Buffalo Creek Watershed District
Overall Plan (2014-2023)

2013 Photo Contest Winners

1st Place ~ Melody Ruehling

2nd Place ~ Justin Selle

3rd Place ~ Nancy Fuhrman

May 7, 2014
Prepared by the
Buffalo Creek Watershed District
and the Mid-Minnesota Development Commission
### Common Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACE</td>
<td>Army Corps of Engineers</td>
</tr>
<tr>
<td>BCWD</td>
<td>Buffalo Creek Watershed District</td>
</tr>
<tr>
<td>BMP</td>
<td>Best Management Practice</td>
</tr>
<tr>
<td>BWSR</td>
<td>Minnesota Board of Water and Soil Resources</td>
</tr>
<tr>
<td>CD</td>
<td>County Ditch</td>
</tr>
<tr>
<td>CLMP, CSMP</td>
<td>Citizen Lake (Stream) Monitoring Program</td>
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<tr>
<td>CLWP</td>
<td>Comprehensive Local Water Plan</td>
</tr>
<tr>
<td>CROW</td>
<td>Crow River Organization of Water</td>
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<tr>
<td>CRP</td>
<td>Conservation Reserve Program</td>
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<tr>
<td>CWP</td>
<td>Clean Water Partnership</td>
</tr>
<tr>
<td>DA</td>
<td>Ditch Authority</td>
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<tr>
<td>DNR</td>
<td>Minnesota Department of Natural Resources</td>
</tr>
<tr>
<td>E&amp;CD</td>
<td>Environment and Community Development</td>
</tr>
<tr>
<td>EM</td>
<td>Emergency Management</td>
</tr>
<tr>
<td>EPA</td>
<td>U.S. Environmental Protection Agency</td>
</tr>
<tr>
<td>EQIP</td>
<td>Environmental Quality Incentive Program</td>
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<tr>
<td>ES</td>
<td>Environmental Services</td>
</tr>
<tr>
<td>FEMA</td>
<td>Federal Emergency Management Agency</td>
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<tr>
<td>LAP</td>
<td>Lake Assessment Project</td>
</tr>
<tr>
<td>LGU</td>
<td>Local Governmental Unit</td>
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<tr>
<td>MDA</td>
<td>Minnesota Department of Agriculture</td>
</tr>
<tr>
<td>MDH</td>
<td>Minnesota Department of Health</td>
</tr>
<tr>
<td>MGS</td>
<td>Minnesota Geological Survey</td>
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<tr>
<td>MPCA</td>
<td>Minnesota Pollution Control Agency</td>
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<tr>
<td>NRCS</td>
<td>Natural Resource Conservation Service</td>
</tr>
<tr>
<td>OHWL</td>
<td>Ordinary High Water Level</td>
</tr>
<tr>
<td>PH</td>
<td>Public Health Department</td>
</tr>
<tr>
<td>PW</td>
<td>Public Works Department</td>
</tr>
<tr>
<td>PZ</td>
<td>Planning and Zoning</td>
</tr>
<tr>
<td>RIM</td>
<td>Reinvest in Minnesota Program</td>
</tr>
<tr>
<td>SFCR</td>
<td>South Fork Crow River Watershed</td>
</tr>
<tr>
<td>SSTS</td>
<td>Subsurface Sewage Treatment System</td>
</tr>
<tr>
<td>SW</td>
<td>Solid Waste Department</td>
</tr>
<tr>
<td>SWCD</td>
<td>Soil and Water Conservation District</td>
</tr>
<tr>
<td>TMDL</td>
<td>Total Maximum Daily Load</td>
</tr>
<tr>
<td>UMES</td>
<td>University of Minnesota Extension Service</td>
</tr>
<tr>
<td>USFWS</td>
<td>U.S. Fish and Wildlife Service</td>
</tr>
<tr>
<td>WCA</td>
<td>Wetland Conservation Act</td>
</tr>
<tr>
<td>WMA</td>
<td>Wildlife Management Area</td>
</tr>
<tr>
<td>WP</td>
<td>County Water Planner</td>
</tr>
<tr>
<td>WPA</td>
<td>Waterfowl Production Area</td>
</tr>
</tbody>
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For more information on the Buffalo Creek Watershed District, please visit

www.bcwatershed.org
Buffalo Creek Watershed District Overall Plan

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Buffalo Creek Watershed District
Overall Plan Executive Summary

Chapter One Highlights

Location

The Buffalo Creek Watershed District (BCWD) is located in south-central Minnesota, approximately 30 miles west of the Minneapolis-St. Paul Metropolitan Area (refer to Map 1A). The Buffalo Creek watershed is the southern-most subwatershed of the larger South Fork of the Crow River Watershed, which eventually outlets to the Mississippi River near Dayton, Minnesota. There are five counties (Kandiyohi, Renville, McLeod, Sibley, and Carver) and six cities (Brownton, Buffalo Lake, Glencoe, Hector, Plato and Stewart) that are wholly or partially located within the District. The City of Glencoe, which is the County Seat of McLeod County, is the largest city in the District.

History and Organizational Structure

The BCWD was established under the order of the Minnesota Water Resources Board (now known as the Minnesota Board of Water and Soil Resources) on January 30, 1969. Soon after its formation, the District developed its first Overall Plan in accordance with Minnesota Statutes. The Plan, which was adopted on February 8, 1974, provided the District with a basis for making decisions on the management of its water resources. The District’s Plan was revised in 1991 and again in 2003. This fourth generation Plan shall serve the years 2014-2023 or until amended.

Mission Statement

The BCWD was formed with the mission to: 1) help alleviate water problems, 2) enhance the living conditions of the area and 3) maintain or improve the economic wellbeing of the residents of the District. The District has in the past and will continue to strive towards the realization of this mission by:

- Serving as a link between residents and governmental agencies;
- Providing technical assistance to citizens and governmental agencies;
- Providing a means of financial assistance for the implementation of environmental projects; and
- Coordinating intergovernmental efforts.
Rules and Regulations

On January 25, 2011, the BCWD Board of Managers adopted a revision to the District’s Rules and Regulations, effectively replacing the Rules and Regulations that were in effect since 1993. The Rules and Regulations establish a permitting process for the guidance of activities that have the potential to impact water resources throughout the District (BCWD Rules and Regulations can be viewed online at www.bcwatershed.org).

BCWD Completed Projects

Table 1B in the Plan lists the BCWD’s major projects and expenses from 2002 to 2013 (only the large-scale projects are included). Table 1B includes the year it was initiated, project status (complete or ongoing) and the project’s total cost. The 10-year total of major projects equaled $898,611. The projects can be grouped into the following categories (not ranked in order of significance or expenditure):

1. Tree & Dam Clearing
2. Aerial Research & LiDAR
3. Lake Allie Land Acquisition & Basin Project
4. Stream Restoration & Buffer Projects
5. Septic and Open Tile Intake BMP incentives
6. Water Quality BMPs

BCWD Stakeholders and Planning Process

The BCWD has several stakeholders, including the residents of the District, State and Federal agencies, local governmental units, special interest groups and an Advisory Committee. The ten-member Advisory Committee is appointed by the BCWD Board of Managers and meets as necessary to provide direction on BCWD issues, projects, and priorities. The Advisory Committee also met three times throughout the planning process to provide insight on the contents of the District’s updated Overall Plan.

Note: Chapter Ones also contains a population profile and an extensive profile of the District’s Physical Characteristics, including subsections on hydrology, subwatersheds, soils, topography, and land use.
Chapter Two Highlights

Water Quantity Management Overview

Balancing the need for water quantity management and its associated environmental and social impacts was one of the key issues that led to the formation of the BCWD. The District has the authority to regulate the management of water resources through its adopted rules (contained in Appendix A of the Plan or online at www.bcwatershed.org). These rules are believed to be adequate to balance the need for and impacts of water quantity management.

Drainage Management

There is an extensive drainage system throughout the BCWD, consisting of approximately 800 miles of public drainage ditches. A majority of these ditches were installed in the early part of the last century and were designed to remove large quantities of water rapidly. As a result of their design, several water quality and quantity problems, such as nonpoint source pollutant loading and flooding, commonly arise. An effective means to mitigate many of these impacts would be to increase upland water storage and riparian buffering, which would reduce the overall volume of water transported by the drainage systems and provide filtration of nonpoint source pollutants.

BCWD Priority Issue 1: Conservation Drainage Practices

Issue Overview: Open surface tile intakes serve as direct conduits for nonpoint source pollutants, such as sediment and nutrients, to enter subsurface drainage systems, which eventually outlet to surface water resources. Conservation drainage practices offer landowners an option to replace existing open intakes with more environmentally conscious practices, while preserving drainage benefits. As a priority issue, the Overall Plan Taskforce recommended that the District review possible funding sources to assist landowners in the implementation of conservation drainage practices.

BCWD Priority Issue 2: Drainage Coefficients

Issue Overview: Under the District’s Rules and Regulations, a permit is required for any tiling of 8” or larger or any size tile where an easement is required (i.e., for projects potentially affecting adjacent landowner’s property). Generally, this size requirement is in excess of the size of tile landowners are currently installing.
Flooding

Map 2B in the Plan identifies the FEMA 100-year floodplain for the BCWD. The majority of the designated floodplain is found east of the City of Stewart (note: the 100-year floodplain west of Stewart has not been officially mapped). Flooding within the District generally occurs on flat agricultural land that is adjacent to waterways. The City of Glencoe is the only urbanized area that is found within the floodplain and the community frequently experiences flooding. Presently, the cities of Hector, Buffalo Lake, and Stewart do not participate in the National Flood Insurance Program (NFIP), however, these communities are not considered High Risk Areas according to FEMA. The District should continue to coordinate activities with governmental units to ensure that the existing 100-year floodplain elevations of the Buffalo Creek and its tributaries are preserved.

Chapter Three Highlights

Profile of Priority Pollutants

Improving the quality of surface water resources is a major concern of the BCWD. In many areas of the District surface water is being impaired by sediment and nutrients, as well as by biological pollutants, such as bacteria. Sources of these pollutants are generally tied to land usage and associated management. According to the 1989 Minnesota Land Use-Agricultural and Transition Areas Inventory, agricultural land comprises 88.4 percent of the BCWD, much of which is considered to be erosion prone. Another potential source of pollution is from urban and rural developments. Although not as large in composition as agricultural land, urban and rural developments present pollution potential in the form of contaminated stormwater, soil erosion, failing SSTSs and wastewater treatment facilities.

BCWD Priority Issue 3 - Conservation Buffers

Issue Overview: Generally, the Buffalo Creek and its floodplain, from the City of Stewart to the South Fork of the Crow River, remains in its natural state, providing an adequate riparian buffer. West of Stewart, the Buffalo Creek has been channelized and has very little vegetative buffering. The lack of buffers has led to erosion and overall degradation of the Creek’s banks.

BCWD Priority Issue 4 - Erosion and Sediment Control

Issue Overview: Management of erosion and sedimentation has been an important objective of the BCWD since its creation. With additional growth and
development projected to occur in the District, the need for erosion and sediment control will become increasingly important in order to prevent the degradation of water resources. As a priority issue, the Overall Plan Taskforce recommended that the District profile practices that can be used to control various forms of erosion and associated sedimentation.

BCWD Priority Issue 5 - Feedlots

**Issue Overview:** Each of the counties within the BCWD are delegated to administer the State Feedlot Program. While the District is not directly involved with this Program, feedlots pose a potential pollution hazard to the water resources of the District.

BCWD Priority Issue 6 - Subsurface Sewage Treatment Systems (SSTS)

**Issue Overview:** Subsurface Sewage Treatment Systems (SSTSs) within the District are failing to properly treat sewage, thus posing a threat to the quality of water resources. As a priority issue, the BCWD shall continue to provide cost-share assistance, when funds are available, to upgrade non-compliant systems.

**Note:** Chapter Three also contains a vast amount of water quality information.

**Chapter Four Highlights**

**Profile of Multi-Purpose Corridors**

The Buffalo Creek is the largest and most important multi-purpose corridor within the BCWD. A multi-purpose corridor is defined as a stream and/or contiguous tracts of land that serves multiple functions, including protection of water quality, conservation of habitat and facilitation of recreational opportunities. The unchannelized portion of the Buffalo Creek, from approximately the City of Stewart to the South Fork of the Crow River, provides the most multi-purpose functions. This portion of the Creek and its associated floodplain remains nearly in its natural state. The portion of the Buffalo Creek west of Stewart has been channelized for drainage and has very few associated multi-purpose benefits.
**BCWD Priority Issue 7 - Multi-Purpose Corridors**

**Issue Overview:** Buffalo Creek is only used marginally for canoeing and fishing. Interest in developing trails has grown steadily and is anticipated to do so more over the next ten years. Finally, protecting rare biological resources has become increasingly more challenging as development pressures continue throughout the District.

**Chapter Five Highlights**

Chapter Five of the BCWD Overall Plan establishes the District’s goals, objectives and policy guidelines. Collectively, they will be used to help guide future management activities and funding decisions. More importantly, the objectives and policy guidelines provide a framework for the District’s Board of Managers to use on a day-to-day basis to help guide land use and permitting decisions. The following four goal areas each have corresponding objectives and policy guidelines:

**GOAL 1:** TO IMPROVE STAKEHOLDER PARTICIPATION, COOPERATION AND COORDINATION IN IMPLEMENTING THE DISTRICT’S INITIATIVES.

**GOAL 2:** TO ENSURE THAT AN ADEQUATE SUPPLY OF SURFACE WATER IS AVAILABLE FOR AGRICULTURAL, COMMERCIAL/INDUSTRIAL, NATURAL RESOURCES AND RECREATIONAL PURPOSES, WHILE MINIMIZING FLOOD RELATED DAMAGE.

**GOAL 3:** INCREASE THE USE OF BEST MANAGEMENT PRACTICES (BMPS) TO MINIMIZE WATER POLLUTION.

**GOAL 4:** TO PROTECT AND ENHANCE THE BIOLOGICAL RESOURCES AND RECREATIONAL AMENITIES OF THE BUFFALO CREEK CORRIDOR.

**Chapter Six Highlights**

Chapter Six contains information on plan administration. Key sections include an Implementation Plan with identified implementation priorities; Implementation Plan Highlights and Priority Subwatersheds information; and information on the Plan’s Coordination and Amendment Procedures. Table 6A highlights the BCWD’s Project Implementation Priorities and Estimated Costs.
Table 6A:  
BCWD Project Implementation Priorities and Estimated Costs

<table>
<thead>
<tr>
<th>Priority</th>
<th>Project Overall Rank, Name and Brief Description ~ Please refer to the text for a full description ~</th>
<th>Target Year(s)</th>
<th>Estimated Costs</th>
</tr>
</thead>
</table>
| High     | 1. Marsh Ditch Water Project. This project is detailed in the March Water Project Engineering Report (2012) and consists of the following four components:  
A. West Branch Stormwater Wetland $399,000  
B. Main Trunk Biofiltration Basin $521,000  
C. Stormsewer Repairs $99,000  
D. System-wide Easements & Maintenance $141,000 | 2014 | $1,159,000 |
| High     | 2. Brownton Erosion Site. Stabilizing 600 feet of severely eroding shoreland along Buffalo Creek adjacent to residential development in the City of Brownton. | 2015 | $100,000 |
| High     | 3. JD 15 Enhanced Drainage Management Plan. The BCWD would like to target JD 15 for an enhanced Drainage Management Plan. Best Management Practices (BMPs) and cost-share incentives will also be targeted to JD 15, which encompasses 105 square drainage miles. | 2016 | $75,000 |
| High     | 4. JD 4 Evaluation of Downstream Impacts Due to Tile Improvements. This project is intended to serve as a pilot project for a District-wide study that will evaluate the short- and long-term effects of improvements to the public drainage systems tiles. | 2014 | $16,500 |
| High     | 5. Eagle Lake Project. Replacing needed water control structure and making system improvements. | 2014 | $160,000 |
| High     | 6. Conservation Drainage Cost-Share Program. Develop a cost-share program to enhance conservation drainage management activities. Target the District’s priority subwatersheds (Map 6A). Establish two conservation drainage demonstration sites. | 2015-19 | $450,000 |
| High     | 7. BCWD Tile Study. This project is similar in nature to the JD 4 Evaluation Project, however, a hydrologic analysis of the remaining District would be completed. | 2017 | $250,000 |
| High     | 8. SWCD Incentives. Work with the McLeod and Renville County SWCDs to establish an accelerated cost-share BMP program for the District’s priority issues. Target the District’s priority subwatersheds (refer to Map 6A). | 2015-19 | $500,000 |

Table 6A continued…

Buffalo Creek Watershed District Overall Plan (2014-2023)
<table>
<thead>
<tr>
<th>Priority</th>
<th>Project Overall Rank, Name and Brief Description</th>
<th>Target Year(s)</th>
<th>Estimated Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium</td>
<td><strong>10. Local County Water Plan Implementation.</strong> Partner with the various counties on properly implementing the projects identified within the BCWD.</td>
<td>2014-23</td>
<td>$100,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>11. BCWD Local Drainage Management Guide.</strong> This project would produce a local guide to drainage management.</td>
<td>2015</td>
<td>$15,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>12. Glencoe East Drainage Ditch Project.</strong> Feasibility Engineering Study for the Glencoe East Drainage System. This project is similar in nature to the Marsh Water Project.</td>
<td>2018</td>
<td>$30,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>13. Drainage Management Workshop.</strong> BCWD would like to facilitate a number of local drainage stakeholder meetings to assist with identifying issues and opportunities</td>
<td>2015</td>
<td>$7,500</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>14. BCWD Rules and Regulations.</strong> Update the District’s Rules and Regulations as needed.</td>
<td>2014-15</td>
<td>$7,500</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>15. BCWD Hydrologic Flood Analysis.</strong> Conduct a District-wide analysis of flooding problems.</td>
<td>2017</td>
<td>$150,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>16. WRAPS and WHAF.</strong> Partner with the DNR to ensure the District’s information is properly included and used in the Watershed Restoration and Protection Strategy and Watershed Health and Assessment Framework projects.</td>
<td>2014-18</td>
<td>$25,000</td>
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<td>Medium</td>
<td><strong>17. Mud Lake Project.</strong> Water quality and quantity project including a new culvert and cleaning the channel.</td>
<td>2015</td>
<td>$150,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>18. Livestock BMPs.</strong> Develop a cost-share incentive program for exclusionary fencing for livestock located near water resources.</td>
<td>2016</td>
<td>$15,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>19. State of Buffalo Creek Watershed Report.</strong> Work to produce a publication that summarizes water quality and quantity studies and key BCWD activities.</td>
<td>2014-23</td>
<td>$5,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>20. Buffalo Creek Bacterial TMDL.</strong> Cost-share with landowners who are impacted by TMDL implementation activities.</td>
<td>2014-23</td>
<td>$250,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>21. BCWD Funding.</strong> Appropriate financing mechanisms should be utilized to finance all District activities, including but not limited to mechanisms and procedures outlined in Minnesota Statutes 103B (Water Planning and Project Implementation) and 103D (Watershed Districts).</td>
<td>2014-23</td>
<td>N/A</td>
</tr>
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*Table 6A continued…*
<table>
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<tr>
<th>Low</th>
<th>22. Expand the BCWD’s Administrative Boundaries. <em>Upon request</em>, the BCWD is prepared to expand its administrative boundaries in order to address water quality and quantity issues.</th>
<th>N/A</th>
<th>N/A</th>
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| **Ten-Year Cost Estimate for BCWD Implementation Priorities** | **$3,615,500** |
CHAPTER ONE
GENERAL PROFILE OF THE DISTRICT

Chapter One profiles the Buffalo Creek Watershed District by providing information on the District’s location, history, organizational structure, mission statement, rules and regulations, and completed projects. The Chapter also profiles the District’s key stakeholders and provides an overview of the District’s main demographics. Finally, the District’s physical characteristics are profiled, including sections on climate, hydrology, subwatersheds, topography, and land use.

A: Location of the BCWD

The Buffalo Creek Watershed District (BCWD) is located in south-central Minnesota, approximately 30 miles west of the Minneapolis-St. Paul Metropolitan Area (refer to Map 1A). The Buffalo Creek watershed is the southern most subwatershed of the larger South Fork of the Crow River Watershed, which eventually outlets to the Mississippi River near Dayton, Minnesota.

As Map 1A shows, there are 5 counties, 6 cities and 28 townships that are wholly or partially encompassed within the District. Table 1A reveals the overwhelming majority of the District is located within McLeod and Renville Counties (93%). The cities of Brownton, Buffalo Lake, Glencoe, Hector, Plato and Stewart are each located within the District. All of these cities are located along U.S. Highway 212. The City of Glencoe, which is the County Seat of McLeod County, is the largest city in the District.

Table 1A:
BCWD Area per County

<table>
<thead>
<tr>
<th>County</th>
<th>Area in Square Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carver County</td>
<td>4.0</td>
</tr>
<tr>
<td>Kandiyohi County</td>
<td>10.3</td>
</tr>
<tr>
<td>McLeod County</td>
<td>161.9</td>
</tr>
<tr>
<td>Renville County</td>
<td>229.8</td>
</tr>
<tr>
<td>Sibley County</td>
<td>16.1</td>
</tr>
<tr>
<td><strong>Total Square Miles</strong></td>
<td><strong>422.1</strong></td>
</tr>
</tbody>
</table>
B: History and Organizational Structure

The BCWD was established under the order of the Minnesota Water Resources Board (now known as the Minnesota Board of Water and Soil Resources) on January 30, 1969. Soon after its formation, the District developed its first Overall Plan in accordance with Minnesota Statutes. The Plan, which was adopted on February 8, 1974, provided the District with a basis for making decisions on the management of its water resources. The District’s Plan was revised in 1991 and again in 2003. This fourth generation Plan shall serve the years 2014-2023, unless amended prior to its expiration.

The organizational structure of the District remains unchanged since its formation. The Board of Commissioners from the District’s three largest counties (Renville, McLeod and Sibley) appoint five board managers to govern the BCWD. Both McLeod and Renville Counties appoint two managers, while one manager is appointed by Sibley County. Each manager is required to be a resident of the District and is prohibited from being a public official of the county, State or Federal government. Managers serve three-year terms, which are renewable upon approval of their County Board of Commissioner.

There has been one boundary adjustment since the formation of the District. The adjustment, which occurred in January of 1999, involved a small tract of land in the City of Stewart being transferred to the High Island Watershed District after it was determined that the area was part of that watershed. Consideration for future boundary adjustments will be dependent upon such factors as roadway alterations, local drainage activities and citizen’s petition.

C: Mission Statement

The BCWD was formed with the mission to: 1) help alleviate water problems, 2) enhance the living conditions of the area and 3) maintain or improve the economic wellbeing of the residents of the District. The District has in the past and will continue to strive towards the realization of this mission by:

- Serving as a link between residents and governmental agencies;
- Providing technical assistance to citizens and governmental agencies;
- Providing a means of financial assistance for the implementation of environmental projects; and
- Coordinating intergovernmental efforts.
D: BCWD Rules & Regulations

On January 25, 2011, the BCWD Board of Managers adopted a revision to the District’s Rules and Regulations (See Appendix A), effectively replacing the Rules and Regulations that were in effect since 1993. The Rules and Regulations establish a permitting process for the guidance of activities that have the potential to impact water resources throughout the District. The following activities require a permit from the Buffalo Creek Watershed District (BCWD Rules and Regulations can be viewed online at www.bcwatershed.org).

5.01 Surface Water: Surface Water includes any natural or manmade water body that is found above ground (i.e., lakes, streams, rivers, wetlands, etc.) and drainage systems. The District has a vested interest in ensuring that all of the following projects potentially affecting surface water resources are properly implemented through the District’s permitting process:

A. Stream, Creek, and River Projects: Any project potentially affecting, crossing, or involving a stream, creek, and/or river throughout the District.

B. Dams and/or Dikes: Any project involving a dam and/or dike.

C. Bridge and/or Crossings: Any bridge construction, repair, and/or crossing.

D. Culvert Repairs or Replacement: Any culvert repair or replacement project.

E. Clean Outs: Any surface water clean out, including drainage systems.

F. Water Discharge: Any project involving discharging water into a surface water resource.

G. Wetlands: Any wetland development, modification, and/or restoration.

H. Ponding and/or berming: Any project potentially resulting in holding water.

I. Multiple Subwatersheds: Any project proposed to impact more than one subwatershed must demonstrate how the proposed project may impact the subwatersheds.

J. Miscellaneous: Any other projects potentially negatively affecting surface water resources.

5.02 Drainage Systems: Every person shall use their land reasonably in disposing of surface water. Surface water shall not be artificially removed from upper land to and across lower land without adequate provision being made on the lower land for its passage, nor shall the natural flow of surface water be obstructed so as to cause an overflow onto the property of others. The District will enforce and comply with the drainage laws under Minnesota’s State Statutes. District intends to preserve drainage capacity, prevent flooding, and improve water quality by regulating certain agricultural drainage facilities within the watershed.
In addition to the provision listed in Section 5.01, drainage systems have the following additional permit requirements and must meet the standards set forth in Subsection 5.02 E:

A. Tiling: Any tiling of 8” or larger or any size tile where an easement is required (i.e., for projects potentially affecting adjacent landowner’s property)

B. New or expanded systems: Any proposed new or expanded public or private ditch system.*

C. Repairs: Any proposed repair or enhancement, including private ditch systems if they outlet into public ditch systems or public waters (as defined in Appendix B).*

D. Outlets/Inlets: Any new or improved outlets or inlets into an existing drainage system. The primary concern is to manage the volume of water directly entering into the drainage system.

E. Standards. A site drawing with the location of all drainage facilities must be submitted with the permit application. Where the exact location of drain tiles is unknown, an approximate location is sufficient. An application for a drainage permit under this Section must meet the following standards:

1. Demonstrate that downstream capacity exists for the additional water discharged by the drainage facility; and

2. Demonstrate that the proposed project complies with all local, State, and Federal wetland regulations; and

3. Design and maintain drain tile system intakes in a way that minimizes the introduction of sediments to the drainage facility; and

4. All new and improved outlets into existing public drainage systems or public waters shall be constructed in such design which will:

   a) Provide and maintain a stable outfall that minimizes erosion; and

   b) Will not impede the flow of water; and

   c) Will not cause a deterioration of the receiving water.

* The repair or replacement of an existing private drainage system is exempt from this Section as long as the repair or replacement is not an expansion and the other provisions set forth in these Rules and Regulations are met.
5.03 Land Use and Development: The District has a vested interest in ensuring that all land use and development projects which could potentially negatively impact surface or groundwater resources are properly implemented through the District’s permitting process. The following projects are specially identified as needing a District permit:

A. Any land use alterations that could affect the quality and quantity of water resources.

B. Any underground construction, including but not limited to storm sewers, gas lines, pipelines, manure holding basins, underground storage, etc. Exemptions include basements, foundations, septic systems, and wells.

C. New roadway construction or improvements which could potentially negatively impact water resources.

D. Any construction crossing (over, through, or underground) which could potentially negatively impact water resources.

E. The platting of property to ensure proper stormwater retention and drainage.

5.04 Erosion Control: The District intends to prevent erosion and sedimentation into surface waters within the watershed by regulating land disturbing activities. The District requires that erosion control measures be in place for all land disturbing activities above specific thresholds. The erosion control measures must minimize erosion and sedimentation to the greatest extent possible. The following projects are specially identified as needing a District permit:

A. Any person or political subdivision undertaking a land disturbing activity that is (a) greater than 200 square feet in area; AND (b) within 300 feet of any surface water resource.

B. Agricultural Exemption. The ordinary agricultural practices of cultivating and planting, performed as part of an ongoing farming operation, are exempt from this Section.

C. Standards. An erosion and sediment control plan must be submitted and approved before a permit may be issued. The plan must minimize erosion and sedimentation to the greatest extent possible. A site plan drawing with the location of all erosion control features must be submitted with the permit application. The plan must demonstrate how the project will achieve the following standards:
1. Each landowner and operator is expected to apply the proper land use practices to minimize runoff and soil erosion from sloping land; and

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

3. The project must be phased to the greatest extent possible to minimize the area of disturbed land at any given time; and

4. Site specific topography and soil conditions must be specifically addressed; and

5. BMPs must be utilized in a manner consistent with MPCA guidance documents.

5.05 Stormwater Management. The District intends to manage storm water runoff within the watershed to promote infiltration, encourage pretreatment, and minimize peak flows after storm events and snow melt. A District permit is required for any development or redevelopment of the following properties:

A. The development or redevelopment of property resulting in the creation of more than one acre of new impervious surface.

B. The development of any new resort or PUD.

C. The expansion or replacement of a structure at an existing resort.

D. The redevelopment of a parcel that currently exceeds impervious surface limits imposed by Minnesota Rules Chapter 6120 or by any political subdivision within the watershed.

E. Standards. A site plan must be submitted with the permit application. A storm water permit application under this Section must meet the following standards:

1. Runoff rates for the proposed development or redevelopment of a property shall not exceed existing runoff rates for the 2-year, 10-year, and 100-year critical storm events. The runoff rate for the property after development or redevelopment must not exceed the runoff rate in existence prior to the proposed development or redevelopment.
2. All development or redevelopment of property shall treat 0.5 inch of runoff from all newly created or redeveloped impervious surface on the property such that implemented storm water BMPs, consistent with MPCA guidance documents, achieve removal of 90 percent of total suspended solids and 50 percent of total phosphorus prior to any runoff leaving the property.

3. The applicant must submit runoff calculations for 2-year, 10-year, and 100-year critical storm events. The applicant must also submit water quality calculations demonstrating that the total suspended solids and phosphorus standards will be met.

5.06 Notification Only: A permit is normally not required on the following projects if the District is properly notified 30 days prior to the projects being issued a permit by the proper regulating authority.**

A. Public facility wastewater projects
B. Feedlot expansion and/or development projects
C. Aggregate mining projects

** The District reserves the right to determine if a permit from the District is required whenever the proposed project triggers one of the topics regulated by the District’s Rules and Regulations.

E: BCWD Completed Projects

Table 1B lists the BCWD’s major projects and expenses from 2002 to 2013 (only the large-scale projects are included). Table 1B includes the year it was initiated, project status (complete or ongoing) and the project’s total cost. The projects can be grouped into the following categories (not ranked in order of significance or expenditure):

1. Tree & Dam Clearing
2. Aerial Research & LiDAR
3. Lake Allie Land Acquisition & Basin Project
4. Stream Restoration & Buffer Projects
5. Septic and Open Tile Intake BMP incentives
6. Water Quality BMPs
<table>
<thead>
<tr>
<th>Project Name</th>
<th>Year</th>
<th>Status</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree &amp; Dam Clearing</td>
<td>2002</td>
<td>Complete</td>
<td>$29,540</td>
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<tr>
<td>Aerial Research – Start of Photo Program</td>
<td>2002</td>
<td>Complete</td>
<td>$4,061</td>
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<tr>
<td>Tree &amp; Dam Clearing</td>
<td>2003</td>
<td>Complete</td>
<td>$28,340</td>
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<tr>
<td>Stream Flow Engineering &amp; Water Quality Studies</td>
<td>2003</td>
<td>Complete</td>
<td>$27,800</td>
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<tr>
<td>Crow River Organization of Waters funding</td>
<td>2003-5</td>
<td>Complete</td>
<td>$30,000</td>
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<tr>
<td>Aerial Research Photography Program</td>
<td>2004</td>
<td>Complete</td>
<td>$5,620</td>
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<tr>
<td>Tree and Dam Clearing</td>
<td>2004</td>
<td>Complete</td>
<td>$6,436</td>
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<tr>
<td>Aerial Research –LiDAR (cost share with McLeod Co)</td>
<td>2006</td>
<td>Complete</td>
<td>$495</td>
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<td>Tree &amp; Dam Clearing</td>
<td>2007</td>
<td>Complete</td>
<td>$1,770</td>
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<td>STREAM Bank Stabilization Projects</td>
<td>2007</td>
<td>Complete</td>
<td>$38,798</td>
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<td>Aerial Research, LiDAR Project</td>
<td>2007</td>
<td>Complete</td>
<td>$27,107</td>
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<td>Lake Allie - Land Acquisition &amp; Basin Digging Project</td>
<td>2008</td>
<td>Complete</td>
<td>$78,898</td>
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<tr>
<td>Hansen, Maiers, and Sondergaard Projects</td>
<td>2008</td>
<td>Complete</td>
<td>$90,687</td>
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<td>Rain Gardens</td>
<td>2008</td>
<td>Complete</td>
<td>$7,046</td>
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<tr>
<td>Aerial Research Project with McLeod Co</td>
<td>2008</td>
<td>Complete</td>
<td>$40,607</td>
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<tr>
<td>Tree &amp; Dam Clearing</td>
<td>2008</td>
<td>Complete</td>
<td>$1,855</td>
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<td>Buffer Strip Incentive</td>
<td>2008</td>
<td>Complete</td>
<td>$7,110</td>
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<td>Drainage Management Plan – Phase One</td>
<td>2008</td>
<td>Complete</td>
<td>$25,000</td>
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<tr>
<td>Restoration Projects</td>
<td>2009</td>
<td>Complete</td>
<td>$6,159</td>
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<tr>
<td>Tree &amp; Dam Clearing</td>
<td>2009</td>
<td>Complete</td>
<td>$80,507</td>
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<tr>
<td>Septic Incentive &amp; Buffer Strips</td>
<td>2009</td>
<td>Complete</td>
<td>$15,689</td>
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<td>STREAM Bank Stabilization Restoration Projects</td>
<td>2010</td>
<td>Complete</td>
<td>$30,522</td>
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<td>Basin Desilting, Septic, &amp; Open Intake Incentive</td>
<td>2010</td>
<td>Ongoing</td>
<td>$37,925</td>
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<td>Drainage Records Modernization</td>
<td>2010</td>
<td>Complete</td>
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<td>Ten-Year Office Lease – City of Glencoe</td>
<td>2010-20</td>
<td>Ongoing</td>
<td>$22,400</td>
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<td>Buffer &amp; Water Quality Septic Incentives</td>
<td>2011</td>
<td>Ongoing</td>
<td>$10,500</td>
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<tr>
<td>Stream Project and Restoration Project</td>
<td>2011</td>
<td>Complete</td>
<td>$23,211</td>
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<tr>
<td>Rain Gardens</td>
<td>2011</td>
<td>Complete</td>
<td>$5,867</td>
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<tr>
<td>Water Sampling – Cost-share with CROW</td>
<td>2011</td>
<td>Complete</td>
<td>$10,500</td>
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<tr>
<td>Office Equipment</td>
<td>2011</td>
<td>Ongoing</td>
<td>$6,126</td>
</tr>
<tr>
<td>Rules &amp; Regulations</td>
<td>2011</td>
<td>Complete</td>
<td>$7,500</td>
</tr>
<tr>
<td>Marsh Watershed Project Feasibility Study</td>
<td>2012</td>
<td>Ongoing</td>
<td>$31,650</td>
</tr>
<tr>
<td>Tree &amp; Dam Clearing – Buffalo Creek Cleanout</td>
<td>2012</td>
<td>Complete</td>
<td>$75,450</td>
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<tr>
<td>Water Quality &amp; Septic Incentives</td>
<td>2012</td>
<td>Ongoing</td>
<td>$8,750</td>
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<tr>
<td>Watershed Plan</td>
<td>2013</td>
<td>Ongoing</td>
<td>$8,700</td>
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<tr>
<td>Marsh Watershed Project</td>
<td>2013</td>
<td>Ongoing</td>
<td>$7,385</td>
</tr>
<tr>
<td>Buffalo Creek Cleanout</td>
<td>2013</td>
<td>Ongoing</td>
<td>$31,040</td>
</tr>
</tbody>
</table>

Total: $898,611

* Many smaller expenses and some of 2013’s major expenses are not included.
F: Profile of BWCD Stakeholders

The BCWD has several stakeholders, including the residents of the District, State and Federal agencies, local governmental units and special interest groups. Understanding the missions, activities, programs and policies of these stakeholders is imperative to the water resource management of the District. Listed below are the District’s key stakeholders, along with an overview of their functions.

Public

The public is the single largest and most important stakeholder within the BCWD. Nearly every decision made on the District level has the potential to impact the public. For this reason, the District places a high value on public input. In the past, the District has held public hearings and informational meetings in an effort to obtain input from the public for the development of plans and discussion of important planning issues. Notices for these meetings are published in the official District newspaper, in accordance with Minnesota Statutes Chapter 103D. The public is also encouraged to provide input to the District by either attending the monthly Board of Managers meeting, which is held on the fourth Tuesday of every month, or by contacting their respective Board Manager.

Advisory Committee

The BCWD maintains a ten-member Advisory Committee consisting of local citizens and key stakeholders. The Advisory Committee is appointed by the BCWD Board of Managers and meets as necessary to provide direction on BCWD issues, projects, and priorities.

BCWD Advisory Committee Members
~ As of October 2013 ~

<table>
<thead>
<tr>
<th>Leeland Fischer</th>
<th>Ken Schiroo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffalo Lake</td>
<td>Glencoe</td>
</tr>
<tr>
<td>Lloyd Picha</td>
<td>Rich Wehking</td>
</tr>
<tr>
<td>Buffalo Lake</td>
<td>Hector</td>
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<tr>
<td>Earl Youngkrantz</td>
<td>Larry Zupke</td>
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<tr>
<td>Lake Lillian</td>
<td>Olivia</td>
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<tr>
<td>Lea Doberstein</td>
<td>Merlin Klabunde</td>
</tr>
<tr>
<td>Buffalo Lake</td>
<td>Hutchinson</td>
</tr>
<tr>
<td>Jon Sellnow</td>
<td>Dale Schauer</td>
</tr>
<tr>
<td></td>
<td>Glencoe</td>
</tr>
</tbody>
</table>
Counties

The District encompasses portions of five counties: Carver, Kandiyohi, McLeod, Renville and Sibley. Each county has adopted its own Comprehensive Local Water Plan, in accordance with Minnesota Statutes Chapter 103B. The Plans have countywide applicability, with the exception of Carver County, which only has authority over watersheds not already regulated by another governmental unit. Water plans are required to be updated every five to ten years. Each of the counties within the District has adopted a ten-year plan within the past two years. These plans were found to be consistent with the BCWD’s Overall Plan and corresponding rules and regulations. In addition to water plans, each county has implemented specific programs and policies relating to public drainage. Each county also has adopted related water-plan ordinances, such as for shoreland management, floodplain management, feedlots and septic systems.

County Websites:

- Carver County - [www.co.carver.mn.us](http://www.co.carver.mn.us)
- Kandiyohi County - [www.co.kandiyohi.mn.us](http://www.co.kandiyohi.mn.us)
- McLeod County - [www.co.mcleod.mn.us](http://www.co.mcleod.mn.us)
- Renville County - [www.co.renville.mn.us](http://www.co.renville.mn.us)
- Sibley County - [www.co.sibley.mn.us](http://www.co.sibley.mn.us)

Cities

There are six cities that are located wholly or partially within the District: Brownton, Buffalo Lake, Glencoe, Hector, Plato and Stewart. Each of the cities has been incorporated and subsequently has the authority to establish ordinances and conduct zoning activities within their territorial limits. Each of the municipalities has established ordinances related to the management of stormwater and municipal wastewater. Each of these municipalities also have the responsibility of managing water supply treatment and distribution systems, sewage collection and treatment systems, and stormwater drainage management systems. In addition, the cities of Brownton, Glencoe, and Plato also administer local floodplain ordinances.

City Websites:

- Brownton – [www.cityofbrownton.com](http://www.cityofbrownton.com)
- Buffalo Lake – [www.buffalolake.org](http://www.buffalolake.org)
- Glencoe – [www.glencoemn.org](http://www.glencoemn.org)
- Hector – [www.hector.govoffice.com](http://www.hector.govoffice.com)
- Plato – [www.cityofplato.com](http://www.cityofplato.com)
- Stewart – none
**Townships**

Townships located wholly or partially within the District include Camden and Young America in Carver County; East Lake Lillian, Lake Lillian and Roseland in Kandiyohi County; Bergen, Collins, Glencoe, Hassan Valley, Helen, Lynn, Penn, Rich Valley, Round Grove and Sumter in McLeod County; Bird Island, Boon Lake, Brookfield, Hector, Kingman, Martinsburg, Melville, Norfolk, Osceola, Palmyra, Preston Lake and Winfield in Renville County; and Grafton, Green Isle, New Auburn and Washington Lake in Sibley County.

Under Minnesota Law, townships have the authority to establish land use controls necessary for their own administration. In some cases, townships may adopt ordinances related to water resource management activities, such as drainage along or through township road systems. Currently, there are no townships within the District that have adopted such land use controls.

**Soil and Water Conservation Districts**

Soil and Water Conservation Districts (SWCDs) are established under Minnesota Statutes Chapter 103C. The purpose of SWCDs is to promote programs and policies that can conserve the soil and water resources within their boundary. Each county within the District is served by an SWCD. SWCDs in this portion of the State are particularly concerned with water and wind erosion. As a result, they are frequently involved with the implementation of practices that reduce or prevent erosion, sedimentation, siltation and agricultural-related pollution. SWCDs frequently act as local sponsors for many types of water management projects, including grassed waterways, drainage ditches, flood retarding dams, on-farm terracing, erosion control structures and other water-related projects. They also are actively involved in educational programs that promote water and soil conservation practices, such as minimum tillage. SWCDs generally work in conjunction with the Natural Resources Conservation Service (NRCS).

**SWCD Websites:**

- Carver County SWCD - [www.co.carver.mn.us/departments/LWS/history.asp](http://www.co.carver.mn.us/departments/LWS/history.asp)
- Kandiyohi County SWCD - [www.kandiyohiswcd.org](http://www.kandiyohiswcd.org)
- McLeod County SWCD - [http://mcleodswwcd.org](http://mcleodswwcd.org)
- Renville County SWCD - [www.renvilleswcd.com](http://www.renvilleswcd.com)
- Sibley County SWCD - [www.sibleyswcd.org](http://www.sibleyswcd.org)
Crow River Organization of Water

The Crow River Organization of Water (CROW) is a Joint Powers Organization organized to preserve, protect and restore the Crow River. The CROW Joint Powers Board was formed in 1999 and consists of one representative from each of the county boards with land in the watershed (ten members in all). Counties involved within the organization include Carver, Hennepin, Kandiyohi, McLeod, Meeker, Pope, Renville, Sibley, Stearns and Wright (refer to Figure 1A). The Crow River consists of three main forks, referred to as North, Middle and South Forks. The watershed also has three operating watershed districts: North Fork Crow River, Middle Fork Crow River, and the Buffalo Creek Watershed District.

Crow River Watershed Facts:
- The Crow River has three Forks; the North, Middle, and South.
- The Buffalo Creek Watershed District is located in the South Fork Crow River Watershed.
- The Crow River Watershed drains a 2,725 square mile basin.
- Of the 1.8 million acres in the watershed, 1.6 million are privately owned.
- Primary land use in the watershed is agriculture. However, in the eastern portion of the watershed is occupied by urban development.
- The Crow River flows into the Mississippi River near Dayton, Minnesota.

Figure 1A: Crow River Organization of Waters
In 2001, the CROW was awarded a Phase I Clean Water Partnership grant from the Minnesota Pollution Control Agency to complete a diagnostic study on the Crow River Watershed. The diagnostic study was necessary because although previous studies completed on select areas of the watershed had shown potential phosphorus and other nutrient loading problems, there had been no coordinated effort to characterize the watershed as a whole. The diagnostic study was designed to fill in some gaps that existed in the available data and increase our understanding of the Crow River Watershed flows as well as primary sources of nutrient loading. The results of the diagnostic study were published in 2005 and are summarized under the water quality section of this Plan. For more information on CROW, including current landowner incentive programs, visit the following CROW website:

CROW Website - www.crowriver.org

State Agency Stakeholders

Minnesota Board of Water and Soil Resources

In 1986, the Minnesota State Legislature established the Minnesota Board of Water and Soil Resources (BWSR), thus consolidating the functions of the Minnesota Soil and Water Conservation Board, Minnesota Water Resources Board and Southern Minnesota Rivers Basin Council. BWSR’s duties include oversight of programs and funding of the State’s SWCDs, formation and guidance of watershed districts, directing and assisting counties in developing their Comprehensive Local Water Plans and implementation of the Minnesota Wetland Conservation Act (WCA). BWSR is the State agency that is responsible for reviewing and approving water management plans of watershed districts.

BWSR Website - www.bwsr.state.mn.us

Minnesota Department of Natural Resources

The Minnesota Department of Natural Resources (DNR) has both regulatory and enforcement authority over natural resource programs of the State. The principal divisions of the DNR include Ecological and Water Resources, Fisheries, Forestry, Lands and Minerals, Parks and Recreation and Trails, and Wildlife. The DNR has permit authority over watershed district projects that impact Protected Waters of the State. The DNR is also actively involved in helping local units of government administer floodplain management ordinances and standards.

MnDNR Website - www.dnr.state.mn.us
**Minnesota Pollution Control Agency**

The Minnesota Pollution Control Agency (MPCA) has both the regulatory and enforcement authority to protect the surface and ground waters of the State from pollution. Because many projects involve water quality considerations, the MPCA becomes an active participant in watershed management activities. The MPCA is also involved with other local governmental units, such as municipalities, in the construction and operation of wastewater treatment plants and the control of nonpoint source pollution.

MPCA Website - [www.pca.state.mn.us](http://www.pca.state.mn.us)

**Minnesota Environmental Quality Board**

The Minnesota Environmental Quality Board (EQB) has final authority on permits involving a wide range of construction activity throughout the State. The EQB is comprised of the commissioners of State agencies, the chairmen of State boards and five citizen members. The EQB is responsible for the oversight of Environmental Assessments Worksheets (EAWs) and Environmental Impact Statements (EISs) that are written for specific project proposals.

EQB Website - [www.eqb.state.mn.us](http://www.eqb.state.mn.us)

**Minnesota Department of Agriculture**

The Minnesota Department of Agriculture (MDA) is responsible for ensuring the safety of agricultural related products in the State. As a leading agricultural state with more surface waters than any other of the 48 contiguous states and an abundance of clean drinking water, Minnesota is committed to helping farmers, homeowners, and industry protect these water resources. Specifically, the MDA is responsible for or involved in many water quality programs and initiatives. These include but are not limited to the following:

1. Agricultural Best Management Practices Loan Program. A low interest loan program run by the MDA that helps finance water quality practices.

2. Minnesota Clean Water Legacy Act. The MDA currently oversees several research and other projects aimed at making cleanup efforts more effective.


MDA Website - [www.mda.state.mn.us](http://www.mda.state.mn.us)
Minnesota Department of Health

The statutory mission for the Minnesota Department of Health (MDH) is to “protect, maintain and improve the health of all Minnesotans”. The MDH has permit and regulatory authority for monitoring water supply facilities. These facilities include water wells, surface water intakes, water treatment and water distribution for public use. Currently, the MDH is assisting surface water suppliers in developing Wellhead Protection Plans.

MDA Website - www.health.state.mn.us

Minnesota Department of Transportation

The Minnesota Department of Transportation (Mn/DOT) is responsible for the administration of Federal and State highway systems. Since many highway systems cross natural and artificial waterways, there is frequent interaction between the District and Mn/DOT. District projects that intersect regulated highways require approval by Mn/DOT. Conversely, Mn/DOT activities that have the potential to impact waters often require a District permit.

MnDOT Website - www.dot.state.mn.us

Federal Agency Stakeholders

U.S. Army Corps of Engineers

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

USACE Website - www.usace.army.mil

U.S. Department of Agriculture

There are two agencies in the U.S. Department of Agriculture (USDA) that the District commonly interacts with: the Natural Resources Conservation Service (NRCS) and the Consolidated Farm Service Agency (CFSA). The NRCS (formerly known as the Soil Conservation Service) provides technical advice and engineering design services to the local SWCDs within the District. The NRCS’s involvement in USDA program participation significantly benefits the water resources of the District.
The Consolidated Farm Service Agency (CFSA) participates in sponsoring and funding projects related to water and soil conservation. In this respect, the NRCS serves as the technical and design function, while the CFSA provides the funding. The CFSA is involved in tree planting, sodding of grassed waterways, manure management facilities, cover crops, mulch tillage practices and streambank setback strips.

USDA Website - [www.usda.gov](http://www.usda.gov)

**U.S. Environmental Protection Agency**

The U.S. Environmental Protection Agency (EPA) is involved in the protection of the nation’s air, soil and water resources. Of particular interest, the EPA has had an expanding role in construction project activities of the BCWD. The agency has overview authority of the Stormwater Phase II regulations, as well as Section 404 permits issued by the ACOE. EPA also has the right to review the ACOE permit decisions.

EPA Website - [www.epa.gov](http://www.epa.gov)

**U.S. Fish and Wildlife Service**

The U.S. Fish and Wildlife Service (USFWS) is a key player in wildlife and wetland management in the nation. The USFWS has been involved in several wetland restoration projects in the District. Prior to beginning such a project, the USFWS is required to obtain a permit from the District.

USFWS Website - [www.fws.gov](http://www.fws.gov)

**U.S. Geological Survey**

The U.S. Geological Survey (USGS) is principally a data-gathering agency. Of particular interest to the District is the data collected by the agency related to water resources. Data collected by the USGS includes stream flow discharge, ground water levels and water quality.

USGS Website - [www.usgs.gov](http://www.usgs.gov)
Other Stakeholder Organizations

Nature Conservancy

The Nature Conservancy is an organization whose primary purpose is the preservation and utilization of grasslands, wetlands and other natural assets, for public use. Their protection goal is to preserve ecologically significant natural areas through acquisition, gifts of land, management agreements, conservation easements and voluntary land protection. The Nature Conservancy is supported through membership and gifts from individuals, community groups, corporations and foundations. They have often been involved in creating, funding and supporting programs, such as the County Biological Survey, which includes digital databases.

NC Website - www.nature.org

Lake Associations

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

Miscellaneous Wildlife, Conservation and Sportsmen’s Organizations

There are several sportsmen’s clubs and wildlife conservation groups within the District. These organizations sponsor a wide variety of environmentally positive initiatives, including wildlife habitat restoration, wetland development and other activities that are beneficial to and consistent with the goals of the District. The District has an ongoing policy of cooperating with these groups in the development of mutually beneficial projects.
G: BCWD Population Profile

Historic Population Levels

Table 1C provides U.S. Census population data for cities and counties in the BCWD since 1970. Three out of the six cities and three out of five counties experienced population growth.

Table 1C:  
Population of Cities and Counties in the  
Buffalo Creek Watershed District since 1970

<table>
<thead>
<tr>
<th>City/County</th>
<th>1970</th>
<th>1980</th>
<th>1990</th>
<th>2000</th>
<th>2010</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brownton</td>
<td>688</td>
<td>697</td>
<td>781</td>
<td>807</td>
<td>762</td>
<td>74</td>
<td>11%</td>
</tr>
<tr>
<td>Buffalo Lake</td>
<td>758</td>
<td>782</td>
<td>734</td>
<td>768</td>
<td>733</td>
<td>-25</td>
<td>-3%</td>
</tr>
<tr>
<td>Glencoe</td>
<td>4,217</td>
<td>4,396</td>
<td>4,648</td>
<td>5,453</td>
<td>5,631</td>
<td>1,414</td>
<td>34%</td>
</tr>
<tr>
<td>Hector</td>
<td>1,178</td>
<td>1,252</td>
<td>1,145</td>
<td>1,166</td>
<td>1,151</td>
<td>-27</td>
<td>-2%</td>
</tr>
<tr>
<td>Plato</td>
<td>303</td>
<td>390</td>
<td>355</td>
<td>336</td>
<td>320</td>
<td>17</td>
<td>6%</td>
</tr>
<tr>
<td>Stewart</td>
<td>666</td>
<td>616</td>
<td>566</td>
<td>564</td>
<td>571</td>
<td>-95</td>
<td>-14%</td>
</tr>
<tr>
<td>Carver County</td>
<td>28,310</td>
<td>37,046</td>
<td>47,915</td>
<td>70,205</td>
<td>91,042</td>
<td>62,732</td>
<td>222%</td>
</tr>
<tr>
<td>Kandiyohi County</td>
<td>30,548</td>
<td>36,763</td>
<td>38,761</td>
<td>41,203</td>
<td>42,239</td>
<td>11,691</td>
<td>38%</td>
</tr>
<tr>
<td>McLeod County</td>
<td>27,662</td>
<td>29,657</td>
<td>32,030</td>
<td>34,898</td>
<td>36,651</td>
<td>8,989</td>
<td>32%</td>
</tr>
<tr>
<td>Renville County</td>
<td>21,139</td>
<td>20,401</td>
<td>17,673</td>
<td>17,154</td>
<td>15,730</td>
<td>-5,409</td>
<td>-25%</td>
</tr>
<tr>
<td>Sibley County</td>
<td>15,845</td>
<td>15,448</td>
<td>14,366</td>
<td>15,356</td>
<td>15,226</td>
<td>-619</td>
<td>-4%</td>
</tr>
<tr>
<td>State of Minnesota</td>
<td>3,804,971</td>
<td>4,075,970</td>
<td>4,375,099</td>
<td>4,919,479</td>
<td>5,303,925</td>
<td>1,498,954</td>
<td>39%</td>
</tr>
</tbody>
</table>

Source: U.S. Census

Population Projections

Population and household projections for cities and counties within the BCWD are provided in Table 1D. Population projections were calculated by carrying forward each area’s average growth rate since 1970. Household projections were developed by dividing the area’s population projection by average household size during the 2010 Census. Because of the complex interaction of factors that drive population and household growth and loss, such as births, deaths, migration, immigration and annexation, the projections given in Table 1D should only be viewed as an estimate of what could develop in the District over the next 20 years.
**Table 1D:**

City, County and State Population and Household Projections

<table>
<thead>
<tr>
<th>Population Projections* (Based upon the last 40 years)</th>
<th>2010 Census</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brownton</td>
<td>762</td>
<td>772</td>
<td>783</td>
<td>793</td>
<td>804</td>
<td>42</td>
</tr>
<tr>
<td>Buffalo Lake</td>
<td>733</td>
<td>730</td>
<td>727</td>
<td>724</td>
<td>721</td>
<td>-12</td>
</tr>
<tr>
<td>Glencoe</td>
<td>5,631</td>
<td>5,808</td>
<td>5,985</td>
<td>6,161</td>
<td>6,338</td>
<td>707</td>
</tr>
<tr>
<td>Hector</td>
<td>1,151</td>
<td>1,148</td>
<td>1,144</td>
<td>1,141</td>
<td>1,138</td>
<td>-14</td>
</tr>
<tr>
<td>Plato</td>
<td>320</td>
<td>322</td>
<td>324</td>
<td>326</td>
<td>329</td>
<td>9</td>
</tr>
<tr>
<td>Stewart</td>
<td>571</td>
<td>559</td>
<td>547</td>
<td>535</td>
<td>524</td>
<td>-48</td>
</tr>
<tr>
<td>Carver County</td>
<td>91,042</td>
<td>98,884</td>
<td>106,725</td>
<td>114,567</td>
<td>122,408</td>
<td>31,366</td>
</tr>
<tr>
<td>Kandiyohi County</td>
<td>42,239</td>
<td>43,700</td>
<td>45,162</td>
<td>46,623</td>
<td>48,085</td>
<td>5,846</td>
</tr>
<tr>
<td>McLeod County</td>
<td>36,651</td>
<td>37,775</td>
<td>38,898</td>
<td>40,022</td>
<td>41,146</td>
<td>4,495</td>
</tr>
<tr>
<td>Renville County</td>
<td>15,730</td>
<td>15,054</td>
<td>14,378</td>
<td>13,702</td>
<td>13,026</td>
<td>-2,705</td>
</tr>
<tr>
<td>Sibley County</td>
<td>15,226</td>
<td>15,149</td>
<td>15,071</td>
<td>14,994</td>
<td>14,917</td>
<td>-310</td>
</tr>
<tr>
<td>State of Minnesota</td>
<td>5,303,925</td>
<td>5,491,294</td>
<td>5,678,663</td>
<td>5,866,032</td>
<td>6,053,401</td>
<td>749,476</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Household Projections*</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brownton</td>
<td>314</td>
<td>319</td>
<td>323</td>
<td>327</td>
<td>332</td>
<td>18</td>
</tr>
<tr>
<td>Buffalo Lake</td>
<td>288</td>
<td>288</td>
<td>287</td>
<td>286</td>
<td>284</td>
<td>-4</td>
</tr>
<tr>
<td>Glencoe</td>
<td>2,220</td>
<td>2,225</td>
<td>2,292</td>
<td>2,360</td>
<td>2,428</td>
<td>208</td>
</tr>
<tr>
<td>Hector</td>
<td>513</td>
<td>514</td>
<td>513</td>
<td>511</td>
<td>510</td>
<td>-3</td>
</tr>
<tr>
<td>Plato</td>
<td>139</td>
<td>139</td>
<td>140</td>
<td>141</td>
<td>142</td>
<td>3</td>
</tr>
<tr>
<td>Stewart</td>
<td>235</td>
<td>235</td>
<td>230</td>
<td>225</td>
<td>220</td>
<td>-15</td>
</tr>
<tr>
<td>Carver County</td>
<td>36,120</td>
<td>41,570</td>
<td>47,000</td>
<td>51,770</td>
<td>57,110</td>
<td>20,990</td>
</tr>
<tr>
<td>Kandiyohi County</td>
<td>17,020</td>
<td>17,290</td>
<td>17,670</td>
<td>18,140</td>
<td>18,410</td>
<td>1,390</td>
</tr>
<tr>
<td>McLeod County</td>
<td>15,570</td>
<td>16,340</td>
<td>17,160</td>
<td>17,990</td>
<td>18,760</td>
<td>3,190</td>
</tr>
<tr>
<td>Renville County</td>
<td>6,830</td>
<td>6,860</td>
<td>7,010</td>
<td>7,150</td>
<td>7,270</td>
<td>440</td>
</tr>
<tr>
<td>Sibley County</td>
<td>6,050</td>
<td>6,140</td>
<td>6,310</td>
<td>6,480</td>
<td>6,580</td>
<td>530</td>
</tr>
<tr>
<td>State of Minnesota</td>
<td>2,141,830</td>
<td>2,257,210</td>
<td>2,374,360</td>
<td>2,472,940</td>
<td>2,566,940</td>
<td>425,110</td>
</tr>
</tbody>
</table>

*Projections for cities are based upon the average rate of growth since 1970. County and State projections were provided from the Minnesota State Demographer’s Office. Household projections are based upon 2010 average household size (number of people living in each household per jurisdiction).
H: Physical Characteristics Profile

Precipitation

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

Figure 1B reveals the State’s average annual precipitation from data collected between 1981 and 2010. Notice that precipitation within the District increases from west to east. The western portion of the District receives approximately 27 inches of precipitation on average annually, while the east portion receives up to 30 inches of precipitation on average annually. Seasonal precipitation, the total precipitation of the months of May through September, in this region ranges from 17 to 19 inches annually.

Annual snowfall within the District is approximately 40 inches. Although this total is over three feet, snowfall represents only a small portion of the District’s total annual precipitation because of the relatively low moisture content of snow. While only a small portion of the total annual precipitation actually falls during the winter months, flooding can occur in the spring as a result of a number of factors, including a deep, late winter snow pack, frozen soil prohibiting the infiltration of water, rapid snow melt due to an intrusion of warm air and heavy early spring precipitation.

Precipitation within the BCWD is monitored through a cooperative interagency effort between the Minnesota DNR and county SWCDs. The SWCDs are responsible for recording and compiling precipitation data at the local level. Once information is collected, it is then forwarded to the DNR, State Climatology Office, where it is further analyzed and entered into a statewide database.

Source: Minnesota State Climatology Office
**Hydrogeology**

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

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

The two principal aquifers in BCWD are outwash and bedrock (refer to Map 1B). Each of these aquifer types is discussed below.

**Outwash Aquifers**

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

Buried-drift aquifers are composed of sand or gravel deposits, but because of repeated glaciation, are confined beneath layers of silt and clay. Well depths in these aquifers range from 80-380 feet deep, with yields of approximately 25-500 gallons per minute. Water from these aquifers is generally hard due to the presence of iron. High concentrations of sulfate and chloride are also present in some areas. Buried-drift aquifers are found throughout the BCWD.

**Bedrock Aquifers**

Bedrocks aquifers consist of two types in the District: Cretaceous and Precambrian. Cretaceous aquifers are made up of sandstone lenses near the base of a predominant shale section. The water associated with these aquifers is commonly hard and is generally confined. Large sulfate, chloride and dissolved solids concentrations exist in many areas. Depth to bedrock generally ranges from 280 to 620 feet. These aquifers typically yield 10-250 gallons per minute. Precambrian aquifers are undifferentiated and only exist in faults and fractures. Found at depths of 300 to 450 feet, these aquifers commonly yield 5 to 25 gallons per minute.

*Sources: Minnesota Department of Natural Resources & U.S. Geological Survey*
Surface Water Resources

The BCWD is located in the southern-most portion of the South Fork of the Crow River Watershed, which is a part of the larger Upper Mississippi River Drainage Basin. As Map 1C displays, there are 42 subwatersheds within the District. The general flow direction of the subwatersheds is from west to east, towards where the Buffalo Creek joins the South Fork of the Crow River near Lester Prairie. A complete listing of the subwatersheds within the BCWD is provided in Table 1E (Source: Minnesota Department of Natural Resources).

Major surface water resources within the District include the Buffalo Creek and several lakes, including Allie, Barber, Boon, Clear, Eagle, Hodgson, Marion, Mud, Phare and Preston. With the exceptions of Allie, Marion and Preston, which are classified as recreational development, all of these lakes have a DNR designated shoreland classification of natural environment. Natural environment lakes are typically small, shallow and sparsely developed. Surface water resources associated with the District’s extensive public drainage system are discussed later in this plan.

Table 1E:
BCWD Subwatersheds

<table>
<thead>
<tr>
<th>Subwatershed Name (#)</th>
<th>Area (ac)</th>
<th>Subwatershed Name (#)</th>
<th>Area (ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffalo Creek (19011)</td>
<td>4,976.6</td>
<td>South Fork Crow River (19039)</td>
<td>392.7</td>
</tr>
<tr>
<td>Buffalo Creek (19013)</td>
<td>10,186.3</td>
<td>Unnamed (19012)</td>
<td>51.1</td>
</tr>
<tr>
<td>Buffalo Creek (19038)</td>
<td>12,860.4</td>
<td>Unnamed (19025)</td>
<td>1,517.7</td>
</tr>
<tr>
<td>Buffalo Creek (19043)</td>
<td>11,203.6</td>
<td>Unnamed (19029)</td>
<td>294.0</td>
</tr>
<tr>
<td>Buffalo Creek (19045)</td>
<td>5,109.1</td>
<td>Unnamed (19040)</td>
<td>616.6</td>
</tr>
<tr>
<td>Buffalo Creek (19055)</td>
<td>11,805.1</td>
<td>Unnamed (19041)</td>
<td>7,490.6</td>
</tr>
<tr>
<td>Buffalo Creek (19056)</td>
<td>6,888.2</td>
<td>Unnamed (19042)</td>
<td>7,816.6</td>
</tr>
<tr>
<td>Buffalo Creek (19057)</td>
<td>15,645.9</td>
<td>Unnamed (19044)</td>
<td>4,484.3</td>
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<tr>
<td>Buffalo Creek (19065)</td>
<td>6,405.7</td>
<td>Unnamed (19046)</td>
<td>6,941.1</td>
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<tr>
<td>Buffalo Creek (19067)</td>
<td>8,327.4</td>
<td>Unnamed (19051)</td>
<td>15,182.0</td>
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<tr>
<td>Buffalo Creek (19069)</td>
<td>12,421.9</td>
<td>Unnamed (19052)</td>
<td>6,217.6</td>
</tr>
<tr>
<td>County Ditch #33 (19079)</td>
<td>7,198.5</td>
<td>Unnamed (19053)</td>
<td>7,855.7</td>
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<tr>
<td>County Ditch #4 (19066)</td>
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<tr>
<td>County Ditch #74 (19068)</td>
<td>4,399.2</td>
<td>Unnamed (19058)</td>
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</tr>
<tr>
<td>From Preston Lake (19070)</td>
<td>9,003.2</td>
<td>Unnamed (19063)</td>
<td>4,846.1</td>
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<tr>
<td>Judicial Ditch #15 (19073)</td>
<td>16,984.4</td>
<td>Unnamed (19064)</td>
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</tr>
<tr>
<td>Judicial Ditch #15 (19076)</td>
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<td>McCuen Creek (19050)</td>
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<tr>
<td>South Fork Crow River (19010)</td>
<td>38.6</td>
<td>Unnamed (19078)</td>
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</tr>
</tbody>
</table>
Soils

Soils are one of the most important natural resources found within the BCWD. Soils found in this region are noted to be amongst the most fertile in the world. As a result of high soil fertility, much of the land within the District is intensively managed for agricultural production. Soils develop from the breakdown of rock minerals, intermixed with plant and animal remains. Their formation is an extremely long process, taking place over hundreds to thousands of years. The District’s soils were formed from deposits originally left by glaciers more than 10,000 years ago. The District has a wide variety of soil types due to the wide variety of parent material from which they were formed. Also important in the formation of the District’s soils are factors such as climate, vegetation and topography.

The BCWD’s 14 major soil associations are displayed in Map 1D (Source: Natural Resource Conservation Service). A brief description of each association is provided below.

- **Canisteo-Glencoe-Cokato Association.** Soil textures for the association include loam and clay loam. Infiltration ranges from good to poor. The common landform setting for soils classified in the Canisteo-Glencoe-Cokato Association is moraines. Slopes generally range from 0 to 6 percent.

- **Canisteo-Nicollet Association.** Soil texture for the association ranges from loam to clay loam. Infiltration ranges from good to poor. The common landform setting for soils classified in the Canisteo-Nicollet Association is moraines. Slopes generally range from 0 to 5 percent.

- **Clarion-Canisteo Association.** Soil textures for the association include loam, silty clay loam and clay loam. Infiltration ranges from good to poor. The common landform setting for soils classified in the Clarion-Canisteo Association is moraines. Slopes generally range from 0 to 5 percent.

- **Clarion-Harps-Glencoe Association.** Soil textures for the association include loam and clay loam. Infiltration rates range from good to poor. The common landform setting for soils classified in the Clarion-Harps-Glencoe Association is moraines. Slopes generally range from 0 to 12 percent.

- **Clarion-Nicollet-Webster Association.** Soil textures for the association include loam, silty clay loam and clay loam. Infiltration ranges from good to poor. The common landform setting for soils classified in the Clarion-Nicollet-Webster Association is moraines. Slopes generally range from 0 to 5 percent.
Map 1D: Buffalo Creek Watershed District Major Soil Associations

- Watershed District
- Municipality
- County
- Lake

District Approximate Size
- Total Area = 422.1 Square Miles
- East/West Length = 51 Miles
- North/South Length = 19 Miles

Major Soil Associations (general location)
- Canisteo-Glencoe-Cokato
- Canisteo-Nicollet
- Clarion-Canisteo
- Clarion-Harps-Glencoe
- Clarion-Nicollet-Webster
- Cokato-Cordova
- Coland-Clarion-Hawick
- Corvus-Lura-Cosmos
- Estherville-Coland-Biscay
- Harps-Nicollet
- Harps-Okoboji-Norman
- Havelock-Mayer-Omsrud
- Lester-Cordova
- Normania-Canisteo-Harps

Prepared by the Mid-Minnesota Development Commission
(320) 235-8504 or www.mnrdc.org

Minneapolis

Wright County

Kandiyohi County

Meeker County

Renville County

McLeod County

Sibley County

Carver County

Buffalo Creek Watershed District Overall Plan

Legend:
- Watershed District
- Municipality
- County
- Lake

Buffalo Creek
- Major Road
- Minor Road

District Approximate Size
- Total Area = 422.1 Square Miles
- East/West Length = 51 Miles
- North/South Length = 19 Miles
- **Cokato-Cordova Association.** Soil textures for the association include loam and clay loam. Infiltration rates range from good to poor. The common landform setting for soils classified in the Cokato-Cordova Association is moraines. Slopes generally range from 0 to 12 percent.

- **Coland-Clarion-Hawick Association.** Soil textures for the association include sandy loam, loam and clay loam. Infiltration is generally good to poor. The common landform setting for soils classified in the Coland-Clarion-Hawick Association is floodplains, outwash plains and moraines. Slopes generally range from 0 to 12 percent.

- **Corvuso-Lura-Cosmos Association.** Soil textures for the association include clay loam and silty clay. Infiltration is generally poor. The common landform setting for soils classified in the Corvuso-Lura-Cosmos Association is moraines. Slopes generally range from 0 to 2 percent.

- **Estherville-Coland-Biscay Association.** Soil textures for the association include loam and clay loam. Infiltration ranges from good to poor. The common landform setting for soils classified in the Estherville-Coland-Biscay Association is terraces and floodplains. Slopes generally range from 0 to 6 percent.

- **Harps-Nicollet Association.** Soil textures for the association include silty clay loam and clay loam. Infiltration is generally poor. The common landform setting for soils classified in the Harps-Nicollet Association is moraines. Slopes generally range from 0 to 3 percent.

- **Harps-Okoboji-Normania Association.** Soil textures for the association include loam, silty clay loam and clay loam. Infiltration ranges from fair to poor. The common landform setting for soils classified in the Harps-Okoboji-Normania Association is moraines. Slopes generally range from 0 to 3 percent.

- **Havelock-Mayer-Omsrud Association.** Soil textures for the association range from loam and clay loam. Infiltration is generally good to poor. The common landform setting for soils classified in the Havelock-Mayer-Omsrud Association is floodplains, outwash plains and moraines. Slopes generally range from 0 to 18 percent.

- **Lester-Cordova Association.** Soil textures for the association include loam and clay loam. Infiltration ranges from good to poor. The common landform setting for soils classified in the Lester-Cordova Association is moraines. Slopes generally range from 0 to 12 percent.

- **Normania-Canisteo-Harps Association.** Soil texture for the association is a loam. Infiltration rates range from fair to poor. The common landform setting for soils classified in the Normania-Canisteo-Harps Association is till plains. Slopes generally range from 0 to 5 percent.
**Topography**

The BCWD is characterized by a gently undulating till plain, with scattered moraines. The topography of the District was formed as a result of the advance and retreat of the Grantsburg glacial lobe during the Wisconsin glacial period, approximately 10,000 years ago. Elevations within the District generally range from approximately 1,000 to 1,100 feet above sea level. The highest point in the BCWD is found in southern Kandiyohi County at an elevation of 1,137 feet above sea level. The lowest point in the District is found near the mouth of the Buffalo Creek at an elevation of 945 feet above sea level.

Figure 1C provides a contrast of the topography of Minnesota. Detailed topographic maps for the BCWD are available by contacting each county’s SWCD office or visiting the Minnesota Geospatial Information Office at [http://www.mngeo.state.mn.us/chouse/elevation/index.html](http://www.mngeo.state.mn.us/chouse/elevation/index.html).

**Figure 1C:**
Minnesota’s Topography

*Source: Minnesota Department of Natural Resources*
Presettlement Vegetation

The Minnesota DNR has inventoried the original vegetation of the District through its Presettlement Vegetation Database. Presettlement vegetation was determined by analyzing the detailed maps and records of early surveyors (circa 1895). The purpose of the database is to “analyze presettlement vegetation patterns for the purpose of determining natural community potential, productivity indexes and patterns of natural disturbance”. Map 1E presents the presettlement vegetation of the BCWD.

Before settlement, the District was predominately covered with upland prairie and prairie wetland vegetation. Upland prairie vegetation occupied a wide variety of landforms, including beach ridges and swales, glacial lakebeds, morainic hills, steep bluffs and rolling till plains. Big bluestem and Indian grass occupied the deep soils of the moist uplands, while little bluestem and side oats grama covered the thin soils of the dry uplands. In general, bluejoint, prairie cordgrass, rushes and sedges dominated the lowland areas and wetlands. Many of these wetlands are known today as “prairie potholes”.

In the far eastern portion of the District, brush prairie and hardwoods provided a transition between the prairie and deciduous forest ecotonal types. The hardwoods and brushland ranged from small groves of trees intermixed with open prairie, to communities of scrub forest and dense scrub thicket. The dominant tree species were aspen, basswood, elm, maple and oak.

Land Use

As an update to the 1969 Land Use Inventory, the Minnesota Land Management Information Center (LMIC) conducted the Minnesota Land Use-Agricultural and Transition Areas Inventory in 1989. Land uses were interpreted using National Wetland Inventory Maps from the USFWS, USDA-Agricultural Stabilization and Conservation Service (ASCS) low altitude 35-mm aerial photography and Landsat satellite imagery. The results are reproduced in Map 1F. The land cover classifications used in this project were derived from A Classification Manual for Land Cover and Land Use in Minnesota, which was developed in 1978 by the Minnesota State Planning Agency. The objective of the current classification scheme was to provide as much consistency as possible with the 1969 land use categories, while at the same time recognizing current user needs and better data sources. The definitions describe the types of land use found in each classification scheme are briefly described.
Although this Plan includes data from the 1989 land use analysis, land use information was updated as part of the 2006 National Land Cover Database conducted by the U.S. Geological Survey. For more information on the updated land use data, please visit the following website: 


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

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

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

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

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

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

  **Agriculture** - Developments include those agricultural facilities not directly associated with farmsteads. It includes machine storage areas, grain storage areas, barns and corrals and isolated buildings. It also includes isolated farmsteads that no longer have apparent road access.
• **Cultivated Land** - Cultivated land includes those areas under intensive cropping or rotation, including periods when a parcel may be fallow. It represents land planted to forage or cover crop. The units exhibit linear or other patterns associated with current or relatively recent tillage.

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

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

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

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

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

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

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

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

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

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

• **Unclassified** - This category includes areas that could not be classified into any of the other categories.

• **Unlabeled** - These areas were not labeled on the original mylar.
Table 1F provides a breakdown of each land use category by acreage and percentage of the BCWD. The single largest land use is cultivated agricultural land, which comprises 238,927 acres or 88.4 percent of the District. Other major land uses within the District include Grasslands (3.9%), Deciduous Forest (2.8%), Farmsteads and Rural Development (1.5%) and Water (1.4%).

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Acreage</th>
<th>Percent of Watershed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivated Land</td>
<td>238,927</td>
<td>88.4</td>
</tr>
<tr>
<td>Grassland</td>
<td>10,599</td>
<td>3.9</td>
</tr>
<tr>
<td>Deciduous Forest</td>
<td>7,535</td>
<td>2.8</td>
</tr>
<tr>
<td>Farmstead and Rural Residential</td>
<td>4,026</td>
<td>1.5</td>
</tr>
<tr>
<td>Water</td>
<td>3,877</td>
<td>1.4</td>
</tr>
<tr>
<td>Urban and Industrial</td>
<td>2,167</td>
<td>0.8</td>
</tr>
<tr>
<td>Wetlands</td>
<td>2,045</td>
<td>0.8</td>
</tr>
<tr>
<td>Other Rural Developments</td>
<td>496</td>
<td>0.2</td>
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<tr>
<td>Rural Residential Development Complexes</td>
<td>242</td>
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<tr>
<td>Grassland-Shrub-Tree Complex</td>
<td>223</td>
<td>0.1</td>
</tr>
<tr>
<td>Gravel Pits and Open Mines</td>
<td>42</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Exposed Soil, Sandbars and Sand Dunes</td>
<td>5</td>
<td>&lt;0.1</td>
</tr>
</tbody>
</table>

The implications of cultivated agriculture being the single largest land use in the District has far reaching impacts on the quality and quantity of water resources. Over the past few decades, land use practices in agriculture have changed significantly. Agriculture used to be more diversified with livestock and dairy operations. Most of the crops that were produced were considered high residue and were grown to feed the livestock. High residue crops (i.e., corn, alfalfa, small grain) protected the soil from erosion. Presently, crop selection in agriculture has shifted to primarily cash grain operations, with corn, soybeans, small grain and sugar beets being produced. Some of these cash grain crops are considered low residue (i.e. soybeans, sugar beets) and do not protect the soil from erosion as well as high residue crops. Over the next ten years, land use within the District is expected to remain relatively the same. The most significant changes are expected to occur in the farmstead and rural residential, and urban and industrial categories. These land uses are expected to increase to accommodate projected growth in the area. The percentage of cultivated agricultural land within the District could potentially increase slightly, as a result of decreased involvement in conservation easement programs.
CHAPTER TWO
WATER QUANTITY MANAGEMENT

This Chapter provides a profile of water quantity management within the BCWD and includes information on flow monitoring, public drainage systems, stormwater management and floodplain management. Priority issues examined in this chapter include alternative drainage practices, drainage coefficients, stormwater management and water retention and wetlands.

Chapter Two includes the following sections:

Sections                                       Page

A: Water Quantity Management Overview             1
B: Flow Monitoring Data                           2
C: Drainage Management                           7
D: Stormwater Management                         23
E: Flooding and Water Retention                  25

A: Water Quantity Management Overview

Management of water quantity is a key component of agricultural production and urban and rural development within the BCWD. Drainage systems are widely used throughout the District to remove excess water from areas where the topography of the landscape is nearly level and the soils are poorly drained. While necessary to accommodate these land uses, excessive drainage can lead to several unwanted consequences. In many instances, excessive drainage results in flashier stream flows and increased downstream flooding problems. The following section describes the status of water quantity management within the BCWD, as well as the District’s role in the equation.

BCWD’s Role in Water Quantity Management

Balancing the need for water quantity management and its associated environmental and social impacts was one of the key issues that led to the formation of the BCWD. The District has the authority to regulate the management of water resources through its adopted rules (Appendix A). In general, the District has been successful in implementing its water quantity management related
rules. These rules are believed to be adequate to balance the need for and impacts of water quantity management. However, one apparent inadequacy is in the area of stormwater management. The District’s current stormwater management criteria are generalized in many areas and often lack the level specificity often necessary for implementation. With additional growth and development expected to take place within the BCWD, the need to bolster this portion of the District’s rules should be of top priority.

B: Flow Monitoring Data

BCWD Flow Monitoring

The BCWD previously conducted flow monitoring on the Buffalo Creek and its tributaries beginning in 1989. Table 2A displays the monitoring results for these sites from 1996 to 2000. Notice that flows increase substantially during the months of May and June, which is a result of the spring snowmelt and increased precipitation. Flows gradually regress during the month of July, eventually reaching base flow conditions in August.

<table>
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<tr>
<th>Site</th>
<th>Years Monitored</th>
<th>Average Monthly Flow (millions of gallons per month)</th>
</tr>
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<tbody>
<tr>
<td>E</td>
<td>1998-2000</td>
<td>580</td>
</tr>
<tr>
<td>H</td>
<td>1998-2000</td>
<td>1,953</td>
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<td>N1</td>
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<td>N4</td>
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USGS/DNR Flow Monitoring

From October 1972 to October 1980, the USGS operated a continuous flow monitoring station on the Buffalo Creek, near the City of Glencoe. Flow data collected was used to create a historical baseline for the Buffalo Creek. Table 2B displays the mean daily flow values for the monitoring station. Notice that the data generally coincides to the monitoring results of the BCWD. According to the table, flows begin to increase substantially during the early spring (mid-March), as a result of snowmelt and increased precipitation, and diminish to base flow conditions by the beginning of August.
Table 2B:
USGS Station 05278930 Buffalo Creek Near Glencoe, MN
Mean Daily Flow Values (ft$^3$/s)

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<tr>
<th>Day of month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
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<td>21.3</td>
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</tbody>
</table>
Presently, the USGS, in conjunction with the DNR, maintains two continuous flow monitoring stations on the Buffalo Creek: one at Brownton and another near Glencoe. Flow (ft$^3$/s) and stage (ft.) are monitored at each of these sites. Figures 2A and 2B show the stream flows for both sites from April 1, 2013, to October 31, 2013. Current conditions are posted live on the Internet at the websites listed below each flow graph.

**Buffalo Creek Near Glencoe, MN**

**Figure 2A:**
Buffalo Creek Stream Flow near Glencoe, MN (April 1, 2013 to October 31, 2013)

![Graph of Buffalo Creek Stream Flow near Glencoe, MN](http://www.dnr.state.mn.us/waters/csg/site_report.html?mode=getsitereport&site=19043001)
Source:
http://www.dnr.state.mn.us/waters/csg/site_report.html?mode=getsitereport&site=19056001

Exceedence Value Ranges

The Minnesota DNR evaluates average annual stream flow per major watershed by using Exceedence Value Ranges (EVRs). An exceedence value is a statistical measurement of stream flow based upon historical discharge records. The value is the probability of the stream flow exceeding a certain value. For instance, a 50 percent exceedence value (Q50) indicates that the level of stream flow currently being reported at a gauging station has been equaled or exceeded 50 percent of the time during the period of record (which could be monthly or yearly). A 75 percent exceedence value (Q75) would be the level of stream flow at a particular gauging station that was equaled or exceeded 75 percent of the time during the period of record. A description of each EVR is provided:
- **Critical Flow (Q90-Q100):** A watershed is classified as having critical flow when its stream flow falls below the annual 90 percent exceedence value (Q90). If a watershed is classified as having critical flow, the DNR may, if necessary, restrict the appropriation of water from that watershed to conserve water for instream flow or other higher priority uses.

- **Low Flow (Q75-Q90):** A watershed is classified as having low flow when its stream flow is below the monthly 75 percent exceedence value (Q75), but still above critical flow.

- **Normal Flow (Q25-Q75):** A watershed is classified as having normal flow when its stream flow is between the monthly 25 percent (Q25) and 75 percent (Q75) exceedence values.

- **High Flow (Q10-Q25):** A watershed is classified as having high flow when its stream flow is above the monthly 25 percent exceedence level (Q25).

- **Flood Flow (Q1-Q10):** A watershed is classified as having flood flow when its stream flow is at or above the flood stage set for that watershed by the National Weather Service (NWS).

Table 2C displays the mean annual EVRs for streams in the South Fork of the Crow River Watershed, which includes the Buffalo Creek Watershed, from 1990 to 2002. The highest flows, based on mean EVRs, occurred in 1993. During that year, streams in the watershed had mean EVRs that categorized them into the flood flow range (Q1-Q10). Since 1993, the mean EVRs in the South Fork of the Crow River Watershed have generally been in the high flow range (Q10-Q25).

### Table 2C:
Mean Stream Exceedence Value Ranges for the South Fork of the Crow River Watershed (1990-2002)

<table>
<thead>
<tr>
<th>Year</th>
<th>EVR</th>
</tr>
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<tbody>
<tr>
<td>1990</td>
<td>Q25-Q75</td>
</tr>
<tr>
<td>1991</td>
<td>Q10-Q25</td>
</tr>
<tr>
<td>1992</td>
<td>Q10-Q25</td>
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<tr>
<td>1993</td>
<td>Q1-Q10</td>
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<td>1994</td>
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<tr>
<td>2002</td>
<td>Q10-Q25</td>
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</table>
Implications and Assessments

Flow data collected by the BCWD, DNR and USGS reveals that the flows of the Buffalo Creek fluctuate greatly during the year. Flows are greatest during the spring and early summer as a result of snowmelt and increased precipitation. Continuous flow monitoring has also indicated that the Buffalo Creek’s flows are often flashy, which means that both high and low flows are exaggerated. A large contributing factor to this is the design and operation of drainage systems. As a whole, these systems are designed to remove large quantities of water in a short duration, thus contributing to downstream flooding problems. To stabilize flows, upland storage needs to be increased to reduce the overall volume of water transported by the drainage systems.

C: Drainage Management

An extensive network of public drainage ditches has been established throughout the BCWD to increase agricultural production in areas where natural drainage is limited, either by fine textured soils or due to flat topography. Drainage ditches serve as conveyance systems for surface water and as outlets for subsurface tile lines. Proper design and maintenance of ditches can increase soil productivity, therefore playing a vital role to both the agricultural community and the District’s overall economy.

Nonpoint source pollutants, such as bacteria, nutrients and sediment commonly degrade drainage ditches. This, in turn, can degrade the quality of other water features interconnected to these systems. To minimize this problem, landowners need to implement best management practices (BMPs), such as filter strips, along ditches and tile inlets. Implementation of such practices not only improves the quality of the District’s surface water, but it also reduces the need for expensive ditch cleanout and repair.

Besides problems related to water quality, drainage ditches pose water quantity threats as well. Because ditches were designed to remove large quantities of water in a short duration, flooding problems can and do occur, especially following major storm events and during the spring snowmelt. To minimize flooding impacts, upland storage, including wetland restoration, needs to be increased to reduce the overall volume of water transported by the drainage ditch systems.

Map 2A shows the approximate location of the BCWD’s public drainage ditches. A listing of these ditches is given in Table 2D. There are 28 public ditches within the District, with a combined length of approximately 795 miles. Drainage ditches are regulated under Minnesota State Statutes, Chapter 103E (also known as The Drainage Law). This statute contains provisions for transferring ditches from county control to a watershed district.
Table 2D:
Public Drainage Systems in BCWD

<table>
<thead>
<tr>
<th>Name</th>
<th>County(s) Served</th>
<th>Year Established</th>
<th>Watershed Area (mi.$^2$)</th>
<th>Length (mi.)</th>
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</thead>
<tbody>
<tr>
<td>J.D. No. 15 and Laterals/Branches</td>
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<td>1923</td>
<td>104.9</td>
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<td>J.D. No. 28A and Laterals/Branches</td>
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<td>15.6</td>
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<td>13.1</td>
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<td>12.5</td>
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<tr>
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<tr>
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<td>4.1</td>
<td>7.2</td>
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<tr>
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<td>1.5</td>
<td>1.6</td>
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</tbody>
</table>

| Totals                           | N/A                 | Average 1934    | 440                        | 795          |
The Watershed District serves as the drainage authority for two drainage systems, Judicial Ditch 79-2 and 75-2. All other systems within the District are regulated under the jurisdiction of their respective county(s). The District has adopted specific rules and regulations regarding the management of water resources within its boundary (a complete copy of the District’s Rules and Regulations can be found on the District’s Website www.bcwatershed.org or in Appendix A). These guidelines establish the District’s permitting process for activities that have the potential to impact water resources.

“The Drainage Issue”

In 1999, John Helland, a State Legislative Analyst, wrote a legislative information brief titled “The Drainage Issue” for the Minnesota House of Representatives. The following text contains key portions of the information brief:

Drainage activity over the years has ebbed and flowed based on agricultural prosperity and the drought cycle. The activity peaked in the 1950s, and by the 1960s public policy had shifted toward an emphasis on wetland conservation. People began to question whether drainage was always in the public interest.

Federal and State law evolved toward acquisition and protection of wetlands. Water bank programs were created to pay landowners not to drain wetlands and to place them under easement. The Federal Clean Water Act gave the U.S. Army Corps of Engineers permit control over the discharge of substances into wetlands. The 1985, 1990 and 1996 Federal farm bills all contained significant wetland protection measures for landowners planning crops (consequently, the 2002 Farm Bill does as well). Minnesota’s law has changed during the last three decades by increasing the consideration of environmental measures before a drainage proceeding commences and imposing stricter protection of wetlands. This culminated in the State Wetland Conservation Act of 1991, which established a “no-net-loss” policy for Minnesota’s remaining wetlands.

Activity and Authority

A 1985 estimate calculated that Minnesota had about five million acres of drained land. About 20 percent of the acreage was drained by tile pipes, conveying excess water from farm fields to collection ditches. The remaining 80 percent was drained by 27,000 miles of constructed drainage ditches.

“The Drainage Issue” continued…
“The Drainage Issue” continued…

General authority for public drainage is vested in the counties under Minnesota Statutes, chapter 103E, although some drainage systems are located in and under the supervision of a watershed district (Minn. Stat., Ch. 103D). Counties and watershed districts are more or less on their own in the interpretation of the drainage law, on a case-by-case basis. This has caused a growing lack of standardization of drainage procedures among the counties and watershed districts.

Issues

Issues and concerns about public drainage have emerged among various interest groups during the 1990s. Some of the groups have expressed an interest in specific changes to the drainage law, or wholesale change to “modernize” it. Recently, the State Board of Water and Soil Resources sponsored a public drainage forum to identify and discuss the issues and concerns. The major concerns are presented below.

- There is a great need for more education on the drainage law, which is very process oriented, for all interested parties, but especially public officials who change and may be unfamiliar with the law. An information clearinghouse and specialized training program should be provided, and perhaps the University of Minnesota could construct a “drainage model” for demonstration purposes.

- The buffer strips required to be placed along new drainage systems to prevent erosion need to be maintained and inspected. Minnesota Statutes, section E, requires the planting of a 16.5 foot wide permanent grass strip on each bank of a new or improved drainage ditch. However, the law doesn’t reach 90 percent of previously existing public drainage ditches or private systems. According to a 1990 study, enforcement of the permanent grass strip is non-existent for the most part.

- The abandonment of a public drainage ditch is very hard to accomplish. The initiative must come from assessed landowners with a petition signed by at least 51 percent of the property owners assessed for the system. The petition must designate the drainage system proposed to be abandoned, and show that it is not of public benefit and utility. This has proved to be difficult because existing law is designed to increase drainage, not to reduce it. As a result, separate legislation often is introduced to abandon a particular system.

“The Drainage Issue” continued…
“The Drainage Issue” continued…

- Repair of an existing drainage ditch sometimes is thought of as an improvement. Repairs are not intended to significantly increase the hydraulic efficiency or capacity of a ditch, or to extend and improve drainage benefits to the new land. If a ditch is maintained on a regular basis, major repair should not be required. However, many ditches are not maintained regularly and repairs can cross the line and become an improvement.

- Some drain tile systems are overwhelming the capacity of existing ditch systems to handle the water flow. Although some counties have conducted ditch inventories, there is a need for a statewide inventory and record keeping system. This would help public officials to have exact information on local drainage and to better enforce the law.

- The viewers’ report in a drainage proceeding may be the single most important document; it lists three viewers’ facts and findings. Viewers gather information that is used by the county board or watershed district to decide if a drainage project is feasible. It also identifies who will pay for construction and maintenance of the drainage system. The original establishment of benefits on a new system will affect all later repairs related to that system. Environmental criteria is required by Minnesota Statutes, section 103E.015, to be considered in a proposed drainage project. However, the law does not specify when it is to be done, so it often isn’t accomplished at the beginning of the project but during the hearing stage. This can make a project more troublesome and costly.

Several ideas came from the drainage forum to improve the current situation:

- There should be a cost/benefit analysis of drainage on a countywide basis, not project-by-project.

- Best management practices on ditch systems, similar to those used on agricultural land, would improve overall water quality.

- New technology in drain tile systems may also improve water quality and could be mandated.

- Perhaps compensation or other incentives should be provided to landowners in order to more easily abandon ditch systems no longer providing a public benefit.

- Engineers working on a proposed drainage system should review the required environmental criteria to assess the impacts immediately after the project is initiated by petition and before it gets to the hearing stage.

End of Summary - “The Drainage Issue,” written by John Helland
Implications and Assessment

There is an extensive drainage system throughout the BCWD, consisting of approximately 800 miles of public drainage ditches. A majority of these ditches were installed in the early part of the last century and were designed to remove large quantities of water rapidly. As a result of their design, several water quality and quantity problems, such as nonpoint source pollutant loading and flooding, commonly arise. An effective means to mitigate many of these impacts would be to increase upland water storage and riparian buffering, which would reduce the overall volume of water transported by the drainage systems and provide filtration of nonpoint source pollutants.

The Minnesota Department of Natural Resources (DNR) has observed more “flashy” stream flows throughout the State, meaning that both high and low flows are exaggerated. Because many drainage ditch systems were designed to remove large quantities of water in a short duration, flooding problems are occurring more frequently, especially following major storm events and during the spring snowmelt. To minimize flooding impacts, upland storage needs to be increased to reduce the overall volume of water transported by the drainage system.

Due to recent high crop prices, an increasing amount of farmland is being tiled. This presents itself the opportunity to install new conservation drainage systems and to make improvements to the existing system. The newer systems can be designed to reduce nutrient losses and also positively affect the timing of flows into surface waters.

Although proper agricultural drainage is a necessary component in a healthy farming community, some negative environmental risks do exist if best management practices are not implemented properly. These sometimes include the following water-related problems:

- Loss of wetlands and water storage
- Increased flooding (due to loss of wetlands and water storage)
- Increased loss of nitrates through tile drains; increased phosphorus levels
- Increased soil erosion and turbidity
- Increased pesticides and farm chemicals in public waters

In many cases the systems were not designed for the current drainage volume. Private drainage of agricultural lands also adds hundreds of miles of underground tile that tie to the public systems. These waters also make their way to streams and lakes, impacting the quality of these water resources.
Drainage systems that require repair can make use of new drainage water management technologies that can aid in flood water control and water quality improvement as well as address the drainage needs for agriculture. Properly maintained drainage systems support the productive capability and erosion protection of soils.

**Minnesota Board of Water and Soil Resources (BWSR)**

The Minnesota Board of Water and Soil Resources explains why drainage is an important priority water planning concern:

- Water quality and quantity management are increasingly important as the Impaired Waters List for Minnesota continues to grow. Total Maximum Daily Load (TMDL) studies and plans are developed and implemented, and the Minnesota Clean Water, Land and Legacy Amendment is implemented.

- Because drainage is critical for agriculture, roads and urban areas, drainage management is likewise critical. Drainage management can be a sensitive issue.

- Drainage infrastructure provides substantial opportunity for multipurpose water management practices and projects.

BWSR has increasingly become an important stakeholder in assisting with agricultural drainage issues. One of the categories in the BWSR’s Clean Water Fund competitive grant RFP (FY2013) was:

- **Clean Water Conservation Drainage Management Grants** ~ the purpose of these grants is to facilitate the installation of conservation practices on drainage systems through planning and project implementation to improve water quality and local hydrologic conditions.

For FY2014, the installation of conservation practices on drainage systems are still eligible. In the future however they simply will be part of a larger category of Clean Water Funds called BWSR Projects and Practices and not a separate grant program. For more information, please visit BWSR’s website at [http://www.bwsr.state.mn.us](http://www.bwsr.state.mn.us).

**Redetermination of Benefits**

A number of drainage authorities in Minnesota have undertaken a systematic redetermination of benefits and damages for all of the Chapter 103E drainage systems under their jurisdiction,
including surface ditches and subsurface tile systems. These drainage authorities include: Freeborn, Martin, Steele, Sibley, Kandiyohi and Faribault Counties. According to BWSR in their publication titled, “Redetermination of Benefits and Damages for Drainage Systems,” the following points are highlighted (www.bwsr.state.mn.us/drainage):

- Benefited lands and benefits of many public drainage systems have not been updated for decades, some for over a century.
- Drainage system benefits are determined at one point in time, with no provision in Chapter 103E to index for inflation over time. The cost of a repair cannot exceed the total value of benefits of the drainage system on record.
- The drainage system repair fund limit is 20% of the total assessed benefits of the system, or $100,000, whichever is greater.
- Chapter 103E projects that require right-of-way (establishment, improvement, or repair by resloping of ditch side slopes) must have viewers appointed to determine associated benefits and damages. Partial system projects can create benefit inequities.
- As new private drainage is outlet into a public drainage system, the total benefits of the system and the relative benefits to land parcels and other infrastructure change. These benefits and associated assessments for repairs can only be updated via a redetermination of benefits and damages.

**Minnesota Department of Agriculture (MDA)**

New drainage and drainage improvements and repairs represent an opportunity to design and install systems in ways that help reduce nutrient losses into surface water and positively affect the timing and flow of drainage water into surface waters. These efforts combined with wetland restoration and water retention initiatives can have positive impacts upon water quality in agricultural landscapes.

The Minnesota Department of Natural Resources writes that cumulative impacts of accelerated runoff due to loss of available water storage on the land surface have fundamentally changed the flow regimes in many watersheds.

- Increased flood potential due to decreased lag time of water entering surface drainage systems has resulted in greater and more frequent high flow events, especially in larger systems.
- Increased erosion in natural drainage systems due to accelerated runoff and more frequent flow events.
• Potential impacts to public infrastructure due to increased flood potential and necessary remediation and repair.
• Negative impacts to watershed ecology through habitat minimization.

The public’s expectations concerning drainage water management continues to evolve - multipurpose drainage management involves much more than just the specific drainage system. Rather conservation practices for on field, on farm and on drainage system must all work together using structural and non-structural means. Many conservation practices support multiple goals.

Guiding principles for multipurpose drainage management include

• Reduce runoff and nitrogen loss by increasing soil profile water storage and cover crops.
• Avoid runoff concentration.
• Protect concentrated flow areas from erosion.
• Reduce peak flows to reduce erosion and flooding, and to improve water quality and habitat. Store water appropriately.
• Manage nutrients and denitrify tile drainage.
• Target investments for both incremental practices and watershed approaches.
• Improve agricultural sustainability.

Public Drainage Ditch Buffer Study 2006 --- prepared by the Minnesota Board of Water and Soil Resources at the direction of the Minnesota Legislature.

Key findings regarding buffers along public drainage ditches in Minnesota:

• GIS miles of public drainage ditch = 21,415 miles
• Approximately 60 percent of the estimated total miles of public drainage ditches in Minnesota may currently be buffered by either natural buffers (45 percent), voluntary conservation program (8.3 percent), or Section 103E.021 required grass buffer strips (7.3 percent).
• The combined voluntary and natural buffers protect an estimated 53.8 percent of the public drainage ditches; however there are wide differences by county and region of the state.
Natural buffers protect greater than 90 percent of ditches in many northern forested counties but are less prevalent in western and southern portions of the state where row crop agriculture is predominant.

What actions are needed?

- Continue and accelerate the promotion and marketing of conservation buffers.
- Market and implement Drainage Water Management/Conservation Drainage BMPs to land users.
- Use LiDAR to target implementation activity such as identifying systems that are overloaded, areas needing filter/buffer strips, potential wetland restorations/water storage areas, etc.
- Provide information and assistance to private drainage system operators to include technologies used on public drainage systems.
**BCWD Priority Issue 1: Conservation Drainage Practices**

**Issue Overview:** Open surface tile intakes serve as direct conduits for nonpoint source pollutants, such as sediment and nutrients, to enter subsurface drainage systems, which eventually outlet to surface water resources. Conservation drainage practices offer landowners an option to replace existing open intakes with more environmentally conscious practices, while preserving drainage benefits. As a priority issue, the Overall Plan Taskforce recommended that the District review possible funding sources to assist landowners in the implementation of conservation drainage practices.

**Key Players:** BCWD, Counties, EPA, MPCA, CROW, UMES

**District’s Role:** Nonregulatory - cooperator, facilitator

**Priority Areas and Subwatersheds (also refer to Map 6A):**

- Judicial Ditch 4
- Judicial Ditch 15
- Minor Watersheds 19056; 19057; 19058; 19067; 19069; 19071; 19072; 19073; 19074; 19075; 19076; 19077; 19078; and 19079

**Implications and Assessments**

The wide spread installation of subsurface artificial (tile) drainage systems has led to tremendous agricultural development within the BCWD. While these systems have provided great agricultural benefits to landowners, they are often associated with several negative environmental effects. For instance, subsurface drainage systems often act as conveyance systems for sediment and nutrients to enter water resources. Research on conservation drainage practices, such as pattern tiling, rock inlets and Hickenbottom intakes, has shown that these systems have the potential to reduce some of the negative environmental impacts of subsurface drainage, while preserving, or even enhancing in some cases, agronomic impacts, thus better achieving both agronomic and environmental objectives.
Two-Stage Ditch Systems

One of the conservation drainage practices currently being promoted is the use of two-stage ditch systems (refer to Figure 2C). The Nature Conservancy explains how the two-stage ditch concept works:

“Researchers have developed a drainage design by observing the natural processes of stable streams and rivers that could relieve the erosion, scouring and flooding that conventional ditches may cause. This design, known as the two-stage ditch, is a drainage channel that will benefit both agriculture and the environment. The concept of the two-stage ditch is simple. The design incorporates a floodplain zone, called benches, into the ditch by removing the ditch banks roughly 2-3 feet above the bottom for a width of about 10 feet on each side. This allows the water to have more area to spread out on and decreases the velocity - or energy - of the water. The flow of that water is a function of the velocity and area of the water. Since flow can be considered as the amount of water moving through the ditch, the design has actually increased the amount of water that the ditch can process by constructing the benches, or floodplain area. This not only improves the water quality, but also improves the biological conditions of the ditches where this is located” (http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/indiana/howwework/two-stage-ditches.xml).

Toe Wood-Sod Mat

A second conservation drainage practice is to redesign the drainage system using a toe wood-sod mat (refer to Figure 2D). This involves angling back the upper bank and excavating or filling in (depending on stream width and site restrictions) the lower bank with a bankfull bench. The bench consists of a bottom layer of logs, branches, brush, roots and soil as fill. Root wads can be incorporated to provide additional roughness and habitat. The fill is covered with a layer of live cuttings then with a top layer of sod mats and transplants set at bankfull stage (the flow at which the channel fills the banks and just begins to overflow onto the floodplain), which is level with the point bar. The stream bed may deepen with

Buffalo Creek Watershed District Overall Plan (2014-2023)
time as the stream develops its proper dimensions. In some cases, rock vanes may be installed up and downstream of the mat depending on how flow is impacted.


Streambank Restoration Fundamentals
~ Understanding Our Streams: Tow Wood-Sod Mat Factsheet (Dec 2010) ~

Several factors need to be considered when proposing a streambank restoration project, like a toe wood-sod mat:

1. Evaluate the current and future watershed condition. Often, the presence of cutbanks indicates watershed-scale channel incision due to channel straightening, changes in the watershed that have introduced low-sediment water (dam, urbanization, tiling), or increased flood magnitude. Before taking action, consider the purpose and scale of a restoration.

2. Determine if there really is an erosion problem. Channel erosion is natural channel adjustment to change. Occasional cutbanks are a natural stream feature that provide unique habitat. For example, a straightened ditch that is forming new meanders is adjusting towards a more stable form. Yet there are cases where local protection of infrastructure is necessary, and so determining if erosion is a problem is important.

BCWD Conservation Drainage Policy Guidelines

Based upon the information presented in this Chapter, the BCWD should use the following principles to guide land-use, permitting and administrative decisions regarding conservation drainage (please refer to Chapter Five for a complete listing of BCWD Goals, Objectives, and Policy Guidelines):

✓ Conservation drainage practices should be promoted through educational materials, demonstration sites, and cost-share incentives.

✓ The BCWD should proactively apply for grant funds for the education, demonstration, and implementation of conservation drainage practices within the District.

✓ A vegetative cover should be maintained on all ditch banks and slopes. The District shall provide cost-share assistance when available.

✓ Overland flow of water into ditches should be filtered or avoided.
BCWD Priority Issue 2: Drainage Coefficients

Issue Overview: Under the District’s Rules and Regulations, a permit is required for any tiling of 8” or larger or any size tile where an easement is required (i.e., for projects potentially affecting adjacent landowner’s property). Generally, this size requirement is in excess of the size of tile landowners are currently installing.

Key Players: Counties, BCWD, DNR, NRCS, SWCDs

District’s Role: Regulatory

Priority Subwatersheds: All subwatersheds

Implications and Assessments

Subsurface tile drainage systems can be used to lower high water tables for both agricultural production and urban development. To provide adequate protection for agricultural crops, tile systems need to have sufficient capacity to remove excess water from a major part of the root zone of the soil profile within 24 to 48 hours following a heavy rain event. Capacity requirements should be based upon one or more of the criteria listed below.

- Application of a locally tried and proven drainage coefficient to the acreage drained, including added capacity required to dispose of surface water entering through inlets.
- Yield of groundwater based on the expected deep percolation of irrigation water from the overlying fields, including the leaching requirement.
- Comparison of the site with other sites where subsurface drain yields have been measured.
- Measurement of the rate of subsurface flow at the site during a period of adverse weather and groundwater conditions.
- Application of Darcy’s Law to lateral or artesian subsurface flow.
- Estimates of lateral or artesian subsurface flow.
The rate that water must be removed from the drainage area is known as the drainage coefficient. Drainage coefficients, expressed in inches per 24 hours, are selected principally on such factors as rainfall characteristics (frequency, intensity and duration) and kind of crop being grown. The drainage coefficient assumes that surface drainage is adequate and applies to the entire area being drained. If surface runoff from an upland area spreads over the area to be drained and is likely to increase the drainage problem, then the acres used in determining tile size shall be proportionately increased. Tile size need not be increased if runoff from upland is diverted from the tiled area and disposed of by surface measures.

Drainage coefficients for urban drains, or other large drainage systems that protect high value property, are usually higher than those for agricultural drainage. In such instances, additional information must be considered such as land use, area drained and the degree of protection required. Usually, these systems are designed using peak flows from storms of certain frequencies from hydrologic analysis.

**Renville County Board Comments**

During the public review process of this draft plan, the Buffalo Creek Watershed District received a comment letter from the Renville County Board (included in Appendix B). The letter expresses concern over the Buffalo Creek Watershed District using a 3/8” drainage coefficient standard in the District’s permitting process. The letters promotes using a 1/2” drainage coefficient instead, referencing the NRCS, DNR, SWCD, and other watershed districts located in Renville County use the larger design standard. The following two activities took place in order to help resolve this issue:

**Drainage System Analysis**

The Buffalo Creek Watershed District hired Houston Engineering, Inc., in January 2014 to determine the tile capacities of Branch M on Judicial Ditch 15 (refer to Appendix C). The study was initiated after one landowner expressed interest in petitioning for an improvement of JD 15 to a drainage coefficient of 1/2-inch (1/2”). The project area is the upstream portion of Branch M, west of County Road 54 (see Figure 1 in Appendix C). Branch M consists mostly of tile with some open channels at its downstream end, and drains approximately 2,400 acres of agricultural land. Three tile outlets (Laterals M1, M20, and M32) provide the majority of flow into the Branch M open channel. Since the diameter of these tile outlets control the outflow of the remainder of the system, the analysis focused solely on the capacities of these laterals. The methodology used is fully described in Engineering Memo contained in Appendix C. The results showed that each of the branches reviewed have a capacity equivalent to or less than a 1/4-inch drainage coefficient. To increase the drainage coefficient to 1/2-inch, each tile would need to be increased by approximately two pipe sizes from the existing condition, and the total flow to
Branch M will increase by 200%. The analysis concluded that a storage area of 77 acre-feet (8 acres of land to an average depth of 9.6 feet) would be required to reduce flows from a 1/2-inch drainage coefficient to meet existing conditions.

Renville County Board Workshop

The Buffalo Creek Watershed District Board of Managers met with the Renville County Board of Commissioners on February 18, 2014, at the County Board’s workshop to discuss drainage coefficients. The following two items were discussed:

1. The Watershed District presented the preliminary results of the two drainage system engineering studies, Judicial Ditch 4 and Branch M of JD15 (described above).

2. The Buffalo Creek Watershed District acknowledges that many other regulatory agencies use the 1/2” drainage coefficient when surface water flooding is not a concern. When surface water flooding is a concern, however, some regulatory agencies have adopted a smaller 1/4” drainage coefficient. Due to the Buffalo Creek Watershed District experiencing frequent flooding, especially in the eastern portion of the District, the District adopting a 1/2” drainage coefficient standard would be counterproductive by adding more surface water quicker to the effected areas.

BCWD Conservation Drainage Policy Guidelines

Based upon the information presented in this Chapter, the BCWD should use the following principles to guide land-use, permitting and administrative decisions regarding drainage coefficients (please refer to Chapter Five for a complete listing of BCWD Goals, Objectives, and Policy Guidelines):

✓ It shall be the overall policy of the District to maintain up to a 3/8” drainage coefficient. Exceptions to this include when the drainage system was designed to accommodate smaller or larger coefficients or if mitigation measures (i.e., stormwater ponds, restored wetlands, etc.) are implemented when using larger drainage coefficients.

D: Stormwater Management

Population projections provided in Chapter One suggested the BCWD will likely experience population and household growth over the next twenty years. As a result of this growth, the need for stormwater management will also increase. Stormwater management refers to the development of programs and policies that preserve and/or enhance the quality of stormwater runoff, control the quantity of stormwater runoff, reduce erosion and prevent flooding. There are numerous structural management techniques for controlling stormwater quality and quantity,
including ponds, wetlands, infiltration, filtering systems and open channels. Prior to the last
decade, stormwater management efforts within the State focused primarily on controlling the
quantity of runoff from urban and developing areas. As development occurred, many drainage
systems were “improved” to rapidly collect runoff and quickly convey it away (using curb and
gutter, enclosed storm sewers and lined channels), to be discharged to downstream waters, such
as drainage ditches, lakes and streams.

The EPA and MPCA have stepped up their focus on managing stormwater for quality through
initiatives, including the National Pollution Discharge Elimination System (NPDES) program.
Diagnostic research has concluded that urban and rural development can potentially have a large
influence on the quality of local watercourses. The initial clearing and grading during
construction dramatically alters an area’s hydrologic cycle. Trees and other vegetation that once
had intercepted rainfall are removed, and natural depressions that had temporarily ponded water
are graded to a uniform slope. The organic layer of the soil profile that had absorbed rainfall is
removed, eroded or severely compacted. Having lost its natural storage capacity, a cleared and
graded site can no longer prevent rainfall from being rapidly converted into stormwater runoff.
Runoff from such sites often contains high concentrations of sediment, phosphorus and nitrogen,
which can contribute to the eutrophication of lakes and streams.

Stormwater management issues often worsen after construction. Rooftops, roads, parking lots,
driveways and other impervious surfaces no longer allow rainfall to infiltrate into the soil.
Consequently, most rainfall is directly converted into stormwater runoff. Studies of runoff rates
have shown that a one-acre parking lot produces 16 times more stormwater runoff than a one-
acre meadow annually.

The District has adopted rules related to stormwater management (see Appendix A). These
regulations are primarily focused upon industrial and commercial development, as well as
residential developments over one acre in size. As a result, stormwater management activities
within the BCWD are primarily limited to urban areas. The following section provides an
overview on how each city within the District addresses stormwater management.

**Brownton** - The City of Brownton has upgraded a majority of its storm sewer system in
recent years. The system will continue to be upgraded on an as needed basis and as
opportunities arise, such as during the reconstruction of streets. Stormwater collected by the
system is discharged directly to the Buffalo Creek, without treatment. At this time, there has
been no discussion to provide treatment of stormwater generated by the City.

**Buffalo Lake** - Buffalo Lake has upgraded their storm sewer system. As part of the project,
a five-acre retention pond was installed to treat stormwater. This pond was required as a
condition of receiving a permit from the BCWD. Future development will be required to tie
into the City’s storm sewer system.
Glencoe - The City of Glencoe’s storm sewer infrastructure is believed to be in good condition. Upgrades to the system are generally made in conjunction with the reconstruction of streets. Portions of the City’s system receive treatment through retentions ponds, while others discharge stormwater untreated. The City will continue to explore opportunities to expand their current stormwater management efforts as they arise.

Hector - The City’s storm sewer system is in good working repair and continues to be upgraded as opportunities arise, such as during the reconstruction of streets. Stormwater collected by the system is discharged, untreated to the Buffalo Creek. At this time, there has been no discussion of stormwater treatment.

Plato - According to the City of Plato’s Comprehensive Plan, the City’s storm sewer system is in good working condition. General maintenance and repair to the system is done in conjunction with road construction and repair projects. Stormwater collected by the system, however, is discharged into the Buffalo Creek untreated.

Stewart - The City of Stewart is divided into two watersheds: Buffalo Creek, which is north of the railroad tracks, and High Island Creek, which is south of the railroad tracks. Stormwater generated in the northern portion of the City receives treatment via two vortex tank treatment systems before it is discharged to the Buffalo Creek.

Implications and Assessment

The BC WD’s stormwater rules and regulations are primarily focused upon industrial and commercial development, as well as large-scale residential development. As a result, a majority of the stormwater management activities within the District occurs in or near urban areas. In addition, the District’s stormwater management criteria are generalized in many areas and often lack the level of detail necessary for implementation. The District should consider revising its rules and regulations to include additional performance based stormwater management criteria, especially for smaller developments.

Presently, only the cities of Buffalo Lake, Glencoe and Stewart provide treatment of stormwater. All other cities discharge their stormwater untreated into the Buffalo Creek or its tributaries. The District should continue to educate residents, as well as units of government, on the necessity of stormwater management and the District’s rules and regulations. In addition, the District should also build a working relationship with its cities to explore opportunities to expand stormwater treatment to all urbanized areas of the District.
E: Flooding and Water Retention

Historically, development has occurred in floodplains adjacent to waterways and lakes. In order to protect existing property and structures within the floodplain, the Minnesota State Floodplain Management Act requires floodplain regulations to be adopted by communities with mapped floodplains. This includes the cities of Brownton, Glencoe, and Plato within the District. Areas of land regulated are based on the 100-year frequency flood, which are designated as floodplain. The Minnesota DNR and the Federal Insurance Administration, under the Federal Emergency Management Agency (FEMA), are responsible for defining areas of flood hazard and notifying local governments of regulatory need.

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

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

Implications and Assessments

Map 2B identifies the FEMA 100-year floodplain for the BCWD. Notice the majority of the designated floodplain is found east of the City of Stewart (note: the 100-year floodplain west of Stewart has not been officially mapped). Flooding within the District generally occurs on flat agricultural land that is adjacent to waterways. The City of Glencoe is the only urbanized area that is found within the floodplain. Presently, the cities of Hector, Buffalo Lake, and Stewart do not participate in the National Flood Insurance Program (NFIP), however, these communities are not considered High Risk Areas according to FEMA. The District should continue to coordinate activities with governmental units to ensure that the existing 100-year floodplain elevations of the Buffalo Creek and its tributaries are preserved.
What Exactly is a 100-Year Flood?

Floods are classified according to their frequency and depth. A 100-year flood occurs less frequently than a 10-year flood, but because it has larger volume and greater depth of water, is far more destructive and damaging, and is a more serious threat to human safety. The National Flood Insurance Program adopted as a national standard a “100-year floodplain” to describe Special Flood Hazard Areas (SFHAs) that are depicted on the Flood Insurance Rate Maps (FIRMS) as Zone A. Due to the confusion it created, use of the term “100-year floodplain” has been replaced with the newer designation of “base flood”. Base Flood Elevation (BFE) requirements are listed on FIRMS and are used on Elevation Certificates to indicate the expected depth of water should a flood occur. The State of Minnesota requires that new buildings be built to the regulatory flood protection elevation, which is defined as the BFE plus one foot of freeboard place any stage increase. The Table below shows the statistical chances of flooding a building located in one of these higher risk areas over different periods of time.

<table>
<thead>
<tr>
<th>Period of Time</th>
<th>Flood Level and % Chance of Flooding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10-yr flood</td>
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<tr>
<td>1 year</td>
<td>10%</td>
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<tr>
<td>10 years</td>
<td>65%</td>
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<tr>
<td>20 years</td>
<td>88%</td>
</tr>
<tr>
<td>30 years</td>
<td>96%</td>
</tr>
<tr>
<td>50 years</td>
<td>99%</td>
</tr>
</tbody>
</table>

Source: Information excerpted from Watermark, Fall/Winter 1998 - a FEMA/National Flood Insurance Program newsletter. Revised after comments received from the Minnesota DNR.
Chapter Three provides a profile of the District’s priority pollutants. Water quality data, programs and standards are discussed in depth. Priority issues examined in this chapter include: conservation buffers, erosion and sediment control, feedlots, individual sewage treatment systems and wastewater discharges.

Chapter Three includes the following sections:

Sections                                 Page

A: Profile of Priority Pollutants..............................................................1

B: Conservation Buffers *(Priority Issue 3)* ...........................................24

C: Erosion and Sediment Control *(Priority Issue 4)*...............................31

D: Feedlots *(Priority Issue 5)* .................................................................35

E: Individual Sewage Treatment Systems *(Priority Issue 6)*.....................37

A: PROFILE OF PRIORITY POLLUTANTS

Improving the quality of surface water resources is a major concern of the BCWD. In many areas of the District surface water is being impaired by sediment and nutrients, as well as by biological pollutants, such as bacteria. Sources of these pollutants are generally tied to land usage and associated management. According to the 1989 Minnesota Land Use-Agricultural and Transition Areas Inventory, agricultural land comprises 88.4 percent of the BCWD, much of which is considered to be erosion prone. Another potential source of pollution is from urban and rural developments. Although not as large in composition as agricultural land, urban and rural developments present pollution potential in the form of contaminated stormwater, soil erosion, failing SSTSs and wastewater treatment facilities.
District’s Role in Reducing Priority Pollutants

While the BCWD does not have the outright authority to regulate water quality directly, many of its adopted rules and regulations were devised for the purpose of protecting the quality of water resources. The District, in conjunction with the CROW (since 2001), has also conducted water quality monitoring on the Buffalo Creek and its tributaries since 1989. The purpose of this monitoring effort is to further the development of the overall water quality data baseline, monitor the impact of land use changes and to assess the effectiveness of conservation efforts within the District.

Water Quality

State Water Quality Management Classifications

The MPCA establishes water quality standards for all waters of the State, both surface and groundwater. These standards are contained in Minnesota Rules Chapter 7050 and have statewide applicability. The MPCA’s statutory authority to adopt water quality standards and to classify waters of the State is found in Minnesota Statutes Chapter 115. Water quality standards consist of beneficial uses and the numerical standards needed to protect those uses. The beneficial uses of water include drinking, protection of aquatic life, fishing and recreation, industrial, agriculture and wildlife use.

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

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

Refer to the current version of the rule for the specific water quality standards that apply to the waters of interest. The use classifications are defined below.
• **Class 1 Waters: Domestic Consumption** - The quality of Class 1 Waters of the State shall be suitable for drinking. All groundwaters, and certain specifically designated surface waters are Class 1 Waters. These waters must meet both the primary (maximum contaminant levels) and secondary drinking water standards issued by the EPA.

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

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

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

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

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

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

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

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

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

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

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

Table 3A lists the waters within the BCWD that have been assigned an MPCA Water Quality Management Classification. The location of each of the waters is given by township(s), range(s) and section(s).

**Table 3A:**

**MPCA Water Quality Management Classifications**

<table>
<thead>
<tr>
<th>Name</th>
<th>Classification</th>
<th>Township(s)</th>
<th>Range(s)</th>
<th>Sections (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Judicial Ditch No. 15</td>
<td>7</td>
<td>115N</td>
<td>31W</td>
<td>15,16,20,21,29,30</td>
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<tr>
<td></td>
<td>7</td>
<td>115N</td>
<td>32W</td>
<td>22,25,26,27,28,32,33</td>
</tr>
<tr>
<td>County Ditch No. 63</td>
<td>7</td>
<td>116N</td>
<td>30W</td>
<td>19,20,21,28,33</td>
</tr>
<tr>
<td>Unnamed Ditch, Glencoe</td>
<td>7</td>
<td>115N</td>
<td>28W</td>
<td>14, 21,22,23,27,28</td>
</tr>
</tbody>
</table>
Ecoregional Classification of Minnesota Lakes

Minnesota has over 12,000 lakes and 92,000 miles of streams spread across a diverse array of environmental conditions. Studies have shown conclusive regional patterns in lake and stream productivity associated with regional differences in geology, vegetation, hydrology and land use. Based on this concept, the EPA established a classification system of Minnesota lakes and streams based upon ecoregions. Figure 3A presents Minnesota’s seven major ecoregions. Notice that the BCWD is found primarily within the Western Cornbelt Plains Ecoregion, which is characterized by rolling to flat terrain and intensive row crop farming.

![Figure 3A: Minnesota’s Seven Ecoregions](image)

Ecoregions were delineated based upon water quality data that was collected on reference lakes and streams statewide. Reference lakes and streams were chosen to represent minimally impacted sites within the region. Criteria used in selecting reference lakes and streams included maximum depth, surface area, fishery classification and general recommendations from the Minnesota DNR. These lakes and streams were also tested for a variety of chemical and physical water quality parameters. Table 3B displays the summer average water quality characteristics for the Western Cornbelt Plains Ecoregion. For additional water quality standards, please visit the following MPCA website:

www.pca.state.mn.us
Table 3B:
Average Summer Water Quality Characteristics for the Western Cornbelt Plains Ecoregion

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Average Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lakes</td>
<td></td>
</tr>
<tr>
<td>Total Phosphorus (mg/l)</td>
<td>0.07-0.15</td>
</tr>
<tr>
<td>Chlorophyll a (mg/l)</td>
<td>0.03-0.08</td>
</tr>
<tr>
<td>Secchi Disk (ft.)</td>
<td>1.6-3.3</td>
</tr>
<tr>
<td>Total Kjeldahl Nitrogen (mg/l)</td>
<td>1.3-2.7</td>
</tr>
<tr>
<td>Streams</td>
<td></td>
</tr>
<tr>
<td>Total Phosphorus (mg/l)</td>
<td>0.16-0.33</td>
</tr>
<tr>
<td>Total Suspended Solids (mg/l)</td>
<td>10.0-61.0</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>5.2-22.0</td>
</tr>
</tbody>
</table>

**Trophic Status**

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

\[
\text{CTSI (for Secchi disk readings)} = 60 - 14.41 \ln \text{Secchi disk (meters)} \\
\text{CTSI (for chlorophyll } a \text{ levels)} = 9.81 \ln \text{chlorophyll } a \text{ (ug/L)} + 30.6 \\
\text{CTSI (for total phosphorus)} = 14.42 \ln \text{total phosphorus (ug/L)} + 4.15
\]

where:

- CTSI = Carlson’s Trophic State Index
- $\ln$ = natural logarithm

Figure 3B displays the values that are associated with various trophic levels. The subsections following Figure 3B show the average results for Secchi disk readings, chlorophyll $a$ levels, total phosphorus levels and CTSI for MPCA monitored lakes in the District from 2003 to 2012.
Lake Allie Water Quality (ID# 65-0006)

Lake Allie is located approximately four miles northeast of the City of Buffalo Lake in Renville County. The Lake is classified as a shallow lake or reservoir for water quality standards. The Lake covers approximately 504 acres and is approximately 12 feet deep. There are seven water quality monitoring stations located on the Lake. Table 3C below shows the Trophic State Index (TSI) numbers for Lake Allie based on data collected between June and September 2003 to 2012. Notice the Lake’s Total Phosphorus average is well above the expected TSI range for lakes in the same Ecoregion. Based upon the three water quality parameters, Lake Allie’s overall Trophic State Index number is 67.

Table 3C: Lake Allie Trophic State Index Data (2003-2012)
**Lake Marion Water Quality** (ID# 43-0084)

Lake Marion is located approximately three miles northwest of Brownton in McLeod County. The Lake is classified as a shallow lake or reservoir for water quality standards. The Lake covers approximately 522 acres and is approximately 15 feet deep. There are eight water quality monitoring stations located on the Lake. Table 3D below shows the Trophic State Index (TSI) numbers for Lake Marion based on data collected between June and September 2003 to 2012. Lake Marion’s overall Trophic State Index number is 64.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>10-Year Average of All Summer Samples</th>
<th>Parameter TSI</th>
<th>Expected TSI Range for Lakes</th>
<th>Number of Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparency (meters)</td>
<td>1</td>
<td>58</td>
<td>60 - 70</td>
<td>29</td>
</tr>
<tr>
<td>Chlorophyll-a (parts per billion)</td>
<td>32</td>
<td>65</td>
<td>64 - 74</td>
<td>21</td>
</tr>
<tr>
<td>Total Phosphorus (parts per billion)</td>
<td>101</td>
<td>71</td>
<td>64 - 76</td>
<td>21</td>
</tr>
<tr>
<td>Overall Trophic State Index</td>
<td></td>
<td></td>
<td></td>
<td>64</td>
</tr>
</tbody>
</table>

**Table 3D:**
Lake Marion Trophic State Index Data (2003-2012)

**Lake Preston Water Quality** (ID# 65-0002)

Lake Preston is located adjacent to Lake Allie four miles northeast of Buffalo Lake in Renville County. The Lake is classified as a shallow lake or reservoir for water quality standards. The Lake covers approximately 659 acres and is approximately 10 feet deep. There are two water quality monitoring stations located on the Lake. Table 3E below shows the Trophic State Index (TSI) numbers for Lake Preston based on data collected between June and September 2003 to 2012. Lake Preston’s overall Trophic State Index number is 70 (notice high TP average of 73).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>10-Year Average of All Summer Samples</th>
<th>Parameter TSI</th>
<th>Expected TSI Range for Lakes</th>
<th>Number of Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparency (meters)</td>
<td>1</td>
<td>68</td>
<td>60 - 70</td>
<td>22</td>
</tr>
<tr>
<td>Chlorophyll-a (parts per billion)</td>
<td>47</td>
<td>68</td>
<td>64 - 74</td>
<td>23</td>
</tr>
<tr>
<td>Total Phosphorus (parts per billion)</td>
<td>119</td>
<td>73</td>
<td>64 - 76</td>
<td>23</td>
</tr>
<tr>
<td>Overall Trophic State Index</td>
<td></td>
<td></td>
<td></td>
<td>70</td>
</tr>
</tbody>
</table>

**Table 3E:**
Lake Preston Trophic State Index Data (2003-2012)
The Federal Clean Water Act requires states to adopt water quality standards to protect the nation’s waters. These standards define how much of a pollutant can be in surface and/or groundwater, while still allowing the water to meet its designated uses, such as drinking, fishing, swimming or irrigation. Minnesota’s statewide water quality standards and other provisions that protect water quality are found in Minn. Rules Chapter 7050. Standards are broken down based upon water use classifications.

Section 303 (d) of the Clean Water Act requires States to publish, every two years, an updated list of lakes and streams that are not meeting their designated uses because of excess pollutants. The list, referred to as the Section 303(d) List of Impaired Waters, is based on violations of water quality standards. For each pollutant that causes a waterbody to fail to meet State water quality standards, the Clean Water Act requires the State to conduct a Total Maximum Daily Load (TMDL) study, which identifies all potential point and nonpoint sources. Water quality sampling and computer modeling determine how much each pollutant source must reduce its contributions to assure the standard is met. Lakes and streams may have several TMDLs, each determining the limit for a different pollutant.

Table 3F shows that three watercourses and one lake in the BCWD are included on the 2012 Section 303(d) List of Impaired Waters. Two watercourses are listed multiple times for different pollutants. The Table also gives the year the impairment was listed. The absence of a waterbody or watercourse from the 303 (d) List does not necessarily mean that it is meeting its designated uses. It may be that the waterbody or watercourse has either not been sampled or there is not enough data to make an impairment determination.

<table>
<thead>
<tr>
<th>Reach</th>
<th>ID</th>
<th>Affect Use</th>
<th>Pollutant or Stressor</th>
<th>Year Listed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffalo Creek; Headwaters to JD #15</td>
<td>07010205-502</td>
<td>Aquatic Life</td>
<td>Fish Bioassessments</td>
<td>2002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aquatic Life</td>
<td>Aquatic Bioassessments</td>
<td>2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aquatic Recreation</td>
<td>Fecal Coliform</td>
<td>2008</td>
</tr>
<tr>
<td>Buffalo Creek; JD #15 to South Fk. Crow R.</td>
<td>07010205-501</td>
<td>Aquatic Life</td>
<td>Fish Bioassessments</td>
<td>2002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aquatic Life</td>
<td>Aquatic Bioassessments</td>
<td>2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aquatic Recreation</td>
<td>Fecal Coliform</td>
<td>2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aquatic Life</td>
<td>Dissolved Oxygen</td>
<td>2010</td>
</tr>
<tr>
<td>JD 15; Headwaters to Buffalo Cr.</td>
<td>07010205-513</td>
<td>Limited Resource Value</td>
<td>Fecal Coliform</td>
<td>2010</td>
</tr>
<tr>
<td>Lake Marion</td>
<td>43-0084-00</td>
<td>Aquatic Consumption</td>
<td>Mercury in Fish Tissue</td>
<td>1998</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aquatic Recreation</td>
<td>High Nutrients</td>
<td>2010</td>
</tr>
</tbody>
</table>
TMDL Development

For each impairment on the 303 (d) List, the federal CWA requires that a 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.

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.

Buffalo Creek Bacterial TMDL Report

The Final Buffalo Creek Bacterial TMDL Report was published in September 2013. The study was prepared by Wenck Associates, Inc. (Wenck) for the Crow River Organization of Water (CROW). It addresses Buffalo Creek to South Fork Crow River reach IDs 07010205-501 and 07010205-502 located in Kandiyohi, Renville, McLeod, Sibley, and Carver Counties (refer to Figure 3C). These waters are impaired and do not meet Minnesota water quality standard for pathogen indicator bacteria. These reaches were placed on the 303(d) list in 2008 because of monitoring data collected between April 1 and October 31 from 2001 through 2009. In addition, data collected from 2001 and 2005 was analyzed for fecal coliform and then E. coli beginning in 2006. The data collected revealed that: 1) fecal coliform (FC) concentrations (a class of bacteria which is a good indicator of the potential presence of pathogens) at times exceed 2,000 colony forming units per 100 milliliters (CFU/100ml), and/or 2) the geometric mean FC of a least 5 samples collected within a calendar month across several years of monitoring data at times exceed 200 CFU/100mL. This could pose a risk to swimmers and limit other recreational uses.
Figure 3C: Buffalo Creek Bacterial TMDL Study

Note: Figure 3C does not show all of Buffalo Creek Watershed District’s Impaired Waters. JD 15 Headwaters to Buffalo Creek was listed in 2010 for Fecal Coliform, after the TMDL study has been initiated. Lake Marion is also not shown.
TMDL Water Quality Data

All bacteria data utilized for the development of this TMDL are grab samples collected by the Crow River Organization of Waters (CROW) between April 1 and October 31 from 2001 through 2009. Although data prior to this period exists, the more recent data better represent current conditions in the watershed. Samples collected between 2001 and 2005 were analyzed for fecal coliform and then E. coli beginning in 2006 (refer to Table 3G). Figure 3C shows the location of the monitoring stations at which samples were collected to support this TMDL. All data was obtained through Minnesota Pollution Control Agency’s STORET online database.

Table 3G: Bacteria Data Collected at each Buffalo Creek Monitoring Station

<table>
<thead>
<tr>
<th>Site</th>
<th>STORET ID</th>
<th>Parameter</th>
<th>Year(s)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSAH24</td>
<td>S002-017</td>
<td>Fecal Coliform</td>
<td>03</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>E. coli</em></td>
<td>06-09</td>
<td>49</td>
</tr>
<tr>
<td>JD-15</td>
<td>S002-016</td>
<td>Fecal Coliform</td>
<td>01, 03</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>E. coli</em></td>
<td>06-09</td>
<td>49</td>
</tr>
<tr>
<td>Brownton</td>
<td>S000-460</td>
<td>Fecal Coliform</td>
<td>01, 03</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>E. coli</em></td>
<td>06-09</td>
<td>48</td>
</tr>
<tr>
<td>Glencoe</td>
<td>S000-582</td>
<td>Fecal Coliform</td>
<td>01, 03</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>E. coli</em></td>
<td>06-09</td>
<td>49</td>
</tr>
</tbody>
</table>

It should be noted that three of the four monitoring sites (Glencoe, Brownton and CSAH24) are located within the two impaired reaches of Buffalo Creek. The JD-15 monitoring site is located outside the listed reaches but appears to be a major contributor to the lower reach (501) impairment. Thus, this reach will be included in the data assessments presented throughout this report. JD-15 was also listed as impaired in 2010 for *E. coli*.

Data from the four monitoring sites within the Buffalo Creek watershed were analyzed to determine spatial and seasonal variability of bacteria violations. Since the bacteria standard is now expressed as E. coli, all fecal coliform data (pre 2006) was converted to E. coli “equivalent” values and combined with the E. coli data collected (post 2006) to provide the data set for which the assessments are based. Table 3H and summarize the E. coli bacteria data set (by site) available for the project area, showing the total number of samples and monthly geomeans.
Table 3H:
Impairment Assessment Data

<table>
<thead>
<tr>
<th>Site</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSAH24</td>
<td>20</td>
<td>41</td>
<td>292</td>
<td>98</td>
<td>323</td>
<td>249</td>
<td>210</td>
</tr>
<tr>
<td>JD-15</td>
<td>72</td>
<td>91</td>
<td>534</td>
<td>528</td>
<td>427</td>
<td>683</td>
<td>920</td>
</tr>
<tr>
<td>Brownton</td>
<td>32</td>
<td>53</td>
<td>376</td>
<td>372</td>
<td>420</td>
<td>518</td>
<td>330</td>
</tr>
<tr>
<td>Glencoe</td>
<td>25</td>
<td>50</td>
<td>514</td>
<td>281</td>
<td>669</td>
<td>600</td>
<td>140</td>
</tr>
</tbody>
</table>

Note: Shaded values monthly geometric mean exceed the chronic E. coli standard of 126 organisms per 100 milliliters.

The data presented in Table 3H shows the impaired reaches do not meet the bacteria standard for the April through October period based on the most recent 10 year period of record. The data also the severity of the bacteria impairments on Buffalo Creek appears to increase significantly below the Creek’s confluence with JD-15. Further, elevated bacteria concentrations in JD-15 itself may well be a substantial contributor to the impairments on the lower reach of Buffalo Creek, depending on JD-15 discharge.

BCWD Monitoring Efforts

From 1989 to 2000, the BCWD routinely sampled seven sites along the Buffalo Creek and its tributaries. Samples were collected and tested for a variety of water quality parameters, including total phosphorus, total nitrogen and total suspended solids. The results of past monitoring efforts are given in Figures 3D-3F.

Phosphorus, especially its dissolved form, orthophosphate, is often the limiting factor in the growth of algae and other types of aquatic vegetation. High concentrations of phosphorus can lead to undesirable algal blooms, which can in turn reduce aesthetic appeal and impair biological integrity. Based upon the BCWD’s sampling monitoring results, average total phosphorus concentrations are greatest during July and August. During these months, runoff levels are typically high, which is a result of increased precipitation and a moderately established crop canopy.
Total nitrogen is a cumulative measurement of nitrate, nitrite and ammonia concentrations. Together with phosphorus, nitrogen can accelerate eutrophication, causing dramatic increases in aquatic plant growth and a reduction in the ecological stability of surface water. Total nitrogen levels in the District generally exceed mean Western Corn Belt Plains Ecoregion values during May, June and July. These results can be attributed to the high levels of runoff that are normally experienced in the spring and early summer.

Total Suspended Solids (TSS) is a measurement of the suspended matter in water and is often directly related to turbidity levels. TSS can include a wide variety of material, such as soil particles and decaying plant and animal material. High concentrations of suspended solids can cause many problems for stream health and aquatic life. High levels of solids can block light from reaching submerged vegetation, which can reduce photosynthesis levels and eventually dissolved oxygen levels. TSS concentrations within the District are significantly higher than the mean values for the ecoregion. Much like total phosphorus and total nitrogen concentrations, TSS levels peak in the spring and early summer months.

Figure 3D:
Buffalo Creek Watershed District
Summary of Total Phosphorus Monitoring (1996-2000)
**Figure 3E:**
Buffalo Creek Watershed District

**Figure 3F:**
Buffalo Creek Watershed District
Crow River Organization of Water (CROW)

In 2001 the Crow River Organization of Water (CROW) was awarded a Phase I Clean Water Partnership grant from the Minnesota Pollution Control Agency to complete a diagnostic study on the Crow River Watershed. The diagnostic study was necessary because although previous studies completed on select areas of the watershed had shown potential phosphorus and other nutrient loading problems, there had been no coordinated effort to characterize the watershed as a whole. The diagnostic study was designed to fill in some gaps that existed in the available data and increase our understanding of the Crow River Watershed flows as well as primary sources of nutrient loading.

Monitoring sites were selected with input from the MPCA, the Metropolitan Council, local water planners and water quality professionals. The study began in the spring of 2001 with the establishment of 17 primary monitoring stations and 13 secondary stations. Table 3I shows the sites located within the Buffalo Creek Watershed District. Primary Sites were equipped with flow data loggers and in some cases, electronic rain gauges. Data was downloaded each month by the DNR. At Secondary Sites, flows were taken manually. The Minnesota Department of Natural Resources (DNR) was hired to measure all water flows at the monitoring sites.

A target sample size of 15-20 samples per year per station for the first two years of sampling was set and met. All samples were analyzed for Total Phosphorus (TP), Ammonia (NH4), Ortho Phosphorus (OP), nitrate-nitrogen (NO3), Total Kjeldahl Nitrogen (TKN) and Total Suspended Solids (TSS). Alkalinity, Chlorides, BOD, Chlorophyll a, and bacteria were monitored somewhat less intensively. In addition, minisonde measurements were taken for Dissolved Oxygen (DO), temperature, pH and conductivity at each monitoring site. Samples were taken mid-stream and mid-depth from bridges and culverts using a horizontal sampler.

<table>
<thead>
<tr>
<th>Site Number</th>
<th>Site Name</th>
<th>Type</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Glencoe</td>
<td>Primary</td>
<td>County Road 1, approximately 1 mile east of Glencoe in McLeod County. DNR flood gauging station.</td>
</tr>
<tr>
<td>22</td>
<td>Browntont</td>
<td>Primary</td>
<td>Flows taken on County Road 25 in Browntont (DNR flood gauging site). Samples taken on Orange Avenue approx. 1 mile east of Browntont in McLeod County.</td>
</tr>
<tr>
<td>28</td>
<td>JD 15</td>
<td>Secondary</td>
<td>Buffalo Creek Tributary - on 550th Street, approximately 2 miles west of County Road 20, and ¼ mile south of County Road 25 in Renville County.</td>
</tr>
<tr>
<td>31</td>
<td>CSAH 24</td>
<td>Primary</td>
<td>BC – ¼ mile north of CR 23</td>
</tr>
</tbody>
</table>
**Phase I Phosphorus Results**

Eutrophication is a condition in an water body where high nutrient concentrations stimulate blooms of algae. Although eutrophication is a natural process in the aging of lakes and streams, human activities can greatly accelerate eutrophication by increasing the rate at which nutrients and organic substances enter a waterbody from its surrounding watershed. Because Phosphorus is generally the limiting nutrient for aquatic plant growth, excess phosphorus causes nuisance algae blooms and reduced water transparency, making waters unsuitable for swimming or other activities. In the Crow River, as in most lakes and rivers, the phosphorus inputs come from both point and non-point sources. Point sources include discharges from municipal, industrial and commercial wastewater treatment facilities. Non-Point sources come from feedlots, septic systems, urban storm water and agricultural runoff.

Excess phosphorus has been linked to excessive algal growth in the lower reaches of the Crow River. During the diagnostic study, two forms of phosphorus were measured; total phosphorus (TP) and ortho phosphorus (OP).

**Ortho-Phosphorus**

Ortho phosphorus (OP) is a chemical form of phosphorus that is more available for use by plants, algae and bacteria. During the diagnostic study, OP concentrations made up to 90% of the total phosphorus concentrations at some monitoring sites. This indicates a high potential for eutrophication in downstream waters. The highest OP values in BCWD were found at the Glencoe monitoring site (refer to Figure 3G):

**Figure 3G:**
CROW Phase I FWM Ortho Phosphorus Concentrations
**Total Phosphorus**

Flow-weighted mean (FWM) concentrations reflect the total estimated load of phosphorus divided by the total volume of water passing by a stream location. In the Western Corn Belt Plains Ecoregion (where Buffalo Creek Watershed District is located), the typical FWMC range from 220 ppb (25%) to 360 ppb (75%) with a median of 280 ppb (50%). Figure 3H shows the total phosphorus FWMC for the South Fork Subwatershed. Notice the JD 15, Brownton, and Glencoe monitoring sites were all above the 50% WCBP Ecoregion averages.

**Figure 3H:**
CROW Phase I FWM Total Phosphorus Concentrations

![Graph showing total phosphorus concentrations for various sites with JD 15, Brownton, and Glencoe monitoring sites above the average.]

**Phase I Total Suspended Solids Results**

Total Suspended Solids (TSS) can include a wide variety of material, such as silt, decaying plant and animal matter, industrial wastes, and sewage. High concentrations of suspended solids can cause many problems for stream health and aquatic life. It can cause aquatic plants to die due to lack of light, causing oxygen depletion as the plants are decomposed. High TSS can cause an increase in surface water temperature because the particles absorb heat from the sun. An increase in TSS can also cause problems for fish. It makes it difficult for them to see and catch food, can clog their gills and prevent egg and larval development.

The diagnostic study showed (refer to Figure 3I) that in the North Fork sub-watershed, mainstem TSS loading was generally greater in 2002 than in 2001. The opposite was generally true in the South Fork, with higher loading occurring in 2001. The lower South Fork TSS loads in 2002 coincided with reduced rainfall for this portion of the watershed up to the Mayer-Delano area.
The FWMC averages in the NCHF ecoregion are 4,800 to 16,100 ug/l (25%-75%). The North FWMC for TSS values in 2001 were generally 5,000 to 20,000 ug/l, quite similar to the ecoregion range. The FWMC concentrations increased substantially in 2002 going from the Hwy 22 site (22,000ug/l) to the Kingston site (34,000 ug/l) to the CR 4 site (40,000 ug/l). These North Fork values indicate a potential for stream bed erosion sources of TSS.

For the WCBP ecoregion, the TSS FWMC averages are 10,000 to 57,700 ug/l (25%-75%). The diagnostic study showed values in the South Fork that were quite comparable to the typical ranges. Buffalo Creek’s FWMC had more variability, ranging from 5,000 to nearly 70,000 ug/l. The higher values are somewhat greater than typical values for the WCBP ecoregions. The effects of the wet conditions of 2002 resulted in higher FWMC for several of the South Fork and Buffalo Creek stations than what was observed in 2001. In some cases (JD 15, Mayer) the values almost doubled.

**Figure 3I:**
CROW Phase I TSS Concentrations

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**Phase I Nitrogen Results**

Nitrogen is very common and found in many forms in the environment. The diagnostic study measured the following forms: nitrate (NO₃) nitrogen, ammonia (NH₃), total kjeldahl nitrogen (TKN). Excessive concentrations of nitrate, nitrite, or ammonia can be harmful to humans and wildlife. High levels of nitrate, along with phosphate, can over stimulate the growth of aquatic plants and algae, resulting in the consumption of dissolved oxygen, causing the death of fish and other aquatic organisms. This process is called eutrophication. Nitrate, nitrite, and ammonia enter waterways from lawn fertilizer run-off, leaking septic tanks, animal wastes, industrial waste waters, sanitary landfills and discharges from car exhausts.
**Nitrate nitrogen**

Nitrate nitrogen FWMC for the basin increase substantially as you move across the watershed from the North Fork toward the South Fork and into Buffalo Creek (refer to Figure 3J). The nitrate concentrations in the North Fork sub-watershed greatly exceed typical NCHF ecoregion stream values of 40 ug/l (25%) to 260 ug/l (75%). Values of greater than 10,000 mg/l were noted at Buffalo Creek and JD 15 sites in the South Fork Subwatershed. Buffalo Creek’s FWMC ranged from 7000 to 16000 ug/l, much higher than the typical range of 1400 to 7400 ug/l noted in the WCBP ecoregion streams.

**Figure 3J:**

**CROW Phase I Nitrate N Concentrations**

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**Citizen Stream Monitoring Program**

The Citizen Stream Monitoring Program (CSMP) is a citizens monitoring program for Minnesota’s 92,000 miles of streams. CSMP combines the knowledge and commitment of interested citizens with the technical expertise and resources of the MPCA. When CSMP began in 1998, 17 volunteers monitored 22 sites. Currently, approximately 400 volunteers monitor over 500 sites in Minnesota. Five of these sites are located within the Buffalo Creek Watershed District.

Approximately once a week during the summer, monitors measure transparency, appearance, recreational suitability and stream stage at a designated location on a stream. Monitors also measure precipitation daily.
The purpose of the CSMP is to increase the overall understanding of how human activities, such as land use, affect water quality. The goals of the CSMP are to:

- Help determine the condition of Minnesota streams by expanding our water-quality monitoring network.
- Provide the opportunity for anyone interested to participate in a basic, centrally administered and interpreted stream monitoring program.
- Support existing volunteer monitoring programs.
- Facilitate awareness and understanding of water-quality issues, and promote shared responsibility for protection of Minnesota's water resources.

Changes over time in transparency, appearance and recreational suitability can serve as yardsticks to measure improvements or declines in water quality. CSMP data can be used in the following ways:

- **Water quality assessment and impairment determination** - Transparency readings are good predictors of the turbidity (cloudiness) of the water. CSMP transparency data are used to assess the condition of MN streams under the Federal Clean Water Act. When a stream transparency reading is below 20 centimeters, which is Minnesota’s State limit or “standard” for turbidity, the stream is considered to have turbidity problems.

- **Before and after a change in upstream land use** - If a land management change is planned near a stream or river, select a monitoring site just downstream of where the change will take place. Monitor before and after the change occurs to detect any potential effects on the stream.

- **Seasonal storm monitoring** - Compare CSMP data for rainfall events during spring, summer, and fall to background or baseflow (low flow) conditions. Keep track of upstream land management practices or crop status during this period.

- **Upstream and downstream of a water quality improvement project** - Monitor a site upstream, and a site downstream of a stormwater retention pond or stream vegetative buffer (fenced area along the edges of a stream) to evaluate its effectiveness at reducing sediment inputs.

Table 3J lists the six Citizen Stream Monitoring Program sites located within the BCWD and provides a summary of the data collected in 2012. Notice that three of the sites were only tested one or two times during 2012. The District’s most tested CSMP is located in the City of Glencoe.
Taking a close look at where the MPCA and CROW have established monitoring sites within the BCWD, and comparing it to the CSMP sites listed in Table 3J, it would appear that a few more CSMP sites would be beneficial. This is especially true towards the northwester boundary of the BCWD, a few miles southeast of the City of Blomkest. In addition to adding a few more test sites, it might be even more beneficial to the BCWD to have the established CSMP sites be tested more regularly throughout the summer months. It is difficult to assess the value of data when only one or two site visits are reported annually. Table 3K shows the average transparency CSMP results for the Buffalo Creek at CSAH-15 site in Glencoe for the years 2006-2012.

Table 3J:
Citizen Stream Monitoring Program Sites in BCWD and 2012 Results

<table>
<thead>
<tr>
<th>Station ID</th>
<th>Station Name/Location</th>
<th>Number of 2012 Visits</th>
<th>Mean (cm)</th>
<th>Min/Max (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S000-458</td>
<td>Buffalo Creek at RD BTN S2/3 (3 miles SE of Brownton)</td>
<td>1</td>
<td>16.00</td>
<td>16/16</td>
</tr>
<tr>
<td>S000-580</td>
<td>Buffalo Creek at CR-74 (2.5 miles North of Plato)</td>
<td>12</td>
<td>23.92</td>
<td>10/49</td>
</tr>
<tr>
<td>S005-365</td>
<td>UNN STR on 835th Avenue (5 miles NE of Buffalo Lake)</td>
<td>1</td>
<td>23.00</td>
<td>23/23</td>
</tr>
<tr>
<td>S000-366</td>
<td>JD-1, Inlet to Lake Allie (6 miles NE of Buffalo Lake)</td>
<td>2</td>
<td>24.00</td>
<td>22/26</td>
</tr>
<tr>
<td>S000-298</td>
<td>Buffalo Creek at CSAH-15 (in Glencoe)</td>
<td>23</td>
<td>23.74</td>
<td>9/53</td>
</tr>
<tr>
<td>S000-137</td>
<td>UNN STR to JD-15, Just N of CR-71 (3 miles SE of Bird Island)</td>
<td>5</td>
<td>96.20</td>
<td>81/100</td>
</tr>
</tbody>
</table>

Table 3K:
2006-2012 Average Transparency Results for the Buffalo Creek at CSAH-15 CSMP Site

<table>
<thead>
<tr>
<th>Data/Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>7-Year Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Results</td>
<td>25</td>
<td>32</td>
<td>25</td>
<td>27</td>
<td>26</td>
<td>25</td>
<td>23</td>
<td>26</td>
</tr>
<tr>
<td>Average (cm)</td>
<td>29.40</td>
<td>28.88</td>
<td>38.50</td>
<td>35.11</td>
<td>41.65</td>
<td>41.36</td>
<td>23.74</td>
<td>34.09</td>
</tr>
</tbody>
</table>
Environmental Data Access

The Minnesota Pollution Control Agency (MPCA) collects a wide variety of data on environmental conditions and pollution sources. Environmental Data Access provides convenient public access to much of this data. Data on the following subjects can be accessed by visiting www.pca.state.mn.us or clicking the hyperlink below (electronic BCWD Plan version only).

- **Air quality**
  - Air monitoring, facility emissions, air pollutants

- **Contaminated Sites**
  - Superfund, contaminated sites, voluntary cleanup

- **Petroleum storage tanks**
  - Registered tanks, tank leaks

- **Recycling and pollution prevention**
  - Recycling facilities, household hazardous waste collection

- **Spatial data**
  - Geospatial datasets and GIS shapefiles

- **Stormwater**
  - [Construction Stormwater Permit Information](#)
  - [Industrial Stormwater Permit Information](#)

- **Waste Management**
  - **Hazardous waste**
    - Licensed generators and transporters, manifest reports
  - **Solid waste**
    - Disposal, landfills, management

- **Water Quality**
  - **Groundwater**
    - Monitoring wells, monitoring data
  - **Surface water**
    - Lake and stream monitoring, condition assessments, impaired waters, restoration/protection projects, permits

- **What's in My Neighborhood?**
  - Find a wide variety of environmental information about your community or any Minnesota locale of interest. Use text-based or map-based tools to search for information on businesses or activities regulated by the MPCA.
B: BCWD Priority Issue 3 - Conservation Buffers

Issue Overview: Generally, the Buffalo Creek and its floodplain, from the City of Stewart to the South Fork of the Crow River, remains in its natural state, providing an adequate riparian buffer. West of Stewart, the Buffalo Creek has been channelized and has very little vegetative buffering. The lack of buffers has led to erosion and overall degradation of the Creek’s banks.

Key Players: BWSR, NRCS, SWCDs

District’s Role: Nonregulatory – cooperator

Priority Areas and Subwatersheds (also refer to Map 6A):

- Judicial Ditch 4
- Judicial Ditch 15
- Minor Watersheds 19056; 19057; 19058; 19067; 19069; 19071; 19072; 19073; 19074; 19075; 19076; 19077; 19078; and 19079

Implications and Assessments

A conservation buffer is an area or strip of land maintained in permanent vegetation to help control pollutants and manage other environmental problems. Examples of conservation buffers include filter strips, riparian buffers, contour buffer strips, field borders, windbreaks, shelterbelts and living snow fences. Whether short term or perpetual, conservation buffers are commonly used to protect water quality, reduce soil erosion and enhance fish and wildlife habitat. If properly installed and maintained, buffers have the capacity to:

- Remove up to 50 percent or more of nutrients and pesticides in runoff.
- Remove up to 60 percent or more of certain pathogens in runoff.
- Remove up to 75 percent or more of sediment in runoff.

Besides the aforementioned benefits, conservation buffers can also be used to reduce noise and odor, reduce flooding, conserve energy, protect buildings, roads and livestock and improve aesthetics. There is an extensive body of literature that demonstrates the environmental and economic benefits of conservation buffers. In general, most studies recommend a minimum buffer width of 25-30 feet for minimal water quality benefits. For wildlife benefits, buffer widths of 100 to 200 feet are commonly advised, with some studies advocating for buffers over 300 feet.
Conservation Buffer Programs

In April 1997, the USDA launched the new National Conservation Buffer Initiative and pledged to help landowners install 2 million miles of conservation buffers. The Initiative encourages farmers and ranchers to understand the economic and environmental benefits of buffer strips and implement practices through the various programs in the conservation tool kit. These programs include the continuous Conservation Reserve Program (CRP) sign-up, Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentives Program (WHIP), Wetlands Reserve Program (WRP) and Emergency Watershed Protection Program (EWP).

The Initiative is led by the NRCS in cooperation with the Agricultural Research Service, Farm Service Agency; Forest Service; Cooperative State Research, Education, and Extension Service; State conservation agencies; conservation districts; and numerous other public and private partners. To implement the initiative, the NRCS designated an agricultural coordinator to work with the National Corn Growers Association to promote buffers among corn growers and other agricultural groups, as well as appointed a liaison to assist the National Pork Producers Council in promoting the acceptance of conservation buffers as a means of aiding livestock manure management efforts.

Conservation Reserve Program (10-15 Year Contracts)

The Conservation Reserve Program (CRP) offers annual rental payments and cost-share assistance to landowners to establish long-term resource-conserving covers on eligible land. Cover options include grasses, legumes and tree plantings. The goals of the program are to reduce soil erosion, enhance fish and wildlife habitat, improve water quality, protect soil on cropland, demonstrate good land stewardship and improve rural aesthetics.

Under the CRP program, the Commodity Credit Corporation (CCC) makes annual rental payments based on the agriculture rental value of the land and provides cost-share assistance in an amount equal to not more than 50 percent of the participant’s costs in establishing approved practices. The durations of contracts are from 10 to 15 years. In return for annual payments, the landowner agrees to implement a conservation plan approved by the local conservation district for converting highly erodible cropland or environmentally sensitive land to a less intensive use (i.e., cropland must be planted with a vegetative cover, such as perennial grasses, legumes, forbs, shrubs, or trees). The cropland must be owned or operated for at least 12 months prior to the close of the annual sign-up period, unless the land was acquired by will or succession or the Farm Service Agency (FSA) determines that ownership was not acquired for the purpose of placing the land in the conservation reserve. Through the continuous sign-up portion of the CRP program, landowners are given additional flexibility to implement certain high-priority
conservation practices on eligible land. Offers to landowners are accepted without a waiting period, provided that eligibility requirements are met. In addition, the following financial incentives are available through the continuous CRP sign-up.

- A signing incentive payment of $100 to $150 per acre for riparian buffers, filter strips, grassed waterways, shelterbelts, field windbreaks and living snow fences.
- Up to 50 percent cost sharing for practice installation.
- A practice incentive payment equal to 40 percent of eligible practice installation costs.
- A 20 percent rental rate incentive for riparian buffers, filter strips, grassed waterways and field windbreaks.
- A 10 percent rental rate incentive for wellhead protection areas.
- Higher annual maintenance payments per acre for certain activities.

The CRP program is administered by the FSA, with assistance from the NRCS and local soil and water conservation districts. As of December 31, 2002, the BWSR reported 47,324 acres enrolled in the CRP program within the District’s five-county region. This total represented approximately two percent of the five-county region’s total area. In August 2013, BWSR updated this report (http://www.bwsr.state.mn.us/easements). The results are shown in Table 3L, which show the region’s conservation acres have doubled to 85,628 acres (5.1% of total cropland) since 2002.

**Table 3L: Kandiyohi, Renville, McLeod, Carver, and Sibley County’s Conservation Lands Summary**

~ Prepared by BWSR as of 8-1-2013 ~

<table>
<thead>
<tr>
<th>County</th>
<th>CRP</th>
<th>Continuous CRP</th>
<th>CREP</th>
<th>RIM</th>
<th>RIM/WRP</th>
<th>WRP</th>
<th>Total Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carver</td>
<td>1,585</td>
<td>2,417</td>
<td>135</td>
<td>626</td>
<td>116</td>
<td>481</td>
<td>5,361</td>
</tr>
<tr>
<td>Kandiyohi</td>
<td>16,703</td>
<td>15,473</td>
<td>3,017</td>
<td>2,923</td>
<td>2,592</td>
<td>81</td>
<td>40,788</td>
</tr>
<tr>
<td>McLeod</td>
<td>1,455</td>
<td>4,231</td>
<td>865</td>
<td>940</td>
<td>1,082</td>
<td>410</td>
<td>8,982</td>
</tr>
<tr>
<td>Renville</td>
<td>1,601</td>
<td>5,253</td>
<td>10,375</td>
<td>5,256</td>
<td>621</td>
<td>1,079</td>
<td>24,186</td>
</tr>
<tr>
<td>Sibley</td>
<td>1,106</td>
<td>2,078</td>
<td>810</td>
<td>1,708</td>
<td>579</td>
<td>30</td>
<td>6,311</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>22,450</td>
<td>29,452</td>
<td>15,202</td>
<td>11,453</td>
<td>4,990</td>
<td>2,081</td>
<td><strong>85,628</strong></td>
</tr>
</tbody>
</table>

| 5-County Area Total Acres of Cropland | 1,668,191 |
| 5-County Area Percent of Conservation Easements/Total Acres of Cropland | 5.1% |
Environmental Quality Incentives Program (1-10 Year Contracts)

The Environmental Quality Incentives Program (EQIP) was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for livestock and agricultural producers that promotes agricultural production and environmental quality as compatible goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.

The EQIP program offers contracts with a minimum term that ends one year after the implementation of the last scheduled practices and a maximum term of ten years. These contracts provide incentive payments and cost-shares to implement conservation practices. EQIP may cost-share up to 75 percent of the costs of certain conservation practices. Incentive payments may be provided for up to three years to encourage producers to carry out management practices they may not otherwise use. However, limited resource producers and beginning farmers and ranchers may be eligible for cost-shares up to 90 percent. Program measures are carried out according to an environmental quality incentives program plan of operations, developed in conjunction with the landowner, which identifies the appropriate conservation practice or practices to address the resource concerns. Practices identified in the plan are subject to NRCS technical standards and approval through the local SWCD.

Wildlife Habitat Incentives Program (5-10 Year Contracts)

The Farm Security and Rural Investment Act of 2002 reauthorized the Wildlife Habitat Incentives Program (WHIP) as a voluntary program for people who want to develop and improve wildlife habitat. WHIP has proven to be a highly effective and widely accepted program throughout the State. WHIP wildlife habitat targets projects on all lands and aquatic areas, and provides assistance to conservation minded landowners who are unable to meet the specific eligibility requirements of other USDA conservation programs.

Through WHIP, the NRCS provides both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat. WHIP agreements between NRCS and the landowner generally last from 5 to 10 years from the date the agreement is signed.

Wetland Reserve Program (Perpetual/ Limited Easements)

The Wetland Reserve Program (WRP) is a voluntary program through the USDA to restore and protect wetlands on private property. It provides an opportunity for landowners to receive financial incentives to restore or enhance wetlands on their property. Landowners can enroll in the WRP by one of the following means.
Permanent Easement - USDA will pay the lowest of the following three amounts: (1) the agricultural value of the land, (2) an established payment cap, or (3) an amount offered by the landowner. In addition, the USDA pays 100 percent of the cost of restoring wetlands and seeding of upland areas into native grasses and forbs.

30-Year Easement - USDA will pay 75 percent of the appraised market value for the land and 75 percent of the cost associated with wetland restorations and upland native grass seeding.

Restoration Cost-Share Agreement - USDA will pay 75 percent of the cost of restoring a wetland in exchange for a minimum ten-year agreement to maintain the restoration. No land use payment is provided.

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

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

The WRP program is administered by the NRCS, with assistance from local soil and water conservation districts. In December 31, 2002, the BWSR reported 1,116 total acres enrolled in the WRP program in the District’s five county area. In 2013, this number increased to 2,081 acres (refer to Table 3L).

Emergency Watershed Protection Program (Contract/Perpetual Easements)

The Emergency Watershed Protection (EWP) program was developed to help protect lives and property threatened by natural disasters such as floods, hurricanes, tornadoes and wildfires. The program is administered by the NRCS, which provides technical and financial assistance to owners, managers and users of public, private, or tribal lands whose watershed area has been damaged by a natural disaster. Each EWP project, with the exception of floodplain easements, requires a sponsor who applies for the assistance. A sponsor can be any legal subdivision of State or local government, including officials of city, county, or State governments, Indian tribes, soil conservation districts, U.S. Forest Service and watershed districts. They determine priorities for emergency assistance while coordinating work with other Federal and local agencies.
Sponsors are needed to provide legal authority to do repair work, obtain necessary permits, contribute funds or in-kind services and maintain the completed emergency measures.

EWP has traditionally provided funding to project sponsors for such work as clearing debris from clogged waterways, restoring vegetation and stabilizing river banks. The NRCS provides up to 75 percent of the funds needed to restore the natural function of a watershed. The community or local sponsor of the work pays the remaining 25 percent, which can be provided by cash or in-kind services. Measures taken need to be environmentally and economically sound and generally benefit more than one property owner.

In 1996, the EWP program was amended to provide for the purchase of floodplain easements as an emergency measure. Floodplain easements restore, protect, maintain and enhance the functions of the floodplain; conserve natural values, including fish and wildlife habitat, water quality, flood water retention, ground water recharge, and open space; reduce long-term Federal disaster assistance; and safeguard lives and property from floods, drought, and the products of erosion. The NRCS may purchase EWP easements on any floodplain lands that have been impaired within the last 12 months or that have a history of repeated flooding (i.e., flooded at least two times during the past 10 years). Purchases are based upon established agency priorities. Under the floodplain easement option, a landowner voluntarily offers to sell a permanent conservation easement that provides the NRCS with the full authority to restore and enhance the floodplain’s functions and values. In exchange, a landowner receives the least of one of the three following values as an easement payment.

- A geographic rate established by the NRCS State conservationist;
- A value based on a market appraisal analysis for agricultural uses or assessment for agricultural land; or
- The landowner offer.

The easement provides the NRCS with the authority to restore and enhance the floodplain’s functions and values. The NRCS may pay up to 100 percent of the restoration costs. To the extent practicable, the NRCS actively restores the natural features and characteristics of the floodplain through re-creating the topographic diversity, increasing the duration of inundation and saturation and providing for the re-establishment of native vegetation. The NRCS may pay 75 percent of the cost of removing buildings when appropriate.
Reinvest in Minnesota Reserve Program (Perpetual Easement)

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

Since its beginning in 1986, funding for the program has been erratic, ranging from $51 million to $3 million. The program has historically fostered partnerships with private organizations, including Pheasants Forever, Ducks Unlimited, Minnesota Waterfowl Association and other government agencies, including the USFWS and the Minnesota DNR. According to Table 3L, the five county area has approximately 11,453 acres enrolled in RIM (note: Table 3L also reports an additional 4,990 acres enrolled in both WRP/RIM).

**BCWD Conservation Buffers Policy Guidelines**

Based upon the information presented in Chapter Four, the BCWD should use the following principles to guide land-use, permitting and administrative decisions to facilitate conservation buffers (please refer to Chapter Four for a complete listing of BCWD Goals, Objectives, and Policy Guidelines):

- A vegetative cover should be maintained on all ditch banks and slopes. The District shall provide cost-share assistance when available.

- Overland flow of water into ditches should be filtered or avoided.
C: BCWD Priority Issue 4 - Erosion and Sediment Control

**Issue Overview:** Management of erosion and sedimentation has been an important objective of the BCWD since its creation. With additional growth and development projected to occur in the District, the need for erosion and sediment control will become increasingly important in order to prevent the degradation of water resources. As a priority issue, the Overall Plan Taskforce recommended that the District profile practices that can be used to control various forms of erosion and associated sedimentation.

**Key Players:** BCWD, Cities, Counties, MECA, MPCA

**District’s Role:** Regulator

**Priority Areas and Subwatersheds (also refer to Map 6A):**

- Judicial Ditch 4
- Judicial Ditch 15
- City of Brownton
- County Park 1
- Minor Watersheds 19056; 19057; 19058; 19067; 19069; 19071; 19072; 19073; 19074; 19075; 19076; 19077; 19078; and 19079

**Implications and Assessments**

Soil erosion and sedimentation are major sources of non-point source (NPS) pollution within the District. Soil particles can potentially carry a wide variety of pollutants into lakes and streams, including: nutrients, pesticides, toxic metals, oils and other contaminants. Water resource impacts associated with erosion and sedimentation include those listed below.

- **Fisheries** – Increased temperature and turbidity of water drives out sensitive fish species. Sediment deposits in stream channels impair gravel beds necessary for the reproduction of many species. Aquatic organisms that are food for fish are also adversely affected. Loss of habitat, reproduction areas and food sources combine to reduce fish populations.

- **Recreation** – Nutrients adhering to sediment often leads to nuisance growth of algae and weeds. The combination of weeds and sediment deposits choke navigable waters and create boating hazards.
• **Health Hazards** – Sediment deposits reduce reservoir storage space and introduce toxins, bacteria and chemicals to water supplies. Increased treatment is needed to bring drinking water into compliance with State and Federal standards. Frequent flooding increases exposure to a variety of health risks associated with contaminants in floodwater or in sediment deposits left after water recedes.

• **Economic** – Taxpayers bear the burden of costs to dredge water channels, to clean clogged storm sewer systems, to repair flood damage and to increase treatment of water supplies. Topsoil loss from agricultural areas reduces productivity of farmland, eventually resulting in increased cost for agricultural products.

**Erosion and Sedimentation Control BMPs**

Erosion can occur in many forms, including splash, sheet, rill, gully and streambank and streambed. The following section reviews each type and provides examples of BMPs typically implemented to control erosion. Because agricultural land is exempted from the District’s rules and regulations, the following section focuses primarily on construction site erosion and sediment control.

**Splash Erosion**

Raindrops can impact the ground at velocities up to 20 mph, detaching and suspending soil particles in runoff. On bare ground, that can contribute to nearly 100 tons/acre splashed into the air during a heavy storm. The following are BMPs that are commonly used to control splash erosion.

- Preserve and maintain existing vegetative cover
- Limit soil exposure by phasing construction
- Utilize temporary and permanent cover

**Sheet Erosion**

When runoff is dispersed over a wide area of disturbed soil, soil is removed in thin layers or sheets. Sheet erosion is the transporting mechanism of soil loosened by raindrops. BMPs used to control sheet erosion include those listed below.

- Reduce runoff volume
- Install sediment trapping devices
Rill Erosion

Depending on slope length and gradient, soil erodibility, rainfall intensity and amount of cover, sheet erosion can concentrate into tiny channels known as “rills”. Road cuts and fills are particularly susceptible to this form of erosion. To control rill erosion, the following BMPs are often implemented.

- Roughen the topsoil
- Stabilize slopes
- Reduce slopes
- Reduce runoff velocity
- Dissipate rills

Gully Erosion

If rills have not been repaired or converted back to sheet flow, runoff can further concentrate and enlarge into gullies. Gully repair can be very time-consuming and costly in terms of labor and machinery. A listing of possible BMPs is provided below.

- Divert concentrated flows
- Stabilize culvert inlets and outlets
- Sediment traps or basins

Streambank and Streambed Erosion

As runoff gains momentum, the discharge into streams can scour and undercut streambanks. Bank erosion adds to suspended material carried downstream from construction sites. Sediment deposits can alter stream channel characteristics and flow patterns. Methods to compensate for these changes are listed below.

- Protection of streambanks and stream beds
- Restoration of streambanks

Sedimentation

Sedimentation occurs wherever water slows down enough to deposit the silt and sediment load from upstream. Installing sediment trapping devices in these strategic areas provides for the maximum reduction of sediment. The following BMPs should be implemented in conjunction with sediment control devices.
- Maintain the sediment control device
- Adapt sediment controls to the site
- Remove sediment from the device, as necessary

**Erosion and Sedimentation Control Standards**

Presently, the District implements the *Minnesota Construction Site Erosion and Sediment Control Planning Handbook*. While the criteria outlined in this handbook is believed to be adequate to meet the current needs of the District, adaptation may be necessary to address future growth related issues. An additional source of erosion and sediment control criteria that could be reviewed is the *Minnesota Urban Small Sites BMP Manual*, which was developed by the Metropolitan Council. As discussed in chapter two, the manual focuses on runoff management for sites less than five acres and provides information on tools and techniques to assist local governmental units and landowners in guiding development. The manual includes detailed information on several erosion and sediment control BMPs that are designed for small sites in a cold-climate setting.

**BCWD Erosion and Sediment Control Policy Guidelines**

Based upon the information presented in Chapter Four, the BCWD should use the following principles to guide land-use, permitting and administrative decisions to related to erosion and sediment control issues (please refer to Chapter Four for a complete listing of BCWD Goals, Objectives, and Policy Guidelines):

- Adequate erosion control measures should be incorporated into the designs of all proposed projects.
- All contractors, including “do-it-yourself” projects, should be held accountable for minimizing water runoff and soil erosion.
- Erosion should be prevented during and after construction projects and ditch maintenance activities.
- Support efforts by local units of government in the District to develop, adopt and administer performance standards that protect water resources.
- Abandoned above ground and underground storage tanks should be filled or removed.
- Unrestricted access of livestock to waterways should be prevented.
D: BCWD Priority Issue 5 - Feedlots

Issue Overview: Each of the counties within the BCWD are delegated to administer the State Feedlot Program. While the District is not directly involved with this Program, feedlots pose a potential pollution hazard to the water resources of the District.

Key Players: Counties, MPCA, MDA

District’s Role: Nonregulatory – cooperator

Priority Areas and Subwatersheds (also refer to Map 6A):

- Judicial Ditch 4
- Judicial Ditch 15
- Minor Watersheds 19056; 19057; 19058; 19067; 19069; 19071; 19072; 19073; 19074; 19075; 19076; 19077; 19078; and 19079

Implications and Assessments

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

The County feedlot program is a cooperative arrangement between the Minnesota Pollution Control Agency (MPCA) and county government to administer Minnesota's feedlot rule. This cooperative program is known as "county delegation" or the "county feedlot program." County feedlot programs are responsible for the implementation of feedlot rules and regulations. All of the BCWD counties are delegated counties.

There are about 25,000 feedlots on record in Minnesota required to be registered. In accordance with the MPCA’s feedlot regulations, the owner(s) of an animal feedlot or manure storage area with 50 or more animal units, or 10 or more animal units if in shoreland (less than 300 feet from a stream or river, or less than 1,000 feet from a lake) needed to be registered with the MPCA.

Definition of an animal unit

A standardized measure to compare differences in the production of animal manure for an animal feedlot or manure storage area. A mature cow of about 1000 pounds (455 kg.) is the standard unit.
Figure 3J shows the number of feedlots on record with the MPCA by county, along with each county’s main feedlot contact.

2013 Feedlot Rule Update

The Minnesota Pollution Control Agency proposes amending existing Minn. Rules Ch. 7020, which govern the storage, transportation, disposal, and use of animal manure and process wastewaters, and the application for and issuance of permits for construction and operation of animal manure management and disposal or utilization systems for the protection of the environment. For more information on the proposed amendments, Statement of Need and Reasonableness explaining why the changes were made, and the public comment process, go to the Feedlot Rulemaking webpage on the MPCA website (www.pca.state.mn.us).

BCWD Feedlot Policy Guidelines

Based upon the information presented in Chapter Four, the BCWD should use the following principles to guide land-use, permitting and administrative related decisions to feedlots (please refer to Chapter Four for a complete listing of BCWD Goals, Objectives, and Policy Guidelines):

✓ Unrestricted access of livestock to waterways should be prevented.

✓ Work to ensure that stakeholders understand the issues related to nutrient and sediment reduction, as well as other sources of nonpoint source pollution.

✓ Best Management Practices (BMPs) should be encouraged along all waterways and watercourses, with special emphasis on private and public ditches.
E: BCWD Priority Issue 6 - Subsurface Sewage Treatment Systems (SSTS)

Issue Overview: Subsurface Sewage Treatment Systems (SSTSs) within the District are failing to properly treat sewage, thus posing a threat to the quality of water resources. As a priority issue, the BCWD shall continue to provide cost-share assistance, when funds are available, to upgrade non-compliant systems.

Key Players: Counties, MPCA

District’s Role: To provide non-regulatory information on rules and statutes and to provide cost-share assistance when funds are available.

Priority Areas and Subwatersheds (also refer to Map 6A):

- Judicial Ditch 4
- Judicial Ditch 15
- Minor Watersheds 19056; 19057; 19058; 19067; 19069; 19071; 19072; 19073; 19074; 19075; 19076; 19077; 19078; and 19079

Implications and Assessments

Subsurface Sewage Treatment Systems (SSTSs) are used for the treatment and disposal of wastewater from individual homes, clusters of homes, isolated communities, industries, or institutional facilities. When properly functioning, SSTSs are an effective means of treating wastewater. However, if improperly designed, installed or maintained, SSTSs have the potential to adversely impact surface and groundwater resources. Human waste contains high concentrations of microorganisms and many chemicals, including carbon, nitrogen, phosphorus, salts and trace elements. These pollutants are a public health concern and can degrade the environment.

The first State law addressing failing SSTSs, known as the SSTS act, went into effect in 1994. This legislation has since been codified as Minn. Rule Chapter 7080. Chapter 7080 requires that all new construction and replacement of SSTSs meet minimum statewide standards. It also systematically addresses the adequacy of existing systems through upgrading of failing systems before construction of an additional bedroom. The following are the State’s objectives in regulating sewage systems through Chapter 7080.

- Keep inadequately treated sewage away from human contact to prevent disease.
- Reduce levels of pathogenic bacteria and viruses discharged to the environment.
• Reasonably and cost-effectively prevent groundwater contamination.

• Develop clear direction for design, construction and maintenance of sewage treatment facilities.

• Strive for cost effective methods of sewage treatment to maintain or improve property values.

• Encourage personal responsibility for treating sewage.

Under MN Statutes 115.55, which is cited below, counties are required to adopt an SSTS ordinance that complies with the MN Rules Chapter 7080. Counties are responsible for administering and enforcing their local septic system ordinances. This includes assuring there is a septic system ordinance with a permitting and inspection program. Local permits may be issued for new septic system construction and replacement for systems with the capacity to treat up to 10,000 gallons per day.

“MN Statutes 155.55, Subd. 2. Local ordinances. (a) All counties that did not adopt ordinances by May 7, 1994, or that do not have ordinances, must adopt ordinances that comply with Subsurface Sewage treatment system rules by January 1, 1999, unless all towns and cities in the county have adopted such ordinances. County ordinances must apply to all areas of the county other than cities or towns that have adopted ordinances that comply with this section and are as strict as the applicable county ordinances. Any ordinance adopted by a local unit of government before May 7, 1994, to regulate Subsurface Sewage treatment systems must be in compliance with the Subsurface Sewage treatment system rules by January 1, 1998.”

**BCWD SSTS Policy Guidelines**

Based upon the information presented in Chapter Four, the BCWD should use the following principles to guide land-use, permitting and administrative decisions related to SSTS (please refer to Chapter Four for a complete listing of BCWD Goals, Objectives, and Policy Guidelines):

✓ Work with landowners on understanding current SSTS issues and requirements. Continue to provide cost-share incentives, when available, to assist with upgrading noncompliant SSTS.
CHAPTER FOUR
MULTI-PURPOSE CORRIDORS

Chapter Four provides a profile of the multi-purpose corridors of the Buffalo Creek Watershed District. Included in this chapter are sections on wildlife and recreation, as well as priority issues, which focus on canoeing/innertubing, fisheries, rare biological resources and trails.

Chapter Four includes the following sections:

Sections ................................. Page

A: Profile of Multi-Purpose Corridors ........................................................................................................ 4 - 1

B: BCWD Priority Issues 8 - Multi-Purpose Corridors ........................................................................... 4 – 12

A: PROFILE OF MULTI-PURPOSE CORRIDORS

The Buffalo Creek is the largest and most important multi-purpose corridor within the BCWD. A multi-purpose corridor is defined as a stream and/or contiguous tracts of land that serves multiple functions, including protection of water quality, conservation of habitat and facilitation of recreational opportunities. The unchannelized portion of the Buffalo Creek, from approximately the City of Stewart to the South Fork of the Crow River, provides the most multi-purpose functions. This portion of the Creek and its associated floodplain remains nearly in its natural state. The portion of the Buffalo Creek west of Stewart has been channelized for drainage and has very few associated multi-purpose benefits.

The following section describes the District’s role in promoting the multi-purpose functions of the Buffalo Creek corridor and takes an in depth look at individual functions relating to biological resources and recreation.

District’s Role in Multi-Purpose Corridors

In the past, the District has primarily focused its efforts on the water quality and quantity functions of the Buffalo Creek corridor. Efforts to protect and enhance the biological resources and recreational opportunities of the corridor have been left to cities, counties and State and Federal agencies. While not directly involved in these functions, the District has maintained that improvements in water quality and quantity management will undoubtedly enhance the Creek’s many other amenities.
Biological Resources

Over the past century, the biological resources of the BCWD have been degraded by the combination of a number of factors, including ditching, damming, channelization, polluting, dredging, removal of native vegetation, drainage of wetlands and urbanization. The combination of these factors has led to an overall reduction in the carrying capacity of the land to support certain biological species. The biological resources of present concern to the District are wildlife and vegetation. Each of these components is discussed below.

Wildlife

Wildlife consists of game and nongame species of birds, mammals, reptiles, amphibians, fish and insects, not generally regarded as pests. All wildlife has four basic needs: food, water, shelter and space. Even though the combination of these components varies by species, all four are vital for wildlife management. The following provides a profile of each of these basic needs.

Food - Every species has its own unique food requirements, which changes seasonally and over an animal’s life. Food includes obvious nutritional parts of an animal’s diet, as well as supplements, such as salt. Several types of foods can be integrated into conservation efforts by planting the appropriate species. Examples of wildlife foods are fruits and berries, grains and seeds, nectar sources, nuts and acorns, browse plants (twigs and buds), forage plants (grasses and legumes) and aquatic plants.

Water - The importance of water for wildlife cannot be overstated. Any permanent or intermittent water or wetland created or restored can be a major attractant for wildlife, especially if shallow.

Shelter - Shelter, or cover, is necessary for protection from adverse weather, hiding from predators and resting. Shelter is particularly critical while animals are nesting and raising their young. Wildlife seek shelter in trees, shrubs, grasses, flowers, or in structures like rock piles, brush piles, cutbanks, hollow trees, bird houses and burrows.

Space - Every wildlife species has unique needs for space or territory. By understanding the area needed by species, an estimate of the carrying capacity can be obtained for a tract of land.

Because much of the District’s original vegetation and wetlands were lost to the expansion of agriculture during the last century, wildlife are generally confined to small areas, such as the Buffalo Creek corridor. Several programs, including the WMA and WPA programs (which are discussed later in this chapter), have been established to preserve existing critical habitat. Preserving and linking these areas will be key focus of future wildlife management in the BCWD.
Vegetation

Map 1E in Chapter One shows the presettlement vegetation of the District. Presettlement vegetation was determined through the Minnesota DNR’s Presettlement Vegetation Database, which was created by analyzing the detailed maps and records of early surveyors (circa 1895).

Before settlement, the District was predominately covered with upland prairie and wetland prairie vegetation. Upland prairie vegetation occupied a wide variety of landforms, including beach ridges and swales, glacial lakebeds, morainic hills, steep bluffs and rolling till plains.

Big bluestem and Indian grass occupied the deep soils of the moist uplands, while little bluestem and side oats grama covered the thin soils of the dry uplands. In general, bluejoint, prairie cordgrass, rushes and sedges dominated the lowland areas and wetlands. Many of these wetlands are known today as “prairie potholes”.

In the far eastern portion of the District, brush prairie and hardwoods served as a transition between the prairie and deciduous forest ecotonal types. The hardwoods and brushland ranged from small groves of trees intermixed with open prairie, to communities of scrub forest and dense scrub thicket. The dominant tree species were aspen, basswood, elm, maple and oak.

Today, much of the land within the District is under intensive agricultural production. In fact, according to the 1989 Minnesota Land Use-Agricultural and Transition Areas Inventory an estimated 88.4% of the District’s land is managed for intensive agricultural purposes. The inventory also estimated that the cumulative total area of grasslands, deciduous forests, water and wetlands made up only 9% of the District. Many of District’s grasslands and deciduous forests are located along the Buffalo Creek corridor, especially east of the City of Stewart. This portion of the Creek’s corridor has been virtually undisturbed by agriculture. Programs, such as CRP and RIM offer landowners an opportunity to preserve or restore native vegetation.
Recreation

There are numerous existing and potential recreational opportunities within the BCWD, including biking, canoeing, fishing, hiking, hunting, snowmobiling and various other forms of active and passive recreation. Demand for these recreational activities is expected to increase in the future. According to Figure 4A, which was derived from the 2000 Minnesota State Park System Land Study, the District’s recreational demand in 2025 is expected to be in the moderate to high range. If this projection holds true, recreational opportunities may need to be enhanced or expanded, especially along the Buffalo Creek, which is virtually untapped for recreational potential.

The Minnesota DNR, along with the cities and counties within the BCWD, are primarily responsible for the management of existing recreational lands within the District. Each city has developed and maintains park land for its residents. Presently there are three county parks within the District, two of which are managed by McLeod County and one that is managed by Renville County. The DNR, which manages many of the State’s natural resources, is in charge of managing Wildlife Management Areas (WMAs) and public water accesses within the District. The following provides an overview of recreational lands within the District.
Wildlife Management Areas

DNR Wildlife Management Areas

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

WMAs are managed for wildlife production and are open to public hunting and wildlife watching. Hunters contribute $1 million per year, through a $4 surcharge on their small game licenses, to help buy and improve WMAs. Conservation clubs also donate money to support habitat projects on these wildlife lands.

According to Table 4A, there are 9 WMAs in the BCWD, totaling 2,084 acres. Map 4A displays the location of the WMAs in the District.

<table>
<thead>
<tr>
<th>WMA Name</th>
<th>Township</th>
<th>Range</th>
<th>Section</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bob Gehlen</td>
<td>115N</td>
<td>28W</td>
<td>31</td>
<td>166</td>
</tr>
<tr>
<td>Daak</td>
<td>116N</td>
<td>31W</td>
<td>26</td>
<td>10</td>
</tr>
<tr>
<td>Kohl’s</td>
<td>114N</td>
<td>29W</td>
<td>4</td>
<td>86</td>
</tr>
<tr>
<td>Pebbles</td>
<td>115N</td>
<td>30W</td>
<td>21,28</td>
<td>110</td>
</tr>
<tr>
<td>Prairie Heritage</td>
<td>116N</td>
<td>29W</td>
<td>32</td>
<td>76</td>
</tr>
<tr>
<td>Prohels Woods</td>
<td>114N</td>
<td>28W</td>
<td>12</td>
<td>134</td>
</tr>
<tr>
<td>Ras-Lynn</td>
<td>115N</td>
<td>30W</td>
<td>3,4,5</td>
<td>1,302</td>
</tr>
<tr>
<td>Schmalz</td>
<td>115N</td>
<td>31W</td>
<td>22</td>
<td>120</td>
</tr>
<tr>
<td>Sumter</td>
<td>115N</td>
<td>29W</td>
<td>4</td>
<td>80</td>
</tr>
<tr>
<td><strong>Total WMA Acreage</strong></td>
<td><strong>2,084</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
USFWS Waterfowl Production Areas

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

WPAs provide numerous recreational opportunities to the public, including hunting, fishing, trapping, wildlife observation and photography. The use of motorized vehicles, including snowmobiles and all-terrain vehicles, is generally prohibited (contact USFWS for more information). Table 4B shows there are 6 WPAs in the District, totaling 1,077 acres. The location of these WPAs is shown in Map 4A (the location of the Osceola WPA is not shown on the Map).

Table 4B: Waterfowl Production Areas

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barber Lake WPA</td>
<td>7 miles NW of Browntont</td>
<td>229</td>
</tr>
<tr>
<td>Brownton WPA</td>
<td>2 miles W of Brownton</td>
<td>174</td>
</tr>
<tr>
<td>Eagle Lake WPA</td>
<td>5 miles N of Stewart</td>
<td>78</td>
</tr>
<tr>
<td>Osceola WPA</td>
<td>8 miles NW of Hector</td>
<td>321</td>
</tr>
<tr>
<td>Phare Lake WPA</td>
<td>NW of Lake Allie</td>
<td>114</td>
</tr>
<tr>
<td>Preston Lake WPA</td>
<td>2.5 miles E of Buffalo Lake</td>
<td>161</td>
</tr>
<tr>
<td><strong>Total WPA Acreage</strong></td>
<td></td>
<td><strong>1,077</strong></td>
</tr>
</tbody>
</table>

Walk-In Access (WIA) Program

Minnesota Walk-In Access (WIA) began in 2011 when the State received a grant from the United States Department of Agriculture Voluntary Public Access Program. The goal is to provide public hunting opportunities on private lands. WIA sites are currently available on 19,861 acres (192 sites) in 35 counties in western Minnesota. WIA #30, located northwest of Eagle Lake in McLeod County is currently the only one located in the BCWD. Most WIA land is also enrolled in a conservation program (e.g., CRP, RIM Reserve, CREP) or has natural cover. The program permits landowners to carry out land cover management or upgrade activities according to an approved conservation plan, so these sites may not have high-quality habitat. Tiles 75 and 76 (following Map 4A) from the Minnesota WIA Hunting Atlas 2013 show the location of WIA #30, along with the other wildlife and recreational areas discussed in this Chapter.
Map 4A: Buffalo Creek Watershed District Recreational Lands

Watershed District
Municipality
County
Major Road
Minor Road

District Approximate Size
Total Area = 422.1 Square Miles
East/West Length = 51 Miles
North/South Length = 19 Miles

Recreational Category
- Boat Trailer
- County Park
- Carry-in Access
- Fishing Pier
- Waterfowl Production Area
- Snowmobile Trail
- Wildlife Management Area
Public Water Accesses

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

The program works year round on acquisition, development and maintenance of water access sites. Funds are derived through boat license fees and a portion of gas tax revenues attributed to motorboats. In addition, funding is periodically provided through the Legislative Commission on Minnesota Resources (LCMR) and the State Bonding Program.

Table 4C provides information on the 7 public water accesses located in the BCWD. Map 4A displays the location of each of these public water accesses.

Table 4C:
Public Water Accesses

<table>
<thead>
<tr>
<th>Waterbody Name</th>
<th>Ramp Type</th>
<th>Administrator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eagle Lake</td>
<td>Gravel</td>
<td>DNR</td>
</tr>
<tr>
<td>Lake Allie</td>
<td>Concrete</td>
<td>DNR</td>
</tr>
<tr>
<td>Lake Marion (east)</td>
<td>Concrete</td>
<td>County</td>
</tr>
<tr>
<td>Lake Marion (southeast)</td>
<td>Carry-In</td>
<td>DNR</td>
</tr>
<tr>
<td>Lake Whitney</td>
<td>Carry-In</td>
<td>DNR</td>
</tr>
<tr>
<td>Preston Lake</td>
<td>Concrete</td>
<td>DNR</td>
</tr>
<tr>
<td>Schilling</td>
<td>Carry-In</td>
<td>DNR</td>
</tr>
</tbody>
</table>
County and Regional Parks

There are three County and Regional Parks located in the BCWD, all of which are tied to water resources (refer to Map 4A). A brief description of each park is provided below. Information on each park was derived from its respective county.

- **Buffalo Creek Park (McLeod County)** - Located on the east side of the City of Glencoe, along Buffalo Creek, this park consists of 45.5 acres. At this time, the area along the river has not been developed. The park has a 10-acre area, which includes three wildlife ponds, a food plot and a tree cover area. Other features include a picnic shelter, playground equipment and open space for activities.

- **Lake Allie Park (Renville County)** - This 4.4 acre park is located on the west side of Lake Allie, along County State Aid Highway 24. Facilities provided include a shelter, restrooms, a temporary dock, picnic tables and playground equipment. The park also offers utilities, including electrical hookups, water spigots and waste disposal.

- **Lake Marion Regional Park (McLeod County)** - Located on the east side of Lake Marion, this 86 acre park offers a fishing pier, public swimming beaches, a boat access and a 50 unit camping area. Additionally, the Lake Marion Regional Park offers three miles of hiking trails, cross country skiing areas and numerous other outdoor recreational opportunities.

Implications and Assessment

Preserving and expanding wildlife habitat is an important component of this plan. Due to the widespread expansion of agriculture, much of the District’s original vegetation and wetlands, which once provided wildlife with food, water and shelter, have been lost. As a result, wildlife habitat within the District is fragmented. The largest tract of contiguous wildlife habitat in the District is the Buffalo Creek corridor. To protect this corridor and other critical habitat areas, the District should support the efforts of the DNR, USFWS and other wildlife habitat related organizations. Options to link wildlife habitat should be encouraged.

The BCWD has many recreational amenities, including 9 Wildlife Management Areas, 6 Waterfowl Production Areas, 7 public water accesses and 3 county and regional parks. Many of these amenities are associated with water resources. If future recreational demand increases, existing opportunities may need to be enhanced or expanded, especially along the Buffalo Creek, which is practically untapped for its recreational potential. The District should work actively in conjunction with key recreational stakeholders to pursue grants and other funding to acquire and maintain recreational lands.
B: BCWD Priority Issue 7 - Multi-Purpose Corridors

**Issue Overview:** Buffalo Creek is only used marginally for canoeing and fishing. Interest in developing trails has grown steadily and is anticipated to do so more over the next ten years. Finally, protecting rare biological resources has become increasingly more challenging as development pressures continue throughout the District.

**Key Players:** DNR, Cities, Counties

**District’s Role:** Nonregulatory – cooperator

**Priority Subwatersheds**

*All subwatersheds*

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**Canoeing Potential**

The Buffalo Creek, which is not a designated State Canoe and Boating Route, is only marginally used for canoeing and innertubing. The unaltered portion of the Creek, from Stewart eastward, is most often used for such activities. The Creek is largely navigable during moderate flow conditions; however, during low flow periods, the Buffalo Creek is often impassable by canoe or innertube due to obstructions. Long-term improvements in the Buffalo Creek’s canoeing and innertubing potential could be made through improving base flows. This would entail holding more water on the landscape for longer periods. Even if this were accomplished, given the size of the watershed and the extent of the drainage systems, the Buffalo Creek will likely continue to be a marginal resource for canoeing and innertubing.

**Fishing Potential**

The Minnesota DNR, Division of Fisheries, routinely surveys and assesses fish populations in lakes and streams it manages. Definitions of the various surveys and assessments conducted by the DNR are given below. Table 4D lists those which have been conducted on the Buffalo Creek.
- **Reconnaissance Survey** – A cursory sampling of physical and biological parameters to obtain a qualitative overview. Typically this survey is the initial work conducted, but it may be done anytime for planning and evaluation.

- **Initial Survey** – A detailed sampling of physical and biological parameters to determine the status of a waterbody and guide management decisions.

- **Population Assessment** – A sampling of fish populations to determine the status and short-term fishery potential of a waterbody.

### Table 4D:
DNR Fisheries Surveys and Assessments Conducted on the Buffalo Creek

<table>
<thead>
<tr>
<th>Survey Type</th>
<th>Year</th>
<th>Survey Type</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reconnaissance</td>
<td>1980</td>
<td>Other Assessment</td>
<td>1985</td>
</tr>
</tbody>
</table>

During surveys and assessments, the DNR identifies opportunities to improve fish and wildlife habitat, as well as water quality. Examples of such opportunities are presented below.

- Providing areas for northern pike spawning and waterfowl production by restoring wetlands and creating urban stormwater ponds and siltation basins.

- Protecting, preserving and establishing native emergent vegetation (i.e., cattails, bullrushes, etc.) improves water quality, while providing fish and wildlife habitat.

- Stabilizing shorelines with buffer strips, riprap and other measures, enhances natural spawning shoals by reducing turbidity.

- Managing exotic aquatic plants, such as Eurasian watermilfoil, purple loosestrife and curled pondweed, primarily through prevention, allows the growth of native species.

- Filtering nutrients and pollutants from water by diverting storm sewers, drainage tiles and sewage treatment effluent through properly designed treatment ponds or vegetated waterways and wetlands to improve water quality.

In the 1991 population assessment, carp, black bullhead, green sunfish and white sucker were sampled by electrofishing. These species in large numbers are indicative of a degraded system. The assessment concluded that frequent flooding, silt loading, low base flows in the winter and
summer and lack of fish habitat were collectively limiting the fisheries potential of the Creek. Comprehensive watershed management was recommended in order to produce a more desirable fishery.

**Trails**

The various forms of trails (i.e., bike, snowmobile, ATV, etc.) located throughout the BCWD provide the best opportunity to enjoy the natural amenities the area has to offer. In 2002, the City of Glencoe completed a trail feasibility study. The study examined various trail development options, as well as opportunities to expand and connect to existing trails. One component of this study involved negotiating a trail along the Buffalo Creek corridor. The proposed trail would meander along the Creek, from the western edge of the City to the eastern edge of the City. Once completed, the trail would be used for primarily nonmotorized uses, such as walking and bicycling. Presently, the City of Glencoe does not have any fixed plans in place for the development of the trail. Future trail development efforts will be largely dictated by the availability of funding.

In 2013, the Minnesota Department of Transportation published a Statewide Bicycle Planning Study to provide foundational information to assist with better integrating bikeway facility planning and implementation into local decision-making. This Study included multiple components integral to further improving conditions for bicycling on Minnesota roads so that the economic, social, health and environmental benefits can be delivered to those living in, visiting or traveling through Minnesota. Highlights of the Study’s goals included:

- Provide recommendations for use by MnDOT in the planning, programming, scoping, design and implementation of trunk highways projects and associated initiatives with consideration to state bikeways.
- Establish the legislatively mandated Bikeways Registry and methods for regular updates.
- Create an updated statewide bicycle map.
The BCWD is committed to working with local stakeholders to continuing to enhance the District’s trails network. Due to the organization and commitment to trails development demonstrated by the City of Glencoe, the BCWD has made the Glencoe area a priority subwatershed for project implementation.

There are several funding sources for the development of trails in Minnesota. These funds are primarily administered through the Minnesota DNR and Mn/DOT.

**Rare Biological Resources**

The Minnesota Biological Survey (MBS) systematically collects, interprets, and delivers baseline data on the distribution and ecology of rare plants, rare animals, native plant communities, and functional landscapes needed to guide decision making. The Minnesota DNR began the County Biological Survey (MCBS) in 1987 as a systematic survey of rare biological features. The goal of the MCBS is to identify significant natural areas and to collect and interpret data on the distribution and ecology of rare plants, animals and native plant communities. Native habitats surveyed by the MCBS contribute to a sustainable economy and society because of the reasons listed below.

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

To date, surveys have been completed in 81 counties statewide, including all of the BCWD area. Through the surveys, a total of over 15,000 new records of rare plants and animals have been added to the Rare Features Database, Natural Heritage Information System (NHIS). Online maps and additional information can be viewed online at the following DNR website:

[http://www.dnr.state.mn.us/mbs/index.html](http://www.dnr.state.mn.us/mbs/index.html)
BCWD Multipurpose Corridors Policy Guidelines

Based upon the information presented in Chapter Four, the BCWD should use the following principles to guide land-use, permitting and administrative decisions to facilitate multipurpose corridors (please refer to Chapter Five for a complete listing of BCWD Goals, Objectives, and Policy Guidelines):

- The District should support stakeholders in identifying and protecting important conservation corridors
- Fish and wildlife habitat should be protected and enhanced through partnerships with stakeholders.
- The relationship between fish and wildlife habitat and water quality, as well as opportunities to enhance and/or protect habitat through voluntary conservation programs, should be promoted.
- The District should support the development of management plans for lakes and streams within its boundary.
- Stream impediments should be removed based upon sound ecological principles.
- Concepts of native biotic diversity should be incorporated into projects when feasible (e.g. use of native grasses for buffer strips).
- The District should provide technical and financial support, as available, to entities applying for grants and other available aid to fund recreational opportunities.
- Encourage the DNR and other applicable governmental units and organizations, to provide the public open and unimpeded access and use of all navigable public waters within the District.
CHAPTER FIVE
GOALS, OBJECTIVES AND POLICY GUIDELINES

Chapter Five of the BCWD Overall Plan establishes the District’s goals, objectives and policy guidelines. Collectively, they will be used to help guide future management activities and funding decisions. More importantly, the objectives and policy guidelines provide a framework for the District’s Board of Managers to use on a day-to-day basis to help guide land use and permitting decisions.

Throughout the Overall Plan, goals, objectives and policy guidelines are defined in the following way (also see Figure 5A).

**Goal:** This is an idealistic statement intended to be attained at some undetermined future date. Goals are purposely general in nature.

**Objective:** Objectives are action-oriented and can be measurable if a date, dollar amount, etc. is included. Objective statements always begin with an action verb. There may be more than one objective for a goal.

**Policy Guideline:** These statements support the action of the objective. The statements are recommendations often qualified by the word “should”. Policy guidelines can be used to create action work plans.

**Figure 5A:**
Goal, Objective & Policy Guideline Hierarchy

![Goal, Objective & Policy Guideline Hierarchy Diagram]
GOAL 1: TO IMPROVE STAKEHOLDER PARTICIPATION, COOPERATION AND COORDINATION IN IMPLEMENTING THE DISTRICT’S INITIATIVES.

Objective A: Meet with stakeholders to discuss important water quality and quantity issues.

Guideline 1: Meetings should be held as needed with stakeholders to discuss important planning issues and to determine what opportunities exist to solve conflicts and to share resources.

Guideline 2: Technical assistance and guidance should be exchanged between stakeholders in the development of water management plans, regulatory programs and other planning documents.

Guideline 3: Comments and recommendations should be provided to State and local units of government on projects that have the potential to impact water resources in the District.

Guideline 4: Meet as necessary with the District’s Advisory Committee to address key water planning issues.

Objective B: Assist in the coordination of administrative activities between the District and local units of government.

Guideline 1: Local controls, ordinances, and administrative rules, should be periodically assessed for their effectiveness, consistency and coordination, as they relate to water resource management.

Guideline 2: The duplication of regulation and oversight should be minimized unless a clear justification and/or rationale exists.

Objective C: Keep the public advised of important planning issues and events.

Guideline 1: The media should be invited to attend key meetings and important events.

Guideline 2: The Internet and other multi-media should be used, when feasible, to keep the public informed on District activities and issues.
Guideline 3: Public meetings should be held as needed to identify issues and to discuss the nature of important planning issues.

Guideline 4: Residents should have ample time to provide input into important District decisions.

Guideline 5: Data and other public information developed by the District should be made available to all those who request it.

Guideline 6: The District should actively pursue environmental education and outreach projects in conjunction with existing environmental education entities.

Objective D: Utilize long-term planning and partnerships to cost-effectively fulfill District goals and address water resource management issues.

Guideline 1: Appropriate financing mechanisms should be utilized to finance all District activities, including but not limited to mechanisms and procedures outlined in Minnesota Statutes 103B (Water Planning and Project Implementation) and 103D (Watershed Districts).

Guideline 2: The District should continue to apply for grants and other aid to support funding of targeted water resource management projects.

GOAL 2: TO ENSURE THAT AN ADEQUATE SUPPLY OF SURFACE WATER IS AVAILABLE FOR AGRICULTURAL, COMMERCIAL/INDUSTRIAL, NATURAL RESOURCES AND RECREATIONAL PURPOSES, WHILE MINIMIZING FLOOD RELATED DAMAGE.

Objective A: Maintain the public drainage system to District and State specifications.

Guideline 1: The District should continue to enforce the provisions of the Minnesota Drainage Code.

Guideline 2: The benefits of a drainage system should be redetermined when they do not reflect current value or conditions.
Guideline 3: A vegetative cover should be maintained on all ditch banks and slopes. The District shall provide cost-share assistance when available.

Guideline 4: Overland flow of water into ditches should be filtered or avoided.

Guideline 5: Environmental review data related to a proposed drainage system project should be incorporated into final plans and permit conditions.

Guideline 6: The abandonment of public drainage ditches no longer providing a benefit to the public should be encouraged.

Guideline 7: Conservation drainage practices should be promoted through educational materials, demonstration sites, and cost-share incentives.

Guideline 8: The BCWD should proactively apply for grant funds for the education, demonstration, and implementation of conservation drainage practices within the District.

Guideline 9: It shall be the overall policy of the District to maintain up to a 3/8” drainage coefficient. Exceptions to this include when the drainage system was designed to accommodate smaller or larger coefficients or if mitigation measures are implemented (i.e., stormwater ponds, restored wetlands, etc.) when using larger drainage coefficients.

Objective B: Utilize both structural and nonstructural measures to stabilize hydrographs and reduce downstream flooding.

Guideline 1: The District should strictly regulate the construction, alteration, repair and removal of water control structures.

Guideline 2: The construction/installation of bridges, cables, culverts and pipelines should be regulated to maintain the integrity the District’s waterways.

Guideline 3: The BCWD should continue to require (since 1974) a one-foot swellhead on bridge and culvert projects.

Guideline 4: Upland storage areas should be preserved and, when possible, restored to slow surface runoff, stabilize stream hydrographs and reduce downstream flooding.
Objective C: Preserve existing wetlands through education and regulation and provide technical assistance to landowners for wetland restorations.

Guideline 1: Degradation of wetlands should be prevented by implementing Best Management Practices (BMPs).

Guideline 2: Wetland inventories and flooding records should be utilized to identify priority areas for wetland preservation and restorations.

Guideline 3: Wetlands should be preserved through regulatory controls and conservation programs.

Guideline 4: Opportunities should be sought to create new wetlands and restore previously impacted wetlands.

Guideline 5: Wetland restoration programs should be promoted to willing landowners.

Guideline 6: Promote the use of the wetland banking program in the District.

Objective D: Minimize stormwater pollution and manage stormwater volumes to acceptable levels.

Guideline 1: Ensure the District’s stormwater management rules and regulations, as well as other applicable State and Federal regulations, are well understood and implemented.

Guideline 2: The District should provide assistance on the appropriate design requirements for stormwater management practices.

Guideline 3: The District shall assist with promoting the need for stormwater management.

Guideline 4: When feasible, stormwater management should be integrated with the functions and values of wetlands.

Guideline 5: Permanent and temporary water retention and settling basins should be designed to enhance surface water quality.
Guideline 6: Infiltration methods and techniques should be incorporated into District stormwater management projects and should be periodically studied and researched.

Guideline 7: Implement Best Management Practices (BMPs) to minimize stormwater pollution and manage stormwater quantity.

Objective E: Through land use controls, protect floodplain areas from encroachment to minimize flood-related damage.

Guideline 1: Flood plains should be well defined within the District by the Federal Emergency Management Agency (FEMA).

Guideline 2: Water quantity control practices should be required on all new developments and redevelopments to preserve existing 100-year flood elevations.

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**GOAL 3: INCREASE THE USE OF BEST MANAGEMENT PRACTICES (BMPS) TO MINIMIZE WATER POLLUTION.**

Objective A: Encourage landowners to implement BMPs to protect the water resources of the District.

Guideline 1: Partner with Stakeholders to ensure that BMPs are properly installed and maintained.

Guideline 2: Best Management Practices (BMPs) should be encouraged along all waterways and watercourses, with special emphasis on private and public ditches.

Guideline 3: The District should support and provide assistance, as available, on promoting and demonstrating lakescaping and other shoreland BMPs that reduce the movement of sediment and nutrients into lakes.
Guideline 4: Work to ensure that stakeholders understand the issues related to nutrient and sediment reduction, as well as other sources of nonpoint source pollution.

Guideline 5: The District should annually review the effectiveness of conservation efforts and discuss anticipated future program needs.

Objective B: Utilize programs and regulations to protect water resources from potential pollution sources.

Guideline 1: Adequate erosion control measures should be incorporated into the designs of all proposed projects.

Guideline 2: All contractors, including “do-it-yourself” projects, should be held accountable for minimizing water runoff and soil erosion.

Guideline 3: Erosion should be prevented during and after construction projects and ditch maintenance activities.

Guideline 4: Support efforts by local units of government in the District to develop, adopt and administer performance standards that protect water resources.

Guideline 5: Abandoned above ground and underground storage tanks should be filled or removed.

Guideline 6: Unrestricted access of livestock to waterways should be prevented.

Guideline 7: Work with landowners on understanding current SSTS issues and requirements. Continue to provide cost-share incentives, when available, to assist with upgrading noncompliant SSTS.

Objective C: Work with landowners to best interpret water quality data and corresponding solutions.

Guideline 1: Water quality and quantity monitoring results within the District should be annually reviewed to assess achievement of water quality standards and effectiveness of Best Management Practices (BMPs).
GOAL 4:  TO PROTECT AND ENHANCE THE BIOLOGICAL RESOURCES AND RECREATIONAL AMENITIES OF THE BUFFALO CREEK CORRIDOR.

Objective A:  Protect and enhance fish and wildlife habitat through established programs and principles.

  Guideline 1:  The District should support stakeholders in identifying and protecting important conservation corridors

  Guideline 2:  Fish and wildlife habitat should be protected and enhanced through partnerships with stakeholders.

  Guideline 3:  The relationship between fish and wildlife habitat and water quality, as well as opportunities to enhance and/or protect habitat through voluntary conservation programs, should be promoted.

  Guideline 4:  The District should support the development of management plans for lakes and streams within its boundary.

  Guideline 5:  Stream impediments should be removed based upon sound ecological principles.

  Guideline 6:  Concepts of native biotic diversity should be incorporated into projects when feasible (e.g. use of native grasses for buffer strips).

Objective B:  Support efforts to maintain and improve recreational opportunities within the District.

  Guideline 1:  The District should provide technical and financial support, as available, to entities applying for grants and other available aid to fund recreational opportunities.

  Guideline 2:  Encourage the DNR and other applicable governmental units and organizations, to provide the public open and unimpeded access and use of all navigable public waters within the District.
CHAPTER SIX
PLAN ADMINISTRATION

Chapter Six contains information on overall plan administration. Key sections include an Implementation Plan, which lists the District’s priority projects, target years, and estimated costs; a description of the high priority projects and priority subwatersheds; and a section on the Plan’s coordination and amendment procedures.

A: Plan Administration

Coordination of the Overall Plan’s initiatives will commence with the Board of Managers’ adoption of the Plan. The District recognizes the importance of water resource management and the role citizens and local units of government play in decision making. The Overall Plan’s goals, objectives, policy guidelines and action items are a reflection of the water related concerns in the BCWD. Implementation will be based on current needs and availability of funding. The District’s annual report will detail measurable criteria for action items to be carried out.

The District will ensure coordination and implementation of its Overall Plan through its Advisory Committee. The committee will meet to review progress and to identify emerging problems and issues. The Board of Managers shall coordinate the activities of the Advisory Committee and direct the overall administration of the Plan. Initiatives will be carried out throughout the lifetime of the Plan, when it is adopted in 2014 to ten years later (approximately by the end of 2023). Section B of this Chapter outlines BCWD’s Implementation Plan.

B: Implementation Plan

Table 6A lists specific projects and ranks them in order of implementation priority (i.e., high, medium, low). Please note that many of the Action Steps will need to secure grant and/or stakeholder funding in order to be accomplished. Target implementation years are also listed, which will also be dependent upon securing project funding. In addition, the major projects and priority subwatersheds are shown in Map 6A. Each of the high priority items listed in Table 6A and shown on Map 6A are briefly described in Section C of this Chapter.

Note: BCWD’s main water planning priorities are represented in the Goals, Objectives and Policy Guidelines outlined in Chapter Five. Many of the Policy Guidelines prescribe activities that should be accomplished on an ongoing basis, however, the key action items are also listed in Table 6A.
### Table 6A: BCWD Project Implementation Priorities

<table>
<thead>
<tr>
<th>Priority</th>
<th>Project Overall Rank, Name and Brief Description ~ Please refer to the text for a full description ~</th>
<th>Target Year(s)</th>
<th>Estimated Costs</th>
</tr>
</thead>
</table>
| High     | **1. Marsh Ditch Water Project.** This project is detailed in the March Water Project Engineering Report (2012) and consists of the following four components:  
A. West Branch Stormwater Wetland $399,000  
B. Main Trunk Biofiltration Basin $521,000  
C. Stormsewer Repairs $99,000  
D. System-wide Easements & Maintenance $141,000 | 2014 | $1,159,000 |
| High     | **2. Brownton Erosion Site.** Stabilizing 600 feet of severely eroding shoreland along Buffalo Creek adjacent to residential development in the City of Brownton. | 2015 | $100,000 |
| High     | **3. JD 15 Enhanced Drainage Management Plan.** The BCWD would like to target JD 15 for an enhanced Drainage Management Plan. Best Management Practices (BMPs) and cost-share incentives will also be targeted to JD 15, which encompasses 105 square drainage miles. | 2016 | $75,000 |
| High     | **4. JD 4 Evaluation of Downstream Impacts Due to Tile Improvements.** This project is intended to serve as a pilot project for a District-wide study that will evaluate the short- and long-term effects of improvements to the public drainage systems tiles. | 2014 | $16,500 |
| High     | **5. Eagle Lake Project.** Replacing needed water control structure and making system improvements. | 2014 | $160,000 |
| High     | **6. Conservation Drainage Cost-Share Program.** Develop a cost-share program to enhance conservation drainage management activities. Target the District’s priority subwatersheds (Map 6A). Establish two conservation drainage demonstration sites. | 2015-19 | $450,000 |
| High     | **7. BCWD Tile Study.** This project is similar in nature to the JD 4 Evaluation Project, however, a hydrologic analysis of the remaining District would be completed. | 2017 | $250,000 |
| High     | **8. SWCD Incentives.** Work with the McLeod and Renville County SWCDs to establish an accelerated cost-share BMP program for the District’s priority issues. Target the District’s priority subwatersheds (refer to Map 6A). | 2015-19 | $500,000 |
| Medium   | **9. Best Management Practices (BMP) Program.** Continue to offer cost share incentives for BMPs addressing priority issues. | 2014-23 | $150,000 |

*Table 6A continued…*
Table 6A continued…

<table>
<thead>
<tr>
<th>Priority</th>
<th>Project Overall Rank, Name and Brief Description ~ Please refer to the text for a full description ~</th>
<th>Target Year(s)</th>
<th>Estimated Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium</td>
<td><strong>10. Local County Water Plan Implementation.</strong> Partner with the various counties on properly implementing the projects identified within the BCWD.</td>
<td>2014-23</td>
<td>$100,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>11. BCWD Local Drainage Management Guide.</strong> This project would produce a local guide to drainage management.</td>
<td>2015</td>
<td>$15,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>12. Glencoe East Drainage Ditch Project.</strong> Feasibility Engineering Study for the Glencoe East Drainage System. This project is similar in nature to the Marsh Water Project.</td>
<td>2018</td>
<td>$30,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>13. Drainage Management Workshop.</strong> BCWD would like to facilitate a number of local drainage stakeholder meetings to assist with identifying issues and opportunities</td>
<td>2015</td>
<td>$7,500</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>14. BCWD Rules and Regulations.</strong> Update the District’s Rules and Regulations as needed.</td>
<td>2014-15</td>
<td>$7,500</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>15. BCWD Hydrologic Flood Analysis.</strong> Conduct a District-wide analysis of flooding problems.</td>
<td>2017</td>
<td>$150,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>16. WRAPS and WHAF.</strong> Partner with the DNR to ensure the District’s information is properly included and used in the Watershed Restoration and Protection Strategy and Watershed Health and Assessment Framework projects.</td>
<td>2014-18</td>
<td>$25,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>17. Mud Lake Project.</strong> Water quality and quantity project including a new culvert and cleaning the channel.</td>
<td>2015</td>
<td>150,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>18. Livestock BMPs.</strong> Develop a cost-share incentive program for exclusionary fencing for livestock located near water resources.</td>
<td>2016</td>
<td>$15,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>19. State of Buffalo Creek Watershed Report.</strong> Work to produce a publication that summarizes water quality and quantity studies and key BCWD activities.</td>
<td>2014-23</td>
<td>$5,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>20. Buffalo Creek Bacterial TMDL.</strong> Cost-share with landowners who are impacted by TMDL implementation activities.</td>
<td>2014-23</td>
<td>$250,000</td>
</tr>
<tr>
<td>Medium</td>
<td><strong>21. BCWD Funding.</strong> Appropriate financing mechanisms should be utilized to finance all District activities, including but not limited to mechanisms and procedures outlined in Minnesota Statutes 103B (Water Planning and Project Implementation) and 103D (Watershed Districts).</td>
<td>2014-23</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 6A continued…

Buffalo Creek Watershed District Overall Plan (2014-2023) 6 - 4
Table 6A continued…

| Low | 22. Expand the BCWD’s Administrative Boundaries. Upon request, the BCWD is prepared to expand its administrative boundaries in order to address water quality and quantity issues. | N/A | N/A |

**Ten-Year Cost Estimate for BCWD Implementation Priorities**

$3,615,500

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### C: Implementation Plan Priority Projects and Priority Subwatersheds

Table 6A identifies a number of aggressive and optimistic implementation priorities for the District to pursue over the next ten years (2014-2023). The District’s top priority project is briefly described below and is fully described in Appendix C. Most of other listed projects will be outlined in full detail once the project moves forward to be implemented. Chapters Two, Three and Four of this Plan, however, have profiled priority issues with priority subwatersheds. Map 6A shows the location of the District’s priority subwatersheds for the duration of this Plan. It should be noted the BCWD fully intends to provide technical and financial assistance outside of the priority subwatersheds (as funding is available), however, the District will target the priority subwatersheds with accelerated BMP funding once grant assistance is secured.

#### A Description of Map 6A…

The purpose of Map 6A is to show the Buffalo Creek Watershed District’s priority projects and subwatersheds. The approximately location of the priority projects (numbered 1-5) are labeled on the Map and are described in detail in this Chapter. The priority subwatersheds on displayed on Map 6A show where the BCWD would like to establish accelerated cost-share funding to implement Best Management Practices. They were selected based upon the Districts priority issues related TMDL concerns.

1. **Marsh Water Project**

The Buffalo Creek Watershed District’s top priority project consists of addressing water resource concerns along a private ditch on the west side of the City of Glencoe, referred to as the “Marsh Water Project.” Map 6B shows the project’s noted water quality/quantity deficiencies. Appendix C contains the main portion of the project’s Engineering Report. The following primary technical objectives were established for this project:
Map 6B:
Marsh Water Project

Flooding
Flooding/Crop Damage
Storm Sewer Deterioration
Water Quality
US Highway
State Highway
County State Aid Highway
Local Roads
Marsh Ditch

Figure 3: Noted Deficiencies

Source: MN DOT
Image: 2010 FSA NAIP
1. Reduction in sediment and nutrient loading to Buffalo Creek;
2. Reduction in peak flows to Buffalo Creek;
3. Reduction in damages to flood prone areas along Marsh Ditch; and
4. Improved maintainability of the drainage system.

Table 6B outlines the project’s projected construction costs, which total $1,159,000. The Buffalo Creek Watershed District unsuccessfully applied to BWSR for Clean Water Funds in 2012 and 2013. The BCWD is considering breaking up the project into two phases: one to deal with the flooding components and another to address the project’s water quality components.

Table 6B:
Marsh Water Project Projected Construction Costs

<table>
<thead>
<tr>
<th>Project Component</th>
<th>West Branch Stormwater Wetland</th>
<th>Main Trunk Biofiltration Basin</th>
<th>Stormsewer Repairs</th>
<th>System-Wide Easements and Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>$236,000</td>
<td>$373,000</td>
<td>$56,000</td>
<td>$38,000</td>
</tr>
<tr>
<td>Easements</td>
<td>$52,000</td>
<td>$6,000</td>
<td>$0</td>
<td>$50,000</td>
</tr>
<tr>
<td>Engineering/Legal/Admin</td>
<td>$64,000</td>
<td>$67,000</td>
<td>$31,000</td>
<td>$45,000</td>
</tr>
<tr>
<td>Contingency</td>
<td>$47,000</td>
<td>$75,000</td>
<td>$11,000</td>
<td>$8,000</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$399,000</td>
<td>$521,000</td>
<td>$98,000</td>
<td>$141,000</td>
</tr>
</tbody>
</table>

2. Brownton Erosion Site

The Brownton Erosion Site consists of stabilizing 600 feet of severely eroding shoreland along Buffalo Creek adjacent to residential development in the City of Brownton. The project is considered a high priority project and is highlighted in Map 6C. The estimated project costs are $100,000, however, the Buffalo Creek Watershed District will be putting out a Request for Proposal (RFP) to qualified shoreland restoration companies prior to applying for grant assistance. The BCWD would like to move forward with the project in 2015.
Map 6C: Brownton Erosion Project

Legend
- Red: Weir
- Blue: Riverbank
- Gray: McLeod County Roads
- Yellow: Brownton Parcels
- Black: Railroad

8-Digit HUC #07010205

Prepared By
Mid-Minnesota Development Commission

McLeod County

600 Feet of Shoreland
3. JD 15 Enhanced Drainage Management Plan

The BCWD would like to target Judicial Ditch 15 (JD 15) for an enhanced Drainage Management Plan (refer to Map 6D). JD 15 was established in 1923 and is the second largest drainage ditch system located in the District by surface area (105 square miles). The system contains approximately 56 miles of open drainage ditch, however, which makes JD 15 by far the largest drainage system by open ditch miles (Note: JD 2 contains 30 open ditch miles). In addition, the system has approximately 430 miles of known drainage tiles. The purpose of the enhanced Drainage Management Plan would be to:

A. Profile JD 15 with updated physical drainage system characteristics (i.e., tiling, improvements, etc.); and

B. Profile JD 15 with known water quality data and identify gaps; and

C. Determine drainage coefficients; and

D. Identify problem areas and potential solutions (target major projects for implementation); and

E. Work with landowners to identify potential wetland restoration and/or stormwater holding pond sites; and

F. Establish a targeted Best Management Practices (BMPs) program for the drainage system, establishing enhanced cost-share incentives to install BMPs.

Map 6D:
Judicial Ditch 15 in Renville County
4. **JD 4 Evaluation of Downstream Impacts due to Tile Improvements**

The Judicial Ditch 4 (JD 4) Evaluation of Downstream Impacts due to Tile Improvements project is intended to serve as a pilot project for a District-wide study that will evaluate the short- and long-term effects of improvements to public drainage systems tiles. The review of impacts will be focused on the downstream open channel systems, in particular Buffalo Creek. The potential impacts may include increased erosion in the channels, increase in flood stage, or damage to existing roadways. The intent of the pilot project will be to evaluate the potential for impacts on a single public drainage system, and assess the need for further evaluation on a watershed-wide scale. A copy of a similar evaluation for JD 15 Branch M appears in Appendix C. The results show the drainage coefficients for JD 15 Branch M are less than or equal to ¼ inch.

5. **Eagle Lake Project**

The purpose of this project is to replace the lake’s water control structure along County Ditch 33 with a new sheet pile weir for the purposes of variable level water management. Work includes embankment construction, channel clean out, and downstream culvert modification (refer to Map 6E). The main project partners are Ducks Unlimited, Inc., the Minnesota Department of Natural Resources, and the Buffalo Creek Watershed District. The project is expected to cost approximately $160,000.

**Map 6E: Eagle Lake Project**
6. **Conservation Drainage Cost-Share Program**

This action item represents the Buffalo Creek Watershed District being involved with strongly promoting conservation drainage throughout the District as one way to mitigate flooding and to lessen drainage systems from being over capacity. The BCWD would like to apply for funds to establish the program, which would include providing cost-share to landowners for implementing conservation drainage Best Management Practices (BMPs) and for money to create two conservation drainage demonstration sites. The BCWD would like this project to commence in 2015 for a period of five years. It is estimated the District will apply for approximately $375,000 of the estimated $450,000 costs over the five-year period. Shorter grant requirements may force the District to reduce the scope of the project over a two- to three-year timespan.

7. **Buffalo Creek Watershed District Tile Study**

This project is similar in nature to the Judicial Ditch 4 (JD 4) Evaluation of Downstream Impacts Project, however a hydrologic analysis of the remaining District would be completed. This study would greatly assist the District moving forward with addressing drainage issues and properly issuing drainage tile permits. The project is anticipated to cost $250,000 and is targeted to begin in 2017.

8. **SWCD Incentives**

This priority action step item refers to partnering with the McLeod and Renville County Soil and Water Conservation Districts (SWCDs) to establish an accelerated cost-share Best Management Practices (BMPs) Program for the District’s priority issues. SWCD would provide the staffing while the BCWD would provide the required match. The project would be implemented throughout the portions of the District within both McLeod and Renville Counties, however, Map 6A shows the priority subwatersheds due to the presence of impaired waters. The BCWD and both SWCDs would like to have the project set up to be implemented beginning in 2015 for a five-year period.
Stakeholder Cooperation

Managing the water resources of the BCWD is a cooperative effort, involving many local, State and Federal agencies, as well as private citizens and special interest groups. For any water management activity to be successful, stakeholder cooperation is needed. The BCWD is committed to working with all of its stakeholders to ensure proper management of its water resources.

Recommendations for State Programs

To implement the initiatives set forth in the Overall Plan, continued cooperation between the District and various State agencies is necessary. In an effort to increase coordination in this effort, the District respectfully makes the following recommendations regarding State agency programs.

- The District would like to be notified of State agency program changes and the availability of funding.
- Data collected by State agencies should be readily shared with the District to avoid duplicative efforts.
- State agencies should continue to provide local and/or regional staff to assist local officials with agency programs.
- State agencies should provide greater flexibility to districts in setting annual work plan priorities. Priorities should be based upon current needs and the availability of funding.

Intergovernmental Conflicts/Resolution Process

In the event of an intergovernmental conflict, the Board of Managers shall request a work session with the local governmental unit to identify possible solutions. The Advisory Committee may also be asked to informally negotiate resolution of the conflict. If either the work session or the Advisory Committee does not resolve the conflict, the District shall petition the BWSR for a contested case hearing.
Plan Evaluation

To successfully implement the Overall Plan, periodic review is necessary. The District should review the plan at least once every two years in order to ensure that the BCWD’s “vision” remains both accurate and constructive. Any changes can be documented as an amendment to the plan. The plan can be amended by the recommendation of the Advisory Committee to the Board of Managers, or the Board of Managers can propose an amendment to the plan by resolution to the Advisory Committee.

Major Plan Amendment Procedure

The Overall Plan is intended to expire ten years from adoption by the BCWD, however, the District may propose amendments to the plan prior to that. The following procedures will be used by the District for major amendment proposals to the Overall Plan.

1. When issues are brought to the attention of the District with regard to the need for amendments to its adopted Overall Plan, the District will refer that person, group, local unit of government, or agency to the District’s Advisory Committee.

2. The District’s Advisory Committee will review the issue and may, if necessary, undertake studies relating to the issue. After review, the committee will determine whether the Overall Plan should be amended.

3. If the District’s Advisory Committee determines that the Overall Plan should be amended, it will make recommendations to the Board of Managers. The Board of Managers shall approve or disapprove the proposed amendment.

After development, a proposed amendment to the Overall Plan must be submitted for local review and comment in the following manner. The District must submit the proposed plan amendment to all local units of government wholly or partly within the District, the applicable regional development commission (if any) and other counties or watershed management organizations within the same watershed unit and groundwater system that may be affected by the proposed plan amendment. Each local unit of government must review the proposed amendment, along with its own water and land-related land resources plans and/or official controls, and comment on the fiscal and policy ramifications of the amendment. Comments from local review must be submitted to the Board of Managers within 60 days after receiving a proposed plan amendment for comment, unless the Board of Managers determines that good cause exists for an extension of this period and grants an extension. The Board of Managers must conduct a public hearing on the proposed plan amendment after the 60-day period is completed, but before it is submitted to the State.
After conducting the public hearing, the Board of Managers must submit the proposed plan amendment, all written comments and a record of the public hearing to the BWSR for review. The BWSR must complete the review within 90 days after receiving the proposed Overall Plan amendment and supporting documentation. The BWSR must consult with the Departments of Agriculture, Health, Natural Resources, Pollution Control, Planning Agency, Environmental Quality and other appropriate State agencies during the review.

The BWSR may disapprove a proposed amendment if it determines the amendment is not consistent with State law or the principles of sound hydrologic management, effective environmental protection or efficient management. If the amendment is disapproved, the BWSR must provide a written statement of its reasons for disapproval. The disapproved Overall Plan amendment may be revised by the Board of Managers and resubmitted for approval by the BWSR within 120 days after receiving notice of disapproval, unless the BWSR extends the period for good cause. The decision of the BWSR to disapprove the amendment may be appealed by the Board of Managers to District Court. The Board of Managers must adopt and begin implementation of its amended Overall Plan within 120 days after receiving notice of approval of the amendment from the BWSR.

**Minor Plan Amendment Procedure**

If an amendment to the Overall Plan is considered to be minor in nature, the following process will be followed:

1. The Board of Managers will receive a recommendation for an amendment to the Overall Plan. Recommendations can be introduced by the Advisory Committee, a resident of the District, or a Board of Manager.

2. At the Board of Manager’s meeting, where the amendment is introduced, the District will hold a vote on the proposed amendment. If the proposed amendment passes with a simple majority, the District will hold a public hearing to explain the amendment(s) and publish a legal notice of the hearing at least ten (10) days before the date of the hearing in the official District newspaper.

3. After the Public Hearing is closed, the amendment(s) shall pass with either a 4/5th or 3/4th vote from the Board of Managers.

4. The District will send copies of the amendment to BWSR for review and comment.
Appendix A:
Buffalo Creek Watershed
District Rules & Regulations
BUFFALO CREEK WATERSHED DISTRICT

BUFFALO CREEK WATERSHED DISTRICT RULES & REGULATIONS

ADOPTED JANUARY 25, 2011
These Rules and Regulations are adopted pursuant to Minnesota Statute 2009, Chapter 103D.341, on this 25th day of January, 2011.

Donald Belter, President

Charles Kubesh, Secretary

Buffalo Creek Watershed District
Board of Managers
~ January 2011 ~

Donald Belter, Sibley County
Corey Henke, McLeod County
Charles Kubesh, Renville County
Larry Phillips, McLeod County
Scott D. Lang, Renville County
The Buffalo Creek Watershed District
Rules & Regulations

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SECTION 1: ADMINISTRATION

1.01 **Official Website:** The Buffalo Creek Watershed District (BCWD or District) maintains an official website that has the District’s most current rules, regulations, and permit information, including all of the necessary application forms. The BCWD’s official website is located at: [www.bcwatershed.org]

1.02 **Origins of the District:** BCWD was established under the order of the Minnesota Water Resources Board (now known as the Minnesota Board of Water and Soil Resources or BWSR) on January 30, 1969. The District developed its first Overall Plan, in accordance with Minnesota Statutes, Section 112.46, which was adopted on February 8, 1974. The Plan provided the District with a basis for making decisions on the management of its water resources until the Plan was revised in 1991. The District’s current overall plan was adopted in 2004 and was written to cover a 10-year time-frame. There was a minor boundary change located in the City of Stewart, MN, which took place between BCWD and High Island Watershed District, with official BWSR Board approval in January 1999.

1.03 **Jurisdiction:** The jurisdiction of these Rules and Regulations includes all the area, incorporated and unincorporated, including both land and water, within the territory of the Buffalo Creek Watershed District. The map found in Appendix A shows the District’s legal boundary, which has remained unchanged since its formation. The District spans approximately 422 square miles within parts of five counties: Renville (55%), McLeod (38%), Sibley (4%), Kandiyohi (2%), and Carver (1%) Counties.

1.04 **Organizational Structure:** Renville and McLeod County Boards of Commissioners each appoint two BCWD Board Managers while Sibley County Board of Commissioners appoints one manager. Each manager is required to be a resident of the District. In addition, they are also prohibited from being a public official of the county, State or Federal government (exception: Soil and Water Conservation District Supervisors may also be BWCD managers). Appoint District Managers serve three-year terms, which are renewable upon reappointment by their respective County Board of Commissioners.

1.05 **Mission Statement:** The BCWD was formed with the Mission to: 1) help alleviate water problems, 2) enhance the living conditions of the area and 3) maintain or improve the economic well being of the residents of the District. The District has in the past and will continue to strive towards the realization of this Mission by:

A. Coordinating activities and issues between the public, interest groups, and governmental agencies;

B. Providing technical and financial assistance, when feasible, towards important water-related issues and projects within the District;

C. Collecting, analyzing, and reporting data on the quality and quantity of water resources throughout the District.
1.06 **Intergovernmental Cooperation:** The District will coordinate the administration of its Rules and Regulations with all involved local, state, and federal governmental units and agencies having jurisdiction in the District. The District may provide review and comment to county, cities, and townships for proposed land use activities and may also provide comment or list requirements for water quality, water quantity, or other natural resource protection. The District requests/recommends that all such governmental units submit proposed ordinances relating to surface water, drainage, land use and development, stormwater management and/or other water and land related ordinances to the District for review and comment.

1.07 **Due Process:** It is the intention of the Board of Managers that no person shall be deprived or divested of any previously established beneficial use or right, by any rule or regulation of the District, without due process of the law, and that all Rules and Regulations for the District shall be construed according to said intention.

   A. It shall be the function of the Board of Managers to exercise control over proposed improvements only to the extent necessary to protect the waters of the Watershed District from unreasonable impacts that are inconsistent with the policies contained in the Overall Plan, Policy Manual, and these Rules and Regulations.

   B. The Board of Managers shall review permit applications filed with the Minnesota DNR, pursuant to Minnesota Statutes 1990, Chapter 103G.001, that may impact water management decisions in the District as well as other development plans and proposed improvements. The Board of Managers desire to become informed of improvements and land development proposals during the early planning stages. The application shall be the primary vehicle for submission of proposed improvements to the Board of Managers.

   C. The Board of Managers will submit to the applicant their comments, recommendations, requirements and all other District actions regarding the proposed improvements.

   D. The Board of Managers will coordinate their review with the applicant and, when appropriate, the applicant will coordinate with the County, Municipal, MDNR, MPCA and all other appropriate governmental agencies.

1.08 **Definitions:** Appendix B contains a list of definitions, acronyms, and terminology used throughout these Rules and Regulations. If a definition, acronym, and/or terminology is not defined, the common usage of the definition, acronym, and/or terminology shall prevail.

1.09 **Effective Date:** These Rules and Regulations shall be in full force and effect after adoption on January 25, 2011, and shall replace the Rules and Regulations adopted by the Buffalo Creek Watershed District on May 25, 1993.
SECTION 2:
PURPOSE, GOALS, AND OBJECTIVES

2.01 **Purpose:** The District is required by Minnesota Chapter Statutes 103D to maintain administrative rules and the District’s Overall Plan identifies several areas where rules are necessary to successfully achieve the District’s statutory purposes. These areas include, but are not limited to: agricultural drainage; erosion and sediment control; storm water management; and reducing other sources of pollution and problems that affect both water quality and quantity. The District’s rules are intended to fill gaps in existing federal, state, and local regulations and are not intended to duplicate existing regulations.

2.02 **Goals:** The District’s Rules and Regulations were developed with the following goals:

A. To aid the Board of Managers in their review process; and

B. To inform the District’s staff of the criteria on which they should base their review and recommendation; and

C. To inform permit applicants of the criteria which their proposed project will be reviewed; and

D. To provide guidelines for the implementation of the District’s Overall Plan.

2.03 **Objectives:** Buffalo Creek Watershed District has enacted these rules to carry out the purposes for which the District was created under Minnesota Statutes Chapter 103D and to implement the policies of the District’s Overall Plan. Specifically, the District’s Rules and Regulations have the following objectives:

A. To implement the purpose for which the Watershed District was created.

B. To carry out the policies contained in the District’s Overall Plan and Policy Manual.¹

C. To coordinate the District’s activities with other governmental agencies.

D. To ensure that the water resource is considered, protected and preserved during the urbanization and development of the District.

E. To ensure that future regional water management needs are considered in the development of individual subdivisions, farms and all local water management plans.

F. To protect public health, safety, and general welfare.

¹ As of January 2011, the Buffalo Creek Watershed District Policy Manual is currently being developed.
SECTION 3: VALIDITY AND AMENDMENT PROCEDURE

3.01 Validity: All rules adopted by the District shall have the force and effect of law. If for any reason a section or subdivision of these rules should be held invalid, such decision shall not affect the validity of the remaining rules.

3.02 Amendment Procedure: The following amendment procedures shall apply to all rule adoption and/or rule amendments:

A. Any District property owner, Manager, or the District Administrator may propose rules or amendments to the Board. A copy of the proposed rules or amendments shall be submitted to each Manager, along with a statement justifying the proposed rule or amendment.

B. At the Board’s discretion, depending on the potential impact of the proposed rule, District staff may be directed to conduct stakeholder meetings to solicit input from persons and political subdivisions likely to be affected by the proposed rule.

C. In accordance with Minnesota Chapter Statutes 103D, the District shall submit the proposed rules to the Board of Soil and Water Resources and transportation authorities within the District for comments 45 days before the Managers vote to adopt the proposed rules.

D. The Board shall hold a public hearing prior to the adoption of all rules or amendments. The time, date, and location of the public hearing shall be determined by the District’s Board of Managers and notice shall be provided by publication in a legal newspaper of general circulation in each county with territory in the District.

E. The Managers shall adopt or reject the proposed rules or amendments based on a majority vote of the Managers. After public hearing, a majority vote of the Managers, and upon being signed by the District's President and Secretary, the proposed rules or amendments are deemed adopted.

F. The adopted rules or amendments shall become effective and have the full affect and force of law after publication in a legal newspaper of general circulation in each county having territory in the District.

G. A copy of adopted rules or amendments shall be forwarded to each of the following persons: the County Auditor and the County Commissioners of each county having territory in the District; every Township Board Clerk, City Clerk, and Regional Development Commission Chairman within the District; the Board of Soil and Water Resources; the Commissioner of the Minnesota Department of Natural Resources Board; the Executive Director of the Minnesota Pollution Control Agency; the Commissioner of the Minnesota Department of Health, SWCD, all Zoning and Planning Boards in the district, the Administrator of the Minnesota Environmental Quality Board, and other entities that the Board deems appropriate.
SECTION 4: 
THE DISTRICT’S PERMITTING PROCESS

4.01 Justification and Prior Approval: The requirement for a permit for certain activities within the District is not intended to delay or inhabit development. The District finds that a permit program is needed to help ensure wise development and conservation of natural resources in accordance with the District’s Overall Plan. No work or use requiring a permit shall be commenced prior to issuance of the permit. If work does commence prior to permit approval, an after-the-fact fee can be assessed in addition to any fees associated with acquiring the required permit.

4.02 Application Process: Any permit required by these rules will be issued in accordance with the procedural process of this Section and all applications are subject to the following requirements:

A. Prior to the submission of any application, the applicant must be familiar with the District’s rules, application requirements, and the standards for the approval of an application. The applicant is encouraged to contact and/or meet with the District Staff if necessary. A copy of the District’s current Rules, permit requirements, and application forms are maintained on the District’s official website at: www.bcwatershed.org

B. All applications for a District permit must be submitted on the application form as shown in Appendix C and contain all of the information required by the District’s Rules and Regulations.

C. All applications must be accompanied by a fee according to the District’s current fee schedule.2

D. Any application that requires Board review must be submitted, and deemed complete, 10 business days prior to the next regularly scheduled Board Meeting in order to be on the agenda. If an application is deemed to be incomplete, a written letter will be sent outlining what additional information is required.

E. Drawings or plans are required to be submitted with every permit application. The drawings or plans are not required to be prepared by an engineer, but they must adequately depict the information required by the District’s application form.

F. An initial site inspection, in-progress site inspections, final site inspection, and post-project monitoring inspections may be required as part of the approval of a permit application. A site inspection fee is charged to the applicant for each required site inspection. The fee shall be equal to the District’s actual costs as outlined in the District’s Fee Schedule.

2 The District’s current Fee Schedule is available online at www.bcwatershed.org
4.03 **Staff and/or Administrative Review:** It is administratively difficult for the Board to review every permit application. As a result, District Staff shall review all applications and make recommendations for approval or denial, including suggesting conditions that should be required. In addition, Staff may work with consultants on the administrative review of a permit. Any fees charged to the District may be passed upon to the applicant.

4.04 **Temporary Permit Approvals:** Temporary permits may be approved by any two Board Members in rare circumstances, such as during an emergency or critical situation. These temporary approvals require a full permit at the next scheduled Board meeting and may require additional conditions as necessary.

4.05 **Board Approval:** The Board will review and discuss all permit applications and may rely upon comments and/or advice from staff, legal counsel, consultants, governmental agencies, local units of government, and the general public.

A. The Board shall review permit applications at regularly scheduled meetings.

B. The applicant or a representative of the applicant must be present at the meeting to answer questions about the permit application. If no one is present and additional information on the permit is requested by the Board, a letter will be written to the applicant outlining what additional information is required. This may ultimately delay the Board’s final decision on the permit until all of the information required for the application is available.

C. The Board may add reasonable conditions to the approval of a permit to address site-specific or activity-specific concerns.

D. All Board approved permits shall be deemed issued when signed by the Board and all conditions of the permit have been satisfied.

E. If the District denies an application, written reasons for the denial will be provided.

4.06 **Conditions:** A permit may be approved subject to reasonable conditions necessary to ensure compliance with the requirements and intent of these rules. All conditions of the permit must be satisfied before the permit is deemed to be issued and the applicant can begin work.

A. A site inspection may be required anytime before, during, or after a project is complete in order to ensure that the applicant will and/or has complied with the conditions of the permit. Applicants are responsible for associated site inspection fees as outlined in the District’s Fee Schedule.

B. The requirements of any other permit (i.e., NPDES permit, wetland permit, public water permit, etc) required for the proposed activity are incorporated into the District permit. A violation of other required permits is a violation of the District permit.
C. By requesting and receiving a District permit, an applicant affirmatively grants the District a right of entry onto the applicant’s property for the purpose of performing site inspections.

D. A performance surety may be required as outlined in Section 4.08.

E. The Board of Managers may charge a fee for field inspections, if one is required. This fee will vary from permit to permit based upon actual costs, a per diem, or the District’s current fee schedule.

F. The Board of Managers will also charge for after-the-fact permits. The fee for after-the-fact permits shall be up to $1,000 plus all other expenses incurred by the Watershed District. All cost incurred shall be paid before the permit is issued.

G. If conditions of the permit have not been met, the District has the authority to fix the situation at the applicant’s expense.

4.07 **Deadlines for Action:** The District will seek to approve or deny a permit application within 60 days after receipt of a complete application and full payment of fees.

A. An application that requires a site inspection is not deemed complete until a site inspection is completed by District Staff. When weather, or other uncontrollable natural conditions, makes a site inspection temporarily impossible, then the timeline under this Section and Minnesota Statute 15.99 is tolled until conditions allow for the site inspection. Within 15 business days of receiving an application, the District will notify the applicant if the application is incomplete. Within 15 days, the District will also notify the applicant if the application requires a site inspection and is therefore incomplete until the site inspection is performed.

B. The District will comply with Minnesota Statutes Section 15.99 where it is applicable. Failure to meet an approval deadline shall not authorize any activity for which a permit cannot be granted because the activity is unlawful under applicable law.

C. If a state or federal law or court order requires a process to occur before the District acts on an application, or if an application requires prior approval of a state or federal agency, any applicable deadline for the District to approve or deny is extended to 60 days after completion of the required process or the required prior approval is granted.

D. If necessary, the District may extend any applicable initial 60-day period according to the provisions found in Minnesota Statutes Section 15.99.

4.08 **Performance Surety:** In accordance with Minnesota Statute 103D.345 Subdivision 4, the Board may require a performance surety, such as a bond or an irrevocable letter of credit, to secure performance of permit conditions and compliance with District rules. The federal
government, state, and political subdivisions are exempt from the requirements of this subdivision.

A. When a permit is conditionally approved upon the applicant providing a performance surety, the surety must be provided to the District before the permit is deemed to be issued and the applicant can begin work.

B. When the Board requires a performance surety, it shall be for an amount sufficient to cover the potential costs to cure any problems that may result from a violation of the permit. The District Engineer shall assist in determining this amount.

C. The performance surety must be in a form acceptable to the District and from a surety company licensed to do business in Minnesota.

D. The performance surety must be in favor of the District and conditioned on the applicant’s compliance with the terms of the permit. The performance surety must allow the District to claim the performance surety if the conditions are not met.

E. The District will release the performance surety in writing after all work is completed in compliance with the permit and District rules. The District, in writing, may release a portion of the surety if the entire surety, in the District’s sole discretion, is no longer necessary to secure compliance with the permit and District rules.

4.09 Applicant Agreement: When a permit is conditionally approved, the applicant is entering into an agreement with the District. The conditions of the permit must thereafter be executed before the permit is deemed to be issued and the applicant can begin work. The Board may require as a condition of the permit that an applicant and/or landowner, including any mortgagee, enter into an additional agreement with the District to specify the following items:

A. Specify the responsibility for the construction and future maintenance of approved structures; and

B. Document other continuing obligations of the applicant or owner; and

C. Grant reasonable access to the proper authorities for inspection, monitoring and enforcement purposes; and

D. Affirm that the District or other political subdivisions can require or perform necessary repairs or reconstruction of such structures; and

E. Reimburse the reasonable costs incurred to enforce the agreement; and

F. Require indemnification of the District for claims arising from issuance of the permit or construction and use of the approved structures.
4.10 Assignment and Transfer of Permits: An assignment or transfer of a permit without a change in the approved plans may be approved by the District Administrator. No assignment or transfer of a permit is allowed where the approved plans are changed. A change in the approved plans requires a new permit application. No assignment or transfer, regardless of whether the assignment or transfer is approved by the District Administrator, shall relieve the original applicant from liability under the permit.

4.11 Expiration of Permits: Permits are valid for 12 months unless otherwise specified in permit. Permit extensions may be granted by the District Administrator and/or the Board. Extension requests must be made in writing at least 30 days before the expiration of the permit. Additional conditions may be added to the permit when an extension is requested.

4.12 Appeals: Any person adversely affected by the approval or denial of a permit by the District may appeal the District’s decision in accordance with the appellate procedure provided by Minnesota Statutes Sections 103D.537 and 103D.539.

4.13 Exemptions: The Board of Managers may hear requests for an exemption from the literal provisions of these Rules and Regulations in the rare circumstance where the strict enforcement would cause undue hardship because of conditions unique to the property under consideration. In order to grant an exemption, the Board must find that the request meets **ALL** of the following four standards:

A. Special conditions apply to the applicant’s property that do not apply generally to other property within the District; and

B. Because of the unique conditions of the property involved, undue hardship to the applicant will result, as distinguished from mere inconvenience, if the strict letter of the rules is carried out. Economic considerations alone shall not constitute undue hardship if any reasonable use of the property exists under the terms of the District's rules; and

C. The proposed activity for which the exemption is sought will not adversely affect the public health, safety, welfare; will not create an extraordinary public expense; and will not adversely affect water quality, water control, or drainage in the District; and

D. The intent of the District's Rules and Regulations are met.

An exemption expires when the permit it is associated with expires. A violation of any condition for a permit where an exemption has been granted shall automatically terminate the exemption.
SECTION 5:  
THE DISTRICT’S REQUIRED PERMITS

A permit from the Buffalo Creek Watershed District is required for the following water related projects in the Watershed District:

5.01 **Surface Water:** Surface Water as defined in Appendix B includes any natural or manmade water body that is found above ground (i.e., lakes, streams, rivers, wetlands, etc.) and drainage systems. The District has a vested interest in ensuring that all of the following projects potentially affecting surface water resources are properly implemented through the District’s permitting process:

A. **Stream, Creek, and River Projects:** Any project potentially affecting, crossing, or involving a stream, creek, and/or river throughout the District.

B. **Dams and/or Dikes:** Any project involving a dam and/or dike.

C. **Bridge and/or Crossings:** Any bridge construction, repair, and/or crossing.

D. **Culvert Repairs or Replacement:** Any culvert repair or replacement project.

E. **Clean Outs:** Any surface water clean out, including drainage systems.

F. **Water Discharge:** Any project involving discharging water into a surface water resource.

G. **Wetlands:** Any wetland development, modification, and/or restoration.

H. **Ponding and/or berming:** Any project potentially resulting in holding water.

I. **Multiple Subwatersheds:** Any project proposed to impact more than one subwatershed must demonstrate how the proposed project may impact the subwatersheds.

J. **Miscellaneous:** Any other projects potentially negatively affecting surface water resources.

5.02 **Drainage Systems:** Every person shall use their land reasonably in disposing of surface water. Surface water shall not be artificially removed from upper land to and across lower land without adequate provision being made on the lower land for its passage, nor shall the natural flow of surface water be obstructed so as to cause an overflow onto the property of others. The District will enforce and comply with the drainage laws under Minnesota’s State Statutes. District intends to preserve drainage capacity, prevent flooding, and improve water quality by regulating certain agricultural drainage facilities within the watershed.
In addition to the provision listed in Section 5.01, drainage systems have the following additional permit requirements and must meet the standards set forth in Subsection 5.02 E:

A. **Tiling:** Any tiling of 8” or larger or any size tile where an easement is required (i.e., for projects potentially affecting adjacent landowner’s property)

B. **New or expanded systems:** Any proposed new or expanded public or private ditch system.*

C. **Repairs:** Any proposed repair or enhancement, including private ditch systems if they outlet into public ditch systems or public waters (as defined in Appendix B).*

D. **Outlets/Inlets:** Any new or improved outlets or inlets into an existing drainage system. The primary concern is to manage the volume of water directly entering into the drainage system.

E. **Standards.** A site drawing with the location of all drainage facilities must be submitted with the permit application. Where the exact location of drain tiles is unknown, an approximate location is sufficient. An application for a drainage permit under this Section must meet the following standards:

1. Demonstrate that downstream capacity exists for the additional water discharged by the drainage facility; and

2. Demonstrate that the proposed project complies with all local, State, and Federal wetland regulations; and

3. Design and maintain drain tile system intakes in a way that minimizes the introduction of sediments to the drainage facility; and

4. All new and improved outlets into existing public drainage systems or public waters shall be constructed in such design which will:
   
a) Provide and maintain a stable outfall that minimizes erosion; and

b) Will not impede the flow of water; and

c) Will not cause a deterioration of the receiving water.

* The repair or replacement of an existing private drainage system is exempt from this Section as long as the repair or replacement is not an expansion and the other provisions set forth in these Rules and Regulations are met.
5.03 **Land Use and Development:** The District has a vested interest in ensuring that all land use and development projects which could potentially negatively impact surface or groundwater resources are properly implemented through the District’s permitting process. The following projects are specially identified as needing a District permit:

A. Any land use alterations that could affect the quality and quantity of water resources.

B. Any underground construction, including but not limited to storm sewers, gas lines, pipelines, manure holding basins, underground storage, etc. Exemptions include basements, foundations, septic systems, and wells.

C. New roadway construction or improvements which could potentially negatively impact water resources.

D. Any construction crossing (over, through, or underground) which could potentially negatively impact water resources.

E. The platting of property to ensure proper stormwater retention and drainage.

5.04 **Erosion Control:** The District intends to prevent erosion and sedimentation into surface waters within the watershed by regulating land disturbing activities. The District requires that erosion control measures be in place for all land disturbing activities above specific thresholds. The erosion control measures must minimize erosion and sedimentation to the greatest extent possible. The following projects are specially identified as needing a District permit:

A. Any person or political subdivision undertaking a land disturbing activity that is (a) greater than 200 square feet in area; **AND** (b) within 300 feet of any surface water resource.

B. **Agricultural Exemption.** The ordinary agricultural practices of cultivating and planting, performed as part of an ongoing farming operation, are exempt from this Section.

C. **Standards.** An erosion and sediment control plan must be submitted and approved before a permit may be issued. The plan must minimize erosion and sedimentation to the greatest extent possible. A site plan drawing with the location of all erosion control features must be submitted with the permit application. The plan must demonstrate how the project will achieve the following standards:

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

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

3. The project must be phased to the greatest extent possible to minimize the area of disturbed land at any given time; and

4. Site specific topography and soil conditions must be specifically addressed; and

5. BMPs must be utilized in a manner consistent with MPCA guidance documents.

5.05 **Stormwater Management.** The District intends to manage storm water runoff within the watershed to promote infiltration, encourage pretreatment, and minimize peak flows after storm events and snow melt. A District permit is required for any development or redevelopment of the following properties:

A. The development or redevelopment of property resulting in the creation of more than one acre of new impervious surface.

B. The development of any new resort or PUD.

C. The expansion or replacement of a structure at an existing resort.

D. The redevelopment of a parcel that currently exceeds impervious surface limits imposed by Minnesota Rules Chapter 6120 or by any political subdivision within the watershed.

E. **Standards.** A site plan must be submitted with the permit application. A storm water permit application under this Section must meet the following standards:

1. Runoff rates for the proposed development or redevelopment of a property shall not exceed existing runoff rates for the 2-year, 10-year, and 100-year critical storm events. The runoff rate for the property after development or redevelopment must not exceed the runoff rate in existence prior to the proposed development or redevelopment.

2. All development or redevelopment of property shall treat 0.5 inch of runoff from all newly created or redeveloped impervious surface on the property such that implemented storm water BMPs, consistent with MPCA guidance documents, achieve removal of 90 percent of total suspended solids and 50 percent of total phosphorus prior to any runoff leaving the property.

3. The applicant must submit runoff calculations for 2-year, 10-year, and 100-year critical storm events. The applicant must also submit water quality calculations demonstrating that the total suspended solids and phosphorus standards will be met.
5.06 **Notification Only:** A permit is normally not required on the following projects if the District is properly notified 30 days prior to the projects being issued a permit by the proper regulating authority: *

- A. Public facility wastewater projects
- B. Feedlot expansion and/or development projects
- C. Aggregate mining projects
- D. Any permit normally required in by the District as identified in this Section which is deemed exempt for being regulated by existing local regulations. These exemptions are described in Section 5.07.

** The District reserves the right to determine that a permit from the District is required if the proposed project triggers one of the topics regulated by the District’s Rules and Regulations.

5.07 **Exemption for Existing Regulation:** The District does not intend to duplicate the regulations of other political subdivisions where other political subdivisions have regulations that are equally as stringent or more stringent than the District’s regulations. An exemption from the District’s Rules and Regulations will be assumed if all of the following conditions are met:

- A. The political subdivision must enforce its regulations at a standard which meets or exceeds the District’s standards; and

- B. The political subdivision must provide the District with notice of all pending permit applications within the watershed 15 days prior to approval by the political subdivision; and

- C. The political subdivision must consider any comments provided by the District in regards to the pending permit.
SECTION 6:
ENFORCEMENT

6.01 Violation is a Misdemeanor: A violation of a District rule, or a permit issued under District rules, is a misdemeanor subject to the maximum penalty provide by Minnesota law.

6.02 Court Action: The District may exercise all powers conferred upon it by Minnesota Statutes Chapter 103D in enforcing these rules, including criminal prosecution, injunction, or an action to compel performance, restoration, or abatement.

6.03 Administrative Order: The District may enforce its rules by issuing a cease and desist order when it finds that an activity violates any rule of the District or permit issued by the District.

6.04 Order to Show Cause: The Board may require a person or political subdivision in violation of a District rule or permit to appear at a District meeting to show cause why the violation should be allowed to continue.

6.05 Future Permits: No future permit shall be issued to any person or political subdivision in violation of a District rule or a previously issued District permit until the violation has been remedied to the sole satisfaction of the District.

6.06 After-the-Fact Permits: The Board of Managers may also charge for after-the-fact permits. The fee for after-the-fact permits shall be up to $1,000 plus all other expenses incurred by the Watershed District. All costs incurred shall be paid before the permit is issued.

SECTION 7:
PUBLIC MEETINGS AND RECORDS

7.01 Public Meetings: All meetings of the District, whether regular or special, shall be open to the public and shall be held at a time, date, and place determined by the Board of Managers. All regular scheduled meetings shall be posted on the District’s website at:

www.bcwatershed.org

7.02 District Records: The records of the District shall be public records, as required by State statute and shall be available to the public for inspection to the extent required. The intention of the District is to cooperate with all persons, governmental units, organizations, and agencies in the promotion of the District’s regulatory activities.
APPENDIX A:

BUFFALO CREEK
WATERSHED DISTRICT OFFICIAL MAP
APPENDIX B:
DEFINITIONS, ACRONYMS,
AND TERMINOLOGY

For the purpose of these rules, unless a different meaning clearly appears from the context, certain terms are defined as follows (if a phrase, acronym, and/or terminology is not defined, the common usage of the phrase, acronym, and/or terminology shall prevail. Definitions found in Minnesota’s State Statutes, State Rules and Regulations, and the Webster-Merriam Dictionary may be consulted if necessary):

**Alterations to Land:** including, but not limited to, grading, excavation, fill or movement of soil or vegetative material.

**BMPs (Best Management Practices):** practices to prevent or reduce the pollution of waterbodies and wetlands, including schedules of activities, prohibitions of practices, and other management practices.

**Board:** the District’s Board of Managers.

**Board of Managers:** the District’s Board of Managers.

**Board Meeting:** the District Board of Managers meeting held on the fourth Tuesday of each month at the District Office.

**BWSR:** stands for the Minnesota Board of Water and Soil Resources and is the State’s soil conservation agency. The 20-member board consists of representatives of local and state government agencies and citizens.

**CROW:** The Crow River Organization of Water (CROW) was formed in 1999 as a result of heightened interest in the Crow River. A Joint Powers Agreement has been signed between all ten of the Counties with land in the Crow River Watershed. The CROW Joint Powers Board is made up of one representative from each of the County Boards who signed the agreement. The Counties involved in the CROW Joint Powers include Carver, Hennepin, Kandiyohi, McLeod, Meeker, Pope, Renville, Sibley, Stearns and Wright.

**Detention System:** a structure or facility which collects and stores runoff on a temporary basis with a subsequent gradual release of stormwater at a controlled rate. A detention basin by retain some water.

**Discharge:** the disposal, conveyance, channeling of runoff or drainage of water or material, including, but not limited to, surface water, drainage facilities, stormwater, and snow melt.

**District:** the Buffalo Creek Watershed District.

**Drainage Facilities:** open ditches and drain tile systems collectively.
**Drain Tile System:** any privately owned underground conduit used to conduct the flow of water in order to drain agricultural lands.

**Erosion:** the wearing away of soil by rainfall, surface water runoff, wind, or ice-movement.

**Fill:** soils, sand, gravel, clay, or any other natural material which is moved from one place to another and placed on land or in water.

**FSA:** stands for the Farm Service Agency, responsible for the implementation of U.S farm policy. The organizational structure of FSA is laid out by Congress and overseen by the secretary of agriculture. The FSA administrator reports to an undersecretary of agriculture for Farm and Foreign Agricultural Services (FFAS).

**Groundwater Recharge Area:** an area in which surface water accumulates and conveyed to groundwater aquifers.

**Intake:** an opening through which fluid enters a duct, channel, or drainage tile.

**Impervious Surface:** a surface that is compacted or covered with a layer of material that is resistant to the infiltration of water, including, but not limited to, compacted sand, gravel, or clay and streets, sidewalks, parking lots, and structures.

**Land Disturbing Activity:** any disturbance to the ground surface that may result in soil erosion from water or wind and the movement of sediments into or upon waterbodies or wetlands within the watershed. Land-disturbing activity includes but is not limited to the demolition of a structure or surface, soil stripping, clearing, grubbing, grading, excavating, filling and the storage of soil or earth materials. This includes a disturbance to the land that results in a change in the topography, existing soil cover, or vegetation that may result in accelerated storm water runoff which may lead to soil erosion and movement of sediment. The term does not include normal farming practices as part of an ongoing farming operation.

**Lateral:** any constructed waterway or drain which conveys water to a public ditch.

**Managers:** the Board of Managers of the Buffalo Creek Watershed District. Please refer to Section 1.03 of the District’s Rules for more information.

**MAWD:** The Minnesota Association of Watershed Districts (MAWD) represents 45 watershed districts in the state. The watershed districts are partners in water protection and management.

**MDNR:** The Minnesota Department of Natural Resources.

**MPCA:** the Minnesota Pollution Control Agency.
NRCS: Since 1935, the Natural Resources Conservation Service (originally called the Soil Conservation Service) has provided leadership in a partnership effort to help America's private land owners and managers conserve their soil, water, and other natural resources.

On-Site: within the contiguous confines of a commonly owned land and/or parcel.

Open Ditch: any privately owned open channel used to conduct the flow of water in order to drain agricultural lands.

Ordinary High Water (OHW) – the boundary of public waters and wetlands which is an elevation delineating the highest water level which has been maintained for a sufficient period of time. Commonly it is the point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial. For watercourses, the OHW is the elevation of the top of the bank of the channel.

Person: any individual, partnership, company, corporation, but does not include any political subdivision.

Point Discharge: discharge from a specific outlet, such as a storm sewer, pipe, culvert, or ditch.

Political subdivision: any city, township, county, school district, or political subdivision of the State of Minnesota.

Public Waters: are all types of surface water that meet the criteria set forth in Minnesota Statutes, Section 103G.005, subd. 15, that are identified on Public Water Inventory maps authorized by Minnesota Statutes, Section 103G.201.

PUD (Planned Unit Development): a type of development characterized by a unified site design for a number of dwelling units or dwelling sites on a parcel, usually involving clustering of these units or sites to provide areas of common open space, density increases, and a mix of structure types, land uses, and form of ownership.

Redevelopment: any change in use of a property or permanent physical change to a property that alters the drainage pattern of the property or causes an increase in pollutants in storm water runoff from the property.

Resort: a building or group of buildings located adjacent to any waterbody for purposes of providing convenient access to the waterbody, and held out to the public to be a place where sleeping accommodations are furnished to the public, primarily to those seeking recreation.

Retaining Wall: a structure or facility which accumulates a specified amount of stormwater or runoff.
Runoff: water, including nutrients, pollutants and sediments carried by water, discharged from a land surface.

Sediment: mineral or organic particulate matter what has been carried from its point of origin by water or wind.

Shoreland (Shoreland District or Shoreland Zone): land located within 1,000 feet of the ordinary high water mark of a protected water (lake) or 300 feet from a river or stream. These areas are often identified in the various county zoning ordinances.

Storm Sewer: a system installed for the specific purpose of transporting water from one location to another. Normally made of pipe material, but may also include reaches of flumes, spillways, or open channels.

Stormwater: normally refers to precipitation runoff and/or snow melt runoff, but may also include any other surface runoff and/or drainage that varies according to precipitation levels.

Surface Water: any natural or manmade water body that is found above ground (as opposed to underground). Surface water includes but is not limited to lakes, rivers, streams, ditches, wetlands, ponds, drainage ditches, etc.

TMDL: A Total Maximum Daily Load (TMDL) is a regulatory term in the U.S. Clean Water Act (CWA), describing a value of the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards. Alternatively, TMDL is an allocation of that water pollutant deemed acceptable to the subject receiving waters.

Vegetation: normally refers to naturally occurring brush, shrubs, grass, or trees, but may also refer to preferred vegetation based upon a prescribed Best Management Practice (BMP).

Waterbody: any body of water including lakes, rivers, streams, watercourses, or water basins.

Watercourse: channel having definable bends and banks capable of conducting confined runoff from adjacent lands (except during periods of flooding). A watercourse may be perennial or intermittent, natural (i.e. stream), or man-made (i.e. ditch).

Watershed: means the boundaries of Buffalo Creek Watershed District (see the District Map found in Appendix A).

Wetland: 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 and where hydric soils and hydrophytic vegetation are present under normal circumstances. This definition includes public waters wetlands as designated by the Minnesota Department of Natural Resources and wetlands under the jurisdiction of the Wetland Conservation Act.
APPENDIX C:

BCWD PERMIT FORMS
APPLICATION FOR PERMIT

TO:      BUFFALO CREEK WATERSHED DISTRICT              PERMIT NO.______________

Applicant______________________________________________________________________
(Print or Type)

Address_______________________________________________________________________

Telephone Number (     ) _______-__________      Email Address____________________

Cell Phone Number (     ) _______-__________

Applicant proposes to do the following work:

☐ Clean Existing Ditch   ☐ Install Erosion Control Structure
☐ Construct New Ditch    ☐ Install Tile
☐ Build Water Retention Area  ☐ Repair Shoreline
☐ Abandon and Fill an Existing Ditch or Waterway  ☐ Install Culvert
☐ Abandon Existing Tile and Replace With a New Tile
☐ Other ________________________________

The proposed construction is necessary because:

☐ Flooding Occurs   ☐ Poor Drainage
☐ Control Runoff    ☐ Ditch Filled with Silt
☐ Excessive Erosion ☐ Present Design Inadequate
☐ Other ________________________________

If a ditch is to be constructed or cleaned; a culvert is to be installed; a tile is to be installed, provide how many acres will it drain and percent of grade? ________________ ________%

I intend to begin construction on/or about _______________________________________

The work is to be done in _____________ TWP, TWP_______ North, Range _______ West, Section _____________
The applicant shall provide all necessary drawings, studies, maps, aerial photographs, calculations, easements, etc., with the permit application.

I UNDERSTAND THAT THE CONSTRUCTION I PROPOSE MAY BE VIEWED AND/OR EVALUATED PRIOR TO BOARD ACTION AND MUST BE DATED 15 DAYS PRIOR TO REGULAR BOARD MEETING DATE TO BE CONSIDERED.

Date__________________ Signed__________________________________________________

I am aware of the requirements of the Rules of the District. This Permit does not relieve the applicant of any requirements for other Permits which may be necessary from Township, County, State, or Federal Government Agencies.

______________________________________________________________________________

ACTION BY THE BOARD OF MANAGERS OF THE BUFFALO CREEK WATERSHED DISTRICT

The above Application for Permit is approved _____ disapproved _____ this _____ day of ________________, 20_____. This permit is valid for a period of one year from the date of issuance. The Board makes the following (suggestion/requirement) as a part of this Permit:

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Buffalo Creek Watershed District

____________________________                                   ______________________________
President                                                                            Secretary
Appendix B:

Public Review Comments
January 9, 2014

Donald Belter, President
Buffalo Creek Watershed District
P.O. Box 55
Glencoe, MN 55336

RE: Buffalo Creek Watershed District Management Plan

Dear Donald,

I have had the opportunity to be involved with the Buffalo Creek Watershed District as they have worked towards developing their next generation watershed management plan. I appreciate the time and effort the watershed district has put into this planning process.

Your draft Buffalo Creek Watershed District Management Plan 2014 – 2023 was recently made available for review. Based on my review, I offer this letter with my comments and recommended corrections/additions and request that it becomes part of the public hearing record.

- The draft Management Plan does not include Acknowledgements, an Executive Summary, or an Introduction. Each of these components was included in your previous Management Plan. These sections are important and should be included in this plan as well.

- The Table of Contents is missing the lists of maps, tables, and figures, which should be included.

- In your previous Management Plan you included references for many of the sections. I don’t see these references in this Management Plan despite a large portion of the text remaining the same. These references should be included again.

- Page 1-1, 2nd Paragraph, 2nd Sentence: I believe you are referring to Table 1A here, not Table 1B.

- Page 1-3, Map 1A: You should update the populations for the Major Cities with 2010 Census numbers.

- Page 1-8, Last Paragraph: It should be Table 1B that you are referring to in the first sentence, just as you do in the second sentence. Also in that first sentence, the projects in Table 1B appear to range from 2002 to 2013, not 2012 as currently stated.
• Page 1-10, 3rd Paragraph: More information on your Advisory Committee should be provided. How are they appointed? How often do they meet? What specific issues and/or projects have they advised on in the past? Also, in the listing of members, Jon Sellnow is listed as “Mr. Jon Sellnow”, while none of the other members have a title. You should be consistent in how you name each member of the committee.

• Page 1-19, Table 1C: The percent change since 1970 for the City of Stewart should be -14%.

• Page 1-21, Figure 1A: An updated map of the Normal Annual Precipitation for Minnesota using data from 1981 through 2010 is available on the State Climatology Office website (http://climate.umn.edu/image/normals/81-10_precip/81-10_precip_norm_annual.htm). Information in the second paragraph of this page should be updated based on the use of this updated figure.

• Page 1-22, 2nd Paragraph: It should be Map 1B you are referring to in the first sentence, not Map 2B.

• Pages 1-32 through 1-35: A number of the land use categories described through these pages do not actually occur within the Buffalo Creek Watershed, according to Table 1F. Examples include Bare Rock, Coniferous Forest, and Transitional Agricultural Land. It doesn’t seem necessary to include their descriptions in the plan if they don’t occur in the watershed.

• Page 1-36, 1st Paragraph, 1st Sentence: It should be Table 1F that you are referring to, not Table 1l.

• Page 1-36, Table 1F: The last column of the table should be Percent of Watershed instead of Percent of County.

• Page 2-2, 1st Full Paragraph, 3rd Line: You refer to the monitoring locations in Map 3A in Chapter 3 of the Management Plan here. I don’t see a Map 3A included in the plan. Was it intended to be included or are you referring to a different Map?

• Page 2-2, 1st Full Paragraph: If the Buffalo Creek Watershed District has been collecting flow monitoring data continuously since 1989, why is the most recent data displayed here from 2000? The section should be updated with data collected since the last plan update. If data has not been collected since 2000 it should be stated in the plan.

• Page 2-6, 1st Full Paragraph and Table 2C: The data presented in this paragraph and Table 2C is only current through 2002, which is when your plan was last updated. This section should be updated to reflect your most recent data, not just copied from your old plan.

• Page 2-7, Last Paragraph, 3rd Sentence: I see 28 public ditches listed in Table 2D on Page 2-8, not 24.
• Page 2-10: BWSR recommends you reference "The Drainage Issue" or include this as an appendix, rather than include it within the plan. "The Drainage Issue" was included in your 2002 plan, so it would probably be better to reference it in your update. If not, page 2-11, 1st Paragraph: You have an extra blank line within this first paragraph.

• Pages 2-14 through 2-16: It appears you copied and pasted a majority of the BWSR FY13 RFP for the Conservation Drainage Clean Water Grant here. If the intention is to show the types of grants and programs BWSR works with pertaining to drainage you could talk about a few of them here, but including the entire RFP for a grant that is already out-of-date is unnecessary at this point. BWSR recommends including a hyperlink to our website for reference, which would serve the same purpose, rather than including the RFP.

• Page 3-13, Last Paragraph, 3rd Sentence: It states that the greatest average total phosphorus concentrations are found in June and July. However, Figure 3D seems to indicate that the highest concentrations from 1996 to 2000 were found in July and August.

• Page 3-24: For Priority Issue 3, wouldn’t the western half of the Buffalo Creek Watershed comprise your priority subwatersheds? As it states in the Issue Overview, there is an adequate buffer along Buffalo Creek from Stewart to the South Fork of the Crow River, while west of Stewart the Buffalo Creek has been channelized and has very little vegetative buffering.

• Page 3-26, 2nd Full Paragraph, 2nd Sentence: You should have more recent CRP acreages than from 2002. You can find these numbers at the following location: http://www.bwsr.state.mn.us/easements/CLS%20Statewide%20Summary%20August%202013.pdf

• Page 3-28, 2nd Paragraph, 2nd Sentence: Updated WRP acreages can also be found from the link in the previous comment.

• Page 3-29, Last Paragraph, 2nd Sentence: Updates RIM data is available at the following location: http://www.bwsr.state.mn.us/easements/easements_general.pdf

• Page 3-30, 1st Paragraph, 1st Sentence: I think you are referring to Chapter Three here, not Chapter Four.

• Page 3-34, 2nd Full Paragraph, 1st Sentence: I think you are referring to Chapter Three here, not Chapter Four. You also mention facilitating multipurpose corridors instead of erosion and sediment control. I think this is due to a copy and paste error.

• Page 3-36, 3rd Paragraph, 1st Sentence: Same comment about referring to Chapter Three instead of Four.

• Page 3-39, 3rd Paragraph, 1st Sentence: Same comment about referring to Chapter Three instead of Four.
• Page 4-3, 1st Paragraph, 1st Sentence: Presettlement vegetation is displayed in Map 1E, not Map 1D as referenced here.

• Page 4-5, 3rd Paragraph, 2nd Sentence: You should be referring to Map 4A here, not 4E.

• Chapter 5: The Goals, Objectives, and Guidelines listed in Chapter 5 do not match up with Priority Issues that are listed in Chapters 2, 3, and 4 very well. Ideally, you should discuss these Priority Issues earlier in the plan (which you have done) and then they should feed into the Goals, Objectives, and Guidelines you set near the end of the plan. BWSR strongly recommends revising the section to establish a stronger link between your Priority Issues and your Goals, Objectives, and Guidelines.

• Page 5-7: There seems to be two different font sizes used for the Goal 4 text. Specifically, “THE BUFFALO CREEK” appears to be a smaller size than the rest of the text.

• Table 6A includes several Plan Project Implementation Priorities. Page 6-3, the 7th priority listed has Flood miss-spelled as Food. The 8th and 9th priorities are lake drawdowns, but with no description of why (flood control, habitat, invasive species, etc.) and who some partners may be (DNR, local governments, etc.). Any added detail to implementation priorities may help make a grant application more competitive (priority areas, partners (who else thinks this is important?), targeted based on flow or water quality date, etc.).

Thank you for the opportunity to provide constructive comments and recommendations. As stated in previous BWSR comments, please note; to have a useful, fundable plan (i.e. receive competitive grant funds) targeting, measurability, prioritization of priority concerns, and goals, and actions will be needed. You will not be successful if your plan reflects implementation with a watershed-wide emphasis. A more targeted approach will be necessary.

Feel free to contact me if you have any questions about any of the comments I have provided.

Sincerely,

Adam J. Beilke
BWSR Board Conservationist

Cc:  BCWD Board of Managers
     Matthew Johnson, Mid-Minnesota Development Commission
     Jeff Nielsen, BWSR Southern Region Supervisor
     Travis Germundson, BWSR Water Management Specialist
January 31, 2014

Board of Soil and Water Resources
Attention: Jeff Nielsen & Adam Belike
261 Highway 15 South
New Ulm MN 56073

UPDATED BUFFALO CREEK WATERSHED PLAN (2014-2023)

Dear Jeff and Adam:

Thank you for the opportunity to review the draft watershed district plan for the next 10 years. Overall the plan provides an excellent source of information about watershed conditions, goals, issues and priorities. Water quality data collected to date are included and discuss the MPCA's impaired waters designations and the Total Maximum Daily Load (TMDL) process. However, the TMDL study process has been replaced by the more comprehensive approach to addressing water quality impairments – Watershed Restoration and Protection Strategy (WRAPS).) As you are probably aware the South Fork Crow River WRAPS project was initiated in 2012. The DNR, Buffalo Creek Watershed District and the CROW are all considered important partners assisting MNPCA with this effort. It is important that this information is included and incorporated by reference into the revised plan as it provides an important framework for better understanding the water resource issues and addressing them in a targeted and system based approach. More information on WRAPS can be found at: (http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/watershed-approach/index.html).

Many of the goals and issues listed in the plan are interrelated such as water quality, flood reduction, drainage management, recreation and habitat. DNR Ecological and Water Resources have developed a decision support tool called the Watershed Health and Assessment Framework or WHAF. The WHAF incorporates five components: Water Quality, Hydrology, Biology, Geomorphology and Connectivity to use a system approach for watershed assessment, restoration and protection. Area Hydrologist, Garry Bennett would be happy to meet with the board and demonstrate the value this tool may have in helping the BFC Watershed District target future efforts within sub watersheds to positively affect the hydrology of the watershed: improve water quality, reduce high peak flows, minimize low or no flows and minimize flooding. More information on the WHAF can be found at: (http://www.dnr.state.mn.us/whaf/index.html).

Reducing accelerated runoff in the watershed is listed as a primary goal. During peak flow periods (i.e. spring runoff) runoff from agricultural lands, along with improvements in water quality and soil health, can be achieved through the use of cover crops. Our Regional Ecologist, Megan Benage would be happy to meet with the district to discuss the benefits and barriers of cover crops and possibly explore implementing a project in the watershed. She can be reached at (507) 359-6079.
Additionally, Regional Cleanwater Specialist Brooke Hacker (507) 389-6712 and Area Hydrologist, Garry Bennett (320) 234-2557 can help the watershed prioritize project proposals and where they should be located for the most benefit in the watershed. While the Brownton river bank erosion project is one specific project, the hydrology of the watershed is causing similar eroded banks all over the watershed. Assessing drainage impacts on downstream waters and developing goals for the watershed is needed.

Listed below are the department’s more detailed comments and recommendations:

**Detailed Comments**

Page 1-3, Map 1A. COMMENT: Map should be updated using 2010 census data.

Page 1-9, Table 1B. REMINDER: In accordance with Minnesota Statutes 103E, *DNR Ecological & Water Resources* should be notified prior to commencing District projects within Buffalo Creek.

Page 1-11. COMMENT: Cities – Brownton, Glencoe, and Plato also administer their local floodplain management ordinances.

Page 1-14. COMMENT: Minnesota Department of Natural Resources – Should state "...principal divisions of the DNR include *Ecological and Water Resources*, Fisheries, Forestry, Lands and Minerals, Parks and Trails, and Wildlife."

Page 1-21, Figure 1A. COMMENT: Newer precipitation data is available, as given below, and should be used in the figure to replace the dated 2002 data.

Page 1-22. COMMENT: HYDROGEOLOGY – The Renville County Geologic Atlas, including both Part A (geology) and Part B (hydrogeology) is currently listed as "in progress"; however, the McLeod County Geologic Atlas was recently completed in 2013. The Watershed District might consider incorporating the results of these atlases into the plan.

Page 1-33, Map 1F. COMMENT: Newer land use data is available (e.g. USDA 2012 Cropland Data Layer or 2006 USGS National Land Cover Dataset) and should be used in the map to replace the dated 1990 data. Land use changes since 1990 can be significant on a subwatershed level.

Page 1-36, Table 1F. COMMENT: Newer land use data is available and should be used to replace the "Land Use Analysis" table, which again uses the dated 1990 dataset.

Page 2-1. COMMENT: BCWD's Role in Water Quantity Management – It should maybe be noted that the District’s role appears to be specific to surface water quantity management. Subsurface water quantity is generally less available in the western portions of the District, and increasing interest in agricultural irrigation may stress groundwater availability in those areas.

Page 2-5, Figure 2B. COMMENT: The Brownton gage is a flood warning gage and is not maintained through the winter months. The hydrograph in the figure is clearly under the influence of ice or some other interference from January to March. Either make note of this in the figure or consider displaying a spring/summer/fall hydrograph only.

Page 2-6, Table 2C. COMMENT: Updating the table to include data since 2002 might be considered.

Page 2-7. COMMENT: Implications and Assessments – It should be noted that the installation of drainage tile can, under certain circumstances, also contribute to higher stages and greater peak discharges.
Page 2-7 & 2-10. COMMENT: Drainage Management – There appears to be a discrepancy; page 2-7 states the "District only exercises jurisdiction over J.D. 7-91," while page 2-10 indicates the "Watershed District serves as the drainage authority for two drainage systems, Judicial Ditch 79-2 and 75-2". If this is an error, it should be corrected.

Page 2-10. Reference to the 2002 Farm Bill seems dated. Recommend updating this sentence "...the 1985, 1990, and 1996 Federal farm bills all contained significant wetland protection measures for landowners planning crops (consequently, the 2002 Farm Bill does as well)...".

Page 2-19. COMMENT: BCWD Priority Issue 1 – Although the entire Buffalo Creek is listed as impaired, conservation drainage practices should be targeted towards those drainage systems more directly impacting an impaired waterbody – or those systems located within subwatersheds characterized by highly degraded water quality. The DNR has developed a tool to assess subwatershed health called "the Watershed Health Assessment Framework". More information on this tool may be found at: (http://www.dnr.state.mn.us/whaf/index.html).

Page 2-20. COMMENT: Two-Stage Ditch Systems – Two-stage ditches also have a greater ability to transport sediment compared to conventional ditch designs because of the relatively narrow and deep "main channel". For natural watercourses, such as Buffalo Creek, DNR recommends considering toe wood-sod mat bank stabilization and revetment where the channel exhibits instability. Toe wood-sod mats are similar to two-stage ditches in that they attempt to reconnect the channel with its floodplain by creating a bankfull bench, thereby reducing near-bank shear stress while also providing aquatic habitat. More information on toe wood-sod mats may be found at: http://files.dnr.state.mn.us/publications/waters/toe_woodsod_mat_dec2010.pdf

Page 2-21. COMMENT: BCWD Priority Issue 2 – Sizing coefficients outlined in the "Minnesota Drainage Guide" may help assign priority subwatersheds (e.g. based on soil type, crop value, tolerance to wetness, topography, crop residue, etc.).

Page 2-26. COMMENT: Flooding and Water Retention – The statement "...Federal and State governments require floodplain regulations to be adopted by counties and municipalities..." is not wholly correct. As a condition of the National Flood Insurance Program (NFIP), communities agree to adopt and enforce Federal and State floodplain regulations. In return, the Federal government agrees to make Federally-backed floodplain insurance available to the residents of that community. Participation in the NFIP is generally voluntary. However, the State Floodplain Management Act does require those communities with mapped floodplains to adopt management regulations. Many smaller towns still do not have FEMA floodplain maps and are not required to adopt regulation.

Page 2-27. COMMENT: Flooding and Water Retention – The sentence "Local enforcement is generally through the county or municipal zoning official and the regional DNR hydrologist," to be more accurate, should state "DNR Area Hydrologist", instead of "regional DNR hydrologist".

Page 2-27. COMMENT: Implications and Assessments – The plan indicates that the majority of the designated floodplain is found east of the City of Stewart. While true, it should be noted that the 100-year floodplain west of Stewart has not been mapped, yet.

Page 2-27. COMMENT: Implications and Assessments – The statement "All five of the counties within the District have adopted a floodplain ordinance" is not correct. Presently, the City of Hector, City of Buffalo Lake, and the City of Stewart do not participate in the NFIP and do not likely have adopted floodplain management ordinances. However, it should be noted that these communities also do not have any FEMA mapped High Risk Areas.
Page 2-27. COMMENT: What exactly is the 100-Year Flood – The statement “New buildings constructed in SFHAs are required to have their lowest floors at or above the BFE listed for that location on the current FIRM” is not entirely correct. The State of Minnesota requires that new buildings be built to the regulatory flood protection elevation, which is defined as the BFE plus one foot of freeboard plus any stage increase.

Page 3-24. COMMENT: BCWD Priority Issue 3 – The Watershed District should consider assigning priority subwatersheds for the targeting of conservation buffers based on subwatershed water quality health, proximity to impaired water bodies, reaches having unstable banks (erosive banks), etc.

Page 3-31. COMMENT: BCWD Priority Issue 4 – The Watershed District should consider assigning priority subwatersheds for targeting erosion and sediment control BMPs based on subwatershed water quality health, proximity to impaired water bodies, reaches having unstable banks, non-buffered areas, ravines, etc.

Page 6-2, Table 6A. COMMENT: The affected subwatersheds should be identified for each project listed to help establish a relationship with the priority issues and priority subwatersheds listed in Chapters 2 and 3 of the plan.

Page 6-2, Table 6A. COMMENT: JD 4 Evaluation of Downstream impacts due to Tile Improvements Project – The District should consider monitoring the changes in channel morphology as part of the JD 4 pilot project. To accomplish this, one or more permanent cross sections could be established, along with study bank sites to measure erodibility and near-bank shear stress.

Page 6-3, Table 6A. COMMENT: The project description starting with “BCWD Hydrologic Food Analysis” should be corrected to state “BCWD Hydrologic Flood Analysis”.

Again we appreciate the opportunity to comment on the draft updated watershed plan. Thank you for your consideration of these comments. We are hopeful we can increase our cooperation to protect the watershed and the water resources that flow through it. We look forward to working together on achieving our common goals.

Sincerely,

Robert Collett
Regional Manager

ec: Brooke Hacker, Cleanwater Specialist
Megan Benage, Regional Ecologist
Garry Bennett, Area Hydrologist
Lee Sundmark, Fisheries Manager
Joel Stangel, Wildlife Manager
Margaret Leach, PCA
January 16, 2014

Board of Managers
Buffalo Creek Watershed District
P.O. Box 55
Glencoe, MN 55336

Matthew E. Johnson
Community Development Director
Mid-Minnesota Development Commission
333 6th Street SW, Ste. 2
Willmar, MN 56201

Dear Board Members:

Upon review of the proposed changes in the 2014 BCWD Plan Update, the Renville County Board of Commissioners would like to take this opportunity to voice our concerns with some of the proposed revisions being considered.

Our first area of concern, as you are aware from prior meetings with Commissioner Kramer and our Advisory Board Representatives, deals with making the 3/8 drainage coefficient the standard by which all tile system proposals will be evaluated by the District. Your proposed plan revisions also reference sizing to be conducted by coefficients outlined in the Minnesota Drainage Guide. We feel this statement contradicts the 3/8 sizing value. If the Minnesota Drainage Guide is used, each tile system proposal would need to be evaluated by soils types in the watershed area to be drained. This would lead to tile sizing coefficients from ¼ inch to ¾ inch, depending on the soils present in the watershed of the proposed new tile line.

We fully understand the District’s desire to hold more water for a longer period of time to lessen the flood impacts to downstream areas of Buffalo Creek. However, we cannot agree that utilizing a limiting tile sizing design standard is the way to accomplish this goal. We feel strongly that the ¼ inch design standard should be adopted in the BCWD Plan. This is the design standard accepted by all other regulatory agencies within Renville County (examples: NRCS, DNR, SWCD, and the other permit issuing Watershed Districts covering the County). This is the design standard needed to meet the needs of agricultural producers throughout the entire watershed.

The Renville County Board believes that additional time and efforts should be devoted to larger scale retention projects, such as the Phare Lake and Hodgson Lake modification projects that will have substantial impacts on downstream flooding issues. We believe the BCWD should expend additional time and resources to identify
areas within the watershed capable of acting as large scale retention basins and work toward making these areas a reality.

The second item of concern we have with the BCWD Plan Update is in the sizing and evaluation of road system bridge replacement projects, and the closure of open drainage ditches. In review of the recent BCWD evaluations of road system bridge replacement plans and open ditch closure plans, it seems that additional size restrictions are always proposed. Permit applicants for both project types are asked to provide hydraulic analysis by qualified engineers. Once the BCWD consultant reviews the flow sizing data, a sizing reduction is usually recommended to the Permit Applicant.

We, as a Board, feel that the replacement of a clear span bridge with a box culvert, or the closing of an open drainage channel and replacing it with a down sized tile system to transport water to the outlet point, are already a restriction of flow. We feel that road system bridge replacement projects should be sized to provide equal to, but not greater than, flows allowed by the pre-existing structure. The same criteria should be applied to a new tile system installed to replace an open ditch channel. We also feel that a single sizing standard cannot be applied across all project proposals.

Thank you for your consideration of our concerns. Please inform us of your thoughts and ideas on these matters prior to your final adoption of the new BCWD Plan in 2014.

Respectfully Submitted,

[Signature]

John Stahl, Chairman
Renville County Board of Commissioners
March 20, 2014

Travis Germundson
Water Management Specialist
Board of Water and Soil Resources
520 Lafayette Road North
St. Paul, MN 55155

Dear BWSR Watershed Plan Review Committee

Thank for this opportunity to once again allow the Renville County Board of Commissioners to offer written comments regarding the Buffalo Creek Watershed Districts 2014 Proposed Plan Revision. We were very pleased to see that the final draft of the BCWD revised plan does provide some flexibility from the Buffalo Creek Watershed Board when addressing tile system design and drainage coefficient values. The Renville County Board also wishes to state for these proceedings that it fully supports water retention projects, storm water ponds, wetland restorations and any other proposed mitigation projects designed to decrease the detrimental impacts to downstream property owners within the Buffalo Creek Watershed Area during flooding events.

The point the Renville County Board wishes to make to the Board of Water and Soil Resources in your review of the proposed plan is that we feel you simply cannot apply the 3/8 inch drainage coefficient design criteria as a fixed standard by which all project proposals seeking a permit from the BCWD are evaluated. We appreciate the studies conducted by Houston Engineering to apply engineering principles to the BCWD’s position of maintaining the 3/8 coefficient as their design sizing evaluation standard. However we also feel that in each of the commissioned studies neither took into account the stage increases to the open channel which we feel should be considered as a major factor in determining a tile system design standard for the Watershed District. The Renville County Board does not support sizing increases to downstream channel crossings. We believe that the downstream structures act as the primary flow restrictions to channel capacity. If these existing structure sizes are maintained downstream impacts should also be maintained to the same standard as they have been in the past.
We feel that enhanced efforts by both the BCWD and Renville County to locate, secure and create water storage areas in the upper regions of the watershed would yield greater benefits to all property owners within the BCWD rather than placing fixed limitations on tile system design standards within the area. The modern farming practices of today require drainage systems to balance both the environmental and economic needs of farm operators. Each drainage proposal request within the watershed needs to be evaluated on the drainage needs of the property and we believe a fixed sizing standard can not be applied as a blanket policy. We respectfully request the BWSR Watershed Plan Review Committee consider our request for setting the BCWD tile system evaluation maximum standard at the ½ inch drainage coefficient level. This will allow the District some flexibility in their evaluation of new tile system proposals based on the needs of each individual tile system proposal. As we have stated previously the ½ coefficient also is the accepted standard of all other watersheds and governmental agencies that review tile project proposals in Renville County.

Lastly we also request your consideration for modifying the BCWD Plan on road system bridge replacement projects. We the Renville County Board of Commissioners wish to see these sections of the Revised Plan show that all future bridge system replacement structures should be sized to provide equal to, but not greater then flows as was previously allowed by the pre-existing structure. We believe this requirement would meet the needs of the District as well as address concerns for changes to downstream impacts.

Thank you again for your consideration of our concerns. A written response to our concerns would be greatly appreciated prior to your final review and action on the BCWD Plan Revision in 2014.

Respectfully Submitted,

[Signature]

John Stahl, Chairman
Renville County Board of Commissioners
March 24, 2014

Donald Belter  
President  
Buffalo Creek Watershed District  
43540 180th Street  
Glencoe, MN  55336

Dear Mr. Belter:

The Minnesota Department of Agriculture (MDA) encourages the Buffalo Creek Watershed District (BCWD) to consider additional information before official adoption of the draft comprehensive plan occurs. The MDA also realizes that not all comments and recommendations will be adopted given the short time-frame. However, the following comments and recommendations are being provided by the MDA in light of the drainage co-efficient discussion that was held at the public hearing on Wednesday, March 12, 2014 in Glencoe:

1. As you know, the management of public drainage systems is complex and involves consideration of how public open ditches, tiles and culverts interact or are affected by private systems – both subsurface tile and open ditches with private culverts. Therefore, the MDA recommends that the BCWD create a permanent drainage management or advisory team to further discuss important drainage issues before policy decisions are made by the BCWD board of managers.

2. The MDA recommends that the BCWD develop and implement an overall drainage management plan. As an example of a recent plan, Martin County and has created a draft drainage management plan to guide their local public ditch system management efforts. The document can be found at the website below:


3. The MDA recommends that the BCWD conduct a system-wide culvert inventory if one is not available or complete. This will provide much needed information about the location, capacity and condition of culverts that are part of the public drainage system. Once conducted, the BCWD may want to consider how culvert sizing affects downstream flooding in the lower reaches of the watershed. The MDA is referring the BCWD to a technical paper that was developed by the Technical and Scientific Advisory Committee of the Red River Watershed Management Board titled, “Culvert Sizing for Flood Damage Reduction” and the report can be found at the following website:

4. The MDA recommends developing an inventory (if one does not exist) of open tile inlets that are immediately adjacent to public ditches. An inventory will provide information about where inlets could be converted into blind inlets, rock inlets or some other type of inlet to reduce sediments and to slow water flow. The inventory could also provide information about where side inlet controls would be beneficial. Local Soil and Water Conservation Districts within the watershed may already have knowledge of areas that are in need of open tile inlet conversion or side inlet controls.

5. The BCWD should consider more specific goals regarding floodwater storage. The MDA recognizes that storage impoundments are expensive to construct, require maintenance and takes land out of agricultural production. However, without clear goals for floodwater storage throughout the watershed, water management and permit issuance will become even more difficult. Storage may include wetlands, constructed storage impoundments, or potentially water storage trading. Storage may also be short-term, long-term, small-scale and/or large-scale.

6. An “Early, Middle and Late Water” management strategy was also developed by the Technical and Scientific Advisory Committee of the Red River Watershed Management Board. The strategy can be found in a report titled “Red River Basin Flood Damage Reduction Framework” and can be found at the following website:


   This strategy provides direction and a framework to manage surface water during spring flooding in the Red River Valley and some components may have applicability for the BCWD. The MDA encourages you to review this document and management strategy.

7. The BCWD may want to consider a distributed storage study to determine where storage would be possible in an “Early, Middle and Late Water” framework to reduce potential floodwater impacts. The MDA realizes that it takes financial resources to conduct such a study. However, without such information, it is more difficult to model, engineer, strategically construct and maintain water storage projects.

8. The BCWD should consider control structures for new pattern tile systems or retrofits to existing systems - when appropriate. This could be based on an “Early, Middle and Late Water” framework to reduce downstream impacts during spring flooding. Control structures, when managed properly, may have a positive effect upon downstream flood impacts. However, before implementing any such requirement, discussion should be held and studied by a drainage management or advisory team.

9. The Red River Watershed Management Board recently approved a set of recommendations for the permitting of tile, which can be used by local watershed districts on a voluntary basis in the Red River Valley. These recommendations are attached and may provide some insight regarding how other parts of the state are managing tile from a permitting and water management standpoint.
10. The Red River Retention Authority created a Basin Technical and Scientific Advisory Committee to study the impacts of pattern tiling upon flooding. Two briefing papers were developed and the Committee is currently working on a third briefing paper that discusses the interactions of surface ditches during spring flooding. The papers can be found at the weblink below:

http://www.rrbdin.org/archives/649

Recommendations from the second briefing paper included control structures, water storage trading, subsurface drainage co-efficients, on and off-site storage, and culvert sizing. While it may be difficult to conceive how water storage trading would occur at this point in time, it may be a future initiative for consideration.

The MDA thanks the BCWD for the opportunity to comment. The intent of the comments is to provide additional insight into decisions that will be made about drainage co-efficients and other major drainage policy decisions within the BCWD. The MDA encourages the BCWD to consider drainage regulations that are equitable, protect downstream landowners, and that do not limit the ability of farmers upstream to grow agricultural crops.

Again, the MDA realizes that some of these recommendations come with certain costs and that it takes time and careful consideration at the local level to implement major changes. Please contact me with any questions at 651-319-1832. Thank you.

Sincerely,

Robert L. Sip
Environmental Policy Specialist

CC: Matt Wohlman, MDA Assistant Commissioner
Travis Germundson, BWSR Water Management Specialist
Matt Johnson, Mid Minnesota Development Commission
Appendix C:
Miscellaneous Engineering Reports and Project Descriptions
**Introduction and Background**

We understand that at least one landowner along Renville/Sibley Judicial Ditch 15 (JD 15) Branch M has expressed interest in petitioning for an improvement of this public drainage system, to a drainage coefficient of 1/2-inch. We also understand that the Buffalo Creek Watershed District (BCWD) has concerns regarding the increased flows associated with an improvement. The purpose of this memorandum is to provide the BCWD an analysis of current and proposed capacities for JD 15 Branch M and an evaluation of water storage requirements if an improvement is undertaken.

The project area is the upstream portion of Branch M, west of County Road 54 (see Figure 1). Branch M consists mostly of tile with some open channels at its downstream end, and drains approximately 2,400 acres of agricultural land. Three tile outlets (Laterals M1, M20, and M32) provide the majority of flow into the Branch M open channel. Since the diameter of these tile outlets control the outflow of the remainder of the system, our analysis focused solely on the capacities of these laterals.

**Tile Capacities**

The drainage coefficients and capacity of the existing tile Laterals M1, M20, and M32 were determined using the methods described in the Minnesota Drainage Manual. Pipe grades were estimated using LiDAR topography. The LiDAR topography was also used to delineate subwatersheds for each tile. Each of the tile branches reviewed currently have a capacity equivalent to or less than a 1/4-inch drainage coefficient (see Table 1).

<table>
<thead>
<tr>
<th>Branch</th>
<th>Diameter (inches)</th>
<th>Slope (%)</th>
<th>Drainage Area (Acres)</th>
<th>Drainage Coefficient</th>
<th>Flow (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>24</td>
<td>0.050</td>
<td>1184.8</td>
<td>&lt; 1/4”</td>
<td>5.1</td>
</tr>
<tr>
<td>M20</td>
<td>24</td>
<td>0.080</td>
<td>497.73</td>
<td>1/4”</td>
<td>6.4</td>
</tr>
<tr>
<td>M32</td>
<td>10</td>
<td>0.080</td>
<td>129.06</td>
<td>&lt; 1/4”</td>
<td>0.65</td>
</tr>
</tbody>
</table>

**Table 1 – Existing Tile Conditions**
We then examined conditions (diameter of tile and discharge) of this tile if an improvement were undertaken to increase the drainage coefficients to 3/8-inch and 1/2-inch. For a drainage coefficient of 3/8-inch, each tile outlet will increase approximately one pipe size, and total flow into the Branch M open channel will increase by 125%. For a drainage coefficient of 1/2-inch, each tile would increase by approximately two pipe sizes from the existing condition, and the total flow to Branch M will increase by 200% (see Table 2).

Table 2 – Comparison of Existing to Improved Condition

<table>
<thead>
<tr>
<th>Branch</th>
<th>Existing Conditions</th>
<th>Improvement to 3/8” Coefficient</th>
<th>Improvement to 1/2” Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diameter (inches)</td>
<td>Flow (cfs)</td>
<td>Diameter (inches)</td>
</tr>
<tr>
<td>M1</td>
<td>24</td>
<td>5.1</td>
<td>30</td>
</tr>
<tr>
<td>M20</td>
<td>24</td>
<td>6.4</td>
<td>26</td>
</tr>
<tr>
<td>M32</td>
<td>10</td>
<td>0.65</td>
<td>16</td>
</tr>
<tr>
<td>TOTAL</td>
<td>12.15</td>
<td>27.4</td>
<td></td>
</tr>
</tbody>
</table>

Required Storage to Offset Additional Flows

For the purposes of this memorandum, we assumed a stormwater storage area will be located along Branch M east side of County Road 54. This appears to be the most suitable area for a stormwater basin; however, it may be possible to store the stormwater west of County Road 54 as well. To determine the additional water storage required to offset the additional flows created by a proposed improvement, we utilized a nomograph found in Technical Release 55 (a.k.a. TR-55, developed by Natural Resources Conservation Service), which uses the ratio of the inflow and desired outflow to size a storage area.

Our analysis determined that a storage volume of 66 acre-feet may be required to reduce flows resulting from 3/8-inch drainage coefficient to existing conditions. Assuming a storage area 8 acres in size, the total storage depth required is just over 8 feet. A storage volume of 77 acre-feet is required to reduce flows from a 1/2-inch drainage coefficient to existing conditions. This would require nearly 10 feet of depth in the same storage area.

Please note that our storage determinations assume that offsite flows resulting from an improvement must be restricted to existing condition. It is possible that an increase in downstream flows may not result in negative impacts to structures and properties downstream. To understand whether an increase in downstream flows will impact downstream properties would require a much more extensive analysis (similar to the study currently underway for McLeod / Renville Judicial Ditch 4).
Marsh Water Project

Engineering Report

Prepared for:

Buffalo Creek Watershed District
P.O. Box 55
Glencoe, MN 55336

August 13, 2012

Prepared by:

Houston Engineering, Inc.
6901 East Fish Lake Road
Suite 140
Maple Grove MN 55369
Ph: 763-493-4522
I hereby certify that this plan, specification, or report, was prepared by me or under my direct supervision, and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

Christopher C. Otterness
Minn. Reg. No. 41961

Date: August 13, 2012

Houston Engineering, Inc.
Suite 140
6901 East Fish Lake Road
Maple Grove, Minnesota 55369
763.493.4522 (Phone)
763.493.5572 (Fax)
www.houstonengineeringinc.com

HEI Project No. R126234-003
1.0 **Introduction**

1.1 **Background**

The Buffalo Creek Watershed District (BCWD) has many ongoing efforts to conserve and preserve the water resources within their boundaries. One of these resources is a privately constructed and owned drainage system on the west side of the City of Glencoe referred to as the “Marsh Ditch.” With a contributing drainage area of 3.83 square miles located within the City of Glencoe and Glencoe Township, Marsh Ditch serves both urban and agricultural lands via a system consisting of two branches (hereafter referred to as the West Branch and the East Branch) and a Main Trunk which drains generally from north to south, eventually outletting into Buffalo Creek (see **Figure 1**). This system currently consists of open channel, stormsewer, and culverts, and is approximately 5.28 miles in length.

Like most drainage systems in urbanizing areas, the Marsh Ditch increasingly receives loadings of total suspended solids, total phosphorus, and other pollutants. These pollutants are generated from impervious surfaces (pavements, roofs, concrete), lawns, ground disturbances, and agricultural fields. Although recent land developments have added stormwater management facilities to mitigate the effects of development, the majority of urbanized area drains untreated stormwater directly into the drainage system.

Because the drainage system is privately owned and not managed by a public entity, any maintenance efforts that have occurred in the system have solely been undertaken by the individual owning that segment of the drainage system, with little or no coordination amongst other landowners. This has led to widespread deterioration throughout the system, as evidenced by a loss of both system capacity and functionality which has resulted in an increase of sediment and nutrient loading to Buffalo Creek. At the same time, urbanization has increased the rate and volume of stormwater runoff into the system, taxing the system even further resulting in increased flooding.

In order to manage nutrient loading and stormwater in the Marsh Ditch, the BCWD under resolution initiated a watershed project pursuant to MS 103D.701, called the “Marsh Water Project.” The BCWD then retained Houston Engineering, Inc. (HEI) to develop an Engineer’s Report under MS 103D.711 for the Marsh Water Project. This report will detail the project features and associated costs and benefits of the proposed project features provide a recommendation for implementation.
1.2 Purposes of the Project

Establishing design goals is an essential component of a water resources project. A description of technical objectives and design criteria is needed to reasonably ensure the desired project outcome and proper function. The following primary technical objectives have been established for this project:

1. Reduction in sediment and nutrient loading to Buffalo Creek
2. Reduction in peak flows to Buffalo Creek;
3. Reduction in damages to flood prone areas along Marsh Ditch; and
4. Improved maintainability of the drainage system.

Each of these technical objectives is discussed in detail below.

1.2.1 Reduction in sediment and nutrient loading to Buffalo Creek

Sediment and nutrient loading to Buffalo Creek via the Marsh Ditch is generated by both agricultural (row crop) and urban (pavement) sources. Because of the lack of vegetative buffers and stormwater basins, eroded sediments are regularly deposited into Marsh Ditch. With nearly no storage in the ditch for low flow events, the majority of the sediment entering the ditch is washed directly into Buffalo Creek. Best Management Practices are needed not only to capture sediment and nutrients entering the ditch, but also to prevent sediment from entering the ditch in the first place.

1.2.2 Reduction in peak flows to Buffalo Creek

Historically, flooding along Buffalo Creek has resulted in substantial damages to buildings, crops, and other property on a relatively frequent basis. For this reason, one of the stated goals of the BCWD is to manage the flow of stormwater into Buffalo Creek, specifically controlling the volume and rate of flows into the stream. By storing stormwater upstream, the volume of runoff flowing to Buffalo Creek can be reduced through infiltration and evaporation, and the peak flow in the creek can be reduced by attenuating the incoming flow.
1.2.3 Reduction in damages to flood prone areas along Marsh Ditch

Several locations along the drainage system are prone to flooding, including agricultural fields and residential areas (see Section 2.3 Problem Areas). Increasing the capacity of the system could potentially reduce flooding within the system. However, this would also increase flows to Buffalo Creek, counter to Goal #1 above. Instead, by storing water in the upper portion of the system, flows can be decreased to the lower portions of the system and reduce flooding along Marsh Ditch.

1.2.4 Improved maintainability of the drainage system

Currently, there is no right of way or easements for maintenance along the majority of the drainage system. Easements along the drainage system would provide the drainage authority access to maintain the system and avoid costly repairs in the future.

2.0 Existing Conditions

2.1 Drainage System Characteristics

Because this report focuses on projects along the Main Trunk, this section will only discuss the characteristics of the Main Trunk portion of the system. The Main Trunk is 16,100 feet in length. The lower 1,311 feet of the system consists of concrete storm sewer, 283 feet of which is 6 ft by 6 ft box culvert (under U.S. 212) and 1028 feet is 48 inch reinforced concrete pipe (RCP). The storm sewer is the steepest potion of the drainage system, with grades averaging 1%. The storm sewer portion of the system is in fair condition, with gaps existing between several pipe segments but no major failure locations.

The remainder of the Main Trunk consists of open channel, with a depth of 3 to 8 feet and a bottom width of 5 to 20 feet. There are many locations along the open channel system that have eroded banks, and sediment has been deposited in other areas. There are 12 culverts along this branch, serving as crossings of State Hwy. 22, County Road 3, a railroad, and several private driveways and field approaches. Culvert sizes range from 42 to 48 inches in diameter. The corrugated steel culvert under the railroad has been deteriorating for many years, and the Twin Cities & Western Railroad Company has indicated that they will be replacing the structure in the coming year.
2.2 Hydrology and Hydraulics

The drainage area to the Marsh Ditch is 2,453 acres, including 957 acres draining to the West Branch and 537 acres to the East Branch. Thirty (30) separate subcatchments have been identified as indicated in Figure 2, ranging in size from 7 acres to 325 acres.

An InfoSWMM hydrology/hydraulic model (based on the EPA-SWMM modeling engine) was created using the subcatchments determined above, culvert and channel geometry provided by a field survey and McLeod County LiDAR data. The model was then run for several synthetic rainfall events. Flows determined for several locations in the system are detailed in Table 1.

Table 1: Summary of Peak Flows at Various Locations in the Marsh Ditch (cfs)

<table>
<thead>
<tr>
<th>Storm Event (24 Hour Duration)</th>
<th>West Branch Outlet</th>
<th>East Branch Outlet</th>
<th>Main Trunk at T.H. 22</th>
<th>Main Trunk at Railroad</th>
<th>Main Trunk Buffalo Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-year</td>
<td>14</td>
<td>56</td>
<td>41</td>
<td>45</td>
<td>54</td>
</tr>
<tr>
<td>10-year</td>
<td>29</td>
<td>64</td>
<td>67</td>
<td>53</td>
<td>121</td>
</tr>
<tr>
<td>100-year</td>
<td>44</td>
<td>128</td>
<td>81</td>
<td>59</td>
<td>142</td>
</tr>
</tbody>
</table>

2.3 Known System Deficiencies

2.3.1 Water Quality

Flows in the drainage system often exhibit a very high turbidity, particularly following a rainfall event. The suspended solids and nutrients entering the system are primarily derived from two sources: 1) tilled agricultural fields adjacent to the system; and 2) runoff from pavements and other impervious surfaces within the City of Glencoe. The greatest concentrations of suspended solids and nutrients likely occur in the open channel just upstream of the stormsewer, where large paved areas from the Seneca plant and other urbanized areas flow directly into the ditch.

2.3.2 Sedimentation

Due to lack of maintenance, sediment has accumulated throughout the drainage system. In particular, the Main Trunk upstream of T.H. 22 has been exposed to some of the greatest sedimentation throughout the system, resulting in poor drainage during lower water periods both upstream in the Main Trunk and in the East Branch.
2.3.3 *Stormsewer Failures*

The entire Main Trunk stormsewer was televised in 2012 by Infratech (see the televising report in Appendix A). In general, the individual concrete stormsewer pipes are intact and in good condition. However, in at least 14 locations pipes are separating, enabling soil to wash in and providing the potential for a major failure. One of these pipe separation locations is at a bend in the system. This joint may continue to separate until it is replaced with a manhole. In addition, four holes were discovered within the reinforced concrete pipes that will require patching. A segment of corrugated steel pipe is deteriorating and should be replaced soon. One manhole casting is completed buried, and should be raised to the current grade.

2.3.4 *Flooding*

The location along the drainage system with the greatest potential for property damage is the mobile home park adjacent the East Branch (see Figure 3). The elevation resulting from the 100-year, 24-hour rainfall event in the ditch at this location is approximately 1011.83 feet, while the grades near homes in this area ranges from 1011 to 1013 feet. Because the flood elevation outside of the ditch will be somewhat higher than the flood elevation within the ditch, many homes in this area are at risk for flooding. Agricultural fields along the ditch have also experienced flooding, including at least twice in 2012, in the locations shown in Figure 3, resulting in loss of crops.

3.0 **Proposed Projects**

The Marsh Water Project as proposed consists of several individual project features at locations on or near the Main Trunk, intending to accomplish the goals stated in Section 1.2 Purposes of the Project above. The following is a detailed description of the proposed project features at each location as well as project features that were withdrawn from consideration.

3.1 *West Branch Stormwater Wetland*

This proposed project consists of the construction of a stormwater wetland at the current outlet of the West Branch into the Main Trunk (see Figure 4). This 7 acre basin will contain deep plunge pools (4-6 feet normal depth), shallow marshes (1 foot normal depth or less), and vegetated upland fringes. The normal water level of the wetland will be at an elevation of 1007.0 feet. The primary outlet structure will include a concrete skimmer manhole with an

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1 All elevation s provided herein are in NAVD’88 vertical datum.
inverted 24” pipe inlet and a 24” outlet. An armored emergency overflow will be provided at an elevation of 1008.5 feet. Because the Main Trunk channel bottom is approximately 5 feet lower than the normal water elevation, it must be diverted around the wetland to prevent upstream flooding along the Main Trunk. Hydrology to the stormwater wetland will be provided by the West Branch, with a contributing drainage area of 957 acres.

The forebay at the upstream end of the stormwater wetland will provide an initial capture of larger suspended solids. A maintenance bench will be provided on three sides of a forebay to enable periodic dredging of the accumulated sediments. Finer sediments will be captured through the shallow marsh portions of the wetland, through both sedimentation and plant uptake. The native vegetation to be planted in the wetland will also uptake dissolved phosphorus.

Other Alternatives Considered at this Location

One alternative initially considered consisted of a stormwater wetland placed inline with both the Main Trunk and the West Branch. The advantage of this scenario is that a larger drainage area could be treated in one location. However, since the Main Trunk at this location is approximately 5 feet lower than both the West Branch and the adjacent grade, creating a basin to store stormwater below the elevation of the Main Trunk would require substantial quantities of excavation. The scale of the upstream watershed would also require the doubling or tripling of the pond surface area to limit flushing and enable the basin to be effective.

3.2 Main Trunk Biofiltration Basin

This BMP is intended to treat stormwater from impervious surfaces draining south at the Seneca Foods plant, as well as agricultural runoff from an adjacent corn field. The biofiltration basin will be located directly over the existing Main Trunk open channel, between the Seneca Foods plant and the cemetery (see Figure 5). To enable flows from the Main Trunk to bypass the BMP, the existing stormsewer through the cemetery will be extended upstream approximately 810 feet to a point just upstream of the south Seneca Foods crossing.

The biofiltration basin will contain filtration media to a depth of 2 feet, a six-inch perforated underdrain, native plants tolerant of both wet and dry conditions, and vegetated pre-treatment filter strips (see Figure 6). The bottom of the basin will be at an elevation of 1000 feet. An outlet will be provided at elevation 1001.5 feet, with the open grate spilling directly into
the Main Trunk storm sewer. An armored emergency overflow will also be provided. Large sediment will be captured primarily via the pretreatment filter strips. Fine sediment and some dissolved phosphorus will be captured via the filtration media and through plant uptake.

**Other Alternatives Considered at this Location**

Construction of additional biofiltration basins in the current open channel corridor through Seneca Foods was also considered. These basins could provide additional removal of suspended solids and nutrients generated by the impervious surfaces at the Seneca Foods site. However, Seneca Foods representatives indicated that corn husks and other debris blowing into the basin would likely necessitate frequent and expensive maintenance of the basin, and they are no longer interested in participating in that portion of the project.

3.3  Stormsewer Repair

Proposed repairs to the existing stormsewer system include both installation of new structures and repair of existing structures (see Figure 7). New structures to be installed include a manhole at the current location of the major bend in the stormsewer system, 111 linear feet of 48” RCP to replace the existing corrugated steel pipe, and installation of a flared end section (FES) to replace the existing inlet grate (note: the FES will not be required if the Main Trunk Biofiltration Basin is constructed). Gaps between several of the existing pipe joints and a few holes in the concrete pipes will also be grouted and patched. Although it is possible that future settlement may cause these joints to re-separate at some time in the future, patching of the joints is an inexpensive way to extend the life of the system.

**Other Alternatives Considered at this Location**

Slip lining or membrane lining of the existing stormsewer system was also considered. Slip-lining consists of placing a slightly smaller, thin-walled pipe inside of an existing pipe. This method would require extensive excavation to provide a runout at each manhole, and thus would not be feasible at all locations in this system. Membrane lining involves the expansion of a thin membrane inside of an existing pipe for the purposes of sealing the pipe. Both slip lining and membrane lining require a considerable expense ($150-175 per foot), nearly matching the cost of replacement via open trench. For this reason, these alternatives were not considered further.
3.4 Easement Acquisition and System Maintenance

Routine maintenance of the drainage system will not only increase the capacity of the system but also decrease the foot-print of required future repairs. Maintenance should occur on an as-needed basis, with routine inspections occurring at least once every five years. To perform maintenance of the system will require the acquisition of easements for access and placement of spoil materials. Easements over storm sewer portions of the drainage system should be a minimum of 30 feet in width, and in open channel reaches 66 feet in width. The easement along the open channels will be wide enough to not only enable maintenance but provide the ability to create a one-rod grass buffer along each side. The figures in Appendix A show the location of proposed easements. The parcels requiring easement purchase are also included in Appendix A.

4.0 Analysis of Project Performance

4.1 Water Quality Treatment

Water quality models were created to estimate the surface water runoff, the total suspended sediment (TSS) loading, and total phosphorus (TP) loading to the proposed stormwater wetland and biofiltration basin, as well as to predict the pollutant removal. The model selected was P8 (Program for Predicting Polluting Particle Passage thru Pits, Puddles, & Ponds), developed by William Walker. A full description of modeling assumptions and conventions is provided in Appendix B.

The modeling demonstrates that the proposed Main Trunk biofiltration basin is very efficient in its water quality treatment, providing a high percentage of removal (92% for suspended solids, and 80% for total phosphorus). This efficiency is due a couple of reasons: 1) the basin is located immediately downstream of the source of the pollution; and 2) the ratio between the contributing drainage area to the size of the basin is relatively low (6.2:1). A tabulation of pollutant loadings to the basin and removals is provided in Table 2.

Table 2: Pollutant Loadings and Removals – Biofiltration Basin

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Load (lbs/yr)</th>
<th>Removal (lbs/yr)</th>
<th>Percent Removal (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSS</td>
<td>5,204</td>
<td>4,763</td>
<td>92%</td>
</tr>
<tr>
<td>TP</td>
<td>17</td>
<td>13</td>
<td>80%</td>
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</table>
The proposed West Branch stormwater wetland is not nearly as efficient in its removal of TSS and TP as the biofiltration basin, due to large size of its contributing drainage area to the size of the BMP (136:1). However, because of the substantial loading to this basin, the total yearly removals of TSS and TP are considerable (46,053 lb/year and 67 lb/year, respectively). A tabulation of pollutant loadings to the stormwater wetland and removals is provided in Table 3.

Table 3: Pollutant Loadings and Removals – Stormwater Wetland

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Load (lbs/yr)</th>
<th>Removal (lbs/yr)</th>
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<tr>
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<td>80,609</td>
<td>46,314</td>
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<td>TP</td>
<td>225</td>
<td>67</td>
<td>26%</td>
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4.2 Stormwater Flows and Peak Elevations

The effects of the proposed West Branch stormwater wetland and Main Trunk biofiltration basin projects on the Marsh Ditch were modeled by modifying the existing conditions InfoSWMM model. (Note: The stormsewer repair and channel maintenance project components provide no significant alteration to the function of the system during large rainfall events and thus were not modeled). The implementation of both projects was modeled simultaneously to demonstrate the cumulative effects of the projects.

Peak water surface elevations for the 2-year, 24-hour rainfall at selected locations are summarized in Table 4 below. The analysis indicates that the implementation of both projects will decrease the peak water elevations in the Main Trunk by 3 to 5 inches in all locations downstream of State Highway 22, and reduce flows in the Main Trunk by approximately 5 percent.

Table 4: Peak Water Surface Elevations for the 2-year, 24-hour Rainfall Event (ft)

<table>
<thead>
<tr>
<th>Location</th>
<th>Elevation Under Existing Conditions</th>
<th>Elevation Resulting from Proposed Projects</th>
<th>Decrease in Peak Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seneca Foods</td>
<td>1002.15</td>
<td>1001.88</td>
<td>0.27</td>
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<tr>
<td>Upstream of Railroad</td>
<td>1006.52</td>
<td>1006.21</td>
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<td>Upstream of County Road 3</td>
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<td>Upstream of State Hwy. 22</td>
<td>1008.77</td>
<td>1008.74</td>
<td>0.03</td>
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Upstream of the state highway, the projects have very limited effect on water elevations for the 2-year event, due to the reduced size of the culverts. Currently, the Main Trunk flows through a 24-inch culvert at the bottom of the channel, and a 42-inch culvert approximately 3 feet above the channel bottom. For the 100-year, 24-hour rainfall event, however, the proposed projects provide a larger reduction in peak elevations upstream of State Hwy. 22 (0.09 feet). Table 5 summarizes the peak water surface elevations for the 100-year, 24-hour rainfall event.

<table>
<thead>
<tr>
<th>Location</th>
<th>Elevation Under Existing Conditions</th>
<th>Elevation Resulting from Proposed Projects</th>
<th>Decrease in Peak Elevation</th>
</tr>
</thead>
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<td>Upstream of State Hwy. 22</td>
<td>1011.83</td>
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4.3 Adequacy of the Outlet

The outlet for the Marsh Ditch drainage system is the cemetery stormsewer, which flows directly into Buffalo Creek. Because the stormsewer system has a diameter equal to the largest upstream culverts and has a greater gradient than the remainder of the drainage system, its capacity is currently sufficient to convey upstream flows. The proposed stormwater wetland and biofiltration project features will decrease the flows to this outlet. The proposed repairs to the stormsewer system will increase the capacity of the outlet by replacing a portion of corrugated steel pipe with reinforced concrete pipe. The proposed projects will maintain or improve the adequacy of the outlet.

5.0 Costs and Benefits

5.1 Preliminary Opinion of Probable Construction Cost

Preliminary Opinions of Probable Construction Costs (POPCC) were developed for the projects to a feasibility study level of detail. The POPCC for each project is based upon the conceptual design of the project (presented as described in Section 3.0), initial estimates of quantities, and unit prices believed “reasonable” for the various items. The POPCCs presented
for the project are suitable for assessing the relative cost of the projects; i.e., general magnitude. Preliminary Opinion of Probable Costs for the projects are summarized in Table 6 (detailed estimates are presented in Appendix C). Total estimated cost for the completion of all for projects is $1,159,000.

Table 6: Preliminary Opinion of Probable Construction Cost

<table>
<thead>
<tr>
<th>Project Component</th>
<th>West Branch Stormwater Wetland</th>
<th>Main Trunk Biofiltration Basin</th>
<th>Stormsewer Repairs</th>
<th>System-Wide Easements and Maintenance</th>
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<td>Construction</td>
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<td>$373,000</td>
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<td>$521,000</td>
<td>$98,000</td>
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System-wide maintenance costs were estimated for the first five years of District management of the system, assuming a one-time spot maintenance extending along the entire open channel system. Although costs for maintenance beyond the initial five years are not included in this report, it will be necessary to continue yearly maintenance as long as the District manages the system.

5.2 Easements

Acquisition of easements from private landowners will be required for the construction of the two BMP projects as well as for future maintenance and repair of the system. Locations of required easements for the West Branch stormwater wetland and the Main Trunk biofiltration basin are shown in Figures 5 and 6, respectively. The current landowner at both locations is Seneca Foods Corporation.

Appendix A shows the location of easements required for system-wide maintenance and includes a listing of affected parcels and landowners (from the most currently available County parcel data). Acquisition costs for the easements were assumed for the purposes of this report to be $8,000 per acre for tilled land and $500 per acre for other lands. Actual easement costs will vary from parcel to parcel based on the current land use, the quality of the land for its current usage, and other factors.
5.3 Benefits vs. Costs

There are many approaches to evaluating the benefits and costs. A formal benefit-cost analysis describes the advantages (benefits) and disadvantages (costs) of an alternative using a “benefit-cost” ratio, where the ratio is computed from the dollars of benefit, to the dollar cost of for the alternative. The process of developing and computing the benefits and costs, as is normally completed by the federal government for flood control or other civil works projects, faces its own set of technical and policy issues. For example, placing a monetary value on protecting and conserving unique habitats and protecting water quality is not straight forward and can depend on what a person values. For this reason, benefit-cost ratios for each project were not determined within this report. Instead, the following paragraphs describe and quantify the relative benefits of each of the projects, which the Board may compare to the estimated costs to determine the value of each project.

Benefits of West Branch Stormwater Wetland
- Removal of 67 pounds/year of total phosphorus;
- Removal of 23 tons/year of total suspended solids;
- 7 acres of new aquatic habitat;
- 0.44 foot decrease in water levels at County Road 3 for the 2-year, 24-hour rainfall event;
- 0.09 foot decrease in water levels north of State Highway 22 (near mobile home park) for the 100-year, 24-hour rainfall event; and
- Reduction of peak flow rate in Main Trunk for 2-year, 24-hour rainfall event (combined effects of both BMP projects).

Benefits of Main Trunk Biofiltration Basin
- Removal of 13 pounds/year of total phosphorus;
- Removal of 2.4 tons/year of total suspended solids;
- 0.27 foot decrease in water levels in the Main Trunk at Seneca Foods for the 2-year, 24-hour rainfall event;
- Reductions in annual stormwater volume to the Marsh Ditch and Buffalo Creek; and
• Reduction of peak flow rate in Main Trunk for 2-year, 24-hour rainfall event (combined effects of both BMP projects).

Benefits of Stormsewer Repairs

• Avoidance of replacement costs (estimated at over $250,000 for the 48” portion of the stormsewer); and
• Decreased future maintenance costs.

Benefits of System-Wide Maintenance and Easements

• Improved everyday function of the drainage system;
• Decreased future repairs costs;
• Predictable and protected drainage for landowners contributing stormwater to the system; and
• Potential for placement of buffer strips along the open channel,

6.0 Funding

It is anticipated that the district will need to utilize a mixture of revenue sources to fund this project. Funding for the project may include a combination of the following sources: 1) conservation & clean water grants; 2) district wide (ad-valorem) funds; and/or 3) direct assessment. The following is a synopsis of each of these potential funding sources, the project components most appropriate for this funding, and the processes required to obtain the funding.

6.1 Conservation and Clean Water Grants

An April 12, 2012 memorandum entitled Potential Grant Opportunities for the Marsh Water Project outlined a variety of grant opportunities available to the BCWD for water resource projects, and described the relative likelihood of receiving grant dollars from each of these programs for components of the Marsh Water Project.

BWSR Clean Water Fund Grants

The Minnesota Board of Water and Soil Resources (BWSR) distributes appropriations from the Outdoor Heritage Fund and the Clean Water Fund (CWF) established by the Clean Water Land & Legacy Amendment. This amendment utilizes a 0.375% sales tax to generate grant funding for projects which promote clean water and wildlife habit. This funding is
available to a variety of local government units (LGUs), including watershed districts, via a Request for Proposals process that typically begins in August of each year. For Fiscal Year 2013, the Request for Proposals was issued on July 29, 2012, and applications must be submitted and received by September 14, 2012 to be eligible for funding.

Although there are no guarantees that any project will be awarded funding through the CWF, the features of the Marsh Water Project most likely to be eligible for grant funding are those that provide water quality benefits, including the West Branch Stormwater Wetland and the Main Trunk Biofiltration Basin. A local match of 25% of the project cost is required to receive this funding.

Crow River Organization of Water Cost Share Program

The Crow River Organization of Water (CROW) provides a cost-share program for landowners and local partners to fund projects that promote the quality of water in the Crow River. Currently, the CROW is accepting applications for projects to be completed prior to June 2013. The BCWD may wish to seek cost-share assistance in the next cost-share program cycle for partial funding of the water quality project features (potentially as the local match for the CWF grants).

6.2 District Wide (Ad Valorem) Funds

Ad valorem funds are taxes assessed to all landowners within the District for use in day-to-day operation of the District. These funds are utilized for activities and projects specifically addressing goals of the Watershed Management Plan or otherwise providing a benefit to the District as a whole. In the case of a project like the Marsh Water Project, ad valorem funding may be used for water quality and flood control components such as the West Branch Stormwater Wetland and the Main Trunk Biofiltration Basin. Although these project components may be largely funded through grants, ad valorem funding will likely still be required to provide local matching funds.

6.3 Direct Assessment

The Stormsewer Repair and System-Wide Easement and Maintenance project components of the project will provide a benefit mostly received by the landowners within the
drainage area of the Marsh Ditch. These project components could be funded through a direct assessment to the contributing landowners via a special assessment. The charges for this assessment would be based on the proportion of the total benefit that are realized by each parcel.

Determining the benefit received by a particular parcel within the contributing drainage area to a watershed project can be very difficult, considering the variety of land uses (agricultural, residential, industrial, etc.) that exist with the drainage area. One way to simplify this determination is to assume that benefits are directly proportionate to the runoff volume leaving each parcel. This approach, utilized by the Rice Creek Watershed District on several public drainage system repairs, assigns a Drainage Coefficient for each land use that currently exists within the contributing drainage area. The amount of revenue needed for the project is then allocated to each parcel in proportion to the estimated runoff volume from a parcel (estimated to be the drainage coefficient times the parcel acreage) and compared to the total runoff volume from all parcels.

Per acre charges are then determined by multiplying the total amount of revenue necessary by the ratio between the drainage coefficient for a particular land use and the runoff volume for all of the parcels. The charge for each parcel is the per-acre charge for their land use, multiplied by the acreage of the parcel within the contributing drainage area. These charges may be assessed as a one-time charge, or spread out over a period of years.

7.0 Conclusions / Recommendation

Whether a project provides the intended “value” is the judgment of the Board and depends in part upon the cost, whether the project achieves the intended purpose, local acceptance and social factors. Because each of the four project features contributes to the accomplishments of the project purposes stated in Section 1.2 (i.e. reduction in peak flows to Buffalo Creek, reduction in sediment and nutrient loading to Buffalo Creek, reduction in damages to flood prone areas along Marsh Ditch, and improved maintainability of the drainage system), we recommend implementation of all four project features as described within this report. We further recommend that to assist with the funding of the stormwater wetland and biofiltration projects, the Board should apply for a BWSR Clean Water Fund grant for Fiscal Year 2013. This grant application must be submitted prior to September 14, 2012.
Figure 1: Existing Drainage System: Marsh Ditch

Source: MN DOT
Figure 2: Subwatersheds

Subwatersheds
US Highway
State Highway
County State Aid Highway
Local Roads
Marsh Ditch
Flow Direction

Source: MN DOT
Imagery: 2010 FSA NAIP
Figure 3: Noted Deficiencies

- **Flooding**
- **Flooding/Crop Damage**
- **Storm Sewer Deterioration**
- **Water Quality**
- **US Highway**
- **State Highway**
- **County State Aid Highway**
- **Local Roads**
- **Marsh Ditch**

Source: MN DOT
Image: 2010 FSA NAIP

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<th>Plot</th>
<th>Lot</th>
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Scale: Drawn by: Checked by: Project No.: Date: Sheet: AS SHOWN SMW 6234-003 07/13/12 1 of 1
Buffalo Creek Watershed District
Marsh Water Project
Stormwater Wetland

Figure 4: Proposed West Branch Stormwater Wetland

CONSTRUCTED WETLAND PROFILE VIEW

Source: MN DOT
Image: 2010 FSA NAIP
Buffalo Creek Watershed District
Marsh Water Project
Proposed Storm Sewer Repairs

Map Legend:
- Existing Flared End Section
- Existing Manhole
- New Flared End Section
- Raise Buried Manhole Casting
- Replace Existing Bend With 84" Manhole
- Storm Sewer Repair
- Replace Steel Pipe With Concrete
- Marsh Ditch

Figure 7: Proposed Storm Sewer Repairs
Source: MN DOT
Image: 2010 FSA NAIP
## Preliminary Opinion of Probable Construction Cost Details

### Description

<table>
<thead>
<tr>
<th>Description</th>
<th>Units</th>
<th>Unit Price</th>
<th>Total Construction</th>
<th>Easements Acquisition - Tiltle Acreage</th>
<th>Total Easements</th>
<th>Engineering / Legal / Admin</th>
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### Total - MARSH WATER PROJECT

$1,158,286.50
Buffalo Creek Watershed District
Overall Plan (2014-2023)

Appendix D:
Water Management Districts

A. Use of Water Management Districts
B. Establishment of Marsh Water Management District

Attachment 1 – City of Glencoe’s Petition for Marsh Water Project (4/8/14)

Attachment 2 – Marsh Water Project Addendum to the Engineering Report (10/8/2014)

Attachment 3 – Marsh Water Project Implementation Preliminary Charge Analysis and Timeline
Water Management Districts

A. Use of Water Management Districts

The Buffalo Creek Watershed District (BCWD) plans on using Water Management Districts (WMD) as one of several funding mechanisms for the implementation of activities to solve local and regional problems and issues. The provision for collection of charges found under Minnesota Statutes (MS) 103D.729 and 444.075 allows a watershed district, through the amendment of its plan or during an update to the Water Management Plan (WMP), the authority to establish one or more water management districts for the purpose of collecting revenues and paying the costs of projects initiated under MS 103B.231, 103D.601, 103D.605, 103D.611, or 103D.730.

To establish a water management district, the WMP update, or an amendment to the WMP, must describe the area to be included, the amount of the necessary charges, the methods used to determine the charges, and the length of time the water management district will remain in effect. After adoption, the amendment or WMP must be filed with the county auditor and county recorder of each county affected by the water management district. The water management district may be dissolved by the same procedures as prescribed for the establishment of the water management district.

A distinguishing element of the water management district over an assessment, or ad valorem tax is that the watershed district assumes the authority similar to that of a municipality; the ability to establish a system of charges based a prescribed method, such as a property’s contribution of storm water and/or pollutants to a receiving body of water. Thus, funds generated by utilizing a water management district can be based upon a mechanism related to a property’s contribution to a problem rather than the value of the property. Ultimately the water management district provides a supplemental financing tool for the BCWD and is especially useful in situations where project components are required to address a locally generated need or problem.

Through this amendment to the WMP (the addition of Appendix D in the Buffalo Creek Watershed District Overall Plan 2014-2023), the BCWD intends to establish the Marsh Water Management District (Marsh WMD) and the framework for creating and implementing additional water management districts by amendment to this Plan.

B. Establishment of the Marsh Water Management District

Establishment Purpose: Marsh Ditch is a privately constructed and owned ditch which conveys runoff from the west side of the City of Glencoe and portions of Glencoe Township, into Buffalo Creek. The drainage system is necessary for stormwater management. Because the drainage system is privately owned and not managed by a public entity, little or no coordinated efforts have been taken to repair the drainage system, and thus its condition and function has deteriorated throughout the system. To address this deterioration and provide an opportunity to address nutrient loading to Buffalo Creek, the BCWD initiated a watershed project called the “Marsh Water Project” which would provide a comprehensive stormwater management project over the entire contributing drainage area to Marsh Ditch.

On April 8, 2014 the City of Glencoe petitioned the BCWD to re-establish the Marsh Water Project under MS 103D.605 as a phased Basic Water Management Project. The petition, included as Appendix D Attachment 1, described the following four project phases:
1) Identifying existing conditions and opportunities for stormwater management;
2) Regional comprehensive stormwater management planning;
3) Development of implementation timelines and cost allocation; and
4) Project implementation.

The goals of Phase 1 were addressed through an August 13, 2012 report entitled, *Marsh Water Project – Engineering Report* (refer to Appendix C of the BCWD Overall Plan). Phase 2 was completed via a subsequent report, *Marsh Water Project - Addendum to the Engineering Report* dated October 8, 2014 (included as Appendix D Attachment 2). This addendum recommended five project components as a first phase to the Marsh Water Project, including:

1) Construction of a stormwater wetland;
2) Completion of repairs to the Main Trunk stormsewer system;
3) Acquisition of easements for access and maintenance;
4) Replacement of culverts; and
5) Creation of buffer strips.

Funds collected through the Marsh WMD will be used to construct specific project features. The specific project features to be planned for, designed, constructed and maintained using the WMD are described with a May 15, 2015, memorandum entitled *Marsh Water Project Implementation Preliminary Charge Analysis and Timeline* (included as Appendix D Attachment 3) which concludes Phase 3 of the City of Glencoe’s petition.

**Estimated Costs:** Charges will be based on properties that contribute runoff to Marsh Ditch. The charge collected will be used for the implementation of those features providing benefit to properties located within the boundary of the Marsh WMD. These features yield direct benefit by providing predictable drainage to largely agricultural lands now and urban stormwater conveyance as development proceeds. The Engineer’s Opinion of Probable Cost for the project is an estimated $941,800 of which an estimated $402,200 will be paid by the charge collected through the Marsh WMD. The remaining portion of the Opinion of Probable Cost, primarily for all or portions of those features which provide water quality benefit, will be paid for through the district-wide Ad valorem levy. The initial charge will be used to repay the capital construction cost. Continued maintenance and repairs to the system, as necessary, shall not exceed an average of $25,000 annually with a public hearing and providing notice to the Board of Water and Soil Resources. In addition, Marsh WMD issues and charges will be readdressed in future revisions to the Buffalo Creek Watershed District Overall Plan.

**Area for Inclusion:** The hydrological boundary of the Marsh Ditch drainage system will comprise the area for the Marsh WMD as shown in Map 1.

**Methods for Determining Charges:** The method to determine the per-acre charge will generally consist of evaluating the runoff amount by land use type. Specifics of the method of determining the stormwater charge are expected to include:

- Use soils and land use data to determine the existing curve numbers or runoff coefficients for each current land use within the Marsh WMD;
• Use the curve number or runoff coefficients for each current land use and the annual average precipitation depth to compute the annual runoff volume for each land use;

• Sum the annual runoff volumes for all land uses within the Marsh WMD to determine the total annual runoff volumes for current conditions. Divide the sum of the annual runoff volumes by the total annual runoff volume for each land use, respectively, within the Marsh WMD. This represents a “charge ratio” for each land use.

• Apply the charge ratio to the total amount of revenue needed for the Marsh WMD to carry out the projects, programs and activities of the BCWD within the Marsh WMD.

• The charge for a specific parcel will be determined by area-weighting the per acre charges based on the land use within a parcel.

This approach may be further defined or revised once the BCWD develops the necessary data required to determine the charge.

**Duration:** This Marsh WMD is intended to be a permanent WMD. Initial charges will be effective for a duration consistent with the time necessary to repay the capital cost for the project, which currently is estimated at 10 years. Thereafter, the Marsh WMD charges may be reinitiated to generate revenue to pay for project maintenance.

**Local Appeal Procedures for Water Management Districts**

**Subpart 1. Applicability.** This part applies when an owner of land in a water management district disputes the charges to be collected for their land in the water management district. This part does not apply to the validity of a water management district being in place.

**Subpart 2. Petition.** A petition may be made by an owner of land in a water management district to appeal the charges to be collected for their land in the water management district. A petition must be made in writing to the Buffalo Creek Watershed District. The petition must state the reasons the water management district charges are calculated improperly for their land.

**Subpart 3. Petition review process.**

A. Within ten working days of receiving a petition, the watershed district, its staff, legal counsel or consultants (District), are required to acknowledge in writing to the petitioner receipt of the petition.

B. The District must complete an assessment of the reasons stated in the petition to revise the charges. The District may request further information from the petitioner, have discussions with the petitioner or their legal counsel, view the property that is the subject of the petition, conduct onsite investigations, and such other fact finding as the District deems necessary to evaluate the petition.

C. The results of the assessment shall be reviewed by the Board of Managers and a decision made on the findings and recommendations in the assessment.

D. Upon the Board of Managers approval of an assessment, the assessment must be provided to the petitioner or their legal counsel accompanied with notification of the deadline for the petitioner to submit evidence to the District refuting the assessment.

A. The District must notify the petitioner or their legal counsel in writing at least ten working days before the meeting in item B takes place.

B. On receipt of any information from, or lapse of the time period in, subpart 3, item D, the Board of Managers must:
   1. Advise staff to conduct additional fact finding it considers necessary and report back to the managers accordingly;
   2. Direct staff to attempt to resolve the matter and to advise the managers further; or
   3. Issue findings of fact and conclusions of its investigation on the petition.

C. The District shall provide written notice of the decision in item B to the petitioner or their legal counsel within five working days of the decision.

Subpart 6. Limitations. A petition may not be filed more than once in five years for a specific parcel of land unless significant land alterations or land use changes have occurred since the charges were calculated or since a previous petition was filed with the watershed district.

Subpart 7. Withdrawal of petition. If agreement is reached at any time before the above procedures are completed, the petitioner may withdraw their petition and the District may revise the charges if needed.
STATE OF MINNESOTA
BUFFALO CREEK WATERSHED DISTRICT

The matter of the petition of the City of Glencoe for a Basic Water Management Project to address stormwater management and flooding within the City of Glencoe (Related to the previously established BCWD “Marsh Water Project”)

Petition for Watershed Project

Petitioner City of Glencoe, upon authority given by resolution of the City Council, for its petition to the Board of Managers of the Buffalo Creek Watershed District state and request the following:

1. The Board of Managers (Board) of the Buffalo Creek Watershed District (BCWD) has initiated the Marsh Water Project by unanimous resolution of the Board under Minnesota Statutes Section 103D.701.

2. The Board has received an engineer’s report (Report) for the project and the Report has been qualified to contain an eligible project plan for Clean Water Act (319, Federal) and Clean Water Partnership (103F, State) competitive grants.

3. The project is described in the Report dated August 13, 2012.

4. The Report indicates the project purpose(s) as: (1) the reduction of sediment and nutrient loading to Buffalo Creek; (2) the reduction of peak flows in Buffalo Creek; (3) the reduction of flood damages in areas along the Marsh Ditch and Buffalo Creek; and (4) the improvement of predictable function and maintenance of Marsh Ditch as a primary conveyance of stormwater passing into and through the City of Glencoe (the City).

5. The project will require the voluntary or other acquisition of property interests over a right of way for the Marsh Ditch or any altered course of stormwater conveyance necessary for project implementation.

6. The engineer’s opinion of cost for the project is approximately $1.16 million.

7. For the past many years the City has experienced localize flooding. This flooding is influenced by stormwater runoff from adjacent property outside of the City and the lack of or inadequate stormwater management controls and infrastructure within the contributing subwatershed.

8. Notice of the BCWD’s initiation of the Marsh Water Project caused the City to evaluate the adequacy of existing stormwater conveyance and management facilities in the City and the
extent to which the Marsh Water Project, combined with additional actions by the City, could alleviate or provide for better management of stormwater demands within the City.

9. The City has determined that the Marsh Water Project will be beneficial to stormwater management within the City.

10. Rather than implementing a series of individual, un-integrated projects, the City seeks to develop a comprehensive and integrated approach to stormwater management, flood damage reduction, and water quality enhancement within the City and, therefore, seeks to partner with various entities, including the Buffalo Creek Watershed District, for the purpose of developing a comprehensive strategy that implements a series of project components to achieve reasonable stormwater management and flood damage reduction objectives. A central component of this strategy is the proposed Marsh Water Project.

11. The City acknowledges that some components of a comprehensive strategy fall solely within its purview, while others fall within the regional management focus of the Buffalo Creek Watershed District – including the management of contributing watershed outside of the City, management of public and private drains that both contribute stormwater flow and provide the ultimate, downstream outlet and primary conveyance infrastructure for stormwater. The City and the BCWD share interest in enhancing water quality.

12. The City believes that the Marsh Water Project -- a comprehensive system of pro-active drainage system maintenance, repair or improvement; the creation of stormwater retention, detention and storage; BMPs for rate and volume controls and water quality improvement for development and redevelopment, as well as active and passive flood proofing/damage reduction methods -- is required to achieve reasonable stormwater management and flood damage reduction objectives.

13. The City, therefore, petitions the Buffalo Creek Watershed District to re-establish the Marsh Water Project under Statutes Section 103D.605 as a phased Basic Water Management Project for the following purposes:

   a. Phase 1: Identifying and analyzing current conditions, challenges and opportunities related to stormwater management and flood damage and making recommendations of actions likely to address comprehensive stormwater management and flood damage issues within those downstream areas affected by stormwater runoff;
   b. Phase 2: Developing a regional, comprehensive stormwater management and flood damage reduction plan, to include water quality features, which identifies capital improvements and other actions to be undertaken by the City and the Buffalo Creek Watershed District;
   c. Phase 3: Developing implementation timelines and priorities, costs allocations and revenue generation methods for both implementation and long term maintenance of capital improvements and water quality features;
d. Phase 4: Implementing one or more of the project components identified in Phase 2 as a coordinated series of capital improvements by the City and the Buffalo Creek Watershed District;

14. Because this petition is being submitted by the governing body of a city, no bond is required under Statutes Section 103D.705, Subdivision 3.

15. Subject to the provisions of Statutes Section 103D.705, Subdivisions 3 & 4, the City may dismiss this petition or any amendment hereof.

16. This petition is conditioned upon the following process to be followed by the Buffalo Creek Watershed District in implementing project phases:

   a. Pre-coordination: The City and the Buffalo Creek Watershed District shall meet at the initiation of any project phase to establish a scope of work and anticipated cost.

   b. Study/Component Development: The Buffalo Creek Watershed District, in consultation with City staff shall prepare all studies and develop project features consistent with project phases and purposes described in paragraph 13. Project study and component development shall culminate with a presentation to the City Council of the outcomes and recommendations of the Buffalo Creek Watershed District.

17. This petition is authorized by separate resolution of the City Council authorizing its Mayor and City Manager to sign and submit this petition as the action of the City.

18. The proposed Basic Water Management Project will be conducive to the public health, safety, convenience and welfare of the City and its residents as well as regional providers and consumers of goods and services within the City.

19. The City requests, as part of its petition, that the Buffalo Creek Watershed District exercise its full authorities for generating revenues for the implementation of the petitioned project. Based upon the modeling conducted by Houston Engineering, the City of Glencoe contribution will not exceed 16% of the total project Costs.

20. Phase 1 actions may include but are not limited to:
   a. Confirming of the study area;
   b. Establishing project goals and objectives;
   c. Establishing design criteria and standards;
   d. Developing concepts for BMPs / projects and agreement on what will be looked at in more detail in subsequent phases;
   e. Identifying detailed processes, including permitting, regulatory issues, and relevant local approval processes.

21. All actions described in this Petition are intended to support and be implemented as part of a petitioned Basic Water Management Project of the Buffalo Creek Watershed District.
SIGNATURE PAGE OF THE CITY OF GLENCOE TO THE PETITION TO THE BUFFALO CREEK WATERSHED DISTRICT FOR A BASIC WATERS MANAGEMENT PROJECT TO ADDRESS STORMWATER MANAGEMENT AND FLOOING WITHIN THE CITY OF GLENCOE, MINNESOTA

Respectfully Submitted:

City of Glencoe

Dated: 4/8/14

By: [Signature]

Its Mayor

Attest:

By: [Signature]

Its City Manager
Attachment 2:
Marsh Water Project
Addendum to the Engineering Report

Prepared for:

Buffalo Creek Watershed District
P.O. Box 55
Glencoe, MN 55336

October 8, 2014

Prepared by:

Houston Engineering, Inc.
6901 East Fish Lake Road
Suite 140
Maple Grove MN 55369
Ph: 763-493-4522
ADDENDUM to the
MARSH WATER PROJECT ENGINEERING REPORT

for the
Buffalo Creek Watershed District
P.O. Box 55
Glencoe, Minnesota 55336

I hereby certify that this plan, specification, or report, was prepared by me or under my
direct supervision, and that I am a duly Registered Professional Engineer under the laws
of the State of Minnesota.

Christopher C. Otterness
Minn. Reg. No. 41961

Date: October 8, 2014

Houston Engineering, Inc.
Suite 140
6901 East Fish Lake Road
Maple Grove, Minnesota 55369
763.493.4522 (Phone)
763.493.5572 (Fax)
www.houstonengineeringinc.com

HEI Project No. R146234-010
1.0 Introduction

1.1 Background

The Buffalo Creek Watershed District (BCWD) has many ongoing efforts to conserve and preserve the water resources within their boundaries. One of these resources is a privately constructed and owned drainage system on the west side of the City of Glencoe referred to as the “Marsh Ditch.” To manage nutrient loading and stormwater in the Marsh Ditch, the BCWD initiated a watershed project called the “Marsh Water Project.” The BCWD then retained Houston Engineering, Inc. (HEI) to develop an Engineer’s Report for the Marsh Water Project, which was delivered August 13, 2012. The report detailed the project features and associated costs and benefits, and provided a recommendation for implementation.

On April 8, 2014 the City of Glencoe petitioned the Watershed District to re-establish the Marsh Water Project under MS 103D.605 as a phased Basic Water Management Project. The petition described four project phases: 1) Identifying existing conditions and opportunities for stormwater management; 2) Regional comprehensive stormwater management planning; 3) Development of implementation timelines and cost allocation; and 4) Project implementation. The 2012 Report fully completed the petitioned goals of Phase 1 and most of the goals of Phase 2. The only Phase 2 goals not provide in the report include an updated estimate of project costs and evaluation of project components proposed by the City of Glencoe (City) and the Board of Water and Soil Resources (BWSR).

1.2 Purposes of the Addendum

The purpose of this addendum is to fully complete the work described as Phase 2 of the petitioned Marsh Water Project.

Since the completion of the Engineering Report, construction and land costs have changed, necessitating an update to the cost estimate. The City has also expressed interest in a project component (culvert inlet modifications) that was identified in a previous City report. Finally, based on a recent meeting with BWSR staff, identification of potential vegetative buffer locations along the drainage system are recommended in order to provide a more comprehensive water management project.

This will continue the goals of the petitioned project, which are:

1. Reduction in sediment and nutrient loading to Buffalo Creek
2. Reduction in peak flows to Buffalo Creek
3. Reduction in damages to flood prone areas along Marsh Ditch
4. Improved maintainability of the drainage system

2.0 **Main Trunk Culvert Replacement**

In June of 2003, Short Elliott Hendrickson (SEH) completed a study for the City of Glencoe examining hydraulic conditions of the portion of the Marsh Ditch within the City and identifying potential solutions to decrease flood elevations. Using the XP-SWMM hydrology and hydraulics model, SEH identified several flow restrictions that cause higher flood elevations along the ditch, including culvert and channel conditions, culvert size and roughness, sediment and debris accumulation, and poor culvert inlet conditions. The study recommended repair of the ditch by maintaining the open channel, installing flared end sections (aprons) on culverts to decrease hydraulic losses in the system, and replacing the corrugated metal pipe (CMP) culverts with reinforced concrete pipe (RCP) culverts.

For this Addendum, and expanding upon SEH’s study, HEI modified the InfoSWMM model created for the 2012 Report (which was created at a finer scale than the XP-SWMM model) to determine the effect replacing culverts and installing culvert aprons would have on upstream flood elevations. HEI then determined if similar benefits could be achieved even while decreasing the scope of the culvert replacements to mitigate expense.

2.1 **Existing Conditions and Proposed Alternatives**

There are currently ten structures (culverts or storm sewer inlets) along the Main Trunk of Marsh Ditch within or adjacent to the City of Glencoe (see Figure A1). Most of these structures have no aprons, and the culvert ends project from the fill slope. Culverts projecting from the slope are less efficient than those with aprons installed, which can result in higher upstream water surface elevations following a rainfall event. Likewise, CMP culverts (including eight of the nine culverts within the study area) are less hydraulically efficient that culverts with smooth interiors (such as RCP or high density polyethylene (HDPE) pipes) and also can result in higher upstream water surface elevations. A summary of the existing culvert and storm sewer inlet locations is provided in Table A1.
Table A1 – Comparison of Existing and Proposed Scenario Conditions

<table>
<thead>
<tr>
<th>Structure ID</th>
<th>Location</th>
<th>Inlet Type</th>
<th>Material Type</th>
<th>Proposed Modification</th>
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<td>State Hwy. 22</td>
<td>Aprons</td>
<td>CMP</td>
<td>Replace With RCP</td>
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<td>2</td>
<td>County Hwy. 3</td>
<td>Aprons</td>
<td>RCP</td>
<td>No Change</td>
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<td>3</td>
<td>Private Crossing</td>
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<td>CMP</td>
<td>Replace With RCP, Install Aprons</td>
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<td>Private Crossing</td>
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<td>5</td>
<td>Railroad</td>
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<td>Seneca Driveway - West</td>
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<td>Seneca Driveway - Middle</td>
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<td>9</td>
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<td>10</td>
<td>Sewer Inlet</td>
<td>Grate (No Apron)</td>
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<td>Install Apron**</td>
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</table>

*Refer to Figure A1 for locations.

**Replacement of storm sewer inlet is a component of the Stormsewer Repairs project described in the Report.

There are other conditions at the existing structures that are decreasing the efficiency of the drainage system. The inlet of the stormsewer currently is fitted with a grate that not only decreases the open area of the inlet but also traps debris and sediment, further blocking flow through the system. Also, several of the culverts are deteriorated and/or distorted, decreasing the cross-sectional area and increasing the friction in the culvert. Since the effect of this deterioration is difficult to accurately model, the current condition of the pipe materials was not considered within our analysis.

The first proposed alternative simulates the maximum effect of culvert replacement and/or inlet modification by modeling each of the ten structures as an RCP culvert with aprons on both ends. (Note: Although RCP was simulated for each culvert, HDPE has a similar roughness and would provide nearly identical hydraulics if utilized in lieu of RCP). A second alternative evaluates the effectiveness of the culvert replacement project if the three most
expensive culverts to replace (those under State Highway 22, County Highway 3, and the railroad) were left in their present condition.

2.2 Modeling Methods and Results

Existing hydrologic conditions were modeled in 2012 in conjunction with the Engineer’s Report, for the 2-, 10-, and 100-year, 24-hour rainfall events (2.8-, 4.1-, and 5.9-inches, respectively). To model the proposed conditions alternatives, the entrance loss and Manning’s N parameters were modified to represent the inlet condition and pipe roughness. The entrance loss for the culverts was assumed to be 0.5 for an apron inlet and 0.9 for the pipe projecting from the ground. The Manning’s N value was assumed to be 0.022 for corrugated steel pipe (CSP) and 0.013 for reinforced concrete pipe (RCP).

The resulting peak water surface elevations along the Marsh Ditch from the InfoSWMM modeling were tabulated and compared to existing condition (see Table A2). Note that negative values reflect a decrease in the peak water surface elevations compared to existing conditions.

<table>
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<tr>
<th>Location</th>
<th>Proposed Alternative 1 – Replace All Culverts</th>
<th>Proposed Alternative 2 – Replace All Except Highways and Railroad</th>
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<tbody>
<tr>
<td></td>
<td>2-yr Rainfall*</td>
<td>10-yr Rainfall*</td>
</tr>
<tr>
<td>Upstream of State Hwy 22</td>
<td>-0.2</td>
<td>-0.2</td>
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<tr>
<td>Upstream of County Hwy 3</td>
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<td>-0.4</td>
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<td>Upstream of Railroad</td>
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<tr>
<td>Seneca Foods Plant</td>
<td>-0.6</td>
<td>-0.5</td>
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<tr>
<td>Storm Sewer Inlet</td>
<td>0.1</td>
<td>0.1</td>
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</table>

*All modeled rainfall events are 24-hour duration

The results confirm that replacing the existing CMP culverts with smooth-walled culverts will substantially decrease flood elevations along portions of the drainage system, particularly the area downstream of State Highway 22 and upstream of Seneca Foods. The modeling also

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1 Precipitations were based on National Oceanic and Atmospheric Administration (NOAA) Technical Paper 40 (TP-40). NOAA recently has issued Atlas 14 which estimates precipitation frequencies based on an additional forty years of rainfall data. TP 40 precipitation depths were used in this Addendum for consistency with the previous Report.
reveals that replacing the State Highway 22 and railroad culverts only provides a small amount of additional flood elevation reduction. Due to the difficulty and expense of maintaining traffic at both of these crossings during a structure replacement, we do not recommend that replacement of the State Highway 22 and railroad culvert be included in the scope of the Marsh Water Project and have excluded their costs from the Preliminary Opinion of Probable Construction Cost in Section 4.0 below. Alternatively, the BCWD may consider partnering with the Minnesota Department of Transportation and the Twin Cities and Western Railroad Company on the replacement of these culvert. Field crossing #9 (as identified in Table 1 and shown in Figure 1) has not been utilized by the landowner for many years and may likely be able to be removed in its entirety in lieu of a culvert replacement.

3.0 Buffer Strips

There are numerous agricultural fields that drain directly into Marsh Ditch. At locations where crops are planted right up to the ditch bank, the potential for sediment loss and phosphorus entering the ditch is very high, and the ditch banks are generally less stable. Vegetative buffer strips installed along the drainage system may decrease the loading of sediment from the fields and bank erosion.

The 2012 Report included a project alternative for drainage system-wide easements and maintenance, which envisioned acquisition of easements over the entire drainage system including a minimum of 16.5 feet width from the top of each bank. This easement will not only provide an adequate corridor for maintenance access and spoil placement, but enable installation of buffer strips where advisable.

3.1 Determination of Buffer Strip Locations

Due to the high value of crop land and the cost of acquiring easements, it is most cost-effective to site buffer strips only in location where there is a high risk for erosion and sediment transport. Along Marsh Ditch, the most effective buffer strip locations are in cultivated farmland where surface flow drains directly into the ditch. A map of potential new buffer strip locations is provided in Figure A2. Prior to implementation of the Marsh Water Project, these locations should be field-reviewed to verify that vegetative buffers do not already exist in these locations.

3.2 Benefits of Buffer Strip Construction
Proper placement and installation of buffer strips will result in a reduction in total suspended solids (TSS) and total phosphorus (TP) entering the Marsh Ditch drainage system. A July 2002 fact sheet on soil erosion by the Board of Soil and Water Resources (BWSR) estimates the state-wide average erosion rate on cultivated cropland at 2.1 tons per acre per year. Using the Pollution Reduction Estimator spreadsheet provided on BWSR’s eLINK website, the filter strips shown in Figure 2 would result in an estimated reduction of TSS to Marsh Ditch of 300 tons/year, and a TP reduction of 470 pounds per year.

4.0 Costs

The 2012 Report included a Preliminary Opinion of Probable Construction Cost (POPCC) for each of the four project features evaluated in the Report. Due to the fluctuations and/or inflation in unit costs over the last two years, these costs have been re-evaluated and are tabulated in Appendix A. The costs of culvert replacement along the Main Trunk and construction of buffer strips have also been estimated and are included in this table. A summary of the POPCCs for each of the project areas is provided in Table A3.

5.0 Conclusions/Recommendations

5.1 Recommended Project Components

The replacement of culverts along the Main Trunk and the construction of buffer strips will provide flood control and water quality benefit, at less combined cost than the Main Trunk Biofiltration project feature. The BCWD should consider constructing these two project features in lieu of the Main Trunk Biofiltration feature to provide improved function from the originally conceptualized project, at a reduced cost.

Modeling indicates that the Main Trunk Culvert Replacements provides substantial peak flood reduction downstream (south) of Highway 22, but limited flood reduction upstream to the trailer park in the northwest part of Glencoe. This suggests that the root causes of the flooding in the trailer park is likely a result of the onsite stormsewer system and open channel conditions immediately downstream of the trailer park. (Note: Flooding recently occurred during the 2014 snowmelt event that was attributed to snow and ice buildup in open channel just downstream of the trailer park). A study to determine the root cause of the flooding in the trailer park could be conducted and would require a detailed survey of the East Branch of Marsh Ditch and of the
Table A3: Preliminary Opinion of Probable Construction Cost

<table>
<thead>
<tr>
<th>Project Component</th>
<th>West Branch Stormwater Wetland</th>
<th>Main Trunk Biofiltration Basin</th>
<th>Stormsewer Repairs</th>
<th>System-Wide Easements and Maintenance</th>
<th>Main Trunk Culvert Replacements</th>
<th>Buffer Strip Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>$250,400</td>
<td>$393,200</td>
<td>$68,200</td>
<td>$43,500</td>
<td>$189,900</td>
<td>$38,700</td>
</tr>
<tr>
<td>Easements</td>
<td>$62,000</td>
<td>$6,800</td>
<td>$0</td>
<td>$60,100</td>
<td>$0</td>
<td>$0*</td>
</tr>
<tr>
<td>Engineering/Legal/Admin</td>
<td>$65,000</td>
<td>$79,300</td>
<td>$33,600</td>
<td>$49,800</td>
<td>$59,000</td>
<td>$17,700</td>
</tr>
<tr>
<td>Contingency</td>
<td>$50,100</td>
<td>$78,600</td>
<td>$13,600</td>
<td>$8,700</td>
<td>$38,000</td>
<td>$7,700</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$427,500</strong></td>
<td><strong>$558,900</strong></td>
<td><strong>$115,400</strong></td>
<td><strong>$162,200</strong></td>
<td><strong>$286,800</strong></td>
<td><strong>$64,100</strong></td>
</tr>
</tbody>
</table>

*Easements required for buffer strip installation are included in the System-Wide Easements and Maintenance project.
storm sewer system within the trailer park, as well as a site-level hydraulic model of the storm sewer system in the trailer park.

5.2 Project Phasing

On October 1, 2014 representatives from the City of Glencoe and the Buffalo Creek Watershed District met to review and discuss the Draft Addendum to the Engineer’s Report for the Marsh Water Project. A consensus was achieved among the attendees to consider all of the proposed project components, with the exception of the Main Trunk Biofiltration Basin, as part of the overall Marsh Water Project. However, the attendees also recognized the need to prioritize the project components to enable the overall project to be completed in phases, making the financing of the project more feasible.

Because of the recent flooding occurring in the northwest portions of the City of Glencoe and the substantial acreage of impervious surface draining to the eastern segments of the Marsh Ditch, the highest priority areas for both flood control and water quality treatment were agreed upon to be the East Branch of Marsh Ditch and the Main Trunk downstream of the East Branch. To address the flooding and water quality concerns at these locations, the following project components are recommended as a “first phase” of the Marsh Water Project:

- Construction of the Stormwater Wetland just upstream of the Main Trunk on the West Branch;
- Completion of repairs to the Main Trunk storm sewer system through the cemetery (as described in the Marsh Water Project Engineer’s Report);
- Acquisition of easements along the East Branch and the portion of the Main Trunk downstream of the East Branch;
- Replacement of culverts at five private driveway crossings of the Main Trunk (including installation of pipe aprons) as described in Section 2.0 Main Trunk Culvert Replacement above; and
- Creation of buffer strips along the East Branch and Main Trunk downstream of the East Branch as shown in Figure 2.

Future phase(s) of the Marsh Water Project may include the acquisition of easements and creation of buffer strips along the West Branch and the Main Trunk upstream of the East Branch, as well as other site-specific projects identified at a later date.
The total cost of the first phase of the Marsh Water Project as detailed above is estimated to be approximately $937,000.
Appendix A
Preliminary Opinion of Probable Construction Cost Details

Description

Units

Unit Price

West Branch
Stormwater Wetland
Est'd
Quantity

Mobilization & Clearing
Mobilization
Clearing and Grubbing

Lump Sum
Acre

Subtotal
Earthwork
Common Excavation - place onsite
Infiltration Filter Media (select
granular) (LV)
Excavtor / Dozer Hours (Leveling
Spoils)
Spot Maintenance in Ditch
Subtotal
Structures and Pipe

$15,000.00
$6,000.00

1.00
0.50

Cubic Yard

$3.50

48630.00

Cubic Yard

$12.00

0.00

Extension
$15,000.00
$3,000.00
$18,000.00

Main Trunk
Biofiltration Basin
Est'd
Quantity
1.00
0.75

Extension

Cemetery Stormsewer
Repairs
Est'd
Quantity

Extension

System-Wide
Modification of Culverts Vegetated Buffers
Easements and
Maintenance
Est'd
Est'd
Est'd
Extension
Extension
Extension
Quantity
Quantity
Quantity

$15,000.00
$4,500.00
$19,500.00

1.00
0.00

$15,000.00
$0.00
$15,000.00

0.50
0.50

$7,500.00
$3,000.00
$10,500.00

1.00
0.00

$15,000.00
$0.00
$15,000.00

0.75
0.00

$11,250.00
$0.00
$11,250.00

$170,205.00 5250.00

$18,375.00

0.00

$0.00

0.00

$0.00

0.00

$0.00

0.00

$0.00

$0.00 2700.00

$32,400.00

0.00

$0.00

0.00

$0.00

0.00

$0.00

0.00

$0.00

Hour

$300.00

0.00

$0.00

0.00

$0.00

0.00

$0.00

0.00

$0.00

0.00

$0.00

24.00

$7,200.00

Mile

$5,500.00

0.00

$0.00
$170,205.00

0.00

$0.00
$50,775.00

0.00

$0.00
$0.00

5.28

$29,040.00
$29,040.00

0.00

$0.00
$0.00

0.00

$0.00
$7,200.00

Stormwater Outlet Control Structure

Each

$5,500.00

1.00

$5,500.00

0.00

$0.00

0.00

$0.00

0.00

$0.00

0.00

$0.00

0.00

$0.00

Remove and dispose inplace culvert

Linear Foot

$17.00

0.00

$0.00

180.00

$3,060.00

111.00

$1,887.00

0.00

$0.00

553.00

$9,401.00

0.00

$0.00

6" Draintile w/sock
24" RCP Storm Sewer
42" RCP Storm Sewer
48" RCP Storm Sewer
24" RC Apron w/grate
48" RC Apron w/grate
42" RC Apron
48" RC Apron
72" Dia. Manhole w/casting
Raise Manhole casting
RCP Joint Repair
RCP Hole Repair
Bituminous Roadway Patching
Gravel Rowadway Patching
Subtotal
Erosion and Sediment Control
Silt Fence
Rip Rap CL III
Geotextile Fabric Type III
Erosion Control Blanket Cat. 3
Shredded Hardwood Mulch, Brown
Subtotal
Vegetative Cover
Seeding, Upland Seed Mix
Seeding - Wetland mix
Biofiltration Basin Plants
Compost (MNDOT Grade 2) (LV)
Vegetation Management (3
seasons)
Subtotal

Linear Foot
Linear Foot
Linear Foot
Linear Foot
Each
Each
Each
Each
Each
Each
Each
Each
Square Yard
Ton

$20.00
$95.00
$175.00
$210.00
$1,500.00
$2,700.00
$2,200.00
$2,500.00
$6,000.00
$1,000.00
$650.00
$500.00
$50.00
$42.00

0.00
40.00
0.00
0.00
2.00
0.00
0.00
0.00
0.00
0.00
0.00
0.00
0.00
0.00

$0.00
$3,800.00
$0.00
$0.00
$3,000.00
$0.00
$0.00
$0.00
$0.00
$0.00
$0.00
$0.00
$0.00
$0.00
$12,300.00

275.00
0.00
0.00
878.00
0.00
1.00
0.00
1.00
3.00
0.00
0.00
0.00
0.00
0.00

$5,500.00
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$184,380.00
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$2,700.00
$0.00
$2,500.00
$18,000.00
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$0.00
$0.00
$0.00
$0.00
$216,140.00

0.00
0.00
0.00
111.00
0.00
1.00
0.00
1.00
1.00
1.00
14.00
4.00
0.00
0.00

$0.00
$0.00
$0.00
$23,310.00
$0.00
$2,700.00
$0.00
$2,500.00
$6,000.00
$1,000.00
$9,100.00
$2,000.00
$0.00
$0.00
$48,497.00

0.00
0.00
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$0.00
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$0.00

0.00
0.00
386.00
167.00
0.00
0.00
6.00
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$0.00
$0.00
$22,500.00
$2,520.00
$167,741.00

0.00
0.00
0.00
0.00
0.00
0.00
0.00
0.00
0.00
0.00
0.00
0.00
0.00
0.00

$0.00
$0.00
$0.00
$0.00
$0.00
$0.00
$0.00
$0.00
$0.00
$0.00
$0.00
$0.00
$0.00
$0.00
$0.00

Linear Foot
Cubic Yard
Square Yard
Square Yard
Cubic Yard

$3.50
$115.00
$5.00
$4.00
$70.00

1500.00
30.00
60.00
600.00
0.00

$5,250.00 1200.00
$3,450.00 32.00
$300.00 75.00
$2,400.00 400.00
$0.00 340.00
$11,400.00

$4,200.00
$3,680.00
$375.00
$1,600.00
$23,800.00
$33,655.00

200.00
20.00
50.00
100.00
0.00

$700.00
$2,300.00
$250.00
$400.00
$0.00
$3,650.00

0.00
0.00
0.00
0.00
0.00

$0.00
$0.00
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$0.00
$0.00

360.00
0.00
0.00
270.00
0.00

$1,260.00
$0.00
$0.00
$1,080.00
$0.00
$2,340.00

0.00
0.00
0.00
0.00
0.00

$0.00
$0.00
$0.00
$0.00
$0.00
$0.00

Acre
Acre
Acre
Cubic Yard

$2,000.00
$2,300.00
$44,000.00
$70.00

7.00
5.00
0.00
0.00

$14,000.00
$11,500.00
$0.00
$0.00

1.00
0.00
0.85
450.00

$2,000.00
$0.00
$37,400.00
$31,500.00

0.50
0.00
0.00
0.00

$1,000.00
$0.00
$0.00
$0.00

2.00
0.00
0.00
0.00

$4,000.00
$0.00
$0.00
$0.00

2.40
0.00
0.00
0.00

$4,800.00
$0.00
$0.00
$0.00

10.11
0.00
0.00
0.00

$20,221.97
$0.00
$0.00
$0.00

Acre

$2,600.00

5.00

$13,000.00

0.85

$2,210.00

0.00

$0.00

0.00

$0.00

0.00

$0.00

0.00

$0.00

$73,110.00
$393,180.00

0.00

$1,000.00
$68,147.00

0.00

$4,000.00
$43,540.00

$38,500.00
$250,405.00

Total Construction
Easements
Easement Acquisition - Tillable
Acreage
Easement Acquisition - Non-tillable
Acreage

Acre
Acre

$9,500.00

6.15

$600.00

5.96

Total Easements
Engineering / Legal / Admin
Engineering, Surveying,
Construction Management
Legal
Admin

$20,221.97
$38,671.97

$58,425.00

0.58

$5,510.00

0.00

$0.00

4.28

$40,660.00

0.00

$0.00

0.00

$0.00

$3,576.00

2.18

$1,308.00

0.00

$0.00

32.44

$19,464.00

0.00

$0.00

0.00

$0.00

$62,001.00

Lump Sum

$4,800.00
$189,881.00

$6,818.00

$40,000.00

$0.00

$40,000.00

$60,124.00

$20,000.00

$0.00

$15,000.00

$0.00

$40,000.00

$10,000.00

Percent
Percent
Total Engineering / Legal / Admin

5%
5%

$12,520.25
$12,520.25
$65,040.50

5%
5%

$19,659.00
$19,659.00
$79,318.00

10%
10%

$6,814.70
$6,814.70
$33,629.40

40%
40%

$17,416.00
$17,416.00
$49,832.00

5%
5%

$9,494.05
$9,494.05
$58,988.10

10%
10%

$3,867.20
$3,867.20
$17,734.39

Contingency

20%

$50,081.00

20%

$78,636.00

20%

$13,629.40

20%

$8,708.00

20%

$37,976.20

20%

$7,734.39

TOTAL PER PROJECT
TOTAL - MARSH WATER PROJECT

$427,527.50
$1,614,075.36

$557,952.00

$115,405.80

$162,204.00

$286,845.30

$64,140.76


**Introduction**

The provisions for the collection of charges under MS 103D.729 gives a Watershed District, through the amendment of, or during an update to the Watershed Management Plan (WMP), the authority to establish one or more Water Management Districts (WMD) for the purpose of collecting revenues and paying the costs of projects initiated under sections 103B.231, 103D.601, 103D.605, 103D.611, or 103D.730. The establishment of a WMD requires the description of the methods used to determine the charges. This memorandum describes these methods and the charges determined for the Marsh Water Project. A general philosophy for the proportion of the City of Glencoe, ad valorem, and WMD used to fund project construction, believed to be consistent with the policies established within the WMP and the direction provided by the Board, is also presented.

**Probable Construction Cost**

The Probable Construction Cost for the project was estimated in the *Marsh Water Project Phase 3 Implementation Timeline and Cost Allocation Memo* dated February 5, 2015 at a cost of $941,800. Due to minor revisions to the project scope (including removal of a culvert upstream of the cemetery), the Probable Construction Cost has since been reduced to $929,000. This project estimated cost has been used for the purposes of determining the WMD charges.

**Project Funding Approach**

The Buffalo Creek Watershed District (BCWD) has elected to finance the project through administrative funds (ad valorem), a per parcel watershed management charge within in the Marsh WMD (see Figure 1), and the City of Glencoe (City). The basic premise of the funding approach is that the costs to construct the various project features should be paid for by the benefitting entity. Benefitting entities include those residing within the hydrologic boundary of the public drainage system, as well as those residing beyond the hydrologic boundary of the public drainage, but within the boundary of the BCWD. Ecological and water quality benefits are generally considered as accruing to the larger, general public and therefore to all residents within the BCWD. The portion of the Marsh WMD outside of the city has its primary benefit from direct drainage improvements (including drainage function, decreased flood elevations and flooding extents, and decreased future maintenance cost). Finally, the City’s benefit can be derived from each of the project components, since every component provides flood reduction benefit to some landowners within the City limits.
Table 1 shows the allocation of cost for each of the various project features to ad valorem, WMD, and City funding, per the guidance provided by the Board of Managers at the April 28 Board Meeting. The City has previously indicated a willingness to pay for a portion of the project cost proportionate to the percent of WMD that is within City limits (16%). In addition to 16% of the cost of each project feature, the City is allocated the replacement cost of the culvert under 110th Street with an equivalent corrugated steel pipe (approx. $16,000) with the upgrade to reinforce concrete and apron installation to be assigned to ad valorem funding. The remaining 84% of each project feature costs will be funded by ad valorem or that portion of the WMD outside of the City limits, as described above (see Table 1) below.

Table 1
Preliminary Allocation of Cost

<table>
<thead>
<tr>
<th>Project Feature</th>
<th>Total Cost</th>
<th>Ad Valorem</th>
<th>City of Glencoe</th>
<th>WMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetland</td>
<td>$427,500</td>
<td>$359,100</td>
<td>$68,400</td>
<td>-</td>
</tr>
<tr>
<td>Repairs</td>
<td>$115,400</td>
<td>-</td>
<td>$18,464</td>
<td>$96,936</td>
</tr>
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<td>Easements</td>
<td>$76,600</td>
<td>$64,344</td>
<td>$12,256</td>
<td>-</td>
</tr>
<tr>
<td>City Culvert</td>
<td>$48,000</td>
<td>$32,000</td>
<td>$16,000</td>
<td>-</td>
</tr>
<tr>
<td>Private Culvert</td>
<td>$226,000</td>
<td>-</td>
<td>$36,160</td>
<td>$189,840</td>
</tr>
<tr>
<td>Buffer Strip</td>
<td>$35,500</td>
<td>$29,820</td>
<td>$5,680</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>$929,000</td>
<td>$485,264</td>
<td>$156,960</td>
<td>$286,776</td>
</tr>
</tbody>
</table>

Defining the WMD Boundary
The Marsh WMD is defined as the area within the BCWD legal boundary that flows into Marsh Ditch (i.e. the hydrologic boundary). The hydrologic boundary was determined using 2007 LiDAR topographic data collected by McLeod County. This boundary considers surface drainage features (e.g. open channels and culverts) but does not consider subsurface drainage features (i.e. tiling).

Since the City is allocated a portion of the project cost separately, only the portion of the WMD outside of the city limits will be included with the initial Marsh WMD charge. For the purposes of this memorandum, the term “Marsh WMD” will hereafter refer to only the portion of the WMD outside of the City. However, the WMD as defined and established in the forthcoming minor amendment to the BCWD Watershed Management Plan will include the entire hydrologic boundary to Marsh Ditch, including those properties within the City. The entire WMD will be eligible for future charges as maintenance, repairs, or other project work within the WMD occurs.
Determination of WMD Parcel Charges

Each parcel within the Marsh Project WMD was categorized by current land use primarily through the use of aerial imagery (see Figure 2).

Some parcels either partially or wholly within WMD have been excluded from the charge. These types of parcels generally include: 1) fractional parcels with a total area of less than 0.05 acres; or 2) fringe parcels at the outer edge of the WMD having a small amount of area within the WMD.

Initial Charge Determination

The method to determine the charge for each parcel generally consists of developing an index of the runoff volume from each deeded parcel and the right of way parcels. The amount of revenue needed for the Water Management District is then allocated to each parcel in proportion to the estimated annual runoff volume from a parcel compared to the total runoff volume from all parcels. The amount of runoff is represented by the curve number (CN).¹ Each current land use classification was assigned a curve number (see Table 2).

Per acre charges were determined by multiplying the total amount of revenue necessary to pay for the local benefits through the WMD charge ($286,776 – see Table 1) by the ratio between the land use CN for a parcel and the sum of area-weighted CN’s for all of the parcels. The dominant land use was used to represent each parcel. The ratio for each parcel represents the proportion of the total runoff volume for the entire subwatershed coming from that parcel. Per-acre charges were rounded to the nearest $1.00/acre and a minimum parcel total charge of $25 established. The minimum charge reflects the fact that all parcels contribute some runoff volume using the public drainage system as an outlet. Table 2 lists the estimated initial total per-acre charges by land use.

Financing the Parcel Charges

To achieve a balance between efficiently administering the WMD charge and easing the short-term burden on any particular landowner, we recommend applying a 10 year payment schedule for any parcel incurring a charge of $300 or greater. Parcels incurring less than a $300 of total charge will pay the full amount the first year. Landowners with one or more parcels incurring more than $300 charge will be expected to pay 10 equal annual installments, subject to an interest rate of 2% annually (matching the interest rate provided by the MPCA Clean Water Partnership Loan). Landowners will have the prerogative to pay the full amount in the first year to avoid incurring interest charges.

¹ The curve number, representing a proportionality of the ratio between rainfall and runoff, is the Soil Conservation Service (SCS) curve number for each land use, assuming hydraulic soil group B/D soils and a compacted condition in urban lawn areas.
Table 2. Estimated Initial Charge for Land Currently Developed and Undeveloped.

<table>
<thead>
<tr>
<th>Land Use Code</th>
<th>Current Land Use</th>
<th>Curve Number</th>
<th>Charge Per Acre</th>
<th>Total Area of Land Use in the WMD* (ac)</th>
<th>Total Number of Parcels*</th>
<th>Revenue Generated from Charge by Land Use**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Undeveloped (Agricultural and Idle Lands)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Row Crop</td>
<td>76</td>
<td>$143</td>
<td>1797</td>
<td>43</td>
<td>$256,913</td>
</tr>
<tr>
<td>2</td>
<td>Hay/Pasture/Open space</td>
<td>60</td>
<td>$114</td>
<td>40</td>
<td>9</td>
<td>$4,608</td>
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<tr>
<td><strong>Currently developed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Residential -Multifamily</td>
<td>90</td>
<td>$169</td>
<td>0</td>
<td>0</td>
<td>$0</td>
</tr>
<tr>
<td>4</td>
<td>Residential - (0.25-2 ac.)</td>
<td>83</td>
<td>$157</td>
<td>5</td>
<td>4</td>
<td>$751</td>
</tr>
<tr>
<td>5</td>
<td>Residential - (2-5 ac.)</td>
<td>72</td>
<td>$136</td>
<td>38</td>
<td>14</td>
<td>$5,195</td>
</tr>
<tr>
<td>6</td>
<td>Residential - (5-10 ac.)</td>
<td>71</td>
<td>$133</td>
<td>38</td>
<td>7</td>
<td>$5,109</td>
</tr>
<tr>
<td>7</td>
<td>Residential - (10-30 ac.)</td>
<td>70</td>
<td>$132</td>
<td>59</td>
<td>4</td>
<td>$7,792</td>
</tr>
<tr>
<td>8</td>
<td>Commercial/Industrial</td>
<td>94</td>
<td>$177</td>
<td>7</td>
<td>4</td>
<td>$1,200</td>
</tr>
<tr>
<td>9</td>
<td>Cemetery</td>
<td>74</td>
<td>$141</td>
<td>9</td>
<td>3</td>
<td>$1,250</td>
</tr>
<tr>
<td>10</td>
<td>Public - Open Space</td>
<td>75</td>
<td>$143</td>
<td>0</td>
<td>1</td>
<td>$25</td>
</tr>
<tr>
<td>11</td>
<td>Public - Transportation</td>
<td>86</td>
<td>$163</td>
<td>29</td>
<td>4</td>
<td>$4,673</td>
</tr>
<tr>
<td>--</td>
<td>Excluded parcels ***</td>
<td>--</td>
<td>--</td>
<td>&lt;1</td>
<td>18</td>
<td>--</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td>2,022</td>
<td>111</td>
<td><strong>$287,516</strong></td>
</tr>
</tbody>
</table>

*Totals are only for those portions of the WMD outside of the City of Glencoe.

**Revenue generated from charge may be larger than the product of the land area and the per-acre charge, due to the $25 minimum charge per parcel.

***Parcel fragments less than 0.05 acres.
Figure 1: Marsh Water Management District
Figure 2. Current Land Use

- Exempt
- Cemetery
- Commercial/Industrial
- Hay/Pasture/Open space
- Multifamily/Mobile Homes
- Public - Open Space
- Public - Transportation
- Row Crop
- Residential - (0.25-2 ac.)
- Residential - (2-5 ac.)
- Residential - (5-10 ac.)
- Residential - (>10 ac.)
- Residential - (0.25-2 ac.)
- Residential - (2-5 ac.)
- Residential - (5-10 ac.)
- Residential - (>10 ac.)
- Row Crop
- Map of Drift Contributing Drainage Area
- WMD Within City Limits
- BCWD Legal Boundary

Aerial Background: 2014 FSA NAIP Imagery

Scale: 1" = 0.25 miles

Drawn by:
Checked by:
Project No.:
Date:
Sheet:

AS SHOWN
SMW
6234-014
5/15/2015
1 of 1
<table>
<thead>
<tr>
<th>Task</th>
<th>Start Date</th>
<th>Duration (days)</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board submittal of plan amendment</td>
<td>5/26/2015</td>
<td>1</td>
<td>5/27/2015</td>
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<tr>
<td>BWSR 60-day review of plan amendment</td>
<td>5/26/2015</td>
<td>60</td>
<td>7/25/2015</td>
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<tr>
<td>Public Hearing on plan amendment (latest date)</td>
<td>7/25/2015</td>
<td>45</td>
<td>9/8/2015</td>
</tr>
<tr>
<td>Submit final plan to BWSR &amp; DNR</td>
<td>6/23/2015</td>
<td>1</td>
<td>6/24/2015</td>
</tr>
<tr>
<td>BWSR &amp; DNR Review</td>
<td>6/24/2015</td>
<td>45</td>
<td>8/8/2015</td>
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<tr>
<td>BCWD set hearing date (special Board meeting)</td>
<td>8/11/2015</td>
<td>1</td>
<td>8/12/2015</td>
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<tr>
<td>Notice hearing</td>
<td>8/12/2015</td>
<td>27</td>
<td>9/8/2015</td>
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<td>Public Hearing on project</td>
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<td>9/9/2015</td>
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<tr>
<td>Recess public hearing</td>
<td>9/9/2015</td>
<td>13</td>
<td>9/22/2015</td>
</tr>
<tr>
<td>Resume public hearing, order project, certify charges, authorize plans</td>
<td>9/22/2015</td>
<td>1</td>
<td>9/23/2015</td>
</tr>
<tr>
<td>Charges received and reviewed by County</td>
<td>11/30/2015</td>
<td>1</td>
<td>12/1/2015</td>
</tr>
<tr>
<td>Prepare charge request (invoice) to road authorities</td>
<td>11/30/2015</td>
<td>1</td>
<td>12/1/2015</td>
</tr>
<tr>
<td>Charge reviewed by County and initiated</td>
<td>12/1/2015</td>
<td>45</td>
<td>1/15/2016</td>
</tr>
<tr>
<td>WMD charge (year 1) collected by County</td>
<td>1/15/2016</td>
<td>350</td>
<td>12/30/2016</td>
</tr>
</tbody>
</table>