OVERALL PLAN

JUNE 2004

ROSEAU RIVER WATERSHED DISTRICT

Portions of Beltrami, Kittson, Lake of the Woods, Marshall, and Roseau counties, Minnesota

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Section I: Introduction

Background

The heavy rains that fell on June 9 and 10, 2002 and the subsequent flooding that occurred in the city of Roseau forever changed how local citizens view flooding, flood damage and flood prevention. Prior to June 2002, in times of high water the dikes always held, and if the waters of the Roseau River were close to overtopping it's banks a citywide sandbagging effort would keep the water at bay. The rain that fell in June of 2002 was at record levels with maximum 48-hour rainfall recorded at 14.55 inches. Other areas were doused with over 12 inches of rainfall in a 48-hour period. This heavy precipitation prompted the citizens in Roseau to fight the rising waters of the Roseau River. This time, unfortunately, the temporary dikes and a massive sandbagging campaign couldn't keep the waters of the Roseau River within the banks. Floodwater from the Roseau River and overland flooding caused extensive damage. It's estimated that over 90% of the homes and businesses in the city of Roseau were damaged by floodwater. Flood damages in the city of Roseau and the surrounding area has been estimated at over 100 million dollars.

After the waters of the June 2002 flood receded, a massive cleanup effort was put into place. Most of the summer and fall was consumed with flood cleanup: repairing damaged homes and businesses, demolition of buildings that sustained extensive damage and the construction of temporary housing for winter. This rebuilding effort continues and will take a number of years, but steady progress is being made.

The June 2002 flood brought the communities together during the flood fight, cleanup and into the recovery phase. Most local citizens view of flooding, flood damage and flood prevention has changed. Prior to the flood many felt that dikes and sandbagging were all that would be needed to protect homes and businesses. The record rainfall in June of 2002 was more water than was ever seen in such a short amount of time (Appendix 10&11). The existing dikes and sandbags couldn't keep this volume of water from overtopping the banks. Since the 2002 flood, local citizens and organizations recognize the need to work together to find solutions to prevent future flooding.

The Roseau River Watershed District (RRWD) has a Board of Managers that work on water and water related issues in the Roseau River Basin. The RRWD has the authority, granted by the State of Minnesota, to comprehensively manage the water resources of the District. Minnesota Statues require the Watershed Board of Managers to develop and update a watershed plan every ten years. This overall plan will serve as guide for ongoing and future projects that relate to water concerns of the District.

The information contained in this overall plan was gathered from many sources, the most important being local input. During the development of this overall plan, the Roseau River Watershed Board of Mangers held meetings to gather concerns of local citizens. Advisory committees were formed and met monthly over 18 months to identify issues, concerns and solutions that address water problems in the Roseau River Basin. One group was a Citizen's Advisory Committee (CAC) and another group was a Technical Advisory

Committee (TAC). Both of these committees worked very hard to identify problems and offer solutions to improve water management issues in the Roseau River Basin.

The Board of Managers followed the guidelines of the Red River Mediation process for both flood damage reduction (FDR) and natural resource enhancement (NRE). Proposed watershed projects that reduce flooding and flood damage can also benefit the natural system. Water control projects can be designed and constructed with minimal impact on the environment and have a positive impact on the surrounding natural resources. The Board of Managers recognizes and will strive for a balance between FDR and NRE concerns in current and future watershed projects.

The overall plan includes a general description of the RRWD and its water resources. This plan also contains the District's mission, goals, policies and rules. With the help of the CAC and TAC, this plan contains the current situation of water issues in the District and lists potential solutions. This plan is to be used by the Board of Managers and other local, state and federal agencies as a guide for watershed projects and policies within the District. This revised overall plan is intended to be used as a resource and will promote good stewardship of the District's water and other related resources.

Watershed Personnel

Board of Managers

A five member Board of Managers governs the RRWD. Four members are appointed by the Roseau County Commissioners and one is appointed by the Kittson County Commissioners. The 2004 members are:

Chairman – Farrell Erickson
3375 230th Avenue
Badger, MN 56714

Vice Chairman – Raymond Moser
22359 County Rd 13
Roseau, MN 56751

Secretary/Treasurer – Allison Frislie
3873 47th Ave
Lancaster, MN 56735

Manager – LaVerne Voll
35572 520th Ave
Salol, MN 56756

Manager – LeRoy Carriere
504 4th Ave NE
Roseau, MN 56751

Staff
Rob Sando, Administrator
Tracy Halstensgard, Secretary

Office Information
The RRWD office is located at 120 2nd Ave SW, Roseau. Mailing address: PO Box 26, Roseau, MN 56751. Phone: (218) 463-0313, Fax: (218) 463-0315 and E-mail: rrwd@mncable.net. Office hours are 8 a.m. to 4 p.m. Monday through Friday.

Consultants
Pat Moren - Attorney
JOR Engineering - Engineering firm
Coutts, Keaveny and Rinde - Auditor

Planning Background

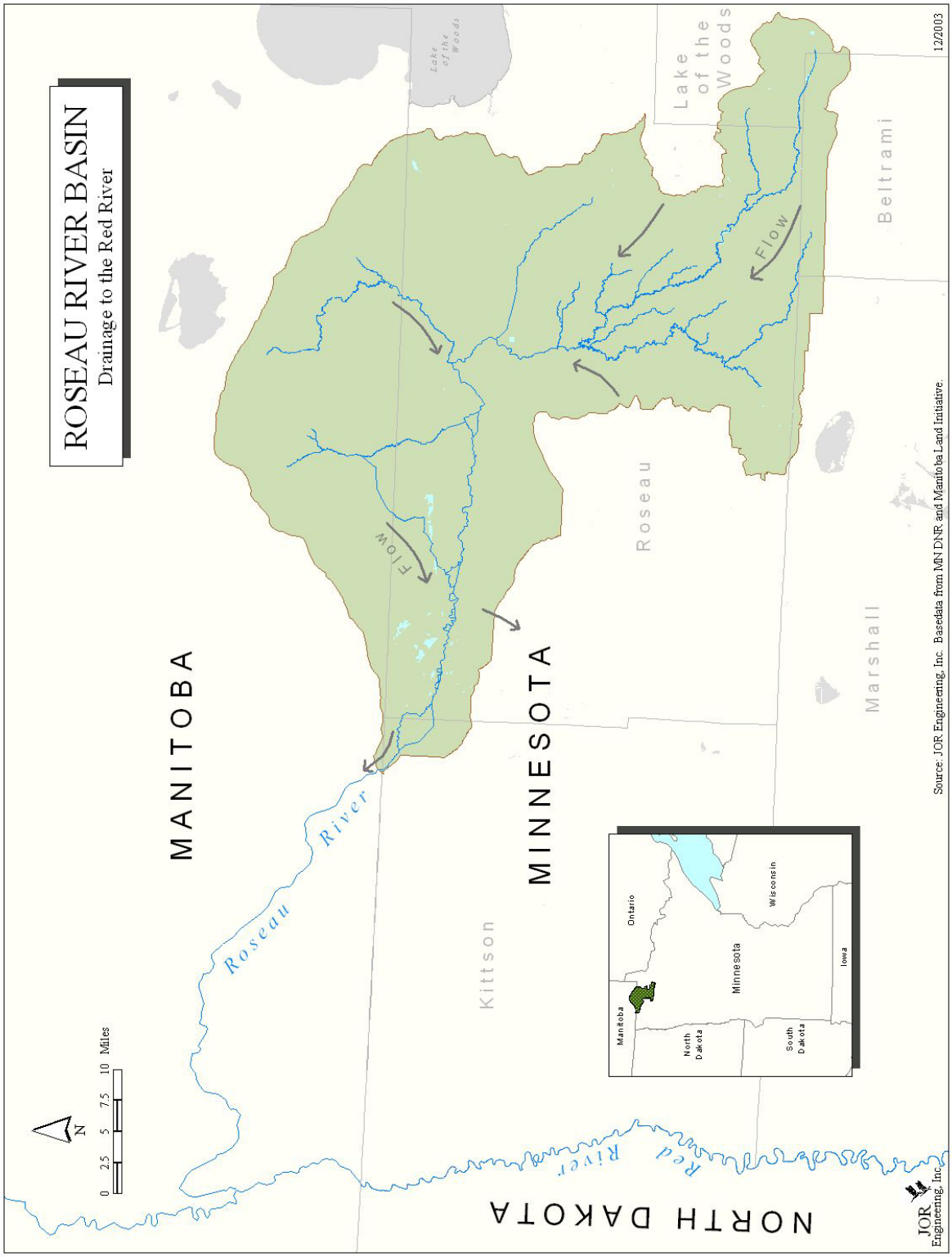
Water management for present and future generations is in the best interest of all citizens in the District. Before man settled this area, the RRWD had a diversity of fish and wildlife species with various wetland, upland, prairie and forests communities. Man's activities over the last 100 years have altered the natural landscape of the area. Agricultural interest was a strong driving force in this change. However, the logging industry, construction of villages and towns, railroads, and a network of roads all played a part in altering the natural landscape.

Some advocate that the land should return to what it was over 100 years ago. A better solution is to have various groups of people, with different ideas and backgrounds, work together to identify potential solutions for water quality and quantity issues. The issues that pertain to water management in the district are complex and it is next to impossible for everybody to be happy with a decision that relates to water that impacts "my home, my farm, or my hunting property."

Since the flood of 2002, many meetings have been held to determine the best course of action for flood prevention in the city of Roseau. Raising the dikes, widening the channel through town, diverting the water around the city, and holding water upstream of Roseau are some of the options being considered. However, with each potential solution other problems can arise. For example, a diversion channel around the city of Roseau will help the citizens in Roseau, but will increase the potential flooding for those who live downstream.

Water that flows in the RRWD not only has an impact locally but also can have an impact on other watershed districts. Water that leaves the RRWD enters the Province of Manitoba, Canada or the Two Rivers Watershed District; this water then contributes to the flooding problems of the Red River of the North. (Figure 1: Roseau River Basin) As important as it is to solve a local water problem, consideration must be given to the impact on a broader area or region. In the past, many water projects had a local focus without much consideration to the "bigger picture".

Figure 1: Roseau River Basin



A local watershed project may benefit a localized area, but can have a negative impact in a larger area or region. One of the goals of an overall plan is to give consideration to local projects, but also determine how local projects fit into a regional water plan. The District's water flow problems will not be solved with the construction of one project at one specific location. Only a comprehensive approach with many types of projects and various water management techniques will be successful in solving the water flow problems in the District. Projects may be sponsored by various jurisdictions within a government, by private individuals, or other groups. Whoever takes the lead on a specific project should be made aware of the "big picture" of water management issues and this plan can serve as a template for future water management activities in the District.

The Red River Flood Damage Reduction Work Group (RRFDRWG) Agreement of December 1998 was an attempt to develop a framework for flood damage projects in the Red River Basin. The RRWD will follow the process established by the RRFDRWG in the development of potential flood control projects. The purpose of the Mediation process was to reach an agreement on long-term solutions for reducing flood damage and ensuring the protection and enhancement of natural resources. The primary focus of this agreement is to balance economic, environmental and social considerations when planning and implementing flood damage reduction and natural resource enhancement projects in the District. The District encourages participation by local, state and federal governments, natural resource agencies, conservation organizations and local citizens in this planning process.

Flood damage reduction projects identified as having local and regional benefits can be constructed with no significant environmental loss and also have a positive impact on the surrounding natural resources. Flood control projects may provide opportunities for both flood damage reduction and environmental enhancements, which is a win-win situation. Future water control projects should attempt to provide a balance between flood damage reduction and environmental enhancements.

Solving the District's flooding and drainage problems will require more than a simple single-pronged approach. Rather, a multi-faceted approach will provide solutions for complex problems. Listing all the water problems in individual watersheds gives a localized view of water issues and concerns. It is important to identify individual problems, but watershed-wide goals attempt to look at the water problems of the District as a whole. This is not to minimize a localized problem, but rather give it a priority ranking when compared to problems of the whole watershed. Problems that occur in more than one subwatershed have a higher priority than problems that occur only in an isolated subwatershed. These watershed-wide goals and objectives should be reviewed when evaluating water problems of the lower Red River Basin.

SECTION II: WATERSHED'S MISSION

History of the District

The RRWD was first established as the Roseau River Drainage and Conservancy District (RRDCD) by order of the District Court, Roseau County, dated August 13, 1920, under provisions of Chapter 13, Laws of 1919, Special Session.

In 1963, the governing body of the RRDCD petitioned the District Court, Roseau County, for the right to operate under sections 112.34 - 112.84 of Minnesota Statutes (Currently MN Statutes 103D) and the Court did order on June 17, 1963 that the RRDCD shall operate under and exercise all the rights and authority contained in Minnesota Statutes, sections 112.34 - 112.84, known as the "Minnesota Watershed Act".

Roseau and Kittson Counties petitioned the Minnesota Water Resources Board on November 20, 1963 asking for a change in boundary and change in name of said District to Roseau River Watershed District and to designate a place of business for the Watershed District, pursuant to the provisions of Minnesota Laws of 1955, Chapter 799 as amended, and the Minnesota Water Resources Board did order on March 18, 1964 the change in name of the RRDCD to the RRWD and the City of Roseau to be the place of business and did define the District's boundary.

Mission Statement

It is the intention of the Board to manage the waters and related resources within the Watershed District in a reasonable and orderly manner to improve the general welfare and public health of the residents of the Watershed District.

The Managers of the RRWD accept the responsibilities with which they are charged as a governing body by Minnesota Statutes. Said Board of Managers, in the conduct, duties and responsibilities conferred upon them, do not intend to unsurp the authority or responsibilities of other agencies or governing bodies; however, said Board of Managers will not avoid their responsibilities and obligations.

It is the stated intent of the Managers herein that no person shall be deprived or divested of any previously established beneficial use or right, by any rules of the District, without due process of law. All rules of this District shall be construed according to this intention.

Purpose

The RRWD existing purposes are as follows:

1. Control or alleviation of damage by floodwaters;
2. Improved stream channels for drainage, navigation, and any other public purpose;
3. Reclaiming or filling wet and overflowed lands;
4. Providing water supply for irrigation;
5. Regulating the flow of streams and conserving the waters thereof;
6. Diverting or changing watercourses in whole or in part;
7. Providing and conserving water supply for domestic, industrial, recreational, agricultural, and other public use;
8. Providing for sanitation and public health and regulating the use of streams, ditches, or watercourses for the purpose of disposing of waste;
9. Repair, improve, relocate, modify, consolidate, and abandon, in whole or in part, drainage systems within a watershed district;
10. Imposition of preventative or remedial measures for the control or alleviation of land and soil erosion and siltation of watercourses of affected bodies of water;
11. Regulation of riparian improvements by landowners of the beds, banks, and shores of lakes, streams, and marshes, by permit or otherwise, in order to preserve the same for beneficial use;
12. Provide for the generation of hydroelectric power;
13. Protect or enhance the quality of water in watercourses or bodies of water;
14. Protect groundwater and regulate its use to preserve it for beneficial use;

Goals

1. Flood Damage Reduction (FDR) Goals
   - Provide 100-year flood protection for the City of Roseau and rural homesteads in the district.
   - Provide 10-year flood protection for agricultural lands.
   - Reduce flood damage to roads and crossings.
   - Reduce drought damages.
   - Preserve ground water supply and recharge areas.

2. Natural Resource Enhancement (NRE) Goals
   - Protect, restore, enhance and manage lakes and streams in the RRWD to support sustainable aquatic communities.
   - Manage wetland and upland habitats to support sustainable wildlife communities.
   - Preserve, protect and restore unique natural resource communities and other features in the watershed.
   - Increase and promote outdoor recreational activities related to fish, wildlife and other natural resources in the watershed.
   - Improve water quality in the RRWD.

3. Promote Education and Information Transfer Relating to Water Stewardship
   - Cooperate with SWCD, U of MN and other agencies in the education of local residents and students.
   - Coordinate and support workshops, public informational meetings and local media to educate the public on water stewardship issues.

4. Protect, Improve and Monitor the Quality and Quantity of Water in Roseau County
   - Continue to encourage land use practices that enhance water recharge and improve water quality.
   - Educate the public for proper abandonment of wells, solid waste disposal, underground storage tanks and continue to inventory and record.
   - Develop programs to identify and monitor potential sources of point and non-point pollution.
   - Protect sensitive groundwater recharge areas and improve groundwater recharge monitoring programs.

District's Policy

1. The Board of Managers agrees to cooperate with other Watershed District Boards of Managers on matters which might affect both areas.

2. The Board of Managers agrees to cooperate with all units of local government, with private or public corporation, or with individual persons on matters of common concern.

3. The Board of Mangers agrees to cooperate with all other units of State, Federal, Tribal and Canadian Governments on matters of common concern.

4. The Board of Managers will cooperate with the State of Minnesota, Roseau County, or any towns or municipalities within the District, in land and water planning and zoning activities carried on by such public corporations pursuant to the authority of Minnesota Statutes, Section 394.21 through 394.37 or any other legislative authority.

5. The Board of Managers will encourage improved land treatment practices. Approved on-the-land treatment practices are recognized as vital to the successful control of water in this watershed.

6. When so authorized, the Board of Managers will accept the responsibility of operation and maintenance of all structural measures of water management installed with public funds whether presently existing or to be installed within the District to insure their continued established functions.

7. All projects consistent with this Overall Plan that are paid by assessment upon benefited properties shall be instituted upon filing of a valid petition with the Managers or by Board Resolution.

8. The Managers will not approve a petition for work unless the following facts are found to exist:
   a) That the proposed improvement is for the public interest and welfare as defined by the Minnesota Watershed Act;

   b) That it is practicable and in conformity with this Overall Plan;

   c) That the total benefits are greater than the total estimated costs and dangers; and

   d) That the proposed project is in compliance with applicable laws and rules of the local government entities, the State of Minnesota and the Federal Government.

9. Measures of flood prevention are of primary importance to the District. Flood detention measures may be required. These should be of multiple uses wherever the public interest is best served.

10. Improvement of habitat for game and fish and for other recreational facilities should be a matter of consideration in all proposed works of improvement and repair. The Managers shall at all times work toward the protection of fish and game and provide and improve, wherever possible, their natural habitat.

11. All requests for necessary permits for water usage and irrigation, for structures spanning navigable streams, for retention structures, or for any improvement or changes requiring permit submitted to the Commissioner of the DNR, or other state and federal agencies, will be directed through the Board of Managers. The Commissioner or agency's decision on these permits shall be made known to the Board of Managers.

12. Local flood conditions may result from stream flow deviation resulting from improperly situated private or public structures or works. The Board of Managers will exercise control over any stream or stream bank structures or works contemplated.

13. The Managers of the RRWD will conserve and manage the surface and underground supplies of water in the District for the beneficial use of said water for domestic, industrial, agricultural, recreational, wildlife, and any other public uses.

14. Before approving any project, the Managers will carefully consider the effect of the contemplated project on other areas and other interests within and outside the Watershed.

15. The Managers will encourage the multiple-use concept on public and private lands.

16. The use of the streams, ditches, or watercourses within the District for sanitary effluent or other waste disposal will be permitted only when the project meets the requirements and is approved by the MPCA.

17. A policy will be adopted requiring a permit for the outlet of drainage to the present ditches from lands other than those already assessed for benefits for said ditches.

18. The Board of Managers will participate with the recently formed Roseau River International Watershed Board to seek solutions to water problems in northwest Minnesota and southern Manitoba.

Rules of the Watershed District

The RRWD has adopted the following rules:

1. Permits - Permit requirements for certain uses of waters, or for performing certain works within the District. The permit process is intended to effectuate the purpose and intent of the Minnesota Watershed Act not as an inhibition to development or to the free use of property.

2. Drainage - The purpose of drainage rules is to provide an orderly disposal of surface water, development of county and municipal drainage plans, and to promote sound design criteria for drainage and storm water systems.

3. Agricultural diking - Diking necessitated the District to implement rules to pertain to this. Landowners constructing agricultural dikes to protect their lands from damages due to frequent flooding are expected to be willing to provide public benefit by storing water that overtops their dikes for time periods sufficiently long to remove this water from downstream flood peaks.

4. Water Uses - Permits under M.S. Chapter 103G.

5. Erosion and Sedimentation - To control and alleviate soil erosion and the siltation of the drainage ways and lakes of the District.

6. Pollution Control - In order to provide for the abatement of the pollution of public and private water resources as a part of a comprehensive program to eliminate the pollution thereof, the Watershed District shall have the power and authority to impose certain preventive and remedial measures to promote the public health and general welfare, to promote safety and sanitation, and to improve the quality of these waters for general use.

7. Environmental Assessment and Impact - The RRWD shall have the power and authority to require any person, governmental subdivision, or governmental

agency to submit an environmental assessment or statement of the impact of any construction, improvement, or act on the water-related natural resources of the District or to require that such person, governmental subdivision, or agency submit a statement that the construction, improvement, or act will have no adverse impact on the water resources of the District.

8. Review of Plans and Plats - In order to carry out the intent of the Minnesota Watershed Act, and to provide for assurance that the development of the District and its natural resources is carried out in an orderly manner, the Watershed District Board of Managers shall require the submission of certain plans and documents for various types of improvement, developments, projects, and proposals, and may, at its discretion, review and report on these activities together with suggestions, recommendations, and requirements as to their contemplated affect on the water resources of the District.

9. Enforcement Powers of Managers - Any provision of the District's Rules or any order or stipulation agreement made, or any permit issued by the Board of Managers of the RRWD may be enforced by criminal prosecution, by injunction pursuant to Section 103D.545, Subd. 2 of the Minnesota Statutes, by action to compel performance, restoration, abatement, and other appropriate action.

10. Public Meetings, Hearings and Records - All meetings of the RRWD, whether regular or special, shall be conducted in full compliance with current legal requirements. Any member of the public may request a public hearing on the approval of a permit. The records of the District shall be public records as required by state statute and shall be open to the public for inspection to that extent required.

Historical Effectiveness of the District

Flood Damage Reduction

The RRWD's (and the Conservancy District before 1965) first priority was to be the local sponsor for a Corps of Engineers (USCOE) project that would have provided significant flood damage relief from the City of Roseau to the Canadian boundary. The project was proposed as a deepening and widening of the Roseau River channel (also known as State Ditch 51) that flows along most of potentially affected river miles. The project progressed to the point of having funding authorized by Congress before being dropped because of potential downstream impacts in Canada and also because of the expected environmental impacts from the channel dredging (Note: although a majority of the channel miles were dredged as State Ditch 51 during 1914 to 1918, trees had grown along the ditch spoil banks in the intervening years). One component of the USCOE project, the Duxby Levee was completed in the early 1990's and has provided flood damage relief to some farmlands in Pohlitz and Moose Township.

The District has also participated in an effective Farm Dike program, which has provided Flood Damage Protection to some individual farmsteads.

In addition, the District has investigated the feasibility of constructing water retention areas. One such project located in the Palmville area had progressed to serious consideration by the State of Minnesota for funding. However, this project was tabled when all such projects in the Red River Basin were reviewed for environmental impacts. In a modified form, there is some chance that this project will be developed in the future. Currently, the USCOE is investigating a water holding and channel restoration northeast of the city of Roseau. If this project proceeds to completion, it will result in implementing some FDR goals.

The District did participate with Minnesota DNR on a project to provide some flood control storage in the Roseau River Wildlife Management Area (RRWMA). While the total available flood storage is insufficient for optimal flood control given the tributary drainage area, the local Wildlife Manager has consistently operated the project to provide the maximum flood relief possible during the major flood events.

Overall, the achieved FDR goals in the Roseau River Basin have fallen far short of what one can assume was the goal when the District was organized. This can be primarily attributed to the fact that for many years the hope was placed on a USCOE project and when that failed, alternatives such as floodwater storage have been under environmental review. That review process is now complete and new (or revised) projects that meet environmental criteria can be again considered.

Agricultural Drainage

The District also has responded to ditch petitions with mixed results. Watershed Ditch (WD) #1 is a new outlet for County Ditch (CD) #16 and has been effective. WD #2 would have been an improvement to CD #8 but the proceedings were dropped. The inadequate drainage of CD #8 to some otherwise very good farmland just south of Roseau continues to be a problem. WD #3's laterals were constructed to provide drainage to lands in Ross, Moose, Dieter and Pohlitz townships. The WD #3 laterals are of inadequate design to provide the necessary effective drainage for agricultural production. Therefore, these lands continue to have frequent crop losses. There have been numerous other inquiries about the need for a legal ditch. However, no others have progressed to submission of a petition to the Watershed District.

In 1988, the District did obtain authority for State Ditch 51, the dredging of most of the Roseau River downstream of the City of Roseau. The channel is at constructed dimensions along most of its length and repairs have been limited to removing obstructions (such as old bridges of marginal use), removing serious log jams, and cleaning flow obstructing sand bars. Maintenance of this ditch has at least kept the marginal original drainage outlet capacity from decreasing.

Natural Resources

While the District didn't have NRE goals in the past it's clear that except for the original USCOE project, the successive board members have tried to consider natural resource benefits in their decisions. For example, the previously proposed Palmville Project was developed through cooperation with Minnesota DNR. The District has been conservative in exercising its State Ditch 51 authority to insure that only critical work is done on that channel and the District has modified the Roseau City dam to reduce its impact as a fish barrier. Also, the District is now considering working with the USCOE on a multipurpose project which includes a Hay Creek channel restoration and a Norland township wetland restoration.

Section III: General Description

Watershed Setting

Location and Size

The Roseau River Basin encompasses an area of about 2,057 square miles. This drainage system is located in Northwestern Minnesota and South Central Manitoba, Canada, and is part of the Red River Basin and the Hudson Bay drainage system. The outlet of the Roseau River is into the Red River of the North, approximately 9 miles north of the International Border. Of the lands drained by the Roseau River watershed, 52% are in the United States and 48% in the Province of Manitoba Canada (Figure 1: Roseau River Basin).

The United States portion of the RRWD is approximately 1,047 square miles or 670,080 acres (Figure 2: Roseau River Watershed District). Approximately, 589,670 acres (88%) of the watershed's land is located in Roseau County with the remaining 80,410 acres located in the counties of; Kittson (2%), Lake of the Woods (5%), Beltrami (4%), and Marshall (1%). The upper portion of the Watershed, comprising the headwaters and tributaries, is fan shaped and the remaining portion is long and narrow like the neck of a bottle. The overall length of the basin is about 110 miles and the maximum width is 30 miles.

The RRWD is bounded on the east by the Warroad River Watershed, on the southeast by the Rapid River Watershed, on the south by the Red Lake River Watershed, and on the southwest and west by the Two Rivers Watershed. The International Border defines the northern boundary of the District.

Political Units within the District

The RRWD is organized in the United States portion of the watershed and occupies portions of Beltrami, Kittson, Lake of the Woods, Marshall, and Roseau counties in the United States (Figure 3: Political Boundaries). Each county has a county government and a Soil and Water Conservation District (SWCD). In addition, the geographic bounds of the Watershed District include lands of the Red Lake Band of Chippewa, a sovereign Indian Nation that exists on a closed Reservation. The Roseau River Basin includes lands in the province of Manitoba, Canada. Because lands lie in two countries, water resource planning between the two countries is done by the International Joint Commission (IJC). Local planning is coordinated with the Canadians through a Memorandum of Agreement forming the Roseau River International Watershed (RRIW).

Population

It is not possible to accurately determine the present population within the boundaries of the RRWD, as the District boundaries do not follow county, township or section lines. However, a close estimate can be obtained from the 1960, 1970, 1980, 1990, and 2000 United States census of population. For townships that are only partially included within the watershed boundaries, an estimated population was determined by dividing the number of total farmsteads within the township into the number of farmsteads in the township within the District. This ratio was then multiplied with the population of the township. The number of farmsteads within a township was determined by the use of published plat books. The population figures are tabulated in Table 1.

Figure 2: Roseau River Watershed District

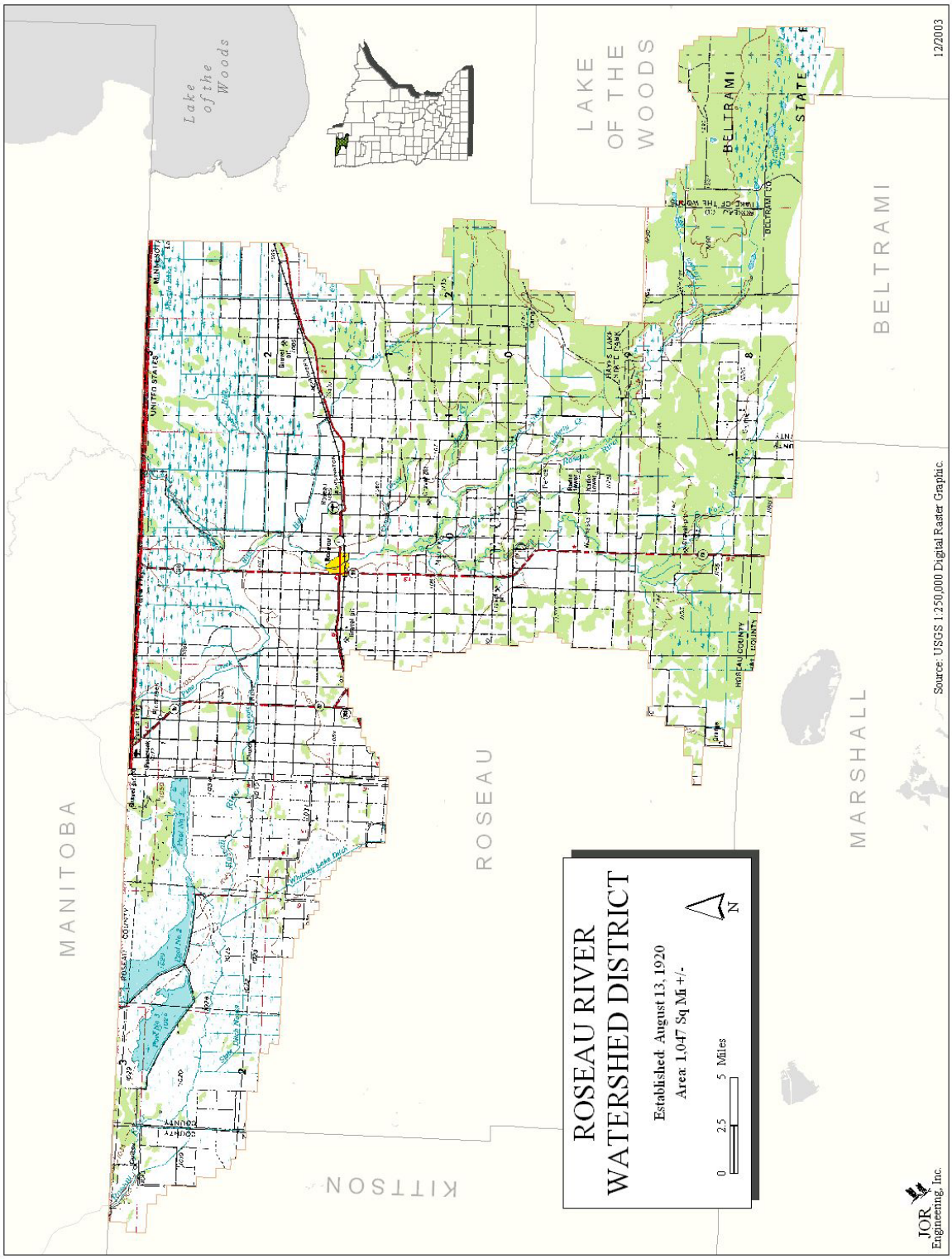


Figure 3: Political Boundaries

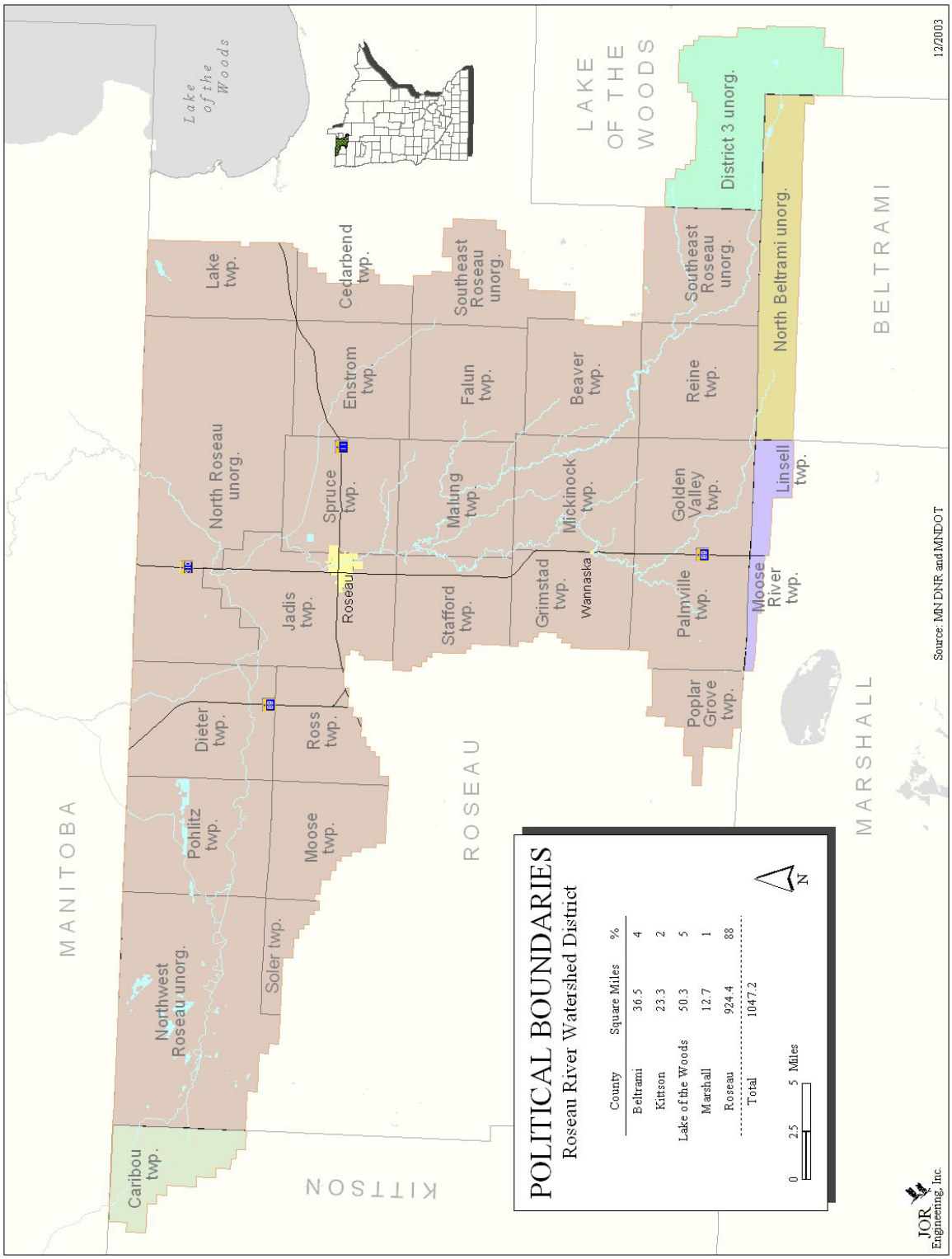


Table 1: Watershed Population 1960 through 2000

Township or Cities	1960	1970	1980	1990	2000
Roseau County					
City of Roseau	2146	2552	2272	2396	2756
Beaver	111	92	103	91	103
Blooming Valley	20	14	8	8	8
Cedarbend	45	34	38	72	67
Dieter	263	209	216	177	162
Enstrom	239	196	263	478	580
Falun	302	207	250	257	226
Golden Valley	141	165	184	200	190
Grimstad	181	183	195	156	190
Jadis	507	417	534	535	564
Lake	112	129	230	572	646
Malung	336	310	349	390	427
Mickinock	400	345	301	262	302
Moose	126	116	133	108	134
Palmville	60	36	55	50	55
Pohlitz	102	66	52	42	36
Poplar Grove	77	68	69	56	44
Riene	112	90	89	92	115
Ross	151	149	222	238	454
Soler	36	30	29	26	25
Spruce	283	297	537	573	614
Stafford	203	167	160	182	245
Unorganized: T161N; R37W	44	56	61	57	61
T162N; R44W	0	0	0	0	0
T163 & 164N; R38W	100	90	99	93	100
T163 & 164N; R39W	5	7	8	7	7
T163 & 164N; R40W	32	48	52	49	53
Beltrami County	2	4	3	4	4
Kittson County	80	100	49	29	32
Lake of the Woods County	0	0	0	0	0
Marshall County	151	85	53	24	24
TOTAL POPULATION	6367	6262	6614	7224	7797

Economy

Agriculture

Agriculture plays a major role in the economy of the District today. Agriculture began in Roseau County about 1886, but progressed very slowly prior to 1908. In that year, the Great Northern Railway provided rail service to the area by extending its system from Thief River Falls through Roseau ending in Warroad. Rail transportation was one of the major factors in the development of this area.

Prior to man's settlement in the area, the vegetation of the RRWD is estimated as being 1/3 dry and wet prairie in the northwest and the remaining 2/3 forest and wetlands. Plant communities in the Roseau River Basin included large areas of peat bogs, swamps and forests. An extensive drainage campaign in the early 1900's made agricultural development possible in Roseau County.

In the early to mid-1900's, agriculture in the county was primarily small dairy operations with grain and forage production. Wheat, oats, barley, and flax were the principal crops raised. In recent years, the dairy industry has declined and has been replaced with beef cattle operations. The current cropping practices in Roseau County include small grain (wheat, oats and barley) oil seeds (canola, soybeans and sunflower) and grass seed (bluegrass, timothy, fescue, reed canary grass, big bluestem, Indian grass and switch grass).

Data on utilization of agricultural land within the District is difficult to obtain (Figure 4: Present Land Use Map). However, cropping practices within the District are relatively uniform; therefore, data from Roseau County is used to represent the cropping patterns within the District. Crops and yield data for 2000 crop year is listed in Table 2. This information is gathered by the Minnesota Agricultural Statistics and published by the Minnesota Department of Agriculture.

The conservation reserve program (CRP) has over 130,000 acres enrolled throughout the county, with large tracts of CRP land located south of Salol, southwest of Malung, southeast and northwest of Badger, and northwest of Roseau.

Land along the main stem of the Roseau River has the highest concentration of farmland in the District. Approximately, 65,000 acres of farmland are subject to flooding along the Roseau River between the City of Roseau and the upstream limit of Big Swamp. Included in this total area is a small area bordering Hay Creek and extending upstream about three miles above its confluence with Roseau River. Below the Big Swamp another 22,000 acres of farmland are subject to flooding. Agricultural land in the flood plain accounts for 75%, with the remainder state owned property and private lands.

Figure 4: Present Land Use Map

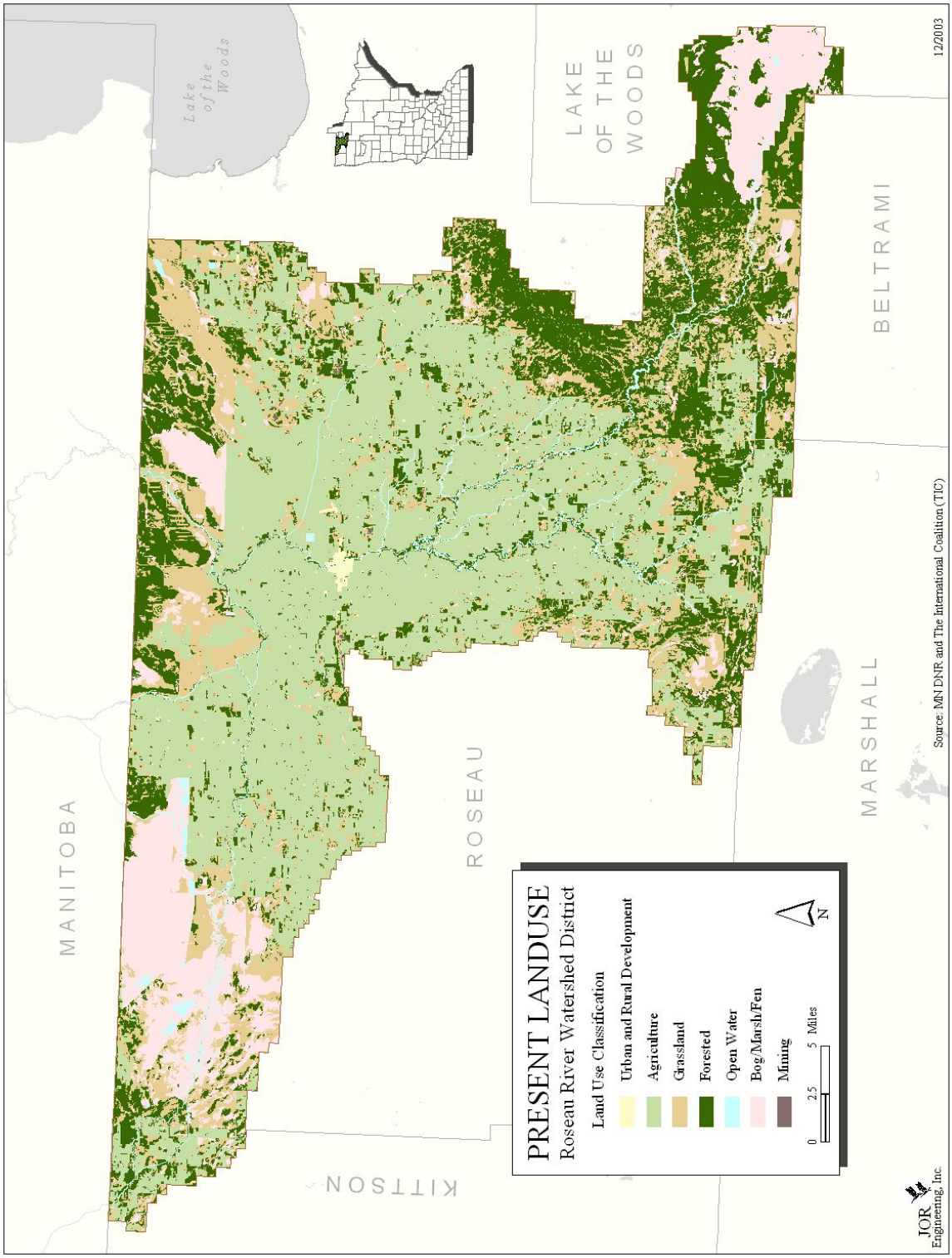


Table 2: Roseau County Crops - 2000

Crop	Planted Acres	Average Yield Per Acre
Corn	9,300	95 bu
Wheat	134,200	51 bu
Oats	16,000	70 bu
Barley	32,600	67 bu
Flax	3,000	20 bu
Canola	61,000	1,440 lbs
All Hay	64,100	2.0 tons
Alfalfa Hay	36,600	2.7 tons
Sunflowers	15,700	1,654 lbs
Soybeans	9,300	30 bu
Native grasses	542	175 lbs
Reed Canarygrass	7,498	180 lbs
Kentucky Bluegrass	12,771	150 lbs
Red Clover (seed)	513	35 lbs
Timothy	6,114	170 lbs
Switchgrass	730	200 lbs
Birdsfoot Trefoil	660	154 lbs.
CRP	130,000	
Pasture	27,500	

Forestry

The District is classified as 35% trees and woodlands; one-half of this is located in the upper reaches of the Watershed (Figure 4). This area lying in Lake of the Woods, Beltrami, and southeastern Roseau Counties is part of the Beltrami Island State Forest. The total area of this state forest is about 672,000 acres. Approximately, 100,000 acres of forests are within the boundaries of the District. This area consists of coniferous swamps, open bogs, and sandy ridges covered with growths of jack pine and aspen. The Lost River State Forest lies in the northeastern portion of the District and comprises about 85,000 acres within the District.

About 90% of the wood products harvested are sold as pulpwood. The major purchasers of pulpwood are Boise Cascade, Moss Sales, Northwood Panelwood and Potlatch. These mills are located outside of the District. The remaining 10% is processed as dimensional lumber at local mills, such as Fish Lumber, Moss Sales, and Potlatch. Aspen makes up 65% of the harvested timber followed by Jack Pine at 25%.

Industrial Development

The City of Roseau is located 350 road miles from Minneapolis/St. Paul MN, 120 miles from Grand Forks, ND, 110 miles from Winnipeg, Manitoba, Canada and 285 miles from Duluth, MN.

Based on the 2000 census for Roseau County, manufacturing has the largest share of people employed, followed by sales, then agriculture.

Table 3: Roseau County Employment

	1970	1980	1990	2000
Ag. Fisheries, Forestry	618	802	738	683
Manufacturing	347	834	3,111	4,029
Sales	143	885	1,048	1,632
TOTAL EMPLOYED	1,505	4,574	7,199	9,866

Polaris Industries is largest employer within the District. Approximately, 1,800 people work at Polaris with less than ½ living within the city limits of Roseau. In Roseau, Polaris manufactures snowmobiles and all-terrain vehicles. Woodland Container Corporation and Techniques Inc., construct crating for Polaris and Intercept Industries does contract assembly for Polaris.

Roseau Area Hospitals, Roseau Area School District #684, the city of Roseau, Roseau County, State of Minnesota and the United States government offices are significant employers within the district.

Outside of the District, Marvin Windows and Doors (2000+), Central Boiler (125), Heatmor (40) and Christian Brothers (20) provide jobs for people within the district.

Transportation

The District is well served by a system of improved highways, secondary roads, railroads, and truck routes (Figure 2). Minnesota State Highway No. 11 crosses the District from east to west through the towns of Badger, Roseau, and Salol. State Highway No. 89 crosses the District from north to south beginning at the International Boundary, south through the Villages of Pinecreek, Ross, and Fox and then east to Roseau and south through Wannaska and on to Bemidji and points south. State Highway No. 310 connects Roseau with the port of entry 10 miles directly north of Roseau and the village of South Junction, Manitoba, Canada.

Interstate No 29 is a north-south freeway located 70 miles west of the City of Roseau. This freeway connects Fargo, ND with the Canadian Province of Manitoba, and its principal highway to Winnipeg. The Minnesota Department of Transportation reported in 2001, an average daily traffic (ADT) of 8700 vehicles on Minnesota Highway No. 11, an ADT of 1600 vehicles on Minnesota Highway No. 310, and an ADT of 6100 on Minnesota Highway No. 89 at Roseau.

Two railroads serve the area. The Minnesota Northern Railroad begins in Thief River Falls and crosses the District serving Badger, Roseau, Salol and ends in Warroad. The Canadian National Railway does not enter United States portion of the RRWD but serves Province of Manitoba just north of the International Boundary.

An all-weather lighted airport is located two miles east of Roseau. An airport is also located at the port of entry at Pinecreek. Commercial air travel is available at Winnipeg, Manitoba; Thief River Falls, Minnesota; and Grand Forks, North Dakota.

The Roseau River is not used for commercial navigation, but is used for recreational boating and canoeing.

Tourism and Recreation

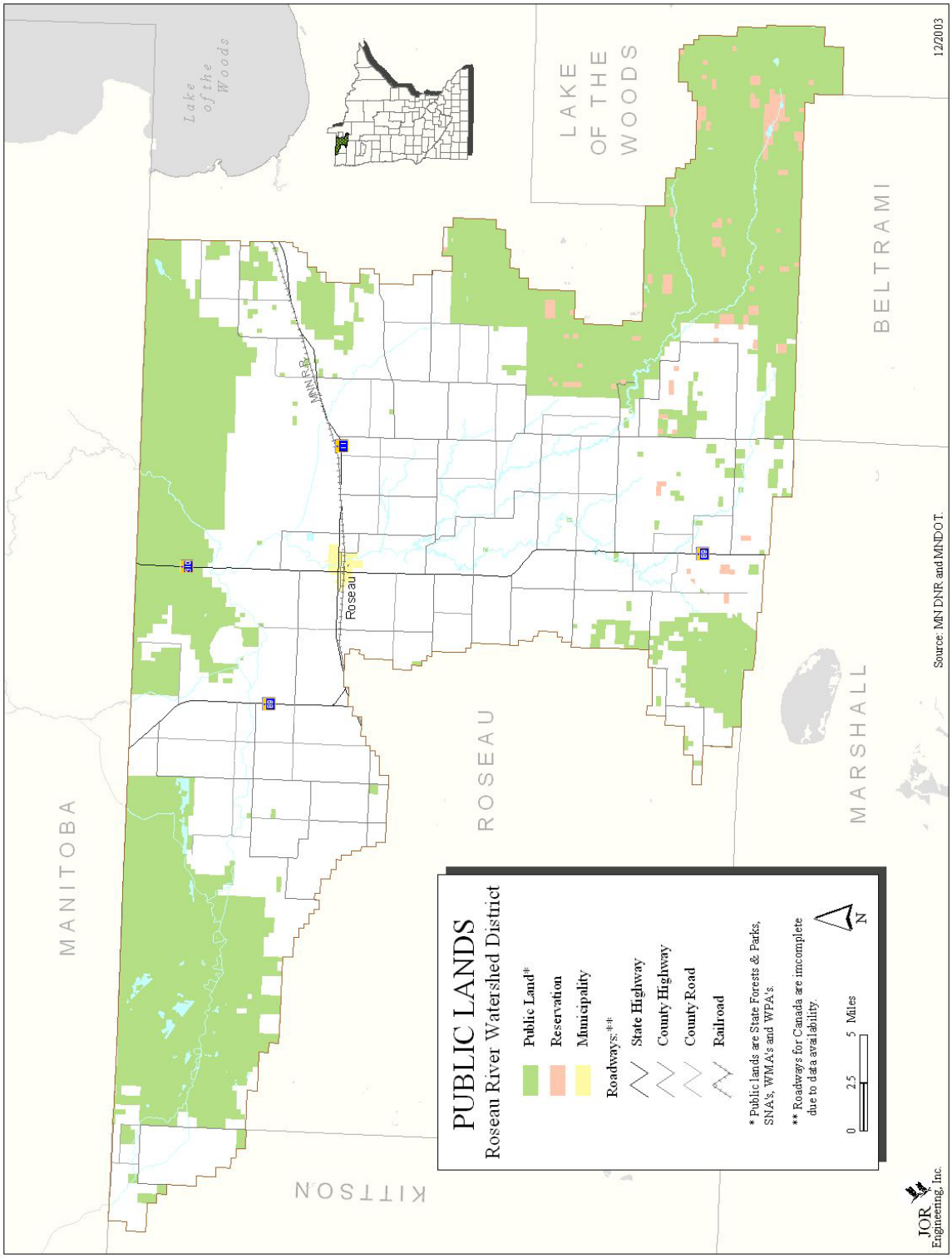
Northwestern Minnesota provides many recreational opportunities. One of the major year round recreational areas is Lake of the Woods, located just east of the District. This fishery generates over $60 million annually. Each year anglers exert approximately 1.6 million hours of fishing activity on Lake of the Woods. Within the District, recreational opportunities exist at Hayes Lake State Park, Beltrami Island State Forest, Red Lake Wildlife Management Area, Lost River State Forest, RRWMA and the many smaller wildlife management areas located throughout the District (Figure 5: Public Lands).

Hayes Lake State Park is located in the southeastern part of the District. Hayes Lake State Park comprises an area of approximately 3,000 acres around a 200-acre impoundment, known as Hayes Lake, on the Roseau River. The park averages between 30,000 and 35,000 visitors per year with a peak year of 50,000 visitors to date. There are thirty-five (35) total camping sites; nine (9) are available with electrical hookups, two (2) backpack campsites, a group camping site, and two (2) cabins. Visitors will find thirteen (13) miles of hiking trails. In the winter these trails are divided into cross-country ski trails and snowmobile trails. Hayes Park has a swimming beach, and two (2) picnic areas. There is a fishing pier located on the lake and boat landing (motorized boats are not allowed except electric motors).

The Beltrami Island State Forest and Red Lake Wildlife Management Area lie in the southeast portion of the District. These comprise an area of 1,050 square miles of which 156 square miles lie within the District. This diverse area of bogs, fens, upland forests, and wetland forests provide a multitude of recreational opportunities. These areas have few roads, but there are numerous logging and snowmobile trails throughout the area. In addition, picnic and campgrounds are located at Bemis Hill within the Beltrami Island State Forest. Other activities include: snowmobiling, hunting (small game, waterfowl and large game), berry picking, nature observations and trial riding.

The Lost River State Forest, located in the northeast portion of the District, was established in 1988. Lost River State Forest comprises an area of 150 sq miles with the International Border being the north boundary. This area has lowland areas (spruce, cedar and tamarack swamps with the associated lowland brush) and areas of upland (aspen and birch ridges). Leased hunting cabins are located throughout the forest.

Figure 5: Public Lands



The RRWMA is located in the northwest part of the District has improved the waterfowl population and attracts hunters every year. In addition, a number of other wildlife management areas are scattered around the District. Each of these areas offer the general public various recreational opportunities with the locations listed in Table 4.

Table 4: Wildlife Management Areas

Wildlife Management Area	Township(s)	Range(s)
Bear Creek	T161N	R38W
Bog Owl	T163 & 164N	R39 & 40W
Cedarbend	T162N	R37W
Enstrom	T162N	R38W
Golden Valley	T159N	R39W
Hayes	T160N	R38W
Moose Marsh	T162N	R42W
Ondation	T162	R42W
Palmville	T158 & 159N	R40 & 41W
Procyon	T162N	R44W
Roseau River WMA	T162,163,164N	R42, 43,44W
Roseau Lake WMA	T163N	R40, 41W
Rosver	T163N	R39W
Skime	T159N	R39W
Solar	T162N	R43W
Taxidae	T162	R44W
Thief Lake	T158N	R39 & 40W
Wannaska	T159N	R39W

Five small parks and picnic grounds are situated within the RRWD. These parks are located at Bemis Hill within the Beltrami Island State Forest, in the City of Roseau and Hayes Lake State Park. Picnic grounds exist near the port of entry at Pinecreek and at the port of entry straight north of Roseau. The city of Roseau operates an 18-hole golf course, city park, indoor sports arena, baseball field and museum. Other recreation opportunities in Roseau include a bowling alley, Movie Theater, numerous softball fields and tennis courts.

Land Use/Land Cover

The land use classifications for the 670,080 acres in the RRWD are listed in Table 5. Of the 670,080 acres in the District, agriculture makes up 45% of the total. Agriculture land use includes: cropland, hay and pasture and acres enrolled in government set-aside programs. Land uses in the "other" category would include: gravel pits, rural farmsteads and lakes.

Table 5: Land Use

Land Use	Acres	Percent
Agricultural Cropland	306,227	45.7
Forestry	109,223	16.3
Trees/shrubs	75,049	11.2
Wetlands	62,317	9.3
Grasslands	51,596	7.7
Roads, Ditches, Towns	49,586	7.4
Other	16,082	2.4
TOTAL	670,080	100%

Land Ownership

The RRWD has a much higher proportion of publicly owned land than other Watershed Districts in Minnesota. Using the State Ditch 51 redetermination of benefits done in 1988, it was determined that approximately 39% of the land within the District is publicly owned, 60% is privately owned, and 1% is owned by the Red Lake Nation. The breakdown of land ownership by county and township is listed in Table 6. Of the total District acreage, 60.3% is privately owned; the Federal Government controls 1.1%; the Red Lake Nation controls 1%; 36.9% is under State ownership; and 0.7% is under local government ownership.

Table 6: Land Ownership in the RRWD

County & Township	Acres Lying Within Watershed	Acres Privately Owned	Acres Publicly Owned	Acres Red Lake Nation	% Of Land Privately Owned
Roseau County:					
Blooming Valley	27,858	2,672	25,186		9.6
T 163 & 164 N; R 43 W	28,682	79	28,603		0.3
Pohlitz	28,982	14,979	14,003		51.7
Dieter	28,421	25,291	3,131		89.0
T 163 & 164 N; R40W	28,389	14,863	13,526		52.4
Spruce Valley	28,595	12,942	15,653		45.3
Norland	29,743	8,269	21,474		27.8
Lake	19,430	10,910	8,520		56.2
Juneberry	1,117	0	1,117		0.0
Soler	5,713	3,440	2,273		60.2
Moose	18,420	18,063	357		98.1
Ross	17,200	17,200	0		100.0
Jadis	22,147	22,005	142		99.4
Spruce	22,758	22,237	521		97.7
Enstrom	22,924	20,658	2,267		90.1
Cedarbend	8,911	5,518	3,393		61.9
Stokes	160	80	80		50.0
Stafford	19,525	19,443	82		99.6
Malung	22,962	22,864	98		99.6
Falun	22,761	22,431	330		98.6
America	15,782	3,825	11,957		24.2

County & Township	Acres Lying Within Watershed	Acres Privately Owned	Acres Publicly Owned	Acres Red Lake Nation	% Of Land Privately Owned
Grimstad	19,093	17,642	1,451		92.4
Mickinock	24,147	24,094	53		99.8
Beaver	22,211	8,585	13,626		38.7
T 160 N; R 37 W	2,260	95	2,165		4.2
Poplar Grove	11,199	6,388	4,811		57.0
Palmville	22,291	14,409	7,882		64.6
Golden Valley	23,195	21,543	1,651		92.9
Reine	23,035	18,360	4,675		79.7
Elkwood	22,936	604	22,332		2.6
Subtotal **% of Total**	590,687	379,410 64.2	211,277 35.8		
Marshall County:					
Moose River	2,397	1,609	788		67.1
Linsell	5,794	4,950	844		85.4
Subtotal **% of Total**	8,191	6,559 80.1	1,632 19.9		
Beltrami County:					
T158N; R36W	7,878	212	7,666		2.7
T158N; R37W	7,874	0	7,874		0.0
T158N; R38W	6,621	1,588	4,673		25.4
Subtotal **% of Total**	22,014	1,801 8.2	20,213 91.8		
Lake of the Woods Co:					
T158N; R35W	8,320	200	8,120		2.4

County & Township	Acres Lying Within Watershed	Acres Privately Owned	Acres Publicly Owned	Acres Red Lake Nation	% Of Land Privately Owned
Norris	8,640	960	7,680		11.1
Beaver Dam	15,402	362	15,040		2.4
Subtotal **% of Total**	32,362	1,522 4.7	30,840 95.3		
Kittson County:					
Caribou	14,936	13,531	1,405		90.6
Subtotals **% of Total**	14,936	13,531 90.6	1,405 9.4		
GRAND TOTAL **% of Total**	666,189	402,822 60.3	265,367 39.7		

Government Land Holdings

Consolidated Conservation Lands, State Holding - Some of the land in the RRWD is classified as Consolidated Conservation lands. These lands were created under various acts of the Minnesota Legislature. The areas were known as Roseau County Conservation Areas, Marshall County Conservation Areas, and the Red Lake Game Reserve. They were created under the provisions of Chapter 258, Laws 1929 (Minnesota Statutes, Section 84A.01), Chapter 407, Laws 1931 (Minnesota Statutes, Section 84A.20), and Chapter 402, Laws 1933 (Minnesota Statutes, Section 84A.31).

Minnesota law provides for the transfer of tax delinquent lands to state ownership. These lands suitable for the development of forests and other purposes would be taken over by the State. The reforestation areas include land having delinquent drainage ditch assessments. The law provided the title to all parcels of land lying within any such area except, in cities and villages, shall be held by the State free from trust in favor of taxing Districts, upon the acquisition by the state of such parcels through delinquency of taxes under conditions set forth in the law.

Under the act, certain monies received in connection with the area are paid into the State Treasury, and transferred to the Consolidated Conservation Area Fund. Half of the money is paid to the county from which it was derived and the remainder is to be used by the State as provided in the law. The law provides for payments to the county in which the project is located of amounts equal to the deficits in the ditch fund of that county chargeable to drainage ditches within the project area.

The commissioner's powers and duties include: the care, preservation, and development of forests, the prevention of forest fires, the sale of timber, the regulation of the waters, the protection of wildlife, the regulation of the propagation of wildlife by any person, the issuance of special hunting, fishing, camping, and other licenses, the policing of the area necessary to execute his duties, the maintenance of roads and landing strips, the investigation of drainage proposals and participation in drainage projects under certain conditions, and the acquisition of land by purchase or condemnation.

Through various Commissioners' orders, many of the Consolidated Conservation Lands (Con-Con Lands) have been converted to wildlife management areas. The latest orders transferring many tracts of Con-Con Lands were executed in May of 2002. The final 102,315 acres of disputed Con-Con lands were officially given the designation of wildlife management areas (WMA). While this bill designates theses lands located in Beltrami, Marshall, and Roseau counties as WMA's, it also mandates the DNR work with user groups to establish a total of 90 miles of motorized and non-motorized trials on or contiguous to WMA's on Con-Con lands.

Beltrami Island Settler Relocation Project, Federal Holding - The Federal Resettlement Administration in 1934 approved a 750,000 acre area in Beltrami, Lake of the Woods, and Roseau Counties as a project area for the removal of distressed settlers from isolated locations and their relocation on lands nearer markets and schools. About 200 settlers resided in this project area in Roseau, Beltrami, and Lake of the Woods Counties. The project is also referred to as the Beltrami Island Land Utilization Project.

The lands involved are spoken of as Land Utilization Project (LUP) lands. The title to these lands rests with the Federal Government, specifically the USFWS. Minnesota DNR manages LUP lands by an agreement with the Federal Government. There are 28,122 acres of LUP lands in Roseau County.

Beltrami Island State Forest, State Holding - Chapter 124, Laws 1931, provided for the withdrawal from sale of state-owned lands within described limits and for the establishment of these lands as state forest. The described limits include some of the present area of the Beltrami Island State Forest. Chapter 419, Laws 1933, named the forest and extended the limits. They have been modified from time to time since.

State Forests are established for growing, managing, and harvesting timber and other forest crops, for the establishment and development of recreational areas, for the protection of watershed areas and the preservation and development of rare and distinctive species of flora and fauna.

Beltrami Island State Forest is located in the southern portion of the RRWD and is managed by the Minnesota DNR through their Division of Forestry. The RRWD and the Beltrami Island State Forest are in DNR Region 1 with headquarters at Bemidji. The Watershed is located in two Forestry Areas with headquarters at Warroad and Wannaska.

Much of the land within the Beltrami Island Forest is federal land acquired by the United States in its Beltrami Island Land Utilization Project and placed under jurisdiction of the USFWS by Executive Order dated March 6, 1942. The project lands were designated as the Beltrami WMA by order, and were made available to the Minnesota Conservation Department for management under a cooperative agreement with the USFWS. The Division of Forestry manages the forest resources on these lands and the Division of Game and Fish manage the Wildlife Resources.

The RRWMA, State Holding - Chapter 375, Laws 1947, withdrew from sale all trust fund lands in Townships 163 and 164 North, Ranges 42, 43, and 44 West in Roseau County lying north of the Roseau River. This statute provided for transfer of supervision and control of those lands to the Conservation Department through the Division of Game and Fish for 50 years, upon payment of $30,000 to the trust fund from the public shooting ground fund, for the purpose of establishing and maintaining a public hunting ground and game refuge.

Chapter 633, Laws 1949, appropriated not to exceed $100,000 to be paid to the Province of Manitoba by the Commissioner of Conservation for the completion of dams, ditches, control works, and other structures for the diversion of Pine Creek in Manitoba into the Roseau River Game Refuge and Public Hunting Grounds. Chapter 242 amended this law, Laws 1951. The International Joint Commission held a public hearing on the proposal to divert Pine Creek at Winnipeg, Manitoba, October 15, 1949.

In 1952 and 1953, an extensive system of dikes was constructed by the Minnesota Department of Conservation north of the Roseau River in the Game Refuge for the purpose of maintaining 3 pools, and the Pine Creek diversion was built pursuant to an agreement between the State of Minnesota and the Province of Manitoba dated February 18, 1952.

The construction of the Pine Creek Diversion is such that a substantial part of the flow of the creek is diverted. There is a provision for some flow down the creek below the point of diversion. Flow from the diversion ditch is into the eastern most pool, which overflows to the middle pool. Water may overflow from the middle pool into the Roseau River or into the western most pool, which also overflows to the Roseau River.

In 1985 to 1987 improvements were done on three pools to enhance wildlife benefits and flood control potential. This work was done through the cooperation of the Minnesota DNR, Ducks Unlimited, RRWD, and the Lower Red River Watershed Management Board.

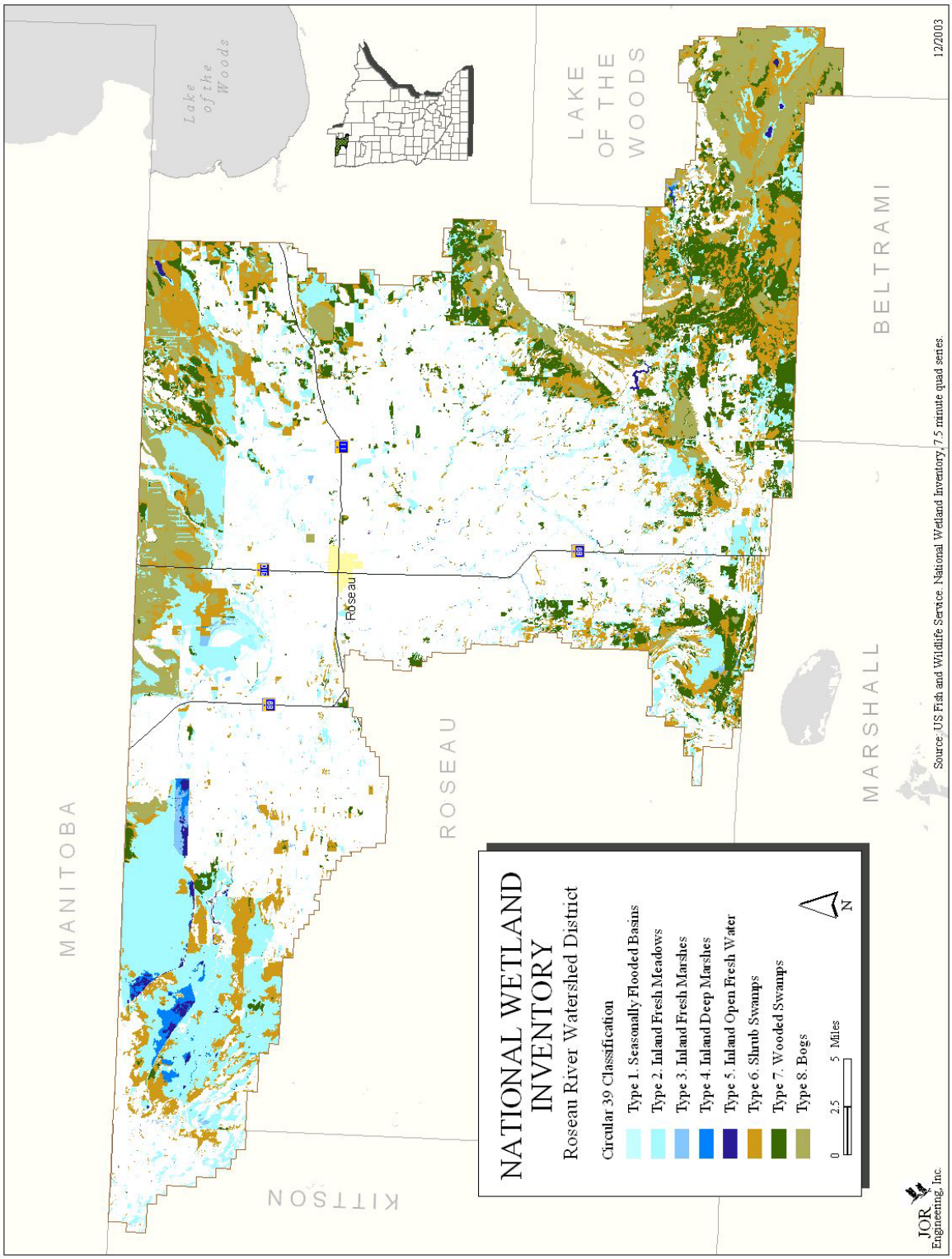
The Minnesota DNR operates the RRWMA. This area, composed of three pools resulting from an extensive system of dikes, was built with the intention of establishing a public

hunting ground and game refuge primarily for migratory waterfowl (Figure 6: National Wetland Inventory).

The Norris Camp State Game Refuge is partially within the RRWD. In addition to those mentioned in Table 4, an 80-acre WMA is located in Section 22, Township 163 North, Range 38 West, Roseau County and a 120-acre WMA is located in Section 32, Township 159 North, Range 36 West, Lake of the Woods County. Most of the Roseau River Watershed lands in Township 158 North, Range 36 West, Beltrami County are in the Red Lake Game Refuge and Public Hunting Grounds.

Bureau of Indian Affairs and Bureau of Land Management, Federal Holdings - Prior to 1889, the land in the Watershed southeast of the old Red Lake Indian Reservation boundary was a part of the Red Lake Indian Reservation. In that year, the land was ceded to the United States. From 1900 to 1930, much of the land that had been sold reverted to state ownership. Most of the lands, which were owned by the United States, were returned to the Red Lake Nation and are known as "Restored Ceded" lands.

Figure 6: National Wetland Inventory



Physical Features

Climate

Northwestern Minnesota has a continental climate, influenced primarily by the continuous successions of high and low pressure areas moving from west to east across the region. The climate is characterized by wide temperature variations with moderate to heavy winter precipitation occurring as snow and ample summer rainfall. Meteorological data for the region are available from the United States Weather Bureau station at Roseau and substations near Wannaska and Caribou. The Roseau and Wannaska stations record both precipitation and temperature while the Caribou station only records precipitation.

The average daytime temperature in the winter is 4.6 degrees F and average daily minimum temperature is -6 degrees F. The lowest recorded temperature at Roseau is -48 degrees F, which occurred on February 18, 1966. Winter blizzards are common and occasionally life and property are endangered. The average seasonal snowfall is 35.3 inches. The record snowfall event of 38 inches was recorded on March 5, 1966. On average, 140 days per year have at least 1 inch of snow cover on the ground.

The average daytime temperature in the summer is 63.9 degrees F and average daily maximum temperature is 76.7 degrees F. The highest recorded temperature at Roseau was 101 degrees F, which occurred on August 18, 2003. Average annual temperature in the RRWD is about 37 degrees. The frost-free period extends for approximately 102 days from May 20 to August 30.

Heavy summer rains occur periodically. The record rainfall event of 14.55 inches in 48-hr period was recorded south of the city of Roseau, on June 9-10, 2002. In addition, much of the area was doused with over 12 inches of rainfall in a 48-hour period and was the cause of the June 2002 flood, which damaged over 90% of the homes in the city of Roseau. Total annual precipitation is 20.52 inches. The majority (12.35 inches) falls between and including the months of June and September.

The annual precipitation averages about 20 inches and has varied from a low of 12 inches to a maximum of over 30 inches. Fifty percent of the precipitation occurs during the frost-free period. Average annual snowfall is 35 inches.

The prevailing wind is from the west. April has the highest average wind speed average of 10.1 miles per hour.

Topography

The entire Red River Basin was shaped by the activities of continental glaciers of the Wisconsin glacial age. Lake Agassiz was the dominant feature of the landscape. At one time, the majority of Roseau County was covered by glacial Lake Agassiz. This glacial lake receded approximately 8500 years ago and left behind the present day landscape of lake beds (Roseau, Mud, Whitney, etc.), lowlands, beach ridges and upland glacial till. This watershed is relatively level with 70% of the landscape made up of lacustrine materials from glacial Lake Agassiz and organic deposits. The remaining 30% of the watershed was derived from glacial till and has rolling, undulating topography (Figure 7: Topography).

The Roseau River Basin terrain is nearly void of topographic irregularities and consists of a nearly level plain, with the exception of the Campbell Ridge that slopes from elevation 1,250 at the head to 1,000 at the International Border. Approximately 50% of the district lies between elevations of 1,000 and 1,100 feet. Lake-derived silts and clays are the major soil types. Water infiltration rates are slow due to the impermeability of the clay soils. This lends to a high water table in much of the district. In addition, peat bogs are common in localized depressions and are up to 20 feet deep.

The Roseau River is the dominant water feature in the district and follows a west to northwest course through the basin in a well-defined channel upstream of the city of Roseau and a meandering channel downstream of Roseau. Stream gradients upstream of Roseau are approximately 17 feet/mile. Downstream of the city of Roseau the stream gradient flattens to 0.2 feet/mile in the big swamp.

Geology

The RRWD is located in the bed of glacial Lake Agassiz, a large lake that covered the entire area during the recession of the last glacial ice mass over 8,500 years ago. Three general types of soil are found: fluvial sediments, lacustrine deposits varying in thickness of a few feet to over 50 feet deep and glacial drift underlie this area. Precambrian granite underlies the soil at depths exceeding 100 feet (Figure 8: Geomorphology).

Figure 7: Topography

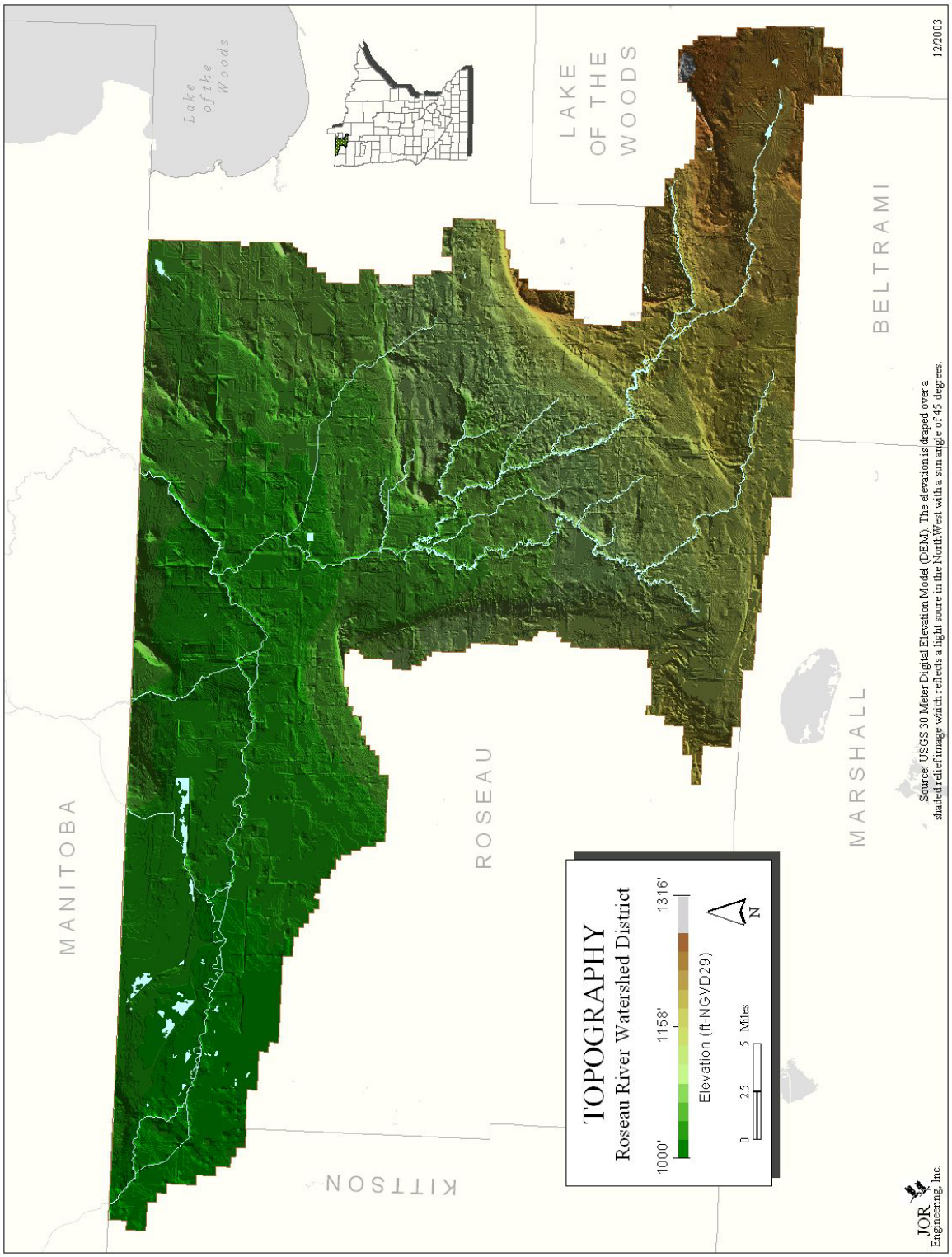
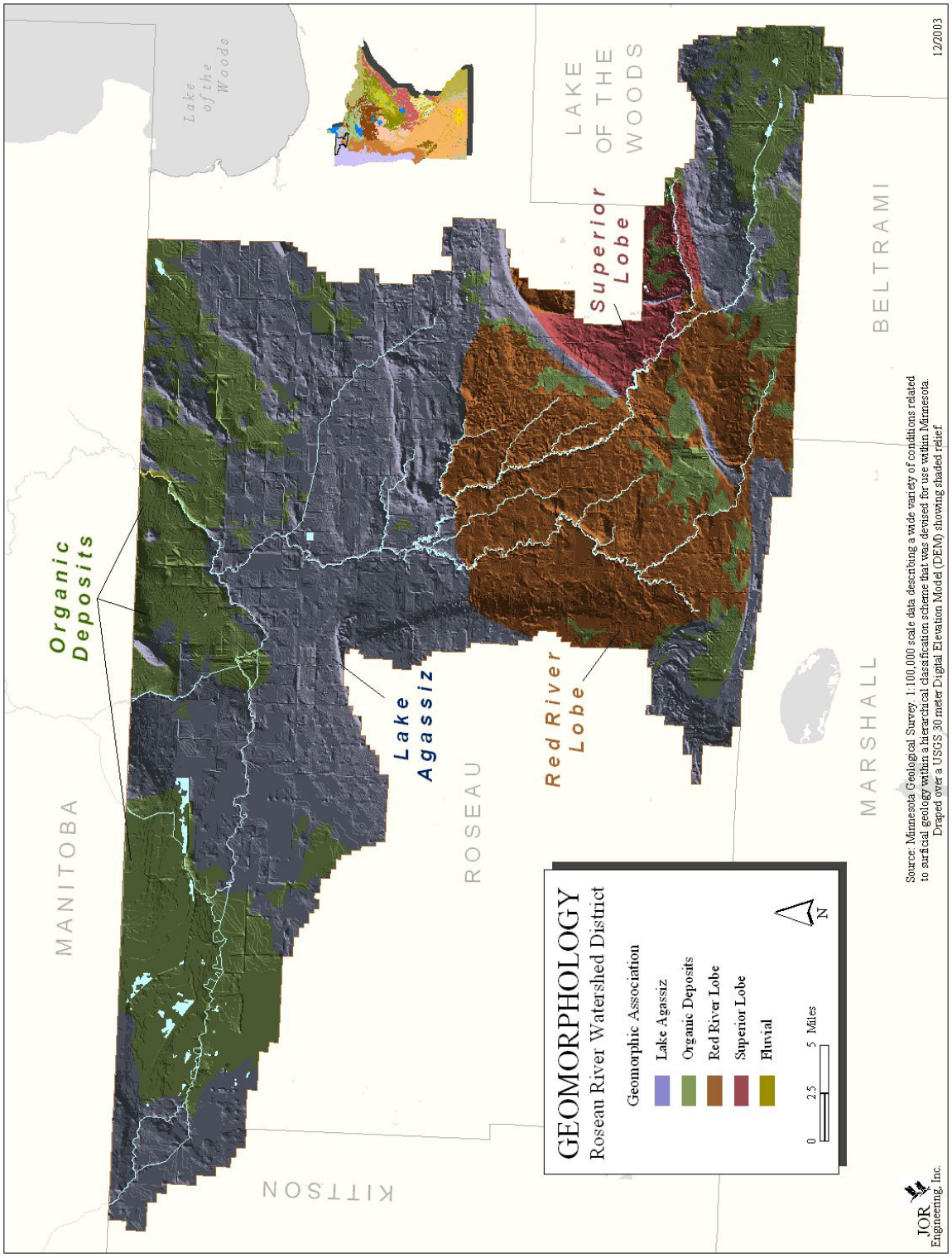


Figure 8: Geomorphology



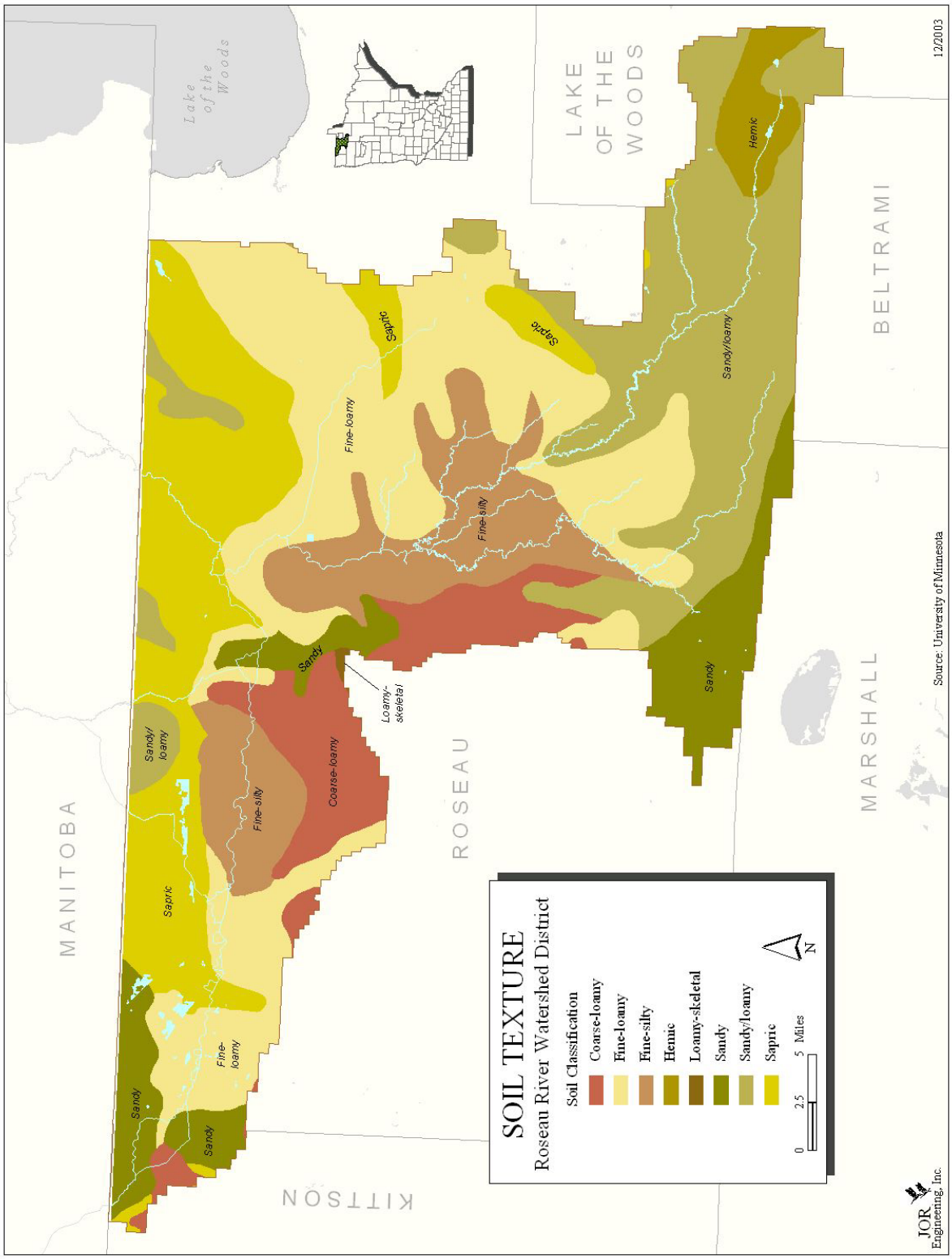
Soils

From a water management viewpoint, soil texture is one of the most important characteristics of a soil. Soil texture is one of the characteristics that determines the drainage properties of a soil, how fast water infiltrates into the soil or runs off. Soil texture also influences the drought resistance of a particular soil. The soils of the RRWD are varied, having developed under different types of vegetation, topography and drainage regimes. One thing the soils of the RRWD have in common, they all developed from deposits of glacial action. Unsorted glacial till is a mixture of clay, silt, sand, gravel and rocks. The action of wind and water, over time, on these glacial deposits sorted the materials giving rise to the various soil textures found in the RRWD today. Because of poor drainage, peat soils developed in some areas. Poor drainage caused organic materials to accumulate and not decompose completely. A generalized soil texture map of the RRWD is found in Figure 9.

Water runoff from any area is a combination of many factors including: the depth and duration of rainfall, soil type, topography, land cover and cultural practices. Soils vary in water runoff rates. Figure 11 shows the estimated runoff from a 5 inch rain during a 24 hour period. This rainfall event is from a storm frequency of approximately 100 year reoccurrence. This is presented to give the reader a feel for the runoff contribution of the different portions of the RRWD.

Soils of the District have been extensively mapped by the U.S Department of Agriculture. Detailed soil surveys are available for each of the counties within the RRWD. The most recent soils inventory and survey for Roseau County was completed in 2000 (survey information available on a CD from the SWCD office in Roseau).

Figure 9: Soil Texture



Natural Resources

Wildlife

The RRWD offers diversity of wildlife habitat. This habitat ranges from upland forests (oak, birch, popular, pines) to lowland forests (tamarack and spruce) to remnants of tall grass prairie (big bluestem) to wetlands that range from potholes to open water to low land marshes.

The RRWD supports a good population of white-tailed deer and limited numbers of moose and black bear. The District has fair to excellent habitat for many species of upland game; including sharp-tailed grouse, ruffed grouse, Hungarian partridge, snowshoe rabbits, gray squirrels, and woodcock.

Major fur bearing species in the District include: beaver, coyote, muskrat, red fox, and mink. Other fur bearing animals in the District include: bobcat, fisher, raccoon, river otter, timber wolf, and weasel.

Thirty-three species of non-game mammals have been identified by a University of North Dakota Ecological study. Mammals ranged from several species of mice, shrews and voles to chipmunks and skunks.

Waterfowl and other birds are abundant in the District. A North Dakota Ecological study reported that 162 species of avian species were identified along the Roseau River. The Minnesota DNR has identified a total of 101 species that breed in the District. A breakdown of the species: 87 species of non-game birds, 10 species of native game birds, 1 non-native game bird and 3 non-native pest birds. Non-game birds identified included: yellow warbler, Baltimore oriole, veery, warbling vireo, and black-capped chickadee. Game birds include: Canada geese, mallard ducks, and other species of ducks and geese.

Over 17 species of amphibian and reptile species have been reported in the District. Species range from western plains garter snake, eastern tiger salamander to northern leopard frog.

Aquatic invertebrate species are very diverse in the RRWD. Mayflies, caddisflies, many species of beetles and fly larvae can be found in many areas. Snails, worms, clams and crayfish can be found in and around rivers and streams. Microscopic plankton in the genus, Daphnia, voluox, mougeotia and spirogyra have been reported in the district.

Fisheries

The Roseau River is the primary fishery in the District. However, Hayes Lake does offer fishing opportunities. The Roseau River has been designated a warm game fish class II stream by the Minnesota DNR. The Roseau River was last surveyed in 2000. The findings of the survey conducted in 2000 were consistent with fish surveys conducted in 1978, 1982, 1992 and 1996. This would indicate that the fish population in the Roseau River has been relatively stable over the past 25 years. Thirty-eight species of fish were captured in the RRWD. The dominant game fish included: walleye, sauger, catfish and northern pike. The most common fish caught were blackside darter, central mud minnow, creek chub and white sucker. (Red River Basin Stream Survey Report, Roseau River Watershed 2000, copy on file at RRWD office)

Denny's Outdoor Sports in Roseau held the first annual Roseau River Fishing Contest in September 2003. One hundred and sixty eight people registered for this one-day fishing contest. Largest Walleye caught was 8.57 pounds and the largest Northern was 12.05 pounds (Appendix 7).

The Headwaters of the Hay Creek is managed by the DNR as a designated cold water trout stream. Brook trout have been stocked, annually.

Water Resources

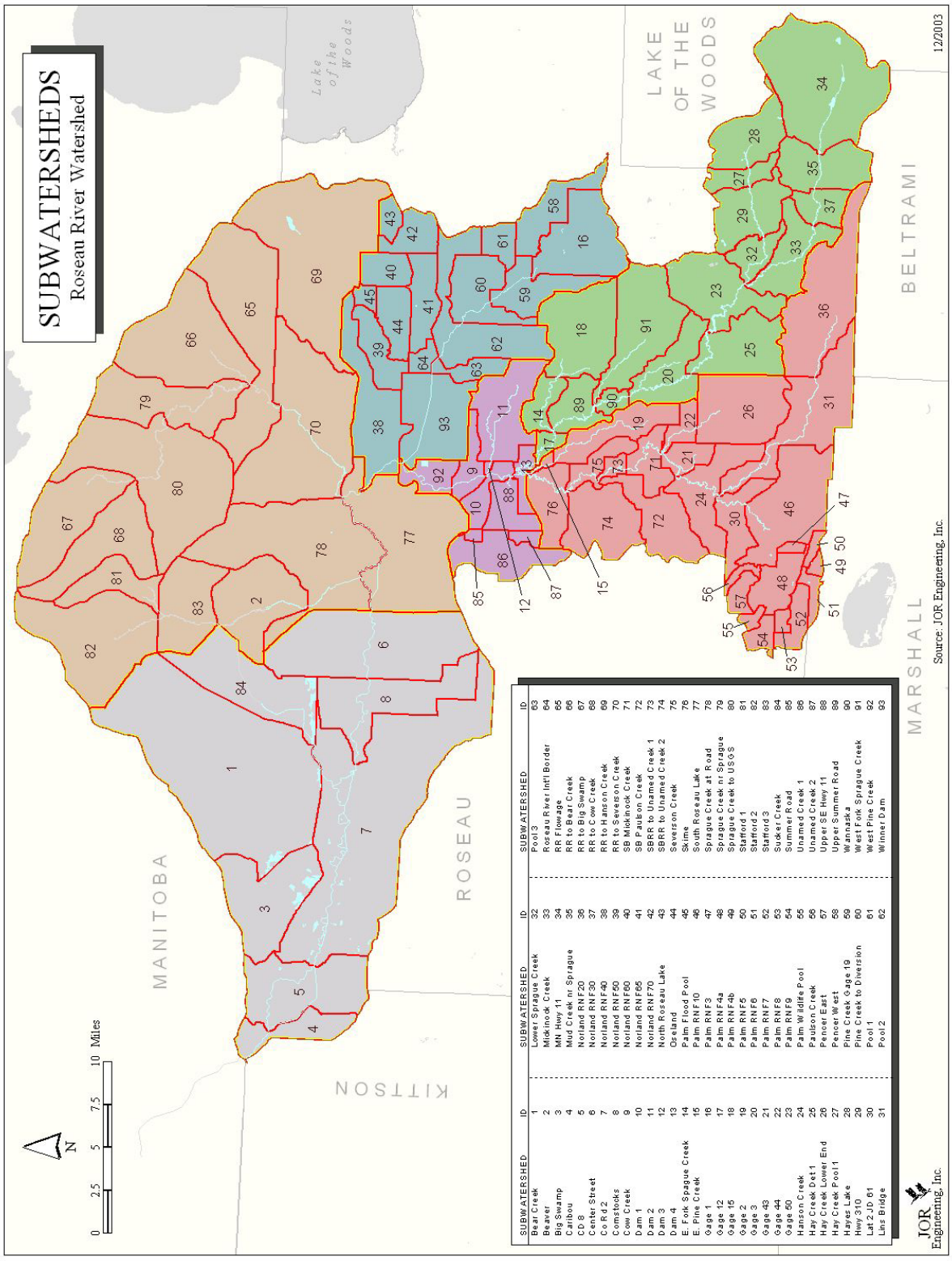
Major watercourses in the District

The information in Table 7 gives the drainage areas of the main watercourses in the RRWD. Drainage area for the Minnesota and Manitoba sections are listed separately and summed together if the drainage area encompasses both areas. The South Branch of the Roseau River is red on the Subwatershed map. The North Branch of the Roseau River is green on the subwatershed map. Local drainage between Malung and Roseau is purple on the subwatershed map. Hay creek would be blue on the subwatershed map. Sprague creek and Pinecreek is brown on the subwatershed map. The Roseau River at the International Border is gray on the subwatershed map (Figure 10: Subwatersheds).

Table 7: Drainage area of watercourses

Stream reach	**Minnesota** (Sq.Mi.)	**Manitoba** (Sq.Mi.)	**Total** (Sq.Mi.)
South Branch near Malung	216.86	-	216.86
North Branch near Malung	215.77	-	215.77
Roseau River and South Fork near Malung	432.63	0.00	432.63
Local Drainage between Malung and State Ditch 51	55.60	-	55.60
Hay Creek	112.07		112.07
Roseau River at State Ditch 51	600.30	0.00	600.30
Local Drainage to State Ditch 51	357.13	199.00	556.13
Sprague (Mud) Creek	87.62	169.00	256.62
Pine Creek	12.64	75.00	87.64
Roseau River at International Border	1057.69	443.00	1500.69
Downstream of International Border		467.00	467.00
Roseau River at Mouth	1057.69	910.00	1967.69

Figure 10: Subwatersheds



Roseau River (State Ditch 51) - The Roseau River channel, throughout this entire reach, has been modified by a larger channel cross-section and by straightening the channel's alignment. This reach of the channel is approximately 45 miles in length. Natural ground is 1010 MSL at the International Border and 1035 MSL at the upper end of State Ditch 51.

Improvements to the Roseau River were done between 1906 and 1918. These works included: the construction of State Ditch 37, State Ditch 51 and portions of Judicial Ditch 61. In the 1980's, Roseau and Kittson Counties turned these ditches over to the District for administration. In the District's redetermination of benefits, it was concluded that State Ditch 37 and those portions of Judicial Ditch 61 within the bed of Roseau Lake and those that followed the Roseau River alignment should be combined with State Ditch 51. In 1988, the District concluded the redetermination of benefits and viewers found benefits of $9,000,000 for State Ditch 51, at the same time, the District combined those portions of Judicial Ditch 61 and State Ditch 37 into State Ditch 51.

This area of the District is relatively level. Big Swamp and the Historic Roseau Lake Bed provide flood storage. In addition, floodwaters will overflow and leave the Roseau System through the Big Swamp area and flow into the Two Rivers Watershed District (TRWD). Pine Creek and Sprague Creek join the river in this reach. Hay Creek enters the river within a quarter mile upstream of the end of this reach. The direct drainage to State Ditch 51 is about 556 square miles, of this 199 square miles is contributed from Canada. The 357 square miles within the District is mostly in agriculture production. In the area of Big Swamp, the land is mainly under State ownership and managed for wildlife production and forestry.

Badger and Skunk Creeks have been diverted into the TRWD. Lateral 1 of State Ditch 95 and Roseau County Ditch 13 moves water into the TRWD. This diversion removes approximately 54 square miles of drainage area from the Roseau River.

Roseau River End of State Ditch 51 to Malung - From the upstream end of State Ditch 51 to the confluence of the South Branch and the Roseau River near Malung, the Roseau River is a natural channel. This channel reach is approximately 9 miles in length. Natural ground is around 1035 MSL at the end of State Ditch 51 and 1055 MSL near Malung. The City of Roseau straddles the river near the midpoint of this reach. The local drainage to this reach comprises an area of approximately 56 square miles. Of this area approximately 2 square miles is urban development, with the remainder agricultural croplands.

North Branch of the Roseau River - The River through this reach is a natural channel approximately 65 miles long. The channel begins in a patterned fen in the Beltrami Island State Forest. The river channel meanders throughout this reach. The majority of the drainage area lies to the north and east of the channel. Major tributaries are; Bear Creek, Severson Creek, Rafferty Creek, and Hansen Creek. Mulligan Lake and an unnamed lake are located at the headwaters. The river has been dammed near the western edge of the Beltrami Island State Forest. The lake formed by this dam is called Hayes Lake and is a State Park. The total drainage area is approximately 216 square miles. Of this, about 152

square miles is located in and around the Beltrami Island State Forest and is primarily wooded or wetlands. The majority of this land is held by the State and is managed for wildlife and forestry production. The remaining 64 square miles are primarily in agriculture production.

South Branch of the Roseau River - The South Branch (also known as the South Fork) arises out of the wetlands of northwestern Beltrami County and northeastern Marshall County. It flows westerly for about one third of its approximate 32-mile length and then flows north-northwesterly to its confluence with the Roseau River. The river is a natural channel with the majority of its drainage area lying to the south and west of the channel. Mickinock Creek contributes water from the southwestern part of its drainage area. Sucker Creek joins the South Branch near its confluence with the Roseau River. This tributary drains much of the land that lies between the South Fork and the Roseau River. Two additional named tributaries are: Norin Creek and Paulson Creek. The drainage area is slightly over 217 square miles. Approximately 22 square miles in the upper watershed is State land partially within Beltrami Island State Forest. This land is primarily wetland and forests and is managed for wildlife and forestry production. Also in the southwest corner of this watershed is an area of approximately 18 square miles, primarily owned by the state, which is mainly forest and wetlands. The remaining 177 square miles is a mixture of lands under agricultural production, forested lands, and wetlands.

A drainage area of 45 square miles has been diverted from the South Branch's drainage area by the construction of Branch A of Judicial Ditch 21. This water now flows into the Moose River, which is a part of the Red Lake Watershed District.

Hay Creek - The confluence of Hay Creek with the Roseau River is just upstream of the end of State Ditch 51. Throughout the entire length of Hay Creek, the channel has been modified with legal ditches, Roseau County Ditches 7 and 9. At the mouth, natural ground is 1035 MSL and at the upper end of County Ditch 9 the natural ground is 1170 MSL. The source of Hay Creek is located in the northwestern part of the Beltrami Island State Forest near Bemis Hill. Hay Creek has a drainage area of over 112 square miles. Approximately 21 square miles is located in the Beltrami Island State Forest, this land is mainly wetlands and forests. The remaining 91 square miles is primarily agricultural lands.

Sprague (Mud) Creek - The portion of Sprague Creek that lies within the RRWD is a dredged channel of Judicial Ditch 61. Sprague Creek has a total drainage area of approximately 257 square miles; of this 169 square miles are located in Canada. The remaining 88 square miles is predominately within the boundaries of the Lost River State Forest. Most of this land is wetlands or forests with a few small tracts of land developed for agricultural production. Some water that would naturally drain into Lake of the Woods has been diverted into Sprague Creek by branches and laterals of Judicial Ditch 61.

Pine Creek - The portion of Pine Creek that lies within the District is a dredged channel (State Ditch 87). It has a drainage area of approximately 88 square miles of which 75 square miles are located in Canada. The remaining 13 square miles are predominately in agricultural production. A large patterned fen is located on the east side of the creek, covering an area of approximately 4.5 square miles.

The Pine Creek diversion, constructed in Canada, diverts water from Pine Creek west to the wildlife pools in the RRWMA.

Surface Waters

Rivers and Natural Streams

The Roseau River and its South Branch, along its course in the United States exhibit little trace of a valley. Broad and relatively flat plains flank it. The Roseau River has four main tributaries: the South Branch of the Roseau River, Hay Creek, Pine Creek and Sprague (Mud) Creek. All enter the main stem in Roseau County, although Sprague Creek and Pine Creek have their origin and the greater portion of their drainage area is in the Province of Manitoba. The South Branch joins the main stem near Malung, south of Roseau. Hay Creek and Sprague Creek enter the main stem north of Roseau, but south of the historic Roseau Lake bed. Pine Creek enters the main stem within the historic Roseau Lake bed.

Table 8: Roseau River Tributaries and Area Drained

	Total Area Drained	
Tributaries	**USGS**	**RRWD**
South Branch of the Roseau River	312 Square Miles	217 Square Miles
North Branch of the Roseau River	252 Square Miles	216 Square Miles
Hay Creek	81 Square Miles	112 Square Miles
Sprague Creek	220 Square Miles	257 Square Miles
Pine Creek	90 Square Miles	88 Square Miles

Runoff and Stream Flow

High stream flow invariably occurs in the Roseau River Basin during the snowmelt period (April to May) and occasional high flows are noted in summer months following heavy rains (Figure 11: Estimated Runoff).

Computations by the USCOE, based on run-off records, indicate more than 75% of the annual run-off from the Roseau River Basin above Ross and Caribou takes place during the period April to July, inclusive. The average annual run-off from the basin above Ross is approximately 2.5 inches or about 12.5 percent of the average precipitation. Water evaporation from swamps and wetlands in the entire Roseau River Basin is an important factor in the reduction of watershed run-off.

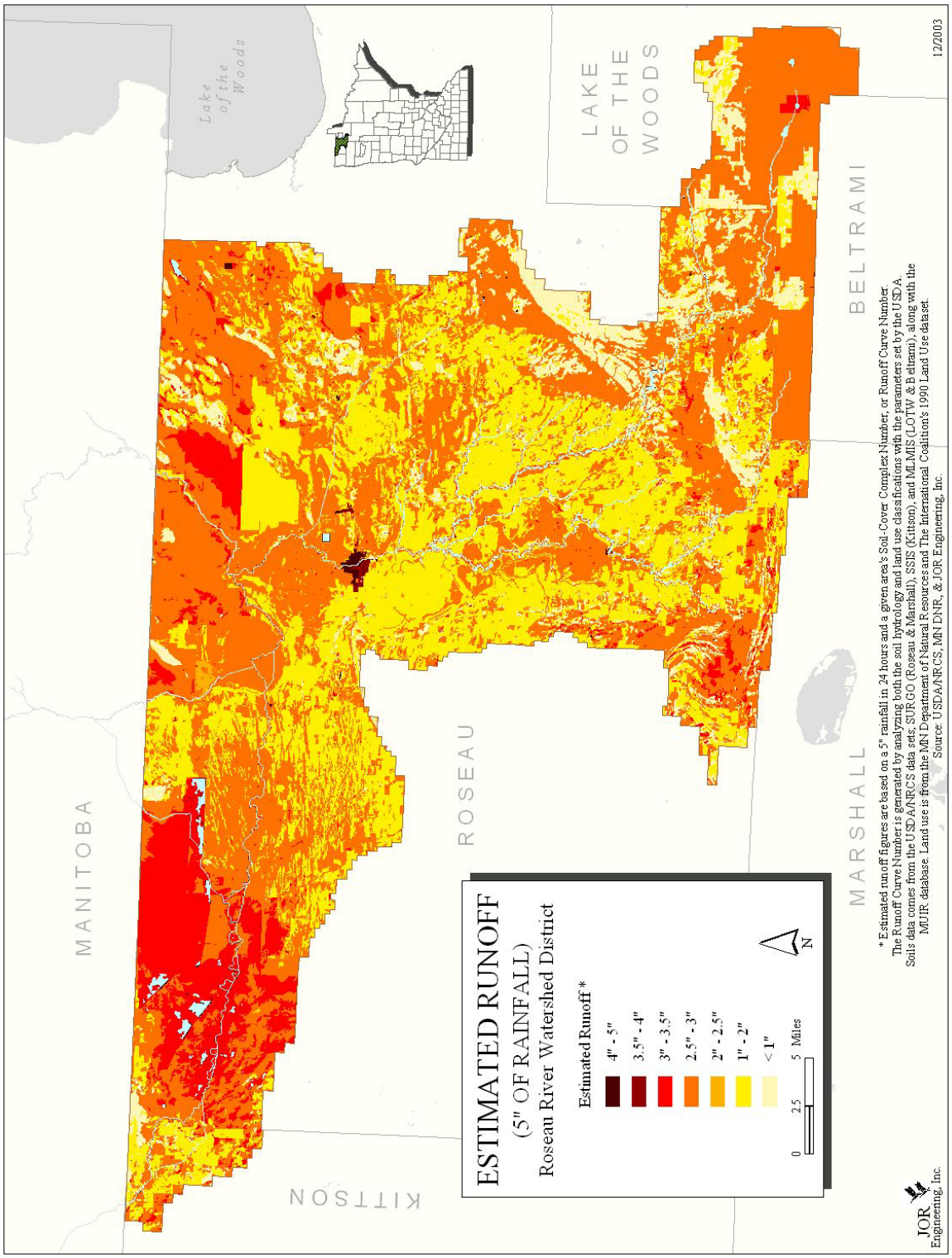
The natural water storage capacity of Roseau Lake and the Big Swamp has a very pronounced effect on the stream flows. In contrast to those of adjacent streams, hydrographs of Roseau River discharges below Roseau Lake show run-off characterized by delayed and diminished peaks and extended over long periods of time.

Average stream flow in the Roseau River varies with the year. A review of United States Geological Survey peak stream flow data collected at Malung, Ross, and Caribou from 1929 to present is shown in (Appendix 10, 11 & 12). At Caribou, the range in peak water flow ranges from a high of 4320 cfs in 2002 to a low of 340 in 1939. At Malung, the high peak flow was 16,000 cfs in 2002 to a low of 78 in 1990.

The flow of the Roseau River during the year tends to have multiple peaks and times with low flow between peaks. Peak average daily flows of over 1,500 cfs were recorded at three hundred and seventy nine times during the 10-1-1946 to 9-30-2002. These times of peak flow were followed by periods of very little to no recorded flow.

Stream flow data from the Sprague creek has been recorded off and on during the last 50 years. The data from this gauging station tends to follows a similar pattern as the Roseau River. One of the issues that face the newly formed RRIW group is water flow patterns from Canada into the United States.

Figure 11: Estimated Runoff



Lakes in the District

Hayes Lake - This lake covers approximately 200 acres and is located in the southeastern part of the District. Hayes Lake is a man-made lake created when the Minnesota DNR built a dam on the North Branch of the Roseau River. This Lake was created to provide recreational opportunities, not as a flood control structure. Lake location: T 159 & 160 N, R 38W. (68-004P)

Roseau Lake - This historic lake was approximately 3.5 miles in diameter and its natural state was a shallow permanent body of water covering 2,198 acres. Under existing conditions, following construction of drainage ditches and channel enlargement downstream from the lake, this lake is nonexistent, except during flood periods. At other times most of the lakebed is arable soils. The Roseau Lake area, under existing conditions, serves as a natural retarding basin, which regulates run-off from the headwaters tributaries. Lake location: T 161 N, R 40 & 41 W.

Marvin Lake - This Lake is located in the extreme northeast corner of the District near the International Boundary. Marvin Lake is a narrow rectangular shallow lake of approximately 240 acres. Lake location: T 164 N, R 37 W. (68-0002P)

Luxenberger Lake - Lake location: T 161N, R 37 W. (68-0139P)

Mulligan Lake - In Beltrami County sections 2 and 3, T 158 N, R 36 W, size 119 acres. (04-0346P)

Whitney Lake - This historic lakebed was located in sections 7, 8, 9, 15, 16, 17, 19, 20, 21, 28, 29 and 30 of Moose Township (T162N, R42W). It had a surface area of approximately 3,500 acres.

Mud Lake - This historic lakebed was located in sections 22, 23, 26, 27, 28, 32, 33, and 34 Jadis Addition (T163N, R40W). It had a surface area of approximately 800 acres.

Lost Lake - Located in section 5 of Lake of the Woods County (T 158 N, R 35 W). This lake is located at the head of the Roseau River, upstream from Mulligan Lake. (39 – 0005P)

Unnamed Lake - Located in section 1 of Beltrami County (T 158 N, R 36 W). This lake is located near the source of the Roseau River, upstream from Mulligan Lake. (04-0345W)

Wetlands: natural, altered and drained

Numerous wetlands are found scattered throughout the RRWD. At one time, glacial Lake Agassiz covered most of the RRWD. When this body of water receded, it left behind a series of beach ridges in a relatively level lake plain with low marshy areas scattered throughout the RRWD. Primary locations of these lowland areas are along the northern tier which borders Canada and the headwaters of the Hay Creek, and both branches of the Roseau River.

Wetlands in the RRWD have been inventoried and classified by the US Fish and Wildlife Service (Figure 6: National Wetland Inventory). The RRWD supports a diversity of wetlands and associated plant and animal species which vary with the type of wetland. Wetlands include potholes, marshes, and open bodies of water provide habitat for aquatic and terrestrial plant and animal life.

Of the marshy areas in the RRWD, the Big Swamp is the largest and most distinctive. The Big Swamp occupies the major portion of the basin between mile 115 (about 10 miles west of the outlet of Roseau Lake) and mile 100 (about 9 miles upstream from the border). In this reach, about 12 miles long, the land slopes generally to the southwest. Consequently, that portion of the reach lying north of the Roseau River drains into the river while the area south of the stream, before being modified by ditching, drained away from Roseau River. Drainage ditches in the area have modified natural drainage characteristics to a limited extent, but nevertheless during high flow periods part of the flow which overtops the south bank of Roseau River, within the Big Swamp reach, finds its way overland and through ditches into several branches of TRWD in spite of blocks in the ditches leading into the Roseau River.

Drainage Systems

Extensive but not fully effective drainage systems, most constructed from 1900 to 1925, are located in the District intended to assist surface water removal. RRWD has approximately 560 miles of legal drainage systems. Drainage authority in the District varies with ditch system and responsibility for maintenance. Cooperation between these organizations is necessary to be efficient in the movement of water in the District (Figure 12: Legal Ditches).

Figure 12: Legal Ditches

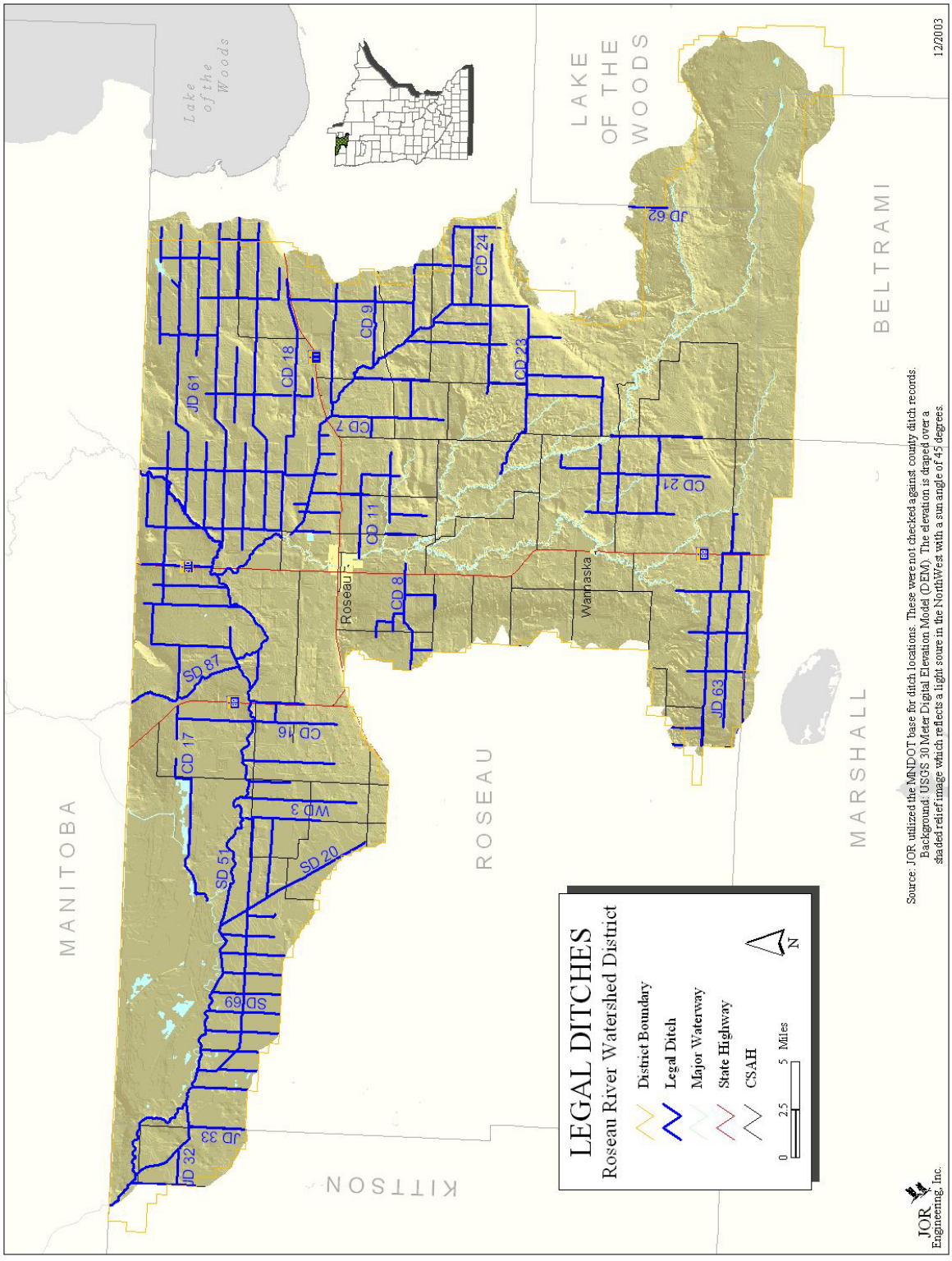


Table 9: Drainage Ditches

State	Judicial	County	Watershed
20 RC	19 RC	7 RC	1 WD
51 WD	32 KC	8 WD	3 WD
69 RC	33 RC	9 RC	
87 RC	61 RC	11 RC	
	62 WD	16 WD	
	69 RC	17&18 RC	
		21 RC	
		23&24 RC	
Ditch Authority RC - Roseau Co KC- Kittson Co WD – RRWD			

Diversions

New Lands into District

County Ditch No. 6 into No. 9 - Water in the Warroad River Watershed running northward in Ditch No. 6 empties into Ditch No. 9, which moves water westward out of Warroad Watershed into Hay Creek then into the Roseau River.

Judicial Ditch No. 61 - Water in the area of Marvin Lake which normally drained to the Lake of the Woods now moves westward in Judicial Ditch No. 61 into Sprague Creek then into the Roseau River.

Judicial Ditch No. 69 - This system intercepts water south of the river that would have naturally flowed southwest into the Two Rivers System.

Lands Excluded from the District

Branch A of Judicial Ditch No. 21 - This ditch located along the southern boundary of the District diverts water that would have naturally flowed into the South Branch, west into Thief Lake.

Lateral 1 of State Ditch No. 95 - This ditch intercepts the upper watershed of Badger Creek. In addition, Roseau County Ditch 13 diverts water from Skunk Creek and outlets those waters into Lateral 1 of Ditch 95. These waters now flow directly into the TRWD.

Internal Diversions

Pine Creek Diversion - Primarily on the Canadian side of the International Boundary, north of Dieter Township in the United States, this diversion channel moves water out of Pine Creek westward into storage pools of the RRWMA. The RRWMA is located in the northwest portion of the RRWD.

Water Management Structures

Roseau River Wildlife Management Area - This area of approximately 53,000 acres is located in the northwest part of the RRWD. It was created for the purpose of increasing migratory waterfowl habitat. The land in this area is owned by the State and is managed by the Minnesota DNR. In 1985, a joint project between the DNR, Ducks Unlimited, Red River Watershed Management Board, and the RRWD was undertaken to increase wildlife and flood control benefits of this impoundment. These improvements were done to pool #2 and pool #3, providing 4,985 acre-feet of spring floodwater storage. Pool #2 has an area of 4,900 acres, with a volume of 4,035 acre feet and draw down for spring flooding of 2,885 acre feet. Pool #3 has an area of 4,100 acres, with a volume of 3,900 acre feet and draw down for spring flooding of 2,100 acre feet.

Dam at Roseau - There is a pool of water upstream of the Roseau River dam in the city of Roseau. The pool impounded by this dam is confined within the riverbanks. This dam was modified in 1995 with the removal of walkway and piers for the walkway. This was done because the walkway and piers caught debris and obstructed flows. In addition, concrete on the walkway was deteriorating and citizen's safety was an issue. The dam was again modified in 1999. This involved cutting the headwalls down and sloping the banks. This work was done to further increase safety and to decrease backwater effects during floods at Roseau. During the winter of 2000-2001 the dam was modified by placing rock riprap downstream to make the dam safer and to allow fish passage.

Hayes Lake - Located about 20 miles southeast of Roseau, the Minnesota DNR has constructed an earth dam and lake. The Hayes Lake Dam is about 25 feet in height and the impoundment covers about 187 acres with a capacity of 1640 acre feet at a normal pool elevation of 1167.

Roseau River Flowage - Located in the Beltrami Island State Forest on the headwaters of the Roseau River, this impoundment has an earthen embankment and a sheet pile weir. The permanent pool covers an area of 90 acres, with a volume of 240 acre-feet. The flood pool covers an area of 375 acres, with a volume of 1,140 acre-feet.

Winner Dam - This impoundment was constructed by the DNR and is located on Hanson Creek, in the Beltrami Island State Forest of southeastern Roseau County. The pool covers an area of approximately 200 acres. Recent high water has caused this dam to fail.

Dam 1 - This dam located on the headwaters of Hanson Creek in Beltrami Island State Forest, in southwestern Lake of the Woods County. The pool covers an area of approximately 300 acres. Recent high water has caused this dam to fail.

Ground Waters

Distribution - Glacial drift contains the only known aquifers in the District, although most of the drift is too fine-grained to yield sufficient amounts of water to wells. Material in the aquifers consists largely of fine to medium sands and course gravel. Groundwater is available over a large area and yields are adequate for anticipated needs.

Quantity and Yield - Underground water sources appear to be adequate for the needs of the foreseeable future. Due to high amounts of calcium, iron, magnesium, and bicarbonate ions in solution, well screens become encrusted, resulting in declining well yield. Some screens are replaced every two years, but most screens are used for 5 to 10 years. In many cases, declining yields are caused by incrustation in the well or in adjacent water bearing formations, rather than a lowering of the water level in the groundwater reservoir. Many of the older wells, some of which are more than 50 years old and not screened, flow continuously at a restricted rate. Beach ridge aquifer water production can range from less than 5 gpm in the smaller beach ridges, to over 20 gpm from shallower domestic wells in the larger ridges. An aquifer north and west of Roseau yields 15 to 30 gpm from farm wells. Yields of more than 100 gpm could be developed in this aquifer as evidenced by two active wells at Roseau, both of which yield over 200 gpm. Some wells with natural flow are pumped to increase their yield, and several wells of this type yield more than 100 gpm. Natural flows range from less than 1 gpm to more than 50 gpm, but most flows are less than 10 gpm.

Quality - The hardness of groundwater in most of the basin causes moderate to severe incrustations of well screens and pipes. Where hardness exceeds 500 parts per million (ppm), incrustations on domestic well screens may require replacement after several years of use. Concentration of dissolved iron in most of the basin is sufficient to cause precipitation of relatively insoluble ferric hydroxide when water is exposed to air. Iron also contributes to incrustation of well screens and iron removal from laundry water is necessary.

Recharge Areas - Basically, the two high areas located in the Sandilands Forest Reserve (SFR), located in Canada and in the Beltrami Island State Forest, represents the areas of rapid groundwater recharge in the basin. Another significant groundwater movement is worthy of note. An eastward moving system, originating somewhere west of the Red River, is a source of supply for low flows along most of the Roseau River in Manitoba.

Discharge Areas - The central corridor is primarily an area of groundwater discharge, mainly in the large areas of peat deposits in the lowlands, in the middle of the basin. At the base of Beltrami recharge area, artesian flows are frequently experienced. The Palmville Fen, in the southwest portion of the District, is a discharge area for lands to the west and north. Pine Creek and other small drainage systems west of Pine Creek are major collectors of the groundwater flow moving in a general southwesterly direction from the SFR. Similarly, the Roseau River, Roseau River South Fork, and Hay Creek are primary collectors of northerly flowing groundwater originating in the Beltrami Island Area. The groundwater converges on the Roseau Lake segment of the central corridor from both the south and north recharge areas. The groundwater supply to the Big Swamp portion of the central corridor is primarily from the north. It is likely that a portion of the southwesterly subsurface flow actually bypasses the Roseau River and moves into the Two Rivers Basin.

Unique Water Resources and Land Related Resources

The MN DNR has identified three boreal patterned peatlands of significant value within the District. These are the Pine Creek, Sprague Creek, and the Mulligan Lake peatlands. These peatlands were identified as being ranked in the top eighteen patterned peatlands within the State of Minnesota. In addition, the DNR has identified peatlands within the RRWMA and the Palmville Fen area as high priority non-patterned peat lands.

In the headwaters of the Hay Creek tributary is Bemis Hill Creek, which is managed as a designated brook trout stream.

Outstanding Resource Value Waters (ORVW) - According to MN Rule of 70-50, no ORVW's were identified in the district.

Rare, Threatened and Endangered Species – The Eastern timber wolf, bald eagle and Artic peregrine falcon are species that are on the rare or endangered list that can be found in the District. Wet meadow plants on the rare list include: Yellow water buttercup, starwort, meadow grass and orchids.

Water Use

Groundwater

Water supply for domestic and municipal use is from wells ranging from 80-120 feet deep with an average of 18 grains of total hardness. The towns within the District are supplied by municipal wells. This underground water supply has been adequate to supply the needs of humans and livestock.

The groundwater level in much of the RRWD is at or near the surface, and there are flowing wells in Mickinock, Beaver, Moose, and Solar Townships and near Ross, Pinecreek, Roseau, and Wannaska.

The two active municipal wells in Roseau provide about 41.2 million gallons per year (mgy) for industrial and commercial use and about 27.5 mgy for domestic use. These wells yield from 200 to 300 gpm and are adequate for present needs. Roseau is the only urban site in the Roseau River Basin and the only location of known municipal wells. Most other groundwater pumpage is within the agricultural area around Roseau and provides about 45.5 mgy for domestic use and 103.1 mgy for stock watering.

Inventory of Public Water Supplies

Roseau is the only known municipal water user. The Minnesota Department of Public Heath keeps records of public water supplies in the State.

Inventory of Municipal Wastewater Treatment Systems

The cities of Roseau and Warroad release treated waters to tributaries of the Roseau River.

Existing Water Management Plans and Programs

County Water Management Plans

Comprehensive water plans for Roseau and adjacent Counties have been written in the past. One was released in 1990 and the most recent in 1997. Copies of these reports are on file at the Roseau River Watershed office.

Soil and Water Conservation District Plans

The Roseau County portion of the District lies within the Roseau County SWCD which was organized March 13, 1956. The Marshall County portion of the District and the part of the District in Township 158 North, Range 38 West, in Beltrami County are in the

Marshall-Beltrami SWCD, which was organized in 1950. The Kittson County SWCD was organized in 1953, includes the Kittson County portion of the District. The Lake of the Woods County SWCD was organized in 1952, includes the Lake of the Woods portion the Watershed.

State Agency Water and Resources Management Plans

The Red River Basin Flood Damage Reduction Work Group and Mediation agreement is a collaborative approach to planning and implementing flood damage reduction and natural resource enhancement projects. This agreement spells out goals and strategies that will allow for effective flood protection and natural resource protection. The purpose of this process is to assess the impacts of flood control and natural resource enhancement projects built and supported by the Watershed Districts in the entire Red River Basin.

International Joint Commission

The International Joint Commission has been created by a treaty between the United States and Canada. This body has jurisdiction over matters relating to use, obstruction, or diversion of boundary waters, waters flowing from boundary waters, and waters at a lower level than the boundary in rivers flowing across the boundary. It is also concerned with pollution of boundary waters.

The United States headquarters of this commission is located in Washington, D.C. and the Canadian headquarters is the Department of External Affairs located in Ottawa, Ontario Canada.

Red River Basin Water Quality Plan

MCPA follows the water quality goals and objectives in a document titled Red River Basin Information Document.

Roseau River Flood Committee

This committee has been involved in several projects that have an impact in the District. A public survey was mailed out to county citizens in 1997. A copy of the results of this survey is on file at the watershed office. Mr. Robert Bergland is the current acting chair of this citizens group.

Roseau River International Watershed

The Roseau River International Watershed (RRIW) was formed in 2002. The primary goal of this group is to work towards solutions of water issues in the Roseau River Basin in Minnesota, USA and Manitoba, Canada. This organization is in its infancy but is working to solve the complex water issues in the two countries. Names of the board members and meeting times are kept at the RRWD office in Roseau, MN.

SECTION IV: EXISTING WATERSHED CONDITIONS

Existing Conditions

The Roseau River flows north and west through Roseau County and the extreme northeastern corner of Kittson County before entering Canada. The drainage area of the river in Minnesota is approximately 1,570 square miles, as measured upstream of the Caribou gage in Kittson County near the Canadian border.

The predominant land use in the RRWD is cultivated cropland, although there are large areas of wetlands interspersed with grasslands and forests (Figures 4 & 15). The upper reaches of the North and South Branch of the Roseau River contain a mixture of cropland, wetlands, grasslands, and forest. From the upper reaches downstream to Ross, cultivated cropland predominates.

Flooding problems within the Roseau River Basin vary from tributary to tributary and by location along the Roseau River. They also vary by land use. The extent of the problem and the causes are still being defined and modeled. However, the existing conditions are discussed in general below. A more detailed discussion can be found in the subwatershed implementation section of this plan.

Flood Damage Reduction

Upper Roseau River to Roseau

The upper reaches of the Roseau River and its tributaries generally feature incised channels and well-defined adjacent floodways. Natural floodplain storage is relatively limited. Some storage is provided by Hayes Lake and the Roseau River Flowage Impoundment. However, the aggregate storage of these reservoirs is relatively small. Consequently, high peaks and relatively short duration characterize the flood flows on the Roseau River upstream from Roseau.

Populated areas subject to flooding are Wannaska, Malung, and Roseau.

The maximum flow recorded at Malung was 16,000 cubic feet per second (cfs) in 2002 from a drainage area of about 435 square miles (Appendix 10). This is equivalent to over 36 (cfs) per square mile. This record flow in 2002 was over **2 times** higher than the previous record high which was recorded in 1950. This extremely high volume of water that fell in a 48- hour period was the reason for the extensive flooding and flood damage in 2002.

Roseau River from Roseau to Ross

At Roseau, the Roseau River enters a lake plain area and dramatically changes. Although the main channel of the river remains well defined, the floodway becomes diffused and the

floodplain area and associated storage is massive. From approximately 3 miles north of the city of Roseau, the Roseau River has been dredged into a legal ditch, State Ditch 51. The floodplain area includes the old Roseau Lake bed. Floodway flows are typically away from rather than adjacent to the river from the City of Roseau to the old Roseau Lake bed. Remnants of overflow channels can be seen on the landscape. However, the overflow characteristics of the river have been largely ignored in the construction of roads and related culverts in the floodway area. The resultant loss of natural floodway capacity causes a significant increase in flood elevations at Roseau.

A portion of the City of Roseau is within this reach and most of the city is within the designated 100-year floodplain. It is partially protected by levees and emergency sandbagging.

The maximum flow recorded at Ross was 10,500 cfs in 2002 from a drainage area of 1,023 square miles (Appendix 11). This is equivalent to 10.26 cubic feet per second per square mile. The decrease in flow in spite of an increase in drainage area is due to floodplain storage. Most of the floodplain area is used for agricultural production, which suffers huge losses.

Roseau River from Ross to Caribou

From the old Roseau Lakebed to the Big Swamp the river channel has a capacity of about 2,550 cfs. Flows at or above this figure are frequent and may have a duration of a month or longer. The Duxby Levee built by the USCOE protects much of the area south of the River. However, during these periods the river does not provide an outlet for the ditch system that would normally drain into it. The Big Swamp provides another major floodplain storage area. When levels in this area get high, flows cross over into the TRWD. These flows are initially through the culverts under County Road 7 into State Ditch 72. At high levels, water also overtops CR 7, causing significant traffic interference. Generally, water that flows into the Two Rivers Watershed occurs late in the runoff event after the local drainage into SD 72 has subsided. However, the amount of flow can exceed the ditch capacity and cause considerable damage in overflow areas. Therefore, crossover flows should be considered a benefit to the Roseau River Basin, but can be a problem to the Two Rivers.

There are no major populated areas in this reach of the river.

The maximum-recorded flow at Caribou was 4,320 cfs in 2002 from a drainage area of 1,570 square miles this is equivalent to 2.75 cubic feet per second per square mile (Appendix 12). The previous recorded high was 4,080 cfs (2.6 cfs/square mile) in 1950.

Roseau River from Caribou to Dominion City

This reach of the Roseau River is in Canada. The flood peak is typically much earlier at Dominion City than at Caribou. This would seem to indicate that the peak flows within Canada are primarily due to local runoff.

Related Problems Flood Damage Reduction

Upstream of the city Roseau, the basin drainage area is fan shaped with significant slopes such that any excess waters rapidly run off and produce flash type flooding, taking out roads and bridges as it flows down stream. This has also caused concerns of major flooding in the city of Roseau. Until the summer of 2002, the temporary dike system in the city has done a fairly good job of protecting the city from devastating flooding. Starting just a few miles upstream of Roseau, the slope flattens as it enters the glacial age lake plain. The city is actually located on the prehistoric flood delta formed where the river entered the ancient lake plain. With this loss of grade the flood waters lose velocity and start to "stack up" resulting in flooding in the city of Roseau and the surrounding agricultural land. CRP and other large tracts of land make this an attractive area for potential water impoundments see figure 14. For additional impoundment sites, see JOR Report - Impoundments sites August 5, 2002)

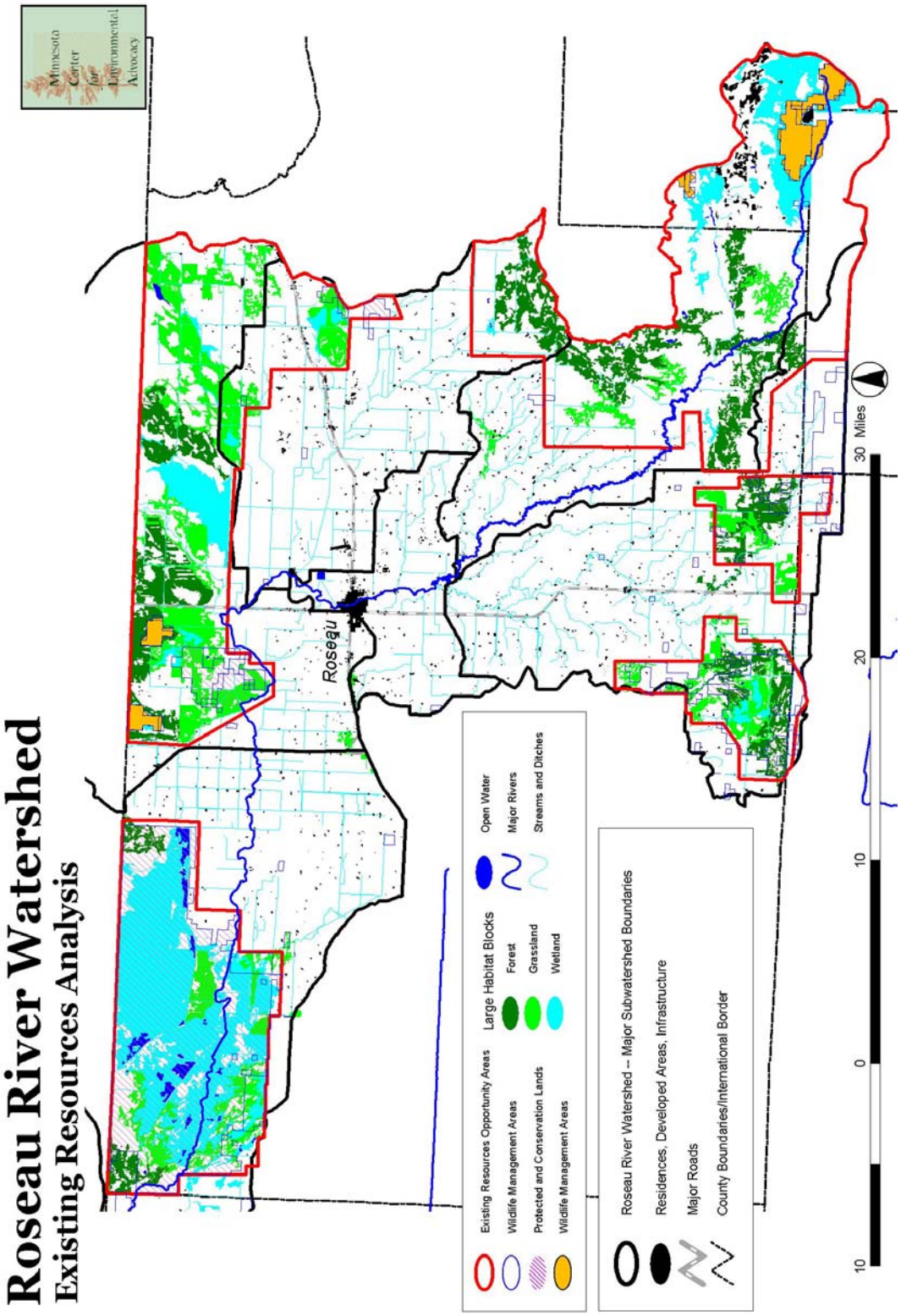
Downstream of Roseau to the Canadian border is a flat lake plain with limited natural drainage. Just down stream from the city of Roseau is the historic Roseau Lake basin, which was drained in the early 1900's. The lake basin does temporarily store water (from the upper reaches of the Roseau River, South Branch of the Roseau, and Hay and Sprague Creeks) thus, provides considerable attenuation of flood flow rates for the land downstream. Depending on the time of year this temporary storage comes at the expense the agricultural land, homes, roads and bridges around the perimeter of the lakebed.

The original river channel downstream of Roseau Lake was able to handle flows experienced on a yearly basis before flooding overland. The channel capacity was enlarged to approximately a 3-year capacity by the State of Minnesota in the early 1900s. However, with more extensive drainage (over 1200 square miles) and the tendency for increased water flow due primarily to this increased drainage system, the river channel is still inadequate for economic farming operations.

Before entering Canada, the Roseau River flows into a large area called the Big Swamp. The topography of the land in the Big Swamp slopes to the south such that before the State enlarged the Roseau River channel, the majority of flood flows went into the TRWD (which still happens during periods of high flows). Thus, Canada was not prepared for the increased flood flows that resulted from the early 1900's Roseau River enlargement.

The Canadians did construct a floodway just across the border and will have legitimate concerns if a plan results in any future increase in peak flood flow rates. Meanwhile, given the Roseau River dredging, the TRWD hasn't flooded as often, which led to land improvements that are now subject to flood damages when the excess floodwaters flow south and over top County Road #7.

Figure 13: Existing Resource Analysis



Natural Resources Enhancement

A total of 150,000 acres are considered to be excellent wildlife habitat in the RRWD. This represents approximately 20% of the District. These areas are primarily located on the south, east and northern borders of the District (Figure 13: Existing Resource Analysis).

A substantial portion of the land in the RRWD is publicly owned and managed as wildlife habitat, forestry, and for recreational purposes. A total of 123,281 acres is designated as recreational lands, excluding Beltrami Island State Forest, which contains an additional 121,680 acres. Most of these lands are in wildlife management areas, including Enstrom, Palmville, Roseau River, Solar and many others (Table 4). Other public areas include the Roseau Park and Recreations area, Hayes Lake State Park, and the Lost River State Forest.

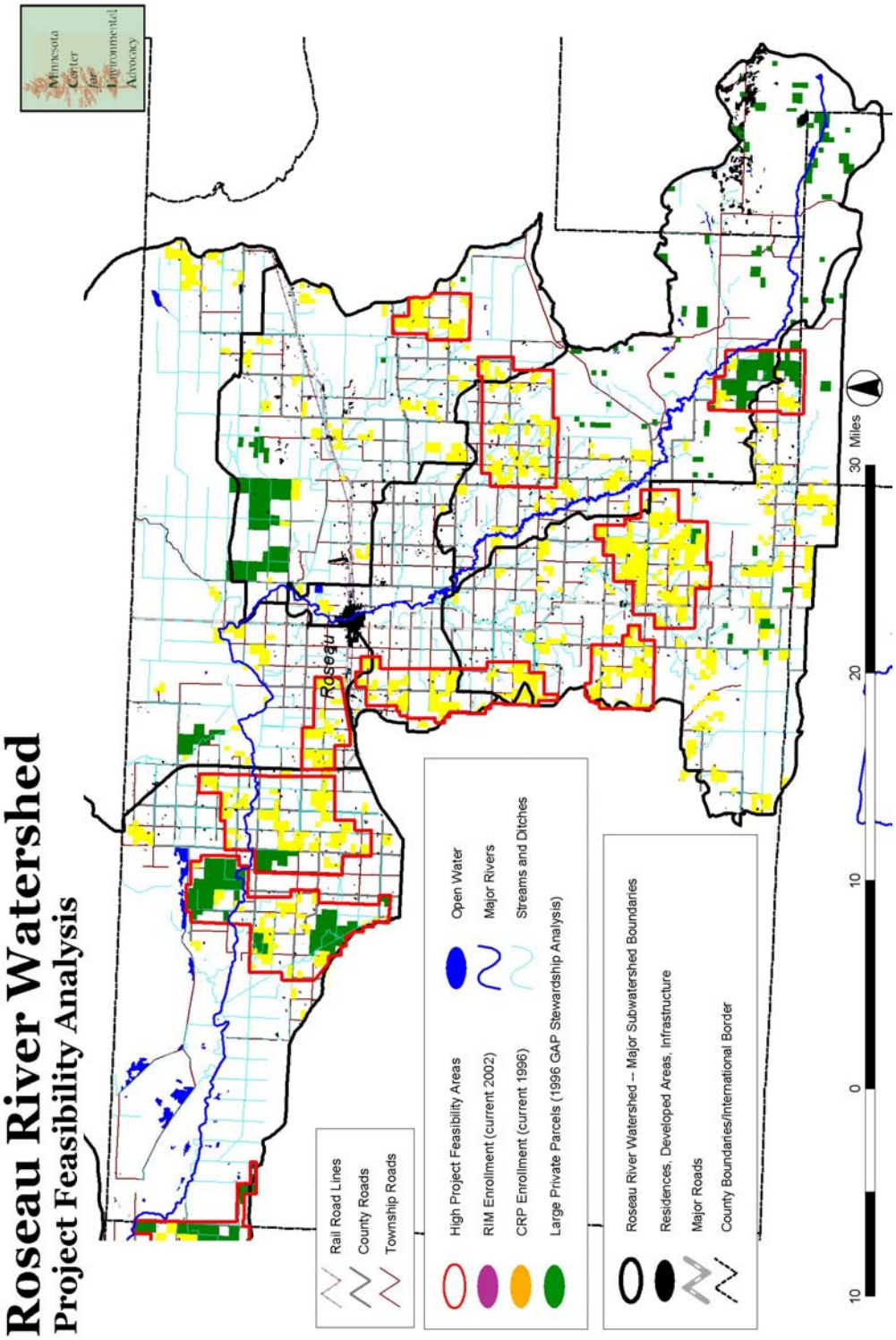
Included in these publicly owned lands are three "Scientific and Natural Areas" (SNA):

- Pine Creek Peatland SNA
- Sprague Creek Peatland SNA
- Mulligan Lake Peatland SNA

The remaining wildlife habitats are diverse and support a diverse population of wildlife. The prairie remnants (primarily located in the beach ridge area) on the southern and northeastern regions of the District provide valuable habitats for those species that utilize grassland ecosystems wholly or in part. The woodlands and brushlands, which are largely located in state forests in the south and eastern portions of the District, provide breeding, nesting, feeding and resting areas for both migratory and resident wildlife. Where the woodlands and brushlands are contiguous in a linear fashion along streams, found throughout the watershed, they provide travel corridors through disturbed areas. Wetlands, which include potholes, marshes and open water, provide excellent habitats for migratory waterfowl, and in some cases spawning areas for fish. Although wetland habitat blocks are dispersed throughout the watershed the highest concentration is located in the northwestern portion of the District.

The drainage of wetlands and the clearing of timber, woodlands, and brush for agricultural purposes has had a major impact on the natural resources. These activities have highly affected woodland habitat, and moderately affected grassland and wetland habitats resulting in the loss of wildlife numbers and diversity. Historic woodland loss has been 79%. The remaining woodlands make up six percent of the District. Historic grassland loss is approximately 51%. The remaining grasslands cover 5% of the watershed. Historic wetland loss is at 17%. Wetlands make up 43% of the watershed. Source: "EIS of Flood Control impoundments in northwest Minnesota; Technical appendices Volume 2".

Figure 14: Project Feasibility Analysis



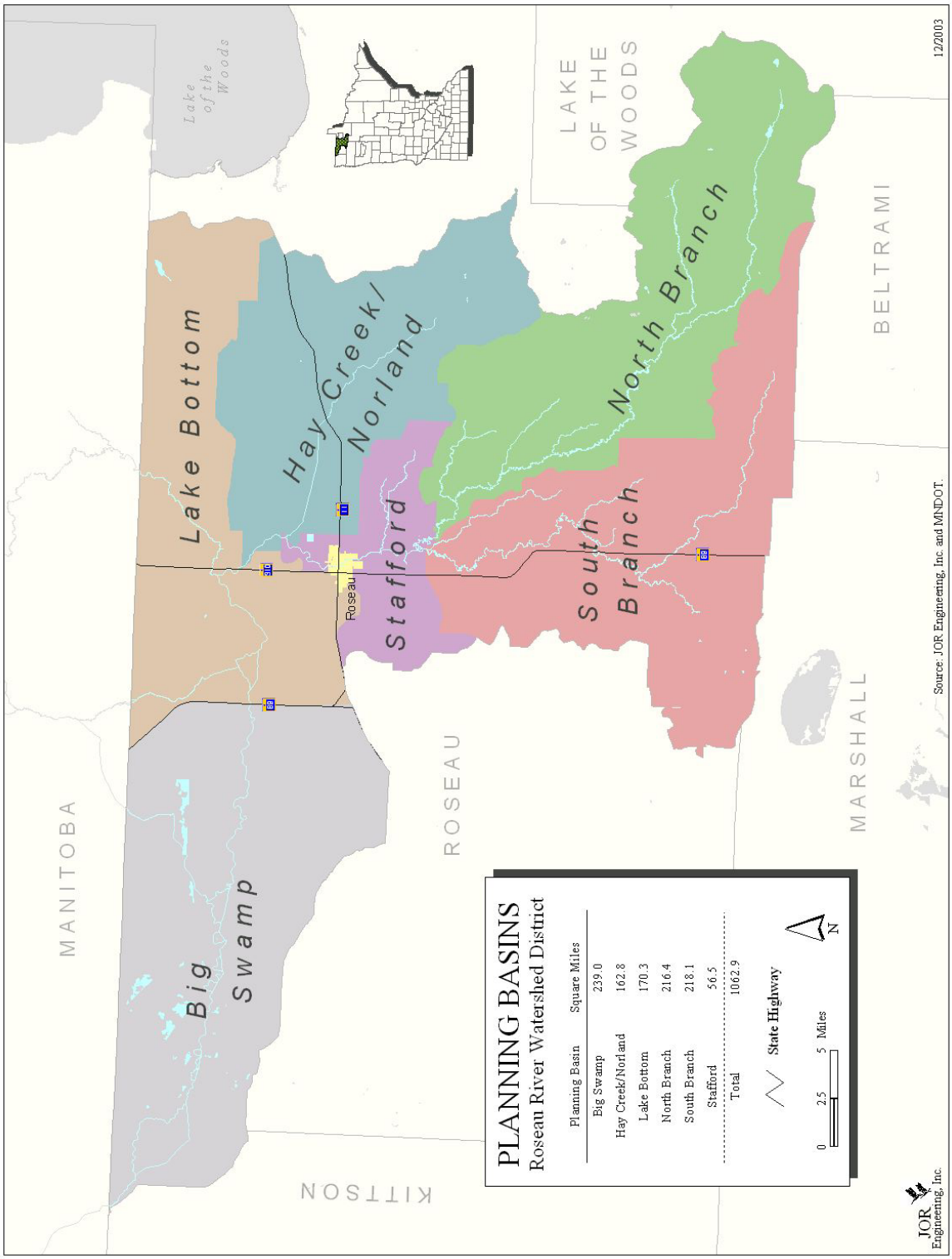
Drainage and land clearing often cause a reduction in the quantity and quality of fish habitat. With more land in agricultural production, the need for more effective main stem water conveyance was needed. Most of the Roseau River north of the city of Roseau and Hay Creek have had the original channel straightened. This has contributed to what can be described as a flashy hydrograph of the Roseau River system, which has had major impacts on the fisheries and stream morphology on the Roseau River System (Red River Basin Stream Survey Report, Roseau River Watershed 2000). Hydrographs of this nature coupled with the loss of functional riparian buffers reduces stream habitat quality by destabilizing stream banks, and reduces base flows that are critical for maintaining healthy fish communities.

Water Quality

Like most watersheds within the Red River Basin, much of the natural hydrology and landscape of RRWD has been altered to accommodate agriculture and other land use activities. As a result, the water quality of the watershed's rivers and streams has been adversely impacted in many instances. Insufficient water quality data prevents a detailed water quality analysis of the watershed's rivers and streams. Therefore, there is no way to ascertain the level of surface water degradation since pre-development times. The data that does exist infers that most surface waters within the District have in fact been impacted. Comparison with surface water quality data collected for the least impacted streams in the Northern Minnesota Wetland Ecoregion indicates that the Roseau River and its tributaries such as Hay Creek and Sprague Creek on average fall short of water quality mean concentrations expected in this ecoregion. Notably, recent sampling by River Watch in the watershed indicated (Roseau River Water Quality Summary, 2002) the average expected for total phosphorus (.083mg/l), and turbidity (9.4 NTU) is very seldom met. Nutrients such as phosphorus are critical factors in the degradation of surface waters. Furthermore, virtually the entire length of the Roseau River has been identified by the MPCA in its 303d listing as being impaired for dissolved oxygen (numerous readings of less than 5mg/l of DO). A TMDL study has been initiated on the Roseau River to validate that data and ascertain whether the oxygen depletion is due to naturally occurring conditions or other causes.

Several groups and organizations have been involved with water quality evaluations in the RRWD. The Red River Basin Monitoring Program, Roseau Soil and Water Conservation District, Minnesota Pollution Control Agency and the river watch program have been involved in water monitoring in the RRWD. Water quality information is on file at the RRWD office (Roseau Watershed Water Quality Summary 2002, River Watch information).

Figure 15: Planning Basins



Section V: Overall Watershed Goals

In an attempt to identify localized problems and issues that contribute to the over-all issues experienced within the RRWD, the District engaged in two processes. Prior to the signing of the "Red River Basin Flood Damage Reduction Work Group Mediation Agreement of December 1998", the RRWD formed a Roseau River Flood Control Committee to address the recurring flooding issues within the District. This committee, being interested in public opinion, conducted a mail survey in 1997 (Copy of survey on file at RRWD office). The purpose of the survey was to gather public opinion on the District's flood control efforts and the level of public support to the various approaches. Results of this mail survey were used in the planning process of this Overall Watershed Plan.

In the other process, the District identified FDR and NRE issues during this Overall Plan update process. The RRWD was divided into six subwatersheds or planning units (Figure 15). The RRWD engaged in a detailed issues identification process in each planning unit with landowners, residents, local, state, and Federal agencies. CAC and TAC groups were involved in the identification of the existing conditions, problems, potential solutions and other water issues of each subwatershed (data on file at RRWD office). This information will help to channel resources to the highest priority project or areas. It is critical that each piece of this watershed plan fits together in a coordinated fashion, even if components are completed at different times based on resources available. If a long-term plan is followed in a step-by-step sequence, when all components are implemented the RRWD should be much better off than if projects were completed on an as need basis.

The vision of the Roseau River Board of Managers is to be good stewards of water resources in the District. In other words, water quality and quantity and other water resources will be left to future generations in better conditions than exist today. The RRWD Board of Managers is committed to help solve water issues in the entire hydrologic basin of the RRWD. A high level of cooperation, coordination and communication is required as the RRWD lies in two countries, the State of Minnesota and the Province of Manitoba.

The RRWD Board of Managers will strive for fairness when trying to solve difficult water problems and concerns of all interested parties. The Board of Managers will utilize various programs and implementation strategies to strike a balance between flooding and flood damage concerns while at the same time making good decisions regarding the conservation and wise use of the Districts water and water resources.

A desired outcome of the information contained in this overall plan was local citizen's input. One of the methods used to gather local information was the formation of a Citizen's Advisory Committee (CAC). This committee met monthly to provide input and discuss various aspects of the overall plan. Another important source of information was a survey sent to the citizens in the District (Mail survey on file at the RRWD office).

A mail survey was sent to citizens of the district to gather input on flood and flood control issues in the district. Forty-seven percent (1067) of the citizens in the district completed and returned this mail survey. Results of the survey; 81% of the respondents indicated a need for flood management in the Roseau River Basin. When asked what flood control measures would be supported: Drainage ditches and levees in Roseau would be supported by 81%, sandbagging and gated culvert openings 77%, improved channelization and restoration of the Roseau river 65%, conservation tillage 64%, floodways 62% and wet dam impoundments, temporary dikes and culvert sizing 60%. Citizens in this survey indicated public support for a project should be 2/3 or greater.

A Technical Advisory Committee (TAC) met monthly to comment on various aspects of the plan, review the manuscript, and provide data and other input to be included into the overall plan. The TAC was made up of various State and Federal Agencies as well as local government and watershed personnel. The results of the individual subwatershed problems and concerns can be found in the CAC and TAC identified existing conditions, problems, potential solutions and other water issues of each subwatershed (data on file at RRWD office).

This information was given an index as a method of ranking the various issues and concerns for the entire District. FDR identified issues for each subwatershed is listed in Appendix 1. A weighted index was used to prioritize items in the entire watershed. The top 5 responses in a category were added together to give a composite score and the location in the RRWD (Appendix 2).

Overall FDR goals were organized to address the high priority issues in the District. The following 5 goals provide a framework for potential solutions for the identified flood damage reduction items from input by CAC, TAC and public survey information.

FDR Goals, Objectives, and Indicators

Implementation of these goals will take cooperation with other organizations, local state and federal government and local citizens.

Goal 1: Provide 100-year flood protection for the City of Roseau and rural homesteads in the district.

Objectives:

1. Reduce the 100-year flood flow rate
2. Reduce height of 100-year flood
3. Raise the no damage elevation

Indicator: The 100-year flood height below the no damage elevation

Potential Partners: City of Roseau, Roseau County Board, Landowners, Township Boards, RRWMB, NRCS, FSA, BWSR, and DNR.

Goal 2: Provide 10-year flood protection for Agricultural lands

Objectives:

1. Decrease the 10-year flood flow rates
2. Increase channel capacity
3. Improve outlets for water

Indicator: The 10-year flood height below a no damage elevation

Potential Partners: Roseau County Board, Landowners, Township Boards, RRWMB, NRCS, FSA, BWSR, and DNR.

Goal 3: Reduce flood damage to Roads and Crossings

Objectives:

1. Reduce flow rate upstream
2. Comprehensive culvert sizing program
3. Armor road overflow areas
4. Raise the road

Indicators:

1. 10 year washout of minimum maintenance roads
2. 25 year washouts of township roads
3. 50 year washouts of county roads
4. 100 year washouts of trunk highways
5. Reduction of dollars spent for road repairs

Potential Partners: County Highway Departments, State of Minnesota, Roseau County Board, Landowners, Township Boards, RRWMB, NRCS, FSA, BWSR, DNR,

Goal 4: Reduce Drought Damages

Objectives:

1. Reduce flashiness and extend stream flow into summer months
2. Utilization of impoundment water for irrigation
3. Improve understanding of Ground Water resources

Indicator: Plants at the wilting point; leaf rolling, loosing green color or leaf drop.

Potential Partners: Roseau County Board, Landowners, Township Boards, RRWMB, NRCS, FSA, BWSR, and DNR.

Goal 5: Preserve ground water supply and recharge areas.

Objectives:

1. Identify and protect groundwater recharge areas.
2. Support well water testing programs.
3. Support well capping program.
4. Protect surface and groundwater from chemical contamination, nutrient loading and sedimentation.

Indicator: Stable or improved water quality over time.

Potential Partners: Roseau County Board, Landowners, Township Boards, NRCS, FSA, BWSR, and DNR.

The above-stated Goals and Objectives will be accomplished by utilizing the strategies outlined in a report titled: "Roseau River - A Comprehensive Water Management Plan" (Appendix 13). The Roseau River Watershed Board of Mangers and other groups can use this information when planning current projects or proposed projects to address specific flood damage control issues. However, the implementation of these FDR goals will take cooperation with other organizations, local state and federal government and local citizens to address specific flood control issues.

The planning process for flood damage control in the entire Roseau River Basin will require a comprehensive effort. A document titled "Roseau River - A Comprehensive Water Management Plan", written by JOR Engineering is an attempt to solve flooding problems in the entire watershed (Appendix 13). The proposed cost of this entire plan was over $100 million in 2004. However, cost estimates of the damage done by the June 2002 flood are over $100 million. If this comprehensive plan had been in place prior to June 2002, the cost of the projects would have been less than the damage that occurred.

All the proposed projects that have been identified to reduce flood damages will not be built at the same time. For this reason, it is important to have an overall plan in mind when building flood control projects. These projects will have to be constructed in phases. If an overall plan is followed, the various phases of flood damage control projects will be constructed independently but in the end will fit together in a coordinated fashion.

To accomplish this watershed wide flood damage reduction plan, a cooperative mind-set of all the people in the district will be needed. An attitude of "the only good water is water off my property as fast as possible" will have to change in order to accomplish watershed wide flood damage reduction goals.

Overall NRE Goals

A desired outcome of the information contained in this overall plan was local citizen's input. One of the methods used to gather local information was the formation of a CAC. This committee met monthly to provide input and discuss various aspects of the overall plan.

The TAC met monthly to comment on various aspects of the plan, review the manuscript, and provide data and other inputs to be included in the overall plan. TAC consisted of personnel representing various State and Federal Agencies, local government representatives, and watershed board members.

The results of the individual subwatersheds problems and concerns can be found in the CAC and TAC identified existing conditions, problems, potential solutions and other water issues of each subwatershed (data on file at RRWD office).

The individual subwatershed responses were given a weighted index as a method to give a priority ranking for the entire watershed. NRE identified issues for each subwatershed is listed in the Appendix 3. A weighted index was used to prioritize items in the entire watershed. The top 5 responses in a category were added together to give a composite score and the location in the RRWD (Appendix 4).

Overall NRE goals were identified to address high priority issues in the District. The following 5 goals provide a framework for potential solutions for identified NRE items provided by CAC, TAC and local citizens input.

NRE Goals, Strategies, and Indicators

Implementation of these goals will require cooperation with State and Federal Agencies, State and local governments, and local citizens.

Goal 1: Protect, restore, enhance and manage lakes and streams in the Roseau River watershed to support sustainable aquatic communities.

Objective 1: Lower peaks and enhanced base flows compared to the current hydrograph for a given runoff event.

Strategies:

1. Identify and utilize groundwater recharge areas to augment base flows.
2. Identify, construct and manage water retention areas upstream of Roseau that will reduce peak flows and augment base flows.
3. Manage drained lake basins (Roseau, Whitney, Mud etc.) to reduce peak flows and augment base flows.

4. Develop water storage areas to reduce peak flows and stabilize hydrology by supplying base flow augmentation.
5. Implement a culvert-sizing program that will attenuate peak flow.
6. Restore pre-drainage hydrology in areas where it would serve to reduce peak flows and augment base flows.
7. Re-evaluate management plans and design of existing water retention areas for potential reduction of peak flows and augmentation of base flows.

Indicator: Increased Q-90 (indictor of low flows) values and decreased 100 year flood values for stream-gauging stations at Malung, Sprague and Caribou.

Potential Partners: BWSR, County and Township Boards, DNR, FSA, NRCS, MPCA, State of Minnesota, MN dept of Ag, SWCD, USFWS

Objective 2: Identify, prioritize and rehabilitate reaches of streams that have been modified or straightened; and add to, protect, enhance, and maintain existing naturally functioning riparian areas.

Strategies:
1. Increase the extent of functional riparian areas along streams in the watershed.
2. Support the American Fisheries Society guidelines for woody debris and snag removal. Utilize these guidelines to manage woody debris accumulation in rivers and streams to enhance fish and wildlife habitat and minimize negative effects (plugging bridges and culverts) during high water events.
3. Rehabilitate reaches of degraded streams.

Indicators:
1. Increase the number of miles and/or acres of naturally functioning riparian areas along streams in the watershed.
2. Miles of rehabilitated streams.

Potential Partners: BWSR, County and Township Boards, DNR, FSA, NRCS, MPCA, State of Minnesota, MN dept of Ag, SWCD, USFWS

Objective 3: Improve fish passage on the main stem and major tributaries.

Strategies:
1. Eliminate fish barriers, where appropriate, on the main stem and major tributaries.
2. Reduce low flow events in the watershed (see Objective 1).
3. Design and size culverts that will facilitate fish passage on the main stem and major tributaries.

Indicator: Increase the number and diversity of fish species in the upper reaches of the main stem and major tributaries of the Roseau River.

Potential Partners: BWSR, County and Township Boards, DNR, FSA, NRCS, MPCA, State of Minnesota, MN dept of Ag, SWCD, USFWS

Objective 4: Reduce erosion and sedimentation of ditches, streams and rivers.

Strategies:

1. Encourage agricultural best management practices (BMP) to reduce soil erosion by wind and water.
2. Utilize buffer strips on agricultural lands adjacent to ditches, rivers and streams.
3. Enhance naturally functioning riparian corridors along streams (see objective 2).
4. Cooperate with agencies such as SWCD and NRCS in programs/projects that reduce soil erosion and sedimentation of streams (CRP, RIM CREP etc).
5. Reduce flashiness (maximum flow velocities) of the flood hydrographs.

Indicators:

1. Improved water quality of streams (turbidity).
2. Increased stable reaches of streams.

Potential Partners: BWSR, County and Township Boards, DNR, FSA, NRCS, MPCA, State of Minnesota, MN dept of Ag, SWCD, USFWS

Goal 2: Manage wetland and upland habitats in the Roseau River watershed to support sustainable wildlife communities.

Objective 1: Manage existing wetland and wildlife areas to maximize wildlife productivity and minimize adverse effects to agricultural interests.

Strategies:

1. Support active management of public lands by prescribed burning, selected timber harvest, wildlife food plots, and other methods.
2. Develop partnerships with public land owning agencies (WMA, State Forests, etc) for opportunities to meet overall watershed goals.
3. Encourage programs and/or partnerships between individual landowners and public agencies to enhance wildlife habitat.
4. Develop programs and/or partnerships with individual landowners to enhance wildlife habitat.
5. Support enrollment of marginal land in set-aside programs (CREP, RIM).
6. Support adequate funding for programs that beneficially impact wildlife resources.

Indicators:

1. Reduced wildlife depredation complaints/problems.
2. Increased wildlife numbers and diversity in managed areas.
3. Numbers of projects and acres enrolled therein.
4. Increased harvest levels of game species.

Potential Partners: BWSR, County and Township Boards, DNR, FSA, NRCS, MPCA, State of Minnesota, MN dept of Ag, SWCD, USFWS

Objective 2: Promote communications between government agencies, landowners and local citizens.

Strategies:

1. Recommend the formation of an advisory board that promotes communication and seeks common solutions.
2. Encourage communications between public land managers and local citizens.
3. Distribute or contribute to a newsletter (e.g. SWCD newsletter)

Indicator: The formation of an advisory board or regular newsletters to improve communications between private and public landowners and the general public.

Potential Partners: BWSR, County and Township Boards, DNR, FSA, NRCS, MPCA, State of Minnesota, MN dept of Ag, SWCD, USFWS

Objective 3: Increase and enhance wetland and upland wildlife habitat and promote diversity of flora and fauna in the watershed.

Strategies:

1. Support CRP or other long-term conservation practices in sensitive areas.
2. Restore native grassland areas.
3. Support reforestation efforts where practical.
4. Identify critical areas of waterfowl habitat and improve waterfowl nesting sites.
5. Utilize soil survey, land use maps and aerial photography to help prioritize and classify tracts of land to optimize management of wildlife habitat.

Indicators:

1. Increased acres in sensitive areas enrolled in continuous conservation programs.
2. Increased number of acres enrolled in native grass or forest.
3. Support the design of wildlife areas based on land use patterns.

Potential Partners: BWSR, County and Township Boards, DNR, FSA, NRCS, MPCA, State of Minnesota, MN dept of Ag, SWCD, USFWS

Goal 3: Preserve, protect and restore unique natural resource communities and other features in the watershed.

Objective 1: Support the preservation and rehabilitation of unique natural resources and features.

Strategies:

1. Identify and catalog potential sites for the DNR heritage database.
2. Protect endangered species (plants and animals).
3. Support DNR trout stocking program in cold-water streams including stream rehabilitation.
4. Preserve Native American burial grounds/sensitive sites.
5. Restore the Palmville fen.
6. Restore some long-term water storage in Roseau Lake.
7. Document unique watershed features and support efforts to protect sensitive areas.
8. Participate in/and support projects that have a goal to improve unique natural resources in the watershed

Indicators:

1. No-net loss of unique natural resource areas and a gain in these unique areas in the watershed.
2. Improve the uniqueness of natural resources in the watershed.

Potential Partners: BWSR, County and Township Boards, DNR, FSA, NRCS, MPCA, State of Minnesota, MN dept of Ag, SWCD, USFWS

Goal 4: Increase and promote outdoor recreational activities related to fish, wildlife and other natural resources in the watershed.

Objective 1: Evaluate existing recreational opportunities and expand, where appropriate, outdoor activities on lakes and streams in watershed.

Strategies:

1. Cooperate with federal, state and local agencies to develop plans that balance local economic benefits, recreational opportunities and stewardship with environmental and wildlife resources.
2. Support installation of ADA (American Disabilities Act) facilities.
3. Expand current boat access sites on the Roseau River.

Indicators:

1. Implementation and promotion of Roseau River Local Management Plan.
2. Number of ADA approved and boat access sites.

Potential Partners: BWSR, County and Township Boards, DNR, FSA, NRCS, MPCA, State of Minnesota, MN dept of Ag, SWCD, USFWS

Objective 2: Promote hunting and wildlife viewing areas on public land.

Strategy: Improve cooperation between public and private landowners to increase wildlife habitat and promote a positive experience for the general public.

Indicator: Increased number of people that have a positive experience when hunting and viewing wildlife.

Potential Partners: BWSR, County and Township Boards, DNR, FSA, NRCS, MPCA, State of Minnesota, MN dept of Ag, SWCD, USFWS

Objective 3: Improve access of roads, trails and walking trails on public lands.

Strategies:

1. Support the development of trails for all terrain vehicles (ATV) and snowmobiles that balance recreational opportunities with minimal impacts on wildlife and surrounding environment.
2. Support the creation of new and enhance existing walking and bike trails.
3. Recommend the MN DNR evaluate current motorized vehicle roads, trails and where appropriate, recommend improvements or close trails in sensitive areas.

Indicator: Coordinated network of access trails to provide outdoor recreational opportunities for the diverse interests of the general public.

Potential Partners: BWSR, County and Township Boards, DNR, FSA, NRCS, MPCA, State of Minnesota, MN dept of Ag, SWCD, Local trail riding clubs, USFWS

Goal 5: Improve water quality in the Roseau River Watershed.

Objective 1: Maintain and improve the surface and ground water resources within the watershed.

Strategy: Endorse, promote, plan for and implement all projects, plans, activities and strategies that protect and enhance the surface and groundwater resources of the watershed.

Indicator: Observed and measured improvements in the chemical and biological indicators for both surface and ground waters within the watershed.

Potential Partners: BWSR, County and Township Boards, DNR, FSA, NRCS, MPCA, State of Minnesota, MN dept of Ag, SWCD, USFWS

Objective 2: Construct flood damage reduction projects and initiate flood damage reduction activities that improve surface water quality downstream of these projects.

Strategies:

1. Develop monitoring plans for each project that are consistent with the recommendations for project monitoring offered by the Red River Basin Flood Damage Reduction Workgroup.
2. Develop project operational and maintenance plans that address long-term natural resource enhancement activities and water quality goals.

Indicator: Water quality data for each project site that document both pre- and post construction water quality conditions.

Potential Partners: BWSR, County and Township Boards, DNR, FSA, NRCS, MPCA, State of Minnesota, MN dept of Ag, SWCD, USFWS

Objective 3: Participate with federal, state and local agencies to develop a long-term watershed-wide monitoring program that effectively assess changes of water quality over time.

Strategies:

1. Participate with the MPCA and the Roseau County SWCD in the development and operation of the Red River Basin Water Quality Monitoring Program.
2. Continue to participate in the River Watch Program.
3. Develop project-monitoring plans that can be readily integrated into other monitoring programs and activities within the watershed.

Indicators:

1. The establishment of long term monitoring sites within the watershed to effectively characterize water quality tends throughout the watershed.
2. The establishment of long term monitoring sites within the watershed that are integral components of the Red River Basin Water Quality Monitoring Program.

Potential Partners: BWSR, County and Township Boards, DNR, FSA, NRCS, MPCA, State of Minnesota, MN dept of Ag, SWCD, USFWS

Objective 4: Coordinate the watershed's water quality activities with related programs and activities of federal, state and local agencies and organizations.

Strategies:

1. Support the implementation of storm water BMP's within the watershed.
2. Support the implementation of agricultural Best Management Practices (BMP's).
3. Partner with the MPCA and other local units of government in the preparation of watershed Total Maximum Daily Load (TDML) studies.
4. Cooperate with state, federal, and local units of government to ensure future activities undertaken by the district takes into account load allocation strategies identified by local TDML studies.

Indicators:

1. Acres enrolled in conservation programs.
2. Reduced pollutant loads to the Districts lakes, rivers and streams.
3. TMDL strategies included in the watershed district's plans.

Potential Partners: BWSR, County and Township Boards, DNR, FSA, NRCS, MPCA, State of Minnesota, MN Dept of Ag, SWCD, USFWS

By following the above goals and strategies the natural resources of the area will be in better conditions for future generations than they are today. The Roseau River Watershed Board of Managers and other groups can incorporate the NRE goals, indicators, and strategies into current and proposed projects in the District. This will insure that future generations will be able to enjoy the various outdoor activities that range from bird watching, hunting and fishing to trail riding.

Section VI: Subwatershed Implementation Plans

The RRWD was divided into six major subwatersheds (Figure 15: Planning Basins). This watershed plan made an attempt to divide the district into subwatersheds with similar problems and concerns. The information in the following sections came from a series of meetings of CAC and TAC. These committees met monthly over the last 18 months and provided much of the information for this report.

For each subwatershed, the existing conditions, problems, opportunities, environmental issues and water management issues were identified (CAC and TAC identified existing conditions, related problems and potential solutions document on file at RRWD office). A discussion of potential FDR and NRE goals and solutions for each subwatershed are outlined in this plan. A listing with a weighted index of the identified FDR and NRE issues for each of the subwatersheds can be found in the Appendix 1-4. The weighted index is a method of ranking the various identified problems in the entire watershed.

BIG SWAMP

Description of the subwatershed

The Big Swamp is located in the northwest section of the RRWD and lies in Roseau and Kittson counties. The big swamp subwatershed consists of 239 square miles. The International Border is the north boundary, the Lake Bottom subwatershed borders on the east and the TRWD on the south and west. State ditch 51 (Roseau River) outlets the RRWD into Canada in the northwest corner of this subwatershed.

The Roseau River Wildlife Management Area (RRWMA) is the primary surface water feature in this subwatershed. The RRWMA was constructed over 50 years ago with the primary purpose to provide wetland habitat for marsh dependent wildlife species. In the 1980s, water control structures were redesigned to improve the management of water in the pools and improve flood control benefits.

The Roseau River has been dredged and straightened as State Ditch 51 from two miles north of Roseau to the Caribou outlet two times beginning in the early 1900's. These efforts to move water faster through the Big Swamp by deepening and straightening the channel has not been very successful due to the limited outlet into Canada, near Caribou. In addition, an agreement with the International Joint Commission restricts the amount of water that can be released into Canada (IJC report). Water enters this subwatershed from Canada through the RRWMA and from all other subwatersheds in the district via the Roseau River and its tributaries.

State ditch 51 and SD 69 are the main watercourses in the subwatershed. Numerous laterals feed SD 51 and SD 69. Minimal maintenance has been conducted on many of these laterals, in the RRWMA, since the laterals were originally constructed. Some laterals only function during periods of high water, thereby contributing to downstream flooding.

Water exits this watershed via SD 51 (Roseau River) and during periods of extensive runoff also exits via the TRWD.

Land ownership in this subwatershed is approximately 50% public and 50% private (Table 6). Agricultural land use is approximately 80% for crop production with 20% pasture. Most wetlands on private lands have been drained. Land enrolled in CRP borders RRWMA. Lowland brush and scattered wetlands are the dominant plant communities on public lands.

There are no major populated areas in this subwatershed. Caribou, Ross and Pinecreek once were villages located in this subwatershed.

Surface water problems within this subwatershed include: flooding, overland flooding, flood damage, drainage, water quality, and quantity (too much at times and not enough at other times), low stream flows, outlet into Canada undersized for volume of water, fish and wildlife issues and access to public waters.

Existing conditions, Related Problems and Opportunities

Water Quantity

The Big Swamp is a natural large water storage area. Once this area floods, it may take weeks or months for water to recede back into the streambeds. Flooding occurs most years in the Big Swamp subwatershed and spring flooding is most common. However, summer flooding can be a problem due to heavy rains within this subwatershed or upstream. Downstream flows are reduced due to the large storage capacity, the nearly flat topography, and slow discharge rates from the swamps and lowlands.

Water from the big swamp does enter the TRWD during large events. The land in this area slopes to the south and west. County road #7 acts as a dike until water overtops the road and enters the TRWD. The height of the road is controlled to its 1964 elevation by order of the International Joint Commission (see IJC Report).

Flood damage reduction rankings (FDR)

CAC and TAC meetings were held to identify and classify FDR problems in this subwatershed (Appendix 1). Damage to homesteads, crops, roads, pasture and livestock and fish and wildlife were identified as issues within this watershed. FDR action items are potential projects that would reduce flood damages in the Big Swamp subwatershed.

Local residents of the Big Swamp recognize this is the most downstream area in the Roseau River Basin. The drainage area upstream is over 1261 square miles and includes land in the United States and Canada. This area floods when the water comes too fast or too high a volume. To address the water problems of this area, a comprehensive water plan for the whole watershed must be designed and implemented.

Upstream of Caribou to the upstream end of Cutoff #10 State Ditch 51, although dredged in 1914, provides excellent spawning habitat for walleyes, sauger, etc.

The original channel of SD 51 (Roseau River) has been dredged to deepen and straighten the entire length of this subwatershed. As a result of this dredging, the spoil banks restrict overland water flow and the natural oxbows in the channel that were cut off (total of 9) and the banks of the stream are degrading. The cut-offs are functioning as the stream channel. The natural channel that was isolated due to the channel cutoff is being filled by sediment; thus losing its capacity to allow flows to pass through.

FDR Action Items: (potential solutions to reduce flood damage in the Big Swamp subwatershed).

1. Roseau River Restoration Project. The purpose of this project is to restore some of the natural function of the river by opening oxbows that have been cut off and the installation of a series of low head riffles/dams to divert low flows into the restored oxbows. An additional feature of this project is to remove dredged spoil deposited in the oxbow and the silt accumulation that results from the cut off oxbows.
2. RRWMA Modification. The purpose of this project is to improve flood control benefits by the installation of two large gated outlets. The design goal of this project is to allow local floodwaters in the RRWMA to pass through these gated outlets without using flood storage until downstream river conditions require.
3. Dike the south side of the Big Swamp. The purpose of this dike is to reduce the amount of water that enters the TRWD. The goal of this project would be to store water in the big swamp and release the water into Canada below a 3,000 cfs, 100-year flow rate, which causes no damage to the Canadians. The design of this dike would be to an elevation of 1027 and with two water control structures at elevation 1024. This dike will provide an additional 125,000 acre-feet of water storage. If water were over 1024, water would enter the TRWD and into Two Rivers State Ditch 72.
4. Ring Dikes. The purpose of ring dikes is to protect farmsteads to an elevation above the 100-year flood.

5. Continue the dialog with the Roseau River International Watershed (RRIW) on water quantity and quality issues, specifically efforts to reduce Canadian contributions to flood runoff events.
6. Continue the annual discussion with DNR on the operation of the RRWMA as outlined in the existing agreement.
7. Continue to promote runoff reduction strategies (e.g. culvert sizing, CRP, etc.).

Natural Resource Enhancement Rankings (NRE)

CAC and TAC meetings were held to gather input on what were the major NRE issues in this subwatershed (Appendix 3). Low base flow was one of the major problems identified. Low water flow has a negative impact on fish and other aquatic life throughout this subwatershed. The lack of stream channel diversity was also identified as a problem.

NRE opportunities are good in this subwatershed. Quality wildlife habitat would be enhanced by improved cooperation between private and public landowners. Buffers or other corridors would improve the connectivity among existing habitats. The lack of water control in the RRWMA is an issue in this subwatershed.

Public land accounts for over 50% of the property in this subwatershed. Flooding and uncontrolled water is a serious limitation for wildlife management. It is difficult to manage for upland and wetland wildlife species with the erratic water flow.

This area provides habitat for many species of waterfowl. Waterfowl species nest in this area and migratory wildlife species use this area in the spring and fall.

Whitetail deer over-winter in this area, as do many other upland species.

NRE Action Items: (potential solutions to improve NRE conditions in the Big Swamp subwatershed).

1. Explore the potential of restoring Whitney Lake to serve as water storage area. Aggressive drainage in the past has reduced the water holding capacity of this basin. A properly managed Whitney Lake may help reduce peak flows and could augment base flows.
2. Explore the potential of using natural flowing wells to augment base flows.
3. Restore water flows to cutoff oxbows along state ditch 51.
4. Re-evaluate water flow in and out of RRWMA and all private land tracts. It's difficult to manage habitat for upland species and waterfowl with erratic water flow.
5. Install in-stream riffles/dams and barbs to provide habitat diversity and grade control.
6. Utilize agricultural BMP's to protect natural resources and where appropriate, sustain or enhance this resource.

Water Quality

The RRWD, as with most watersheds in the Red River Basin, has had its natural hydrology and land use altered due to modification in land use patterns over the last 100 years. As a result of mans activities over the years, water quality has been adversely impacted in most areas. The monitoring of water quality in watersheds in the Red River Basin is an ongoing project. A TMDL study has been initiated on the Roseau River to determine whether oxygen depletion is due to naturally occurring conditions or other causes.

The Minnesota Pollution Control Agency (MPCA) has identified this entire reach of the Roseau River as impaired due to low levels of dissolved oxygen. Water quality information is limited for this subwatershed and further testing is ongoing to determine the extent and cause of this problem.

Several groups and agencies monitored water quality in the RRWD in 2001 and 2002 including: the Red River Basin Monitoring Program (RRBMP), the Roseau Soil and Water Conservation District (SWCD) and MPCA. These results were compared to values of comparable areas in the Red River Valley ecoregion.

Turbidity levels on the Roseau River near Ross were above the expected ecoregion averages (Roseau Watershed Water Quality Summary 2002). Turbidity is a measure of the suspended material in the water. All other water quality parameters were better than expected ecoregion values.

Livestock confined close to the river was identified as a potential water quality issue in this subwatershed.

NRE action items: (potential solutions to improve water quality in the Big Swamp subwatershed).

1. Continue to monitor the water quality in this subwatershed. Work with local and agency personnel to identify problem areas to gather data.
2. Work with livestock owners and SWCD to reduce negative water quality issues due to livestock confinement by rivers and streams.
3. Work with MPCA on water quality projects in the district.
4. Require best management practices for ditch construction design, maintenance, and management.

Erosion and Sedimentation

Erosion and sedimentation can be a serious problem in this subwatershed. Water often times overflows stream banks and sediment is deposited on farm fields and pastures. In several areas along SD 51 channel erosion has caused stream bank failure. The practice of tilling land up to, and including the ditch banks has been identified as a problem in this subwatershed. The district will promote agricultural best management practices to reduce soil erosion including soil tillage practices that leave crop residue on the surface or alternatively the establishment of a cover crop during October – April.

NRE Action Items: (potential solutions to reduce erosion and sedimentation in the Big Swamp subwatershed).

1. The district will partner with Roseau County SWCD to promote the installation of buffer strips along sensitive streams and stream corridors.
2. The district will support the use of government conservation programs in sensitive areas to reduce erosion and sediment loading of streams (e.g. CRP).
3. Continue dialog with SWCD/NRCS to implement conservation opportunities in the watershed.
4. Inventory streams to evaluate stream channel stability.
5. Water impoundments upstream would reduce the potential for overland flooding in this subwatershed.

Fish and Wildlife Habitat

Fish and wildlife utilize public and private lands as habitat in this subwatershed. This area has been identified as an important area for migratory and shore birds. Fish habitat has declined over time due to ditching and stream channelization. Low stream flow can be a serious problem for fish survival in this subwatershed. Private landowners in this subwatershed have land enrolled in the CRP program.

NRE action items: (potential solution to improve fish and wildlife habitat in the Big Swamp subwatershed).

1. Improve stream channel diversity in the lower reaches of this subwatershed.
2. Increase the miles of functional riparian areas in this subwatershed
3. Work with Wildlife Management personnel and local landowners to reduce the number of wildlife depredation claims.
4. Protect and enhance existing habitat (upland and waterfowl).
5. Protect spawning habitat in the channel between Cutoff #10 and Caribou.
6. Promote program to compensate landowners for leaving lure or feed crops for migrant and resident wildlife.

Water Based Recreational Activity

The RRWMA provides numerous opportunities for fishing, hunting and viewing wildlife. One of the problems identified by the CAC meetings was limited access to public lands. It was the general opinion of the group the state should allow more access to public lands and waters in this subwatershed.

NRE Action item: (potential solutions to improve water based recreational activity in the Big Swamp subwatershed).

1. Increase the number of river access points in this subwatershed.
2. Support efforts to require local governments (i.e. county and townships) to provide the road maintenance, including public roads to or on public lands utilizing the payment in lieu of taxes collected from state governments, rather than diverting those funds to other uses.

Unique Water and Land Related Resources

This subwatershed has several flowing wells. The recharge areas are in the province of Manitoba, Canada. The Canadians should be made aware of these flowing wells and protect these recharge areas.

Reports have had Lake Sturgeon living in the lower reach of the Roseau River. If the Roseau River is restored this species may return to this area. The Minnesota DNR has implemented a lake sturgeon recovery plan for the Roseau River. Lake sturgeon fry will be stocked, (200,000) annually, for twenty years in an attempt to establish a self-sustaining stock of fish. Historically, the area around Caribou had large concentrating of spawning lake sturgeon.

This area is a breeding, nesting and sanctuary for migratory wildlife.

The existence of rare and endangered plant and animal species are most likely in this subwatershed. Information of this type can be obtained from the Minnesota DNR, County Biological Survey or other fish and wildlife personnel.

Several farms have been identified as century farms in this subwatershed (Appendix 8). Agricultural interests have deep roots in this county and the preservation of these century farms have a significant historical value.

Recognize and support the preservation of Native American history in this area.

LAKE BOTTOM

Description of the subwatershed

The Lake Bottom subwatershed is located in the north central section of the RRWD. The Lake Bottom subwatershed consists of 170.3 square miles. The International Border is the north boundary of the Lake Bottom subwatershed, Hay creek/Norland borders the south and east, Stafford and Two Rivers Watershed District on the south and the Big Swamp subwatershed on the west.

The Roseau River enters the Lake Bottom subwatershed just north of the city of Roseau. Hay creek, Sprague creek and Pinecreek are tributaries to the Roseau River. Waters from Canada enter this sub-watershed via the Sprague and Pine Creeks, Lost River State Forest and Marvin Lake. The main channel of the Roseau River is well defined at Roseau. The historic Roseau Lake and Mud Lake, which were ditched and drained in the early 1900s, are located in this subwatershed. Marvin Lake is the primary surface water feature in this subwatershed. Lost River State Forest (LRSF) is located along the International Border.

Land ownership in this subwatershed is over 70% by the public. Land utilization on private land is a mix of agricultural (85%) and recreational (15%). Lowland brush and scattered wetlands are the dominant plant communities on public lands.

Part of the City of Roseau is the only municipal area in this subwatershed.

Surface water problems within this subwatershed include: flooding, flood damage, drainage, water quality, water supply (too much at times and not enough at other times), stream flows, fish and wildlife issues and access to public waters.

Existing conditions, Related Problems and Opportunities

Water Quantity

Flooding occurs in the Lake Bottom subwatershed very frequently. Spring flooding is most common. However, summer flooding is a problem with heavy rains in this subwatershed or watersheds upstream as water eventually enters this subwatershed. The flood plains receive flows quickly due to the high gradient upstream of this subwatershed. As the upstream water enters this subwatershed, the land gradient is up to 17 feet/mile. Just north of City of Roseau, the gradient is 0.5 feet/mile or less. The banks of the rivers cannot hold the volume of water and water moves out its floodplain, which causes overland flooding. Once this area floods, it may take several weeks to over a month for water to recede into stream banks in the old Roseau Lake area.

Flood damage reduction rankings (FDR)

CAC and TAC meetings were held to identify and classify FDR problems in this subwatershed. Damage to homesteads, crops, roads, pasture and livestock and fish and wildlife were identified as issues within this watershed.

One of the biggest concerns of the people at these meetings was when the water from upstream comes too fast or in too high a volume this area will flood. To address the water problems of this area, a comprehensive water plan for the whole watershed must be designed and implemented.

Concern was also expressed about the water that enters this subwatershed from Canada via the Sprague creek and Hay creek/Norland via the Hay creek.

FDR Action Items: (potential solutions to reduce flood damage in the Lake Bottom subwatershed).

1. Rehabilitation of Roseau Lake. If Roseau Lake was rehabilitated it could increase the effectiveness of the significant water storage in this natural basin. Estimates of over 150,000 acre-feet of storage can be better utilized. This project could be a multi-faceted proposal incorporating flood control and natural resource enhancements. The Minnesota DNR continues to purchase land as it becomes available.
2. Diversions. The Roseau River downstream from Roseau Lake has limited capacity to handle the volume of water that comes from upstream. In the early 1900's the State of Minnesota enlarged the channel of the Roseau River but channel capacity is still undersized. To provide additional flow between the Roseau Lake and the Big Swamp two diversion channels are proposed. A 10-year capacity of 3,500 cfs is required to protect farmland and homestead damage. A north and south diversion may be needed to provide the necessary capacity. The local and down stream effects of these diversions will need thorough review.
3. Ring Dikes. The purpose of ring dikes is to protect homesteads from a 100-year flood event.
4. Water from Canada. Monitor the volume of water that enters this subwatershed from Canada via the Sprague creek. It was the opinion of the CAC that the volume of water entering this watershed from Canada has increased in recent years. Continue relationship with RRIW group.
5. Mud Lake Restoration. The proposed restoration of Mud Lake will provide over 1,000 acre-feet of water storage.
6. Outlet of West Intercept Ditch. The Interceptor Ditch will move water from 2 miles south of the city of Roseau north to State ditch 51.

Natural Resource Enhancement Rankings (NRE)

CAC and TAC meetings were held to gather input on what were the major NRE issues in this subwatershed. Lack of stream flow was one of the problems identified. Low water flow has a negative impact on fish and other aquatic life throughout this subwatershed. The lack of stream channel diversity was identified as a problem.

Lack of connectivity among existing habitats is a limitation to quality wildlife habitat in this subwatershed. Erratic water flow is a limitation. Low stream flow at times and an inability to attenuate high water flows make it difficult to manage the aquatic and terrestrial resource in this area.

NRE Action items: (potential solutions to improve NRE conditions in the Lake Bottom subwatershed).

1. Explore the potential of developing the drained Roseau Lake basin into a joint WMA and flood control project. A properly managed Roseau Lake would help reduce peak flows and augment base flows.
2. Explore the potential of using natural flowing wells to augment base flows.
3. Manage the proposed Mud Lake restoration project to reduce peak flow and augment base flow.
4. Implement recommendations of a "Local Management Plan Roseau River."
5. Utilize agricultural BMP's to protect natural resources and where appropriate, sustain or enhance this resource.

<u>Water Quality</u>

Several groups and agencies monitored water quality in the RRWD in 2001 and 2002 including: the Red River Basin Monitoring Program (RRBMP), the Roseau Soil and Water Conservation District (SWCD) and the MPCA. These results were compared to values of comparable areas in the Red River Valley consortium.

Water turbidity at the Highway 310 bridge was above the expected values for the ecoregion means. Turbidity is a measure of the suspended material in the water and will settle out as the water movement slows down. All other water quality parameters were better than expected ecoregion values (Report on file at RRWD office).

NRE action item: (potential solutions to improve water quality in the Lake Bottom subwatershed).

1. Continue to monitor water quality in this subwatershed.
2. Work with local and agency personnel to prioritize existing monitoring sites and to identify additional sites requiring study.
3. Continue dialog with RRIW to look for common solutions to water problems.
4. Require best management practices for ditch construction design, maintenance, and management.

Erosion and Sedimentation

Water and wind erosion and sedimentation can be a serious problem in this subwatershed. Water often times overflows stream banks and sediment is deposited on farm fields and pastures. In several areas along the Roseau River channel and other waterways (both public and private), erosion has caused bank failure. An area of high sedimentation was identified from the 310 bridge west to the lake bottom. The practice of tilling land up to and including the ditch banks have been identified as a problem in this subwatershed.

NRE Action Items: (potential solutions to reduce erosion and sedimentation in the Lake Bottom subwatershed).

1. The district will partner with SWCD to promote the installation of buffer strips along sensitive streams and stream corridors.
2. The district will support the use of government conservation programs in sensitive areas to reduce erosion and sediment loading of waterways (e.g. CRP).
3. Ensure new and improved ditches are built with a non-erosive design.
4. The district will promote agricultural BMP's to reduce soil erosion and stream sedimentation.
5. Water impoundments upstream would reduce the potential for overland flooding in this subwatershed.

Fish and Wildlife Habitat

Fish and wildlife utilize public and private lands as habitat in this subwatershed. Fish habitat has declined over time due to ditching and stream channelization. Low stream flow can be a serious problem for fish survival in this subwatershed. Private landowners in this subwatershed have land enrolled in the CRP program. Several landowners report crop damage from waterfowl.

NRE action items: (potential solutions to improve fish and wildlife habitat in the Lake Bottom subwatershed).

1. Modify stream gauge to allow fish passage upstream on the Sprague creek.
2. Restore potential water retention areas such as, Roseau Lake and Mud Lake. This area has potential for migratory bird habitat (Roseau Lake).
3. Promote programs to compensate landowner for leaving or providing feed crops for both migrant and resident wildlife.
4. Erratic flows of water in this subwatershed make management a challenge. A more stable hydrograph would help the habitat for upland and waterfowl species.

Water Based Recreational Activities

The Roseau River provides numerous opportunities for fishing, hunting and viewing wildlife. One of the problems identified by the CAC meetings was limited access to public lands. It was the general opinion of the group the state should allow more access to public lands in this subwatershed. This reach of the Roseau River is popular for fishing, canoeing and other water related recreational activities.

NRE action items: (potential solutions to improve water based recreational activities in the Lake Bottom subwatershed).

1. Implement recommendations of "Local Management Plan Roseau River"
2. Support efforts to require local governments (i.e. county and townships) to provide the road maintenance, including public roads to or on public lands utilizing the payment in lieu of taxes collected from state governments, rather than diverting those funds to other uses.

Unique Water and Land Related Resources

This subwatershed has several flowing wells. The recharge areas are in the province of Manitoba, Canada. The Canadians should be made aware of these flowing wells and protect recharge areas.

A known Indian burial ground is located west of the old Roseau Lake bottom. There are also reports of other archaeological sites in this area. The district recommends further archaeological investigation.

Rare and endangered plant and animal species exist in this subwatershed. Information of this type can be obtained from the Minnesota DNR, County Biological Survey or other fish and wildlife personnel.

Several farms have been identified as century farms in this subwatershed (Appendix 8). Agricultural interests have deep roots in this county and the preservation of these century farms have a significant historical value.

Recognize and support the preservation of Native American history in this area.

SOUTH BRANCH

Description of the subwatershed

The south branch is in the southwest section of the RRWD and is located in Roseau and Marshall Counties. The South Branch subwatershed consists of 218.1 square miles. The Stafford subwatershed is the north boundary, Two Rivers Watershed District is the west border, The Red Lake Watershed District is on the south and the North Branch subwatershed borders on the east.

The source of the South Branch of the Roseau River is found in this subwatershed. Many tributaries feed into the South Branch of the Roseau River. The main channel of the South Branch of the Roseau River is well defined and features incised channels and well defined adjacent flood plain floodways. The natural flood plain storage in this reach is relatively small. Floodwater in this reach is characterized by high peaks of short duration.

Large habitat blocks can be found in the southern portion of this subwatershed. State, Federal and tribal lands are located in this area.

The proposed Palmville impoundment project is located in this subwatershed.

Land ownership in this sub-watershed is 70% private and 30% public. Private land use is 80% agricultural and 20% recreational. Approximately 30% of the private land is enrolled in CRP.

The villages of Wannaska and Skime are located in this subwatershed.

Surface water problems are not a major problem compared to other subwatersheds; however, there is some localized crop damage. A lack of sufficient drainage due to beaver dams was also stated as a concern.

Existing conditions and Related Problems and Opportunities

Water Quantity

Spring flooding is the most common flood event in this subwatershed. Summer floods cause damage to agricultural crops and water from this subwatershed does contribute to water problems downstream. The South Branch of the Roseau River and other watercourses in this subwatershed have very well defined incised channels and have well defined adjacent floodways. Water storage areas in this subwatershed are generally limited. High peak flows during floods of relatively short duration characterize the hydrograph in this subwatershed.

Flood damage reduction rankings (FDR)

CAC and TAC meetings were held to identify and classify FDR problems in this subwatershed. Damage to crops, roads, pasture and livestock were identified as issues within this watershed. Discussions are ongoing to identify areas that could serve as water holding sites in this subwatershed. Water storage areas would reduce the peak flows and would help reduce the volume of water downstream.

FDR Action Items: (potential projects to reduce flood damage in the South Branch subwatershed).

1. Restoration of the Palmville Fen. The Minnesota DNR has suggested restoring the Palmville Fen. The project will have NRE and FDR benefits. The project will require blocking portions of JD #63 ditch system.
2. Proposed impoundments. Several sites have been identified as potential impoundment sites. (JOR Report, Potential Impoundment Sites on file at RRWD office)

Natural Resource Enhancement Rankings (NRE)

CAC and TAC meetings were held to gather input on the major NRE issues in this subwatershed. Drainage and water management in the Palmville area is an issue. Lack of stream flow was one of the problems identified as it has a negative impact on fish and other aquatic life throughout this subwatershed.

This area supports a good population of upland game species. Whitetail deer and other upland species utilize this area to over winter.

Large wildlife blocks (Palmville and Skime WMA) can be found in this subwatershed.

NRE Action Items: (potential solutions to improve NRE conditions of the South Branch subwatershed).

1. Coordinate with the Red Lake Watershed District and DNR to consider low flow augmentation from lateral A of JD 21.
2. Restoration of Palmville Fen (see above).
3. Utilize agricultural BMP's to protect natural resources and where appropriate, sustain or enhance this resource.

Water Quality

Stream water monitoring program has not shown any water quality concerns in this subwatershed. Livestock close to streams was discussed at the CAC meetings.

NRE action item: (potential solutions to improve water quality in the South Branch subwatershed).

1. Continue to monitor water quality in this subwatershed.
2. Work with local and agency personnel to prioritize monitoring sites and identify problem areas to gather data.
3. Require best management practices for ditch construction design, maintenance, and management.

Erosion and Sedimentation

Sedimentation of agricultural ditches was an issue with several members on the CAC. Localized hot spots of stream bank failure were also a concern. The practice of tilling land up to and including the ditch banks have been identified as a problem in this subwatershed.

NRE Action Items: (potential solution to reduce erosion and sedimentation in the South Branch subwatershed).

1. District will partner with SWCD to promote the installation of buffer strips along sensitive streams and stream corridors.
2. Investigate the potential to rehabilitate Mickinock Creek.
3. The district will promote the use of government conservation programs in sensitive areas to reduce erosion and sediment loading of streams (e.g. CRP).

Fish and Wildlife Habitat

Fish and wildlife utilize public and private lands as habitat in this subwatershed. Fish habitat has declined over time due to ditching and stream channelization. Low stream flow can be a serious problem for fish survival in this subwatershed.

NRE action items: (potential solution to improve fish and wildlife habitat in the South Branch subwatershed).

1. Protect and enhance existing habitat.
2. Increase miles of functional riparian areas.
3. Low flow limits fish habitat in upper reaches of this subwatershed. A more stable hydrograph would improve fish and other wildlife habitat.

Water Based Recreational Activities

None identified.

Unique Water and Land Related Resources

The existence of rare and endangered plant and animal species are most likely in this subwatershed. Information of this type can be obtained from the Minnesota DNR, County Biological Survey or other fish and wildlife personnel.

Several farms have been identified as century farms in this subwatershed (Appendix 8). Agricultural interests have deep roots in this county and the preservation of these century farms have a significant historical value.

Recognize and support the preservation of Native American history in this area.

HAY CREEK /NORLAND

Description of the subwatershed

The Hay Creek/Norland subwatershed is in the northeast section of the RRWD is located in Roseau County. The Hay Creek/Norland subwatershed consists of 162.8 square miles. The Lake Bottom is the north boundary, the Warroad Watershed District on the east and the North Branch and Stafford on the south and Lake Bottom on the west.

Hay Creek, JD #61, County Ditches 6, 7, 9, 18 and Lost River are the main watercourses in the subwatershed. A portion of County Ditch 9 is a unique cold-water stream and managed for brook trout.

Land ownership in this sub-watershed is 60% private and 40% public. Private land use is 90% agricultural and 10% recreational. Large tracts of private lands enrolled in CRP are located in this subwatershed.

Salol is the only village located in this subwatershed.

Surface water problems within this subwatershed include: flooding, flood damage, drainage, water quality, low stream flows, fish and wildlife issues and access to public lands.

Existing conditions, Related Problems and Opportunities

Water Quantity

Flooding occurs in the Hay Creek/Norland subwatershed on frequent basis. Spring flooding is most common. Summer flooding is also a problem. Heavy rains in the upper reaches of this watershed quickly flow down to and concentrate in the lower subwatershed, resulting in overland flooding. An unknown question is how much water enters this subwatershed from Canada. CAC members indicated that water might enter from Marvin Lake, Lost River and possibly even Lake of the Woods.

Flood damage reduction rankings (FDR)

CAC and TAC meetings were held to identify and classify FDR problems in this subwatershed. Damage to homesteads, crops, roads, pasture and livestock and fish and wildlife were identified as issues within this watershed.

One of the biggest concerns people expressed at these meetings was the proposed Hay Creek/Norland Project. This proposed USCOE project has significant natural resource benefits in addition to storing floodwaters.

The channel of the lower Hay Creek (CD #7) has been dredged. The original channel of the Hay Creek in this area was very diffuse and meandered throughout the lowland area. The ditching created a straight channel. Over time the stream banks have become unstable and in times of high water overland flooding is common. One of the features of the Hay Creek project is to restore the lower reach of the Hay Creek.

One of the issues that came from meetings is water from the Warroad Watershed district is entering this subwatershed. This additional water is adding to the overland flooding on CD 9 and adds to the problems in the lower reaches of this subwatershed.

Overland flooding along JD 61 and CD 18 is aggravated by crossover water from the Warroad Watershed District. One suggestion would be to review the Watershed boundaries.

CAC meetings brought out the opinion that uncontrolled runoff from Beltrami State Forest and Lost River State Forest is a major problem. The question was asked if water could be temporarily stored in these areas to reduce the flow of water out of these areas during peak flows.

FDR Action Items: (potential projects to reduce flood damage in the Hay Creek Norland subwatershed).

1. Hay Creek/Norland Project. The Hay Creek/Norland Project protects downstream farmland from the 10-year rainfall event. In addition, this project will provide up to 10,300 acre-feet of water retention.
2. Determine the volume of water that enters this subwatershed from Canada and the Warroad River Watershed.
3. Explore the viability of using the Beltrami Island State Forest as temporary water storage. This stored water could be released over time and reduce the peak flow and augment base flows downstream.
4. Flood corridors should be identified and managed as such.

Natural Resource Enhancement Rankings (NRE)

CAC and TAC meetings were held to gather input on what were the major NRE issues in this subwatershed. Lack of stream flow was one of the problems identified. Low water flow has a negative impact on fish and other aquatic life throughout this subwatershed. The lack of stream channel diversity was identified as a problem.

The entire reach of the Hay Creek has been altered and natural hydrology changed. Erratic water flow is a limitation. Low stream flow at times and an inability to attenuate high water flows make it difficult to manage the aquatic and terrestrial resource in this area.

This area supports a diverse population of upland game species. White tailed deer over-winter in the Beltrami Island State Forest.

NRE action items: (potential solutions to improve NRE conditions in the Hay Creek/Norland subwatershed).

1. Sponsor the Hay Creek/Norland 206 project to rehabilitate Hay Creek and wetland complex.
2. Utilize agricultural BMP's to protect natural resources and where appropriate sustain or enhance this resource.

Water Quality

Several groups and agencies monitored water quality in the RRWD in 2001 and 2002 including: the Red River Basin Monitoring Program (RRBMP), the Roseau Soil and Water Conservation District (SWCD) and MPCA. These results were compared to values of comparable areas in the Red River Valley consortium (Reports on file at RRWD office).

Water turbidity in the Hay Creek was above the expected values for the ecoregion means. The data indicates that the Hay Creek contributes a significant amount of sediment to the Roseau River. In addition to sediment, the Hay Creek also had nitrate nitrogen content that is higher than expected ecoregion values.

NRE action item: (potential solutions to improve water quality in the Hay Creek/Norland subwatershed).

1. Continue to monitor water quality in this subwatershed.
2. Work with local and State agency personnel to identify problem areas to gather data.
3. Require best management practices for ditch construction design, maintenance, and management.

Erosion and Sedimentation

Erosion and sedimentation can be a serious problem in this subwatershed. Sediment is deposited on farm fields and pastures during floods. In several areas along the Hay Creek channel erosion has caused stream bank failure. The practice of tilling land up to and including the ditch banks have been identified as a problem in this subwatershed.

NRE Action Item: (potential solutions to reduce erosion and sedimentation in the Hay Creek/Norland subwatershed).

1. The district will partner with SWCD to promote the installation of buffer strips along sensitive streams and stream corridors.

2. Determine if a culvert-sizing program has potential in the upper reaches of this subwatershed.
3. The district will support the use of government conservation programs in sensitive areas to reduce erosion and sediment loading of streams (e.g. CRP).
4. Sponsor the Hay Creek/Norland 206 project to restore Hay Creek and wetland complex.
5. Determine the sediment source and institute measures to reduce or control stream sedimentation.
6. Promote agricultural best management practices to reduce soil erosion.

Fish and Wildlife Habitat

Fish habitat has declined over time due to ditching and stream channelization and low stream flow can be a serious problem for fish survival in this subwatershed. Private landowners in this subwatershed have land enrolled in the CRP program.

This area has been identified as an important area for shore birds (Roseau Lagoon). It is estimated that 4,000 to 20,000 birds per year use this lagoon as a refuge. Roseau County's cold-water stream originates from this sub-watershed. (County Ditch 9.)

NRE action items: (Potential solutions to improve fish and wildlife habitat in the Hay Creek/Norland subwatershed).

1. Increase miles of functional riparian areas, especially along Hay creek and its tributaries.
1. Protect unique plant communities that are found at the base of Bemis Hill.
2. A more stable hydrograph would improve fish habitat of Hay creek.
3. Review management plan for Lost River and Beltrami Island State Forest. Conflicts exist between the various Agencies; Fisheries, Forestry, Wildlife (waterfowl and upland).

Water Based Recreational Opportunities

Beltrami State Island Forest offers numerous opportunities for hunting, viewing wildlife, camping, trail riding and other outdoor activities.

Unique Water and Land Related Resources

A managed brook trout stream on county ditch 9 is located in this subwatershed. In addition, trout can be found in other streams that carry water off Bemis hill.

Several unique plant communities can be found at the base of Bemis hill.

The existence of rare and endangered plant and animal species are most likely in this subwatershed. Information of this type can be obtained from the Minnesota DNR, County Biological Survey or other fish and wildlife personnel.

Several farms have been identified as century farms in this subwatershed (Appendix 8). Agricultural interests have deep roots in this county and the preservation of these century farms have a significant historical value.

Recognize and support the preservation of Native American history in this area.

NORTH BRANCH

Description of the subwatershed

The North Branch subwatershed is in the southeast section of RRWD and is located in Roseau, Lake of the Woods and Beltrami counties. The North Branch subwatershed consists of 216.4 square miles. The Hay Creek/Norland and Stafford subwatersheds form the north boundary, the Warroad Watershed District east, the Red Lake Watershed on the south and the South Branch of the Roseau River on the south and west. Beltrami Island State Forest is located in the eastern most portion of this subwatershed.

Hayes Lake, Mulligan Lake and Luxemburg Lake are the primary surface waters in this subwatershed.

The North Branch is the source of the Roseau River and is the main watercourse in the subwatershed. Numerous tributaries flow into the North Branch of the Roseau River.

Beltrami Island State Forest, Hayes Lake State Park, two peatlands SNA's, Red Lake Wildlife Management Area and Red Lake Tribal lands are located in this subwatershed. Communication should be ongoing with these groups on watershed issues.

Large habitat blocks can be found in the southern portion of this subwatershed. State, Federal and tribal lands are located in this area.

Land ownership in this sub-watershed is 60% public and 40% private.

Malung is the only village located in this subwatershed.

Surface water problems within this subwatershed include: flooding, flood damage, drainage, water quality and low flows.

Existing conditions, Related Problems and Opportunities

Water Quantity

Spring flooding is most common. The southeast section of this subwatershed is primarily marshy areas and streams with well-defined channels and flood plains characterize the northwest section. Stream flows tend to have high peaks of short duration.

Flood damage reduction rankings (FDR)

CAC and TAC meetings were held to identify and classify FDR problems in this subwatershed. Damage to homesteads, crops, roads, pasture and livestock and fish and wildlife were identified as issues within this watershed, though not as severe in areas downstream of this subwatershed.

One of the biggest concerns people have at these meetings is the uncontrolled water flowing out of State and Federally owned property.

FDR Action Items: (potential projects to reduce flood damage in the North Branch subwatershed).

1. Explore the viability of using Beltrami Island State Forest and other areas as temporary water storage. This water could be released over time and reduce the peak flow and augment base flow of water in this subwatershed. Impoundments sites were identified in this subwatershed (JOR report, Potential Impoundment sites on file at RRWD office).
2. Utilize culvert sizing, as appropriate, to reduce peak flows.

Natural Resource Enhancement Rankings (NRE)

CAC and TAC meetings were held to gather input on what were the major NRE issues in this subwatershed. Beaver dams were identified as a problem. The water levels at Hayes Lake were discussed at several meetings. Water flows from State and Federal property was an issue. Low water flow has a negative impact on fish and other aquatic life throughout this subwatershed.

The southern area in this subwatershed is scattered lowland brush, sedges and grasses to conifer forests. The northern portion is primarily agricultural land.

NRE Action items: (potential solutions to improve NRE conditions in the North Branch subwatershed).

1. Modify Hayes Lake Dam (fish passage, water level).
2. Coordinate with DNR on forest management planning.
3. Support Conservation programs on private lands.
4. Utilize agricultural BMP's to protect natural resources and where appropriate, sustain or enhance this resource.

Water Quality

Several groups and agencies monitored water quality in the RRWD in 2001 and 2002 including: the Red River Basin Monitoring Program (RRBMP), the Roseau Soil and Water Conservation District (SWCD) and MPCA. These results were compared to values of comparable areas in the Red River Valley ecoregion. Water quality in the subwatershed was better than the ecoregion means (Water Quality Report on file at RRWD office).

NRE action item: (potential solutions to improve water quality in the North Branch subwatershed).

1. Continue to monitor water quality in this subwatershed. Work with local and agency personnel to identify areas to gather data.
2. Require best management practices for ditch construction design, maintenance, and management.

Erosion and Sedimentation

In several areas along the North Branch of the Roseau River channel erosion has caused stream bank failure, downstream of Hayes Lake and also Bear Creek tributary were two areas of special concern.

NRE Action Items: (Potential solutions to reduce erosion and sedimentation in the North Branch subwatershed).

1. The district will partner with SWCD to promote the installation of buffer strips along sensitive streams and stream corridors.
2. The district will support the use of government conservation programs in sensitive areas to reduce erosion and sediment loading of streams (e.g. CRP).
3. A culvert-sizing program may have potential in the upper reaches.
4. Consider replacing dams that have washed out in Beltrami Island State Forest.

Fish and Wildlife Habitat

Low stream flow can be a serious problem for fish survival in this subwatershed. This area has large habitat blocks for upland game.

NRE action items: (potential solutions to improve fish and wildlife habitat in the North Branch subwatershed).

1. A more stable hydrograph would improve fish habitat in the North Branch of the Roseau River.
2. Modify Hayes Lake dam to allow fish passage to upper reaches of the North Branch of the Roseau River.
3. Review the management plans for Beltrami Island State Forest, WMA's and SNA's. A conflict exists between the various Agencies; Fisheries, Forestry and wildlife (waterfowl and upland).

Water Based Recreational Opportunities

The Beltrami Island State Forest and Hayes Lake provides numerous opportunities for hunting, fishing, swimming and viewing wildlife.

Unique Water and Land Related Resources

The existence of rare and endangered plant and animal species are most likely in this subwatershed. Information of this type can be obtained from the Minnesota DNR, County Biological Survey or other fish and wildlife personnel.

Several farms have been identified as century farms in this subwatershed (Appendix 8). Agricultural interests have deep roots in this county and the preservation of these century farms have a significant historical value.

Recognize and support the preservation of Native American history in this area.

STAFFORD

Description of the subwatershed

The Stafford subwatershed is in the central portion of the RRWD is located in Roseau County. The Stafford subwatershed consists of 56.5 square miles. The Lake Bottom and Hay Creek/Norland subwatersheds form the north boundary, Hay Creek/Norland the east and the north and South Branch on the south and the Two Rivers Watershed District on the west. The Roseau River is the primary watercourse in this subwatershed. Several laterals feed into the Roseau River.

Land ownership in this sub-watershed is over 90% private. Private land use is 99% agricultural. The land in this subwatershed is the most intensively farmed in the entire watershed.

The city of Roseau is located in this subwatershed.

Surface water problems within this subwatershed include: flooding, flood damage, drainage, water quality, water supply (too much at times and not enough at other times), and drainage problems.

Existing conditions and Related Problems and Opportunities

Water Quantity

Flooding occurs in the Stafford subwatershed every year. Spring flooding is most common. However, summer flooding can be a problem. Overland flooding is a significant problem in this subwatershed. Water runs off the high land with a steep gradient and fans out in the lowlands on the land on the east side of this subwatershed. This caused overland flooding as the ditches cannot handle the volume of water.

Water from this subwatershed contributes immediately to any potential floodwaters in the city of Roseau.

Flood damage reduction rankings (FDR)

CAC and TAC meetings were held to identify and classify FDR problems in this subwatershed. Damage to homesteads, crops and roads were identified as issues within this watershed.

Ditch improvement of CD # 8 or an impoundment in the CD #8 area are projects that would reduce the potential of overland flooding from water as it flows from west to east.

Water comes off the ridge west of the city of Roseau and contributes to the flooding problems in the city.

FDR Action Item: (potential projects to reduce flood damage in the Stafford subwatershed).

1. A proposed impoundment site has been identified in Stafford Township section 4 and Jadis Township Section 33. This site is located on CD # 8 and would control 11.5 square miles of the 20 square mile area that is drained by CD # 8. Proposed water storage of 2500 acre-feet would result from this structure.
2. The origin of the proposed West Intercept is located in this subwatershed. The West Intercept project would move water north rather than into the city of Roseau.

Natural Resource Enhancement Rankings (NRE)

CAC and TAC meetings were held to gather input on what were the major NRE issues in this subwatershed. Lack of stream flow was one of the problems identified. Low water flow has a negative impact on fish and other aquatic life throughout this subwatershed. No large blocks of wildlife habitat are located in this subwatershed. Expanding the corridor (buffer) areas of Rivers and other watercourses would improve habitat. Wetland or upland habitat (CRP) areas adjacent watercourses would improve wildlife habitat.

NRE Action items: (potential solutions to improve NRE conditions in the Stafford subwatershed).

1. Support agricultural conservation programs and practices.
2. Utilize agricultural BMP's to protect natural resources and where appropriate, sustain or enhance this resource.

Water Quality

Several groups and agencies monitored water quality in the RRWD in 2001 and 2002 including: the Red River Basin Monitoring Program (RRBMP), the Roseau Soil and Water Conservation District (SWCD) and the MPCA. These results were compared to values of comparable areas in the Red River Valley ecoregion. Water quality in the subwatershed was better than the ecoregion means (Water Quality Report on file at RRWD office).

NRE action items: (potential solutions to improve water quality in Stafford subwatershed).

1. Continue to monitor water quality in this subwatershed. Work with local and agency personnel to identify problem areas and to gather data.
2. Require best management practices for ditch construction design, maintenance, and management.

Erosion and Sedimentation

Erosion and sedimentation can be a serious problem in this subwatershed. Water often times overflows stream banks and sediment is deposited on farm fields. On the south end of this subwatershed, riverbank erosion is a problem.

NRE Action Items: (potential solutions to reduce erosion and sedimentation in Stafford subwatershed).

1. The district will partner with SWCD to promote the installation of buffer strips along sensitive streams and stream corridors.
2. The district will support the use of government conservation programs in sensitive areas to reduce erosion and sediment loading of streams (e.g. CRP).

Fish and Wildlife Habitat

Low stream flow in Roseau River can be a serious problem for fish survival in this subwatershed.

The stream gauging station at Malung does restrict fish passage during low flows. A recommendation was to review the design of this gauging station and make necessary modifications to allow fish to pass upstream.

NRE Action item: (potential solutions to improve fish and wildlife habitat in the Stafford subwatershed).

1. Propose modifying USGS gauging station at Malung for fish passage.
2. Increase the miles of functional riparian areas in the Stafford subwatershed.

Water Based Recreational Opportunities

The Roseau River provides recreational opportunities and aestitic values as it flows through the city of Roseau. The district should work with the city to balance flood control, recreational and NRE benefits.

Unique Water and Land Related Resources

The existence of rare and endangered plant and animal species are least likely in this subwatershed. Information of this type can be obtained from the Minnesota DNR, County Biological Survey or other fish and wildlife personnel.

Several farms have been identified as century farms in this subwatershed (Appendix 8). Agricultural interests have deep roots in this county and the preservation of these century farms have a significant historical value.

Recognize and support the preservation of Native American history in this area.

SECTION VII: POLICIES AND PROPOSED ACTIONS OF THE DISTRICT

The RRWD was created and operates under Chapter 103D of the Minnesota Statues. Minnesota law gives the District authority to establish rules and regulations, require permits, construct projects, conduct studies and perform other activities for the purpose of water activities in the District. The District has the authority to implement projects and strategies for water concerns of the District. The Roseau River Watershed Board of Managers makes decisions at regularly scheduled board meetings. The Board will seek input and guidance from an Advisory Committee. State law requires annual updates and review of project planning and coordination. This Advisory Committee will meet annually to provide the Board of Managers the opportunity to review the effectiveness of meeting the goals and objectives of the past year and shape the efforts for the new upcoming year.

Projects for consideration by the Roseau River Watershed Board may be initiated through a petition process as outlined in Chapter 103D.705 of the Minnesota Statues. Petitioned projects generally fall into two categories drainage or flood control. This petition process is an effective method for landowners or other interested groups to propose projects or to receive relief from unacceptable or undesirable existing conditions due to water excess or shortages.

The District supports project and activities for the general benefit of the District as a whole. The District will allocate funds from its administration and construction accounts for works of common benefit throughout the District. Some examples of works of common benefit include: removal of beaver dams and trapping of beaver, cleaning debris of waterways, construction of erosion control structures and assisting other agencies with funding of water related activities. Many of these projects frequently occur in areas that do not have an established maintenance fund or assessment area. All projects and activities of the District will consider the overall effect and environmental impact prior to the implementation phase.

Chapter 103D.601 of the Minnesota Statues gives the Board of Managers authority to initiate construction projects by majority resolution of the Board of Managers. Funding for construction projects can come from various sources both public and private sectors. The assessment of benefit for projects may be found adjacent to or many miles from the location of the project. The Board of Managers who have jurisdiction for the entire watershed has the responsibility to find solutions to problems within the District. However, the Board has representation on the Red River Basin Board that has responsibility for water concerns of the entire Red River Basin. It is possible that projects may have a small local benefit but can have a larger benefit when coordinated with other projects in a larger geographic area.

Several types of flood control and natural resource projects have been identified for consideration by the Roseau River Watershed Board of Managers.

Potential Flood Control Projects	Potential Natural Resource Projects
Impoundments	Impoundments
Diversions	Buffer & filter strips
Floodways	Stream restoration
Storm drains	Public education & outreach
Ring Dikes	Lake & wetland restoration
Culvert sizing	Agricultural Best Management Practices

CAC and TAC identified 114 FDR and 82 NRE problems in the RRWD (Appendix 1-4). Each problem may have one or more components as a part of the solution. The RRWD Board of Managers is committed to seek solutions for water problems of the District. The RRWD Board of Managers also considers the natural system in the approval process for flood control projects. Benefits to the natural system may be one of the above listed projects or others that makes good environmental sense.

The top 46 CAC and TAC identified FDR problems are listed in a matrix found in the Appendix 9. This matrix is a listing of the problems, a potential solution, possible funding sources, other benefited subwatersheds and reference to overall watershed goals. This matrix is an attempt to prioritize the identified problems and provide solutions alternatives for problems with the highest CAC and TAC rated FDR problems.

The RRWD is involved in many other activities that pertain to water in the District.

Ditch inspection - RRWD conducts annual inspections of ditches under its jurisdiction. District will hire contractors to do maintenance when necessary.

Flood to cities and property - RRWD will assist with communities with information and other resources to reduce the potential flood impacts on homes and property.

Water Quality Monitoring Program - RRWD provides assistance to the water monitoring programs of the MPCA and SWCD district. This data will provide the District with water quality information in the District over time.

Stream Flow Monitoring Program - RRWD is involved with the monitoring of stream flow. Stream flow monitoring provide data that can be used to document historical stream flows and provide critical data in flood forecasting and flood warnings.

Envirothon - RRWD participates each year in the envirothon competition. This is a "hands on" opportunity for high school students to compete with other schools in the topics of soils, wildlife, forestry and natural resources.

River Watch - RRWD provides technical and financial support to the river watch program. In this program high school students are given the opportunity to take water samples at selected sites and do measure water quality parameters.

Technical Assistance - RRWD is available to local, state and federal governments and other private groups and the general public to address water management issues in the District. Water quality, stream flow, surveying, flood control are some of the topics that the RRWD has been asked to provide information in the past.

SECTION VIII: COORDINATION/CONFLICT WITH EXISTING PROGRAMS & POLICIES

Local Governments

Counties

The RRWD encompasses portions of five counties: Beltrami, Kittson, Lake of the Woods, Marshall and Roseau. Each county has its own Comprehensive Water Plan. Local County Management Plans must be updated once every 5 to 10 years in accordance with current Minnesota legislative requirements. In addition to their comprehensive water plans, each county also has specific programs and policies relating to drainage issues on its highway systems and county ditch systems. Each county also has established shore land zoning ordinances for the control of development activity along the shorelines of lakes and the banks of major rivers. These zoning ordinances also regulate established 100-year flood plains.

Townships

Each township within the watershed district has the authority under Minnesota Law to establish ordinances necessary for the administration of the township. In some cases, these ordinances relate to water management activities, especially drainage along or through township road systems.

Municipalities

Each municipality within the watershed district, which has been incorporated under Minnesota Law, has the authority to establish ordinances and conduct zoning activities within their territorial limits. In many cases, these ordinances relate to the management of water supplies, treatment and distribution systems, sewage collection and treatment systems, and some drainage management systems. In many cases, municipalities are eligible to receive state and federal funding in support of these water-related projects. Municipalities within the district also are tasked with the responsibility of implementing floodplain management ordinances and zoning restrictions for the 100-year flood plain, and in some cases a floodway.

Tribal Councils

Tribal Councils have been established on the Red Lake Reservation under the auspices of the Federal Bureau of Indian Affairs for the purposes of conducting business and administering activities within the boundaries of the Reservation and these activities often involve water management. Whenever common interests of the Watershed District and the Tribal Councils overlap, the District strives to cooperate on projects of mutual interest.

School Districts

There are a number of school districts in each of the counties that are in the RRWD. Each of the school districts is also a taxing authority that has a monetary impact on the citizens of the District.

Soil and Water Conservation Districts

Legislation authorizing the formation of Soil and Water Conservation Districts (SWCDs) as a special purpose subdivision of state government was approved in response to the Dust Bowl of the 1930s. SWCDs are political subdivisions of the state established under Minnesota Statue, Chapter 103C. Originally, districts worked primarily with farmers to help fight soil erosion. Today, districts work with landowners in both rural and urban settings to manage and conserve natural resources. Each district operates at the direction of five locally elected supervisors.

SWCDs fill a crucial niche of providing land and water conservation services to owners of private lands, which promotes a sound economy and sustains and enhances natural resources. Private landowners trust SWCDs to provide the needed technology, funding and educational services because they are established in each community, governed by local leaders and focused on the conservation of local soil and water resources.

SWCDs provide voluntary, incentive driven approaches to landowners for better soil and cleaner water. A wide variety of conservation practices that are provided by SWCDs include restoring wetlands, planting shelter belts and buffers, and preventing soil erosion. The soil and water district addresses local needs by serving as an efficient and effective delivery provider of state programs such as RIM reserve, Wetlands Conservation Act, Local Water Management and State Cost Share Programs. Landowners across Minnesota count on SWCD technical assistance with conservation practices that protect the quality of Minnesota's natural resources.

Adjacent Watershed Districts

The RRWD is bounded to the north by Manitoba, Canada. The Roseau River International Watershed has recently been formed to address water management issues in the U.S. and Canada. In the United States, the RRWD east boundary is the Warroad River Watershed District, the south and west by the Two River Watershed and to the south by the Red Lake Watershed District.

Red River Watershed Management Board

The Red River Watershed Management Board (RRWMB), a Joint Powers Agreement between member Watershed Districts, was created to coordinate and fund flood damage reduction programs and projects within the Minnesota portion of the Red River basin. The RRWMB developed its own method for evaluating potential projects. In allocating funding

to potential projects, the RRWMB utilizes its "Project Evaluation Manual" for guidance. The RRWMB is comprised of the Minnesota Red River Basin member watershed districts. Many of the District's projects have received funding from the RRWMB. The RRWMB has also funded environmental projects, education programs, studies and initiatives, the development of a Geographic Information System (GIS) database, and participated in county comprehensive water planning efforts to enhance its member district's overall comprehensive approach to water management.

State Government

Minnesota Board of Water and Soil Resources

The Minnesota Board of Water and Soil Resources (MNBWSR) was created in 1986 by the state legislature. Three functioning state boards were eliminated by this legislation and their duties were transferred to MNBWSR on October 1, 1987. MNBWSR's duties include oversight programs and funding of SWCD's, formation and guidance of Watershed Districts, and the direction and assistance to counties in developing their Local Water Management Plan. A major activity of the Board is the development of policy and guidance involving natural resources enhancement. The MNBWSR is responsible for implementation of the Wetland Conservation Act. MNBWSR reviews and approves water management plans and project activity of watershed districts, Local Water Management Plans and SWCD's.

Minnesota Department of Natural Resources

The Minnesota DNR has both regulatory and enforcement authority over natural resource programs of the state. The DNR is responsible for all natural streams and wetland areas, types 3, 4, and 5's greater than 10 acres in size and management of lakes within the state. In addition, the DNR administers a statewide flood plain management program. Permits are required from the DNR to perform work in any protected watercourse, water basin, or wetland within the state. These protected water resources systems have been designated on County protected water inventory maps throughout the District. With respect to flood plain management, the DNR administers statewide criteria for any alterations, change or alterations in watercourses that would change the current flood plain status. The DNR also works with municipalities and the Federal Emergency Management Agency in developing floodway and flood plain regulations and ordinances. The principal divisions of MNDNR include the Division of Waters, the Divisions of Forestry, and the Division of Fisheries, Wildlife and Ecological Services.

Minnesota Pollution Control Agency

The MPCA has both regulatory and enforcement authority relative to potential actions which could affect the quality of groundwater and surface waters of the state. Since some of the District's projects involve water quality considerations, the MPCA becomes an active participant in these projects. The MPCA also is involved with the other governmental units, such as municipalities and other entities, in the construction and operation of wastewater treatment plants, NPDES/SDS permits, and the control of non-point source pollution.

Minnesota Environmental Quality Board

The Minnesota Environmental Quality Board (MNEQB) has final authority on permits involving a wide range of construction activity throughout the state. The Board is comprised of the commissioners of state agencies, chairmen of state boards, and five citizens. The MNEQB bases its decisions on formal environmental assessments or environmental impact statements written for specific project proposals.

Minnesota Department of Transportation

The Minnesota Depart of Transportation (MNDOT) is responsible for State and Federal highways within the Watershed District. As a result, all actions contemplating a change in the drainage structures or other facilities affecting the drainage of these roadway systems must receive the approval and a permit from the MNDOT. The Department of Transportation also receives significant benefits from legal drainage systems in the District and in fact is frequently assessed to such systems.

Since highway systems cross drainage patterns of natural and artificial waterways, there is opportunity for interaction between the District and MNDOT. District projects requiring structures through MNDOT regulated highways require coordination and approval by the MNDOT.

Federal Government

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USCOE) have permit and regulatory authority over specific projects of the District. The USCOE has permit authority over all actions concerning navigable waters and tributaries to navigable waters, including wetlands. Specifically, the USCOE requires a permit for any action involving the placement of fill material within the ordinary high waters area of a navigable stream or its tributary. This essentially covers all of the surface water streams and lakes within the District. In addition, the USCOE has been actively involved in project planning and construction.

U.S. Department of Agriculture

Two major agencies of the U.S. Department of Agriculture (USDA) have had a great deal of impact on the activities of the RRWD, the Natural Resources Conservation Service (NRCS-formerly the Soil Conservation Service) and the Farm Service Agency (FSA). The NRCS has traditionally provided technical advice and engineering design services to the local Soil and Water Conservation Districts within the RRWD. In recent years, NRCS has become and active player in many of the district's activities and projects.

U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (EPA) has had an expanding role in construction project activities of the RRWD. The Environmental Protection Agency (EPA) is involved in the disposal and treatment of sewage and non-point sources of pollution. The EPA has been instrumental in the nationwide program of eliminating combined sewer system throughout the sponsorship of several separation projects. The EPA also must certify USCOE permits, thereby giving them veto authority over the issuance of such permits. EPA has the right to review the USCOE permit decisions.

U.S. Fish and Wildlife Service

The USFWS has been involved in the restoration of wetlands previously drained on agricultural land and now in the Conservation Reserve Program of the USDA. In constructing these wetland projects, the USFWS is required to obtain a permit from the RRWD before proceeding, if the project is located within the territorial jurisdiction of the District.

The USFWS also become involved in actions potentially affecting wetland or other types of wildlife habitat. However, their involvement generally occurs as part of the USCOE permit process.

U.S. Geological Survey

The U.S. Geological Survey (USGS) is principally a data-gathering agency of the federal government. The RRWD is particularly interested in data collected by the USGS related to the water resources of the district. These data include stream flow discharge, groundwater levels, and water quality, which are used during the conduct of district activities. The RRWD places a high value on the data collection efforts of the USGS.

National Oceanic and Atmospheric Administration

The National Oceanic and Atmospheric Administration (NOAA) was previously known as the U.S. Weather Bureau. NOAA collects and publishes weather data, which is of great utility to the RRWD. This data includes flood forecasting, rainfall, snowfall, evaporation, and temperature. This information is utilized in the design of water management projects.

Red Lake Band

The Red Lake Band owns property throughout the RRWD. The Red Lake Band operates under the authority of the Bureau of Indian Affairs. The Red Lake Band is involved in numerous types of activities including water-related issues, particularly water levels of lakes within its boundaries.

Private and Other Organizations

Within the District, there are numerous private organizations. These organizations sponsor a wide variety of environmentally positive initiatives, including wildlife habitat, wetland development, and flood control initiatives, as well as other activities which are beneficial and consistent with the goals of the District. The District has an ongoing policy of cooperating with these groups in the development of projects of mutual benefit. These organizations include, but are not limited to: the Nature Conservancy, Ducks Unlimited, miscellaneous wildlife, conservation and sportsmen organizations, as well as the Minnesota Center for Environmental Advocacy (MCEA), and many others.

COORDINATE CONFLICTS BETWEEN EXISTING PROGRAMS AND POLICIES OF OTHER JURISDICTIONS

Watershed district coordination and cooperation with other governmental units, at all levels, is a natural outcome of the political water environment. Coordination between the Watershed District and permitting agencies such as the USCOE, DNR, and the MPCA, are mandated through legislation. Cooperation between the Board and units of government such as municipalities, township boards, county boards, and SWCD's are necessary in the planning process. Coordination between the District and agencies such as the RRWMB are required to achieve adequate level of funding for water management projects. Many times cooperative agreements between various governmental units and the District are necessary prior to the construction of certain types of projects.

The RRWD performs annual work planning in conjunction with its annual business meeting. This includes a coordination meeting with its Watershed District Advisory

Committee, as required under Section 103D of the Minnesota Statutes. It should be noted that the Statutes recommend that the Advisory Committee members must include a supervisor of an SWCD, a member of a County Board, a member of a sporting organization, and a member of a farm organization when practicable. Therefore, this annual meeting with the Advisory Committee provides a forum of reporting to the SWCD, the County Board, recreational and sporting organization, and farm organizations.

The RRWD views intergovernmental coordination, cooperation, communication and education as an absolute necessity in order for it to perform its required functions. The Board will continue to foster an environment that will enhance coordination and cooperation to the maximum extent possible.

The Project Team was created in the Red River Basin Flood Damage Reduction Work Group agreement (December 9, 1998). This agreement outlines a process for reducing flood damage and improving natural resources in the Minnesota portion of the Red River Basin. The agreement provides for a new collaborative approach to planning and implementing both flood damage reduction and natural resource protection and enhancement projects, which involves early consultation and collaboration among all stakeholders and a cooperative approach to permitting projects.

The Project Team consists of appropriate stakeholders (watershed district, state, federal and tribal agency personnel, local government officials, affected landowners and interested citizens group representatives), including at least one designated contact person from each agency.

The Project Team is advisory to the Watershed Board of Managers and is responsible for working with a project from an early concept and alternative evaluation through to construction and follow-up monitoring. In the early stages, much of the team's time will be spent on identification of problems and opportunities for FDR and NRE. Another important step in this process is the formulation and evaluation of alternative plans that will address problems and opportunities. At all significant project milestone, project team members representing regulatory interests will be asked to indicate any permitting "red flags". If the permit cannot be obtained, the project design may have to be modified to gain the necessary permits.

The Red River Basin Flood Damage Reduction Work Group also agreed on certain flood damage reduction principles. These principles are consistent with the broad flood damage reduction goals and are intended to guide the efforts of policymakers and project proponents to implement those goals through the comprehensive watershed planning process and project planning, design, and permitting. The principles are:

1. Reduction of overland flooding is needed; any solution will probably require on-site and upstream solutions.

2. Water resource problems should not be passed along to others. A solution for a watershed should not create a problem upstream or downstream.

3. Water should be stored/managed as close to where it falls as is feasible and practical.

4. A systems approach should be used to manage the timing of flow contribution from multiple minor watersheds.

5. Projects should be consistent with comprehensive watershed management.

6. Project cost responsibilities should be negotiated project-by-project based on flood damage reduction and natural resource benefits.

7. The responsibility of mitigation of negative environmental and cultural impacts rests with the project proponent.

8. If costs are incurred in connection with a project to produce an environmental gain for the project as a whole, it may be appropriate for alternative sources of funding (in addition to project money) be used for that gain.

9. Existing laws and procedures should be the basis for compensation to landowners adversely affected by a change in the existing condition.

10. Incentives should be developed to encourage landowners to voluntarily manage their land to achieve flood damage reduction and natural resource goals in order to avoid the need for additional regulatory controls.

11. A natural resource project should not exacerbate flooding.

The RRWD has on a regular basis attended meetings of the International Roseau River Watershed. These meetings are held in various communities in Manitoba, Canada. The primary goal in theses meetings is to try and resolve the difficult water management issues that exist between the two countries.

The RRWD will strive to coordinate water management efforts with the local water plans of other counties or watershed districts. Beltrami, Lake of the Woods, Kittson and Marshall counties are neighboring counties in Minnesota and Manitoba, Canada all have interests in water management. Efforts will be made to share staff, funding and other resources to solve difficult water management issues.

Appendix 1: FDR Issues Area 1-6

FDR Issues Area 1
Big Swamp

INDEX	FLOODING	INDEX	FLOOD DAMAGE
68.1	Undersized outlet	77.0	Crops
55.4	Multiple systems converge	66.4	Homesteads
55.1	Loss of water storage	64.0	Roads
50.5	Inadequate ditch system	45.8	Pastures
48.8	Beaver dams	43.2	Livestock
48.8	Spoil banks SD 51	39.3	Overflow/Two Rivers
48.0	Impacts Two Rivers		
44.8	More runoff from developed land		
37.7	Damage to upland habitat		

INDEX	STREAM FLOW	INDEX	DRAINAGE
57.8	Low flow	59.2	Pinecreek diversion
56.6	Unstable stream banks	57.9	Drained lakes
50.8	Peaky stream flow	50.9	Farmland flooding
50.5	Sediment in oxbows	38.8	$ for projects

INDEX	GROUNDWATER	INDEX	DROUGHT
20.4	Flowing well recharge	50	Low flow in streams
14.2	Flowing wells	42.2	Crop & Pastures

CAC and TAC identified one hundred and fourteen (114) FDR problems in the RRWD. A weighted index is a method to rank the various FDR problems. Index values ranged from a high of 92.3 to a low of 14.2. The Big Swamp subwatershed had 27 of the 114 (23.7%) identified FDR problems.

FDR Issues Area 2
Lake Bottom

INDEX	FLOODING
69.0	West Acres Roseau
64.7	Loss of water storage
57.7	Crossover from Sprague Creek
55.7	Crossover from Hay Creek
53.0	Overland flooding
52.7	Crossover from Arpin Ditch
51.2	Runoff from developed land
45.1	Backwater from diked west bank
38.6	Impacts on upland habitat
36.3	Flooding old lake bed

INDEX	FLOOD DAMAGE
76.0	Crops
65.6	Bridges & Debris
62.6	Culvert/road washout
54.7	Homesteads
50.6	Polaris infrastructure
45.8	Upland game habitat

INDEX	STREAM FLOW
61.5	Pine Creek diversion
61.4	Sediment & Erosion
58.3	Unstable stream banks
50.8	Peaky stream flow

INDEX	DRAINAGE
71.0	Water from Canada
65.2	Outlet too small
57.3	Water from Hay Creek& Roseau River
16.0	Flowing wells

INDEX	GROUNDWATER
16.0	Uncapped flowing wells

INDEX	DROUGHT
25.3	Peat soils

CAC and TAC identified one hundred and fourteen (114) FDR problems in the RRWD. A weighted index is a method to rank the various FDR problems. Index values ranged from a high of 92.3 to a low of 14.2. The Lake Bottom subwatershed had 26 of the 114 (22.8%) identified FDR problems.

FDR Issues Area 3
South Branch

INDEX	FLOODING	INDEX	FLOOD DAMAGE
44.9	Spring/Summer	41.9	Crops

INDEX	STREAM FLOW	INDEX	DRAINAGE
54.1	Peaky stream flow	21.2	Surface runoff
28.4	Saturated groundwater		

INDEX	GROUNDWATER	INDEX	DROUGHT
		20.4	Upper 2/3
		18.1	Lower 1/3

CAC and TAC identified one hundred and fourteen (114) FDR problems in the RRWD. A weighted index is a method to rank the various FDR problems. Index values ranged from a high of 92.3 to a low of 14.2. The South Branch subwatershed had 7 of the 114 (6.1%) identified FDR problems.

FDR Issues Area 4
Hay Creek/Norland

INDEX	FLOODING	INDEX	FLOOD DAMAGE
68.8	Water from Marvin Lake	74.8	Road washouts
68.5	Overland CD 9	73.0	Crops
68.1	Overland JD 61 & CD 18	62.7	Ag property
57.4	Loss of water storage	37.8	Timber
53.7	Runoff from developed land	29.6	Upland game habitat

INDEX	STREAM FLOW	INDEX	DRAINAGE
62.7	Flashy stream flow	61.5	Runoff from Beltrami
57.5	Peaky stream flow	47.1	Inadequate outlet
50.5	Sediment in streams	46.0	Ditches not working
44.9	Unstable stream banks	45.7	Culvert sizing
35.2	Turbid water	34.4	Overflow/Marvin Lake & Canada
25.0	Trout stream (temp)		

INDEX	GROUNDWATER	INDEX	DROUGHT
27.9	Seepage from Lake of Woods & Marvin Lake	27.7	Crop & pastures

CAC and TAC identified one hundred and fourteen (114) FDR problems in the RRWD. A weighted index is a method to rank the various FDR problems. Index values ranged from a high of 92.3 to a low of 14.2. The Hay Creek/Norland subwatershed had 23 of the 114 (20.1%) identified FDR problems.

FDR Issues Area 5
North Branch

INDEX	FLOODING
66.9	Water loss from storage
60.0	Crossover from Norland
58.2	Lower reaches in summer
53.3	Upper reaches
51.0	Runoff from Beltrami

INDEX	FLOOD DAMAGE
63.8	Homesteads lower 1/3
62.8	Crops
59.3	Roads
29.6	Upland game habitat

INDEX	STREAM FLOW
52.3	Flashy stream flow
40.1	Unstable stream banks
37.4	Sedimentation
19.0	Turbid water

INDEX	DRAINAGE
51.0	Runoff from Beltrami
36.4	Hayes Lake level
30.5	Improved upper reach
26.1	Lower reach

INDEX	GROUNDWATER

INDEX	DROUGHT
19.6	Ag lands

CAC and TAC identified one hundred and fourteen (114) FDR problems in the RRWD. A weighted index is a method to rank the various FDR problems. Index values ranged from a high of 92.3 to a low of 14.2. The North Branch subwatershed had 18 of the 114 (15.8%) identified FDR problems.

FDR Issues Area 6
Stafford

INDEX	FLOODING
92.3	City of Roseau
60.7	Ag lands
52.5	Loss of water storage
47.6	Developed lands

INDEX	FLOOD DAMAGE
82.9	City of Roseau
62.2	Culvert washouts
58.2	Crops
56.2	Roads/water over top

INDEX	STREAM FLOW
57.1	Flashy stream flow
48.3	Unstable stream banks
47.5	Sediment in streams

INDEX	DRAINAGE
39.7	Inadequate drainage

INDEX	GROUNDWATER

INDEX	DROUGHT
27.6	Ag land

CAC and TAC identified one hundred and fourteen (114) FDR problems in the RRWD. A weighted index is a method to rank the various FDR problems. Index values ranged from a high of 92.3 to a low of 14.2. The Stafford subwatershed had 13 of the 114 (11.4%) identified FDR problems.

Appendix 2: Top Five FDR Responses in Entire RRWD

Flood Damage Reduction

ISSUE	SCORE	AREA	PROBLEM
Flood damage			
	82.9	6	City of Roseau
	77.0	1	Crop damage
	76.0	2	Crop damage
	74.8	4	Road washouts
	73.0	4	Crop damage

Composite score: 383.7

ISSUE	SCORE	AREA	PROBLEM
Flooding			
	92.3	6	City of Roseau
	69.0	2	West Acres of Roseau
	68.8#	2	Overland flooding
	68.3*	4	Overland flooding
	68.1	1	Undersized outlet

Composite score: 366.5

Overland flooding from: Marvin Lake, Warroad Lagoon and Lost River State Forest.
* Overland flooding of CD 9 (68.5) and JD 61 & CD 18 (68.1) were combined into one score of 68.3.

ISSUE	SCORE	AREA	PROBLEM
Drainage			
	71.0	2	Water from Canada
	65.2	2	Inadequate outlet
	61.5*	4	Water from Bemis hill
	59.2	1	Pinecreek diversion
	57.9	1	Drained lake

Composite score: 314.8

*Uncontrolled water from Bemis Hill area and state land below hill, which is the source of the Hay Creek.

Area 1 = Big Swamp, Area 2 = Lake Bottom, Area 3 = South Branch, Area 4 = Hay Creek/Norland, Area 5 = North Branch, Area = 6 Stafford

Flood Damage Reduction
Top Five Responses in the Entire RRWD

ISSUE	SCORE	AREA	PROBLEM
Steam flow			
	62.7	4	Flashy hydrograph
	61.5	2	Pinecreek diversion
	59.8*	2	Unstable stream banks
	57.8	1	Low flows
	57.1	6	Flashy hydrograph

Composite score: 298.9

*Channel degradation (61.4) and unstable stream banks (58.3) were averaged into one score of 59.8

ISSUE	SCORE	AREA	PROBLEM
Drought			
	42.2	1	Crop damage
	40.9	5	Fish kills in upper reach
	27.7	4	Crop & pasture damage
	27.6	6	Crop damage
	25.3	2	Peat soils (fires)

Composite score: 163.7

Area 1 = Big Swamp, Area 2 = Lake Bottom, Area 3 = South Branch, Area 4 = Hay Creek/Norland, Area 5 = North Branch, Area = 6 Stafford

Appendix 3: NRE Issues Area 1-6

NRE Issues Area 1
Big Swamp

INDEX	FISH & WILDLIFE	INDEX	EROSION
84.1	Low flow in spawning area	68.1	SD51
79.6	Lack of channel diversity	67.2	SD 51 Sediment
64.8	Lack of natural streams	65.2	SD 51 Bank failure
48.4	Lack of woody material in stream	62.2	Ag land sediment
44.1	Depredation of crops (geese)	56.5	Farming road ditch
42.3	High water relocates upland game	48.9	Ditch maintenance

INDEX	WATER QUALITY	INDEX	WATER ACTIVITY
76.3	Low DO	53.5	Low flows
50.9	Livestock by streams	50.1	Limited boat access
		43.3	shore fishing (ADA)
		30.0	Repair existing access
		25.4	Trangsrud access

INDEX	UNIQUE WATER AND OTHER RESOURCES
58.8	Lake sturgeon habitat
42.3	Several endangered species
22	Anthrax

This weighted index was a method to rank the 82 identified NRE problems from the various CAC and TAC meetings. The Big Swamp subwatershed had 22 of the 82 (26.8%) identified NRE problems.

NRE Issues Area 2
Lake Bottom

INDEX	FISH & WILDLIFE
73.2	Low DO
72.1	Lack of channel diversity
69.8	SD 37 & 51 cutoffs
69.1	Lack of stream diversity
69.1	SD 87 at Pine Creek diversion
69.0	Outlet of system unstable
55.5	Sprague gauge/fish movement
53.2	Lack of woody material in stream
50.0	High water Relocates upland game

INDEX	EROSION
74.4	High sedimentation
68.1	Bank stability (clay)
54.7	Ag lands
54.7	Farming ditches

INDEX	WATER QUALITY
74.4	High sedimentation
70.1	Low DO in summer
54.8	Septic system/Lagoon seepage

INDEX	WATER ACTIVITY
42.3	Limited shore fishing
19.0	Personal watercraft

INDEX	UNIQUE WATER AND OTHER RESOURCES
50.0	Indian burial ground
31.2	Over 60% non-agricultural land

This weighted index was a method to rank the 82 identified NRE problems from the various CAC and TAC meetings. The Lake Bottom subwatershed had 20 of the 82 (24.4%) identified NRE problems.

NRE Issues Area 3
South Branch

INDEX	FISH & WILDLIFE
74.2	Palmville fen restoration
36.7	Beaver dams
69.8	SD 37 & 51 cutoffs

INDEX	EROSION
63.2	Roads
59.6	Stream banks
56.5	Ditches
48.3	Ag lands

INDEX	WATER QUALITY
46.3	Ag runoff
45.1	Livestock by streams
31.7	Shallow wells in south 1/3

INDEX	WATER ACTIVITY
26.4	Limited Fishing
20.1	Limited water activity

INDEX	UNIQUE WATER AND OTHER RESOURCES
	None identified

This weighted index was a method to rank the 82 identified NRE problems from the various CAC and TAC meetings. The South Branch subwatershed had 12 of the 82 (14.6%) identified NRE problems.

NRE Issues Area 4
Hay Creek/Norland

INDEX	FISH & WILDLIFE	INDEX	EROSION
71.9	Lack of channel diversity	56.2	Ag lands
47.4	Lack of woody material in streams		
45.6	Transfer of non-native fish (drum)		

INDEX	WATER QUALITY	INDEX	RECREATIONAL ACTIVITY
50.0	Leaky septic systems	45.7	Trout fishing
44.8	Livestock by streams	34.7	Goose/duck hunting
40.9	Seepage from Warroad lagoon	27.4	Bemis hill
		24.7	Trail Riding
		23.6	Berry picking
		20.6	Access to hunting
		19.0	Camping
		7.0	Swatting mosquitoes

INDEX	UNIQUE WATER AND OTHER RESOURCES
56.3	Trout stream

This weighted index was a method to rank the 82 identified NRE problems from the various CAC and TAC meetings. The Hay Creek/Norland subwatershed had 16 of the 82 (19.5%) identified NRE problems.

NRE Issues Area 5
North Branch

INDEX	FISH & WILDLIFE	INDEX	EROSION
71.9	Flashy stream flow	65.8	Bank failure
60.6	Malung gauge barrier to fish	62.0	Sedimentation
60.6	Ditching of wetlands		
60.6	Lack of stream diversity		
46.4	Lack of woody debris		

INDEX	WATER QUALITY	INDEX	WATER ACTIVITY
56.5	Low DO below Hayes Lake	41.6	Limited access
48.8	Leaky septic systems	28.6	Limited fishing
45.6	Livestock by streams		

INDEX	UNIQUE WATER AND OTHER RESOURCES
	None identified

This weighted index was a method to rank the 82 identified NRE problems from the various CAC and TAC meetings. The Hay Creek/Norland subwatershed had 12 of the 82 (14.6%) identified NRE problems.

NRE Issues Area 6
Stafford

None identified

Appendix 4: Top 5 NRE Responses for RRWD

Natural Resource Enhancement
Top Five Responses in the Entire RRWD

ISSUE	SCORE	AREA	PROBLEM
Fish & wildlife Habitat	84.1	1	Low flow
	79.6	1	Lack of channel diversity
	74.2	3	Restore Palmville Fen
	73.2	2	Low dissolved oxygen (DO)
	72.1	2	Channel diversity
Composite score:	383.2		

ISSUE	SCORE	AREA	PROBLEM
Water Quality			
	76.3	1	Low DO
	74.4	2	High sedimentation
	70.1	1	Low DO
	56.5	5	Low DO below Hayes dam
	54.8	2	Leaky septic systems
Composite score:	332.1		

ISSUE	SCORE	AREA	PROBLEM
Erosion & Sedimentation	68.1#	2	SD 51 bank stability
	68.1	3	Road washouts
	67.6*	1	SD 51 sediment
	65.8	5	Bank failure
	62.2	1	Ag land sedimentation
Composite score:	331.8		

SD 51 bank stability was identified as a problem in area 1 (65.2) and area 2 (68.1).
* Erosion (68.1) and Sedimentation (67.2) of SD 51 scores were averaged (67.7).

Area 1 = Big Swamp, Area 2 = Lake Bottom, Area 3 = South Branch, Area 4 = Hay Creek/Norland, Area 5 = North Branch, Area = 6 Stafford

Natural Resource Enhancement
Top Five Responses in the Entire RRWD

ISSUE	SCORE	AREA	PROBLEM
Water based Recreation	59.2	1	Low water levels
	50.1	1	Limited boat access
	45.7	4	Trout stream
	45.7	5	Limited access south 1/3
	43.3	1	Limited shore fishing

Composite score: 244

ISSUE	SCORE	AREA	PROBLEM
Unique Resource	58.8	1	Lake sturgeon habit
	56.3	4	Trout stream
	50.0	2	Historic Indian site
	42.3	1	Loss of habitat
	31.2	2	65% non-ag land

Composite score: 238.6

Area 1 = Big Swamp, Area 2 = Lake Bottom, Area 3 = South Branch, Area 4 = Hay Creek/Norland, Area 5 = North Branch, Area = 6 Stafford

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Appendix 6: Acronyms Defined

BWSR - Board of Soil and Soil Resources

CAC - Citizens Advisory Committee

CLWP - County Local Water Plan

CREP - Conservation Reserve Enhancement Program

CRP - Conservation Reserve Program

DNR - Department of Natural Resources

EPA - Environmental Protection Agency

FEMA - Federal Emergency Management Agency

FDR - Flood Damage Reduction

FSA - Farm Service Agency

IJC - International Joint Commission

MDA - Minnesota Department of Agriculture

MPCA - Minnesota Pollution Control Agency

NRCS - Natural Resource Conservation Service

NRE - Natural Resource Enhancement

PCA - Pollution Control Agency

RRBC - Red River Basin Commission

RRWD - Roseau River Watershed District

RRWMA - Roseau River Wildlife Management Area

RRWMB - Red River Watershed Management Board

RRBMP - Red River Basin Monitoring Program

Acronyms Defined Con't

RRIW - Roseau River International Watershed

SWCD - Soil and Water Conservation District

TAC - Technical Advisory Committee

TRWD - Two Rivers Watershed District

TMDL - Total Maximum Daily Load

USFWS - United States Fish and Wildlife Service

USCOE - United States Army Corps of Engineers

USGS - United States Geological Survey

Appendix 7: 2003 Roseau River Fishing Contest

The first annual Denny's Outdoor Sports Roseau River Fishing Contest was held September 6, 2003. A twenty-seven mile section between the Malung gauge and the Ross Bridge was the boundaries for this one day fishing contest.

The biggest fish in three categories received prizes. Categories were walleye, northern and fish of other categories. Registered participants for this contest were 168.

Fishing contest results:

Walleye - Sixteen fish were registered with largest 8.57 pounds.

Northern - Forty-six fish were registered with the largest 12.05 pounds and 39" long.

Others - Fifteen fish were registered. Species were carp, sheep head, sucker and red horse.

Many other fish were caught and released during this fishing contest. Due to the success of this contest, plans are in place for this Roseau River Fishing Contest to become an annual event.

The results of this fishing contest suggest the Roseau River is a productive fishery. Local interest to manage this resource for fish and water quality is a priority. Proper management of this resource will assure continued enjoyment for current and future generations.

Source: Personal communication Denny Kjos, September 2003.

Appendix 8: RRWD Century Farms 1990-2002

Land Owner	Year Homesteaded	Township	Year* Recognized
Marcella (Erickson) Woidtke	1889	Dieter	1990
Herman T. Hedin	1890	Malung	1991
Gaylord John Halvorson	1889	Jadis	1992
Gilmet M. Pederson	1892	Jadis	1992
Dennis E. & Rose Strandlund	1887	Jadis	1992
Julia C. Johnson	1893	Ross	1993
Albert Efshen	1894	Jadis	1994
Mrs. Henry F. Nelson	1894	Jadis	1994
Thomas C. & Jilleen Johnson	1895	Stafford	1995
Mark & MaryAnn Olafson	1895	Spruce	1995
Earle R. Goos & Morris E. Goos	1898	Malung	1999
James A. & Florence E. Dahlen	1899	Spruce	2000
Clifford & Roberta Grahn	1899	Spruce	2000
Gary & Ione Olson	1900	Stafford	2000
Lewis E. Besserud	1901	Dieter	2001
Emmett, Donald and Roxann Lee	1901	Dieter	2001
Roland A & Carolyn E Besserud	1902	Jadis	2002
Clarence & Jeanette Erickson	1902	Ross	2002
Curtis Hukee	1902	Moose	2002

*Century Farms are recognized by the University of Minnesota Extension Service.
Other RRWD farms are over 100 years old, however, to qualify for a Century Farm designation the appropriate paperwork must be filled out and be on file at the Roseau County Courthouse.

Appendix 9: Matrix of Top 46 FDR Problems Identified by CAC and TAC

Identified Problem	Problem Type*	Subwatershed**	Index Score#	Proposed Solution	Timeline	Cost	Primary Sponsor Cash	Secondary Sponsor Cash	Primary Sponsor In-Kind	Resource Other	Other Benefitted Subwatersheds	Reference to Goal^
Protect City of Roseau	FL	6	92.3	Impoundments Upstream	10-20 years	30 million	BWSR,Federal,State	RRWD, RRWMB, USFWS, DNR	MPCA, NRCS	County,SWCD	1 & 2	1, 2, 3 & 5
City of Roseau	FD	6	82.9	Floodway	8-12 years	30 million	FEMA, Federal, State	City of Roseau	MPCA	BWSR, SWCD		1
Crop Damage	FD	1	77	Impoundments Upstream	10-20 years	30 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	County, SWCD		1, 2, 3 & 5
Crop Damage	FD	2	76	Impoundments Upstream	10-20 years	30 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	County, SWCD		1, 2, 3 & 5
Road Washouts	FD	4	74.8	Temporary Water Storage Beltrami	10-20 years	?	DNR, BWSR, USFWS	NRCS, RRWD, RRWMB	MPCA, NRCS	County,SWCD	1 & 2	1, 2, 3 & 5
Crop Damage	FD	4	73	Temporary Water Storage Beltrami	10-20 years	?	DNR, BWSR, USFWS	NRCS, RRWD, RRWMB	MPCA, NRCS	County,SWCD	1 & 2	1,2, 3 & 5
Water from Canada	DR	2	71	Impoundments in Canada	10-20 years	?	?	?	?	RRIW	1	1, 2, 3 & 5
West Portion of Roseau	FL	2	69	West Intercept	1-3 years	4 million	MN DNR, USA-EDA	City of Roseau, RRWD, RRWMB	MPCA, SWCD, BWSR	USFWS, Roseau County	6	1
Excess Water from Marvin Lake	FL	4	68.8	Norland Project	4-8 years	8 million	Federal-COE, State	RRWMB, RRWD	MPCA, SWCD, BWSR	USFWS, NRCS, Roseau County	1 & 2	1, 2, 3 & 5
Overland Flooding CD 9	FL	4	68.5	Temporary Water Storage, Lost River State Forest	10-20-years	?	DNR, BWGR, USFWS	NRCS, RRWD, RRWMB	MPCA, NRCS	County, SWCD	1 & 2	1, 2, 3 & 5
Undersized Outset	FL	1	68.1	Impoundments Upstream	10-20 years	30 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	SWCD	2,3,4,5 & 6	1, 2, 3 & 5
Overland Flooding CD 18 & JD 61	FL	4	68.1	Norland Project	4-8 years	8 million	Federal-COE, State	RRWMB, RRWD	MPCA, SWCD, BWSR	USFWS, NRCS, Roseau County	1 & 2	1, 2, 3 & 5
Water Loss from Storage	FL	5	66.9	Store Water in Beltrami SF	10-20 years	?	DNR, BWGR, USFWS	NRCS, RRWD, RRWMB	MPCA	County, SWCD	6,2,1	1, 2, 3 & 5
Damage to Homesteads	FD	1	66.4	Ring Dikes	1-3 years	250,000	State, RWMB, SWSR	RRWD, USFWS	NRCS, MPCA, DNR	County, SWCD		1
Damage to Bridges	FD	2	65.9	Impoundments Upstream	10-20 years	30 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	SWCD	1,3,4,5&6	1, 2, 3 & 5

Identified Problem	Problem Type*	Subwatershed	Index Score#	Proposed Solution	Timeline	Cost	Primary Sponsor Cash	Secondary Sponsor Cash	Primary Sponsor In-Kind	Resource Other	Other Benefitted Subwatersheds	Reference to Goal^
Outlet too Small	DR	2	65.2	?								
Loss of Water Storage	FL	2	64.7	Restore Roseau Lake	15-30 years	15 million	DNR, BWGR, USFWS	RRWD, NRCS	MPCA, SWCD	RRIW	1	1,2 & 3
Damage to Roads	FD	1	64	Impoundments Upstream	10-20 years	30 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	SWCD	2,3,4,5 & 6	3
Damage to Homes and Property	FD	5	63.8	Impoundments Upstream	10-20 years	30 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	NRCS, MPCA, DNR	County, SWCD	6,2,1	1, 2, 3 & 5
Damage to Crops	FD	5	62.8	Store Water in Beltrami SF	10-20 years	?	DNR, BWGR, USFWS	NRCS, RRWD, RRWMB	MPCA	County, SWCD	1,2 & 6	1, 2, 3 & 5
Flashy Stream Flow	SF	4	62.7	Culvert sizing	4-8 years	?	County,State FEMA	NRCS, RRWD, RRWMB	MPCA,DNR	SWCD	1 & 2	3
Damage to Homes and Property	FD	4	62.7	Impoundments Upstream	10-20 years	10million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	County, SWCD	6,2,1	1, 2, 3 & 5
Road and Culvert Washouts	FD	2	62.6	Impoundments Upstream	10-20 years	30 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	County,SWCD	2,3,4,5 &6	1, 2, 3 & 5
Damage to Roads	FD	6	62.2	Impoundments Upstream	10-20-years	30million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	County, SWCD	1 & 2	1, 2, 3 & 5
Excess Runoff from Beltrami	DR	4	61.5	Store Water in Beltrami SF	10-20years	?	DNR, BWSR, USFWS	NRCS, RRWD, RRWMB	MPCA	County,SWCD	1,2,3, 5 & 6	1, 2, 3 & 5
Pinecreek Diversion	SF	2	61.5	Evaluate controls	4-8 years	?	DNR, BWSR, USFWS	NRCS, RRWD, RRWMB	MPCA	County,SWCD	1	1, 2, & 3
Erosion & Sedimentation	SF	2	61.4	Install Buffer Strips	1-3 years	?	DNR, NRCS	NRCS, RRWMB,State	MPCA, SWCD	County	1	5
Flooding Ag Land	FL	6	60.7	Impoundments Upstream	10-20 years	30 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	SWCD	1 & 2	1, 2, 3 & 5
Crossover Flooding from Norland	FL	5	60	Norland Project	4-8 years	8 million	Federal-COE, State	RRWMB, RRWD	MPCA, SWCD, BWSR	SWCD	1,2 & 4	1, 2 & 3
Damage to Roads	FD	5	59.3	Culvert sizing	4-8 years	?	County,State FEMA	NRCS, RRWD, RRWMB	MPCA,DNR	SWCD	1, 2 & 6	3
Pinecreek Diversion	DR	1	59.2	Evaluate controls	?							
Stream Banks	SF	2	58.3	Establish Riparian Corridors	8-12 years	1 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	County,SWCD	1	5

Identified Problem	Problem Type*	Subwatershed	Index Score#	Proposed Solution	Timeline	Cost	Primary Sponsor Cash	Secondary Sponsor Cash	Primary Sponsor In-Kind	Resource Other	Other Benefitted Subwatersheds	Reference to Goal^
Overland Flooding Lower	FL	5	58.2	Store Water in Beltrami SF	10-20 years	?	DNR, BWGR, USFWS	NRCS, RRWD, RRWMB	MPCA	County,SWCD	1,2 & 6	1,2,3 & 5
Crop Damage	FD	6	58.2	Impoundments Upstream	10-20 years	30 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	SWCD	1 & 2	1, 2, 3 & 5
Drained Lake Bed	DR	1	57.9	Restore Roseau Lake	15-30 years	15 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	SWCD	1	1 & 2
Low Flows	SF	1	57.8	Impoundments Upstream	10-30-years	30 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	SWCD		1, 2, 3 & 5
Crossover from Sprague Creek	FL	2	57.7	Impoundments in Canada	8-12 years	?	?	?	?	RRIW	1	1, 2, 3 & 5
Crossover from Hay Creek	FL	2	55.7	Norland Project	4-8 years	8 million	Federal-COE, State	RRWMB, RRWD	MPCA, SWCD, BWSR	USFWS, NRCS, Roseau County	1 & 2	1& 2
Flashy Stream Flow	SF	4	57.5	Culvert sizing	4-8 years	?	County,State FEMA	RRWD, USFWS	MPCA,DNR	SWCD	1 & 2	3
Loss of Water Storage	FL	4	57.4	Store Water in Beltrami SF	4-8 years	?	DNR, BWGR, USFWS	NRCS, RRWD, RRWMB	MPCA	SWCD	1,2 & 6	1,2,3 & 5
Uncontrolled Water from Roseau River & Hay Creek	DR	2	57.3	Impoundments Upstream	10-20 years	30 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	County, SWCD	1	1, 2, 3 & 5
Flashy Stream Flow	SF	6	57.1	Impoundments Upstream	10-20 years	15 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	County, SWCD	1 & 2	1, 2, 3 & 5
Instable Stream Banks	SF	1	56.6	Establish Riparian Corridors	8-12 years	1 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	County, SWCD		5
Water Overtops Roads	FD	6	56.2	Impoundments Upstream	10-20 years	30 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	County, SWCD	1 & 2	1, 2, 3 & 5
Multiple Systems Converging	FL	1	55.4	Impoundments Upstream	10-20 years	30 million	BWSR,Federal,State	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	County,SWCD		
Loss of Water Storage	FL	1	55.1	Restore Whitney Lake	30-50 years	?	DNR, BWGR, USFWS	RRWD,RRWMB,USFWS, DNR	MPCA, NRCS	SWCD		1 & 2

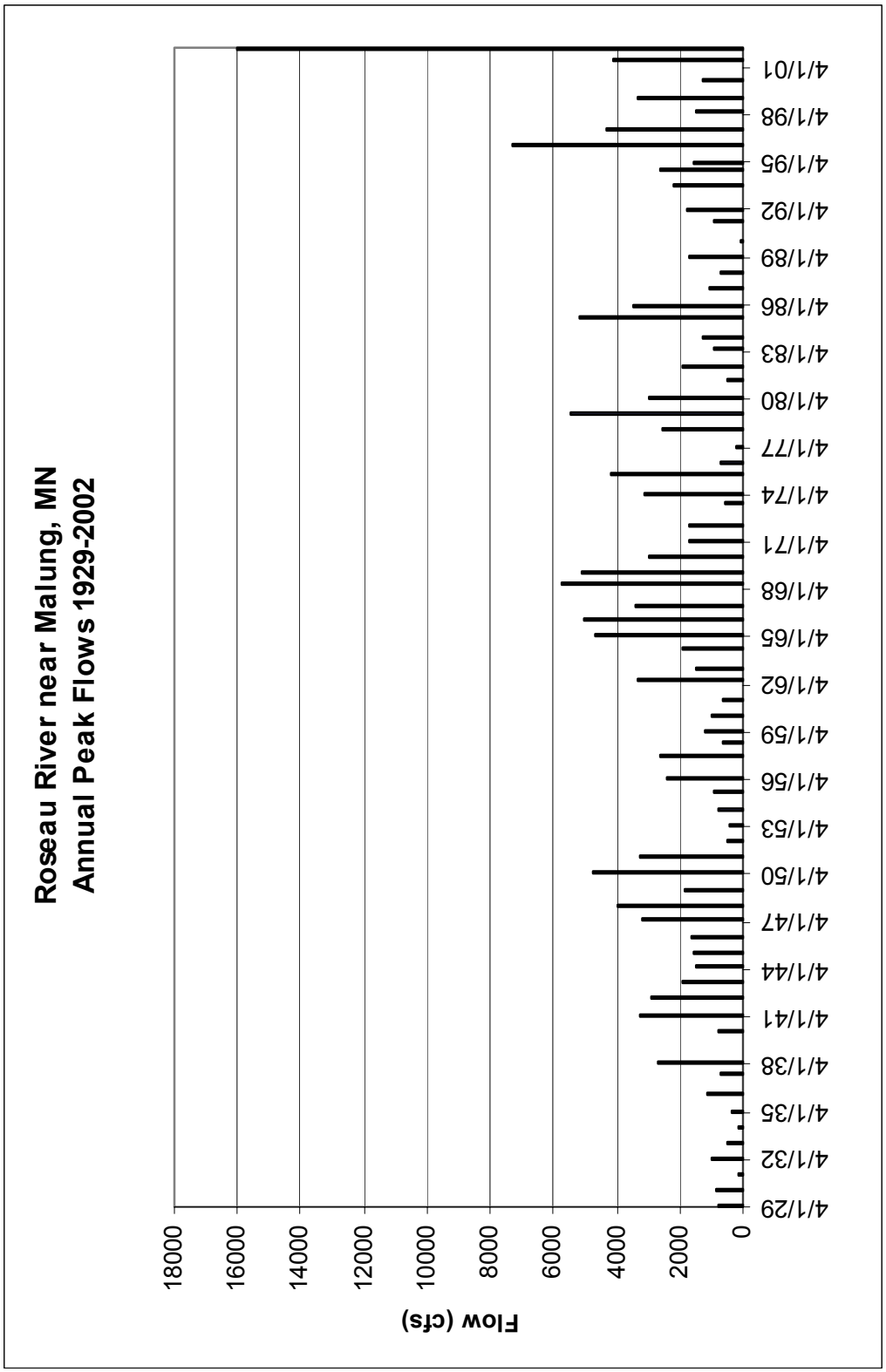
****Area 1 = Big Swamp, 2 = Lake Bottom, 3 = South Branch, 4 = Hay Creek/Norland, 5 = North Branch, 6 = Stafford**

***FL = Flooding, FD = Flood damage, DR = Drainage, SF = Stream Flow**

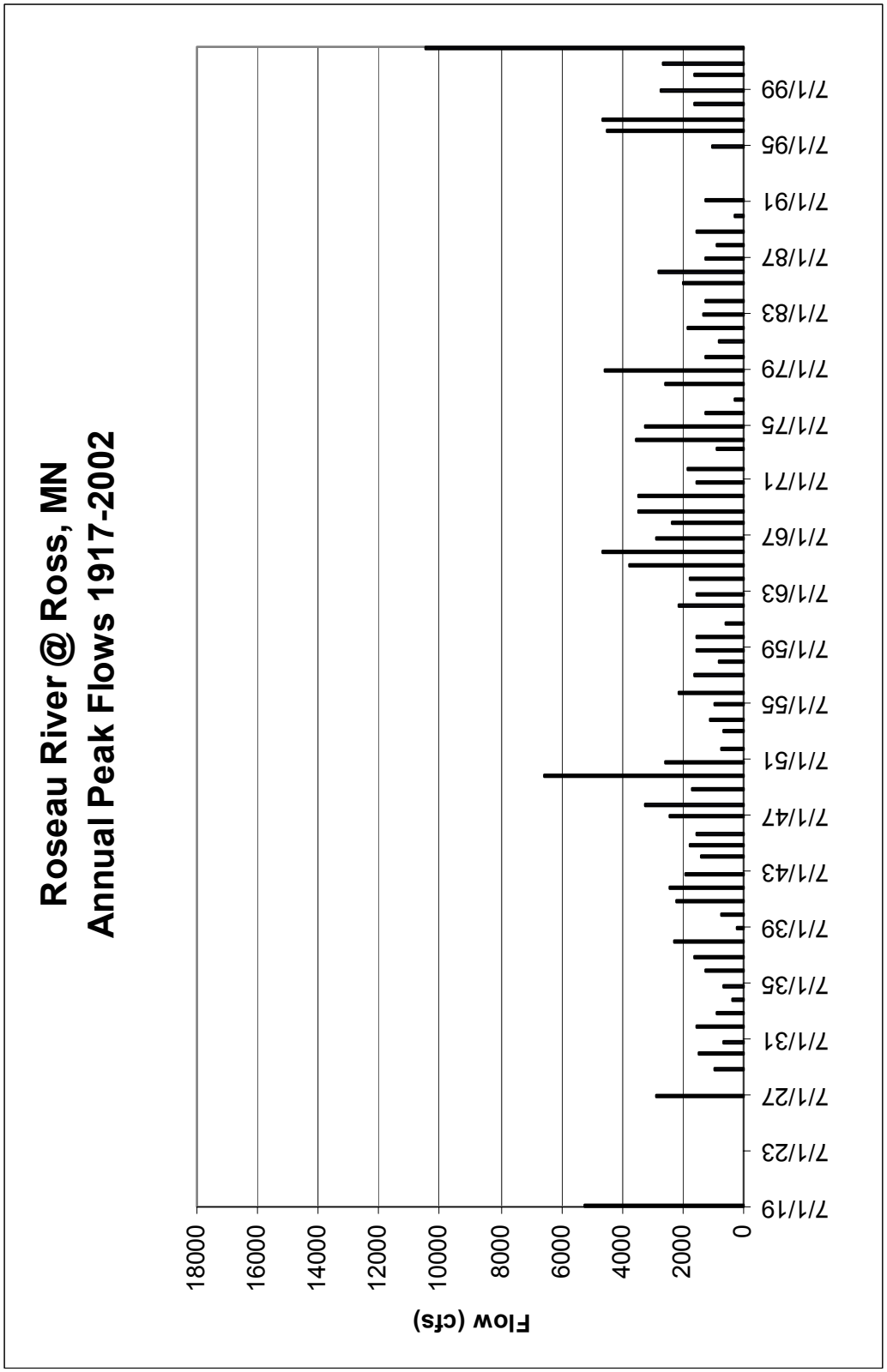
 # Weighted index of 114 identified FDR issues by CAC and TAC

^ Overall RRWD FDR Goals

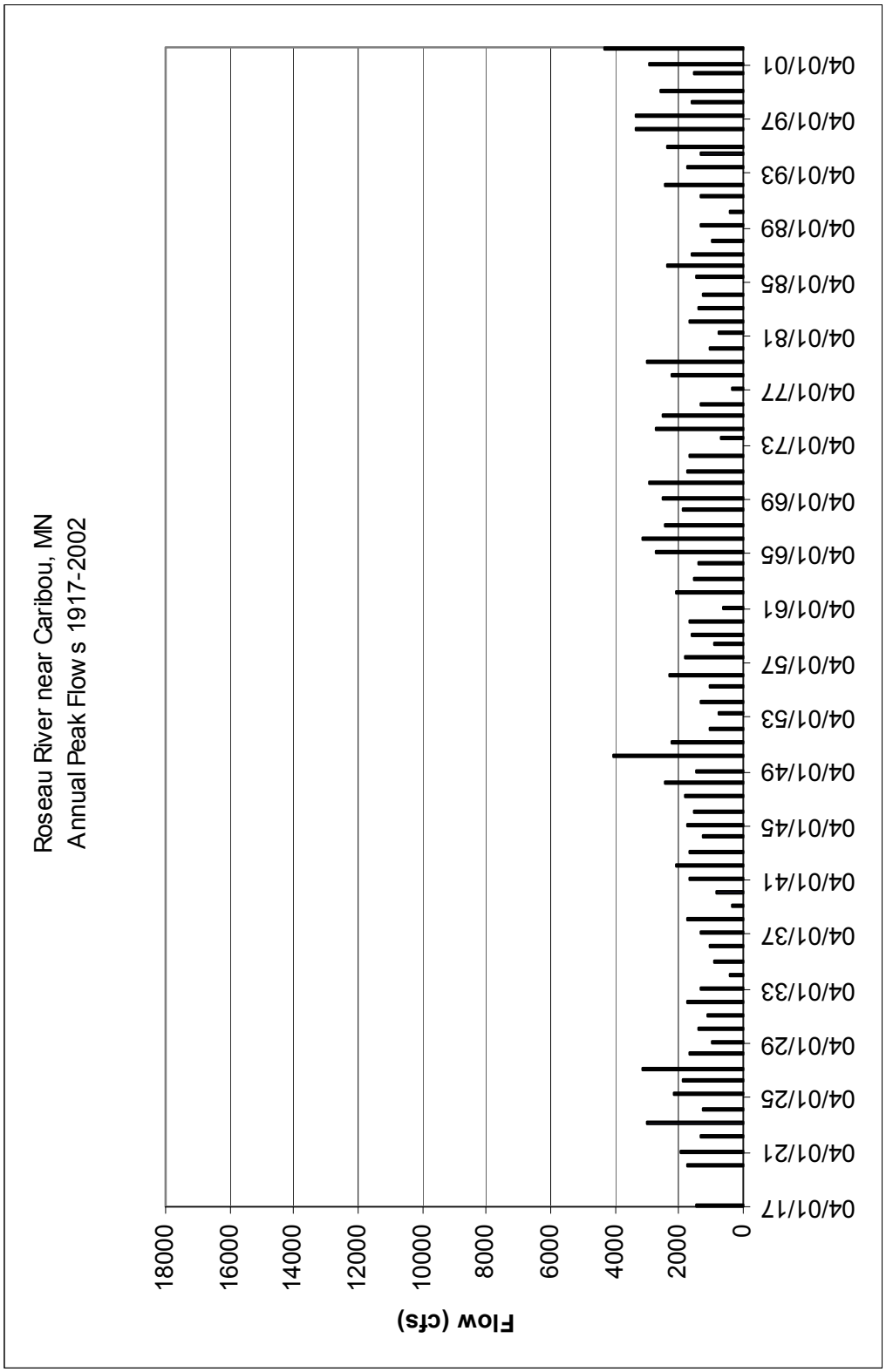
Appendix 10: Roseau River Annual Peak Flow at Malung 1929-2002



Appendix 11: Roseau River Annual Peak Flow at Ross 1929-2002



Appendix 12: Roseau River Annual Peak Flow at Caribou 1929-2002



Appendix 13: Roseau River - A Comprehensive Water Management Plan

Under Separate Cover