Lilydale Regional Park and Cherokee Heights Ravine Improvements

2021 MN Water Resources Conference

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Overview

- History
- Studies
- Projects
- Construction



Orientation



Orientation



Location – Hwy 13 and Annapolis



Location – Hwy 13 and Annapolis St.



History of Site - Brickyard



Former location of Twin Cities Brickyards

1 Park - 2 Studies

- Two parallel studies initiated following 2013 landslide in Brickyard Area
 - -Slope Stability
 - -Ravine Erosion
- Heavy rain events 2014
 - Disaster declaration in Ramsey County
 - -Significant erosion identified

Stormwater Management and Slope Stability Analysis for the Brickyard area of the Lilydale Regional Park

- City Lead
- Entire Park
- Erosion
- Bluff Stability
- Public Safety





North Knob & Lower Channel Stabilization

- Project Lead:
 - City of Saint Paul Parks & Recreation
- Funding:
 - Ramsey County Disaster Relief (925k) (BWSR & FEMA)
 - City of Saint Paul
- Partners:
 - Saint Paul Parks & Recreation
 - Ramsey County



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Cherokee Heights Culvert & Ravine Study

- Cherokee Heights Culvert Analysis and Erosion Control Feasibility Study
 - LMRWMO lead (City Funding)
 - Focused on most severe ravine erosion
 - "Upper 300 feet"
 - 60 inch culvert
 - Sediment to Miss. River and Pickerel Lake



Cherokee Heights Ravine Stabilization & Stormwater HDS Units

- Project Lead:
 - City of Saint Paul Sewers
- Funding:
 - LMRWMO (BWSR Clean Water Fund (700k)
 - City of Saint Paul
 - City of Mendota Heights
 - City of West St. Paul
- Partners
 - City of Saint Paul
 - LMRWMO



Drainage Areas – 71 Acres to 60 inch Culvert



Multiple Cities & LMRWMO Allowable Flow



2015 Aerial Image (North Knob Area - June 2014 Failure)



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Slope Failure Area & Lower North Stream Channel







Large June 2014 slope failure from below with inset showing seepage (July 2014 site visit)

Slope Failure Area & Lower North Stream Channel After 2014 Slide

March 30, 2017

Slope Failure Area & Lower North Stream Channel Final Grading

DANGER

STEEP DROP ROCKS AHEAD

Lower North Stream Channel Channel View from bottom and top





- Partners
- Studies and Projects
 - City of Saint Paul (study lead)
 - Stormwater Management and Slope Stability Analysis for the Brickyard area of the Lilydale Regional Park
 - North Knob Stabilization (2018)
 - Lower Channel Stabilization (2019)
 - LMRWMO (study lead)
 - Cherokee Heights Culvert Analysis and Erosion Control Feasibility Study
 - Hydrodynamic separators (2018)
 - Cherokee Heights Ravine Stabilization (2019)

Cherokee Heights Culvert Analysis and **Erosion Control Feasibility Study**







1. Downstream channel stabilization

- Engineered and bioengineering techniques
- Selective planting and vegetation management
- 2. Peak flow reduction (US storage/culvert modifications)
- Upstream storage & infiltration reduced bluff slope stability
- Significant excavation changed park aesthetics
- Loss of trees and park space

3. Downstream piped system

- Riprap channel & piped system Mississippi River
- High construction cost



Cherokee Heights Ravine Selected Improvements



- 1. Underground stormwater treatment systems
- 2. Downstream channel stabilization



Hydrodynamic Separators (2018)

- City installed 2 hydrodynamic separators
- 70 acres treated
- Removes 1.3 tons TSS/year, 3 lbs of TP/year
- \$298,000 construction





LMR WMO

LOWER MISSISSIPPI RIVER

Hydrodynamic Separators (2018)







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Cherokee Heights Ravine Selected Improvements



- 1. Underground stormwater treatment systems
- 2. Downstream channel stabilization



Upper Ravine Before

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Lower Ravine Before

Lower Ravine Before



Lower Ravine Near Falls Before

Design



- Side slope stabilization
 - Selected "isolated erosion protection" on south side using ramp
 - Filled channel to support north side slope







- Balance cost and benefits of side slope stabilization:
 - Removed unstable south slope to create access path
 - Protected parkland above the bluff and mature oaks
 - -Raised grade of channel to stabilize north side slope
- Benefits:
 - Reduce pollutant loading to Pickerel Lake and Mississippi River
 - 16 tons of TSS and 16 lbs of TP per year
 - Stabilize channel and (some) slopes



- Lametti & Sons, Inc.
- ~\$300,000 in construction
- November 2018 through November 2019

Scope:

- Stabilize 250 feet of ravine and add new stilling basin
- Repair upstream stilling basin
- Stabilize slopes with vegetation
- -Mill and overlay Cherokee Heights Blvd
- Reconstruct trail
- -Install ADA ramp to connect to MNDOT project

Tree removals

Tree removals

Initial grading

- AN

Initial grading

Erosion control

Riprap placement

Riprap placement

Riprap placement

Riprap placement and stilling basin

Riprap placement and stilling basin

Targeted stabilization using concrete





Topsoil placement

Topsoil placement

Restoration





Flexible Growth Medium (FGM) - Flexterra® (high performance hydraulic mulch/tackifier)

Engineered Soil Media (ESM) - ProGanics™ (topsoil alternative)

Lower Ravine: Vegetated

Lower Ravine: Vegetated

Upper ravine: riprap

Upper ravine: riprap

Public Outreach and Education



Public Outreach and Education

RAVINE STABILIZATION PROJECT



Construction Activities



Project Goals

The ravine, leading from the culvert at Cherokee Heights Boulevard down to the East Clay Pit Falls, has become eroded due to steep slopes, sandy soils, and fast moving water. The project goals are to stabilize the existing channel and prevent further slope erosion. Using a light touch, steep slopes will be graded back and stabilized using riprap stone. The surrounding areas will be replanted to hold the soil in place. A small area upstream (east) of Cherokee Heights Boulevard will also be stabilized with riprap.



Armoring and Buttressing

To prevent further erosion and washout during large storm events limestone boulders will be installed along the bottom of the ravine channel. Limestone will armor the base of the channel and serve to buttress, or support, the steep slopes on either side of the channel.



Site Access & Selective Clearing

In order to reach the ravine channel an access trail will be cleared through the existing forest up to Cherokee Heights Boulevard. The City of Saint Paul worked with engineers, foresters, and landscape architects to minimize tree removal and damage to the existing canopy trees. Seed, trees and shrubs will be planted to replace the Gisturbed vegetation.



Native Plantings and Slope Seeding

In addition to the hard armoring and buttressing of the ravine channel, native shrubs, trees, grasses and wildflowers will be used to stabilize slopes. Native plants not only create beneficial habitat but the roots of grasses, sedges, shrubs and trees also play a vital role in stabilizing soils on steep slopes. Plant roots provide tensile strength and increase friction to help hold soil back. Roots of perennial plants help grip the upper soil layer while woody plants, like trees and shrubs, help hold deeper layers of the soil back.



Stormwater Benefits

Phosphorus Reduction:

Each year 16 pounds of phosphorus will be prevented from entering Pickerel Lake and the Mississippi River



Sediment Removal:

Each year 16 tons of sediment will be prevented from entering Pickerel Lake and the Mississippi River



Public Outreach and Education













North Knob & Ravine – Spring 2019



North Knob & Ravine – Spring 2019



Project Benefits

Goals

- Stabilize unsafe slopes
- 300 linear feet of channel stabilized
- Native vegetation and habitat improvements where possible

Outcomes

- 19 lbs decrease in Total Phosphorus to Miss River / Pickerel Lake
- 17.3 ton (34,600) decrease in Sediment to Miss River / Pickerel Lake
- Reduce floatable trash to channel and river

Next Steps - Maintenance



Next Steps – Direct Drainage Study



Lessons Learned

- Stabilization vs. restoration
- Grant Funding Try, try, try, again
- Impact of outside forces , economy, politics, funding cycles
- Benefits of disaster declaration
- Difficulty working on bluffs/bedrock



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Questions?

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