

Bluff Creek Reach 5 Ecological Enhancement Plan



Overview

Objectives

Project Need

Identified Enhancement Measures

Path Forward

Project Vision & Approach

VISION

Provide an ecologically diverse wetland & stream reach that

- Improves ecological functions
- Provides diverse habitat layers
- Significantly reduces streambank erosion
- Enhances public access & understanding importance of stable streams

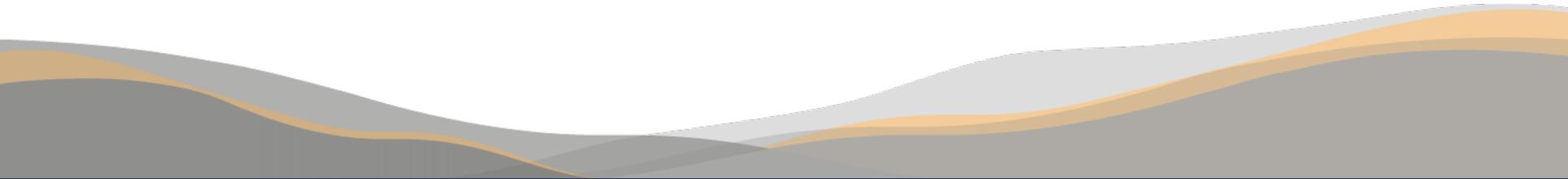
APPROACH

Adaptive management approach

Preferred by RPBCWD, MnDNR and USACE

- Restoration methods selected to enhance wetland's and creek's ecological values and functions while mitigating and preventing additional erosion
- Foster use of natural materials and bioengineering methods for restoration and maintenance whenever feasible to maintain natural function and appearance and provide higher quality habitat
- Align with RPBCWD Plan Goals

Why this stream reach?

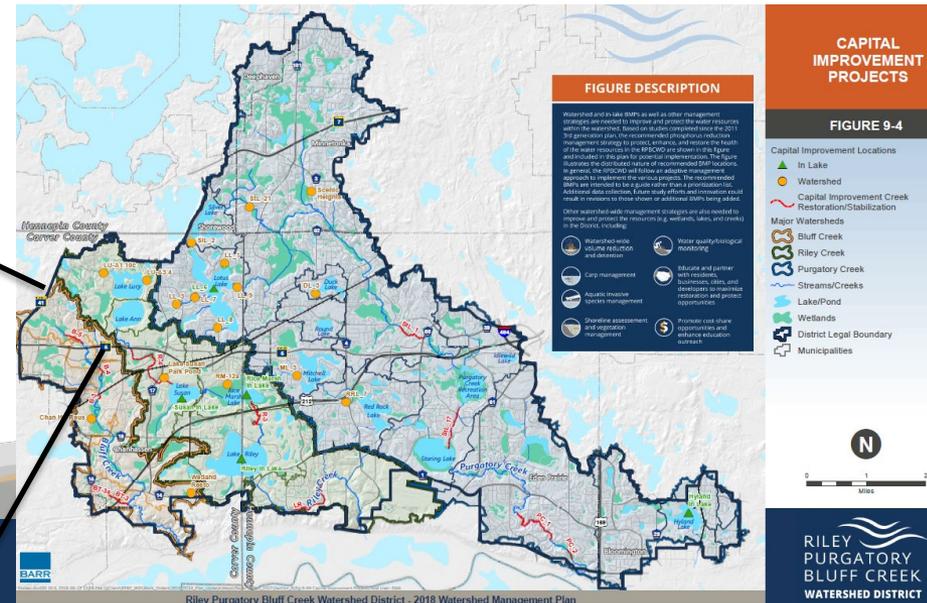
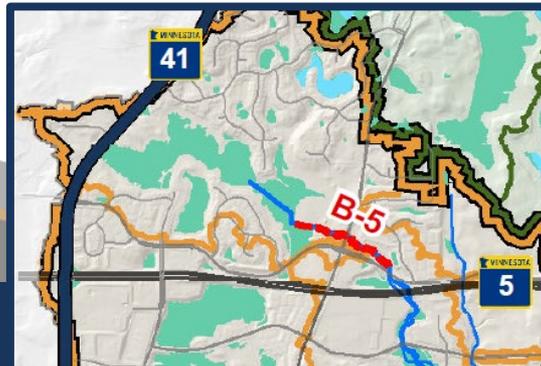


Prioritized in 2018 10-year Plan

	Goal Index	Sustainability Index	Volume Management Index	Pollutant Management	Stabilization	Habitat Restoration	Partnership	Education	Watershed Benefit	Total Benefit Score
Plan Score	3	7	1	1	7	7	1	3	7	37

(1) See Section 4 of 10-Year Watershed Management Plan for additional details about the RPBCWD prioritization methodology and associated descriptions for the variables used to assess multiple project benefits.

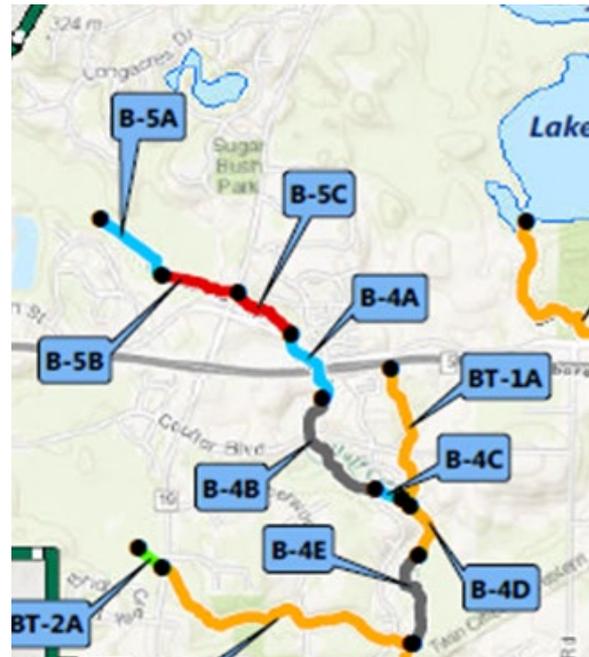
- High score relative to other projects in the 10-year Plan
- Programmed to be implemented in 2021



High Priority Reach for RPBCWD

RPBCWD assesses creek reach restoration by assessing

- Infrastructure
- Erosion/channel stability
- Ecological benefits
- Water quality



LEGEND

Stream Reaches - Erosion and Channel Stability

1 (Best)

3

5

7 (Worst)

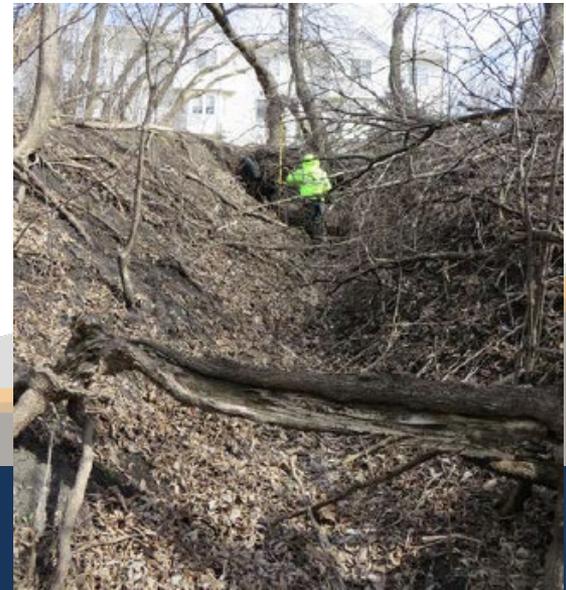
No Score

Lakes

Watershed District Boundary

Reach	Description	Infrastructure	Erosion/ Channel Stability	Ecological Benefits	Water Quality Summary	Tier I Score	Tier I Priority
B5A (2015)	Ridgeview Road Recreational Trail to 985 feet Upstream of Galpin Boulevard	1	1	7	7	16	Low
B5B (2016)	985 Feet upstream of Galpin Blvd to Galpin Blvd	3	5	5	7	20	High
B5C (2015)	Galpin Blvd to West 78 th Street	5	7	5	7	24	Severe
B5C (2020)	Galpin Blvd to West 78 th Street	5	7	5	5	22	Severe

Incised Channel, Disconnected from Floodplain, & Bank and Gully Erosion



Impaired Waterbodies

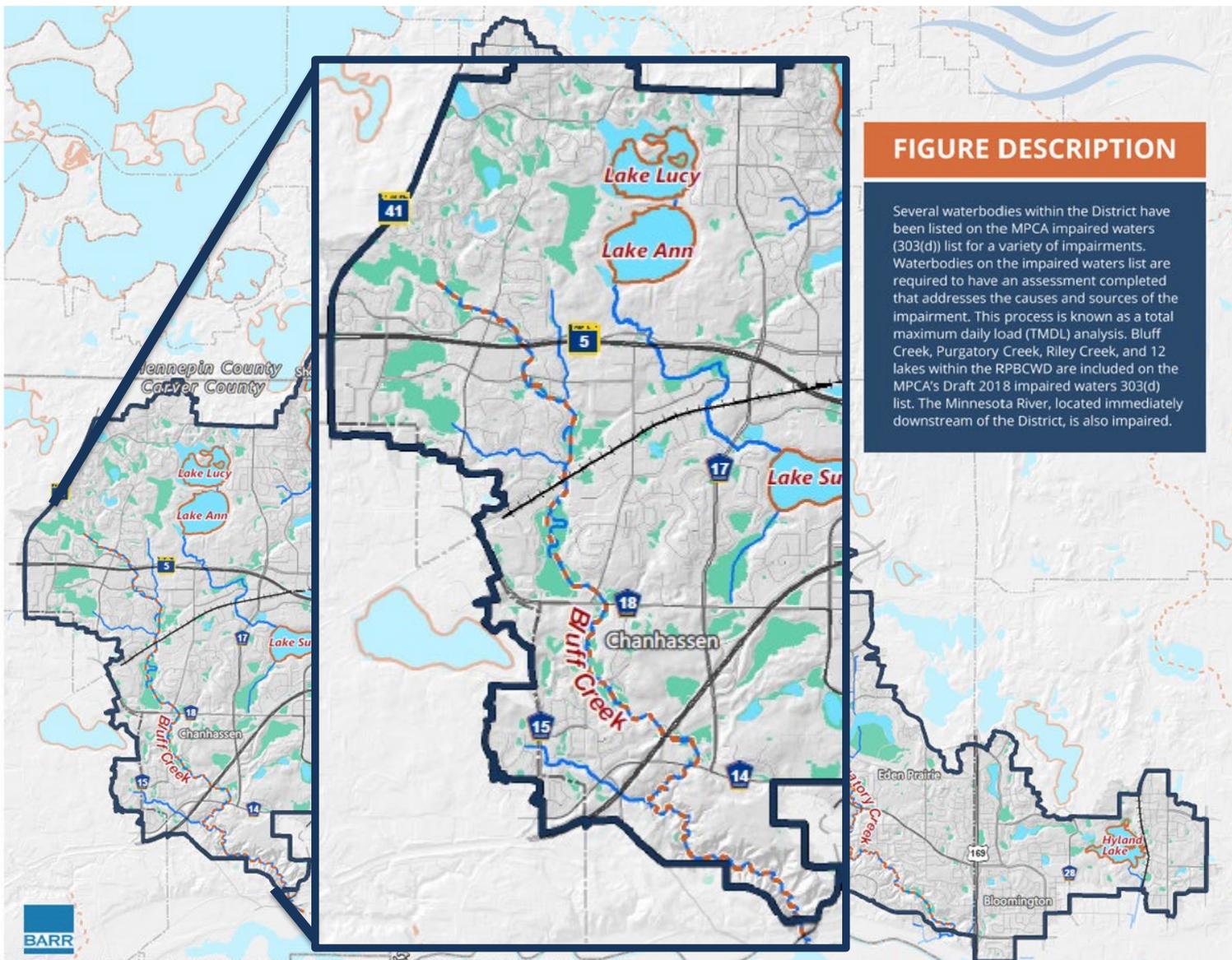


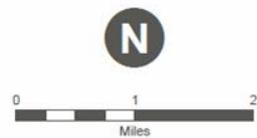
FIGURE DESCRIPTION

Several waterbodies within the District have been listed on the MPCA impaired waters (303(d)) list for a variety of impairments. Waterbodies on the impaired waters list are required to have an assessment completed that addresses the causes and sources of the impairment. This process is known as a total maximum daily load (TMDL) analysis. Bluff Creek, Purgatory Creek, Riley Creek, and 12 lakes within the RPBCWD are included on the MPCA's Draft 2018 impaired waters 303(d) list. The Minnesota River, located immediately downstream of the District, is also impaired.

IMPAIRED WATERS

FIGURE 5-9

- MPCA 2018 Draft Impaired Waters
- Impaired Lakes
 - Impaired Streams
 - Streams/Creeks
 - Lake/Pond
 - Wetlands
 - District Legal Boundary
 - Municipalities



Existing Water Quality Impairment

- District monitoring indicates Bluff Creek does not meet MPCA water quality standards

Table 4-3 2019 Bluff Creek Water Quality Sampling Summary at Galpin Boulevard (Downstream of Reach B5B) (5)

Parameter	Minimum	Maximum	2019 Average	MPCA Water Quality Standards
TP (mg/L)	0.154	1.77	0.525	≤ 0.1mg/L
TDP (mg/L)	0.025	0.237	0.135	-
Chl-a (ug/L)	3.34	24	11.562	≤ 18ug/L
TSS (mg/L)	5	800	84.625	≤ 30mg/L

Table 4-4 2021 Bluff Creek Water Quality Sampling Summary Downstream of Reach B5C

Parameter	Minimum	Maximum	2021 Average	MPCA Water Quality Standards
TP (mg/L)	0.08	1.80	0.26	≤ 0.1mg/L
TDP (mg/L)	0.03	0.20	0.09	-
Chl-a (ug/L)	1.00	75.00	7.16	≤ 18ug/L
TSS (mg/L)	1.00	88.00	9.83	≤ 30mg/L

Existing Water Quality Impairment

- District monitoring indicates Bluff Creek does not meet MPCA water quality standards

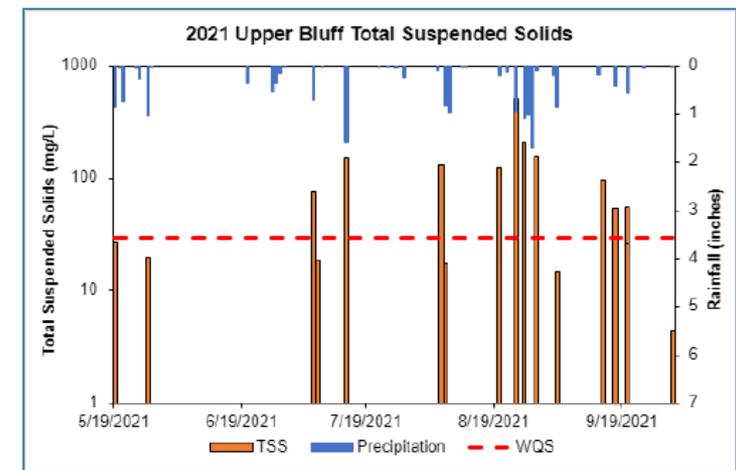
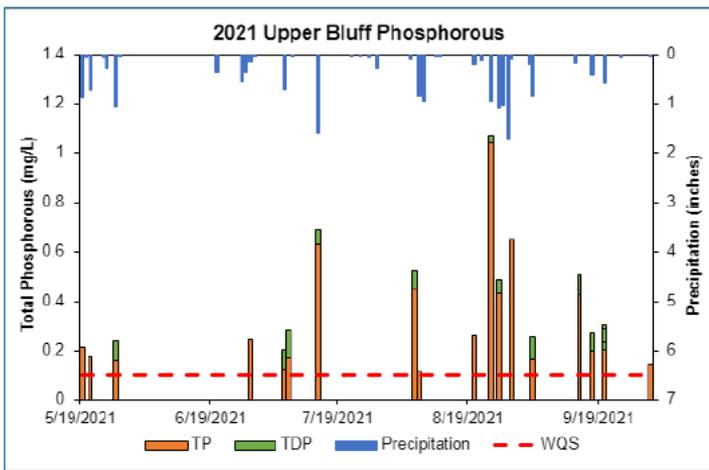
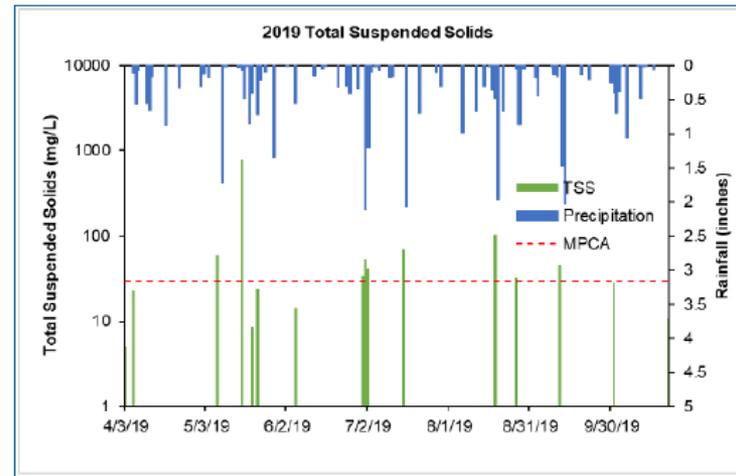
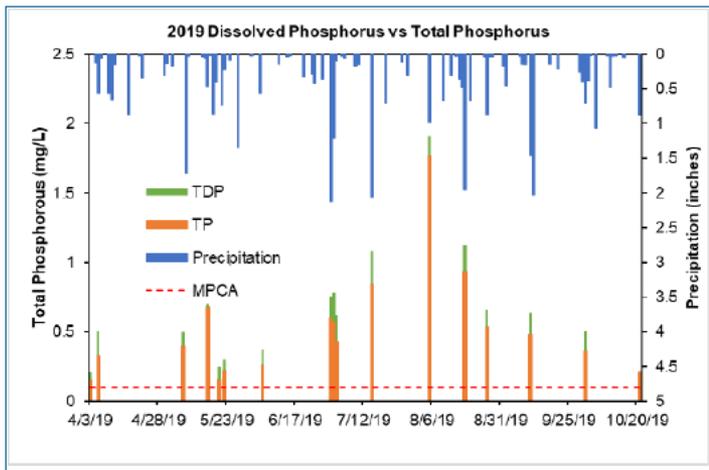
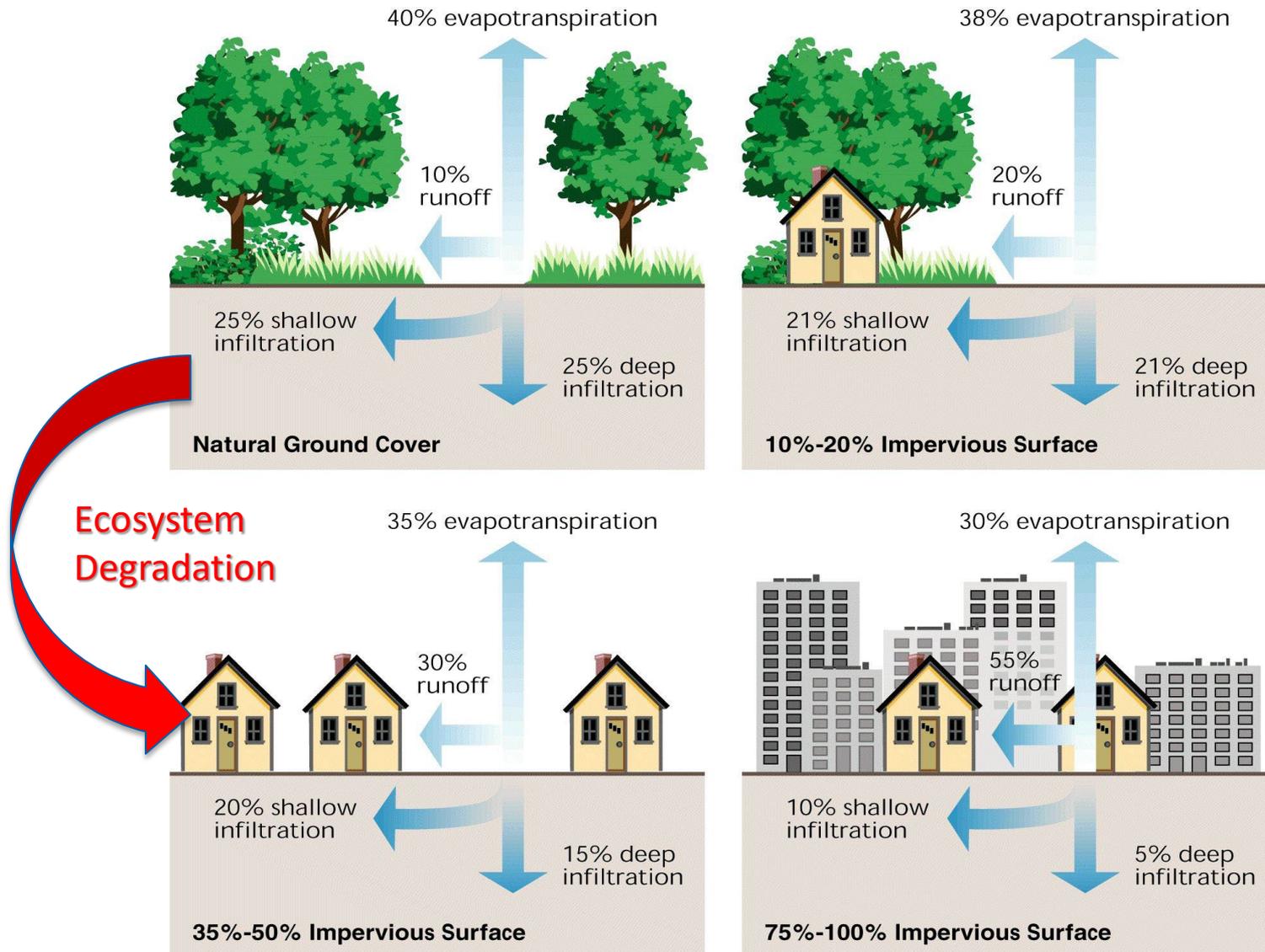


Figure 4-4 Bluff Creek TP and TDP Measurement at Galpin Avenue (2019) and 78th Street (2021) (5)

Figure 4-5 Bluff Creek TSS Measurements at Galpin Boulevard (2019 above and 2021 below)

How did we get here?

Main Driver



What Can Be Done?

CROSSING ENHANCEMENT

WETLAND RESTORATION

STREAM RESTORATION

CROSSING REPLACEMENT WITH GALPIN BLVD PROJECT



- 42-INCH RCP CIRCULAR CULVERT WITH FLARED END
- MODELING SUGGESTS VELOCITIES RANGE FROM 6 FPS DURING 1-YEAR EVENT UP TO 13 FPS DURING 100-YEAR EVENT
- PIPE SLOPE IS OVER TWICE THE SLOPE OF THE EXISTING STREAM
- LOW CONNECTIVITY TO STREAM (CULVERT ELEVATED ABOVE STREAM BED)
 - High undercutting and scour potential
 - Erosion in upstream and downstream channel segments



DESIGN CONSIDERATIONS

- GOAL IS TO REDUCE VELOCITIES THROUGH THE CULVERT, ENCOURAGE AQUATIC GROWTH, AND IMPROVE ECOLOGICAL FUNCTION

- Span bankfull width
- Allow conveyance of debris
- Improve sediment transport
- Improve channel stability
- Connectivity with stream

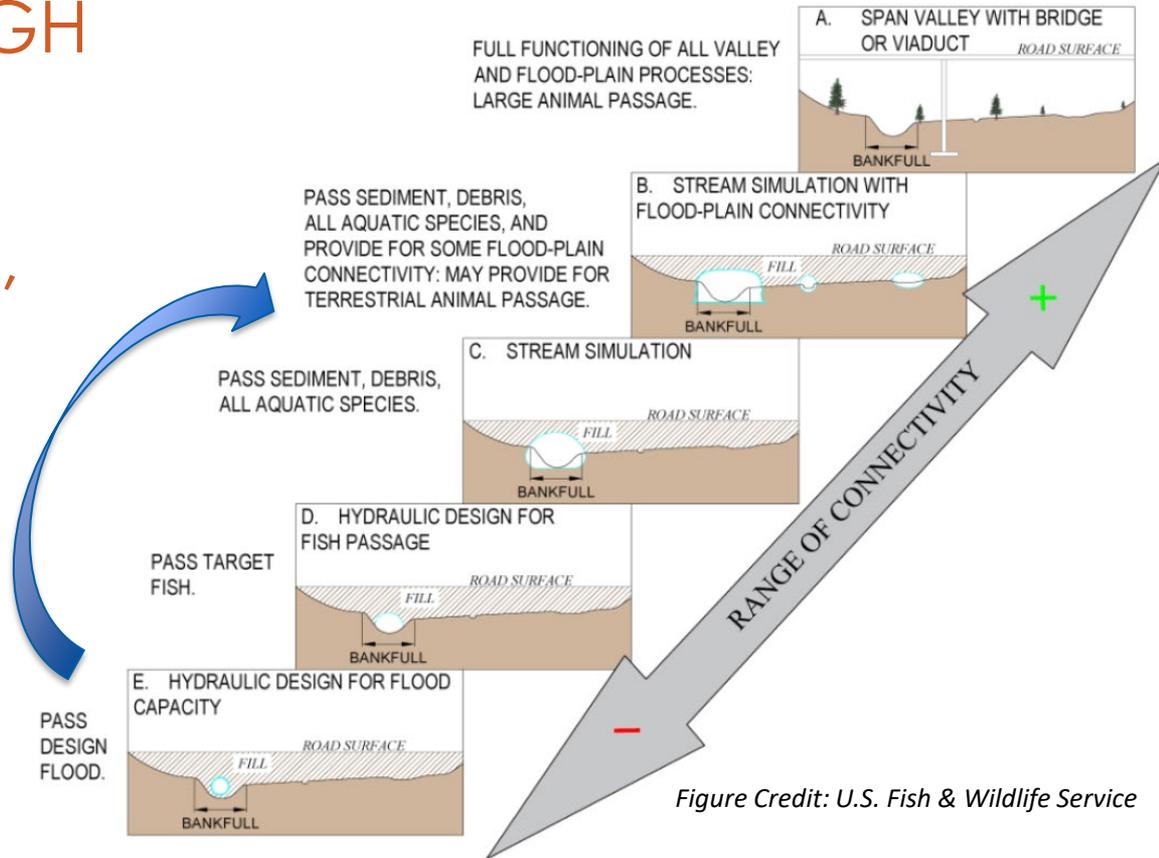
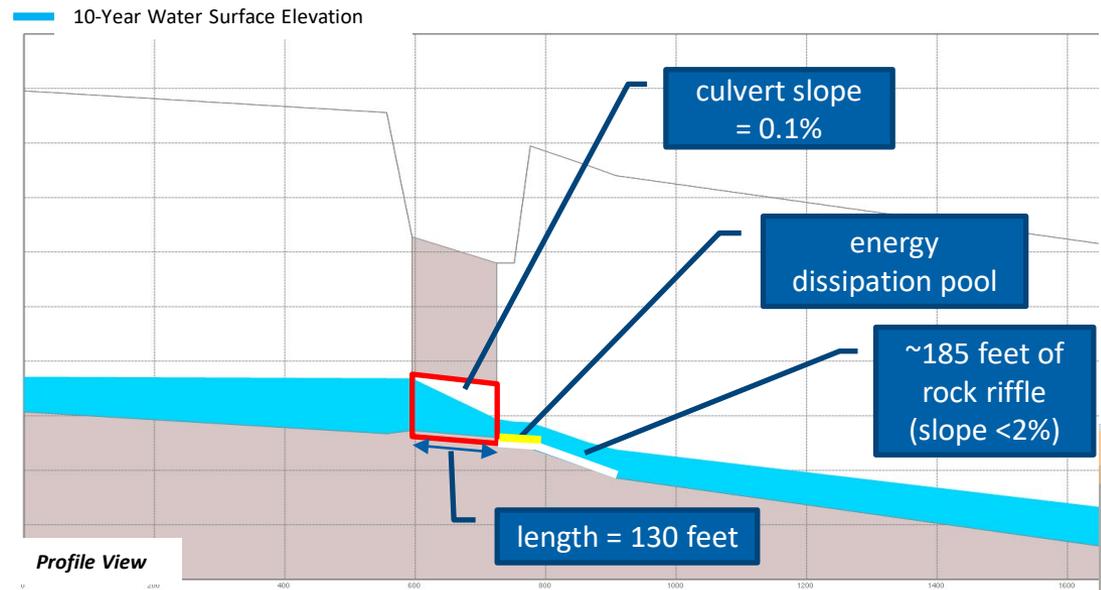
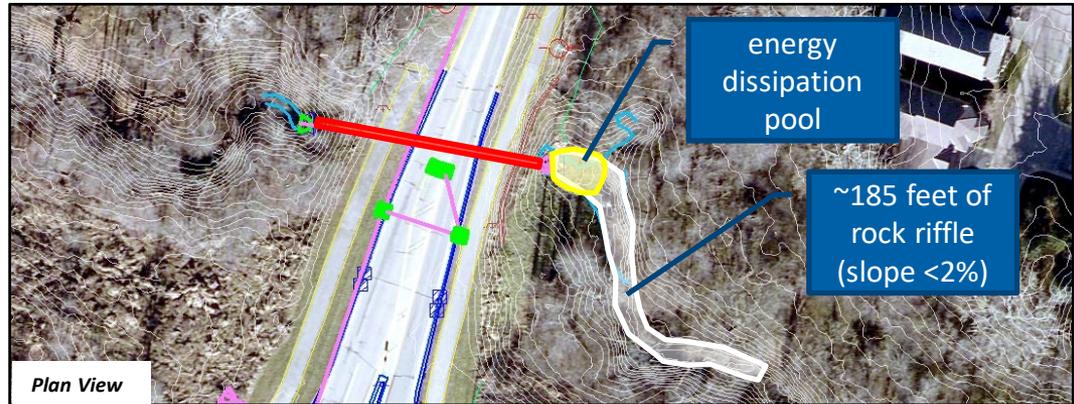


Figure Credit: U.S. Fish & Wildlife Service

DESIGN INCLUDED IN GALPIN BLVD PROJECT

- 6' WIDE BY 4' HIGH BOX
 - 5' upstream opening
 - invert embedded 1.3' to naturalize the bed
- MODIFY EXISTING SANITARY SEWER
- MINIMIZES UPSTREAM AND DOWNSTREAM IMPACTS
- COST-EFFECTIVE
- INCREASES CONNECTIVITY WITH NATURAL STREAM
- IMPROVES FISH PASSAGE
- DEBRIS PASSAGE
- REDUCES VELOCITIES AND EROSION POTENTIAL AT CROSSING

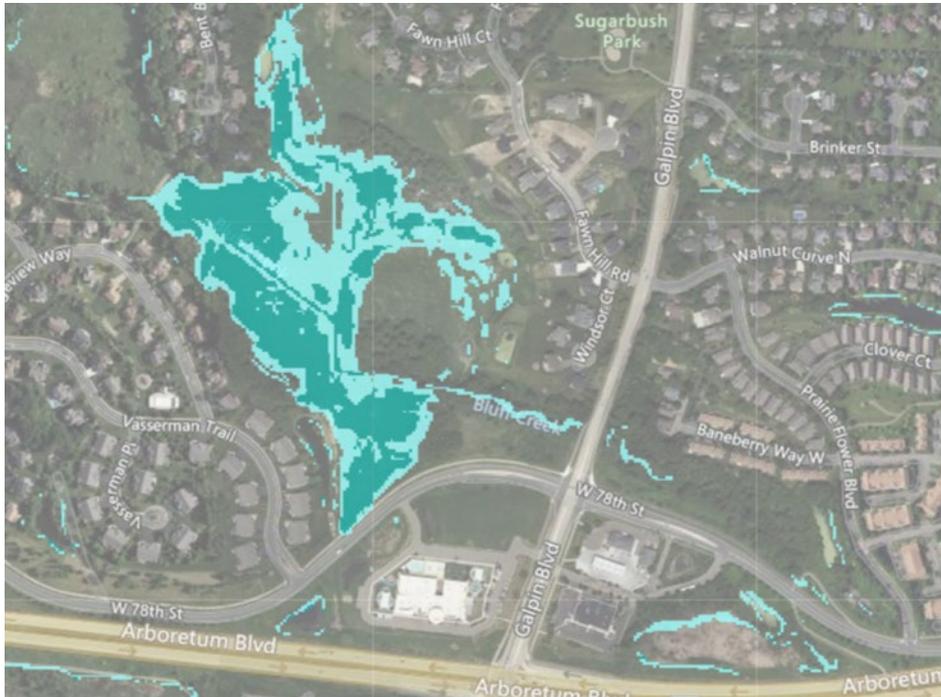


CROSSING ENHANCEMENT POTENTIAL PARTNERSHIP COST SPLIT

Description	Total Cost	Partners	RPBCWD
Replacement in-kind (42" RCP)	\$105,394*	\$105,394	\$0
Ecological Enhancement (6'x4' box + Riffle)	\$395,205*	\$105,394	\$298,811

* BASED BID UNIT PRICES FROM THE GAPLIN BLVD PROJECT

RECOMMENDED WETLAND RESTORATION



Reach B5A contains a restorable wetland on the Restorable Wetland Index, shown in blue and aqua



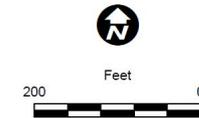
Example of a stage weir from the *Minnesota Wetland Restoration Guide* by the Minnesota Board of Water and Soil Resources (BWSR)

RECOMMENDED STREAM RESTORATION



Constructed Feature

-  Cross Vane
-  Toe Protection
-  Stabilize Drainage
-  Rock Riffle
-  Riprap



Control Structure to restore headwaters wetland hydrology



Rock Riffles create natural channel patterns, control stream bed elevations, provide habitat diversity



Cross Vanes control stream bed elevations, dissipate flows, provide pool habitat



Floodplain Connectivity decreases erosion & provides habitat transitions

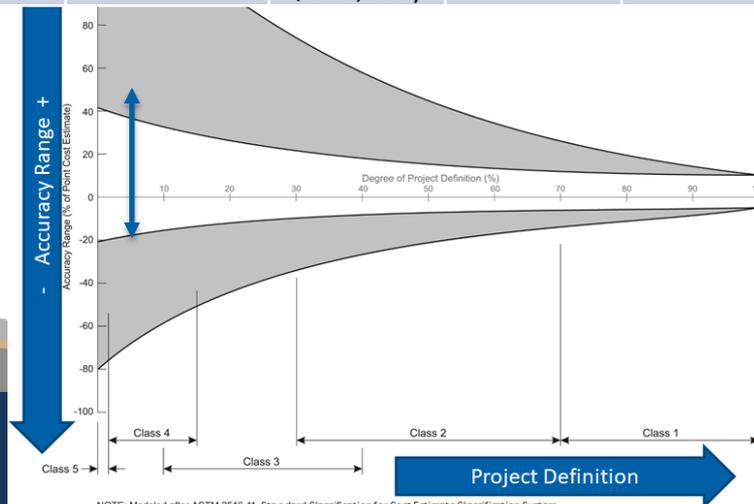
ANTICIPATED OUTCOMES

Improved ecological functions by restoring the hydrology to the headwaters wetland, reducing streambank erosion, reconnecting creek to floodplain, enhancing habitat, improving soil health, and promoting diverse vegetation

- Up to 0.3 acres of in-channel habitat improvements
- Up to 7.9 acres of wetland habitat improvements
- 1,000 feet of channel length stabilized with improved riparian buffer to promote habitat diversity and improved soil health
- Total estimated reduction in pollutant loading:
68,455 lbs year Total Suspended Solids (TSS)
69 lbs/year Total Phosphorus (TP)
- Critical ecological health improvement of headwater wetland and upper Bluff Creek (e.g., improving baseflow conditions in the creek)
- Restore the headwaters wetland hydrology and re-connect Bluff Creek channel to floodplain, allowing high flows to extend across the wetland area, reducing erosive flow velocities through the creek, improving creek baseflow, and enhancing the systems resiliency.

RECOMMENDED WETLAND AND STREAM IMPLEMENTATION STRATEGY SUMMARY

Reach	Concept	Alternative Description	Ecological Enhancement Area (ac)	Project Opinion of Probable Cost ⁽¹⁾	Annualized Cost ⁽²⁾	TP Loading		TSS Loading	
						Load Reduction (lb/yr) ⁽³⁾	Cost/lb Reduced ⁽⁴⁾	Load Reduction (lb/yr) ⁽³⁾	Cost/lb Reduced ⁽⁴⁾
B5A	A	Restore Wetland Hydrology	7.9	\$240,400 (\$216,400-\$336,600)	\$16,828	31	\$543	8,255	\$2.04
B5C	C	Stabilize Gullies, Install grade control, Restore Bank	0.6	\$365,700 (\$329,100-\$512,000)	\$25,599	38	\$681	60,200	\$0.43
Total			8.5	\$606,100 (\$545,500-\$848,600)	\$42,427	69	\$615	68,455	\$0.62



NOTE: Modeled after ASTM 2516-11 Standard Classification for Cost Estimate Classification System

POTENTIAL WETLAND AND STREAM IMPLEMENTATION SUMMARY

- **Crossing Enhancement**
 - \$240,000 - \$300,000
 - Partnership agreement late-2023
 - Late-2024 Construction with Galpin Blvd Reconstruction
- **Wetland and Stream Restorations**
 - \$550,000 - \$850,000
 - Potential Ordering in Nov 2023
 - Design, Property agreements (public and private), and Permitting in 2024 – early 2025
 - Construction in mid-2025 to early-2026

Questions?