

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.

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PROFILE OF WATER QUANTITY MANAGEMENT

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.

District’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.

Flow Monitoring Data

BCWD Flow Monitoring

The BCWD has conducted flow monitoring on the Buffalo Creek and its tributaries since 1989. A total of five sites have been monitored using continuous flow recorders. The location of these sites are shown in Map 3A. 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 2A
BCWD Flow Monitoring
Summary (1996-2000)**

Site	Years Monitored	Average Monthly Flow (millions of gallons per month)					
		May	June	July	Aug.	Sept.	Oct.
E	1998-2000	580	1,959	704	224	90	73
F	1996, 1998-2000	877	3,205	917	321	289	248
H	1998-2000	1,953	8,534	3,818	868	712	639
N1	1996, 1998-2000	4,414	9,412	5,941	1,509	1,017	637
N4	1999-2000	927	11,437	6,720	2,600	1,589	551

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 (ft³/s)

Day of month	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	20.7	14.9	19.9	399	323	140	153	19.6	46.9	22.3	66.0	54.0
2	20.2	14.7	20.9	404	270	137	138	19.3	44.1	20.9	68.3	51.9
3	19.9	14.6	22.6	412	230	137	123	17.6	37.4	22.8	70.2	49.3
4	19.3	14.6	24.1	431	208	133	105	20.7	32.3	22.2	73.6	44.5
5	19.1	14.4	26.5	431	192	121	89.3	19.6	27.5	20.5	82.1	41.6
6	18.7	14.4	29.1	378	172	115	76.6	22.5	25.3	20.1	84.2	40.1
7	18.4	14.4	33.0	359	155	112	77.8	25.9	22.7	21.5	79.5	38.5
8	18.1	14.7	37.6	312	141	106	69.2	26.3	20.4	25.6	71.6	37.4
9	17.7	15.4	42.7	292	131	106	66.7	28.6	19.1	25.2	71.3	35.6
10	17.2	16.3	51.0	279	150	137	63.1	27.3	18.0	25.8	69.0	34.6
11	17.1	17.3	63.4	255	149	166	58.1	28.0	17.4	25.4	64.9	33.2
12	17.1	17.7	71.1	242	164	169	52.1	27.4	48.3	27.7	63.9	32.0
13	17.0	18.0	102	236	256	154	49.2	31.0	66.5	29.5	62.8	30.8
14	17.1	18.3	125	226	235	134	47.0	36.5	54.3	31.6	62.2	29.7
15	17.1	18.5	149	231	195	122	45.5	46.5	47.1	34.0	61.5	29.0
16	17.5	19.0	145	236	165	113	46.1	48.8	45.2	38.2	59.6	28.2
17	17.5	19.6	143	257	148	109	43.2	42.1	41.7	45.0	56.7	27.5
18	17.5	20.0	148	265	131	105	40.7	33.8	40.8	49.4	53.8	26.9
19	17.2	20.4	147	257	117	108	36.2	28.8	38.9	50.8	50.9	26.3
20	16.8	20.6	144	250	107	120	36.6	30.3	34.8	47.3	54.4	26.0
21	16.6	20.6	151	245	99.2	133	33.1	44.8	32.6	45.1	55.6	25.6
22	16.4	20.8	172	257	93.1	149	31.9	41.3	31.0	39.9	53.1	25.2
23	16.3	20.7	205	293	87.4	166	46.0	36.7	27.9	36.6	54.7	24.7
24	16.2	20.5	235	280	90.7	333	66.2	35.4	26.5	34.4	56.7	24.2
25	15.9	20.2	301	271	84.8	342	49.8	36.3	26.7	31.8	58.3	23.8
26	15.8	19.8	247	327	81.6	303	40.4	39.5	25.9	30.1	60.0	23.4
27	15.7	19.2	239	391	107	246	32.8	57.6	24.3	28.9	59.8	23.0
28	15.6	19.5	246	406	144	201	28.9	51.7	21.7	27.6	58.7	22.5
29	15.4	26.3	299	395	140	177	26.5	57.4	20.6	27.5	57.0	22.0
30	15.0		351	379	143	163	25.6	49.5	19.2	29.3	55.7	21.6
31	14.8		377		144		22.5	55.6		48.0		21.3

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 (ft³/s) and stage (ft.) are monitored at each of these sites. Current conditions are then posted live on the Internet at the following websites:

Buffalo Creek Near Glencoe, MN

http://mn.usgs.gov/rt-dnr-cgi/gen_stn_pg?station=19043001

Buffalo Creek at Brownton, MN

http://mn.usgs.gov/rt-dnr-cgi/gen_stn_pg?station=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 given below.

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

Table 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)

Year	EVR
1990	Q25-Q75
1991	Q10-Q25
1992	Q10-Q25
1993	Q1-Q10
1994	Q10-Q25
1995	Q10-Q25
1996	Q10-Q25
1997	Q10-Q25
1998	Q10-Q25
1999	Q25-Q75
2000	Q25-Q75
2001	Q10-Q25
2002	Q10-Q25

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 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.

Public Drainage System

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 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.

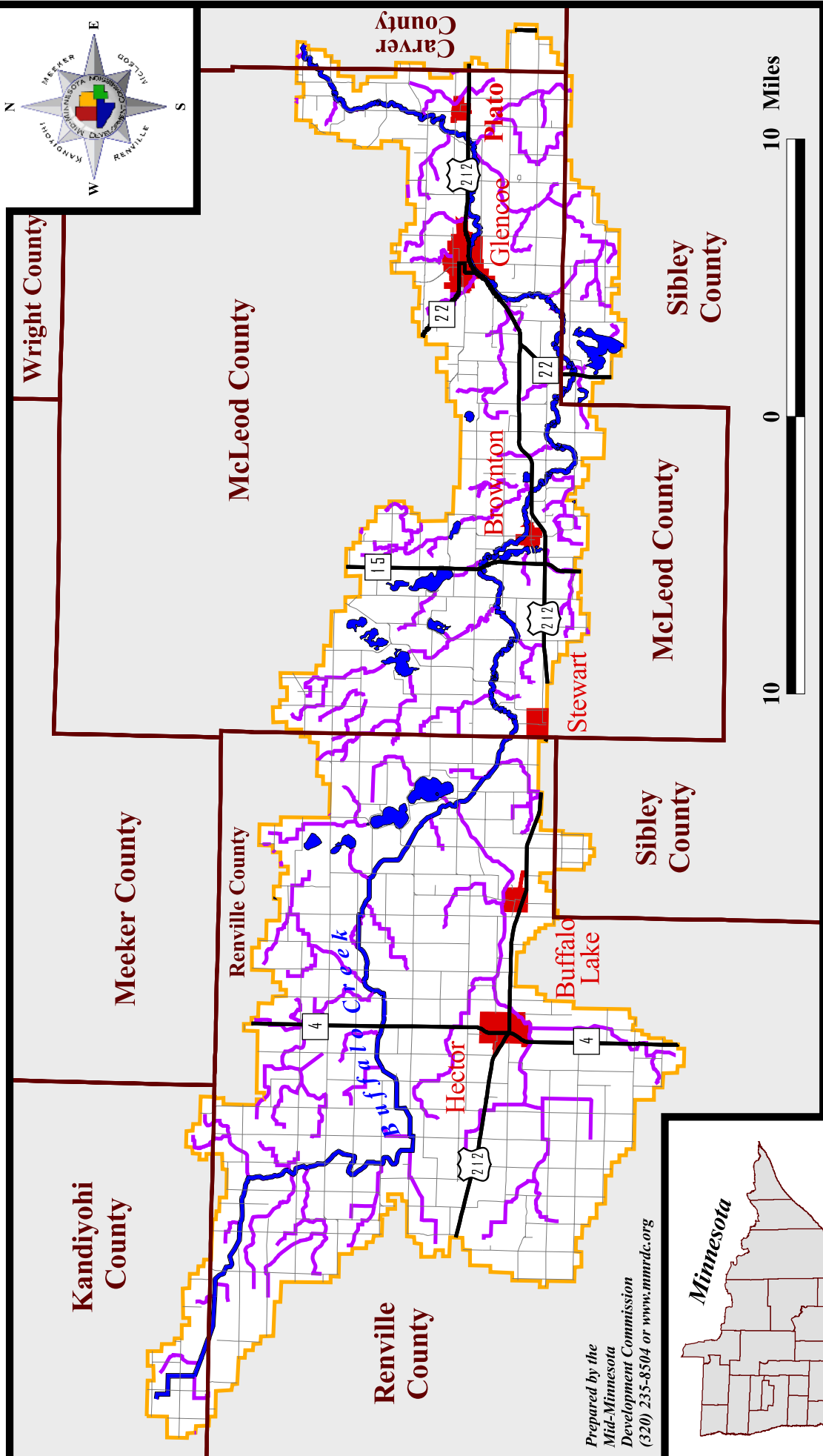
Besides problems related to water quality, drainage ditches pose water quantity threats as well. Because ditches were designed to remove large quantities of water in a short duration, flooding problems can and do occur, especially following major storm events and during the spring snowmelt. To minimize 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. In all, there are 24 public ditches within the District, with a combined length of approximately 800 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. Currently, the District only exercises jurisdiction over J.D. 79-2. All other public drainage ditches are regulated under the authority of their respective county.

**Table 2D
BCWD Drainage System**

Name	County(s) Served	Year Established	Watershed Area (mi.²)	Length (mi.)
J.D. No. 15 and Laterals/Branches	Renville County	1923	112.0	505.5
J.D. No. 2 and Laterals	Kandiyohi and Renville	1908	57.4	54.0
J.D. No. 27 and Laterals	Kandiyohi and Renville	1954	81.6	46.7
C.D. No. 4	Kandiyohi and Renville	1898	24.0	27.5
C.D. No. 67	Kandiyohi and Renville	1916	9.0	26.7
C.D. No. 8	McLeod and Sibley	1917	14.0	24.2
J.D. No. 9 and Laterals/Branches	Kandiyohi and Renville	1911	10.9	16.0
J.D. No. 28A and Laterals/Branches	Kandiyohi and Renville	1959	111.2	15.1
C.D. No. 7A	Kandiyohi and Renville	1901	8.5	9.6
C.D. No. 132	Renville County	1958	6.0	9.3
C.D. No. 28	McLeod County	1916	3.8	7.2
J.D. 79-2	McLeod County	1917	4.0	6.9
C.D. No. 65	Kandiyohi and Renville	1915	2.6	6.1
C.D. No. 12A	McLeod County	1906	6.0	6.0
C.D. No. 133	Renville County	1958	3.5	5.5
C.D. No. 33	McLeod County	1920	2.0	5.4
C.D. No. 134	Kandiyohi and Renville	1958	3.0	5.3
C.D. No. 48	Kandiyohi and Renville	1911	1.2	5.0
C.D. No. 64	McLeod County	1967	2.8	4.9
C.D. No. 114	Renville County	1952	1.2	3.5
C.D. No. 15	McLeod County	1944	2.3	3.2
C.D. No. 129	Renville County	1957	2.5	3.0
C.D. No. 137	Kandiyohi and Renville	1959	0.6	1.8
C.D. No. 33	Renville County	1906	1.2	1.6

Map 2A Buffalo Creek Watershed District Public Drainage System

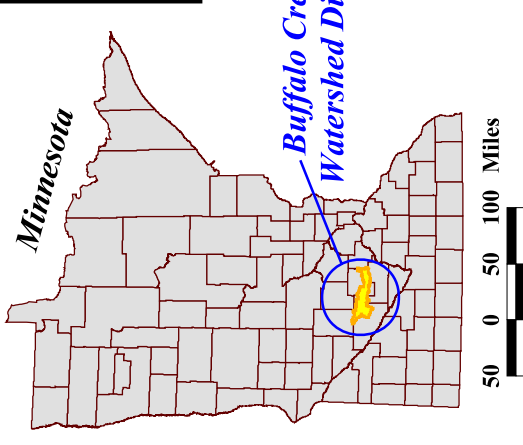


- Watershed District
- Municipality
- County
- Lake
- Buffalo Creek
- Major Road
- Minor Road

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

Public Drainage Ditch
 Approximate locations based upon statewide data. Contact each County for more detailed information.

- Major Roads**
- U.S. Highway 212
 - State Highway 4
 - State Highway 15
 - State Highway 22



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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.

Drainage activity has tapered off in the last two decades. There are fewer individual farmers, and subsequently less interest in opening up new land to drain. The growing realization of public benefits of wetland protection, and accompanying laws, has slowed wetland drainage. Some drainage activity is taking place in the State’s growing urbanization areas, including preparing for streets, roads, airports and residential and industrial development.

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.
- 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.

Implications and Assessment

As stated earlier, the BCWD has an extensive drainage system, 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.

In discussing drainage issues and opportunities, the BCWD Overall Plan Taskforce discussed a number of issues similar to the ones identified in John Hellend's "The Drainage Issue". Issues discussed included the use of buffers to prevent erosion and the replacement of open surface tile intakes with alternative technologies. The conversation led to the formation of a number of policy guidelines and action items.

Stormwater Management

Population projections provided in chapter one indicate that 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. By definition, 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.

In recent years, 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.



City of Glencoe ~ C.R.O.W.

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 and B). 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 recently 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. To date, there has been no sampling of the effluent from the retention pond. 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 is discharged into the Buffalo Creek untreated. To date, there has been no discussion to provide treatment of the City's stormwater.

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 BCWD'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.

Floodplain Management

Historically, development has occurred in floodplains adjacent to waterways and lakes. In order to protect existing property and structures within the floodplain, Federal and State governments require floodplain regulations to be adopted by counties and municipalities when areas of anticipated flooding have been identified. Areas of land regulated are based on the 100-year frequency flood, 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 regional DNR 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 that a majority of the designated floodplain is found east of the City of Stewart. 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. All five of the counties within the District have adopted a floodplain ordinance. 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?

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

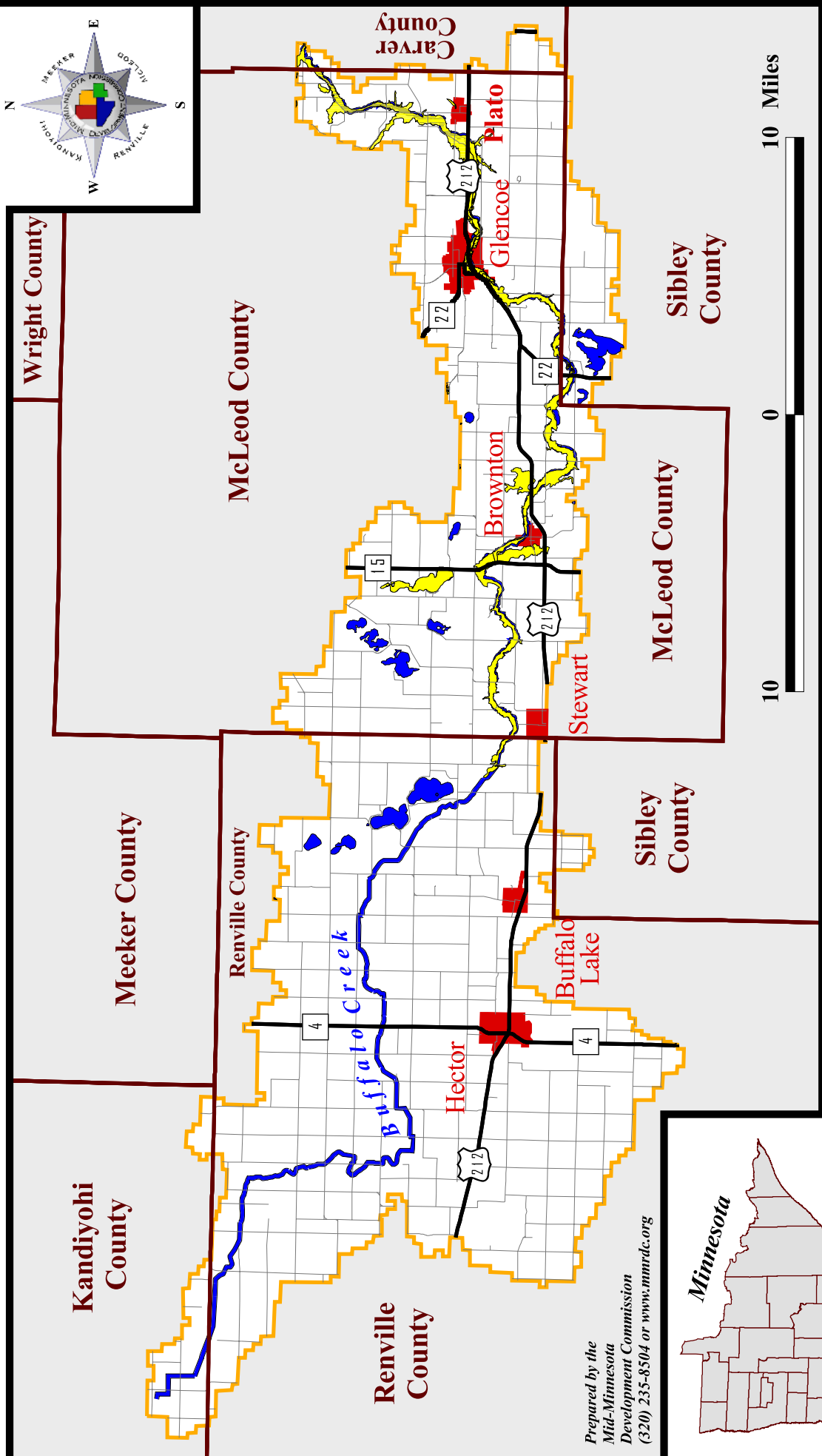
Floods are classified according to their frequency and depth. For instance, there are 10-year, 25-year, 50-year, 100-year and 500-year floods. A 100-year flood occurs less frequently than a 10-year flood, but because it has larger volume and greater depth of water, is far more destructive and damaging, and is a more serious threat to human safety. The National Flood Insurance Program adopted as a national standard a “100-year floodplain” to describe Special Flood Hazard Areas (SFHAs) that are depicted on the Flood Insurance Rate Maps (FIRMS) as Zone A. Due to the confusion it created, use of the term “100-year floodplain” has been replaced with the newer designation of “base flood”. Base Flood Elevation (BFE) requirements are listed on FIRMS and are used on Elevation Certificates to indicate the expected depth of water should a flood occur. New buildings constructed in SFHAs are required to have their lowest floors at or above the BFE listed for that location on the current FIRM. Table 2E shows the statistical chances of flooding a building located in one of these higher risk areas over different periods of time.

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

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

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

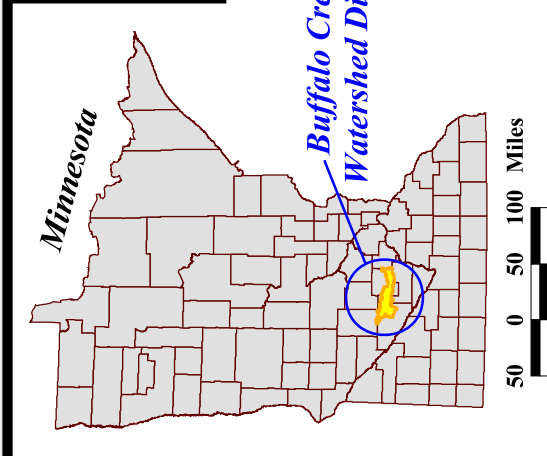
Map 2B Buffalo Creek Watershed District FEMA Floodplain



- Watershed District
 - Municipality
 - County
 - Lake
 - Buffalo Creek
 - Major Road
 - Minor Road
- District Total Area = 422.1 Square Miles
 Approximate East/West Length = 51 Miles
 North/South Length = 19 Miles

Floodplain
 The Federal Insurance and Mitigation Administration maintains and updates the National Flood Insurance Program Maps. Please call 1-877-FEMA-MAP for more information.

- Major Roads**
- U.S. Highway 212
 - State Highway 4
 - State Highway 15
 - State Highway 22



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

Priority Water Quantity Management Issues

The Overall Plan Taskforce designated a number of water quantity management related issues as high priority for the BCWD. These issues were so designated because they pose serious threats to the public's health or sensitive resources if they are not addressed, or important opportunities could be lost through inaction. The taskforce recommended that the District individually profile each of these issues in greater detail. Information provided on each issue includes an issue overview, key players, the District's role, priority subwatersheds, implications and assessments, and taskforce recommended initiatives.

Listed below are the priority water quantity management related issues of the BCWD.

- ✓ Alternative Drainage Practice Funding
- ✓ Drainage Coefficients
- ✓ Stormwater Management
- ✓ Water Storage and Wetlands

ALTERNATIVE DRAINAGE PRACTICES

Priority Issue 1

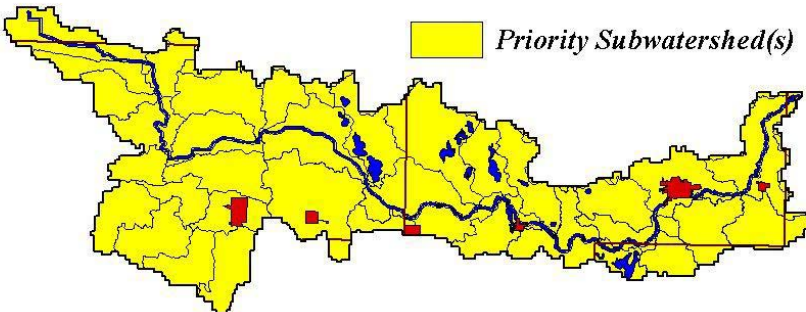
Issue Overview Open surface tile intakes serve as direct conduits for nonpoint source pollutants, such as sediment and nutrients, to enter subsurface drainage systems, which eventually outlet to surface water resources. Alternative drainage practices offer landowners an option to replace existing open 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 alternative drainage practices.

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

District's Role Nonregulatory - cooperator, facilitator

Priority Subwatersheds

All subwatersheds



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 alternative 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.



Rock (Blind) Inlet

Because research on alternative drainage practices is limited, there are few funding sources for the installation of such practices. The Section 319 Program, which is administered by the EPA at the Federal level and the MPCA at the State level, is the most prominent source of funding for alternative drainage practices. The following section provides background information on the Section 319 Program.

Section 319 Program

In 1987, Congress amended the Clean Water Act to establish the Section 319 Nonpoint Source (NPS) Management Program to help focus State and local nonpoint source pollution efforts. Under Section 319, governmental units can receive grant money to support a wide variety of activities, including technical assistance, financial assistance, education, training, technology transfer, demonstration projects and monitoring to assess the success of specific implementation projects.

Section 319 projects are implementation oriented and must offer a means of moving towards a resolution of the pollution problem(s) identified in the grant application. Section 319 funds are often used for educational and demonstration projects. Educational projects are required to have a strong technology/information transfer component. Demonstration projects typically have a regional focus and are not about familiar uses of well-established technologies or best management practices. Examples of past demonstration/education projects include development and delivery of an education program on restoring native shoreline vegetation, co-sponsoring statewide water conferences, a personalized educational program on nutrient management for farmers, with key information on a central Web site, and a project to examine converting tailings basins into wetlands.

In recent years, approximately \$3,000,000 has been available annually for nonpoint source projects through the Section 319 program. Funding for the program is dependent on the Federal budget and is based on the Federal fiscal year, which runs from October 1 to September 30. Beginning with the 2003 Federal fiscal year, 43 percent of the Section 319 grant funds are required to be spent on Total Maximum Daily Load (TMDL) implementation.

Local units of government, including counties, joint powers boards and watershed districts, are eligible to apply for Section 319 funds. Multi-governmental collaboration is encouraged, provided one local unit of government is designated as the fiscal agent. The application period is typically opened in late summer, with a notice being published in the Minnesota State Register. Application packets are available from MPCA district and State offices and on the MPCA Web site. By law, the application period is required to remain open for at least 60 days. Once the application period has passed, the MPCA reviews all of the potential projects. Funding decisions are usually made and announced by mid-January.

References

Minnesota Pollution Control Agency - www.pca.state.mn.us
University of Minnesota Extension Service - www.extension.umn.edu

Taskforce Recommended Initiatives

- ✓ **Policy Guideline:** Alternative drainage practices should be promoted to willing landowners as a viable option to replace existing open surface tile intakes.
- ✓ **Action Item:** Apply for Section 319 Program grant funds for the demonstration of alternative drainage practices within the District.

DRAINAGE COEFFICIENTS

Priority Issue 2

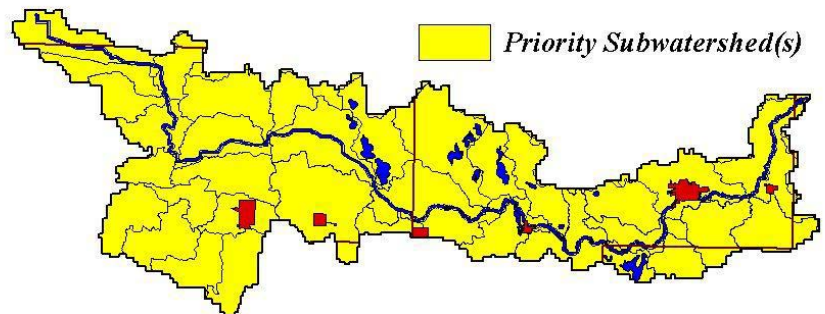
Issue Overview Under the District’s Rules and Regulations, any work or alteration on a drainage system, where the tile size exceeds 8 inches, requires a permit from the District. Generally, this maximum size requirement is in excess of the size of tile landowners are currently installing. As a priority issue, the Overall Plan Taskforce recommended that the District assess the adequacy of the tile sizing coefficients outlined in the *Minnesota Drainage Guide*, which the District has adopted by reference in their Rules and Regulations.

Key Players BCWD, NRCS, SWCDs, UMES

District’s Role Regulatory (*Policy Manual, Page 17*)

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.

The BCWD has adopted the drainage coefficients contained in the *Minnesota Drainage Guide* (See Appendix B). The guide contains one drainage coefficient drainage chart for plastic tile and another for clay or concrete tile. The difference between the two charts is that plastic tile is less efficient in removing water, due to increased friction posed by its inner ridges.

In practice, the selection of a drainage coefficient should be based upon a combination of drainage charts, knowledge of past cropping and farm operational problems in the area and professional judgment of the designer. Below are some items to consider in increasing or decreasing the drainage coefficient.

Increase Drainage Coefficient if

- Soils are lighter
- Crops are high value
- Crops have lower tolerance to wetness
- Topography is flat
- Crop residue left is high
- Little surface drainage
- Crop ET is low
- Frequent and low intensity rainfalls
- Planting and harvesting times critical

Decrease Drainage Coefficient if

- Soils are heavier
- Crops are lower value
- Crops have high tolerance to wetness
- Topography is sloping
- Crop residue left is low
- Extensive surface drainage
- Crop ET is high
- Infrequent and high intensity rainfalls
- Planting and harvesting times moderately critical

According to Table 2F, where high value truck crops tend to be damaged by ponded water, inlets should be installed in the depressional areas where surface water tends to collect. If surface water is admitted into a subsurface drainage system through such inlets, the drainage coefficient values must be increased. The selected drainage coefficient will apply to the entire watershed contributing runoff to the inlet, except where only a small amount of runoff will be impounded at the location of the inlet, with the remainder flowing away in a confined channel. For the latter case, the tile should be large enough to remove the impounded water in 24 hours, plus provide capacity for the required internal drainage.

Table 2F
Drainage Coefficients where
Surface Water enters Subsurface Tiles

Soil	Field Crops		Truck Crops	
	Blind Inlets (in.)	Open Inlets (in.)	Blind Inlets (in.)	Open Inlets (in.)
Mineral	3/8	1/2	1/2	1
Organic	1/2	3/4	3/4	2

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.

Agency Comments

In consultation with several local, State and Federal agencies, the general consensus was that the drainage coefficients outlined in the *Minnesota Drainage Guide* were still applicable and more than adequate for the design and installation of subsurface tile drainage systems within the District. Several agencies raised the point that in many instances the soil is the limiting factor in how much water can be removed through the subsurface. For instance, when a heavy clay soil is tilled, the tile may have the capability of removing 3/8 inch of water in a 24 hour period; however, the soil itself will not yield that much. Each of the agencies contacted recommended that the District continue to implement the drainage coefficients given in the *Minnesota Drainage Guide*.

References

Prinsco Inc - www.prinsco.com
 Natural Resources Conservation Service - www.mn.nrcs.usda.gov
 University of Minnesota Extension Service - www.extension.umn.edu

Taskforce Recommended Initiative

- ✓ **Policy Guideline:** The District should continue to implement the drainage coefficients outlined in the *Minnesota Drainage Guide*.

STORMWATER MANAGEMENT

Priority Issue 3

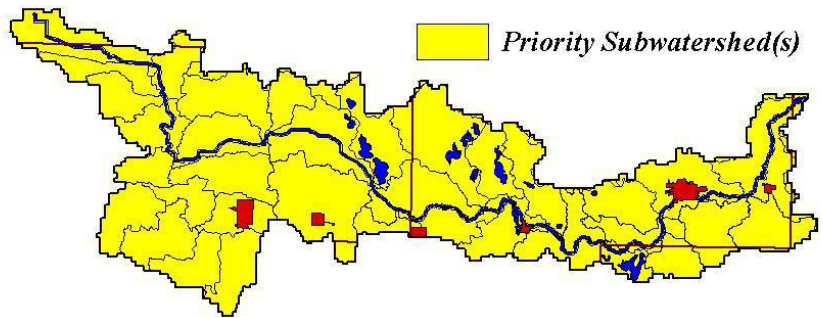
Issue Overview Management of stormwater is anticipated to become a much larger issue, especially in the eastern portion of the District, where additional development is projected to occur. As a priority issue, the Overall Plan Taskforce recommended that the District review common stormwater management techniques, explore additional minimum standards that the District could enact and profile the new Stormwater Phase II Final Rule regulations.

Key Players BCWD, Cities, Counties, MPCA

District's Role Regulatory (*Policy Manual, Page 9*)/Nonregulatory – cooperator

Priority Subwatersheds

All subwatersheds



Implications and Assessment

Stormwater management practices are used to delay, capture, store, treat or infiltrate stormwater. These practices are commonly implemented to compensate for the hydrological changes caused by new development. The general goals for stormwater management practices are listed below.

- Maintain groundwater recharge and quality
- Reduce stormwater pollutant loads
- Protect stream channels
- Prevent increased overbank flooding
- Safety convey extreme floods

There are numerous structural stormwater management techniques for controlling stormwater quantity and quality. These practices can be categorized into five broad groups.

- **Ponds** – The three types of stormwater ponds are wet, dry extended detention and wet extended detention. Wet ponds rely entirely on the permanent pool to treat stormwater runoff through biological activity and settling. The concept behind this design is that incoming runoff displaces the permanent pool and the treated water flows out of the

system. Dry extended detention ponds treat runoff by detaining it for a given period of time (usually 24 hours). Pollutant removal is accomplished through settling. Wet extended detention ponds combine both of the aforementioned concepts by dividing treatment between a permanent pool and a extended detention pond. Part of the runoff is detained and the remainder is treated in the permanent pool.

- **Wetlands** - Stormwater wetlands are very similar to stormwater ponds, except that they are generally shallow and more extensively incorporate wetland vegetation into the design. The wetland plants remove pollutants by slowing runoff and through pollutant uptake. The three types of wetlands commonly used in stormwater management are shallow marshes, pond/wetland systems and extended detention wetlands. The difference among the three types is the amount of area and storage allocated to the high marsh (<6" depth), low marsh (6" to 18" depth), extended detention and deep-water zones.
- **Infiltration** - Infiltration systems recharge the groundwater, helping to mitigate the impacts of development on the hydrologic cycle. In addition, they use the soil as a filter, treating polluted runoff as it percolates into the ground. Porous pavement, infiltration trenches and infiltration basins all remove pollutants through stormwater infiltration, but are used in different situations and scales.
- **Filtering Systems** - Filtering BMPs treat runoff as it flows through a filtering medium, such as sand or an organic material, and are generally used on small drainage areas of five acres or less. Filtering BMPs are designed only for pollutant removal, and do not reduce peak flows for flood control or channel protection.
- **Open Channels** - Open channel systems treat stormwater runoff through a combination of filtration through a vegetative cover and infiltration. The four basic types of open channel systems are grass channels, dry swales, wet swales and vegetative filter strips. All of these systems treat runoff through similar mechanisms, but differ slightly in their application and design.

Stormwater Management Standards

One of the most comprehensive sources of stormwater management standards in the State is the *Minnesota Urban Small Sites BMP Manual*, which was developed by the Metropolitan Council. The manual focuses on runoff management for small sites (less than five acre) and provides information on tools and techniques to assist local governmental units and landowners in guiding development. The manual includes detailed information on several BMPs that are aimed at managing stormwater pollution for small sites in a cold-climate setting. The goal of the manual is to enable users to prescribe effective and site-appropriate stormwater management practices that accommodate growth, while preserving the environment.

The *Minnesota Urban Small Sites BMP Manual* is divided into the following four chapters:

- Chapter 1: Factors in BMP Selection
- Chapter 2: Selecting BMPs

- Chapter 3: Best Management Practices
- Chapter 4: Regulation of Water Quality

Chapter one offers background information on hydrology and information on the most common surface water pollutants and their relationship to stormwater runoff. Cold-climate considerations for watershed management and the relationship between hydrology and watershed management are also discussed.

Chapter two outlines the process for selecting stormwater treatment BMPs for small sites and provides factors to consider for their placement. Both developers and regulators can use this process to select the most effective and appropriate best management practices (BMPs) for sites.

The centerpiece of the manual, chapter three, contains a set of 40 stand-alone BMP profiles, each illustrating a technique that is practical for a small site, cold-climate setting. Each of the BMP profiles includes the following.

- Definition and description of the BMP
- Discussion of the BMP's means of operation
- Diagrams and information to guide design and installation
- Listing of inspection and maintenance considerations
- References for more detailed information

Finally, chapter four explains how Federal and State water quality rules affect water quality management decisions. This chapter also explains how local governmental units can adapt the manual to develop their own stand-alone document.

Stormwater Phase II Final Rule

The 1972 amendments to the Federal Water Pollution Control Act, referred to as the Clean Water Act (CWA), prohibit the discharge of any pollutant to navigable waters of the United States from a point source, unless the discharge is authorized by a National Pollutant Discharge Elimination System (NPDES) permit. In the past, efforts to improve water quality under the NPDES program traditionally have focused on reducing pollutants in industrial process wastewater and municipal sewage treatment plant discharges. Over time, it has become evident that more diffuse sources of water pollution, such as stormwater runoff from construction sites, are also significant contributors to water quality problems.

In 1990, the EPA enacted rules establishing Phase I of the NPDES stormwater program that address stormwater runoff from “medium” and “large” municipal separate storm sewer systems (MS4s), construction activity disturbing five acres of land or greater and ten categories of industrial activities. The Stormwater Phase II Final Rule is the next step in the EPA’s effort to

preserve, protect and improve water resources from polluted stormwater runoff by placing additional restrictions on discharges regulated in Phase I. It also institutes the use of controls on some formerly unregulated sources of stormwater discharges that have the greatest likelihood of causing environmental degradation. A description of the implications of the new rule for each of these activities is given below.

MS4s in Urbanized Areas

A municipal separate storm sewer system (MS4) is a conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches channels and storm drains) that is:

- Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes;
- Designed or used for collecting or conveying stormwater;
- Not a combined sewer; and
- Not part of a publicly owned treatment works.

Stormwater discharges from MS4s are a concern because of the high concentration of pollutants found in these discharges. Concentrated development in urbanized areas substantially increases impervious surfaces, such as city streets, driveways, parking lots and sidewalks, on which pollutants from concentrated human activities settle and remain until a storm event washes them into nearby storm drains. Common pollutants include pesticides, fertilizers, oils, salt, litter and other debris and sediment. Another concern is the possible illicit connections of sanitary sewers, which can result in fecal coliform bacteria entering the storm sewer system. Stormwater runoff picks up and transports these and other harmful pollutants then discharges them to waterways via storm sewer systems. When left uncontrolled, these discharges can result in fish kills, destruction of habitats, loss of aesthetic value and contamination of drinking water supplies and recreational waterways that can threaten public health.

The Phase I Stormwater Program required NPDES permit coverage for medium and large MS4s. The Phase II program requires operators of small MS4s in urbanized areas to obtain permits and implement programs and practices to control polluted stormwater runoff. Under the Phase II program the three categories of regulated small MS4s are mandatory (population >50,000), discretionary (population >10,000) and petition. Owners and operators of small MS4s were required to apply for NPDES permit coverage by March 10, 2003. After the issuance of the permit, an annual report on the implementation of the program must be submitted by March 10 of each year beginning in 2004. The report must evaluate the effectiveness of BMPs to determine whether the practices are reducing the discharge of pollutants from their systems to the “maximum extent practicable” and to determine if the practices are satisfying the water quality requirements of the Clean Water Act. Permittees are also required to assess their progress in achieving their program’s measurable goals. While monitoring is not required under the rule, the NPDES permitting authority has the discretion to require monitoring if deemed necessary. If

there is a need for improved controls, permittees can revise their selection of BMPs to create a more effective program.

Construction Activity

Uncontrolled construction site runoff is a concern because of the devastating effects that sedimentation can have on local waterbodies, particularly small streams. Numerous studies have shown that the amount of sediment transported by runoff from construction sites is typically 10 to 20 times greater than that of agricultural lands, and 1,000 to 2,000 times greater than that of forestlands. Such sediment laden runoff can result in the loss of stream habitat for aquatic species, an increased difficulty in filtering drinking water, the loss of drinking water reservoir storage capacity and negative impacts on the navigational capacity of waterways. In addition to sediment, construction activities can potentially yield pollutants such as pesticides, petroleum products, construction chemicals, solvents, asphalts and acids that can contaminate stormwater runoff.

The Phase I Stormwater Program required NPDES permit coverage for all operators of construction activity disturbing five or more acres of land. Operators of sites disturbing less than five acres were also required to obtain a permit if their activity is part of a “larger common plan of development or sale” with a planned disturbance of five acres or greater. “Disturbance” refers to exposed soil resulting from activities such as clearing, grading and excavating. Construction activities can include road building, construction of residential houses, office buildings, industrial sites, or demolition.

Phase II of the NPDES stormwater program, which fully goes into effect in January 2004, expands upon Phase I and regulates smaller construction activities disturbing between one and five acres. Site activities disturbing less than one acre are also regulated as small construction activity if they are part of a larger common plan of development or sale with a planned disturbance of equal to or greater than one acre and less than five acres, or if they are designated by the NPDES permitting authority. The NPDES permitting authority or the EPA may designate construction activities disturbing less than one acre based on the potential for contribution to a violation of a water quality standard or for significant contribution of pollutants to waters of the United States.

Industrial

Stormwater discharges from industrial sites are a concern because of the potentially high concentration of pollutants, including pesticides, fertilizers, oils, salt, litter and other debris and sediment. Under the Phase II Stormwater Program industrial sites are divided into ten categories. Each of the categories listed below have an associated list of SIC codes and/or a narrative description of the facilities.

- Facilities with effluent limitations
- Manufacturing
- Mineral, metal, oil and gas

- Hazardous waste, treatment, or disposal facilities
- Landfills
- Recycling facilities
- Steam electric plants
- Transportation facilities
- Treatment works
- Light industrial activity

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 temporarily exempted industrial facilities with certain SIC codes which are owned and operated by municipalities with populations of less than 100,000 from the need to obtain a NPDES permit. Exceptions included power plants, airports and uncontrolled sanitary landfills. Under Phase II, no new categories of industrial activity were added to the stormwater program; however, a revised conditional no exposure exclusion is included. Under Phase I, only discretionary facilities were eligible for the no exposure exclusion. Under Phase II, the no exposure exclusion now applies to all regulated categories of industrial activity, except construction. Because the no exposure exclusion is available to most, industrial facilities are no longer identified as either mandatory or discretionary. A facility may be eligible for the conditional no exposure exclusion from permitting, provided their industrial materials and activities are entirely sheltered from stormwater. Small municipalities that were temporarily exempted were required to obtain permit coverage for their industrial activity by March 10, 2003.

References

Center for Watershed Protection - www.cwp.org
 Environmental Protection Agency - www.epa.gov
 Minnesota Pollution Control Agency - www.pca.state.mn.us
 Metropolitan Council - www.metrocouncil.org

Taskforce Recommended Initiatives

- ✓ **Policy Guideline:** The public and governmental units should be informed of the District's stormwater management rules and regulations, as well as other applicable State and Federal regulations.
- ✓ **Policy Guideline:** The District should provide assistance to the public and governmental units on the appropriate design requirements for stormwater management practices.

- ✓ ***Policy Guideline:*** A working relationship with cities should be established and cultivated to explore opportunities to expand stormwater treatment to all urbanized areas of the District.
- ✓ ***Policy Guideline:*** Efforts to educate the public on the need for stormwater management should focus upon the importance of minimizing imperviousness.
- ✓ ***Policy Guideline:*** When feasible, stormwater management should be integrated with the functions and values of wetlands.
- ✓ ***Policy Guideline:*** Permanent and temporary water retention and settling basins should be designed to enhance surface water quality.
- ✓ ***Policy Guideline:*** Infiltration methods and techniques should be incorporated into District stormwater management projects and should be periodically studied and researched.
- ✓ ***Action Item:*** Revise the District's stormwater management criteria utilizing the *Minnesota Urban Small Sites BMP Manual*.

WATER RETENTION/WETLANDS

Priority Issue 4

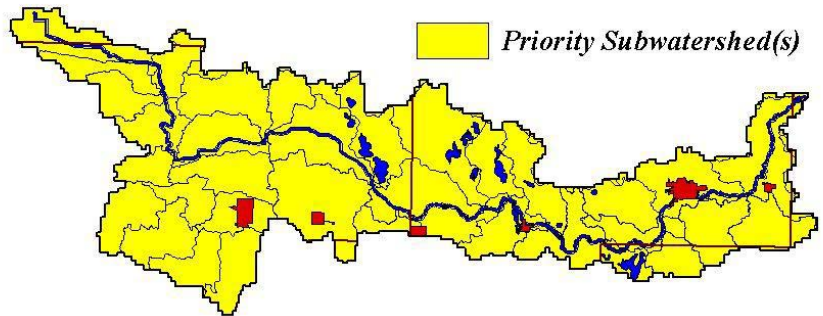
Issue Overview Overall, there has been a lack of interest in large-scale water storage and flood attenuation projects in rural parts of the District. In many areas, smaller, wetland creation and restoration projects have been successfully implemented. As a priority issue, the Overall Plan Taskforce recommended that the District summarize past water storage and flood attenuation efforts, identify existing wetland inventories and profile programs to protect and restore wetlands.

Key Players ACOE, BCWD, BWSR, Counties, NRCS, SWCDs, USFWS

District's Role Regulatory (*Policy Manual, Page 14*)

Priority Subwatersheds

All subwatersheds



Implications and Assessments:

In the past, the District has explored the feasibility of large-scale water retention; however, due to lack of interest from landowners and the area's relatively flat topography, such projects have been deemed largely infeasible. Smaller, wetland creation and restoration projects have been implemented within the District, primarily by the NRCS, SWCDs and USFWS. In general, these projects have proven to be far less contentious and easier to implement than a large-scale water retention project would be. Besides water storage and flood attenuation, wetlands offer numerous other benefits, including filtration of pollutants and sediment, groundwater and aquifer recharge, wildlife habitat and aesthetic appeal.

Wetland Inventories

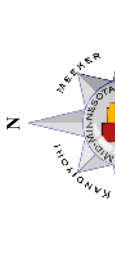
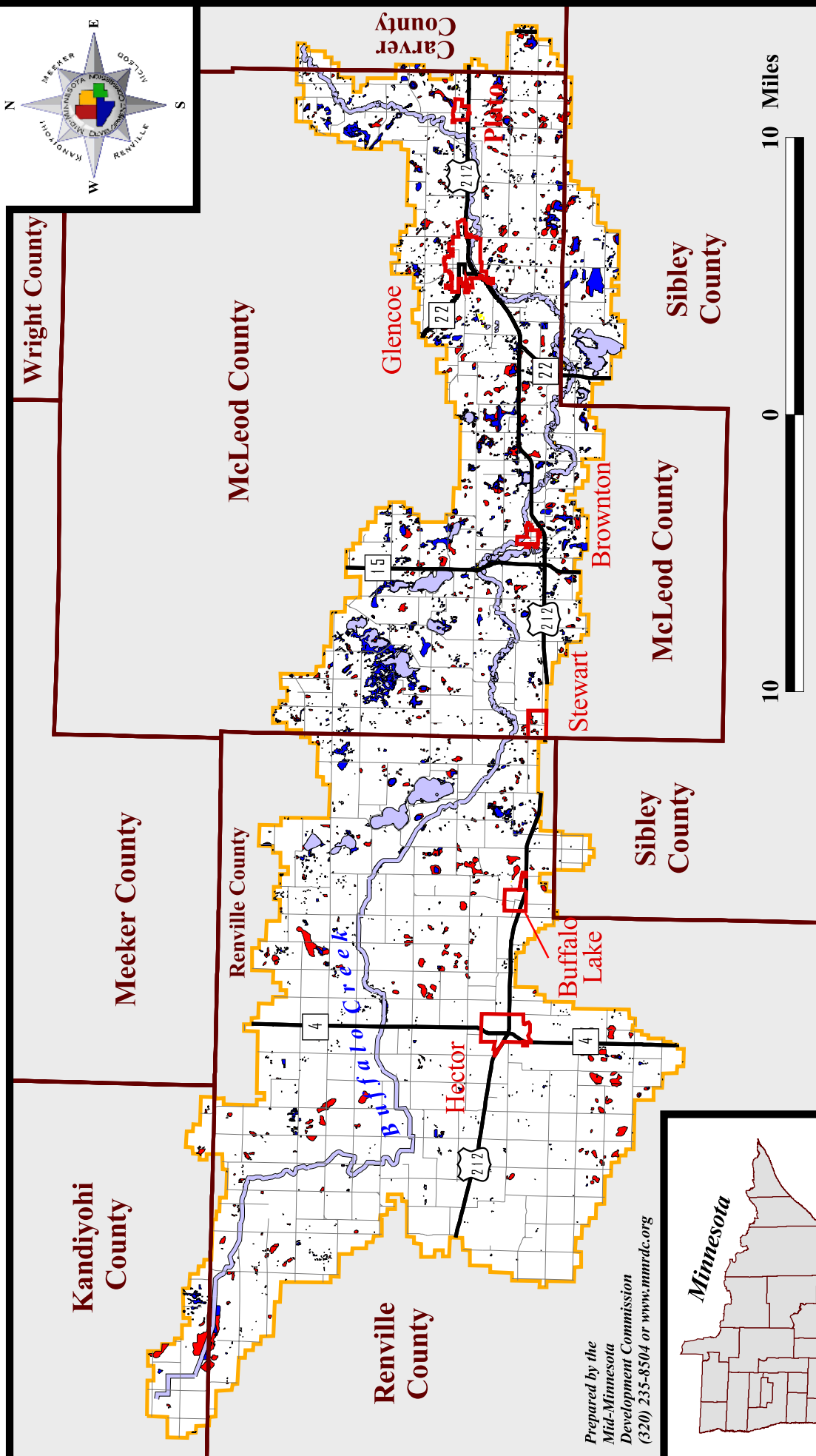
The three major sources of wetland inventory maps for the District are the USFWS (National Wetland Inventory), NRCS (wetlands in cropland areas) and DNR (Protected Waters Inventory). Presently, the USFWS, in conjunction with South Dakota State University, is working on a drained wetlands inventory pilot study in Minnesota. The inventory, which is done at the county level, is being developed using digital soils data, digital elevation models and manual stereoscope interpretation. The inventory has already been conducted in several counties in western Minnesota. Kandiyohi County is the only county within the District that is contemplating conducting the inventory. Expansion of current inventory efforts will largely depend upon the availability of funding from stakeholders.

The following definitions of wetland types are derived from the USFWS National Wetlands Inventory.

- **Type 1: Seasonally Flooded Basins or Flats** - Soil is covered with water or is waterlogged during variable seasonal periods, but usually is well drained during much of the growing season. Vegetation varies greatly according to season and duration of flooding.
- **Type 2: Inland Fresh Meadows** - Soil is usually without standing water during most of the growing season, but is waterlogged within at least a few inches of the surface. Vegetation includes grasses, sedges, rushes and various broad-leaf plants. Meadow may fill shallow basins, sloughs, or farmland sags, or these meadows may border shallow marshes on the landward side.
- **Type 3: Inland Shallow Fresh Marshes** - Soil is usually waterlogged early during growing season; often covered with as much as six inches or more of water. Vegetation includes grasses, bullrushes, spike rushes and various other plants such as cattails, arrowheads and smartweed. These marshes may nearly fill shallow lake basins or sloughs, or may border deep marshes on the landward side.
- **Type 4: Inland Deep Fresh Marshes** - Soil is usually covered with six inches to three feet or more of water during the growing season. Vegetation includes cattails, reeds, bullrushes, etc. Deep marshes may completely fill shallow lake basins, potholes, limestone sinks and sloughs, or may border open water in such depressions.
- **Type 5: Inland Open Fresh Water** - Shallow ponds and reservoirs are included in this type. Water is usually less than ten feet deep and fringed by a border of emergent vegetation similar to open areas of type 4.
- **Type 6: Shrub Swamps** - Soil is usually waterlogged during the growing season and is often covered with as much as six inches of water. Vegetation usually includes alders, willows, dogwood, etc. Swamps occur mostly along sluggish streams and occasionally on floodplains.
- **Type 7: Wooded Swamps** - Soil is waterlogged within a few inches of the surface during the growing season and is often covered with as much as one foot of water.
- **Type 8: Bogs** - Soil is usually waterlogged and supports a spongy covering of moss. Vegetation is woody, herbaceous or both.

Map 2C displays the USFWS National Wetlands Inventory for the BCWD. Notice that many of the smaller type 1 and 2 wetlands, which originally dominated the landscape of the District, have been drained for agricultural purposes, leaving behind sporadically distributed type 3, 4 and 5 wetlands. Much of the wetland drainage within the District occurred prior to the 1980s, when policies were enacted to prevent further wetland loss. The Minnesota Wetland Conservation Act (WCA), DNR Protected Waters, U.S. Army Corps of Engineers regulations and Swampbuster provisions of the USDA Farm Program, are examples of such policies.

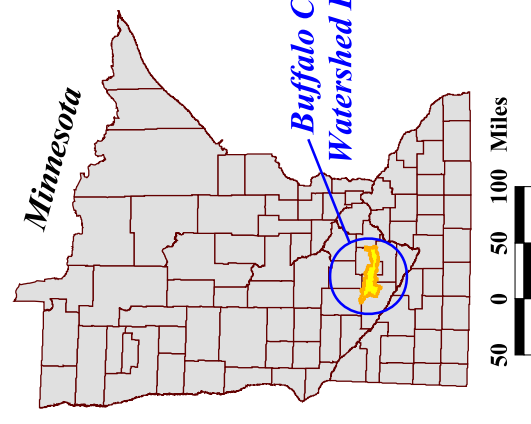
Map 2C Buffalo Creek Watershed District Wetlands



- Watershed District
 - Municipality
 - County
 - Lake
 - Buffalo Creek
 - Major Road
 - Minor Road
- District Total Area = 422.1 Square Miles
 Approximate East/West Length = 51 Miles
 North/South Length = 19 Miles

Wetland Types

1	Seasonally Flooded	5	Shallow Water
2	Wet Meadow	6	Shrub Swamp
3	Shallow Marsh	7	Wooded Swamp
4	Deep Marsh	8	Bogs (none)



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Wetland Regulations

U.S. Army Corps of Engineers, Section 404

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

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

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

Activities in wetlands that normally require permits include, but are not limited to the list below.

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

The Corp of Engineers must consider the following Federal laws during permit review:

- National Environmental Policy Act
- Fish and Wildlife Coordination Act
- Endangered Species Act
- National Historic Preservation Act
- Federal Power Act
- Wild and Scenic Rivers Act
- National Fishing Enhancement Act of 1984

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

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

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

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

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

Wetlands Conservation Act

In 1991, the Minnesota Legislature passed Chapter 354, the Wetlands Conservation Act (WCA), which created a statewide "no-net loss" policy for wetlands. The law requires anyone proposing to drain or fill a wetland, first to try to avoid disturbing the wetland; second, to try to minimize any impact on the wetland; and, finally, to replace any lost wetland acres, functions and values. Certain wetland activities are exempt from the act, allowing projects with minimal impact or projects located on land where certain pre-established land uses are present to proceed without regulation. Counties and/or SWCDs often implement the act locally. The BWSR administers the WCA at the State level and the DNR provides enforcement.

The WCA recognizes a number of wetland benefits that are deemed important, including those listed below.

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

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

Swampbuster

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

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

Regulated Wetland Categories

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

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

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

Converted Wetland (CW) - Wetlands drained, dredged, filled, leveled, or otherwise manipulated for the purpose of, or to have the effect of, making possible the production of an agricultural commodity. These lands must have been W, FW, or FWP and not highly erodible prior to the conversion. They may have been converted by any activity, including the removal of woody

vegetation, that impaired or reduced the flow, circulation, or reach of water; provided the conversion activity was such that agricultural production on the land would not have been possible without its application.

Exempted Wetland Categories

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

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

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

Wetland Restoration/Protection Programs

Wetland Reserve Program (Perpetual/ Limited)

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

- **Permanent Easement.** USDA will pay 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.

Reinvest in Minnesota Reserve Program (Perpetual)

The Reinvest in Minnesota (RIM) Reserve Program, administered by local SWCDs and the 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 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 a high of \$51 million, to a low of \$3 million. Since it began, RIM Reserve has enrolled approximately 3,927 easements, covering 126,567 acres, including 43,401 acres of wetland restoration and adjacent upland. The program has historically fostered partnerships with private organizations, including Pheasants Forever, Ducks Unlimited and the Minnesota Waterfowl Association, as well as other government agencies, including the USFWS and the Minnesota DNR. As of May 2003, the BWSR reported 10 RIM contracts in the BCWD, covering a total of 295 acres.

References

Board of Water and Soil Resources - www.bwsr.state.mn.us
 Center for Watershed Protection - www.cwp.org
 Natural Resources Conservation Service - www.mn.nrcs.usda.gov
 United States Army Corp of Engineers - www.usace.army.mil
 United States Fish and Wildlife Service - www.fws.gov

Taskforce Recommended Initiatives

- ✓ **Policy Guideline:** Degradation of wetlands should be prevented by managing or buffering the direct and indirect activities that impact their quality.
- ✓ **Policy Guideline:** Existing and future wetland inventories should be utilized to identify priority areas for wetland preservation and restoration.

- ✓ **Policy Guideline:** Wetlands should be preserved through regulatory controls and conservation programs.
- ✓ **Policy Guideline:** Opportunities should be sought to create new wetlands and restore previously impacted wetlands.
- ✓ **Policy Guideline:** Wetland restoration programs should be promoted to willing landowners.
- ✓ **Policy Guideline:** The establishment of exotic and invasive species in wetlands should be prevented.
- ✓ **Policy Guideline:** Support the use of the wetland banking program in the District.
- ✓ **Action Item:** Contribute in-kind services and financial assistance, as available, towards the completion of USFWS county level drained wetlands inventories within the District.

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