency for evaluating standards. The high fecal coliform levels found in these streams suggest that site specific evaluations may be warranted to assess compliance with the recreational use standards.

High levels of nutrients in slow moving impounded river systems with low total suspended solid concentrations revealed high concentrations of algae (chlorophyll a) which contributed to elevated pH, especially in soft waters with low alkalinity. Chlorophyll a levels were significantly correlated to total phosphorus and followed a similar relationship found in Minnesota's rivers.

Toxic Substance Monitoring: Fish Tissue

During calendar years 2004-2005, over 1400 fish samples were collected as a part of the fish contaminant monitoring program (Table 1 below is preliminary as of March 2006). The data below includes samples collected and/or analyzed by WDNR as a part of normal fish contaminant monitoring, by cooperators like the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) or the Environmental Protection Agency (EPA), and under special projects and research.

Wisconsin's Fish Contaminant Monitoring Summary

Time Period	Sites Sampled **	Samples Collected **
Prior to 1980	233	3,003
1980-1989	978	11,139
1990-1999	770	11,565
2000-2003	371	3,998
2004	110 *	924 *
2005	62 *	560 *
Total Cumulative	**1,583** *	**31,204***

* Total number not yet available, based on data available as of March 2006. (Total cumulative number of sites does not include duplicate visits to a site.)
** includes samples collected and/or analyzed by cooperators

The 2004-2005 samples were collected from approximately 89 lake locations, 41 sites in flowing waters, and 27 areas of Green Bay and Lakes Michigan and Superior.

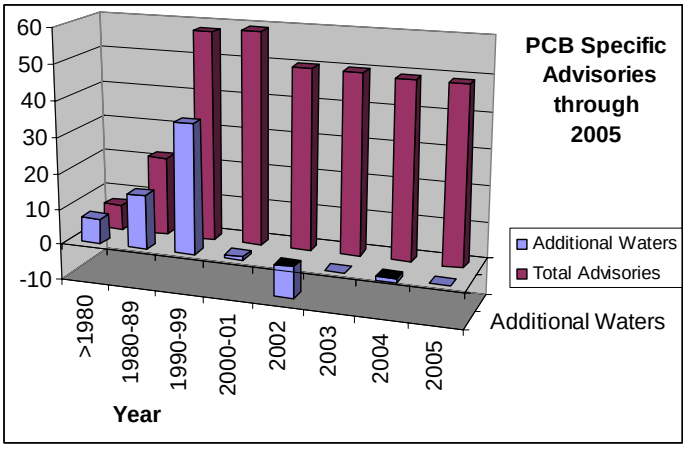
Each year the WDNR collects and analyzes samples of fish tissue from Wisconsin's inland waters and the Great Lakes, including their tributary streams. The objectives of the fish contaminant program includes protection of fish consumers by determining the levels of bioaccumulatory contaminants in the edible portions of fish and compare these levels to health guidelines as determined by the Wisconsin Division of Health.

Samples from the Great Lakes were analyzed for PCBs, pesticides, and mercury, while samples from river systems were primarily analyzed for PCBs and mercury. Fish samples from inland lakes were analyzed almost exclusively for mercury.

Fish consumption advisories are issued for certain species and sizes of fish from given areas where the concentrations of chemicals in the fish flesh exceed the health advisory levels. Fish contaminant data is also used to make natural resource and environmental management decisions.

Fish Advisory

Wisconsin issues general advice that applies to most inland waters where other pollutants or where mercury concentrations do not require more stringent advice. The general statewide advisory issued in 2002 is based on US EPA's reference doses for mercury and typical levels of mercury found in Wisconsin fish based on the mercury concentration data that Wisconsin amassed over the last 30 years.



In addition to the statewide advisory that applies to most inland waters, more stringent consumption advice applies where fish have been found to contain higher concentrations of mercury or PCBs and other pollutants. *The number of sites with fish consumption advice changed over the years in part due to monitoring, banning and limiting chemical usages, and also based on the protocols used to determine appropriate advice.*

The 2005 update of the Wisconsin Fish Consumption Advisory lists fish from 49 of the more than 2,000 lakes, river segments, and border waters tested (See Charts) due to the presence of PCBs and other organic chemicals. The 2005 update of the Wisconsin fish consumption advice lists fish from 94 specific surface waters due to higher concentration of mercury. See Table 3 below for a list of health criteria used for Wisconsin's advisories.

Table 3. Wisconsin Fish Consumption Advisory Guidelines

Contaminant	Population	Concentration	Advice
PCB[1]	All	< 0.05 ppm	Unlimited Consumption
		0.05 – 0.2 ppm	1 meal/week or 52 meals/year
		0.2 – 1.0 ppm	1 meal/month or 12 meals/year
		1.0 – 1.9 ppm	6 meals/year
		> 1.9 ppm	Do Not Eat
Mercury	Sensitive Group[2]	< 0.05 ppm	Unlimited Consumption
		0.05 – 0.22 ppm	1 meal/week or 52 meals/year
		0.22 – 1.0 ppm	1 meal/month or 12 meals/year
		> 1.0 ppm	Do Not Eat
	General Group[2]	<0.16 ppm	Unlimited Consumption
		>0.16 ppm	1 meal/week or 52 meals/year
Dioxin[3]	All	< 10 ppt	No Advice Given
		> 10 ppt	No one should eat
Chlordane	All	< 0.16 ppm	No advice given
		0.16 - 0.65 ppm	1 meal/week or 52 meals/year
		0.66-2.82 ppm	1 meal/month or 12 meals/year
		2.83-5.62 ppm	6 meals/year
		> 5.62 ppm	No one should eat

1. Although this advice is based on reproductive health effects, the same advice is given for women, children, and men to protect against other potential health effects such as immune suppression and cancer

2. Sensitive group includes pregnant women, women of childbearing age, and children under age 15. General Group includes women beyond childbearing age and men.

3. Sum of total dioxin equivalence expressed as 2,3,7,8-TCDD based on dioxin and furan congeners and EPA human health TEFs.

Wisconsin provides information on fish consumption advice on the fish advisory website, in an advisory brochure and the fishing regulations booklet, and in other publications.

Special State Concerns

During 2004-05, the Water Division identified four strategic objectives and associated goals and performance measures, as well as a number of special initiatives. These key areas provide the foundation for protecting and managing water in Wisconsin and are provide measurable milestones and tasks to communicate progress in the coming years.

Courtesy of: MODIS Rapid Response System

Great Lakes

The Great Lakes bound the eastern and northern borders of Wisconsin. With the islands of Door County and the Apostle Islands, there are over 1000 miles of Great Lakes shoreline. With over half of the state's population living in the basin, the Great Lakes are critical as source of drinking water, industrial and commercial process and cooling water, a significant transportation system and a highly desirable tourist destination for fishing, boating or the beaches. As interstate and international waters, management programs must be established at a regional scale to be effective.

In 2004, the Department elevated the status of Great Lakes issues by creating an Office of the Great Lakes. This office works closely with DNR's administration to support Wisconsin's Governor in his chairing of the Council of Great Lakes Governors. The Council is developing a regional agenda in response to a Congressional inquiry that focuses on 9 priority areas:

- ensure sustainable use of Great Lake waters
- protect public health from adverse impacts of pollution
- control pollution from diffuse sources
- continue to reduce the introduction of bioaccumulative substances into the ecosystem
- stop the introduction and spread of non-native invasive aquatic species
- enhance fish and wildlife by protecting and restoring important habitats
- restore the environmental quality in Areas of Concern
- standardize and enhance methods for data collection, analysis and distribution
- adopt sustainable use practices to protect environmental resources and enhance the recreational and commercial values of the Great Lakes.

Using this agenda, Wisconsin will be working in partnership with other states to carry out specific actions to eliminate the need for fish and wildlife consumption advisories through remediation of contaminated sediment, atmospheric pollutant controls, nonpoint source reductions. Important habitat areas will be identified and protected or restored in those cases where habitat quality may be impaired. Plans to stop exotic species will be implemented with an emphasis on preventing new introductions from any sources. Sources of pollution which lead to beach closure will be identified and corrected. Through this agenda, the Great Lakes state Governors will seek federal support for a multi-year campaign to restore the quality of the Great Lakes ecosystem.

Because of their immense size, management actions will require extensive collaboration and

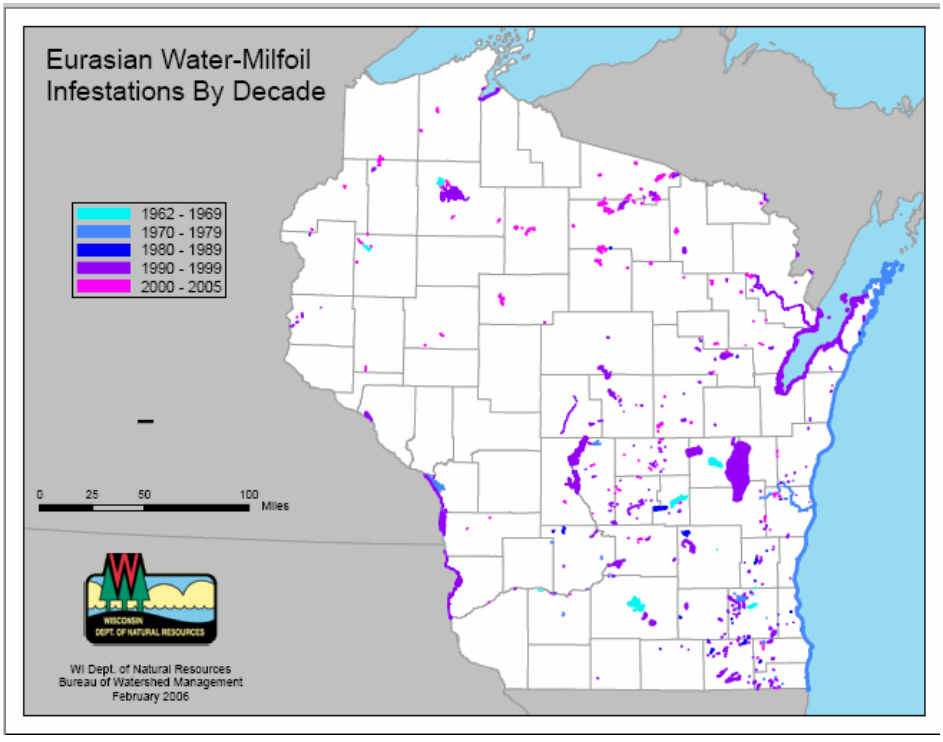
cooperation among jurisdictions and among all levels of government, advocacy interests and industry. These are large- scale problems which need multi-year efforts. With 20 % of the world's supply of freshwater at stake, increasing the prominence and national investments into the Great Lakes restoration projects are necessary and reasonable actions.

Aquatic Invasive Species

Since the early 1800s, more than 140 aquatic nonindigenous species (ANS) have arrived in the Great Lakes. Not all arrivals have resulted in harm. However, some threaten the diversity or abundance of native species, the ecological stability of habitats, and/or commercial, agriculture, and recreation activities. The pace of introductions is increasing and will only continue to increase with global trade unless international prevention and control measures can be put in place.

In 2002, WDNR completed a Comprehensive Management Plan to Prevent Further Introductions and to Control Existing Populations of Nonindigenous Aquatic Nuisance Species (ANS), a blueprint for managing ANS designed to help prevent new introductions, to slow the spread, and to control or abate the ecological and economic impact of existing problem species. This plan was prepared in partnership with the University of Wisconsin Sea Grant Institute and in 2002 was submitted to the National Aquatic Nuisance Species Task Force, when it was approved.

During 2004-05, the state's comprehensive program for invasives conducted preventio education, outreach, and data collection through watercraft inspection at boat landings, enforcement efforts, and a stepped up public awareness campaign that includes television and radio messages to reach a large audience. The Surface water Integrated Monitoring Program (SWIMS), an integrated data system to support this work, was developed. A number maps and charts developed from tracking data in the state's Surface Water Integrated Monitoring System are available. Below is an example of the type of data available on aquatic invasive species from SWIMS. For more information go to: Aquatic Invasive Species Distribution: http://dnr.wi.gov/invasives/aquatic/distribution.htm



Water Quantity Issues

Wisconsin is known for its abundant water resources. However, there is a growing concern about the availability of enough high quality water for uses ranging from public water supply to sustaining cold water habitat for fish. Wisconsin's surface water and groundwater quantity concerns, while seemingly distinct, are as closely linked as the resources. Studies throughout the state illustrate the direct connection between shallow aquifers and the state's streams, rivers, lakes and wetlands. Thus, in general, water quantity concerns with one aspect of the resource - groundwater, for example, likely involve and affect the other - surface water.

Groundwater availability in a given area is limited by geologic and hydrologic factors. Over the years the state's increasing population, rapid widespread development and increasing and varied industrial demands in some areas have increased demands for groundwater beyond the amount that can be sustained. This imbalance can result in cumulative water quantity and related water quality problems. Significant regional groundwater quantity impacts are documented in the Lower Fox Valley, and Southeastern Wisconsin and are beginning to be seen in Dane County. These three areas are experiencing substantial groundwater level declines. Localized surface expressions of quantity issues include lake level drops, stream flow declines, wetland size and level declines, and the disappearance of springs. In addition these declines have contributed to drinking water quality problems in the Lower Fox Valley and Southeastern Wisconsin.

Historically, management of Wisconsin's groundwater and surface water has been functionally distinct. The State's regulations for water use cover installation of high capacity wells, surface water diversions, in-stream flows and water conservation. The recent evaluation of placement of a high capacity well for a drinking water bottling plant in a spring-fed region illustrated the complexity of social, ecological and institutional issues involved and underscored the state's limited powers to protect sensitive water bodies, such as springs, from the impacts of high capacity wells. In Spring 2004, Wisconsin took an important step towards integrated management of water resources by passing groundwater quantity legislation designed to further protect groundwater and surface waters from the impacts of high capacity wells. Specifically, the law expands the WDNR's authority to regulate high capacity wells that may impact certain critical surface water resources. The law also designates two large regional groundwater management areas for which a coordinated water management strategy is needed to alleviate pressures of increasing water demands and creates a Groundwater Advisory Committee to make recommendations on management strategies in these regions.

In addition, increasing interest in and demand for water diversions involving the Great Lakes Basin also mandate a coordinated programmatic response. Most recently, Wisconsin has been participating on a binational committee to oversee implementation of Annex 2001 to the 1985 Great Lakes Charter. The Great Lakes Charter and the Great Lakes Charter Annex are voluntary agreements through which the Great Lakes states and provinces cooperatively manage the waters of the Great Lakes. In the Annex, the Governors and Premiers outline the framework for a set of binding agreements among the Great Lakes States and Provinces and establish a series of principles for a new standard for reviewing proposed withdrawals of Great Lakes water. Site of interest: Great Lakes Water Use and Diversions || Groundwater Summit || GCC Groundwater Quantity Issues.

Riparian Development

Few natural scenes are more treasured than a golden sunrise over a mist-covered lake. Perhaps it is the sense peace this scene provides that, ironically, has resulted in the tremendous changes in the state's shoreland areas. The sense that many, if not most, of the state's lakes and increasingly its riparian shore areas were fully or nearly completely developed prompted the WDNR to initiate its Northern Initiative in the early 1990s. Surveys in 1994 and 1995 indicated that residents and visitors were very concerned about retaining northern Wisconsin's wild and

scenic qualities. Follow-up surveys of land use change in the northern part of the state confirmed suspicions that undeveloped riparian areas were being lost at a rapid rate. Generally, land cover data and land use analyses show extraordinarily rapid growth throughout the entire state. Development pockets are occurring in the Milwaukee to Madison corridor, the Fox Valley/Green Bay area, the Hudson/Eau Claire/Chippewa Falls region (tributary to the Twin Cities) and a generalized growth pattern stretching across the entire northern portion of the state. Within each of these areas and beyond, land values for shorelands have escalated while the same land parcel becomes even more critical (as it becomes more rare) for its ecological functions. Several initiatives, at the federal, state and local levels, are ongoing to address the issue of land use generally - and riparian development specifically - including:

- The Northern Initiative (WDNR), a geographically-based framework for focusing interest and resources on preserving the fundamental values of wild places in the north;
- Revisions to ERW/ORW List. A proposal to add an additional 44 northern waters to the ORW/ERW list which will provide additional protection for these important water resources.
- Land Legacy (WDNR), a proposed 50-year land acquisition framework for public land purchase and easement development in the state;
- Conservation Reserve and Enhancement Program (Federal), a federal match program to secure buffers through easement and acquisition;
- Smart Growth (Local), a series of state level requirements for comprehensive planning and the local level which involves identifying key natural resource features in a community. This may result in some type of local protection for key riparian resources.
- Shoreland Management Program (State/Local). In the 1960s Wisconsin established an administrative code known as "NR 115" to protect water quality, wildlife habitat and natural shoreline beauty through statewide minimum standards for land uses and development adjacent to lakes, rivers and streams in unincorporated areas. NR 115 was implemented via mandated county shoreland ordinances. NR117 is a similar provision applying to shoreland-wetlands in incorporated areas. NR118 covers shoreland management associated with the Lower St. Croix Riverway.
- Lakes Planning, Protection and Classification Grants (State/Local) have provided funds for careful resource planning and protection at the local level, resulting in initiatives designed to meet the resource protection needs of lakes based on waterbody characteristics and development potential.
- Rivers Planning and Protection Grants (State/Local) have provided funds to protect rivers through resource planning at the local level to help prevent water quality, fisheries habitat, and natural scenic beauty from deteriorating as residential, recreational, industrial and other uses increased along rivers.

Issues

While Wisconsin's Shoreland Management Program was landmark legislation in the 1960's, it has not kept current with development trends or the impacts of the resulting development. Studies have shown that the current minimum standards may be inadequate to prevent water pollution, shoreline erosion and the loss of fish and wildlife habitat. The Department has updated Ch. NR 115, Wis. Admin. Code, to offer landowner more flexibility in developing and maintaining shoreland property while offsetting the impacts of shoreland development and increasing environmental protection.

Many local communities have adopted local land use policies that exceed the state minimum standards recognizing the need to protect Wisconsin's resources, however, turnover is often high in local government. As a result there is a continuous need to provide education and training to local governments.

Private property rights groups are becoming more active in the State, and many local

communities are turning to the Department for help in understanding the legal implication of proposed regulations, as well as implications of State and Federal Supreme Court cases. Concerns range from regulation and takings to when can a variance be issued. Education and training is needed for local Corporation Counsels, as well for the general public. Land prices have skyrocketed surrounding Wisconsin lakes and rivers. One result is that it is more expensive to preserve the remaining undeveloped land, and the State is often at odds with developers for the same piece of land. The other problem is more and more people are turning to "marginal" pieces of property to develop, often with large areas of wetlands that are difficult to develop and often, the landowners have unrealistic expectations of how the property can be managed.

Contaminated Sediment

Contaminated sediment is by no means a new issue to the state of Wisconsin - the state has been working in partnership with public and private entities for many years to identify and remove contaminated sediment. Today, however, the state is redoubling its efforts to remediate contaminated sediment as this issue has been identified as a priority for the Water Division. Showcasing the latest technology and partnership approaches is the Fox River Sediment Remediation. As one of the Governor's top environmental program priorities, the Fox River work is spurring momentum for a much broader effort - the development and implementation of a contaminated sediment strategy for the state.

Great Lakes Contaminated Sediments Program

The contaminated sediments sub-program of the Watershed Management Program focuses efforts in areas identified in the 303(d) list of impaired waters of the state. Statewide there are more than 60 steam segments and lakes identified on this list. The program has been developing guidance and approaches to investigating contaminated sediment sites and work across program lines to use available regulatory and non-regulatory approaches to accomplish remedial actions at these sites.

The program is more advanced in the Great Lakes portion of the state because of the greater availability of federal and state support in the Great Lakes Areas of Concern identified with the International Joint Commission. Since 1990, with the ability to match federal and local resources, the State has used Great Lakes Harbors and Bays bonding authority to implement contaminated sediment site assessments, engineering design, and sediment remediation projects. In addition, federal and state regulatory programs have been used to accomplish remediation projects both in the Great Lakes basin and statewide.

The goal of the contaminated sediments program is to eliminate water quality impairments caused by pollutants in sediment. Reducing fish consumption advisories caused by bioaccumlative chemicals such as PCBs and mercury is the highest priority. PCBs have been identified as a Lake Michigan-wide contaminant of concern. Consumption advisories have been issued for fish in each of the major tributaries.

The state has either led or assisted in the following major sediment remediation projects since 2000. The Lower Fox River PCB site has had fish consumption advisories in place since the late 1970s. While not on the

A hydraulic dredge used on the Fox River, Wisconsin in 2006 to remove contaminated sediment.

National Priority List this project is being managed under CERCLA rules and guidelines. Since 2004, 210,000 cubic yards of contaminated sediment have been dredged from the system and disposed of in upland landfills. This material carried with it 1,580 pounds of PCBs. This is almost two-thirds of the PCB mass in Operable Unit 1 of the project area, also known as Little Lake Butte des Morts. Plans are in place to dredge another 100,000 cubic yards of contaminated sediment in 2007 in OU 1 as well as 140,000 cubic yards in OU 4 of the river.

The most upstream three miles of the five-mile long PAH contaminated site on the Little Menominee River in Milwaukee County has been remediated. The remedial action is being conducted on this Superfund site involve a combination of dredging for the removal of the contaminated material as well as stream modifications to reduce the impact of PAHs in the floodplain ecosystem.

A contaminated sediment site known as Hog Island Inlet, at the mouth of Newton Creek in Superior Harbor was remediated in 2006. The site was dredged to remove approximately 90,000 cubic yards of sediment contaminated by PAHs and metals. The material was disposed of in an upland landfill.

In a floodplain site in the Manitowoc River Basin known as the Hayton Area Remediation Project, more than 3.5 miles of stream have been remediated by dredging and disposal of 19,000 cubic yards of contaminated soil carrying 2,500 pounds of PCBs.

USEPA placed the Sheboygan River and Harbor site on the National Priorities List in 1986. Sediment dredging began at the Sheboygan River Superfund Site in 2006. Approximately 9,000 cubic yards of sediment, stream bank soils, and interim armoring material have been removed and disposed of at off-site landfills.

Sheboygan River Area of Concern

The lower Sheboygan River and Harbor were designated a Great Lakes Area of Concern (AOC) in 1985. A Great Lakes AOC is an area where water-quality problems affect the use of the waterway such that it needs priority attention. High levels of nutrients, solids, and toxic chemicals entering the river had caused a series of problems including nuisance algal blooms, fish consumption advisories, and contaminated sediments. The pollution of the river was also suspected of contributing to the degradation of animal and plant populations and the reduction in fish and wildlife habitat. Nine Beneficial Use Impairments (BUIs) were identified for the Sheboygan River and Harbor AOC:

Sheboygan Harbor, Sheboygan Wisconsin, 2006.

- restrictions on fish and wildlife consumption
- degradation of fish and wildlife populations
- fish tumors and other deformities
- bird or animal deformities or reproductive problems
- degradation of benthos (bottom-dwelling animals)

- restrictions on dredging activities
- eutrophication or undesirable algae
- degradation of phytoplankton (small, floating plants) and zooplankton (small, floating animals) populations
- loss of fish and wildlife habitat

The end goal is for all of the Great Lakes Areas of Concern to be restored and protected so that they can be "delisted," or removed from the list of AOCs. In order to do this, a Remedial Action Plan (RAP) must be developed and implemented. It must be shown that all of the BUIs have been addressed and the beneficial uses therefore restored. Goals or targets must be set and then met for each of the BUIs so that the AOC can be considered cleaned up. The process takes time and commitment, and, like most of the other AOCs, ours is still in progress. Of the 43 AOCs designated in the United States and Canada, only two have been delisted and two more are considered to be in recovery.

The initial Sheboygan River and Harbor RAP was prepared in 1989, and an update was prepared in 1994 and published in 1995. Both plans were cooperative efforts between the WDNR and other stakeholders, including other agencies, researchers, and the citizens of the Sheboygan area. The plans analyze the problems, present general goals and objectives, and recommend activities to help us reach those goals and restore and protect the Sheboygan River and Harbor. The goals were developed to describe the "desired future state" of the Sheboygan River ecosystem:

- Protect the ecosystem (including humans, wildlife, fish, and other organisms) from the adverse effects (on the reproduction, survival, and health of individuals, and the integrity of interspecies relationships) of toxic substances.
- Maintain and enhance a diverse community of terrestrial and aquatic life and their necessary habitat.
- Control eutrophication (nutrient enrichment of water), and sediment loadings to the Sheboygan River for the protection of Lake Michigan.
- Restore the river so that it is of recreational quality from its source to Lake Michigan.

Since the 1994 RAP update, much progress has been made and many of the RAP recommendations have been completed or are in progress. Various restoration projects and erosion and runoff control programs have helped improve upstream habitat and decrease the amount of sediment, nutrients, and bacteria entering the river. The PCB-contaminated sediment cleanup is currently underway, with the upper portion of the AOC scheduled to be completed in 2006 (link to Superfund page). Studies have been conducted to better understand the state of the river and its aquatic life.

Mississippi River

Environmental Management Program - Long Term Resource Monitoring Program

The Long Term Resource Monitoring Program (LTRMP) was authorized by Congress in 1986 as part of the U.S. Corps of Engineers' Environmental Management Program on the Upper Mississippi River (UMR). This program is being implemented by USGS with assistance and field support by the five UMR States (MN, IA, WI, IL and MO). This program has been in place since 1988 and provides information on water quality, vegetation, fisheries and land-cover/land-use and other resource information used to assess the trends and ecological health of the River. The Department's field station at La Crosse, WI carries out this monitoring program.

Seining at Stoddard Wetland, Summer, 2003. Courtesy of John F. Sullivan

In 2005, due to anticipated long-term federal budget shortages, a monitoring program restructuring was necessary which resulted in *dropping invertebrate sampling* and *reduced monitoring of the other components (fish, vegetation, water quality) by about one third*.

LTRMP Reports
2006 Water Quality Report
2004 Fish Status Report
LTRMP Data and Reports.

Major products and reports or publications completed in 2004 and 2005 included:

- annual data summaries in each component for each year,
- multi-year synthesis analysis reports for each component,
- input about indicators chosen for the Report To Congress for the Environmental Management Program,
- a Fish Data graphical browser, which is user friendly for the river managers and the public,
  (related: Water Quality graphical browser)
- and a manuscript about aquatic vegetation as related to habitat rehabilitation (island building) projects in Lower Pool 8.

An assessment of LTRMP's quarterly stratified random sampling (SRS) data for Pools 4 and 8 of the Mississippi River was conducted in 2005. The data were evaluated by assessment reaches agreed to by the five UMR States and considered different aquatic areas (strata) and seasons. Data were compared to both Minnesota's and Wisconsin's water quality standards (Table 1). The assessment revealed frequent exceedances (> 10% of samples) in Minnesota's turbidity standard, particularly in upper Pool 4 (Lock & Dam 3 to Lake Pepin). This problem was primarily associated with high suspended sediment loads from the Minnesota River. Minnesota's and Wisconsin's pH standard of 9.0 were commonly excee there are overlaps in data acquisition or if there are data gaps.EMAP-GRE and LTRMP datasets both will be used for bioindicator development. Website:http://www.epa.gov/emap/greatriver/index.html.

Habitat Rehabilitation and Enhancement Projects

Section 1103 of the Water Resources Development Act of 1986 (P.L. 99-662) authorized the construction of Habitat Rehabilitation and Enhancement Projects (HREPs) as one element of the Upper Mississippi River System Environmental Management Program (UMRS-EMP). These projects are selected by biologists and designed by multi-agency teams led by the Corps of Engineers. Input from the public is an important element of planning these habitat projects and is accomplished through public meetings and personal contacts.

HREPs use conventional and experimental techniques to restore and enhance fish and wildlife habitat degraded by human activities that have altered the river ecosystem. A variety of techniques may be used to achieve chemical, physical and biological objectives for projects:

- Dredging sediments to deepen selected backwaters and side channels.
- Constructing dikes and levees to reduce sedimentation in backwaters and control water levels
- Building islands to reduce wind and wave induced resuspension of sediments.
- Side channel modifications to reduce sedimentation in backwaters.
- Providing flows to isolated backwaters to improve fish habitat.

After construction is completed, all projects are monitored to document chemical and physical responses. Some projects are also monitored to determine if biological objectives are achieved.

The State of Wisconsin has sponsored, or co-sponsored, 17 projects that have been constructed since 1986. These projects are located in several different areas of the Mississippi River along Wisconsin's western border. Ten projects have also been constructed along Wisconsin's border in the states of Minnesota and Iowa. For more information on individual EMP habitat projects, visit the St. Paul and Rock Island Corps of Engineers Web sites: http://www.mvr.usace.army.mil/EMP.

Interstate Coordination

The Upper Mississippi River (UMR) is a resource of major importance to Wisconsin and forms the boundary between Minnesota, Iowa and Wisconsin. Sharing management responsibilities for this Upper Mississippi segment with these states and federal agencies, WDNR participates in numerous multi-state planning, monitoring, and restoration projects involving this major resource, including the Environmental Management Program (EMP), navigation studies, environmental pool plans, channel maintenance plans, water level management and other planning activities.

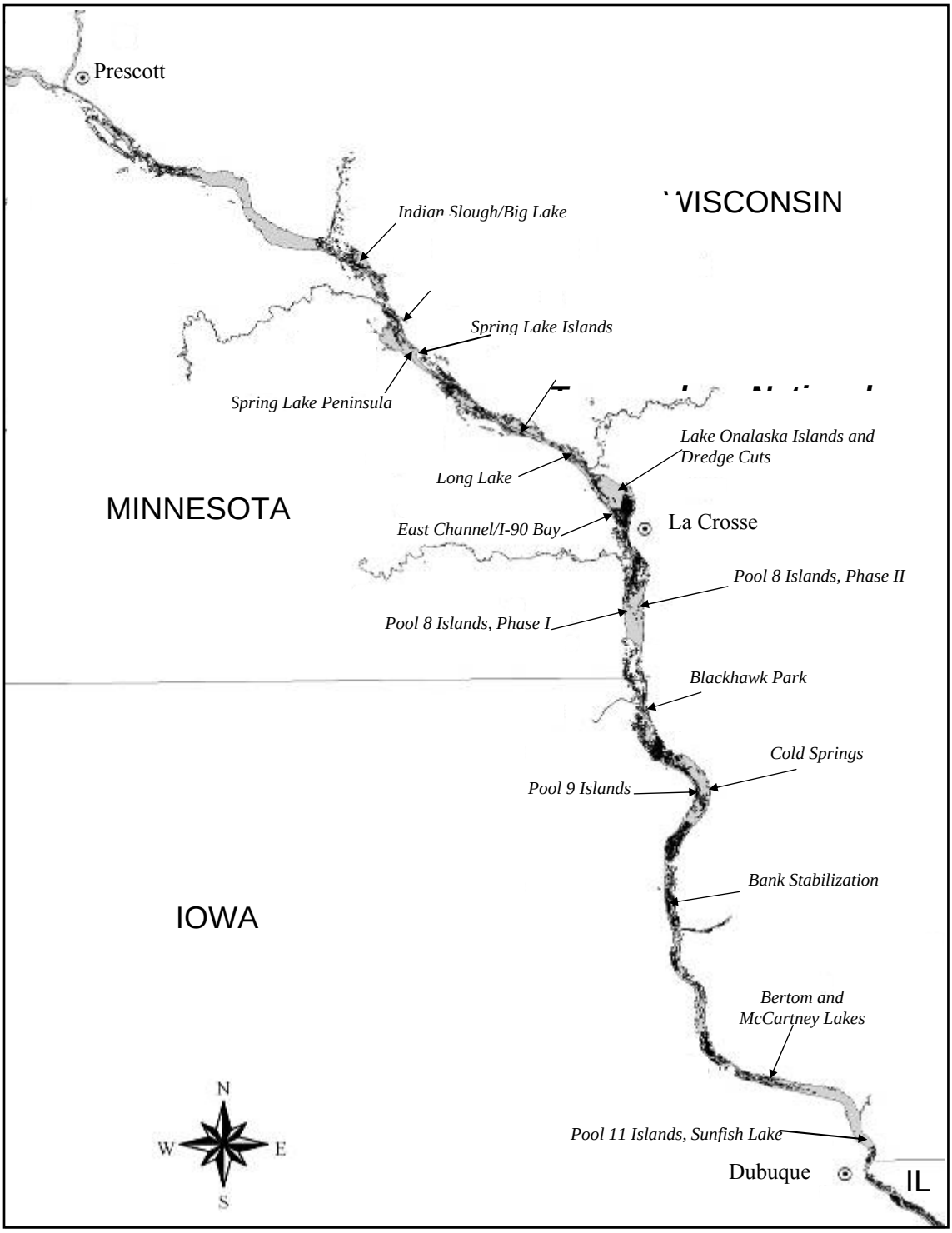
During 2004-05, Wisconsin participated on the Upper Mississippi River Basin Water Quality Task Force, coordinated by the Upper Mississippi River Basin Association (UMRBA). This task force, comprised of water administrators and staff from UMR basin states, met regularly to improve coordination of water management on the Mississippi. In August 2005, the Task Force prepared a report on States' fish consumption advisories on the river with recommendations to improve consistency. This and other management reports can be found at: http://www.umrba.org/reports.htm. Current Task Force efforts include assessing sediment-related water quality problems and guidance for sediment impairment decisions.

LTRMP Stratified Random Sampling Table 1: Assessment of LTRMP Stratified Random Sampling data for state water quality standard exceedances, 1993-2002.

Monitoring based on quarterly sampling conducted in different aquatic areas (strata). The periods include spring (April-May), summer (July-August) and fall (September-October). Sampling depth was 0.2 m. Data are assessed by USGS hydrologic unit code (HUC) reaches adopted by the five UpperMississippi River States (IA, IL, MN, MO & WI).

Reach	Description	Stratum	Period	Variable/Unit	Standard	State	Samples	Percentile	% of Std
07040001	Lock & Dam 3 to Chippewa River	Main Channel	Annual	Turbidity ntu	25	MN	346	38.0	152
		Side Channels	Annual	Turbidity ntu	25	MN	379	39.0	156
		Backwaters	Annual	Turbidity ntu	25	MN	428	67.1	268
		Backwaters	Winter	DO mg/L	5	MN/WI	80	2.7	54
		Main Channel	Spring	Turbidity ntu	25	MN	83	33.6	134
		Side Channels	Spring	Turbidity ntu	25	MN	93	31.0	124
		Backwaters	Spring	Turbidity ntu	25	MN	106	33.6	134
		Backwaters	Spring	pH	9	MN/WI	106	9.1	101
		Main Channel	Summer	Turbidity ntu	25	MN	87	54.0	216
		Side Channels	Summer	Turbidity ntu	25	MN	103	58.2	233
		Backwaters	Summer	Turbidity ntu	25	MN	129	73.0	292
		Lake Pepin	Summer	Turbidity ntu	25	MN	298	27.0	108
		Main Channel	Fall	Turbidity ntu	25	MN	86	36.3	145
		Side Channels	Fall	Turbidity ntu	25	MN	90	36.9	148
		Backwaters	Fall	Turbidity ntu	25	MN	115	90.2	361
		Lake Pepin	Fall	Turbidity ntu	25	MN	267	30.0	120
07040003	Chippewa River to Lock & Dam 7	Backwaters	Spring	pH	9	MN/WI	342	9.10	101
07040006	Lock & Dam 7 to Root River	Isolated	Annual	DO mg/L	5	MN/WI	281	0.3	6
		Backwaters	Winter	DO mg/L	5	MN/WI	103	3.0	60
		Isolated	Winter	Chloride mg/L	230	MN	11	345	150
		Isolated	Winter	T. Ammonia-N	5.1	WI	51	6.87	135
		Isolated	Winter	Turbidity ntu	25	MN	46	128	512
		Backwaters	Spring	pH	9	MN/WI	119	9.30	103
		Isolated	Spring	pH	9	MN/WI	80	9.40	104
		Backwaters	Summer	Turbidity ntu	25	MN	144	29.0	116
		Isolated	Summer	DO mg/L	5	MN/WI	78	0.2	4
		Side Channels	Fall	pH	9	MN/WI	78	9.11	101
		Backwaters	Fall	Turbidity ntu	25	MN	104	26.0	104
		Isolated	Fall	DO mg/L	5	MN/WI	72	1.0	20
07060001	Root River to Lock & Dam 9	Isolated	Annual	DO mg/L	5	MN/WI	62	0.2	4
		Isolated	Annual	Turbidity ntu	25	MN	60	39.3	157
		Isolated	Winter	DO mg/L	5	MN/WI	15	0.0	0
		Isolated	Winter	Turbidity ntu	25	MN	15	98.2	393
		Isolated	Winter	NH3-N	0.04	MN	12	0.064	160
		Backwaters	Spring	pH	9	MN/WI	419	9.10	101
		Impounded	Spring	pH	9	MN/WI	225	9.04	100
		Isolated	Spring	pH	9	MN/WI	10	9.87	110
		Side Channels	Summer	Turbidity ntu	25	MN	232	26.0	104
		Backwaters	Summer	Turbidity ntu	25	MN	436	32.0	128
		Isolated	Summer	Turbidity ntu	25	MN	17	52.8	211
		Isolated	Summer	DO mg/L	5	MN/WI	19	0.2	4
		Main Channel	Fall	pH	9	MN/WI	135	9.14	102
		Side Channels	Fall	pH	9	MN/WI	194	9.10	101
		Backwaters	Fall	pH	9	MN/WI	428	9.10	101
		Impounded	Fall	pH	9	MN/WI	223	9.10	101

Figure 1. Locations of Wisconsin sponsored Habitat Rehabilitation and Enhancement Projects.



Project Name	Pool	Year Complete	Acres Affected	Features	Monitoring Conducted	Comments
Indian Slough/Big Lake	4	1994	100	Dredging, riffle-pool structure, closing structure, tree revetments	Water quality Bathymetry Fishery	Young-of-the-year smallmouth bass use is high in the riffle-pool structure. Disposal site vegetation well established. Centrarchid response difficult to assess due to sampling effectiveness.
Small Scale Drawdown	5	1997	52	One time water level reduction	Vegetation Sediment	The drawdown was successful at increasing plant diversity and coverage of emergent vegetation.
Spring Lake Peninsula	5	1995	300	Dredging, island construction	Water quality Fishery	The structure did reduce velocities in the upper end of Spring Lake. Spring Lake Islands will further reduce velocities in project area
Spring Lake Islands	5	2006	600	Dredging, island construction, stabil-ization, sand/mud flats	Water quality Fisheries Aquatic Vegetation	Although the project was not complete in 2005, enough features were in place by winter of 2005 for the area to begin providing benefits for backwater fish. The first year of post project monitoring began in winter of 2005. Water quality parameters are being met in the majority of the area.
Trempealeau National Wildlife Refuge	6	1999	5,600	Water control structures, dredging, interior dike construction	Water quality Vegetation	First operation of the structures for water level management will began in 2000. Monitoring of project is being done by FWS
Long Lake	7	2002	15	Water control structure	Water quality Fishery	The project was damaged by 2001 flood. Flood repair was completed in 2002. Post project monitoring shows that DO has improved.
Lake Onalaska Islands and Dredge Cuts	7	1990	7,000	Dredging, island construction	Water quality Wildlife	Although not specifically being monitored, fisheries response to the project has been good based on reported harvests and observation of anglers. Waterfowl nesting use of the islands continues to increase, but is variable due to periodic nest predation.
I-90 Bay and East Channel	8	1997	100	Bank stabilization, island construction	Fishery	Target fish present in I-90 bay. Assessment of response continuing. Project may have unexpected benefit of also providing some centrarchid overwintering habitat in the upper portion of I-90 bay.
Pool 8 Islands Phase I	8	1993	1,000	Dredging, island construction	Water quality Vegetation Bathymetry Wildlife	Aquatic vegetation response to project is good. Waterfowl nesting limited due to high water events and size of main island. Vegetation response in shadow of island was augmented by pool wide water level management in 2001 and 2002. Emergent vegetation appears to be persisting in area protected by island.
Pool 8 Islands Phase II	8	1999	600	Dredging, island construction	Water quality Fishery Vegetation Bathymetry	Target water quality parameters met. Vegetation response better than expected. Statistical comparison of aquatic plant response in project area was significantly better than control area. Fish response has been exceptional leading to this project area becoming one of the most heavily fished in Pool.
Blackhawk Park	9	1990	420	Dredging and flow introduction	Water quality Fishery	Low dissolved oxygen problems alleviated through introduction of flow into backwaters. Fish response good.
Pool 9 Islands	9	1995	350	Rock island construction	Vegetation	Within 3 years of construction, almost the entire area within the island complex was, and continues to be, vegetated with submersed vegetation.
Cold Springs	9	1994	35	Weir structure and dredging	Water quality Fishery	Low dissolved oxygen has been alleviated in the southern lobe. Fish response good and consistently yields some of the highest CPUE of largemouth bass for survey overwintering sites.
Bank Stabilization	7, 8, 9, 10	1999	2,000	Shoreline protection		A variety of rock protection designs have stabilized over 5,000 feet of shoreline.
Ambro Slough/Gremore Lake	10	2005	2,500	Dredging, flow introduction, partial closing structure, island construction	Water quality Fishery	Post project monitoring continuing. DO levels in backwaters have improved due to increased depth in Big Missouri, Tilmont, Spring and Upper Doubles Lake and the introduction of flow into Gremore Lake.
Bertom and McCartney Lakes	11	1991	2361	Riverine "habitat" channel, island construction, dredging	Water quality Fishery Wildlife	Low dissolved oxygen in summer and winter alleviated. Fisheries response good and still being assessed. Ten acre wetland in interior of island receiving heavy wildlife use.
Pool 11 Islands, Sunfish Lake	11	2005	600	Dredging, island construction, isolated wetland	Water quality Fishery Wildlife	Post project monitoring of fish and water quality has been initiated.

Cost Benefit Assessment

The Clean Water Act requires states to report to Congress on the social costs and benefits of actions necessary to achieve the objectives of the Clean Water Act. WDNR believes that while cost benefit assessments can inform the decision making process, this type of analysis should not override the goals of environmental or ecosystem health as a single dominant decision point.

The complex and multi-jurisdictional nature of environmental protection and water quality regulation and restoration precludes a precise analysis of fiscal outlays in the context of this biannual report. In addition, rapid change in our understanding of the complexity of environmental systems, as well as evolving knowledge of precise endpoints for environmental damage exerted by a single contaminant, further complicate our ability to assess potential benefits of specific actions or regulations. Thus, this section of the report assessment is limited to a brief discussion of some of the major financial outlays related to water quality, including the Environmental Improvement Fund (with special emphasis on the Clean Water Fund and the Safe Drinking Water Program), the state's Stewardship Program (Land Acquisitions and Easements) and the state's Polluted Runoff Management Program.

Environmental Improvement Fund

Wisconsin's Environmental Improvement Fund (EIF) consists of three separate financial assistance programs: the Clean Water Fund Program for wastewater treatment and urban runoff projects, the Safe Drinking Water Loan Program for drinking water projects, and the Land Recycling Loan Program for Brownfield projects. The EIF directs limited financial resources to projects with the highest environmental priority score.

The EIF is an excellent tool for Wisconsin in meeting its responsibilities under the 1987 Clean Water Act. EIF programs provide financial assistance to local units of government in the form of subsidized loans and, in some cases, grants or interest subsidy payments.

Clean Water Fund Program

The Clean Water Fund Program (CWFP) is Wisconsin's revolving loan program. The CWFP uses funding from the capitalization grant authorized by the Clean Water Act and supplemental funding from state borrowing to help achieve state water quality goals and the objectives under the Clean Water Act.

Repayments of principal and interest from CWFP loans will make up the primary source of funding for future EIF programs. The programs are administered jointly by WDNR and the Department of Administration. The CWFP provides financial assistance to municipalities for planning, design and construction of surface water and groundwater pollution abatement facilities. Over the years an increased emphasis has been placed on preventive maintenance for existing pollution abatement facilities. Financial assistance is administered by the CWFP through: 1) a federal revolving loan program, 2) a state leveraged loan program, 3) a state direct loan and hardship program, 4) a federal hardship program, and 5) a small loan program. The state programs are a commitment made by the Legislature to exceed the federal funding for surface water pollution abatement.

From 1991 through 2005, the CWFP entered into 594 financial assistance agreements with Wisconsin municipalities totaling $2.2 billion in loans and $121 million in financial hardship assistance grants. In addition, the CWFP has executed agreements with 52 municipalities to subsidize interest payments on wastewater treatment project loans made to the municipalities by a state program other than the CWFP. The amount of financial assistance provided for individual CWFP projects ranges from $25,000 to over $134 million. The Milwaukee Metropolitan Sewerage District, which is comprised of 28 individual municipalities serving a population of about 1.2 million, has received 64 CWFP loans totaling over $683 million. This amount represents 31% of

the CWFP's total loan dollar volume since the program began in 1991.

The CWFP provides financial assistance for the following types of projects:

- Compliance maintenance projects – These wastewater projects are necessary to prevent a municipality from exceeding effluent limitations contained in their Wisconsin Pollution Discharge Elimination System (WPDES) permit.
- New or changed limits projects – These wastewater projects are necessary for a municipality to meet effluent limitations contained in its WPDES permit which were newly established or modified after May 17, 1988.
- Unsewered projects – These wastewater projects provide treatment facilities and sewers for unsewered or partially unsewered municipalities.
- Urban runoff projects – These stormwater/nonpoint source projects are necessary to meet WPDES permit requirements, meet non-agricultural performance standards, or control urban stormwater problems under WDNR-approved plans.

The CWFP may provide financial assistance to municipalities in the following ways: provide loans at or below market interest rates, provide grants under a state or federal hardship assistance program, purchase or refinance the debt obligations of municipalities incurred for CWFP-eligible water pollution control projects, and make subsidy payments to municipalities to reduce interest on loans made by the Board of Commissioners of Public Lands for CWFP-eligible projects.

Each project is prioritized using a system established by Wisconsin Administrative Code. The environmental criteria used to select projects include: impacts to human health, maintenance of fish and aquatic life, maintenance of wildlife, impacts to outstanding and exceptional resource waters, the ability to treat septage and leachate, and the population served by the project. The priority system assigns a score to every project based on the criteria. Projects are ranked numerically, so in the event funding is not available for all requested projects in a given year, awards will be made by the order in which they are ranked. Funding each biennium has been sufficient to fund all eligible CWFP projects, except for those projects requested under the financial hardship assistance program.

Safe Drinking Water Loan Program

The Safe Drinking Water Loan Program (SDWLP) was enacted in 1997 to provide financial assistance to municipalities for the planning, design, construction or modification of public water systems. To be eligible for SDWLP funding, projects must comply with national primary drinking water regulations under the Federal Safe Drinking Water Act or otherwise significantly further the health protection objectives of the Act. The SDWLP began providing assistance in 1998. From the beginning of the program through 2003, the SDWLP has provided 54 loans to local units of government totaling $168.8 million.

Land Acquisitions and Easements

WDNR Bureaus of Facilities and Lands and Community Financial Assistance manage the Stewardship Program, which provides funding for a variety of fee simple and easement acquisitions that protect natural resources and increase public recreational opportunities. Typical projects include preserving green space and incorporating proper land management practices; expansion of wildlife management areas, fisheries areas, natural areas, and state parks; recreational development projects; and habitat restoration areas. Where possible, the WDNR looks for opportunities to blend funds from the Stewardship Program with funds from other federal programs such as the Land and Water Conservation fund (LAWCON).

This funding, $46 million dollars a year through the year 2010, is to provide for both land acquisition and property development. Portions are to be used by non-profit conservation organizations and local governments, both for acquisition and property development purposes. Examples of projects funded by Stewardship in the past several years include establishment of

the Peshtigo River State Forest, Capitol Springs State Park, and the Lower Chippewa River State Natural Area. In addition, substantial expansions to several water-based properties have occurred including the Turtle Flambeau Scenic Waters Area and Tomahawk River State Natural Area. WDNR looks for opportunities to partner with other organizations or to cost-share project costs with federal dollars available for acquisition of lands protecting wildlife, fishery or water quality.

Two of the five acquisition priorities for Stewardship funding are lands that preserve or enhance the state's water resources. This includes land along the Lower Wisconsin State Riverway; land abutting wild rivers and wild lakes, and land along the shores of the Great Lakes. In addition, the Stewardship program focuses on efforts to protect water quality and fishery habitat by acquiring buffer areas along streams. This program provides funding for WDNR projects and provides cost sharing to municipalities and nonprofit organizations. Since 1990, approximately $10 million has been spent on WDNR streambank projects, and about $4.5 million in grants have been provided to municipalities and nonprofit organizations for 45 projects. The WDNR has targeted 146 stream corridors with a goal of 21,075 acres or 1,317 miles for easements and 19 stream corridors totalling approximately 30,334 acres or 130 miles for acquisitions.

In addition to the Stewardship Program, the Nonpoint Source Pollution Abatement Program provides funding for WDNR easements to reduce polluted runoff. This program has funded approximately $3.3 million for purchase of 61 easements totaling 1,400 acres. Management of properties owned by the WDNR is outlined in master plans for each property. These plans cover maintenance, management, and development that will occur on the property for at least 15 years. Contained in the plans are recommendations for a variety of land management and recreational activities, especially for those properties that include large water features that are aimed at protecting water quality and scenic natural features. Master plans for properties such as the Lower Wisconsin Riverway, Brule River State Forest, Turtle-Flambeau Flowage Scenic Waters Area, Chippewa Flowage, and Dells of the Wisconsin River State Natural Area contain provisions for protection of water quality and scenic beauty. Polluted Runoff Management Program

Priority Watershed/Lake Program

Expenditures for polluted runoff including pass through funding to communities via the Priority Watershed/Lake Program, open competition grants through the Targeted Runoff Management (TRM) Grant Program, and Urban Nonpoint Source and Storm Water Grant Program. Financing compliance with performance standards (described above under "polluted runoff"), has a total estimated annualized cost of $92 million. The estimated portion for state government is $22 million (24%), for local government is $46 million (50%) and for private landowners and operators is $24 million (26%). The majority of the local government and private sector costs are associated with meeting the non-agricultural performance standards. Sources of government funds include state bonding, segregated and general purpose revenue sources for cost-sharing and local staff, the state clean water revolving loan fund, federal programs, including EQIP, CRP, CREP and section 319, and local funding sources, including county cost-share programs and storm water utilities. These funds are needed to meet standards across the state, including the 120 waters listed as impaired on the federal section 303(d) list.

Groundwater

The material below is from the state's Groundwater Coordinating Council 2006 Annual Report to the Legislature.

Highlights of the State's groundwater protection activities this past year include:

- The first year of implementation of the new groundwater legislation 2003 Wisconsin Act 310. The Groundwater Advisory Committee continued to meet regularly and made

significant progress on groundwater management areas and other issues. DNR secured funding, hired staff and took several steps to implement the new law.

- Key groundwater information and education publications were revised including *Groundwater: Wisconsin's Buried Treasure* a Natural Resources Magazine insert, and the *Groundwater Study Guide,* a popular DNR publication for teachers. Additionally, agency and UW staff supported teacher workshops, a groundwater festival for students,
- Farm Technology Days, county groundwater programs and other educational outreach opportunities.
- The UW Water Resources Library put online many UW and DNR monitoring and research final reports. The reports are included in the widely accessible UW Ecology and Natural Resources Digital Collection
    - *http://digital.library.wisc.edu/1711.dl/EcoNatRes.Groundwater*.

GROUNDWATER COORDINATION

The GCC, its Subcommittees, and member agencies worked together to address groundwater management issues and coordinate groundwater activities in FY 06. Examples include:

1. *Implementation of the Groundwater Protection Act, 2003 Wisconsin Act 310.* The Groundwater Advisory Committee (GAC), required by Act 310, met regularly throughout 2006 and made significant progress on groundwater management area and other issues. The GCC and its subcommittees shared technical information and advice with the GAC.

2. *The fourth annual Groundwater Festival was held in Manitowoc on April 27, 2006.* The event was organized by staff at the Center for Watershed Science and Education (CWSE), Groundwater Guardians, and local land conservation departments. Volunteers from many state agencies, local colleges and high schools helped lead hands-on groundwater activities to over 600 5th and 6th graders from Brown, Calumet, Kewaunee, Manitowoc and Door counties.

3. *Groundwater: Wisconsin's Buried Treasure* and the *Groundwater Study Guide,* both very popular DNR publications, were revised, printed and distributed in FY 06. Other informational or educational publications that were recently updated to include new information were *Arsenic in Drinking Water, Nitrate in Drinking Water, Iron Bacteria Problems in Wells,* and *Karst: Avoid that Sinking Feeling.*

4. *For the sixth year in a row, three groundwater workshops for teachers were taught jointly by staff from the DNR, WGNHS and CWSE at UW Stevens Point.* The workshop leaders instructed teachers on using a groundwater sand tank model and provided additional resources to incorporate groundwater concepts into their classroom. Teachers from 21 different schools attended the workshops and received a free model for their school. With funding from an EPA grant, 141 groundwater models have been given to schools since 2001.

5. *The GCC and the UWS Groundwater Research Advisory Council (GRAC) continued coordination of the annual solicitation for groundwater research and monitoring proposals among state agencies*. The GCC approved the FY 07 solicitation for groundwater research and monitoring proposals, which was sent out in September 2005 (see *Appendix D*). A total of 12 project proposals were received. A comprehensive review process resulted in the selection of 10 new projects for funding for FY 07, five by UWS and five by the DNR. The GCC unanimously approved the proposed UWS groundwater research plan as required by s. 160.50(1m), Wis. Stats.

SUMMARY OF AGENCY GROUNDWATER ACTIVITIES

State agencies and the University of Wisconsin System addressed a number of issues related to groundwater protection and management and implementation of Chapter 160, *Wis. Stats.* in FY 06:

1. *Groundwater Protection Act Implementation* – The Groundwater Protection Act (2003 Act 310) expanded DNR's authority to consider environmental impacts on critical surface water resources when considering approval of high-capacity well applications. Notification and fees for all new wells, and annual water use reporting for high capacity wells are also now required. Further provisions include designation of two Groundwater Management Areas to address regional groundwater quantity issues and the creation of a Groundwater Advisory Committee to recommend management approaches in these areas and evaluate the need for further statutory changes. In FY 06 DNR secured funding for and hired five staff to implement the new law.

FY 06 accomplishments include:

- Implementation of an automated Internet well construction notification and fee collection system as well as an internal DNR approval application tracking system.
- Assessment of the availability of data and evaluation tools needed for evaluating potential significant adverse impacts of high-capacity wells on protected surface waters.
- Coordination of three inventory, monitoring, and research projects on springs and one project measuring baseflows on small protected streams.
- Support for the Groundwater Advisory Committee (GAC) and Subcommittee meetings. The GAC meetings occurred every two months.

2. *Continued Remediation and Redevelopment of Contaminated Properties*

- The DNR approved 512 cleanups of contaminated properties raising the total of approved cleanups (excluding spills and abandoned container responses) to more than 13,700. More than 95 percent of the cleanups undertaken by responsible parties proceeded without enforcement.
- DNR awarded 50 Site Assessment Grants totaling approximately $1.7 million to 33 communities across the state. The grants will provide funds for site assessments and investigations, the demolition buildings or structures and the removal of tanks, drums and other abandoned containers.
- To protect human health and the environment the DNR used $3.5 million in State Environmental Fund dollars to initiate or continue environmental cleanup actions at over 60 sites where groundwater contamination is known or suspected and the responsible party is unknown, unable or unwilling to conduct environmental restoration.
- The DNR, in a Wisconsin's Urban Reinvestment Initiative partnership with the city of Milwaukee and the 30th Street Industrial Corridor Corporation, initiated work on redevelopment of this economically and environmentally distressed area of the state. A focus area was selected and within it 14 Phase I Environmental Site Assessments have been completed. Sampling has taken place on two properties for completion of Phase II reports.

3. Nutrient management plans - DATCP, through its land and water resource management program, provides funding, primarily to counties to assist in the protection of water resources through farmer adoption of nutrient management planning. In FY 06 approximately $90,000 was provided to develop tools for nutrient management plans on farms to maximize profitability and to minimize excessive runoff of nutrients to surface and groundwater. Additionally, $520,000 was budgeted and allocated in FY 06 to provide cost-sharing to write nutrient management plans. Staff also worked to train farmers, consultants, and local agencies on the principles of sound nutrient management and how to comply with performance standards.

4. *New wellhead protection plans*. In FY 06, 11 communities received DNR approval of required WHP plans (for new wells) and 22 communities submitted voluntary plans to the DNR. In addition, WRWA completed Source Water Protection Plans for 3 geographic areas (with multiple

public water systems). There are now nearly 300 communities who have a WHP plan for at least one of their wells.

5. *Groundwater project reports online* - The UW Water Resources Library disseminates the results of more than 120 groundwater research projects funded since 1989 by UWS, DNR, DATCP and the Department of Commerce through its Web site devoted to the Wisconsin Groundwater Research and Monitoring Program at *http://www.wri.wisc.edu/wgrmp/wgrmp.htm*. During the past year, the Water Resources Library partnered with UW Libraries' Digital Collections Center to digitize and put online most WRI and selected DNR final project reports. The WRI Groundwater Research and Monitoring Program Web site now links to the full-text reports, which are included in the University of Wisconsin Ecology and Natural Resources Digital Collection at *http://digital.library.wisc.edu/1711.dl/EcoNatRes.Groundwater*. Inclusion in the UW Ecology and Natural Resources online collection should make a wider audience aware of this important groundwater research.

CONDITION OF THE GROUNDWATER RESOURCE

Major groundwater quality and quantity concerns in Wisconsin include:

1. *Volatile Organic Compounds (VOCs):* Sources of VOCs in Wisconsin's groundwater include landfills, underground storage tanks, and hazardous substance spills. Thousands of wells have been sampled for VOCs. Fifty-nine different VOCs have been found in Wisconsin groundwater. Trichloroethylene is the VOC found most often in Wisconsin's groundwater.

2. *Pesticides*: Pesticide contamination in groundwater results from field applications, pesticide spills, misuse, or improper storage and disposal. The most commonly detected pesticides in Wisconsin groundwater are: metabolites of alachlor (Lasso) and metolachlor (Dual); atrazine and its metabolites; metribuzin (Sencor); and a metabolite of cyanazine (Bladex). DATCP databases show that about 40% of private wells tested have atrazine detections, while about 1% have atrazine over the groundwater enforcement standard of 3 µg/L. A recent DATCP survey of 336 private drinking water supplies showed that 38% of wells contain a detectable level of a herbicide or herbicide metabolite.

3. *Nitrate*: Nitrate-nitrogen is the most common contaminant found in Wisconsin's groundwater. Nitrate can enter groundwater and surface water from a variety of sources including farm fields, animal feedlots, septic tanks, urban storm water, and decaying vegetation. Concentrations of nitrate in private water supplies frequently exceed the state drinking water standard of 10 mg/L. In 2005, DNR aggregated and analyzed data from three extensive statewide groundwater databases. This combined dataset from DNR's Groundwater Retrieval Network (GRN) database, the Center for Watershed Science and Education database and DATCP's groundwater database, includes only the most recent nitrate result for each sampled private well. Out of the 48,818 samples, 5686 (11.6 %) equaled or exceeded the 10 mg/L standard. Further analysis of this data continued throughout FY 06 and will continue in FY 07.

4. *Microbial agents*: Microbiological contamination often occurs in areas where the depth to groundwater or the depth of soil cover is shallow, or in areas of fractured bedrock. Microbial agents include bacteria, viruses, and parasites. These agents can cause acute illness and result in life-threatening conditions for some population groups. In one assessment, approximately 23% of private well water samples statewide tested positive for total coliform bacteria, an indicator species of other biological agents. Approximately 3% tested positive for *E. coli*, an indicator of water borne disease that originates in the mammalian intestinal tract. Viruses are increasingly

becoming a concern as new analytical techniques have detected viral material in private wells and public water supplies.

5. *Radionuclides*: Naturally-occurring radionuclides, including uranium, radium, and radon are becoming an increasing concern for groundwater quality, particularly in the Cambro-Ordovician aquifer system in eastern Wisconsin. The water produced from this aquifer often contains combined radium activities in excess of 5 pCi/L, in some cases in excess of 30 pCi/L. Approximatly 60 public water systems exceed the drinking water standard of 15 pCi/L for gross alpha activity. New federal standards are causing many communities to search for alternative water supplies.

6. *Arsenic*: Naturally occurring arsenic has been detected in wells throughout Wisconsin. DNR historic data show that 3,830 public wells and 3,013 private wells have detectable levels of arsenic. About 10% of these wells exceed the new Federal drinking water standard of 10 µg/L. The highest concentration of arsenic detected in a private well in Wisconsin is 15,000 µg/L. Arsenic has been detected in well water samples in every county in Wisconsin. However, the problem is especially prevalent in northeastern Wisconsin where increased water use has likely mobilized arsenic into the groundwater. The State continues to proactively address arsenic concerns through well drilling advisories, health studies, well testing campaigns, and studies aimed at improving geological understanding and developing practical treatment technologies.

7. *Groundwater quantity*. Despite a general abundance of groundwater in Wisconsin, there is a concern about the overall availability of good quality groundwater for municipal, industrial, agricultural, and domestic use and for adequate baseflow to our lakes, streams, and wetlands. Groundwater use grew from 570 to 804 million gallons per day (Mgal/d) from 1985 to 2000. Groundwater quantity problems have occurred both naturally and from human activities, and often affect groundwater quality. Regional effects of groundwater withdrawals are well documented in the Lower Fox River Valley, southeastern Wisconsin, and Dane County. Localized effects of groundwater pumping on trout streams, springs, and wetlands have been noted throughout the state. Groundwater quantity legislation enacted in 2004 was the first step towards managing groundwater quantity on a comprehensive basis. The DNR began to implement the provisions of the new law in FY 06.

BENEFITS OF MONITORING AND RESEARCH PROJECTS

The GCC provides consistency and coordination among state agencies in funding groundwater monitoring and research to meet state agency needs. Approximately $13.3 million has been spent by DNR, UWS, DATCP, and Commerce through FY 06 on 336 different projects dealing with groundwater or related topics. While the application of the results is wide and difficult to document, this report describes topic areas where the results of state-funded groundwater research and monitoring projects have been successfully applied to groundwater problems in Wisconsin.

These areas include:
- Pharmaceuticals and personal care products
- The Atrazine Rule
- Groundwater monitoring at solid waste disposal sites
- Arsenic monitoring and research in Northeastern Wisconsin
- Groundwater movement in fractured dolomite
- Developing new tools for groundwater protection
- Prevention and remediation of groundwater contamination
- Detection and monitoring of microbiological contaminants
- Groundwater drawdown

- Comprehensive planning
- Microbiological groundwater monitoring
- Rain garden design & evaluation
- Methylmercury formed in groundwater
- Estrogenic endocrine disruptors in groundwater

Conclusion

This 2006 Water Quality Report to Congress represents the cumulative progress in water quality and water resources program work through December 2005. Between the end of the reporting period and the publication of this report, several significant developments have occurred. In various areas of this report, we have updated information to reflect that new information.

However, in other areas, such as Water Program Management structures, data management systems, data availability, etc. we are deferring those updates to the next Water Quality Report to Congress which will be published in 2008 in the form of an *Integrated Report* following guidance published by the USEPA.

For more information regarding the materials contained in this report, please refer to the WDNR Water Division website for the specific program or geographic area of interest to you. http://dnr.wi.gov/environmentprotect/water.html

Cherokee Marsh Wetlands, Madison, Wisconsin 2006
Photo by Lisa Helmuth, WDNR