BLUE EARTH COUNTY
WATER MANAGEMENT PLAN

2008-2016 Major Accomplishments

and

2017-2026 Plan Highlights

Prepared for
Minnesota Board of Water and Soil Resources
Southern Region Committee Meeting
August 24, 2017

Priority Concerns Scoping Document

Priority Concerns

Groundwater

Surface Water

Wetlands

Water Plan Development

2008-2016 Major Activities

Water Management Plan 2017-2026 Stakeholder Input

Blue Earth County Board and/or staff held 57 meetings related to the water plan update and wetland planning.

- 1 publicly-noticed Public Meeting.
- 5 Water Plan Task Force Committee meetings.
- 2 County Board of Commissioners work sessions.
- 3 Open House meetings.
- 1 Lake Shoreland and Zoning information meeting for local officials.
- 22 Information Meetings, Work Sessions and Other Forums.
- 20 meetings with ad hoc wetland stakeholder/technical advisory committee including TEP.
- 5 meetings with City of Mankato and/or Blue Earth County TEP.
- County Board of Commissioners conducted Public Hearing in 2016 and in 2017.

Water Management Plan Contents

Priority Areas for Protection and Restoration

Impaired Waters
Surface Water Monitoring and Assessment
State Plans and Priorities
Local Priority Areas
Wetland Priorities
Greenprint Priority Areas
Priority Sites for Wetland Water Quality Functions
Priority Subwatersheds
Priority Lake Watersheds
Prioritizing and Targeting Subwatersheds
Targeting and Land Use Planning Goals

Groundwater

Ground Water Contaminants
Ground Water Quantity and Use
Ground Water Quality – Private and Non-Community Wells
Public Water Supplies

Surface Water

Cropland
Feedlots
Flooding
Near Channel Erosion
Drainage 103E systems
Stormwater Management
Wastewater
Aquatic Invasive Species
Wetland Protection, Enhancement and Restoration

GROUNDWATER AND DRINKING WATER

2008-2016 Major Accomplishments

- Since 1989 the County has administered a well program under a MDH well delegation agreement to administer Minnesota Well Code.
- Since 1989 the County has continued a locally-funded well sealing cost share program.
- 646 wells sealed 2008-2016.
- 383 new wells permitted and inspected 2008-2016.
- 7 of 11 municipalities completed wellhead protection plans.
- DNR and MGS completed *Geologic Atlas of Blue Earth County Part A and Part B*. County hosted DNR training for using Part B.

2017-2026 Water Plan Highlights

Goal: *Protect the quantity and quality of groundwater resources to ensure long term sustainability of groundwater supplies.*

Goal: *Reduce nitrate nitrogen in rivers recharging surficial sands aquifers used for drinking water.*

- County will continue locally-funded well sealing cost share program that was started in 1989.
- County will continue well delegation agreement with MDH.
- 4 municipalities will complete wellhead protection plans.
- Nitrate monitoring in Blue Earth River watershed.
- Incorporate groundwater protection in land use plan updates.

SHORELAND BUFFERS

2008-2016 Major Accomplishments

Shoreland Buffer Initiative 2011-2013

- County notified 336 landowners that parcel(s) were out of compliance with County Shoreland Ordinance and instructed them to contact the SWCD.
- 227 landowners contacted the SWCD with the following results:
  - 79 landowners came into compliance (58 at own expense).
  - 53 landowners were interested in a program.
  - 90 landowners said they were unsure.
  - 9 landowners stated they will not establish a buffer.
- 109 landowners did not respond to the letter.

2017-2026 Water Plan Highlights

- Riparian Buffer Law implementation.

DRAINAGE

2008-2016 Major Accomplishments

- 4 Multipurpose Drainage Plans completed: CD 56, 86, 5 and JD116.
- County Ditch 57 project constructed near Mapleton in the Cobb River watershed. Water quality monitoring.
- County Ditch 56 project construction in 2017 in Lake Crystal watershed.

2017-2026 Water Plan Highlights

Goal: *Drainage project plans will identify potential wetland preservation and restoration projects, creation of water quality improvements or flood control projects to provide measurable water quality benefits in receiving waters.*

- Drainage Authority will identify and quantify potential projects that consider water storage, downstream flooding and peak flows, lakes and wetlands, nutrient and phosphorus transport, and erosion and sedimentation.

WASTEWATER

2008-2016 Major Accomplishments

- City of Mankato Regional Wastewater Treatment System expansion to the City of Madison Lake and Lake Washington Sewer District. Extended sewer collection to shoreland areas of Duck, Ballantyne, and Madison Lake. Eliminated 400 septic systems.
- 804 replacement septic systems for residential use 2008-2016.
- 272 septic systems for new residential development 2008-2016.
- 79 septic systems for businesses and other uses 2008-2016.

2017-2026 Water Plan Highlights

Goal: *Eliminate discharge of untreated and undertreated wastewater to surface water and groundwater.*
Goal: *Ensure all subsurface sewage treatment systems (SSTS) are in compliance with Blue Earth County Code.*

- Continue wastewater programs for septic systems, municipal wastewater treatment and regional partnerships.

CROPLAND

Soil and Water Conservation District

2011-2016 (six years) Major Accomplishments

- BMPs and Projects:
  - 13 Grassed Waterways
  - 3 Shelter Belts
  - 19 WASCOBS
  - 21 Grade Stabilization
  - 655 Acres Cover Crops
  - 1 Sediment Basin
  - 1 Water Control Structure
- 47 RIM Easements and 2 RIM/WRP Easements closed
- County-wide Tillage and Erosion Research Project with U of M
- 78,395 trees sold
- South Central Technical Service Area Shared Services Host
- 32 Ag BMP loans 2011-2015 ($575,086 in five years)

2017-2026 County Water Plan Highlights

Goal: *Increase adoption of voluntary best practices to protect and improve soil health and water quality.*

- Education: Farmer-led, on-farm trials and demonstration projects.
- Nutrient Management.
- Treat subsurface tile drainage water.
- Vegetative buffers and vegetation practices.
- Target best practices to highly erodible land.
- Improve Soil Health.
- Increase water storage.
- Monitoring.
- Conservation Easement Delivery.

FEEDLOTS

2017-2026 Water Plan Highlights

Goal: *Minimize potential transport of bacteria and nutrients to surface water and groundwater from feedlots and manure applied to cropland.*

- Manure management tracking.
- Manure management for sensitive soils – shallow depth to bedrock and coarse textured soils.
- Transition to inspecting and reviewing feedlots on a watershed basis and coordinate activities in priority watersheds with the SWCD.
- Work with landowners to properly abandon manure pits.

FLOODING AND NEAR CHANNEL EROSION

2008-2016 Major Events & Accomplishments

In 2008 flooding was a priority concern addressed in the water plan. Near channel erosion was addressed as an "expected change" during the planning period.

- First County in Minnesota to address riverine and near channel erosion hazards and landslides in an all hazard mitigation plan - *Blue Earth County All Hazard Mitigation Plan Update 2013.*
  - 89 structures within 30 feet of bluffs.
  - 267 structures within 50 feet of bluffs.
  - 186 miles of roadway within 30 feet of bluffs.
  - 3 municipal wells in hazard areas.
  - 4 municipal wastewater treatment facilities in hazard areas.
- Bluff and ravine erosion assessments.
  - 300 eroding ravines.
  - More than 900 eroding bluffs in the greater Blue Earth River watershed.
- Le Sueur River Stream/Bluff Restoration Demonstration - 4 Wood-Toe Projects.
- Seven Flood Disaster Declarations between 2010 and 2016.
  1. March 19, 2010
  2. April 9, 2010
  3. July 2, 2010
  4. October 13, 2010
  5. May 10, 2011
  6. July 21 2014
  7. November 1, 2016
- City of St. Clair wastewater treatment facilities were flooded in 2010 resulting in no water or sewer use during the flood. An earthen, flood protection levee was constructed to just above the FEMA flood elevation after 2010. The 2016 flood breached FEMA flood elevation (and earthen levee).
- City of Mankato watershed plans for Indian Creek watershed in the Middle Minnesota watershed and Wilson Creek drainage area in the Le Sueur River watershed.
- City of Eagle Lake identified area for upstream water storage to minimize effects of flash flooding.
- 2 dwellings affected by riverine erosion removed after 2010 Disaster Declaration with FEMA-funded, Homeland Security and Emergency Management Hazard Mitigation Assistance Program.
- 2 dwellings affected by riverine erosion after 2016 Disaster Declaration determined eligible for FEMA-funded, Homeland

Security and Emergency Management Hazard Mitigation Assistance Program after 2016 Disaster Declaration.
- Bluff restoration near a new bridge on the Maple River and numerous other flood mitigation projects throughout the county.

2017-2026 Water Plan Highlights

Goal: *Protect public safety and property.*

Goal: *Ensure community resilience to extreme rainfall events.*

Goal: *Minimize near channel erosion, erosion hazards and mitigation costs.*

- Coordination and assessment with *Blue Earth County All Hazard Mitigation Plan 2018 Update*.
- Increase dwelling setbacks in County Shoreland Ordinance beyond minimum required by Minnesota Shoreland Rules using technical information.
- Support City of St. Clair flood protection structures and other flood protection measures to protect infrastructure.
- Water storage, flood and stormwater attenuation.
- Implement watershed plans for Indian Creek and Wilson Creek.
- Implement City of Eagle Lake plan for upstream water storage.
- Seek funds and technical support to develop technical information for elected officials, conservation, planning and zoning staff and landowners making land use decisions in erosion hazard areas.

STORMWATER MANAGEMENT

2008-2016 Major Activities

- Mankato MS4 boundary expanded by MPCA to adjacent townships, MSU-Mankato, City of Eagle Lake and City of Skyline. Regional MS4 joint powers established.
- City of Mankato annual contractor training.

2017-2026 Water Plan Highlights

Goal: *Ensure community resilience with stormwater management that prevents flooding and protects water quality*.

- Education and training for the public, local officials and construction contractors.
- Update land use plans, stormwater policies and ordinances to protect water quality in lake watersheds and channel protection.
- Stormwater retrofits.
- Green infrastructure.
- Constructed wetlands and water quality treatment wetlands to provide flood and stormwater attenuation functions and nutrient treatment.

AQUATIC INVASIVE SPECIES

Aquatic Invasive Species (AIS) were not addressed in the 2008 water plan. As a result of AIS Prevention Aid to counties beginning in 2015, the County developed an AIS plan and funding guidelines.

2008-2016 Major Events & Accomplishments and Plan Highlights

- Concern about zebra mussels and bighead carp newly identified in Minnesota River spreading to area lakes.
- Conduct watercraft inspections and worked with lake associations and local businesses to distribute promotional items.
- DNR constructing electric fish barrier between Le Sueur River and Madison Lake in 2017 or 2018 to prevent migration of invasive fish species to Madison Lake during years of high water.

PRIORITIZING AND TARGETING

2008-2016 Major Accomplishments

- Updated Blue Earth County Greenprint - wildlife habitat, surface waters, shorelands, wetlands, woodlands, and environmentally sensitive areas.
- Identified potential sites and priority areas for groundwater protection and recharge using the *Geologic Atlas of Blue Earth County, Part B*.
- Identified and prioritized potentially restorable wetlands for water storage and nutrient treatment functions.
- Mapped ravine and bluff (near channel) erosion sites.

2017-2026 Water Plan Highlights

Goal: *Prioritize, target and measure watershed protection and restoration planning and implementation strategies in priority areas.*

- Target subwatersheds with best available science, WRAPS, terrain analysis, local knowledge and local monitoring results.

Watershed for Protection

- Duck Lake & Lake Ballantyne in Shanaska Creek/Middle Minnesota watershed. Declining water quality. Concern about urban development and stormwater management in watershed.

Watersheds for Restoration

- Madison Lake in Le Sueur watershed.
- Lake Crystal and Loon Lake in Minneopa Creek/Middle Minnesota watershed.

Near-Channel Erosion: Ravines

- Indian Creek, Middle Minnesota River, Le Sueur River, Blue Earth River and Watonwan River

Watershed Plans

Watershed	MPCA Intensive Monitoring Schedule	Estimated MPCA WRAPS Schedule	Estimated One Watershed One Plan Schedule
Le Sueur	2008-2012	2013-2015	unknown
Middle Minnesota	2013-2014	2016-2018	2019-2021
Watonwan	2013-2014	2016-2017	2018-2020
Blue Earth	2017-2018	2019-2021	2021-2023
Le Sueur	2018-2020	2021-2023	2023-2025

Goal: *Protect, enhance and restore wetlands in priority areas to provide important water quality, wildlife habitat and groundwater protection functions in local watersheds.*

- Greenprint
- Groundwater Protection and Recharge
- Water Storage Functions
- Nutrient Treatment Functions
- Flood and Stormwater Attenuation

LAND USE PLANNING FOR NATURAL RESOURCES

2017-2026 Water Plan Highlights

Goal: *Protect, enhance and restore aquatic and natural resources in priority areas to provide important water quality, wildlife habitat, water storage and groundwater protection functions with the greatest local public value in local watersheds.*

- Greenprint Priority Areas
- Shoreland Protection
- Wetland Functions Framework
- Environmental Review
- Transportation Planning

Blue Earth County Greenprint

Priority Areas - Greenprint

The Greenprint is a map of green infrastructure in the county. Priority areas include natural resources in river corridors, lake shoreland and wetland complexes.

Green Infrastructure

Green infrastructure is a strategically planned, interconnected network of waterways, wetlands, woodlands, wildlife habitats, and other natural areas; greenways, parks, trails; conservation lands; and other open spaces that support natural ecosystem processes and contributes to the health and quality of life for communities and people.

Adapted from:
Green Infrastructure: Smart Conservation for the 21st Century
Mark A. Benedict and Edward T. McMahon
and ESRI

Green infrastructure is an organizational strategy that provides a planning framework for conservation and development.

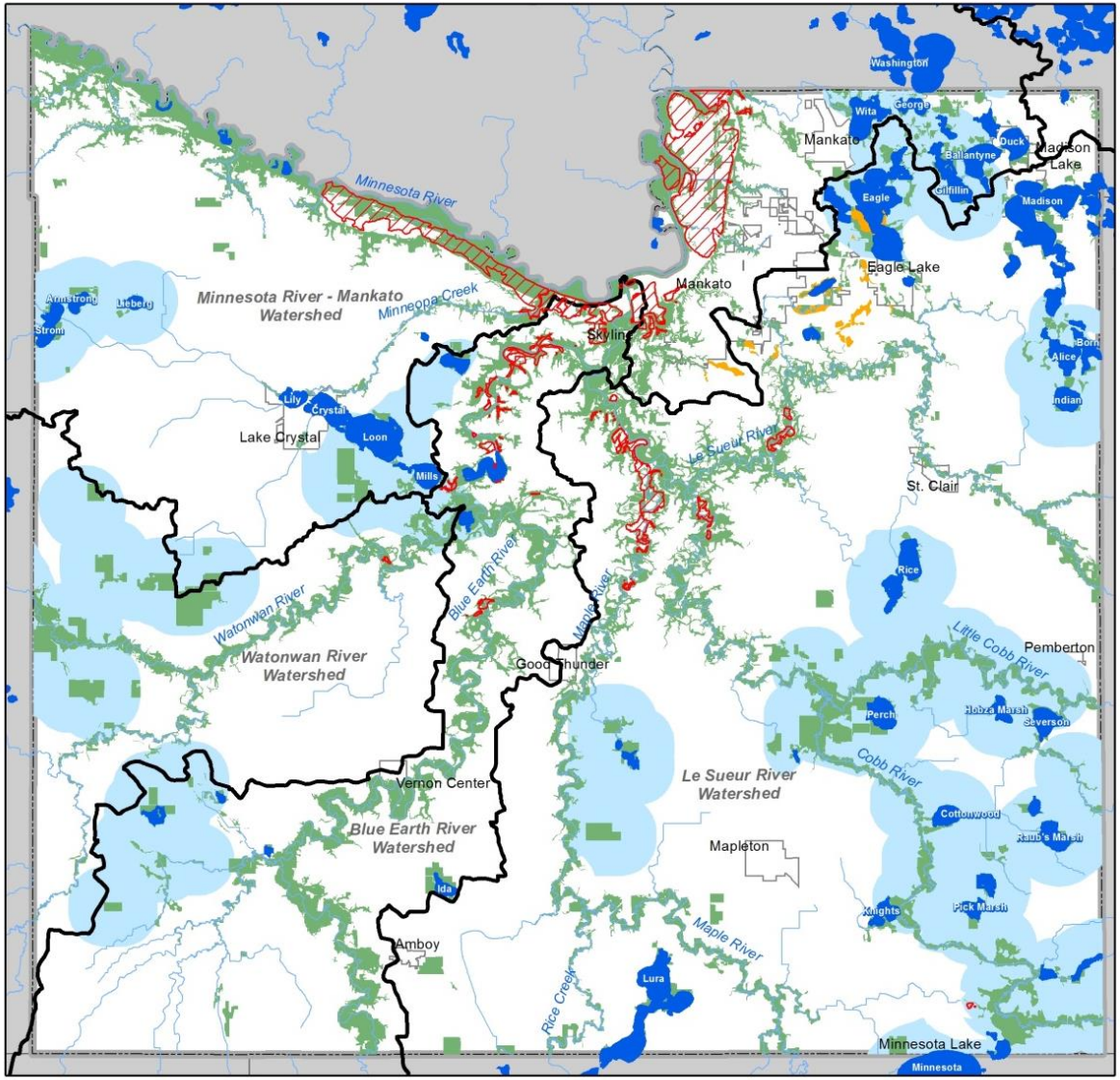
Source: *Green Infrastructure:*
Linking Landscapes and Communities
Mark A. Benedict and Edward T. McMahon

Making the Greenprint

A land use planning approach was used to identify Greenprint priority areas based on the ability to provide multiple aquatic and natural resource benefits. An inventory of aquatic and natural resources, sensitive features, land cover, floodplains, rivers, streams, lakes, wetlands, rare plant and animal habitat, sensitive geology, park lands, and protected or publicly-owned lands was followed by an analysis of their landscape position, proximity and connectivity in four landscape settings - river corridors, shallow bedrock and karst, lake shoreland and wetland complexes. These diverse landscape settings, natural resources and hydrologic conditions were combined to make the Greenprint.

Protecting natural resources and open spaces in Greenprint priority areas is a land use management priority.

Greenprint, Wetland Complexes, Shallow Bedrock and Karst



Bedrock within 10 Feet of Ground Surface or Karst

Planned Greenprint Corridor Connection

Greenprint Corridor

Wetland Complexes

Major Watershed

Public Water Basin

0 5 Miles

Prepared By: Blue Earth County 2016

Greenprint

The Blue Earth County Greenprint is a strategically planned interconnected network of waterways, wetlands, woodlands, wildlife habitat, conservation lands and open spaces that support natural ecosystems. The Greenprint identifies priority areas and provides a planning framework for conservation and development that contributes to the health and quality of life for communities and people.

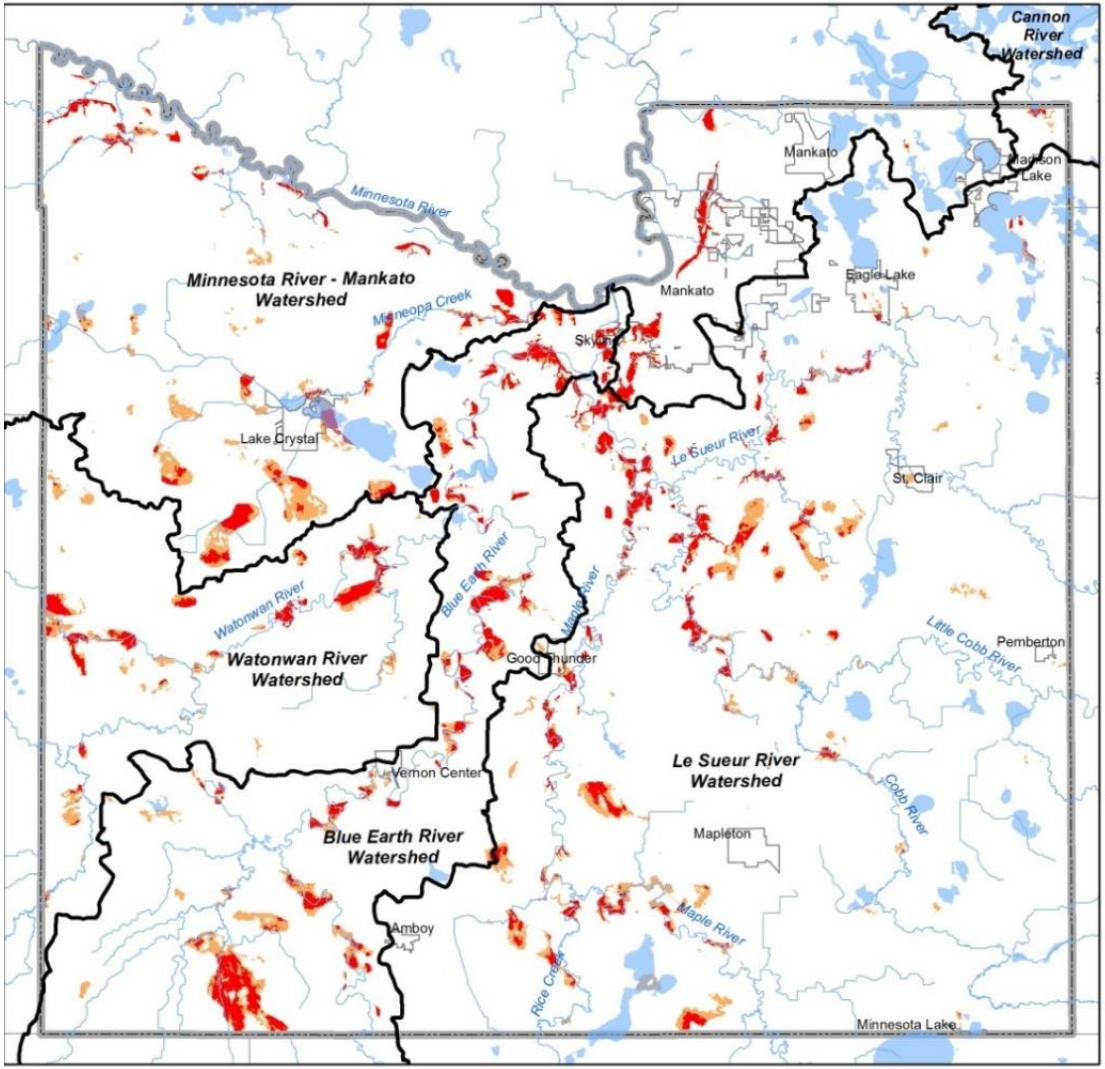
Landscape Position	Description	Greenprint Inventory & Criteria
Corridors	River corridors contain a continuous band of flood plains, riparian wildlife habitat, wooded and grassy hillsides, marshes and swamps. This variety of landscapes provides excellent habitat for a wide variety of bird and other wildlife species as well as water storage and water treatment functions.	• Floodplain • Native Plant Communities in the Minnesota County Biological Survey that have ratings of Outstanding, High or Moderate for level of biodiversity • Steep slopes (18% slopes or greater that have connections to river corridors) • Woodlands connected to floodplains, steep slopes or native plant communities
Wetland Complexes	Wetland complexes are areas where wetlands are in close proximity, providing ideal habitat for most types of birds and waterfowl as well as other wildlife species. Hydrologic connections are not required. A variety of wetland types (seasonal and temporarily flooded) is preferred along with grassland. The working lands criteria were used to prioritize wetland complexes: • 4 to 9 square miles in size • 1 shallow lake over 50 acres • 20% total wetland acres • 50% seasonal wetland acres (few weeks to a few months) and temporary (few days to a few weeks) • 40% is grassland, one half in long term protection	• 50-acre or greater public shallow lake • Wildlife Management Area • Waterfowl Production Areas • Permanent conservation easements • 4 to 9 square miles in total size
Shoreland	Wetlands connected to lakes and near the shore provide critical wildlife habitat, water storage and water quality benefits. Near-shore wetlands protect the shore from erosion. Near-shore habitat is critical for many wildlife species. For example, male green frogs establish breeding territories within 2 feet from the lake edge.	• Lakes or wetlands that are Public Waters • Wetlands adjacent to the shore • Wetlands that have a direct hydrologic connection to Public Waters
Geology	The *Geologic Atlas of Blue Earth County, Part B*, 2016, shows areas with shallow depth to bedrock and karst. Fens are most likely to be in these areas.	• Bedrock within 10 Feet of ground surface • Karst
Recreation	Parks, trails and open spaces can provide important connections between population centers or developed landscapes to wetlands, woodlands and waterbodies.	• Park and Open Space Plans • Planned Greenways

Conservation Practices and Replacement Sites for Voluntary Conservation

Potentially restorable basins may provide important functions such as water storage, nutrient treatment and wildlife habitat, depending on site suitability, the landowner's goals, project engineering and design.

Function	Considerations	Basin Criteria
Water Storage	Basin has the potential to store a large volume of water and store surface runoff to the basin from a 10-year, 24-hour storm event. Volume assumes the basin is dry.* This will vary year-to-year and seasonally. 10-year: 4.37 inches. 2-year: 2.91 inches.	Capacity for 10-year, 24-hour storm event or larger* **Yes or No**
Nutrient Treatment	Vegetation is needed for nutrient treatment. The basin must be shallow to support wetland vegetation. For maximum nutrient treatment, the wetland/basin should be located near the bottom of its watershed and receive drainage from tile-drained fields. Iowa CREP: Depressions that have a watershed size of 494 acres or larger, have at least 75% of basin that is less than 3 feet in depth, and surface area is 0.5-2.0% of the total drainage area.	**High:** (Modified Iowa CREP) ***Depth:*** at least 75% of basin less than 3 feet ***Ratio of basin to watershed area:*** Basin 0.4% to 2.5% of watershed area ***No minimum watershed size*** **Medium:** ***Depth:*** *75%* or more of basin is less than 3 feet deep **Low:** ***Depth:*** Less than 75% of basin is under 3 feet deep
Pollution Sensitivity & Groundwater Recharge	Soil types in the county limit infiltration and groundwater recharge capabilities. Geologic Atlas of Blue Earth County Part B, maps of pollution sensitivity to buried sand aquifers and near surface materials provide a qualitative evaluation of recharge rate or flow of surface water to deeper aquifers.	Geologic Atlas of Blue Earth County Part B pollution sensitivity maps of surficial and buried sand aquifers **Very High:** hours to months **High:** weeks to years
Other	Determined by landowners. Basins owned by one landowner.	

Areas of Highest Potential Groundwater Recharge



Major Watershed

Recharge Potential and Estimated vertical travel time for water to enter a buried sand aquifer

Very High: Hours to Months

High: Months to Years

0 5 Miles

Prepared By: Blue Earth County 2016

Source: Geologic Atlas of Blue Earth County - Part B Minnesota Department of Natural Resources 2016

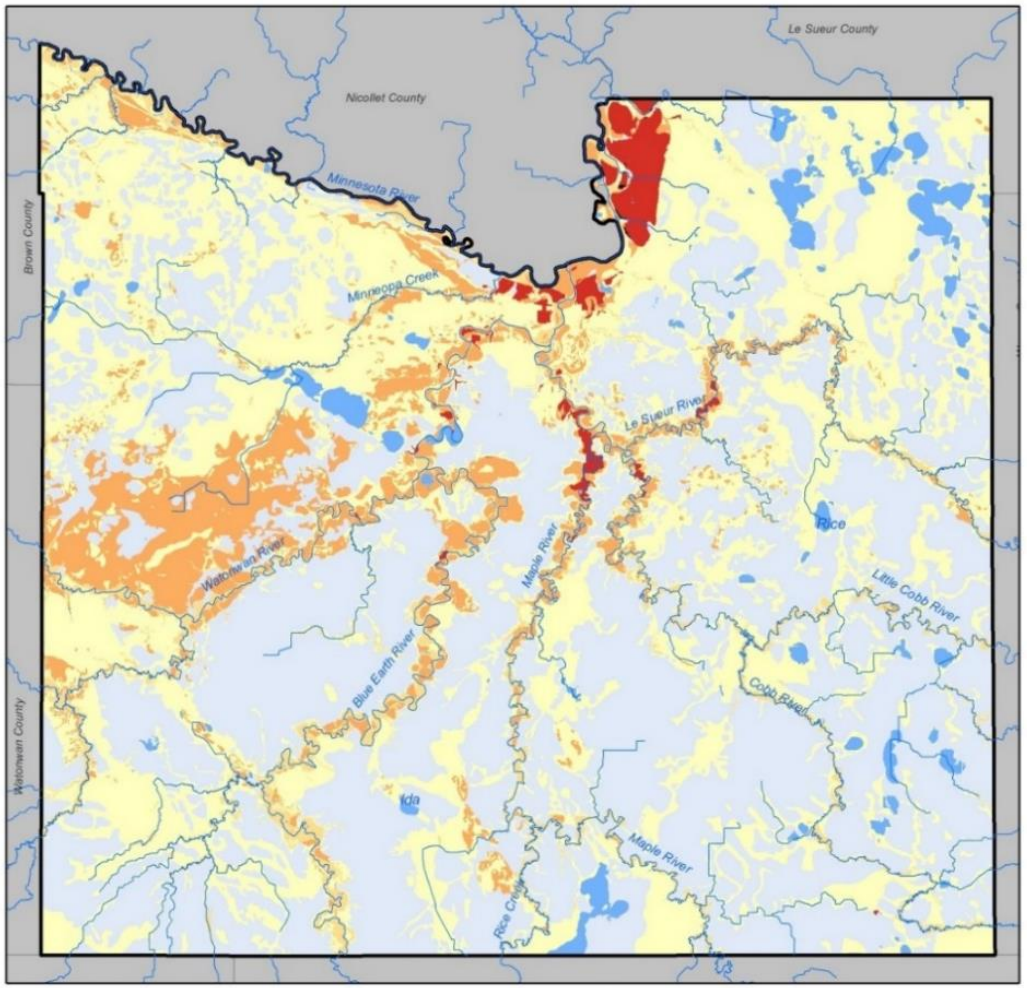
This map shows a compilation from the pollution sensitivity maps on pages 42-47 of the Geologic Atlas of Blue Earth County, Part B. Pollution sensitivity is defined by the physical properties that affect downward migration of pollutants to the groundwater. The main variable is the rate that water travels from the surface to the aquifers.

GROUNDWATER RECHARGE

The map on this page shows a compilation of pollution sensitivity of buried sands aquifers maps on pages 42-47 in the *Geologic Atlas of Blue Earth County, Minnesota, Part B*.

> "The pollution sensitivity modeling process for buried aquifers provides a qualitative evaluation of recharge rate or flow of surface water into deeper aquifers. This, along with the flow direction (indicated by the potentiometric surface contours), gives a good indication of areas at the surface that are worthy of protection. The travel times to buried aquifers vary from days to thousands of years. Areas with relatively short travel times of less than a few years are rated high or very high pollution sensitivity. Areas with estimated travel times of decades or longer are rated low or very low pollution sensitivity." (*Geologic Atlas of Blue Earth County Part B)*

Pollution Sensitivity of Near-Surface Materials



Pollution Sensitivity: Estimated vertical travel time through near-surface materials

- High: hours to a week
- Moderate: a week to weeks
- Low: weeks to months
- Very Low: months to a year
- Karst[1]
- Bedrock
- Water

N

0 5 Miles

Prepared By: Blue Earth County 2016

Source: Geologic Atlas of Blue Earth County - Part B Minnesota Department of Natural Resources 2016

1 Karst allows a direct, very rapid exchange between surface water and groundwater and significantly increases groundwater contamination risk from surface pollutants.

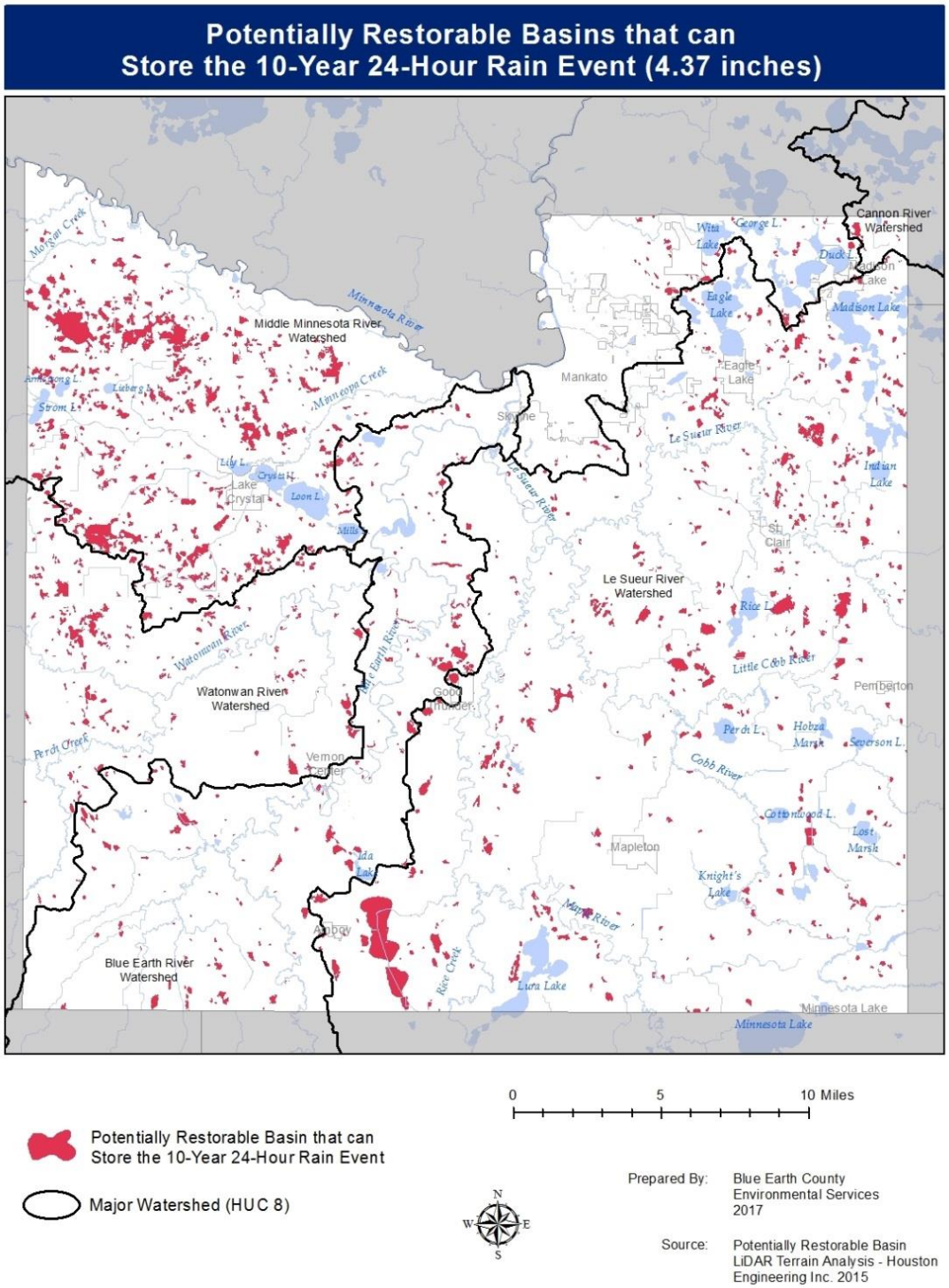
This pollution sensitivity model assumes a 10-foot-deep water table and vertical travel of possible pollutants through unsaturated, near-surface materials.

GROUNDWATER POLLUTION SENSITIVITY OF NEAR SURFACE MATERIALS

The map on this page shows the pollution sensitivity and combined travel time for soil and surfical geologic sediment.

The *Geologic Atlas of Blue Earth County Part B* describes pollution sensitivity in some areas of the county:

> "The slower infiltration rates (low to very low pollution sensitivity) are common in the eastern and southern portions of the county. The exceptions are the larger stream valleys where sandier sediment and soil are present.
>
> Higher infiltration rates (moderate to high pollution sensitivity) occur in the northwestern portion of the county where sandier soil and sediment are common at the surface.
>
> Potentially very high infiltration rates (karst) exist in portions of the Minnesota, Blue Earth, Watonwan, Maple, Le Sueur, and Cobb river valleys."



WATER STORAGE

Water storage functions relate to the capacity to collect and retain surface water runoff, direct precipitation and discharging groundwater. Water storage includes water standing in the basin and water held in the soil.

Water that is delayed or stored in the wetland reduces the amount of runoff down slope, thereby ensuring a decrease in flood crests down gradient. When runoff is detained in a regionally dispersed manner by wetland basins, pulses of water that eventually enter downstream areas in most cases are staggered (desynchronized). This broadens the storm hydrograph and reduces streamflow peaks.

Potential sites were prioritized based on the ability to hold a 10-year, 24-hour storm event (4.37 inches), which sites hold the largest volume of water and which sites have the smallest footprint while storing the most water.

Potentially Restorable Basins - Priority Water Storage Criteria

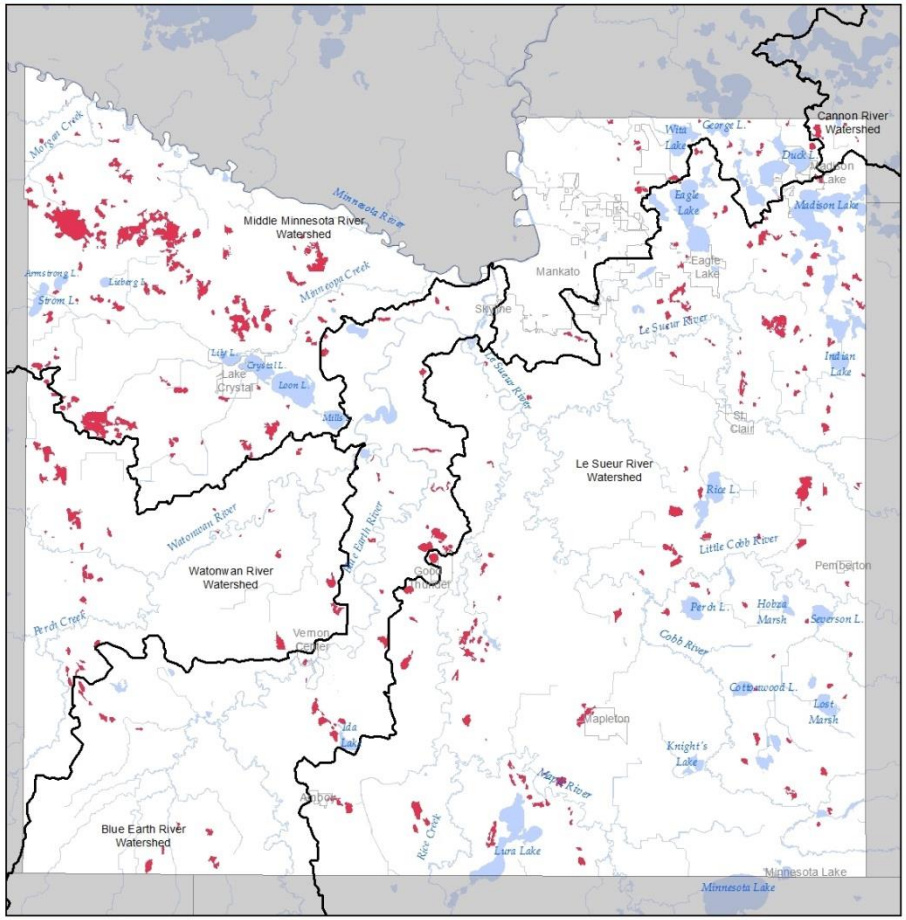
Maps on the following pages display potential sites for water storage based on the following prioritization criteria:

1. Ability to store a 10-year 24-hour rain event (4.37 inches)

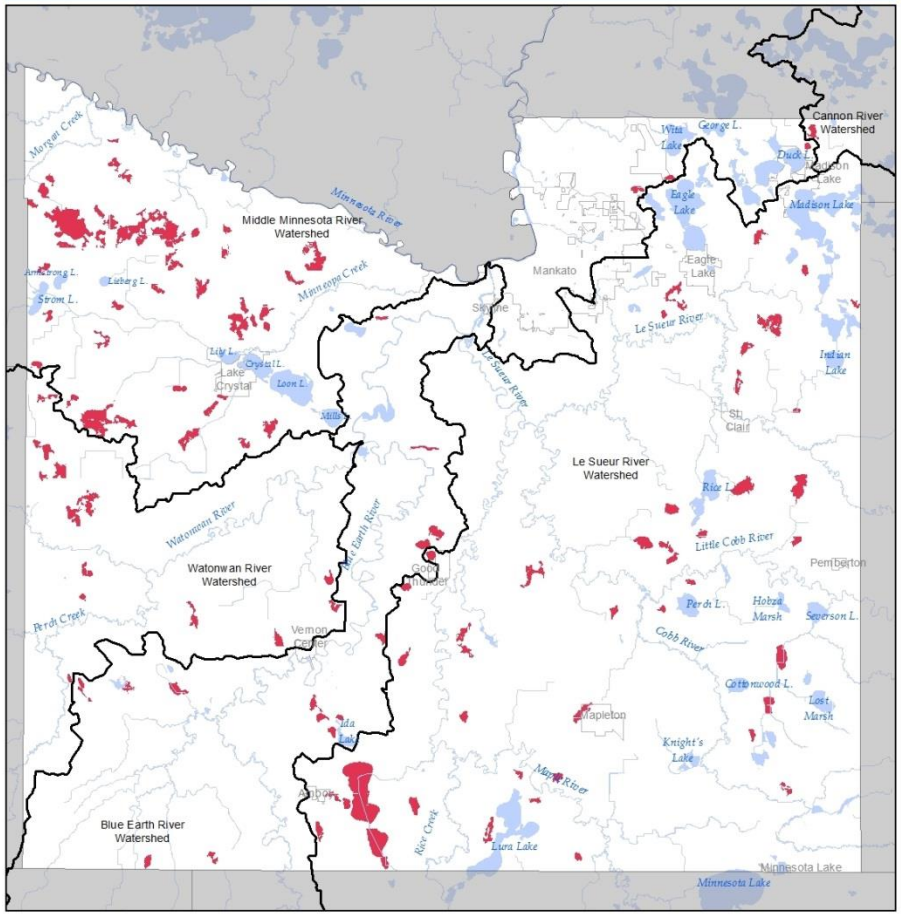
2. Largest potential storage volume (100 acre feet or more), and

3. Top 10% for ratio of volume to surface area – they hold the most water in the smallest footprint

Potentially Restorable Basin in the Top 10 percent for Ratio of Volume to Surface Area



Potentially Restorable Basins that Have a Volume of 100 Acre-Feet or More



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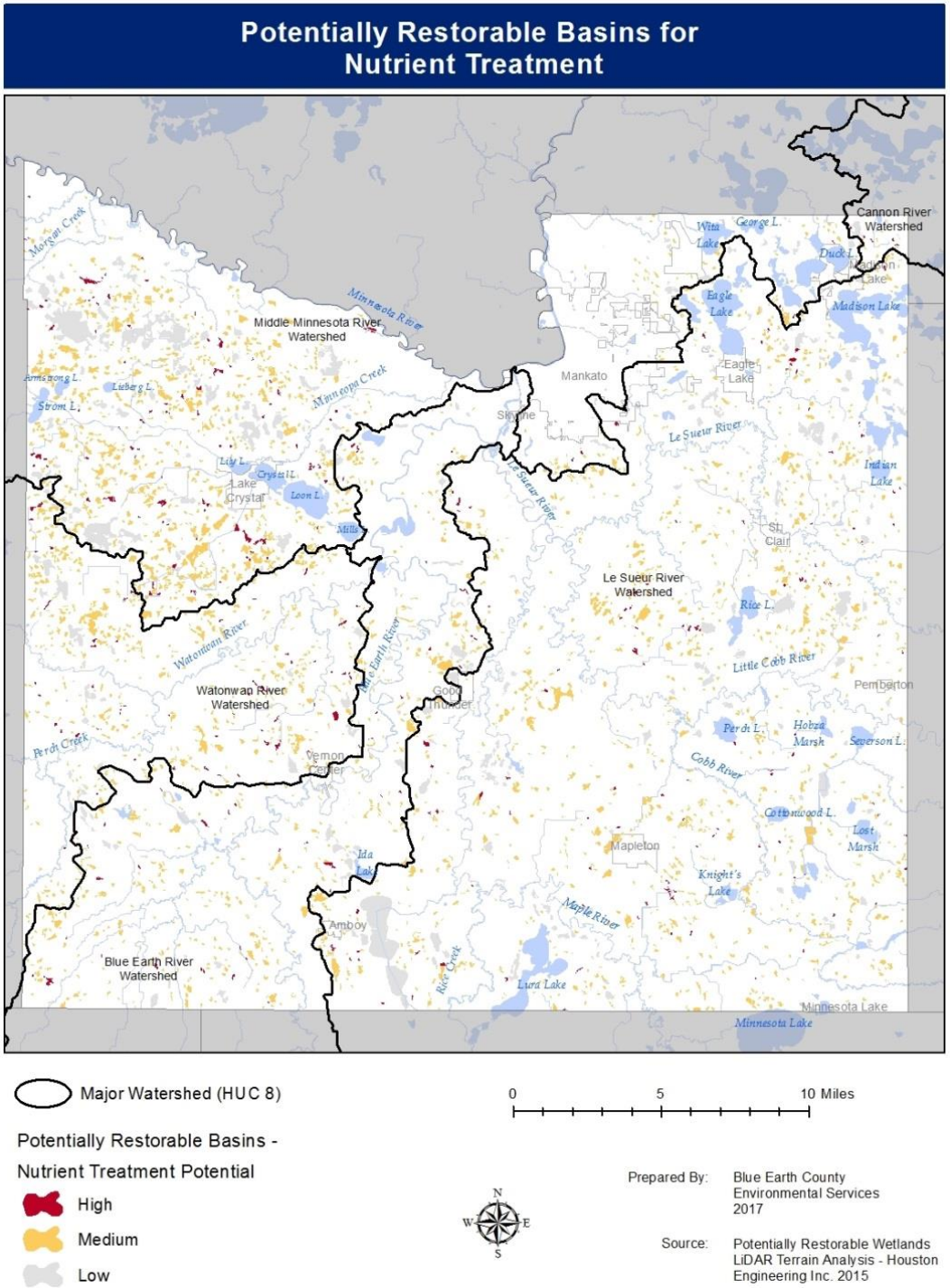

NUTRIENT TREATMENT

A wetland's ability to uptake, metabolize, sequester and/or remove nutrients and imported elements from the water is primarily dependent on wetland vegetative conditions. Wetland vegetation needed for removing nutrients survives best in wetlands less than three feet deep.

Wetland environments are effective at denitrification. Forested wetlands retain ammonia during seasonal flooding.

The best long-term phosphorus removal process is uptake by growing plants, and the storage of plant remains as peat or removal of plant material by harvest. There is a limit to the amount of phosphorous that can be adsorbed because adsorption sites can become saturated with phosphorous.

Potentially Restorable Basins – Priority Nutrient Treatment Criteria

High Potential for Nutrient Treatment

Depth: 75% or more of the basin is less than 3 feet
Ratio of basin to watershed area: Basin 0.4% to 2.5% of the site's watershed area
Size: No minimum watershed size

Medium Potential for Nutrient Treatment

Depth: 75% or more of the basin is less than 3 feet
No other criteria applied

Low Potential for Nutrient Treatment

Depth: Less than 75% of the basin is less than 3 feet
No other criteria applied