Upper Minnesota River Watershed District

Plan Update

Final

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Prepared for:

Board of Managers
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Watershed District
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1.0 INTRODUCTION

Watershed Districts are local units of government that work to prevent and solve water related problems. The boundary of a District generally follows a "natural" watershed boundary. Districts are usually named after that "natural" watershed. Because water does not follow political boundaries, it makes sense to manage water and natural resources on a watershed basis. This allows for a comprehensive holistic approach to resource conservation.

The Upper Minnesota River Watershed District is one of Minnesota's 44 Watershed Districts. Each District is governed by a Board of Managers appointed by the County Board of Commissioners with land in the District. Chapter 103D of Minnesota Statutes is the enabling statute for Watershed Districts. To form a Watershed District, local residents, cities, or county boards may petition the Minnesota Board of Water and Soil Resources (BWSR) formerly the Minnesota Water Resources Board. Watershed Districts are formed for reasons ranging from flood control to water quality protection.

Minnesota Rules Chapter 103D requires the periodic update of the overall plan for the District. The plan serves as the guiding document for District operation. This document serves as the plan update for the Upper Minnesota River Watershed District.

The District is located at the headwaters of the Minnesota River, a river that has attained national prominence because of the ongoing restoration efforts. This plan represents an opportunity for local, state, and federal agencies to recognize the important and significant role-played by the Upper Minnesota River Watershed District in past and ongoing restoration efforts.

2.0 HISTORY OF THE WATERSHED DISTRICT

2.1 PREVIOUS PLANNING EFFORTS

The Upper Minnesota River Watershed District (hereafter referred to as the "District") was formed by Order of the Minnesota Water Resources Board on September 7, 1967. The Big Stone County Board of Commissioners signed a nominating petition for the District on September 8, 1966. The first overall plan was developed in 1970 and the Watershed District Board of Managers adopted it on December 15, 1970. The Minnesota Water Resources Board, as part of the state review and approval process, conducted a public hearing on the plan on March 11, 1971. On July 14, 1971, the Minnesota Water Resources Board approved the Upper Minnesota River Watershed District's first Overall Plan. At that time the Watershed District encompassed approximately 505 square miles primarily in Big Stone County, with smaller areas in Traverse County, Swift County, Lac Qui Parle County, and Stevens County. The present District boundary remains largely unchanged. (Figure 1).

The District continued operation under the policies identified in the first overall plan until approval of a Revised Plan, initiated in 1984.

On March 6, 1984 the Board of Managers filed a revised overall Plan outline with the Minnesota Water Resources Board. The District received comments on the outline in March of 1984 from the Water Resources Board, urging the District to consider the following items: 1) the collection of existing information from other local units of government and state and federal agencies; 2) taking a total water resources management perspective; 3) initiation of a district water quality testing program; 4) promotion of conservation tillage in cooperation with Soil and Water Conservation Districts (SWCDs) and other agencies; and 5) a revision of the District's rules.

On July 29, 1985, the District filed a draft revised Overall Plan. The Water Resources Board issued comments on the draft plan on December 31, 1985. The comment letter

suggested that the District: 1) more fully explain the features of the District's Clean Lakes Project; 2) include better information on feedlots, critical erosion areas, wetlands, and filter strips; 3) incorporate information about the Federal Conservation Reserve Program; 4) attempt to quantify the economic value of its water and related land resources; and 5) include specific measurable objectives.

On December 17, 1987, the District filed a second draft of its revised Overall Plan with the Water Resources Board. In March of 1988, the Water Resources Board issued a notice of filing of the revised overall plan. The notice was officially published within the District the first and second week of April 1988. The notice was also mailed to each affected county, SWCD, city, state agency, and other interested parties. The notice briefly summarized the content of the revised Overall Plan and stated that any person could request a public hearing. The Water Resources Board received no requests for a public hearing.

Water Resources Board members received summary information about the revised Overall Plan in May 1988. On November 30, 1988, the Minnesota Board of Water and Soil Resources (formerly the Water Resources Board) received and considered additional information on the content of the revised Overall Plan and prescribed the revised Overall Plan for the Upper Minnesota River Watershed District. The District operated under the policies identified in the revised Overall Plan from 1988 through 1999.

2.2 WATER MANAGEMENT

The State of Minnesota led water management efforts within the area comprising the District from the late 1800s through the early 1940s. The State's efforts focused primarily on providing flood control and drainage for agriculture. The federal government, under the auspices of the U.S. Army Corps of Engineers ("Corps"), assumed a lead role for water management within the Minnesota River basin during the late 1940s. The Corps began investigating methods to reduce flooding and provide improved

drainage. However, the implementation of any civil works by the Corps required local cooperation and commitments.

Local government has assumed a greater role in water management during the last 20 years. The District has initiated and completed many investigations or projects since formation, some of which are described within Appendix A. Past District projects have included surface and groundwater quality studies, flood control, surface water level management, wetland restorations, natural resource management, education and erosion control projects.

2.3 DISTRICT EVOLUTION SINCE ESTABLISHMENT

2.3.1 Organizational Structure and Boundary Adjustments

The organizational structure of the Board of Managers remains unchanged since inception. The County Board of Commissioners for Big Stone appoints three of the District's Board of Managers, the County Board of Commissioners for Swift County appoints one Board Manager and the County Board of Commissioners for Traverse County appoints one Board Manager. Each Manager must be a resident of the District. Managers are prohibited from being a public official of the county, state or federal government. Each Manager serves a three-year term, which is renewable by approval of the County Board of Commissioners.

No boundary adjustments have occurred since inception of the District. Future boundary adjustments may be needed to reflect the effect of roadway alterations, local drainage activities, and additional topographic information.

2.3.2 Review and Assessment of Existing Objectives

Like many early water management agencies, the original goals and objectives of the District focused on managing water quantity. The early goals and objectives of the

District are presented in "*Overall Plan, Upper Minnesota River Watershed District.*" General objectives identified by the plan included:

a. To slow down weed and algae growth in the District's Lakes.

b. To reduce the pollution of the water in the lakes and water courses within the District.

c. To intelligently regulate the water levels of the various lakes within the District.

d. To keep adequate records of the water level, the chemistry, and other useful data.

e. To enhance the recreational facilities and scenic beauty of the District.

f. To improve the needed drainage, prevent excessive runoff or seepage, and provide needed soil and water conservation in the District.

g. To provide funds to accomplish these objectives and to engage technical assistance and advice.

h. Investigate the possibility of securing additional watershed area to supplement the present water supply.

i. To preserve, maintain, and improve habitat for fish and wildlife.

The Board of Managers understood the plan's purpose as providing a framework for operation of the District, rather than identifying all possible future projects. As

technology, societal attitudes and economic conditions changed, the Board of Managers understood plan review and revision might be needed.

The District has undertaken and completed a number of activities in an effort to achieve their original objectives. More activities have been completed toward achieving some objectives than others. Table 1 evaluates the degree of activity by original objective and evaluates whether there is a need for a similar or revised objective within this updated plan. The need for a similar or revised objective is based on present water management problems within the District and whether there are solutions to these problems.

2.3.3 Future Direction

Maintaining and improving the water quality of Big Stone Lake has historically been the focus of the Upper Minnesota River Watershed District. The District has completed a number of activities oriented toward improving lake water quality, including the development of a work plan for continued improvement of lake water quality, bank stabilization projects along the shoreline, the implementation of agricultural conservation management practices, and addressing point source discharges within the watershed (e.g., Browns Valley).

The emerging issues within the District are more related to potential conflicts between natural resource and water management issues associated with natural, modified and created watercourses than management of the lake. Many of the present drainage systems within the District have not been "maintained" and now exhibit some degree of natural resource value. Proposals to modify these waterways become controversial with natural resource agencies.

An important future direction for the District is becoming an integral component of the decision making process for these types of issues. Preference is to work with the Big Stone County Board of Commissioners to obtain responsibility for those financially solvent legal drainage systems. By integrating natural resource and water management

issues, the District believes creative and innovative solutions can be developed to address these complex issues.

2.4 MISSION STATEMENT

The mission of the Upper Minnesota River Watershed District is to serve the residents of the District by wisely and judiciously managing water, in a manner that sustains and enhances the social, economic and natural resources of the District. The District prefers the use of innovative water management methods, which recognize the unique agricultural, community, lake and stream, and natural resources within the District. These innovative approaches as reflected by the policies of the District should be oriented toward ensuring the economic viability of the District's agrarian community.

3.0 PRINCIPLES GUIDING PLAN DEVELOPMENT

Changes in technology and societal attitudes, new approaches toward water management, and progress have necessitated updating the District's Overall Plan. Three underlying principles have guided the development of this plan. Recognition of the statutory authority provided under Minnesota Law to the Upper Minnesota River Watershed District for managing water and natural resources, is the first principle. The large number of local, state, and federal agencies with responsibility and authority for water management within the District represents a significant planning challenge. This plan is based on recognizing the responsibility and authority provided to the District within the larger context of state and federal government. The plan attempts to clearly identify the role and responsibilities of the various agencies involved in water management and identify the role and responsibilities of the District.

The second principle used during plan development is recognition of the need for and use of a comprehensive watershed based approach to water management. The policies as a whole, which are recommended by this plan, represent a comprehensive approach toward water management. Each policy is one component of the approach. This comprehensive approach to water management will only function properly by using all plan components.

The need for sustainable solutions to water management problems is the third principle, which guided plan development. Sustainability is defined as using resources to meet current needs, while ensuring that adequate resources are available for future generations. The need for water resource management using sustainability principles has been recognized by many, but there are presently no guidelines for water resource plan development (see *Meeting Minnesota's Water and Wastewater Needs, Draft Recommendations; Crosscurrents, Managing Water Resources; Minnesota Water Plan; and Common Ground, Achieving Sustainable Communities in Minnesota*). Therefore, this plan attempts to broadly incorporate the concept of sustainability.

3.1 PRINCIPLES OF SUSTAINABILITY AS THEY APPLY TO WATER MANAGEMENT

The basis for sustainability within water resource management is the realization that water is an integral part of the ecosystem, a natural resource and a social and economic good, whose quantity and quality determine the nature of its utilization. Priority must be given to satisfying basic human needs and the safeguarding of ecosystems. The concept of sustainability is a comprehensive form of planning that encompasses least-cost analysis of resource management options, as well as a participatory decision-making process and the development of water resource alternatives that take into consideration the communities and environment that may be affected, the numerous institutions concerned with water resources and the potential for competing policy goals.

3.2 CHARACTERISTICS OF SUSTAINABILITY[1] IN WATER RESOURCES MANAGEMENT

A set of characteristics is perhaps the best method to describe sustainability as it related to water management. These characteristics are:

a. The general objective is to make certain adequate supplies of water of good quality are maintained for human use, while preserving the hydrological, biological and chemical functions of ecosystem;

b. Adapting human activities within the limits imposed by nature;

c. Recognize the multi-sectoral nature and importance of water as a resource; i.e., for water supply and sanitation, agriculture, industry,

[1] Modified from "Protection of the Quality and Supply of Freshwater Resources: Application of Integrated Approaches to the Development, Management and Use of Water Resources", United Nations Plenary in Rio de Janeiro, June 14, 1992 and "A white paper from the American Water Works Association - Integrated Resource Planning in the Water Industry" June, 1994.

urban development, hydropower generation, transportation, recreation, and ecosystems;

d. Recognize the need for coupling of water supply, conservation and waste minimization;

e. Design, implement and evaluate projects and programs that are both economically efficient and socially appropriate within clearly defined strategies, based on full public participation.

The recognition of the statutory authority of stakeholders, the use of a watershed based approach and the concept of sustainability form the basis for this plan. This plan constitutes a revision to "*Overall Plan, Upper Minnesota River Watershed District*" and is intended to meet the requirements of Chapter 103D,[2] Section 103D.405 of the Minnesota Statutes.

[2] Chapter 103D represents recodification of the original Chapter 112, the Minnesota Watershed Act.

4.0 WATERSHED SETTING

4.1 SIZE, LOCATION AND SUBWATERSHEDS

4.1.1 Location

The Watershed District is located in west-central Minnesota, (Figure 1). Big Stone Lake and the South Dakota border form the western boundary of the District. The continental divide and Traverse County are located to the north. Areas south of the continental divide contribute runoff southerly to the Minnesota and Mississippi Rivers and north of the divide northerly to the Hudson Bay via the Red River of the North. Generally, the watershed district includes all of the land east of Big Stone Lake draining into Big Stone Lake and into the north side of the Minnesota River above the Marsh Lake Dam, which is located in Section 30, Township 120, Range 43, 5th Principal Meridian, Swift and Lac Qui Parle counties.

Approximately 80% of the land area of Big Stone County is in the District. The small area of north central and northeast Big Stone County, not in the District, casts its runoff northward through the west branch of the Mustinka River. In Stevens County the few acres in the District are along the west line of the township situated in the southwest corner of Stevens County. Most of Shible Township in southwestern Swift County is in the District.

On the south, southwest of the Minnesota River, the District includes the northern part of Agassiz and Yellow Bank Townships in Lac Qui Parle County west of U.S. Highway 75. The territory of the District in northwestern Lac Qui Parle County includes the Big Stone National Wildlife Refuge.

4.1.2 Size

There is approximately 505 square miles of land within the District. The area is distributed between counties as follows:

a. Big Stone County – 410 square miles (81%).

b. Traverse County, 40 square miles (8%).

c. Swift County – 35 square miles (7%).

d. Lac Qui Parle County – 18 square miles (3%).

e. Stevens County – 2 square miles (1%).

4.1.3 Subwatersheds

Subwatersheds within the District flow to the Minnesota River, some through Big Stone Lake and others directly to the Minnesota River. Subwatersheds flowing into Big Stone Lake include Browns Valley, Hoss Creek, Fish Creek, Salmonsen Creek, Lindholm Creek, Meadowbrook Creek, direct drainage area in or near Ortonville and a number of small-scattered direct tributaries to Big Stone Lake. Subwatersheds which are tributary on the northeast of the Minnesota River include: Stony Run, Upper Stony Run, County Ditch No. 4, Five-Mile Creek, Shible Lake and a few areas that contribute runoff directly to the Minnesota River. On the southwest side of the Minnesota River there are about 18 square miles that contribute runoff to the Minnesota River. Locations of the sub-watersheds are shown in Figure 2.

Stream flows in the watershed generally attain peak flows in March or April following snowmelt runoff. Increased runoff occurs after heavy summer storms.

4.2 LOCAL STAKEHOLDERS WITHIN THE DISTRICT

There are several types of stakeholders within the Upper Minnesota River Watershed District. Stakeholders are defined as persons, groups or institutions having an interest in an activity, project or program. The definition includes both intended beneficiaries and intermediaries, winners and losers, and those involved or excluded from a decision-making process. Stakeholders include residents of the District, state and federal agencies, special interest groups, and local government. Local stakeholders are the local governmental units and residents responsible for or involved with local water management.

There are several types of local governmental units within the District. Cities located within the District include Ortonville, Browns Valley, Odessa, Beardsley, Barry, and Clinton. Townships included or partially included in the watershed are: Browns Valley, Toqua, Graceville, Foster, Prior, Almond, Malta, Big Stone, Ostrey, Artichoke, Ortonville, Odessa, and Akron, in Big Stone County; Shible, Appleton, and Hegbert in Swift County, Yellow Bank and Agassiz in Lac Qui Parle County; Stevens in Stevens County; and Parnell, Arthur, and Folsom in Traverse County.

Big Stone, Traverse, Swift, Lac Qui Parle, and Stevens Counties are local units of government and vital stakeholders involved in District activities. The County Board of Commissioners for Big Stone appoints three of the District's Board of Managers, the County Board of Commissioners for Swift County appoints one Board Manager and the County Board of Commissioners for Traverse County appoints one Board Manager. Soil and Water Conservation Districts within Big Stone, Traverse, Swift, Lac Qui Parle, and Stevens Counties work jointly with District Staff.

Local residents are stakeholders in District activities by virtue of District residency. Some local residents serve on the Watershed District Advisory Committee. Members of the Advisory Committee are residents of the District, typically community leaders, and have the role of advising and assisting the District Board of Managers. They can also make

recommendations on all contemplated projects and initiatives. Currently the District has seven Advisory Board Members. They include two landowners, one Big Stone County Commissioner, one Ortonville City Council Member, a District Conservationist for NRCS, the Big Stone County Environmental Officer, and the Big Stone County Highway Engineer. Other local residents become involved with specific District initiatives.

4.3 POPULATION OF THE DISTRICT

People have a direct effect on the use, need for and distribution of water. Therefore, some understanding of population trends within the District is useful when attempting to understand the need for water management within the future. Population within the District has declined since 1960 although the trend has slowed or leveled off. For example, Big Stone, Swift, Stevens, and Traverse Counties collectively showed a gain in population of 0.01% between 1996 and 1997. The population trend within the District since 1990 is similar to Minnesota as a whole. The population within Minnesota decreased by an average annual rate of 1% between the 1950s and the 1970s, but has increased annually by 1% since the early 1980s. The population loss within the District between 1990 and 1995 resulted from death rates exceeding birth rates, rather than a loss through migration.

According to the Minnesota State Demographic Center, the population of the District will decrease through 2015. The projected population is a decrease in population for Big Stone County of approximately 1% per year. This results in a projected county population of 5,660 in 2000 decreasing to 4,760 in 2015. The Center has similar projections for Traverse County with a decrease of approximately 0.8% per year, resulting in a projected population of 4,170 in 2000 decreasing to 3,640 in 2015. The county population projection for Swift County shows a slight increase from a projected population of 11,000 in 2000 to 11,130 in 2015. These projected losses and lack of population growth in western Minnesota have often been attributed to loss of employment opportunities within the agricultural economy.

The area comprised by the District lacks regionally significant industrial activity. Most of residents of the District live in rural rather than urban areas, as few municipalities of significant size are located within the District. Most of the rural residents within the District are employed by some sector of the agricultural economy. The number of farms has declined and average farm size increased within the District, as the number of people within the District declined. In Big Stone County the number of full time farms declined 20% from 374 farms in 1992 to 301 farms in 1997. While the average size of farms increased by 6% from 570 acres in 1992 to 605 acres in 1997. In Swift County the same trend is evident, as the number of full time farms decreased 14% from 601 farms in 1992 to 518 farms in 1997. The average size of farms for the same time period increased by 2% from 513 acres in 1992 to 525 acres in 1997. The same trend is characteristic of rural Minnesota in general. The number of farms within Minnesota peaked in 1935 at 204,000, and has declined steadily to 75,079 farms in 1992. Farms averaged 211 acres in 1959 and 342 acres in 1992, with the largest farms occurring in northwest Minnesota.

4.4 THE ECONOMY

4.4.1 Overview

The State of Minnesota experienced general prosperity during the early 1990s. Coupled with an abundance of jobs, the Minnesota economy continues to create more employment, luring people to move to Minnesota from less prosperous states. Despite a national recession during 1991 and 1992 and widespread flooding within Minnesota during 1993, Minnesota's economy has grown at a rate faster than the population growth. The economic trend during the early 1990s points to gains in employment and income at a rate greater than our neighboring states.

Minnesota's per capita income of $22,217 (1994) is substantially greater than in Wisconsin, Iowa, North Dakota or South Dakota and slightly greater than the national average. Per capita income in Minnesota was $4,350 greater in 1995 than in 1990 ($18,779), an increase of 23.1% (not adjusted for inflation). Per capita income within

Minnesota during 1993 exhibited the strong negative effects of flooding, but rebounded in 1994 (up 6.3%) as a result of a strong farm economy and one-time disaster payments made in January of 1994. Personal income within counties comprising the District again saw a substantial increase in 1996 due to attractive commodity prices. Personal income in Big Stone County increased by 29.9% from $14,795 in 1990 to $19,216 in 1996. Similar increases were seen in Swift and Traverse Counties between 1990 and 1996 with increases of 42.7% and 39.0% respectively. However, 1997 brought severe flooding and lower prices. The 1998 cropping season was equally disastrous with even lower farm prices resulting in a number of farms closing and renting to larger operators. It is estimated that personal income within the district decreased between the 1996 and 1998 due to low prices for agricultural products.

Employment increased by 25.5% and -3.2% in Swift and Big Stone Counties, respectively, between 1990 and 1998. The increase in Swift County may be due to the addition of manufacturing jobs located outside of the District. The trend in unemployment in the District has been downward. In Big Stone County the rate has dropped every year since 1993. In Swift County, the rate has been in a downward trend since 1992 with the exception of 1996. Unemployment rates remain low within the District. During 1998 the unemployment rate averaged 3.5% within Big Stone County and 2.9% within Swift County. Both of these rates are the lowest in more than eight years.

Economic indicators are generally discussed according to industries of the economy. Industries can be classified as: 1) retail trade; 2) wholesale trade; 3) service; 4) financial, insurance and real estate; 5) transportation, communications and utilities; 6) manufacturing; 7) mineral; 8) construction; 9) agriculture; 10) government; and 11) military. The most important industries to the regional economy of the Minnesota River Valley in priority order are agriculture, government, services and manufacturing.

4.4.2 Agriculture

As one of the nation's leading agriculture states, Minnesota sold $6.48 billion worth of agricultural products during 1992, accounting for 5.5% of gross state product. Minnesota ranked seventh in total agricultural sales after California, Texas, Iowa, Kansas, Nebraska and Illinois and produced more sugar beets and green peas than any other state. Minnesota was third during 1992 in the production of oats and soybeans and the number of farms selling $100,000 or more of agriculture products.

There were 420 farms with an average size of 605 acres in Big Stone County in 1997, compared to 739 farms (525 acres) and 385 farms (818 acres) in Swift and Traverse Counties, respectively. The average size of a farm within Minnesota is 342 acres. The number of farms has decreased and the average size increased since 1959, as advances in farm technology allow individual farmers to operate larger farms with less hired labor. Technological advances in farming have also made smaller plots of land less economical to farm, because of lower efficiency. The economic viability of farm operations has been maintained only through increased production, as profit margins have declined.

Cropland accounted for up to 72% of the land within Big Stone County in 1997, compared at up to 74% in Swift County. The sale of all agricultural products exceeded $54 million within Big Stone County and $119 million in Swift County in 1997, demonstrating the regional importance of agriculture to the economy. In 1997 crop sales within Big Stone and Swift Counties accounted for more than 70% and 64% respectively, of the agricultural products sold. The general trend within the District continues to be toward the production of cash crops, rather than livestock.

This trend is reflected in the livestock numbers within the District. According to the 1997 census of Agriculture, the number of cattle and calves in Big Stone County decreased by approximately 19% from 10,321 in 1992, to 8,335 in 1997. Hogs and pigs showed a similar trend decreasing from 37,910 in 1992 to 36,103 in 1997.

Permitting responsibility for animal feedlots within the district is the responsibility of the Minnesota Pollution Control Agency (MPCA). In Big Stone, Traverse, Stevens, Swift, and Lac Qui Parle counties some aspects of this responsibility has been delegated to the counties. County Feedlot Officers are present in these counties to provide technical assistance and coordinate permitting activities. According to the MPCA approximately 60 feedlots were permitted within the District in 1996. Their locations are shown in Figure 5. The number of feedlots currently operating without a permit is unknown. However, based on a 1997 level 1 survey of livestock operations in Big Stone County, potential feedlots are estimated at between 140 and 160 within the District in Big Stone County alone.

4.4.3 Government

The economic importance of government within the District is difficult to quantify. The primary form of government within the District is local; i.e., county, city, and township. Local Government is considered a significant employer within the District. The city of Ortonville is the county seat of Big Stone County and is the only county seat located within the District. A majority of the local government jobs are located at Ortonville. The Ortonville area also provides both state and federal positions. These include the Minnesota Department of Natural Resources, Natural Resource Conservation Service, and the Farm Service Agency.

4.4.4 Services

Service industries are those engaged in providing services for individuals, business and government establishments, as well as other organizations. The three largest service categories within Minnesota are business, health and professional. The service industry is typically associated with population centers. Because of the lack of significant population centers within the District, earnings within the District resulting from services are likely to be less than state averages, with the majority of earning resulting from health

care and legal services. The service industry within the District employs health care positions within the Medical, Health, Optometry, Chiropractic, and Dental fields.

4.4.5 Transportation

Other industries play a less prominent role within the District. Transportation is important because of the distance often commuted by residents when performing daily activities. Important transportation routes traversing the District from south to north include; State Highway 7 along the western portion of the District, U.S. Highway 75 bisecting the center of the District, and County State Aid Highway 25 along the eastern portion of the District. Important roads serving as east-west routes through the District include; U.S. Highway 12 in the southern portion of the District, County State Aid Highway 6 in the central portion of the District, and State Highway 28 in the northern portion of the District. These highway systems are important within the District, because they serve as access to other regionally important transportation routes. Two railroad systems are located within the District. The Burlington Northern Railroad operates a line running parallel to U.S. Highway 28. The Soo Line Railroad operates a line running parallel to U.S. Highway 75 south of Ortonville.

4.5 PHYSICAL CHARACTERISTICS OF THE DISTRICT

4.5.1 Climate

In general, the climate within the District can be described as continental, meaning the area is characterized by cold winters and mild summers, the result of being near the center of a large land mass (i.e., North America). Polar air masses dominate during the winter months, resulting in cold, dry weather. Warm, moist air masses originating from the Gulf of Mexico dominate during the spring and summer, resulting in warm days and nights. Seasonal temperature extremes within the District are common.

In total, there are eight U.S. Weather Bureau observation stations located within and in proximity to the District used for the determination of the long-term meteorological

conditions. The six U.S. Weather Bureau observation stations within the District are located at Artichoke, Beardsley, Correll, Madison, Milan and Ortonville, MN; the two U.S. Weather Bureau observation stations outside the District are located at Milbank and Wilmot, SD. Each U.S. Weather Bureau observation station is located within 30 miles of Ortonville, the District's office.

Wide variations in temperature and moderate precipitation characterize the District. The mean annual temperature within the District is approximately 44ºF. Mean monthly temperatures vary between 12ºF in January to 74ºF in July. Within the District, temperature extremes as high as 114ºF and as low as -42ºF were recorded at Beardsley on July 29, 1927 and at Milan on February 16, 1936, respectively. Mean annual precipitation within the District is approximately 22 inches (Figure 3). Monthly precipitation varies, on average, between 0.6 inches in January to 4 inches in June. About 58% of the annual precipitation occurs between May and August. Maximum and minimum annual precipitation depths recorded within and around the District are 39.1 inches at Milan, MN and 11.5 inches at Milbank, SD. Maximum 24-hour rainfalls varying from 4.0 inches to 8.7 inches have been recorded on several occasions in the region. Annual snowfall totals about 36 inches and comprises about 16% of the mean annual precipitation.

4.5.2 Physiography

The District is situated within the Northern Glaciated Plains Ecoregion and can further be divided into three geomorphic settings: 1) the headwaters flowing off the Coteau des Prairies, 2) the lower basin-situated within the Blue Earth Till Plain, and 3) the Minnesota River Valley-carved by the glacial River Warren.

The portion of the watershed within the Blue Earth Till Plain is represented by nearly level to gently sloping lands, ranging from 0-6% in steepness (Figure 4). Soils are predominantly loamy, with landscapes having a complex mixture of well and poorly drained soils. Drainage of depressional areas is often poor and tile drainage is common. Water erosion potential is moderate on much of the land within this geomorphic setting.

The Coteau des Prairies is a morainal plateau that occupies the headwaters of the Upper Minnesota River and several other rivers. In addition to being an impressive topographic barrier, the Coteau acts as an important drainage divide. Its well-drained southwestern side sheds water into the Big Sioux River, while waters on the northeastern side flow into the Des Moines and Minnesota Rivers. The Coteau is characterized by landscapes with long northeast facing slopes, which are undulating to rolling (2-18%). Soils are predominantly loamy and well drained.

Tributaries draining the Coteau and entering the Upper Minnesota River from South Dakota include the Little Minnesota River – headwaters of Big Stone Lake and the Whetstone River. Alluvial deposits at the mouth of the Whetstone River formed a natural dam, originally impounding Big Stone Lake. In 1973 a diversion was completed that directed flows of the Whetstone River directly into Big Stone Lake. Further modifications were made in the late 1980s with the completion of the Big Stone/Whetstone River Control Structure. This structure can redirect up to 1460 cubic feet per second (cfs) of flow from the Whetstone directly into the Minnesota River, bypassing the deposition of unwanted sediments and nutrients into Big Stone Lake during high flow periods.

Below Ortonville, the Minnesota is a small but distinct river. It flows for fifteen miles, passing through the Big Stone-Whetstone Reservoir and further down receives the waters of the Yellow Bank River whose headwaters are also in South Dakota. The Upper Minnesota then meets Marsh Lake and Lac Qui Parle. Both Marsh and Lac Qui Parle lakes are natural impoundments, dammed by alluvial fans of sediment deposited at the mouths of two major tributaries, the Pomme De Terre and Lac Qui Parle rivers respectively. The Pomme De Terre River comes down from the hills of the lake country to the north. The Lac Qui Parle River originates in the Coteau des Prairies, flows northeast through the prairies of the southwest, and then joins with the Minnesota River by Watson. Although they are natural reservoirs, the lakes were subject to some natural fluctuation; thus dams were built at the outlets for greater water control. The outlet of the

Upper Minnesota River Watershed is below the Lac Qui Parle Reservoir, 288 miles upstream from the mouth of the Minnesota River.

4.5.3 Geology

An understanding of geology provides insight into the location, movement and natural quality of ground water. The hydrologic character and water chemistry of streams and lakes are also strongly affected by surface geology. Except for the Minnesota River valley and its tributaries, the area is a hummocky plain underlain by 100 to 200 feet of glacial drift composed of clayey till and sandy outwash. The drift rests on Cretaceous shale and Precambrian granite. The present Minnesota River valley floor is 80 to 100 feet below the surrounding regional plain. The valley sediments consist of a thin deposit of fine grained recent alluvium on top of dense glacial till and channel deposits, Cretaceous shale, and Precambrian granite. Scattered granite knolls and ridges of glacial till and outwash protrude through the alluvium on the valley floor. The alluvium of the valley is primarily composed of clays, silts, fine sands and has high organic matter content. This material is variable in thickness that averages less than 25 feet and is not continuous over the valley floor. The main glacial unit is the till on the floor of the valley and forms the material in the valley walls and in the surrounding regional highland. Scattered large boulders are present in the till.

4.5.4 Soils

An understanding of soil type is important when discussing water management issues. Infiltration rates are a function of soil type and differing soil types have differing abilities to hold water. Soils are derived from geologic deposits. The source of minerals within the District is glacial sediments. Soils derived from these sediments range from poorly drained silty clays to well drained sandy loams.

Soils with similar slope, texture, natural drainage and other features are categorized within the same major association. Within the District ten major soil associations are

present (Figure 5). However, three soil associations comprise a least 75% of the District. The primary associations within the District are the Hamerly-Parnell-Lindaas, Hattie-Fulda and Esmond-Heimdal. In proximity to the Lac Qui Parle River the major soil associations are quite varied. In general, the soils within the northern portion of the District are largely poorly drained silty clays and clay loams; the soils within the southern portion of the District are primarily well-drained loams.

4.5.5 Land Use and Cover Types

How land within the District is used by humans and how these uses are distributed across the landscape largely determines the need for water management activities. Most agree that intensive water management is needed within urban areas to protect infrastructure, while less intensive measures are needed in areas with lower population density, provided water management is not needed to sustain important activities (e.g., agriculture). Resource management, whether the resource is water, wildlife, or minerals, is essentially an issue of land management.

Land use within the District is primarily agricultural, with 76% of the available acres utilized for production of grain crops, mainly corn and soybeans. Of these acres, approximately 15% have been tiled to improve drainage. The majority of the croplands (82%) are classified as moderately productive. In 1994, roughly 8% of the agricultural acres within the District were classified as grasslands enrolled in the Conservation Reserve Program (CRP), a voluntary federal program that offers annual rental payments to farmers in exchange for planting areas of grass and trees on lands subject to erosion. According to current estimates amount of land enrolled in this program has been reduced to approximately 9,000 acres or 3% of the District. In addition to the CRP program, approximately 800 acres of land has been enrolled in the Reinvest in Minnesota (RIM) Program. Land eligible for the RIM Reserve Program includes riparian lands, sensitive groundwater areas, wetland restoration areas (drained wetlands), marginal cropland and lands for living snow fences. Approximately 39% of the lands draining into the District have high water erosion potential and 26% have the potential for significant wind

erosion. Water erosion potential is highest on lands draining the Coteau region. Approximately 9% or 29,205 acres within the District are publicly owned. The majority of this land is managed as recreational or wildlife areas as parks or waterfowl production areas. Generally these parcels are under the management of the US Fish and Wildlife Service or the MN Department of Natural Resources.

4.6 BIOLOGICAL AND ECOLOGICAL RESOURCES

4.6.1 Ecological Units

Different types of classification systems have been used for describing "ecological units". The ecoregion concept has been used extensively within Minnesota. The District lies within the Northern Glaciated Plains ecoregion. Just to the north of the District lies the Red River Valley ecoregion, while the North Central Hardwood Forests and the Western Corn Belt Plains ecogregions begin about 75 miles to the east. The Northern Glaciated Plains ecoregion contains three geomorphic settings within the District. These include the Coteeau des Prairies, the Blue Earth Till Plain, and the Minnesota River Valley. The ecoregion concept is useful because characteristics within the area comprising an ecoregion are often similar and water management strategies may differ by ecoregion.

4.6.2 Original Vegetation

Original vegetation consisted of mostly Mesic and Hill Prairie with many marshes and sloughs (Figure 6). Woodlands, in the form of Oak Openings and Barrens occurred along streams and around lake perimeters. A few scattered prairie tracts remain where they have been maintained by haying and occasional fires or through protection or restoration in Waterfowl Production Areas and other Wildlife Management Areas. Major grass species occurring in these prairie remnants include big and little bluestem, indian grass, side-oats grama, prairie cordgrass, and prairie dropseed. The principal species of woody vegetation in the Oak Openings and Barrens community is the bur oak. This plant

community is currently found mostly along the Little Minnesota River near the upper end of Big Stone Lake.

4.6.3 Important Wildlife Habitats

Important wildlife habitats in the District are grasslands and wetlands. The prairie remnants are valuable habitats for those species such as the greater prairie chicken that utilize wholly or in part grassland ecosystems. Woodlands and brushy areas are important as breeding, nesting, feeding, and resting areas for both migratory and resident wildlife. Wetlands, including potholes, marshes, and open waterbodies, provide habitat for aquatic and terrestrial biota. Organisms utilizing these areas include fishes, various aquatic invertebrates, waterfowl, big and small game, furbearers, some rodents, wading birds, and many species of songbirds.

The white-tailed deer is the major big game animal within the District. Typical furbearers include the coyote, red and gray fox, mink, muskrat, beaver, and raccoon. Small game mammals consist of the cottontail rabbit, jackrabbit, and gray squirrel. Upland game birds are composed of the ring-necked pheasant and Hungarian partridge. Waterfowl production occurs in the wetland areas, with the most common breeding ducks consisting of the mallard, blue-winged teal, and northern shoveler. Other migratory birds utilize the stubble fields of the District during the fall. Common nongame breeding birds are the killdeer, house wren, robin, and savannah sparrow. Typical herpetofauna include the western plains garter snake, red-bellied snake, eastern tiger salamander, leopard frog, and wood frog.

4.6.4 Fisheries of the District

The Minnesota Department of Natural Resources manages six lakes for gamefish species within the District. The largest is Big Stone Lake. Big Stone Lake is located on the Minnesota-South Dakota border and was formed nearly 8,000 years ago when glacial sediments deposited at the southern end of the present day lake formed an earthen dam on

what is now the Little Minnesota River. Although classified as hypereutrophic, Big Stone Lake has an excellent fishery. The lake is primarily managed for walleyes, channel catfish, yellow perch, nothern pike, black crappies, and sunfish. The five remaining lakes managed by the Minnesota Department of Natural Resources are generally classified as glacially formed prairie lakes. They include Arens, Botkers, Long Tom, Marsh, and North Long Tom. These lakes are rich in nutrients, relatively shallow and windswept. These fisheries are managed mostly for walleyes and northern pike. While these recreational lakes are managed for game fish species, nongame species or "rough fish" make up a substantial part of the spectrum of species present in the District. These nongame fishes include bullhead, sheepshead, buffalo, quillback, suckers, redhorse, and carp.

4.6.5 Rare and Threatened Resources

The Minnesota Department of Natural Resources has identified 27 species of plants and 14 species of animals as either endangered, threatened or species of special concern, that have been observed within Big Stone County (Table 2). The Minnesota Department of Natural Resources has similarly identified rare community types within the District (Table 3).

4.7 CULTURAL RESOURCES

Locations and buildings of national significance are listed on the National Historic Registry. The Minnesota Historical Society also lists sites of state significance. No sites within the District have been listed on either the National Historic Registry or the State Registry.

4.8 SURFACE WATER RESOURCES

4.8.1 Subwatersheds and Primary Tributaries

The subwatersheds flowing into Big Stone Lake include Browns Valley, Hoss Creek, Fish Creek, Salmonsen Creek, Lindholm Creek, Meadowbrook Creek, and Ortonville. Flows of selected tributaries are listed in Appendix B. The following subwatersheds are tributary to the northeast side of the Minnesota River; Stony Run, Upper Stony Run, County Ditch No. 4, Five-Mile Creek, and Shible Lake. On the southwest side of the Minnesota River there is about 18 square miles that contribute runoff to the Minnesota River.

4.8.2 Important Lakes within the District

The total number of lakes within the District recognized by the Minnesota Department of Natural Resources is six. The lakes within the District include Big Stone, Arens, Botkers, Long Tom, Marsh, and North Tom. Big Stone Lake is by far the largest of the six lakes, having a surface area of approximately 12,600 acres. Marsh Lake is the second largest, having a surface area of approximately 4,500 acres. The remaining four lakes are generally classified as small, prairie lakes with surface areas ranging from approximately 24 to 133 acres. All six lakes are characteristically shallow and nutrient rich.

Lakes within the District are used for recreation, including fishing, boating, and camping. They are also used by permanent residents, summer home residents, and tourists who are attracted to this area from all over the United States and Canada. Public access and campgrounds are available for public use on most of the lakes. Many year-round residences and summer homes have been built in part because of the recreational and aesthetic appeal of the area. Fishing is popular in these lakes. The most common fish found in these waters include bass, northern pike, panfish, and walleye.

The quality of water in the lakes is a fundamental concern of the District. The pressure for development around lakeshore, plus commercial tourism, could result in poor water quality. The District is committed to cooperating with other agencies, such as the Minnesota Pollution Control Agency and the Minnesota Department of Natural Resources, to control lake pollution and lake shore development, so that these valuable natural resources may be preserved.

4.8.3 Density and Distribution of Wetlands

In general, wetland resources exist throughout the District. The northeast and south-central portions of the District generally contain more wetlands than the northwestern part. The northeast and south-central areas also tend to contain more semi-permanently flooded, permanently flooded, and intermittently exposed wetlands, while the north-western part generally contains more saturated and temporarily flooded wetlands (Figure 7).

The number and types of wetlands within the District is a direct result of settlement patterns and historical incentives to landowners. The value of wetlands differs among individuals, but the efforts to preserve, enhance and maintain wetland systems is evidence of their societal importance. A variety of values are attributed to wetlands, i.e., flood control, water quality improvement, ecological, and groundwater recharge. Any specific wetland may exhibit one or many of these attributes depending upon size, location, and degree of human disturbance. Some wetlands clearly exhibit greater quality than others do.

Numerous waterfowl production areas (WPAs) are located within the District. Waterfowl production areas were acquired by the U.S. Fish and Wildlife Service (USFWS) either through fee title or easement. Their purpose is to preserve breeding, nesting, and feeding habitat for migratory waterfowl. These wetland areas are purchased, or an easement interest obtained, with funds received from the sale of migratory bird hunting and conservation stamps (“duck stamps”). These WPAs are significant because

they provide the public with a variety of wildlife oriented recreational opportunities, as well as valuable habitat for migratory waterfowl and many other forms of wildlife. In addition to WPAs, the Minnesota Department of Natural Resources has purchased state-owned wildlife management areas extensively throughout the District. Previously drained or unsuccessfully drained wetlands within the District represent a unique opportunity. The U.S. Fish and Wildlife Service recorded information about whether a wetland had been drained while performing the National Wetland Inventory. These wetlands, depending upon the degree of present ecological function, represent an opportunity to enhance the storage of run-off while increasing ecological diversity, provided some degree of storage can be incorporated into the restoration or enhancement. Throughout the District, many opportunities exist for this type of effort.

4.8.4 Drainage Systems

Legal drainage systems, consisting of both county and judicial ditches, are present throughout the District (Figure 8). The drainage system is comprised of fourteen county ditches and one judicial ditch. All county ditches are located within Big Stone County, i.e. the center of the District. The lone judicial ditch present within the District forms the boundary between Big Stone County and Lac Qui Parle County, while connecting Big Stone Lake and Marsh Lake. Open channels, drainage tile ranging in diameter from 5 to 36 inches or a combination of the two comprise both the county and judicial drainage systems.

4.8.5 Surface Water Quality

Surface water quality has in the past and continues to be a concern of the residents of the District. Pollution of surface waters includes suspended sediments, excess nutrients, pesticides, pathogens, and biochemical oxygen demand. To date the most extensive study of surface water quality has been the *Restoration of Big Stone Lake Evaluation of the Effectiveness of Lake Management Measures*. This report was completed through an EPA

Grant by the District and the Roberts Conservation District, Sisseton, S.D. A copy of the Executive Summary is included in Appendix F.

One stream within the District is listed as a US Environmental Protection Agency 303(d) impaired waterbody. The Little Minnesota River is listed as "not supporting" aquatic life between the Jorgenson River and Big Stone Lake. Much of this river reach is within South Dakota. The nonsupporting reach length is listed as 11.5 miles. Approximately 3 miles of this river reach is located within the District.

Although not 303(d) listed, Fish Creek is assessed as threatened for aquatic life by the MPCA. Fish Creek is a major tributary to Big Stone Lake and is located in the northern part of the District. Part of Fish Creek is also county Ditch No. 7 (Figure 8).

4.9 GROUNDWATER

4.9.1 Distribution

The three principal aquifers above the bedrock are Cretaceous sandstone, buried sand and gravel and near-surface sand and gravel deposits in the glacial till.

Appendix C contains information about the Cretaceous rock and glacial drift overlaying Precambrian bedrock.

Groundwater in the District is also obtained from valley alluvium. Wells in the aquifers of the valley alluvium located near the river or lakes provide abundant supplies of water at comparatively shallow depths. Buried sand and gravel lenses are present in the glacial drift and produce adequate supplies of water for municipalities.

Most of the wells in Cretaceous aquifers are in the northwest and southwest parts of the District. Yields are small-to-moderate. Most of the water is relatively soft.

4.9.2 Recharge Areas

Recharge to aquifers in the valley alluvium occurs rapidly in response to local precipitation. Groundwater flow in the valleys is generally toward the river or lakes. Because of the clayey nature of the glacial drift, aquifers in the drift receive less recharge than valley alluvium.

4.9.3 Quantity and Yield

Adequate groundwater supplies exist generally throughout the District for Municipal and rural users. The best sources of water supply are the near-surface sand and gravel aquifers. Yields from this aquifer are known to be as high as 1,200 gallons per minute. Studies indicate that the groundwater aquifers adjacent to Big Stone Lake supply significant amounts of underflow to Big Stone Lake throughout the year.

4.9.4 Discharge Areas

In the east bluff area along Big Stone Lake are many springs that feed the small tributaries to the Big Stone Lake. In Ortonville, many of the residents living between the shoreline and the bluff obtain their water supply from springs. This supply of water is the westerly flow of groundwater towards Big Stone Lake.

4.9.5 Groundwater Quality

Groundwater profiles conducted by the Minnesota Pollution Agency (MPCA) of the West Central Region indicate a number of water quality issues relative to groundwater (Figure 9). The West Central Region consists of Becker, Big Stone, Chippewa, Douglas, Grant, Kandiyohi, McLeod, Meeker, Otter Tail, Pope, Renville, Sibley, Stevens, Swift, and Traverse Counties. The Upper Minnesota River Watershed is located roughly in the west central portion of this region.

The following groundwater quality issues were identified for this region.

a. Arsenic and other elevated trace metal are associated with the geology of the region.

b. Agricultural practices and domestic land uses may impact ground-water quality with the increased presence of nitrates and dissolved solids.

c. Lakeshore development may adversely impact ground and surface water in the northern part of this region.

The desired actions identified by MPCA to address these concerns include the implementation of a long-term, systematic evaluation of the ground-water resources, monitoring for the establishment of trends in nitrates, pesticides, and urban impacts of water table aquifers, and the identification of areas where nitrate levels in unconfined aquifers exceed drinking water standards.

Figure 9 identifies factors potentially affecting water resources within the District. It identifies the locations of MPCA permitted feedlots, the Big Stone County Sanitary Landfill (now closed), the Beardsley Municipal Well, and unsewered communities or subdivisions. Listed below is an individual listing of the unsewered communities within the District.

				Location		
Community/ Subdivision[1]	Incorporated	Population	County	Section	Township	Range
Barry	Yes	35	B.Stone	9	124N	47W
Correll	Yes	83	B.Stone	3	121N	44W
Herberg Beach	No	17	B.Stone	18	123N	48W
Bowmanza Grove	No	10	B.Stone	18	123N	48W
Bonanza Beach	No	26	B.Stone	18	123N	48W
Trails End	No	41	B.Stone	28	123N	48W
Sylvan Beach	No	10	B.Stone	33	123N	48W
Foster's Sub'd	No	36	B.Stone	33	123N	48W
Bromes Beach	No	5	B.Stone	33	123N	48W
Shady Oak	No	53	B.Stone	6	122N	47W
Sherman's Sub'd	No	34	B.Stone	5	122N	47W
North Shore	No	14	B.Stone	12	122N	47W
Lou Point	No	31	B.Stone	12	122N	47W
Lakeside	No	19	B.Stone	13	122N	47W
Bayview	No	72	B.Stone	19	122N	46W
Meadowbrook	No	70	B.Stone	19	122N	46W
Sunset View	No	17	B.Stone	19	122N	46W
Island View	No	14	B.Stone	29	122N	46W
Apple Valley	No	19	B.Stone	32	122N	46W
Petersburg	No	19	B.Stone	32	122N	46W

4.10 UNIQUE WATER FEATURES

Features within the District considered unique are somewhat dependent upon point of view. However, two features in particular are worth noting. These include the wetland resources and Big Stone Lake. It has been estimated that 90% of the prairie wetlands within the Minnesota River Basin have been drained. The quantity of the remaining wetland resources within the District is unique when compared to the rest of the Minnesota River Basin. These are demonstrated in Figure 7 and also described in Section 4.8.3, Density and Distribution of Wetlands. Many of these wetland resources provide functions of ecological significance to the District and the region. Specific areas providing both ecological functions and public values include the Big Stone National

[1] Source: Minnesota River Basin Information Document. 1997. Minnesota Pollution Control Agency

Wildlife Refuge, the Lac qui Parle Wildlife Management Area, Waterfowl Production Areas, and wetland easements.

Big Stone Lake provides invaluable recreational and economic benefits to the residents of the District as well as the surrounding region. It is likely that the water quality of this lake will be an indicator of the effectiveness of resources management activities as well as the overall health of the region.

5.0 EXISTING PROGRAMS AND POLICIES

Understanding the missions, activities, programs and policies of existing water management agencies is imperative if the District's efforts are to be placed in proper context. Table 4 provides an overview of the missions, activities, programs and policies of existing water management agencies.

5.1 LOCAL GOVERNMENT

5.1.1 Counties

The Upper Minnesota River Watershed District encompasses portions of five counties. These include Big Stone County, Traverse County, Swift County, Lac Qui Parle County, and Stevens County. Each county has its own Comprehensive Water Plan, completed in accordance with Chapter 103B of the Minnesota Statutes. County Comprehensive Water Plans must be updated once every five to ten years in accordance with current Minnesota legislative requirements. Most County Comprehensive Water Plans were updated in 1997. These comprehensive water plans must be consistent with Watershed District plans covering the same geographic area. 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 shoreland 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.

5.1.2 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. Townships included or partially included in the water-

shed are: Browns Valley, Toqua, Graceville, Foster, Prior, Almond, Malta, Big Stone, Ostrey, Artichoke, Ortonville, Odessa, and Akron, in Big Stone County; Shible, Appleton, and Hegbert in Swift County, Yellow Bank and Agassiz in Lac Qui Parle County; Stevens in Stevens County; and Parnell, Arthur, and Folsom in Traverse County.

5.1.3 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 storm water and municipal wastewater. Municipalities also have a responsibility for establishing water supply treatment and distribution systems, sewage collection and treatment systems, and storm 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. Municipalities in the District include: Ortonville, Browns Valley, Odessa, Beardsley, Barry, and Clinton.

5.1.4 Soil and Water Conservation Districts

Soil and Water Conservation Districts (SWCDs) are established under Chapter 103C of the Minnesota Statutes. The purpose of these districts is to promote programs and policies, which can conserve the soil and water resources within their territorial limits. They are particularly concerned with erosion of soil due to wind and water. Therefore, SWCDs frequently are involved with the implementation of practices that effectively reduce or prevent erosion, sedimentation, siltation, and agriculturally related pollution in order to preserve water and soil as natural resources. Districts frequently act as local sponsors for many types of water management projects, including: grassed waterways, drainage ditches, flood retarding dams, on-farm terracing, erosion control structures, and other water-related projects. The districts also are actively involved in educational

programs, which promote water and soil conservation practices, such as minimum tillage. The Soil and Water Conservation Districts receive a great deal of technical assistance from the United States Natural Resource Conservation Service. The SWCD names and boundaries correspond with the counties within the District.

5.1.5 Joint Powers Boards

Area II Minnesota River Basin Projects, Inc. (Area II)

This nine-county joint powers organization was created in 1978 by statute to provide cost-share and technical assistance for the implementation of flood retarding and retention projects to the member counties of Brown, Cottonwood, Lac qui Parle, Lincoln, Lyon, Murray, Pipestone, Redwood, and Yellow Medicine in southwestern Minnesota. The six major watersheds within Area II consist of the Yellow Bank River, Lac qui Parle River, Yellow Medicine River, Redwood River, Cottonwood River, and Little Cottonwood River. Area II has assisted in the planning and creation of nine reservoirs (Walnut Grove, Sonstegaard-Telste, Fales-VanHyfte, Hauschild-Thange, Schoper-Bush, Minett-Krantz, Wellner-Hageman, Labolt Lake in South Dakota, and Del Clark Lake) and numerous road retention/culvert downsizing throughout the Minnesota River watershed of southwestern Minnesota and eastern South Dakota. Local contact: Kerry Netzke, Area II Coordinator, 1400 East Lyon Street, P.O. Box 267, Marshall, MN 56258, phone: 507-537-6368, Fax: 507-537-6368.

Minnesota River Basin Joint Powers Board

The 37-county Joint Powers Board seeks to initiate and provide a coordinated effort to preserve and restore the Minnesota River. The Joint Powers Board is working to: 1) ensure the preservation and restoration of Minnesota River recreation, fish and wildlife habitat, and scenic beauty; 2) leverage existing resources at the local, state and federal levels - both private and public - to preserve and restore the Minnesota river to ensure a swimmable, fishable river with recreational and economic development opportunity available to all; 3) reduce the societal costs associated with river degradation; and 4) provide leadership to address the cumulative impact of many causes of river

degradation over past years with a cooperative effort between all of the parties with an interest in the Minnesota River.

Minnesota River Headwaters Joint Powers Board

Joint powers organization among Pope, Swift, Lac Qui Parle, Chippewa, and Big Stone counties. The original intent and on-going purpose of this JPB is for member counties to work together in implementing their comprehensive local water plans. Contact: John Reubin, Water Planner, Route 1, Box 500, Louisburg, MN 56256, phone: 612-568-2266.

Minnesota River Source Joint Powers Board (SWCD)

Joint powers organization among Douglas, Stevens, Renville, Pope, Swift, Lac Qui Parle, Chippewa, and Big Stone SWCDs, formed to administer technical assistance for the State Revolving Fund, as well as other non-point soil and water resource problems. Contact: Todd Hay, Chippewa County Courthouse, 629 North 11th Street, Montevideo, MN 56205, phone: 320-269-8513.

5.1.6 Special Projects and Environmental Learning Centers

Big Stone Lake Restoration Project (Clean Lake Project, CLP)

The project objective is to reduce nuisance algae blooms in Big Stone Lake through implementation of agricultural BMPs. The final report describes successful implementation of wetland restorations, no-till drill program, nutrient management, shoreline and streambank erosion control and Whetstone River flow management. Significant lake water quality improvements have been noted. The sponsor is the Upper Minnesota River Watershed District in cooperation with the Big Stone SWCD, city of Ortonville, Big Stone County, Citizens for Big Stone Lake, DNR, USFWS, MPCA, and state and local groups from South Dakota. Local Contact: Dianne Radermacher, Upper Minnesota River Watershed District, 342 NW 2nd Street, Ortonville, MN 56278, phone: 612-839-3411. MPCA Contact: Mark Tomasek, Water Quality Division, Minnesota Pollution Control Agency, 520 Lafayette Road, St. Paul, MN 55155, phone: 651-296-6062.

Bonanza Educational Center, Big Stone Lake

The Bonanza Educational Center, is a consortium of seven school districts that have created a hands-on environmental education center for their students and communities. It is located at Big Stone State Park, Big Stone Lake. Students test water quality and survey zooplankton in conjunction with the DNR fisheries program. Contact: Julie Kingsley, 908 Orchard Street, Ortonville, MN 56278, phone: 320-839-3118, fax: 320-839-3708, e-mail: 0055cgps@InforMNs.k12.mn.us

5.1.7 Adjacent Watershed Districts

The Upper Minnesota River Watershed District is bounded to the north by the Bois de Sioux Watershed District and to the south by the Lac qui Parle – Yellow Bank Watershed District. Both of these watershed districts operate in a fashion similar to the Upper Minnesota River Watershed District in that they have an established watershed management plan, and have implemented rules and regulations. The Upper Minnesota River Watershed District frequently is involved in joint activities with each of its neighboring watershed districts to coordinate strategies to address water-related problems, which affect both districts.

5.2 STATE GOVERNMENT

5.2.1 Minnesota Board of Water and Soil Resources

The Minnesota Board of Water and Soil Resources (BWSR) was created by the 1986 legislature. Three functioning state boards were eliminated by this legislation and their duties were transferred to BWSR on October 1, 1987. BWSR's duties include oversight programs and funding of State Soil and Water Conservation Districts, formation and guidance of Watershed Districts, and the direction and assistance to counties in developing their Comprehensive Water Plans. A major activity of this Board is the development of policy and guidance involving natural resources enhancement. The BWSR is responsible for implementation of the Wetland Conservation Act (WCA).

BWSR reviews and approves water management plans and project activity of watershed districts and soil and water conservation districts.

5.2.2 Minnesota Department of Natural Resources

The DNR has both regulatory and enforcement authority over natural resource programs of the state. The principal divisions of DNR include the Division of Waters, the Division of Forestry, and the Division of Fish and Wildlife (which includes the Sections of Wildlife, Fisheries, and Ecological Services). The DNR has permit authority over watershed district projects, which impact the Protected Waters jurisdiction of the state. The DNR is also actively involved in helping local units of government administer floodplain management ordinances and standards. The Upper Minnesota River Watershed District cooperates with the DNR in the development of water management projects, which enhance wetlands and wildlife habitat. The District has assumed oversight of DNR General Permits for a variety of work activities conducted in protected waters. This has helped reduce overlapping regulatory programs, provided better customer service to the public and is evidence of the cooperative relationship between the DNR and the District in managing water resources.

5.2.3 Minnesota Pollution Control Agency

The Minnesota Pollution Control Agency has both regulatory and enforcement authority relative to potential actions which could affect the quality of the ground waters 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 other governmental units, such as municipalities, in the construction and operation of wastewater treatment plants and the control of nonpoint source pollution.

5.2.4 Minnesota Environmental Quality Board

The Minnesota Environmental Quality Board (EQB) 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, the chairmen of state boards, and five citizens. The EQB bases its decisions on formal environmental assessments or environmental impact statements written for specific project proposals.

5.2.5 Minnesota Department of Agriculture

The Minnesota Department of Agriculture (MDA) has a variety of activities in the District. The Agricultural Best Management Practices Loan Program provides low interest financing to farmers, agriculture supply businesses and rural landowners to encourage agriculture best management practices that prevent or mitigate nonpoint source pollution. The MDA also coordinates the Minnesota River Agriculture Team, which is an advisory team of producers, working together on nonpoint source pollution issues.

5.2.6 Minnesota Department of Health

The Minnesota Department of Health (MDH) has permit authority and regulatory authority for monitoring water supply facilities. These facilities include water wells, surface water intakes, water treatment, and water distribution for public use.

5.2.7 Minnesota Department of Transportation

Several federal and state highway systems are administered by the Minnesota Department of Transportation within watershed district boundaries. Since highway systems cross drainage patterns of natural and artificial waterways, there is opportunity for frequent interaction between the District and Department of Transportation (DOT). District projects requiring structures through DOT regulated highways require coordination and

approval by the DOT. In a similar fashion, DOT activities relating to improvements of their highway systems require a permit from the watershed district.

5.3 FEDERAL GOVERNMENT

5.3.1 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers can have permit and regulatory authority over projects of the District. Generally areas of permit jurisdiction include the placement of fill or dredged material in wetlands and alterations or impacts to navigable waters. In addition, the Corps of Engineers has been actively involved in project planning and construction. The District has enjoyed a long relationship with the Corps of Engineers in the development of projects.

5.3.2 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 Upper Minnesota River Watershed District. The Natural Resources Conservation Service (NRCS - formerly the Soil Conservation Service), has traditionally provided technical advice and engineering design services to the local Soil and Water Conservation Districts within the Upper Minnesota River Watershed District. Many projects originally studied by the NRCS did not meet federal criteria for construction. However, the District has been able to use data generated during these studies in its own activities. The current activities of the NRCS involving U.S. Department of Agriculture program participation are a significant benefit toward water management within the Upper Minnesota River Watershed District.

The Consolidated Farm Service Agency (CFSA) is an agency which participates in sponsoring and funding projects related to water and soil conservation. In this respect, the NRCS serves as the technical and design function, while the CFSA provides the funding. The CFSA is involved in tree planting, sodding of grassed waterways, manure

management facilities, cover crops, mulch tillage practices, and streambank setback strips. These federal programs have a major impact on agricultural tillage practices which foster environmental enhancement.

Under the Freedom to Farm Act of 1996, the USDA, through the CFSA and the NRCS, administers rules which, if violated, will result in the denial of agricultural subsidies and other governmental benefits. These rules, known as "Swampbuster", affect lands that have a predominance of hydric soils and that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and, under normal circumstances, do support a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions.

5.3.3 U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (EPA) has had an expanding role in construction project activities of the Upper Minnesota River Watershed District. It has overview authority for Section 404 permits issued by the U.S. Army Corps of Engineers. EPA has the right to review the Corps of Engineers permit decisions.

5.3.4 U.S. Fish and Wildlife Service

The USFWS has been actively involved in the restoration of wetlands previously drained on agricultural land and now in the Conservation Reserve Program of the U.S. Department of Agriculture. The USFWS has developed wetland projects, which affect the water management activities of the Upper Minnesota River Watershed District. In constructing these wetland projects, the USFWS is required to obtain a permit from the Upper Minnesota River Watershed District before proceeding, if the project is located within the territorial jurisdiction of the District.

5.3.5 U.S. Geological Survey

The U.S. Geological Survey (USGS) is principally a data gathering agency of the federal government. The Upper Minnesota River Watershed District is particularly interested in data collected by the USGS related to the water resources of the district. These data include stream flow discharge, ground water levels, and water quality, which is used during the conduct of district activities. The Upper Minnesota River Watershed District places a high value on the data collection efforts of the USGS by partially funding stream-gauging stations at critical locations.

5.3.6 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 Watershed District. This data includes rainfall, snowfall, evaporation, and temperature. This information is used by the District in the design of water management projects.

5.4 PRIVATE ORGANIZATIONS

5.4.1 Nature Conservancy

The Nature Conservancy is an organization whose primary purpose is the preservation and utilization of grasslands, wetlands, and other natural assets in their historic natural condition, for public use. Their protection goal is to preserve ecologically significant natural areas through acquisition, gifts of land, management agreements, conservation easements and voluntary land protection. The Nature Conservancy is supported through membership and gifts from individuals, community groups, corporations and foundations. They have often served as a catalyst in creating, funding and supporting programs such as the county biological survey, which includes digital databases and Geographic Information Systems (GIS).

5.4.2 Ducks Unlimited

Ducks Unlimited (DU) is primarily involved in the design, construction, and funding of projects enhancing waterfowl habitat. The mission of Ducks Unlimited is to support the habitat needs of North America's waterfowl and other wildlife by protecting, enhancing, restoring, and managing important wetlands and associated uplands. To date, DU has contributed to the conservation of more than 8.2 million acres of wildlife habitat throughout the U.S., Canada, and Mexico. The District is interested in cooperating with DU in the development and funding of multipurpose projects for waterfowl habitat and flood control.

5.4.3 Friends of the Minnesota Valley

A nonprofit citizens group devoted to conserving the natural and cultural resources of the Minnesota Valley, and to promoting wildlife oriented education. They foster congressional support and sponsor programs, such as the Minnesota Valley Heritage Registry, that protect the natural and cultural resources of the Valley. Incentives and public recognition are provided for landowners that commit to protection of the natural qualities of their lands. Address: 3815 East 80th Street, Bloomington, MN 55425, phone: 612-854-5900, fax: 612-725-3279, e-mail: mnvalley_friends@mail.fws.gov (web site in development).

5.4.4 Citizens for Big Stone Lake

Citizens for Big Stone Lake is an 800-member organization in Minnesota and South Dakota which initiates and coordinates projects and activities related to water quality of Big Stone Lake. Several state and federal grants have been obtained and projects implemented since 1977. Significant water quality improvement has been achieved. Contact: Wilfred Hanson, President, P.O. Box 121, Ortonville, MN 56278. SWCD Contact: Big Stone SWCD, 342 NW 2nd Street, Ortonville, MN 56278, phone: 320-839-3411.

5.4.5 Clean Up Our River Environment

Clean Up Our River Environment (CURE) is a grassroots organization working to restore and protect the upper Minnesota River. It is involved in education, community organizations, and cultural change. Activities include river awareness/observation trips, wetlands restoration, cleanup campaigns, river celebrations, publicity, and informational meetings. Address: CURE, 103 W Nichols, Montevideo, MN 56265, phone: 320-269-2105, fax: 320-269-2190, e-mail: 76163.176@compuserve.com

5.4.6 Coalition for a Clean Minnesota River

The Coalition for a Clean Minnesota River serves as an umbrella organization for grassroots nonprofit organizations, businesses, faith communities and individuals that have an interest in cleaning up pollution in the Minnesota River. Activities include "Ambassadors for the Minnesota River", outreach and education, guidance and coordination for grassroots organizations, and advise and assist government in its activities related to improvement of the river. Coordinator: Scott Sparlin, P.O. Box 488, New Ulm, MN 56073, phone: 507-359-2346, fax: 507-359-4465.

5.4.7 Miscellaneous Wildlife, Conservation and Sportsmen's Organizations

Within the District, there are numerous sportsmen's clubs and wildlife preservation groups. These organizations sponsor a wide variety of environmentally positive initiatives, including wildlife habitat, wetland development, and other activities which are beneficial to 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.

The District has had periodic contact with national conservation and environmental organizations, such as the Audubon Society, the Isaak Walton League, the Wildlife Federation, and the Sierra Club. These organizations are interested in those aspects of project development and water management that ensure the enhancement and protection

of environmental quality. The District is also dedicated to cooperating with nation-wide groups in the development of projects such that mutual interests can be achieved.

5.5 OTHER AGENCIES' WATER MANAGEMENT PLANS AND GOALS

A variety of plans and goals have been developed by other agencies for resource management within the District. Some analysis of these goals is needed to evaluate compatibility with the District goals and objectives (see Section 7.0). The Environmental Quality Board, the DNR and the Counties comprising the District were the primary entities, which have identified goals for portions of the District. Additional agencies were contacted, but lacked goals specific to the District.

A summary of the goals, objectives and directions of the agencies is provided in Table 4. The District has identified, by goal, the compatibility with District efforts, in order to identify opportunities for cooperation and the need for further discussion and clarification. A review of the table indicates the goals and strategies of most agencies are compatible with those of the District. Some goals however, do not appear to be consistent with those of the District. Therefore, further discussion is needed to clarify and better understand the goals of each agency.

6.0 EXISTING WATER AND WATER-RELATED PROBLEMS

The purpose of problem indentification is to assist with the development of future goals and objectives. This section of the plan identifies whether an issue is perceived by the District or another resource agency as a problem, the severity the problem, the location within the District and the role of the District in addressing the problem.

A variety of informational sources were used to identify possible problems. The identification of local resource concerns was completed through surveys of local, state and federal agencies, as well as surveys of Watershed District Managers. The agency surveys were sent to a number of environmental agency and local government entities. These included: 1) the field staff from the U.S. Fish and Wildlife Service; 2) the Natural Resource Conservation Service; 3) the Minnesota Department of Natural Resources; 4) the Big Stone County Board of Commissioners; 5) the Big Stone Soil and Water Conservation District Board of Supervisors; 6) the Big Stone County Engineer; 7) the Big Stone County Environmental Office; and 8) representatives of the Citizens for Big Stone Lake.

The surveys instructed the participant to rank the following issues in terms of importance within the Watershed: 1) lake water quality; 2) stream water quality; 3) legal drainage systems; 4) flooding; 5) private drainage systems; 6) natural waterways; 7) groundwater quality; 8) wetlands; 9) water levels of closed basins; and 10) soil erosion. In addition, a more detailed description of the resource concerns and proposed solutions were requested for the three most important resource issues. Finally, a map of the Watershed was included to provide the participant an opportunity to identify locations of resource concerns.

The returned surveys were collected and evaluated. Figure 10 summarizes the resource issue ranking information. Stream water quality, lake water quality, and soil erosion were identified as the three most importance issues within the Watershed. The locations of resource concerns are demonstrated in Figure 11.

The process of problem identification also included utilizing resource and planning agency documents as well as Watershed District staff experience. The intent of identifying a completed list of problems is to ensure appropriate lead agencies take action and to better understand the District's present and future role.

In addition to the agency surveys, the Watershed District Board Managers were asked to summarize the water management concerns within each of their areas of the Watershed. Some of the problems identified included water quality concerns with Big Stone Lake due to sediment and stormwater impacts, various locations with excess water levels within closed basins, and runoff and flooding problems along drainage systems (see Table 5).

Potential problems were placed in one of the following categories: 1) surface water; 2) groundwater; 3) ecological; 4) streams and channels; 5) recreation; 6) structures; 7) policy; 8) education; and 9) coordination. Items identified as a problem within the District are classified relative to severity and location (Table 6).

The District's responsibility to resolve a specific problem may be: 1) to lead the effort; 2) to cooperate with another lead agency; 3) to facilitate discussion, as needed to effect problem resolution; or 4) no involvement. The District has developed a number of goals and objectives, intended to address identified problems (see Section 7.0). The solution to most problems involves multiple District policies (see Table 6).

The priority for defining solutions is to address high severity problems occurring throughout the District where lead responsibility is with the District. Table 6 shows problems associated with surface water quantity tend to have greater priority than other problems. It is worth noting the greater priority does not imply greater importance. Rather, the District believes addressing District-wide problems for which they have authority and lead responsibility is prudent.

District-wide problems with moderate severity are the second priority. These problems tend to be those associated with the accumulation of debris jams within channels, each of which potentially leads to damage. Priorities established by the District are subject to future revisions, primarily depending upon assignment of lead responsibility. The District has a cooperating role for many of the District-wide ecological issues. Identifying these types of problems within the plan seems prudent to ensure due consideration while performing District activities. However, lead responsibility for resolving these problems is the task of other resource agencies and, therefore, of lower priority for the District.

7.0 GOALS AND OBJECTIVES OF THE DISTRICT

The Upper Minnesota River Watershed District has established broad-based goals within the water resource management areas of water quantity, water quality, erosion and sedimentation, biotic diversity, recreational resources, intergovernmental relationships and public information and education. Where appropriate, more specific objectives are identified as means of accomplishing the goals. In all cases it is the intent of the District to cooperate with the counties within its boundaries in order to achieve mutual goals and objectives that have been identified in each of the counties' Comprehensive Local Water Plan.

7.1 WATER QUANTITY

7.1.1 To reduce damages caused by floodwaters.

a. All drainage in the District, public and private, must be coordinated and include careful analysis under one authority.

b. Wetland restoration, enhancement and creation will be utilized where feasible and desirable to create storage.

c. Land management techniques which improve infiltration, water-holding capacity, and reduce runoff will be encouraged.

d. Water flow control measures, such as levees and dikes, will be utilized to control flooding where desirable and feasible.

e. Consistent and fair culvert sizing will be used on natural streams and drainage systems.

f. Collaboration with public and private entities will be encouraged to maximize flood control efforts and mitigate flood damage.

g. Runoff rates should be controlled through the use of water control structures or other suitable means so as to delay the flow of water and release water in a controlled manner.

h. The use of water control structures to develop storage of excess runoff on drained lake basins should be sought in areas where such storage is compatible with the present land use.

i. Overflow of water from one watercourse to another should be controlled in the best interests of the District and its residents.

j. The District will encourage cooperation with agencies and organizations, private or public, in the management of flooding.

k. The Managers of the District will endeavor to seek out assistance, private or public, financial or technical, concerning floodwater management.

7.1.2 Administer and maintain the drainage systems of the District in order to fulfill their intended function.

The following objectives are necessary in order to support its goal of maintaining adequate and functional drainage systems within the District:

a. Comply with the laws of the Minnesota Drainage Code.

b. Allow the addition and construction of a new drain into an existing legal drainage system or natural waterway only if it will not

adversely impact downstream landowners, and the additionally benefited lands pay their proportionate share.

c. Coordinate the development of agricultural drainage and ensure the adequacy of the outlets.

d. Repair, improve, relocate, modify, consolidate or abandon all or parts of drainage systems as best meets the needs of the District.

e. Authorize no drainage project until the project effects are understood and the project is deemed to be in the best interest of the District and the public.

f. Encourage landowners within the District to maintain wetlands.

g. Consider the utilization of drainage systems or natural waterways for the discharge of wastewater only when such discharges meet permit requirements of the Minnesota Pollution Control Agency and do not adversely impact downstream water quality as determined by the District.

h. Redetermine benefits when it is determined the present drainage system does not reflect current values or conditions.

i. Consider assessing outlet benefits on property responsible for increased sedimentation and drainage system maintenance, caused by land use practices that accelerate erosion and sedimentation.

j. Encourage landowners undertaking private drainage system improvements to establish permanent 1-rod grassed buffer strips

for those systems with a constructed bottom width of 4 feet or greater.

7.1.3 Develop programs and projects, which sustain an adequate supply of high quality surface and groundwater for public and private use.

a. Use groundwater on a sustained yield basis.

b. Understand the extent of water use for irrigation. When necessary, restrict irrigation where it is found to have detrimental affects to ground or surface water supplies.

c. Encourage the study and delineation of aquifers that are important groundwater resources within the District.

d. Consider the possibility of incorporating water supply as a purpose into selected flood control projects.

e. Cooperate with municipalities within the District to determine how adequate water supply can be maintained.

f. Encourage the restoration, enhancement or creation of wetlands that have the potential for groundwater recharge.

g. Encourage water conservation practices.

7.1.4 Lake Level – Big Stone Lake

Operation of the dam regulating flows leaving Big Stone Lake should be operated in a prudent, reasonable manner, in accordance with "Operation and Maintenance Manual Big

Stone Lake - Whetstone River Flood Control Upstream Works – Minnesota River," dated March 1987 or subsequent revisions.

7.2 WATER QUALITY

7.2.1 General

Maintain or improve water quality of all surface water and groundwater resources within the District. To achieve the goal of maximizing water quality within the District, the following objectives are established:

a. Promote advanced treatment of wastewater at all point sources within the District.

b. Uphold the existing laws controlling discharge of conventional and toxic pollutants into surface waters from point sources.

c. Monitor water quality when necessary and feasible to protect surface and ground water resources.

d. Encourage responsible, efficient use of fertilizers and pesticides in agricultural and urban settings.

e. Encourage land use practices that reduce the movement of nutrients, sediments and other substances off surfaces and into groundwater resources.

f. Encourage the maintenance, restoration, enhancement or creation of wetlands that may be important for nutrient entrapment.

g. Assist with educating and informing District residents how individual actions may impact water quality. Involve citizens in water quality monitoring.

7.2.2 Big Stone Lake Water Quality Goals

Because Big Stone Lake is such an important recreational and economic resource within the District and previous efforts to improve water quality are extensive; a separate goal has been developed for the lake. The contributing drainage area to Big Stone Lake is an estimated 740,157 acres, with 83.7% of the area located within South Dakota and 16.3% of the area in Minnesota. The present total phosphorus and total nitrogen loads to Big Stone Lake for a "normal" hydrologic year, for the entire contributing drainage area, are 16,346 kg/yr and 80,054 kg/yr, respectively.

The District has established an ***interim goal*** of no-net increase in nutrient loading to Big Stone Lake, from the contributing drainage area. The District established the interim goal because of the amount of time likely needed (probably decades) to attain the ultimate goal.

The District has also established an ***ultimate goal*** for the lake. The ultimate goal is to reduce nutrient loading to Big Stone Lake by 40% for a normal hydrologic year, from the contributing drainage area. The 40% annual load reduction corresponds to the following in-lake concentration goals:

Lake Segment	Total Phosphorus (ug l^{-1})	Chlorophyll-a (ug l^{-1})
BSL-1	220	42
BSL-2	160	38
BSL-3	105	38
BSL-4	80	36
BSL-5	100	39
BSL-6	110	38

7.3 EROSION AND SEDIMENTATION

Wind and water erosion and their affects upon streams and drainage systems are a significant, long-term problem within the District. Sedimentation reduces the capacity of drainage systems and streams, damages aquatic habitat and transfers nutrients and other pollutants downstream to lakes.

7.3.1 The District will initiate and support viable projects whose primary or secondary purpose is reducing erosion.

The following objectives have been adopted in support of the erosion and sedimentation goal:

a. The District will promote the installation of erosion control measures as needed on natural and artificial channel systems.

b. The District will ensure proposed projects incorporate sufficient erosion control measures in the design.

7.3.2 The District will pursue erosion control and sedimentation management along all drainage systems whether private or public.

The following objectives are in support of the goal of erosion control and sediment management:

a. Erosion control measures will be pursued where problems exist.

b. Erosion control practices should be included as a component on all projects, including repairs and improvements.

c. Establishment of permanent vegetation and buffer strips will be vigorously pursued on all drainage systems.

d. Encroachment upon ditch right-of-way by destroying permanent cover or cultivating over the crown of a spoil bank will not be permitted.

e. Sediment will be removed from legal drainage systems in order to maintain effective, efficient drainage systems.

f. Promote and advocate the use of accepted agricultural conservation management practices.

7.3.3 Natural areas and riparian buffer strips will be encouraged along natural waterways.

7.4 BIOTIC DIVERSITY

The District recognizes the value of its biotic resources and will seek to maintain the conditions and habitats critical to the existence of these resources. An immediate need is to determine the baseline of the existing biotic resources.

The District will promote the maintenance of biotic diversity (defined as the number and types of plants and animals).

a. The District will cooperate with agencies and organizations to maintain biotic resources.

b. The District will encourage the maintenance of habitat (wetlands, native prairie, woodlands, etc.) that is important for fish wildlife populations.

c. Concepts of biotic diversity will be incorporated into projects where deemed feasible (e.g., use of native grasses for buffer strips).

d. Exceptional or unique resources identified by the County Biological Survey will be protected.

e. Promote the use of temporary and permanent easements to enhance fish and wildlife habitat.

7.5 RECREATIONAL RESOURCES

Promote recreational opportunities when possible within the District.

The following objectives are consistent with the District's goal of creating recreational opportunities:

a. Remove stream impediments to enhance boating and rafting activities on the river systems, consistent with ecological principles.

b. Complete wetland restoration and wildlife enhancement features to enhance wildlife habitat and in turn recreational opportunities.

c. Develop facilities, where feasible and practical, to enhance recreational activities on streams and lakes within the District.

d. To provide facilities, where feasible and practical, for the observation of wildlife.

7.6 INTERGOVERNMENTAL RELATIONSHIPS

7.6.1 All initiatives of the District should utilize potential cooperative efforts with appropriate federal, state, county, and township agencies.

7.6.2 The District shall adopt by reference the applicable and compatible provisions of County Comprehensive Local Water Plans.

7.6.3 The District shall continue to provide representation on County Water Resource Advisory Committees which are active within its jurisdiction.

7.7 PUBLIC INFORMATION AND EDUCATION

7.7.1 The District shall seek to inform and educate the citizens within its jurisdiction of all its ongoing activities and projects.

7.7.2 The District shall seek to inform and educate the citizens within its jurisdiction of the benefits of the conservation of water and soil in the preservation and enhancement of our natural resources.

7.8 IMPLEMENTATION OF GOALS AND OBJECTIVES

The Upper Minnesota River Watershed District was created by and operates under Section 103D of the Minnesota Statutes. This legislation gives the District its authority to establish rules and regulations, require permits, construct projects, conduct studies, and perform other activities which contribute to the purpose for which the District was organized. Therefore, the District will use the power granted to it by the legislature to implement its goals and objectives. Implementation decisions are made at regularly scheduled Board meetings throughout the year. In addition, the Board conducts project planning and coordination meetings with its Watershed District Advisory Committee, as required under Section 103D.331, on an annual basis. These meetings provide the Board

of Managers with an opportunity to reflect on the effectiveness of meeting goals and objectives during the past year, as well as to re-invigorate its efforts for the coming year. Through these various meetings, the Board maintains an effective course of action to insure the implementation of its goals and objectives.

8.0 POLICIES OF THE DISTRICT

The following policies have been developed by the District as solutions to problems identified in Section 6.0, Existing Water and Water-Related Problems and to obtain the goals identified in Section 7.0, Goals and Objectives of the District.

8.1 PROJECT INVESTIGATION AND INITIATION

8.1.1 Petitioned Projects (Policy PI-1)

Projects of the Upper Minnesota River Watershed District may be initiated through the petition process as outlined in Section 103D of the Minnesota Statutes. The petition process remains an effective way for interested landowners to receive relief from unacceptable and undesirable "as-is" conditions.

The District has and will continue to assist the landowners and other interested parties in actively pursuing projects through the petition procedure.

8.1.2 Projects for the General Benefit of the District (Policy PI-2)

The District has historically allocated funds from its administrative and maintenance accounts for work with widespread benefits throughout the District. The restoration efforts of Big Stone Lake are an example. The District has and will continue to sponsor works of common benefit within the District.

8.1.3 Majority Resolution of the Board (Policy PI-3)

Section 103D.601 of the Minnesota Statutes authorizes the Board of Managers of Watershed Districts to initiate projects by a majority resolution of the Board of Managers. In most cases, funding utilized to construct projects of this nature is obtained from other governmental agencies or other agencies outside of the affected area. These projects are

unique in that it is usually difficult to define an immediate adjacent benefiting area for assessment purposes. Instead, the benefiting area for these projects may be found many miles away from the location of the project, and in some cases entirely outside of the watershed district.

The Board of Managers, having jurisdiction and concern for the entire watershed, including that of the entire Minnesota River basin, has the responsibility for finding solutions to problems within the District. The Board has historically conducted public informational meetings and required hearings to receive public response for projects proposed through the majority resolution procedure.

The Board of Managers will continue to actively pursue investigations and to maximize the use of public information when addressing water management issues. The Board will also continue to use the resolution procedure to initiate such projects, if needed.

8.1.4 Miscellaneous Studies and Investigations (Policy PI-4)

The Upper Minnesota River Watershed District can levy a tax for its "survey and data acquisition" account as needed and allowed for by Minnesota Statutes (Chapter 103D.905, Subd. 8). This fund allows for the research and investigation into potential solutions to problems that are brought to the Board's attention by interested citizens of the District or by individual members of the Board of Managers. Some of the technical investigations could result in project initiation. This account could be useful in the future as the District completes the more immediately apparent project investigations.

The District will establish its "Survey and Data Acquisition" account and conduct the necessary technical investigations and surveys for water-related problems brought to the attention of the Board of Managers.

8.1.5 Special Purpose Management Districts (Policy PI-5)

Certain District activities are more "specialized" in nature (i.e., water quality studies) specific to a localized portion of the District, (i.e., subwatershed) and more suited to funding through the establishment of a Special Purpose Management District. The Board of Managers has authority under 103D.729, Water Management District, to establish smaller geographical areas within the District for the purposes of addressing problems where benefits are more narrowly focused.

The District will consider the use of Special Purpose Management Districts to address issues and problems within the District. Establishment of such an entity will only occur after the territory to be included within the Special Purpose Management District is identified, and fiscal matters including the methods for computing and assessing charges are identified.

8.2 REGULATION OF ACTIVITIES AFFECTING WATER RESOURCES

8.2.1 Rules and Regulations of the District (Policy RE-1)

The "Rules", as adopted and subsequently amended, are the guiding force behind the District's permit system. All landowners, public entities, and governmental units that anticipate implementing projects which affect the water resources of this District, as governed by the "Rules" of the District, are required to apply for and receive a permit before beginning construction activity. Participation by the public in the District's permit process has increased over the years. The District also acts in a consultant role as a disseminator of information for the public relative to local, state, and federal permits needed before initiating construction activity. A copy of the current Rules and Regulations of the District are included in this Water Management Plan in Appendix E.

The District will continue to enforce its Rules and Regulations as a matter of policy.

8.2.2 Permits (Policy RE-2)

The Upper Minnesota River Watershed District uses the permit system to enforce its adopted Rules and Regulations of the District. Permits are required for a wide variety of construction activities that affect the water resources of the District. Any individual landowner, public entity, or governmental unit that contemplates a project impacting the water resources of the District, must secure a permit. Permit applications are considered at regular monthly meetings of the Board of Managers. It is a common occurrence for permit applicants to meet with the Board of Managers to explain their individual circumstances and conditions surrounding their permit application. Such interaction with the permit applicants is strongly encouraged by the Board of Managers. The Board members and office staff are available to assist applicants in the permitting process. In addition to "in-house" assistance, it has become very common for prospective applicants to request field investigations by the Board or the District's staff in order to obtain recommendations on construction technique and "best practices" applications.

The District will continue to use the permit system to enforce its adopted Rules and Regulations. It is also a policy of the District to assist permit applicants with technical advice so that project function may be accomplished in the most environmentally acceptable manner.

8.3 NATURAL, MODIFIED AND CREATED WATERWAYS

The Upper Minnesota River Watershed District recognizes resource agency concern about the loss of ecological value by activities, which modify the course, current and cross section of natural waterways. Natural waterways are defined as streams, rivers and creeks whose course, current and cross section have not been previously modified by human activities. The District also recognizes that some streams; rivers and creeks are greatly modified with regard to course, current and cross-section, compared to the natural condition, with diminished ecological value. Created waterway are those constructed by man where none previously existed.

It will be the policy of the District to consider whether a waterway is natural, modified or created, when undertaking District activities and recommending appropriate solutions. The District will recommend solutions consistent with the type of waterway.

8.3.1 Grade Control Structures (Policy NMCW-1)

Grade control structures within natural, modified or created waterways shall be properly engineered. The District will give due consideration to structures which allow fish passage, enhance natural character, and provide for long-term stream stability.

8.3.2 Bank Erosion and Stabilization (Policy NMCW-2)

Bank stabilization activities to reduce erosion must be engineered and designed in a manner intended to increase the long-term stability of District waterways and minimize future need for maintenance. The specific bank stabilization activity will consider the "value" of the resource being protected; i.e., whether a road, bridge, agricultural, field, or fish spawning area. It is the District's policy that methods proposed for bank stabilization will be commensurate with the value of the resource at risk, the type of waterway, and the probability of attaining bank stability.

8.3.3 Debris Removal (Policy NMCW-3)

The District recognizes "debris" consisting of downed trees and timbers, large rocks and other "natural" features provides habitat to aquatic life within streams, lakes and rivers. The District also recognizes that debris and sediment accumulation within created waterways reduces hydraulic capacity and diminishes their hydraulic effectiveness. The District will, as a matter of policy, consider the type of stream and recreational uses when evaluating the need for debris removal from District waterways.

Debris removal will be paramount on all District waterways where accumulation poses an immediate threat to the loss of human life or infrastructure (e.g., a bridge). The District

will give due consideration to minimizing debris removal on unaltered, natural waterways, where the accumulation does not pose a risk to human life, infrastructure loss, or increase flood damages.

8.3.4 Fish Passage (Policy NMCW-4)

The District will, as a matter of policy, give due consideration to the issue of fish movement through unaltered natural waterways of the District. Permanent barriers to fish movement on unaltered natural waterways will be duly evaluated and recommended only when deemed as absolutely necessary by the District. The District will generally consider fish passage a lesser issue when posing solutions for created waterways.

8.3.5 Riparian Areas (Policy NCMW-5)

The District recognizes the concern of resource agencies relative to the loss of riparian areas. The District will, as a matter of policy, duly consider the potential impact upon the riparian areas of unaltered natural and modified natural channels. The primary concern of the District for areas adjacent to created waterways will be the maintaining the function of the created waterway.

8.3.6 Consideration of Agricultural Drainage Alternatives (Policy NCMW-6)

The District recognizes the importance of drainage to maintaining and enhancing the economic viability of agriculture within its boundary. Drainage completed in a reasonable and prudent manner is an essential component of water management within the District. Because of the increased complexity of agricultural, social, and environmental issues associated with agricultural drainage the District will, as a matter of policy, encourage the evaluation of reasonable and prudent alternatives to traditional agricultural drainage. These alternatives may include any of the following: 1) the storage of water; 2) retiring land from production; 3) the use of temporary set-aside programs; 4) the utilization of set-back levees; 5) the use of diversions; 6) restoration the natural flow characteristics of

the stream channel; and 7) all other traditional and non-traditional approaches. Providing project cost-share and other financial incentives to project proponents will be the primary vehicle for implementing this policy.

8.4 BASIN WATER TRANSFERS

8.4.1 Interbasin Transfer of Water (Policy ITW-1)

Because of the topography within portions of the District, a potential exists for the transfer of surface water between basins. The interbasin transfer of water can be undesirable because problems related to the amount of water are transferred downstream. The District will, as a matter of policy, work to minimize activities, which results in the transfer of water between basins, unless deemed beneficial.

8.4.2 Water Levels Within Land-Locked Basins

Excessive runoff during wet cycles results in rising water levels within many land-locked basins, potentially causing damage to roads, buildings and other infrastructure. Maintaining water levels at reasonable, non-damaging levels is most prudent when infrastructure damage is the primary concern. Maintaining water levels at reasonable or normal elevations within land-locked basins, will be allowed as a matter of policy, when infrastructure protection is the primary consideration and the potential for inducing downstream flood damages is low.

8.5 PROTECTION AND USE OF FREQUENTLY FLOODED LANDS (Policy FFL-1)

Some lands within the District are subject to flooding with sufficient frequency and severity that use for agricultural production is greatly reduced and, therefore, does not appear to be economically sustainable. The extended detention of floodwaters upon these frequently flooded lands has the potential to decrease flooding downstream. The District

will, as a matter of policy, evaluate alternative uses for frequently flooded lands, including the extended detention of floodwaters.

8.6 INCREASING CONTRIBUTING DRAINAGE AREA (Policy DA-1)

Increasing contributing drainage area has the potential to diminish the benefits provided by downstream water management efforts. The District will, as a matter of policy, consider and evaluate activities which increase contributing drainage area, without due consideration for the effects of the increased drainage area.

8.7 WETLANDS

8.7.1 Wetland Restoration (Policy W-1)

The Upper Minnesota River Watershed District recognizes resource agency concern about the loss of wetlands within the District. The District will cooperate with resource agency efforts to restore wetlands within the District.

The District identifies the entire watershed district as a high priority wetland preservation, enhancement, and restoration area. This area is consistent with high priority wetland areas identified in the county comprehensive local water plans of Big Stone, Swift, Lac Qui Parle and Traverse counties. The District however, recognizes the need for comprehensive approach to the identification of specific high priority areas within the District and would support such an effort.

The District also recognizes that the likelihood of negative ecological effects is greater where human activities may impact a previously unaltered wetland system. Wetland systems previously altered by human activities, whether partially or wholly, represent an opportunity for attaining multiple benefits. It is a policy of the District to recognize the value of previously altered wetland systems for potential multiple benefits, which includes flood control.

8.7.2 Wetland Banking (Policy W-2)

The District recognizes that human activities, including those of the District, potentially affect wetland resources within the District. The District will, as a matter of policy, consider the development and use of a wetland banking system to offset the potential impact of District activities.

8.8 MANAGEMENT OF BIG STONE LAKE

The policies and procedures developed for Big Stone Lake are intended to achieve the interim and ultimate water quality goals. The actions and activities of the District will be completed in a manner consistent with the desire to reduce present nutrient (i.e., total phosphorus and total nitrogen) loads from the entire drainage for a normal hydrologic year area by 40%.

The District anticipates using these policies to address lake management issues, either through direct activities like the District's existing permit program or indirect activities like participation in the State environmental review process or state/federal permit processes.

8.8.1 Early Engagement During Planning (Policy BSL-1)

The District shall maintain of policy of early engagement and discussion with potential point and nonpoint source dischargers, including cities, developers and farmers and others. The primary purpose of the early engagement and discussion is to clearly describe the water quality goals for Big Stone Lake to potential dischargers explain the ramification of the goals relative to possible (project) proposals.

8.8.2 No-Net Increase in Nutrient Load (Policy BSL-2)

An increase in the annual nutrient load to Big Stone Lake is contrary to the goals of the District. Increased nutrient loading elevates in-lake concentrations and increases the probability of occurrence of algal blooms. The District will, as a matter of policy, ensure permit decisions under their jurisdiction are evaluated on the basis of (at a minimum) a no-net increase in nutrient load on a project specific basis. The District will actively engage agencies, municipalities, counties, developers, landowners and others to work toward a no-net increase in nutrient load.

8.8.3 Long-Term Reduction in Nutrient Load (Policy BSL-3)

A reduction in nutrient loading is necessary to achieve the ultimate water quality goals for Big Stone Lake. The District will, as a matter policy, encourage a net reduction in the annual nutrient load on a project specific and a subwatershed basis.

8.8.4 Pollutant (Nutrient) Load Trading (Policy BSL-4)

A watershed based approach is key to obtaining the ultimate water quality goals for Big Stone Lake. A component of the watershed based approach is the ability to "trade" pollutant loads between sources; e.g., it may be more cost-effective to reduce point source nutrient loads than nonpoint or vice versa. Pollutant trading on a watershed basis represents an important opportunity to reduce nutrient loads to Big Stone Lake, greater than might be possible by reductions from a single discharge. And, these load reductions could be achieved at substantial economic savings.

The District will encourage the use of pollutant trading, especially within the contributing drainage area to Big Stone Lake. Pollutant trading must be done in a manner consistent with state and federal rules National Point Discharge Elimination System rules. Progress toward achieving the water quality goals for Big Stone Lake must also be demonstrated.

8.8.5 Lake Level Management (Policy BSL-5)

As local sponsor for the U.S. Army Corps of Engineers project, the District has agreed to operate the dam at the outlet from Big Stone Lake. Dam operation is constrained by the Minnesota/South Dakota Boundary Waters Commission. The Boundary Commission established the operating level (elevation) of Big Stone Lake at 964.6 msl. The ability of the District to maintain this level is dependent in part upon the hydraulic characteristics of the dam and the outlet channel. The District will, as a matter of policy, operate the dam in accordance with operational procedures established within and described by the operational plan.

8.9 SPECIAL PURPOSE MANAGEMENT PROGRAMS

8.9.1 Data Collection Programs (Policy SPMP-1)

Subject to budget limitations, the District intends to install stream gages at critical points throughout the District, which supplement gaging stations already operated by the U.S. Geological Survey. The District has collected water quality data at selected locations. The accumulated data is recorded and published for future utilization in decision-making activities of the Board of Managers. Stream gaging data is usable in the design of water management projects, and in the operation of existing water management structures. Data collected from the SWCD volunteer rain gage network is used in conjunction with stream gage information to assess relationships between rainfall and runoff.

The District intends to install new gaging stations as necessary throughout the District. It is also the District's policy to cooperate with the U.S. Geological Survey in the funding and operation of its gaging stations.

8.9.2 Watershed Modeling Studies (Policy SPMP-2)

Historically, the Upper Minnesota River Watershed District has been very active in conducting watershed studies on various subwatersheds draining to Big Stone Lake. The objective of these studies has been to develop an understanding of how lake water quality can be improved. This lake water quality model was used to establish the ultimate water quality goals.

The District has supported the modeling studies for the Minnesota River under the direction of the MPCA. The completion of this basin-wide perspective of Minnesota River Water quality should be used for funding purposes.

The District will continue to utilize watershed modeling as a tool in achieving optimum water management within the District.

8.9.3 Technical Assistance Programs (Policy SPMP-3)

The District has traditionally provided technical assistance and advice wherever requested in the solution of water-related problems. The District's legal and technical staff are available to provide assistance as required and authorized by the Board of Managers.

The Board will continue to provide needed technical assistance and consultation to landowners, governmental units, and other entities within the jurisdiction of the Upper Minnesota River Watershed District.

8.10 PUBLIC INFORMATION AND EDUCATION PROGRAMS (Policy PIE-1)

The Upper Minnesota River Watershed District is extremely concerned that information relating to its activities and projects are adequately publicized. In addition, the District realizes that optimum water management practices result when affected people are

sufficiently educated on water issues. For this reason, the District has taken an active position in publicizing its activities and educating the public. From the standpoint of education, District staff and managers have appeared before other governmental boards and organizations to inform them about District activities and programs. The District has provided support for educational exhibits at county fairs, school programs and agricultural winter shows. The Board of Managers actively participates in state, regional, and basin functions associated with Watershed District activities. The District also maintains a considerable amount of printed information concerning watershed activities and water-related issues. This information is available to the public at the office of the District.

The District will continue to aggressively publicize its activities and other water-related information so that its constituent public is educated on water issues to the maximum extent possible.

8.11 INTERGOVERNMENTAL COORDINATION AND COOPERATION (Policy IGCC-1)

Watershed District coordination and cooperation with other governmental units, at all levels, is a natural outcome of the political water environment. This cooperation and coordination is both horizontal and vertical. Vertical coordination between the Watershed District and permitting agencies such as the Corps of Engineers, Department of Natural Resources, and the Minnesota Pollution Control Agency, are mandated through legislative and permit requirements. Horizontal cooperation between the Board and comparable units of government such as municipalities, township boards, and county boards, are a practical necessity to facilitate District activities. Coordination between the District and agencies such as the U.S. Fish and Wildlife Service is routinely required to coordinate funding of project works. Many times, cooperative agreements have been arrived at between various governmental units and the District in the construction of certain types of projects.

The District will pursue several "Interagency Cooperative Memoranda" to establish procedures for participation in the management of important issues to the Watershed. The role of the District will be determined in memoranda. This role could include review and comment on permits, providing permitting services, and providing technical assistance. In some cases these agreements have already been established. Currently the UMRWD has been delegated permitting responsibilities for DNR General Permits. This enables the Board to issue permits for various types of activities in protected waters. Listed below are additional priority issues and corresponding agencies where these agreements will be pursued.

Natural Resource Management Issue	Agency
New Feedlots, Relocations and Expansions	MPCA/County Feedlot Officers
Water Use Permits	DNR
Land Application of Industrial or Municipal Wastes	MPCA/County Zoning
Land Acquisitions for Wildlife and Conservation Purposes	USF&W, DNR, County
Vegetative Management Near Lakes and Drainageways	DNR/County Zoning
Management of Aquatic Vegetation in Lakes	DNR

The District 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.331 of the Minnesota Statutes. It should be noted that the Statute recommend, where practicable, that the Advisory Committee members include a supervisor of a Soil and Water Conservation District, a member of a County Board, a member of a sporting organization, and a member of a farm organization. Therefore, this annual meeting with the Advisory Committee provides a forum of reporting to the Soil and Water Conservation Districts, the County Board, recreational and sporting organizations, and farm organizations.

The Watershed District views intergovernmental coordination and cooperation as an absolute necessity in order for it to perform its required functions. The Board will continue to foster an environment, which enhances coordination and cooperation to the maximum extent possible.

The Board will continue to provide representation on County Water Resource Advisory Committees which are active within its jurisdiction. The District will invite the involvement of Department of Natural Resources' personnel at the earliest possible time in all project planning. It shall be District policy to coordinate with and inform all Soil and Water Conservation Districts within its jurisdiction of Watershed District activities and planning initiatives.

8.12 SELF ASSESSMENT POLICY

The Upper Minnesota River Watershed District will conduct a periodic review of its goals and objectives with the intent to assessing the Board's effectiveness in meeting them.

8.13 SUMMARY STATEMENT OF DISTRICT POLICY AND COMMITMENT

The Upper Minnesota River Watershed District is committed to carrying out the goals, objectives, and policies outlined in its Water Management Plan. To ensure compliance with appropriate ordinances and standards, the District will maintain open communication and will cooperate and coordinate with all governmental units in implementing, reviewing, and regulating water development within the District.

9.0 FUTURE DIRECTIONS AND PRIORITIES OF THE DISTRICT

Through this planning process the Board of Managers has identified a number of directions and priorities the District will pursue as high priority activities, until the next plan update is completed. These activities will primarily be pursued through application of the rules and policies established by the District within this plan. New policies and programs may be implemented through the use of innovative financing options like the use of Special Purpose Water Management District.

Developing an exhaustive, unchanging list of the future priorities and activities the District plans to pursue is not possible. The reason is the importance of various priorities or activities change is response to the needs of District residents and local, state and federal policies. An example of this is the recent focus on managing water at a watershed scale within the federal government. The federal government (primarily the Environmental Protection Agency and the Natural Resources Conservation Service) has only recently heightened efforts to provide funding to local governmental units to manage water resources at the watershed level, a practice used by the District since inception. If water is to be managed successfully, it must be done so by those responsible for implementing actions at the local level.

Although developing an exhaustive, unchanging list in not possible, future priorities and activities of the District can generally be categorized based on past efforts and emerging issues. Expectations are that the following will be the future priorities of the District:

- Drainage systems and natural waterways – many of the private and legal drainage systems within the District have not been maintained and conflicts arise when there is a desire to do so. The District believes innovative solutions to these conflicts are possible and plans to work cooperatively with the County and other agencies to attain solutions. Priorities are to: 1) actively engage the County Board of Commissioners in discussion about obtaining responsibility for the County legal drainage system; 2) the use of watershed based principles

as they apply to managing drainage systems; 3) the use of private and state funding sources to implement watershed based solutions; and 4) Geographic Information System mapping of drainage systems.

Geographical areas, which are a District priority, include:

- Stony Run;
- Big Stone County Ditch No. 2;
- Swift County Ditch No. 10; and
- Dry Lake.

- Continue efforts to improve the water quality of Big Stone Lake – the District has long been engaged in efforts to improve the water quality of Big Stone Lake. Funding is the primary limitation to continuing these efforts. Additional (external) funding is needed to implement priority lake improvement measures (see Appendix F).

  The water quality goals for Big Stone Lake effectively establish maximum allowable or total maximum daily loads for the lake. State and federal funding sources will be pursued and should be allocated to achieving the necessary long-term load reductions.

- Minnesota River Restoration effort -- many of the state and federal efforts to improve the water quality of the Minnesota River have failed to recognize the fact that the headwaters of the Minnesota River are within the Upper Minnesota River Watershed District. Consequently, funding priorities for improving water quality have been shifted to downstream areas and fail to recognize the experience and success of the Districts efforts in improving the water quality of Big Stone Lake. The successful implementation of District activities can be greatly enhanced by recognizing the geographical importance of the District.

  The District plans to initiate discussions with the Minnesota Pollution Control Agency about how state and federal funding can be use to establish permanent flow and water quality monitoring locations within the District, commensurate with the states unified watershed assessment and total maximum daily load efforts.

- Unsewered communities and failing individual sewage treatment systems – a number of small communities within the District are presently not sewered. In addition, some of the seasonal cabins along Big Stone and other lakes are served by failing sewage treatment systems. The long-term efforts of the District may be to assist with funding and technical issues related to sewering these communities and residents.

These future priorities and activities are subject to refinement and change. The primary mechanism for refinement and change will be present and future discussions between the Board of Managers, the Watershed District Advisory Board, the County Board of Commissioners and appropriate state agencies.

Table 1

EVALUATION OF ORIGINAL OBJECTIVES OF THE UPPER MINNESOTA RIVER WATERSHED DISTRICT

Plan Objective	Degree of Activity[1]	Is there Need for Similar or Revised Policy?
To slow down weed and algae growth in the District's Lakes.	High	Yes
To reduce the pollution of the water in the lakes and water courses within the District.	High	Yes
To intelligently regulate the water levels of the various lakes within the District.	High	Yes
To keep adequate records of the water level, the chemistry, and other useful data.	High	Yes
To enhance the recreational facilities and scenic beauty of the District.	Moderate	Yes
To improve the needed drainage, prevent excessive runoff or seepage, and provide needed soil and water conservation in the District.	High	Yes
To provide funds to accomplish these objectives and to engage technical assistance and advice.	Moderate	Yes
Investigate the possibility of securing additional watershed area to supplement the present water supply.	Low	No
To preserve, maintain, and improve habitat for fish and wildlife.	High	Yes

[1] Since preparation of "Overall Plan Upper Minnesota River Watershed District" (1988).

Table 2

THREATENED, ENDANGERED OR SPECIES OF SPECIAL CONCERN WITHIN BIG STONE COUNTY

Number of Known Occurrences Within the County	Federal Status	State Status	Common Name (Element Name)
Plants			
1	--	END	Eared false foxglove (A*galinis auriculata*)
3	--	NON	Carolina foxtail (*Alopecturus calolinianus*)
2	--	SPC	Red three-awn (Aristida purpurea var. longiseta)
12	--	SPC	Slender milk-vetch (*Astragalus flexuosus*)
6	--	NON	Low milk-vetch (*Astragalus lotiflorus*)
4	--	SPC	Missouri milk-vetch (*Astragalus missouriensis*)
4	--	SPC	Prairie moonwart (*Botrychium campestre*)
1	--	END	A Species of lichen (*Buellia nigra*)
1	--	SPC	Large water-starwort (*Callitriche heterophylla*)
1	--	NON	Mouse-ear chickweed (*Cerastium brachypodum*)
2	--	END	Short-pointed umbrella-sedge (Cyperus acuminatus)
3	--	SPC	Small white lady's-slipper (C*ypripedium candidum*)
11	--	SPC	Prairie mimosa (*Desmanthus illinoensis*)
1	--	NON	Waterwort (*Elatine triandra*)
1	--	SPC	Dwarf spike-rush (*Eleocharis parvula*)
1	--	SPC	Few-flowered spike-rush (*Eleocharis quinqueflora*)
8	--	END	Ball cactus (*Escobaria vivipara*)

Table 2 - Continued

THREATENED, ENDANGERED OR SPECIES OF SPECIAL CONCERN WITHIN BIG STONE COUNTY

Number of Known Occurrences Within the County	Federal Status	State Status	Common Name (Element Name)
3	--	SPC	Mudwort (L*imosella aquatica*)
4	--	SPC	Cutleaf inronplant (*Machaeranthera pinnatifida*)
2	--	NON	Forget-me-not (*Myosotis verna*)
5	--	NON	Mousetail (*Myosurus minimus*)
1	--	SPC	Sea naiad (*Najas marina*)
1	--	END	Hair-like beak-rush (*Rhynchospora capillacea*)
1	--	SPC	Ditch-grass (*Rupia maritima*)
1	--	SPC	Tumble grass (*Schedonnardus paniculatus*)
7	--	SPC	Soft goldenrod (*Solidago mollis*)
4	--	NON	Marsh arrow-grass (*Triglochin palustris*)
Animals			
1	--	SPC	Lake sturgeon (*Acipenser fulvescens*)
1	--	THR	Mucket mussel (*Actinonaias ligamentina*)
1	--	SPC	Skipjack herring (*Alosa chrysochloris*)
1	--	SPC	Short-eared owl (*Asio flammeus*)
33	--	NON	Upland sandpiper (*Bartramia longicauda*)
3	--	NON	Lark bunting (*Calamospiza melanocorys*)
2	--	NON	Chestnut-collared longspur (*Calcarius ornatus*)
6	--	THR	Dakota skipper (*Hesperia dacotae*)

Table 2 - Continued

THREATENED, ENDANGERED OR SPECIES OF SPECIAL CONCERN WITHIN BIG STONE COUNTY

Number of Known Occurrences Within the County	Federal Status	State Status	Common Name (Element Name)
1	--	THR	Ottoe skipper (*Hesperia ottoe*)
1	--	THR	Loggerhead shrike (*Lanius ludovicianus*)
6	--	SPC	Marbled godwit (*Limosa fedoa*)
10	--	SPC	Powesheik skipper (*Oarisma powesheik*)
3	--	THR	Wilson's phalarope (*Phalaropus tricolor*)
2	--	SPC	Regal frittilary (*Speyeria idalia*)

Federal Status: LT = Listed Threatened
C2 = Candidate status 2

State Status: END = Endangered
THR = Threatened
SPC = Special Concern

Table 3

RARE COMMUNITY TYPES WITHIN THE DISTRICT IDENTIFIED BY THE MINNESOTA DEPARTMENT OF NATURAL RESOURCES

Number of Known Occurrences Within District	Community Name
7	Wet Prairie
58	Mesic Prairie
44	Hill Prairie
19	Rock Outcrop
1	Dry Prairie Woodland Complex

Table 4

GOALS AND STRATEGIES DEVELOPED FOR UPPER MINNESOTA RIVER WATERSHED DISTRICT BY OTHER AGENCIES

Agency/Entity/ Reference	Goals/Strategies	Compatible with Goals/Strategies of This Plan?
Minnesota Department of Natural Resources Reference: Strategic Plan - An Ecosystem – Based Framework for Setting Natural Resource Management Priorities (July 1997)	**GOAL NO. 1:** Maintain, enhance or restore the health of Minnesota's ecosystems so that they can continue to serve environmental, social and economic purposes.	Yes
	GOAL NO. 2: To foster an ethic of natural resource stewardship among all Minnesotans.	Yes
	STRATEGY NO.1:	
	• Expand development of partnerships with organizations and other agencies to develop common resource management objectives.	Yes
	• Promote integrated approaches to managing resources.	Yes
	• Accelerate the collection, interpretation, and dissemination of scientific information describing Minnesota's ecosystems and natural resources.	Yes
	STRATEGY NO. 2:	
	• Expand efforts to provide technical assistance to citizens and local government	Yes
	STRATEGY NO. 3:	
	• Improve communication with all stakeholders and citizens.	N/A
	STRATEGY NO. 4:	
	• Establish Environmental Education as a cornerstone for developing a natural resource stewardship ethic among all Minnesotans.	Yes
	STRATEGY NO. 5:	
	• Establish standards for evaluating and monitoring ecosystem health and the effectiveness of ecosystem based management efforts.	Yes
	STRATEGY NO. 6:	
	• Improve integration of budgeting and planning across area, regional, and state levels.	N/A
	STRATEGY NO. 7:	
	• Place more authority with area staff to manage budget and staffing priorities.	N/A

Table 4 - Continued

GOALS AND STRATEGIES DEVELOPED FOR UPPER MINNESOTA RIVER WATERSHED DISTRICT BY OTHER AGENCIES

Agency/Entity/ Reference	Goals/Strategies	Compatible with Goals/Strategies of This Plan?
Minnesota Department of Natural Resources Reference: Ecosystem Management in Southwest Minnesota "Strategic Plan for Region 4" (December 1998)	**ISSUE STATEMENT A:** Manage, protect and improve surface and groundwater for sustainable use with emphasis on holding water on the landscape and enhancing water quality though Best Management Practices. **Goal A-1:** Improve water quality for public use and aquatic habitat. **Goal A-2:** Promote sustainable use of ground and surface water. **Goal A-3:** Stabilize the hydrograph on priority watersheds. **ISSUE STATEMENT B:** Restore, enhance and maintain land and water functions and processes that are ecologically sustainable. **Goal B-1:** Foster sustainable natural communities. **Goal B-2:** Increase Region 4 outdoor recreation opportunities. **Goal B-3:** Address the board and cumulative impacts of growth and development.	Yes
Environmental Quality Board Reference: "Minnesota Water Plan"	**GOAL NO. 1**: To improve and maintain the high quality and availability of Minnesota's water for future generations and long-term health of the environment. **GOAL NO. 2**: To ensure that our uses of water are sustainable, and that in meeting our needs for water, we recognize its limits and interconnections, accept its changing and variable nature, and adjust our demands upon it when necessary to safeguard it for future needs. **PRINCIPLES**: • Manage water's interconnections. • Focus on the resource. • Manage hydrologic units. • Make partnerships work for water. • Make prevention the focus. • Put public health and safety first. • Recognize the importance of information. • Understand the importance of research. • Think long-term. • Accept limits to growth. • Make those who benefit pay. • Let citizens make a difference. • Educate people to change behavior. • Make government understandable, adaptable, and accountable.	Yes Yes

Table 4 - Continued

GOALS AND STRATEGIES DEVELOPED FOR UPPER MINNESOTA RIVER WATERSHED DISTRICT BY OTHER AGENCIES

Agency/Entity/ Reference	Goals/Strategies	Compatible with Goals/Strategies of This Plan?
Environmental Quality Board Reference: "The Minnesota Water Monitoring Plan"	**GOAL NO. 1**: Adopt a comprehensive approach to monitoring. **GOAL NO. 2**: Expand ambient monitoring substantially. **GOAL NO. 3**: Recognize trend analysis as an essential component of water management and routinely incorporate it as a key state and local government duty. **GOAL NO. 4**: Help policy makers, policy developers, and citizens recognize the importance of good information and analysis. **GOAL NO. 5**: Support data exchange and analysis through integrated information management systems. **GOAL NO. 6**: Encourage and expand citizen and local government participation in the monitoring of water resources. **GOAL NO. 7**: Provide the basis for a coordinated and integrated water monitoring system.	Yes Yes Yes Yes Yes Yes Yes
Environmental Quality Board Reference: Meeting Minnesota's Water and Wastewater Needs: Draft Recommendations	**GOAL NO. 1**: Use an overall mission to guide water supply and wastewater treatment activities, programs and regulations. **GOAL NO. 2**: Guidelines for sustainable development plans should cover water supply and wastewater treatment elements and help strengthen local efforts. **GOAL NO. 3**: Sustainable development plans should include information about existing and future water and wastewater needs and priorities. **GOAL NO. 4**: Require water supply and wastewater authorities to provide their plans and strategies for inclusion in local water plans so that local plans cover all aspects of water resource problems and needs. **GOAL NO. 5**: Communities should protect water sources, maintain existing systems and reduce the need for expanding water supply and wastewater treatment systems through collaboration and aggressive conservation efforts, such as installing household water-saving devices, metering water use and correcting infiltration and inflow problems. **GOAL NO. 6**: Hold all communities responsible for complying with laws. **GOAL NO. 7**: Local government should advise people about the value of Minnesota's water resources and institute best management practices for the efficient and judicious use of water and wastewater systems. **GOAL NO. 8**: The state should develop informational materials about water and wastewater issues and promote research to expand options and improve water management. **GOAL NO. 9**: Local governments and other service providers should ensure water and wastewater choices are cost-effective and protect resources. **GOAL NO. 10**: The state should use state and federal incentives to support the overall mission. **GOAL NO. 11**: The state should provide financial assistance to help communities meet existing and future needs in an environmentally and economically sound manner.	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes

Table 4 - Continued

GOALS AND STRATEGIES DEVELOPED FOR UPPER MINNESOTA RIVER WATERSHED DISTRICT BY OTHER AGENCIES

Agency/Entity/ Reference	Goals/Strategies	Compatible with Goals/Strategies of This Plan?
Environmental Quality Board Reference: "Common Ground Achieving Sustainable Communities in Minnesota"	**GOAL NO. 1**: Guide change through planning. **GOAL NO. 2**: Coordinate planning for compatibility. **GOAL NO. 3**: Include citizens in planning and decision-making. **GOAL NO. 4**: Respect and foster diversity among communities. **GOAL NO. 5**: Use integrated information as a foundation for plans and decisions. **GOAL NO. 6**: Consider the long-term social, economic and environmental costs of growth and development. **GOAL NO. 7**: Pay as we go. **GOAL NO. 8**: Use natural resources and public funds efficiently. **GOAL NO. 9**: Preserve features of local, regional and state-wide significance. **GOAL NO. 10**: Live within our means. **GOAL NO. 11**: Foster livable communities. **GOAL NO. 12**: Enhance Minnesota's economic strength and competitiveness.	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes
Environmental Quality Board Reference: "Crosscurrents Managing Water Resources"	**GOAL NO. 1**: Continue to build on the current management structure. **GOAL NO. 2**: Develop a multi-year plan to merge regional (state agency) offices. **GOAL NO. 3**: Simplify procedures for modifying special purpose districts. **GOAL NO. 4**: Build on local water planning. **GOAL NO. 5**: Enhance coordination among agencies. **GOAL NO. 6**: Integrate financial assistance programs. **GOAL NO. 7**: Identify additional permitting decisions that can be handled through general permit, rule or delegation. **GOAL NO. 8**: Seek waivers from federal mandates. **GOAL NO. 9**: Invest in technology. **GOAL NO. 10**: More fully integrate sustainable development into state efforts.	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes
Minnesota[1] Wetland Conservation Plan (January 1997)	To maintain and restore the quality and diversity and increase the overall quantity of wetlands in the state, varying regionally in accordance with differences in the character and health of the wetland resource, in order to promote ecologically, socially and economically sustainable communities.	Yes

1 Sponsoring agencies include Minnesota Department of Agriculture, Department of Natural Resources, Minnesota Pollution Control Agency, and Board of Soil and Water Resources.

Table 4 - Continued

GOALS AND STRATEGIES DEVELOPED FOR UPPER MINNESOTA RIVER WATERSHED DISTRICT BY OTHER AGENCIES

Agency/Entity/ Reference	Goals/Strategies	Compatible with Goals/Strategies of This Plan?
Minnesota Pollution Control Control Agency Reference: Minnesota River Basin Information Document (1997)	**GOAL:** For the Minnesota River, interim basin-wide targets have been established to move toward the water quality standards. One target is 40 percent reduction in biological oxygen demand in the lower Minnesota River; the other is a 40 percent reduction in sediment entering the Minnesota River and its tributaries from cropland and other nonpoint sources. The first of these interim targets is a water quality goal, while the second is a goal that applies directly to one of the main nonpoint pollutants.	Yes
Big Stone County Comprehensive Water Plan 1995 Update	**SURFACE WATER INITIATIVES** **GOAL NO. 1**: Protect the quality of surface water in the County. **Objective A;** Establish a priority listing of lakes in the county for protection and restoration. **Objective B:** Continue to improve urban and rural land use practices to protect surface water resources. **Objective C:** Regularly review all existing county ordinances to protect surface water resources. **Objective D:** Increase surface water quality monitoring in Big Stone County. **Objective E:** Identify and protect High Priority Wetland Preservation Areas in the County. **Objective F:** Evaluate the impact of storm water runoff on surface water in the county and determine the need for storm water management controls. **GOAL NO. 2:** Maximize use of surface water in the County. **Objective A:** Increase recreational opportunities and access to Big Stone Lake. **Objective B.** Support Big Stone Lake Restoration Project programs and the Minnesota River Improvement Project. **Objective C:** Support and encourage planned development on other lakes in the county. **GOAL NO. 3:** Improve local input into surface water allocation in the County. **Objective A:**. Promote local input into the surface water allocation process. **GOAL NO. 4:** Improve control of surface water in the County. **Objective A:** Encourage best management practices in areas drained by open public ditches to minimize drainage problems and erosion and sedimentation in the system. **Objective B.**: Identify and determine solutions to surface water flooding.	Yes

Table 4 - Continued

GOALS AND STRATEGIES DEVELOPED FOR UPPER MINNESOTA RIVER WATERSHED DISTRICT BY OTHER AGENCIES

Agency/Entity/ Reference	Goals/Strategies	Compatible with Goals/Strategies of This Plan?
Big Stone County Comprehensive Water Plan 1995 Update (cont.)	**GROUNDWATER RESOURCE INITIATIVES** **GOAL NO. 1:** Establish a comprehensive database on groundwater quality and quantity in the county. **Objective A:** Identify geologically sensitive areas in the county, and better define the limits and recharge areas of major aquifers. **Objective B:** Increase both the level and extent of groundwater testing in the county. **Objective C:** Inventory nonpoint and point sources of groundwater contamination. **Objective D:** Promote special projects in the county. **GOAL NO. 2:** Protect and preserve groundwater quality in the county. **Objective A:** Protect the county groundwater resources from future contamination. **Objective B:** Encourage land use practices that enhance high quality recharge. **GOAL NO. 3:** Assist public water suppliers in the county with wellhead protection plan development. **Objective A:** Advise and assist where applicable Public Water Suppliers in preparing Wellhead Protection Plans. **GOAL NO. 4:** Locate and seal abandoned wells in the county. **Objective A:** Maintain a program to locate abandoned wells. **Objective B:** Educate people on the need for proper abandonment of wells. **LAND RESOURCE INITIATIVES** **GOAL NO. 1:** Control disposal of solid and hazardous waste in the county. **Objective A:** Improve the solid waste stream in the county. **Objective B:** Promote educational programs concerning waste disposal. **GOAL NO. 2:** Protect prime farmland in the county. **Objective A:** Protect prime farmland in the county. **GOAL NO. 3:** Encourage development of land and wetlands for wildlife habitat. **Objective A:** Improve wildlife habitat in the county. **Objective B:** Promote alternative land use in the county. **GOAL NO. 4:** Reduce wind erosion in the county. **Objective A:** Protect highly erodable lands from wind erosion. **GOAL NO. 5:** Reduce water erosion in the county. **Objective A:** Protect critical areas from water erosion.	Yes Yes

Table 4 - Continued

GOALS AND STRATEGIES DEVELOPED FOR UPPER MINNESOTA RIVER WATERSHED DISTRICT BY OTHER AGENCIES

Agency/Entity/ Reference	Goals/Strategies	Compatible with Goals/Strategies of This Plan?
Traverse County Water Plan	**SURFACE WATER INITIATIVES** **GOAL NO. 1:** Protect and improve the quality of surface water in the county. **Objective A:** Promote and implement land use practices to protect surface water resources. **Objective B:** Enforce existing regulations and develop new regulations to protect surface water resources. **Objective C:** Develop a comprehensive data base for surface water quality in the county. **GOAL NO. 2:** Reduce flooding in the county. **Objective A:** Encourage proper land use practices and structures to reduce flooding in the county. **Objective B:** Install structures required to control flooding in the county. **Objective C:** Enforce existing regulations or update new ordinances to help reduce flooding in the county. **Objective D:** Continue to update County database concerning flood damages.	Yes
	GROUNDWATER RESOURCE INITIATIVES **GOAL NO. 1:** Establish a comprehensive data base concerning the county groundwater resources. **Objective A:** Increase the level and extent of groundwater testing in the county. **Objective B:** Better define the limits and recharge areas of aquifers in the county. **GOAL NO. 2:** Protect and preserve groundwater quality in the county. **Objective A:** Protect the county groundwater resources from contamination. **Objective B:** Encourage land use practices that enhance high quality recharge. **GOAL NO. 3:** Locate and seal abandoned wells in the county. **Objective A:** Establish a program to locate abandoned wells. **Objective B:** Educate people as to the need for properly abandoning wells.	Yes
	LAND RESOURCE INITIATIVES **GOAL NO. 1:** Control disposal of solid and hazardous waste in the county. **Objective A:** Control solid waste disposal in the county. **Objective B:** Promote educational programs concerning waste disposal. **GOAL NO. 2:** Increase development or procurement of fish and wildlife habitat. **Objective A:** Increase wildlife habitat in the county. **GOAL NO. 3:** Reduce soil erosion in the county in excess of 2T per acre per year on class 1-4 soils. **Objective A:** Protect highly erodable lands in key areas from wind and water erosion.	Yes

Table 4 - Continued

GOALS AND STRATEGIES DEVELOPED FOR UPPER MINNESOTA RIVER WATERSHED DISTRICT BY OTHER AGENCIES

NOTE: The following local plans were reviewed and although items are not specifically listed, no conflicts or incompatibilities are perceived.

Big Stone County Shoreland Management Ordinance – 1993
Big Stone County Sewage Treatment Ordinance – 1997
1998 Big Stone County Land and Related Resources Management Ordinance
Big Stone County Animal Feedlot Ordinance – 1996
Traverse County Shoreland Ordinance, adopted November 1, 1994
Sewage and Wastewater Treatment – Traverse County

Table 5

WATER MANAGEMENT AND RESOURCE ISSUES IDENTIFIED BY THE UPPER MINNESOTA RIVER WATERSHED BOARD MANAGERS

Resource Issue	**Location**	**Possible Solution**	**Problem[1] Category**
Storm water impact to Big Stone Lake	Ortonville	Detention pond	Surface water
Water levels in closed basins	1. U.S. Fish & Wildlife Unit Sec. 2, T121 R 43	None given	Surface water
	2. Grifith Lake – Swift County Road No. 55	None given	Surface water
	3. Hart and Shible Lakes	None given	Surface water
Sediment deposition issues to Big Stone Lake	North end of Lake	None given	Surface water
Funding programs needed for wetland restorations on agricultural land	District wide	None given	Ecological
Soil erosion on agricultural land	District wide	Increase no-till and minimum till farming	Ecological
Runoff and flooding problems	1. Swift County Ditch No. 10	Impoundments	Streams and channels
	2. Dry lake project	Bring to a conclusion	Structures
	3. Stony Run above the City of Odessa	None given	Streams and channels

[1] See Section 8.0 for policies to address problems

Table 5 - Continued

WATER MANAGEMENT AND RESOURCE ISSUES IDENTIFIED BY THE UPPER MINNESOTA RIVER WATERSHED BOARD MANAGERS

Resource Issue	**Location**	**Possible Solution**	**Problem[1] Category**
Sediment and erosion problems	1. Swift County Ditch No. 10	Long-term land retirement	Streams and channels
	2. Hoss Creek near Bartlett Slough	BMPs and a sedimentation basin	Streams and channels
	3. County Ditch No. 7 (Fish Creek)	Sedimentation basin below County Road No. 33	Streams and channels
Debris along stream channels	Little Minnesota River	Removal	Streams and channels
Flood safety	Big Stone Lake outlet	Construct an emergency spillway	Structures
Drainage issues – downstream and erosion impacts	1. Projects impacting Big Stone Lake	None given	Policy
	2. New drainage improvements – district wide	Encouragement of tiles rather than open ditches	Policy
Ditch maintenance issues	District wide	Evaluate how equitable and effectively the District rules are enforced	Policy

Table 6 - Continued

EVALUATION OF WATER MANAGEMENT PROBLEMS WITHIN THE UPPER MINNESOTA RIVER WATERSHED DISTRICT

Description of the Possible Problem	Problem[1] Within District? (Y/N)	Severity[5]	Location[6]	Comment	Authority To Address? (Y/N)	District's[4] Role	Applicable[2,3] District Policy	Additional Responsible Agencies? (Y/N)
Surface Water								
Overbank flows resulting from summer rainfalls result in frequent damage to agricultural crops	Y	High	WD	Most prevalent on flat areas with little slope.	Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, PI-5, RE-1, RE-2, NMCW-3, ITW-1, FFL-1, DA-1, SPMP-1, SPMP-2, SPMP-3, PIE-1	Y
The lack of a channel system causes ponding for sufficient time to damage agricultural crops, during the growing season	Y	High	WD	Most prevalent on flat areas with little slope. Isolated cases throughout the District.	Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, PI-5, RE-1, RE-2, NMCW-3, ITW-1, FFL-1, DA-1, SPMP-1, SPMP-2, SPMP-3, PIE-1	Y
Water levels of closed basins causes impacts to agricultural lands and public roads.	Y	High	WD	Primary concerns include USF&W Land Sec. 2, T121 R43, Grifith Lake located in Swift County impacting County Road 55, and Hart and Shible Lakes located in Swift County.	Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, PI-5, RE-1, RE-2, NMCW-3, ITW-1, FFL-1, DA-1, SPMP-1, SPMP-2, SPMP-3, PIE-1	Y
Flooding from snowmelt and rainfall events threatens infrastructure, homes and cities	Y	High	WD	Cities of Odessa and Browns Valley are primary concerns.	Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, PI-5, RE-1, RE-2, NMCW-3, ITW-1, FFL-1, DA-1, SPMP-1, SPMP-2, SPMP-3, PIE-1	Y
The overflow of water between subwatersheds contributes to excessive flows for others	Y	High	WD	Isolated cases within the District.	Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, RE-1, RE-2, ITW-1, DA-1, SPMP-2, SPMP-3, PIE-1	Y
Lack of maintaince on man-made drainage systems causes elevated water levels on upstream lands	Y	Low	WD	Generally case-by-case problem often related to debris accumulation, beaver dams or other factors.	Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, RE-1, RE-2, NMCW-1, NMCW-3, SPMP-2, SPMP-3, PIE-1	N
The accumulation of debris (e.g., logs and trees) in culverts and some waterways causes elevated water levels on upstre am land and excessive ponding, sufficient to damage agricultural crops and causing erosion.	Y	Moderate	WD	Generally case-by-case problem often related to beavers or trees. Primary areas of concern include the Little Minnesota River.	Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, RE-1, RE-2, NMCW-1, NMCW-3, SPMP-2, SPMP-3, PIE-1	Y
Ice jams and debris accumulation within structures (i.e., bridges, culverts) increases the probability of structure failure	Y	Moderate	WD	Generally case-by-case problem often related to beavers or trees.	Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, RE-1, RE-2, NMCW-1, NMCW-3, SPMP-2, SPMP-3, PIE-1	Y
The lack of adequate outlets for nature and man-made drainage systems causes flooding on downstream lands.	Y	High	WD	Generally case by case problems	Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, RE-1, RE-2, NMCW-1, NMCW-3, SPMP-2, SPMP-3, PIE-1	Y
Natural and man-made channel depths are insufficient for navigation	N			Navigation is not prevalent in the District	Y			
Base flow is insufficient to support the ecological needs of the stream	UN	UN		Determination of ecologically based base flow needs, is yet to be completed.	Y	Cooperator, Facilitator	PI-2, PI-3, PI-4, ITW-1, DA-1, SPMP-1, SPMP-2, SPMP-3, IGCC-1	Y
Too little surface water is available for human consumptive uses (e.g., drinking water, irrigation, industrial use)	N			Surface water use within District is minor.	Y			
Hydropower operation cause excessively modifies hydrologic regime	N			No hydropower with the District.	Y			

Table 6 - Continued

EVALUATION OF WATER MANAGEMENT PROBLEMS WITHIN THE UPPER MINNESOTA RIVER WATERSHED DISTRICT

Description of the Possible Problem	Problem[1] Within District? (Y/N)	Severity[5]	Location[6]	Comment	Authority To Address? (Y/N)	District's[4] Role	Applicable[2,3] District Policy	Additional Responsible Agencies? (Y/N)
Drainage of new lands increases downstream peak discharges, resulting in increased flood damage	N			The number of present human activities which increases contributing drainage area is small. Most affects result from previous human activity.	Y			
Urban areas need protection from large flood events	Y	Moderate	GLP	Primarily the cities of Odessa and Browns Valley.	Y	Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, PI-5, RE-1, RE-2, NMCW-3, ITW-1, FFL-1, DA-1, SPMP-1, SPMP-2, SPMP-3, PIE-1	Y
Farmsteads need protection from flooding	Y	High	WD		Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, PI-5, RE-1, RE-2, NMCW-3, ITW-1, FFL-1, DA-1, SPMP-1, SPMP-2, SPMP-3, PIE-1	Y
Storm water runoff from urban areas causes water quality impacts to surface waters.	Y			Developing areas within District are few. Primary concerns include the City of Ortonville.	Y	Lead, Cooperator, Facilitator	PI-1, PI-4, PI-5, BSL-2, BSL-3, IGCC-1	
Continued agricultural drainage increases peak discharge and flooding	UN			The effect of agricultural drainage on flooding is complex and subject to debate. Generalizations about the affects of drainage are misleading and need to be evaluated on a site specific basis. Site specific effects are presently evaluated as required by drainage law.	Y	Cooperator, Facilitator	PI-2, PI-4, RE-1, RE-2, NMCW-3, ITW-1, FFL-1, DA-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Wetland drainage increases discharge and flooding downstream	N			Consideration for small rainfall events, where runoff remains within the channel and no storage within the wetland.	Y		W-1, SPMP-2	Y
Funding opportunities are insufficient for a comprehensive wetland restoration program.	Y	Moderate	WD	Additional funding sources and a comprehensive management plan and inventory is needed.	Y	Lead, Cooperator Facilitator	W-1,W-2	
Wetland restoration increases discharge downstream	N			False when restoration incorporates storage.	Y		W-1, SPMP-2	Y
Recreational demand for lake use is excessive	Y			Launch facilities on Big Stone Lake are periodically inadequate because of high use.	Y	Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, PI-5, SPMP-3, PIE-1, IGCC-1	Y
Erosion is impacting surface waters from agriculture fields.	Y	High	WD	Increase minimum and no-till farming to reduce soil erosion.	Y	Cooperator, Facilitator	SPMP-3	Y
Lake elevations are too high or too low	Y			Many closed basins within the District are a problem. Big Stone Lake elevation established in accordance with operating plan.	Y	Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, PI-5, ITW-1, DA-1, W-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Water quality is poorer than it should be	Y	Moderate	WD	Efforts continue to improve water quality of Big Stone Lake. Sediment is a concern in the upper portion of Big Stone Lake. Little is known relative to streams.	Y	Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, PI-5, ITW-1, DA-1, W-1, SPMP-2, SPMP-3, PIE-1, IGCC-1, BSL-2, BSL-3, BSL-4	Y

Table 6 - Continued

EVALUATION OF WATER MANAGEMENT PROBLEMS WITHIN THE UPPER MINNESOTA RIVER WATERSHED DISTRICT

Description of the Possible Problem	Problem[1] Within District? (Y/N)	Severity[5]	Location[6]	Comment	Authority To Address? (Y/N)	District's[4] Role	Applicable[2,3] District Policy	Additional Responsible Agencies? (Y/N)
Water quality is insufficient to support the intended stream uses	UN	High	WD	Little is known relative to streams.	Y	Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, PI-5, ITW-1, DA-1, W-1, SPMP-2, SPMP-3, PIE-1, IGCC-1, BSL-2, BSL-3, BSL-4	Y
Groundwater								
The volume of available ground water is insufficient for human use	N			Little ground water is utilized for human use within the District.	Y			
Ground water use is too great, reducing the elevation of the aquifer and reducing stream base flow	N			Little ground water is utilized for human use within the District.	Y			
Ground water use is too great, threatening water supply wells and increasing pump costs	N			Little ground water is utilized for human use within the District.	Y			
Aquifer recharge areas are at risk, affecting the recharge capability of the aquifer	UN			Location of recharge areas not entirely known.	Y	Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Contamination of surficial aquifers by human activities threatens the water supply	N			None documented.	Y			
Contamination of bedrock aquifers by human activities threatens the water supply	N			None documented.	Y			
Ground water is already contaminated	UN			No documented cases.	Y	Cooperator, Facilitator		Y
Ecological								
The frequency of overbank flow to adjacent riparian areas has been sufficiently altered, placing the riparian area at risk	UN	UN		Need information about the change in frequency of bankfull discharge.	Y	Cooperator	NMCW-1, NNCW-3, NCMW-5, ITW-1, FFL-1, DA-1, SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
The number of acres of various type of habitats (e.g., wetlands, grasslands, woodlands) is insufficient.	Y*	High	WD	No goals have been established for the District.	Y	Cooperator	W-1, W-2, SPMP-1, SPMP-3, PIE-1, IGCC-1	Y
Control structures prevent the movement of fish and other aquatic life upstream	N	UN	WD	Few structures within the District.	Y	Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, RE-1, RE-2, NMCW-1, NMCW-3, NMCW-4, SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Exotic species threaten the ecological integrity of streams and lakes	UN		WD	No information.	Y	None	SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Stream channel lacks habitat for fish and other aquatic life	UN	High	WD	No information.	Y	Cooperator	SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Areas of continuous habitat along natural streams and rivers is being reduced, impacting riparian ecology	UN	High	WD	No information.	Y	Cooperator	PI-4, NMCW-2, NMCW-3, NMCW-5, FFL-1, SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Structures on lakes result in artifically high levels, altering the natural lake functions	N	Low	WD	More of an issue with "natural outlets".	Y	Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, RE-1, RE-2, SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y

Table 6 - Continued

EVALUATION OF WATER MANAGEMENT PROBLEMS WITHIN THE UPPER MINNESOTA RIVER WATERSHED DISTRICT

Description of the Possible Problem	Problem[1] Within District? (Y/N)	Severity[5]	Location[6]	Comment	Authority To Address? (Y/N)	District's[4] Role	Applicable[2,3] District Policy	Additional Responsible Agencies? (Y/N)
Streams and Channels								
Bank erosion threatens infrastructure (e.g., bridges, culverts, road crossings)	Y	Moderate	WD	Occurs on a case-by-case basis. Priority areas include Swift County Ditch No.10. BMP's and long term land retirement is needed.	Y	Lead	PI-1, PI-2, PI-3, PI-4, RE-1, RE-2, NMCW-1, NMCW-2, NMCW-3, SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Increasing stream bed elevation (i.e. stream aggradation) is increasing the frequency of flooding from small storms	UN		WD	No Streams Identified.	Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, RE-1, RE-2, NMCW-1, NMCW-2, NMCW-3, SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Decreasing stream bed elevation results in excessive bank sloughing (i.e., mass wasting)	UN		WD	No Streams Identified.	Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, RE-1, RE-2, NMCW-1, NMCW-2, NMCW-3, SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Decreasing stream bed elevation threatens infrastructure (e.g., bridge foundations, drinking water intakes)	UN		WD	No Streams Identified.	Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, RE-1, RE-2, NMCW-1, NMCW-2, NMCW-3, SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Excessive sedimentation results in increased maintenance costs	Y	High	WD	Occurs on a case-by-case basis. Priority areas include Swift County Ditch No.10, Stony Run, County Ditch No.7 (Fish Creek) and Hoss Creek near Bartlett Slough. Sedimentation Basins are needed in these subwatersheds.	Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, RE-1, RE-2, NMCW-1, NMCW-2, NMCW-3, SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Channel capacity in downstream areas is insufficient to carry the flow, resulting in excessive flooding	Y	High	WD	Occurs on a case-by-case basis.	Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, RE-1, RE-2, NMCW-1, NMCW-2, NMCW-3, NMCW-4, NMCW-5, FFL-1, SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	
Meandering of the stream channel threatens infrastructure and results in the loss of farmland and ecological resources	Y*	Low	WD	Occurs on a case-by-case basis.	Y	Lead, Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, RE-1, RE-2, NMCW-1, NMCW-2, NMCW-3, NMCW-4, NMCW-5, FFL-1, SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Recreation								
Natural channels are unsuitable for recreational use (i.e. canoeing) and are insufficient for navigation	Y*	Moderate	WD	No navigation within District. Structures on lower part of river deemed as recreational barrier.	Y	Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, RE-2, NMCW-1, NMCW-3, SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Structures present a barrier to river and stream recreation (e.g., canoeing)	Y*	Moderate	WD	No navigation within District. Structures on lower part of river deemed as recreational barrier.	Y	Cooperator, Facilitator	PI-1, PI-2, PI-3, PI-4, RE-2, NMCW-1, NMCW-3, SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Surface water based recreational opportunities are lacking	N	High		Big Stone Lake is the primary recreational resource.	Y	Cooperator, Facilitator		Y

Table 6 - Continued

EVALUATION OF WATER MANAGEMENT PROBLEMS WITHIN THE UPPER MINNESOTA RIVER WATERSHED DISTRICT

Description of the Possible Problem	Problem[1] Within District? (Y/N)	Severity[5]	Location[6]	Comment	Authority To Address? (Y/N)	District's[4] Role	Applicable[2,3] District Policy	Additional Responsible Agencies? (Y/N)
Structures								
Aging dams present a safety hazard because of the possibility of failure	N			No Structures owned by District (including Big Stone Lake Dam). District is cooperative operator. District communicates needs to State and Federal agencies.	Y			
Frequent maintenance of structures is expensive	N			Cost for annual visit for inspection is minimal.	Y			
No conclusion to the Dry Lake Dam Project.								
No emergency spillway is present on Big Stone Lake.				District needs to communicate need to State and Federal Agencies.	N	Cooperator, Facilitator	IGCC-1	
Policy								
Lack of floodplain regulations results in development within the flood plain	N			Responsibility of county.	N			
Building codes are insufficient to ensure construction above the 100-year flood elevation	N			Responsibility of county.	N			
Clear policy is needed on drainage improvements impacting Big Stone Lake.	Y			Drain tiles should be constructed instead of open ditches. Equitable enforcement of District drainage policies is difficult.	Y		PI-1, PI-2, PI-3, PI-4, RE-1, RE-2, SPMP-1, SPMP-2, SPMP-3, PIE-1, IGCC-1	Y
Acquisition and relocation programs for flood prone structures are insufficient	N			Responsibility of county.	Y			
Benefit determinations relative to legal drainage systems are dated	N			Responsibility of county.	Y			
Assessing benefits to individuals for certain types of projects and programs is difficult	Y	Moderate		Responsibility of county.	Y	Lead	PI-5, PIE-1, IGCC-1	N
Education								
There is a general lack of understanding of drainage law	Y	High	WD	Issue is not confined to District.	Y	Cooperator	PIE-1, IGCC-1	
There is a general lack of understanding about roles and responsibilities relative to water management	Y	High	WD	Issue is not confined to District.	Y	Cooperator	PIE-1, IGCC-1	
A lack of technically based discussion prevents informed policy decisions	Y	High	WD	Issue is not confined to District.	Y	Cooperator	PIE-1, IGCC-1	
Lack of baseline water quality data for decision making	Y	High	WD	Mainly for streams not draining to Big Stone Lake.	Y	Cooperator	PIE-1, IGCC-1	
Lack of understanding and awareness of land stewardship and natural resource practices	Y	High	WD		Y	Cooperator	PIE-1, IGCC-1	

Table 6 - Continued

EVALUATION OF WATER MANAGEMENT PROBLEMS WITHIN THE UPPER MINNESOTA RIVER WATERSHED DISTRICT

Description of the Possible Problem	Problem[1] Within District? (Y/N)	Severity[5]	Location[6]	Comment	Authority To Address? (Y/N)	District's[4] Role	Applicable[2,3] District Policy	Additional Responsible Agencies? (Y/N)
Coordination								
Coordination among those responsible for water management is lacking	Y	High	WD	Issue is not confined to District. Work is needed on Minnesota – South Dakota cooperation on lake management and improvement efforts.	Y	Cooperator	IGCC-1	
There is apprehensiveness to recognize the responsibilities of entities involved in water management	Y	High	WD	Issue is not confined to District.	Y	Cooperator	IGCC-1	
A lack of trust exists among those involved in water management	Y	High	WD	Issue is not confined to District.	Y	Cooperator	IGCC-1	
Philisophical differences among those involved in water management are great	Y	High	WD	Issue is not confined to District.	Y	Cooperator	IGCC-1	

[1] The identification of possible water management problems is intended to be comprehensive, independent from District perspective. May be considered as a problem by another resource agency.
[2] Solutions to the problems will be pursued by the District using policies identified in Section 8 Policies of the District.
[3] Types of solution: 1) PI = project initiation or investigation; 2) PIE = public information and education; 3) RE = regulation; 4) SPMP = special purpose management program; 5) IGCC = intergovernmental cooperation and coordination; and 6) POL = policy.
[4] District role: 1) Lead; 2) Coordinator; 3) Facilitator; and 4) None.
[5] Problem Magnitude: 1) High; 2) Moderate; and 3) Low.
[6] Location: WD = Whole District.
* Depends on the value placed on the resources.

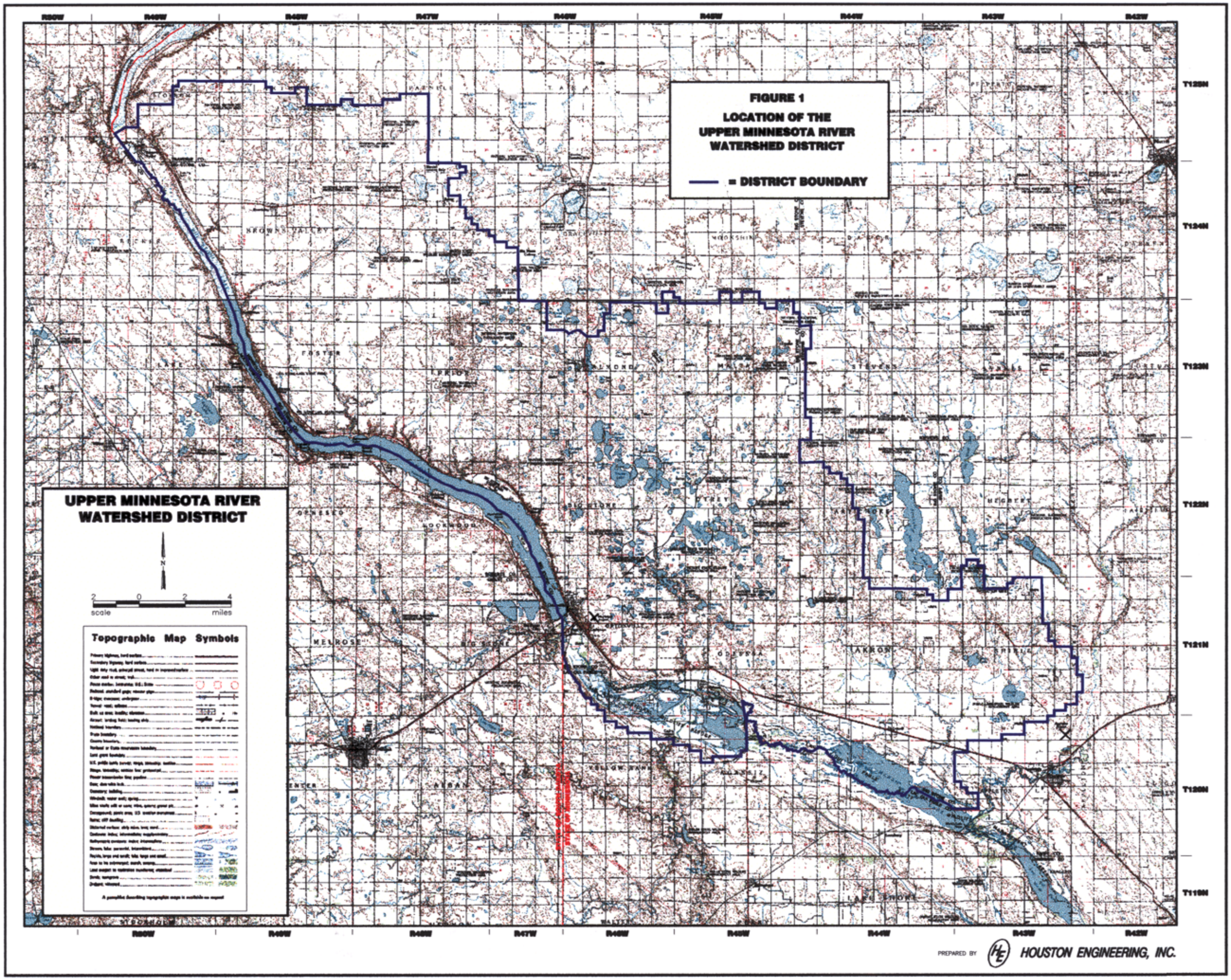
FIGURE 1
LOCATION OF THE
UPPER MINNESOTA RIVER
WATERSHED DISTRICT
= DISTRICT BOUNDARY
UPPER MINNESOTA RIVER
WATERSHED DISTRICT
N
2 0 2 4
scale miles
Topographic Map Symbols
R50W
R49W
R48W
R47W
R46W
R45W
R44W
R43W
R42W
T125N
T124N
T123N
T122N
T121N
T120N
T119N
PREPARED BY
HOUSTON ENGINEERING, INC.

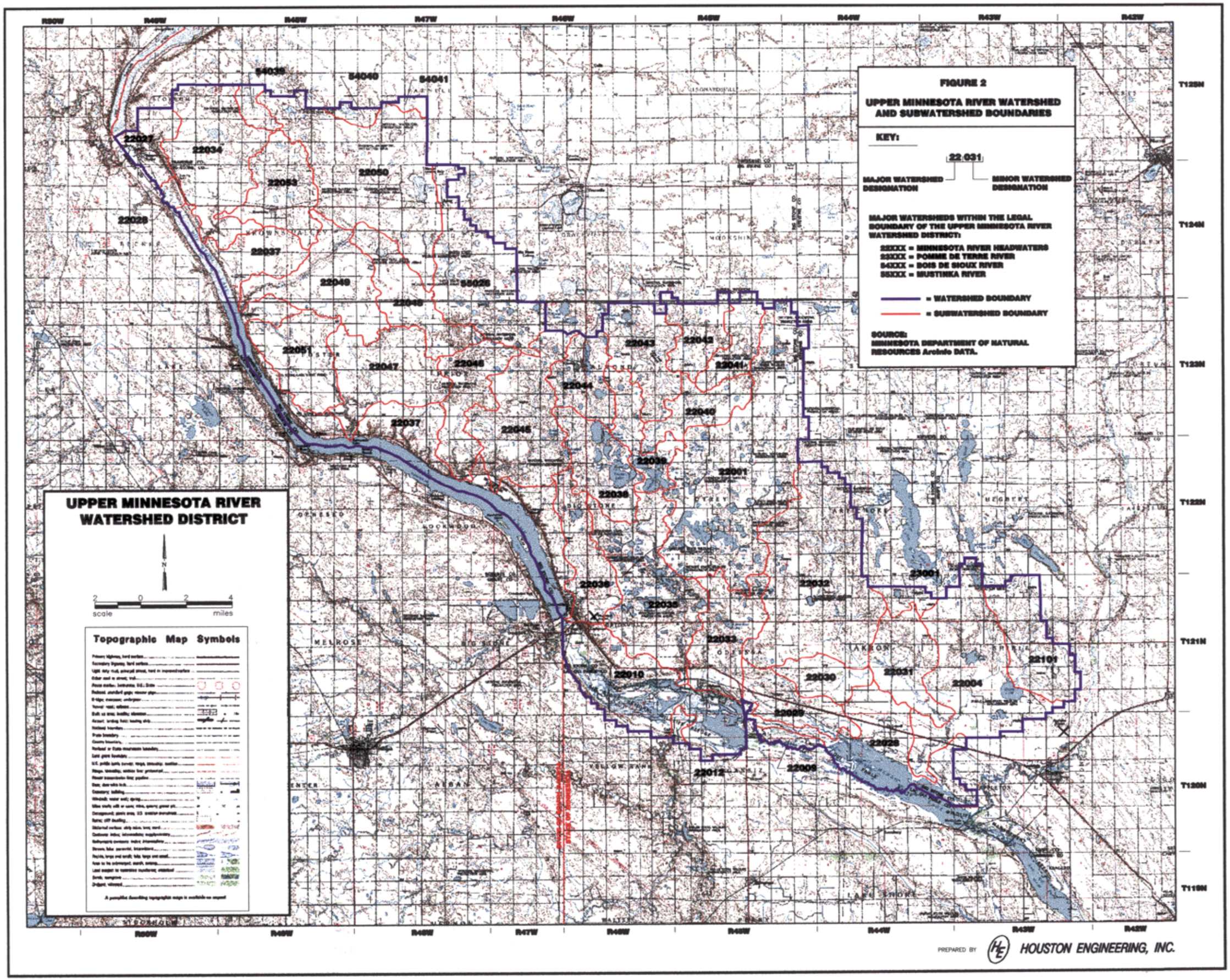
FIGURE 2
UPPER MINNESOTA RIVER WATERSHED AND SUBWATERSHED BOUNDARIES
KEY:
22031
MAJOR WATERSHED DESIGNATION
MINOR WATERSHED DESIGNATION
MAJOR WATERSHEDS WITHIN THE LEGAL BOUNDARY OF THE UPPER MINNESOTA RIVER WATERSHED DISTRICT:
22XXX = MINNESOTA RIVER HEADWATERS
23XXX = POMME DE TERRE RIVER
54XXX = BOIS DE SIOUX RIVER
56XXX = MUSTINKA RIVER
= WATERSHED BOUNDARY
= SUBWATERSHED BOUNDARY
SOURCE:
MINNESOTA DEPARTMENT OF NATURAL RESOURCES ArcInfo DATA.
UPPER MINNESOTA RIVER WATERSHED DISTRICT
N
2 0 2 4
scale miles
Topographic Map Symbols
R50W
R49W
R48W
R47W
R46W
R45W
R44W
R43W
R42W
T125N
T124N
T123N
T122N
T121N
T120N
T119N
54039
54040
54041
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22028
22037
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22047
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22001
22036
22035
22033
22032
23001
22101
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22004
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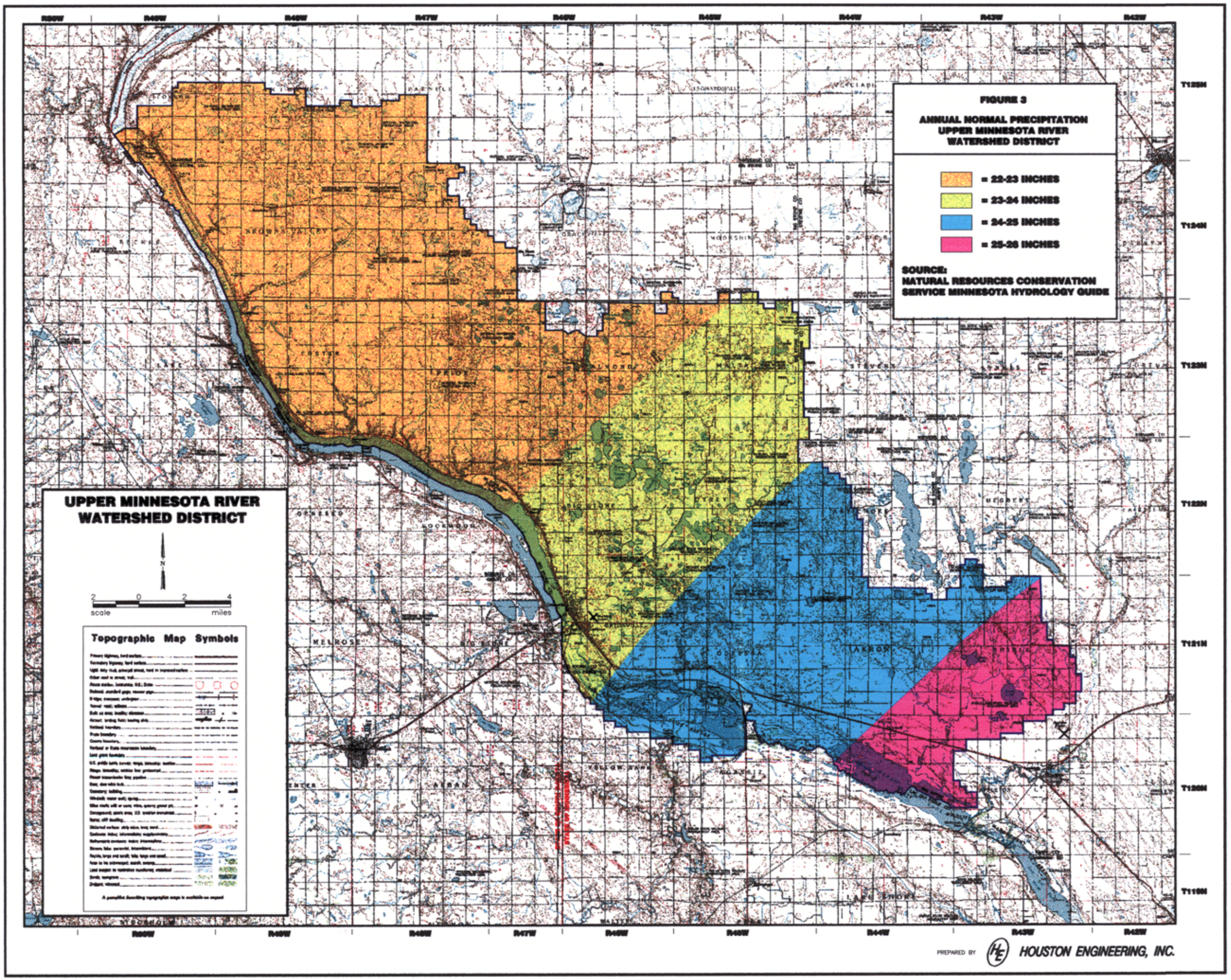
FIGURE 3
ANNUAL NORMAL PRECIPITATION
UPPER MINNESOTA RIVER
WATERSHED DISTRICT
= 22-23 INCHES
= 23-24 INCHES
= 24-25 INCHES
= 25-26 INCHES
SOURCE:
NATURAL RESOURCES CONSERVATION
SERVICE MINNESOTA HYDROLOGY GUIDE
UPPER MINNESOTA RIVER
WATERSHED DISTRICT
N
2 0 2 4
scale miles
Topographic Map Symbols
R50W
R49W
R48W
R47W
R46W
R45W
R44W
R43W
R42W
T125N
T124N
T123N
T122N
T121N
T120N
T119N
PREPARED BY
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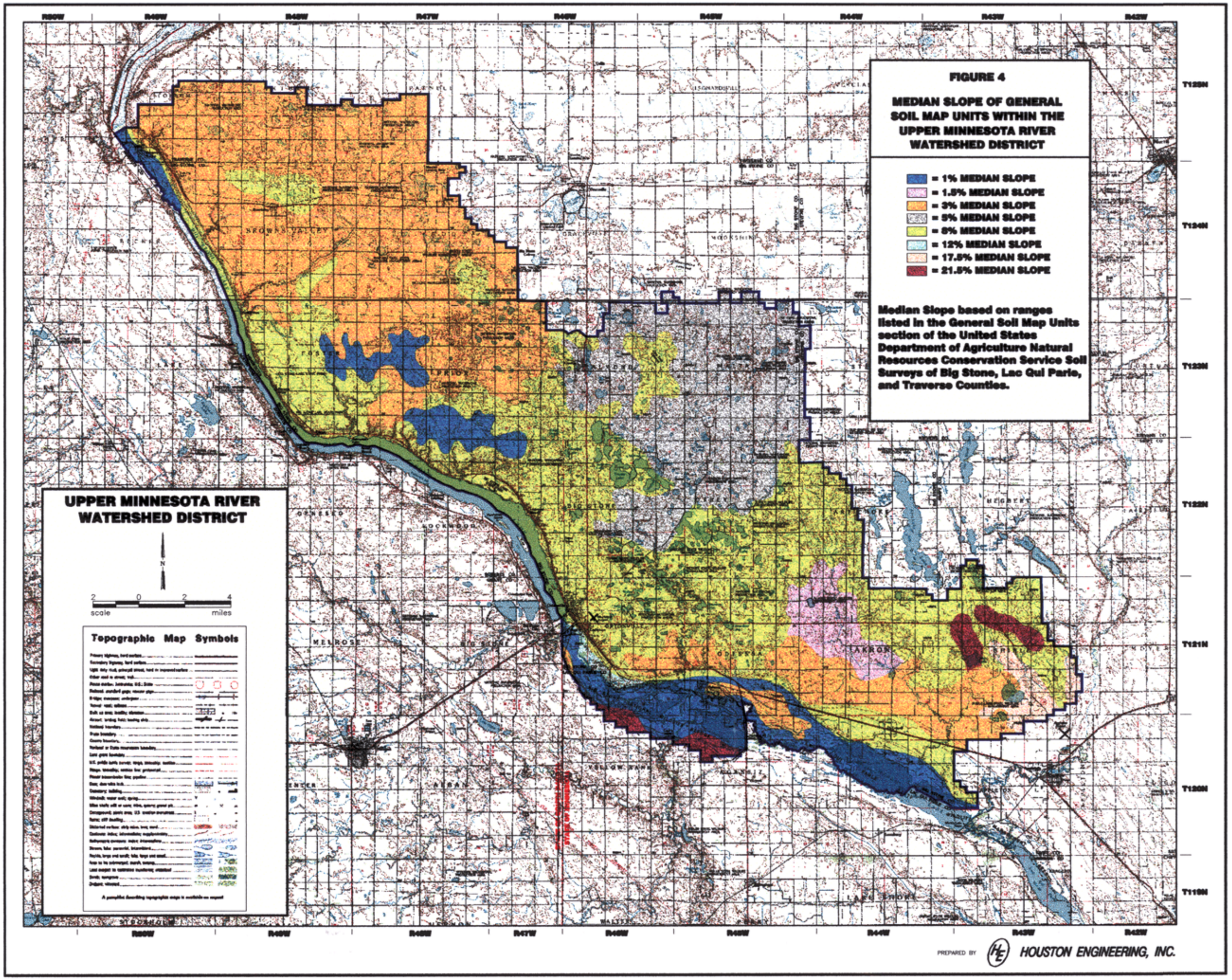
FIGURE 4
MEDIAN SLOPE OF GENERAL SOIL MAP UNITS WITHIN THE UPPER MINNESOTA RIVER WATERSHED DISTRICT
= 1% MEDIAN SLOPE
= 1.5% MEDIAN SLOPE
= 3% MEDIAN SLOPE
= 5% MEDIAN SLOPE
= 8% MEDIAN SLOPE
= 12% MEDIAN SLOPE
= 17.5% MEDIAN SLOPE
= 21.5% MEDIAN SLOPE
Median Slope based on ranges listed in the General Soil Map Units section of the United States Department of Agriculture Natural Resources Conservation Service Soil Surveys of Big Stone, Lac Qui Parle, and Traverse Counties.
UPPER MINNESOTA RIVER WATERSHED DISTRICT
N
2 0 2 4
scale miles
Topographic Map Symbols
R50W R49W R48W R47W R46W R45W R44W R43W R42W
T125N T124N T123N T122N T121N T120N T119N
PREPARED BY HOUSTON ENGINEERING, INC.

FIGURE 5

SOIL ASSOCIATIONS WITHIN THE UPPER MINNESOTA RIVER WATERSHED DISTRICT

- = PEEVER-DORAN-PARNELL
- = HAMERLY-PARNELL-LINDAS
- = GONVICK-LINDAAS
- = HATTIE-FULDA
- = ESMOND-HEIMDAL
- = FORMDALE-BUSE
- = EGELAND-MARYSLAND-ESTELLINE
- = FORDVILLE-SWENODA
- = GARDENA-GLYNDON
- = LAPRAIRIE-LAMOURE
- = COPASTON-ROCK OUTCROP
- = RENSHAW-FORDVILLE-SIOUX
- = BARNES-BUSE-SVEA
- = LAMOURE-RAUVILLE-LAPRAIRIE
- = ESMOND-HEIMDAL-PARNELL
- = VALLERS-SVEA-BUSE

UPPER MINNESOTA RIVER WATERSHED DISTRICT

N

2 0 2 4

scale miles

Topographic Map Symbols

A pamphlet describing topographic maps is available on request

R50W R49W R48W R47W R46W R45W R44W R43W R42W

T123N T122N T121N T120N T119N

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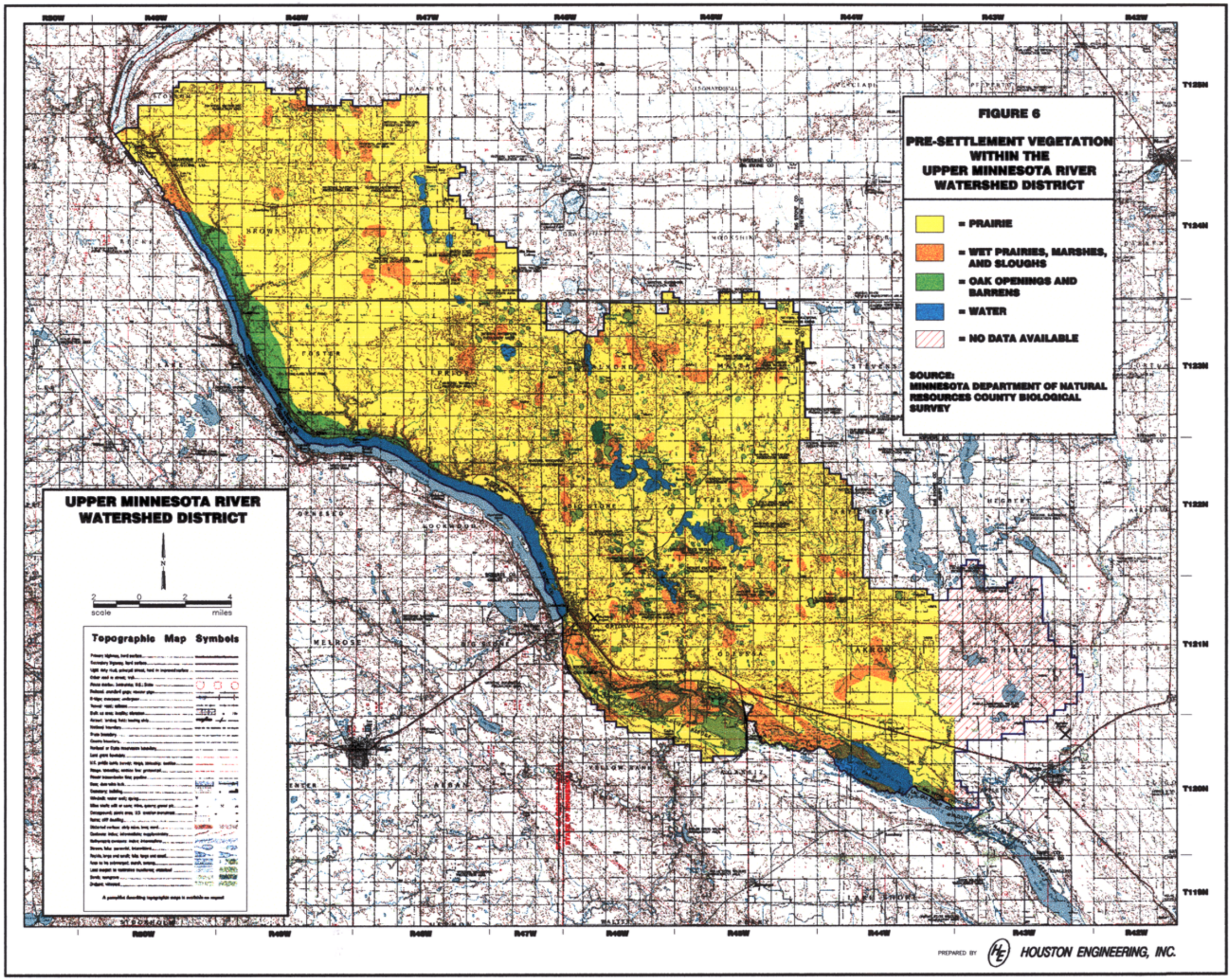
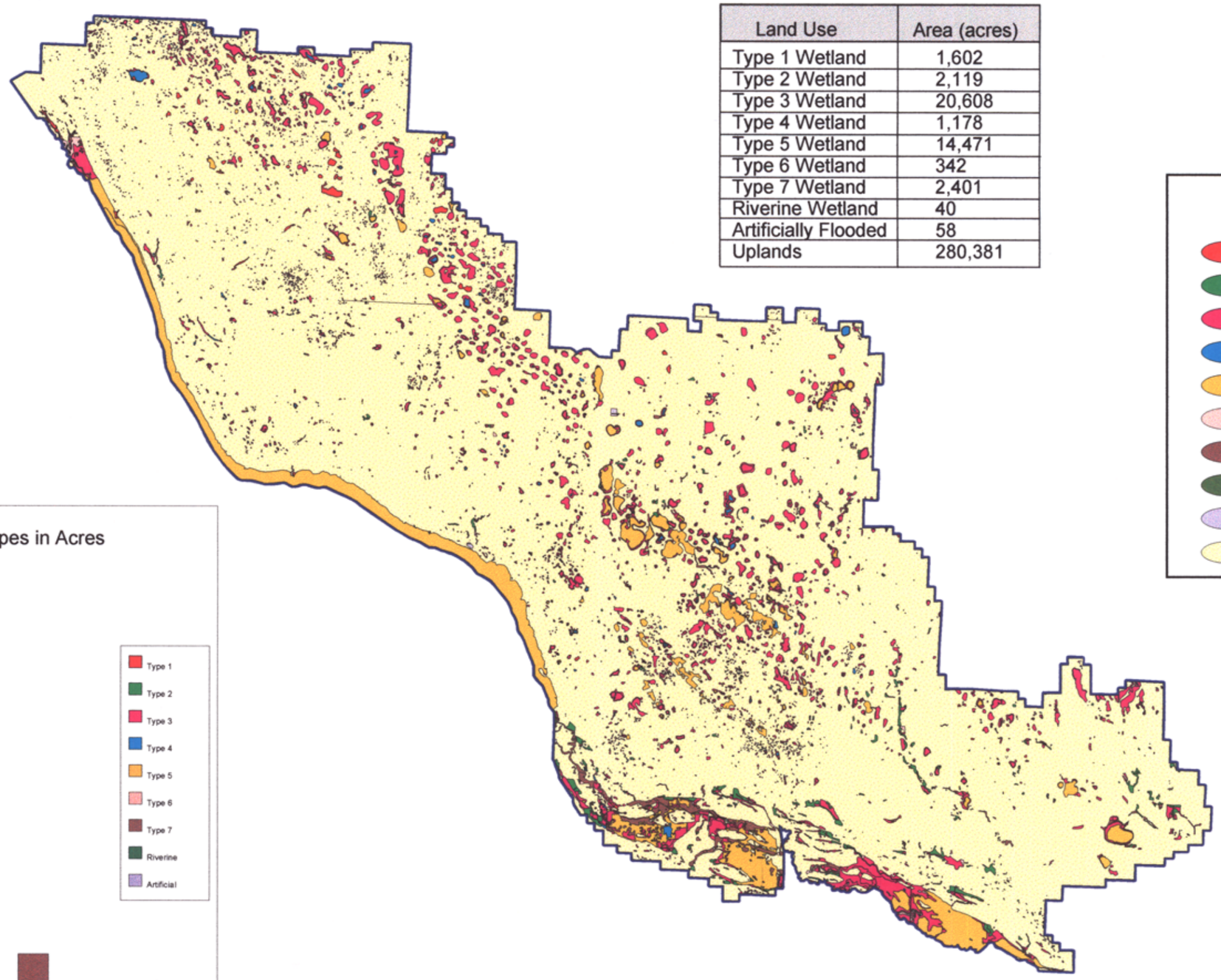


FIGURE 6
PRE-SETTLEMENT VEGETATION WITHIN THE UPPER MINNESOTA RIVER WATERSHED DISTRICT
= PRAIRIE
= WET PRAIRIES, MARSHES, AND SLOUGHS
= OAK OPENINGS AND BARRENS
= WATER
= NO DATA AVAILABLE
SOURCE:
MINNESOTA DEPARTMENT OF NATURAL RESOURCES COUNTY BIOLOGICAL SURVEY
UPPER MINNESOTA RIVER WATERSHED DISTRICT
N
2 0 2 4
scale miles
Topographic Map Symbols
R50W
R49W
R48W
R47W
R46W
R45W
R44W
R43W
R42W
T125N
T124N
T123N
T122N
T121N
T120N
T119N
PREPARED BY
HOUSTON ENGINEERING, INC.

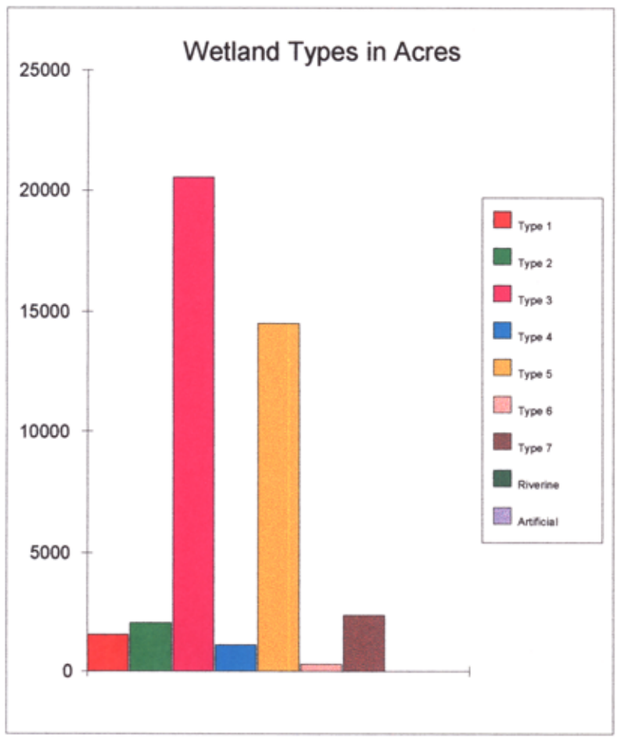
WETLAND TYPES WITHIN THE UPPER MINNESOTA RIVER WATERSHED DISTRICT

Land Use	Area (acres)
Type 1 Wetland	1,602
Type 2 Wetland	2,119
Type 3 Wetland	20,608
Type 4 Wetland	1,178
Type 5 Wetland	14,471
Type 6 Wetland	342
Type 7 Wetland	2,401
Riverine Wetland	40
Artificially Flooded	58
Uplands	280,381



Legend

- Type 1 Wetland
- Type 2 Wetland
- Type 3 Wetland
- Type 4 Wetland
- Type 5 Wetland
- Type 6 Wetland
- Type 7 Wetland
- Riverine Wetland
- Artificially Flooded
- Uplands



N
W E
S

2 0 2 4 6 8 Miles

FIGURE 7

FIGURE 8

LEGAL DRAINAGE SYSTEMS WITHIN THE UPPER MINNESOTA RIVER WATERSHED DISTRICT

COUNTY DITCH 2 – OPEN CHANNEL
COUNTY DITCH 4 – OPEN CHANNEL
COUNTY DITCH 5 – OPEN CHANNEL, 3716' OF 8" TILE & 5184' OF 12" TILE
COUNTY DITCH 6 – OPEN CHANNEL
COUNTY DITCH 7 – OPEN CHANNEL
COUNTY DITCH 13 – OPEN CHANNEL, 18,000' OF 15" TILE & 1,075' OF 36" TILE
COUNTY DITCH 17 – 1,300' OF 10" TILE & 1,900' OF 8" TILE
COUNTY DITCH 18 – 41,700' OF 5" TILE, 13,600' OF 6" TILE, 7,200' OF 8" TILE & 9,200' OF 10" TILE
COUNTY DITCH 19 – 2,855' OF 5" TILE, 2,550' OF 6" TILE, 1,250' OF 7" TILE & 800' OF 8" TILE
COUNTY DITCH 20 – OPEN CHANNEL & 1,000' OF 18" TILE
COUNTY DITCH 21 – 160' OF 6" TILE, 500' OF 8" TILE, 7,950' OF 10" TILE, 2,900' OF 12" TILE & 7,300' OF 14" TILE
COUNTY DITCH 24 – OPEN CHANNEL & 13,650' OF TILE RANGING FROM 7" TO 24" DIAMETER
COUNTY DITCH 25 – OPEN CHANNEL
COUNTY DITCH 30 – OPEN CHANNEL & 1,770' OF 10" TILE
JUDICIAL DITCH 2 – THE MINNESOTA RIVER BETWEEN BIG STONE LAKE & MARSH LAKE

THIS MAP SHOWS THE APPROXIMATE LOCATION OF LEGAL DRAINAGE SYSTEMS WITHIN THE UPPER MINNESOTA RIVER WATERSHED DISTRICT. MOST SYSTEMS ARE A COMBINATION OF OPEN CHANNEL AND TILE LINES THAT CANNOT BE DETAILED AT THIS SCALE.

UPPER MINNESOTA RIVER WATERSHED DISTRICT

N

2 0 2 4
scale miles

Topographic Map Symbols

A pamphlet describing topographic maps is available on request

CO. DITCH 24 (TILE)
CO. DITCH 17 (TILE)
COUNTY DITCH 7
CO. DITCH 25
COUNTY DITCH 13
CO. DITCH 6, 20
COUNTY DITCH 7
CO. DITCH 18 (TILE)
CO. DITCH 5 (TILE)
CO. DITCH 19 (TILE)
CO. DITCH 21 (TILE)
COUNTY DITCH 2
COUNTY DITCH 4
JUDICIAL DITCH 2 (MINNESOTA RIVER)

R50W R49W R48W R47W R46W R45W R44W R43W R42W
T123N T122N T121N T120N T119N

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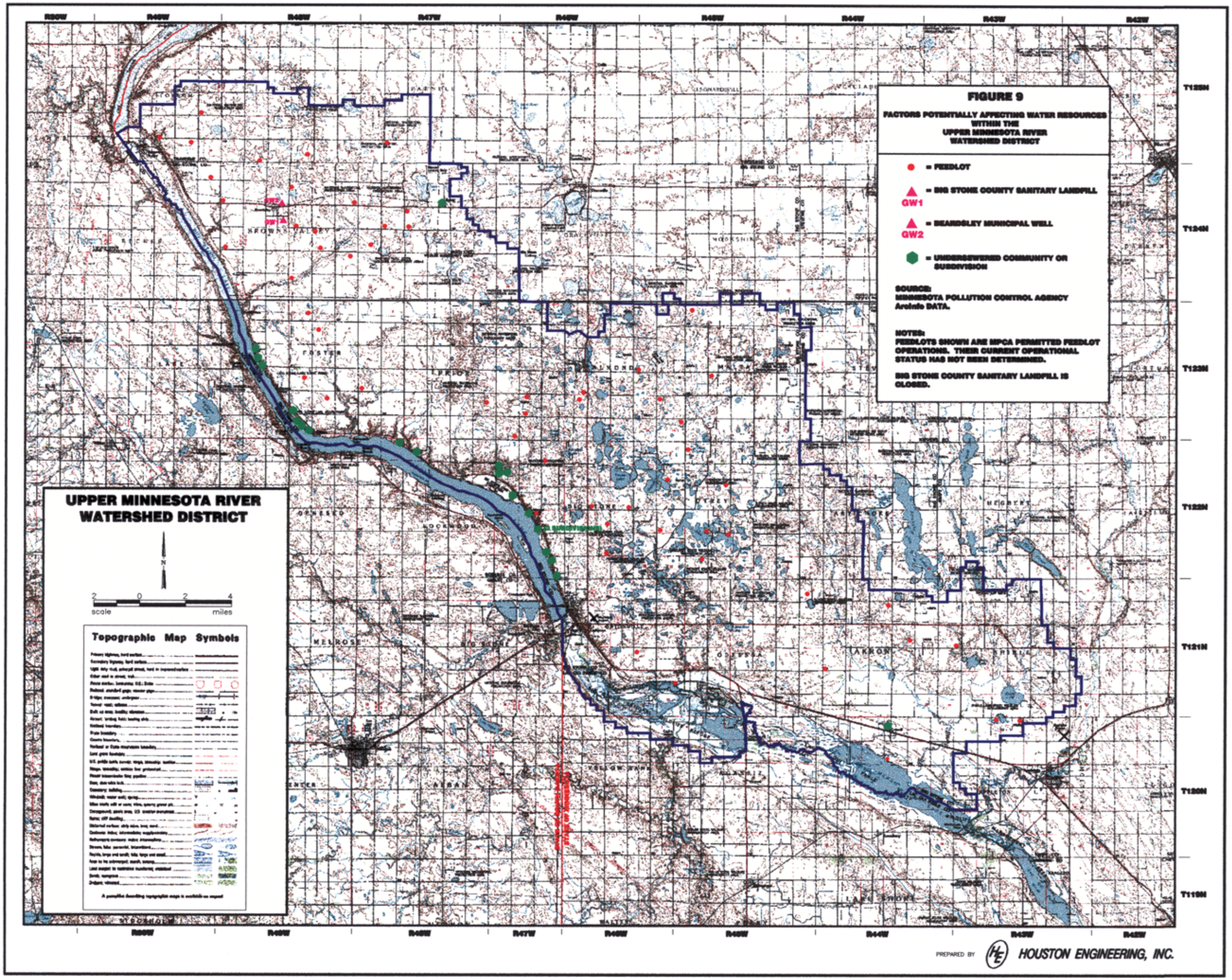
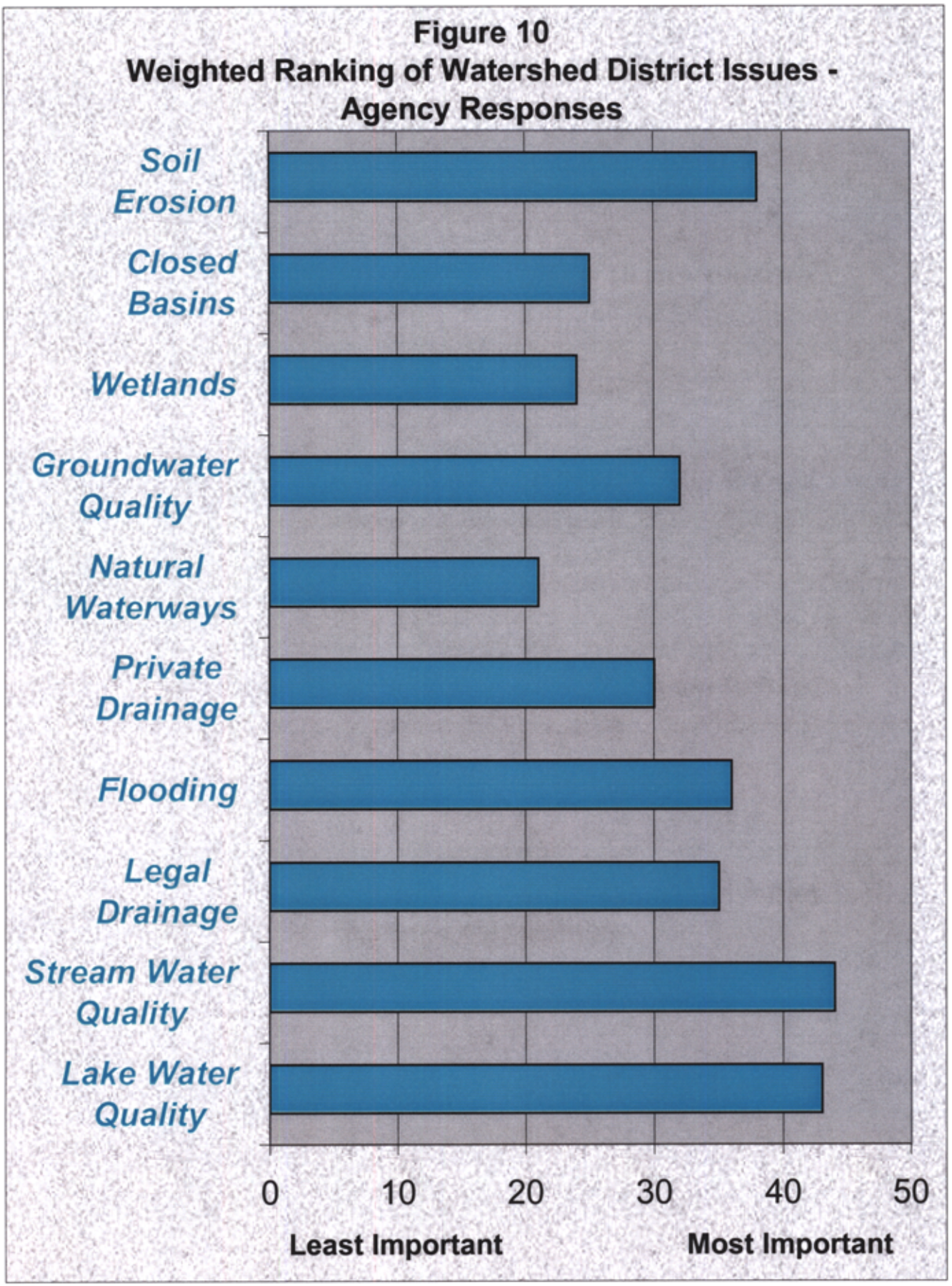


FIGURE 9
FACTORS POTENTIALLY AFFECTING WATER RESOURCES WITHIN THE UPPER MINNESOTA RIVER WATERSHED DISTRICT
= FEEDLOT
GW1 = BIG STONE COUNTY SANITARY LANDFILL
GW2 = BEARDSLEY MUNICIPAL WELL
= UNDERSEWERED COMMUNITY OR SUBDIVISION
SOURCE:
MINNESOTA POLLUTION CONTROL AGENCY
ArcInfo DATA.
NOTES:
FEEDLOTS SHOWN ARE MPCA PERMITTED FEEDLOT OPERATIONS. THEIR CURRENT OPERATIONAL STATUS HAS NOT BEEN DETERMINED.
BIG STONE COUNTY SANITARY LANDFILL IS CLOSED.
UPPER MINNESOTA RIVER WATERSHED DISTRICT
N
2 0 2 4
scale miles
Topographic Map Symbols
R50W
R49W
R48W
R47W
R46W
R45W
R44W
R43W
R42W
T123N
T122N
T121N
T120N
T119N
PREPARED BY
HOUSTON ENGINEERING, INC.

Figure 10
Weighted Ranking of Watershed District Issues - Agency Responses



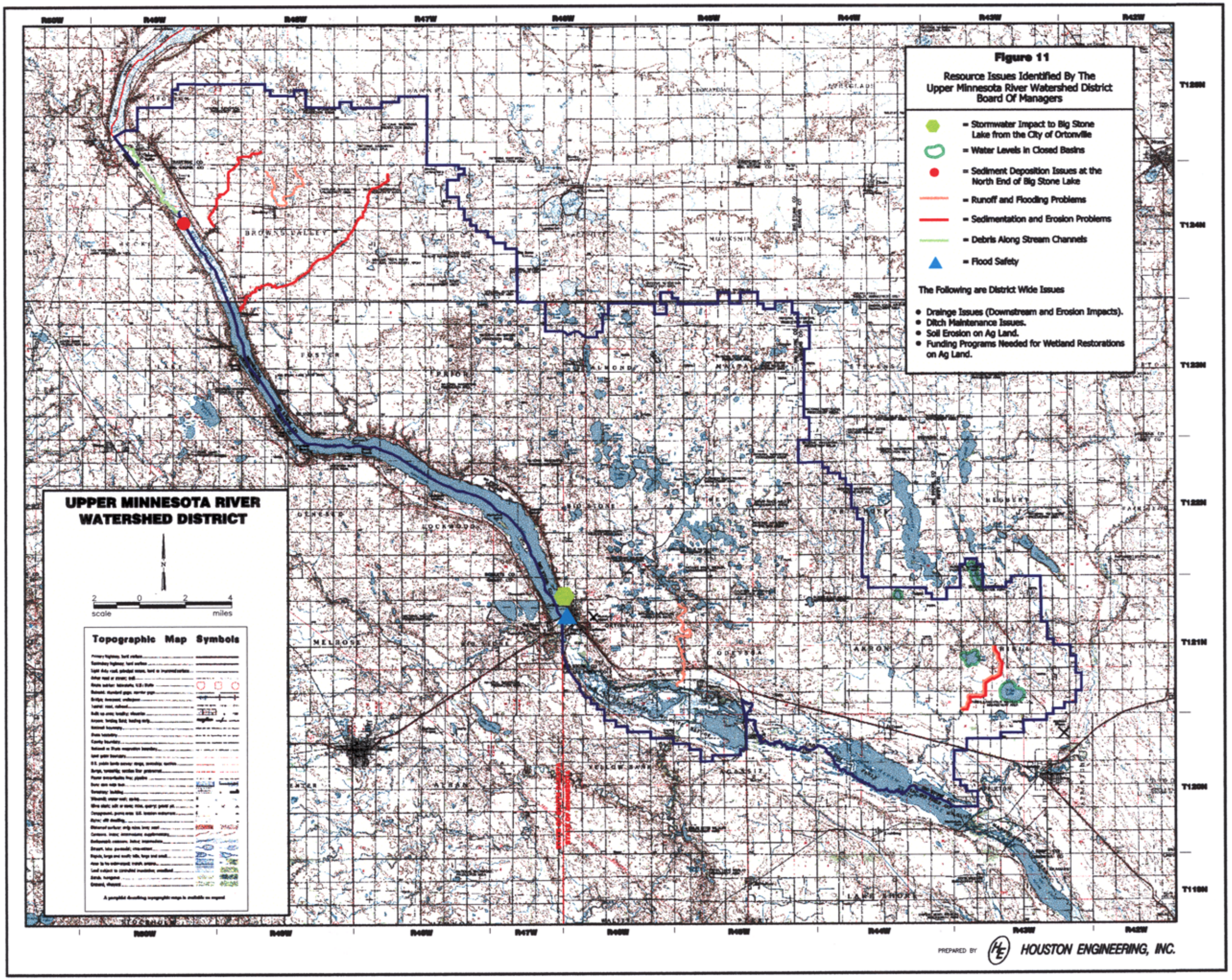


Figure 11
Resource Issues Identified By The Upper Minnesota River Watershed District Board Of Managers
= Stormwater Impact to Big Stone Lake from the City of Ortonville
= Water Levels in Closed Basins
= Sediment Deposition Issues at the North End of Big Stone Lake
= Runoff and Flooding Problems
= Sedimentation and Erosion Problems
= Debris Along Stream Channels
= Flood Safety
The Following are District Wide Issues
Drainge Issues (Downstream and Erosion Impacts).
Ditch Maintenance Issues.
Soil Erosion on Ag Land.
Funding Programs Needed for Wetland Restorations on Ag Land.
UPPER MINNESOTA RIVER WATERSHED DISTRICT
N
2 0 2 4
scale miles
Topographic Map Symbols
R50W R49W R48W R47W R46W R45W R44W R43W R42W
T125N T124N T123N T122N T121N T120N T119N
BROWNS VALLEY
FOSTER
LOCKWOOD
ORTONVILLE
MELROSE
ODESSA
AKRON
LAKE SHORE
PREPARED BY HOUSTON ENGINEERING, INC.

Appendix A

UPPER MINNESOTA RIVER WATERSHED DISTRICT

PROJECT DESCRIPTIONS

4.0 IMPLEMENTATION ACTIVITIES

This section presents a discussion of activities undertaken to improve the water quality of Big Stone Lake. Some activities were undertaken and funded solely under a Clean Lakes (Section 314) Grant. Others were funded by various federal, state or local programs, but resulted from the activities of the Clean Lakes Project. Each of these are described in this section and appropriately noted.

4.1 GENERAL DISCUSSION, ADMINISTRATION AND FUNDING

Restoration activities undertaken during the Big Stone Lake Restoration Project are multifaceted, designed to control pollutant sources to the lake and intended to reverse the cultural eutrophication of the lake. The project encompasses the entire 740,157 acre watershed contributing to the 12,610 acre Big Stone Lake. Portions of the restoration effort lie within Roberts, Grant, and Marshall counties in South Dakota and Big Stone and Traverse counties in Minnesota. Oversight for the implementation effort is divided between two U.S. Environmental Protection Agency (EPA) Regions; Region VIII in Denver, Colorado, and Region V in Chicago, Illinois.

The overall objective of the implementation effort is to maintain or increase the recreation potential and life span of Big Stone Lake by altering the trophic status from hypereutrophic to eutrophic. Specific implementation goals include a reduction of the density of algae and duration of algal blooms and a reduction in sediment accumulation rate. Numerous activities were recommended at the completion of the Phase I study to meet these objectives. Because of the large watershed size, the number of agencies involved, and the limitation imposed because of funding constraints, the project proceeded in a step-wise fashion. The step-wise approach eventually will implement each of the activities recommended during Phase I.

Implementation activities discussed within this report include: feedlot management, grazing and crop management, lake level management, monitoring, public involvement, wetland

restoration, and Whetstone River flow management. The reader is referred to Figure 1-3 for a pictorial representation of these activities.

Project administration is accomplished jointly among the DENR, the MPCA, the UMRWD, and Roberts, Big Stone, and Grant Conservation Districts. Project technical assistance has been provided by the Soil Conservation Service (SCS), DENR, the Nature Conservancy, Citizens for Big Stone Lake, and various other public and private entities.

Funding for the project consisted of EPA Clean Lakes grants in 1982 (314 grant funds) to South Dakota and Minnesota in the amount of $156,500.00 and $91,366.00, respectively. Matching funds for these grants were received from a variety of sources including, but not limited to: Community Development Block Grants (CDBG), the UMRWD, Big Stone County, the cities of Ortonville, Big Stone, and Milbank, Minnesota State Conservation cost share funds, and participating landowners. Supplemental 314 grant funds of $225,000.00 to South Dakota and $404,521.00 to Minnesota were approved in 1985.

The DENR applied for and received a $595,315 Section 319 grant from Region VIII EPA during 1989 and in December 1989, the Roberts County agreed to become the local project sponsor of the Big Stone Lake Restoration Project in South Dakota. State subagreements were signed by Roberts County Commissioners in December 1989. The Commissioners subcontracted with the Roberts Conservation District to fulfill contract requirements of the substate agreement. The following is a discussion of each of the implementation activities. A detailed breakdown of UMRWD Section 314 funds is presented in Table 4-1.

4.2 GRAZING AND CROP LAND MANAGEMENT

The objective of watershed management is to reduce and control the agriculturally related degradation of water quality in targeted subwatersheds. The program is specifically intended to educate farmers about the economic and environmental benefits of conservation tillage.

Program Element	Funding Source	Federal (EPA 314)	State Match	Local Match
Watershed Management	EPA Clean Lakes	50,146.96		
	UMRWD			50,146.96
Watershed Technical and Engineering	EPA Clean Lakes	155,788.73		
	UMRWD			155,788.73
Equipment	EPA Clean Lakes	23,477,44		
	UMRWD			23,477.45
Ag BMP Implementation	EPA Clean Lakes	43,565.21		
	SWCD		28,895.20	
	UMRWD			240.00
	Landowners			14,430.00
Streambank Erosion Control	EPA Clean Lakes	43,637.38		
	UMRWD			22,427.19
	Big Stone County			21,210.19
Technical Assistance	EPA Clean Lakes	11,250.00		
	UMRWD			11,250.00
Shoreline Erosion	EPA Clean Lakes	33,345.00		
	MnDNR		1,643.25	
	UMRWD			31,701.75
Monitoring	EPA Clean Lakes	1,548.36		
	UMRWD			1,548.37
Public Information	EPA Clean Lakes	3,654.72		
	UMRWD			3,654.71
Access Roadside Erosion Control	EPA Clean Lakes	20,000.00		
	Big Stone County			20,000.00
Wetland Land-Purchase	EPA Clean Lakes	62,250.00		
	MnDNR		52,250.00	
	UMRWD			3,000.00
	CBSL			2,000.00
	Nature Conservancy			5,000.00

BIG STONE LAKE RESTORATION PROJECT

Big Stone Lake

Clean Lakes Funding by Program Elements (Minnesota Only)
Table 4-1

Program Element	Funding Source	Federal (EPA 314)	State Match	Local Match
Wetland - Outlet Structure	EPA Clean Lakes MnDNR	7,500.00	7,500.00	
Wetland - Water Analysis	EPA Clean Lakes UMRWD	500.00		500.00
Wetland - Legal, Administrative and Easements	EPA Clean Lakes Nature Conservancy MnDNR	8,395.87	6,395.87	2,000.00
Wetland - Contruction and Inspection	EPA Clean Lakes UMRWD	1,000.00		1,000.00
SWCB[1] Communications Project Development	EPA Clean Lakes UMRWD	3,266.76		3,266.76
SWCB[1] Communications Project Coordinator	EPA Clean Lakes SWCB	9,984.62		9,984.62
SWCB[1] Communications Project Promotion	EPA Clean Lakes UMRWD	4,920.60		4,920.61
SWCB[1] Communications Project Final Report	EPA Clean Lakes UMRWD			
SWCB[1] Communications Project Evaluation	EPA Clean Lakes UMRWD			
Phase II Final Report	EPA Clean Lakes UMRWD	22,074.35		22,674.35
Totals		**506,306.00**	**96,684.32**	**409,621.68**

[1] Board of Water and Soil Resource (BWSR).

Watershed management activities are coordinated between numerous state and local agencies. To provide for the most efficient use of available funds and resources, specific subwatersheds were selected (or "targeted") in which to implement agricultural Best Management Practices (BMPs). This selection was accomplished during the Phase I study with the aid of using tributary data and the Agricultural Nonpoint Source (AGNPS) model in the Little Minnesota River trunk, Cow Creek, a subwatershed tributary of the Little Minnesota River and Salmonsen Creek. The use of the AGNPS model was also used to identify and prioritize those problem feedlots in the Big Stone Lake watershed (refer to work plan in Appendix C for AGNPS data).

4.2.1 No-Till

The UMRWD developed a no-till demonstration project in 1984 as a special program in the Minnesota portion of the Big Stone Lake watershed. The need for a no-till demonstration program was identified in the Minnesota portion of the watershed during the Phase I study. A no-till cost share program had already been implemented by Roberts County within the South Dakota portion of the watershed. The stated purpose of the no-till demonstration project was to:

- Help farmers become more informed about the use of conservation tillage practices (especially no-till farming).
- Provide farmers with the opportunity to use no-till equipment generally unavailable within the county; and
- Assist farmers with the decision to use conservation tillage practices.

The UMRWD purchased no-till demonstration services from the Big Stone Soil and Water Conservation District (SWCD). In cooperation with the SWCD, UMRWD owned and operated the no-till drill for 5 years from 1984 to 1989. Demonstration plots of up to 80 acres were planted for individual farmers. A tour of no-till plots by area farmers was conducted near harvest time to demonstrate the effectiveness of the no-till system to those not using no-till conservation.

The no-till drill program was a successful activity (see Table 4-2). Farmer interest in drill use often exceeded the planting capacity of the drill. Nearly 1,250 acres were seeded with the no-till drill in 1987, the last year cost sharing was provided. Although the drill was available for rent at a cost of $15/acre in 1988 and 1989, a large reduction in the number of acres planted occurred.

The 350 acres planted using the no-till drill in 1988, were further reduced in 1989. The major reasons included the lack of an available cost share for renting the drill and an increase in privately owned and operated no-till or reduced till drills. After the 5-year demonstration program ended during the fall 1989, the no-till drill was sold by bid. Many minimum and no-till drills have been purchased by farmers in the Big Stone Lake watershed, and reduced tillage planting has become a commonly accepted BMPs. The types of tillage used from 1986-1992 are presented in Table 4-3.

In 1992 because of increased interest by farmers to use no-till, the Minnesota portion of the watershed reinstated the no-till cost share program. Table 4-4 shows the number of acres planted and locations during 1992. The purpose of the program implemented in 1992, was to demonstrate no-till farming systems and residue management that will:

- Protect soil from wind and water erosion; and
- Reduce nonpoint source pollution from animal waste, sediment, and chemically contaminated runoff from agricultural production.

Policies for participation in the program are:

- Cost sharing is not available if the farmer has already adopted a satisfactory conservation tillage system of farming;
- The acreage cost shared cannot exceed 80 acres, per producer;
- The landowner is responsible for locating and renting the no-till equipment needed; and
- Soil must be undisturbed prior to planting.

	No. of Cooperators	Units	Estimated Annual Reduction[1] Total Solids (kg/yr)	Total Solids (lb/yr)	Total Phosphorus (kg/yr)	Total Phosphorus (lb/yr)	Total Nitrogen (kg/yr)	Total Nitrogen (lb/yr)
MINNESOTA								
No-Till	56	3909.6 acres	2,598,995	5,742,366	1,560	3,447	51,980	114,848
Grassed Waterways	8	36,180 ft.	ne	ne	ne	ne	ne	ne
Terraces	1	3 acres	ne	ne	ne	ne	ne	ne
Conservation Reserve Program	147	12,145 acres	9,688,398	21,406,094	5,813	12,844	193,768	428,122
Reinvest in Minnesota (Perm. Cover)	6	152.8 acres	121,893	269,317	73	161	2,438	5,387
Subtotal			12,409,286	27,417,777	7,446	16,452	248,186	548,356
SOUTH DAKOTA								
No-Till	63	4,578.2 acres	3,043,463	6,724,399	1,826	4,034	60,869	134,487
Permanent Vegetation Cover	112	3,957 acres	2,517,908	5,563,208	1,511	3,338	50,358	111,264
Conservation Reserve Program	312	25,222 acres	16,049,195	35,459,998	9,630	21,277	320,984	709,200
Subtotal			21,610,566	47,747,605	12,967	28,650	432,211	954,951
Total			34,019,852	75,165,382	20,413	45,102	680,397	1,503,308

[1] Not equal to delivered load. Rather, an estimate of the reduction at the field edge or practice effectiveness. Typical delivery to the lake would range from 2-10%. See Appendix J for calculations.

ne means no estimate.

BIG STONE LAKE

RESTORATION PROJECT

Big Stone Lake

Summary of Clean Lakes Cost Shared Agricultural Best Management Practices Implemented in Big Stone Lake Watershed June 1984-1992
Table 4-2

Conservation Tillage
1986 - 1992

Year	Crop Acreage	No-Till	Ridge Till	Mulch Till	15-30% Residue	Less Than 15% Residue
1986	103,000	2,550	8,000	22,000	-	-
1987	112,250	6,000	7,500	23,000	-	-
1988	112,250	6,750	7,500	28,250	-	-
1989	112,286	6,750	7,500	13,000	27,500	39,250
1990	92,100	6,750	9,000	12,750	30,750	32,850
1991	100,203	8,125	10,500	13,125	35,065.5	33,387.5
1992	104,864.5	9,775	11,440	13,500	35,119.5	34,715
Total	**736,953.3**	**46,700**	**53,940**	**125,625**	**128,435**	**140,202.5**

Note: Acreage includes cost-shared through Clean Lakes progran and noncost shared acreage.

Big Stone Lake
Conservation Tillage Practices in Big Stone Lake Watershed 1986-1992
Table 4-3

1992 No-Till Cost Share Program			
Location		**Number of Acres**	**Subwatershed**
Sec. 32	Almond Twp.	80	Meadowbrook Creek
Sec. 30	Almond Twp.	80	Meadowbrook Creek
Sec. 6	Big Stone Twp.	80	Meadowbrook Creek
Sec. 8	Big Stone Twp.	80	Meadowbrook Creek
Sec. 10	W. Browns Valley Twp.	80	Hoss Creek
Sec. 11	W. Browns Twp.	80	Hoss Creek
Sec. 3	Browns Valley Twp.	80	Hoss Creek
Sec. 7	Browns Valley Twp.	80	Hoss Creek
Sec. 8	Browns Valley Twp.	80	Hoss Creek
Sec. 18	Browns Valley Twp.	80	Hoss Creek
Sec. 12	Folsom Twp.	80	Hoss Creek
Sec. 5	Foster Twp.	80	Salmonsen Creek
Sec. 27	Foster Twp.	80	Salmonsen Creek
Sec. 23	Prior Twp.	80	Lindholm Creek
Sec. 9	Toqua Twp.	80	Fish Creek
Sec. 19	Toqua Twp.	80	Fish Creek
Sec. 14	Browns Valley Twp.	80	Fish Creek
Sec. 20	Browns Valley Twp.	80	Fish Creek
Sec. 29	Browns Valley Twp.	160	Fish Creek
Sec. 4	Ortonville Twp.	35	Big Stone Lake
TOTAL		**1,635**	

BIG STONE LAKE
RESTORATION PROJECT

Big Stone Lake

Locations and Number of Acres Enrolled in 1992 No-till Clean Lakes Cost Share Program Big Stone County

Table 4-4

Cost sharing is authorized for:

- Planting directly into old standing crop stubble;
- Applying necessary herbicides and insecticides to eliminate the need for tillage.

Compliance for this practice is determined as follows:

- Designated acreage must be checked by SWCD staff for residue cover before and after planting is completed. For standing stubble, a minimum of 30% of the ground surface shall have standing crop residue stubble.
- Spring planted crops shall be checked after planting but not later than June 15.

The cost share rate is $15.00 per acre. Four of the twenty operators, enrolled in the 1992 no-till cost share program, purchased their own drills in 1993. All four farmers contacted the SCS to have their names put on the list of minimum till equipment available for rent or custom hire. It's estimated that each drill will seed approximately 1,500-2,000 acres in 1993.

Restoration project staff were contacted numerous times concerning the continuation of the no-till cost share program for 1993. The project was unable to continue because of the lack of available funds. However, the Big Stone County ASCS received funding to continue the program in 1993.

During the Phase I study, the need for a no-till project was also identified in the South Dakota portion of the Big Stone Lake watershed. The Big Stone Lake Project and Roberts Conservation District promoted the use of a "No-Till Project" through cost share funds made available through the ASCS's Special Projects funds. The stated purpose of the project was to; help farmers become more informed about the use of conservation practices (especially no-till farming).

Cost share funds were made available to interested operators from 1982-1987. In 1992 approximately 1635 acres were cost shared. The project was discontinued in 1987. In 1992, Roberts Conservation District, Big Stone Lake Project and SCS again promoted the no-till

project. Roberts Conservation District entered into an agreement with John Deere Inc. for the purpose of leasing two no-till drills. Thirty-two operators have signed up 5,000+ acres for no-tilling in Roberts County for 1993. No cost share monies are being used at this time to further promote this project.

In 1992 Big Stone Lake Project, Roberts Conservation District, and SCS sponsored an educational "Residue Tillage Plot". The plot is located 6½ miles East of Sisseton, South Dakota, on Highway 10. The plot is being used not only to compare the different tillage methods per the amount of residue remaining on the surface, but also to show different crop responses by tillage method.

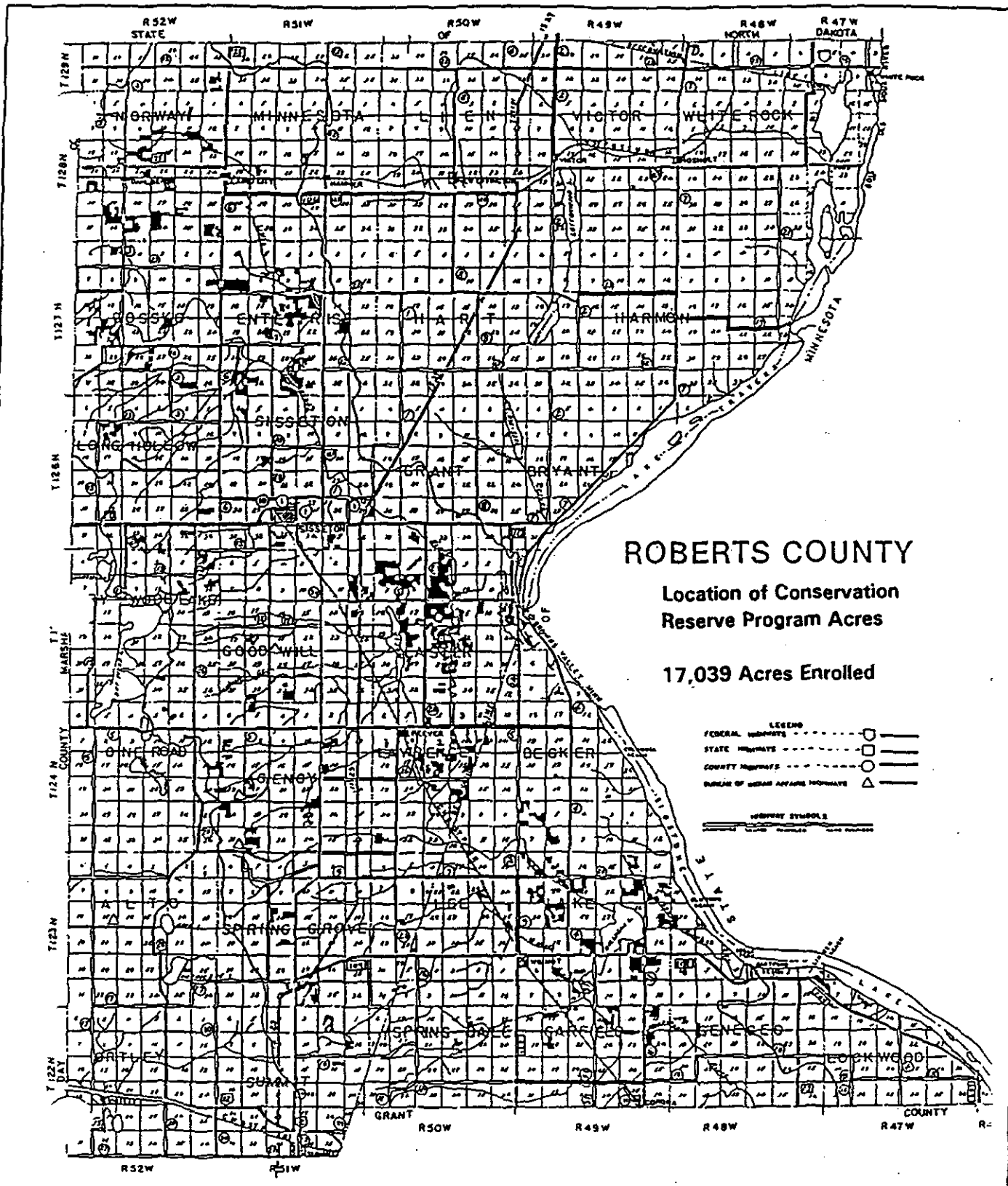
The Roberts County SCS District Conservationist recorded 2,875 acres of no-till, 3,900 acres of ridge-till (30% cover) and 5,900 acres of minimum till in Roberts County during 1991.

4.2.2 Conservation Reserve Program

The most popular and widely accepted agricultural BMPs in the watershed was the Conservation Reserve Program (CRP). A total of 33,867 acres were "signed-up" under CRP within the watershed drainage to Big Stone Lake. Of the total, 14,865 acres are located in the Little Minnesota River subwatershed and 4,530 acres are in the Whetstone River subwatershed. There are additional 12,145 acres of CRP within the Minnesota portion of the watershed (Big Stone County). Figures 4-1 and 4-2 show the location of CRP acres within Roberts and Big Stone counties. CRP acreage will be eligible for production starting in 1996 and 1998 for South Dakota.

4.2.3 Filter Strips

The use of filter strips under CRP provided another BMP which could have been very beneficial to the Lake. A special edition of the "Land and Water", the newsletter of the UMRWD, was mailed in February of 1988 to inform area farmers about CRP filter strips. Less than 2% of the



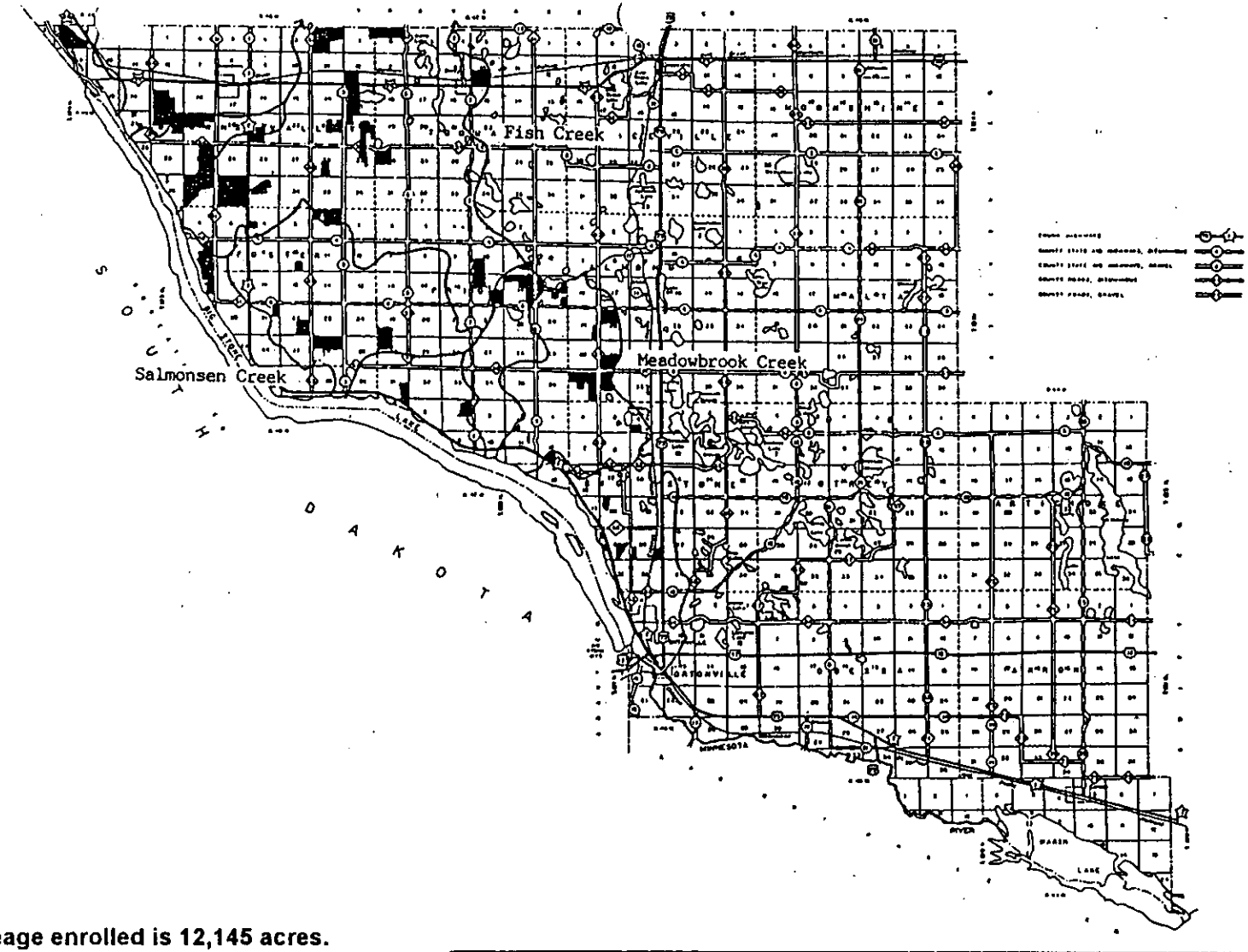
BIG STONE LAKE

RESTORATION PROJECT

Big Stone Lake

Location of Conservation Reserve Program Acreage Enrolled in Roberts County, South Dakota

Figure 4-1



Note: total acreage enrolled is 12,145 acres.

BIG STONE LAKE

RESTORATION PROJECT

Big Stone Lake

Location of Conservation Reserve Program Acreage Enrolled in Big Stone County, Minnesota

Figure 4-2

CRP sign-ups for the following sign-up period were for filter strips. None of the 2% were implemented. The width requirement (min. 66 feet and max. 99 feet) on one side of the water body, not being able to square up the field (CRP filter strip must run parallel to the water body) and the landowner's opinion that land eligible for the program was more valuable than potential annual CRP payment, were reasons for not enrolling in the program. To encourage the implementation of CRP filter strips within the Minnesota portion of the watershed, the UMRWD offered a one time initial sign-up bonus of $50.00 per acre. Not one dollar in Minnesota was spent on filter strip implementation even with the extra $50.00 per acre bonus. South Dakota, however, had six contracts for filter strips in Roberts County.

4.2.4 Reinvest In Minnesota

A State of Minnesota program similar to CRP, Reinvest in Minnesota (RIM) was also available. RIM differs from CRP in the fact that an easement is recorded on the land and a one time lump sum payment is paid up-front. Within Big Stone's watershed in Minnesota, 152 acres are enrolled in RIM and five wetlands have been permanently removed from production. In 1989, the RIM Program introduced a pasture land pilot project. The Big Stone County SWCD requested, and received authorization, to be a participant in this pilot project.

The goals of the pasture land pilot project included: erosion control, improved water quality, runoff retention, improved wildlife habitat and improved forest management. The criteria necessary for enrollment included the following.

- Five-acre minimum.
- Owned by the applicant at least one year prior to application.
- Focus on domestic pasture with present evidence of overgrazing or grazed forest resulting in erosion problem.
- Grazing damage must have occurred prior to June 1, 1989.
- Limited to land capability class 3 or poorer lands (class 4 lands or poorer used for prioritization).
- Either perpetual or 20-year easements enrolled.

- Each site must be reviewed by a local technical review group to determine eligibility and prioritization.

- Preference to hillsides closer to the surface waters.

- Shifting of cattle to other class 3 or poorer lands prohibited for enrolled landowners except for grazing plan approved by SWCD.

- Allow a one-to-one match of class 1 and 2 pasture lands for each acre of eligible pasture land.

- Timber stand improvement measures allowed but not cost shared by RIM. Only timber production measures are allowed. Orchard, ornamental or Christmas tree production is not allowed.

- Conservation plan practices and rates same as marginal agricultural land program.

- Conservation plan must be approved by DNR Forestry and DNR Wildlife Manager if forestry measures are planned.

- Eroding areas must be addressed in the conservation plan.

- The easement payment rates for enrollment were: perpetual; same as RIM agricultural land 20-year rate.

The RIM pasture land pilot project received no enrollment because most of the land signed-up, was later deemed ineligible. And, many of the landowners which have eligible land for the program, believe the payments are to low to consider enrolling.

4.3 FEEDLOT MANAGEMENT

The objective of feedlot management is to upgrade or eliminate feedlot discharges causing water quality degradation within Big Stone Lake. Within the Minnesota portion of the Big Stone Lake watershed, very few high priority feedlots were identified during the Phase I study. An active program of voluntary feedlot management by the Big Stone SWCD and the County SCS office, with some MPCA enforcement, has resulted in improvement or elimination of over 60 problem feedlots since 1967. Five cooperators constructed five AWMS units at a cost of $25,498. Clean Lakes funds were used to cost share each AWM (no load reduction estimates are available).

During 1991 the UMRWD filed a complaint with the MPCA concerning a feedlot system located approximately 100 feet from the shoreline of Big Stone Lake in Section 10 of lower Prior Township. A review of the system by MPCA Staff revealed that the system was in violation of their regulations and it was determined that the following conditions must be met:

- The cattle present in the feedlot will remain no later than September 30, 1991. After September 30, 1991, no cattle will be allowed in the feedlot, except for periods of up to 12 hours for sorting;
- The feedlot will be retired after September 30, 1991. To retire the feedlot the operator must:
  - Remove all manure from the lot, and land apply it; and
  - Seed the feedlot to permanent vegetation.

Currently, 36 feedlots have been identified within the Minnesota portion of the watershed. All have ratings of less than 50 in AGNPS. Feedlots with ratings above 50 potentially quality for cost sharing of an AWMS. The SWCDs will be conducting an extensive feedlot survey in the fall of 1994. Existing cost share and MPCA enforcement in Minnesota will be used to control the few remaining problem feedlot discharges in the Minnesota portion of the watershed.

An alternative approach to feedlot management is used in the South Dakota portion of the Big Stone Lake watershed. Large numbers of small to medium feedlots were identified during the Phase I study as sources of pollution to Big Stone Lake. Currently, 133 feedlots have been identified within the South Dakota portion of the watershed. Of these, 52 have ratings greater than 50 in AGNPS.

Little previous work before the Big Stone Lake Restoration project had been done to control feedlot discharges within the South Dakota portion of the watershed, because of the lack of state regulations or a local enforcement effort. Widespread enforcement of existing feedlot regulations seemed counter productive to the overall project. A voluntary participation approach through education and cost sharing is presently being pursued.

Initially, a special cost share program was developed in Grant and Roberts County to begin building AWMS through a voluntary program. A cost share of 85%, with a $7,500.00 maximum per feedlot, was established to facilitate voluntary participation. CDBG funds received by Grant and Roberts County on behalf of the Grant and Roberts County Conservation Districts were used to fund the program. The program was administered by the County conservation district including publicity, sign-ups and program guidelines. The SCS voluntarily provides technical assistance, engineering, and construction management. Table 4-5 shows AWMS constructed to date within South Dakota, while Figures 4-3 and 4-4 shows those constructed in Grant and Roberts County, South Dakota. The CDBG cost share program initiated in Grant County was also used in Roberts County to assist with construction of AWMS. Each county was awarded $100,000 of CDBG funds for this purpose. (In Grant County $20,000 of the $100,000 was designated for restoration of Lake Farley, leaving $80,000 for construction of AWMS.)

Effective June 1, 1989, additional funding became available to the Big Stone Lake Project through a U.S. EPA Section 319 Grant. The funding for this grant is being provided through Region VIII of the EPA, in Denver. These funds continued the construction of AWM's. Cost sharing for these systems was provided from the 319 Grant as well as from the South Dakota Consolidated Water Facilities (SDCWF).

Experience has shown that maintaining a workable strategy for implementing feedlot pollution containment projects in South Dakota has proven to be a complex issue confounded by many factors including:

- The depressed farm economy has made the cost of constructing containment facilities unaffordable for some operators.
- Many operators have sufficient capital, but remain unconvinced of a problem. Consequently, they are unwilling to spend money to correct a problem they perceive as not existing.
- In some cases technical problems (high water table, shallow gravel, etc.) make installing a system cost prohibitive.

WHETSONE RIVER WATERSHED

Year	Name	Type	No. of Animals	Animal (1000) lbs. Units	Feedlot Rating	AWM Cost	Controlled Load Total Phosphorus	Controlled Load Total Nitrogen
1985	Chuck Liebe	Beef	111	-	54	$9,121	56.6	66.6
1986	O'Farrell (2 systems)	Beef	900	-	81	$13,743	459.0	540.0
1987	Dahle Dairy	Dairy	135	-	66	$11,660	124.2	226.8
	Orgene McCrea	Beef	225	-	50	$9,859	114.8	135.0
	Marlin Schmidt	Beef	300	-	62	$12,568	153.0	180.0
1988	Gerald Thaden	Beef	85	-	37	$6,867	43.4	51.0
	Melvin McCulloch	Dairy	55	-	48	$17,073	50.6	92.4
	Don Bassett	Dairy	100	130	64	$12,383	92.0	168.0
	Lowell Bassett	Dairy	100	98	39	$9,130	ne	ne
	Francis VanSanbeek	Beef	200	115	49	$9,450	200.0	200.0
	Wes Green	Beef	150	105	46	$10,956	210.0	210.0
1990	Delvin Hanson	Hogs	910	-	68	$48,392	103.1	103.8
		Beef	80	-				
		Sheep	20	-				
	Paul DeBoer	Dairy	150	-	84	$46,416	1001.4	436.4
		Yearlings	240	-				
		Calves	140	-				
	Subtotal					$217,618	2608.1	2410.0

BIG STONE LAKE

RESTORATION PROJECT

Big Stone Lake

Animal Waste Management Systems
South Dakota Portion of Watershed
Table 4-5

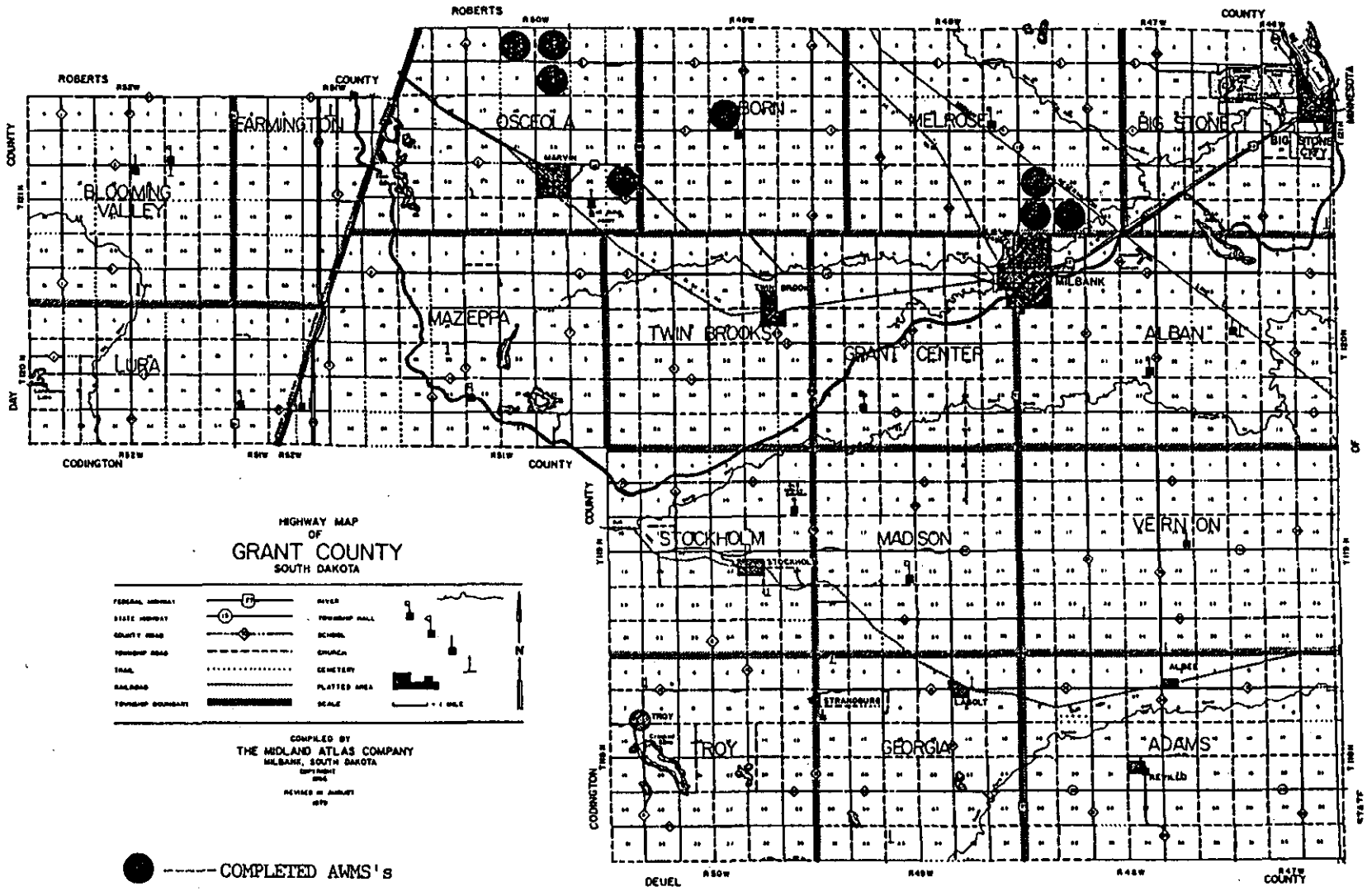
LITTLE MINNESOTA AND AREA ADJACENT TO LAKE

Year	Name	Type	No. of Animals	Animal (1000) lbs. Units	Feedlot Rating	AWM Cost	Controlled Load Total Phosphorus	Controlled Load Total Nitrogen
1986	Maynard Anderson	Dairy	115	129	76	$8,002	69.0	126.0
	Harry Ziemer	Beef	120	108	74	$10,950	74.7	83.0
1988	Dale Nigg	Beef	500	228	71	$8,150	500.0	500.0
	Schiltz's Inc.	Geese	3,500	88	83	$9,100	105.0	70.0
	Eugene Bucklin	Dairy	100	98	52	$17,758	73.6	134.4
1989	Derrell Cerrol	Dairy	80	-	ne	$28,704	194.4	262.4
		Yearling	80	-				
		Beef	45	-				
1990	Dennis Fisher	Beef	75	-	62	$36,814	159.0	ne
		Yearling	100	-				
	Brad Ziemer	Hogs	136	-	83	$18,137	599.0	28.6
1991	Schiltz's Inc	Geese	40,000	-	83	$102,478	859.0	900.0
1992	Scott Nelson	Beef	125	-	70	$13,942	283.0	ne
		Yearling	125	-				
	Lloyd Hassen	Dairy	100	-	69	$23,681	161.0	ne
		Yearling	50	-				
	Paul Hanson	Dairy	125	-	67	$32,641	134.0	ne
		Calves	16	-				
	Subtotal					$310,357	3211.7	2104.4
	TOTAL					$527,975	5819.8	4514.4

Notes:
A feedlot rating of 50 or greater is generally needed to be eligible for cost share. Some early feedlots had ratings less than 50, but were constructed because of low program participation to encourage program participation.

ne means no estimate.

Controlled load is estimated load at edge of feedlot based on AGNPS feedlot model for a 25 year design storm.



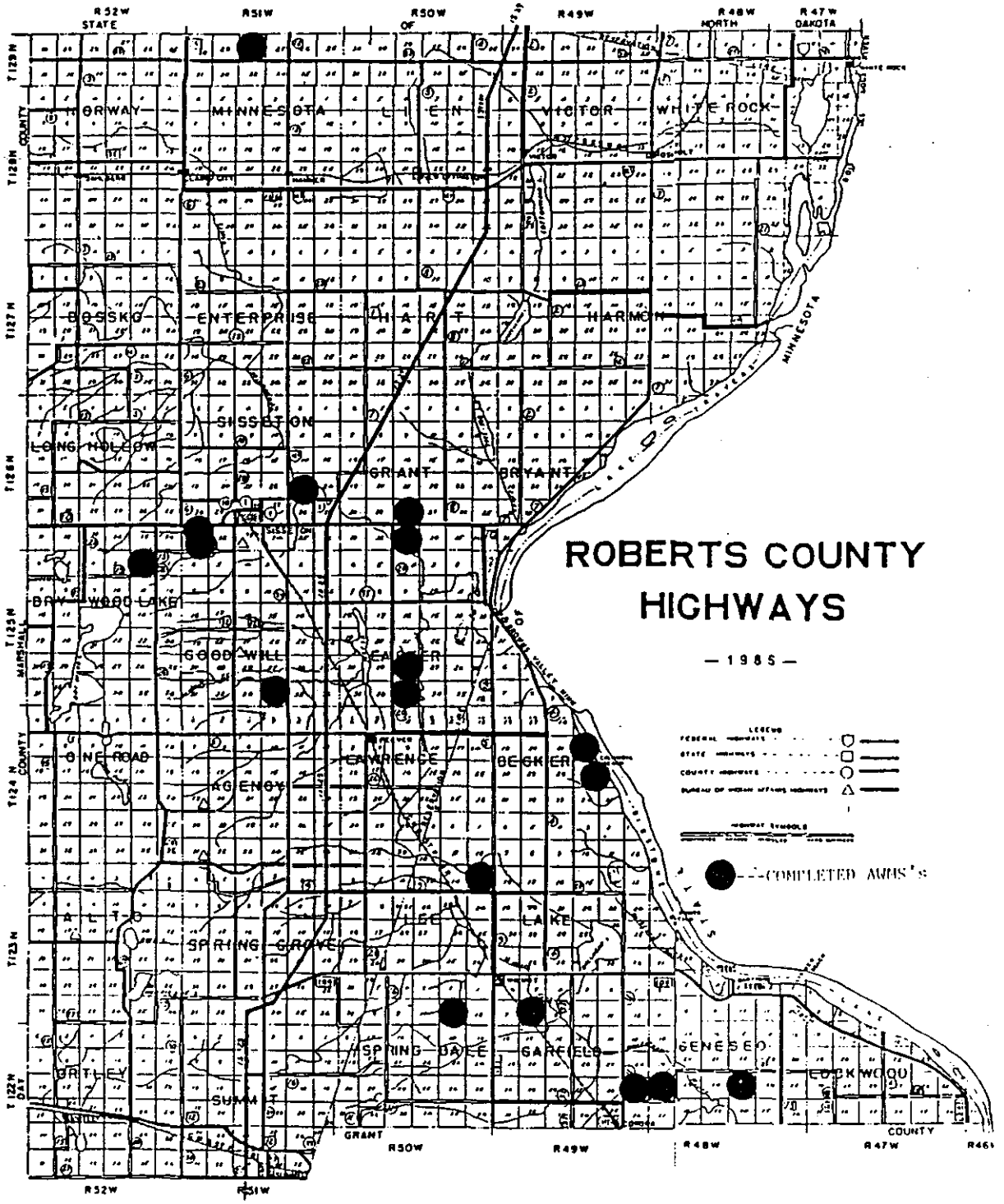
BIG STONE LAKE

RESTORATION PROJECT

Big Stone Lake

Location of Animal Waste Management Units Constructed in Grant County, South Dakota

Figure 4-3



BIG STONE LAKE

RESTORATION PROJECT

Big Stone Lake

Location of Animal Waste Units
Constructed in Roberts County, South Dakota

Figure 4-4

- A general lack of public awareness and understanding of the environmental consequences created by improper handling and disposal of animal wastes.

The Conservation District signed an operating agreement with each operator to maintain the system for a minimum of 10 years. Operation and maintenance of individual feedlot systems is the responsibility of the feedlot owner. Markers were installed in each holding pond to indicate its capacity to contain a 25-year, 24-hour duration storm with no discharge.

Interest in designing and building a AWMS continues to increase. Benefits include dryer feedlots and reduced fertilizer costs due to improved waste utilization. In 1993, it is projected that four or five AWMS will be completed under the ASCS, ACP special project funds SDCWF monies. Requests to build AWMS within the Little Minnesota watershed are being given priority, because the Little Minnesota Watershed is the major contributor of nutrient loading to Big Stone Lake.

4.4 LAKE LEVEL MANAGEMENT

The objective of lake level management is to increase the export of in-lake nutrients for improved water quality within Big Stone Lake. The level of Big Stone Lake has been set by the Minnesota and South Dakota legislatures at 967 project datum (964.6 mean sea level). The level is regulated by the Minnesota/South Dakota Boundary Waters Commission, which granted the Minnesota Department of Natural Resources (MDNR) the authority to issue operational instructions for the control dam.

Many public meetings during 1986 and 1987 were held concerning the operation for the control structure. The main issue was a minimum release of 20 or 5 cubic feed per second (cfs), instead of 2 cfs, into the Minnesota River. The other issue was whether to use the water between 964.6 NGVD and 965.9 NGVD for flushing/exporting nutrients and sediment downstream or for recreational purposes. The old stop logs in the control dam were replaced with steel sliding gates, in 1988, allowing for the rapid release of excess water to an elevation of 968 project datum. Additional release to an elevation of 967 project datum is authorized when the water is of poor quality, because of the entrainment of bottom sediments by the wind, and during late fall when

the die-off of aquatic macrophytes, attached algae and planktonic algae cause nutrient levels to rise within the water column. This procedure is intended to remove some of the sediment and nutrients that enter the lake during high flows, primarily from the Whetstone River.

The involved parties ultimately agreed to release at least 5 cfs when the lake level is below 964.6 NGVD and at least 20 cfs, when the lake level is between 964.6 NGVD and 965.6 NGVD. During favorable conditions the lake level is held near 965.9 NGVD from May 1 to September 30. The end of summer target elevation is 964.6 NGVD. The "extra" water allows for summer evaporation and flushing/exporting of sediment and nutrients before winter freeze-up. This allows for summer recreational use and the export of nutrients.

4.5 WHETSTONE RIVER FLOW MANAGEMENT

The objective of Whetstone River Flow Management is reduction in the loadings of sediment and nutrients to Big Stone Lake from the Whetstone River. The UMRWD and the U.S. Army Corps of Engineers (COE) completed modifications of the Big Stone Lake water level control structure, the silt barrier and channelization of the Minnesota River in 1988. Total cost of this project was $12,300,000, with $227,000 being nonfederal funds. This allows for improved control of Whetstone River flows. Based on COE design data, up to 1,460 cfs of Whetstone River flow can be diverted away from Big Stone Lake when the lake is at normal elevation and the control structure is fully open.

United States Geological Survey (USGS) discharge records indicate that Whetstone River discharges frequently exceed 1,460 cfs. Typically, high peak flows occur during spring runoff for a relatively short duration. During high flow periods, a considerable amount of unwanted sediment and nutrients still enters Big Stone Lake, even with the enlargement in capacity of the control structure and the Minnesota River channel. To attain maximum diversion of the Whetstone River, small flood storage areas in the Whetstone River drainage are needed. The implementation of agricultural BMPs within the watershed may result in a load reduction equal to diversion.

As previously discussed in Section 4.4 project staff held numerous meetings with the MDNR, DENR, MPCA, and U.S. Fish and Wildlife Service (FWS) concerning the operational procedures for the Big Stone Lake/Whetstone River Control Structure. The Big Stone Lake/ Whetstone River control structure is operated in accordance with Boundary Water Commission rules to reach the summer target level of 967.0 project datum. The electronic gates of the control structure are adjusted daily to ensure the Whetstone River is diverted down the Minnesota River, without entering Big Stone Lake. When the lake is below 964.6 NGVD, 5 cfs or the Whetstone River flow, whichever is greater is released. Between lake levels 964.6 NGVD and 965.6 NGVD, the greater of 20 cfs or Whetstone River flow is released. Between lake levels 965.6 NGVD and 965.9 NGVD the greater of 90 cfs or the Whetstone River flow is released. Above lake level 965.9 NGVD all spillway gates are open.

These operating procedures help reduce loading to Big Stone Lake caused by runoff below 1,460 cfs, but fail to address the problem of high peak flows that account for the bulk of the sediment and nutrient loading from the Whetstone River. Flood storage in the Whetstone River drainage could alleviate this problem. Small storage structures within the Whetstone watershed can be used to store water for 1-2 weeks. This would smooth peak flows in the Whetstone River, and keep flow as much as possible, below 1,460 cfs. Additional benefits related to trapping of sediments before they enter the main Whetstone River channel can be realized. Reduction in peak flow would also reduce the severe channel erosion now occurring in the lower Whetstone River.

A portion of the Community Development Block Grant that was allocated to Grant County for AWMS ($20,000) was used to assist with the removal of sediment in the recently drained Lake Farley. Lake Farley is located in the City of Milbank, South Dakota. Lake Farley receives runoff from a 75 square mile watershed and acts as a sedimentation basin. Because the spillway of the structure was breached (under provisions of the Dam Safety Act), a significant storm event could scour the sediment from the basin into the South Fork of the Whetstone River and subsequently, into Big Stone Lake. The sediment needed to be removed before it could be washed downstream. This activity was accomplished by the simple employment of earth moving equipment to remove the sediment. Stringent CDBG environmental assessment guidelines were

followed. This included inspections and approval of sediment disposal sites by State and Federal agencies affected by the project.

The City of Milbank and volunteer organizations were responsible for the major portion of funding and actual completion of the sediment removal. The City also had plans to repair the dam and refill the reservoir when sediment removal was completed. It is estimated that approximately 100,000 cubic yards of sediment were removed by use of the CDBG funding as well as funding from the City of Milbank. Grant County also provided equipment and labor. The City of Milbank made other improvements including tree removal from the dam embankment and strengthening of the earth embankment on the east side of the lake.

In December, 1989, the South Dakota Board of Water Management granted a variance from the Safety of Dams Rules to the City of Milbank. The variance was granted because a breach analysis indicated that during large storm events the flooding conditions caused by the failure of a dam at Lake Farley would be comparatively the same as flooding conditions without a dam.

Upon approval of the variance, the City of Milbank contracted with a consulting engineering firm to conduct a feasibility study for repair or replacement of the dam and spillway at Lake Farley. The feasibility study conducted by the City's consultant concluded that the existing spillway was not repairable, and would have to be replaced with a structure which would have the same capacity as the existing spillway.

Two spillway alternatives were evaluated. A chute spillway, similar to the existing spillway, has an estimated cost of $494,000. A free overfall (straight drop) spillway has an estimated cost of $287,000. Based on the lower cost alternative, the City's consultant has recommended that the existing spillway be replaced with a free overfall spillway.

The City of Milbank is in the process of contacting various organizations and agencies concerning funding assistance to construct the dam. Some of the groups contacted include Ducks Unlimited, the FWS, South Dakota Game Fish and Parks, local sportsman's Clubs, Grant County, East Dakota Water Development District, and Minnesota Soil and Water Resources.

Ultimate construction of the free overfall spillway depends on the success of obtaining funding assistance.

4.6 MEADOWBROOK WETLAND RESTORATION AND OTHER WETLAND RESTORATIONS

The specific goal of the Meadowbrook Wetland Restoration Project is to recover a previously drained wetland.. The wetland basin is located in the SE¼ of Sec. 31 in Almond Township, of Big Stone County. There are approximately 3,200 acres of watershed located above the wetland basin. The total amount of land purchased was 185 acres, previously owned by two farmers. The selection of this subwatershed was based on slope and the rapid runoff characteristics the creek exhibits during storm events.

To secure matching funds for the wetland recovery, project staff contacted the MDNR and The Nature Conservancy (TNC). These contacts resulted in the MDNR agreeing to fund approximately 40% of the land purchase and completely fund the construction of the outlet control structure. The Nature Conservancy agreed to negotiate with the two landowners on purchase price and conduct the real estate transactions on behalf of the UMRWD and the MDNR. The Nature Conservancy also offered to match, dollar for dollar, funds contributed to the wetland restoration project by the UMRWD and the Citizens for Big Stone Lake (up to a maximum total of $5,000). The SCS agreed to survey the basin and design the outlet control structure.

Prior to the survey, SCS engineers had developed the following preliminary calculations for the outlet control structure and wetland basin:

- Design life of the structure and basin is 50-75 years.
- Sediment storage within the wetland is designed for 50 year period and is 80 acre-feet.
- The reservoir detention time is 1.5 days, based on a 25-year storm of 4.4 inches of rainfall.
- The 25-year frequency peak flow entering the reservoir is 776 cfs.

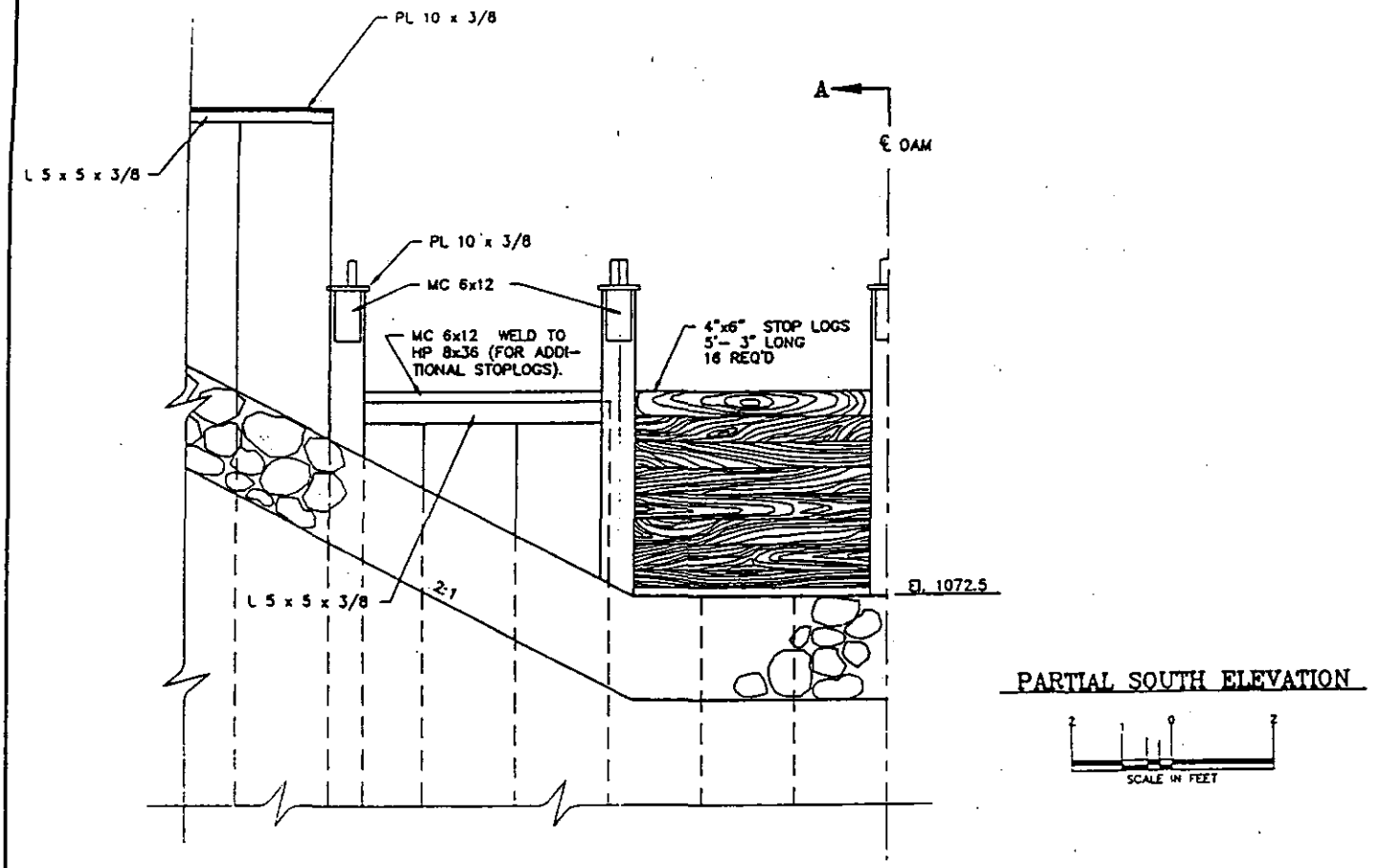
The control structure was built by the MDNR according to SCS specifications (Figure 4-5). The structure is designed for sediment retention with easy maintenance of the structure. An agreement between the UMRWD, MDNR, and TNC was drafted by the MDNR and project staff to ensure the wetland would be managed and maintained for sediment retention, runoff storage, and wildlife enhancement. The agreement stated other necessary requirements and outlined the funding contributions by each party. The MDNR developed a separate wildlife management plan for the wetland, based upon the joint agreement. Funding for the construction of the outlet control structure came from Minnesota duck stamp revenues. The MDNR was responsible for hiring the contractor for the construction, and provided engineering assistance and construction inspections.

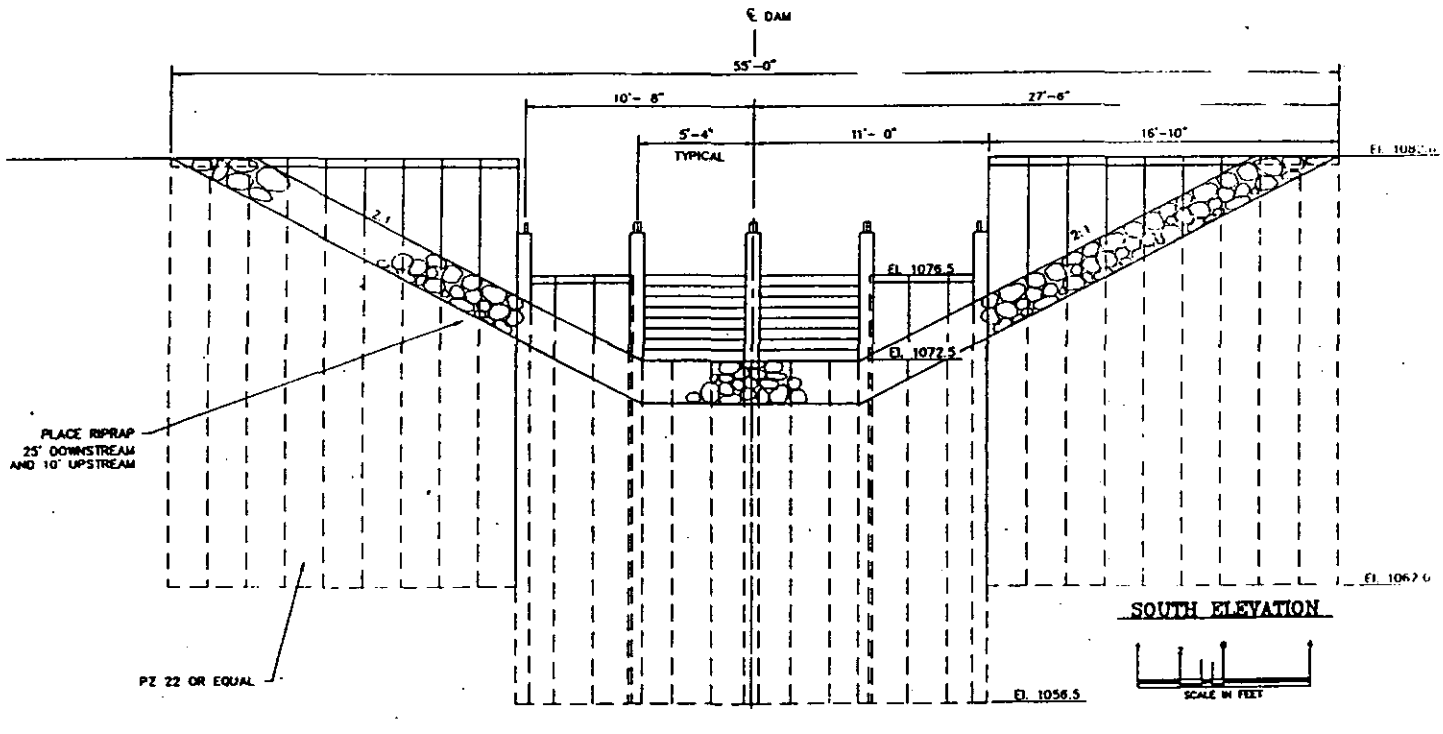
Bids for the outlet structure were let during the second half of 1988 and construction completed in September, 1988. The $29,700 structure will normally hold 30 inches of water covering approximately 60 acres. The project also includes 125 acres of upland area. After a heavy rain or rapid snowmelt, the water depth will double and an additional 17 acres will be covered by the wetland.

This retention of water will provide the following anticipated benefits:

- Cleaner Water: The wetland will reduce runoff from soil particles and nutrients. Wetland vegetation filters dissolved nutrients. Conceptually, the wetland will trap phosphorus.
- Flood Control. Runoff will be stored and slowly released, reducing peak flows.
- Reduced Streambank Erosion: Reduced peak flow will reduce streambank erosion.
- Wildlife Habitat: Additional wildlife habitat will be established in the wetland and surrounding grassland and shrubs.

The Meadowbrook Wetland Recovery Project was dedicated April 26, 1989. The project was dedicated in memory of David H. Steen, a District Technician for the Big Stone SWCD for 15 years. More than 70 people attended the dedication ceremony of the David H. Steen Wildlife Management Area.





Upper Minnesota River Watershed

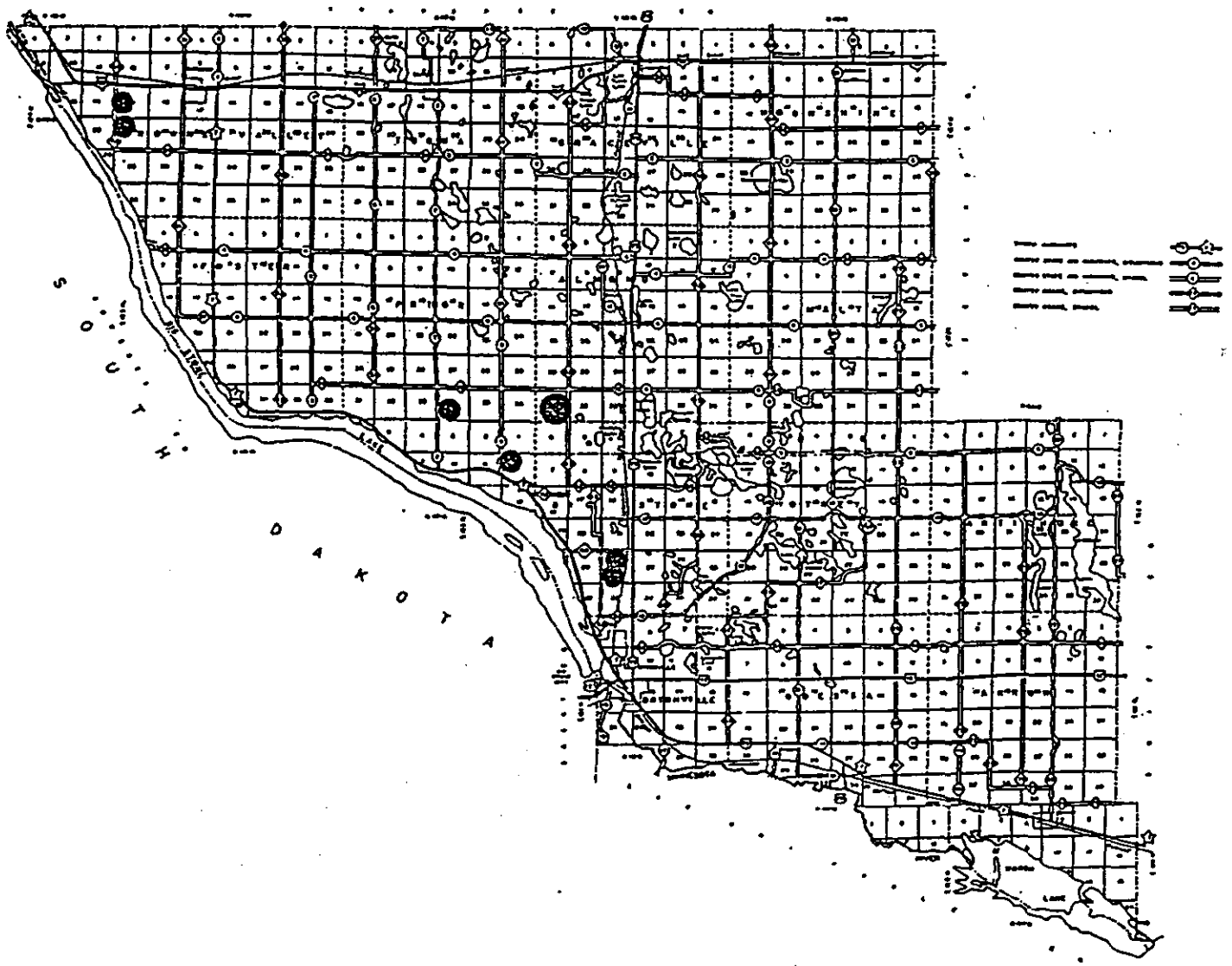
Big Stone Lake

Meadowbrook Wetland Restoration,
Control Structure Design
Figure 4-5

The unique aspect of this project is the cooperation between the many different agencies. The Nature Conservancy contributed $5,000 cash for the land and $4,000 of in-kind legal and land acquisition services. The UMRWD contributed $3,000 from their administrative fund, and $62,250 (EPA Section 314 Clean Water Act funds) through the Restoration Project for the purchase of land. Citizens For Big Stone Lake contributed $2,000 toward the land purchase, and the MDNR also contributed $52,250 to the purchase of land. MDNR also designed and funded the control structure, purchased trees for the upland area, and will provide maintenance dredging for sediment removal when a minimum depth is reached. The Big Stone SWCD planted the trees and assisted the Minnesota SCS in surveying.

The Big Stone Lake Clean Lakes Program, has identified wetland restoration as one of the principle land management practices to be implemented within the watershed to address nonpoint source pollution. The UMRWD received a $60,000 EPA 319 Grant for wetland restoration on September 23, 1991. Upon receipt of this grant, local agencies (UMRWD, Big Stone SWCD and SCS) began working with the FWS on the Dale Johnson Wetland Project and other potentially restorable areas (Figure 4-6). The Restoration Project staff made a preliminary inventory of these restorable areas by comparing 1950s aerial photos to present aerial photos. Significant accomplishments have been made in the area of wetland restorations, even though the construction season was cut short in 1991 because of adverse weather conditions. As of December 31, 1993, 6 wetlands have been restored through this grant, for a total of 51.5 acres. Table 4-6 describes the location, cost, area and method of restoration for each of these wetlands.

Landowners have shown a great interest in restoring wetlands on their property. It is anticipated the entire $60,000 grant will be spent by the end of 1994. The UMRWD will apply for additional grant funds to continue this program at that time. Because of the major concern to preserve and enhance wetlands the UMRWD became involved in yet another wetland project during 1992. The project is a cooperative effort between the FWS and MPCA, EPA, the UMRWD and the University of Minnesota. The major goals of this project are to quantify water flow, sediment, nutrient and other natural tracers in the surface water before and after the David H. Steen Wetland. This will allow us to define some of the mechanics of how restored wetlands improve water quality.



Upper Minnesota River Watershed

Big Stone Lake

Location of Completed Wetland Restoration Projects in Big Stone County, Minnesota

Figure 4-6

Wetland Restorations Completed
1991 - 1993

Date	Location	Acres	Method of Restoration	Cost
9-25-91	NW 1/4 Sec 24, T124 N, R49 W	5	Earthen Ditch Plug	$ 2,867.50
9-25-91	SW 1/4 Sec 28, T122 N, R46 W	3	Earthen Ditch Plug	$ 560.00
9-26-91	SW 1/4 Sec 28, T122 N, R46 W	2	Earthen Ditch Plug	$ 350.00
10-30-91	NW 1/4 Sec 12, T122 N, R47 W	30	Earthen Dam and Water Control Structure	$ 20,000.00
11-1-92	SW 1/4 Sec 34, T123 N, R47 W	6.5	Earthen Ditch Plug	$ 4,000.00
10-28-93	SW 1/4 Sec 13, T124 N, R49 W	5	Earthen Ditch Plug	$ 2,302.00
Total		**51.5**		**$ 30,080.00**

Note: Funded under supplemental Clean Lakes Grant to UMRWD in 1985.

BIG STONE LAKE
RESTORATION PROJECT

Big Stone Lake
Wetland Restorations Completed in Big Stone County, Minnesota During 1991 and 1992

Table 4-6

In South Dakota the Roberts County Conservation District has restored 151 acres of wetlands with the cooperation of twenty-nine different operators. Sixteen of these operators built multipurpose dams in the Big Stone Lake Watershed. Table 4-7 shows the dates the impoundments were completed, the number of acres, cost and subwatershed location. The funding for the multipurpose dam projects were made available through the sources presented in Table 4-8.

4.7 SALMONSEN CREEK STREAMBANK STABILIZATION

The objective of this project is to reduce sediment and nutrient loadings caused by severe streambank erosion. The goal is to install erosion control structures along the lower reaches of Salmonsen Creek. The resulting impact on water quality is an estimated reduction in sediment loadings by approximately 35% (refer to Big Stone Lake Phase I Diagnostic/Feasibility Study, Volume I).

The Phase I Diagnostic Feasibility Report showed Salmonsen Creek carried sediment loadings far above acceptable levels. Natural drainage within the subwatershed has been extensively altered. Drained wetlands and poor agricultural practices result in rapid storm water runoff. Preliminary water quality data indicated that severe streambank erosion accounted for 40-50% of the sediment load entering Big Stone Lake from Salmonsen Creek during large storm runoff events. The implementation of streambank erosion control like the reshaping of eroded streambanks with the placement of riprap and/or reseeding is expected to reduce sediment loadings significantly. Salmonsen Creek drops 80 feet in elevation within the last 5,000 feet of length, prior to it entering the lake.

During 1986, in an effort to increase the SCS design priority of Salmonsen Creek, the UMRWD hired a private contractor to survey the lower reaches of the creek. The Minnesota Area V SCS office provided a computerized laser transit to survey the creek, for which the Big Stone SCS District Conservationist was responsible. Local SCS and SWCD personnel assisted project staff and the contractor with the survey. After completion of the survey, the area SCS engineer started preliminary design of the stabilization project. The design calculations showed the stabilization of the entire lower reach of Salmonsen Creek to be unfeasible, because of the very

MULTI-PURPOSE DAMS BUILT IN THE BIG STONE LAKE WATERSHED

COMPLETED DURING THE BIG STONE LAKE 319 GRANT				
NAME	**DATE**	**ACRES**	**WATERSHED**	**TOTAL COST**
Prins Bruce	9/91	15.5	Little Minnesota River	$ 2,948[1]
Duane Schneider	10/91	3.0	Little Minnesota River	$ 1,300
Stegge Duane	11/91		Little Minnesota River	$ 4,488[1]
Hagen Don	4/92	1.1	Little Minnestoa River	$ 1,635
Hagen Don	4/92	1.1	Little Minnesota River	$ 2,565
COMPLETED DURING THE BIG-STONE LAKE -LITTLE MINNESOTA RIVER WATERSHED 319 GRANT				
Ammann Allyn	11/92	3.2	Whetstone River	$ 1,354
Evenson Glenn	9/92	3.0	Little Minnesota River	$ 9,080[1]
Evenson Glenn	9/92	3.7	Little Minnesota River	$ 3,411
Frerichs Gene	11/92	1.0	Whetstone River	$ 1,567[1]
German Henry	10/92	4.0	Little Minnesota River	$ 2,000[2]
German Henry	10/92		Little Minnesota River	$ 3,960[1]
Johnson Don	12/92	3.0	Big Stone Lake	$ 5,600[1]
Julius Robert	9/92	7.0	Little Minnesota River	$ 2,248[1]
Julius Robert	9/92	3.0	Little Minnesota River	$ 2,770[1]
Overby Byron	11/92	3.0	Big Stone Lake	$ 3,780
Palmquist Clayton	10/92		Whetstone River	$ 1,655[1]
Peterson Betty	9/92		Little Minnesota River	$ 2,772[1]
Plant Stanley	11/92		Big Stone Lake	$ 1,485[1]
Ziemer Harry	9/92	3.0	Big Stone Lake	$ 2,970
Hanson Wesley		3.0	Little Minnesota River	$ 2,413
TOTAL				**$60,001**

[1] ACP funds were used.
[2] Operator built on their own.

Big Stone Lake

Multipurpose Dams Built in the Big Stone Lake Watershed

Table 4-7

Funding Sources for Multipurpose Dam Projects

U.S. Fish and Wildlife Service		$10,000
25% Land Owner Cost Share		$ 2,500
	Subtotal	**$12,500**
North American Wetland District Match		**$10,000**
Option 1		
Ducks Unlimited		$ 2,500
25% Landowner Cost Share		$ 3,125
District Cash		$ 4,375
Citizens for Big Stone		$ 2,000
	Subtotal	**$12,000**
	Total	**$34,500**

Upper Minnesota River Watershed

Big Stone Lake

Funding Sources for Multipurpose Dam Projects

Table 4-8

high cost. The alternative was to design for the two most severe erosion sites, on the lower reaches of the creek.

During 1987, Area V SCS engineers resurveyed the most severe erosion area on the creek. Site I is located in the east one-half of Section 26, Foster Township, approximately 600 feet down stream of the culvert outlet on Big Stone County Road 3. The Salmonsen Creek - East Fork monitoring Station (BS-9Y) is located at the culvert inlet. An SCS design memorandum entitled "Salmonsen Creek Streambank Stabilization - Site I" was completed for the east branch erosion control project too late in 1988 for construction. During the spring of 1989 a SLR grant application was applied for by project staff and the Big Stone SWCD technician. The Minnesota Board of Water and Soil Resources (BWSR) approved the grant. The $15,000 SLR grant funded 25% of the project cost. Because the creek bends around and erodes under Big Stone County Road 3, the county also agreed to fund 25%. The UMRWD funded 50% or $30,000 of the ($60,471.50) construction cost with EPA's Clean Water Act Section 314 money. The Site I project was completed during the fourth quarter of 1989. The UMRWD, SWCD and local SCS staff performed daily construction monitoring and inspections, surveyed progress and calculated as-built quantities.

UMRWD staff assisted area SCS personnel with the design survey of Salmonsen Creek Streambank Stabilization Site II during 1989. Design calculations were drafted in the SCS Area Office and completed in the spring of 1991. Construction on the Salmonsen Creek Streambank Stabilization Site II Project began the first week of October 1991 and was completed the last week of October. Project and Big Stone SWCD staff applied for and received an SLR grant from the Minnesota Board of Water and Soil Resources to fund 25% of the project. EPA Section 314 monies funded 50%. Big Stone County provided the final 25% of the $23,569.25 project. Area SCS personnel performed the Site II construction layout and were construction inspectors on a daily basis.

4.8 ACCESS ROAD EROSION CONTROL

The objective of access road erosion control is to reduce or eliminate roadside erosion adversely affecting the water quality of Big Stone Lake. The specific goal of the Access Road Erosion Control Project is to identify the most severe sediment hazards created by inadequate drainage along lake access roads and correct the problems with the assistance of SCS and Conservation District personnel. Approximately 20 sites along the access roads to Big Stone Lake, both public and privately owned, were identified in the Phase I Diagnostic Feasibility Report as having erosion problems. These problem sites appeared mostly in road ditches with slopes greater than 6%. Because of the close proximity of these problem areas to the lake, they often have a greater affect on water quality than areas of erosion further away from the lake. Runoff from areas removed from the lake may be filtered by natural grass swales and sediment basins like wetlands, before entering the lake. Excessive scouring and gully formation along access roads not only add to the degradation of water quality, but also results in diminished use of the access roads due to unstable road conditions. The diminished use of access roads has an economic impact because of the resulting reduction in recreational use of the lake.

Four access roads were identified in 1986 as significant sediment hazards. All are located in Roberts County, South Dakota. The roads are located at Minnehaha Cove, Hiawatha Beach, South Dakota Park, and Hartford Beach. Financial assistance was available from the South Dakota Department of Agriculture on a 50/50 cost share basis up to $1,500 for erosion control projects on rural roads, which were adjacent to Big Stone Lake.

Application for the assistance was made through county Conservation District offices. EPA funds were used to match state and local contributions on a 50-50 basis. After inspection by SCS Engineers, the most cost-effective means of dealing with the road erosion at Hartford Beach was to abandon the road. The current owners have quit using the road and it has grown over with vegetation. Project staff consider the problem solved. Project staff time was the only expenditure of EPA project funds to eliminate the erosion occurring on the Hartford Beach road.

The road to Minnehaha Cove had severe erosion in the right, downhill ditch. SCS surveyed the road and ditch. Project staff also met with Lake Township officers to inform them of the erosion problem and the solution in progress. The township installed a low dike within the ditch to prevent flow. A 15-inch diameter culvert was placed under the road so flows would follow a ravine with heavy vegetation. The area now follows natural drainage present prior to the construction of the road.

The Hiawatha Beach road also had a severely eroded ditch on the right downhill side of the road. SCS surveyed the road and ditch. Staff again met with Lake Township officers concerning the project and gained their support. The township had field rock comparable to the Class 2 riprap placed in the ditch. No further visible erosion has occurred to date.

An agreement between Lake and Genseo townships, Roberts County, and Big Stone Lake Restoration Project resulted in the South Dakota Road project being implemented. Due to the slope of the original road and lack of an adequate road ditch, water erosion carrying silt and nutrients into Big Stone Lake was a continuing problem. The original road was vacated and planted to grass. The new road incorporates the use of diversion barriers in the ditch, eliminating many of the problems experienced with the old road.

In the Minnesota portion of the watershed, Big Stone County completed an access road erosion control project on both sides of County Highway 34. The project is located 2 miles north of Ortonville at the junction of County Highways 7 and 34. The 9% slope of Highway 34 caused serious erosion problems in the roadside ditches for many years. As corrective measures, catch basins were installed with drop inlet pipes to prevent high velocity runoff from forming gullies. Runoff is collected in the catch basins and piped down the hill. The total project cost was $246,907, of which about $127,600 was for erosion control.

4.9 SHORELINE STABILIZATION

The objective of shoreline stabilization is to reduce sediment and nutrient loadings resulting from excessive shoreline erosion on Big Stone Lake. The specific goal of shoreline erosion control is to install bank stabilization structures in areas of severe shoreline erosion.

The most severe shoreline erosion on Big Stone Lake is in an area that totals approximately 1,500 feet and is owned by 24 individuals. The erosion in this area is caused by a number of influences; primarily wave action, high lake levels and ice expansion during the winter. The owners of the most severe shoreline erosion area are all members of the Sunset View Lakeshore Owners Association. During the summer of 1985, the Association invited project staff to attend their annual summer meeting, to update Association members about the lake restoration project. Project staff discussed erosion controls needed for their shoreline. The owners in attendance expressed an interest in obtaining more information about erosion control and its cost.

During 1985, Project Staff, Big Stone SWCD and local SCS personnel surveyed the Sunset View area. These cross-sections were sent to the SCS Area Office to begin design work. The UMRWD contacted a private engineering firm in 1988 to design a cost effective method to stabilize the shoreline at Sunset View. An aerial topographic survey was completed early during the summer of 1989 and a preliminary engineering report was submitted to the UMRWD in December of 1989. The preliminary design cost estimate for the shoreline stabilization was $648,750.00.

A public information meeting was held July 13, 1990 to discuss the preliminary design. All cabin owners (24) were notified by mail about the meeting. Representatives from MDNR, BWSR, MPCA, Big Stone County, UMRWD, the private engineering firm, and project staff were present. The proposed design, with fill and sheet piling, failed to receive approval from MDNR. MDNR recommended the use of riprap. MDNR stated, riprap would protect the shoreline from wave action and allow ground water to continue to flow unrestricted to the lake if properly designed. Winter ice push-up would require some yearly maintenance by the shoreline owner. Nine of the 24 shoreline owners were at the July 13 meeting. All shoreline

owners present agreed the problem must be addressed and each expressed a positive attitude to MDNR's recommendation of riprap.

The UMRWD contracted with HDR Engineering in the spring of 1991 to design a riprap shoreline stabilization. The riprap stabilization design was comprised of high strength filter fabric with 6 inches of gravel bedding and 24-36 inches granite rock. The engineer's estimate was $145,000. The consensus among the shoreline owners and the UMRWD was the most eroded area (670 feet) be stabilized first and additional funding be sought to complete the remaining area.

Bids for the project were let on September 30th. Construction started on November 1 and the project completed on November 15. The total cost of the project was $118,106.00. Fifty percent of the project cost ($59,053.00) was paid for by the Big Stone Lake Restoration Project, using EPA 314 funds. The Big Stone SWCD provided 25% ($29,526.50) and the remaining $29,526.50 was provided by the affected property owners.

4.10 ELIMINATION OF WASTEWATER DISCHARGES

November 1, 1989 was an important date for the Big Stone Lake Restoration Project. Sisseton, South Dakota and Browns Valley, Minnesota Wastewater Treatment Facilities could no longer discharge wastewater effluent into the Little Minnesota River and Big Stone Lake. Sisseton upgraded their system by adding 12 ponds covering 248.3 acres where the effluent will evaporate. The vegetation in the ponds will use the nutrients which previously made their way to Big Stone Lake. The new Sisseton facility cost $1,695,404 million of which $1,238,615 is Federal dollars. The remaining $456,790 is local money provided by bond issue. Quarterly residential sewer fees increased from $6 to $27. The estimated total phosphorus load from Sisseton was 1,818.2 kg/year (4000 lb/yr) (German 1985). Browns Valley improved their system by placing more than 3,600 feet of new sewer lines in the city and 2 miles of line from the city to the ponds southeast of town. The two primary ponds are 11 acres each. Raw sewage enters one of the primary ponds then is pumped to the 22-acre secondary pond. Effluent is then

pumped from the secondary pond to a center pivot irrigation system. The center pivot will be able to irrigate close to 400 acres.

The final cost of Browns Valley's new facility is nearly 2.4 million. Federal money accounted for 55% of the project cost while the State of Minnesota paid for 20%. The City paid the remaining 25% by securing a Farmers Home Administration loan of up to $515,000. Monthly residential sewer fees increased from $7 to $12. The estimated total phosphorus load reduction from the Browns Valley upgrade is estimated at 610.6 kg/year (1343.3 lb/year) (MPCA 1992).

These new systems will benefit Big Stone Lake by eliminating effluent discharge into the river and the lake. Annually an estimated 55,350 pounds of suspended solids and 3161.5 kg/year (6955.3 lb/year) of phosphorus no longer enter Big Stone Lake.

The certification of wastewater systems contractors in South Dakota and Minnesota this year has resulted in improvements in the construction of individual wastewater treatment systems in the Big Stone Lake watershed. Some lake cabin owners have become involved in up-dating their old wastewater systems to the present State Regulations. The Staff became involved in helping Schmidts Landing Resort install a mound wastewater system. This project corrected a problem of overloading the wastewater's absorption field which was adjacent to Big Stone Lake.

4.11 COMMUNICATIONS PROJECT

The objective of the communications project is to provide information and education in the areas of soil erosion, nutrient loss, and agricultural impacts on water quality. The specific goal of this two year project was to plan, implement and evaluate communication activities in the Big Stone Lake watershed. These activities were designed to assist project staff, local SWCD's and the SCS in their efforts to accelerate the adoption of recommended BMPs on critical areas.

The Minnesota Soil and Water Conservation Board (now BWSR) hired a Watershed Communications Coordinator in 1985 to provide staff support in developing and implementing the information/education program. The Coordinator cooperated directly with project staff and other

local groups. The responsibility for the communications project was transferred to project staff in 1987. Major publications titled "Watershed Management: A Community Commitment" produced in cooperation with the Freshwater Society; "Farmer's Guide to Technical and Financial Assistance; and two "Land and Water" newsletters were completed before the project was turned over to project staff.

From 1988 to 1992 a total of twelve "Land and Water" newsletters were mailed to 1,800 area farmers by the project staff, and also provided to Citizens for Big Stone Lake to be mailed with their project newsletters. Six 4 foot by 8 foot Lake Restoration Project signs and Seven 4 foot by 8 foot Eurasian Water Milfoil signs were developed and placed around the watershed.

A project display was developed by project staff on the Big Stone Lake Restoration Project. The display is featured in booths for Ortonville Cornfest, and Farm and Home shows in Ortonville, Milbank and Sisseton each year. The display was also used at Clean Lakes and Minnesota Lake Management Conferences.

Slide shows and presentations are given by project staff at Kiwanis and Rotary meetings in Ortonville, Milbank and Madison at least annually and sometimes semiannually. The same types of presentations are given at Boy Scout Banquets and schools in natural science classes.

BWSR also contracted with a rural Sociologist from the University of Wisconsin to develop and administer a survey of owners and operators in the Salmonsen Creek and Meadowbrook Creek subwatersheds to obtain farmers' ideas for use in developing the Communications Program. The survey assessed prevailing attitudes and knowledge about conservation practices, perception of resource conservation issues, agencies and programs, and sources of conservation information. The Rural Sociologist evaluated the communications strategies implemented in the program, and recommend which strategies should be continued and emphasized.

4.12 PUBLIC INVOLVEMENT

The objective of public involvement is to ensure effective participation in the restoration of Big Stone Lake by the public, private groups, and local, State, and Federal agencies. The Big Stone Lake Project grew out of a public concern for declining water quality in Big Stone Lake and a reduction in recreational use. When Phase I began, various forms of assistance came from local civic groups and local units of government. Contributions of money, time, background information, and other resources made the completion of the Phase I final report possible.

Although there was a strong interest in the lake and an eagerness to help with the restoration project, there was also frequent fragmentation of effort and even some adversarial relationships between groups that had similar goals, but misunderstood each others operational procedures. As the Phase I study began, an effort was made by DWNR staff to meet with citizens groups and local units of government to learn from them about their perception of the lake's problems, gain a historical perspective, obtain ideas on corrective measures, determine expectations of what the lake should be like, and encourage cooperation. The Citizens for Big Stone Lake also made a significant effort to reach out to other groups and encourage a cooperative lake restoration effort.

At the same time, the process of better educating the public about their lake began. As existing data was analyzed, new data gathered and surveys completed, the information was shared with local groups. Through this process, the public began to get a better understanding of the complex problems affecting Big Stone Lake. A consensus began to form concerning action that would be needed to correct the problems. Many ideas for restoration of the lake grew out of this interaction between the public and DENR staff. Individuals and groups that have recently become actively involved in the project probably do not realize that the current support and cooperation did not materialize overnight. It has been encouraged and carefully cultivated by local organizers and DENR staff and should not be taken for granted.

This interaction process continued to be an important part of the project during the Phase II implementation period. The project coordinator and watershed technician worked with local

groups and the news media to keep the public updated on the overall project. In order to do this, the following activities were performed:

- Provide quarterly reports to local units of government and other participants.
- Continue the Farm Bulletin Board Program with SCS, KDIO radio, and the Ortonville Independent in Big Stone County.
- Provide interview time with local reporters about important project activities.
- Contribute a project update to the lake association's (Citizens for Big Stone Lake) quarterly newsletter.
- Initiate and participate in meetings with local units of government and citizens groups to exchange information and get them to target resources and provide technical assistance and guidance in implementing the restoration plan.
- Assist other agencies in preparing grant applications for projects related to the restoration of Big Stone Lake.

All of these activities were carried out by the project coordinator as necessary, to ensur successful implementation of restoration measures. Approximately 150 articles have been published in area newspapers. Some articles were written by project staff, with the remaining written by reporters from interviews with project staff.

4.13 COMPLEMENTARY PROJECTS

Typically these projects have been funded through federal or state programs other than 314 Clean Lake Grants or began before the start of the implementation phase of the Big Stone Lake Restoration Project.

The Big Stone County Comprehensive Local Water Plan (CLWP) was approved by the Minnesota BWSR on December 17, 1991. The purposes of the CLWP are to: 1) identify existing and potential problems and opportunities for the protection, management, and development of water and related land resources; and, 2) develop objectives and carry out a plan of action to promote sound hydrologic management of water and related land resources, effective environmental protection, and efficient management. The Big Stone Lake Restoration Project is a major

component of the CLWP and stresses the need for continued cooperation with and support of all agencies involved in the Project in South Dakota. It is anticipated that the CLWP will provide additional sources of funding from the State of Minnesota for Lake Restoration Project activities.

Project staff have identified septic system nonconformance as high priority. An estimated 80% of the systems presently in-place are considered nonconforming. There are 330 improved and 193 unimproved lots on the Minnesota side of Big Stone Lake. One-hundred fifteen are year-around residences. On the South Dakota side of the lake there are 723 developed lots.

4.14 MDNR FISHERIES MANAGEMENT

The fishery of Big Stone Lake has historically been managed primarily for walleye, with a secondary emphasis on northern pike, bluegill, black crappie, largemouth bass and channel catfish. Management activities have consisted of generic fishing regulations for South Dakota border waters, stockings, commercial fishing, efforts to improve water quality, and improvement of angler access.

Approximately 6 million walleye fry have been stocked in Big Stone Lake during even numbered years, since 1976. Walleye have increased in abundance, from a catch rate of over 4 per gill net set in 1985 to over 39 per net in 1989 and over 150 per net in 1991. The 1991 catch rate was over 15 times higher than the high end of the "normal range" for lakes with similar physical and chemical characteristics, and 25 times higher than the long-range goal CPE index. The effects of the high walleye abundance are not completely known. A high abundance of walleye may negatively affect other fish species, particularly forage fish species. It could also affect size and condition of walleyes themselves, through increased intraspecific competition. Average weight of walleye declined from 1.8 pounds in 1985 to 1.0 pounds in 1987, to 0.8 pounds in 1989, then increased slightly to 1.1 pounds in 1991. Proportional Stock Density (PSD) of walleyes collected in gill nets decreased from 31 in 1987, to 24 in 1989, and 20 in 1991. The changes in PSD are indicative of more small, young fish and fewer large, old fish in recent years' samples. Yellow perch abundance declined from 1971 through 1985, increased in 1987,

then declined again through 1991. Despite the declines, perch abundance is still above the normal range for similar lakes. Average weight, average length and PSD of perch all declined from 1981 to 1989, then all increased dramatically in 1991. The shift in size of perch was due to proportionally more small fish and fewer large fish through 1989, then proportionally more large fish and very few small fish in 1991. No perch less than 7 inches long, and no young of the year (YOY) perch were collected in 1991. This may be an indication of increased predation on the perch by the abundant walleyes.

Trap net catch rates of black crappie in Big Stone declined from 3.6 per net in 1971 to 0.1 per net in 1989, then increased slightly to 0.9 per net in 1991. Trap net catch rates of bluegill declined from 4.7 per net in 1971 to 0.9 in 1989 and 1991. Even in 1971, crappie and bluegill grap net catch rates were at the low end of the normal range for similar lakes. Since then, catch rates have generally been below the normal range. The declines in trap net catch rates of crappie and bluegill since the 1970s reflect the observations of local anglers.

From 1987-1989 a drainable pond was operated cooperatively with a local fishing club to rear bluegill fingerlings which were harvested and stocked into Big Stone Lake. Bluegill fingerlings were also reared and stocked into Big Stone Lake by South Dakota Game Fish and Parks Department (SDGF&PD) from 1987-1989. In 1991 the Minnesota rearing pond was stocked with adult black crappie and a limited number of fingerlings were reared and stocked into Big Stone Lake. Black crappie fingerlings have been reared and stocked into Big Stone by SDGF&PD annually since 1985. Catch rates of YOY bluegill collected by seining increased in 1989 and again in 1990. Black crappie gill net catch rates increased substantially in 1991, to over 25 per net. Over 99% of the crappies collected in 1991 were YOY. These fish were not vulnerable when trap net sampling was conducted earlier that summer. These increases may have been due a die-off of white bass during the winter of 1988-1989 which allowed increased survival of young bluegill and crappie, climatic conditions or improved water quality which allowed increased natural reproduction or survival, or to the contribution of the fingerling stockings.

Northern pike catch rates have fluctuated between 0.4 and 1.8 per gill net. This is consistently lower than, or barely within, the normal range for similar lakes. Big Stone Lake regularly produces low numbers of large northern pike, but it appears that the lake may not be well suited to produce large numbers of northerns. A 7-acre drainable pond has been used almost annually since 1969 to rear a limited number of northern pike fingerlings for stocking into Big Stone Lake. Channel catfish abundance has fluctuated between 0.1 and 1.1 fish per gill net since 1981, despite low density stockings of catfish fingerlings in 1976, 1978, 1980, 1983, and 1987. The gill net catch rate of channel catfish in 1991 was 0.5 fish per net.

Social Considerations - Big Stone Lake and its fishery provide the primary feature for Big Stone Lake State Park, Hartford Beach State Park and several resorts, as well as an important recreational attraction for Ortonville and Big Stone City. The fishery of the lake has the potential to contribute substantially to local and state economies. A 1987 summer creel survey estimated a total of 48,330 angler trips with an economic value of $1,014,930. A 1987-1988 winter creel survey estimated a total of 12,245 angler trips yielding an estimated economic value of $257,145.

Commercial Fishery - Records indicate commercial fishing operations began in 1925 and have occurred annually since 194748. During the 10-year period from 1982-83 through 1991-92, commercial harvest of fish ranged from 12,100 to 890,000 pounds and averaged 306,883 pounds annually. That harvest has consisted of carp, freshwater drum, white bass, suckers, and buffalo. Commercial fishing and monitoring operations should be continued annually, in conjunction with SDGF&PD, to take advantage of under utilized fish, to reduce their biomass, or to alter their size structure.

Rough Fish Removal - The removal of rough fish from Big Stone Lake has been performed on an annual basis throughout the restoration project. The removal is performed every year by both the MDNR and SDGF&PD. The total number of pounds removed each year is listed in Table 4-9.

Big Stone Lake
Rough Fish Removal
1980 - 1991

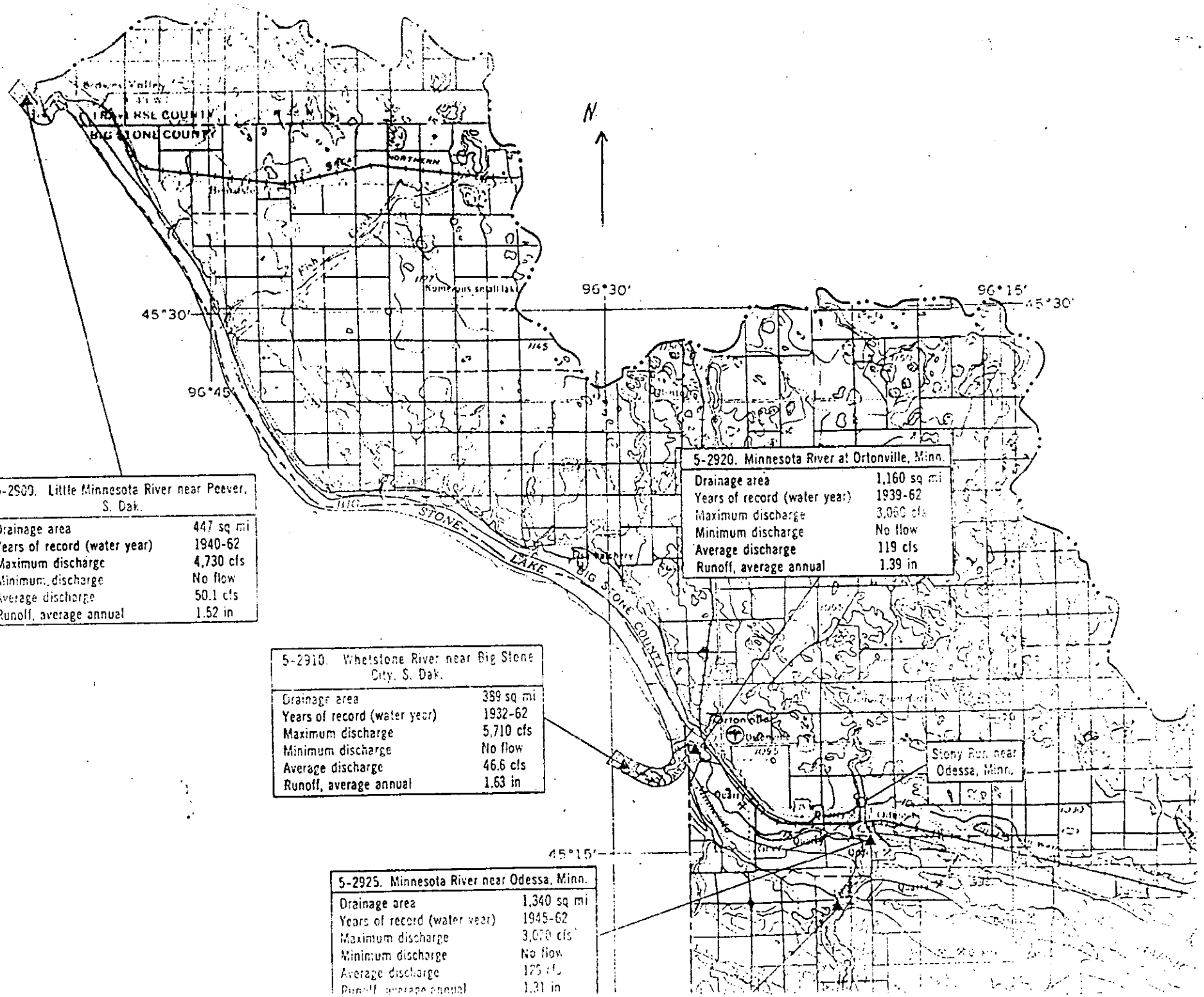
YEAR	AGENCY	LBS.	TONS
1980 - 1981	SD GF&P	153,900	69.8
1981 - 1982	MN DNR	950,967	431.3
1982 - 1983	SD GF&P	12,100	5.5
1983 - 1984	MN DNR	321,735	145.9
1984 - 1985	SD GF&P	241,400	145.9
1985 - 1986	MN DNR	191,200	109.5
1086 - 1987	SD GF&P	316,300	86.7
1987 - 1988	MN DNR	44,915	143.5
1988 - 1989	SD GF&P	890,000	20.4
1089 - 1990	MN DNR	270,800	403.6
1990 -1991	SD GF&P	478,200	122.8
TOTAL		**3,871,517**	**1,756**

4.15 IMPLEMENTATION SUMMARY

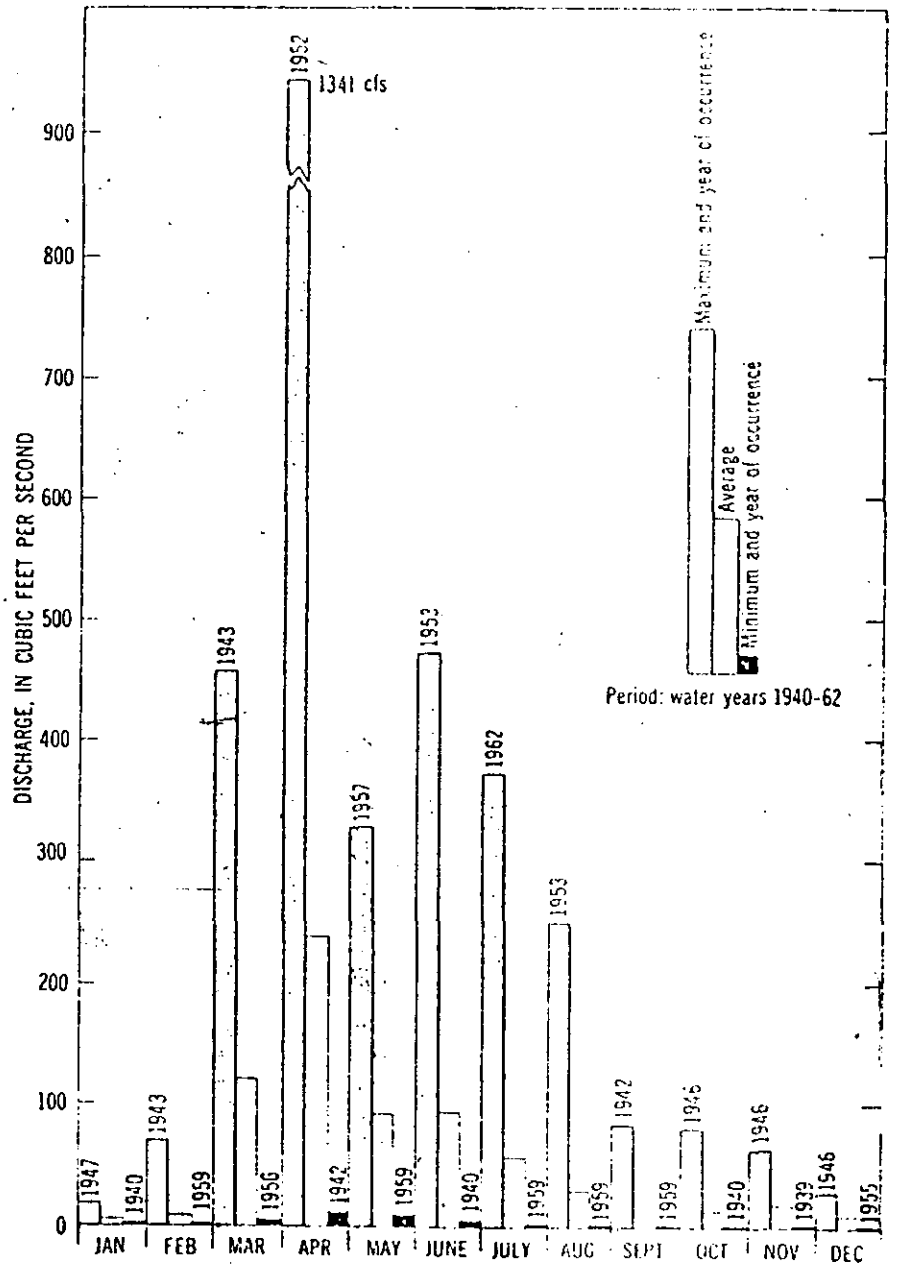
A variety of implementation activities have been initiated since 1985. Each of these activities by project type, are summarized in Table 4-10. Quantitative estimates of nutrient load reductions are also presented. However, these should be viewed with caution, considering the uncertainty in the estimates.

Appendix B

FLOWS OF SELECTED TRIBUTARIES

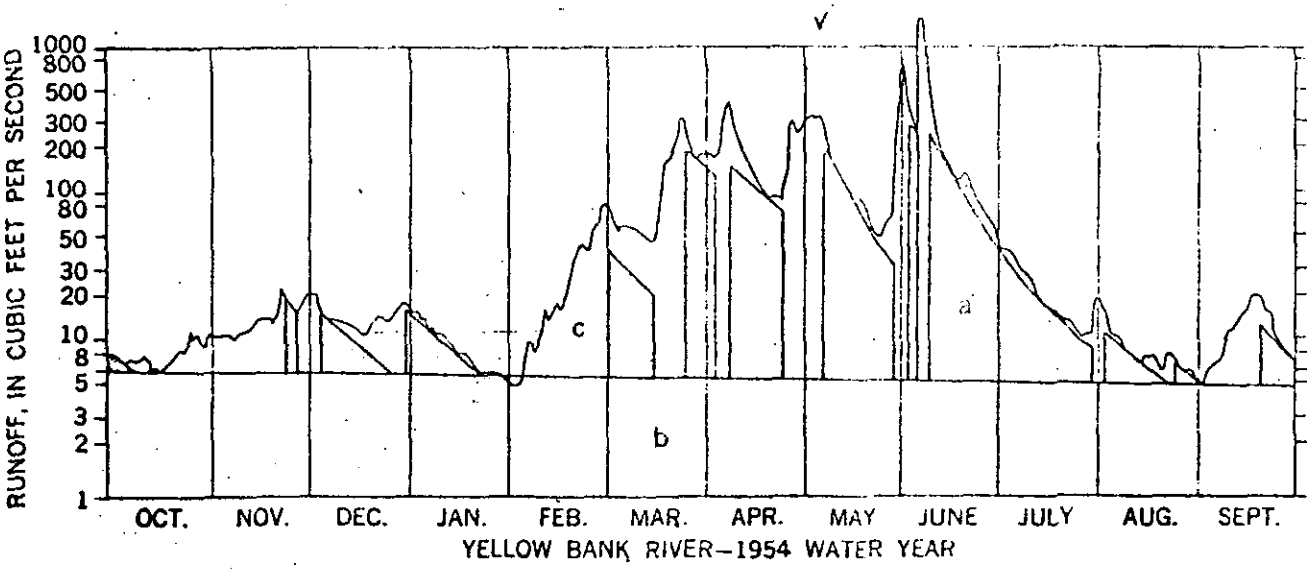

N
96°30'
96°15'
45°30'
45°15'
96°45'
BIG STONE COUNTY
STONE
LAKE
BIG STONE COUNTY
Ortonville
Stony Run near Odessa, Minn.
5-2900. Little Minnesota River near Peever, S. Dak.
Drainage area 447 sq mi
Years of record (water year) 1940-62
Maximum discharge 4,730 cfs
Minimum discharge No flow
Average discharge 50.1 cfs
Runoff, average annual 1.52 in
5-2910. Whetstone River near Big Stone City, S. Dak.
Drainage area 389 sq mi
Years of record (water year) 1932-62
Maximum discharge 5,710 cfs
Minimum discharge No flow
Average discharge 46.6 cfs
Runoff, average annual 1.63 in
5-2920. Minnesota River at Ortonville, Minn.
Drainage area 1,160 sq mi
Years of record (water year) 1939-62
Maximum discharge 3,060 cfs
Minimum discharge No flow
Average discharge 119 cfs
Runoff, average annual 1.39 in
5-2925. Minnesota River near Odessa, Minn.
Drainage area 1,340 sq mi
Years of record (water year) 1945-62
Maximum discharge 3,070 cfs
Minimum discharge No flow
Average discharge 175 cfs
Runoff, average annual 1.31 in

Map No. 5



VARIATION IN MEAN MONTHLY DISCHARGE OF YELLOW BANK RIVER NEAR ODESSA IS TYPICAL OF THE STREAMS IN THE WATERSHED.

Figure No. 5



RUNOFF OF A STREAM IS DERIVED FROM WATER IN STORAGE AND FROM DIRECT OVERLAND RUNOFF OF PRECIPITATION.—*In the above figure, runoff components were estimated for the Yellow Bank River using Kunkle's (1962) hydrograph separation method.*

a — ***37% of the total stream-flow is contributed from the area adjacent to the stream channel—about 10% of the total area of the watershed. This 37% consists of (1) water stored on the flood plain, (2) water that entered the ground-water reservoir from the stream, remained for a period of a few days to a few weeks, and gradually discharged back into the stream, and (3) a small amount of water added to the ground-water reservoir from precipitation on the flood plain (Flashy, varies with river stage).***

b — ***7% of the total streamflow (basin storage discharge) is contributed from the area away from the stream channel—about 90% of the total area of the watershed. This 7% consists of water added to the ground-water reservoir from precipitation on the watershed area beyond the flood plain (Fairly constant, affected only by long-term climatic changes).***

c — ***56% of the total streamflow is contributed from overland runoff (Flashy, varies with precipitation and season).***

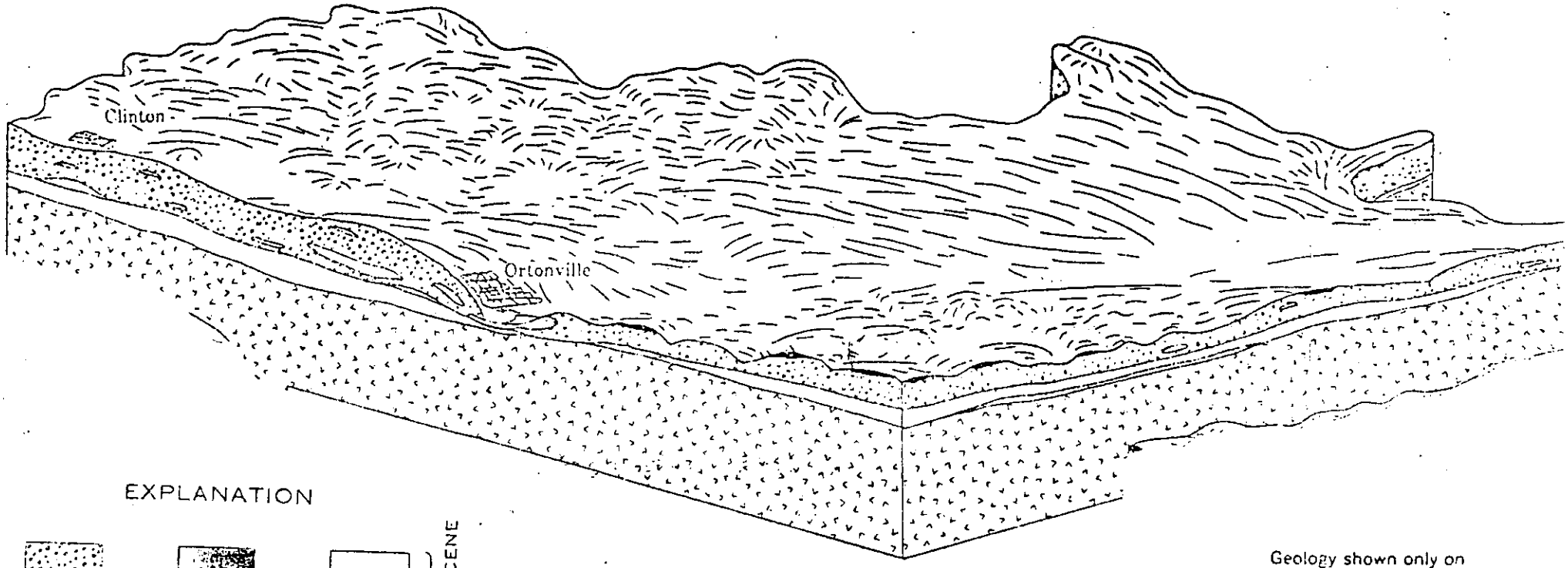
For the same year and method, an analysis of the Whetstone River hydrograph showed, a=41%; b=11%; and c=48% of the total flow

Figure No. 6

Appendix C

GROUNDWATER INFORMATION

GROUND W TER



EXPLANATION

Till

Near-surface sand and gravel

Buried sand and gravel

QUATERNARY PLEISTOCENE

Shale

Sandstone

CRETACEOUS

Granite

PRE-CAMBRIAN

Piezometric surface for water in the glacial drift

Direction of water movement within the glacial drift

Geology shown only on vertical sections

Lake and alluvial deposits not shown

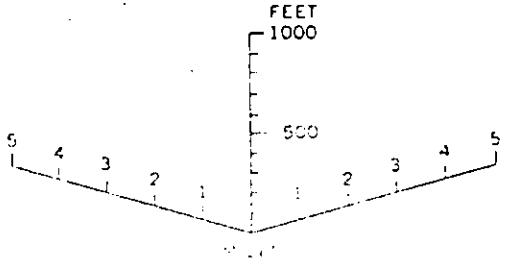


Figure No. 7

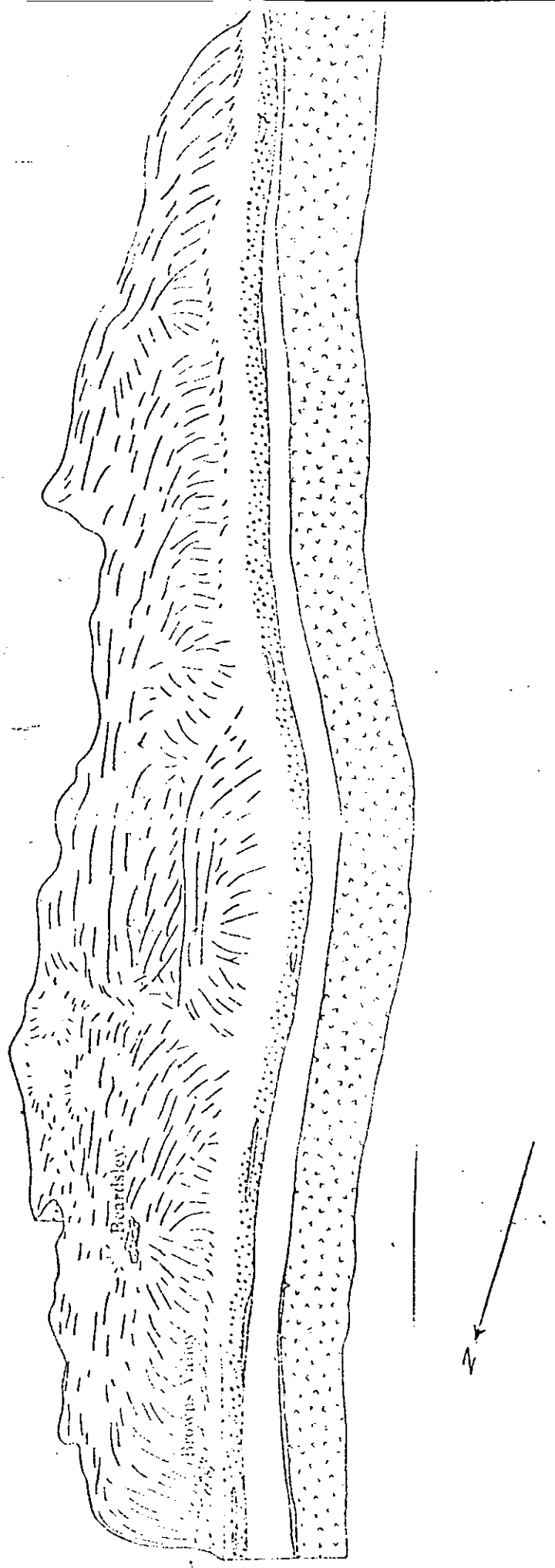
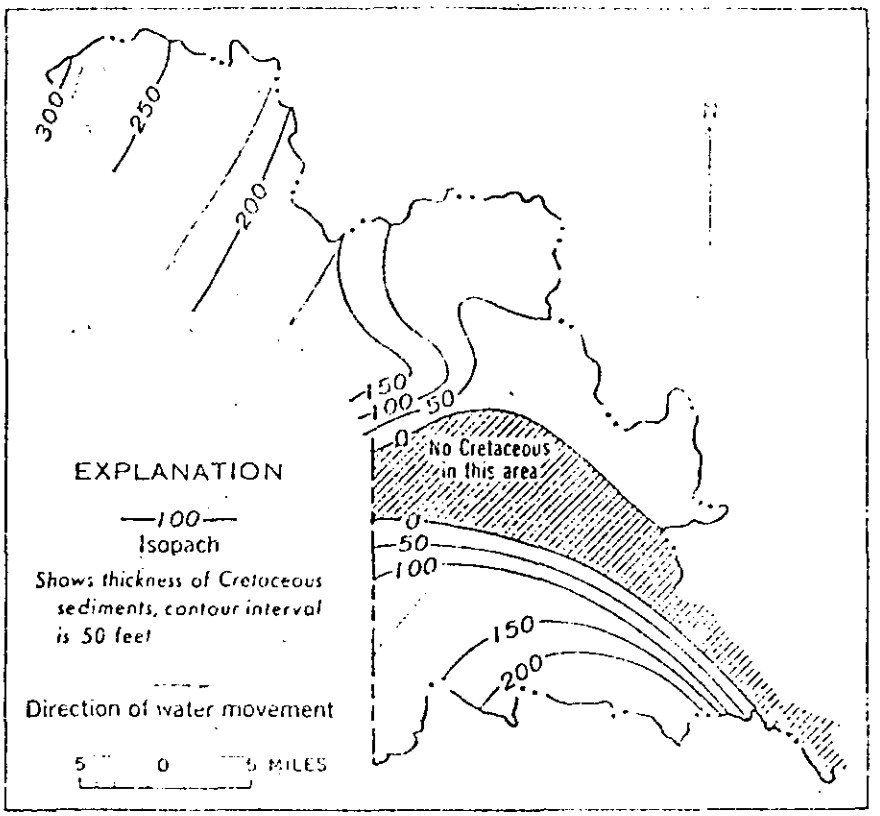
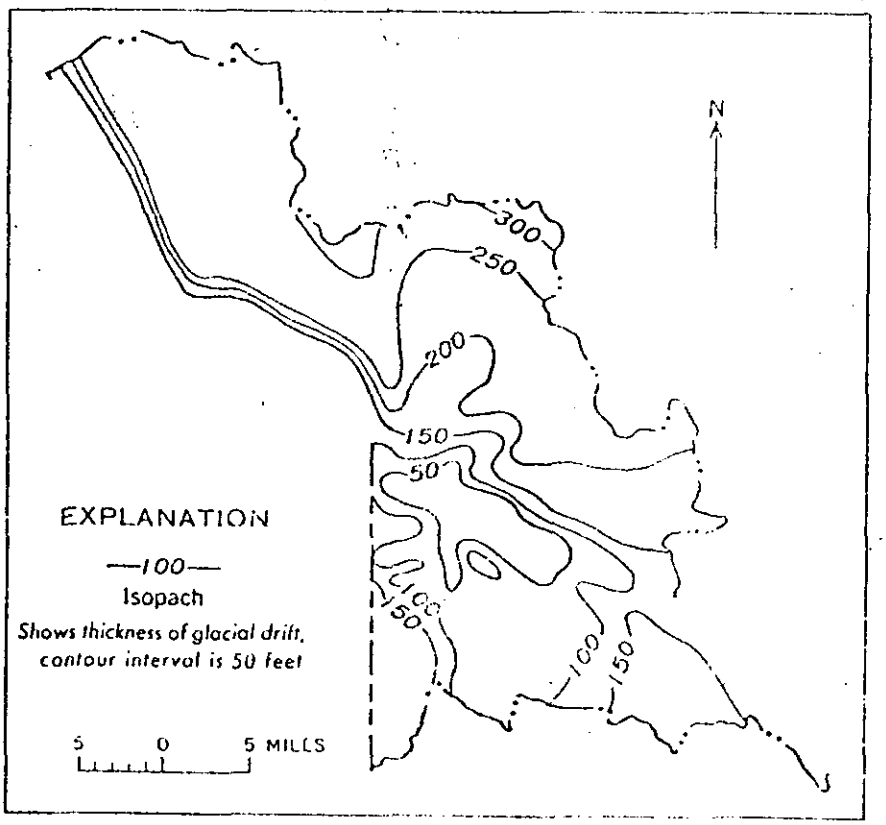


Figure No. 8



CRETACEOUS SEDIMENTS.—*Wells tapping Cretaceous sediments are concentrated within the area where these sediments are over 100 feet thick*

Figure No. 9



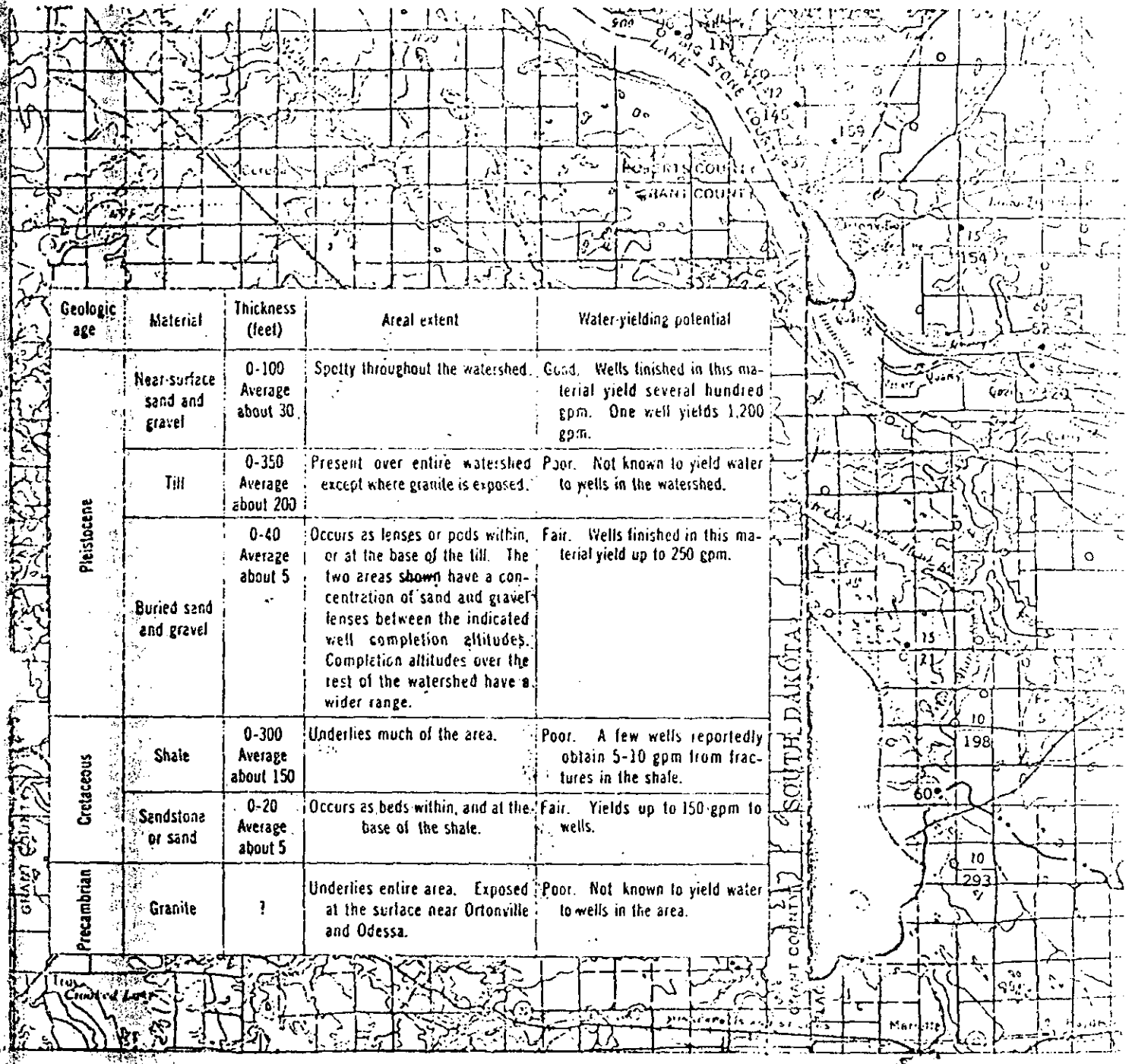
GLACIAL DRIFT.—*The probability of a well tapping several aquifers in the drift is greatest where the drift is thickest (See block diagram)*

Figure No. 10

Table 10

Ground Water Potential

Geologic age	Material	Thickness (feet)	Areal extent	Water-yielding potential
Pleistocene	Near-surface sand and gravel	0-100 Average about 30	Spotty throughout the watershed.	Good. Wells finished in this material yield several hundred gpm. One well yields 1,200 gpm.
	Till	0-350 Average about 200	Present over entire watershed except where granite is exposed.	Poor. Not known to yield water to wells in the watershed.
	Buried sand and gravel	0-40 Average about 5	Occurs as lenses or pods within, or at the base of the till. The two areas shown have a concentration of sand and gravel lenses between the indicated well completion altitudes. Completion altitudes over the rest of the watershed have a wider range.	Fair. Wells finished in this material yield up to 250 gpm.
Cretaceous	Shale	0-300 Average about 150	Underlies much of the area.	Poor. A few wells reportedly obtain 5-10 gpm from fractures in the shale.
	Sandstone or sand	0-20 Average about 5	Occurs as beds within, and at the base of the shale.	Fair. Yields up to 150 gpm to wells.
Precambrian	Granite	?	Underlies entire area. Exposed at the surface near Ortonville and Odessa.	Poor. Not known to yield water to wells in the area.



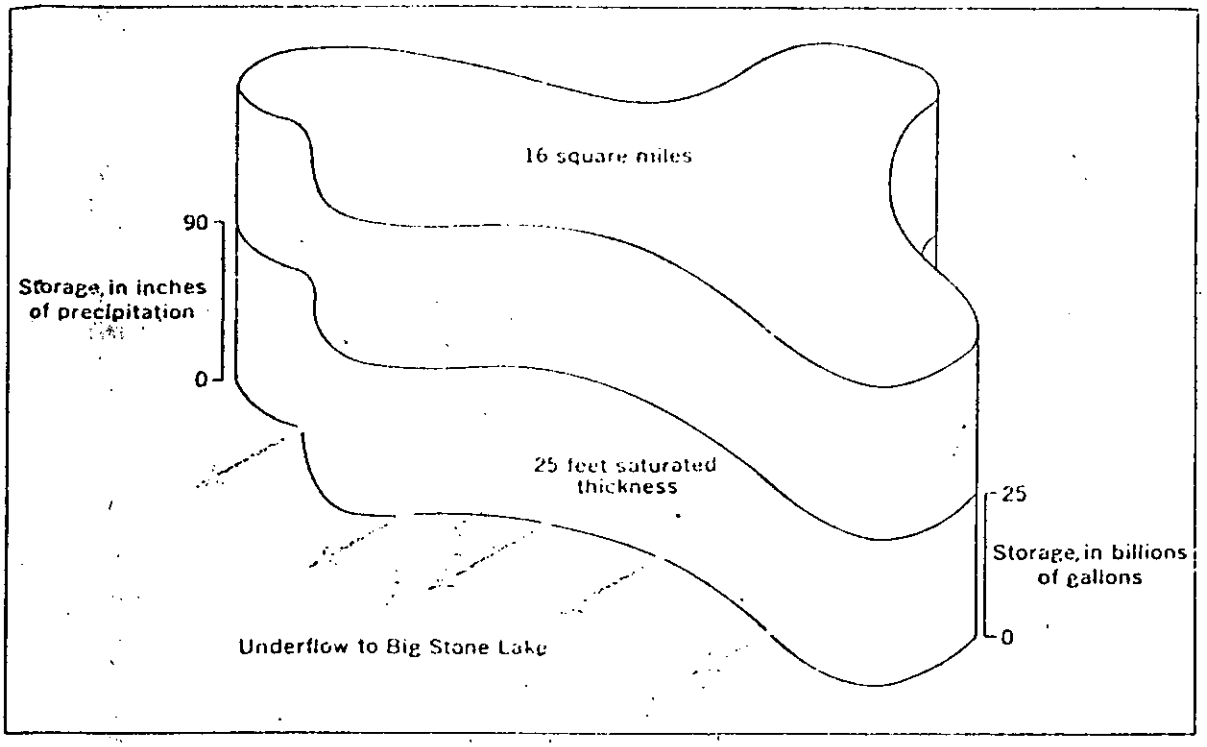
Base from Army Map Service 1:250,000 series:
Milbank, S. Dak., Minn., N. Dak., 1953, and
St Cloud, Minn., 1953

SCALE 1:250 000

5 0 5

5 0 5 10

CONTOUR INTERVAL 50 FEET



AN EXAMPLE OF THE NEAR-SURFACE SAND AND GRAVEL AQUIFER NEAR BEARDSLEY.—*Using an estimated permeability, it is calculated from Darcy's Law that about one billion gallons of ground water leaves this aquifer each year*

Figure No. 12

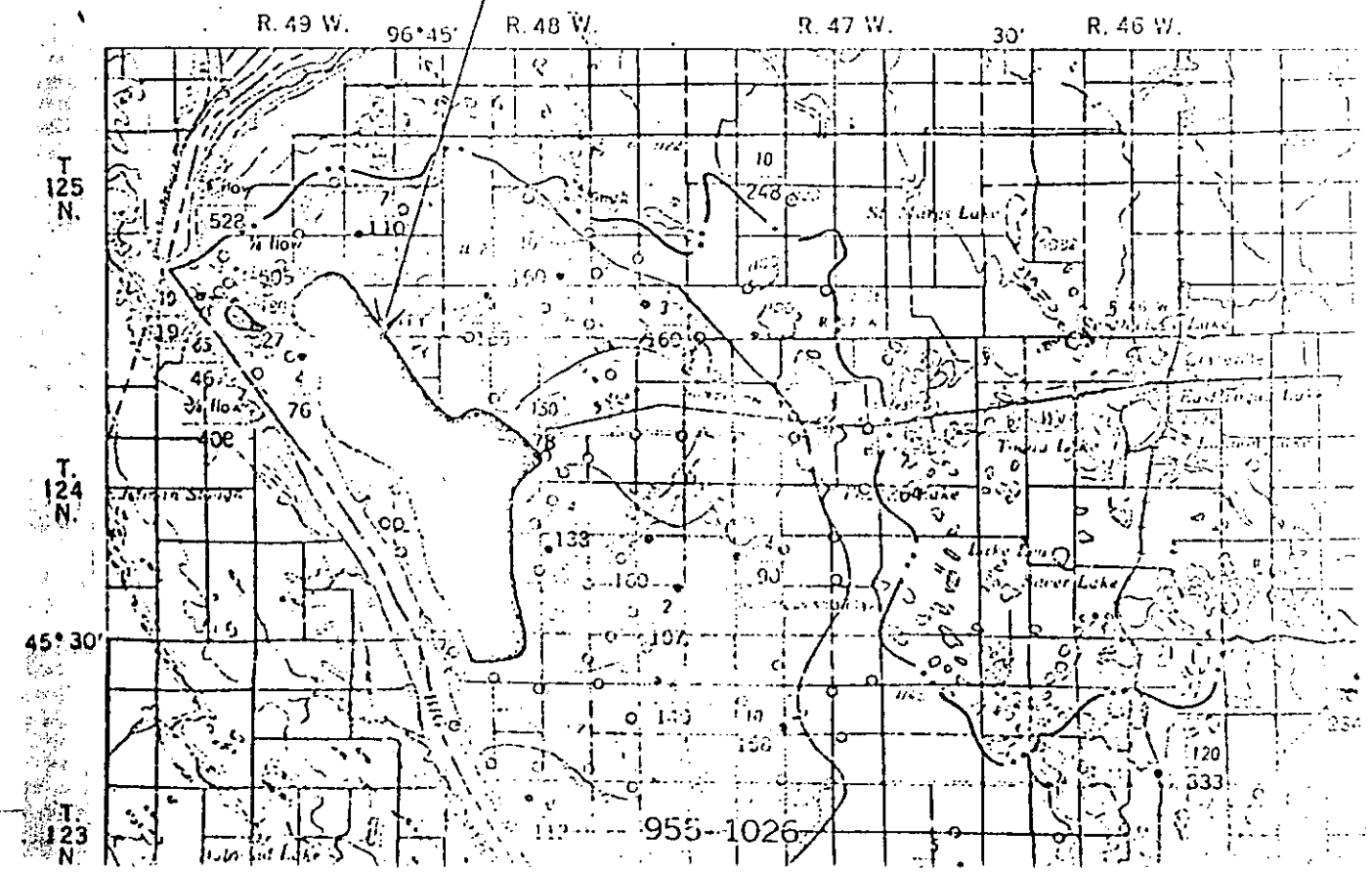


Table No. 11

GROUND WATER

1. Ground water in the watershed is from three principal aquifers.
   a. Near-surface sand and gravel aquifers are spotty throughout the watershed, but have the highest well yields. These aquifers, which are commonly exposed at the surface, receive high recharge but are more easily contaminated. The water is hard and commonly high in iron.
   b. Buried sand and gravel aquifers are present throughout most of the watershed. Well yields are low to moderate; the water is hard, and is commonly high in iron.
   c. Most of the wells in Cretaceous aquifers are in the northwest and southwest parts of the watershed. Yields are small to moderate. Most of the water is relatively soft and low in iron, but high in chloride, sulfate, sodium, and boron.
2. More ground water is available than is presently being pumped (1.4 mgd), or than is presently being discharged to surface water (3.5 mgd). Water can be salvaged from evapotranspiration losses by lowering the water table where it is near the land surface. However, lowering of the water table may result in changes in vegetation and wildlife habitat.

Aquifer	Estimated discharge to surface water (Million gallons per day)[1]	Estimated discharge to wells (mgd)[1]	Additional amount that could probably be developed by wells (mgd)[2]	Estimate of discharge to surface water (gpd/sq. mile)[1]	Estimated discharge to wells (gpd/sq. mile)[1]	Additional amount that could probably be developed by wells (gpd/sq. mile)[2]
Near-surface sand and gravel	3.5	0.9	over 4	50,000	13,000	over 60,000
Buried sand and gravel	negligible	0.4	over 12	negligible	600	over 15,000
Cretaceous sandstone	negligible	0.1	over 4	negligible	300	over 10,000

[1] These figures are probably accurate to within 50 percent

[2] These estimates are based on scanty information and should be considered only relative. They are much less reliable than figures on present discharge.

Appendix D

AGENCY COMMENT LETTERS

Minnesota Department of Natural Resources

P.O. BOX 457, SPICER, MN 56288
(320) 796-6272

July 9, 2001

Dianne Radermacher
Upper Minnesota River Watershed District
342 NW 2ND ST
Ortonville, MN 56278

Dear Dianne:

SUBJECT: UPPER MINNESOTA RIVER WATERSHED DISTRICT PLAN

I have reviewed the Agency Draft, dated May 2000, of your above referenced plan. I believe your plan lays a good foundation for the future direction of water management activities within the district. Your stated priorities seem timely and your commitment to sustainable water resource management is in keeping with our water management goals and policies.

Thanks for giving me the opportunity to provide input on the initial draft of your plan. I look forward to working with you and the board in the future on projects that will help sustain the Upper Minnesota's irreplaceable water resources..

Sincerely,

DNR WATERS

Skip Wright

Skip Wright
Area Hydrologist

c: David Leuthe
John Linc Stine
David Sill
Norm Haukos
Dave Soehren

Minnesota Board of Water & Soil Resources

One West Water Street
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Fax (218) 723-4794

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Fax (507) 359-6018

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(507) 285-7458
Fax (507) 280-2875

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Marshall, MN 56258
(507) 537-6060
Fax (507) 537-6368

Metro Region:
One West Water Street
Suite 250
St. Paul, MN 55107
(612) 282-9969
Fax (612) 297-5615

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June 19, 2000

Dianne Radermacher, Administrator
Upper Minnesota River Watershed District
342 NW 2nd Street
Ortonville, MN. 56278

Dear Dianne,

Thank you for the opportunity to review your Watershed District Plan Update. I found it to be a well written and thoughtful plan addressing the issues, problems and opportunities your District is currently facing. I commend your watershed district for making this plan update a priority. Much has changed since your last plan was written, thus making this document and its vision even more important as it guides your District and the critical role it plays in water resource management.

The Upper Minnesota River Watershed District has had much success in the past - giving you a strong framework to build upon. There is much opportunity for your district to provide leadership for watershed based analysis, planning and implementation, serving the residents of your district, as well as the public good. The Board of Water and Soil Resources along with you, want to make this plan update as effective as possible in guiding your watershed district in the next ten years. The attached comments from the Board of Water and Soil Resources are made from that perspective.

Sincerely,

David Sill

David Sill, BWSR Board Conservationist

c: Doug Thomas, BWSR Water Planning Coordinator
Jeff Nielsen, BWSR Southern Region Supervisor

June 19, 2000

SUBJECT: Review of the Upper Minnesota River Watershed District Management Plan

Mission Statement, page 2-6: With recent plan updates, the Minnesota Board of Water and Soil Resources (BWSR) has suggested that watershed districts develop a mission statement and incorporate it into their plan. A well-written mission statement can help focus the purpose of your watershed district and clearly define your specific role. *You have accomplished this.* Throughout the ten-year length of your new plan, revisit your mission every several years and see that it continues to correctly reflect your District's purpose.

Land Use and Cover Types, page 4-13: Your plan identifies roughly 8% of the agricultural acres within the District enrolled in the Conservation Reserve Program (CRP) - based on 1994 data. Can an estimate based on year 2000 data be provided for a more current perspective? In addition to the CRP acres, there are approximately 800 acres of land in the Reinvest in Minnesota Reserve (RIM) Program in the District.

Also, under this section at least some limited discussion and documentation regarding current crop residue management status should be addressed. I have included a table reflecting 1999 crop residue survey results from participating counties. All agricultural counties in Minnesota participated in the year 2000 statistical survey, this information should be available shortly. Contact Derek Fisher, BWSR Conservation Agronomist for further information and interpretation at 507-359-6090. As a potential objective or action in your plan for the future, in addition to major watershed information, you may want to generate statistical crop residue information based on certain high priority sub-watersheds in the District. This can be accomplished by adjusting the transect route.

Regarding Table 6 - Evaluation of Water Management Problems Within The Upper Minnesota River Watershed District: Under the Surface Water section of the table, one of the possible problems identified is - Erosion is impacting surface waters from agricultural fields. The table for this identified problem however was not completed. Please identify if your District has the authority to address this problem, what the District's role will be, and identify if there are additional responsible agencies.

Surface Water Quality, page 4-19: Surface water quality is briefly written about under the heading Drainage Systems. I would suggest making a separate heading for this section - i.e. 4.8.5 - Surface Water Quality. This would be similar to section 4.9.5 - Ground Water Quality.

Factors affecting water resources, page 4-22: The plan discusses factors potentially affecting water resources within the District. In providing a complete picture of the District, I believe adding a listing of municipal waste water treatment systems and a listing of public water suppliers in the District would be informative. Your previous plan (page 40) has a listing of municipal sewage disposal systems. The Minnesota Department of Health should be able to provide a list of public water suppliers.

Water Quantity goal, page 7-1: Regarding the objective - To reduce damages caused by flood waters. Do you not think it would be appropriate for the District to also encourage temporary and long term land retirement options on flood prone areas?

Identification of high priority wetland preservation, enhancement, and restoration areas: Included in your watershed management plan update is a requirement for the identification of high priority wetland preservation, enhancement and restoration areas. The Minnesota Wetland Conservation Act administrative rules, 8420.0350, subp. 2 requires this identification to be included in the next scheduled water management plan update whether water management organizations (metro area), counties or watershed districts. This is also mentioned in the WD Managers Handbook, planning section.

With the most recent update of county comprehensive local water plans this identification was addressed. Big Stone, Swift and Lac qui Parle all designated their entire county as a high priority area for wetland preservation. My assumption is that Traverse did also. With your Watershed District's strong emphasis on protection and restoration of wetlands you may want to make a similar designation. This would make your watershed district plan and the county water plans compatible.

Future Directions and Priorities of the District, page 9-1 - 9-3: Based on past efforts by the District and emerging issues - I believe the key priorities of the District which you have identified (the four bullet items) set important and excellent direction for implementation. However, I have added some comments and seek some possible additions to this section.

♦ Drainage systems and natural waterways:
In the recently completed legislative session, as part of an appropriation bill (supplemental budget bill, Ch. 482), a change was made to the drainage law - Minnesota Statutes 1998, section 103E.011, is amended by adding a subdivision to read: *Subd. 5 [Use of External Sources of Funding] Notwithstanding other provisions of this chapter, a drainage authority may accept and use funds from sources other than, or in addition to, those derived from assessments based on the benefits of the drainage system for purposes of wetland preservation or restoration or creation of water quality improvements or flood control. The sources of funding authorized under this subdivision may also be used outside the benefited area but must be within the watershed of the drainage system.* This recent change may provide some new opportunity in helping to manage drainage systems in the District.

♦ Continue efforts to improve the water quality of Big Stone Lake:
Upper Minnesota River Watershed District has provided great leadership and effort in addressing the restoration of Big Stone Lake. The narrative in this section of the plan references Appendix F - Big Stone Lake Restoration - Description of Program Elements for Phase III. I believe these Phase III program elements were drafted in 1994 as a part of the Phase II final report. Have any of the elements identified been partially implemented or completed? The plan update would be more complete with a summary of the *status* of the phase III program elements.

Also in this narrative section, funding is identified as a limitation. Many of the program elements listed would potentially be eligible for Challenge Grants via Comprehensive Local Water Planning. These are competitive statewide grants which generally have an application period every other year. Watershed Districts are an eligible applicant. I would suggest including efforts to investigate this or other funding opportunities in this narrative.

♦ Minnesota River Restoration Efforts:

Your past efforts are an excellent example showing that by working to restore your own local watershed's resources you are and have been helping to restore the Minnesota River. I agree that we need to build on the experience and success that your District has had, and just as importantly help to continue your efforts. However, I do not completely agree that water quality opportunities have shifted to downstream areas. Basin wide opportunities like the Conservation Reserve Enhancement Program (CREP), continuous CRP, local water planning challenge grants, accelerated Minnesota River cost-share funds, feedlot-water quality cost-share, seeking a watershed-wide clean water partnership project and EQIP opportunities are all potential funds and opportunities. More often than not, funding is going to whom most aggressively is seeking it, rather than where the greatest pollution problems exist. While it is important to recognize these opportunities, it is critical to act now, realizing the state's emphasis on the Minnesota River Basin will not last forever!

One such opportunity for improving water quality - the implementation of riparian filter strips and buffers needs more discussion in this section of the plan addressing priorities. Unprecedented opportunity and funding currently exist through CREP and continuous CRP. How will your District encourage the implementation of filters and buffers? An objective in your plan states that they will be vigorously pursued and encouraged - but how will this be accomplished, what will be done? How can the District assist soil and water conservation districts and NRCS in generating landowner interest and understanding of this water quality practice? Across the basin the greatest success is happening where direct landowner contact is taking place. What will be the District's role? If the District has placed a priority on filter and buffer implementation, has this been conveyed to soil and water district boards in your watershed? Are there priority areas in the watershed you would like targeted? Does the District have the ability to provide any financial incentives? Heron Lake Watershed District has provided a per acre bonus payment to landowners enrolling in these programs. Bois de Sioux Watershed District has offered some incentives to SWCD offices for promoting buffer strips. Could your District possibly assist SWCD / NRCS offices in setting acreage goals or landowner contact goals?

♦ Unsewered communities and failing individual sewage treatment systems:

The District has identified some level of involvement in addressing unsewered communities and failing individual sewage treatment systems. It seems by not mentioning animal feedlots a significant water quality issue is over looked. I know the District recognizes their importance. While county government must provide the key local government role, how will the District support this effort? With the new feedlot rules written and continued public expectation for animal agriculture to address water quality concerns, this issue will clearly have significance in the next five to ten years. There are certain time lines landowners must meet, and I believe the potential for significant new cost-share incentives may be provided.

How will the District assist county government in solving this problem? Is a more thorough or complete inventory of feedlots in the District or a part of the District needed? If so, advocate this and support the county board in accomplishing this task. By advocating a water quality perspective, helping identifying priority areas, and providing frequent encouragement and support to solve this problem from the District, another local resource agency's voice and opinion is heard. I believe this will ultimately increase individual county's active leadership on this issue. Please address the above discussion in this area of the plan.

Appendix A - Upper Minnesota River Watershed District Project Descriptions: I assume this section, which has not been included in the draft document, will provide summary descriptions of completed and ongoing projects, studies, etc. with financial information. This is a required part of the plan update.

1999 Minnesota Crop Residue Survey Results

	County	Corn Planted into >15% Residue	Soybean Planted into >30% Residue	Residue Trend Analysis Percent of Cropland Meeting Residue Targets[1] 1999	1998	1997	1996	1995
1	Nobles	94%	78%	86	54	77	NA	64
2	Martin	74%	78%	76	63	78	66	56
3	Le Sueur	76%	75%	76	68	NA	74	50
4	Swift	72%	79%	76	63	67	61	31
5	Big Stone	75%	65%	70	64	NA	50	NA
6	Cottonwood	62%	77%	70	62	73	67	59
7	Nicollet	81%	53%	67	49	53	53	NA
8	Jackson	67%	65%	66	57	61	38	21
9	Rock	70%	61%	66	98	82	63	NA
10	Stevens	60%	69%	65	35	NA	NA	NA
11	Lincoln	65%	57%	61	54	53	48	34
12	Murray	48%	64%	56	55	64	51	NA
13	Scott	40%	48%	44	26	73	46	20
14	Sibley	42%	46%	44	45	48	50	25
15	Waseca	34%	48%	41	38	72	30	46
16	Chippewa	51%	29%	40	33	33	37	8
17	Hennepin	37%	41%	39	42	NA	43	39
18	Renville	49%	28%	39	11	17	29	20
19	Dodge	28%	48%	38	45	NA	NA	NA
20	Traverse	30%	43%	37	35	NA	50	28
21	Lac Qui Parle	34%	37%	36	76	43	39	40
22	Kandiyohi	32%	38%	35	10	48	42	29
23	Dakota	41%	28%	35	39	41	NA	NA
24	McLeod	40%	27%	34	NA	62	54	17
25	Watonwan	30%	27%	29	38	NA	46	40
26	Pipestone	26%	30%	28	15	27	23	17
27	Lyon	29%	21%	25	41	NA	38	27
28	Fillmore	38%	9%	24	35	NA	NA	64
29	Washington	21%	22%	22	20	NA	NA	NA
30	Sherburne	29%	13%	21	27	21	19	NA
31	Rice	24%	17%	21	12	NA	NA	NA
32	Todd	13%	23%	18	20	NA	23	26
33	Brown	13%	20%	17	23	33	26	17
34	Benton	25%	7%	16	14	NA	19	NA
35	Redwood	21%	11%	16	32	29	30	27
36	Pine	21%	8%	15	NA	NA	NA	16
37	Mower	8%	14%	11	NA	NA	NA	NA
38	Grant	15%	5%	10	NA	30	24	23
39	Carver	9%	10%	10	11	9	NA	NA
40	Becker	16%	1%	9	NA	NA	10	9
41	Yellow Medicine	5%	8%	7	22	48	24	25
42	Blue Earth	4%	8%	6	11	51	59	41
43	Wadena	10%	0%	5	NA	NA	NA	NA
	Averages	39%	37%	37	39	50	41	31
				Average of Counties Reporting				

1 Beginning in 1999, the method used to compute 'Percent of Cropland Meeting Residue Targets' is modified and for some counties the values vary slightly from the previous summary prepared by the MPCA. It is computed as the average of the percent of corn acres planted into >15% residue, and the percent of soybean acres planted into >30% residue.

Minnesota Department of Natural Resources
P.O. BOX 457, SPICER, MN 56288
(320) 796-6272

November 19, 1999

Dianne Radermacher
Upper Minnesota River Watershed District
342 NW 2ND ST
Ortonville, MN 56278

Dear Dianne:

SUBJECT: TEN YEAR PLAN UPDATE (DRAFT)

I have finally had a chance to review your draft plan. Overall I think the document is well organized, farsighted and reflective of a watershed that is among the best in the state. I do have some specific comments to offer and they are listed by section as follows.

Section 4.8.3 Density and Distribution of Wetlands
I tend to disagree with the statement that the distribution of wetlands is quite consistent throughout the district. It appears to me that the distribution of wetlands is quite variable. Some of the major tributary watersheds to Big Stone Lake have less than 10% of their original wetlands while other tributaries to the Minnesota River and some of the closed basins located within the county may have 25 to 50% of their original wetlands. It is true that this area retains more of its original wetland acres than some of the more highly drained counties located in the Minnesota River Basin (i.e. Renville and Redwood counties where over 99% of the original wetlands have been drained). However, wetland drainage has contributed significantly to the problems of lake & stream water quality and erosion listed as priority areas of concern by the watershed district.

Section 4.8.4 Drainage Systems
It doesn't appear to me that the distribution of the drainage ditches throughout the district is uniform. Also, it may be worth noting that most of the legal drainage systems consist of channelized natural streams that outlet into Big Stone Lake and the Minnesota River. Also, the density of legal drainage systems is much lower than in most of the counties that border the Minnesota River. Private ditches are quite extensive and in most years farmed through. This practice of farming through scraper ditches has a major impact on erosion, water quality and habitat degradation.

Section 4.10 Unique Water Features
Landlocked or closed basins should be added to what are considered unique water features in the district. During extended periods of above average rainfall they offer additional fishing opportunities for citizens living in the district. Conversely, during drought periods many of these basins offer critical waterfowl habitat and groundwater recharge because of their slow response to climatic changes and connection to the regional groundwater table. They also provide important flood

storage and water quality benefits for the Minnesota River unlike many other areas of Minnesota River where landlocked basins have been interconnected and drained into the Minnesota River.

Section 5.22 Minnesota Department of Natural Resources
I think it would be important to add that the watershed district has assumed oversight over a DNR general permit for a variety of work activities conducted in protected waters within the district. This has helped reduce overlapping regulatory programs, provided better customer service to land owners within the district and is evidence of the cooperative relationship between the DNR and the watershed district in managing water resources located within the district.

Section 6.0 Existing Water and Water Related Problems
The top three problems identified in the survey that you undertook were stream water quality, lake water quality and soil erosion. These problems can all be related to wetland drainage as noted in my comments above. I think flooded crop lands and residential flooding should be noted as a priority problem (I know if you conducted your survey 2 years ago - it would be).

Section 7.2.2 Big Stone Lake Water Quality Goals
The ultimate goal to reduce nutrient loading to Big Stone Lake by 40% is commendable and achievable. Hopefully a similar goal can be set for tributaries to the Minnesota River Basin located downstream of Big Stone Lake. I believe that more needs to be said about addressing water quality problems associated with animal waste contained in feedlot runoff, manure application and riparian grazing operations. ***To reach desired nutrient reduction goals these issues will need to be given high priority.*** Also, I would recommend that consideration be given to identifying fecal coliform bacteria problem areas and setting goals for dealing with bacteria as well as excessive nutrients.

Section 8.4.2 Water Levels Within Landlocked Basins
I would recommend that landlocked basins be mapped and that drainage projects within their watershed be carefully scrutinized so as not to create more flooding problems for the riparian landowners. Alternative forms of flood control on landlocked basins should be looked at before constructing outlets. In other words look for upstream water retention and consider land retirement options. Outlets should be considered the least acceptable alternative and only when the other ones are not practical or feasible. Further, outlets for landlocked basins need to consider the potential for introduction of carp, bullheads and other aquatic organisms into the landlocked basins as a result of connection with other drainage systems. Fish barriers should be installed where possible.

Section 8.9.1 Data Collection Programs
I applaud your plans to increase the number of stream gages located throughout the district. I would recommend you set a goal for establishing gages on all the major tributaries to Big Stone Lake and the Minnesota River. I would be happy to meet with you and the U.S. Geological Survey to discuss prioritization of sites and possible cost share on sites that could be used for flood warning or flood gaging purposes.

In addition to expanding the stream gage network, our office would like to work with the Watershed District to establish a more extensive lake gaging network within the district. We could collectively establish a goal of having twenty (20) lake level gages (read by volunteers) located across the district within the next two (2) years.

Thank for providing me the opportunity to comment on your ten year plan. Your stated goals of sustainable water resource management and comprehensive drainage system management dovetail well with the direction that the Department of Natural Resources has charted for future water resource management in the State of Minnesota.

Please call me if you have any questions.

Sincerely,

DNR WATERS

Skip Wright

Skip Wright
Area Hydrologist

c: David Leuthe
David Sill
Deserae Henriksen
Dave Soehren

MEMO

Minnesota Board of Water & Soil Resources

To: Dianne Radermacher - Upper Minnesota River WD
From: David Sill - MN. BWSR
Subject: Watershed District Plan Update
Date: October 15, 1999

Thanks for sending me a copy of the *pre-draft work* which has been completed on your watershed district plan update. I read the complete document - though not in great detail at this point. I appreciate being able to get a sense of the plan format and content. In general the data and information presented is done very well - the document provides good context in explaining past watershed district activity and success; identifies current resource needs and problems, in addition the plan makes an effort to identify the watershed district's role; and finally establishes some priorities for the watershed district.

Your District has played a significant role and has had great past success in the water resource management of the upper Minnesota River region. I believe this update will provide a good assessment of that work, but more importantly identify and establish the current and future priorities of the District. If successful the plan can serve an important role by re-focusing and re-invigorating the District and its many partner's efforts.

I will provide only some limited comments at this time, and look forward to more complete review when the actual draft is distributed.

> page 1-1, paragraph 2: there are actually 44 watershed districts presently in Minnesota.

> page 2-3, first complete paragraph: reference is made to Appendix A (which was not included in my pre-draft copy) - the watershed district update needs to include summary descriptions of completed and on-going projects, studies, etc. with financial information. I assume this is what appendix A will document.

> page 3-1, *principles guiding plan development*: the state of Minnesota is currently beginning to prepare its Minnesota Water Plan 2000 - the state's 10 year water plan which is due to the Legislature in September 2000. Public input is currently being requested from local government and citizens about the conditions of Minnesota water resources and how to measure results - (i.e. the goals and objectives established). What measurements or indicators should be used to track progress. For each indicator, what should the target be for 2010?

I mention this because, this offers both an *opportunity* for your watershed district to provide input and comment to the State's water plan..... but also the state plan could give your watershed district *some additional framework or direction* as to measurements, indicators or targets to work toward in your local water resource management efforts.

> page 4-3, page 8-13 - watershed advisory committee: the plan discusses the committee and recommended members to include on such a committee. I believe it would be a good addition to the plan to identify the number of advisory committee members for your watershed and who they each represent. Is the city of Ortonville represented by an advisory member?

> page 4-7 - though livestock numbers are declining in the district, are there statistics on current numbers and types? Is there a current inventory of feedlots within the district? Is there current knowledge on permitted vs non-permitted sites?

> page 4-12, land use and cover type or on page 4-17, density and distribution of wetlands: is there any data available identifying the extent of public ownership of land within the watershed district?

> page 4-18, at the end of the surface water section is it possible to present a brief summary of current surface water quality conditions in the watershed district, similar to what was done for ground water quality (see page 4-19, bottom of the page). The Minnesota Extension Service bulletin FO-7079-E (Minnesota River Basin Water Quality Overview) may be useful.

> page 4-18 - 4-20. Groundwater: in this section would it be valuable to have a listing or inventory of public water suppliers within the watershed district? This information should be available from the MN Department of Health. Also in this section or the Surface Water section of the plan would it be informative to have an inventory of municipal waste water treatment systems? Are there any unsewered communities within the watershed district?

> page 5-3, Minnesota River Headwaters Joint Powers Board: the original intent and on-going purpose of this JPB is for member county's to work together in implementing their comprehensive local water plans.

> page 5-3: should the 37 County - MN River Basin Joint Powers Board be identified and briefly described here?

> page 5-3, 5-4, MN River Source Joint Powers Board: Aaron Buesing is no longer employed by this JPB. Todd Hay is the current contact. The purpose of the jpb staff is to provide technical design and engineering assistance addressing non-point soil and water resource problems. The state revolving loan fund is an example of one funding source for project implementation.

> page 5-4, Bonanza Education Center: Has a new person replaced Julie Kingsley?

> page 5-6: I would suggest including the MN Department of Agriculture, because of the availability of low interest loan funds via MDA to address non-point water resource problems.

> page 6-1 - 6-3: it appears a good job was done in seeking input to identify and rank resource issues and problems.

> page 7-6, Erosion and Sedimentation: you may want to review statistical information gathered via the tillage transect program (swcd / nrcs info) assessing crop residue management across Big Stone, Swift and Traverse Counties. In the future you may want to encourage the collection of tillage transect information via major watershed or sub watershed units. (Derek Fisher, BWSR Education / Agronomist, located in our New Ulm office, can provide additional interpretation, 507-359-6074).

I will quit at this point with current comments. Will look forward to providing additional comments when the final draft is available regarding goals, priorities and opportunities. Your well on your way with this plan! Thanks - Dianne.

Appendix E

RULES AND REGULATIONS OF THE

UPPER MINNESOTA RIVER WATERSHED DISTRICT

RULES AND REGULATIONS

The rules and regulations of the District are to effectuate the purposes of Minnesota Statues, Chapter 103D and the authority of the managers therein prescribed. These rules and regulations are deemed necessary to implement the law administered by them.

These rules and regulations were adopted pursuant to Minnesota Statutes, Chapter 103D on November 14, 1972. The Board of Managers recognize that water resource issues have changed over time and will continue to change. Therefore, to address both current and possible future water resource issues the District is planning to review and revise the rules and regulations in 2010.

1. General Policy:

The Managers accept the responsibilities with which they are charged as a governing body. While there is no intention to usurp the authority or responsibilities of other agencies or governing bodies, neither will they shirk their responsibilities. They will cooperate to the fullest extent feasible with personal groups, state and federal agencies and other governing bodies.

It is the intention of the managers that no person shall be deprived or divested of any previously established beneficial use or right to natural resources by any rule or regulation of the District without due process of the law, and that all rules and regulations of the District shall be construed to said intention; and by the use of these rules and regulations to assist in the orderly use and conservation of the waters of the District.

If any part of these rules and regulations is for any reason held to be invalid, such decision shall not affect the validity of the remaining portion of these rules and regulations.

If any rule or regulation is inconsistent with the provisions of Minnesota Statutes, Chapter 103D or other applicable state laws, the provisions of such laws shall govern.

2. Definitions:

For the purposes of these regulations, the following terms shall have the meanings attached to them:

District: All of the land area within the established boundary of the Upper Minnesota River Watershed District.

Managers: The Board of Managers of the District.

Person: An individual, firm, partnership, association, or corporation that does not include public or political subdivisions.

Public Corporations: A country, town, school district, or a political division or subdivision of the state.

Public Health: Includes any act or thing tending to improve the general sanitary conditions of the District.

General Welfare: Includes any act or thing tending to improve or benefit or contribute to the safety or well-being of the general public or benefit the inhabitants of the District.

Drainageway: An artificial or natural channel which provides a course for water flowing continuously or intermittently.

Legal Drainageway: All artificially constructed Judicial or County ditch Systems.

Private Drainageway: An individual or mutual drainage system.

Plan: A map or drawing and supporting data for proposed works.

Work or Works: Any construction, maintenance, repairs, or improvement.

Floodplain: All of the land area along channels and drainageways including the area around lakes, marshes, and lowlands which would become inundated as a result of a flood occurring on the average of once every 100 years.

Normal High Water Level: A mark delineating the highest water level which has been maintained for a sufficient period of time to leave evidence upon the landscape. Commonly it is that point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial.

Water Impoundment Structure: A structure constructed to retain or contain runoff water such as dams, reservoirs, dikes, but does not include pits or dugouts in which the water level is maintained by seepage.

3. Works Paid by Assessment:

All works of the District which are to be paid by assessment upon benefited properties shall be instituted only upon a petition filed with the Managers, as prescribed in Minnesota Statutes, Chapter 103D.625, subd. 2. A copy of the law is on file in the District office.

4. Permits:

The Board of Managers requires that permits be secured from the District prior to the start of some planned works of improvements. The request for permits is not intended to be a denial or a delay of any project. The permits are necessary for the Managers to be informed of planned projects and to insure the orderly development of the natural resources in accordance with the Overall Plan.

A. All permits when issued shall be signed by the chairman and/or secretary of the District or their designates.

B. No works requiring a permit shall be commenced prior to the issuance of the permit.

C. Unless specified in the permit, works for which a permit is issued must be completed within one year. The Managers further require that they be notified when the works of improvement are completed.

D. Applications for a permit will be acted on by the Managers within 60 days from the date that the request is made.

E. If a permit application is refused or granted subject to conditions, the applicant may, within 30 days, demand a hearing on the application.

F. The issuance of a permit by the Managers does not relieve the applicant from the responsibility of obtaining permits from other agencies when public waters are involved.

G. Applications for a permit may be filed with Managers at their regular monthly meeting on the second Tuesday of each month or mailed to: Upper Minnesota River Watershed District, Ag. Service Center, 342 NW 2nd St., Ortonville, MN 56278.

H. A plan shall accompany the application, and the Managers may request additional information.

I. There will be no charge for permits except where unusual circumstances require an engineering appraisal of the proposed works.

5. Drainage:

Every person shall use his land reasonably in disposing of surface water and he may turn into a natural drainageway all of the surface water that would naturally drain there, but he may not burden a lower landowner with more water than is reasonable under the circumstances.

Surface water shall not be artificially removed from upper land to and across lower land without adequate provision being made on the lower land for its passage, nor shall the natural flow of surface water be obstructed so as to cause an overflow onto the property of others. The following rules and regulations shall govern drainage projects in the District:

A. The District will enforce and comply with the drainage laws under the Minnesota Drainage code.

B. The District will assume the legal responsibility for all new and improved drainage systems within its boundary. When so authorized, it will accept the legal responsibility of all existing legal drainage systems within the District.

C. No person or public corporation shall cut an artificial drainageway across a subwatershed and thereby deliver water into another subwatershed without a permit from the Managers.

D. No person or public corporation shall divert water to or cast water by any artificial means into any legal drainage system from any land not assessed to said drainage system without complying with the proper statutory procedure therefore, and securing a permit from the Managers.

E. A permit shall be secured from the Managers prior to any works or alterations undertaken on any private drainage system. A permit is also required before any repair or alteration is started on any legal drainage system under the jurisdiction of the Managers.

F. A permit is required from the Managers for all outlets of drainage into existing right-of-ways of township, county, state, and federal road ditches.

G. All new and improved outlets into existing legal or natural drainageways shall be constructed in such design which will not cause a deterioration of the channel or impede the flow of water.

H. No wetland or marsh shall be drained without a permit from the Managers.

I. All new and improved legal drainageways shall be assessed annually for a specific amount of maintenance.

6. Soil Erosion and Sedimentation:

Soil and water conservation practices on the land are recognized as an important part of good water management program. Stopping rain where it falls allows more infiltration of moisture into the soil to be used by the growing crops. Reducing runoff and soil erosion will prolong the life of all works of improvement below.

It shall be the policy of the Managers to cooperate with the Soil and Water Conservation District and other agencies and to encourage the adaptation of proper land use practices.

To control and alleviate soil erosion and siltation of the drainageways, reservoirs, and lakes in the District the following will apply:

A. Each landowner and operator is expected to apply the proper land use practices to minimize runoff and soil erosion from sloping land.

B. Sloping land abutting drainageways, lakes, ponds, or reservoirs shall be used in such manner so as to provide reasonable control of sediment. (A permit is required from the Managers to till any area covered with permanent grass within 200 feet of the low water mark of drainageways and within 200 feet of the normal high water mark of lakes, ponds, or reservoirs.)

C. All new or improved drainageways shall be constructed with side slopes, as determined by proper engineering practices, so as to reasonably minimize soil erosion, giving due consideration to the intended capacity of the drainageway, its depth, width, and elevation, and the character of the soils through which the drain passes.

D. On all new and improved legal and private drainageways which have a minimum bottom width of 4 feet, the side slopes above the low water mark and the berm shall be planted with a permanent grass buffer strip. (The berm is defined as a strip of land at least 15 feet in width on each side of the top edge of the channel.) No agricultural practices other than those required for the maintenance of a permanent growth of grass shall be permitted. Harvest of grass in any manner not harmful to the grass or works of repair on any drainage system may require the foregoing practice; if additional right-of-way is required to comply with the foregoing, the matter shall proceed as provided by law. The area to be planted to grass as herein provided is a minimum requirement and may be enlarged in any works of improvement of new construction.

7. Water Quality:

The Managers will cooperate with public corporations and state and federal agencies in the application of ordinances and rules concerning water quality within the District.

The Managers will cooperate with the various agencies in South Dakota to attain uniform regulations which will improve the quality of the joint boundary waters to enhance their recreational and aesthetic values.

A. In the interest of public health and to prevent pollution of waters within the District, the applicable county ordinances and the rules of the State Board of Health and the Minnesota Pollution control Agency regarding the disposal of wastes, are by reference hereby adopted as rules and regulations of the District within the limits of the statutory authority granted to the Managers.

B. A permit must be secured from the District prior to the construction of all new or relocated livestock feedlots.

C. A permit must be secured from the District prior to any activity in the lakes which would cut and remove aquatic weeds or the use of chemicals to control algae or weeds.

D. A permit must be secured from the District to dump or spray industrial or municipal liquid wastes on or in any land, lake, reservoir, slough, marsh, river ditch, or natural waterway. Liquid wastes discharged into public waters must meet the minimum standards established by state and federal agencies.

E. Dumping of solid wastes into lakes, reservoirs, sloughs, marshes, rivers, ditches, or natural waterways is prohibited.

F. Wastes from chemical toilets in boats or cabins, or used by campers must be disposed of in approved disposal areas.

8. Flooding and Water Impoundment Structures:

Flooding is an annual occurrence in some parts of the watershed. While soil and water conservation practices on the land will help to reduce runoff, some structural measures might be necessary to alleviate the problems.

Multi-purpose reservoirs, farm ponds and other water detention structures are encouraged by the Mangers. Some diking might be necessary to protect low lands from water overflow.

To provide for orderly development of flood control and water conservation measures the following rules shall govern:

A. A permit shall be secured from the District prior to the construction, alteration, or removal of any reservoir or water impoundment structure.

B. A permit shall be secured form the District before a dike is constructed, altered, or removed on or near any drainageway, or any lake or marsh.

C. Normal maintenance which does not decrease the effectiveness of a structure, or harvesting of grass from a water impoundment structure or dike may be done without a permit.

D. No permit is needed for construction of pits or dugouts.

9. Accelerated Soil Erosion Caused by Construction:

A. A permit shall be obtained from the District prior to the start of any road or building construction or land development activities including ditching, grading, stripping, cutting orfilling which would:

1. Remove top soil and/or vegetation from an area one acre or more.

2. Increase, concentrate, or dispose of runoff on a temporary or permanent basis which might cause or increase soil erosion.

B. A request for such a permit shall include plans for the construction which shall include a description of the erosion control measures to be followed during and after construction. A work schedule and time table for erosion control measures and construction shall be included in the plan.

C. Individuals or developers carrying out the erosion control measures for a permit, and all subsequent owners of the property involved, shall effectively maintain all erosion control features.

10. Bridges, Culverts, and Drains:

No bridge, culvert, or drain shall be constructed, reconstructed, laid, to or across any natural, legal, or private drainageway without a permit from the Managers. They shall be suitably located, have adequate waterway openings and shall have adequate shoulder and bank protection.

11. Water Use Permit:

A permit shall be obtained from the District to appropriate surface or underground water for irrigation, municipal, or industrial use. No permits are required for individual dwellings or farm water supplies.

12. Shoreland Protection and Floodplain Zoning:

Each of the counties involved in the District have established or will establish Shoreland Protection and Floodplain Zoning regulations in accordance with Minnesota State criteria. Procedures for administration of these regulations have been developed by each county. The District will adopt and comply with these regulations and the counties will retain the administration of the regulations.

13. Wildlife:

The Managers will encourage private land owners to retain non-agricultural land for wildlife purposes. They will cooperate with state and federal agencies and private persons and organizations in their habitat development and land purchase programs.

A. No marsh shall be drained without a permit from the District.

B. A permit is required from the District prior to any land acquisition for wildlife habitat by state and federal agencies and by private persons and organizations.

14. Penalty:

In the event of a violation or a threatened violation of these rules and regulations, the Managers may institute appropriate actions or proceedings to prevent, restrain, correct, or abate such violations or threatened violations as provided for by Minnesota Statutes 103D.545, Subd. 2.

15. Appeal:
Any party aggrieved by the adoption or enforcement of these rules and regulations or by any order of the Managers thereof may appeal in accordance with the appellate procedure and review as provided in Minnesota Statutes, Chapter 103D.537.

16. Changes in Rules and Regulations:
All changes in these rules and regulations shall be made with the approval of the Advisory Committee. Any person or public corporation may petition the Managers for such changes. The Managers may initiate changes in these rules and regulations.

17. Effective Date:
These rules and regulations were adopted pursuant to Minnesota Statutes, Chapter 103D, on the 14th day of November, 1972.

18. DNR General Permiting:
General Permit #97-4241 authorizes the UMRWD to issue permits for various types of activities in protected waters.

Permitable activities include the installation of natural riprap rock; replacement of bidges and culverts (in kind); channel cleanouts in altered natural watercourses; installation of outlets for landlocked basins (above the OHW); and bioengineering erosion control. All work must be done in accordance with all the general and special provisions that follow and those that are applicable based on project type.

GENERAL PROVISION

1. The permittee is not released from any rules, regulations, requirements or standards of any applicable federal, state or local agencies; including, but not limited to, the U.S. Army Corps of Engineers, Board of Water and Soil Resources, MN Pollution Control Agency, watershed districts, water management organizations, county, city and township zoning. This permit does not release the permittee of any permit requirement of the St. Paul District, U.S. Army Corps of Engineers, Army Corps of Engineers Center, 190 Fifth Street East, St. Paul, MN 55101-1638.

2. This permit is not assignable by the permittee except with the written consent of the Commissioner of Natural Resources.

3. The permittee shall notify the UMRWD at least five days in advance of the commencement of the work authorized hereunder and notify him/her of its completion within five days.

4. The permittee shall make no changes, without written permission previously obtained from the UMRWD Board of Managers in the dimensions, capacity, or location of any items of work authorized hereunder.

5. The permittee shall grant access to the site at all reasonable times during and after construction to authorized representatives of the UMRWD for inspection of the work authorized hereunder.

6. This permit amy be terminated by the UMRWD at any time deemed necessary for the conservation of water resources of the state, or in the interest of public health and welfare, or for violation of any of the provisions or applicable law of this permit, unless otherwise provided in the Special Provisions.

7. Construction work authorized under this permit shall be completed on or before the date specified above. The permittee may request an extension of time to complete the project, stating the reason thereof, upon written request to the UMRWD.

SPECIAL PROVISIONS

RIPRAP PROTECTION PROJECTS

1. The riprap materials shall consist of a gradation of natural rock of sufficient size, quality, and thickness to withstand ice and wave action. The riprap shall be ungrouted.

2. The minimum finished slope shall be no steeper than 2:1 (horizontal to vertical).

3. A filter consisting of geotextile fabric and/or well-graded gravel or crushed stone is installed to prevent undercutting of the riprap.

4. The encroachment into the water is the minimum amount necessary to provide protection and does not unduly interfere with the flow of water. The maximum encroachment waterward of the ordinary high water elevation is 10 feet.

5. The riprap shall conform with the natural alignment of the shoreline (i.e., maintaining an undulating or meandering shoreline). At each end of the stabilized shoreline, the finished slope of the riprap shall be varied in a fashion to produce a smooth transition with the natural shoreline.

6. The sub-permittee shall routinely inspect the authorized project and any needed maintenance work. Prior to commencing any maintenance work, the sub-permittee shall advise the Upper Minnesota Watershed District of the extent and method of maintenance. Maintenance shall not be commenced until sub-permittee receives written approval from the Upper Minnesota Watershed District.

EXCAVATION FOR BIOENGINEERING (I.E., SHORELINE/BANK STABILIZATION WITH PLANT MATERIALS

1. The project must be approved by the DNR Area Fisheries Manager (320) 839-2656. If aquatic plants (seed or root stock) are proposed to be transplanted from another basin or supplied by a vendor, an Aquatic Plant Management permit must be obtained from DNR-Section of Fisheries.

2. The project shall not involve cribs, tree anchoring or other bioengineering methods that encroach on the shoreline, streambank profile or floodway (note: permitted methods include: willow wattling, brush layering, willow-posts, etc.).

EXCAVATION IN ALTERED NATURAL WATERCOURSES

Permits shall only be issued for removal of accumulated silt and sediment on altered natural watercourses where channel maintenance has been conducted within the last 25 years and there is no forested buffer strip. Finished sideslopes are to be 3:1 or less steep.

1. Adequate methods shall be employed where necessary to prevent and/or correct erosion of channel banks resulting from entry of surface waters from adjacent lands and/or tributaries. Such methods may include drop structures, inlet pipes, riprap, and establishment and maintenance of vegetation.

The authorized work shall be done only under low flow conditions to minimize erosion and siltation caused by excavation.

Spoil material is to be placed landward of the grassed buffer strip, in an upland area. (Channel improvment-deepening or enlargement is not allowed).

The Sub-Permittee shall level all spoil piles to a depth of less than 1-foot and seed to grasses and/or legumes all side slopes, plus a strip of land 16.5 feet wide (minimum) along both sides of the new channel. This work shall be completed as soon as spoil material moisture conditions allow and within 180 days of completion of the excavation. The grassed strips shall not be mowed until after July 31 of each year.

Excavation which shall partially or wholly drain protected waters or wetlands is NOT authorized under this permit. All channel excavation authorized under this general permit is prohibited within 500 feet of any DNR Protected Waters or Wetlands. Contact the UMRWD if work is proposed within 500 feet of a protected lake or wetland.

INKIND REPLACEMENT OF BRIDGE & CULVERTS

1. A DNR Protected Waters Permit is required if the structure serves a water level control for a "Protected Waters Basin."

2. The Sub-Permittee is responsible for maintaining existing navigation and access to navigation.

3. Barn and cliff swallows often nest under bridges. Both of these species are protected by federal and state law. The permittee is responsible to determine if swallows nest under this bridge. If so, it will be necessary to obtain a U.S. Fish and Wildlife Service permit to destroy swallow nests or eggs. The permittee should be aware of the policy to not grant such permits if the eggs have hatched and young are still in the nest. For questions regarding the federal permit, contact the U.S. Fish and Wildlife Service at 612-725-3530.

4. The culvert nearest the deepest potion of the stream channel shall be depressed six inches to concentrate low stream flows within this culvert and allow for free passage for fish migration.

5. All material in, or resulting from the demolition of the existing structure shall be completely removed from the floodplain of the river and disposed of in accord with all local, state, or federal regulation.

6. Unless otherwise authorized, MDOT Class III natural rock riprap shall be used to armor both the upstream and downstream ends of the culvert(s). The channel banks and roadway embankment shall be shaped to a 3:1 (horizontal:vertical) finished slope. Riprap shall be placed along the channel and roadway embankment to an elevation one foot above the top of the culvert. Riprap shall be a minimum of 1.5 feet thick and extend at least 25 feet from the ends of the culvert(s).

7. No access roads or temporary channel diversions to aid in construction of any project are allowed below the OHW of public waters unless specifically authorized in writing by the Division of Waters.

8. No change in the existing flowline/gradient shall occur unless specifically authorized in writing by DNR Waters.

9. For the replacement of existing structure, stage increase for the regional (100 year) flood may be allowed up to that created by the existing structure provided there are no structures in the reach affected by the stage increase. For new structures, the maximum increase in the regional flood is 0.5 foot or the more restrictive provisions of a local government floodplain ordinance. Stage increases in excess of these thresholds must be approved in writing by the Department.

10. This permit is not valid until completion of environmental review if the bridge/culvert construction is part of a road project that includes other features that require a mandatory Environmental Assessment Worksheet. The Environmental Assessment Worksheet results may change the location or conditions of this permit.

OUTLETS FOR LANDLOCKED BASINS

1. Proposed control elevation must be above Ordinary High Water Level.

2. Outlet rights and/or flowage eastments for the proposed discharge have all been obtained.

3. The project is implemented in a manner that will not cause significant erosion and/or flooding to downstream areas (i.e. limiting flow rate, restricting outflow to non-flooding periods & employing adequate energy dissipation structures at the point of discharge).

Appendix F

BIG STONE LAKE RESTORATION

DESCRIPTION OF PROGRAM ELEMENTS FOR PHASE III

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DESCRIPTION OF PROGRAM ELEMENTS FOR PHASE III

The Upper Minnesota River Watershed District (UMRWD) completed Phase II Final Report, Effectiveness of Lake Restoration Measures for Big Stone Lake, in October 1994. The report evaluated the effectiveness of various restoration alternatives implemented by the UMRWD and Roberts Conservation District (South Dakota), the local project sponsors, since 1984. The report also evaluated the improvement in water quality since implementation of restoration measures began in 1984, established technically feasible water quality goals and made recommendations for additional implementation measures to ensure continuing improvement of water quality within Big Stone Lake. This document identifies and describes the program elements to be completed by the UMRWD during Phase III, in order to implement the specific recommendations from the study, and the estimated cost of each program element.

Program Element 1.0 - Flow and Lake Sediment Monitoring

Task 1.1 - Purchase and Installation of Flow and Precipitation Monitoring Equipment

The Phase II Final Report identifies flow measurement with select tributaries to Big Stone Lake as a priority. Sufficient chemistry data have been previously gathered by UMRWD and Roberts Conservation District to establish relationships between water quality and flow for Minnesota tributaries to the lake. However, the Phase II Final Report also shows that nutrient and solids loads to Big Stone Lake vary by many orders of magnitude, depending upon the type of hydrologic year and the amount of runoff. The purpose of this Program Element is to purchase and install continuous electronic stage recorders on previously monitored Minnesota streams, tributary to Big Stone Lake. These tributaries are the Little Minnesota River, Hoss Creek, Fish Creek, Solmonsen Creek, and Meadowbrook Creek. These locations will also be instrumented with electronic rain gages, installed at or near the same locations as the continuous stage recorders.

The UMRWD has established a permanent repository for flow and chemistry data generated during the Big Stone Lake project. These data are stored in Lotus 1-2-3 files and available for immediate use with the FLUX model. Flow data gathered as a part of this program element will be added to this data repository. With the new electronic instrumentation, these data will be available for real-time analysis of flows and loads.

The primary product as a result of this task will be the installation of the 5 continuous stage recorders and rain gages, the collection of these data, and the reduction of these data into the Lotus 1-2-3 format suitable for use within FLUX.

Task 1.2 - Nutrient Release from Sediment

Currently implemented restoration measures and new measures being proposed, are directed toward reducing nutrient loads from subwatersheds to Big Stone Lake. One additional source of nutrients is the lake sediment. Within the Phase II Final Report, estimates were made of the amount of phosphorus released to the water column. These estimated were based on presently available information.

The Phase II report identified the lack of data about the importance of sediment as a source of phosphorus, as an important piece of information needing verification to ensure the success of the restoration measures. The purpose of this program element is perform sediment experiments to determine the rate of release of phosphorus. The experiments will be performed by extracting sediment cores from the lake and performing the analysis within the laboratory.

The primary product as a result of the task will be a brief memorandum describing the importance of phosphorus released from sediments, in relation to external loads during dry, normal and wet hydrologic seasons.

Program Element 2.0 - Riparian Restoration Pilot Project

The purpose of this program element is to establish a riparian restoration pilot project, within the Minnesota portion of the Big Stone Lake watershed. One potential location is within the Meadowbrook Creek subwatershed. The lower portion of Meadowbrook Creek is experiencing accelerated and excessive erosion as a result of intensive grazing. This program element would consist of developing a detailed plan for restoring the riparian area and implementing the plan. Activities to be considered in developing the plan consist of alternative grazing regimes, animal exclusion through fencing, revegetation and plantings, and bio-engineered bank stabilization methods. Activities considered during development of the plan will closely follow the stream classification concepts developed by Rosgen (1988).

Specific activities performed during the completion of this program element include:

1) Identify willing land owners to participate in the pilot project;

2) Perform the needed site survey;

3) Prepare a preliminary plan. The preliminary plan will include drawings showing the design of the riparian area. The preliminary plan will also include a most probable estimate of cost completion for the project.

4) Upon completion of the preliminary plan, conduct meetings with the public and interested agencies to evaluate support for the pilot project and evaluate whether to proceed with final plans and the preparation of specifications.

The primary "deliverable" as a result of the completion of this task will be the preliminary plan and a completed restoration pilot project.

Program Element 3.0 - Conservation Tillage Practices Cost Share Program

Nonpoint pollution is generally considered to be a result of land use practices. Certain land use practices contribute greater nonpoint sources of nutrients and sediment than others. The Phase II study identified target load reductions for 2 priority subwatersheds, within the Minnesota portion of the Big Stone Lake Watershed. The report also included estimates of the acreage needing conservation tillage practices to achieve the water quality goals. ___ and ___ acres are the estimated acreage needing treatment within the Hoss Creek and ____ Creek subwatersheds. Conservation tillage is considered one method of achieving load reductions at the source of the problem. During the completion of this program element, the UMRWD will also establish a useable GIS system, to assist in the planning process.

Specific activities completed during this task include:

1) Obtain the land use data for the Minnesota portions of the Big Stone Lake watershed, from the Board of Water and Soil Resources (BWSR). Overlay the watershed map developed during the Phase II study on the land use data. Develop land use statistics by subwatershed, within the Minnesota portion of the watershed. Forward these data to the SCS, Sisseton, South Dakota.

2) Using the GIS and estimated erosion rates, Identify tracts of land within the 2 priority

subwatersheds for conservation tillage practices. This identification should include Conservation Reserve Program lands coming into production and estimates of the potential load from each of the tracts of land.

2) Identify whether the land owners of these tracts are willing to participate in this cost share program;

3) Establish a cost share rate structure for the landowners, based on the conservation tillage practice, being implemented.

4) Ensure conservation tillage practices (i.e. permanent cover, no-till, minimum till) are implemented, when cost share is provided.

The primary product as a result of the completion of this task will be the establishment of a cost share program, for a duration of ___ years.

Program Element 4.0 - Suspended Sediment Reduction, Little Minnesota River

Suspended sediment within the Little Minnesota River is identified within the Phase II report, as one of the primary water quality problems for Big Stone Lake. Associated with the sediment being transported by the Little Minnesota River are nutrients like phosphorus. A reduction of the sediment load being delivered by the Little Minnesota River, has the potential to greatly improve the water quality of Big Stone Lake.

The Soil Conservation Service, Sisseton, South Dakota, and Robert Conservation District, have implemented a conservation program within the Little Minnesota River subwatershed. Their goal is a 40% reduction in total phosphorus load, through the implementation of these conservation measures. The UMRWD can assist in achieving this goal. The UMRWD proposes two activities to assist with the reduction of sediment loads within the Little Minnesota River subwatershed.

Task 4.1 - Identification of the Source of Suspended Sediment

The first activity is to establish a monitoring program to determine the sources of sediment being delivered by the Little Minnesota River, to Big Stone Lake. This task will determine the amount of suspended sediment as bed load, bank erosion rates, and suspended sediment. The proportion of phosphorus associated with the sediment will also be determined. Specific activities completed during this task include:

1) The design of the sediment monitoring program. The design will use U.S.G.S. procedures and guidance. The design will include the selection of a representative stream reach, surveying the reach to determine stream geometry, installing flow monitoring equipment, the installation of bank "pins" to determine erosion rates, and sampling using bed load and suspended sediment samplers.

2) Performing the sediment sampling and resurveying the site during a 2 year study period. It is anticipated that erosion rates are sufficiently large to evaluate changes during a 2 year period.

3) Statistically reduce and analyze the data.

4) Summarize the results in a Technical Memorandum for review by area residents, project sponsors, and agency staff.

The primary product as a result of the completion of this task will be the Technical Memorandum.

This memorandum will be available for review by area residents, project sponsors and agency staff. The memorandum will provide needed information about how much sediment comes directly from agricultural land versus the stream channel. These data will allow an assessment of the effectiveness of conservation tillage type practices in improving the water quality of Big Stone Lake.

Task 4.2 - Sediment Storage and Water Quality Treatment Pilot Project

The Phase II report provided the conceptual design for a project along the Little Minnesota River, which would divert high flows from the river to an area ("constructed wetland") for treatment. Although presented in concept, the feasibility of the project has not been evaluated in detail. The purpose of this task is develop a feasibility report for such a project. Items evaluated within the feasibility report include possible locations for constructing a system, design flows, surface area needed, influent and effluent quality, anticipated treatment efficiencies, maintenance requirements, and an estimated cost.

Specific activities performed during the completion of this element include:

1) Identify willing land owners and potential locations for the pilot project;

2) Perform the needed site survey;

3) Prepare a preliminary design report. The preliminary design report will also include a most probable estimate of cost completion of the project.

4) Upon completion of the preliminary design, conduct meetings with the public and interested agencies to evaluate support for the pilot project and evaluate whether to proceed with final design and the preparation of specifications.

The primary product as a result of the completion of this task will be the preliminary design report. This document will be available for review by area residents, project sponsors and agency staff. Information will be provided to the public through the public education program element.

Program Element 5.0 - Wetland Restorations

The UMRWD has a history of restoring wetlands within the watershed to Big Stone Lake. The purpose of this element is to obtain the needed funding to restore ____ wetlands during the next ____ years. This effort will continue to be coordinated with the U.S. Fish and Wildlife Service, the Board of Water and Soil Resources, the Soil Conservation Service, the Minnesota Pollution Control Agency and local resource agencies.

Program Element 6.0 - Septic System Program

Septic systems have been identified as a potential problem affecting water quality. The Phase II Final Report estimated loads from septic systems and identified them as a controllable source of nutrients. However, the number of failing systems in unknown. The purpose of this program element is to establish a cost share inspection and testing program for septic systems.

Specifically, during this program element the UMRWD will work with local agencies to:

1) Establish an inspection program for septic systems;

2) Perform inspections to determine whether individual systems are failing;

3) Provide recommendations to lakeshore homeowners for the installation of needed improvements.

The primary product as a result of the completion of this program element will be the establishment of a cost share program for providing the inspection services and making recommendations.

Program Element 7.0 - Public Education Program

An aggressive public education program has been the cornerstone of the Big Stone Lake project. Public education is essential to the continued success of this project. The purpose of this program element is to ensure the existence of an aggressive program for disseminating information to the public and providing a mechanism for public input to the process. Specific activities to be completed during this program element include:

1) Develop a Public Information and Education Plan. It is anticipated that this plan will include biannual newsletters to area residents, public meetings at key decision points, the development of informational literature, and a schedule for press releases to local and regional media.

2) Continue conducting surveys to identify the views and desires of area residents, project sponsors and agency staff.

3) Implement the public information and education plan.

The primary product as a result of the completion of this task will be the development of the Public Information and Education Plan and completion of the plan.

Restoration Activity	Estimated Annual Load Reduction					
	Total Solids		Total Phosphorus [11]		Total Nitrogen	
	(kg/yr)	(lb/yr)	(kg/yr)	(lb/yr)	(kg/yr)	(lb/yr)
Permanent Cover[1,5]	503,437	1,109,871	302	666	10,069	22,197
No-till[2,5]	212,285	468,000	127	281	4,246	9,360
Ridge till[3,5]	776,255	1,711,320	466	1,027	15,525	34,226
Mulch till[3,5]	565,208	1,246,050	339	748	11,304	24,921
15-30% residue[3,5]	1,117,441	2,463,494	145	319	4,819	10,624
Less than 15% residue[3,5]	240,952	531,200	670	1,478	22,349	49,270
Animal Waste Management Units[4]	ne	ne	2,640	5,820	2,048	4,514
Wastewater Treatment Plants[6]						
Browns Valley, MN	ne	ne	277	611	ne	ne
Sisseton, SD	ne	ne	825	1,818	ne	ne
Lake Level Management[7,9]	6,367	14,037	708	1,560	56,596	124,771
Whetstone River Flow Diversion[8,9]	939	2,070	104	230	835	1,840
Wetland Restoration[10]	10,491	23,129	14	30	137	303
Total	3,433,376	7,569,170	3,977	8,768	125,879	277,512

[1] Costs for permanent cover are $55/acre (CRP Minnesota), $45/acre (CRP South Dakota), $418.90/acre (RIM Minnesota) and $20.30/acre (other permanent Cover, South Dakota). Costs for total phosphorus range from $24.10/lb (permanent cover) to $52.20/lb (CRP).

[2] No-till costs are $30/acre (Minnesota) and $21.30/acre (South Dakota). Costs for total phosphorus range from $24.20/lb - $34.20/lb.

[3] No cost available.

[4] Loads are for 25-year design storm and not comparable to annual load - only for information purposes. Estimated cost is ~ $20,300/AWM. Load is excluded from total.

[5] See Appendix J for calculation method and assumptions; assumes 2% delivery to Big Stone Lake.

[6] Assumes entire amount delivered to lake. Cost for total phosphorus control for facilities combined is ~ 315/lb.

[7] Assumes release of 0.3 meters of water (15.6 hm^3) with average total phosphorus, total nitrogen, and total solids concentrations of 100 ug/l, 800 ug/l and 900 ug/l.

[8] Based on average annual flow to the lake prior to construction (1985 and 1986) of 8.4 hm^3/year in Little Minnesota River watershed and post contstruction (1987-1991) of 6.1 hm^3/year and concentrations of 100 ug/l total phosphorus, 800 ug/l total nitrogen and 900 ug/l total solids.

[9] Estimated cost is $3120/lb; calculated by combined load reduction from lake level managment and whetsone river diversion.

[10] Assumes total suspended solids yield of 49.9 lb/acre/year, total phosphorus yield of 0.194 lb/acre/year and total nitrogen yield of 0.979 lb/acre/year (see Table 5-2; mean values for Meadowbrook Creek). Assumes 90% total suspended solids removal, 30% total phosphorus removal and 60% total nitrogen removal.

[11] Estimated annual total phosphorus load ranges from 21,916 kg/yr in normal hydrologic year to 82,560 kg/yr in wet hydrologic year.

BIG STONE LAKE
RESTORATION PROJECT

Big Stone Lake
Summary of Big Stone Lake Implementation Projects
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Appendix F

BIG STONE LAKE RESTORATION

DESCRIPTION OF PROGRAM ELEMENTS FOR PHASE III

BIG STONE LAKE RESTORATION
DESCRIPTION OF PROGRAM ELEMENTS FOR PHASE III

The Upper Minnesota River Watershed District (UMRWD) completed Phase II Final Report, Effectiveness of Lake Restoration Measures for Big Stone Lake, in October 1994. The report evaluated the effectiveness of various restoration alternatives implemented by the UMRWD and Roberts Conservation District (South Dakota), the local project sponsors, since 1984. The report also evaluated the improvement in water quality since implementation of restoration measures began in 1984, established technically feasible water quality goals and made recommendations for additional implementation measures to ensure continuing improvement of water quality within Big Stone Lake. This document identifies and describes the program elements to be completed by the UMRWD during Phase III, in order to implement the specific recommendations from the study, and the estimated cost of each program element.

Program Element 1.0 - Flow and Lake Sediment Monitoring

Task 1.1 - Purchase and Installation of Flow and Precipitation Monitoring Equipment

The Phase II Final Report identifies flow measurement with select tributaries to Big Stone Lake as a priority. Sufficient chemistry data have been previously gathered by UMRWD and Roberts Conservation District to establish relationships between water quality and flow for Minnesota tributaries to the lake. However, the Phase II Final Report also shows that nutrient and solids loads to Big Stone Lake vary by many orders of magnitude, depending upon the type of hydrologic year and the amount of runoff. The purpose of this Program Element is to purchase and install continuous electronic stage recorders on previously monitored Minnesota streams, tributary to Big Stone Lake. These tributaries are the Little Minnesota River, Hoss Creek, Fish Creek, Solmonsen Creek, and Meadowbrook Creek. These locations will also be instrumented with electronic rain gages, installed at or near the same locations as the continuous stage recorders.

The UMRWD has established a permanent repository for flow and chemistry data generated during the Big Stone Lake project. These data are stored in Lotus 1-2-3 files and available for immediate use with the FLUX model. Flow data gathered as a part of this program element will be added to this data repository. With the new electronic instrumentation, these data will be available for real-time analysis of flows and loads.

The primary product as a result of this task will be the installation of the 5 continuous stage recorders and rain gages, the collection of these data, and the reduction of these data into the Lotus 1-2-3 format suitable for use within FLUX.

Task 1.2 - Nutrient Release from Sediment

Currently implemented restoration measures and new measures being proposed, are directed toward reducing nutrient loads from subwatersheds to Big Stone Lake. One additional source of nutrients is the lake sediment. Within the Phase II Final Report, estimates were made of the amount of phosphorus released to the water column. These estimated were based on presently available information.

The Phase II report identified the lack of data about the importance of sediment as a source of phosphorus, as an important piece of information needing verification to ensure the success of the restoration measures. The purpose of this program element is perform sediment experiments to determine the rate of release of phosphorus. The experiments will be performed by extracting sediment cores from the lake and performing the analysis within the laboratory.

The primary product as a result of the task will be a brief memorandum describing the importance of phosphorus released from sediments, in relation to external loads during dry, normal and wet hydrologic seasons.

Program Element 2.0 - Riparian Restoration Pilot Project

The purpose of this program element is to establish a riparian restoration pilot project, within the Minnesota portion of the Big Stone Lake watershed. One potential location is within the Meadowbrook Creek subwatershed. The lower portion of Meadowbrook Creek is experiencing accelerated and excessive erosion as a result of intensive grazing. This program element would consist of developing a detailed plan for restoring the riparian area and implementing the plan. Activities to be considered in developing the plan consist of alternative grazing regimes, animal exclusion through fencing, revegetation and plantings, and bio-engineered bank stabilization methods. Activities considered during development of the plan will closely follow the stream classification concepts developed by Rosgen (1988).

Specific activities performed during the completion of this program element include:

1) Identify willing land owners to participate in the pilot project;

2) Perform the needed site survey;

3) Prepare a preliminary plan. The preliminary plan will include drawings showing the design of the riparian area. The preliminary plan will also include a most probable estimate of cost completion for the project.

4) Upon completion of the preliminary plan, conduct meetings with the public and interested agencies to evaluate support for the pilot project and evaluate whether to proceed with final plans and the preparation of specifications.

The primary "deliverable" as a result of the completion of this task will be the preliminary plan and a completed restoration pilot project.

Program Element 3.0 - Conservation Tillage Practices Cost Share Program

Nonpoint pollution is generally considered to be a result of land use practices. Certain land use practices contribute greater nonpoint sources of nutrients and sediment than others. The Phase II study identified target load reductions for 2 priority subwatersheds, within the Minnesota portion of the Big Stone Lake Watershed. The report also included estimates of the acreage needing conservation tillage practices to achieve the water quality goals. ___ and ___ acres are the estimated acreage needing treatment within the Hoss Creek and ____ Creek subwatersheds. Conservation tillage is considered one method of achieving load reductions at the source of the problem. During the completion of this program element, the UMRWD will also establish a useable GIS system, to assist in the planning process.

Specific activities completed during this task include:

1) Obtain the land use data for the Minnesota portions of the Big Stone Lake watershed, from the Board of Water and Soil Resources (BWSR). Overlay the watershed map developed during the Phase II study on the land use data. Develop land use statistics by subwatershed, within the Minnesota portion of the watershed. Forward these data to the SCS, Sisseton, South Dakota.

2) Using the GIS and estimated erosion rates, Identify tracts of land within the 2 priority

subwatersheds for conservation tillage practices. This identification should include Conservation Reserve Program lands coming into production and estimates of the potential load from each of the tracts of land.

2) Identify whether the land owners of these tracts are willing to participate in this cost share program;

3) Establish a cost share rate structure for the landowners, based on the conservation tillage practice, being implemented.

4) Ensure conservation tillage practices (i.e. permanent cover, no-till, minimum till) are implemented, when cost share is provided.

The primary product as a result of the completion of this task will be the establishment of a cost share program, for a duration of ___ years.

Program Element 4.0 - Suspended Sediment Reduction, Little Minnesota River

Suspended sediment within the Little Minnesota River is identified within the Phase II report, as one of the primary water quality problems for Big Stone Lake. Associated with the sediment being transported by the Little Minnesota River are nutrients like phosphorus. A reduction of the sediment load being delivered by the Little Minnesota River, has the potential to greatly improve the water quality of Big Stone Lake.

The Soil Conservation Service, Sisseton, South Dakota, and Robert Conservation District, have implemented a conservation program within the Little Minnesota River subwatershed. Their goal is a 40% reduction in total phosphorus load, through the implementation of these conservation measures. The UMRWD can assist in achieving this goal. The UMRWD proposes two activities to assist with the reduction of sediment loads within the Little Minnesota River subwatershed.

Task 4.1 - Identification of the Source of Suspended Sediment

The first activity is to establish a monitoring program to determine the sources of sediment being delivered by the Little Minnesota River, to Big Stone Lake. This task will determine the amount of suspended sediment as bed load, bank erosion rates, and suspended sediment. The proportion of phosphorus associated with the sediment will also be determined. Specific activities completed during this task include:

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3) Statistically reduce and analyze the data.

4) Summarize the results in a Technical Memorandum for review by area residents, project sponsors, and agency staff.

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Task 4.2 - Sediment Storage and Water Quality Treatment Pilot Project

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1) Identify willing land owners and potential locations for the pilot project;

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