

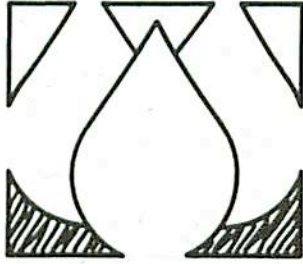


1992

NORTH DAKOTA

*State Water
Management Plan*

NORTH DAKOTA STATE WATER COMMISSION



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Management Plan*

NORTH DAKOTA STATE WATER COMMISSION

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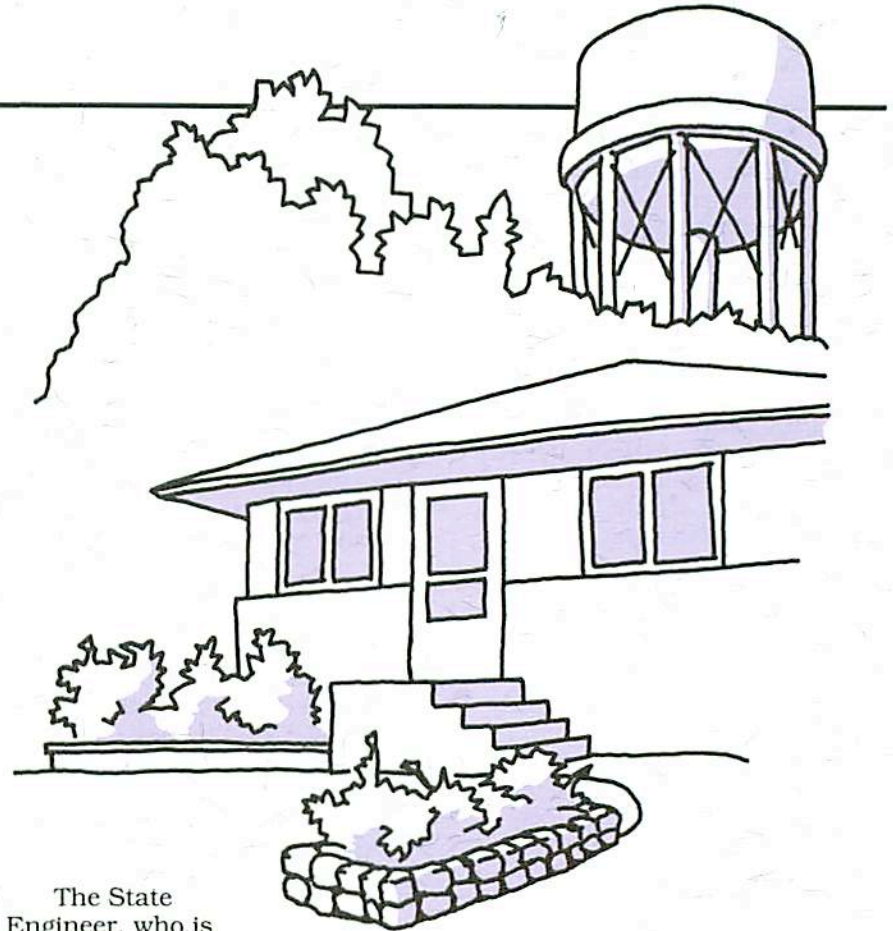
Setting

Water is a unique and precious natural resource critical to the survival of all living things. Clearly, no human endeavor can be successful without water. From gunfights to courtroom, conflicts over rights to water have raged for years in the western United States. The intensity of past and present conflicts illustrates that a reliable supply of quality water is essential to support a healthy economy and high quality of life. A state that inadequately plans for the wise use and protection of its water resources risks losing opportunities to make important choices about its future.

Planning Authority

Since before statehood, North Dakota's founding fathers recognized the importance of water. Article XI Section 3 of the State Constitution secured public control of all water resources within the state's boundaries. This critical provision ensured equal access to the state's water resources for all potential users.

North Dakota, like other western states, adopted the Prior Appropriation Doctrine to allocate both ground and surface water among users. This legal principle allocates water on a first-come, first-served basis. A user who is the first to put an available water supply to a beneficial use has the right to continue using an allotted quantity of water from a specific source. The user must continue the beneficial use of the water to keep the rights to it.



The State Engineer, who is Secretary and Chief Engineer for the State Water Commission (SWC), exercises regulatory authorities outlined in North Dakota Century Code (NDCC) Chapter 61-03. Responsibilities of the State Engineer include administration of water rights, issuance of permits to construct and operate certain water control works, and the collection, compilation, and distribution of water-related data. NDCC Section 61-02-14 assigns powers and duties to the SWC to develop and maintain plans for water resource development. Several statutes authorize SWC involvement in virtually all aspects of water project or program planning and implementation.

State legislators embraced wise water resource development guided by careful planning in NDCC Section 61-01-26. Subsection 4 states:

"...accruing benefits from these resources [water resources] can best be achieved for the people of the state through the development, execution, and periodic updating of comprehensive, coordinated, and well-balanced short-term and long-term plans and programs for the conservation and development of such resources by the departments and agencies of the state having responsibilities..."

Past Water Plans

The first state-wide water plan, published in 1937 by the State Planning Board, developed strategies to address immediate water problems. A plan published in 1962 also focused on resolving immediate problems but went another step by trying to anticipate future water needs. The 1968 State Water Plan progressed even further. It addressed specific water development needs to satisfy the expected growth in lignite mining, power production, and irrigation.

The 1983 State Water Plan approached state-wide water resource planning by incorporating broad public input into the planning process. An extensive public involvement program designed to obtain maximum input from the grass-roots level was used. This extensive local participation was seen as vital for developing a comprehensive set of publicly supported water development proposals.

Every 1983 Plan proposal originated through the public involvement process. The plan also featured a three-account analysis, considering economic, environmental, and social implications for every proposal. Finally, each proposal was prioritized by the public into one of three implementation timeframes to develop a short- and long-term schedule for water development. The 1983 Plan emphasized future water demand projections, particularly from the Missouri River.

1992 State Water Management Plan

The process used to produce the 1992 Plan built upon the 1983 planning process. Both planning efforts organized committees or boards for information, guidance, review, and input. A Steering Committee and a Technical Review Committee were consulted throughout the 1992 Plan's development. Like the 1983 Plan, an extensive public involvement process was conducted.

Steering Committee

Initially, the SWC and State Engineer began the planning process and followed its progress through reports at their regular meetings. The Steering Committee, chaired by Lt. Governor Lloyd Omdahl, was created to offer guidance to the planning process from divergent perspectives. Members included two State Water Commission members and other state leaders from agriculture, industry, water development, Native American, and environmental interest areas. Their specific role was to review and approve the planning process design, the Future Without Plan section, and assist in resolving any conflicts that arose. The SWC thanks the following Steering Committee members:

*Lt. Governor, Lloyd Omdahl,
Chair, Bismarck*
William Lardy, Bismarck
Howard Olson, Fargo
Fletcher Poling, Bismarck
Alfred Underdahl, Hebron
Jay Leitch, Fargo
Lorry Kramer, Minot
*Brenda Schilf, Billings, MT,
formerly of New Town*
Pam Dryer, Bismarck

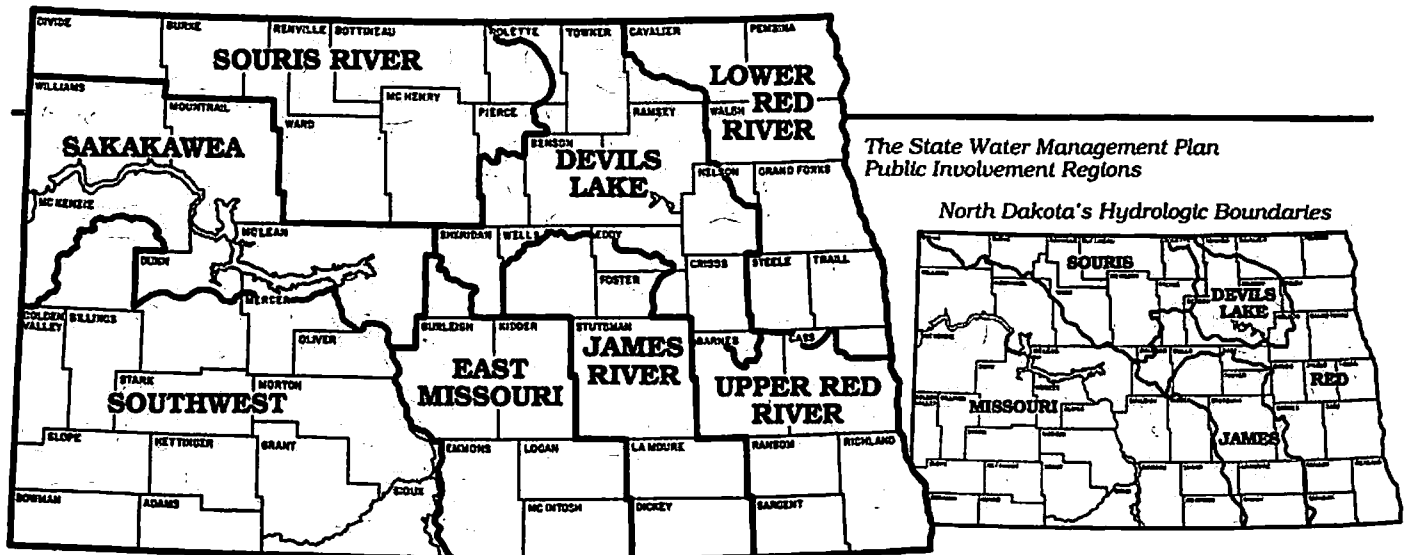
Robert Brodshaug, Fargo
Leon Dubourt, Walhalla

Pam Dryer resigned from the committee during the planning effort.

Technical Review Committee

The Technical Committee was formed to coordinate the many state and federal agencies which are directly and indirectly involved in water resource management. Committee members, appointed by their respective agencies, submitted project/program proposals which were important to their agencies for consideration by the Citizen Advisory Boards. They provided information used to develop the Future Without Plan section and other portions of the 1992 Plan. The SWC thanks the Technical Review Committee members including:

*Ken Junkert, North Dakota
Department of Agriculture*
*Steve Dyke, North Dakota Game
and Fish Department*
*Melissa Miller, North Dakota State
Health Department and
Consolidated Laboratories*
*Blake Vander Vorst, North Dakota
Soil Conservation Committee*
*Chuck Fine, North Dakota
Economic Development and
Finance Commission*
*Mark Luther, North Dakota
Geological Survey*
*Julie Salvesson-Duffey, North
Dakota Parks and Tourism
Department*
*Dennis Breitzman, United States
Bureau of Reclamation*
*Jim Winters, United States Army
Corps of Engineers*
*Karen Kreil, United States Fish
and Wildlife Service*
*Russell Harkness, United States
Geological Survey*
*Ron Sando, United States Soil
Conservation Service*



Public Involvement Process

The SWC planning staff established eight public involvement regions which roughly follow the state's hydrologic boundaries. In organizing the regions, special attention was given to historic water management problems and to generating maximum public participation. A Citizen Advisory Board (CAB) was appointed for each region by SWC Chair, Lt. Governor Lloyd Omdahl. CAB members were selected from nominations received from Water Resource District Boards within each region and from state-wide organizations interested in water management. Regional planning councils, local cooperatives, civic organizations, as well as agricultural, tribal, and environmental groups were asked to nominate individuals to represent their interests on the CABs.

Water Resource Districts played a major role on the CABs by design because they are the local authority in managing water resources. Water Resource Districts have extensive power and responsibilities including the

ability to fund water projects and programs. Through their responsibilities, individuals serving on local Water Resource Districts are very well-informed about local water management problems and opportunities.

The State Water Commission and the planning staff sincerely thank the following CAB members for their time and energy in making the planning process a success. (*Denotes Water Resource District Board member.)

SAKAKAWEA REGION:

- * Allen Ferrell, Alamo, Chair
- * Donald Severtson, Watford City, Vice-Chair
- * Frank Heinzen, Garrison
- * Walter Sailer, Hazen
- * Stanley J. Vachal, Stanley
- Lars Oynes, New Town
- Herb Nathan, Coleharbor
- Tom Rolfstad, Williston
- Jack Tasker, Sidney, MT
- Don Morgan, New Town
- Waldo Westrum, Turtle Lake
- Monte Meiers, Williston
- Jeff Keller, Williston
- Tom Beierle, Mercer
- Felicia Felix-Fox, New Town
- John Lindvig, Williston

SOUTHWEST REGION:

- * Jack Olin, Dickinson, Chair
- * Lincoln Reinhiller, Hazen, Vice-Chair
- * Gene Davison, Hettinger
- * Ludwig Buresh, Dickinson
- * Jerry Palczewski, Scranton
- * Bill Flaget, Halliday
- * Orville Moe, Beach
- * Joe Braun, Carson
- * Vernon E. Lemke, Mott
- * George Toman, Mandan
- * Harvey Farrel, Marmarth
- * Bruce Jaeger, Hebron
- * Lloyd T. Huber, New Salem
- * Gordon Dix, Morrystown, SD
- * Joe Steier, Reeder
- Jerry Volk, Dickinson
- Chris Christman, Lemmon, SD
- Clayton Hoffman, Hazen
- Albert Gipp, Fort Yates
- Jerome Koppl, Beulah
- Terry Rich, Dickinson
- Henry Schank, Dickinson

SOURIS RIVER REGION:

- * Arden Haner, Douglas, Chair
- * Ervin Schultz, Bowbells, Vice-Chair
- * Clifford Issendorf, Kramer
- * Curtis Nordehus, Souris
- * Robert Priebe, Noonan
- * Glenn Wunderlich, Voltaire
- * Hartley Carlson, Bottineau
- * John Axtman, Rugby
- * Harry G. Nelson, Lansford
- * Werner Kitzing, Willow City
- Stewart Bliss, Bottineau
- Lyle Weeks, Minot
- Alan Walters, Minot
- Toby Graber, Rolette
- David Beuchler, Sawyer
- Orlin Oium, Towner
- Percy Kleeman, Minot
- John Schultz, Rugby
- David DesLauriers, Sherwood

EAST MISSOURI REGION:

- Herb Grenz, Bismarck, Chair
- Gary Puppe, Bismarck, Vice-Chair
- * Robert J. Boyd, McKenzie
- * Glen McCrory, Linton
- * Leonard Landenberger, Tuttle
- * Ray Erbele, Streeter
- * Marvin Schneider, Ashley
- * Alvin Herr, McClusky
- Paul Bakkum, Steele
- Keith Demke, Bismarck
- Ray Mount, Bismarck
- Carter Vander Wal, Pollock, SD
- Melwin Schmidt, Menoken
- Gary Killian, Bismarck

JAMES RIVER REGION:

- Waide Kritsky, Jamestown, Chair
- * Ron Nelson, Litchville, Vice-Chair
- * Herbert Miller, Ellendale
- * Kenneth Reis, New Rockford
- * Glen Lindstrom, Glenfield
- * Arnold Swanson, Jamestown
- * Richard Leintz, Harvey
- John Bollingberg, Bremen
- Darald Olson, Buchanan
- Ray Greenwood, Jamestown

DEVILS LAKE REGION:

- Curt Brekke, Devils Lake, Chair
- Arne Berg, Starkweather, Vice-Chair
- * Thor Sollin, Minnewaukan
- * Stan Ripplinger, New Rockford
- * Robert Johnson, Sutton
- * Ben Varnson, Lakota
- * Marvin Gisi, Selz
- * Wayne Simon, Hampden
- * Don Lentz, Perth
- * Arlo Dockter, Anamoose
- * Kent Vesterso, Munich
- Rolf Berg, Maddock
- Ron Rodenbiker, Rock Lake
- Bruce Burkett, Devils Lake

LOWER RED REGION:

- * Ray Trosen, Larimore, Chair
- * Ben Varnson, Lakota, Vice-Chair
- * William S. Hardy, Walhalla
- * Nils Buringrud, Gardner
- * Henry Klindt, Walhalla
- * Lee Nerdahl, Sharon
- * Gary L. Peterson, Buxton
- * Vernon Carlson, Park River
- Ralph McCanna, McCanna
- Paul Satrom, Galesburg
- Gary Goetz, Grand Forks
- Nolan Ver West, Finley
- Thomas Mann, Langdon
- Richard Crawford, Grand Forks
- Ken Vein, Grand Forks

UPPER RED REGION:

- * Fred Selberg, Harwood, Chair
- * Kenneth Stroh, Lisbon, Vice-Chair
- * Calvin Lettenmaier, Sandborn
- * Wesley Beilke, Buffalo
- * Michael Gilles, Lidgerwood
- * Ken McIntyre, Harwood
- * John C. Totenhagen, Sstrum
- Milton McLaen, Havana
- Dan Spiekermeier, Sheldon
- Wilber Mchelson, Fargo
- Bev Stone, Barney
- Dave Breker, Lisbon
- Tom Winkleman, Lisbon
- Greg Link, Lisbon

Each of the eight CABs met on four occasions between April 1991 and June 1992. All four rounds of meetings were open to the public who were notified through a variety of sources. News releases announcing each meeting were sent to all state-wide and local newspapers and other mass media. In addition, a special newsletter, *WaterWays*, was published prior to the meetings to increase public awareness. Meeting schedules were also published in the SWC's *Oxbow* newsletter.

Like the 1983 Plan, input from the public involvement process is considered extremely important and remains the foundation of the final recommendations. Public input was the integral part of the four planning process stages which were:

- organizing the public involvement process,
- developing goals and objectives,
- identifying problems and development opportunities, and
- selecting and prioritizing plan recommendations.

The initial round of meetings provided an opportunity for board members to become acquainted. The planning staff explained the planning process and what would be expected of board members throughout the remainder of the planning process. Chairs and vice-chairs were elected at the first meetings. Most boards chose to hold their remaining meetings in various locations within their regions to facilitate public attendance.

At the second round of meetings, the boards reviewed water management Goals and Objectives taken from the 1983 State Water Plan. The broad goals and specific objective statements were revised to reflect the contemporary views of people living in each of the eight regions. A selection of representative goals and objectives are listed in this report.

Water management problems and development opportunities were reviewed and updated in the third round of meetings. The CABs updated 1983 Plan problems and opportunities as well as offering input on the new water-related developments in their regions. The time between the third and fourth meetings was used by the planning staff to develop proposed solutions to address each problem or opportunity.

During the fourth meeting, CAB members discussed each proposal and selected those they wished to recommend. In making recommendations, the CABs also set priorities by scheduling when each proposal should be implemented. Recommended proposals were scheduled into timeframes of years; 1993-1995, 1995-2000, or 2000 and beyond. This priority ranking is useful for decision-makers to gauge the relative importance given to each proposal by the CABs and to allow planning for short- and long-term water management needs.

The planning process for the Devils Lake region was accelerated to allow the information to be used in a Corps of Engineers reconnaissance study. The Corps study gathered information about stabilizing Devils Lake through water quantity and quality management. High lake levels have caused flooding and current low water levels threaten the lake's fishery which was estimated to be worth \$30 million per year to the local economy.

A special Devils Lake Task Force was formed. They developed a conceptual basin-wide water management plan for the Corps using information from the planning process and other sources. The conceptual plan offers recommendations that agricultural, fish and wildlife, recreation, and economic development interests can use to work together in water management and promote peace and harmony in the basin.

Purpose and Use of Study

The SWC and State Engineer are charged with developing the state's water resources to maximize their benefits for the public. This obligation also includes protecting citizens' health and safety while maintaining the natural environment. For decision-makers to fulfill these responsibilities, a comprehensive plan is needed to broadly address the state's water-related needs. The plan should provide a useful information base for decision-makers to easily keep in touch with water needs across the state.

The 1992 State Water Management Plan's purpose is to offer state and local decision-makers:

- a thorough list of contemporary water management needs and public concerns,
- information on projects, programs, and water management issues, and
- short- and long-term schedules of recommended proposals designed to meet the state's future water needs.

By defining and describing the wide range of water management needs, this report represents an important tool for formulating short-term and long-term state and local budgets. It identifies specific projects and programs, a brief description of why they are needed, and their estimated cost when available. Legislators and water managers can use this information to estimate the funding required to meet priority needs. To assist potential project sponsors, state and federal agencies involved with each project or program are identified and a section describing available financing options is included in the report.

This report and its supplements are an educational tool and a reference guide for water management rather than a binding blueprint. Like most written documents, some data in this report will be outdated soon after publication. This report and its supplements, available upon request, will be updated every five years or as directed by the SWC and State Engineer. The 1992 Plan anticipates change and has taken steps to keep abreast of new developments.

Plan Maintenance and Computer Database

Past water planning efforts have shown that information, conditions, and assumptions on which water plans are based can become outdated very quickly. Final recommendations are vulnerable to sudden, unexpected changes in government policies, financial conditions, and public attitudes which are often driven by the climatic extremes (floods and droughts) common to North Dakota. The state's unpredictable climate and the SWC's project implementation policy require water plans to be flexible and dynamic.

Water's limited and unpredictable natural occurrence in North Dakota presents water managers with constantly changing circumstances. This report addresses the range of short-term water management needs, from floods to drought, that come and go with cyclic changes in climate. However, it is important to maintain a long-term perspective to prevent crisis-driven water management. By doing so, managers and decision-makers can avoid short-sighted decisions and find comprehensive solutions. These solutions can satisfy the needs of several interests and address problems at both ends of the climatic spectrum.

Another factor making flexibility in water planning necessary is the state's implementation process. Progress towards completion of most proposed projects and programs is very dependent on local initiative. In other words, local citizens must show their support for proposals by spending the time, energy, and money needed to move proposals through the sometimes long process of approval and into the implementation stage. Proposals are studied in detail and must be deemed viable from technical, environmental, social, and economic standpoints. They also must be consistent with state and federal laws before implementation can begin. This long, detailed process mandates that water plans be developed with flexibility and foresight.

To counteract obsolescence, all recommendations in the 1992 State Water Management Plan will be added to a computer database. Individuals can access the database to view the most current information on proposed projects or programs. Proposals will be added or modified to reflect actions taken by the SWC and State Engineer or other factors.

Plan Organization

Recommendations and other information in the 1992 Plan are organized according to the state's five major hydrologic boundaries which are the Missouri, Souris, James, and Red River basins along with the Devils Lake drainage basin. This encourages water managers to consider nature's boundaries rather than arbitrary, political boundaries. Water management plans must recognize hydrologic systems whether they be surface or ground water.

This report is written and organized to meet the practical information needs of decision-makers, local water managers, and the public. The information is presented in a concise, non-technical form for ease in reading and understanding. The report was kept as brief as possible by including only the most essential information. In-depth information on recommendations, issues, data, or procedures may be obtained by contacting the North Dakota State Water Commission.

Goals & Objectives

Water Management Goals and Objectives were reviewed, revised, and approved by each of the eight Citizen Advisory Boards (CAB). The purpose of this goal setting exercise was to help CAB members organize and develop the long-term direction of water management in their respective areas. The broadly stated goals and more specific objectives also offer state-level decision-makers an overview of the public sentiment regarding water management for each region.

The first draft of the Goals and Objectives were developed by State Water Commission staff from the 1983 Water Plan and other sources. This draft was presented to CAB members at the second round of meetings. The CABs reviewed, then revised the first draft by adding new objectives to reflect new developments and deleting old objectives that were not relevant. In this way, each region tailored the Goals and Objectives to reflect their sentiments on water management. The final draft was mailed to CAB members and approved at the third meeting.

Water Management Goals and Objectives are arranged under the topics of water supply, irrigation, water quality, flooding, fish and wildlife, outdoor recreation, weather modification, energy, and economic development. A broad goal was developed for each of these topics. Under each goal, CABs approved several more specific objectives.

The goal for each topic is fairly uniform among regions. The representative objectives are only a partial list and are presented as examples of objectives

developed during the planning process. Complete sets of Water Management Goals and Objectives for any of the eight CAB regions can be obtained by contacting the State Water Commission.

Representative Goals and Objectives

WATER SUPPLY

GOAL:

To meet projected water supply demands for all purposes for the years 1995, 2000, 2020, and beyond.

OBJECTIVES:

- Develop self-supporting rural water systems where quantities demanded exceed available supplies or where water quality is below standard. Subsidies should be considered for systems serving isolated areas.
- Reserve sufficient quantities of Missouri River water to provide a viable supply for future municipal, industrial, agricultural, recreation, and domestic needs.

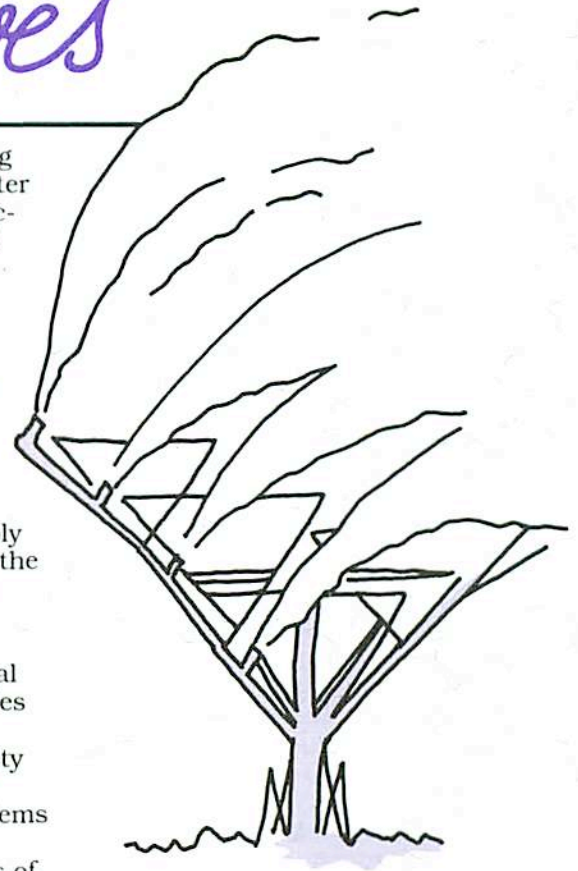
IRRIGATION

GOAL:

To encourage irrigation development where feasible in the public and private sectors to help stabilize and diversify the state's agricultural production.

OBJECTIVES:

- Satisfy the water supply demands for new irrigation development and create facilities that conserve water yet increase the net economic, social, and environmental benefits to the public.
- Complete Garrison Diversion Project features. Develop canal-side irrigation which can benefit agriculture and possibly improve water quality in Lake Audubon.



WATER QUALITY

GOAL:

To maintain and enhance the quality of all the state's waters.

OBJECTIVES:

- Improve land management practices and continue researching methods to help control nonpoint source pollution.
- Increase monitoring of water quality where needed to detect and eliminate pollution sources that may affect water users and the natural environment.

FLOODING:

GOAL:

To reduce and/or eliminate flood damages to property and protect lives in floodplains and other flood-prone areas.

OBJECTIVES:

- Continue the public information/education program on floodplain management in affected communities.
- Maintain channel capacities of coulees and streams across the state and remove obstructions where necessary.

FISH AND WILDLIFE:

GOAL:

To perpetuate and enhance where possible, fish and wildlife resources for continued recreational, aesthetic, and scientific uses.

OBJECTIVES:

- Provide incentives through voluntary programs, such as the state and federal Water Bank Programs, to encourage private landowners to maintain or enhance wildlife habitat.
- Reduce point and nonpoint pollution that adversely impacts aquatic and other ecosystems.

OUTDOOR RECREATION:

GOAL:

To develop sufficient water-based outdoor recreation facilities to meet the projected demand for years 1995, 2000, and 2020.

OBJECTIVE:

- Identify and evaluate opportunities to develop new sites and/or improve existing facilities near the state's lakes and streams. Developments should be suitable for all ages and not seriously affect natural ecosystems.

WEATHER MODIFICATION:

GOAL:

To develop a scientifically credible and socially acceptable state-wide program of precipitation management administered under existing state authority and local control.

OBJECTIVE:

- Determine the economic impact on the state's economy from cloud seeding operations.

ECONOMIC DEVELOPMENT

GOAL:

To conserve, protect, develop, and manage water resources to provide a foundation that meets the state's need for strong, viable social and economic structures.

OBJECTIVE:

- Carefully develop water and land resources in ways that can broaden the state's economic base.

ENERGY

GOAL:

To manage water resources for optimal use in energy production while minimizing potential negative impacts.

OBJECTIVE:

- Increase the efficiency of hydroelectric power generation at Garrison Dam.

The preceding objectives are only a partial list of the many that were approved by the eight CABs. Most CAB regions had very similar goals and objectives even though they were encouraged to tailor their list to their specific sentiments on water management. Developing goals and objectives helped local water managers use a long-term approach to water management.



Recommendations

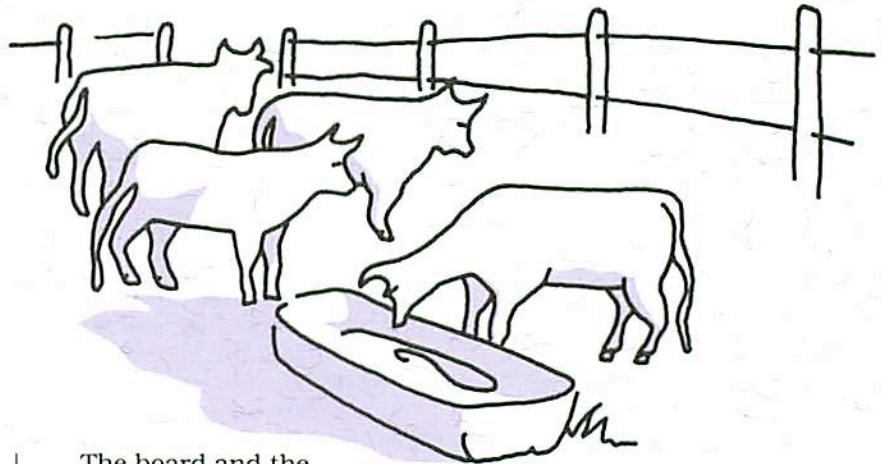
The sets of state-wide and regional water management recommendations summarized in this section offer decision-makers a comprehensive list of the state's water management demands. These recommended projects and programs originated as problems or water management opportunities that someone recognized and brought to the State Water Commission's (SWC) attention through the public involvement process. They are in various stages of implementation with many scheduled to be finished over the next few years. Others are simply concepts or ideas for improving water management that need to move through the SWC's implementation process before they become active projects or programs.

The SWC Implementation Process

Any of the eight region's recommended projects or programs can begin and proceed in different ways. But those that progress from idea to completion will have one common element. Local citizens will organize and support their idea through an implementation process needed to answer the many engineering, environmental, economic, and social questions linked with every proposal.

The process begins with people from an area identifying a water-related problem or an opportunity for improved water management. They contact a member of their county's Water Resource Board. Usually, the board contacts the SWC requesting an investigation but boards can hire private engineering firms.

Once completed, the investigation report is reviewed by the local board who also decide if they wish to implement the proposal. Securing funding is again a major consideration for the local board. The SWC and any other involved agencies supply some of the money needed but local sponsors must pay part of the construction costs.



The board and the SWC then enter into an agreement, often with other agencies, to detail responsibilities and investigation cost-shares. The agencies involved and the local board usually cost-share investigation and construction activities. The investigation determines whether the proposal is viable from engineering, economic, environmental, and social standpoints. Many times, these activities are taking place simultaneously. In complex proposals it can take months or years to complete this stage of the process. Others progress more quickly.

If the board chooses to implement the proposal, they formally request the SWC to cost-share with them. Construction can begin upon SWC approval. Construction work can be done by the SWC crew or a private firm. However, the SWC is in charge of inspection.

Each proposal begins and proceeds differently from idea to completion. The SWC offers funding and technical assistance to local boards but it is local initiative that moves a proposal through the process. It is through this process that feasible projects that enjoy widespread support of the people they are meant to benefit can be constructed.

The Recommendations

State-wide and regional water management recommendations began as problems and development opportunities that were compiled from many sources including the 1983 Plan, state and federal agencies, Water Resource District Boards, Citizen Advisory Boards (CAB), citizens-at-large, and other sources. The eight CABs reviewed water management problems and opportunities in the third round of meetings and also proposed new problems and opportunities throughout the planning process. A possible solution for each proposal was identified and studied briefly for engineering feasibility and analyzed using a three-account analysis.

The three-account analysis estimates the economic, social, and environmental effects a proposal will have on the area where it is located. This information was presented to the CABs but does not appear in the 1992 Plan. It is available in the SWC's computer database. This information will be continually updated as changes occur.

The completed state-wide and regional proposals received a final review by the CABs at the fourth and final round of meetings. After reviewing proposed solutions, the CABs were asked to develop a schedule of when they thought the proposed solutions would most likely be implemented. Proposals could be placed into four timeframes which were; the present or ongoing timeframe, years 1993-1995, years 1996-2000, or beyond the year 2000.

Characteristics of proposals caused them to be placed into a logical timeframe. Some were only ideas needing feasibility studies while others had completed the study process and awaited funding. Some were critical situations whereas others could be attended to later. Some proposals did not enjoy widespread public support and were placed in later timeframes.

This prioritization process is not intended to be a strict guide that cannot be changed. Rather, it offers decision-makers a guide that provides basic information about proposals. It also gives decision-makers a feeling for the relative importance each CAB placed on any given proposal. Finally, the prioritization process helps the SWC and the Legislature budget for water management in upcoming bienniums.

Regional water management proposals are organized into the eight public involvement regions. To help readers locate proposals, numbers on each region's map correspond to specific proposals. Circled numbers indicate region-wide proposals. State-wide proposals were either supported, not supported, or received no recommendation from the CABs.

State-wide

WATER RESOURCE MANAGEMENT PROPOSALS

PROPOSAL LOCATION	DESCRIPTION	POSSIBLE SOLUTION		AGEN*	REGION									
		A)	B)		UPPER RED	LOWER RED	SOURIS RIVER	DEWITT LAKE	EAST MISSOURI	SAKAKAWEA	SOUTHWEST	JAMES RIVER		
Reservoir Management Garrison Dam and Oahe Dam	The COE should maintain high water levels in the reservoirs to maximize hydropower production and recreation benefits. If necessary, high water levels should be maintained even at the expense of downstream barge interests.	Continue SWC involvement in the COE, Missouri River Master Manual Review process.	Continue encouraging the COE to operate the system to maximize hydropower production and recreation benefits.	COE	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup
				SWC										

Hydropower Upgrade Garrison Dam	The State should study the feasibility of cost-sharing with the COE to replace old turbine runners at Garrison Dam with new high-efficiency runners. The cost-share agreement would allow ND to receive revenue from power sales. The revenue could be used to fund water projects.	Conduct a feasibility study of a state cost-share with the COE for a hydropower upgrade at Garrison Dam.	SWC COE	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup
Atmospheric Resources (Cloud Seeding)	Weather modification activities suppress hail and enhance rainfall by seeding select convective clouds.	Continue and expand the North Dakota Weather Modification Program. (The program's cost is \$528,000.)	County ARB SWC	No Rec	Sup	Sup	Sup	Sup	Sup	Sup	Sup	No Sup
Atmospheric Resources (Coop. Research)	The research program defines cloud processes involved in developing rainfall and hail during northern Great Plains thunderstorms. It also studies the conditions necessary to beneficially modify thunderstorms.	Continue the Federal-State Cooperative Program in Atmospheric Modification Research. (Federal cost is \$500,000 and state cost is \$25,000.)	ARB SWC NOAA	No Rec	Sup	Sup	Sup	Sup	Sup	Sup	Sup	No Sup
Atmospheric Resources (Education)	Inform North Dakotans of the capabilities, limitations, and economic benefits of weather modification.	Continue developing the Weather Modification Public Education Program.	ARB SWC	No Rec	Sup	Sup	Sup	Sup	Sup	Sup	Sup	No Sup
Atmospheric Resources Research and Evaluation	Maintain the state-wide rain and hailfall observation network of about 900 volunteer observers. Data is used to evaluate the Weather Modification Program and is used by the National Weather Service and the SWC.	Continue the observation network and evaluation activities.	ARB SWC	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup	No Sup
Irrigation (Groundwater)	Ground-water information is needed to expedite the water permit process.	Continue present SWC program. (Souris and Lower Red River CABs suggested moving more irrigation permit hearings to the local areas for better public input.)	SWC	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup
Land Management (State Water Bank Program)	The State Water Bank Program helps preserve, restore, and improve wildlife habitat. Landowners receive annual payments for maintaining wetlands on their property. Funding relies on private contributions or EPA and GFD money.	Support the program and endorse the annual payments to landowners concept rather than long-term easements.	SDAG SWC GFD Private	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup
Irrigation (Education)	Seminars are needed to educate landowners on irrigation's advantages and limitations.	Continue supporting the educational efforts of the GDCD, EXT, and IA.	EXT GCD IA	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup
Irrigation (Waste Stabilization Pond)	Some communities could use water from waste water treatment facilities to irrigate adjacent land.	Encourage the concept where soil and water are compatible (i.e. Dickinson and Carrington).	City Private	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup
Irrigation Districts	Legislation governing the formation of irrigation districts should be reevaluated. Establishing irrigation districts on a county or township basis should be explored.	Legislative change (The Souris CAB suggested a requirement that irrigation district board members must be landowners in the district.)	IA SWC	Sup	No Rec	Sup	No Rec	Sup	No Rec	Sup	No Rec	No Rec

WATER RESOURCE MANAGEMENT PROPOSALS

UPPER RED RIVER
 LOWER RED RIVER
 SOUTHS RIVER
 DEVILS LAKE
 EAST MISSOURI
 SAKAWAYLA
 SOUTHWEST JAMES RIVER

PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	AGENCY	UPPER RED	LOWER RED	SOUTHS RIVER	DEVILS LAKE	EAST MISSOURI	SAKAWAYLA	SOUTHWEST JAMES RIVER
Soil Erosion	Land treatment measures are essential to protect and preserve water and soil resources.	Support existing federal and state programs.	SCS ASCS Private	Sup	No Rec	Sup	Sup	Sup	Sup	Sup
Land Management (Plugging Wetlands)	Plugging drained wetlands in years when the land is fallow could aid agriculture and wildlife.	Encourage use of the concept, set up demonstration projects, and disseminate information (i.e. Bottineau County Pilot Project).	WRD GFD Private	Sup	Sup	Sup	Sup	Sup	Sup	Sup
Stormwater Management	Coordination is needed between cities and rural areas to manage stormwater.	Improve communication between all governmental entities.	WRD City	Sup	Sup	Sup	Sup	Sup	Sup	Sup
Wetland Inventory	The National Wetland Inventory maps should be digitized so information can be used by natural resource agencies.	Support the program to digitize the National Wetland Inventory maps.	SHD SWC GFD FWS	Sup	No Rec	No Sup	Sup	No Sup	No Sup	No Sup
Wetland Restoration	The SWC and WRDs could cost-share in wetland restorations and contribute to the No-Net-Loss Program's wetland bank.	SWC policy change	WRD SWC SHD	Sup	No Rec	Sup	Sup	No Sup	No Sup	No Sup
Section 404 Permit Process	The COE Section 404 permit process should be shortened and require on-site inspection of materials used in bank stabilization. (The Lower Red River and Devils Lake CABs suggested SHD water quality standards should not be more restrictive than COE standards.)	A) Monitor techniques and materials (The SWC is studying 404 program administration in ND for the COE.) B) COE administrative change	SWC WRD COE COE	Sup	Sup	Sup	Sup	Sup	Sup	Sup
Abandoned Wells	Abandoned wells must be identified and plugged to prevent them from contaminating ground water.	A) Identify and inventory abandoned well locations. B) Expand the SHD's well plugging demonstration project and study using township boards to help locate abandoned wells.	SHD SWC SHD SWC CTB	Sup	Sup	Sup	Sup	Sup	Sup	Sup
Aquaculture (Fish farming)	Study the potential of aquaculture in ND using the latest technologies, fish species, and marketing strategies.	Study and disseminate information.	EXT EDF	Sup	Sup	Sup	Sup	Sup	Sup	Sup
Alternative Municipal Water Supplies	Communities need to identify alternative water supplies to use in emergencies when their current supply is lost or contaminated.	The SHD and SWC should start a program to help communities develop Contingency Plans that identify alternative water supplies.	SHD SWC City	Sup	Sup	Sup	Sup	Sup	Sup	Sup
Water Conservation (Irrigation)	Inefficient use of ground and surface water can occur through mismanagement or use of outdated equipment.	Water-saving irrigation technologies and management techniques should be studied and promoted.	EXT SWC GCD	Sup	Sup	Sup	Sup	Sup	Sup	Sup

Fish and Wildlife Habitat	Serious long-term fish and wildlife problems occurred from changes in land uses (urbanization) and farming practices. Projects and programs which create, protect, or enhance wildlife habitat and wetlands should be promoted.	Continue to support existing federal, state, and private programs such as CRP, No-Net-Loss, Create a Wetland, Adopt a Pothole, Wetland Reserve, state and federal Waterbank Programs, and GFD's ND Development Programs. Continue to support only voluntary, incentive-based, non-perpetual federal, state, and private programs such as CRP. Create a Wetland, Adopt a Pothole, Wetland Reserve, state and federal Waterbank Programs, and GFD's ND Development Programs.	SDAG GFD SCS ASCS SWC WRD Private	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup
Land Management (Waterfowl Production)	Rather than further acquisitions, waterfowl production could be increased with better development and management of wetlands now under state and federal control.	Improve management techniques.	FWS	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup
Drainage	Surface water management can be enhanced by using a watershed or "systems" approach to drainage.	Encourage watershed management and continue to enforce existing drainage regulations.	SWC WRD	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup	Sup
Public Education	Educate the public about water-related problems and issues and inform them of potential projects and impacts.	Expand and improve present programs (WET, SWC Communit-cation Plan, and The Oxbow).	SWC WRD	Sup	Sup	No Sup	No Sup	No Sup	No Sup	No Sup	No Sup	No Sup	No Sup
Minimum Instream Flows	Reservoir operations and management plans should consider releases for downstream fish and wildlife purposes.	A) Conduct a study to determine minimum flow requirements for fish and wildlife. B) Legislative change recognizing minimum flows for fish and wildlife.	SWC GFD SWC	Sup	No Sup	No Rec	No Rec	No Rec	Sup No Rec	Sup No Rec	Sup No Rec	Sup No Rec	Sup No Rec

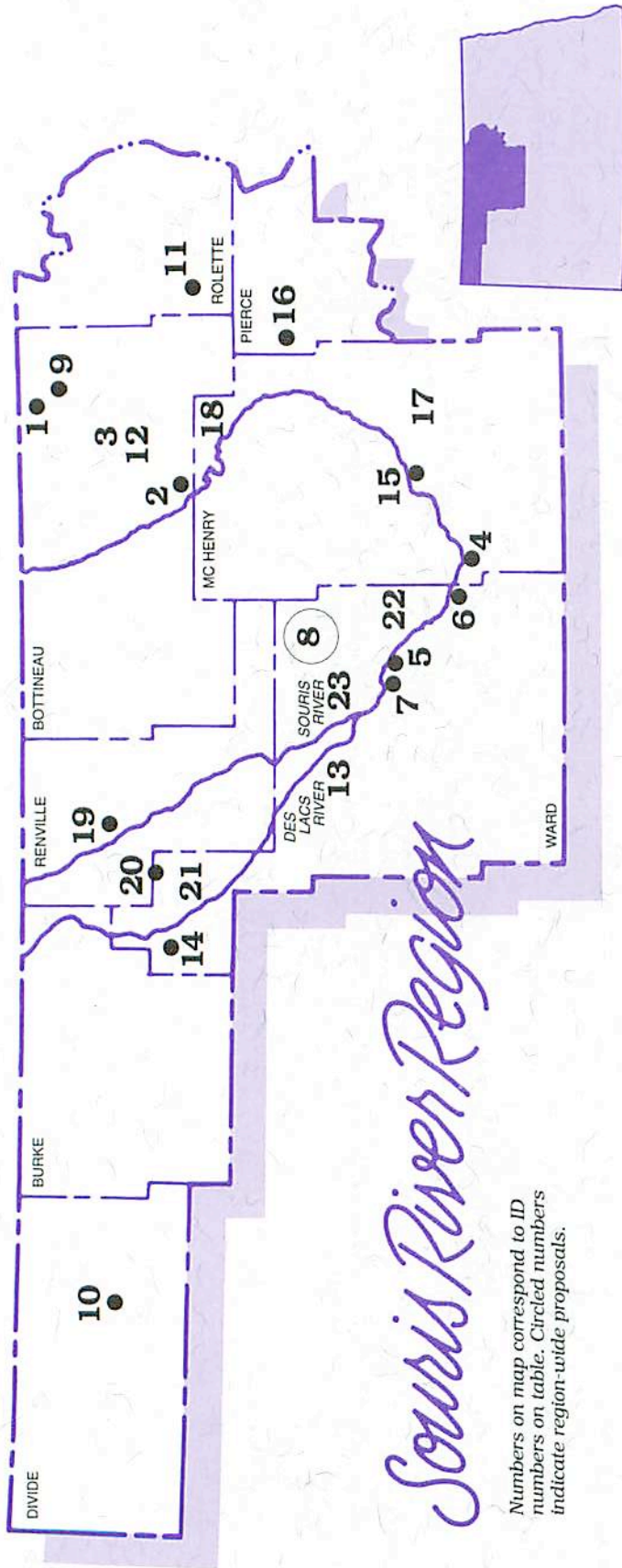
*Agencies involved with project study and implementation:
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ASCS Ag. Stabilization & Conservation Service
BOR Bureau of Reclamation
BWWC Board of Water Well Contractors
COE Corps of Engineers
CTB County Township Board
DU Ducks Unlimited

EDF Dept. of Economic Development & Finance
EPA U.S. Environmental Protection Agency
EXT ND State University Extension Service
FBR Fort Berthold Indian Reservation
FWS U.S. Fish and Wildlife Service
GCD Game & Fish Department
GS Garrison Diversion Conservancy District
U.S. Geological Survey

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NOAA National Oceanic & Atmospheric Admin.
PSC Public Service Commission
RRJT Red River Joint Board
SDAG State Department of Agriculture
SCS Soil Conservation Service
SFS State Forest Service
SHD State Health Department

SWC State Water Commission
WRD Water Resource Districts

Sup = Supported
No Sup = No Support
No Rec = No Recommendation



Souris River Region

Numbers on map correspond to ID numbers on table. Circled numbers indicate region-wide proposals.

WATER RESOURCE MANAGEMENT PROPOSALS

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGEN*	SCHEDULE**			
					STUDY**	ONGOING	1993-1995	beyond 2000

SR1. Water Quality/ Lake Restoration Lake Metigoshe Bottineau County	Lake Metigoshe has a history of excessive plant growth which contributes to its accelerated aging (eutrophication).	Regional sewage system improvements and an administrative change in Lake Sharp management in Canada are needed.	N/A	WRD SWC	Imp.				
SR2. Flooding Stone Creek Bottineau County	Steep slopes in the upper watershed release water very quickly causing flooding in the lower watershed.	White Spur Drain and Stone Creek Improvement (404 permit delay)	\$685,000	WRD SWC	Imp.	Done			
SR3. Flooding Northern McHenry and Pierce, eastern Bottineau, and western Rolette Counties	Ox, Oak, and other Turtle Mountain watersheds drain into Willow Creek in a very flat area. Willow Creek cannot remove the water fast enough to prevent flooding.	Series of small dams in the upper watershed	Varies by site (\$37,000 to 8.1 M)	WRD SWC			Imp.		
SR4. Bank Stabilization Oak Creek McHenry County	Streambank erosion along Oak Creek near Velsa is causing problems near a farm home and the road leading to the farm.	Oak Creek Bank Stabilization	N/A	WRD SWC		ongoing		Imp.	

SR5. Flooding Puppy Dog Coulee Ward County	There have been flood problems in a housing development in southeast Minot due to upstream urbanization and inadequate drainage.	Puppy Dog and Larson Coulee Flood Control	N/A	WRD SWC	ongoing	Imp.	
SR6. Flooding City of Sawyer Ward County	Flooding occurs in Sawyer when flows through the Highway 52 embankment exceed channel capacity in the city.	Sawyer Highway 52 Crossing	N/A	WRD SWC	ongoing	Imp.	
SR7. Channel Improvements Souris River Ward County	Snagging and clearing is needed on the Souris River to improve channel capacity. Critical areas are between Minot and Burlington as well as east of Minot near the bypass bridge on Highways 2 and 52.	Souris River Snagging and Clearing	\$300,000	WRD SWC		Imp.	
SR8. Saline Seeps Souris River Region	Salty areas have recently developed on non-irrigated soils where cropping has been reduced or eliminated.	Provide information on research and methods which may restore soil productivity. Demonstration projects would be beneficial.	N/A	EXT SCS SWC ASCS		Imp.	
SR9. Recreation Thompson Lake Bottineau County	The proposed dam would raise the water level of Thompson Lake for improved recreation.	A feasibility study is needed to determine if the watershed will yield sufficient water.	N/A	WRD SWC GFD		F.S.	
SR10. Flooding Sections 5, 8, 15, 16 of T161/R97 and S32/T162/R97 Divide County	Spring runoff has caused high water levels in a large slough south of Crosby. The dikes in place may not prevent flood damages during a large event.	A study is needed to identify possible solutions.	N/A	WRD SWC		F.S.	
SR11. Flood Control S26/T160/R73 Rouleau County	This site was found infeasible in a previous study. However, another site may offer flood control benefits.	A new study is needed to determine the feasibility of the alternate site.	N/A	WRD SWC		F.S.	
SR12. Flooding Oak, Wolf, and Willow Creeks Bottineau County	Areas inundated by various sized events need to be determined for floodplain management uses.	Oak, Wolf, and Willow Creek Floodplain Management Study	N/A	SCS WRD SWC	Done	Imp.	
SR13. Flooding Des Lacs River Valley Ward, Remville, and Burke Counties	Flooding and bank erosion occur throughout the river's length.	Des Lacs River Flood Control (cost excludes land costs)	\$3.9 M	WRD SWC	Done	Imp.	
SR14. Recreation Ward County	A dam on Niobe Coulee has been proposed for recreation and waterfowl production. The project is stalled due to a lack of unpermitted water and land acquisition problems.	Niobe Coulee Dam	\$1.6 M	WRD SWC GFD		Imp.	
SR15. Flooding Souris River McHenry County	Eight families at S17/T154/R78 have bank erosion problems during major floods.	Souris River Washout	\$60,000	WRD SWC		F.S.	
SR16. Flooding Pierce County	The overflow channel for Rush Lake and Horseshoe Lake is poorly developed and unable to handle high flows.	Horseshoe Lake Flood Control	\$1.2 M	WRD SWC		F.S.	

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGEN*	STUDY** ONGOING	1993-1995	1996-2000	beyond 2000
SR17. Flooding Wintering River McHenry County	Flooding and bank erosion have occurred along this major Souris River tributary.	A study is needed to identify possible solutions.	N/A	WRD SWC			Supported	
SR18. Water Supply Eaton Irrigation District McHenry County	Low spring runoff during droughts may not supply the water needed to operate the irrigation district efficiently.	Continue working with current permit holders within existing agreements.	N/A	WRD SWC			Supported	
SR19. Flooding Sections: 3,9,11,14, 15, and 16 of T162/R86 in Renville County	A series of locked-in low areas overflow and do not soak away in time for normal farming practices.	Culverts near affected areas need to be replaced or resized.	N/A	WRD SWC			Supported	
SR20. Flooding Ward and Renville Counties	A large low area between the Des Lacs and Souris watersheds near Norma-Tolley floods when runoff collects in the upper basin. There is no drainage system to remove water after floods recede.	A study found no feasible alternatives.	N/A	WRD SWC	Done		Supported	
SR21. Fish and Wildlife Production Des Lacs Wildlife Refuge Ward and Burke Counties	Des Lacs Lake could be raised to improve conditions for fish and wildlife production and recreation.	FWS approval is required.	N/A	FWS WRD			Supported	
SR22. Water Quality Souris River downstream from Minot Ward County	The timing of effluent releases from the Minot sewage lagoon has caused problems during low flow periods.	Minot's Water Management Plan and wetland treatment system have resolved the issue.	N/A	City WRD			Resolved	
SR23. Flooding Souris River	Flooding and bank erosion have been problems along the length of the Souris River.	Rafferty and Alameda Dams plus COE constructed channel improvements and dikes have resolved most flood problems.	N/A	COE SWC			Resolved	

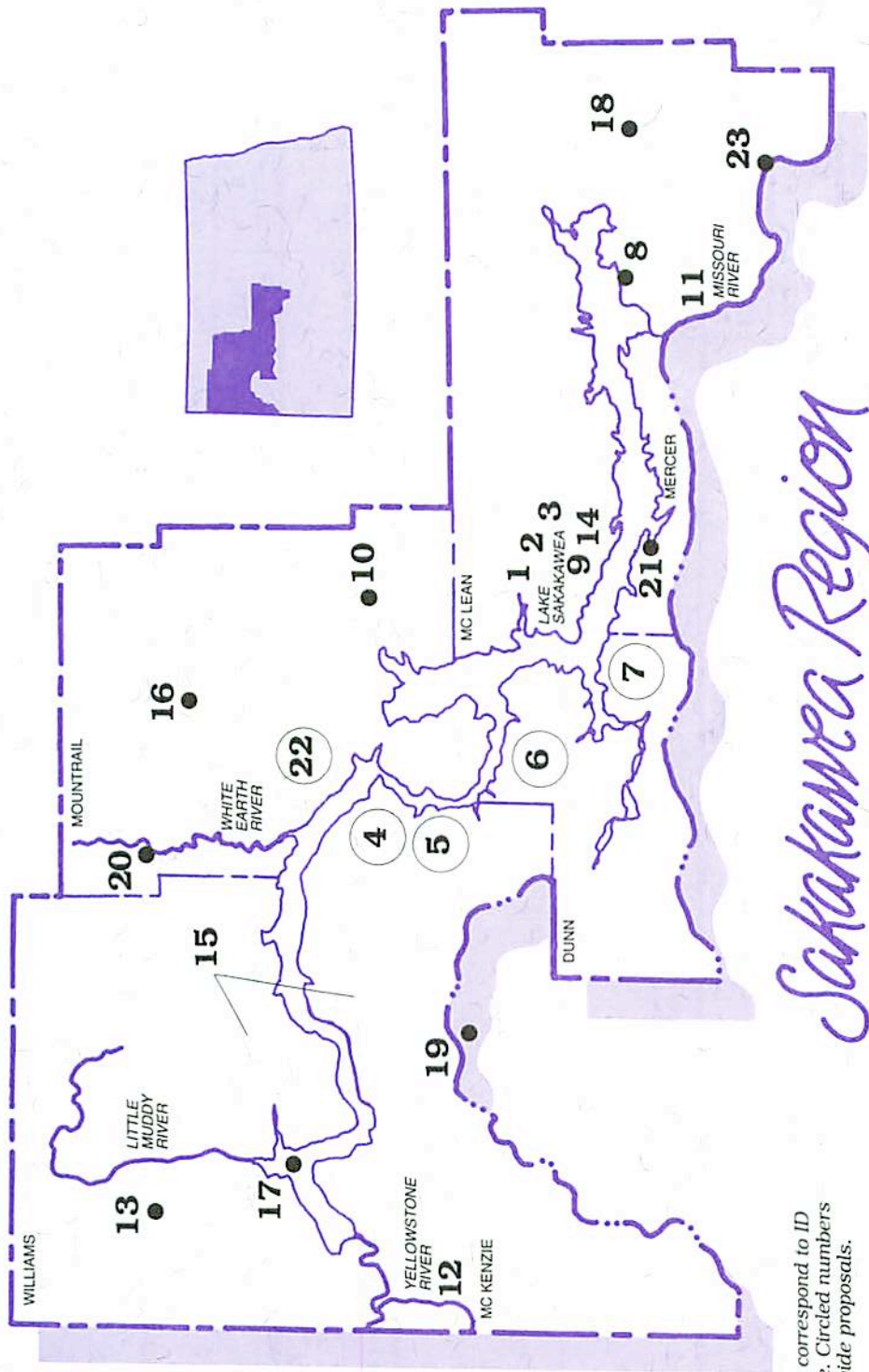
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 BOR Bureau of Reclamation
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 FWS U.S. Fish and Wildlife Service
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WATER RESOURCE MANAGEMENT PROPOSALS

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION		COST	SCHEDULE**			
		COE	SWC		1993-1995	1996-2000	2000	beyond 2000

SK1. Erosion Lake Sakakawea	Shoreline erosion occurring at Lake Sakakawea is an unresolved chronic condition.	N/A							
SK2. Irrigation (Lake-Side) Lake Sakakawea	Irrigable soils and suitable crops must be identified and their financial feasibility evaluated.	N/A							
SK3. Recreation Lake Sakakawea	Lake Sakakawea shore management should be diverted to local governmental entities such as a water resource districts and Tribes.	N/A							

SCHEDULE**

MAP ID, PROPOSAL, LOCATION DESCRIPTION POSSIBLE SOLUTION COST AGEN* STUDY** ONGOING 1983-1985 1986-2000 beyond 2000

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGEN* STUDY** ONGOING 1983-1985	1986-2000	beyond 2000
SK4. Soil Erosion Missouri River Region	Land treatment measures are essential to protect and preserve soil resources.	Continue and expand present programs.	N/A	SCS ASCS	Imp.	
SK5. Habitat Destruction Missouri River Region	Serious long-term fish and wildlife problems have occurred due to COE operation and management of the Missouri River System.	COE administrative change (The Master Manual will be available for public comment in 1993.)	N/A	COE SWC	ongoing	Imp.
SK6. Saline Seeps West of the Missouri River	Saline seeps are reducing or eliminating crop production.	Provide information on research and methods that can improve soil productivity to include continuous cropping rotations.	N/A	EXT	Imp.	
SK7. Oil Exploration Activities Western North Dakota	The potential exists for oil activities to contaminate ground-water supplies.	A) PSC Administrative Change. B) On-site monitoring at oil drilling sites.	N/A	PSC SWC	Imp.	
SK8. Boat Ramp Wolf Creek Lake Sakakawea	Heavy use and low lake levels have created boat access problems in the Wolf Creek area of Lake Sakakawea.	A) COE Administrative Change. (maintain lake level) B) Provide additional ramps or extend existing ramps.	N/A	PSC SHD	Imp.	
SK9. Water Contamination Lake Sakakawea	Landfills flooded by Lake Sakakawea may be potential sources of water contamination.	Identify landfill locations and other potential sources of water contamination in Lake Sakakawea. (Costs of eliminating the problem should be a federal responsibility.)	N/A	SWC GFD	Imp.	
SK10. Dam Deterioration Paulsen Dam Mountrail County	Paulsen Dam, an old CCC Dam, needs repairs. The area has potential for more recreation if facilities were developed.	Paulsen Dam Repairs	\$20,000	EPA SHD	Imp.	
SK11. Erosion Missouri River	Bank erosion along the Missouri River is a serious problem which has worsened since completion of Garrison Dam.	A) COE Administrative Change B) Missouri River Steambank Stabilization involving 46 sites	N/A	WRD SWC	Imp.	
SK12. Erosion Yellowstone River Mckenzie County	Bank erosion is occurring at several sites along the Yellowstone River. Two identified sites are: S32/T150/R104 and S15/T150/R104.	A) COE Administrative Change B) Yellowstone Streambank Stabilization	\$7.7 M	SWC WRD	Imp.	
SK13. Flooding Blacktail Dam Williams County	Cabins surrounding Blacktail Dam have flooded because they are located at or below the emergency spillway elevation.	Blacktail Dam Spillway	\$546,000	COE	Imp.	

SK14. Irrigation Lake Sakakawea	Development of an irrigation experiment station next to Lake Sakakawea should be considered.	Encourage irrigation development.	N/A	EXT		Imp.	
SK15. Irrigation Northern McKenzie and Williams Counties	Identify irrigable soils and investigate using abandoned railroad rights-of-way as a water delivery feature.	McKenzie and Williams Irrigation	N/A	WRD SWC	ongoing	Imp.	
SK16. Erosion Mountrail County	Runoff needs to be rechanneled to prevent serious soil erosion problems near Stanley.	Stanley Drain	\$10,000	WRD SWC		Imp.	
SK17. Sedimentation Williston, Trenton and Buford area Williams County	Lake Sakakawea headwaters cause the Missouri and Yellowstone Rivers to drop their sediment (silt) load near Williston.	Missouri River Channelization - Williston Area Dredging	\$25 M	COE SWC WRD City	ongoing (COE)	Imp.	
SK18. Lake Restoration Brush, Peterson, and Pelican Lakes McLean County	Water from the McClusky Canal could help restore area lakes.	Brush, Pelican, & Peterson Lake Improvement	\$2.6 M	BOR SWC WRD IA		F.S.	
SK19. Flooding Watford City McKenzie County	Cherry Creek flows along the eastern edge of Watford City and has caused localized flood problems.	Cherry Creek Dam Multi-purpose project	\$3.5 M	WRD SWC		Imp.	
SK20. Flooding White Earth Mountrail County	White Earth experiences flooding from the White Earth River and Paulsen Creek.	White Earth Flood Control Dam	\$162,000	WRD SWC		Imp.	
SK21. Hydropower Pumpback Structure Mercer County	Developing pumpback hydropower as a low cost power source could aid future development at Fort Berthold Reservation.	Pumpback Reservoir	\$11.5 M	FBR COE SWC		Imp.	
SK22. Water Well Drilling Sakakawea Region	More regulatory guidelines as well as spot inspections may be needed to ensure wells are properly constructed.	Legislative and administrative changes along with educational programs.	N/A	SWC SHD EXT BWWC		Supported	
SK23. Water Quality City of Washburn McLean County	EPA regulations require improved treatment systems for surface water used for domestic consumption.	Improved water treatment systems	N/A	City		Supported	

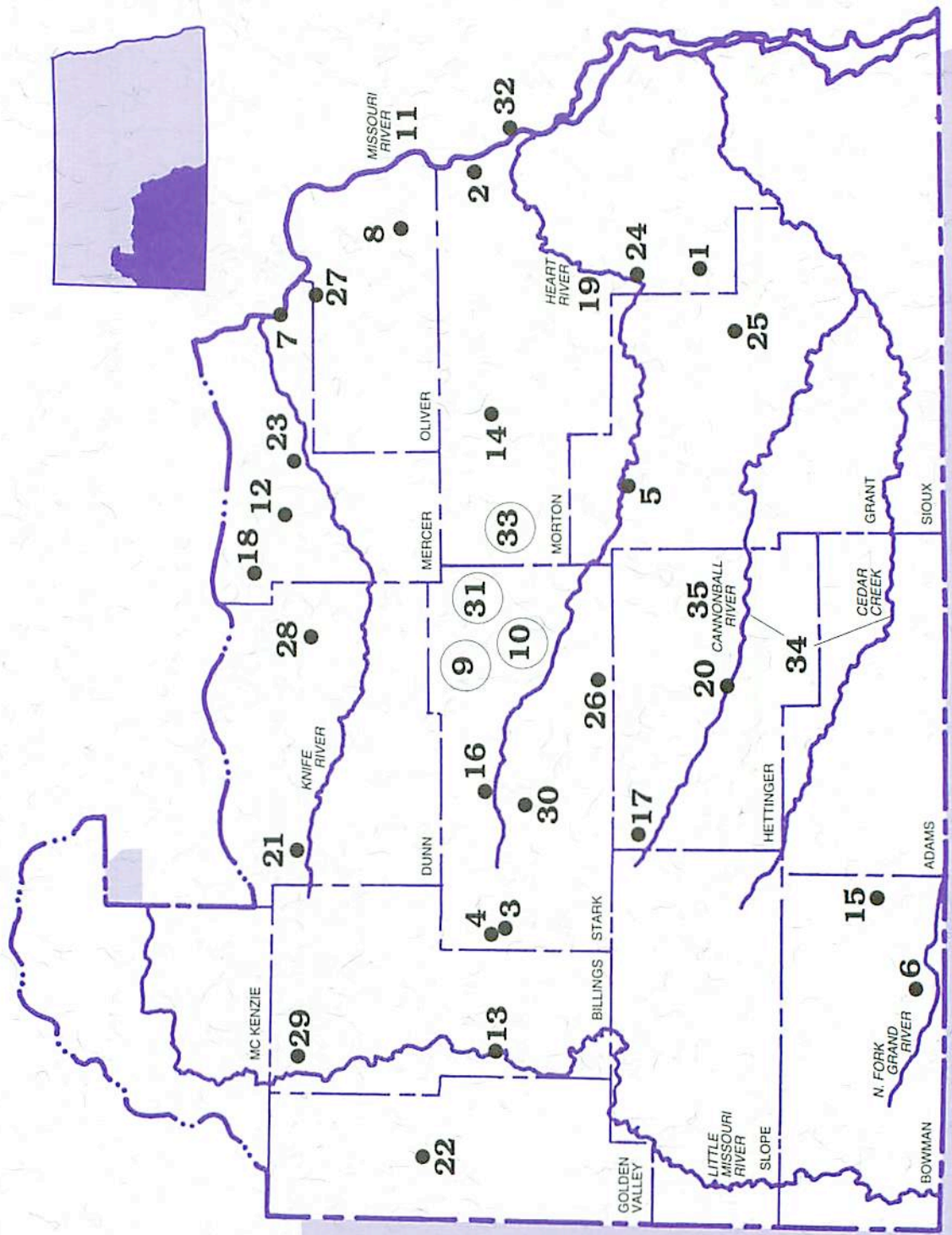
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Southwest Region

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MAP ID, PROPOSAL, LOCATION	DESCRIPTION	WATER RESOURCE MANAGEMENT PROPOSALS				SCHEDULE**			
		POSSIBLE SOLUTION	COST	AGEN*	STUDY**	ONGOING	1993-1995	1996-2000	beyond 2000
SW1. Flooding Louse Creek Grant and Morton Counties	Farmland, homes, and businesses in Flasher suffer flood damages during 100-year frequency events on Louse Creek. Most flooding occurs from snowmelt runoff.	Flasher Flood Control (modifications to existing dike will be completed in 1992)	N/A	SCS City SWC	Imp.				
SW2. Flooding Square Butte Creek Oliver and Morton Counties	The SCS's Square Butte Creek Watershed Project is ongoing. Completed project features include Dam Sites No.2,4,5 and Floodway No.1. Dam Site No.6 is in the planning stage.	Square Butte Dam No.6 Multi-purpose (Phase component of the Square Butte Creek Watershed Project-SCS)	\$2.7 M	SCS WRD SWC	Imp.	Done			
SW3. Outdoor Recreation Belfield Conservation Dam Stark County	Belfield Conservation Dam requires repairs and rehabilitation.	Belfield Conservation Dam (project will be completed prior to 1993)	\$75,000	WRD SWC	Imp.	Done			
SW4. Flood/Erosion Control Billings and Stark Counties	Several SCS and RC&D projects address flood and erosion problems as well as non-point source pollution problems in the Belfield and Patterson Lake watersheds.	Continue the Belfield Watershed PL 566 Project and efforts to obtain EPA 319 Funds to reduce non-point source pollution between Belfield and Dickinson.	\$2 M	SCS WRD SWC	Imp.				
SW5. Lake Restoration Heart Butte Dam Grant County	Improve water quality at Heart Butte Dam by implementing land treatment measures within the watershed.	A) Clean Lakes Diagnostic/ Feasibility Study to identify non-point source pollution areas and possible treatment measures. B) The BOR plans to build four experimental wetlands on Heart Butte Dam tributaries to improve water quality.	\$20,000	SHD WRD GFD			F.S.		
SW6. Water Quality Bowman-Haley Reservoir Bowman County	Bowman-Haley Reservoir is highly eutrophic. It suffers nutrient loading and heavy siltation. The current program of implementing land treatment measures within the watershed will improve water quality.	Continue and expand the SHD's Bowman-Haley Improvement Project involving land treatment measures and sediment pond development. The COE plans to construct four experimental wetlands as nutrient traps.	N/A	SHD WRD GFD COE SCS DU	Imp.				
SW7. Water Quality City of Stanton Mercer County	Past sewage disposal and feedlot effluent in the old Knife River channel may be causing contamination of the aquifer beneath Stanton.	The SHD has developed a Wellhead Protection Program which identifies problem areas as well as protection measures.	N/A	SHD City	Imp.				

SCHEDULE**

1989- 1996- beyond
1995 2000 2000

MAP ID, PROPOSAL, LOCATION

DESCRIPTION

POSSIBLE SOLUTION

COST

AGENCY

STUDY** ONGOING

1989- 1996- beyond

1995 2000 2000

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGENCY	STUDY** ONGOING	1989- 1996- beyond	1995 2000 2000
SW8. Erosion Nelson Lake Oliver County	Water releases from Nelson Lake by Minnesota Power Company are causing streambank erosion.	A) Monitor the problem and keep it from becoming more severe. B) Bank Stabilization Project	N/A	WRD Private	Imp.		
SW9. Saline Seeps West of the Missouri River	Saline seeps are reducing or eliminating crop production.	Provide information on research and methods that can improve soil productivity.	N/A	EXT	Imp.		
SW10. Oil Exploration Western North Dakota	The potential exists for oil exploration activities to contaminate ground-water supplies.	A) FSC Administrative Change B) On-site monitoring at oil drilling sites.	N/A	SWC PSC SHD	Imp.		
SW11. Erosion Missouri River Southwest Region	Severe streambank erosion is occurring along the Missouri River. Garrison Dam has caused a new erosion-accretion trend.	A) COE Administrative Change B) 60 sites require protection	N/A \$8.1 M	SWC WRD COE	Imp. Done		
SW12. Flooding City of Zap Mercer County	A diversion project is needed to solve a flood/drainage problem which occurs in the northwest corner of Zap.	Zap Flood Control	\$30,200	City WRD SWC	Done		
SW13. Erosion Little Missouri River Billings County	Bank stabilization is needed along the Little Missouri River south of Medora to prevent water contamination from an oil reserve pit.	Little Missouri Stabilization	N/A	WRD SWC	Imp.		
SW14. Lake Restoration Danzig Dam Morton County	Danzig Dam has serious water quality and sedimentation problems. Dredging and upstream sediment control structures may improve conditions.	Danzig Dam Restoration	N/A	WRD SWC	ongoing		
SW15. Outdoor Recreation Gascoyne Lake Bowman County	Improvements are needed to enhance recreational opportunities. Improvements include bank stabilization, boat ramps, picnic shelters, and roadway graveling.	Gascoyne Lake Improvement (stabilization only)	\$15,000	WRD SWC	Imp.		
SW16. Outdoor Recreation Meyer Dam Stark County	Meyer Dam near the eastern edge of Dickinson needs repairs or reconstruction.	Meyer Dam	N/A	WRD SWC	Imp.		
SW17. Outdoor Recreation Lenhardt Dam Hettinger County	Local residents are interested in construction of a recreation dam about 5 miles northeast of New England.	Lenhardt Dam	\$910,000	WRD SWC	Imp.		
SW18. Water Quality/Land Treatment Northwestern Mercer County	A RC&D study of the Goodman Creek watershed is identifying point and non-point pollution sources as well as treatment measures to improve water quality within the watershed.	Goodman Creek Watershed Project (Multi-Year Project; funding proposal pending with EPA-319 Program)	\$267,700	WRD SCS EPA SWC SHD	ongoing		

SW19. Water Supply Heart River Morton County	The feasibility of low-head structures on the Heart River and its tributaries for instream storage for irrigation should be studied.	A) Seek contracts with the BOR and Western Heart River Irrigation District. B) Heart River Lowhead Dam	N/A	BOR IA Private		Imp.	
SW20. Flooding City of Mott Hettinger County	Numerous short Cannonball River tributaries join north of Mott and form a channel which flows through the floodplain where Mott is located. Portions of the watershed are inundated by snowmelt and/or summer rainfall runoff.	Mott Dam (Multi-Purpose)	\$2.7 M	WRD SWC		F.S.	Imp.
SW21. Recreation Restoration Lake Ilo Dunn County	Investigate restoring Lake Ilo as a recreation and fishing area and identify alternative sites. The FWS manages the Lake Ilo National Wildlife Refuge and does not intend to restore the fishery which would require dam raising and repairs. Several sites have been identified as alternatives to Lake Ilo. The WRD has not identified a preferred site.	Fayette Dam	\$3 M	WRD SWC		F.S.	Imp.
SW22. Dam Deterioration Odland Dam Golden Valley County	Odland Dam is severely deteriorated. The WRD is pursuing breaching the existing structure, excavating the sediment and constructing a new dam.	North Coyote Creek Dam	\$709,000	WRD SWC		F.S.	Imp.
SW23. Flooding City of Beulah Mercer County	Beulah is located on the banks of the Knife River. Two coulees break through town and empty into the Knife River. Although normally dry, the coulees have caused flash floods due to their steep gradients.	Emerson Dam	\$11.5 M	WRD SWC		F.S.	Imp.
SW24. Erosion Heart River Morton County	Odland Dam is severely deteriorated. The WRD is pursuing breaching the existing structure, excavating the sediment and constructing a new dam.	Odland Dam Improvement	\$996,000	WRD SWC	Done		Imp.
SW25. Outdoor Recreation Lark Township Grant County	Beulah is located on the banks of the Knife River. Two coulees break through town and empty into the Knife River. Although normally dry, the coulees have caused flash floods due to their steep gradients.	Beulah Dry Dam (three dams)	\$700,700	WRD SWC			Imp.
SW26. Outdoor Recreation Plum Creek Dam Stark County	Several sites along the Heart River have serious erosion problems. The WRD is considering a demonstration project.	Heart River Stabilization Demonstration Project (other sites should be addressed)	\$30,000	WRD SWC	Done		Imp.
SW27. Irrigation Efficiency Improvements Mercer and Oliver Counties	Local interest exists to construct a recreation dam about 10 miles east of Carson.	Louse Lake Dam	\$2.8 M	WRD SWC			Imp.
SW26. Outdoor Recreation Plum Creek Dam Stark County	Local interest exists to investigate the feasibility of a recreation dam on Plum Creek.	Plum Creek Dam	\$ 3 M	WRD SWC			Imp.
SW27. Irrigation Efficiency Improvements Mercer and Oliver Counties	Improvements are needed at the Ft. Clark Irrigation District Project to improve efficiency in water delivery.	Ft. Clark Irrigation District Improvement (SWC study will determine cost)	N/A	WRD IA SWC	ongoing		Imp.

SCHEDULE...

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGENCY	STUDY ONGOING			BEYOND		
					1993-1995	1996-2000	2001-2000	1993-1995	1996-2000	2001-2000
SW28. Drainage Dunn County	A 15.5 square mile slough could be drained to increase agricultural production.	Dunn County Drainage	\$374,000	WRD SWC						Imp.
SW29. Multi-purpose Structure Blacktail Creek Billings County	A feasibility study is needed for a dam at S22/T144/R102 in Billings County for recreation, fish, and wildlife uses.	Blacktail Dam	\$2 M	WRD SWC						Imp.
SW30. Outdoor Recreation Upper Antelope Creek Dam Stark County	There is local interest in studying the feasibility of a recreation dam on Upper Antelope Creek.	Upper Antelope Creek Dam	\$3.4 M	WRD SWC						Imp.
SW31. Water Supply Southwest Region	Investigate the West River Diversion Study for feasible sites to provide water for irrigation, recreation, and industrial purposes.	Cannonball Dam - Irrigation (Grant County)	\$19.4 M	WRD SWC						F.S.
		Hettinger Dam - Irrigation (Adams County)	\$10.6 M	WRD SWC						
		Thunderhawk Dam - Irrigation (Adams County)	\$35.2 M	WRD SWC						
		Spring Lake Dam - Irrigation (Mercer County)	\$6.5 M	WRD SWC						
		Lower Antelope Creek Dam - Irrigation (Grant County)	\$4.4 M	WRD SWC						
SW32. Water Quality Missouri River City of Mandan Morton County	EPA regulations require improved treatment systems for surface water used for domestic purposes.	Otter Creek Dam - Irrigation (Oliver County)	\$3.2 M	WRD SWC						Supported
		Square Butte Dam - Recreation (Adams County)	\$614,000	WRD SWC						
		Hallstone Creek Dam - Recreation (Morton County)	\$662,000	WRD SWC						
		Otter Creek Dam - Recreation (Grant County)	\$710,000	WRD SWC						
		Buffalo Creek Dam - Recreation (Stark County)	\$1.2 M	WRD SWC						
		Improved water treatment systems	N/A	City						

SW33. Water Well Drilling Southwest Region	More regulatory guidelines as well as spot inspections may be needed to ensure wells are properly constructed.	Legislative and administrative changes along with educational programs.	N/A	SWC SHD EXT BWWC	Supported
SW34. Water Supply Cedar Creek/ Cannonball River Multi-County	Flows in Cedar Creek are extremely low during most of the spring and summer.	No feasible solution has been identified. (A 1960 SWC moratorium prohibits granting new water permits for Cedar Creek or the Cannonball River.)	N/A	SWC	No feasible solution
SW35. Flooding Cannonball River and Thirty-Mile Creek Hettinger County	Flood control is needed for the Cannonball River and its tributary, Thirty-Mile Creek. Potential sites have been found infeasible due to high reservoir space costs. A site on Thirty-Mile Creek was found infeasible because of inadequate soil conditions.	No feasible solution is available.	N/A	WRD SWC	No feasible solution

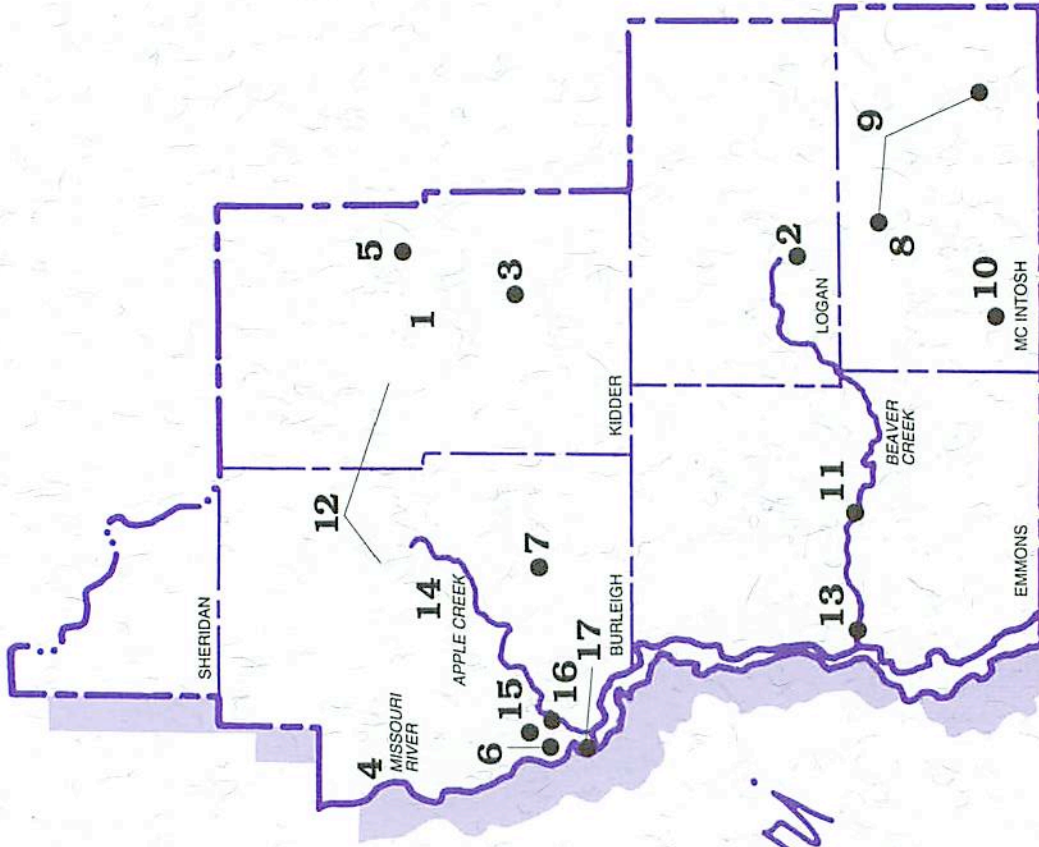
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East Missouri Region

Numbers on map correspond to ID numbers on table.

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGEN*	SCHEDULE**			
					ONGOING	1995	1996-2000	beyond 2000

WATER RESOURCE MANAGEMENT PROPOSALS

EM1. Irrigation Kidder County	There is a great deal of interest to organize an irrigation district in Kidder County	Continue investigating the feasibility of organizing an irrigation district which may expand to Stutsman County.	N/A	WRD SWC Private	ongoing	Imp.		
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EM2. Dam Deterioration Hildenbrand Dam Logan County	Hildenbrand Dam, built in 1937, was breached in 1991 for safety purposes. The spillway must be replaced and banks stabilized to reestablish a fishery.	Hildenbrand Dam Repairs	\$100,000	WRD SWC	Done	Imp.	
EM3. Lake Stabilization Lake Isabel Kidder County	Lake Isabel needs stabilization to prevent large water level fluctuations.	Lake Isabel Stabilization	\$32,000	WRD SWC	Done	Imp.	
EM4. Erosion Missouri River Burleigh and McLean Counties	Bank erosion along the Missouri River is a serious problem which is worsened by Garrison Dam operations.	A) COE Administrative Change B) Missouri River Streambank Stabilization at 25 sites.	N/A \$4.5 M	SWC WRD COE	Done	Imp.	
EM5. Recreation Lake Williams Kidder County	Recreation facilities at Lake Williams are inadequate. Development of a recreation facility plan could improve opportunities.	Lake Williams Recreation Facilities (local entities should coordinate)	N/A	WRD SWC		Imp.	
EM6. Erosion Tyler Coulee Burleigh County	Soil erosion from a new development area northwest of Bismarck near the Missouri River has created drainage problems. Pioneer Park and private land adjacent to Tyler coulee are affected.	Tyler Coulee Improvements	\$400,000	WRD SWC	Done	Imp.	
EM7. Dam Deterioration McDonald Dam Burleigh County	McDonald Dam requires reconstruction of the emergency spillway and installation of a low-level discharge.	McDonald Dam Repairs	\$20,000	WRD SWC	Done	Imp.	
EM8. Lake Restoration Green Lake McIntosh County	Green Lake is very nutrient rich and has serious water quality problems. The fishery and recreation would benefit from a restoration project to improve water quality.	Clean Lakes Diagnostic Study	\$20,000	SHD WRD GFD	ongoing	Imp.	
EM9. Recreation McIntosh County	McIntosh County lacks recreational opportunities. Green Lake, Lake Hoskins, and Coldwater Lake require restoration efforts to improve water quality.	A) Coldwater Lake Shoreline Improvement B) Green Lake Dredging Project (implementation is recommended if lake can be dried out)	N/A \$1.4 M	WRD SWC WRD SWC		F.S. Imp.	
EM10. Dam Deterioration Jund Dam McIntosh County	Jund Dam, built in 1935, requires repairs or reconstruction to prevent washout.	Jund Dam Repairs	\$32,000	WRD SWC		F.S.	
EM11. Flooding City of Linton Emmons County	Flooding of Beaver Creek is a serious problem in the Linton area. A levee system was studied in the past. A SCS PL-566 study is being sought for Spring Creek.	Linton Flood Control	N/A	City SWC WRD SCS		F.S.	

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGEN* STUDY** ONGOING	1989- 1995	1996- 2000	beyond 2000
EM12. Water Supply/Quality, and Flood Control Burleigh and Kidder Counties	Burleigh and Kidder Counties have varied water management problems including: - Difficulty in finding high yielding aquifers south of Pettibone limits irrigation and water supplies in rural areas. - Reduced recreation opportunities on Lake Josephine, Long Lake, and Cherry Lake due to low lake levels and poor water quality, and - Flooding of private property bordering McKenzie Slough Game Management Area and Long Lake National Wildlife Refuge (believed to be caused by improper watershed operation and management).	Determine support for a Burleigh-Kidder County Regional Water Supply Study. Communicate with the public and inform them of potential opportunities.	N/A	BOR WRD SWC		F.S.	
EM13. Multi-purpose Dam Beaver Bay Dam Emmons County	Low water levels at Lake Oahe have created interest in building a dam on Beaver Creek near the Highway 1804 crossing.	Beaver Bay Dam (Additional study cost of \$60,000 is not included in \$3 million cost)	\$3 M	WRD SWC	Done		Imp.
EM14. Flooding Apple Creek Burleigh County	Areas adjacent to Apple Creek are subject to recurring floods. Numerous dry dams have been proposed within the watershed.	Apple Creek Flood Control Dams	\$200,000	WRD SWC			Imp.
EM15. Recreation Burnt Creek Burleigh County	Constructing a dam on Burnt Creek north of Bismarck may provide recreational opportunities.	Burnt Creek Dam	\$3 M	WRD SWC			Imp.
EM16. Water Quality/Recreation Burleigh County	Poor water quality reduces recreational opportunities at McDowell Dam.	McDowell Dam Improvement	\$360,000	WRD SWC			Imp.
EM17. Water Quality Burleigh County	New EPA regulations will make treatment of surface water for human consumption more difficult. Communities relying on surface water, such as Bismarck, will need to improve treatment facilities.	Improve treatment facilities	N/A	City			Supported

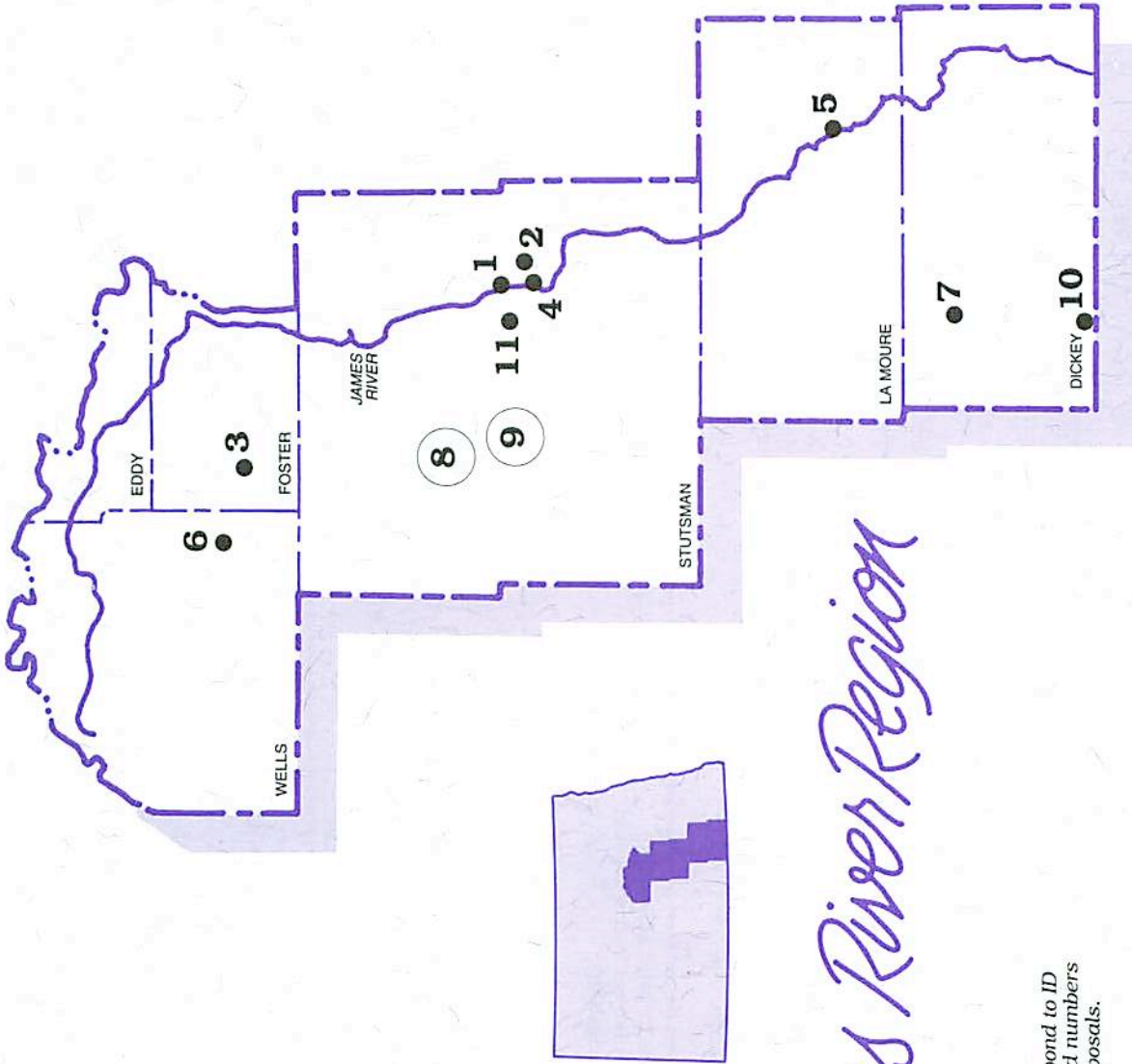
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James River Region

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MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGEN*	STUDY**	SCHEDULE***		
						ONGOING 1995	1996- 2000	beyond 2000
JR1. Drainage Stutsman County	Drainage projects upstream from Jamestown and Pipestem Reservoirs may cause operation and maintenance problems of the dams.	Continue to enforce existing drainage rules and regulations.	N/A			Imp.		

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGENCY	STUDY** ONGOING	1989-1989	1989-2000	beyond 2000
JR2. Rising Water Tables Stutsman County	Ladish Malting Plant's wastewater disposal system may be raising the local water table. Adjacent lands have been purchased, and wastewater is being reused for irrigation.	Monitor situation.	N/A	SWC	Imp.			
JR3. Flooding Foster County	Houses in northeast Carrington and farmland are flooded due to inadequate channel capacity.	Carrington Drain	\$189,000	WRD SWC	Done	Imp.		
JR4. Dam Deterioration Stutsman County	Bank stabilization and repairs are needed at Ice House Dam in Jamestown to make gate operation less hazardous.	Ice House Dam Repairs	\$6,000	City WRD SWC		Imp.		
JR5. Dam Deterioration LaMoure County	Repairs are needed at Memorial Park Dam in Grand Rapids.	Memorial Park Dam Repairs	\$50,000	City WRD SWC		Imp.		
JR6. Outdoor Recreation Lake Hiawatha Wells County	Recreation at Lake Hiawatha could be enhanced by developing a swimming area.	Lake Hiawatha Improvement	\$110,000	WRD SWC	ongoing	Imp.		
JR7. Dam Deterioration Dickey County	Repairs are needed at Wilson Dam located 8 miles west of Monango.	Wilson Dam Repairs	N/A	WRD SWC GFD	ongoing	Imp.		
JR8. Irrigation (Canal-side)	Irrigation turn-outs for land adjacent to Garrison Diversion Project features would allow canal-side irrigation.	BOR administrative change	N/A	BOR GCD SWC Private		Imp.		
JR9. Dam Deterioration James River Region	Many old WPA dams need repairs. Information is needed on purposes, ownership, and maintenance responsibilities.	Identify and gather information on old dams.	N/A	SWC WRD		F.S.		
JR10. Flooding City of Forbes Dickey County	The SCS is considering a Flood Plain Management study to address flood problems created by an unnamed Elm River tributary near the western side of Forbes.	Forbes Flood Plain Management Study	N/A	SCS SWC City			F.S.	
JR11. Erosion Stutsman County	Streambank erosion is occurring downstream from Pipestem Dam.	Pipestem Creek Stabilization	N/A	COE				Imp.

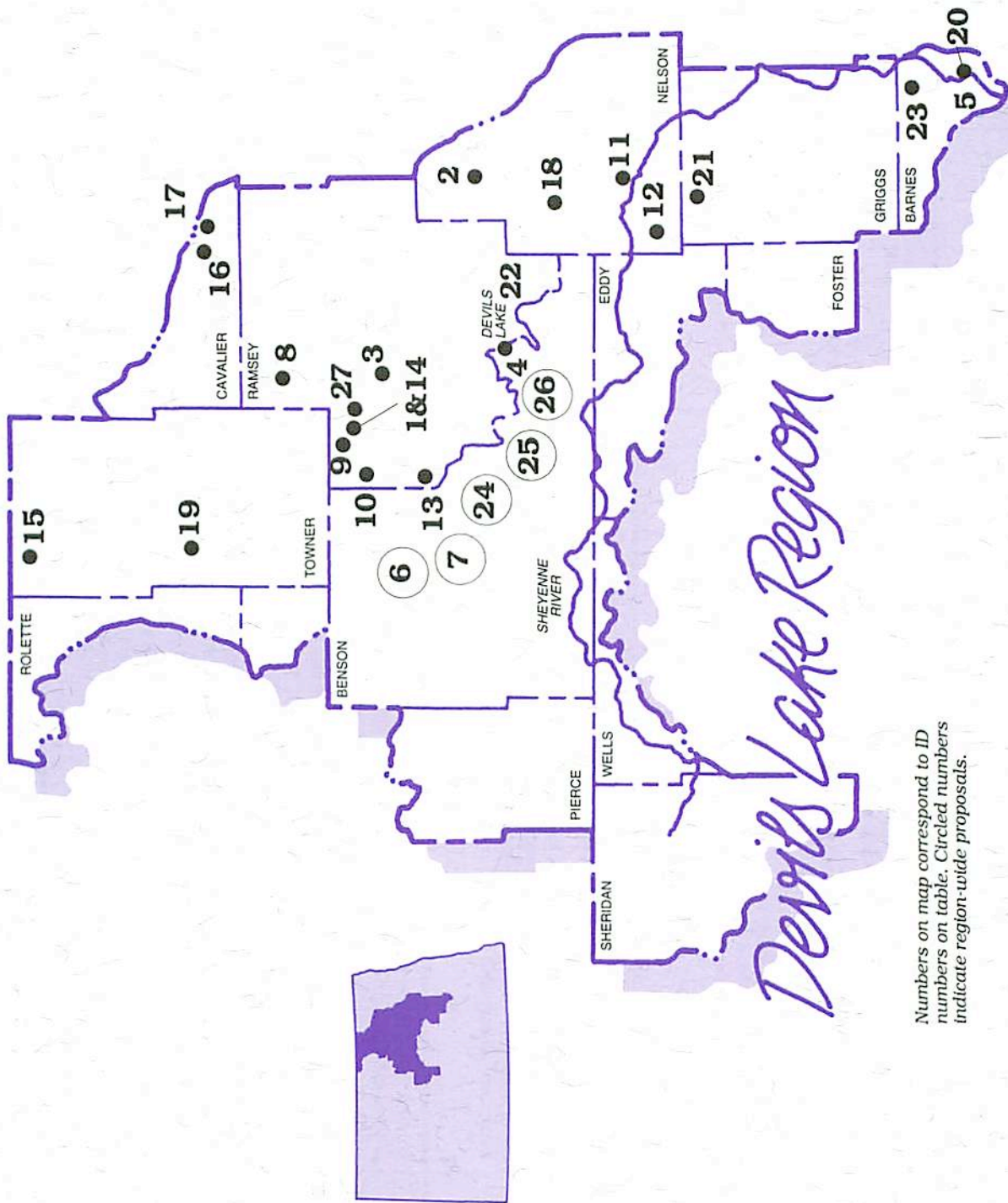
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WATER RESOURCE MANAGEMENT PROPOSALS

SCHEDULE**
1993-1995
1996-2000
beyond 2000

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGENCY	STUDY**	ONGOING	1995	1996-2000	beyond 2000
DL1. Channel Improvements Ramsey County	Clean out is needed for 2.2 miles of the Starkweather Coulee from station 667+00 to 785+00.	Starkweather Coulee Improvements-Phase I	\$68,300	WRD SWC	ongoing	Imp.			

MAP ID, PROPOSAL, LOCATION DESCRIPTION POSSIBLE SOLUTION COST AGEN* STUDY** ONGOING Done Imp.

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGEN* STUDY** ONGOING	Done	Imp.
DL2. Channel Improvements Ruben Township Nelson County	Channel improvements are needed for about 3 miles of the Ruben Township Drain.	Rubin Township Drain	\$25,000	WRD SWC	Done	Imp.
DL3. Lake Stabilization Cavanaugh Lake Ramsey County	A channel with gated culverts between Morrison Lake and Dry Lake and into Cavanaugh Lake could stabilize and control water levels in Cavanaugh Lake.	Cavanaugh Lake Stabilization	\$20,000	WRD SWC	Done	Imp.
DL4. Lake Restoration/Water Quality Improvement Devils Lake Ramsey and Benson Counties	Nutrient-laden runoff entering Devils Lake is contributing to the nutrient buildup (nitrogen and phosphorus) in the water and sediment. Overall water management coordination is needed in the basin.	The Devils Lake Basin Conceptual Management Plan outlines voluntary cost-share programs which enhance wildlife habitat and incorporate soil conservation practices.	N/A	SWC SHD FWS GFD EPA GS WRD JBs		Imp.
DL5. Channel Obstructions Sheyenne River	Many clogged reaches badly need snagging and clearing. WRDs need to organize long-range plans.	There are phased snagging and clearing projects in Barnes County.	N/A	WRD SWC		Imp.
DL6. Land Management Practices (Conservation) Devils Lake Region	Inadequate water and soil management along upstream tributaries results in gully formation, silting, and flooding.	Provide financial and other incentives for landowners to implement structural and nonstructural measures. Continue educational efforts.	N/A	ASCS SCS EXT		Imp.
DL7. Water Quality Information Devils Lake Region	Limited data prevent accurate assessment of threats to ground-water and impacts of fertilizers and farm chemicals on water quality.	A) Identify and protect ground-water recharge areas. B) Continue and expand current monitoring programs.	N/A	SHD		Imp.
DL8. Flooding Southwest Cavalier County	Sheet flooding occurs during rapid snowmelt or heavy rains. Wetland drainage also adds to the problem. FWS easements block drainage from non-easement land.	A) Hammer-Sullivan Drain Project (ND's No-Net-Loss Policy and Swampbuster regulations have curtailed most drainage.) B) Negotiations with FWS can lead to agreements that allow assessment drain construction through FWS easements on a case-by-case basis.	\$170,000	WRD SWC		Imp.
DL9. Channel Improvements Chain Lakes Ramsey County	To control and manage flood waters, a channel is needed in the Duck Road area.	Chain Lakes Improvement Duck Road Area Channel	\$26,700	WRD SWC FWS	Done	F.S.

Supported

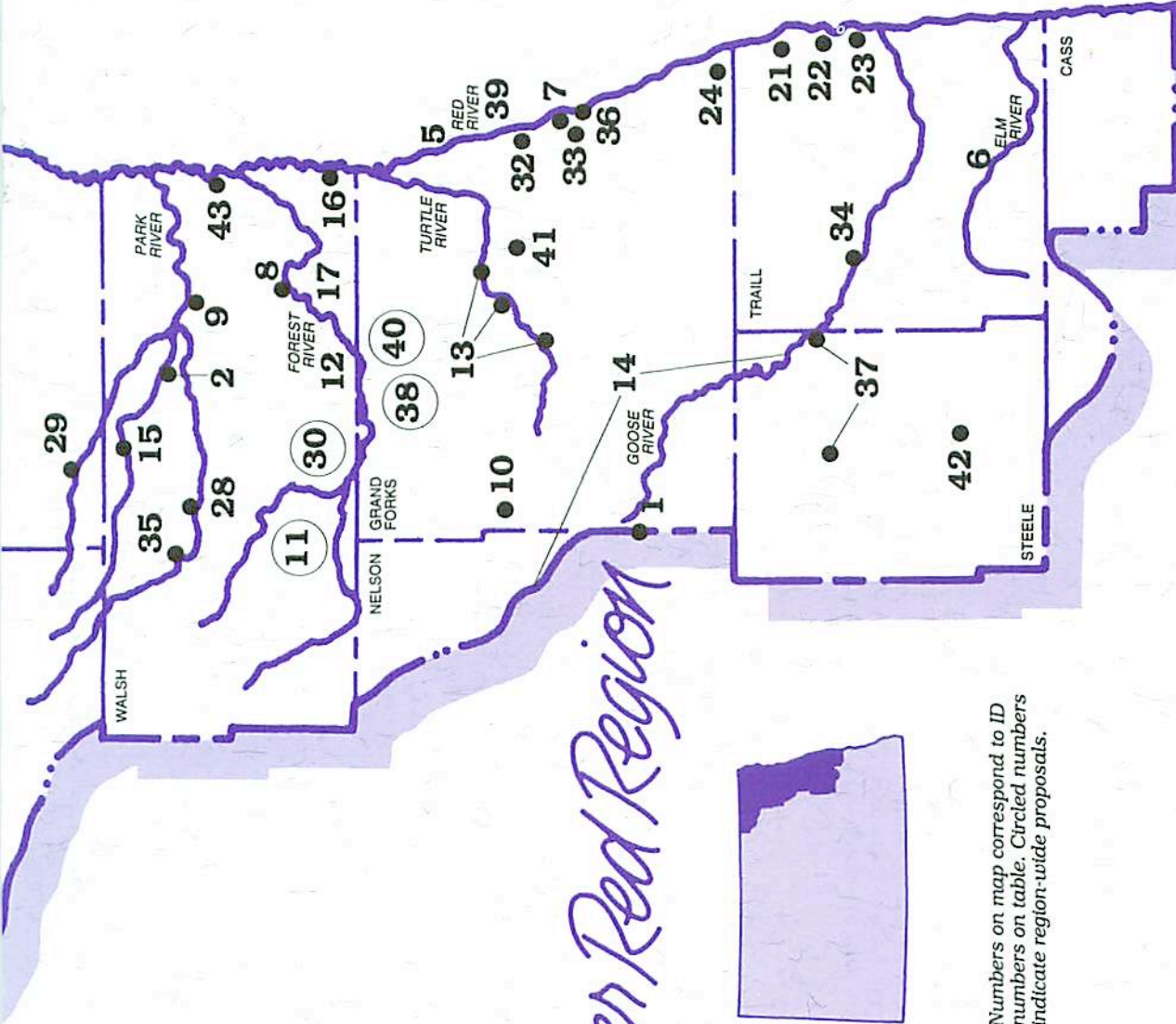
			Lake Irvine Control Structure	\$60,000	WRD SWC	Done	F.S.		
DL10. Flooding Lake Irvine Ramsey County	A new control structure is needed on Lake Irvine for flood control. It can be constructed in conjunction with the replacement of an existing bridge.								
DL11. Channel Improvements/Lake Restoration Nelson County	Snagging and clearing in Shyenne River reaches would be done in conjunction with the restoration of Peterson Dam.		Shyenne River - Peterson Dam	\$45,000	WRD SWC	Done	F.S.	Imp.	
DL12. Snagging and Clearing Forde Township Nelson County	Snagging and clearing is needed in a tributary of the Shyenne River.		Forde Township Snagging and Clearing	\$45,000	WRD SWC	Done	F.S.	Imp.	
DL13. Channel Improvements Benson and Ramsey Counties	To reduce agricultural flood damages, channel improvements plus snagging and clearing are needed for 19 miles of the Lower Mauvals Coulee.		Lower Mauvals Coulee Improvements	\$608,900	WRD SWC COE	Done	F.S.	Imp.	
DL14. Channel Improvements Ramsey County	Clean out is needed in 1.86 miles of the Starkweather Coulee from station 568-45 to 667=00.		Starkweather Coulee Improvements-Phase II	\$619,100	WRD SWC	Done		Imp.	
DL15. Channel Improvements Towner County	To reduce agricultural flood damages, clean out is required in Hidden Island Coulee.		Hidden Island Coulee Clean Out	\$108,000	WRD SWC	Done		Imp.	
DL16. Flooding Nekoma Township Cavalier County	The waterway needs to be cleaned and graded to pass a 10-year frequency flood event.		Nekoma-Billings Drain #1	\$100,000	WRD SWC			F.S.	
DL17. Flooding Cavalier County	To lessen agricultural flood damages, existing waterways need to be cleaned and channel crossings upgraded to pass 10-year frequency snowmelt or rainfall flood events.		A) Billings Township Drain #1 B) North Loma Township Drain #1	\$30,000 \$50,000	WRD SWC WRD SWC			F.S. F.S.	
DL18. Flooding Stump Lake Basin Nelson County	A study found using a pump station to discharge water into the northeast waterway and into East Stump Lake could reduce agricultural flood damages.		McHugh Outlet to Stump Lake	\$1 M	WRD SWC	Done		F.S.	
DL19. Water Quality Bisbee Dam Towner County	Bisbee Dam is very nutrient rich and has water quality problems leading to algae blooms and fish kills.		Investigate conducting a Clean Lakes Diagnostic/Feasibility Study to identify non-point pollution sources.	N/A	SHD SWC WRD GFD			F.S.	
DL20. Lake Restoration Lake Ashtabula Barnes County	Conduct a Clean Lakes Diagnostic/Feasibility Study of the Lake Ashtabula watershed to identify non-point pollution sources and treatment measures.		Lake Ashtabula Clean Lakes Diagnostic/Feasibility Study	N/A	SHD SWC WRD GFD			F.S.	
DL21. Lake Restoration Red Willow Lake Griggs County	Red Willow Lake is very nutrient rich and has water quality problems. A feasibility study of circulating lake water to an adjacent wetland to remove nutrients and improve water quality is needed.		Red Willow Lake Restoration	N/A	SHD WRD SWC GFD			F.S.	

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGENCY	STUDY** ONGOING	1993-1995	1996-2000	beyond 2000
DL22. Lake Restoration/Stabilization Stump Lake Nelson County	An outlet from Devils Lake to Stump Lake could stabilize and freshen the lake with Missouri River water through GDU features. An outlet from Stump Lake to the Red River via the Goose River would be needed.	Devils Lake Restoration-Goose River Outlet	N/A	COE SWC BOR WRD		F.S.		
DL23. Flood Control Dam Devils Lake Region	Baldhill Creek floods could be reduced by constructing a flood control dam within the watershed.	Baldhill Creek Dam (Site BHC-15)	\$3 M	WRD SWC	Done	F.S.	Imp.	
DL24. Management policy of FWS easement lands Devils Lake Region	Changing FWS easement policy to allow small wetlands to be drained into larger, more permanent wetlands could benefit wildlife and agriculture.	Federal action	N/A	WRD		Supported		
DL25. Storage Structures Devils Lake Region	Small impoundments could be used as settling ponds to improve water quality and retain flood waters.	Continue SCS support of stockpond construction. Restoring wetlands on non-crop land could provide some benefit. Construction of small dry dams in strategic locations is possible.	N/A	WRD SCS FWS GFD SHD		Supported		
DL26. Wetland Policy Devils Lake Region	Farmers and landowners are dissatisfied with the state's No-Net-Loss policy.	Senate Bill 2373 written to repeal No-Net-Loss did not pass in the 1991 Legislative Assembly. Policy changes are needed.	N/A	WRD		Supported		
DL27. Water Quality Devils Lake Ramsey County	Diverting low to moderate flows out the west side of Dry Lake to Chain Lake could improve water quality in Devils Lake.	Dry Lake Diversion	\$275,000	SHD WRD SWC		No Recommendation		

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Lower Red Region

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WATER RESOURCE MANAGEMENT PROPOSALS

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGENCY	SCHEDULE**				
					ONGOING	1993-1995	1996-2000	beyond 2000	
LR1. Channel Improvements South Petersburg Drain Nelson County	Channel improvements are needed for about four miles of the South Petersburg Drain.	South Petersburg Drain Improvements	\$15,000	WRD SWC	ongoing	Imp.			

SCHEDULE**

	1993-	1995	1995	1995	2000	2000	2000
	STUDY**	ONGOING	1995	1995	2000	2000	2000

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGENCY	STUDY**	1993-1995	1995-2000	beyond 2000
LR2. Channel Obstructions Park River Walsh County	The Middle, South, and North Branches of the Park River need snagging and clearing for 78 miles.	Park River Snagging and Clearing (Study cost of \$35,000 not shown in project cost)	\$450,000	WRD SWC	Imp.			
LR3. Channel Improvements Pembina River Pembina County	Snagging and clearing in a 50-mile reach of the Pembina River is needed to remove the dead and fallen trees clogging the channel.	Pembina River Snagging and Clearing	\$400,000	WRD SWC	Imp.			
LR4. Channel Improvements Tongue River Pembina County	Maintenance and repairs are needed for 4.5 miles of channel in the Tongue River Cutoff Flood Control Project area.	Tongue River Cutoff Channel Improvement	\$695,000	SCS WRD SWC	Done			
LR5. Flooding Red River	The Red River floods during spring runoff periods and after heavy summer rains. The wide, flat river valley can be inundated and remain so for weeks.	No sites exist for large impoundments on the mainstem. Small impoundments on tributaries may reduce some flood damages. Watershed studies have identified sites but each need more study. Follow floodplain management objectives.	N/A	WRD RRJT SWC	Imp.			
LR6. Flooding Elm River Steele, Cass, and Trail Counties	Flooding causes damage to crops and farmland during spring snowmelt or after heavy rains.	A) The system approach developed by Houston Engineering B) The Hydrologic and Water Management Study of the Elm River Basin by Houston Engineering identified several dam sites but each need more study.	N/A	WRD SWC	Done			Imp.
LR7. Bank Erosion Riverside Park Dam Grand Forks County	Bank erosion is occurring downstream of the new dam in Grand Forks.	A study of possible solutions will be completed before 1993.	N/A	SWC City	ongoing			
LR8. Flooding City of Minto Walsh County	Residential areas are often flooded during spring snowmelt or after heavy rains.	Adhere to floodplain management objectives.	N/A	City	Imp.			
LR9. Flooding City of Grafton Walsh County	Flooding of the Park River in Grafton occurs periodically.	A) Adhere to floodplain management objectives. B) Grafton Flood Control Project	N/A	City	Imp.			
LR10. Dam Deterioration Niagara Dam Grand Forks County	Niagara Dam is north of the City of Niagara and needs the existing spillway to be replaced to ensure the dam's integrity.	Niagara Dam-New Spillway	\$91,000	WRD SWC GFD	Done			

LR11. Dutch Elm Disease Lower Red Region	Efforts should be made to remove infected trees for disease control and to prevent dead trees from clogging the channel.	Cooperation between landowners and the State Forester is encouraged.	N/A	SFS WRD Private	Imp.		
LR12. Flooding Forest River Walsh and Grand Forks Counties	A floodplain management study is needed for the Forest River from Fordville to the Red River.	Forest River Floodplain Management Study	N/A	SCS WRD	ongoing		
LR13. Flooding Turtle River Grand Forks County	Flooding of the Turtle River is a problem during spring snowmelt and heavy rains. The SCS has identified dam sites which will reduce downstream flood damages. Clearing channel obstructions is also needed.	A) Upper Turtle River Channel E Improvements	\$650,000	SCS WRD SWC COE	Done	Imp.	
		B) Turtle River Snagging and Clearing	\$375,000	WRD SWC		Imp.	
		C) Turtle River Dam #10	\$2 M	SCS WRD SWC	ongoing		Imp.
LR14. Snagging and Clearing Goose River Nelson and Steele Counties	Snagging and clearing is needed in eastern Nelson County and Steele County.	A) Goose River Snagging and Clearing (Nelson)	\$7,000	WRD SWC	ongoing	Imp.	
		B) Goose River Snagging and Clearing (Steele)	\$1 M	WRD SWC	ongoing		Imp.
LR15. Flooding Park River Watershed Walsh County	The Park River and its tributaries have a history of periodic flooding. The SCS will construct four flood control dams within the watershed through a PL-566 program and is continuing to study other solutions.	A) Middle Branch of the Park River Dam Site #5 (Component of SCS PL-566 Program)	\$3.2 M	SCS RRJT WRD SWC	ongoing		Imp.
		B) Middle Branch of the Park River Channel Improvement	N/A	SCS WRD SWC	ongoing		F.S.
		C) Cart Creek Dam	\$600,000	RRJT WRD SWC			Imp.
		D) Milton Dam	\$2.7 M	RRJT SWC			Imp.
		E) Pursue system approach to flood damage reduction.	N/A	SCS WRD SWC			
LR16. Channel Obstructions Morais River Walsh County	Snagging and clearing for 12 miles of the Morais River is needed to remove dead and fallen trees that obstruct the channel.	Morais River Snagging and Clearing (Study cost of \$10,000 not included in project cost.)	\$350,000	WRD SWC	Done	Imp.	
LR17. Channel Obstructions Forest River Walsh County	About 24 miles of the Forest River need snagging and clearing.	Forest River Snagging and Clearing (Study cost of \$10,000 not included in project cost.)	\$250,000	WRD SWC	ongoing	Imp.	

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGENCY	STUDY STATUS	1993-1995	1996-2000	beyond 2000
LR18. Flooding Cavaller County	Channel improvements are needed about 4 miles northeast of Langdon to reduce agricultural flood damages.	Padden Lake Flood Control	\$55,000	WRD SWC	ongoing	Imp.		
LR19. Dam Safety/ Water Supply Mt. Carmel Dam Cavaller County	Mt. Carmel Dam, about 10 miles northeast of Langdon, needs its spillway improved and modified to meet current dam safety requirements. A pool elevation increase will also provide added water for the municipal and rural water system, recreation and fishery purposes, and flood control.	Mt. Carmel Dam	\$600,000	WRD SWC	Done	Imp.		
LR20. Flooding Cavaller County	Existing channels need grading, and road crossings need redesigning to pass 10-year frequency flood events and reduce damages.	Dresden Township Drain #1	\$40,000	WRD SWC	Done	Imp.		
LR21. Erosion Red River Traill County	Installing a rock chute in a washout near Rust Drain #24 will reduce erosion and sedimentation and improve water quality.	Rust Drain #24 Critical Area Treatment (CAT)	\$14,500	WRD SWC	Done	Imp.		
LR22. Erosion Red River Traill County	A rock chute and bank stabilization are needed at the Brokke Drain #30 outlet into the Red River to prevent erosion, reduce sedimentation, and improve water quality.	Brokke Drain #30 Critical Area Treatment (CAT)	\$25,000	WRD SWC	ongoing	Imp.		
LR23. Erosion Red River Traill County	There is a washout near the Red River where roadways have diverted water to an unstable outlet. A control structure is needed.	Bingham Township Critical Area Treatment (CAT)	N/A	SCS WRD	ongoing	Imp.		
LR24. Erosion Bentru Township Grand Forks County	A control structure is needed to stabilize a deep coulee which discharges into the Red River.	Bentru Township Erosion Control	\$150,000	WRD SWC		Imp.		
LR25. Lake Restoration Renwick Dam Pembina County	A Clean Lakes Diagnostic/Feasibility study of Renwick Dam watershed would identify non-point source pollution sources and measures to improve water quality.	Renwick Dam Clean Lakes Study	\$20,000	SHD WRD GFD		Imp.		
LR26. Flooding Cavaller County	Existing channels need cleaning and road crossings need upgrading to pass a 10-year flood event and reduce damages.	Mt. Carmel Drain #1	\$10,000	WRD SWC	ongoing	Imp.		
LR27. Wetland Restoration/ Flood Control Rush Lake Cavaller County	A Rush Lake area project is being designed to enhance, restore, and maintain wetlands and reduce agricultural flood damages.	A) Rush Lake-Phase I B) Waterloo-South Dresden and Rush Lake - Phase II C) Moscow-Minto and Rush Lake - Phase III D) Rush Lake Flood Control #6 Rush Lake - Phase IV	\$600,000 \$100,000 \$150,000 \$600,000	WRD SWC GFD WRD SWC WRD SWC WRD SWC	ongoing ongoing ongoing	Imp. Imp. F.S. Imp.		

Project ID	Project Name	Problem/Justification	Homme Dam Improvement	Cost	SCS WRD SWC	F.S.	Imp.
LR28.	Desilting Dams Walsh County	Desilting dams upstream from Homme Dam may lessen sediment deposition in the reservoir.		N/A			
LR29.	Water Seepage Crystal Dam Pembina County	Water is seeping from the dam causing some adjacent land to become boggy. The City of Crystal no longer uses the water for domestic consumption.	The reservoir could be drawn down further to minimize seepage.	N/A	WRD SWC	F.S.	
LR30.	Outdoor Recreation Lower Red Region	Few outdoor recreation opportunities are available for area citizens.	Multi-purpose sites such as the South Fork Pembina River Dam have been identified by the SCS but need further study.	N/A	WRD SWC	F.S.	
LR31.	Flooding South Fork of the Pembina River Pembina County	The Pembina River usually floods due to rapid snowmelt. Flood control structures have been proposed within the watershed.	South Fork Pembina River Dam	\$3.2 M	RRJT WRD SWC	F.S.	Imp.
LR32.	Erosion Control Grand Forks County	A control structure is needed in the Red River to reduce erosion and sedimentation and improve water quality.	Hazenbrook Channel and Erosion Control	\$2 M	WRD SWC	F.S.	Imp.
LR33.	Flooding English Coulee Grand Forks County	Improved in 1991, English Coulee expences flow restrictions at the railroad bridge. English Coulee Dam and diversion channel are complete but the diversion structure is under construction.	A) English Coulee improvements in city limits are being considered. B) The COE's proposed diversion channel around city limits could alleviate some of the problem.	N/A	COE City	F.S.	Imp.
LR34.	Multi-purpose Structure Traill County	This dam could retain 980 acre-feet of water for flood control, recreation, and wildlife habitat.	Norway Township Dam	\$202,000	WRD SWC	F.S.	Imp.
LR35.	Multi-purpose Structure Park River Walsh County	The dam could provide flood control, recreation, water for human consumption.	Tiber-Vesta Dam	\$ 9 M	COE	F.S.	Imp.
LR36.	Flooding Belmont Road Area Grand Forks Grand Forks County	Red River backwaters flood an area between 13th Ave. S. and 17th Ave. S. during 100-year events. Existing drains do not remove stormwater from southern city limits.	The COE completed a reconnaissance study of a by-pass channel around city limits and is negotiating for a feasibility study.	N/A	COE City	F.S.	Imp.
LR37.	Flooding Goose River Watershed Steele and Traill Counties	The Goose River's lower reach is highly susceptible to floods which occur during spring snowmelt and heavy summer rainstorms.	A) Goose River Dam #145 B) Finley East Dam C) Consider the system approach in the 1986 Goose River Technical Resource Service. Several dam sites have been identified but each need further study.	\$6.5 M \$1.5 M N/A	RRJT WRD SWC RRJT WRD SWC WRD SWC	F.S. F.S. Imp.	Imp.

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGEN*	STUDY** ONGOING	1989-1996- beyond 1995-2000-2000
LR38. Water Supply Eastern North Dakota	Lake Sakakawea water could be transported to eastern communities (Fargo and Grand Forks) via a pipeline.	The 1986 Garrison Diversion Reformulation Act authorizes delivery of 200 cubic feet per second of water to Fargo via the Sheyenne River. A feasibility study of a pipeline is needed. Estimated construction costs were prohibitive.	\$268 M	SWC City		F.S.
LR39. Diking Red River	The 40 miles of dikes along the Red River's Minnesota side cause extensive flooding in ND where 20 miles of dikes have been built. A letter of cooperation among the six counties and two states has been signed.	The COE, ND, and MN are cooperating in flood damage reduction efforts from Grand Forks to Canada.	N/A	ND MN COE	ongoing	Supported
LR40. Water Management Red River Basin	Consider reestablishing the Tri-State Water Compact to resolve Red River Basin water management problems and issues.	Consider a legislative change to reestablish the Tri-State Water Compact or a similar group.	N/A	SWC		Supported
LR41. Flood Control/ Wildlife Habitat Kelly Slough Grand Forks County	The Kelly Slough Project involves wetland developments consisting of embankments and water control structures. It will provide flood control, recreation and wildlife benefits.	Continue the Kelly Slough Project	\$500,000	FWS	Done	No Recommendation
LR42. Flooding Goose River Hugo Township Steele County	A dry dam in Hugo Township should be studied to determine its potential flood control benefits.	Hugo Dam	\$75,000	WRD SWC		No Recommendation
LR43. Channel Obstructions Red River Walsh County	Snagging and clearing for 50 miles of the Red River is needed to remove dead and fallen trees obstructing the channel.	Red River Snagging and Clearing (Study cost of \$25,000 is not included in project cost.)	\$ 1 M	COE WRD SWC	Done	No Recommendation
LR44. Multi-purpose Structure Pembler Dam Pembina and Cavalier Counties	A structure on the Pembina River could reduce flood damages and provide water for recreation, irrigation, and wildlife habitat.	Pembler Dam, a COE project, was found infeasible. A feasibility study of a smaller dam that could control 40-to-60 year events should be considered.	N/A	WRD SWC		The CAB could not consider this project due to its late introduction in the planning process.

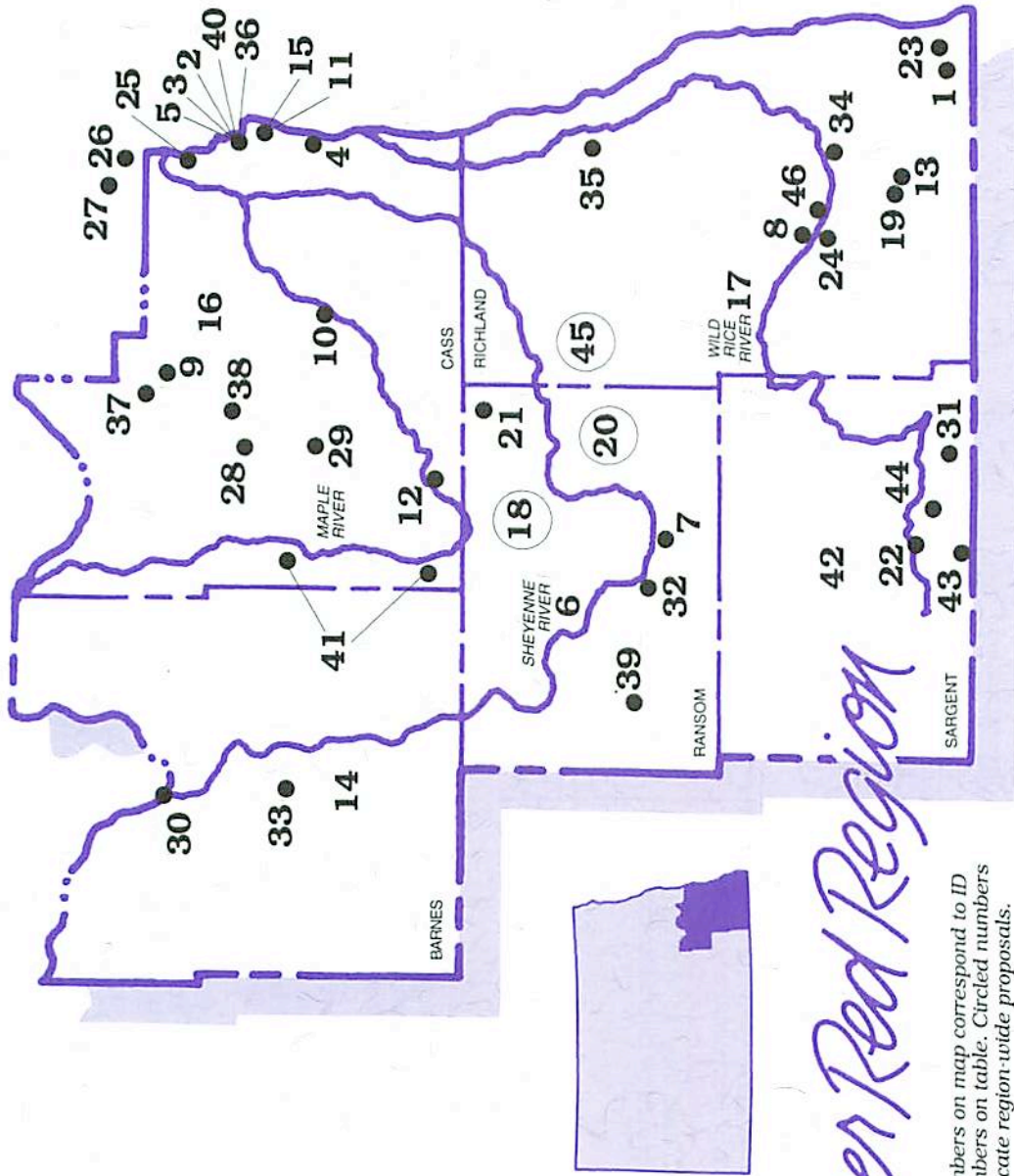
*Agencies involved with project study and implementation:
 ARB Atmospheric Resources Board
 ASCS Ag. Stabilization & Conservation Service
 BOR Bureau of Reclamation
 BWWC Board of Water Well Contractors
 COE Corps of Engineers
 CTB County Township Board
 DU Ducks Unlimited

EDF Dept. of Economic Development & Finance
 EPA U.S. Environmental Protection Agency
 EXT ND State University Extension Service
 FBR Fort Berthold Indian Reservation
 FWS U.S. Fish and Wildlife Service
 GFD Game & Fish Department
 GCD Garrison Diversion Conservancy District
 GS U.S. Geological Survey

IA Irrigation Association
 JBa Joint Boards
 NOAA National Oceanic & Atmospheric Admin.
 PSC Public Service Commission
 RRJT Red River Joint Board
 SDAg State Department of Agriculture
 SCS Soil Conservation Service
 SFS State Forest Service
 SHD State Health Department

SWC State Water Commission
 WRD Water Resource Districts

**Indicates if feasibility and/or design studies have been completed (Done) or ongoing.
 ***Indicates if project/program implementation (Imp.) or feasibility study (F.S.) is ongoing, or to begin in years 1989-1996, 1996-2000, or beyond year 2000.



Upper Red Region

Numbers on map correspond to ID numbers on table. Circled numbers indicate region-wide proposals.

WATER RESOURCE MANAGEMENT PROPOSALS

SCHEDULE**

1993-1995

ONGOING

1996-2000

AGEN' STUDY**

COST

WRD SWC WRD

Done

Imp.

beyond 2000

POSSIBLE SOLUTION

Drain #30 Reconstruction

\$355,000

Channel improvements and reconstruction are needed to maintain channel capacities at Drain #30. Water moving through Drain #65 overloads Drain #30. Past projects include a structure that diverts water into Drain #30 or #65, whichever has lower flows. German-Madsen Dam was built upstream of Drain #65. Greater than 10-year events will cause flooding.

DESCRIPTION

MAP ID, PROPOSAL, LOCATION

UR1. Drainage Drain #30 and #65 Richland County

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGENCY	STUDY STATUS	1993-1995	1996-2000	beyond 2000
UR2. Channel Improvements Reed and Harwood Townships Cass County	Channel improvements are needed in Reed and Harwood Townships from 1-29 to the Red River to increase outlet capacities.	Cass County Drain #40 and #45	\$1.8 M	WRD SWC	Done	Imp.		
UR3. Drainage Reed Township Cass County	A lateral drain was studied in 1989 to improve drainage for agricultural land adjacent to Drain #10.	Cass County Drain #10 Lateral	\$500,000	WRD SWC	Done	Imp.		
UR4. Channel Improvements Stanley and Barnes Townships Cass County	Drain #27 located in Stanley and Barnes Townships needs reconstruction to improve channel capacity.	Cass County Drain #27 Reconstruction	\$200,000	WRD SWC		Imp.		
UR5. Channel Improvements Barnes and Reed Townships Cass County	Drain #45 from Section 17 in Barnes Township to 1-29 in Reed Township must be reconstructed to improve channel capacities and reduce flood damages.	Cass County Drain #45 Reconstruction	\$1.9 M	WRD SWC	ongoing	Imp.		
UR6. Channel Obstructions Sheyenne River Barnes, Ransom, Richland, and Cass Counties	The Sheyenne River needs snagging and clearing in areas where the channel is clogged with dead trees. Most of the problem is caused by Dutch Elm Disease.	Sheyenne River Snagging and Clearing	\$204,000	WRD SWC		Imp.		
UR7. Outdoor Recreation Dead Colt Creek Ransom County	Seepage water is escaping from Dead Colt Creek Dam. The water could be retrieved to maintain the lake elevation.	Dead Colt Creek Seepage Pump System	\$25,000	WRD SWC	Done	Imp.		
UR8. Channel Obstructions Wild Rice River Richland County	A three-mile reach of the Wild Rice River in Liberty Grove Township needs snagging and clearing to remove channel obstructions.	Wild Rice River Snagging and Clearing	\$25,000	WRD SWC	ongoing	Imp.		
UR9. Channel Obstructions Rush River Cass County	Several reaches of the Rush River need cleaning and maintenance to remove obstructions in the river channel.	Rush River Cleaning and Maintenance	\$50,000	WRD SWC		Imp.		
UR10. Channel Obstructions Maple River Cass County	Snagging and clearing is needed to remove dead and fallen trees along a 50-mile reach of the Maple River.	Maple River Snagging and Clearing	\$200,000	WRD SWC		Imp.		
UR11. Channel Obstructions Red River Cass County	Snagging and clearing is necessary to remove fallen trees from the Red River. The problem is due mostly to Dutch Elm Disease.	Red River Snagging and Clearing	N/A	WRD SWC		Imp.		

			Maple River Dam A-170	\$15 M	RRJT WRD SWC	ongoing	Imp.		
UR12. Flooding Maple, Sheyenne, and Red Rivers Cass County	A dam being studied on the mainstem of the Maple River northeast of Enderlin could reduce flood damages along the Maple, Sheyenne, and Red Rivers.								
UR13. Flood Control/Wildlife Habitat Stack Slough	Constructing three water control structures in the Stack Slough area can provide flood control, recreation, and wildlife habitat.		Stack Slough	\$500,000	FWS	Done	Imp.		
UR14. Dam Deterioration Barnes County	Several small dams on Sheyenne River tributaries need routine maintenance and repairs to maintain the structures.		Barnes County Dam Repairs	\$75,000	WRD SWC		Imp.		
UR15. Outdoor Recreation Fargo Cass County	Improvements to the Red River within Fargo are required to develop water-based recreation opportunities.		Red River Front Development	\$1 M	City WRD SWC		Imp.		
UR16. Flooding Lower Branch Rush and Rush Rivers Cass County	Siltation has reduced the Rush River's channel capacity to where its tributaries have greater channel capacities.		An assessment for drain cleaning and maintenance may be needed. Survey work is needed to determine project requirements.	N/A	WRD SWC		Imp.		
UR17. Flooding Wild Rice River	Flat terrain yields widespread flooding, compounded at times by overland floodwaters from the Sheyenne River and backwater from the Red River. Antelope Creek and Wyndmere Dry Dams were found infeasible.		A) Snagging and Clearing projects will slightly improve channel capacity. (See project UR8.) B) Adherence to floodplain management objectives may reduce damages. C) Dry dams in the upper watershed may help but no sites have been identified.	N/A	WRD SWC		Imp.		F.S.
UR18. Outdoor Recreation Upper Red Region	Little water-based outdoor recreation is available for area citizens. Natural lakes exist but reservoirs could be constructed or improved to offer more opportunities.		Sites such as the Maple River Dam, the Wyndmere Dam, and improving the Sheyenne River for canoeing need to be considered. Projects UR7, UR13, UR15, UR19, UR22, and UR40 address this issue.	N/A	WRD SWC GFD		Imp.		
UR19. Outdoor Recreation Lake Elsie Richland County	A maximum lake level needs to be established and a control structure outlet added to improve recreational uses.		Preliminary talks have begun with ND Game and Fish Department.	N/A	WRD SWC GFD FWS		Imp.		
UR20. Dutch Elm Disease Red River Region	Efforts to remove infected trees for disease control and to prevent downed trees from plugging river channels should be made.		Foster coordination between the State Forester and landowners to identify problem areas.	N/A	SFS WRD Private		Imp.		
UR21. Flood Control Coburn Township Ransom County	Sheetwater flooding in Coburn Township causes crop damages because of inadequate drainage during heavy rains or snowmelt.		Coburn Township Flood Control	\$205,000	WRD SWC	ongoing		Imp.	

SCHEDULE...

MAP ID, PROPOSAL, LOCATION DESCRIPTION POSSIBLE SOLUTION COST AGEN' STUDY** ONGOING 1989-1995 1996-2000 Beyond 2000

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGEN'	STUDY** ONGOING	1989-1995	1996-2000	Beyond 2000
UR22. Outdoor Recreation Silver Lake Dam Sargent County	Silver Lake Dam is located on the Wild Rice River. The proposed 2 foot raise in the water level may improve recreational conditions.	Silver Lake Dam	N/A	WRD SWC	ongoing	Imp.		
UR23. Erosion Control Drain #65 Greendale Township Richland County	Constructing a three-mile channel with holding areas and drop structures is proposed to reduce erosion and prevent overload of Drain #65.	Drain #65 Lateral	\$90,000	WRD SWC	ongoing	Imp.		
UR24. Drainage Liberty Grove Drain Richland County	About 6.5 miles of channel with holding areas and gated culverts is being studied to reduce crop damages due to poor drainage.	Liberty Grove Legal Drain	\$179,500	WRD SWC	ongoing	Imp.		
UR25. Channel Improvements Cass County	Drain #13 in Berlin, Harwood, and Wiser Townships needs reconstruction to improve channel capacities.	Drain #13 Reconstruction	\$ 1 M	WRD SWC SCS	ongoing	Imp.		
UR26. Channel Improvements Cass County	Drain #22 in Noble Township needs reconstruction to improve channel capacity.	Drain #22 Reconstruction	\$75,000	WRD SWC	ongoing	Imp.		
UR27. Channel Improvements Cass County	Drain #31 in Kinyon and Noble Townships needs reconstruction to improve channel capacities.	Drain #31 Reconstruction	\$75,000	WRD SWC		Imp.		
UR28. Channel Improvements Cass County	Channel improvements and maintenance are needed on discharge channels of a SCS PL-566 Project in the Wheatland area.	Wheatland Channel Improvements	\$100,000	WRD SWC		Imp.		
UR29. Channel Improvements Buffalo Creek Cass County	Channel improvements and maintenance are needed on discharge channels associated with a SCS PL-566 Project.	Buffalo Creek Improvements	\$100,000	WRD SWC		Imp.		
UR30. Flooding Sheyenne River	Spring floods occur and are often aggravated by clogged channels which cause flooding to large areas.	A) Baldhill Dam Renovation for dam safety. B) Baldhill Creek Dam (Devils Lake Region DL23) C) Sheyenne River Flood Control Project.	N/A	COE WRD SWC	Done	Imp.		
UR31. Dam Deterioration Nelson Dam Sargent County	Nelson Dam, about 7 miles east of Havana, is sitting in and needs repairs.	D) Raise flood pool elevation of Baldhill Dam Nelson Dam Repairs	N/A \$25,000	COE WRD SWC		No Recommendation	F.S.	Imp.

UR32. Flood Control Ransom County	A dry dam at T134/R56 on Timber Coulee could prevent flood damages and provide wildlife habitat.	Timber Coulee Dry Dam	\$660,000	WRD SWC		F.S.	Imp.
UR33. Multi-purpose structure Hansen Dam S30/T139/R58 Barnes County	This existing reservoir on an unnamed tributary of the Sheyenne River could have the dam raised for several beneficial purposes.	Hansen Dam	\$417,000	WRD SWC		F.S.	Imp.
UR34. Erosion Control Richland County	Soil erosion is a serious problem along the Wild Rice River about 3 miles north of Hankinson.	Brandenburg Erosion Control	\$75,000	SCS WRD SWC	ongoing		Imp.
UR35. Flood Control Collax Township Richland County	Flooding is a problem in Collax Township because of poor drainage during heavy rains or excess runoff.	Collax Watershed Flood Control	\$700,000	SCS WRD SWC	ongoing		Imp.
UR36. Erosion Control Cass County	There is a serious erosion problem along the banks of the Red River north of Fargo.	Red River Critical Area Treatment (CAT) Township 141	\$50,000	SCS WRD SWC	Done		Imp.
UR37. Erosion Control Cass County	There is a serious erosion problem near the Rush River northeast of Erite.	Rush River (CAT) Township 142	\$50,000	SCS WRD SWC	Done		Imp.
UR38. Channel Improvements Swan Creek Cass County	Channel improvements and maintenance are needed on the discharge channels of a SCS PL-566 Project.	Swan Creek Channel Improvements	\$100,000	SCS WRD SWC	Done		Imp.
UR39. Artificial Recharge Englevale Aquifer Ransom County	Determine the feasibility of importing Sheyenne River water during high flow periods and storing it in the Englevale Aquifer for irrigation use.	Englevale Aquifer Recharge Study	\$35,000	WRD SWC	Done		Imp.
UR40. Outdoor Recreation Fargo Cass County	A lowhead dam is being studied on the Red River to improve recreational opportunities and for bank stabilization in north Fargo.	Fargo North Dam	\$1.8 M	City WRD SWC	Done		Imp.
UR41. Flooding Maple River Cass County	The Maple River has a history of periodic flood problems because of the flat terrain. The river overflows its banks during spring snowmelt runoff and/or heavy rainfall.	A) Maple River T-132 Dam B) Maple River T-114 Dam	\$1.8 M \$900,000	RRJT SWC RRJT SWC			Imp. Imp.
UR42. Channel Improvements Sargent County	All water channels, natural drains, and legal drains should be reviewed for maintenance and improvement needs.	Inventory Channels and Drains	\$50,000	WRD SWC			Imp.
UR43. Dam Repairs Brummond-Lubke Dam Sargent County	The Brummond-Lubke Dam, a component of the Tewaukon watershed project, needs repairs.	Brummond-Lubke Dam 1-1A	\$25,000	WRD SWC			F.S.

MAP ID, PROPOSAL, LOCATION	DESCRIPTION	POSSIBLE SOLUTION	COST	AGENCY	STUDY**	ONGOING	1993-1995	1996-2000	beyond 2000
UR44. Waterfowl Production Mann Lake Sargent County	Several small dams such as dry dams or stock dams could hold water for waterfowl and other wildlife.	An ASCS program exists for stock dams and the GFD, FWS, and WRD have funded dry dams in the past.	N/A	ASCS GFD FWS WRD					Imp
UR45. Water Management Red River Basin	Consider reestablishing the Tri-State Water Compact to help resolve Red River Basin water management problems and issues.	Use current organizations such as WRDs, Joint Boards, or the Red River Resource Council.	N/A	SWC					Supported
UR46. Water Quality Wild Rice River Richland County	Oxbow cutoffs at S25/T131/R50 from road construction and channel changes cause stagnant water to pool and create health hazards.	No final solution has been identified. Water could be diverted during high flows to improve water quality. This would require a Corps Section 404 permit.	N/A	WRD SWC SHD GFD					No Recommendation

*Agencies involved with project study and implementation:
 ARB Atmospheric Resources Board
 ASCS Ag. Stabilization & Conservation Service
 BOR Bureau of Reclamation
 BWWC Board of Water Well Contractors
 COE Corps of Engineers
 CTB County Township Board
 DU Ducks Unlimited

EDF Dept. of Economic Development & Finance
 EPA U.S. Environmental Protection Agency
 EXT ND State University Extension Service
 FBR Fort Berthold Indian Reservation
 FWS U.S. Fish and Wildlife Service
 GFD Game & Fish Department
 GCD Garrison Diversion Conservancy District
 GS U.S. Geological Survey

IA Irrigation Association
 JB9 Joint Boards
 NOAA National Oceanic & Atmospheric Admin.
 PSC Public Service Commission
 RRJT Red River Joint Board
 SDAG State Department of Agriculture
 SCS Soil Conservation Service
 SFS State Forest Service
 SHD State Health Department

SWC State Water Commission
 WRD Water Resource Districts

**Indicates if feasibility and/or design studies have been completed (Done) or ongoing.
 ***Indicates if project/program implementation (Imp) or feasibility study (F.S.) is ongoing, or to begin in years 1993-1995, 1996-2000, or beyond year 2000.

Future Without Plan

Typically, a Future Without Plan (FWP) discussion predicts what can be expected if plan recommendations are not implemented as proposed. This FWP plan deviates in that it contains projects and programs whose progress or status will be determined outside of this planning process. FWP projects and programs are usually of regional scope. They are federally authorized and funded, or have previous commitments from the State Water Commission (SWC) or other state agencies.

FWP projects and programs are organized into two categories. The first category describes project and program recommendations of the Governor's Water Strategy Task Force. The Other FWP Recommendations are projects and programs submitted by Citizen Advisory Boards (CABs), water resource district boards, citizens at large, and state and federal agencies. This

FWP will conclude with a more traditional, general discussion directed toward recommendations approved by the CABs.

Governor's Water Strategy Task Force FWP Recommendations

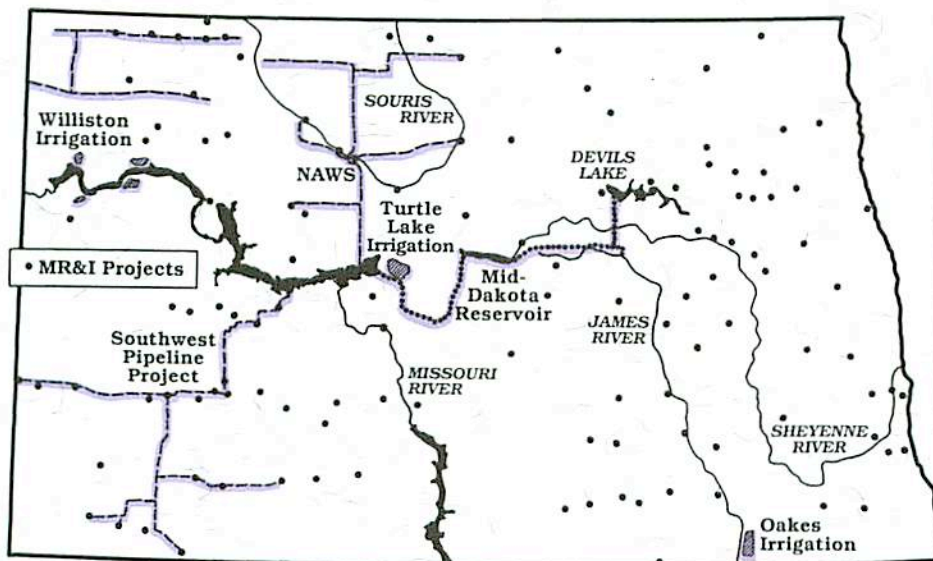
Governor George A. Sinner's executive order created the Water Strategy Task Force, chaired by Lt. Governor Lloyd Omdahl, on April 26, 1991. The Task Force consisted of about 20 representatives of interests concerned with water management. Their assignment was to recommend a water supply development program. Two rounds of eight regional hearings were held to receive testimony which defined water management needs and reviewed potential solutions.

The Task Force recommended a series of regional projects that would create a state-wide water delivery system to meet short-

and long-term needs. The state's ability to finance these recommendations is influenced by the State Legislature's willingness to develop and pass a special funding package. The unsuccessful Initiated Measure No. 4, sponsored by the North Dakota Water Users in the 1992 general election, earmarked proceeds from a one-half cent state sales tax increase to water projects. A discussion of financing issues is found in the Water Management Issues section of this report. The Task Force's 11 recommendations, each with a brief description, comprise this part of the FWP. More information on Task Force recommendations is available at the SWC office.

Municipal, Rural and Industrial (MR&I) Water Supply Program:

The Garrison Diversion Reformulation Act of 1986 allocated \$200 million federal dollars for planning and constructing MR&I water supply systems state-wide. About 120 applications for MR&I funding have been received. Before 1991, the MR&I program granted 75 percent of eligible project costs. The program now operates under a grant/loan concept where 65 percent of eligible project costs are granted and a low-interest loan covers the remaining 35 percent. As of 1992, about \$65 million has been used to complete nine projects and fund 12 others into design and construction phases.



The Governor's Water Strategy Task Force Recommendations

Mid-Dakota/Sheyenne Lake:

The Mid-Dakota/Sheyenne Lake would link the McClusky and New Rockford Canals. This link would make it possible to move Missouri River water to eastern North Dakota and to Devils Lake. Congressional efforts are underway to direct the Bureau of Reclamation to study the project and report by March of 1994.

Canal Maintenance and Rehabilitation:

Maintenance and repair of the 74-mile McClusky Canal and completion of the 45-mile New Rockford Canal are needed before the systems can begin operations.

Sheyenne River Biota Treatment Plant and Devils Lake Pipeline:

A treatment plant with an 8-mile pipeline would deliver Missouri River water into the Sheyenne River for MR&I uses at Fargo, Grand Forks, and other communities. In addition, a pipeline/canal delivery system would be constructed to serve as an inlet/outlet to stabilize Devils Lake.

Federal authorization exists for delivery of MR&I water to the Sheyenne River. However, progress hinges on the approval and completion of Mid-Dakota/Sheyenne Lake, the state's preferred link between the McClusky and New Rockford Canals. The U.S. Army Corps of Engineers has completed a reconnaissance study of a stabilization project for Devils Lake. The next step is a Corps feasibility study to determine the best method to stabilize Devils Lake.

James River Feeder Canal and James River Bank Stabilization:

The three-mile canal would link the New Rockford Canal with the James River and supply Missouri River water for irrigation and other purposes. Minor bank stabilization is needed at sites along about 190 miles of the James River to prevent bank erosion resulting from increased flows of water. This is part of the Garrison Diversion Project.

Turtle Lake Area Irrigation Development:

A 13,000-acre irrigation district has been formed. The McClusky Canal would transport Missouri River water to the irrigated areas.

Williston Area Irrigation Development:

An irrigation district would be created in the Williston area that could serve about 10,000 acres. Prompting the proposal was the loss of one irrigation district and major damage to another due to high water tables linked to sedimentation at the headwaters of Lake Sakakawea. Engineering reconnaissance studies are being completed.

Southwest Pipeline Project:

The Southwest Pipeline Project plans to supply Missouri River water to more than 20 cities and three rural water systems in southwestern North Dakota. Lake Sakakawea water has been delivered to Dickinson and ongoing pipeline construction will deliver water to surrounding communities in late 1993 or 1994.

State Water Commission Contract Fund:

This fund, established in the 1940s, allows the SWC to cost-share with local sponsors on a variety of water management projects and participate in hydrologic data collection programs.

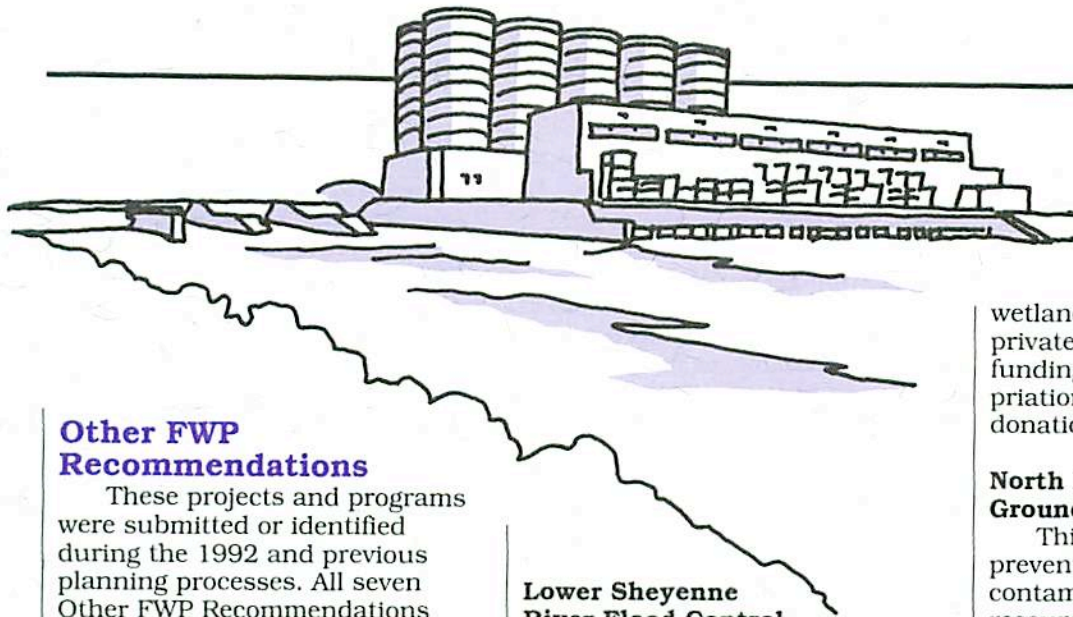
Northwest Area Water Supply:

This system would deliver Missouri River water to a nine-county area in the northcentral and northwest parts of the state including the cities of Minot, New Town, and Parshall. Federal cost-share funds will be sought in the congressional session.

Water Supply Development Fund:

MR&I development and maintenance needs are expected to continue indefinitely. State funds are needed to begin the program which is founded on a 65 percent grant and 35 percent loan concept for MR&I projects. Loan interest and repayments would go into a special account within the Resources Trust Fund and would be earmarked for future MR&I needs.

These recommendations were reviewed and supported by the Steering Committee. Task Force recommendations were also reviewed by the CABs during their third meetings. Seven of the eight CABs passed resolutions of support for the Task Force's water development program. The eighth CAB also supported the recommendations but chose to contact local legislators individually. All state legislators received the CABs' resolutions of support.



Other FWP Recommendations

These projects and programs were submitted or identified during the 1992 and previous planning processes. All seven Other FWP Recommendations are ongoing projects or programs which are not directly affected by the 1992 Plan. However, these projects and programs are important water management features in North Dakota. Detailed information on the recommendations can be obtained at the SWC.

Souris River Flood Control Project:

This nearly completed joint Canada-U.S. effort consists of two multi-purpose dams located in Canada along with levees, channel improvements, and structures in North Dakota. It gives 100-year flood protection to the cities of Burlington, Minot, Sawyer, and Velva and rural areas in McHenry and Ward Counties along the Souris River.

Lower Sheyenne River Flood Control Project:

The portion of the project that diverts Sheyenne River floodwaters around West Fargo and Horace is nearing completion. The final phase, a flood control dam on the Maple River, is being analyzed by the Corps of Engineers.

National Flood Insurance Program:

About 230 communities participate in North Dakota's program. Compliance with the program's nonstructural, floodplain management objectives reduces long-term losses due to flood damages.

No-Net-Loss of Wetlands Program:

No-Net-Loss is a state initiated wetland protection and replacement program which balances wise water and agriculture development with wetland protection and enhancement.

State Waterbank Program

The State Legislature created the State Waterbank Program in 1981 to protect wetlands by leasing

wetlands and upland cover from private landowners. Program funding is from legislative appropriation, grants, and private donations.

North Dakota Pesticide/ Groundwater Management Plan

This plan was adopted to prevent inadvertent pesticide contamination of ground-water resources. Part of the plan outlines the state's authority to regulate and monitor agricultural chemical applications through irrigation systems. Another part of the plan assists in the recycling or disposal of empty pesticide containers and unused pesticides.

North Dakota Wellhead Protection Program

In response to a growing national trend, this program addresses the protection of city or rural water system wells from possible contamination. The program identifies and monitors potential sources of contamination. Protection measures may include limiting certain land uses and practices in the aquifer recharge areas.

Traditional Future Without Plan

A traditional FWP predicts what will happen if plan recommendations are not implemented. This FWP offers a few examples of how Water Management Goals and Objectives could be affected. A thorough FWP of this nature would require extensive research and would be of questionable value because of the many unforeseeable factors in water management.

Example 1.

The Water Management Goal for water supply is to meet projected water supply demands for the years 1995, 2000, and beyond. One objective was to develop self-supporting rural water systems where demand exceeds available supplies or where water quality is below standards. The SWC's Municipal, Rural, and Industrial Water Supply (MR&I) Program attends some of these needs. This program could ultimately provide water to about 360,000 urban and rural residents. About 150 cities have shown interest in the program. Some of these cities and farms have water with fluoride, arsenic, or high levels of total dissolved solids that pose health risks. Seven cities faced possible fines of up to \$20,000 per day for exceeding minimum water quality standards set by the EPA. These and other water supply concerns would not be addressed if the MR&I Program was not continued.

Example 2.

An objective for Weather Modification is to determine the economic impacts of cloud seeding operations on the state's economy. Research suggests that hail suppression and enhanced rainfall increased wheat yields in the target area by about 6 percent. Hail damages to crops were reduced about 50 percent. Weather modification operations improve the state's economy by about \$19 million per year in the six targeted counties. It could be said that the state's economy would suffer an annual loss of \$19 million if weather modification operations were suspended.

Example 3.

An objective for Energy is to increase the efficiency of hydroelectric power generation at Garrison Dam. One Plan recommendation requests the state to study cost-sharing with the Corps of Engineers to replace the old turbine runners with new, high efficiency runners. Efficiency increases ranging from 1 to 5 percent are predicted. North Dakota's share of the additional revenue could be used for funding water management proposals.

These three example illustrate how a traditional FWP would be constructed. Because of rapidly changing circumstances, traditional FWPs are of limited use in water planning. The baseline conditions a typical FWP predicts are affected by a complex set of factors that make even short-term predictions difficult. Future water plans will rely on continuous updates of new information to anticipate demands rather than trying to predict an increasingly uncertain future.

Economics

An economic perspective of water management is concerned with how proposals affect the overall well-being of people rather than acting as a simple accounting of dollars involved. In economics, dollars are used to estimate how proposals affect people's well-being. Although more money does not perfectly equate to improving someone's well-being, dollars remain the most understandable way to measure the concept.

Decision-makers use economics as a tool to help them allocate scarce resources among competing demands, and it is becoming an increasingly important tool in water management. Decreases in funds available for water management, compounded by increasing costs, force decision-makers to evaluate each proposal more closely to effectively use their limited funds. Although engineering, environmental, social, legal, and political implications are also considered in any project, this section offers insights and practical information on economic perspectives used in water management.

Three distinct perspectives (local/regional, state, and federal) emerge when making economic evaluations of water management projects or programs (proposals) in North Dakota. The local economic perspective considers how proposals affect a community and the surrounding area. The state economic perspective evaluates a proposal on how well it promotes the state's overall goals. The federal government's economic perspective is omitted. Although important to water management, it is not influenced by this report.

Local/regional and state perspectives are discussed to help local water managers and state-level decision-makers better understand each other's needs. This section will discuss local and state economic perspectives to offer North Dakota decision-makers a framework for using economic principles to evaluate water management proposals and policies.

Local/Regional Perspective

The local/regional economic perspective tends to be provincial in its assessment of a proposal because only impacts to the immediate area are considered. Local economic evaluations consider one or a combination of three criteria to make comparisons among various investment opportunities for local dollars.

They are:

- efficiency,
- regional economic development, and/or
- improving the area's quality of life.

Some proposals are implemented to meet federal or state regulations or to solve a crisis such as a lost water supply. In these cases, local or state governments are compelled to meet these people's needs. These types of situations make typical economic evaluations irrelevant.

Efficiency

The concept of efficiency at the local level means an effective use of local dollars and resources. Local decision-makers often use benefit/cost (B/C) analysis to help them estimate the dollars of benefits per dollar

of cost for proposals. B/C ratios of various proposals can be compared to help find the most effective use of local funds. Using a single value (e.g. 2.0) as a measure of efficiency is convenient for decision-makers to compare many proposals. However, there are inherent weaknesses in B/C analysis which will be discussed in the state perspective.

Most proposals are funded by combining local, state, and federal dollars. However, a local B/C analysis includes only the local cost-share and excludes costs incurred by state and federal governments as well as the benefits that accrue to them. The final measure represents only part of the project's total benefits and costs. Any benefits or costs accruing to the state or federal governments are not included even though they often contribute a large percentage of total project benefits and costs. In most cases, a proposal that is efficient from a local perspective does not enjoy the same level of efficiency in an overall state perspective.

Regional Economic Development

Another way to evaluate proposals at the local level is to estimate regional economic development impacts. This decision-making model estimates direct and secondary economic benefits of:

- (1) state and federal dollars used for project construction, operation, and maintenance, and
- (2) increased economic activity resulting from project services.

Direct benefits are the dollars of expenditures associated with the project. Secondary impacts are estimated using an input-output model that can be developed specifically for a region or for an entire state. North Dakota's model simulates the "rollover" or "multiplier" effect of money as goods and services are purchased, and the proceeds are reinvested in the local economy. It estimates increases in total business activity, personal income (wages and salaries), and employment in the region.

Regional economic analyses estimate the effects of "new" money (i.e. money originating from outside the region) in the local economy. New money to a local economy can be:

- state or federal dollars,
- goods or services exported from the region or purchased by nonlocal residents, or
- reduced or prevented leakage of money spent by local residents for goods or services produced out of the region.

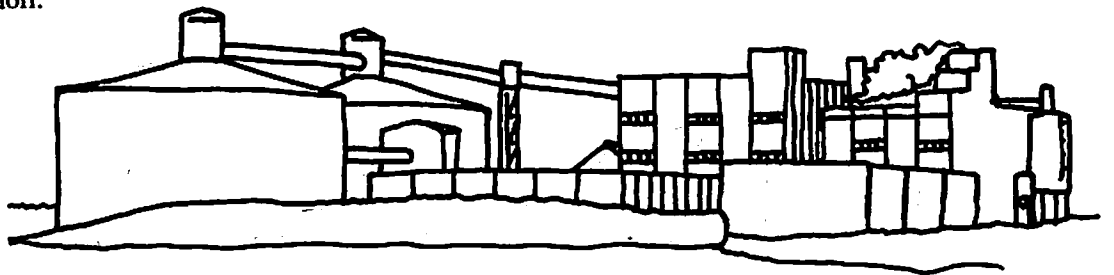
Money contributed by the state or federal government for project construction, operation, or maintenance is considered new money whereas the local cost-share is not. The same logic is used to define new money from project services. Money spent by local users of a recreation facility is not new money to the region since recreationists may only be switching activities (e.g. golf to

fishing). This is not a net economic gain to the region. However, it is new money if a new reservoir attracts locals and nonlocals who would have spent money at a site outside the region.

For example, a new reservoir built near a small town attracts recreationists from a city 60 miles away who spend about \$100,000 per year in the area. Local residents who spent \$50,000 at another reservoir

Improving the Area's Quality of Life

Proposals improving an area's quality of life provide services that enhance living conditions in a community or area. They may promote public health and safety or make life more pleasant and convenient. These proposals also may indirectly improve economic development prospects in a community by increasing the area's attractiveness as a place to live and



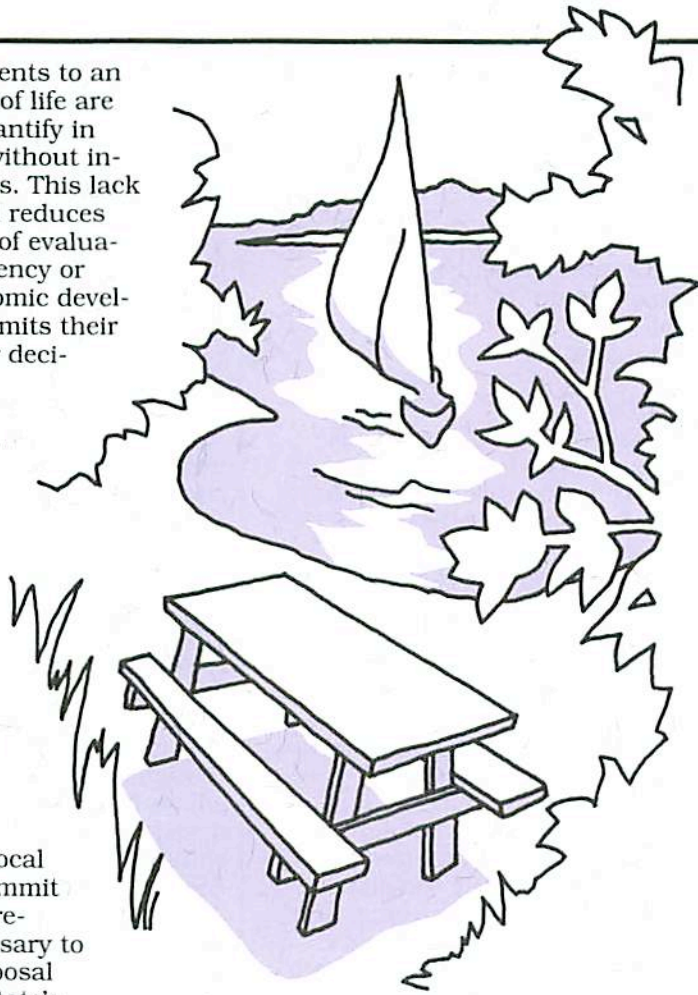
located outside of the region to fish and camp now stay in the area. This \$150,000 of new money is inserted into the input-output model's recreation and tourism sector and multiplied by the number of times the money "rolls over" (R&T multiplier = 3.3).

The region's total business activity increases by nearly \$500,000. Of that amount, about \$100,000 is personal income (wages and salaries). Three additional jobs are supported from economic activity attributed to the new reservoir. Although an actual analysis is much more complex, the estimates provide information that is easily understood and can be used to make comparisons with other investments of local dollars.

work. Healthy workers are less likely to miss work and be more productive while at work. One could also assume both employers and employees prefer to live, and consumers would prefer to shop, in an aesthetically pleasing environment. Examples of water management proposals which improve quality of life can be improvements to water quality, aesthetics, or wildlife habitat, municipal, rural, and industrial water supply projects, or small water recreation projects that generate little new money to the area.

Improvements to an area's quality of life are difficult to quantify in dollar terms without in-depth analyses. This lack of information reduces the reliability of evaluations for efficiency or regional economic development and limits their usefulness for decision-making purposes. In North Dakota, projects that improve the quality of life generally receive widespread support from area citizens. When local citizens judge the quality of life improvements to be greater than local costs, they commit the time and resources necessary to move the proposal through the state's implementation process.

Few past water management proposals have been scrutinized at the local level using economic analyses. But as state funding decreases and water management demands grow, more emphasis will be placed on economics to help find the best uses for limited funds. Understanding the local/regional perspective can help decision-



makers at the state level better communicate with local citizens. Because they use different criteria, proposals seen as worthy from a local perspective may not be as important to the state. Recognizing these differences should improve discussions and aid in decision-making.

State Perspective

State government views water management proposals from a broad, overall perspective that considers how each will affect the state's goals as a society. Water management is not an end in itself. Water is a tool that can be used with other resources to help achieve goals. A state's societal goals can be roughly categorized as:

- efficiency,
- equity (fairness),
- economic stability or growth.

Balancing societal goals is the role of decision-makers and politicians on the state level. Almost any proposal will be more successful by some criteria than by others. The State Water Commission and other state agencies attempt to balance these sometimes overlapping and conflicting goals when funding various proposals. Economics offers a method to measure the impacts of their decisions on various goals and helps them organize discussions.

Efficiency

The state views efficiency as the best use of available funds to maximize citizens' well-being. As a proxy for efficiency, the state commonly uses B/C analyses that consider all dollar benefits and costs of a proposal. It also includes nonmonetary impacts (benefits and costs) that are difficult to quantify in dollar terms. Nonmonetary benefits could be improvements in quality of life, aesthetics, environmental quality, or saving of lives. Environmental degradation, habitat loss, or decreases in social well-being can be nonmonetary costs. In some proposals, nonmonetary impacts may outweigh dollar impacts.

Decision-makers need to critically view any single value that measures efficiency such as a B/C ratio. Although using a single value is convenient to help choose among alternative projects, sometimes the trade-off for convenience is accuracy. B/C analysis is a good tool for organizing information but it has some weaknesses including:

- B/C analysis can appear more precise than it actually is.
- All benefits and costs should be included. Some cannot be measured in dollar terms yet they are very important (e.g. environmental and social values, and unintended side-effects).
- Benefits can be difficult to estimate and require in-depth analysis (e.g. recreation or MR&I water supply benefits).
- Benefits accrue throughout a project's lifespan, making their estimated values sensitive to arbitrarily chosen factors (e.g. project lifespan, discount rate).
- Ex post analyses on previous projects have shown B/C analysis to be a limited tool for long-term decision-making. External forces such as weather cycles, demographic changes, or politics can radically alter the anticipated types and flows of benefits. This can render the original B/C analysis a misleading measure for project or program justification.
- Equity or fairness is not considered.

Efficiency is an evaluation criterion but it is not the sole measure of a proposal's worthiness. State government does not fund water management proposals to profit financially. Some

proposals are needed to alleviate a crisis or meet new state or federal regulations. In most cases, the state makes expenditures for society and does not expect to recover all outlays on water management. Public sector water management costs are often "repaid" by increased social well-being, which is mostly unquantifiable.

Equity

The concept of equity has many interpretations but all involve fairness. Fairness is hard to define because what is fair to one person may be something wholly different to another. The concept's vagueness makes equity decisions the responsibility of decision-makers and politicians on the state level. Economics can be used to estimate the impacts of decisions which are made for equity reasons.

Water management equity concerns can be organized into categories involving the distribution of income, opportunity, and resources among generations. Decision-makers concerned with equity may implement proposals based on one or any combination of the three categories.

Government has long concerned itself with the redistribution of income among geographic regions, demographic groups, or generations. In North Dakota, rural residents have experienced lower personal incomes, higher unemployment, and lower real earnings per job than urban residents. Water management funding decisions can be affected by income redistribution concerns.

For example, two proposals of similar scope and costs compete for funding. B/C analyses find them about equal. The annual total business activity for Proposal A is \$200,000 with Proposal B at \$150,000. Personal income would increase by \$40,000 in Proposal A's region and \$30,000 in Proposal B's region. Strict adherence to efficiency criteria would dictate that Proposal A be funded.

Equity concerns may at times override efficiency concerns. Suppose Proposal A is located in an urban area where per capita personal income is much higher than in Proposal B's rural location. An influx of new business activity and personal income would have a greater beneficial effect in Proposal B's region and might be chosen for equity reason. Although somewhat simplistic, this shows how economics can help decision-makers as they wrestle with balancing efficiency and equity concerns.

Equity in opportunity implies evaluating water management proposals by how well they distribute opportunities for employment, leisure activities, or quality of life. Decision-makers concerned with equity of opportunity may choose to fund water supply projects that build infrastructure in depressed areas, especially where water is a limiting factor in economic growth, or for health and safety reasons. An example of equity in leisure opportunities is the state funding proposals to create water-based recreation facilities in areas where few exist. Water quality improvements can enhance recreational opportunities at existing sites.

Distributing resources among generations is known to decision-makers as intergenerational equity. These decisions revolve around what quantity of natural resources and the environment to develop and how much to conserve for future generations. An even more difficult question is how to ensure a future clean environment while developing the present resources needed to provide economic growth for future generations (infrastructure development). Economics can help decision-makers with these issues but the need for public input is essential.

Equity continues to be an important concern for state-level decision-makers and politicians. Because of its many interpretations, equity concerns will remain difficult to define. Economics can help organize discussions and estimate the trade-offs when equity and efficiency concerns differ.

Economic Stability or Growth

The goal of economic stability or growth addresses the long-term well-being of North Dakotans. The state's economy fluctuates dramatically from year to year but has experienced no real growth for 20 years. This economic stagnation has contributed to the state's loss of jobs and population.

The Vision 2000 Committee developed a strategy for the state to build its economic future. Water resources were considered an essential ingredient in the mix of resources needed to improve the state's economic future.

Water management's role is to protect and maintain present water resources and develop the water-related infrastructure where it is needed for future economic development.

Water and wastewater system's effects on economic development are discussed in *Infrastructure Investment and Economic Development*, published by the U.S. Department of Agriculture. The authors found situations where public water and wastewater investments may promote economic development. Public water investments have the best chance of promoting development in situations where the lack of suitable water quality or quantity constrains development. Water's effects can be direct (e.g. water used in a production process) or indirect (e.g. water for quality of life). The authors stressed the need for local involvement to determine areas where lack of water infrastructure inhibits development.

David Aschauer, in the March/April 1991 issue of *Challenge* magazine, found states who invested more in infrastructure had greater rates of output, private investment, and employment growth. The evidence also indicated that public sector investment must precede private sector investment. In other words, public infrastructure investment (e.g. schools, highways, water systems) provides the foundation for private sector investments. Public investments stimulate job growth in manufacturing, industry, and in financial,

business, and consumer services. Aschauer also found a one-dollar increase in the stock of public infrastructure added as much to American's productivity as a four-dollar investment in private business capital.

There is no guarantee that public investment in water management will promote economic development, but research does show that it can. Water infrastructure is an investment in an area's economic future and other forces will have an effect. The strength of the linkage between infrastructure and economic development is subject to many factors, and it clearly depends on each location's situation.

Local and state decision-makers will be making more extensive use of economic analyses to help them allocate limited funds among the many competing demands. Anticipating these needs, the State Water Management Plan contains a framework for using economics to help make decisions. The economic, social, and environmental analyses of Plan recommendations do not contain enough detailed information on which to base decisions. Future planning efforts will include more in-depth economic analyses of proposals to provide decision-makers with more useful information.

Financing

Cooperation among federal, state, and local governments, and the private sector is the key to funding water management projects and programs. A combination of local and state funds are typically used to finance projects. Most projects combine local funds with federal and state dollars as well as donations from private citizens and organizations. This cooperation is fostered by each entity's interest in water management and the need to pool financial resources. However, the progress of most projects and programs is driven by local commitment.

In North Dakota, the funding and implementation of water management projects or programs relies heavily on the initiative and financial support of local communities or governments. Local entities must be willing and capable of financing their share (cost-share) of a project or program. The percentage of total costs which locals must pay varies among types of projects and programs. Once a project is studied, found feasible, and local entities have secured their cost-share, they can seek available federal and/or state funds to implement it. In reality, project studies and efforts to secure funding occur simultaneously.

Local Funding Sources

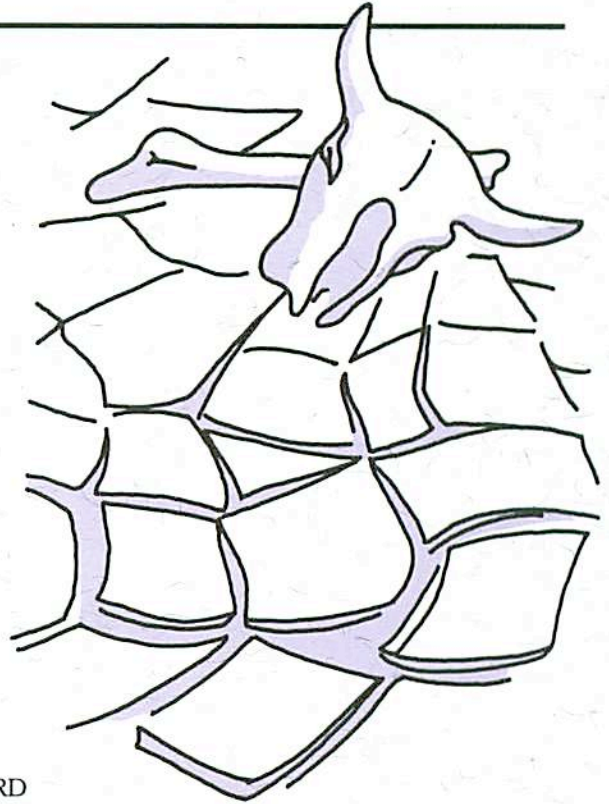
Local water management funds usually originate through county or city government actions which are initiated by the project or program's proponents. Local cost-share can be raised

through one or a combination of:

- property taxes (mill levy),
- special assessments,
- user fees,
- revenue bonds,
- city sales taxes,
- other fees, and
- donations.

Water Resource District Boards (WRDs), appointed by County Commissions, often serve as local project sponsors. They are authorized to raise money for the local cost-share through property taxes, special assessments, user fees, or revenue bonds. Most local cost-shares are raised by property taxes (up to 4 mills) or special assessments. WRDs can combine to form Joint WRD Boards for larger, regional projects and levy an additional two mills.

Other methods are used to raise local cost-share money for various projects. For example, city governments have used city sales taxes to raise cost-share for projects within city limits. Rural water systems use a series of fees to plan, construct, and operate the systems. A good intentions fee or deposit is paid by prospective users to pay study costs. If found feasible, a hookup fee completes water delivery. A basic service and user fee based on the amount of water used continues service. Local sponsors of recreation projects have solicited donations from private citizens, sportsmen's clubs, or civic and fraternal organizations to raise part of the local cost-share.



Inherent in any of the local fund raising methods is widespread public support for the project or program. Local fund raising techniques are subject to direct public approval through the voting process, indirect public approval through elected officials, or through direct payments or donations by citizens. Water management in North Dakota relies heavily on local funding, and regardless of the methods used, raising local funds is contingent on public support and commitment.

State Funding Sources

Funds for water management are administered through state agency programs. Six agencies administer 11 programs that distribute funds for a variety of

specific water management purposes: water quality improvement projects, wetland protection, or flood control (Table 1). Local project sponsors often seek state cost-share from more than

one program if their project qualifies under each program's criteria. State water management programs allocate money through grants, loans, or a combination of grants and loans.

Table 1
STATE WATER-RELATED PROGRAMS

ADMINISTERING AGENCY/PROGRAM	PURPOSE	TYPE OF FUNDS
<i>Office of Intergovernmental Assistance</i>		
Community Development Block Grants	Improve living environment for small communities and counties (i.e. flood control projects)	Grants
<i>State Agriculture Department</i>		
State Waterbank Program	Maintain and protect wetlands	Grants
<i>State Game and Fish Department</i>		
Federal Aid in Sport Fish Restoration Act ...	Develop fish habitat and provide boat access and pollution control (i.e. reservoirs, boat ramps, low-level drawdown discharges)	Grants
Private Lands Initiative Program	Watershed treatment and point source pollution control (animal waste lagoons)	Grants
<i>State Health and Consolidated Laboratories</i>		
State Revolving Fund	Wastewater treatment facilities	Loans
State Clean Lakes Program	Watershed and in-lake treatment to improve water quality (not funded since 1987)	Grants
<i>Nonpoint Source Pollution Abatement Program</i>		
	Watershed treatment measures to improve water quality	Grants
<i>State Parks and Tourism</i>		
Land and Water Conservation Fund	Swimming and boating facilities and other recreation activities	Grants
<i>State Water Commission</i>		
Contract Fund	Small scale water development including flood control, recreation, irrigation, water supply, and drainage projects, and special programs such as the Drought Disaster Livestock Water Supply Assistance Program and studies	Grants & Loans
Garrison Diversion Municipal, Rural & Industrial Water Supply Program*	Water supply projects for municipal, rural, and industrial users	Grants
Resources Trust Fund	Large scale water development projects	Grants & Loans

*Jointly administered with the Garrison Diversion Conservancy District

The State Water Commission (SWC) offers financial assistance to local project sponsors, usually in the form of grants, through the Contract Fund, the Resources Trust Fund, and the Garrison Diversion MR&I Water Supply Program. The items eligible for SWC cost-share as well as the percent of SWC cost-share vary among types and purposes of projects (Table 2).

Noneligible items which must be paid by local project sponsors include easements, rights-of-way, and land purchases. The SWC does not cost-share for general, routine maintenance projects such as silt removal in drains, culvert repair, or routine erosion control measures near structures. WRDs are encouraged to submit cost-share proposals to the SWC when the eligibility of their project is in doubt.

The SWC often assists local sponsors to secure funding from both state and federal sources. The myriad of regulations and procedures which must be followed can be difficult for local citizens who may be unfamiliar with government processes. Therefore, the SWC coordinates and assists local sponsors with funding applications.

Federal Funding Sources

Local sponsors may enter into cost-share agreements with only state agencies to complete projects. However, the federal government also offers cost-share dollars in the form of grants, loans, and combinations of grants and loans. Twenty-two programs from ten federal agencies offer funds for various water management activities (Table 3). Local project sponsors

often pool their money with state and federal dollars to implement a project.

In recent years, the federal government has steadily reduced its funding of water management and is shifting more financial burden to the states. North Dakota's ability to fund water management projects is also declining due to a shrinking General Fund and reduced energy revenues upon which state water management funding relies. The state must develop innovative strategies to continue important water management activities recommended in this plan. Future developments in financing water management are addressed in the Special Issues section.

Water management in North Dakota is driven by local funding and initiative. State and federal programs offer money on a cost-share basis for a variety of water management projects. Local project sponsors can combine local, state, federal, and private money to finance water management improvements in their area and provide a better quality of life for the state's citizens.

Table 2
STATE WATER COMMISSION COST-SHARE POLICY

PROJECT TYPE/PURPOSE	PERCENT COST-SHARE
Flood Control (Storage)	50
Channelization or Improvements	40
Clean-out/Snagging & Clearing	25
Recreation	33
Studies (field costs only)	50
Erosion Control (applies only to the local sponsor's cost-share)	40
Drought Disaster Livestock Water Supply Assistance Program	50 (or \$2000 max.)
Garrison Diversion MR&I Water Supply Program	65 (grant) 35 (low interest loan)

**Table 3
FEDERAL WATER-RELATED PROGRAMS**

ADMINISTERING AGENCY/PROGRAM	PURPOSE	TYPE OF FUNDS
<i>Agricultural Stabilization & Conservation Service</i>		
Agricultural Conservation Program	Soil, water, and energy conservation	Grants
Emergency Conservation Program	Rehabilitation of farmland damaged by wind, floods, or other natural disasters	Grants
Conservation Reserve Program	Reduce erosion and maintain wetlands	Grants
Waterbank Program	Maintain and restore wetlands	Grants
Wetland Reserve Program	Maintain and protect wetlands	Grants
<i>Bureau of Reclamation</i>		
Congressional Authorized Projects	Water storage and delivery systems	Grants & Loans
Investigations Program	Water resources management	Grants
Loan Programs	Small, multi-purpose water development projects	Loans
<i>Corps of Engineers</i>		
Civil Works	Flood control, navigation, water supply, and recreational developments	Grants
Continuing Authorities Program	Flood control	Grants
Emergency Services	Flood control	Grants
<i>Economic Development Administration</i>		
Public Works & Economic Development	Water and related planning and development	Grants & Loans
<i>Environmental Protection Agency</i>		
Clean Lakes Program	Lake restoration and implementation of best management practices in the watershed	Grants
<i>Farmers Home Administration</i>		
Resource Conservation & Development	Multi-purpose water and related land conservation and facilities	Loans
Rural Development	Water supply and wastewater disposal	Grants & Loans
<i>Federal Emergency Management Agency</i>		
Presidential Declared Disaster	Flood damage mitigation	Grants
Floodplain Management	Acquisitions of structures in floodplains	Grants
<i>Housing and Urban Development</i>		
Community Development Block Grant Program	Water resources planning and development	Grants
<i>National Oceanic & Atmospheric Admin.</i>		
Atmospheric Modification Program	Cloud and precipitation research	Grants
<i>Soil Conservation Service</i>		
Resource Conservation & Development	Multi-purpose water and related land conservation and other facilities	Grants
River Basin Surveys & Investigations	Floodplain management studies, flood hazard analysis, and river basin surveys & investigations	Grants
Watershed Protection & Flood Prevention	Flood control, water supply, wildlife, and recreation facilities	Grants

Education

It became apparent during the 1983 planning process that citizens had a general lack of knowledge and misinformation about water management. As a result, the State Water Commission (SWC) began focusing resources on information and education programs. The Water Education for Teachers (WET) Program became the most visible aspect of that effort.

The WET program facilitates and promotes awareness, appreciation, and knowledge of the state's water resources. It

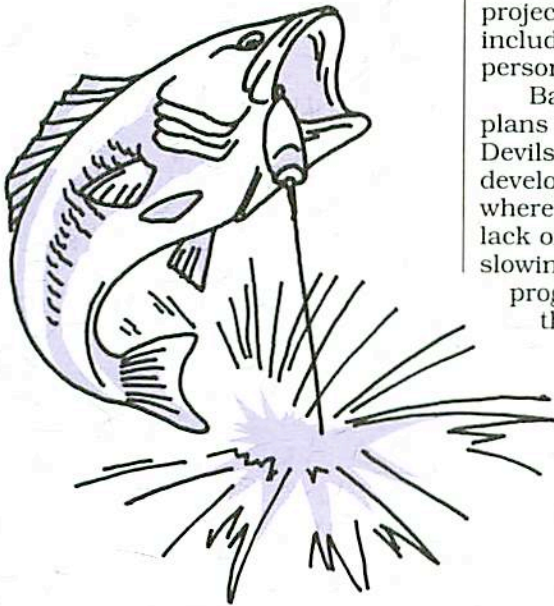
achieves this by developing and disseminating information and printed materials. Since its inception in 1987, WET has enrolled 3,838 participants of which about 2,100 received college credit for continuing education. North Dakota's WET Program served as the prototype for water education programs in Montana, Idaho, Arizona, and for National Project WET.

Another SWC educational effort is the monthly *Oxbow* newsletter and annual edition magazine. They provide information on water management projects and programs and include feature articles and personal interviews.

Basin-wide communication plans for the Red River and Devils Lake basins have been developed to identify instances where poor communication or a lack of understanding may be slowing progress of a project or program. The plans identify the communication deficiencies and outline strategies to improve communication and understanding.

A state-wide communication plan is being developed by the SWC to offer a "big picture" of the state's communication needs. A random survey of citizens measured North Dakotan's knowledge and attitudes on water management. Survey data will be used to identify communication and knowledge deficiencies as well as the most effective methods of bridging these gaps.

The SWC and State Engineer are committed to promoting water education in North Dakota and will continue to cooperate with private, local, state, and federal entities. A more well-informed public can make better decisions on future water management issues. Future planning efforts will also benefit from a better-informed public. The extensive public involvement process used in North Dakota water plans demands that citizens be knowledgeable on all aspects of water management.



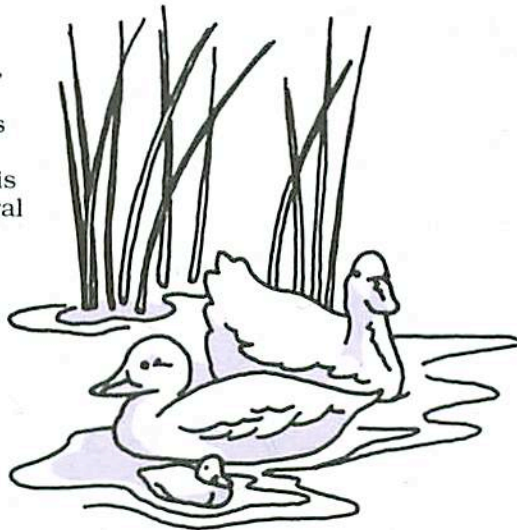
Special Issues

Many important water management issues exist across North Dakota. They range from primarily local concerns to issues that are important at the national level. Some result from long-standing conflicts among competing interests, and others are relatively new, stemming from changes in regulations or from concerns over growing demands for limited water resources. To varying degrees, solutions to these issues are certain to impact how water is managed in this state.

This discussion of issues is organized in the form of general statements which describe concerns and, in some cases, offer potential solutions which reflect current thinking. Some issues can be resolved with relatively simple changes in policy or statute. Others are so complex, or the involved parties so polarized, that an additional commitment of resources will be needed to find tenable solutions. Maintenance activities for the State Water Management Plan will continue to address the more difficult issues and develop optional solutions.

This section highlights some of the pressing issues and is not an exhaustive listing. Many issues were brought out during Citizen Advisory Board (CAB) meetings. Some were identified by state and federal agencies through their planning reports, and the remainder came from State Water Commission (SWC)

staff input. Water management issues are organized under the following major headings: financing, water rights/water supply, environmental, and policy/rules and regulatory. There is no intended significance to the order in which issues are presented.



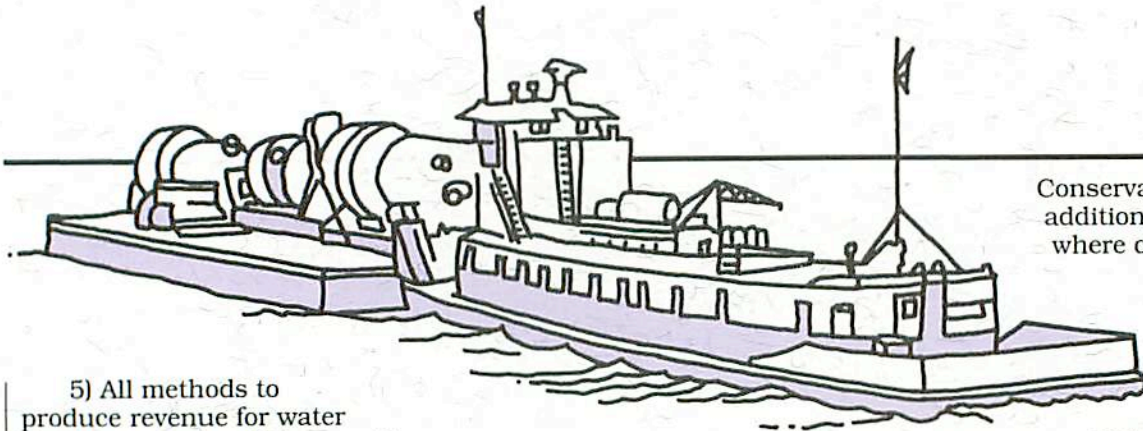
Financing

1) Federal willingness or capability to monetarily participate in water development projects is steadily decreasing. As a result, state and local governments need to contribute a larger share of the money for capital improvements. State and local water managers should continue to investigate and develop alternative means to raise non-federal cost-share. Cost-share arrangements should be organized to have the non-federal cost-share more closely reflect sponsor's ability to pay and have the balance furnished from federal sources.

2) Increasing competition for state general fund dollars combined with declining revenue to support the Resource Trust Fund have caused corresponding reductions in SWC budgets and increased the need to prioritize expenditures. The State Water Management Plan provides a mechanism to aid decision-makers in establishing priorities. The State Water Management Plan priorities should consider economic efficiency as well as environmental and social implications of all proposals.

3) Reduced state general fund and Resources Trust Fund dollars and limited staff time hinders the SWC's ability to consider the same number of proposals as in the past. In the future, proposals brought to the SWC should include a preliminary engineering report. This information would also aid in prioritizing proposals in the State Water Management Plan.

4) Typical water management projects can cost in excess of \$2 million. Regional scale projects often exceed \$100 million. A primary means of acquiring capital in many cases is by state or local governments issuing bonds. Limits imposed under various bonding authorities in North Dakota should be reviewed and modified to reflect contemporary water project costs and methods to secure repayment. Constitutional and statutory changes would be required.



Conservation could allow additional users in areas where competition for available water supplies is very high. The SWC needs to promote water conservation

strategies in appropriate areas.

4) North Dakota must establish its right to a fair share of Missouri River water and secure this important resource for current and future generations. The only way to accomplish this under western water law is to develop and implement specific plans to withdraw water for beneficial use. A fair share of the Missouri River includes benefits such as recreation and hydro-power from Lake Sakakawea and Lake Oahe. Funding the water development program recommended by the Water Strategy Task Force is important to establish North Dakota's Missouri River water rights. North Dakota should continue its efforts to work with all Missouri River Basin states through formal organizations such as the Missouri Basin States Association.

5) More should be done to provide technical assistance to landowners to help them preserve water quality. This primarily educational process is being addressed by several entities including the North Dakota Cooperative Extension Service, the State Health and Consolidated Laboratories Department, and the SWC. Additional funding through appropriation or grants would increase agency capabilities to accelerate the education process.

5) All methods to produce revenue for water development should be considered. One such proposal is cooperative effort with the U.S. Army Corps of Engineers to add electrical generating capacity through efficiency modifications at Garrison Dam. A partnership could provide money to the state through sales of additional hydropower.

6) The federal Land and Water Conservation Fund Program should be revitalized to provide financing for water-related outdoor recreation facility maintenance and enhancement. The state Centennial Trees Trust Fund needs financial support to promote forestry conservation and education. Congressional action will be necessary in the former and state action in the latter.

7) The CABs indicated that financial compensation should be paid to farm operators who must give up wetland development due to federal and state wetland preservation policies and laws. The cost of complying with the No-Net-Loss program should be passed on to all of society.

8) Adequate funds must be appropriated or otherwise made available to make full in-lieu-of-taxes payments. Typically, only partial in-lieu-of-taxes payments on land owned by federal agencies is made most years. This negatively affects local units of government.

Water Rights/ Water Supply

1) Abandoned water wells exist across North Dakota. When not adequately sealed, these wells represent a risk to ground-water quality. Abandoned water wells should be identified and sealed to reduce the potential for ground-water contamination. A financial support program and liability waiver may be necessary to ease the burden on landowners. Without such a program, landowners may be hesitant to volunteer information on abandoned wells.

2) All community or rural water supply systems should identify alternative water supplies to be used in cases of emergency. Major concerns include mechanical breakdown, drought, and contamination. A survey conducted in 1991 indicated that very few systems have planned for an alternative water supply. The SWC and North Dakota Health Department should offer technical assistance.

3) Water and energy conservation will become increasingly important. Water-saving irrigation technologies such as low energy precision application (LEPA) and advanced management techniques should be studied and promoted. Water savings can be realized by application of existing technologies and system management.

6) The low priority given to game and fish in water rights statutes has been identified as a problem in the Game and Fish Department's (G&FD) Participative Management Process (PAMA) report. The G&FD will seek legal recognition of fish and wildlife resources as beneficial water users, establishment of minimum instream flow standards, secure specific water allocations for fish and wildlife purposes, and actively oppose additional allocation of water rights where those allocations would be detrimental to fish and wildlife populations.

7) As competition grows for available water supplies in the Red River, conflicts may result between Minnesota and North Dakota water users. There is growing interest in maintaining a minimum instream flow in the Red River to protect aquatic ecosystems. Establishment of an organization similar to the Tri-State Compact which involved Minnesota, North Dakota, and South Dakota should be considered. It may be appropriate to include Manitoba in any new organization.

8) Wise use of the state's surface and underground water resources requires that citizens of all age groups have better knowledge of these vital resources. Educational programs outlined in the State Communications Plan should be given adequate priority in funding and manpower.

9) Atmospheric water resource management (cloud seeding) is being applied in many western states to augment existing water supplies. This is not seen as a sole solution to water supply problems. Rather, it is a part of the total water management picture. Application of this developing technology has been endorsed by the Western States Water Council and the Interstate Council on Water Policy and should continue to be included in North Dakota water management plans.

10) Native American and some federal water rights are senior to those issued by the State of North Dakota. In many cases, these rights have not been quantified making it difficult for the state to authorize new water appropriations in some hydrologic systems. Disputes have arisen over federal water rights associated with National Wildlife Refuges. A potential exists for federal agencies to charge fees for water appropriated from federal reservoirs such as Lake Sakakawea and Lake Oahe. Every effort should be taken to cooperatively quantify Native American and federal water rights. Water rights disputes should be resolved through negotiation at the earliest possible date.

11) Some rivers in western North Dakota are under a moratorium preventing new water appropriations. The state should develop a basis and procedure for lifting these moratoriums.

Environment

1) Reservoir operation plans should consider releases for downstream fish and wildlife purposes. This may require minimum instream flows be established for fish and wildlife purposes for specific river reaches.

2) The SWC and Water Resource Districts should promote restoring wetlands providing they are credited to the No-Net-Loss Wetland Bank. Support programs exist to provide financial and technical assistance. Joint SWC and Water Resources District investments should be considered.

3) Disputes frequently arise over what constitutes a wetland. All National Wetland Inventory maps developed by the U.S. Fish and Wildlife Service in North Dakota and wetland mapping done by the U.S. Soil Conservation Service associated with Swampbuster should be digitized so this information can be readily used by natural resource agencies. National wetland classification definitions must be made more consistent.

4) CAB members indicated that sentiment existed for repealing No-Net-Loss of Wetlands legislation. This law, in conjunction with the State Wetland Bank, is viewed as not working as anticipated to ease the impact of Swampbuster provisions of the federal farm bill. Current Swampbuster regulations discourage people from using Wetland Bank to restore frequently cropped wetlands. Changes are needed in Swampbuster law and/or regulation to remove this impediment to an effective No-Net-Loss of Wetland program.

5) Wetland habitat important to migratory waterfowl and other fish and wildlife species should be protected and maintained in ways consistent with the welfare of all resources, laws, treaties, and sustained profitable agriculture. A state comprehensive wetland conservation plan should be developed and implemented.

6) Wildlife managing agencies and interest groups need to recognize the importance of private land to the production and enjoyment of wildlife. Managing agencies and interest groups need to actively work with landowners to create and enhance wildlife habitat on private land. These groups can be expected to advocate that fish, wildlife, and their habitats receive favorable consideration relative to other resources in land and water management decisions.

7) Major fisheries exist in the Missouri River main stem reservoirs which are being seriously threatened by the Corps of Engineer's current management practices. These fisheries represent significant revenue-generating recreation opportunity. Fisheries management input should be given more emphasis in developing annual operating plans for the Missouri River main stem dams.

8) Protection of existing wetlands and wetland restoration is important if the many values of wetlands are to be realized. Wetlands and adjacent habitat should be secured through voluntary programs which provide incentives to landowners/farm operators rather than through regulations which require compliance.

9) Provisions of the farm bill such as Swampbuster or Section 404 of the Clean Water Act require mandatory compliance for conserving wetlands. These provisions represent major implications to land use in North Dakota. The state should continue to work with appropriate federal agencies to mitigate these impacts. State assumption of the administrative responsibilities associated with Section 404 permits should be considered to improve the turnaround time for application reviews.

10) Shoreline land use practices reduce water quality by adding nutrients from livestock and other agricultural practices along the water's edge to some lakes and streams in North Dakota. A major educational campaign should be undertaken to inform people of this land use/water quality situation and recommend actions to resolve this problem. Remedies may include regulations or incentives to farm/ranch operators in critical areas.

11) Water quality is a growing concern in mid-sized and small lakes, reservoirs, and streams. An "Adopt a Reservoir" or similar program should be implemented to involve the public in responsible water management. Another approach is a massive education campaign to gain support of both landowners and general public for watershed plans. Funding is needed to support efforts directed toward solving non-point pollution problems.

12) Proposed diversion of Missouri River water into the Hudson Bay drainage via Garrison Diversion has caused concerns in Canada over transfer of foreign biota and pathogens that

may be detrimental to aquatic species and ecosystems. Any such diversion must meet Boundary Waters Treaty of 1909 water quality criteria.

Policy/Rules and Regulations

1) Several CABs suggested that water permit hearings be held in a community near where the permit is being considered. Currently, nearly all hearings are held in Bismarck unless concerns are heard from a large number of people in the affected area. Following the CAB suggestion would require additional full-time employees and considerable travel expense if timeliness is to be maintained.

2) The cost limit for maintenance projects undertaken by the SWC construction staff is \$25,000. A statutory change is needed to increase the limit to \$50,000 and be indexed periodically to account for inflation.

3) Compliance with tightening federal rules and regulations, particularly with public water supplies, is placing an increasing financial burden on state and local water managers. Federal financial assistance or other compensation to ease this burden should be provided when statutes are promulgated.

4) There are recurring problems caused by the public's poor understanding of federal and state laws and regulations. Managing wetland areas has become difficult due to the number of agencies involved. The SWC should consider assumption of federal Section 404 regulatory functions as part of offering "one stop shopping" to state citizens.

5) State, federal, and local entities, including universities are moving to electronic storage and manipulation of water and related land data. Differing approaches in hardware and software may make sharing digital information difficult. A state-wide coordination mechanism should be in place and participation encouraged.

6) Communication between water management interests in and outside North Dakota is needed to improve awareness and reduce the potential for conflicts. Existing newsletters are an important communication tool and should be continued. The new communication plan will identify other means to facilitate dialogue. Annual conferences between professionals in the water management field (planners, engineers, hydrologists, etc.) from North Dakota, Native American tribes, neighboring states, and Canadian provinces should be considered. North Dakota should monitor important water-related events that take place on the regional and national level through continued membership in existing organizations.

7) River bank erosion is a major issue along the Missouri and Yellowstone Rivers in North Dakota. Problems have arisen due to certain features of the Pick-Sloan Plan. The state, in cooperation with local water resource districts and the U.S. Army Corps of Engineers, should work toward protection of riparian lands along these rivers.

8) Many Water Resource District (WRD) members do not fully understand the breadth of their powers. Regular training sessions should be made available to have WRD members review existing laws and keep them abreast of changes. Special sessions should be provided for new WRD members.

9) To more efficiently use state funds, the SWC should require all non-structural alternatives for proposed flood control projects be considered before state funds are spent on preliminary engineering investigations.

10) Residential developments along the Missouri River are vulnerable to ice jam induced flooding resulting from varied releases for power generation. The State Engineer/SWC should consider a policy under floodplain management laws (in cooperation with the Corps of Engineers) of imposing additional restrictions on building along the Missouri River.

11) Roughly two-thirds of North Dakota's approximately 3000 dams are Works Project Administration (WPA) or Civilian Conservation Corps (CCC) dams constructed in the 1930s and early 1940s. These dams vary considerably in size and condition. The risk to life and property from any one of these dams failing varies from quite high to very little. WRD managers are generally aware of which dams represent significant risk and frequently approach the SWC for assistance making repairs. Decision-makers need to be aware that WRDs repairing these dams will require continued financial and technical assistance.

12) Improvements to or maintenance of a drainage system in one area of a watershed will have effects downstream. These effects can occur outside the county where the work is done. Engineering analysis of a proposed drainage maintenance or improvement project should identify potential changes required to culverts and bridges downstream and have costs for these changes included in the overall project cost.

13) Improper water well construction techniques represent a threat to ground-water quality. Adequate personnel and resources should be made available to enforce water well construction rules and regulations.

Again, this discussion on water management issues is not intended to be an exhaustive list. Those included are primarily state-wide or regional in nature. Certainly, there are important issues in localities across the state that are not listed. The problems and opportunities identified by the CABs and reported in the recommendations section should address most local issues.

Because water resources are important in virtually all endeavors, conflicts due to competition for available resources or opposing views on how to manage the resource will continue to arise. It is important for the State Water Management Plan to be continually updated, be based on current events, and keep decision-makers informed.

Conclusion

Decisions made to manage the state's water resources affect all North Dakotans. Unfortunately, water management's importance to their lives often remains unnoticed until something goes wrong. The State Water Commission's (SWC) responsibility is to anticipate problems before they arise and help satisfy demands which cannot be anticipated.

This report is designed to be a reference tool for the SWC and other decision-makers involved in water resource management. It offers a broad perspective on water needs and issues throughout the state. This report is designed to help:

- SWC members and others more easily visualize the breadth of current water management needs in each of the state's major drainage basins. Commissioners can become more aware of water management problems or development opportunities in any given area of the state.
- Technical and administrative people from natural resource agencies become aware of the

many water management proposals being considered. This can improve coordination in natural resource management and, perhaps, help streamline efforts to build additional multi-purpose projects.

- Develop and manage the SWC's budget. The need for water-related infrastructure for economic development and the increasing competition for available financial resources requires decision-makers to have a complete listing of proposals that must be considered during current and future budget cycles.

As stated in the introduction, this plan is not a map which must be followed step by step. Water management is a dynamic process and maintaining flexibility is a must. This report is the product of a planning process which actively sought and fully incorporated public input. Public involvement is important because it offers valuable insights into the attitudes citizens have toward water management; what is important to them and what is not.

The information provided is a synopsis of a large volume of background data compiled to make and prioritize recommendations. No recommended proposal will go forward based solely on information in this document. An adequate determination of feasibility and desirability will precede any implementation. Any proposal's advancement is very dependent on local sponsor initiatives.

Every time the SWC meets, actions they take will affect the information in the State Water Management Plan. To keep the plan as current as possible, all plan proposals will be added to a computer database which will be updated following each meeting. New proposals brought to the SWC staff will be added to the database so they can be tracked more easily. As new data on proposals is developed, it will be added to the database. This updated information will be provided at regular intervals to the State Water Commissioners or anyone requesting to be on the mailing list. Major revisions of the State Water Management Plan are anticipated about every five years.

