

## **Section IV.**

# **Water Quality Programs and Activities in the Upper Mississippi River Basin**

## **State Agency Initiatives**

### **Board and Water and Soil Resources**

The Minnesota Board of Water and Soil Resources (BWSR) is responsible for the oversight of the Comprehensive Local (County) Water Planning Process, Watershed District Operations, and other soil and water conservation measures including cost share funding of agricultural best management practices through the local Soil and Water Conservation Districts.

In addition, BWSR provides funding to the local water planning task forces for various water quality monitoring activities. Up to 65 counties have performed water monitoring activities across the state through the local water planning programs. Local Water Planning by the Counties in the Upper Mississippi River Basin is a high priority and each of the counties activities are discussed later in this section.

Overall the water monitoring programs have monitored ground water for pesticides, nitrates, sulfates and coliform bacteria. Lakes and streams monitoring have included nutrients, pesticides, sediment and chlorophyll *a*.

Best management practices in the Upper Mississippi River Basin that BWSR has provided cost-shared assistance to include the construction of manure management and ag-waste systems, the construction of buffer strips along rivers and lakes, livestock fencing, clean

water diversions, temporary sediment controls, stream crossings, controlled watering access points and windbreaks.

### **Department of Natural Resources**

The Minnesota Department of Natural Resources has responsibility for the management of Minnesota public lands, forests, fish and wildlife, and water quantity resources.

Additionally, the Department of Natural Resources has some special projects in the Upper Mississippi River Basin that include involvement in the Big Sandy Lake Clean Water Partnership, the Lake Margaret Clean Water Partnership, various Leech Lake projects, Mille Lacs Lake Clean Water Partnership and various other efforts.

#### ***Tri-County Leech Lake Watershed Project***

The Tri-County Leech Lake Watershed Project is a special project of the Minnesota Department of Natural Resources intended to coordinate resource management activities in the Leech Lake Watershed. The project is designed to be headed by a local citizen groups and resource managers working together on local priority projects.

The project has been involved in creating a private foundation for resource management in the Leech Lake area, funding of cluster septic systems upgrades in highly sensitive areas of the watershed, involvement in land swaps to protect sensitive lake shore areas and finally, the

coordination of a public education campaign in the watershed.

## **Federal Agency Initiatives**

### **US Army Corps of Engineers – Upper Mississippi River Reconnaissance Study**

The Corps of Engineers is now conducting a Reconnaissance Study for the Upper Mississippi River, with the study area from Lake Itasca to Lock and Dam 2 at Hastings, Minnesota. The focus of this study is to form multi-agency partnerships and prepare scopes of work for cost-shared feasibility studies that would lead to preparation of water quality, water quantity and water use studies related to the Upper Mississippi Watershed. Local-State-Federal partnerships are needed to collect key baseline land use and water data, identify and evaluate basin-wide problems and opportunities, and to work together to define meaningful protection and restoration actions that will insure future economic and natural viability of the river. A plan to optimally operate the existing Headwaters Lake/Reservoirs as a system needs to be cooperatively defined and tribal trust responsibilities adequately integrated into a future systemwide Headwater Reservoirs operations plan. Also, the public and all levels of government recognize that better water quality monitoring and modeling is needed to protect and restore important water resources in the Upper Mississippi River Basin.

There is a growing recognition that economic value to the people of the region is dependant on a healthy Upper Mississippi River environment and that future coordinated and comprehensive land use and water management is critical to continued clean and productive use of the river. The Corps Reconnaissance Study is the first step towards cost-shared detailed water resources

studies and remedial actions. However, in order to proceed into detailed feasibility studies, non-federal cost sharing partners must come forward with local and/or state funding for federal funding of such studies to begin.

### **US Geological Survey**

The United States Geological Survey (USGS) is a section of the U. S. Department of Interior. The USGS's primary mission is to assess the quantity and quality of the earth and water resources of the nation to assist resource managers and policy makers in making decisions impacting water resources.

Currently in the Upper Mississippi River Basin, the USGS has a number of activities underway. Two examples of efforts include the following.

#### ***National Water Quality Assessment Program - Upper Mississippi River Basin***

Since 1994, the U.S. Geological Survey National Water Quality Assessment Program (NAWQA) began studies in the Upper Mississippi River Basin, primarily from Royalton through the Twin Cities Metropolitan area and down to Lake Pepin. The goals of the program are to quantify the quality of surface and ground water throughout the basin. The project recently completed the intensive study and is preparing a final report. Many of the studies released as part of this study effort are identified in whole or summary in this document. Additional reports are identified in the Appendix – References Section. The overall studies covered topics in water quality, nutrient sampling, pesticides in the streams and ground water, trace elements, fish tissue, and quality of the surface and ground water related to land use practices.

It is the part of the NAWQA program to return approximately every 5 to 10 years to evaluate

the trends and changes in a system since the last evaluation.

### ***Interdisciplinary Research Initiative - Shingobee River Headwaters Area***

The Interdisciplinary Research Initiative (IRI) was initiated in 1989 to apply a scientifically panoramic perspective to the need for fundamental research on the physical, chemical, and biological processes that interact to generate the characteristics of a lake, wetland or stream (and its watershed). Research at the site is focused on the interfaces of scientific disciplines, the idea being that scientists who might not normally work together will learn from each other's approaches and develop fresh ideas for conducting research on a watershed scale. From these new ideas and new approaches comes a better understanding of physical, chemical and biological interactions that occur in and adjacent to lakes, wetlands and streams. Resource managers can use this new information to better manage our nation's water resources.

The USGS established the Interdisciplinary Research Initiative (IRI) at the Shingobee River Headwaters-Williams Lake area in 1989 to encourage scientists from many different disciplines to work together to conduct research for the sound management of water resources and watersheds. The primary focus of the IRI effort has been the processes associated with watershed, lakes and ground water interactions.

Lakes were selected as an initial focus of the IRI effort because lakes integrate many hydrological processes that are present in their watersheds, and they preserve a record of past environmental change in their sediments. The direction of research at the IRI has evolved to include research on streams and wetlands and their watersheds. Participation at the IRI has evolved to include scientists from the Geologic Division

of the USGS, as well as from 8 universities in 5 states.

Research efforts at the USGS IRI also have focussed on newer methods to determine ground water inputs to lakes, new methods of determining water, chemical and nutrient budgets for lakes, ground water, lake and wetland interactions. Additional information on the IRI Research Effort can be found in Winter et.al. noted in the References Section of Appendix A.

## **Metropolitan Council**

The Metropolitan Council coordinates regional planning and guides development in the seven-county metropolitan area. The Council operates regional services including wastewater collection and treatment, transit and Metro HRA – an affordable housing service that provides assistance to low income families in the region. Created by the Minnesota Legislature in 1967, the Council establishes policies and provides planning and technical assistance to communities in the Twin Cities region for airports, regional parks, highways and transit, sewers, water resources management, land use and affordable housing.

The mission of the Metropolitan Council is to improve regional competitiveness in the global economy, so this is one of the best places to live, work, raise a family and do business.

The Metropolitan Council, as the designated area-wide water quality management planning agency under section 208 of the federal Water Pollution Control Act, has a responsibility to ensure that water quality management policies and programs are implemented.

Through the Council's Environmental Services Division, the Council attempts to fulfill this role by the following activities:

1. The Council reviews and comments on all of the metropolitan area watershed management organization and watershed district plans to make sure the plans are consistent with metropolitan system plans and adopted chapters of the Council's *Regional Blueprint*.
2. The Council reviews and comments on all of the local water plans required by local cities and townships as part of the comprehensive planning process.
3. The Council reviews and comments on all of the water supply plans for communities with municipal water systems as part of the comprehensive planning process.
4. The Council is leading a collaborative effort to develop an environmental framework for the metropolitan area.
5. The Council has a grant program for local governments to help them to set up management programs to monitor the status of and track the condition of their individual sewage treatment systems.
6. The Council has a local water resources plan grant program to help local governments implement items in their local water resources management plans.
7. The Council has a lake monitoring program and a citizen assisted lake monitoring program that has helped monitor and track the condition of over 200 lakes in the Metropolitan Area.
8. The Council has a watershed outlet-monitoring program that assists local governments in setting up monitoring sites to collect event-based monitoring information on the major outlets to the area rivers.
9. The Council reviews and comments on environmental assessment worksheets, environmental impact statements, wetland permits, NPDES/SDS permits for consistency with the *Regional Blueprint*.

**Table 32**  
**Metropolitan Council**  
**Upper Mississippi River Basin Grant Projects**

|  |           |
|--|-----------|
| Hennepin Cons Dist-Macroinvertebrate Education/Monitoring      | \$97,185  |
| Univ Mn Ext--Alternative On-Site Demonstration Project         | \$42,000  |
| South Wash Wtshd District/Infiltration Detention Demonstration | \$96,000  |
| St. Paul-Phalen Wetland Restoration                            | \$100,000 |
| Mpls/St. Paul Self-Adhesive Stencil Project                    | \$40,000  |
| Hamline Ctr Global Env Ed/Pauline—NPS CD-Rom                   | \$130,000 |
| Cairns/Pauline Teacher Training                                | \$24,840  |
| Mpls Park Rec Bd-Stormwater Wetland Assessment                 | \$78,200  |
| Mpls-Near Northside Stormwater Pond and Wetland Restoration    | \$100,000 |
| Mpls.-Grass Lake Bioretention Filter                           | \$100,000 |
| Lake Water Quality through Remote sensing                      | \$100,000 |
| 10 NPS Teachers Work shops                                     | \$50,000  |
| Lake McCarrons Retrofit  | \$275,000 |
| Metro Lakeshed Definition/Delineation                          | \$67,000  |
| City of Dayton-septic systems                                  | \$5,000   |
| Columbus Twp-septic systems                                    | \$5,000   |
| Ham Lake-septic systems  | \$10,000  |
| East Bethel-septic systems                                     | \$13,315  |
| Burns Twp-septic systems                                       | \$5,000   |
| Shingle Creek Wtshd Mgmt Org-local Water plan                  | \$10,000  |
| Minnetonka-local water plan                                    | \$8,100   |
| East Bethel-local water plan                                   | \$13,000  |
| Lexington-local water plan                                     | \$1,845   |
| Vadnais Lake Area Wtshd Mgmt Org-local water plan              | \$5,200   |
| Capitol Region Watershed-local water plan                      | \$10,000  |
| Endocrine disruptor project                                    | \$200,381 |
| Citgo brownfield remediation                                   | \$29,790  |
| Big River Journey Scholarships                                 | \$18,720  |
| Clean Streets, Clean Como Lake                                 | \$30,000  |
| Metro WaterShed Education Network                              | \$35,000  |
| WaterShed 2000   | \$50,000  |
| Metro Area Children's Water Festival                           | \$8,000   |
| Erosion Team Training and Program Development                  | \$22,500  |
| NPS Education For the Crow River Watershed                     | \$16,500  |
| Reducing NPS from Backyard Livestock                           | \$89,000  |
| Wetland Construction for Humboldt Greenway                     | \$120,000 |
| Lower Phalen Rain Garden And Education Initiative              | \$30,000  |
| Hawthorne Greening and Stormwater Runoff Prevention            | \$30,000  |
| Aeration in Ditch/wetland System to Reduce Phosphorus          | \$16,000  |

Additionally, since 1993 the Metropolitan Council has had a grant program to address nonpoint source pollution. Between 1993 and

1998, the Council awarded over \$8.2 million in grants. The current grant program is a five-year program with \$7.5 million. Of the \$10.8 million dollars awarded since 1993, over \$2 million dollars went to projects in the Upper Mississippi River Basin. The purpose of the Metro Environment Partnership grant program is to improve the water quality of Metro Area lakes and rivers by reducing nonpoint source pollution through education and implementation grants.

In the past this grant program has funded wetland restoration projects, macroinvertebrate monitoring, wetland construction projects, demonstration projects for various best management practices and many education projects in the Upper Mississippi River Basin.

For more information on the projects funded in the Upper Mississippi River Basin since 1993, see Table 32.

## **Mississippi Headwaters Board Programs**

### **Mississippi Headwaters Board River Watch Project**

#### ***Mississippi River Watch Project - An Analysis of Low Dissolved Oxygen Levels in the Upper Mississippi River in Late Summer to Early Fall***

As part of the Mississippi Headwaters Board River Watch Project a student from Bemidji High School studied a 110 kilometer (70 mile) reach of the Mississippi River from the Mississippi Headwater at Itasca State Park to approximately 5 kilometers (3 miles) downstream of Lake Bemidji. In the past, monitoring efforts in the study area have identified low dissolved oxygen levels. The Minnesota Pollution Control Agency has identified the upper area of the study area on its

Section 303(b) Total Maximum Daily Load (TMDL) list as an impaired reach for dissolved oxygen.

The River Watch study noted period in the study area where the dissolved oxygen dropped below the 5 mg/L standard set by the Minnesota Pollution Control Agency. The primary conclusion of the study was that the dissolved oxygen decline was caused by aerobic decay within the wetlands adjacent to the Mississippi River. The effect was intensified by the lower solubility of oxygen because of high temperature and lack of replenishment because of flooded rapids.

### **Mississippi Headwater Board/ Crow Wing County Soil and Water Conservation District/Erosion Inventory of the Mississippi Headwaters**

The Counties of Hubbard, Clearwater, Beltrami, Cass, Itasca, Aitkin, Crow Wing and Morrison, through the Mississippi Headwaters Board, undertook an inventory of the first 400 miles of the Upper Mississippi River Corridor to identify the extent of erosion problems on the Mississippi River.

Using methodology from the Northwest Michigan Streambank Inventory developed by the U.S. Department of Agriculture and the Natural Resources Conservation Service, the project staff and volunteers documented 105 erosion sites in the corridor. Of the 105 sites, 34 percent were rated as minor erosion, 47 percent were moderately eroding and 19 percent were classified as severely eroding. Information gathered in the project will be used to develop further implementation plans.

## Minnesota Rivers Council

The Rivers Council of Minnesota (RCM) is a nonprofit corporation dedicated to helping Minnesotans protect, restore and enjoy our 92,000 miles of streams and rivers. The principal means the RCM achieves this mission is by assisting individuals and communities in protecting rivers locally. This is done by the following.

1. Supporting participation in decision-making and management organizations.
2. Providing information, education, training and networking services.
3. Enhancing performance of local river groups.
4. Implementing water quality monitoring and interpretation.

Organization of the Rivers Council began in January 1991, when representatives of water resources groups met at the Blandin Foundation to guide development and implementation of a comprehensive water quality monitoring program for the Mississippi Headwaters region. Participants recognized first, the need to link all the state, regional and local activities that influence rivers, and second, the need for a comprehensive network of water quality monitoring statewide. Two major grants from the Blandin Foundation supported the establishment of the River Watch water quality monitoring network (1990-1995) and then the development of a statewide nonprofit to support local monitoring programs (1995-1998). The Rivers Council is currently funded by contributions of its 400 members and by grants from private foundations.

In the Upper Mississippi River Basin, the Rivers Council of Minnesota is participating in the multi-agency and community Upper Mississippi Source Water Protection Initiative (1998-2001),

by compiling a bibliography of water quality information, leading the development of the Initiative's communications strategy, education and training program.

## Mississippi River Defense Network

The River Defense Network is being implemented in Minnesota counties and communities along the Mississippi River from its Headwaters to the Twin Cities. This initiative is being coordinated by an oversight committee of local, regional, state and federal agencies linked with industry and the non-profit community. It focuses on a common goal - to prevent spills and to protect the Mississippi River from contamination from spills. The accomplishment of this goal rests on a well-informed, trained, and equipped network of local officials, including first responders, water planners, and other city and county officials in communication with area industry.

Development of the RDN has been funded by the Legislative Commission on Minnesota Resources, the U.S. Army Corps of Engineers, the Blandin Foundation, and participating agencies and industry.

Creation of the RDN was prompted by the drought of the late-1980s and experience in Minnesota and elsewhere with chemical spills into rivers; both of these factors increased concern over the vulnerability of the Mississippi to contamination from spills. Following publication of a report by the Corps of Engineers, several organizations gathered to measure the contamination risk and devise river protection strategies. Several organizations have met over the past five years to develop and implement the RDN. Participants in this effort include The Blandin Foundation, the St. Cloud, Minneapolis and St. Paul water utilities, The Minnesota Pollution Control Agency,

Department of Public Safety, Department of Health, Department of Natural Resources, the U. S. Army Corps of Engineers, Morrison, Stearns and Hennepin Counties, the City of Minneapolis, Northern States Power, the Mississippi Headwaters Board; the Metropolitan Council and the Rivers Council of Minnesota.

The River Defense Network emphasizes local government for two reasons. Local officials are knowledgeable about potential spill sources and local river and shoreland conditions. Moreover, spills into river environments require rapid response; this calls for a primary role for local spill response and management. By creating an action plan and framework to respond to spills and manage our spills preparedness, the RDN is developing relationships and a mechanism for collaboration among those in various sectors, levels of government and locations along the river who play important roles in spills planning and management.

The River Defense Network has produced two manuals: The Spill Response Manual including and inventory of some 3,300 potential spill sources, sensitive sites, spill responders, river users along the river, an explanation of communications protocol and spills management responsibilities, identification of equipment deployment sites, and a description of spill response procedures. The Riverine Emergency Management Model Manual contains a computer model and supporting technical information to allow planners and responders to model spill characteristics in the river.

The River Defense Network Oversight Committee is currently implementing a project funded by the 1999 Minnesota Legislature to acquire and deploy spill response equipment in strategic locations along the Mississippi River. In addition, the committee is considering

options for the future management of the RDN, as well as possible expansion of the RDN to other rivers within Minnesota.

The River Defense Network, the Cities of St. Cloud, St. Paul, Minneapolis, and the Metropolitan Council, through funding by the Minnesota Department of Health and the Minnesota Pollution Control Agency's Clean Water Partnership Program, will be undertaking a planning process for the communities along the Mississippi River under the Federal Source Water Protection Program. The Source Water Protection Program identifies areas requiring special protection because they are a source of drinking water. In the Upper Mississippi River Basin, this will include both ground water and surface water sources. At the present time, the Cities of St. Paul, St. Cloud and Minneapolis' primary drinking water source is surface water from the Mississippi River. An additional 52 communities along the Mississippi River pump drinking water from aquifers that are dominated by the Mississippi River.

## **Local Governmental Units Water Quality Programs**

### **Comprehensive Local Water Plans (Outstate Counties)**

#### ***BACKGROUND***

In 1987, the Minnesota Legislature enacted the Comprehensive Local Water Plan Act. The purpose of the act was to encourage the 80 greater Minnesota Counties to plan for the management of their surface and ground water resources. Participation by the counties was voluntary. By 1990 all of the counties in the Upper Mississippi River Basin had completed or were in the water planning process. The structure of the water plans allowed each county to prioritize their individual plans to allow for

local issue identification, prioritization and implementation.

## **Aitkin County**

The majority of Aitkin County lies within the Upper Mississippi River Basin, although parts of the county contains watersheds that are parts of the St. Croix and Lake Superior Basins. The county is composed of three major watersheds of the Upper Mississippi River Basin: the Mississippi River - Grand Rapids (HUC 07010103), the Mississippi River - Brainerd (HUC 07010104), and the Rum River (HUC 07010207).

First adopted in 1990, the Aitkin County Water Plan is implementing its second revision. Surface water resources remains a primarily concern of the plan. Since the first plan adoption, the Aitkin County Water Plan Task Force has been instrumental in the establishment of the Big Sandy Watershed Project and the Mille Lacs Lake Watershed Project. Both of these projects have been successful partnerships between the various county offices, the Minnesota Department of Natural Resources, the Minnesota Pollution Control Agency, the Minnesota Board of Water and Soil Resources, the Mille Lacs Lake Band of Ojibwe, numerous local lake associations, and other interested citizens and interest groups.

Policies of the water plan were incorporated into the Aitkin County Shoreland Ordinance. The water plan was also responsible for the creation of the Aitkin County Green Shores Program, which provides incentives to landowners for fencing livestock from the county's rivers and lakes. To date, the green shores program has completed 12 projects on more than four miles of shoreland.

## **Becker County**

The eastern part of Becker County is within the Upper Mississippi River Basin and contains the headwaters of some of the most important streams, rivers and lakes in the basin. Becker County is composed of the Redeye or Leaf River (HUC 07010107) and the Crow Wing River (HUC 07010106). Other major streams within the county are parts of the Crow Wing River Watershed including the Straight River, known for its brown trout fishery, and the Shell River.

The Becker County Water Plan stressed ground and surface water resources. Projects and activities implemented to date include well water nitrate testing, a cost share program to assist in the sealing of abandoned wells, establishment of buffer strips next to the water resources, establishment of a lake monitoring program in conjunction with the Becker County Coalition of Lake Associations to determine the trophic status of the lakes, sponsorship of a pesticide container collection day and completing an inventory of septic system compliance around 23 lakes resulting in a reduction of percentage of failing system from 33% to 11%.

## **Beltrami County**

The very southern part of Beltrami County lies within the Upper Mississippi River Basin and includes the Mississippi River - Headwaters Watershed (HUC 07010101) and a small part of the Leech Lake River (HUC 07010102). The County seat, Bemidji, is that largest city in the county and within this segment of the Mississippi River - Headwaters watershed.

The Beltrami County Water Plan was first adopted in 1989. The plan is currently on its second revision. The Beltrami County plan addresses both surface and ground waters. For the Mississippi River - Headwaters Watershed



and the Leech Lake River Watershed, the plan identified the following issues and strategies.

1. Shoreland development on lakes in Bemidji area that are under development pressure and/or vulnerable as a result of their physical characteristics, including the Mississippi and Turtle River chain of lakes.
2. The disposal of stormwater from the City of Bemidji into Lake Bemidji.
3. Potential of surface and ground water contamination from potential pipeline breaks.
4. Protection of high priority public water supply wells from ground water contamination.
5. The application of pumped septage to land in Beltrami County, and the potential for ground and surface water contamination from this practice.
6. Understanding and managing recreational water use conflicts.
7. Potential ground water contamination from old town dumps.
8. Nutrient loading into the Mississippi River and tributaries from agricultural activities in the Moose Lake sub-watershed, and other high priority sites.
9. Potential ground water contamination from underground storage tanks.
10. Reduce nonpoint source pollution in Upper Mississippi Watershed which culminated in Lake Bemidji.

Beltrami County, through its water plan, has accomplished: the monitoring of forty-four lakes for basic water chemistry (pH, temperature, dissolved oxygen, total phosphorus and chlorophyll *a*); the monitoring of 47 lakes through the Citizens Lake Monitoring Program; conducted annual tests of private wells for nitrates and coliform bacteria; developed language for a septage disposal ordinance and a contaminated soils ordinance which await county board approval; continued the

cooperative effort with the U.S. Geological Survey on the Bemidji-Bagley Sandplain Aquifer - sampling 45 wells for a total of 93 different water quality parameters; as part of the Lake Bemidji Project, installed stormwater and sediment traps and treatment systems to treat storm water from the City of Bemidji before discharge to Lake Bemidji; and inventoried over 40 wetland restorations or enhancement sites for potential mitigation - a total of 46 acres in 19 basins were restored.

## **Benton County**

Benton County has been active in its implementation of local water planning activities. Early focus of their plans centered on the creation of a Joint Powers agreement with Sherburne County, creating the Elk River Watershed Association. The purpose of the Joint Powers Agreement was to reduce sediment and nutrient loading to the watershed by the use of low cost – high return best management conservation practices.

The county also conducted a feedlot inventory, developed programs in manure management, including a manure spreader calibration program, and inventories of abandoned wells and drained wetlands.

## **Cass County**

Cass County adopted its first Comprehensive Water Plan in 1990 and revised the plan in 1996. The current plan and implementation stresses protection and, if needed, restoration of the surface and ground waters of the county. The principal goals and objectives of the plan are to: 1. Monitor and regulate water use to assure adequate ground water resources; 2. Preserve the quality of Cass County's ground water, and, where degradation has occurred, work to restore the ground water quality; 3. Preserve the quality of Cass County's surface

water, and where degradation has occurred, work to restore the surface water quality; and 4. Monitor and regulate water use to assure adequate surface water resources.

Under its water planning and management program, Cass County has implemented a series of projects or efforts to accomplish its mission. The county adopted a county-wide plan and zoning ordinance, a wetland protection ordinance, wellhead protection programs, ground water/aquifer studies and has undertaken watershed studies in the Leech Lake Watershed, the Middle Boy River Watershed, the Lake Margaret/Homebrook Watershed, the Upper Mississippi River (Cass Lake-Lake Winnibigoshish Watersheds), and the Upper Boy River or Ten Mile Lake Watershed.

Other watershed efforts prioritized by Cass County include the Willow River, the Pine River and Whitefish Chain Reservoir system, and the Crow Wing River.

Additionally, the county has instituted a lake association Hydrolab™ monitoring program, a water quality library system at three county libraries, and environmental education-demonstration lake lot landscaping and septic displays at the Deep Portage Conservation Reserve.

## **Clearwater County**

Clearwater County is divided by two major basins, the Red River of the North and the Upper Mississippi River Basin. The majority of the county is within the Red River Basin, however a portion of the southeastern corner is in the Upper Mississippi River Basin near the Headwaters of the Mississippi.

Clearwater County's water planning activities involved the whole County and a breakdown of activities by basin was not available, however

the county was involved in a number of implementation activities.

In the Upper Mississippi River Basin, Clearwater County was involved in the Lake Bemidji Watershed Clean Water Partnership which included implementing best management practices through-out the watershed. A more detailed discussion of this project is elsewhere in this document.

The County also participated in lake projects through the Tri-County Lake Enhancement Project, which included lake baseline monitoring and a public education campaign.

Finally, the county water plan participated in a stormwater survey of the City of Bagley, a grazing inventory of 250 miles of rivers and streams to determine sites of best management practices, and developed an erosion control project at Peace Pipe Vista in Itasca State Park.

## **Crow Wing County**

Crow Wing County adopted its first Comprehensive Water Plan in 1990 and revised the plan in 1996. The current plan and implementation stresses protection and restoration of the surface and ground waters of the county. The principal goals and objectives of the plan are to: 1. Monitor the ground water to preserve ground water resources; 2. Preserve the quality of Crow Wing County's ground water and work to restore the ground water quality; 3. Preserve the quality of Crow Wing County's surface water and restore the surface water quality; and 4. Monitor surface water use to assure adequate surface water resources.

Under its water planning and management program, Crow Wing County has implemented a series of projects or efforts to accomplish its mission. The County has implemented a series of individual on-site septic evaluations for the

Mission Lakes, the Whitefish Chain of Lakes, and North Long Lake. In addition, through the planning and zoning department, the county has been working on wetland management, developing a management plan for a highway/commercial growth corridor to protect water quality and stormwater management, and ongoing septic system inspections for new development.

Crow Wing County has also been working with the Pine River Watershed Foundation to develop management programs for the protection of the Pine River Watershed and the Whitefish Chain of Lakes.

## Douglas County

The eastern half of Douglas County lies in the Upper Mississippi River Basin and is the headwaters area for two major watershed units, the Long Prairie Watershed (HUC 07010101) and the Sauk River Watershed (HUC 07010108). Douglas County adopted its first County Water Plan in 1990. The second revision was completed in 1998, extending the plan through the year 2002.

Alexandria, the county seat of Douglas County and the Alexandria Lakes area, lie within the Long Prairie River Watershed of the Upper Mississippi River Basin.

Since the inception of the Douglas County Water Plan, implementation projects have included the following.

1. An education program through the local media on various water management concerns.
2. An annual Kids' Ground Water Festival.
3. Assistance with the formation of the Douglas County Lakes Association.
4. Completion of lake assessments for selected county lakes.

5. Assistance in the Agnes, Henry and Winona Lakes diagnostic study to identify water quality impacts.
6. Assistance to the Sauk River Watershed District to complete work on the diagnostic study and project implementation for the Osakis Lake Watershed.
7. Formation of a landscaping committee to focus on revegetation of shorelines with species native to the lakes.
8. Conduction of water test of private wells.
9. Establishment of buffer strips along two county ditches.

For the future, Douglas County has specified five goals and a number of implementation activities through the year 2002 for surface water management. These goals include the following.

1. Protect the quality and use of the county's surface water. Under this program, the county developed two objectives, 1.) Continue to encourage and promote land use practices to protect and improve surface water resources, which will be accomplished through 13 action items; and 2.) Enforce existing regulations and develop new regulations to protect surface water, which will be accomplished through nine action items.
2. Increase monitoring of surface water quality and quantity and maintain a surface water database in the county. This goal will be accomplished through four action items.
3. Continue educational programs relating to surface water degradation problems in the county, to be accomplished through seven action items.
4. Improve and maintain the quality of Lakes Winona, Henry and Agnes, through the implementation of a Clean Water Partnership project.

For the ground water resource of Douglas County, three goals have been established.

1. Establish a comprehensive database on ground water resources in the County, to be accomplished through seven action items.
2. Protect and preserve ground water quality in the county through eight action items including wellhead protection and land use management.

Finally, recognizing the rapid growth associated with the lake's areas, Douglas County has four goals to protect land resources, which ultimately protect water resources. These four goals include the following.

1. Encourage orderly development and expansion in Douglas County that includes strictly enforcing zoning regulations and encouraging land use practices that minimize degradation to water resources during development.
2. Controlling surface water runoff in the county, including assessing the effectiveness of the county ditch and municipal storm water system, developing and enforcing regulations to help control surface water drainage.
3. Control the disposal of chemical and hazardous waste in the county.
4. Reduce soil erosion in the county.

## **Hubbard County**

Hubbard County water management activities through the comprehensive local water plan process were first adopted in 1990. The county has completed one revision to the plan in 1995. Hubbard County lies entirely in the Upper Mississippi River Basin and include sections of three major watersheds: the Mississippi River - Headwaters Watershed (HUC 07010101); the Leech Lake River (HUC 07010102); and the Crow Wing River (HUC 07010106).

Overall, the Hubbard County local water planning effort stresses the non-degradation of the surface and ground water quality and the protection of the surface water, ground water and wetland resources. Water plan goals are grouped into three categories: 1. Surface and ground water quality and quantity which includes the non-degradation of the water resource quality and assure adequate quantities for the future; 2. Land development, use and management to sustain the water-dependent economy of the county and provide for growth and development without the degradation of the water quality; and 3. Education and information, to inform citizens of the need for water management.

The county has instituted numerous studies and data collection efforts to provide a baseline of the overall water quality of the county. Other activities completed through the water plan include the following.

1. Conducted a level 1 feedlot inventory in the county.
2. Developed and adopted a sewage application ordinance.
3. Developed an agriculture best management practices seminar, which is held annually, and created an evapo-transpiration hotline.
4. Conducted numerous lake assessments with the cooperation of state agencies.
5. Inventoried septic systems located within 1000 feet of a lake's shoreline in cooperation with local lake associations.

## **Isanti County**

Parts of Isanti County lie within two basins, the Upper Mississippi River Basin and the St. Croix River Basin, however the majority of the county is in the Rum River major watershed unit (HUC 07010207) of the Upper Mississippi River Basin.

Isanti County has recently completed their revision to the their Comprehensive Water Plan. Overall goals and actions for the protection of the water quality in the county include the following.

1. Prioritize the lakes, streams and ditches for monitoring on ecological sensitivity, land use and known problems.
2. Identify and correct contamination problems associated with land use practices within the Anoka Sand Plain.
3. Increase monitoring of ground water for chemical contaminants and water levels in major irrigation areas within the Anoka Sand Plain.
4. Update the soil survey.
5. Conduct a feedlot inventory and provide technical assistance to feedlot owners on minimizing the impact of animal wastes on water quality.
6. Conduct an abandoned well survey and prioritize the well for sealing based on their proximity to contaminants and geologic background.
7. Institute an education program that encourages the active involvement of citizens, the formation of Coalition of Lake Associations and Shoreland Volunteers, education on the principles of best management practices for water quality protection.

Activities completed to date through the Isanti County Water Plan include sponsoring an annual household hazardous waste collection program which has drawn 300-400 participants; provide funds to Pheasants Forever to plant 500-600 acres of native Prairie grasses and 75,000 trees and shrubs for water quality protection and pheasant habitat; conducted an annual well testing program with 200-300 people participating per year; and conducted an education program which included a telephone

water help line, stenciling storm drains in the Cities of Cambridge and Isanti, and publishing a newsletter three times a year to distribute to the landowners in the county.

## **Itasca County**

Itasca County lies in three drainage basins, the Upper Mississippi River, the Rainy River and the Lake Superior. In the Upper Mississippi River Basin, the county contains the Mississippi River - Headwaters (HUC 07010101) and the Mississippi River - Grand Rapids (HUC 07010103) major watershed units. Because of this, a clear breakdown of activities by basin was not available from existing documents.

According to the water plan, surface water management, primarily lake management, is a major emphasis. The county developed a long-range plan for its lakes, which included a ranking and classification of over 170 lakes for additional monitoring in the upcoming years. From this list of lakes, the county developed a computer-based lake and watershed assessment and modeling system to assess the condition of the lakes.

As part of this effort, the county promoted various conservation practices to reduce runoff to lakes and rivers.

## **Kandiyohi County**

Kandiyohi County is located in both the Upper Mississippi River Basin and the Minnesota River Basin. Local water plan implementation is also divided by the two basins. The county contains a number of quality lake areas including the New London-Spicer area and lakes in the Willmar area. Kandiyohi County has provided funding to Big Kandiyohi Lake and Diamond Lake for MPCA Clean Water Partnership Phase I and II projects. The County Water Plan also conducted environmental and

lake protection education programs through the Kandiyohi Area Conservation Association, the Prairie Woods Environmental Learning Center, and the Kandiyohi County Lakes Association.

Kandiyohi County has a large number of agricultural operations in the county, therefore working with these groups in implementing manure management, cost-sharing on best management practices, and restoration of drained wetlands also received high priority in the Local Water Plan.

## **McLeod County**

Another county located in the Upper Mississippi River and Minnesota River Basins is McLeod County. Through the Comprehensive Local Water Plan, McLeod County helped establish a county coalition of lake associations, adopted a new county septic system ordinance and a new county feedlot ordinance.

As part of the adoption of a feedlot ordinance, the county has accepted delegation of the feedlot program from the MPCA and is assisting local landowners with best management practice installation.

McLeod County has also instituted a county monitoring program for its lakes and rivers. They assisted the Buffalo Creek Watershed District monitor Buffalo Creek for nutrients, phosphorus and nitrogen, and fecal coliform. They also were actively involved in the Crow River Initiative formation.

## **Meeker County**

Lake management and protection is a major focus of the Meeker County Comprehensive Local Water Plan implementation activities. The county is divided between the Upper Mississippi River Basin and the Minnesota River Basin.

The local water plan has assisted a number of lake and watershed groups with securing MPCA Clean Water Partnership financial assistance, including the Lake Minnie Belle Association, Long and Spring Lakes. Additionally, the water plan has assisted lake associations with lake monitoring, control structures and other lake studies.

Meeker County land use is over 85 percent agricultural. Because of this, the county has conducted a county feedlot inventory and provided education and information on best management practices to interested groups.

## **Mille Lacs County**

Mille Lacs Lake is the primary focus of the Mille Lacs County Local Water Plan implementation. The county has implemented a number of projects with State, Tribal and citizen partners to monitor, identify needs, and implement solutions in the 188-square-mile Mille Lacs Lake Watershed. These efforts included funding assistance from the Minnesota Board of Water and Soil Resources and the Minnesota Pollution Control Agency Clean Water Partnership Program.

Other activities include cost sharing of best management practices in the Rum River Watershed of the Upper Mississippi River Basin and a comprehensive soil survey.

Mille Lacs County is in both the Upper Mississippi River Basin and the St. Croix River Basin. Part of their work activities also includes involvement in the Snake River Watershed Joint Powers Board in the St. Croix Basin.

## **Morrison County**

Morrison County began developing their water plan in 1988 with adoption in 1990. The 1995

revision reinforced the major strategies adopted in the 1990 plan. The county encompasses four major watersheds of the Upper Mississippi Basin: the Mississippi River - Sartell (HUC 07010201), the Mississippi River - Brainerd (HUC 07010104), the Crow Wing River (HUC 07010106) and the Long Prairie River (HUC 07010108).

The county contains several water resource areas that require special attention in the Water Plan. These areas include the lakes area of the northwest corner (Long Prairie Watershed), which includes Fish Trap, Shamineau, Alexander, and Crookneck Lakes, numerous streams including the main stem of the Mississippi River (Mississippi River - Brainerd Watershed), the main stem of the Long Prairie River, the main stem of the Crow Wing River and parts of the Crow Wing River Reservoirs (Lake Sylvan Reservoir, and Lake Placid Reservoir), the Two Rivers Area Watershed, the Platte River Watershed, the Skunk River Watershed and the Swan River Watershed.

The county also contains several geologic conditions for ground water protection including a sand plain aquifer underlying several major county population centers, that include numerous unsewered areas. Additionally, recent ground water surveys have shown the presence of nitrates and pesticides in the sand plain aquifer system.

Other major water plan issues include managing the expected changes to the physical environment, land use caused by growth and development, and protection of the county's wetland resources.

## **Otter Tail County**

Approximately the eastern quarter of Otter Tail County is in the Upper Mississippi River Basin; the largest part of the county is in the Red River

of the North Basin. The county's water plan implementation stressed the whole county and reporting was not available by basin at this time.

However, Otter Tail County has instituted a comprehensive lake-monitoring program, which is collecting baseline information on over 68 sites on the county's river and lakes. These activities resulted in the installation of best management practices including livestock exclusion, stream buffers, feedlot waste management and stream bank protection.

Otter Tail also entered into a 20-year cooperative ground water monitoring project with the Minnesota Department of Agriculture to study nitrates and pesticides in over 60 wells in the county.

## **Pope County**

Only a very small portion of the north west corner of Pope County is in the Upper Mississippi River Basin. A breakdown of water plan activities by basin was not available at this time.

Local lake protection includes developing a diagnostic study and implementation plan for a watershed and lake in the county. Participation with the Pope County Coalition of Lake Associations in a number of lake assessment projects, a Trophic State Index Lake Monitoring Program, and an Eurasian Milfoil Awareness Program are also included.

The county also established a cost-share program for sealing abandoned wells.

## **Renville County**

Renville County is located in the South Fork of the Crow Watershed of the Upper Mississippi River Basin and the Minnesota River Basin.

Through the Comprehensive Local Water Plan, Renville County conducted a manure management program and developed a drainage management guide.

The county also developed a water monitoring system for all the major creeks. They also were actively involved in the Crow River Initiative formation.

## **Sherburne County**

The Sherburne County Plan was first adopted in 1990 and revised in 1995. As part of their water plan implementation, Sherburne County has been actively involved in both surface and ground water protection efforts.

Under their ground water program, the county directed a well sampling program for nitrates, an abandoned well program, sponsored on-site sewage treatment education programs and assisted in the approval of the Clear Lake Wellhead Protection Area.

For surface water, Sherburne County helped create the Elk River Watershed Joint Powers Board, sponsored annual county lakeshore conferences, conducted a county-wide feedlot inventory and monitoring of the Elk River to establish sources of sedimentation problems.

## **Stearns County**

Through the combined efforts of the Stearns County Water Plan Task Force, the Stearns County Department of Environmental Services, and the Stearns County Soil and Water Conservation District, the county has initiated a number of activities for the protection of the surface and ground water through the county's water plan.

Stearns County undertook a feedlot inventory, implemented a feedlot program, received

delegation from the MPCA for the feedlot program and passed a comprehensive feedlot ordinance for the county.

Through the Stearns County Soil and Water Conservation District (SWCD) and the U. S. Department of Agriculture, Natural Resources Conservation Service (NRCS), Stearns County has been aggressively providing cost sharing assistance to implement best management practices in the county.

Also, the SWCD and NRCS, through the USDA national water quality program, targeted Getchell and Unnamed Creek in the Sauk River Chain of Lakes Watershed to implement a water quality monitoring program and installation of agricultural best management practices, including ag-waste/manure management systems.

The county assisted local lake associations in completing lake assessments and provided assistance on the development of applications for financial assistance.

The county also updated their Comprehensive Plan, revised the on-site and shoreland ordinances and established a point of sale upgrade program for on-site sanitary systems.

Finally, Stearns County has been assisting many of its local units of government upgrade existing sanitary systems to meet new regulations and requirements.

## **Todd County**

The protection of surface and ground water quality are the major implementation activities of the Todd County Water Plan. The Long Prairie River Watershed is a major water resource for the county, provide both a source of water for its agricultural, industry, and as a recreation resource. As problems with fish kills



and low levels of dissolved oxygen were discovered, the Todd County Water Plan Task Force and Soil and Water Conservation District have been very instrumental in the identification of the problems facing the river. The county, through the MPCA Clean Water Partnership has been working on the problem for the last few years (a separate discussion on the project appears elsewhere in this report).

Additionally, Todd County has provided financial and technical support through the water plans to county livestock producers to implement manure management programs and other agricultural best management practices for protecting water quality.

For ground water protection, Todd County has provided cost-sharing for well abandonment, provided free nitrate testing for well samples, assisted two cities start wellhead protection programs, and sponsored a hazardous waste and pesticide container disposal program.

## **Wadena County**

Wadena County is entirely in the Upper Mississippi River Basin and is drained by three major watersheds of the Upper Mississippi River Basin, the Crow Wing River (HUC 07010106), the Redeye or Leaf River Watershed (HUC 07010107) and the Long Prairie River Watershed (HUC 07010108). The Crow Wing River and the Redeye/Leaf River Watersheds drain over 95 percent of the county land area.

The Wadena County Water Plan was adopted in 1993 for six years. They are now in the process of revising the plan for the next five (5) years. The 1993 plan has water management objectives, which fall into three categories: Surface and Ground Water, Land Development, Use and Management, and Education and Information. Major work activities for these categories include the following.

1. Collect data on water quality and quantity on the surface and ground water resources of the county.
2. Identify and set priorities for issues related to point and non-point sources of pollution.
3. Undertake a comprehensive review of local land use ordinances.
4. Provide for the proper disposal of septage, municipal sewage sludge, industrial waste and by-products, and agricultural waste and by-products.

## **Wright County**

Wright County is on the western edge of the seven-county metropolitan area and is receiving growth pressure due to its proximity to the metro area.

Through the County Water Plan program, Wright County has been stressing the proper use of on-site sanitary systems. This effort has included the adoption of a “point-of-sale” ordinance requiring septic system compliance at the time of property transfers, supplying a video tape on septic system care and maintenance to every homeowner installing a new or upgraded septic system and coordinating the development of a community sewer system for rural subdivisions.

In addition, for subdivisions, the county developed storm water management guidelines for residential development and developed a method of prioritizing wetlands in the county.

Finally, the county is conducting pilot well inventories and a well testing project.

## **Metropolitan Watersheds (Seven County Metro Area)**

### ***BACKGROUND***

In the Metropolitan Area, watershed management organizations and watershed districts are responsible for the local water planning. Watershed organizations prepare watershed management plans in response to legislation, known as the Metropolitan Surface Water Management Act and the Watershed Management Act (Minnesota Statutes 103A through 103G). Minnesota Statutes 103D and 103B outline Watershed District responsibilities and authorities. Statute 103D states the general purpose of Watershed Districts is to conserve the natural resources of the state by land use planning, flood control, and other conservation projects by using sound scientific principles for the protection of public health and welfare and the provident use of the natural resources.

Minnesota Statute 103B outlines the specific purposes of water management organizations and districts in the Metropolitan Area. The purposes of water management programs in the Metropolitan Area are:

1. To protect, preserve, and use natural surface and groundwater storage and retention systems;
2. To minimize public capital expenditures needed to correct flooding and water quality problems;
3. To identify and plan for means to effectively protect and improve surface and groundwater quality;
4. To establish more uniform local policies and official controls for surface and groundwater management;
5. To prevent erosion of soil in to surface water systems;
6. To promote groundwater recharge;

7. To protect and enhance fish and wildlife habitat and water recreational facilities; and,
8. To secure the other benefits associated with the proper management of surface and ground water.

State agencies along with the Metropolitan Council review the watershed management plans and give comments to the Board of Water and Soil Resources for their use in approval of the plans.

Local governments are also required to complete local water plans within two years after all of the watershed organizations that they are part of have approved watershed plans. Local water plans are required to include an executive summary, a land and water resource inventory, a section that establishes the goals and policies, sections that assess the problem areas and suggest corrective actions to identified problems, a section on the financial considerations, sections on the implementation program and implementation priorities, and a section on amendment procedures.

The Metropolitan Council reviews the local water plans in the Metro Area. Local water plans are a required element of the city and township comprehensive land use plans.

### **Rice Creek Watershed District. (Mississippi River - Twin Cities Watershed (HUC 07010206))**

The Rice Creek Watershed District was formed in 1972 for the purpose of conserving and management of the waters and natural resources of the district. The district covers 201 square miles of area and is part of the water supply source for the City of Saint Paul. Over the years, the Rice Creek Watershed District has worked on many inter-rated water issues through its regulatory and construction/projects programs.

These programs and priorities fall into broad categories including: runoff and stormwater management; public ditch and channel management; potable water supply; surface and ground water quality management; individual sewage treatment systems; wetland management; shoreland management; floodplain management; agricultural and construction erosion control; rough fish control; and public information and education.

Through the Capital Improvement Program, identified in the Rice Creek Watershed District's plan, the District will be implementing a number of projects in the upcoming years. These projects include: the Locke Lake Restoration and Improvement, Lake Sediment Sealing Projects on Centerville Lake; phosphorus removal (ferric chloride system) chemical addition to Hardwood Creek; Schuneman Marsh Restoration; Howard Lake Revegetation; Marsden Lake Restoration; and the Clearwater Creek Truck Improvements (drainage and wetland enhancement projects).

Rice Creek Watershed District covers portions of Anoka, Hennepin, Ramsey, and Washington Counties. Communities partially or entirely within the District boundaries include: Centerville, Circle Pines, Columbia Heights, Fridley, Ham Lake, Lexington, Lino Lakes, Columbus Township, Blaine, Spring Lake Park, St. Anthony, Arden Hills, Falcon Heights, Lauderdale, Mounds View, New Brighton, Shoreview, Roseville, White Bear Township, White Bear Lake, Birchwood, Dellwood, Forest Lake, Forest Lake Township, Grant Township, Hugo, Mahtomedi, May Township, New Scandia, and Willernie.

There are three regional parks, three wildlife management areas, and various trails and canoe routes within the District. The major lakes in the District include: Moore Lake, Golden Lake,

Baldwin Lake, Rice Lake, Reshanau Lake, Ward Lake, Sherman Lake, Centerville Lake, Marshan Lake, George Watch Lake, Peltier Lake, Rondeau Lake, Crossways Lake, Columbus Lake, Howard Lake, Otter Lake, Spring Lake, Ramsey Lake, Langton Lake, Little Johanna Lake, Lake Johanna, Lake Josephine, Jones Lake, Silver Lake, Island Lake, Valentine Lake, Pike Lake, Long Lake, Rush Lake, Round Lake, Karth Lake, Sunfish Lake, Turtle Lake, Poplar Lake, Bald Eagle Lake, Priebe Lake, Marsden Lake, White Bear Lake, Long Lake, Echo Lake, Pine Tree Lake, Mann Lake, Fish Lake, Round Lake, Sunset Lake, Egg Lake, Rice Lake, Oneka Lake, Horseshoe Lake, White Rock Lake, Clear Lake, and Mud Lake.

### **Vadnais Lakes Area Watershed Management Organization** (Mississippi River - Twin Cities Watershed (HUC 07010206))

The Vadnais Lakes Area Watershed Management Organization is in Anoka and Ramsey Counties and includes the City of North Oaks and parts of White Bear Township, Gem Lake, White Bear Lake, Vadnais Heights; and Lino Lakes. The watershed area covers over 23 square miles and includes land owned by the St. Paul Water Utility.

The watershed area provides a drinking water supply source for the City of Saint Paul and recreational, habitat, ground water recharge and flood control.

The major lakes in the watershed include Charley Lake, Pleasant Lake, Deep Lake, Wilkinson Lake, Amelia Lake, Black Lake, Gilfillan Lake, Birch Lake, Vadnais Lake, Lambert Lake, Grass Lake, Sucker Lake, Gem Lake and Goose Lake. There are two Ramsey County Regional Parks within the watershed: Grass-Vadnais Regional Park and the Tamarack Nature Center.

Overall, goals of the organization include: flood prevention; protect potable water drinking supplies of both surface and groundwater; maintain or improve the water quality of all waters in the organization's area; protect the waters for wildlife habitat and recreation; enhance public education and information; manage the public ditches; protect the ground water quality and quantity; protect wetland resources; and control soil loss, sedimentation and water quality degradation due to soil erosion.

The Vadnais Lakes Area Watershed Management Organization plan implementation program includes projects on Lambert Creek and Birch Lake with the St. Paul Water Utility. The watershed management organization will also work with its respective local units of government to require adoption of water management plans by the localities.

### **Lower Mississippi River Watershed Management Organization. (Mississippi River - Twin Cities Watershed (HUC 07010206)**

The Lower Mississippi River Watershed Management Organization contains portions of the cities of Inver Grove Heights, Lilydale, Mendota Heights, South St. Paul, Sunfish Lake, West St. Paul and St. Paul. The watershed is located in northern Dakota County and a southern Ramsey County. The watershed covers approximately 50 square miles.

There are a large number of small lakes and wetlands in the watershed. The major lakes in the watershed include Sunfish Lake, Horseshoe Lake, Hornbeam Lake, Seidl's Pond, Dickman Lake, Golf Course Pond, Pickerel Lake, Simley Lake, the Marcott Lakes, and Rogers Lake.

The watershed plan was written in 1989. The watershed organization is in the process of updating their plan. Their updated plan should be completed and submitted for review and approval in 2000. The 1989 plan was written to address inter-community water resource management and to develop watershed-wide goals and policies. The general purpose of the plan has not changed much since 1989 but the general goals have. The general goals of the watershed today are:

1. To reduce to the greatest practical extent the public capital expenditures necessary to manage stormwater runoff and water resources.
2. To keep regulation at the local level.
3. The member communities are responsible for primary management of stormwater runoff and water management issues.
4. To classify and monitor inter-community water resources.
5. To monitor and evaluate stormwater runoff quality.
6. To coordinate inter-community management planning for stormwater runoff, flooding and other water quantity issues.
7. To develop policies to be implemented by the cities to protect the water resources.
8. To provide a mechanism to assess the performance of the watershed organization and member cities toward achieving the goals in the plan.
9. To provide member cities useful information about the watershed organization, its activities, and water resource management.

### **West Mississippi River Watershed Management Commission (Mississippi River - Twin Cities Watershed (HUC 07010206)**

The West Mississippi River Watershed Management organization is in northeastern

Hennepin County and includes all or portions of the cities of Brooklyn Center, Brooklyn Park, Champlin, Maple Grove, and Osseo. The watershed covers 23.5 square miles.

The Commission completed its watershed management plan in 1988. The plan identified 8 issue areas: runoff management, floodplain management, shoreland management, water quality monitoring, erosion and sediment control, stormwater treatment, wetlands management, and groundwater protection. Implementation actions and policies were developed for each of these issue areas.

The watershed has several wetlands and one unnamed lake. The main watercourses in the watershed are Edinbrook Creek, and Oxbow Creek. Much of the watershed drains directly into the Mississippi River.

The plan is scheduled to be updated in 2002.

### **Grass Lake Watershed Management Organization.** (Mississippi River - Twin Cities Watershed (HUC 07010206))

The Grass Lake Watershed Management Organization includes portions of the cities of Roseville and Shoreview in Ramsey County. The watershed is approximately 9 square miles and consists of predominantly urban land, water, and wetlands.

The major waterbodies in the watershed include Snail Lake, Grass Lake, Shoreview Lake, Wabasso Lake, Lake Judy, Emily Lake, Harriet Pond, Charlie Pond, Lake Owasso, Willow Pond, Bennett Lake, Westwood Village Pond, and the Central Park Pond. Part of the Vadnais-Snail Lake Regional Park is in the watershed.

The watershed adopted its watershed management plan in 1986. The plan had 9 goals.

1. To guide future development and growth in such a manner to minimize surface water problems and enhance the general quality of life and the open space recreational environment of the watershed.
2. To regulate the general water quality in all Group 2, 3, and 4 lakes, wetlands, and watercourses within the watershed.
3. To maintain or improve water quality in all Group 1 lakes and watercourses.
4. To control flooding and soil erosion from surface flows.
5. To preserve and utilize natural stormwater storage and detention systems to reduce, to the greatest practical extent, the public capital expenditures necessary to control excessive volumes, and rates of runoff.
6. To support lake level management.
7. To encourage natural groundwater recharge.
8. To protect and enhance fish and wildlife habitat areas, and all "protected" waters and wetlands.
9. To maintain and/or improve existing natural and artificial watercourses.

The watershed organization is currently updating their watershed plan. The plan is expected to be submitted for review and approval in 2000. The proposed goals for the new plan are to:

1. Manage regional water quality issues, with emphasis places on recreational lakes.
2. Manage inter-community stormwater runoff, flooding, and other water quantity issues.
3. Keep regulation at the local level.
4. Develop the policies to be implemented by the cities that area needed to protect the watershed's water resources.
5. Reduce to the greatest practical extent, the public capital expenditures necessary to

control excessive volumes, and rates of stormwater runoff while pursuing the goals and policies of the watershed plan.

### **Elm Creek Watershed Management Commission.** (Mississippi River - Twin Cities Watershed (HUC 07010206))

The Elm Creek Watershed Management Commission includes portions of the cities of Champlin, Corcoran, Dayton, Maple Grove, Medina, Plymouth, Greenfield, Rogers, Hassan Township and the Hennepin Park Reserve District. The watershed is located entirely within Hennepin County. The watershed covers 109 square miles.

The watershed organization completed their watershed management plan in 1983. The watershed is due to update its plan in 2001. All discussion that follows is taken from their 1983 watershed plan. Major surface water collector systems in the watershed include Diamond Creek, North Fork of Rush Creek, Rush Creek and Elm Creek. All surface water flows from the basin flow eventually into Elm Creek and ultimately into the Mississippi River.

The lakes in the area include Henry Lake, Diamond Lake, French Lake, Jubert Lake, Meadow Lake, Hayden Lake, Mud Lake, Powers Lake, Lemans Lake, Goose Lake, Mud Lake, Mill Pond, Rice Lake, Fish Lake, Weaver Lake, Cook Lake and Mud Lake. The Elm Creek Park Reserve, which includes an area of 5,000 acres, is almost entirely within the basin.

The purpose of the 1983 plan was to develop a plan for the management of conservation of the natural resources of the entire Elm Creek drainage area to provide coordinated efforts in dealing with protection of the lakes, streams, and wetlands in the watershed.

### **East Mississippi River Watershed Management Organization.** (Mississippi River - Twin Cities Watershed (HUC 07010206))

The East Mississippi River Watershed Management Organization includes portion of the cities of Newport, St. Paul Park, Maplewood, Cottage Grove, Woodbury and Grey Cloud Island Township. The watershed covers 17 ½ square miles.

The watershed organization has never formally adopted a watershed plan. They are currently working with the South Washington Watershed District to work out an agreeable merger of the two watershed organizations. It is anticipated that once the agreement has been formalized, South Washington Watershed District will amend their plan to include the areas covered by the East Mississippi River Watershed Management Organization.

### **Coon Creek Watershed District.** (Mississippi River - Twin Cities Watershed (HUC 07010206))

The Coon Creek Watershed District lies totally within Anoka County and encompasses portions of the cities of Andover, Blaine, Coon Rapids, Ham Lake and part of Linwood and Columbus Townships. The Coon Creek Watershed covers an area of 93 square miles.

Coon Creek is the principal watercourse in the District and has a length of 25.4 miles. There are four meandered lakes in the District: Bunker Lake, Ham Lake, Crooked Lake and Netta Lake. Other lakes in the District include Coon Lake, McKay Lake and Round Lake. Approximately 5000 acres in the northwestern part of the District are part of the Carlos Avery Wildlife Management Area.

Coon Creek Watershed District is in the process of updated their watershed management plan. Their plan was due to be updated in 1998. The original watershed plan was completed in 1985. The main emphasis of the original plan was on flood control. Wetland protection and erosion control were other issues addressed in the original plan.

### **Capitol Region Watershed Management Organization.** (Mississippi River - Twin Cities Watershed (HUC 07010206))

The Capitol Region Watershed District was formed in 1998. The watershed includes parts of St. Paul, Roseville, Maplewood, Lauderdale, Falcon Heights, the State Fairgrounds and the University of Minnesota. The watershed is considered urban and the majority of the area drains to the Mississippi River through storm sewer systems.

The main lakes in the watershed are Como Lake and Lake McCarrons. Como Lake is located in a regional park and McCarrons Lake is located in a county park. Crosby Lake is a floodplain lake and is in Hidden Falls Regional Park. There are several natural wetlands in the District.

The District has developed goals and policies for the watershed. The goals and policies are organized under six major areas of involvement: watershed management, water quality, water quantity management, wetland management, groundwater quality protection and stewardship.

The purpose of the watershed management policies and goals is to manage the watershed from an effective watershed management plan that addresses short-term and long-term goals and that meets the needs of the watershed

public. The watershed plan includes three goals for watershed management.

1. Pursue partnerships to provide effective, efficient and consistent water management activities in the watershed.
2. When planning and implementing water resource management activities within the watershed, evaluate the effects on other natural resources and strive for a balanced approach.
3. Utilize long-term planning, education and partnerships to minimize capital expenditures to address water resource management issues.

The purpose of the water quality goals and policies is to protect and improve water quality to maintain or enhance the range of uses for the District's water resources. The plan includes three water quality goals.

1. Establish realistic levels of use for the water bodies within the District.
2. Reduce nonpoint source pollution loads to district water bodies.
3. Require retrofitting of existing stormwater management facilities and BMPs where necessary to achieve water quality standards.

The purpose of the water quantity management goals and policies is to effectively manage the flow of floodwaters within the District without threatening life or permanent improvements. The plan includes two water quantity goals.

1. Preserve existing flood levels on District water bodies, excluding the Mississippi River, at or below the 100-year flood elevations.
2. Reduce runoff rates to levels that allow for stable conveyance of flow throughout the water resources of the District.

The purpose of the wetland management goals and policies is to manage wetlands to achieve no-net loss of acreage, functions and values, and where possible, strive to enhance the functions and values of existing wetlands within the District. The plan includes two wetland management goals.

1. Develop and implement a wetland management program that allows for the proper use of District's wetlands while maintaining their size and functions and values.
2. Maintain, enhance and restore where possible the functions and values of existing areas and wetlands within the District.

The purpose of the groundwater quality protection goals and policies is to protect and conserve the groundwater resource and encourage the infiltration of properly treated surface water to recharge groundwater. The plan includes two groundwater quality protection goals.

1. Protect groundwater sources and recharge areas consistent with the responsibilities identified in the *Ramsey County Groundwater Quality Protection Plan*.
2. Encourage infiltration of properly treated surface water into groundwater system, where appropriate.

The purpose of the stewardship goals and policies is to provide those living, working and recreating in the District with the knowledge and skills required to assure protection and improvements of the District's surface and groundwater resources. The plan includes five stewardship goals.

1. Residents and community members will understand the concept of the watershed and that individual combined land use practices

determines the quality of shared water resources.

2. Residents, community members and recreational users will understand the basics of lake, stream, groundwater and wetland science and the factors that impact water quality, public health, flood control and wildlife habitat.
3. Residents, community members, government officials, and government staff will know they live or work in the District, know the District's purpose, be able to identify the District's major water resources, know how to contact the District and know what issues the District should be contacted for.
4. Residents and community members will understand and be able to carry out practices that protect and enhance the lakes, streams, groundwater and wetlands of the District.
5. Local, county and state government officials will be given regular updates of District initiatives, projects and problems.

### **Pioneer Sarah Creek Watershed Management Commission.** (Mississippi River - Twin Cities Watershed (HUC 07010206))

The Pioneer Sarah Creek Watershed Management Organization includes portions of all of the cities of Independence, Minnetrista, Medina, Greenfield, Corcoran, Loretto, Maple Plain and Watertown Township. The watershed organization lies within western Hennepin County and northeastern Carver County. The organization covers approximately 59 square miles.

The major waterbodies include Lake Independence, Lake Sarah, Ardmere Lake, Half Moon Lake, Little Long Lake, Peter Lake, Spurzem Lake, Whaletail Lake, and Winterhalter Lake. Baker, Lake Rebecca and



Lake Sarah Park Reserves are all located in the watershed.

The commission adopted the watershed plan in 1986. The framework of the 1986 plan was to deal with erosion, sedimentation, water pollution, and flooding. Problem assessments were completed for these major issues and strategies were developed to minimize the impacts.

The plan defined critical construction site erosion areas. A map was developed to identify the areas most likely to present erosion problems and to be used to establish a construction site erosion overlay district. Policies for construction site erosion control are included in the plan.

The plan defined the critical flood plain areas. Lands adjacent and contiguous to Pioneer Creek and Lake Sarah were found to potentially be subject to periodic flooding. This section of the plan was written to guide and regulate the orderly development of such lands and to minimize public and private losses due to flooding, minimize the increase of floodwater volumes and flow rates, minimize private costs for structural corrective measures and to insure maintenance of needed natural water storage areas.

The critical cropland erosion areas section was designed to provide for the conservation of the soil and water resources of the watershed and for the prevention and control of accelerated soil erosion of cropland and sediment damage to land, water and other natural resources.

The critical water quality areas section was meant to provide a management strategy for reducing and/or maintaining the present levels of nutrients and other pollutants now entering lakes and streams.

The watershed plan is scheduled to be updated in 2002.

### **Ramsey-Washington Metro Watershed District (Mississippi River - Twin Cities Watershed (HUC 07010206))**

The Ramsey-Washington Metro Watershed District is located in the Mississippi River Twin Cities Watershed in eastern Ramsey and western Washington County. The watershed district is approximately 53 square miles and includes parts of White Bear Lake, Vadnais Heights, Gem Lake, Little Canada, Maplewood, Landfall, North St. Paul, St. Paul, Oakdale and Woodbury. Major water resources within the district include Fish Creek, Battle Creek, Beaver Lake, the Phalen Chain of Lakes (Kohlman-Gervais-Keller-Round-Phalen), the Mississippi River Bluffs, the Pigs Eye Lake Area and the St. Paul Beltline Storm Sewer System.

The mission of the District is the protection and improvement of the water-related environment; provide and coordinate the delivery of services that transcend community boundaries; and provide for the protection of public health and safety.

The major lakes in the watershed include Battle Creek Lake, Beaver Lake, Carver Lake, Gervais Lake, Keller Lake, Kohlman Lake, La Lake, Lake Phalen, Round Lake – Maplewood, Round Lake- Little Canada, Tanners Lake, Twin Lake, Wakefield Lake and Willow Lake. Fish Creek and Battle Creek are the main unaltered streams in the watershed.

Overall priorities and implementation activities in the Ramsey-Washington Metro Watershed District fall into eight categories: flood control; water quality management; lake management; wetland management; groundwater

management; surface water management; integrated resource management; and water course management. Water management activities designed to meet the priorities include: construction of detention basins; water outlet modifications; phosphorus reduction treatments (alum treatment); diversion of flows; subdivision controls and water detention; and wetland protection.

### **South Washington Watershed District (Mississippi River - Twin Cities Watershed (HUC 07010206)**

The South Washington Watershed District is located entirely in Washington County and contains parts of Afton, Cottage Grove, Lake Elmo, Oakdale and Woodbury. The watershed consists of 34,000 acres or 53.1 square miles, with the Mississippi River as the southern border.

Over the next five years the South Washington Watershed District has prioritized water management activities into nine activities which include the following.

1. The Central Draw Outlet Study focusing on stormwater and development issues.
2. West Draw Drainage Improvements focusing on drainage, flow and funding issues related to development.
3. Central Draw Interim Ponding Project involving the water quality management of stormwater impacts to the surface and ground water in the Bailey Lake South area.
4. Wetland Assessment and Management Plan including an inventory and assessment of functional uses of the wetlands in the watershed district.
5. Public Education and Learning Centers in coordination with the local schools to develop environmental and water quality education programs.

6. Powers Lake Management Plan to identify measures required to maintain the quality of the lake's fishery and recreation values.
7. Lake Assessment Studies will be developed for all the lakes in the watershed district to determine the applicable standards and reflect the unique characteristics of each lake.
8. Greenway Concept Plan to focus on the preservation, enhancement and linking of the natural areas in the watershed.
9. Pond/Wetland Treatment System in the Westerly Drainage which will focus on the southern parts of the watershed district where development has left limited ponding of water before discharge to the Mississippi River.

### **Bassett Creek Watershed Management Commission (Mississippi River - Twin Cities Watershed (HUC 07010206)**

The Bassett Creek Watershed Management Organization contains parts of Crystal, Golden Valley, Medicine Lake, Minneapolis, New Hope, Minnetonka, Plymouth, Robbinsdale and St. Louis Park. The Water Management Commission was formed in 1984 by the adoption of a Joint Powers Agreement between the local units of government. The watershed area is approximately 25,702 acres, with the majority developed.

The Bassett Creek Watershed Management Organization files in the MPCA are from 1987, with no updates. The Commission is in the process of updating their plan, goals and policies at this time. In 1987 the major issues were flood control and water quality, particularly sediment in Bassett Creek as it discharges through 1-1/2 mile conduit to the Mississippi River above St. Anthony Falls.

## **Minnehaha Creek Watershed District (Mississippi River - Twin Cities Watershed (HUC 07010206)**

The Minnehaha Creek Watershed District covers over 180 square miles including parts of 27 cities, three townships and two counties. The watershed was established in 1967 to conserve the natural resources of the Minnehaha Creek Watershed including improving the lakes, marshes and channels for water storage, drainage, recreation, and other public purposes. Other issues included flood control, reclaiming wetlands and controlling stormwater.

The 1997 Minnehaha Creek Watershed District Plan cited 11 water resource management goals for the district:

1. To reduce the severity and frequency of flooding and high water, and to improve the chemical and physical quality of the surface water.
2. Control temporary sources of sediment resulting from construction and land development activities and to identify, minimize, and correct the effects of sedimentation from erosion-prone and sediment source areas.
3. Preserve existing water storage capacity below 100-year flood elevations on all water bodies in the watershed to minimize frequency and severity of high water.
4. Preserve the natural appearance and function of shoreline areas and minimize degradation of surface water quality, which can result from dredging operations.
5. Maintain the hydraulic capacity of and minimize obstructions to navigation in watercourses and preserve the water quality and navigation appearance of shoreland areas.
6. Improve water quality by requiring best management practices (BMPs), which meet or exceed Minnesota Pollution Control

Agency (MPCA) guidelines requiring their adoption in local management plans, and their implementation on development and redevelopment sites.

7. Protect the recreational opportunities associated with all District water resources by improving water quality and enhancing fish and wildlife resources
8. Enhance public participation in district activities and provide informational and educational material to municipalities, community groups, businesses, schools, developers, contractors and individuals,
9. Maintain public ditch systems within the district as required under ditch authority jurisdiction.
10. Support efforts to both provide for the protection of groundwater and regulate its use to preserve it for beneficial purposes.
11. Protect existing wetlands and restore diminished or drained wetlands.

Implementation efforts in the Minnehaha Creek Watershed District are defined as:

Nonstructural solutions which includes protection of natural wetlands and floodplains, land use ordinances, buffer requirements, best management practices which includes phosphorus fertilizer restrictions; Programmatic solutions which includes district permitting for stormwater management, floodplain alterations, dredging, shoreline and streambank improvement and stream and lake crossings; and structural solutions which includes retrofitting wet detention basins in areas with inadequate stormwater or runoff treatment. Overall, the Minnehaha Creek Watershed District, in partnership with the local units of government within the District boundaries, undertakes wetland regulation, erosion and sedimentation controls, shoreline and floodplain ordinances, and other water quality public nuisances control

Additionally, the Minnehaha Creek Watershed District will develop target in-lake nutrient

concentrations for future water quality improvement projects. Lakes already meeting this goal will be the existing nutrient level will serve as the long-term non-degradation goal. Long-term monitoring, data collection, and a public information and education program are also high priorities.

### **Middle Mississippi River Watershed Management Organization (Mississippi River - Twin Cities Watershed (HUC 07010206)**

The Middle Mississippi River Watershed consists of 31.5 square miles of developed urban land within the Minneapolis/St. Paul metropolitan area. The watershed consists of portions of the Minneapolis, St. Paul, Lauderdale, Falcon Heights and St. Anthony, however over 94 percent of the surface area is within the City of Minneapolis.

The mission of the watershed organization is to provide for the long-term management of its water and associated land resources through the development and implementation of projects, programs, and policies that respect ecosystem principles and reflect changing community values. The fifteen goals of the watershed plan fall under nine categories: surface water quantity; surface water quality; recreation; public participation; groundwater; wetlands; erosion and sediment control; land use; and historical and cultural resources.

The goals of the plan are:

1. Prevent flooding.
2. Mitigate the effects of drought.
3. Protect and enhance the surface water quality.
4. Reduce non-point sources of pollution.

5. Work with other organizations to improve surface water quality across watershed boundaries.
6. Provide opportunities for public outdoor recreation in a way that preserves and enhances the environment.
7. Create a continuous river corridor.
8. Enhance public participation.
9. Educate communities about environmental impacts to the Mississippi River, especially non-point sources of pollution.
10. Educate communities about redevelopment plans impacting the Mississippi River.
11. Protect and preserve groundwater quality and quantity.
12. Protect and restore wetland resources.
13. Control loss of soil due to erosion.
14. Preserve, minimize impact to, and restore natural habitat; especially shorelines and habitat corridors.
15. Preserve and interpret cultural resources that relate the history of the Mississippi River and its watershed.

The Middle Mississippi Management Plan implementation is delegated to the local governments within the organization boundaries. Since the area is already urbanized, the local units of government are responsible for maintaining and complying with the policies and rules adopted and with maintaining existing and proposed storm drain conveyance systems including stormwater detention ponds, sewers, inlet and outlet drainage structures, and issuance of building and grading permits.

### **Six Cities Watershed Management Organization (Mississippi River - Twin Cities Watershed (HUC 07010206)**

Located in the southern part of Anoka County adjacent to the Mississippi River, the Six Cities Watershed Management Organization contains all or parts of the cities of Blaine, Columbia

Heights, Coon Rapids, Fridley, Hilltop and Spring Lake Park. The watershed covers 21 square miles.

The organization contains six hydrologically independent subwatersheds with discharges to the Mississippi River. Four of the subwatersheds, CFH, Oak Glen, Stoney Brook and Coon Rapids West, are completely developed. The drainage systems consist of storm sewers, and with the exception of scattered lots and bluff areas, is completely in place. Two of the watersheds, Pleasure Creek and Spring Brook, are currently under development, and water management systems have been incorporated into development plans.

The water resources of the Six Cities Watershed Management Organization typically consist of small, shallow lakes and ponds. The resources are used for detention, sedimentation, water quality enhancement, wildlife habitat and aesthetic purposes.

Goals for the organization cover the areas of water quantity, recreation, fish and wildlife, education, and ditching, were identified in the plan. Current activities being implemented under the plan include: erosion control projects; the Spring Brook Nature Center Clean Water Partnership Project; storm water drainage projects; and various feasibility studies.

### **Shingle Creek Watershed Management Organization (Mississippi River - Twin Cities Watershed (HUC 07010206))**

The Shingle Creek Watershed Management Commission covers an area of approximately 44 square miles in the cities of Brooklyn Center, Brooklyn Park, Crystal, Maple Grove, Minneapolis, New Hope, Osseo, Plymouth, and Robbinsdale.

The creek itself flows for a total of approximately 11 miles from the Plymouth and Maple Grove area south and easterly until discharging into the Mississippi River. The watershed management organization area is mostly urban in nature. The western area has some rural areas, but is developing rapidly.

The Shingle Creek Watershed completed a watershed plan in 1988.

The Shingle Creek Watershed Management Organization plan identified eight management issues for implementation programs. These issues include: runoff management; floodplain management; shoreland management; water quality monitoring; erosion and sedimentation control; stormwater treatment; wetland management and ground water protection.

Shingle Creek is the major stream within the watershed. Shingle Creek flows about 11 miles through the watershed before discharging into the Mississippi River. Palmer Lake is the only lake directly associated with Shingle Creek. Other lakes in the watershed area include Bass Lake, Cedar Island Lake, Crystal Lake, Eagle Lake, Magda Lake, Meadow Lake, Pomerleau Lake, Ryan Lake, Twin Lakes and Schmidt Lake.

The watershed is scheduled to update their watershed management plan in 2002.

### **Upper Rum River Watershed Management Organization (Rum River Watershed (HUC 07010207))**

The Upper Rum River Watershed Management Organization is located in the northwestern corner of Anoka County and covers a drainage area of 126.5 square miles. The area includes all of Burn Township, and the cities of Oak Grove, St. Francis and Bethel, and parts of the cities of Ham Lake and East Bethel.

The Upper Rum River Watershed Management Organization has ten goals and seventy-two policy statements that guide the priorities of their work. These goals fall into the categories of: water quantity management; water quality management; planning; waters and wetlands; ground water; erosion and sediment control; floodplain management; shoreland management; Rum River Management Plan-related to the river's designation under Minnesota Statutes, Chapter 103F.301-103F.345 as a wild and scenic river system; recreation, open space and wildlife management; drainageway maintenance; intergovernmental relations; administration; public participation; and financing.

There are 36 lakes within the boundary of the Upper Rum River Watershed Management Organization. With the exception of East Twin Lake, all of the lake basins are relatively shallow, ranging from poorly drained wetland areas to moderately shallow lakes. Fourteen of the 36 lakes are large or deep enough to either maintain a marginal-to-good fishery or possess significant wildlife management habitat. The lakes are Deer Lake, Fish Lake, Minard Lake, Coopers Lake, Lake George, Sandshore Lake, Rogers Lake, Mud Lake, Norris Lake, Burns Lake, Goose Lake, Pinnaker Lake, Pickerel Lake, Bear Lake, and East Twin Lake. There are four main watercourses in the watershed; Cedar Creek, Ford Brook, Rum River, and Seelye Brook.

### **Lower Rum River Watershed Management Organization (Rum River Watershed (HUC 07010207)).**

The Lower Rum River Watershed Management Organization covers an area in the southwestern part of Anoka County at the confluence of the Rum River and the Mississippi River. The watershed area is approximately 56 square miles and includes all or parts of the cities of Coon

Rapids, Anoka, Andover and Ramsey. The three minor watersheds of the organization drain either to the Rum River or directly to the Mississippi River.

The purpose of the watershed organization is to provide for conservation of water and natural resources; prevention and alleviation of flood damage; and regulation of creeks, lakes, watercourses, and storm water conveyance systems for domestic, recreational and public use across municipal boundaries.

Major water bodies in the watershed include Lake Itasca, Rogers Lake, Jelvans Marsh, Grass Lake, Eddy Lake, Sunfish Lake, Round Lake, Ward Lake, the Mississippi River, Rum River, Ford Brook, Trott Brook, and Cedar Creek.

Plan activities are divided into seven categories and include: public education/involvement; water data collection which includes water quality and quantity monitoring; wetlands management and plan development; regulatory and permitting activities and activities specific to the North Rum River Minor Watershed, the South Rum River Minor Watershed, and the Mississippi River Minor watershed. Activities in the minor watersheds include development of consistent management strategies, ditch assessments, review of hydrologic models and permits, dam improvements, a river outfall inventory, river outfall easements and development of an outfall improvement strategy.

## **Local Initiative and Studies**

### **Crow River Project**

The Crow River Watershed is made up of two major watersheds - the North Fork Crow River Watershed and the South Fork Crow River Watershed. The Crow River is an important natural resource. Part of the North Fork Crow is

a state-designated Wild, Scenic, and Recreational River, and the Crow River discharges to the Wild, Scenic, and Recreational River segment of the Mississippi River at Dayton, Minnesota.

Representatives of various interests of the watershed came together to form the CROW (Crow River Organized Waters) Project in early 1998. Initially, the group formed in response to concerns regarding the potential negative effects of rapid urbanization in the lower watershed (such as increased point-source wastewater discharges and urban runoff), which is on the fringe of the Twin Cities Metropolitan area and in the growth corridor between the Twin Cities and St. Cloud. Quickly, the group recognized that the rest of the watershed would need to be involved in the watershed effort to holistically address water quality and natural resource issues in the watershed. Currently, the project consists of a variety of stakeholders from the watershed who have volunteered to serve on a watershed steering committee and subcommittees on water quality, information and monitoring, and growth and development. The organizations that are currently represented on the group include:

- Rivers Council of Minnesota
- Carver County Environmental Services
- Hennepin Parks
- City of Glencoe
- Professional Services Group, Aqua Alliance
- Bonestroo, Anderlik, Rosene and Assoc.
- City of St. Michael
- Hennepin Conservation District Rockford High School
- RCM Consulting
- Carver County Planning and Zoning
- Minnesota Pollution Control Agency
- City of Litchfield

- Watertown-Mayer High School
- Minnesota Department of Natural Resources, Waters and Fisheries Divisions
- North Fork Crow River Watershed District
- Wright County Board
- Clean Water Action
- Muller Engineering
- Paynesville Township
- U.S. Geological Survey
- Sherburne County Extension Service
- Metropolitan Council Environmental Services
- Manannah Township Board
- City of Otsego
- Natural Resources Conservation Service
- New Dimension Plating
- McLeod SWCD
- Wright SWCD
- Rockford Township
- Marysville Township
- City of Hutchinson
- Minnesota Department of Agriculture
- Minnesota Center for Environmental Advocacy
- Burns Philp Food and Fermentation
- League of Minnesota Cities
- Board of Water and Soil Resources
- several citizens of the watershed with no other specific group affiliation

As this is an informal, ad hoc committee, all meetings are open and are attended frequently by other groups and citizens.

In early 1999, the members of the committees identified the scope and goals of the CROW Project as the following:

## ***CROW Project Scope***

*"The Crow River Watershed project will include the whole of the 2 watersheds of the North Fork Crow River Watershed (hydrologic unit code 7010204) and the South Fork Crow River Watershed (hydrologic unit code 7010205), all pollution sources, and water quantity concerns of flow and flooding."*

## ***General Areas of Focus and Goals***

- Water Quality: Improve water quality in the Crow River.
- Monitoring: Develop a comprehensive monitoring program on which to be able (1) base decisions and (2) track trends; communicate monitoring results.
- Water Quantity: Stabilize flows.
- Recreation/Open Space: Inventory historical and present recreation, aesthetic enjoyment, and open space in the river corridor; enhance, improve, and promote opportunities for recreation and open space.
- Land Use: Integrate land and water plans to attain a sustainable watershed.
- Best Management Practices: Inventory (1) threats to water quality and (2) the current level of best management practices implementation; promote and enhance best management practices implementation in the watershed.
- Education: (1) get people physically on the river to help them connect with it and their place in the watershed, (2) publicize this planning effort, (3) make people aware of the current state of the river, and (4) encourage ownership of the river and watershed through education

To formalize the effort, nine of the ten counties of the watershed (Carver, Hennepin, Kandiyohi, McLeod, Meeker, Pope, Renville, Sibley, and

Wright counties) have decided to form an official Joint Powers Board for the watershed effort, and are in the process of taking care of the administrative details.

The project has applied for several grants, including a River Network Watershed Grant, a 319 nonpoint source grant, a Board of Soil and Water Resources Challenge grant, and grants from the Department of Natural Resources, to hire a local watershed coordinator and to implement watershed projects. The project will be developing a monitoring strategy in 1999.

## **MPCA Clean Water Partnership Program**

### **Background**

The Minnesota Pollution Control Agency Clean Water Partnership Program was started in 1988 to assist local units of government with nonpoint source water pollution control efforts.

The projects are divided into two phases. A Phase I project is a diagnostic project to identify the source of problems to a water body. A Phase II project is the implementation of programs or activities to correct identified problems for a surface or ground water resource.

The program provides up to 50 percent of eligible funding costs for the local unit of government.

Below is a summary of the Clean Water Partnership Projects in the Upper Mississippi River Basin.



## Long Prairie River Watershed Clean Water Partnership

The Long Prairie River is one of 21 major watersheds in the Upper Mississippi River Basin (HUC Code 0701008). It is the largest and most important river in Todd County, meandering along a course of nearly 100 miles from its start in the lakes area of Douglas County, through Todd County and into Morrison County, before it discharges into the Crow Wing River east of the City of Motley.

From its headwaters the Long Prairie River can be divided into three sections based on land use, topography and geology. From Leslie Township in Todd County near the Douglas County border, the river flows through large marsh areas with abundant natural resources. The mid-watershed area contains rich agricultural lands with large irrigated fields and conservation reserve lands bordering the river. In the lower portion, the river contains more wild and scenic areas of the watershed.

The Long Prairie River Watershed has seven municipal discharges to the system: Alexandria Area Lakes SD which discharges to Lake Winona which then flows into Lake Carlos; the City of Carlos; the City of Milotona; the City of Long Prairie consisting of three facilities and currently under review by the MPCA for a new permit; the City of Browerville; the City of Eagle Bend which discharges to Eagle Creek, a tributary of the Long Prairie River; and the City of Clarissa which also discharges to Eagle Creek.

The Long Prairie River segment from Eagle Creek to the Crow Wing River has an identified TMDL for dissolved oxygen. The TMDL schedule had work commencing on the segment in 1997 and completed in 2002.

In 1997, Todd County submitted an application to the Minnesota Pollution Control Agency

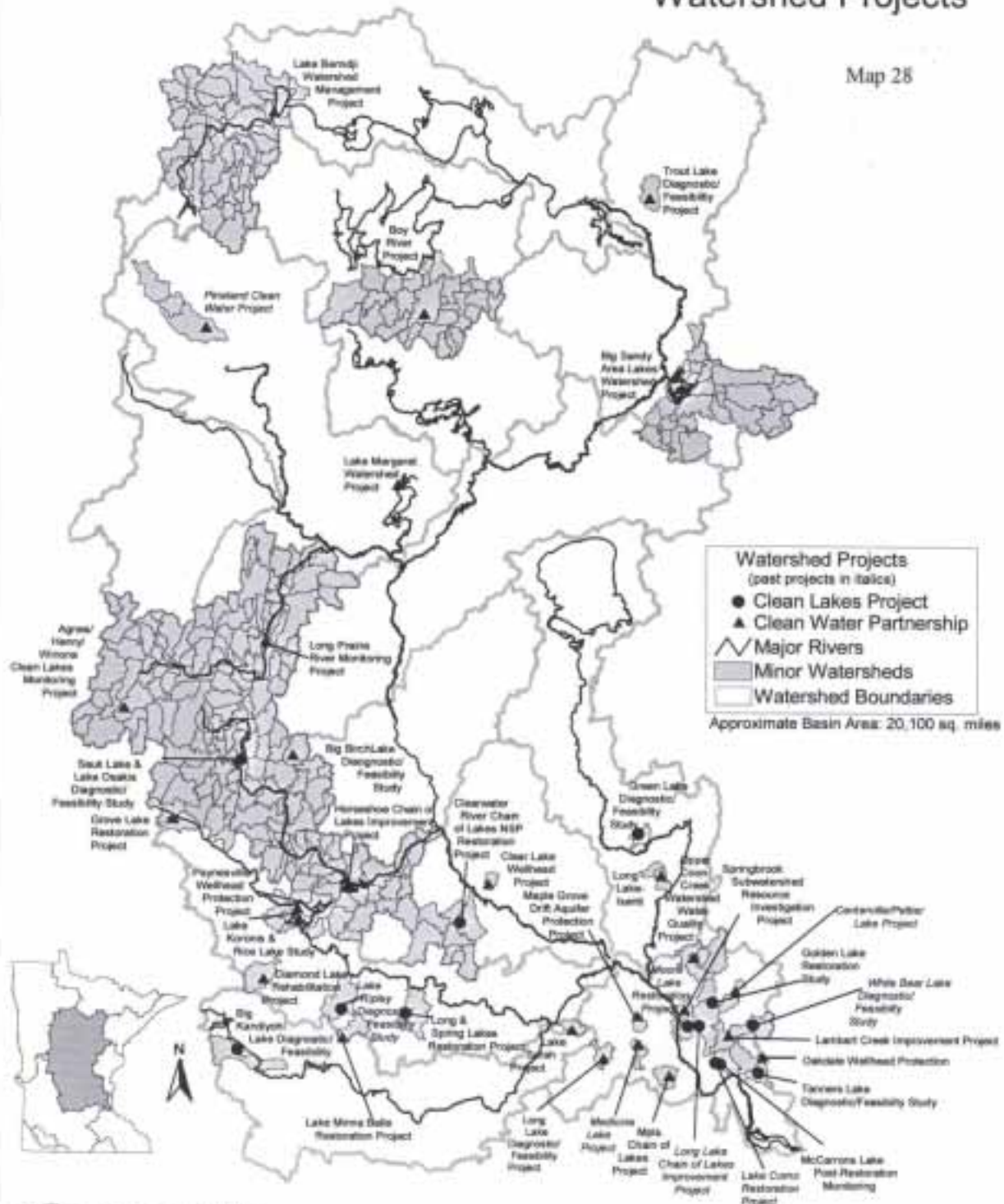
under the Clean Water Partnership Program. The goal of the Todd County - Long Prairie Project was to augment previous studies and investigations by defining water flows and nutrient loading sources along the river's course, by the installation of seven automated monitoring sites. The data collected will be used to develop short- and long- term management goals for the three defined river reaches: 1. Upper reach covering the watershed to Long Prairie; 2. the middle reach from Long Prairie to approximately Eagle Creek, and 3. the lower reach from Eagle Creek to the Crow Wing River. The application was approved and the county has since completed two years of sampling at various segments of the Long Prairie River Watershed. The Todd County Phase I CWP has completed its work plan sampling and is now entering the data analysis and plan development component of its Phase I. The concerns expressed at the beginning of the project about the general condition of the water quality focused on the following.

- Low dissolved oxygen, particularly in the middle reach, has caused periodic fish kills in 1988, 1991 and again during the study in 1998.
- Concerns about general nutrient and sediment sources.
- Urbanization and resulting runoff quality issues.
- River corridor development pressures.

The project is currently in the process of completing their sampling. Based on the results of the sampling, the project will complete a nonpoint management program to address the needs of the river.

# Mississippi River Basin - Headwaters to St. Croix River Watershed Projects

Map 28



## **Lake Bemidji Watershed Project Clean Water Partnership**

Lake Bemidji is a large, mesotrophic lake located in north central Minnesota, in the Northern Lakes and Forests ecoregion. The Mississippi River enters Lake Bemidji along the southern shore after flowing through Lake Irving, a 620-acre lake just upstream from Bemidji. The City of Bemidji (population 11,000 and growing) is located primarily on the shores of Lakes Bemidji and Irving. Population within the city limits has remained relatively steady over the past few years, however substantial growth in adjoining townships has occurred. The trend of increasing population is expected to continue. Management efforts for the Lake Bemidji Watershed have focused primarily upon reducing phosphorus loading to the system using an integrated watershed approach with seven primary management concerns:

1. Urban runoff;
2. Moose Lake subwatershed;
3. Residential lawn care;
4. Agricultural pesticide and nutrient management;
5. Shallow aquifer protection and management;
6. Individual septic tanks;
7. Schoolcraft and Upper Mississippi River subwatersheds.

The LBWMP has completed Clean Water Partnership Phase I, II and IIb (continuation grant), State Revolving Fund loan program, U.S. Environmental Protection Agency 314 (a) Clean Lakes Phase II and Section 319 Clean Water Act grant efforts since 1989. A detailed diagnostic study of Lakes Bemidji and Irving was the main focus of a Phase I Clean Water Partnership grant. In addition to characterizing water quality conditions within the lake basins, water quality assessments of the Mississippi and

Schoolcraft Rivers, several smaller tributaries, stormsewers and ground water were conducted. The diagnostic study allowed the Steering Committee of the LBWMP to establish in-lake water quality objectives. Phase II of the Clean Water Partnership grant was conducted from March of 1992 to September of 1995 with a primary focus of the installation of Best Management Practices (BMPs) along with coordinated information and education campaign. Phase IIb Clean Water Partnership efforts have continued from 1995 to present with the installation of additional sediment basins, education and information, septic tank upgrading, agricultural and forestry BMP installations.

## **Cass/Winnibigoshish Watershed Clean Water Partnership – Beltrami, Cass and Itasca Counties**

The Cass/Winnibigoshish Watershed Project is a Phase I Clean Water Partnership Project. It is a diagnostic and feasibility study designed to characterize the water quality of the second segment of the Mississippi headwaters from the Stump Lake dam through the Lake Winnibigoshish dam.

The project will also identify land use practices and patterns that currently are stressors to water quality and will further identify future areas of concern.

The "waters of concern" in the project area are Cass Lake, Lake Winnibigoshish and the Mississippi River downstream from Lake Bemidji through Lake Winnibigoshish. The watershed includes the major tributaries of the Turtle River, North Turtle River, Third River, First River and Pike Bay Creek. Numerous other small streams, lakes and wetlands are an important part of the watershed. The size of the

project area is 522,880 acres with land use composition as follows:

|     |                    |
|-----|--------------------|
| 8%  | Agricultural       |
| 0%  | Drained/Tiled      |
| 2%  | Urban/Suburban     |
| 1%  | Impervious Surface |
| 62% | Forest             |
| 8%  | Wetland            |
| 19% | Surface Water      |

The project area is located in portions of four counties, five municipalities, 15 townships and the Leech Lake Indian Reservation.

Contributing sponsors to the project include:

Beltrami County  
Beltrami SWCD  
Itasca SWCD  
Cass CWCD  
Hubbard SWCD  
Minnesota Chippewa Tribe  
Bemidji State University  
Mississippi River Watch  
Mississippi Headwaters Board  
Citizens Steering Committee  
Chippewa National Forest  
US Army Corps of Engineers  
Minnesota Dept. of Natural Resources

The total estimated cost for the project is \$187,000, with \$93,500 being a grant from the Minnesota Pollution Control Agency.

Cass Lake and Lake Winnibigoshish are the eighth and fifth largest lakes respectively in the State of Minnesota and as such are invaluable recreational resource for the tourism industry of Northern Minnesota. The Minnesota Chippewa Tribe makes extensive use of the resource for harvesting wild rice. The rice beds are some of the largest natural beds in the world. Cass and Winnie are also operated as reservoirs for multipurpose use by the Corps of Engineers.

## **Big Sandy Area Clean Water Partnership Project**

Big Sandy Lake, one of the state's largest lake recreational resources (as evidenced by the number of boats, the number of homes, lake surface area and the number of requested lake summaries during the Minnesota State Fair), has exhibited considerable fluctuations in water runoff quantity and lake water quality over the past 10 years. As a reservoir, it has a larger watershed than natural lakes and hence can be expected to exhibit greater fluctuations in water quality than is typical for the Northern Lakes and Forests Ecoregion. Additional future developmental pressures (e.g. including agricultural, urban and especially lakeshore development) will not likely improve these conditions without implementing reasonable and effective Best Management Practices as well as carrying out rehabilitation efforts as opportunities allow.

The Big Sandy Area Watershed lakes and streams are important economic, social and environmental resources. The lakes are home to thousands of individuals, hundreds of plants and animals and the center of the quality of life known to Northern Minnesota. In terms of real-estate values, there is over \$27 million around Big Sandy Lake alone.

The Big Sandy Area Watershed Study conducted an intensive monitoring and assessment program of the lake and 413-square-mile watershed complex. To accomplish this task a network of stream and lake monitoring stations were established in mid-1994, which have been operated through 1999 to characterize the individual subwatershed drainages within the watershed. An intensive inflow monitoring effort was conducted in 10 subwatersheds, representing over 74 % of the water inflows and more than 73% of the total phosphorus loading to the lake in the study period. Six state-of-the-

art monitoring sites were constructed, consisting of computerized flow loggers and automated storm event samplers.

Big Sandy Lake is a reservoir system, which means it has a very large watershed and variable water flow-through volumes, it can be expected to have year-to-year variations in water quality. Conditions monitored in 1995 were relatively "wet" and hence stream flows were considerable. The majority of water inflows occurred from three surface drainages including the Prairie, Minnewawa and Sandy River subwatersheds which collectively contributed 65% of the water and 75% of the total phosphorus loads. The highest total phosphorus and total suspended solids concentrations were monitored in the Sandy River system as values were 68 ug P/L and 13 mg/L, respectively. These concentrations exceed more typical ecoregion interquartile ranges of 20 to 50 ug P/L and 1.8 to 6 mg/L, respectively. Loss of critical sport fisheries and their associated biological food webs and the elevated nutrient and sediment loss rate appear to be a function of the extent of wetland drainage. However, the lake and stream resource will likely improve, with relatively small improvements within the watershed, focusing upon the priority management areas.

Phase II implementation actions have been underway since 1996, with a recent extension of the Big Sandy Area Lakes CWP Phase II grant in March of 2000. Updating of project goals and objectives will be accomplished in 2000.

#### Priority Management Areas

Based upon the results of several years of study, the long-term management of this watershed is based upon (1) maintaining a Nondegradation Policy and (2) achieving reductions in nutrient and sediment loading from Priority Areas (or Priority Management Areas). For this purpose,

four watershed areas have been emphasized for specific future implementation actions to achieve desired future conditions including: (1) Big Sandy Lakeshore; (2) Sandy River; (3) Tamarack River contributing to the Prairie River system; and (4) the lower Minnewawa Creek subwatershed. General implementation objectives by Priority Management Area are defined below.

|           |                 |          |
|-----------|-----------------|----------|
| Lakeshore | Sandy River     | Tamarack |
|           | Minnewawa Creek |          |

#### **Short-term Goals**

- Septic Tanks - full compliance within 3 years
- Compliance with Shoreland Zoning Rules (90%+ compliance based on Aitkin SWCD Audit)
- Develop septage ordinance
- 15% reduction in flow weighted mean (FWM) total phosphorus (numeric goal is 60 ug P/L)
- 25% reduction in FWM total suspended solids (numeric goal is 10 mg/L)
- Implement continuous dissolved oxygen, temperature, redox, solids and pH monitoring at three points within the Sandy River system to better define effects of watershed best management practice implementation (this could serve as an important model for NLF ecoregion impacted stream assessments for future CWPs)
- Continue to fine-tune the Sandy River monitoring network to better assess effects of widespread spring vegetation burning upon water quality
- Institute voluntary BMPs on riparian livestock operations
- 10% reduction in FWM total phosphorus

In general, the large stream numeric goals are a Flow Weighted Mean total phosphorus

concentration of 50 ug P/L and a target range for total suspended solids of 2-6 mg/L.

### Long-term Goals

- Minimization of nutrients and bacterial sources from on-site systems
- Lake Mean TP = 30 to 40 ug P/L
- 27% reduction in FWM total phosphorus (numeric goal is 50 ug P/L)
- 50% reduction in FWM total suspended solids (numeric goal is 2-6 mg/L)
- Increase diversity and abundance of fish and mussels similar to unditched rivers (Tamarack River)
- Develop more flow monitoring of the Prairie River System to assess opportunities for reducing TP and TSS sources (Tamarack River is tributary)
- Institute voluntary BMPs on all riparian livestock operations
- Increase forestry BMP compliance using audit as measurement tool (increase compliance from 87% to 95%+)
- Maintain biodiversity (mussels and fish) in river
- Institute voluntary BMPs on all riparian livestock operations

The Diagnostic-Feasibility Study concluded that three monitored tributaries contributed over 75% of the measured total phosphorus load to the lake. Of this amount, it was estimated that about 15-25% of the loading could be reduced from a combination reduction plan associated with primary management areas. Given the current ranges of total phosphorus observed in Big Sandy Lake, reductions of loading will likely have perceptible impacts to long-term residents. Additionally, the plan calls for a 50% reduction in the total solids loads entering the Sandy River system.

## Lake Osakis Clean Water Partnership Project

Lake Osakis had experienced decreasing water clarity and increasing areas of submerged aquatic vegetation since the early 1970s. The 1993 Phase I Diagnostic Study documented that Lake Osakis had experienced declining transparency over the past 10 years. Lakes of the North Central Hardwood Ecoregion typically have Total Phosphorus concentrations ranging from 23 to 50 ug/L while Lake Osakis averaged about 91 ug/L in 1989 and 63 ug/L in 1990.

The principal conclusion of the Diagnostic Study was that Lake Osakis had become eutrophic and that if corrective actions were not undertaken, continued degradation would likely occur at measurable rates and could reach non-recreational conditions within 20 years.

The Lake Osakis Watershed Management Project (LOWMP) was a logical extension of the Phase I Study. Therefore the following grants were attained to help fund Best Management Practices implementation in order to improve the water quality of Lake Osakis.

- Clean Lakes Program (CLP) from the Environmental Protection Agency for the Judicial Ditch 2 subwatershed
- Central Minnesota Initiative Fund for water quality monitoring and staff time
- A Clean Water Partnership (CWP) grant from the Minnesota Pollution Control Agency for water quality monitoring and Septic System upgrades
- A Clean Water Partnership (CWP) continuation grant for additional Best Management Practices and Alum Treatment for the Clifford and Faille Lake chain of wetland/lakes.

## Big Birch Lake Clean Water Partnership Project

Big Birch Lake is a popular recreational water body located in central Minnesota. Big Birch Lake is made up of two large basins, the Northeast Basin, covering 705 acres, and the Main Basin covering 1,362 acres, for a total area of 2,067 acres. There are two public beaches and six public boat accesses located around the lake. The overall watershed is approximately 9,601 acres in size for a watershed to lake ratio of 4.65. Its land use is comprised of lakeshore property, agriculture, wooded areas (Big Birch Lake State Forest) and wetlands.

Evidence suggests that Big Birch Lake has been degraded over the past decade as evidenced by algal scums and the perception of impaired fisheries. In order to address these issues, the Big Birch Lake Association funded a Phase I Diagnostic Study (\$93,000) with assistance from the Sauk River Watershed District, and contracted with Barr Engineering to complete the Diagnostic Study. The Diagnostic Study was completed in 1993 and the results prompted the Big Birch Lake Association to pursue this Phase II Implementation Grant.

The study concluded that the water quality of Big Birch Lake was poorer or close to the outside of the range for lakes in its ecoregion. Lakes of the ecoregion typically have total phosphorus concentrations ranging from 23 to 50 ug/L while Big Birch Lake averaged about 46 ug/L(Northeast Basin) in 1992-93.

The Big Birch Lake Phase I study determined that about 17% of the phosphorus budget is from direct atmospheric deposition. The watershed contributes approximately 73% of the total phosphorus to Big Birch Lake, with 66 % coming from the Fish Creek subwatershed. The remaining 10% was estimated to be contributed from septic systems.

### *Fish Creek*

Fish Creek is located on the northeast corner of the lake and is the largest subwatershed of Big Birch Lake (42%). Fish Creek winds through 1,670 acres of prime agricultural land before it discharges into Big Birch Lake. Fish Creek discharges the largest volume (48%) of water to Big Birch Lake and was found to have the highest phosphorus concentrations.

Calculations from Phase I indicate that approximately 66% of the total phosphorus entering Big Birch Lake is from Fish Creek\Goose Lake subwatershed.

The high concentrations together with the high inflow volume combine to produce the most significant mass loading of pollutants.

Therefore, the Steering Committee has recommended that this watershed receive first priority consideration for implementation of management alternatives.

### *Septic Systems*

Septic system performance was further examined in an attempt to better understand this potential bacterial and nutrient source to the lake. It is extremely difficult and expensive to technically quantify the precise losses of any one system to the lake. However, over the past 10 years, methods have been defined to approximate nutrient losses to septic systems which were employed in the Phase I Diagnostic-Feasibility study. These results indicated that up to 10 % of the total phosphorus loading to the lake could be attributed to septic systems.

### **Short Term Goals and Activities (1-3 years)**

For the project, the following goals will guide the implementation of the activities.

### *Fish Creek*

- Implement education programs
- Implement water monitoring program
- Reduce the flow-weighted mean average total phosphorus concentrations by about 60% from 468ug/L to those more closely

resembling regional average values of 150 ug/L

- Reduce the flow-weighted mean average ortho phosphorus concentrations by about 70% from 101ug/L to those more closely resembling regional average values of 30 ug/L
- Reduce average total suspended solids concentrations by a target of 80% from 35,700 ug/L to those more closely resembling regional average values of 7,000 ug/L

### ***Big Birch Lake***

- Nondegradation goal - to maintain 1993 water quality conditions, at a minimum, allowing for natural year-to-year variability
- Reduce average epilimnetic whole total phosphorus to less than 30ug/L (primary emphasis on the Northeast basin to achieve less than 40ug/L)
- Chlorophyll A 15 ug/L +/-18
- Summer transparency 5 feet +/-1.5ft
- Achieve 3 to 5 septic demonstration programs around the Big Birch Lake using cluster systems and or upgraded 50+ individual sites within three years.

### **Long Term Goals and Activities** (4 plus years)

#### ***Fish Creek***

- Maintain education programs and project effectiveness monitoring
- Targeted average annual flow-weighted mean total phosphorus concentrations 150 ug/L or less
- Targeted average annual flow-weighted mean ortho phosphorus concentrations 30 ug/L or less
- Targeted average annual flow-weighted mean total suspended solids concentrations 7000 ug/L

### ***Big Birch Lake***

- Maintain education programs and project effectiveness monitoring
- Average summer total phosphorus concentrations 20 - 25 ug/L
- Average summer Secchi transparency - greater than 2 meters
- Chlorophyll A 10ug/L +/- 5
- Achieve 90 % compliance with county ordinance septic tank rules by year 2005

Short- and long-term water quality goals are the foundation of the watershed management effort. Desired lake water quality improvements were used to define likely ranges of watershed phosphorus loading reductions. The first and most important lake management goal is to prevent further declines in lake water quality. Therefore a NONDEGRADATION GOAL has been established.

The defined goals are based upon historical lake data and ecoregion patterns. Application of MINLEAP demonstrated that the lake would reasonably be expected to be in better condition (e.g. average summer total phosphorus of 23 ug/L +/- 9 (see Table 2). As the lake is averaging approximated 46 ug/L in the Northeast basin and 34ug/L in the Main basin, substantial improvements in lake water quality appear to be reasonable over the long-term. The model of Vighi and Chiadani (1983) predicted presettlement water quality was on the order of 20 ug/L. Hence, the long-term goals were chosen to be on the order of 20-25ug/L. Achievability will be assessed by the SRWD as the project progresses over the next two years. Monitoring and further examination of attained water quality will be used to reassess this level in the future after implementation of priority actions.

To achieve the inlake goal of less than 30 ug/L whole-lake average total phosphorus concentration, it will be necessary to reduce



phosphorus loading to the lake by about 50%, which in turn translates into annual flow-weighted mean total phosphorus concentrations in the inflow streams of about 100 - 160 ug/L. Hence, this value being used for the long-term stream total phosphorus target levels is necessary to achieve improvement of inflake conditions.

To achieve the goals mentioned above, it will be necessary to decrease feedlot and agriculture runoff, upgrade septic systems, and incorporate Best Management Practices in the Fish Creek Watershed and the near-shore areas of Big Birch Lake. Selected management options were chosen to meet the short- and long-term goals of the project and perceptibly improve Big Birch Lake. Proposed monitoring of streams and the lake basins using state-of-the-art monitoring techniques will allow tracking of project progress to defined resource management goals.

## **Horseshoe Chain of Lakes Clean Water Partnership Project**

In 1985, the Minnesota Pollution Control Agency (MPCA) completed a "Limnological Investigation" of the Sauk River Chain of Lakes. As recommended by the MPCA, the Sauk River Watershed District addressed the identified pollution point sources, i.e. the Melrose Waste Water Treatment Plant (WWTP). However, area citizens continued to express their concerns about poor water quality. In 1989, the Sauk River Chain of Lakes Association requested the Sauk River Watershed District to sponsor a Phase I Diagnostic Feasibility Study for the Sauk River Chain of Lakes. With funds from the Environmental Protection Agency (section 314 of the Clean Water Act), the Sauk River Watershed District sponsored a Phase I project, which was completed in 1992. The objective of this study was to determine baseline hydrologic, water quality and ecological information to make necessary remedial and management

decisions. The problems identified have had a detrimental impact on recreation, aesthetics, economics and the aquatic environment in the area.

Water quality data collected during the 1992 study concluded that phosphorus concentrations had been reduced since the implementation of Alum treatment at the Melrose WWTP. However, the 1992 diagnostic study further concluded that the non-point sources (NPS) of phosphorus were more severe than previously anticipated. The primary NPS source of nutrients and sediments entering the Sauk River Chain of Lakes is from agricultural and feedlot runoff (97%) during the spring thaws and rainstorms and from direct input from septic systems (2%). According to the 1992 study, unless a major reduction in nutrient and sediment loading is transpired, "swimming impaired" conditions will likely continue and "no recreation" conditions may be encountered within 20 years, causing immediate economic consequences to this area.

Lakes of the North Central Hardwood Forest ecoregion typically have total phosphorus concentrations ranging from 23 to 50 ug/L. According to both previous studies, and the STORET data received from the MPCA, the study lakes having lake-like (nonflowage) characteristics had a yearly TP average **5 times** that of the ecoregion average while the study lakes having more river-like (flowage) characteristics had TP averages **10 times** the ecoregion average.

The Sauk River Watershed District attained the 1997 Clean Water Partnership Implementation grant and its continuation (2000) to reduce the nutrient loading to the Sauk River Chain of Lakes.

Further discussion on the Sauk River Chain of Lakes or the Horseshoe Chain of Lakes is in the

Water Quality – Lakes Assessment Section of this document.

## **Boy River Clean Water Partnership Project.**

### ***Boy River Project***

The Middle Boy River Watershed (MBRW) Project was initiated in the late 1980s by citizens, lake associations and sports groups who were concerned about the quality of the lakes of the area and who wanted to maintain the water quality for generations to come. At that time there was no evidence of large degradation patterns. However, there were suspicions that the lakes could change quickly with intense upper watershed and lakeshore development. The combined efforts of several dedicated individuals resulted in a lake protection management plan, which is the first in Minnesota for a chain of lakes of this size.

Previous lake management efforts that have taken place in the MBRW area started with Cass County working with the Minnesota Pollution Control Agency's (MPCA) Lake Assessment Program in 1988. This effort laid the foundation by: (1) accurately defining inlake conditions for the Upper Chain of Lakes (e.g., Child, Woman and Girl Lakes); (2) underscoring the importance of citizen volunteer monitors to detect trends; (3) determining general watershed characteristics; and, most importantly, (4) setting general lake management goals. Cass County received a Clean Water Partnership resource investigation grant in 1990 as one of the first 14 projects across the state. Various information was collected as a part of that study, which serves as the groundwork for much of this report and summary.

Most recently, Phase II (implementation) lake protection efforts have been conducted by Cass

County with Clean Water Partnership and U.S. Environmental Protection Agency 319 grant funds. Further data collection and assessments have allowed continued estimation of water quality trends and definition of very difficult-to-measure water flows through this system. Citizen volunteers, Cass County staff and MPCA staff performed all of the implementation and continuing monitoring activities.

State-of-the-art computerized stream flow monitoring conducted in the 190 mi<sup>2</sup> M B R W over the 1994-95 sampling seasons measured about 66% of the tributary flows and nearly 70% of tributary phosphorus loading. Pick Lake outlet flow weighted mean total phosphorus concentrations were 11- 15 µg P/L, which is less than the typical ecoregion interquartile range of 20 to 50 µg P/L. Elevated concentrations (e.g. 80 to 100 µg P/L) were monitored from one stream (Spring Creek) that was believed to have been caused by water level fluctuation induced effects upon oxidation/reduction of wetland organic materials. Additional monitoring will likely reveal greatly-reduced concentrations over time.

Long-term Secchi transparency monitoring conducted by citizen volunteers has revealed a statistically significant improvement in the quality of Woman Lake's main basin over the past 10 years. No defined patterns were identified for the other lake basins of the study area. The measured stream concentrations and volumes, along with in-lake measurements, were coupled in the computerized lake simulation model (BATHTUB) to develop a practical lake management tool to predict future conditions based upon changing watershed conditions. The primary focus for these efforts should be on total phosphorus loading to the lakes from their watersheds. The models did a very good job at estimating in-lake conditions in 1994-95. Additional refinement of flows and

monitoring of in-lake variabilities will improve the utility of these models further. In general, these models will be useful for predicting and diagnosing the water quality of the lakes, and estimating in-lake conditions based upon changes in land use within the watershed. The Citizens Steering Committee for this project has defined lake protection as nondegradation - meaning that there should be no statistically determined degradation of water quality over time, while allowing for reasonable year-to-year variability. Accordingly, goals have been defined for each lake based upon several years of data collection and statistical analyses.

Table 33  
Proposed Long-term Water Quality Goals for the Middle Boy River  
Watershed Project Lakes

|   | <u>Child</u> | <u>Woman</u> | <u>Girl</u> | <u>Wabedo</u> | <u>Little Boy</u> | <u>Inguadona</u> |
|---|--------------|--------------|-------------|---------------|-------------------|------------------|
| Long Term Averages                      |              |              |             |               |                   |                  |
| Secchi (feet)                           | 11.8         | 11.2         | 12.8        | 10.2          | 9.3               | 9.7              |
| All sites values are about +/- 1.1 feet |              |              |             |               |                   |                  |
| Total Phosphorus ppb                    | 14           | 17           | 14          | 20            | 18                | 18               |
| All sites values are about +/- 4 µg P/L |              |              |             |               |                   |                  |

From the project, the County instituted the following recommendations.

- Lake management efforts shall have to focus upon minimizing the loss of phosphorus and sediments to these lakes from all sources. Even small amounts will have cumulative impacts upon these very sensitive lakes. Incremental changes will be immediately noticeable to long-term residents as noted by increased plant accumulations in near shore areas as well as increased amounts of algae in the open waters. The main bay of Woman Lake will be an excellent barometer of the system and should have perpetual Secchi monitoring performed about 8-10 times per summer.
- Every effort should be made to maintain volunteer monitors for each lake segment measuring Secchi transparency in the MPCA's Citizens-Lake Monitoring Program. This will continue to provide cost-effective information for trend detection.
- Every effort should be made to minimize the creation of additional impervious surfaces that would increase the rates of water, nutrient and sediment loading to these lakes.
- As virtually the entire first tier areas of these lakes have been developed, second and third tier development will increasingly occur. Flow-weighted mean total phosphorus concentrations should be maintained at low levels (e.g. less than 30 µg P/L), which will take very careful planning and implementation of multiple Best Management Practices (e.g., three or four practices employed to reduce sediment and phosphorus loss rates). Every effort should be made to minimize the loss of phosphorus from wastewater systems to these lakes as they will be very sensitive to nutrient additions. Alternative wastewater collection systems such as subordinate service clusters may provide efficient removal and should be encouraged. As development densities increase over time, consideration should be given to municipal collection and treatment systems as opportunities arise.
- Careful consideration should be given to potential conversion of forested land uses to urban or agricultural uses. Changes in land use that are not corrected /mitigated by Best Management Practices can be expected to increase phosphorus loading to these very sensitive lakes.
- Continue abbreviated monitoring of Spring Creek watershed to better define the impacts of ditching and/or water level fluctuations upon phosphorus release rates from this subwatershed. As resources allow, year round water flow monitoring should also be continued at MN 200 using pressure

transducers, to better define flows through the system and winter-related ground water flows.

### ***Wabedo Township***

The Wabedo Township Project originated in the Middle Boy River Project as one of the implementation activities. The project is using low-interest loan dollars from the CWP program to form several subordinate sewer districts as an alternative to individual septic treatment systems. This is a solution for several lake areas that have many lots that are too small for siting a compliant septic system.

### **Lake Margaret Clean Water Partnership Project**

Lake Margaret is located in north central Minnesota in the City of Lake Shore, in Cass County. The lake is 217 acres in size, with a maximum depth of 26 feet. The near shore area and the lake basin itself are entirely located within the City of Lake Shore.

The watershed consists of 18,340 acres, with forested land as the primary land use. There are three streams, which run into Lake Margaret: Home Brook, Cory Brook, and Rush Brook. There are 104 landowners on Lake Margaret, most of which have seasonal or year-round homes there. Total population of the watershed is approximately 3,560, with 2,460 living either year round or seasonally within the City of Lake Shore, and the rest residing in Fairview Township of Cass County.

According to the Minnesota Department of Natural Resources (DNR), Lake Margaret and Home Brook have historically had walleye spawning habitat, but recent surveys show this habitat has disappeared. Also, Cory Brook still produces great numbers of brook trout, but habitat conditions there have deteriorated and

most fish can't live past two years old. The DNR has acquired easements along part of the critical habitat area of Cory Brook, and would like to acquire more to protect this habitat.

Lake Margaret is the first lake draining into the larger Gull Lake watershed from the west, and is first to experience nutrient loading coming into the lake from the Home Brook Watershed. Residents began to notice a decline in the quality of water in the lake, as evidenced by decreased clarity, increased weed growth, and sediment on the bottom. In 1989 as part of a Gull Lake assessment, the Minnesota Pollution Control Agency found that while Gull Lake was where it was expected to be with regards to nutrient and algae levels, Lake Margaret was above what was expected in a lake in this ecoregion. Because of these and subsequent assessments, following the recommendation of the MPCA the City of Lake Shore determined that the water quality in Lake Margaret was poor enough to warrant additional study and action to prevent further degradation.

In the summer of 1994, the MPCA, along with members of the Gull Area Lakes Association (GALA), sampled Lake Margaret as part of the Lake Assessment Program (LAP). Water quality data collected during this study indicate that Margaret is eutrophic to hypereutrophic, with a mean total phosphorus concentration of 65.2 ug/l, a summer mean Secchi transparency of 3.5 feet, and a mean chlorophyll of 52.6 ug/l. The typical range for these readings in the Northern Lakes and Forests Ecoregion should be between 14-27 ug/l for phosphorus, 8-15 feet Secchi, and less than 10 ug/l chlorophyll a.

In 1995, through the city's Environmental Committee, the City of Lake Shore undertook a study of the Home Brook watershed. The study identified preliminary total and ortho-phosphorus flow weighted means in the stream of 90 and 50 ug/L respectively.

It is suspected that the elevated phosphorus in Home Brook and Lake Margaret are causing the decreasing water clarity that has been a concern to local residents. Land use practices in the watershed and along the lakeshore are believed to be the main contributing factor to the elevated phosphorus levels. The Clean Water Partnership Project purpose is to further assess the inputs from this watershed to the lake. The project will be completed in April of 2001.

### **Lake Mille Lacs Clean Water Partnership Project**

The Lake Mille Lacs Watershed Group was successful in obtaining Phase I CWP funding for a diagnostic study on Lake Mille Lacs in 1999. Several activities have been outlined in the recently-completed work plan including data assessment, lake and stream sampling, education and outreach on lakeshore management, development of consistent planning and zoning strategies, a recreation impact study and geographic information system mapping. The project encompasses the entire Lake Mille Lacs Watershed, which extends approximately two miles around the lake and will last for three years.

### **Minneapolis Chain of Lakes Clean Water Partnership Project.**

Funding to improve the water quality in the Minneapolis Chain of Lakes (Brownie Lake, Cedar Lake, Lake of the Isles, Lake Calhoun and Lake Harriet) became available in 1993 through a seven-year initiative with the Chain of Lakes Clean Water Partnership (CWP). This partnership is funded and sponsored by the City of Minneapolis, the City of St. Louis Park, Hennepin County, the Minneapolis Park and Recreation Board, the Minnehaha Creek

Watershed District, and the Minnesota Pollution Control Agency.

The project is the “*Minneapolis Chain of Lakes Clean Water Partnership*” (CWP), and it is one of the largest urban watershed-restoration initiatives in the U.S. It is a multi-faceted program, and its goal is to significantly improve the water quality of the Chain of Lakes. From 1994 to 2001, \$8.1 million is being strategically spent to achieve this goal.

In order to restore the water quality of the lakes, the CWP is using multiple, proven techniques throughout the Chain of Lakes watershed. An initial action to clean up the lakes was to increase street sweeping practices and efficiency. Street sweeping removes sand, leaves and other pollutants that would otherwise reach the lake through storm drains. As part of the CWP, the Minneapolis Park and Recreation Board added one sweeper in 1995 and Minneapolis purchased two additional sweepers in 1996 at a cost of \$110,000 each. City streets, parkways and parking lots are now swept more frequently.

An important part of the CWP program is the management of storm water runoff. In order to trap pollution-laden sediment before it enters the lakes, the CWP plan includes the installation of 10 grit chambers in the Chain of Lakes watershed. The plan also includes the creation of two wetland and storm water pond systems to naturally filter storm water, and remove phosphorus. Alum will be applied to some of the lakes after the wetlands and other storm water management techniques are in place. Alum treatments stop phosphorus already in lake sediment from fueling algae growth. The following table summarizes the specific actions being taken on each lake (parentheses indicate CWP future actions).

Table 34

| LAKE        | Grit Chamber                   | Alum Treatment | Wetlands    |
|-------------|--------------------------------|----------------|-------------|
| CEDAR       |                                | 1996           | 1996        |
| BROWNIE     |                                |                |             |
| ISLES       | One in 1994<br>(three in 1999) | 1997           |             |
| CALHOUN     | One in 1995<br>(two in 1998)   | (1998)         | (1998 )     |
| HARRIET     | Two in 1996<br>(one in 1999)   |                |             |
| Total Costs | \$700,000                      | \$196,000      | \$2,160,000 |

Many other initiatives have been launched as part of the CWP's efforts to clean up the lakes. In 1994, a public education program was designed and implemented. It is aimed at creating an awareness of water quality issues and describing specific actions people can take to improve Chain of Lakes water quality. Approximately \$50,000 is being spent each year on this education campaign.

Since 1994, the water quality of 13 Minneapolis lakes has also been monitored as part of the CWP. The lakes are monitored bi-weekly, April through October, at a cost of \$50,000 per year. Approximately \$50,000 per year is also being spent on monthly monitoring of storm water flowing into the chain. During the swimming season, \$6,000 is spent per year on weekly beach monitoring to track bacteria.

New regulatory controls aimed at eliminating the introduction of pollutants into water bodies, as well as enforcement of existing ordinances to control lake pollutants were established. Along with new controls, current regulations that prohibit the placement of pollutants in the storm water system are strongly enforced. Included under such ordinances are proper pet waste disposal and prohibitions on the placement of leaves and lawn clippings, oil, antifreeze, paint and other substances that could be classified as a pollutant into the sewers or onto the streets and alleys. Improved enforcement of these regulations will reduce the pollutant load to the lakes by a significant amount.

In addition to these management practices, 100 Canada geese are removed each year from Lake of the Isles. Goose removal helps eliminate excessive goose droppings that contribute to higher phosphorus levels in nearby lakes.

Shoreline restoration projects have also been completed on Cedar and Isles to control the erosion of vulnerable lakeshore areas.

Alum treatment were applied to Cedar and Isles after the wetlands and other storm water management techniques were in place. The main purpose of the Alum treatments was to control internal phosphorus recycling from the lake sediments and reducing the amount of food available to algae. Alum is most effective when external sources of pollutants, such as stormwater and goose droppings, are already being effectively managed before the treatments occur.

The diagnostic study completed for this project indicated that internal loading of phosphorus was contributing to the phosphorus concentration in the lakes, later sediment phosphorus release microcosm work concurred that internal phosphorus loading was occurring in both lakes. Alum treatment was selected as a Best Management Practice for Cedar Lake and Lake of the Isles for a number of reasons. First, efforts to control external sources of phosphorus were completed for the two lakes. Secondly, funding became available through the seven-year initiative with the Chain of Lakes Clean Water Partnership to improve water quality in the Minneapolis Chain of Lakes.

Using the data collected from 1991 to 1999, trophic states for each given lake were determined using Carlson's trophic state index. This index uses three water quality parameters to assess lake fertility or trophic state: Secchi transparency, total phosphorus and chlorophyll-a

concentration. Using the data collected over this nine-year period, an attempt was made to determine whether lake water quality was improving or declining in the Minneapolis lakes.

Table 35  
Trophic State Index Trends: 1991-1999 (May-September)

| Lake       | Regression Slope | R <sup>2</sup> |
|------------|------------------|----------------|
| Brownie    | .587             | 0.699          |
| Calhoun    | .258             | 0.525          |
| Cedar      | .766             | 0.576          |
| Harriet    | .003             | 0.000          |
| Hiawatha   | .052             | 0.039          |
| Isles      | .889             | 0.318          |
| Loring     | .265             | 0.679          |
| Nokomis    | .279             | 0.075          |
| Powderhorn | .184             | 0.744          |
| Webber     | .737             | 0.670          |
| Wirth      | .593             | 0.363          |

Based upon these results it is possible to describe the direction of the trend (- values for the slope indicate improvement and + values indicate declines) and the degree of confidence one can place upon the trend (the closer the R<sup>2</sup> value is to 1.00 the stronger the trend).

#### *Lakes showing water quality improvement*

Lake Calhoun (-1.258) (0.525)  
Cedar Lake (-1.766) (0.576)  
Lake of the Isles (-0.889) (0.318 weak trend)

#### *Lakes showing no significant changes in water quality*

Lake Harriet

### **Diamond Lake Rehabilitation Clean Water Partnership Project Phase II, Kandiyohi County**

The Diamond Lake Association and Kandiyohi County applied for, and received, a Clean Lakes Program (about \$32,000.00, Federal dollars) "Diamond Lake Diagnostic-Feasibility Study" grant, (a Phase I) in August 1992. The purpose

of this grant was to identify the sources of nutrient and sediment pollution to Diamond Lake and then based on those findings, select Best Management Practices to reduce the sources of nutrients and sediment pollution to Diamond Lake.

Upon completion of their Phase I, the Diamond Lake Association and Kandiyohi County applied for and received the current (April 1997 through April 2001) Diamond Lake Rehabilitation Project (\$ 49,000.00 Clean Water Partnership, State dollars) Phase II grant.

The Diamond Lake Project area is about 18,000 acres, mainly agricultural watershed, in west central Minnesota. The project area is mainly row crop agriculture, hilly terrain. Phase II Best Management Practice implementation efforts have emphasized shoreline/homeowner education, agricultural landowner educational efforts, septic system upgrades and maintenance, rough fish management, and curly leafed pondweed (an exotic) controls. The Project has about half of their grant funds available for landowners to accept the incentives for Best Management Practice implementation in the Diamond Lake watershed. The grant is about one year from the expiration date and project staff are concerned that all their grant dollars may not be utilized.

### **Dunns and Richardson Lakes Phase I Clean Water Partnership Study, Meeker County**

The Dunns and Richardson Lake Associations (DARLA) formed an association, conducted Secchi disc readings, participated in the MPCA Lake Assessment Program and stated that they still did not know where their sources of pollution were coming from. Lake association members were aware that Dunns Lake water quality was considerably poorer than the

upstream Lake Richardson's water quality, but still did not know why.

In the fall of 1998 Meeker County sponsored DARLA's Phase I Clean Water Partnership application. The "Dunns and Richardson Lakes Phase I Study" received a \$33,750.00 Clean Water Partnership grant. Because of the small grant dollar amount DARLA volunteers, with MPCA staff and consultant assistance, will be conducting the sampling. The project area watershed has been evaluated, the monitoring sites have been selected and the monitoring plan has been completed. The monitoring equipment will be installed and volunteer training will be provided again this spring, a refresher course for last year's volunteer training.

### **Lake Francis Clean Water Partnership Diagnostic Feasibility Study, Isanti County**

Over the past several years, watershed residents have observed a continual degradation of the water quality in Lake Francis. More severe and more frequent algae blooms have been documented, unsightly shoreline scums, and, in general, a rapidly diminishing lake water quality have been observed by lakeshore homeowners. The perception is that watershed run-off coupled with septic system contributions and sediment enrichment are responsible for the excessive algal blooms in the lake.

Isanti County and the Lake Francis Lake Association applied for the "Lake Francis Diagnostic-Feasibility Study" and were funded (\$24,150.00 Clean Water Partnership grant), effective March 23, 1999. The objective of the Phase I Study will be to determine baseline hydrology, water quality and ecological information to make the necessary remedial and management decisions. Phase I objectives include the gathering of water quality, stream flow and watershed data. Data will be

summarized, modeled and analyzed to produce a prioritized list of cost effective lake and watershed management alternatives for subsequent implementation.

The desired uses for the lake include fishing, swimming and boating. Contact sports are currently avoided due to turbidity, algal scum and mucky bottom. There is currently no aquatic vegetation in Lake Francis because of turbidity and algae density. Phosphorus and nitrogen levels are currently very high and are responsible for the excessive algae growth.

### **Grass Lake Restoration Project, Kandiyohi County**

The Grass Lake Restoration Project is a 319 grant (\$100,000.00) for the restoration of Grass Lake, which was drained many years ago. The majority of the 319 grant will be used for sedimentation basins upstream of the Grass Lake Basin. The storm water that will be treated by the sedimentation basins is from the City of Willmar. This project should soon be completed.

### **Long and Spring Lakes Restoration Project – Clean Water Partnership Phase II, Meeker County**

The Long and Spring Lakes residents formed the Dassel Area Environmental Association. Since their formation the association has participated in numerous water quality projects: The MPCA Lake Assessment Program (1992), the "Long and Spring Lakes Restoration Project" (a Clean Lakes Program, Diagnostic-Feasibility Study) 1993-1997, a Federal 319 shoreline stabilization grant (\$15,000.00) October 1998, and a "Long and Spring Lakes Restoration Project" Phase II Clean Water Partnership grant (\$26,689.00) March 1999 - March 2002.



Shoreline restoration efforts are currently underway. Association members and DNR Waters staff have videotaped the shoreline, met to view the shoreline and discuss and select the priority sites. Most landowners have been contacted and several sites are working on shoreline restoration/stabilization plans. Several storm sewer outlets had erosion problems at the lake shoreline. The City of Dassel owns those properties so those site restoration plans are also in progress.

### **Minnie Belle Restoration Clean Water Partnership Project Phase II, Meeker County**

The Lake Minnie Belle Restoration Project is the result of years of water quality efforts by the Lake Minnie Belle Lake Association. The association has participated in Meeker County Coalition of Lakes efforts, the MPCA Lake Assessment Program, the MPCA Citizens Lake Monitoring Program, the Clean Lakes Program Phase I Diagnostic-Feasibility Study, and now the Minnie Belle Restoration Project, a Clean Water Partnership Phase II (\$76,225.00).

The Phase II efforts have included: Septic system educational material purchase and distribution to lakeshore (and some watershed) homeowners; lawn care and septic system care workshops; replacement of septic systems with State Revolving Fund loan dollars, shoreline stabilization demonstration projects, and numerous agricultural Best Management Practice efforts to reduce nutrient and sediment contributions into Lake Minnie Belle. The project is nearing the end date and still has about half of the grant money to spend on Best Management Practice implementation.

### **Green Lake Diagnostic Feasibility Clean Water Partnership Study, Isanti County**

Green Lake is a major recreational water body (about 800 acres) in Isanti County. Over 50% of the shoreline has sand ridges up to 40 feet high, and the remaining shoreline is about 10 feet above normal lake level. The watershed is small, about 19 square miles. Surface runoff to the lake is low because of the relatively flat terrain and pervious surface soils. The Rum River does occasionally back flow into Green Lake during significant rain events and during spring melts, when the stop log dam gets held open with logs and debris.

People who had lived around Green Lake for many years thought the lake had more frequent and severe algae blooms. They formed the Green Lake Association to try to confirm or dispel the suspected water quality degradation and try to identify the cause, if justified.

The Green Lake Association has conducted a 1984 lake hydrology study, a 1989 lake and stream survey (both funded by the lake association), the MPCA Citizens Lake Monitoring Program (ongoing), the MPCA Lake Assessment Program (1991), and the Green Lake Diagnostic Feasibility Study 1994 – 1997.

The studies did not identify a significant source of pollutants. The orthophosphate to total phosphorus ratio was high. Although the total phosphorus itself was not high compared to the North Central Hardwood Forest Ecoregion expected range. The suspected source of the orthophosphate was wetland organic materials and/or nutrient management on sandy agricultural lands in the watershed. The watershed land composition is: wetlands ~53%, agricultural ~27%, urban ~ 10%, forest ~ 9%, and water ~ 1 %. So far the project has not applied for the Phase II Implementation grant.

## **Big Fish Lake Clean Water Partnership Project**

Big Fish Lake is located in Stearns County north of Cold Spring. The lake has a surface area of approximately 580 acres, a mean depth of 26.5 feet and a maximum depth of 70 feet. Water residence time is estimated at approximately 12 years.

The Phase I CWP project for Big Fish & Long Lakes has three major objectives.

- Conduct a comprehensive diagnostic study to determine which elements of the watershed are functioning and helping to maintain the high water quality of Big Fish and Long Lakes.
- After completion of the diagnostic study, protect critical watershed functions and processes through various means such as land use regulations, conservation easements, and other regulatory or volunteer efforts.
- Preserve and improve the health of the aquatic and terrestrial ecosystems of the lakes and surrounding watershed.

Major project elements of the project include: lake and tributary monitoring, watershed assessment, homeowner education and data analysis. Stearns County is the local project sponsor and the Sauk River Watershed District will conduct water quality monitoring for the project.

## **Other Watershed Projects**

### **The McKnight Foundation - Upper Mississippi Initiative.**

The McKnight Foundation is a charitable foundation, headquartered in Minneapolis, Minnesota. The foundation's primary geographic focus is in the State of Minnesota. Founded in 1953 and endowed by William L. McKnight and Maude L. McKnight, the foundation's purpose is to strengthen community and community institutions to improve and provide opportunities to enrich people's lives through the arts, preservation of the natural environment, and support of scientific knowledge.

The McKnight Foundation's Environmental Program and Upper Mississippi River demonstration project were established in 1991. Its larger goal is to maintain and, where necessary, restore a healthy and sustainable environment in the Mississippi River Basin. A secondary goal is to encourage energy conservation and the use of alternative sources of energy in Minnesota. Grants within the Mississippi River program seek to safeguard the river at reasonable cost while maintaining its economic and recreational value.

### **The Fish Hook/Shell River Corridor Project-Hubbard and Wadena Counties**

The Fish Hook/Shell River Corridor Project is a cooperative effort by Hubbard and Wadena County SWCDs, the MNDNR, the MPCA, the USACOE and local residents to restore a portion of the two rivers back to their original channels. These river reaches were channelized in 1912-15 at the request of individuals who wanted to farm the river bottoms. The Hubbard County Board denied the original petition, the

individuals then appealed to the Minnesota Supreme Court who overturned the county's decision.

The subsequent channelization failed to produce the desired result, and may have resulted in significant siltation to downstream Upper Twin Lake.

The Army Corps of Engineers provided a project manager and a preliminary engineering report along with a preliminary budget. The project needs a local sponsor to proceed, but liability language within the sponsor contract has precluded selection of a sponsor. DNR Fisheries has expressed interest in becoming the local sponsor, and they are working with the attorney general's office to interpret the liability language in the Corps' contract.

The project area is still a legal drainage with Hubbard County being the drainage authority. Legal abandonment by the drainage authority must be accomplished before the project can proceed.

The proposed natural channel restoration would approximately triple the length of the current channel and greatly enhance fish and wildlife habitat, thereby increasing recreational opportunities. Also, the problem of siltation to the downstream lakes would likely be reduced.

## **Leech Lake Watershed Foundation**

The Leech Lake Watershed Foundation (LLWF) is a non-profit, tax exempt organization of citizens in the Leech Lake area who are dedicated to preserving the environment. Volunteer citizens, in partnership with private and public entities, work to identify and protect sensitive lands and waterways in the 750,000-acre Leech Lake area watershed, and encourage land and water stewardship, for the benefit and enjoyment of present and future generations.

The LLWF was formed in 1995, but already has been an instrumental leader in lake, river and forest protection. The foundation's first project, completed in 1997 on Lost Lake east of Hackensack, involved the purchase and protection of 2,000 feet of wild lakeshore for an aquatic management area.

## **Pine River Watershed Foundation**

The Pine River Watershed Foundation (PRWF) is a non-profit, tax exempt organization of citizens in the Pine River Watershed and the Whitefish Chain of Lakes in Crow Wing County who are dedicated to preserving the Pine River Watershed. Volunteer citizens, in partnership with private and public entities, work to identify and protect sensitive lands and waterways in the watershed.