THE KANDIYOHI COUNTY COMPREHENSIVE LOCAL WATER PLAN

South Long Lake, Kandiyohi County

January 2003 - December 2012

Focus Plan: 2003 to 2007

Prepared by Kandiyohi County and the Mid-Minnesota Development Commission

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COUNTY COMMISSIONERS

Richard Falk, Willmar
Richard Larson, Willmar
Harlan Madsen, Lake Lillian
Dennis Peterson, Spicer
Bruce Shuck, Sunburg (2002)
Dean Shuck, Sunburg

WATER PLAN STAFF

Jeff Bredberg, Water Plan Coordinator

WATER PLAN TASKFORCE

Member	*Representing*
Duane Anderson	Township Officer
Robert Brauchler	North Fork Crow River Watershed District
Alan Carlson	Resort Owners
Kevin Clough	Kandiyohi County SWCD Supervisor
Dave Dunn	Coalition of Lake Associations
Hubert Fixsen	Soybean Growers
Larry Knutson	Municipalities
Harlan Madsen	County Commissioner
Roger Molenaar	Tile and Drainage
Donovan Monson	Corn Growers
Bryan Nelson	Onsite Sewage Treatment Systems
Brian Olson	Township Officer
Dennis Peterson	County Commissioner
Dale Scheffler	Agri-Business
Dalette Schwalboski	Ducks Unlimited
Mike Steffl	Well Drillers
David Stuhr	Lake Association
Ronald Thorson	Irrigation

WITH SPECIAL ASSISTANCE FROM:

Tom Fischer, Board of Water and Soil Resources
Kandiyohi County Soil and Water Conservation District

Kandiyohi County Comprehensive Local Water Plan
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Common Acronyms

ACOE	Army Corps of Engineers
BMP	Best Management Practice
BWSR	Minnesota Board of Water and Soil Resources
CD	County Ditch
CLMP, CSMP	Citizen Lake (Stream) Monitoring Program
CLWP	Comprehensive Local Water Plan
CR	Chippewa River Watershed
CREP	Conservation Reserve Enhancement Program
CROW	Crow River Organization of Water
CRP	Conservation Reserve Program
CWI	County Well Index
CWP	Clean Water Partnership
DA	Ditch Authority
DNR	Minnesota Department of Natural Resource
EPA	U.S. Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
ES	Environmental Services
FEMA	Federal Emergency Management Agency
HC	Hawk Creek Watershed
ISTS	Individual Sewage Treatment System
LAP	Lake Assessment Project
LGU	Local Governmental Unit
LMIC	Land Management Information Center
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MFCR	Middle Fork Crow River Watershed
MGS	Minnesota Geological Survey
MPCA	Minnesota Pollution Control Agency
MRBJPB	Minnesota River Basin Joint Powers Board
NFCR	North Fork Crow River Watershed
NRCS	Natural Resource Conservation Service
OHWL	Ordinary High Water Level
PH	Public Health Department
PW	Public Works Department
RIM	Reinvest in Minnesota Program
SFCR	South Fork Crow River Watershed
SWCD	Soil and Water Conservation District
TMDL	Total Maximum Daily Load
UMES	University of Minnesota Extension Service
USFWS	U.S. Fish and Wildlife Service
WCA	Wetland Conservation Act
WMA	Wildlife Management Area
WMLO	Watershed Management-like Organization
WPA	Waterfowl Production Area

Common Agency Websites

Agency/ Office	Website	Telephone
Army Corps of Engineers	http://www.usace.army.mil/	(651) 290-5200
Environmental Protection Agency	http://www.epa.gov/	(800) 621-8431
Minnesota Board of Water and Soil Resources	http://www.bwsr.state.mn.us/	(800) 627-3529
Minnesota Department of Natural Resources	http://www.dnr.state.mn.us/index.html	(800) 657-3929
Minnesota Planning	http://www.mnplan.state.mn.us/	(651) 296-3985
Minnesota Pollution Control Agency	http://www.pca.state.mn.us/	(800) 657-3864
Natural Resource Conservation Service	http://www.mn.nrcs.usda.gov/	(651) 602-7900
Minnesota Department of Health	http://www.health.state.mn.us/	(651) 215-5800
Minnesota Department of Agriculture	http://www.mda.state.mn.us/	(800) 967-2474
Minnesota Geological Survey	http://talc.geo.umn.edu/mgs/	(612) 627-4780
United States Fish and Wildlife Service	http://www.fws.gov/	(612) 713-5360
United States Geological Survey	http://www.usgs.gov/	(763) 783-3100

Glossary of Common Terms

Aquifer: A natural water-bearing geological formation (e.g., sand, gravel and sandstone) that is found below the surface of the earth.

Best Management Practices (BMP): A practice or practices that have been determined to be most effective, practical means of preventing or reducing pollution from nonpoint sources.

Discharge: The volume of water that passes a given location within a period of time.

Erosion Rate "T": "T" is the soil lost per year yet productivity remains for crop growth indefinitely. "T" values range from 1 ton/acre/year to 5 ton/acre/year.

Fecal Coliform Bacteria: The portion of coliform group of bacteria that originates in the intestinal tract of warm-blooded beings. It is used as an indicator of fecal waste pollution and it indicates the presence of other disease organisms.

Gauging Station: A site on a stream or lake or other body of water where direct systematic observations of hydrologic data are obtained.

Groundwater: The subsurface water supply in the saturated zone below the watertable.

Hydrology: The science of water, the study of water.

Nitrate: The NO3 anion. Nitrate is the most oxidized form of nitrogen and is a form readily available to plants. Nitrate molecules are negatively charged and do not adhere to soil particles, so it is subject to leaching.

Potable Water: Water of a quality suitable for drinking.

Rill Erosion: Similar to sheet wash but flow is concentrated in subtle swale in the surface topography. Again when the rate of rainfall exceeds soil infiltration on patches of bare soil, sheet erosion converges toward the swale forming rills. Fine particles separated from the soil aggregates make their way down slope. The velocity of rill flow is too slow to create gullies.

Sedimentation: The process or manner in which minerals (displaced soil particles), dissolved or organic material comes to rest on the earth's surface after being transported by water.

Sheet Erosion: Bare soil is exposed to raindrops that break up soil aggregates. If the rate of rainfall exceeds soil infiltration, a film of water 2-3 mm thick develops and flows as a sheet to lower elevations. This slowly and nearly invisibly removes the topsoil.

Total Maximum Daily Load (TMDL): Is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. States, Territories and Tribes set water quality standards. They identify the used for each waterbody, for example, drinking water supply, contact recreation (swimming) and aquatic life support (fishing), and the scientific criteria to support that use. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation must include a margin of safety to ensure that the waterbody can be used for the purposes the State has designated. The calculation must also account for seasonable variation in water quality. The Clean Water Act, section 303, establishes the water quality standards and TMDL programs.

Watershed: That surface area, which drains to a specified point on a watercourse (outlet), usually a confluence of streams or rivers.

Watershed Management-like Organizations: Includes Clean Water Partnerships, Lake Associations, Watershed Districts and Watershed Projects.

INTRODUCTION TO THE KANDIYOHI COUNTY COMPREHENSIVE LOCAL WATER PLAN

Comprehensive Local Water Management Act

The Comprehensive Local Water Management Act (Minnesota Statutes Sections 103B.301 to 103B.355) encourages counties to develop and implement a comprehensive water plan. Pursuant to the requirements of the law, this plan:

- Covers the entire area of the County;
- Addresses water problems in the context of watershed units and groundwater systems;
- Is based upon principles of sound hydrologic management of water, effective environmental protection and efficient management;
- Is consistent with comprehensive water plans prepared by counties and watershed management organizations wholly or partially within a single watershed unit or groundwater system; and
- The comprehensive water plan must specify the period covered by the comprehensive water plan and must extend at least five years, but no more than ten years, from the date the Board of Water and Soil Resources (BWSR) approves the comprehensive water plan. Comprehensive water plans that contain revision dates inconsistent with this section must comply with that date, provided it is not more than ten years beyond the date of BWSR approval. A two-year extension of the revision date of a comprehensive water plan may be granted by BWSR, provided no projects are ordered or commenced during the period of the extension.

To ensure that these objectives are realized, the Comprehensive Local Water Management Act further specifies the basic contents of the comprehensive water plan to contain:

- A description of the existing and expected changes to physical environment, land use and development in the County;
- Available information about the surface water, groundwater and related land resources in the County, including existing and potential distribution, availability, quality and use;
- Objectives for future development, use and conservation of water and related land resources, including objectives that concern water quality and quantity, and sensitive areas, wellhead protection areas, high priority areas for wetland preservation, enhancement, restoration, and establishment, stormwater management for developing areas, and related land use conditions, and a description of actions that will be taken in affected watersheds or groundwater systems to achieve the objectives;
- A description of potential changes in State programs, policies and requirements considered important to the management of water resources in the County;

- A description of conflicts between the comprehensive water plan and existing plans of other local units of government;
- A description of possible conflicts between the comprehensive water plan and existing or proposed comprehensive water plans of other counties in the affected watershed units or groundwater systems;
- A program for implementation of the plan that is consistent with the plan's management objectives and includes schedules for amending official controls and water and related land resources plans of local units of government to conform with the comprehensive water plan, and the schedule, components, and expected State and local costs of any projects to implement the comprehensive water plan that may be proposed, although this does not mean that projects are required by this section; and
- A procedure for amending the comprehensive water plan.

Comprehensive Water Management Plan

This plan is divided into seven major sections:

- Introduction
- Chapter 1: County Profile
- Chapter 2: Physical Environment, Land Use and Development
- Chapter 3: Hydrologic Inventory
- Chapter 4: Special Land Uses and Conditions
- Chapter 5: Issues, Goals, Objectives and Actions
- Chapter 6: Plan Administration

The introduction identifies the statutory components of a comprehensive water plan, a general overview of plan content and describes the planning process that was utilized in the development of the plan.

Chapter one provides a generalized profile of Kandiyohi County. Information provided in this chapter includes the location of Kandiyohi County, a population profile and a description of watershed management-like organizations within the County.

Physical environment, land use and development, which comprises chapter two, includes a profile and assessment of the county's existing environmental conditions. This profile contains descriptions of Kandiyohi County's key natural resources, including information on the County's geology, topography, soils and watersheds. In addition, the County's physical development is outlined by examining current land use, major public investments (i.e. sewer, water, etc.) and conservation easements.

Chapter three, hydrologic inventory, contains information necessary to evaluate the condition of surface and groundwater resources in the County. The following information is included in this chapter: watershed boundaries, high, mean and low flows, established ordinary high water marks, permitted surface and groundwater withdrawals, conveyance systems and floodplains. In addition, both ground and surface water conflicts are identified in this chapter.

Chapter four, special land uses and conditions, inventories specific land uses that have the potential to impact water quantity and quality. Information discussed includes erodible soils, sedimentation, irrigation, drainage ditches, open dumps and landfills, feedlots, underground storage tanks, abandoned wells and hazardous waste generators. Wetlands, shoreland, and floodplains are presented in relation to existing conditions and current regulatory protection. Water-based recreation, fish and wildlife management and unique features and scenic areas conclude the chapter.

Issues, goals, objectives and actions comprise chapter five. This chapter reflects the purpose set forth in the Comprehensive Local Water Management Act and the desires of the County. Goals and objectives developed by the County define specific actions and provide a framework in which to address water management issues.

Chapter six contains information on plan administration, including plan coordination, implementation, schedule, role of the County in implementation, role of other agencies in implementation, recommended changes to State programs, intergovernmental conflicts/resolution process, major plan amendment procedure, minor plan amendment procedure and general information.

Description of the Planning Process

A multiple step planning process was utilized in the development of this plan, with special emphasis placed on involving local constituents, local governments, bordering counties and State agencies. The initial phase of this process involved an informational meeting to identify issues and concerns of the public. Issues identified through the public informational meeting process were used to establish the basis for the development of goals, objectives and actions for the plan.

The second phase of this process involved the appointment of a special Water Plan Revision Committee. Members of the committee consisted of Water Plan Taskforce members, various local and State governmental units, private industries and special interests of the County. The committee was responsible for reviewing the comments from the public informational meeting and developing goals, objectives and actions for the plan.

Once in draft form, State and local agencies were provided a 60-day period to review the plan. Following this review period, the County held a public hearing. Upon conduction of the public hearing, the draft plan, State and local comments and proceedings of the public hearing were submitted to the Board of Water and Soil Resources (BWSR) for review and approval.

Executive Summary

Submitted by: Jeff Bredberg, Kandiyohi County Water Planner

Kandiyohi County adopted the original Comprehensive Local Water Management Plan (CLWP) in December 1991. The first revision was completed by December 1995, and became effective January 1996, with an end date of December 31, 2001. The second revision of the Water Plan was to be completed by December 31, 2000, and effective January 1, 2001, but Kandiyohi County requested, and was granted, a two-year extension from the Board of Water and Soil Resources. The extension was requested based on numerous watershed projects already underway. This third generation Water Plan will be for the time period of January 2003 through December 2012 (ten years).

This third generation plan is organized and divided into six chapters. Chapter one is the introduction. Chapters two through four include the fifty-five data items required in the plan. These three chapters are broken down further to include Kandiyohi County's physical environment, land use and development, hydrologic inventory of Kandiyohi County and Kandiyohi County's special land uses and conditions. Chapter five, which probably is the most important section of the plan, identifies goals, objectives and actions pertaining to issues and concerns related to water issues in the County. Chapters six provides details on plan administration.

The CLWP is reviewed by the Water Plan Taskforce (WPTF), which sets priorities annually for the upcoming year when the Natural Resource Block Grant (NRBG) is submitted to the BWSR by the Water Plan Coordinator. The Work Plan, as prepared by the Water Plan Coordinator, incorporates all the priorities set forth by the WPTF. The 20-member taskforce meets quarterly and is appointed by the County Board. Each member shall serve on the taskforce for no more than a maximum of eight years. The taskforce represents a wide spectrum of individuals and businesses who are interested in water related activities in Kandiyohi County.

The WPTF implemented a cost share program for individuals and organizations requesting funds to implement projects related to surface and groundwater issues. Applicants requesting cost share funds present their project(s) to the WPTF, the taskforce then gives their recommendation to the County Board for a final decision. In the past, most of the requests for cost share funds came from individual lake associations. In the last few years more and more requests for cost share funds have come from watershed groups. Counties, government agencies, as well as lake associations are working cooperatively with one another in addressing concerns on water quality and quantity management activities inside and outside of Kandiyohi County's boundaries. These partnerships further strengthen our goals in addressing our concerns on water issues by providing additional finances and manpower to implement projects, sharing information, and avoiding duplication of certain tasks. Thus, increasing the efficiency and effectiveness of water planning and implementation.

Kandiyohi County is actively involved and is working cooperatively with other counties on three large watershed projects, the Chippewa River Watershed Project, Hawk Creek Watershed Project, and the Crow River Watershed Project. The three Watershed Projects encompass all of Kandiyohi County. Each of the watershed projects is in various stages of their MPCA Clean

Water Partnership Grants. The Chippewa River Watershed Project and the Hawk Creek Watershed Project are currently in MPCA Phase II Implementation, while the Crow River Watershed Project is a MPCA Phase I Diagnostic/Feasibility Study.

Other ongoing watershed projects in the County include the Diamond Lake Project, Upper Shakopee Watershed Project (USWP) and the Green Lake & Middle Fork Crow River Watershed Project (GLMFCRWP). The USWP includes the lakes of: Games, Norway, Andrew and Florida. The GLMFCRWP includes the lakes of: Green, Monongalia, Calhoun, Long, Nest, George and Elkhorn. The Diamond Lake Project and GLMFCRWP are funded through a MPCA Clean Water Partnership Grant with cash and/or in-kind services provided by the County, Lake Associations, government agencies and municipalities.

In 1999, a Wetland Restoration Project installed by the Willmar Senior High School was nominated by the WPTF and was awarded by the Board of Water and Soil Resources as the 1999 Local Water Plan Project of the Year. This Wetland Restoration Project provided wildlife habitat, educational opportunities to students and water quality benefits to nearby Willmar and Foot Lake. Numerous partners provided financial and technical assistance to complete this project.

Many CLWP actions have been accomplished or are being actively pursued in Kandiyohi County. Kandiyohi County has supported and allocated cash and/or in-kind services for the following activities:

Education & Information

- Conservation Credit Initiative Program, 1996.
- Seminar held by COLA, 1997.
- University of Minnesota, Jeff Lopez, Manure Management Program, 1997, 1998, 1999.
- Prairie Woods Environmental Learning Center, purchased educational equipment, 1997.
- Eagle Lake Management Plan, 1997.
- Kandiyohi County Area Conservation Association, educational equipment, 1998.
- Kandiyohi County purchased water test monitoring equipment for area lake assn., 1998.
- Member MRJPB, 1999, 2000.
- New London-Spicer School, Wolf Ridge Learning Center, 2000.
- Kandiyohi County Lakes Improvement Assn., Eurasian Millfoil. 2001.

Inventory & Mapping

- Abandoned well inventory.
- Kandiyohi County Environmental Service Office purchased G.I.S. system, 1998.
- MPCA Level I & Level II Feedlot Inventory.

Monitoring & Data Collection

- Middle Crow River Lakes Association, water testing, 1996, 1999.
- Upper Shakopee River, water testing, 1997, 1998, 2000.
- Chippewa River Watershed Project, MPCA Phase I Study, 1997, 1998.
- Crow River Watershed, Phase I Study, 2001.
- Green Lake Property Owners Association, water testing, 1997.
- Hawk Creek River Watershed Project, MPCA Phase I, 1999, 2000.
- Kandiyohi SWCD, Department of Agriculture Groundwater Study, 1999.
- Upper Shakopee Watershed, Minnesota River Grant, 2000.
- Middle Fork Crow River Lake Association, MPCA Phase I, 2000, 2001.
- Eagle Lake, water testing and sampling, 2001.

Land & Water Treatment

- Sealing Abandoned Well Program (1996, 1997, 1998, 1999, 2000, 2001).
- Nest Lake, Weed Cutter Program.
- Kandiyohi County, Aeration Program (1996, 1997, 1998, 1999, 2000, 2001).
- Middle Fork Crow River Lake Association, installed data logger.
- Installed waterways and terraces at J & J Farms, Inc.
- Tree program to stabilize shoreland areas, 1997.
- A sheet pile structure was installed at inlet of Norway Lake, 1997.
- Eagle Lake, wetland cleanout, 1997.
- Diamond Lake, MPCA Phase II Project, 1997, 1998, 1999, 2000.
- Willmar Senior High, erosion control, Wetland Restoration Project, 1998.
- Norway Lake, reroute tile system for water quality benefits, 1998.
- Roseland Township, stabilize ditch bank, 1998.
- Kandiyohi County SWCD, Grass Lake Project, 1999.
- Schafer, water control structure, 1999.
- Norway Lake, channel stabilization, 2000.
- Prairie Woods Environmental Learing Center, erosion control, 2000.
- Lake Elizabeth, Erosion Project, 2000.
- Provide financial (State Revolving Funds, Grants) and technical assistance for upgrading failing septic systems.
- Upper Shakopee River Watershed Project, Phase II, 2001.
- Chippewa River Watershed Project, Phase II, 2001.
- Hawk Creek Watershed Project, Phase II, 2001.

Regulation & Planning

- Member Joint Powers Board (Kandiyohi, McLeod, Meeker and Renville County).
- Member on Highway 23 Steering Committee.
- MPCA delegated County for administering Feedlot Program.
- Administer Minnesota Wetland Conservation Act.

This second generation CLWP has provided many challenges and opportunities for the WPTF and the County as shown above by the list of completed and ongoing accomplishments. The scope of projects in the past emphasized personal agendas concerning water issues on particular projects or individual lakes. Water planning concerns and issues have expanded and focused on a broad scale implementing projects and educating people in a particular watershed. By broadening the scope of work, watershed projects tend to be all encompassing, limiting staff time and requiring more funds to implement and accomplish certain projects, goals and objectives.

On January 29, 2002, the Kandiyohi County WPTF held a public informational meeting regarding the revision and update of the water plan. This meeting provided the public and all local governmental units, as well as State agencies, an opportunity to present information and concerns about water-related issues that they believed should be considered in the revision of the water plan. Based upon issues discussed at the informational meeting, the WPTF established goals, objectives and action items for the Ten Year Implementation Plan. The WPTF also identified five high priority goals to be achieved within the next five years for the protection and management of water and land resources. The high priority goals, which comprise the Five Year Focus Plan, consist of the following objectives:

- Decrease the nutrient and sediment concentration of surface water to the 50th percentile of the North Central Hardwood Forests and Western Corn Belt Plains Ecoregion.
- Through education and regulation, preserve existing wetlands within the County.
- Provide educational and technical assistance to landowners to restore 1,250 acres of wetlands within the County.
- Through education and regulation, ensure proper rural and urban stormwater management.
- Provide educational and technical assistance to landowners and cities to ensure the compliance of ISTSs and municipal wastewater treatment facilities.
- Through education and regulation, protect shoreland areas within the County.
- Provide opportunities for the general public to become informed on water resource management and the Water Plan.
- Improve communication and cooperation between Federal, State and local agencies and groups.

The updated third generation Comprehensive Local Water Plan, following BWSR approval, will be officially adopted by the Kandiyohi County Board of Commissioners in January of 2003. This revised plan will serve to guide water planning through the year 2012. During this time, opportunities will exist to amend goals, objectives and the work plan, as needed, to incorporate new data and address issues as they emerge. Kandiyohi County will continue to build on its past accomplishments and encourage new programs and opportunities for the effective management and protection of its water and land resources.

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CHAPTER ONE:
KANDIYOHI COUNTY PROFILE

A View of Long Lake

Chapter one provides a generalized profile of Kandiyohi County. Information provided in this chapter includes the location of Kandiyohi County, as well as a population profile assessing historic population levels and future population and household projections. Also included in this chapter, is a profile of the County's watershed projects, clean water partnerships, watershed districts and lake associations.

Location of Kandiyohi County

Founded in 1858, Kandiyohi County is located in central Minnesota, approximately 60 miles west of the Minneapolis-St. Paul Metropolitan Area. As Map 1A shows, there are 12 cities and 24 townships in the County. The City of Willmar, located near the center of the County, is the County Seat. Kandiyohi County is characterized by numerous lakes, rolling hills and vast agricultural land. The County shares borders with Pope and Stearns counties to the north, Meeker County to the east, Renville County to the south, and Chippewa and Swift counties to the west.

Historic Population Levels

One of the most important aspects of a County's population to analyze is the historic rate of growth or decline that has been experienced. Table 1A provides U.S. Census population data for Kandiyohi County's cities, Kandiyohi County and the State of Minnesota since 1960. Nine out of twelve Kandiyohi County cities have experienced positive growth during the past forty years. Only the cities of Lake Lillian, Prinsburg and Sunburg experienced a decline in population over that same time frame. As a whole, Kandiyohi County experienced an overall growth of 11,216 residents (37.4%) since 1960. While this is a significant increase, it is slightly less than the 44.1 percent growth rate the State of Minnesota experienced over the past 40 years.

Table 1A:
Kandiyohi County's
Population since 1960

Kandiyohi County City	U.S. Census Year					Change	
	1960	1970	1980	1990	2000	#	%
Atwater	899	956	1,128	1,053	1,079	180	20.0%
Blomkest	171	172	200	183	186	15	8.8%
Kandiyohi	312	295	447	506	555	243	77.9%
Lake Lillian	335	316	329	229	257	-78	-23.3%
New London	721	736	812	971	1,066	345	47.9%
Pennock	257	255	410	476	504	247	96.1%
Prinsburg	462	448	557	502	458	-4	-0.1%
Raymond	608	589	723	668	803	195	32.1%
Regal	53	44	70	51	40	-13	24.5%
Spicer	589	586	909	1,020	1,126	537	91.2%
Sunburg	161	144	130	117	110	-51	-31.7%
Willmar	10,417	12,869	15,895	17,531	18,351	7,934	76.2%
Kandiyohi County	29,987	30,548	36,763	38,761	41,203	11,216	37.4%
State of Minnesota	3,413,864	3,804,971	4,075,970	4,375,099	4,919,479	1,505,615	44.1%

Population Projections

Future population and household growth has tremendous implications on the quality and availability of water resources in Kandiyohi County. As population and household numbers increase, so does the level of demand that is placed on water resources to meet the needs of these individuals. If growth and development is properly planned, the impact on water resources will be minimized. However, if growth and development occurs unplanned and unchecked, the overall carrying capacity of a water resource can be diminished to the point that it no longer suits the needs of the residents of the area.

Tables 1B and 1C provide population projections for Kandiyohi County, based on historic levels of population change since 1960. In addition to the historic-based projections (referred to as "based on the last 40 years" in the tables), the tables also include a population projection that is based on a fast annual rate of population gain. This projection represents 150 percent of the historic rate of growth. For example, if the County gained 1,000 people over the last 20 years, the fast population projection would estimate another 1,500 people over the next 20 years. The combination of historic and fast population projections provide a realistic range of possibilities that could occur in Kandiyohi County over the next 20 years.

Map 1A: Kandiyohi County's Location, Cities and Townships

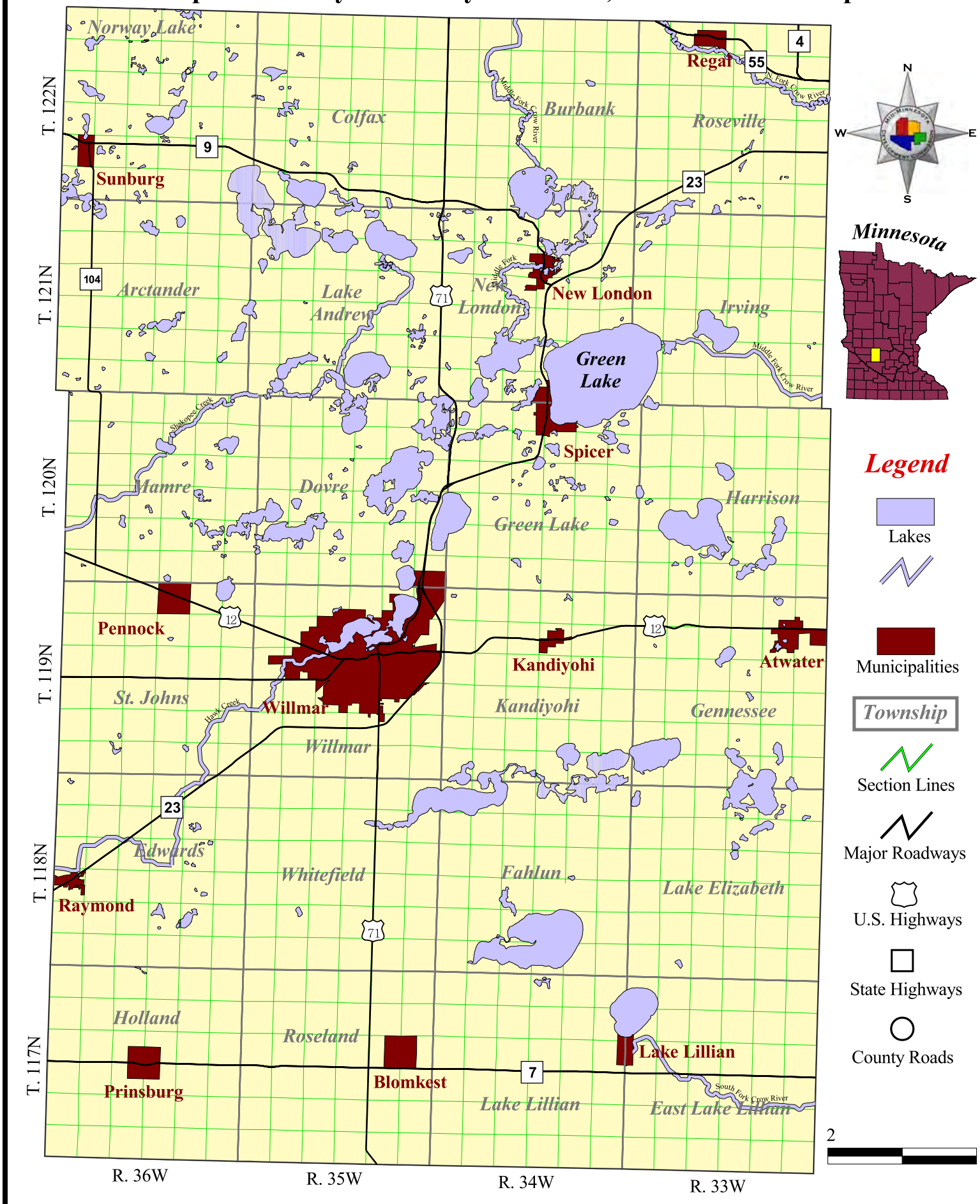


Table 1B:
City, Township and County Population Projections

Based on the Last 40 Years	2005	2010	2015	2020	Change
Cities	19,343	20,335	21,326	22,318	3,967
Townships	23,262	23,673	24,083	24,493	1,641
Kandiyohi County	42,605	44,007	45,409	46,811	5,608
Based on "Fast" Growth	**2005**	**2010**	**2015**	**2020**	**Change**
Cities	19,839	21,327	22,814	24,302	5,951
Townships	23,468	24,083	24,699	25,314	2,462
Kandiyohi County	43,306	45,409	47,512	49,615	8,412

Tables 1B and 1C suggest that Kandiyohi County would stand to gain an additional 5,608 residents and 2,138 households by the year 2020, if it simply experiences the same growth rate over the next 20 years as it has since 1960. However, because of development pressure within the County, the fast projection rates should be used for planning purposes. At this rate, Kandiyohi County would gain an additional 8,412 residents and 3,220 households over the next 20 years. Regardless of how fast Kandiyohi County's population expands, proper planning of growth and development will be essential to preserve the County's water and other natural resources.

Table 1C:
City, Township and County Household Projections

Based on the Last 40 Years	2005	2010	2015	2020	Change
Cities (1.86 people/household)	10,399	10,933	11,466	11,999	2,154
Townships (3.75 people/household)	6,203	6,313	6,422	6,531	440
Kandiyohi County (2.59 people/household)	16,450	16,991	17,532	18,074	2,138
Based on "Fast" Growth	**2005**	**2010**	**2015**	**2020**	**Change**
Cities (1.86 people/household)	10,666	11,466	12,266	13,066	3,221
Townships (3.75 people/household)	6,258	6,422	6,586	6,750	659
Kandiyohi County (2.59 people/household)	16,720	17,532	18,344	19,156	3,220

Economic Mainstays

According to the Minnesota Department of Economic Security (MDES), there was an available workforce of 22,103 people in Kandiyohi County in 2000. The total employment within the County during the same year was 21,444 people. As a result of the workforce being greater than the number of employment opportunities, a total of 569 people, or 2.6 percent of the workforce was unemployed.

Table 1D displays the employment by industry for Kandiyohi County for the year 2000. According to the MDES, there are four industries that comprise a majority of the County's employment base. These industries include: services (4,820), government (4,118), retail trade (3,983) and manufacturing (3,515). This is a noticeable change from past decades, when the agricultural industry was amongst the prominent employers in Kandiyohi County. As of the 2000 U.S. Census, only 1,226 people in the County were employed in the agricultural industry. Due to poor commodity prices, the overall trend of fewer farms, farming larger acreages and employing fewer employees is likely to continue over the next ten years.

Table 1D:
Kandiyohi County Employment By Industry (2000)

Industry	People Employed
Services	4,820
Government	4,118
Retail Trade	3,983
Manufacturing	3,515
Agriculture, Forestry, Fisheries	1,226*
Wholesale Trade	1,310
Construction	1,007
Finance, Insurance, Real Estate	677
Transportation, Communication, Utilities	610
Mining	NA

* 2000 U.S. Census figure

Clean Water Partnerships/Watershed Projects

The Clean Water Partnership (CWP) Program was created in 1987 to address pollution associated with runoff from agricultural and urban areas. The program is funded by the Minnesota Pollution Control Agency (MPCA) and provides local governments with resources to protect and improve lakes, streams and groundwater.

CWP projects begin with a desire by a local government to improve a water resource that has been polluted by land-use-related activities. Local leadership and expertise, combined with technical and

financial resources from the State, create an effective program for controlling pollution and restoring water quality.

Funding for CWPs is awarded in two phases. In the first, or resource investigation phase, a diagnostic study and implementation plan are completed. As part of the diagnostic study, local sponsors work with the MPCA to collect data and information on the water resource and its drainage area. This information is used to identify pollution problems and their causes and define water quality goals and objectives. The final step of the resource investigation phase is the development of an implementation plan that identifies the combination of education, management practices and other activities needed to protect or restore water quality.

The second phase, called project implementation, involves putting in place the best management practices (BMPs) identified in the first phase. BMPs may include sedimentation ponds, manure management, conservation tillage, terraces, new ordinances, wetland restoration, fertilizer management, education or other methods designed to reduce nonpoint source pollution.

Projects may be completed either partially or completely through the CWP program. To be eligible for CWP funding, the entire project must meet program requirements. This means that if the project sponsor intends to seek CWP funding for later phases (e.g., implementation), the MPCA must first approve a diagnostic study and an implementation plan.

The financial assistance available through the program falls into two categories: grants and low-interest loans. Grants are available for up to 50 percent of project costs. Loans can only be used for the project implementation phase, and can cover the entire cost of implementation or supplement a grant. Local governments can also use loans to set up their own programs to provide pass-through loans to private parties. Local governments with the authority to generate cash revenues and adopt and enforce official controls are eligible to sponsor CWP projects and receive grant funding. To be eligible for a loan, a local government must also be able to secure the loan with a general obligation promissory note. In addition, the water of concern must be addressed in an approved local water plan.

According to the MPCA, there have been 8 CWP funded projects in Kandiyohi County. A brief description of each of the projects is given below:

- ***Big Kandiyohi Lake Diagnostic/Feasibility Study.*** A phase I diagnostic/feasibility study. Start date: 10/01/87. End date: 9/03/93. Project sponsor/representative: Kandiyohi County/ Jeff Bredberg, Phone # (320) 231-6288. Grant amount: $39,176. MPCA project manager: Roger Ramthum, Phone # (651) 296-9262.

- ***Crow River Watershed Water Quality Enhancement Project*** (formal project title). A 319 project. Major watershed: # 18 North Fork and # 19 South Fork. Project sponsor: Prairie Country Resource Conservation and Development Council, Randy Nelson, Willmar. Start date: October 1, 1999. End date: September 30, 2003. Grant amount: $453,790. MPCA project manager: Roger Ramthum, Phone # (651) 296-9262.

- ***Crow Watershed Phase I Clean Water Partnership study*** (not formal project name). A phase I study for # 18 North Fork and # 19 South Fork of the Crow River. Project sponsor: Crow Joint Powers Board. Grant amount: $398,415. MPCA project manager: Ken LaVoir, Brainerd, Phone # (218) 828-2668.

- ***Diamond Lake CWP Phase II continuation***. Phase II implementation expired. Needed more time to work on implementation measures, so a phase II continuation began 4/11/01, it will end 4/10/04. Continuation grant amount: $25,000. Phase II grant amount: $49,000, spent about $35,000 prior to expiration. Project sponsor/representative: Kandiyohi County/Jeff Bredberg, Phone # (320) 231-6288. MPCA project representative: Roger Ramthum, Phone # (651) 296-9262.

- ***Green Lake and Middle Fork Crow River Watershed Project***. CWP phase I diagnostic/feasibility study. Start date: 4/06/00. End date: 4/05/03. Project sponsor/representative: Kandiyohi County/Jeff Bredberg, Phone # (320) 231-6288. Grant amount: $105,000. MPCA project manager: Roger Ramthum, Phone # (651) 296-9262.

- ***Minnesota Grass Lake Restoration Project.*** A 319 Project. Start date: 2/01/97. End date: 5/17/00. Project sponsor/representative: Kandiyohi County SWCD (320) 235-3540. Grant amount: $100,000. MPCA project manager: Roger Ramthum, Phone # (651) 296-9262.

- ***Upper Shakopee Creek Headwaters Project***. Start date: 2/22/00. End date: 6/30/02. Funding type: Minnesota River. Amount: $50,000.

- ***Upper Shakopee Creek Loan***. Start date: 8/20/01. End date: 8/20/04. Funding type: CWP Loan. Amount: $250,000.

Chippewa River Watershed Project
Submitted by: Kylene Olson, Executive Director

The Chippewa River Watershed Project (CRWP) is a cooperative effort of over 25 organizations, from County, State, and Federal agencies, to non-profit organizations, lake associations, citizens and landowners throughout the 1.3 million acre watershed. Counties involved include parts of Kandiyohi, Swift, Chippewa, Pope, Grant, Stevens, Douglas and Ottertail. The CRWP began in March 1998, when the Minnesota Pollution Control Agency (MPCA) awarded the project a Clean Water Partnership Grant to conduct a three year Phase I Diagnostic Study of the watershed. Extensive water quality monitoring and land use assessment was conducted from 1998 through 2001. The data collected was used in the development of an Implementation Plan for the watershed. The project received funding in the spring of 2001 for the first three years of implementation through the MPCA's Clean Water Partnership grant program.

Through the Diagnostic Study it was found that the Chippewa River carries high sediment, nutrient (phosphorus and nitrogen) and bacteria pollutants during the growing season, from rainfall-driven polluted runoff that occurs throughout most of the watershed. The usefulness and aesthetic qualities of the river are impaired and conditions are unlikely to improve unless changes are made in land use and water management practices within the watershed. Change can be accomplished through an

implementation plan that reflects real problems occurring on the landscape and clearly identified solutions to those problems, while developing and organizing sufficient resources to attain meaningful and effective solutions.

In setting goals and objectives, consideration is given to four important watershed characteristics. First, agriculture is the predominant land use in the watershed and improvements to water quality will require changes in agricultural practices, which requires education and presenting solutions that are economically viable to the agricultural community. Second, pollutant transport in the watershed is primarily affected by uncontrolled runoff through the many hydrologic pathways present (i.e. the extensive drainage system). Third, the Chippewa River holds enormous potential for being a recreational resource, but past and present conditions prevent it from being used to its full potential. And, fourth, watershed residents, through their involvement and actions, hold the key to protecting and enhancing the Chippewa River. To achieve each of these goals continued and increased education of urban and rural watershed residents needs to be done through an intense outreach campaign.

The ten-year goals of the CRWP are:

1. To achieve the highest water quality attainable for ecoregion streams;
2. To increase the number of watershed residents taking an active role in enhancing and protecting the Chippewa River;
3. To continue to have the watershed community of agencies and organizations bonded together (across county boundaries) as a group working toward the common goal of improved water quality in the Chippewa River Watershed;
4. To develop the Chippewa River as a major recreational resource within the Minnesota River Basin.

The long-term goal of the CRWP is to improve the water quality and flooding problems in the watershed while also promoting a healthy agricultural, industrial and recreation-based economy for the region. The best management practices (BMPs) to be utilized include nutrient management, residue management, wetland restoration, buffer strips, water and sediment control basins, livestock waste management, individual sewage treatment systems, grassed waterways, streambank restoration, terraces, contour farming, grade control structures, pasture management, alternative tile inlets, RIM, CRP and shoreline naturalization. Urban practices to be promoted include recycling, directing downspouts to lawns, phosphorus free fertilizer for lawn care, construction site erosion control and stormwater management. Implementation of these practices on the landscape will be accomplished through the work of the cooperating partners and through grant applications for funds targeted for specific subbasins of the watershed.

In a watershed this large it has been necessary to break down into sub-basins of priority management areas for development of the Implementation Plan. The major tributaries of the Chippewa River create natural sub-basins making this delineation possible. Water quality monitoring data, watershed assessments and judgments about reasonable expectations for rivers and streams in this area of the State were used in ranking the sub-basins. Due to the high levels of nutrients (phosphorus and nitrogen), sediment and fecal coliform bacteria, the Shakopee Creek

Headwaters (SCH) area has been ranked as the Chippewa's first priority sub-basin. The Shakopee Creek Headwaters Project is discussed in more detail later in this document. Other sub-basins of the Chippewa River include: East Branch Chippewa River, Lower Main Stem, Little Chippewa River, Dry Weather Creek, Spring Creek, Lines Creek, Cottonwood Creek and the Upper Main Stem.

The monitoring program established in the watershed during the Diagnostic Study will continue throughout the Implementation Phase. Water quality monitoring plays a key role in identifying priority areas and documenting changes, as well as gaining a greater understanding of the complexities of a watershed. In addition, a bio-monitoring program has been developed to engage high school students throughout the watershed.

The outreach and education program of the CRWP is based on the concept of "connecting people through their river". The Citizen Monitoring Network of the CRWP engages landowners in watershed activities. Other education efforts include a newsletter, annual meeting, monthly meetings, bus tours, seminars, workshops and creating new partnerships. Education efforts revolve around urban and rural BMPs to enhance water quality and water quantity issues, hydrology, watershed concepts and the connection of land use to the river.

Crow River Organization of Water
Submitted by: Jenny Gieseke, Watershed Coordinator

The Crow River Organization of Water (C.R.O.W.) is a Joint Powers Organization organized to preserve, protect and restore the Crow River. The C.R.O.W. Joint Powers Board was formed in 1999 and consists of one representative from each of the County Boards with land in the watershed (ten members in all). Counties involved within the organization include Carver, Hennepin, Kandiyohi, McLeod, Meeker, Pope, Renville, Sibley, Stearns and Wright.

The C.R.O.W. is currently working on a phase I diagnostic study for the entire watershed. Local, State and Federal agencies are cooperatively working with C.R.O.W. to conduct water quality monitoring on the Crow River from 2001 to 2003. The diagnostic study is needed in order to determine the extent to which rapid urban growth, new and expanding wastewater treatment facilities, erosion and drainage from agricultural lands and other land uses are affecting the Crow River.

The main objectives of the phase I diagnostic study are to:

- Identify water, nutrient and sediment loss rates along the Crow River.
- Identify river water quality patterns by river segment and tributary.
- Increase awareness among citizens and landowners in the watershed of water quality issues.

The study began in April of 2001, with the establishment of approximately 28 monitoring sites on the Crow River and its tributaries. The monitoring sites are set up and supervised through a cooperative effort between the C.R.O.W., the Minnesota Department of Natural Resources (DNR), Minnesota Pollution Control Agency (MPCA), North Fork of the Crow River Watershed District

and the Buffalo Creek Watershed District. As part of the study, samples will be tested for total phosphorus, orthophosphate, ammonia, nitrite, nitrate, total suspended solids and total Kjeldahl nitrogen. A limited number of samples will also be tested for biological oxygen demand, fecal coliform bacteria, chloride, alkalinity, hardness, turbidity and chlorophyll a. A Sonde will be used to measure pH, dissolved oxygen, temperature and conductivity as well. The C.R.O.W. has also been working in cooperation with the MPCA to establish a Citizens Stream Monitoring Program focused on the Crow River. Approximately 35 volunteers have enrolled in the program so far.

When completed, the phase I diagnostic study should help to identify problem areas in the watershed and to identify site-specific best management practices (BMPs) that will maximize pollution reduction. Solutions will likely be applied to smaller, subwatersheds. The C.R.O.W. plans to work closely with local water planners, soil and water conservation districts (SWCDs) and Natural Resource Conservation Service (NRCS) offices to educate citizens and encourage the use of appropriate BMPs throughout the watershed. Potential projects could include buffer strips, filter strips, replacement of open tile inlets, wetland restorations, stormwater detention basins, upgrading of septic systems and agricultural feedlots, among others.

Hawk Creek Watershed Project
Submitted by: Loren Engelby, Project Coordinator

The Hawk Creek Watershed project began in the summer of 1998, when a phase I clean water partnership grant was allocated from the Minnesota Pollution Control Agency (MPCA). The diagnostic study was conducted to determine the health of the watershed. Samples were collected from area streams and ditches during the summers of 1999 and 2000. A Tailored Integrated Stream Watershed Assessment (TISWA) was also conducted during this study to determine the areas of the watershed with the highest pollution potential.

Six primary locations within the Hawk Creek Watershed were sampled and monitored during the diagnostic study. Samples collected were tested for total suspended solids, total phosphorus, orthophosphate, nitrate-nitrite, ammonia, total Kjeldahl nitrogen and fecal coliform bacteria. High levels of sediment were found throughout the watershed. Nutrient levels were also high. Nitrogen was found to be high in Chetomba and Beaver Creeks. Elevated levels of phosphorus were found in Hawk Creek, especially in the upper portion of the watershed. Bacteria were found to be high across the watershed, with the highest levels found in the Beaver Creek subwatershed. Major issues to be addressed, as identified through the diagnostic study, include erosion and runoff from agricultural and developed areas and failing septic systems.

In the spring of 2001, the Hawk Creek Watershed Project was awarded further funding from the MPCA for a phase II study. This second phase focuses on the implementation of best management practices (BMPs) on the land to help reduce pollutant loadings. The project will also focus on education and awareness activities including the understanding of storm drain systems, septic systems, urban and agricultural runoff and the watershed concept.

Middle Fork of the Crow River Watershed Project
Submitted by: Tom Bonde, Project Coordinator

The Middle Fork of the Crow River has an area of 280 square miles and is a part of the 2,756 square mile Crow River Watershed. Precipitation falling in the headwaters of the Middle Fork Watershed in Kandiyohi, Stearns and Pope counties feed the many small wetlands, lakes and tributaries that eventually flow into the Middle Fork Crow River, the North Fork and ultimately the Mississippi River.

The portion of the Middle Fork Crow River under study is that area extending from Crow Lake in Stearns County (river mile 40.9), downstream to the gauging station located just upstream of Kandiyohi County State Aid Highway 2 (river mile 10.3). The watershed at this point contains a total of 106,712 acres or 166.7 square miles. Included in the watershed are 70 lakes and wetlands over 10 acres in size, with a combined area of 15,815 acres. Discharge from the watershed averages 66.5 cubic feet per second, with an average annual runoff of about 5.2 inches.

The involvement of local residents, lakeshore owners and conservation organizations in matters relating to water quality extends back more than 70 years. It is interesting to note that sustained efforts to understand what is happening to our lakes began in the 1970s, when the lake associations on George and Green lakes began to collect Secchi disk data. Equally important is the fact that they continue to do so to this day. The Green Lake Property Owners Association has been particularly active in funding and carrying out water quality studies. After many years of effort, the Association, in cooperation with the DNR and the financial support of the Kandiyohi County Water Plan Taskforce, was able to reestablish the gauging station at CSAH 2. At the suggestion of State agencies and the Water Plan Taskforce, seven lake associations including Green, Nest, Monongalia, Long, Calhoun, George and Elkhorn, banded together to apply for a Clean Water Partnership Phase I Grant for the Middle Fork Crow River Watershed. The associations were awarded a grant of $105,000, which combined with a matching $20,000 Water Plan contribution and cash and in-kind from others, brings the study total to $210,000. The two-year study began in April 2000, with fiscal management provided by Kandiyohi County; hydrology, water quality and resource data provided by the DNR; water quality, hydrology and project oversight provided by the MPCA; and project coordination by the Middle Fork Crow Lakes Association. Blue Water Science, Inc. and Schuler Environmental Engineering were retained as project consultants, with responsibilities for report preparation.

Shakopee Creek Headwaters Project
Submitted by: Rob Spitzley, Project Coordinator

Shakopee Creek is the largest tributary of the Chippewa River, which itself is a major tributary to the Minnesota River. A comprehensive study of polluted runoff problems affecting this area has been underway since 1996. The study area, known as the Shakopee Creek Headwaters (SCH) Watershed, is comprised of about 70 square miles of land located upstream from the spot where the Shakopee Creek enters the Crook Lake slough. Previously this watershed was defined as the 50 square miles upstream of the Lake Andrew Dam, but with the large amount of support received from the Lake Florida Association the Lake Florida watershed was included as well. Located within the larger Chippewa River Watershed (CRW), the SCH sub-basin has been identified as a

priority management area determined to contribute a significant share of the pollutant load to the Chippewa River. Directing attention toward this area will result in the greatest environmental and economic benefit at the least cost.

Water quality monitoring has revealed high fecal coliform bacteria, phosphorus and sediment are currently impairing the SCHW. A detailed and comprehensive study from 1996 through 1998 revealed some of the highest fecal coliform bacteria test numbers in the State. Some numbers were 500 times higher than the human health standard for human contact. Along with fecal coliform, an average of 1.1 million pounds of sediment and 8,313 pounds of phosphorus are added to the system every year. This is more phosphorus than is generated by a community of 4,000 people and enough sediment to fill 41 dump trucks.

Best management practices (BMPs), such as buffer strips, precision farming, nutrient management, feedlot management and wetland restoration, will be targeted in priority management areas with direct funding, or with education and outreach. The SCH Project Coordinator and other sponsors with GIS capability will be tracking and mapping the land and landowners engaging in these activities. A complete listing of goals, objectives and solutions can be found in the *Shakopee Creek Headwaters Project Work Plan.*

Watershed Districts

North Fork of the Crow River Watershed District

Submitted by: Mark Schmisek, Water Quality Technician

The North Fork of the Crow River (NFCR) Watershed District was formed in 1985. The boundaries for the NFCR Watershed District are based upon the hydrological boundaries of the North Fork Crow River. The District covers a total of 348 square miles within Kandiyohi, Meeker, Pope and Stearns counties.

The mission of the District is to improve and enhance water quality, to control water flow, to reduce erosion and sediment, to promote wise public, private and natural use of water, while maintaining, enhancing and preserving public and private drainage for present and future residents.

A Phase I equivalent study of the North Fork of the Crow River Watershed District is being conducted for 2001-2002. The purpose of the study is to determine the sources of point and nonpoint pollution that degrade water quality within the boundaries of the Watershed District.

Buffalo Creek Watershed District

Submitted by: Charles Eberhard, District Engineer

The Buffalo Creek Watershed District was established January 30, 1969 by the Minnesota Board of Water and Soil Resources (BWSR). The District is governed by a board of five managers appointed by the County Board of Commissioners from McLeod, Renville and Sibley counties. The purpose of the Buffalo Creek Watershed District is to help alleviate water problems and maintain or improve the economic well being of the residents within the District.

Permits are required from the Buffalo Creek Watershed District when work is proposed for the following:

- Tiling/Ditching
- Water withdrawal/discharge
- Installation of underground storage tanks
- Watercourse clean out
- Any alterations that could affect the quality of the water resources of the District
- Any underground construction
- Ponding or berming
- Wastewater lagoons
- Dams, dikes and crossing
- Wetland modification
- Streams, creeks or river projects
- Earth moving

Besides issuing permits, the Buffalo Creek Watershed District funds various projects that are geared towards improving water quality and quantity within the District. The following are examples of projects that have been funded by the District in the past.

- Removal of channel obstructions
- Deepening the outlet of Schillings Lake into Buffalo Creek
- Desilting basin
- Drainage ditch improvements
- Erosion control and channel realignment
- Water quality sampling

Since 1989, the Buffalo Creek Watershed District has monitored water quality and flow levels of Buffalo Creek. Water quality parameters used include fecal coliform bacteria, phosphorus and nitrogen. Sampling is normally conducted between the months of April through October.

Lake Associations

A lake association is an organized group of people who have come together because of their common interest in a specific lake. Lake associations serve as an organized voice of their members to township and county government and are often a watchdog for enforcement of local ordinances. Associations may also monitor the condition of a lake, develop lake management plans, educate shoreland property owners about individual and collective actions to protect a lake and provide volunteers to assist in lake and watershed projects. They may also work with the Department of Natural Resources (DNR) to improve fish habitat or fish stocking, get permits for aquatic plant removal, maintain lake accesses or implement lakeshore stabilization projects.

Table 1E lists the 12 lake associations that have been formed in Kandiyohi County. A contact, current as of May 2002, has been provided for each lake association for additional information.

Table 1E:
Kandiyohi County Lake Associations

Association	President	Address
Kandiyohi Lakes Improvement	Terry Frazee	194 Rainbow Drive West, Dundee, FL. 33838
Green Lake	Wendell Halverson	11956 Indian Beach Road, Spicer, MN 56288
Diamond Lake	Dave Solbrack	354 East 5th Street, Litchfield, MN 55355
Norway-Games Lakes	Merle Kluver	3651 198th Avenue NW, New London, MN 56273
Lake Andrew	Roger Spieker	1080 South Andrew Drive, New London, MN 56273
Lake Florida	Don Holmgren	1112 17th Street SW, Willmar, MN 56201
George Lake	Drew Sietsema	12001 42nd Street NE, Spicer, MN 56288
Henderson Lake	Jerome Elkjer	10645 Highway 71 NE, Spicer, MN 56288
Nest Lake	Gary Butcher	14626 Highway 23 NE, Spicer, MN 56288
Crow River	Mike Bork	19080 Riverview Lane, New London, MN 56273
Long (Irving) Lake	Howard Buffington	11803 212th Avenue NE, New London, MN 56273
Lake Calhoun	Ruth Schaefer	14950 East Calhoun Road, Spicer, MN 56288

CHAPTER TWO:
KANDIYOHI COUNTY'S PHYSICAL ENVIRONMENT, LAND USE AND DEVELOPMENT

This chapter profiles many of Kandiyohi County's key natural resources, including sections on the County's geology, topography, soils and watersheds. In addition, the County's physical development is outlined by examining current land use, major public investments (i.e., sewer, water, etc.) and water resource easements.

Chapter two includes information on the following data items:

Precipitation Gauging Stations (*Data Item 1*), Total Precipitation (*Data Item 2*), and Seasonal Precipitation (*Data Item 3*)

Because of its location near the center of North America, Kandiyohi County is subject to a variety of air masses that affect the amount of precipitation that falls within the County. During the winter months, cold, dry continental polar air dominates the region. Hot, dry continental tropical air masses from the desert southwest, along with warm, moist maritime tropical air masses that originate over the Gulf of Mexico, are common during the summer months. The spring and fall months serve as transition periods between summer and winter, composed of alternate intrusions of air from various sources.

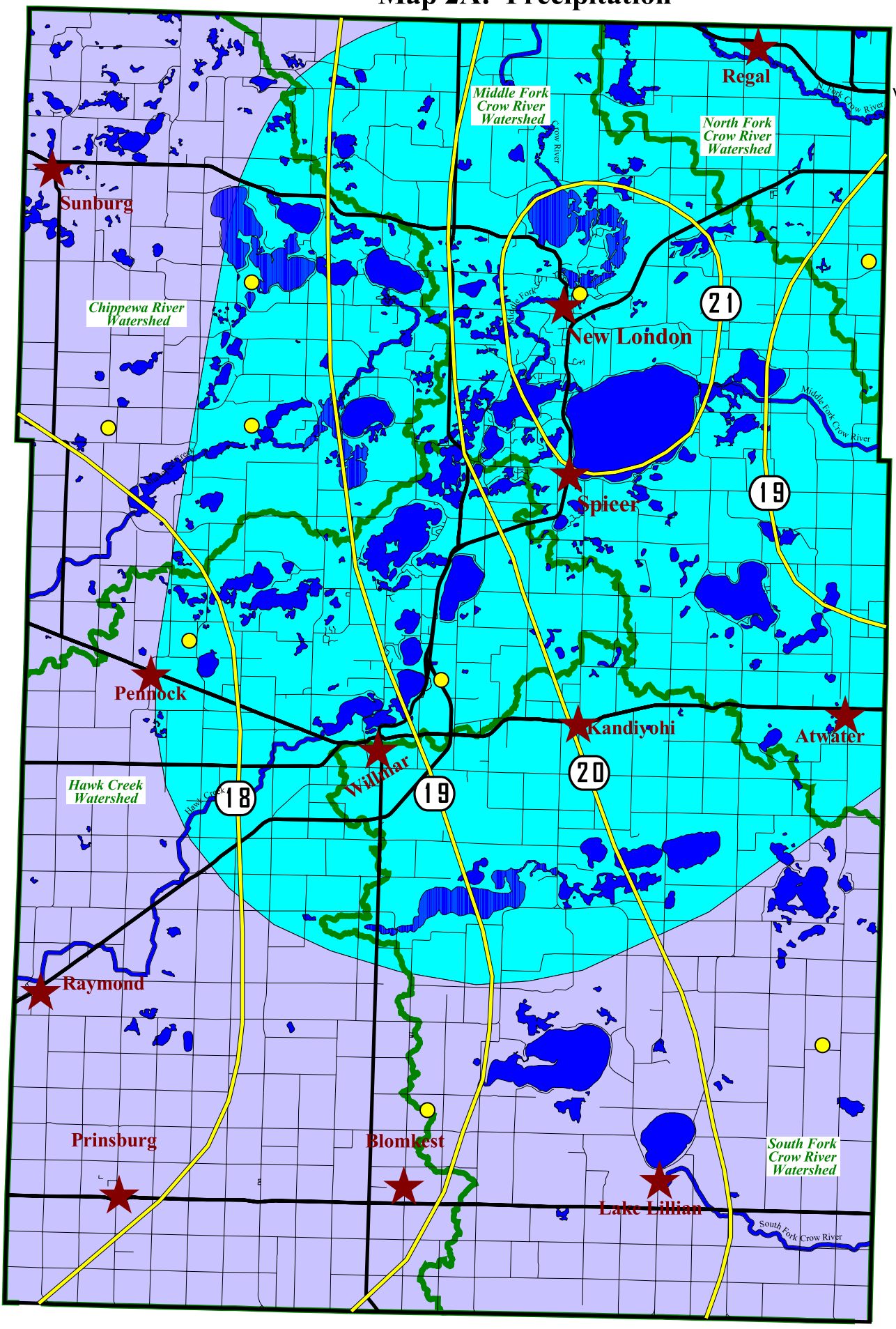
Precipitation within Kandiyohi County is monitored through an interagency cooperative effort between the Minnesota Department of Natural Resources (DNR), the Kandiyohi County Soil and Water Conservation District (SWCD) and the National Weather Service (NWS). The Kandiyohi County SWCD and the NWS are responsible for recording and compiling precipitation data at the local level. Once information is collected, it is then forwarded to the DNR, State Climatology Office, where it is further analyzed and entered into a statewide database.

According to Table 2A, there were nine precipitation gauging stations in operation in Kandiyohi County during the 2001 monitoring year. The Kandiyohi County SWCD had a network of seven precipitation gauging stations, while the NWS had monitoring stations at two locations. The geographic location of each of these stations can be found on Map 2A.

Table 2A:
Kandiyohi County Precipitation Gauging Stations

Network Type	Township	Range	Section
Kandiyohi County SWCD	T117N	R35W	1
Kandiyohi County SWCD	T118N	R33W	26
National Weather Service	T119N	R35W	1
Kandiyohi County SWCD	T120N	R36W	35
Kandiyohi County SWCD	T121N	R33W	1
National Weather Service	T121N	R34W	10
Kandiyohi County SWCD	T121N	R35W	7
Kandiyohi County SWCD	T121N	R35W	31
Kandiyohi County SWCD	T121N	R36W	33

Map 2A: Precipitation



In addition to detailing the location of precipitation monitoring stations, Map 2A also depicts the total annual and seasonal precipitation averages for Kandiyohi County. The information that was used to create the total precipitation portion of the map is based upon precipitation data from 1961 through 1990 (The Minnesota DNR, State Climatology Office has yet to update their maps to reflect data from 1991 to 2002). Isolines for total precipitation are given in two-inch increments. In general, the southern portion of Kandiyohi County receives between 26 and 28 inches of precipitation, while the northern portion of the County receives between 28 and 30 inches of total precipitation.

Table 2B details the monthly and annual precipitation averages for the two National Weather Service precipitation gauging stations in Kandiyohi County. These are the only stations within the County that have updated precipitation averages that reflect data through 2000. The totals listed in Table 2B generally coincide with Map 2A, with increased total precipitation in the northern reaches of the County.

Table 2B:
Monthly and Annual Precipitation Averages for
National Weather Service Precipitation Gauging Stations (1971-2000)

Month	Average Precipitation (inches)	
	Willmar RTC (169)	**New London (111)**
January	0.82”	1.14”
February	0.62”	0.78”
March	1.54”	2.02”
April	2.13”	2.36”
May	3.22”	3.56”
June	5.16”	5.45”
July	3.76”	4.10”
August	3.78”	3.94”
September	2.80”	3.31”
October	2.17”	2.42”
November	1.55”	1.67”
December	0.66”	0.92”
Annual Average	***28.21”***	***31.67”***

Source: Information was derived from Climatography of the United States No. 81 – a National Oceanic and Atmospheric Administration publication.

Seasonal precipitation, the total precipitation of the months of May through September, is shown with isolines on map 2A. This portion of the map is based upon data collected from 1990 to 2001. The average seasonal precipitation for this time frame was approximately 19.5 inches, or

65 percent of the total precipitation for the County. This is a slight decrease from the figures given in the *1990 Kandiyohi County Comprehensive Local Water Management Plan*, in which it was stated that seasonal precipitation within the County was approximately 21 inches, or 75 percent of the total precipitation. According to Map 2A, seasonal precipitation is greater in the eastern portion of Kandiyohi County, than in the western portion of the County.

The presence of moist versus dry air masses helps to determine the atmosphere's ability to absorb water vapor evaporating from soil and surface water, as well as transpiring from leaf surfaces. The combination of both of these processes is termed "evapotranspiration". West central Minnesota, which is more frequently under dry air masses, generally has higher evapotranspiration rates than eastern Minnesota.

According to Figure 2A, the majority of Kandiyohi County is located in the transitional zone between the semi-arid climate regime of western Minnesota and the semi-humid climate regime of eastern Minnesota. In this zone, average annual precipitation equals average annual evapotranspiration, thus leading to an overall balance of water inputs and outputs.

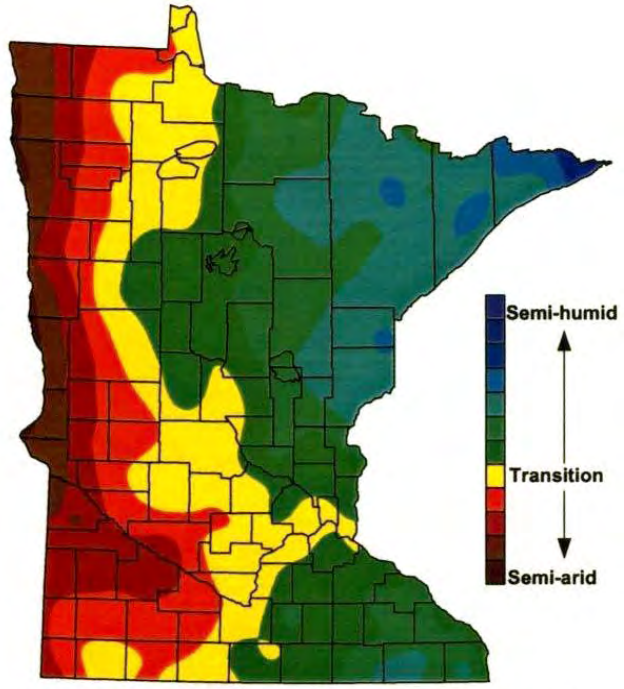


Figure 2A: Precipitation minus Evapotranspiration

According to the Minnesota DNR, total annual snowfall within Kandiyohi County is approximately 47 inches. Snowfall generally increases from the southwest to the northeast within the County. Although the average annual snowfall total for the County is nearly four feet, this form of precipitation is only a small portion of the total annual precipitation. This is a result of the relatively low moisture content of snow. According to Table 2B, the Willmar Regional Treatment Center and the City of New London NWS precipitation gauging stations received only 12.9 percent and 15.3 percent of their respective total annual precipitation during the winter months of December through March. Even though only a small portion of the total annual precipitation actually falls during the winter months, flooding can occur in the spring as a result of a number of factors, including: a deep, late winter snow pack, frozen soil prohibiting the infiltration of water, rapid snow melt due to an intrusion of warm air and heavy early spring precipitation.

References:

Minnesota Department of Natural Resources, Division of Waters, State Climatology Office
National Oceanic and Atmospheric Administration

Hydrogeology
(*Data Item 4*)

Aquifers are defined as water-bearing porous soil or rock strata that yield significant amounts of water to wells. An aquifer must have the following two properties:

1. The aquifer formation must be porous, such as sand and gravel or cracks and fractures in more solid rock, and
2. Water must be able to flow through and out of the formation in quantities large enough to be significant.

There are two principal aquifers in Kandiyohi County: outwash and bedrock. Map 2B shows the general location of each aquifer type, as well as approximate yield rates. Notice that a majority of the outwash aquifers are located in the northern half of the County.

Outwash Aquifers

Outwash aquifers can be subcategorized into surficial-drift aquifers and buried-drift aquifers. Surficial-drift aquifers are made up of sand or gravel deposits located at or near ground level. These aquifers are generally unconfined and have well depths ranging from 30-240 feet deep, with yields ranging from 25-500 gallons per minute. The water is generally of good quality. These aquifers have high concentrations of iron and manganese in some areas. Nitrate contamination is also present in some areas.

Buried-drift aquifers are composed of sand or gravel deposits located within thick drift and are generally confined. Well depths in these aquifers range from 80-380 feet deep, with yields of approximately 25-500 gallons per minute. Water from these aquifers is generally hard due to the presence of iron. High concentrations of sulfate and chloride are also present in some areas.

Bedrock Aquifers

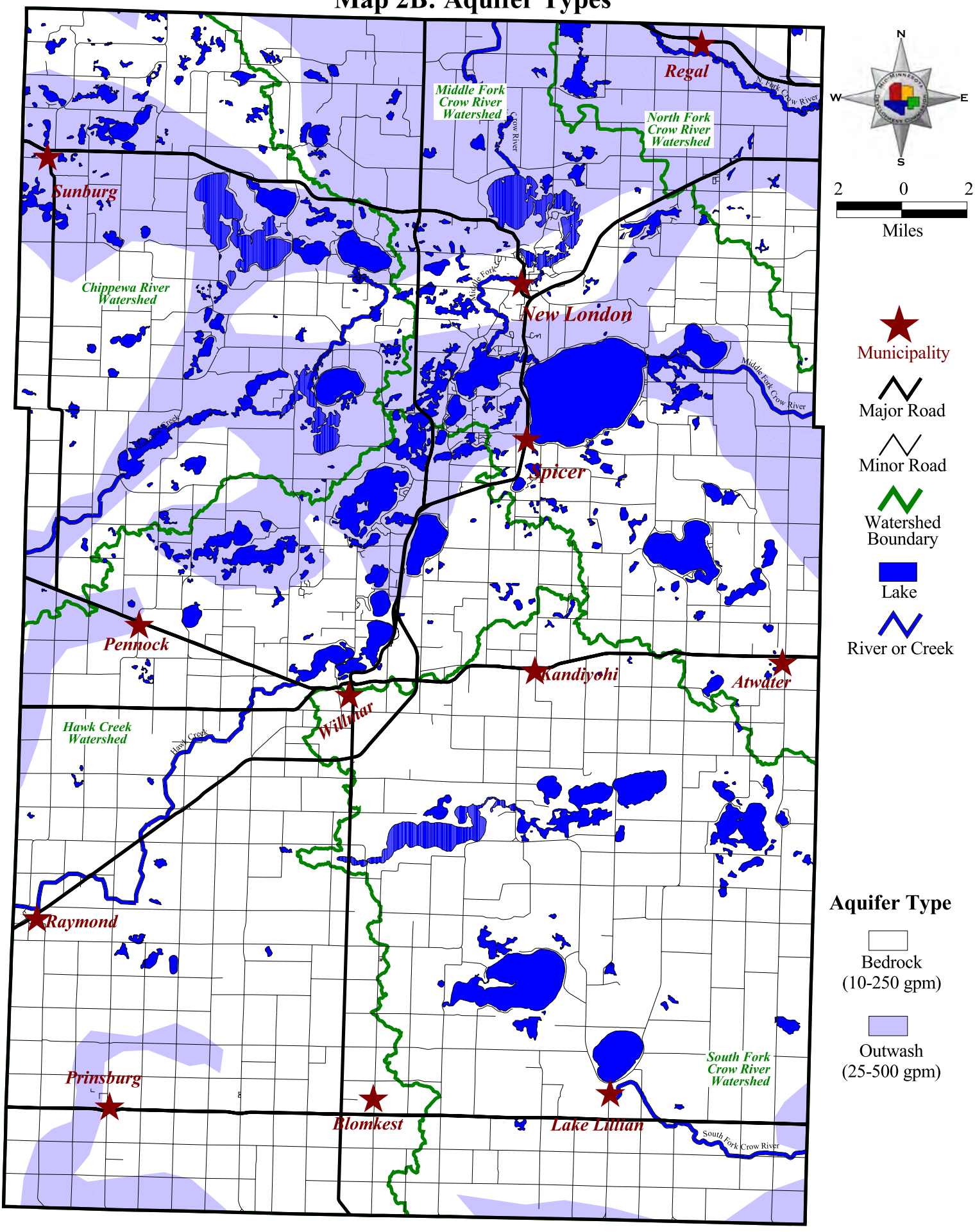
Bedrocks aquifers consist of two types in Kandiyohi County: Cretaceous aquifers and Precambrian igneous and metamorphic aquifers. Cretaceous aquifers are made up of sandstone lenses near the base of a predominant shale section. The water associated with these aquifers is commonly hard and is generally confined. Large sulfate, chloride and dissolved solids concentrations exist in many areas.

Precambrian igneous and metamorphic aquifers are undifferentiated and are not typically aquifers, except in faults and fractures. These aquifers can yield water from interflow sediments and from joints and fractures in basalt.

The depth to bedrock in Kandiyohi County is at least 200 feet; as a result, bedrock wells must be at least 200 feet deep. According to the Minnesota Geological Survey's (MGS) well records for Kandiyohi County, Cretaceous aquifers typically have well depths that range between 200 to 450, with yields of 10 to 250 gallons per minute.

References: Minnesota Geological Survey, United States Geological Survey

Map 2B: Aquifer Types



Ground and Surface Water Interconnections, Recharge and Discharge Areas (*Data Item 5*)

Most of Kandiyohi County is considered a recharge area. This is where surficial sands and gravel deposits receive and hold relatively large amounts of precipitation, slowly releasing it throughout the year into streams and other water features. Till deposits receive the same amount of precipitation, but have a lower recharge rate because their higher clay content makes them less permeable to infiltration. In areas of till deposits, most of the precipitation runs off overland into streams and lakes.

In areas where the parent material is glacial till, aquifers are confined sand and gravel layers that vary in thickness. Some layers are too thin to provide the desired quantity of water. Generally, the thicker the layer, the higher the water yield. These aquifers occur in a random pattern and can vary within short distances. Some are under pressure and function as artesian wells if tapped. Most are under less pressure, thus water cannot rise or rises only partially up the well casing. Once aquifers are tapped, they generally provide an ample and dependable supply of water, but may be depleted if the withdrawal rate exceeds the recharge rate. This is often the case during periods of drought.

Domestic wells in glacial outwash areas are generally shallow and tap only the surface aquifers. The base of these aquifers generally rests on the top of buried glacial till. They generally do not yield the quantity of water needed for large irrigation systems. Deeper aquifers within the underlying glacial till are often tapped for this purpose. Some wells in the County are more than 400 feet deep and have tapped water within fractured or eroded bedrock.

Shallow groundwater in surficial aquifers flows toward and discharges into streams and rivers. Regionally, groundwater flow is usually parallel to the flow direction of major rivers. Watersheds and groundwater movement are interrelated in flow direction.

References:

Minnesota Geological Survey
United States Geological Survey

Watersheds
(*Data Item 6*)

Kandiyohi County is located within five major watersheds. The first three are all part of the Upper Mississippi River Drainage Basin: the South Fork, Middle Fork and North Fork Crow River watersheds. The remaining two are part of the Minnesota River Drainage Basin: the Hawk Creek and Chippewa River watersheds. Map 2C shows the location of the Kandiyohi County's five major watersheds, as well as corresponding minor watersheds. Table 2C lists the area of each major and minor watershed in square miles. A brief description of each of the County's major watersheds is provided below, including information on groundwater flow patterns:

The Chippewa River Watershed covers approximately 150.2 square miles of northwestern Kandiyohi County. Groundwater generally flows from northeast to southwest. The depth of water varies from shallow, to over 100 feet below the surface. Pleistocene glacial drift, including till, clay, silt, sand and gravel cover the entire watershed. Sand and gravel are the only glacial deposits that are aquifers and are grouped according to their mode of deposition. Sunburg is the only city located in this watershed.

The Hawk Creek Watershed covers approximately 254.4 square miles of southwestern Kandiyohi County. Groundwater generally flows southwestward in movement. Cretaceous sandstone aquifers are present over most of this area, but yields in many places are minimal. Aquifers are generally less than ten feet thick. The cities of Blomkest, Pennock, Prinsburg and Raymond are located in this watershed.

The Middle Fork of the Crow River Watershed covers approximately 196.3 square miles of northwestern Kandiyohi County. Groundwater flows generally from west to east. Cambrian and Precambrian sedimentary rocks underlie the glacial drift in the eastern part of the watershed. Cretaceous sedimentary rocks are present in areas of the western two-thirds of the watershed. Where sedimentary rock is absent, the glacial drift is underlain by Precambrian igneous or metamorphic rocks. The cities of Atwater, New London and Spicer are located in this watershed.

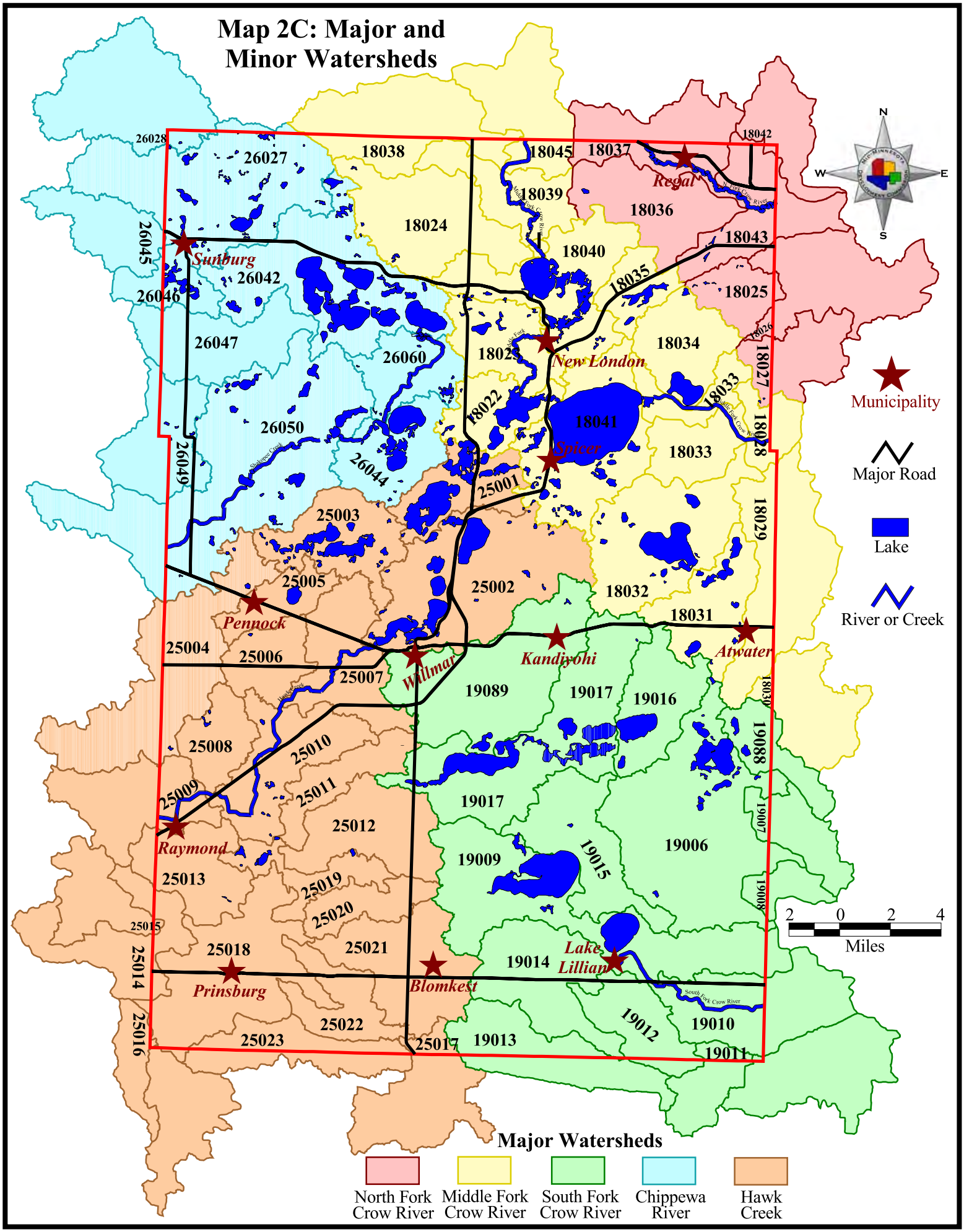
The North Fork of the Crow River Watershed covers approximately 43.6 square miles of northeastern Kandiyohi County. Groundwater flows generally from west to east. Cambrian and Precambrian sedimentary rocks underlie the glacial drift in the eastern part of the watershed. Cretaceous sedimentary rocks are present in areas of the western two-thirds of the watershed. Where sedimentary rock is absent, the glacial drift is underlain by Precambrian igneous or metamorphic rocks. Forested areas are sparse and occur mainly in areas too steep for agriculture. The City of Regal is located in this watershed.

The South Fork of the Crow River Watershed covers approximately 217.7 square miles of southeastern Kandiyohi County. Groundwater flows generally west to east. Cretaceous sedimentary rocks are present in the western two-thirds of the watershed, while Cambrian sedimentary rocks underlie the remaining eastern portion. The cities of Willmar, Kandiyohi and Lake Lillian are located in this watershed.

Reference: Minnesota Department of Natural Resources, Division of Waters

Table 2C:
Major and Minor Watersheds by Area

Major Watershed Name Minor Watershed # (Name)	Area (mi^2)	Major Watershed Name Minor Watershed # (Name)	Area (mi^2)
Chippewa River	150.2	18028 (Middle Fk. Crow R.)	3.2
26027 (Unnamed)	25.5	18029 (Co. Ditch #47)	10.8
26028 (Mud Creek)	1.1	18030 (Co. Ditch #26)	0.8
26042 (From Lake Andrew)	32.6	18031 (Diamond Lake)	13.6
26044 (Shakopee Creek)	12.5	18032 (Ck. to Lake Koronis)	24.6
26046 (From Monson Lake)	4.3	18033 (Middle Fk. Crow R.)	14.5
26047 (Co. Ditch #27)	13.7	18034 (From Lake Calhoun)	12.0
26049 (Mud Creek)	6.7	18035 (From Long Lake)	6.5
26050 (Shakopee Creek)	43.7	18038 (Co. Ditch #B6)	6.4
26060 (Shakopee Creek)	10.1	18039 (Middle Fk. Crow R.)	11.5
Hawk Creek	254.4	18040 (Middle Fk. Crow R.)	21.4
25001 (From Long Lake)	11.6	18041 (Green Lake)	25.3
25002 (Foot Lake)	32.8	18045 (Middle Fk. Crow R.)	3.3
25003 (From W. Solomon)	14.7	North Fork of the Crow River	43.6
25004 (Unnamed)	16.1	18025 (Lake Koronis)	6.6
25005 (From St. Johns Lake)	7.0	18026 (Lake Koronis)	1.5
25006 (Unnamed)	8.4	18027 (Lake Koronis)	2.4
25007 (Hawk Creek)	16.2	18036 (N. Fk. Crow River)	15.6
25008 (Unnamed)	8.1	18037 (N. Fk. Crow River)	7.1
25009 (Hawk Creek)	5.0	18042 (N. Fk. Crow River)	0.2
25010 (Hawk Creek)	17.0	18043 (N. Fk. Crow River)	10.3
25011 (Unnamed)	8.6	South Fork of the Crow River	217.7
25012 (Unnamed)	16.1	19006 (S. Fk. Crow River)	38.4
25013 (Unnamed)	11.1	19007 (Creek to Ditch #18)	1.5
25014 (Jud. Ditch #2)	3.7	19008 (Jud. Ditch #18)	1.2
25015 (Unnamed)	0.2	19009 (S. Fk. Crow River)	33.9
25016 (Jud. Ditch #8)	0.1	19010 (S. Fk. Crow River)	10.7
25017 (W Fk. Beaver Ck.)	1.7	19011 (Buffalo Creek)	1.2
25018 (Chetomba Creek)	25.9	19012 (S. Fk. Crow River)	9.3
25019 (Co. Ditch #31)	7.8	19013 (Buffalo Creek)	8.2
25020 (Co. Ditch #16)	7.2	19014 (Kandiyohi Lake)	18.0
25021 (Co. Ditch #8)	18.9	19015 (S. Fk. Crow River)	16.0
25022 (Co. Ditch #18)	9.5	19016 (Wagonga Lake)	13.0
25023 (Jud. Ditch #16)	6.5	19017 (Kandiyohi Lake.)	32.4
Middle Fork of the Crow River	196.3	19028 (Jud. Ditch #29)	0.1
18022 (Nest Lake)	9.4	19088 (Lake Elizabeth)	4.2
18023 (Middle Fk. Crow R.)	12.0	19089 (Wagonga Lake)	29.6
18024 (Co. Ditch #37)	21.0		


Map 2C: Major and Minor Watersheds
N
S
E
W
Municipality
Major Road
Lake
River or Creek
2 0 2 4
Miles
Major Watersheds
North Fork Crow River
Middle Fork Crow River
South Fork Crow River
Chippewa River
Hawk Creek
Sunburg
Regal
New London
Spicer
Pennock
Willmar
Kandiyohi
Atwater
Raymond
Prinsburg
Blomkest
Lake Lillian
26028
26027
26045
26042
26046
26047
26060
26050
26049
26044
18038
18045
18037
18042
18039
18024
18036
18043
18040
18035
18025
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18026
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18033
18041
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19011
25016

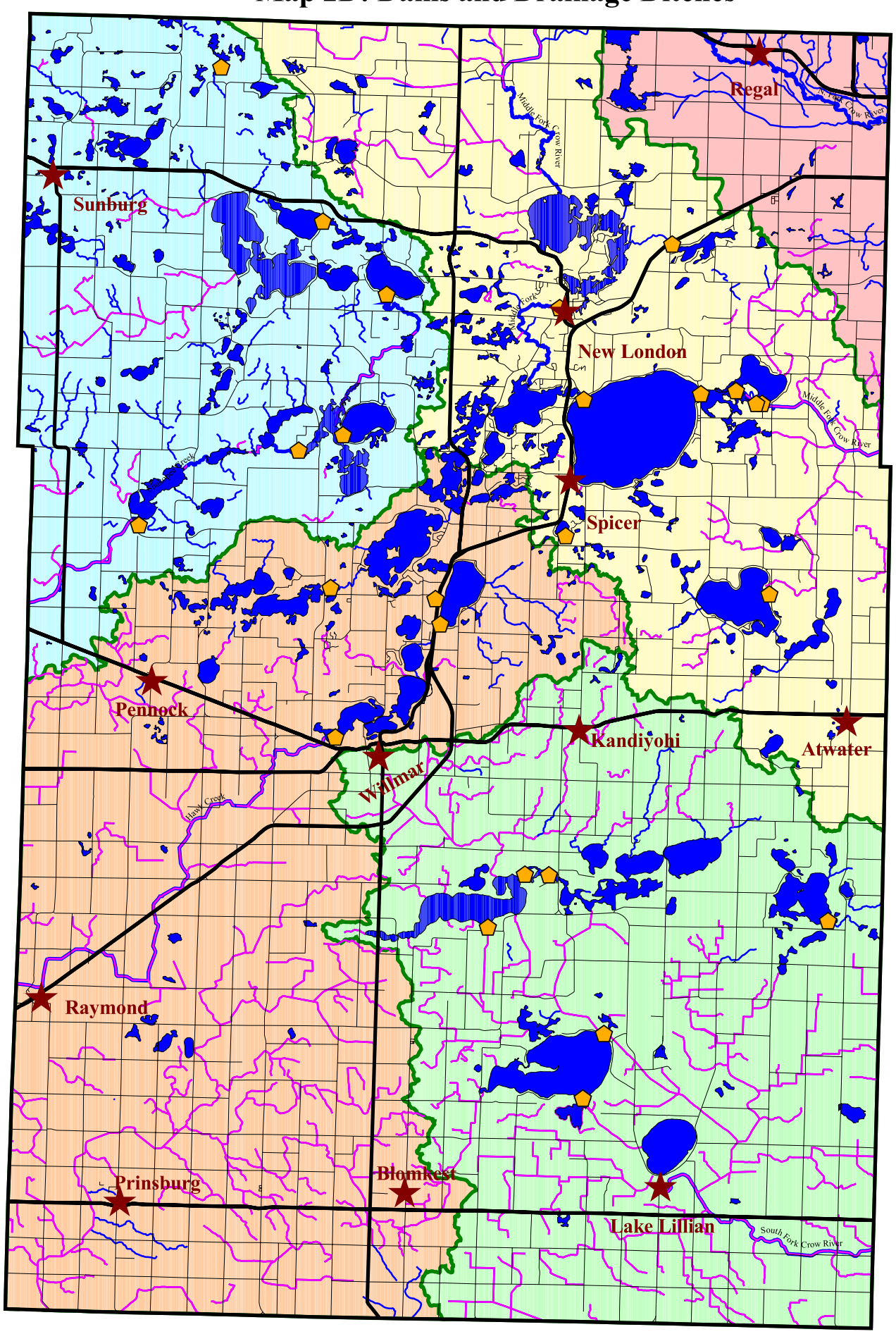
State Public Waters, Drainage Ditches, Dams and Control Structures (*Data Item 7*)

Public Waters

Public Waters are designated as such to indicate which lakes, wetlands and watercourses the Minnesota Department of Natural Resources (DNR), Division of Waters has regulatory jurisdiction over. The statutory definition of Public Waters can be found in Minnesota Statute 103G, Subdivision 15. The following waterbodies and watercourses are given such a classification:

- All types 3, 4 and 5 wetlands (as defined in U.S. Fish and Wildlife Service Circular No. 39, 1971 ed.) that are 10 acres or more in size in unincorporated areas or 2½ acres or more in size in incorporated areas;
- Water basins assigned a shoreline management classification by the Commissioner of the DNR, under sections 103F.201 to 103F.221, except wetlands less than 80 acres in size that are classified as natural environment lakes;
- Waters of the State which have been determined to be public waters or navigable waters by a court of competent jurisdiction;
- Meandered lakes, excluding lakes that have been legally drained;
- Water basins previously designated by the Commissioner for management for a specific purpose, such as trout lakes and game lakes pursuant to applicable laws;
- Water basins designated as scientific and natural areas under Section 84.033;
- Water basins located within and totally surrounded by publicly owned lands;
- Water basins where the State of Minnesota or the Federal government holds title to any of the beds or shores, unless the owner declares that the water is not necessary for the purposes of the public ownership;
- Water basins where there is publicly owned and controlled access that is intended to provide for public access to the water basin;
- Natural and altered watercourses with a total drainage area greater than two square miles in area;
- Natural and altered watercourses designated by the Commissioner as trout streams; and
- Public Waters wetlands, unless the statute expressly states otherwise.

Map 2D: Dams and Drainage Ditches



The regulatory boundary for State Public Waters is the Ordinary High Water Level (OHWL), which is determined by DNR field technicians. Under Minnesota Statute 103G.245, Subdivision 1 (except as provided in Subdivisions 2, 11, and 2), the State, a political subdivision of the State, a public or private corporation, or a person must obtain a public waters work permit to do the following:

1. Construct, reconstruct, remove, abandon, transfer ownership of, or make any change in a reservoir, dam, or waterway obstruction on public waters; or

2. Change or diminish the course, current, or cross section of public waters, entirely or partially within the State, by any means, including filling, excavating, or placing of materials in or on the beds of public waters.

Detailed Public Waters maps are available for viewing at applicable county auditors offices, DNR Waters regional and area offices, DNR area fisheries offices, county Soil and Water Conservation District offices and planning and zoning offices. A listing of Public Waters in Kandiyohi County with a DNR approved shoreland classification can be found under Data Item 46.

Drainage Ditches

Map 2D details Kandiyohi County's drainage ditch system. A breakdown of the miles of drainage ditch per Kandiyohi County watershed is given in Table 2D. The Hawk Creek (232.5 mi.) and South Fork of the Crow River (239.0 mi.) watersheds, located in the southern portion of the County, have extensive drainage ditch systems. Fine textured soils, with low to moderate infiltration rates, are found throughout the area, making drainage critical to agricultural production. The three northern watersheds, the Chippewa River (44.9 mi.), the Middle Fork of the Crow River (82.1 mi.) and the North Fork of the Crow River (4.8 mi.), all have less extensive drainage ditch systems. Soils in this region of the County are generally coarser in texture, resulting in higher infiltration rates and a reduced need for drainage for agricultural production. For detailed ditch maps and related information, please contact the Kandiyohi County Soil and Water Conservation District or the Kandiyohi County Public Works Department.

Table 2D:
Miles of Drainage Ditch per Watershed

Watershed	Miles of Drainage Ditches
Chippewa River	44.9
Hawk Creek	232.5
Middle Fork of the Crow River	82.1
North Fork of the Crow River	4.8
South Fork of the Crow River	239.0
Total	603.3

Dams and Control Structures

Map 2D also displays the 25 water level control structures in Kandiyohi County that have been classified as dams by the DNR, 21 of which have been assigned a hazard potential. A dam's hazard potential is rated 1 to 3. The lower the rating a dam receives, the higher the risk for structural, economic and human life loss if it were to fail. Table 2E lists the County's dams and their associated DNR hazard potential rating. Twenty of the structures in Kandiyohi County have been classified as having a hazard potential rating of 3 (the safest rating). Only the New London Dam, which received a hazard potential rating of 1 (the highest risk), received a rating lower than 3. Because of its rating, an emergency response plan has been developed for the New London Dam. For information relating to this plan, please contact Kandiyohi County Emergency Management.

Table 2E:
Kandiyohi County Dams

DNR ID	Name	Section	Township	Range	Hazard Potential
MN01154	Big Kandiyohi Lake	34	118N	34W	3
MN00067	Calhoun Lake Diversion	28	121N	33W	3
MN00066	Calhoun Lake Outlet	28	121N	33W	3
MN00075	Calhoun Lake West	20	121N	33W	3
MN00069	Diamond Lake	NA	NA	NA	3
MN01153	Eagle Lake	25	120N	35W	3
MN00498	Elkhorn Lake Rearing Pond	25	120N	35W	3
MN00495	Fisher Unit Pond	NA	NA	NA	3
MN00068	Florida Lake	34	121N	35W	3
MN00496	Florida Slough Lake	32	121N	35W	3
MN00060	Foot Lake	16	119N	35W	3
NA	Games Lake	33	122N	35W	NA
MN00370	Green Lake	30	121N	33W	3
MN00064	Kandiyohi Lake Inlet	23	118N	34W	3
NA	Lake Andrew	11	121N	35W	NA
NA	Lake Elizabeth	2	118N	33W	NA
NA	Lake Wagonga	8	118N	34W	NA
MN00493	Langsjoen WPA	NA	NA	NA	3
MN00063	Little Kandiyohi Lake	3	118N	34W	3
MN00065	Long Lake	6	121N	33W	3
MN00061	Nest Lake	27	121N	34W	3
MN00062	New London	10	121N	34W	1
MN00497	Swan Lake	NA	NA	NA	3
MN01155	Wagonga Lake	33	119N	34W	3
MN00494	Weber Fish and Wildlife Area	NA	NA	NA	3

Reference: Minnesota Department of Natural Resources, Division of Waters

Soils
(*Data Item 8*)

As an agricultural county, soils are one of Kandiyohi County's most valuable resources. Soils develop from the breakdown of rock minerals, intermixed with plant and animal remains. The formation of a soil is an extremely long process, taking place over hundreds to thousands of years. Kandiyohi County's soils were formed from deposits originally left by glaciers more than 10,000 years ago. The County has a wide variety of soil types due to the wide variety of parent material from which they were formed. Also important in the formation of the County's soils are factors such as climate, vegetation and topography.

Kandiyohi County's ten major soil associations are displayed in Map 2E. A brief description of each association is provided below:

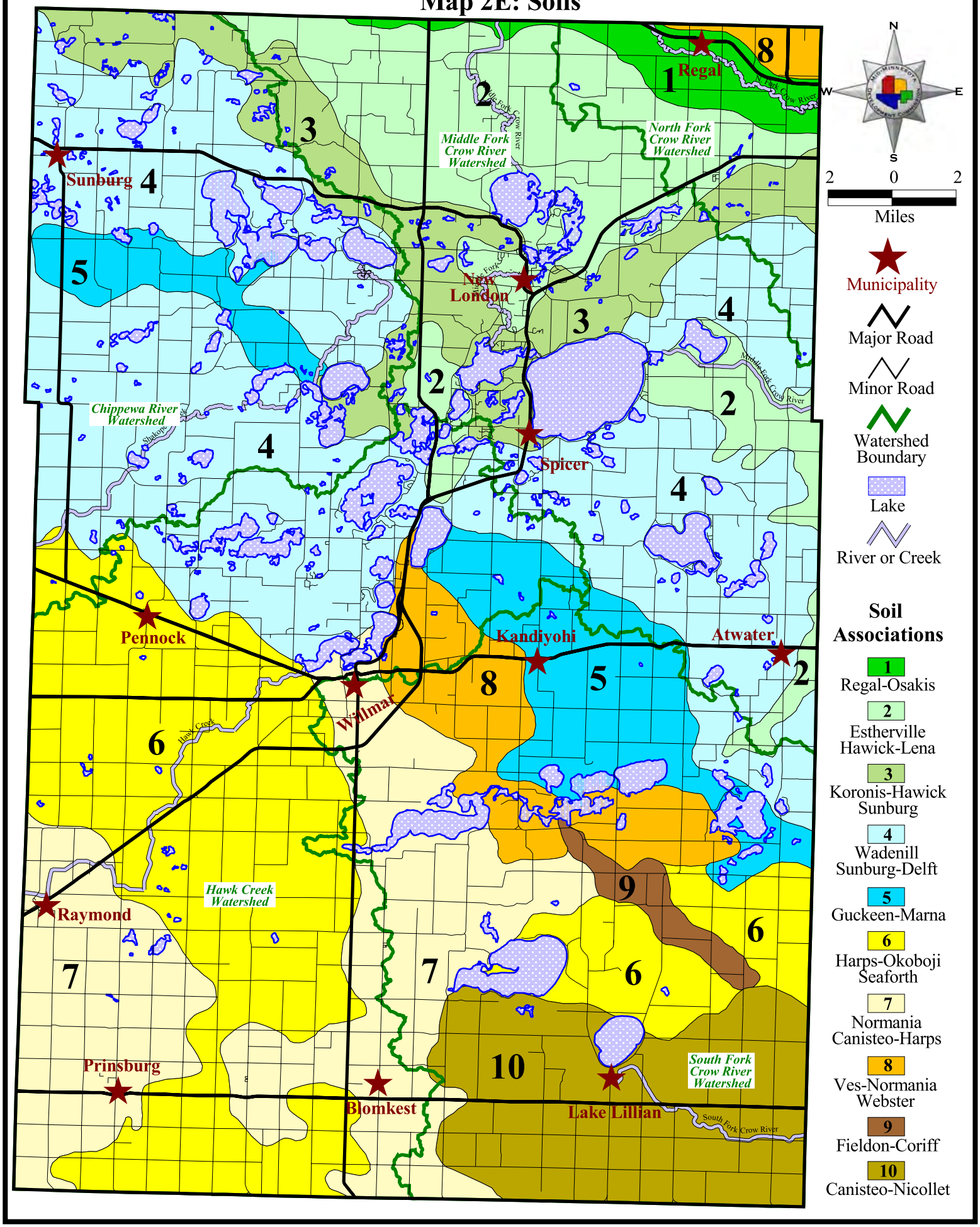
1. **Regal-Osakis Association**. Soil texture for the association is a loam. Infiltration rates generally range from fair to poor. The common landform setting for soils classified in the Regal-Osakis Association is outwash plains. Slopes generally range from 0 to 3 percent. The Regal-Osakis Association comprises 2 percent of the area in Kandiyohi County and is primarily found in the northeastern portion of the County.

2. **Estherville-Hawick-Lena Association**. Soil textures for the association include loam and sandy loam. Infiltration is generally poor. The common landform setting for soils classified in the Estherville-Hawick-Lena Association is moraines and outwash plains. Slopes generally range from 0 to 18 percent. The Estherville-Hawick-Lena Association comprises 11 percent of the area in Kandiyohi County and is found scattered throughout the northern half of the County

3. **Koronis-Hawick-Sunburg Association**. Soil textures for the association include loam and sandy loam. Infiltration is generally good. The common landform setting for soils classified in the Koronis-Hawick-Sunburg Association is outwash plains. Slopes generally range from 2 to 35 percent. The Koronis-Hawick-Sunburg Association comprises 7 percent of the area in Kandiyohi County and is found in the northern portion of the County.

4. **Wadenill-Sunburg-Delft Association**. Soil texture for the association is a loam. Infiltration ranges from good to poor. The common landform setting for soils classified in the Wadenill-Sunburg-Delft Association is moraines and till plains. Slopes generally range from 2 to 35 percent. The Wadenill-Sunburg-Delft Association comprises 28 percent of the area in Kandiyohi County and is primarily found in the northern half of the County.

Map 2E: Soils


N
W
E
S
2 0 2
Miles
Municipality
Major Road
Minor Road
Watershed Boundary
Lake
River or Creek
Soil Associations
1 Regal-Osakis
2 Estherville Hawick-Lena
3 Koronis-Hawick Sunburg
4 Wadenill Sunburg-Delft
5 Guckeen-Marna
6 Harps-Okoboji Seaforth
7 Normania Canisteo-Harps
8 Ves-Normania Webster
9 Fieldon-Coriff
10 Canisteo-Nicollet
Regal
Sunburg
New London
Spicer
Kandiyohi
Atwater
Willmar
Pennock
Raymond
Prinsburg
Blomkest
Lake Lillian
Middle Fork Crow River Watershed
North Fork Crow River Watershed
Chippewa River Watershed
Hawk Creek Watershed
South Fork Crow River Watershed
North Fork Crow River
Middle Fork Crow River
South Fork Crow River
Hawk Creek
Shakopee

5. **Guckeen-Marna Association**. Soil textures for the association include loam and clay loam. Infiltration rates range from good to poor. The common landform setting for soils classified in the Guckeen-Marna Association is moraines and till plains. Slopes generally range from 0 to 18 percent. The Guckeen-Marna Association comprises 7 percent of the area in Kandiyohi County and is found in the central portion of the County.

6. **Harps-Okoboji-Seaforth Association**. Soil textures for the association include loam and silt loam. Infiltration ranges from good to poor. The common landform setting for soils classified in the Harps-Okoboji-Seaforth Association is moraines and till plains. Slopes generally range from 0 to 18 percent. The Harps-Okoboji-Seaforth Association comprises 7 percent of the area in Kandiyohi County and is found in the southern portion of the County.

7. **Normania-Canisteo-Harps Association**. Soil texture for the association is a loam. Infiltration rates range from fair to poor. The common landform setting for soils classified in the Normania-Canisteo-Harps Association is till plains. Slopes generally range from 0 to 5 percent. The Normania-Canisteo-Harps Association comprises 12 percent of the area in Kandiyohi County and is found in the southern portion of the County.

8. **Ves-Normania-Webster Association**. Soil textures for the association include loam and silt loam. Infiltration is generally good to poor. The common landform setting for soils classified in the Ves-Normania-Webster Association is till plains. Slopes generally range from 0 to 18 percent. The Ves-Normania-Webster Association comprises 5 percent of the area in Kandiyohi County and is found scattered throughout the eastern half of the County.

9. **Fieldon-Coriff Association.** Soil texture for the association is a loam. Infiltration is generally poor. The common landform setting for soils classified in the Fieldon-Coriff Association is moraines and outwash plains. Slopes generally range from 0 to 2 percent. The Fieldon-Coriff Association comprises 1 percent of the area in Kandiyohi County and is found just east of Big Kandiyohi Lake and Lake Kasota.

10. **Canisteo-Nicollet Association.** Soil textures for the association include loam and silt loam. Infiltration rates range from fair to poor. The common landform setting for soils classified in the Canisteo-Nicollet Association is till plains. Slopes generally range from 0 to 5 percent. The Canisteo-Nicollet Association comprises 7 percent of the area in Kandiyohi County and is found in the southeastern portion of the County.

Reference:

United States Department of Agriculture, Soil Survey of Kandiyohi County, Minnesota

Erosion-Prone Soils
(*Data Item 9*)

The previous section provided a generalized description of the ten soil associations found in Kandiyohi County. The following section analyzes the erosion potential of those soil associations. Kandiyohi County is adversely affected by both wind and water erosion.

Water Erosion

Water erosion results from soil being moved from its original location by the force of water to the convex lower slopes and flats. Average tolerable soil loss for the County is three to five tons per acre per year. Erosion types are classified as sheet, rill, ephemeral and gully. Soil erosion affects cropland, urban areas, roadsides, lakeshores, streambanks and drainage systems. Water erosion impacts the water quality of the County's waterbodies, as well as develops detrimental conditions in the uplands and steeper slopes of the soil associations with erosion prone characteristics. Water erosion in Kandiyohi County generally occurs most often between the months of April and June, when fields have been tilled and planted, but a crop canopy has not developed to protect the soil surface.

The USDA developed the Universal Soil Loss Equation (USLE) to effectively predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. One of the six factors used in the equation, erosion factor K, indicates the susceptibility of a soil to sheet and rill erosion. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion. Map 2F identifies the water erosion prone Kandiyohi County soil associations that have K factors equal to or greater than 0.28. Table 2F details the Kandiyohi County soil associations that are classified as erosion prone. Notice that water erosion prone soils cover 36 percent of Kandiyohi County.

Table 2F:
Water Erosion Prone Soil Associations

Soil Association	Percent of County
01 - Regal-Osakis	2%
05 - Guckeen-Marna	7%
06 - Harps-Okoboji-Seaforth	7%
07 - Normania-Canisteo-Harps	12%
09 - Fieldon-Coriff	1%
10 - Canisteo-Nicollet	7%
Total	**36%**

Wind Erosion

The potential for wind erosion occurs when wind velocities increase above 12 miles per hour. Wind speeds above this mark overcome the force of gravity and dislodge soil particles. Soil is most vulnerable when unprotected by vegetative cover. Soils with fine granulated structure are most susceptible to erosion, including sandy loam, loamy sand and sand. November through June, when field surfaces may be dry and strong northwest winds are prevalent, is the worst time period for wind erosion.

The USDA has classified soils into Wind Erodibility Groups, according to their susceptibility to wind erosion in cultivated areas. Wind Erodibility Groups range from 1-8. The lower the group number, the higher the vulnerablity to wind erosion. Groups 4L or less are classified as highly susceptible to wind erosion. Map 2F displays the Kandiyohi County soil associations that are classified as wind erosion prone. Table 2G indicates that 75 percent of Kandiyohi County has wind erosion prone soils.

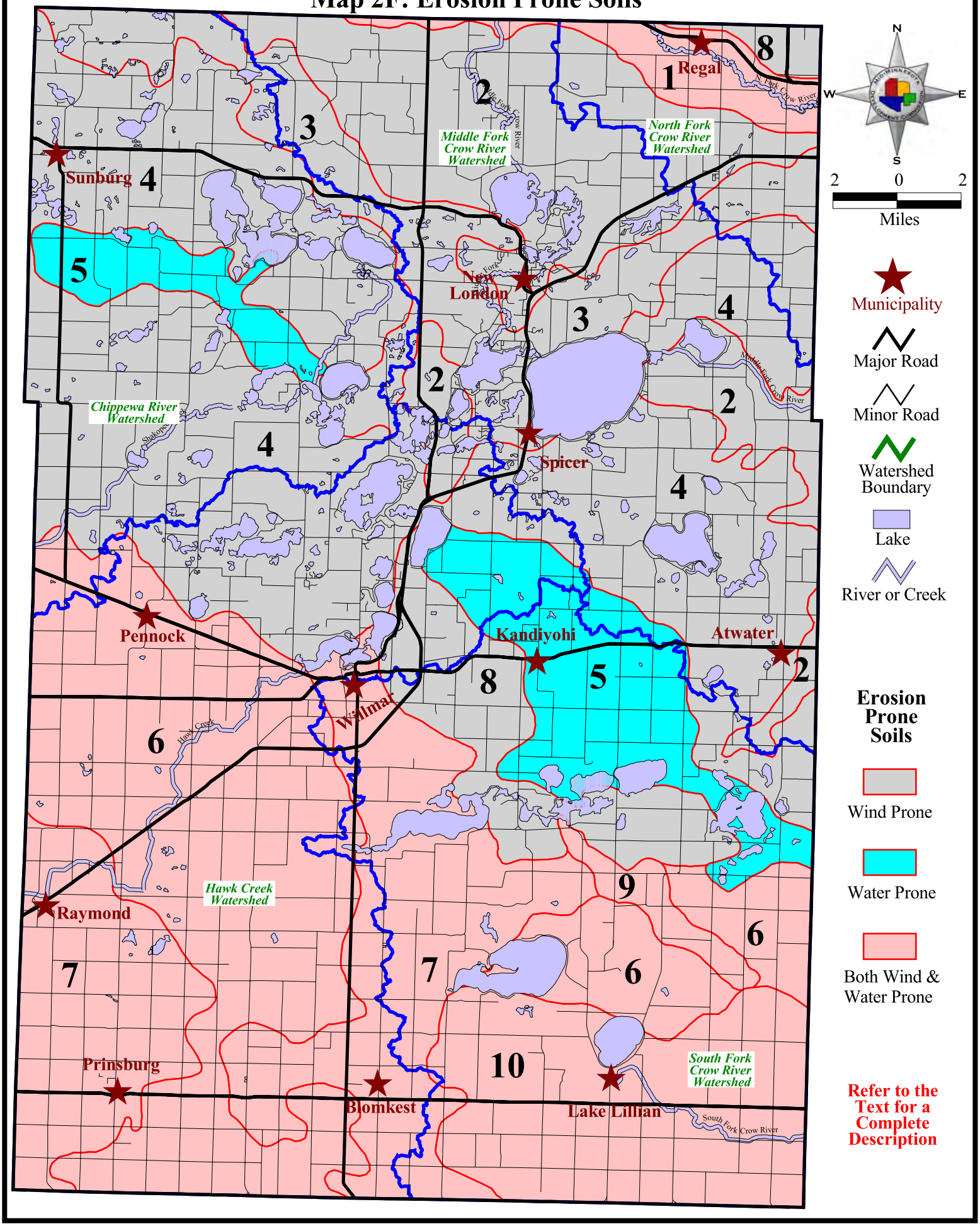
Table 2G:
Wind Erosion Prone Soil Associations

Soil Association	Percent of County
01 - Regal-Osakis	2%
02 - Estherville-Hawick-Lena	11%
03 - Koronis-Hawick-Sunburg	7%
04 - Wadenill-Sunburg-Delft	28%
06 - Harps-Okoboji-Seaforth	7%
07 - Normania-Canisteo-Harps	12%
08 - Ves-Normania-Webster	5%
09 - Fieldon-Coriff	1%
10 - Canisteo-Nicollet	7%
Total	**75%**

Reference:

United States Department of Agriculture, Soil Survey of Kandiyohi County, Minnesota

Map 2F: Erosion Prone Soils



Original Vegetation
(*Data Item 10*)

The Minnesota Department of Natural Resources (DNR) has inventoried the original vegetation of Kandiyohi County through its Presettlement Vegetation Database. Presettlement vegetation was determined by analyzing the detailed maps and records of early surveyors (circa 1895). The purpose of the database is to "analyze presettlement vegetation patterns for the purpose of determining natural community potential, productivity indexes and patterns of natural disturbance". Map 2H presents the presettlement vegetation of Kandiyohi County.

Before settlement, Kandiyohi County was predominately covered with upland prairie and prairie wetland vegetation; however, large stands of hardwood trees were commonly found throughout the northern part of the County. The upland prairie occupied a wide variety of landforms, including beach ridges and swales, glacial lakebeds, morainic hills, steep bluffs and rolling till plains. Big bluestem and Indian grass occupied the deep soils of the moist uplands, while little bluestem and side oats grama covered the thin soils of the dry uplands. In general, bluejoint, prairie cordgrass, rushes and sedges dominated the lowland areas and wetlands. Many of these wetlands are known today as "prairie potholes".

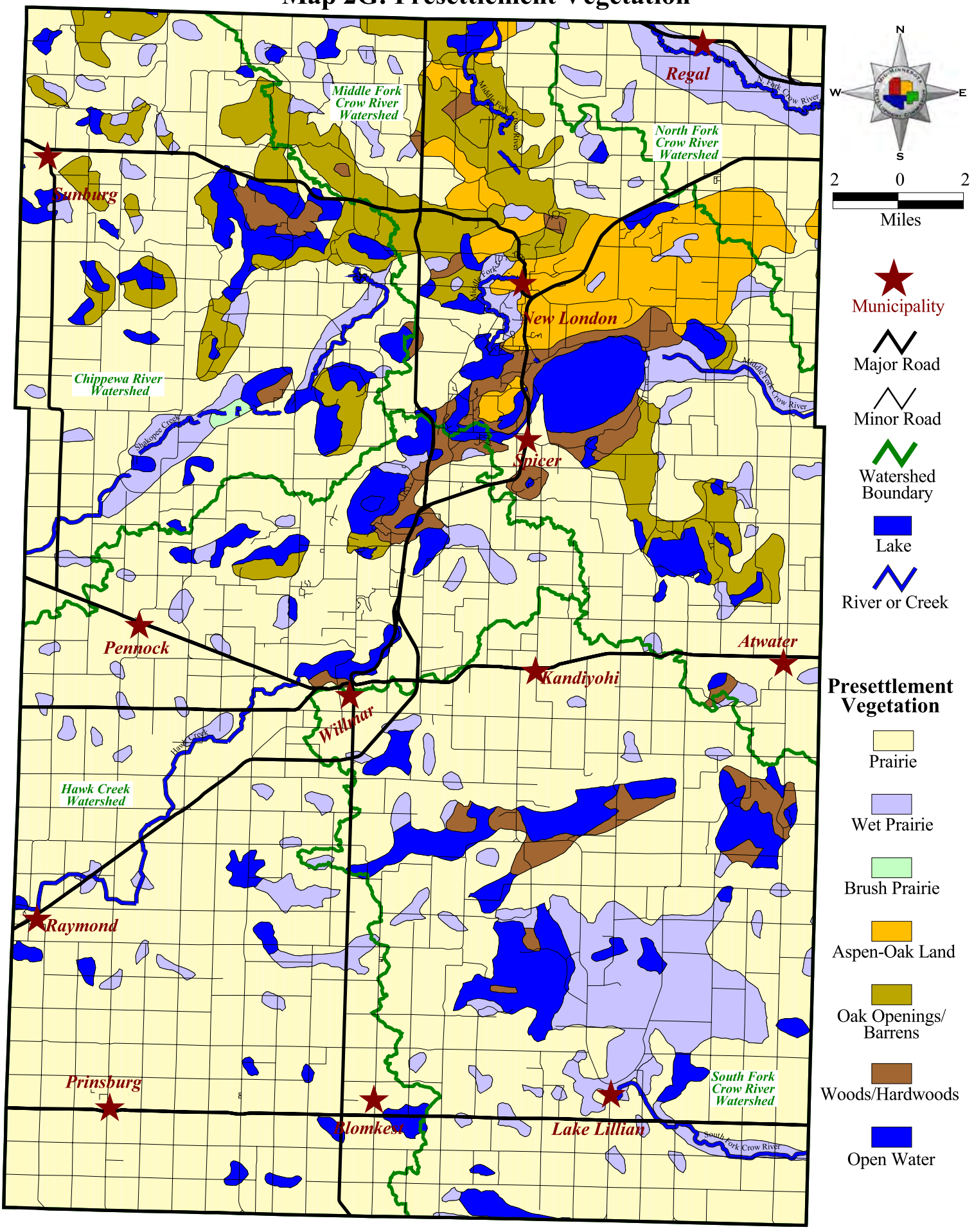
The oak woodland and brushland was a common ecotonal type between the prairie and deciduous forest. Fire, more than topography or climate, was the primary factor influencing the location and extent of this type of vegetation. The oak woodland and brushland ranged from small groves of trees intermixed with open prairie to communities of scrub forest and dense scrub thicket. The dominant tree species were bur and pin oak. Maple-basswood forests were dominated by elm, basswood, sugar maple and red oak. These forests were highly sensitive to fire. As a result, their boundaries were in large part controlled by the frequency of fire. The forests were restricted to areas where natural firebreaks (such as rivers, lakes and rough topography) prevented the spread of fire from the adjacent prairie lands.

Map 2G shows that a large stand of trees stretched across the northern half of the County between what is now Green Lake and Sibley Park. Much like today, aspen, basswood, hickory, maple and oak trees were all common.

Reference:

Minnesota Department of Natural Resources, Division of Forestry

Map 2G: Presettlement Vegetation



Topographic Description of Watersheds
(*Data Item 11*)

For watershed locations, please refer to Map 2C.

Chippewa River Watershed – This watershed is characterized by a rolling moraine topography. The moraines in this region are most likely terminal moraines, formed during the advance of the Wadena Glacial Lobe. Elevation within the watershed generally ranges from 1,150 to 1,300 feet above sea level. The Chippewa River Watershed boasts the highest point in the County, Mt. Tom (a peak in Sibley State Park), with an elevation of 1,375 feet above sea level.

Hawk Creek Watershed – The Hawk Creek Watershed is characterized by a gently twisting till plain formed during the advance of the Des Moines Lobe. Elevations generally range from 1,070 to 1,130 feet above sea level within the watershed. The lowest point within Kandiyohi County is found near the area where Chetomba Creek exits the County to the south. The elevation of this point within the watershed is 1,060 feet above sea level.

Middle Fork of the Crow River Watershed – The topography of this watershed is dominated by rolling moraines, characterized by forested areas, lakes and swamps. The moraines are part of the Alexandria Moraine Complex. Elevation with the watershed is generally between 1,150 and 1,300 feet above sea level.

North Fork of the Crow River Watershed – This watershed is dominated by a rolling moraine topography. In general, forested areas are sparse and occur in mainly areas too steep for agriculture. Elevations within the watershed range from approximately 1,150 to 1,300 feet above sea level.

South Fork of the Crow River Watershed – The topography of this watershed is characterized by a gently undulating till plain. This plain has a mantle of silty lake deposits. Elevation is generally flat within the South Fork of the Crow River Watershed, but can range from 1,070 to 1,130 feet above sea level.

Detailed topographic maps for Kandiyohi County can be viewed at the Kandiyohi County Soil and Water Conservation District office.

References:

United States Department of Agriculture, Soil Survey of Kandiyohi County, Minnesota
United States Geological Survey

Land Use
(*Data Item 12*)

As an update to the 1969 Land Use Inventory, the Minnesota Land Management Information Center conducted the Minnesota Land Use-Agricultural and Transition Areas Inventory in 1989. Land uses were interpreted using National Wetland Inventory Maps from the United States Fish and Wildlife Service, USDA-Agricultural Stabilization and Conservation Service (ASCS) low altitude 35-mm aerial photography and Landsat satellite imagery. The results of the Inventory are reproduced in Map 2H (the numbers correspond with the text below).

The land cover classifications used in this project were derived from *A Classification Manual for Land Cover and Land Use in Minnesota,* which was developed in 1978 by the Minnesota State Planning Agency. The objective of the current classification scheme was to provide as much consistency as possible with the 1969 land use categories, while at the same time recognizing current user needs and better data sources. The following definitions describe the types of land use found in each classification scheme:

- **Urban and Industrial (Area 11) -** This category includes cities, towns and villages with place names. Small residential areas without USGS topographic map place names are classified as rural residential developments. The urban and industrial category also includes commercial, industrial or urban developments that are included within, or are directly associated with, an urban area. Examples include manufacturing and processing plants, power plants, urban airports and waste treatment plants.

- **Farmsteads and Rural Residences (Area 12) -** Farmsteads include the farmhouse and adjoining farmyard areas. Farmsteads also include buildings such as machinery storage areas, grain storage facilities, corrals, livestock holding and feeding areas directly associated with the farmyard area. Rural residences are non-urban residences other than farmsteads. Rural residences include the residence, associated structures (such as garages and sheds) and the associated landscaped area. This category includes from one to four residences within close proximity, with no distinguishable, intervening, non-residential features.

- **Rural Residential Development Complexes (Area 13) -** This category includes rural residences, as defined above, in a complex that includes five or more residences within close enough proximity to be mapped as a single unit.

- **Other Rural Developments (Area 14) -** This category includes commercial, industrial, cultural, recreational and agricultural developments not directly associated with urban areas.

    - **Commercial and Industrial -** Developments include substations, communications facilities, power plants, small private airstrips, junkyards, landfills, storage maintenance yards, businesses, factories, lumber mills, commercial livestock and grain operations.

- **Cultural and Recreational -** Developments include built-up factories and service areas associated with parks and rest areas, camp grounds and golf courses.

- **Agriculture -** Developments include those agricultural facilities not directly associated with farmsteads. It includes machine storage areas, grain storage areas, barns and corrals and isolated buildings. It also includes isolated farmsteads that no longer have apparent road access.

- **Cultivated Land (Area 21) -** Cultivated land includes those areas under intensive cropping or rotation, including periods when a parcel may be fallow. It represents land planted to forage or cover crop. The units exhibit linear or other patterns associated with current or relatively recent tillage.

- **Transitional Agricultural Land (Area 23) -** This category includes areas that show evidence of past tillage but do not now appear to be continuously cropped or in a crop rotation. Parcels in this unit include fields that are idle or abandoned and may or may not have been planted to a cover crop. In addition to displaying some evidence of past tillage, they usually are relatively uniform in vegetation.

- **Grassland (Area 31) -** This unit includes grasslands and herbaceous plants. It may contain up to one-third shrubs and/or tree cover. Areas may be small to extensive, and range from regular to very irregular in shape. They are often found between agricultural land and more heavily wooded areas, and along right-of-ways and drainages. These areas may be mowed or grazed, and range in appearance from very smooth to quite mottled.

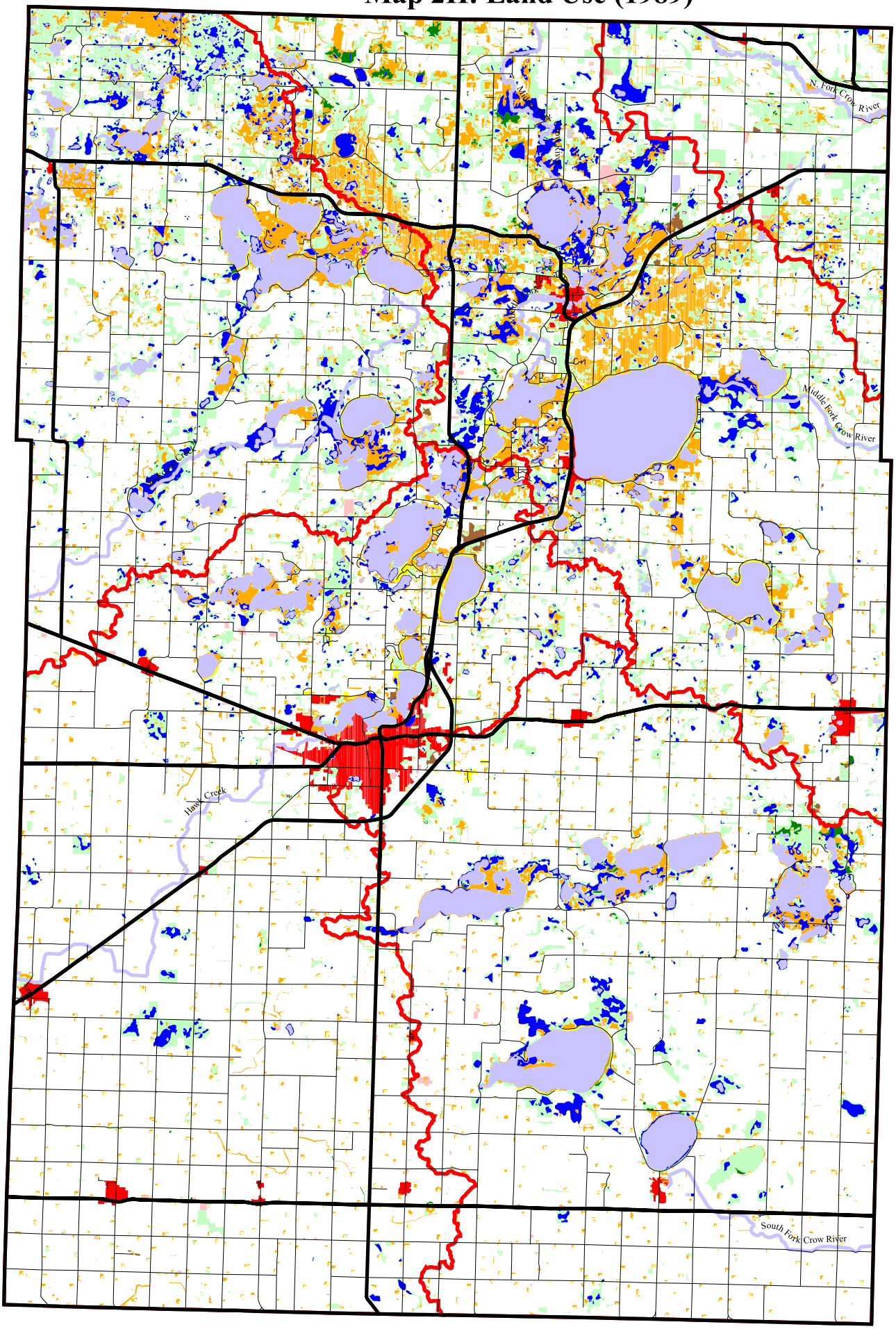
- **Grassland-Shrub-Tree Complex (Area 32) -** This classification includes a combination of grass, shrubs and trees, in which the ***deciduous tree cover*** comprises from one-third to two-thirds of the area, and/or the shrub cover comprises more than one-third of the area. This complex is often found adjacent to grassland or forested areas, but may be found alone. These areas are often irregular in shape and vary greatly in extent.

- **Grassland-Shrub-Tree Complex (Area 33) -** This classification includes a combination of grass, shrubs and trees, in which the ***coniferous tree cover*** comprises from one-third to two-thirds of the area, and/or the shrub cover comprises more than one-third of the area. This complex is often found adjacent to grassland or forested areas, but can be found alone. These areas are often irregular in shape and vary greatly in extent.

- **Deciduous Forest (Area 41) -** This classification includes areas with at least two-thirds of the total canopy cover composed of predominantly woody deciduous species. It may contain coniferous species but it is dominated by deciduous species. It includes woodlots, shelterbelts and other planted areas.

- **Coniferous Forest (Area 42) -** This classification includes areas with at least two-thirds of the total canopy cover composed of predominantly woody coniferous species. It may contain deciduous species but it is dominated by coniferous species. It includes woodlots, shelterbelts and other planted areas.

Map 2H: Land Use (1989)



- **Water (Area 50) -** This category includes permanent waterbodies, including lakes (U.S. Fish and Wildlife Service Lacustrine System 'L'), rivers, reservoirs, stock ponds and permanent palustrine open water. Intermittently exposed palustrine open water areas are included in this open water category when the photo evidence indicates that the area is covered by water the majority of the time.

- **Wetlands (Area 61) -** This category includes wetlands visible through photography, with an area of at least two acres. Wetlands boundaries are delineated from U.S. Fish and Wildlife Service National Wetland Inventory data. In cases where these boundaries have changed (such as for drained wetlands), the boundaries are determined from the current photography. U.S. Fish and Wildlife Service National Wetland Inventory types included in this category are semi-permanent palustrine emergent wetlands and areas of semi-permanent palustrine open water. These categories represent basins with deep-water emergents (primarily cattail, bulrush and whitetop) and open water inclusions. Where U.S. Fish and Wildlife Service data is not available, wetland classification will be based on the distribution of visible deep-water emergents and open water inclusions. Temporary, saturated, seasonal and intermittently exposed palustrine wetlands will, in most cases, be mapped according to dominant cover type visible on the photography (e.g., open grassland, cultivated, grass-shrub-tree complex, etc.) rather than as wetlands.

- **Gravel Pits and Open Mines (Area 71) -** This category includes areas stripped of topsoil with exposed substrate. Gravel pit areas that have been reclaimed either naturally or artificially are classified as the current cover type.

- **Bare Rock (Area 72) -** This category includes areas of rock outcrops that lack appreciable soil development or vegetative cover.

- **Exposed Soil, Sandbars and Sand Dunes (Area 73) -** This category includes areas lacking appreciable plant cover that are not gravel pits or bare rock.

- **Unclassified (Area 80) -** This category includes areas that could not be classified into any of the other categories.

- **Unlabeled (Area 0) -** These areas were not labeled on the original mylar.

Table 2H provides a breakdown of each land use category by acreage and percentage of the County. The single largest land use is cultivated agricultural land, which comprises 377,212 acres, or 68.4 percent of the County. Other major land uses within Kandiyohi County include Grasslands (11.0%), Water (7.1%), Deciduous Forest (6.8%) and Wetlands (3.3%).

Table 2H:
Land Use Analysis

Land Use	Acreage	Percent of County
Cultivated Land (Area 21)	377,212	68.4
Grassland (Area 31)	60,563	11.0
Water (Area 50)	39,158	7.1
Deciduous Forest (Area 41)	37,360	6.8
Wetlands (Area 61)	18,396	3.3
Farmstead and Rural Residential (Area 12)	7,705	1.4
Urban and Industrial (Area 11)	5,862	1.1
Rural Residential Development Complexes (Area 13)	1939	0.4
Other Rural Developments (Area 14)	1,564	0.3
Grassland-Shrub-Tree Complex (Area 32)	1,225	0.2
Transitional Agricultural Land (Area 23)	201	<0.1
Gravel Pits and Open Mines (Area 71)	610	0.1
Bare Rock (Area 72)	1	<0.1
Exposed Soil, Sandbars, and Sand Dunes (Area 73)	46	<0.1

The implications of cultivated agriculture being the single largest land use in the County has far reaching impacts on the quality and quantity of surface and groundwater resources. Over the past few decades, land use practices in agriculture have changed significantly. Not long ago, agriculture was diversified with livestock and dairy operations. Most of the crops that were produced were considered to be high residue and were grown to feed livestock. High residue crops (i.e., corn, alfalfa, small grain) protected the soil from both water and wind erosion. Today, crop selection in agriculture has shifted to primarily cash grain operations with corn, soybeans, small grain and sugar beets being produced. Some of these cash grain crops are considered low residue (i.e. soybeans, sugar beets) and do not adequately protect the soil from erosion. As a result, water quality and quantity is adversely affected.

Even though cultivated agricultural land is the largest land use within the County, the number of acres of farmland is slowly decreasing as a result of urban sprawl around growing municipalities. This is especially true in Willmar Township, where the City of Willmar has been expanding dramatically in a southern direction. Many of the lakes in the County are also experiencing lake shore development. This is especially true in Green Lake, Dovre and New London Townships.

References:

Kandiyohi County Soil and Water Conservation District
Minnesota Land Management Information Center

Public Water, Storm Sewer and Sanitary Sewer Systems (*Data Item 13*)

According to Table 2I, 10 of Kandiyohi County's communities are served by public water, 8 are served by a storm sewer system and 10 are served by a sanitary sewer system (Please refer to Map 1A for community location). While 10 communities are served by a sanitary sewer system, 3 have been specifically identified by the MPCA as in need of system upgrades to become or remain in compliance with State and Federal discharge requirements. Those cities identified by MPCA include: Prinsburg, Raymond and Willmar. In addition, the unsewered communities of Blomkest, Hawick, Regal, Roseland and Svea have been identified by MPCA as in need of installing a centralized sanitary sewer system. Over the next ten years, Kandiyohi County should assist each of these communities in seeking options to install or upgrade their existing systems, thus avoiding further degradation of water resources.

Table 2I:
Communities Served by Public Water,
Storm Sewer and Sanitary Sewer Systems

Community	Public Water	Storm Sewer	Sanitary Sewer
Atwater	Yes	Yes	Yes
Blomkest	Yes	No	No
Hawick	No	No	No
Kandiyohi	Yes	Yes	Yes
Lake Lillian	Yes	Yes	Yes
New London	Yes	Yes	Yes
Pennock	Yes	No	Yes
Prinsburg	Yes	Yes	Yes*
Raymond	Yes	Yes	Yes*
Regal	No	No	No
Roseland	No	No	No
Spicer	Yes	Yes	Yes
Sunburg	No	No	Yes
Svea	No	No	No
Willmar	Yes	Yes	Yes*

** Identified by the MPCA as in need of system upgrades*

The Green Lake Sanitary Sewer and Water District

The Green Lake Sanitary Sewer and Water District (GLSSWD) serves residents surrounding Green Lake. The Kandiyohi County Board established the District in 1975 to help ensure that wastewater from the area residents was being treated adequately. The GLSSWD is managed by the Green Lake Sanitary Sewer and Water Commission, which consists of two members from New London, two members from Spicer, two lake residents and one County Commissioner.

The primary physical components of the District are a water distribution system around Green Lake, a new water treatment facility and a new wastewater treatment facility. In addition, the District has made many other needed improvements, such as new lift stations, wells and storage facilities.

Water Pollution Control Revolving Fund

The Federal Clean Water Act authorizes a Clean Water State Revolving Fund program to provide funds to finance water pollution control projects. Under the Act, the U.S. Environmental Protection Agency (EPA) awards annual capitalization grants to each state to capitalize a State Revolving Fund (SRF), which the State can then use to provide loans for both point source (wastewater) and nonpoint source water pollution-control projects. As part of its capitalization grant application, each State must annually prepare an Intended Use Plan (IUP) that describes the intended use of the available funds.

The Minnesota Legislature has established the Water Pollution Control Revolving Fund under Minn. Statutes Section 446A.07 to receive the Federal capitalization grants and State matching funds. The Minnesota Public Facilities Authority is responsible for managing the funds and its assets. The Authority is also responsible for the financial administration of the point source (wastewater) loan program, including reviewing applicants and setting the rates, terms and conditions of the loans.

The Minnesota Pollution Control Agency (MPCA) is responsible for preparing the annual IUP and for setting wastewater project priorities and reviewing wastewater projects to ensure they meet technical and environmental requirements. Nonpoint source loan programs are administered by the MPCA, the Minnesota Department of Agriculture and the Minnesota Department of Trade and Economic Development.

The 2002 IUP identifies projects and activities that are expected to be funded through the Water Pollution Control Revolving Fund in 2002. In Kandiyohi County, only the cities of Lake Lillian and Prinsburg requested funding through the Water Pollution Control Revolving Fund for the upcoming year. Both cities requested funding to rehabilitate and/or expand their existing wastewater treatment facility. However, both cities were denied placement on the final 2002 IUP. The City of Lake Lillian was turned down on the basis that they would not be able to start construction until 2003. In the City of Prinsburg's case, they applied to Rural Development to seek the necessary funding for their project.

References:

Green Lake Sanitary Sewer and Water District
Mid-Minnesota Development Commission
Minnesota Department of Natural Resources, Division of Waters
Minnesota Pollution Control Agency

Community Public Water Supply Wells and Intakes
(*Data Item 14*)

Data available from the Minnesota DNR Water Appropriate Permit Index lists permitted community public water or municipal wells in Kandiyohi County. A Minnesota DNR Water Appropriation Permit is required for withdrawals greater than 10,000 gallons per day or one million gallons per year. Table 2J lists those public water supplies within Kandiyohi County that have a DNR issued Water Appropriation Permit.

Wellhead Protection

Wellhead protection, which is administered by the Minnesota Department of Health (MDH), is a means of safeguarding public water supply wells by preventing contaminants from entering the area that contributes water to the well or wellfield over a period of time. A public water supply is defined as a system that provides piped drinking water for human use to 15 or more service connections or to 25 or more persons for at least 60 days a year. The wellhead protection area is determined by using geologic criteria, such as the physical characteristics of the aquifer and the effects which pumping has on the rate and direction of groundwater movement. A management plan is developed for the wellhead protection area that includes inventorying potential sources of groundwater contamination, monitoring for the presence of specific contaminants, and managing existing and proposed land and water uses that pose a threat to groundwater quality.

The long-term goal of the MDH is to implement wellhead protection measures for all public water supply wells. However, due to the large number of public water supply wells (13,000), the diversity of geologic conditions in Minnesota and current resource constraints, wellhead protection will be implemented in phases. MDH began implementing wellhead protection measures in 1996, beginning with new community wells. Existing community wells and other types of public water supply wells will be phased in between June 1998 and June 2003. All public water suppliers will be required to:

1. Maintain the isolation distances from potential contamination sources defined in the State Well Code;
2. Monitor noncomplying sources located on their property; and
3. Report to MDH other violations to the isolation distance, or ask a local governmental unit to regulate these sources.

In addition to maintaining the isolation distances, owners of community and nontransient noncommunity wells, when notified by either MDH or when a new well is added to a municipal water supply system, must develop a wellhead protection plan which includes:

1. A map of the wellhead protection area;
2. A vulnerability assessment of the well and the wellhead protection area;
3. An inventory of potential sources of contamination within the wellhead protection area;
4. A plan to manage and monitor existing or proposed potential source(s) of contamination; and
5. A water supply contingency strategy.

Table 2J:
Public Water Supplies

Municipality	DNR Permit #	Permitted Withdrawal*	Township	Range	Section
Atwater, City of	844139-1	60.0	119N	33W	11
Atwater, City of	844139-3	60.0	119N	33W	12
Atwater, City of	844139-4	60.0	119N	33W	11
Blomkest, City of	854122-1	8.0	117N	35W	13
Blomkest, City of	854122-2	8.0	117N	35W	13
GLSSWD	984209-1	105.0	121N	34W	22
GLSSWD	984209-2	105.0	121N	34W	22
GLSSWD	984209-3	105.0	121N	34W	22
Kandiyohi, City of	814076-1	25.0	119N	34W	10
Kandiyohi, City of	814076-2	25.0	119N	34W	10
Lake Lillian, City of	844197-1	13.0	118N	34W	13
Lake Lillian, City of	844197-2	13.0	118N	34W	13
New London, City of	844231-3	10.0	121N	34W	9
Pennock, City of	854137-2	15.0	119N	36W	3
Pennock, City of	854137-4	15.0	119N	36W	3
Prinsburg, City of	844160-1	13.0	117N	36W	16
Prinsburg, City of	844160-2	13.0	117N	36W	16
Prinsburg, City of	844160-3	13.0	117N	36W	16
Prinsburg, City of	844160-4	13.0	117N	36W	15
Prinsburg, City of	844160-6	13.0	117N	36W	21
Raymond, City of	794349-2	30.0	118N	36W	20
Raymond, City of	794349-3	30.0	118N	36W	20
Raymond, City of	794349-5	30.0	118N	36W	18
Spicer, City of	814310-3	10.0	120N	34W	4
Willmar, City of	74228-D-2	1,600.0	119N	35W	9
Willmar, City of	74228-E-10	1,600.0	119N	35W	11
Willmar, City of	74228-E-17	1,600.0	119N	35W	11
Willmar, City of	74228-E-19	1,600.0	119N	35W	11
Willmar, City of	74228-E-20	1,600.0	119N	35W	11
Willmar, City of	74228-E-21	1,600.0	119N	35W	11
Willmar, City of	74228-E-22	1,600.0	119N	35W	11
Willmar, City of	74228-W-7	1,600.0	119N	35W	16
Willmar, City of	74228-W-8	1,600.0	119N	35W	16
Willmar, City of	74228-W-9	1,600.0	119N	35W	16
Willmar, City of	74228-W-12	1,600.0	119N	35W	16
Willmar, City of	74228-W-14	1,600.0	119N	35W	16
Willmar, City of	74228-W-15	1,600.0	119N	35W	16
Willmar, City of	74228-W-16	1,600.0	119N	35W	16
Willmar, City of	74228-W-18	1,600.0	119N	35W	16

** Millions of Gallons per Year (MG/Y)*

Table 2K displays the status of wellhead protection in Kandiyohi County. To date, there are no water suppliers within the County that participate in MDH's Wellhead Protection Program. The cities of Pennock and Willmar are expected to be conducting wellhead protection planning in the near future. The remaining water suppliers within the County will be phased in based on priority, which is identified by their MDH assigned State ranking. Through the State ranking system, the lower the ranking assigned to a community, the higher the priority for the community to participate in the Wellhead Protection Program.

Table 2K:
Status of Wellhead Protection

Water Supplier	Rank	Status
City of Pennock	NA	*Expected to conduct wellhead protection plan
City of Willmar	NA	*Expected to conduct wellhead protection plan
St. John's Lutheran Church and School	155	Expected to be phased in within the next five years
Lakeview Court	352	Expected to be phased in within the next five years
North Roseland Water Association	424	Expected to be phased in within the next five years
City of Atwater	487	Expected to be phased in within the next five years
City of Raymond	523	Expected to be phased in based on ranking
Willmar Regional Treatment Center	547	Expected to be phased in based on ranking
Christianson Systems Inc.	672	Expected to be phased in based on ranking
Farm Credit Services of MN Valley	723	Expected to be phased in based on ranking
West Central Sanitation	722	Expected to be phased in based on ranking
TDS Telecom	828	Expected to be phased in based on ranking
Prinsco, Inc.	1032	Expected to be phased in based on ranking
City of Kandiyohi	1032	Expected to be phased in based on ranking
Green Lake Water District	1039	Expected to be phased in based on ranking
Lake Lillian	1127	Expected to be phased in based on ranking
Prinsburg	1134	Expected to be phased in based on ranking
City of Blomkest	1147	Expected to be phased in based on ranking
R and R Properties	1189	Expected to be phased in based on ranking
Roseland Coop Well	1216	Expected to be phased in based on ranking
Assembly of God Church	1247	Expected to be phased in based on ranking

**** Due to new well construction***

References:

Minnesota Department of Health
Minnesota Department of Natural Resources

Land Ownership
(*Data Item 15*)

In 1995, the Minnesota Land Management Information Center (LMIC), in conjunction with the Minnesota Department of Natural Resources (DNR), developed a computerized database of publicly owned lands in the State, called the Gap Analysis Project (GAP) Stewardship. Much of the data used to create the GAP Stewardship database was from the mid 1970s to the late 1980s, thus the accuracy of the database is limited. Another factor that limits the accuracy of this database is that tracts are only broken down by 40 acre blocks, thus land interest is only expressed when an agency owns more than 50 percent of a 40 acre tract.

According to the GAP Stewardship, the vast majority of land in Kandiyohi County (97.3 percent) is privately owned. Approximately 13,939 acres, or 2.6 percent of the County is publicly owned (the national average is over 30%). The Department of Natural Resources (DNR) is the single largest public land entity within Kandiyohi County. Other public agencies and organizations that own or operate land within Kandiyohi County include the Bureau of Land Management, Department of Corrections, Department of Transportation, Kandiyohi County and U.S. Fish and Wildlife Service.

Table 2L provides a breakdown of public land ownership within Kandiyohi County. Map 2I displays the location of the publicly owned lands within the County.

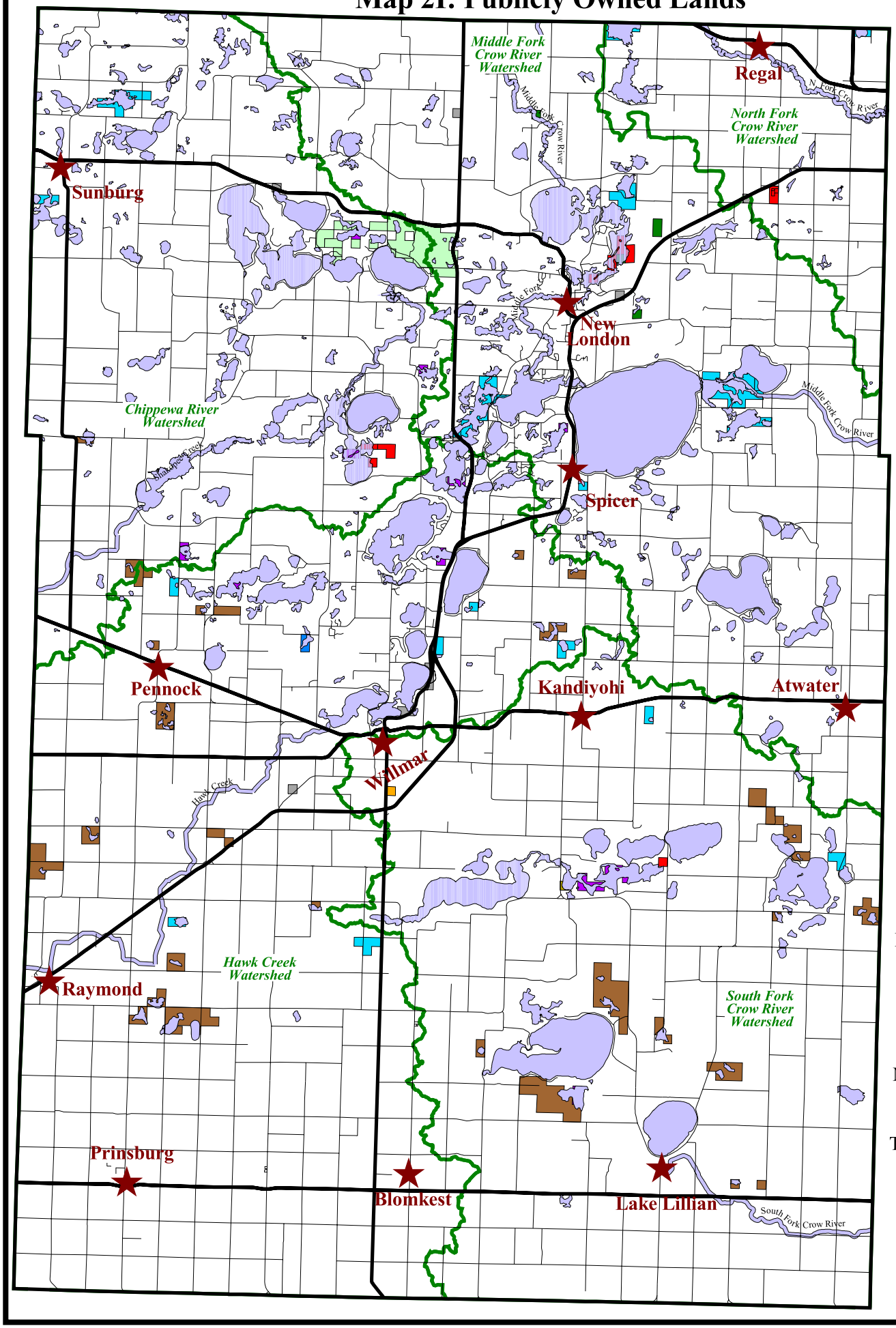
Table 2L:
Public Land Ownership

Agency/ Organization	No. of Tracts	Area (acres)
Bureau of Land Management	15	1,112
Department of Corrections	1	40
Department of Transportation	10	591
DNR, Division of Fish and Wildlife	21	3,579
DNR, Division of Forestry	4	199
DNR, Division of Minerals and Waters	1	79
DNR, Division of Parks and Recreation	12	2,115
DNR, Division of Trails and Waterways	1	39
Kandiyohi County	8	575
U.S. Fish and Wildlife Service	33	5,620
Total	**106**	**13,949**

References:

Minnesota Department of Natural Resources
Minnesota Land Management Information Center

Map 2I: Publicly Owned Lands



N
W E
S

2 0 2
Miles

Municipality

Major Road

Minor Road

Watershed Boundary

Lake

River or Creek

Public Ownership

Bureau of Land Mgnt.

Kandiyohi County

Dept. of Corrections

DNR Div. of Fish & Wildlife

DNR Div. of Parks & Recreation

DNR Div. of Forestry

DNR Div. of Minerals & Waters

DNR Div. of Trails & Waterways

U.S. Fish & Wildlife

MN Dept. of Transportation

Water Resource and Related Easements
(Data Item 16)

Easements, whether short-term or perpetual, are commonly used to protect water quality, reduce soil erosion and enhance fish and wildlife habitat. There are a variety of programs offered through local, State and Federal governmental agencies. Among the most common programs offered are the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Reinvest in Minnesota (RIM) Reserve Program, Wetland Reserve Program (WRP) and U.S. Fish and Wildlife Service easements. In general, the number of conservation easement contracts within the County has increased over the past decade.

Conservation Reserve Program (10-15 Year Contracts)

The Conservation Reserve Program (CRP) offers landowners, operators and tenants the opportunity to voluntarily convert land with high erosion rates and other environmentally sensitive land to permanent vegetative cover. Permanent cover options include grasses and legumes, tree plantings and wildlife habitat. The program goals are: to reduce soil erosion, enhance fish and wildlife habitat, improve water quality, protect the soils on the nation's cropland base, demonstrate good land stewardship and improve rural aesthetics.

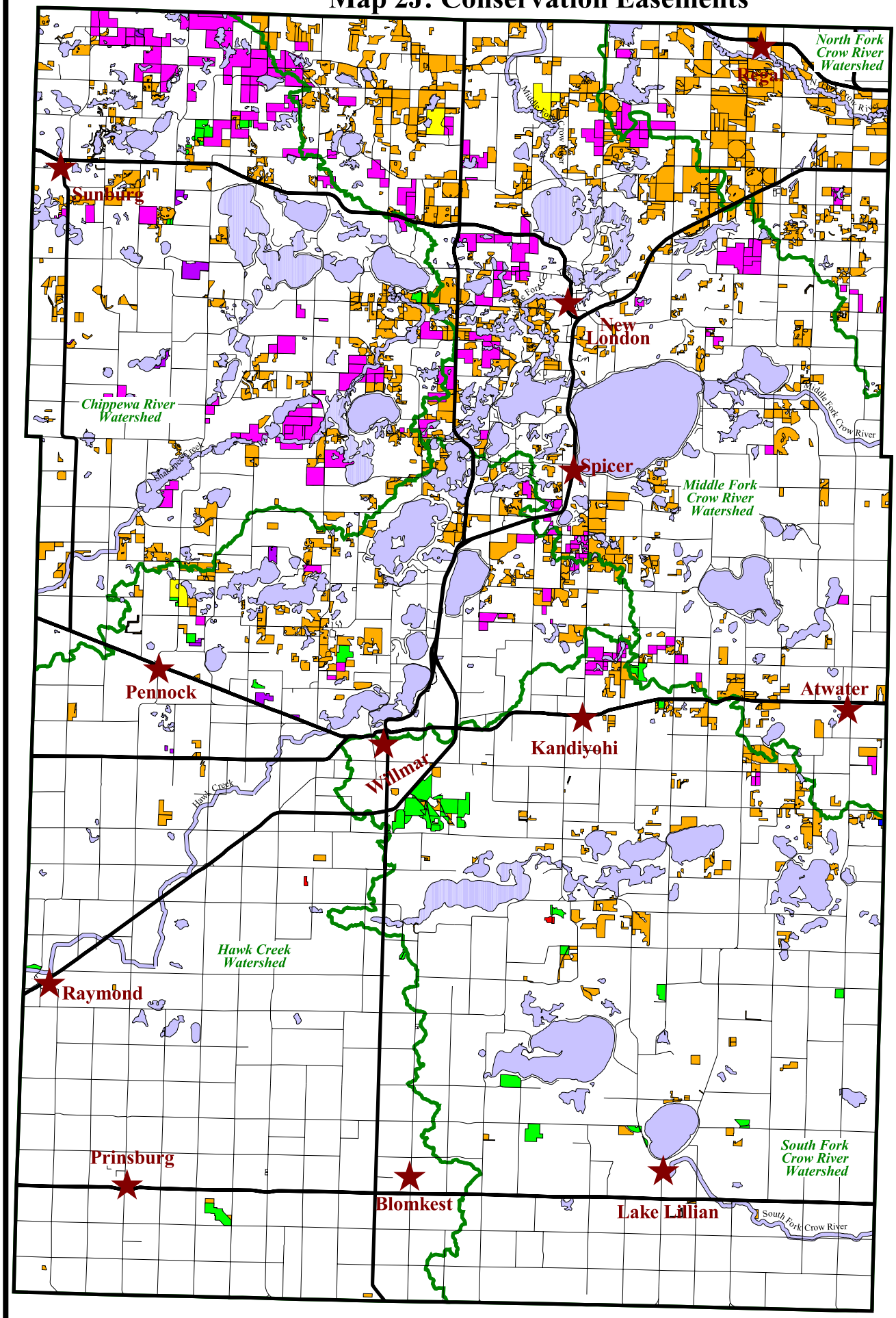
Eligible owners or operators may place highly erodible or environmentally sensitive land into a 10 to 15 year contract. The participant, in return for annual payments, agrees to implement a conservation plan approved by the local conservation district for converting highly erodible cropland or environmentally sensitive land to a less intensive use (i.e., cropland must be planted with a vegetative cover, such as perennial grasses, legumes, forbs, shrubs, or trees). The cropland must be owned or operated for at least 12 months prior to the close of the annual sign-up period, unless the land was acquired by will or succession or the Farm Service Agency (FSA) determines that ownership was not acquired for the purpose of placing the land in the conservation reserve.

Map 2J shows the location of land in Kandiyohi County that has been enrolled in the CRP program through the first 12 signups (1985-1994). However, it should be noted that nearly all of the land enrolled in CRP signups 1-10 is no longer in the program because the contracts have expired. Thus as a result, Map 2J should not be viewed as a current portrayal of CRP lands within the County. Table 2M provides the most current CRP signup totals for Kandiyohi County (signups 04-24). According to the Table, there have been a total of 1,102 CRP contracts in the County, totaling nearly 34,000 acres.

Table 2M:
Kandiyohi County CRP Signups 04-24

# Contracts	1,102
# Acres	33,824
Average Rental Rate	$68.52

Map 2J: Conservation Easements



N
W E
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2 0 2
Miles

Municipality
Major Road
Minor Road
Watershed Boundary
Lake
River or Creek

Easement Program

Permanent Wetland Preserve (PWP)
Conservation Reserve Program (CRP)
RIM Wetland Restoration
WRP/RIM Wetland Reserve
Conservation Reserve Enhancement Program (CREP)
USFWS FmHA
USFWS Wetland

Conservation Reserve Enhancement Program (Perpetual)

The Conservation Reserve Enhancement Program (CREP) is a unique combination of the State's RIM Program and the Federal CRP Program. CREP aims to improve the water quality of the Minnesota River, which in large part is degraded by runoff from marginal agricultural lands, floodplains, riparian areas and drained wetlands. CREP provides a unique opportunity for landowners along the Minnesota River to voluntarily remove these lands from agricultural production.

Through CREP, farmers are given an upfront State "bonus" payment, plus 15 years of guaranteed USDA annual payments, based on the value of the land. Funding for the program comes through a match of State and Federal dollars. The State of Minnesota is required to match Federal dollars (about $0.44 for every Federal dollar) for the placement of perpetual CREP easements on up to 100,000 acres in the 37-county Minnesota River Watershed. Approximately $163 million in Federal funds are available through September 30, 2002.

Kandiyohi County's CREP easements are shown in Map 2J. As of July 10, 2002, there were 63 perpetual CREP easements, covering a total of 3,379.2 acres of land in Kandiyohi County. The State's contribution thus far for CREP easements in the County has totaled $2,429,392.12.

Reinvest in Minnesota Reserve Program (Perpetual)

The Reinvest in Minnesota (RIM) Reserve Program, administered by local SWCDs and BWSR, was one of the first State programs of its kind in the nation. RIM allows landowners to sell perpetual easements for riparian lands, sensitive groundwater areas, wetland restoration areas (drained wetlands), marginal cropland and land for living snowfences. The payment rate for the program is based on 90 percent of the average market value of tillable land in the township. In addition, RIM Reserve provides cost share funds, often times 100 percent, for establishing appropriate conservation and wildlife habitat practices on easement lands.

Since its inception in 1986, funding for the program has been erratic, ranging from a high of $51 million, to a low of $3 million. Since it began, statewide RIM Reserve has enrolled approximately 3,927 easements, covering 126,567 acres, including 43,401 acres of wetland restoration and adjacent upland. The program has historically fostered partnerships with private organizations including Pheasants Forever, Ducks Unlimited and the Minnesota Waterfowl Association, as well as other government agencies, including the U.S. Fish and Wildlife Service (USFWS) and the Minnesota Department of Natural Resources (DNR).

Map 2J displays the RIM wetland restoration easements that have been acquired in Kandiyohi County, as of October 2001. A total of 3,233.5 acres of wetlands countywide have been enrolled in the RIM program.

Wetland Reserve Program (Perpetual/ Limited)

The Wetland Reserve Program (WRP) is a voluntary program through the USDA to restore and protect wetlands on private property. It provides an opportunity for landowners to receive financial incentives to restore or enhance wetlands on their property. Landowners can enroll in the WRP by one of the following three means:

- Permanent Easement. USDA will pay up to the appraised market value for the land and 100 percent of the cost of restoring wetlands and seeding of upland areas into native grasses and forbs.
- 30-Year Easement. USDA will pay 75 percent of the appraised market value for the land and 75 percent of the cost associated with wetland restorations and upland native grass seeding.
- Restoration Cost-Share Agreement. USDA will pay 75 percent of the cost of restoring a wetland in exchange for a minimum ten-year agreement to maintain the restoration. No land use payment is provided.

Any type of land that can be restored to a wetland at a reasonable cost is eligible for WRP, except for wetlands drained in violation of Swampbuster or land established to trees under the Conservation Reserve Program. Cost-share is available to restore:

- Wetlands cleared and/or drained for farming, pasture, or timber production;
- Upland areas around a restored wetland and;
- Drained wooded wetlands where hydrology will be restored.

Through the WRP the landowner continues to control access to the land and may lease the land for hunting, fishing and other compatible recreational activities.

Map 2J displays the location of the WRP/RIM easements that have been acquired in Kandiyohi County, as of October 2001. A total of 17.6 wetland acres are enrolled in the WRP program in the County.

U.S. Fish and Wildlife Service Easements (Perpetual)

The U.S. Fish and Wildlife Service (USFWS) manages land enrolled in two types of conservation easement programs in Kandiyohi County: the Farmer's Home Administration Program and Wetland Easement Program. Land enrolled in each of these USFWS programs is displayed in Map 2J.

Under the Farmer's Home Administration (FmHA) program, when a landowner defaults on an FmHA loan, and that property contains wetlands, those wetlands receive protection. Protection may come in the form of a perpetual conservation easement or fee title transfer to a Federal or State fish and wildlife agency for management. As of May 2002, there were 692.4 acres enrolled in the FmHA Program in Kandiyohi County.

The Wetland Easement Program provides landowners an opportunity to permanently protect existing wetlands through a perpetual easement. Wetlands that are enrolled in this program cannot be drained, filled, leveled or burned. Landowners retain both hunting and mineral rights and can graze or hay wetland when they naturally dry up. As of May 2002, there were a total of 14,265.1 acres enrolled in the Wetland Easement Program in Kandiyohi County.

References:

Kandiyohi County Soil and Water Conservation District
Minnesota Board of Soil and Water Resources
Minnesota Department of Agriculture
United States Department of Agriculture
United States Fish and Wildlife Service

Expected Changes to Physical Environment, Land Use and Development

Changes to Kandiyohi County's physical environment, land use and development can have a significant impact on water resources. The following provides insight to projected changes in the County's population, economic mainstays, land use, wastewater treatment systems, groundwater protection and conservation easements.

Population

According to population projections provided in Tables 1B and 1C, Kandiyohi County would stand to gain an additional 5,608 residents and 2,138 households by the year 2020, if it simply experiences the same growth rate over the next 20 years, as it has since 1960. However, because of development pressure within the County, the fast projection rates should be used for planning purposes. At this rate, Kandiyohi County would gain an additional 8,412 residents and 3,220 households over the next 20 years.

Future population and household growth will have tremendous implications on the quality and availability of water resources in Kandiyohi County. As population and household numbers increase, so does the level of demand that is placed on water resources to meet the needs of these individuals. If growth and development is properly planned, the impact on water resources will be minimized. However, if growth and development occurs unplanned and unchecked, the overall quality and carrying capacity of the County's water resources could be diminished to the point that it no longer suits the needs of the residents of the area.

Economic Mainstays

According to the Minnesota Department of Economic Security (MDES), there was an available workforce of 22,103 people in Kandiyohi County in 2000. The total employment within the County during the same year was 21,444 people. As a result of the workforce being greater than the number of employment opportunities, a total of 569 people, or 2.6 percent of the workforce was

unemployed. The MDES also reported that four industries comprise a majority of the County's employment base. These industries include: services (4,820), government (4,118), retail trade (3,983) and manufacturing (3,515). This is a noticeable change from past decades, when the agricultural industry was amongst the prominent employers in Kandiyohi County. As of the 2000 U.S. Census, only 1,226 people in the County were employed in the agricultural industry. Due to poor commodity prices, the overall trend of fewer farms, farming larger acreages and employing fewer employees, is likely to continue over the next ten years.

Land Use

As an update to the 1969 Land Use Inventory, the Minnesota Land Management Information Center conducted the Minnesota Land Use-Agricultural and Transition Areas Inventory in 1989. According to the inventory, cultivated agricultural land is the single largest land use in the County (68.4%). The implications of cultivated agriculture land being the largest land use has far reaching impacts on the quality and quantity of the County's surface and groundwater resources. Over the past few decades, land use practices in agriculture have changed significantly. Not long ago, agriculture was diversified with livestock and dairy operations. Most of the crops that were produced were considered to be high residue and were grown to feed livestock. High residue crops (i.e., corn, alfalfa, small grain) protected the soil from both water and wind erosion. Today, crop selection in agriculture has shifted to primarily cash grain operations with corn, soybeans, small grain and sugar beets being produced. Some of these cash grain crops are considered low residue (i.e. soybeans and sugar beets) and do not adequately protect the soil from erosion. As a result, water quality and quantity is adversely affected. Over the next ten years, it is expected that the current crop selection within the County will remain the same.

Even though cultivated agricultural land is the largest land use within the County, the number of acres of farmland is slowly decreasing, as a result of urban sprawl in rapidly growing areas. This is especially true in the Middle Fork of the Crow River Watershed and surrounding the City of Willmar. To meet the aggregate demand of this growth, gravel mining within the County has also risen. The increased mining has led to the removal of additional acres of farmland from production and an increased need for erosion and stormwater management. The overall the trend of increasing development and mining activity within the County is expected to remain constant over the next ten years.

Wastewater Treatment Facilities

According to the Minnesota Pollution Control Agency (MPCA), the cities of Prinsburg and Willmar are in need of wastewater treatment facility upgrades to become or remain in compliance with Federal and State discharge requirements. In addition, the unsewered communities of Blomkest, Hawick, Regal, Roseland and Svea have been identified by MPCA as in need of installing a centralized sanitary sewer system. Over the next ten years, it is expected that each of these communities will be working with the MPCA and the County to seek options to install or upgrade their existing systems.

Groundwater Protection

Wellhead protection, which is administered by the Minnesota Department of Health (MDH), is a means of safeguarding public water supply wells by preventing contaminants from entering the area that contributes water to the well or wellfield over a period of time. Over the next ten years it is expected that 21 public water suppliers in Kandiyohi County will enroll in the MDH Wellhead Protection Program. Each of these water suppliers will be developing a management plan for the wellhead protection area that includes inventorying potential sources of groundwater contamination, monitoring for the presence of specific contaminants and managing existing and proposed land and water uses that pose a threat to groundwater quality.

Conservation Easements

Common conservation easement programs in Kandiyohi County include the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Reinvest in Minnesota (RIM) Reserve Program, Wetland Reserve Program (WRP) and U.S. Fish and Wildlife Service easements. These programs offer short term and/or perpetual easements to protect water quality, reduce soil erosion and enhance fish and wildlife habitat. With the exception of CREP, which will conclude on September 30, 2002, the number of conservation easements within the County is expected to remain at least the same over the next ten years, depending on Federal and State funding.

CHAPTER THREE:
HYDROLOGIC INVENTORY OF KANDIYOHI COUNTY

This chapter provides a hydrologic inventory of Kandiyohi County, with sections on the quality and quantity of streams, lakes and groundwater. In addition, information on groundwater appropriations and water use conflicts is included.

Chapter three includes information on the following data items:

High, Mean and Low Flows of Streams *(Data Item 17)*

The Minnesota Department of Natural Resources (DNR) evaluates average annual stream flow by using Exceedence Value Ranges (EVRs). An exceedence value is a statistical measurement of stream flow based on historical discharge records. The value is the probability of the stream flow exceeding a certain value. For instance, a 50 percent exceedence value (sometimes written as Q50) indicates that the level of stream flow currently being reported at a gauging station has been equaled or exceeded 50 percent of the time during the period of record being used (which could be monthly or yearly). A 75 percent exceedence value (Q75) would be the level of stream flow at a particular gauging station that was equaled or exceeded 75 percent of the time during the period of record. A description of each EVR is given below.

- **Critical Flow (Q90-Q100):** A watershed is classified as having critical flow when its stream flow falls below the annual 90 percent exceedence value (Q90). If a watershed is classified as having critical flow, the DNR may, if necessary, restrict the appropriation of water from that watershed to conserve water for instream flow or other higher priority uses.
- **Low Flow (Q75-Q90):** A watershed is classified as having low flow when its stream flow is below the monthly 75 percent exceedence value (Q75), but still above critical flow.
- **Normal Flow (Q25-Q75)**: A watershed is classified as having normal flow when its stream flow is between the monthly 25 percent (Q25) and 75 percent (Q75) exceedence values.
- **High Flow (Q10-Q25):** A watershed is classified as having high flow when its stream flow is above the monthly 25 percent exceedence level (Q25).
- **Flood Flow (Q1-Q10):** A watershed is classified as having flood flow when its stream flow is at or above the flood stage set for that watershed by the National Weather Service (NWS).

Table 3A displays the mean annual EVRs for streams in Kandiyohi County by watershed (1996-2000). The highest flows, based on mean EVRs, occurred in 1996 and 1997. During that time, streams in the Chippewa River and Hawk Creek watersheds had mean EVRs that categorized them into the Flood Flow range (Q1-Q10). Since 1997, the mean EVRs of streams in Kandiyohi County's watersheds have returned to the Normal Flow range (Q25-Q75). For specific information relating to stream hydrographs or gauging stations, please contact the DNR or USGS.

Table 3A:
Mean Stream Exceedence Value Ranges by Watershed

Watershed	1996 EVR	1997 EVR	1998 EVR	1999 EVR	2000 EVR
Chippewa River	Q1-Q10	Q1-Q10	Q10-Q25	Q10-Q25	Q25-Q75
Hawk Creek	Q1-Q10	Q1-Q10	Q10-Q25	Q10-Q25	Q25-Q75
Middle-Fork Crow River	Q10-Q25	Q10-Q25	Q10-Q25	Q25-Q75	Q25-Q75
North Fork Crow River	Q10-Q25	Q10-Q25	Q10-Q25	Q25-Q75	Q25-Q75
South Fork Crow River	Q10-Q25	Q10-Q25	Q10-Q25	Q25-Q75	Q25-Q75

Reference: Minnesota Department of Natural Resources, Division of Waters

Ordinary High Water Levels for Lakes
(Data Item 18)

The boundary of protected waters and wetlands, for regulatory purposes, is defined by the Ordinary High Water Level (OHWL). The OHWL is the elevation delineating the highest water level which has been maintained for a sufficient period of time to leave evidence on the landscape. Generally, it is the point where the natural vegetation changes from predominately aquatic to predominately terrestrial. Any work done below the OHWL is within the beds of public waters and is therefore subject to the permit authority of the DNR. Table 3B lists the 55 lakes within Kandiyohi County that have DNR established OHWLs.

Table 3B:
Ordinary High Water Levels for Lakes

Lake Name (ID)	OHWL	Lake Name (ID)	OHWL
Andrew (34-0206)	1192.2	Mud (34-0158)	1203.4
Big Kandiyohi (34-0086)	1103.2	Nest (34-0154)	1166.1
Calhoun (34-0062)	1157.2	Norway (34-0251)	1197.7
Carrie (34-0032)	1126.9	Pay (34-0023)	1194.4
Cedar Island (34-0153)	1189.4	Reed WMA (34-0262)	149.5*
Crook (34-0218)	1116.2	Ringo (34-0172)	1166.4
Diamond (34-0044)	1172.9	Saint Johns (34-0283)	1123.5
Eagle (34-0171)	1126.3	Skataas (34-0196)	101.1*
East Sunburg (34-0336)	1236.5	Sperry (34-0040)	1167.7
East Twin (34-0115)	1168.2	Summit (34-0027)	1214.3
Elizabeth (34-0022)	1126.2	Sunburg (34-0359)	1236.3
Elkhorn (34-0119)	1168.1	Swan (34-0223)	1195.5
Florida (34-0217)	1122.1	Swan (34-0285)	148.1*
Foot (34-0181)	1118.1	Swenson (34-0321)	1170.2
Games (34-0224)	1197.7	Unnamed (34-0161)	1227.1
George (34-0142)	1166.3	Unnamed (34-0307)	1242.8
Gina (34-0126)	1179.2	Unnamed (34-0353)	1229.9
Glesne (34-0352)	1229.9	Unnamed (34-0407)	1166.1
Green (34-0079)	1158.2	Unnamed (34-0267)	1092.7
Henchien (34-0207)	1193.5	Unnamed (34-0089)	1104.5
Henderson (34-0116)	1166.6	Unnamed (34-0476)	1198.3
Henjum (34-0316)	1238.8	Unnamed (34-0476)	1198.0
Hubbard (34-0054)	1173.1	Wagonga (34-0169)	1106.0

**** Assumed Datum***

Table 3B:
Ordinary High Water Levels for Lakes *(continued…)*

Lake Name (ID)	OHWL	Lake Name (ID)	OHWL
Jesse (34-0060)	1157.8	West Lindgren (34-0297)	1137.9
Knutson (34-0306)	1218.6	West Twin (34-0117)	1167.2
Little Kandiyohi (34-0096)	1105.9	Willmar (34-0180)	1118.1
Long (34-0066)	1209.8	Woodcock (34-0141)	1178.0
Long (34-0192)	1165.4		

Reference:

Minnesota Department of Natural Resources, Division of Waters

Permitted Surface Water Appropriations
(Data Item 19)

A listing of Minnesota Department of Natural Resources (DNR) issued water appropriation permits for Kandiyohi County's lakes and streams is provided in Appendix A (identified with resource codes of 2 or 3). A total of 7 permits have been issued within the County for lake and stream water withdrawal. Water appropriation permits are required by the DNR for withdrawals greater than 10,000 gallons per day or one million gallons per year. There are several exemptions from the permit requirement, including domestic uses serving less than 25 persons for general residential purposes, test pumping, reuse of water already authorized by a permit and certain agricultural drainage systems. All active water appropriation permit holders are required to measure monthly water use with an approved measuring device to an accuracy of 10 percent and report water use yearly.

Reference:

Minnesota Department of Natural Resources, Division of Waters

State Protected Lake Levels and Stream Flows
(Data Item 20)

The Minnesota Department of Natural Resources (DNR) is the regulatory agency in charge of establishing protected flows and lake levels within the State. The DNR has defined protected flow as "the amount of water required in the watercourse to accommodate instream needs such as water-based recreation, navigation, aesthetics, fish and wildlife habitat, water quality and needs by downstream higher priority users located in reasonable proximity to the site of appropriation." Protection flow for "instream needs" has been identified as a significant social and environmental issue. Instream flow protection is addressed in Minnesota Statutes, and permits issued for appropriation of water from streams or lakes may be limited in order to maintain and protect instream uses.

Although Minnesota is widely perceived as a water-rich State, local and statewide shortfalls are common. For instance, in 1988 Minnesota and much of the Upper Midwest experienced a severe to extreme drought, rivaling the drought conditions of 1933-1934. Wells went dry, streams had low or no flow, and the lack of adequate water supplies affected all users, out-of-stream and instream. Surface-water appropriators who had never before experienced water availability shortages, had their surface water appropriation permits suspended as early in the season as June.

As recently as the summer of 2000, serious thought was given to suspending appropriations due to low flows because the growing season was abnormally dry over significant areas of Minnesota. The DNR notified water appropriators to plan ahead in case of permit suspensions. However, heavy rainfall in early November helped to replenish dehydrated topsoil, as well as streams and lakes.

According to the DNR, there are no known protected lake levels in Kandiyohi County. To regulate surface water appropriators, the DNR uses the following protection elevations:

1. For basins with a functioning outlet below their ordinary high water level (OHWL), the basin's runout elevation will be used as the protection elevation for permit suspension.

2. For basins without a functioning outlet below the OHWL (landlocked basins), the protection elevation for permit suspension will be 1.5 feet below the OHWL.

3. Exceptions to A or B: A protection elevation other than listed in A or B must be based on an analysis of important aquatic vegetation characteristics related to fish and wildlife habitat, existing uses by public and riparian landowners, the total volume of the basin and the slope to the littoral zone, as provided in Minnesota Statutes, Section 103.285, Subdivision 3.

Table 3C details the protected flows that have been established on select Kandiyohi County rivers and streams. On rivers or streams that do not have an established protected flow, the DNR issues new water appropriation permits based on the waterbody's annual 90 percent exceedence flow.

Table 3C:
Protected Flows

River/ Stream	Protected Flow (cfs)
Hawk Creek	2.0
Middle Fork of the Crow River	59.0
North Fork of the Crow River	9.2

Reference:

Minnesota Department of Natural Resources, Division of Waters

Water Use Conflicts
(Data Item 21)

Increases in surface and groundwater use may affect the usage of nearby property owners. For instance, wells that were once adequate in supply, now can no longer meet the domestic needs of residents because of one or more nondomestic users. In such instances, domestic well owners and municipal water suppliers can file a water use complaint with the Department of Natural Resources (DNR).

According to Minnesota Statutes 103G.261, domestic water use is the highest priority when the State's water supply is limited. If upon DNR investigation it is found that the water use conflict is the direct result of the nondomestic water user(s), water use restrictions may be imposed. For instance, the Water Appropriation Permit Program could consider imposing permit restrictions, based on the user's priority, water conservation measures and well improvements. In addition, the DNR Technical Analysis Program may assist the user(s) in evaluating alternative water supply sources.

To date, the DNR has documented and investigated only one water use conflict in Kandiyohi County. The conflict occurred in 1977 and involved the issuance of the Beusekom groundwater irrigation permit (DNR Permit #780497). Upon DNR investigation, the permit was issued without any restrictions.

Reference:

Minnesota Department of Natural Resources, Division of Waters

Implications and Assessment

Kandiyohi County is very surface water-rich, with thousands of acres of lakes, streams and wetlands. These surface water resources are utilized extensively for recreational uses and to a lesser extent irrigation. A total of seven water appropriation permits have been issued by the Minnesota Department of Natural Resources (DNR) throughout the County for surface water withdrawal, 5 of which were issued for irrigation purposes. To date, the DNR has yet to document a surface water use conflict within the County.

High water problems have been reported predominantly in the Middle Fork of the Crow River Watershed, as well as many area lakes, including Green, Diamond and Calhoun. Water control structures have been placed on these lakes to control water levels and reduce downstream flooding. The County should work with the DNR and lake associations to resolve any future lake level conflicts.

Kandiyohi County has over 600 miles of public drainage ditches. These ditches were installed to provide drainage for agricultural lands at a time when Federal and State policies were to increase agricultural production. These drainage ditches are primarily in the southern part of the County

and have resulted in an overall increase in agricultural productivity in the area. Unfortunately, drainage systems designed in the past have been managed primarily to remove water as rapidly as possible, without regard to effects on surface water quality and quantity. Best management practices (BMPs), such as filter strips and alternative drainage methods, need to be targeted on drainage systems to prevent exacerbating current water quality and quantity problems. Wetland restorations should also be targeted in conjunction with drainage ditch systems for flood attenuation purposes.

In rapidly developing areas of the County, particularly in the Middle Fork of the Crow River Watershed and surrounding the City of Willmar, the increasing amount of impervious surface has resulted in a need for greater stormwater management. The County should work with landowners in these areas to install BMPs to reduce runoff rates. The County should also consider developing a stormwater management ordinance to set standards for the quality and quantity of runoff. Through land use controls, stormwater management plans should be required for future development projects.

Permitted Groundwater Appropriations
(Data Item 22)

A listing of Minnesota Department of Natural Resources (DNR) issued groundwater appropriation permits in Kandiyohi County is provided in Appendix A (identified with a resource code of 1). A total of 156 permits have been issued within the County for groundwater withdrawal, 39 of which are for municipal water usage. Water appropriation permits are required by the DNR for withdrawals greater than 10,000 gallons per day or one million gallons per year. There are several exemptions from the permit requirement, including domestic uses serving less than 25 persons for general residential purposes, test pumping of a groundwater source, reuse of water already authorized by a permit, or certain agricultural drainage systems. All active water appropriation permit holders are required to measure monthly water use with an approved measuring device to an accuracy of 10 percent and report water use yearly.

Reference:

Minnesota Department of Natural Resources, Division of Waters

Well Interferences/Groundwater Use Conflict
(Data Item 23)

When a high capacity well is pumping, a portion of the aquifer around it is dewatered in a pattern known as a cone of depression. Wells located within the cone of depression may experience lower water levels and have problems getting water if water levels are lower than the well pump. This condition, displayed in Figure 3A, is referred to as "well interference". Most well interference problems tend to be localized and short in duration; however, being without water is a major inconvenience and can cause damage to well pumps. Lowering the pump in the well or installing a new well pump can resolve many well interference problems. In some situations it may become necessary to construct a new water supply well.

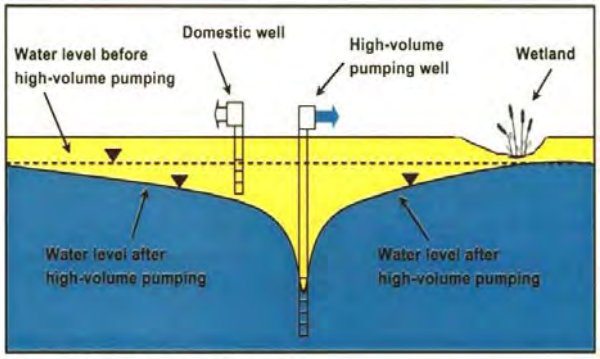


Figure 3A: Well Interference

Minnesota Statutes 103G.261 establish domestic water use as the highest priority of the State's water when supplies are limited. Procedures for resolving well interferences are defined by Minnesota Rules 6115.0730. Domestic well owners and municipal water suppliers that have problems obtaining water and believe the situation is due to the operation of a high capacity well that pumps in excess 10,000 gallons per day or one million gallons per year, can submit a well interference complaint to the DNR for investigation. However, before the DNR will investigate a well interference complaint, the well owner must have the well inspected by a licensed well driller to determine if the water supply problems are related to the condition of the domestic well.

The DNR Well Interference Complaint Tracking Database lists only one well interference complaint that has occurred in Kandiyohi County. The single complaint occurred in 1977 and involved the Beusekom Irrigation Permit, DNR Permit #780497. The complaint was investigated by the DNR and the decision was made to issue the permit.

Reference:

Minnesota Department of Natural Resources, Division of Waters

Observation Wells
(Data Item 24)

The Minnesota Department of Natural Resources (DNR) monitors the use of the State's water and allocates resources to assure there is sufficient quality and quantity to supply the needs for future generations. Under the observation well network program, groundwater levels are routinely measured in 700 wells statewide. The primary objectives of the observation well network are to:

- Place wells in areas of future or present high groundwater use while considering variations in geologic and other environmental conditions;
- Identify long-term trends in groundwater levels;
- Detect significant changes in groundwater levels;
- Provide data for evaluation for local groundwater complaints;
- Provide data to resolve allocation problems; and
- Identify target areas that need further hydrogeologic investigation, water conservation measures, or remedial action.

There are three types of aquifer systems that are sampled by observation wells in Kandiyohi County: water table, buried artesian and other. Water table aquifers are the saturated portions of the upper soil profile located above a confining layer. The saturated soil must be of such composition (e.g., sand and/or gravel) that the water can be easily withdrawn. A saturated, clayey soil does not meet the definition of a water table aquifer. Buried artesian aquifers are composed of glacially deposited sands and gravels, over which a confining layer of clay or clay till was deposited. Their hydraulic connections beneath the ground surface are often unknown.

Map 3A identifies the locations of the 56 DNR observation wells within Kandiyohi County. Table 3D provides specific details for each of the observation wells, including information on the location of the well, depth of the well, aquifer type and years of record. The average reading for the 14 observation wells that are currently monitored is also provided. Readings for each of the observation wells is graphed in Appendix E.

Map 3A: DNR Observation Wells

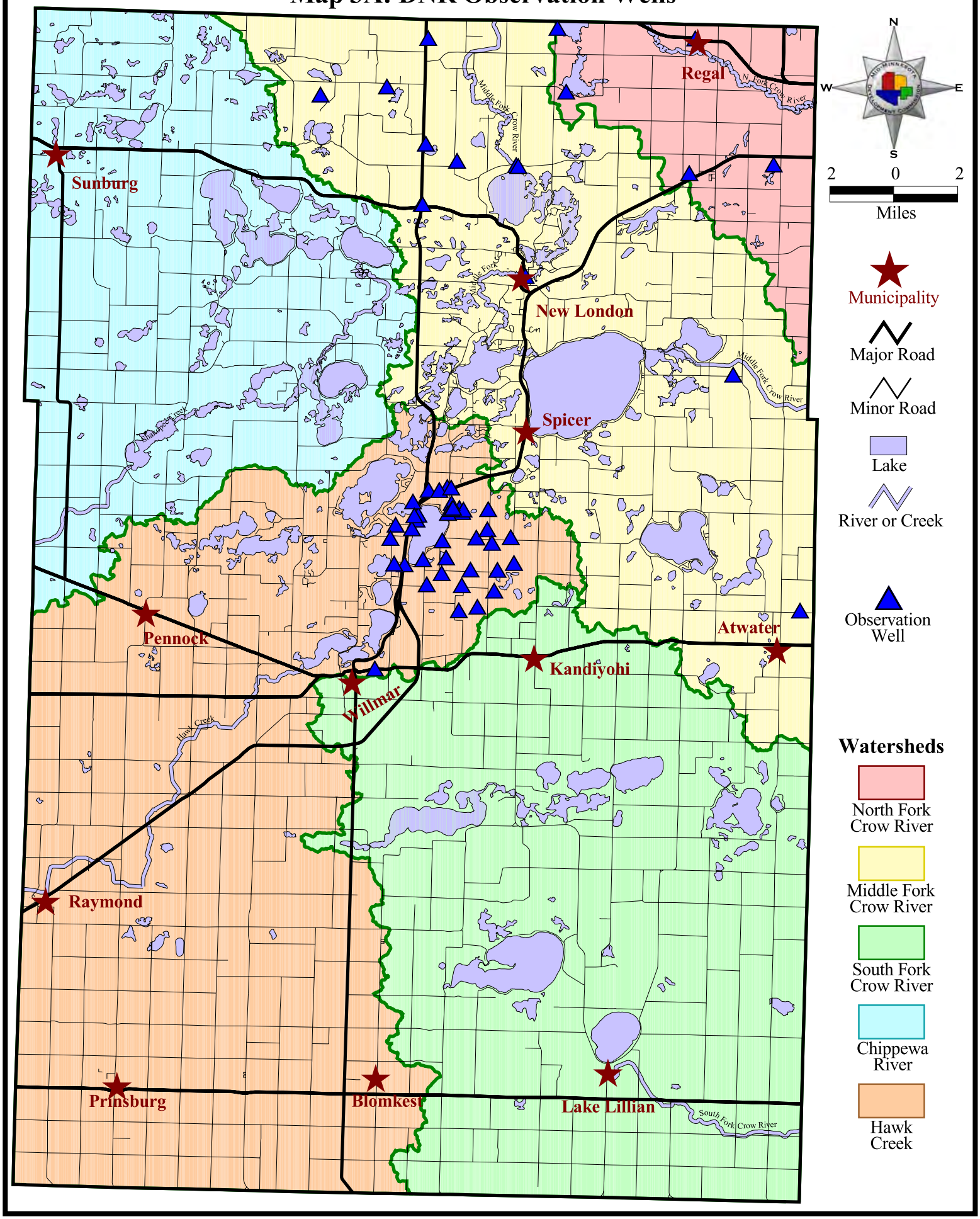


Table 3D:
DNR Observation Wells

Well #	Unique #	Township	Range	Section	PLSQ	Depth	Aquifer Type	Years of Record	Average Reading
34000	210690	119N	35W	14	NWNWNE	320’	Buried Artesian	1968-1987	NA
34001	243897	122N	33W	4	SESENW	17’	Water Table	1966-Present	-8.43’
34002	243898	122N	34W	6	SWNWSW	23’	Water Table	1966-Present	-9.37’
34003	243899	120N	35W	25	SENESE	46’	Other	1977-1978	NA
34004	243900	120N	35W	24	SESWNE	41’	Other	1977-1978	NA
34005	243901	120N	34W	31	SWSWNW	37’	Other	1977-1978	NA
34006	243902	120N	34W	31	NWNWNE	56’	Other	1977-1978	NA
34007	243903	120N	35W	25	NESESW	42’	Other	1977-1978	NA
34008	243904	120N	34W	20	NWNWNW	70’	Buried Artesian	1977-1978	NA
34009	243905	120N	34W	20	SWSWSE	41’	Other	1977-1978	NA
34010	243906	120N	34W	29	SESESW	34’	Other	1977-1978	NA
34011	243907	120N	34W	30	NWNWNE	41’	Buried Artesian	1977-1978	NA
34012	243908	120N	34W	32	SESWNW	26’	Other	1977-1978	NA
34013	243909	119N	34W	5	SWNWNW	48’	Other	1977-1978	NA
34014	243910	120N	34W	18	SESWNE	55’	Water Table	1977-1978	NA
34015	243911	120N	34W	20	SENESE	48’	Other	1977-1978	NA
34016	243912	120N	34W	28	NWNWNW	76’	Other	1977-1983	NA
34017	243913	120N	34W	33	NENWSW	41’	Other	NA	NA
34018	243914	120N	35W	25	NWSWSW	41’	Other	NA	NA
34019	243915	120N	35W	24	SWNWSE	20’	Other	1977-1978	NA
34020	243916	120N	34W	19	NWNENE	40’	Other	1977-1978	NA
34021	243917	120N	35W	24	NWSENE	33’	Other	1977-1978	NA
34022	243918	120N	34W	28	SWSESW	55’	Other	1978	NA
34023	243919	120N	35W	13	SWSWSE	40’	Water Table	1977-1978	NA
34024	243920	119N	34W	5	NENWNE	41’	Other	1978	NA
34025	243921	120N	34W	20	NENENE	40’	Other	NA	NA
34026	243922	120N	35W	24	NESWNE	19’	Water Table	1977-1978	NA
34027	243923	120N	35W	24	SENWSW	33’	Buried Artesian	1977-1978	NA
34028	243924	120N	34W	30	NENWSE	51’	Other	1977-1978	NA
34029	243925	120N	34W	28	SENESE	40’	Other	1977-1978	NA
34030	243926	120N	34W	21	SESWSE	48’	Buried Artesian	1977-1978	NA
34031	243927	120N	34W	20	SENWNW	23’	Other	NA	NA
34032	243928	120N	34W	20	SENWNW	54’	Buried Artesian	1977-1978	NA

Table 3D:
DNR Observation Wells *(continued…)*

Well #	Unique #	Township	Range	Section	PLSQ	Depth	Aquifer Type	Years of Record	Average Reading
34033	243929	120N	34W	18	SWSESE	47’	Water Table	1977-1978	NA
34034	243930	120N	34W	19	NESWNE	24’	Water Table	1977-1978	NA
34035	243931	120N	34W	18	NWSWSW	83’	Water Table	1977-1978	NA
34036	243932	120N	34W	18	NENESW	61’	Water Table	1977-1978	NA
34037	243933	120N	34W	19	NESWNE	9’	Water Table	1977-1978	NA
34038	243934	120N	34W	19	NESWNE	9’	Water Table	1977-1978	NA
34039	243935	120N	34W	18	SWSENE	61’	Water Table	1977-1978	NA
34040	243936	120N	35W	26	NENENE	48’	Other	NA	NA
34041	116396	120N	33W	36	SWSWSE	39’	Water Table	1982-Present	-16.43’
34042	229542	121N	33W	27	SENWSE	46’	Water Table	1982-Present	-3.98’
34043	243937	121N	34W	10	SWNESW	74’	Buried Artesian	1982-1996	NA
34044	243938	122N	33W	26	NE	48’	Buried Artesian	1982-1986	NA
34045	178721	122N	33W	28	NENWSW	57’	Water Table	1982-Present	-27.78’
34046	135429	122N	34W	14	SWNENW	29’	Water Table	1982-Present	-3.45’
34047	229558	122N	34W	19	NWSWSW	33’	Water Table	1982-Present	-5.60’
34048	211160	122N	35W	16	SWSENE	45’	Water Table	1982-1996	NA
34049	152112	122N	34W	2	SWNWNW	183’	Buried Artesian	1984-Present	-11.21’
34050	243939	122N	34W	29	NWSWNW	20’	Water Table	1985-Present	-10.05’
34051	243940	122N	35W	14	NWNENE	22’	Water Table	1985-Present	-3.07’
34052	243941	122N	34W	28	SESENE	244’	Buried Artesian	1989-Present	-1.16’
34053	243942	122N	34W	28	SESENE	15’	Water Table	1989-Present	-4.75’
34054	243943	122N	34W	31	SWNWSW	192’	Buried Artesian	1989-Present	-48.81’
34055	243944	122N	34W	31	SWNWSW	52’	Water Table	1989-Present	-38.39’

Reference:

Minnesota Department of Natural Resources, Division of Waters

Implications and Assessment

Relative to the amount of information known about surface water in the County, very little is known about groundwater resources. Available information indicates that groundwater resources are plentiful within the County. Outwash and bedrock aquifers are the two

predominant aquifer systems that are found in the County. Outwash aquifers are generally found in the northern half of the County and provide a high quality water source for use in domestic and municipal water supplies, irrigation and commercial uses. These aquifers typically yield 25-500 gallons per minute. Aquifers within the bedrock system are typically found in the southern half of Kandiyohi County, at depths of 200 feet or greater. Yields from bedrock aquifers generally range from 10 to 250 gallons per minute. The quality of aquifers within this system is typically very hard, with high concentrations of sulfate, chloride and dissolved solids in many areas.

In an effort to further the understanding of groundwater resources in the area, the County should work in conjunction with the Minnesota Department of Natural Resources (DNR) and McLeod, Meeker and Renville Counties to conduct a Regional Hydrogeologic Atlas. Current groundwater quality monitoring efforts by the Minnesota Department of Agriculture (MDA), Minnesota Department of Health (MDH) and the Minnesota Pollution Control Agency (MPCA) should be continued and expanded within the County. The County should also work with the DNR to continue the observation well program in the County.

To date, the DNR has issued a total of 156 water appropriation permits in Kandiyohi County for groundwater withdrawal, a majority of which have been issued for irrigation purposes. Groundwater irrigation is primarily focused in the northern portion of the County. Townships with greater than 1,000 acres of irrigated land include: Burbank, Colfax, Harrison, Irving and Roseville. This area is characterized by outwash aquifers that can be quite susceptible to contaminants, such as nitrates. The water table in this region is typically found within five feet of the soil surface, with surficial material consisting of coarse sands and gravels. These water-bearing deposits are generally noncontiguous, thus if contamination were to occur, it would be localized. Landowners in this region should be targeted for educational assistance on the proper application and disposal of chemicals and fertilizers. In addition, homeowners should be encouraged to annually test their wells for contaminants.

In addition to those DNR water appropriation permits issued for groundwater irrigation, 39 have been issued for municipal water usage. In an effort to protect public water supplies from contamination, the MDH is in the process of developing wellhead protection plans for public water suppliers. The County should support the MDH in their efforts by participating in wellhead protection technical committees and assisting in data collection efforts. Septic system upgrades, abandoned well sealing and BMPs should be targeted in wellhead protection areas. In addition, the County should work with the MDH to modify or develop land use regulations receptive to wellhead protection areas.

Water Quality Management Classifications
(Data Item 25)

The Minnesota Pollution Control Agency (MPCA) establishes water quality standards for all waters of the State, both surface and groundwater. These standards are contained in Minnesota. Rules Chapter 7050 and have statewide applicability. The MPCA's statutory authority to adopt water quality standards and to classify waters of the State is found in Minnesota Statutes Chapter 115. Water quality standards consist of beneficial uses and the numerical standards needed to protect those uses. The beneficial uses of water include drinking, protection of aquatic life, fishing and recreation, industrial, agriculture and wildlife use. Chapter 7050 is usually revised every three years. The current version became effective on February 14, 2000.

Chapter 7050 classifies all waters for multiple uses. For example, all trout waters are classified as Class 1B, 2A, 3B, 3C, 4A, 4B, 5 and 6 Waters (see definition of Classes below). All wetlands are classified as Class 2D, 3D, 4C, 5 and 6 Waters. All surface waters of the State, that are not specifically listed in Chapter 7050 and are not wetlands, which includes most lakes and streams in Minnesota, are classified as Class 2B, 3B, 4A, 4B, 5 and 6 Waters. Since all waters carry multiple use classes, all the water quality standards for each of the classes apply. If more than one use class has standards for the same pollutant, the most stringent standard is used.

Numerical water quality standards are assigned to each use class to protect that beneficial use. For surface waters not protected for drinking, most of the applicable standards are associated with Class 2, fisheries and recreation. In general, if the Class 2 standards are met, other uses such as industrial and agricultural uses are also protected. Chapter 7050 includes a method to develop site-specific criteria to address pollutants for which numerical standards have not been adopted.

Refer to the current version of the rule for the specific standards that apply to the waters of interest. The use classifications are defined below.

- **Class 1 Waters: Domestic Consumption.** The quality of Class 1 Waters of the State shall be suitable for drinking. All groundwaters, and certain specifically designated surface waters, are Class 1 Waters. These waters must meet both the primary (maximum contaminant levels) and secondary drinking water standards issued by the U.S. EPA.

- **Class 2 Waters: Aquatic Life and Recreation.** The quality of Class 2 Waters shall be suitable for the growth and propagation of a healthy community of aquatic plants and animals and their habitats, and for aquatic recreation of all kinds, including swimming. Fish from Class 2 Waters should be safe for human consumption, and aquatic organisms should be safe for consumption by wildlife. Class 2 Waters are further divided into four subclasses listed below.

    - **Class 2A Waters: Trout Waters.** These waters shall be suitable for the maintenance of a healthy community of cold-water fish. The MPCA uses the Department of Natural Resources list of trout lakes and streams to define Class 2A Waters. This class of surface waters is also protected as a source of drinking water.

- **Class 2B Waters**. These waters shall be suitable for maintenance of a healthy community of cool or warm water sport fish, associated aquatic life and their habitats. Most lakes, streams and rivers in the State are Class 2B Waters.

- **Class 2Bd Waters**. These waters are the subgroup of Class 2B Waters that are protected for drinking.

- **Class 2C Waters**. Class 2C Waters are usually small streams that provide a more limited habitat for game fish populations. However, with very few exceptions, the same standards that apply to Class 2B Waters also apply to Class 2C Waters.

- **Class 2D Waters**. These waters are wetlands and they are protected for the propagation and maintenance of a healthy community of aquatic and terrestrial species indigenous to wetlands, and their habitats. Wetlands shall be suitable for boating and other forms of aquatic recreation. Most Class 2B standards apply to wetlands.

- **Class 3 Waters: Industrial Consumption.** The quality of Class 3 Waters shall be such as to permit their use with or without chemical treatment for most industrial purposes, except food processing.

- **Class 4 Waters: Agricultural and Wildlife.** Class 4 Waters of the State shall be such as to permit their use for irrigation without significant damage or adverse effects upon any crops or vegetation, including truck garden crops; and for use by livestock and wildlife for watering without inhibition or injurious effects. Class 4 wetlands (4C) are also protected for erosion control, groundwater recharge, low flow augmentation and stormwater retention.

- **Class 5 Waters: Aesthetic Enjoyment and Navigation.** The quality of Class 5 Waters of the State shall be such as to be suitable for aesthetic enjoyment of scenery, to avoid any interference with navigation or damaging effects on property.

- **Class 6 Waters: Other Uses.** The uses to be protected in Class 6 Waters may be under other jurisdictions and in other areas to which the waters of the State are tributary and may include any or all of the above uses, plus any other possible beneficial uses. No numerical standards are associated with the Class 6 use. (This classification does not refer to storwater detention ponds).

- **Class 7 Waters: Limited Resource Value Waters.** The quality of Class 7 Waters of the State shall be such as to protect aesthetic qualities, secondary body contact use and groundwater for use as a potable water supply. Class 7 Waters do not provide enough water or suitable habitat for aquatic life and aquatic recreation and are not protected for this use.

Table 3E list the waters of Kandiyohi County that have an MPCA Water Quality Management Classification. The location of each of the waters is given by township(s), range(s) and section(s).

Table 3E:
MPCA Water Quality Management Classifications

Name	Classification	Township(s)	Range(s)	Sections (s)
Chetomba Creek	2C	117N	36W	NA
Chetomba Creek, Prinsburg	7	117N	36W	8,916,17,21,28,29,30,31,32
County Ditch No. 46, Willmar	7	119N	35W	19,20,29
Hawk Creek (County Ditch No. 10) Willmar/Pennock	7	118N	36W	2,3,8,10,15,16,17,18,19
	7	119N	35W	19
	7	199N	36W	24,25,26,35
Shakopee Creek	2C	119N	36W	NA
Unnamed Creek, Pennock	7	119N	36W	4,5,6,7,18,19
Unnamed Ditch	7	119N	34W	10,15,21,22,28,29,32
Unnamed Ditch, Pennock	7	119N	36W	2,3,4,9,10
Unnamed Swamp	7	122N	36W	30

Reference:

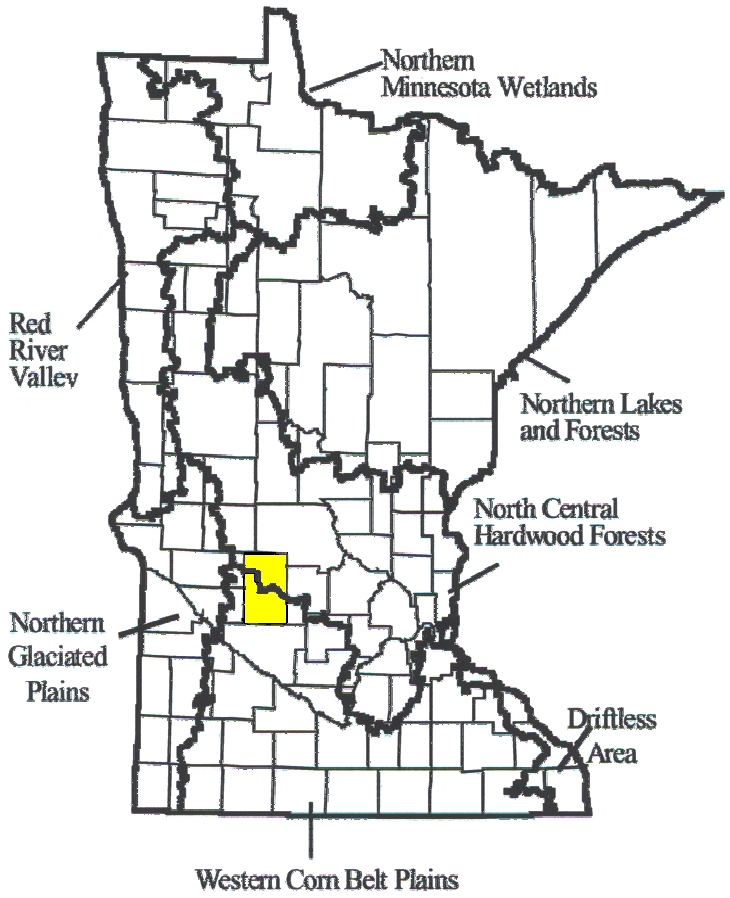
Minnesota Pollution Control Agency

Lake and Stream Water Quality
(Data Items 26 & 27)

Ecoregional Classification of Minnesota Lakes

Minnesota has over 12,000 lakes spread across a diverse array of environmental conditions. Studies have shown distinct regional patterns in lake productivity associated with regional differences in geology, vegetation, hydrology and land use conditions. Based on this concept, the Minnesota Pollution Control Agency (MPCA) established a classification system of Minnesota lakes based upon seven ecoregions. Figure 3B details the ecoregions of Minnesota. Notice Kandiyohi County is divided into two ecoregions: North Central Hardwood Forests and Western Corn Belt Plains.

Figure 3B:
Minnesota's Seven Ecoregions



Ecoregions were delineated based on water quality data that was collected on 90 reference lakes statewide between 1985 and 1987. Lakes were tested for such water quality parameters as total phosphorus, chlorophyll *a* and water clarity. Reference lakes were chosen to represent minimally

impacted sites within the region. Criteria used in selecting reference lakes included maximum depth, surface area, fishery classification and general recommendations from the Minnesota Department of Natural Resources (DNR). In addition to reference lake data, the MPCA examined a statewide database containing water quality data collected on approximately 1,400 lakes from 1977 to 1987. Table 3F displays the summer average water quality characteristics for the two ecoregions found in Kandiyohi County. For additional water quality standards, please contact the MPCA.

Table 3F:
Summer Average Water Quality
Characteristics for Kandiyohi County's Ecoregions

Parameter	Ecoregion	
	North Central Hardwood Forest	**Western Corn Belt Plains**
Total Phosphorus (ug/l)	23-50	65-150
Chlorophyll *a* (ug/l)	5-22	30-80
Secchi Disk (ft.)	4.9-10.5	1.6-3.3
Total Kjeldahl Nitrogen (mg/l)	<0.6-1.2	1.3-2.7

The combination of total phosphorus levels, chlorophyll *a* levels and Secchi disk readings is often used to define the degree of eutrophication, or trophic status of a lake. The concept of trophic status is based on the fact that changes in nutrient levels (measured by total phosphorus) causes changes in lake clarity (measured by Secchi disk transparency). A trophic state index is one convenient means of quantifying this relationship. One popular index was developed by Dr. Robert Carlson of Kent State University, called the Carlson's Trophic State Index (CTSI). The CTSI uses a log transformation of Secchi disk values as a measure of algal biomass on a scale from 0-110. Each increase of ten units on the scale represents a doubling of algal biomass. Because chlorophyll *a* and total phosphorus are usually closely correlated to Secchi disk measurements, these parameters can also be assigned trophic state index values. Formulas for calculating CTSI values for Secchi disk readings, chlorophyll *a* levels, and total phosphorus levels are listed below.

CTSI (for Secchi disk readings) = 60 – 14.41 In Secchi disk (meters)
CTSI (for chlorophyll *a* levels) = 9.81 In chlorophyll *a* (ug/L) + 30.6
CTSI (for total phosphorus) = 14.42 In total phosphorus (ug/L) + 4.15

where:

CTSI = Carlson's Trophic State Index
In = natural logarithm

Table 3G details mean values for Secchi disk readings, chlorophyll *a* levels, total phosphorus levels and CTSI for MPCA monitored lakes in Kandiyohi County. Figure 3C displays the values that are associated with various trophic levels.

Figure 3C:
Trophic Levels

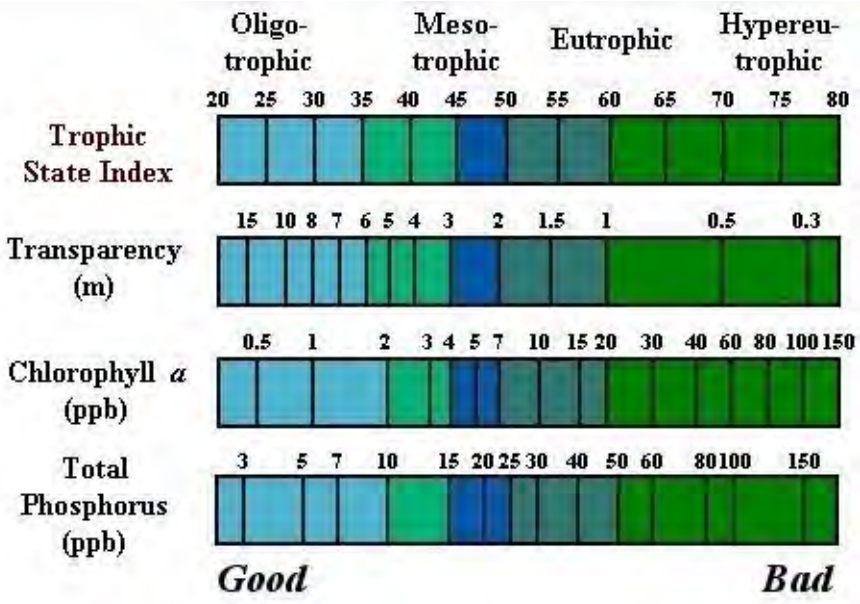


Table 3G:
MPCA Water Quality Data

Lake Name	DNR ID	Mean Secchi Disk (m)	Mean Chlorophyll *a* (ppb)	Mean Total Phosphorus (ppb)	Mean CTSI value
Andrew	34-0206	2.4	NA	NA	47
Big Kandiyohi	34-0086	1.2	23	163	65
Diamond	34-0044	1.7	31.7	95	62
Eagle	34-0171	1.9	23.7	50	58
Florida	34-0217	2.9	7	22	48
Foot	34-0181	0.5	NA	NA	70
Games	34-0224	1.8	15	33	55
George	34-0142	3.3	5.7	17	45
Green	34-0079	3.0	6.2	15	45
Henderson	34-0116	3.9	3.3	17	42
Long	34-0066	3.4	5.1	18	45
Long	34-0192	2.4	21.9	73	58
Mud	34-0158	1.7	NA	NA	52
Nest	34-0154	1.6	29.8	63	60
Norway	34-0251	1.0	23.2	48	60
Point	34-0193	0.9	NA	NA	62

Lake Water Quality Assessment Reports

The Lake Assessment Program (LAP) was developed in 1985 in response to requests from lake associations that were interested in cooperatively assessing the condition of their lake. Since 1985, the MPCA has conducted over 160 LAP studies. In addition to complete studies, the MPCA conducts a variety of other lake-monitoring (regional and trend studies) efforts that result in briefer reports. These include the following:

- **Trend Reports** are often follow-up studies to previously conducted LAP or other studies. Their primary focus is to assess trends in lake condition over time.
- **Note Reports**, as they are referred to, are brief LAP-like reports often prepared in response to lakeshore residents' concerns or as a part of oral presentations. These are brief reports that focus primarily on the current trophic status of the lake.
- **Status Reports** are brief reports that serve to characterize the trophic status and trends of several lakes in a county.

Table 3H provides a listing of all available LAP and related reports for Kandiyohi County. A total of six LAP reports have been conducted in the County.

Table 3H:
MPCA Lake Water Quality Reports

Lake and Description	DNR ID	Year
Big Kandiyohi Lake LAP Report	34-0086	1985
Eagle Lake LAP Report	34-0171	1994
Henderson Lake LAP Report	34-0116	1996
Lake Florida LAP Report	34-0217	1997
Long Lake (north of Willmar) LAP Report	34-0192	1997
Norway and Games Lake LAP Report	34-0251	1994

Citizen Lake Monitoring Program

The Citizen Lake Monitoring Program (CLMP) is a cooperative program combining the technical resources of the Minnesota Pollution Control Agency (MPCA) and volunteer efforts of citizens statewide who collect water quality data on their lakes. CLMP volunteers collect water transparency data using an eight-inch, circular, all-white metal plate attached to a calibrated rope. This tool is called a Secchi disk. About once a week during the summer, volunteers boat to a designated spot on their lakes to collect transparency readings. The volunteer lowers the disk into the water until it is no longer visible and notes the depth from the markings on the rope. The disk is then lowered a little further and then raised back up until it is just visible. The second depth reading is averaged with the first, and a final number is recorded on a data sheet.

At the end of summer, volunteers send their data sheets to the MPCA to be compiled with other water quality data. Water transparency readings derived through the CLMP provides MPCA with highly useful information concerning the lake's water quality. First it indicates the amount of light penetration into a lake. Second, Secchi transparency provides an indirect measure of the amount of suspended materials in the water, which in many cases is an indication of the amount of algae in the water. Long-term transparency monitoring helps scientists detect signs of degradation to a lake. Generally, the sooner water quality problems are detected, the easier and less expensive it is to restore the lake to its previous state. Since 1973, 17 lakes in Kandiyohi County have been monitored through the Citizens Lake Monitoring Program. Table 3I lists the average annual Secchi disk readings for lakes monitored through the program.

Table 3I:
CLMP Lake Transparency

Lake Name	Year	Average Secchi Reading (ft.)	Lake Name	Year	Average Secchi Reading (ft.)
Andrew (34-0206)	1975	8.1	Big Kandiyohi (34-0086)	1999	4.5
	1978	6.1		2000	3.8
	1979	7.3		2001	6.4
	1980	9.7	Crook (34-0218)	1975	7.2
	1981	7.0	Diamond (34-0044)	1975	5.3
	1991	5.0		1979	4.2
	1993	8.1		1981	5.6
	1994	8.8		1982	6.9
	1995	8.8		1983	6.1
	1996	9.0		1985	7.3
	1997	8.9		1987	5.3
	1998	6.9		1988	6.5
	1999	9.1		1989	5.7
	2000	10.0		1990	5.2
	2001	10.4		1991	4.2
Big Kandiyohi (34-0086)	1977	1.5		1992	5.7
	1978	2.2		1993	9.6
	1979	2.5		1994	5.3
	1986	3.0		1995	6.6
	1987	3.4		1996	4.9
	1988	3.9		1997	8.9
	1989	3.4		1998	4.6
	1990	3.8		2000	5.9
	1995	3.6		2001	5.4
	1996	4.1	Eagle (34-0171)	1973	8.2

Table 3I:
CLMP Lake Transparency *(continued…)*

Lake Name	Year	Average Secchi Reading (ft.)	Lake Name	Year	Average Secchi Reading (ft.)
Eagle (34-0171)	1974	8.0	George (34-0142)	1981	7.1
	1993	9.6		1982	8.7
	1994	4.4		1983	9.1
	1998	4.0		1984	8.9
	1999	5.3		1985	7.0
	2000	8.8		1986	10.6
	2001	7.2		1987	8.1
Elizabeth (34-0022)	2000	2.9		1988	7.8
Florida (34-0217)	1975	9.8		1989	10.5
	1977	11.5		1990	10.5
	1978	18.9		1991	11.8
	1979	12.2		1992	11.5
	1980	9.6		1993	8.8
	1981	11.9		1994	9.3
	1983	13.8		1995	11.6
	1984	10.3		1996	10.5
	1986	7.5		1997	11.9
	1988	8.9		1998	11.3
	1995	8.8		1999	10.9
	1996	8.5		2000	10.6
	1997	13.2		2001	12.2
	1998	8.6	Green (34-0079)	1978	7.2
	1999	8.3		1979	8.8
	2000	13.0		1980	11.4
	2001	10.1		1983	8.3
Foot (34-0181)	1975	1.7		1985	10.1
Games (34-0224)	1992	6.5		1986	8.3
	1993	4.5		1987	10.0
	1994	5.0		1988	9.2
	1995	5.2		1989	11.6
	1997	6.6		1990	11.6
	1998	6.7		1991	9.4
	1999	7.3		1993	8.5
	2000	6.6		1994	9.4
	2001	10.3		1995	8.1
George (34-0142)	1975	9.7		1996	10.2
	1978	6.7		1997	7.2
	1979	10.2		1998	8.5
	1980	8.6		1999	9.7

Table 3I:
CLMP Lake Transparency *(continued…)*

Lake Name	Year	Average Secchi Reading (ft.)	Lake Name	Year	Average Secchi Reading (ft.)
Green (34-0079)	2000	10.0	Long (34-0192)	1976	1.8
	2001	9.7		1977	1.7
Henderson (34-0116)	1978	12.1		1978	1.5
	1979	10.5		1991	6.5
	1981	12.9		1992	8.7
	1982	12.6		1993	7.3
	1985	12.5		1994	8.7
	1989	14.2		1995	6.8
	1990	15.2		1996	8.5
	1991	14.4		1997	8.3
	1992	10.9		1999	6.8
	1993	12.3		2000	6.6
	1994	12.9		2001	8.4
	1995	12.9	Mud (34-0158)	1988	5.2
	1996	11.1	Nest (34-0154)	1975	5.4
	1997	13.9		1976	7.4
	1998	13.3		1978	8.0
	1999	12.9		1979	3.2
	2000	11.2		1980	4.9
	2001	8.8		1981	4.6
Long (34-0066)	1990	9.6		2001	8.7
	1991	8.4	Norway (34-0251)	1986	5.8
	1992	9.4		1992	3.0
	1993	10.0		1994	4.5
	1994	12.1		1995	4.1
	1995	11.6		1996	3.9
	1996	12.1		1997	3.8
	1997	15.1		1998	2.6
	1998	12.9		1999	3.6
	1999	11.4		2000	3.7
	2000	11.1		2001	7.1
	2001	13.6	Point (34-0193)	1978	3.0
Long (34-0192)	1975	3.2			

Citizen Stream Monitoring Program

The Citizen Stream Monitoring Program (CSMP) combines the knowledge and commitment of interested citizens with the technical expertise and resources of the Minnesota Pollution Control

Agency (MPCA) to develop a more comprehensive statewide network for monitoring Minnesota's 92,000 miles of streams. Any person or group willing to devote a small amount of time and energy to conduct simple stream checks on a regular basis can become a volunteer monitor with the MPCA. Approximately once a week during the summer months, monitors measure transparency, appearance, recreational suitability and stream stage on an established spot of a nearby stream. Monitors measure precipitation on a daily basis.

The CSMP increases our overall understanding of how human activities, such as land use, affect water quality. Increased stream monitoring will help identify problems, develop strategies and prioritize activities for improving water quality, and track progress toward improvement.

Goals of the CSMP are to:

1. Help determine the condition of Minnesota streams by expanding our water quality monitoring network.
2. Provide the opportunity for anyone interested to participate in a basic, centrally administered and interpreted stream monitoring program.
3. Support existing volunteer monitoring programs.
4. Facilitate awareness and understanding of water quality issues

Changes over time in transparency, appearance and recreational suitability can serve as yardsticks to measure improvements or declines in water quality. Individuals and organizations can use CSMP data to detect trends in water quality and help decide if additional assessments or actions are needed to protect and improve water quality. Some potential projects for CSMP monitoring include:

- **Before and after a change in upstream land use -** If a land management change is planned near a stream or river, select a monitoring site just downstream of where the change will take place. Monitor before and after the change occurs to detect any potential effects on the stream.
- **Seasonal storm monitoring -** Compare CSMP data for rainfall events during spring, summer and fall to background or baseflow (low flow) conditions. Keep track of upstream land management practices or crop status during this period.
- **Upstream and downstream of a water quality improvement project -** Monitor a site upstream, and a site downstream of a stormwater retention pond or stream vegetative buffer to evaluate its effectiveness at reducing sediment inputs.

Table 3J lists the Kandiyohi County volunteer monitors who have registered with the MPCA's Citizen Stream Monitoring Program, as derived from MPCA's *2000 Report on the Water Quality of Minnesota Streams*. Additionally, a summary of the 2000 water quality data collected for each site is also included. As of August 2002, a summary of the results from the 2001 monitoring year remained unavailable. However, those volunteers that were registered with the MPCA for 2001 are indicated with an asterisk beside their name.

Table 3J:
CSMP Volunteers and Water Quality Data

Volunteer	Site ID	Stream Name	Mean Transparency (cm)	Minimum Transparency (cm)	Maximum Transparency (cm)
Gary Butcher*	202	Middle Fork Crow River	60	60	60
Ruth Schaefer*	255	Middle Fork Crow River	60	60	60
Erik Cunningham*		North Fork Crow River	Data Unavailable		
Erik Homme*		South Fork Crow River	Data Unavailable		
Deb Nelson*		Shakopee Creek (CR. 29)	Data Unavailable		
Ruth Schaefer*		Middle Fork Crow River (CR. 2)	Data Unavailable		
Dave Schmidt*		Co. Ditch 26	Data Unavailable		
Glenn Simons*		Halvorson Slough Inlet	Data Unavailable		
Dave Stuhr*		Unnamed Ditch	Data Unavailable		

Total Maximum Daily Loads (TMDLs)

The Federal Clean Water Act requires states to adopt water quality standards to protect the nation's waters. These standards are to define how much of a pollutant can be in surface and/or groundwater, while still allowing it to meet its designated uses, such as drinking water, fishing, swimming, irrigation or industrial purposes. Minnesota's statewide water quality standards and other provisions that protect water quality are found in Minn. Rules Chapter 7050. Standards are broken down based upon water use classifications.

Many of Minnesota's water resources cannot currently meet their designated uses because of pollution problems from a combination of point and nonpoint sources. For each pollutant that causes a waterbody to fail to meet State water quality standards, the Clean Water Act requires the states to conduct a Total Maximum Daily Load (TMDL) study. A TMDL study identifies all point and nonpoint sources of each

Hypoxia Zone of the Gulf of Mexico

Over the past two decades, scientists have studied the hypoxia zone of the Gulf of Mexico. The hypoxia zone is an oxygen depleted area of the Gulf, caused by excessive nitrogen and phosphorus loading from the Mississippi River. High levels of these nutrients cause excessive plankton growth, which in turn die and aerobically decompose. The result is an overall reduction in the level of dissolved oxygen in the Gulf, which can lead to fish kills and overall ecological instability.

In studying the hypoxia zone of the Gulf of Mexico, scientists have concluded that this area has increased dramatically over the last several years. Studies conducted by the Environmental Protection Agency (EPA) have identified agricultural production in the Upper Mississippi River Basin (Illinois, Iowa, Minnesota and Wisconsin) as the primary source of nitrates in the hypoxia zone.

pollutant in a waterbody, which fails to meet water quality standards. Water quality sampling and computer modeling determine how much each pollutant source must reduce its contributions to assure the standard is met in that waterbody. Rivers and streams may have several TMDLs, each one determining the limit for a different pollutant.

Section 303 (d) of the Clean Water Act requires states to publish, every two years, an updated list of streams and lakes that are not meeting their designated uses because of excess pollutants. The list, known as the Section 303 (d) List of Impaired Waters, is based on violations of TMDL standards. A draft of the 2002 Section 303 (d) List of Impaired Waters for Kandiyohi County is found in Table 3K. According to the Table, a total of three river reaches and twelve lakes are due to be included on the List. A number of these reaches and lakes are listed multiple times for different pollutants. Analysis of pollution sources and treatment on these impaired waters should be done on a watershed basis. The absence of a waterbody from the 303d List does not necessarily mean the reach is meeting its designated uses. It may be that the reach has either not been sampled or there is not enough data to make an impairment determination.

Table 3K:
Draft 2002 Section 303 (d) List of Impaired Waters (Kandiyohi County)

Reach	ID	Affect Use	Pollutant	Target start/ Completion
Buffalo Creek; Headwaters to JD #15	07010205-502	Aquatic Life	Impaired Biota	2007/2014
Buffalo Creek; Headwaters to JD #15	07010205-502	Aquatic Life	Mercury FCA	2002/2015
Crow River, South Fk; Headwaters to Hutchinson Dam	07010205-503	Aquatic Life	Impaired Biota	2005/2012
Crow River, South Fk; Headwaters to Hutchinson Dam	07010205-503	Aquatic Life	Mercury FCA	2002/2012
Unnamed Creek; Headwaters to South Fk Crow R	07010205-507	Aquatic Life	Impaired Biota	2008/2015
Big Kandiyohi Lake	34-0086	Aquatic Life	Mercury FCA	2002/2015
Diamond Lake	34-0044	Aquatic Life	Mercury FCA	2002/2015
Eagle Lake	34-0171	Aquatic Life	Mercury FCA	2002/2015
Green Lake	34-0086	Aquatic Life	Mercury FCA	2002/2015
Henderson Lake	34-0116	Aquatic Life	Mercury FCA	2002/2015
Lake Andrew	34-0206	Aquatic Life	Mercury FCA	2002/2015
Lake Elizabeth	34-0022	Aquatic Life	Mercury FCA	2002/2015
Lake Florida	34-0217	Aquatic Life	Mercury FCA	2002/2015
Lake George	34-0142	Aquatic Life	Mercury FCA	2002/2015
Long Lake	34-0192	Swimming	Excess Nutrients	2007/2011
Long Lake	34-0192	Aquatic Life	Mercury FCA	2002/2015
Nest Lake	34-0154	Aquatic Life	Mercury FCA	2002/2015
Norway Lake	434-0251	Aquatic Life	Mercury FCA	2002/2015

A number of lawsuits dealing with TMDL development have been filed nationally, primarily by environmental advocates who charge the studies are not being completed as required. The U.S. Environmental Protection Agency (EPA) is under court order to establish TMDLs in at least 20 states if these states do not do so themselves. There is currently no such lawsuit in Minnesota. However, if Minnesota does not comply with Federal requirements to establish TMDLs, a lawsuit and subsequent requirements to complete the studies are likely.

Beyond the Federal requirements, there are a number of reasons why the State needs to move forward with the development of TMDLs. Foremost is the need to clean up rivers and lakes to maximize their contributions to the State's economy and quality of life and protect them as a resource for future generations.

STORET

STORET is a water quality data clearinghouse that is maintained by the Environmental Protection Agency (EPA), with help from the Minnesota Pollution Control Agency (MPCA). The EPA maintains two STORET data management system: the Legacy Data Center and STORET.

The Legacy Data Center (LDC) contains historic water quality data dating back to the early part of the 20th century and collected up to the end of 1998. STORET contains data collected beginning in 1999, along with older data that has been properly documented and migrated from the LDC. Currently, the new STORET system contains very little information for Kandiyohi County. Table 3L identifies the location of STORET stations within the County.

Table 3L:
STORET Stations

Lake/ Stream	ID	Station Location	Agency
Calhoun	34-0062	5.5 miles south of Hawick	MPCA
Long	34-0066	2 miles SW of Hawick	MPCA
Green	34-0079	At Spicer	MPCA
Big Kandiyohi	34-0086	4 miles NW of Lake Lillian	MPCA
Little Kandiyohi	34-0096	5 miles SE of Willmar	MPCA
Kasota	34-0105	6 miles SE of Willmar	MPCA
Henderson	34-0116	2 miles west of Spicer	MPCA
George	34-0142	1 mile west of Spicer	MPCA
Nest	34-0154	1 mile NW of Spicer	MPCA
Mud (Monogalia)	34-0158	At New London	MPCA
Wagonga (Far East)	34-0169	2 miles north of Svea	MPCA
Wagonga (East Bay)	34-0169	2 miles north of Svea	MPCA
Wagonga (Main Basin)	34-0169	2 miles north of Svea	MPCA

Table 3L:
STORET Stations *(continued…)*

Lake/ Stream	ID	Station Location	Agency
Wagonga (West Bay)	34-0169	2 miles north of Svea	MPCA
Wagonga (Far West)	34-0169	2 miles north of Svea	MPCA
Eagle	34-0171	1 mile north of Willmar	MPCA
Foot	34-0181	At Willmar	MPCA
Long	34-0192	2 miles north of Willmar	MPCA
Point	34-0193	4 miles NE of Willmar	MPCA
Andrew	34-0206	4 miles west of New London	MPCA
Middle	34-0208	7 miles west of New London	MPCA
Florida	34-0217	4 miles SE of Norway Lake	MPCA
Crook	34-0218	8 miles north of Willmar	MPCA
Games	34-0224	7 miles east of Sunburg	MPCA
Norway	34-0251	2 miles north of Norway Lake	MPCA
Hawk Creek	S000-601	CR-87, 4 miles SW of Willmar	MPCA
Hawk Creek	S000-602	2.5 miles SW of Willmar	MPCA
County Ditch 46	S000-603	1 mile SW of Willmar	MPCA
Hawk Creek	S000-604	At MN-40, 1 mile SW of Willmar	MPCA
County Ditch 46	S000-991	Culvert above Willmar WWTP	MPCA

Watershed Management-like Organization Data

Many of Kandiyohi County's watershed management-like organizations (i.e. watershed projects, clean water partnerships, watershed districts) routinely monitor the quality of the County's surface water. Samples are analyzed for a number of physical, chemical and biological parameters, such as total suspended solids, total phosphorus, nitrate nitrogen and fecal coliform bacteria. Appendix F contains recent data collected from each of the organizations. Contact each organization for additional baseline data.

Fish Kills

Winterkill of fish in Kandiyohi County lakes is limited, but does occur occasionally. Winterkill results when dissolved oxygen concentration in a lake or stream falls beneath lethal limits for fish. Lethal limits are different for each fish species. Lethal limits can change for individual fish species and even different age classes of a species of fish, when they are under added stress from reproduction, competition for food and habitat, lack of forage and fish pathogens, among other things. Dissolved oxygen declines as snow depth and ice thickness increase and fish and other aquatic organisms respire, aquatic plants die, in which case they consume more dissolved

oxygen than they produce, and plants and other organic matter decompose. The rate at which dissolved oxygen declines can differ as well. Fish adjust better if dissolved oxygen declines slowly than they do if it declines rapidly (increasing stress). The Area Fisheries Supervisor can open a lake for unlimited fishing if the potential for winterkill is imminent (i.e. dissolved oxygen is perilously low and some fish will likely winterkill) and the public has lawful access. Dissolved oxygen is not necessarily checked on an annual basis. DNR Completion Reports for Kandiyohi County water basins tested for dissolved oxygen in the winter of 2000-2001, can be found in Appendix D.

The following waterbodies have aeration permits with the DNR: East Solomon Lake, Elizabeth Lake, Foot Lake, Long Lake (by Willmar), Middle Fork of the Crow River (City of New London), Mud (Monongalia) Lake, Ringo Lake, Swenson Lake, Tadd Lake, Lake Wagonga and Willmar Lake.

Informal Sources of Surface Water Quality Information

Currently, there are no Federal, State or local agencies that formally compile information relating to informal sources of water quality information.

References:

Minnesota Department of Natural Resources, Division of Fisheries
Minnesota Department of Natural Resources, Division of Waters
Minnesota Pollution Control Agency
Watershed Management-like Organizations

Implications and Assessment

Improving the quality of surface water is a major issue in Kandiyohi County. In many areas of the County water quality is in fair to poor condition. Surface water is being adversely affected by sediment and nutrients, as well as by biological pollutants, such as bacteria. Sources of these pollutants are generally tied to land usage and associated management. According to the Minnesota Land Use-Agricultural and Transition Areas Inventory conducted in 1989, agricultural land comprises 68.4 percent of Kandiyohi County, much of which is classified as erosion prone. The County should work with landowners to implement BMPs, such as grass buffer strips, crop residue management, field windbreaks and alternative drainage systems, to reduce soil erosion.

Another major source of surface water pollution is urban and rural developments. Although not as large in composition as agricultural land, urban and rural developments present pollution potential in the form of contaminated stormwater, soil erosion, failing ISTSs and sewage bypasses. To address these issues, the County should consider developing an erosion and stormwater management ordinance, as well as enforce its existing ISTS ordinance. The County

should also assist those communities in need of wastewater treatment facility upgrades in seeking options to do so.

Trouble spots for surface water quality are found throughout the County. Table 3K lists the 18 watercourses and waterbodies that have been included in the 2002 Section 303(d) List of Impaired Waters. Watercourses and waterbodies that were included on the list are not meeting their designated uses because of excess pollutants, many of which were included because of high levels of mercury (toxic to humans). For each pollutant that causes a watercourse or waterbody to fail to meet its designated use, the Clean Water Act requires a Total Maximum Daily Load (TMDL) study be conducted. A TMDL study identifies all point and nonpoint sources of each pollutant in an impaired watershed. The County should work with the Minnesota Pollution Control Agency (MPCA) and other Federal, State and local agencies and groups in developing TMDLs for the County's impaired waters.

Additional efforts to diagnose trouble spots within the County are occurring through Clean Water Partnerships and Watershed Projects. Through water quality testing and modeling, these organizations are able to pinpoint areas where pollution is occurring and provide, in many cases, cost share money to resolve pollution issues. Continued financial support of the efforts of these organizations will be critical in the effort to improve the quality of water resources in Kandiyohi County.

Groundwater Quality
(Data Item 28)

Minnesota Department of Health

The Minnesota Department of Health (MDH) monitors public water supplies under the Federal Safe Drinking Water Act. Public water supplies generally fall into three categories: 1) Community Public Water Supplies, 2) Nontransient Noncommunity Public Water Supplies and 3) Noncommunity Public Water Supplies. The first two categories of public water supplies are tested regularly for 25 chemical and biological parameters. The third category is usually routinely tested for nitrate levels and bacteria only.

Under the 1989 Minnesota Groundwater Protection Act, the MDH developed Health Risk Limits (HRLs) for substances found to degrade groundwater through groundwater quality monitoring. A health risk limit is the concentration of a groundwater contaminant, or a mixture of contaminants, that can be safely consumed daily for a lifetime. HRLs are expressed as a concentration in micrograms per liter, or calculated as a "hazard index." The limits are calculated using the same methodology as for the "recommended allowable limits" (RALs), which were advisory levels MDH used before the HRL rules were promulgated.

HRLs reflect health effects data alone. They do not incorporate economic or technological factors such as treatment cost and treatment feasibility, as do Federal drinking water standards, the Maximum Contaminant Levels (MCLs). Economic and technological factors, the protection of the environment and the health of non-human species are considered in other groundwater protection regulations. The health risk limit rules are unique in that they do not specify how health risk limits are to be applied. The following are some of the public health protection purposes the Minnesota Department of Health uses Health Risk Limits for:

1. **Advice for Private Wells**. Because private well drinking water supplies are not regulated for contamination, HRLs are used to evaluate contaminated wells and provide advice to consumers and well owners about the suitability of their water supply for consumption and other uses.

2. **Unregulated Contaminants in Public Water Supplies**. In instances where no Federal drinking water standard exists for a contaminant in public water supplies, HRLs are used as criteria to evaluate options for reducing the community's exposure to the contaminant.

3. **Environmental Review**. The MDH uses health risk limits as criteria in environmental review projects. For example, monitoring data may be compared to HRLs to evaluate potential impacts of a project on public health.

4. **Site Assessment Criteria**. The MDH's Site Assessment and Consultation Program uses HRLs as criteria to evaluate potential site impacts on public health and to make recommendations on monitoring and mitigation.

Minnesota Pollution Control Agency

In 1989, the Minnesota Pollution Control Agency (MPCA) received a grant from the Legislative Commission on Minnesota Resources to redesign Minnesota's ambient groundwater monitoring program. The resulting program was called the Groundwater Monitoring and Assessment Program (GWMAP). GWMAP's primary objective was to meet statewide and local groundwater quality information needs. For over a decade the program endeavored to answer five basic questions about Minnesota groundwater quality:

1. What are background concentrations of chemicals in Minnesota's groundwater?
2. Where is the groundwater impacted by human activities?
3. What is the nature and severity of the impact?
4. Why is the groundwater impacted?
5. What can be done to minimize groundwater impacts?

Three components were created to facilitate answering these questions. The first component was a statewide baseline assessment of water quality in Minnesota's principal aquifers, conducted from 1990-1996. The second component involved conducting groundwater trend studies. The staff of GWMAP conducted a series of discussions and determined that changes in land use could be linked to trends in water quality. Consequently, GWMAP designed and conducted a variety of land use studies between 1996 and 2001. Groundwater studies were conducted throughout the State to evaluate impacts from different land use management strategies. The third and final component of GWMAP was the development of regional cooperatives. Between 1992 and 2001, GWMAP staff provided groundwater data and information to a variety of people and groups, as well as technical support to local groups conducting groundwater monitoring.

The GWMAP program was discontinued in the summer of 2001. Table 3M details the groundwater quality data that was collected in Kandiyohi County. The following provides a brief summary of some of the key water quality parameters that were used in the GWMAP study.

- **Arsenic -** Although arsenic has many human sources, including industrial applications, such as pesticides, most arsenic found in wells sampled for the baseline study comes from natural sources. Arsenic is one of the few proven human carcinogens. The current drinking standard is 10 ug/L (parts per billion).

  The greatest concentrations of arsenic occur in wells located along a line extending from northern Minnesota through the southern Twin Cities Metropolitan Area. This is an area consisting primarily of stagnation moraines, but the geologic source of the arsenic is still unknown. Arsenic concentrations are greatest in wells completed in buried Quaternary deposits. Table 3M reiterates this point, as four of the eight wells classified in the Buried Quaternary Aquifer Group had arsenic concentrations above 10 ppb.

- **Boron -** Most boron found in groundwater is from natural sources, although there may be small contributions resulting from human activity. At high concentrations boron can affects the human reproductive system. The current drinking water criteria for boron is 600 ppb.

  The greatest concentrations of boron are found in southwest and northeast Minnesota. Concentrations are usually lower in central and southeast Minnesota. The highest concentrations of boron are generally correlated with Buried Quaternary aquifers above Cretaceous bedrock aquifers. This is because water flows upward from the Cretaceous aquifers into the Quaternary aquifers. Drilling shallow wells in these locations may reduce the risk of encountering high boron concentrations.

  According to Table 3M, only one well in Kandiyohi County tested above the 600 ppb drinking water standard.

- **Nitrate -** Nitrate occurs naturally at concentrations less than 1 ppm. Concentrations are much lower deep in aquifers where oxygen is absent. Nitrate is the most important anthropogenic (related to human activity) chemical in groundwater. Infants less than six months in age may be affected by drinking water with high nitrate concentrations. The drinking water standard for nitrate is 10 ppm.

  Elevated nitrate concentrations are found throughout the State, but clusters of high concentrations are found in southwest, southeast and central Minnesota. These are areas where shallow groundwater is sensitive to contamination from human activity at the land surface. Mean concentrations of nitrate are generally low in groundwater. Concentrations are lowest in buried Quaternary and Cretaceous aquifers because they are well protected, and in Precambrian aquifers because there are low inputs of nitrogen.

  Nitrate concentrations greater than 1 part per million are often considered to represent aquifers impacted by human activity. Despite the low average nitrate concentrations in groundwater, over 10 percent of all wells sampled statewide had a nitrate concentration greater than 1 ppm. However, there were no wells sampled in Kandiyohi County that exceeded the 1 ppm concentration level.

  The concentration of nitrate in groundwater is dependent on a source for the nitrate (e.g., fertilizer, animal waste) and on aquifer geochemical conditions. In the presence of oxygen, oxidation-reduction potential (Eh) is high, iron and manganese concentrations are low, and nitrate is stable in groundwater. When oxygen becomes depleted, nitrate is denitrified and concentrations decrease rapidly. Consequently, in areas where there are large potential inputs of nitrogen to groundwater (e.g. agricultural areas, unsewered residential developments), sensitivity of an aquifer to nitrate contamination can be determined by measuring Eh and concentrations of dissolved oxygen, iron and manganese.

- **Manganese -** Manganese is a naturally occurring chemical in groundwater. Although there are many uses of manganese in industrial processes, it is unlikely that human activity has much impact on manganese concentrations in groundwater. Manganese may impact the

central nervous system when present in high concentrations. The current drinking water criteria for manganese is 100 ppb, but the Minnesota Department of Health has issued a memorandum supporting use of 1000 ppb as the drinking water criteria.

Elevated concentrations of manganese are distributed throughout the state. Low concentrations are generally found in northeast and southeast Minnesota. Manganese concentrations are greatest in Quaternary aquifers and lowest in Precambrian and Paleozoic bedrock aquifers. The source of manganese in Quaternary deposits is most likely shale incorporated into till during glaciation. Table 3M shows that six of the nine Quaternary aquifer wells in Kandiyohi County had manganese concentrations in excess of 100 ppb.

Although manganese concentrations differ between aquifers, geochemical conditions within groundwater exert a large influence on concentrations of manganese. Manganese concentrations are generally lowest in the presence of oxygen (Eh > 250). When oxygen and nitrate concentrations in groundwater are low, dissolved manganese concentrations increase.

- **Volatile Organic Compounds -** Volatile Organic Compounds (VOCs) are primarily synthetic compounds. VOCs are commonly found in fuel oils, gasoline, paints, dyes and a wide variety of industrial solvents. For drinking water purposes, VOCs should not be detected in a water source. The occurrence of VOCs in groundwater is generally associated with a point source, rather than the geology or the geochemical conditions within the aquifer. Although most common in Cretaceous aquifers, VOCs have been detected in a variety of geological settings.

  In conducting testing for the GWMAP program, Chloroform was the most frequently detected VOC and was found in 5.8 percent of sampled wells statewide. Chloroform is generally associated with well disinfection, but may occur naturally at low concentrations. Chemicals associated with fuel oils and industrial solvents were found in 3.5 and 2.4 percent of sampled wells statewide.

  In respect to Table 3M, two wells in Kandiyohi County tested positive for VOCs. Both wells were classified into the Buried Quaternary Aquifer Group.

- **Chloride -** Chloride is a highly mobile chemical found naturally in groundwater. There are also many human sources of chloride, such as road salt, fertilizer and animal waste. This makes chloride an excellent indicator of chemical and transport processes occurring in an aquifer. Although there is no established health-based drinking water criteria for chloride, a Secondary Maximum Contaminant Level of 250 ppm does exist. Chloride concentrations can be elevated in different areas of the State, but concentrations generally increase from east to west. This is related to reduced recharge to groundwater, increased residence times in groundwater and differences in geology from east to west.

  Concentrations of chloride are greatest in Cretaceous bedrock. Cretaceous bedrock is enriched in minerals associated with seawater, including chloride. Concentrations are also commonly high in surficial Quaternary aquifers. Since these aquifers should be

Table 3M:
GWMAP Water Quality Data

ID Number	Well Use	UTM Easting	UTM Northing	Aquifer Group	Well Depth (ft)	Sampling Date	Arsenic (ppb)	Boron (ppb)	Nitrate-N (ppm)	Manganese (ppb)	VOC Detected	Chloride (ppm)
GWMAP00494	Domestic	347025	4982924	Buried Quaternary	74.0	9/27/1994	4.62	390.9	<0.5000	103.3	no	0.6800
GWMAP00525	Domestic	328256	5022104	Buried Quaternary	85.0	9/27/1994	31.36	136.4	<0.5000	176.1	no	2.4300
GWMAP00535	Domestic	347541	5019006	Buried Quaternary	75.0	9/14/1994	11.58	44.7	<0.5000	376.8	no	139.6400
GWMAP00548	Domestic	343916	5004329	Buried Quaternary	310.0	9/14/1994	32.68	186.1	<0.5000	31.9	no	<0.1000
GWMAP00564	Domestic	346974	4982870	Buried Quaternary	92.0	9/13/1994	0.06	310.3	<0.5000	47.5	no	0.7900
GWMAP00583	Domestic	345884	5021532	Surficial Quaternary	56.0	9/14/1994	1.72	17.1	<0.5000	202.1	no	10.3700
GWMAP00599	Domestic	330978	5002965	Buried Quaternary	81.0	9/13/1994	3.94	49.3	<0.5000	101.7	no	3.3100
GWMAP00617	Domestic	326039	4984978	Buried Quaternary	238.0	9/13/1994	2.51	1,178.3	<0.5000	18.2	yes	15.2600
GWMAP00620	Domestic	348032	5017410	Buried Quaternary	99.0	9/14/1994	10.11	30.0	<0.5000	185.2	yes	1.9900

readily recharged and have low concentrations of chloride in the geologic material comprising the aquifer, the chloride is due to human activity. Fertilizer, road salt and human waste are the most likely sources of chloride in these aquifers.

Concentrations of chloride in Kandiyohi County wells are generally low. According to Table 3M, there were no wells tested with in the County that had chloride levels above the 250 ppm Secondary Maximum Contaminant Level.

MDA Nitrate Water Testing Program

In 1993, the Minnesota Department of Agriculture developed a "walk-in" style of water testing clinic with the goal of increasing public awareness of nitrates in rural drinking and livestock water supplies. Results from the testing not only educate the participants, but may also provide some broad information on the occurrence of nitrate 'hotspots' across the State; this could eventually aid in justifying nitrate monitoring networks/programs. The clinic concept revolves around a number of simple principles: local participation is critical; testing is free to the public with immediate results; the overall program needs to be inexpensive; a non-regulatory atmosphere is important and wellowners may remain anonymous; and the staff's most important goal is to provide the required technical assistance across a diverse audience of wellowners.

Since the beginning of the program six years ago, the Nitrate Water Testing Program has provided testing services and educational outreach to over 16,000 well owners. The concept has proven adaptable for county fairs, field day events, public school programs and 'stand alone' events. Past sponsors have been the Soil and Water Conservation Districts, U of M Extension Service, county health or environmental health services, county planning and zoning, public schools, lake associations and farm organizations. Well inspectors and hydrologists from the Minnesota Department of Health are often present at the clinics to help answer well construction and health concern type problems.

On June 6 and 7, 2000, the MDA held a nitrate testing clinic in Willmar. Residents of Kandiyohi County were allowed to bring samples of their well water to be sampled for nitrate levels. A total of 45 samples were tested during the two-day clinic. Of those wells sampled, 9 percent had nitrate levels above the 10 ppm drinking water standard. The highest level recorded was 19.0 ppm.

MDA Central Sands Groundwater Monitoring Study

The Central Sands Groundwater Monitoring Study consists of six groundwater monitoring sites located in the sand plains of northern Kandiyohi County. The sites, which are operated cooperatively between the Kandiyohi County Soil and Water Conservation District (SWCD) and the Minnesota Department of Agriculture, were specifically chosen to measure the impacts of the normal use of agricultural chemicals (pesticides and nitrates) to groundwater. Sampling of the monitoring sites began in the spring of 2000 and is expected to continue for up to 20 years or more. The SWCD acts as the local contact with the landowners and occasionally does a survey

with them regarding land management practices. Information developed through this monitoring effort is used in the evaluation and management of the use of agricultural chemicals that are commonly detected in groundwater. Data from the study will also be used locally for education and development of improved awareness regarding agricultural chemicals and groundwater protection. Funding for the study has been secured through a combination of State and local funds, including Water Plan monies.

References:

Minnesota Department of Agriculture
Minnesota Department of Health
Minnesota Pollution Control Agency

Implications and Assessment

As stated earlier, relative to surface water, very little information is known about groundwater resources in the County. Overall, the quality of groundwater in the County is believed to be good. However, testing through programs, such as MPCA's GWMAP program and the MDA's Nitrate Water Testing Program, has revealed that some wells within the County are being adversely impacted by contaminants. Common contaminants in Kandiyohi County wells include arsenic, manganese, nitrate and volatile organic compounds (VOCs). At high levels, many of these contaminants can pose a potential health risk. Additional testing and analyzation of existing data is needed to establish an accurate baseline of groundwater quality in the County.

A potential trouble spot for groundwater quality is the sand plain area of northern Kandiyohi County. This region is characterized by rapid, indiscriminate recharge, making the area vulnerable to contaminants, such as nitrate and pesticides. In the spring of 2000, the Minnesota Department of Agriculture (MDA) began a 20-year study in this area to evaluate the impact of the normal use of agricultural chemicals (nitrate and pesticides) on groundwater quality. Kandiyohi County should assist and support the MDA in conducting this study. The County should also provide landowners in this region with educational assistance on the proper application and disposal of chemicals and fertilizers. In addition, homeowners should be encouraged to annually test their wells for contaminants.

To protect existing groundwater quality and minimize potential health risks, the County needs to continue to implement existing land use controls, such as its zoning and ISTS ordinances. Additional opportunities for groundwater protection are possible through the MDH's Wellhead Protection Program. The County should assist the MDH and public water suppliers as they develop wellhead protection plans.

CHAPTER FOUR:
KANDIYOHI COUNTY'S SPECIAL LAND USES AND CONDITIONS

This chapter highlights specific land usages and conditions that exist within Kandiyohi County. Sections on irrigation, pollutant sources, wetlands, flooding and wildlife management, among others, are provided in this chapter.

Chapter four includes information on the following data items:

Eroding Lands and Nonpoint Source Pollution
(Data Item 29)

Eroding lands are a major cause of nonpoint source pollution. Land in the northern portion of Kandiyohi County (primarily the Chippewa River, Middle Fork of the Crow River and North Fork of the Crow River watersheds), which is characterized by highly erodible soils and steep slopes, is the most pollution and sedimentation-prone area of the County. In agricultural areas, the major nonpoint sources of pollutants are sediments, nutrients, pesticides, bacteria and oxygen-demanding substances. Each of these is discussed below.

Sediment

Sedimentation resulting from eroding land is a major source of water pollution in Kandiyohi County. Sedimentation affects most surface water types: lakes, wetlands and streams. Sediment clogs drainageways, fills basins, increases lake water turbidity and adversely affects spawning areas for fish. In addition, nutrients and chemicals attached to sediment can have adverse effects on water quality. Phosphate, attached to fine textured sediments, accelerates algae and plant growth in many lakes.

In Kandiyohi County, high priority sedimentation areas are primarily located in the northern portion of the County, particularly in the Chippewa River, Middle Fork of the Crow River and North Fork of the Crow River watersheds. Soil associations that are prone to sedimentation, as a result of erosion, include Canisteo-Nicollet, Estherville-Hawick-Lena, Guckeen-Marna, Harps-Okoboji-Seaforth, Koronis-Hawick-Sunburg, Normania-Canisteo-Harps and Wadenill-Sunburg-Delft.

Nutrients

Nutrients such as phosphorus, nitrogen and potassium are the essential part of plant growth in agriculture. They are normally added to the soil in the form of fertilizers, manure, or decaying vegetation. These nutrients, particularly phosphorus and nitrogen, can become pollutants when they are transported from eroding lands to surface and groundwater in runoff or are leached below the root zone.

Pesticides

Pesticide is a term that covers a wide range of chemicals such as herbicides, insecticides and fungicides. Pesticides can wash off crops and fields and into lakes and streams, where they may be toxic to fish and other aquatic organisms. Pesticides can also adversely affect water resources if they are improperly stored or disposed of.

Bacteria

Fecal coliform bacteria are prolific in the intestines of warm-blooded animals, including humans. Although these bacteria are not necessarily harmful, they are often associated with disease producing organisms or pathogens, which can cause diarrheal disease, infectious hepatitis, parasites and cholera. Common sources of bacteria are runoff or seepage from feedlots and failing septic systems.

Oxygen-Demanding Substances

When oxygen-demanding pollutants enter a lake or stream from runoff, they can upset the delicate balance between oxygen-consuming organisms and the oxygen replenishing process. If oxygen is consumed faster than it is replenished, the oxygen content can fall below the level needed to support aquatic life. Pollutants, such as inadequately treated sewage, manure, crop residues and decaying organic matter such as leaves, create an oxygen demand on a lake or stream.

Urban Pollutants

Agriculture is not the only culprit of nonpoint source pollution. In urban areas, natural cover is removed, many areas are paved over and natural channels are modified to remove runoff faster. This scenario creates more runoff, while reducing the opportunity for natural treatment. Urban runoff may contain oil drippings, fallout from auto emissions, sediment from construction sites, road salt, pet wastes, fertilizer, and pesticides from lawns and many other pollutants.

References:

Kandiyohi County Soil and Water Conservation District, Minnesota Pollution Control Agency

Implications and Assessment

As described previously, sediment is adversely affecting water resources in the County. Sedimentation, as a result of erosion, has been identified as a major source of outer basin pollution in the Hawk Creek and South Fork of the Crow River watersheds. Because this portion of the County is already intensively farmed, it is not anticipated that sedimentation problems will increase, as long as current best management practices (BMPs), such as windbreaks, grass strips and conservation or no tillage, remain in place. To further reduce erosion and sedimentation, the County should assist landowners in implementing the aforementioned BMPs on a more widespread basis.

In the Chippewa River, Middle Fork of the Crow River and North Fork of the Crow River watersheds sedimentation is a problem, however, not to the extent of the southern portion of the County. With a vast majority of the County's valuable water resources lying within these watersheds, sediment poses a significant water quality threat to lakes and streams in this region. Sediment not only decreases water clarity, but also the nutrients that are attached to the soil particles (i.e. phosphorus) can result in unwanted algal growth. There are two primary sources of sediment in this portion of the County: agricultural land and newly developed land. The agricultural source of sediment has been reduced over the past decades, due in part to the increased participation rate of landowners in conservation and marginal land retirement programs, as well as the implementation of BMPs. However, because of the tremendous development pressure that is being placed on northern Kandiyohi County, the sedimentation problem related to newly developed land is ever present. To minimize this threat, landowners and developers need to minimize soil disturbance, while implementing construction site BMPs, such as silt fencing and sedimentation basins. The County should also explore developing an erosion and stormwater management ordinance.

Effects of Land Use and Cover on Runoff by Watershed Unit
(Data Item 30)

Land usage by Kandiyohi County watershed unit was determined by using the Minnesota Land Use-Agricultural and Transition Areas Inventory, conducted by the Minnesota Land Information Center in 1989 (refer to Data Item 12). The effects of land use and cover on runoff by watershed unit is described below:

Chippewa River Watershed

According to Table 4A, Grassland (40.4%) and Cultivated Agricultural Land (30.8%) are the predominant land use types in the Chippewa River Watershed. The substantial percentage of grassland within the watershed should have a positive impact upon runoff quality and quantity, providing filtration of runoff and decreased runoff volume. Conversely, the high percentage of cultivated agricultural land within the watershed presents a significant potential of runoff quality and quantity being adversely affected. Quality can be degraded if best management practices, such as crop residue management and variable rate fertilization, are not implemented. The lack of these practices allows the topsoil to be exposed to the effects of water erosion, enabling sediment and nutrients to be carried and dissolved in runoff. The quantity of runoff from cultivated agricultural land can be increased a number of ways. Extensive field tiling and drainage are often the most common means by which the quantity of runoff can be increased off of cultivated land. Increased runoff quantity often leads to an increased potential for flooding further down the watershed. BMPs, such as the ones listed above, along with programs, such as CRP and RIM, should be encouraged throughout the Chippewa River Watershed.

Moderate land usages within the Chippewa River Watershed include Deciduous Forest (17.2%), Water (6.7%) and Wetlands (3.4%). As long as vegetative cover is maintained in and around these land uses, the quality and quantity of runoff should be positively impacted. Wetlands not only improve runoff by offering filtration of sediments and nutrients, but also offer storage for runoff. Fertilization of lake lot lawns above recommended application rates can be a major source of pollution into a lake. Fertilizer nutrients, such as nitrogen and phosphorus, can lead to algal blooms, which decrease lake transparency. Practices and policies should be implemented to protect the integrity of these land usages.

The remaining land usages constitute less than 1 percent of the total area of the watershed, they include: Farmsteads and Rural Residences, Rural Residential Development Complexes, Other Rural Developments, Transitional Agricultural Land, Grassland-Shrub-Tree Complex, Gravel Pits and Open Mines, Exposed Soils, Sandbars and Sand Dunes, and Urban and Industrial. These land use types are scattered throughout the watershed. Urban and Industrial land is comprised of the City of Sunburg. Presently the City is not served by a stormwater system. Vegetation associated with these land use types should be maintained as much as possible to promote better runoff quality and reduced runoff quantity. When construction occurs, measures, such as filter blankets, sediment basins, vegetative cover seeding and other erosion control practices, should be implemented to control runoff from the site.

Table 4A:
Chippewa River Watershed Land Use

Land Use Type	Percent of Watershed (%)
Grassland	40.4
Cultivated Land	30.8
Deciduous Forest	17.2
Water	6.7
Wetlands	3.4
Farmsteads and Rural Residences	0.9
Rural Residential Development Complexes	0.2
Other Rural Developments	0.2
Transitional Agricultural Land	0.1
Grassland-Shrub-Tree Complex	0.1
Gravel Pits and Open Mines	0.1
Urban and Industrial	<0.1
Exposed Soils, Sandbars, and Sand Dunes	<0.1

Hawk Creek Watershed

Land use for the Hawk Creek Watershed is given in Table 4B. Cultivated agricultural land (75.6%) is the primary land use in the watershed. If managed improperly, this land use can degrade the quality runoff, while increasing the overall quantity of runoff. BMPs, such as crop residue management, conservation tillage, variable rate fertilizer application and vegetative buffers, along with participation in State and Federal conservation programs, such as CRP and RIM, should be encouraged throughout the Hawk Creek Watershed.

Other minor land usages within the Hawk Creek Watershed include Grassland (13.4%), Water (3.1%), Deciduous Forest (3.0%), Urban and Industrial (2.0%), Farmstead and Rural Residences (1.2%) and Wetlands (1.1%). These land use types are distributed throughout the watershed. The cities of Blomkest, Pennock, Prinsburg, Raymond, and a portion of Willmar are located in the Hawk Creek Watershed. Only Prinsburg and Willmar are served by a storm sewer system. Contaminated urban runoff should be collected and treated by a storm sewer system. Vegetation associated with each land use type should be maintained as much as possible to promote better runoff quality and reduced runoff quantity. When construction occurs, measures, such as filter blankets, sediment basins, vegetative cover seeding and other erosion control practices, should be implemented to control runoff from the site.

Table 4B:
Hawk Creek Watershed Land Use

Land Use Type	Percent of Watershed (%)
Cultivated Land	75.6
Grassland	13.4
Water	3.1
Deciduous Forest	3.0
Urban and Industrial	2.0
Farmsteads and Rural Residences	1.2
Wetlands	1.1
Rural Residential Development Complexes	0.3
Other Rural Developments	0.2
Gravel Pits and Open Mines	0.1
Transitional Agricultural Land	<0.1
Grassland-Shrub-Tree Complex	<0.1

Middle Fork of the Crow River Watershed

Table 4C details the land use for the Middle Fork of the Crow River Watershed. Cultivated agricultural land (49.3%) is the dominant land use in the watershed. If managed improperly, this land use can degrade the quality of runoff, while increasing the overall quantity of runoff. BMPs, such as crop residue management, conservation tillage, variable rate fertilizer application and vegetative buffers, along with participation in State and Federal conservation programs, such as CRP and RIM, should be encouraged throughout the Middle Fork of the Crow River Watershed.

Moderate land usages within the Middle Fork of the Crow River Watershed include Grassland (15.9%), Deciduous Forest (13.8%), Water (11.3%) and Wetlands (5.5%). As long as vegetative cover is maintained, these land uses should have a positive impact upon the quality of runoff and reduce the overall quantity of runoff. Practices and policies should be implemented to protect the integrity of these land usages.

Other land uses that have the potential to impact the quality and quantity of runoff include Farmsteads and Rural Residences (1.4%), Urban and Industrial (0.8%), Rural Residential Development Complexes (0.8%), Other Rural Developments (0.3%) and Gravel Pits and Open Mines (0.2%). These land uses are scattered throughout the watershed, with increased residential density around lakes, especially in the Green Lake area. The cities of New London and Spicer are located in the west central portion of the watershed, along State Highway 23. Both communities are served by stormwater systems. These systems should collect and properly treat contaminated urban runoff. Vegetation associated with each land use type should be maintained as much as possible to promote better runoff quality and reduced runoff quantity. When construction or mining occurs, measures, such as filter blankets, sediment basins, vegetative cover seeding and other erosion control practices, should be implemented to control runoff from the site.

Table 4C:
Middle Fork of the Crow River Watershed Land Use

Land Use Type	Percent of Watershed (%)
Cultivated Land	49.3
Grassland	15.9
Deciduous Forest	13.8
Water	11.3
Wetlands	5.5
Farmsteads and Rural Residences	1.4
Urban and Industrial	0.8
Rural Residential Development Complexes	0.8
Grassland-Shrub-Tree Complex	0.6
Other Rural Developments	0.3
Gravel Pits and Open Mines	0.2

North Fork of the Crow River Watershed

According to Table 4D, cultivated agricultural land (64.1%) is the dominant land use in the North Fork of the Crow River Watershed. If managed improperly, this land use can degrade the quality runoff, while increasing the overall quantity of runoff. BMPs, such as crop residue management, conservation tillage, variable rate fertilizer application and vegetative buffers, along with participation in State and Federal conservation programs, such as CRP and RIM, should be encouraged throughout the North Fork of the Crow River Watershed.

Moderate land usages within the North Fork of the Crow River Watershed include Deciduous Forest (18.5%), Grassland (13.9%) and Wetlands (2.2%). As long as vegetative cover is maintained, these land uses should have a positive impact upon the quality of runoff and reduce the overall quantity of runoff. Wetlands have a beneficial impact on runoff quality and quantity, by providing filtration and storage. Practices and policies should be implemented to protect the integrity of these land usages.

Other land uses that have the potential to impact the quality and quantity of runoff include Farmsteads and Rural Residences (0.6%), Other Rural Developments (0.2%), Urban and Industrial (0.1%), Gravel Pits and Open Mines (0.1%) and Water (0.2%). These land uses are scattered throughout the watershed. The City of Regal is located in the northern portion of the watershed, along State Highway 55. Currently, Regal does not have a stormwater system to collect and treat runoff from the City. Vegetation associated with each land use type should be maintained as much as possible to promote better runoff quality and reduced runoff quantity. When construction or mining occurs, measures, such as filter blankets, sediment basins, vegetative cover seeding and other erosion control practices, should be implemented to control runoff from the site.

Table 4D:
North Fork of the Crow River Watershed Land Use

Land Use Type	Percent of Watershed (%)
Cultivated Land	64.1
Deciduous Forest	18.5
Grassland	13.9
Wetlands	2.2
Farmsteads and Rural Residences	0.6
Other Rural Developments	0.2
Water	0.2
Urban and Industrial	0.1
Gravel Pits and Open Mines	0.1
Grassland-Shrub-Tree Complex	<0.1
Bare Rock	<0.1

South Fork of the Crow River Watershed

According to Table 4E, cultivated agricultural land (73.3%) is the dominant land use in the South Fork of the Crow River Watershed. If managed improperly, this land use can degrade the quality runoff, while increasing the overall quantity of runoff. BMPs, such as crop residue management, conservation tillage, variable rate fertilizer application and vegetative buffers, along with participation in State and Federal conservation programs, such as CRP and RIM, should be encouraged throughout the South Fork of the Crow River Watershed.

Other land usages within the South Fork of the Crow River Watershed include Urban and Industrial (8.7%), Grassland (7.3%), Water (4.9%), Deciduous Forest (2.4%), Wetlands (1.9%) and Farmsteads and Rural Residences (1.0%). These land uses are distributed throughout the Watershed. The cities of Lake Lillian, Kandiyohi and a portion of Willmar are located in the South Fork of the Crow River Watershed. All of these communities are served by a storm sewer system. Storm sewer systems should be used to collect and treat contaminated urban runoff. Vegetation associated with each land use type should be maintained as much as possible to promote better runoff quality and reduced runoff quantity. When construction occurs, measures, such as filter blankets, sediment basins, vegetative cover seeding and other erosion control practices, should be implemented to control runoff from the site.

Table 4E:
South Fork of the Crow River Watershed Land Use

Land Use Type	Percent of Watershed (%)
Cultivated Land	73.3
Urban and Industrial	8.9
Grassland	7.3
Water	4.9
Deciduous Forest	2.4
Wetlands	1.9
Farmsteads and Rural Residences	1.0
Other Rural Developments	0.2
Rural Residential Development Complexes	0.1
Grassland-Shrub-Tree Complex	0.1
Gravel Pits and Open Mines	<0.1
Exposed Soils, Sandbars, and Sand Dunes	<0.1

References:

Crow River Organization of Water
Kandiyohi County Soil and Water Conservation District
Minnesota Land Management Information Center
North Fork of the Crow River Watershed District

Irrigation Areas
(Data Items 31 & 32)

Data available from the Minnesota Department of Natural Resources (DNR) Water Appropriation Permit Index provides information on permitted irrigation withdrawals in Kandiyohi County. DNR water appropriation permits are required for withdrawals greater than 10,000 gallons per day or one million gallons per year. All active water appropriation permit holders are required to measure monthly water use with an approved measuring device to an accuracy of 10 percent and report water use yearly. Currently, there are a total of 105 Water Appropriation Permits, covering a total of 12,742 acres, that have been issued in Kandiyohi County for irrigation purposes. Information concerning water appropriation permits issued for irrigation purposes in Kandiyohi County can be found in Appendix A.

Sources for irrigation withdrawal include both surface waters and groundwater. Withdrawals from surface water potentially include lakes, streams, rivers, wetlands, ditches and dug pits. Row crops, such as corn and soybeans, are the predominant crops irrigated within the County. A concentration of row crops and irrigation on coarse textured soils significantly increases the potential of nonpoint source contamination of surface and groundwater. In such areas, highly water soluble agricultural chemicals and fertilizers, such as nitrates, are easily leached through the soil column to the aquifers beneath.

A majority of the irrigated land within Kandiyohi County is found in the northeastern portion of the County. Table 4F lists the five townships within the County, specifically Burbank, Colfax, Harrison, Irving, and Roseville, that have more than 1,000 acres under irrigation. This area is part of the Bonanza Valley Irrigation Area, which has been thoroughly studied by the USGS in the past. Coarse textured soils, that are prone to leaching of agricultural chemicals and fertilizers are common throughout this area. Implementation of best management practices (BMPs), such as crop residue management and site-specific fertilizer application, are needed in this area to prevent current and potential future pollution from occurring.

Although the availability of water in this portion of the County is plentiful, there has been a well interference complaint involving groundwater usage for irrigation entered into the Minnesota DNR Well Interference Complaint Tracking Database for Kandiyohi County. Upon investigation, the DNR resolved the complaint by issuing the water appropriation permit.

Table 4F:
Townships with Greater Than 1,000 Acres of Irrigated Land

Township	Acres Irrigated	Township	Acres Irrigated
Burbank	3,596	Irving	1,439
Colfax	1,292	Roseville	2,548
Harrison	2,681		

References: Minnesota Department of Natural Resources, Division of Waters, United States Geological Survey

Public Drainage System
(Data Item 33 & 34)

Kandiyohi County has approximately 603 miles of public drainage ditches, most of which is located in the highly agricultural, southern half of the County. Drainage systems are used where the topography of the landscape is nearly level and soils are poorly drained. Wetness is a limitation that occurs in many low-lying areas. A drainage system is needed to control ponding and to lower the water table below the root zone. Open ditches drain much of the surface water and can be used as outlets for subsurface tile lines. Proper design and maintenance of drainage systems can improve and increase the productivity of the soil.

Over the past six years, annual disbursements for Kandiyohi County's drainage system have averaged $308,359.68. Annual disbursements may consist of, but are not limited to: beaver control, installing side inlet pipes, stabilizing banks, erosion control, major and minor ditch cleanouts and weed spraying. Table 4G lists the annual disbursements for the Kandiyohi County public ditch system from 1995 to 2000. Specific annual cost per drainage system can be made available by contacting the Kandiyohi County Public Works Department.

Table 4G:
Public Drainage Systems Annual Disbursements (1995-2000)

Year	Annual Disbursements
1995	$249,337.33
1996	$246,294.18
1997	$226,878.78
1998	$473,899.45
1999	$428,081.06
2000	$225,667.27
Average	**$308,359.68**

Table 4H details the drainage ditch water quality monitoring sites in Kandiyohi County (See Appendix F for tabular data). The County's watershed projects and watershed districts coordinate the monitoring of these sites. Of obvious concern are sediments, fertilizers and agricultural chemicals that are carried by wind blown soil particles or by surface water runoff, especially in areas where highly erodible soils are present. The installation of new and the maintenance of existing vegetative buffers can reduce the potential for contamination from these elements.

Table 4H:
Drainage Ditch Water Quality Monitoring Sites

Site Name	Site Location	Monitoring Entity
Co. Ditch 26	Section 22, Irving Township	Middle Fork Crow River Watershed Project
Co. Ditch 27 (Site A12)	Section 12, Arctander Township	Chippewa River Watershed Project
Co. Ditch 29 (Site B)	Section 35, Norway Lake Township	Chippewa River Watershed Project
Co. Ditch 29 (Site C10)	Section 36, Norway Lake Township	Chippewa River Watershed Project
Co. Ditch 37	Section 29, Burbank Township	Middle Fork Crow River Watershed Project

Table 4I provides a listing of drainage ditches, lakes and streams that the Kandiyohi County Soil and Water Conservation District has identified as high priority for the installation of best management practices (BMPs). Each of the areas identified would be eligible for available conservation program dollars.

Table 4I:
Priority Areas for the Installation of BMPs

Township	Ditch System(s)
Arctander	CD27,CD62
Burbank	JD3, CD37
Colfax	Lat. 1 (86), CD37, Branch #2, Branch 87 to JD3, Middle Fork of the Crow River, Branch #4
Dovre	CD12, JD18, JD7, CD10
East Lake Lillian	CD52, Lat. C, Lat. A, JD1, CD15, CD51, Lat. 5, CD24A, B1, B2, B3
Edwards	JD3, CD10, CD48, Branches 1-4, CD31, CD60, Lat. A,B of JD3, Lat. 10 of JD3, Lat. A4, Lat. A3,B5 of JD3, JD7 Hawk Creek
Fahlun	JD1, SD1, CD64, CD58, B1,B4
Gennessee	CD45, CD42
Green Lake	JD7
Harrison	CD28, B10, CD50, CD45, B6, B7, Lat. A of B4, and B4
Holland	CD56, CD60, CD8, CD31, JD16, CD54, JD7, CD16A, CD18A, JD2
Irving	CD26, B13, B2, B7, B6, B8, Lat. 2, CD28, CD9, CD20, JD11, B5, B9, B10,
Kandiyohi	CD38, CD23A
Lake Andrew	Shakopee Creek, Lake Andrew, Lake Flordia, Middle Lake, Norway Lake, Norstedt Lake
Lake Elizabeth	CD61, Lake Elizabeth, Johnson Lake, SD1 & Branch 1&2, B10, B12, B7, B8, Lat. B1&B2 & Lat. F

Table 4I:
Priority Areas for the Installation of BMPs *(continued…)*

Township	Ditch System(s)
Lake Lillian	CD58, Branch 2&5, CD24A, Lake Lillian Lake, SD1, CD51, Lat. A, Lat. C, Lat. H1
Mamre	JD18, CD62, Swan Lake, Mamre lake, Mud Creek, CD34, JD21, Church Lake
New London	Nest Lake, Bear Lake, Green Lake, George Lake, West Woodcock Lake, Middle Fork of the Crow River, Eight Lake, Mud Lake
Norway Lake	CD15, Glense Lake, Crook Lake, Lake Ole, East Lake Johanna, Sunburg Lake, E. Sunburg lake, Hefta lake
Roseland	CD16A, CD18A, B2, JD16, CD8, CD58
Roseville	Crow River, JD2, Long Lake, Otter Lake
St. Johns	St. Johns Lake, CD10, CD19, Lat. D, Branch 15, CD7, CD47, CD48, Branch 23, Lat. A, B1
Whitefield	Lat. 10, Lake Wagonga, CD16A, CD31, Branches 3,4,5, CD40,
Willmar	CD12, CD10, Willmar Lake, Foot Lake, CD46, CD47, Lat. 10, CD25A, Branch B3, Swan Lake, Branches B1, B2

References:

Chippewa River Watershed Project
Crow River Organization of Water
Buffalo Creek Watershed District
Hawk Creek Watershed Project
Kandiyohi County Auditor/Treasurer's Office
Kandiyohi County Public Works
Kandiyohi County Soil and Water Conservation District
Minnesota Pollution Control Agency
North Fork of the Crow River Watershed District

Implications and Assessment

As stated earlier, a majority of Kandiyohi County's public drainage system is located in the highly agricultural southern half. This region, which primarily includes the Hawk Creek and South Fork of the Crow River watersheds, is adversely affected by both water and wind erosion. Water quality testing is currently being conducted on the County's ditches by various watershed projects and organizations. Data collected by these entities indicates that sediment, nutrients and bacteria are degrading the water quality of the County's ditches, which in turn degrades the quality of County's lakes and streams. To minimize this problem, landowners need to further implement best management practices (BMPs), such filter strips and drop inlet structures, along the County's drainage ditches. Implementation of such practices would not only improve the quality of the County's surface water, but it would also reduce the need for expensive ditch cleanout and repair.

Broadly, the Minnesota Department of Natural Resources (DNR) has observed more "flashy" stream flows throughout the State, meaning that both high and low flows are exaggerated. A large contributing factor to this is the design and operation of drainage ditch systems. Because many drainage ditch systems were designed to remove large quantities of water in a short duration, flooding problems can and do occur, especially following major storm events and the spring snowmelt. To minimize flooding impacts, upland storage needs to be increased to reduce the overall volume of water transported by the public drainage system.

Finally, in recent years the amount of pattern tiling has dramatically increased within the County. While pattern tiling has definite water quality and quantity benefits over conventional open tile intakes, the increasing installation could place a further burden on the County's drainage system. This could result in numerous negative impacts including: increased downstream flooding, increased bounce in lakes and wetlands and increased bank and instream erosion in ditches and streams. Additional assessment of tiling within the County is needed.

Potential Pollutant Sources
(Data Item 35)

Open Dumps and Sanitary Landfills

A comprehensive inventory of previously operating open dumps, both public and private, has not been conducted in Kandiyohi County. Little information exists on the occurrence of unregulated dumps that have closed or may still be operating illegally. Under certain circumstances, individuals may dispose of refuse on their property by burning or burial, but due to the number of individual farm disposal sites, it is impractical to attempt a specific listing of these sites.

The Minnesota Pollution Control Agency (MPCA) does, however, maintain an Open Dumps Inventory Database. This inventory was originally conducted and compiled in 1980. Listed in this database are 22 open dumps in Kandiyohi County, none of which are in operation today. Table 4J details the name and location of the open dumps within the County (note: this is not to be viewed as a comprehensive listing of all dumps that have operated in the County). Contact the MPCA for water quality monitoring data that may exist for each site.

Kandiyohi County Sanitary Landfill/ Regional Household Hazardous Waste Facility

The Kandiyohi County Sanitary Landfill is the only landfill in County permitted through the MPCA. The facility is located in Section 23, Township 121 North, Range 35 West (Lake Andrew Township). Kandiyohi County also has a Regional Household Hazardous Waste (HHW) Facility located at 1104 22nd Street SW in Willmar. Products accepted at the HHW facility include paint, stain, varnish, fuels, pesticides, aerosols, poisons and acids. In addition to Kandiyohi County, the facility also serves Big Stone, Chippewa, Laq qui Parle, Meeker, Renville and Swift counties. This facility is also licensed to accept hazardous waste from very small quantity generators on an appointment basis.

Federal Superfund Sites and Hazardous Waste Generators

Currently, there are no Federal Superfund sites in Kandiyohi County. A complete listing of hazardous waste generators in Kandiyohi County, along with their EPA identification numbers, can be found under data item 37.

Table 4J:
MPCA Open Dump Inventory Sites

ID	Dump Name	Location	Nearest City
1848	Atwater Dump	0.5 miles southeast of the intersection of US Highway 12 and CSAH 2	Atwater
1847	Blomkest Dump	0.4 miles north of State Highway 7 and east of CSAH 11	Blomkest
1858	Burlington Northern Demolition Landfill	1,000 feet west of State Highway 23, off County Road 103	New London
1031	Farmers Coop Elevator Company	236 Milky Way Ave., Lake Lillian	Buffalo Lake
1863	Gennessee Dump	0.75 miles south of Atwater	Atwater
2135	Holm Brothers	1700 South 1st Street	Willmar
1848	Kandiyohi Dump	0.2 miles off CSAH 8, 0.25 miles south of US Highway 12	Kandiyohi
2833	Lake Lillian Dump (New)	0.2 miles west of Highway 8	Lake Lillian
1862	Lake Lillian Dump (Old)	1+ miles west of junction of CSAH 4 and CSAH 8	Lake Lillian
1849	New London Dump	1 miles east of New London on CSAH 3	New London
1861	New Raymond Dump	1+ miles northwest of State Highway 23, on CSAH 7	Raymond
1855	Old Raymond Dump	On the south side of State Highway 23, on the east edge of Raymond	Raymond
1854	Pennock Dump	1+ miles northeast of US Highway 12, off County Road 89	Pennock
1856	Prinsburg Dump	One mile south of Prinsburg, east of CSAH 1, near New Holland Cemetery	Prinsburg
1851	Regal Dump	1 mile west of Regal, on County Road 109	Regal
1852	Sibley Park Dump	1+ miles west of US Highway 71, on the north side of CSAH 48	New London
1853	Sunburg Dump	1+ miles south of Sunburg, on the west side of State Highway 104	Sunburg
1850	Trinity Industries Dump	Just west of the New London Dump	New London
1864	Unnamed Dump	South of Spicer 0.75 mile on the west side of State Highway 23	Spicer
1865	Unnamed Dump	North of Schulz Lake, south of CSAH 28	Harrison Township
1857	Willmar Brush Disposal Facility	0.5 mile east of US Highway 71 and east 0.75 mile south of CSAH 23	Willmar
2954	Willmar Ready Mix	405 East Benson Avenue	Willmar

Individual Sewage Treatment Systems (ISTSs)

Individual Sewage Treatment Systems (ISTSs) are used for the treatment and disposal of wastewater from individual homes, clusters of homes, isolated communities, industries, or institutional facilities.

When properly functioning, ISTSs are an effective means of treating wastewater. However, if improperly designed, installed or maintained, ISTSs have the potential to adversely impact surface and groundwater resources. Human waste contains high concentrations of microorganisms and many chemicals, including carbon, nitrogen, phosphorus, salts and trace element. These pollutants not only represent a public health concern, but also can degrade the environment.

In 1994, the first State law addressing failing ISTSs went into effect. This 1994 legislation is known as the ISTS Act and has since been codified as Minn. Rule Chapter 7080. Chapter 7080 requires that all new construction and replacement of ISTSs meet minimum statewide standards. It also puts into place a method to systematically address the adequacy of existing systems through requiring upgrading of failing existing systems before construction of an additional bedroom. The following are the State's objectives in regulating sewage systems through Chapter 7080:

- Keep inadequately treated sewage away from human contact to prevent disease;
- Reduce levels of pathogenic bacteria and viruses discharged to the environment;
- Reasonably and cost-effectively prevent groundwater contamination;
- Develop clear direction for design, construction and maintenance of sewage treatment facilities;
- Strive for cost effective methods of sewage treatment to maintain or improve property values;
- Encourage personal responsibility for treating sewage; and
- Require all counties to adopt an ISTS ordinance.

According to the 1990 U.S. Census *(2000 U.S. Census information is not scheduled to be released until late 2002)*, there were 6,594 year-round housing units in Kandiyohi County that utilized ISTSs to treat sewage. This total represents 40.1 percent of the total year-round housing units within the County.

In May of 1997, the Kandiyohi County Board of Commissioners adopted the County's current ISTS ordinance. Since that time the County has inspected 1,256 ISTS installations. While this is a significant number of inspections to ensure ISTSs are in compliance with Chapter 7080 specifications, a number of systems still exist in the County that are not adequately treating sewage. In fact, the Kandiyohi County Environmental Services Office estimates that there are 2,798 systems that are failing within the County. This would represent 42 percent of the total ISTSs within Kandiyohi County, according to the 1990 Census.

References:

Environmental Protection Agency
Kandiyohi County Environmental Services
Minnesota Pollution Control Agency

Feedlots, Unsealed Abandoned Wells, Underground Storage Tanks and Permitted Wastewater Dischargers
(Data Item 36)

Feedlots

The Minnesota Pollution Control Agency (MPCA) regulates and controls pollution created by animal feedlots. The MPCA's feedlot rules were first adopted in 1971 and were amended in 1974, 1978 and again in 2000. The trend in agriculture has been toward fewer but larger livestock and poultry facilities. There has also been a trend of increasing awareness about the potential environmental effects of feedlots.

In accordance with MPCA feedlot regulations, the owner(s) of an animal feedlot or manure storage area with 50 or more animal units, or 10 or more animal units if in shoreland (less than 300 feet from a stream or river, less than 1,000 feet from a lake) needed to register with the MPCA by January 1, 2002. Registration was accomplished one of three ways: 1) the owner(s) could fill out information on an MPCA registration form and return it to the MPCA or, in a delegated county, the delegated county feedlot officer, 2) the owner(s) could fill out a permit application (if required to obtain a permit), or 3) the owner(s) could be listed on a current (as of October 1, 1997) Level II or Level III inventory that also contains the required information and the inventory has been submitted to the MPCA, this serves as fulfilling the initial registration requirement.

> ***Definition of an animal unit***
>
> A standardized measure to compare differences in the production of animal manure for an animal feedlot or manure storage area. A mature cow of about 1000 pounds (455 kg.) is the standard unit.

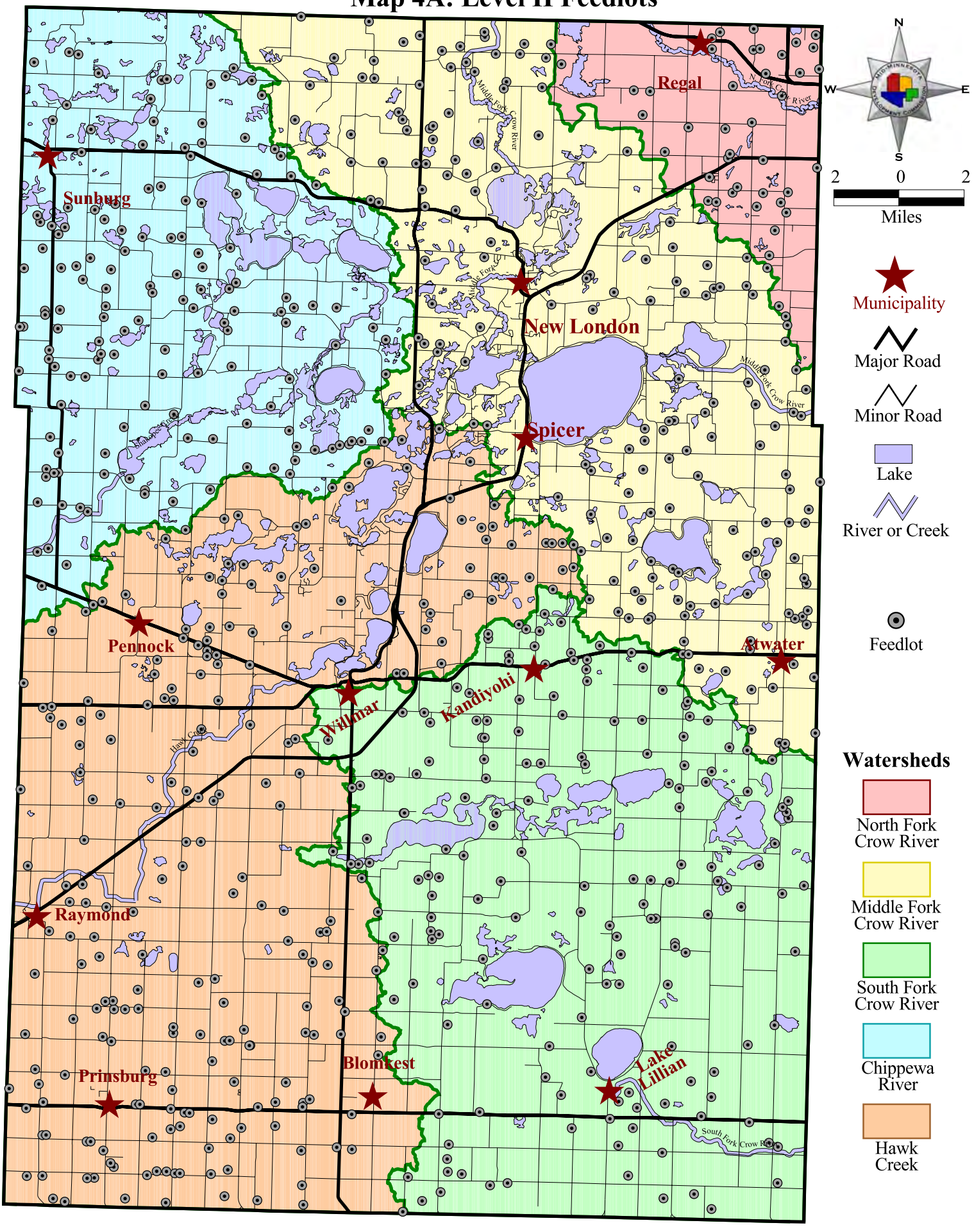
It is the owner's responsibility to ensure that his or her registration information has been forwarded to the MPCA. Registration information must be updated at least once in every four-year period after January 1, 2002. The MPCA or delegated county will notify owners that they must re-register at least 90 days before their current registration expires. Also, the MPCA or delegated county will send the owner a receipt within 30 days of receiving the registration information from the owner.

Exemptions to registration**:**

- Owners of livestock facilities located on county fairgrounds were not required to register.
- Owners of pasture or grazing operations that have buildings or lots with a capacity of less than 50 animal units, or less than 10 animal units in shoreland areas, were not required to register.
- Owners of pasture or grazing operations that do not have buildings or open lots were not required to register.

Once registered, owners are directed to obtain any needed permits. The requirement for a feedlot permit is dependant upon the size of the operation and whether or not a pollution hazard has been identified. Owners with less than 300 animal units are not required to have a permit for

Map 4A: Level II Feedlots



the construction of a new facility or expansion of an existing facility if construction is in accordance with the technical standards contained in Minnesota State Rules. For owners with 300 animal units or more, but less than 1,000 animal units, a streamlined short-form construction permit is required for construction activities. An Interim Permit is required for owners with 300 animal units or more, but less than 1,000 animal units, if a pollution hazard has been identified. Finally, a National Pollutant Discharge Elimination System (NPDES) permit or State Disposal System (SDS) permit is required for all feedlots with 1,000 animal units or more. NPDES and SDS permits must be issued by the MPCA, all other permits are to be issued by the County.

Owners of feedlots with less than 300 animal units, with passive manure-contaminated runoff from open lots, are encouraged by the County to sign up for the 2005/2010 Open-lot Agreement. If an owner qualifies for the agreement, the County will allow the owner to phase in any needed corrections to pollution problems. Owners are required to install clean-water diversions, vegetated buffer areas or filter strips for manure-contaminated runoff to flow through, or other corrective measures by October 1, 2005. One way owners can demonstrate compliance with these requirements is by a computer model ("An Evaluation System to Rate Feedlot Pollution Potential," more commonly known as FLEVAL) that achieves a 50 percent or more reduction in phosphorus and biochemical oxygen demand loading. The second step in the Open-Lot Agreement is for the owner to meet the discharge standard of 25 mg/L BOD by October 1, 2010.

Kandiyohi County is currently delegated to administer the MPCA feedlot program. The County has completed both a Level One and Level Two Feedlot Inventory. The Level One Inventory was done to identify the location of existing feedlots. The Level Two Feedlot Inventory contains much more detailed information, such the size and type of manure storage for each feedlot within the County. Map 4A displays the location of Kandiyohi County's feedlots. Table 4K provides a breakdown of the number of feedlots per major watershed unit. Both Map 4A and Table 4K are based upon the Level Two Feedlot Inventory.

Table 4K:
Feedlots per Watershed

Watershed	# of Feedlots	# of Animal Units
Chippewa River	108	12,156.9
Hawk Creek	173	45,976.8
Middle Fork of the Crow River	130	16,441.9
North Fork of the Crow River	41	10,579.7
South Fork of the Crow River	101	21,136.4
Total	**553**	**106,291.7**

Abandoned Wells

The Minnesota Groundwater Protection Act requires that the status and location of wells on a property be disclosed upon property sale to the buyer and the Minnesota Department of Health (MDH). The Act applies to all types of wells, including wells used for drinking water, irrigation, commercial or industrial processing, heating or cooling, or monitoring. These wells include drive-point (sand point) wells, drilled wells and dug wells.

Well disclosure is a particularly useful tool in identifying unused or "abandoned" wells. Unused wells that have not been properly sealed can be a source of groundwater contamination, allowing surface water, contaminated water and improperly disposed of waste to reach sensitive aquifers below ground. In addition to being a potential pollution hazard, unused wells also pose a potential safety hazard for children and animals and a potential liability for the property owner.

Before signing an agreement to sell or transfer real property the seller must provide the buyer with a Well Disclosure Statement. The Statement must include the following information:

1. the legal description and County;
2. a map showing the location of each well; and
3. whether each well is in use, not in use, or sealed.

A well is "in use" if the well is functioning for some purpose. A well is "not in use" if the well is not functioning or is not capable of functioning, such as when the well pump on the well is disconnected, or when the well is no longer connected to a power supply. A well is "sealed" if the well has been filled with an approved sealing material by a licensed well contractor or a licensed well sealing contractor and the MDH has received a Well and Boring Sealing Record.

At the time of closing of the sale, the information on the Well Disclosure Statement, the name and mailing address of the buyer, and the quarter, section, township, and range of the property must be provided on a Well Disclosure Certificate. This form is available from many realtors, county recorders or district offices of the MDH. The seller or person authorized to act on behalf of the seller signs the certificate. In the absence of the seller's signature, the certificate is prepared and signed by the buyer or person authorized to act on behalf of the buyer. In the case of a contract-for-deed sale, the certificate is prepared and signed by the seller (grantor) or person authorized to act on behalf of the seller (grantor), if the contract is recorded at the beginning of the contract. When the contract is recorded at the fulfillment of the contract, the certificate is prepared and signed by the buyer (grantee) or person authorized to act on behalf of the buyer (grantee). Once completed, the Well Disclosure Certificate is filled along with the property deed at the County Recorders office.

If a well is not in use, the property owner has three options:

1. the well can be put back into use;

2. the well can be sealed by a licensed well contractor, or a licensed well sealing contractor; or

3. the property owner can apply for a maintenance permit.

If one of these steps has not been taken at the time of property transfer, it will be the responsibility of the buyer to choose an option and follow through with it.

The well sealing option involves permanently and completely filling a well with an approved sealing material, called "grout." State law requires that a well must be sealed by a licensed well contractor or a licensed well sealing contractor. The sealing process starts with removal of the pump, the inner pipe to the pump and any materials or obstructions in the well. A grout "tremie" pipe is then installed to the bottom of the well and the contractor pumps in the grout, usually consisting of a special cement or a special clay. In certain cases, the contractor may have to remove or perforate the well casing(s) before pumping the grout to ensure a proper sealing. After sealing the well, the contractor sends a "Well and Boring Sealing Record" to the MDH. Once a licensed well contractor or a licensed well sealing contractor seals a well, the owner of a well is no longer liable for contamination of groundwater from that well. For this reason, many financial institutions and realty companies are requiring the sealing of wells that are not in use as a condition for loans and mortgages.

The maintenance permit option allows an unused well to remain unsealed if it is properly maintained. State law requires that a well that is not in use must be sealed unless the property owner has a maintenance permit for the well. The permit is not transferable and requires a yearly fee of $100. The property owner does not have to apply for a maintenance permit if the well is put back into use or if the well is sealed by a licensed contractor or a licensed well sealing contractor. A maintenance permit will not be approved by the MDH if the well is contaminated; if the well is improperly sealed; or if the well is located, constructed, or maintained in a manner that is a safety or health hazard. Local delegated well programs may have additional requirements for maintenance permits and should be contacted for additional requirements.

As of August 2002, the MDH has recorded 2,214 wells that have been sealed in Kandiyohi County. The MDH has recorded an additional 117 wells within the County that have been disclosed as not in use. These unused wells could be targeted for sealing through the County's Well Sealing Program.

Kandiyohi County Abandoned Wells Inventory/Sealing Program

From 1993 to 1996, Kandiyohi County conducted an abandoned wells inventory. The inventory was conducted on a volunteer basis and is not considered to be a comprehensive inventory of all abandoned wells within the County. The Kandiyohi County Water Plan Taskforce utilizes this inventory to set priorities on the abandoned well sealing cost share program offered through the County. Approximately $90,000 to $100,000 has been provided through the County's cost share program to seal nearly 500 abandoned wells within the County.

Underground Storage Tanks

The Minnesota Pollution Control Agency's (MPCA) Underground Storage Tank (UST) Program was created to help prevent contamination caused by leaking tanks. This program focuses on technical assistance, inspections and outreach to achieve this objective. As a part of the program, underground storage tanks throughout the State have been inventoried and entered into a database. A complete listing of underground storage tanks in Kandiyohi County, as of November 2001, can be found in Appendix C.

The UST Program regulates all containers including tanks, vessels, enclosures, or structures and underground appurtenances connected to them that is used to contain or dispense an accumulation of regulated substances, and the volume which, including the volume of under ground pipes connected to them, is 10 percent or more beneath the surface of the ground. All tank owners and operators must comply with both State and Federal regulations for underground storage tanks. At the State level, owners and operators must comply with Minn. Rules, Chapter 7150. The Federal regulations for USTs include 40 CFR Parts 280-282, which are regulated by the Environmental Protection Agency (EPA).

Under State and Federal regulation, all UST systems must have spill protection, overfill protection, corrosion protection and leak detection to comply with State and Federal requirements. However, regulated USTs that receive less than 25 gallons of product at a time are only required to have corrosion protection and leak detection. A description for each component necessary for compliance is provided below.

- **Spill Protection -** Regulated USTs are required to have spill buckets or catchment basins to catch spills that may occur when the delivery hose is disconnected from the fill pipe. The spill buckets can vary in size from a couple gallons, to much larger buckets. These spill buckets should be kept clear of debris and liquid. Spill protection has been required for regulated USTs since December 22, 1998.

- **Overfill Protection** - Regulated USTs are required to have overfill protection to minimize and eliminate the chances of delivering more product to a tank than the capacity of the tank allows. There are three options for overfill protection to comply with State and Federal requirements. They include an automatic shutoff device, an overfill alarm, or a ball float valve. Overfill protection has been required for regulated USTs since December 22, 1998.

- **Corrosion Protection** - Regulated USTs are required to have corrosion protection to prevent degradation and rusting of metal tanks and piping. USTs and piping systems that are made of fiberglass or are completely isolated from surrounding soil are not required to have additional corrosion protection. All other regulated USTs must use an impressed current system, a sacrificial anode system, or provide an interior lining of non-corrodible material for the tank system. Corrosion protection has been required for regulated USTs since December 22, 1998.

- **Tank System Leak Detection** - Leak detection for regulated UST systems was phased in between 1989 and 1993 based upon the date the tank was installed. Facilities with new tanks can use statistical inventory reconciliation (SIR), automatic tank gauges, vapor monitoring, interstitial monitoring, or groundwater monitoring as their leak detection method. Facilities with existing tanks can use these leak detection methods or inventory control performed with a tank tightness test annually. The inventory control and tank tightness test option can only be used for ten years after installation of the corrosion protection system on the tank.

Permitted Wastewater Dischargers

The National Pollution Discharge Elimination System (NPDES) is a Federal program established under the Clean Water Act, aimed at protecting the nation's waterways from point and nonpoint sources of pollution. In Minnesota, the NPDES program is administered by the Minnesota Pollution Control Agency (MPCA), under delegation from the U.S. Environmental Protection Agency (EPA). Under the program, any industrial, municipal or private-entity point source that proposes to discharge treated wastewater to surface waters of the state must apply for a permit. As part of the permitting process, NPDES permit applicants are required to submit information to the MPCA on design flows of the facility, the route that treated wastewater will travel to a surface waterbody and a description of the existing treatment system of the system to be built.

In addition to issuing NPDES permits, the MPCA is also responsible for setting effluent limitations to protect water quality standards and the designated uses of waters of the State. All municipal and other point source dischargers of sewage are required, at minimum, to provide secondary treatment. Minimum secondary treatment effluent limits include those listed in Table 4L below.

Table 4L:
MPCA's Minimum Effluent Limitations for Secondary Treatment

Parameter	Limiting Concentration or Range
5-day CBOD (CBOD5)	25 mg/L
Fecal Coliform Organisms	200 organisms/100 mL
Total Suspended Solids	30 mg/L
pH Range	6.0 – 9.0 SU
Phosphorus	1 mg/L

Effluent limits which are more stringent than the minimum secondary treatment requirement may be assigned to a discharge where stream flows are not adequate to protect water quality standards and designated uses. The MPCA considers a number of factors in developing effluent limits for a particular discharge, including the characteristics of the receiving water (use classification, water quality standards, flow characteristics) and discharge (design flow, discharge duration and frequency).

According to Table 4M, there are 66 facilities in Kandiyohi County that are currently operating under an MPCA issued NPDES permit. Permits listed below are as of March 1, 2002. Additional NPDES permit applications, especially those issued for feedlots, may still be pending final approval. Contact the MPCA for additional permit information.

Table 4M:
NPDES Permits

Facility Name	Permit #	Permit Purpose/ Type	City (Nearest)
City of Atwater WWTP	MN0022659	Water Quality Treatment	Atwater
Burlington Northern-Willmar	MN0000779	Water Quality Treatment	Willmar
Duininck Brothers Inc.	MNG490046	Water Quality Treatment	Prinsburg
Green Lake SSWD	MNL052752	Water Quality Treatment	Hawick
City of Kandiyohi WWTP	MNL023841	Water Quality Treatment	Kandiyohi
City of Lake Lillian WWTP	MNL021954	Water Quality Treatment	Lake Lillian
Mooneys Inc.	MN0061573	Water Quality Treatment	Prinsburg
Northern Plating Inc.	MNG120012	Water Quality Treatment	Willmar
City of Pennock WWTP	MN0055158	Water Quality Treatment	Pennock
City of Raymond WWTP	MN0045446	Water Quality Treatment	Raymond
City of Sunburg WWTP	MN0063894	Water Quality Treatment	Sunburg
Willmar Regional Treatment Center	MN0062332	Water Quality Treatment	Willmar
City of Willmar WWTP	MNL025259	Water Quality Treatment	Willmar
AGCO Manufacturing	NA	Industrial Stormwater	Willmar
BNSF Railroad	NA	Industrial Stormwater	Willmar
Bergh's Fabricating	NA	Industrial Stormwater	Willmar
Central Minnesota Fabricating Inc.	NA	Industrial Stormwater	Willmar
Central Ready Mix	NA	Industrial Stormwater	New London
Concrete Products of New London	NA	Industrial Stormwater	New London
Dooley's Amoco	NA	Industrial Stormwater	Willmar
EBO Farms Inc.-Atwater Feedmill	NA	Industrial Stormwater	Atwater
Hanson's Repair & Tire Sales	NA	Industrial Stormwater	New London
Jennie-O Foods-Willmar	NA	Industrial Stormwater	Willmar
Jennie-O Foods-Willmar 2	NA	Industrial Stormwater	Willmar
Johnson Fur Company Inc.	NA	Industrial Stormwater	Willmar
Kandi Bus Service Inc.	NA	Industrial Stormwater	Kandiyohi
Kandiyohi County Sanitary Landfill	NA	Industrial Stormwater	New London
Land O'Lakes-Harvest State Feed Plant	NA	Industrial Stormwater	Willmar
Leaders Manufacturing	NA	Industrial Stormwater	Willmar
New London Materials	NA	Industrial Stormwater	New London
Paynesville Excavating Inc.	NA	Industrial Stormwater	Paynesville
Peterson Bus Service Inc.	NA	Industrial Stormwater	New London
Rohner's Auto Parts Inc.	NA	Industrial Stormwater	Willmar
Schiller Custom Cabinetry Inc.	NA	Industrial Stormwater	Spicer

Table 4M:
NPDES Permits *(continued…)*

Facility Name	Permit #	Permit Purpose/ Type	City (Nearest)
Tim Mack Recycling	NA	Industrial Stormwater	Willmar
Timber Wholesalers Inc.	NA	Industrial Stormwater	Willmar
Tollefson Oil Inc.	NA	Industrial Stormwater	Sunburg
United Parcel Service	NA	Industrial Stormwater	Willmar
Willmar Air Service	NA	Industrial Stormwater	Willmar
Willmar Bus Service	NA	Industrial Stormwater	Willmar
Willmar Municipal Airport	NA	Industrial Stormwater	Willmar
Willmar Municipal Utilities	NA	Industrial Stormwater	Willmar
Willmar Poultry Company Inc.	NA	Industrial Stormwater	Willmar
Willmar Precast Company	NA	Industrial Stormwater	Willmar
Willmar Ready Mix	NA	Industrial Stormwater	Willmar
Windy Hills Auto Parts	NA	Industrial Stormwater	New London
Gorans Bros. Inc. A-Farm	067-50010	Feedlot	Willmar
Shoreview Farm Inc.	067-50003	Feedlot	Atwater
Holland Pork Cooperative-Farm II	067-50002	Feedlot	Prinsburg
Holland Pork Cooperative-Farm I	067-50001	Feedlot	Prinsburg
Prinsburg Farmers Co-op	067-50008	Feedlot	Prinsburg
Willmar Poultry Farms Inc.-Hilltop	067-50025	Feedlot	Willmar
Willmar Poultry Farms Inc.-Highland	067-50023	Feedlot	Willmar
Willmar Poultry Farms Inc.-Millcreek	067-50022	Feedlot	Willmar
Willmar Poultry Farms Inc.-Quam	067-50019	Feedlot	Willmar
Sunnyside Turkeys Inc.-Bartel	067-50027	Feedlot	Willmar
Willmar Poultry Farms Inc.-Burlington	067-50026	Feedlot	Willmar
Willmar Poultry Farms Inc.-Magnum	067-50024	Feedlot	Willmar
Willmar Poultry Farms Inc.-Highway 71	067-50018	Feedlot	Willmar
Willmar Poultry Farms Inc.-Crestview	067-50017	Feedlot	Willmar
Willmar Poultry Farms Inc.-Prairie Ridge	067-50021	Feedlot	Willmar
Willmar Poultry Farms Inc.-Solomon Lake	067-50020	Feedlot	Willmar
Jennie-O Turkey Store-Roseville Farm	067-50006	Feedlot	Willmar
Jennie-O Turkey Store-Wilner Farm	067-50007	Feedlot	Willmar
Jennie-O Turkey Store-Groen Farm	067-50005	Feedlot	Willmar
Norling Farm Inc. 1	067-50009	Feedlot	Blomkest

References:

Minnesota Department of Health
Minnesota Pollution Control Agency

Hazardous Waste Generators
(Data Item 37)

There are currently 57 hazardous waste generators existing in Kandiyohi County, as listed by the Environmental Protection Agency. Hazardous wastes generated by these facilities include a wide range of environmentally damaging materials including acids, industrial solvents, petroleum products, photographic chemicals and many others. Currently there are 5 large quantity generators and 52 small quantity generators within the County. Tables 4N and 4O identify these hazardous waste generators.

Table 4N:
Large Quantity Hazardous Waste Generators

Facility Name	ID	Address	City
American Cyanamid West Central	MN0000686329	2700 Trott Avenue SW	Willmar
Johnson Sales Company Inc.	000007513584	16295 Highway 23 NE	New London
Larry's Power Equipment	MND985682905	182 Progress Way	Spicer
Nelsen's Laundry and Dry Cleaners	MND023112493	220 West Benson Avenue	Willmar
S W Recycling Division of SW Inc.	000008989294	3701 West Highway 12	Willmar

Table 4O:
Small Quantity Hazardous Waste Generators

Facility Name	ID	Address	City
Action Auto Parts Inc. Willmar	MND985692904	611 South 1st Street	Willmar
AGCO MFG	MND006213458	2508 Airport Drive	Willmar
Amoco One-Stop Service Center	MND981776131	2645 South Highway 71	Willmar
Auto Collision and Colour	MND985695782	302 Pleasant Avenue	Prinsburg
Body Shop	MND982423576	3961 Abbott Drive	Willmar
Car Clinic	MND068164607	228 East Benson	Willmar
Crown Auto Inc.	MND981803117	701 South 1st Street	Willmar
Custom Printing of Willmar Inc.	MND006218200	330 West 3rd Street	Willmar
D.J. Service Center	MND981532054	1st and Main	New London
Duininck Bros. Inc.	MND022977813	County Road 1	Prinsburg
Ed's Service Center and Sales	MND098279888	919 West Gorton Avenue	Willmar
Farmers Union Oil Company	MND981950249	721 West Litchfield Avenue	Willmar
First Street Standard	MND130737752	104 East Litchfield Avenue	Willmar
Hillcrest Truck Stop	MND083466474	North Highway 71	New London
Holiday Companies	MND985687425	817 Litchfield	Willmar
Honda Willmar	MND056075880	2511 Highway 71 NE	Willmar

Table 4O:
Small Quantity Hazardous Waste Generators *(continued…)*

Facility Name	ID	Address	City
I.S.D. 347 Willmar Senior High	MND985694207	824 SW 7th Street	Willmar
Jeff's Body Shop	MND985702505	130 S.E. 2nd Street	Pennock
Johnson Sales Co.	MND982066243	County Road 9	New London
Kemos Diesel Service	MND982213506	3761 Highway 12 East	Willmar
Kevin's Auto Sales/ Small Engine	MND981532476	South Highway 9	New London
Laib's Gunsmithing	MND982210031	201 North Highway 23	Spicer
Lampert Lumber Building Center	MND120166939	Highway 12 East	Willmar
Leader's Mfg. Inc.	MND985704782	800 19th Avenue SW	Willmar
Loren's Autobody	MND985680388	13051 Highway 12 NE	Atwater
Maracom Corp.	MND097897052	508 Industrial Drive	Willmar
Mason Brothers Save Foods	000010247610	1604 1st Street	Willmar
Minnesota DOT	MND010484178	2505 Transportation Rd	Willmar
Molenaar Inc.	MND985719871	601 West Highway 40	Willmar
MPCA HWTS Consolidated Oil	MN0001175611	401 East Benson Avenue	Willmar
Nelson International	MND023112550	East Highway 12	Willmar
Nelson's Auto Service	MND982065682	City 9 to Riverwood	New London
New Life Communication Printing	MND985702471	905 Highway 71 North	Willmar
Norsten Supply Company	MND023112626	7821 South 1st Street	Willmar
Northern Natural Gas	MND985682145	605 23rd Street SW	Willmar
Peterson Bus Service Inc.	MND040831141	302 South Oak Street	New London
Rambow Inc.	MN0002132215	1000 Rambow Parkway	New London
Raymond News	MND076497486	204 Spicer Avenue	Raymond
Rice Memorial Hospital	MND010337533	301 Becker Avenue SW	Willmar
Roger's Body Shop	MND985747732	1911 60th Avenue NW	Willmar
Roth Chevrolet Inc. Mazda Inc.	MND023111768	1418 1st Street South	Willmar
Spicer 66	MND063623201	Highway 23	Spicer
Spicer Food and Fuel	MN0001864156	Highway 23	Spicer
State Special Waste Facility	MND985702877	1400 22nd Street SW	Willmar
SuperAmerica 4213	MND985761345	415 South 1st Street	Willmar
Timber Wholesalers Inc.	MND0665336988	Route 1	Willmar
Tires Plus	MND982613242	1801 SE 1st Street	Willmar
West Central Printing	MND098279284	101 SW 5th Street	Willmar
Willmar Medical Center	MND010345189	101 Willmar Avenue SW	Willmar
Willmar Regional Treatment Center	MND980277552	1510 Highway 71 NE	Willmar
Willmar Senior High	MN0000329045	2701 30th Street NE	Willmar
Yamaha Sports Center	MND112871041	3501 South First	Willmar

Superfund Sites

The Superfund sites in Minnesota are listed on the Minnesota Permanent List of Priorities (PLP). This list was approved by the MPCA in June 2001. The PLP lists 108 sites where investigation and cleanup are needed, cleanup is underway, or cleanup has been completed and long-term monitoring or maintenance continues. Currently, there are no Superfund sites that have been identified in Kandiyohi County.

References:

Environmental Protection Agency
Minnesota Pollution Control Agency

Implications and Assessments

Special pollution sources in the County that have the potential to affect water resources include: abandoned wells, feedlots, hazardous waste generators, open dumps, storage tanks, failing septic systems (ISTSs) and municipal wastewater treatment facilities.

Abandoned wells that have not been properly sealed can be a source of groundwater contamination, allowing potentially contaminated surface water to reach sensitive aquifers below ground. To address this issue, Kandiyohi County conducted a voluntary abandoned wells inventory from 1993 to 1996. The County has used this inventory to target the sealing of nearly 500 abandoned wells with County cost share money. As of August 2002, the Minnesota Department of Health (MDH) has documented the sealing of 2,214 abandoned wells in the County. The MDH has also documented an additional 117 wells in the County that have been disclosed as not in use. These unused wells could be targeted for sealing through the County's cost share program.

In January of 2002, Kandiyohi County completed its level two feedlot inventory. The inventory revealed 553 active feedlots, distributed throughout all parts of the County. While there have been few documented reports of feedlots contaminating surface water in the County, a number of feedlots are located within vulnerable shoreland areas, or in close proximity to ditches and other surface water areas. Water quality data collected by watershed projects has revealed high levels of fecal coliform bacteria in many of the County's ditches, lakes and streams, which could be possibly attributed to feedlots. Through the County's feedlot program, technical assistance should be provided to feedlot owners to ensure compliance with County and State regulations.

Hazardous waste generators, open dumps and above ground and underground storage tanks are regulated by the Minnesota Pollution Control Agency (MPCA). To date, MPCA has documented 57 hazardous waste generators, 22 open dumps and several hundred storage tanks located throughout Kandiyohi County. When pollution does occur from these sources, it is often localized in the area it affects. The County should continue to work with the MPCA in investigating and remediating pollution from these sources.

Failing individual sewage treatment systems (ISTSs) present a significant problem for water quality in the County, especially for lakes. Kandiyohi County Environmental Services has estimated that 42 percent of ISTSs in the County are failing to properly treat sewage. Kandiyohi County currently regulates sewage treatment systems through its ISTS and shoreland ordinances. Through land use controls, approximately 200 ISTSs are installed/upgraded per year. To complement this effort, the County should continue to provide educational and technical assistance to the public on proper ISTS installation, treatment, disposal and maintenance.

Finally, the discharge of effluent from wastewater treatment facilities has been included as potentially affecting water quality within the County. When properly treated to State and Federal standards, the effluent from wastewater treatment facilities has a minimal impact on the quality of County's water resources. However, problems arise when these facilities are forced to release minimally treated sewage, due to lack of capacity. This can occur in communities that have inflow & infiltration (I&I) problems or have their sewage and storm sewer combined. While these flaws may not pose a problem a majority of the year, during large storm events and the spring snowmelt, the capacity of these systems can be reduced to the point where it becomes necessary to bypass wastewater to prevent sewage from backing up into homes. Such bypasses can have a significant impact on the quality of water resources in the County. According to the MPCA, the cities of Prinsburg and Willmar are in need of wastewater treatment facility upgrades to become or remain in compliance with State and Federal discharge requirements. In addition, the unsewered communities of Blomkest, Hawick, Regal, Roseland and Svea have been identified by MPCA as in need of installing a centralized sanitary sewer system. Over the next ten years, Kandiyohi County should assist each of these communities in seeking options to install or upgrade their existing systems, thus avoiding further degradation of water resources.

Known Geologic Conditions
(Data Item 38)

In the northeastern part of Kandiyohi County, specifically Burbank, Colfax and Roseville townships, there is a large surficial outwash aquifer. This aquifer is part of the Brooten-Belgrade Sand Plain or the Bonanza Valley Area. This surficial outwash aquifer is made up of gravel or sand deposits located at or near land surfaces and is generally unconfined. The upper limit of the aquifer is the water table and its base is glacial till. The water table in most parts of the area is within 20 feet of the land surface, especially in the Regal-Osakis soils associations. In this area of the County, contamination of groundwater is a significant threat. Because the water table is near the surface and soils are highly permeable, contamination could easily occur.

Reference:

United States Geological Survey

Implications and Assessments

The sand plain area of northern Kandiyohi County is geologically sensitive to groundwater pollution from land use, such as agriculture. As a result of groundwater recharge being rapid and indiscriminate, this area can be quite susceptible to contaminants, such as nitrate and pesticides. In the spring of 2000, the Minnesota Department of Agriculture (MDA) began a 20-year study in this area to evaluate the impact of the normal use of agricultural chemicals (nitrate and pesticides) on groundwater quality. Kandiyohi County should assist and support the MDA in conducting this study. The County should also provide landowners in this region with educational assistance on the proper application and disposal of chemicals and fertilizers. In addition, homeowners should be encouraged to annually test their wells for contaminants.

To better understand the geological characteristics of the area, Kandiyohi County should work together with the DNR and McLeod, Meeker and Renville counties to conduct a Regional Hydrogeologic Atlas. Once completed, the atlas could be utilized as a tool for land use planning decisions and to assist public water suppliers in the development of wellhead protection plans.

National Wetlands Inventory Maps
(Data Item 39)

There are three major sources of wetland inventory maps for Kandiyohi County, including the U.S. Fish and Wildlife Service (USFWS), Natural Resource Conservation Service (NRCS) and Minnesota Department of Natural Resources (DNR). The USFWS has identified wetlands through its National Wetlands Inventory. Wetlands located within cropland have been inventoried by the NRCS. Finally, the Minnesota DNR has identified wetlands as part of the Protected Waters Inventory. The following definitions of wetland types are derived from the USFWS National Wetlands Inventory.

- **Type 1: Seasonally Flooded Basins or Flats.** Soil is covered with water or is waterlogged during variable seasonal periods, but usually is well drained during much of the growing season. Vegetation varies greatly according to season and duration of flooding.

- **Type 2: Inland Fresh Meadows.** Soil is usually without standing water during most of the growing season, but is waterlogged within at least a few inches of the surface. Vegetation includes grasses, sedges, rushes and various broad-leaf plants. Meadow may fill shallow basins, sloughs, or farmland sags, or these meadows may border shallow marshes on the landward side.

- **Type 3: Inland Shallow Fresh Marshes.** Soil is usually waterlogged early during growing season; often covered with as much as six inches or more of water. Vegetation includes grasses, bullrushes, spike rushes and various other plants such as cattails, arrowheads and smartweed. These marshes may nearly fill shallow lake basins or sloughs, or may border deep marshes on the landward side.

- **Type 4: Inland Deep Fresh Marshes.** Soil is usually covered with six inches to three feet or more of water during the growing season. Vegetation includes cattails, reeds, bullrushes, etc. Deep marshes may completely fill shallow lake basins, potholes, limestone sinks and sloughs, or may border open water in such depressions.

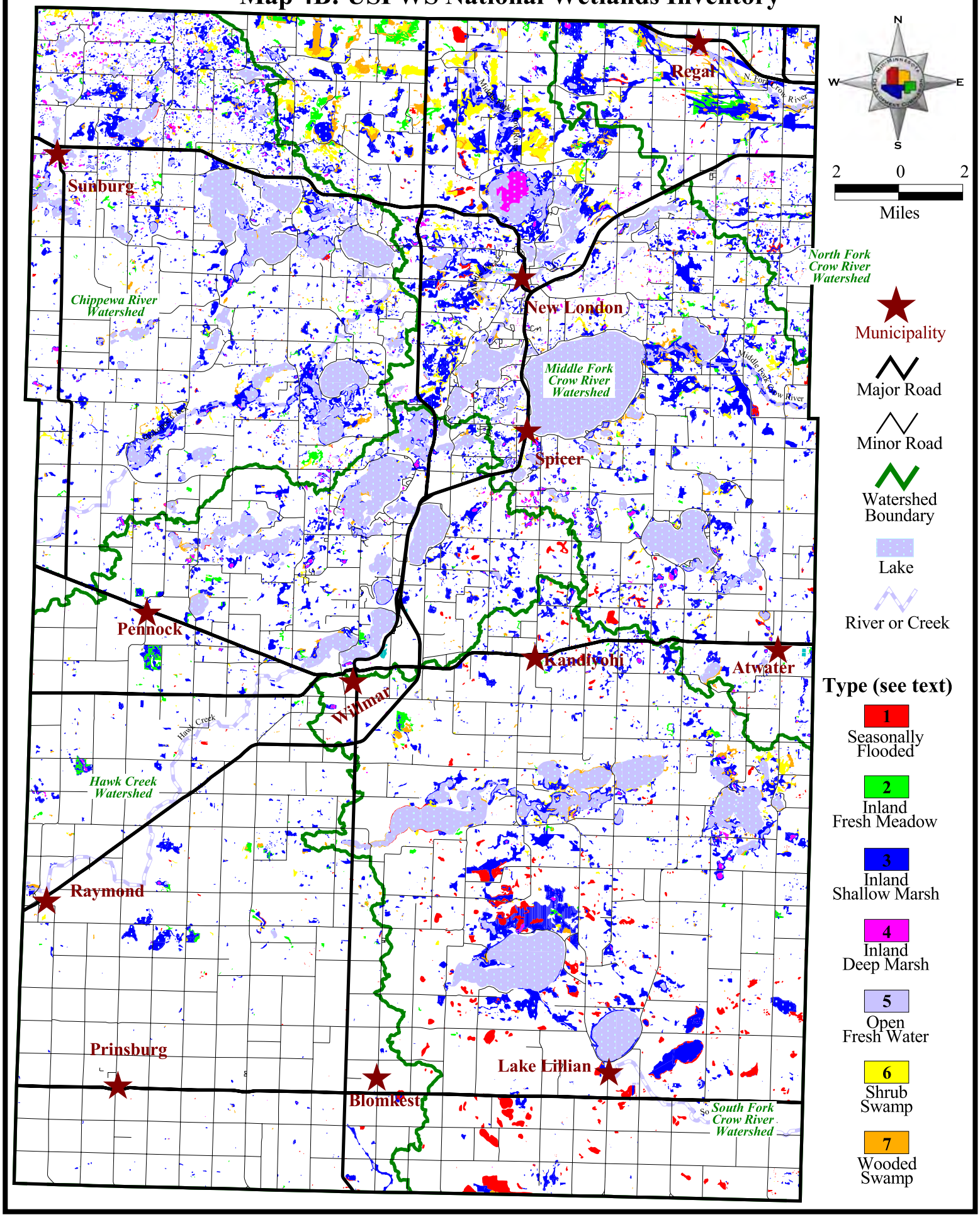
- **Type 5: Inland Open Fresh Water.** Shallow ponds and reservoirs are included in this type. Water is usually less than ten feet deep and fringed by a border of emergent vegetation similar to open areas of Type 4.

- **Type 6: Shrub Swamps.** Soil is usually waterlogged during the growing season and is often covered with as much as six inches of water. Vegetation usually includes alders, willows, dogwood, etc. Swamps occur mostly along sluggish streams and occasionally on floodplains.

- **Type 7: Wooded Swamps.** Soil is waterlogged within a few inches of the surface during the growing season and is often covered with as much as one foot of water.

- **Type 8: Bogs.** Soil is usually waterlogged and supports a spongy covering of moss. Vegetation is woody, herbaceous or both.

Map 4B: USFWS National Wetlands Inventory



Wetlands provide many benefits to humans including the reduction of flooding by means of storage during high flows, filtration of pollutants and sediment, groundwater and aquifer recharge, wildlife habitat and aesthetic appeal. Much of the drainage of wetlands within the County occurred prior to the 1980s, when policies were enacted to prevent future wetland loss. The Minnesota Wetland Conservation Act (WCA), DNR Protected Waters, U.S. Army Corps of Engineers regulations and Swampbuster provisions of the USDA Farm Program, are examples of such policies. Wetland policies are discussed in greater detail in Data Items 7 and 41.

Map 4B displays the USFWS National Wetlands Inventory for Kandiyohi County. A majority of the remaining wetlands are located in the northern half of the County. The Chippewa River, Middle Fork of the Crow River and the North Fork of the Crow River watersheds have an abundance of wetlands. On the contrary, many of the wetlands located within the Hawk Creek and South Fork of the Crow River watersheds have been drained for agricultural purposes.

References:

Kandiyohi County Soil and Water Conservation District
Minnesota Department of Natural Resources
Natural Resource Conservation Service
United States Fish and Wildlife Service

Plans for Wetlands with Controlled Outlets
(Data Item 40)

Most restored wetlands in Kandiyohi County have structures of varying degrees of complexity to control water elevations within the given basin. Restored wetland water levels are commonly controlled via fixed risers, emergency spillways and dikes. The elevation of the riser is then set at the pool elevation desired for the wetland. This gives excess water a means of escape without washing out the dike or impacting adjacent landowners. All tiles within the restored basin are broken. This practice is done by removing approximately 100 feet of tile, and compacting the trench. Special care is taken to maintain drainage service to upstream landowners not involved in the restoration project. This is achieved by re-routing tile to maintain upstream service.

In rare situations, it is desired to design water control structures that can be manipulated to bring pool levels up or down as desired. This can be achieved by incorporating a "stop-log" bay as part of the control. In such a structure, planks or "logs" can be removed or added as desired to increase or decrease pool depth. Such manipulations are a means of controlling aquatic vegetation in a given basin, which is necessary to provide optimum wildlife habitat conditions. The stop-logs can be included in a variety of structure types: full-round riser, half-round riser, earthen, metal or wood dams may have stop-log bays.

Kandiyohi County has seen many wetlands restored in the past few years due to favorable State and Federal conservation programs such as RIM, WRP and CREP. These wetlands act as sediment traps and nutrient sponges. This is especially important in an area where there are lakes or streams that are the recipients of large quantities of runoff waters. When dense stands of aquatic vegetation exist in a wetland, current is slowed, causing suspended sediments to settle out. The lush vegetation, such as cattails, can utilize and/or tie up huge quantities of nutrients, thereby cleansing the water.

Because of the common occurrence of hydric soils and extensive drainage, Kandiyohi County has a large number of potentially restorable wetlands. Natural resource agencies should continue to pursue restorations to aid in relieving farmers, landowners and the County of poorly functioning drainage systems and marginal agricultural land prone to flooding.

Grass Lake Prairie Wetland Restoration Project

The Grass Lake Prairie Wetland Restoration Project is a collaborative effort by the Kandiyohi SWCD, NRCS, BWSR, USFWS, DNR, Ducks Unlimited, Pheasants Forever, MN Waterfowl Association, MN Deer Hunters Association, Kandiyohi County and the Izaak Walton League. The project aims to provide benefits such as improved water quality, wildlife habitat, flood attenuation, recreational opportunities and aesthetics. Conservation easements have been secured on the entire 1,200-acre Grass Lake basin. To date nearly 450 acres of the basin has been restored. Restoration work will likely be completed in the fall of 2002, but could last into the early part of 2003. Water levels within the restored basin will be controlled by multiple control structures.

References: Kandiyohi County Soil and Water Conservation District, Minnesota Department of Natural Resources, Division of Wildlife, Willmar Area Office

U.S. Army Corps of Engineers, Section 404, Wetland Conservation Act and Swampbuster *(Data Item 41)*

U.S. Army Corps of Engineers, Section 404

The U.S. Army Corps of Engineers has been regulating activities in the nation's waters since 1890. Laws and court decisions to consider the full public interest in both protection and utilization of water resources have broadened this regulatory program. These regulatory activities and responsibilities are based on Section 10 of the Rivers and Harbors Act of 1899 [33 U.S.C. 403], which prohibits obstruction or alteration of navigable waters of the United States without a permit from the Corp of Engineers.

Section 404 of the Clean Water Act [33 U.S.C. 1344] prohibits discharge of dredged or fill material into waters of the United States without a permit from the Corps of Engineers. Waters of the United States include adjacent wetlands and tributaries to navigable waters of the United States and other waters where the degradation or destruction of which could affect interstate or foreign commerce. If a project involves discharge of dredged or filled material, the Corps will evaluate the proposed activity under the Section 404 guidelines prepared by the Environmental Protection Agency (EPA). These guidelines restrict discharge into aquatic areas where less environmentally damaging practical alternatives exist.

The Corps of Engineers and the EPA define wetlands as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas, under these rules.

Activities in wetlands that normally require permits include, but are not limited to:

- Placement of fill material.
- Ditching activities when excavated materials is sidecast.
- Levee and dike construction.
- Land clearing involving relocation of soil material.
- Land leveling.
- Most road construction.
- Dam construction.

The Corp of Engineers must consider other Federal laws during permit review. These other laws include:

- National Environmental Policy Act
- Fish and Wildlife Coordination Act
- Endangered Species Act
- National Historic Preservation Act
- Federal Power Act

- Wild and Scenic Rivers Act
- National Fishing Enhancement Act of 1984

The Corps of Engineers uses four different types of review processes depending upon the nature of the work to be done:

Letter of Permission. This is used for minor non-controversial projects in navigable waters of the United States, and concerns docks and small dredging projects.

Nation Wide General Permit. This permit is a blanket authorization for activities that will have minimal environmental effects such as navigational aids, fill for minor road crossings, certain outfall structures, discharges into certain waters, bank stabilization and fill for utility lines.

Regional General Permit. This permit authorizes certain projects in Minnesota where a DNR permit is usually required, and includes projects including larger bank stabilization projects, bridge and culvert replacements, sand blankets, dredging and rough fish barriers.

Full Public Interest Review. This is required for large projects such as new marinas or harbors in navigable waterways, large dredging projects, highway projects through wetlands or waters, fill in wetlands to convert them to upland and large drainage projects.

Wetlands Conservation Act

In 1991 the Minnesota Legislature passed Chapter 354, the Wetlands Conservation Act (WCA), which created a statewide "no-net loss" policy for wetlands. The law requires anyone proposing to drain or fill a wetland first to try to avoid disturbing the wetland; second, to try to minimize any impact on the wetland; and, finally, to replace any lost wetland acres, functions and values. Certain wetland activities are exempt from the Act, allowing projects with minimal impact or projects located on land where certain pre-established land uses are present to proceed without regulation. The Kandiyohi County Environmental Services Office and the Kandiyohi County Soil and Water Conservation District implement the Act locally. The Minnesota Board of Water and Soil Resources (BWSR) administers the Act statewide, and the Department of Natural Resources (DNR) enforces it.

The WCA recognizes a number of wetland benefits deemed important, including:

- Water quality, including filtering pollutants out of surface water and groundwater, using nutrients that would otherwise pollute public waters, trapping sediments, protecting shoreline and recharging groundwater supplies;
- Floodwater and stormwater retention, including reducing the potential for flooding in the watershed;
- Public recreation and education, including hunting and fishing areas, wildlife viewing areas and nature areas;

- Commercial benefits, including wild rice and cranberry growing areas and aquaculture areas;
- Fish and wildlife benefits; and
- Low-flow augmentation during times of drought.

Since its adoption more than a decade ago, the WCA has been revised and amended numerous times. In 2000, the legislature passed Chapter 382 (Senate File 83), which amended parts of Minnesota Statutes 1998, Section 103G in order to consolidate State wetland laws. The law was changed to maintain wetland protection to current standards, to better coordinate with Federal wetland programs and to simplify and make wetland regulation consistent for landowners. Specific details of the bill included the refinement of the Protected Waters Inventory, established a consistent statewide definition of wetland, gave state conservation officers enforcement flexibility in pursuing Wetland Conservation Act and DNR violations, standardized wetland replacement/mitigation standards among state wetland agencies, and added an appeals process for landowners to challenge a wetland boundary or type determination.

Swampbuster

The Wetland Conservation provision (Swampbuster) of the 1985 Natural Food Security Act and its subsequent amendment grants the Natural Resources Conservation Service (NRCS) the primary authority over wetlands related to agricultural lands. Swampbuster requires all agricultural producers to protect the wetlands on the farms they own or operate if they want to be eligible for USDA farm program benefits. Producers will not be eligible if they plant an agricultural commodity on a converted wetland that was converted by drainage, leveling, or any other means after December 23, 1985, or convert a wetland for the purpose of or to make agricultural commodity production possible after November 28, 1990.

The NRCS categorizes wetlands according to Swampbuster exemptions. There are four categories of wetlands subject to Swampbuster restrictions and three categories of wetlands with Swampbuster exemptions. Each wetland classification includes its own unique set of regulatory requirements. The following is a list of the different NRCS wetland categories and a brief definition of each.

Regulated Wetland Categories

Wetlands (W) - Areas meeting wetland criteria under natural conditions that have typically not been manipulated by altering hydrology and/or removing woody vegetation.

Farmed Wetlands (FW) - Wetlands that were drained, dredged, filled, leveled, or otherwise manipulated before December 23, 1985, for the purpose of making the production of an agricultural commodity possible, and continue to meet specific wetland criteria. Under this category drainage may be maintained but not improved.

Farmed Wetland Pasture or Hayland (FWP) - Wetlands manipulated and used for pasture or hayland, including native pasture and hayland, prior to December 23, 1985 that still meet specific wetland hydrology criteria and are not abandoned; or were in agricultural use and met FWP criteria on December 23, 1985.

Converted Wetland (CW) - Wetlands drained, dredged, filled, leveled, or otherwise manipulated for the purpose of, or to have the effect of, making possible the production of an agricultural commodity. These lands must have been W, FW, or FWP and not highly erodible prior to the conversion. They may have been converted by any activity, including the removal of woody vegetation, that impaired or reduced the flow, circulation, or reach of water; provided the conversion activity was such that agricultural production on the land would not have been possible without its application.

Exempted Wetland Categories

Prior Converted Cropland (PC) - Converted wetlands where the conversion occurred prior to December 23, 1985; an agricultural commodity had been produced at least once before December 23, 1985; and as of December 23, 1985, the converted wetland met certain specific hydrologic criteria and did not support woody vegetation.

Artificial and Irrigation-Induced Wetland (AW) - Wetlands in an area that was formerly non-wetland, but now meets wetland criteria due to human activities. This definition includes wetlands created by an irrigation system on an area that was formerly non-wetland.

Non-Wetland (NW) - Land that under natural conditions does not meet wetland criteria. This definition includes wetlands which were converted to the extent that wetland criteria was not present prior to December 23, 1985 but were not cropped.

References:

Kandiyohi County Soil and Water Conservation District
Natural Resources Conservation Service
Minnesota Department of Natural Resources, Division of Waters
United States Army Corps of Engineers

Implications and Assessment

Wetlands in Kandiyohi County serve many important functions, including flood attenuation, wildlife habitat, improved water quality, recreational opportunities and aesthetics. A majority of the existing wetlands are found in the northern half of the County, particularly in the Chippewa River, Middle Fork of the Crow River and the North Fork of the Crow River watersheds. Most of the wetlands in the Hawk Creek and South Fork of the Crow River watersheds have been drained in the past for the purpose of agricultural production. Much of the wetland draining in this area occurred in the 1960s and early 1970s, when the Federal government's farm policies compensated agricultural producers up to 90 cents on the dollar to install artificial drainage

systems. As result of these Federal government payments and policies, an extensive artificial drainage system was installed in the southern half of Kandiyohi County.

Today, due in part to regulations such as the Minnesota Wetland Conservation Act (WCA), State Protected Waters Inventory, Swampbuster and Section 404 of the Clean Water Act, very few, if any wetlands are being lost through drainage. In fact, conservation programs, such as the Wetland Reserve Program and Reinvest in Minnesota Program, actually provide landowners an opportunity to restore previously drained wetlands and preserve existing wetlands. These programs and others like them should continue to be promoted to landowners within the County.

To further wetland preservation efforts, Kandiyohi County should work with the Minnesota Department of Natural Resources (DNR) to explore options to inventory existing wetlands in the County. Current wetland inventories are not comprehensive enough for preservation purposes. The County should also continue to designate wetlands in shoreland and floodplain areas as high priority areas for preservation and administration of WCA.

Floodplains and Flood Prone Areas
(Data Items 42 & 43)

Historically, development occurs in floodplains adjacent to waterways and lakes. In order to protect property and structures within the floodplain, Federal and State governments require floodplain regulations to be adopted by counties and municipalities when areas of anticipated flooding have been identified. Areas of land regulated are based on the 100-year frequency flood, and these areas are designated as floodplain. The Minnesota Department of Natural Resources (DNR) and the Federal Insurance Administration, under the Federal Emergency Management Agency (FEMA), are responsible for defining areas of flood hazard and notifying local government of regulatory need.

Structural flood control projects of the past, such as dikes, levees, reservoirs, or diversion channels, which kept flood waters away from developed property, are generally expensive and do not insure protection against flood damage to life and property. Current Federal and State regulations address comprehensive floodplain management to encourage wise land use as well as needed structural projects. Regulatory, nonstructural methods of flood control include floodplain zoning, flood insurance, building permits, flood proofing, flood warning systems and disaster planning.

The State of Minnesota, through the Floodplain Management Act, requires local governments to adopt a floodplain ordinance compliant with minimum State and Federal standards. This ordinance stresses the reduction of flood damages through nonstructural controls, such as wise land use, in addition to structural controls, and encourages a community floodplain management program with preventive actions to reduce flood risk. The DNR administers and enforces the Floodplain Management Act, serves as the coordinating agency for the National Flood Insurance Program, and oversees local enforcement of county or municipal floodplain ordinance. Local enforcement is generally through the county or municipal zoning official and the regional DNR hydrologist. Land use and building permits are strictly regulated within the floodplain, local governments have the authority to issue conditional use permits after a special administrative review. Kandiyohi County adopted their current Floodplain Ordinance on October 9, 1990. The County has also entered into the National Flood Insurance Program, offered through FEMA.

Map 4C identifies the 100-year floodplain for Kandiyohi County. The only municipality within the County that is occasionally affected by flooding is the City of Raymond, located on the bank of Hawk Creek. Like the County, Raymond has adopted their own Floodplain Ordinance and participates in the National Flood Insurance Program. To view a detailed County floodplain map, contact the Kandiyohi County Environmental Services office.

References:

Kandiyohi County Emergency Management
Federal Emergency Management Agency
Minnesota Department of Natural Resources

What Exactly is a 100-Year Flood?

The phrase "100-year flood" still seems to cause confusion among the public, lenders and insurers. Many continue to believe it is a description of a flood that occurs only once every 100 years. In fact, "100-year flood" is an abbreviated way of describing the magnitude of a rainfall and subsequent flood event that has a 1 percent chance of occurring. It is important to note that the same statistical chances apply for any storm at any time in each year.

Floods are classified according to their frequency and depth. For instance, there are 10-year, 25-year, 50-year, 100-year and 500-year floods. A 100-year flood occurs less frequently than a 10-year flood, but because it has larger volume and greater depth of water, is far more destructive and damaging, and is a more serious threat to human safety. The National Flood Insurance Program adopted as a national standard a "100-year floodplain" to describe Special Flood Hazard Areas (SFHAs) that are depicted on the Flood Insurance Rate Maps (FIRMS) as Zone A. Due to the confusion it created, use of the term "100-year floodplain" has been replaced with the newer designation of "base flood". Base Flood Elevation (BFE) requirements are listed on FIRMS and are used on Elevation Certificates to indicate the expected depth of water should a flood occur. New buildings constructed in SFHAs are required to have their lowest floors at or above the BFE listed for that location on the current FIRM. Table 4P shows the statistical chances of flooding a building located in one of these higher risk areas over different periods of time.

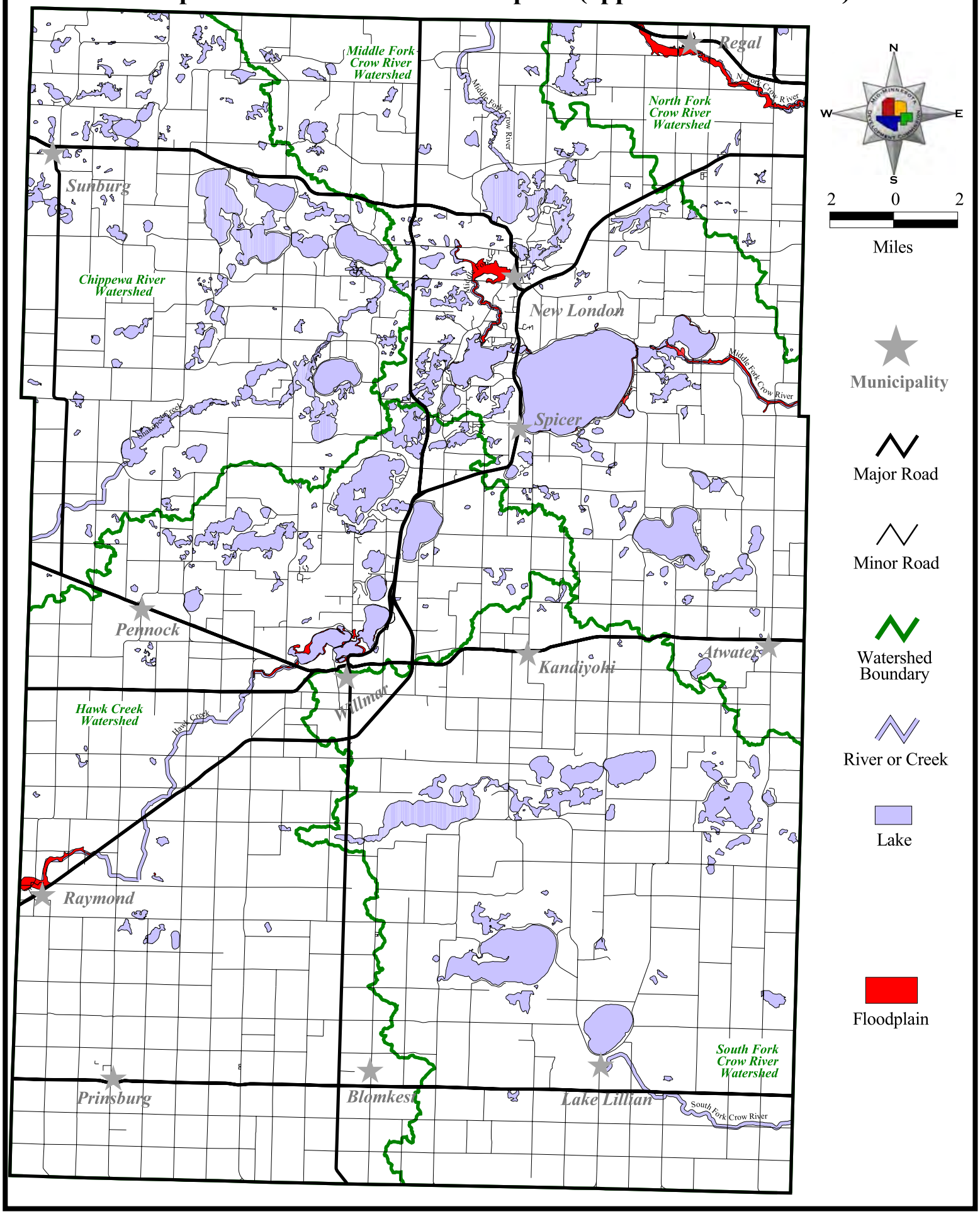
Buildings located in 100-year flood areas are required to have flood insurance as a condition of receiving a federally backed mortgage loan or home equity loan. Given that many mortgages have repayment period of 30 years, buildings in areas subject to a 100-year flood have a 26 percent chance of experiencing that flood during the life of the loan. However, during that same period, there is only a 4 percent chance of a fire. In summary, if the last 100-year flood happened three years ago, don't think the next one will occur in another 97 years: statistically it could happen again in any given year.

Table 4P: Chances of Being Flooded

Period of Time	Flood Level			
	10-yr flood	25-yr flood	50-yr flood	100-yr flood
1 year	10%	4%	2%	1%
10 years	65%	34%	18%	10%
20 years	88%	56%	33%	18%
30 years	96%	71%	45%	26%
50 years	99%	87%	64%	39%

Source: Information excerpted from Watermark, Fall/Winter 1998 - a FEMA/National Flood Insurance Program newsletter.

Map 4C: FEMA 100-Year Floodplain (approximate locations)



Flood Damages
(Data Item 44)

Annual flooding causes various degrees of damage in Kandiyohi County. Damage often occurs to wetlands, wildlife habitat, floodplain woodlands and natural areas. Damage may also occur to structures, croplands and other land improvements made within the floodplains of the County. According to the Minnesota Natural Resource Inventory, a total of 4,400 acres in Kandiyohi County is classified as flood-prone. Approximately 3,200 acres is classified as flood-prone Minor Land Use and Cover. The Minor Land Uses and Cover classification also encompasses natural areas. The remaining 1,200 acres is classified as flood-prone cropland.

Under normal circumstances, the County or State does not record flood damage and associated monetary costs. However, if a flood related Presidential Disaster were to be declared, local and state emergency services would be responsible for reporting flood damage.

References:

Kandiyohi County Emergency Management Office
Natural Resource Conservation Service

Implications and Assessment

Kandiyohi County and the City of Raymond have adopted floodplain ordinances that are up to date and compliant with the State's Floodplain Management Act. While both of these local units of government are believed to be adequately enforcing the provisions of their ordinance, concern has been raised that existing floodplain maps are not entirely accurate to protect floodplain areas. Kandiyohi County should work with the Federal Emergency Management Agency (FEMA) and the Minnesota Department of Natural Resources (DNR) to update the existing County floodplain maps. The DNR should be encouraged to develop a Statewide Digital Elevation Model (DEM), which could be used as a tool to accomplish this task. The County should also encourage the DNR and other agencies and groups to purchase and remove flood prone agricultural land from production.

Approved Municipal Shoreland Ordinances
(Data Item 45)

The Minnesota Shoreland Management Act was initially implemented in 1969 to reduce the effect of uncontrolled and unplanned development on public waters, to maintain the economic value of shoreland property and to preserve the intrinsic qualities of natural shoreland and waters. As a result of this Act, Minnesota counties and specified municipalities were required to regulate land use and compatible development on public water shoreland through State approved shoreland zoning ordinances. In addition to the Shoreland Management Act, the State of Minnesota also regulates shoreland use through the 1969 Floodplain Management Act and the 1973 Minnesota Wild and Scenic Rivers Act.

1n 1989, the Minnesota Department of Natural Resources (DNR) adopted revised statewide shoreland regulations. The revision required all units of government that were implementing shoreland controls to amend their shoreland ordinances with two years to conform with the State's revised regulations.

Local units of government that have a DNR approved shoreland ordinance include Kandiyohi County and the cities of New London, Spicer and Willmar. All of these ordinances are believed to be in compliance with the Minnesota Shoreland Management Act.

References:

Kandiyohi County Planning and Zoning Office
Minnesota Department of Natural Resources, Division of Waters

Protected Waters and Shoreland Classification
(Data Item 46)

The Minnesota Department of Natural Resources (DNR) has developed a shoreland classification system for Protected Waters, including lakes and rivers in the State. The classification system is based upon development classes. Development classes for both lakes and rivers are provided below:

Lakes

- **Natural Environment Lakes** usually have less than 150 total acres, less than 60 acres per mile of shoreline and less than 3 dwellings per mile of shoreline. They may have some winterkill of fish; may have shallow, swampy shoreline; and are less than 15 feet deep.
- **Recreational Development Lakes** usually have between 60 and 225 acres of water per mile of shoreline, between 3 and 25 dwellings per mile of shoreline, and are more than 15 feet deep.
- **General Development Lakes** usually have more than 225 acres of water per mile of shoreline and 25 dwellings per mile of shoreline, and are more than 15 feet deep.

Rivers

- **Remote Rivers** are primarily in roadless, forested, sparsely populated areas in Northeast Minnesota.
- **Forested Rivers** are in forested, sparsely to moderately populated areas with some roads in northeast, southwest, and north-central Minnesota.
- **Transition Rivers** are a mixture of cultivated, pasture and forested lands.
- **Agriculture Rivers** are in intensively cultivated areas, mainly southern and western areas of the State.
- **Urban Rivers** are in high-density residential, commercial and industrial development areas.
- **Tributary Rivers** are all other rivers in the Protected (Public) Waters Inventory not classified above.

Table 4Q lists the Statewide shoreline minimum standards for each lake and river development class. Separate standards are in place for lakes that are sewered and unsewered.

Table 4Q:
Statewide Shoreline Minimum Standards

Sewered Lakes						
Lake Class	**Lakeshore**				**Non-Lakeshore**	
	Lot Width (ft)	**Lot Area (ft^2)**	**Structure Setback (ft)**	**Impact Zone (ft)**	**Lot Width (ft)**	**Lot Area (ft^2)**
Natural Environment	125	40,000	150	75	125	20,000
Recreational Development	75	20,000	75	37.5	75	15,000
General Development	75	15,000	50	25	75	10,000

Unsewered Lakes						
Lake Class	**Lakeshore**				**Non-Lakeshore**	
	Lot Width (ft)	**Lot Area (ft^2)**	**Struc./ Sewer Setback (ft)**	**Impact Zone (ft)**	**Lot Width (ft)**	**Lot Area (ft^2)**
Natural Environment	200	80,000	150/150	75	200	80,000
Recreational Development	150	40,000	100/75	50	150	40,000
General Development	100	20,000	75/50	37.5	150	40,000

Rivers				
River Class	**River Shoreland**			
	Lot Width (ft)	**Structure Setback (ft)**	**Impact Zone (ft)**	**Sewage Setback (ft)**
Remote	300	200	100	150
Forested	200	150	75	100
Transition	250	150	75	100
Agricultural	150	50/100*	25/50*	75
Urban & Tributary	75/100*	50/100*	25/50*	75

** Sewered/ Unsewered*

Note: *Setbacks and the Shore Impact Zone are measured from the Ordinary High Water Level*

Table 4R lists the 51 lakes in Kandiyohi County that have been given a DNR designated shoreland classification. Twenty-eight lakes are classified as Natural Environment, 12 are classified as Recreational Development and 11 are classified as General Development. A complete listing of Kandiyohi County's Protected Waters that have been assigned a DNR Shoreland classifications can be found in Appendix B.

Table 4R:
Lake Shoreland Classifications

Lake Name	Shoreland Classification	Lake Name	Shoreland Classification
Andrew (34-0206)	General Development	Long (34-0066)	Recreational Development
Big Kandiyohi (34-0086)	General Development	Long (34-0192)	Recreational Development
Blaamyhre (34-0345)	Natural Environment	Mud (34-0158)	Natural Environment
Calhoun (34-0062)	Recreational Development	Nest (34-0154)	General Development
Carrie (34-0032)	Recreational Development	Norway (34-0251)	Recreational Development
Cedar Island (34-0153)	Natural Environment	Pay (34-0023)	Natural Environment
Crook (34-0218)	Natural Environment	Reed WMA (34-0262)	Natural Environment
Diamond (34-0044)	General Development	Ringo (34-0172)	Recreational Development
Eagle (34-0171)	General Development	Saint Johns (34-0283)	Recreational Development
East Sunburg (34-0336)	Natural Environment	Skataas (34-0196)	Recreational Development
East Twin (34-0115)	Natural Environment	Sperry (34-0040)	Natural Environment
Elizabeth (34-0022)	Recreational Development	Summit (34-0027)	Natural Environment
Elkhorn (34-0119)	Recreational Development	Sunburg (34-0359)	Natural Environment
Florida (34-0217)	General Development	Swan (34-0223)	Natural Environment
Foot (34-0181)	General Development	Swan (34-0285)	Natural Environment
Games (34-0224)	Recreational Development	Swenson (34-0321)	Recreational Development
George (34-0142)	General Development	Unnamed (34-0161)	Natural Environment
Gina (34-0126)	Natural Environment	Unnamed (34-0307)	Natural Environment
Glesne (34-0352)	Natural Environment	Unnamed (34-0353)	Natural Environment
Green (34-0079)	General Development	Unnamed (34-0089)	Natural Environment
Henchien (34-0207)	Natural Environment	Wagonga (34-0169)	Natural Environment
Henderson (34-0116)	General Development	West Lindgren (34-0297)	Natural Environment
Henjum (34-0316)	Natural Environment	West Twin (34-0117)	Natural Environment
Jesse (34-0060)	Natural Environment	Willmar (34-0180)	General Development
Knutsons (34-0306)	Natural Environment	Woodcock (34-0141)	Natural Environment
Little Kandiyohi (34-0096)	Natural Environment		

Reference: Minnesota Department of Natural Resources, Division of Waters

Implications and Assessment

Kandiyohi County, as well as the cities of New London, Spicer and Willmar, have adopted Shoreland Ordinances that are up to date and meet the State's minimum shoreland standards. While each of these local units of government are believed to be adequately enforcing the provisions of their ordinance, simply adhering to the State's minimum shoreland standards is not enough to promote consistent and sustainable development. The County, as well as each of the communities listed above, should work with the Minnesota Department of Natural Resources (DNR) to revise their shoreland ordinance to provide greater protection of water resources from development.

Water-Based Recreational Lands
(Data Item 47)

Map 4D displays the water based recreational lands in Kandiyohi County. Water-based recreation in the County consists of one State Park and seven County Parks, as well as two municipal swimming beaches. A brief description of each park is provided below. Information concerning Kandiyohi County Parks is derived from the *Kandiyohi County Comprehensive Plan.*

Sibley State Park

Sibley State Park is located in the northern portion of Kandiyohi County. The park is located 4 miles west of New London and 15 miles north of Willmar. The main entrance is on U.S. Highway 71. Sibley State Park is named after Henry Hastings Sibley, Minnesota's first governor, who used the surrounding woods as his hunting grounds. This land was purchased by the State in 1919, assuring that it would be protected as a park. In 1934, Sibley State Park was established and is now approximately 2,500 acres in size.

One of the main attractions of Sibley State Park is Lake Andrew. The Park provides a boat access, excellent fishing, hiking and swimming beach, along with numerous other water-related activities. Sibley has a capacity of 138 family campsites

County Parks

County Park 1 – (1957), is located on the west side of Big Kandiyohi Lake. The Lake has good northern, walleye, bullhead and crappie populations. In the spring of the year, the park is known for its excellent crappie fishing in the bay next to the park. The park is located approximately ten miles south of the City of Willmar and has 90 campsites with electricity.

County Park 2 - (1957) is located on the east side of Big Kandiyohi Lake approximately five miles north of the City of Lake Lillian. The park has an excellent sandy swimming beach and access to shoreline fishing. The park also has 90 campsites with electricity.

County Park 3 - (1929) is located on the western shore of Diamond Lake, approximately four miles north of the City of Atwater or six miles southeast of the City of Spicer. Diamond Lake is known for its good walleye and northern populations. The park has 70 paved campsites, most with electricity.

County Park 4 - (1956) is located on the southern shore of Green Lake in the City of Spicer. The park has an excellent swimming beach and a shady picnic area. There are also changing rooms and toilet facilities, but no campsites are available. The park attracts many daytime users due to its close proximity to the many amenities that Spicer offers.

County Park 5 - (1927) is located on the northeastern shore of Green Lake, approximately five miles from the City of Spicer. The park has 45 paved camping sites with electricity.

County Park 7 - (1968) is located on the east shore of Games Lake, approximately nine miles west of the City of New London. Games Lake is part of the "Norway Chain of Lakes", which are four lakes totaling 2,800 acres. They are also well known for excellent fishing. The park has 60 campsites, 45 of which are paved and most are served with electricity (note: there is no County Park 6).

Municipal Swimming Areas

Kandiyohi County has two municipal swimming areas, one in the City of Willmar and one in the City of New London.

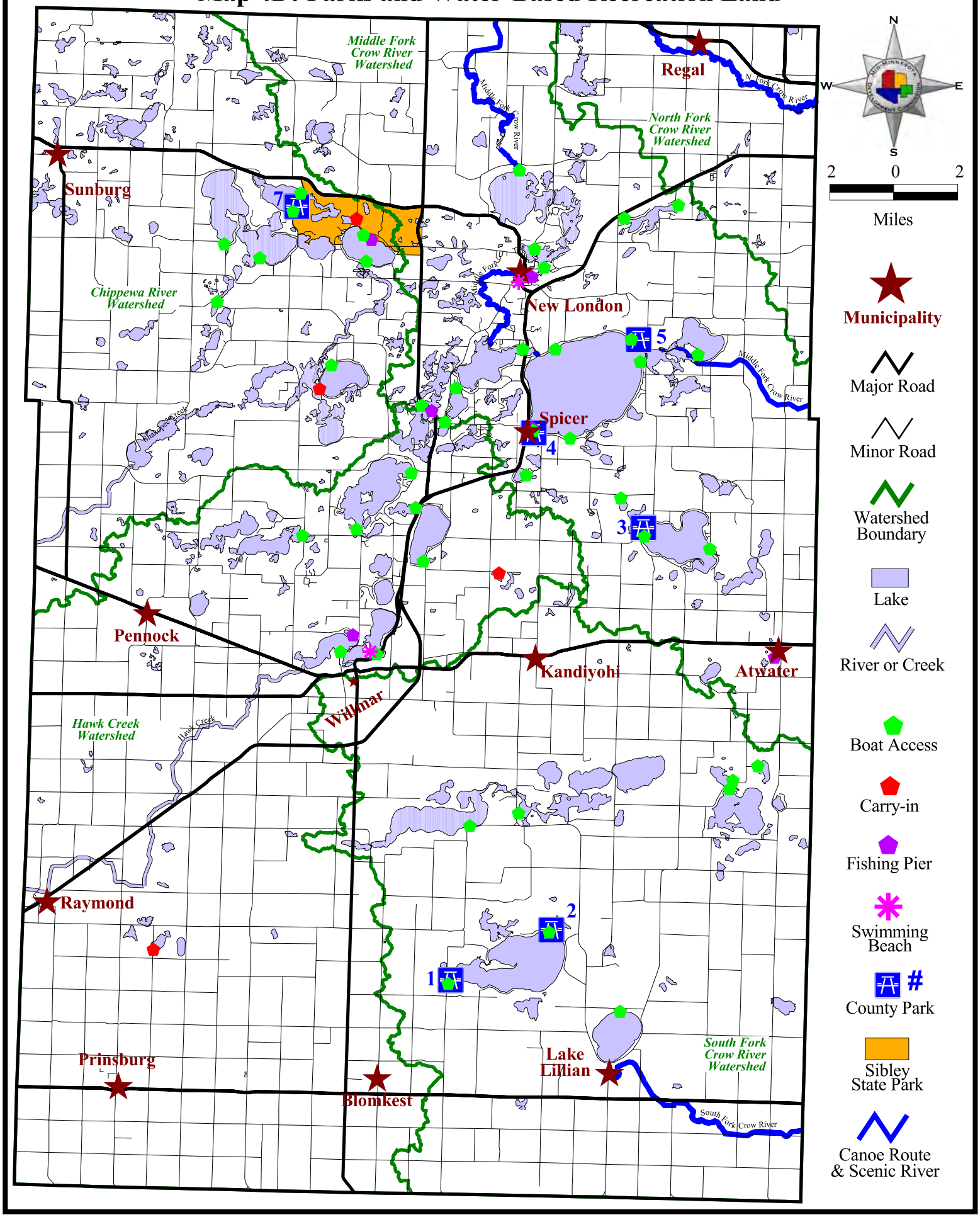
Robbins Island Park is located in the city limits of Willmar on Foot Lake and is managed by the Willmar Park and Recreation Department. Robbins Island Park provides public boat access, hiking, fishing and picnicking. The park also provides a public swimming beach, known as Virgil Olson Beach.

The City of New London Swimming Beach is located at 12 Second Avenue Southwest. It has a sandy beach, a covered shelter with a fireplace, picnic tables and a restroom. A lifeguard is also on duty during the summer months.

References:

Kandiyohi County Comprehensive Plan
Kandiyohi County Planning and Zoning
Minnesota Department of Natural Resources

Map 4D: Parks and Water-Based Recreation Land



Public Water Accesses
(Data Item 48)

The Minnesota Department of Natural Resources (DNR), through its Public Water Access Program, manages over 1,500 trailer and carry in boat accesses on Minnesota's lakes and rivers. These accesses usually remain open 24 hours a day unless posted and are patrolled by conservation officers. There is no fee for their use. However, accesses located within a State Park require a daily or annual State Park sticker. The Public Water Access Program also provides other water access amenities such as fishing piers and shore fishing sites for those who may not have a boat. Fishing piers and shoreline enhancements are barrier free and are generally operated and maintained by local units of government.

The goal of the Public Water Access Program is to provide free access to Minnesota's lakes and rivers. The program strives to meet the increasing demand on the State's water resources for all boating activities. The Public Water Access Program works year round on acquisition, development and maintenance of water access sites. Funds to provide public accesses are derived through boat license fees and a portion of gas tax revenues attributed to motorboats. In addition, funding is periodically provided through the Legislative Commission on Minnesota Resources (LCMR) and the State Bonding Program.

Table 4S provides information on the 47 public water accesses that are located in Kandiyohi County. Map 4D displays the location of each of these public water accesses, as well as fishing piers within the County.

Table 4S:
Public Water Accesses

Waterbody/Course Name	Ramp Type	Administrator
Andrew Lake (north)	Concrete	DNR
Andrew Lake (south)	Concrete	DNR
Bass Lake	Earth	Township
Big Kandiyohi Lake (east)	Concrete	DNR
Big Kandiyohi Lake (west)	Concrete	County
Burr Oak Lake	Carry In	USFWS
Calhoun Lake	Concrete	DNR
Carrie Lake	Gravel	County
Diamond Lake	Gravel	County
Diamond Lake	Concrete	County
Eagle Lake	Concrete	DNR
East Solomon Lake	Concrete	DNR
Elizabeth Lake	Concrete	DNR
Elkhorn Lake	Concrete	DNR
Ella Lake	Concrete	DNR
Lake Florida	Concrete	County

Table 4S:
Public Water Accesses *(continued…)*

Waterbody/Course Name	Ramp Type	Administrator
Lake Florida Slough	Gravel	DNR
Foot Lake	Gravel	County
Games Lake	Concrete	County
Games Lake	Concrete	DNR
George Lake	Concrete	DNR
Green Lake (northwest)	Concrete	Township
Green Lake (northeast)	Concrete	County
Green Lake (east)	Concrete	Township
Green Lake (south)	Concrete	Township
Green Lake (southwestern)	Concrete	DNR
Henderson Lake	Gravel	County
King Lake	Carry in	DNR
Lake Lillian	Concrete	DNR
Long Lake (north)	Concrete	DNR
Long Lake (south)	Concrete	DNR
Long Lake (Hawick)	Gravel	Township
Long Lake (Hawick)	Concrete	DNR
Middle Fork of Crow River	Concrete	DNR
Middle Fork of Crow River	Concrete	County
Mud (Monongalia) Lake	Concrete	DNR
Mud (Monongalia) Lake	Concrete	County
Nest Lake (east)	Concrete	MnDOT
Nest Lake (east)	Concrete	DNR
Norway Lake (east)	Concrete	DNR
Norway Lake (west)	Concrete	DNR
Olson Lake	Carry In	USFWS
Point Lake	Concrete	DNR
Ringo Lake	Concrete	DNR
Swenson Lake	Concrete	Township
Lake Wagonga	Earth	DNR
Willmar Lake	Concrete	City

Reference:

Minnesota Department of Natural Resources, Division of Trails and Waterways

State and Federal Wild and Scenic Rivers/ Canoe and Boating Routes
(Data Item 49)

The Minnesota State Wild and Scenic Rivers Program was established in 1973 to protect rivers which have outstanding natural, scenic, geographic, historic, cultural and recreational value. Once a river is designated as a part of the program, a management plan, which outlines the rules and goals for that waterway, is developed. The management plan is designed to work in conjunction with local zoning ordinances to protect the river from pollution, erosion, over-development and degradation. Six rivers in Minnesota have segments that are designated as wild, scenic, or recreational under the State Wild and Scenic Rivers Program, none of which are located in Kandiyohi County.

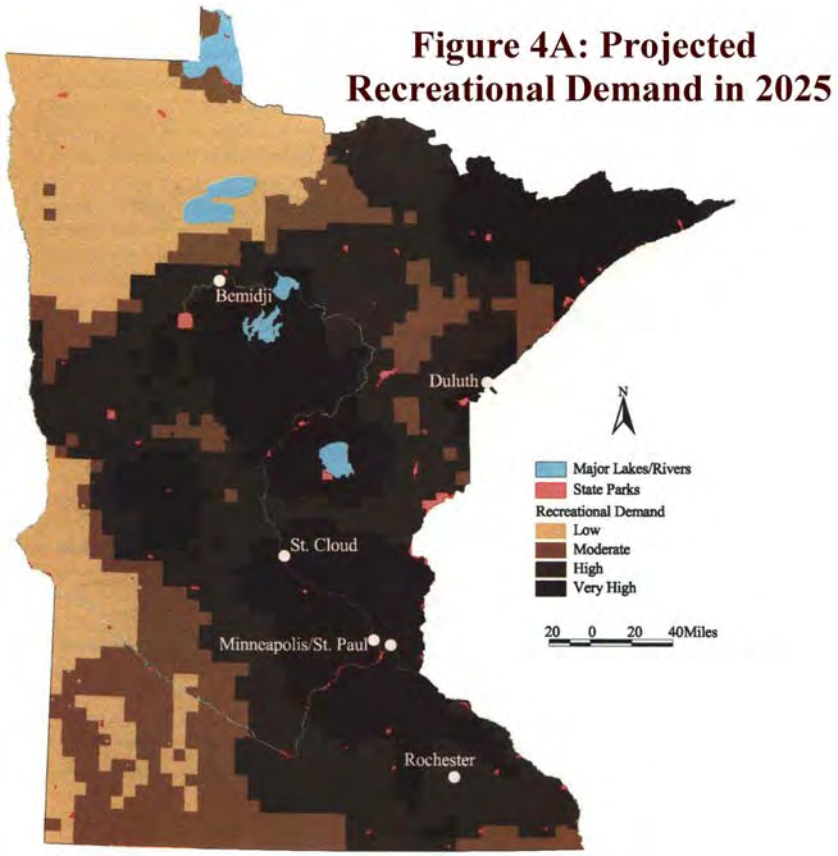
The Minnesota Department of Natural Recourses (DNR) has designated 19 Canoe and Boating Routes, most of which are located in the eastern half of the State. Currently, there are no such designated routes in Kandiyohi County.

Reference:

Minnesota Department of Natural Resources, Division of Waters

Implications and Assessment

Kandiyohi County is rich with water-based recreational lands. The County has one State Park, seven County parks, two municipal swimming beaches and forty-seven public water accesses that are associated with surface water resources. Besides publicly owned lands, there is an abundance of privately owned resorts, motels and camps oriented around water-based recreation. Kandiyohi County should support State and local efforts to maintain and/or expand public and private water-based recreation opportunities within the County.



According to Figure 4A, which is taken from the *2000 Minnesota State Park System Land Study*, Kandiyohi County's projected

recreational demand in 2025 is expected to be in the moderate to high range. To meet this projected demand, the County should work with the Minnesota Department of Natural Resources (DNR) to identify locations that have the potential for expanding water-based recreation. The County should also pursue grants and other available funding to acquire and maintain water-based recreational lands.

Water and related land resources can be better managed to protect and/or enhance the County's water-based recreational lands through the implementation of best management practices (BMPs). Programs, such as continuous CRP and EQIP, provide landowners compensation for the implementation of conservation practices, such as the placement of buffers along watercourses and the upgrading of feedlots. These practices can improve water quality, thus enhancing the water-based recreational opportunities of the water resource. The Kandiyohi County SWCD, watershed management-like organizations and the Kandiyohi County Lakes Improvement Association play a vital role in promoting such practices.

The County and DNR are primarily in charge of ensuring that important recreational waters are protected for water quality concerns. The DNR protects important waters through its Public Waters Inventory and also assists the County in enforcing shoreland regulations. These programs are described in depth within this Plan.

Wildlife Management Areas
(Data Item 50)

Wildlife Management Areas

The State Wildlife Management Area (WMA) Program was established as an attempt to preserve wildlife habitat areas, primarily wetlands that were being destroyed by development and agricultural land uses. WMAs were incorporated as components of the Minnesota outdoor recreation system, which was established by the Minnesota Outdoor Recreation Act of 1975. The Act establishes an outdoor recreation system that will: 1) preserve an accurate representation of Minnesota's natural and historical heritage for public understanding and enjoyment and 2) provide an adequate supply of scenic, accessible and useable lands and waters to accommodate the outdoor recreation needs of Minnesota's citizens. WMAs are managed for wildlife production and are open to public hunting and wildlife watching.

According to Table 4T, there are 20 WMAs in Kandiyohi County, totaling 4,079 acres. Table 4T also includes the Elizabeth Lake Aquatic Management Area (AMA), which was recently acquired by the DNR. Map 4E displays the location of the WMAs in the County.

Table 4T:
Wildlife Management Areas and Aquatic Management Area

Name	Township	Range	Section	Acres
Burbank WMA	122N	34W	26	450
Dietrich Lange WMA	121N	33W	29	909
Eagle WMA	120N	34W	30	48
Elizabeth Lake AMA	118N	33W	3	52
Follies WMA	122N	34W	2	301
Gennessee WMA	119N	33W	35	105
Kandi WMA	120N	34W	33	126
Mamre WMA	120N	36W	27	80
New London WMA	121N	34W	4	39
Oleander WMA	122N	36W	16	362
Rau Prairie Pothole WMA	119N	35W	7	100
Reed WMA	118N	36W	11	116
Regal Flats WMS	122N	33W	10	287
RIM Memorial	120N	36W	26	77
Ringo Nest WMA	121N	34W	29	531
Roseville WMA	122N	33W	1	66
Sunburg WMA	121N	36W	31	109
Whitefield WMA	118N	35W	15	158
Wig WMA	120N	35W	14	10
Willmar WMA (refuge)	119N	35W	1	121
Yohi WMA	119N	33W	12	84
Total WMA Acreage				**4,079**

Waterfowl Production Areas

Waterfowl Production Areas (WPAs) are acquired and managed under the direction of the U.S. Fish and Wildlife Service (USFWS). WPAs aim to preserve wetlands and grasslands that are critical to waterfowl and other wildlife. These public lands were included in the National Wildlife Refuge System in 1966, through the National Wildlife Refuge Administration Act. Part of the money collected through purchasing a Duck Stamp in Minnesota goes toward the acquisition and maintenance of these areas.

WPAs provide numerous recreational opportunities to the public, including hunting, fishing, trapping, wildlife observation and photography. The use of motorized vehicles, including snowmobiles and all-terrain vehicles, is generally prohibited in WPAs. For additional rules and regulations regarding WPAs, contact the USFWS.

According to Table 4U there are 56 WPAs in Kandiyohi County, totaling 14,818 acres. Map 4F displays the location of the WPAs in the County.

Table 4U:
Waterfowl Production Areas

WPA Name	Acres	WPA Name	Acres
Allen	200	Henjum	45
Arctander	376	Henjum Lake	468
Big Kandiyohi Lake	765	Irving	132
Bjur	41	Johnson	79
Bomsta	565	Lake Charlotte	254
Brenner Lake	268	Lake Elizabeth	57
Broberg	60	Lake Lillian	314
Burbank	898	Lake Mary	112
Burr Oak Lake	339	Lindgren Lake	310
Carlson Lake	288	Mamre	230
Colfax	319	Meeker	200
Degroot	131	Miller Hills	405
Dengerud	98	New London	162
Ella Lake	418	Norway Lake	40
Erickson	101	Olson Lake	459
Evenson	142	Pennock	51
Florida Slough	518	Peterson	38
Freese	370	Priam	347
Gilberts	50	Quinn	546
Hanson	118	Rambow	282
Harrison	25	Randall	560

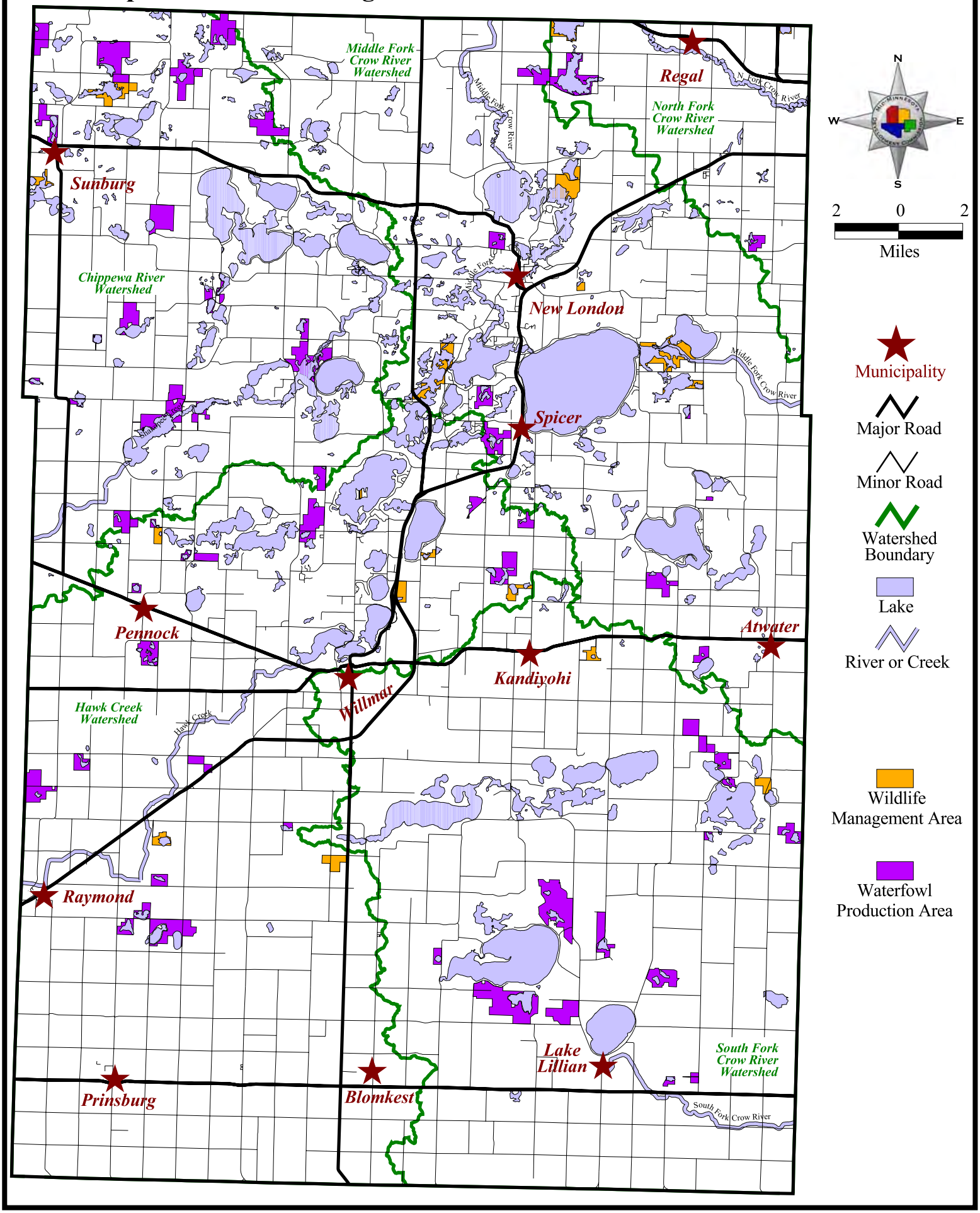
Table 4U:
Waterfowl Production Areas *(continued…*

WPA Name	Acres	WPA Name	Acres
Raymond	374	Swan Lake	692
Reynolds	120	Swanson	96
Schueler	46	Sweep	261
Shakopee Creek	143	Uncle Matt's Lake	265
Sperry Lake	16	Weber	419
Summit Lake	99	Yarmon	818
Sunburg	257	Zwemke	31
Total WPA Acreage			**14,818**

References:

Minnesota Department of Natural Resources, Division of Wildlife
United States Fish and Wildlife Service

Map 4E: Wildlife Managment Areas and Waterfowl Production Areas



State Designated Trout Waters
(Data Item 51)

The Minnesota Department of Natural Resources (DNR) has designated trout lakes and streams in Minnesota. Restrictions have been placed on designated trout streams in order to protect and foster the propagation of the species. In such streams, fishing is limited, except during the open season, and the taking of minnows is prohibited at all times, unless permitted by the DNR.

Currently, there are no DNR designated trout lakes or streams in Kandiyohi County.

Reference:

Minnesota Department of Natural Resources, Division of Fisheries

State Ecological and Management Classifications
(Data Item 52)

The Minnesota Department of Natural Resources (DNR), Division of Fisheries, has developed several lake classification systems. Lake classification systems have been used to categorize lakes according to their general fish community composition, natural ecological condition and the most suitable species for which a lake can be managed. Fisheries managers use these lake classifications to prescribe lake management goals and objectives. Ecological and Management Classification systems, were the earliest classification systems developed by Fisheries managers and are still used to some extent today. More recently, *An Ecological Classification of Minnesota Lakes with Associated Fish Communities* was developed by DNR Fisheries. The older Ecological Classification system categorizes suitable fish populations that are adapted to the physical, chemical and biological features of a lake. The older Management Classification system categorizes the most important species, or combination of species, on which management efforts should be directed. The *Ecological Classification of Minnesota Lakes with Associated Fish Communities* categorizes lakes according to limnological variables including variables associated with lake size, lake depth and chemical fertility and length of the growing season.

Table 4V lists the ecological and management classification for lakes in Kandiyohi County. A brief description of each classification system is provided below.

Ecological Classification

The Ecological Classification denotes the basic lake type. This classification is described in terms of the natural and characteristic fish population which are best adapted to the physical, chemical and biological characteristics of a lake and which the lake could be expected to support if it were left alone and no special management applied to it.

The principal ecological types, in order of oligotrophic to eutrophic, are as follows:

1. **Trout –** Deep, rocky, infertile lakes with oxygen throughout.
2. **Soft-water Walleye –** Infertile, medium to large size lakes in northeastern Minnesota with natural walleye populations.
3. **Hard-water Walleye –** Moderately fertile, medium to large size lakes in which walleyes are well established naturally.
4. **Centrarchid-Walleye –** Medium to large sized, usually lakes consisting of many ecologically different bays or sections, some being natural walleye habitat, others more suitable to pan fish species.
5. **Centrarchid –** Medium to small sized, weedy, fertile, hard water lakes. Usually no large open areas. Many also contain moderate to substantial populations of carp, buffalofish and bullheads. Many may occasionally winterkill.

6. **Rough Fish-Game Fish –** Fertile hardwater lakes in southern and central Minnesota characterized by relatively large rough-fish populations. Many may occasionally winterkill.
7. **Bullhead –** Shallow lakes in which frequent winterkills promote the dominance of bullheads.
8. **Unclassified –** These are often small lakes whose native fish populations do not fit any of the above categories.

Management Classification

The management classification describes the most important species, or combination of species, on which management effort is to be directed.

The principal management classifications, in order of oligotrophic to eutrophic, are as follows:

1. **Trout –** Specific by species. Lake trout management usually restricts introductions to this species, unless a two-story condition prevails. Stream trout management usually involves elimination of competitive species and the introduction of fingerlings of the appropriate species.
2. **Walleye –** These lakes are managed to favor established walleye populations and northern pike. Usually little or no management of other sport fishes.
3. **Walleye-Centrarchid –** This type of management is designed to furnish a walleye fishery of moderate size, without displacing largemouth or smallmouth bass or pan fish populations.
4. **Centrarchid –** Management is geared towards largemouth or smallmouth bass since physical characteristics of the lakes managed will differ depending on the species. In addition to bass and pan fish, considerable attention is usually given to the northern pike.
5. **Warm-Water Game Fish –** This is designed to cover those lakes in southern and central Minnesota, where rough fish removal and stocking of rescued fish are common management procedures. They include lakes which occasionally winterkill where management is aimed at building up a desirable fish population in as short time as possible.
6. **Regular Winter Kill –** Management of lakes is usually confined to rescue work and/or walleye fry stocking. Fishing is of the boom or bust type.

It should be noted that in addition to the DNR's Lake Management Classification System, which is based upon fisheries resources, many of the County's lakes are or should be managed for wildlife production.

Table 4V:
Lake Ecological and Management Classifications

DNR ID	Lake Name	Ecological Class	Management Class
34-0022	Elizabeth	Rough Fish-Game Fish	Warm-Water Game Fish
34-0028	Unnamed	Rough Fish-Game Fish	Warm-Water Game Fish
34-0032	Carrie	Centrarchid	Centrarchid
34-0032	Ella	Rough Fish-Game Fish	Warm-water Game Fish
34-0044	Diamond	Centrarchid-Walleye	Walleye-Centrarchid
34-0062	Calhoun	Warm-Water Game Fish	Centrarchid
34-0066	Long	Centrarchid	Centrarchid
34-0072	Lillian	Rough Fish-Game Fish	Warm-water Game Fish
34-0078	Bass	Centrarchid	Centrarchid
34-0079	Green	Centrarchid-Walleye	Walleye-Centrarchid
34-0086	Big Kandiyohi	Rough Fish-Game Fish	Centrarchid
34-0116	Henderson	Centrarchid	Centrarchid
34-0119	Elkhorn	Centrarchid	Centrarchid
34-0142	George	Centrarchid	Centrarchid
34-0148	Bear	Warm-Water Game Fish	Warm-water Game Fish
34-0154	Nest	Centrarchid-Walleye	Walleye- Centrarchid
34-0169	Wagonga	Warm-Water Game Fish	Winter-kill
34-0171	Eagle	Centrarchid-Walleye	Walleye- Centrarchid
34-0172	Ringo	Rough Fish-Game Fish	Regular Winter-Kill
34-0180	Willmar	Rough Fish-Game Fish	Warm-water Game Fish
34-0181	Foot	Rough Fish-Game Fish	Warm-water Game Fish
34-0192	Long	Rough Fish-Game Fish	Warm-water Game Fish
34-0193	Point	Warm-Water Game Fish	Warm-water Game Fish
34-0196	Skataas	Rough Fish-Game Fish	Warm-water Game Fish
34-0206	Andrew	Centrarchid	Walleye-Centrarchid
34-0217	Florida	Centrarchid	Walleye-Centrarchid
34-0222	Unnamed	Bullhead	Regular Winter-Kill
34-0224	Games	Centrarchid	Centrarchid
34-0244	Unnamed	Centrarchid	Centrarchid
34-0246	East Solomon	Warm-Water Game Fish	Warm-water Game Fish
34-0251	Norway	Centrarchid	Walleye-Centrarchid
34-0321	Swenson	Rough Fish-Game Fish	Warm-water Game Fish
34-0347	Hefta	Bullhead	Regular Winter-Kill

Reference:

Minnesota Department of Natural Resources, Division of Fisheries, Spicer Area Office

Biological Surveys and Reconnaissance Studies
(Data Item 53)

Minnesota County Biological Survey

The Minnesota County Biological Survey (MCBS) began in 1987 as a systematic survey of rare biological features. The goal of the MCBS is to identify significant natural areas and to collect and interpret data on the distribution and ecology of rare plants, rare animals and native plant communities. Native habitats surveyed by the MCBS contribute to a sustainable economy and society because they:

- Provide reservoirs of genetic materials potentially useful in agriculture and medicine.
- Provide ecological services that contribute to the quality of air, soil and water.
- Provide opportunities for research and monitoring on landscapes, native plant communities, plants, animals and their relationships within the range of natural variation.
- Serve as benchmarks for comparison of the effects of resource management activities.
- Are part of natural ecosystems that represent Minnesota's natural heritage and are sources of recreation, beauty and inspiration.

To date, the MCBS has added 12,800 new records of rare plants and animals to the Rare Features Database, Natural Heritage Information System (NHIS). Work for the Survey has been completed in 50 of Minnesota's 87 counties. Kandiyohi County's Survey is currently in progress, with a plan completion data of summer 2002. Additional information concerning the Minnesota Biological Survey and the NHIS can be found in data item #55.

DNR Fisheries

According to the DNR Spicer Fisheries Management Area, surveys and assessments of fish populations are available for lakes "managed" by DNR Division of Fisheries. Table 4W provides a listing of surveys and assessments that have been conducted in Kandiyohi County.

Table 4W:
DNR Fisheries Surveys and Assessments

Watercourse	Survey Type	Year
Middle Fork Crow River	Population Assessment	1991
South Fork Crow River	Population Assessment	1994
South Fork Crow River	Initial Survey	1978

References:

Minnesota Department of Natural Resources, Division of Ecological Services
Minnesota Department of Natural Resources, Spicer Fisheries Management Area Office

Management Plans for Fish and Wildlife Areas
(Data Item 54)

Minnesota Department of Natural Resources (DNR) Fisheries personnel routinely survey lakes and streams. Data collected in the survey process includes the initial survey, resurveys, population assessments, reproduction checks and creel surveys. Information collected is often used to develop and revise Lake and Stream Management Plans (LSMP). LSMPs include long-range goals, operational plans, mid-range objectives, potential plans, primary and secondary species management and a narrative section. Plans are periodically revised as new data is collected and information from other sources becomes available. Table 4X identifies the 35 LSMPs that are currently in place for Kandiyohi County.

Table 4X:
Lake and Stream Management Plans

Lake Name	Year Adopted	Lake Name	Year Adopted
Andrew (34-0206)	1996	Hefta (34-0148)	NA
Bass (34-0078)	1999	Henderson (34-0116)	2000
Bear (34-0148)	1989	Lillian (34-0072)	1996
Big Kandiyohi (34-0086)	1996	Long (34-0066)	1999
Calhoun (34-0062)	1999	Long (34-0192)	2000
Carrie (34-0032)	1996	Middle (34-0208)	1997
Diamond (34-0044)	1998	Mud (34-0158)	1999
Eagle (34-0171)	2000	Nest (34-0154)	1999
Elizabeth (34-0022)	1996	Norway (34-0251)	1996
Elkhorn (34-0119)	1999	Point (34-0193)	2000
Ella (34-0033)	1996	Ringo (34-0172)	2000
East Solomon (34-0246)	2000	Skataas (34-0196)	1993
Florida (34-0217)	1996	Swenson (34-0321)	1995
Foot (34-0181)	2000	Tadd (34-0028)	1996
Games (34-0224)	1996	Twenty One (34-0222)	1995
George (34-0142)	1999	Wagonga (34-0169)	2000
Golden Pond (34-0355)	1996	Willmar (34-0180)	2000
Green (34-0079)	2000		

During the process of conducting lake and stream surveys, the Minnesota DNR Fisheries has identified opportunities to not only improve fish and wildlife habitat, but also improve water quality. Opportunities identified by the DNR Fisheries include:

1. Stormwater retention ponds, siltation basins, and restoration and development of wetlands in strategic locations that can provide waterfowl production and northern pike spawning.

2. Protection, preservation and establishment of native emergent vegetation (i.e., cattails, bulrushes, ect.) yield water quality benefits, while providing fish and wildlife habitat.

3. Stabilization of shoreline utilizing buffer strips, riprap and other erosion and siltation prevention measures, could enhance natural spawning shoals and minimize turbidity.

4. Carp, and other undesirable fishes uproot vegetation and stir up bottom sediments and destabilize shoreline areas. Electric fish barriers and velocity culverts in strategic locations could minimize or prevent migration of undesirable fish species.

5. Winter aeration of marginal fish producing waters and stocking of desirable species can provide additional recreational opportunities, spread out/reduce angling pressure on existing resources and through biological control, reduce the abundance of undesirable fish.

6. Aquatic plant management, including the detection and control of exotic plant species (i.e., Eurasian Watermilfoil, Purple Loosestrife and Curled Pondweed).

7. Diversion of storm sewers, drainage tiles, county ditches and sewage treatment facilities away from lakes and streams into wetlands or though sedimentation basins.

Management of the County's fish resources is critical to the long-term sustainability of not only the resource itself, but the portion of the local economy that is dependant upon the sportsfishing industry. One popular tool that has been used in the County to manage fish resources is winter aeration systems. Table 4Y lists the eight lakes in Kandiyohi County that are permitted by the DNR for winter aeration systems.

Table 4Y:
Winter Aeration Systems

Lake Name	DNR ID	Type	Sponsor
Foot	34-0181	Diffuser	Kandiyohi County
Long	34-0192	Diffuser	Kandiyohi County
Middle Fork of the Crow River	34-0158	Pump and Baffle, Diffuser	Kandiyohi County
Ringo	34-0172	Diffuser	Kandiyohi County
Solomon	34-0246	Diffuser	Kandiyohi County
Swenson	34-0321	Diffuser	Kandiyohi County
Tadd	34-0028	Diffuser	City of Atwater
Wagonga	34-0169	Diffuser	Kandiyohi County
Willmar	34-0180	Pump and Baffle	City of Willmar

Reference:

Minnesota Department of Natural Resources, Division of Fisheries, Spicer Area Office

Implications and Assessment

Increasing and improving wildlife habitat in Kandiyohi County is an important component of this plan. In addition to providing benefits to wildlife, wood and grass covered habitat areas aid in reducing wind and water erosion by stabilizing the topsoil. Currently, the Minnesota Department of Natural Resources (DNR) manages 20 Wildlife Management Areas and 1 Aquatic Management Area in Kandiyohi County. In addition to these lands, the United States Fish and Wildlife Service (USFWS) currently manages 56 Waterfowl Production Areas within the County. Both Federal and State owned lands are being actively managed to ensure necessary conditions for fish and wildlife habitat. Additional opportunities for fish and wildlife habitat exist through these programs.

DNR Fisheries personnel routinely survey lakes and streams within Kandiyohi County. Currently, 35 Lake and Stream Management Plans (LSMPs) are on file for the County. These LSMPs include long-range goals, operational plans, objectives, species management and narrative sections. Methods to ensure continued support of the County's fisheries will be greatly augmented by the implementation of the surface water quality and lake management activities defined in this plan.

Additional possibilities for fish and wildlife habitat exist through Federal and State conservation programs (CRP, RIM, WRP, etc.) and conservation practices, such as buffer strips. Vegetative cover provided through these programs and practices not only reduces soil erosion, but it also provides valuable fish and wildlife habitat. The County should promote and provide assistance to conservation groups involved in the LCMR Corridors Habitat Project, which focuses on protecting and developing wildlife habitat in the Alexandria Moraine Corridor, located in northern Kandiyohi County. Finally, the County should explore the development of an integrated roadside management program, which recognizes the important role it plays in providing wildlife habitat.

Unique Features and Scenic Areas
(Data Item 55)

The Federal Endangered Species Act of 1973 requires the U.S. Department of the Interior to identify species as endangered or threatened, according to a separate set of definitions, and imposes a separate set of restrictions pertaining to those species. Definitions for endangered, threatened and species of special concern are provided below.

- **Endangered Species -** A species is considered endangered if the species is threatened with extinction throughout all or a significant portion of its range within Minnesota.
- **Threatened Species -** A species is considered threatened if the species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range within Minnesota.
- **Species of Special Concern -** A species is considered a species of special concern if, although the species is not endangered or threatened, it is extremely uncommon in Minnesota, or has unique or highly specific habitat requirements and deserves careful monitoring of its status. Species on the periphery of their range that are not listed as threatened may be included in this category, along with those species that were once threatened or endangered but now have increasing or protected, stable populations.

Minnesota's Endangered Species Statute (Minnesota Statutes, Section 84.0895) requires the Minnesota Department of Natural Resources (DNR) to adopt rules designating species meeting the statutory definitions of endangered, threatened, or species of special concern. The resulting list of endangered, threatened and species of special concern is codified as Minnesota Rules, Chapter 6134. The Endangered Species Statute also authorizes the DNR to adopt rules that regulate treatment of species designated as endangered and threatened.

Minnesota's Endangered Species Statute and the associated Rules impose a variety of regulations pertaining to species designated as endangered or threatened. Under State regulations, a person may not take, import, transport, or sell any portion of an endangered or threatened species. However, these acts may be allowed through the issuance of a DNR permit. In addition, certain exemptions exist for agricultural lands and for the accidental, unknowing destruction of designated plants. Minnesota’s Endangered Species Statute or associated Rules does not protect species of special concern.

Map 4F shows the general location of rare plants, animals and geologic features in Kandiyohi County, as derived from the Minnesota DNR Natural Heritage Information System (NHIS) on November 26, 2001. The NHIS is a statewide database, which includes information from the County Biological Survey, on rare species and features. The lack of data for any geographic area should not be construed to mean that no significant features are present. In addition, there may be inaccuracies in the data, of which the DNR is not aware and shall not be responsible for.

Table 4Z lists the rare features and species that are found within the County, including natural communities, animal aggregations, animals and plants. Information concerning common name, legal status, date last observed and number of occurrences is also provided.

Map 4F: Rare Features and Species (approximate locations)

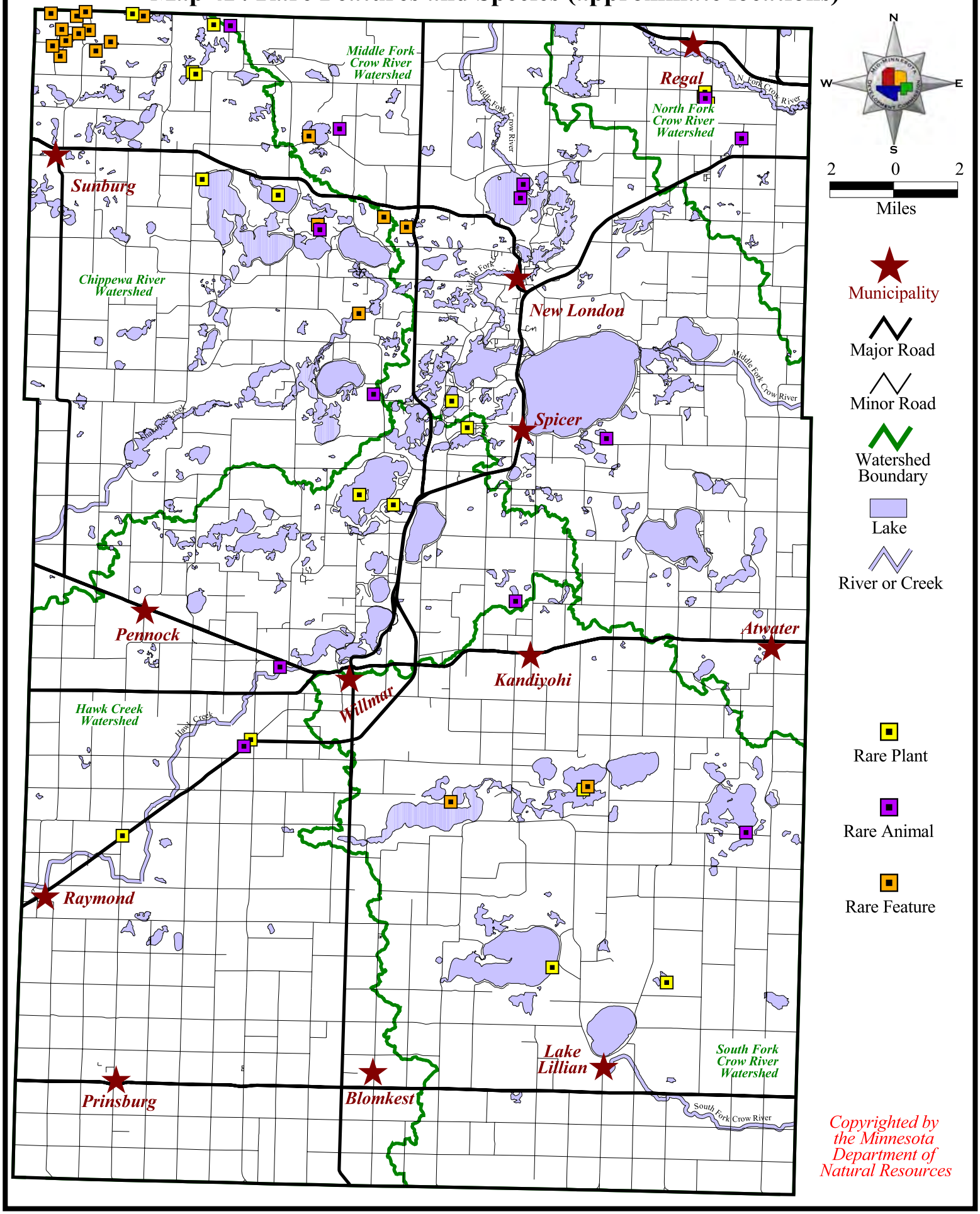


Table 4Z:
Rare Features and Species

Feature/Specie	Common Name	Legal Status	Last Observed	# of occurrences
Natural Communities	Dry Prairie (Central) Sand-gravel Subtype	NA	2001	34
	Maple-Basswood forest (West Central)	NA	1996	5
	Mesic Prairie (Central)	NA	2001	9
	Oak Forest (Central) Dry Subtype	NA	2001	3
	Poor Fen Sedge subtype	NA	2001	6
	Poor Fen Shrub subtype	NA	2001	1
	Rich Fen (Transition) Sedge Subtype	NA	2001	2
	Rich Fen (Transition) Shrub Subtype	NA	2001	1
	Shrub Swamp unknown Subtype	NA	2001	3
	Southern Dry-Mesic Hardwood forest	NA	2001	10
	Southern Mesic Hardwood Forest	NA	2001	6
	Wet Meadow	NA	2001	6
	Wet Meadow Shrub Subtype	NA	2001	1
	Wet Prairie (Central	NA	1978	1
Animal Aggregations	Colonial Waterbird nesting site	NA	1980	1
Animals	Short-eared owl	Special Concerned	1978	1
	Upland sandpiper	NA	1991	1
	Common Moorhen	Special Concerned	1999	1
	Bald Eagle	Special Concerned	2001	5
	Pugnose shiner	Special Concerned	2000	1
	Powesheik Skipper	Special Concerned	1993	2
	Northern Grasshopper mouse	NA	1963	1
	Regal Frittilary	Special Concerned	1997	3
Plants	Prairie Moonwort	Special Concerned	2001	7
	Sterile Sedge	Threatened	2001	1
	Hill's thistle	Special Concerned	2001	8
	Small while Lady's-Slipper	Special Concerned	2001	11
	Kentucky Coffee-Tree	NA	1996	1
	Sea Naiad	Special Concerned	2000	3
	American Ginseng	Special Concerned	2001	4
	Western Prairie Fringed Orchid	Endangered	1892	1
	Ditch-Grass	Special Concerned	1938	3

Reference:

Minnesota Department of Natural Resources, Division of Ecological Services

Implications and Assessment

The Minnesota Department of Natural Resources' (DNR) Natural Heritage Information System (NHIS) identifies Kandiyohi County's rare plants, animals, natural communities and features, many of which are tied to water resources. The NHIS includes information from the County Biological Survey, which is due to be completed in the summer of 2002. Map 4F details the approximate locations of the County's rare features and species. Because of the possible threat of disturbance or destruction, the DNR does not allow maps to show or detail the exact location of rare species or features.

To protect its rare features and species, Kandiyohi County should support Federal, State and local agencies and groups in providing a wide array of protection options for these areas, including purchasing. The County should also work with the DNR to develop land use regulations that are receptive to protecting rare features and species.

Expected Changes to Surface Water, Groundwater and Related Land Resources

Based on population projections provided Table 1B, Kandiyohi County is expected to gain an additional 5,608 residents by 2020, if it simply experiences the same growth rate over the next twenty years, as it has since 1960. Population growth and development is expected to primarily occur in the northern half of the County. Proper planning of the growth and development in this area will be essential to the preservation of the County's water resources. Issues, such as stormwater management, should be focused upon in this region.

The southern portion of Kandiyohi County is expected to remain agriculturally focused over the next ten years, with relatively little additional growth and development expected to occur. Agricultural related issues, such as sedimentation and nutrient management, should be focused upon in this area to protect and improve the condition of the area's water resources. Several Federal and State programs, such as CRP, EQIP and RIM, provide landowners opportunities to address these issues in the form of best management practices (BMPs) and short term and perpetual conservation easements. Over the next ten years, it is expected that the number of BMPs and conservation easements in the County will remain at least the same, depending on Federal and State funding.

Countywide, groundwater is the primary source of drinking water for residents. Protection of this valuable resource, through programs like the MDH's Wellhead Protection Program, is imperative. A total of 21 water suppliers in the County are expected to develop Wellhead protection plans in the next two years. The County should take an active role and assist these water suppliers in meeting this requirement.

Wastewater treatment needs of municipalities need to be assessed to ensure adequate design capacity. In addition, the challenge of keeping stormwater out of sanitary sewer systems will continue to be an important issue for the municipalities dealing with the wastewater treatment issues. There is a need for all local units of government to address stormwater treatment as development occurs in urban and rural areas.

Through the implementation of the Minnesota Wetland Conservation Act (WCA), State Protected Waters Inventory, Swampbuster and Section 404 of the Clean Water Act, wetland loss in Kandiyohi County is expected to be minimal. In addition, wetland restoration projects are likely to occur under one of the Federal and State incentive programs. Wetland restorations will benefit both surface and groundwater resources.

Concern has been raised about the quality of surface water in Kandiyohi County. Lakes and streams in the County are often difficult to manage because of point and nonpoint source pollution. Additional assessment of the County's lakes and streams will be necessary to determine and remediate pollution sources.

Administrative, technical and financial assistance from the Federal and State level will be needed to accomplish goals and objectives identified in this plan.

CHAPTER FIVE:
KANDIYOHI COUNTY ISSUES, GOALS, OBJECTIVES AND ACTIONS

Chapter five of the Water Plan establishes the County's issues, goals, objectives and actions. Goals are used as a framework for the objectives and actions, which, in turn, reflect upon what water related issues are important to the County's residents. This chapter contains a ten-year implementation plan and a five-year focus plan, which will serve as a guide to the County in managing its water resources.

On January 29, 2002, a public informational meeting was held to identify issues to be addressed in the Kandiyohi County Comprehensive Local Water Plan. This meeting enabled local and State governmental units and the public to have an opportunity to present information and concerns about water related issues that they believe should be considered in the updated plan.

A total of 39 issues were identified at the public informational meeting. The Kandiyohi County Water Plan Taskforce reviewed each of the issues and prioritized them based upon the following three tiered system:

> **Urgent**: Issues that must be addressed immediately. These would be issues where serious threats to public health or sensitive resources are possible if they are not addressed or where important opportunities could be lost through inaction.
>
> **Important**: Issues that will be dealt with as funds and personnel become available.
>
> **Noteworthy**: Issues that are not crucial to human health or resource protection.

Listed below are issues that were identified at the public informational meeting, categorized by the taskforce's assigned priority. Those issues that were not assigned a priority by the taskforce are listed under the "Omitted" heading, along with a brief description of the taskforce's reasoning. Map 5A displays the taskforce's top priority issues/opportunities per watershed.

- **Urgent**
    - High levels of phosphorus entering the County's lakes
    - Reducing or eliminating phosphorus fertilizers for lawns
    - Groundwater and surface water pollution hazard of failing septic systems
    - Continued coordination and communication between local and state agencies for funding that is available for Best Management Practices (BMPs) and other environmental related projects
    - Groundwater pollution hazard of abandoned wells
    - Need for funding to address the pollution problems associated with unsewered communities

- **Urgent (continued…)**

    - Educating the public on water resource management issues
    - Control of Eurasian Watermilfoil and other noxious weeds
    - Educating the public on water plan related issues
    - Protecting existing prime farmland from development

- **Important**

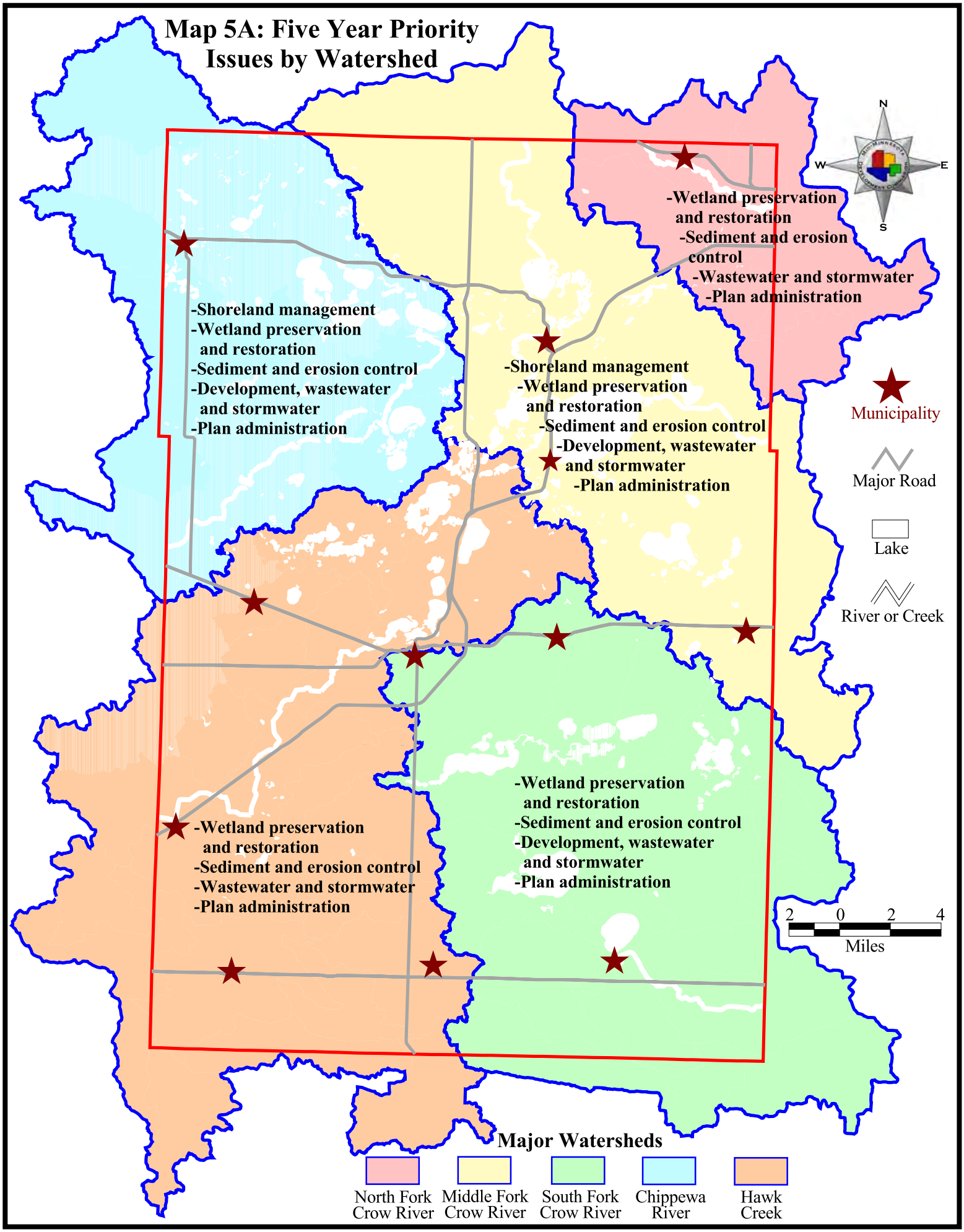
    - Promotion of alternative ISTS systems
    - Need to promote shoreland management
    - Need to promote marginal agricultural land retirement programs (i.e. CRP, RIM)
    - Management of stormwater
    - Promotion of alternative tile intake systems and buffer strips
    - Maintenance of the County's drainage system
    - Restoration of drained wetlands and lakebeds
    - Installation of drop inlets in drainage ditches
    - Need to conduct an inventory of available GIS data
    - Need for GIS data to be stored in a centralized location

- **Noteworthy**

    - Explore conducting a voluntary inventory of failing ISTSs
    - Documentation of wastewater discharges
    - Need to list and promote watershed management-like organizations in the Water Plan
    - Control of cormorants, geese and pelicans
    - Utilization of restored gravel pits as wildlife habitat
    - Implementation of no wake zone on lakes where motorized watercraft are damaging shoreline
    - Limiting the horsepower of watercraft engines on shallow lakes
    - Support of the Grass Lake restoration project
    - Proper prescription of aeration systems
    - Need for individuals capable of writing grant

- **Omitted**

    - Mandatory inspection of ISTSs that are 20 years of age or older
        - Reasoning: Many ISTSs are being upgraded through low interest loans and through the requirements set forth in zoning regulations and by finance companies
    - Enrolling farmers in conservation programs
        - Reasoning: Addressed in a previous issue listed above


Map 5A: Five Year Priority Issues by Watershed
N
W
E
S
-Wetland preservation and restoration
-Sediment and erosion control
-Wastewater and stormwater
-Plan administration
-Shoreland management
-Wetland preservation and restoration
-Sediment and erosion control
-Development, wastewater and stormwater
-Plan administration
-Shoreland management
-Wetland preservation and restoration
-Sediment and erosion control
-Development, wastewater and stormwater
-Plan administration
-Wetland preservation and restoration
-Sediment and erosion control
-Development, wastewater and stormwater
-Plan administration
-Wetland preservation and restoration
-Sediment and erosion control
-Wastewater and stormwater
-Plan administration
Municipality
Major Road
Lake
River or Creek
2 0 2 4
Miles
Major Watersheds
North Fork Crow River
Middle Fork Crow River
South Fork Crow River
Chippewa River
Hawk Creek

- **Omitted (continued…)**
    - Use of GIS technology to identify critical erosion prone areas
        - Reasoning: Addressed in a previous issue listed above
    - Groundwater issues facing Eagle Lake and the Highway 23 Project
        - Reasoning: Taskforce believes that these issues are already being addressed
    - Pollution hazard of leaking underground storage tanks
        - Reasoning: MPCA enforces strict regulations concerning underground storage tanks
    - Burning of leaves and garbage near lakes and streams
        - Reasoning: This issue is already being addressed through state burning regulations
    - Proper planning of lakeshore developments
        - Reasoning: This is already occurring through the implementation of zoning standards
    - Design and enforcement of an impervious surface ordinance
        - Reasoning: Already addressed in the County's zoning ordinance
    - Effect of irrigation on groundwater quantity
        - Reasoning: The Minnesota DNR already addresses these issues through the issuance of water appropriation permits

Once prioritized, the taskforce then reviewed each of the issues, along with the existing Water Plan, to develop goals, objectives and actions for the more comprehensive ten-year implementation plan. To more effectively implement these strategies, the taskforce identified the highest priority goals, objectives and actions from this plan and devised the five-year focus plan. The five-year focus plan identifies specific and quantitative goals, objectives and actions that the County looks to achieve over the next five years (2003-2007).

In order to lay the foundation for achieving goals and objectives specified in the ten-year implementation plan and five-year focus plan, all actions are assigned specific implementation information. Information assigned to each action includes: applicable watershed(s), timeline, coordinating agencies (including the lead), funding source(s) and local cost. In addition, each of the actions in the ten-year implementation plan has been given a priority *(Note: this was not done to the five-year focus plan because all actions identified in this plan are of high priority to the County).* The following provides a definition of each of these parameters.

Priority: Actions are prioritized based on urgent, important and noteworthy (see definitions on Ch. 5, Pg. 1). Actions ranked as urgent should be addressed immediately.

Applicable Watershed(s): Details which watershed(s) the action is applicable to, whether it be the Chippewa River (CR), Hawk Creek (HC), Middle Fork of the Crow River (MFCR), North Fork of the Crow River (NFCR), or the South Fork of the Crow River (SFCR) Watershed. If the action applies to all five of the watersheds, "All" is listed.

Timeline: Provides a timeframe, from 2003 to 2012, for when the action will be initiated and/or completed.

Coordinating Agencies: Entails the Federal, State and local agencies and offices that will be involved in the implementation of the action item. A listing of possible participants is given in the text box to the right.

Funding Source(s): Details where funding for implementing the action is expected to come from, whether it be from Federal, State or local sources (i.e. programs, grants, NRBG, etc.).

Local Cost: Is the estimated cost, at the local level, that it will take to implement each action. This estimate includes costs that would be incurred to the County, townships and watershed management-like organizations *(please note that this estimate does not factor in costs to municipalities).*

Coordinating Agencies

FEDERAL

Army Corps of Engineers (ACOE)
Natural Resource Conservation Service (NRCS)
United States Fish and Wildlife Service (USFWS)

STATE

Minnesota Board of Soil and Water Resources (BWSR)
Minnesota Department of Agriculture (MDA)
Minnesota Department of Health (MDH)
Minnesota Department of Natural Resources (DNR)
Minnesota Geological Survey (MGS)
Minnesota Pollution Control Agency (MPCA)
University of Minnesota Extension Service (UMES)

LOCAL

County

Ditch Authority (DA)
Environmental Services (ES)
Planning and Zoning (PZ)
Public Health (PH)
Public Works (PW)
Soil and Water Conservation District (SWCD)
Solid Waste (SW)

Municipalities

Townships

Watershed Management-Like Organizations (WMLOs)

Clean Water Partnerships
Lake Associations
Watershed Districts
Watershed Projects

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Kandiyohi County Chapter 5 – Five-Year Focus Plan

GOAL 1: PROTECT AND IMPROVE SURFACE WATER QUALITY.

Objective 1: Decrease the nutrient and sediment concentration of surface water to the 50th percentile of the North Central Hardwood Forests Ecoregions and Western Corn Belt Plains.

Action	Applicable Watershed(s)	Timeline	Coordinating Agency(s) *(Lead)*	Funding Source(s)	5-yr. Local Cost (approx.)
Implement 60 acres of filter strips and riparian buffers adjacent to drainage ditches, streams, rivers, wetlands and lakes in the County.	All	2003-2007	*NRCS, SWCD,* WMLOs	Federal, State, Local	$25,000
Install 50 miles of field windbreaks and 25 miles of living snow fence in the County.	All	2003-2007	*NRCS, SWCD*	State, Local	$100,000
Through inspections, have 250 of the County's registered feedlots in compliance with State standards.	All	2003-2007	*ES, MPCA, SWCD*	State, Local	$250,000
Enroll 500 acres in State and Federal programs that take highly erodible land out of tillage.	All	2003-2007	*NRCS, SWCD*	State, Federal	$54,000
Provide educational and technical assistance to landowners regarding the implementation of alternative drainage practices.	All	2003-2007	*SWCD*, UMES, WMLOs	State, Local	$20,000
Provide educational, financial and technical assistance to landowners to implement BMPs (i.e. bank stabilization, filter strips, lakescaping, etc.).	All	2003-2007	*ES, SWCD, WMLOs*	State, Local	$20,000
Hold yearly educational meetings on feedlot regulations and nutrient management.	All	2003-2007	*UMES*	State	$3,000
Develop and administer a County Feedlot Ordinance.	All	2003	*ES*	Local	$1,000
Work with the MDA on regulations relating to pesticides and fertilizer.	All	2003-2007	*ES*	State, Local	$1,500

Objective 1: Decrease the nutrient and sediment concentration of surface water to the 50th percentile of the North Central Hardwood Forests Ecoregions and Western Corn Belt Plains *(Continued…).*

Action	Applicable Watershed(s)	Timeline	Coordinating Agency(s) *(Lead)*	Funding Source(s)	5-yr. Local Cost (approx.)
Continue yearly empty pesticide container collection day.	All	2003-2007	*UMES*	State, Local	$5,000
Work with watershed management like organizations to identify priority areas for the installation of BMPs.	All	2003-2007	*ES, SWCD, WMLOs*	Federal, State, Local	$10,000

GOAL 2: INCREASE WETLAND PRESERVATION AND RESTORATION EFFORTS.

Objective 1: Through education and regulation, preserve existing wetlands within the County.

Action	Applicable Watershed(s)	Timeline	Coordinating Agency(s) *(Lead)*	Funding Source(s)	5-yr. Local Cost (approx.)
Administer the Minnesota Wetland Conservation Act as the LGU for Kandiyohi County.	All	2003-2007	*ES, SWCD*	State, Local	$192,000
Inventory and prioritize wetlands for benefits to water quality, flood control, recharge and recreation.	All	2003-2005	*SWCD,* ES	State, Local	$5,000
Hold meetings as needed with the County Ditch Authority on ditch maintenance issues.	All	2003-2007	*ES*	Local	$500
Through meetings, newspaper articles and other media, provide education and information on the functions and values of wetlands.	All	2003-2007	*ES, SWCD, WMLOs*	State, Local	$1,000
Wetlands that are located within shoreland and floodplain areas shall be designated as high priority preservation areas.	All	2003-2007	*DNR, SWCD*	State, Local	$10,000

Objective 2: Provide educational and technical assistance to landowners to restore 1,250 acres of wetlands within the County.

Action	Applicable Watershed(s)	Timeline	Coordinating Agency(s) *(Lead)*	Funding Source(s)	5-yr. Local Cost (approx.)
Support wetland restoration through State and Federal programs by providing options and information to landowners.	All	2003-2007	*ES, NRCS, SWCD*	Federal, State, Local	$2,000
Educate landowners on opportunities provided by the State wetland banking program.	All	2003-2007	*ES, SWCD*	State, Local	$2,500

GOAL 3: IMPLEMENT PROGRAMS AND REGULATION TO MINIMIZE THE EFFECT OF STORMWATER AND WASTEWATER ON WATER QUALITY.

Objective 1: Through education and regulation, ensure proper rural and urban stormwater management.

Action	Applicable Watershed(s)	Timeline	Coordinating Agency(s) *(Lead)*	Funding Source(s)	5-yr. Local Cost (approx.)
Explore the development of an erosion and stormwater management ordinance (including impervious surface limits) for the fastest developing areas within the County (i.e. Middle Fork Crow River Watershed, shoreland areas and the Willmar area).	All	2003-2007	*ES*	Local	$2,000
Explore the development of a Regional Stormwater Plan within the Middle Fork of the Crow River Watershed.	MFCR	2003-2005	*DNR, ES, MPCA*	State, Local	$3,000
Provide yearly educational programs on stormwater management and other BMPs.	All	2003-2007	*SWCD, UMES*	State, Local	$2,500
Through land use controls and regulations, require stormwater management plans for proposed development projects.	All	2003-2007	*ES*	Local	$2,000

Objective 2: Provide educational and technical assistance to landowners and cities to ensure the compliance of ISTSs and municipal wastewater treatment facilities.

Action	Applicable Watershed(s)	Timeline	Coordinating Agency(s) *(Lead)*	Funding Source(s)	5-yr. Local Cost (approx.)
Provide technical assistance to landowners to upgrade 1,000 failing septic systems.	All	2003-2007	*ES*	State, Local	$250,000
Work with the Green Lake Sanitary Sewer and Water District (GLSSWD) to hook up nonconforming ISTSs from trailer parks and subdivisions located within 1,000 feet of existing sewer lines.	MFCR	2003-2007	*ES, GLSSWD, MPCA*	Local	$5,000
Seek and provide Federal and State programs that provide funding to upgrade ISTSs and municipal wastewater treatment infrastructure.	All	2003-2007	*ES, MPCA, WMLOs*	State, Local	$100,000
Assist unsewered communities in their efforts in gaining local, State and Federal funds for the installation of community wastewater systems. These communities include Prinsburg, Blomkest, Hawick, Regal, Roseland and Svea.	All	2003-2007	*ES, MPCA*	Federal, State, Local	$10,000

GOAL 4: PROTECT WATER RESOURCES FROM THE IMPACT OF SHORELAND DEVELOPMENT.

Objective 1: Through education and regulation, protect shoreland areas within the County.

Action	Applicable Watershed(s)	Timeline	Coordinating Agency(s) *(Lead)*	Funding Source(s)	5-yr. Local Cost (approx.)
Revise shoreland controls for Green Lake, within the City of Spicer, and Kandiyohi County to promote consistent and sustainable development.	All	2003-2007	*DNR, ES*	State, Local	$5,000

Objective 1: Through education and regulation, protect shoreland areas within the County *(Continued…)*.

Action	Applicable Watershed(s)	Timeline	Coordinating Agency(s) *(Lead)*	Funding Source(s)	5-yr. Local Cost (approx.)
Explore the creation of Special Protection Districts within the Shoreland District to limit development in ecologically fragile areas, such as Diamond Lake's Dog Fish Bay and the bulrush stand near the outlet of Green Lake.	All	2003-2007	*DNR, ES*	State, Local	$1,000
Provide technical assistance to watershed management-like organizations on monitoring the effects of development.	All	2003-2007	*DNR, SWCD*	Local	$2,000
Administer Shoreland and Floodplain Zoning Ordinances, as well as MPCA's NPDES permit requirements.	All	2003-2007	*ES*	Federal, State, Local	$125,000
Provide education and technical assistance on remediating lakeshore and streambank erosion and if available, provide State cost share assistance for the control of erosion in these areas.	All	2003-2007	*DNR, ES, SWCD*	State, Local	$100,000
Establish public/information system on the impacts of shoreline development and ways to minimize them (shoreline stabilization, erosion control, land use regulation, lawn care, etc.).	All	2003-2005	*DNR, ES, SWCD, WMLOs*	State, Local	$10,000
Encourage lawn chemical (pesticides, herbicides, and fertilizers) use along lakeshores and streams to be done in strict accordance with established restrictions and recommended application techniques. Work with Lake Associations through educational efforts.	All	2003-2007	*ES, SWCD, UMES, WMLOs*	Local	$2,500

GOAL 5: IMPROVE AGENCY AND PUBLIC PARTICIPATION, COOPERATION AND COORDINATION IN IMPLEMENTING WATER PLAN GOALS AND OBJECTIVES.

Objective 1: Provide opportunities for the general public to become informed on water resource management and the Water Plan.

Action	Applicable Watershed(s)	Timeline	Coordinating Agency(s) *(Lead)*	Funding Source(s)	5-yr. Local Cost (approx.)
The County Water Plan Coordinator shall conduct or attend local meetings, as well as answer questions and provide information to the public regarding Water Plan implementation.	All	2003-2007	*ES*	State, Local	$500
Encourage more active public informational efforts by Federal, State and local agencies and groups regarding water resource management.	All	2003-2007	*ES*, DNR, MPCA, NRCS, SWCD, UMES, WMLOs	Federal, State, Local	$5,000
Develop and maintain a webpage listing general Water Plan goals, as well as available Federal, State and local funding assistance programs.	All	2003-2007	*ES*	Local	$5,000
Provide financial assistance, as available, to the Prairie Woods Environmental Learning Center for agricultural and environmental education.	CR	2003-2007	*DNR, ES, WMLOs*	State, Local	$5,000
The County Water Planning Committee will annually review the implementation of this Plan.	All	2003-2007	*ES*	Local	$2,500
Solicit projects on a quarterly basis for cost sharing with funding recommendations being forwarded to the County Board.	All	2003-2007	*ES*	Local	$2,500
Provide a 50 percent cost-share, with a $3,000 cap per project unless the Taskforce, at its discretion, determines a different rate.	All	2003-2007	*ES*	State, Local	$175,000
Meet yearly with watershed organizations on issues, concerns, projects, etc.	All	2003-2007	*ES*	Local	$500
Hold quarterly Taskforce meetings for reviewing the Water Plan.	All	2003-2007	*ES*	Local	$10,000

Objective 2: Improve communication and cooperation between Federal, State and local agencies and groups.

Action	Applicable Watershed(s)	Timeline	Coordinating Agency(s) *(Lead)*	Funding Source(s)	5-yr. Local Cost (approx.)
Continue membership in the C.R.O.W. and Minnesota Rivers Joint Powers Boards.	MFCR, NFCR, SFCR	2003-2007	ES	Local	$30,000
Coordinate, as needed, the efforts of Federal, State and local agencies and groups to develop local water management plans.	All	2003-2007	ES	Local	$1,000
Maintain communication and cooperation between public agencies regarding all areas of water and environmental management.	All	2003-2007	ES	Local	$1,000
Seek funding sources to assist with local water planning, inventorying/mapping and implementation efforts.	All	2003-2007	ES, SWCD	Local	$1,000

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Kandiyohi County Chapter 5 – Ten-Year Implementation Plan

GOAL 1: MINIMIZE FLOOD RELATED DAMAGE, WHILE ENSURING AN ADEQUATE SUPPLY OF SURFACE WATER FOR AGRICULTURAL, COMMERCIAL/INDUSTRIAL, NATURAL RESOURCES AND RECREATIONAL PURPOSES.

Objective 1: Assist in gathering and utilizing information concerning surface water quantity.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Provide technical and financial assistance, as available, to watershed management-like organizations in installing and monitoring flow and level gauges on major rivers and lakes in the County. (I)	All	2003-2012	*ES, SWCD*	State, Local	$30,000
Increase the number of rain gauge readers that report to the State Climatology Office to one per township. (I)	All	2003-2007	*DNR, ES, SWCD*	State, Local	$1,500
Explore creating a County Surface Water Atlas GIS database. (N)	All	2003-2005	*DNR, ES, SWCD*	State, Local	$500

Objective 2: Implement educational efforts and land use controls to maintain or reduce current rates of runoff.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Explore the development of a Regional Stormwater Plan within the Middle Fork of the Crow River Watershed. (U)	MFCR	2003-2005	*DNR, ES, MPCA*	State, Local	$3,000
Through County Land Use Ordinances, require any future developments to provide adequate ponding to maintain predevelopment runoff rates. (U)	All	2003-2012	*ES*	Local	$10,000

Objective 2: Implement educational efforts and land use controls to maintain or reduce current rates of runoff *(Continued…).*

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Encourage the restoration of wetlands and lakebeds as storage areas and to slow surface drainage. (I)	All	2003-2012	*NRCS, SWCD, WMLOs*	Federal, State, Local	$50,000
Implement educational efforts to control or reduce the effects of accelerated runoff from urban and rural areas. (I)	All	2003-2005	*ES, MPCA*	Federal, State, Local	$5,000
Work with municipalities on managing stormwater runoff. (I)	All	2003-2012	*MPCA*, ES	Federal, State, Local	$10,000
Support efforts to examine the use of reservoirs to minimize flooding with landowner compensation. (N)	All	2003-2012	*County*	Federal, State, Local	$5,000

Objective 3: Minimize flood-related damage and protect floodplain areas from encroachment through the implementation of projects and land use controls.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Support the Grass Lake Stormwater Storage Project. (U)	SFCR	2003-2012	*ES, SWCD*	Federal, State, Local	$5,000
The County shall continue to enforce its existing floodplain regulations. (I)	HC, MFCR, NFCR	2003-2012	*ES*	Local	$500
Request from DNR an update of floodplain map. (I)	All	2003	*ES*	Local	$50
Work with the DNR to resolve lake level conflicts. (N)	All	2003-2012	*ES*	State, Local	$100

Objective 4: Maintain or improve the surface water drainage system to current regulatory specifications and as to promote water quality.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Provide technical assistance to landowners to implement BMPs to control erosion along watercourses and waterbodies. (U)	All	2003-2012	*NRCS, SWCD*	Federal, State, Local	$500,000
Evaluate impacts on wetlands if future drainage projects are planned according to the Minnesota Wetland Conservation Act. (U)	All	2003-2012	*DA, ES, SWCD*	State, Local	$100,000
Promote use of drop inlets for drainage ditch side inlets. (U)	All	2003-2012	*DA*	Local	$5,000
Provide educational assistance to landowners on proper ditch maintenance. (U)	All	2003-2012	*DA*	Local	$5,000
Evaluate the impact of additional tiling on the County's drainage system. (U)	All	2003	*DA, WMLOs*	Local	$1,000
Maintain the availability of cost share for side inlet structures to drainage ditches if monies are made available. (I)	All	2003-2012	*SWCD*	Local	$20,000
Continue an annual drainage ditch maintenance program including a maintenance schedule and adequate funding through the County ditch maintenance fund. (I)	All	2003-2012	*DA*	Local	$150,000
Work with the Lake Associations in examining future funding options for lake outlet improvements. (I)	All	2003-2012	*DA, DNR*	Federal, State	$2,500
Support efforts to maintain the drainage system between Lake Wagonga and Big Kandiyohi Lake. (N)	SFCR	2003-2012	*DA*	Local	$1,000

GOAL 2: MAXIMIZE THE BENEFITS OF COUNTY WETLAND RESOURCES.

Objective 1: Protect and preserve existing wetlands through education and existing regulations.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Identify wetlands that are located within shoreland and floodplain areas as high priority preservation areas. (U)	All	2003-2012	*DNR, ES, SWCD*	State, Local	$20,000
Encourage and cooperate with Federal, State and local efforts to purchase existing wetland areas for wildlife habitat areas or inclusion of privately owned wetlands into Federal and State conservation programs. (I)	All	2003-2012	*County*	Federal, State, Local	$20,000

Objective 2: Promote the restoration of wetlands through education and enrollment in conservation programs.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Promote the restoration of wetlands by landowners with financial incentives or assistance in the form of tax breaks or cost sharing from government or private entities. (I)	All	2003-2012	*NRCS, SWCD*	Federal, State, Local	$50,000

GOAL 3: PROTECT AND IMPROVE SURFACE WATER QUALITY.

Objective 1: Provide educational and technical assistance to landowners to control and reduce the water quality impacts of agricultural land use.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Provide educational and technical assistance to landowners regarding the implementation of alternative drainage practices. (U)	All	2003-2012	*SWCD*, UMES, WMLOs	State, Local	$20,000
Provide educational and technical assistance to local landowners for agricultural erosion and sediment control. (U)	All	2003-2012	*NRCS, SWCD*	Federal, State, Local	$250,000
Promote the utilization of land retirement programs to remove land that is contributing significant sediment loads to surface waterbodies and watercourses from agricultural production. (U)	All	2003-2012	*NRCS, SWCD, WMLOs*	Federal, State, Local	$200,000
Through land use controls, protect existing prime farmland and critical watershed protection areas from development. (U)	All	2003-2012	*DNR, ES*	State, Local	$10,000
Work with the DNR, SWCD and the Eagle Lake Association to examine options to maintain the Halvorson Dam. (U)	HC	2003-2007	*DNR, ES, SWCD, WMLOS*	State, Local	$1,000
Promote the creation of sediment basins or traps along drainage courses prior to entering lakes. (I)	All	2003-2012	*DNR, SWCD*	Federal, State, Local	$5,000
Prohibit the cultivation of roadside ditches, ponding areas, or other drainage features. (I)	All	2003-2012	*DA, HD*	Local	$5,000
Support the Minnesota Department of Agriculture's programs of the licensing of chemical applicators for both agricultural and urban purposes. (I)	All	2003-2012	*County*	State, Local	$10,000

Objective 2: Support present and future surface water quality monitoring efforts.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Assist and promote Federal, State and local water quality monitoring programs and efforts. (U)	All	2003-2012	*ES, SWCD, WMLOs*	Federal, State, Local	$200,000
Work with the MPCA and other Federal, State and local agencies and groups on the development of TMDL plans, if required, on impaired waters in the County. (U)	All	2003-2012	*DNR, ES, MPCA, SWCD, WMLOs*	Federal, State, Local	$10,000
Provide financial and technical assistance, as available, to watershed management-like organizations in conducting diagnostic, feasibility and other studies. (U)	All	2003-2012	*County*	State, Local	$50,000

Objective 3: Utilize programs and regulations to protect surface water resources from livestock manure contamination.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Educate landowners on the proper storage and land spreading of animal manure. (U)	All	2003-2012	*ES, NRCS, SWCD, UMES*	Federal, State, Local	$10,000
Maintain, through the County feedlot program, a minimum distance of feedlots or manure storage from surface waters. (U)	All	2003-2012	*ES*	Local	$10,000
Promote and cooperate with the efforts of the MPCA to regulate feedlots and reduce related water resource contamination. (U)	All	2003-2012	*ES*	State, Local	$10,000
Promote Federal, State and local programs that offer technical or financial assistance for upgrading feedlots. (U)	All	2003-2012	*ES, MPCA, NRCS, SWCD, WMLOs*	Federal, State, Local	$10,000
Provide technical and financial assistance, as available, to upgrade feedlots. (U)	All	2003-2012	*ES, MPCA, NRCS, SWCD*	Federal, State, Local	$500,000

Objective 4: Implement programs and regulations to minimize the effects of development and construction activities on water quality.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Implement buffer strips and lakeshore naturalization projects on 25 percent of the County's developed shoreline, with emphasis on heavily developed lakes (i.e. Eagle, Green, Norway, Nest, etc.). (U)	All	2003-2012	*DNR, ES, SWCD, WMLOs*	State, Local	$20,000
Explore the development of an erosion and stormwater management ordinance (including impervious surface limits) for the fastest developing areas within the County (i.e. Middle Fork Crow River Watershed, shoreland areas and the Willmar area). (U)	All	2003-2007	*ES*	Local	$2,000
Explore the creation of Special Protection Districts within the Shoreland District to limit development in ecologically fragile areas, such as Diamond Lake's Dog Fish Bay and the bulrush stand near the outlet of Green Lake. (U)	All	2003-2007	*DNR, ES*	State, Local	$1,000
Revise shoreland controls for Green Lake, within the City of Spicer, and Kandiyohi County to promote consistent and sustainable development. (U)	All	2003-2007	*DNR, ES*	State, Local	$5,000
Work with the DNR and MPCA to resolve the hydrogen sulfide issue that faces the City of New London's Mill Pond. (U)	MFCR	2003-2005	*DNR, ES, MPCA*	State, Local	$8,000
Administer Shoreland and Floodplain Zoning Ordinances, as well as MPCA's NPDES permit requirements. (U)	All	2003-2012	*ES*	Federal, State, Local	$250,000

Objective 4: Implement programs and regulations to minimize the effects of development and construction activities on water quality *(Continued…)*.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Encourage lawn chemical (pesticides, herbicides, and fertilizers) use along lakeshores and streams to be done in strict accordance with established restrictions and recommended application techniques. Work with Lake Associations through educational efforts. (U)	All	2003-2012	*ES, SWCD, UMES, WMLOs*	Local	$10,000
Provide educational and technical assistance on remediating lakeshore and streambank erosion and if available, provide State cost share assistance for the control of erosion in these areas. (U)	All	2003-2012	*DNR, ES, SWCD*	State, Local	$200,000
Establish public/information system on the impacts of shoreline development and ways to minimize them (shoreline stabilization, erosion control, land use regulation, lawn care, etc.). (I)	All	2003-2005	*DNR, ES, SWCD, WMLOs*	State, Local	$10,000
Work with the Kandiyohi County Lakes Improvement Association to re-establish trees and buffer strips on lakeshore properties, to restore lake water quality, fish and wildlife habitat, and aesthetics. (I)	All	2003-2012	*DNR, ES, SWCD, WMLOs*	State, Local	$30,000
Utilize the digital soils map, when made available, to assist County staff and decision-makers on land use changes. (I)	All	2003-2007	*ES, NRCS, SWCD*	Federal, State, Local	$2,500
Encourage Lake Associations to join the Kandiyohi County Lakes Improvement Association. (I)	All	2003-2012	*ES, WMLOs*	Local	$1,000

Objective 5: Through education and regulations, promote the use of individual sewage treatment and municipal wastewater treatment systems to protect water quality.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Work with the Green Lake Sanitary Sewer and Water District (GLSSWD) to hook up nonconforming ISTSs from trailer parks and subdivisions located within 1,000 feet of existing sewer lines. (U)	MFCR	2003-2007	*ES, GLSSWD, MPCA*	Local	$5,000
Continue to provide educational information to the public on proper ISTS installation, treatment, disposal and maintenance, as well as applicable State and County regulations. (U)	All	2003-2012	*ES, MPCA, UMES*	State, Local	$20,000
Continue annual training program for septic system installers and septage haulers. (U)	All	2003-2012	MPCA, *ES*	State, Local	$1,000
Seek and provide Federal and State programs that provide funding to upgrade ISTSs and municipal wastewater treatment infrastructure. (U)	All	2003-2012	*ES, MPCA, WMLOs*	Federal, State, Local	$100,000
Promote the voluntary upgrade of ISTSs. (U)	All	2003-2012	*ES*, MPCA	Local	$5,000
The County shall investigate all complaints of nonconforming septic systems. (U)	All	2003-2012	*ES*	Local	$10,000
Assist unsewered communities in their efforts in gaining local, State, and Federal funds for installation of community wastewater systems. These communities include Prinsburg, Blomkest, Hawick, Regal, Roseland, and Svea. (U)	All	2003-2012	*ES, MPCA*	Federal, State, Local	$20,000
Promote alternative ISTS methods when conventional methods are not feasible. (I)	All	2003-2012	*ES, MPCA*	State, Local	$5,000

GOAL 4: ENSURE THE LONG-TERM QUALITY AND SUPPLY OF GROUNDWATER.

Objective 1: Provide assistance to landowners to protect and maintain existing groundwater recharge areas.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Encourage and cooperate with State and local efforts to preserve wetland areas, ponding sites, or lowland areas through the CRP and RIM programs, which may serve to recharge groundwater, as well as minimize flooding, filter sediments, and provide wildlife habitat. (U)	All	2003-2012	*NRCS, SWCD, USFWS*	Federal, State, Local	$5,000
Work with McLeod, Meeker and Renville counties to request the DNR conduct a regional hydrogeologic atlas for the region. (U)	All	2003-2007	*EC&D*	Local	$1,000
Work with property owners or localities to obtain financial assistance to encourage recharge area protection or offset lost tax revenues from such efforts. (N)	All	2003-2012	*County*	Federal, State, Local	$5,000
Through implementation of runoff management, ponding basins will be protected or designed for groundwater recharge purposes. (N)	All	2003-2012	*MPCA*, ES, SWCD	Federal, State, Local	$5,000

Objective 2: Establish an information base on the existing states of groundwater quality and quantity.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Encourage water conservation research and demonstration projects. (I)	All	2003-2012	*DNR, ES, SWCD, UMES*	Federal, State, Local	$5,000
Work with the DNR and municipalities on water shortage issues and circumstances. (I)	All	2003-2012	*ES, SWCD*	State, Local	$5,000

Objective 2: Establish an information base on the existing states of groundwater quality and quantity *(Continued…).*

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Provide technical assistance for groundwater level monitoring programs and incorporate the data into the State database. (I)	All	2003-2012	*DNR, SWCD*	State, Local	$5,000
Support State and local efforts, through agencies such as MDH, MPCA, MDA, and Kandiyohi County Public Health, in monitoring groundwater quality. (I)	All	2003-2012	*County*	State, Local	$2,000
Encourage efforts by public or private interests to test groundwater quality. (N)	All	2003-2012	*ES, PH*	State	NA
Develop a private water well testing education program. (N)	All	2003-2012	*PH*	Local	$1,000

Objective 3: Provide education to landowners to ensure proper well construction, maintenance, and closure/sealing.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Cooperate with the MDH in the regulation of the construction of new wells and sealing of old wells according the State codes. (I)	All	2003-2012	*ES, SWCD*	State, Local	$1,000
Promote Federal and State well closure cost-share programs and provide local funds, as available. (I)	All	2003-2012	*ES, MDH, SWCD*	Federal, State, Local	$150,000
Provide available information to the public on well maintenance and closure, as well as agencies to contact regarding well closure or general information. (N)	All	2003-2012	*ES, SWCD*	Local	$1,000

Objective 4: Minimize the impacts of agricultural, industrial and residential chemicals on groundwater quality through education and collection programs.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Promote and assist the MDA in waste pesticide collection efforts. (U)	All	2003-2012	*ES*	State, Local	$2,000
Continue programs to educate landowners, rural and urban, on the proper application and disposal of agricultural and lawn chemicals and fertilizer based on established standards, including BMPs and integrated pest management. (I)	All	2003-2012	*ES, UMES*	State, Local	$3,000
Continue to support EPA and MPCA regulations regarding Class V injection wells. (I)	All	2003-2012	*County*	Local	$3,000

Objective 5: Provide educational assistance to landowners on state requirements for above ground and underground storage tanks and minimize groundwater contamination from leaking tanks.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Provide information and direct landowners to proper State agencies for the proper abandonment, removal and cleanup of storage tanks. (U)	All	2003-2012	*MPCA*, ES	Local	$3,000
Request the MPCA inventory and map above ground and underground storage tanks on a GIS database. (N)	All	2003	*ES*	Local	$100
Cooperate, when requested, with the MPCA when they inspect and monitor fuel storage tanks that may be leaking into surface or groundwater. (N)	All	2003-2012	*ES*	State	NA

Objective 6: Assist the MDH in implementing the Wellhead Protection Program.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Consider land use regulations receptive to the needs of wellhead protection areas. (U)	All	2003-2012	*ES*	Local	$1,000
Assist the MDH in wellhead protection technical committees, contaminant source inventories, data collection efforts and creation of land use and property ownership maps. (I)	All	2003-2012	*ES, SWCD*	State, Local	$10,000
Promote ISTS upgrades, abandoned well sealing and BMPs in wellhead protection areas. (I)	All	2003-2012	*ES, NRCS, SWCD*	State, Local	$5,000

GOAL 5: ENSURE THE PROPER HANDLING AND DISPOSAL OF SOLID AND HAZARDOUS WASTE.

Objective 1: Ensure the proper disposal of solid waste through existing regulations and programs.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Continue implementation of the solid waste abatement and disposal strategies outlined by the Kandiyohi County Solid Waste Management Plan. (U)	All	2003-2012	*ES*	State, Local	$30,000,000
Continue educating the public on the importance of recycling, yard waste composting and waste reduction. (U)	All	2003-2012	*ES, MPCA*	State, Local	$500,000
Review and update, as necessary, the County Solid Waste Ordinance to conform to MPCA rules and Waste Management Act amendments. (U)	All	2003-2012	*ES*	Local	$5,000

Objective 1: Ensure the proper disposal of solid waste through existing regulations and programs *(Continued…)*.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Investigate and remediate illegal dumping activities. (U)	All	2003-2012	*ES, MPCA*	Local	$10,000
Provide information to industries and businesses as to where they can get technical assistance for waste disposal. (U)	All	2003-2012	*ES, MPCA*	State, Local	$10,000
Provide information and opportunities to the public to discourage burning and burying of solid waste. (U)	All	2003-2012	*ES, MPCA*	Local	$5,000
Investigate resource recovery options for solid waste management. (I)	All	2003-2012	*ES, MPCA*	Local	$5,000
Encourage through education the cleanup of “private” dumps. (I)	All	2003-2012	*ES, MPCA*	State, Local	$500
Support MPCA’s monitoring program for the Burlington Northern dumpsite at New London. (N)	MFCR	2003-2012	*County*	State	NA
Encourage the MPCA to identify and inventory old dumpsites on a GIS database and assess the pollution impacts to groundwater by testing nearby private wells and conducting regular groundwater monitoring, if necessary. (N)	All	2003	*ES*	State, Local	$1,000

Objective 2: To improve public awareness pertaining to the identification and disposal of hazardous waste.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Manage household hazardous wastes in accordance with the strategy developed in the Solid Waste Management Plan. (U)	All	2003-2012	*ES*	Local	$500,000
Provide information to very small quantity generators on the proper storage, handling, disposal and spill control of hazardous materials. (U)	All	2003-2012	*ES, MPCA*	State, Local	$10,000
Encourage the public to participate in the Kandiyohi County Regional Household Hazardous Waste Program. (U)	All	2003-2012	*ES*	Local	$10,000

GOAL 6: PROTECT AND ENHANCE FISH AND WILDLIFE POPULATIONS AND HABITAT.

Objective 1: Provide educational and technical assistance to landowners to preserve and enhance valuable water-related and upland habitat areas.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Cooperate with DNR, Water Safety Officer, and established Lake Associations to ensure water-based recreational activities are conducive to fish and wildlife habitat. (U)	All	2003-2012	*DNR, ES, WMLOs*	State, Local	$150,000
Provide information to landowners on Federal, State and local programs that enhance and protect fish and wildlife habitat (i.e. Wetland Restoration/Partners for Wildlife Land Acquisition, Private Lands Agreement Program, etc.). (U)	All	2003-2012	*DNR, SWCD, USFWS*	Federal, State, Local	$10,000

Objective 1: Provide educational and technical assistance to landowners to preserve and enhance valuable water-related and upland habitat areas *(Continued…).*

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Provide educational, financial and technical assistance, as available, to control Eurasian Watermilfoil and other noxious weeds. Support the Kandiyohi County COLA in their Eurasian Watermilfoil education efforts. (U)	All	2003-2012	*DNR, ES*	State, Local	$200,000
Support and provide technical assistance, as available, to conservation groups involved in the LCMR Corridors Habitat Project, which aims to protect and develop wildlife habitat within designated corridors, including the Alexandria Moraine Corridor. (U)	CR, MFCR, NFCR	2003-2007	*DNR, SWCD, USFWS*	Federal, State, Local	$5,000
Encourage and promote landowners to seek assistance from Federal, State, local and private programs in planting trees, native grasses and food plots. (I)	All	2003-2012	*NRCS, SWCD*	Local	$5,000
Provide administrative and financial assistance, as available, to local conservation organizations that encourage fish and wildlife habitat improvement projects where appropriate. (I)	All	2003-2012	*ES*	Local	$20,000
Explore the development of an integrated Roadside Management Program that acknowledges the diverse role it plays in water quantity and quality issues as well as wildlife habitat. (I)	All	2003-2012	*DNR, HD*	Local	$10,000
Encourage the establishment of wildlife habitat in cropped covers through field windbreaks, food plots, living snow fences and winter field cover. (I)	All	2003-2012	*NRCS, SWCD*	Federal, State, Local	$10,000

Objective 1: Provide educational and technical assistance to landowners to preserve and enhance valuable water-related and upland habitat areas *(Continued…).*

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Encourage the proper application of aeration systems to improve the angling potential of lakes and streams. (I)	All	2003-2012	*DNR, ES*	State, Local	$10,000

Objective 2: Coordinate efforts with the DNR to protect rare and endangered species.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Work with the DNR to develop land use regulations that are receptive to protecting rare features and species. (U)	All	2003-2007	*DNR, ES*	State, Local	$2,000
Encourage the DNR to complete the Kandiyohi County Biological Survey. (I)	All	2003	*DNR, ES*	State	NA

GOAL 7: PROMOTE SAFE AND ADEQUATE WATER-RELATED RECREATION OPPORTUNITIES.

Objective 1: Expand and improve water-based recreational resources within the County.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Promote and assist the County and Minnesota State Park systems in meeting the recreational needs of the County and the region. (U)	All	2003-2012	*County*	State, Local	$2,000,000
Work with Federal, State and local agencies and groups to pursue grants and other available funding for the acquisition and maintenance of water-based recreation areas. (I)	All	2003-2012	*ES, PD*	Federal, State, Local	$5,000

GOAL 8: MAINTAIN AGENCY AND PUBLIC INVOLVEMENT IN WATER RESOURCE MANAGEMENT.

Objective 1: Actively research and address important existing or potential water resource management issues.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
The County Water Plan Coordinator shall conduct or attend local meetings to keep the public informed of current Water Plan activities and accomplishments, as well as answer questions and provide information to the public regarding Water Plan implementation. (U)	All	2003-2012	*ES*	State, Local	$170,000
Encourage more active public informational efforts by Federal, State and local agencies and groups regarding water resource management. (I)	All	2003-2012	*ES*, DNR, MPCA, NRCS, SWCD, UMES, WMLOs	Federal, State, Local	$10,000
Develop and maintain a webpage listing general Water Plan goals, as well as available Federal, State and local funding assistance programs. (I)	All	2003	*ES*	Local	$10,000
Encourage the development of the Prairie Woods Environmental Learning Center for agricultural and environmental education. (I)	CR	2003-2012	*DNR, ES, WMLOs*	State, Local	$10,000

Objective 2: Continue communication and cooperation with Federal, State and local agencies and groups, regarding water resource management and the implementation of the Water Plan.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
The County Water Planning Committee will annually review the implementation of this Plan. (U)	All	2003-2012	*ES*	Local	$5,000
Continue membership in the C.R.O.W. and Minnesota Rivers Joint Powers Boards. (U)	NFCR, MFCR, SFCR	2003-2012	*ES*	Local	$60,000

Objective 2: Continue communication and cooperation with Federal, State and local agencies and groups, regarding water resource management and the implementation of the Water Plan *(Continued…)*.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Hold quarterly Taskforce meetings for reviewing the Water Plan. (U)	All	2003-2012	*ES*	Local	$20,000
Coordinate, as needed, the efforts of Federal, State and local agencies and groups to develop local water management plans. (I)	All	2003-2012	*ES*	Local	$2,000
Maintain communication and cooperation between public agencies regarding all areas of water and environmental management. (I)	All	2003-2012	*ES*	Local	$2,000

Objective 3: Continue to provide Natural Resource Block Grant monies, as available, to local organizations for local projects.

Action U=Urgent, I=Important, N=Noteworthy	Applicable Watershed(s)	Timeline	Coordinating Agencies *(Lead)*	Funding Source(s)	10-yr. Local Cost (approx.)
Solicit projects on a quarterly basis for cost sharing with funding recommendations being forwarded to the County Board. (U)	All	2003-2012	*ES*	Local	$5,000
Provide a 50 percent cost-share, with a $3,000 cap per project unless the Taskforce, at its discretion, determines a different rate. (U)	All	2003-2012	*ES*	State, Local	$350,000
Recipients of cost-share funds shall submit testing results or reports (if applicable) in report format to the Taskforce prior to receiving final payment, as requested. (I)	All	2003-2012	*ES*	NA	NA

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CHAPTER SIX:
PLAN ADMINISTRATION

Chapter six contains information on plan administration, including plan coordination, implementation, schedule, role of the County in implementation, role of other agencies in implementation, recommended changes to State programs, intergovernmental conflicts/resolution process, major plan amendment procedure, minor plan amendment procedure and general information.

Plan Coordination

Managing Kandiyohi County's water resources is a complicated task, involving many local, State and Federal agencies, as well as private citizens and special interest groups. For any water planning activity to be successful, a well-coordinated effort is needed. Kandiyohi County is committed to working with each of these entities to ensure proper management of its water resources.

Implementation

Kandiyohi County will ensure coordination and implementation of its Comprehensive Local Water Plan through its established Water Plan Taskforce. The taskforce will meet, at least quarterly, to review progress, identify emerging problems, opportunities and issues and continue to direct the implementation of the plan. Taskforce members will be appointed by the County Board and shall serve four-year terms, with an eight-year maximum. The taskforce will be supported by the County Board appointed Water Plan Coordinator. The coordinator shall administer the implementation of this plan, coordinate the taskforce activities, write grant proposals, prepare annual work plans and reports and other activities as specified by the Kandiyohi County Board of Commissioners.

Schedule

Coordination of the Comprehensive Local Water Plan activities will commence with the County Board adoption of the plan. These activities will be conducted throughout the planning period identified as January 1, 2003, through December 31, 2012. A more focused five-year plan, with more specific goals, objectives and action steps, will be implemented during the period of January 1, 2003, through December 31, 2007.

Role of the County in Implementation

The County recognizes the importance of comprehensive local water planning and the key role the County, township and city government must play in water planning decisions that impact water resources. The Water Plan's goals, objectives and actions are a reflection of the water related concerns in the County. Implementation will be based on current needs, funding and availability of staff. Consideration will be given to changes in State initiatives and regulations.

The annual work plan will be a detailed strategy of measurable criteria for actions to be carried out. The County realizes that completion of all goals and objectives requires staff and funds beyond the County budget. It is also understood that State funding cannot provide the funding for all goals and objectives for all counties. The County, through various sources, will pursue outside funding opportunities as they become available.

Role of Other Agencies in Implementation

Throughout the Comprehensive Local Water Plan, County departments, local government units, special interest groups, and State and Federal agencies that are involved are listed. It is hoped that the valuable cooperation that has been established over the past years will continue.

Recommended Changes to State Programs

In order to implement the goals and objectives set forth in the Kandiyohi County Comprehensive Local Water Plan, continued cooperation between the County and various State agencies is necessary. In an effort to increase coordination in this effort, the County makes the following recommended changes to State agency programs:

A. Counties should continue to be notified of State agency program changes and the availability of funding;

B. Data collected by State agencies should be readily shared with the County and other agencies to avoid duplicative efforts;

C. State agencies should continue to provide local and/or regional staff to assist local officials with agency programs;

D. Fees collected at the County level should be allowed to remain within the County to administer and implement water-related programs;

E. An annual listing of State agency staff that are assigned to water management planning should be created to facilitate increased coordination between local officials and agency staff; and

F. State agencies should provide greater flexibility to counties in setting annual work plan priorities. Priorities should be based upon current needs, funding, availability of staff and changes in State initiatives and regulations.

Intergovernmental Conflicts/Resolution Process

In the development of this plan, there were no intergovernmental conflicts that arose. In the event of an intergovernmental conflict, the Kandiyohi County Board of Commissioners shall request the Kandiyohi County Water Plan Taskforce to intervene and informally negotiate resolution of the conflict. If the taskforce does not resolve the conflict, the County shall petition the Board of Water and Soil Resources (BWSR) for a contested case hearing.

Major Plan Amendment Procedure

The Kandiyohi County Comprehensive Local Water Plan is intended to extend through the year 2012. The County may prepare proposed amendments to the plan prior to 2012; however, the plan will be updated, including any proposed plan amendments, before the end of 2012.

The following procedures will be used by Kandiyohi County to deal with proposed major amendments to the County Comprehensive Local Water Plan:

A. When issues are brought to the attention of the County with regard to the need for amendments to its adopted County Comprehensive Local Water Plan, the County will refer that person, group, local unit of government, or agency to the County's Water Plan Taskforce.

B. The Kandiyohi County Water Plan Taskforce will review the issue and may, if necessary, undertake studies or investigations to gather information relating to the issue. After reviewing the issue, the County Water Plan Taskforce will determine whether the County Comprehensive Local Water Plan should be amended.

C. If the County Water Plan Taskforce determines that the County Comprehensive Local Water Plan should be amended, it will make recommendations to the County Board. The County Board shall approve or disapprove the proposed amendment.

After development, but before final adoption by the County Board, a proposed amendment to the County Comprehensive Local Water Plan must be submitted for local review and comment in the following manner. The County must submit the proposed plan amendment to all local units of government wholly or partly within the County, the applicable regional development commission (if any), each contiguous county and watershed management organization and other counties or watershed management organizations within the same watershed unit and groundwater system that may be affected by the proposed plan amendment.

A local unit of government must review the proposed amendment and its existing water and land-related land resources plan or official controls and in its comments describe in a general way, possible amendments to its existing plans or official control, and an estimate of the fiscal or policy effects that would be associated with those amendments, to bring them into conformance with the proposed plan amendment. A county or watershed management organization within the same watershed unit or groundwater system must review the proposed plan amendment and describe in its comments possible conflicts with its existing or proposed comprehensive water plan and suggest measures to resolve the conflicts. The regional development commission must review the proposed amendment under Section 462.391, Subdivision 1.

Comments from local review must be submitted to the County Board within 60 days after receiving a proposed plan amendment for comment, unless the County Board determines that good cause exists for an extension of this period and grants an extension. The County Board must conduct a public hearing on the proposed plan amendment pursuant to Section 375.51 after the 60-day period for local review and comment is completed, but before it is submitted to the State.

After conducting the public hearing, but before final adoption, the County Board must submit the proposed plan amendment, all written comments, a record of the public hearing and a summary of changes incorporated in the proposed plan amendment as a result of the review process to the BWSR for review. The BWSR must complete the review within 90 days after receiving the proposed County Comprehensive Local Water Plan amendment and support document. The BWSR must consult with the Departments of Agriculture, Health, Natural Resources, Pollution Control, Planning Agency, Environmental Quality and other appropriate State agencies during the review.

The BWSR may disapprove a proposed amendment if it determined the amendment is not consistent with State law or the principles of sound hydrologic management, effective environmental protection and efficient management. If the amendment is disapproved, the BWSR must provide a written statement for its reasons for disapproval. The disapproved County Comprehensive Local Water Plan amendment must be revised by the County Board and resubmitted for approval by the BWSR within 120 days after receiving notice of disapproval, unless the BWSR extends the period for good cause. The decision of the BWSR to disapprove the amendment may be appealed by the county to District Court.

A County Board must adopt and begin implementation of its amended County Comprehensive Local Water Plan within 120 days after receiving notice of approval of the amendment from the BWSR.

Minor Plan Amendment Procedure

If a revision/amendment to the Kandiyohi County Comprehensive Local Water Plan is considered to be minor in nature, the following revision process will be followed:

A. The Kandiyohi County Board of Commissioners will receive a recommendation from the Kandiyohi County Water Plan Taskforce for an amendment to the Water Plan.

B. At the Board of Commissioners' meeting, where the amendment is introduced, the County will hold a public hearing to explain the amendments and publish a legal notice of the hearing at least ten (10) days before the date of the hearing.

C. The County will send copies of the amendments to the BWSR Board Conservationist assigned to Kandiyohi County for review and comment.

General Information

All amendments adopted by the County will be printed in the form of replacement pages for the Comprehensive Local Water Plan. Each page will show deleted text as stricken and new text as underlines on draft amendments, as needed, and include the effective date of the amendment. The County will maintain a distribution list of agencies and individuals who have received a copy of the Comprehensive Local Water Plan and the County shall distribute copies of the amendment(s) within thirty days of adoption.

To view a copy of the following appendices of the Kandiyohi County Comprehensive Local Water Plan, please contact the Kandiyohi County Environmental Services Office.

Appendix A – DNR Water Appropriation Permits

Appendix B – DNR Classified Lakes

Appendix C – MPCA Underground Storage Tank List

Appendix D – DNR Fisheries Completion Reports

Appendix E – DNR Observation Well Data

Appendix F – Water Quality Data