Part II: Background

Atlas Data

Wisconsin is a state rich in water resources. There are more than 32,000 miles of perennial rivers and streams and approximately 23,000 miles of intermittent rivers and streams for a total of 57,698 linear stream miles. The state has 15,057 inland lakes (about 944,000 acres) of which 6,040 are named and 9,017 are unnamed. Wisconsin also has 1,751 square miles of Great Lakes' estuaries and bays that adjoin 1,017 miles of Lake Michigan and Lake Superior shoreline, 5.3 million acres of wetlands and two quadrillion gallons of groundwater.

The task of assessing, monitoring and managing these water resources is large, and quite frequently, available data for many of the resources is outdated or non-existent. As Figure 1 below shows, Wisconsin subdivides the state by Geographic Management Units (GMUs) for the purpose of managing water resources. GMUs are a mixture of hydrologic basins at the 8-digit HUC level, county boundaries, and DNR regional boundaries. Figure 2 shows that lake assessments have been completed and entered into the waterbody assessment database for all GMUs in 2002. Figure 3 shows that all of the GMUs have been assessed for aquatic life use and fish consumption advisories, yet stream assessments for only 9 of the 21 GMUs have been entered into the 305b database. The results of these assessments are discussed in Chapters 3 and 4.

Figure 1. Map of GMUs, counties, basins

Figure 2. Map of assessment work completed for lakes

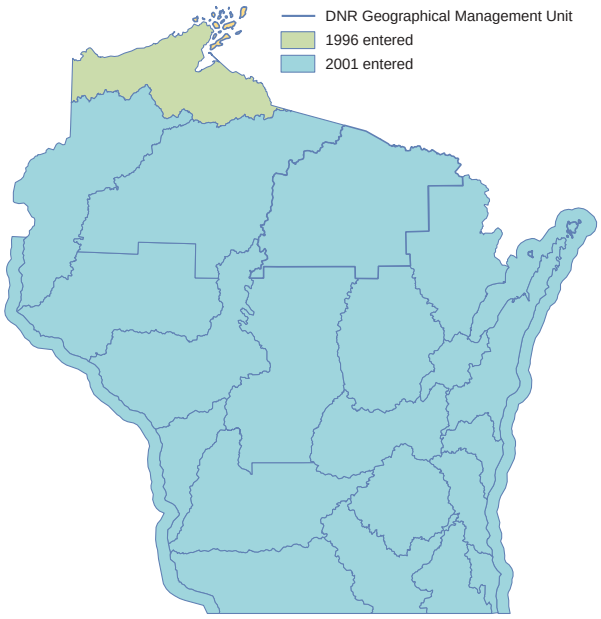
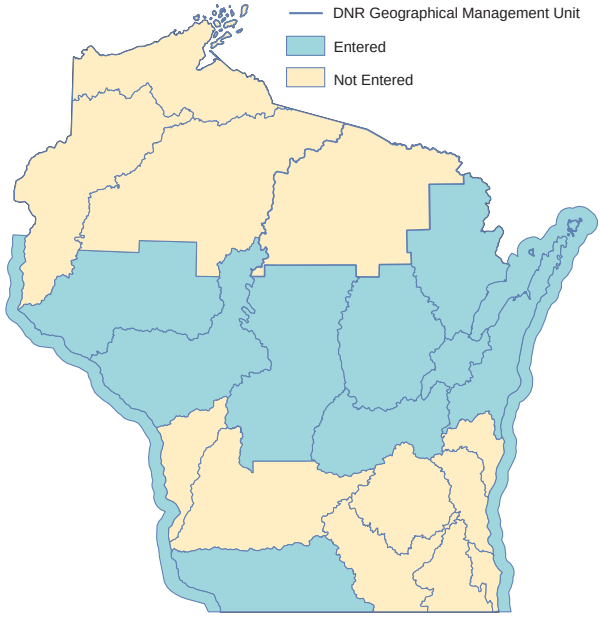


Figure 3. Map of assessment work completed for streams



Resource Management Framework

To learn more go to: http://www.dnr.state.wi.us/aboutdnr/plans/

Strategic Planning

In the summer of 1999, we completed the Department's Strategic Plan. Our Strategic Plan presents our four goals - Making People Our Strength, Providing Outdoor Recreation, Sustaining Ecosystems and Protecting Public Health and Safety - plus numerous strategies that will help us achieve our goals. Shortly after the Strategic Plan was completed, we initiated our efforts to create the Strategic Implementation Plan. The purpose of this Plan was to create clear, measurable objectives of major outcomes that the Department wants to achieve between now and 2006. These objectives typically state *what* we want to achieve - whether it is improving the working environment for staff, cleaner air and water, or better recreational opportunities for our citizens and visitors - and by when. *How* we achieve these objectives is not described in the Strategic Implementation Plan; the paths for achieving these objectives will be found in the creativity of our staff and partners. And, we'll know whether we're successful in achieving our objectives by following the performance measures that are included in the Strategic Implementation Plan, along with the stories that we create to describe our efforts.

This Strategic Implementation Plan establishes a limited number of objectives that are intended to provide a link between the Strategic Plan and the everyday work done by department staff, as set forth in biennial work plans. The objectives in the Strategic Implementation Plan are limited to those that emphasize newer directions and strategic initiatives. As part of the Strategic Implementation Plan Process, the department has identified performance measures by which achievement of the objectives can be determined. The department is committed to evaluating progress towards achieving the plan objectives and to reporting progress based on the performance measures. Biennial work plans will continue to allocate time and resources to these "core" activities. Some programs, such as forestry, fisheries and wildlife, are developing more specific implementation plans to further guide their work and assure that the work important to the public will be accomplished.

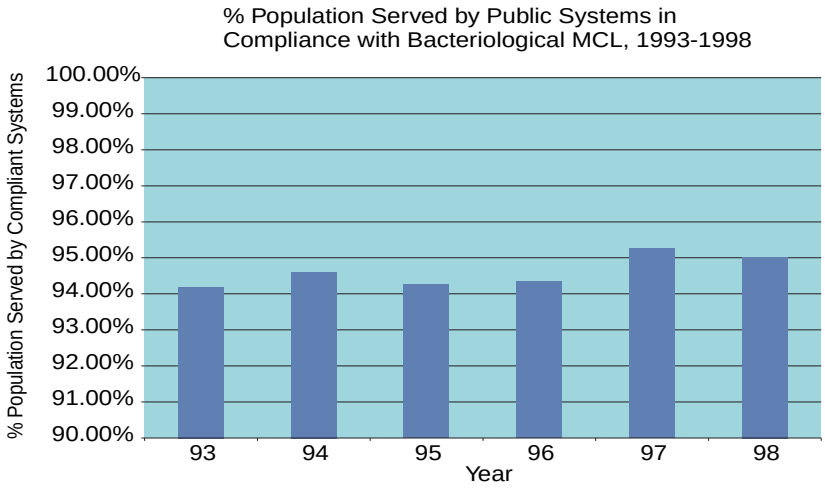
To effectively achieve its mission and the four goals, the department is using an Ecosystem Management Decision Model. The model helps department staff make decisions that sustain Wisconsin's environment, economy and quality of life. Under this model, department staff share ecological, social and economic information with the public to effectively engage them to collectively make decisions within the context of guiding laws and institutions. The department will apply the model to address the four goals of *sustaining ecosystems, protecting public health and safety, providing outdoor recreation and making people our strength.* The objectives outlined in this Strategic Implementation Plan will be the strategic focus of the department over the next six years. The objectives will be reviewed and modified, as appropriate, each biennium.

Performance Measures

In support of the Department's Strategic Planning and Implementation effort, the DNR began developing performance measures for aspects of the ecosystem and the programs designed to manage resources. These performance measures were "reported out" in the state's first and second "State of the Natural Resources Report," published in 2000 and 2001. In the Water Division, performance measures were developed for a variety of ecological and work-based aspects of resource management. Some of these performance measures had previously been identified in the state's Environmental Performance Partnership Agreement as core performance measures. Examples of water-related performance measures include:

- River Restorations/Dam Removals
- Walleye Densities, Catch Rate
- Commercial Whitefish Harvest on Lake Michigan
- Distribution of Zebra Mussels
- Number of stream miles meeting or not meeting their potential uses

Figure 4. Graphic of a performance measure as an example



Watershed Approach

Wisconsin's Watershed Approach is an evolving framework, infusing traditional management tools (standards, regulations) with fresh ideas borne of cutting edge technology and visionary thinking. Prior to 1999, Wisconsin integrated its water and water-related programs to protect water quality through basin planning and linking this planning with monitoring, regulatory and non-regulatory action, such as grant distribution. Each plan described water resources and recommendations for actions on an array of water-related issues.

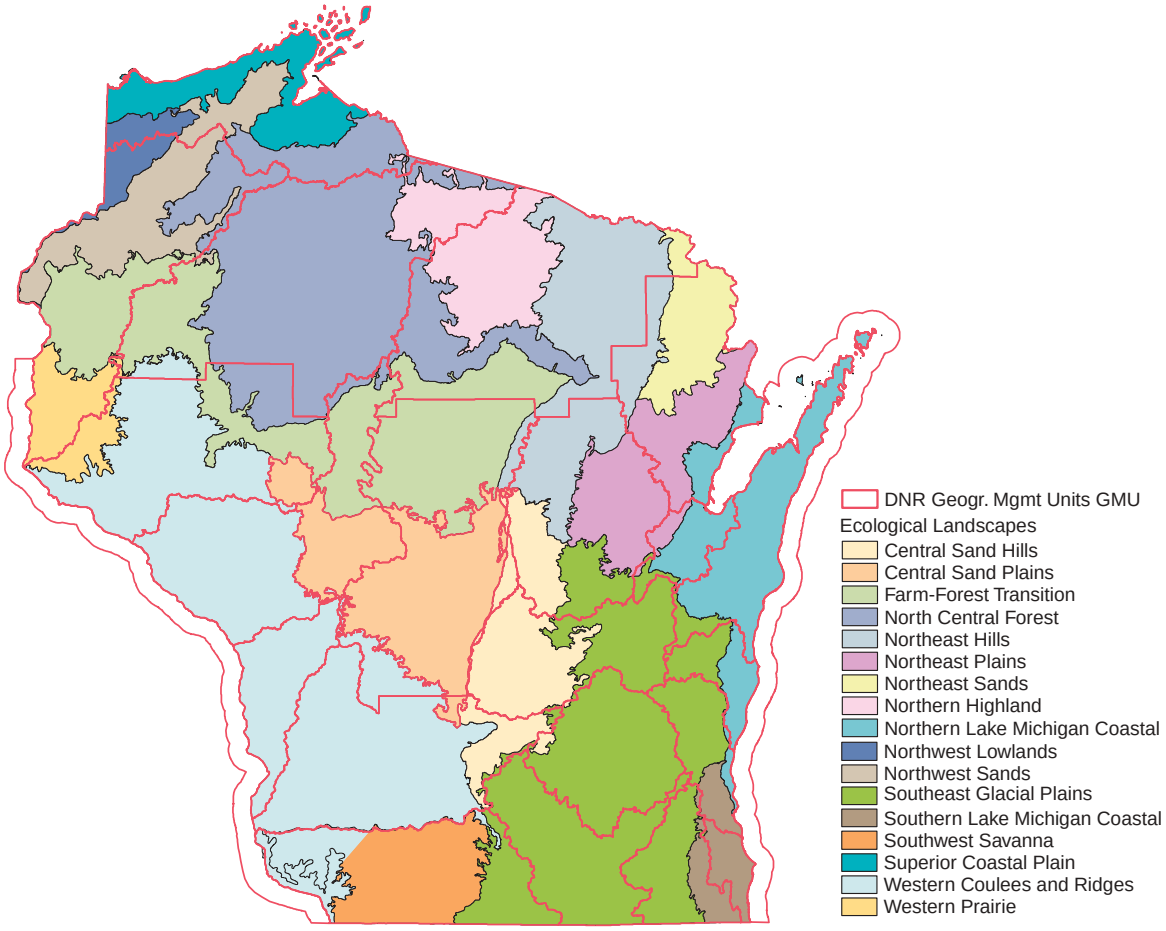
Implementation of DNR's reorganized structure, however, has called for moving beyond a programmatic or media-specific approach. While still focused on the basin as a hydrologic unit (modified by the state's Geographic Management Unit (GMU) structure), the Watershed Approach has moved even closer to an idealized model for ecosystem management and protection. With the GMU or Basin as the focus of planning and management, the integrated planning process (see

below) has enhanced the breadth of coverage, including such diverse areas as water quality, fisheries, habitat, wildlife, and forestry. Connections to the state's Ecological Landscapes Fig 5, which describe an area's ecological potential, are being made. Further, integrated plans are being developed through meaningful cooperative decision making on priority issue identification and strategic direction between the GMUs/Basins and partner groups. In each plan this participatory dynamic is exhibited somewhat differently, reflecting the necessarily adaptive framework employed to involve the people and address the issues pertinent to particular basins.

With the broadening of Wisconsin's Watershed Approach, the depth of water-related information in the plans has somewhat diminished. However, because Integrated Planning is focused on developing "living documents," resource-specific reports such as research projects or issue summaries will be amended to the initial reports, providing fresh, detailed information on an ongoing basis. Further, the Division of Water will continually look to the redesign and re-adaptation of its programs to remove unnecessary impediments to integration and to utilize incentive-based resource management practices where possible. The Division will focus on integrated data management, structural linkages between critical watershed initiatives such as an Agricultural Strategy, the Conservation Research and Enhancement Program (CREP), and a new eutrophication strategy; performance indicators and monitoring; and adaptive management paired with evolving regulatory (TMDLs, permits, nonpoint source performance standards) and non-regulatory (monitoring, data communication, EMS, Green Tier) approaches or tools.

Further, the Division of Water will continue to rely on the state's Watershed Advisory Committee, the Groundwater Coordinating Council, and in-place processes such as the Upper Mississippi Water Quality Task Force work, the Lake Superior Bi-National Program, the two Great Lake LAMPs, and the St. Croix Basin Water Management Initiative.

Figure 5. Map of Ecological Landscapes vs. GMUs



Science and Innovation in Water Management

To learn more go to: http://www.dnr.state.wi.us/org/es/science/project/project.htm

During 2000 and 2001, the Wisconsin DNR participated in a number of research projects to enhance knowledge of watershed and contaminant transport processes, with the ultimate goal of refining and improving resource management and ecosystem health. Below are a few of these projects.

Watershed Studies

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. Practical, standardized procedures have been developed for determining the characteristics and quality of wadeable stream physical habitat and fish communities. 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 11 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*. DNR is in the process of evaluating Otter Creek watershed, which will continue through 2002. Due to the lack of BMP implementation, sampling three of the five priority watersheds has been discontinued until sufficient BMPs have been installed. The results from Spring Creek provide novel information regarding the sufficiency of riparian and watershed BMPs in improving stream habitat and biological communities.

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 of - 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 macroinvertebrate were sampled. Urban land use in both riparian and watershed were digitized using GIS. *Preliminary results indicate that stream base flow and biological indices decrease dramatically for watersheds with 7-11% imperviousness, beyond which stream base flow is consistently low and biological indices are consistently poor.* No trout is found in streams with more than 11% imperviousness. The models that will be developed can 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.

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 was 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. At the time of report publication, collection of field physical and biological data and developing GIS layers for watershed characteristics was being conducted. The developed 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. 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.

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 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. We have gathered data for N, P, periphyton, macroinvertebrate, fish, and physical habitat from 160 wadable streams and are in the process of gathering watershed land use and identifying periphyton and macroinvertebrate. The result of this study will be used to help interpret TMDL data and to refine nutrient standard.

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) have been sampled. And, field data collection on fish, macroinvertebrate, and physical habitat is also complete. Riparian and watershed land use data has been gathered and watershed BMP implementation information is being assembled. The results from this study can answer if large-scale, low-level BMP implementation will improve stream quality.

Status Assessment and Development of a Fish IBI for Small Warmwater Streams

The objectives of this study are to evaluate fish and habitat status and to develop a fish IBI for small warmwater Wisconsin streams. Ninety-eight (98) small warmwater streams throughout the state with different levels of impairment (from lest to highly impacted) have been sampled for fish and habitat twice a year for two years. Watershed boundaries have been delineated and land use information for these stream catchments has been 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.

Impacts of Land Use and Groundwater Flow on Trout Streams Water Temperature

The objective of this study is to modify and calibrate a stream water temperature model developed for the driftless area (in Wisconsin) for use in the other state ecoregions. Water temperature, stream flow, and channel morphology data have been collected from six trout streams and watershed and riparian land use information is being gathered. The results of this study will be used to (1) evaluate potential impacts of changes in management of riparian zone on stream temperature; (2) evaluate potential impacts of watershed land use on groundwater discharge and stream temperature; (3) determine the sensitivity of stream temperature to changes in groundwater inflow.

The Effect of Near-Shore Development on Water Quality Loadings to Lakes in Northern Wisconsin

Over the past two years, the Bureau of Integrated Science Services and US Geological Survey have been involved in a field study to compare nutrient losses from lake-shore residential lawns to adjacent natural forest areas. Lawn/forest pairs were chosen at four lake locations in Vilas or Forest counties. Both surface runoff and ground water quantity and quality were monitored over the two-year period. Nutrients quantified included ammonia, nitrate, total Kjeldahl nitrogen, dissolved and total phosphorus.

The total number of runoff samples generated at the 11 sites varied from zero to 25 with lawns generally producing more runoff than the adjacent forested areas. The sites producing the largest quantities of runoff were either underlain with clay or facing south, which resulted in rapid large volume snowmelt events. Differences in nutrient yields (lbs/ac/yr) were generally found between lawn and forested paired sites. Twenty-nine out of the 35 paired comparisons were significantly different ($p<0.05$), with the lawns producing a greater nutrient yield.

Monitoring & Assessment

Development of a Probability-Based Stream Monitoring and Assessment Strategy

Millions of dollars have been spent in the state of Wisconsin on monitoring and watershed and stream management activities, yet aside from limited site-specific examples, there is little evidence of the effectiveness of these efforts in broadly protecting or restoring stream resources. Certain land use practices continue to significantly impact many of the state's waters and in some areas continued severe degradation of stream resources are apparent. In the absence of comprehensive data on the status of Wisconsin's stream resources and lack of understanding of how land use factors impact streams, politics continue to drive land and water resource management activities. To reverse stream resource losses, improvements in stream monitoring, assessment, and greater understanding of factors impacting water resources are needed. The resulting data and 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: 1) 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; 2) 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 3) pilot the development of a multi-metric macroinvertebrate index for wadable 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 be used to improve the Wisconsin Department of Natural Resource's (WDNR) wadable stream monitoring and assessment program, and advance and institutionalize the use of probability-based monitoring in Wisconsin.

Refinement and expansion of the Wisconsin wetland biological index for assessment of depressional, palustrine wetlands

This project represents the evaluation and expansion phase of an earlier study that resulted in the preliminary development of a Wisconsin Wetland Biological Index based on plant and macroinvertebrate metrics. This study is designed to: 1) Test and refine a Biotic Index for Wisconsin's palustrine wetlands. 2) Expand the list of assemblages to include macroinvertebrates, zooplankton, diatoms, amphibians, plants, and small mammals. 3) Establish a biological integrity rating system for classifying wetlands based on the response of selected biological attributes (metrics) of the above communities to surrogate measures of human disturbance

Data from the current study will be used to refine and further evaluate the preliminary indices and expand communities covered to include zooplankton, diatoms, amphibians, and small mammals. Field studies for this project were conducted during the spring and summer of 2000, with laboratory analysis and data synthesis in progress. Funding was provided by a grant from the U.S. Environmental Protection Agency - Region 5. A final report will be prepared and distributed after April1, 2002.

Water Management Programs

Water Quality Management Planning

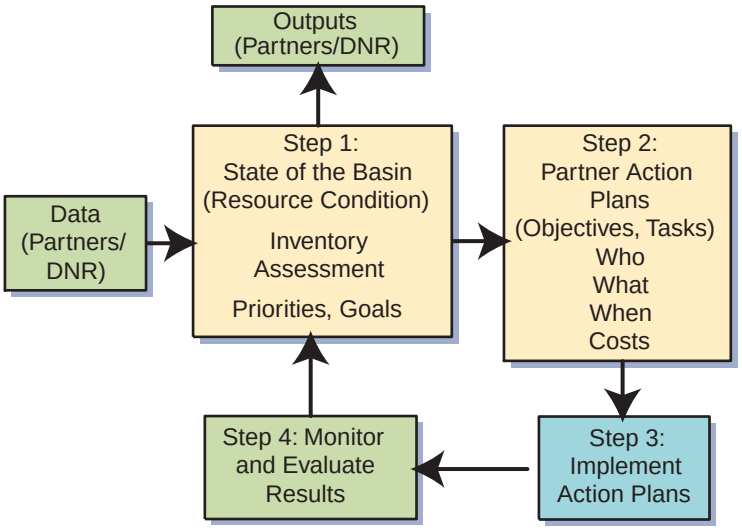
Wisconsin's Water Quality Management Planning Program encompasses a broad array of activities, as the 'basin plans' serve as the foundation for conformance reviews during implementation of many of the state's water-related programs, grants and permits. Water Quality Planning includes the following key activities:

- Preparation of 'Basin' or Integrated Management Plans under NR121;
- An assessment of rivers, streams, lakes and groundwater in basin plan "watershed tables"; includes identification of potential waterbodies for addition or removal from state's Impaired Waters (303d) List;
- Identification of key areas for monitoring and management and identification of goals, objectives and projects;
- Ranking of nonpoint source priorities for large scale, small scale and individual streams or lakes for ranking under the state's Targeted Runoff and Urban Stormwater Grant Programs;
- Recommendations for specific Lake or River Planning or Protection Grants, which provide additional weight to the applicant's proposal during the grant award process;
- Recommendations for prioritization of total maximum daily load (TMDL) implementation among a region or GMU's identified Impaired Waters;
- Administration of the Local Water Quality Aid Program or "604b Grant Program," which provides grant funds to local and regional governments for assistance to DNR in administration of various aspects of the Clean Water Act, specifically water quality management planning;
- Preparation of Sewer Service Area Plans under NR121;
- Oversight, review and approval of plans developed by designated planning agencies (Southeast Regional Planning Commission, Dane County Regional Planning Commission) and for additional designated management areas (Fox Valley Area, including Brown County and major portions of the East Central Regional Planning Area;
- Oversight, review and approval of plans developed by communities with populations of greater than 10,000 – these undesignated planning areas.

Integrated Basin Plans

The State's 32 river basins fall into 23 geographic management units (GMUs), 21 of which are "inland." During 2000-2001, each of the 21 in-land GMUs or 'basins' was responsible for developing a State of the Basin Report through the integrated planning process. This multi-step process (Figure 6) utilizes the strengths of the basins external partnerships to identify, prioritize and implement goals and objectives for ecosystem management. First, the basins worked with partner groups to evaluate data and identify key issues or priorities for the area. The resource inventory takes into account WDNR data and other available information on water and land resources to develop an accurate ecosystem assessment for each basin. Second, basins developed goals, objectives and tasks or recommendations for specific work projects, which provided the basis for work planning and budget decisions for fisheries, habitat, wildlife, and water resources. For DNR the Step 2 in the integrated planning cycle will involve translating these priorities, goals and

Figure 6. Four-step integrated basin planning process



objectives into workplan commitments under the state's biennial workplanning cycle. Step 3 involves implementing these projects over a two year period, and Step 4 involves both ecological monitoring and program monitoring and evaluation to assess whether the plans priorities and goals have been reach, and to evaluate if new priorities and goals should be developed due to changing conditions.

Integrated Basin Plans (or "State of the Basin Reports"):

- Highlight priorities identified through a partner group process;
- Provide a descriptive summary of the physical and biological characteristics of the basin;
- Identify GMU-specific water, fishery, wildlife and habitat issues; and
- Identify basin-specific objectives (in the form of recommended actions) linked to the GMU or basin-specific issues.

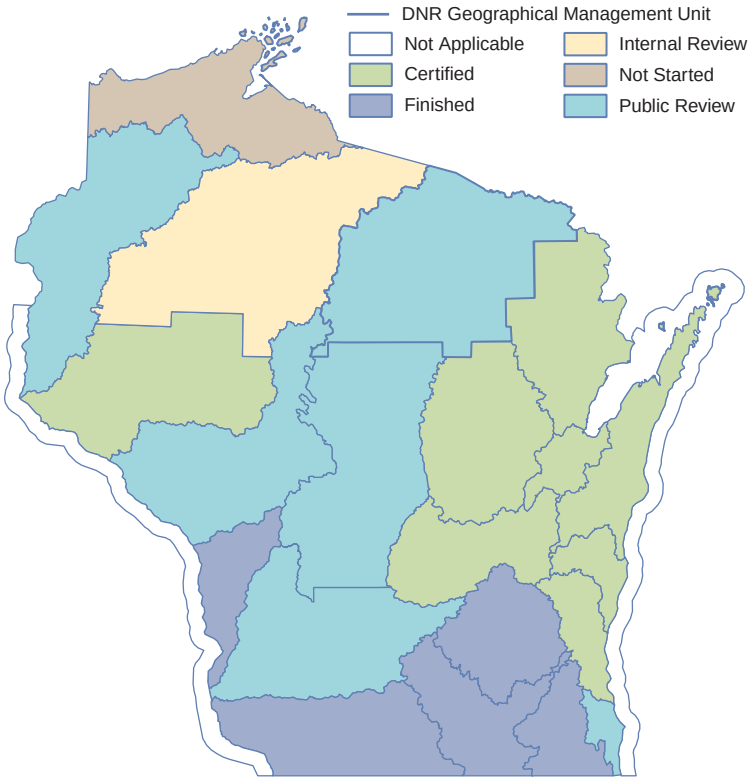
Planning Status

The state's traditional planning schedule, that of plan updates on a five-year rotating basis, was replaced with a simultaneous six-year schedule to support the structure of the basin/GMU-partner management approach. Through the identification of key issues, goals, objectives and recommendations, the plans provide a starting point for project identification and work coordination. This statewide schedule also coincides with DNR's internal biennial workplanning schedule and fisheries management planning approach. Through refinement of the Integrated Planning Process over the next few years, the Division will make additional linkages to enhance how this process supports internal needs and external reporting requirements. Figure 7 shows the status of integrated plan development.

To learn more go to: http://www.dnr.state.wi.us/gmu/index.htm

The broadened scope of water quality management planning reflects a broadening of the state's key management issues as they relate to water. Priority issues identified in newly developed integrated plans are arrayed and compiled to identify the overall priorities identified at the GMU or basin level. Figure 8 shows the principle issues identified through the integrated planning process. These issues include habitat loss/land use conflicts, deterioration and fragmentation; nonpoint source pollution of surface waters; groundwater deterioration; contaminated sediments; user conflicts due to heavy recreational uses; contaminated sediments.

Figure 7. Status of integrated plan development

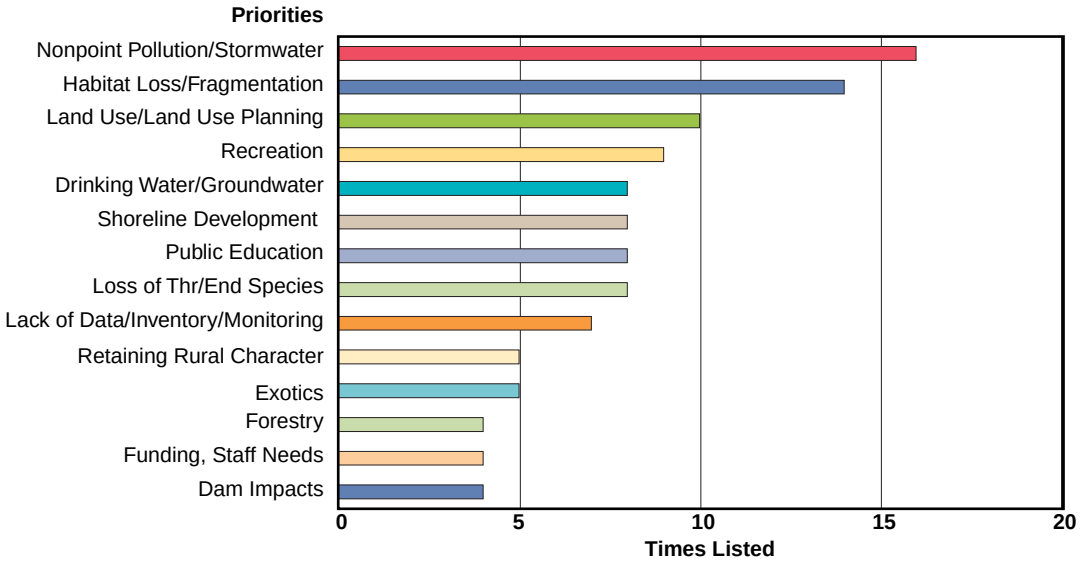


WDNR continues to make progress toward increasing the number of surface waters assessed for their water quality condition. This effort will be enhanced in the next year through an analysis of assessment protocols for streams, lakes, Great Lakes and how these 305b assessments relate to the state's impaired waters or 303d list.

The primary issues for streams continue to be degraded habitat and polluted runoff. For lakes, it is mercury contamination from airborne pollutants, polluted runoff, and hydrologic modifications and shoreline development.

For the Great Lakes, priority issues include fish consumption advisories, the presence of toxic pollutants, runoff and habitat loss. For wetlands, it is degradation and loss of wetlands through development, and for groundwater, contaminants from agricultural activities, groundwater quantity issues, and storage and spills of materials.

Figure 8. Principle Issues Identified through the Integrated Planning Process



These problems are addressed through a variety of programs and initiatives focused on stemming the influx of contaminants as well as removing in place contaminants from historic discharges. This work can be achieved through end of the pipe controls, pollution prevention or enhancing ecosystem function by securing buffers or wild places. The following is a summary of DNR's core water programs.

Local Water Quality Planning Aid Program

The Local Water Quality Planning Aid (LWQPA) Program is a grant program designed to support local and regional water quality planning activities that assist WDNR in its administration of the Clean Water Act. Grant priorities are determined based on statutory requirements, bureau priorities and emerging issues. WDNR receives authority for this grant program from 604(b) of the Federal Clean Water Act, s. 281.51, Wisconsin Statutes and from Chapter NR 121 of the Wisconsin Administrative Code.

Grant Priorities and Eligibility

Financial support is provided to local and regional planning agencies to assist the WDNR in the development of watershed and areawide water quality management planning activities. The first priority is the funding of water quality implementation in designated management areas of the state, as defined in NR 121. These areas include the Southeast Wisconsin Regional Planning Commission (seven counties in southeastern Wisconsin), Dane County, and the Fox Valley Region that encompasses Brown County and portions of the East Central Regional Planning area. A second priority are those areas in the state that are required to develop sewer service area plans, or long-term plans that identify where public sewers will be placed in the future (refer to the Sewer Service Area Planning section). Municipalities with populations greater than 10,000 are required under law to develop such a plan. These are called "undesignated" or "nondesignated" management areas (designated versus undesignated planning areas). This grant program generally funds the first of these plans for the community. The community is then responsible for the implementation of the plan, including updates. A third priority is plans and studies that support watershed management. Examples include municipal stormwater analyses for municipalities with populations greater than 10,000, regional wastewater facility planning studies, identification and protection of environmentally sensitive areas (environmental corridors), or special watershed studies in support of pollution trading.

In addition to the ongoing funding of RPCs in the designated management areas (DCRPC, SEWRPC, BCPC, ECRPC), recently funded projects include:

- Cities of Beaver Dam, Monroe, Platteville and Watertown Sewer Service Area Plan development;

- Stormwater Management Study by the city of Platteville to evaluate impacts to Rountree Branch River;
- Village of Lake Delton wastewater infrastructure study (lift station analysis).

Sewer Service Area Planning

Sewer Service Area Planning is a process that anticipates a community's future needs for wastewater treatment. This planning helps protect communities from adverse water quality impacts through development of cost-effective and environmentally sound 20-year growth plans for sewerage systems. A sewer service area plan identifies existing sewered areas, adjacent land most suitable for new development, and areas where sewers should not go because they are environmentally sensitive and would cause adverse impacts on water quality. Sewer service area planning plays an important role in keeping Wisconsin's water safe for drinking, recreation and fish and aquatic life. The plans are designed to provide structure to a community's wastewater collection system. The plans also accommodate current and future growth while at the same time consolidating wetland, shoreland and floodplain protection programs within a community-based plan for sewered development.

In "undesignated areas" (see above), sewer service plans identify future service areas for communities with populations exceeding 10,000 (as per NR 121.05(1)(g)(4)). Urban areas with wastewater treatment plants that treat 1.0 million gallons per day or more within standard metropolitan regions are included in the sewer service area planning process. There are 28 municipalities in the state that fall under this "undesignated area" definition. Most of these 28 areas have an approved sewer area plan. Only a handful (6) require the development of an initial plan to come into compliance with state law (See Table 1 below).

Table 1. "Undesignated" Communities Needing a SSA Plan

City, County	Population (1999)*	Plan Required	Plan In Place?
C PLATTEVILLE, Grant	10,030	Yes	In Development
C BARABOO, Sauk	10,487	Yes	In Development
C MONROE, Green	10,638	Yes	In Development
C FORT ATKINSON, Jefferson	11,342	Yes	No
C WHITEWATER Jefferson, Walworth 2,582+10,920=	13,502	Yes	No
C WATERTOWN Dodge, Jefferson 8,002+13,149=	21,151	Yes	In Development

* Population Projection from the Wisconsin Department of Administration website

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 codes, ranging from the classification of the waterbodies found in NR102 to the specific details on how to calculate effluent limits for toxic substances found in NR106. NR103 provides water quality criteria for wetlands and NR104 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 marginal (limited forage fisheries or limited aquatic life communities). NR105 provides standards for toxic substances and NR 106 details how to implement standards found in NR105 through calculation of water quality based effluent limits or "WQBELs."

Water Quality Classifications

NR102 identifies water quality classifications for Wisconsin Surface Waters (see below). WDNR uses the state's fish other aquatic life uses classification as the basis for its assessment procedures (see Chapter 2).

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. All surface waters in the state not listed in Wisconsin Administrative Code NR 104 are, by default, classified as warm water forage fish communities.
- 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.

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. By January 1993, through a highly public and controversial process, a significant number of waters were added to Chapter NR 102 as ORWs and ERWs. At that time, only two flowages were included as ORWs because the WDNR did not have adequate information or a systematic approach for classifying flowages. Subsequently, at the direction of the Natural Resources Board, the agency conducted an extensive monitoring and evaluation program on eight flowages over a 3-year period from 1993-96. As a result of that effort, selection criteria were developed by the WDNR staff for flowages and approved by the Natural Resources Board. Four flowages were classified as ORWs using these criteria and added to the list of waters in NR 102 in January 1998. These flowages, all of which are located in northern Wisconsin, include the St. Croix Flowage in Douglas County, the Gile Flowage in Iron County, the Willow Flowage in Oneida County and Caldron Falls Flowage in Marinette County. The classification of these flowages corresponded with the state's purchase of 16,145 acres surrounding the Willow Flowage from the state's Stewardship Fund.

No additional waters have been classified as ORWs or ERWs since January 1998. Below is a summary of the number of waters that are classified in NR 102 as Outstanding and Exceptional Resource waters:

	ORWs	ERWs
Streams	220	1532
Lakes	97	
Flowages	6	

To learn more go to: http://www.dnr.state.wi.us/org/water/wm/glwsp/

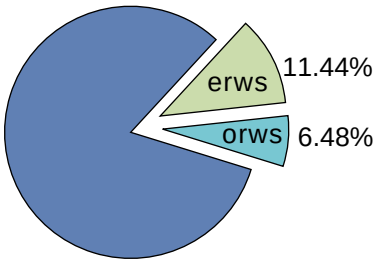


Figure 9. ORW/ERW Waters as a Percent of Waterbodies Statewide

Figure 9 shows that a total of 2,075 stream miles or 6.5% of the 32,010 perennial river miles in the state have been classified as ORW. A total of 3,661 stream miles or 12% of the river miles in the state have been classified as ERW. Of Wisconsin's 27,723 waterbodies, 1,855 (6.7%) are now classified in NR 102 as either Outstanding or Exceptional Resource Waters.

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.

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 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

Phase I: Stream Classification Revision

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 they type of aquatic life community that may be supported by a surface water after carefully considering its naturally occurring 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 DNR is currently updating the aquatic life use designations and is repackaging the rules in a more logical, user-friendly format. In the original NR 104 (October 1976), streams that did not meet standards for fish and aquatic life, primarily due to natural conditions, were listed in the rule. 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. Since the original publication of NR 104 many additional streams have been evaluated and need to be added to the rule. In addition, many of the classifications conducted in the 1970s have been reviewed and, based on new information, need to be reclassified to another classification sub-category. These changes in classification carry with them different water quality standards and associated requirements (e.g. effluent limitations for point sources).

To properly update stream classifications, revisions to chapters NR 102, 104 and 106 are necessary. The revisions will be completed in two phases. In Phase I, the revisions are minimal and focus primarily on accurately updating current classifications. There are no use designation changes included in the Phase I rule revision that force a WWTP upgrade – this revision is intended to make the rule current with respect to use designations and WWTP effluent limits. The proposed revisions to each of the Natural Resource code chapters are as follows:

Chapter NR 102, *Water Quality Standards for Wisconsin Surface Waters*, will contain rule language that was previously located in NR 104. NR 102 is a more appropriate rule to locate the language since the language is specific to designated use categories and water quality criteria necessary to support those uses for the surface waters of Wisconsin.

Chapter NR 104, *Uses and Designated Standards*, is the chapter that establishes uses and designated standards for surface waters of the state. Surface water use designations and variances included in this chapter have been updated. Further, specific waters that may be characterized as "limited use" waters are listed in this chapter.

Chapter NR 106, *Procedures for Calculating Water Quality Based Effluent Limitations for Toxic and Organoleptic Substances Discharged to Surface Waters*, has been re-titled. The proposal is to change the title to "*Water Quality-Based Effluent Standards and Limitations for Discharges to Limited Aquatic Life Waters*." The purpose of this subchapter is to specify how the department will determine effluent limitations for substances discharged to waters that have been designated as "limited use" surface waters.

Phase II: Water Body Use Designation and Five Subgroups

Phase II of the rule revision deals with several issues. One issue that will be completed by the department is to compile and maintain an updated listing of all classified waters in NR 104 - including outstanding resource waters (ORWs) and exceptional resource waters (ERWs). All classified waters will eventually be made available in a GIS (Geographic Information System) format for use with appropriate data systems. Five other main issues will be addressed under the purview of the Water Body Use Designation Advisory Committee (WBUD AC), which has members from the academic, environmental, and regulated community. This advisory committee has been sub-divided into five different subgroups which each deal with a specific WBUD issue. Following are brief explanations of each of the five subgroups that are part of the WBUD AC.

SUBGROUP 1: Use Designation Guidelines: The guidance that is used by Department staff to designate surface waters was completed in 1981. The Department, with much internal and external input, has re-drafted this guidance for designating fish and aquatic life uses for Wisconsin surface waters using current knowledge and science. Cold water use designations have been expanded to account for different dissolved oxygen requirements and the procedures used for classifying fish and aquatic life waters have been updated and more fully developed. The subgroup has provided input and commented extensively on the Guidance.

SUBGROUP 2: Cold Water Issues and Great Lakes Drinking Water Designation: This subgroup is dealing with issues related to seasonally protecting fish species that may be present in surface waters during specific times of the year and also determining drinking water designations with respect to Great Lakes tributaries.

Currently, the subgroup is discussing which categories of streams should be considered for seasonal use classifications. This determination is based on an assessment of where dischargers are located on tributaries as well as what tributaries are currently or proposed to be managed for cold water species. Initially, this effort focused on the tributaries to the Great Lakes, but has since been expanded to consider the seasonal classification approach for inland waters.

This subgroup has also completed an analysis of where persistent bioaccumulative toxic substances (PBTs) have been detected in the Great Lakes Basin. This analysis will be used to develop a site-specific approach for developing limits for discharges of toxic substances to protect drinking water sources. This site-specific approach will be used while additional data is gathered to develop a more comprehensive approach.

SUBGROUP 3: Effluent Channels/Discharges to Dry Runs/Ratcheting: This subgroup is dealing with situations where a discharger "creates" a continuous flowing surface water (and thereby habitat for aquatic life) by virtue of the location of their discharge.

The subgroup has agreed on a definition of an effluent channel and is discussing a proposal for how to deal with discharges to dry runs (including effluent channels) and the ratcheting (more restrictive limits) issue.

SUBGROUP 4: Wetlands: This subgroup is dealing with wetland use designations — how to determine those use designations and how to protect wetlands from discharge impacts. Increased flows to wetlands from discharges that adversely impact the functional value of a wetland are of major concern.

SUBGROUP 5: Implementation Strategy/Procedural Issues: This subgroup will determine how to mesh and implement the different approaches proposed by the other four subgroups. To date, this subcommittee has focused on how to involve "interested parties" in the use designation process.

Proposed Classifications

Fish and Aquatic Life Stream Classification 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 the Department: Fish and Aquatic Life, Recreation, Public Health and Welfare (including drinking waters), and Wildlife. Of these classifications, the Fish and Aquatic Life classification is designed as a water quality standard management tool to qualitatively assess and designate fish and aquatic life uses for surface waters receiving waste discharges. Within the Fish and Aquatic Life use designation, five sub-categories of uses have been proposed: Salmonid A, Salmonid B, Full Fish and Aquatic Life (FFAL), Limited Forage Fish (LFF) and Limited Aquatic Life (LAL). Minimum characteristics for each of these sub-categories are detailed in the table below.

There are environmental requirements associated with each Fish and Aquatic Life sub-category. These physical and chemical characteristics of water volume, habitat structure, and water quality are used to determine an appropriate use designation. Each of these factors influences the assemblage of fish and aquatic life that can be present in an aquatic ecosystem. Analyzing surface waters by considering common characteristics allows the Department to assign use designations consistently on a statewide basis.

The use designation system is one that is dynamic, and it is possible for designations of surface waters to change. The current use of a waterbody is referred to as the **existing use**. 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 **attainable use (currently referred to as potential use)**. The **designated (or potential) use** of a waterbody is the use that is selected and promulgated as a management goal.

When it is determined that a surface water needs to be classified (or re-classified), 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.

Table 2. Fish and Aquatic Life Use Minimum Characteristics (Proposed)

Sub-category	Dissolved Oxygen(mg/L)	Minimum Characteristics
Salmonid A	6 and 7	1. Naturally reproducing salmonid community. 2. Year to year survival. 3. More than 2 individuals per 100 meters. Potential to meet all expectations
Salmonid B	6	1. No natural reproduction with population sustained by stocking or migration. 2. More than 2 individuals per 100 meters Potential to meet all expectations
Full Fish And Aquatic Life	5	1. Game fish community with more than 2 individuals per 100 meters (except Green Sunfish and salmonids). 2. Non-game fish community with a significant number of individuals (5 to 25 % or more) belonging to species that are not tolerant to low dissolved oxygen. 3. Macroinvertebrate communities with a significant number of individuals (5 to 25 % or more) belonging to taxa with an HBI value of 5 or less. 4. Any fish or macroinvertebrates listed as endangered, threatened, or special concern species that are not tolerant to low dissolved oxygen or other factors with inadequate protection provided by the limited use sub-categories. Potential to meet one or more expectations
Limited Forage Fish	3	1. No potential to meet the above criteria. 2. Non-game fish community dominated by individuals (numerically 75_to 100%) belonging to species that are tolerant to low dissolved oxygen. 3. Macroinvertebrate community with a significant number of individuals (numerically 75 to 100%) belonging to species with an HBI value greater than 5. Potential to meet one or more expectations
Limited Aquatic Life	1	1. No potential to meet the above criteria. 2. No potential to contain a fish community. 3. Any macroinvertebrate community is dominated (75 to 100%) by individuals belonging to species with an HBI value of greater than 8. Potential to meet one or more expectations

Waterbody Assessment Implications

Modifications to the system on which Wisconsin bases its Aquatic Life Use Designations demands a review and revision to the way in which the state assesses its waterbodies for the 305(b) Water Quality Assessment procedure. The current aquatic life community-based system (described in Part III, Chapter 2), which is used hierarchically to identify use support levels for state level assessments – and, which is used in conjunction with the waterbody's codifed use to identify additions to the state's 303(d) list of impaired waters, will no longer be in effect once new classification rules have been promulgated. In addition, the state's new baseline monitoring strategy (described in Part III, Chapter 1) has the potential to change the nature in which assessments for wadeable streams and lakes are conducted (ie., use of the stratified random sample design for possible extrapolation of resource information to carry out assessment work). This change also demands a re-evaluation and redesign in the way streams and lakes are assessed statewide. Thus, in the coming years, the DNR's various water and fisheries programs will be working together to evaluate potential changes in how assessments are conducted as a precursor to designing a new system for determining use designation support for waterbodies.

Wastewater Management

To learn more go to: http://www.dnr.state.wi.us/org/water/wm/ww/

Wisconsin DNR has primary state management authority over wastewater treatment and disposal in the state. This management responsibility is accomplished through the implementation of the following programs and activities:

- Wisconsin Pollutant Discharge Elimination System (WPDES) permits program.
- Industrial pretreatment for discharges to municipal sewerage systems.
- Approval of plans for wastewater treatment and disposal facilities and practices ("facility planning")
- Enforcement and compliance assistance.
- Assuring continuing and sufficient wastewater management practices in municipalities through a compliance maintenance program.

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. No person may legally discharge to surface waters or the groundwater of the state without a permit issued under this authority. All permits issued under the WPDES permit program are either specific permits or general permits. Specific permits are issued to individual facilities. 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.

Permits issued under the WPDES Permit Program 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.

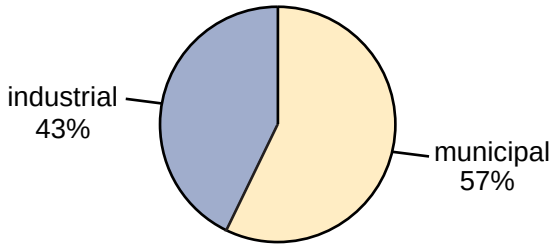
The number and type of individual permittees currently regulated by the WPDES program as of January 2002 are displayed in Figure 10.

Figure 10. Individual Permit Type

Municipal 666

Industrial 486

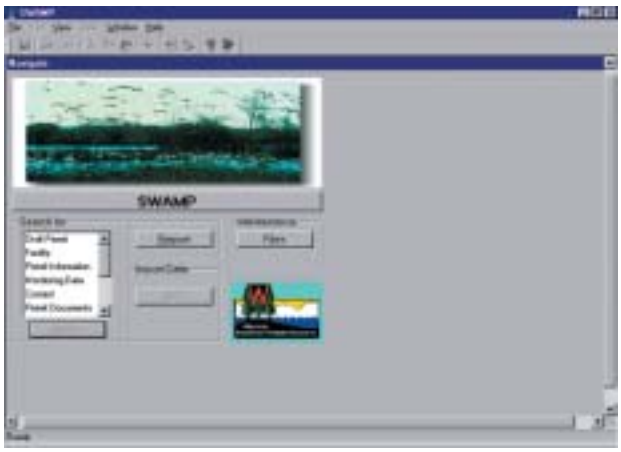
CAFOs - 115



System for Wastewater Applications, Monitoring and Permits (SWAMP)

Data management has become a focal point for managing the state's permit system with the development of the System for Wastewater Applications, Monitoring and Permits (SWAMP), which modernizes the WPDES system. The system's primary features include a consistent permit drafting system, storage capacity for monitoring and attribute data, linkages of monitoring and compliance data to permit limits and conditions, and an ability to track compliance, enforcement and other information related to the permit.

Figure 11. SWAMP System Screen



The SWAMP database was developed to provide access to monitoring, facility and inspection information, and permit drafting systems using an Oracle-based network. The system was first available for use in late 1998 and additional segments and embellishments have been added as system use has expanded and as funding was available. All permits are now being written through use of the SWAMP system, all Discharge Monitoring Report (DMR) data is being entered into the system, and it is being used by staff to assess compliance. The time needed to draft a permit has been reduced about 150 hours to about 70 hours and the permit backlog has been reduced to less than 10% as a result of the efficiencies gained through use of the system.

Permit Backlog

The WDNR is not, in all instances, able to reissue permits before the 5-year term expires. The number of expired permits, however, is a small fraction of the total number of WPDES permits that are in effect at any given time. The objective of the WPDES permit program is to ensure that the Department does not exceed a backlog of more than 10% at any time. As of January 1, 2002, the backlog of industrial and municipal permits, including both surface and groundwater discharges, was under the 10% goal (see below).

Congressional oversight has highlighted the permit backlog as an issue of importance to U.S. EPA. National tracking of permit backlogs reveal that many states and U.S. EPA Regions that issue NPDES permits have backlogs that exceed 40%. Therefore Wisconsin's program has a backlog that is much less than most other states or the U.S. EPA. Importantly, 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.

Table 3. Wisconsin WPDES Permit Backlogs as of January 1, 2002

	Total	Expired Total (minors and majors)	Percent Backlog
Municipal	666	41	6.2%
Industrial	498	43	8.6%
(overall totals)	1164	84	7.2%
CAFOs	120	5	4.3%

Permits that expire and are not issued prior to the expiration date for several reasons including WDNR is awaiting additional data from the permittee, public or other comment necessitates additional review, rules are inadequate to address concerns with the discharge, and a permittee is not in substantial compliance with the terms of the expired permit and enforcement action is underway.

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).

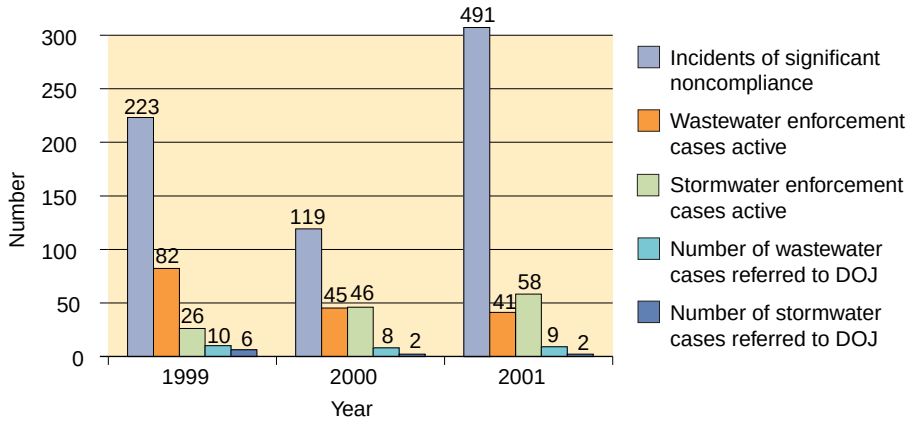
Due to the excellent record of compliance of major permittees, the Department has initiated efforts to revise its inspection strategy to allow it to focus greater attention on minor permittees who more frequently experience compliance difficulties. This inspection strategy is expected to be completed prior to mid-2002. Additionally, the Department has identified a need to update its overall enforcement strategy to assure there is appropriate and timely response to permit violations. This update will be completed in spring 2002.

WPDES permittees have an excellent record of compliance. Figure 12 and Table 4 show the number of cases of significant violations identified during 1999, 2000 and 2001, along with the other formal enforcement data:

Table 4. Significant WPDES Violations

Enforcement Activity	1999	2000	2001
Incidents of significant noncompliance	223	119	491
Wastewater enforcement cases active	82	45	41
Stormwater enforcement cases active	26	46	58
Number of wastewater cases referred to DOJ	10	8	9
Number of stormwater cases referred to DOJ	6	2	2

Figure 12. Incidents of Significant Noncompliance for WPDES, 1999-2001



There are sometimes cases which include both wastewater and stormwater violations. The cases would be coded to the program with the more serious violation. The water program also referred 9 Fisheries and Habitat cases in 2000 and 6 cases in 2001.

Permit Adjudications

Permittees may legally appeal terms and conditions of a permit within a specified time following issuance. As of March 2002, there were 17 outstanding adjudicatory requests pending resolution. Many cases are resolved by modification or reissuance of a permit to include revised regulatory requirements.

General Permits

General permits cover groups of facilities or industries with similar types of wastewater discharges to surface water or groundwater. There are 17 general permits that may be used to cover applicable discharges. Efforts are underway to place information on facilities covered by general permits into the SWAMP system. However, due to workload constraints, not all facilities have been inserted into this data system. The number of facilities covered under a general permit is over several thousand.

Non-Contact Cooling Water, Condensate and Boiler Blowdown - This permit is intended to cover non-contact cooling water, air conditioning condensate and boiler blowdown (with no additives or nontoxic additives) discharges to Wisconsin surface waters or seepage systems.

Contaminated Groundwater from Remedial Action Operations - This permit covers wastewater from soil and groundwater remediation projects involving organic contaminants (primarily hydrocarbons and solvents) discharged to surface waters or seepage systems. The permit also contains requirements for infiltration discharges to enhance in-situ bioremediation.

Petroleum Contaminated Water - This permit is intended to regulate petroleum contaminated water from fueling areas (auto, rail, airport, etc.) and petroleum storage tank farms discharged to surface waters or seepage systems.

Pit/Trench Dewatering - This permit is intended to cover construction site pit and trench dewatering wastewater discharges to surface waters or seepage systems.

Concrete Products Operations - This permit is intended to cover concrete products operations (excluding concrete asphalt) where washwater, boiler blowdown, non-contact cooling water, and dust control wastewater are discharged to surface waters or seepage systems. The permit also contains stormwater requirements in accordance with NR 216, Wis. Adm. Code.

Nonmetallic Mining Operations - This permit is intended to cover sand, gravel, dimension stone, rotten granite, clay pit, and crushed stone operations where wash water, pit dewatering, dust control and non-contact cooling wastewaters are discharged to surface waters or seepage systems. The permit also contains stormwater requirements in accordance with NR 216, Wisconsin Administrative Code (see sidebar).

Swimming Pool Facilities - This permit is intended to cover pool cleaning, pool drainage and pool filter backwash wastewaters that are discharged to surface waters or seepage systems.

Potable Water Treatment and Conditioning - This permit is intended to cover iron filter, lime softener, alum coagulation, granular media filter and reverse osmosis facilities where backwash, regeneration, and rinse water are discharged to surface waters or seepage systems.

Dredging Operations - Carriage and Interstitial Water This permit is intended to cover dredging operations where carriage water or interstitial water from sediment dredging projects is discharged to surface waters or seepage systems.

Hydrostatic Test Water and Water Supply System Water - This permit is intended to regulate discharges of hydrostatic test water and water supply system water to surface waters or seepage systems.

Nondomestic Wastewater to Subsurface Absorption Systems -This permit is intended to cover discharges of liquid industrial wastes containing biodegradable pollutants discharged to subsurface absorption systems (septic tanks followed by subsurface drainfield systems). Typical wastewaters will come from, but not be limited to, food processing facilities (including fruit, vegetable, meat, fish and poultry processing facilities), mink raising operations, and aquaculture operations.

Land Application of Liquid Wastes -This permit is intended to cover discharges of liquid wastes to landspreading sites from, but not limited to, food processing facilities (including fruit, vegetable, dairy products, meat, fish, and poultry processing facilities), mink raising operations, and aquaculture operations. The wastes will typically contain biodegradable pollutants with annual limitations on the application of nitrogen and chlorides.

Land Application of Industrial Sludges This permit is intended to cover the application of industrial sludges to landspreading sites regulated under ch. NR 214, Wis. Adm. Code. These sludges must not have detrimental effects on soils, crops or groundwater, and have beneficial properties as a soil conditioner or fertilizer. These sludges are typically from the treatment of food processing wastewaters.

Land Application of Food Processing By-Product Solids - This permit is intended to cover discharges of by-product solids to land spreading sites. By- product solids are waste materials from the animal or food processing industry including, but not limited to: vegetable waste leaves, cuttings, peelings, husks and sweet corn cobs; animal paunch manure (stomach contents); and waste fruit and pits.

Asphalt Operations Using Wet Scrubbers - This permit is intended to cover facilities that produce asphalt (bituminous concrete) with wet air scrubbers using lagoons, ponds, or holding tanks to contain recycle wastewater. For this type of wastewater there is no discharge allowed to either surface water or groundwater. The permit requires that there is no discharge from the wastewater holding pond.

Outside Washing of Vehicles, Equipment and Other Objects - This permit is intended to cover a variety of facilities that wash equipment, vehicles and other objects outside and can not direct the wastewater to sanitary sewage facilities. Discharges from these washing operations typically contain contaminants (suspended solids and foam) that can be addressed by implementing Best Management Practices. Occasional residential and non-profit vehicle washing is exempt.

Bypasses and Overflows from Sanitary Sewer Collection Systems - This permit is intended to cover inadvertent or deliberate discharges of untreated sewage either directly or indirectly to the ground and/or surface waters of Wisconsin. This permit regulates municipal entities or sanitary districts that own or maintain a sanitary sewer system but are tributary to a neighboring municipality's or regional wastewater treatment facility.

Nonmetallic mining

The nonmetallic mining general discharge permit contains requirements for discharges of nonmetallic mining process wastewater and stormwater to Wisconsin surface waters and groundwater. The guidance document for this permit was finalized and signed by the watershed bureau director on August 7th, 2001. Due to limited Department resources and a very large number of active and inactive nonmetallic mining operations required to submit NOI's under Ch.. NR 216, the Watershed Management Program has establishing a priority system for conferring WPDES general permit coverage to nonmetallic mining operations. This priority system has been chosen to assure that sites with the greatest potential for adverse impacts on waters of the state will receive the highest priority for regulation under the permit. Establishing these priorities will focus the limited staff resources on the nonmetallic mining operations with the highest potential for adverse water quality impacts.

Electronic Transfer of WPDES Discharge Monitoring Report Data (EDMR)

Although the SWAMP system has enhanced the permit issuance process, the discharger monitoring information continues to be submitted in paper format and must be entered into the database with DNR resources. The Department has initiated an effort to allow for data to be more efficiently received through the electronic transfer of data.

The DNR and many permitted or regulated facilities have had a long-term goal to develop an electronic data transfer system. Prior to the development of SWAMP, approximately 170 of 1200 facilities generated Discharge Monitoring Reports (DMRs) onsite using various software packages. The EDMR project will allow data to be transferred directly from the permitted facility to the WDNR to be used in the generation of DMRs. Provisions will be in place to ensure the integrity of the data..

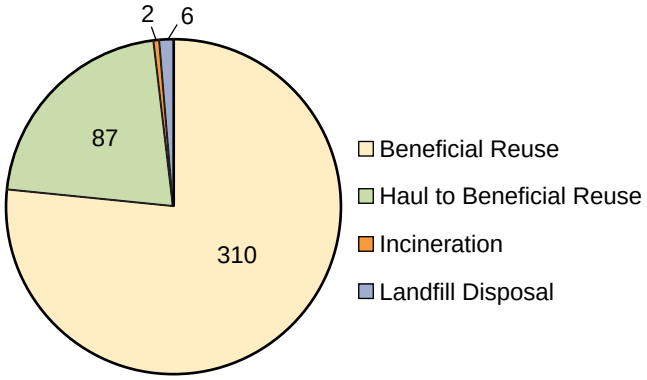
Effluent Limitations

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 requirements is evaluated for all 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 percent 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 percent of municipal sludge generators, for example, either ultimately apply it on farmland or distribute it for individual use. Figure 13 shows that 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.

Figure 13. Disposition of Sludge Waste from Municipal Facilities



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.

Delegation of the Sludge Program

Wisconsin became the fourth state in the nation to be delegated authority to implement the biosolids program under Sections 402 and 405 of the Clean Water Act, in July 2000. This grant of authority verified that Wisconsin's state program met and exceeded all federal requirements for program implementation and oversight. Wisconsin is in the national biosolids program through participation on various U.S. EPA-sponsored groups, including a National Academy of Sciences review of the program

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.

Over the past several years, the amount of WDNR oversight of the pretreatment program has declined substantially. This reduction is due to a variety of reasons including loss of staff to other high priority activities or budget reductions and a determination that most of the delegated municipalities are adequately implementing the program. Recent efforts have been made to incorporate pretreatment program

activities into the workload of Regional staff that have other WPDES program responsibilities. The program is, however, at a point of being so significantly reduced that it may be losing its effectiveness and relevance. The WDNR will be reviewing this program to determine what actions are needed, if any, to assure the continued implementation of this program.

Sanitary and Combined Sewer Overflows

In the period from 1998 through 2000, heavy rains in the Milwaukee urban area resulted in numerous incidents of overflows from the sanitary and combined sewerage systems serving the Milwaukee Metropolitan Sewerage District (MMSD)and tributary (satellite) communities. These overflow events resulted in impairments to local surface waters, and caused considerable public concern about the efficacy of these systems. In response, the Department published a report in 2001 describing the incidents and presented a lengthy series of recommendations for addressing the issue of sanitary sewer overflows in the Milwaukee area and statewide. In addition, this investigation resulted in the Department initiating an enforcement action against the MMSD for permit violations. The result of this action is the development of a stipulation requiring substantial work in the MMSD system to assure that sanitary sewer overflows are being addressed by the local governments. In addition, the Department has initiated efforts to revise state regulations that govern the overflows from sanitary sewerage systems.

Power Plants

As in many parts of the country, projected energy shortages have been identified as a concern. In response, several independent power producers have proposed construction of power generating facilities in Wisconsin. Most of these plants are simple cycle or combined cycle gas turbine plants that recirculate cooling water and use cooling towers. Due to recent changes in state laws regarding the siting of power plants, permit actions in response to these proposals have been elevated in priority. Additionally, the process requires substantial interaction with the project developers, and severely truncates the time scales for permit actions. As of early 2002, there were at least 6 power plant projects being reviewed by WPDES permit staff. These new projects affect the ability of the program to keep pace with the ongoing permit reissuance workload. There will be a continuing workload associated with these projects for the foreseeable future.

Wastewater Systems Plan Review

Wisconsin Statutes require the owners of sewerage and industrial wastewater systems to submit plans and obtain plan approval from the Department of Natural Resources for new construction or modification of sanitary sewers, wastewater pumping stations, wastewater treatment plants, large septage storage facilities and effluent outfall sewers. Plan review is intended to be a proactive and preventive component of the Department's Watershed program, designed not only to ensure compliance with applicable regulations, but also to promote attainment of various objectives beneficial to system owners, operators, the environment, and the general public.

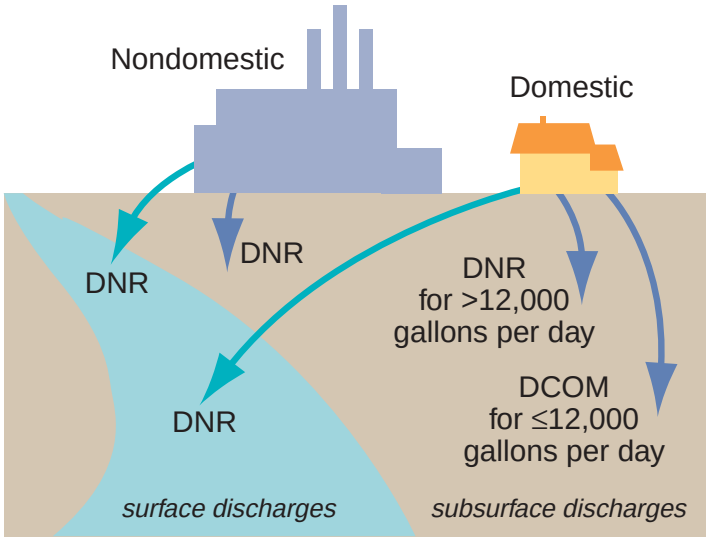
Plan review provides an intervention point in the wastewater treatment system planning process that promotes an exchange of information, technical assistance, coordination between owners and various agencies, documentation of sewerage system infrastructure, and development of appropriate technologies for statewide use. For major projects, plan review includes an evaluation of project environmental impacts and an opportunity for public input.

Privately—Owned Onsite Wastewater Treatment Systems

The Wisconsin Department of Commerce (DCOMM) has authority to review and approve installation of wastewater treatment systems that use subsurface disposal for the wastewater. These are normally in the form of septic tanks and drain fields, although DCOMM has adopted new rules in early 2000 that allows the use of alternative treatment methods prior to disposal into the subsurface systems. In 1999, WDNR and DCOMM signed a Memorandum of Understanding that establishes the jurisdictional boundary between the agencies regarding regulation of these types of on-site disposal permits for facilities greater than approximately 12,000 gallons per day, and DCOMM has the review and approval authority for smaller systems (see Figure 14). WDNR began

to issue WPDES permits for large new and replacement systems in 2000. WDNR additionally retains review authority for all sizes of systems that contain and are used for the disposal of non-domestic wastewater. Some of these systems fall within the regulatory authority of Class 5 Injection wells under the Safe Drinking Water Act and are reviewed to conform to those regulations.

Figure 14. DCOMM/DNR Wastewater Regulation Jurisdictional Boundary



Regulating Mercury in Wastewater

The Department began work on revising, and formalizing in rule form, its wastewater mercury strategy in early 2001 by forming an advisory committee that included representatives from EPA, municipal and industrial permittees, laboratories, environmentalists and dentists. In January 2002 the Natural Resources Board authorized the Department to gather public input through the formal public hearing process. This rule package advocates a common-sense approach to regulating mercury in wastewater.

Current rules, in place since the late 1980's, that limit the levels of toxic pollutants in wastewater discharges, have not worked well for mercury, largely because we lacked a test method sensitive enough to detect mercury and a means to collect uncontaminated samples. Water quality criteria for mercury are very low and many wastewater professionals acknowledge that it's technically and economically not feasible to treat large volumes of wastewater to levels necessary to meet standards.

In the mid 1990's, although there was evidence that mercury was in many wastewater effluents, we were unable to measure the concentrations. Intent on not ignoring this important contaminant, the Department implemented a pollution prevention approach for mercury from the more traditional regulatory mode of limits, monitoring and enforcement. That approach appears to be working. However, about 2 years ago, EPA approved a much more sensitive test method. This, along with clean sampling techniques, now allows us to measure mercury concentrations at or below water quality criteria levels. It is now possible to compare effluent concentrations to water quality standards and determine effluent limits. The rule package proposes to:

- Formally promulgate the new test method for use in Wisconsin
- Begin reissuing wastewater permits for large and medium-sized facilities with requirements to use that test method on their effluents
- Require that facilities institute pollution prevention measures if they find mercury levels that would cause them to exceed water quality standards
- Issue variances that would allow permittees to discharge at current levels while pollution prevention steps achieve reductions.

WDNR does not anticipate major obstacles during finalization of this rule package during 2002.

Innovation in Pollution Reduction

Pollution prevention initiatives in Wisconsin contribute to improving water pollution control efforts. Through their prevention efforts, facilities reduce the pollution they generate, and in the process, save millions of dollars and make Wisconsin's environment a safer, cleaner and more sustainable place to live. In the past few years, Wisconsin has been active in developing programs and initiatives designed to go beyond the traditional regulatory framework to achieve pollution reductions. Major initiatives include Green Tier, Cooperative Agreements, and Pollution Prevention work.

Green Tier Legislation

In June 2001 a coalition of large and small businesses, environmental groups, municipalities, law firms and community organizations submitted draft "Green Tier" legislation after having met seven times since July, 2000. This proposal encourages entities subject to environmental regulations to adopt Environmental Management Systems (EMS), achieve superior environmental performance and obtain appropriate regulatory flexibility. The Departments of Natural Resources and Justice and the USEPA provided technical assistance to this group during its deliberations. The process that was used to develop Green Tier required substantial give and take by all involved and allowed a solid trust relationship to build was built around the attached draft

Cooperative Agreements

The Environmental Cooperation Pilot Program is a Wisconsin initiative designed to test an innovative approach to regulation. In February, 2000, the Wisconsin Electric Power Company was the first business in the state to sign a cooperative environmental agreement with the state under which the utility committed to pursuing environmental improvements beyond those required by current regulations.

Under the agreement, the company will beneficially reuse coal ash from its landfills as a fuel source, thus reducing its use of coal, freeing landfill space and protecting groundwater. It will also develop and carry out a facility-wide environmental management system (EMS) at its Pleasant Prairie electric generating plant to identify and minimize or eliminate all environmental impacts. Wisconsin Electric will also conduct mercury emissions testing and research, expand its efforts to inform and involve the public in decisions affecting the environment, and publicly report on its environmental performance. In return, DNR will speed up and streamline permitting procedures, eliminate unnecessary monitoring requirements, and increase electronic information sharing to reduce paper use and speed decision-making.

Pollution Prevention

A second major initiative carried forward during the 2000-2002 period was the state's Pollution Prevention work. In Wisconsin, efforts are targeted to assist businesses and communities by providing them with information, technical assistance and training on waste reduction. During the 1999-01, statutory language was included in the state budget that broadened the definition of pollution prevention beyond the old definition of hazardous waste pollution prevention. Non-hazardous wastes and emissions can be as much of a problem as the hazardous ones. Work has gradually shifted to incorporate high volume industrial wastes and secondary impacts such as energy use under the pollution prevention umbrella. This statutory language change brought Wisconsin into conformance with U.S. EPA, other states, and the current thinking about pollution prevention. A few pollution prevention case studies are described below.

Community Mercury Reduction

The DNR is partnering with fourteen Wisconsin communities to reduce the public's use of mercury-containing products, to promote recycling of mercury products that continue to be used, and to reduce he potential for mercury spills. Educational outreach is provided by community and trade association staff to the medical, dental, school, HVAC, and household sectors of the community. Related mercury reduction programs are focused on recovering dairy farm mercury manometers and automobile mercury switches. Participating communities include Appleton, Ashland,

DePere, Eau Claire, Green Bay, Kaukauna, Kenosha, LaCrosse, Madison, Manitowoc, Marinette, Milwaukee, Racine, and Superior.

Through a combination of federal and state grants these communities have been able to offer free or reduced cost recycling of mercury-containing products to facilities in the participating sectors. The 1996-1998 "Mercury Roundup Program" recycled over 5,000 pounds of mercury from these communities. The 1999-2001 "Wisconsin Mercury Recycling Program" has recycled over 3,000 pounds of mercury with final tallies pending. Mercury-containing products that are recycled are replaced with non-mercury alternative products. In addition, most municipalities in Dane, Douglas, and Racine Counties have passed legislation banning the further sale of mercury fever thermometers.

The mercury reduction experiences of the Wisconsin communities will be captured in guidance for municipal "Mercury Pollutant Minimization Programs" that will be implemented throughout Wisconsin as communities comply with wastewater discharge standards resulting from the Great Lakes Water Quality Initiative.

Pulp and Paper Pollution Prevention Partnership

The Pollution Prevention Partnership with the pulp and paper industry, now in its eighth year, features voluntary reduction in environmental releases by one of the state's largest industries and goes beyond what is required by law. In cooperation with DNR, the Wisconsin Paper Council coordinates the Pollution Prevention Partnership (PPP), the industry's trade association. Twenty-five (25) firms and 45 facilities participate in this program, which is designed to find cost-effective ways to reduce potentially harmful by-products from the paper industry's manufacturing process. PPP covers air emissions, wastewater discharges, and solid and hazardous wastes. It also includes voluntary reduction goals for seven "target" substances – chlorine, chloroform, formaldehyde, hydrogen sulfide, methanol, phosphorus and xylene. One way to measure progress is to compare environmental releases with production data. In 1992, the paper industry released 11.73 pounds of process-related pollutants for every ton of pulp, paper and paperboard produced in Wisconsin. In 1997, it released 5.11 pounds per ton of production, a drop of 56 percent in just five years. Other achievements since 1992 include:

To learn more go to: http://www.dnr.state.wi.us/org/caer/cea/mercury/index.htm

- Chlorine releases are down 21 percent;
- Overall chloroform emissions are down 47 percent;
- Formaldehyde emissions have declined almost 32 percent;
- Emissions of hydrogen sulfide have decreased almost 14 percent;
- Methanol releases are down 35 percent; and
- Xylene releases are down 28 percent.

Phosphorus releases dropped 13.6 percent during 1997. The major phosphorus dischargers in PPP also conducted minimization studies in 1998-99 to enhance performance while maintaining efficient wastewater treatment.

Wisconsin Department of Defense Alliance

This Alliance's mission is to create a working relationship with government agencies and local communities to promote and implement pollution prevention as the preferred strategy for protecting the environment, conserving resources, fostering community well-being and enhancing mission readiness at Department of Defense (DOD) federal facilities in Wisconsin.

Active participants include the Army, Army National Guard, Army Reserve, Air Force, and the Air National Guard. These units are implementing pollution prevention in their activities at Fort McCoy, Volk Field, Mitchell Field, Truax Field and the local Army National Guard and Reserve stations in cities throughout the state. Other participants are DNR, EPA and SHWEC.

DNR and Fort McCoy are co-chairs of the Alliance, which has a charter that states the vision, mission and goals of the alliance. The informal exchange of information between the military units during the meetings and base tours often leads to discussions about successful pollution prevention practices.

Management of Polluted Runoff

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. 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. Three primary components of the WDNR's runoff management program include the implementation of the voluntary Priority Watershed/Lake Projects, point source permitting of storm water and agricultural runoff sources, and implementation of state regulatory performance standards. The management strategy for these programs is aimed at abating urban and rural polluted runoff. 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 Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP), county Land Conservation Departments (LCDs), and municipalities, with assistance from a variety of federal, state, and local agencies, particularly the USDA Natural Resources Conservation Service and the University of Wisconsin-Extension.

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 installing voluntary BMPs. From the start of the program in 1978 through December 31, 2001, approximately $159 million in local staffing and cost-share grants has been provided to these priority watershed/lake projects.

Since the program began, 86 of the state's watersheds and lakes were designated as priority watershed or lake projects (see Figure 15). Thirty of the 86 projects have been closed or completed. All of the remaining projects have been approved and are in the implementation phase. Table 5 provides additional details about the location and size of the large-scale priority watershed projects. Table 6 provides a similar summary of the small-scale priority watershed and lake projects.

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.

As of 2000, the annual report data indicate that projects are making progress towards reducing phosphorus from barnyards and upland sediment/soil loss. Approximately 54% of the projects continuing more than 6 years are meeting their barnyard phosphorus reduction goals by 50% or more. Sixty one percent of these projects are meeting their upland sediment/soil loss reduction goal by 50% or more. Each year approximately 235,000 pounds of phosphorus from barnyards and about 57,000 tons of sediment from eroding streambanks or shorelines are prevented from entering waterways through the installation of best management practices in priority watersheds and lakes. Over 354,000 feet of streambanks or shorelines have had best management practices put in place to prevent erosion and enhance habitat and about 750 acres of wetlands have been restored.

In 1997, the Wisconsin legislature significantly changed the direction of the state's runoff management programs. The 1997 Wisconsin Act 27 placed the Priority Watershed/Lake Program, which is chiefly administered by the WDNR, into a multi-year phase-out period. It also strengthened the role of DATCP in addressing agricultural runoff. The changes required the agencies to develop explicit regulatory performance standards for polluted runoff. Further, Act 27 created new competitive funding programs, discussed in the next section, which are available across the state rather than just in priority watersheds/lakes. In 1999, the legislature reinforced these changes by shifting more funding to DATCP for them to coordinate the local staffing grants for the priority watershed/lake projects. Funding for ongoing watershed and lake projects will continue through 2009. To bring program expenditures in line with the available funding, no additional projects will be started.

Figure 15. Priority Watershed Projects in Wisconsin

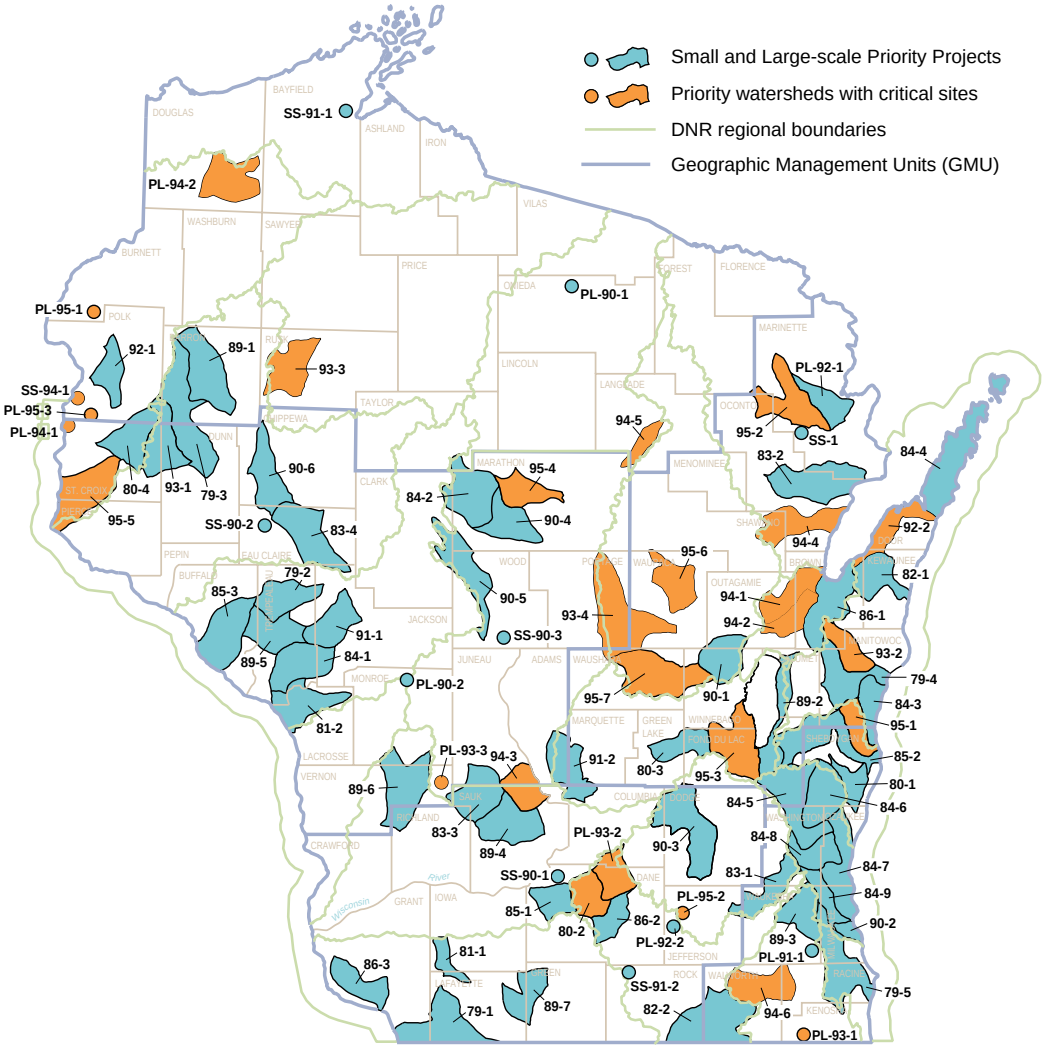


Table 5. Large-Scale Priority Watershed Projects

Yr. Start	Project Name/Map Code	Location	Size – Sq. Miles
1979	Galena River* 79-1	Lafayette, Grant	241
	Elk Creek* 79-2	Trempealeau	112
	Root River* 79-5	Racine, Waukesha, Milwaukee	198
	Lower Manitowoc River* 79-4	Manitowoc, Brown	168
	Hay River* 79-3	Barron, Dunn	289
1980	Big Green Lake* 80-3	Green Lake, Fond du Lac	106
	Upper Willow River* 80-4	St. Croix, Polk	183
	Six-mile Pheasant Branch Creek[1] 80-2	Dane	119
	Onion River 80-1	Sheboygan, Ozaukee	97
1981	Upper W. Branch Pecatonica River* 81-1	Iowa, Lafayette	77
	Lower Black River* 81-2	La Crosse, Trempealeau	189
1982	Kewaunee River* 82-1	Kewaunee, Brown	142
	Turtle Creek* 82-2	Walworth, Rock	288
1983	Oconomowoc River* 83-1	Waukesha, Washington, Jefferson	130
	Little River* 83-2	Oconto, Marinette	210
	Crossman Creek/Little Baraboo River* 83-3	Sauk, Juneau, Richland	213
	Lower Eau Claire River* 83-4	Eau Claire	399
	Beaver Creek 84-1	Trempealeau, Jackson	160
1984	Upper Big Eau Pleine River* 84-2	Marathon, Clark, Taylor	219
	Seven-mile/Silver Creek* 84-3	Manitowoc, Sheboygan	112
	Upper Door Peninsula* 84-4	Door	287
	East & West Branch Milwaukee River* 84-5	Fond du Lac, Washington, Sheboygan, Dodge Ozaukee	265
	North Branch Milwaukee River* 84-6	Sheboygan, Washington, Ozaukee	149
	Cedar Creek 84-8	Ozaukee, Washington	129
	Milwaukee River South 84-7	Ozaukee, Milwaukee	167
	Menomonee River* 84-9	Milwaukee, Waukesha, Ozaukee, Washington	136
1985	Black Earth Creek* 85-1	Dane	105
	Sheboygan River 85-2	Sheboygan, Fond du Lac, Manitowoc, Calumet	260
	Waumandee Creek* 85-3	Buffalo	221
1986	East River 86-1	Brown, Calumet	206
	Yahara River-Lake Monona 86-2	Dane	93
	Lower Grant River 86-3	Grant	129

Yr. Start	Project Name/Map Code	Location	Size – Sq. Miles
1989	Middle Trempealeau River 89-5	Trempealeau, Buffalo	205
	Lake Winnebago/East 89-2	Fond du Lac, Calumet	99
	Middle Kickapoo River 89-6	Vernon, Monroe, Richland	246
	Yellow River 89-1	Barron	239
	Upper Fox/Illinois River 89-3	Waukesha	151
	Narrows Creek/Baraboo River 89-4	Sauk	176
	Lower E. Branch Pecatonica River 89-7	Green, Lafayette	144
1990	Arrowhead River/Daggets Creek 90-1	Outagamie, Winnebago	142
	Kinnickinnic River 90-2	Milwaukee	33
	Beaver Dam River 90-3	Dodge, Columbia, Green Lake	290
	Duncan Creek 90-6	Chippewa, Eau Claire	191
	Lower Big Eau Pleine River 90-4	Marathon	138
	Upper Yellow River 90-5	Wood, Clark, Marathon	212
1991	Upper Trempealeau River 91-1	Jackson, Trempealeau	175
	Neenah Creek 91-2	Adams, Marquette, Columbia	173
1992	Balsam Branch Creek 92-1	Polk	104
	Red River/Little Sturgeon Bay 92-2	Door, Kewaunee, Brown	139
1993	Branch River 93-2	Brown, Manitowoc	108
	Soft Maple/Hay Creek 93-3	Rusk	176
	South Fork Hay River 93-1	St. Croix, Dunn, Polk, Barron	181
	Tomorrow/Waupaca River 93-4	Waupaca, Portage	290
1994	Apple & Ashwaubenon Creeks 94-2	Brown, Outagamie, Oneida Nation	113
	Dell Creek 94-3	Juneau, Sauk	133
	Duck Creek 94-1	Brown, Outagamie, Oneida Nation	151
	Pensaukee River 94-4	Oconto, Shawano	163
	Spring Brook 94-5	Langlade, Marathon	69
	Sugar & Honey Creeks 94-6	Racine, Walworth	166
1995	Fond du Lac River 95-3	Fond du Lac, Winnebago	244
	Kinnickinnic River 95-5	Pierce, St. Croix	206
	Lower Little Wolf River 95-6	Waupaca	152
	Lower Rib River 95-4	Marathon	129
	Middle Peshtigo & Thunder Rivers 95-2	Marinette, Oconto	193
	Pigeon River 95-1	Manitowoc, Sheboygan	78
	Pine & Willow Rivers 95-7	Waushara, Winnebago	303
		TOTAL	11,328

* Completed projects

[1] Six-mile/Pheasant Branch is a part of the Lake Mendota Priority Lake Project (1993).

Table 6. Small-Scale Priority Watersheds & Priority Lake Projects

Year Start	Project Name/Map Code	Location	Size – Sq. Miles
Small-Scale Watershed Projects			
1986	Bass Lake* SS-1	Marinette	1
1990	Dunlap Creek SS-90-1	Dane	14
	Lowes Creek* SS-90-2	Eau Claire	10
	Port Edwards Groundwater Proj.* SS-90-3	Wood	10
1991	Whittlesey Creek SS-91-1	Bayfield	12
	Spring Creek SS-91-2	Rock	6
1994	Osceola Creek SS-94-1	Polk	9
Priority Lake Projects			
1990	Minocqua Lake* PL-90-1	Oneida	10
	Lake Tomah PL-90-2	Monroe	32
1991	Little/Big Muskego-Wind Lakes PL-91-1	Waukesha, Racine	41
1992	Middle Inlet-Lake Noquebay PL-92-1	Marinette	155
	Lake Ripley PL-92-2	Jefferson	8
1993	Camp/Center Lakes PL-93-1	Kenosha	8
	Hillsboro Lake PL-93-3	Vernon	35
	Lake Mendota PL-93-2	Dane, Columbia	230
1994	St. Croix Lakes Cluster PL-94-1	St. Croix	3
	St. Croix Flowage/Upper St. Croix Lake PL-94-94-2	Douglas	45
1995	Big Wood Lake PL-95-1	Burnett	20
	Horse Creek PL-95-3	Polk	15
	Rock Lake PL-95-2	Jefferson	10
		TOTAL	274

* Completed projects

Additional Runoff Management Grant Programs in Wisconsin

In 1997 and 1999, the Wisconsin Legislature created two additional grant programs, as part of the nonpoint source program redesign discussed later in this report. The grant programs, namely the Targeted Runoff Management Grant Program and the Urban Nonpoint Source and Storm Water Grant Program, address the effects of polluted runoff statewide. Both programs are administered by the WDNR and provide competitive financial awards to control polluted runoff. Grant applications are scored based on fiscal accountability, cost effectiveness, water quality, extent of pollutant control, extent of local support and likelihood of project success. The funded projects are site-specific, generally smaller than a sub-watershed, and are targeted at high-priority resource problems.

Targeted Runoff Management Grant Program

The Targeted Runoff Management (TRM) Grant Program provides financial assistance to rural and urban governmental units. The maximum cost-share rate available to TRM grant recipients is 70 percent 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. To date, TRM grants have funded construction of rural and urban best management practices. The projects last from two to four years. Please refer to Table 7 for additional information regarding the TRM grant projects. The first grant cycle for the program was in 1999, and 16 rural and 26 urban projects have been funded by TRM grants since then. Approximately $4,513,472 was authorized to fund these projects. Thus far, 31 of the 42 projects have been completed.

Urban Nonpoint Source and Storm Water Grant Program

The Urban Nonpoint Source and Storm Water Grant Program focuses on financial assistance in urban areas. 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. Urban Nonpoint Source and Storm Water Grants can be used to pay for a variety of activities. Eligible technical assistance costs for planning, related informational and educational activities, ordinance development and enforcement, training and design are cost-shared at 70 percent. Eligible construction costs may include such projects as storm water detention ponds, streambank stabilization, and shoreline stabilization and are cost-shared at 50 percent. The funded projects last between two to three years. Table 7 provides additional details about the projects. Since the first grant cycle in 2000, approximately $8,755,818 were authorized to fund 31 planning and 25 design/construction projects.

Table 7. Runoff Management Grant Programs

Targeted Runoff Management Grants

	CY 1999			CY 2000			CY 2001		
Grant Type	**Grant Funds**	**Number of Projects**	**Number Completed**	**Grant Funds**	**Number of Projects**	**Number Completed**	**Grant Funds**	**Number of Projects**	**Number Completed**
Rural	$716,275	7	7	$581,900	5	1	$466,361	4	0
Urban	$1,278,920	12	12	$905,666	10	10	$564,350	4	1
TOTAL	$1,995,195	19	19	$1,487,566	15	11	$1,030,711	8	1

Urban Nonpoint Source & Storm Water Grants

	CY 2000		
Grant Type	**Grant Funds**	**Number of Projects**	**Number Completed**
Planning	$2,130,422	31	21
Design/Construction	$6,625,396	25	11
TOTAL	$8,755,818	56	32

Storm Water Management

In 1993, the Wisconsin Legislature adopted section 283.33 of the Wisconsin Statutes, which gave the WDNR the authority to regulate storm water discharges. The WDNR then promulgated Chapter NR 216, Wisconsin Administrative Code to regulate storm water discharges under a Wisconsin Pollutant Discharge Elimination System (WPDES) permit. Chapter NR 216 has three subchapters that regulate three categories of storm water discharges – municipal, industrial and construction sites.

To date, the WDNR has given WPDES storm water permit coverage to 19 Municipal Separate Storm Sewer Systems (MS4s), and approximately 50 other MS4s have been designated and are in the application process. The WDNR will be actively working on revising Chapter NR 216 during 2002 to comply with EPA Phase 2 storm water regulations. It is expected that approximately 200

MS4s, including cities, villages, towns, counties and state and federal institutions, will be required to have permit coverage once the Phase 2 regulations are implemented.

Most sediment entering urban lakes, streams, and wetlands originates from construction sites. The amount of sediment that comes off a construction site per acre is generally an order of magnitude greater than the amount that comes from agricultural cropping practices. Construction site pollutants also include nutrients (such as phosphorus and nitrogen), heavy metals, oil, and grease. The WDNR gives permit coverage to approximately 500 new construction sites each year that disturb five or more acres of land. The WDNR is revising its regulations to require permit coverage of construction site that disturb one acre or more of land by March 10, 2003 in accordance with the federal Phase 2 regulations.

Over 4,000 industrial facilities are covered under the general storm water industrial WPDES permits. The WDNR has issued six general permits to cover storm water discharges from industrial facilities. Three of these permits were drafted specifically to cover one type of industry each, namely scrap recycling, used auto parts recycling, and non-metallic mining facilities. The scrap and auto parts recycling permits include the option for a facility to join a Cooperative Compliance Program (CCP). A CCP is an organization that provides additional training and auditing of its members and provides compliance reports to the WDNR. More than 50% of permitted facilities have voluntarily joined a CCP, and those facilities have done substantially better at maintaining compliance than the non-CCP managed facilities. Thus, the CCP has been successful in its first 3 years of operation.

Wisconsin has been actively working for the past three years on developing a new set of performance standards for runoff under proposed Chapter NR 151, Wis. Adm. Code. The performance standards will apply to construction site development and management of storm water runoff from urbanized areas. It is anticipated that the standards will be promulgated in 2002. The proposed standards identify a level of sediment control for construction sites during construction as well as post-construction total suspended solids control. Additional requirements are buffers for streams, lakes, and wetlands, peak flow control, and infiltration devices. Chapter NR 151 also includes total suspended solids controls for permitted MS4 facilities and general information and education requirements for all urbanized areas.

Model Ordinances for Storm Water Management

Implementation of non-agricultural performance standards by cities, counties, towns, and villages will be critical to achieving water quality goals. Although the state has ultimate authority for enforcing these standards, local regulation will greatly enhance their implementation. The WDNR has developed two model ordinances to help assure statewide consistency in storm water regulations. One ordinance covers regulation of construction site erosion, the other post-construction storm water runoff. These ordinances are included in Chapter NR 152, Wisconsin Administrative Code, which is part of the redesign of the nonpoint source program. The performance standards contained in these ordinances are consistent with the performance standards contained in Chapter NR 151, Wis. Adm. Code, which is also part of the runoff management program redesign. Adoption of either ordinance by a local governmental unit is voluntary, although the department strongly encourages that any local regulation be at least as stringent as the state's performance standards. The WDNR makes these ordinances available to local governments and provides assistance to local governments that wish to use the models as a basis for local regulations.

Agricultural Runoff Management

Approximately 40,000 active livestock operations exist in Wisconsin. Manure from livestock operations contains organic materials, nitrogen, phosphorus and other water pollutants. Through Chapter NR 243, Wisconsin Administrative Code, discharges from larger-scale operations have been avoided, and many smaller-scale sites in the state with manure discharges have been addressed.

WPDES Permits

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 Wisconsin Pollutant Discharge Elimination System (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 issues associated with these operations. 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 and the land application of CAFO manure. About 110 livestock operations are currently required to have a WPDES permit. The WDNR has experienced a significant increase in the number of operations applying for permits in recent years.

Notice of Discharge

Wisconsin regulates livestock operations with fewer than 1,000 animals units with discharges that significantly affects water quality through the Notice of Discharge (NOD) Program. The WDNR may issue NODs to livestock operators if an on-site investigation reveals the presence of a significant discharge to waters of the state. Technical assistance to control the discharge is available through the county LCDs and cost-share financial assistance has been available through DATCP for the implementation of corrective measures. Beginning in 2002, the WDNR will be the primary cost-sharing agency for NODs. Throughout the process, the WDNR may conduct follow-up investigations to monitor compliance. A livestock operator who fails to implement necessary corrective measures within a specified time frame 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 recently 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 Waters) instead of relying solely on citizen complaints.

Since 1984, 579 NODs have been issued; during this time, DATCP has provided an estimated $6.4 million in cost-sharing and $531,510 in technical assistance for 319 smaller animal feeding operations to correct deficiencies identified in NODs. Nine NODs were issued during the 2000-2001 time period; during this time, DATCP provided an estimated $412,875 in cost share funds and $38,717 in technical assistance. For all NODs where DATCP has provided cost-sharing, the average grant amount was approximately $20,000 with a range of $144 to $179,121. About 55 percent of the livestock operations that received NODs from the WDNR received grants from DATCP. Most livestock operations that received funding from DATCP corrected their problem. About nine percent of the livestock operators failed to take required actions under the NOD and have been issued WPDES permits or have a WDNR action pending.

Performance Standards and Prohibitions

The WDNR is currently in the process of codifying statewide performance standards and prohibitions for all agricultural operations. These include manure management prohibitions, nutrient management, manure storage and clean water diversions. Implementation of these standards and prohibitions is intended to occur primarily through county LCDs. The WDNR will continue to regulate WPDES permitted livestock operations and serve as an implementation back-up to local governments for crop producers and livestock operators with fewer than 1,000 animal units.

Redesign of the Nonpoint Source Pollution Program

As mentioned previously, the Wisconsin Legislature made significant changes to the state's nonpoint source pollution program in 1997 and 1999. A redesign of the program was mandated to address persistent urban and rural runoff pollution problems statewide. The legislative initiatives were part of Wisconsin Act 27, which required WDNR and DATCP to create nonpoint source

pollution standards and to restructure existing programs. Other affected state agencies include the Wisconsin Department of Transportation (DOT) and the Wisconsin Department of Commerce (COMM). Since 1997, the WDNR has been working with state agencies, local governmental units and the affected publics to develop the redesigned nonpoint source pollution program. The program redesign is embodied in 9 administrative rules, 8 to be administered by WDNR and one to be administered by DATCP.

Key components of the redesigned program for WDNR include regulatory performance standards, implementation and enforcement strategies and financing.

Statewide Performance Standards

Agricultural, non-agricultural and transportation performance standards apply statewide wherever applicability criteria are met. Although the performance standards are directed at nonpoint pollution sources, these same standards have been incorporated into the WDNR's point source regulation for animal feeding operations and storm water management.

Agricultural performance standards address runoff pollution from both croplands and livestock facilities. Cropland performance standards address cropland erosion and nutrient management. Livestock performance standards address manure storage and facilities needing clean water diversions. In addition, there are manure management prohibitions that address overflowing manure storage facilities, unconfined manure piles, direct runoff of manure to state waters and trampled shoreline areas.

Non-agricultural performance standards address runoff pollution from construction sites, post-construction runoff from new development and re-development and runoff from developed urban areas. Construction site standards target sediment reduction. New development standards target suspended solids and peak flow discharges and contain special provisions for infiltration, protective buffer areas and vehicle fueling and maintenance areas. Standards for smaller developed urban areas focus on development and implementation of information, education, municipal housekeeping and municipal nutrient management activities. Permitted municipalities must also meet these requirements in addition to phasing in practices to reduce storm water discharges of suspended solids.

Transportation performance standards address runoff pollution from transportation facilities including highways, bridges, railroads and airports. The standards generally parallel those for non-agricultural performance standards.

Implementation and Enforcement

Implementation and enforcement strategies differ for agricultural and non-agricultural performance standards.

Agricultural Performance Standards. County land conservation departments will, on a voluntary basis, carry out administrative, technical and enforcement activities (through local ordinances) necessary to achieve compliance with performance standards. Support will be provided by state agencies, including WDNR and DATCP, federal agencies, including NRCS and FSA and educational institutions including the University of Wisconsin-Extension. Where a county is unwilling or unable to perform these activities, the WDNR will fulfill the required functions. WDNR will continue to take the lead in assuring compliance at livestock operations subject to WPDES permits. Funding must be made available to require compliance for existing livestock facilities and croplands. Funds will be provided by WDNR through its priority watershed and targeted runoff management programs, in addition to funding made available under federal programs, other state programs, such as those administered by DATCP, and county cost-share programs.

Non-agricultural and Transportation Performance Standards. The WDNR will use its storm water permitting program and an equivalent cooperative agreement with DOT to carry out administrative and enforcement activities needed to assure compliance with non-agricultural and

transportation performance standards. In addition, DOT and COMM will play key roles in implementing these standards through their own administrative rules. Although funding does not have to be offered to require compliance, the department will offer funding under its Targeted Runoff Management Grant Program and its Urban Nonpoint Source and Storm Water Grant Program.

Targeted Performance Standards. Uniform adherence to the statewide performance standards and prohibitions are expected to resolve many nonpoint source pollution problems. However, statewide performance standards may be inadequate to meet water quality goals in certain areas. In these areas, targeted performance standards requiring a higher level of treatment or protection may be established by the WDNR or local units of government. Targeted standards may be identified in integrated resource management plans and through local ordinances, and must be promulgated in administrative rules by the WDNR.

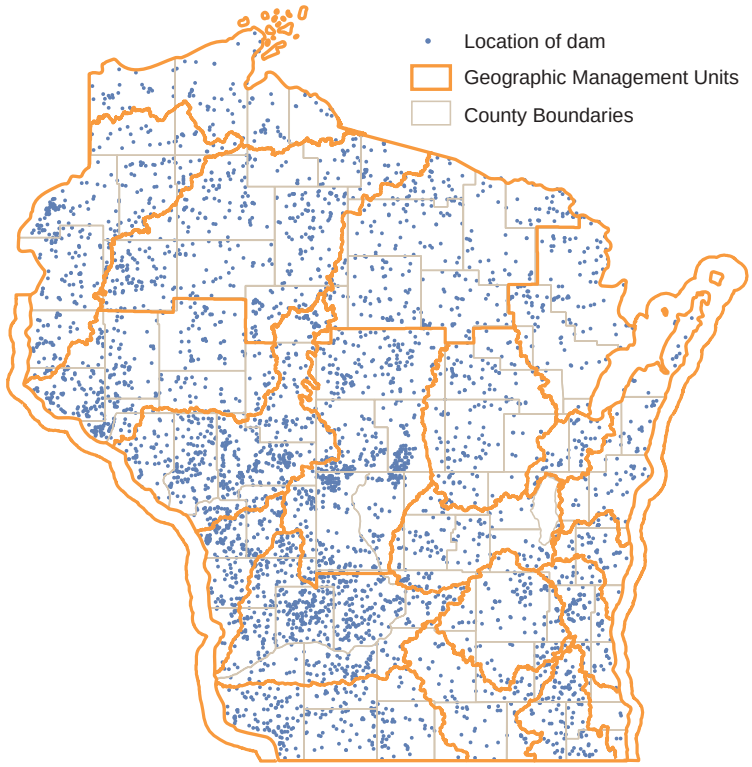
Financing Compliance with Performance Standards

The total estimated **annualized** cost to implement these standards is $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 CWA Section 303(d) list.

Dam Management

The state's over 3,500 dams (Figure 16) have a significant impact on the state's river systems. Many dams in Wisconsin serve useful purposes, ranging from the generation of power to supporting recreational opportunities. Responsible individuals or municipalities own the vast majority of these dams. When faced with a decision to repair or reconstruct a dam, owners are always provided with a range of options, including removal. The WDNR does not issue orders to remove a dam in situations where owners want to repair a failing structure and have the financial capability to do so. In selected cases the WDNR has advocated for the removal of a dam or helped establish financial incentives to facilitate removal.

Figure 16. Dams in Wisconsin



Although some dams serve useful purposes, dams can also cause water level fluctuations, changes in water temperature and oxygen levels, sedimentation leading to inhibition of fish movement, habitat loss, and fish mortality. Under the authority of Chapter 31 created in 1917 under the Water Power Law, the state has responsibility for and oversight of

- Dam permitting
- Dam construction Dam safety, operation and maintenance
- Alteration or repair of dams
- Dam transfer and dam removal
- Water level and flow control

Dam Safety

To learn more go to: http://www.dnr.state.wi.us/org/water/wm/dsfm/section/index.htm.

The state's Dam Safety Program was developed under Chapter 31 to ensure that dams are safely built, operated and maintained. Two state Natural Resources regulations provide structure to the program. **NR 333** provides design and construction standards for large dams and **NR 335** covers the administration of the Municipal Dam Repair and Removal Grant Program. DNR is responsible for administration of these regulations.

The authority under Chapter 31 includes approval of plans for dams, alteration or additions to an existing structure and removal of a dam. Chapter 31 requires the owner of a dam to operate and maintain their dam in a safe condition. The owner can initiate repair, reconstruction or removal actions. However, dam removal is more frequently the result of a failure or of an inspection uncovering significant defects requiring major repairs.

Dam Removal

The decision to remove a dam is primarily an economic decision made by the dam owner. Dam removal, which requires WDNR approval, must follow specific guidelines to assure protection of life, health, and property, as well as the surrounding environment. Chapter 31 requires the WDNR to inspect all of the large dams in the state at least once every 10 years. Approximately 1,130 of the state's dams are classified as large dams, meaning they are over six feet high and impound more than 50 acre-feet of water or they are 25 feet or more in height and impound more than 15 acre-feet of water. If these dams fail, they can cause loss of life or significant property or environmental damage.

In the last 20 years, over 50 dams have been removed from the state's waterways. Most of these were economic-based decisions made by the dam's owner or were abandoned dams where a responsible owner could not be found. There is a growing awareness of the negative affects dams can have on river ecosystems. Where dams have been removed, significant improvements have been noted in water quality, habitat and biodiversity at many of these sites. In recent years, the DNR has been more proactive in discussing potential habitat and water quality benefits from dam removal. Integrated management plans (see Chapter 3: Rivers and Streams) identify rivers that would benefit from dam removal in a given basin. WDNR has worked with partners to advocate for the removal of a dam or helped establish financial incentives to facilitate removal. See Chapter 3 of this report for case studies on dam management and removal.

Dam Relicensing

The Federal Energy Regulatory Commission (FERC) is responsible for licensing the state's hydropower plants and reviews the 30- to 50-year-old leases to ensure that they meet federal regulations for safety and resource protection. Since 1993, 55 licenses have expired in the state, with 17 of those between 1998 and 2001. Most facilities operate under interim annual licenses until FERC completes its reviews.

DNR is actively involved in the FERC relicensing. The Department's regulatory role was expanded through Federal court cases to require facility receipt of a State water quality certification under Section 401 of the Clean Water Act. FERC facilities must evaluate both direct and indirect impacts to water quality, reflecting a recognition of the role of nearby land use on water quality, for example. Issuing a Water Quality Certification requires the applicant to conduct studies and provide information about intentions concerning anticipated changes in land use of owned properties near the dam and reservoir. Utilities often own substantial acreage of wild and scenic property adjacent to the dam and reservoir.

To assure continued protection of surface water systems relating to FERC facilities and other state regulated dams, the Department has been active in several areas as indicated below.

Information to the Congressional Delegation on Proposed FERC License Process Revisions

In October of 2001, DNR Secretary Darrell Bazzell informed members of Congress of the Department's concern with recommendations advanced by the Federal Energy Regulatory Commission (FERC) to either remove or limit the scope of the State Water Quality Certification now provided during the re-licensing process for hydroelectric facilities. The Secretary argued that our Certifications are completed in a timely fashion and in cooperation with the U.S. Fish and Wildlife Service and National Park Service to help establish terms and conditions for protection, restoration, and enhancement of natural resources and recreational opportunities.

The letter emphasized that reducing the scope of State Water Quality Certification will not produce the benefits intended by the Commission. Staff closely associated with riverine systems near hydropower facilities best know what improvements are needed and know what can be practically accomplished. Secretary Bazzell requested Congressional support to retain the existing Water Quality Certification process for FERC facilities to ensure that Wisconsin continues to have a strong voice in the relicensing process to find the best balance of environmental and power generation needs

Preparing a Land Use Position Paper Related to Transfer of FERC facility lands

In December, 2001, Department staff prepared a draft issue paper regarding sale of FERC owned properties. Licensed hydropower facilities in Wisconsin and nationally have increasingly made requests to the FERC to sell land or change land use within project boundaries. Much of this land is wild, scenic and undeveloped and contributes to maintenance of high quality surface water resources. Although utilities can realize additional income and reduced long-term maintenance costs through land sales, those that result in subsequent development can have substantial impacts to the quality of lakes and rivers. The impacts of property sales are site specific and in fact may include cases where a land sale may be compatible with the Department's local land management interests.

There should be individual analyses of proposed land use changes in light of state land acquisition plans and license conditions. Further early coordination work among regional staff can help determine where hydro project lands overlap planned state land acquisitions, which can then be followed by legal intervention or acquisition.

Unless protected land use is guaranteed, the Department should oppose FERC approval of hydropower facility property sales or changes in land use. By analyzing public benefits (using current land acquisition plans) the Department can decide on a case-by-case basis, the best course of action.

Issuance of Run of River Guidance

In October of 2001, the Department issued statewide program guidance to help manage the concept of Run-of-River flows. Under Section 31.02, Wis. Stats., the Department may regulate and control the level and flow of water for dams on navigable waters. Pursuant to Section 401 of the Clean Water Act and under Wis. Admin. Code NR 299, Water Quality Certification (WQC) authority the Department may also regulate flows and water levels on FERC licensed hydroelectric dams. The guidelines are designed to help assure *consistent* Department application and regulation of run-of-river operations at state regulated and FERC regulated dams. The guidelines can also be used as a training tool for new staff and serve to help clarify points of discussion or negotiations with dam operators, FERC staff or other interested parties.

The guidance indicates that unless site-specific analyses show that an alternate operating regime would not have serious adverse environmental impacts, run-of-river operating mode should be ordered so that dam operations are least disruptive to the normal river flow. The guidance provides definitions, information on how to process applications, how to determine performance standards for dam operators to assure clarity and a solid base for enforcement, if needed.

The guidance indicates that at all times dam owner/licensee shall maintain a discharge from the dam (includes powerhouse, spillway or diversion channel) so that, at any concurrent point in time, flows, as measured downstream, approximate the sum of inflows (main channel and tributaries) to the reservoir. Provisions are included for exceptions and monitoring.

Contaminated Sediment Management Program

To learn more go to: http://www.dnr.state.wi.us/org/water/wm/wqs/sediment/index.htm

Contaminated Sediment Management in Wisconsin involves a multidisciplinary approach within the Department and coordination with and other state and federal agencies and private partners. The goal of the program is to restore surface waters to assure the applicable water quality standards are achieved where resource uses have been impaired by the presence of contaminated sediments. Managing contaminated sediments and floodplain soils associated with Wisconsin's inland and Great Lakes waters is a multi-program effort within the Bureau of Watershed Management and other Bureaus, such Remediation and Redevelopment. The integrated work of the scientists and engineers involved is designed to:

1. Develop a consistent and holistic contaminated sediment strategy,
2. Integrate contaminated sediment issues with other program efforts,
3. Ensure consistency in evaluating and assessing contaminated sediment sites, and
4. Ensure the most current and applicable technology is used in remediating contaminated sediment sites

Key elements of the integrated effort

Key elements of the integrated effort for managing contaminated sediments include:

- Evaluation, development, and application of appropriate sediment quality assessment tools that will yield a weight-of-evidence approach to demonstrate actual or potential effects to biota including humans from contaminated sediments.
- Development of site-specific sediment quality objectives to be used with other balancing factors in making management decisions at contaminated sediment sites, applying controls on wastewater dischargers, and abating discharges from non-point sources to surface waters.
- Understanding and integrating sediment issues into various regulatory programs such as Superfund, RCRA (Resource Conservation and Recovery Act), and State Environmental Repair Program sites (includes Manufactured Gas Plant Sites) and other programs including Great Lakes Remedial Action Plans.
- Maintaining a statewide sediment data base from all sediment related sampling projects.
- Developing, maintaining, and updating a statewide inventory of sites with contaminated sediments, floodplain soils, and wetland soils.
- Development of a site ranking and prioritization system to be used in the decision making process for selection of contaminated sediment sites for remediation based on available funding and resources.
- Investigating remedial and treatment technologies including dredging, capping, in situ and ex situ treatment, and handling and disposal of sediments.

While many sediment projects are large-scale endeavors, many smaller scale projects are ongoing throughout the state. The state has established a Contaminated Sediment Standing Team — CSST to develop guidance, provide technical guidance, and to communicate with the Regional offices pertaining to sediment management. This work includes standardization and implementation of policies, procedures and guidance for identification and inventory of sites, assessment of environmental and human health impacts, and enhancement of water quality in Wisconsin's surface waters through various remedial techniques. During 2000-2001 the CSST worked on further developing its website and refining a GIS-based data layer with the location of and information on each of the ongoing sediment projects in the state. In addition it is developing consensus-based sediment quality guidelines and assessment procedures to address contaminated sediment issues for dredging sites.

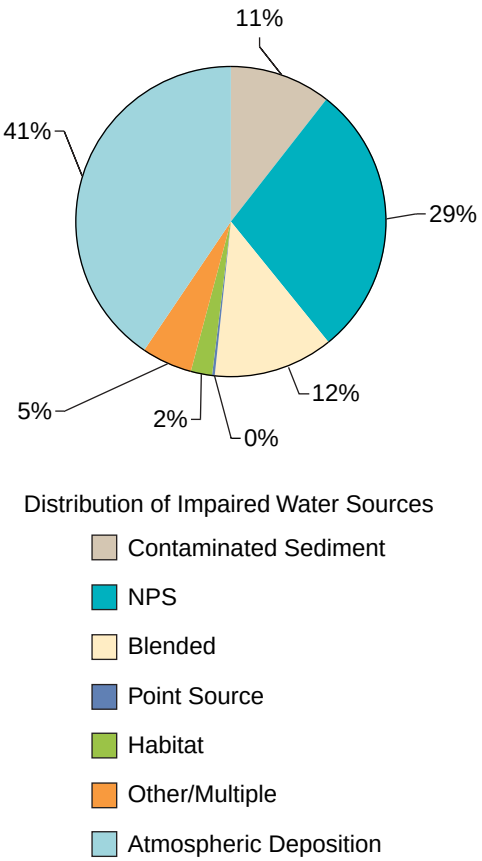
Impaired Waters Program

In 1998, as required under the provisions of Section 303(d) of the Clean Water Act, the Department submitted to EPA for approval a list of surface waters considered impaired, as they do not meet Wisconsin water quality standards. This list of impaired waters was subsequently approved with a small number of additions. EPA's vision is that a Total Maximum Daily Load (TMDL) analysis and allocation will be prepared for each of the listed impaired waters. The Department will be again be submitting an update to its list of impaired waters in October 2002.

Wisconsin's 1998 list of impaired waters contained 552 waters, which includes rivers, lakes and river segments, harbors and bays. For purposes of management, the Department placed those 552 waters into categories shown in Figure 17 based on causes of the impairment:

- Contaminated sediment – 63 waters
- Nonpoint source dominated – 170 waters
- Point source and nonpoint source blend waters – 74 waters
- Point source dominated – 2 waters
- Physical habitat – 12 waters
- Other (or multiple) – 32 waters
- Atmospheric Deposition (mercury or other toxics) – 241 waters

Figure 17. Categories of Impairment and Numbers of Waterbodies or Waterbody Segments



Clean Up Progress - A Categorical Approach

Since 1998, Wisconsin has made progress in water quality cleanup relating to a number of these categories. For **contaminated sediment waters**, the Department will pursue "de-listing" in 2002 for the *Bay Shipping Building site in Sturgeon Bay* and the *Fountain City Bay Boatyard in the Mississippi River* due to successful contaminated sediment removal projects. In addition, removal of contaminated sediment has taken place as part of the *Hayton Area Remediation Project along Jordan Creek and in Wausau along the Wisconsin River*. Remediation plans have been developed for the *Lower Fox River and Sheboygan River*.

For **nonpoint source dominated waters**, *Spring Creek in Rock County* will be proposed for "de-listing" in 2002 due to a substantial improvement in the stream and fishery resulting from a small-scale priority watershed project. In addition, a TMDL has been approved for *Squaw Lake in the St. Croix Basin*, a priority lake project, and a TMDL has been developed for sedimentation problems in *Token Creek in the Rock River Basin*. Ongoing priority watershed project implementation has been taking place in watersheds draining to 57 waters on the 1998 impaired water list.

For **point source and nonpoint source blend waters,** many of the waters are receiving reduced phosphorus loads due to the requirement for phosphorus removal at municipal and industrial wastewater treatment plants under the provisions of Chapter NR 217, Wis. Adm. Code. For the nonpoint source portion of these blend situations, ongoing priority watershed project implementation has been taking place in watersheds draining to 22 waters on the 1998 impaired water list.

For **the nonpoint source dominated, point source and nonpoint source blend and certain of the "other" category waters**, in late 2001, Wisconsin began implementing the Conservation Reserve Enhancement Program (CREP). CREP is targeted towards establishing vegetated, riparian "buffers" along more than 95% of the impaired waters in these categories.

Progress in the other categories is limited. For the **point source dominated waters**, it appears that the impairments are likely due to past discharges and current discharges are not causing further degradation of the receiving waters. For the **physical habitat** category, removal of three dams on the Baraboo River will result in that segment of water being "de-listed" in 2002. For

waters with fish consumption advisories resulting from **atmospheric deposition** of mercury, progress will depend largely on reduction in air emissions of mercury both in Wisconsin and outside of the state. The Department is working with the Environmental Council of States and EPA and others to identify the best approach to address air emissions causing water impairments.

TMDL Monitoring and Modeling

Technical guidance for developing a total maximum daily load (TMDL) allocation has been developed based on 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. Monitoring options were developed based upon staff experience working on these types of projects; however, each situation requires independent evaluation and adjustment based on site-specific conditions. *The WDNR's TMDL Monitoring and Modeling Technical Guidance Document (2001)* identifies pollutants to be monitored, sample collection, duration and frequency. The document also identifies suggested station locations for monitoring based on the type of model used and other factors. Model selection is also based on this tiered approach. Project specific issues to be considered in determining the appropriate resource level of monitoring and modeling would include:

- Regulatory implications for dischargers.
- Input from interested stakeholders.
- Financial and work load resources.
- Accuracy needs.
- Knowledge and types of pollutant sources.
- Size of the water body/watershed.

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 - for example - 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 Aquisitions 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 brownfields 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 developed following the 1987 amendments to the Clean Water Act. The CWFP began making loans in 1991, using funding from the capitalization grant authorized by the Clean Water Act. Supplemental funding, generated through state borrowing, was also available as a means to leverage the federal capitalization grant. The CWFP has played a crucial part in achieving the state's water quality goals and the objectives of the Clean Water Act.

In addition, the 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. Since 1991, the CWFP shifted the state's financing of wastewater treatment facility construction from grants to loans. An increased emphasis was placed on preventive maintenance for existing pollution abatement facilities. The CWFP replaced the point source pollution abatement grant program, which provided grants to municipalities for wastewater treatment systems from 1978-90. 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 2001, the CWFP entered into 472 financial assistance agreements with Wisconsin municipalities totaling $1.43 billion in loans and $97.1 million in financial hardship assistance grants. In addition, the CWFP has executed agreements with 41 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 $67 million. The Milwaukee Metropolitan Sewerage District, which is comprised of 28 individual municipalities serving a population of about 1.2 million, has received 36 CWFP loans totaling over $384 million. This amount represents 27% 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 wild and domestic animals, 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 2001, the SDWLP has provided 18 loans to local units of government totaling $80.5 million.

Land Acquisitions and Easements

WDNR Bureaus of Facilities and Lands and Community Financial Assistance manages the Stewardship Program, which provides funding for a variety of land acquisitions and easements that protect natural resources and increase public recreational opportunities. Many acquisition projects benefit water quality because they usually receive higher priority for funding. Typical project areas include streambank corridors, natural areas, habitat restoration areas, urban greenspace and large river corridors. Stewardship has also funded a number of recreational development projects, primarily for the State Park and Trail System.

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 funds 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.

The Stewardship Program includes a wide range of acquisition purposes all with the intent of preserving or enhancing natural resources as well as providing public recreational opportunities. Although these areas may not have water quality protection as a primary purpose, they do provide water quality protection by preserving green space and incorporating proper land management practices. Expansions of wildlife management areas, fisheries areas, natural areas, state parks, and habitat restoration areas are primarily funded through the Stewardship Program and other federal programs such as the Land and Water Conservation fund (LAWCON) and other federal sources.

Two of the five acquisition priorities for Stewardship funding are lands that preserve or enhance the state's water resources (including land along the Lower Wisconsin State Riverway; land abutting wild rivers and wild lakes, and land along the shores of the Great Lakes) and land for the stream bank protection program. The purpose of the stream bank protection program is the protection of 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 $6.7 million has been spent on WDNR streambank projects, and about $3.4 million in grants have been provided to municipalities and nonprofit organizations for 38 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 totaling 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 manage-

ment 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

The information below can also be found in Part II under Water Management Program - Polluted Runoff Management.

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 installing voluntary BMPs.

Targeted Runoff Management Grant Program

The Targeted Runoff Management (TRM) Grant Program provides financial assistance to rural and urban governmental units. The maximum cost-share rate available to TRM grant recipients is 70 percent 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. To date, TRM grants have funded construction of rural and urban best management practices. The projects last from two to four years. Please refer to Table 7 for additional information regarding the TRM grant projects. The first grant cycle for the program was in 1999, and 16 rural and 26 urban projects have been funded by TRM grants since then. Approximately $4,513,472 was authorized to fund these projects. Thus far, 31 of the 42 projects have been completed.

Urban Nonpoint Source and Storm Water Grant Program

The Urban Nonpoint Source and Storm Water Grant Program focuses on financial assistance in urban areas. 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. Urban Nonpoint Source and Storm Water Grants can be used to pay for a variety of activities. Eligible technical assistance costs for planning, related informational and educational activities, ordinance development and enforcement, training and design are cost-shared at 70 percent. Eligible construction costs may include such projects as storm water detention ponds, streambank stabilization, and shoreline stabilization and are cost-shared at 50 percent. The funded projects last between two to three years. Table 7 provides additional details about the projects. Since the first grant cycle in 2000, approximately $8,755,818 were authorized to fund 31 planning and 25 design/construction projects.

Financing Compliance with Performance Standards

The total estimated **annualized** cost to implement these standards is $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.

Special State Concerns and Recommendations

Eutrophication Strategy

In 2001, the Department began developing a strategy specifically designed to address eutrophication. Many of Wisconsin's lakes and streams are experiencing "eutrophic" conditions that are beyond what would be considered as "natural aging" of these waters and which is often associated with the impaired use of the water. Eutrophic conditions are most often caused by high concentrations of phosphorus or nitrogen. Phosphorus and nitrogen are essential nutrients necessary to support life in both terrestrial and aquatic systems. However, the presence of these nutrients in large amounts or high concentrations in the aquatic environment can result in nuisance algae conditions, prolific macrophyte growth, reduced dissolved oxygen, fish kills and other problematic conditions. In turn, these conditions may result in unaesthetic conditions for swimming and sightseeing, undesirable changes in fish and aquatic life communities. They may also result in increased costs to treat water for human consumption from surface water supplies. Public concern for water quality and federal and state regulatory and non-regulatory initiatives drive the development of this strategy. This strategy focuses on reducing eutrophic conditions through the management of nutrients. During 2002 and beyond the Wisconsin DNR will continue to identify and integrate various disparate initiatives that affect nutrients in surface waters to capitalize on opportunities for cost-effective approaches to reduce eutrophication in the state.

To learn more go to: http://www.dnr.state.wi.us/org/caer/ce/invasives/index.htm.

The handful of invasive aquatic species that Wisconsin now monitors has already taken a toll on Wisconsin ecosystems, recreation and economy. In the decade that zebra mussels have been in Wisconsin, they have decimated native mussel populations on the Mississippi River and contributed to low oxygen levels that endangered fish in the late 1990s. They have cost water utilities some $4 million a year to clear from their intake pipes and another $1 million for power plants — and those are 1994 figures, before the zebra mussels really took hold.

Rainbow smelt, which have invaded several lakes in Vilas County in northern Wisconsin, are causing significant declines in walleye reproduction and fish managers are now having to stock waters that once had healthy walleye fisheries.

Eurasian watermilfoil, a feathery-looking aquatic plant that forms thick mats at the water's surface, has spread to 310 lakes in more than 50 counties and is hampering boating, swimming and fishing.

Aquatic Nuisance Species

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

In 2001, DNR completed a draft of *A Comprehensive Management Plan to Prevent Further Introductions and to Control Existing Populations of Nonindigenous Aquatic Nuisance Species.* This plan is a blueprint for managing aquatic invasive species and is designed to help prevent new introductions, to slow the spread of existing ANS and to control or abate the ecological and economic impact of existing problem species. This plan, prepared in cooperation with University of Wisconsin Sea Grant Institute, was submitted to the National Aquatic Nuisance Species Task Force. If the task force approves the plan, the state will qualify for federal funding to begin implementation of an invasive species program in Wisconsin.

The plan, submitted to a special *Governor's Task Force on Invasive Species*, recognizes the need for regional, national and international action and coordination in targeting ballast water of ocean going vessels — the primary, documented way many invasive species reach the Great Lakes. Also,

the plan calls for a coordinated study of the potential for introductions by the bait and aquaculture industry and development of recommendations to reduce this pathway for importation of aquatic exotics. Many aquatic activities can result in the transport of invasive species and their introduction into uninfested waters, but the bait and pet sales and aquaculture operations is a much lesser threat than ballast water represents.

The primary way invasive species spread to new inland waters is by hitching a ride aboard the boats, trailers, bait buckets and other equipment of recreational boaters and anglers. Inspections of recreational boats at key public landings and an expanded information and education campaign and outreach efforts to slow the advance of zebra mussels and Eurasian watermilfoil are also recommended.

In 2001 Wisconsin Gov. Scott McCallum signed a biennial budget allocating $300,000 to DNR for aquatic invasive species control in each of the next two years – six times the amount allocated in each year of the last biennial budget. This money will be used to start developing a coordinated, comprehensive program modeled after the state of Minnesota's. Key program elements will include prevention, control and abatement 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. Minnesota's program has been credited with greatly slowing the spread of invasive species – in particular, Eurasian water milfoil. Results from recent boater surveys have shown that Minnesota has been effective in getting the message out to boaters by slowing the spread of Eurasian Water Milfoil in inland waters by more than 50%.

Water Quantity Issues

Wisconsin is known for its abundant water resources. However, there is a growing concern about the overall availability of water for a varied spectrum of uses ranging from public water supply to sufficient 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 surficial or 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.

Over the years the state's increasing population, rapid widespread development and increasing and varied industrial demands have in some areas resulted in water quantity and related water quality problems. These short-term temporal factors affecting quantity add to the geological and hydrologic factors that result in less than abundant water supplies in a given area. Regional impacts from quantity problems are documented in the Lower Fox Valley, Southeastern Wisconsin and in Dane County. These three areas are experiencing substantial groundwater level declines with the added complexity of quality problems for drinking water. In addition, localized expressions of quantity issues include lake level drops, stream flow declines, wetland size and level declines, and the disappearance of springs.

While management of Wisconsin's groundwater and surface water programs are functionally distinct, coordination on this issue has become a priority. 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 drinking water bottling plant involving a high capacity groundwater well in a spring-fed region of Wisconsin illustrates the complexity of social, ecological and institutional issues involved. This 'case study' highlighted public concern for DNR to protect resources, while at the same time underscored the existing framework and procedures established by law. 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.

Riparian Development

Few natural scenes are more treasured than a magenta sunset over a glistening body of water or the serenity of dawn breaking while wildlife and fish scurry to take advantage of the early morning hour. Perhaps it is the sense peace these scenarios provide that, ironically, has resulted in a tremendous decline in the state's undeveloped 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;
- 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 existing incorporated areas.
- Clean Lakes Program Grants (State/Local) have provided funds for careful resource planning and protection at the local level, resulting in lake shoreland classification schemes more stringent and protective than state rules.

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.

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. With new people inevitably come questions of why regulations exceed minimum standards. New staff also require training in administration and implementation of land use regulations, which the Department has begun to provide, but demand exceeds our ability to provide currently.

Private property rights groups are becoming more and 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 variance be issued. Education and training is needed for local Corporation Counsels, as well for the general public.

Land prices are skyrocketing on Wisconsin's lakes and rivers as it becomes harder and harder to find the perfect piece of property. 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.

Habitat Protection and Restoration

Habitat issues have become increasingly important in water resource management due to the connection with water quality and quantity in both surface water and groundwater. Many of the restoration goals for streams are imbedded in developing a better understanding of regional hydrology and the impacts of land cover and land use types as they relate to these flow patterns. While programs like the Conservation Reserve Program buffers and Conservation Research and Enhancement Program buffers and filter strips have been established to protect zones, the design of riparian practices and the assessment of the regional hydrological patterns must occur together.

Instream habitats, or the stream morphology, are significantly affected by the speed and volume of runoff delivery. Practices designed to reduce pollutants should be assessed to promote loss of energy in these overland flows. These designs will also promote greater opportunities for recharge and support of base flows, while working to minimize both the amount of fluctuations and duration of peak to average flow variations. These land practices to support attainment of in-stream habitat goals will also result in increases in habitat quality and amounts for wildlife needing riparian areas for survival

Thus, there is a need for an equivalent program of some kind to support continuous signup for buffers and filter strips in non-agricultural areas. Further, regional and local, where possible, hydrologic modeling should be encouraged during the design of large developments, and all practical steps should be taken to encourage infiltration and preservation not only of pre-development flow patterns, but of water quality as well.

During development of the state's "Smart Growth" network, DNR must help develop a vertical infrastructure to provide data to local governments about sensitive of resource areas so that protection can take place through local ordinance and planning, such as smart growth or comprehensive planning efforts.

Mercury

Mercury remains a critical pollutant of concern for Wisconsin waters. Emissions of mercury from fossil fuel-fired boilers used to generate electricity and from other major sources significantly contribute to mercury entering waterbodies and ultimately fish and wildlife. In the past two years, Wisconsin has continued to study the biogeochemistry and ecological movement of mercury, while simultaneously developing a strategic initiative to both better understand the contaminant and to stem its influx into the environment through regulatory and nonregulatory methods.

Ongoing Research

Four mercury research projects described in the Year 2000 305b report continued during 2000-2002. This research includes a study of total and methyl mercury and other trace metals in tributaries to Lake Superior to develop a predictive model responsive to changes in mercury emissions in the lake's airshed. WDNR also continued its wildlife risk assessment model using the common loon, developing lowest observable effect level (LOEL) and no observable effect level (NOEL) for Hg in the loon. A third study involves monitoring mercury cycling through lake bog connections and changes (over a 10-year period) in bioaccumulated Hg levels in young of the year fish. An additional study involves a 3-year monitoring of the Hg cycle in Devil's Lake to allow

verification of a USEPA Mercury Cycling Model, which is being used in the Devil's Lake TMDL pilot project. The pilot project is one of two atmospheric deposition pilot projects in the country.

Mercury Analysis Team

The DNR Air Program assembled a Mercury Analysis Team to address the problem of mercury in the environment through the development of a strategic initiative involving non-regulatory and regulatory tools. The Mercury Analysis Team is charged with developing an atmospheric mercury modeling system for Wisconsin and the Great Lakes region. This process includes conducting a comprehensive analysis of the emission, transport, transformation, and deposition of mercury to land and water surfaces in the region. The model will be used to support development and evaluation of the effectiveness of mercury emission reduction initiatives and strategies. These initiatives and strategies include atmospheric mercury TMDLs (Total Maximum Daily Loads) for impaired water bodies, proposed state regulations for the reduction of mercury from fossil fuel-fired utility plants, and other volunteer mercury reduction programs.

Regulatory Initiatives

During the past two years the state has initiated or completed two major regulatory initiatives involving mercury. In response to the growing awareness and scientific study of mercury and its ecological effects, the Natural Resources Board in December 2000 adopted a resolution that granted a citizen petition seeking rulemaking to reduce mercury emissions to the air. The Board directed staff to develop proposed rules that protect public health and the environment and that are cost-effective, reasonable, and do not interfere with the ability of electric utilities to supply the state's energy needs. Under the authority of s. 285.11(9), Wis. Stats., proposed administrative rules to reduce mercury emissions was developed and presented to the Board in June 2001.

Included with the presentation of the proposed rule to the Board was the formation of a Technical Advisory Group (TAG) and Citizens Advisory Committee (CAC). The purpose of these two groups is to consider alternatives and making recommendations for changes to the proposed rule. The two groups continue to hold meetings and are expected to compile a report to the Secretary by the end of May 2002. After considering the recommendations in the report, the Department will then seek authorization from the Board to conduct public hearings on the proposed rule.

In February 2001, the Natural Resources Board adopted a statewide general advisory for mercury, covering all waters of the state, which is supplemental to the existing specific mercury advisories in place for waters with supporting fish tissue monitoring data. The state is evaluating how this general mercury advisory will affect its assessment criteria for lakes and streams.

Also, in January 2002, the DNR Board approved holding public hearing on modifications to NR106 and NR 219 that would control mercury in wastewater discharges. These rule modifications are designed to formalize, using a more rigorous regulatory format, the state's Wastewater Mercury Strategy, which has provided guidance to permit drafters since 1996 on how to handle mercury. Near the end of 1999, USEPA officially approved of a sensitive test method that allows direct evaluation of compliance with a mercury water quality standard. The proposed rule changes will require dischargers to utilize this new analytical method to test mercury in effluent and to then to plan for and implement pollution prevention actions or where necessary request a variance. Implementation of this rule may have a modest but still significant impact on mercury inputs into the environment.

Prior to these newer initiatives, in 1998 the state submitted to the USEPA a list of impaired waters, which are waters that do not meet water quality standards ("303d List") and for which remedial action should be initiated to improve the quality back to a level commensurate with standards. This Impaired Waters List and associated Total Maximum Daily Load (TMDL) initiative involves 421 streams, stream segments and lakes listed exclusively for mercury deposition related problems.

While progress on the influx of mercury may be achieved through rules regarding atmospheric deposition and municipal treatment plant discharges, the nature of the contaminant's biogeochemical cycle, the pool of existing contamination in waterbodies, and the breadth or scope of mercury sources (both in terms of number of products containing mercury and the regional and global nature of mercury air emissions) likely preclude substantive change in ambient mercury

concentrations in surface waters or in fish tissue for quite some time. The state believes that the nature of mercury deposition demands a multi-state, regional and national effort to stem the influx of this contaminant from the myriad of sources. Also needed are additional funds and time for stepped up pollution prevention efforts and for research to better understand this contaminant and its movement in the environment.

Monitoring and Data Management

Effective water management demands knowledge of resource quality conditions. Without such information, management actions may or may not be effectively applied, prioritization of work may be misguided at best – arbitrary at worst, and ecological evaluation of project effectiveness is impossible. Monitoring and associated management of data, however, is both "behind the scenes" and expensive, so that garnering a constituency for support is difficult. Further, in the area of data management, the pace of change and the availability of new systems result in rapid technology turnover – which can inhibit investment in new data initiatives. While these problems have been somewhat overcome in some areas of water management in Wisconsin, in other areas they persist and result in loss of efficiencies from lack of communication, data availability and accessibility. These problems are exacerbated by severe budget cuts in this routinely under-funded area of work. Despite these problems, Wisconsin is making progress in several areas of surface water monitoring and database development and management including:

Accomplishments

- Development and implementation of standardized protocols for baseline monitoring for wadeable and nonwadeable streams, lakes and wetlands;
- Monitoring for biological and physical parameters necessary to develop indices capable of summarizing ecological condition;
- Implementing a random stratified sample design for wadeable streams;
- Continuation of long-term trend monitoring on large river systems;
- Identification of additional key stations where flow gages are needed to conduct TMDL modeling and floodplain management;
- Development of a state-of-the-art web-interactive biological database for surface water data;

Work Yet to Accomplish

- Sufficient funding to fully implement the state's baseline monitoring program;
- Sufficient funding to achieve substantive progress in the area of data management for water systems;
- Incorporation of chemical monitoring into baseline monitoring program;
- Evaluation and modification of the state's 305b assessment procedures in light of major changes in NR102, the state's water quality classification code;
- Development of assessment procedures and linkage of chemical, biological and physical data into a cohesive database system for water quality assessments;
- Upgrade of the state's 305b assessment database system into an oracle, web-interactive system readily linkable to the state's 1:24,000 hydrography layer through the Surface Water Integration System (SWIS);
- Linkage of key related databases (Fish and Habitat Monitoring Database; 303d/Impaired Waters, Outstanding and Exceptional Resource Waters, Aquatic Nuisance Species locations, Outfalls; contaminated sediment/fish consumption advisory database) with the 305b assessment database, preferably through the DNR's in-house 'enterprise database' system.
- Progress in developing and implementing a long-term, strategic perspective for the state's water and water-related databases

These numerous yet important work items are necessary to support and provide for a basic understanding water quality condition in the state.

• recognizing ecosystem services as well as economic benefits of groundwater

Over the next year, the GCC and agency staff will be compiling results of the small group sessions, developing a set of strategic action items, and putting together full conference proceedings.