BLUFF CREEK *"One Water"*

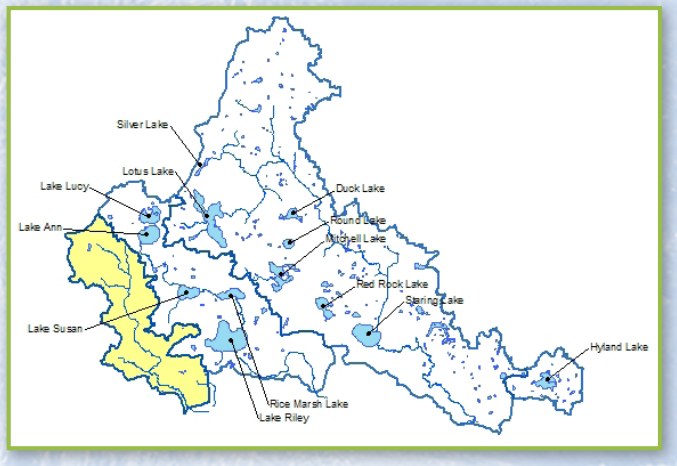
Riley Purgatory Bluff Creek Watershed District

The Bluff Creek Watershed has no lakes within its boundaries.

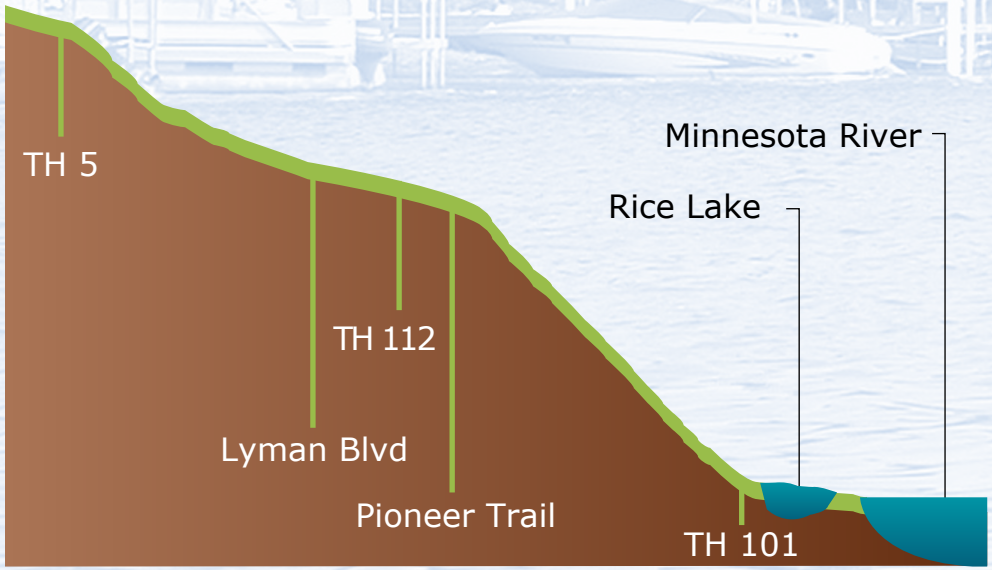
As the westernmost watershed within the District, land use changes from agricultural to residential have occurred relatively recently; however land uses are beginning to stabilize.

The defining features of this watershed are the bluffs as Bluff Creek winds down into the Minnesota River Valley before it outlets into Rice Lake and then the Minnesota River.

A Total Maximum Daily Load (TMDL) assessment of Bluff Creek began in 2009. The stream has been identified as impaired for aquatic life, with a turbidity stressor problem.



Bluff Creek Stream Profile



SECTION 6

Bluff Creek One Water

The Bluff Creek watershed is located at the western edge of the District, adjacent to the Riley Creek watershed to the east. The majority of the Bluff Creek watershed lies within the City of Chanhassen. Portions of the watershed lie within the City of Chaska.

Bluff Creek has a tributary drainage area of 5.9 square miles. The watershed ranges from a mix of forested upland and meadow in the upper portions of the watershed, to relatively flat open farm field in the middle portion of the watershed, to the steep valley walls as the creek flows to the Minnesota River. Unlike Riley and Purgatory Creek watersheds, there are no lakes along the entire length of Bluff Creek, the watershed is not divided into subwatersheds (see Figure 6-2).

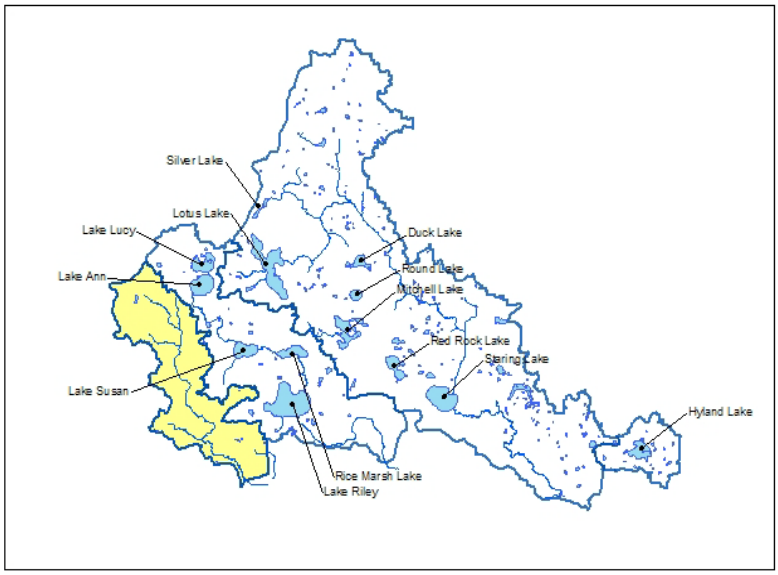


FIGURE 6-1
Bluff Creek Watershed

This section describes the following in regards to the Bluff Creek watershed:

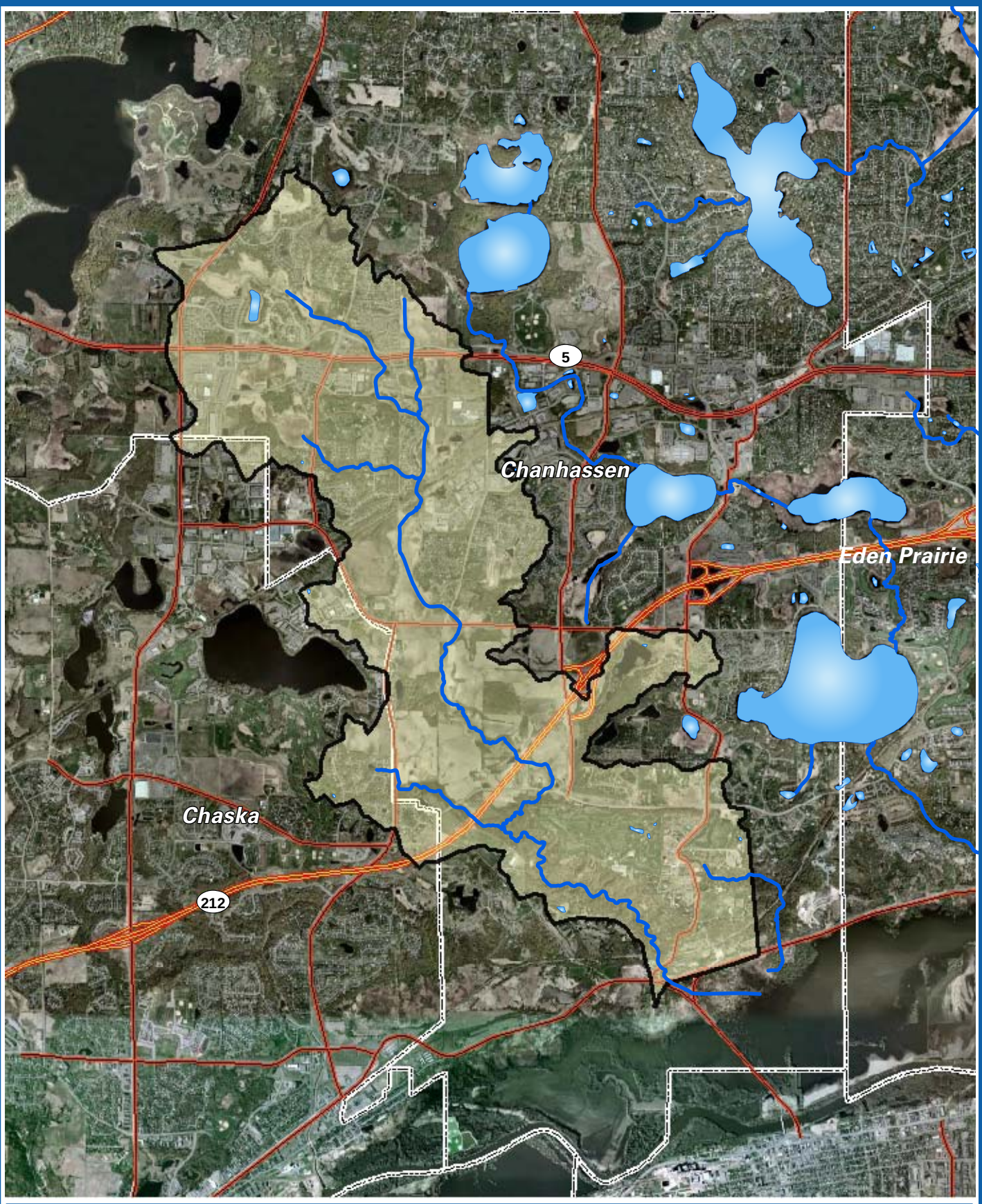
- History of the District's activities within the watershed during the 2nd Generation Plan,
- Land and water resources summary,
- Watershed problem assessment
- Watershed potential solutions

Prioritization and selection of Bluff Creek watershed projects and other restoration actions are included in Section 7.

6.1 History

6.1.1 Review of 1996 Data Program and Results

The 1996 Water Management Plan (WMP) included a comprehensive data collection program for streams, lakes, and groundwater.



LEGEND

- Watershed Boundary
- Streams
- Lakes

Riley Purgatory Bluff Creek Watershed District

Figure 6-2
Subwatershed Boundaries - Bluff Creek One Water
Riley Purgatory Bluff Creek Watershed District

N
W E
S

0 0.375 0.75 1.125 Miles

Imagery Source: Google Earth Pro

Streams – 1996 Program and Results

The 1996 WMP recommended a total of three data collection points, or "stations," on the Bluff Creek. Each station was to have an annual macroinvertebrate, fish, and habitat survey conducted. Physio-chemical parameters to be tested for included dissolved oxygen, temperature, conductivity, pH, and turbidity.

The implemented streams program included several more stations, beginning in 1996. Instead of 3 stations, a total of 4 stations on Bluff Creek were incorporated into the stream data collection program. A review of the data collected from 1996 to 2006 shows very few gaps in the data plan versus actual data collected over that time. The only exception was no habitat assessments conducted in 2006.

A notable addition to stream monitoring program during this timeframe was the addition of "Watershed Outlet Monitoring Program" (WOMP) stations in 2003. These stations provide continuous monitoring (at 15-minute intervals) of flow, temperature, conductivity, and dissolved oxygen, at five stations in the watershed. Bluff Creek has one WOMP station at its outlet near the Minnesota River. The WOMP station on Bluff Creek is owned and operated by the Metropolitan Council.

6.2 Land and Water Resource Summary

6.2.1 Land Use and Public Utilities Services

The Metropolitan Council has produced spatial data sets for both existing (2005) and planned (2020) land use for the Twin Cities Metropolitan Area. Table 6-1 is a summary of the two land use data sets for the Bluff Creek watershed. Existing land use is dominated by low density residential and undeveloped land. Planned land use is dominated by single family low density residential and mixed uses.

TABLE 6-3
Bluff Creek Watershed Land Use

Land Use	2005 Area (ac)	Percent	2030 Area (ac)	Percent
Agriculture / Farmstead	849.0	21.9%	2.4	0.1%
Single Family Low Density	799.6	20.7%	1869.8	48.3%
Single Family Medium Density and Multifamily	103.9	2.7%	346.2	8.9%
Retail / Commercial	78.1	2.0%	91.1	2.4%
Office	25.3	0.7%	88.8	2.3%
Mixed Use	9.6	0.2%	473.5	12.2%
Industrial / Utility	196.6	5.1%	119.7	3.1%
Institutional (School, Religious, etc.)	55.6	1.4%	177.0	4.6%
Park / Preserve / Golf Course	543.3	14.0%	482.6	12.5%
Transportation / ROW	57.2	1.5%	212.3	5.5%
Undeveloped	1145.3	29.6%	0.0	0.0%
Water	6.1	0.2%	6.1	0.2%
Total	3869.5		3869.5	

Source: Metropolitan Council (http://www.datafinder.org/catalog/index.asp)

Public utilities service within the Riley Creek watershed is provided within the Metropolitan Urban Service Area.

6.2.2 Stream Summary

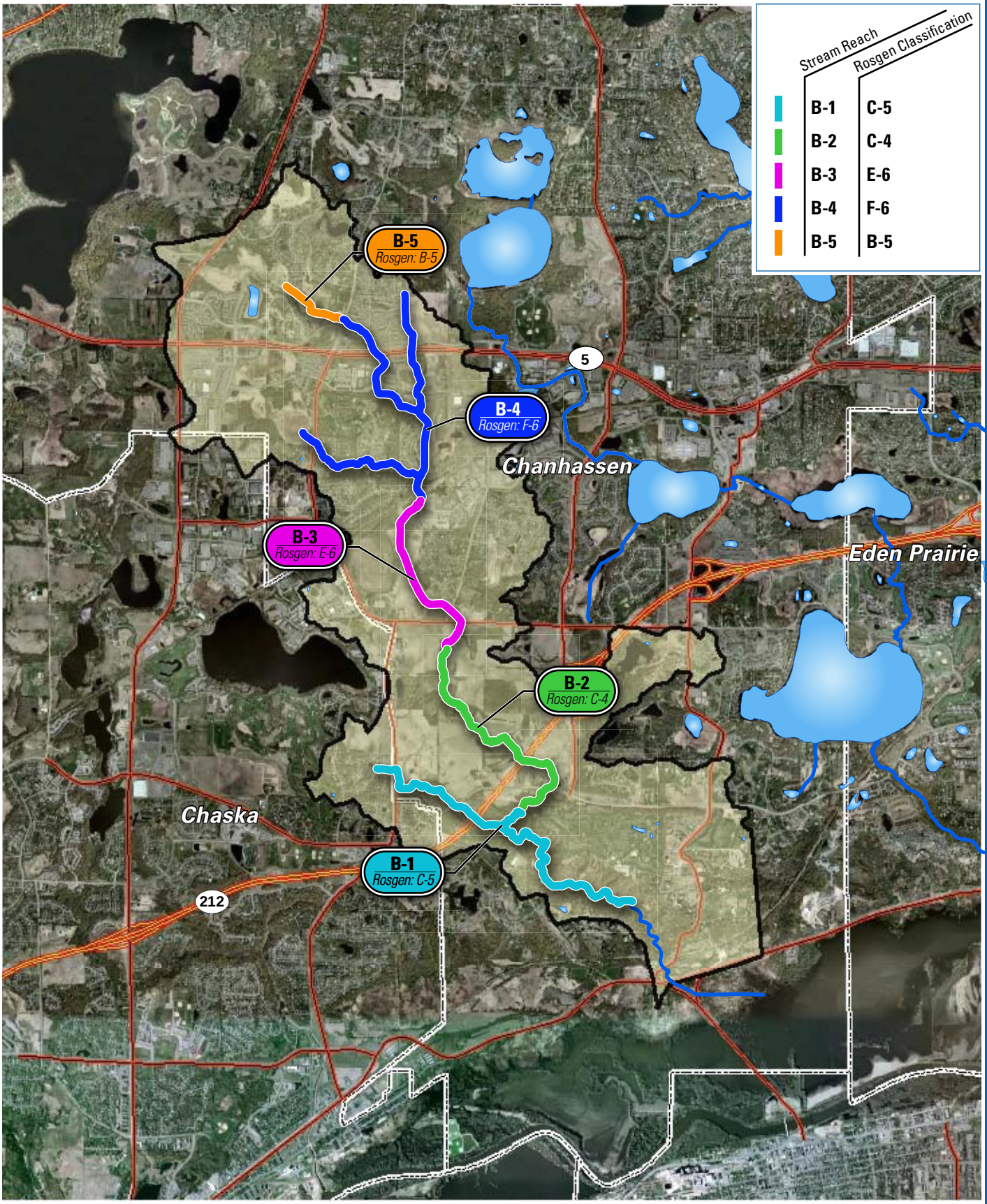
Existing Physical Classification

Five reference reaches of Bluff Creek were physically classified as shown on Table 6-2 and Figure 6-3. The majority of the creek consists of C and E stream type, with some portions of type B and type F. The E stream type occurs in much of the middle reaches of the watershed, where the channel slopes are mild. This type is defined by a deep, narrow channel with a low, wide floodplain. The E stream type is typical of marsh and meadow areas. Reach B-3 is an E stream type in one of the few remaining pastures in the watershed. Bluff Creek is a C stream type from Pioneer Trail downstream to Flying Cloud Drive, where the floodplain is more confined by the valley walls. The C stream type is typified by a somewhat wider and shallower channel than the type E channel, with a narrower floodplain. Reach B-1 and B-2 are type C channels. Type B channel was observed at the uppermost reference reach B-5. This stream type is characterized by a narrow, gently sloping valley, through which the stream is confined. This stream type is less meandering than type C or E, with little floodplain. It is generally, however, a stable stream type. Reach B-4 was classified as an F stream type. This stream type is characterized by an entrenched channel with a high width/depth ratio, and fairly high sinuosity. Reach B-4 is probably a degraded C stream type due to the upstream railroad culvert.

TABLE 6-2
Bluff Creek – 1996 Physical Classification Summary

Classification Parameter	Reference Reach				
	B-1	**B-2**	**B-3**	**B-4**	**B-5**
Entrenchment Ratio[1]	17 Slight	2 Moderate	3 Slight	1 Fully	2 Moderate
Width/Depth[2]	11 Low	9 Low	8 Very Low	16 High	13 Moderate
Sinuosity[3]	1.5 High	1.4 High	1.4 High	1.9 Very High	1.2 Moderate
Slope[4]	0.004 Low	0.006 Low	0.0008 Low	0.005 Low	0.007 Low
Bed Material	Sand	Gravel	Silt/Clay	Sand/Silt	Sand
Rosgen Classification	C-5	C-4	E-6	F-6	B-5

[1]Entrenchment Ratio = Floodprone Width/Bankfull Channel Width
[2]Width/Depth = Bankfull Channel Width/Average Bankfull Channel Depth
[3]Sinuosity = Channel Length/Valley Length
[4]Slope = Change in Water Surface Elevation/Channel Length



LEGEND

- Subwatershed Boundary
- Lakes
- Streams

Riley Purgatory Bluff Creek Watershed District

Figure 6-3
Bluff Creek Stream Reaches
Riley Purgatory Bluff Creek Watershed District

N
W E
S

0 0.375 0.75 1.125
Miles

Imagery Source: Google Earth Pro

6.3 Problem Assessment

As with Riley and Purgatory Creeks, Bluff Creek's observed problems are associated with the impacts of an altered hydrology due to urbanization, straightened channel reaches, particular culvert crossings, and areas of inadequate vegetative protection on the stream banks and floodplain. Improving the physical characteristics of Bluff Creek where necessary will improve the ability of the stream to convey surface waters without eroding and also improve the ecological characteristics and aesthetics of the stream. Problems associated with particular reference reaches are described as follows:

- *B-1* No significant problems were observed.
- *B-2* Bank stability problems were observed; this is due partly to wet clay soils and change in gradient.
- *B-3* Loss of meandering due to straightening and grazing was observed.
- *B-4* This reach is likely a degraded C stream type, resulting from the upstream railroad culvert and downstream channel straightening.
- *B-5* No significant problems were observed.

TMDL Identification

Like the lower portion of Riley Creek, Bluff Creek has been identified as impaired for aquatic life, with a turbidity stressor problem. Additionally, Bluff Creek has been assessed to have a fish Index of Biotic Integrity criterion impairment as well. The TMDL study for Bluff Creek commenced in 2008. As part of the process, a "Bluff Creek Stressor Identification Report" has been completed to identify probable causes of fish biota impairment. The probable causes of fish biota impairment of Bluff Creek are habitat fragmentation, sediment, flow, and metals contamination. These probable causes will be addressed in more detail in the Bluff Creek Watershed TMDL and Implementation Plan.[1]

Construction of Highway 212

The construction of Highway 212 through Chanhassen in 2008 has impacted Bluff Creek in many ways. The Minnesota Department of Transportation implemented many mitigations to manage the impacts, as follows:

Much time was spent in the design process to consider and mitigate existing erosion in Bluff Creek southwest. The roadway alignment was changed to consolidate two bridges proposed to cross Bluff Creek southwest and only one bridge was built. Bioengineering techniques were utilized at Bluff Creek mainly to stabilize the channel and stream banks. Three wetland mitigation sites were located in the Bluff Creek Watershed. The project north of Lyman Blvd remeandered a portion of Bluff Creek main and reestablished over ten acres of native wetland vegetation. Eight stormwater ponds, four that treat Highway 212 and four that treat Carver County roadways were installed within the Bluff Creek watershed

[1] Report may be found at: http://www.pca.state.mn.us/index.php/water/water-types-and-programs/minnesota-s-impaired-waters-and-tmdls/tmdl-projects/minnesota-river-basin-tmdl-projects/underway-tmdl-bluff-creek-tmdl-–-turbidity-and-fish-biota.html

area. A storm septor was installed to treat stormwater coming from Bluff Creek Drive. A total of 35 ponds were installed with the complete Highway 212 project.

6.4 Potential Solutions

The development of the Bluff Creek TMDL and its implementation plan will identify the solutions necessary to remove the turbidity impairment and improve the fish IBI criterion. Ongoing coordination with Citizen Advisors and other watershed partners will also help to identify potential cost-sharing program opportunities for project implementation. The District has set aside funding for petitioned projects from municipalities. In the case of Bluff Creek, set asides have been identified to fund stream assessments in 2013, 2014, and 2018.