Seminary Fen/Chaska Ravine Restoration Project

Final Report

July 2016

I. Project Timeline and Key Documents

- Identified in the LMRWD Watershed Management Plan (December 2011), Ravine Stabilization at Seminary Fen
- CWF Grant Application was submitted in September 2012 and awarded in FY 2013
- Seminary Fen Ravine Assessment Report by Stantec December 18, 2013
- A Second CWF Grant was requested in 2013 and was not awarded
- March 2014 modified project was submitted to Board of Water & Soil Resources
- Public Participation Process
    - Public participation consisted of discussion and presentations at Board of Manager meetings
- Final Seminary Fen Ravine Report by Stantec, December 1, 2014
- MNDNR review and comment on project. MN DNR agrees to participate financially in the project, March 2015
- Cooperative Agreement between LMRWD and Chaska signed June 2015
- Project Construction milestones
    - June 2015 - award contract
    - October 2015 - Construction begins
    - December 2015 anticipated completion date delayed because of unseasonable weather which made the site inaccessible
    - December 2015 extension of grant requested and approved, new grant deadline June 30, 2016
    - May 2016 work substantially compete
    - June 2016 final walk through
    - August 2015 project acceptance, final payment processed
    - June 2018 two-year warranty period ends
- Project completed and final reimbursement paid

II. Project Area

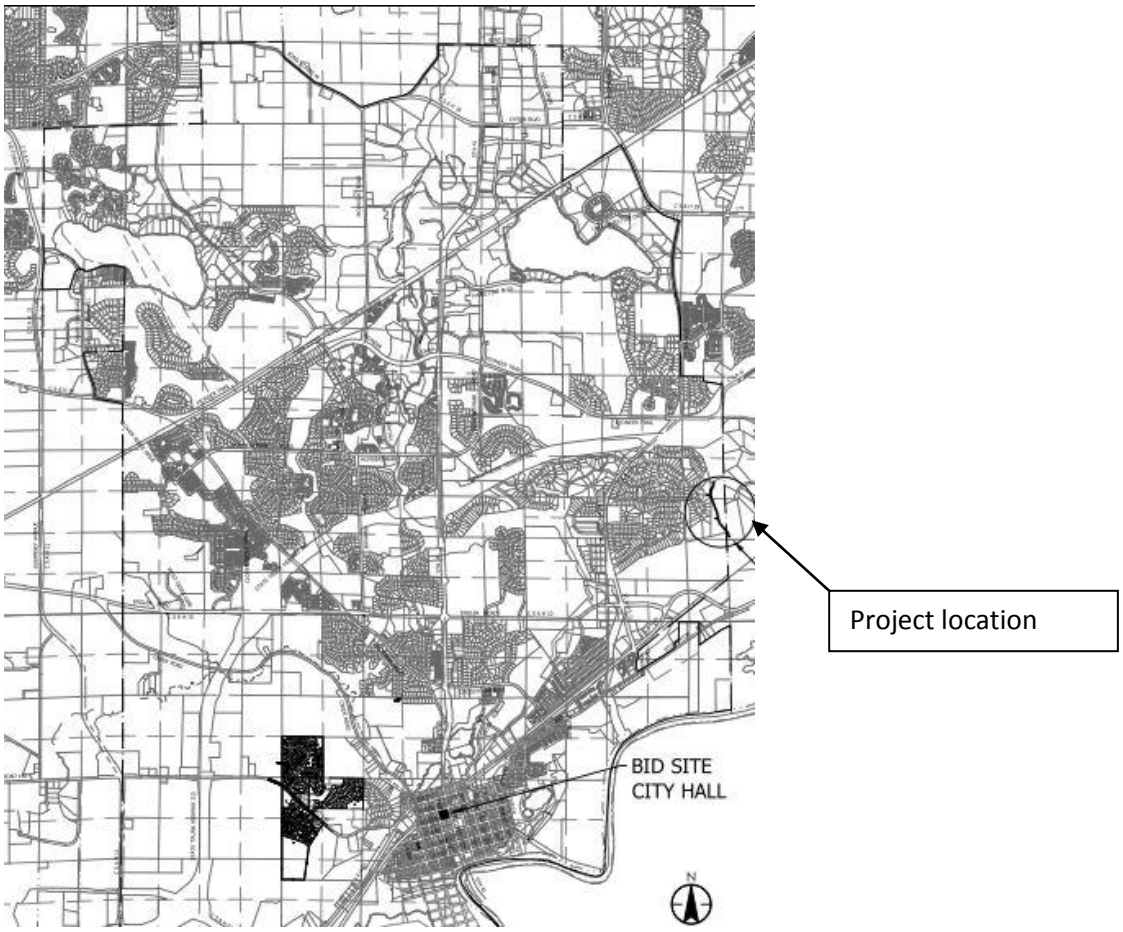
Seminary Fen, a 600-acre complex in Carver County, supports one of only 500 calcareous fens in the world and is one of the highest quality calcareous fens in southern Minnesota. It has been characterized as one of the most significant natural areas in the Twin Cities Metropolitan Area and is part of the Minnesota Department of Natural Resources Scientific and Natural Areas program. The project is located in the city of Chaska. The Fen's unique hydrology, soils, plants and habitats are highly sensitive to water quality and sedimentation stress. Prior to this project, sediment was being discharged to the northern portion of the Fen complex from an eroding ravine flowing north to south. It is estimated that 5.3 acres of the Seminary Fen

wetland at the end of the ravine has been covered with as much as four feet of sediment.

The overall project area defined in the LMRWD CIP is a ravine along the north half of Seminary Fen. This project is phase 2 of a project that was completed in 2009 by the City of Chaska that involved restoration of a wetland outlet for rate control to the ravine. The erosion found in this ravine is a comment symptom of concentrated flow, loss of herbaceous vegetation due to shading and increased impervious surfaces in the watershed. As the ravine is eroded, steep sided channels form with vertical head cuts that migrate upstream, accelerating the erosion and the problem. Phase 1 was constructed to address the rate of flow in the ravine and this project involves stabilizing the eroding slopes of the ravine.

Stabilization is necessary to reduce the transport of sediment to the Seminary Fen wetland complex. Annualized sediment transport was modeled using a 1-D bedload sediment transport model by Meyer-Peter and Muller (1948). This project represents a 63% reduction in sediment load to Seminary Fen.

A map showing the general area of the project is below:



The project is in a residential area of Chaska north of Seminary Fen

III. Project Description

Approximately 2,150 linear feet of ravine, including the lower portions of three side channels, was stabilized under the project. Seminary Fen supports dozens of rare, threatened and special concern animal and plant species that are sensitive to sedimentation stress, so reducing sediment is critical to maintaining the unique character of the fen.

In general, the ravine stabilization techniques used in the construction of the project were chosen based on the existing conditions present including flows and velocities, ravine morphology, shade cover and slopes. The stabilization techniques included the following:

- reshaping eroding slopes to achieve a more stable banks along the ravine
- stabilizing 3 side channel to reduce head cutting
- installing live stakes
- tree removal required to access and construct the project, also served to increase light penetration for native vegetation growth
- reducing velocity of flows by the creation of sequences of riffle pools to reduce erosion
- seeding and blanketing disturbed area
- realign channel and riprap side channels
- raise the channel bed closer to historic elevations and create a stable channel bottom using a cobble channel -pool system

Minor erosion from historic flows and lack of herbaceous vegetation along slopes

Unstable channel bottom and fallen trees cause toe of slope erosion and slope failure

In addition, the following improvements and benefits were also realized:

- Removal of numerous dead, dying or leaning softwood trees will reduce the potential for obstructions and flooding. This also reduces the safety risks to city staff that remove these obstructions during and after storms
- Removal of weeds and invasive species (predominantly buckthorn, reed canary grass) incidental to tree removal
- Preserving and enhancing the natural aesthetics along the ravine and contributing to the natural habitat and species diversification by establishing native vegetation
- Preventing future ravine erosion and associated negative impacts on Seminary Fen
- Prevention of additional property loss in the ravine

Loss of channel bottom and toe erosion cause slope failure

Side hill seeps cause slope instability

Completion of the project will reduce the overall sediment load to Seminary Fen. The preliminary design report for the project computed that the proposed work would reduce the total sediment loads by an estimated 1,680 tons per year. Invasive

species like buckthorn and reed canary grass were removed and replaced with native species that will provide additional stabilization to the slopes.

As a result of this project, the city is investigating additional improvements to Seminary Fen, such as removal of the sediment plume caused by many years of erosion of this ravine into the Fen, removal of drain tile and removal of invasive terrestrial species.

Construction occurred in December 2015

IV. Funding

In September 2012, the LMRWD applied for a Clean Water grant to construct the project. At the time of the grant request, it was estimated the project could be completed for $320,850. The original application considered a CWF grant of $220,800, $50,000 from the city of Chaska and $100,000 from the LMRWD. The grant was awarded in FY 2013.

Concurrently with the initial grant application, the city proceeded to engage Stantec to design the project. The preliminary design estimate for the project came in at $535,798, exceeding the planned funding. A second grant was requested in 2013. The second grant request was denied.

The LMRWD and the city looked at alternatives. Additional partners were approached. Carver County agreed to participate; contributing $10,000, but that was not enough to move ahead with the project as planned, so the LMRWD and the City considered reducing the scope of the project to fit the funding available. In March 2015, modified design plans reducing the scope of the project to fit the available funding were submitted to BWSR for approval. The estimated cost of the modified project was $375,555. Before BWSR responded to the request to reduce the scope of the project, the MN Department of Natural Resources agreed to contribute $175,000 to fund the project as originally designed.

Below is a detailed breakdown of the funding sources for the project:

2013 Clean Water Fund Grant	$220,800
MN Department of Natural Resources	$175,000
Lower MN River Watershed District	$100,000
City of Chaska	$50,000
Carver Count	$10,000

V. Maintenance

Following project completion, the city's maintenance routine will consist of walking the ravine and inspecting the stabilization practices twice a year for two years through the warranty period. During the warranty period the contractor will be required to add seed in some areas.

Following the warranty period, the City anticipates inspecting the project area at least once a year. There is no budget for long-term maintenance, in particular vegetation maintenance, along the ravine. The City is currently developing a Natural Resources Management Plan which includes policies and a maintenance schedule for activities such as tree removal, invasive species management, and vegetation management along streams within the nature areas. However there is no budget for these activities at this time.

Based on past project experience, it is anticipated that there will be very little maintenance required for the stone rock practices installed with this project. The City will watch the project area to see if flooding, frost heave, or subsidence shifts the stone out of place and will mobilize to address these concerns once discovered.

VI. Lessons Learned

Having a clear idea of the scope and estimated cost of the project would have helped the project come in on time.
Application for Clean Water Funding was premature. A feasibility study and cost estimate would have eliminated the need to secure additional funds or require modification of the project. These items need to be developed prior to submission of any grant requests.

Fall/winter construction was planned.
Work was scheduled on frozen ground to minimize the potential for erosion, mud tracking, rutting and other impacts to the landscape. However, unseasonably warm weather and above average rainfall hindered the project. Weather along with under

estimation of the cost of the project hindered completion of the project by the original grant deadline of December 31, 2015.

Heavy rain falls that have occurred since completion of the project gave us the ability to see how the practices perform under higher flows and velocities. It provided an opportunity to repair and maintain practices prior to final stabilization.

Long term vegetation management
Establishing and maintaining native vegetation along banks and steep slopes is challenging. The city will have to monitor the area closely to keep out weeds and invasive species in the long term.

Some tree removal is beneficial.

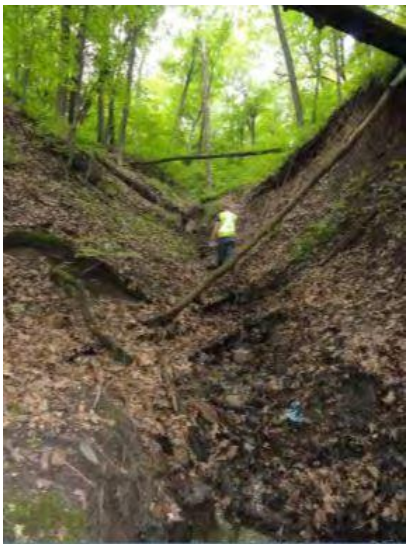
- Removing trees in densely shaded areas helps increase light penetration for understory, ground cover and native seed growth;
- A significant amount of buckthorn was removed within the work areas incidental to the clearing and grubbing
- Removing large softwood trees that were dead, dying or leaning over the ravine helped reduce the potential for flood obstructions and the liability to City staff responsible for clearing the obstructions during and after storm events.

Partnering is good
Finding partners was key to the success of this project.

VII. Photos

Before construction

Channel migrating to the steep bluff slope and a loss of access to the floodplain has caused toe erosion and slope failure.



Most erosion from side channels has occurred where they enter the main ravine.

After construction

Pools and riffles created from cobbles stabilize the bottom of the channel and reduce velocities of the flows