Minnesota Water Plan



Minnesota Environmental Quality Board
Water Resources Committee

January 1991

To The People Of Minnesota

Water is precious to Minnesotans. It is a symbol of our state and our people. Protecting and conserving water resources is an investment in Minnesota, not a cost.

The rich outdoor experience that we value, and that so typifies our state, centers on our lakes, wetlands, and streams. Beneath the surface, we also share the hidden treasure of abundant, pure ground water. Most of us get our drinking water from this treasure.

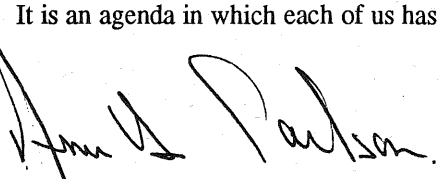
We have come to realize in recent years that our water resources are at risk. We cannot stand pat and maintain the quality of Minnesota's water.

We have also begun to understand a very simple principle — the ecological principle of interdependence. What we do on the land affects water quality and availability. When we seek to protect water quality, we had better understand quantity. When we think to use surface water, we need to realize that ground water may also be affected.

Minnesotans across the state have joined in a unique grassroots campaign called "comprehensive local water planning." The word "comprehensive" signals a recognition of the principle of interdependence; the word "local" means that the people involved are close to the real issues and solutions.

Minnesotans were honored at Earth Day 1990 festivities with the National Environmental Achievement Award for ground water protection. The winners were the initial 52 participating counties and their state partners in comprehensive water planning. Today, local water planning is the foundation of the **Minnesota Water Plan**.

The **Minnesota Water Plan** sets an ambitious agenda for protecting and conserving our water. It is an agenda in which each of us has a part to play.



ARNE CARLSON
Governor

Minnesota Water Plan

Directions for Protecting and Conserving Minnesota's Waters

A Report of the EQB Water Resources Committee
January 1991

Environmental Quality Board
Minnesota State Planning Agency

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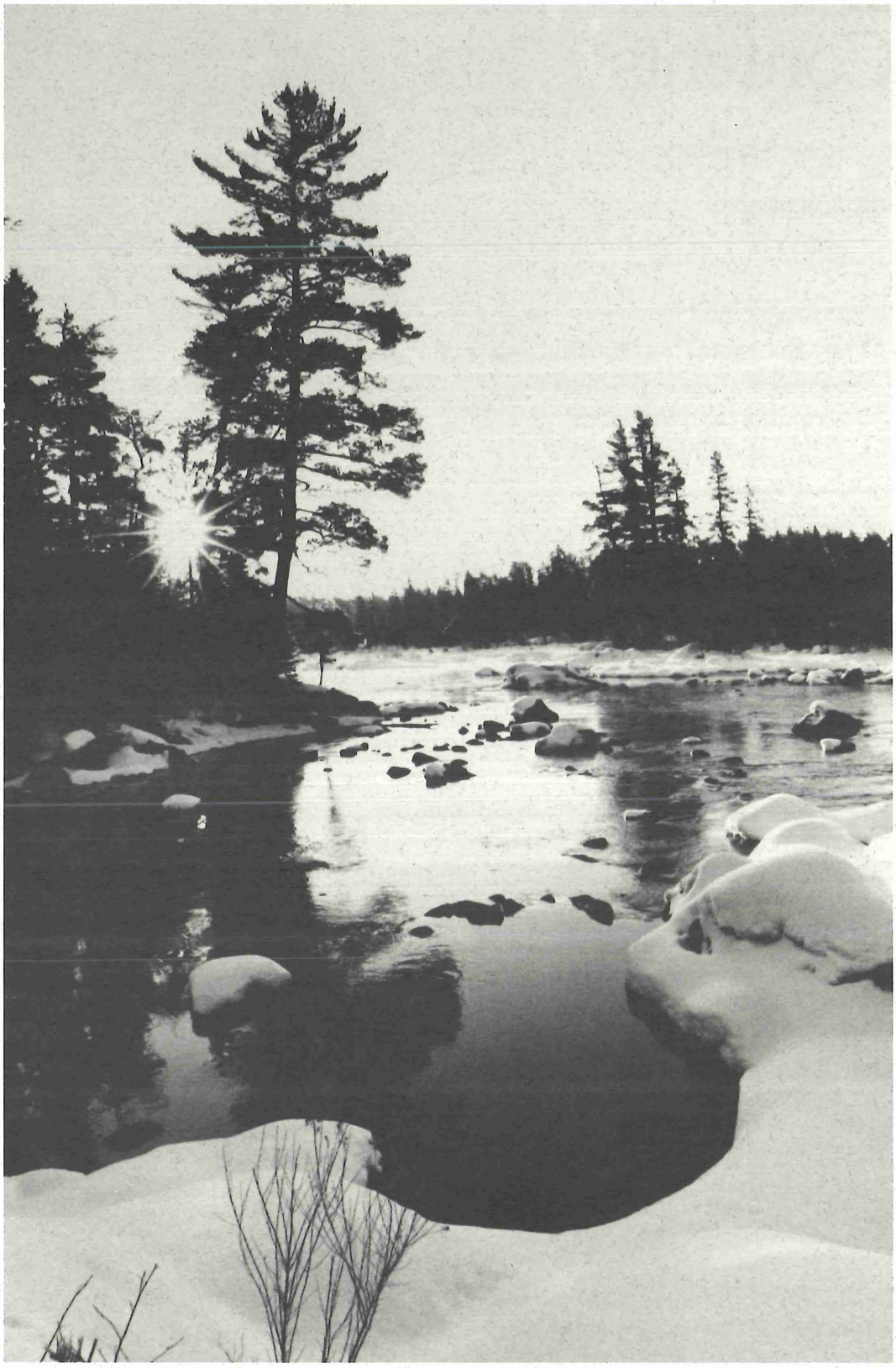
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Executive Summary

The **Minnesota Water Plan (MWP)** sets an ambitious agenda for protecting and conserving water resources in the state. It identifies the principles, policies, and actions needed for managing water in the 1990s and beyond.

Minnesota's water is not evenly distributed. The character of Minnesota's land use, a prime determinant of water quality and use, also varies dramatically across the state. The demands Minnesotans place on water are equally diverse.

The State of Minnesota needs a plan to manage the challenges that arise from water's changing nature and the variable demands Minnesotans place on it. Minnesotans face an increasing and changing population and economy, with changing land use, and even the threat of global warming. Minnesotans cannot stand pat and maintain the quality of their water resources.

It is easy to forget that, only five years ago, there was little indication of the extent of Minnesota's ground water pollution. Monitoring studies have since indicated contamination by volatile organic chemicals and by pesticides. It is also easy to forget that drought has dried up water supplies and crops and altered water quality.

The **Minnesota Water Plan (MWP)** is the state's plan for harnessing the energy and resources needed to protect and conserve Minnesota's water. In it, commitments are made by the key state agencies responsible for water. These commitments embrace the directions that must be pursued to keep what we have and to make it better. The **MWP** also signals the state's commitment to local water planning as a key to managing water in the 1990s. The state's directions are built around local initiative through comprehensive water planning.

The **MWP** stresses the importance of understanding water's interconnections and integrating government efforts to address them. It argues for helping partnerships to address these connections. It recognizes the necessity of making the most out of what we have.

Understanding water's interconnections and integrating government efforts to address them. Water quality cannot be considered without understanding quantity. Availability hinges upon quality, as well as quantity. Surface waters are connected to ground water. Land use affects both quality and quantity of water. Air quality affects water quality. Clearly, the environment must be managed well to protect water, just as water must be well managed to protect the environment.

Government often addresses these interconnections in a fragmented way. The **MWP** makes "integrating water management" a priority for Minnesota agencies. To do this, the plan calls for a renewed "focus on the resource." By focusing on protecting a lake, stream, or aquifer, people may worry less about specific government program "wants" and more about what the resource needs are.

The resource focus is intended to aid program integration across agency lines. For example, a lake may need a combination of steps involving weed harvesting (regulated by DNR) and watershed land treatment (supported by PCA and BWSR).

Helping partnerships address these connections. The state must continue to work closely with local governments involved in comprehensive local water planning. This local / state partnership holds a key to our ability to manage water in the 1990s. Both local and state governments must involve others in partnerships too. The federal government, the academic community, and the private sector, especially nonprofit organizations, offer important opportunities for Minnesota's water.

Making the most out of what we have. Minnesotans must work together to protect and conserve water. We cannot afford to waste efforts on inefficient programs. We need to use the authority we have to protect water. We

Environmental Quality Board membership:

Chair appointed by Governor.

Commissioner of Agriculture.

Commissioner of Health.

Commissioner of Natural Resources.

Commissioner of Pollution Control.

Commissioner of Public Service.

Commissioner of State Planning.

Commissioner of Transportation.

Director of Waste Management.

Chair of Board of Water and Soil Resources.

Five Citizen Members.

Minnesota's WATER GOALS:

- To improve and maintain the high quality and availability of Minnesota's water for future generations and long-term health of the environment.
- To ensure that our uses of water are sustainable, and that in meeting our needs for water, we recognize its limits and interconnections, accept its changing and variable nature, and adjust our demands upon it when necessary to safeguard it for future needs.

Minnesota's WATER PRINCIPLES are that we:

- Manage water's interconnections.
- Focus on the resource.
- Manage hydrologic units.
- Make partnerships work for water.
- Make prevention the focus.
- Put public health and safety first.
- Recognize the importance of information.
- Understand the importance of research.
- Think long-term.
- Accept limits to growth.
- Make those who benefit pay.
- Let citizens make a difference.
- Educate people to change behavior.
- Make government understandable, adaptable, and accountable.

need to target government's efforts toward the most pressing problems. We need a well-coordinated, focused state effort.

MWP Goals and Principles . . . The MWP identifies key goals and principles for water management and policy development in Minnesota. These apply to all water activities in Minnesota. They are part of every recommendation made in the plan.

The recommendations . . . The MWP identifies objectives for the decade, key recommendations, and "first steps" for carrying them out. These are organized around the themes of integrating water management, focusing on the resource, protecting and conserving water resources, and managing water's interconnections.

A series of objectives define the Environmental Quality Board's targets for Minnesota's water program in the next ten years. The ten-year objectives are ambitious. It will take dedicated efforts to reach them.

The MWP presents 28 recommendations for Minnesota's water resources and for its water programs. They are designed to help Minnesota meet the objectives for water management. They are the heart of the MWP.

By chapter, the MWP recommendations are:

Integrating Water Management In Minnesota

The Minnesota Coordination Strategy

- Establish, monitor, and refine a Minnesota coordination strategy.
- Make comprehensive local water plans a highly visible element of the coordination strategy.

Communication and Education

- Launch a major environmental education initiative to show people how their actions affect the environment.
- Open up lines of communication among local, state, and federal levels of government, as well as citizens and the private sector.
- Strengthen efforts to meet the ongoing training needs of local and state water managers and policy-makers.

Information and Research

- Build a long-term base of support for the priority research needs identified in the biennial EQB water research needs assessment.
- Improve the state's Geographic Information System so that all users can easily access and integrate data on surface water,

ground water, and related land resources.

- Make the commitment of money and authority necessary to carry out the state Water Resources Monitoring Plan.

Liability and Enforcement

- Enhance the state's environmental compliance strategy.
- Develop a consistent state approach to fairly and equitably assign consequences and liability for water misuse.

Infrastructure

- Upgrade Minnesota's water infrastructure with new technology to better safeguard public health and the environment.
- Take steps to ensure that money is set aside for infrastructure maintenance and improvement.

Financing

- Expand revenue sources and options available to state and local units.
- Tie allocation of funds to priorities identified in the **Minnesota Water Plan** at the state level, and to comprehensive local water plans at the local level.

Focusing on the Resource

Lakes

- Develop a strategy for integrated lake management.

Wetlands

- Establish and operate a state / local "no net loss" program for wetlands.

Rivers

- Address water and related land resource issues from both a major river basin and a smaller watershed perspective.

Ground Water

- Protect and manage aquifers as hydrologic units.
- Gather sufficient hydrogeologic information for making adequate water management and protection decisions.

Protecting and Conserving Water Resources

Reduction of Environmental Pollutants

- Evaluate how state programs should be changed to move toward the Minnesota clean water goals, then begin making the changes.
- Reduce the amounts of polluting materials used, wastes produced, and pollutants entering the environment.
- Ensure that agricultural activities in the state are environmentally sound, and economically and socially viable in both the short and long term.

Water Well Management

- Strengthen enforcement of the well code at the state and local level.
- Develop a system for private well testing that provides a basic level of service across the state while encouraging innovation in meeting regional needs.
- Develop and implement wellhead protection for public and private wells.

Water Conservation

- Develop a water conservation strategy for long-term and seasonal water use throughout Minnesota.

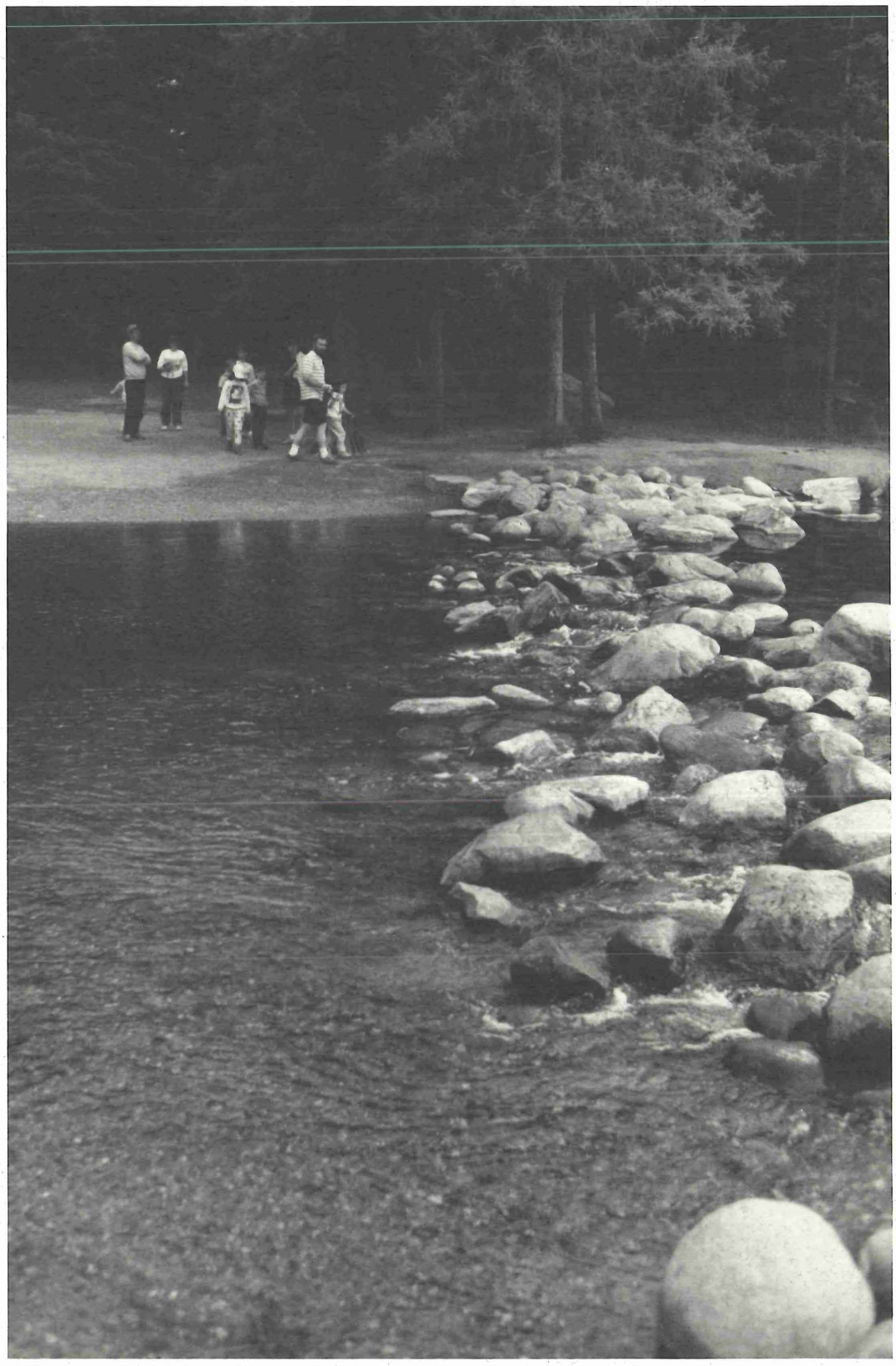
Managing Water's Interconnections

- Identify and remove barriers to managing water's interconnections for a sustainable environment.
- Build consideration of water protection needs into land use decisions.

The **MWP** provides the agenda for managing Minnesota's water in the 1990s and beyond. Working closely together as Minnesota partners in water management, the Legislature, local, regional, state, and federal governmental agencies, the educational community, the private sector, and Minnesota citizens can indeed carry out this agenda.

The Minnesota Pilot Project for Local Water Planning received the National Environmental Achievement Award for Ground Water Protection at the 1990 Earth Day celebrations in Washington, D.C.

SPA received the award on behalf of the 52 participating counties and their state partners.



Introduction

Minnesotans pride themselves on the abundance and quality of their water resources. In our so-called "water-rich" state, we count over 25,000 miles of fishable streams, 12,000 lakes, five million acres of wetlands, and great supplies of ground water. Most western states could only dream of such supplies as we have.

With all this water, one might ask why Minnesotans need a plan for its protection and conservation. Several compelling reasons exist.

For one thing, Minnesota's water is not evenly distributed. Rainfall varies from over thirty inches in the southeast to a semi-arid nineteen inches in the northwest. Lakes are not evenly distributed, either, with most found in the central and northern sections of the state. Wetlands follow similar patterns, except that Minnesota's western prairie lands harbor wetlands of great value. The character of Minnesota's land use, a prime determinant of water quality and use, also varies dramatically across the state.

The demands Minnesotans place on water show equally diverse characteristics. Water use is the greatest in the Metropolitan area, where people and industry are concentrated. The central sand plains are tapped for irrigation. The Iron Range places demands on water through mine dewatering and taconite processing. Electric utilities and pulp and paper mills are major users of water throughout the state.

The State of Minnesota needs a plan to manage the challenges that arise from water's changing nature and the variable demands Minnesotans place on it. Minnesotans face an increasing and changing population and economy, with changing land use, and even the threat of global warming. Minnesotans cannot stand pat and maintain the quality of their water resources.

It is easy to forget that, only five years ago, there was little indication of the extent of Minnesota's ground water pollution. Monitoring studies have since indicated contamination by volatile organic chemicals, like gasoline and solvents, and by pesticides, like atrazine. It is also easy to forget that drought has dried up water supplies and crops and altered water quality.

It is all too easy to assume that people in education and government know all about water. It can be a hard sell to convince people that more research and monitoring are greatly in need, and that smart decisions depend on more and better information. It is difficult to argue how improved teamwork may make a big difference in protecting and conserving water.

It is easy to assume that someone is taking care of all the threats to Minnesota's water, that someone is always in charge, and that they know what to do and when to do it.

But, it is not that easy. Water protection and conservation require a great deal of energy, resources, and commitment. People and programs make a difference when they are supported by good policy, by good information, and by good expertise.

The **Minnesota Water Plan (MWP)** is the state's plan for harnessing the energy and resources needed to protect and conserve Minnesota's water. In it, commitments are made by the key state agencies responsible for water. These commitments embrace the directions that must be pursued "to keep what we have" and to make it better. The **MWP** also signals the state's commitment to local water planning as a key to managing water in the 1990s. The state's directions are built around local initiative through comprehensive water planning.

The **MWP** is authorized by Minnesota Statutes, Section 103B.151. This section requires the Environmental Quality Board (EQB) to develop a "new plan and strategy" by November 15, 1990. The plan is to be updated every five years. The previous plan was developed by the Water Planning Board in 1979.

Like its predecessor, the new **MWP** is not

The Headwaters State.

Minnesota is at the headwaters of three major North American watersheds: the Great Lakes basin to the east, the Souris-Red-Rainy Rivers basin to the north, and the Mississippi River basin to the south. Minnesotans often characterize their state as water rich.

In a very real sense, the state's location at the headwaters of these major basins carries with it a special responsibility to protect the quality and quantity of water leaving the state.

Minnesota Facts.

Population (1990):
4,387,029.

State surface area:
85,447 square miles.

Nine major water basins.

Miles of rivers and streams:
92,000.

Lakes and reservoirs:
12,034 covering
3,411,200 acres.
> 5,000 acres — 62 lakes.
< 5,000 acres — 11,972 lakes

Approximately 5 million acres of wetlands.

Minnesota Water Plan

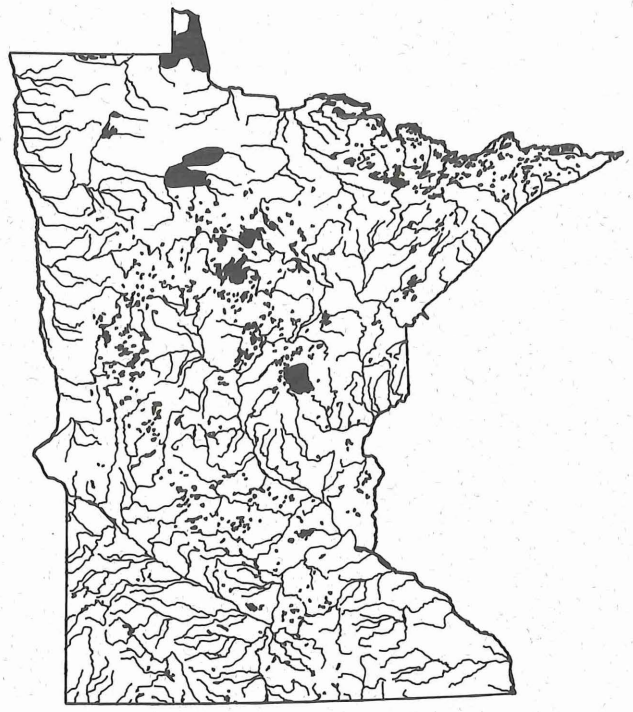
Implementation Leaders

AG	Office of the Attorney General
BWSR	Board of Water and Soil Resources
DNR	Department of Natural Resources
EQB	Environmental Quality Board
FED	Federal Agencies
GOV	Governor of Minnesota
LCMR	Legislative Commission on Minnesota Resources
LCWM	Legislative Commission on Waste Management
LEG	Legislature
LGU	Local Governmental Units
LWC	Legislative Water Commission
MDA	Department of Agriculture
MDE	Department of Education
MDH	Department of Health
MES	Minnesota Extension Service
METC	Metropolitan Council
MGS	Minnesota Geological Survey
NRRI	Natural Resources Research Institute
OEE	Office of Environmental Education (SPA)
OWM	Office of Waste Management
PCA	Pollution Control Agency
SPA	State Planning Agency
SUS	State University System
TED	Department of Trade and Economic Development
UM	University of Minnesota
WRC	EQB Water Resources Committee

The Environmental Quality Board established the Water Resources Committee in 1985 to help coordinate and guide state water management activities.

a regulatory document. It guides by the use citizens, legislators, and agencies make of it. It is up to those who manage water and those who make policy to apply the MWP principles and to address the actions recommended. In this way, the MWP provides the foundation for Minnesota's efforts to coordinate and integrate water programs. It is a sounding board for evaluation of the new policies needed to protect and conserve Minnesota's water into the 21st century.

Figure 1 Surface Water Resources



Source: SPA Land Management Information Center.

How was the MWP put together?

The EQB assigned the job of developing the MWP to its Water Resources Committee (WRC). A preliminary version of the plan was developed by the WRC in the fall of 1989. It was sent to over 100 interest groups and associations.

Many of these leaders participated in a "State Water Plan Kickoff" meeting in December 1989, and follow-up meetings in May and October of 1990. The February 1990 issue of the Water BillBoard, an interagency newsletter coordinated and published by the Board of Water & Soil Resources (BWSR), was devoted to the water plan.

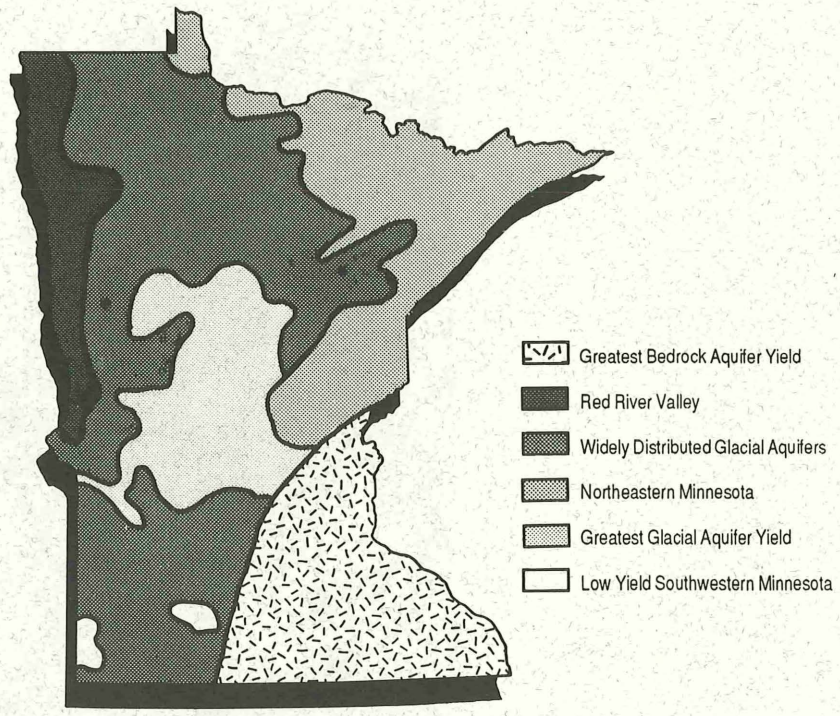
A series of public meetings to discuss the MWP was organized by the BWSR in late March and early April, and by local water planning groups in August and September. These gave the WRC the opportunity to hear directly from local water planning groups and other interests.

The meetings provided public input for revision of the various drafts of the MWP. The WRC and its staff used many ideas offered by readers and meeting participants. Foremost among these have been ideas from comprehensive local water plans. Local water plans are a major ingredient of the MWP's foundation.

Who will carry out recommended actions?

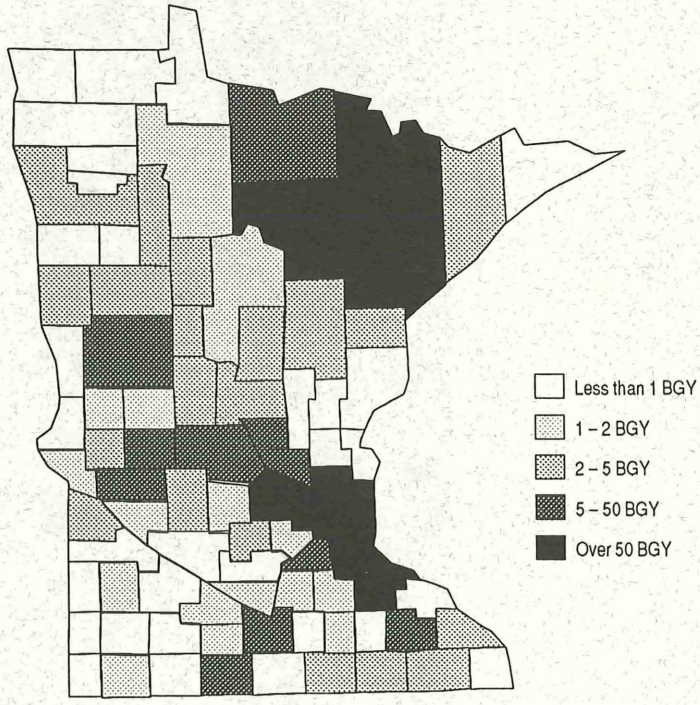
The MWP identifies leaders for facilitating implementation of a recommendation's "first steps." These are indicated throughout the plan with an acronym. The references do not identify every agency that may need to get involved in carrying out a first step. They merely identify the lead agency, or agencies, that will take responsibility for getting the step implemented. These agencies are shown on page 2. The Environmental Quality Board will monitor and guide implementation of the **Minnesota Water Plan** through the WRC.

Figure 2 Hydrogeologic Regions



Source: Minnesota Geological Survey.

Figure 3 Minnesota Water Withdrawals
Billions gallons / year (BGY), 1988



Source: Department of Natural Resources / SPA DATANET.



Goals and Principles

The Minnesota Water Plan's goals and principles set the course for water and related resources management in the state. They address both public and resource needs. They are the foundation of every recommendation made in the MWP.

Goals for Minnesota

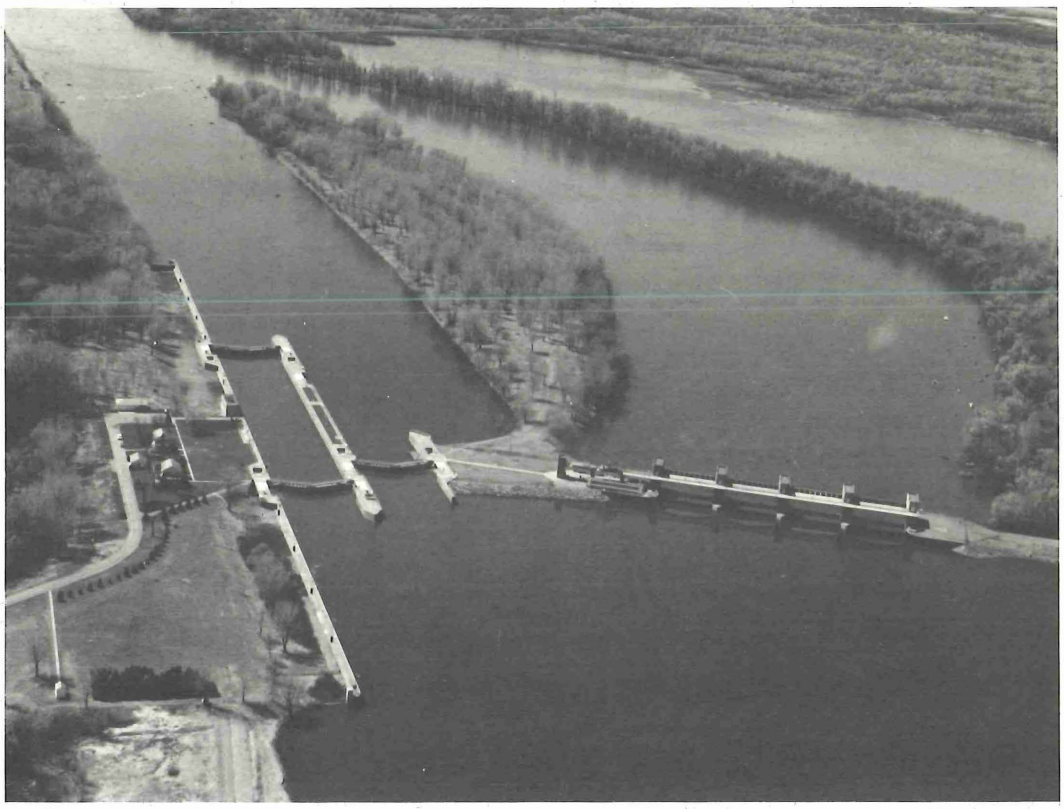
Minnesota's WATER GOALS are:

- To improve and maintain the high quality and availability of Minnesota's water for future generations and long-term health of the environment.
- To ensure that our uses of water are sustainable, and that in meeting our needs for water, we recognize its limits and interconnections, accept its changing and variable nature, and adjust our demands upon it when necessary to safeguard it for future needs.

Principles

Certain principles need to be followed by administrators, lawmakers, and citizens to attain these goals. Minnesota's WATER PRINCIPLES are that we:

- ***Manage water's interconnections.*** These occur between water and ecosystem health, surface and ground water, water quality and quantity, and among air, land, and water resources.
- ***Focus on the resource.*** A wide range of programs must be brought together to protect and manage the lake, wetland, stream, or aquifer in jeopardy.
- ***Manage hydrologic units.*** Minnesotans need to manage the interconnections of streams, lakes, wetlands, and ground water through their watershed, river basin, and "ground-watershed" systems.
- ***Make partnerships work for water.*** Partnerships bring people together to address Minnesota's complex water needs. Local, regional, state, and federal governments, the University community, the nonprofit sector, and interest groups must all take part in Minnesota's water partnerships.
- ***Make prevention the focus.*** Minnesotans must focus efforts on prevention of water degradation and overuse. It costs far less in the long run.
- ***Put public health and safety first.*** Public health and safety must never be compromised in the management of water.
- ***Recognize the importance of information.*** Sound information makes for sound decisions. Minnesotans need water information that accurately describes what is happening to water. They also need data that is accessible, understandable, and interconnected.
- ***Understand the importance of research.*** Research provides the scientific knowledge base essential for making sound water management decisions.
- ***Think long-term.*** The long-term costs and benefits to society, not short-term demands and crises, must guide water decisions.
- ***Accept limits to growth.*** The vulnerability and availability of water resources should limit economic development when environmental quality would otherwise not be sustained.
- ***Make those who benefit pay.*** The public at large should share the cost of government actions where society benefits, but when individuals benefit, they should bear the costs.
- ***Let citizens make a difference.*** Citizens



help to identify, understand, and reconcile the competing demands for water. It is important to involve them in the full range of water activities, from monitoring to policy debate.

- ***Educate people to change behavior.*** People pollute. People waste water. People need to understand the consequences of their behavior. Otherwise, they will be less likely to change habits. Formal and non-formal water education are keys to the success of all water management activities.
- ***Make government understandable, adaptable, and accountable.*** Minnesotans must understand how programs protect resources. Programs must adapt to changing conditions. They must respond to changing needs. Administrators must account for program results.

"Humankind has not woven the web of life. We are but one thread within it. Whatever we do to the web, we do to ourselves. All things are bound together. All things connect. Whatever befalls the Earth, befalls also the children of the Earth."

Chief Seattle

Integrating Water Management

The Minnesota Coordination Strategy

How can state government be made more understandable and responsive to the public?

How can Minnesota governments be unified in pursuit of a common set of goals and principles?

How can we continue to build the partnership between state and local government in comprehensive water planning?

The state has a number of agencies that relate to water. Each administers water-related programs authorized by law. The number of agencies, laws, and programs make the system difficult to understand. Federal requirements and local responsibilities add to the complexity. Yet, citizens need to understand where to go to get information and answers to problems. Government, itself, needs a sharp definition of the duties its agencies and units must carry out. Otherwise, it will not do the job expected by the citizens of Minnesota in protecting and conserving water resources.

No single agency or governmental unit can protect or manage water alone. The federal, state, regional, and local levels of government each have key jobs to do.

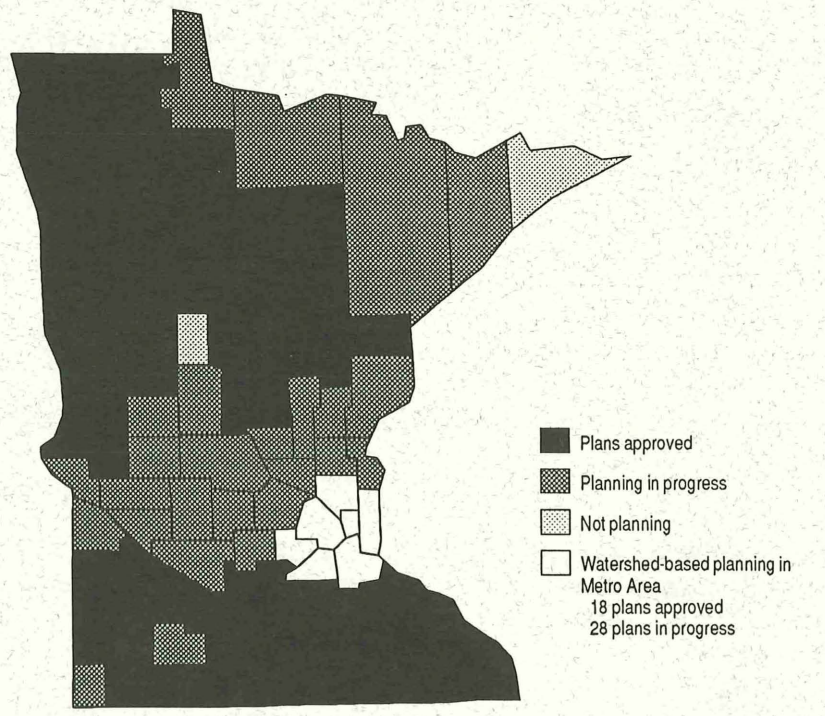
Local government makes crucial day-to-day land and water decisions that directly affect water resources. It has important land use authorities needed to protect water resources. Local water plans provide a focus for local priorities and actions. Local water planning and plan implementation is underway across the state.

The regional, or interlocal, level of government brings local units together for joint protection activities. For a number of reasons, this has greatly aided greater Minnesota counties in developing local water plans. The counties have pooled their resources. They have tapped the resources that various university and state university campuses have to offer. They have tied into state government. Without the regional, multi-county organization much of this would not have been possible. Not incidentally, the regional level is also needed to address problems that cut across local boundaries.

EQB Water Resources Committee (WRC):

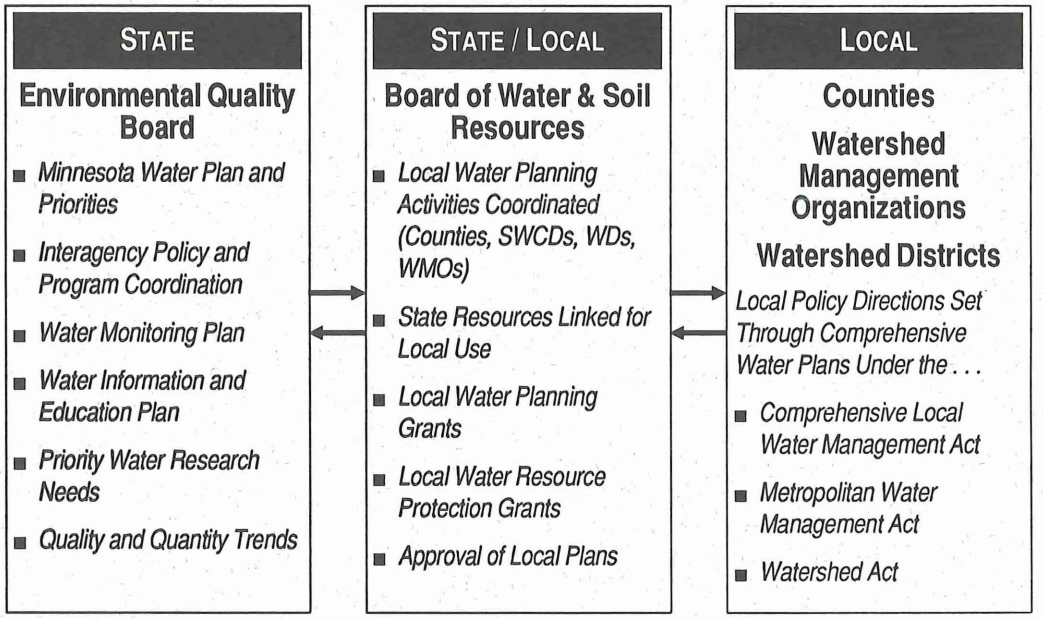
Commissioner of Agriculture,
Commissioner of Health,
Commissioner of Natural Resources,
Commissioner of Pollution Control,
Chair of Board of Water and Soil Resources,
Director of Legislative Water Commission,
Director of Office of Waste Management,
Representative of the University of Minnesota,
EQB Citizen Members (2).

Figure 4 Status of Local Water Planning



Source: Board of Water and Soil Resources.

Figure 5 Water Program Coordination in Minnesota



Water is a major state asset. There is a great state interest in protecting, conserving, and allocating it. In carrying out its responsibility for water, the state implements policy established by the United States Congress and by the Minnesota Legislature. In doing so, it has the job of ensuring that the interests of all Minnesotans are fairly considered. This duty includes those citizens as yet unborn. The **Minnesota Water Plan** provides the framework for tying state water efforts and needs together.

The federal government has a job similar to that of the state, except that its focus is nationwide. Many of Minnesota's water-related regulations originate from the federal government. Air and water quality standards, and wetland "fill" permits are examples. In addition, the Minnesota offices of the federal agencies provide assistance to state and local units and citizens in the form of cost-sharing, technical advice, research, and information and education.

The various federal, state, and local contributions to the management of Minnesota's surface and ground water are described in tables located in the chapter "Focusing on the Resource."

The challenge of our system of government is to recognize the strengths and weaknesses of each level. The State of Minnesota should not defer to the federal level in every instance, because it has a better understanding of Minnesota's needs. For this same reason, the state must recognize that local government may often better understand the local situation. A system that is sensitive to these realities seeks flexibility without sacrificing the public trust.

The 10-Year Objective

To make water management in Minnesota more understandable, efficient, and directed toward meeting state goals.

Recommendation 1

Establish, monitor, and refine a Minnesota coordination strategy.

The strategy must ensure that coordination occurs between agencies, Native American Na-

"Local water planning has evolved to the point where counties now feel they have a meaningful voice in establishing policy."

Molly McGregor
Administrator, Mississippi Headwaters Board

tions, and among local, state, and federal governments.

The coordination strategy should meet the following tests. It must:

1. clearly define the jobs each level of government and each agency should carry out;
2. make government responsive to the mandates given it by the Legislature and Congress;
3. seek coordinated, cooperative, flexible, and innovative approaches to water issues;
4. provide a fair way to avoid and resolve conflicts;
5. keep open lines of communication among all the participants involved in managing Minnesota's water;
6. continually check government's success in carrying out the public trust; and
7. be easily understood and easily followed.

The **Minnesota Water Plan** provides the strategy's framework for guiding policy, funding, and management activities in the State of Minnesota. To fill in this framework, it is necessary to ensure that the plans and strategies of state agencies are consistent with the policies, principles, and priorities of the **MWP**. It is also important to work with federal agencies to ensure that they recognize the guidance function of the **MWP**.

The First Steps

- Establish the coordination strategy in cooperation with representatives of comprehensive local water planning, member agencies of the EQB Water Resources Committee, federal agencies, the Native American community, and the Legislative Water Commission. *(EQB)*
- Assist the Legislative Water Commission in its assessment of the state's water management needs for the year 2000. *(EQB)*
- Cooperate with the Legislature on actions necessary to address the priority issues identified in the **MWP**. *(EQB)*
- As an initial step in using the strategy, examine the issues surrounding distribution of state agency staff in central and regional offices. *(SPA)*

Recommendation 2

Make comprehensive local water plans a highly visible element of the coordination strategy.

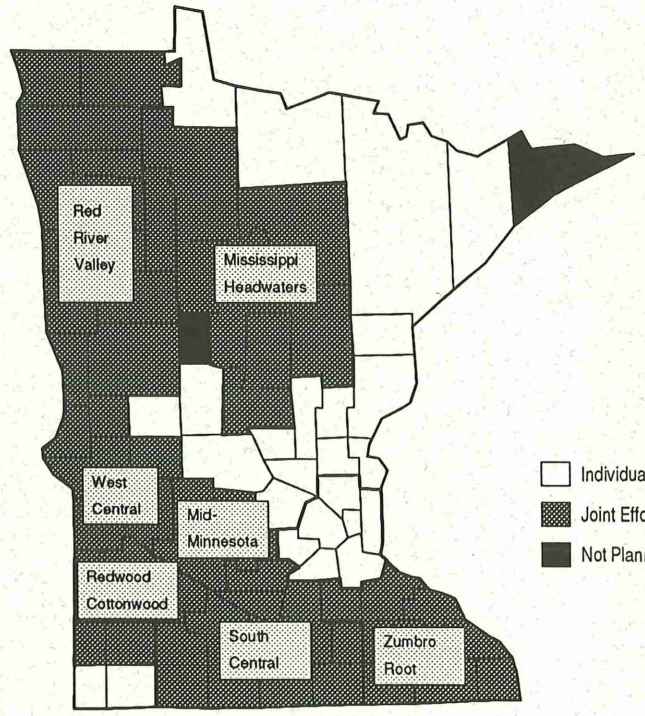
State programs should require existence of, and responsiveness to, approved comprehensive water plans as a condition of eligibility for water-related grants and a factor affecting priorities. The state also needs to consider comprehensive water plan recommendations of local governments in future **MWP** development. Finally, the state should encourage multi-county and, in the metropolitan area, intercommunity efforts to address water problems from a basin, or other regional, perspective.

Local government is often in the best position to understand a problem and its possible solution. Land use controls are a primary responsibility of cities and counties and are a major tool for protection and management of water resources.

Advantages of Intercounty Approaches to Local Water Planning:

- *Manage major watersheds and aquifers as units.*
- *Ensure communication and coordination.*
- *Provide consistent approaches.*
- *Share innovative ideas and information.*
- *Share staff and expertise.*

Figure 6 Joint Water Planning Efforts



Source: Board of Water and Soil Resources.

Legislative Water Commission, Jobs for 1991

Minnesota's Water Management Needs for the Year 2000.

Sustainable Agriculture.

Waste Pesticides and Pesticide Containers.

Wastewater Treatment.

Review Policy/Programs/Reports on:

- Acid Rain.
- Ag Chemical Response Board.
- Aquaculture.
- Environmental Ag Education Contracts.
- Metropolitan Water Management Act.
- Minnesota Water Plan.
- Nitrogen in Ground Water.
- Water Availability Trends.
- Water Quality Trends.
- Water Research Needs.
- Water Resource Protection Requirements.
- Wetlands.

The First Steps

- Identify state water-related grant programs not yet tied to comprehensive local water plans and initiate steps to make appropriate ties. *(BWSR)*
- Set an agenda for strengthening comprehensive local water plans. Many of the plans completed thus far are excellent by any measure. Others represent a good first step. If plans are to become the "building blocks" for water management initiatives, if they are to lead to effective local ordinances, they must be strong. *(BWSR)*
- Expand the state's ability to provide technical assistance to local units involved in comprehensive water planning and plan implementation. *(BWSR, DNR, MDA, MDH, PCA)*

Comprehensive Local Water Plans:

- *Pull together existing information.*
- *Estimate future demands on water and land resources.*
- *Identify problems and opportunities.*
- *Define local goals, objectives, and priorities.*
- *Point out opportunities with state programs.*
- *Establish a plan of action for local water management.*

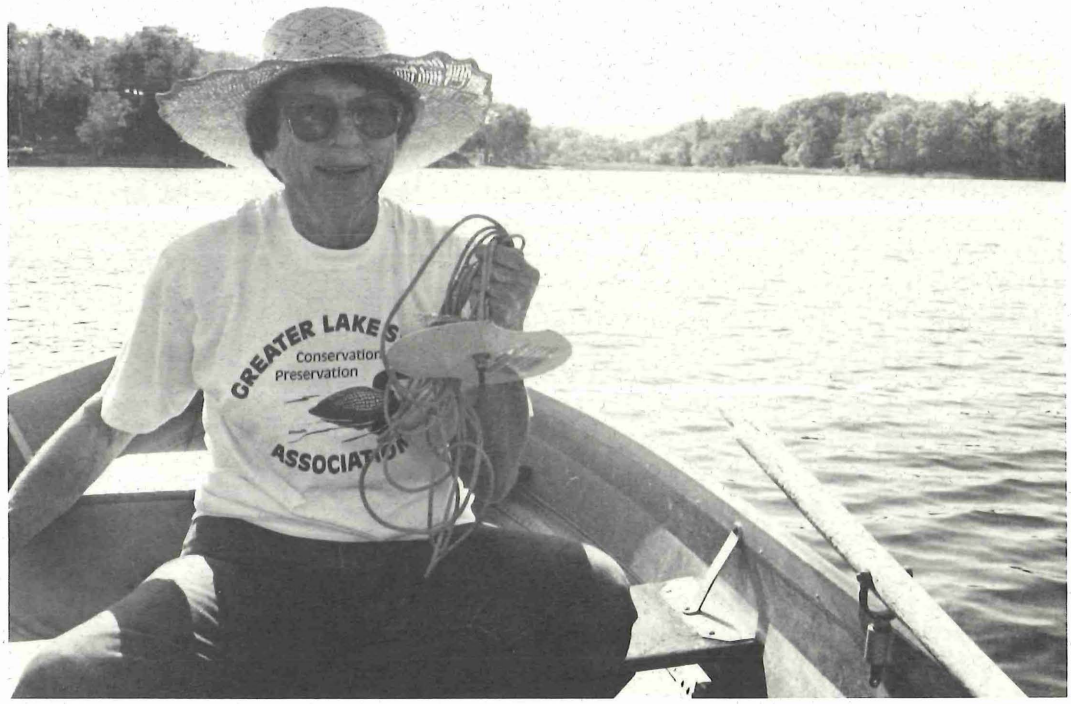
Board of Water and Soil Resources (BWSR)

Voting members include representatives of:

Counties (3);
Watershed Districts or Watershed Management Organizations (3);
Soil And Water Conservation districts (3), and
Unaffiliated citizens (3).

Nonvoting members include:

Commissioner of Agriculture;
Commissioner of Health;
Commissioner of Natural Resources;
Commissioner of Pollution Control
University of Minnesota Representative.



Communication and Education

How can people be better educated about water issues?

How can communication between state and local governments and citizens be strengthened?

Are there better ways to provide the training both local and state staff and officials need?

Environmental education needs to begin early and last a lifetime. It occurs in many places such as in schools, the workplace, at public meetings, and in the media. Continued improvement in water quality and wise management of water depend on individuals and groups voluntarily changing behavior. Yet today, many have lost touch with nature or fail to see how their actions affect water and soil resources.

The 1990 Legislature enacted the Environmental Education (EE) Act. The new law is based on the Strategy for Environmental Education prepared by the former Minnesota Environmental Education Board. A major effort is ahead to get it carried out.

We need to improve communication between the state and others relating to water resources. People need to understand how they can obtain or provide information to the state. Training is needed at both the state and local levels to ensure that policy-makers and staff take a broad view and have the skills needed to manage the resource.

Local government plays a key role in water management. The state needs to unify its delivery of information and assistance to local government to ensure problems are addressed in the broadest context.

The 10-Year Objective

To develop and carry out a statewide water resources information and education strategy as an integral part of the state's new environmental education program.

Recommendation 3

Launch a major environmental education initiative to show people how their actions affect the environment.

The initiative must strengthen the state's existing formal and nonformal water educational efforts. It must ensure that they occur in a coordinated, systematic manner. The new Office of Environmental Education (OEE) must develop into a respected focal point and catalyst for water, as well as environmental education. The Department of Education must expand its formal education efforts to ensure that Minnesota children receive K-12 water-related (as well as the broader environment-related) curriculum.

The First Steps

- Fund the Office of Environmental Education. *(OEE)*
- Develop a water information and education plan that defines the roles and linkages of the OEE, MES, and other water-related interests. *(EQB, OEE)*
- Establish state and regional Environmental Education Resource Centers that serve as clearinghouses for environmental materials. *(OEE)*
- Provide assistance to local government in carrying out the educational efforts recommended in their local water plans. *(OEE, BWSR)*
- Develop a model integrated K-12 curriculum and evaluate it using selected school districts. *(MDE)*
- Support teacher training for water issues and ensure that curricula integrates environmental goals and measurable results. *(MDE)*

Recommendation 4

Open up lines of communication among local, state, and federal levels of government, as well as citizens and the private sector.

Safeguarding Minnesota's water requires greater communication and

1990 Environmental Education (EE) Act calls for:

- *Office of EE in SPA.*
- *Agency and citizen advisory board.*
- *Continuous planning for EE.*
- *Regional resource centers.*
- *EE programs in all public schools.*
- *Biennial conference.*

"One major accomplishment of local water planning is the heightened awareness of local decision-makers and citizens about the importance of natural resource protection."

"A related accomplishment is improved communication among the public, water planning committees, and state and federal agencies."

"A valuable outcome is clarification and appreciation of the variety of water protection programs currently in force."

Robert Finley
Director, Redwood-Cottonwood Rivers Control Area Board

Figure 7 1990 Status of Water Protection Ordinances
Zumbro–Root River Joint Powers Board

County	Sinkhole	Water Well Construction	Water Well Abandonment	Sewage System	Livestock Waste	Erosion Control	Solid Waste	Geologic Atlas
Dodge	EP/I	EP/I	EP/I	●	●	R	●	
Fillmore	●	●	EP/I	●	EP/I	●	●	
Goodhue	EP/I	EP/I	●	●	EP/I	EP	●	
Houston	EP/I	EP/I	EP/I	●	●	EP	●	
Mower	EP/I	EP/I	●	●	EP/I	EP	●	
Olmsted	X	X	●	●	EP/I	●	●	●
Rice	EP/I	EP/I	●	●	●	EP	●	X
Wabasha	EP/I	EP/I	●	●	EP/I	EP		
Winona	●	●	●	●	X	●	●	●

● – Adopted
EP – Education Program Only
X – In Progress
I – Inventory
R – Revising Old Program

Public support for protecting Minnesota's water:

85% of Minnesotans believe that more needs to be done to solve state ground water pollution problems.

75% support increasing taxes on polluting industries.

75% support banning activities which cause pollution.

Over 90% were in favor of the following measures:

- *Increasing regulation of disposal practices;*
- *Researching ways to minimize the production of industrial waste; and*
- *Requiring the use of processes which minimize the generation of hazardous wastes.*

Survey results from Center for Urban and Regional Affairs, University of Minnesota, January 1989

The 15 counties in northwest Minnesota and the 13 south central counties emphasized the need to develop educational programs. Both groups hired Cluster Water Quality Extension agents to develop and coordinate education and information activities in the region.

cooperation among local, state, regional, and federal governments, the university system, and the private sector. Good communication is essential to the local / state partnership in water planning. That partnership also needs regular communication with post-secondary schools. Communication with citizens is important. Citizens can make a difference, as the MWP principle states. But, they need to be informed about programs and policy choices.

The First Steps

- Develop a pilot electronic information system to share water-related information including data bases, water news, and calendars with interested parties. *(SPA)*
- Support and improve the Water Billboard in providing information about water issues and solutions. Expand the use of its calendar for meeting notices. This effort requires the participation of all agencies. *(BWSR)*
- Prepare a citizens guide to state and local water programs and regulations. By informing citizens about the state's programs and policies, the state builds educated participators in the decisions it makes. *(BWSR, EQB)*

Recommendation 5

Strengthen efforts to meet the ongoing training needs of local and state water managers and policy-makers.

All levels of government need to attract and keep highly motivated, well-trained staff. They need up-to-date technical understanding to develop and carry out regulations and programs.

It will be important to ensure that Minnesota schools of higher education provide educational opportunities that enable students to understand the state's complex water resources including its hydrogeology.

An ongoing process is needed to provide training opportunities for resource staff regarding research findings, new technologies, and innovations in resource management. Ongoing internships for state staff at Minnesota educational facilities should be one element of the process. In addition, local governments should be given special training for water and related land resource management including the development and use of official controls.

The First Steps

- Assist local units with water plan development and implementation by providing training opportunities on tools for addressing local water-related problems. *(BWSR, MES, UM, SUS)*
- Assess cross-departmental training needs of state water professionals and develop a joint state-university continuing education program to address priority needs. *(DNR, BWSR, MDA, MDH, PCA, UM, SUS)*

Information and Research

How can the state ensure that key research required to meet water management goals receives adequate funding?

How can we make data readily accessible and more useful for those who need it?

How can we get a better long-term understanding of changes in Minnesota's water quality and availability?

Managing water resources wisely requires understanding of the cause and effect of certain actions. This requires good information, as well as an understanding of the natural processes that such information may describe.

Sound decisions are made with sound information and understanding. Too often, neither the information nor the understanding is sufficient to guide those who are asked to make policy and management decisions.

Information is often not complete, or not available at all. Research is needed on a variety of water quantity, quality, and land use issues. There is also an urgent need to organize information so that it is readily available, so that it fits with related information to provide a total picture, and so that it can be analyzed to reveal trends.

Many agencies, units of government, and private organizations monitor water resources. Each party has its own, often unique, reasons for monitoring. Each collects and manages its water and related data to meet those needs. Each stores data in different locations, and in different formats, ranging from file cabinets to main frame computers. So, data collected for one program can be difficult to obtain for use in another. In addition, agencies and organizations often do not have sufficient data to meet their own needs, nor sufficient funding to expand data collection.

Baseline information about our water-related resources and about the effects of pollution on fish and wildlife is often also lacking. Needed baseline and trend information must come from new collections of missing data and from organizing existing data in a way that draws a complete picture.

Local government uses state water-related information and also collects its own data. To continue the partnership between state and local government, information needs to be easily shared between each level.

The 10-Year Objective

To establish the foundation for sound public policy and management decisions through a systematic approach to research and collecting, managing, and using water-related information.

Recommendation 6

Build a long-term base of support for the priority research needs identified in the biennial EQB water research needs assessment.

Ultimately, research must help land and water managers — right down to the individual land user — make good decisions. Today's research challenges, more than ever, require an interdisciplinary systems focus, and a focus on water resource units, like a particular aquifer or river basin.

Water research needs of the public sector often differ from the kinds of research the private sector may want to sponsor. Many research projects, not production- or profit-oriented, may take several years to obtain results. It is difficult to obtain needed funding for long-term research needs due to the short-term nature of governmental funding sources. The Environment and Natural Resources Trust Fund provides a new opportunity to fund vital research. Federal research contributions will continue to play a major role.

Each year, new demands are placed on government to safeguard public health and protect the environment. These demands require the support of research to define the approaches that should be taken. A close give-and-take relationship between the

"How can one buy or sell the air, the warmth of the land? That is difficult for us to imagine. We do not own the sweet air or the sparkle of the water. How then can you buy them from us?"

Chief Seattle
Address to the American President, 1855

Legislative Commission on Minnesota Resources
Selected Projects 1992 – 1993

Information and Research – $4,200,000

Stream and Watershed Information Systems.
Lake Superior Institute for Research.
South Central Surface Water Atlases.
Biological Control of Pests.
Base Maps for 1990s.
Statewide NWI/PWI/Watershed Map Digitization.

Ground Water – $2,169,000

County Geologic Atlas/Sensitivity Mapping.
Ground Water Remedial Actions Assessment.
Aquifer Analyses in Southeast Minnesota.
Effective Nitrogen Management for Sensitive Areas.
Review Levels of Pesticides at Spill Sites.

Surface Water – $4,032,000

Minnesota River Basin Water Quality Monitoring.
Waterwatch–Citizen Monitoring.
Clean Water Partnership Grants.
Mitigating Mercury in Northeast Minnesota Lakes.
Cannon River Watershed Protection Program.
RIM Reserve and Resource Protection.

Education – $1,090,000

Comprehensive Environmental Education Program.
Integrated Resources Training.

Grand Total – $11,491,000

research and management communities is essential. In addition, there is great competition for today's research dollar. Both factors make it vital for research to be targeted to meeting priority needs.

The First Steps

- Establish an EQB research advisory committee. The committee should consist of local, state, and federal government representatives and research experts. The committee should cooperate with the University Water Resources Research Center and other State University Centers. The committee should help update the biennial research needs assessment developed in 1989. A research funding plan should also be prepared with its assistance. *(EQB)*
- Seek agreement with the Legislative Commission on Minnesota Resources and the Legislative Water Commission on water research priorities warranting support through the trust fund and other state funding sources. *(EQB)*
- Develop an extended grant program component for a portion of Trust Fund and Minnesota Future Resources Fund expenditures to address long-term research projects. *(LCMR)*

Recommendation 7

Improve the state's Geographic Information System so that all users can easily access and integrate data on surface water, ground water, and related land resources.

The state's existing geographic information system, developed in the 1970s, is an automated system of land and water resources data. The system is valuable for evaluating information and understanding relationships, but contains outdated information and lacks other key information. Much information is based on 40 acre parcels, which is not sufficiently detailed for today's needs. Still, it offers an excellent template for building an overall system for managing information.

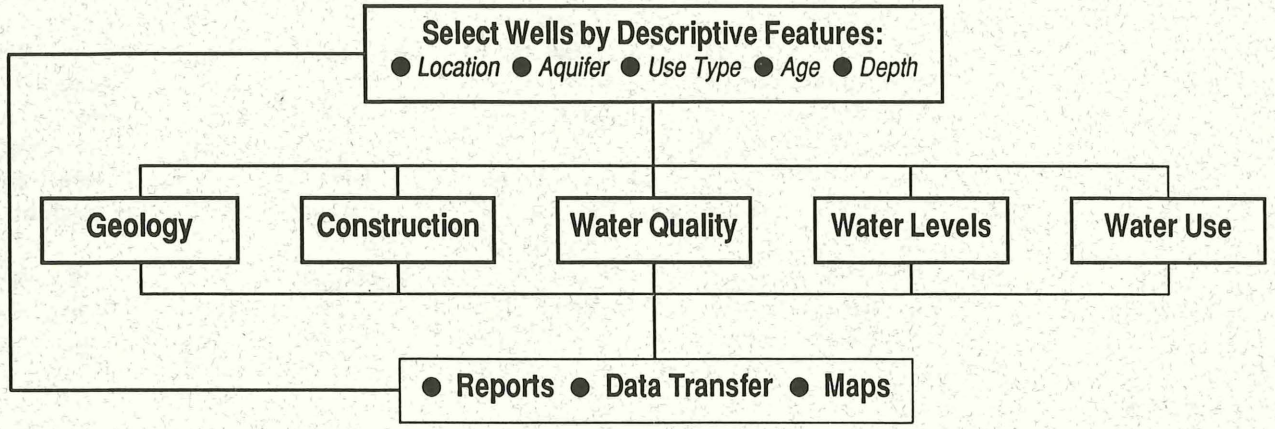
An improved state GIS system must do a better job of integrating ground water, surface water, and related land resources data. New standards and guidelines for data classification, automation, and exchange are a key part of this. A new series of data bases must be added to the system to make it relevant to today's information demands at both the state and local levels of government. Finally, understanding and use of the system, and access to it through data collection and automation standards, must be promoted at both the state and local levels.

The First Steps

- Implement the LMIC Ground Water Clearinghouse and the PCA Integrated Ground Water Information System. This should include long-term funding for automation of new well log records so that an

Surface water is a high priority for the eight Mississippi Headwaters counties. They established River Watch to monitor the Mississippi River's water quality and biotic communities.

Figure 8 State Planning Agency Ground Water Clearinghouse
Information Retrieval Features



up-to-date automated water well record data base can be maintained. *(SPA, PCA, MGS)*

- Initiate development of an integrated system for retrieving stream, lake, and related watershed information so that data systems reflect resource systems. Ultimately, this system should be linked to ground water information systems. *(SPA)*
- Revise and enforce LMIC compatibility standards for data collection, automation and integration so that more data bases are compatible, comparable, and able to be mapped. Standards should include a list of data depots, an indication of data source or quality, and the specific resource monitored. *(SPA, EQB)*
- Use regional and state water information depots to house information collected by state and local units in an accessible format. *(SPA, EQB)*
- Begin development of a "second-generation" geographic data base. This should have 1:24,000 USGS quad-level detail coverage of land use, soil survey, topography, hydrology, and other information needed for water analysis. *(SPA, LCMR)*

Recommendation 8

Make the commitment of money and authority necessary to carry out the state Water Resources Monitoring Plan.

Minnesota has a long history of water resource monitoring. Yet, much of this monitoring has addressed a particular purpose or project. Most was not designed to give a broad understanding of the environment or changes over time. As a result, the amount of available information varies greatly from one part of the state to another, and from one time to another. In addition, budget constraints have led to cuts in existing systems, further limiting our ability to track trends in water resources.

The state Water Resources Monitoring Plan will define the ground rules for coordinating state and local monitoring programs. It will emphasize the "networking" of information systems. The gathering of baseline resource information and the assessment of trends will be adequately supported, routine activities under the plan. Funding for baseline monitoring efforts will be stabilized through the Environmental and Natural Resource Trust Fund and fees on water use and pollutant sources. The plan is scheduled for adoption by the EQB in early 1991.

The comprehensive approach to monitoring will give us the ability to recognize changes that may be occurring in Minnesota's environment. It will help us rationally decide what

Geographic Information Systems (GIS)

"GIS development in Beltrami County . . . has enhanced water plan implementation by allowing local units of government to target water protection efforts."

Beltrami County uses of GIS:

- *Setting abandoned well priorities;*
- *Evaluating ground water contamination potential;*
- *Developing controls for septic system upgrading; and*
- *Evaluating sedimentation potential from ag uses.*

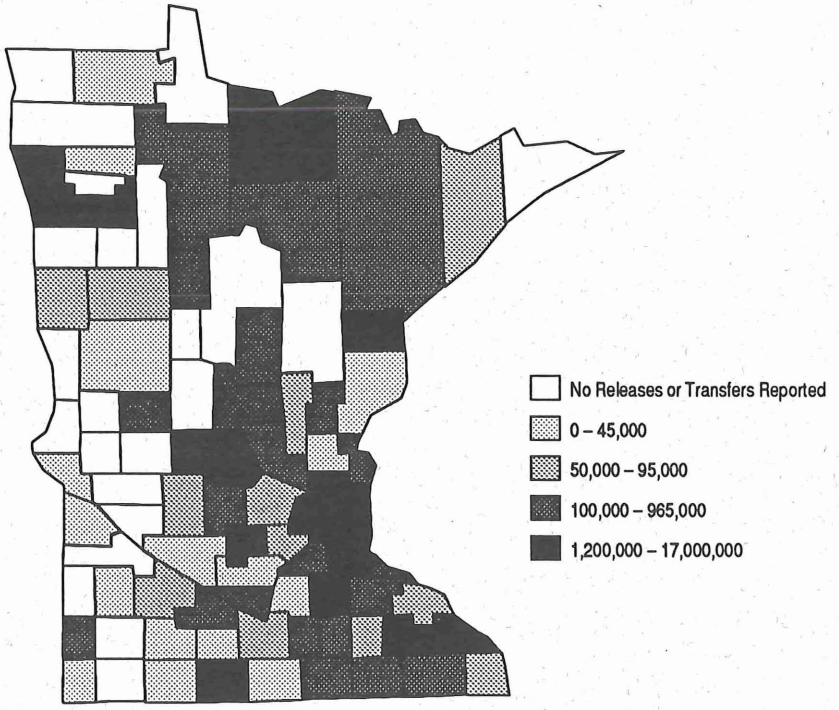
Since the early 1980s, nine southeast counties compiled data from water tests regionally. Now these counties plan to determine conditions in water supply aquifers and identify local sources of contamination.

should be done about them.

The First Steps

- Lay out the framework for a comprehensive, intergovernmental environmental quality monitoring network. *(SPA)*
- Prepare the initial biennial reports on water resource trends. *(EQB)*
- Implement the revised ambient ground water quality monitoring system, expanded drinking water quality monitoring, expanded surface water quality and quantity monitoring, accelerated ordinary high water mark determinations, and aquifer safe yield determinations. *(PCA, DNR, MDA, MDH)*
- Establish regional monitoring cooperatives through local water planning groups, and ensure that data collected is accessible through state data systems. *(PCA, SPA)*
- Encourage citizen monitoring. The "waterwatch" program recommended by LCMR would help fund local efforts and provide technical assistance on interpretation of data. It would also ensure that data is made compatible with state systems. *(PCA, LCMR)*
- Evaluate the adequacy of public and private laboratory facilities at meeting new citizen and local government demand for water tests. *(MDA, MDH, PCA)*

Figure 9 Amount of Toxic Chemicals Released
In pounds, 1988



Source: Department of Public Safety and Emergency Response Commission / SPA DATANET.

Liability and Enforcement

What steps should be taken to ensure a consistent approach to holding people liable for misuse of water?

How can the state do a better job of enforcing its water laws?

Liability is a complicated issue. Someone or some group of people pay the price for water that is polluted. These are paid directly, through such means as remediation costs. They are also paid indirectly, through such means as health costs or loss of aesthetics.

Minnesota law provides liability exemptions for certain groups. The statutes are inconsistent regarding liability questions and may not actually remove liability. As individuals and groups are removed from bearing liability for actions, the costs fall elsewhere. These costs need to be reassigned in a way that protects innocent victims.

A related problem exists with enforcement of existing laws. Whether enforcement has faltered because of budget cuts, or for other reasons, the state must take steps to systematically ensure that its laws are followed.

The 10-Year Objective

To uniformly enforce Minnesota law and fairly assign liability through it so that the environment is fully protected and the burden on people innocently exposed to water misuse is minimized.

Recommendation 9

Ensure a consistent state approach to fairly and equitably assigning liability for water misuse.

This requires assessment of the various statutory and common law approaches to assignment of liability in Minnesota. The assessment will evaluate consistency in these approaches and the degree to which innocent people are protected from bearing the actual costs of water misuse. The circumstances under which the manufacturer of a product should bear liability for its use or misuse must also be considered.

The First Step

- Assess statutory and common law approaches to liability in Minnesota. *(AG)*

Recommendation 10

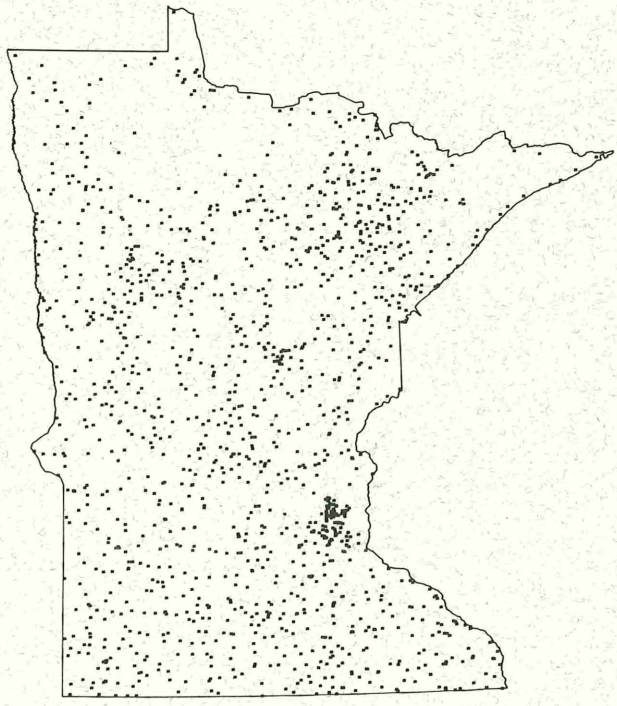
Enhance the state's environmental compliance strategy.

The strategy should enable government to ensure compliance with the growing number of environmental laws and regulated facilities. It should also help to ensure that effective enforcement tools and resources are applied across the board.

Costs of Contamination

- *Over $80 million for clean up at the Twin Cities Army Ammunition plant.*
- *$150,000 to replace seven Lansing residential wells polluted with pesticides.*
- *$90,000 for one year to provide carbon filtration in Long Prairie.*
- *$159,312 for one year for 97 Lakeland residences to receive bottled water and for remedial investigations.*
- *Property valuations reduced by $8,000 apiece in 1989 for Lakeland properties on bottled water.*
- *No FHA and VA mortgage when drinking water standards are exceeded.*

Figure 10 Historical Dumps



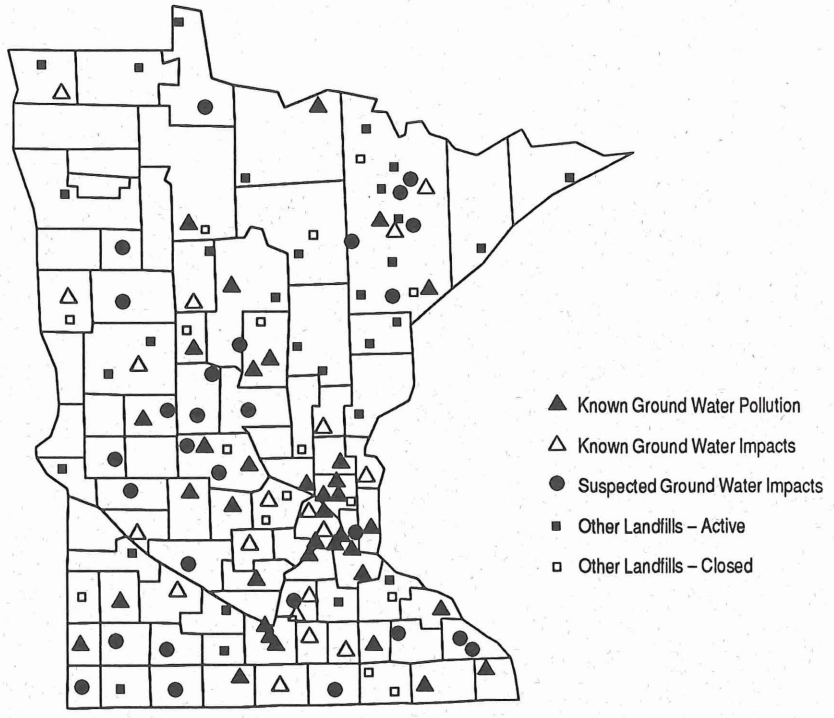
Source: 1980 U.S. EPA / PCA Open Dump Inventory. Digital Data: SPA Ground Water Clearinghouse.

The First Steps

- Encourage agencies to recover all costs resulting from permitting and enforcement activities. *(LEG)*
- Stiffen penalties for persons knowingly discharging toxics into air or water in violation of an emission limit or knowingly creating an unpermitted solid waste disposal site. *(AG, PCA)*
- Evaluate the role of the Environmental Rights Act in meeting today's enforcement needs. *(AG)*

A *July 1987 Twin Cities rainstorm provided enough water to fill Lake Calhoun eighty times, and caused over $39 million in damages.*

Figure 11 Groundwater Pollution at Permitted Mixed Municipal Landfills



Source: Minnesota Pollution Control Agency.

Infrastructure

How can we ensure that water and wastewater treatment systems meet new health and environmental protection needs of the state?

How can we ensure that our water infrastructure is effectively operated and maintained?

The water infrastructure, or "underlying foundation," includes the public works constructed for water management. Examples include water and wastewater treatment and distribution systems, constructed stormwater runoff systems, dams, locks, and navigation channels.

The issues surrounding Minnesota's water infrastructure involve research and financing questions. As with other elements in this chapter, they also require integrated approaches.

Minnesota's water and wastewater treatment systems and dams are aging. New demands are being made for safer, more protective systems. In the face of this, government funds for infrastructure improvements are decreasing. Further, they were never intended for replacement, repair, or maintenance of systems. The ability to pay for these improvements will be of even greater concern in small communities, and as the proportion of those on fixed incomes increases.

The 10-Year Objective

To ensure that Minnesota's water infrastructure is maintained and enhanced to keep pace with new demands for protection of people and the environment.

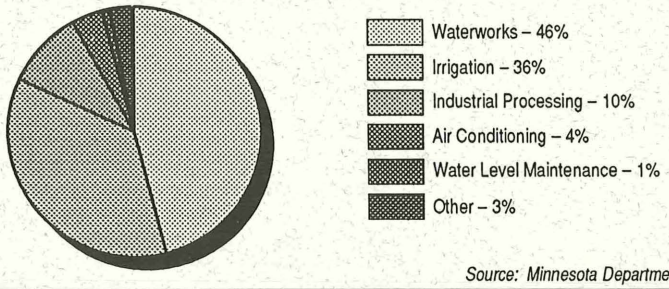
Recommendation 11

Upgrade Minnesota's water infrastructure with new technology to better safeguard public health and the environment.

Research must devise water and wastewater treatment systems that are more effective at removing contaminants, yet still affordable.

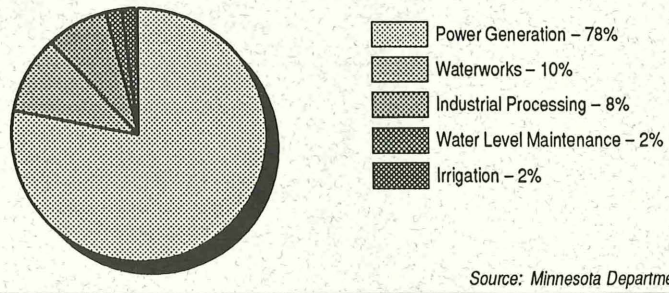
Improvements must also be made by using existing technology in a way that recognizes water's interconnections. Examples include: a) navigation maintenance and improvements that enhance or maintain both the economy and environment; b) stormwater systems designed for water quality protection, as well as runoff management; c) solid waste disposal facilities managed to prevent toxics from contaminating air, as well as water; and d) water and wastewater disinfection processes with reduced use of chlorine to control by-products

Figure 12 Reported Ground Water Use
1988 – 246 billion gallons



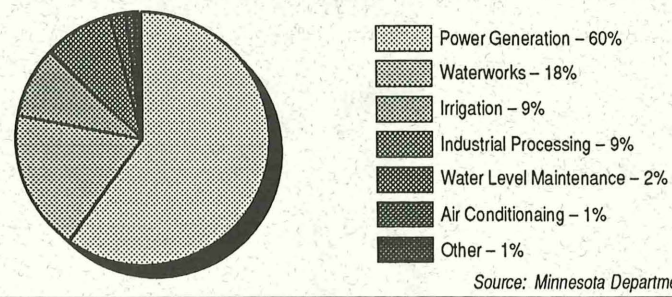
Source: Minnesota Department of Natural Resources.

Figure 13 Reported Surface Water Use
1988 – 856 billion gallons



Source: Minnesota Department of Natural Resources.

Figure 14 Total Reported Water Use
1988 – 1,102 billion gallons



Source: Minnesota Department of Natural Resources.

that are hazardous to human health and the environment.

The First Steps

- Support research on ways to upgrade individual and small community wastewater treatment systems so that — at a reasonable cost — they meet state degradation prevention goals. *(UM, SUS)*
- Support research to develop effective, inexpensive techniques for full scale drinking water treatment plants, as well as point-of-use and point-of-entry systems needed where no alternatives to contaminated supplies exist. *(UM, SUS)*
- Assess existing stormwater management policy to ensure that system improvements needed for water quality protection, as well as runoff management, are made at the time of their expansion or maintenance. *(PCA, LGU)*

Recommendation 12

Take steps to ensure that money is set aside for infrastructure maintenance and improvement.

Development of alternate funding methods for addressing small systems and low income populations will be one key. Requirements of financial assurance from those responsible for waste facilities is another. This will ensure that costs of long-term care of the waste once disposed, including maintenance and replacement of waste disposal facilities, are covered. Establishment of a contingency fund for dealing with actual or potential dam failure will also be necessary.

The First Steps

- Enact requirements for a wastewater treatment facility replacement fund within each public entity with a central treatment system to finance future infrastructure improvements. *(PCA)*
- Inventory future replacement needs of public water supply and wastewater treatment systems, and develop cost estimates for meeting these needs. *(MDH, PCA)*



Minnesota has 27 wastewater facilities that do not comply with federal and state requirements.

Approximately 150 cities will need major improvements by 2010. Early estimates place costs at $780 million.

Financing

How can state and local programs be placed on a sound financial footing?

How can the limited resources devoted to water be targeted to priority needs?

From research, to monitoring, to infrastructure, to state programs whose budgets were cut or duties expanded in the 1980s, to comprehensive local water plan implementation, financing remains one of the major issues in water management. It is clear that the Environment and Natural Resources Trust Fund is not going to supply a one-stop answer. There is too much competition for the fund's money.

Efficient direction of the trust fund toward meeting priority water data, education, and research needs will make a substantial contribution. However, more consistent and expanded use of fees, and development of new revenue sources must be considered. While the cost of water in Minnesota is low, the cost of protecting it is high. The cost of water generally does not reflect its value to the user, nor does it encourage conservation.

Clearly, water program resources must be targeted toward high-priority efforts. Low-priority activities must be reduced or eliminated.

The 10-Year Objective

To place state and local programs on a sound financial footing by targeting limited resources to priority needs and by expanding revenue sources.

Recommendation 13

Expand revenue sources and options available to state and local units.

Local governments need more flexibility and options for raising money to implement comprehensive local water plans. Recognition of this point must be a basic element of a revenue-generation plan. In concert with this, consideration will need to be given to sharing revenues generated by water fees at the state level.

The cost of water supply protection must be more fully recovered in fees. Fees and special taxes should also be designed to influence behavior. This can be done by using fees to underscore the relationship between special activities and problems and benefits.

The First Steps

- Develop a package of funding options upon which local governments may draw for implementation of comprehensive local water plans. *(BWSR, LGU, Revenue)*
- Evaluate the technical feasibility of dedicating new taxes or fees to water programs. *(EQB, Revenue)*
- Quantify the gross cost of water management activities and move toward fee and pricing structures that require users to finance management. *(DNR, PCA, MDH, MDA)*
- Broaden the base of funding for the Superfund program. The intent is to reduce its reliance on the General Fund and to stabilize the fund by making manufacturers whose products are sold in Minnesota contribute to the fund. *(PCA)*

Recommendation 14

Tie allocation of funds to priorities identified in the* Minnesota Water Plan *at the state level and to comprehensive local water plans, at the local level.

The Ground Water Protection Act of 1989 directs the EQB to identify priorities and to devise a funding plan to address these priorities. Comprehensive local water plans should provide a similar function at the local level. Actions related to the local plan function are described under Recommendation 2.

The First Step

- Develop a funding plan for addressing priority recommendations of the **Minnesota Water Plan**, the state water resources monitoring plan, and priority research needs assessment. *(EQB)*

Rice Creek Watershed District is funding a cost share program to help individual landowners fund shoreland erosion projects.

Minnesotan's on paying for water protection:

52% willing to pay higher general taxes.

56% support water use fees.

63% for higher prices for goods and services that cause water quality problems.

Over 75% favor paying higher prices for goods and services that depend on water quality.

Survey results from Center for Urban and Regional Affairs, University of Minnesota, January 1989

Several metro municipalities are instituting a surface water utility to fund water management. It allows a municipality to collect an annual fee based on runoff generated by particular land uses. It provides a stable revenue source.

Focusing on the Resource

Lakes

How can lakes be protected by comprehensive management of the environment?

Lake Quality Concerns:

- *25% of lakes smaller than 5,000 acres did not meet water quality standards for swimming and fishing.*
- *8% of lakes greater than 5,000 acres did not meet standards.*
- *Poor quality is primarily attributed to nonpoint sources.*

In 1986, 71,000 tons of copper sulfate were applied to Minnesota lakes to control algae and other pests. This is a piecemeal approach to problems that may be caused upstream in the watershed.

Minnesotans take pride in their lakes. They are a symbol of Minnesota. Their quality and their abundance reflect the quality of Minnesota's environment and our quality of life.

Lake problems are increasing. The sources of problems include air pollution, waste disposal, aquatic vegetation, and urban and rural runoff. In the past ten years, we have experienced formidable problems from both high and low lake levels.

There are many programs and regulations that address specific aspects of lake problems. A special opportunity exists to unify these efforts to ensure a comprehensive approach. Protecting and managing Lake Superior is a good example of how lake management often requires many disciplines crossing many jurisdictions. It is also a prime example of the need for a unified approach.

The 10-Year Objective

To adopt a coordinated, inter-disciplinary approach to managing the Minnesota lake environment.

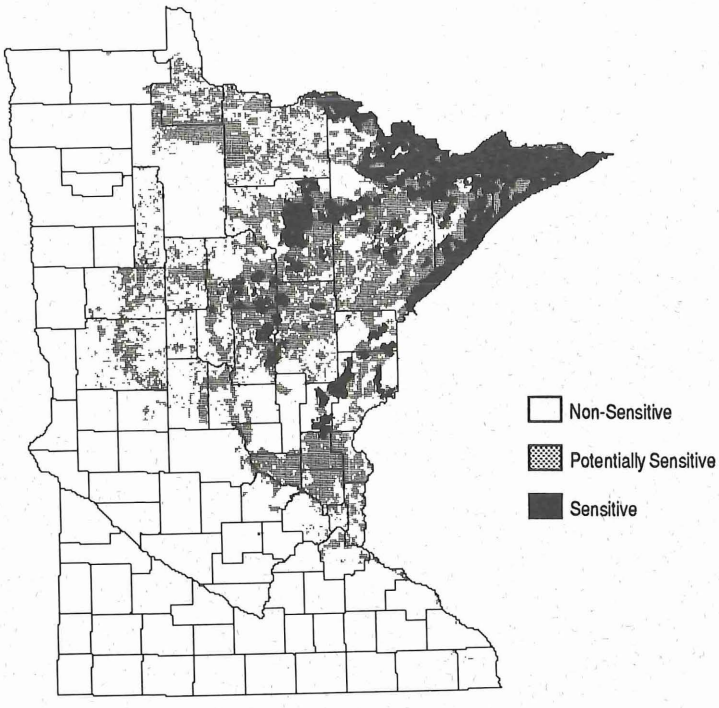
Recommendation 15

Develop a strategy for integrated lake management.

Several state and local agencies have responsibility for lake management. Fisheries, wildlife, aquatic nuisance control, public access, water surface use, and shoreland management programs are administered by the DNR. Lake quality protection and clean-up are handled through the PCA. Other state agencies, including MDH, MDA, and BWSR, have lake-related interests. Watershed districts, soil and water conservation districts, lake improvement districts, lake conservation districts, counties, cities, and towns all get involved in lake management.

A focus on the lake and its watershed as a resource is necessary to bring these disparate interests together. For example, decisions about fisheries management cannot be isolated from watershed protection choices. Neither should they be divorced from local lake use preferences. Both local and state interests must be considered in lake management decisions. In the metropolitan area, surface water management plans should be the vehicle for setting lake protection, lake enhancement, and lake management goals. To date, they have not been.

Figure 15 Acid Rain Sensitivity



Source: Minnesota Pollution Control Agency / SPA Land Management Information Center.

Understanding, managing, and protecting Lake Superior presents unusual challenges that could affect most Minnesotans. The lake demands a comprehensive approach which should consider air, land, and water interactions and inputs. It should bring together local, regional, state, and federal governments with educational and research interests.

The First Steps

- Convene a lake management task force to identify state management problems and priorities, the role of various lake programs, and a state strategy for comprehensive management of lakes. *(DNR, PCA)*
- Evaluate the effect of metropolitan surface water management plans on lake protection, lake enhancement, and lake management. *(METC, BWSR)*
- Adopt requirements in the new state rule for metropolitan water planning to ensure that metropolitan surface water management plans effectively address lake protection, lake enhancement, and lake management. *(BWSR)*
- Expand long-term water quality monitoring and toxics research efforts for Minnesota lakes. *(PCA, UM)*
- Design a research program to develop the understanding of Lake Superior's physical, chemical, and biological limnology needed to protect and manage the lake. *(UM, NRRI)*



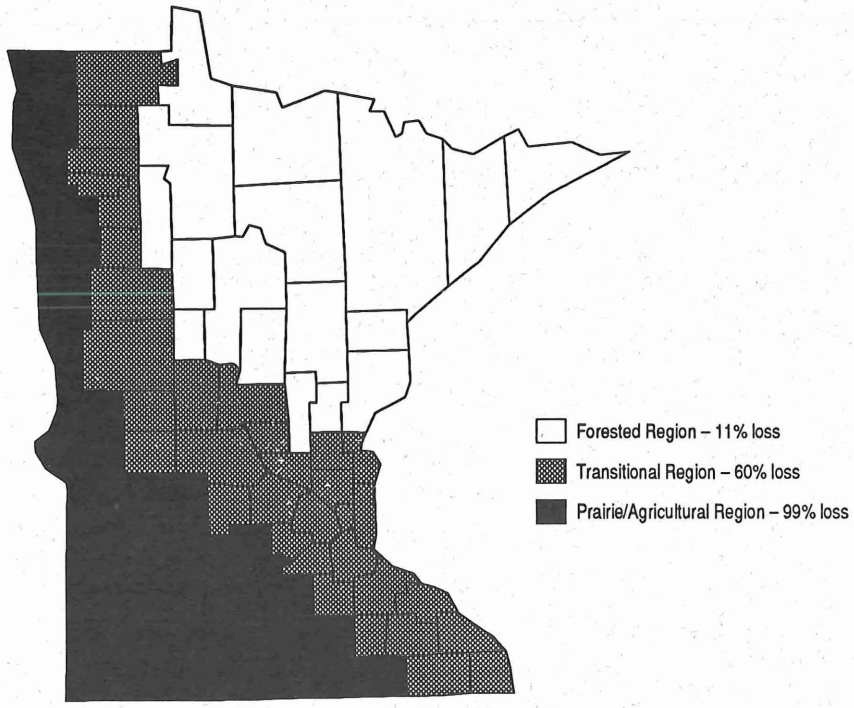
A recent study of mercury in northeastern Minnesota waters indicates that levels have increased from 2-5 percent per year in sediments and fish.

From 1967 to 1984, there was a 74 percent increase in the number of cabins and homes around lakes.

Since 1977, pesticide use water permits increased dramatically due to:

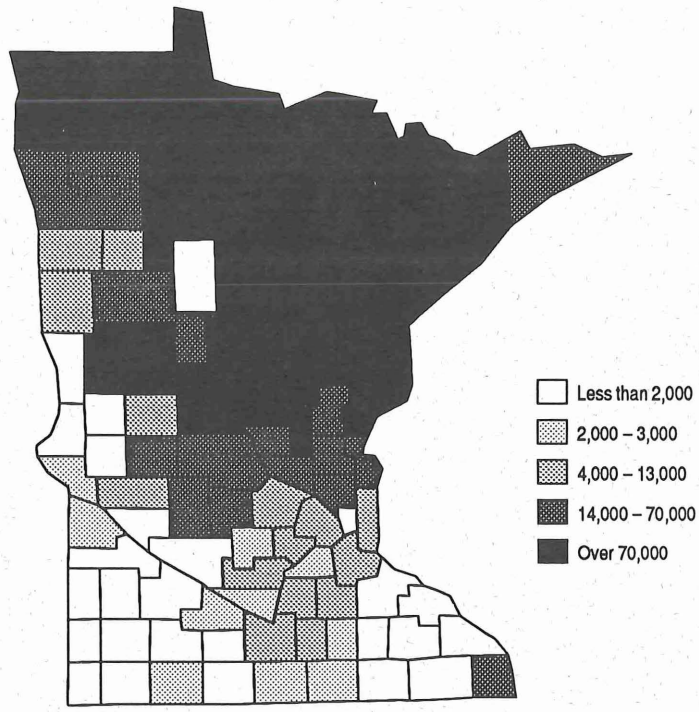
- *Marginal lakeshore development.*
- *Swimming, boating, and water skiing increases.*
- *Permit regulations awareness.*
- *Cultural eutrophication.*
- *Exotic plant species spread (e.g., purple loosestrife).*

Figure 16 Minnesota Wetland Loss by Region
1850 – 1984



Source: Center for Urban and Regional Affairs.

Figure 17 Current Minnesota Wetland Acreage



Source: Center for Urban and Regional Affairs.

Wetlands

What should be done to ensure that we do not lose the values provided by Minnesota's wetlands?

Nine million acres of Minnesota wetlands have been drained. About five million acres remain. Only 262,000 acres of these remaining wetlands are regulated by the state. At the current rate, the state can expect to lose about 5,000 acres each year through the 1990's.

The value of wetlands for wildlife is generally understood. Now, other benefits such as flood attenuation and water quality protection are recognized. Each year, Minnesota experiences about $70 million in direct and $60 million in indirect flood damages. On the average statewide, it costs $300 to replace an acre-foot of water for flood storage purposes. The cost is even greater in the metropolitan area. Minnesota can ill afford to lose the flood storage provided by wetlands.

The loss of wetlands is increasing in both rural and urban areas. The drainage code presents problems when used in urban expansion areas. The exact location, specifications, construction, and maintenance history of all public drainage systems need to be accurately documented.

The 10-Year Objective

To protect and restore wetlands while recognizing their importance in watershed-based management strategies for lakes, rivers, and ground water.

Recommendation 16

Establish and operate a state-local "no net loss" program for wetlands.

The program should be watershed-based. Watershed units would be the basis for wetland loss/gain accounting and banking. A wetland information system, based upon digitized (computerized) wetland boundaries, is necessary for tracking wetlands. Tracking and use of the state's wetland evaluation methodology, a tool for identifying the values of individual

wetlands, should each be elements of a protection program. In addition, local government should complement state wetland legislation by using its authorities to protect wetlands.

Agricultural drainage accounts for most wetland losses. An automated statewide inventory of public drainage systems and their characteristics is needed. An inventory of previously drained but restorable wetlands would provide the basis for wise use of RIM funds in wetland management. These inventories should be included in the wetland information system.

Public participation in the drainage law and the capability of participants to introduce environmental management components into drainage proceedings should be assessed. In addition, a handbook about building environmental concerns into drainage activities would help reduce wetland loss.

The First Steps

- Enact a comprehensive wetland management act that incorporates a wetland protection and enhancement policy and a watershed-based "no net loss" policy to cover wetlands that fall through current regulatory cracks. *(DNR)*
- Provide a consistent definition of wetlands to ensure compatible administration of wetland programs. *(DNR, FED)*
- Incorporate wetland protection provisions in metropolitan water management rules to ensure no net loss of wetland values. *(BWSR)*



Wetland management components:

- *No-net loss policy.*
- *National wetland inventory.*
- *Computerized information.*
- *Minnesota evaluation method.*
- *Wetland mitigation/banking.*
- *Wetland restoration and enhancement.*
- *Compensation.*
- *Local government involvement.*
- *Public-private partnerships.*

Gun Club Lake WMO completed an inventory of wetlands down to 0.5 acres and developed a system to protect water from development.

Minnesota has about 5 million acres of wetlands.

State "Protected Wetlands" total 261,709 acres.

Current losses of wetlands from all activities amount to about 5,000 acres annually.

80 percent of the prairie pothole wetlands existing in 1850 were lost to drainage for improved farmland.

Rivers

How can we tie together various land and water-related programs so that rivers and streams are protected and enhanced?

How can we build on local water plans to address the problems and opportunities found in our major river basins?

Minnesota has nine major river basins and 81 major watersheds. There are 25,000 miles of rivers and streams large enough to sustain significant fish populations and recreational activity. Rivers are a vital source of water for such divergent uses as drinking water, recreation, wildlife, and waste assimilation.

Most programs tend to focus on one facet of a river or stream. For example, Minnesota has programs addressing shorelands, wastewater discharges, and flood plains. However, we know that the quality and quantity of water in rivers are affected by land use activities far from the river's edge. While pollution from point sources is decreasing, storm water continues to be an important pollution source for sediment, fertilizers, pesticides and other wastes. Nonpoint source problems demonstrate the land use connection, but inter-connections between wetlands, ground water levels, and water use are not always obvious.

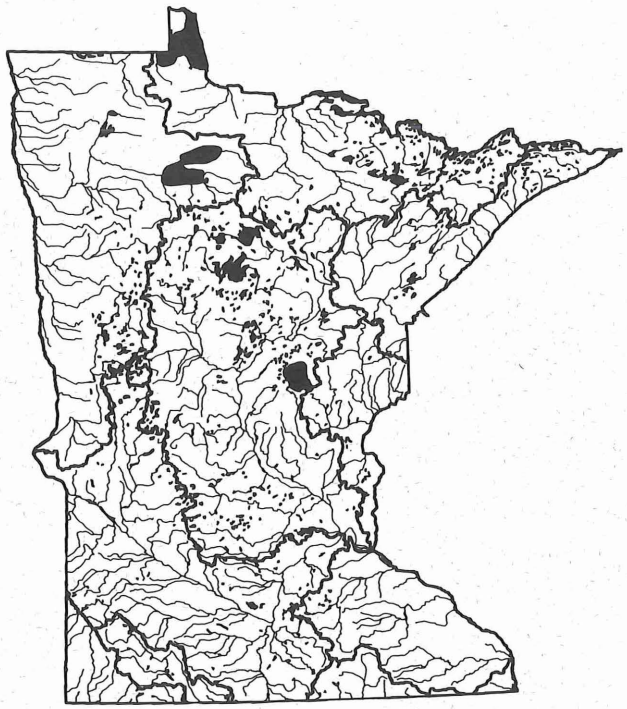
The aquatic ecoregion is a new concept used by the Pollution Control Agency to help people understand natural water quality characteristics and potential. It is based upon land use, soils, land surface forms, and potential natural vegetation.

The nature of Minnesota's rivers varies (as does the nature of many of its lakes) by ecoregion. Since rivers cut across ecoregions, their quality and linkage to the land may vary as one moves downstream. The ecoregion is useful in understanding natural characteristics of river segments. Wise management of a river requires application of this concept as ecoregion changes occur across the basin.

The state must provide leadership for activities and projects to safeguard the quality of Minnesota's rivers. Some cooperative river management programs are underway, such as in the Red River and in the Minnesota River. However, no one has the responsibility for tying all the various local, state, and federal activities together for the river. State agencies and local governments are simply not geared toward comprehensive river management. Because each river has its own unique qualities, this special focus is needed.

The Lower Mississippi River WMO requires the application of floodplain management standards in areas where state and federal law does not mandate them.

Figure 18 Minnesota Major River Basins



Source: SPA Land Management Information Center.

The 10-Year Objective

To manage rivers, both large and small, with their related land resources, as units.

Recommendation 17

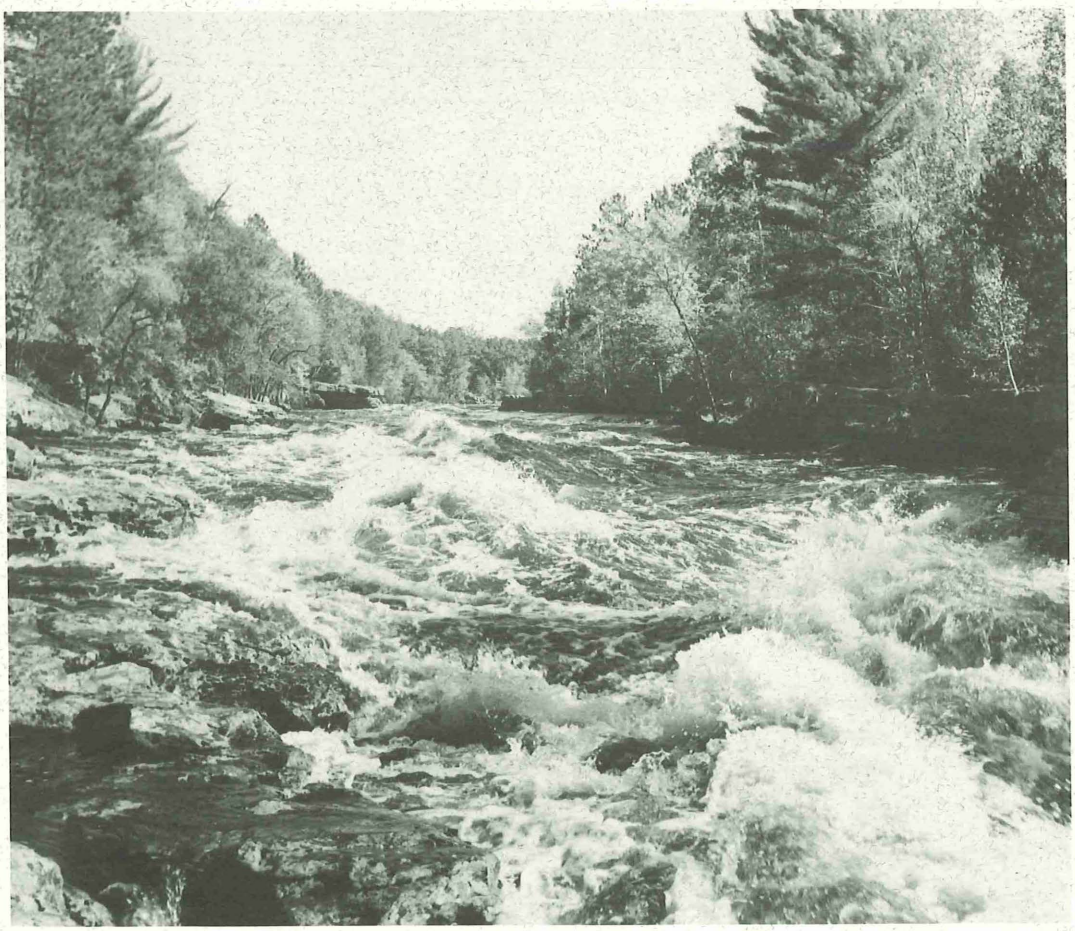
Address water and related land resource issues from both a major river basin and a smaller watershed perspective.

Much of the local water planning effort has focused on smaller watersheds. Multi-county, or in the metropolitan area, multi-watershed management organizations offer an opportunity to bring together smaller watershed plans for a focus on larger watersheds. The state needs to assist local governments in addressing issues associated with the larger watersheds by tying together smaller watershed or county plans.

Beyond the major watershed unit focus, the state must take responsibility for its nine major river basins. No one else is in a position to take the broad perspective necessary to manage the large river basin as a system. The federal government can provide major assistance to the state in this effort. Some of the areas in which this help is needed include spills preparedness, watershed protection, navigation, and reservoir operations planning and policy development.

The First Steps

- Identify priority rivers for comprehensive management based upon resource quality and use, problems and opportunities, and local interest. *(DNR, PCA, BWSR, EQB)*
- Establish private-local-state projects on the priority rivers. These will use comprehensive local water plans as "building blocks" for comprehensive river management strategies. *(DNR, BWSR, EQB, FED, PCA)*
- Give priority to local proposals designed to carry out comprehensive river management strategies. State rules should link state grants to jointly implement comprehensive river strategies. *(DNR, PCA, BWSR, EQB)*
- Establish inter-agency, inter-governmental river basin coordinating teams to advise agencies about river system concerns with the programs they administer. *(DNR, PCA, BWSR, EQB)*



Over 300 lake and river segments have fish consumption advisories due to contamination by mercury, PCBs, or dioxin.

Wetland Values:

- *Floodwater Storage and Rentention.*
- *Nutrient Assimilation.*
- *Sediment Entrapment.*
- *Ground Water Recharge.*
- *Low Flow Augmentation.*
- *Esthetics and Recreation.*
- *Shoreland Anchoring & Erosion Control.*
- *Wildlife & Fisheries Habitat.*

Figure 19 Surface Water Programs

Agency	Information/Technical Assistance	Projects/Incentives	Regulation
FEDERAL			
Agricultural Stabilization and Conservation Service		Agriculture Conservation Program; Conservation Reserve, Federal Waterbank.	Food Security Act.
Corps of Engineers	Floodplain Management; Planning Assistance to State / Local Government.	Construction of Flood Management, Aquatic Plant Control, Fish and Wildlife, Environmental Quality, Emergency Streambank, and Clearing & Snagging Projects; Cost Share.	Navigation Management; Reservoir Management; Section 404 Permits; Section 10 Navigable Waters Permits.
Environmental Protection Agency	STORET Database *(w/MPCA)*; Guidance Documents.	Clean Lakes *(w/MPCA).*	Safe Drinking Water Act; RCRA; CERLA; FIFRA; Clean Water Act; NPDES Permits (through PCA); State Water Quality Standards Approval.
Farmers Home Administration		Debt Restructuring; Conservation Easement.	
Fish & Wildlife Service	National Wetland Inventory.	Small Wetland Aquisition.	F&W Coordination Act Permit Review.
National Park Service		LAWCON; Purchase.	
Soil Conservation Service	Wetland Restoration; FSA Wetlands Determination Conservation Planning and Application.	Watershed Protection *(PL566)* Cost Share.	Food Security Act.
STATE			
Agriculture	Pesticide & Fertilizer Monitoring; Pesticide Use Survey.	Sustainable Agriculture; Integrated Pest Management; Waste Pesticide Collection; Pilot Pesticide Container Collection.	Fertilizer Regulation; Pesticide Regulation; Applicator Certification; Crop Consultant Certification; Ag Chemical Incident Response.
Board of Water & Soil Resources	Local Water Planning Assistance.	Local Water Resources Protection and Management Grants; Erosion Control & Water Quality Cost Share; RIM Reserve; Wetlands Restoration; Environmental Ag Education Contracts.	Local Water Plan Approval.
Environmental Quality Board	Minnesota Water Plan; Research Priorities Reports; State Monitoring Plan; Quality/Quantity Trends Reports.		Environmental Assessment; Critical Areas; Pipeline Routing; Power Plant Siting.
Department of Health	Health Risk;Public Water Supply Monitoring/ Assistance; Fish Advisories.		Health Risk Limiits; Public Water Supply.
Metropolitan Council*	Metropolitan Water Plan; Water Quality Goals; Water Supply Plan; Wetland Research; Lake Database; Water Quality Monitoring.	Regional Recreation Open Space Grants.	Regional Sewer System.
Natural Resources	Scientific & Natural Area; Wetland Evaluation Methodology; Protected Waters Inventory; Stream Gage Network; Dam Safety; Lake Watershed Mapping; Canoe & Boating Routes; Lake Levels; Instream Flow Needs; Lakes Database.	State Waterbank; RIM Habitat Grants; Shoreland Ordinance Grants; Public Access; Flood Mitigation Grants.	Water Appropriation Permits; Protected Waters Permits; Floodplain & Shoreland Regulations; Wild & Scenic Rivers; Fishing/Boating Enforcement; Protected Flow Levels; Ordinary High Water Mark; Surface Use Management; Aquatic Nuisance Control.
Pollution Control Agency	STORET Database (w/EPA); Water Quality Monitoring; Citizen Lake Monitoring Program; Best Management Practices; Monitoring and Data Management Assistance; Lake Assessment Program; Facility Operator Training / Assistance.	Clean Water Partnership; Clean Lakes Program; Wastewater Treatment Grants and Loans *(w/TED)*; Septic System Upgrade Program; Tanks Program.	Water Quality Standards; Pollution Discharge/ Management Permits; Tanks / Spills Regulations; Animal Waste Mangement; Superfund Program; Solid and Hazardous Waste Management; Lake Attainment Goals; 401 Certification.
State Planning Agency	Lakes Database; Systems for Water Information Management; Land Management Information Center / Geographic Information Systems Support.		
Trade and Economic Development		Small Cities Development Grants; Wastewater Treatment Grants and Loans *(w/PCA)*; Outdoor Recreation Grants.	

** Regional Agency*

Source: Minnesota State Planning Agency.

Figure 20 Ground Water Programs

Agency	Information/Technical Assistance	Projects/Incentives	Regulation
FEDERAL			
Agricultural Stabilization and Conservation Service		Agriculture Conservation Program; Conservation Reserve Program.	
Corps of Engineers	Planning Assistance to State / Local Government.		
Environmental Protection Agency	STORET Database *(w/PCA)*; Guidance Documents.		Safe Drinking Water Act; RCRA; CERCLA; FIFRA; Clean Water Act; Underground Injection Control.
Geological Survey	Cooperative Geological Studies.		
Soil Conservation Service	Water Resource Assessment; Conservation Planning & Application Technical Assistance.	Demonstration Project; Hydrologic Unit Project.	Watershed Protection *(PL-566)* Cost Share.
STATE			
Agriculture	Pesticide & Fertilizer Monitoring; Pesticide Use Survey.	Sustainable Agriculture; Integrated Pest Management; Waste Pesticide Collection; Pilot Pesticide Container Collection.	Fertilizer Regulation; Pesticide Regulation; Applicator Certification; Crop Consultant Certification; Ag Chemical Incident Response.
Board of Water & Soil Resources	Local Water Planning Assistance.	Local Water Resources Protection and Management Grants; RIM Reserve; Environmental Ag Education Contracts; Well Sealing Grants.	Local Water Plan Approval.
Environmental Quality Board	Minnesota Water Plan; Research Priorities Reports; State Monitoring Plan; Quality / QuantityTrends Reports.		Environmental Assessment; Pipeline Routing.
Health	Health Risk; Public Water Supply Monitoring / Assistance; Well Management.	Community Health Service Grants.	Health Risk Limits; Public Water Supply; Water Well Code; Wellhead Protection.
Metropolitan Council*	Metropolitan Water Plan; Water Quality Goals; Water Supply Plan.		
Minnesota Geological Survey	County Geologic Atlas (w/DNR); Regional Hydrogeologic Assessments (w/DNR); Hydrogeologic Mapping.		
Natural Resources	Sensitive Area Mapping; County Geologic Atlas (w/MGS); Aquifer Safe Yields; Regional Studies & Assessments; Observation Well Network; Water Use Database; Well Log Database.		Water Appropriation Permits; Sensitive Area Criteria.
Office of Waste Management	Solid and Hazardous Waste Management Assistance; Waste Education.	Solid and Hazardous Waste Management Grants and Loans.	County Solid Waste Management Plan Approval.
Pollution Control Agency	Ambient Ground Water Monitoring; Best Management Practices; IGWIS Database; Monitoring and Data Management Assistance; Special Ground Water Studies.	Clean Water Partnership; Wastewater Treatment Grants and Loans (w/TED); Septic System Upgrade Program; Tanks Program.	Water Quality Standards; Pollution Discharge / Management Permits; Tanks / Spills Regulations; Animal Waste Management; Superfund Program.
State Planning Agency	Ground Water Data Clearinghouse; Land Management Information Center / Geographic Information Systems Support.		

** Regional Agency*

Source: Minnesota State Planning Agency.

Ground Water

How can we better protect our ground water resources?

How can we better understand the vulnerability of ground water to contamination?

Ground water is important to Minnesotans. It is a major source of water for drinking. It is vital to agriculture for irrigation, livestock watering, and food processing. It is interconnected with our lakes and streams and exchanges water with them.

Ground water is affected by many activities. However, it is often not considered when decisions are made. Ground water is out of sight below the surface of the ground and, consequently, out of mind. Ground water does not follow political boundaries. In addition, it was long believed, incorrectly, that ground waters were naturally protected from the polluting activities of man. These features have translated to a lack of advocacy for ground water.

We now know that ground water is more easily contaminated from land uses in some places than in others. The results of past activities are now seen in ground water quality. It is evident that we must better understand this resource and consider its vulnerability when decisions affecting it are made.

The Ground Water Protection Act of 1989 sets a tough new degradation prevention goal for the state's ground water. State programs must be revised to help Minnesotans move toward meeting this goal.

Many programs and decisions within programs have been developed without considering the possible effects on ground water quality and quantity. Programs and decision-making steps of state and local government may need to change in order to protect ground water.

Government needs to coordinate activities with the ground water unit in mind. To accomplish this, state and federal agencies must link efforts to assist local units in protecting vulnerable aquifers. Local units must adopt land use ordinances to protect aquifers. Comprehensive local water plans must guide local management activities.

The 10-year Objective

To make protection of ground water quality and quantity a routine consideration in all governmental decisions.

Recommendation 18

Protect and manage aquifers as hydrologic units.

The state has several programs designed to protect ground water. The Water Well Construction Code, water appropriation permit, and pilot well sealing programs are examples. Local government plays a part in many of these programs. Some local units have also adopted, or are thinking about adopting, ordinances to help protect ground water. Plans are also underway to encourage adoption of wellhead protection measures.

What these initiatives lack is a focus on the hydrologic units they are designed, incrementally, to protect. For ground water, this unit is the aquifer. Without looking at all the land and water uses that affect an aquifer, it is unlikely that we will succeed in protecting it.

The First Steps

- Identify priority aquifers for comprehensive management based upon resource quality and use, problems and opportunities, the adequacy of information describing aquifer sensitivity, and local interest. *(DNR, BWSR, EQB, MDA, MDH, PCA)*
- Establish private-local-state projects on the priority aquifers. These will use comprehensive local water plans as "building blocks" for comprehensive aquifer management strategies. *(DNR, BWSR, EQB, FED, MDA, MDH, PCA)*
- Give priority to local proposals designed to carry out comprehensive aquifer management strategies. State rules should link state

"Approximately 4,000 households in the county are using septic systems that have been installed without inspection or soil investigation . . . . Improperly designed, constructed, or operated systems can cause ground and surface waters to be affected by pathogenic bacteria, viruses, parasites, nitrogen, phosphorus, chlorides, sodium, calcium and magnesium from water softeners, toxic chemicals from sewage treatment system additives, and household chemicals."

Olmsted County Comprehensive Water Plan.

"No information whatsoever is available on underground tanks with a capacity of less than 1,100 gallons."

Redwood County Comprehensive Water Plan.

grants to jointly implement comprehensive aquifer management strategies. *(DNR, BWSR, EQB, MDA, MDH, PCA)*

- Establish inter-agency, inter-governmental aquifer protection teams to advise agencies about ground water system concerns with the programs they administer. *(DNR, BWSR, EQB, MDA, MDH, PCA)*

Recommendation 19

Gather sufficient hydrogeologic information for making adequate water management and protection decisions.

Understanding the ground water system is much more difficult than understanding the surface water system. This is simply a result of the fact that the resource is hidden. For the most part, ground water is understood only through construction and monitoring of wells. At best, these points of understanding can be pieced together to sketch a general picture of an aquifer. Due to the cost of collecting ground water data, and the variability of aquifers, the state has tremendous gaps in its basic knowledge about this vital source of water.

Efforts better to define our ground water system have begun, but much work remains. These include work on detailed county hydrologic atlases, regional assessments, sensitivity studies, and hydrogeologic modeling. State and local units should strive to complete county geologic atlas studies for one-half the state by the year 2000. These efforts will give state or local officials necessary information for making wise resource management decisions.

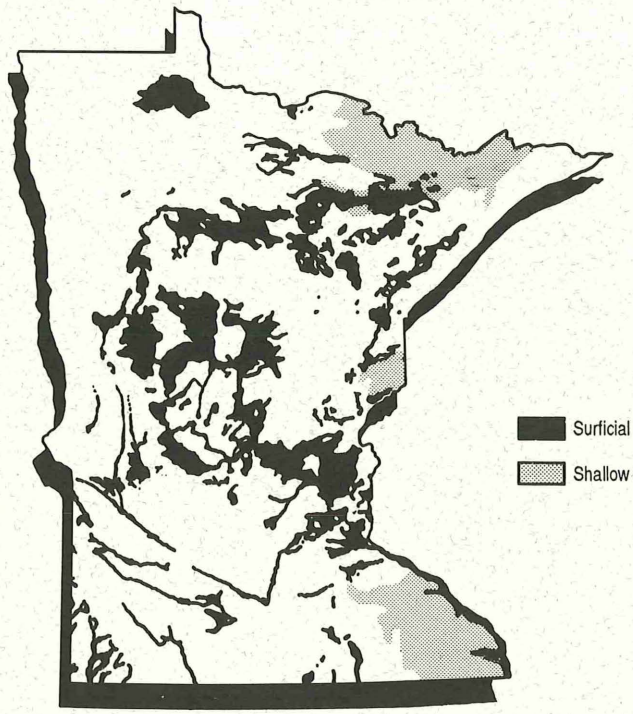
The First Steps

- Accelerate collection of geologic information and its mapping, including the county geologic atlas, regional hydrogeologic assessments, detailed soil surveys, and major ground water recharge areas identification. *(DNR, MGS, LCMR, LGU)*
- Automate information from these efforts as they are completed and merge with the state's geographic information system data base. *(DNR, MGS, LGU, SPA)*
- Complete rules for identifying sensitive ground water areas that incorporate different details of assessment. The assessments may vary from reliance on information about surface materials, only, to use of information about deeper geologic formations. The state also must develop and distribute maps and other materials that show the location of sensitive areas. *(DNR)*
- Develop guidelines for local government and private party preparation of regional assessments and county atlases to accelerate preparation and ensure data quality and compatibility. *(DNR, MGS)*
- Formalize procedures for setting priorities for future regional assessments and county atlases that draw on local water planning recommendations, identified sensitive areas, and state agency expertise. *(DNR)*

Ground water resources of many areas are not well understood. Specific studies dealing with individual aquifers have been prepared, but little is known of the deeper aquifers that may exist beneath them.

Elevated nitrate concentrations are common in the surficial aquifers of areas intensely cropped or heavily used for animal feedlots. These conditions are found in the surficial sand aquifers of southwestern Minnesota and the Mississippi River basin, and the carbonate aquifers in the Karst region of southeastern Minnesota.

Figure 21 Extent of Surficial Quarternary Aquifers



Source: Minnesota Geological Survey, U.S. Geological Survey.

One or more pesticides have been detected in 39 percent of wells sampled in susceptible areas of the state.

42 percent of 199 private wells tested and 7 percent of 395 public wells tested had nitrate levels exceeding the standard for drinking water.

Volatile organics have been found in 8 percent of community water supply wells tested.

About 40,000 large underground storage tanks are located in Minnesota and many are leaking.

178 hazardous waste disposal sites have been identified for priority clean-up activity.

Over 95,000 tons of hazardous wastes are produced annually in Minnesota.

Protecting and Conserving Water Resources

Reduction of Environmental Pollutants

What new steps must be taken to meet state and federal clean water goals?

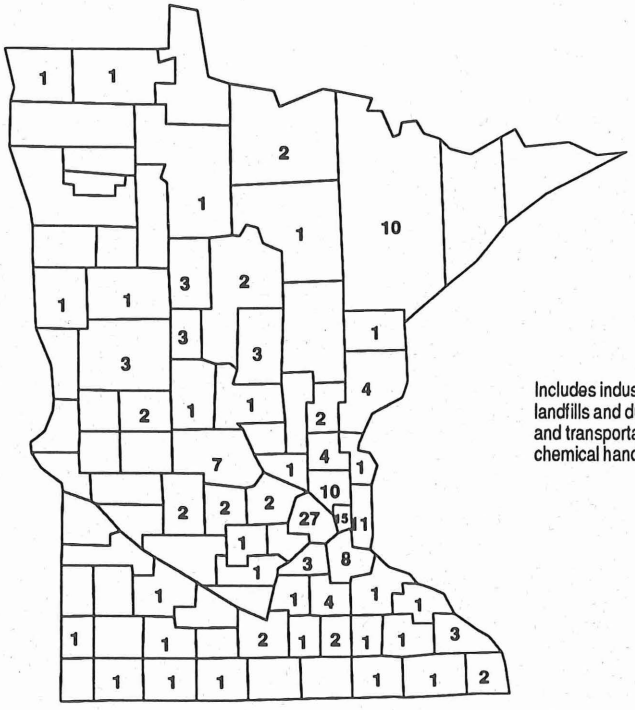
What can be done to reduce the amount and number of pollutants entering the environment?

How can we protect our water and soil resources while ensuring the vitality of the state's agriculture?

Minnesota has made major strides in reducing traditional pollutants from point sources. Yet, water quality problems still exist in both surface and ground waters. Nonpoint sources of pollution and toxic chemicals are the biggest concerns. Pesticides are used on the land and in the water to aid agriculture, silvaculture, and recreation. Fertilizers are used to boost plant growth. Both types of products may leach into Minnesota's waters with unintended effects. Pollutants are also released and transported in the air. Biotechnology, a growing new field, offers both opportunities and threats for water quality. Sources of pollution must be reduced and new cleanup methods found.

It is important, too, that Minnesota's environmental "fixes" consider total effects on the environment. Minnesotans must not spare one part of the environment at the expense of another.

Figure 22 Minnesota's Superfund Sites
1990



Includes industrial spills and disposal, landfills and dumps, petroleum storage and transportation, and agricultural chemical handling facilities.

Source: Minnesota Pollution Control Agency.

The 10-Year Objective

To build degradation prevention goals into all Minnesota programs and practices affecting water.

Recommendation 20

Evaluate how state programs should be changed to move toward the Minnesota clean water goals; then begin making the changes.

While there is agreement on the need to prevent pollution, a concerted effort is needed to make this happen. Many programs were developed before there was much recognition either of the significance of non-point pollution or how ground-water pollution occurs. State and local water-related measures are needed that reflect these new understandings.

The Ground Water Protection Act of 1989 required the study of nitrogen compounds in ground water. That study should point the way toward actions that will prevent further nitrate pollution.

The First Steps

- Identify the state programs having the greatest influence on water quality and establish a procedure and timetable for their evaluation. *(EQB)*
- Develop best management practices that address Minnesota's clean water goals. These should include integrated pest and fertilizer management practices for urban areas, roadsides, and public lands. *(MDA, PCA)*
- Accelerate efforts to protect areas sensitive to ground water pollution. Direct Reinvest in Minnesota (RIM) and Conservation Reserve Program (CRP) efforts to these areas. Identify ground water sensitive areas in comprehensive local water plans consistent with DNR rules. *(BWSR, PCA, DNR, LGU)*
- Complete and begin to implement recommendations to reduce nitrogen compounds in ground water. *(MDA, PCA)*

Recommendation 21

Reduce the amounts of polluting materials used, wastes produced, and pollutants entering the environment.

Waste policy issues have implications that are in some ways far broader than the traditional view of the field of "water." Still, it is very appropriate for these issues to be part of the Minnesota Water Plan. Whether the concern is the toxic chemical leaching to an aquifer, or falling into a pristine lake, waste management is very much a water management issue.

The increasing level of environmental pollution is an alarming trend. We now find small quantities of toxic pollutants in remote areas and formerly pristine lakes. Some discharges of toxic pollutants are obvious, like the wastewater discharge into streams and lakes. Others, like spills, leaks, and pollution from land use and land management activities, are more difficult to observe.

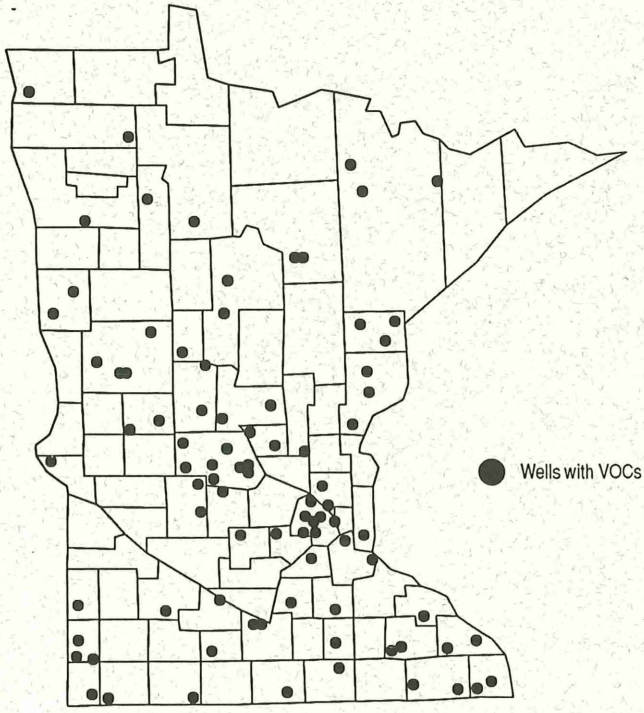
Even more subtle are those pollutants that volatilize from various human activities and are carried by the winds to be deposited in remote areas by rain or dryfall. Since wind carried sources of pollution are many and diffuse, their management requires a multifaceted approach. The approach needs to include education, technical assistance, incentives, and regulation. Government at all levels must make a strong commitment if these pollutant sources are to be controlled.

Solid waste is also a major water quality concern. Expansion of the state's population and economy means that solid waste will grow as a potential contaminant of water. Minnesotans must reduce both the quantity and the toxicity of the wastes they generate. This can be done through reducing sources of wastes, reusing materials, recycling materials into new products, and promoting alternatives to polluting products.

The Pollution Control Agency estimates that 10,000 to 14,000 of the state's feedlots are significant pollution hazards.

The thirteen southcentral counties are now involved in well closings, demonstration farms, wetland inventories, abandoned well inventories, taking over the well code, a series of Clean Water Partnership projects, a major LCMR project, and a survey of Ag drainage wells.

Figure 23 Communities with VOCs Detected
1982 – 1990



Source: Minnesota Department of Health.

Minnesota Agriculture

More than half of Minnesota's land area is in farms. Since the 1930s, farm size increased while farm numbers decreased.

Minnesota farms sold agricultural products valued at $5.7 billion in 1987.

Minnesota ranked seventh nationally in cash receipts from farm products in 1988. The state was first in sugar beets, second in turkeys, third in soybeans and hogs, fourth in milk production, and fifth in corn.

Land in crops continued to grow through the 1980s to over 21 million acres in 1989.

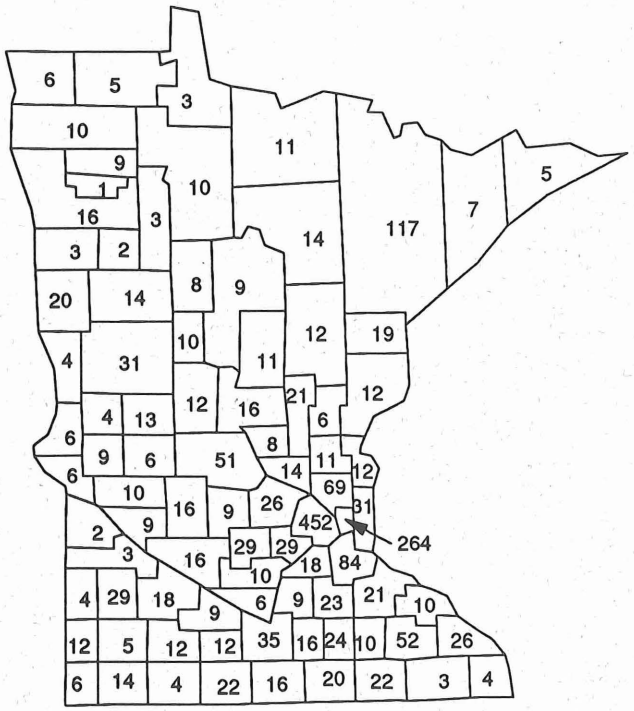
The Legislative Commission on Waste Management has been a leader in developing waste management policy recommendations. The LCWM and the new Legislative Water Commission may need to address many waste and water management concerns jointly.

The State of Minnesota should ensure that all commercial, industrial and municipal dischargers of toxics develop source reduction plans. By the year 2000, dischargers should be required to use the best available technology for reducing toxic inputs, byproducts, and wastes. The state must also make sure that the remaining wastes are disposed of in facilities specifically designed for them. Inadequate facilities should be closed.

The First Steps

- Develop, revise and implement pollution standards so that pollutants are below harmful levels. This should include:
  a) Biological criteria for overall environmental health. *(PCA)*
  b) Water quality criteria to protect wildlife, lakes, and wetlands. *(PCA)*
  c) Standards for discharges of toxics to the air, land, and water. *(PCA)*
  d) Health risk limits for pollution detected in ground water. *(MDH)*
- Promote waste reduction and reuse by:
  a) Expanding educational programs on waste reduction and reuse. These should emphasize cradle-to-grave costs of products, hazards of improper disposal, and reinforcement of good behavior. *(OWM, OEE)*
  b) Exploring opportunities for a Center for Recycling and Waste Management Research and Education at the University of Minnesota. *(UM, OWM)*
  c) Addressing problems associated with packaging and the environment. The report of the Select Committee on Packaging and the Environment provides analysis of the key issues and options. *(OWM)*
  d) Helping industry implement the Battery Disposal and Recycling Law of 1990. The state should also recommend added requirements for reducing the hazardous components of industrial and household batteries and determine approaches for routinely recycling batteries. *(PCA, OWM)*
  e) Expanding solid waste recycling and household hazardous waste collection and drop-off programs. It is important that convenient services are available to all citizens. Citizens need to understand the effects of their buying and product use habits on the environment. *(PCA, OWM)*
  f) Continuing to identify and explore options for waste and toxics reduction. These should include bans, substitutes, and alternate disposal procedures for the most toxic and common constituents in municipal waste. *(PCA, OWM)*
  g) Expanding and continuing technical assistance to industries and local units of government for waste reduction, treatment, and management efforts. *(OWM)*

Figure 24 Number of Known Leaking Underground Storage Tanks *1990*



Source: Minnesota Pollution Control Agency.

- Evaluate the Toxic Pollution Prevention Plan progress reports submitted by facilities through the Minnesota Toxic Pollution Prevention Act. Recommend further actions needed to reduce toxic releases/discharges. *(PCA, OWM)*
- Design approaches for evaluating and managing fuel storage tanks and on-site wastewater treatment systems. These should include monitoring and maintenance procedures and repair or abandonment of nonconforming systems. Comprehensive local water plans should guide approaches developed. *(BWSR, PCA)*
- Study and recommend elements of a systematic program to prevent spills, especially in the Mississippi River. *(PCA)*

Recommendation 22

Ensure that agricultural activities in the state are environmentally sound, and economically and socially viable in both the short and long term.

Agriculture is an important part of Minnesota's economy and way of life. More than half the state's exports come from farm and food products. Also, about one-fourth of Minnesota's employment comes from agriculture and related industries. Minnesota has the second largest farm population in the nation and devotes more than half its land area to agriculture.

Yet, these same activities that contribute to our economy and way of life also pose threats to our water. Stormwater and snowmelt runoff from cropland carry sediment, nutrients, bacteria, and other contaminants into surface waters. Nitrate and pesticides seep from these lands into underlying ground waters.

The Soil Conservation Service estimates that water erodes 58 million tons of soil annually from Minnesota's cropland and wind, an additional 90 million tons. The sediment and attached contaminants harm Minnesota's water resources. Future crop production potential is also jeopardized.

The State of Minnesota must foster agricultural practices that support both a healthy environment and economy. It must develop new and better approaches for dealing with problems as they arise. It must promote an understanding of the connections between practices and problems.

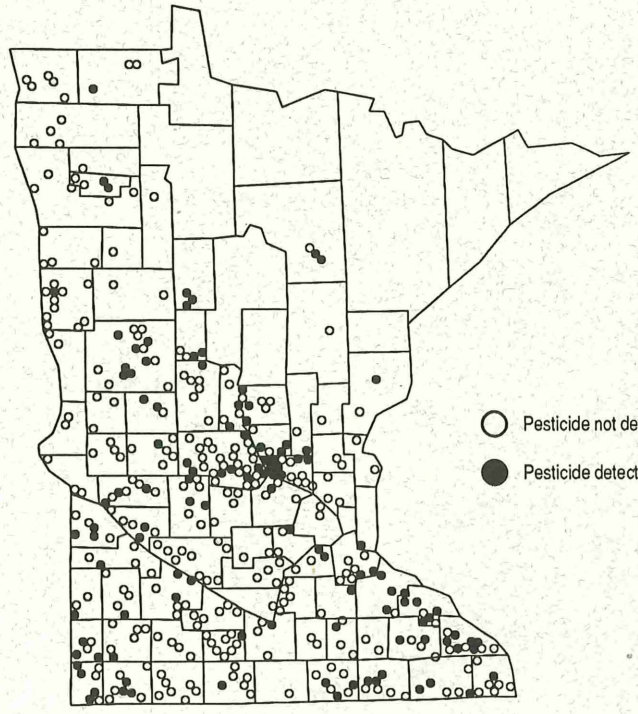
Research, conservation planning, education, and financial and technical assistance must be brought together in priority areas. The state also must continue to influence federal farm legislation and related federal initiatives. It is important to ensure that these are compatible with Minnesota's goals.

The First Steps

- Adopt a state goal of reducing soil erosion on all agricultural lands to tolerable rates by the year 2000. *(BWSR)*
- Make allocation of state erosion control funds a catalyst in pursuit of this goal by linking expenditures to adoption and enforcement of erosion control ordinances. *(BWSR)*
- Encourage an accelerated shift in focus of

In 1988, about 1200 confirmed and possible feedlots existed in Olmsted County. Only 133 had MPCA permits. Olmsted County plans to develop and implement a county feedlot ordinance.

Figure 25 Occurrence of Pesticides in Public Wells
1988



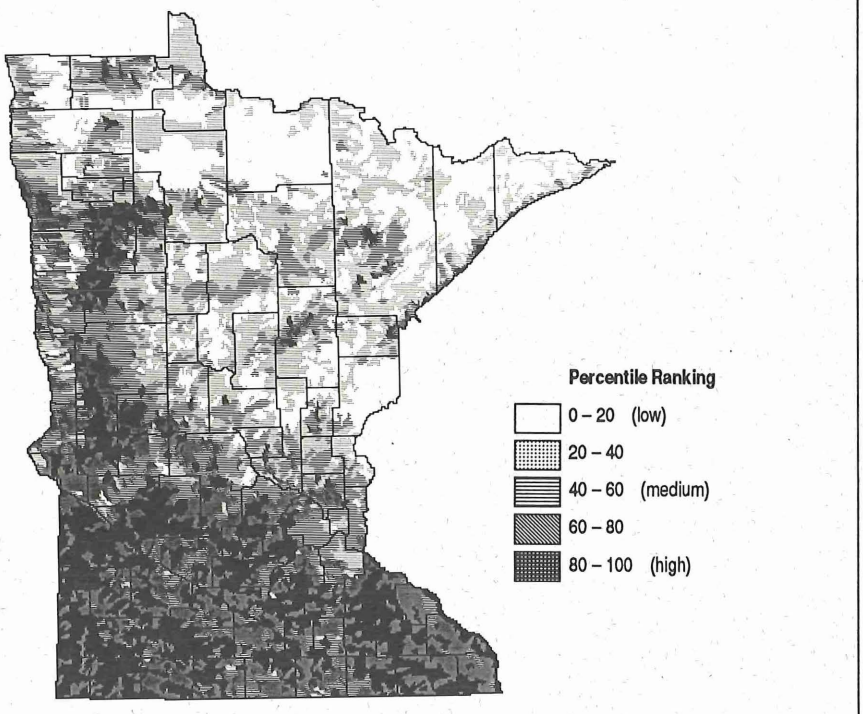
Source: Minnesota Department of Health.

Erosion and sedimentation are significant throughout most of the agricultural portion of the state. Almost 60 million tons of soil are eroded each year due to water and another 90 million tons due to wind.

research at the University toward sustainability rather than production. Enhance basic research on management practices; alternate crops; and alternate, sustainable farming systems. *(UM, MES)*

- Continue to promote wise pest management. Adopt and carry out a state Pesticide Management Plan and an Integrated Pest Management Plan. Complete the pilot pesticide container pickup project and seek needed legislation or rules. Establish the waste pesticide pick-up program. *(MDA)*
- Develop management plans for farms in environmentally sensitive areas. Provide incentives and assistance for transition to alternate practices. These efforts should include strategies for keeping marginal agricultural land now under temporary retirement out of production and for retiring additional priority marginal lands. *(BWSR, LGU)*
- Expand educational efforts to foster an environmental stewardship ethic and to recognize the need for farming systems that can be sustained. *(MES)*
- Expand private and public sustainable agriculture demonstration and assistance programs to illustrate the need for resource conservation and protection and the profitability of practices. *(MDA)*
- Encourage collaborative projects among local, state, and federal governments. Examples include the Northern Cornbelt Sand Plain, the Anoka Sand Plain Water Quality Demonstration, and the St. Peter/Prairie Du Chien projects. *(FED, LGU, MES, PCA, UM)*
- Carry out the state Fertilizer Management Plan and begin management practice promotion, particularly in areas with existing problems or high probability of problems. *(MDA)*

Figure 26 Non-Point Source Pollution Potential



Source: Minnesota Pollution Control Agency / SPA Land Management Information Center.

Water Well Management

What is the best way to ensure that wells are protected and are not pollution hazards?

How can the system for testing private wells be improved?

Two-thirds of all Minnesotans receive their drinking water from wells. Efforts to protect wells from contamination from surrounding areas are crucial in protecting water supplies.

Most of Minnesota's active wells were constructed before well construction rules were developed in 1974. Many unused wells have never been sealed properly. The use of inferior construction materials is causing casings to deteriorate. Improperly constructed, maintained, or abandoned wells offer a direct path for pollutants into ground water.

Recent surveys suggest serious problems from some abandoned wells. About 300,000 to 370,000 have the potential to degrade ground water in the vicinity of municipal water supplies. From 700,000 to over 1.2 million have the potential to endanger ground water quality.

Multi-aquifer wells are of special concern since they pose threats to the deepest, most naturally protected aquifers. Wells used to carry surface, septic, or agricultural drainage water into ground water are another serious concern.

Until the mid 1970s, the Department of Health offered private well owners free water tests for a limited number of parameters. With the onset of state funding for Community Health Services (CHS), the state turned over responsibilities for private water testing to local government. The result is inconsistent service by private water testing programs across the state.

The 10-Year Objective

To strengthen protection and management of water wells at the state and local level.

Recommendation 23

Strengthen enforcement of the well code at the state and local level.

To protect ground water, it is important to identify, and to reconstruct or seal wells that are abandoned or improperly constructed or maintained. The vast number of wells involved makes this a tremendous task. The urgent need is to correct polluting wells and those with a potential to contaminate ground water.

A growing number of local governments are administering the well code. Ultimately, local governments across the state should administer the code. But, to ensure that well records are available for enforcement and geologic analysis, information systems must tie wells to land parcels. State assistance is needed to make this possible.

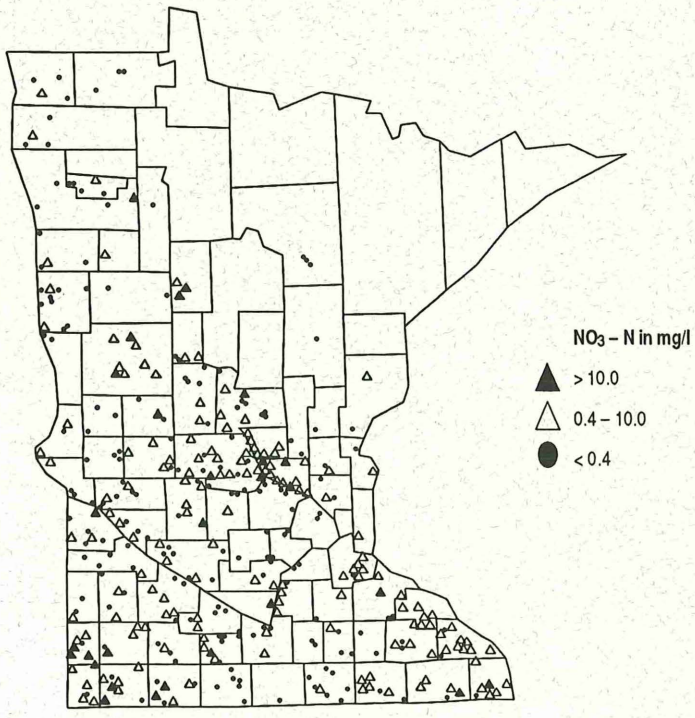
The First Steps

- Establish procedures for identifying and

Multi-aquifer wells at Pine Bend and St. Louis Park brought VOCs to the Mt. Simon Hinckely aquifer. These wells were reconstructed or sealed. The number of wells in use today causing similar problems is unknown.

300,000 to 370,000 abandoned wells have the potential to degrade ground water in the vicinity of municipal water supplies.

Figure 27 Occurence of Nitrate – Nitrogen in Public Drinking Wells *1988*



Source: Minnesota Department of Health.

priorities for sealing unused polluting wells including multi-aquifer, injection, and agricultural drainage wells. *(MDH, BWSR)*
- Develop and implement methods for sealing priority wells. *(MDH, BWSR)*
- Encourage and assist local governments interested in administering the Water Well Construction Code. *(MDH, BWSR)*

Recommendation 24

Develop a system for private well testing that provides a basic level of service across the state, while encouraging innovation in meeting regional needs.

Well owners need information about how to get their water tested, what to test for, and what the results mean. Local government needs to work toward offering well owners a basic water testing program. State technical assistance is essential for this kind of effort, especially regarding what kind of pollutants may exist due to specific local conditions.

- Water tests for many pollutants are expensive. State universities and technical institutes should explore offering tests for selected pollutants.

The First Steps

- Develop minimum requirements for private well testing programs across the state and for associated state technical aid. Recommend incentives for accelerated local programs. A task force of Community Health Service (CHS) agency representatives, comprehensive water planning organizations, representatives of private labs, state agencies, and the university/state university community should advise the state in program development. *(MDH)*
- Evaluate the ability of Community Health Service agencies and alternative systems to deliver private well testing programs. *(MDH)*

Recommendation 25

Develop and implement wellhead protection for public and private wells.

Wellhead protection seeks to reduce the risk of well contamination due to land use in the area surrounding a well. The immense number and types of wells in the state make wellhead protection a challenge. During the decade, Minnesotans should cooperate to protect wellhead zones of the state's community wells. The state should develop and carry out a strategy for protecting noncommunity wells. It should also establish generic guidelines for protection of private wells.

New and revised local water plans should identify ground water sensitive areas consistent with DNR rules and wellhead protection areas consistent with MDH rules.

The First Steps

- Develop and carry out the strategy for wellhead protection controls for public water supply wells. Establish several pilot wellhead protection projects. *(MDH)*
- Conduct studies to support development of wellhead protection policies including the necessary legal and financial needs and resources of local governments. *(MDH)*

Well Facts:

- *2 million people served by public wells.*
- *About 11,000 public water supply systems (17,000 wells).*
- *1,000 community systems (4,000 wells) and 11,000 noncommunity systems (13,000 wells).*
- *1 million people served by private wells.*
- *About 400 water well contractors construct between 7,000 and 12,000 wells each year.*

Water Conservation

How can we ensure that Minnesotans have sufficient water to meet their future needs?

How can the state be better prepared for water emergencies and drought?

Ample, high quality water is and will continue to be important to Minnesota. Threats to our water include drought, demand from water deficient regions, contamination, over use, population growth, and global warming.

The state regulates water appropriations. Still, appropriations occasionally exceed the amount of water available. With demand increasing, problems are expected to mount.

New estimates of metropolitan ground water indicate that less water may be available than previously thought. The competition for water in the seven-county region is expected to strain these supplies.

Statewide, water supply conflicts are increasing. Yet, few meaningful conservation plans are in place, even though conservation may be necessary for the fair allocation of water. The new drought contingency plan for the Mississippi River illustrates how conservation can be the key to fairly managing competing uses of water.

Court decisions have strengthened the federal role in water allocation. Federal courts have interpreted water as an article of commerce, limiting state authority to prohibit water export. They have declared, in some situations, that federal regulations prevail over state regulations. The onus is on the state to clearly document water needs as a prerequisite of state regulation.

10-Year Objective

To develop a coordinated local / state program to ensure that Minnesotans have enough water to meet their long-term needs.

Recommendation 26

Develop a water conservation strategy for long-term and seasonal water use throughout Minnesota.

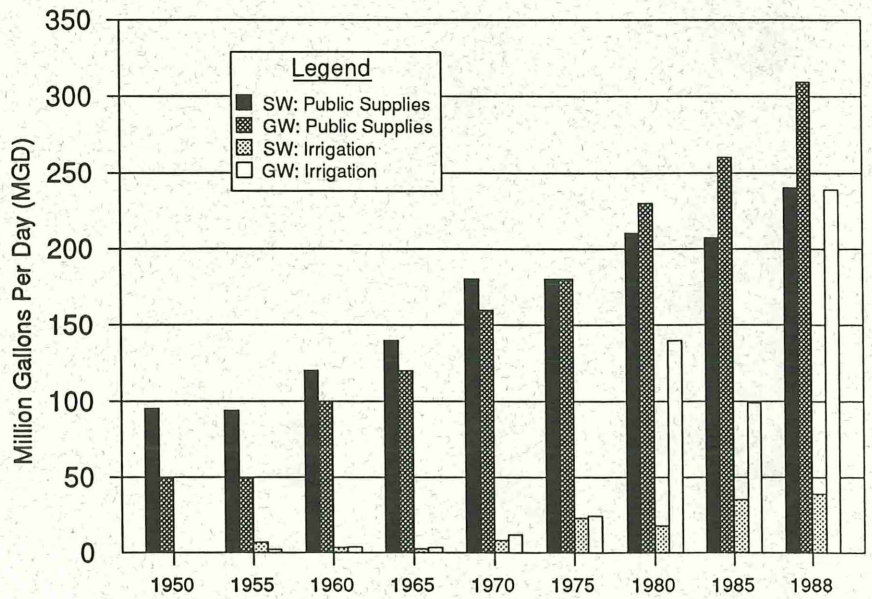
The recent drought illustrates the vulnerability of both ground and surface waters. Some aquifers experienced significant declines in water levels, while even the Mississippi River was shown to have its limits. Renewed efforts are needed to ensure that water use is kept within resource limits, and that water is allocated efficiently and fairly.

To ensure adequate supplies, the state needs to continue steps to implement the drought contingency plan for the Mississippi River. It must work toward restricting nonessential (e.g. lawn watering) use of aquifers, and eliminate use of ground water for "once through" heating and cooling systems. Appropriators need to have contingency plans for emergencies and drought that include water conservation measures. Federal court rulings add to the urgency of the state developing strategies for managing water supplies within a "basin of origin" and within safe yield limits for aquifers.

Effects of the drought:

- *Nearly 200 surface water irrigation permits were suspended along 17 Minnesota Rivers.*
- *40 homes left without water in Sherburne County when wells went dry.*
- *Town of Stephen water supply (Tamarac River) had to be supplemented at a cost of $2.50 per thousand gallons.*
- *Controversy surrounded proposed release of water from the Headwaters Reservoirs.*
- *Minneapolis instituted its first ban on outdoor water use.*
- *White Bear Lake dropped to a new record low and Minnetonka dropped nearly three feet.*

Figure 28 Trends in Surface Water and Ground Water Use



Source: Minnesota Department of Natural Resources.

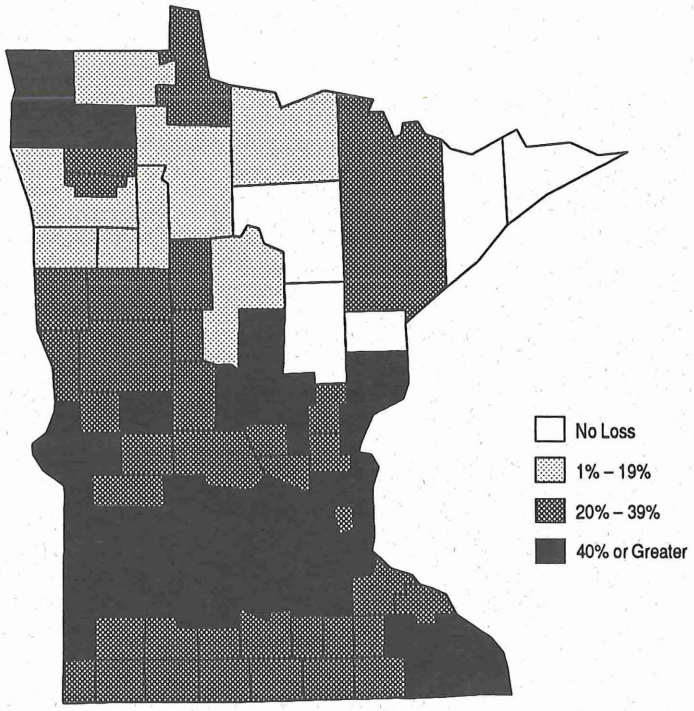
Local governments should explore use of flood storage areas for domestic water supplies, as well as various other uses. They should also consider the advantages of merging water utilities or sharing water supplies. Finally, local governments should adopt land use controls to protect the quality of water supplies.

The First Steps

- Examine rate schedules, what water use should be subject to charges, and what effects charges have on use. *(DNR, MDH)*
- Refine priorities for water use and define essential and nonessential use. *(DNR)*
- Explore the reuse of "gray water" (e.g. water from showers, sinks) for uses such as gardens. *(MDH, PCA)*
- Establish criteria for interbasin transfers to safeguard long-term water quality and quantity. Develop strategies for managing water supply needs within the "basin of origin." *(DNR)*
- Complete the metropolitan area water use and supply plan. In it, evaluate a regionally planned, locally operated, Twin Cities metropolitan water supply system. *(METC)*
- Establish a pricing system that keeps the cost of water treatment from being a barrier to water supply sharing between communities. *(MDH, UM)*

Estimates for the year 2010 show that close to 200 new large-capacity wells will be needed for growth in the Metropolitan area alone.

Figure 29 Percent Loss in Corn Production Due to Drought *1988*



Source: U.S. Department of Agriculture / SPA DATANET.

Managing Water's Interconnections

How can government integrate programs to address water's interconnections?

How can water protection needs proactively influence growth?

How can water be managed to help sustain the quality of Minnesota's environment?

Minnesota has many programs that seek to manage the use of land and water. Programs like the Shoreland Management program and Clean Water Partnership have become national models. Comprehensive local water planning — also nationally recognized — is demonstrating the key job of local government in water management.

Still, the drought of 1988 exposed weaknesses in the way land and water uses are managed. Subdivisions depending on shallow wells ran out of water. Homes built on poor soils developed cracks in their foundations. The City of Minneapolis, depending solely on the Mississippi River for its water supply, sparked debate of both water conservation and river use policy.

Other problems, not drought-related, indicate need for new approaches. Impoundments for flood management raise water quality and land management issues. For example, excess upstream erosion may shorten reservoir life expectancy and degrade reservoir water quality. Yet, erosion control programs often are not linked to project approval. Bluffs along the Mississippi are developed in ways many consider unwise, without effective use of local or state land use controls.

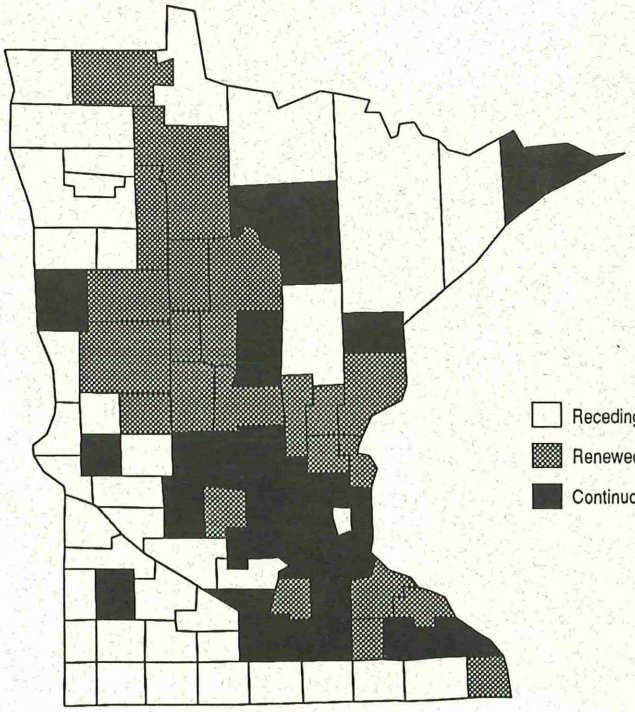
The challenge is to coordinate and concentrate local, state, and federal programs on protecting resources. A river protected from industrial pollution can be degraded by shoddy bluff development. A lake with well-managed shorelands can be made unattractive by polluted runoff from far upstream. Ground water can be the unintentional recipient of the by-products of land uses, or it can place its own limits to growth when supplies are limited.

An integrated approach is needed to avoid or resolve conflicts between the use and protection of land and water. We need to think about land when we manage water. We need to think about water when we manage land. We need to consider water and land when managing air emissions. We need to run state and local programs as if they were administered by one agency. This approach requires the special focus on the resource

"The only alternative is to reverse our dominent attitude toward the earth and in our use of it recognize that man is part of nature."

Sigurd F. Olsen

Figure 30 Minnesota Population Trend Patterns
1910 – 1988



Source: U.S. Census and SPA estimates.

described throughout the MWP.

State and local governments must lead the way in removing or avoiding barriers to a sustainable environment policy. These barriers can be complicated. They often include institutional, political, informational, educational, technical, and financial constraints. In leading the way, governments must involve citizens, interest groups, and educational interests in the joint management of water resource units.

The 10-Year Objective

To help sustain the quality of Minnesota's environment by recognizing water's interconnections.

Recommendation 27

Identify and remove barriers to managing water's interconnections for a sustainable environment.

Minnesota's water programs should be reviewed to ensure that they recognize water's interconnections, and that they contribute to sustaining the state's environmental quality.

Historically, linking programs is difficult when they have been independent. It is hard to argue that the benefits of one program be tied to another, especially when this places conditions on the release of money. Yet, the alternative is a fragmented approach to managing the resource. This approach is often inefficient. It leads to unconnected, uncoordinated efforts, despite the best intentions of the people involved.

The First Steps

- Identify program changes needed to recognize interconnections and sustain environmental quality. These should include:
  a) Linking water quality protection and restoration projects to measures such as ordinances and regulations necessary to prevent recurrence of problems; *(PCA)*
  b) Linking a unified program of flood damage reduction grants to land treatment requirements, erosion control regulations, and cost-sharing; *(DNR, BWSR)*
  c) Linking decisions under drainage proceedings to policies of approved comprehensive local water plans; *(LGU)* and,
  d) Tying land treatment cost-sharing, water quality and agricultural chemicals regulation, stormwater management, and land use regulation into wellhead protection requirements by state law and rule and through comprehensive local water plans. *(MDH, BWSR, MDA, PCA)*

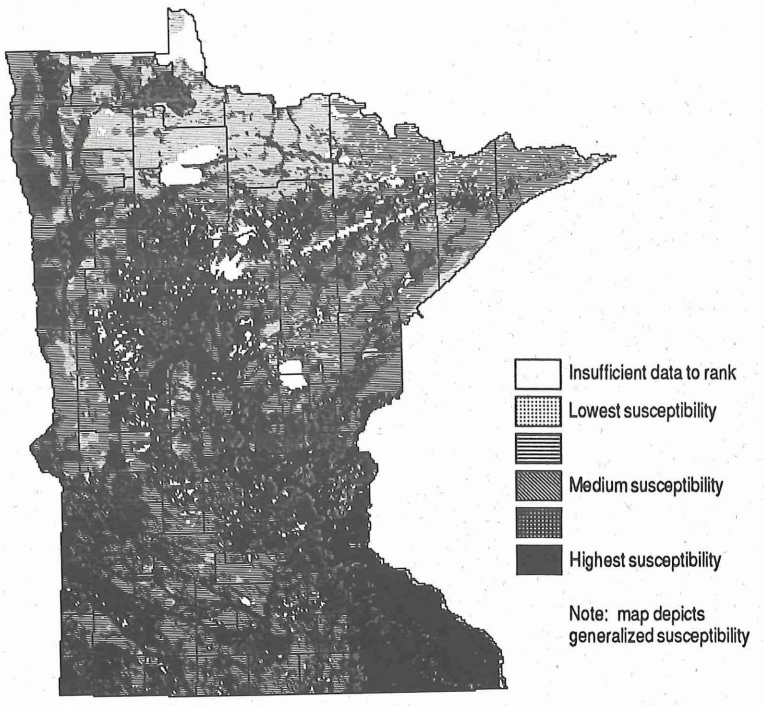
Recommendation 28

Build consideration of water protection needs into land use decisions.

The land use connection is a key to management and protection of water resources. The connection ranges from shoreland and flood plain issues, to both urban and agricultural land management and chemical use issues, to growth management issues. The MWP ap-

Growth is concentrating in areas of the state sensitive to pollution such as the Karst areas of southeast, the sandplains north of the Twin Cities, and the northern lakes region.

Figure 31 Ground Water Contamination Susceptibility in Minnesota



Source: Pollution Control Agency / SPA Land Management Information Center.

proach is to address these issues with a focus on the resource, whether the resource affected is a lake, wetland, river, or aquifer or multiple resources over a large area.

The consequences of economic and population growth raise issues that cut across all disciplines of the water arena. Growth may impact the quality of water resources through the discharge of waste or the runoff (or infiltration) of stormwater. It may expend available water supplies when the demands of growing communities are met. The management of growth presents a real challenge to the MWP themes of integrating management of water, focusing on the resource, and recognizing water's interconnections. Making these themes "work" in managing growth may be the litmus test for success of the MWP.

Problems are more likely to be prevented when people making growth decisions understand the limits of resources. It is possible to cooperatively manage growth within resource limits. The alternative is to let uncontrolled, unplanned growth determine the quality of Minnesota's water and the quality of life of Minnesotans.

Water programs too often are geared to react to problems growing out of population and economic factors. Flood mitigation efforts, cleanup of superfund sites, and restoration of lakes are examples of management that is reactive to development. Calls for interbasin diversion of water to meet the demands of water short areas are another example.

The state must begin to link approval of out-of-basin diversion proposals to growth and water use projections for basin-of-origin needs. It must also encourage the use of comprehensive plans as well as comprehensive local water plans as vehicles for linking environmental protection concerns to growth management.

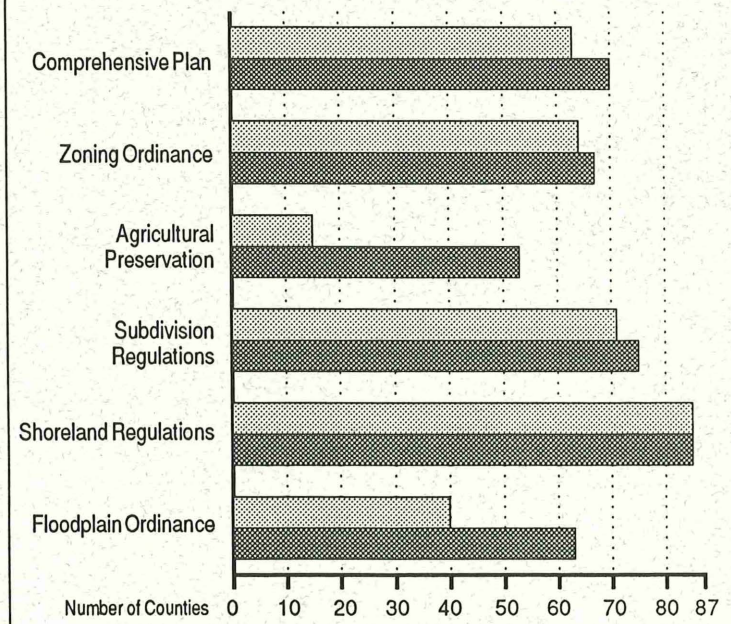
The First Steps

- Address the following land use connections requiring a resource-oriented approach in Minnesota:
  a) Managing the quality, habitat, and bluff-lands of the Mississippi/Minnesota Rivers;
  b) Managing land uses in areas of the state sensitive to ground water contamination; and
  c) Managing gravel pits and the new mining of nonferrous minerals in a way that addresses long-term environmental protection and restoration needs. *(LGU, DNR, MDA, MDH, NRRI, PCA, UM)*
- Assess implications of uncontrolled growth and recommend cooperative local / state approaches to identify and manage areas sensitive to growth. This assessment would include:
  a) Evaluating how to coordinate the management of growth;
  b) Evaluating the effect of ground water clean-up costs on industrial siting decisions;
  c) Identifying disincentives in Minnesota law and administrative policy to a sustainable growth / sustainable environment policy;
  d) Evaluating the need for statewide land use suitability guidelines; and

There are from 3,400 to 6,848 sources of aggregate in Minnesota. Minnesota ranks seventh nationally in nonfuel mineral value which includes sand and gravel. While the state regulates open-pit mines, regulation of sand and gravel operations is left to local government.

Many local water plans expressed the same concern as Norman County — that abandoned gravel pits are used as illegal disposal sites.

Figure 32 County Land Use Controls



Source: State Planning Agency.

e) Evaluating how to change the management of growth by building in consideration of long-term environmental damages associated with growth choices. *(SPA, UM, SUS)*

- Adopt the comprehensive planning and zoning legislation proposed by the Advisory Council on State and Local Relations. The purpose is to coordinate and modernize the planning law governing cities, counties, and towns. Care must be taken to retain the hierarchy of authority that was established under the comprehensive local water management act for managing water. *(SPA)*
- Develop environmental quality standards for subdivision and development of land as authorized by M.S. 83.29. *(EQB)*
- Examine ways to make the Environmental Assessment and Critical Areas programs meaningful tools for management of growth. *(EQB)*



"Harmony with land is like harmony with a friend; you cannot cherish the right hand and chop off his left. That is to say, you cannot love game and hate predators; you cannot conserve the waters and waste the ranges; you cannot build the forest and mine the farm. The land is one organism."

Aldo Leopold

"It will take some tough policies over the next 100 years to protect our environment and all life that it sustains . . . The next 100 years call for a change in course involving human restraint, international cooperation, and the money to keep our planet livable."

Willard Munger
State Representative

Acknowledgments

EQB Water Resources Committee

Paul Toren, EQB Citizen Member, Chair
Robert Dunn, EQB Citizen Member, Vice-Chair
Martha Brand, former EQB Citizen Member and WRC Chair
Pat Brezonik, Don McNaught, University of Minnesota
Bill Bulger, Department of Agriculture
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Lee Paddock, Office of the Attorney General
Mel Sinn, Douglas Thomas, Board of Water and Soil Resources
John Wells, State Planning Agency, Chair

Other Contributions

Local water planning teams made critical contributions to the **Minnesota Water Plan**. The multi-county water planning coordinators contributed in many ways, ranging from setting up public meetings to highlighting the innovative ideas in county plans. Participants in the various interest group meetings made significant contributions of time and thought to the **MWP**.

State Planning Agency

The Minnesota State Planning Agency staffs the Environmental Quality Board and its Water Resources Committee. The **Minnesota Water Plan** was prepared by Marilyn Lundberg, Deborah Pile, and John Wells, WRC Director, as part of this service. Sandy Henry and Pat Ciernia were responsible for technical production of the report.

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