Blue Earth County Water Management Plan 2008-2013

Blue Earth County

Blue Earth County
Soil and Water Conservation District

Blue Earth County Water Management Plan 2008-2013

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Effective through June 30, 2013.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY ..... i.

LIST OF MAPS ..... a.

ABBREVIATIONS AND TERMS ..... b.

INTRODUCTION 1

BACKGROUND AND NATURAL RESOURCES INVENTORY 11

PRIORITY CONCERN: GROUND WATER 59

PRIORITY CONCERNS ASSESSMENT 60
GOALS AND GUIDING PRINCIPLES 74
OBJECTIVES AND ACTIONS 75

PRIORITY CONCERN: SURFACE WATER - IMPAIRED SURFACE WATERS AND TMDLS 77

PRIORITY CONCERNS ASSESSMENT 78
GOALS AND GUIDING PRINCIPLES 84
OBJECTIVES AND ACTIONS 85

PRIORITY CONCERN: SURFACE WATER - LIVESTOCK FEEDLOTS AND MANURE MANAGEMENT 87

PRIORITY CONCERNS ASSESSMENT 88
GOALS AND GUIDING PRINCIPLES 103
OBJECTIVES AND ACTIONS 104

PRIORITY CONCERN: SURFACE WATER - COUNTY DRAINAGE DITCHES 107

PRIORITY CONCERNS ASSESSMENT 108
GOALS AND GUIDING PRINCIPLES 119
OBJECTIVES AND ACTIONS 120

PRIORITY CONCERN: SURFACE WATER - AGRICULTURAL RUNOFF, SOIL EROSION AND PESTICIDES 125

PRIORITY CONCERNS ASSESSMENT 126
GOALS AND GUIDING PRINCIPLES 138
OBJECTIVES AND ACTIONS 140

PRIORITY CONCERN: GROUND AND SURFACE WATER - WASTEWATER TREATMENT - SUBSURFACE SEWAGE TREATMENT SYSTEMS (SSTS) 143

PRIORITY CONCERNS ASSESSMENT 144
GOALS AND GUIDING PRINCIPLES 153
OBJECTIVES AND ACTIONS 154

PRIORITY CONCERN: SURFACE WATER - URBAN DEVELOPMENT, STORMWATER RUNOFF AND PESTICIDES 157

PRIORITY CONCERNS ASSESSMENT 158
GOALS AND GUIDING PRINCIPLES 165

OBJECTIVES AND ACTIONS 166

PRIORITY CONCERN: WETLANDS & WILDLIFE 169

PRIORITY CONCERNS ASSESSMENT 170
GOALS AND GUIDING PRINCIPLES 181
OBJECTIVES AND ACTIONS 182

PRIORITY CONCERNS: GROUND AND SURFACE WATER - HOUSEHOLD HAZARDOUS WASTE, WASTE PESTICIDES AND MERCURY PRODUCTS 185

PRIORITY CONCERNS ASSESSMENT 186
GOALS AND GUIDING PRINCIPLES 190
OBJECTIVES AND ACTIONS 191

IMPLEMENTATION PLAN SCHEDULE 193

IMPLEMENTATION PLAN 194
IMPLEMENTATION PLAN BUDGET TABLE AND TIMELINE 197

APPENDIX A – IMPAIRED WATERS, TMDLS – FACTSHEETS AND MAPS 209

APPENDIX B – PRIORITY CONCERS SCOPING DOCUMENT

WATER MANAGEMENT PLAN 2008-2013

Practical, Measurable and Achievable

EXECUTIVE SUMMARY

Purpose of the Plan

The purpose of the Blue Earth County *Water Management Plan 2008-2013* is to identify and assess priority water resource concerns, develop goals and objectives to address priority concerns, and provide direction for Blue Earth County and Blue Earth County Soil and Water Conservation District (SWCD) programs and decision making. Actions to achieve plan objectives are specified along with the necessary financial and staff resources and lead agency for a five-year period, July 1, 2008 through June 30, 2013.

Priority Concerns

Written surveys, a public meeting and many workshops were used to identify the priority concerns for Blue Earth County. A *Priority Concerns Scoping Document* (PCSD) summarizing the process used to identify priority concerns was prepared and is included in the Appendix. The five priority concerns identified in the PCSD are: Ground water, Surface Water, Drainage Ditches, Wetlands and Wildlife. These priority concerns are broad and most are interrelated from a hydrological standpoint. In addition, there are a many sources of surface water pollution, and many pollutants are a concern to both ground and surface water. Land use and pollutant sources directly related to surface water and ground water priority concerns were identified and addressed separately as sub-priority concerns in the *Water Management Plan 2008-2013.* A complete list of priority concerns and sub-priority concerns includes the following:

- Ground water
- Surface water
    - Impaired Waters and Total Maximum Daily Loads (TMDLs)
    - Agricultural Runoff, Erosion and Pesticides
    - Feedlots, Manure Management
    - Urban Development and Stormwater Runoff
- Drainage ditches
- Wetlands
- Wildlife
- Ground water *and* Surface water
    - Wastewater Treatment - Subsurface Sewage Treatment Systems
    - Mercury, Pesticides and Household Hazardous Waste

The permanent conversion of agricultural land and open space to urban land use is an overriding concern and is considered one of the greatest threats to natural resources in Blue Earth County. Protecting water resources and all natural resources is a local priority. The County is leading a planning effort in partnership with municipalities and many other stakeholders to develop a local plan for prioritizing, protecting, restoring and enhancing natural resources throughout Blue Earth County.

Priority Concern: Ground Water

Protecting ground water quality and quantity is the highest priority for Blue Earth County's residents. Geologic sensitivity, well construction, and land use influence the quality of ground and drinking water supplies. There are public and private wells with a higher susceptibility to contamination due to shallow depth to bedrock, coarse soils or shallow aquifers.

Groundwater supply and groundwater quality data are lacking. Better data is needed to develop more meaningful local policy to protect ground water. As described in the 2005 DNR Report to the Legislature on the *Sustainability of Minnesota's Ground Water: A Statement of Issues and Needs,* there is a State-wide need for groundwater information. The County supports State efforts to complete a geologic atlas for Blue Earth County and expanded monitoring programs such as ground water level monitoring wells and physical and chemical testing in Blue Earth County.

Well Sealing Next to Feedlot

Priority Concern: Surface Waters

Surface water is a broad priority concern. It includes rivers, streams, lakes and wetlands. The sources of pollution to surface waters are numerous, generally related to land use and are considered either point or nonpoint sources. Point sources are mainly municipal wastewater and industrial discharges. The MPCA regulates point sources with permitting, inspections, monitoring and reporting requirements. Nonpoint sources are less easily identified, widespread and include both agricultural and urban land use. Nonpoint source pollution is recognized as a major source of pollution.

As the dominant land use in Blue Earth County, it is generally understood that runoff from agricultural land is a major source of nonpoint source pollution related to land use. Runoff from urban areas, wastewater discharges in

unincorporated areas and natural processes such as channel and bank erosion are also nonpoint sources contributing significantly to local water quality impairments.

Priority Concern: Impaired Waters and Total Maximum Daily Loads (TMDLs)
The MPCA is in the process of assessing surface waters in Minnesota and has identified water quality impairments in virtually every watershed in Blue Earth County. The pollutants causing these impairments affect aquatic life and include mainly turbidity, nutrients, fecal bacteria, pesticides and mercury. TMDL reports and implementation plans will be required for these impairments. TMDLs are relatively new to local water management, but addressing pollutants causing water quality impairments has been the focus of local water planning for twenty years and much longer for many local programs at the County and SWCD. Depending on available resources, the County's role with impaired waters and TMDLs will develop along with State TMDL programs.

Priority Concern: Agricultural Runoff, Erosion and Pesticides
Soil erosion and runoff containing nutrients and pesticides are known sources of pollutants to surface water. These pollutants are transported through gully, sheet and rill erosion, tile intakes, tile lines, ditches and directly to surface water. Highly erodible soils are associated with slope and are found along every river, stream and intermittent stream in Blue Earth County. Of the total existing cropland, just over one percent of the cropland in the County is considered "highly erodible" and 3.53 percent "potentially highly erodible" according to the *USDA Soil Survey for Blue Earth County*.

Priority Concern: Feedlots, Manure Management
Livestock feedlot manure can be a source of bacteria, TSS, phosphorus, nitrogen and other pollutants. Most livestock in Blue Earth County is produced in confinement barns with below-barn, concrete manure storage pits. Runoff containing manure used as fertilizer for agricultural crop production is likely the greatest source of pollution from livestock feedlots as most feedlots with direct runoff were improved or eliminated early in the County's feedlot program history.

Priority Concern: Urban Development and Stormwater Runoff
Urban stormwater runoff refers to rain water and snow melt runoff from impervious surfaces and urban type of development such as residential subdivisions, shoreland areas, commercial, business, industrial, institutional, government, and roadways located in incorporated and unincorporated areas. Pollutants contained in stormwater runoff include pesticides, nutrients, petroleum, refuse, leaves and grass, chemicals and other contaminants. Stormwater runoff can also increase the rate erosion of stream banks, ditches, gullies, and outfalls. Increasing infiltration in urban areas reduces the volume and erosion potential of stormwater discharge.

Priority Concern: Drainage Ditches

Drainage ditches can be a source of sediment from eroding ditch banks and can also transport sediment and pollutants from agricultural and urban runoff to surface waters. Buffer strips along drainage ditches help reduce erosion and sedimentation by slowing overland flow, trapping sediment and other pollutants, and holding soil in place along the ditch banks. Reducing erosion and sedimentation also reduces maintenance costs for ditch owners.

Drainage systems alter natural hydrology by efficiently removing water from poorly drained areas. Peak flows in the drainage system have the potential to cause erosion both in the drainage system and in downstream surface waters. Retaining water within drainage systems can reduce peak flows and the rate of erosion in the drainage system and downstream.

Priority Concerns: Wetlands and Wildlife

Most of the County's pre-settlement wetlands were lost due to drainage for agriculture, community development and transportation. Due to the high percentage of lost wetlands, the County is considered a "high priority region" for preservation, enhancement, restoration, and establishment of wetlands, according to the Wetland Conservation Act (WCA). Wetlands are important for water quality, flood control, wildlife and recreation. Restoring fragmented habitat and impacts to remaining wetlands that may harm wildlife are important considerations for wetland management in the County. While all land uses can harm the ecological value of wetlands, urban development is likely the greatest threat to permanent loss of wetland quantity and quality in Blue Earth County at this time.

Priority Concern: Wastewater Treatment - Subsurface Sewage Treatment Systems

Wastewater contains bacteria, pathogens, chemicals, nutrients, and solids. Untreated wastewater is a potential threat to public health and can pollute surface and ground water. The bulk of the County population (77-percent in 2005) lives in one of the eleven municipalities utilizing State-permitted wastewater treatment systems. Most of the remaining

population utilizes onsite, subsurface soil treatment systems (SSTS) regulated by State rules and County ordinance.

Priority Concern: Mercury, Pesticides and Household Hazardous Waste

Waste from residential, business, industry and agriculture sources can pollute ground and surface water. Ground water quality, pesticide pollution and run-off from urban and rural land uses were identified as high priorities in citizen surveys administered during development of the PCSD. MDA monitoring of surface waters in Blue Earth County shows the presence of pesticides in surface waters. The pesticide, acetochlor, has been identified by the MPCA as an impairment of surface waters in Blue Earth County. The County's Household Hazardous Waste Facility is currently the only location in the area where farmers and residents can legally dispose of waste pesticides.

Mercury is identified by the MPCA as impairment of many surface waters in Blue Earth County. Although the main source of mercury impairments is atmospheric deposition, reducing use and managing the disposal of products containing mercury is part of the State's mercury TMDL plan. Mercury-containing products such as fluorescent bulbs, thermostats and thermometers are accepted for recycling at the County's Household Hazardous Waste Facility.

Implementation Summary

The bulk of the Water Management Plan 2008-2013 involves continuation of successful, existing local programs. These programs will be enhanced with use of GIS and LiDAR technology to provide more targeted education, outreach, planning and implementation activities. Public access to natural resources data and information will also be expanded.

Both urban and rural nonpoint source pollution are priority concerns addressed in the plan. However, agricultural nonpoint pollution sources are the focus of much of the implementation plan because:

1) Agricultural land use accounts for most of the land area in the County.
2) The County and SWCD are responsible for plan implementation and work directly mostly with agricultural land owners and operators.
3) Point sources are regulated by the MPCA and are located mostly in municipalities.

The following is a summary list and description of plan objectives addressing priority concerns.

Objective: Protect ground water quality.
Continuing the Minnesota Department of Health-delegated, County Well Code program, well sealing cost share program and administration of local land use regulations are high priorities. Assisting with source water protection plans, targeting education and providing information to local government officials in areas with a high susceptibility to ground water contamination are high priorities of the *Water Management Plan 2008-2013.*

Objective: Improve livestock manure management.
Continuing the County feedlot program and working with feedlot operators to improve nutrient management planning and application methods in sensitive areas are high priority actions related to livestock production and feedlots in the *Water Management Plan 2008-2013.*

Objective: Address pollutants causing impaired waters and TMDLS.
There is a high density of impaired waters with multiple pollutant stressors in Blue Earth County. Continuing existing programs to reduce nonpoint source pollution and working cooperatively on a watershed basis to prioritize local implementation efforts consistent with local, watershed and TMDL implementation plans are priorities of the *Water Management Plan 2008-2012*.

Objective: Reduce erosion and runoff from agricultural land.
Identifying and targeting high priority erosion areas and continuing local SWCD programs to reduce runoff and erosion and establishing and promoting proven soil and water conservation practices including buffer strips, filter strips, grassed waterways, terraces, crop residue, tillage practices, nutrient management, water retention, and other USDA-approved best management practices are priority actions in the *Water Management Plan 2008-2013.*

Objective: Reduce runoff from urban areas.
Promoting the reduction of pollutants in stormwater runoff, encouraging land use and urban stormwater management policy changes to minimize erosion, and constructing and other water quality projects in conjunction with local parks, transportation and other projects in all incorporated and unincorporated urban areas are priority actions in the *Water Management Plan 2008-2013*.

Urban runoff will be addressed with the collaborative efforts of the County Environmental Services Department, individual and locally organized municipalities and townships in the County, private consultants, local engineers, and State agencies.

Objective: Reduce erosion and increase water retention in County ditches.
Establishing vegetated ditch buffers and increasing water retention in County drainage systems are high priority actions of the *Water Management Plan 2008-2013.*

The 2007 Drainage Code amendments require the County to complete a ditch buffer inventory and inspect ditches every five years and every year on ditches with reported problems. The County has already developed an inspection program and buffer inventory, but the new reporting and inspection requirements are expected to increase program management needs and costs.

Objective: Increase on site waste water treatment system compliance.
Reducing public health threats and increasing compliance with State rules with installation of onsite wastewater treatment are priorities of the *Water Management Plan 2008-2013*. The County program is administered in the Environmental Services Department. The program includes a local ordinance, permits, inspections, education and enforcement.

Objective: Increase wetland area and wildlife habitat.
The County will continue administration of the Wetland Conservation Act. Identifying, assessing and prioritizing wetland areas for protection and enhancement and restoring wetlands for water quality as well as wildlife are a continuation of the County's *Greenprint* plan and are priorities of the *Water Management Plan 2008-2013.*

Objective: Provide collection sites for mercury product recycling and waste pesticide disposal.
The County will continue operating the Household Hazardous Waste Facility that currently accepts mercury products with funding from Xcel Energy, household pesticides with funding assistance from the MPCA, and ag waste pesticides with funding from the MDA. Ensuring continued convenient local collection of mercury products for recycling and ag pesticides for disposal are priorities of the *Water Management Plan 2008-2013.*

Total Projected Cost of the Implementation Program

The projected cost to implement the actions contained in the *Water Management Plan 2008-2013* is $3,035,380. This cost includes and assumes continued State grants such as the Natural Resources Block Grant (NRBG), BWSR grants for SWCD for operations, and the Erosion, Sediment Control and Water Quality Cost-Share Program. It is difficult to estimate the costs associated with highly variable USDA Farm Program funding and State and Federal water quality grants, so these costs were not projected in the budget. Historical levels of funding will not be adequate to meet State, TMDLs, watershed and County water quality goals. Additional funding will be needed for this work, mainly for SWCD staff and projects.

Plan Consistency with Local, State and Regional Plans and Controls

Ground water
The Water Management Plan supports State plans to expand ground water data, information and monitoring. The DNR and EQB have prepared reports describing these needs throughout the State.

Soil and Water Conservation Practices
The objectives and actions contained in the plan are consistent with other water related plans. The actions address the sources of pollutants common to agricultural and urban land use and soil types in the Minnesota River Basin. The plan is consistent with the State's Soil and Water Conservation Policy, Minnesota Statute 103C.005, encouraging implementation of practices that:

1) control or prevent erosion, sedimentation, siltation, and related pollution in order to preserve natural resources;
2) ensure continued soil productivity;
3) protect water quality;
4) prevent impairment of dams and reservoirs;
5) reduce damages caused by floods
6) preserve wildlife;
7) protect the tax base; and
8) protect public lands and waters.

Minnesota Statutes, Delegation Agreements and Local Programs
Much of the plan involves continuation of ongoing County and SWCD programs. Many of these programs are administered under official delegation agreements and/or the authority of State Statutes and Rules. County programs and ordinances affected by specific State controls include SSTS, Feedlots, WCA, Well Code and County Ditches (Drainage Code). The SWCD is not a regulatory agency, but administration of the SWCD and SWCD programs are defined by State Statutes. State agencies review these SWCD and County programs and reports to the State are required.

Clean Water Legacy Act
Although it was a one time appropriation, the Clean Water Legacy Act defined prioritization methods for assessing, restoring and preventing impaired waters and recognized the benefits of working with existing local authorities. The plan is consistent with and supports the following priorities and considerations contained in the Clean Water Legacy Act:

1) Coordinate with and utilize existing local authorities and infrastructure for implementation.
2) Can be implemented in whole or in part by providing support for existing and ongoing restoration efforts.
3) Use existing regulatory authorities to achieve restoration for point and nonpoint sources of pollution where applicable.
4) Promote the development and use of effective non-regulatory measures to address pollution sources for which regulations are not applicable.
5) Use restoration methods that have a demonstrated effectiveness in reducing impairments and provide the greatest long-term positive impact on water quality protection and improvement and related conservation benefits.
6) Effectively leverage other sources of funds, including federal, state, local and private sources.
7) Identify, encourage and fund implementation actions to prevent waters from becoming impaired and to improve the quality of waters that are listed as impaired but have no approved TMDL addressing the impairment using the best available data and technology.

Recommendations to Achieve Consistency

No specific amendments to plans or official controls have been identified to achieve consistency with other plans or official controls. Local programs will evolve during the planning period and changes expanding water resources protection are expected within

five years. Changes in plans and official controls at the State and watershed level are expected but the impact on local government and plan implementation is unknown.

Local Government

The plan includes objectives and County actions to encourage changes in official plans and controls at the local government level to address stormwater runoff and to protect groundwater.

State, Watershed and Other Plans

As water related plans are developed by other entities, consideration of and consistency with the *Water Management Plan 2008-2013*'s local priorities and established programs is recommended. Continuation of existing, locally developed, County- and municipal-based programs and local regulations is the foundation of the Water Management Plan. The County's existing programs integrate land use, water quality, health, waste management, and other issues protecting the health, safety and welfare of the residents of Blue Earth County. Local programs were shaped over time in a public process involving meetings and hearings which led to County standards more restrictive than standards prescribed by the State of Minnesota. Implementation of the plan and local authority for programs related to objectives and actions in the plan should not be delegated, transferred or assumed by other entities or joint powers boards that are not accountable to County residents and lack an understanding of the collective social, environmental and economic needs and priorities in Blue Earth County.

LIST OF MAPS

Map Number	Title	Page
1	General Location Map	14
2	1990 Land Use - Land Cover	15
3	Minnesota River Basin Major Watersheds	17
4	Major Watersheds - Blue Earth County	18
5	2000 Population	20
6	2005 Population Estimate	20
7	Houses Built by Section Since Last Water Plan was Approved	23
8	Protected Streams, Lakes, and Wetlands	25
9	FEMA Floodplain	27
10	NWI Wetlands	30
11	General Soil Map	32
12	Erodible Land Classification	34
13	Erodible Land Classification of Cropland	35
14	Soil Texture	37
15	Wind Erodibility Index	39
16	Hydric Soils	41
17	Example Blue Earth River Channel Changes 1991-2005	45
18	Example Le Sueur River Channel Changes 1991-2005	46
19	Example 2 of Le Sueur River Channel Changes 1991-2005	47
20	Example Maple River Channel Changes 1991-2005	48
21	State Hydrogeologic Map	58
22	Depth To Bedrock	65
23	Level I Geologic Sensitivity	67
24	Feedlots	92
25	Feedlots in Shoreland	95
26	County Ditch and Tile Systems	111
27	Class V Disposal Well Sensitivity	150

List of Acronyms

AU- Animal Unit
AUAR – Alternative Urban Area Review

BEC – Blue Earth County
BWSR – Board of Water and Soil Resources
BMP – Best management practice(s)

CD – County Ditch
CWI – County Well Index
CWL – Clean Water Legacy (Act)
CWP - Clean Water Partnership, an MPCA-administered water quality grant

DNR – (Minnesota) Department of Natural Resources

EAW – Environmental Assessment Worksheet
EIS – Environmental Impact Statement
EPA – Environmental Protection Agency
EQB – Environmental Quality Board

FEMA – Federal Emergency Management Agency
FSA – Farm Service Agency (division of the USDA)

GBERBA – Greater Blue Earth River Basin Alliance. GBERBA includes the Blue Earth River watershed and its tributary watersheds, the Le Sueur and Watonwan.

HEL- Highly erodible land.

ISTS- Individual sewage treatment system (generally means the same as SSTS)
IPHT – Imminent public health threat. IPHT is a term used in State rules to describe straight pipe wastewater discharges.

JD – Judicial Ditch

MDA- Minnesota Department of Agriculture
MDH- Minnesota Department of Health
MES – University of Minnesota Extension Service
MGS – Minnesota Geological Survey
MNDOT – Minnesota Department of Transportation
MPCA- Minnesota Pollution Control Agency
MRB- Minnesota River Board
MSU-Mankato- Minnesota State University – Mankato
MSU-Mankato-WRC- Minnesota State University – Mankato, Water Resources Center

NCED – National Center for Earth Surface Dynamics
NPDES – National Pollution Discharge and Elimination Standards
NRBG – Natural Resources Block Grant. The NRBG is administered by BWSR and is a consolidation of grants from MPCA, DNR and BWSR.

NRCS – Natural Resource Conservation Service (Division of the USDA)

PCB - Polychlorinated Biphenyls
PFA – Public Facilities Authority
POTW – Publicly owned treatment works, a government-owned wastewater treatment facilities

SSTS – Subsurface Soil Treatment System
SWCD - Soil and Water Conservation District
SWPPP – Stormwater Pollution Prevention Plan

TEP – Technical Evaluation Panel (Wetlands Conservation Act)
TMDL – Total Maximum Daily Load (Impaired Waters, Clean Water Act)

USDA- United States Department of Agriculture
USFWS – United States Fish and Wildlife Service
USGS – United States Geological Survey

WCA – Wetland Conservation Act
WMA – Wildlife Management Area

List Of Terms

Agricultural Drainage. Improving the productivity of agricultural land by removing excess water from the soil by such means as ditches or subsurface drainage tiles.

Approved Practice. A conservation practice that qualifies for state cost-sharing and that has been approved by the state board.

Best Management Practice (BMP). Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from non-point sources. “BMPs” means the same as conservation practices.

Conservation Practices. Practices applied to the land for the purpose of controlling or preventing soil erosion, sedimentation, nutrient runoff, or other water pollution to maintain the sustainable use of soil and water and other natural resources.

Conservation Practice Plans. Consists of drawings and specifications. The drawings are a graphical description and the associated specifications are a narrative description of the tasks involved to install the practice.

Cost Sharing. A publicly financed program shares part of the cost of establishing soil and water conservation practices, cultural practices, or pollution control measures with land owners, operators or other entities.

Cultural Practices. Refers to tillage and cultivation activities, or constructed features of terrain such as buildings, canals, boundary lines, i.e., people made structures.

Encumber. To designate funds for a specific practice or purpose. This is accomplished via a motion at an official conservation district board meeting and documented in the approved minutes of the meeting and all applicable forms and ledgers.

Erosion. The wearing away of land surface by wind or water, intensified by land-clearing practices related to farming, residential or industrial development, road building, or logging.

Established. A conservation practice that has been properly installed and has successfully developed to function properly.

Eutrophication. The slow aging process during which a lake, estuary, or bay evolves into a bog or marsh and eventually disappears. During the later stages of eutrophication the water body is choked by abundant plant life due to higher levels of nutritive compounds such as nitrogen and phosphorus. Human activities can accelerate the process.

Fecal Coliform Bacteria. Bacteria found in the intestinal tracts of mammals. Their presence in water is used as an indicator of pollution and possible contamination by pathogens.

Ground Water. The supply of fresh water found beneath the Earth's surface, usually in aquifers, which supply wells and springs.

Hazardous Chemical. An EPA designation for any hazardous material requiring an MSDS under OSHA's Hazard Communication Standard. Such substances are capable of producing fires and explosions or adverse health effects like cancer and dermatitis. Hazardous chemicals are distinct from hazardous waste.

Hazardous Substance. 1. Any material that poses a threat to human health and/or the environment. Typical hazardous substances are toxic, corrosive, ignitable, explosive, or chemically reactive. 2. Any substance designated by EPA to be reported if a designated quantity of the substance is spilled in the waters of the United States or is otherwise released into the environment.

Hazardous Waste. By-products of society that can pose a substantial or potential hazard to human health or the environment when improperly managed. Possesses at least one of four characteristics (ignitability, corrosivity, reactivity, or toxicity), or appears on special EPA lists.

Herbicide. A chemical pesticide designed to control or destroy plants, weeds, or grasses.

High Priority Erosion Problems. “High priority erosion problems” in the Blue Earth County Water Plan means soils identified as “highly erodible” and “potentially highly erodible” in the USDA Soil Survey. It also means areas where erosion from wind or water is occurring equal to, or in excess of, 2 X T tons per acre per year or is occurring on any area that exhibits active gully erosion or is identified as high priority in the comprehensive local water management plan or the conservation district’s comprehensive plan.

High Priority Water Quality Problems. "High priority water quality problems" means areas where sediment, nutrients, chemicals, or other pollutants discharge to DNR designated protected waters or to any high priority waters as identified in a comprehensive local water management plan or the conservation district's comprehensive plan, or discharge to a sinkhole or groundwater. The pollutant delivery rate to the water source is in amounts that will impair the quality or usefulness of the water resource.

Household Hazardous Waste. Hazardous products used and disposed of by residential as opposed to industrial consumers. Includes paints, stains, varnishes, solvents, pesticides, and other materials or products containing volatile chemicals that can catch fire, react or explode, or that are corrosive or toxic.

Hydrology. The science dealing with the properties, distribution, and circulation of water.

Hydraulic Conductivity. The rate at which water can move through a permeable medium. (i.e. the coefficient of permeability.)

Imminent Threat. A high probability that exposure is occurring.

Land Owner. A person, corporation, or legal entity that holds title to or is in possession of land.

Land Owner / Operator. A person, corporation, or legal entity that holds title to or is in possession of land within a conservation district as an owner, lessee, tenant, or otherwise. It is the same as the term "land occupier" used in the State Cost Share Guide.

Monitoring. Periodic or continuous surveillance or testing to: 1) determine the level of compliance with statutory requirements and/or pollutant levels in water, plants, and animals, 2) observe a situation for any changes which may occur over time using a measurement of some sort, such as the performance of an established conservation practice, an identified erosion problem or biological conditions of surface water.

National Pollutant Discharge Elimination System (NPDES). A provision of the Clean Water Act which prohibits discharge of pollutants into waters of the United States unless a special permit is issued by the State of Minnesota as delegated by the EPA.

Nitrate. A compound containing nitrogen that can exist in the atmosphere or as a dissolved gas in water and which can have harmful effects on humans and animals. Nitrates in water can cause severe illness in infants and domestic animals. A plant nutrient and inorganic fertilizer, nitrate is found in septic systems, animal feed lots, agricultural fertilizers, manure, and industrial waste waters.

Non-Point Sources. Diffuse pollution sources (i.e. without a single point of origin or not introduced into a receiving stream from a specific outlet). The pollutants are generally carried off the land by storm water. Common non-point sources are agriculture, forestry, urban, mining, construction, dams, channels, land disposal, and city streets.

Nutrient. Any substance assimilated by living things that promotes growth. The term is generally applied to nitrogen and phosphorus in wastewater, but is also applied to other essential and trace elements.

Nutrient Pollution. Contamination of water resources by excessive inputs of nutrients. In surface waters, excess algal production is a major concern.

Pathogens. Microorganisms (e.g., bacteria, viruses, or parasites) that can cause disease in humans, animals and plants.

Pesticide. Substances or mixture there of intended for preventing, destroying, repelling, or mitigating any pest. Also, any substance or mixture intended for use as a plant regulator, defoliant, or desiccant (herbicide).

Phosphorus. An essential chemical food element that can contribute to the eutrophication of lakes and other water bodies. Increased phosphorus levels result from discharge of phosphorus-containing materials into surface waters.

Planning period. 2008-2013 period of time intended for implementation of the Blue Earth County Water Management Plan.

Point Source. A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution; e.g. a pipe, ditch, ship, ore pit.

Pollutant. Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

Pollution. Generally, the presence of a substance in the environment that because of its chemical composition or quantity prevents the functioning of natural processes and produces undesirable environmental and health effects. Under the Clean Water Act, for example, the term has been defined as the man-made or man-induced alteration of the physical, biological, chemical, and radiological integrity of water and other media.

Polychlorinated Biphenyls. (PCBs) A group of toxic, persistent chemicals used in electrical transformers and capacitors for insulating purposes, and in gas pipeline systems as lubricant. The sale and new use of these chemicals, also known as PCBs, were banned by law in 1979. PCBs are a pollutant stressor causing water quality impairments in Blue Earth County.

Potable Water. Water that is safe for drinking and cooking.

Publicly Owned Treatment Works (POTWs). A waste-treatment works owned by a unit of government, usually designed to treat domestic wastewaters.

Recharge Area. A land area in which water reaches the zone of saturation from surface infiltration, e.g., where rainwater soaks through the earth to reach an aquifer.

Run-Off. That part of precipitation, snow melt, or irrigation water that runs off the land into streams or other surface-water. It can carry pollutants from the air and land into receiving waters.

Sediment. Topsoil, sand, and minerals washed from the land into water, usually after rain or snow melt.

Sediment Yield. The quantity of sediment arriving at a specific location.

Sedimentation. Solids settling out of water in reservoirs, rivers and harbors, destroying fish and wildlife habitat, and clouding the water so that sunlight cannot reach aquatic plants.

Sewer. A channel or conduit that carries wastewater and storm-water runoff from the source to a treatment plant or receiving stream. "Sanitary" sewers carry household, industrial, and commercial waste. "Storm" sewers carry runoff from rain or snow. "Combined" sewers handle both.

Soil Erodibility. An indicator of a soil's susceptibility to raindrop impact, runoff, and other erosive processes.

Solid Waste. Non-liquid, non-soluble materials ranging from municipal garbage to industrial wastes that contain complex and sometimes hazardous substances. Solid wastes also include sewage sludge, agricultural refuse, demolition wastes, and mining residues. Technically, solid waste also refers to liquids and gases in containers.

Source-Water Protection Area. The area delineated by a state for a Public Water Supply or including numerous such suppliers, whether the source is ground water or surface water or both.

Soil and Water Conservation Practices. Control measures consisting of managerial, vegetative, and structural practices to reduce the loss of soil and water.

Stakeholder. Any organization, governmental entity, or individual that has a stake in or may be impacted by a given approach to environmental regulation, pollution prevention, TMDLs, etc.

Storm Sewer. A system of pipes (separate from sanitary sewers) that carries water runoff from buildings and land surfaces.

Subwatershed: Topographic perimeter of the catchment area of a stream tributary.

Surface Runoff. Precipitation, snow melt, or irrigation water in excess of what can infiltrate the soil surface and be stored in small surface depressions; a major transporter of non-point source pollutants in rivers, streams, and lakes..

Suspended Solids. Small particles of solid pollutants that float on the surface or are suspended in water, sewage or other liquids.

SWCD Board. The board of supervisors of a Soil and Water Conservation District as organized under Minnesota Statutes, chapter 103C.

SWCD Technical Representative. A district employee assigned by the conservation district board or other designee who has expertise in the design and application of conservation practices.

Total Suspended Solids (TSS). A measure of the suspended solids in wastewater, effluent, or water bodies, determined by tests for "total suspended non-filterable solids."

Soil and Water Conservation Practices. Control measures consisting of managerial, vegetative, and structural practices to reduce the loss of soil and water.

Technical Approval Authority. The authorization granted to a district technical representative to provide comprehensive technical assistance for individual conservation practices, including associated technical signoff as the district technical representative of record.

Turbidity. A cloudy condition in water due to suspended silt or organic matter.

Urban Runoff. Stormwater from city streets, domestic or commercial properties and other paved impervious surfaces that carries pollutants of various kinds into storm sewer systems and receiving surface waters.

Vegetative Controls. Non-point source pollution control practices that involve vegetative cover to reduce erosion and minimize loss of pollutants.

Water Table. The level of groundwater.

Water Well. An excavation where the intended use is for location, acquisition, development, or artificial recharge of ground water.

Wastewater. The spent or used water from a home, community, farm, or industry that contains dissolved or suspended matter.

Water Pollution. The presence in water of enough harmful or objectionable material to damage the water's quality.

Water Quality Criteria. Levels of water quality expected to render a body of water suitable for its designated use. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, fish production, or industrial processes.

Water Quality Standards. State-adopted and EPA-approved ambient standards for water bodies. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect designated uses.

Water Quality-Based Limitations. Effluent limitations applied to dischargers when mere technology-based limitations would cause violations of water quality standards. Usually applied to discharges into small streams.

Watershed. The land area that drains into a stream; the watershed for a major river may encompass a number of smaller watersheds that ultimately combine at a common point.

Watershed Approach. A coordinated framework for environmental management that focuses efforts on the highest priority problems within hydrologically-defined geographic areas taking into consideration both ground and surface water flow.

WATER MANAGEMENT PLAN 2008-2013

Practical, Measurable and Achievable

INTRODUCTION

Purpose of the Plan

The purpose of the Blue Earth County *Water Management Plan 2008-2013* is to identify and assess priority water resource concerns, develop goals and objectives to address priority concerns, and provide direction for Blue Earth County and Soil and Water Conservation District (SWCD) programs and decision making. Actions to achieve plan objectives are specified along with the necessary financial and staff resources and lead agency for a five year period, July 1, 2008 through June 30, 2013.

Authority

The authority and requirements for preparing County water management plans are defined in the Comprehensive Water Management Act, Minnesota Statutes, Chapter 103B. The *County's Water Management Plan 2008-2013* includes programs implemented under authority of many different State of Minnesota Statutes and Rules. To receive State funding, the County and Soil and Water Conservation District must have current plans approved by the Board of Water and Soil Resources (BWSR).

Historical Plans and Updates

This water plan will be Blue Earth County's third plan for water resources. The list of water plans include:

Comprehensive Water Plan 1988-1997 (first plan)
Comprehensive Water Plan 1998-2007 (second plan/first update)
Water Management Plan 2008-2013 (third plan/second update)

As a result of changes in the Comprehensive Water Management Act, the updated *Water Management Plan 2008-2013* differs from Comprehensive Water Plans of the past. The main differences between the plans can be summarized as follows:

Title and Focus: The updated plan is more focused and management oriented, directing limited available resources strategically to refine and enhance successful ongoing programs and public-private partnerships to improve water quality. Previous plans were comprehensive and attempted to address and include all potential water quality problems and implementation partners without consideration of budget limitations.

Duration: The updated plan addresses a five-year period instead of ten years. Establishing a realistic implementation plan is easier with a shorter time period.

Responsibility: Blue Earth County is the designated, local unit of government responsible for the plan. The SWCD also adopts the plan, is the primary partner for implementation,

and is the lead agency for many of the plan objectives. Previous plans included goals, objectives and actions that would be implemented by many different organizations, local government units, and Federal, State and local government agencies, in addition to or instead of the County and the SWCD.

Accomplishments

The County and SWCD have successfully accomplished most of the objectives and actions contained in the *Comprehensive Water Plan 1998-2007*. Many existing, ongoing County programs were built on or enhanced as a result of implementing the plan. The following are some of the accomplishments between 1998 and 2007:

Feedlot Program
The County has permitted and inspected all feedlots. Through efforts of the County, SWCD and NRCS, nearly every feedlot with runoff pollution problems was either improved with structural practices or voluntarily closed by the owner. Since the County completed the first feedlot inventory and database, all feedlots have been inspected at least three times, and routine, systematic site review including inspections and permit review continue as part of the County program. The feedlot program continues to evolve, changing and responding to water quality needs. With most feedlot runoff issues addressed, manure management has become a major focus of the feedlot program.

County Well Program
Between 1997 and 2007, 899 new wells were constructed and 1,169 wells were sealed. The County operates an annual, County-funded well sealing, 50 percent cost-share program, with nearly $10,000 each year. The County provided nearly $100,000 cost-share for 403 of the 1,169 sealed wells between 1997 and 2007. Since the County was delegated the State Well Code program in 1989, 2,254 wells have been properly sealed.

County Septic System Program
Between 1998 and 2007, permits were issued for more than 2,000 septic systems, an average of 184 each year. County Codes were amended requiring compliance inspections at property transfer, and the septic system program was enhanced with an electronic database. The County's septic system inspection and permit program has operated since the early 1970s. The City of Mankato and the County worked with the City of Skyline, City of Madison Lake, Lime Township, South Bend Township and the Lake Washington Sanitary District to address wastewater treatment needs with regionalization of Mankato's wastewater treatment facility.

Water Quality Studies and Implementation Projects
The County and/or SWCD participated in, or coordinated, many water quality studies and implementation projects, including Thompson Creek, Indian Creek, Blue Earth River, Le Sueur River, Watonwan River, Maple River, Minneopa Creek, Crystal-Loon-Mills Lakes, Duck Lake, Lura Lake, Cobb River, Middle Minnesota River, and Lake Washington.

GIS and LIDAR

The Blue Earth County Board of Commissioners invested over $340,000 local funding in 2005 for a high resolution ortho-photo and a Light Detection and Ranging (LIDAR)

Digital Elevation Model (DEM). LIDAR is a remote sensing system used to collect topographic data. From this data, the County was able to create elevation contours for the entire County at a 2-foot interval.

The County's use of GIS and LIDAR is proving to be a valuable asset and tool for local water management. Local water management efforts have been re-energized as the timing and availability of the new LIDAR and the process of preparing the County Water Management Plan coincide. To a great extent, much of the County's Water Management Plan is based on continuation of existing programs; however, there will be improved programs and effectiveness with GIS supporting better data management and planning. New objectives in the *Water Management Plan 2008-2013* also utilize LIDAR and GIS tools. Public access to information, especially maps and aerial photos, will be expanded. Public access to GIS and LIDAR data and tools is expected to increase awareness and understanding of water resources resulting in more focused and effective water planning and management.

The County provided the LIDAR data, 2-foot contours, and ortho-photos to State agencies, Federal agencies, and universities for $250 to cover the cost of the hard drive required to transfer the large amount of data. Consulting firms are able to obtain the same data for $500. The data has been used for many purposes such as a tool for wetland determinations, creating planning models and research. For example, MDA is doing a stream power index study, the National Center Earth Surface Dynamics is studying sediment transport in the Le Sueur River, and the MPCA and MSU-Mankato Water Resources Center are preparing TMDLs and many other projects using the LIDAR. The results of these studies and research projects may provide information helpful for local planning and implementation efforts in future years.

Priority Concerns

A *Priority Concerns Scoping Document* (PCSD) was prepared in order to identify and prioritize problems to be addressed in the County *Water Management Plan*. Preparation of the PCSD is a requirement of the Comprehensive Water Management Act which also prescribes a structured local public input process, State agency review and BWSR review and approval. The County also held many small group meetings and work sessions with the SWCD, County Board, Planning Commission, County staff and stakeholders.

There were five priority concerns identified in the *Priority Concerns Scoping Document* (PCSD). The priority concerns were ground water, surface water quality, drainage, wetlands and wildlife. As reflected in written surveys distributed during preparation of all three of the County water plans, protecting ground and drinking water resources is the most important concern to the residents of Blue Earth County. The five priority concerns are broad and most are interrelated from a hydrological standpoint. In addition, there are a many sources of surface water pollution, and many pollutants are a concern to both ground and surface water. Land use and pollutant sources directly related to surface water and ground water priority concerns were identified and addressed separately as sub-priority concerns. These include agricultural-related runoff, erosion, pesticides, feedlots, manure management, urban-related development, stormwater runoff and pesticides, and wastewater. Surface water impairments are a concern and the State

Total Maximum Daily Load (TMDL) program to address impairments is also discussed in the plan.

The public process used for preparation of the PCSD is specified in the Comprehensive Water Management Act. The County conducted a written survey and held a legally-noticed, public meeting and a public hearing. State agency input from BWSR, DNR, MPCA, MDA and MDH was also used in development of the PCSD. The County's priority concerns and the *Water Management Plan 2008-2013* are consistent with State and regional water plans, watershed plans and TMDLs. The PCSD was presented to the BWSR Board Southern Region Subcommittee and approved by the BWSR Board.

The *Water Management Plan* must focus on addressing priority concerns with realistic goals and objectives that are practical, measurable and can be achieved in the five-year planning period. This somewhat limits the use of the plan as opportunities to access additional financial resources to accomplish objectives may be unknown.

Plan Organization
The plan is organized into sections including the Executive Summary, Introduction, Background and Natural Resources Inventory, Priority Concerns, Implementation Schedule and Appendix.

I. Executive Summary

II. Introduction

III. Background and Natural Resources Inventory: This section describes location, demographic trends, natural resources, soils and expected changes to natural resources. Most of the maps are contained in this section of the plan.

IV. Priority Concerns: This section is divided into subsections to address issues related to the five priority concerns. Each subsection describes why the issue is a concern, applicable existing programs, guiding principles, goals, objectives, and actions. The Priority Concerns and related subsections include the following:

Priority Concern 1: Ground water

Priority Concern 2: Surface Water
- Impaired Waters and Total Maximum Daily Loads (TMDLs)
- Agricultural Runoff, Soil Erosion and Pesticides
- Feedlots, Manure Management
- Urban Development and Stormwater Runoff

Priority Concern 3: County Drainage Ditches

Priority Concern 4 and 5: Wetlands and Wildlife

Priority Concern 1 and 2: Ground *and* Surface Water
- Wastewater Treatment - Subsurface Sewage Treatment Systems
- Mercury, Pesticides and Household Hazardous Waste

V. Implementation Plan Schedule: This section is a table summary of the plan objectives and actions with projected budget, timeline and lead agency identified for each action.

VI. Appendix: This section contains the Priority Concerns Scoping Document and MPCA TMDL Fact Sheets and maps.

Roles and Responsibilities

Implementing the *Water Management Plan 2008-2013* will primarily be the responsibility of the County and the Blue Earth County Soil and Water Conservation District (SWCD). The *Water Management Plan-2008-2013* is officially adopted by only the County and the SWCD. The *Water Management Plan-2008-2013* contains realistic goals and objectives that are practical, measurable and achievable in the five-year planning period.

Municipalities and Townships, State and Federal Agencies, businesses, individuals and non-profit organizations have important roles in plan implementation but are not responsible for implementing the plan. The County encourages and supports sustainable programs with investment in local capacity and local public-private partnerships to achieve long-term, measurable success.

The role and responsibility of land owners, business owners, farmers and citizens of Blue Earth County must be recognized, as they support the tax base, are required to comply with local and State regulations and will pay for many of the water plan implementation projects on their property. Organized wildlife conservation groups, lake associations and others will be involved with implementation of the plan. Land owners, business owners, and citizens of Blue Earth County will ultimately determine the success of water management programs.

State Agencies: Some of the priority concerns are addressed administratively through State programs, regulations and permitting requirements. Projects are funded through State grant programs, mainly from the BWSR, MPCA and DNR. The DNR is also involved with DNR activities and partnerships in Blue Earth County relating to wildlife, fisheries, forestry, and parks. The Minnesota Geologic Survey also works with the County, mostly through the County well program.

Townships and Municipalities: Municipalities and Townships are both regulators and are regulated by State regulations. These local government units, like the County, are in a position to provide leadership related to water quality.

City of Mankato: The City of Mankato's population exceeds the threshold for a number of State environmental regulations. The City of Mankato is subject to higher wastewater treatment and stormwater management standards compared with other cities in the County. To effectively manage and operate stormwater and wastewater treatment systems, the City has developed applicable local plans and regulations.

Federal Agencies: The U.S. Fish and Wildlife Service (USFWS) will be involved with implementation projects related mainly to wetland habitat and water retention. The U.S. Army Corps of Engineers (USACE) is involved with implementation related to wetlands and flood control.

Watershed Organizations and Projects
The County participates in one watershed joint powers organization, the Minnesota River Board (MRB). The County and SWCD both participate in one watershed joint powers organization, the Greater Blue Earth River Basin Alliance (GBERBA). The Water Management Plan 2008-2013 is consistent with GBERBA plans. The GBERBA's role with watershed management is mainly to bring additional project funding to the Blue Earth County SWCD. The GBERBA organization consists of a technical committee and a policy committee.

The County's *Water Management Plan 2008-2013* is not intended to extend to watershed or joint powers organizations as the plan's purpose and implementation program are based on local authority and with recognition of local needs and the organizational capacity of multiple programs and jurisdictions. The County and SWCD do make the plan available to watershed organizations to ensure consistency with and consideration of County plans and priorities.

Blue Earth County Role and Responsibilities

Several County departments will be involved directly and indirectly with plan implementation including Environmental Services, Tax Payer Services- Ditch Management, and County Highway- Parks. The County supports providing Blue Earth County residents with consistent, reliable, and cost-effective services and programs.

Environmental Services Department
The County has regulatory authority under Minnesota Statutes and is accordingly the lead agency through programs and County Code regulations for feedlot and manure management, wastewater management, well code, Wetland Conservation Act administration, water planning, zoning and comprehensive land use planning. These land management issues are also managed under County Code regulations.

Beyond the Water Management Plan, the County integrates water management in many other plans and policies. The County is working on a comprehensive natural resources planning project with many partners. The County also provides data and information and routinely uses GIS.

The County also participates in or acts as the Regulatory Government Unit in the environmental review process for public and private entities, including Environmental Impact Statements, Environmental Assessment Worksheets, and Alternative Urban Area Review.

Taxpayer Services and Ditch Authority
The County has management authority of County ditches under Minnesota Statutes and is accordingly the lead agency through the Ditch Authority and Ditch Manager for drainage. The County Ditch Manager is located in the Taxpayer Services Department

The Taxpayer Services Department works with all property owners on recorded easements, liens, land sales and acquisitions and tax exemptions related to conservation practices.

Blue Earth County Public Works – County Highway Department and Parks
The County Public Works Department establishes many conservation projects, both voluntarily and as required, during construction of roads and other projects. The County parks and trails provide opportunities for public access to scenic areas, wildlife and natural resources. Most County parks are located in shoreland areas.

Soil and Water Conservation District (SWCD)
The SWCD organization is a non-regulatory agency that is operated by a board of five Supervisors elected to represent districts within the boundaries of Blue Earth County. The Soil and Water Conservation District (SWCD) is the lead agency related to establishing structural and other agricultural land best management practices to reduce soil erosion and runoff from agricultural land. The SWCD staff also provides technical assistance related to reducing soil erosion and runoff, wetland management, wildlife habitat and shoreland protection. The SWCD works with many partners including Federal, State and local government agencies, land owners/operators and non-profit organizations. The USDA Natural Resources Conservation Service (NRCS) is the SWCD's main partner.

BWSR annually allocates a general services grant to all Minnesota SWCDs for expenditures necessary for operation of the district. BWSR oversees SWCD operations. The County also allocates funds annually to the SWCD for operation of the district. The SWCD employs a District Manager and an Office Technician.

SWCD Mission and Purpose
The Blue Earth County SWCD's mission and purpose is consistent with the State of Minnesota soil and water conservation policy.

Blue Earth County Soil and Water Conservation District Mission Statement:
To assist and educate the people of Blue Earth County Soil and Water Conservation District in efficiently and effectively using the natural resources in order to increase the responsible use of the cropland, pasture land, woodland, wildlife habitat, wetlands, urban land, recreational land; and to improve the soil resource base, water quality, wildlife habitat and quality of life within the district.

Minnesota Statute 103C.005 Soil and Water Conservation Policy.
Maintaining and enhancing the quality of soil and water for the environmental and economic benefits they produce, preventing degradation, and restoring degraded soil and water resources of this state contribute greatly to the health, safety, economic well-being, and general welfare of this state and its citizens. Soil and water conservation measures implemented on private lands in this state provide benefits to the general public by reducing erosion, sedimentation, siltation, water pollution, and damages caused by floods. The soil and water conservation policy of the state is to encourage land occupiers to conserve soil, water, and the natural resources they support through the implementation of practices that:

(1) control or prevent erosion, sedimentation, siltation, and related pollution in order to preserve natural resources;
(2) ensure continued soil productivity;
(3) protect water quality;

(4) prevent impairment of dams and reservoirs;
(5) reduce damages caused by floods;
(6) preserve wildlife;
(7) protect the tax base; and
(8) protect public lands and waters.

Programs and Projects

The SWCD operates many ongoing, well-structured, traditional programs. Some of these programs raise money for the district while providing services to the public. Other projects are temporary, grant funded special projects. The SWCD participates as technical advisors for site specific situations under WCA, land owner requests and environmental review. Some of the SWCD programs include:

Tree Sales and Planting for Conservation Projects: The SWCD earns money for district programs by selling trees to the general public.

Equipment Rental: The SWCD rents a tree planter and a drill for grasses, native grasses and flowers/forbs

Wetlands and the Wetland Conservation Act (WCA): The Blue Earth County SWCD assists with developing restoration and replacement plans and serves on the Technical Evaluation Panels (TEP) for both the County and the City of Mankato.

Zone 10 - Nonpoint Technical Assistance Grant, aka State Revolving Fund (SRF) Implementation Program: Technical support for other programs dealing with conservation practices is allowed. The Blue Earth County SWCD houses and supervises the Zone 10 engineer and technician who work with land owners to design conservation practices. Zone 10 consists of nine SWCDs, including Blue Earth, Brown, Faribault, Le Sueur, Martin, Nicollet, Sibley, Waseca and Watonwan.

Rural Rainfall Monitoring: This program is a cooperative effort between BWSR, SWCDs and the State Climatology Office to monitor precipitation in a statewide network. The SWCD collects and reports rain gauge reader data to the State Climatology Office monthly.

Cost Share and Financial Incentives

The SWCD manages and administers cost share and financial incentive programs for the establishment of soil and water conservation practices. The sources, partners, levels of funding and terms and conditions are variable. The most consistently funded program administered by the SWCD is the BWSR Erosion, Sediment Control and Water Quality Cost-Share Program. The BWSR Reinvest in Minnesota (RIM) Reserve Program also provides local funding. MDA loans have been consistently available in varying amounts. Cost share funded through these programs does not meet local need and supplemental funding is obtained from watershed and other special projects.

Watershed and Special projects

Under various agreements, the SWCD also manages, supervises or houses staff working on projects with project partners. Currently the SWCD supervises two

watershed project staff. One works for the Maple River Clean Water Partnership and the other works in the GBERBA Cobb River project. Both the Cobb River and Maple River projects are temporary, grant-funded projects with staff and cost-share funding for projects available for a limited time period. The type of grants funding these projects include: MPCA Clean Water Partnership, MPCA 319 and Clean Water Legacy (BWSR).

Background and Natural Resources Inventory

General Description

Blue Earth County is located in South-Central Minnesota approximately 75 miles southwest of the Twin Cities. The County is 764 square miles in area and had a population of 55,941 in 2000 according to the U.S. Census. Mankato is the County Seat and largest city in the County with a population 32,427 in 2000. Blue Earth County's most notable features are its rivers, lakes, and productive agricultural land. The Minnesota River forms the Blue Earth County's northern border with Nicollet County. The County contains the confluence of three major rivers: the Le Sueur River, the Watonwan River, and the Blue Earth River. The Blue Earth River joins the Minnesota River at the "bend" in the Minnesota River in Mankato. Map 1 shows the general location of the County.

Physical Characteristics

Natural features, such as lakes and rivers, play a significant role in the County's development patterns, land management and conservation. The Minnesota River forms the County's irregular, northern border. The "bend" in the Minnesota River is confluence of several major river systems. Approximately 99 percent of the County is located within the Minnesota River Basin.

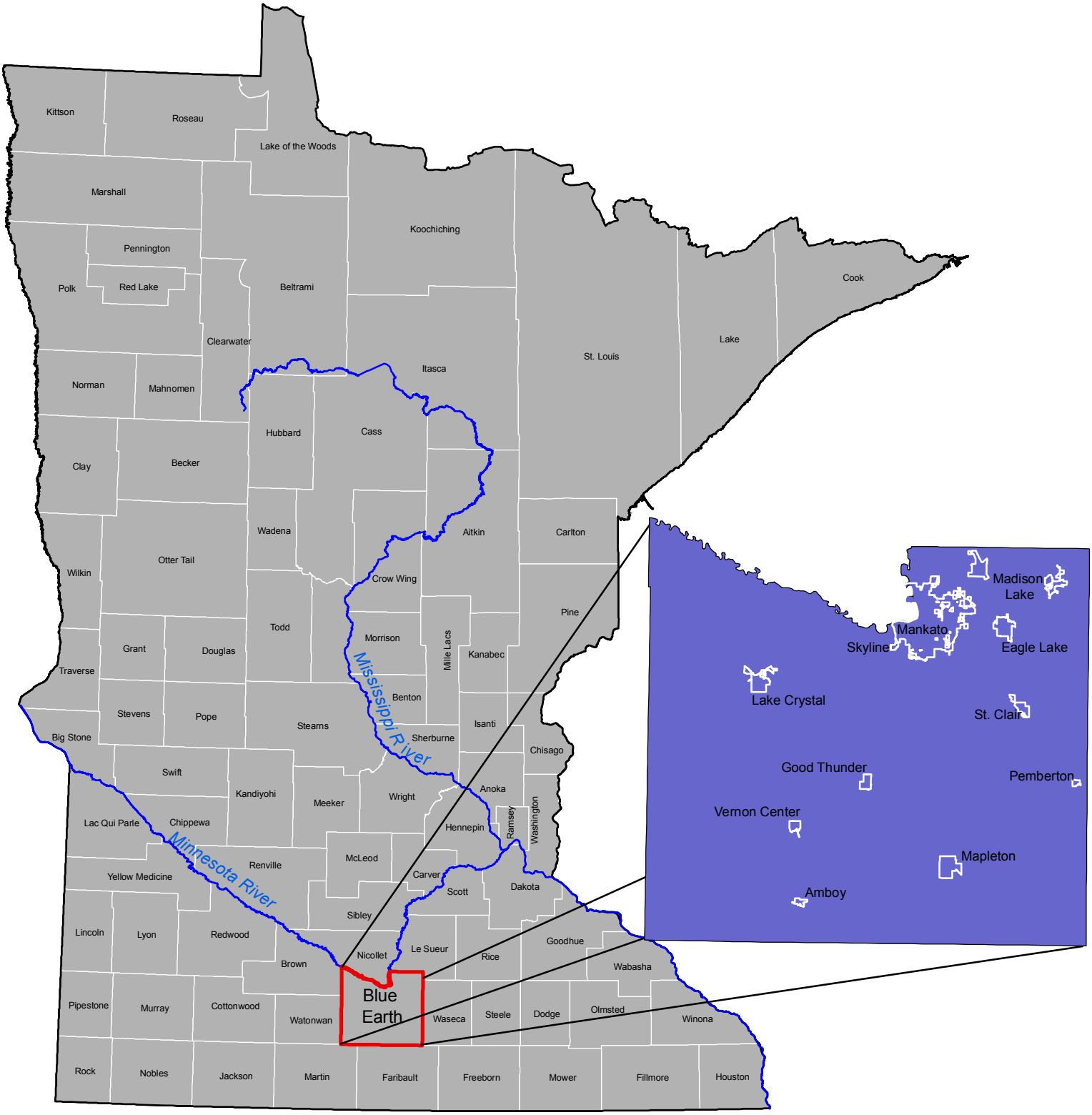
The relief of Blue Earth County is the product of a back-wasting continental glacier. Steep slopes and bluffs are common along the County's many river systems which developed during the retreat of the glacier. Most of the County ranges from nearly level on the lake plain and on ground moraines to rolling where the end moraines form a complex pattern. In areas where there were scattered ice block depressions, a few large lakes formed. There are also many small depressions throughout the County. Secondary drainage in much of the County is immature, and like much of southern Minnesota, the County has an extensive agricultural drainage system of open ditches and subsurface tile lines.

Land Use and Land Cover

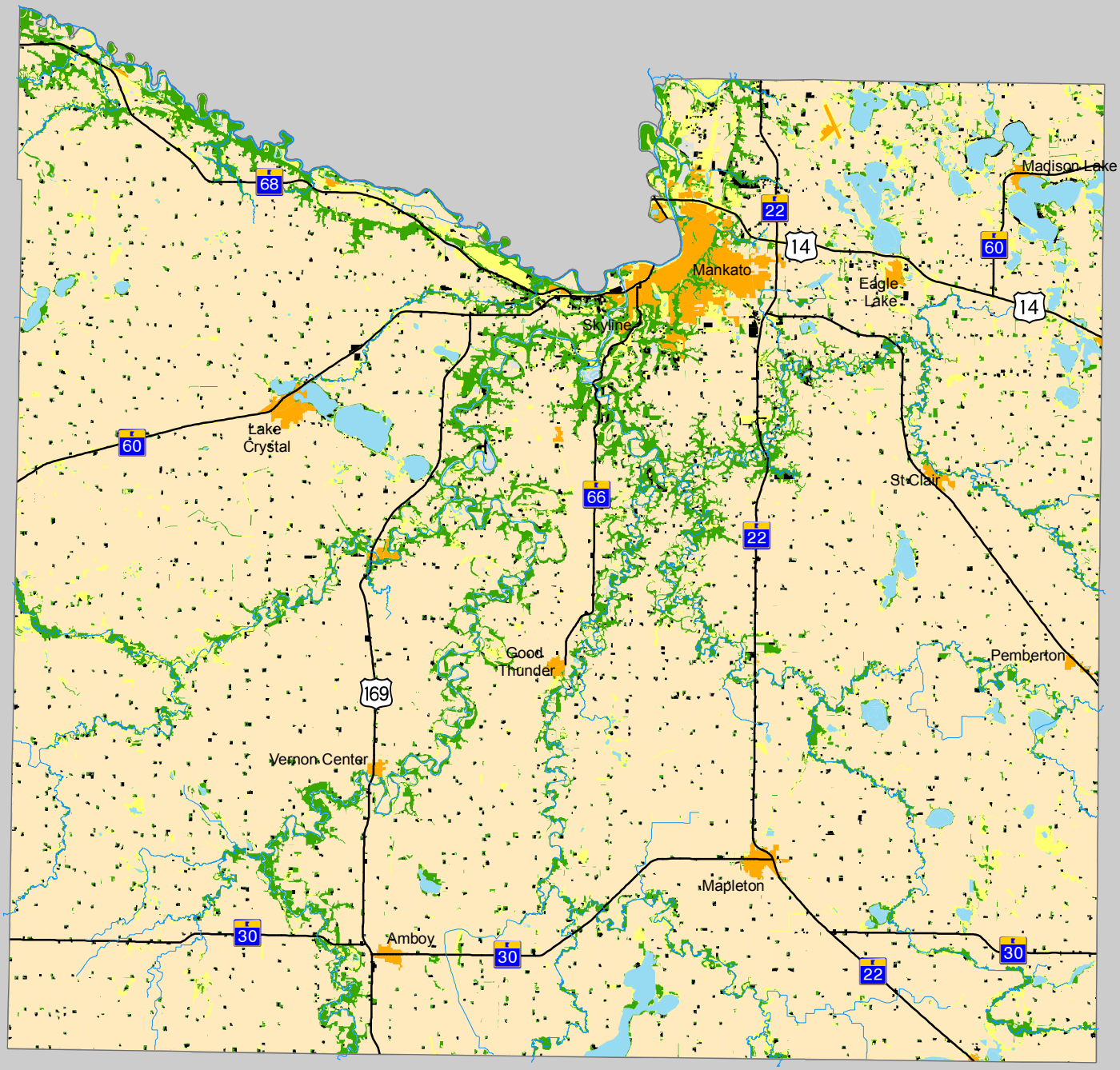
Blue Earth County's landscape is dominated by agricultural uses. Map 2 displays the land use/cover data from the 1990 State Census of Land Use and Cover. Just over 80-percent of the County was cultivated in 1990 according the State's Census of Land Use and Land Cover. Deciduous forests, mostly along the steep slopes adjacent to the rivers, represented just over eight percent of the County. Urban land uses represented just 1.4 percent of the total area of the County in 1990 and farmsteads and rural development represented 1.9 percent of the County's land use. The majority of the rural residential development in the County is scattered along the river bluffs and wooded ravines near Mankato, lakes in the northeast corner and lakes near Lake Crystal. Map 2 displays the land cover data from the 1990 State Census of Land Use and Land Cover.

Although a comprehensive land use analysis in the County has not been done since 1990, observable changes in land use have occurred. Primarily in the municipalities, there has been a great deal of residential, commercial, and industrial growth. Much of this urban growth involves conversion of agricultural land. In 2006, 77 percent of the County was used for cropland. Rural residential growth has slowed as the County's land use policies are aimed at preventing scattered, residential development and preserving agricultural land. Agricultural changes have also occurred since 1990. The animal agriculture industry, primarily hog feedlots, has expanded in Blue Earth County since 1990.

Map 1. General Location - Blue Earth County



Map 2 - 1990 Land Use - Land Cover



1990 Land Use/Cover

- Cultivated Land
- Grassland or Pasture
- Forest
- Urban - Industrial
- Farmsteads or Rural Development
- Gravel Mines or Bare Rock
- Water or Wetland

0 5 Miles

N

BLUE EARTH COUNTY

Prepared By: Blue Earth County
Environmental Services
October 2007

Source: MN Land Use Management Information System's International Coalition Land Use/Land Cover

Watersheds
Over 99 percent of Blue Earth County is located in four major watersheds within the Minnesota River Basin. The Minnesota River Basin's major watersheds are shown in Map 3. The County contains the confluence of the Watonwan River with the Blue Earth River, the confluence of the Le Sueur River with the Blue Earth River, and the confluence of the Blue Earth River with the Minnesota River. Map 4 displays the portions of each watershed in Blue Earth County. The portion of Blue Earth County in each of the four watersheds and the portion of each watershed in Blue Earth County is shown in Table 1.

A significant portion of the Blue Earth River Watershed is located in Martin, Faribault and Jackson County in Minnesota and northern Iowa. Most of the Watonwan River Watershed is located in Watonwan, Cottonwood and Brown Counties. The Le Sueur River Watershed is located in Waseca, Faribault, Freeborn County and Steele County.

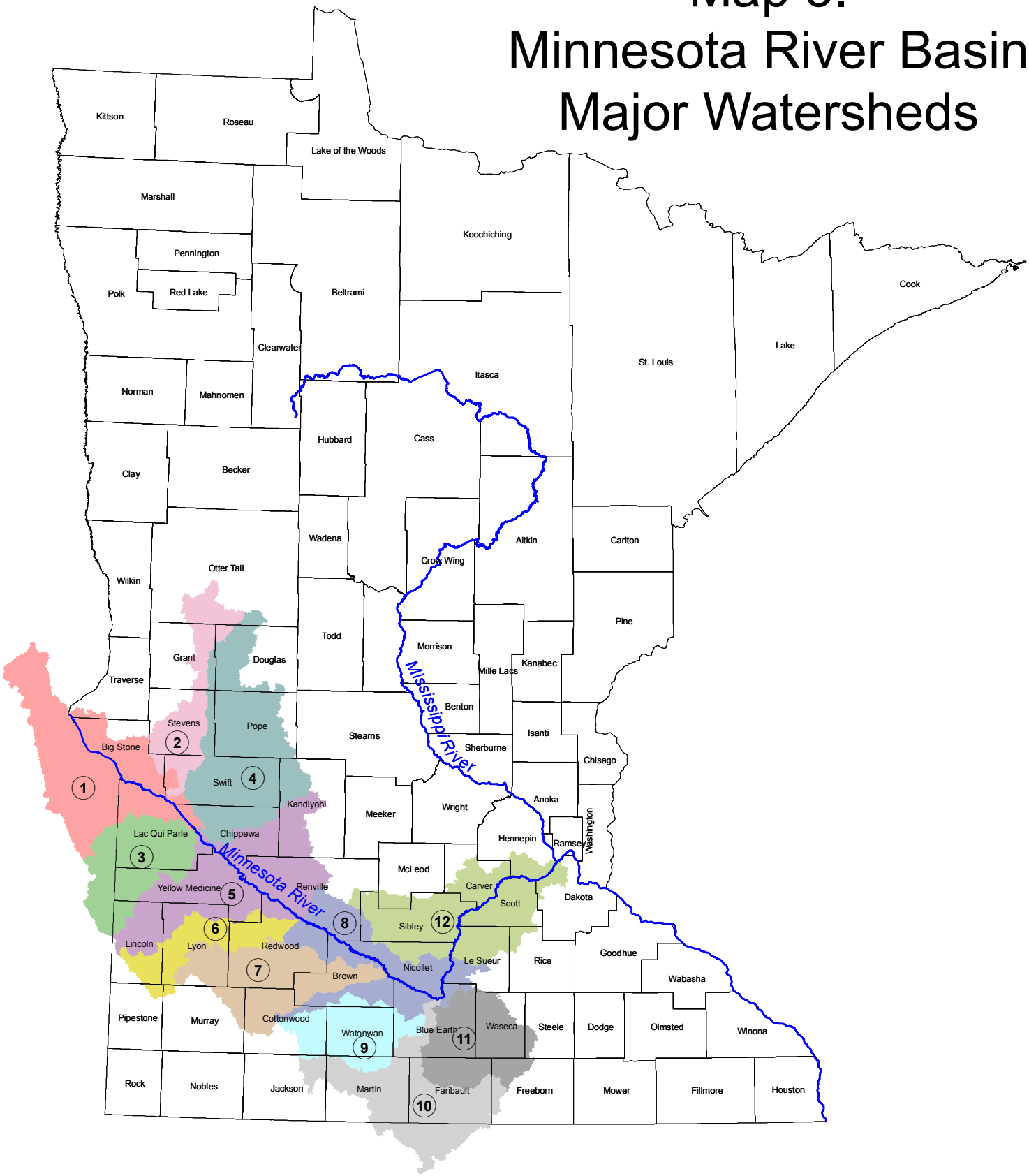
At the regional and Minnesota River Basin scale, the Watonwan, Le Sueur and Blue Earth River watersheds are often combined and collectively referred to as the "Greater Blue Earth River Watershed." When combined, the Greater Blue Earth River Watershed covers more than 75 percent of the County's total land area. The remaining area is the Middle Minnesota River Watershed. The Blue Earth River outlet at Mankato separates the Middle Minnesota River Watershed into two sections: the northeast and the northwest corners of the County. The Le Sueur River watershed occupies 48 percent of the County, the greatest amount of land coverage in Blue Earth County. The Le Sueur River watershed contains a number of relatively large tributary streams including the Maple River, Cobb River, Little Cobb River, and Rice Creek.

Two-square miles in the northeast corner of the County drains east to the Cannon River watershed.

Table 1. Comparison of Major Watersheds
Source: Blue Earth County Environmental Services Department

Watershed	Total Square Miles	Square Miles in Blue Earth County	Percentage of Watershed in Blue Earth County	Land Coverage In Blue Earth County For Each Watershed
Blue Earth River	1,205	124	10.2%	16.2%
Cannon River	1,482	2	0.1%	0.2%
Le Sueur River	1,078	368	34.1%	48.1%
Middle Minnesota Rive	1,385	178	12.8%	23.3%
Watonwan River	850	93	10.9%	12.2%

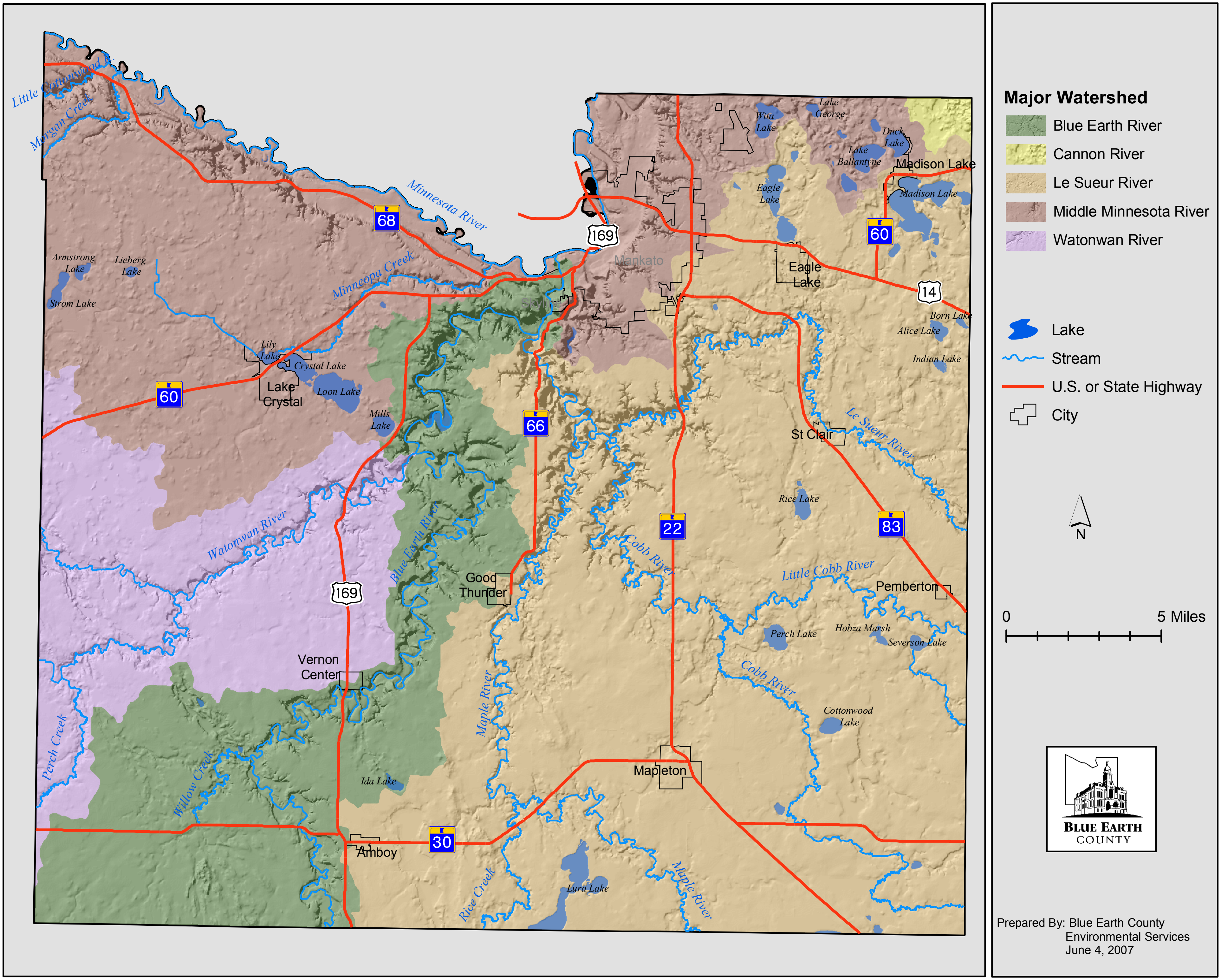
Map 3.
Minnesota River Basin
Major Watersheds



Watersheds in the Minnesota River Basin

1	Upper Minnesota River	5	Hawk Creek - Yellow Medicine River	9	Watonwan River
2	Pomme De Terre River	6	Redwood River	10	Blue Earth River
3	Lac Qui Parle River	7	Cottonwood River	11	Le Sueur River
4	Chippewa River	8	Middle Minnesota River	12	Lower Minnesota River

Map 4. Major Watersheds - Blue Earth County



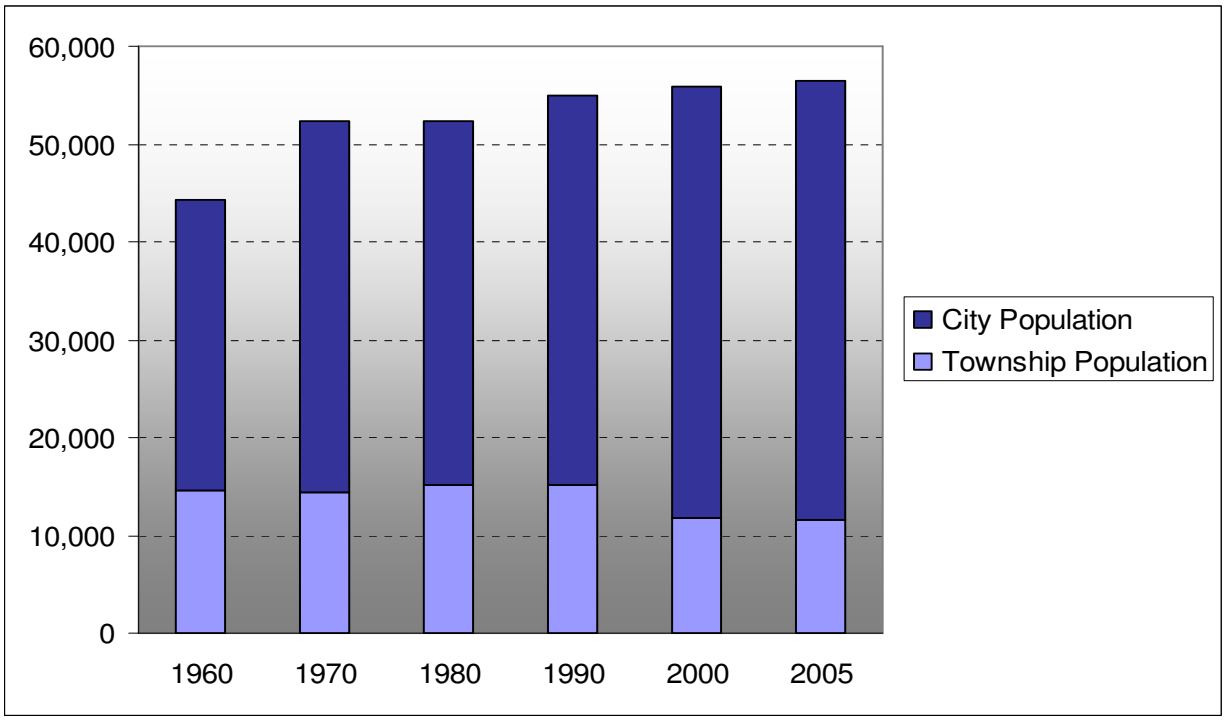
Population

According to estimates from the Minnesota Demographic Center, the County population in 2005 was 58,494. This represents a 4.6 percent increase in population since the 2000 U.S. Census when the County had a population of 55,941. Table 2 shows the population for the cities and township in the County for the 2000 U.S. and for the 2005 estimates from the Minnesota Demographic Center. The majority of the growth in population is from the incorporated cities within the county. In the past forty years the population of the Cities within the County has increased while the population in the unincorporated areas remained stable and started to decrease in 2000. Chart 1 shows population changes between 1960 and 2005.

The City of Mankato has seen the most growth in total population since 2000, while Eagle Lake's population grew at a rate of 13 percent compared to 8 percent for Mankato. Madison Lake is estimated to have grown by 8.7 percent and Lake Crystal is estimated to have grown by 5.3 percent from 2000 to 2005. All of the other cities in the County are estimated to have slightly decreasing or stable populations. Jamestown Township and Decoria Township were the only townships growing in population. Portions of Mankato Township were annexed to the City of Mankato explaining the Township's loss of population.

Map 5 and Map 6 and Table 2 show these population changes in each City and Township.

Chart 1. City and Township Population 1960-2005
Source: U.S. Census ~ 1960-2000 population
Minnesota Demographic Center ~ 2005 population estimate



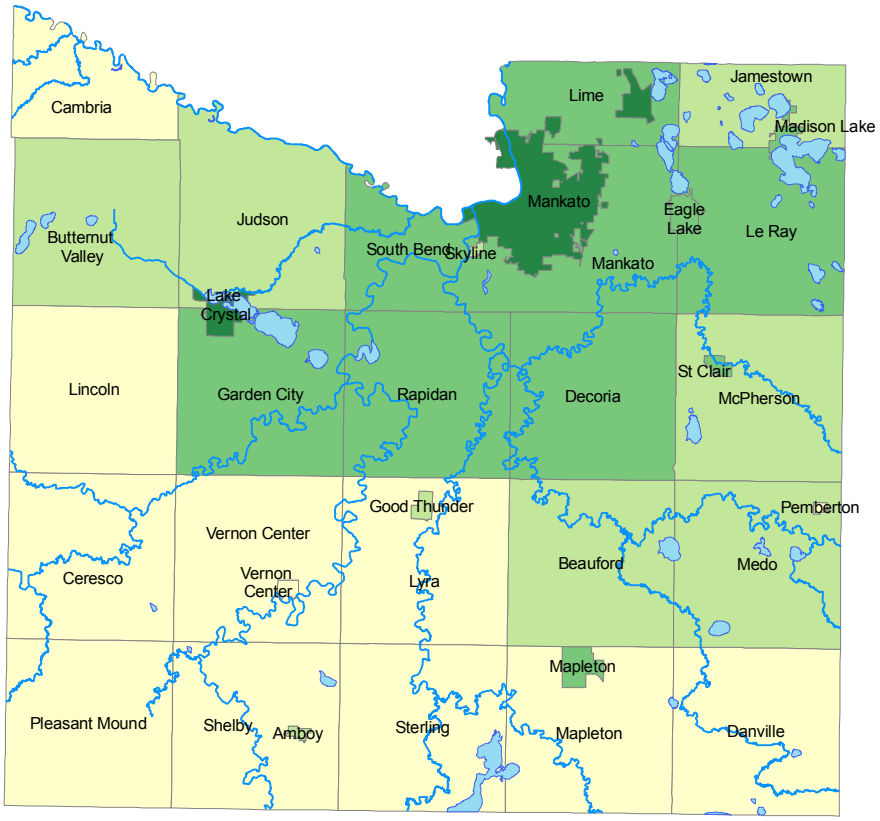
Map 5
2000 Population

Population

- 198 - 350
- 351 - 625
- 626 - 1875
- 1876 - 32357
- Lake
- River

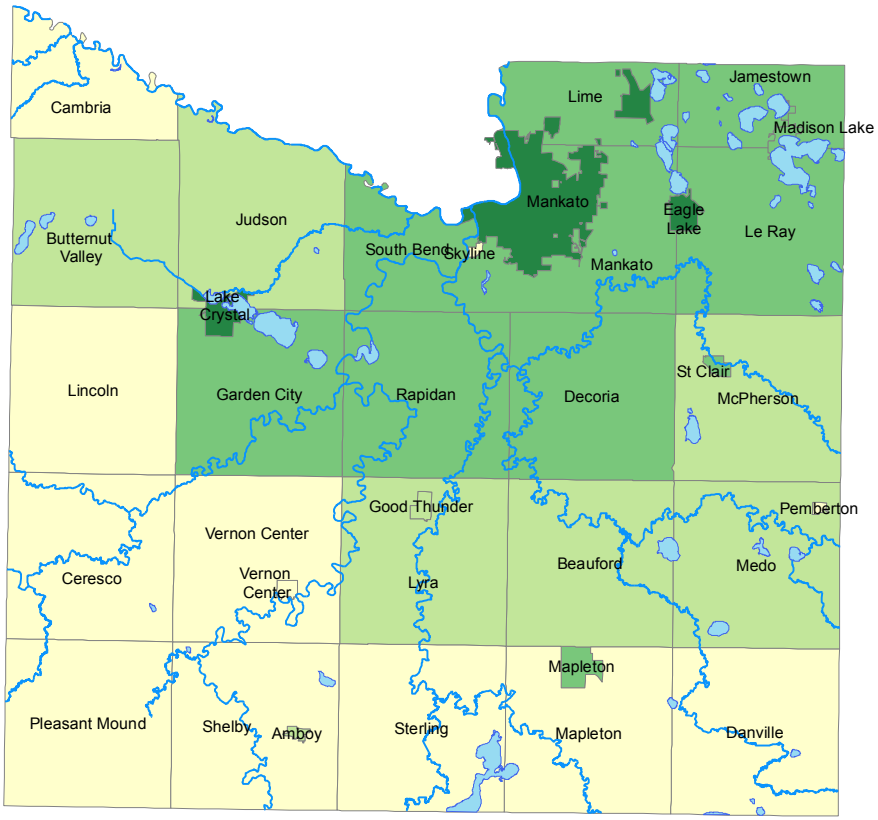
N

0 5 Miles



Prepared By: Blue Earth County
Environmental Services
June 2007
Source: 2000 U.S. Census

Map 6
2005 Population Estimate



Population Estimate

- 198 - 350
- 351 - 625
- 626 - 1875
- 1876 - 35031
- Lake
- River

0 5 10 Miles

N

Prepared By: Blue Earth County
Environmental Services
June 2007
Source: Minnesota State Demographic Center

Table 2. City and Township population 2000 and 2005
Source: U.S. Census ~ 2000 population
Minnesota Demographic Center ~ 2005 population estimate

	2000 Population	2005 Population Estimate	Number Change 2000-2005	Percent Change 2000-2005
City				
Amboy city	575	544	-31	-5.4%
Eagle Lake	1,787	2,020	233	13.0%
Good Thunder	592	563	-29	-4.9%
Lake Crystal	2,420	2,549	129	5.3%
Madison Lake	837	910	73	8.7%
Mankato	32,427	35,031	2,604	8.0%
Mapleton	1,678	1,661	-17	-1.0%
Pemberton	246	246	0	0.0%
St. Clair	827	800	-27	-3.3%
Skyline	330	305	-25	-7.6%
Vernon Center	359	336	-23	-6.4%
City Total	42,078	44,965	2,887	6.9%
Township				
Beauford	442	419	-23	-5.2%
Butternut Valley	382	376	-6	-1.6%
Cambria	271	264	-7	-2.6%
Ceresco	255	244	-11	-4.3%
Danville	262	254	-8	-3.1%
Decoria	922	1,023	101	11.0%
Garden City	700	689	-11	-1.6%
Jamestown	628	643	15	2.4%
Judson	591	557	-34	-5.8%
Le Ray	846	824	-22	-2.6%
Lime	1,314	1,252	-62	-4.7%
Lincoln	227	214	-13	-5.7%
Lyra	378	358	-20	-5.3%
McPherson	470	461	-9	-1.9%
Mankato	1,833	1,775	-58	-3.2%
Mapleton	310	285	-25	-8.1%
Medo	374	360	-14	-3.7%
Pleasant Mound	235	215	-20	-8.5%
Rapidan	1,061	1,037	-24	-2.3%
Shelby	294	281	-13	-4.4%
South Bend	1,491	1,451	-40	-2.7%
Sterling	276	272	-4	-1.4%
Vernon Center	301	275	-26	-8.6%
Township Total	13,863	13,529	-334	-2.4%
County Total	55,941	58,494	2,553	4.6%

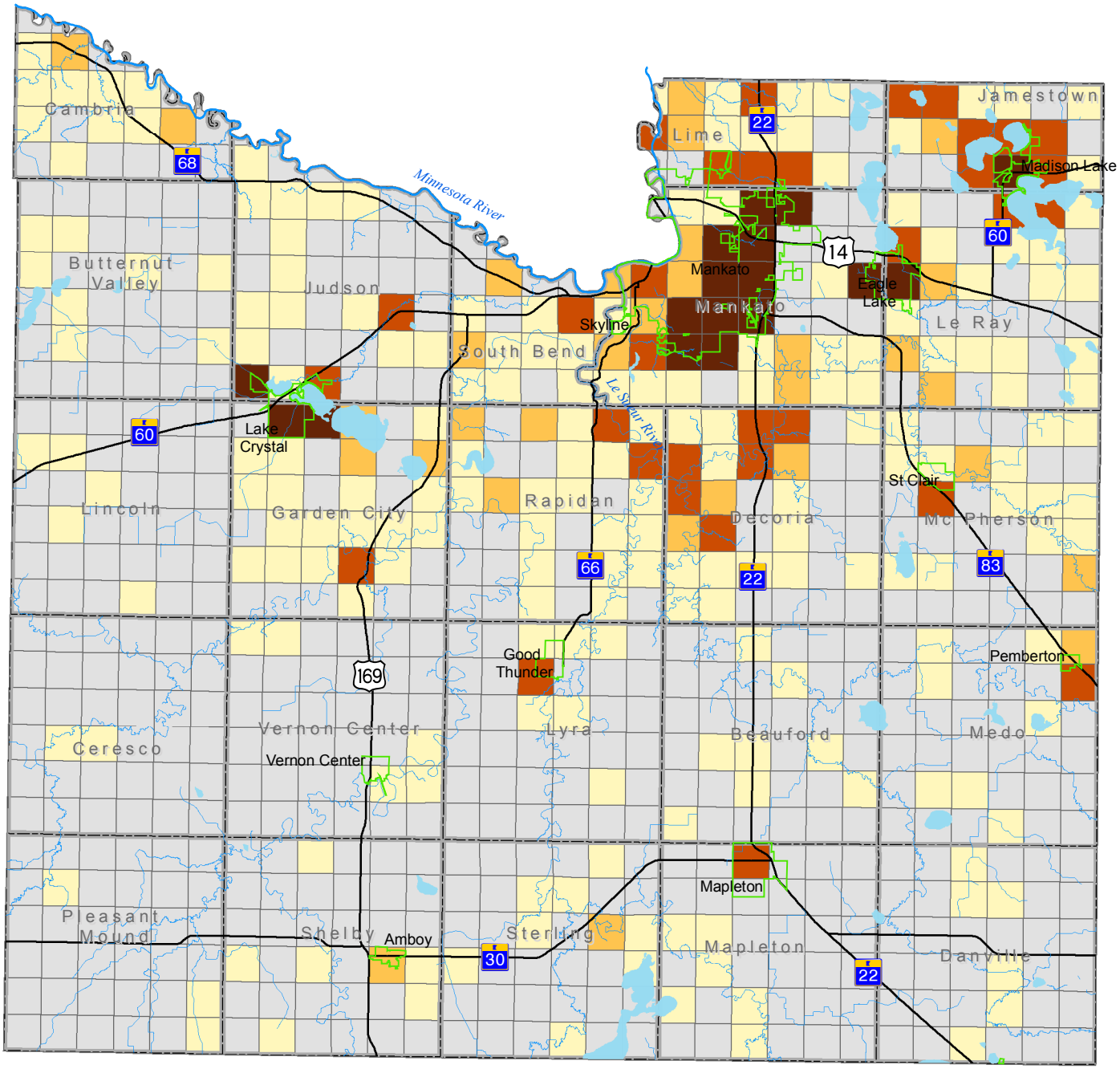
Areas of Growth
The main centers of population growth in the County have been Mankato, Eagle Lake, Madison Lake and Lake Crystal. A great deal of commercial growth has also occurred mainly in Mankato.

Since the Water Plan was updated in 1998, there have been 3,177 single family dwellings constructed in the County. Using the County's Assessor's database and GIS, this information is shown by Section on Map 7. The data includes single family attached or detached houses that have been completed and assessed by the County. Of those houses constructed since 1998, 2,538 or 79.9 percent are located within the municipalities. Sixty-two percent of the all of the houses constructed in the County since 1998 are within the City of Mankato.

Dwellings constructed in the unincorporated areas of the County since 1998 appear to be located generally near the County's rivers, streams, lakes and wetlands.

The current County Zoning Regulations do not allow subdivisions with more than four lots in a quarter-quarter section (40-acres) without being connected to municipal services. Development of previously undeveloped lots in a number of subdivisions created in the 1980's and early 1990's account for much of the residential growth along the County's rivers, lakes and streams since 1998. These subdivisions are located along the Le Sueur River, Maple River, Cobb River, and the lakes in the northeast portion of the County.

Map 7. Houses Constructed By Section Since Last Water Plan Was Approved (1998)



City

Township

Houses Constrcuted by Section Since 1998

- 1 - 2
- 3 - 5
- 6 - 39
- 40 - 361
- No New Houses Constructed

0 5 Miles

N

BLUE EARTH COUNTY

Prepared By: Blue Earth County Environmental Services December 2007

Source: Dwellings - BEC Taxpayer Services Assessors Data

Public waters

Minnesota Statutes, Section 103G.005 sets forth criteria for public water basins and watercourses. According to this statute, Public Waters mean:

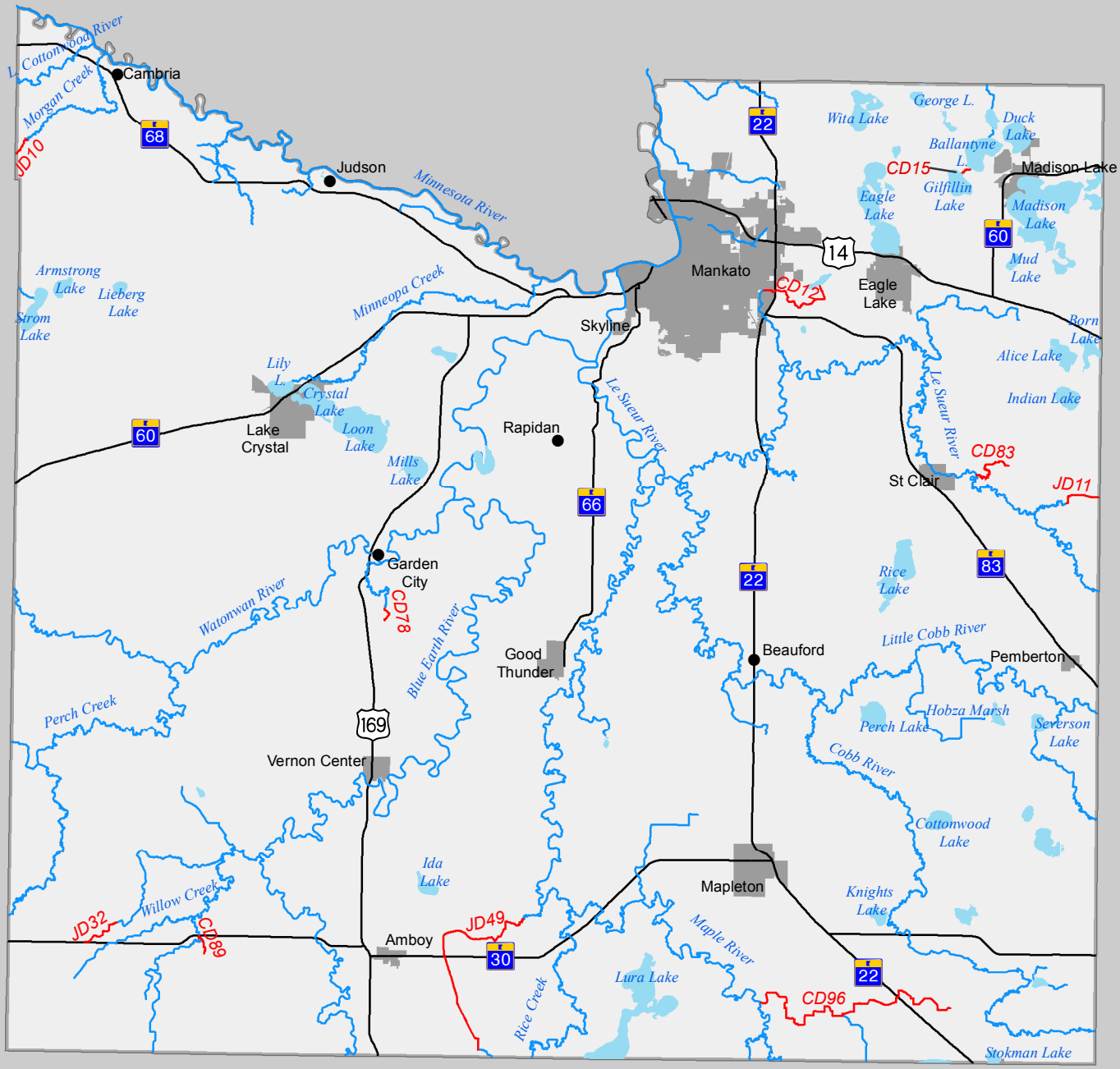
> (1) water basins assigned a shoreland management classification by the commissioner under sections 103F.201 to 103F.221;
> (2) waters of the state that have been finally determined to be public waters or navigable waters by a court of competent jurisdiction;
> (3) meandered lakes, excluding lakes that have been legally drained;
> (4) water basins previously designated by the commissioner for management for a specific purpose such as trout lakes and game lakes pursuant to applicable laws;
> (5) water basins designated as scientific and natural areas under section 84.033;
> (6) water basins located within and totally surrounded by publicly owned lands;
> (7) 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;
> (8) water basins where there is a publicly owned and controlled access that is intended to provide for public access to the water basin;
> (9) natural and altered watercourses with a total drainage area greater than two square miles;
> (10) natural and altered watercourses designated by the commissioner as trout streams;
> (11) public waters wetlands, unless the statute expressly states otherwise.

The DNR oversees these waters and regulates activities below the Ordinary High Water Level (OHWL). Activities such as dredging, filling, excavating, constructing bridges, culverts, or water level control structures are examples that are regulated by the DNR under the Public Waters Program. The DNR maintains a Public Waters Inventory Map.

Protected Waters

Activities above the OHWL of public waters are regulated by the County or municipalities. The Shoreland Section of the County Code identifies the lakes, wetlands and streams which are Protected Waters under County regulations. The Protected Waters in the County Code is nearly identical to the State Public Waters map with the exception of a few Public Water Wetlands that are not listed as Protected Waters in the County Code. Map 8 displays the Protected Waters in Blue Earth County.

Map 8. Protected Streams, Lakes, and Wetlands



Protected Lake or Wetland

County Ditch Classified as Protected Water

Protected Stream or River

State or U.S. Highway

City

0 5 Miles

N

BLUE EARTH COUNTY

Prepared By: Blue Earth County
Environmental Services
December 2007

Note: Protected streams, lakes, and wetlands listed in the Shoreland Section of the County Code are shown.

Floodplains

With over 200 miles of rivers and streams in the County, flooding is a concern, particularly related to protection of existing property in the floodplain. Most floodplain development is located in the City of Mankato, Judson Township and Cambria Township. Floodplains in the County are officially identified on Federal Emergency Management Administration's (FEMA) Flood Insurance Rate Maps. Map 9 shows the FEMA-identified floodplains in the County. The majority of the area in the County is covered by Floodplain maps that were last updated in 1990. Maps along the Minnesota River and the confluence of the Blue Earth River were updated in 1999.

Limitations
Detailed Flood Studies were conducted for all areas of the County when FEMA's Floodplain Maps were compiled. Just over two thirds of the land the County which is defined as being in a Special Flood Hazard Area Inundated by the 100-Year Flood is classified as being in Zone A which does not have detailed flood information or elevations for the 100-year Flood.

There have been significant river channel changes since the Floodplain maps were last revised. There are river channels in the County that have changed so much that the river channel itself is now located outside of the Floodplain that was delineated in 1990.

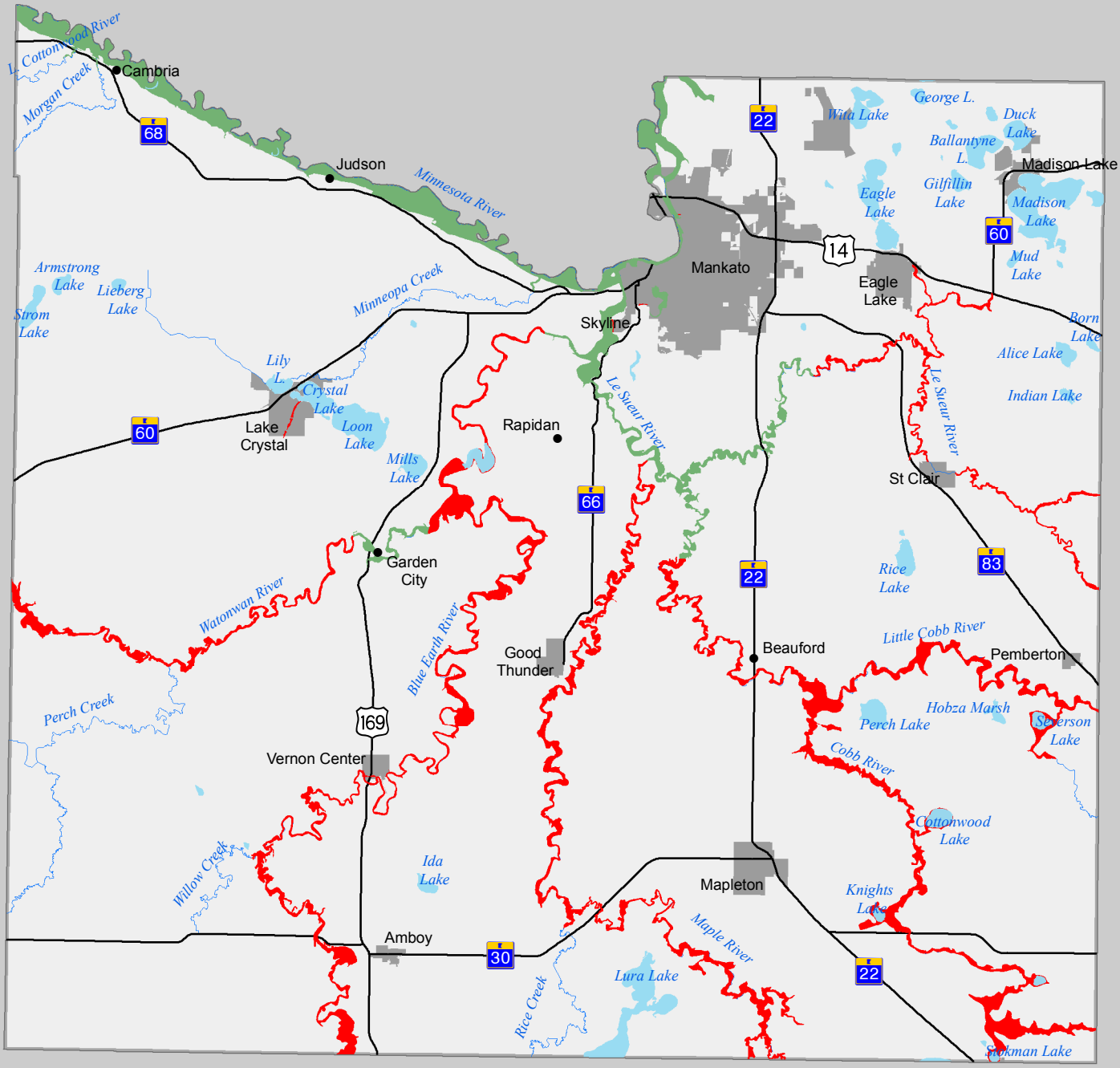
In addition to the lack of elevation data available on the current Flood Insurance Rate Maps, several of the smaller streams and rivers in the County such as Minneopa Creek, Morgan Creek and the Little Cottonwood River only have delineated Floodplain at their confluence with the Minnesota River.

Municipalities, such as the City of St. Clair, which have not chosen to participate in the National Flood Insurance Program, are simply not included in the FEMA Flood Insurance Rate Map. For example, the Floodplain along the Le Sueur River is shown as stopping at the City limits of St. Clair.

Within the City of Lake Crystal, a small area of floodplain has been delineated along County Ditch 56.

FEMA Map Modernization
FEMA is in the process of updating Flood maps nationwide. Digital Flood Insurance Rate Maps for Blue Earth County will be available as part of their map modernization process. The County collected LiDAR high resolution elevation data a high resolution orthophoto in 2005. Both the photo and elevation data have been provided to FEMA and its consultant and are important components in helping improve the quality and resolve the limitations with the current Floodplains that are delineated in the County. FEMA is scheduled to complete Blue Earth County's maps in the next few years.

Map 9. FEMA Floodplain



State or U.S. Highway

City

FEMA Floodplain

Floodplain Without Base Flood Elevations

Floodplain With Base Flood Elevations

0 5 Miles

N

BLUE EARTH COUNTY

Prepared By: Blue Earth County
Environmental Services
October 2007

Source: Floodplain - Federal Emergency Management Agency

Wetlands

Like other counties in Southern Minnesota, the vast majority of the pre-settlement wetlands in Blue Earth County were drained to allow for the production of crops and the development of communities. It is difficult to quantify the loss of wetlands in the County. The DNR's "*Minnesota Wetlands Conservation Plan*" from 1997 estimated that only two percent of the County's pre-settlement wetlands remained in 1981.

For regulatory purposes of the Wetland Conservation Act (WCA), the County falls within a group of counties for which less than 50-percent of the pre-settlement wetlands are intact.

Definition of a Wetland

Minnesota Statutes, Chapter 8420.0010, Subp. 52 defines wetlands as: "lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water." It also states that a wetland must:

1. have a predominance of hydric soils;
2. be inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions; and
3. under normal circumstances, support a prevalence of hydrophytic vegetation.

Wetland Inventory

A comprehensive inventory of existing wetlands is not available. The U.S. Fish and Wildlife Service and DNR have inventories of wetlands.

Minnesota Protected Waters: The State Public Waters law, Minnesota Statutes, Section 103G.005, designates some wetlands as public waters, including:

- Water basins are assigned a shoreland management classification, including wetlands. Wetlands less than 80 acres in size are classified as natural environment lakes.
- Water basins designated for management for a specific purpose such as a trout lake and game lake;
- All types 3, 4 and 5 wetlands as defined in U.S. Fish and Wildlife Service (USFWS) Circular No. 39 not included within the definition of public waters, not included in the definition of public waters, that are ten or more acres in size in unincorporated areas or 2.5 acres or more in incorporated areas.

National Wetlands Inventory: The purpose of the NWI was to provide better information on the location and type of wetlands that were shown on the U.S. Geological Survey topographical maps. The NWI was compiled based on interpretation of aerial photos from 1980. Map 10 shows the NWI wetlands in the County. It was not the intent of the NWI to provide exact wetland boundaries and the NWI does not depict all wetlands. Many wetlands under an acre in size and wetlands in areas such as forests where wetlands are not identifiable using photos are not shown on the maps. In Blue Earth County, there are many wetlands that do not appear on the NWI maps for those reasons, and there and also wetlands which are identified on the NWI that are currently farmed or developed. The NWI provides information, but wetland delineations may be necessary when wetland determinations are made under the WCA.

Wetland types

Wetlands vary in depth, flow, proximity to other water bodies and vegetation. The U.S. Fish and Wildlife Service developed a classification of wetlands which includes many types of wetlands, according to *Wetlands of the United States*, U.S. Fish and Wildlife Service Circular 39 (1971 edition). These types of wetlands include:

Type 1 wetlands are seasonally flooded basins or flats in which soil is covered with water or is waterlogged during variable seasonal periods but usually is well-drained during much of the growing season. Type 1 wetlands are located in depressions and in overflow bottomlands along watercourses, and in which vegetation varies greatly according to season and duration of flooding and includes bottomland hardwoods as well as herbaceous growths.

Type 2 wetlands are inland fresh meadows in which soil is usually without standing water during most of the growing season but is waterlogged within at least a few inches of surface. Vegetation includes grasses, sedges, rushes, and various broad-leafed plants. Meadows may fill shallow basins, sloughs, or farmland sags, or these meadows may border shallow marshes on the landward side.

Type 3 wetlands are inland shallow fresh marshes in which soil is usually waterlogged early during a growing season and often covered with as much as six inches or more of water. Vegetation includes grasses, bulrushes, spike rushes, and various other marsh plants such as cattails, arrowheads, pickerelweed, and smartweeds. These marshes may nearly fill shallow lake basins or sloughs, or may border deep marshes on the landward side and are also common as seep areas on irrigated lands.

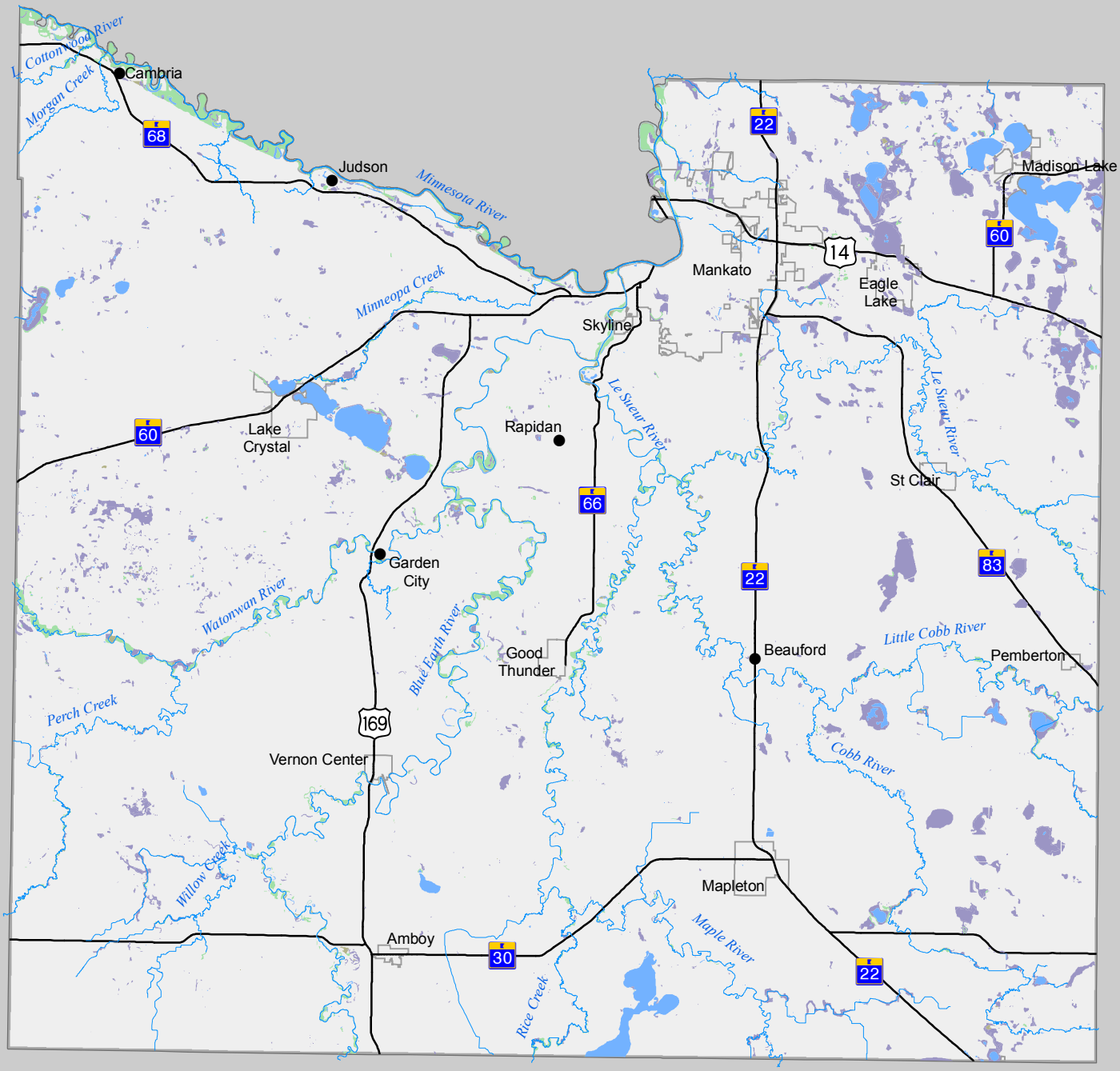
Type 4 wetlands are inland deep fresh marshes in which soil is usually covered with six inches to three feet or more of water during the growing season. Vegetation includes cattails, reeds, bulrushes, spike rushes, and wild rice. In open areas, pondweeds, naiads, coontail, water milfoils, waterweeds, duckweeds, water lilies, or spatterdocks may occur. These deep marshes may completely fill shallow lake basins, potholes, limestone sinks, and sloughs, or they may border open water in such depressions.

Type 5 wetlands are inland open fresh water, shallow ponds, and reservoirs in which water is usually less than ten feet deep and is fringed by a border of emergent vegetation similar to open areas of type 4 wetland.

Type 6 wetlands are shrub swamps in which soil is usually waterlogged during growing season and is often covered with as much as six inches of water. Vegetation includes alders, willows, buttonbush, dogwoods, and swamp-privet. This type occurs mostly along sluggish streams and occasionally on floodplains.

Type 7 wetlands are wooded swamps in which soil is waterlogged at least to within a few inches of the surface during growing season and is often covered with as much as one foot of water. This type occurs mostly along sluggish streams, on floodplains, on flat uplands, and in shallow basins. Trees include red maple, and black ash. Deciduous swamps frequently support beds of duckweeds and smartweeds.

Map 10. National Wetlands Inventory



NWI Wetland Type

- Emergent
- Forested
- Riverine
- Scrub-shrub
- Open Water

State or U.S. Highway

City

0 5 Miles

N

BLUE EARTH COUNTY

Prepared By: Blue Earth County
Environmental Services
October 2007

Source: NWI - U.S. Fish and Wildlife Service

SOILS AND EROSION

The USDA Soil Survey for Blue Earth County was published in 1978. It includes a general soil map of the County for general land use planning and 14 broad soil classifications. The broad classification is a summary of detailed inventory of 65 different soil descriptions. Included in the description are the essential soil characteristics for management of crops, pasture and hay, establishment of windbreaks and environmental plantings, suitability for wildlife habitat, use for recreation, and engineering and soil properties.

The soils in the County are considered young. The process of soil formation began about 12,000 years ago as the glaciers receded. Most of the soil material deposited by the glaciers consisted of reworked drift carried by earlier glaciers.

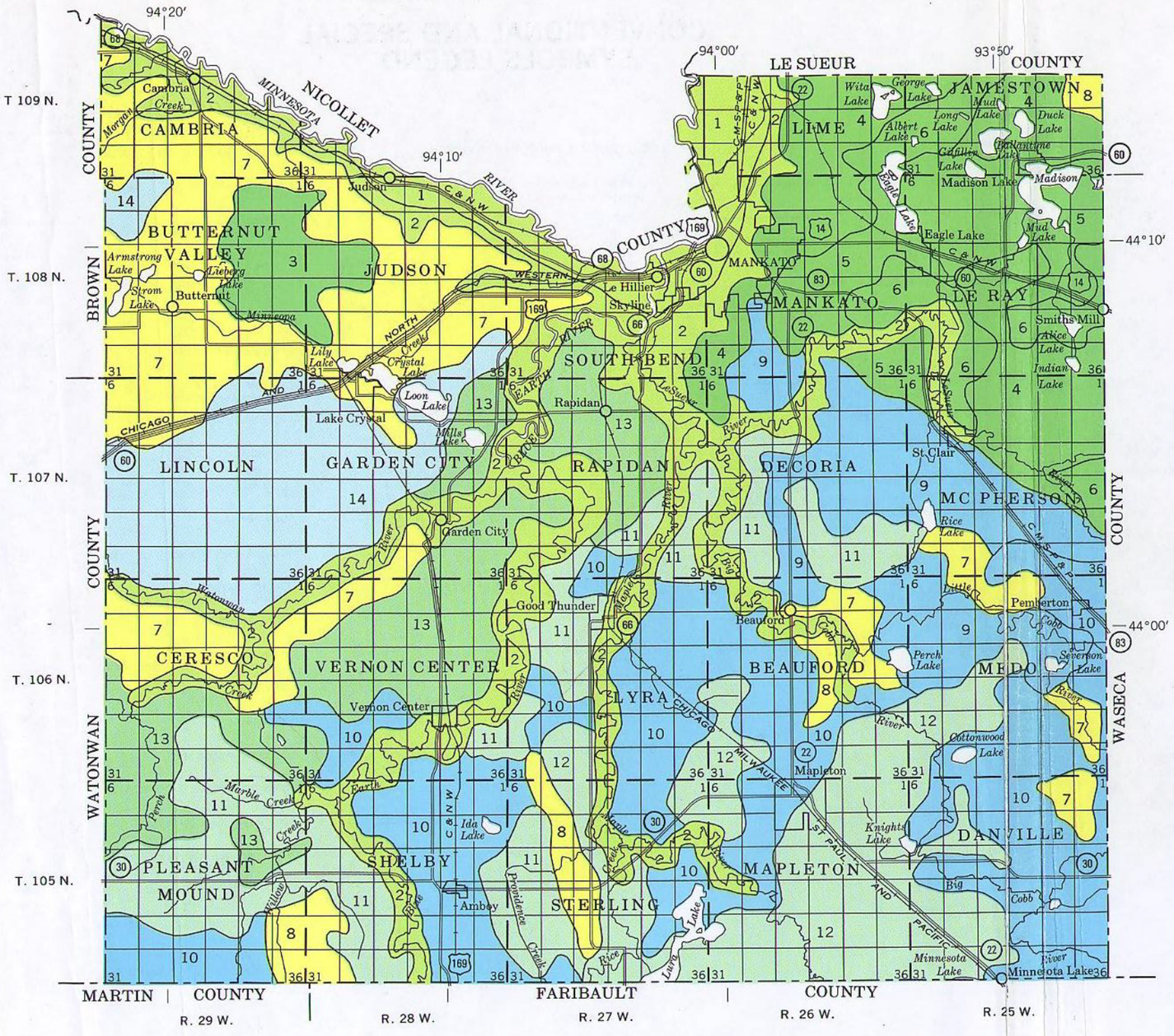
Most of the County is covered by an unconsolidated mantle of glacial drift and lacustrine sediments. This mantle generally ranges from a depth of about 90 to 140 feet in the southeastern portion of the County, to more than 200 feet deep in the northwest part of the County. There are also areas of the County with shallow soils and exposed bedrock.

Recent alluvium is found along streams. The thickness varies. These sediments are saturated with water, but the texture retards the water yield. Many terraces of late glacial gravel and buried glacial gravel beds are important local sources of drinking water.

Two types of vegetation, forest and prairie, have strongly influenced the formation of soils in Blue Earth County. The Le Sueur River forms a general boundary between the Big Woods and the prairie region. There were small strips of Big Woods along the river in the County from the south and west. The Blue Earth River and the glacial lake plain generally form the southern and western boundary of the oak openings. The remainder of the County was in tall prairie grasses, with lesser areas consisting of wet prairies and brush land.

The last glaciation period left the County with unique topography, soils and river systems. The major rivers winding their way across the County are deeply eroded tributaries which have resulted in the creation of many valley and ravine systems with steep and complex slopes.

The reduction of sedimentation is an important issue when seeking to improve water quality. A large amount of sediment entering a stream can kill aquatic plants by blocking sunlight and disrupt feeding and reproduction of many fish species by covering the gravel and natural stream bed. Heavy sediment loads gradually fill the channel which can also contribute to increases in flooding. Sedimentation is a problem common to area lakes which are outlets for streams and ditches.



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MINNESOTA AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

BLUE EARTH COUNTY, MINNESOTA

Scale 1:253,440

1 0 1 2 3 4 Miles

N

SOIL ASSOCIATIONS

ALLUVIAL TERRACES AND STEEP LAND ADJACENT TO RIVERS

1 — Alluvial land-Copaston-Chaska: Nearly level and gently undulating, poorly drained to well drained soils formed in medium textured alluvium stratified with moderately coarse and coarse textured material; some are underlain by limestone bedrock

2 — Storden-Comfrey-Lomax: Nearly level to very steep, well drained and poorly drained soils formed in moderately coarse to moderately fine textured alluvium and medium textured glacial till

LOW, NEARLY CIRCULAR HILLS HAVING NEARLY LEVEL TO GENTLY UNDULATING TOPS AND SMOOTH SIDES

3 — Nicollet-Webster-Clarion: Nearly level and gently undulating, moderately well drained, poorly drained, and well drained soils formed in medium textured and moderately fine textured glacial till

4 — Cordova-Lester-Caron: Nearly level and moderately steep, very poorly drained, poorly drained, and well drained soils formed in medium textured and moderately fine textured glacial till and organic material

5 — Minnetonka-Kilkenny-Caron: Nearly level and moderately steep, very poorly drained, poorly drained, and well drained soils formed in moderately fine and fine textured material over glacial till or in organic material

6 — Kilkenny-Minnetonka-Lerdal: Nearly level to moderately steep, poorly drained, somewhat poorly drained, and well drained soils formed in moderately fine and fine textured material over glacial till

GENTLY UNDULATING TO STEEP, IRREGULARLY SLOPING GROUND AND END MORAINES

7 — Webster-Nicollet-Canisteo: Nearly level and gently undulating, poorly drained and moderately well drained soils formed in medium textured and moderately fine textured glacial till

8 — Clarion-Storden-Estherville: Rolling to steep, well drained and somewhat excessively drained soils formed in medium textured glacial till and moderately coarse textured glacial outwash

CLAYEY MANTLED GROUND MORAINE

9 — Minnetonka-Shorewood-Lura: Nearly level and gently sloping, very poorly drained, poorly drained, and moderately well drained soils formed under timber and grasses in moderately fine and fine textured lacustrine material and the underlying glacial till

10 — Marna-Guckeen-Lura: Nearly level and gently undulating, very poorly drained, poorly drained, and moderately well drained soils formed under prairie grasses in moderately fine and fine textured lacustrine material and the underlying glacial till

CLAYEY LAKE PLAIN

11 — Waldorf-Collinwood-Lura: Nearly level, very poorly drained, poorly drained, and moderately well drained soils formed in moderately fine and fine textured lacustrine material underlain in some areas by stratified, medium textured material

12 — Beauford-Lura-Shorewood: Nearly level, very poorly drained, poorly drained, and moderately well drained soils formed in fine textured lacustrine material

SILTY LAKE PLAIN

13 — Madelia-Kingston-Spicer: Nearly level and gently sloping, poorly drained and moderately well drained soils formed in moderately fine textured and medium textured lacustrine material

DELTA SEDIMENTS ON GROUND MORAINE

14 — Darfur-Dassel-Fieldon: Nearly level, very poorly drained and poorly drained soils formed in moderately coarse textured and medium textured, stratified delta sediments

Compiled 1977

Erodible Land Classification
Highly erodible land (HEL) comprises four percent of the total land area in the County, and potentially highly erodible land makes up 3.55 percent. Much of this land is located along steep bluffs adjacent to the rivers and streams in the County. Of the HEL, about 3,800 acres is designated as cropland, representing just over nineteen percent of the HEL in the County. Cropland includes established CRP and other established conservation practices that are not considered permanent.

When looking at the cropland in the County, only 1.03 percent is classified as highly erodible land and 3.53 percent is classified as potentially highly erodible land. Chart 2 summarizes erodible land classification for all land in the County while Chart 3 displays a summary of only the cropland. The cropland that is classified as highly erodible land and the potentially highly erodible cropland can easily be targeted for best management practices. Map 12 displays the Erodible Land Classification for all of the soils in the County and Map 13 displays the Erodible Land Classification for the cropland in the County.

Chart 2
Highly Erodible Land Classification
Summary for All Land in County

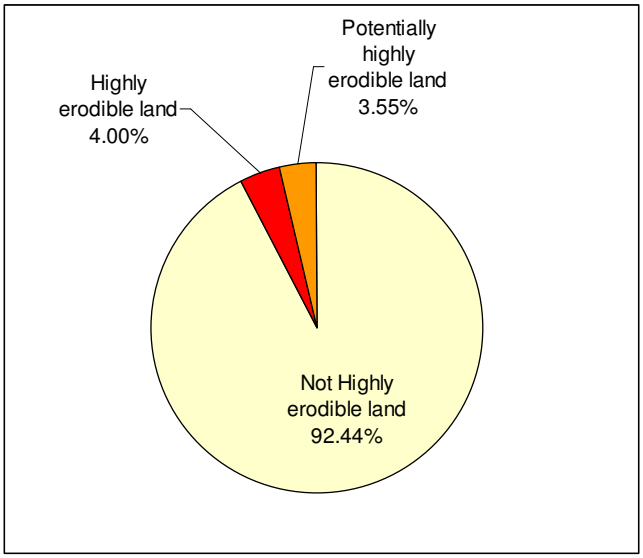
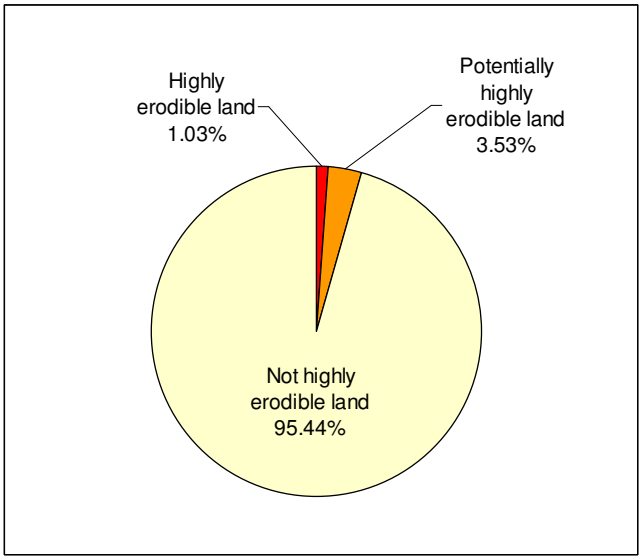
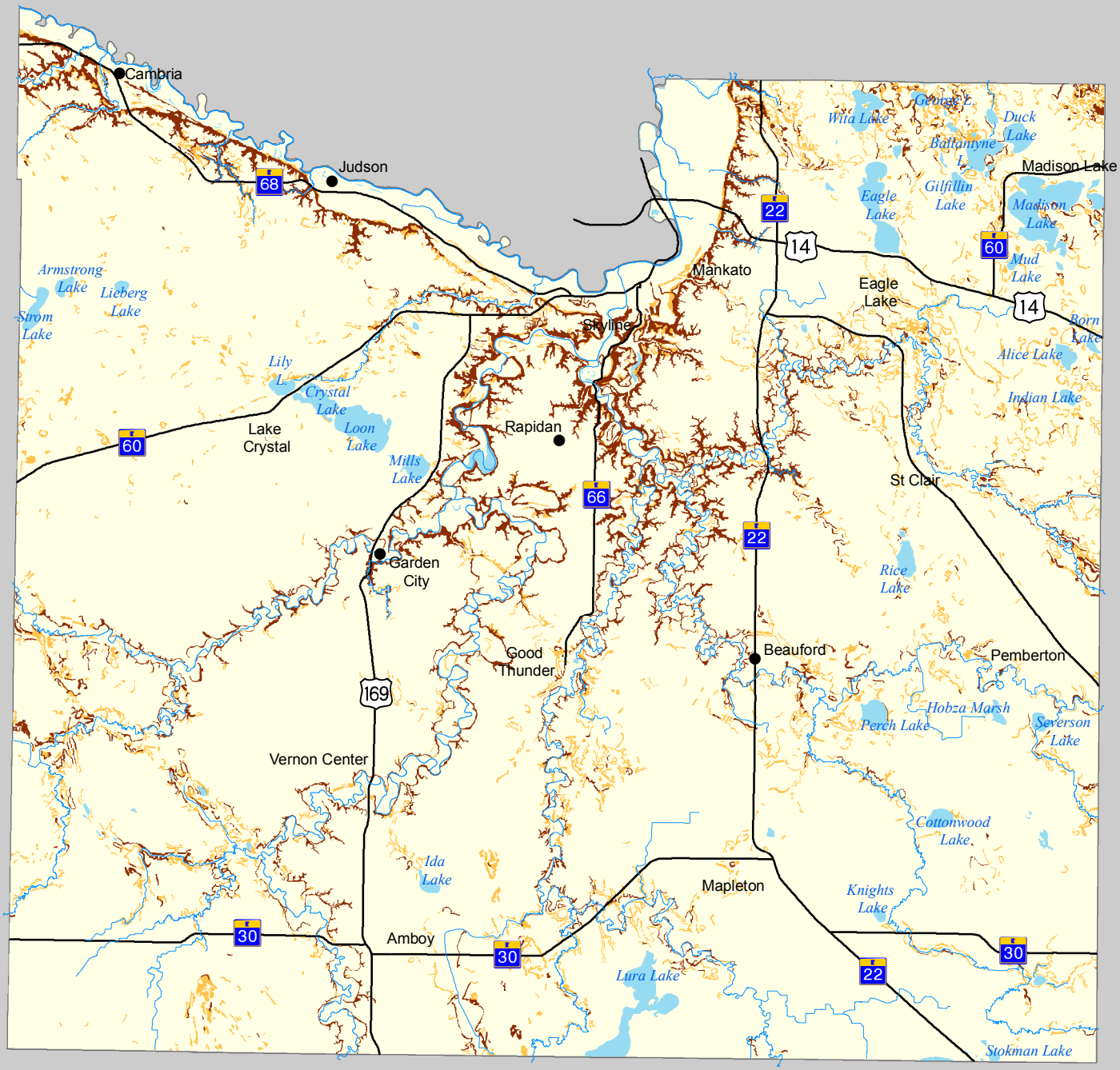


Chart 3
Highly Erodible Land Classification
Summary for Cropland in County



Source: USDA NRCS SSURGO Soils and USDA NRCS Common Land Unit

Map 12. Erodible Land Classification of Soils



Erodible Land Classification

- Highly erodible land
- Potentially highly erodible land
- Not highly erodible land
- No Value or Water

0 — 5 Miles

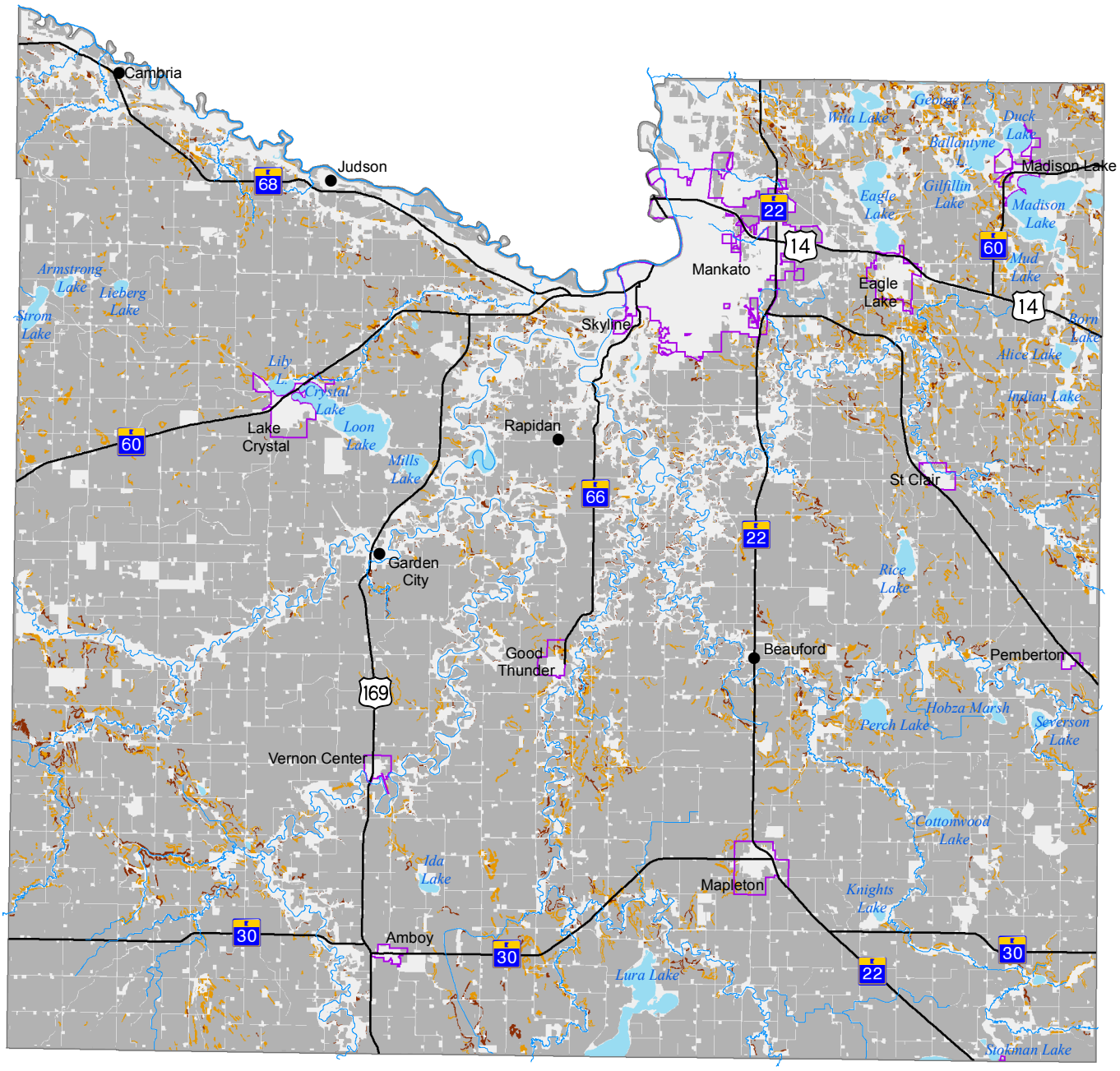
N

BLUE EARTH COUNTY

Prepared By: Blue Earth County
Environmental Services
October 2007

Source: NRCS SSURGO Soils

Map 13. Erodible Land Classification of Cropland



Erodible Land Classification of Cropland

- Not highly erodible land
- Potentially highly erodible land
- Highly erodible land

0 — 5 Miles

N

BLUE EARTH COUNTY

Prepared By: Blue Earth County
Environmental Services
October 2007

Source: NRCS SSURGO Soils

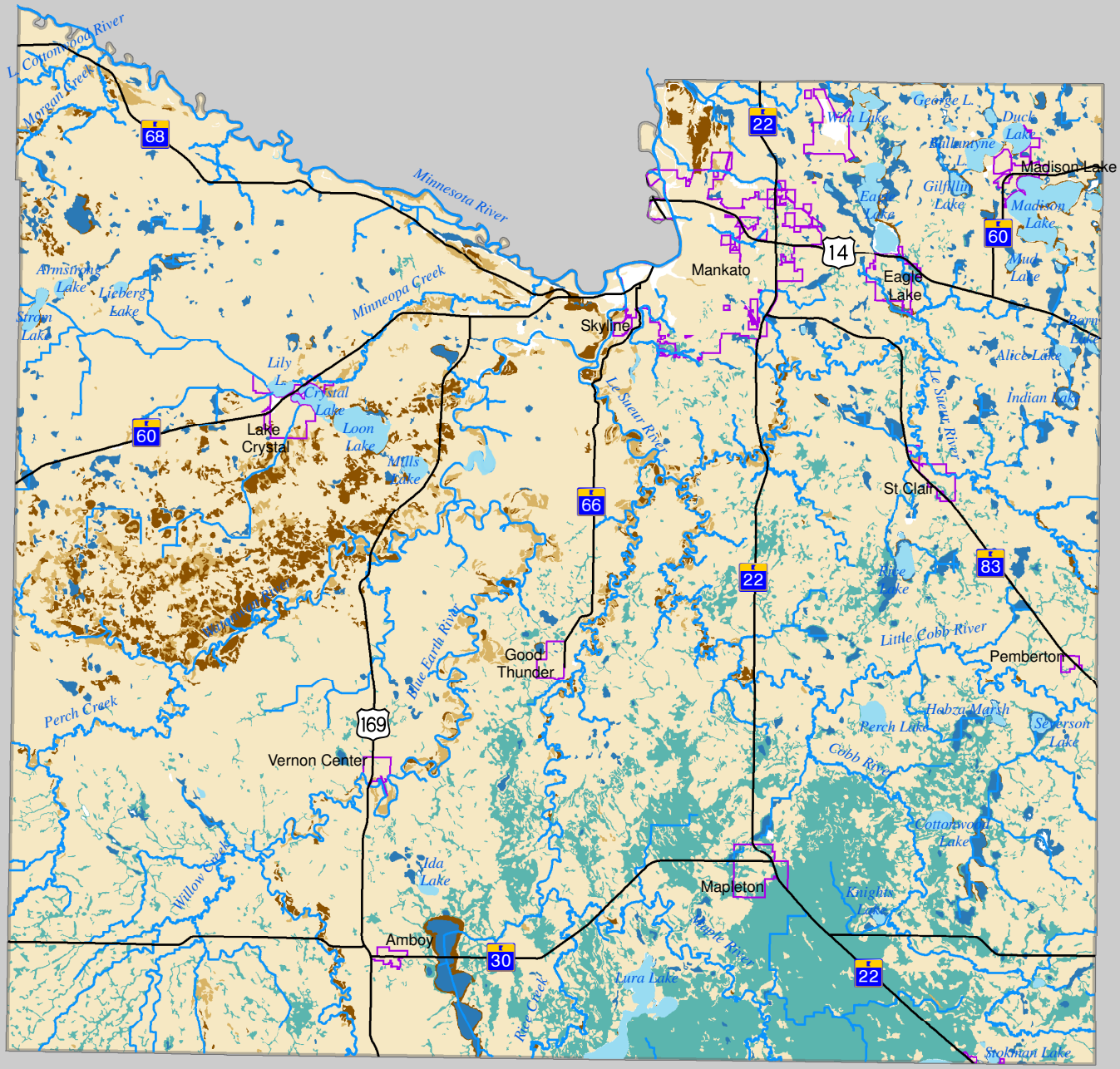
Soil Texture
Map 14 displays the general soil texture in the County.

Coarse Soils
Coarse soils are found mainly in an area south and east of Lake Crystal to the Watonwan River. Other notable deposits of coarse soils are found near wetlands and Morgan Creek north of Armstrong Lake, along the Blue Earth River south of Vernon Center, along the lower reaches of the Le Sueur, Maple and Cobb River, and an area just north of the City of Mankato. Another area with coarse soil deposits is along the north "shore" of the drained Jackson Lake east of Amboy.

Muck – Mucky peat or mucky silt loam
Muck soils are found in historic wetlands and shallow lakes throughout the County.

Fine Soils
Fine soils are found mainly in the southern half of the County, with the largest consolidated areas being in the Le Sueur River watershed near Good Thunder and Mapleton.

Map 14. General Soil Texture



General Soil Texture

- Coarse
- Moderately Coarse
- Medium or Moderately Fine
- Fine
- Muck- mucky peat or mucky silt loam
- No Value

0 — 5 Miles

N

BLUE EARTH COUNTY

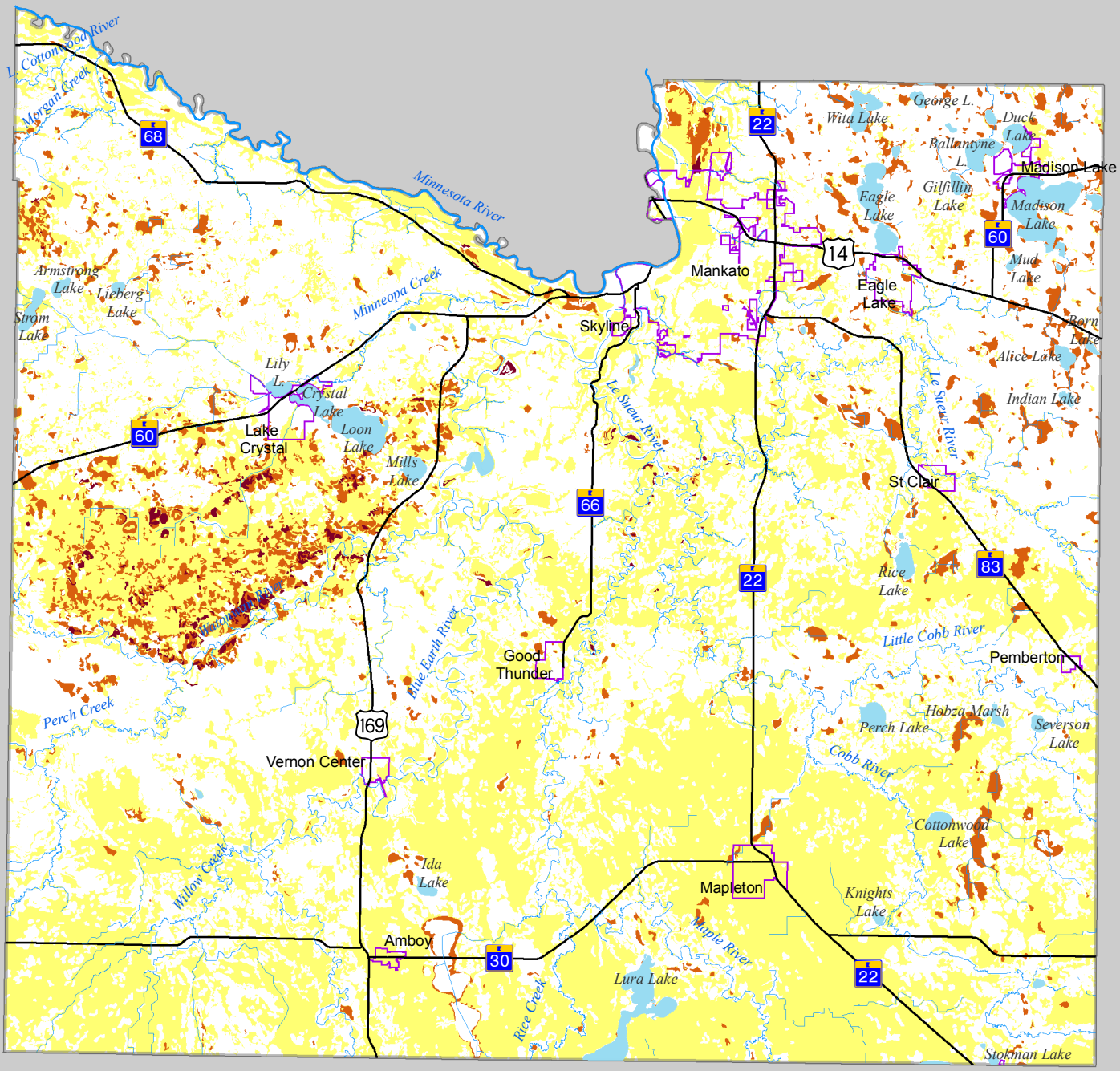
Prepared By: Blue Earth County Environmental Services November 2007

Source: NRCS SSURGO Soils

Wind Erosion
Map 15 displays the Wind Erodibility Index for the soils in the County. The greatest single area with wind erodible soils is found in the area with coarse textured soils south of Lake Crystal to the Watonwan River. To a lesser extent, fine textured soils are also prone to wind erosion.

Wind erosion is significant during the months of the year when the soil is unprotected by vegetation, crop, crop residue or snow cover and exposed to wind and rain. Drifts of eroded soil collect in and along ditches and fence lines across the landscape. This is commonly observed in the area south of Lake Crystal.

Map 15. Wind Erodibility Index



Wind Erodibility Index

Tons lost per acre per year

- 0 -50
- 51-100
- 101-200
- Over 200

0 — 5 Miles

N

BLUE EARTH COUNTY

Prepared By: Blue Earth County Environmental Services October 2007

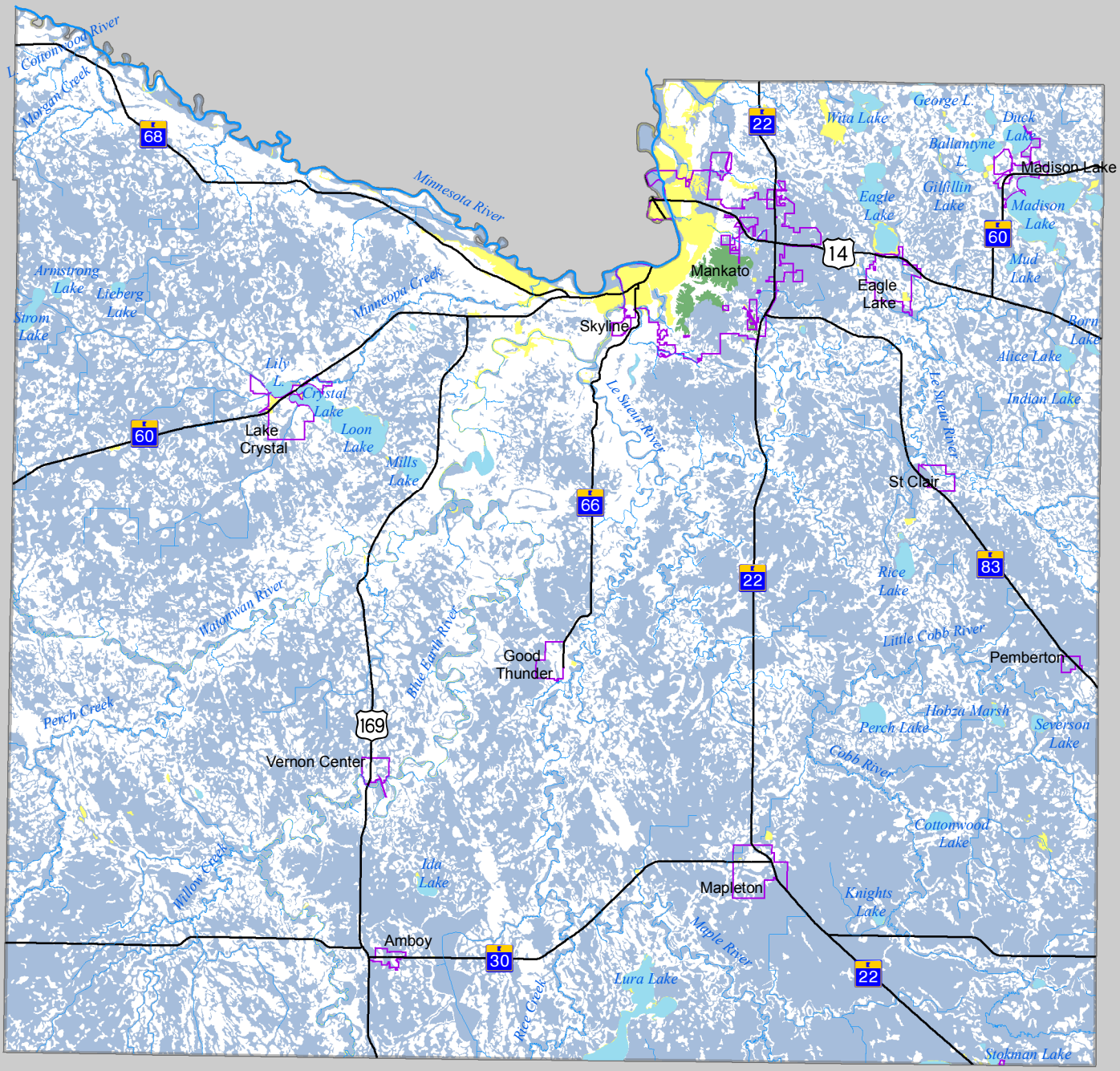
Source: NRCS SSURGO Soils

Hydric Soils
Map 16 displays the Hydric Soil Classification for the County. A Hydric Soil is defined by the USDA NRCS as "a soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part."

The concept of hydric soils includes soils developed under sufficiently wet conditions to support the growth and regeneration of hydrophytic vegetation. Soils that are sufficiently wet because of artificial measures are also included in the concept of hydric soils. Also, soils in which the hydrology has been artificially modified are hydric if the soil, in an unaltered state, was hydric. Some series, designated as hydric, have phases that are not hydric depending on water table, flooding, and ponding characteristics. (USDA NRCS)

Many non-hydric soil units have inclusions of hydric soils in drainage ways and depressed areas. These inclusions were sometimes too small to be shown in the Soil Survey.

Map 16. Hydric Soils Classification



Hydric Soils Classification

- All hydric
- Partially hydric
- Not hydric
- Unknown

0 — 5 Miles

N

BLUE EARTH COUNTY

Prepared By: Blue Earth County Environmental Services October 2007

Source: NRCS SSURGO Soils

EXPECTED CHANGES TO SURFACE WATER, GROUND WATER and RELATED NATURAL RESOURCES

The County expects there will be many changes that impact water resources planning and management for the next five to ten years. Three expected changes have been identified for inclusion in the plan.

1. On-going stream bank erosion, bank sloughing, channel migration, gully and ravine erosion.
2. Land conversion for urban development
3. Ag land management related to economic and market changes

All of these expected changes have potentially negative impacts for surface water, ground water and natural resources. The amount of change and the extent the County can address or control these changes is limited by many socio-economic, environmental and political factors.

Expected Change: On-Going Stream bank erosion, bank sloughing, channel migration, gully and ravine erosion.

When the last Water Plan was written in 1997, significant changes to the surface water resources were not expected. It was known that stream bank erosion and stream channel changes were occurring, but it was not easy to track those changes over time. With advances in GIS technology and digital aerial photography, dramatic changes to stream channels can now be documented on many of the rivers in the County.

There have also been several studies documenting stream erosion and bank sloughing on the Blue Earth River which have been conducted by David Thoma and Satish Gupta with the University of Minnesota. These studies have focused on quantifying the amount of sediment lost from stream banks compared to non-point sources such as farming. Their studies used a laser scanning altimeter to determine the rate of mass wasting along some of the high eroding bluffs and have conservatively estimated that 56 percent of the sediment in the Blue Earth River comes from its eroding stream banks. Studies such as these provide important insight into the dynamic nature of the rivers and streams in the County and the complexity of the source of sediment.

Example Sloughing bank on the Blue Earth River studied by Gupta and Thoma.
Note: person circled for scale reference. (Source: Gupta and Thoma University of Minnesota)

While the studies that have been conducted on the Blue Earth River have focused mainly on the tall eroding bluffs and mass wasting, recent stream meanders on less steep terrain is also evident on many of the streams in the County. The County has not completed a comprehensive review of all rivers in the County, but dramatic stream channel changes are evident when comparing the 1991 U.S. Geological Survey DOQ with the high resolution orthophotos collected by the County in 2005. During the 1990's, there were periods of flooding and record rainfall which were likely factors influencing these stream channel changes.

Several examples of stream channel migration are included to illustrate the ongoing changes occurring in Blue Earth County river systems.

1. Blue Earth River Example - Map 17 shows the Blue Earth River in Rapidan Township in 1991 and in 2005. This example shows channel migration of up to 200 feet in the period of 14 years. The banks have eroded in both wooded areas on the south side of the map and in areas that were cropland. The area which eroded 200 feet to the west in the central portion of the map contains just under 3-acres. Just to the south, 2.6 acres of the wooded area to the south were lost to the river where the channel migrated 140 feet over the 14-year period. A high eroding or slumping bluff is also able to be clearly seen in the east bank of the River in the central portion of the 2005 County Photo.

2. Le Sueur River Example – Map 18 shows the Le Sueur River in Decoria Township south of Mankato. This area shows channel migration of up to 230 feet in a 14-year period. Many of the outside curves of the Le Sueur River in 1991 have shifted downstream and have developed into sand bars; some even supported vegetation in 2005.

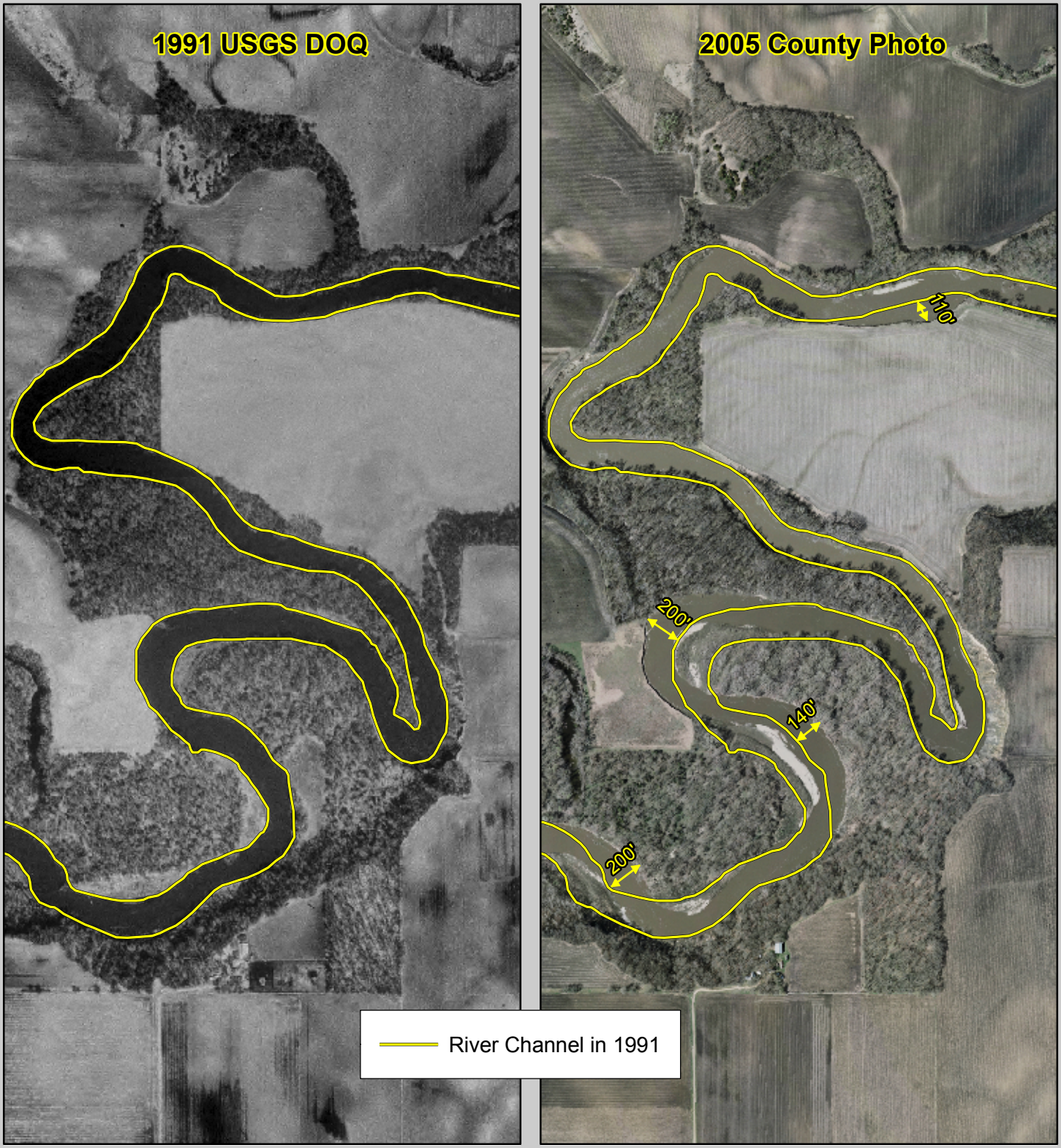
3. Le Sueur River Example 2 – Map 19 shows another example of channel migration of the Le Sueur River in Decoria Township. This example shows a channel that existed in 1991 and the channel cut-off in 2005. The new channel shown in 2005 carved through more than 300 lineal feet of land. The area of the land which the new channel cut through contains just over an acre. Using the County LiDAR DEM, a conservative estimate of the amount of soil lost in this location over the 14-year period can be placed over 39,000 cubic yards.

4. Maple River Example – Map 20 shows two areas of significant channel change and several smaller changes between 1991 and 2005. The two significant areas of channel migration have occurred in areas that were wooded in 1991. In the north central portion of this example, the Maple River has migrated 130-feet in fourteen years through a wooded area and into cropland. The cropland in that area is between six and eight feet above the river. Using the County's LiDAR based DEM, a conservative estimate of 27,000 cubic yards were lost in the one area during the fourteen year period.

Stream channel and bank erosion and gully erosion are continually, naturally occurring in Blue Earth County. Dramatic stream channel changes in the past formed ox-bows that now function as wetlands and floodplains vegetated with mature trees. Changes in the landscape are expected but the location and extent of stream channel movement cannot be predicted because the process is complex and variables such as seasonal weather conditions and other factors, including human actions, can vary significantly from year to year and the impact not immediately observed.

With this understanding and acceptance of uncertainty, the *Water Management Plan's* implementation efforts are intended to focus on actions known to reduce human influences that may cause or accelerate water quality related problems and maximize opportunities to improve water quality, wildlife habitat and other quality of life characteristics consistent with State and local goals. Water retention, wetlands and grassed, vegetated buffers along protected waters, ditches, and tile intakes are well known, well accepted best land management practices that reduce runoff, slow the flow of water, trap and treat pollutants and provide a physical separation between potentially harmful human activities and surface water. Promoting and establishing these features are among the most important objectives and actions of the *Water Management Plan*.

Map 17. Example River Channel Changes
Blue Earth River - 1991 to 2005



0 500 1,000 2,000 Feet

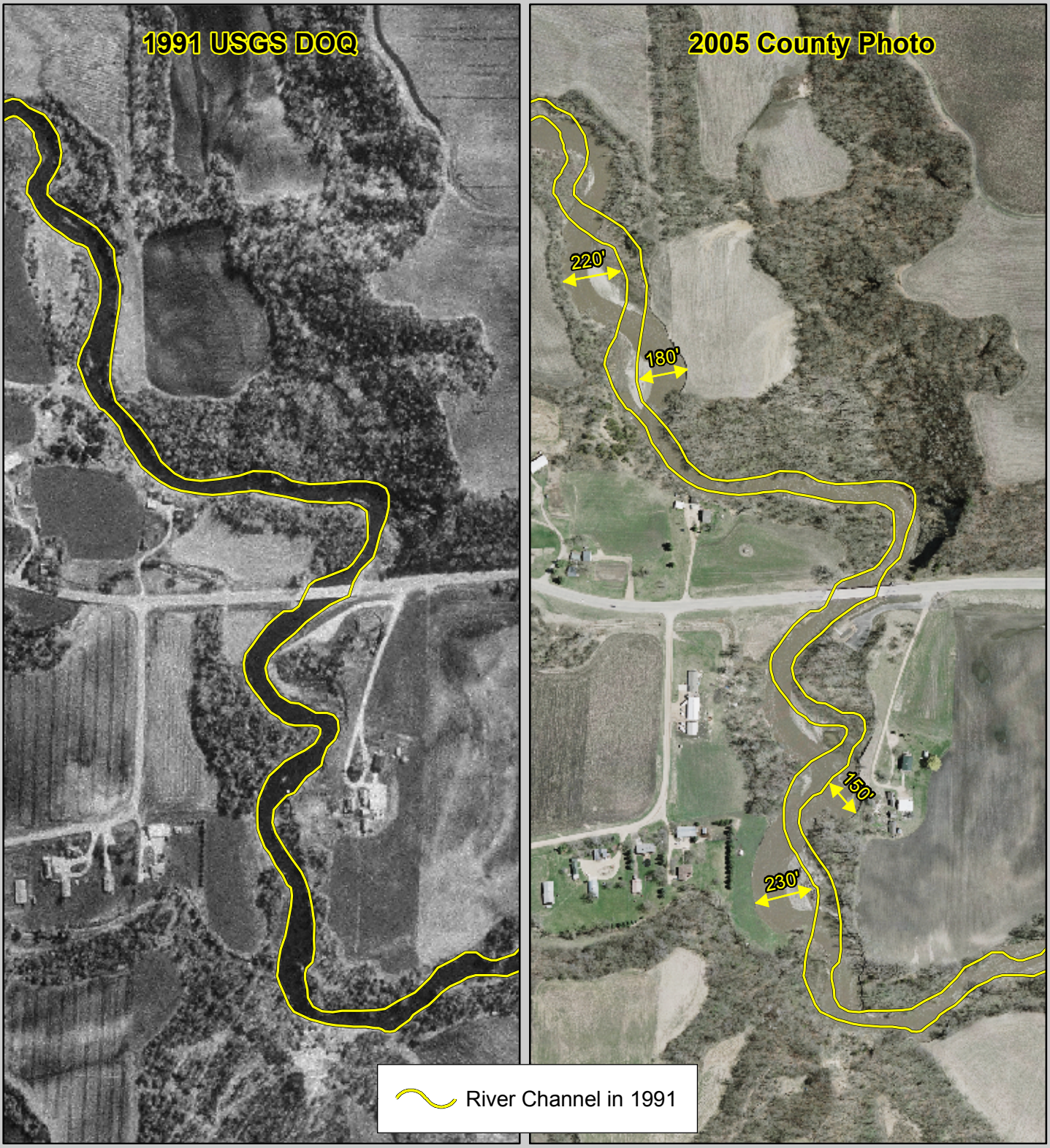
N

BLUE EARTH COUNTY

Prepared By: Blue Earth County
Environmental Services
December 2007

Source: 1991 USGS DOQ
2005 BEC Orthophoto

Map 18. Example River Channel Changes
Le Sueur River - 1991 to 2005



BLUE EARTH COUNTY

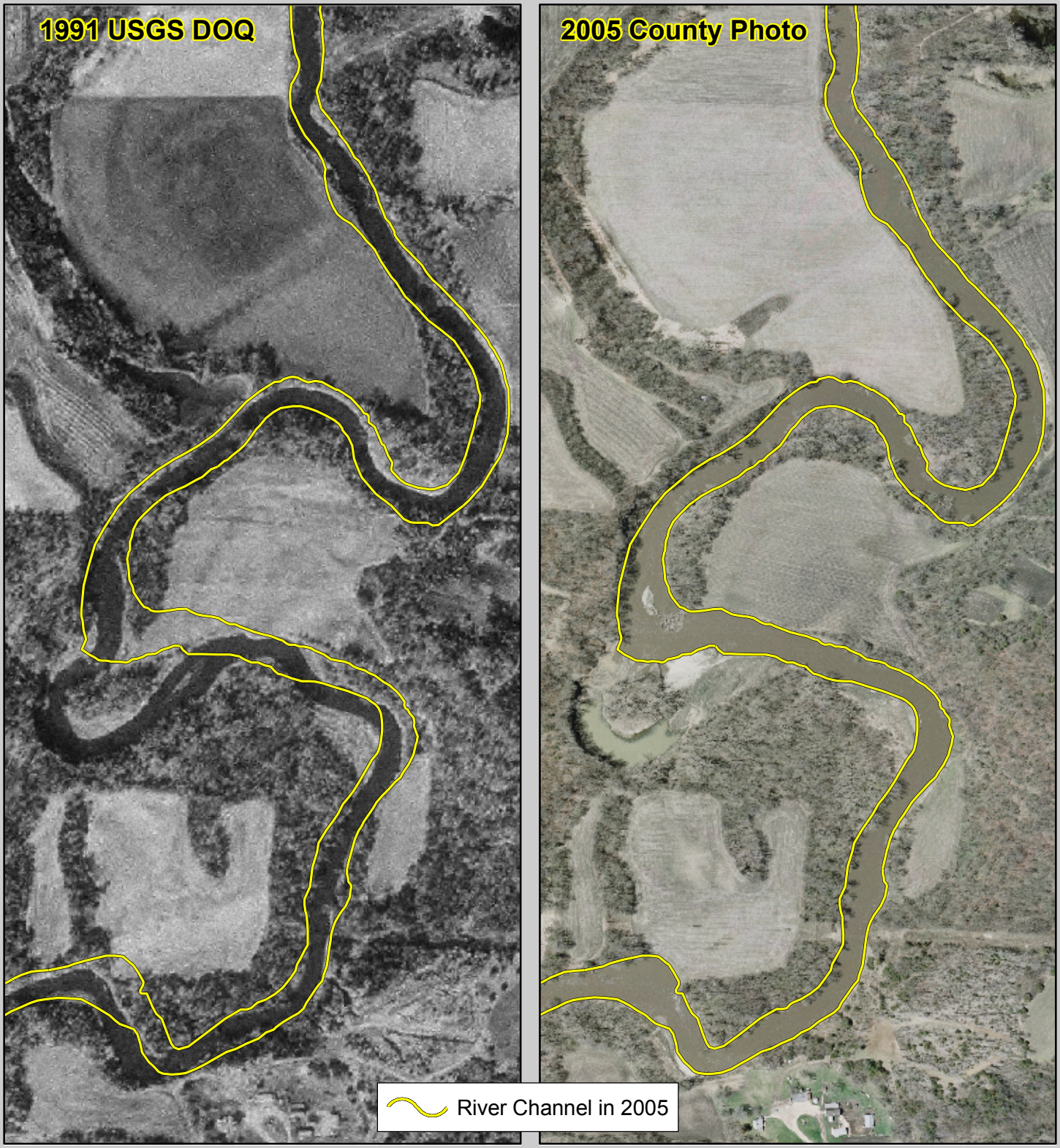
0 500 1,000 Feet

N

Prepared By: Blue Earth County
Environmental Services
December 2007

Source: 1991 USGS DOQ
2005 BEC Orthophoto

Map 19. Example 2 of River Channel Changes
Le Sueur River - 1991 to 2005



0 500 1,000 Feet

N

Prepared By: Blue Earth County
Environmental Services
December 2007

Source:
1991 USGS DOQ
2005 BEC Orthophoto

Map 20. Example River Channel Changes
Maple River - 1991 to 2005

0 500 1,000 Feet

N

BLUE EARTH COUNTY

Prepared By: Blue Earth County
Environmental Services
December 2007

Source:
1991 USGS DOQ
2005 BEC Orthophoto

Expected Change: Land Conversion for Urban Development

Land development and/or population increases are expected in the planning period. Construction of major road interchanges, wastewater services, and other infrastructure are already planned. Urban related land uses such as roads, dwellings, commercial and industrial buildings, and parking lots are probably the greatest threat to natural resources in Blue Earth County, as farm land, wooded areas, wetlands and other environmentally sensitive areas will be converted to or impacted by development. The most immediate change is anticipated in the Northeast corner of the County around the City of Mankato, City of Eagle Lake, City of Madison Lake and the area lakes. Growth is also expected to continue in the City of Lake Crystal and the nearby industrial areas. Residential development pressure around the scenic areas in Blue Earth County, including the lakes, rivers, wooded ravines and wetlands also has been and continues to be an issue in Blue Earth County. Potential impacts as a result of these land conversions include:

- Loss of crop land
- Loss of wetlands and wildlife habitat
- Degraded wetlands and wildlife habitat with impaired water quality and fragmented habitat
- Loss of undeveloped shoreland, fisheries and wildlife habitat
- Loss of wooded areas and prairie
- Increase in impervious surfaces and runoff

Protection strategies, including a 1) detailed inventory of existing natural resources in highest priority areas, 2) planning and policy to protect existing resources and prevent negative impacts inherent with urban type of development, and 3) land acquisition or easements will be critical to avoid permanent loss of natural resources in the highest priority areas.

Expected Change: Ag Land Management Related Economic and Market Change

Currently increasing corn prices are a concern as farmers growing more corn can mean changes on the landscape and changes in land management that could increase water quality problems. Potential impacts as a result of these land management changes could include:

- Land converted from other uses to crop land
- Encroachment on wetlands, floodplains, steep slopes, ditches and other sensitive areas
- Un-renewed conservation easements
- Crop patterns and rotations increasing pests, use of pesticides and herbicides
- Crop patterns and rotations changing and increasing fertilizer needs
- Increased private and public drainage
- Loss of wetlands and wildlife habitat
- Degraded wetlands and wildlife habitat with impaired water quality

GENERAL GEOLOGY

The characteristics of the present land surface in Blue Earth County, including the topography and nature of surface materials, are the result of the action of glacial ice and flowing water from the melting glacial ice sheets. The surficial materials known as drift are glacial deposits from continental glaciers that covered Blue Earth County during the last million years. The glaciers were centered over southern Canada and extended into southern Minnesota. They expanded and contracted several times, and the intervals between glacial episodes allowed deep erosion and weathering of the drift and bedrock surfaces.

The glacial drift is composed mainly of glacial till, which is characterized by a matrix of sand, silt, and clay with scattered pebbles, cobbles, and boulders. The drift deposits overlie the bedrock surface and range in thickness from less than 150 feet to more than 300 feet. Areas along the Minnesota, Blue Earth, and Le Sueur River Valleys have bedrock exposed at the surface where the drift has been removed. Before glaciation, erosion of the bedrock surface produced deep valleys, most of which are now filled with glacial drift.

The glacial drift includes all materials deposited directly by glacial ice or by meltwater streams flowing from the ice. Glacial meltwater streams laid down water-sorted sediments, called outwash deposits, along drainage channels than extended beyond the glacier's margins. Glacial outwash deposits are usually coarse-grained sands and gravels which form good aquifers in the drift. Many outwash deposits were laid down during the retreat of various ice sheets and were not destroyed by the advance of subsequent ice sheets. Inter-glacial erosion may have produced ancient glacial terrain valleys that contained sand and gravel deposits that are now buried and provide productive aquifers. Some of these deposits may be important local aquifers if they are extensive enough and the recharge is large enough. However, glacial outwash deposits form the most important aquifers in the glacial drift.

Materials of low permeability, such as thick clay layers, may exhibit confined conditions in the glacial drift. However, clay layers may have a discontinuous distribution that make unconfined conditions possible. Confined flow may occur in hydraulically isolated lenses of sand and gravel under sufficiently high pressure. The water pressure in glacial aquifers with unconfined conditions will be influenced by the local topography.

Geologic History

The bedrock that underlies Blue Earth County is part of a sequence of Late Cambrian to Early Ordovician sedimentary rock which consists of three major rock types: Sandstone, shale, and carbonates. The bedrock was deposited layer upon layer in shallow marine waters that flooded southern Minnesota about 500 million years ago. The ancient intruding sea followed a shallow depressional lowland that extended into southern Minnesota from a larger basin to the south.

In a shallow marine environment, the material that is transported by water is sorted according to the weight and size of the individual particles. Because of different settling rates, coarse (heavy) materials are deposited in turbulent water while the finer (light weight) materials are transported by waves, currents, or winds and deposited in quiet waters.

The relationship between sandstone, shale, and carbonate deposits correspond to a seaward gradation of sediment size. Sand is deposited along the turbulent shoreline environment, where it becomes cemented into sandstone over time. Clay and silt are transported by wave and current action to a deeper, lower energy environment where they are deposited to form shale.

Still farther off shore, where sand and clay are not transported by wave and current action, calcite is precipitated to form limestone.

The rise of sea level, during Late Cambrian time, resulted in a progressive overlap of sediment types. As the sea advanced landward, sandy beach deposits were overlain by offshore muds which were in turn overlain by carbonates. Thus, the advancing sea is recorded in bedrock layers by the sequence: sandstone overlain by shale overlain by carbonates. The lithologic character of the bedrock varies with such factors as sediment source, distance from the shore line, depth of the water, and transporting agent (waves, currents, and winds).

In the southeastern quarter of Blue Earth County the St. Peter Sandstone forms the bedrock surface beneath the glacial drift. The St. Peter Sandstone is the youngest bedrock unit and gives way to progressively older dolomite, sandstones, and shales to the north and west. This pattern reflects the general dip of the bedrock structure toward the southeast. Deep erosion of the bedrock surface, prior to glaciation, also influence this pattern.

The Cretaceous time period saw the rise of sea level from the west, which resulted in a different kind of progressive overlap. Sediments resulting from this overlap may be lacustrine and alluvial fan deposits as well as marine sediments. The western border of Blue Earth County is thought to represent the eastern shoreline of the advancing sea while the central and eastern portions of the county are viewed as being a coastal plane that was crisscrossed by rivers and streams. In Blue Earth County the Cretaceous age sediments overlie the much older Cambrian and Ordovician age bedrock units and are limited to isolated patches of loosely consolidated clays and sands that were primarily derived from the weathering of the underlying bedrock surface.

Bedrock Units

The following descriptions of the bedrock units that underlie Blue Earth County are primarily derived from water well driller's logs. They are supplemented by more detailed descriptions presented by Mossler (1987). For the purpose of this plan, some of the stratigraphic units currently recognized as individual geologic units are combined.

Cretaceous Rock -- generally composed of white, red or brown clay that may represent the weathering of the underlying bedrock. White Cretaceous sand may be reworked St. Peter or Jordan Sandstone that was deposited along the advancing shoreline of the Cretaceous Sea.

Decorah Formation -- limited to erosional remnants in the extreme southeast corner of the county. Its presence in Blue Earth County is only inferred from maps prepared for the Waseca County Geologic Atlas. The Decorah Formation is primarily a uniform bed of green shale.

Platteville-Glenwood Formations -- limited to erosional remnants in the southeastern corner of Blue Earth County. For convenience, the Platteville and Glenwood Formations are treated as a single geologic unit. The Glenwood Formation is a thin shale unit that directly overlies the St. Peter Sandstone. The Glenwood shale represents a low energy sedimentary environment, offshore from the beaches where the St. Peter Sandstone was being deposited. The Platteville Formation is a thin bed of limestone that contains thin shale partings at its top and base. The Platteville limestone represents a more seaward sedimentary environment of the Glenwood shale.

St. Peter Formation -- measured as thick as 100 feet, its presence is limited to the southern margin of Blue Earth County. The St. Peter Formation is primarily a medium-grained pure quartz sandstone. The lower part of the St. Peter may contain beds with varying amounts of silt or shale. The St. Peter Sandstone marks the advance of the Middle Ordovician Sea into southern Minnesota. The sandstone was deposited along the turbulent shoreline of the advancing sea. The St. Peter Sandstone was deposited on top of the Prairie du Chien Dolomite and its base marks a major erosional unconformity.

Prairie du Chien Group -- will vary greatly in thickness, from a feather edge at its erosional limits to as thick as 230 feet. The Prairie du Chien consists primarily of dolomite and sandy dolomite with some thin shale layers and a few units of quartz sandstone. The Prairie du Chien Dolomite is exposed at the surface along the Minnesota River Valley where it is quarried extensively from the city of Mankato north to the town of Kasota. The massive nature of the Prairie du Chien Dolomite indicates a low-energy sedimentary environment where carbonate deposition was the dominant rock forming process. Carbonate deposits were terminated by the retreat of the shallow sea from the continent. The retreat of the shallow sea exposed the Prairie du Chien Dolomite to the forces of erosion. Consequently, the top of the Prairie du Chien group represents a major erosional surface and its thickness may vary greatly from place to place.

Jordan Formation -- varies between 70 to 90 feet in thickness. The Jordan Formation is characterized as a medium to coarse-quartzose sandstone. The top of the Jordan Sandstone may contain hard-cemented layers and its base may contain minor amounts of shale. The Jordan Sandstone is exposed at the surface as bedrock outcrops along the Minnesota, Blue Earth, and Le Sueur river valleys in north central Blue Earth County. The Jordan Sandstone indicates the return to a high-energy, near shore sedimentary environment, perhaps a beach.

St. Lawrence Formation -- is generally between 60 and 100 feet thick. The St. Lawrence contains several rock types including dolomite, siltstone, shale, sandstone, and glauconite. It is usually characterized by layers of shale, siltstone, and dolomite. Its transition with the underlying Franconia rock is gradational. The dolomitic units of the St. Lawrence Formation would signify a low energy depositional environment; however, the interbedded clay, silt, and sand indicate an environment with fluctuating conditions.

Franconia Formation -- is generally about 80 to 120 feet thick. The Franconia is commonly characterized as a fine-grained, glauconitic sandstone. The upper part of the Franconia Formation may contain substantial amounts of shale and dolomitic layers that are similar to those found in the overlying St. Lawrence Formation. The similarity of rock type makes it difficult to distinguish the Franconia from the overlying St. Lawrence Formation in well drillers' logs. The fine-grained glauconitic sandstone suggest a low-energy sedimentary environment. Glauconite forms on the sea floor in oxygen-poor water where the rate of sedimentation is very slow.

Ironton-Galesville Group -- generally 60 to 80 feet thick, is a medium to coarse-grained quartz sandstone with some glauconite and minor amounts of silt. The Ironton and Galesville Sandstone's are normally classified as separate bedrock formations; however, the two sandstone units are difficult to separate in driller's logs and both are sources of ground water. For the purpose of this study, the Ironton and Galesville Sandstone's are treated as a single geologic unit and for convenience called the Ironton-Galesville Sandstone. The Ironton-Galesville Sandstone may indicate the return to a higher energy near shore or beach environment of sedimentation.

Eau Claire Formation -- is between 80 and 123 feet thick. The Eau Claire consists primarily of shale and siltstone with minor amounts of fine-grained, glauconitic sandstone. Its contact with the underlying Mt. Simon Sandstone is transitional. The fine-grained sediments of the Eau Claire Formation suggest a low energy environment of sedimentation, either relatively deep and quiet water or shallow water tidal flats.

Mt. Simon Formation -- is the lowest mapped unit of bedrock, several hundred feet thick. The Mt. Simon is generally characterized as a medium to coarse-grained quartzose sandstone. The upper parts of the Mt. Simon contain varying amounts of siltstone and shale while the middle part is primarily quartzose sandstone. Its base marks a major erosional surface with the underlying Precambrian age Hinckley Sandstone. The Mt. Simon Sandstone marks the advance of the Late Cambrian sea into southern Minnesota.

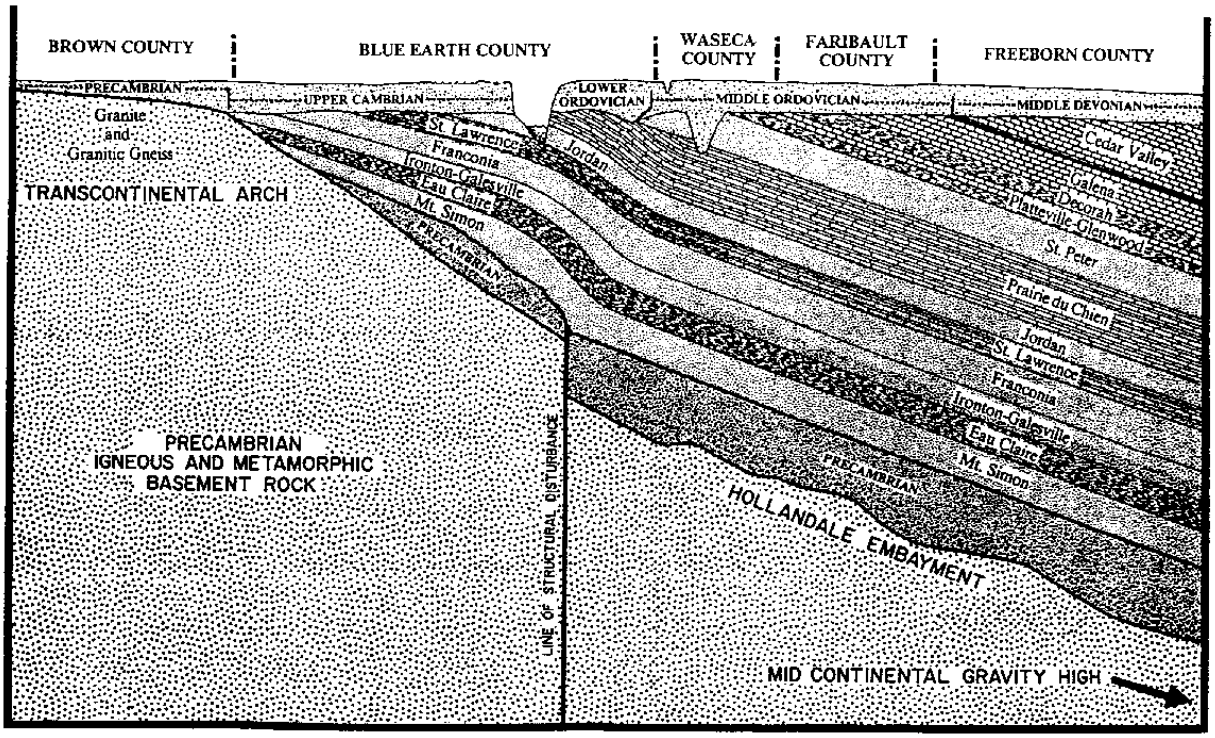


Diagram 1 **Highly generalized cross section showing the variation of subsurface conditions along a line extending from Brown County to Freeborn County Minnesota. The above diagram illustrates the lateral variations and distribution of sediments in the Hollandale Embayment. The geologic structure is much more complex than shown here. Note: the vertical scale is grossly exaggerated; if drawn at true scale the thickest part of the sedimentary basin would be 0.05 inches thick.**

BEDROCK GEOLOGIC COLUMN

STRATIGRAPHIC CLASSIFICATION				DESCRIPTION OF ROCK UNITS		DESCRIPTION OF AQUIFERS		
SYSTEM SERIES	GROUP OR FORMATION NAME	MAP SYMBOL	GRAPHIC COLUMN	THICKNESS	DOMINANT ROCK TYPES	AQUIFER SYSTEM	AQUIFER	AQUIFER CHARACTERISTICS
MIDDLE ORDOVICIAN	DECORAH FORMATION	Odc		Uncertain; presence is inferred	Shale; greenish gray; limited to erosional remnants	CONFINING LAYER	DECORAH SHALE	Limited to erosional remnants in extreme southeastern part of the county. Its presence is only inferred.
	PLATTEVILLE & GLENWOOD FORMATIONS	Opg		Limited to erosional remnants	Carbonate rock over shale; limited to erosional remnants.	NOT AN AQUIFER	PLATTEVILLE & GLENWOOD	Limited to erosional remnants in the southeastern corner of the county.
	ST PETER FORMATION	Osp		90 to 100 feet	Quartzose sandstone; white or yellow; may be thin shale or siltstone beds in lower part of formation. Basal contact with Prairie du Chien is unconformal.	ST. PETER - PRAIRIE DU CHIEN - JORDAN AQUIFER SYSTEM	ST PETER SANDSTONE	Highly permeable quartzose sandstone; has direct hydrogeologic contact with surficial glacial deposits. Used primarily as a source for domestic wells that require moderate water supplies.
LOWER ORDOVICIAN	PRAIRIE DU CHIEN GROUP	Opc		Upper contact is unconformal; ranges from feather edge at erosional limits to as thick as 230 feet	Dolomite and sandy dolomite with beds of quartzose sandstone; may contain thin beds of soft shale or sediment filled crevaces. The top of the Prairie du Chien marks a major erosional unconformity; it disappears as an erosional edge in extreme southwestern part of the county.		PRAIRIE DU CHIEN DOLOMITE	Carbonate rock, dolomite; has direct hydrogeologic connection with surface and shallow groundwater systems. Wide zones of fractures and crevices generally yield moderate quantities of water. Well-crevaced dolomite is partly responsible for local high water yields. Limited shaly layers may form localized confining conditions. The top of the Prairie du Chien marks a major erosional unconformity; it may vary greatly in thickness.
UPPER CAMBRIAN	JORDAN FORMATION	Cj		70 to 90 feet	Quartzose sandstone; white, yellow or brown. In outcrop the Jordan is fine to coarse grained, soft-poorly cemented sandstone.		JORDAN SANDSTONE	Highly permeable quartzose sandstone; has direct hydrogeologic contact with surficial water. Provides moderate supplies where the Jordan forms the bedrock surface; contains negligible water supplies where the sandstone crops out and perennial rivers at as drains.
	ST. LAWRENCE FORMATION	Csl		60 to 100 feet	Interbedded dolomite, siltstone and shale; may contain thin beds of sandstone. Transition with the underlying Franconia is gradational	CONFINING LAYER	ST. LAWRENCE DOLOMITE & SILTSTONE	Rocks of low permeability; act as confining bed at the base of the St. Peter-Prairie du Chien-Jordan aquifer system.
	FRANCONIA FORMATION	Cfn		80 to 120 feet	Fine-grained quartzose sandstone; greenish gray, glauconitic; may contain thin beds of dolomite, siltstone, or shale. Transition with overlying St. Lawrence is gradational.	FRANCONIA - IRONTON - GALESVILLE AQUIFER SYSTEM	FRANCONIA SANDSTONE	Glauconitic sandstone; comes in direct hydrogeologic contact with surficial glacial deposits. Used primarily as a source for domestic wells that require moderate water supplies. Yields artesian flow where land surface elevations are low.
	IRONTON & GALESVILLE FORMATIONS	Cig		60 to 80 feet	Quartzose sandstone; white, buff, or pink.		IRONTON & GALESVILLE SANDSTONE	Highly permeable quartzose sandstone; has direct hydrogeologic connection with surface and shallow groundwater systems. Yields large volumes of water for domestic, commercial, municipal, and industrial use.
	EAU CLAIRE FORMATION	Cec		80 to 120 feet	Mainly shale and siltstone with some beds of sandstone; transition with the underlying Mt. Simon is gradational.	CONFINING LAYER	EAU CLAIRE SHALE	Shales are generally not water yielding; act as confining bed at the base of the Franconia-Ironton-Galesville aquifer system.
	MT. SIMON FORMATION	Cmt		100 feet to several hundred feet	Quartzose sandstone; may contain shale and siltstone. Transition with the overlying Eau Claire is gradational; its base marks a major erosional unconformity.	MT. SIMON - HINCKLEY AQUIFER SYSTEM	MT. SIMON SANDSTONE	Permeable quartzose sandstone; has an direct hydrogeologic connection with surface and shallow groundwater systems. Yields large volumes of water for public, municipal, and industrial use.
PRECAMBRIAN	HINCKLEY & FOND DU LAC FORMATIONS	Pc		Unknown; may exceed 1000 feet	Data sparse; mainly quartzose sandstone and shale. Its base marks a major disconformity.		HINCKLEY SANDSTONE	Data absent; water contribution for aquifer use is unknown.
	METAMORPHIC IGNEOUS	Pc		Unknown; several miles	Igneous and metamorphic rocks; undifferentiated.	BASEMENT ROCK	NOT AN AQUIFER	Not water bearing rock; represents the base of all aquifers and aquifer systems.

EXPLANATION

LIMESTONE

SANDY
SHALY
DOLOMITE

SANDY
SHALY
SANDSTONE

SHALY
SHALE

SILTY
SILTSTONE

EROSIONAL UNCONFORMITY

DISCONFORMITY

Aquifer Systems

An aquifer is any geologic unit that is capable of storing and yielding ground water in usable quantities. Ground water is usually held at significant pressure in an aquifer by a confining bed above the aquifer. In most cases confined water is equivalent to artesian water. A flowing artesian well is a well that yields water at the land surface, under its own pressure, without pumping. In a non-flowing artesian well, the pressure is not sufficient to lift the ground water above the land surface.

Glacial Drift Aquifers

The possibility of developing adequate supplies of ground water for farm and domestic use from wells finished in the glacial drift of Blue Earth County is generally good. The potential for development of moderate to large ground water supplies from the glacial drift ranges from poor, as in the north central part of the county, to favorable in the western and eastern row of townships and in the southern tier of townships in Blue Earth County.

A study of the geologic portions of water well drillers' logs resulted in the recognition of three general hydro-stratigraphic units that were used to construct a geologic framework for describing the hydrologic system within the glacial drift. The glacial drift consists of alternating layers of impermeable, semi-impermeable and permeable materials, forming a series of aquitards and aquifers. The three hydro-stratigraphic units defined here have different properties in relation to the occurrence and movement of ground water through the glacial drift. Mostly clay and silty clay deposits are fine-grained sediments and considered to be impermeable. A heterogeneous mixture of clay, silt, sand and gravel are considered to be semi-impermeable. Sand and gravel bodies within the glacial till are considered to be permeable.

Few of the water wells that are finished within the glacial deposits draw water directly from till; most obtain water from sand and gravel bodies within the till. Generally, the glacial tills have low permeability and, in many places, the till is sufficiently impermeable that it forms an aquitard between productive sand and gravel aquifers. Ground water supplies generally occur in sand and gravel deposits under semi-confined or confined conditions within the glacial till. Therefore, the water-yielding deposits are considered to represent an artesian condition with the water level rising above the level at which it was first encountered.

Ground water in the glacial deposits is derived from precipitation or from underflow into the area through bedrock aquifers. In Blue Earth County, perennial streams and rivers act as drains on the ground water along most of their distance, with the ground water gradient toward the river or stream valley. The Blue Earth, Le Sueur, and lower Watonwan River Valleys drain a particular linear region along their courses and leave a trough of depression that makes the permeable drift deposits less desirable as an aquifer due to low water content. Water wells drilled within these areas may penetrate large amounts of glacial sand and gravel deposits; however, these deposits are often ignored in favor of more productive bedrock aquifers. These conditions are very site specific and occasionally a very adequate supply of water can be found.

Bedrock Aquifer Systems

Three major bedrock aquifer systems, separated on the basis of hydrogeologic properties, are present in Blue Earth County. They are the St. Peter - Prairie du Chien-Jordan aquifer system, the Franconia-Ironton-Galesville aquifer system, and the Mr. Simon-Hinckley aquifer system.

A bedrock aquifer is a geologic formation that is capable of storing and yielding ground water in usable quantities. A bedrock aquifer system is actually a multi-aquifer system that is composed of two or more bedrock units that are bound on the top and bottom by aquitards or aquicludes. Bedrock aquifer systems are a connected set of individual bedrock aquifers that act as a single hydrologic unit. The data suggests that there is good hydraulic connection between the bedrock units within each of the three aquifer systems in Blue Earth County. Individual bedrock aquifers range from coarse-grained deposits such as sandstone to hard fractured sedimentary rocks such as limestone or dolomite (carbonates).

Ground water is usually held in a bedrock aquifer, at significant pressure, by the presence of a confining bed above the aquifer. High water pressure is sometimes the result of continuous bedrock strata with recharge areas at higher elevations. Water pressure will change in response to varying patterns of recharge, discharge, and pumping. In Blue Earth County, the water pressure in bedrock aquifers is not sufficient to lift the water above land surface except within the Minnesota River Valley and the lower Blue Earth and Le Sueur River Valleys where the bedrock is at or near the surface.

In Blue Earth County, the uppermost bedrock aquifer supplies water for farm and domestic use. In the eastern three-fourths of Blue Earth County, bedrock units included in the St. Peter-Prairie du Chien-Jordan aquifer system represent the uppermost bedrock aquifers. In the western quarter of the county, the Franconia and Ironton-Galesville Sandstones occupy the uppermost bedrock aquifer position. The Mt. Simon Sandstone is overlain by the Eau Claire confining bed throughout Blue Earth County.

The St. Peter-Prairie du Chien-Jordan aquifer system directly underlies the glacial drift and forms the bedrock surface throughout the eastern three-fourths of Blue Earth County. The St. Peter Sandstone is generally limited to the southeastern quarter of Blue Earth County where it directly underlies the glacial drift. The Prairie du Chien Dolomite is present throughout the eastern half of Blue Earth County where it forms the bedrock surface or underlies the St. Peter Sandstone. The Jordan Sandstone forms the bedrock surface in the west central portion of the County and has been dissected by past and present stream erosion. These three bedrock units function as a single aquifer system because all three are sources of ground water with no regional confining bed separating them. The bedrock aquifers in this system are the St. Peter and Jordan Sandstones, which yield water from between individual grains and the Prairie du Chien Dolomites, which yield water from between fractures and crevices. Rocks and shales of low permeability in the St. Lawrence Formation underlie the Jordan Sandstone and separate the St. Peter-Prairie du Chien-Jordan aquifer system from the underlying Franconia-Ironton-Galesville aquifer system.

The shallow bedrock has the advantage of local and rapid recharge, particularly in areas where the overlying drift is thin, or where there are permeable materials within the drift that are in direct hydrologic connection with the bedrock and will permit the downward movement of water into the bedrock. One disadvantage of the shallow bedrock aquifers is their susceptibility to contamination. Variability in the quality of the water may limit the use of a shallow bedrock aquifer when the aquifer is near the surface.

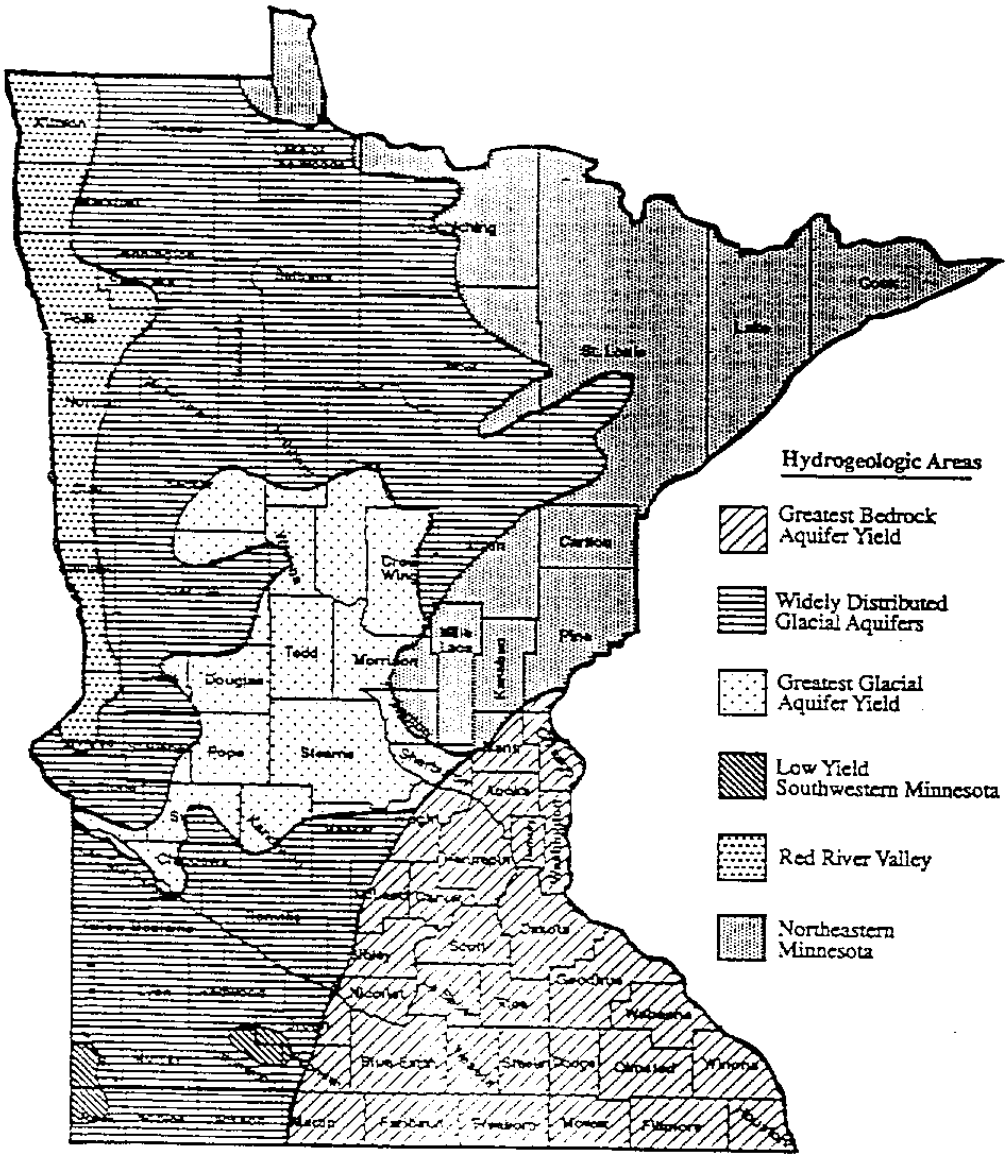
The Franconia-Ironton-Galesville aquifer system is overlain by the St. Lawrence confining bed except within the western row of townships in Blue Earth County. The upper bedrock aquifer unit in this system is the Franconia glauconitic sandstone which yields moderate supplies of ground water. The lower bedrock aquifer unit is the Ironton-Galesville Sandstones which are

generally a more productive aquifer than the overlying Franconia. Rock of low permeability of the Eau Claire Formation directly underlie the Ironton-Galesville Sandstone. The Eau Claire separates the Franconia-Ironton-Galesville aquifer system from the Mt. Simon-Hinckley aquifer system.

The Mt. Simon-Hinckley aquifer system is deepest of the three bedrock aquifer systems in Blue Earth County. These deep sandstone aquifers are overlain by the confining conditions of the Eau Claire formation. Within Blue Earth County less information is available on the geology and hydrology of the Mt. Simon-Hinckley aquifer system because it is utilized by only a few deep water wells.

Historically, wells that required high pumping capacity were often drilled through two or more bedrock aquifers. This presents a potential for contamination of lower aquifers and is no longer permitted by Minnesota Rule 4725, "Rules regulating wells and borings," nor by the Blue Earth County Well Ordinance.

Map 21 State Hydrogeologic Areas Map



Priority Concern: Ground Water

PRIORITY CONCERN: Ground Water

Water Management Plan Goal:
Protect groundwater resources from potential contamination related to residential, commercial and industrial land uses, well construction, abandoned wells and septic systems.

Water Management Plan Goal:
Protect, enhance and restore groundwater recharge areas.

Priority Concern

Geologic sensitivity, well construction, and land use influence the quality of ground and drinking water supplies. Drinking water in Blue Earth County is supplied by private wells and public water supply wells. Public water supply wells are regulated and monitored by the MDH. Private wells are regulated by the County in accordance with the State Well Code under a delegation agreement with the MDH. Areas with high potential susceptibility to ground water contamination due to shallow depth to bedrock or coarse soils have been identified by State agencies. Overall groundwater supply and quality data is lacking in Blue Earth County. There are currently no ground water monitoring program wells in the County and there is not a current geologic atlas for the County.

Protecting ground water resources from contamination by continuing the MDH-Delegated, County Well Code program and local land use regulations are high priorities. Providing targeted education of local government officials in areas with a high susceptibility to ground water contamination will be priorities of the Water Management Plan. The County also supports State efforts to complete a geologic atlas for Blue Earth County and expanded monitoring programs including ground water level monitoring wells and physical and chemical testing in Blue Earth County.

Priority Concern Assessment

Ground Water Quantity, Quality and Sustainability

Blue Earth County currently has a good availability of bedrock source ground water and a thick blanket of glacial till protecting the quality of the resource. Availability of ground water in sands and surficial sands is limited and moderate. Long term availability and sustainability of ground water is not certain and information regarding ground water recharge is needed.

With the exception of a few isolated and localized instances, the potable quality of the ground water has been maintained, even in areas with rural and urban development. The DNR has identified sensitive areas susceptible to ground water contamination based on soils and geologic data. There has not been a systematic quality assessment of ground water resources in Blue Earth County.

The need for more ground water information is reflected in the 2005 DNR Report to the Legislature on the *Sustainability of Minnesota's Ground Water: A Statement of Issues and Needs.*

Water Supply Wells
Public and private water supply wells in the County are sourced from many different aquifers as described in the Background Section of this plan. Most public water supply wells in Blue Earth County are in bedrock aquifers. The City of Mankato is an exception as the major volume of its drinking water is sourced from two, separate, shallow-aquifer wells located beneath the Blue Earth River and the Minnesota River. Source water protection plans are required for all public water supply wells. The MDH oversees and prepares source water assessment and protection plans.

Under a State delegation agreement, Blue Earth County's well program oversees all non-community well construction and well abandonment in accordance with the State Well Code.

Source Water Protection Plans
All wells are susceptible to contamination resulting from activities in the area where the well is located. This is particularity true for large public water supplies because the well's drawdown effect is much more pronounced than for small domestic wells. The consequences of contamination are potentially more catastrophic due to the number of people served by the system. For the purpose of national security, public access to wells and location information has been reduced in recent years.

The Safe Drinking Water Act of 1986 established the national wellhead protection program. This required each state to develop a program to "protect wellhead areas within their jurisdiction from contaminants which may have any adverse affects on the health of persons". The term wellhead protection area is defined as "the surface and subsurface area surrounding, a water well or well field, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or well field."

The MDH Wellhead Protection (WHP) Program received approval from the U.S. Environmental Protection Agency and has amended MN Rule Chapter 4720 to include WHP provisions. The MDH has developed a ranking scheme for phasing public water supplies into the program based on vulnerability and size of the population served. The MDH has worked with WHP for public water suppliers that added wells to their systems and voluntary projects. For public water supply wells serving up to 3,300 people, the MDH 1) delineates the wellhead protection area and 2) assesses vulnerability of the well and wellhead protection area.

The MDH completed a source water assessment for the City of Mankato and well vulnerability assessments for the other municipalities in the County. Community public water supply wells include all municipalities, nursing homes, subdivisions and similar uses with more than 15 service connections or to 25 persons served more than 60 days a year. Public water suppliers must prepare source water protection plans when notified by the MDH and phased into the program. The County provides assistance in the preparation of source water protection plans for public entities as requested.

In some Blue Earth County cities, aging water supply infrastructure is a concern due to taste and distribution system issues. Cities are replacing these systems with new wells and water lines when needed and as grants and loans are available. Source water protection plans are required when new municipal wells are constructed.

LOCAL PROGRAMS and WELLS

Blue Earth County Well Program

Blue Earth County administers a MDH-Delegated well program. The State well program was delegated to Blue Earth County in 1989. The County issues well construction permits, well abandonment permits, conducts construction and well sealing inspections, collects data and reports well log data to the MDH County Well Index. Well code construction requirements and restrictions vary in the County depending on local geology. The MDH regularly reviews the County's well program.

Sealing abandoned wells has been a high priority since the County's first water plan. The County continually funds a local well-sealing cost share program with $9,000-$10,000 annually.

From the start of the program in 1989 through 2007, the County permitted and inspected 1,628 new water wells, and 2,255 wells were sealed.

City of Mankato Public Water Supply Wells

The City operates many wells, including shallow and deep aquifer wells. The shallow aquifer wells provide most of the total water volume for the City of Mankato. The shallow aquifer wells are called Ranney Wells and are located below the Blue Earth River and the Minnesota River. Ranney Wells are technically not surface water wells; however, the river does influence water quality in the shallow aquifers below. The City monitors all drinking water supplies daily and provides quality drinking water meeting all Federal and State drinking water standards. The City is required to prepare a drinking water safety report to its citizens annually.

Even though a source water protection plan was not required by State rules for the Blue Earth River Ranney Well, the City worked with the MDH in preparation of a source water protection plan in 2003. According to the MDH *City of Mankato Source Water Assessment*, the MDH determined three source water protection areas with two main source water priority areas. These include:

> <u>Inner Emergency Response Area</u> is designed to help the City address contaminant releases which present an immediate health concern to users. This area was determined by the time required for the Mankato Water Department to shut off the Ranney Well and a buffer time limit needed to accommodate unanticipated delays in notification and shut down.

The inner-emergency response area is about 57 square miles and includes the lower reaches of the Blue Earth, Le Sueur and Watonwan Rivers located entirely within Blue Earth County and part of the Minnesota River upstream of the Blue Earth River located in Blue Earth and Nicollet County.

Outer Source Water Management Area is designed to protect water users from long term effects related to low levels of chemical contamination or the periodic presence of contaminants at low levels in surface waters. This area should protect users from contaminants which may be usually present at treatable levels or occasionally present an acute health under certain conditions such as low stage of the Blue Earth River.

The outer-source water management area is about 120 square miles and is described as the minor watersheds that either flow directly into the four rivers upstream of the inner-emergency response area or are adjacent to the inner-emergency response area. The outer-source water management area is located entirely within Blue Earth County and Nicollet County.

Watershed: The entire Greater Blue Earth River watershed and portions of the Minnesota River are also identified with a broad perspective in which to prioritize management efforts toward specific land uses that may impact the Ranney Well.

Maps displaying the source water protection area for the Blue Earth River Ranney Well are available from the City of Mankato or the MDH.

The main pollutants of concern include suspended solids, nitrate-nitrogen, pathogenic microorganisms and pesticides. The sources of contaminants are diverse. The MDH *City of Mankato Source Water Assessment* identified 348 potential contaminant sources including pipeline, highway, railroad river crossings and parallels; above- and below-ground petroleum storage tanks; agriculture chemical facilities; animal feedlots; and hazardous waste storage facilities.

The Minnesota River Ranney Well was constructed in 2007, and a source water protection plan will be prepared as required by the MDH.

The Ranney Wells conserve deep aquifer resources and require less energy to operate compared with deep aquifer wells. The City of Mankato also operates a special water conservation facility as part of the wastewater treatment plant. This project is described in the Wastewater Section of the Water Management Plan and more information is available from the City of Mankato.

SENSITIVE GROUND WATER AREAS

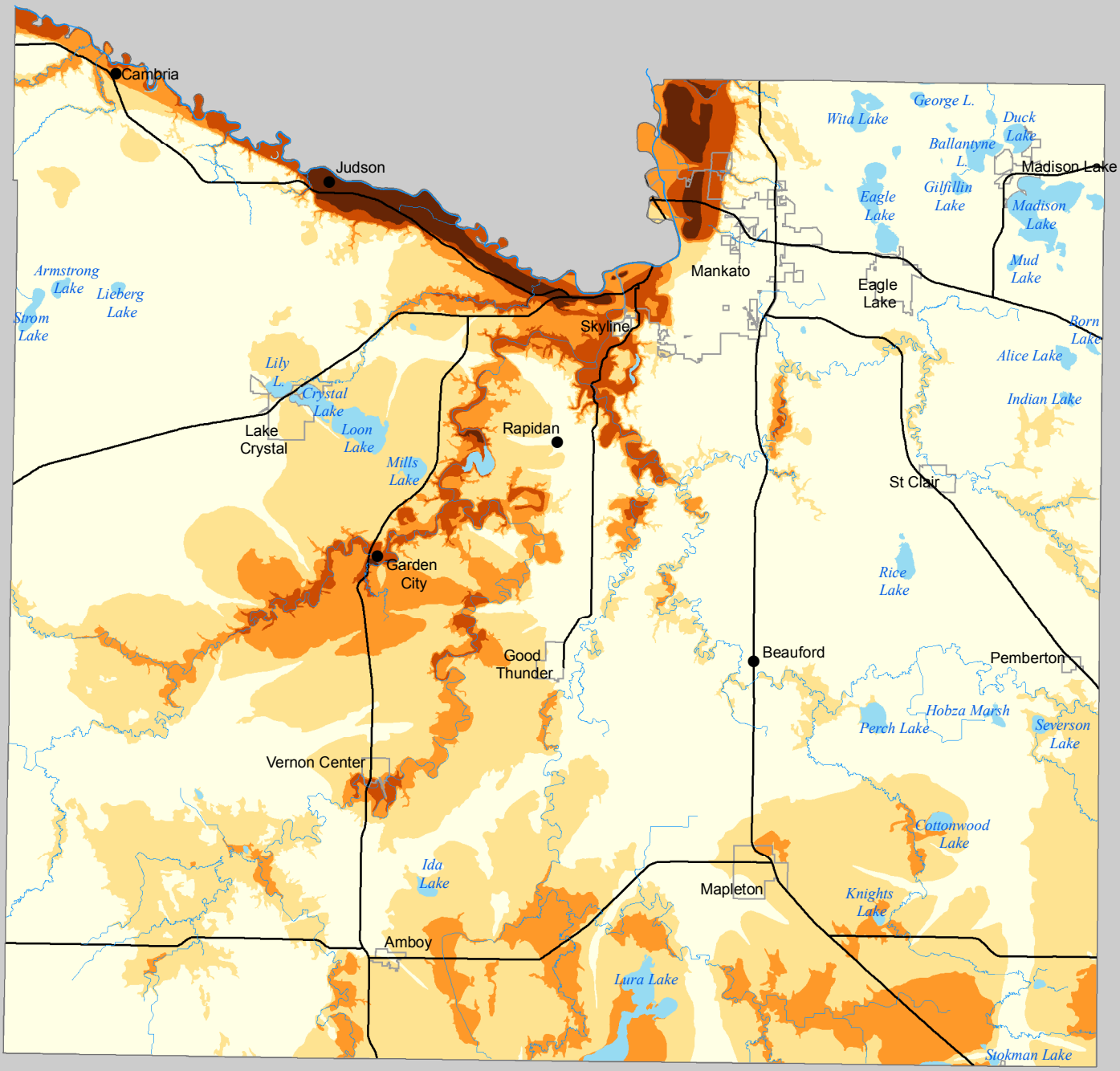
The most geological sensitive area in Blue Earth County is found along the Minnesota River, where areas of shallow soil or exposed bedrock are found on the river terraces. A limestone bedrock area extends from within the City of Mankato and Mankato Township north into Lime Township and Le Sueur County to the area known as the “Kasota Prairie.” These areas were settled early in the County’s history and continue to develop due to close proximity to the City of Mankato and transportation linkages including

railways. The current land use is diverse with rock quarries, heavy industrial uses and residential development. Map 22 displays depth to bedrock in Blue Earth County.

Similar, if not as dramatic, conditions exist along the Minnesota River Valley upstream from the City of Mankato in South Bend, Judson and Cambria Townships. In Cambria Township only small portions of the actual river bottom are included in the sensitive bedrock area. Sand and gravel deposits on the river terraces present their own problems related to well construction and localized concerns relating to potential ground water contamination.

Isolated bedrock exposures are also found along the lower portions of the Blue Earth and Le Sueur River Valleys. The outcroppings of sandstone are normally associated with the actual river channel and are covered with deep soils close to the channels.

Map 22. Depth to Bedrock



Depth to Bedrock

- Less than 1 foot
- 1 - 50 Feet
- 50 - 100 Feet
- 100 - 150 Feet
- More than 150 Feet
- Lake
- Protected Stream or River
- State or U.S. Highway
- City

0 — 5 Miles

BLUE EARTH COUNTY

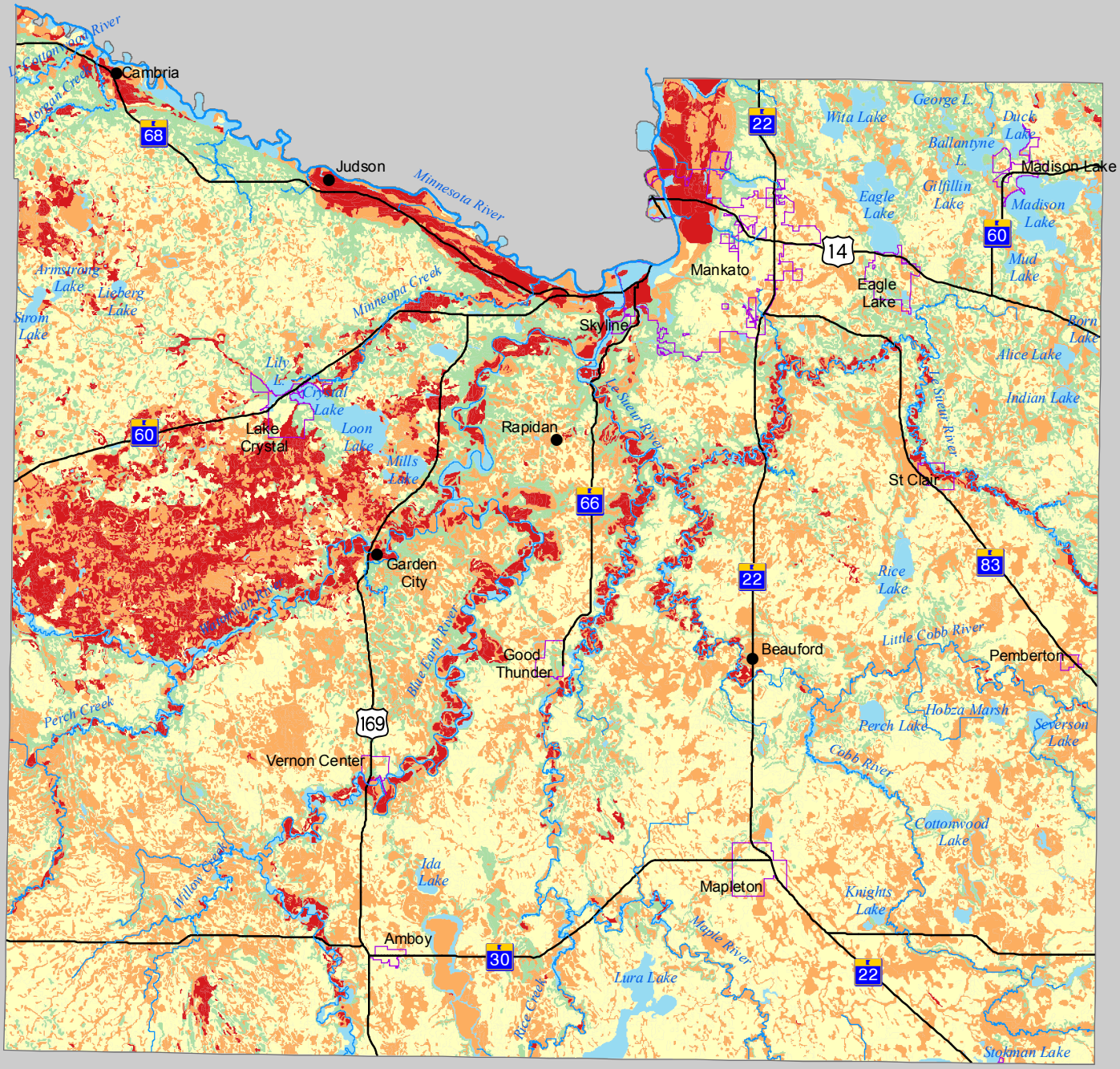
N

Prepared By: Blue Earth County
Environmental Services
October 2007

Source: Depth to Bedrock- Mankato State University
Water Resources Center

Map 23 displays Level I Geologic Sensitivity Rating for the County. A Level 1 assessment examines geologic conditions to a depth of about 5 feet below the land surface and uses soil survey information prepared by the NRCS. DNR Waters has completed a statewide Level 1 preliminary assessment of geologic sensitivity for each of the soil map units in the State. The assessment is based on the assumption that the material to a depth of about 5 feet below the land surface is representative of the entire vadose zone, the unsaturated material above the water table. Many factors or conditions that affect geologic sensitivity and that lie at depths greater than 5 feet cannot be identified by this assessment level. A Level 1 assessment addresses potential ground-water contaminants that originate at the land surface. It does not assess the pollution potential of contaminants that originate below the surface, such as underground storage tanks or improperly constructed wells. (DNR)

Map 23. Level 1 Geologic Sensitivity Rating



0 5 Miles

N

State or U.S. Highway

City

Level 1 Geologic Sensitivity

Low

Moderate

High

Very High

No Value

Prepared By: Blue Earth County
Environmental Services
October 2007

Source: Level 1 geologic sensitivity ratings from MN DNR for each soil type(USDA NRCS SSURGO Soils). "A Level 1 assessment examines geologic conditions to a depth of about 5 feet below the land surface. The assessment is based on the assumption that the material to a depth of about 5 feet below the land surface is representative of the entire vadose zone, the unsaturated material above the water table. Many factors or conditions that affect geologic sensitivity and that lie at depths greater than 5 feet cannot be identified by this assessment level. A Level 1 assessment addresses potential ground-water contaminants that originate at the land surface. It does not assess the pollution potential of contaminants that originate below the surface, such as underground storage tanks or improperly constructed wells." MNDNR

BLUE EARTH COUNTY

Shallow soil depth to bedrock
The Mankato Township and Lime Township terrace areas have small localized outcroppings of limestone with the remainder overlain with shallow Copastan Sandy Loam. The Jordan Sandstone outcrops in one area of a residential development at the terrace edge. The surface of the Limestone is eroded and small scattered areas of deeper sandy soils are present throughout this area. A deep channel of deposited soils exists along much of the eastern border of this terrace within Blue Earth County and appears to be separating this shallow limestone area from the Limestone aquifer that extends east from the river valley. The general ground water flow is towards the Minnesota River which may be a more important explanation for the good water quality seen in the eastern portion of the Limestone aquifer.

This shallow Limestone area has documented water quality problems related to localized petroleum spills and more widespread nitrate contamination due to previous land use activities including agricultural application of manure and application of municipal sewage sludge. The State Well Code prohibits the use of this aquifer for drinking water supplies. The underlying Jordan Formation continues to yield potable water and the Well Code requires special well construction techniques to provide additional protection of this aquifer.

The geomorphology of the valley areas in South Bend Township and Judson Township is more diverse. The limestone is absent in much of the valley floor in South Bend Township but is a dominant feature in South Bend Townsite, which is situated on a terrace. There are also outcroppings of sandstone along the upper terrace areas which may be a remnant of the Jordan Formation. South Bend Township is also a historic area with relatively dense urban development and a multitude of past and current land uses which have impacted surficial water quality.

The Judson Valley is also an area of shallow soils overlying the St. Lawrence confinement unit. Locally isolated areas of deeper deposited soils can be found and some areas are wet due to reduced infiltration as a result of the St. Lawrence confinement unit, creating wetland areas on the terrace.

The area identified in Cambria Township is largely undeveloped and represents basically the valley floor. Numerous oxbow lakes and other river influences, including flooding, are evident. Due to the evident erosional forces of the Minnesota River and lack of actual data from well construction, it is unclear what remains of the bedrock formations. The Geological Atlas indicates the first bedrock is the Franconian or Ironton-Galesville. The terraces are largely comprised of significant deposits of sands and gravel.

Well Drilling Implications in Sensitive Areas
Minnesota Rules Chapter 4725 Rules Relating to Wells and Borings, is the "State Well Code". While Blue Earth County has been delegated this program, the construction requirements for water supply wells is the State Well Code. In geologically sensitive areas this code requires special construction techniques to ensure the development of both safe water supplies and to prevent the possible future contamination of other aquifers. A limestone aquifer which is not covered with at least 50 feet of unconsolidated material or firm insoluble rock cannot be used as a water supply. This applies to all water supplies located within one mile from the shallow limestone formation. When drilling through this shallow limestone formation to reach a deeper aquifer, an oversized hole must be drilled and the space between the well casing and the rock must be sealed with neat cement grout. This prevents downward migration of potentially contaminated water to deeper aquifers. It also adds significant well construction costs for the consumer to insure a safe potable water supply today and in the future.

Flowing Wells
Although not considered geologically sensitive areas by virtue of the soil cover, there are three general areas of the county where flowing wells present special circumstances relative to well construction and ground water conservation. These areas are generally described as:

> Hungry Hollow: Hungry Hollow describes an area south of Mankato which is situated along the Le Sueur River in Sections 33 and 34 of Mankato Township (T108N-R26W) and Section 3 and 4 of Decoria Township (T107N-R26W). This river bottom is capable of producing 500 gallons per minute flows from five inch domestic wells. Double cased and grouted well construction must be employed to ensure the flow can be safely contained.
>
> Big Cobb River: The Big Cobb River Valley, in the vicinity of the unincorporated community of Beauford has numerous small flowing wells that are developed in the glacial drift. While none have significant flows it is an area requiring special well construction. The unrestricted flow from old existing flowing wells is a waste of the ground water resource.
>
> Maple River: A significant portion of the Maple River system that flows through Mapleton and Sterling Townships also has several small flow glacial drift wells. The situation is similar to those found in the Beauford area.

Well Advisory Area
The Minnesota Department of Health is the agency responsible for regulating wells and borings for the purpose of protecting public health and ground water supplies. A well advisory is a mechanism utilized to control the drilling or alteration of public and private wells in an area where ground water contamination has, or may, result in risks to the public health. The purposes of an advisory are to inform the public of potential health risks, provide for the construction of safe water supplies, and prevent the spread of contamination due to improper drilling of wells or borings. Contractors proposing to drill any well or boring in a well advisory area must contact the Minnesota Department of Health, Well Management Unit prior to construction.

There is one well advisory area in Blue Earth County titled LeHillier.

LeHillier Special Well Construction Area
LeHillier is a small unincorporated area located along US Highway 169/60, just across the Blue Earth River from the City of Mankato, in South Bend Township, near the confluence of the Blue Earth and Minnesota Rivers. LeHillier consists of residential, light and heavy industrial, commercial, and highway business land uses.

In 1981, following a tip on the Minnesota Pollution Control Agency (MPCA) "hotline" about dumping of hazardous wastes, ground water contamination was verified. Major contaminants detected in the drift and alluvium and some bedrock wells were nitrates and volatile organic chemicals (VOCs), primarily trichloroethylene. The Minnesota Pollution Control Agency initiated several superfund studies for identifying the source of the contamination and furnishing the residents of the area a safe water supply. Residents of the area were advised to use alternative drinking water sources.

In September of 1981, licensed well contractors working in the Mankato area were advised that contaminated wells not be deepened or new deeper wells be constructed until the source, extent, nature and hydraulics of the contamination was known. The advisory area is in parts of Section 14 and 23, T108N-R27W, Blue Earth County, bounded by Hawley Street on the west and the Blue Earth River on the east, and south and the Minnesota River on the north. This well construction advisory remains in effect today.

At the time of the advisory, there was no central water supply or wastewater treatment system serving the LeHillier community. Most of the 200 dwellings in the area were supplied by individual drive-point wells driven to approximately 30 feet in depth. A few homes had wells cased to the St. Lawrence confining layer with open-hole construction into the Franconia or Ironton aquifer. Many of the individual sewage disposal systems consisted of septic tanks and leaching wells in the Alluvial Sands.

LeHillier received a grant and constructed a community public water supply managed by South Bend Township

LeHillier received a grant and constructed a community public water supply managed by South Bend Township. A wastewater collection system was also constructed and wastewater is treated at the City of Mankato's POTW. No contamination was found in the City of Mankato's shallow aquifer Ranney well located down gradient from LeHillier; however, as a condition of allowing the construction of a sanitary sewer collection system, the City of Mankato required assurances that 1) the contamination would be cleaned up, and 2) to reduce potential for future contamination all subsurface wastewater discharges be discontinued up-gradient from the well field.

A program was implemented to seal multi-aquifer wells to prevent contamination of the Franconia-Ironton-Galesville aquifer. However, the Minnesota Department of Health did not ensure that all wells in the area were properly sealed in accordance with Minnesota Rules. Although mostly shallow wells, unsealed wells continue to be found in the area and are sealed under the County Well Program as discovered.

A remedial study was completed involving numerous monitoring wells and pump out wells. For many years, these wells were used along with U.S. Corp of Engineers flood control wells to pump contaminated water from the area. The pump out water was air stripped of VOC's and discharged to the Blue Earth River. Monitoring of the area continued. Over the years, monitoring wells were sealed when no longer needed. In 2006 and 2007 six of the pumpage wells and 15 monitoring wells were sealed. In 2007, the MPCA determined no further action was required. MPCA continues to monitor the site.

The well construction advisory remains in effect for this Superfund site.

WATER USE

Water use and ground water recharge have become a growing concern as general awareness of the value and limited availability of quality ground water increases. When compared with other natural resources needs and services, access to good quality drinking water is the number one priority for most people. Heavy water users, including for the production of ethanol recently, has raised concerns. Use of good quality ground water aquifers for snow making and irrigation of vegetation other than crops is also criticized. A greater understanding of ground water supplies at the local, County and regional scale is needed to develop plans and policy to protect ground water. The DNR is responsible for water use and appropriation, and water appropriation permits are required for users of a certain size.

Irrigation

Blue Earth County receives an average of 29 inches of precipitation per year. Irrigation is not a wide spread practice in the County for typical row crop agriculture. Where it is most often utilized is in the glacial outwash area south and west of the City of Lake Crystal where coarse soils are found and along the major river courses where coarse droughty soils predominate. Even then the use is limited to late summer applications primarily for corn production during the stress periods and during ear setting. If timely rainfalls occur irrigation may not be required at all.

The irrigation wells generally obtain their water from drift aquifers. Along the river bottoms, the adjoining stream is the water source. Exceptions occur and during 1996 an irrigation well was drilled to the Mt. Simon Sandstone for the purpose of irrigating a tree farm.

DNR Water Appropriation Permits

Minnesota's water appropriation law was first enacted in 1937. The purpose of the original act was to establish a water policy for the state and a permit system to regulate water users. This appropriation law is based on the English common law doctrine of "riparian rights" modified by the concept of "reasonable use". Under this system, the owner of the land abutting a surface water body or overlying a ground water source has the right to make "reasonable use" of the water, subject to the equal rights of other riparian owners to use the water for similar purposes.

The Department of Natural Resources (DNR) plays a critical role in protecting ground water resources. Part of their responsibility is to control and monitor the utilization of both the ground and surface water for all purposes. The Water Appropriation Permit

System is designed to control the use of the resource and to ensure that water use conflicts are avoided if possible. In 1973, the Minnesota Legislature established a priority system for water use to allocate water equitably to riparian owners when a water supply was limited. This priority system was revised in 1989 by the Legislature with the first priority being domestic water supplies and contingency power production as specified by law.

> 103G.261 WATER ALLOCATION PRIORITIES.
> (a) The commissioner shall adopt rules for allocation of waters based on the following priorities for the consumptive appropriation and use of water:
>
> (1) first priority, domestic water supply, excluding industrial and commercial uses of municipal water supply, and use for power production that meets the contingency planning provisions of section 103G.285, subdivision 6;
> (2) second priority, a use of water that involves consumption of less than 10,000 gallons of water per day;
> (3) third priority, agricultural irrigation, and processing of agricultural products involving consumption in excess of 10,000 gallons per day;
> (4) fourth priority, power production in excess of the use provided for in the contingency plan developed under section 103G.285, subdivision 6;
> (5) fifth priority, uses, other than agricultural irrigation, processing of agricultural products, and power production, involving consumption in excess of 10,000 gallons per day; and
> (6) sixth priority, nonessential uses.
>
> (b) For the purposes of this section, "consumption" means water withdrawn from a supply that is lost for immediate further use in the area.
> (c) Appropriation and use of surface water from streams during periods of flood flows and high water levels must be encouraged subject to consideration of the purposes for use, quantities to be used, and the number of persons appropriating water.
> (d) Appropriation and use of surface water from lakes of less than 500 acres in surface area must be discouraged.
> (e) The treatment and reuse of water for non-consumptive uses shall be encouraged.
> (f) Diversions of water from the state for use in other states or regions of the United States or Canada must be discouraged.

The DNR requires all large users of water to obtain water appropriation permits and report usage annually.

In 2007 the DNR had water appropriation permits for these non-domestic or non-municipal water ground water users in Blue Earth County:

> Snow Making
> Mount Kato Ski Area
>
> Irrigation
> St Clair Public School (landscaping/athletic fields)
> Mankato Golf Club (golf course)
> Minneopa Golf Club (golf course)
> Fairview Golf Club (golf course)

Eldon and Helen Jones (golf course)

Crop Irrigation
R. Wynn Kearney Jr. (crop irrigation)
Weerts Company (crop irrigation)
Pioneer Hi-Bred International (crop irrigation)
E P McMonagle (crop irrigation)
Robert Sandt (crop irrigation)

Mining
Vetter Stone (mine processing not sand and gravel washing)
Minnesota Quarries (sand and gravel washing)
Southern Minnesota Construction

Industrial
Midwest Electric (metal processing)
Hiniker Company (non-metallic processing)
Sisters of Notre Dame (commercial and institutional)
Mankato Golf Club (commercial and institutional)

Food
Cenex Harvest States Cooperative

Ethanol
A water appropriations permit is not needed for the ethanol plant near Lake Crystal because its water is supplied by the City of Lake Crystal municipal wells.

IMPLEMENTATION PLAN
Ground Water

Water Management Plan Goal:
Protect groundwater resources from potential contaminants from residential, commercial and industrial land uses, well construction, abandoned wells and septic systems.

Water Management Plan Goal:
Protect, enhance and restore groundwater recharge areas.

GUIDING PRINCIPLES
» The drinking water supply in Blue Earth County is good quality, and there is currently a good availability of glacial drift and bedrock ground water resources.
» Maintaining a good supply of high quality drinking water is the highest priority in Blue Earth County.
» The MDH, DNR, MPCA and MDA are responsible for various aspects of ground and drinking water quality management, including setting standards, monitoring quality and use, and regulations.
» The MDH completed a source water assessment plan for the City of Mankato's pre-2007, shallow aquifer, Ranney wells and determined these wells susceptibility to contamination as medium to high.
» The DNR identified areas in Blue Earth County with shallow depth to bedrock, coarse soils and increased susceptibility for ground water contamination.
» The potential for ground water contamination is reduced with good well construction and proper sealing of unused and abandoned wells.
» Blue Earth County is delegated by the MDH to administer the State Well Code for non-community well construction, including inspections, permits, enforcement, data management and reporting to the MDH County well index.
» Land use regulations can protect water quality by limiting the location and type of development with respect to geologic features and well location.
» Ground water quality monitoring data, technical information and aquifer condition is lacking in Blue Earth County.
» To better protect ground water resources in Blue Earth County, more detailed, current information regarding ground water quantity and quantity is needed for land use, infrastructure and natural resources related planning and policy.
» The County supports MGS, DNR and other State agency programs to expand technological, data and monitoring efforts including a geologic atlas for Blue Earth County and regional aquifers, establishing observation monitoring wells, and analysis of aquifers.

ONGOING PROGRAMS:
The County will continue to protect ground water resources and drinking water quality by operating the MDH-Delegated County Well Code program, including permitting and inspecting all new well construction and properly sealing abandoned wells. The County will continue to protect ground water resources with administration of local land use ordinances, including permits and site evaluation involving well set back verifications for

new and existing wells. The SWCD, County and NRCS will continue to coordinate well sealing cost share to maximize available cost share dollars for all water management programs.

The County well program is funded by permit fees and the County budget. The well sealing cost share program is funded by permit fees, the County budget and landowner cash match. There is no State support for County well programs.

WATER MANAGEMENT PLAN:
Beyond existing ongoing programs, what can be achieved during the planning period is limited by financial and staff resources. Distributing information, primarily to local government officials, to increase awareness of the potential for ground water contamination and how to protect ground water will be the highest priority during the planning period. The County will be addressing and encouraging other local governments to incorporate ground water protection in land use plans and regulations. The County participates in preparation of source water protection plans at the request of local government and the MDH. Identifying priority ground water recharge areas is a high priority, but more information is needed.

The County supports the DNR's *Sustainability of Minnesota's Ground Water: Statement of Issues and Needs as reported to the Minnesota Legislature in June 2005* which includes a list of technical and monitoring needs as wells as planning and regulatory needs. The County especially supports the following changes included in the DNR report:

1) Complete geologic mapping of aquifers or potential aquifers at county scale using modern tools.
2) Compile up-to-date regional and statewide aquifer maps.
3) Accelerate physical and chemical testing of aquifers.
4) Restore measurement frequency and expand ground-water level monitoring network to develop water-level data for aquifers in areas of increasing ground water demand.
5) Construct new ground-water level monitoring wells in selected locations to enhance the capability to anticipate needed information and monitoring.
6) Expand and coordinate precipitation, stream flow, ground-water quality, and lake level monitoring to fully examine the impacts of actual or potential ground-water withdrawals.
7) Analyze and report information by aquifer including an evaluation of the impacts of withdrawals.
8) Recognize, monitor and describe the impacts of surface activities on ground water quality.
9) Continue sub-regional and regional water supply planning and expand participation to more stakeholders.

Objective 1: The County will continue the Well Program.

Action 1: Blue Earth County will permit and inspect construction of new domestic wells and sealing of unused and abandoned wells.

Action 2: The County will continue to fund the well sealing cost share program with at least $9,000 annually.

Objective 2: Increase local government's awareness of the potential for ground water contamination susceptibility in Blue Earth County.

Action 1: The County will work with Township officials providing data and information related to ground water contamination susceptibility and groundwater protection methods, including zoning, with a special focus on Lime Township and Mankato Township because of their unique position having local zoning authority and their location in areas with high susceptibility to ground water contamination due to shallow soil depth to bedrock.

Action 2: The County will provide data and information related to ground water contamination susceptibility and groundwater protection strategies to local government officials, including municipalities.

Objective 3: The County will incorporate ground water protection measures in land use planning and regulations.

Action 1: The County will address ground water protection, source water protection plans and land use in the update of the County Comprehensive Land Use Plan.

Action 2: The County will address ground water protection measures in land use policy at the local level with special attention to business use and storage of potentially hazardous chemicals and materials and subsurface wastewater treatment and disposal.

Objective 4: The County will assist local government units with preparation of source water protection plans.

Action: The County will assist all local government units and the MDH with preparing source water protection plans as requested by participating in planning teams and providing available data and information including maps and aerial photos and County well index data.

Priority Concern: Surface Water

Impaired Waters and Total Maximum Daily Loads (TMDLs)

PRIORITY CONCERN: Impaired Surface Waters and Total Maximum Daily Loads (TMDLs)

Water Management Plan Goal:
Reduce pollutants causing water quality impairments of surface water in watersheds within and affected by land in Blue Earth County.

Priority Concern

The Minnesota Pollution Control Agency (MPCA) is responsible for assessing surface water in Minnesota. The MPCA has found water quality impairments in virtually every watershed in Blue Earth County. The pollutants causing these impairments affect aquatic life and include mainly turbidity, nutrients, fecal bacteria, pesticides and mercury. Pollution impairments are caused by both point source and nonpoint sources. Point sources are regulated by the MPCA. Nonpoint sources are widespread and include both agricultural and urban land use. Nonpoint sources are regulated to a lesser extent than point sources and are more difficult to manage. Continuing existing programs to reduce nonpoint source pollution and working cooperatively on a watershed basis to prioritize local implementation efforts consistent with local, watershed and TMDL implementation plans are priorities of the *Water Management Plan 2008-2012*.

Priority Concern Assessment

The MPCA impaired waters assessment process and Total Maximum Daily Loads (TMDLs) are new to local water management planning. While impaired waters lists and TMDLs are relatively new, addressing pollutants causing water quality impairments has been the focus of the Comprehensive Water Planning for twenty years and local programs for decades. This has included SWCD administered programs to establish soil and water conservation practices, County and City programs and regulation, and local government construction of conservation practices. These programs are described in more detail throughout the *Water Management Plan 2008-2013*.

Nonpoint source pollution is recognized as a major source of pollution causing water quality problems. As the dominant land use in Blue Earth County, it is generally understood that runoff from agricultural land is a significant source of nonpoint source pollution related to land use. Runoff from urban areas, septic systems and natural processes such as channel and bank erosion are also nonpoint sources contributing to water quality impairments. Urban, nonpoint source pollution can be a significant source of pollution in lakes and small subwatersheds. Point sources include municipal wastewater and other industrial discharges. The MPCA regulates point sources with permitting, inspections, monitoring and reporting requirements. Pollutant discharge limits are assigned to individual facility permits.

Impaired Waters and Total Maximum Daily Loads (TMDLs)
The Federal Clean Water Act (CWA) requires States to adopt water quality standards to protect waters from pollution. These standards define how much of a pollutant can be in

the water and still meet designated use standards, such as drinking water, fishing and swimming. The standards are set on a wide range of pollutants and conditions which include bacteria, nutrients, turbidity, mercury and others. A water body is "impaired" if it fails to meet one or more water quality standards. The Clean Water Act, Section 303(d) requires States to identify and restore impaired waters.

In Minnesota, the MPCA administers the Clean Water Act and is required to:

1) Assess all waters of the State to determine if they meet water quality standards.
2) List impaired waters that do not meet standards. This list is also referred to as the 303d list or the impaired waters list.
3) Conduct studies in order to set pollutant reduction goals needed to restore waters. These studies are Total Maximum Daily Load studies (TMDLs).

A Total Maximum Daily Load (TMDL) is the basis for regulation of the Clean Water Act and is expressed quantitatively:

TMDL = LC = WLA + LA + MOS.

The following EPA definitions are important for understanding the regulatory part of TMDLs:

Loading capacity (LC) -- The greatest amount of loading that a water can receive without violating water quality standards.

Load allocation (LA) -- The portion of a receiving water's loading capacity that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources. Load allocations are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading. Wherever possible, natural and nonpoint source loads should be distinguished.

Wasteload allocation (WLA) -- The portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. WLAs constitute a type of water quality-based effluent limitation.

Total maximum daily load (TMDL) -- The sum of the individual WLAs for point sources and LAs for nonpoint sources and natural background. If a receiving water has only one point source discharger, the TMDL is the sum of that point source WLA plus the LAs for any nonpoint sources of pollution and natural background sources, tributaries, or adjacent segments. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure that relate to a State's water quality standard. If Best Management Practices (BMPs) or other nonpoint source pollution control actions make more stringent load allocations practicable, then WLAs can be made less stringent. Thus, the TMDL process provides for nonpoint source control tradeoffs

Margin of Safety (MOS) -- A required component of the TMDL that accounts for the uncertainty about the relationship between the pollutant loads and the quality of the receiving water body. The MOS is normally incorporated into the conservative assumptions used to develop TMDLs (generally within the calculations or models) and approved by EPA either individually or in State/EPA agreements. If the MOS needs to be larger than that which is allowed through the conservative assumptions, additional MOS can be added as a separate component of the TMDL.

MINNESOTA IMPAIRED WATERS LIST

The MPCA is in the process of assessing surface waters. The list of impaired waters is expected to grow as the assessment process is ongoing. The impaired waters lists are revised every two years. The number of new waters on the proposed 2008 Impaired Waters List is longer than the 2006 list. The 2008 list must be approved by the

Minnesota River Basin Impaired Waters
According to the MPCA, in the Minnesota River Basin there are 36 new stream impairments and 10 new lakes added to the 2006 List. There are 99 impaired reaches in rivers and creeks, 64 lakes with impairments, and 340 individual TMDL studies are needed. (MPCA)

TMDLs
The number of TMDLs completed is relatively small but there are many TMDLs underway. Impairments from mercury make up a majority of the impairments addressed in the TMDLs completed. The MPCA summarizes the status of TMDLs on its web site and reports that in November 2007:

Draft/Public Noticed TMDLs: 2
addressing 10 impairments

Approved TMDLs: 16
addressing 95 conventional impairments and 511 impairments for Mercury

TMDL Studies (currently underway): 65
addressing 255 impairments

Inactive Projects (not underway): 234
addressing 1,113 impairments

Appendix A includes MPCA Impaired waters and TMDL fact sheets and maps.

Impaired Waters and TMDLs in Blue Earth County

There is a high density of impaired waters in Blue Earth County. The impaired waters requiring TMDLs are also affected by multiple pollutants or stressors. At least one impaired reach can be found on virtually every river and stream in the County, and more will likely be added during the planning period as the MPCA continues the assessment process. The MPCA has also just adopted water quality standards for acetochlor, a commonly used corn herbicide. There are two locations in Blue Earth County on the proposed 2008 Impaired Waters List for impairments caused by acetochlor. The most common pollutants include: Turbidity, Fecal Coliform, Acetochlor, and Mercury. MPCA maps and fact sheets displaying impaired waters are included in the Appendix A. The maps include the affected use and the pollutant causing the impairment.

Of the impaired reaches located in Blue Earth County, only one TMDL, for fecal coliform in the Greater Blue Earth River, has been completed. Downstream, the Lower Minnesota River Dissolved Oxygen Implementation Plan has been completed, but this TMDL is for low flow conditions and mainly affects regulation of point sources.

The MPCA TMDL studies currently completed or in process for impairments within Blue Earth County include:

- Greater Blue Earth River Fecal Coliform TMDL Report (approved)
- Greater Blue Earth River Fecal Coliform TMDL Implementation Plan (draft)
- Minnesota River Basin TMDL Project for Turbidity (in process)
- Greater Blue Earth River Turbidity TMDL Report (in process)
- Crystal Lake watershed (TMDL study begins 2008)

Minnesota River Basin TMDL Project for Turbidity

The following reaches of rivers in Blue Earth County are included in the Minnesota River Basin Turbidity Project:

- Blue Earth River – from the Rapidan Dam to the Le Sueur River
- Blue Earth River – from the Le Sueur River to the Minnesota River
- Le Sueur River – from the Maple River to the Blue Earth River
- Watonwan River – from Perch Creek to Blue Earth River

Others Rivers with Reaches on 2008 Impaired Waters List

- Minneopa Creek
- Maple River
- Little Cobb (also requires mercury TMDL)
- Cobb River
- Watonwan River (also requires mercury TMDL)

Lakes on the 2008 Impaired Waters List

- Crystal - Nutrient/Eutrophication
- Loon - Nutrient/Eutrophication
- Duck -Nutrient/Eutrophication
- Eagle lake - Nutrient/Eutrophication
- Lura – Nutrient/Eutrophication
- Washington - Nutrient/Eutrophication

2008 List – Acetochlor-Impaired Waters

- Unnamed Creek "Little Beauford Ditch" (also requires mercury TMDL)
- Le Sueur River – Maple River to Blue Earth River (also requires mercury TMDL)

Minneopa Creek

The State has designated Minneopa Creek as a Class 7 waters. Class 7 waters are those with "limited resource value for recreation and wildlife." Minneopa Creek is a local and regionally significant water resource with Minneopa State Park located near the confluence of the creek with the Minnesota River. The State's classification of Minneopa Creek should be upgraded to help improve and protect Minneopa Creek. Future NDPES and discharge permits should recognize local values and recreational and water quality needs for Minneopa Creek and this regionally significant State park.

LOCAL PROGRAMS and TMDLs

Voluntary efforts by land owners/operators are needed to reduce nonpoint source pollution from agricultural land use. Working with land owners/operators to encourage

voluntary establishment of soil and water conservation practices is mainly the role of the SWCD and NRCS. The SWCD and NRCS have been working with land owners/operators for decades. The SWCD and NRCS jointly utilize staff and financial resources to deliver programs and achieve soil and water conservation goals by using restoration methods with demonstrated effectiveness in reducing run-off, erosion, excess nutrients, fecal bacteria and other pollutants. The USDA NRCS is a significant source of financial incentives for soil and water conservation projects. The SWCD maximizes available funding for financial incentives by leveraging water quality grants from State and Federal sources and the USDA funding.

Local government regulatory authority and programs also reduce and prevent nonpoint source pollution from all types of land use. The County uses local land use controls to require land management practices that reduce run-off, excess nutrients, bacteria and other pollutants from feedlots, septic systems, rural development and other land uses. County regulations also prohibit certain land uses in sensitive areas preventing pollution and further degradation of area waters.

In addition to local programs, the County and SWCD have worked across County political boundaries to address water quality on a watershed basis, mainly with the GBERBA. This has included prioritizing areas for implementation in a watershed and working together to get watershed-based grants for establishing BMPs. Implementation of watershed projects has continued to be the role of the SWCD.

With respect to the impaired waters and TMDLs, the existing programs and service delivery structure at the County, SWCD and NRCS are effective means to accomplish TMDL, watershed, State and local goals. The ongoing programs, objectives and actions described in the *Water Management Plan 2008-2013* are well established and have produced measurable results. It is anticipated that new objectives and actions in the *Water Management Plan 2008-2013* will address water quality issues identified in future TMDL implementation plans. What has limited the ability to establish soil and water conservation practices is lack of stable project funds and local staff to work with land owners/operators to better identify local needs and respond accordingly with education and program changes.

Surface Water Quality Monitoring and Assessment

The County and SWCD have been involved with monitoring only as part of water quality projects. The County supports coordinated and centralized water quality assessment and monitoring programs and will support MPCA efforts to monitor surface waters to the extent possible. Meaningful water quality monitoring is costly and requires staff and financial resources not available at the County level.

Citizen Stream Monitoring

The Citizen Stream Monitoring program is managed and coordinated by the MPCA. The SWCD has been involved with Citizen Stream Monitoring through water quality projects and promotes citizen monitoring generally. Most of the volunteers are working in the Maple River, Watonwan River and a few of the lakes. Citizen stream monitoring data is submitted by the volunteers directly to the MPCA. The MPCA uses the data to assess conditions and has used the data for identifying turbidity related impairments.

Nonpoint source Pollution

The EPA guide *Guidance for Water Quality-Based Decisions: the TMDL Process* states that under the CWA, the only federally enforceable controls are those for point sources through the NPDES permitting process. According to the EPA, nonpoint source control measures may fail to achieve projected pollution or chemical load reductions due to inadequate selection, design or implementation of BMPs, or lack of full participation by all contributing sources of nonpoint pollution.

State and local regulations address nonpoint sources of pollution, but managing widely-distributed sources and expansive land area is challenging. Without regulation compelling generators of nonpoint sources of pollution to participate, achieving nonpoint source load reductions relies to a large extent on voluntary actions by land owners/operators and local government. TMDL plans addressing impairments related to nonpoint sources of pollution should involve relevant stakeholders early in the process to increase the likelihood of implementation.

The EPA has a list of suggested BMPs for different types of nonpoint source land use. The multi-category BMPs can be used in all areas. These BMPs are commonly used soil and water conservation practices with demonstrated effectiveness in reducing nonpoint source pollution from runoff, excess nutrients and erosion. The multi-category and agriculture BMPs are also well known soil and conservation practices that are part of USDA and State cost share programs.

Examples of Best Management Practices	
MULTI-CATEGORY	**AGRICULTURE**
Buffer Strips	Animal waste management
Detention/sedimentation basins	Conservation tillage
Devices to encourage infiltration	Contour farming and strip cropping
Grassed waterway	Cover crops
Interception/diversion	Crop rotation
Material ground cover	Fertilizer management
Sediment traps	Integrated pest management
Streamside management zones	Livestock exclusion
Vegetative stabilization/mulching	Range and pasture management
CONSTRUCTION	Terraces
Disturbed area limits	**URBAN**
Non-vegetative soil stabilization	Flood storage
Runoff detention/retention	Porous pavements
Surface roughening	Runoff detention/retention
	Street cleaning

Source: EPA, *Guidance for Water Quality-Based Decisions: the TMDL Process*

IMPLEMENTATION PLAN
Impaired waters and TMDLs

Water Management Plan Goal:
Reduce pollutants causing water quality impairments of surface water in watersheds within and affected by land in Blue Earth County.

GUIDING PRINCIPLES

» The MPCA administers the Clean Water Act and is required to assess all waters of the State to determine if they meet water quality standards, list impaired waters that do not meet standards, and conduct TMDL studies in order to set pollutant reduction goals needed to restore waters.
» The MPCA has identified river and lake water quality impairments due to multiple pollutants, stressors and indicators in every watershed in Blue Earth County.
» Point source pollution is regulated through State administration of the Clean Water Act National Pollution Discharge Elimination (NPDES) permit process and other MPCA programs.
» Nonpoint source pollution is a significant source of water quality impairments in Blue Earth County.
» The County and SWCD support cooperative watershed efforts to identify and prioritize areas and water quality restoration strategies for implementation at the local level.

ONGOING ACTIVITIES

The existing program and service delivery structure at the County, SWCD and NRCS can effectively accomplish nonpoint source TMDL, watershed, State and local goals. The ongoing program activities, objectives and actions described in the *Water Management Plan 2008-2013* include soil and water conservation practices that have demonstrated effectiveness in reducing runoff, excess nutrients, fecal bacteria and other pollutants.

The County's use of its planning and regulatory authority has encouraged and required land management practices that reduce run-off, excess nutrients, bacteria and other pollutants from feedlots, septic systems, rural development and other land uses. County regulations also prohibit certain land uses in sensitive areas preventing pollution and further degradation of area waters. The County's feedlot and SSTS programs are administered in accordance with and exceed State rules.

The State has designated Minneopa Creek as a Class 7 waters. Class 7 waters are those with "limited resource value for recreation and wildlife." Minneopa Creek is a local and regionally significant water resource with Minneopa State Park located near the confluence of the creek with the Minnesota River. The State's classification of Minneopa Creek should be upgraded to help improve and protect Minneopa Creek. Future NDPES and discharge permits should recognize local values and recreational and water quality needs for Minneopa Creek and this regionally significant State park.

WATER MANGEMENT PLAN:
TMDLs are relatively new and few have been completed and approved by EPA. Only one TMDL implementation plan has been completed for impaired reaches in Blue Earth County. The MPCA's needs and expectations related to local involvement in TMDLs will be defined as MPCA completes more TMDL studies and implementation plans. The County and SWCD will work to restore impaired waters consistent with TMDL implementation plans. As the County and SWCD prepare annual plans and prioritize local programs, the prioritization process will be influenced by the availability of data, funding and other resources associated with TMDLs at varying local, watershed and basin scales. The level of involvement will depend on the availability of staff and other resources available. Additional staff is needed at the SWCD to work with land owners/operators to accomplish local, watershed and TMDL goals.

There is a high density of TMDLs in Blue Earth County with common nonpoint sources of pollution and recommended best management practices to address those pollutants. Combining TMDL implementation efforts to address as many TMDLs and pollutants as possible within the County would be the most efficient means to accomplish TMDL goals and best utilize existing programs and human resources. Combining TMDL areas also maximizes the affected land area increasing the likelihood that project funding will be available for interested land owners/operators. The County and SWCD prioritize implementation actions based on a number of factors. The availability of program and project funding can make projects timelier if funding is not available for implementation of other priority actions.

Objective 1: Support development of TMDL Implementation Plans.

Action 1: Work cooperatively on a watershed basis to identify and prioritize implementation activities.

Action 2: At the request of the MPCA or other TMDL sponsor and within the constraints of local staff time and resources, participate in preparation of TMDL studies and implementation plans

Objective 2: Implement soil and water conservation and other practices identified in TMDL implementation plans.

Action 1: Work with agricultural land owners/operators to establish best management practices to achieve TMDL implementation goals as practicable considering availability of local staff and project resources.

Action 2: Seek funding for a County-based staff person at the SWCD to work with land owners/operators in all impaired waters and TMDL Implementation Plan priority areas to establish soil and water conservation practices known to address multiple pollutants causing impairments.

Action 3: Work with other nonpoint sources identified in TMDLs to increase awareness of water quality problems, change behavior and establish best management practices where appropriate and practicable considering availability of local staff and project resources.

Objective 3: Increase participation in the MPCA Citizen Stream Monitoring Program.

Action 1: Promote Citizen Stream Monitoring in SWCD and County newsletters, web site and other information sources.

Priority Concern: Surface Water

Feedlots and
Manure Management

PRIORITY CONCERN: Feedlots and Manure Management

Water Management Plan Goal
Prevent and reduce pollution of surface and ground water with implementation of livestock and nutrient management programs, policies and best practices.

Priority Concern

Livestock feedlot manure can be a source of bacteria, TSS, phosphorus, nitrogen and other pollutants. Most livestock in Blue Earth County is produced in confinement barns with below-barn, concrete manure storage pits. Runoff containing manure used as fertilizer for agricultural crop production is likely the greatest source of pollution from livestock feedlots. Preventing and reducing runoff and protecting groundwater are the highest priorities. Continuing the County Feedlot Program and working with feedlot operators to improve nutrient management planning and application methods in environmentally sensitive areas will be the most important actions related to livestock production and feedlots during the planning period.

Priority Concerns Assessment

Background
There have been many changes in livestock production methods in the past 30-40 years. Modern livestock production involves fewer but much larger, totally confined feedlots. Total confinement barns have replaced open lots, partial confinement barns, shelters and pastures. Another difference is the type of animals produced. In the County, the number of cattle, dairy, turkeys and chickens have declined dramatically, while the number of swine has increased. Blue Earth County is one of the top hog producing Counties in the State.

Awareness of water pollution from feedlots has increased in the past 20 years. In the early 1990s a series of State enforcement actions against several feedlot operators in Blue Earth County brought a great deal of attention to feedlots with direct manure run off to surface waters. The County began aggressively working with feedlot owners to correct feedlot pollution problems. The County also initiated and joined the State in enforcement actions. As a result, most feedlots with direct manure run off were eliminated as many of the operators chose to close these sites and either construct confined facilities to replace the problem sites or discontinue producing livestock. Poorly constructed earthen manure storage pits, basins and other inadequate manure storage facilities were also closed. Blue Earth County was one of the first Counties in the State with a feedlot ordinance. Today Blue Earth County is one of the few Counties with a feedlot program requiring annual County permits and annual permit fees. Feedlots are regulated primarily by Minnesota Rules Chapter 7020. Local programs and regulations are consistent with State of Minnesota Rules.

The SWCD and NRCS have been important partners in feedlot management providing technical support to feedlot operators and the County. For eligible projects, grants to

feedlot operators are available through the SWCD and NRCS. Dozens of feedlots with runoff problems utilized the services and cost share programs through the SWCD and NRCS during the 1990s for fixes such as waste storage, gutters, and surface water diversions.

Today land applied manure is the greatest source of surface water pollution from livestock feedlots in Blue Earth County. Many feedlot operators are doing a good job with manure management and continuing to improve as manure management plans are required for feedlots with 300 or more animal units.

Land applied manure has the potential to pollute surface water two ways: 1) manure runoff from the field, and 2) runoff containing excess nutrients from manure and manure/fertilizer applied above agronomic rates. Manure is more likely to run off when applied without incorporation, applied on slopes, applied close to sensitive areas, or applied on frozen ground. Applying more manure than needed by the crop results in an accumulation of nutrients in the soil. When applied at agronomic rates for phosphorus, most fields require less or less frequent manure than if applied with consideration of only nitrogen needs for crops. Excess nutrients are transported with stormwater and eroded soil particles.

Manure has great benefits as crop fertilizer and can be very valuable depending on current commercial fertilizer prices and availability. Manure is also a waste associated with livestock production. From the feedlot operator's view manure must be managed with consideration of practical needs and economic factors associated with applying the manure. Ideally manure is fully utilized as crop fertilizer and applied at rates related to crop needs and nutrients available using methods to prevent manure or nutrient runoff to surface water according to the feedlot operator's manure and nutrient management plans. Considerations of distance to the field, nutrient density of manure, soil nutrient needs, type of equipment, time, acres, etc. can all influence the operators decisions related to manure application rates.

Liquid swine manure is the greatest volume of manure applied to land in Blue Earth County. Practical considerations associated with manure application from confinement operations relate to timing when manure can be applied to the field and when manure must be removed from the storage pit or basin to allow for adequate storage volume. Weather variables also influence manure management decisions. Wet field conditions, heavy rains, snow, and concerns about ground compaction may limit manure application during a time when the pit is full all influence when, how and where manure is applied to the field.

Manure can also pollute ground water. Although there have been no manure-related ground water problems reported in Blue Earth County, preventative measures can be taken in areas where there is a known susceptibility to ground water contamination.

Environmentally Sensitive Areas

In order to meet State rules for manure management plan preparation, sensitive areas must be addressed. The MPCA forms and guides include the following sensitive areas: lake, stream, intermittent stream, drainage ditch without protective berms, public waters

wetland, open tile intakes, floodplain, road ditch, sinkhole, well, mine, quarry, shallow soil over fractured rock, and other conduits to water.

Ground Water Protection
There are several areas in Blue Earth County identified as highly susceptible to ground water contamination. These include areas with shallow depth of soil to bedrock and areas with coarse, somewhat shallow soils. Ground water is discussed on pages 53-68 of this plan. Map 23 on page 61 displays the geologic sensitivity of the soils.

Shallow depth to bedrock
Shallow soil over bedrock is found along the main river valleys in Blue Earth County including the Minnesota River, Blue Earth River and Le Sueur River. The shallowest depth to bedrock (zero-12 inches) is found along the Minnesota River most notably in Judson Township, South Bend Township, City of Mankato and Lime Township. Map 22 on page 59 displays generalized, depth to bedrock information in Blue Earth County.

Manure is a potential threat to ground water in areas with shallow depth to bedrock. Horses are the most common type of livestock in areas of the County with shallow depth to bedrock. There are eight, relatively small horse feedlots in the County. Many sites with horses have fewer than 10 animal units, do not meet the definition of a feedlot and are not included in the County feedlot inventory. Lime Township has the highest density of horse feedlots, horse barns and horse pastures.

Coarse/Shallow Soils
Areas within the Watonwan River watershed and Crystal Lake watershed are identified as highly susceptible to ground water contamination due to relatively sandy and shallow soils in this area. Swine confinement operations are the most common type of livestock in these areas.

Drinking water wells
The Minnesota Department of Health has identified no vulnerable drinking water supplies or drinking water source protection areas.

The City of Mankato's wells are shallow aquifers located beneath the Blue Earth and the Minnesota River. Due to the relatively shallow position of these wells, the aquifer is more susceptible to contamination compared with deep wells.

Standard MPCA, MDH and County feedlot setbacks apply to all water wells.

Surface waters
MPCA and County setbacks apply to these environmentally sensitive, surface water features: protected waters, lakes, streams, wetlands, ditches, and surface tile intakes. Many intermittent streams are also not identified on maps. Only the landowner knows the location of tile intakes.

Seasonal high water table and saturated soils
The landscape in Blue Earth County is dominated by soil types with a high seasonal high water table. A high seasonal high water table can be a problem for manure storage and manure application. According to the USDA Soil Survey most soils in Blue Earth County are poorly suited for land application of manure due to wetness.

Most below barn, concrete manure storage structures need perimeter tile in order to protect the concrete walls of the pit from cracking and groundwater/pit infiltration. Inspections of these tile systems over time may be necessary for ground water protection.

The water table is lowered in much of the County by privately owned, subsurface tile drainage systems. Even with tile drainage, wetness can limit land application of manure during critical times for manure application before planting in spring and before snowfall in the fall.

Current TMDLs and Water Quality Projects

Lower Minnesota River Dissolved Oxygen TMDL
The Lower Minnesota River Dissolved Oxygen TMDL Implementation Plan includes MPCA activities that will involve Blue Earth County. The implementation plan states:

> "MPCA will pursue increases to the level of manure management plan review required of County Feedlot Officers (CFOs) in their annual work plans. Initially, the focus will be to ensure that producers are keeping the required records and maintaining required manure management plans. By 2010, the goal will be to include more in-depth analysis of soil test phosphorus levels and manure application methods and frequencies that are documented in producer records and manure management plans. "

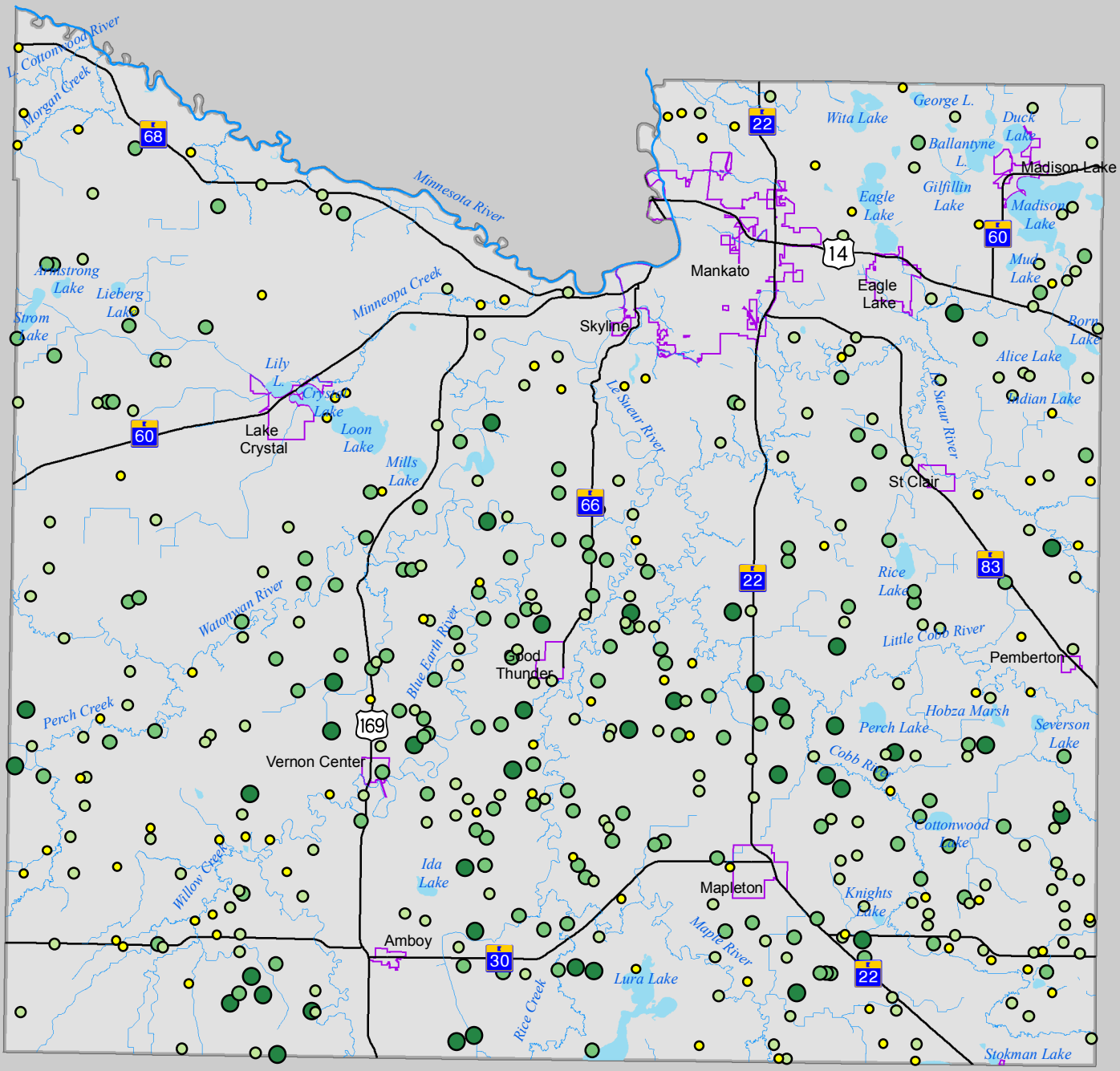
Greater Blue Earth River Fecal TMDL
The draft Blue Earth River Fecal TMDL Implementation Plan includes activities that will involve Blue Earth County. The implementation plan identifies improving manure management plans and establishing vegetated buffers to reduce manure runoff as priority activities.

Maple River Watershed Clean Water Partnership
The Maple River watershed contains the highest density of feedlots, animal units, and associated volume of manure in Blue Earth County.

Feedlot Inventory

In 2007 there are 440 feedlots in Blue Earth County. Most of the feedlots in the County are located in the southern two thirds of the County. Map 24 displays the location of each feedlot in Blue Earth County.

Map 24. Feedlots



State or U.S. Highway

Lake

City

Feedlot (Animal Units)

- 10 - 49 Animal Units
- 50 - 299 Animal Units
- 300 - 999 Animal Units
- 1000 - 2000 Animal Units

0 5 Miles

N

BLUE EARTH COUNTY

Prepared By: Blue Earth County Environmental Services October 2007

Source: Blue Earth County Feedlot Inventory October 29, 2007

The *Zoning Section of the County Code* defines feedlots:

> *Animal feedlot*: means a lot or building, or combination of contiguous lots and buildings, intended for the confined feeding, breeding, raising or holding of animals and specifically designed as a confinement area in which manure may accumulate, or where the concentration of animals is such that a vegetative cover cannot be maintained within the enclosure. For purposes of this article, open lots used for feeding and rearing of poultry (poultry ranges) and barns, dairy facilities, swine facilities, beef lots and barns, horse stalls, mink ranches and domesticated animal zoos shall be considered to be animal feedlots. Pastures shall not be considered animal feedlots under this article.

Many types of livestock are produced in Blue Earth County. Swine, cattle, cows, turkeys and chickens are the most common, but swine production dominates the livestock industry in Blue Earth County. Table 4 summarizes the number of the main animal types.

Table 4. Summary of Main Animal Types in Blue Earth County 2007
Source: Blue Earth County Feedlot Permit Records 2007

	Number of Animals*	**Animal Units***
Dairy Cows	975 Cows, 1400 Heifers, 400 calves	2,380
Beef Cattle	13,800 Finishing, 200 Heifers, 1,780 Cow/Calf Pairs, 800 Calves	16,400
Swine Breeding Stock	31,000	12,400
Swine Finishing	340,000	102,000
Swine Nursery	119,000	6,000
Chickens /Laying hens	85,000	850
Turkeys	160,000	2,880

Note: animal numbers are permitted capacity not an actual inventory

The regulated feedlots in Blue Earth County range in size from 10 AU to 2,200 animal units. Most feedlots are those with less than 300 animal units. Of the 440 total feedlots, 288 are less than 300 AU. When viewing feedlots proportionally by the number of animal units produced at each, the feedlots with less than 300 animal units represent only 21% of the total animal units in the County. A significantly large number of total animal units are produced in feedlots between 300 AU and 999 AU. Table 5 summarizes the number of cattle and swine feedlots of varying size ranges and the total animal units in each size.

Table 5. Summary of Cattle and Swine Feedlot Size
Source: Blue Earth County Feedlot Permit Records 2007

Permitted Size in Animal Units	Total Sites	Inactive Sites	No. in Shoreland	Cattle Sites	Swine Sites	Total Animal Units
10-49	96	12	16	68	28	3,000
50-299	196	14	14	61	118	26,500
300-999	122	1	8	9	114	72,000
1,000 or larger	30	0	1	1	29	39,000

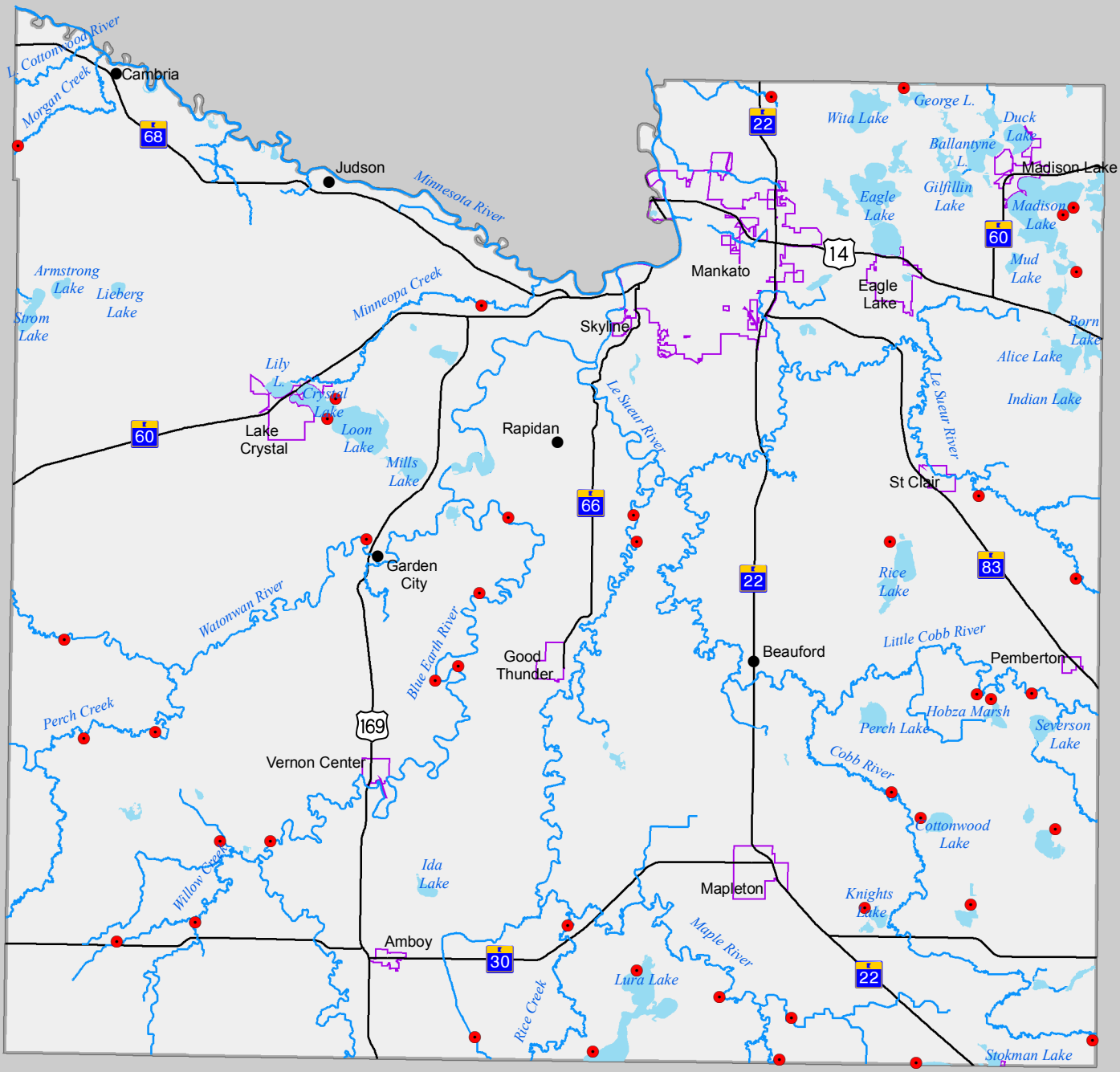
Note: animal numbers are permitted capacity not an actual inventory

Pastures
Pastures are exempt from MPCA feedlot rules. Properly maintained pastures reduce surface runoff and soil erosion and are considered to have less environmental impact than open lots. Pastures are not exempt from State water quality rules. Livestock on pastures are not restricted from accessing lakes, rivers or other waters. Pastures associated with a feedlot are regulated differently than pasture-only operations. Pastures connected to feedlots must register with the MPCA or County, and if located on a lake, a pasture connected to a feedlot must be fenced from the water.

Open Lot agreements
This provision of the MPCA feedlot rules allows small feedlot operators with less than 300 AU to phase in improvements needed to reduce manure runoff. Partial improvements were required in 2005 and the work must be completed by 2010.

Shoreland
Due to close proximity to surface water, feedlots with open lots in Shoreland are considered to have a greater potential for runoff. Map 25 displays the feedlots located within 300 feet of a DNR protected river or stream and within 1,000 feet of a DNR protected lake. Most of the feedlots in Shoreland are less than 300 AU. Of these small feedlots, four have an “Open Lot Agreement”.

Map 25.
Feedlots within Designated Shoreland Areas



- Feedlot Located in a Shoreland Area
- DNR Protected Basin
- Protected Stream or River
- City
- State or U.S. Highway

0 — 5 Miles

N

BLUE EARTH COUNTY

Prepared By: Blue Earth County
Environmental Services
October 2007

Source: Blue Earth County
Feedlot Inventory
October 29, 2007

Note: Shoreland means land located within the following distances from public waters: 1,000 feet from the ordinary high water level of a lake, pond, or flowage; and 300 feet from a river or stream, or the landward extent of a floodplain designated by ordinance on a river or stream, whichever is greater.

Manure Storage

Under-barn concrete manure storage pits are the most common manure storage system in Blue Earth County. There are also earthen manure storage basins, manure stockpiles and few open lots.

Concrete pits

New, under-barn concrete manure storage pits are generally designed with adequate storage capacity planned for pumping and land application in the fall after harvest. There is very little manure runoff potential from total confinement, below-barn concrete manure storage pits. A greater concern related to this type of manure storage is ground water contamination. With a high seasonal water table in much of the county, perimeter tiles have been constructed around most barns.

The number of feedlots with below-barn concrete manure storage pits increased dramatically in the 1990s as the hog industry expanded. Older sites with run off problems were replaced with new facilities designed with greater capacity to ensure adequate manure storage to reduce the need for pumping out during wet conditions, on frozen ground or when crops are still in the field.

Concrete pits idle for three or more years must be recertified prior to use for manure storage. Recertification involves an inspection and certification by an engineer stating the pit is structurally sound and does not pose any foreseeable environmental concerns. The certification doesn't mean the pit would meet today's standards. Any pit with a clay floor is not in compliance with today's standards and not certified. Clay floors were common before 1990. When a concrete pit is idle for more than five years it must be properly abandoned. Abandoned sites are not part of the County's feedlot inventory.

Manure stockpiles and open lots

In Blue Earth County, manure stockpiles and open lots are most commonly associated with relatively small beef, dairy and poultry operations and sites with horses. Manure stockpiles are land applied in spring and fall. Runoff from the manure stockpile becomes a problem when located near surface water or tile intakes. Runoff is the most significant potential problem with this type of manure storage.

Earthen basins

Construction of new earthen manure storage basins for swine is no longer allowed in the State of Minnesota. Earthen basins must have been designed to NRCS standards to remain certified. In Blue Earth County, all earthen manure storage basins still in use are certified. Earthen basins do require maintenance such as tree and weed removal and rodent control. Earthen basins are regularly inspected as part of the County's feedlot program and site review. Some earthen basins were constructed to correct pollution problems or to extend the life of the barn and improve animal/worker health.

Since the inception of the feedlot program, the County has worked with feedlot owners to discontinue use and properly abandon uncertified earthen basins. Currently there are three inactive, un-certified earthen basins in the County. The County and the MPCA do not allow the owners of these sites to utilize the basins for manure storage. The County does keep these facilities in the County feedlot inventory by requiring a feedlot permit until they are properly abandoned.

Blue Earth County Feedlot Program

The County's feedlot program consists of permitting, inspections, enforcement, education, data management and reporting. The strength of the County's program lies in the continuous, systematic review of each individual feedlot by a full-time Feedlot Officer in the Environmental Services Department. The County Feedlot Officer position was established in 1995. Blue Earth County's Feedlot Program is funded with a combination of local permit fees paid by the feedlot operator to the County, State feedlot grant, and County property taxes.

Blue Earth County is a State-delegated feedlot program. The County is responsible for implementation of feedlot rules and regulations with the exception of large feedlots with 1,000 or more animal units that require federal permits (NPDES). The County has been delegated administration of the following State regulations: registration, permitting, inspections, education and assistance, and complaint follow-up. The County is required to submit an annual work plan for review and approval by the MPCA.

Feedlot Inspections and Permit Review

The County Feedlot Officer conducts a continuous, systematic review of all feedlots. Feedlots are inspected approximately every three years. Every feedlot in Blue Earth County has been inspected two or three times since 1995. The review includes verifying and updating information related to both the site and the necessary permits. The Feedlot Officer schedules an appointment with each operator to inspect the feedlot site and to update the feedlot permit information and file. This personalized approach to feedlot management is proactive, consistent and flexible meeting the needs of both the County and the feedlot operator.

At the site the location of wells and open tile intakes are verified, site changes or potential problems are evaluated, and the visible portion of manure storage systems are inspected. The feedlot review also includes meeting with each feedlot operator to verify and update each feedlot's data and permit information, including owners/operators contact information, manure management plans, type and number of animals, site capacity, and manure spreading acres.

Education

The County Feedlot Officer has both conducted and been involved with meetings directly related to feedlot management. The County and SWCD have also been involved with field days, tours and demonstration projects related to nutrient and feedlot management, partnering with Minnesota Extension Service and the MDA.

The County Feedlot Officer regularly mails information directly to every feedlot operator. Manure application setback reminders are mailed at least once a year. The County Feedlot Officer also prepares press releases, articles and paid advertisements.

Inventory and Data Management

Blue Earth County's feedlot inventory is maintained with an electronic data base (Access) and file system. Each feedlot site has a designated file that contains copies of manure spreading agreements and a map of each field identified on the permit, permit applications, permits, general correspondence, construction reports, FLEVAL results,

and anything related to violations if applicable. The County will be enhancing its GIS based data management system during the planning period.

The County maintains and reports feedlot data to the State as required using eLINK.

Manure management plans
All feedlots with 300 or more animal units are required to have manure management plans according to State rules. Smaller feedlots with pollution problems can also be required to have manure management plans. Most feedlot operators in Blue Earth County have manure management plans. Certified crop consultants are increasingly used for preparation of manure management plans.

Ideally a manure management plan is an active document that is part of a larger program for total farm management. A manure management plan includes soil tests, manure tests, commercial fertilizer needs, and maps of fields where manure will be applied and records of where and how much manure was applied.

The NRCS offers manure management incentive programs for manure management planning. NRCS manure management programs are one-time, three year programs. The producer is eligible for manure management plan incentive payments for three years and can be in the program only once. An NRCS-certified technical service provider prepares the manure management plans. The NRCS staff relies mainly on the expertise of the technical service provider for manure management plans.

Manure Spreading Acres
The County has been maintaining a paper map of manure spreading acres reported for each feedlot. This was initiated many years ago to make sure feedlot operators have adequate land area for spreading manure from each individual feedlot without duplication of fields. The feedlot operator is required to identify which fields will be used and must either own the land or provide copies of manure spreading agreements between the land owner and the feedlot operator. The County will be enhancing its GIS based data management system during the planning period to record which fields feedlot operators will be using for manure application.

State rules require each feedlot operator maintain records of where manure was applied. The County Feedlot Officer does check and verify that the feedlot operator has kept records. Not all feedlot operators are keeping records. This is considered a violation, and the County Feedlot Officer works with that feedlot operator to be in compliance. The County doesn't keep copies of the feedlot operator's records.

Manure Application
Manure application set backs are difficult to enforce, but the County, as part of the State program requirements, has begun spot-checking fields for compliance with setback and other manure application rules. The most common manure application violations among both private and commercial applicators relate to encroachment into required manure application set backs from intermittent streams, drainage tile intakes and road ditches.

Ideally manure is applied on the flattest ground possible and incorporated immediately in order to prevent runoff of manure and nutrients in water and with soil. Feedlot operators are required by State rules to record where and at what rates all manure was applied.

Manure should not be applied in close proximity to surface waters, tile intakes or other environmentally sensitive features. State and County regulations include setbacks from environmentally sensitive features. These setbacks vary depending on whether manure is incorporated and if on frozen ground. Blue Earth County manure application set backs from some surface water features are more restrictive than the State.

Winter application of manure is a greater potential pollution problem because of a higher likelihood of run off during snow melt and rainfall before the ground thaws. Winter application of manure is limited to flat ground. MPCA and County regulations for winter application of manure prohibit manure application on slopes of greater than six percent. All types of livestock manure are applied in the winter in Blue Earth County. Limited storage capacity and seasonal conditions necessitate winter application of manure in some cases. Some dairy operations apply manure year round.

There are many commercial applicators operating in Blue Earth County. Commercial manure applicators are licensed by the MDA. Blue Earth County administers the written test locally. Currently there are about five commercial applicators available for hire and close to 20 licensed applicators in Blue Earth County.

Land Use Regulations

In addition to its State-delegated authorities and responsibilities, Blue Earth County manages feedlots with local ordinances. The ordinances are contained in three sections of the County Code: *Livestock* and Manure Management, Zoning and Shoreland.

Livestock and Manure Management Section of County Code

The *"Livestock and Manure Management Ordinance"* was adopted in January 1994 with program implementation beginning in January 1995. This section of the County Code regulates the location of feedlots, setbacks for feedlots and manure application, maximum size of a feedlot, lot area, and contains the standards required for a County feedlot permit.

Examples of some of the standards for contained in Code are:

- Lot Area: 40-acres for a feedlot of 1,000 animal units or greater; 10-acres for a feedlot under 1,000 animal units.
- Density or size – A new feedlot or expansion may not exceed 3,000 animal units.
- Setbacks
    a. Feedlot-Dwelling Mutual Setback of:
        i. 500 feet for Feedlots between 10 and 50 animal units.
        ii. 1,000 foot or 1,500 foot setback based on prevailing winds for feedlots over 50 animal units
    b. 100 feet from a public or private drainage ditch
    c. Must not be in a 100-year floodplain
    d. 30 feet from the top of a steep slope.

The Livestock and Manure Management Section of County Code also contain standards and setbacks for manure application. Blue Earth County's manure application setbacks are greater than the MPCA for intermittent streams, tile intakes, ditches, lakes and wetlands.

Manure Application Set Back Differences Between County Livestock Ordinance and MPCA
Set-backs shown are with incorporation

Intermittent streams:	County- 50'	MPCA- 25'
Tile intakes:	County- 25'	MPCA- 0'
Drainage Ditches:	County- 25'	MPCA- 25'
Lakes:	County- 100'	MPCA- 25'
Wetlands	County- 50'	MPCA- 25'

Some Blue Earth County regulations are more restrictive than the State. The County animal unit conversion for finishing pigs is 0.4 and the MPCA is 0.3.

Zoning Section of County Code
The Zoning section of the County Code also regulates where feedlots can be located. Land in the unincorporated portions of the County is divided into eight zoning districts. New feedlots are only permitted in the Agricultural District. This district encompasses approximately 90 percent of the land area in the County. Prior to 1996, feedlots were also allowed to be constructed in the Conservation District. In June of 1996 the County Zoning Ordinance was amended to prohibit new feedlots from being located in the Conservation District, which is located adjacent to the County's rivers, streams, lakes and some bluff areas.

Feedlots or feedlot expansions over 100-animal units in the Agricultural Zoning district must obtain a Conditional Use Permit prior to being constructed. Conditional Use Permits are approved or denied by the Blue Earth County Board of Commissioners following a legally-noticed public hearing held by the Planning Commission. Conditions of approval are placed on the producer. With a typical Conditional Use Permit, there are approximately 14 conditions that are required to be met before the feedlot is constructed and operated. The conditions range from approval required by other agencies like the MPCA and DNR to requirements for manure management and dead animal disposal. All Conditional Use Permits for feedlots require that the applicant obtain a County Feedlot Permit, which then becomes the permit which guides the operation of the feedlot. Although it is rare, a Conditional Use Permit can be reviewed and potentially revoked by the County Board of Commissioners if conditions of the Permit are violated.

Proposals for feedlots with a capacity of 1,000 animal units or more require an MPCA NPDES permit and are forwarded to the MPCA for approval before the local permitting process.

Shoreland Section of County Code
The Shoreland section of the County Code also plays a role in the location of feedlots. Shoreland is defined as land within 300 feet of a DNR protected river or stream or 1,000 feet of a lake. As of 1998, new feedlots are prohibited from located within Shoreland Areas. Prior to then, feedlots were allowed to be located in the Shoreland of lakes, provided they met a 300 setback from the ordinary high water level.

Other Blue Earth County Permits and Inspections
A Blue Earth County Construction Permit is issued for new feedlot structures in addition to the feedlot permit and CUP. The Feedlot Officer visits each construction site before construction and during construction to ensure compliance with all structural set backs. The Feedlot Officer is also present during construction of concrete manure storage structures.

Feedlot building construction can also involve other County staff. If showers and/or bathroom facilities are part of the facilities, a small SSTS or holding tank will require a County permit and inspections. New wells and properly abandoning and unused wells also require County permits and site inspections.

Stormwater Management
Runoff and soil erosion during construction are a concern for all types of building construction in the County. For feedlots, the MPCA requires sediment and erosion controls at feedlot construction sites as part of the feedlot permit. The County Feedlot Officer evaluates each site before permits are issued. The Feedlot Officer also gives the owner and contractor an MPCA information sheet relating to best stormwater management practices. Final seeding and stabilization are also required in County permits.

NPDES permits are required for feedlots with a capacity of 1,000 or more animal units and are issued by the MPCA. Feedlots with less than 1,000 animal units are required to have an MPCA construction permit short form issued by the County. The MPCA construction permit short form indicates that sediment controls and stabilization best management practices are required on site and down gradient before, during and post construction. These practices include: seeding, grading, compacting, mulching, fiber rolls, textile fencing, keyed and staked hay bales, and other practices designed to reduce runoff and erosion.

Manure Storage Construction
MPCA requires engineered plans for construction of storage structures with the capacity of 20,000 gallons or more. The County Feedlot Officer has a pre-construction meeting with the owner, project engineer and excavator. The MPCA inspects construction when the capacity is 1,000 or more animal units. The County Feedlot Officer asks to be notified when the concrete is poured. County staff visits the site at that time and documents cracks, dirt balls in concrete, the perimeter tile or other concerns. The project engineer must be on site when ten or more yards of concrete is used for construction. The feedlot owner is required to have the design engineer submit a construction report to the MPCA and the County Feedlot Officer within 60 days of completion.

In Blue Earth County most in-ground manure storage systems, including below-barn concrete manure storage pits, are constructed below the natural seasonal high water table. Most important to the design is to reduce pressure on the pit walls from water in the surrounding soils. This is accomplished with perimeter tile.

Other issues

Livestock Mortality Management

Livestock mortality is a concern due to disease and the potential for runoff of fluids and leachate associated with decomposing dead animals to road ditches, surface water and tile intakes. Most feedlot operators in Blue Earth County dispose of dead animals at off-site processing rendering facilities in southern Minnesota.

Some feedlot operators compost dead animals on-site in specially built, enclosed structures. Composting dead animals can help control disease by eliminating the rendering truck. The compost provides a small amount of crop nutrients.

Management of dead animals is not regulated by the MPCA Feedlot rules. The Board of Animal Health regulates dead animal disposal.

Pastures

Blue Earth County doesn't maintain an inventory of pastures because pastures are exempt from State feedlot rules. Of the few known pastures in the County, some do provide access to a lake or stream. Any livestock causing a pollution problem in surface waters are regulated by the DNR. The County has worked with a few pasture owners to fence livestock away from surface water. Of the known pastures in the County, most are owned by very small farmers, and the likelihood the site will change hands or expand is small. It is unlikely new pastures will be established in the planning period as land prices and user markets are greater for crop production and conservation/recreation compared with use of land for pasture.

IMPLEMENTATION PLAN
Feedlots and Manure Management

Water Management Plan Goal:
Protect and improve water quality with implementation of livestock management programs, policies and best practices to prevent and minimize pollution from livestock manure.

GUIDING PRINCIPLES:
» Animal agriculture is important to the economy of Blue Earth County
» Livestock manure is a valuable fertilizer and soil amendment that improves crop production.
» Livestock manure has the potential to cause water pollution problems when not managed properly in environmentally sensitive areas.
» Environmentally sensitive areas include: lakes, rivers, streams, open tile intakes, ditches, wetlands, coarse-textured soils, steep slopes, shallow soil over bedrock, wells and wellhead protection areas, Drinking Water Supply Management Areas (DWSMAs).
» Blue Earth County regulates feedlots in accordance with State rules and a delegation agreement.
» Blue Earth County works directly with individual feedlot operators combining regulation and education to achieve water quality goals.

ONGOING ACTIVITIES:
Blue Earth County will continue its Feedlot Program. Working with feedlots operators individually has been proven to be an effective approach for implementing the County's education goals and regulatory requirements. The County will be enhancing the existing program with the use of GIS to provide education and information to feedlots operators, businesses preparing manure management plans, and those applying manure.

The Blue Earth County Feedlot program is currently funded with a combination of annual permit fees paid by feedlot owners to Blue Earth County, the County, and the MPCA feedlot grant.

The Blue Earth County SWCD and the NRCS will continue to work with feedlot operators to establish best land management practices including 1) technical assistance, 2) construction oversight, and 3) administration of cost share and other financial programs as funds are available.

WATER MANAGEMENT PLAN:
Livestock manure generated at feedlots can be a source of bacteria, TSS, phosphorus, nitrogen and other pollutants. Runoff containing manure used as fertilizer is likely the greatest source of pollution to surface waters from livestock manure. Working with

feedlot operators and related businesses to improve nutrient management planning and application methods in environmentally sensitive areas will be the most important actions related to livestock production and feedlots during the planning period. The County will be the lead agency for feedlot and nutrient management.

Preventing and reducing runoff and protecting groundwater are high priorities of the *Water Management Plan 2008-2013*. Best management practices to reduce runoff address many types and sources of pollutants. Reducing runoff from agricultural land uses is addressed more thoroughly in the Agricultural Land Runoff Section of the plan.

Objective 1. Work with all feedlot operators to improve manure management planning.

The County, SWCD, NRCS, crop consultants, MPCA and MES all work with feedlot operators on manure and nutrient management planning. Improving feedlot operators manure management will require the efforts of all involved with manure management. Improvements will be made with communications between and among those involved, by providing easier access to local information and more detailed, site-specific information with a special focus on environmentally sensitive areas as defined by the MPCA and Blue Earth County. The County will be using GIS to enhance the hands on approach to feedlot program management. GIS, LIDAR and aerial photos will be used to develop specialized mapping and graphics for manure management education and discussion with individual feedlot operators.

Action 1: The County will meet with 100 percent of feedlot operators and crop consultants to improve manure management planning.

Action 2: The County Feedlot Officer will enhance review of manure management fields and field/site specific discussion of sensitive areas and requirements (ground water contamination maps, bedrock, slope, soils, floodplains, ditches, surface water features, two foot contour maps, property boundaries, aerial photos and other information).

Action 3: The County will develop a program to provide County/SWCD web site access to local information about sensitive areas and requirements (ground water contamination maps, bedrock, slope, soils, floodplains, ditches, surface water feature, two foot contour maps, property boundaries, aerial photos and other information).

Action 4: The County and SWCD will enhance its general, feedlot education program by providing information about applying manure in sensitive areas such as surface water and shallow soil over bedrock for distribution and display at the SWCD/NRCS office.

Action 5: The SWCD, County and other organizations will participate in local demonstrations, field days and workshops as appropriate and report the results in newsletters and other communications.

Objective 2: Improve manure management in areas with high susceptibility to ground water contamination due to shallow depth of soil to bedrock.

The County will be working with policy makers at the Township level, feedlot operators and horse owners with fewer than ten animal units to provide information related to the best location and design of barns and other areas occupied by livestock and horses, and manure storage, handling and land application to protect ground water resources in areas with shallow depth to bedrock. Many horse owners are smaller than ten animal units and are not included in the County inventory. The type of technical and other assistance needed is unknown at this time but may include construction of impermeable manure storage areas to prevent infiltration, rotational grazing, and other best management practices to prevent infiltration of manure to ground water. Many horse owners are not farmers and may not be eligible for some types of financial assistance or incentives.

> **Action 1:** Identify feedlots in areas with high susceptibility for ground water contamination and shallow depth to bedrock.
>
> **Action 2:** Work with the Lime Township Board, feedlot operators and horse owners in Lime Township by providing information related to improving site management and manure management and identifying small sites with potential problems.
>
> **Action 3:** Provide site specific information and other resources to feedlot operators in areas with shallow depth to bedrock.
>
> **Action 4**: Provide technical assistance to horse and livestock owners to reduce the potential for ground water contamination from manure.
>
> **Action 5:** Assess the need for and availability of financial assistance to horse owners to improve manure management.

Objective 3: Reduce runoff from agricultural fields.

With implementation of the enhanced manure management education actions identified in the County Water Management Plan and the ongoing feedlot program, feedlot operators will continually improve manure management, applying manure at agronomic rates, incorporating manure, maintaining set-backs from environmentally sensitive features, and avoiding manure application on steeper slopes. Ultimately, the result will be little manure or nutrient runoff in most years. However, the timing of storm events, very wet field conditions due to heavy rainfall, and human error can create circumstances where manure and nutrient runoff is more likely to occur. Vegetated buffer strips and grassed waterways do help trap manure and nutrients when runoff occurs. Grassed buffer strips along ditches and intermittent streams and around tile intakes increase options for manure application, and recommended manure application setbacks are reduced.

Recognizing these factors and the multiple water quality benefits of buffer strips, buffer strips to reduce runoff and manure-related pollutants will be a high priority action during the planning period.

Action: Establish buffer strips, terraces and grass waterways to protect surface waters from runoff from agricultural fields.

Objective 4: Reduce manure runoff problems from livestock feedlots and smaller sites.

There are a few small remaining open feedlots with runoff problems or potential for runoff in the County. A few sites with fewer than ten animal units are stocked from time-to-time. These smaller sites have the potential to be a pollution problem but their locations are unknown as sites with fewer than ten animal units generally are not required to have a feedlot permit. Technical assistance and some financial assistance is available from the SWCD and NRCS.

Action 1: Provide technical assistance to operators of feedlots with open lot agreements to correct pollution problems by 2011, the State feedlot program compliance deadline.

Action 2: Provide technical assistance to feedlot operators and owners of small sites to address pollution problems.

Priority Concern:
County Drainage Ditches

PRIOIRTY CONCERN: County Drainage Ditches

<u>Water Management Plan Goal:</u>
Improve water quality with implementation of mutually-beneficial actions addressing both environmental concerns and drainage of land.

Priority Concern

Drainage ditches can be a source of sediment from eroding ditch banks and can also quickly transport sediment and pollutants from agricultural and urban runoff to surface waters. Buffer strips along drainage ditches help reduce erosion and sedimentation by slowing overland flow, trapping sediment and other pollutants, and holding soil in place along the ditch banks. Reducing erosion and sedimentation also reduce maintenance costs for ditch owners.

Drainage systems alter natural hydrology by efficiently removing water from poorly drained areas. Peak flows in the drainage system have the potential to cause erosion both in the drainage system and in downstream surface waters. Retaining water within drainage systems can reduce peak flows and the rate of erosion in the drainage system and downstream.

Establishing vegetated ditch buffers and increasing water retention in County drainage systems are high priority actions of the Water Management Plan.

Priority Concern Assessment

Background

County Ditches were constructed to drain land and to collect water quickly and efficiently to provide better soil conditions and increase land available for the production of crops. Meandering, small and intermittent streams were deepened and straightened to facilitate better drainage. The result is a relatively straight, lineal system of open channels and subsurface tile that connects and follows naturally low lying areas and drainage ways.

There are many soils in Blue Earth County with a shallow seasonal water table. Related to agricultural land uses, saturated soils in the root zone can drown crops and fields are inaccessible for farm machinery. With good drainage the growing season is effectively extended as cropland can be planted earlier in the spring and harvested later. Cropland drainage also extends the season for fall manure application.

County ditches are often assumed to be owned by County governments. County ditches are actually privately owned, publicly managed ditches. The property owners within each ditch's watershed are collective owners of the ditch and are responsible for all costs of ditch management.

County Government Role
The State Drainage Law, Minnesota Statute, Chapter 103E, known as the Drainage Code, determines how privately-owned County ditches are managed. The Drainage Code was initiated in the late 1800s along with Federal grants to ensure that the nation's "swamps" would be drained. The purpose of the law was to establish a process to oversee drainage management among the ditch owners. The original process is very similar to the process used today. As prescribed in the Drainage Code, the Blue Earth County Government acts as the Ditch Authority and is responsible for drainage management and oversight.
If a ditch's watershed is located in two Counties, both Counties act as the Ditch Authority and the ditch is called a Joint ditch instead of a County ditch. A Judicial Ditch was initiated in a court action with management subsequently turned over to the Ditch Authority by the Court.

Blue Earth County's Ditch Authority is the County Board of Commissioners. Others involved with ditch proceedings include: County Attorney, ditch owners' attorneys, engineers, interested landowners, and State and Federal agencies. The County Board's Drainage Committee includes two County Commissioners, the County Administrator and the County-employed Ditch Manager.

Across the State, there is increasing public pressure for all Counties acting as Drainage Authorities to make more environmentally-friendly interpretations of Drainage Code. The sections of the Drainage Code most questioned are those related to buffers. A Drainage Work Group, coordinated by BWSR, was officially established by the Legislature in 2006. Part of the Drainage Work Group's focus included sections of the Drainage Code related to ditch buffers. The work group arrived at a consensus on many issues resulting in Drainage Law amendments in 2007. The Blue Earth County Ditch Manager has been participating in this and other rule-making committees at the State level. A new drainage guidance manual is currently being prepared by members of the work group and others. The 2007 Drainage Code amendments added requirements for Counties to inspect ditches, maintain ditch buffer inventories, and report annually to BWSR.

Blue Earth County Drainage Systems Inventory
An extensive drainage network covers most agricultural land in the County. This network consists of 704* miles of County ditches. County ditches include both open ditches and subsurface tile ditches. Open ditches are channels that function much like streams. There are 163 miles of open ditch in Blue Earth County. Map 97 and Table 6 display the location and type of ditches in Blue Earth County.

Table 6 Blue Earth County Ditches

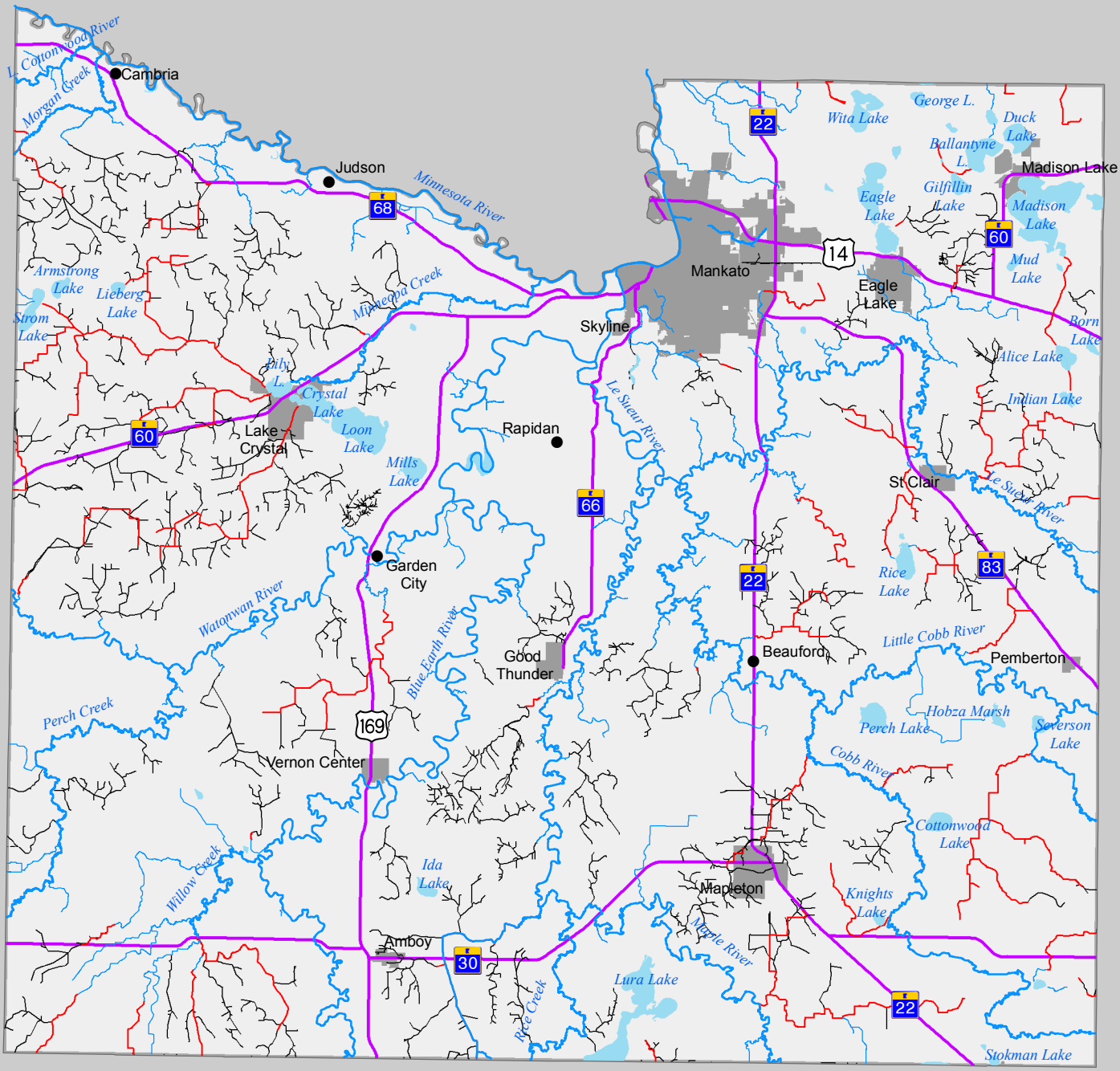
Type of County Ditch	*Ditch Miles*
Open	*163
Tile	*541
Total	704

Source: Blue Earth County Taxpayer Services, Ditch Authority, 2007
*estimated and includes only ditches in BEC and portions of Joint Ditches in Blue Earth County

Some County ditches are also designated as public waters by Minnesota Statutes, Section 103G.005. The Shoreland Section of the County code identifies the public lakes, wetlands and streams which are Protected Waters under County Regulations. Map 8 on page 19 displays the protected waters in Blue Earth County and the County ditches designated as protected waters.

It is important to note that there are also privately owned ditches in the County. The number and location of private ditches is unknown. Due to the abundance of rivers, streams and intermittent streams in the County, many land owners are able to drain directly to these natural drainage systems instead of joining a County ditch system. According to estimates of the County Ditch Manager, slightly less than half of the total land area in the County drains to a County Ditch.

Map 26. County Ditch and Tile Systems



State or U.S. Highway

Stream or River

Lake

County Ditch Type

Open Ditch

Tile Ditch

0 5 Miles

N

BLUE EARTH COUNTY

Prepared By: Blue Earth County
Environmental Services
October 2007

Ditch Buffers

Ditch channel buffers generally benefit both the drainage function of the ditch system and water quality by reducing erosion and sedimentation. The root system and ground cover provided by vegetation in the ditch buffer stabilizes the banks of the ditch reducing the need for ditch maintenance costs. Ditch buffers can trap sediment from water and wind erosion. Ditch buffers can also reduce pesticide and herbicide "drifting" during application and surface water run off from adjacent crop land. Ultimately ditch buffers provide a physical separation between ditch channel and farm equipment applying fertilizers, pesticides, or manure.

The most commonly asked questions related to Ditch Authority administration of the Drainage Code is the required, "one rod" ditch buffers adjacent to County ditches, specifically:

1) *when* the one-rod buffer is required, and
2) *how* and *where* the one-rod buffer distance is measured from the ditch channel

Dutch Buffer Drainage Code Requirements – when buffers are required
All new ditches require a ditch buffer. Existing drainage systems are essentially "grandfathered in", meaning they are allowed to continue without a one-rod buffer until the ditch is *improved*. Ditch buffers are required on all *improvements*. Establishing ditch buffers is not required for all *repairs*. Some repairs, such as re-sloping, require viewers and a buffer must be established.

Amendments to the Drainage Code in 2007 allows Drainage Authorities more flexibility to establish and maintain a one rod buffer strip and side inlet controls where needed (incrementally) using repair procedures and determination of damages, and no longer requires re-determination of benefits for repairs. The Drainage Code amendments are new within the last six months, and the impact on the County Ditch Authority, administrative policy, overall ditch management, and implementation of the Water Management Plan is not realized.

The Drainage Code defines four types of drainage projects: new systems, repairs, improvements and lateral extensions.

<u>New Systems:</u>
Generally new systems involve converting private drainage systems to public drainage systems. The number of new drainage systems constructed is few, as wetlands are now protected.

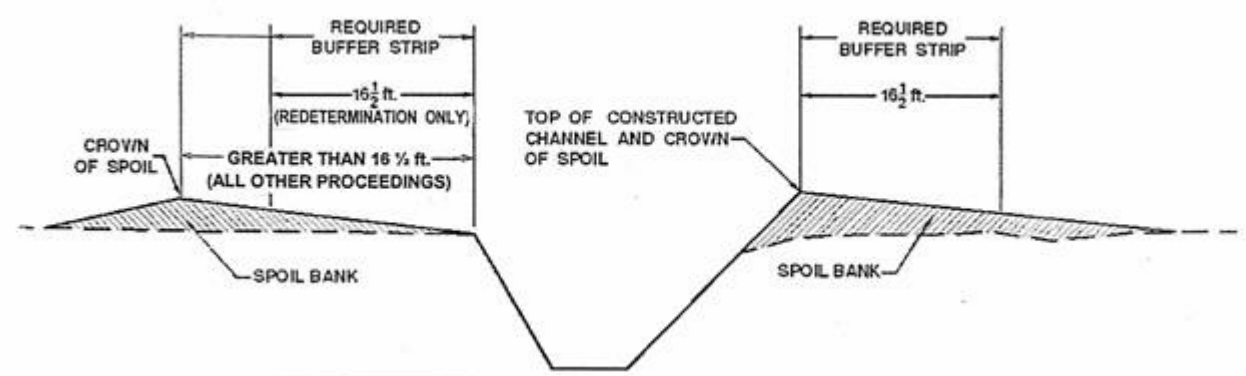
<u>Repairs:</u>
Repairs include minor work such as spraying for weeds and brush, removal of isolated silt deposits, bridge or culvert cleaning, removal of vegetation, debris or other obstructions. Repairs may also involve more extensive cleaning of the ditch bottom of silt deposits to the grade line and bottom width as originally constructed or subsequently improved, and could include fixing isolated side slope damage due to sloughing, fixing damage to culverts and structures, and removing large trees from the channel. These repairs are not intended to significantly increase hydraulic efficiency or capacity of the ditch, or to extend and improve drainage benefits.

Improvements:
An improvement project involves the enlarging, extending, straightening, or deepening of an established, previously constructed system. Generally an improvement project provides for the upgrading and enhancement of the existing system's hydraulic capacity and drainage ability. An existing drainage system may only be extended downstream to a more adequate outlet, and then for only one mile. A determination of benefits is required when there is an improvement.

Lateral Extensions:
Lateral extensions are most often existing privately-owned tile drained area that is officially brought into the ditch. New laterals that are open ditches do require buffers. This type of extension rarely occurs.

Ditch Buffer Drainage Code Requirements – where ditch buffers are required
The Drainage Code defines where the buffer is located relative to the ditches' main channel and spoil banks and the point of beginning for measuring required ditch buffers. Changes to the Drainage Law in 2007 clarify the point of beginning for measuring the required ditch buffer strips to be the "top edge" of the constructed channel resulting from the proceeding (where and when). The Drainage Work Group is developing a guidance manual that will include ditch buffer construction requirements for consistency in administration of the Drainage Code. Figure 3 is a cross section diagram showing the points of measurement clarified by the 2007 Drainage Code amendments.

Figure 3 Ditch Buffer Width and Location Requirements
Drainage Code Amendments 2007



Source: Blue Earth County Ditch Authority

Side Inlet and Tile Inlet Buffers
In some ditches, the spoil banks prevent overland surface water flow from the adjacent field to the ditch channel. Side inlets are constructed to allow controlled drainage from the adjacent, low lying areas to the ditch channel. Buffers around side inlets can provide the same services as ditch buffer strips by reducing erosion and sedimentation. Side inlet buffers can be established as part of the ditch buffer.

Tile inlets in the ditch system can also be the source of pollutants and sediment. Water quality and ditch function can be protected and improved with tile inlet buffers. This is

particularly true when established in areas where soil erosion potential is relatively high with slope, slope length and soil type conditions all contributing factors. Tile inlet buffers and other agricultural best management practices are discussed in the Agricultural BMP section of the Water Management Plan.

The USDA-FSA Conservation Reserve Program requires a greater buffer width than the Drainage Code. The USDA has determined buffer/filter strips be a minimum of 33 feet wide to protect water quality.

Ditch Buffer Vegetation
Drainage code changes in 2007 state that drainage authorities should give preference to planting native species of a local ecotype on required ditch buffer strips. Some of the concerns related to use of native plant species include costs compared to standard grass mixes, time for establishment, maintenance needs and wildlife impacts. Ditch buffers can provide wildlife habitat, such as pheasant nesting areas. Routine ditch maintenance such as mowing and use of herbicides can negatively impact wildlife. The sharp-edged, lineal, narrow shape of a ditch buffer strip is not ideal habitat for some types of wildlife species and may provide easy access for predators or nuisance wildlife species such as raccoons, coyotes and opossum. When considered in association with larger wildlife patches, parts of some County Ditches in Blue Earth County have the potential to provide viable corridors for wildlife to move across the landscape, particularly if vegetation and other wildlife needs are planned and accommodated in priority areas. Wildlife is discussed in more detail in the Wetland and Wildlife section of the Water Management Plan.

Hydrologic Impacts

Drainage in urban, rural and agricultural areas changes the natural hydrologic cycle in order to lower the seasonal high water table. Ideally, rainfall naturally infiltrates to recharge shallow and deep aquifers and surface run-off is minimal. In agricultural areas with poorly drained soils or soils with a high seasonal high water table, subsurface drainage collects groundwater at a fairly shallow depth and discharges to a ditch, river, stream, lake, wetland or other surface water. In urban areas, impervious surfaces provide no infiltration and all rainfall runs off rapidly. The overall volume and rate of water discharged to surface water during rain events and snow melt is increased as water that would have infiltrated to ground water is diverted to surface water relatively quickly. The change in rate and volume can cause erosion of surface water channels within the system and downstream as the channel widens or deepens to carry the increased flow. Surface water channels include any sites with flowing water such as rivers, streams, intermittent streams, the ditch channel itself, gullies and outfalls. Downstream channel impacts are dependent on variables such as the amount of change and the condition of the existing channel. In general, drainage policy minimizing or reducing increases in rate and volume of water can protect surface water channels. Partially restoring natural hydrologic function by providing areas for water retention and infiltration effectively decreases the rate and volume of discharge to surface waters and increases ground water recharge.

Many of the County tile ditches and open ditches are overloaded with water during storm events and snow melt due to the addition of private tile drainage and the construction of laterals. Overloading older, ditch and tile infrastructure increases maintenance costs as

sections of the tile system can collapse. To solve the combined problem of overloading and aging drainage infrastructure, ditch owners sometimes propose increasing flow capacity by replacing a tile ditch with an open ditch, widening and deepening an existing open ditch channel, or increasing the size of the tile mains. Reducing peak flows to the ditch can help avoid this expense, reduce downstream impacts and improve water quality. In many cases, establishing water retention areas and restoring wetlands can be a cost effective alternative to or reduce costs of a ditch improvement project.

Establishing water retention areas can have both positive and negative economic impacts the ditch system. For example, if water retention is added to an overloaded ditch system, the need to improve the ditch and the project costs might be avoided. In another example, if a ditch improvement project is necessary, the land needed for retention is purchased by the entire ditch system adding to the total ditch project costs. The land in the retention area is no longer benefiting from the project and therefore not generating revenue for the project. Ditch system owners often argue that the public benefit must be considered and public money should be used to establish retention and other conservation practices that do not benefit ditch owners.

Water Retention and Wetland Restoration

More than 90% of the pre-settlement wetlands in Blue Earth County were drained to provide additional land for crop production and construction of dwellings and urban land uses. Wetland functions include water retention and infiltration and ground water recharge. Some wetlands were part of hydrologic complexes consisting of basins and flowing connections depending on water levels related to seasonal conditions. Wetlands are addressed in the Wetland and Wildlife Section.

The most viable locations for water retention are typically natural depressions where wetlands were likely drained during construction of the drainage system. Many of these depressions are poorly suited for crop production due to wetness, seasonal flooding and the resultant crop damage. A review of publicly available information can assist with identification of potential retention areas and wetland restorations. The USDA Soil Survey and the County's LIDAR and two foot contour maps can be used to identify depressions. Historic aerial photos of crop damage, flooding, wetlands and land use such as pastures and woodlots can also show areas where water is naturally collected on the landscape.

In recent years, retention basins and wetland restoration projects have been common with most ditch improvement projects in Blue Earth County. These local projects have involved many partners, including the ditch owners, CREP, DNR, Blue Earth County Chapter of Minnesota Pheasants, USFWS and others. Financial resources and incentives to restore wetlands and wildlife habitat can benefit a ditch project by providing retention areas and vegetated cover that reduce erosion and maintenance costs.

Wetland restorations can provide habitat for desirable wildlife species. Consideration of size, shape, placement and proximity of restored wetlands to other existing wildlife habitat patches can further maximize the potential to attract desirable wildlife species. Landowners and the public also experience quality of life benefits with increased local wildlife populations.

Blue Earth County Public Ditch Management Program

County Ditch management responsibilities include administering the requirements in State Drainage Law for individual ditch system projects and collective, day-to-day management of drainage systems under the jurisdiction of the County. Blue Earth County employs a Ditch Manager whose salary is paid by the County.

Data and Information

Currently the County Ditch Manager collects and manages ditch data and information using a standardized, systematic approach, including physical, in-the-field viewing, data collection, data maintenance, and conversion of historical data to electronic information. In order to provide meaningful data, consistent inspection procedures and data collection methods have been developed the Ditch Manager.

1) Ditch Inspections.

The Ditch Manager conducts field inspections each year. All 163 miles of open ditches cannot be inspected in a single year. Field inspections involve walking the entire length of each open ditch identifying and using GPS to record locations of: 1) bank sloughing, 2) tile outlets, 3) blow outs, 4) surface gullies, 5) formation of new gullies as a result of redirected surface flow due to erosion and sedimentation, 6) wildlife dens and dams, and 7) any other current or potential problems.

Ditch inspections are limited by seasonal conditions. Inspections are best made in a dry spring and in fall when a hard freeze flattens buffer vegetation. Ditches cannot be inspected when: 1) crops are in field, 2) ditch buffer vegetation is high, 3) muddy or conditions limit access. Without varying seasonal conditions, it is impossible to develop accurate, annual plans and budgets.

Where repair orders were issued, the Ditch Manager follows up by verifying the repair was made.

2) Data Management.

The County has established a GIS based data management system. This includes an inventory of problem areas identified during the physical assessment of ditches. The Ditch Manager uses GPS in the field to identify problem areas with location and descriptive information.

Historic records including ditch maps, improvements, petitions, plans are on file with the County. These records are important for overall ditch management, planning and re-determination of ditch benefits. Historic notations in records also document why decisions may have been made possibly explaining current problems. Historic ditch records will eventually become part of the GIS data management system. As time allows, historic records are being scanned and entered into the system. Even though the process of scanning is relatively simple, it is time consuming. Completing the process of scanning historic documents will likely span more than the five year planning period. Due to inherent poor quality as a result of long term storage, the documents are fragile and must be handled carefully. Historic notations may be significant but interpretation may be difficult if unfamiliar with drainage, drainage history and the

County. Thorough and accurate recording of historical information is essential for meaningful use of the data.

3) Management tools

Blue Earth County has strong GIS capabilities. Blue Earth County's LIDAR data, two foot contours and aerial photos have greatly enhanced the County's ability to manage County ditches. County plans, programs and policies related to ditch management and water quality can be developed in-County with local information and water quality data from watershed plans and other sources as appropriate.

4) Reporting

With 2007 amendments to the Drainage Code, Blue Earth County will be required to annually report the following buffer strip information to the BWSR on a calendar year basis:

a. Number and types of action for which viewers were appointed.
b. Miles of buffer strips established according to 103E.021.
c. Number of drainage system inspections conducted.
d. Number of violations of Section 103E.021 identified and actions taken.

<u>Status of Blue Earth County Ditch Buffers</u>

In 2007, the County had completed ditch inspections on 25 miles of the total 163 miles of open County Ditches.

The County does not have a plan or procedure for routine ditch maintenance or repairs. The Blue Earth County Ditch Authority generally responds to land owner-initiated requests. Local interest is generally related to ditch repair and maintenance costs associated with aging systems for example.

2007 Drainage Code Amendments

With the 2007 Drainage Code Amendments, Counties are now allowed to require buffer strips incrementally for better ditch function. This increased flexibility may provide opportunities to maximize financial and other resources to target implementation efforts establishing buffers in high priority areas to accomplish multiple goals, including improved water quality, improved ditch function, reduced frequency of ditch inspections and reduced ditch maintenance costs.

Ditch Improvement Projects Environmental Review

Improvement projects require an environmental review. Blue Earth County's approach to environmental review is consistent with the Drainage Code. The environmental criteria listed in 103E.015 include:

103E.015 CONSIDERATIONS BEFORE DRAINAGE WORK IS DONE

Subdivision 1. **Environmental and land use criteria**

(1) private and public benefits and costs of the proposed drainage project;
(2) the present and anticipated agricultural land availability and use in the drainage system project or system;
(3) the present and anticipated land use within the drainage project or system;
(4) flooding characteristics of property in the drainage project or system and downstream for 5-, 10-, 25-, and 50 year flood events;

(5) the waters to be drained and alternative measures to conserve, allocate, and use the waters including storage and retention of drainage waters;
(6) the effect on water quality of constructing the proposed drainage project;
(7) fish and wildlife resources affected by the proposed drainage project;
(8) shallow groundwater availability, distribution, and use in the drainage project or system; and
(9) the overall environmental impact of the above criteria

Subd.2. **Determining the public utility, benefit, or welfare.** In any proceeding to establish a drainage project, or in consideration of or other work affecting a public drainage system under any law, the drainage authority or other authority having jurisdiction over the proceeding must give proper consideration to conservation of soil, water, forests, wild animals, and related natural resources, and to other public interests affected, together with other material matters as provided by law in determining whether the project will be of public utility, benefit, or welfare.

Environmental review also involves the DNR. In the past, the DNR Commissioner was required to provide comments on drainage projects. In future years, the local DNR offices with greater knowledge of the project area will be providing comments instead of the DNR Commissioner.

The County Water Management Plan, Comprehensive Land Use Plan, Greenprint, watershed plans and other plans related to the conservation of soil, water, forests, wild animals and other resources can be considered in the determining the public utility, benefit or welfare as described in 103E.015, Subdivision 1 and 2.

Municipal Impacts

Municipalities are part of several County Ditch watersheds in Blue Earth County. Storm water drainage discharges have increased the rate and volume of water to a few County ditches causing erosion problems at the outfall and downstream. The City of Mapleton's and the City of Amboy's wastewater treatment stabilization ponds and storm water systems discharge to a County Ditch. In Mankato, Eagle Lake and Madison Lake, urban growth and conversions of cropland to urban land uses have impacted County ditches. Issues related to urban drainage connections with County Ditches are concerns primarily in areas where conversion of agricultural land to urban type of land uses is occurring. County ditch concerns at the urban and rural interface most often involve legal or management issues of the ditch and immediately surrounding land uses. These are addressed by the each city during the land development phase. The County Ditch Authority works with each municipality as needed to ensure compliance with the Drainage Code. Municipal storm water management and surface water impacts are addressed in the Stormwater Section of the Water Management Plan.

IMPLEMENTATION PLAN
County Drainage Ditches

Water Management Plan Goal:
Improve water quality with by establishing ditch buffer strips and water retention in areas where environmental concerns and drainage needs are both addressed.

GUIDING PRINCIPLES
»County drainage is critical to a successful agricultural economy.
»County ditches are privately owned by property owners in each ditch system.
» The County Ditch Authority manages County ditches consistent with the State of Minnesota Drainage Law.
» Drainage is best managed at the local level in order to incorporate sustainable socio-economic, environmental, economic and watershed needs.
» Carefully selected land management practices can protect water quality and reduce drainage costs to land owners.
» Ditch buffers reduce maintenance costs by reducing erosion and sedimentation in the system.
» Ditch buffers improve water quality by reducing erosion and sedimentation.

ONGOING ACTIVITIES:
The County will continue to operate the ditch management program, including field inspections and maintaining a GIS-based inventory of ditch buffer strips and other data. The County, SWCD and partners will continue to establish ditch buffers and wetland restorations as part of ditch improvement and other projects. The County will also be reporting to BWSR on ditch buffer inventories and maintenance as required by 2007 Drainage Code amendments. The 2007 Drainage Code amendments require the County to inspect ditches every five years and every year on ditches with problems. For many ditch systems, inspections will be needed more than once in five years as discovery of new problems and annual follow-up inspections will be required. Staff time for inspections and the related expenses will likely increase significantly during the planning period. However, it is anticipated that ultimately ditch buffers will reduce ditch maintenance needs and therefore ultimately reduce the frequency of inspections in future years beyond the planning period.

The Ditch Manager position is funded by the County. Ditch buffer strips, wetland restorations and water retention areas are funded by land owners when part of improvement projects and, in some cases, with financial incentives from Federal and State government sources.

WATER MANAGEMENT PLAN:
The County will be working to increase the total miles of ditch buffers established along County, Joint and Judicial Ditches. The County will develop baseline inventory data to measure success in future years. In order to achieve Water Management Plan goals

and objectives, additional staff resources will be needed for staff at the SWCD and for financial incentives to establish ditch buffers and other BMP's.

Increasingly accessible public data related County management of ditches, buffer strips and enforcement will lead to new planning efforts during the planning period. The County will also be continuing the Greenprint project theme using GIS and LIDAR tools along with local, State and Federal plans for water quality, wildlife, land use, parks, recreation, open space, transportation, wetland management, storm water management, and other plans to identify and prioritize areas to promote voluntary establishment of one rod ditch buffer strips and buffers extending beyond one rod to include tile inlet buffers and water retention areas where appropriate to best meet comprehensive water quality, wildlife and other natural resources needs.

The SWCD will be responsible for coordinating projects funded outside of the Ditch Authority, including project funding, reporting, construction oversight, technical assistance, and education and information activities. The County will be responsible for GIS and coordinating project prioritization. The County Ditch Authority will be responsible for all requirements related to administration of the Drainage Code and overall management. The Ditch Manager's role is limited to administration and financial management in accordance with the Drainage Code.

Objective 1: Encourage voluntary establishment of ditch buffer strips on County ditches with education and information activities promoting the benefits of ditch buffers and the availability of financial incentives.

> **Action 1:** The SWCD will provide a list of conservation funding opportunities to the Ditch Authority annually in order for the Ditch Authority to be fully aware of locally available incentives.
>
> **Action 2:** The County, SWCD and NRCS will increase communications providing information about water quality related benefits of ditch buffers and financial incentives available for establishing new ditch buffers. The SWCD and NRCS prepare annual, informational newsletters. The SWCD is also developing a web-site.
>
> **Action 3:** The County Ditch Authority and other County Departments will work together to provide information in general newsletters and the County web-site. The County Ditch Authority will develop written communications, such as letters and newsletters to ditch system owners when appropriate to special projects.

Objective 2: Increase the total miles of drainage ditch buffer strips on County ditches in Blue Earth County by 50 percent by 2013.

Note: To implement the actions for this objective, additional financial resources will be needed for additional staff, landowner incentives and acquisition costs.

103E 2007 Amendment: "Drainage authorities are allowed to establish and maintain 1-rod ditch buffer strips and side inlet controls where needed (i.e. incrementally) using

repair procedures and determination of damages, but not requiring re-determination of benefits."

Action 1: Establish baseline data for this objective to consistently measure success over time, by using County data reported to BWSR to determine the total miles of ditch buffers in the County.

Action 2: Add a full-time SWCD Technician/BMP Coordinator from 2009-2012 to work at the SWCD working with conservation partners promoting and coordinating the establishment of buffer and filter strips on County ditches, tile intakes and other waterways with an emphasis on County ditches.

Action 3: Work with implementation partners to develop a reasonable, implementation goal and work plan annually for this objective assuming the addition of full time staff and financial incentives to coordinate bmp programs with a special emphasis on ditch buffers.

Action 4: Seek funding to provide financial incentives to establish ditch buffer strips on pre-identified County ditches.

Objective 3: Identify, assess and prioritize County ditch systems and areas within County ditch systems for retention, wider ditch buffers and other strategies to improve surface and ground water quality and wildlife habitat.

Note: To implement the actions for this objective, additional financial resources will be needed for additional staff, landowner incentives and acquisition costs.

103E 2007 Amendment: "Drainage authorities are allowed to establish and maintain 1-rod ditch buffer strips and side inlet controls where needed (i.e. incrementally) using repair procedures and determination of damages, but not requiring re-determination of benefits."

103E 2007 Amendment: "Drainage authorities should give preference to planting native species of a local ecotype on required ditch buffer strips."

Action 1: Work with local committees and workgroups with broad representatives of multiple interests similar to those formed for the Water Management Plan and Greenprint to develop criteria and methods for prioritizing program implementation. Representatives of ditch owners, wildlife conservation, rural residents, water quality and others will be involved by 2010. County GIS tools will be used to support the process.

Action 2: Priority areas will be assessed based on methods and criteria developed by committees and workgroups for program implementation as well as available resources, regulations and other requirements. The County and SWCD will work together to identify representatives and frequency of program planning and evaluation as needed. County GIS tools will be used to support the process.

Action 3: Identify and assess opportunities to reduce impacts from municipal storm water discharges with best management practices, including water retention, wetland restoration, buffer strips, grassed waterways, and other erosion control practices.

Action 4: Identify native plants best suited for ditch buffer plantings, assess and prioritize locations for native plants in conjunction with wildlife and other priority areas.

Objective 4: Increase water retention and wetland restoration in County ditch drainage systems by 30 percent by 2013.

Note: To implement the actions for this objective, additional financial resources may be needed for engineering costs, landowner incentives and acquisition costs.

103E.015 CONSIDERATIONS BEFORE DRAINAGE WORK IS DONE
Subdivision 1. Environmental and land use criteria

(1) the present and anticipated agricultural land availability and use in the drainage system project or system;
(2) the present and anticipated land use within the drainage project or system;
(3) flooding characteristics of property in the drainage project or system and downstream for 5-, 10-, 25-, and 50 year flood events;
(4) the waters to be drained and alternative measures to conserve, allocate, and use the waters including storage and retention of drainage waters;
(5) the effect on water quality of constructing the proposed drainage project;
(6) fish and wildlife resources affected by the proposed drainage project;
(7) shallow groundwater availability, distribution, and use in the drainage project or system; and
(8) the overall environmental impact of the above criteria

Action 1: Seek funding to expand the engineering and environmental review assessment for ditch improvement and repair projects to study flooding characteristics and downstream impacts during small, frequent storm events as well as 5,10, 25, 50 year flood events; water storage and retention practices; and water quality effects.

Action 2: Establish baseline data for this objective to consistently measure success over time.

Action 3: Seek funding to provide financial incentives to establish water retention areas.

Action 4: Work with local conservation groups and State and Federal agencies to seek funding and restore and enhance wildlife habitat in priority areas.

Action 5: Add a full-time SWCD Technician/BMP Coordinator from 2009-2013 at the SWCD working with conservation partners promoting and coordinating the establishment of water retention and wetlands.

Action 6: Work with implementation partners to develop a reasonable, implementation goal and work plan annually for this objective assuming the addition of full time staff and financial incentives to coordinate bmp programs with a special emphasis on ditch buffers.

Priority Concern: Surface Water

Agricultural Runoff, Soil Erosion and Pesticides

PRIORITY CONCERN: Agricultural runoff and soil erosion

Water Management Plan Goal:
Reduce and prevent pollution from agricultural land by establishing conservation practices that minimize runoff, soil erosion and sedimentation and other pollutants.

Priority Concern

Soil erosion and sedimentation and runoff containing nutrients and pesticides are known sources of pollutants to surface water. These pollutants are transported through gully, sheet and rill erosion, tile intakes, tile lines, ditches and directly to surface water. Highly erodible soils are found along every river, stream and intermittent stream in Blue Earth County. Of the total existing cropland, one percent of the cropland is considered highly erodible. Reducing soil erosion on agricultural land requires a combination of understanding soil properties, field conditions and land management practices intended to protect the soil from wind and water. Establishing and promoting proven best management practices including buffer strips, filter strips, grassed waterways, terraces, crop residue, tillage practices, nutrient management, water retention, and other USDA-approved best management practices are priority actions in the *Water Management Plan 2008-2013.*

Priority Concern Assessment

SOIL EROSION

Soil erosion is a wide spread and well known problem associated with agricultural land use and intensive use of soils. Soil loss through erosion can also reduce soil productivity and increase agricultural production costs to individual farmers. Soil eroded from agricultural land can be transported to surface waters through direct runoff to a river, stream, ditch, lake or wetland or through in-field tile intakes to sub-surface drainage tile systems. According to the 1980 USDA *Resources Conservation Act Summary - Natural Resources Inventory of Blue Earth County,* the deterioration of surface water is directly related to sediment and ag-waste pollutants being carried by runoff, and approximately one-half of the total sediment deposited in the streams and lakes is from cropland. Soil erosion also occurs along stream banks, wooded hillsides, ravines, construction sites and anywhere soil is not protected from water and wind. Regardless of the source, all eroded soil can degrade surface water. Loss of soil through erosion and sedimentation is a water quality concern in Blue Earth County.

The reduction of sedimentation is an important issue when seeking to improve water quality. A large amount of sediment entering a stream kills aquatic plants by blocking sunlight and disrupt feeding and reproduction of many fish species by covering the gravel and natural stream bed. Heavy sediment loads gradually fill the channel which contributes to increases in flooding. Sedimentation is a problem in rivers, streams, wetlands and lakes which are outlets for small streams and ditches.

There are different types and degrees of severity of soil erosion. The USDA characterizes erosions with the following definitions:

> *Sheet and Rill*- Detachment and transport of soil particles caused by rainfall splash and runoff degrade soil quality.
>
> *Ephemeral Gully*- Small channels caused by surface water runoff degrade soil quality and tend to increase in size. On crop land they can be obscured by heavy tillage
>
> *Classic Gully*- Deep, permanent channels caused by the convergence of surface runoff degrade soil quality. They enlarge progressively by head-cutting and lateral widening.

High Priority Erosion Areas

Erosion prone soils are found throughout the County but most easily observed from the rivers. Eroding stream banks and steep slopes are relatively common along the rivers in the County. Eroding ravines and gullies are also found near or leading to most rivers. The areas with erodible land classification for Blue Earth County are shown on Map 12. Areas with highly erodible soils are generally not used for farming due to practical difficulties associated with steepness. Map 13 shows the erodible land classification of cropland in the County. As summarized in Chart 3, just over one percent of the cropland in the County is considered "highly erodible" and 3.53 percent "potentially highly erodible" according the USDA Soil Survey.

Wind erosion is also a source of sediment and soil-related pollutants. Map 15 displays the wind erodibility index for the County. The USDA does not consider wind erosion a wide-spread problem in Blue Earth County. Soils with the greatest potential for wind erosion are found mainly south and east of Lake Crystal. Drifts of wind blown soil in this area are commonly observed collecting along fence lines and ditches adjacent to broad expanses of open fields lacking crop residue or vegetation in the winter and spring. The soils with the greatest wind erosion potential are also coarse-textured soils. Map 14 displays general soil texture. A comparison of general soil texture and wind erodibility shows mucky peat and mucky silt loam soils located throughout the County have greater wind erosion potential compared with remaining soil texture classifications.

Reducing soil erosion on agricultural land requires a combination of understanding soil properties, field conditions and land management practices intended to protect the soil from wind and water. Reducing run off and soil loss can include land practices to reduce the force of wind or water, cover the soil, hold soil in place, and trap eroded soil carried by wind or water.

Some of the assessment methods that can be used to locate and monitor soil erosion and corrective/preventative actions are visual assessment, volume calculation, and aerial photo trend analysis. Visual assessments and inventories of soil erosion on a broad scale are limited by accessibility due to erosion-prone soils being located mainly on steep slopes and land-locked parcels. GIS and aerial photos can be used to help identify the worst conditions and can be useful for smaller scale studies. Use of aerial photos, typically taken in the spring and summer, is limited by tree, crop and other vegetative cover. With detailed location information and GPS corrective and preventative actions to reduce soil erosion can be monitored over time. Ultimately, farmers have the

best knowledge of erosion problems on their land and typically initiate contact with the SWCD and NRCS for technical assistance.

FEEDLOTS, MANURE AND NUTRIENT RUNOFF

Nutrient and manure management is the highest feedlot-related priority in the *Water Management Plan 2008-2013*. As a result of an intensive, unified effort by the County, SWCD and NRCS to work with landowners in the mid-1990s, there are few remaining feedlots with potential for direct runoff. The remaining feedlots with pollution potential are relatively small sites. The SWCD, NRCS and County will continue to work with the few remaining sites with pollution potential. These sites will likely require continued technical and financial assistance from the SWCD and County. Structural practices, such as diversions, storage basins, barn gutters and others, may be needed to correct runoff problems. Small sites, with fewer than ten animal units, and pastures may also require technical and financial assistance from the SWCD, NRCS and County.

Feedlots and manure management are discussed and addressed in greater detail in the Livestock Feedlot Section of the plan.

PESTICIDES

Pesticide runoff is a high priority issue related to human health, wildlife and aquatic life. Pesticide air drifting during application and carried with soil eroded by wind is another source of pesticides in surface water. Setbacks from surface waters during application help reduce this source. Vegetated buffer strips provide a physical barrier to protect the set back or impact area and can help trap and filter pollutants and wind blown soil particles.

Pollution potential is dependent on the interaction of the chemical's scientific properties and use relative to conditions such as soil, geology, topography and weather. Ultimately, the pesticide and its pollution impacts are determined to a large extent by proper use and application.

The MDA recommends best management practices for pesticide users to protect water resources, including the following as described in an MDA handout:

1. Scout field for weeds and match the management approach to the weed problem.
2. Evaluate reduced or split herbicide application rates.
3. Soil incorporate.
4. Evaluate surface drainage patterns in field and install filter strips and establish buffer zones for streams, sinkholes and tile intakes.
5. Determine the depth to groundwater in your fields and consider protective practices in vulnerable areas.
6. Rotate herbicide modes of action.
7. Consider precision application.

The MDA is the lead agency for pesticide monitoring. According to an MDA report, the MDA's surface water monitoring efforts are focused in locations where agricultural

chemicals have a relatively high potential for water resource impacts based on rainfall, runoff and direct connections between ground and surface water. The MDA has established several monitoring locations in Blue Earth County, a site on each of the following: Minnesota River, Blue Earth River, Le Sueur River, Little Cobb River, and the "Beauford Ditch."

The MPCA has proposed listing two river reaches in Blue Earth County with aquatic life impairments from acetochlor on the 2008 Impaired Waters list. Acetochlor is a corn herbicide. TMDLs are discussed in greater detail in the "Impaired Waters and TMDLs" section of the plan. MPCA fact sheets and maps related to impaired waters and TMDLs are included in the Appendix.

With limited pesticide monitoring of surface waters in Blue Earth County, the type and amount of pesticides and their impact is not understood and cannot be addressed in the context of the *Water Management Plan 2008-2013*. The County and SWCD rely on the MDA, MPCA and MDH to monitor and regulate pesticides and their impacts on human health and the environment.

LOCAL PROGRAMS

Reducing soil erosion, runoff and other agricultural related pollution is ultimately a land management decision made by land owners and operators. Successfully working with land owners and operators to address soil and water conservation and pollution problems is best accomplished at the local level with trusted and knowledgeable staff providing individual and targeted services and financial assistance. The SWCD, NRCS and County staff serve Blue Earth County landowners and many programs are in place to accomplish water quality goals.

Blue Earth County Soil and Water Conservation District (SWCD) Programs

The SWCD is responsible for education, promotion, technical assistance, establishment and monitoring of conservation practices on agricultural land. The SWCD works with many local, State and Federal government partners.

The SWCD is co-located with the NRCS and the FSA is located in an adjoining office. The NRCS and SWCD work cooperatively sharing office equipment, vehicles, technical expertise, and other support. This one-stop shopping system works well for farmers as well as staff. Farmers benefit from knowing where to consistently obtain reliable information and support from staff familiar with their land and knowledge of solutions and potential financial assistance. In Blue Earth County, a farmer's first contact for information is typically the SWCD and NRCS office.

The process of establishing conservation practices is time consuming and can involve many project partners and funding sources. Each source of funding has a set of rules and deadlines. The number and type of funding sources and program requirements has increased in the past ten years complicating the process for both the SWCD and landowners. Once a project is funded, weather, contractor availability, land owner

commitment and other factors can delay the project. The SWCD is also responsible for reporting and monitoring the life of the practice.

Education and Information
The SWCD general education and information communications provide basic information about SWCD programs, location, special projects and other information. The district uses standard communication methods including a web site, local media, guest lectures, newsletters and mailings. The County web site also provides a link to the SWCD web site. The SWCD works with the NRCS and FSA to distribute a newsletter annually. The SWCD and NRCS work with schools, local media, and conservation organizations. The SWCD also participates in SWCD/BWSR education events and promotions including the Envirothon, Soil Stewardship Program, MASWCD poster and essay contest and tours. SWCD efforts to target and contact landowners is limited mainly by staff resources.

Tree Program
Trees are available for sale to the general public, including individuals, farmers, municipalities, and land developers. About 50 tree species are available for purchase. Buyers pre-order trees between November and March, and the trees are delivered and picked up in April. Owners of CRP and CREP have been targeted for tree sales. Between 27,000 and 30,000 trees are typically sold annually. A tree planter is also available for rent from the SWCD.

Equipment Rental
The SWCD has conservation equipment available for rent to citizens, businesses and government. The equipment available for rent includes: a tree planter and a 12 ft Brillion drill for grasses, flowers and forbs.

Technical Services
The SWCD provides a variety of technical services to land owners. Technical design and approval authority for government funded projects is granted only to properly trained, certified and designated staff. The SWCD, NRCS and Zone 10 technical staff work together to provide technical resources to land owners/operators. Work load demands and seasonal conditions limit the time technical services can be conducted in the field.

Zone 10 is a SWCD joint powers organization that receives BWSR Nonpoint Technical Assistance grant program funds to hire engineering and technician staff for the purpose of assisting landowners in the installation of conservation practices. Initially the technical assistance funds supported the technical needs required for SRF loans. However, technical support for other programs dealing with conservation practices is allowed. The BWSR grant to Zone 10 does not cover the costs needed to maintain adequate engineering staff. Zone 10 charges engineering fees for services. The Blue Earth County SWCD houses and supervises the Zone 10 engineer and technical staff. Zone 10 consists of nine SWCDS, including Blue Earth, Brown, Faribault, Le Sueur, Martin, Nicollet, Sibley, Waseca and Watonwan.

Procedures for Establishing Soil and Water Conservation Practices
In accordance with the State Cost Share Guidelines, the SWCD has certain responsibilities and procedures with respect to administration of cost share funding. GBERBA also administers projects using the State Cost Share Guidelines and the

individual grant terms. Establishing conservation projects can be time consuming. It can take up to a year or more for approved projects to be constructed, depending on weather conditions, project resources and staff time. Establishing land practices generally involves the following steps:

1. Owner/operator Contact
2. On-site Investigation
3. Identify Social and Regulatory Issues
4. Prepare Cost Estimates
5. Identify Potential Financial Assistance Programs
6. Contract with Land Owner to Encumber Funds
7. Construction
8. Life Cycle Inspections and Monitoring

Land owner/operator Contact

In most cases the land owner/operator is requesting technical and financial assistance to solve a known soil erosion problem. Land owners also request information in response to an ad, press release, letter or other source of information. The SWCD/NRCS staff and land owner/operator discuss problem, look at aerial photos, etc. A site visit is scheduled if the owner/operator is interested and makes a request for assistance.

On-site Investigation

SWCD, NRCS or Zone 10 staff visit the site and determine the nature of the problem and whether it is high priority erosion or water quality problem eligible for SWCD assistance. If not eligible, the SWCD might refer the land owner to another agency for assistance. Determine which conservation or management practice(s)/system(s) are needed to effectively treat the problem. Determine if the contributing watershed (including land not managed by the land owner/operator) is a sediment source that will reduce the practice's effective life or prevent normal operation and maintenance.

Social and Regulatory Issues

Assess whether the identified solution would have adverse impacts on the cultural resources, threatened and endangered species, wetlands, or flood plains of the area. Determine whether or not the problem is related to non-compliance with existing regulations, such as a soil loss ordinance, zoning, or feedlot ordinance.

Cost Estimate

Gather information to prepare a cost estimate, including engineering costs. The landowner is typically seeking financial assistance and is usually discussed at the first meeting prior to the site visit. The SWCD tries to be aware of funding sources or programs available outside of the SWCD/NRCS/FSA in order to provide service to the land owner/operators and encourage establishment of conservation practices.

SWCD charges for technical or administrative services provided to a land occupier are not eligible costs to establish a practice. These activities should be funded by setting aside 20 percent of the grant appropriation. Ineligible costs include, but are not limited to, costs to conduct field investigations, design the conservation practice, monitor the establishment of the practice, and all program administration costs.

Conservation district service charges, including but not limited to tree planting or mechanical weed control charges, are not considered technical or administrative

services and are an eligible cost to establish a practice. In addition, the services of a consulting engineer may be an eligible cost.

Use of private engineers and consulting firms are not eligible for State cost share funding. NRCS programs allow different rates of compensation for authorized Technical Service Providers depending government or private affiliation. For example, Zone 10 engineering services are allowed half rate of private consulting firms because Zone 10 is a government-funded program.

Contract
The cost estimate and available funding information is presented to land owner/operator. The land owner/operator signs contract agreeing to establish practice. Some landowners are hesitant to sign the agreement unless they are assured they will receive funding and the project will be completed quickly. The SWCD Supervisors approve contract to encumber project within the terms of the applicable grant.

SWCD oversees construction and verifies construction with paid invoices. The SWCD Board approves payment to land owner/operator. For GBERBA projects, the payment of the project must also be approved by the GBERBA Technical Committee and Policy Board and payment is then made to the land owner/operator.

Maintenance and Life Cycle Inspections
The land owner/operator is responsible for the operation and maintenance of practices to ensure that their conservation objective is met and the effective life, a minimum of 10 years, is achieved. The SWCD must complete practice site inspections at the end of the first, fifth, and ninth years following the certified completion of the conservation practices with a minimum effective life of 10 years.

Within the limits of available resources, the SWCD is also expected to help land owners schedule their operations and maintenance activities, to advise land owners on operation and maintenance techniques, and make engineering surveys and designs for maintenance when needed. In addition, inspect conservation practices for damage after storms producing unusually heavy run off. The SWCD can perform additional site inspections on a case-by-case basis, but with limited staff time, the SWCD generally responds to inquiries from landowners who discover problems.

The SWCD provides ongoing maintenance service and administrative assistance for the RIM and CREP program easements. CREP Land owners continue to request technical assistance from the SWCD for maintenance and repairs. Repairs are sometimes needed for damage caused by muskrat or beaver, tile drainage, or flood damage to structures in or near the floodplain. Maintenance issues such as weed control, plant and tree management, controlled burns, and other ongoing technical and maintenance needs are also handled by the SWCD. The SWCD is also responsible for the ongoing administrative paperwork associated with CREP sales and changes in land ownership. New owners of CREP land generally have questions about the program, their responsibilities and maintaining the property.

Landowner Contacts
The State Cost Share Manual and SWCD Operational Handbook recommend that SWCDs identify and contact land owners/operators with high priority erosion problems and suggests general efforts, such as distributing newsletters or sponsoring workshops,

along with more focused efforts such as personally contacting land owners/operators with high priority problems in a targeted watershed.

With staff- and project-related financial constraints, the SWCD generally works primarily with land owners/operators who make contact with the SWCD and NRCS office. The SWCD promotes program availability with annual newsletters, press releases, open houses, and the web site. Referrals from FSA, NRCS, the County and other organizations also refer land owners to the SWCD and NRCS.

Watershed projects have provided some additional staff in recent years. Unfortunately, watershed staff positions are short term, relatively low paid positions and turn-over is high. Short term positions tend to attract inexperienced candidates who require training and oversight. The local investment in training is lost as these staff as experience leads to jobs with more stable funding and greater compensation. Professional candidates with a good understanding of or experience with agricultural land management practices, economics and other factors are difficult to find.

Program Funding- Financial

There are large geographical areas (land owners/operators) with highly erodible soils and limited financial assistance available. There are increasingly more programs for the SWCD to understand and explain to land owners/operators, and each program has additional reporting and monitoring requirements requiring staff time.

Financial assistance for conservation practices are available though the SWCD from a variety of sources. Financial assistance includes cost share, incentives and low interest loans. Some of the financial assistance programs are described below.

> State Erosion, Sediment Control and Water Quality Cost-Share Program
> BWSR provides up to 75% of cost-sharing to landowners for installation of soil and water conservation practices.
>
> Reinvest in Minnesota (RIM) Reserve Program
> A 20-year or permanent land retirement program that pays landowners to retire marginal agricultural land. It includes wetland restoration, riparian lands, and sensitive ground water area payments, among others.
>
> State Revolving Fund (SRF) Ag Best Management Practices Loan Program
> Low interest loans are available for equipment and projects. Eligible land owners/operators use private banks for MDA-guaranteed, low interest loans.
>
> Watershed Projects:
> Program details vary by project but generally provide financial assistance for establishing soil and water conservation practices. The main funding sources are the MPCA 319, MPCA Clean Water Partnerships and BWSR Clean Water Legacy grants. These funds are often leveraged with NRCS and FSA programs. Watershed projects in the Greater Blue Earth River watershed have increased the amount of financial assistance available in some watersheds in the County.

The only consistent source of funding allocated to the SWCD for conservation practices is the annual cost share allocation from BWSR. The State cost share allocation has not increased significantly in many years even though demand increased. The SWCD has

historically filled the gap by 1) using State cost share to enhance NRCS's 50% cost share payment maximum, and 2) using watershed project funding mainly from MPCA, BWSR and Clean Water Legacy.

NRCS and FSA Programs

The rules for NRCS and FSA programs vary depending on current Farm Bill. At this time CRP and EQIP are the most commonly used programs in Blue Earth County. The following USDA programs have been available in recent years:

Conservation Reserve Program (CRP)

There are two types of CRP: Continuous CRP and General CRP. Continuous CRP has 10-15 year contracts, sign up is year round. General CRP has a limited enrollment period. Applications are ranked nationally and are not site specific based on resource concerns.

Eligible practices include:

- Grassed waterways for gully erosion
- Shelter belts (3-8 rows) and Field Windbreaks (1-3 rows)
- Filter strips to buffer streams, wetlands and some ditches with 30-120 ft grass strips
- Riparian forest buffers to establish 180' tree buffers along streams
- Wetland Restoration for manipulated wetlands
- Farmable Wetland Program for restoring 5-10 acre pothole wetlands in fields
- Grass establishments in grazed pastures containing wetlands or streams
- Hardwood tree plantings in the 100 year floodplain of perennial streams

Environmental Quality Incentive Payment (EQIP)

Cost share to establish conservation practices. Payments are flat rate payments. The Blue Earth County NRCS is allocated a specific amount each year. Contracts are scored and ranked. Contract length varies from 1-10 years. Types of practices include residue management, erosion control structures, terraces, nutrient management, manure storage and more.

Wetland Reserve Program (WRP)

Restores manipulated wetlands back to original extent and set aside in a 10 year, 30 year or permanent easement. Cost share percentage varies depending on length of easement.

Grassland Reserve Program (GRP)

Restores and protects existing pasture land.

Wildlife Habitat Incentive Program (WHIP)

Cost share to provide assistance to enhance or create wildlife habitat. Contract length is five to ten years. Types of projects include fish stream improvements, wildlife openings, and others.

Conservation Security Program (CSP)
The primary goal of this program is not to correct resource problems or concerns but to supports conservation stewardship by rewarding landowners who have a maintained or are willing to improve their level of conservation.

The SWCD maximizes the number of projects completed by combining NRCS and SWCD administered program funds. At one time, the NRCS paid 75% cost share for conservation practices. This amount was reduced to 50% many years ago. As land owners/operators continued to expect 75% cost share assistance, water quality grants and BWSR State cost share funding were used to fill the gap to maintain this level of cost share. Many of the watershed projects leverage the landowner's 25% cash match and NRCS program funds to maximize the funding available and increase the total number of projects. The EQIP program recently started a flat rate payment system. This further complicates the process and increases the SWCD's responsibilities as other payments continue to be made on a percentage basis, typically paying up to 75%.

The SWCD's project budgets are complicated and variable. The SWCD must encumber projects for a period of time determined by the available grant. Unspent funds must be returned. Accurate cost estimates are important to ensure full utilization of available program funds. The terms, eligible projects and other requirements vary between and among water quality programs, soil and water conservation programs and NRCS programs. For some projects, several sources might be used in varying percentages depending on the maximum payment allowed, program eligibility and other factors. For example, if a part of a project is not eligible for payment from an NRCS program, another source might pay 100% for that part of the project but less on another part of the project as long as the payments do not exceed 75% of the project costs.

Watershed Partnerships and Projects

The Greater Blue Earth River Basin Alliance (GBERBA) serves mainly as a means to obtain funding to the SWCD for land owner/operator cost share and financial incentives.

Currently the County and SWCD are involved with several watershed projects. All of these projects focus mainly on agricultural best management practices, including water retention. Most have been funded through GBERBA.

Crystal Lake- This is a CWP- and CWL-funded project sponsored by the City of Lake Crystal. The SWCD manages the CWL funds, is the TSP for the project and participates in project committees. The County participates in project committees. The project is managed by the Water Resources Center at MSU-Mankato.

Maple River – This Phase II CWP Extension expires in 2009. A Maple River Coordinator is employed by the SWCD. The SWCD manages this County-sponsored CWP project.

Cobb River – This is a GBERBA project that expires in 2010. The SWCD supervises the Zone 10 Engineer and staff, including the Cobb River Technician.

TMDLs – As GBERBA members, the SWCD and County participated in the Greater Blue Earth Fecal TMDL, prepared by the Water Resources Center at MSU-Mankato and the MCPA. As described in the Impaired Waters and TMDLs Section of the plan, there will likely be more TMDL projects affecting the SWCD and County.

While working with other Counties to access additional grant funding for incentives and cost share on a watershed basis has added to the amount of funding available for local land owners/operators, there are problems with this approach. First, watershed-based funding is limited to only select watersheds in the County even though there are impaired waters and highly erodible land in every watershed in the County. Second, local staff workloads are increased directly and indirectly as watershed projects require involvement of local staff for technical assistance, education, provision of data, training and other support. Third, watershed projects have inconsistent and variable funding levels which do not allow for the addition of staff to address project and local needs. Finally, funding for technical staff is paid as a percentage of a finished project which, in order to maintain staff, necessitates focus of promotion and outreach to popular practices rather than the most effective practices.

SOIL and WATER CONSERVATION PRACTICES

Filter strips and buffer strips are likely the most widely accepted, commonly used conservation practice in the County. Filter strips reduce the movement of sediment, sediment absorbed nutrients, dissolved nutrients, pesticides, pathogens and particulate organics toward sensitive areas. Filter strips may also provide habitat for wildlife and beneficial insects. Conservation practices include, but are not limited to:

Critical Area Stabilization / Critical Area Planting: Establishing permanent vegetation on sites that have or are expected to have high erosion rates, and on sites that have physical, chemical, or biological conditions that prevent the establishment of vegetation with normal planting practices.

Diversion: A channel constructed across the slope with a supporting ridge on the lower side.

***Field Windbreak and Shelterbelt*:** Linear plantings of single or multiple rows of trees or shrubs or sets of linear plantings.

Grassed Waterway: A natural or constructed channel that is shaped or graded to required dimensions and established in suitable vegetations for the stable conveyance of runoff.

Lined Waterway or Outlet: A waterway or outlet having an erosion-resistant lining of concrete, stone, or other permanent material.

Livestock Waste Management: The application of eligible conservation practice components to improve water quality associated with livestock wastewater and runoff.

Filter Strip: A strip or area of herbaceous vegetation situated between cropland, grazing land, or distributed land (including forest land) and environmentally sensitive areas.

Sediment Basin: A basin constructed to collect and store debris or sediment.

Pond: A water impoundment made by constructing a dam or an embankment or by excavating a pit or dugout.

Grade Stabilization Structure: A structure used to control the grade and head cutting in natural or artificial channels.

Water & Sediment Control Basin: An earth embankment or a combination ridge and channel generally constructed across the slope and minor watercourses to form a sediment trap and water detention basin.

Streambank and Shoreland Protection: Using vegetation or structures to stabilize and protect banks of streams, lakes, estuaries, or excavated channels against scour or erosion.

Stripcropping: Growing row crops, forages, small grains, or fallow in a systematic arrangement of equal width strips on or near the contour of the field slope. A strip of grass or grass/legume or small grain is alternated with a strip of tilled annual crop or fallow.

Terrace: An earth embankment, or a combination ridge and channel constructed across the field slope.

Unused Well Sealing / ***Well Decommissioning:*** The sealing and permanent closure of a water well no longer in use.

Crop residue management: Leaving crop residue from last year on the soil surface by limiting tillage. Includes no-till, mulch till and ridge till.

Nutrient management: Nutrient management is managing the amount, source, placement, form, and timing of the application of plant nutrients and soil amendments.

Tree planting: Establishing woody plants by planting seedlings or cuttings, direct seeding, or natural regeneration to provide erosion control, reduce pollution of air or water, provide or enhance wildlife habitat, to provide energy conservation, to uptake water or nutrients, and other purposes.

Crop rotation: Growing crops in a recurring sequence on the same field to reduce sheet and rill erosion, erosion from wind, maintain or improve soil organic matter content, manage the balance of plant nutrients and manage plant pests.

Pest management: Utilizing environmentally sensitive prevention, avoidance, monitoring and suppression strategies, to manage weeds, insects, diseases, animals and other organisms (including invasive and non-invasive species), that directly or indirectly cause damage or annoyance.

Rotational grazing: Planting forage using grazing rotation among different fields to maximize produce and reduce sediment and nutrient runoff.

IMPLEMENTATION PLAN
Agricultural Pesticides

Water Management Plan Goal:
Reduce and prevent pollution from pesticides and runoff from agricultural land.

GUIDING PRINCIPLES for PESTICIDE MANAGEMENT:
» Agriculture is important to the economy of Blue Earth County.
» Pesticide sales and use regulation is the responsibility of the Federal and State government.
» Pesticide regulation is pre-empted by the State of Minnesota.
» The Minnesota Department of Agriculture is responsible for monitoring surface and ground water for pesticides.
» Pesticides can pollute surface and ground water.
» Pesticides can be harmful to human health and wildlife.
» Runoff containing pesticides can be minimized with best land management practices as recommended by the Minnesota Department of Agriculture.

ONGOING ACTIVITIES:
Regulation and oversight of pesticide use is not an activity of Blue Earth County, SWCD or other units of local government in Blue Earth County.

WATER MANAGEMENT PLAN:
Agricultural use of pesticides is regulated exclusively by State and Federal Government. Pesticides can be a source of pollutants. Preventing and reducing run off is a high priority. Working to reduce runoff with buffer strips and other best land management practices will be the most important action related to pesticide pollution.

The County and SWCD lack the expertise to provide a strong presence with respect to water pollution from pesticides. MPCA TMDL reports for acetochlor will likely give better direction and awareness of pesticide pollution. In the meantime, the SWCD and County will focus on land practices and education to address runoff, including pesticide runoff, as a priority concern.

The land related BMP's recommended by the MDA includes: evaluating surface drainage patterns in field and installing filter strips and establishing buffer zones for streams, sinkholes and tile intakes. Establishing buffer and filter strips is a BMP recommended to address many pollutants and are a strong component of the *Water Management Plan*. The County will focus its efforts on promoting and establishing these land management practices.

IMPLEMENTATION PLAN
Agricultural Runoff, Soil Erosion and Pesticides

Water Management Plan Goal:
Reduce and prevent pollution from agricultural land by establishing conservation practices that minimize runoff, soil erosion and sedimentation and other pollutants.

GUIDING PRINCIPLES:
» Protecting soil from erosion and maintaining soil productivity is important for the agricultural economy.
» Runoff from agricultural land can contain excess nutrients, pesticides and other pollutants.
» Soil and water conservation benefits land owners and the public by reducing erosion, sedimentation, water pollution and damages from flooding.
» Filter and buffer strips, as well as other agricultural best management practices, provide a numerous soil and water conservation services by reducing many types of pollutants.
» Water retention practices reduce flooding impacts and may provide ground water recharge.
» High priority erosion areas are found in every watershed in Blue Earth County.
» Best management practices addressing multiple natural resources needs, including water quality, wildlife, source water protection and recreation, are a cost effective and important approach to protecting and providing for long term health, safety and welfare of the public.

ONGOING ACTIVITIES:
The Blue Earth County SWCD will continue to manage and participate in soil and water conservation programs, provide technical assistance to landowners, students, agency staff, wildlife conservation organizations, and others within the constraints of limited staff and financial resources. The SWCD will continue to work closely with the NRCS and FSA and leveraging financial resources where practical and appropriate. The SWCD will continue the tree sales and conservation equipment rental programs, rain gauge network, tillage transect survey, various general education and communications programs.

WATER MANAGEMENT PLAN:
Public awareness and participation will be enhanced to support new programs and priorities set at the local level and State level. New outreach efforts are planned to target information, landowner assistance and establish proven conservation practices. The County will be supplying LIDAR, aerial photos and GIS to the SWCD. Use of these tools by both the County and SWCD will greatly enhance the local capacity to effectively assess, target and prioritize restoration efforts in accordance with local plans and in response to emerging information, plans and priorities at the watershed and State level.

In accordance with State policy, the County and SWCD will identify highly erodible crop land adjacent to public waters. Establishing vegetation on highly erodible crop land adjacent to public waters and drainage ditches will be a high priority.

> **MN Statute 103A.209 Marginal, Erodible Land Retirement Policy.**
> It is state policy to encourage the retirement of marginal, highly erodible land, particularly land adjacent to public waters and drainage systems, from crop production and to reestablish a cover of perennial vegetation.

Priorities will be determined at the local level through the Water Management Plan, SWCD annual plan, local comprehensive natural resource plans, landowner needs, and State plans. State and regional basin and water plans, TMDLs and other natural resource plans will also be used to set priorities at the local level.

Inadequate financial resources limit the ability of the SWCD to perform conservation outreach programs and services to land owners/operators on a County and watershed basis. The SWCD currently employs two staff positions, a District Manager and Office Technician. Additional, stable funding is needed for both staff and project resources to accomplish Water Management Plan goals, manage projects and complete the planning, monitoring and reporting tasks increasingly required with new programs, TMDLs and watershed projects. State grants for Zone 10 engineering assistance is needed to provide technical assistance for project development. The number of TMDLs is expected to increase in the planning period. Each MPCA TMDL and watershed project requires participation of local staff at the SWCD and County for planning, providing data and implementation. BWSR, DNR, USFWS and others are also partners with meaningful projects and studies that require local involvement for success.

Objective 1: Reduce the amount of farmed, highly erodible land adjacent to public waters and ditches by establishing a buffer strip or a cover of perennial vegetation adjacent to all public waters in the County.

Objective 2: Increase best management practices on farmed, highly erodible and potentially highly erodible land.

> **Action 1:** The County, SWCD and other local implementation partners will identify marginal, highly erodible farmland adjacent to public waters and drainage systems and highly erodible and potentially erodible farm land.
>
> **Action 2:** Identify and prioritize areas to work based on appropriate financial incentives, easements, and regulations, special projects, studies, TMDLs, and local plans related to objective.
>
> **Action 3:** Work with relevant implementation partners to promote conservation practices in priority areas.
>
> **Action 4:** Contact and work with land owners and land occupiers to establish conservation practices achieve objective.
>
> **Action 5:** Establish soil and water conservation practices to reduce runoff, soil erosion and sedimentation.

Objective 3: Increase public awareness of soil and water conservation issues, problems and solutions with education and information.

Action 1: Develop posters and other informational pieces related to soil erosion and other factors used to prioritize local project implementation and funding for display at the County SWCD, NRCS and other related offices.

Action 2: Provide access to aerial photos, maps, topography, soils and other information on the County and SWCD web sites.

Action 3: Promote best management practices in newsletters, web sites, press releases and brochures distributed by the County and SWCD annually.

Objective 4. Bi-annually review and evaluate data and information available for targeting BMP's and other implementation efforts.

Action: Regularly hold *Water Management Plan* meetings with local implementation partners to identify, assess, evaluate and prioritize current project needs, information and future implementation strategies.

Objective 5. Seek stable funding for at least one SWCD staff position to work in all priority areas coordinating and promoting best management practices as described in the *Water Management Plan 2008-2013,* watershed and other relevant plans.

Action1: Develop description of project and staff needs based on annual SWCD plans and other plans.

Action 2: Add a full-time SWCD Technician/Coordinator to:

- Work with land owners/operators in areas with high priority erosion problems coordinating and promoting proven soil and water conservation practices with targeted efforts such as personal contacts, tours and other activities.
- Work with conservation partners promoting and coordinating the establishment of buffer and filter strips on County ditches, tile intakes and other waterways with an emphasis on County ditches. Increase the total miles of drainage ditch buffer strips on County ditches in Blue Earth County by 50 percent.
- Work with land owners/operators in all impaired waters and TMDL Implementation Plan priority areas to establish soil and water conservation practices known to address multiple pollutants causing impairments.

PRIORITY CONCERN:
Ground and Surface Water

Wastewater Treatment

Subsurface Sewage Treatment Systems (SSTS)

PRIORITY CONCERN: Wastewater Treatment
Subsurface Sewage Treatment Systems (SSTS)

Water Management Plan Goal:
Prevent and reduce ground and surface water pollution from wastewater with administration of local programs intended to improve decentralized wastewater treatment and reduce wastewater discharges to surface waters.

Priority Concern
Wastewater contains bacteria, pathogens, chemicals, nutrients, and solids. Untreated wastewater is a potential threat to public health and can pollute surface and ground water. The bulk of the County population (77-percent in 2005) lives in one of the eleven municipalities utilizing State-permitted wastewater treatment systems. Most of the remaining population utilizes onsite, subsurface soil treatment systems (SSTS) regulated by State rules and County ordinance. Reducing public health threats and increasing compliance with State rules with installation of onsite wastewater treatment is an ongoing County program and a priority of the *Water Management Plan 2008-2013*.

Priority Concern Assessment

Relative the *Water Management Plan 2008-2013* assessment, wastewater treatment is categorized as either centralized or decentralized wastewater treatment.

Centralized Wastewater Treatment: Centralized wastewater treatment refers to a community wastewater treatment plant (WWTP) and unincorporated areas served by the WWTP. EPA defines these systems as publicly-owned treatment works (POTW).

The bulk of the County population lives (77-percent in 2005) in one of the 11 municipalities. Of the 11 municipalities in the County, eight own and operate their own MPCA-permitted, publicly owned treatment works (POTW) and three are partners with the City of Mankato. The remaining wastewater is generated in lower density, decentralized areas.

Decentralized Wastewater Treatment: Decentralized wastewater treatment can include a variety of treatment types, including subsurface soil treatment systems, package plants and other small facilities serving one or a few businesses or dwellings and located outside of an incorporated municipality. Treatment of wastewater in decentralized areas is the responsibility of the individual property owner. Most property owners utilize subsurface sewage treatment systems.

Subsurface Soil Treatment Systems (SSTS)
SSTS are grouped by their status as either in-compliance, failing to protect ground water, or are considered “imminent public health threat.”

“Failing system” means a seepage pit, cesspool, drywell, leaching pit, or other pit, a tank that obviously leaks below the designated operating depth, or any system with less than

the required vertical separation between the bottom of the distribution medium and the saturated soil or bedrock.

"Imminent threat to public health or safety" (IPHT) means situations with the potential to immediately and adversely affect or threaten public health or safety, including ground surface or surface water discharges and sewer back up into a dwelling or other establishment. IPHT are sometimes called straight pipe systems. Straight pipe systems include toilet waste and transports raw or partially settled sewage directly to a lake, stream, drainage system or ground surface.

Through local ordinance consistent with State rules, Blue Earth County regulates SSTS, including the few SSTS located within municipalities. All other wastewater treatment systems are regulated and permitted by the MPCA with the exception of additional EPA regulations for Class V wells. Class V wells are subsurface discharge systems or septic systems most often associated with a business but also include systems serving more than twenty persons. The MDH also regulates and licenses food, beverage and lodging establishments, manufactured home parks, and other public facilities that use decentralized wastewater treatment.

Blue Earth County Program

Blue Earth County's program is administered by the Environmental Services Department and includes permitting, inspections and enforcement. The County's program requirements are prescribed by Minnesota Rules, County Code and administrative policy.

Permitting and Inspections

The County has required permits for septic systems for more than 40 years. Permit records have been maintained since 1972. Since 1972 the County has issued more 5,000 permits for septic systems and holding tanks. Table 6 displays a numeric summary of the septic system permits issued since 1972. There has been a decline in the total number of permits issued in recent years, most notably in 2007. This is due to the decline in number of new dwellings constructed in the unincorporated areas of the County as County land use regulations have limited new subdivisions outside of municipalities. The number of replacement systems constructed with older dwellings has stayed fairly consistent. Table 7 displays a summary of an example year, showing the number of systems installed by watershed and a comparison of new and replacement systems. Existing subdivisions at the edge of Mankato are also being annexed. The number of dwellings "upgraded" due to annexation is not reflected in County data.

The permitting process in Blue Earth County is generally initiated by the contractor who was contacted by the property owner. The contractor contacts the County to arrange for County staff to participate in the field site evaluation. A site and field evaluation involves soil borings and observed soil conditions, a general discussion of the project, property lines and setbacks, well location, use of the property, the intended use of the property and other necessary information for proper sizing and locating tanks and treatment areas.

The contractor then submits design plans and permit application to the County. The Contractor contacts the County when installing the septic system. Inspections are made

at critical times of the installation, including setting the tank, soil preparation (soil scarification), and construction of the soil treatment area. When construction is complete, the contractor submits an “as-built” and final paper work. The County then issues a Certificate of Compliance. The Certificate of Compliance is mailed to the property owner along with an “Owners Guide” produced by the Minnesota Extension Service.

Table 6. Septic System Permit Summary 1972-2007

Year	Number of Permit Records	Year	Number of Permit Records
1972	113	1990	85
1973	117	1991	126
1974	138	1992	176
1975	86	1993	177
1976	100	1994	252
1977	172	1995	240
1978	169	1996	189
1979	86	1997	187
1980	66	1998	217
1981	81	1999	240
1982	66	2000	211
1983	71	2001	220
1984	88	2002	162
1985	90	2003	157
1986	102	2004	188
1987	117	2005	150
1988	85	2006	161
1989	92	2007	127
		Total	**5104**

Source: Blue Earth County Environmental Services Department

Table 7. Example Year -- Summary of Septic Systems Installed in 2004

Major Watershed	New Systems	Replacement Systems	Total
Blue Earth River	13	11	24
Cannon River	0	1	1
Le Sueur River	43	41	84
Middle Minnesota River	30	36	66
Watonwan River	5	8	13
Total	**91**	**97**	**188**

Source: Blue Earth County Environmental Services Department

Sewage Ordinance Section of the County Code
The County will be updating the local ordinance in accordance with MPCA rules which became effective in February 4, 2008.

Currently the *Sewage Ordinance Section of the County Code* triggers upgrades in SSTS with the following conditions:

1) Inspections and enforcement in response to a complaint.
2) Requires a compliance inspection at property transfer.
3) Defines the required time for upgrades to failing, non-IPHT systems to be five years.

New subdivisions are required, consistent with Minnesota Rules and County Sewage Ordinance, to provide a review of each new lot by a licensed professional to ensure adequate area for a dwelling and two standard SSTS.

Other County Ordinance Code Provisions
The *Shoreland Ordinance Section of the County Code* requires an upgrade of non-compliant systems whenever a "permit of any kind" is required in the shoreland area.

The *Zoning Ordinance Section of the County Code* requires a review of the status of the septic system for each construction permit associated with a dwelling. IPHT must be upgraded. Urban Fringe Overlay Districts are also established in several townships near the City of Mankato and the City of Madison Lake. In Urban Fringe Overlay Districts, no new subdivisions are allowed in order to reduce development pressure and prevent construction of new dwellings with SSTS in areas adjacent to or near access to centralized wastewater treatment systems.

Through land use regulations, the County restricts development in unincorporated areas in order to:

- Reduce the pollution potential associated with on-site wastewater treatment from failing systems and Class V injection systems.
- Reduce the potential for high remediation costs.
- Reduce infrastructure and social costs associated with scattered low density development, including wastewater treatment, stormwater management, road construction and maintenance, schools, and law enforcement.

Education
In addition to the Minnesota Extension Service SSTS system Owners Guide provided to every home owner when a new system is installed, the County also includes general information about SSTS in newsletters and other publications. County staff speak to citizen groups, realtor groups and others from time to time. The County conducts informational meetings with contractors every few years as needed.

Financing SSTS
Through MPCA Clean Water Partnership projects, the County has offered low interest loans for SSTS in several watersheds. The County borrows money from the State and then lends money to the property owner. The property owner makes repayment with their property taxes paid to the County, and the County repays the State. While the MPCA program is efficient and functions well overall, the watershed limitation is problematic as the County program is a regulatory program administered County-wide.

People living outside of the watershed have expressed interest in loans and have been turned away. There is no way of knowing if there will be loans available in their watershed in the future.

Through the MDA, the SWCD administers County-wide low interest loans to rural residents. The SWCD administers the program through local banks. The SWCD accepts applications as part of a larger low interest loan program for farmers to construct land practices and purchase equipment but non-farmers are eligible for the SSTS loan. The SWCD ranks and approves applications, while local banks determine financial eligibility and service the loan.

Class V Injection Wells

Business use of SSTS is a potential source of ground water contamination as soil treatment areas may not be capable of treating the type and quantity of chemicals, nutrients and hazardous substances generated by and used routinely by some businesses and industry. State rules state that on-site systems at industrial and business locations are not considered SSTS but are Class V injection wells and subject to EPA regulation.

> Minnesota Rules, Chapter 7080: Industrial wastewater treatment systems receiving nonhazardous wastes and systems serving facilities not classified as dwellings are regulated by the United States Environmental Protection Agency as Class V injection wells under Code of Federal Regulations, title 40, parts 144 and 146. These federal regulations along with this chapter cover systems serving other establishments and systems serving more than 20 persons.
>
> Minnesota Rules, Chapter 7080: Dwelling. "Dwelling" means any building or place used or intended to be used by human occupants as a single-family or multifamily residence with no more than nine bedrooms and producing sewage. Dwelling does not include a single-family or multifamily residence that serves as both a domicile and a place of business if the business increases the volume of sewage above what is normal for a dwelling or if liquid waste generated no longer qualifies as sewage.

The MDH has identified areas with a higher Class V sensitivity. Map 27 displays the MDH information related to Class V Sensitivity. Class V sensitivity relates most significantly to automotive type of waste.

EPA Class V Rule

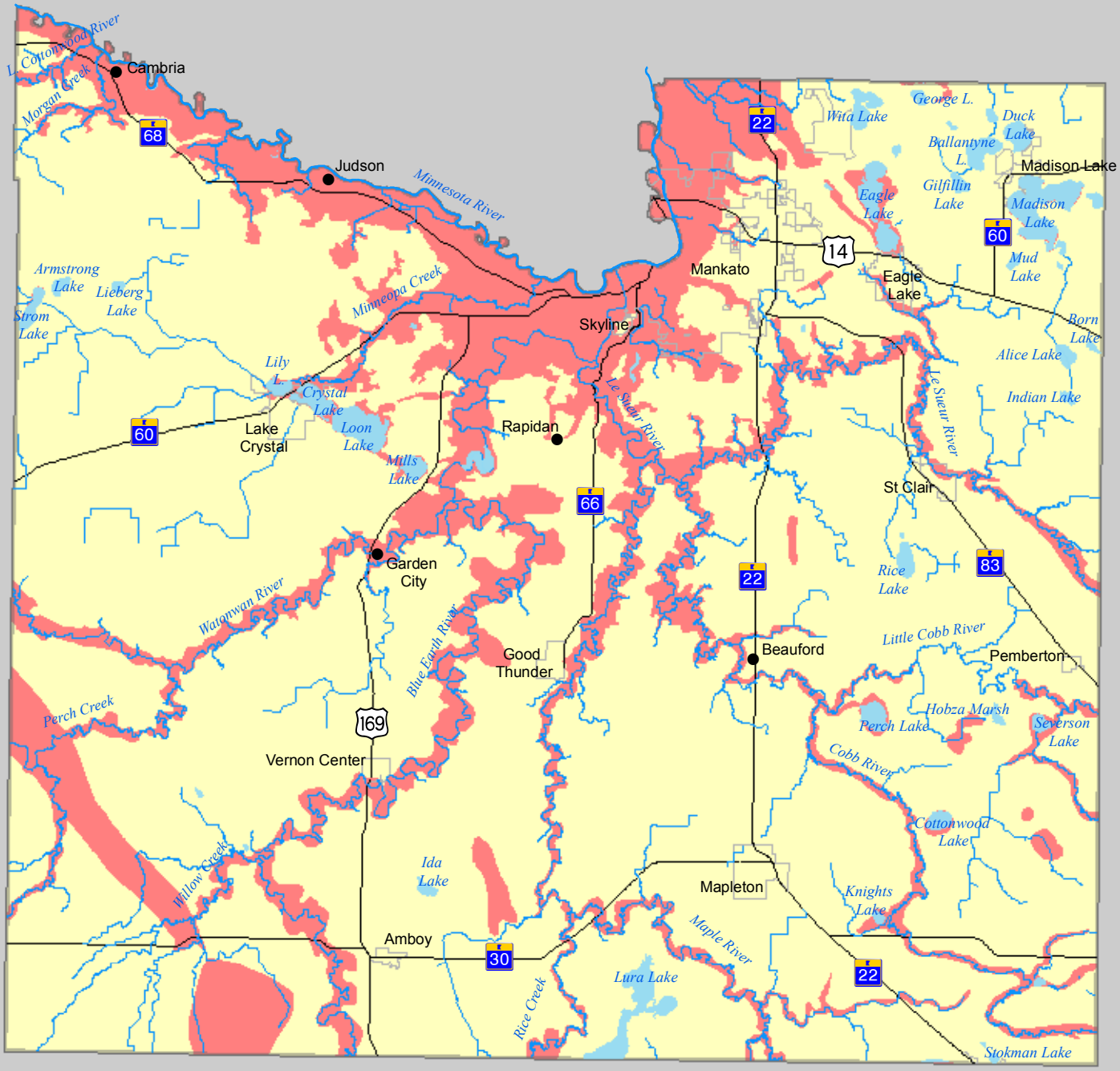
In 1999, EPA finalized the Underground Injection Control Regulations for Class V Injection Wells, Revisions (FR Vol. 46 No. 234 pp. 68546-68573), known as the Class V Rule, Phase 1. The Class V Rule establishes minimum federal standards for two subtypes of Class V wells: large-capacity cesspools and motor vehicle waste disposal wells.

> Class V Rule Purpose: Regulate and manage the safe injection of non-hazardous fluids through on-site disposal systems such as dry wells, septic systems, leach fields or similar types of drainage wells.
>
> Septic System: a “well” that is used to emplace sanitary waste below the surface and is typically comprised of a septic tank and subsurface fluid distribution system or disposal system.

Subsurface Fluid Distribution System: An assemblage of perforated pipes, drain tiles, or other similar mechanisms intended to distribute fluids below the surface of the ground. Examples of Fluids: Wastewater disposal- stormwater runoff, incidental and process wastes from industry, car wash water, food processing wastes, treated sanitary wastes, and drainage from agricultural activities.

The County addresses Class V injection wells by minimizing their potential use during the construction permit process, requiring holding tanks for floor drains, and through land use regulations restricting development of business and industrial development in areas without municipal infrastructure.

Map 27. Class V Disposal Well Sensitivity



Lake

Stream, River or Ditch

State or U.S. Highway

City

Class V Sensitivity

Sensitive

Not Sensitive

0 5 Miles

N

BLUE EARTH COUNTY

Prepared By: Blue Earth County
Environmental Services
October 2007

Source: Minnesota Department of Health -Published December 20, 2005
"The data shows areas where Class 5 automotive waste disposal wells are likely to present a threat to underground sources of drinking water based on geological conditions. The term "Class 5" refers to a broad category of disposal wells defined under federal regulations. Structures such as the drain fields for septic systems, dry wells, and underground gravel pockets that dispose of fluids used by internal combustion engines are identified as automotive waste disposal wells." - MDH)

SSTS Maintenance and Septage Disposal

The owner of the septic system must maintain their septic system at least every three years by pumping the septic tank to remove septage (scum, grease and sludge) and at the time of pumping assess whether the tank leaks. Septage disposal is regulated by State and EPA. There are no County requirements for septage disposal.

Increased compliance with maintenance requirements will increase the amount of septage requiring management. Septage pumpers are licensed and regulated by the State. Most septage generated in the County is land applied. Factors limiting land application include land availability and wet or frozen conditions. Problems have been observed mainly when the ground is saturated and equipment cannot get in the field. Municipalities generally refuse to accept septage. Municipalities have had concerns about the contents of and potential hazardous substances in septage.

CENTRALIZED, PUBLICLY-OWNED TREATMENT WORKS

City of Mankato Wastewater Treatment Plant

The wastewater treatment plant (WWTP) has grown from the mid-1950's primary settling tanks to the current tertiary treatment facility that produces water which is generally about 0.4 mg/l Total Phosphorus,<5 mg/l in Total Suspended Solids and <2 mg/l Biochemical Oxygen Demand. Current flows are approximately 7.0 million gallons per day (MGD) with a maximum month capacity of 11.25 MGD. The City permits and monitors industrial dischargers through the City's delegated pretreatment program. Local industries have spent millions of dollars to reduce pollutants in their effluent resulting in cleaner water and biosolids end products at the wastewater treatment plant.

A Water Reclamation Facility (WRF) was constructed in 2006 to supply cooling tower needs for an electric power company as well as phosphorus removal for all of the city's needs past current design flows. The WRF was funded by local industry to treat WWTP effluent to California Title 22 Standards for Water Reuse. This level of treatment has been determined to be protective of public health in uses that include: edible food crops; parks and playgrounds; school yards; and residential landscaping. The City will own and operate the WRF in exchange for supply water. This award-winning water reuse project was the first of its kind in the State of Minnesota. Previously all wastewater plant effluent had been treated and then discharged to the Minnesota River.

The City of Mankato WWTP serves the cities /districts of North Mankato, Eagle Lake, South Bend Township, Skyline, and Lake Washington Sanitary District. The City has orderly annexation agreements with Lime Township, South Bend Township and Mankato Township. The City of Madison Lake will be also added in 2008. The lakeshore areas near the City of Madison Lake may eventually be partners with the City of Mankato as well.

Other Blue Earth County Municipalities

Of the remaining municipalities, most are located in the Le Sueur River Watershed. The Good Thunder and Pemberton POTWs were newly constructed within the last 15 years and have been issued phosphorus permits by the MPCA. The City of Mapleton's wastewater discharges to a County ditch in the Cobb River watershed. The City of

Amboy's and City of Vernon Center's wastewater discharges in the Blue Earth River watershed.

The City of Lake Crystal WWTP discharges to Minneopa Creek. The State has designated Minneopa Creek as a Class 7 waters. Class 7 waters are those with "limited resource value for recreation and wildlife." Minneopa Creek is a local and regionally significant water resource with Minneopa State Park located near the confluence of the creek with the Minnesota River. The State's classification of Minneopa Creek should be upgraded to help improve and protect Minneopa Creek. Future construction and upgrades Lake Crystal's POTW should recognize the recreational and water quality goals associated with Minneopa Creek.

IMPLEMENTATION PLAN
Subsurface Sewage Treatment Systems (SSTS)

Water Management Plan Goal:
Prevent and reduce ground and surface water pollution from wastewater with administration of local programs intended to improve subsurface wastewater treatment and reduce wastewater discharges to surface waters.

GUIDING PRINCIPLES:
» Untreated wastewater is a potential threat to public health and can pollute surface and ground water.
» Of the total County population, 77 percent live in a municipality.
» All eleven of the municipalities in Blue Earth County own, or are in partnership with a publicly owned, MPCA-permitted wastewater treatment works (POTW) system.
» The County's land use plans and regulations steer new development of residential, commercial and industrial uses to areas with wastewater services provided by POTW in order to protect surface and ground water, among other issues.
» The County operates an SSTS management program in compliance with Minnesota Rules.
» The County accelerates the rate of SSTS compliance and exceeds State rules with local ordinance requirements triggering upgrades, including compliance inspections for property transfers and permit status review with construction permits.
» Dwellings with direct discharge to surface water, defined as imminent public health threats, are the highest priority.

ONGOING ACTIVITIES:
The County will continue to administer the local SSTS management program, including permitting, inspections, enforcement, education and GIS data base all in accordance with State and local regulations. The County will be updating the *Sewage Treatment Ordinance Section of the County Code* in accordance with new State rules effective February 4, 2008. Reducing public health threats and increasing compliance with State rules with installation of onsite wastewater treatment is an ongoing County program and a priority of the *Water Management Plan 2008-2013*. The County will continue to require compliance inspections at property transfer. The County will continue to require upgrades of failing systems within a specified period of time (currently five years). The GIS permitting and data base system will be enhanced with computer and electronic permitting during the planning period.

The County will continue to address decentralized wastewater treatment through land use planning and ordinances, including *Zoning Ordinance and Subdivision Ordinance Sections of the County Code.* The County will continue to discourage the types of land uses likely to be defined as Class V injection wells, such as automotive repair, vehicle washes, health care, multifamily dwellings, and manufacturing. These are especially a concern in areas identified as having a higher Class V sensitivity and source water protection areas.

The County administers low interest loan programs through watershed projects. The SWCD administers low interest loan program funding through the MDA.

WATER MANAGEMENT PLAN:
Major changes are possible with SSTS programs due to State rule changes. The County will be enhancing data management with GIS and computerized permitting systems. Once data is available for better analysis and with consideration of future MPCA rule changes, planning efforts for possible program/policy changes can take place.

With steadily increasing numbers of SSTS in compliance with State and local regulations and the required maintenance of septic systems, the County may address maintenance education needs and the proper management of septage.

The County will be considering establishing a County-wide, low interest loans program, as the availability of low interest loans on a watershed basis is limited and difficult to administer and promote to the public.

Objective 1: Continue to manage decentralized wastewater treatment with the County SSTS program.

Action 1: Maintain and update the County Ordinance consistent with State Statutes.

Action 2: Issue permits, conduct inspections and maintain records for SSTS in Blue Earth County.

Objective 2: Reduce the number of dwellings defined as imminent public health threats by 50 percent.

Action 1: Update and analyze all available data to reasonably estimate the number of imminent public health threats and determine a baseline to evaluate future results related to this goal.

Action 2: Assess the need for financial incentives, including low interest loans, to accelerate the percentage of compliant SSTS.

Action 3: Evaluate overall compliance levels every one to three years and adjust education and other program components accordingly to meet objective.

Objective 2: Increase compliance with SSTS maintenance requirements.

Action 1: Determine the level of compliance with State regulated maintenance requirements.

Action 2: Work with haulers, property owner representatives and others to identify and address education, disposal and other needs related to septic system maintenance issues.

Objective 3: Evaluate septage management systems, including disposal, storage and land application.

Action 1: Identify the septage management systems of each contractor in the County.

Action 2: Work with pumpers, contractors, municipalities and other representatives to assess needs related to septage management in Blue Earth County.

Priority Concern: Surface Water

Urban Development, Stormwater Runoff and Pesticides

PRIORITY CONCERN: Urban Development, Stormwater Runoff and Pesticides

Water Plan Management Goal:
Protect and improve water quality by promoting and establishing stormwater management practices that reduce pesticides, fertilizers and other pollutants in runoff and reduce the rate and volume of stormwater runoff to reduce erosion.

Priority Concern

Urban stormwater runoff refers to rain water and snow melt runoff from impervious surfaces and urban type of development such as residential subdivisions, shoreland areas, commercial, business, industrial, institutional, government, and roadways located in incorporated and unincorporated areas. Pollutants contained in stormwater runoff include pesticides, nutrients, petroleum, refuse, leaves and grass, chemicals and other contaminants. Stormwater runoff can also increase the rate erosion of stream banks, ditches, gullies, and outfalls. Increasing infiltration in urban areas reduces the volume and erosion potential of stormwater discharge. Reducing pollutants in stormwater runoff and encouraging changes in urban stormwater management programs to minimize erosion are priority actions in the *Water Management Plan 2008-2013*.

Priority Concerns Assessment

Conversion of land from agricultural and open space to urban use is likely the greatest threat to natural resources in the County. New development in the Northeast corner of the County and Lake Crystal are the main areas of concern, as these areas of the County are growing. The Northeast area includes the City of Mankato, City of Madison Lake, City of Eagle Lake, Jamestown Township, Le Ray Township, Lime Township, South Bend Township and Mankato Township. New development is a mainly a concern for three reasons: 1) sediment in construction runoff, 2) pollutants in runoff after construction, and 3) changes in hydrology as a result of stormwater infrastructure and increased impervious surfaces.

When an area is developed, runoff is channeled into road gutters, storm sewers and paved channels. The amount of rainfall that can infiltrate into the soil is reduced with increases the volume of runoff from the watershed. Stormwater runoff also increases the velocity of water and decreases the time it takes to convey it to the outlet. With these increases, previously stable channels erode and widen. This occurs in stream channels as well as ravines, ditches and stormwater outlets. The resulting sedimentation is harmful to fish and other aquatic species and is harmful to vegetation and habitat.

Future urban development impacts can be minimized with new approaches to municipal stormwater management infrastructure and related development policy including low impact development strategies and storm water retention systems engineered to protect downstream channels. Retrofitting is possible but can be expensive and may not be necessary, practical or cost effective in some of the smaller communities in the County.

Low impact development
Stormwater management design, infrastructure needs and local policy can address some of the effects of development. Model ordinances and other information related to low impact development and alternative subdivision design is available from the DNR, MPCA Stormwater Manual, the Nonpoint Education for Municipal Officials (NEMO) program, the Center for Watershed Protection, MPCA Stormwater Manual, and other sources.

Key water quality points included in NEMO model ordinances:

- Provide standards for measuring velocity and volume of runoff.
- Making maximum use of infiltration, including standards and technologies, given the variety of soil types, topography and extent of existing development.
- Ensure annual runoff rates and volumes from post development site conditions mimic the annual runoff sites and volumes from predevelopment site conditions.
- Regulating the amount and types of impervious surfaces.
- Protect functional value of wetlands and natural water courses.
- Provide plant and animal habitat.
- Promote watershed-based stormwater management.
- Promote infiltration and ground water recharge.
- Provide a vegetated corridor (buffer) to protect water resources from development.
- Provide no increase in temperature.
- Protect life and property from dangers of flooding.
- Protect public and private property from damage resulting from runoff or erosion.

Runoff from urban land use can also contain pesticides, fertilizers, oil, heavy metals and other pollutants from residential areas and businesses. Research has shown that, urban stormwater runoff does contain significant amounts of fertilizer and pesticides. Compared with runoff from cropland urban runoff contains more nutrients per-acre. In Blue Earth County, the proportion of urban land use, including cities, farmsteads and rural development, occupies less than four percent of the total land area.

Addressing the problem of improper use of pesticides, fertilizers and other potentially hazardous substances by residents is largely an issue of education, as these products are used in relatively small amounts by individuals. Municipalities educate citizens with flyers, advertising and programs such as storm drain stenciling. Education programs, such as promoting rain barrels, rain gardens and other landscaping techniques can also be incorporated in municipal education programs.

Regulations relating to the sales and use of pesticides and fertilizers are preempted by the State of Minnesota. The State has greatly limited the availability and use of phosphorus in lawn fertilizers sold to residential consumers.

MPCA STORMWATER PROGRAM

Construction sites

Erosion from construction sites can be substantial. The EPA and MPCA estimate soil erosion from construction sites to be significantly higher per acre compared with agricultural land use. Soil disturbance is inherent to the construction process, as heavy equipment and vehicles move on and off the site almost daily compacting soil, dragging and tracking soil off site and destroying vegetation. Exposed and tracked soil is easily carried with stormwater directly to surface water or through the storm sewer.

The MPCA regulates stormwater runoff from construction sites with NPDES permits. Since 2003, NPDES permits are required for any construction activity disturbing:

- One or more acre of soil
- Less than one acre of soil if the activity is part of a "larger common plan of development or sale" that is greater than one acre
- Less than one acre of soil if the MPCA determines the activity poses a risk to water resources

Most construction activities are covered by the General NPDES Stormwater Permit, but some construction sites need individual permit coverage. Owners and operators are both responsible for submitting the permit application. Applications for the MPCA General NPDES Stormwater Permit can be made on the MPCA web site.

The MPCA has asked all local governments, including Blue Earth County, to provide general information about the stormwater NPDES permit requirements for construction when issuing local construction permits to encourage compliance with these State regulations.

Industry

Hazardous materials and substances used in industry can leak or spill and even small amounts can be carried with stormwater runoff. The MPCA regulates stormwater run off from industrial sites with NPDES permits. The MPCA Industrial NPDES rules and permit are in revision process. Current Federal regulations require sites with primary activities or Standard Industrial Codes (SIC) that fall under any of the following obtain MPCA NPDES stormwater permit coverage:

- Hazardous waste treatment, storage, or disposal facilities
- Landfills
- Steam electric power generating facilities
- Junkyards, used motor vehicle parts, scrap and waste materials
- Motor freight and warehousing, transportation equipment
- Transportation related activities if they do any maintenance, fueling or clearing
- Food
- Lumber, paper, printing and publishing
- Furniture and fixtures
- Electronics and electrical components; measuring and controlling instruments
- Photographic; medical and optical goods
- Industrial commercial machinery and computer equipment
- Stone, clay, glass and concrete products

- Rubber and miscellaneous plastic products
- Mining and quarrying of nonmetallic minerals
- Chemicals and allied products

Municipalities
The MPCA phased in Clean Water Act stormwater regulations for municipalities based on size. Mankato is the only municipality in Blue Earth County with a population exceeding the threshold regulated by the MPCA. The City of Mankato was part of Phase II which requires preparation of a Stormwater Pollution Prevention Plan (SWPPP). The smaller communities in the County are not required to prepare a SWPPP.

City of Mankato Stormwater Pollution Prevention Plan

Mankato is identified as an MS4 community under the Clean Water Act and was required to prepare a Stormwater Pollution Prevention Plan (SWPPP) in 2007. The City of Mankato's SWPPP addresses:

1) Public education
2) Public participation
3) Illicit discharge, detection and elimination
4) Construction site runoff
5) Post-construction site runoff control
6) Pollution prevention housekeeping

The City of Mankato has adopted local regulations addressing stormwater. The City's new Erosion and Sediment Control Ordinance regulates construction site erosion, sediment and drainage work and exceeds the MPCA's NPDES permit requirements. The City requires all sediment be removed from city streets at the end of each day. The City Stormwater System Ordinance also regulates the temperature, color and type of liquids and waste discharged to a storm sewer.

The City also conducts public education activities, including bill stuffers, press releases and workshops for managing construction site runoff.

LOCAL STORMWATER MANAGEMENT PROGRAMS

All of the municipalities in the County can apply best management practices, programs and policies to reduce stormwater pollution impacts. Some of the municipalities currently operate yard waste and curb-side leaf collection programs, use corn-based road de-icing products and send information to individual homeowners about responsible use of pesticides, fertilizers and keeping grass clippings on the lawn. All municipalities in the County contract with a consultant engineering firm for City engineering services.

Shoreland Areas
Erosion and sedimentation, chemical pollutants, and temperature are all concerns related to urban development in shoreland areas. Wetlands are also impacted by urban land uses and runoff. Removing shore vegetation harms fish and other wildlife habitat and increases the erosive effects of lake waves along the shore of lakes and wetlands.

The long-term effects of development are more difficult to correct as water leaves lakes relatively slowly and pollutants settle and are trapped in the lake. Shoreland management around the County's lakes and wetlands is increasingly important as development pressure increases.

Northeast Corner

The City of Madison Lake and the City of Eagle Lake are growing relatively rapidly in an area of the County with the highest density of lakes and wetlands sensitive to runoff, erosion and sedimentation. With proximity to Mankato, new roadways and extension of utilities, increased development pressure is expected in this area within the planning period. Extension of wastewater utilities to Madison Lake is planned in 2008, and the formation of a sewer district involving Madison, Duck and Ballantyne Lakes is being discussed. This extension of wastewater utilities will likely increase development pressure around these lakes.

The shoreland areas of Duck Lake, Lake Ballantyne, and Madison Lake, are developed with residential subdivisions and seasonal cabins of varying ages and densities. The County anticipates conversion from seasonal to year-round use in this area in the next 5-20 years. The shoreland area of Duck Lake is densely developed with small, seasonal cabins. Most of these seasonal dwellings utilize holding tanks. Over time small cabins will likely be expanded or replaced.

A small part of the southern shore of Lake Washington is located in Blue Earth County. The dwellings on Lake Washington and part of Lake George are part of a sewer district partnership with the City of Mankato.

Duck Lake and Washington Lake are on the MPCA impaired waters list.

Lake Crystal

The City of Lake Crystal and industrial areas near the City, such as Northstar Ethanol and Crysteel, has been growing. Crystal Lake and Minneopa Creek are both receiving waters for the City's stormwater drainage.

Both Crystal Lake and Minneopa Creek are on the MPCA impaired waters list.

Shoreland Regulations

All urban stormwater discharges to surface waters, including lakes, rivers, streams, ditches and wetlands. Some municipalities are located adjacent to a lake or river and are responsible for regulating land use within 1,000 feet of the lake and 300 feet of the river. Oversight of each City's Shoreland Ordinance is the responsibility of the DNR. The following municipalities contain shoreland areas.

Lake Crystal – Crystal Lake, Loon Lake, Minneopa Creek
Madison Lake – Madison Lake, Duck Lake
Mankato – Minnesota River, Blue Earth River, Indian Creek
St. Clair – Le Sueur River

Most land use in shoreland areas is regulated by the County, but Lime Township, Mankato Township and Pleasant Mound Township also regulate land use in shoreland areas. Many of the small, undeveloped lakes are currently protected from dense development by the County land use regulations. With continued Agricultural District zoning and limited density standards, the lakeshores will continue to be protected from

development impacts. The County's land use plans and regulations steer development toward municipalities by restricting development density. In most of the County, residential development is limited to one dwelling per quarter of a quarter-section of land. This generally means one dwelling in 40 acres. The County also restricts the creation of new subdivisions and other development in "urban fringe overlap districts" surrounding Mankato, Madison Lake and along parts of County Road 90.

City and County Parks

Most of the County parks are located in shoreland areas. The County Parks Department has included rain gardens in conjunction with improvements to public canoe and boat accesses on George Lake and the Le Sueur River as a means to control and treat stormwater runoff from paved parking areas. The County has also restored wetlands in County Parks. The following is a list of existing County parkland and the river or lake associated with each.

Bray Park – Madison Lake
Lone Pine Rest Area – Madison Lake
Daly Park – Lura Lake
Duck Lake Park – Duck Lake
Lake George Park – Lake George
Rapidan Dam Park – Blue Earth River
Red Jacket Trail Park – Le Sueur River
Indian Lake Conservation Area – Indian Lake – Indian Creek Watershed
Schimek Conservation Area – Maple River
Wildwood Conservation Area – Le Sueur River
Eagle Lake Wayside Area – Eagle Lake
Hungry Hollow Stop – Le Sueur River
Watonwan Stop – Watonwan River
Williams Nature Center – Minneopa Creek and the Minnesota River

The City of Mankato is redeveloping the Minnesota River corridor, including the Sibley Park area on the Blue Earth River, to bring residents and visitors closer to the river. These redevelopment projects will reduce urban runoff to the river and in some cases the shore areas will be improved and erosion reduced.

The City and County are also concerned about development increasing erosion and sedimentation in the Indian Creek watershed, as Indian Creek is part of the Minnesota River flood control project and City and County parks and trails system.

State parks, including Minneopa State Park along the Minnesota River west of Mankato and the Sakatah Trail, are important park systems for local and regional users.

County Ditch Impacts

Municipalities are part of several County ditch watersheds in Blue Earth County. Some stormwater drainage systems have increased the rate and volume of water to a few County ditches causing erosion at the outfall and downstream. The City of Mapleton's and the City of Amboy's wastewater treatment stabilization ponds and stormwater systems discharge to a County ditch. The County has worked with the City of Amboy and Good Thunder on these issues. A portion of the City of Lake Crystal's stormwater system discharges to a County ditch.

In Mankato, Eagle Lake and Madison Lake, urban growth and conversions of cropland to urban land uses have impacted County ditches. Issues related to urban drainage connections with County ditches are concerns primarily in areas where conversion of agricultural land to urban type of land uses is occurring. County ditch concerns at the urban and rural interface most often involve legal or management issues of the ditch and immediately surrounding land uses. These are addressed by the each city during the land development phase. The City of Mankato's recent changes in stormwater management policy will likely reduce hydrologic impacts related to changes in the urban storm water input to the affected County ditches in the area. The County Ditch Authority works with each municipality as needed to identify problem areas and ensure compliance with the Drainage Code.

Local Plans and Policies

The County is working on a comprehensive natural resources plan, a *Greenprint* for Blue Earth County. The *Greenprint* identifies, assesses and prioritizes the combined natural resources and infrastructure needs of the County, including municipalities. County-wide and regional water quality, stormwater infrastructure, recreation and wildlife needs are combined in the plan.

City of Mankato

The City of Mankato has completed two Alternative Urban Area Review (AUAR) projects on several thousand acres east and northeast of the City under the State Environmental Review Law. The City identified high priority areas for natural resources protection and enhancement based on the draft *Greenprint* plan. The County Highway Department, County Ditch Manager, County Environmental Services and SWCD Manager participated in the AUAR process.

IMPLEMENTATION PLAN
Urban Development, Stormwater Runoff and Pesticides

Water Plan Management Goals:
Protect and improve water quality by promoting and establishing stormwater management practices that reduce the rate and volume of stormwater runoff, erosion, and use of pesticides and fertilizers.

PRIORITY CONCERN:
Urban stormwater runoff refers to rain water and snow melt runoff from impervious surfaces and urban type of development such as residential subdivisions, shoreland areas, commercial, business, industrial, institutional, government, and roadways located in both incorporated and unincorporated areas. Pollutants contained in stormwater runoff include pesticides, nutrients, petroleum, refuse, leaves and grass, chemicals and other contaminants. Stormwater runoff and management systems can also increase the rate erosion of stream banks, ditches, gullies, and outfalls. Increasing infiltration in urban areas reduces the volume and erosion potential of stormwater discharge. Reducing pollutants in stormwater runoff and encouraging changes in urban stormwater management programs to minimize erosion potential are priority actions in the *Water Management Plan 2008-2013*.

GUIDING PRINCIPLES:
» Impervious surfaces prevent infiltration of rain water and snow melt increasing the rate and total volume of runoff.
» Stormwater runoff from urban areas can contain high amounts of pesticides, nutrients, metals and other pollutants.
» Soils can be compacted, infiltration properties reduced and runoff increased as a result of site grading and construction of all types of land use.
» Stormwater runoff from construction sites and industry contain sediment and may contain hazardous pollutants.
» Stormwater management systems that reduce the rate and volume of runoff can protect downstream channels and prevent gully and bank erosion.
» Stormwater management and regulations within municipalities are the responsibility of each City.
» Land use planning and regulations at the County, City and Township level, including zoning, shoreland and subdivision ordinances, generally control where development can occur and can help address stormwater management by controlling growth and incorporating best management and low impact development practices.
» Due to sensitivity of the resource, lake shoreland and wetland areas in the County should be managed with consideration of stormwater runoff impacts.
» The State regulates and permits stormwater runoff from construction sites and industry.
» The City of Mankato's stormwater management program is regulated by the State.

» Pesticide sales and use, including retail sales and homeowner use, is the responsibility of State and Federal government.
» The Minnesota Department of Agriculture is responsible for monitoring surface and ground water for pesticides.

ONGOING ACTIVITIES:
The County will continue to administer local land use regulations and provide information and technical assistance to all municipalities. The County and SWCD will continue to participate in EAW, EIS and AUAR under the Minnesota Environmental Review Statute.

WATER MANAGEMENT PLAN:
The County will be working with all municipalities and townships on planning and land development issues as part of the comprehensive natural resources planning project, the *Greenprint* for Blue Earth County, and the *County Water Management Plan 2008-2013*. There will be a special focus in the most developing areas of the County, including the Northeast corner (Mankato, Eagle Lake and Madison Lake) and Lake Crystal. The County will encourage all municipalities, Lime Township and Mankato Township to review local plans and ordinances, making amendments as needed to control stormwater runoff from new development and incorporate low impact design strategies in new development. In addition to City officials and citizens, this will involve support from each City's consulting engineers and other technical resources and consultants. The County will also be working with the City of Mankato, maximizing opportunities to share education outreach and technical services with Mankato and other communities when possible. Existing municipal stormwater outlets will be reviewed to determine the need and potential for structural solutions to erosion and other water quality problems and the availability of existing resources. The County will be updating the Comprehensive Land Use Plan and stormwater management will be addressed.

Objective 1: Encourage municipalities and Townships to review and revise stormwater, zoning and subdivision ordinances to protect water resources.

Action 1: Work with City staff, engineers and consultants to provide each City with general information about urban stormwater runoff impacts.

Action 2: Work with the City staff, engineers, consultants, NEMO, DNR and others as appropriate to provide each City with model ordinances to address development and stormwater impacts.

Action 3: Assess the need and seek funding for consultant services to review and rewrite local ordinances, if needed.

Action 4: Work with Mankato Township and Lime Township to provide each with general information about urban stormwater runoff impacts and model ordinances to address stormwater impacts.

Objective 2: Reduce erosion at existing urban stormwater outlet structures.

Action 1: Work with City staff, engineers, SWCD and the County Ditch Manager to inventory and evaluate stormwater outlets to determine where erosion problems exist.

Action 2: Identify short-term and long-range solutions to stormwater runoff problems and construct structures, retention areas and other conservation practices where needed.

Action 3: Work with City staff and SWCD to seek funding for Action 2 if needed.

Objective 3: Reduce erosion from construction sites.

Action 1: Provide general information about MPCA NPDES permit rules to municipalities (not Mankato) and Mankato Township staff.

Action 2: Provide general information about MPCA NPDES permit rules along with construction permits issued by the County.

Action 3: Work with staff of municipalities, MPCA stormwater staff and others to assess compliance and educational needs related to State NPDES permit requirements.

Action 4: The City of Mankato will continue implementation of its Stormwater Pollution Prevention Plan, partnering with the County and local municipalities for education and other activities when appropriate.

Objective 4: Promote homeowner best management practices to reduce pesticides, fertilizer and other pollutants generated by lawn, garage and home care.

Action 1: Work with city staff to provide data and information and sample educational materials, flyers, posters, etc. from the City of Mankato and other sources.

Action 2: Include BMP's in County and SWCD newsletters, web sites and other outreach activities.

Objective 5: Protect sensitive lake shoreland areas from development.

Action 1: Assess the shoreland and riparian areas of all lakes, especially those with greatest likelihood of development such as Madison, Duck, Ballantyne, George, Eagle, Lura, Crystal, Loon, and Mills Lakes, to provide a baseline and general information for the County Planning Commission and the affected municipalities.

Action 2: Address shoreline protection in the County's Comprehensive Land Use Plan and amend County land use regulations to protect shoreland areas from development impacts.

Objective 6: City and County park systems will continue to develop and redevelop shoreland areas providing public access, reducing runoff, and protecting stream banks and shoreland.

Action 1: The County Parks Department will continue to utilize and promote best management practices, such as rain gardens and use of native vegetation, in all County parks, as appropriate.

Action 2: The County will continue to work with lake associations, local conservation organizations, the DNR and other State agencies to stabilize shoreland areas in County Parks where needed and as funding is available.

Action 3: The City of Mankato will continue to redevelop waterfront areas, trails and parkways along the Minnesota River, Blue Earth River, Indian Creek, and Thompson Creek to improve water quality and provide education and access to the river for residents and visitors where appropriate and as funding is available.

Priority Concern: Wetlands

Priority Concern: Wildlife

PRIORITY CONCERNS: Wetlands and Wildlife

Water Plan Management Goal:
Maximize opportunities to protect, enhance and restore wetlands and other natural areas to improve water quality, fisheries, wildlife habitat, recreation and land conservation.

Priority Concern

Most of the County's pre-settlement wetlands were lost due to drainage for agriculture, community development and transportation. While all land uses can harm the ecological value of wetlands, urban development is likely the greatest threat to permanent loss of wetland quantity and quality in Blue Earth County at this time. The natural services provided by healthy wetlands are important for water quality, flood control, and wildlife. Identifying, assessing and prioritizing wetland areas for protection and enhancement and restoring wetlands is a continuation of the County's Greenprint Plan and are priorities of the *Water Management Plan 2008-2013.*

Priority Concern Assessment

Appreciation of wetlands is growing as awareness of the functions and benefits of wetlands are increasingly demonstrated. Even with more than half of the State's wetlands lost and Federal, State and local regulations protecting wetlands, wetland losses of quantity and quality continues. This is a concern in Blue Earth County where most of the pre-settlement wetlands have been drained.

Wetland functions and values are numerous and vary depending on location in the landscape and other factors. Some of the benefits of wetlands include:

Water quality
Wetlands filter and absorb polluted surface water runoff before it enters lakes and rivers downstream.

Flood control and low flow augmentation
Wetlands serve as holding areas for water. When rainfall is heavy, wetlands slow the flow of water, reducing flood damage and soil erosion downstream. During drought, slow release of water from wetlands may help maintain stream flows, and may help recharge groundwater supplies.

Fish and wildlife habitat
Wetlands provide a permanent or seasonal home to fish and wildlife, including some threatened or endangered species. Wetlands also indirectly support many species by breaking down large amounts of leaves and stems for food for insects, amphibians and fish.

Education and recreation
Wetlands offer great opportunities for education and recreation. Recreational benefits include fishing, hunting, bird-watching and hiking. Many of the parks and trails in the County are located next to wetlands. Schools visit wetlands to learn about aquatic plants and animals.

Wetlands are described as lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands have the following three attributes:

- a predominance of hydric soils
- are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions; and
- under normal circumstances support a prevalence of such vegetation.

Regulations Protecting Wetlands

With increasing knowledge of the benefits of wetlands, wetland management, including both protection and restoration, has become increasingly important. Concern about the loss of wetlands resulted in legislation at the State and Federal level to protect wetlands. Wetland laws protect wetlands from drainage but also provide exemptions and allow for filling and replacement. The real effectiveness of wetland laws in achieving "no net loss" goals related to wetland quantity is not well understood for many reasons related to coordination and reporting, and very little is known about wetland quality trends in Minnesota. The State is developing methods to improve their ability to monitor and assess status and trends in wetland quantity and quality.

The major wetland laws include the Wetland Conservation Act, Minnesota Public Waters and the Federal Clean Water Act, Section 404. Two or more programs can overlap on the same wetland or even portions of the same wetland. Coordination among laws protecting wetlands can be confusing for local government and land owners. The Food Security Act's "Swamp Buster" provisions protect wetlands in agricultural areas.

Minnesota Public Waters Wetlands
Minnesota Statutes, Section 103G.005, designates some wetlands as public waters, including:

- Water basins are assigned a shoreland management classification, including wetlands. Wetlands less than 80 acres in size are classified as natural environment lakes.
- Water basins designated for management for a specific purpose such as a trout lake and game lake;
- All types 3, 4 and 5 wetlands, as defined in U.S. Fish and Wildlife Service (USFWS) Circular No. 39, not included in the definition of public waters, that are ten or more acres in size in unincorporated areas or 2.5 acres or more in incorporated areas.

The DNR maintains an inventory of all public waters wetlands. Public waters wetlands are shown on an official map available from the DNR. The OHWL is used to determine

the boundary of public waters wetlands. Public waters work permits are required for excavation, filling and other impacts on all public waters wetlands.

Some public waters wetlands with shoreland management classification are also regulated by the Shoreland Ordinance Section of the Blue Earth County Code. Map 8 displays the streams, lakes and wetlands currently protected by the County Code.

Minnesota Wetland Conservation Act

The purpose of the Wetland Conservation Act, Minnesota Statutes, Chapter 8420.0100, is to:

A. achieve no net loss in the quantity, quality, and biological diversity of Minnesota's existing wetlands;
B. increase the quantity, quality, and biological diversity of Minnesota's wetlands by restoring or enhancing diminished of drained wetlands;
C. avoid direct or indirect impacts from activities that destroy or diminish the quantity, quality, and biological diversity or wetlands; and
D. replace wetland values where avoidance to activity is not feasible or prudent.

Implementation of Wetland Conservation Act is the responsibility of both State and local government. BWSR promulgates administrative rules for the program, provides training to local government units (LGUs), participates on technical evaluations panels (TEP), hears appeals from local government determinations, and assures proper implementation by LGUs.

The LGU is responsible for making the initial regulatory determinations for the program. Within Blue Earth County, the City of Mankato administers WCA and a separate TEP, and the County administers WCA in the remainder of the County.

DNR conservation officers issue enforcement orders including cease and desist, restoration and replacement orders. Cease and desist and restoration or replacement orders are not criminal charges; however, violation of a cease and desist or restoration or replacement order is a misdemeanor. Cease and desist and restoration or replacement orders may also be enforced civilly by action for injunction in district court.

Federal Clean Water Act, Section 404

A permit must be obtained from the United States Army Corps of Engineers for non-exempt discharges of dredged or fill material into waters of the United States, including jurisdictional wetlands and wetlands adjacent to waters.

U.S. Department of Agriculture 1985 Food Security Act

Food Security Act rules do not allow new drainage systems or improvements to an existing drainage system that alter the hydrology of wetlands. In order for a land owner/operator to be eligible for USDA program benefits, including loans, subsidies, crop insurance and price support programs, wetlands existing after December 23, 1985, cannot be drained or altered by drainage activities or repairs. An AG-1026 form is used by the land owner to request NRCS determinations of potential impacts for projects disturbing agricultural land, including tile drainage projects. The NRCS makes a determination of the potential lateral effect associated with the drainage project. USDA forms, permits and other information related to land alteration and farming practices on private land are considered private data and not available for public review.

Wetland Boundary Determinations
Lacking a County wide inventory of wetlands, wetland boundaries must be determined when there could be wetland impacts. Wetland boundary determinations are most often necessitated by a development proposal.

A number of manuals and resources are used for determining wetland boundaries by the Federal, State and local government. Basically, three conditions are evaluated in a wetland determination: soils, hydrology and vegetation.

- **Soils-** Wetlands have mostly hydric soils. These are soils that developed in wet conditions.
- **Hydrology-** Wetlands have standing water or saturated soil for at least part of the growing season.
- **Vegetation-** Wetlands have vegetation adapted to wet soil conditions.

WCA Replacement Plan Sequencing
The replacement plan applicant must demonstrate compliance with "sequencing." Specifically, the applicant must demonstrate that:

1. *Avoid.* Wetland impacts have been avoided as much as possible.

2. *Minimize*. To the extent wetland impacts cannot be avoided, the impacts have been minimized.

3. *Replace*. Unavoidably impacted wetlands have been replaced by restoring or creating wetlands of equal or greater public value.

WCA Replacement Plan Requirements
The rules contain numerous specific requirements as to the location, size, and type, etc. of replacement wetlands. In brief summary, some of the major requirements include the following:

Type. Replacement may be provided by wetland restoration or creation. Restoration is preferred over creation.

*Location***.** On-site is preferred over off-site replacement. If not on-site, then the replacement site typically must be in the same or adjacent watershed or county, with exceptions for public transportation projects.

Size. The minimum replacement ratio is generally two acres of replacement wetland for each acre of impacted wetland. WCA replacement ratios vary for restoration in advance of project impacts, establishment of upland buffer areas contiguous to replacement wetlands, and other factors.

Wetland Inventory

Most of the wetlands in Blue Earth County have been lost or drained. While limited in their use for planning and regulatory purposes, the NWI and Minnesota Public Waters

Wetlands are the only inventories of existing wetlands. In order to achieve public goals for preserving wetlands and comply with purpose and requirements of the WCA, the existence and boundaries of wetlands must be determined on a site-by-site basis.

While an inventory of drained wetlands can be helpful, an inventory of existing wetlands combined with a plan identifying and prioritizing areas for wetland restoration are more useful for the purpose of achieving "no net loss" wetland goals related to wetland quantity, quality and the WCA sequencing requirements for restoration activities to be of equal or greater public value.

Potentially restorable wetlands have been identified and mapped by the Ducks Unlimited organization. With a BWSR Challenge Grant, Blue Earth County and MSU-WRC completed an inventory of potentially restorable wetlands. This inventory was completed using 1993 FSA aerial photos to document crop damage caused by standing water or "wet spots" in farm fields following the unusually heavy rainfall and flooding during the summer in 1993. These "wet spots" may point to potentially restorable wetlands.

WETLAND MANAGEMENT IN BLUE EARTH COUNTY

The Wetland Conservation Act (WCA) is the primary tool used for protection of wetlands in Blue Earth County. The Blue Earth County Environmental Services Department administers the WCA in all areas of the County, with the exception of the City of Mankato and publicly owned lands as described in WCA rules. The City of Mankato administers the WCA separately from the County.

Administration of the WCA requires appointment of a Technical Evaluation Panel (TEP). Blue Earth County's TEP includes the SWCD Manager, County Highway Department representative, local BWSR Conservationist and local DNR Hydrologist. The City of Mankato's TEP includes the same SWCD and BWSR staff, the City Engineer and a City Planner.

Administration of the WCA in the County primarily involves urban development, mostly in the northeast area of the County. Urban growth in the County has impacted wetlands and increased the time County and City staff and TEP members devote to the WCA. Many of the wetland determinations involve cropland being converted to urban land use and review of wetland delineations prepared by the land owner or developer's consultant.

Wetland delineations on existing cropland are difficult. Vegetation is virtually non-existent and subsurface drainage to lower the water table is common. Hydric soils are the dominant soil type in the County necessitating drainage for crop production, and many non-hydric soil units have inclusions of hydric soils in drainage ways and depressed areas.

Public agencies at all levels of government respond to public inquiries related to wetlands for general information, technical guidance and regulatory requirements. The SWCD and NRCS are frequently the first local agencies contacted by land owners/operators. The SWCD is involved with many wetland restoration projects and works with many partners, including the USFWS, DNR, BWSR and the County Ditch Authority/Manager. The level of SWCD technical involvement with establishing and

restoring wetlands generally relates to the availability of financial assistance through the SWCD. The SWCD participated in the Minnesota River Conservation Reserve Enhancement Protection (CREP), marketing and establishing sites in Blue Earth County.

Agricultural land uses also impact wetlands. Even though restricted, agricultural drainage impacts to wetlands still occur today. Land owners continue to expand tile drainage systems. Some land owners find alternative outlets to County ditches in order to avoid ditch improvements. Generally, only dramatic wetland impacts are observed on the landscape when, for example, water levels in a wetland appear lower over a number of years. At the State or local level, there are no permits required or tracking methods to monitor tile drainage.

In both urban and rural areas wetland hydrology is impacted when surface water flows are rerouted with new tile drainage or with grading changes and urban storm water infrastructure interrupting the natural surface drainage supplying water to a wetland. Reduced water levels can decrease the wetland's wildlife habitat and ground water recharge benefits.

High Priority Regions and Areas

More than 50% of the pre-settlement wetlands in Blue Earth County have been lost. Due to the high percentage of lost wetlands, the County is considered a "high priority region" for preservation, enhancement, restoration, and establishment of wetlands, according to the WCA, Section 8420.0350, Subparts 1 and 2. The WCA requires Counties in high priority regions to identify in the County Water Management Plan those areas that qualify as "high priority areas" for wetland preservation, enhancement, restoration and establishment.

Minnesota Statutes, Chapter 8420, Wetland Conservation Act Rules, Section 8420.0350, state:

> "Plans should give strong consideration to identifying as high priority areas minor watersheds having less than 50 percent of their original wetland acreages, and intact wetlands, diminished wetlands, and the areas once occupied by wetlands that have been diminished or eliminated and could feasibly be restored taking into account the present hydrology and use of the area. Plans should give strong consideration to identifying as high priority areas all type 1 or 2 wetlands, and other wetlands at risk of being lost by permanent conversion to other uses. When individual wetlands are identified as high priority for preservation and restoration, the high priority area shall include the wetland and an adjacent buffer strip not less than 16.5 feet wide around the perimeter of the wetland and may include up to four acres of upland for each wetland acre."
>
> "In all counties, plans may identify additional high priority areas where preservation, enhancement, restoration, and establishment of wetlands would have high public value by providing benefits for water quality, flood water retention, public recreation, commercial use, and other public uses. High priority areas should be delineated by minor or major watershed. For the purposes of this part, "watershed" means major or minor watershed or sub-watershed. To identify high priority areas, the local government unit shall consider at a minimum those items listed in part 8420.0103. (Public value of wetlands)"

Wetland Functions for Determining Public Values.
Minnesota Statutes, Chapter 8420.013, WCA, defines the publicly valued functions of wetlands. The public values of wetlands must be based upon the functions of wetlands, including:

A. A.water quality, including filtering of pollutants to surface and ground water, utilization of nutrients that would otherwise pollute public waters, trapping of sediments, shoreline protection, and utilization of the wetland as a recharge area for groundwater;
B. flood water and stormwater retention, including the potential for flooding in the watershed, the value of property subject to flooding, and the reduction in fish, wildlife, and native plant habitats;
C. low-flow augmentation;
D. other functions, values and public uses as identified in BWSR-approved wetland evaluation methods.
E. potential flooding by the wetland;
F. public recreation and education, including hunting and fishing areas, wildlife viewing areas, and nature areas;
G. commercial uses, including wild rice and cranberry growing and harvesting, and aquaculture;

The board shall review the inclusion of high priority areas in plans as part of the standard process for plan review established in statute.

Virtually all minor watersheds in Blue Earth County have less than 50% of their original wetland acreage. This causes the entire County to be designated as a high priority area for wetland restoration. Wetlands in the areas near Mankato, Eagle Lake and Madison Lake in the Middle Minnesota River Watershed and the adjacent watersheds of the lower Blue Earth River and lower Le Sueur River are the most likely to be impacted by permanent conversion to other uses.

The *Comprehensive County Water Plan 1998-2007* cited sections of the WCA that suggested criteria for determining high priority areas for wetland restoration. These criteria were removed from WCA; however the County continues to consider those criteria useful for prioritizing as they can be used to categorize landscape and social conditions related to the function of wetlands for water quality, flood control, wildlife and recreation. These criteria include the following:

Water Quality and Quantity

Land Use and Cover Crops.
Wetlands located in watersheds having a high proportion of cultivated land, developed areas or other intensive land use are likely to have high value for water quality and flood water retention.

Wetland and watershed ratio.
Wetlands located in watersheds having a low proportion of wetlands relative to the size of the watershed are likely to have high value for water quality and flood water retention.

Soil erosion rates.
Wetlands located in watersheds where erosion rates are high are likely to have high value for flood water retention and water quality.

Watershed gradient.
Wetlands in watersheds where the difference between the highest and lowest points of the watershed is great are likely to have high value for water retention and water quality.

Surface water retention.
Wetlands in watersheds where direct runoff is high are likely to have high value for flood water retention and water quality.

Soil fertility.
Wetlands in watersheds where soil fertility is high are likely to have high value for water quality, wildlife habitat and commercial uses.

Geology.
Wetlands in watersheds with high subsurface permeability are likely to have high value for ground water recharge and water quality.

Wildlife and Recreation

Wetland complexes.
Wetlands in watersheds where a diversity of wetland types and sizes are or were historically present are likely to have high value for public recreation and benefit to wildlife.

Proximity to population centers.
Wetlands in watersheds that are close to population centers are likely to have high value for water quality, flood water retention, public recreation, and commercial uses.

Public ownership.
Wetlands in watersheds with a high proportion of land in public ownership are likely to have a high value for public recreation.

Significant wildlife use.
Wetlands in watersheds with current or historical records of use by significant numbers or species of wildlife or fish are likely to have high value for public recreation and commercial uses.

Local Comprehensive Wetland Protection and Management Plan
Currently the Wetland Conservation Act (WCA) is the primary "tool" used for wetland management. A major weakness of the WCA is its administration on a site by site basis. A comprehensive view of function and value within local context is absent from WCA. There is a common belief that a lot of effort and expense goes into wetlands of lesser value because of the 'one-size-fits-all' approach to protection of wetlands.

Local units of government were given the authority to develop a comprehensive wetland protection and management plan as an alternative to following parts of the State's WCA rules. These plans allow sequencing flexibility, replacement location flexibility, and integration of wetland protection into local land use controls.

A *Comprehensive Wetland Protection and Management Plan* for Blue Earth County has the potential to protect and preserve existing wetlands, as measured by acreage as well as functions and values, from direct, indirect and cumulative adverse impacts. Without adequate protection measures at the local government level, conversion of agricultural land and natural areas to urban land uses results in a permanent loss of or damage to all natural resources including wetlands. To provide a proactive, workable wetland management strategy, the area and context of a wetland can be assessed by comparing the characteristics of urban, rural or natural environment settings as described in the *Minnesota Wetland Conservation Plan*. The comparison can include the context of the wetland as it exists both before development and a realistic view of post-development impacts.

Urban development is viewed as a significant threat to the limited amount of existing wetlands remaining in Blue Earth County. The northeast corner of the County includes the area within and around the Cities of Mankato, Eagle Lake and Madison Lake. This area has the highest density of lakes and wetlands in the County. The major watersheds included in the northeast priority area include the Middle Minnesota River Watershed and also includes adjacent portions of the lower Le Sueur River and lower Blue Earth River. The Minneopa Creek watershed and Indian Creek Watershed are also priority areas due to proximity to urban development and population centers.

Through continued development of the *Greenprint* Plan, the County will be identifying and assessing overlapping and complementary natural resources needs through a comprehensive planning process involving representatives of broad interests and stakeholders. The advantage of a *Greenprint*-based Wetland Management Plan is that it uses a predefined assessment of wetland functions and public values based on comprehensive priorities and it establishes a baseline for management policies. WCA sequencing and replacement principles can be guided by those criteria identified within the plan. Improving and developing regulatory programs within wetland corridors can be part of the implementation plan.

WILDLIFE

Wildlife Habitat

Wildlife Habitat - Forest

The extensive network of rivers in the County provides forested, riparian habitat corridors of varying widths. The forested areas in the County are found mainly along steep slopes, waterways and ox-bows where farming is not practical due to steepness, wetness or other accessibility issues. These forested, mainly riparian, corridors are long and relatively narrow as they follow the rivers. Widening the forest habitat in some areas would benefit some wildlife species.

The type, location and density of forest land cover in the County have fluctuated based on many factors, including agricultural practices and disease. The historic Big Woods

extended into Blue Earth County in the far northeast corner. The Big Woods were cleared for agriculture and homes by homesteading pioneers. Dutch Elm disease destroyed most elm trees on both the urban and rural landscape in the 1960s and 1970s. In the 1970s and 1980s pasture land was converted to crop land, but some pastures were either planted with trees or trees were allowed to grow. Both urban development and agricultural land use continue to encroach on wooded areas and wooded slopes.

Wooded areas are minimally protected through local ordinances. The City of Mankato has a new Woodland Preservation Ordinance intended to protect valuable wooded areas. Shoreland areas are protected from vegetative alterations and clearing by Shoreland Ordinance of the County Code. Violations of this ordinance are a common problem as home owners remove trees to increase their view of the lake or river. Logging activities also occur in the County.

Wildlife Habitat – Prairie and Wetlands

Prairie, wetland and upland habitats are far less common in the County as a result of agricultural use and urban development. Continued drainage of wetlands for urban development divides the remaining, larger wetlands into smaller and smaller pieces. The resultant smaller wetlands are fragments sometimes referred to as habitat patches.

Wildlife species habitat conditions are critical to the development of healthy populations. Habitat needs vary and may be very different at critical points in the life cycle of many species. Connection of wetland habitat patches with diverse conditions within and between wetlands to form wetland complexes is the most desirable for wildlife habitat. Wetlands adjacent to lakes are critical habitat for quality fisheries.

An understanding of the value of corridors containing wetland complexes is the basis of the Greenprint. The *Greenprint* vision, when incorporated in local planning and policy, will *reconnect* fragmented habitat.

Wildlife and Recreation

Minneopa State Park, most County parks and many of the City parks are located next to rivers, streams, lakes and wetlands. Scenic vistas, water access, wildlife viewing, exercise and other outdoor experiences are provided by these publicly owned parks collectively. As the population continues to shift from rural to urban, providing opportunities for these experiences will be increasingly important. Budget constraints at the State and local government level limit opportunities to acquire land, develop parks, expand parks and establish wildlife conservation and fishing areas in the County.

The County continues to develop and improve parks for conservation and wildlife habitat. The Indian Lake Conservation Area, for example, is a wetland restoration and replacement site developed into a park and is connected to a heavily used local and regional trail system. The County has also started using native vegetation and rain gardens in parks to improve wildlife habitat. Constructing canoe accesses with new bridges and trails with many roadways has become somewhat of a standard practice in the County.

The City of Mankato is redeveloping the Minnesota River corridor, including the Sibley Park area on the Blue Earth River, to bring residents and visitors closer to the rivers. The Mankato Trail also connects the Minnesota River, the City's Rasmussen Park, the

County's Red Jacket Trail and the County Indian Lake Conservation Area. The Indian Creek watershed is an important part of the area providing opportunities for residents to view wildlife habitat in woodland and wetland settings. Indian Creek is also part of the Minnesota River flood control project protecting Mankato and North Mankato.

State parks, including Minneopa State Park along the Minnesota River west of Mankato and the Sakatah Trail, are important park systems for regional and local parks and open space planning. Connecting natural areas and establishing trails along the Minnesota River corridor is part of State, regional and local plans to improve water quality, increase wildlife and enhance recreation experiences.

IMPLEMENTATION PLAN
Wetlands and Wildlife

Water Plan Management Goal:
Maximize opportunities to protect, enhance and restore wetlands and other natural areas to improve surface and ground water quality, fisheries, wildlife habitat, recreation and land conservation.

PRIORITY CONCERN:
Most of the County's pre-settlement wetlands were lost due to drainage for the development of agricultural land use, homes, communities and transportation. While all land uses can harm the ecological value of wetlands, urban development is likely the greatest threat to permanent loss of wetland quantity and quality in Blue Earth County at this time. The natural services provided by healthy wetlands are important for many purposes from flood control, water quality, and wildlife. Identifying, assessing and prioritizing wetland areas for protection and enhancement and restoring wetlands is a continuation of the County's Greenprint Plan and are priorities of the *Water Management Plan 2008-2013.*

GUIDING PRINCIPLES:
» Wetlands filter and absorb polluted surface water runoff before it enters lakes and rivers downstream.
» Wetlands serve as holding areas for water, reducing flood damage and soil erosion downstream.
» Wetlands help to maintain stream flows and may help recharge underground water supplies.
» Wetlands provide permanent or seasonal habitat, and provide food for fish and wildlife.
» Wetlands provide recreational benefits including fishing, hunting, bird-watching and hiking.
» Wetland complexes with a diversity of wetland types, water depth, vegetation and sizes have high value for wildlife and water quality.
» Conversion of land for urban development is a threat to wetlands, wildlife and other natural resources in Blue Earth County.
» More than 80 percent of the pre-settlement wetlands in Blue Earth County have been lost as a result of drainage for agricultural and urban land use.

ONGOING ACTIVITIES:
The County and SWCD will continue their administrative and technical roles associated with the Wetland Conservation Act (WCA). The County and SWCD will continue to encourage water retention and wetland restoration and work with local conservation organizations, the DNR, USFWS and others as appropriate and within the constraints of staff resources.

The County's administration of the WCA is funded through the NRBG, County funds and wetland determination fees paid by the land owner/developer. The SWCD's participation in WCA is partially funded through an annual transfer of $5,000 NRBG WCA funds to the SWCD from the County.

WATER MANAGEMENT PLAN:
The multiple water quality benefits inherent to the function of wetlands naturally lead to wetland restoration being a high priority for addressing water quality problems. Other sections of the *Water Management Plan 2008-2013* contain objectives and actions related to the public value of wetlands for water retention and other benefits. To maximize the function and value of wetlands, native planting will be a priority where appropriate and as funding allows.

Through continued development of the *Greenprint* Plan, the County will be identifying and assessing overlapping and complementary natural resources needs through a comprehensive planning process involving representatives of broad interests and stakeholders. The County will be combining existing data sets such as the Duck's Unilimited Restorable Wetland, the County LiDAR topography, the County 1993 Wet Areas Inventory, and the USDA SSUURGO Soils in a GIS model to prioritize wetland restoration areas.

Objective 1: Continue to administer the Wetland Conservation Ac (WCA).

> **Action 1:** Continue to administer the WCA, including TEP and with the DNR on WCA enforcement.

Objective 2: Continue to identify, assess and prioritize high priority areas for protection, enhancement and restoration of wetlands and wildlife habitat.

There will be an early emphasis to complete this objective in the northeast area of the County, including the City of Mankato, City of Eagle Lake, City of Madison Lake, LeRay Township, Jamestown Township, Lime Township, Mankato Township, and South Bend Township in portions of the Middle Minnesota River watershed and the adjacent lower Le Sueur River and lower Blue Earth River watersheds.

> **Action 1:** Continue to work with DNR Fisheries, DNR Wildlife staff and US Fish and Wildlife Service to identify, assess and prioritize specific areas important for wetland habitat, lake shore habitat, and other conservation practices.
>
> **Action 2:** Work with local wildlife conservation organizations to identify, assess and prioritize specific areas important for wetland habitat, lake shore habitat, and other conservation practices.
>
> **Action 3:** Continue to work with representatives of broad interests and stakeholders to identify, assess and prioritize wetland, lake shore habitat and other conservation areas.
>
> **Action 4:** Evaluate the need for a Comprehensive Wetland Management Plan and ordinance in all or parts of Blue Earth County.

Objective 2: Encourage wetland and wildlife protection and other conservation strategies in park, open space, transportation, stormwater and land use plans.

> **Action 1:** Work with municipalities and townships in conjunction with stormwater implementation objectives and other planning projects to identify areas for wetland protection and enhancement within, adjacent and near the city limits.
>
> **Action 2:** Continue to work with the County Public Works and Parks in conjunction with other planning projects to incorporate natural resources in transportation and park and open space plans.

Objective 3: Identify and incorporate ground water recharge areas in wetland and other conservation plans.

> **Action:** As described in the Groundwater Section of the Water Management Plan, the County views protection of ground water a very high priority. Additional data is needed to identify, assess and prioritize ground water recharge areas to target wetland protection and restorations.

Actions related to wetlands from County Drainage Ditch Section of the plan:

Identify, assess and prioritize County ditch systems and areas within County Ditch systems for retention, wider ditch buffers and other strategies to improve surface and ground water quality.

Increase water retention and wetland restoration in County ditch drainage systems by 30 percent.

Priority Concerns:
Ground and Surface Water

Household Hazardous Waste, Waste Pesticides and Mercury Products

PRIORITY CONCERN: Household Hazardous Waste, Waste Pesticides and Mercury Products

Water Management Plan Goal:
R*educe the generation, disposal and potential pollution of ground and surface water from household hazardous waste, pesticides and problem materials.*

Priority Concern

Waste from residential, business, industry and agriculture sources can pollute ground and surface water. Ground water quality, pesticide pollution and run-off from urban and rural land uses were identified as high priorities in the planning process. MDA monitoring of surface waters in Blue Earth County shows the presence of pesticides in surface waters. The pesticide, acetochlor, is identified by the MPCA as an impairment of surface waters in Blue Earth County. Mercury is identified by the MPCA as an impairment of many surface waters in Blue Earth County. Ongoing waste handling and recycling programs are a priority.

Priority Concern Assessment

Background

The management of waste is regulated by many different Federal and State Laws, depending on the type of waste. In Minnesota, hazardous wastes related to agriculture, business and industry are generally managed directly by State agencies with regulations and State-issued permits. Standards and limits related to hazardous substances in surface and ground water are regulated and monitored by State agencies. State and Federal regulations and guidelines determine which hazardous substances are monitored, monitoring procedures and reporting requirements.

As required by the State and MPCA, Counties are responsible for waste management planning, regulation and implementation of solid waste, recycling and household hazardous waste collection and disposal regulations and programs. The County's Solid Waste Management Plan is approved by the MPCA and addresses many aspects of waste management. The County has a strong history of managing waste recycling and disposal beginning in the mid 1980s. The County owns and operates the Ponderosa Landfill and the Household Hazardous Waste Facility (HHW Facility). The County contracts for operation of the County Recycling Center. The County also educates residents about reducing waste in general as well as recycling and disposal.

The County Water Management Plan addresses the County's role in managing the collection, recycling or disposal of the types of waste identified as concerns during preparation of the PCSD, or are associated with a 303d listed impaired water such as pesticides and mercury.

PESTICIDES

Pesticide run-off from both urban and rural land uses was identified as a high priority in the planning process. The MDA also recommended the County address pesticides as a priority concern during the Priority Concerns Scoping Document input process. The MDA is the lead agency for pesticide monitoring, and several locations in Blue Earth County are monitored. Although many different pesticides are used and detected in surface waters in Blue Earth County, acetochlor is a chemical of concern. Acetochlor is a corn herbicide. The MPCA has added acetochlor impairments in Blue Earth County to the draft 2008 Impaired Waters List. Acetochlor is a corn herbicide. Pesticides are discussed in more detail in other sections of the plan. More information about the sources and management practices related to acetochlor will be available as the MPCA prepares a TMDL report.

The potential for surface water impacts from waste pesticides is probably relatively small when compared with run-off from agricultural fields. Waste pesticides, if in leaking containers or dumped, are likely a greater potential threat to ground water. Pesticides are relatively expensive so farmers generally do not purchase excessive amounts resulting in large quantities of waste. Unused and waste pesticides are not accepted by pesticide dealers. The HHW Facility is currently the only location in the area where farmers can safely and legally dispose of waste pesticides.

MERCURY

Many surface waters in Blue Earth County are impaired by mercury. Although the main source of mercury impairments is atmospheric deposition of mercury, reducing use and managing the disposal of products containing mercury is part of the State's mercury TMDL plan. Fluorescent bulbs, thermostats and thermometers are common examples of mercury products found in homes and businesses. Breakage of these products releases mercury into the environment. Raw mercury is also found in schools, industry and dental-related businesses, and some individuals have containers of mercury in their homes.

Fluorescent bulbs and thermostats are banned from landfill disposal. Businesses and homeowners must keep spent bulbs and take to a location authorized to collect and store the bulbs for recycling. The use of fluorescent bulbs for energy conservation is being heavily promoted nationally by Federal and State government, the electric power industry, and bulb manufacturers and retailers. Programmable, mercury-free thermostats are also promoted to reduce energy use in homes. Thermostats must also be taken to locations authorized for collection and disposal.

Other mercury-containing wastes banned from landfill disposal include motor vehicle and appliance parts and other electrical devices. Salvage yards and vehicle repair shops must manage mercury-containing parts according to Minnesota rules. Thermostats are collected by furnace and air conditioning dealers and installers for disposal. Alternatives to mercury are being used in thermostats and thermometers which may reduce mercury from these sources. The MPCA oversees these mercury generators.

HOUSEHOLD HAZARDOUS WASTE

Residential wastes are the most difficult to manage due to the practicality of educating and regulating personal choices and small quantities from dispersed sources. Pesticides, solvents, paints, and other household chemicals and products are banned from landfills. Residents must separate these materials from their garbage and dispose of at locations authorized to collect the materials or the County Household Hazardous Waste Facility. Businesses using infrequent and/or small quantities comparable to a household are also sources of hazardous waste.

In addition to potential pollution from misuse and improper disposal of household hazardous waste, illegal dumping of these materials in storm drains, ditches or on the ground is also a concern. Providing convenient access to disposal sites can reduce the amount of illegal dumping.

BLUE EARTH COUNTY PROGRAM

In Blue Earth County, most wastes from residential, commercial and industrial sources are disposed of in the local, integrated waste management system. This involves municipally-contracted collection of mixed wastes from residents in municipalities and privately-contracted collection from business and industry. Collected wastes are taken to a processing facility where the wastes are separated for use as refuse derived fuel at the Wilmarth Waste-to-Energy Facility in Mankato or disposed of at the Ponderosa Landfill in Blue Earth County. Ash residual waste from the Wilmarth Waste-to-Energy Facility is disposed of in a landfill owned by Xcel Energy in Blue Earth County. Wilmarth burns waste from other parts of the State including the Twin Cities metro area.

Some waste materials are banned from landfills and require special handling by the consumers. For these types of materials the County either provides a location for collection or educational information instructing citizens where and how to properly dispose of these materials.

Regional Household Hazardous Waste Facility

Blue Earth County operates a Regional Household Hazardous Waste Facility (HHW) for residential and very small quantity business generators. Very small quantity generators are businesses disposing of less than 220 pounds monthly. Residents bring their waste pesticides, paints, solvents, and cleaners to the HHW Facility. The HHW facility opened in 1993 and is heavily used with regular hours open to the public between April and October. The County and Cities in the County provide information to the public about the importance and availability of the facility, including hours of operation, location and materials accepted.

Many of the surrounding Counties are partners with Blue Earth County with varying levels of services but generally include at least one mobile collection in each County every year. Residents of Nicollet, Sibley and Le Sueur County can bring their household hazardous waste to the facility during regular hours. Each year since the facility opened in 1993, more than 2,500 households bring their waste to the facility annually.

The County's Household Hazardous Waste Facility and program is funded by the MPCA, local waste collection and facility licensing fees, and the County.

Mercury products

Mercury containing products, including thermometers, thermostats, fluorescent bulbs, and button batteries can be brought to the HHW Facility. Fluorescent bulbs are the largest volume of mercury products brought the HHW Facility. Fluorescent bulbs are also accepted at one retail lighting store in Mankato. It is expected that the number of fluorescent bulbs requiring special handling and disposal will increase within the planning period as energy conservation and the use of fluorescent bulbs is being heavily promoted nationally by Federal and State government, the electric power industry, and bulb manufacturers and retailers. Thermostats are also accepted at the HHW Facility and mailed to an MPCA-approved recycling corporation for processing and disposal.

The source of funding for the fluorescent bulb recycling program is Xcel Energy and Blue Earth County. Thermostat recycling is funded by Thermostat Recycling Corporation.

Agricultural Waste Pesticides

Retailers and distributors do not accept waste pesticides. There is only one location for waste pesticide collection in Blue Earth County: the HHW Facility. The agricultural waste pesticide program has operated inconsistently in Blue Earth County since 1993. This is due to limited funding available from the MDA. Neighboring Counties are also partners with Blue Earth County. Under a two year contract with Blue Earth County and MDA at this time, the partnering Counties include: Nicollet, Sibley, Watonwan and Brown. Farmers from Blue Earth or any of the partnering Counties must contact the HHW in advance but can bring their waste pesticides to the facility during regular hours.

The pesticide program is funded by the MDA from proceeds of taxes on sales of pesticides. Future funding levels for this program at the County level is unknown as MDA has cut, restored and reduced funding for this program in the past few years.

IMPLEMENTATION PLAN
Household Hazardous Waste, Waste Pesticides and Mercury Products

Water Management Plan Goal:
R*educe the overall generation, disposal and potential pollution of ground and surface water from household hazardous waste, pesticides and problem materials.*

PRIORITY CONCERN:
Waste from residential, business, industry and agriculture sources can pollute ground and surface water. Ground water quality, pesticide pollution and run-off from urban and rural land uses were identified as high priorities in the planning process. MDA monitoring of surface waters in Blue Earth County shows the presence of pesticides in surface waters. The pesticide, acetochlor, is identified by the MPCA as an impairment of surface waters in Blue Earth County. Mercury is identified by the MPCA as impairment of many surface waters in Blue Earth County.

GUIDING PRINCIPLES:
» Pesticides, hazardous wastes and mercury products, including manufacture, distribution, use and disposal are regulated by Federal and State laws.
» Implementation of waste management programs is the responsibility of individual, private, State and local partners.
» Convenient access to disposal options increases participation and decreases the potential for improper ground and surface water disposal.
» Existing local programs provide opportunities for residential collection and disposal of hazardous waste and problem materials.
» Ensuring proper disposal of hazardous wastes and problem materials from agriculture, business and industrial sources is the responsibility of State agencies and the waste generators.

ONGOING ACTIVITIES:
The County will continue to operate the Regional Household Hazardous Waste Facility and provide education to residents about opportunities to reduce, recycle and properly dispose of hazardous wastes and problem materials. Operation of HHW facility is funded by State grants, landfill user fees and surcharges and license fees.

WATER MANAGEMENT PLAN:
Responsible use and disposal of waste by individuals is the best means to reduce pollution. Education efforts will be expanded locally to address waste reduction, recycling and disposal of hazardous waste and problem materials in a surface water context.

Land best management practices to address agricultural pesticide run-off are addressed in Agricultural Runoff, Erosion and Pesticide Section of the plan, and urban management practices are addressed in the Urban and Rural Development and Storm Water Run-off section of the plan.

Objective 1: Increase public awareness of responsible use of hazardous substances and disposal of wastes and problem materials.

> **Action 1:** Identify opportunities to expand and enhance education efforts to target audiences, including the SWCD, NRCS, County and other local partners.
>
> **Action 2:** Incorporate general information related to responsible use of hazardous substances and disposal of wastes and problem materials in County and NRCS/SWCD newsletters and other public places.

Objective 2: Ensure continued agricultural waste pesticide disposal opportunities in Blue Earth County.

> **Action:** Work with MDA to continue operating agricultural waste pesticide disposal sites in Blue Earth County.

Objective 3: Ensure continued mercury product recycling opportunities in Blue Earth County.

> **Action:** Work with MPCA and Xcel Energy to continue mercury product recycling opportunities.

Implementation Plan Schedule

Implementation Plan

The *Water Management Plan 2008-2013* includes objectives and actions that are practical, measurable and achievable in a five-year period. It will likely take much longer to observe measurable improvements in water quality and achieve local, watershed and State TMDL water quality goals. The implementation program is displayed in a table that includes a list of objectives and actions and identifies the lead and supporting agencies, estimated schedule, and the estimated financial resources available or needed for each action.

Lead , Supporting Agency and Others Involved
Implementation of the Water Management Plan 2008-2013 is the responsibility of the County and the SWCD. Many other agencies will be involved with implementation directly and indirectly, providing technical assistance, oversight and funding. The main implementation partner will be the NRCS. Local townships and municipalities will also be involved and will have expenses related to plan implementation.

Lead Agency
The lead agency is either the SWCD or County. They are responsible for the action and are more likely to expend greater staff or other resources on the action. The supporting agency will likely expend less time but will be involved with the action. The lead and supporting agencies are designated with a "1" or "2' in the County or SWCD column of the table.

Other agencies expected to have a significant role or time involvement with an action are listed in a separate column.

Schedule and Financial Resources
The foundation of the plan is ongoing programs. Some programs will be expanded or enhanced in the first few years of plan implementation. This will require additional work and staff for program development, such as support from planning, GIS and other County staff not generally involved with an ongoing program. These amounts have been estimated and are included in the budget.

Financial constraints limit the ability of the SWCD and County to greatly expand existing programs or begin new programs. This is particularly true at the SWCD where stable funding to establish soil and water conservation practices is limited and grant funding is unpredictable. The budget reflects this uncertainty.

Timeline
Each of the five years of the implementation program is shown in columns (2008-2013). An "X" in a column indicates when implementation of an action item is expected. A bold "**X**" indicates more staff time and expenses will be needed during one year of an action spanning more than one year.

Budget

To provide a meaningful implementation budget useful to the County and SWCD, the plan budget for each action distinguishes financial and staff resources available for ongoing programs and new actions. This is shown in three separate columns labeled "ongoing", "special", and "implementation." The "ongoing" column shows the *annual* budget for program staff and related costs to operate the program associated with an action or group of actions. The "special" column is the *total* estimated cost for additional staff needed for an action item. The "implementation" column is the estimated total amount needed for implementation of an action. This includes land management practices. The "implementation" budget for an action might also include expenses such as publication and printing costs not typically part of an ongoing program. The implementation budget does not reflect land owner/operator costs or costs to other agencies or local units of government. The budget also does not include the County Ditch Authority or management of County ditches but does include an estimated budget for actions to improve water quality that will involve the County Ditch Authority.

It was not possible to reasonably estimate the resources needed for all actions. Notes in the table explain that there is either not enough information or the financial resources available are widely variable and cannot be estimated. For example, while there is insufficient data at this time, data collection might be the first action followed by an assessment, but only after the assessment will it be possible to determine financial needs. Budgets tied to unpredictable sources or levels of funding were also not estimated for some actions. For some actions, an estimated range of funding or unit costs is shown based on current costs. Beyond a relatively small amount of State cost-share, there is a great deal of uncertainty with funding to establish soil and water conservation practices, as the bulk of the funding for these practices has been from competitive water quality grants from the MPCA and BWSR. Funding for SWCD staff is also tied to short term water quality grants. There is a need for stable funding to increase local capacity, mainly at the SWCD, to work with partners and land owners/operators to promote and establish land management practices that improve water quality and ensure continued soil productivity.

The need for more local staff is a specific action repeated several times in the plan to address multiple priorities: increasing water retention, increasing ditch buffer strips, and addressing TMDLs. The total projected cost of the budget is conservative and includes the addition of just one staff person. Without additional staff, implementing some of the actions in the plan will not be possible. Notes indicate which actions will require additional financial resources.

Objective / Action	Lead Agency		Other Agency	Timeline					Budget		
	SWCD	County		2008	2009	2010	2011	2012	Ongoing	Special	Implemention
GROUND WATER											
Objective 1: Continue the Well Program.											
Action 1: Blue Earth County will permit and inspect construction of new domestic wells and sealing of unused and abandoned wells.		1		x	x	x	x	x	$59,360		
Action 2. The County will continue to fund the well sealing cost share program with at least $9,000 annually.		1		x	x	x	x	x			$45,000
Objective 2: Increase local government's awareness of the potential for ground water contamination susceptibility in Blue Earth County.											
Action 1: The County will work with Township officials providing data and information related to ground water contamination susceptibility and groundwater protection methods, including zoning, with a special focus on Lime Township and Mankato Township because of their unique position having local zoning authority and their location in areas with high susceptibility to ground water contamination.		1	Mankato Township Lime Township and City of Mankato		x	x				$17,000	
Action 2: The County will provide data and information related to ground water contamination susceptibility and groundwater protection strategies to local government officials, including municipalities.		1	All municipalities		x	x					$200
Objective 3: The County will incorporate ground water protection measures in land use planning and regulations.											
Action 1: The County will address ground water protection and land use in the update of the County Comprehensive Land Use Plan.		1	County Planning Commission and County Board		x	x				$17,000	
Action 2: The County will address ground water protection measures in land use policy at the local level with special attention to business use and storage of potentially hazardous chemicals and materials and subsurface wastewater treatment and disposal.		1	County Planning Commission and County Board		x	x	x				
Objective 4: The County will assist local government units with preparation of source water protection plans.											
Action: The County will assist all local government units and the MDH with preparing source water protection plans as requested by participating in planning teams and providing available data and information including maps and aerial photos and County well index data.		1	Municipalities, MDH	?	?	?	?	?		unknown	unknown

Objective / Action	Lead Agency		Other Agency	Timeline					Budget		
	SWCD	County		2008	2009	2010	2011	2012	Ongoing	Special	Implemention
AG RUNOFF, PESTICIDES											
Objective 1: Reduce the amount of farmed, highly erodible land adjacent to public waters and ditches by establishing a buffer strip or a cover of perennial vegetation adjacent to all public waters in the County.											
Objective 2: Increase best management practices on farmed, highly erodible and potentially highly erodible land.											
Action 1: The County, SWCD and other local implementation partners will identify marginal, highly erodible farmland adjacent to public waters and drainage systems and highly erodible and potentially erodible farm land.	1	2	NRCS, FSA, appropriate State agencies	x	x					$1,680	
Action 2: Identify and prioritize areas to work based on appropriate financial incentives, easements, and regulations, special projects, studies, TMDLs, and local plans related to objective.	1	2	NRCS	x	x	x	x	x	$18,480 [B]	$16,800	
Action 3: Work with relevant implementation partners to promote conservation practices in priority areas.	1		NRCS	x	x	x	x	x		unknown	unknown
Action 4: Contact and work with land owners and land occupiers to establish conservation practices achieve objective.	1		NRCS	x	x	x	x	x		unknown	unknown
Action 5. Establish soil and water conservation practices to reduce runoff, soil erosion and sedimentation.	1		NRCS, BWSR	x	x	x	x	x			$30,000- $35,000 annual State cost share[F]
Action 6: Establish soil and water conservation practices to reduce runoff, soil erosion and sedimentation.	1	2	NRCS, State and Federal Agencies	x	x	x	x	x		unknown	unknown
Objective 3. Increase public awareness of soil and water conservation issues, problems with education and information.											
Action 1: Develop posters and other informational pieces related to soil erosion and other factors used to prioritize local project implementation and funding for display at the County SWCD, NRCS and other related offices.	1	2	NRCS		x	x	x	x	$23,520 [B]	$4,200 [A]	$1,500
Action 2: Provide access to aerial photos, maps, topography, soils and other information on the County and SWCD web sites.	2	1			**x**	x	x	x		$3,400 [A]	
Action 3: Promote best management practices in newsletters, web sites, press releases and brochures distributed by the County and SWCD annually.	1	2	NRCS	x	x	**x**	x	x		$3,400 [C]	$20,000
Objective 4. Bi-annually review and evaluate data and information available for targeting BMP's and other implementation efforts.											

Objective / Action	Lead Agency		Other Agency	Timeline					Budget		
	SWCD	County		2008	2009	2010	2011	2012	Ongoing	Special	Implemention
Action: Regularly hold *Water Management Plan* meetings with local implementation partners to identify, assess, evaluate and prioritize current project needs, information and future implementation strategies.	1	1	NRCS, FSA, DNR, State agencies	x	x	x	x	x		$5,000	
Objective 5. Seek stable funding for at least one SWCD staff position to work in all priority areas coordinating and promoting best management practices as described in the *Water Management Plan 2008-2013,* watershed and other relevant plans.											
Action 1: Develop description of project and staff needs based on annual SWCD plans and other plans.	1	1		x	x					$3,360	
Action 2: **County Drainage Section:** Add a full-time SWCD Technician/BMP Coordinator to work at the SWCD working with conservation partners promoting and coordinating the establishment of buffer and filter strips on County ditches, tile intakes and other waterways with an emphasis on County ditches. **TMDL Section:** Seek funding for a County-based staff person at the SWCD to work with land owners/operators in all impaired waters and TMDL Implementation Plan priority areas to establish soil and water conservation practices known to address multiple pollutants causing impairments. **Wetlands and Wildlife Section:** Add a full-time SWCD Technician/BMP Coordinator from 2009-2013 at the SWCD working with conservation partners promoting and coordinating the establishment of water retention an	1				x	x	x	x		$339,200 [E]	
LIVESTOCK and MANURE MANAGEMENT											
OBJECTIVE 1. Work with all feedlot operators to improve manure management planning.											
Action 1: The County will meet with 100 percent of feedlot operators and crop consultants to improve manure management planning.		1		x	x	x	x	x	$64,608		
Action 2: The County Feedlot Officer will enhance review of manure management fields and field/site specific discussion of sensitive areas and requirements (ground water contamination maps, bedrock, slope, soils, floodplains, ditches, surface water features, two foot contour maps, property boundaries, aerial photos and other information).		1		x	x	x	x	x			

Objective / Action	Lead Agency		Other Agency	Timeline					Budget		
	SWCD	County		2008	2009	2010	2011	2012	Ongoing	Special	Implemention
Action 3: The County will develop a program to provide County/SWCD web site access to local information about sensitive areas and requirements (ground water contamination maps, bedrock, slope, soils, floodplains, ditches, surface water feature, two foot contour maps, property boundaries, aerial photos and other information).	2	1			x	x				$3,360 [A]	
Action 4: The County and SWCD will enhance its general, feedlot education program by providing information about applying manure in sensitive areas such as surface water and shallow soil over bedrock for distribution and display at the SWCD/NRCS office.	1	1			x	x	x	x		$300	
Action 5: The SWCD, County and other organizations will participate in local demonstrations, field days and workshops as appropriate and report the results in newsletters and other communications.	1	1	MES, MDA		x	x	x	x	included in other budgets	$2,400	
Objective 2: Improve manure management in areas with high susceptibility to ground water contamination due to shallow depth of soil to bedrock.											
Action 1: Identify feedlots in areas with high susceptibility for ground water contamination and shallow depth to bedrock.		1			x					$1,175	
Action 2: Work with the Lime Township Board, feedlot operators and horse owners in Lime Township by providing information related to improving site management and manure management and identifying small sites with potential problems.		1	Lime Township			x	x			$4,200	
Action 3: Provide site specific information and other resources to feedlot operators in areas with shallow depth to bedrock.	2	1	NRCS			x	x			$1,680	
Action 4: Provide technical assistance to horse and livestock owners to reduce the potential for ground water contamination from manure.	1	1	NRCS			x	x	x		unknown	unknown
Action 5: Assess the need for and availability of financial assistance to horse owners to improve manure management.	1	1	NRCS			x	x	x		unknown	unknown
OBJECTIVE 3. Reduce runoff from agricultural fields.											
Action: Establish buffer strips, terraces and grass waterways to protect surface waters from runoff from agricultural fields.	1		NRCS, FSA	x	x	x	x	x	part of ongoing program	unknown	unknown
OBJECTIVE 4. Reduce manure runoff problems from livestock feedlots and smaller sites.											
Action 1: Provide technical assistance to operators of feedlots with open lot agreements to correct pollution problems by 2011, the State feedlot program compliance deadline.	1	2	NRCS	x	x	x			$8,400 [B]	unknown	unknown
Action 2: Provide technical assistance to feedlot operators and owners of small sites to address pollution problems.	1	1	NRCS	x	x	x	x	x			

Objective / Action	Lead Agency		Other Agency	Timeline					Budget		
	SWCD	County		2008	2009	2010	2011	2012	Ongoing	Special	Implemention
URBAN RUNOFF, PESTICIDES											
Objective 1: Encourage municipalities and Townships to review and revise stormwater, zoning and subdivision ordinances to protect water resources.											
Action 1: Work with City staff, engineers and consultants to provide each City with general information about urban stormwater runoff impacts.		1	Municipalities, City Engineers		x	x	x			$7,050	Each City's meeting and consulting engineer expenses
Action 2: Work with the City staff, engineers, consultants, NEMO, DNR and others as appropriate to provide each City with model ordinances to address development and stormwater impacts.		1	Municipalities, City Engineers		x	x	x	x			
Action 3: Assess the need and seek funding for consultant services to review and rewrite local ordinances, if needed.		1	Municipalities, City Engineers, DNR		x	x	x	x			unknown
Action 4: Work with Mankato Township and Lime Township to provide each with general information about urban stormwater runoff impacts and model ordinances to address stormwater impacts.		1	Mankato Township Lime Township		x	x	x				Township meeting expenses
Objective 2: Reduce erosion at existing urban stormwater outlet structures.											
Action 1: Work with City staff, engineers, SWCD and the County Ditch Manager to inventory and evaluate stormwater outlets to determine where erosion problems exist.		1	Municalities and engineers	x	x					included in Objective 1	Each City's meeting and consulting engineer expenses
Action 2: Identify short-term and long-range solutions to stormwater runoff problems and construct structures, retention areas and other conservation practices where needed.		1	Municalities and engineers		x	x					
Action 3: Work with City staff and SWCD to seek funding for Action 2 if needed.	2	1	Municalities and engineers		x	x					
Objective 3: Reduce erosion from construction sites.											
Action 1: Provide general information about MPCA NPDES permit rules to municipalities (not Mankato) and Mankato Township staff.		1	Municipalities, Mankato Township		x	x				included in Objective 1	
Action 2: Provide general information about MPCA NPDES permit rules along with construction permits issued by the County.		1			x	x	x	x		$3,360	
Action 3: Work with staff of municipalities, MPCA stormwater staff and others to assess compliance and educational needs related to State NPDES permit requirements.		1	MPCA, Municipalities			x				included in Objective 1	Each City's staff and other expenses

Objective / Action	Lead Agency		Other Agency	Timeline					Budget		
	SWCD	County		2008	2009	2010	2011	2012	Ongoing	Special	Implemention
Action 4: The City of Mankato will continue implementation of its Stormwater Pollution Prevention Plan, partnering with the County and local municipalities for education and other activities when appropriate.		2	Mankato, Municipalities	x	x	x	x	x		$1,680	City of Mankato budget
Objective 4: Promote homeowner best management practices to reduce pesticides, fertilizer and other pollutants generated by lawn, garage and home care.											
Action 1: Work with city staff to provide data and information and sample educational materials, flyers, posters, etc.		1	Municipalities		x	x	x	x	included in other budgets and Objective 1		City expenses for printed materials, mailings
Action 2: Include BMP's in County and SWCD newsletters, web sites and other outreach activities.	2	1			x	x	x	x	included in other budgets		
Objective 5: Protect sensitive lake shoreland areas from development.											
Action 1: Assess the shoreland and riparian areas of all lakes, especially those with greatest likelihood of development such as Madison, Duck, Ballantyne, George, Eagle, Lura, Crystal, Loon, and Mills Lakes, to provide a baseline and general information for the County Planning Commission and the affected municipalities.		1	DNR, County Planning Commission, Madison Lake, Eagle Lake, Lake Crystal	x	x					part of Wetlands and Widlife Objective 2	
Action 2: Address shoreline protection in the County's Comprehensive Land Use Plan and amend County land use regulations to protect shoreland areas from development impacts.		1	County Planning Commission and County Board		x	x				part of Wetlands and Widlife Objective 2	
Objective 6: City and County park systems will continue to develop and redevelop shoreland areas providing public access, reducing runoff, and protecting stream banks and shoreland.											
Action 1: The County Parks Department will continue to utilize and promote best management practices, such as rain gardens and use of native vegetation, in all County parks, as appropriate.		1	DNR	x	x	x	x	x		unknown	unknown
Action 2: The County will continue to work with lake associations, local conservation organizations, the DNR and other State agencies to stabilize shoreland areas in County Parks where needed and as funding is available.		1	DNR, MPCA, Other agencies	x	x	x	x	x		unknown	unknown
Action 3: The City of Mankato will continue to redevelop waterfront areas, trails and parkways along the Minnesota River, Blue Earth River, Indian Creek, and Thompson Creek to improve water quality and provide education and access to the river for residents and visitors where appropriate and as funding is available.		2	City of Mankato	x	x	x	x	x		unknown	unknown

Objective / Action	Lead Agency		Other Agency	Timeline					Budget		
	SWCD	County		2008	2009	2010	2011	2012	Ongoing	Special	Implemention
IMPAIRED WATERS AND TMDLs											
Objective 1: Support development of TMDL Implementation Plans.											
Action 1: Work cooperatively on a watershed basis to identify and prioritize implementation activities.	1	1	GBERBA, neighboring counties, MPCA, State Agencies	x	x	x	x	x	$59,010 [D]	unknown	
Action 2: At the request of the MPCA or other TMDL sponsor and within the constraints of local staff time and resources, participate in preparation of TMDL studies and implementation plans .	1	1	MPCA	x	x	x	x	x		unknown	unknown
Objective 2: Implement soil and water conservation and other practices identified in TMDL implementation plans.											
Action 1: Work with agricultural land owners/operators to establish best management practices to achieve TMDL implementation goals as practicable considering availability of local staff and project resources.	1	2		x	x	x	x	x	part of existing programs		unknown
Action 2: Seek funding for a County-based staff person at the SWCD to work with land owners/operators in all impaired waters and TMDL Implementation Plan priority areas to establish soil and water conservation practices known to address multiple pollutants causing impairments.	1	1			x	x	x	x		$339,200 [E]	
Action 3: Work with nonpoint sources identified in TMDLs to increase awareness of water quality problems, change behavior and establish best management practices where appropriate and practicable considering availability of local staff and project resources.	1	1		x	x	x	x	x	part of existing programs		
Objective 3: Increase participation in the MPCA Citizen Stream Monitoring Program.											
Action 1: Promote Citizen Stream Monitoring in SWCD and County newsletters, web site and other information sources.	1	1		x	x	x	x	x	included in existing and future education efforts		
COUNTY DITCHES											
Objective 1: Encourage voluntary establishment of ditch buffer strips on County ditches with education and information activities promoting the benefits of ditch buffers and the availability of financial incentives.											

Objective / Action	Lead Agency		Other Agency	Timeline					Budget		
	SWCD	County		2008	2009	2010	2011	2012	Ongoing	Special	Implemention
Action 1: The SWCD will provide a list of conservation funding opportunities to the Ditch Authority annually in order for the Ditch Authority to be fully aware of locally available incentives.	1			x	x	x	x	x		$3,360	
Action 2: The County and SWCD will increase communications providing information about water quality related benefits of ditch buffers and financial incentives available for establishing new ditch buffers.	1	2	NRCS		x	x	x	x		$3,360	
Action 3: The County Ditch Authority and other County Departments will work together to provide information in general newsletters and the County web-site. The County Ditch Authority will develop written communications, such as letters and newsletters to ditch system owners when appropriate to special projects.	1	1	NRCS		x	x	x	x	Existing newsletters and web site	unknown	unknown
OBJECTIVE 2: Increase the total miles of drainage ditch buffer strips on County ditches in Blue Earth County by 50 percent by December 31, 2012. *In order to achieve County goals for this objective, financial resources will be needed for additional staff, landowner incentives and acquisition costs.*											
Action 1: Establish baseline data for this objective to consistently measure success over time, by using County data reported to BWSR to determine the total miles of ditch buffers in the County.		1		x	x					unknown	
Action 2: Add a full-time SWCD Technician/BMP Coordinator from 2009-2012 to work at the SWCD working with conservation partners promoting and coordinating the establishment of buffer and filter strips on County ditches, tile intakes and other waterways with an emphasis on County ditches.	1	2			x	x	x	x		$339,200[E]	
Action 3: Work with implementation partners to develop a reasonable, implementation goal and work plan annually for this objective assuming the addition of full time staff and financial incentives to coordinate bmp programs with a special emphasis on ditch buffers.	2	1	NRCS, FSA, Local Implementation Partners		x	x	x	x		$5,000	
Action 4: Seek funding to provide financial incentives to establish ditch buffer strips on pre-identified County ditches.	2	1			x	x	x	x		unknown	$12,000-$14,000 per mile [G]
OBJECTIVE 3: Identify, assess and prioritize County ditch systems and areas within County ditch systems for retention, wider ditch buffers and other strategies to improve surface and ground water quality and wildlife habitat.											

Objective / Action	Lead Agency		Other Agency	Timeline					Budget		
	SWCD	County		2008	2009	2010	2011	2012	Ongoing	Special	Implemention
Action 1: Work with local committees and workgroups with broad representatives of multiple interests similar to those formed for the Water Management Plan and Greenprint to develop criteria and methods for prioritizing program implementation. Representatives of ditch owners, wildlife conservation, rural residents, water quality and others will be involved. County GIS tools will be used to support the process.	2	1		x	x					part of Wetlands and Wildlife section	
Action 2: Priority areas will be assessed based on methods and criteria developed by committees and workgroups for program implementation as well as available resources, regulations and other requirements. The County and SWCD will work together to identify representatives and frequency of program planning and evaluation as needed.	2	1		x	x	x	x	x		part of Wetlands and Wildlife section	
Action 3: Identify and assess opportunities to reduce impacts from municipal storm water discharges with best management practices, including water retention, wetland restoration, buffer strips, grassed waterways, and other erosion control practices.	2	1	Municipalities, Engineers,	x	x					$30,000	
Action 4: Identify native plants best suited for ditch buffer plantings, assess and prioritize locations for native plants in conjunction with wildlife and other priority areas.	1	1	BWSR, DNR		x	x				$5,000	
OBJECTIVE 4: Increase water retention and wetland restoration in County ditch drainage systems by 30 percent.											
Action 1: Seek funding to expand the engineering and environmental review assessment for ditch improvement and repair projects to study flooding characteristics and downstream impacts during small, frequent storm events as well as 5,10, 25, 50 year flood events; water storage and retention practices; and water quality effects.		1		x	x	x	x	x		unknown	unknown
Action 2: Establish baseline data for this objective to consistently measure success over time.		1		x	x					$3,360	
Action 3: Seek funding to provide financial incentives to establish water retention areas.	1	1			x	x	x	x		$8,400	unknown
Action 4: Work with local conservation groups and State and Federal agencies to seek funding and restore and enhance wildlife habitat in priority areas.	1	1		x	x	x	x	x			unknown
Action 5: Add a full-time SWCD Technician/BMP Coordinator from 2009-2013 at the SWCD working with conservation partners promoting and coordinating the establishment of water retention and wetlands.	1	2			x	x	x	x		$339,200 [E]	

Objective / Action	Lead Agency		Other Agency	Timeline					Budget		
	SWCD	County		2008	2009	2010	2011	2012	Ongoing	Special	Implemention
Action 6: Work with implementation partners to develop a reasonable, implementation goal and work plan annually for this objective assuming the addition of full time staff and financial incentives to coordinate bmp programs with a special emphasis on ditch buffers and water retention.	2	1			?	?	?	?		unknown	
WETLANDS AND WILDLIFE											
Objective 1: Continue to administer WCA.											
Action 1: Continue to administer the WCA, including TEP and with the DNR on WCA enforcement.	2	1	BWSR, DNR	x	x	x	x	x	$85,152 [C]		
Objective 2: Continue to identify, assess and prioritize high priority areas for protection, enhancement and restoration of wetlands and wildlife habitat.											
Action 1: Continue to work with DNR Fisheries, DNR Wildlife staff and US Fish and Wildlife Service to identify, assess and prioritize specific areas important for wetland habitat, lake shore habitat, and other conservation practices.		1	DNR, BWSR, USFWS	x	x					$67,840 [A]	
Action 2: Work with local wildlife conservation organizations to identify, assess and prioritize specific areas important for wetland habitat, lake shore habitat, and other conservation practices.		1		x	x						
Action 3: Continue to work with representatives of broad interests and stakeholders to identify, assess and prioritize wetland, lake shore habitat and other conservation areas.		1	Planning Commission	x	x						
Action 4: Evaluate the need for a Comprehensive Wetland Management Plan and ordinance in all or parts of Blue Earth County.	2	1	Mankato, Municipalities, BWSR		x	x					
Objective 3: Identify and incorporate ground water recharge areas in wetland and other conservation plans.											
Action: As described in the Groundwater Section of the Water Management Plan, the County views protection of ground water a very high priority. Additional data is needed to identify, assess and prioritize ground water recharge areas to target wetland protection and restorations.		1	State Agencies	?	?	?	?	?	unknown	unknown	unknown
WASTEWATER AND SSTS											
Objective 1: Continue to manage decentralized wastewater treatment with the County SSTS program.											

Objective / Action	Lead Agency		Other Agency	Timeline					Budget		
	SWCD	County		2008	2009	2010	2011	2012	Ongoing	Special	Implemention
Action 1: Maintain and update the County Ordinance consistent with State State Statutes.		1		x	x	x	x	x	$127,200		
Action 2: Issue permits, conduct inspections and maintain records for SSTS in Blue Earth County.		1		x	x	x	x				
Objective 2: Reduce the number of dwellings defined as imminent public health threats by 50 percent.											
Action 1: Update and analyze all available data to reasonably estimate the number of imminent public health threats and determine a baseline to evaluate future results related to this goal.		1		x	x					$5,020	
Action 2: Assess the need for financial incentives, including low interest loans, to accelerate the percentage of compliant SSTS.	2	1			x	x				$1,175	
Action 3: Evaluate overall compliance levels every one to three years and adjust education and other program components accordingly to meet objective.		1			x	x		x		$3,500	
Objective 2: Increase compliance with SSTS maintenance requirements.											
Action 1: Determine the level of compliance with State regulated maintenance requirements.		1	MPCA		x	x				$2,520	
Action 2: Work with haulers, property owner representatives and others to identify and address education, disposal and other needs related to septic system maintenance issues.		1	Municipalities, Townships		x	x					
Objective 3: Evaluate septage management systems, including disposal, storage and land application.											
Action 1: Identify the septage management systems of each contractor in the County.		1				x	x			$1,260	
Action 2: Work with pumpers, contractors, municipalities and other representatives to assess needs related to septage management in Blue Earth County.		1				x	x			$2,520	

Key for Budget Items

[A] = County staff from departments related to action

[B] = SWCD staff

[C] = Both County and SWCD

[D] = Costs to participate in existing watershed organizations at current levels. Includes annual dues, County Commissioner and SWCD Supervisor per diem, and County and SWCD staff time. Does not include mileage or other expenses.

[E] = Additional SWCD staff is needed to address multiple objectives. This is the estimated cost of one staff person for four years.

[F] = Historic range of cost share

[G] = Current range of cost

APPENDIX A

Impaired Waters and TMDL Fact Sheets and Maps

MPCA - May 2008

Why impaired waters are a priority for Minnesota

Water Quality/Impaired Waters 3.10 • March 2007

The problem

Despite decades of progress in cleaning up water pollution, hundreds of Minnesota's lakes, rivers and streams are still not healthy enough for people to use safely and enjoy. These "impaired" waters do not meet water-quality standards and pose risks to people, aquatic life, and recreation. They can contain too much sediment, bacteria, mercury, phosphorus and other contaminants.

The 2006 impaired waters list shows 2,250 impairments on 284 rivers and 1,013 lakes (a water body may have multiple impairments).

About 40 percent of those assessed against impairment criteria are found to be impaired a rate consistent with the national average for other states. Only a small percentage of Minnesota's river miles and lakes have been assessed so far.

Once all Minnesota waters have been assessed, we may have more than 10,000 impairments statewide, located in nearly every watershed in the state. This is a serious issue for Minnesota.

What is required?

The federal Clean Water Act requires the states to take specific steps to address these "impaired waters," including:

- Identify and list surface waters that fail to meet applicable water-quality standards.
- Evaluate impaired waters to determine sources of pollution and the amount of reduction needed to restore the waters.
- Implement corrective measures to meet Total Maximum Daily Load (TMDL) pollutant reduction goals and restore waters to standards.

Responsibility for keeping our water resources healthy resides with individual citizens, businesses, and a number of state and local government agencies, including the Minnesota Pollution Control Agency (MPCA), Minnesota Department of Natural Resources, Minnesota Department of Agriculture, Board of Water and Soil Resources, counties, cities, soil and water conservation districts, and watershed districts.

All of these players must come together to meet the challenge of impaired waters. Coordinating state resources and scientific expertise with local efforts will be critical to project success.

Why must impaired waters be addressed?

First, consider that:

- Minnesota has more surface waters than any other of the 48 contiguous states.
- A $10-billion-a-year tourism industry is based on Minnesota's water resources, and water quality is important to a healthy agricultural and business economy.

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- Public opinion surveys conducted by the MPCA and others consistently shows that Minnesotans rank protection of surface water as their top environmental priority.
- The number of impaired waters is growing and the problem is not going to go away. We need to act now to restore and protect our valuable and precious surface waters.

Second, addressing impaired waters is a priority because it affects growth and the health of Minnesota's communities and economy.

All Minnesotans depend on healthy water resources for development, growth and a good quality of life.

- Communities throughout Minnesota are beginning to experience constraints on wastewater discharges to waters that are impaired. The Clean Water Act prohibits new or expanded wastewater discharges to an impaired water if a TMDL study is not in place to ensure that additional pollution will not cause or contribute to an impairment.
- A 2005 state appeals court decision in the case of Maple Lake and Annandale, two Minnesota cities which had been issued a permit to build and jointly operate a new wastewater treatment plant that discharged to an impaired water, forced the MPCA to revoke the permit. With their existing plants at capacity, these cities effectively cannot grow until TMDL studies are completed and approved. The decision has been appealed to the state Supreme Court; meanwhile over 100 new or expanding wastewater facilities are affected by the situation.
- The MPCA has found that of approximately 1,400 permitted industrial and municipal wastewater facilities, approximately 550 either discharge to an impaired water or discharge within the watershed of an impaired water.

  A 2003 Bemidji State University study of north-central Minnesota lakes found that property values decreased as water clarity worsened.

  The study found that for each three-foot increase in water clarity (as measured by Secchi disk), the value of lakeshore property rose by $423 per foot of frontage. A three-foot decrease in water clarity cut values by $594 per foot of frontage.

The third reason impaired waters are a priority is the Clean Water Act's mandate requiring all states to address them.

Inadequate progress toward meeting this mandate has led to lawsuits across the country. To date, there have been 40 legal actions in 38 states, most of which have been successful. As a result, the United States Environmental Protection Agency (EPA) is under court order or consent decrees in many states to ensure that TMDLs are established, either by the state or EPA.

To help meet these needs, the Minnesota Legislature passed the Clean Water Legacy Act and the Governor signed it into law on June 2, 2006. This Act provided $24.95 million in first-year funding as well as provided a new operational framework. Funds were available to perform monitoring and assessment of Minnesota's waters, TMDL development and implementation of protection and restoration activities.

This start-up funding was an important first step for Minnesota's Impaired Waters effort; however, assessing and restoring all of the state's impaired waters will require continued, substantial resources.

Combining the federal mandate with the value Minnesotans place on their water resources, and their importance to tourism, economic growth and community growth, the issue of impaired waters clearly is a priority for the state.

For more information

For more information on Minnesota's Impaired Waters efforts, contact Jeff Risberg at 651-296-7231 or jeff.risberg@state.mn.us.

Impaired Waters

Overview

Minnesota Pollution Control Agency

Water Quality/Impaired Waters #3.09 • July 2007

Contents

Description and purpose…….. .. 1
Identify and list impairments 1
TMDL development 1
Restore impaired waters 2
Clean Water Legacy Act 2
More information 2

Description and purpose

Impaired waters are lakes, rivers and streams that do not meet state water-quality standards, set to protect a body of water's beneficial use, for one or more pollutants.

The federal Clean Water Act (CWA) requires states to:

- Assess all waters of the state to identify and list impairments;
- Conduct TMDL studies (see below) in order to set pollutant reduction goals;
- Implement corrective measures to meet a TMDL's pollutant reduction goals and restore waters to standards.

MPCA's primary responsibilities in addressing impaired waters are in the areas of water quality assessment and TMDL development. The agency also coordinates closely with other state agencies, local units of government, and nongovernmental organizations on restoration activities.

Assessment and identification of impairments

First published in 1992, the state's impaired waters list is updated every two years. The 2006 list identifies 2,250 impairments on 284 rivers and 1,013 lakes (a water body may have multiple impairments). Approximately 40 percent of water bodies assessed against impairment criteria are found to be impaired, a rate comparable with what other states are finding. Only a small percentage of Minnesota's river miles and lakes have been assessed so far. The list of impaired waters will expand as assessments continue throughout the state. A state's impaired waters list is used to prioritize funding and activities for restoring impaired waters.

TMDL development

For each impairment on the list, the federal Clean Water Act requires that a Total Maximum Daily Load (TMDL) be prepared. The term "TMDL" describes both a process and a number. The *process* typically involves two to four years of technical study and intensive stakeholder and public input. The *number* is a calculation of the maximum amount of a pollutant the water body can receive and still meet water quality standards. A TMDL results in a pollution reduction plan that identifies all the sources of the pollutant in the watershed and allocates needed reductions among them. It must include a margin of safety for uncertainties in the calculation, account for seasonal variation in water quality, and may leave room for future expansion in discharges (reserve capacity).

TMDLs may be developed by the MPCA, other state agencies, or local governments that have been determined by MPCA to be qualified to do this work. Work plans and draft TMDLs must be approved by the MPCA.

Throughout the process, the MPCA provides oversight, technical assistance, and training to ensure regulatory and scientific requirements are met. Following

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a formal public comment period, the MPCA submits the TMDL report to the U.S. Environmental Protection Agency for final approval.

Restoration of impaired waters

After a TMDL report is completed, a detailed implementation plan is developed to meet the TMDL's pollutant load allocation and achieve the needed reductions to restore water quality. Depending on the type, severity, and scale of the impairment, restoration may require years or even decades, and several million dollars.

Restoration activities typically include infrastructure improvements of wastewater treatment plants or urban stormwater systems, upgrading failing septic systems, and implementing "best management practices" to minimize polluted runoff or soil erosion in urban and agricultural settings.

When a water body is restored to meet applicable water quality standards, it can be removed from the impaired waters list. In addition, monitoring will continue over the long term to ensure standards are maintained.

Clean Water Legacy Act

The Clean Water Legacy Act (CWLA) was signed into law on June 2, 2006.

This law will:

- Accelerate assessment of Minnesota's waters
- Target additional financial resources to existing state and local programs designed to improve water quality
- Leverage additional federal, local and private resources where possible.
- Provide resources to develop TMDLs

The 2006 legislative session resulted in appropriations totaling approximately $25 million for critical clean water priorities and the creation of a citizen/state advisory group called the Clean Water Council. In May 2007, the legislature passed $31 million for continued Clean Water Legacy funding in 2008 & 2009.

For additional information on the CWLA, see the Governor's Clean Water Cabinet Web page at:
http://cwc.state.mn.us/water/cleanwatercouncil/index.html

For more information on the Clean Water Council, see the Council Web page at:
http://www.pca.state.mn.us/water/cleanwatercouncil/index.html

More information

For more information on impaired waters contact

Glenn Skuta, (651) 297-3365 or e-mail:

glenn.skuta@pca.state.mn.us, or

Jeff Risberg, (651) 296-7231 or e-mail:

jeff.risberg@pca.state.mn.us.

Additional information is available on the MPCA Web site at:
http://www.pca.state.mn.us/water/tmdl/index.html

Minnesota Pollution Control Agency

Assessing and listing impaired waters

wq-iw3-11 • March 2007

The assessment of Minnesota's rivers, streams and lakes is tied to the goals of the 1972 Clean Water Act (CWA) for restoring and protecting the ecological integrity of America's waters.

One CWA strategy used to meet these goals is identifying, listing and restoring "impaired waters." The CWA requires states to:

- Assign designated uses to waters and develop standards to protect those uses
- Monitor and assess their waters
- List waters that do not meet standards
- Identify pollutant sources and the reductions needed to achieve standards
- Develop a plan to implement restoration activities

This fact sheet describes the process of assessing and listing impaired waters in Minnesota.

What are "impaired waters"?

The CWA requires states to adopt water-quality standards to protect waters from pollution. These standards define how much of a pollutant can be in a water and still allow it to meet designated uses, such as drinking water, fishing, swimming, irrigation or industrial purposes.

"Impaired waters" are those waters that do not meet water-quality standards for one or more pollutants, thus they are "impaired" for their designated uses.

Section 303(d) of the CWA requires states to assess all their waters for impairments and publish a list of impaired waters every two years. Assessing Minnesota's waters and developing the Impaired Waters List involves a rigorous process that takes more than two years to accomplish.

How are impaired waters identified and listed?

The assessment and listing process involves dozens of agency staff, other state agencies, and local partners. The goal of this effort is to use the best data and best science to assess the condition of Minnesota's water resources.

The process requires a high level of planning and cooperation among Minnesota Pollution Control Agency (MPCA) staff and partners. The many tasks that go into developing the list can be grouped into six major milestones, as follows:

<u>Call for Data</u>

The first step in identifying impaired waters involves collecting all of the monitoring data available for Minnesota's water resources.

The MPCA relies on data it collects along with data from other sources, such as sister agencies, local government and volunteers, to assess a lake or stream. The data must meet rigorous quality-assurance protocols before being used. Some sources of data, such as Secchi disk monitoring by volunteers, are used only in association with other data.

Early in the assessment process, the MPCA publishes a "Call for Data" in the *State Register* and contacts partner organizations directly to request their monitoring data.

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Data analysis

Once all available data are checked for accuracy and entered into a database, MPCA scientists analyze the data to identify potential water impairments. Assessments are based on established water-quality standards (see www.pca.state.mn.us/water/standards/index.html) and the MPCA *Guidance Manual for Assessing the Quality of Minnesota Surface Waters* (www.pca.state.mn.us/water/tmdl/index.html). The guidance contains information on standards, data collection, data-assessment requirements, and minimum data needed to conduct an assessment.

In addition to completing the very detailed, science-based assessments, MPCA staff evaluate waters currently on the list for potential de-listing, and revise the assessment and listing guidance as needed.

Professional judgment teams

Once the preliminary assessments are complete, "professional judgment team" (PJT) meetings are held with resources managers from around the state. These teams consist of MPCA staff, the collectors of the data under review, and other local and regional scientific experts.

The PJTs are peer-review groups that discuss the preliminary assessments and provide a local perspective. The preliminary assessments are either confirmed by the group or refined based on additional knowledge of the water resources. Waters are assigned to categories such as "not impaired," "more data needed to complete an assessment," and "impaired." A record of the PJT discussion is maintained on the MPCA web site at www.pca.state.mn.us/water/tmdl/index.html#support.

Informational meetings

Following the PJT meetings, MPCA staff compile a draft Impaired Waters List consisting of all the waters that have been assessed as impaired. The MPCA then holds meetings across the state to review the draft list with interested parties and answer questions about the assessment and listing process, the draft list, and impaired waters in general.

Public notice

The next step is the formal public notice period. The draft list and request for comments are noticed in the *State Register* and the notice is also mailed to more than 400 contacts. Following the comment period, responses to comments are developed and the draft list is modified as necessary based on the comments received.

EPA approval

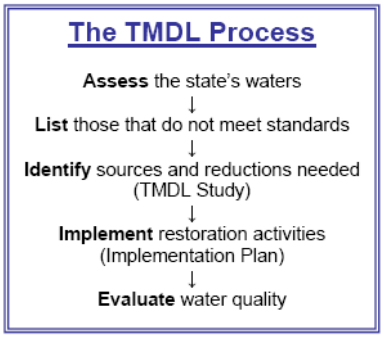
For the last step in this biennial process, the final draft Impaired Waters List is provided to the U.S. Environmental Protection Agency for approval. States are required to submit their final draft list to EPA by April 1 of even-numbered years.

Timeline for 2008 listing cycle

The entire assessment and listing process spans more than two years. For example, work on the 2008 list and report began in August 2005 with an evaluation of the previous listing cycle. The MPCA published the "Call for Data" in the *State Register* on June 26, 2006, and completed preliminary assessments during the winter of 2006-7. PJT meetings are scheduled for the spring of 2007. The MPCA anticipates hosting informational meetings during the late summer of 2007 and noticing the final draft list in late fall 2007 or early winter 2008. This puts the MPCA on schedule to deliver the final draft list to EPA by April 1, 2008.

Beyond the Impaired Waters List

CWA requirements do not stop with the approval of the Impaired Waters List. States are also required to prepare Total Maximum Daily Load (TMDL) studies for every impairment on the list. A TMDL defines the maximum amount of a pollutant that a water body can receive and still meet standards. TMDLs also set limits and reduction goals for restoring impaired waters so they meet standards. More information about TMDLs can be found at www.pca.state.mn.us/water/tmdl/index.html.



For more information

For more information on assessing and listing impaired waters, contact Howard Markus, 651-296-7295 or howard.markus@pca.state.mn.us.

Background on:

Total Maximum Daily Loads (TMDLs)

gp5-13 • Updated: September 2007

Minnesota Pollution Control Agency

Related Information:

Impaired Waters Background Paper available on line at http://www.pca.state.mn.us/newscenter/background.html

Minnesota's **Impaired Waters** list available at http://www.pca.state.mn.us/water/tmdl/tmdl-303dlist.html.

View the list of **TMDL Projects Underway** in Minnesota at http://www.pca.state.mn.us/water/tmdl/index.html#projects

A water body is "impaired" or polluted if it fails to meet one or more water quality standards. Federal standards exist for basic pollutants such as sediment, bacteria, nutrients and mercury. The Clean Water Act requires the Minnesota Pollution Control Agency to identify and restore impaired waters.

Minnesota's Impaired Waters list (updated every two years) identifies assessed waters that do not meet water quality standards. The draft 2008 list includes 1,469 impairments on 836 waters in Minnesota. Listed waters include 500 lakes and 336 rivers and streams, many with multiple impairments. Water quality assessments are complete on a small percentage of Minnesota's river miles and lakes.

The draft 2008 list in on public notice from Mon., Oct. 8, to Wed., Nov. 7, 2007. The state must submit a final draft of the list to the Environmental Protection Agency for approval by April 1, 2008.

What is a TMDL?

For each impairment on the list, the Clean Water Act requires completion of a Total Maximum Daily Load (TMDL).

The term "TMDL" describes both a process and a number. The *process* typically involves two to four years of technical study and intensive stakeholder and public input. The *number* is a calculation of the maximum amount of a pollutant the water body can receive and still meet water quality standards.

A TMDL results in a pollution reduction plan. The pollution reduction plan identifies all the sources of the pollutant in the watershed and allocates needed reductions among them. The plan also includes a margin of safety to account for uncertainties in the calculations and seasonal variability in water quality. In addition, the plan may factor in a reserve capacity to allow potential future expansions in discharge.

The TMDL Process

Assess the state's waters

↓

List those that do not meet standards

↓

Identify sources and reductions needed (TMDL Study)

↓

Implement restoration activities (Implementation Plan)

↓

Evaluate water quality

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What is the process for completing TMDLs?

States must develop a TMDL within 15 years of listing a specific impairment. Developing a TMDL study requires an average of four years and includes extensive stakeholder and public involvement throughout the process.

The process for completing a TMDL study is complex and varies significantly from project to project. Some of the many variables include

- Number of pollutant sources
- Type of pollutant and size of the watershed
- Amount of existing data
- Relationship of one impairment to others that may exist in the same or nearby water bodies
- Extent of stakeholder involvement and number of stakeholders
- Availability of necessary resources

Following a formal public comment period, the MPCA submits the TMDL report to the U.S. Environmental Protection Agency (EPA) for final approval.

The Minnesota Pollution Control Agency (MPCA) is ultimately responsible for completing and submitting TMDLs to the EPA. However, stakeholders play a critical role in the development and implementation of TMDLs. In addition, scientific and technical experts provide valuable information and insight. In many cases, consultants assist with data collection, modeling and development of draft reports.

Through contracts with the MPCA, local governments and watershed organizations will likely lead over two-thirds of Minnesota's TMDLs. The MPCA will direct the remaining projects. The contracts cover staffing, equipment, lab costs, and other project expenses. Nearly 95 percent of all the state's TMDL funding passes through the MPCA to local-governments and contractors.

The MPCA provides oversight, technical assistance, and training to ensure regulatory and scientific requirements are met. The MPCA submits final TMDL reports to the U.S. EPA for approval.

What happens after the TMDL is approved?

After the EPA approves a TMDL, a detailed implementation plan is finalized to meet the TMDL's pollutant load allocation and achieve the needed reductions in point and non-point sources to restore water quality. Depending on the severity and scale of the impairment, restoration may require decades and several million dollars.

What is the current TMDL workload?

The MPCA's current TMDL workload includes more than 300 projects (covering all listings on the 2008 Impaired Waters list). A workload of this magnitude presents considerable challenges for meeting federal TMDL requirements and implementing restoration efforts in a timely manner. The program requires significant coordination and extensive resources throughout the state.

What are the consequences of not completing TMDLs?

The Clean Water Act prohibits new or expanded discharge to an impaired water, if the discharge would "cause or contribute to the violation of water quality standards." Until a TMDL is completed, there can be no new or expanded discharge affecting the impairment. Once the study is complete, all proposed discharges must meet the requirements of the TMDL.

If TMDLs do not move ahead, communities and businesses may find themselves unable to expand. The resulting constraints on economic development and growth could be considerable. In addition, if impairments are not addressed, many prized lakes and rivers will remain polluted, a detriment to the quality of life in Minnesota.

Concern over resource needs for impaired waters led to passage of the Clean Water Legacy Act in 2006. The Act provided initial funding of $24.95 million, including more than $3 million for TMDL development. The legislature approved an additional $31 million for Clean Water Legacy funding in 2008 and 2009. Completing Minnesota's growing number of TMDL projects will require continued, substantial resources.

For more information

For more information on TMDLs, contact
Jeff Risberg, by phone at 651-296-7231 or email at jeff.risberg@pca.state.mn.us

Submit 2008 Draft Impaired Waters List comments to Howard Markus, MPCA, 520 Lafayette Road N., St. Paul, MN 55155.

Scheduling Process for TMDL Projects

Water Quality/Impaired Waters #1.17 • December 2007

Introduction

Minnesota has a growing number of impaired waters that are addressed through Total Maximum Daily Load (TMDL) projects. Because it is not feasible to begin all of these projects at the same time, the Minnesota Pollution Control Agency (MPCA) is required to set a completion schedule that follows federal and state priorities.

However, a project may begin sooner than scheduled through local leadership and qualified public agencies.

Background

Section 303(d) of the Clean Water Act requires states to publish and update a list of waters that do not meet one or more water-quality standards and require a TMDL study. The list, known as the 303(d) list or TMDL list, is updated every two years. The next list will be sent to the U.S. Environmental Protection Agency (EPA) for approval in 2008.

Minnesota's draft 2008 list shows 1,480 impairments on 338 rivers and 510 lakes that require TMDL studies. A TMDL is the maximum amount of a pollutant a water body can receive without violating water quality standards, and an allocation of that amount to the pollutant's sources.

The TMDL list includes a federally-required schedule for TMDL study development for each waterbody on the list. Completed TMDL studies are submitted by the MPCA to the EPA for final approval.

How are TMDL projects prioritized and scheduled?

Priority ranking of impaired waters is indicated by the target start/completion schedule for each impairment on the current list. The earlier the start date, the higher the priority. Project schedules are determined by looking at existing priorities in the basin that were set through the basin management process, and at local priorities set through the local water-planning process. Other local, state or federal priority considerations are also taken into account.

As established in Minnesota's Clean Water Legacy Act, here are the primary priorities:

- Designated uses of waters – drinking water, recreation, agriculture, etc.
- Severity of the impairment.
- Federal guidance – a TMDL must be completed 15 years from listing.
- Risk to human health.
- Risk to threatened or endangered species.
- Risk to aquatic health.
- Where local public agencies have demonstrated readiness (human, technical and financial resources) to lead a TMDL project, as well as demonstrated coordination and cooperation among local units of government in planning and implementation of a TMDL.

wq-iw1-17

A list of secondary priorities are also taken into account:

- Finishing what is started (projects underway needing additional support).
- Basin priorities – local input.
- MPCA capacity to provide technical and other support to a TMDL project.
- Project geographic distribution.
- Density of impairments.
- Efficiency – multiple impairment projects.
- Prototype TMDLs that may establish procedures for future projects.

Public input on the priority ranking occurs during the public notice process for the list and through regular contacts with state or local watershed managers.

In addition, as required by the Clean Water Legacy Act, the new Clean Water Council will help guide the pace of TMDL projects. The Act requires the Council to recommend priorities for scheduling and preparing TMDLs and TMDL implementation plans.

How is funding of TMDL projects determined?

Potential projects should work with MPCA watershed project managers to develop a work plan and budget estimates for the project. Proposed projects will be considered for funding by the MPCA during the spring of each year. As noted above, decisions for funding will be based on the priority ranking of TMDL projects, as established by state and federal requirements and recommended by the Clean Water Council. Projects selected for funding will be awarded with state grants provided through Clean Water Legacy Act appropriations.

Can a project proceed earlier than scheduled?

Given the high number of impaired waters, projects must be prioritized by the MPCA over the 15-year timeline for completing TMDL studies. However, a project may start sooner than its current schedule:

1. If an interested party can demonstrate to the MPCA a compelling reason for starting the project sooner than determined by the current prioritization process, based on the above listed criteria and other critical factors; or,
2. If a qualified public agency[1] would like to finance its own "Third Party TMDL" project. According to the Clean Water Legacy Act, a Third Party TMDL means a TMDL that is developed in whole or in part by a qualified public agency other than the MPCA. The public agency should develop a work plan according to MPCA's work plan guidance and protocols for TMDL development: (http://www.pca.state.mn.us/water/tmdl/tmdl-publications.html#guidance).

These guidance documents are designed for locally-led projects in particular. Final TMDLs must be submitted to the MPCA for approval prior to the MPCA's submission to the U.S. EPA for final approval.

Whom do I contact about doing a TMDL project?

Contact your MPCA regional office and ask for a watershed project manager or the basin coordinator for your area. Information and phone numbers for MPCA offices are on our Web site at http://www.pca.state.mn.us/about/regions/index.html.

[1] A "public agency" includes local units of government, state agencies, soil and water conservation districts and other political subdivisions, as well as public education institutions, with the authority, responsibility or expertise for managing water-related projects in the impaired watershed.

Minnesota Pollution Control Agency

Clean Water Legacy

Monitoring and assessment, TMDL development

wq-s1-11 / March 2008

In 2006, the Clean Water Legacy Act was passed and accelerated a path toward addressing impaired waters by assessing the quality of lakes, rivers and streams, and increasing the number of Total Maximum Daily Load (TMDL) studies initiated as required by the federal Clean Water Act.

Background

Impaired waters are lakes and rivers that do not meet water-quality standards for one or more pollutants, thus they are "impaired" for their designated uses under the federal Clean Water Act. The Act requires states to:

- Assess their waters to identify water quality impairments
- List those that do not meet standards
- Identify pollutant sources and reductions needed (TMDLs)
- Implement restoration activities

A TMDL is both the process used to study the pollution problem and a measurement of the total amount of a pollutant that a water body can receive without violating standards. TMDLs involve two to four years of technical study and intensive stakeholder and public input and they must be approved by the U.S. Environmental Protection Agency (EPA). Minnesota's Impaired Water Inventory includes 2,575 impairments, 1,475 of which still need a TMDL study to be prepared for 336 rivers and 510 lakes (a water body may have multiple impairments).

Currently, only a small percentage of streams and lakes have been assessed, so the number of impairments will continue to rise. With a TMDL required for each impairment on the list, Minnesota will need to prepare many TMDLs in future years. The cost of completing a TMDL varies widely. Some are small in scale; others may cover large regions, such as the Lake Pepin nutrient and turbidity TMDL, which covers half the state. In addition, it is important to note that most TMDLs address multiple impairments.

Completion of TMDLs has a direct economic impact on Minnesota. The Clean Water Act prohibits new or expanded wastewater discharges to an impaired water until a TMDL is completed.

A recent Supreme Court ruling acknowledged that the state has authority to allow discharge to an impaired water from a new facility as long as that discharge is balanced by reductions at another facility within the same watershed. The court's decision allowed the MPCA some flexibility in dealing with wastewater needs, but the clean water challenges facing the state related to community development remain significant. Moreover, Minnesota's $10-billion-a-year tourism industry is based on Minnesota's water resources, and water quality is critical to a healthy agricultural and business economy.

The 2006 Clean Water Legacy Act was passed to protect, restore, and preserve the quality of Minnesota's surface waters. An initial appropriation for FY 2007 was followed by a nearly $54 million

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appropriation for FY 2008-2009 to increase monitoring and assessment, and start a number of new TMDL studies and restoration and protection projects. Of that, just over $12.6 million was provided to the MPCA for monitoring and assessment, and $18 million was provided for TMDL development.

How the funding is being spent

Water quality assessment

The assessment process involves dozens of agency staff, other state agencies, and local partners. The goal of this effort is to use the best data and best science to assess the condition of Minnesota's water resources. As a result of the funding provided to the MPCA for FY 2008-2009 through the Clean Water Legacy Act, the following is being accomplished:

- Monitoring and assessing a total of 80-100 lakes for recreational use support each year, focusing on lakes larger than 500 acres, to accomplish the 10-year goal of assessing all lakes greater than 500 acres.
- Partnering with local units of governments and non profit organizations to monitor more than 390 lakes and 190 streams in 46 watersheds.
- In cooperation with the DNR, establishing permanent load monitoring stations at the outlet of the major watersheds in Minnesota. MPCA hopes to be sampling most of the load monitoring sites by the end of the 2008 monitoring season.
- Intensively sampling the streams in 6-8 major watersheds each year to assess recreational, aquatic life, and aquatic consumption use support. MPCA is scheduled to intensively monitor every major watershed in the state on a 10-year rotation.

TMDL development

With 1,475 listings on the impaired waters list and a TMDL required for each impairment, a workload of this magnitude presents considerable challenges for meeting federal TMDL requirements and implementing restoration efforts in a timely manner. The program requires significant coordination and extensive resources throughout the state. With the support of CWLA funding, the following is being accomplished:

- Approximately 80 TMDL studies addressing more than 300 impaired waters are underway. That's about one-third of all the impaired waters that have been currently identified.
- To date, 15 TMDL studies covering 95 impairments have been approved by the U.S. EPA. Those waters are now in the restoration phase of the process.

While many more waters need attention, more time and money is being invested to clean up lakes and rivers than any other period in Minnesota's history.

Benefits

The money appropriated through CWLA funding for the MPCA was a significant increase in the resources directed towards water-quality assessment and TMDL development:

- Address key policy goals of the Clean Water Legacy Act (M.S. Chapter 114D) in regard to assessing water quality and developing TMDLs
- Increase the ability of the state to address key requirements of Section 303(d) of the Federal Clean Water Act
- Promote an efficient and effective watershed framework of monitoring
- Provide for the collection of critical water-quality data for Minnesota's water resources that will inform policy and resource allocation decisions
- Direct significant new resources to the development of TMDLs, which provide the blueprint for effective, focused cleanup of our polluted waters
- Accommodate, by increasing the number of TMDLs started, demand for economic growth throughout the state
- Identify unimpaired water resources where protection strategies can be employed to avoid the need for more costly cleanup efforts in the future.

The current CWLA appropriation was one-time funding. Additional appropriations will be needed to maintain the current pace of assessing the quality of lakes, rivers and streams, and completing TMDL studies.

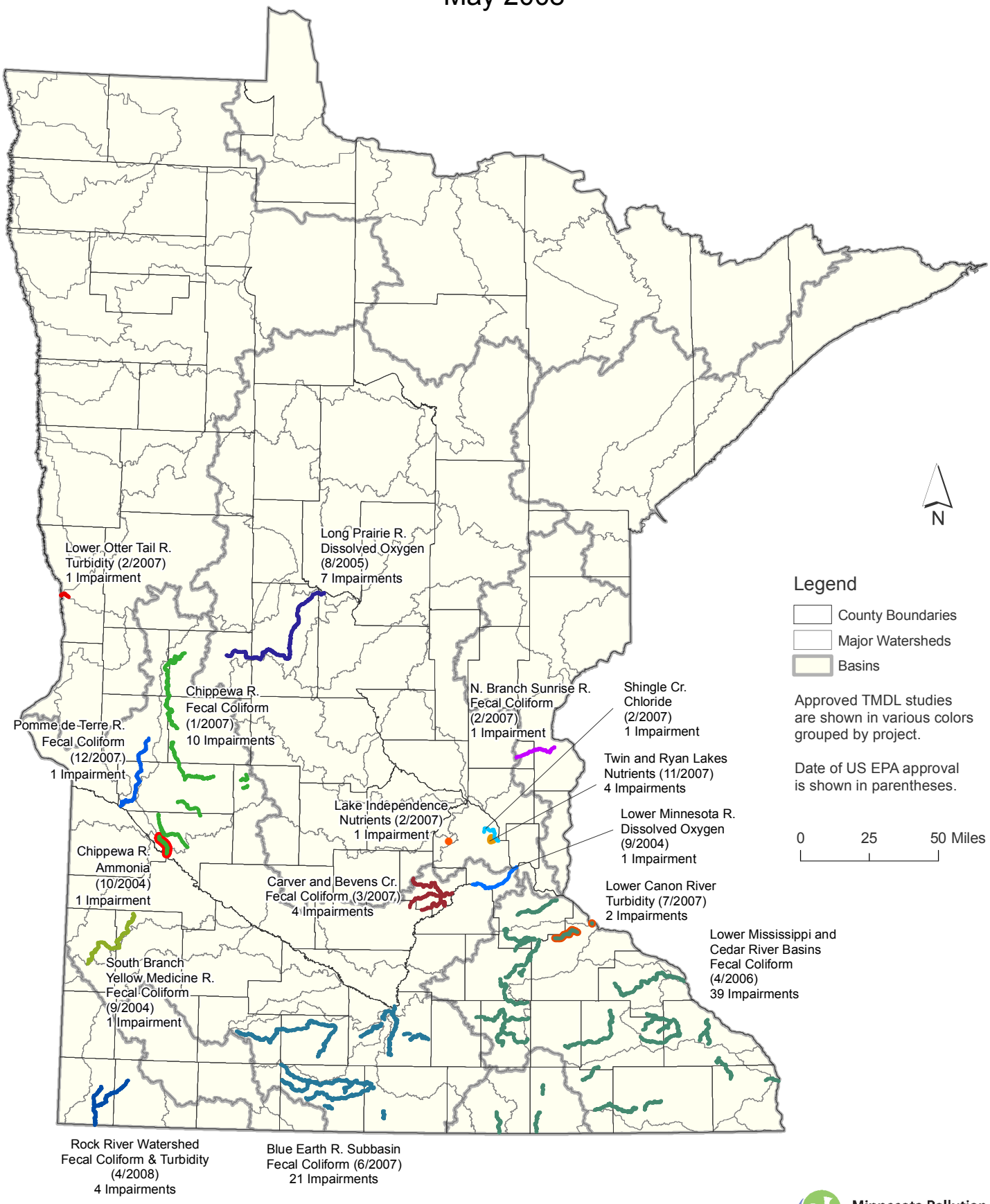
For more information

For more information contact Paul Eger, (651) 296-7319 or paul.eger@state.mn.us.

Approved TMDLs in Minnesota

Conventional Parameters

May 2008



Minnesota Pollution Control Agency

Turbidity: Description, Impact on Water Quality, Sources, Measures

- A General Overview

Water Quality/Impaired Waters #3.21 • March 2008

Many Total Maximum Daily Load projects in Minnesota address turbidity. Turbidity in water is a measurement of how cloudy or murky it is. In your espresso or latte' you want high turbidity. In your lake or stream, probably not. In either case, the substances resulting in high turbidity may not be intrinsically harmful, but their effects can be. Too much caffeine in the evening can affect sleep. Too much algae or sediment in lakes and streams can make them unsuitable for recreation and aquatic life.

Soil erosion on crop land has been a focus of soil and water conservation programs for many years. Urban stormwater runoff is also recognized as an important contributor of sediment, whether from construction sites, runoff from impervious surfaces, or other sources.

What Is Turbidity?

Turbidity is caused by particles suspended or dissolved in water that scatter light making the water appear cloudy or murky. Particulate matter can include sediment - especially clay and silt, fine organic and inorganic matter, soluble colored organic compounds, algae, and other microscopic organisms. In the Minnesota River, sediment is the primary contributor to turbidity. In a shallow lake in August, it may be algae. In a northern Minnesota lake it may be tannin released by the breakdown of organic material.

Impact of Turbidity

High turbidity can significantly reduce the aesthetic quality of lakes and streams, having a harmful impact on recreation and tourism. It can increase the cost of water treatment for drinking and food processing. It can harm fish and other aquatic life by reducing food supplies, degrading spawning beds, and affecting gill function.

A report of the European Inland Fisheries Advisory Commission lists five ways that fine particles can have a harmful impact on freshwater fish:

- acting directly on fish, killing them or reducing their growth rate, resistance to disease, etc.;
- preventing successful development of fish eggs and larvae;
- modifying natural movements and migrations;
- reducing the amount of food available; and
- affecting the efficiency of methods for catching fish.

Turbidity Sources

Sediment often tops the list of substances or pollutants causing turbidity. However, any watershed has multiple sources of the pollutants or physical features that can affect water clarity. These can be divided into natural or background, and human-induced sources. Natural sources can include erosion from upland, riparian, stream bank, and stream channel areas;

MPCA Area Offices:
Rochester area: 507/285-7343
Mankato area: 507/389-5977
Marshall area: 507/537-7146
Willmar area: 320/214-3786
Detroit Lakes area: 218/847-1519
Brainerd area: 218/828-2492
Duluth area: 218/723-4660
Metro area: 651/296-6300
Toll-Free Number: 800/657-3864

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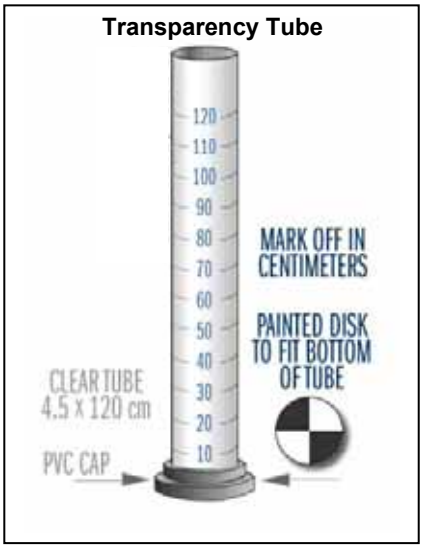
however, this is difficult to measure due to agriculture and development activity. Human activities can accelerate erosion. Tannic acids often associated with peat and bog areas cause water to be colored resulting in turbidity. Algae that grow with nourishment from nutrients entering the stream through leaf decomposition or other naturally occurring decomposition processes can also be a source of turbidity. Stream channel movement can also release sediment.

Phosphorus from various sources can cause algae growth resulting in increased turbidities. Phosphorus sources may include wastewater treatment facilities, nutrient runoff from crop land and other sources; and bottom sediment. Organic matter from sewage discharges, especially during treatment plant bypasses, can contribute to turbidity. Soil erosion on crop land has been a focus of soil and water conservation programs for many years. Urban stormwater runoff is also recognized as an important contributor of sediment, from construction sites, impervious surfaces, or other sources.

Measuring Turbidity

Turbidity is measured using specialized optical equipment in a laboratory or in the field. A light is directed through a water sample, and the amount of light scattered is measured. The unit of measurement is called a Nephelometric Turbidity Unit (NTU), which comes in several variations. The greater the scattering of light, the higher the turbidity. Low turbidity values indicate high water clarity; high values indicate low water clarity.



Measuring water transparency and Total Suspended Solids (TSS) also can be used to predict turbidity values. Secchi disks in lakes and transparency tubes in streams provide a simple and low-cost method for measuring water clarity. These are widely-used in citizen lake and stream monitoring programs. Laboratory analysis is necessary for measuring TSS in milligrams per liter.

Turbidity is affected by several factors in water: presence of dissolved and suspended solids, size and shape of particles and composition of the particles. Water quality measurements that can help in the characterization of turbidity include total suspended solids, volatile suspended solids, total dissolved solids, suspended sediment concentration, chlorophyll *a*, and particle size analysis. Other factors such as flow, sediment source and composition, algal species and sediment transport characteristics can also provide important information in characterizing the turbidity present in water.

Turbidity Water Quality Standard

Minnesota's water quality standards include a turbidity number as a measure of whether a water body meets its designated uses:

Classes (and descriptions)	Turbidity (NTU)
1B (drinking water)	10
2A (cold water fishery, all recreation)	10
2B (cool/warm water fishery, all recreation)	25
2C (indigenous fish, most recreation)	25

The relationship of TSS and transparency to turbidity across many streams indicates that 25 NTU is approximately equal to 58 mg/L for TSS and 20 centimeters of visibility through a T-tube. However, the relationship between turbidity and TSS can vary greatly in individual streams or even locations within a stream.

More Information

Protocol for Turbidity TMDL Development:
www.pca.state.mn.us/publications/wq-iw1-07.pdf

Minnesota River Basin Data Center:
http://mrbdc.mnsu.edu/mnbasin/wq/turbidity.html

Water on the Web:
http://wateronthewww.org/under/waterquality/

Minnesota River Turbidity TMDL Project:
www.pca.state.mn.us/water/tmdl/project-mnriver-turbidity.html

Nutrients: Phosphorus, Nitrogen Sources, Impact on Water Quality

- A General Overview

Water Quality/Impaired Waters #3.22 • May 2008

All lakes need protection from the pollution that robs them of oxygen and aquatic life. We can't do anything about nutrients from natural sources and the sun's warmth, but we can work to prevent excessive nutrients and sediments from human activity from getting into lakes and waterways.

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Rochester area:
507/285-7343
Mankato area:
507/389-5977
Marshall area:
507/537-7146
Willmar area:
320/214-3786
Detroit Lakes area:
218/847-1519
Brainerd area:
218/828-2492
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800/657-3864

In the 1997 Clean Water Action Plan the U.S. Environmental Protection Agency identified nutrients as a significant national problem contributing to water pollution. States reported that more than half of all lakes were affected.

Just as applying fertilizer to gardens and farm fields helps crops grow, nutrients entering lakes and rivers feed the growth of algae, bacteria, and other tiny organisms. Water bodies require some nutrients to be healthy, but too much can be harmful. When lakes receive an overabundance of nutrients, they can become polluted by excessive amounts of algae. Die-off and decomposition of algae blooms can reduce dissolved oxygen and suffocate fish and other aquatic life. Some forms of algae (blue-green) may produce toxins that can be harmful if ingested by humans and animals.

Phosphorus and Nitrogen

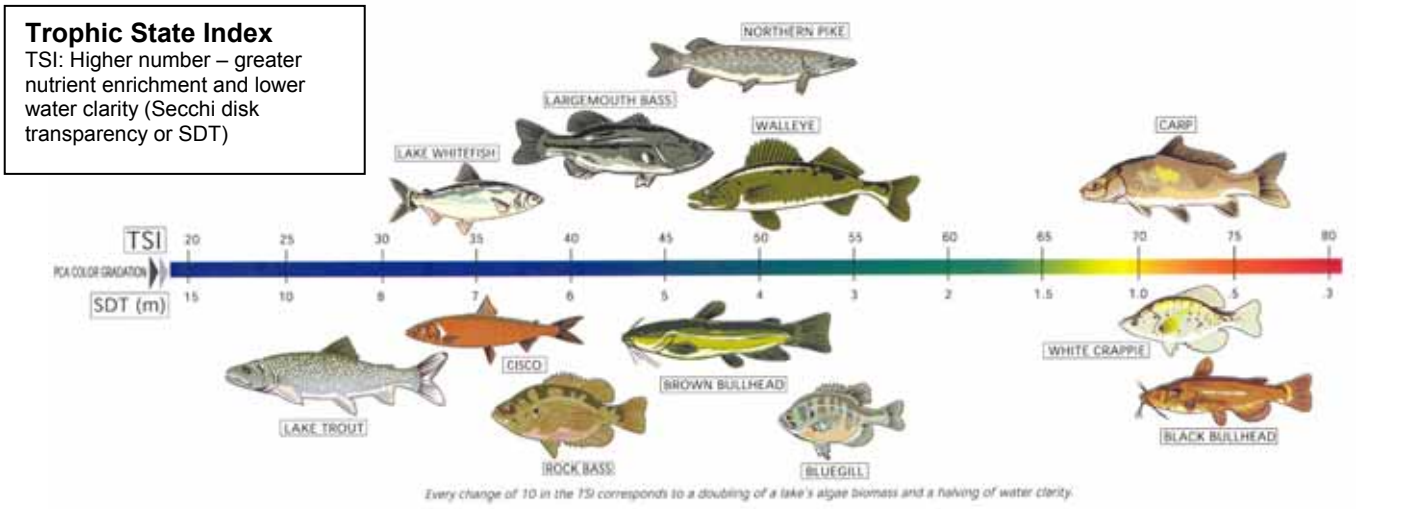
Phosphorus (P) and nitrogen (N) are the primary nutrients that in excessive amounts pollute our lakes, streams, and wetlands. Nitrogen is essential to the production of plant and animal tissue. It is used primarily by plants and animals to synthesize protein. Nitrogen enters the ecosystem in several chemical forms and also occurs in other dissolved or particulate forms, such as tissues of living and dead organisms.

Nitrate, a compound containing nitrogen, can exist in the atmosphere or as a dissolved gas in water, and at elevated levels can have harmful effects on humans and animals. Nitrates in water can cause severe illness in infants and domestic animals. Common sources of excess nitrate reaching lakes and streams include septic systems, animal feed lots, agricultural fertilizers, manure, industrial waste waters, sanitary landfills, and garbage dumps.

Photo: Grace Lake, Beltrami County SWCD

Phosphorus Fuels Algae Growth

Phosphorus is a vital nutrient for converting sunlight into usable energy, and essential to cellular growth and reproduction. It is one of the 20 most abundant elements in the solar system, and the 11th most abundant in the earth's crust. Under natural conditions phosphorus is typically scarce in water. In the late 1960s scientists discovered phosphorus contributed by human activity to be a major cause of excessive algae growth and degraded lake water quality.
Phosphorus occurs in dissolved organic and inorganic forms or attached to sediment particles. Phosphates, the inorganic form, are preferred for plant growth, but other forms can be used when phosphates are unavailable. Phosphorus builds up in the sediments of a lake. When it remains in the sediments it is generally not available for use by algae; however, various chemical and biological processes can allow sediment phosphorus to be released back into the water. For example,



bottom-feeding rough fish such as carp can stir up bottom sediments, releasing phosphorus back into the water.

Impact on Water Quality

Poor water quality in lakes can have many unpleasant consequences. Rough fish – such as carp and bullhead – populations increase at the expense of game fish populations. Severe nuisance algal blooms yield unpleasant odor and appearance that reduce the aesthetic appeal of lakes. This may result in declines in fishing and swimming and hurt tourism.

Citizen volunteers use Secchi disks to collect data on water clarity.

As algae die and decompose, the process consumes oxygen. Submerged plants without sunlight die, decompose and consume more oxygen. Without enough dissolved oxygen in the water, fish and other organisms suffer and die because they can't "breathe." This can occur locally or much farther downstream leading to degraded estuaries, lakes and reservoirs. For example, fish and other aquatic life can no longer survive in the so-called "dead zone" in the Gulf of Mexico.

Nutrient Sources and Pathways

The geology and land use within a lake's watershed determine the amount of nutrients that enter the lake via surface water runoff. Eutrophication is the slow aging process during which a lake, estuary, or bay evolves into a bog or marsh and eventually disappears. Some of the nutrients come from natural processes, such as decomposition of plant and animal material. During the later stages of eutrophication the water body is choked by abundant plant life due to higher levels of nutrients such as nitrogen and phosphorus. Human activities can accelerate the process with urban construction, sewage discharges, agricultural practices, and residential development.

Measuring Impact of Nutrients

Not all lakes are affected to the same degree. The green yuck permeates shallow lakes in the south more so than deeper, cooler northern lakes. The MPCA uses ecoregion-based total phosphorus guidelines in conjunction with Carlson's Trophic State Index (see chart) to classify lakes in their level of quality for swimming and fishing. TSI is a numeric index of lake trophic status on a scale of 1 to 100, the higher the number indicating greater nutrient enrichment. Lake nutrient standards that vary according to ecoregion and lake type have recently been developed. These water quality standards will provide a basis for determining the impairment status of Minnesota's lakes and will be useful for protecting the quality of good lakes as well. The MPCA also is developing nutrient standards for rivers.

Information Sources

Water Quality Standards:
www.pca.state.mn.us/water/standards/index.html
MPCA Lake Programs:
www.pca.state.mn.us/water/lake.html
Volunteer Surface Water Monitoring:
www.pca.state.mn.us/water/volunteer-monitoring.html
Secchi disk transparency slide show:
www.pca.state.mn.us/water/secchi-slideshow.html

Minnesota Pollution Control Agency

Regional Division

Phosphorus: Sources, Forms, Impact on Water Quality

- A General Overview

Water Quality #Impaired Waters #3.12 • July 2007

Phosphorus is an essential nutrient for plants, animals and humans. It is one of the 20 most abundant elements in the solar system, and the 11th most abundant in the earth's crust. Under natural conditions phosphorus (P) is typically scarce in water. Human activities, however, have resulted in excessive loading of phosphorus into many freshwater systems. This can cause water pollution by promoting excessive algae growth, particularly in lakes. Lakes that appear relatively clear in spring can resemble green soup in late summer due to algae blooms fueled by phosphorus. Water quality can be further impaired when bacteria consume dead algae and use up dissolved oxygen, suffocating fish and other aquatic life.

Because phosphorus changes form, most scientists measure total phosphorus rather than any single form to determine the amount of nutrient that can feed the growth of aquatic plants such as algae.

In some water bodies, the concentration of phosphorus is low enough to limit the growth of algae and/or aquatic plants. In this case, scientists say phosphorus is the **limiting nutrient**. For example, in water bodies having total phosphorus concentrations less than 10 parts per billion (1 ppb – equal to one drop in a railroad tank car), waters will be nutrient-poor and will not support large quantities of algae and aquatic plants. At the other extreme, total phosphorus levels of 100 or more ppb categorize lakes as highly eutrophic, with high nutrient and algae levels.

Sources of Phosphorus

Under normal water flows, roughly two-thirds of the total phosphorus load to lakes and rivers comes from nonpoint sources such as runoff from pasture and croplands, atmospheric deposition and stream bank erosion. Phosphorus loading contributed by runoff from pastures and croplands is largest source of nonpoint phosphorus on a statewide basis. Other nonpoint sources include urban runoff, non-agricultural rural runoff and seepage from individual sewage treatment systems.

Approximately 30 percent of the phosphorus load to Minnesota waters comes from point sources such as municipal and industrial wastewater treatment facilities. The magnitude of various sources of phosphorus varies greatly throughout the state due to the diverse nature of Minnesota's watersheds. ("Detailed Assessment of Phosphorus Sources to Minnesota Watersheds," MPCA, February 2004).

Forms of Phosphorus

Phosphorus in water exists in two main forms: dissolved (soluble) and particulate (attached to or a component of particulate matter). *Ortho phosphorus* is the primary dissolved form of phosphorus and is

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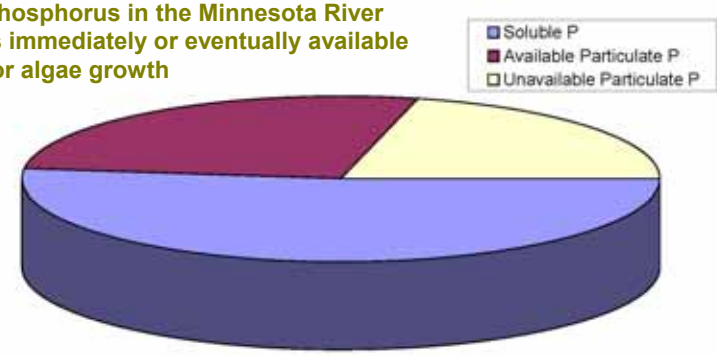
More than three-fourths of total phosphorus in the Minnesota River is immediately or eventually available for algae growth



Source: William F. James, Eau Galle Aquatic Ecology Laboratory

readily available to algae and aquatic plants. Most of the phosphorus discharged by wastewater treatment facilities is in the dissolved form.

Particulate phosphorus can change from one form to another (called *cycling*) in response to a variety of environmental conditions. A portion of particulate phosphorus is contained in organic matter such as algae, plant and animal tissue, waste solids, or other organic matter. Microbial decomposition of organic compounds can convert organic particulate P to dissolved P. Some of the P in soil mineral particles can also be converted to dissolved P both in the water column and during chemical and physical changes in bottom sediment. Only the most tightly bound forms of particulate phosphorus such as aluminum-bound phosphorus are not generally available for algal growth.

Because phosphorus changes form, most scientists measure *total phosphorus* rather than any single form to determine the amount of nutrient that can feed the growth of aquatic plants such as algae.

Minnesota River Basin-Lake Pepin

Three major river basins empty into Lake Pepin in southeastern Minnesota – St. Croix, Upper Mississippi, and the Minnesota. Lake Pepin is listed as an impaired water due to sediment and eutrophication (excessive nutrients and algae). The Minnesota River contributes a majority of the sediment. In a highly turbid water body such as the Minnesota River, much of the phosphorus load is attached to eroded soil particles, especially at higher flows. Much of the particulate phosphorus in the Minnesota River converts to the soluble that can become available to algae. This occurs in several ways: chemical and physical change (diagenesis) of sediment in the river or lake bed, interaction with dissolved chemicals in the water, and decay of organic P releasing dissolved phosphorus from soil particles. Models being used in the Lake Pepin and Minnesota River Total Maximum Daily Load projects keep track of both particulate and dissolved forms of phosphorus.

MPCA Phosphorus Strategy

Controlling phosphorus is an important part of protecting Minnesota's water resources. In 1996 MPCA developed a comprehensive phosphorus strategy. The strategy was adopted in March of 2000. Information is available on the Web at: www.pca.state.mn.us/water/phosphorus.html.
In February 2004, the MPCA submitted a report to the legislature entitled a "Detailed Assessment of Phosphorus Sources to Minnesota Watersheds" (cited on previous page). The report evaluates sources of phosphorus to Minnesota's surface waters and to municipal wastewater www.pca.state.mn.us/hot/legislature/reports/phosphorus-report.html.
Phosphorus Management Plans (PMP) will be recommended or required in many new or reissued National Pollutant Discharge Elimination System permits. PMPs are a tool being used to determine if public wastewater treatment facilities and industrial wastewater dischargers contribute substantial loads of total phosphorus that could be reduced through pollution prevention or improved wastewater treatment methods.

Minnesota River Basin Phosphorus Permit

In December 2005 the MPCA issued a general NPDES permit limiting the amount of phosphorus discharged at 156 municipal and industrial discharges in the Minnesota River Basin from the outlet of the Lac Qui Parle reservoir to the city of Shakopee. The Phase I goal is an aggregate 35% staged reduction in phosphorus discharged to the basin by 2010. Phase II (2010-15) sets a goal of the 1 mg/L phosphorus limit on all facilities discharging more than 1,800 pounds of phosphorus per year and to guarantee that there is no net increase in the amount of phosphorus discharged to the basin. More information is available on the Web at www.pca.state.mn.us/water/basins/mnriver/mnriver-phosphoruspermit.html.

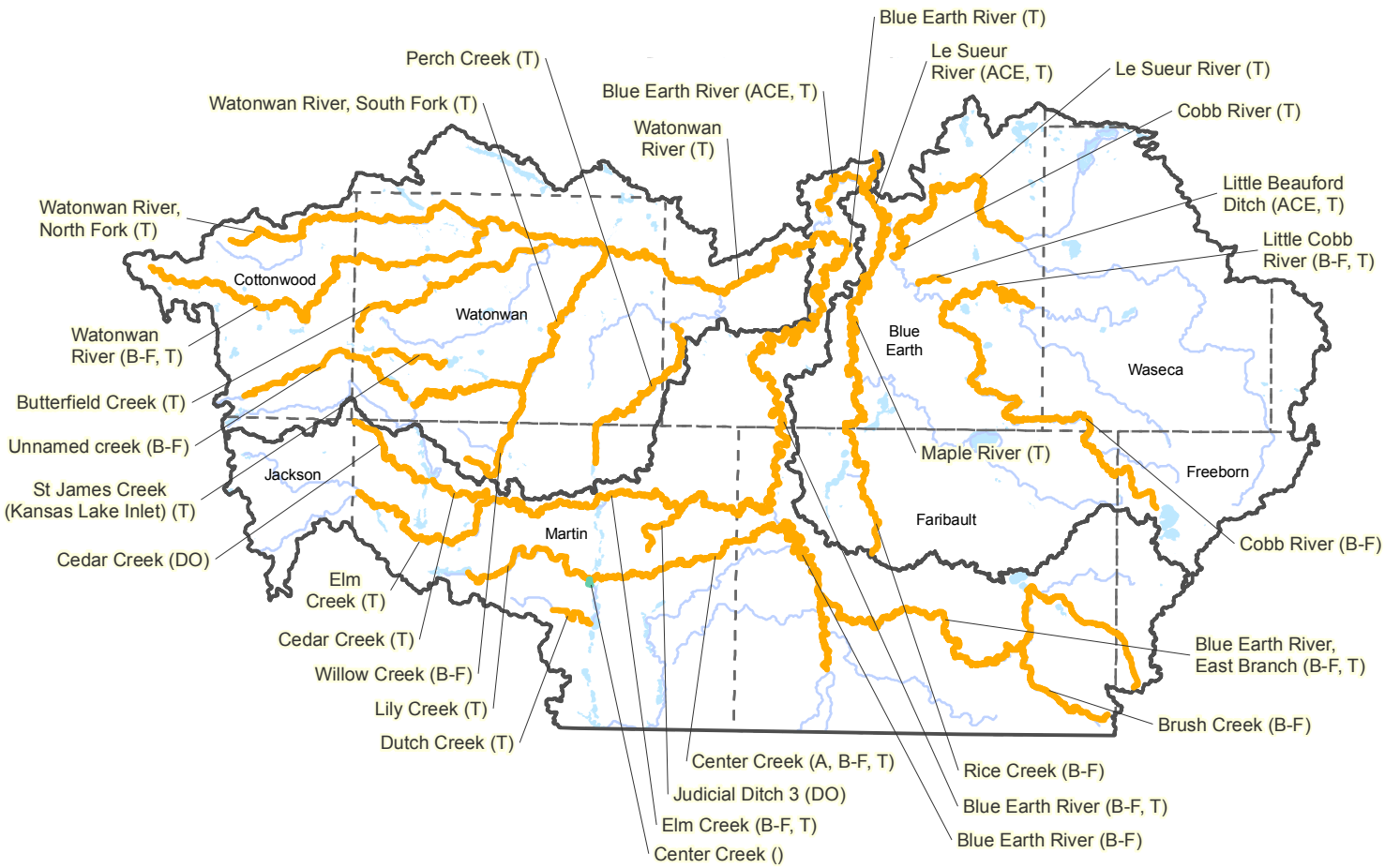
For More Information

Contact Dennis Wasley, 651-296-8660. dennis.wasley@pca.state.mn.us.

DRAFT until approved by US EPA

Greater Blue Earth Basin: Conventional Parameters

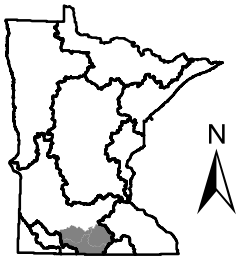
2008 Impaired Waters Requiring a TMDL (per Section 303 (d) Clean Water Act)



Affected Use
- Aquatic Life
- Aquatic Recreation
- Aquatic Life and Aquatic Recreation

Pollutant, Stressor, or Indicator
- A = Ammonia
- ACE = Acetochlor
- B-F = Fish IBI
- B-I = Invertebrate IBI
- B-FI = Fish & Invertebrate IBIs
- Cl = Chloride
- DO = Low Dissolved Oxygen
- FC = Fecal Coliform
- LCWA = Lack of coldwater assemblage
- pH = pH
- T = Turbidity
- Tm = Temperature

- Major Rivers
- Open Water
- Counties
- Major Watersheds
- Major Basins



For additional information concerning impairments, such as station information and monitoring data, see the MPCA Environmental Data Access System. http://www.pca.state.mn.us/data/edaWater

0 5 10 20 30 40 Miles

Minnesota Pollution Control Agency
September, 2007

Lower Minnesota River Basin: Conventional Parameters

2008 Impaired Waters Requiring a TMDL (per Section 303 (d) Clean Water Act)

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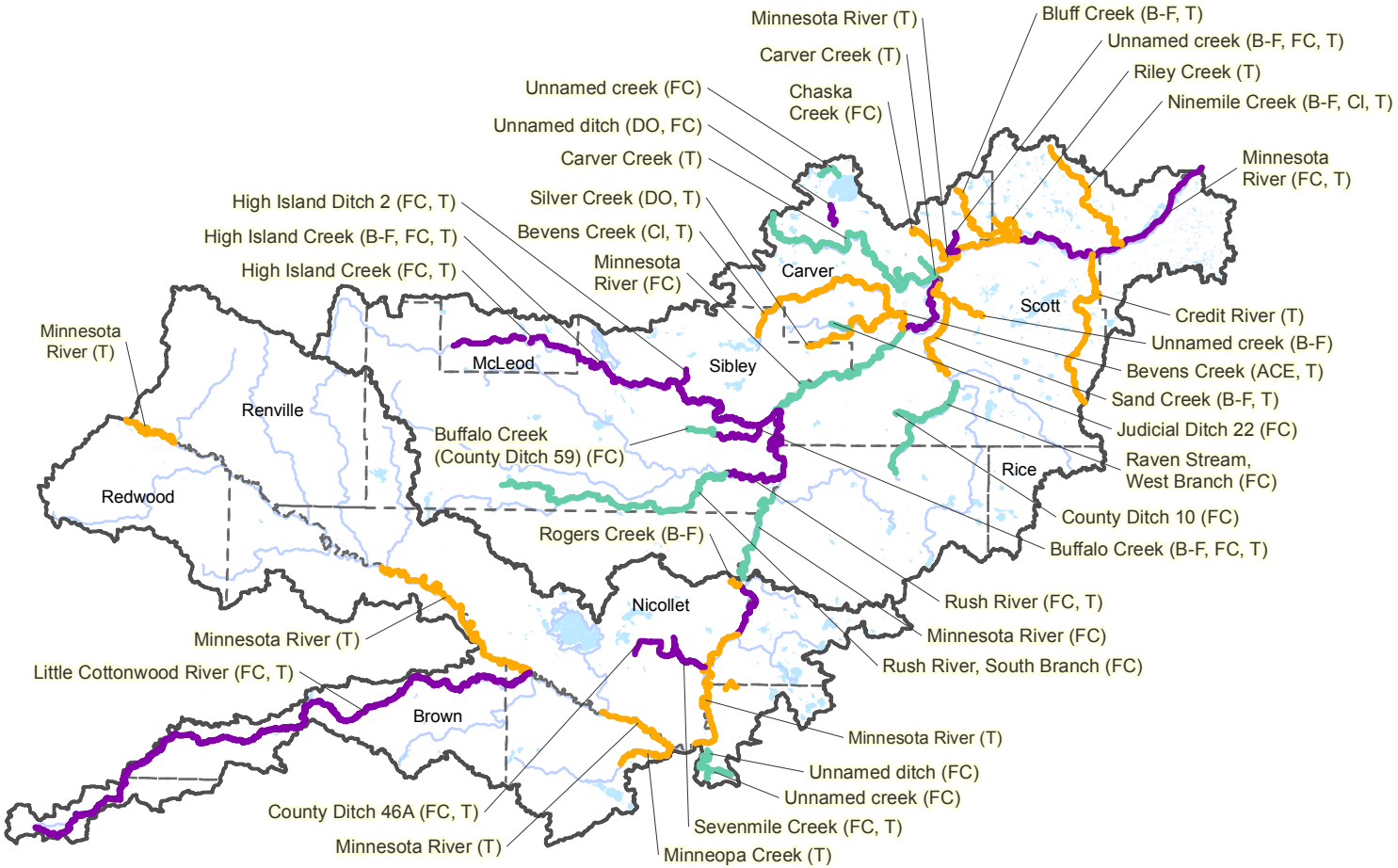

Affected Use

- Aquatic Life
- Aquatic Recreation
- Aquatic Life and Aquatic Recreation

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- Counties
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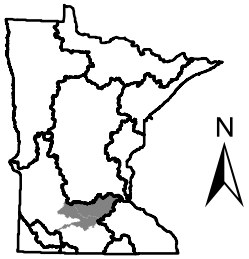
- Major Basins



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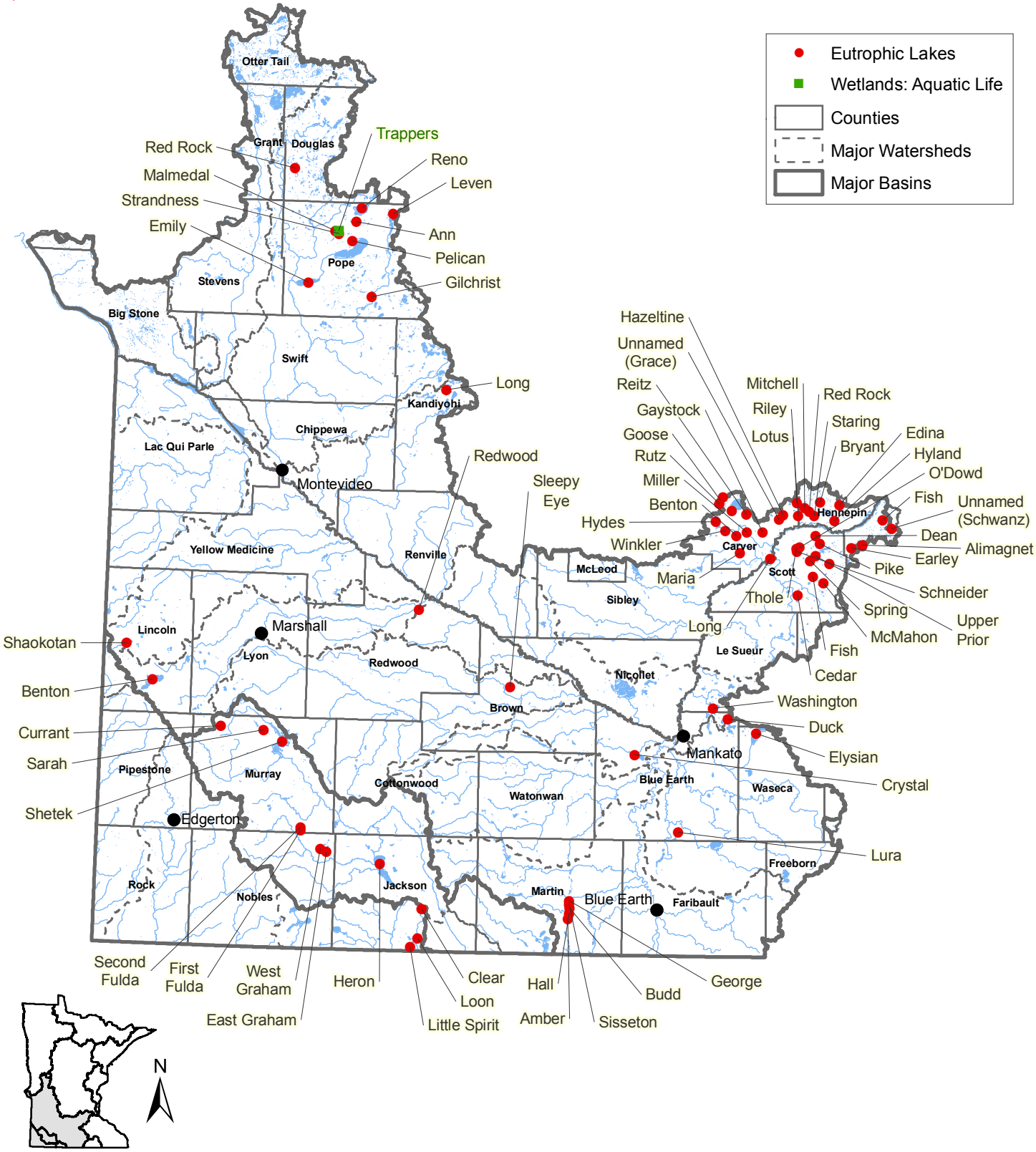
0 5 10 20 30 40 Miles

Minnesota Pollution Control Agency
September, 2007

Minnesota, Missouri, and Des Moines River Basin: Eutrophic Lakes

2008 Impaired Waters Requiring a TMDL (per Section 303 (d) Clean Water Act)

DRAFT until approved by US EPA



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0 5 10 20 30 40 Miles

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Minnesota, Missouri, and Des Moines River Basin: Bioaccumulative Toxics

2008 Impaired Waters Requiring a TMDL (per Section 303 (d) Clean Water Act)

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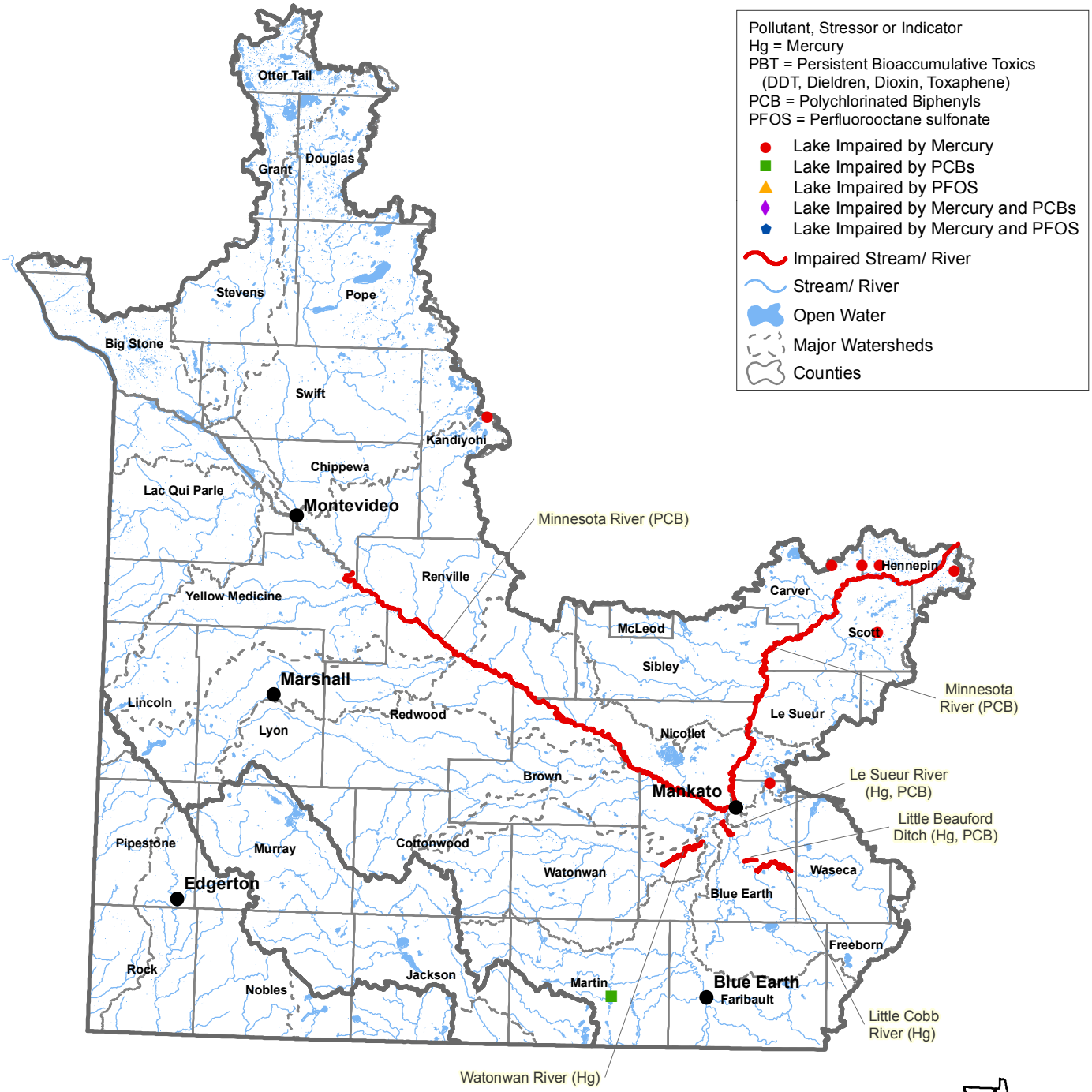

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0 5 10 20 30 40 Miles

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September, 2007

Minnesota Pollution Control Agency

Regional Environmental Management

Impaired Waters Program

Lower Minnesota River Low Flow Dissolved Oxygen TMDL

Water quality/basins #3.07, Revised May 2004

Section 303(d) of the federal Clean Water Act and the United States Environmental Protection Agency' s Water Quality Planning and Management Regulations require states to develop Total Maximum Daily Loads (TMDLs) for water bodies not meeting water quality standards.

The TMDL process establishes the allowable loading of pollutants for a water body based on the relationship between pollutant sources and in-stream water quality conditions. The development of a TMDL Report provides states a basis for determining the pollutant reductions necessary from point and nonpoint sources to restore and maintain the quality of their water resources.

The purpose of this TMDL Report is to identify the allowable levels of phosphorus that will result in the attainment of the dissolved oxygen standard in the lower 22 miles of the Minnesota River during low flow conditions. The low dissolved oxygen problem occurs during low flow conditions in this stretch of the Minnesota River. Low flow conditions are important in this TMDL because that is when the low dissolved oxygen problem occurs.

1985 study - first phase

As a first step in solving the problem, a 1985 Waste Load Allocation Study (WLA Study) established wastewater treatment plant biochemical oxygen demand (BOD) discharge limits for those facilities in the lower 22 miles of the Minnesota River. The WLA Study also established a 40 percent BOD reduction goal for the Minnesota River upstream of Shakopee. In the WLA Study, the upstream area was treated as one unit (i.e. not separated by major watershed or BOD source). The completion of the 1985 WLA Study was Phase I of the TMDL development.

This TMDL Report addresses Phase II. Phase II focuses on achieving the 40 percent BOD reduction goal by reducing the high phosphorus loading upstream of the metropolitan area. Phosphorus is targeted because the nutrient causes excessive algal growth, which in turn produces BOD as a result of algal decomposition. High BOD leads to the low dissolved oxygen.

Advisory committee input

A model was used to determine the major phosphorus sources and to simulate changes in land use (i.e. effluent limits, stormwater BMPs, agricultural BMPs). A 45-member advisory committee met to discuss the modeling results and to offer input on the allocation. The advisory committee was composed of people representing cities and their consulting groups, industry, agriculture, commodity groups, counties, watershed projects, and environmental groups. The recommended land use changes proposed by the group were run through the model.

Components of a TMDL Report include a waste load allocation for point sources, a load allocation for nonpoint sources, a margin of safety, which was included in the modeling assumptions, and reserve capacity to allow for growth. The modeling process used an implicit margin of safety by using conservative assumptions.

Under current land use practices, approximately 1,240 pounds per day of phosphorus is projected to be generated in the Basin during critical low flow

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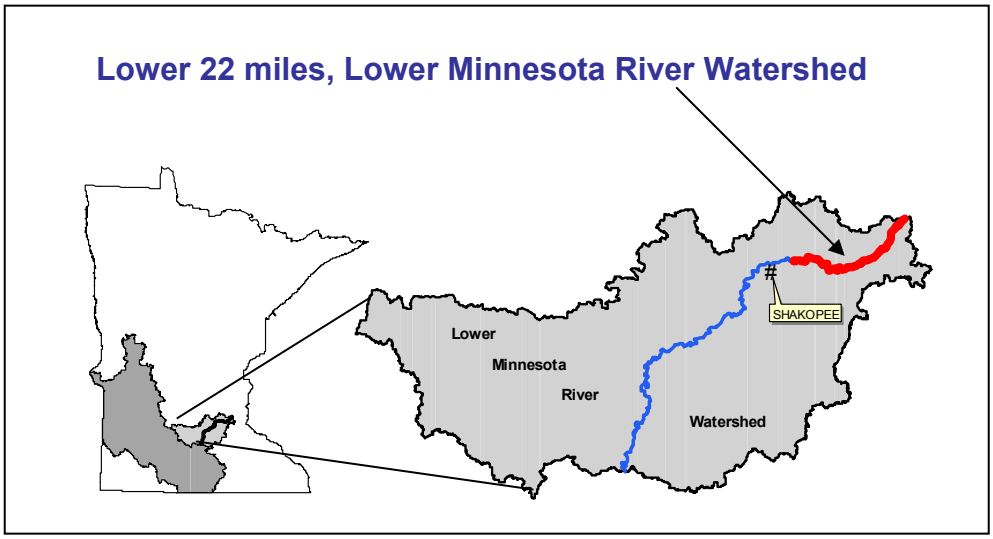
conditions. This TMDL Report reduces the amount to 752 pounds per day during lowflow conditions. Strategies to solve the problem involve decreasing the amount of phosphorus that reaches the river and increasing the amount of flow so low flow periods occur less frequently for shorter periods of time.



The emphasis of this low flow TMDL Report is on wastewater treatment facilities, although agriculture, noncompliant ISTS and stormwater each play a role in the reduction efforts. A watershed permit dealing exclusively with phosphorus will be drafted for the Minnesota River Basin.

Wastewater treatment facility options

As a part of the permit, all communities will evaluate the feasibility of 30 and 50 percent phosphorus reductions and implement the reductions where feasible. Two approaches are being considered for wastewater treatment facilities discharging over 1,800 pounds of phosphorus per year: 1) a 1 mg/l effluent limit (seasonal average or flow triggered) to achieve a 51 percent reduction in ten years; and 2) point-point trading to achieve a 35 percent reduction by the end of the first phase of the watershed permit (five years).

The first watershed permit will be followed by a second watershed permit requiring a 1 mg/l effluent limit or equivalent pollutant trading offsets by the end of the second phase of the permit (ten years). The method will be selected during the development of the watershed permit and the TMDL implementation plan. Additional information from other studies (e.g. updating the 1985 Waste Load Allocation Study) may update this TMDL Report and change the allocations or effluent limits.

Communities will reduce phosphorus in stormwater by stormwater prevention planning and using BMPs. Communities with and without Municipal Separate Storm Sewer permits will be involved.

Noncompliant ISTS that discharge to surface water are also a source of phosphorus. Ninety percent of these systems that discharge to surface water will be moved to compliance.

The methods cited above involve phosphorus reductions. Flow is also a consideration. Because the dissolved oxygen problem occurs during low flow periods, agricultural runoff contributes less phosphorus due to lack of runoff during low flow conditions.

The agricultural sector can, however, implement BMPs to increase ground water recharge such as crop residue and protection of surface tile intakes (or equivalent BMPs). The benefits of these practices will be exhibited during low flow periods when the previously stored water flows into the river via springs, thereby maintaining the flow.

As a result of these proposed solutions, phosphorus, and consequently BOD, can be reduced enough to meet the dissolved oxygen water quality standard during low flow conditions.

For more information

For more information, contact Jim Klang, 651-296-8402, or Larry Gunderson, 651-297-3825. On the Web, visit www.pca.state.mn.us/water/tmdl. The final report is located on the Web at: http://www.pca.state.mn.us/water/basins/mnriver/mnriver-tmdl.html

Minnesota Pollution Control Agency

Regional Division

Impaired Waters Program

Minnesota River Basin TMDL Project for Turbidity

Water Quality/Basins 3.33, June 2005

Contents

Description of water body 2
Pollution sources 2
Measuring turbidity ... 2
Total suspended solids 2
Impact on Lake Pepin 2
Turbidity solutions 3
Project timeline 3
Existing reports 3
Web sites 3
Chart of listed reaches 4

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Introduction

This project addresses turbidity impairments in the Minnesota River Basin. The project area begins near Lac Qui Parle in western Minnesota and ends at the city of Jordan near the Twin Cities metropolitan area. It includes 18 reaches on the mainstem and lower tributaries, including the Chippewa, Redwood, Cottonwood, Blue Earth, Hawk Creek, Yellow Medicine, Watonwan, and Le Sueur Rivers (Map on back page).

Turbid waters of Minnesota River above the dam at Granite Falls. May 2002

What is turbidity?

Turbidity of water is caused by suspended and dissolved matter such as clay, silt, organic matter, algae and color. Turbidity limits light penetration and inhibits healthy plant growth on the river bottom. Aquatic organisms may have trouble finding food, gill function may be affected, and elevated amounts of sediment associated with turbidity can cause spawning areas and other habitat to be covered. It is recognized as an indicator of water quality – the greater the turbidity the greater the pollution.

TMDL background

Under the federal Clean Water Act, states are required to submit a list of impaired waters to the U.S. Environmental Protection Agency every two years. Minnesota's 2004 303(d) List of Impaired Waters includes 920 lakes and 583 river reaches. Some are listed for multiple contaminants. Statewide, approximately 8 percent of the streams and 14 percent of the lakes in Minnesota have been assessed for impairments.

In addition to submitting the list, states must evaluate impaired waters to determine pollutant sources and make reasonable progress toward cleaning up or restoring listed waters. A Total Maximum Daily Load (TMDL) study must be conducted for each pollutant affecting an impaired water. The study identifies all pollutant sources and determines the amount of reduction needed by each source to restore water quality. State agencies, local organizations and other stakeholders work together using water sampling data, computer modeling and public input to develop TMDLs.

Description of water body

From its source at Big Stone Lake on the South Dakota border, the Minnesota River flows 335 miles southeast to Mankato and then northeast to join the Mississippi at Fort Snelling. Native prairie and pothole wetlands once covered most of the 16,770-square-mile Basin. Today it's a patchwork

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of farms sprinkled with areas of urban and industrial development with its outlet in a growing metropolitan area.

As the river flows west-to-east through the basin its water quality is increasingly affected by nonpoint sources of pollution such as stormwater runoff and point source discharges. Pollutants include sediment, bacteria, toxics, and algae-producing nutrients such as nitrogen and phosphorus. Its waters often appear turbid or muddy. Turbidity is caused by high amounts of particulate matter, primarily sediment and algae.

Pollution sources

Streambanks and uplands are sources of sediment in the Minnesota River. Generally, the contributions vary from the two sources by watershed and geography. The Blue Earth River produces significant streambank erosion, accounting for 30 to 45 percent of the sediment in the flow that discharges to the Minnesota River. Sediment may runoff from fields or enter through unprotected tile intakes. Drainage systems contribute to high peak flows that may accelerate bank erosion. Bare soil on cultivated fields can be carried into waterways by wind erosion. Nutrients such as nitrogen and phosphorus in the river come from natural sources, land use practices and point source discharges such as wastewater treatment facilities.

Measuring turbidity

Turbidity can be measured by instruments that record how much light is scattered and absorbed in a water sample. This is recorded in Nephelometric Turbidity Units. Light can be scattered by suspended particles and soluble colored compounds. The water quality standard for turbidity in class 2B waters is 25 NTUs. Water clarity, which is different than turbidity, can be measured with a Secchi disk or transparency tube. The latter is used in rivers and streams to obtain a stationary sample not affected by the current. It measures the maximum distance in a water sample through which the disk remains visible. In lakes a Secchi disk is lowered into the water to measure the depth of clarity.

Total suspended solids

Total suspended solids (TSS) is a quantitative measure of suspended matter in water that is closely associated with turbidity. TSS is the concentration of suspended material in the water as measured by the dry weight of the solids filtered out of a known volume of water. TSS is usually expressed as milligrams per liter. TSS can include sand, silt, clay, plant fibers, algae, and other organic matter.

Sediment in water often makes up most of the TSS in water. The significance of this sediment to the quality of aquatic and riparian systems is well established. Sediment in water causes habitat degradation for fish and other aquatic life, stream channel filling, nutrient deposition and resuspension, and reservoir filling. The U.S. Environmental Protection Agency (1998) identifies sediment as the single most widespread cause of impairment of the nation's rivers and streams, lakes, reservoirs, ponds, and estuaries. *(Source: Comparability of Suspended-Sediment Concentration and Total Suspended Solids Data – USGS, 2000)*

Impact on Lake Pepin

The Minnesota River contributes about 80 to 90 percent of the sediment load to Lake Pepin. The sediment contributes a significant source of plant nutrients. At low flows, the nutrients accelerate algae growth in the lake. At higher flows, the sediment is a major cause of turbidity. The fine particles suspended in the water settle out in the upper portion of the lake and represent a third problem for Lake Pepin – an accelerated in-filling. Core studies have

River reaches in TMDL project for turbidity

In the Minnesota River:

- Blue Earth River to Shanaska Creek
- Cottonwood River to Little Cottonwood River
- Swan Lake Outlet to Minneopa Creek
- Eight Mile Creek to Cottonwood River
- Beaver Creek to Birch Coulee
- Shanaska Creek to Rogers Creek
- Rush River to High Island Creek
- Chippewa River to Stoney Run Creek
- Timms Creek to Redwood River

In the Blue Earth River

- LeSueur River to Minnesota River
- Rapidan Dam to LeSueur River

LeSueur River: Maple River to Blue Earth River

Watonwan River: Perch Creek to Blue Earth River

Yellow Medicine River: Spring Creek to Minnesota River

Hawk Creek: Spring Creek to Minnesota River

Chippewa River: Watson Sag to Minnesota River

Redwood River: Ramsey Creek to Minnesota River

Cottonwood River: JD 30 to Minnesota River

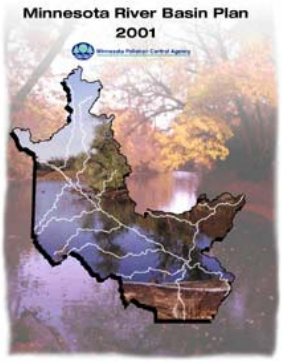
shown that, at current sedimentation rates, the upper portion of Lake Pepin will fill in within 100 years and the lower portion will disappear within 340 years compared to natural rates that would fill the lake in 3,000 to 4,000 years. Once the lake disappears, its function as a protector of downstream water quality will disappear as well.

Turbidity solutions

Land use practices that reduce the amount of sediment and nutrients entering lakes and streams are necessary to reduce turbidity. Riparian (streambank, lakeshore) buffers, streambank stabilization, water storage, surface tile intake buffers or replacements, and crop residue management, all help reduce sediment transport. On farmland conservation tillage and increased crop diversity including pasture can reduce sediment loss considerably. Crop nutrient management plans help keep nitrogen and phosphorus out of waters, as do improvements in private and public wastewater treatment systems. In cities and developing areas, stormwater management and construction erosion control help prevent sediment runoff. On a basin scale such as this, virtually every best management practice involving all types of land use and all citizens will be necessary.

Existing reports

Much research and many reports on the Minnesota River Basin and major watershed already exist. They offer much data and background that will be useful in this TMDL project.



- *Minnesota River Assessment Project*, MPCA, 1994
- *Working Together: A Plan to Restore the Minnesota River*, Minnesota River Citizens' Advisory Committee, MPCA, 1994.
- *Minnesota River Basin Information Document*, MPCA, 1997.
- *Minnesota River Basin Plan*; MPCA, 2001.
- *State of the Minnesota River*; Minnesota State University, MPCA, Minnesota Department of Agriculture, Metropolitan Council, 2002.

Minnesota River Web sites

- Minnesota River Basin Data Center, Minnesota State University, Mankato: http://mrbdc.mnsu.edu/
- Minnesota Pollution Control Agency: pca.state.mn.us/water/basins/mnriver/index.html
- Coalition for a Clean Minnesota River www.newulmweb.com/ccmr/
- Clean Up the River Environment http://curemnriver.org/
- Friends of the Minnesota River Valley www.friendsofmnvalley.org/default.htm
- The Minnesota River Scenic Byway www.mnrivervalley.com/
- Minnesota River Basin Information Page, Department of Soil, Water and Climate, University of Minnesota www.soils.umn.edu/research/mn-river/
- Redwood-Cottonwood Rivers Control Area www.rcrca.com/

TMDL project timeline

Develop TMDL Work Plan – 2005
Project scoping, convene stakeholder group, convene technical advisory committee, finalize work plan.

TMDL Study – 2006
Submit modeling work plan to contactors, evaluate proposals, present to watershed projects, local partners.

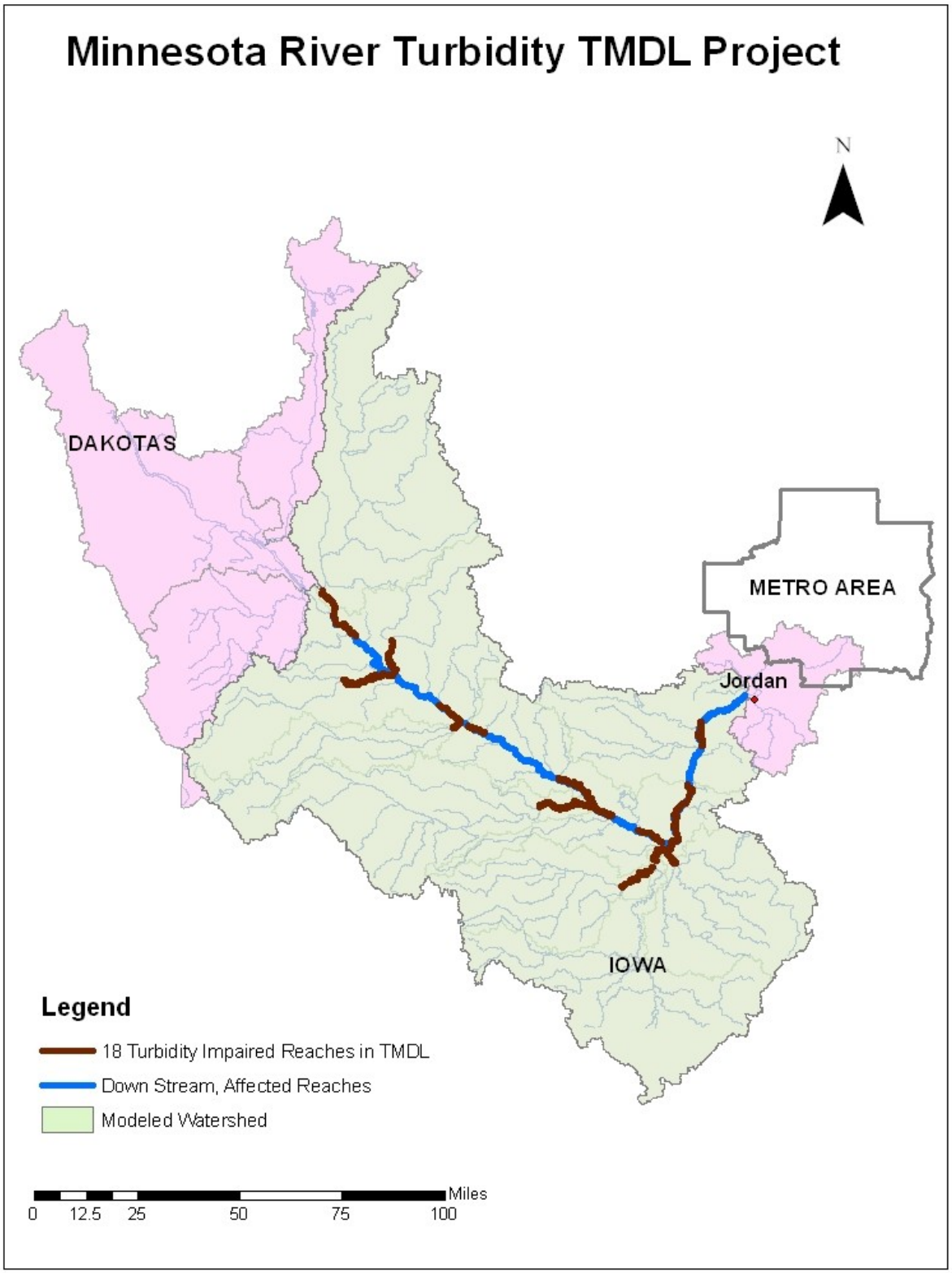
Model scenarios – 2007
Report results of model, committees determine alternative scenarios, test scenarios with stakeholder group, present information to watershed projects and local partners.

Develop TMDL Report – 2008
Send draft TMDL report to EPA for review, public comment period, send report to EPA for formal review.

Develop TMDL Implementation Plan – 2009
Work with partners to develop projects.

For more information

For more information about the Minnesota River Basin Turbidity Total Maximum Daily Load project contact Larry Gunderson, MPCA, St. Paul, 651-297-3825, e-mail: larry.gunderson@pca.state.mn.us


Minnesota River Turbidity TMDL Project
N
DAKOTAS
METRO AREA
Jordan
IOWA
Legend
18 Turbidity Impaired Reaches in TMDL
Down Stream, Affected Reaches
Modeled Watershed
Miles
0
12.5
25
50
75
100

Lake Pepin Watershed TMDL

Eutrophication and Turbidity Impairments Project Overview

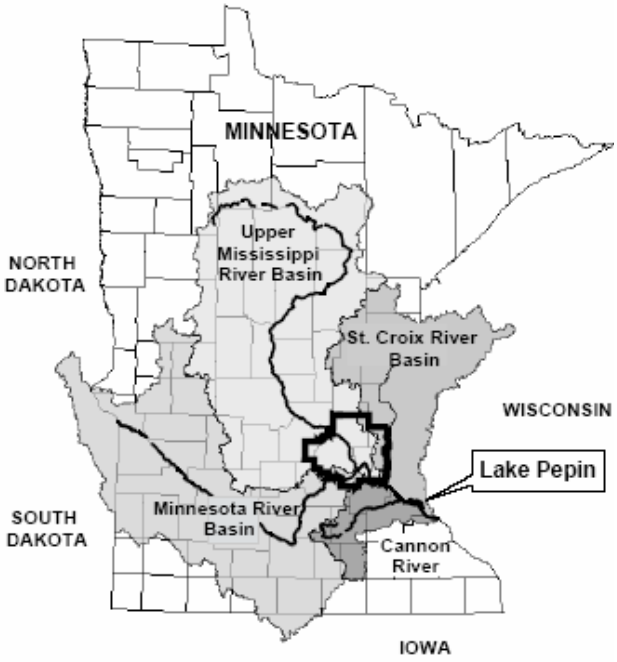
wq-iw9-01a • Updated: April 2007

Eutrophication
Aging process of lakes (natural or cultural); high level of nutrients causing excess algae production

Turbidity
Measures water clarity; related to particles in water (sediment and algae)

TMDL
The total amount of a pollutant that a water body can carry without violating water quality standards

Lake Pepin has been placed on the 2004 list of impaired waters for two types of water quality problems. As a lake, it is impaired by excess nutrients that cause algae blooms, particularly severe during lower-flow periods. As part of the Mississippi River reach extending from the St. Croix River to the Chippewa River, Lake Pepin is also turbidity impaired.



TMDL Background

In accordance with the Clean Water Act, states are required to submit a list of impaired waters to the U.S. Environmental Protection Agency every two years. Minnesota's 2006 303(d) List of Impaired Waters includes 1,008 lakes and 296 rivers, some of which are listed for multiple contaminants. Approximately 10 percent of the streams and 16 percent of the lakes in Minnesota have been assessed for impairments.

In addition to submitting the list, states must evaluate impaired waters to determine pollutant sources and make reasonable progress toward cleaning up or restoring listed waters. A Total Maximum Daily Load (TMDL) study must be conducted for each pollutant affecting an impaired water. The study identifies all pollutant sources and determines the amount of reduction needed by each source to effectively restore water quality. State agencies, local organizations and other stakeholders work together using water sampling data, computer modeling and public input to develop TMDLs.

Description of Water Body

Lake Pepin is a natural lake on the Mississippi River. It has a surface area of about 40 square miles and a mean depth of 18 feet. Its watershed is about 48,634 square miles (approximately half of Minnesota's total land area plus a portion of Wisconsin), including the Upper Mississippi, St. Croix and Minnesota Rivers.

Minnesota Pollution Control Agency • 520 Lafayette Rd. N., St. Paul, MN 55155-4194 • www.pca.state.mn.us
651-296-6300 • 800-657-3864 • TTY 651-282-5332 or 800-657-3864 • Available in alternative formats

Lake Pepin Listed Impairments

Lake Pepin's turbidity and nutrient enrichment impairments are distinct, but inter-related.

At higher flows, large amounts of sediment and phosphorus are carried downstream to Lake Pepin. Suspended sediment contributes to the turbidity problem in the Mississippi River reach that includes Lake Pepin, particularly at higher flows. Sediment also carries considerable quantities of attached phosphorus to the lake. Much of the sediment settles on the lake bed.

At lower flows, phosphorus concentrations of water coming into Lake Pepin remain high. Additional phosphorus is supplied to the lake internally from its highly enriched bed sediments. Because water resides in the lake for longer periods at lower flows, algae have time to more fully utilize available phosphorus. The result is more frequent and severe algae blooms. Adding to these impacts are algae produced upstream that are transported to Lake Pepin. Suspended algae also contribute to turbidity.

Pollution Sources

Both point and nonpoint sources of pollution contribute to Lake Pepin impairments. Point sources refer to a specific discharge point such as a pipe. Nonpoint sources refer to overland runoff.

Phosphorus is the primary pollutant associated with the eutrophication of surface waters. Four principal external sources of phosphorus in Lake Pepin include the Upper Mississippi, St. Croix and Minnesota Rivers as well as the Twin Cities Metropolitan Area. In addition to these external sources, internal recycling of phosphorus plays an important role in the nutrient level in the lake.

The Minnesota River contributes most of Lake Pepin's sediment load. The sediment contributes a significant source of plant nutrients. At low flows the nutrients accelerate phytoplankton (algae) growth. At higher flows, the sediment is a major cause of turbidity. The fine particles suspended in the water settle out in the upper portion of the lake and represent a third problem for Lake Pepin – an accelerated in-filling.

Core studies have shown that, at current sedimentation rates, the upper portion of Lake Pepin will fill in within 100 years and the lower portion will disappear within 340 years. Once the lake disappears, its function as a protector of downstream water quality will disappear as well.

Water Quality Standards

Total phosphorus and chlorophyll-a are typically used for identifying use impairments related to eutrophication. Phosphorus is appropriately used for modeling and source-control while chlorophyll-a is best for making direct linkages to nuisance conditions. Phosphorus and chlorophyll-a levels in Lake Pepin have exceeded MPCA thresholds for 303(d) listing in recent years. Appropriate goals for phosphorus and chlorophyll-a concentrations will be established through the TMDL process.

Minnesota's water quality standard for turbidity is intended to support aquatic life. This includes submersed aquatic vegetation, which requires sunlight for photosynthesis, and sight-feeding fish. The warm water standard for turbidity is 25 nephelometric turbidity units (NTUs).

Lake Pepin TMDL Study

Limno-Tech, Inc. of Ann Arbor, Mich. is under contract to develop a water quality model for the Mississippi River from Lock and Dam 1 through Lake Pepin. Additional contractors are developing other models for the TMDL. The National Center for Earth System Dynamics, University of Minnesota and Science Museum of Minnesota are under contract to identify and quantify sources of sediment.

For More Information

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Minnesota Pollution Control Agency

Blue Earth River Basin

Total Maximum Daily Load for Fecal Coliform Bacteria

Water Quality, Impaired Waters 7-05a • October 2006

The Blue Earth River Basin (BERB) covers parts of 14 counties in south-central Minnesota and northern Iowa. The basin includes three major watersheds, the Blue Earth, LeSueur and Watonwan. The BERB contains 17 stream segments, called reaches (see map), that are listed as "impaired" under section 303(d) of the Federal Clean Water Act.

The listings are based on violations of Minnesota's water-quality standard for fecal coliform bacteria, which indicates these waters are not suitable for swimming and other body-contact recreation. Water testing and data analysis indicate four additional stream reaches are likely to be included on the 2008 impaired waters list for violations of this standard. This fact sheet provides details on a cleanup process called a TMDL (see below) addressing all 21 reaches.

TMDL Background

Impaired waters are those that do not meet water-quality standards established to protect their designated uses such as recreation, fishing, irrigation, and support of wildlife. Examples of pollutants or conditions that may place a lake or stream on the impaired waters list include nutrients, bacteria, sediment, high turbidity, low dissolved oxygen, and bioaccumulative toxins such as mercury and PCBs. Waters are sometimes impaired by multiple pollutants.

For each impaired water, federal law requires that states determine an acceptable Total Maximum Daily Load (TMDL) for the relevant pollutant(s). This total acceptable load is then allocated among all the sources of the pollutant, and reductions necessary to restore the water to required standards are identified. This information serves as the basis for an implementation (cleanup) plan.

A draft TMDL report addressing the fecal coliform impairments in the BERB has been prepared collaboratively by the Greater Blue Earth River Basin Alliance, the Water Resources Center at Minnesota State University-Mankato, and the Minnesota Pollution Control Agency.

The problem

Fecal coliform is a group of bacteria that live in the intestines of warm-blooded animals, including humans. High concentrations of fecal coliform in surface waters indicates the likelihood of recent contamination by human or animal feces, and that water-borne pathogens (disease-causing bacteria, viruses, or protozoa) may be present.

Assessment and implementation

Assessment of fecal coliform sources in the BERB was completed to aid the TMDL process. Sources include wastewater treatment facilities, rural household septic systems, livestock, wildlife and pets. Land-applied manure and inadequately functioning septic systems appear to be the primary sources.

It's important to note that most livestock manure is used appropriately as a fertilizer and soil amendment. However, the sheer

volume of manure produced in the BERB means that runoff of even a very small percentage of what is applied may contaminate surface waters. An estimated 39% (about 5,500) of individual sewage treatment systems in the BERB are allowing inadequately treated wastewater into waterways. Direct discharge of sewage to waterways during low-flow conditions can be a major contributor of fecal coliform bacteria contamination.

In the streams and rivers of the Blue Earth River Basin, fecal coliform levels are typically highest in the months of June, July and August, and during periods of higher water. Restoring impaired stream reaches to compliance will require reducing bacteria levels in most of them by 80-90 percent.

A detailed implementation plan will be developed following completion and approval of this TMDL report. Cleanup of all the impaired reaches will be a complex undertaking involving a mix of regulation, education and incentives, and may take a number of years. However, resources available through the recently passed Minnesota Clean Water Legacy Act should speed up the process.

Public involvement

The public and specific stakeholders were involved in the TMDL project in several ways including:

- A TMDL technical sub-committee
- Frequent discussion with local agency staff and elected officials that make up the Greater Blue Earth River Basin Alliance
- News releases to newspapers throughout the BERB;
- Two radio interviews; one TV interview
- Two mailings to local elected officials, agency staff, and interest groups
- Public open houses at three communities in the basin
- A website hosted by the Minnesota River Basin Data Center.

For more information

The complete report for the Blue Earth River Basin Fecal Coliform TMDL is available on the MPCA Web site at http://www.pca.state.mn.us/water/tmdl/index.html#drafttmdl

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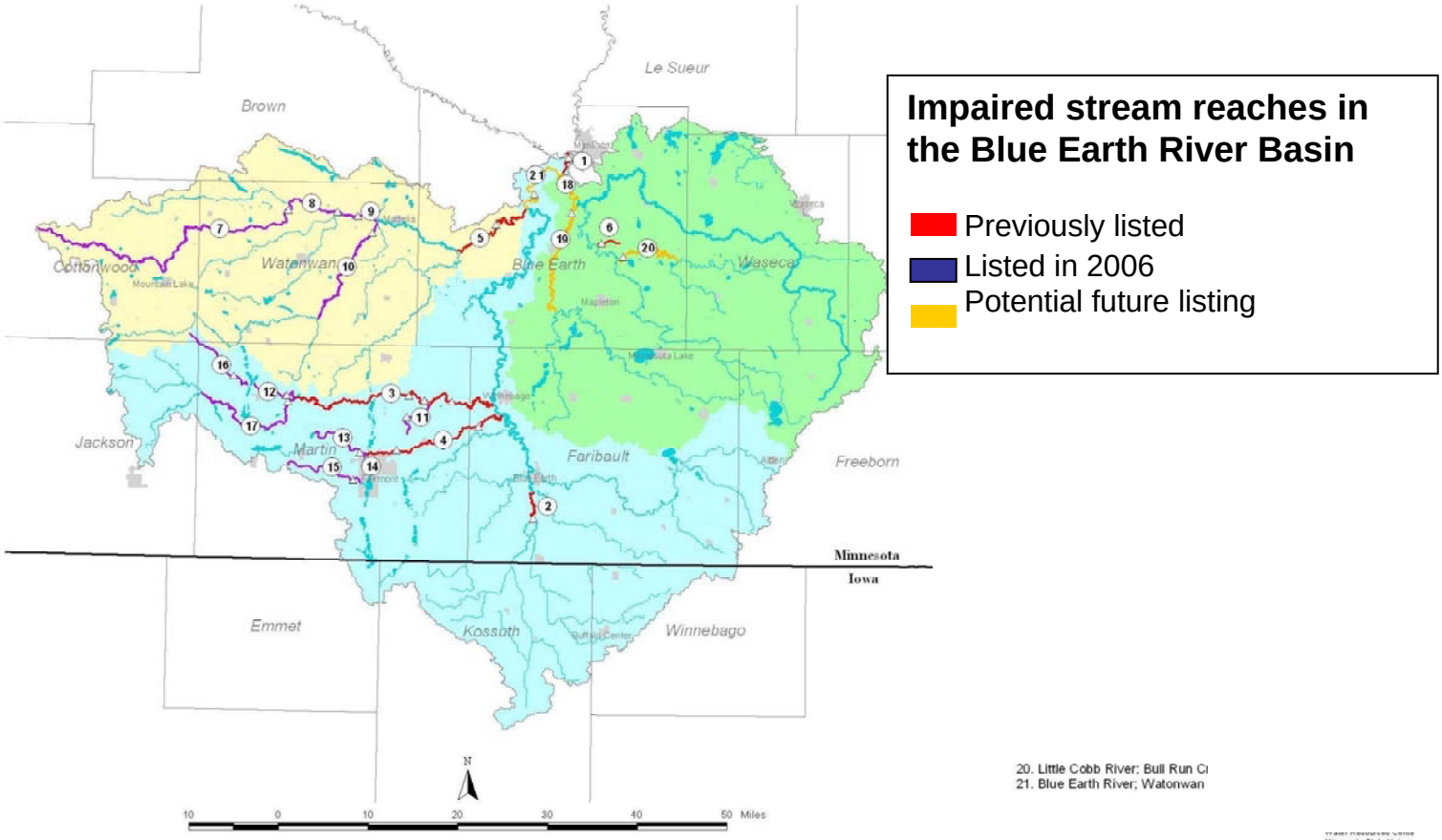


Minnesota's Impaired Waters and TMDLs

Project: Blue Earth River TMDL – Turbidity

Background

Located in southern Minnesota and northern Iowa, the Greater Blue Earth River Basin (GBERB) includes three major watersheds, the Blue Earth, Le Sueur and Watonwan. The basin covers approximately 3,540 square miles (2.3 million acres) and includes 11 counties in Minnesota and 3 in Iowa. Based on the 2000 census, the basin has an estimated population of 92,202, with 60% living in cities and 40% rural areas, with 51 municipalities in total. The primary urban areas include the city of Fairmont, Blue Earth, and portions of the city of Mankato. The majority of the basin is used for agricultural purposes (≈ 88%), primarily for corn and soybean production, along with various numerous live stock operations.

As compared to other Minnesota River major watersheds, the Blue Earth, LeSueur, and to a lesser extent, Watonwan river, have been shown to contribute disproportionately high sediment loads to the Minnesota River. For these reasons, initiating this Total Maximum Daily Load (TMDL) was a priority at both the local and state level.

This TMDL project addresses the multiple turbidity impairments within the Greater Blue Earth River basin. The TMDL study is currently underway and being developed by the Minnesota State University Mankato –Water Resources Center. A stakeholder committee representing urban, agriculture, watershed projects, government and citizens is currently under development.

Minnesota's Impaired Waters and TMDLs

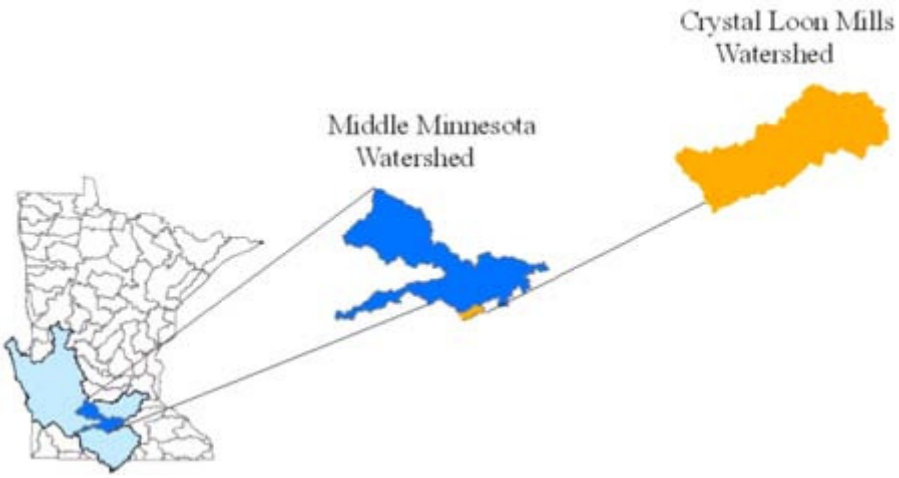
Project: Lake Crystal Excess Nutrients TMDL

Background

Lake Crystal is listed as impaired for excess nutrients. Currently, the Water Resources Center at Mankato is developing a work plan for this TMDL project. The local sponsor for this project is the City of Lake Crystal. A citizen stakeholder group is still being developed.

Map and Location

Lake Crystal is part of the Crystal Loon Mills watershed. Crystal Loon Mills watershed is located in Blue Earth County within the Minnesota River basin.



APPENDIX B

Priority Concerns Scoping Document

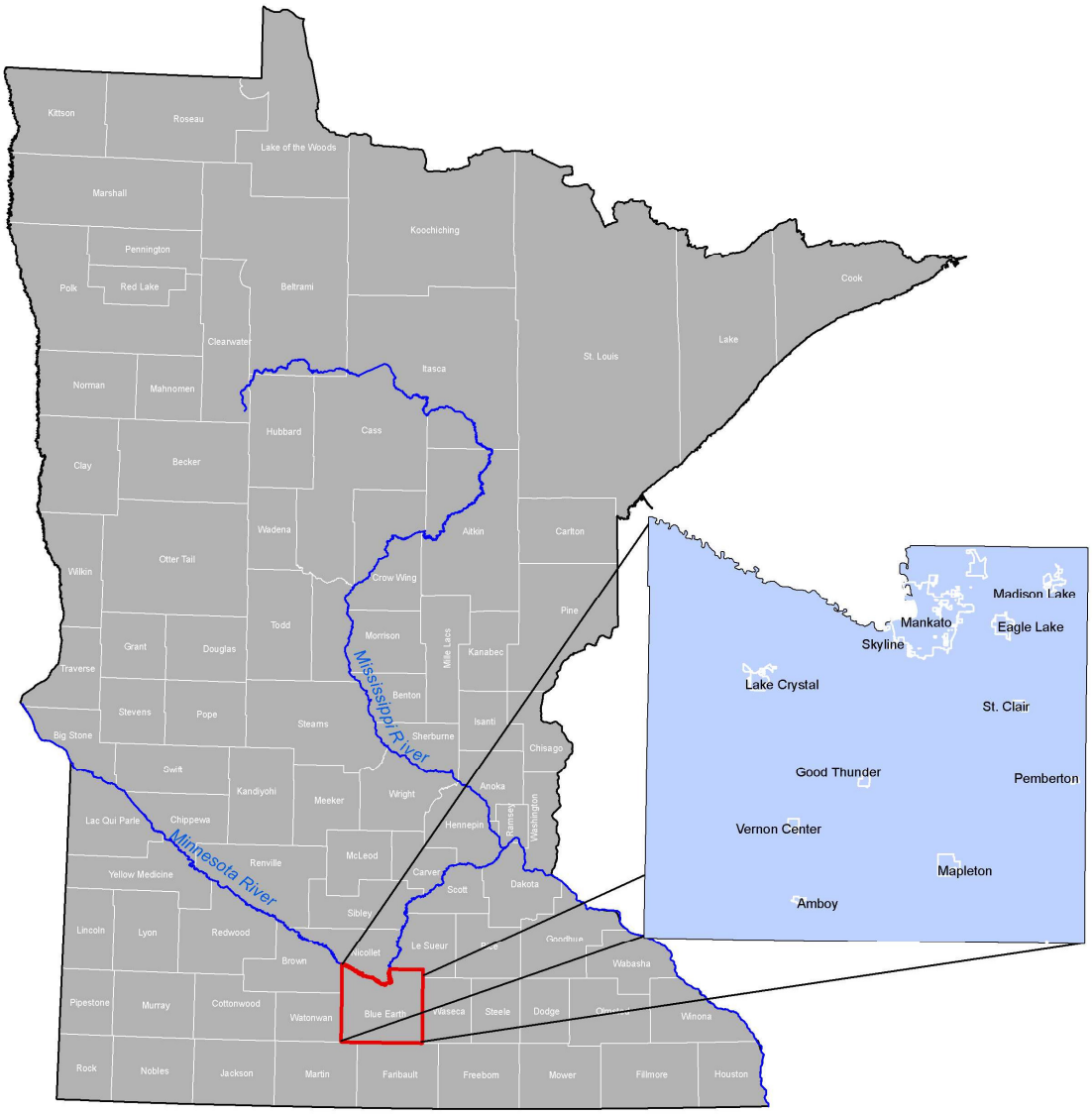
June 2007

Blue Earth County Water Management Plan – 2008 to 2012
Priority Concerns Scoping Document
Submitted June 15, 2007

A. INTRODUCTION

Blue Earth County is located in South-Central Minnesota approximately 75 miles southwest of the Twin Cities. The County is 764 square miles in area and had a population of 55,941 in 2000 according to the U.S. Census. Mankato is the County Seat and largest city in the County with a population 32,427 in 2000. Blue Earth County's most notable features are its rivers, lakes, and productive agricultural land. The Minnesota River forms the Blue Earth County's northern border with Nicollet County. The County contains the confluence of three major rivers: the Le Sueur River, the Watonwan River, and the Blue Earth River. The Blue Earth River joins the Minnesota River at the "bend" in the Minnesota River in Mankato. Agriculture dominates the County's landscape as just over 80-percent of the land in the County was used for agriculture according to the 1990 Census of Land Use and Land Cover.

General Location Map



PHYSICAL CHARACTERISTICS

Blue Earth County is located in South Central Minnesota, at the bend in the Minnesota River. Natural features, such as lakes and rivers, play a significant role in the County's development patterns, land management and conservation. The Minnesota River forms the County's northern border and is one of Blue Earth County's most important features. Approximately 99 percent of the County is located within the Minnesota River Basin.

The relief of Blue Earth County is the product of a back-wasting continental glacier. Steep slopes and bluffs are common along the County's many river systems which developed during the retreat of the glacier. Most of the County ranges from nearly level on the lake plain and on ground moraines to rolling where the end moraines form a complex pattern. In areas where there were scattered ice block depressions, a few large lakes formed. There also are many small depressions throughout the County. Secondary drainage in much of the County is immature and like much of southern Minnesota, the County has an extensive agricultural drainage system of open ditches and tile lines.

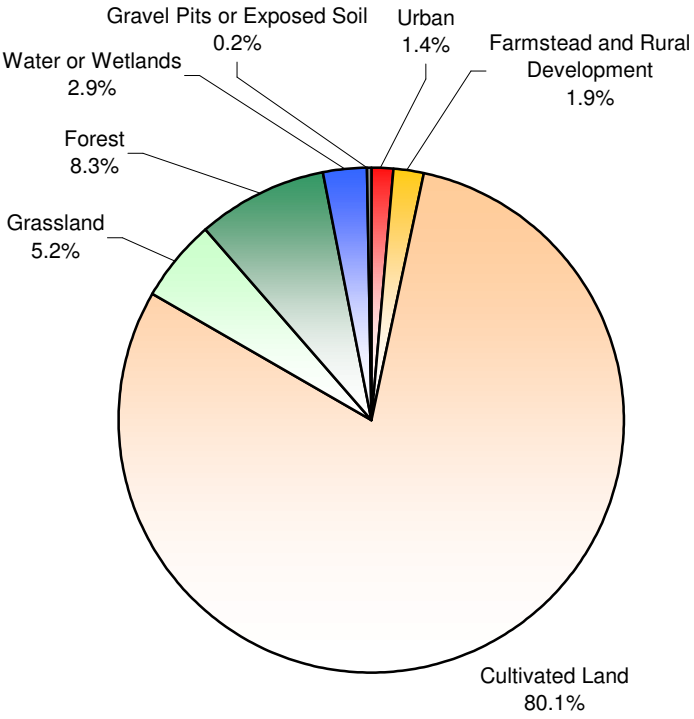
Land Use and Land Cover

Blue Earth County's landscape is dominated by agricultural uses. Map 2 displays the land use/cover data from the 1990 State Census of Land Use and Cover. Just over 80-percent of the County was cultivated in 1990 according the State's Census of Land Use and Land Cover. Deciduous forests, mostly along the steep slopes adjacent to the rivers, represented just over eight percent of the County. Urban land uses represented just 1.4 percent of the total area of the County in 1990 and farmsteads and rural development represented 1.9 percent of the County's land use. Chart 1 displays the percentage of each type of land use cover according to the Minnesota Land Management Information Center. The majority of the rural residential development in the County is scattered along the river bluffs around Mankato and lakeshores in the northeast portion of the County and the lakes near Lake Crystal. Map 2 displays the land cover data from the 1990 State Census of Land Use and Land Cover.

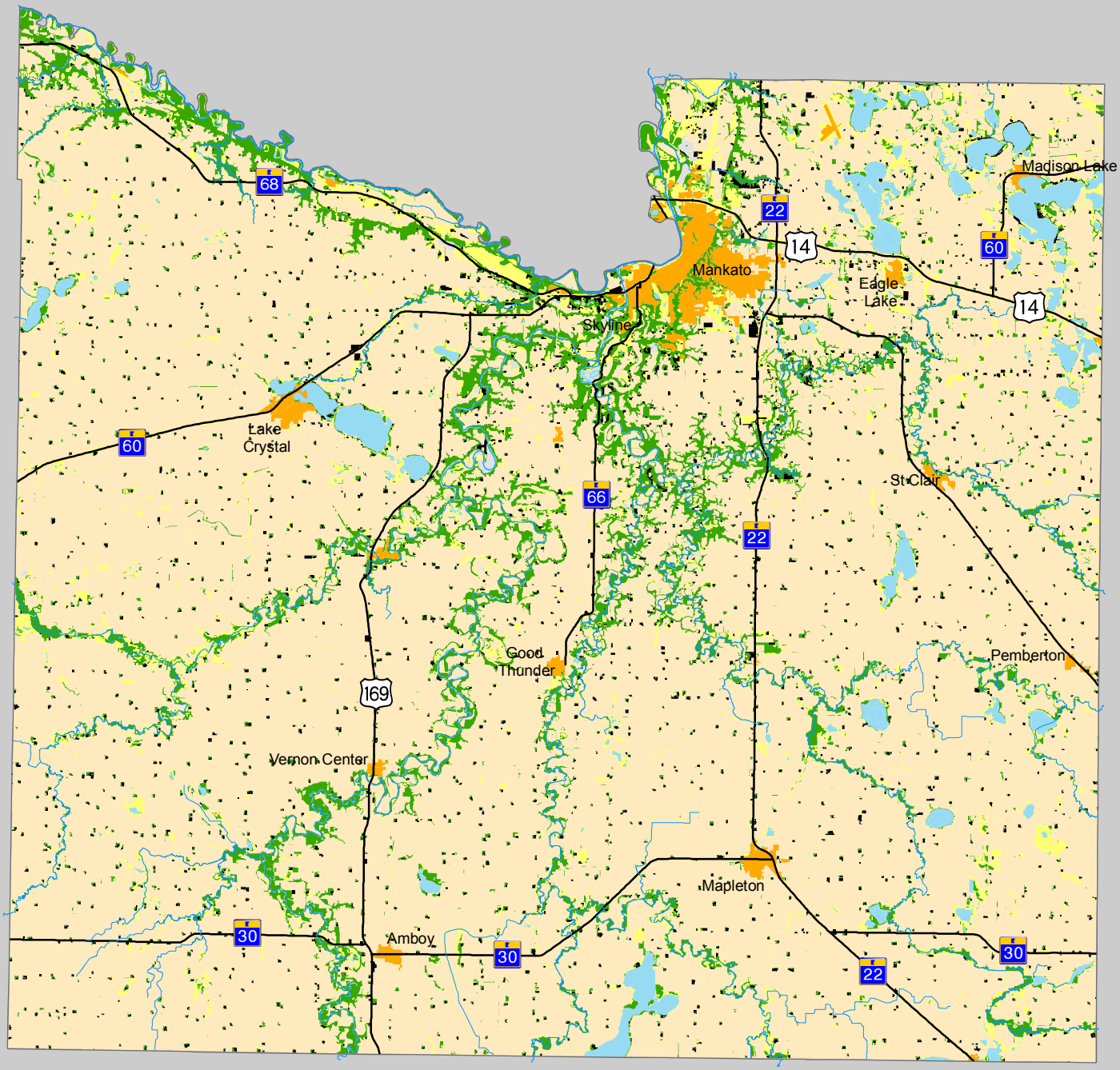
Although a comprehensive land use analysis in the County has not been done since 1990, observable changes in land use have occurred. Primarily in the municipalities, there has been a great deal of residential, commercial, and industrial growth. Much of this urban growth involves conversion of agricultural land. In 2006, 77 percent of the County was used for cropland. Rural residential growth has slowed as the County's land use policies are aimed at preventing scattered, residential development and preserving agricultural land. Agricultural changes have also occurred since 1990. The animal agriculture industry, primarily hog feedlots, has expanded in Blue Earth County since 1990. An ethanol plant was constructed near Lake Crystal in 2005, resulting in agriculture market adjustments.

Chart 1. 1990 Land Use-Land Cover Statistics

(Source: MN Land Management Information Center)



Map 2 - 1990 Land Use - Land Cover



1990 Land Use/Cover

- Cultivated Land
- Grassland or Pasture
- Forest
- Urban - Industrial
- Farmsteads or Rural Development
- Gravel Mines or Bare Rock
- Water or Wetland

0 5 Miles

N

BLUE EARTH COUNTY

Prepared By: Blue Earth County
Environmental Services
October 2007

Source: MN Land Use Management Information System's International Coalition Land Use/Land Cover

Watersheds

Over 99 percent of Blue Earth County is located within the Minnesota River Basin and four of the Minnesota River's major watersheds. The Minnesota River Basin and major watersheds are shown in Map 3. The County contains the confluence of the Watonwan River with the Blue Earth River, the confluence of the Le Sueur River with the Blue Earth River, and the confluence of the Blue Earth River with the Minnesota River. The Watonwan, Le Sueur and Blue Earth River watersheds are often combined and referred to as the "Greater Blue Earth River." Map 4 displays the portions of each watershed in Blue Earth County. The portion of Blue Earth County in each of the four watersheds and the portion of each watershed in Blue Earth County is shown in Table 1. Of all watersheds in Blue Earth County, the LeSueur occupies 48% of the County, the greatest amount of land coverage in Blue Earth County. The LeSueur River watershed contains a number of relatively large tributary streams including the Maple River, Cobb River, Little Cobb River, and Rice Creek. When combined, the Greater Blue Earth River covers more than 75% of the County's total land area. The remaining area is the Middle Minnesota River Watershed. The Blue Earth River outlet at Mankato separates the Middle Minnesota River Watershed into two sections: the northeast and the northwest corners of the County.

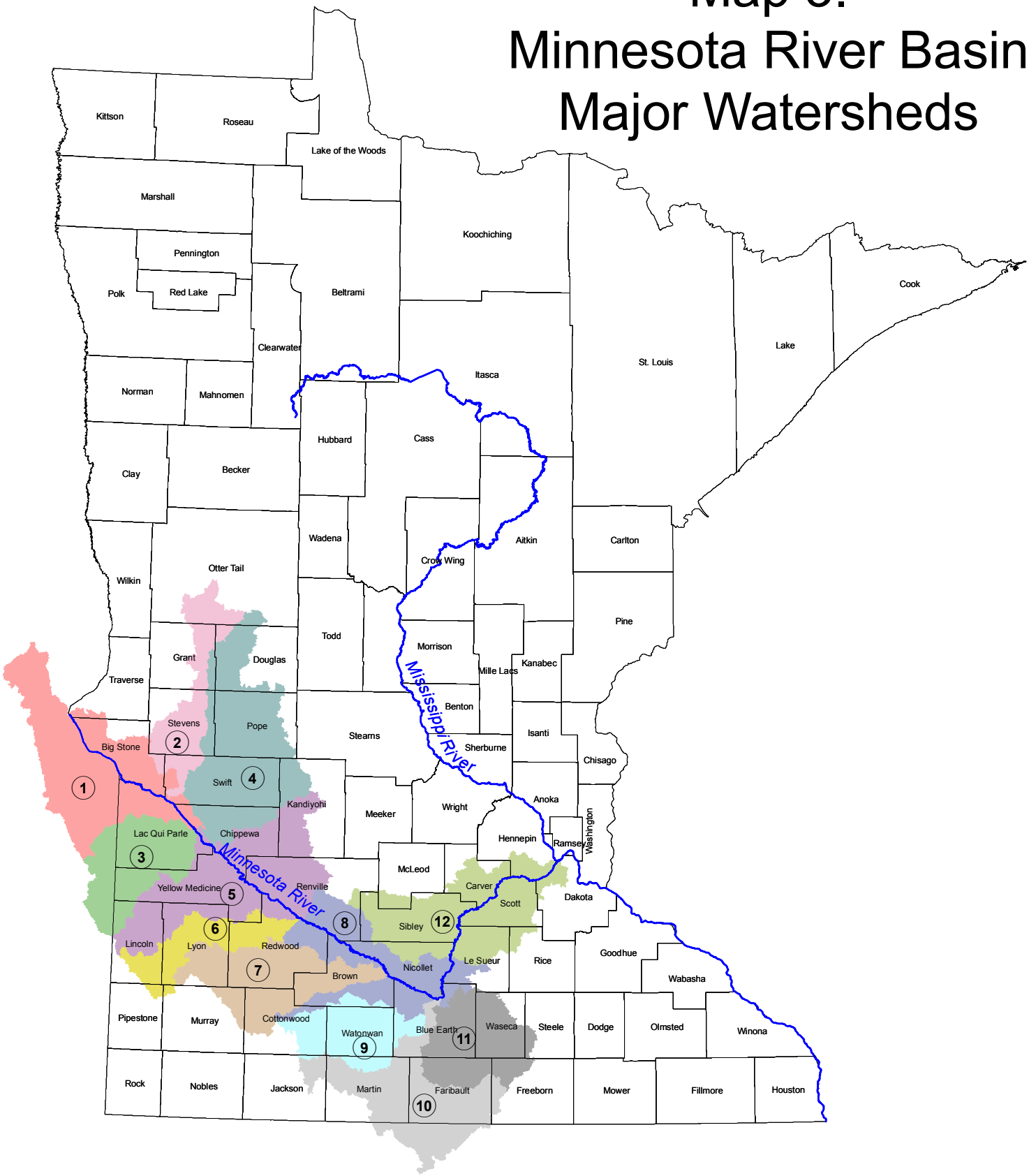
Two-square miles in the northeast corner of the County drains east to the Cannon River watershed.

Table 1 Comparison of Major Watersheds

Source: Blue Earth County Environmental Services Department

Watershed	Total Square Miles	Square Miles in Blue Earth County	Percentage of Watershed in Blue Earth County	Land Coverage In Blue Earth County For Each Watershed
Blue Earth River	1,205	124	10.2%	16.2%
Cannon River	1,482	2	0.1%	0.2%
Le Sueur River	1,078	368	34.1%	48.1%
Middle Minnesota River	1,385	178	12.8%	23.3%
Watonwan River	850	93	10.9%	12.2%

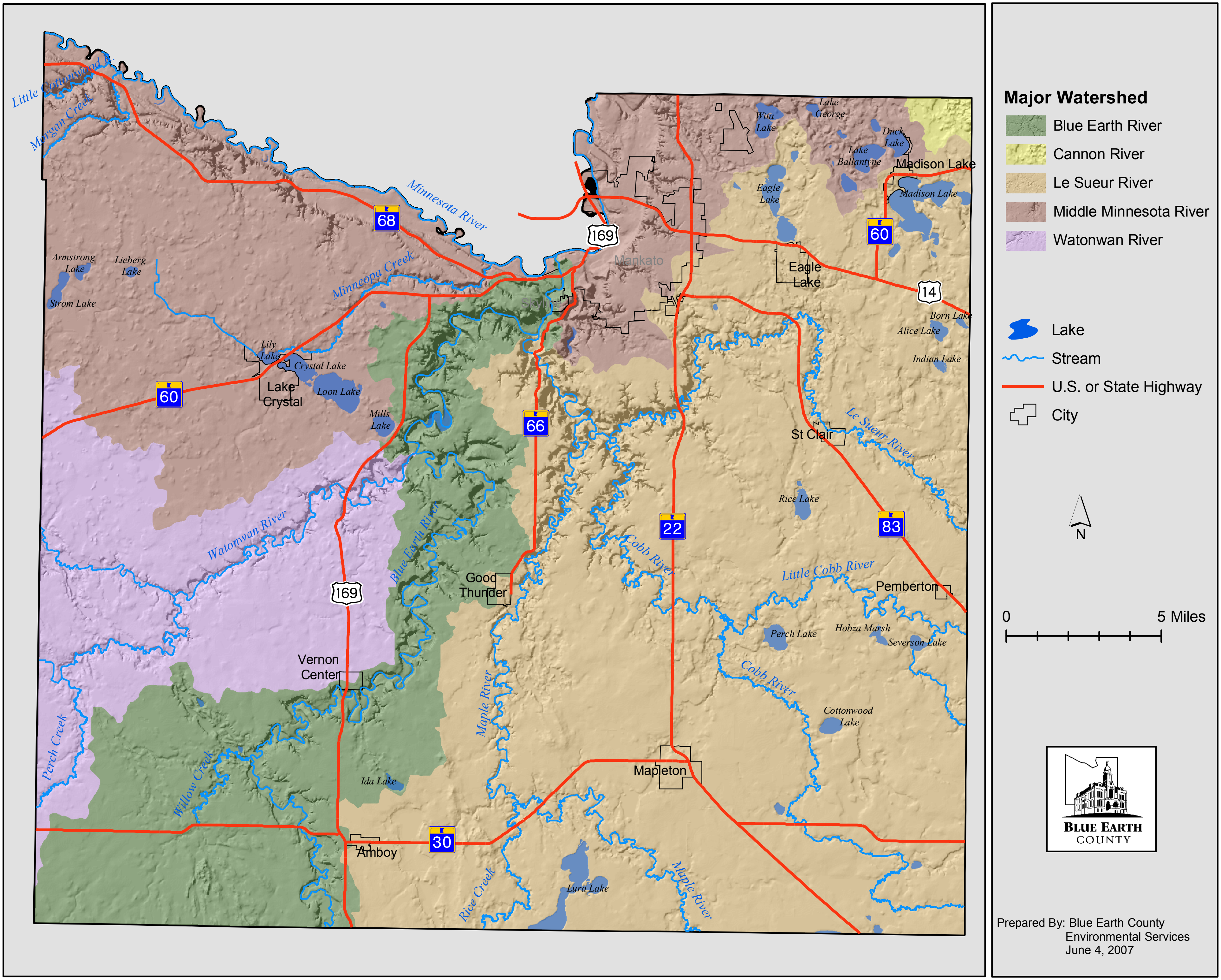
Map 3.
Minnesota River Basin
Major Watersheds



Watersheds in the Minnesota River Basin

1	Upper Minnesota River	5	Hawk Creek - Yellow Medicine River	9	Watonwan River
2	Pomme De Terre River	6	Redwood River	10	Blue Earth River
3	Lac Qui Parle River	7	Cottonwood River	11	Le Sueur River
4	Chippewa River	8	Middle Minnesota River	12	Lower Minnesota River

Map 4. Major Watersheds - Blue Earth County



DEMOGRAPHICS

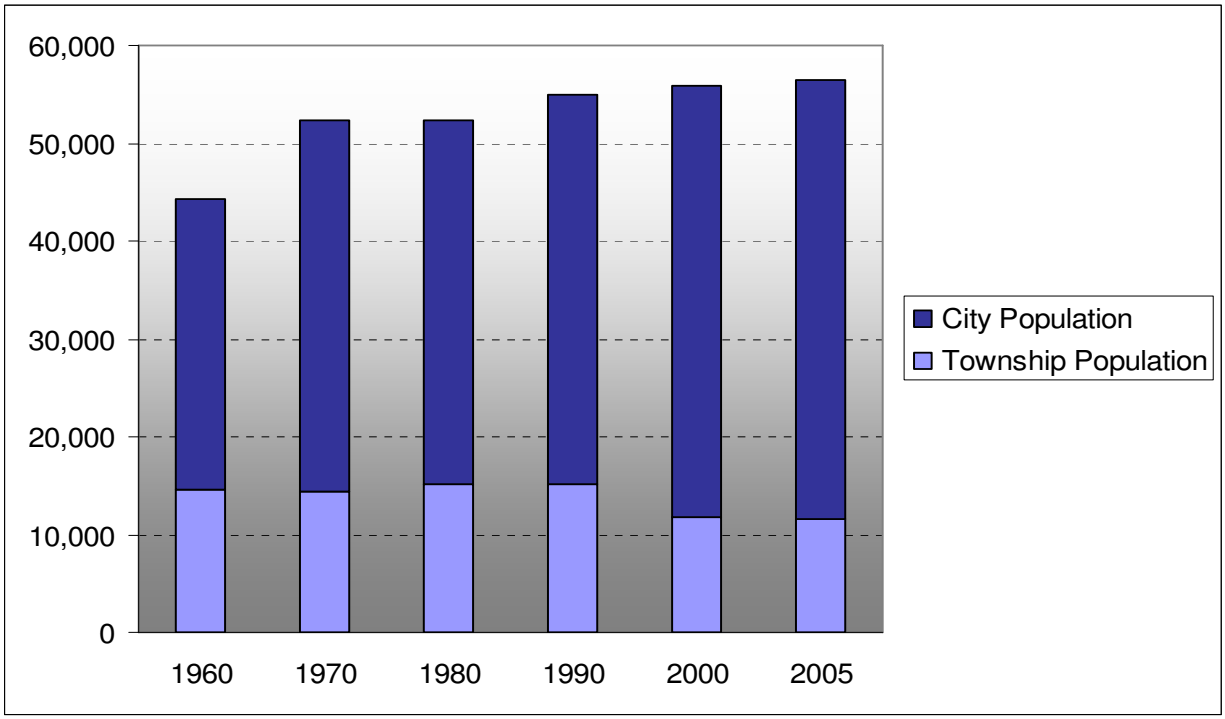
Population and Population Density

The County's total population has grown since the 1990-2007 Comprehensive Water Plan was approved. Changes in the past fifty years show a clear shift in population from unincorporated areas (townships - rural) to incorporated municipalities (cities – urban land use). Chart 2 shows population changes between 1960 and 2005. This trend is common throughout agricultural regions as farms increase in size providing direct farm income to fewer people.

The City of Mankato has seen the most growth. Other cities and townships located within the closest proximity to Mankato are growing in proportion to proximity to Mankato. Map 4 and Map 5 and Table 2 show these population changes in each City and Township.

Chart 2. City and Township Population 1960-2005

Source: U.S. Census ~ 1960-2000 population
Minnesota Demographic Center ~ 2005 population estimate



Map 5
2000 Population

Population

- 198 - 350
- 351 - 625
- 626 - 1875
- 1876 - 32357
- Lake
- River

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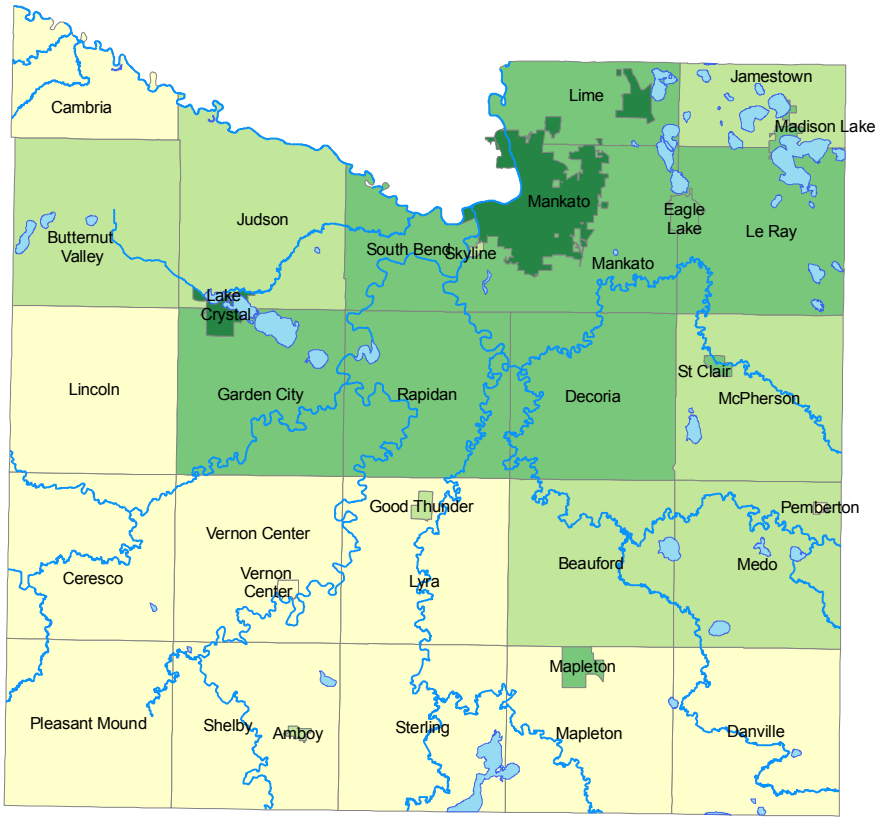
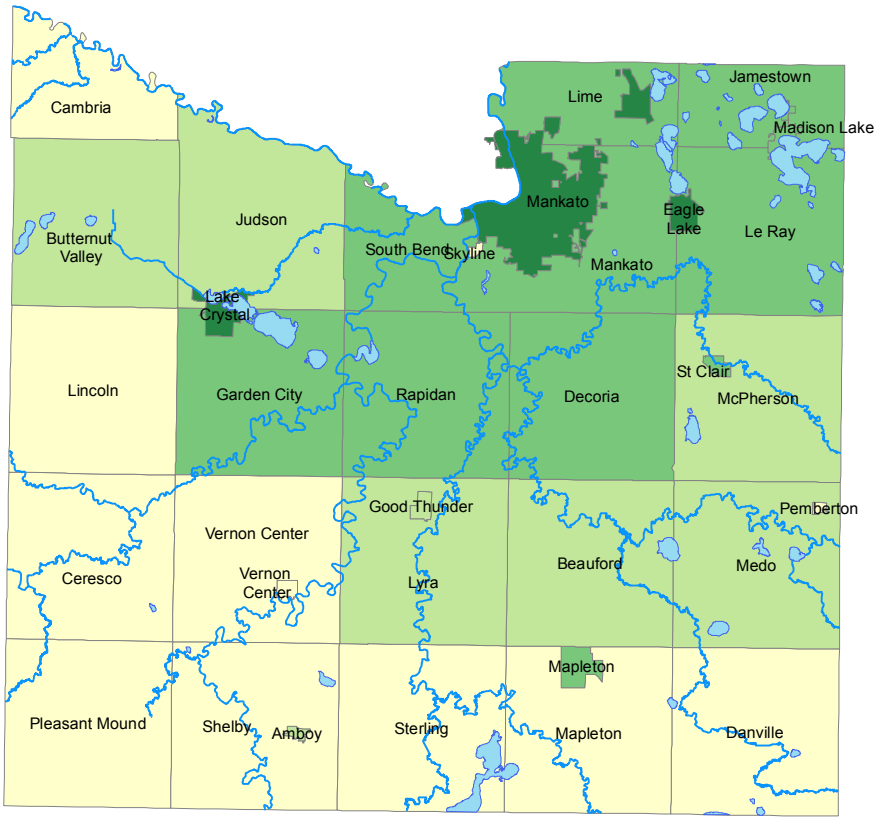


Prepared By: Blue Earth County
Environmental Services
June 2007
Source: 2000 U.S. Census

Map 6
2005 Population Estimate



Population Estimate

- 198 - 350
- 351 - 625
- 626 - 1875
- 1876 - 35031
- Lake
- River

0 5 10 Miles

N

Prepared By: Blue Earth County
Environmental Services
June 2007
Source: Minnesota State Demographic Center

Table 2. City and Township population changes between 2000 and 2005

Source: U.S. Census ~ 2000 population
Minnesota Demographic Center ~ 2005 population estimate

	2000 Population	2005 Population Estimate	No. Change 2000-2005	Percent Change 2000-2005
City				
Amboy city	575	544	-31	-5.4%
Eagle Lake	1,787	2,020	233	13.0%
Good Thunder	592	563	-29	-4.9%
Lake Crystal	2,420	2,549	129	5.3%
Madison Lake	837	910	73	8.7%
Mankato	32,427	35,031	2,604	8.0%
Mapleton	1,678	1,661	-17	-1.0%
Pemberton	246	246	0	0.0%
St. Clair	827	800	-27	-3.3%
Skyline	330	305	-25	-7.6%
Vernon Center	359	336	-23	-6.4%
City Total	*42,078*	*44,965*	*2,887*	*6.9%*
Township				
Beauford	442	419	-23	-5.2%
Butternut Valley	382	376	-6	-1.6%
Cambria	271	264	-7	-2.6%
Ceresco	255	244	-11	-4.3%
Danville	262	254	-8	-3.1%
Decoria	922	1,023	101	11.0%
Garden City	700	689	-11	-1.6%
Jamestown	628	643	15	2.4%
Judson	591	557	-34	-5.8%
Le Ray	846	824	-22	-2.6%
Lime	1,314	1,252	-62	-4.7%
Lincoln	227	214	-13	-5.7%
Lyra	378	358	-20	-5.3%
McPherson	470	461	-9	-1.9%
Mankato	1,833	1,775	-58	-3.2%
Mapleton	310	285	-25	-8.1%
Medo	374	360	-14	-3.7%
Pleasant Mound	235	215	-20	-8.5%
Rapidan	1,061	1,037	-24	-2.3%
Shelby	294	281	-13	-4.4%
South Bend	1,491	1,451	-40	-2.7%
Sterling	276	272	-4	-1.4%
Vernon Center	301	275	-26	-8.6%
Township Total	*13,863*	*13,529*	*-334*	*-2.4%*
County Total	**55,941**	**58,494**	**2,553**	**4.6%**

PLAN IMPLEMENTATION AND ORGANIZATIONAL STRUCTURE

Responsible Local Unit of Government

Blue Earth County is the designated, local unit of government responsible for the County's Water Management Plan. The primary partner for Water Management Plan implementation is the Blue Earth County Soil and Water Conservation District (SWCD). The SWCD will be officially adopting the Water Management Plan update. Information and data needed by the SWCD to meet State requirements will be included in the Water Management Plan. The County and SWCD will be working together for the planning period to continue identifying local priorities and associated implementation strategies. Cities in the County will also be involved with future implementation of the plan.

Historical Plans and Updates

This Water Management Plan will be the second update to the first water plan. The first plan was a ten-year Blue Earth County Comprehensive Water Plan (1988-1997). The second Comprehensive Water Plan (1998-2007) was updated for a ten year period. The SWCD officially adopted this plan as well. This Priority Concerns Document is the pre-cursor to the second update to the first water plan and will be a five year implementation plan. The list of water plans include:

Comprehensive Water Plan 1988-1997 (first plan)
Comprehensive Water Plan 1998-2007 (first update/second plan)
Water Management Plan 2008-2012 (second update)

B. LIST OF PRIORITY CONCERNS

The priority concerns relate to drinking and ground water, surface water quality, agricultural run off, urban storm water, drainage, wetlands and wildlife.

Ground Water-
Even through there have been no reports of ground or drinking water quality issues, concerns about drinking water are a priority issue. Source water protection planning is a current, specific need related to wells and drinking water. Source water protection plans and local, ground water and well protection measures will be included in the plan update.

Surface Water Quality-
The source of surface water quality problems are generally related to land use. This priority concern will be addressed with land management strategies at the State and local level, including 1) regulated land management, 2) watershed plans and priorities at the State, watershed and local level.

Watershed management planning and regulation occurs at the State, local and regional level. At the State level, basin plans, impaired waters and TMDLs plans are prepared at the watershed scale with implementation plans affecting regional, watershed level planning and implementation. Blue Earth County is located within a number of watersheds including the Minnesota River Basin, Greater Blue Earth Watershed, Middle Minnesota Watershed and sub-watersheds within these watersheds. At the County level, the County and SWCD implement best management practices as indicated within these plans. The Comprehensive Water Plan will address water quality plans and TMDLs at the State, regional watershed, and local levels.

Local regulations and plans also address water related issues. Examples of local regulations might include City storm water management plans, parks and open space plans, zoning, subdivision regulations and others. The Comprehensive Water Plan will discuss these water related regulations and plans.

Agriculture is the dominant land use in Blue Earth County. Management of agriculture-related land uses will be a priority concern addressed in the Comprehensive Water Management Plan. Agricultural surface water quality issues, including feedlots, manure management, nutrient management, soil erosion, pesticides and run off will be addressed. Highly erodible soils will be specifically addressed in the plan as needed in the SWCD plan and future work plans. Feedlots are managed by Blue Earth County land use regulations as well as MPCA regulations. The promotion, implementation and oversight of agriculturally-related best management practices and education will be addressed in the plan.

Urban storm water run off is also a source of surface water quality problems. Several municipalities in the County are located adjacent to lakes and rivers within or near the DNR-defined “shoreland” area. Municipalities within the County are responsible for land management decisions affecting the quality of surface water, including shoreland and other land use regulations. Municipalities, as well as individual property owners, are required under State of Minnesota statutes and rules to implement specific controls and best management practices. Municipal storm water management will be addressed in the plan.

Drainage-
Publicly managed private drainage systems are the responsibility of the Blue Earth County Ditch Authority as required and defined by the Minnesota Drainage Code. Day-to-day management of drainage will be addressed, specifically related to utilization of existing and historical data, maintenance and prioritization methods, defining specific parts of the State of Minnesota Drainage Code, and hydrological impacts. Drainage will be addressed in the plan.

Wetlands-
Wetlands serve multiple functions related to ground water recharge, water retention, flood control, and recreation. In urbanizing areas of the County, it will be increasingly important to protect existing wetlands with management in the context of WCA and also with targeting of wetlands. Preservation and enhancement of wetlands has seen increasing public support of these areas as attractive water features and for the associated benefits of wetland functions. Wetlands will be addressed in the plan.

Wildlife and Natural Resources-
Preserving natural resources, including wildlife, was identified as a priority concern. Generally, best management practices benefit wildlife by providing vegetation for wildlife habitat and reducing erosion that can negatively impact aquatic wildlife species. Wildlife habitat needs will be addressed in the plan.

C. PRIORITY CONCERNS IDENTIFICATION

There were more than 30 meetings and internal discussion related to the identification of priority concerns. These meetings were often working meetings focused on one or two of the priority concerns.

In addition, a locally-initiated project also incorporates water quality issues. The Greenprint planning project has involved an extensive public input process with representation from broad groups of stakeholders. There were more than 30 meetings related to the Greenprint project in the past two years. A list of Greenprint meetings and a list of participants involved in both the Greenprint and water management issues are shown in Appendix A.

The following outlines the process Blue Earth County used for identifying priority concerns specifically related to the County Water Management Plan.

November 2006
Public notice
Internal meeting with Environmental Services staff including waste management.

December 2006
December 12 – Meeting with SWCD Manager and NRCS – general discussion regarding how services are provided to customers, specific cost-share programs, shared operation and bmp cost share of the NRCS and SWCD
December 13 – Internal meeting with County Ditch Manager – discussion of Drainage Code and Drainage Authority

January 2007 –
January 3 – Work session with Blue Earth County Planning Commission – discussion of water management priority concerns. Priority concerns discussed were feedlots, urban and lakeshore development
January 12 – Meeting with wildlife conservation meeting with representatives of local wildlife conservation organizations. Discussion related to overlapping wildlife and water quality needs such as proposed in the Greenprint
January 25 – Internal meeting with County's web consultant and Chamber of Commerce representative – Discussion related to ideas for education and promotion of water quality issues
January 29 – Work session to discuss State Agency Priority Concerns – Environmental Services and SWCD staff reviewed each of the State agency's suggested priority concerns

January 31 – Work session to discuss State Agency Priority Concerns – Environmental Services and SWCD staff reviewed each of the State agency's suggested priority concerns – meeting continued from January 29

Mailed written surveys

February 2007 –
February 2 – Internal work session to discuss priority concerns – Environmental Services staff discussed additional priority concerns
February 9 – Internal discussion with Maple River staff to discuss potential priority areas in the Maple River Watershed
February 15 – Internal meeting with SWCD Manager
February 15- Work session meeting with SWCD Manager and Environmental Services staff to discuss priority concerns
February 22 – Work session with SWCD Board and NRCS staff – discussion of Water Management Plan, outlined priority concerns and discussed SWCD and County roles in addressing priority concerns
February 26 – Work session with County Board – discussion with County Board about County and SWCD role in implementation, shared elements between Water Management and Greenprint.

March 2007 –
March 16 – Work session with DNR and County Parks Department – discussion of water quality and habitat needs
March 20 – Meeting with Water Resources Center staff – discussion of TMDLs and Water Resources Center's education projects, and their use of Blue Earth County's LIDAR data.
March 22 – Meeting with the SWCD Board Chair to discuss priority concerns and watershed organizations

April 2007 –
April 10 – Work session with DNR and County Parks Department - continue discussion relating to prioritizing wildlife and water quality related areas in order to maximize resources
April 11 – Meeting with County Ditch Manager, GIS staff and Environmental Services – discussion of specific ditch management needs related to GIS, the formal structure of the County's Ditch Authority and Drainage Code
April 17 – Work session with Ag workgroup and other stakeholders – presentation by MDA and MPCA related to surface water monitoring and TMDLs. Discussed priority concerns and State Agency priority concerns. Meeting was attended by ten agriculture producers, Farm Bureau representatives, County Feedlot staff, County Ditch Manager
April 18 – Internal work session – discussion of specific elements of Priority Concerns Document

Received written surveys

May 2007 –
May 4 – Joint meeting with City of Mankato and City of Eagle Lake staff – discussion related to overlapping needs of water quality, storm water management, low impact development, and specific water quality priority areas. Attended by City Planning staff, City Parks staff, County Parks staff, City of Eagle Lake Administrator and Blue Earth County Environmental Services
May 16 – Meeting with Brown County staff to discuss Middle Minnesota Watershed
May 17 – Public forum, Regional Voices presentation and public comments – presentation to local citizen group and discussion of Water Management Plan and Greenprint
May 22- Meeting with City of Madison Lake City Council/ Planning Commission presentation – initiated discussion of Water Management Plan and Greenprint

May 23 – Meeting with Watonwan, Faribault, Cottonwood and Brown County staff – discussion of watersheds and individual County Water Management Plans
May 30 – Work session - City of Madison Lake – work session related to municipal waste water extension from the City of Mankato, new sewer implications for future development, storm water management issues, sharing Water Management Plan and Greenprint
May 30 – Internal work session – discussed progress of Water Management Plan

June 2007-
June 4 – Work session with DNR and County Parks Department– further discussion of prioritizing wildlife and water quality
June 5- Internal work session – discussed development of priority concerns in Water Management Plan
June 6 – Public Information Meeting
June 7 – Internal work session – discussed finalizing Priority Concerns Document and next steps for completion of Water Management Plan
June 11 – Work session with SWCD manager, NRCS staff, Maple River Coordinator, and Cobb River Technician – discussion of Priority Concerns Document, SWCD's specific needs in the Water Management Plan, next steps for completing Water Management Plan, and scheduling work session with SWCD Board.

Public Information Meeting –June 6, 2007
The public information was held from 4:30-6:30 pm on Wednesday, June 6, 2007.

The meeting was attended by ten people. There were no written comments received at the public information meeting. Those present at the public meeting were:

Julie Bach
Allan Marble
John Rollings
Harold Loeffler
Bill Gardner
Jerad Bach
Herb Wenkel
Chris Hughes
Scott Salsbury
Julie Conrad

Written Survey
A written survey was mailed to all Township officials, City officials, City and County Planning Commission members, and citizen committees. The survey was mailed with a cover letter from the Chair of the County Board of Commissioners. A sample survey and summary of written comments is included in Appendix B.

A total of 224 survey forms were mailed. Of the 224 surveys mailed, 100 (45%) were returned. This included 110 surveys to municipal officials/citizens with 46 returned (42%), and 114 surveys to Township officials/citizens with 54 returned (47%).

When describing where they live, 46% of those returning the survey were city residents, "farmers" 27%, "hobby farmers" 14%, and other rural residents 13%.

City	
Amboy	*6*
Eagle Lake	*6*
Good Thunder	*5*
Lake Crystal	*6*
Madison Lake	*4*
Mapleton	*7*
Pemberton	*2*
Skyline	*3*
St. Clair	*3*
Vernon Center	*4*
Total	***46***

Rural	
Farms	*27*
Hobby Farms	*14*
Townsite/Village	*10*
Small Subdiv.	*2*
Lake Shore	*1*
Total	***54***

The average number of years the respondents have lived in Blue Earth County was 37 years.

Survey Results

Ranking Priority Concerns

Survey respondents were asked to identify four water quality issues they considered the most important.

> *"What do you think are the four most important water quality issues Blue Earth County should address in the next five years?"*

The four water quality issues most often selected as a priority concern were:

1. Soil Erosion – eroding stream banks – agricultural farm fields
2. Ground and Drinking Water – safety
3. Fertilizers and Pesticides Farms - Run off and over-application
4. Fertilizer and Pesticides in Cities – Run off and over-application

A complete list of the overall priority ranking:

1. Soil Erosion (56)
2. Ground water and drinking water (54)
3. Fertilizer and pesticides from farms (53)
4. Fertilizer and pesticides in Cities (51)
5. Feedlots and livestock (43)
6. Urban development and run-off (37)
7. Septic systems (34)
8. City wastewater treatment (14)
9. Flooding or high water (13)

Overall Water Quality

When asked to describe water quality in Blue Earth County, each respondent was asked to choose from a list of terms generally describing water quality.

"How would you describe water quality in Blue Earth County?"
Very good ------- Good -------- Average-------- Poor --------- Very poor

Most of the respondents described water quality as "average" or "good." Of the city respondents, 41 of 46 (89%) indicated water quality was "average" or "good." Of the rural respondents, 47 of 54 (87%) indicated water quality was "average" or "good." Of the 100 respondents, eight considered water quality "very good," four "poor" and zero chose "very poor."

City	
Average	*22*
Good	*19*
Very Good	*3*
Poor	*2*
Very Poor	*0*

Rural	
Average	*14*
Good	*30*
Very Good	*5*
Poor	*2*
Very Poor	*0*
No Response	*3*

Summary of Written Comments

On the survey form, space was left for the respondent to write additional comments. The final question on the survey form:

"Do you have any other water quality concerns?"

The written comments were generally very short in length consisting of one to three sentences. Overall, the main concerns were either related to single, personal water-related issue, specific comments about a lake or river near their home or general comments. Personal comments are not included in this summary.

Summary of common written statements:

» Drinking water: Tastes good reported by many people, (with the exception of one municipality currently constructing a new water system and well water in one area tasting like iron).
» Feedlots: manure run off a problem
» Lakes: Algae beginning in mid summer (a concern listed for several lakes); too many weeds; lake shore erosion a problem; lake shore erosion not too bad because people are taking care of their lake shore
» Rivers: Sediment bank erosion a problem; run off; trash in river; too muddy
» Water quality in general: Compared to other areas, water quality in Blue Earth County is good; things are getting done; more needs to be done; all of our rivers, lakes and wetlands are suffering due to erosion
» Wetlands: More needs to be done to preserve wetlands
» Pesticides: Over use and run off in urban and rural areas
» Other: Ethanol plants; clean water needed for recreation; wastewater dumping by citites

State Agency Priority Concerns Recommendations

State agency concerns were submitted by the Minnesota Department of Agriculture (MDA), Minnesota Pollution Control Agency (MPCA), Department of Natural Resources (DNR), Board of Water and Soil Resources (BWSR) and the Minnesota Department of Health (MDH). The concerns most aligned between the agencies include: source water protection, drainage management, water retention/wetlands and run off. Directly and indirectly, agricultural bmps are recommended to address multiple concerns. Each of the State agency's priority concerns is summarized below.

Minnesota Department of Agriculture

Pesticides impacts on surface waters - MDA
»Review MDA surface water quality monitoring program and address pesticides in surface water.
»Promote bmps for pesticide management in geographic areas susceptible to run-off from land to surface water, with the highest priority being steeper and more poorly drained areas and tile drained systems.

Minnesota Pollution Control Agency

Impaired Waters - MPCA
» The County should submit plans and data to the MPCA for impaired waters.
» Define how the County plans to prioritize, participate and implement TMDLs and submit plans and data to the MPCA for impaired waters.

Feedlots - MPCA
» Describe how the County will address direct run off, land application tracking, compliance and nutrient tracking and open lot agreements.

Drainage System Management and Open Tile Intakes - MPCA
» Address the riparian and hydrologic condition of public and private open ditches and open tile intakes.
» Increase the "one rod buffer" to reach water quality goals in specific watersheds.
» DNR and BWSR help with interpretation and administration of the drainage code.

Erosion and Sediment Control - MPCA
» Soil loss from row crop agriculture.

Urban Development - MPCA
» Urban and lakeshore development.
» Encourage the SWCD to expand its capabilities to address urban and lakeshore development erosion concerns.

Ground Water - MPCA
» Mankato Source Water
» Work with other well head protection areas.
» Pollution prevention in source water protection areas
» Work with MDH to map ground water recharge areas and any important geologic features.
» Ground water sensitivity mapping, Minnesota Geological Survey

Citizen Stream Monitoring - MPCA
» Promote the MPCA's Citizen Stream monitoring program

Department of Natural Resources

Water retention - DNR
» Ensure no net loss, increase funding for enforcement and monitoring, increase penalties for violations.
» Increase legislative appropriation for wetlands.
» Enact tax or surcharge for every foot of new drain tile to create a new funding source for wetland restoration.

» Implement water retention into all future public drainage projects to offset any increase in peak flows.
» Require adequate storm water management for all development activities to eliminate run off.

Creation of buffers on Ditches, Streams and Rivers - DNR
» Enforce applicable regulations and provide economic incentives in other situations.

Agricultural Best Management Practices - DNR
» Legislative change.
» Improved education.
» Develop 3rd crop initiatives.
» Promote bio-ethanol in lieu of corn-based ethanol that requires excessive quantities of water and perpetuates the growth of an environmentally destructive crop (corn).

River and Stream Channel Restoration - DNR
» Loss of recreational opportunities and habitat by development decisions that change the path of rivers and streams.

Rare Natural Features and Biological Significance - DNR
» Rare and natural features and biological significant areas have been documented and identified by the DNR. Many of these are fully aquatic, semi-aquatic or otherwise dependent upon water resources such as streams/rivers, wetlands, lakes. Others are dependent on adjacent buffers.
» Sites with high or moderate significance deserve special consideration.

Board of Water and Soil Resources

Erosion Control of Agriculture Soils - BWSR
» Promote bmps and cost share.

Drainage System Management - BWSR
» Maintain and improve the mapping and data assessment process for public drainage systems in a measurable way to learn more about water quality.
» Inventory drainage systems including ditches having filter strips, potential wetland restoration locations and controlled drainage and cover crops.
» Identify areas of these systems that are overloaded as high priority for water storage.
» Establish a schedule of repair and maintenance.
» Manage at the watershed scale.
» Overview economic benefits.
» Identify and develop additional funding mechanisms for system management.
» Financially support technical assistance for drainage assistance.
» Provide info and assistance to private drainage systems operators to include technologies used on public drainage systems.

Wetlands - BWSR
» Complete a drained wetlands inventory.
» Identify remaining wetlands, prioritize wetlands based on function and values and identify areas for restoration and preservation.
» Determine protection level for targeted areas through local ordinances and voluntary conservation programs.
» Promote and market wetlands preservation and wetland restoration programs.
» Adopt and implement the Wetland Preserve Areas Program through WCA.

» Education of functions and values of wetlands.
»Continue Greenprint Initiative including designation of corridors.

Minnesota Department of Health

Source Water Protection -MDH
» City of Mankato: Provide technical and planning assistance to the City.
» Achieve water quality goals by working with organizations to provide staff and funding.

Cost-share Funding - MDH
» Continue the County-funded well sealing cost share program.
» Prioritize the County's wells sealing cost share program within the source water protection area of the city of Mankato or any public water supply.

Well Inventory - MDH
» Most public water supplies in the County are considered to have "low vulnerability" and have not been phased into the State wellhead protection program. When wellhead protection plans are developed information about local wells is needed. Information regarding well location can be helpful.

Blue Earth County *Greenprint* Public Input
Blue Earth County's Greenprint project is referenced in BWSR State Agency comments. Water quality is one of the important elements of the Greenprint. In addition to water quality, wildlife and land use issues are included. The Greenprint Steering Committee and work groups have met many times in the past two years. There were more than 30 Greenprint committee and work group meetings in the past two years, and there were two public information meetings.

The Greenprint plan development involved a great deal of input from representatives of broad interests. Some of the interests represented were:

Consulting and engineering firms
Land developers
Farmers
WCA TEP
Parks and open space
Water based recreation organizations
Wildlife conservation organizations
Mining companies
County, municipal, township officials from planning and zoning, engineering, highway, parks, economic development, and elected officials
BWSR
DNR

D. PRIORITY CONCERNS SELECTION

The priority concerns selected include virtually all priority concerns submitted in the survey, public meetings, staff meetings and State agencies. The list and description of priority concerns were selected by the SWCD Board and Blue Earth County. The priority concerns were also presented at the public information meeting where input and additions were requested.

E. PRIORITY CONCERNS NOT ADDRESSED IN THE PLAN

Among the comments made during discussion at public meetings, issues related to global, national or state economic and regulatory authority were discussed and are not included in the list of priority concerns. Local government and organizations such as Blue Earth County, SWCD, local cities, townships, and local watershed based organizations have little or no control of those issues. Those issues include: 1) Anticipated market conditions related to corn and ethanol and how land management may change in response to economics, 2) Federal farm programs, 3) Clean Water Act, impaired waters and TMDLs, specifically related only to the methods impaired waters are determined by the State. These concerns were expressed as those methods applied State-wide not directly related Blue Earth County. The uncertain future of nutrient trading related to TMDLs was also discussed, 4) urban growth rates related to economics, 5) regulations of State or Federal authority or preemption such as pesticide use for agricultural, residential and general public areas, 6) State regulations of water use such as water appropriation permits from ground and surface water, 7) Discharge and operation permits for waste water treatment facilities. These concerns are complicated and best addressed in the political arena or State or Federal agencies. Responsibility for these issues cannot be officially delegated to other efforts and organizations under the authority or scope of the Blue Earth County Watershed Management Plan.

Another concern expressed in a written survey is the Rapidan Dam. This issue relates to the future of the Rapidan Dam. The Rapidan Dam is owned by Blue Earth County. The Blue Earth County Public Works/County Highway Department is in charge of dam management and coordination of water quality and quantity issues related to the dam. Water-related needs and studies related to dam management and water quality/quantity will be directed or coordinated by the County as owners of the dam. Federal agencies such as the US Army Corps of Engineers, US Geological Survey and State agencies will be involved as appropriate. Management of the dam is not under the authority or scope of the Watershed Management Plan and cannot be officially delegated to other efforts or organizations.

Blue Earth County
Priority Concerns Document contact person:
Julie Conrad
Blue Earth County Environmental Services Department
410 S 5th St
PO BOX 3566
Mankato MN 56001

Phone: 507-304-4381

Attachment A –

Partial list of participants in Water Management Plan and Greenprint
List of Greenprint committee and work group meetings

List of Participants:

SWCD Board
Julie Bach
Allan Marble
John Rollings
Bill Gardner
Harold Loeffler

Blue Earth County Board
Colleen Landkamer
Kip Bruender
Tom McLaughlin
Will Purvis
Katy Wortel

Agriculture
Jackie Duncanson, Farmer, former MPCA Citizen Board
Kevin Paap, Farmer, Farm Bureau
John Rollings, SWCD, Hobby Farmer
Allan Marble, SWCD, Farmer
Hank Roloefs, Farmer,
Brad Leiding, Farmer

Other
Henry Quade, Citizen, Retired MSU-Mankato Professor, Founder and former Director MSU-Mankato Water Resources Center
Adam Schmidt, President, River Valley Off-Roaders
Mandy Landkamer, Nicollet County Planning and Zoning, Blue Earth County resident
Chris Steffl, Nicollet County Planning and Zoning, Blue Earth County resident

City Representatives
Brad Potter, City Administrator, City of Eagle Lake
Bob Hauge, City Administrator, City of Lake Crystal
Mark Konz, Associate Planner, City of Mankato
Ken Saffert, City Engineer, City of Mankato
City of Mankato Environmental Committee
City of Madison Lake Planning Commission
City Council, City of Madison Lake
City of Lake Crystal Lake Improvement Committee
Ryan Magnus, City Council, City of Lake Crystal
Brad Ahrenstorff, Mayor, City of Lake Crystal
Nancy Schleuter, City of St Clair, Economic Development Committee and Planning Commission
Gary Larson, City of St Clair

County Representatives
Dean Ehlers, Parks Manager, Blue Earth County Highway Department
Mike Krosch, Supervisor, Blue Earth County Highway Department
Craig Austinson, Ditch Manager, Blue Earth County Tax Payer Services, Ditch Authority
Julie Roisen, County Assessor, Blue Earth County
Tim Grant, WCA Administrator, Environmental Health Specialist, Environmental Services
Scott Hanson, Environmental Health Specialist, Environmental Services
Herb Wenkel, Environmental Health Director, Environmental Services
Scott Fichtner, Director, Environmental Services Department
George Leary, Feedlot Officer, Environmental Services Department
Veryl Morrell, Zoning Administrator, Environmental Services Department
Ken Frederick, Hazardous Waste Facility Manager, Environmental Services Department
Scott Salsbury, GIS Planner Specialist, Environmental Services Department
Blue Earth County Planning Commission
Blue Earth County Environmental Services Advisory Committee

State Agencies
Chris Hughes, BWSR
Joel Anderson, DNR Wildlife Manager
Hugh Valiant, DNR Fisheries
John Ellingson, DNR Mining and Minerals
Pat Baskfield, MPCA

Wildlife Conservation
Wayne Krosch, Minnesota Pheasants, Blue Earth County Chapter (also represents other wildlife organizations)

Outdoor Recreation
Mark Bosacker, Mankato Paddling and Outings Club

Developers / Private Industry
Scott Haefner, Land Developer
Doug Losee, I & S Engineers and Architects
Bill Douglass, Bolton and Menk Engineering Consultant
Terry Overn, SMC
Pete Forrey, ISTS installer, developer

SWCD staff
Tony Abrahamson, former Manager
Jerad Bach, current Manager
Erin Degersted, former Maple River Watershed Coordinator
Jonathon Hanson, current Maple River Watershed Coordinator

NRCS
Ryan Braulick

Attachment B – Written Survey Sample

Sample Survey

Blue Earth County
Water Management Plan Survey

Blue Earth County is preparing a five year Water Management Plan. In order to prioritize water related programs, the County is asking for input from residents. Please take a few minutes to complete the survey. A postage-paid, pre-addressed return envelope is included for your use.

---- Please return the survey by May 4, 2007 ---

1) Where do you live?
(check one of the following cities)

___ Amboy ___ Eagle Lake ___Good Thunder ___Lake Crystal ___ Madison Lake
___Mankato ___ Mapleton ___ Pemberton ___Skyline ___St Clair ___Vernon Center

2) How long have you lived in Blue Earth County? _____ years

3) How would you describe water quality in Blue Earth County? (circle your answer)

--------- very good ------- good ------- poor -------- very poor ----------

Why?

4) Are you concerned about any lakes or rivers more than others? ____ no ____ yes
If yes, about which rivers, streams, lakes or wetlands are you *most* concerned? (circle up to three)

Rivers	**Lakes or Wetlands**	
Blue Earth River	Ballantyne	Ida
Le Sueur River	Duck	Lake
Watonwan River	Madison	Gilfillan
Maple River	George	Mud
Perch Creek	Lura	Long
Minneopa Creek	Crystal	Strom
Cobb River	Loon	Armstrong
Little Cobb River	Mills	Lieberg
Other? _____	Other? _____	Indian
Other? _____	Other? _____	Eagle

Why?

5) In Blue Earth County, how often do you view or use a river, lake or stream for recreational purposes each year?
(*Estimate the number of times per year and check the closest answer)*

_____ Rarely or never
_____ A few times
_____ 5 -10
_____ 10-15
_____ 15 – 20
_____ GREATER THAN 20

6) What is your favorite place in Blue Earth County? _____

7) What do you think are the *four most important* water quality issues Blue Earth County should address in the *next five years*?

Water Quality Issues – Blue Earth County's Priorities

Check the four issues you consider most important.

Check up to four	Water Quality Issue	Additional Comments – *Optional* -
	Soil Erosion ___ Agricultural farm fields ___ Eroding river and stream banks	
	Urban Development and Run off ___ Parking lots ___ Construction sites	
	Fertilizers and Pesticides on Farms ___ Over application of agricultural chemicals ___ Fall application of anhydrous ammonia ___ Container storage or disposal ___ Run off into rivers, streams and wetlands	
	Fertilizers and Pesticides in Cities ___ Over application of lawn and garden chemicals ___ Product and container storage or disposal	
	Ground Water and Drinking Water ___ Drinking Water Safety ___ Ground water recharge and protection	
	Feedlots and livestock ___ Run off from feedlots ___ Over application of manure ___ Run off from farm fields – manure applied	
	Septic Systems ___ Old system hooked to field tile or other outlet ___ Not built to code	
	City wastewater treatment ___ Not up to code ___ Bypass	
	Flooding or high water levels ___ Property damage ___ Other	

Do you have any other water quality concerns?

Thank you for your time!

Please return your survey in the envelope provided by May 5, 2007.

Your input is appreciated. All survey results are confidential.

Blue Earth County
Water Management Plan Survey

Blue Earth County is preparing a five year Water Management Plan. In order to prioritize water related programs, the County is asking for input from residents. Please take a few minutes to complete the survey. A postage-paid, pre-addressed return envelope is included for your use.

---- Please return the survey by May 4, 2007 ---

1) Where do you live?
(check one of the following)

_____ Townsite or village (Garden City, Rapidan, Cambria, Judson, LeHillier, South Bend for example)
_____ Lake Shore
_____ Small Subdivision of homes
_____ Farm
_____ Hobby Farm

2) How long have you lived in Blue Earth County? _____ years

3) How would you describe water quality in Blue Earth County? (circle your answer)

--------- very good ------- good ------- poor -------- very poor ----------

Why?

4) Are you concerned about any lakes or rivers more than others? ____ no ____ yes

If yes, about which rivers, streams, lakes or wetlands are you *most* concerned? (circle up to three)

Rivers	**Lakes or Wetlands**	
Blue Earth River	Ballantyne	Ida
Le Sueur River	Duck	Lake
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Maple River	George	Mud
Perch Creek	Lura	Long
Minneopa Creek	Crystal	Strom
Cobb River	Loon	Armstrong
Little Cobb River	Mills	Lieberg
Other? _____	Other? _____	Indian
Other? _____	Other? _____	Eagle

Why?

5) In Blue Earth County, how often do you view or use a river, lake or stream for recreational purposes each year?

(*Estimate the number of times per year and check the closest answer)*

_____ Rarely or never
_____ A few times
_____ 5 -10
_____ 10-15
_____ 15 – 20
_____ GREATER THAN 20

6) What is your favorite place in Blue Earth County? _____

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Water Quality Issues – Blue Earth County's Priorities

Check the four issues you consider most important.

Check up to four	Water Quality Issue	Additional Comments – *Optional* -
	Soil Erosion ___ Agricultural farm fields ___ Eroding river and stream banks	
	Urban Development and Run off ___ Parking lots ___ Construction sites	
	Fertilizers and Pesticides on Farms ___ Over application of agricultural chemicals ___ Fall application of anhydrous ammonia ___ Container storage or disposal ___ Run off into rivers, streams and wetlands	
	Fertilizers and Pesticides in Cities ___ Over application of lawn and garden chemicals ___ Product and container storage or disposal	
	Ground Water and Drinking Water ___ Drinking Water Safety ___ Ground water recharge and protection	
	Feedlots and livestock ___ Run off from feedlots ___ Over application of manure ___ Run off from farm fields – manure applied	
	Septic Systems ___ Old system hooked to field tile or other outlet ___ Not built to code	
	City wastewater treatment ___ Not up to code ___ Bypass	
	Flooding or high water levels ___ Property damage ___ Other	

Do you have any other water quality concerns?

Thank you for your time!

Please return your survey in the envelope provided by May 5, 2007.

Your input is appreciated. All survey results are confidential.