MINNESOTA

LEGACY FUND
RESTORATION EVALUATION REPORT

Technical Panel Findings and Recommendations—2022

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Technical Panel Findings and Recommendations—2022

REPORT TO THE MINNESOTA LEGISLATURE

Senate Environment and Natural Resources Finance Committee

Senate Environment and Natural Resources Policy and Legacy Finance Committee

House Environment and Natural Resources Finance and Policy Committee

House Legacy Finance Committee

Lessard-Sams Outdoor Heritage Council

Clean Water Council

Parks and Trails Legacy Advisory Committee

Submitted by the Department of Natural Resources and the Board of Water and Soil Resources

Legislative Charge

Parks and Trails Fund: M.S. 85.53, Subd. 5

Outdoor Heritage Fund: M.S. 97A.056, Subd. 10

Clean Water Fund: M.S. 114D.50, Subd. 6

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(as required by M.S. 3.197)

Minnesota DNR/BWSR

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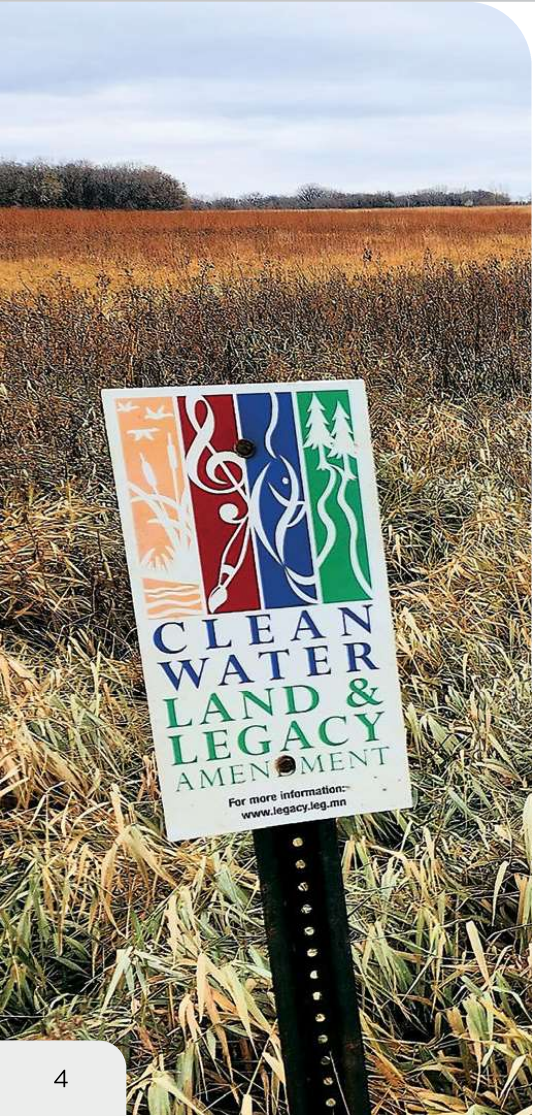
EXECUTIVE SUMMARY



When Minnesotans passed the Clean Water, Land and Legacy Amendment in 2008, they did so with high expectations. As projects have moved forward throughout the state, so too have efforts to ensure that the projects are meeting those expectations.

This report summarizes annual work to evaluate Legacy Fund restorations. This effort is intended to support project partners in maximizing the impact of Minnesotan's investment. The Department of Natural Resources (DNR), Board of Water and Soil Resources (BWSR) (agencies), and the restoration evaluation panel (panel), continue to work together to improve restorations throughout the state. The panel is composed of experts from state and other resource agencies and academic institutions.

This report summarizes evaluations of 21 project sites done in 2022, and panel recommendations based on 247 evaluations conducted since 2012. Projects evaluated in 2022 are largely on track to meet stated goals and utilizing current science. However, the panel did identify areas for restoration improvement including:

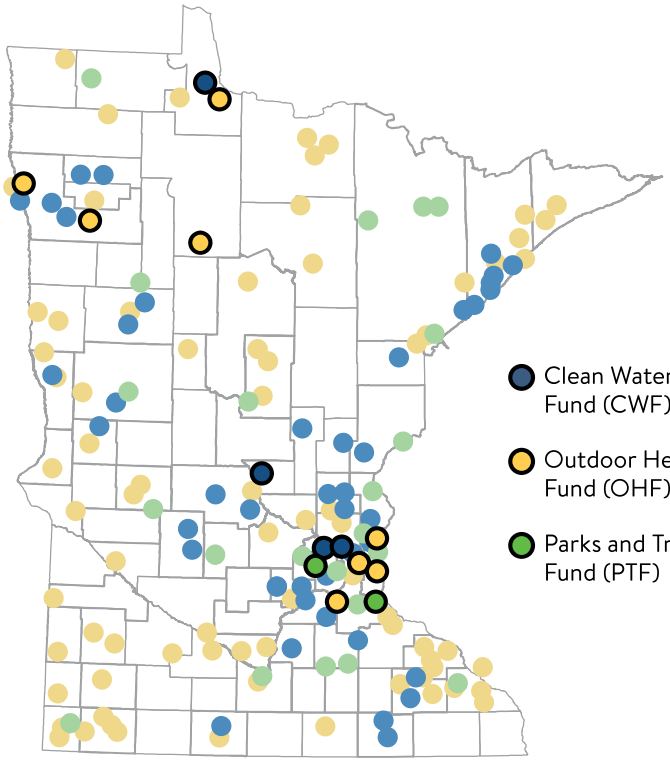
- Incorporating technical expertise in restoration planning
- Encouraging long-term phased approach in buckthorn management
- Utilizing appropriate seed mixes and proper planting guidance
- Increased planning for seeding and plant establishment due to climate change

New and ongoing recommendations from the panel are presented in the Recommendations section. These recommendations are promoted by program staff through reports, presentations, and targeted trainings.

PROJECTS EVALUATED

PROJECTS EVALUATED IN 2022

Dots may represent more than one project site. Circled dots represent projects evaluated in 2022; plain dots represent projects evaluated in previous years. Project evaluations from 2022 are available in Appendix A Program Process and Project Evaluations.



2022 EVALUATIONS SUMMARY

EVALUATED PROJECTS

Projects were completed using three Legacy Funds:

- Clean Water Fund (CWF)
- Outdoor Heritage Fund (OHF)
- Parks and Trails Fund (PTF)

	CWF	OHF	PTF	All Funds
Project sites in evaluation program pool	390	5,342	1,413	7,145
Project sites evaluated in 2022	7	10	4	21
Project sites evaluated to date	92	121	34	247

STATED GOALS

Most projects evaluated to date (80%) were on track to meet or exceed their stated goals. Ongoing monitoring and maintenance are generally required for these projects to provide habitat and other benefits into the future.

- Restoring prairies and oak savannas
- Removing buckthorn to restore hardwood forests
- Removing woody species to restore sharp-tailed grouse habitat
- Installing fencing for conservation grazing
- Removing contaminated lakebed sediment
- Restoring lakeshore habitat
- Restoring streams through bioengineering and re-meandering
- Restoring a pond through sediment removal
- Stabilizing riverbank
- Restoring a ditch and improve water quality and fish spawning habitat
- Lake drawdown and planting to manage nutrients, improve vegetation and habitat

STATUTE CHARGE

As statute directs, projects are evaluated relative to the law, current science and stated goals. Statute also directs the panel to determine any problems with the implementation and provide recommendations on improving future restorations. Detailed project evaluations are provided in Appendix A Program Process and Project Evaluations.

CURRENT SCIENCE

Most projects evaluated to date (85%) utilized best practices within the range of current science. However, the panel identified opportunities to improve the use of current science. These opportunities for improvement include:

- Incorporating a phased approach and best practices in long-term buckthorn management
- Involving the appropriate technical expertise in restoration planning
- Selecting and utilizing the appropriate herbicide to achieve goals and minimize non-target impacts

PROBLEMS WITH IMPLEMENTATION

Restoration projects take place in dynamic and complex landscapes. Most projects to date (73%) were implemented without problems. While not all problems can be predicted or prevented, the panel identified situations where problems arose that could be avoided in the future.

Problems with implementation include:

- Insufficient treatment of invasive species in woodland restoration
- Lack of plant protection for emergent vegetation in lakeshore restoration
- Insufficient watering of native plant species during establishment
- Not identifying staff and funding resources for future management actions

RESTORATION EVALUATION PANEL RECOMMENDATIONS

A critical component of restoration evaluations is identifying issues and providing guidance to project managers to improve future restorations.

Statute directs the panel to determine

...any problems with the implementation of restorations, and if necessary, recommendations on improving restorations.

The emphasis of reporting is also directed in statute

...the report shall be focused on improving future restorations.

NEW RECOMMENDATIONS:

- Improved Project Review by Technical Experts
- Phased Approach for Buckthorn Management
- Improved Seed Selection and Implementation
- Climate Change Contingency Planning

ONGOING PANEL RECOMMENDATIONS

Improved Project Teams—More comprehensive project teams should be used to improve ecological outcomes.

Improved Documentation—Documentation is critical for planning, tracking, and achieving successful restorations.

Improved Restoration Training—Continued development and implementation of training is essential to promote science-based practices.

Improved Design Criteria for Lakeshore Projects—Utilize minimum design criteria to mimic shoreline's natural structure and vegetation.

Improved Planning for Stream Projects—Detailed project planning and consistent implementation of will produce the best outcomes in stream restoration.

Improved Vegetation for Stream Projects—Well established vegetation is critical for the long-term success of stream projects.

Details regarding Ongoing Panel Recommendations are available here:

dnr.state.mn.us/legacy/restoration-evaluation.html

NEW PANEL RECOMMENDATIONS

IMPROVED PROJECT REVIEW BY TECHNICAL EXPERTS

The panel recommends that project managers utilize technical experts in the review and planning of complex projects. Project outcomes will benefit from this review by incorporating current science and best practices more consistently across the state.

ROLES OF PROJECT MANAGERS/ PARTNERS

- Identify projects early where technical capacity is needed for planning and implementation
- Engage state agency, local government units, and technical experts early in the planning phase

ROLES OF FUNDING ORGANIZATIONS

- Request project managers identify technical capacity needs in their request
- Identify and refer project managers to the appropriate resources and or staff to fit those needs

ROLE OF STATE AGENCIES

- Provide technical experts to add capacity to complex projects during planning and implementation
- Consult with project managers regarding design solutions and technical specifications
- Improve networks for technical assistance and collaboration with partners such as University of Minnesota Extension

HERE IS WHAT'S WORKING IN MINNESOTA

MIDDLE SAND CREEK—COON CREEK WATERSHED DISTRICT

The stream restoration efforts on Middle Sand Creek in Anoka County highlight the benefits of incorporating expertise and support from technical experts. Project managers identified early in the planning process the complexity of this stream project and reached out to technical experts from State agencies. The outcomes of this project were improved from guidance on design solutions, feedback on design details, and construction oversight, resulting in multiple benefits including sediment reduction, habitat improvement and flood attenuation.

NEW PANEL RECOMMENDATIONS continued

PHASED APPROACH FOR BUCKTHORN MANAGEMENT

The restoration of buckthorn invaded woodlands requires a multi-year effort. The panel recommends that project managers establish a phased approach for buckthorn management incorporating the timing and sequencing of actions.

ROLES OF PROJECT MANAGERS/ PARTNERS

- Develop a long-term plan as part of a phased approach to woodland restoration
- Create plans that include timelines for sequential phases like adequate site preparation, removal methods, herbicide timing/application requirements, and site seeding/planting post removal
- If goats are used in buckthorn management, project managers should use a browsing plan that aligns with project goals and planned activities

ROLES OF FUNDING ORGANIZATIONS

- Provide project managers with resources or templates for phasing and sequencing buckthorn management plans
- Request that project managers identify their phased plan as part of funding requirements

ROLE OF STATE AGENCIES

- Provide technical resources to support project managers in utilizing best practices to improve outcomes and project longevity
- Technical resources may include:
  - › Outline of phased approaches and techniques for buckthorn removal
  - › Details for perennial seed mixes for adequate ground cover and competition for future invasions
  - › Detailed herbicide application strategies including timing of treatment and herbicide selection

HERE IS WHAT'S WORKING IN MINNESOTA

TANGLEWOOD PRESERVE—SAINT CROIX WATERSHED RESEARCH STATION

The buckthorn removal project at Tanglewood Preserve in Washington County used a phased approach for management. Sequenced management actions included: forestry mulching and hand cutting, herbicide treatments, and diverse seedings to provide competition with buckthorn and fuel for prescribed fire. Buckthorn cover was significantly reduced over seven years to less than 5% from the previous near 100% cover, resulting in reduced invasive species cover, increased native vegetation cover, and improved native plant diversity.

Science Museum of Minnesota, St. Croix Watershed Research Station

Trail cam photo of project site prior to buckthorn removal, August 2016.

Project site after sequenced restoration, November 2022.

NEW PANEL RECOMMENDATIONS continued

IMPROVED SEED SELECTION AND IMPLEMENTATION

The panel recognizes the need for guidance in early planning for seed mix selection and implementation to support more consistent planting success.

ROLES OF PROJECT MANAGERS/ PARTNERS

- Conduct adequate site assessments to inform appropriate seed selection
- Reference State Seed Mixes and fact sheets in early project planning and seed selection

ROLES OF FUNDING ORGANIZATIONS

- Direct project managers and partners to appropriate resources for seed selection/implementation
- Encourage project managers to follow seed source recommendations that are consistent with current science

ROLE OF STATE AGENCIES

- Update State Seed Mixes and provide guidance to project managers and partners
- Provide detailed technical resources to project managers to improve outcomes in restoration seeding and planting

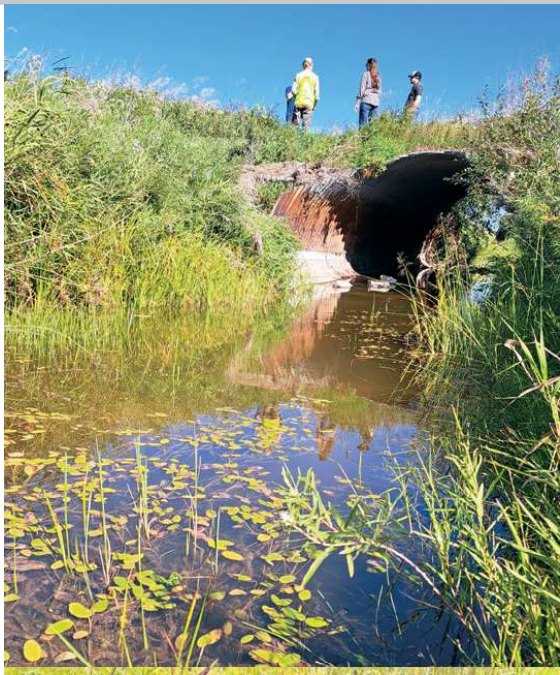
Additional links:

bwsr.state.mn.us/seed-mixes

bwsr.state.mn.us/mn-wetland-restoration-guide

files.dnr.state.mn.us/assistance/backyard/prairierestoration/prairie-handbook.pdf

nature.org/en-us/about-us/where-we-work/united-states/minnesota/stories-in-minnesota/prairie-restoration-guides/



CLIMATE CHANGE CONTINGENCY PLANNING

The panel identifies that climate change is adding complexity to restoration planning and implementation. Variability in precipitation, flooding and drought necessitates that project managers build contingency plans, especially concerning native vegetation establishment.

ROLES OF PROJECT MANAGERS/ PARTNERS

- Create contingency plans such as increased irrigation measures during plant establishment
- Consider diverse species selection that will tolerate extreme precipitation and drought events
- For wetland and stream restorations consider a phased approach for vegetation establishment to account for loss of seed or installed plants
- Plan for increased pressure of invasive species range expansion

ROLE OF STATE AGENCIES

Provide continued and updated guidance such as BWSR's Climate Change Considerations for Plant Selection

Additional links:

bwsr.state.mn.us/node/8806

bwsr.state.mn.us/sites/default/files/2022-11/New%20format%20Section%202.pdf


seco

IMPROVING FUTURE RESTORATIONS

Maximizing the benefits of Legacy Funded restorations requires evaluating projects to learn what's working, engaging experts to promote current science, and communicating recommendations so they can be implemented.

EVALUATING PROJECTS

In 2022, we visited 21 project sites. In addition to visiting several forest and stream restoration projects, we visited projects in new counties completed by a variety of project partners. Combining these evaluations with previously completed site visits provides a broader view of the implementation of Legacy Funds, the benefits they are providing, and opportunities to maximize the benefits of the funds for Minnesotans.

ENGAGING EXPERTS

A goal of the Legacy Fund Restoration Evaluation Program is to facilitate the technical exchange between restoration experts and practitioners. This begins in the field with state or contracted site assessors and project managers discussing implemented restoration practices and shared experience on the ground. Program staff and site assessors then draft site evaluation reports. These reports are presented to the panel annually by site assessors and program staff to discuss challenges and successes across Legacy Funded restoration projects. This technical exchange forms the recommendations for the Annual Report and future communications to stakeholders.

PROGRAM ACTIVITIES
2012-2022

247
PROJECTS EVALUATED
(ALL HABITAT TYPES)

263
EXPERTS
ENGAGED

COMMUNICATING WITH STAKEHOLDERS

For panel recommendations to make a difference, they need to be communicated to the stakeholders engaged in planning, funding, and implementing restorations in the state.

One way our program meets this goal is by helping coordinate training opportunities for practitioners to engage with experts. In 2022 program staff conducted a training session at the BWSR Academy focusing on lakeshore restoration projects. Restoration experts shared the process of planning and implementing high quality shoreline projects.

MORE THAN
5,000
STAKEHOLDERS
REACHED

ADDITIONAL RESOURCES

RESTORATION EVALUATION PROGRAM WEBSITE

dnr.state.mn.us/legacy/restoration-evaluation.html

APPENDIX A PROGRAM PROCESS AND PROJECT EVALUATIONS

lrl.mn.gov/edocs/edocs?oclcnumber=823766285

MINNESOTA

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St. Paul, MN 55155-4040
888-646-6367 or 651-296-6157
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Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

Program Process and Project Evaluations

Appendix A: 2022 Legacy Fund Restoration Evaluation Report

April 2023

Minnesota Department of Natural Resources
Minnesota Board of Soil and Water Resources
Restoration Evaluations
500 Lafayette Rd,
St. Paul, MN 55155-4040
888-646-6367 or 651-296-6157
email@state.mn.us
mn.gov

Legislative Charge
Parks and Trails Fund: M.S. 85.53, Subd. 5.
Outdoor Heritage Fund: M.S. 97A.056, Subd. 10.
Clean Water Fund: M.S. 114D.50, Subd. 6.

As requested by Minnesota Statute 3.197: This report cost $5,400 to prepare, including staff time, printing, and mailing expenses.

Upon request, this material will be made available in an alternative format such as large print, Braille, or audio recording. Printed on recycled paper.

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Legislative Charge and Statutory Requirements

Parks and Trails Fund: M.S. 85.53, Subd. 5.

The commissioner of natural resources may convene a technical evaluation panel comprised of five members, including one technical representative from the Board of Water and Soil Resources, one technical representative from the Department of Natural Resources, one technical expert from the University of Minnesota or the Minnesota State Colleges and Universities, and two other representatives with expertise related to the project being evaluated. The commissioner may add a technical representative from a unit of federal or local government. The members of the technical evaluation panel may not be associated with the restoration, may vary depending upon the projects being reviewed, and shall avoid any potential conflicts of interest. Each year, the commissioner may assign a coordinator to identify a sample of up to ten habitat restoration projects completed with parks and trails funding. The coordinator shall secure the restoration plans for the projects specified and direct the technical evaluation panel to evaluate the restorations relative to the law, current science, and the stated goals and standards in the restoration plan and, when applicable, to the Board of Water and Soil Resources' native vegetation establishment and enhancement guidelines. ***The coordinator shall summarize the findings of the panel and provide a report to the chairs of the respective house of representatives and senate policy and finance committees with jurisdiction over natural resources and spending from the parks and trails fund***. The report shall determine if the restorations are meeting planned goals, any problems with the implementation of restorations, and, if necessary, recommendations on improving restorations. The report shall be focused on improving future restorations. Up to one-tenth of one percent of forecasted receipts from the parks and trails fund may be used for restoration evaluations under this section.

Outdoor Heritage Fund: M.S. 97A.056, Subd. 10.

The commissioner of natural resources and the Board of Water and Soil Resources must convene a technical evaluation panel comprised of five members, including one technical representative from the Board of Water and Soil Resources, one technical representative from the Department of Natural Resources, one technical expert from the University of Minnesota or the Minnesota State Colleges and Universities, and two representatives with expertise in the project being evaluated. The board and the commissioner may add a technical representative from a unit of federal or local government. The members of the technical evaluation panel may not be associated with the restoration or enhancement, may vary depending upon the projects being reviewed, and shall avoid any potential conflicts of interest. Each year, the board and the commissioner may assign a coordinator to identify habitat restoration or enhancement projects completed with outdoor heritage funding. The coordinator shall secure the plans for the projects specified and direct the technical evaluation panel to evaluate the restorations and enhancements relative to the law, current science, and the stated goals and standards in the project plan and, when applicable, to the Board of Water and Soil Resources' native vegetation establishment and enhancement guidelines. ***The coordinator shall summarize the findings of the panel and provide a report to the chair of the Lessard-Sams Outdoor Heritage Council and the chairs of the respective house of representatives and senate policy and finance committees with jurisdiction over natural resources and spending from the outdoor heritage fund.*** The report shall determine if the restorations and enhancements are meeting planned goals, any problems with the implementation of restorations and

enhancements, and, if necessary, recommendations on improving restorations and enhancements. The report shall be focused on improving future restorations and enhancements. At least one-tenth of one percent of forecasted receipts from the outdoor heritage fund must be used for restoration and enhancements evaluations under this section.

Clean Water Fund: M.S. 114D.50, Subd. 6.

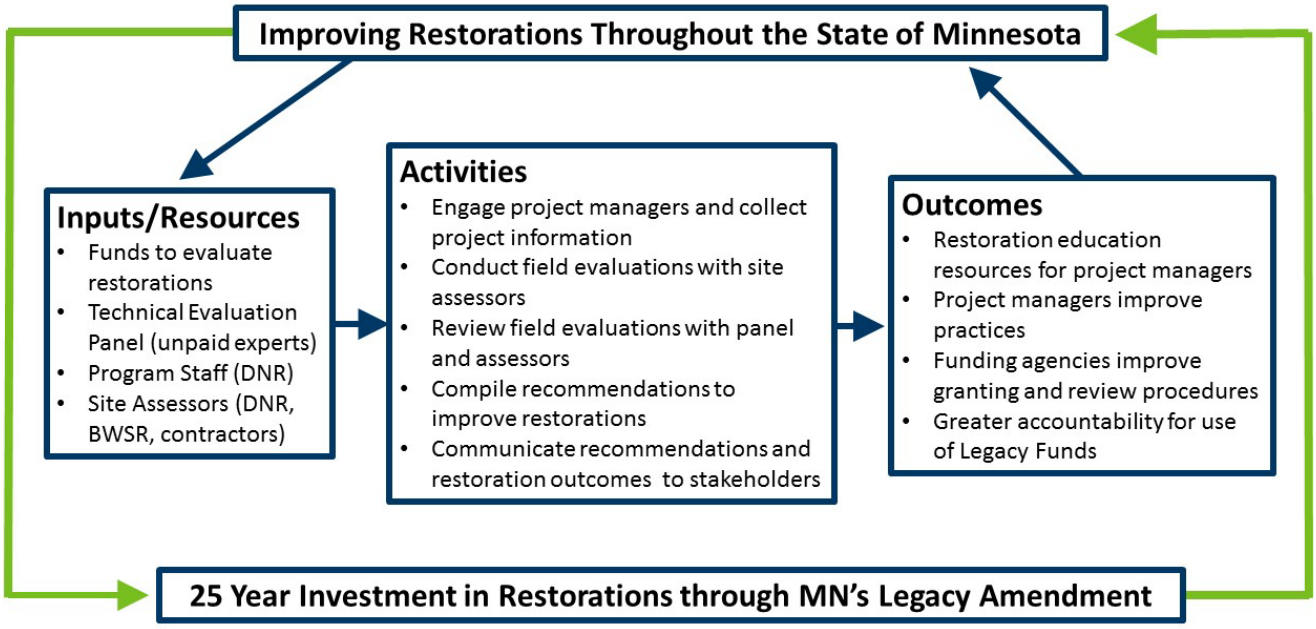
The Board of Water and Soil Resources may convene a technical evaluation panel comprised of five members, including one technical representative from the Board of Water and Soil Resources, one technical representative from the Department of Natural Resources, one technical expert from the University of Minnesota or the Minnesota State Colleges and Universities, and two representatives with expertise related to the project being evaluated. The board may add a technical representative from a unit of federal or local government. The members of the technical evaluation panel may not be associated with the restoration, may vary depending upon the projects being reviewed, and shall avoid any potential conflicts of interest. Each year, the board may assign a coordinator to identify a sample of habitat restoration projects completed with clean water funding. The coordinator shall secure the restoration plans for the projects specified and direct the technical evaluation panel to evaluate the restorations relative to the law, current science, and the stated goals and standards in the restoration plan and, when applicable, to the Board of Water and Soil Resources' native vegetation establishment and enhancement guidelines. ***The coordinator shall summarize the findings of the panel and provide a report to the chairs of the respective house of representatives and senate policy and finance committees with jurisdiction over natural resources and spending from the clean water fund.*** The report shall determine if the restorations are meeting planned goals, any problems with the implementation of restorations, and, if necessary, recommendations on improving restorations. The report shall be focused on improving future restorations. Up to one-tenth of one percent of forecasted receipts from the clean water fund may be used for restoration evaluations under this section.

Evaluation Process

State law directs the DNR and BWSR to convene an expert panel to evaluate restorations completed with Clean Water Land and Legacy Funds. The evaluations include directly engaging project managers and are completed by third party experts to identify gaps and capture lessons learned from restorations. The agencies use this information to improve restorations throughout the state.

Program Model

The Restoration Evaluation Program was developed with the ultimate goal of improving restorations throughout the state. The diagram below outlines the inputs, activities, and outcomes of the program and our continued investment in improving restorations.



Roles and Responsibilities

Evaluation Panel

Statute directs the evaluation panel to:

- Evaluate restorations relative to the law, current science, and the stated goals and standards in the restoration plan
- Provide findings on the evaluations, determining whether restorations are meeting planned goals, identify problems with implementation of restorations and, provide recommendations on improving restorations

Members of the panel are unpaid experts chosen to fulfill statutory requirements and provide needed expertise in a variety of ecosystems and restoration techniques.

Program Staff

The program staff are responsible for coordinating site assessments, program administration and managing the work of the panel. They are directed in statute to:

- Identify restoration projects completed with Parks and Trails, Outdoor Heritage, and Clean Water Funds
- Secure restoration plans for selected projects
- Summarize the findings of the panel
- Provide reports to the legislature

The staff also promote and document continuous improvement in restorations. Staff work with the panel and agencies to identify and promote actions and provide guidance for implementing improved restorations. DNR and BWSR have assigned staff to ensure consistency in program implementation. The staff are currently housed in DNR's Ecological and Water Resources Division.

Site Assessors

The site assessors are responsible for conducting site assessments. Site assessors are selected based on knowledge of restoration practices and work closely with program staff in assessing project plans, conducting field evaluations, and participating in panel reviews. Site assessors include:

- State agency staff
- Local government staff
- Federal agency staff
- Private contractors

Services provided by assessors are negotiated using contracts, State Interagency Agreements, or work assignments.

Project Managers

Project managers are expected to actively participate in the evaluation process. Project managers provide the necessary project background and attend field evaluations when possible to:

- Identify project work sites
- Provide project context
- Answer assessor questions

It is necessary to acknowledge the diversity of managing organizations and their scope and focus when evaluating projects.

Example project managers for the three Legacy Funds.

Clean Water Fund

- Soil and Water Conservation District manager or technician
- Watershed District staff
- Watershed Management Organization staff
- County Water Resources of Environmental Services staff
- City Water Resource staff

Outdoor Heritage Fund

- State agency staff (DNR, BWSR)
- Federal agency staff (USFWS)
- County conservation and land management staff
- Watershed District staff
- Nongovernmental wildlife organizations

Parks and Trails Fund

- MN DNR Parks and Trails Division, resource management staff
- Metro Regional Parks managers, including county park systems and Three Rivers Park District
- Greater Minnesota park managers

Evaluation Methods

Project Selection

Program staff update the pool of eligible restoration projects on an annual basis. For each fund projects are eligible if they are complete and contain restoration or enhancement work. Projects evaluated represent a variety of habitat types and geographic distributions of restorations in the state.

Projects are selected in relative proportion to each Fund's appropriation to restoration evaluations. Many grants and appropriations fund restoration activities at multiple project sites. A smaller subsample of project sites is typically evaluated.

Site Assessments

DNR, BWSR and the panel developed a simple and consistent process to facilitate evaluations. To the extent possible the evaluation process engages project managers in conducting site visits and communicating lessons learned. Facilitating an inclusive evaluation process with project managers increases the transfer of knowledge between field practitioners and agencies, ultimately improving restorations.

A site evaluation form was developed to provide project information and address evaluation requirements directed by law. This form describes site assessors' observations of project effectiveness, estimated outcomes based on current conditions and application of current science.

Field visits include inspecting the project's structural components and plant communities. Restored plant communities may take several years or even decades to mature. Evaluations are based on observations of the present and projected conditions relative to the project goals. Assessments of project sites do not represent an overall evaluation of the larger program or Fund.

Restoration science is continually evolving. Best practices are an area of ongoing discussion between practitioners, researchers, agencies, and stakeholders. Site assessors and the panel evaluate projects based on methods commonly considered to be within the range of current science.

Legacy Fund Attributes and Requirements

Each of the Legacy Funds has a distinct focus on restoration and specific requirements for projects.

	Clean Water Fund	Outdoor Heritage Fund	Parks and Trails Fund
Fund Purpose	*protect, enhance, and restore water quality in lakes, rivers, and streams and protect groundwater from degradation*	*restore, protect, and enhance wetlands, prairies, forests, and habitat for fish, game, and wildlife*	*support parks and trails of regional or statewide significance*
Primary Restoration Goal	Restore water quality	Restore specific wildlife habitat types	Ecological restoration of specific habitat types
Guidance for project types and locations	Local water management plan, TMDL Implementation plans, or Watershed Restoration and Protection Strategies	Statewide or national wildlife habitat plans	State or Regional Park natural area management plans
Funding source for restoration projects	Competitive grants administered by BWSR	Appropriation to project manager; recommended by Outdoor Heritage Council, or Conservation Partners grants administered by MN DNR	MN DNR appropriation: resource management, or Met Council appropriation: County Regional Park System, Three Rivers Park District
Statutory Requirements	MS 114D.50 Subd. 4. (a) *include measurable outcomes, as defined in section 3.303, subdivision 10, and a plan for measuring and evaluating the results. A project must be consistent with current science and incorporate state-of-the-art technology.*	Different appropriation years are subject to different requirements but all include: • *Prepare and retain an ecological restoration and management plan* • *Use current conservation science to achieve the best restoration* • *Establishment of diverse plant species* Appropriations in 2009 and 2010 also included. • *Plant vegetation or sow seed only of ecotypes native to Minnesota.*	MS *85.53 Subd. 2* (a) *include measurable outcomes, as defined in section 3.303, subdivision 10, and a plan for measuring and evaluating the results. A project or program must be consistent with current science and incorporate state-of-the-art technology*

1 Belwin Conservancy Bell Oak Savanna Enhancement

Project Background

Project Name: Belwin Conservancy Bell Oak Savanna Enhancement

Project Site: Bell Oak Savanna

Township/Range Section: Township 28N Range 20W Section 10

Project Manager / Affiliated Organization: Justin Sykora / Belwin Conservancy

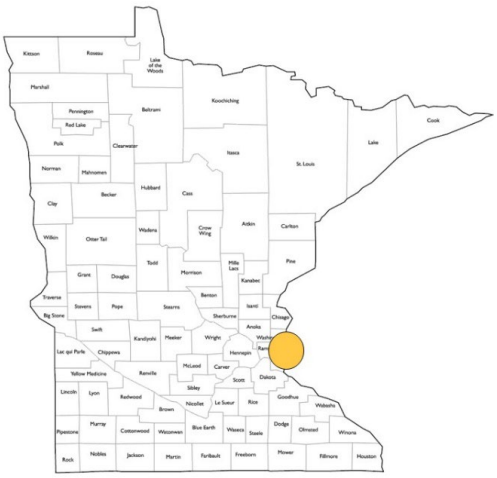
Fund: OHF - CPL ***Fiscal Year Funds:*** 2012

Project Start Date: June 2013

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Forest

Project Status: Post Establishment Phase



County: Washington

Primary Activity: Savanna Enhancement

Project Size: 14 acres

Project Completed: 2015

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***

   Cut/treat of invasive, nonnative brush (primarily European buckthorn and Tatarian honeysuckle), stack brush and burn, follow-up foliar treatment of invasive woody resprouts/seedlings.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Belwin Conservancy has records on file of restoration design and work with restoration contracting company.
   - CPL Restoration and Management Plan
   - CPL Accomplishment Report
3. ***What are the stated goals of the project?***

   The following text is from the 2012 CPL Grant application: "Overall, the goal of the Bell Oak Savanna Restoration is to create and maintain a mosaic of habitat types including prairie, savanna and woodland at a scale that is ecologically meaningful. Specifically, this project would restore habitat types of dry prairie and savanna providing habitat for numerous state-listed wildlife and plant species. Based on the Field Guide to the Native Plant Communities of Minnesota, the southern dry savanna, (Ups14), is the

goal of the Bell Oak Savanna restoration. The following objectives will be used to restore this plant community: 1) Restore and maintain appropriate canopy total canopy cover (25-50%) and select for appropriate tree species. 2) Maintain less than 25% cover of woody invasive species and 10% herbaceous invasive species. 3) Promote an understory composed of appropriate grasses, sedges and forbs. 4) Promote a patchy shrub layer of native species (25-50%) and ensure oak regeneration.

4. ***What are the desired outcomes of achieving the stated goals of the project?***

   As noted in the Summary section of the 2012 CPL Grant application, desired outcomes included: *"Restoration of the proposed project area would increase the quantity and quality of dry prairie remnants and improve habitat for rare species found in the area including Blanding's turtle, North American racer, kittentails, and James Polanisia."*

5. ***Were measures of restoration success identified in plans?*** Choose an item.
   If yes, list specific measurements.

   Measures of restoration success related to vegetation character/composition were included in the 2012 CPL Grant application and referenced MN DNR Native Plant Community description: *"Based on the Field Guide to the Native Plant Communities of Minnesota, the southern dry savanna, (Ups14), is the goal of the Bell Oak Savanna restoration. The following objectives will be used to restore this plant community: 1) Restore and maintain appropriate canopy total canopy cover (25-50%) and select for appropriate tree species. 2) Maintain less than 25% cover of woody invasive species and 10% herbaceous invasive species. 3) Promote an understory composed of appropriate grasses, sedges and forbs. 4) Promote a patchy shrub layer of native species (25-50%) and ensure oak regeneration."*

6. ***Are plan Sets available?*** No ***Have project maps been created?*** Yes
   If yes, provide in "site maps" and list maps provided:
   No formal plan/specification set was developed as part of this project. Restoration design is in the form of narrative, including the methods listed below in Item 7.
   - CPL Restoration and Management Plan
   - CPL Accomplishment Report

7. ***Provide list of best management practices, standards, guidelines identified in plan set?***
   The 2012 CPL Grant application included the following narrative for methods: "In order to achieve the objectives of the savanna restoration, canopy cover needs to be reduced by removing ecologically inappropriate trees and removing woody invasives species. Given the high-quality vegetation in the understory, the shrub and herbaceous vegetation will likely recover once the structure has been restored. In this 14-acre savanna, canopy trees that tend to resprout vigorously when cut, such as aspen, will be girdled in the spring of 2013 by the Conservation Corps of Minnesota. The invasive woody species such as buckthorn and honeysuckle will be cut, hauled, and either chipped and/or burned on site during the fall and winter months of 2013 and 2014. Treating the stumps with a 20% mixture of triclopyr and bark oil blue will prevent most of the stumps from resprouting. The cutting will be done by Prairie Restorations, Inc.; the hauling will be done by students from the St. Paul School District; and the chipping and burning will be done by staff from the Belwin Conservancy. To remove the ecologically inappropriate trees, a hotsaw/skidder will be used to cut and stage this material. A hot saw/skidder is very efficient at cutting and staging material in open areas. This work will be done by Mike's Tree Service when the ground is frozen during the winter of 2013 and 2014 to protect the soil from compaction. To use equipment in the project area, the removal of canopy trees will be followed by stump-grinding on the large stumps and forestry mowing to remove the small stumps and any remaining slash in the winter of 2014. The stump-

grinding will be done by Mike's Tree Service and the forestry mowing will be done by Belwin Conservancy as an in-kind match. For the savanna restoration to provide critical habitat, woody regrowth from the buckthorn must be controlled. A critical period cut (mid-June 2014) followed by a foliar application of herbicide (early October 2014 and 2015) is one of the best ways of managing buckthorn. This work will be done by Prairie Restorations, Inc."

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   No
9. ***In what ways did alterations change the proposed project outcome?***
   No alterations were made

Site Assessment

Field Review Date: 10/11/2022

Field Visit Attendees: Lynette Anderson – Belwin Conservancy; Cooper Crose – Belwin Conservancy; Wade Johnson – MNDNR; Paul Bockenstedt – Stantec

10. ***Surrounding Landscape Characteristics:***
    The project site occurs on a formerly pastured dry hilltop. The surrounding area has moderately to sharply rolling topography and is characterized by large lot rural residential development (low density).
11. ***Site Characteristics:***
    a. Soil Series:
    Soils in the managed area are Mahtomedi loamy sand.
    b. Topography:
    The project area occurs on a gently sloped hilltop.
    c. Hydrology:
    The project area is dry with soils categorized as excessively drained in the NRCS soil survey.
    d. Vegetation: Plant Communities, Dominant Species & Invasives % Cover:
    The project area is perhaps best characterized as Ups14 Southern Dry Savanna. The canopy is patchy with mature bur oak as well as mature and second growth pin oak common. At the time of the field visit, the shrub layer was open with red raspberry and lead plant. The herbaceous layer is in good to excellent condition with dry prairie species common including Indian grass, big bluestem, sand little bluestem, June grass and Pennsylvania sedge abundant. Pennsylvania sedge occurred in patches and broader lawn-like areas in some spots. Native forbs included species that range from those adapted to disturbance such as western ragweed, as well as species characteristic of high-quality prairie such as bastard toadflax, hoary puccoon, blue-eyed grass, silky prairie clover, frost weed and others. A number of nonnative and invasive species were observed but are not widespread – these include spotted knapweed, smooth brome, reed canary grass, and Grecian foxglove. Please also see plant species list and site photos.

12. ***Is the plan based on current science?*** Yes
    Removal of invasive/nonnative shrubs and follow-up foliar treatment of invasive woody seedlings and resprouts are consistent with good initial restoration activities for dry oak savanna.
13. ***List indicators of project goals at this stage of project:***
    Total cover of invasive/nonnative brush species was well below 5% total cover across the management area at the time of the field evaluation. Based on observations, it is perceived that desirable native herbaceous cover has increased as a result of the management activities.
14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***
    Yes, there is an obvious improvement and trend toward recovery/expansion of desirable native vegetation.
15. ***Are corrections or modifications needed to achieve proposed goals?***
    No. While there are some lingering issues with invasive, nonnative herbaceous vegetation, Belwin Conservancy staff are regularly monitoring and actively managing the area.
16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***
    Implemented and anticipated future restoration activities (prescribed burning, ongoing treatment of invasive species) will continue to benefit the quality of this dry oak savanna area. No supplemental native seeding was conducted following invasive brush removal. However, there was a diverse suite of pre-existing native dry prairie/savanna vegetation present when this project began. Management activities completed have allowed it to thrive once again. The long-term challenge to maintaining or further improving the quality of this dry savanna is perhaps most at risk from the Grecian foxglove that is present at the site (Belwin Conservancy staff are aware of and actively manage Grecian foxglove).
17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No. Implemented and planned activities should all contribute toward improved quality of native habitat.
18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    No. Project results were good, and the active management of this area by Belwin Conservancy staff should ensure maintaining or further improving the quality of this area.
19. ***Additional comments on the restoration project.***
    None

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Achieved the stated goals.
21. ***The project will:***
    Likely exceed proposed outcomes.
    Confidence of outcome determination:

High.

22. ***Provide explanation of reason(s) for determination.***

    There is a minimal level of invasive, nonnative woody vegetation at this time and given that Belwin Conservancy has staff/resources dedicated to ongoing management of natural areas should ensure the ability to sustain gains into the future.

23. ***Site Assessor(s) conducting field review:***

    Paul Bockenstedt – Stantec

Site Maps, Project Plans or Vegetation Tables

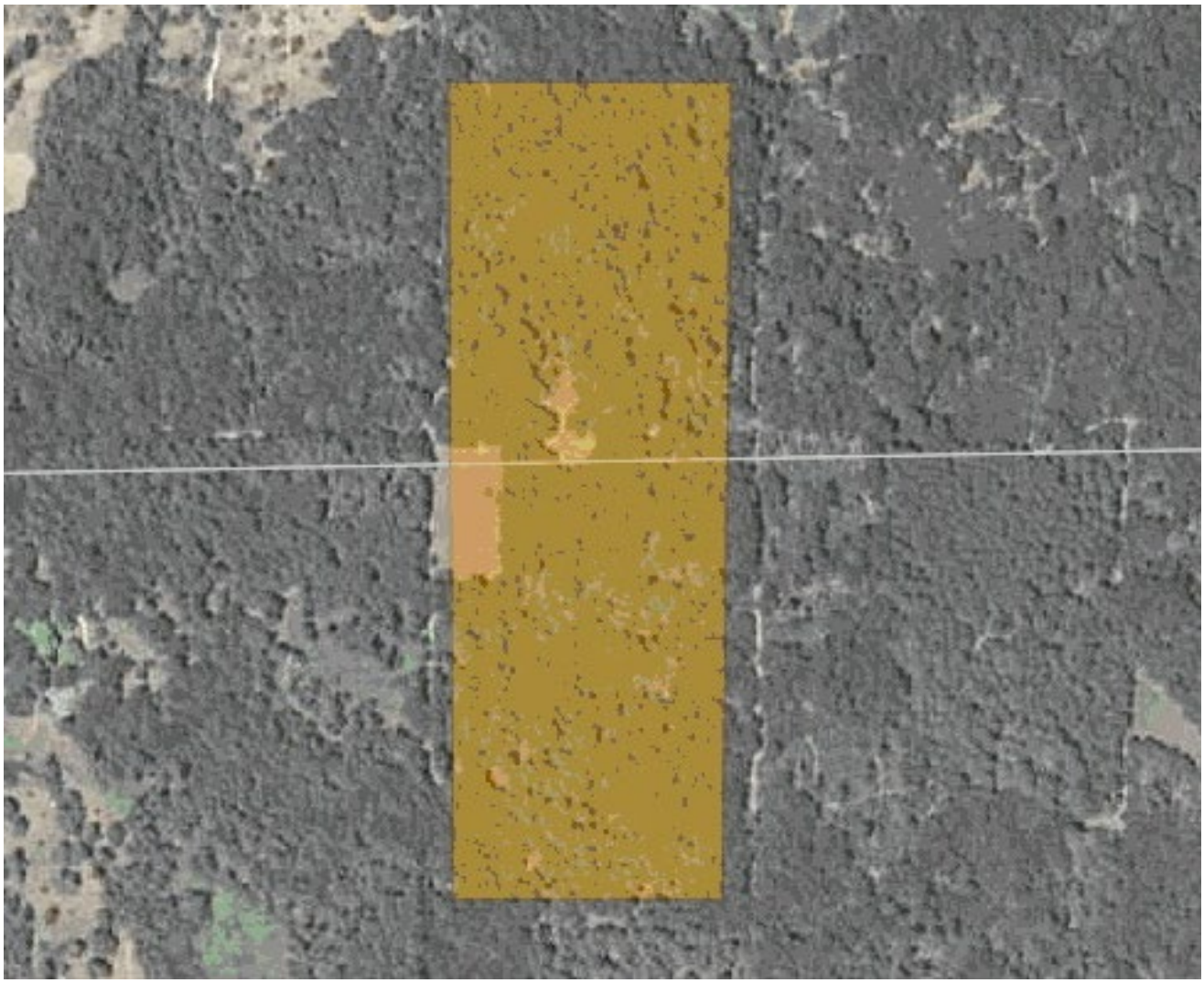


Figure 1 Project area map included in the 2012 Conservation Partners Legacy Grant application.

Table 1 – Plant species observed during meander survey at Belwin Conservancy Bell Oak site.

Scientific Name	Common Name	Cover Class	Seeded? (Y/N)	Status
Achillea millefolium	common yarrow	0-1%	No	Native
Ageratina altissima var. altissima	white snakeroot	0-1%	No	Native
Ambrosia psilostachya	western ragweed	1- 5%	No	Native
Amorpha canescens	leadplant	1- 5%	No	Native
Andropogon gerardii	big bluestem	5-25%	No	Native
Artemisia campestris subsp. caudata	field sagewort	0-1%	No	Native
Artemisia ludoviciana subsp. ludoviciana	white sage	1- 5%	No	Native
Asclepias syriaca	common milkweed	0-1%	No	Native
Asclepias verticillata	whorled milkweed	1- 5%	No	Native
Bromus inermis	smooth brome	0-1%	No	Invasive
Calamovilfa longifolia var. longifolia	prairie sandreed	0-1%	No	Native
Calylophus serrulatus	toothed evening primrose	0-1%	No	Native
Carex blanda	charming sedge	0-1%	No	Native
Carex brevior	short sedge	5-25%	No	Native
Carex pensylvanica	Pennsylvania sedge	5-25%	No	Native
Ceanothus americanus var. pitcheri	American New Jersey tea	0-1%	No	Native
Centaurea stoebe subsp. micranthos	spotted knapweed	1- 5%	No	Invasive
Cirsium discolor	field thistle	0-1%	No	Invasive
Comandra umbellata	bastard toadflax	0-1%	No	Native
Cyperus lupulinus subsp. lupulinus	slender nut sedge	1- 5%	No	Native
Cyperus schweinitzii	Schweinitz's nut sedge	1- 5%	No	Native
Dalea villosa var. villosa	silky prairie clover	0-1%	No	Native
Delphinium carolinianum subsp. virescens	Carolina delphinium	0-1%	No	Native
Dichanthelium oligosanthes subsp. oligosanthes	Scribner's panic grass	5-25%	No	Native
Digitalis lanata	Grecian floxglove	0-1%	No	Invasive
Elymus canadensis var. canadensis	nodding wild rye	0-1%	No	Native
Elymus villosus	downy wild rye	0-1%	No	Native
Eragrostis spectabilis	purple lovegrass	1- 5%	No	Native
Fragaria virginiana	common strawberry	1- 5%	No	Native
Galium boreale	northern bedstraw	0-1%	No	Native
Galium concinnum	shining bedstraw	0-1%	No	Native
Glechoma hederacea	creeping charlie	0-1%	No	Invasive
Helianthemum canadense	Canada frostweed	0-1%	No	Native
Hesperostipa spartea	porcupine grass	1- 5%	No	Native
Koeleria macrantha	junegrass	5-25%	No	Native
Lathyrus ochroleucus	pale vetchling	0-1%	No	Native
Linaria vulgaris	butter-and-eggs	1- 5%	No	Invasive
Lithospermum canescens	hoary puccoon	0-1%	No	Native
Lonicera tatarica	tartarian honeysuckle	1- 5%	No	Invasive
Monarda fistulosa	wild bergamot	1- 5%	No	Native
Phalaris arundinacea	reed canary grass	0-1%	No	Invasive

Scientific Name	Common Name	Cover Class	Seeded? (Y/N)	Status
Physalis heterophylla var. heterophylla	clammy ground cherry	0-1%	No	Native
Prunus serotina	black cherry	5-25%	No	Native
Quercus ellipsoidalis	northern pin oak	5-25%	No	Native
Quercus macrocarpa	oak	5-25%	No	Native
Rhamnus cathartica	common buckthorn	1- 5%	No	Invasive
Rubus idaeus var. strigosus	red raspberry	1- 5%	No	Native
Rubus pubescens	dwarf raspberry	1- 5%	No	Native
Rumex acetosella	common sheep sorrel	1- 5%	No	Nonnative
Schizachyrium scoparium var. scoparium	little bluestem	5-25%	No	Native
Sisyrinchium campestre	field blue-eyed grass	0-1%	No	Native
Solidago nemoralis	gray goldenrod	1- 5%	No	Native
Sorghastrum nutans	Indian grass	5-25%	No	Native
Symphyotrichum oolentangiense	skyblue aster	0-1%	No	Native
Tilia americana	basswood	0-1%	No	Native
Verbascum thapsus	common mullein	0-1%	No	Nonnative
Zanthoxylum americanum	prickly ash	1- 5%	No	Native

Site Photographs

Photo 1 – View of Ups14 Southern Dry Savanna area looking north where invasive, nonnative woody removal occurred. This area illustrates the positive recovery of native herbaceous prairie/savanna vegetation (surrounding people in the photo).

Photo 2 – View of prairie/savanna opening area with good recovery of the herbaceous layer, as well as recruitment of pin oak and bur oak.

Photo 3 – View of an opening/canopy gap with abundant small native warm season bunch grasses (tan- and russet-colored tufts).

Photo 4 – View of prairie/savanna restoration looking down at the ground surface. Native grasses are evident as tan tufts, with forbs interspersed.

Photo 5 – Cooper Crose (left) and Lynette Anderson (center) of Belwin Conservancy, along with Wade Johnson of MNDNR discuss work completed in the surrounding area. Recovery of the native herbaceous layer in this particular area was very good following invasive woody removal.

2 Belwin Conservancy Valley Creek Forest Enhancement

Project Background

Project Name: Valley Creek Forest Enhancement

Project Site: Belwin Conservancy, Valley Creek site

Township/Range Section: Township 28N Range 20W Section 16

Project Manager / Affiliated Organization: Justin Sykora / Belwin Conservancy

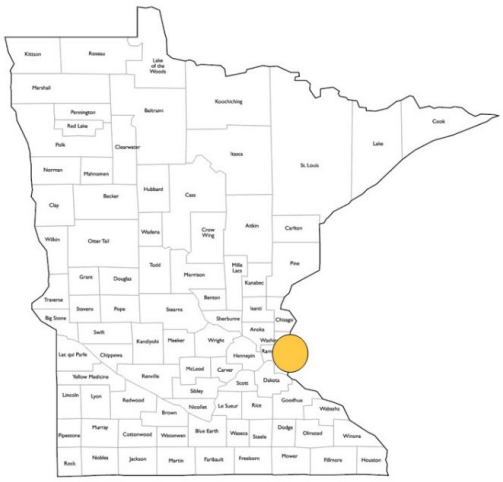
Fund: OHF - CPL ***Fiscal Year Funds:*** 2016

Project Start Date: May 2017

Predominant Habitat type: Forest

Additional Habitat types: Prairie / Savana / Grassland

Project Status: Post Establishment Phase



County: Washington

Primary Activity: Forest Enhancement

Project Size: 33 Acres

Project Completed: June 2021

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Winter cut/treat of invasive, nonnative brush (primarily European buckthorn), stack brush and burn, plant native hardwood tree saplings in stream buffer area, follow-up foliar treatment of invasive woody resprouts/seedlings.
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Belwin Conservancy has records on file of restoration design and work with restoration contracting company.
   - CPL Restoration and Management Plan
   - CPL Final Accomplishment Report
3. ***What are the stated goals of the project?***

   <u>The CPL Grant application includes the following objectives:</u>
   1. To restore southern dry savanna along the steep south-facing slope to the spine of the eastern ridge. a. Remove all non-oak saplings and canopy trees. Oak should be the dominant canopy tree and selected for as a sapling, if necessary. Maintain total canopy cover between 25-50%. b. Maintain less than 25% cover of woody invasive species and 10% herbaceous invasive species. c. Promote an understory

composed of appropriate southern mesic savanna grasses and forbs. d. Promote a patchy shrub layer of native species (25-50%) and ensure oak regeneration of seedlings and saplings. 2. To restore southern dry-mesic oak woodland along the east-facing slope. a. Remove canopy and subcanopy trees not including bur oak, pin oak, northern red oak, white oak, black cherry, and red maple. Maintain total canopy cover between 50-100%. b. Maintain less than 25% cover of woody invasive species and 10% herbaceous invasive species. c. Promote an understory composed of appropriate southern dry-mesic oak woodland species. d. Promote a patchy to continuous shrub layer of native species (25-75%) and ensure that canopy species are regenerating. 3. To restore southern terrace forest along the streambed. a. Maintain and promote canopy trees such as American elm, green ash, hackberry, basswood, box elder, silver maple, black ash and cottonwood. b. Maintain less than 10% cover of woody invasive species and 25% herbaceous invasive species. c. Promote an understory composed of appropriate southern terrace forest shrubs, grasses, sedges and forbs. 4. To restore southern dry-mesic oak woodland in the uplands. a. Remove canopy and subcanopy trees not including bur oak, pin oak, northern red oak, white oak, black cherry, and red maple. Maintain total canopy cover between 50-100%. b. Maintain less than 25% cover of woody invasive species and 10% herbaceous invasive species. c. Promote an understory composed of appropriate southern dry-mesic oak woodland species. d. Promote a patchy to continuous shrub layer of native species (25-75%) and ensure that canopy species are regenerating."

4. ***What are the desired outcomes of achieving the stated goals of the project?***

   The CPL Grant application notes that *"The overall objective of the project is to restore land in the Valley Creek watershed to a more native state to protect the stream, trout populations, and enhance habitat for birds, pollinators and wildlife."*

5. ***Were measures of restoration success identified in plans?*** *Yes*
   If yes, list specific measurements.
   Yes, the narrative above, in item 3 includes information about short- and long-term goals for restoration.
6. ***Are plan Sets available?*** No ***Have project maps been created?*** Yes
   If yes, provide in "site maps" and list maps provided:
   No formal plan/specification set was developed as part of this project. However, a 2008 "Management Plan for the Valley Creek Site" serves as the overall restoration design for this project.
7. ***Provide list of best management practices, standards, guidelines identified in plan set?***
   The Methods section of the CPL Grant application outlines best management practices that apply to individual practices employed in the project, including invasive woody cut/treat, follow-up spot foliar treatment of invasive brush resprouts and invasive herbaceous plants, as well as seeding and seed sourcing. The activities and approaches outlined in this section of the CPL Grant application are consistent with known best management strategies.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   No
9. ***In what ways did alterations change the proposed project outcome?***
   No alterations were made

Site Assessment

Field Review Date: 10/11/2022

Field Visit Attendees: Lynette Anderson - Belwin Conservancy; Cooper Crose - Belwin Conservancy; Keegan Lund - MNDNR; Paul Bockenstedt - Stantec

10. ***Surrounding Landscape Characteristics:***
    The project site occurs along floodplain and slopes of Valley Creek. The vicinity has moderately to sharply rolling topography and is characterized by large lot rural residential development (low density).
11. ***Site Characteristics:***
    a. ***Soil Series:***
    Soils on the north- and south-facing slopes are primarily Hubbard loamy sand and Mahtomedi loamy sand. The floodplain/terrace area of Valley Creek is primarily Chaska silt loam in the project area.
    b. ***Topography:***
    The project area occurs partly on floodplain/terrace areas along Valley Creek, but also includes relatively steep north- and south-facing slopes.
    c. ***Hydrology:***
    The sloped portions of the project area are dry with soils categorized as excessively drained. The area along Valley Creek has somewhat poorly drained soils. Areas closest to Valley Creek itself also show signs of being temporarily flooded.
    d. ***Vegetation: Plant Communities, Dominant Species & Invasives % Cover:***
12. ***Is the plan based on current science?*** Yes
    Removal of invasive/nonnative shrubs and trees along with supplemental planting of trees and herbaceous seeding has resulted in ecological lift to each of the three managed areas.
13. ***List indicators of project goals at this stage of project:***
    Total cover of invasive/nonnative brush species is well below 5% total cover across the management area. Based on observations, it appears that native herbaceous cover has increased as a result of the management activities. Areas on the south-facing slope where invasive trees and brush have been removed are currently comprised of a patchy mix of ruderal plants and desirable native vegetation but appear to be trending toward long-term recovery of desirable native vegetation throughout.
14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***
    Yes, the apparent trend toward recovery/expansion of native vegetation sets the stage for achieving proposed goal, particularly with ongoing implementation of restoration activities that contribute toward ongoing improvement.
15. ***Are corrections or modifications needed to achieve proposed goals?***
    No. While there are some lingering issues with invasive, nonnative herbaceous vegetation the presence of these species should decline with active management and passage of time.
16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***
    Implemented and anticipated future restoration activities (prescribed burning, ongoing treatment of invasive species) should continue to benefit the quality of these areas. No supplemental native seeding

was conducted following invasive brush removal. Supplemental seeding with a mix of species that complemented pre-existing vegetation of modest species richness may have assisted with suppressing invasive woody seedlings/resprouts and nonnative/invasive herbaceous weeds, as well as enriching wildlife habitat value by improving things like diversity and availability of forage for pollinators and others.

17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No. Implemented and planned activities should all contribute toward improved quality of native habitat.
18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    Not likely. The outcomes of the project and likely long-term restoration trajectory look to be predictable and relatively assured with ongoing management by Belwin Conservancy staff.
19. ***Additional comments on the restoration project.***
    None

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Achieved the stated goals.
21. ***The project will:***
    Meet proposed outcomes.
    Confidence of outcome determination:
    High.
22. ***Provide explanation of reason(s) for determination.***
    There is a minimal level of invasive, nonnative woody vegetation at this time and given that Belwin Conservancy has staff/resources dedicated to ongoing management of natural areas should ensure the ability to sustain gains into the future.
23. ***Site Assessor(s) conducting field review:***
    Paul Bockenstedt - Stantec

Site Maps, Project Plans or Vegetation Tables

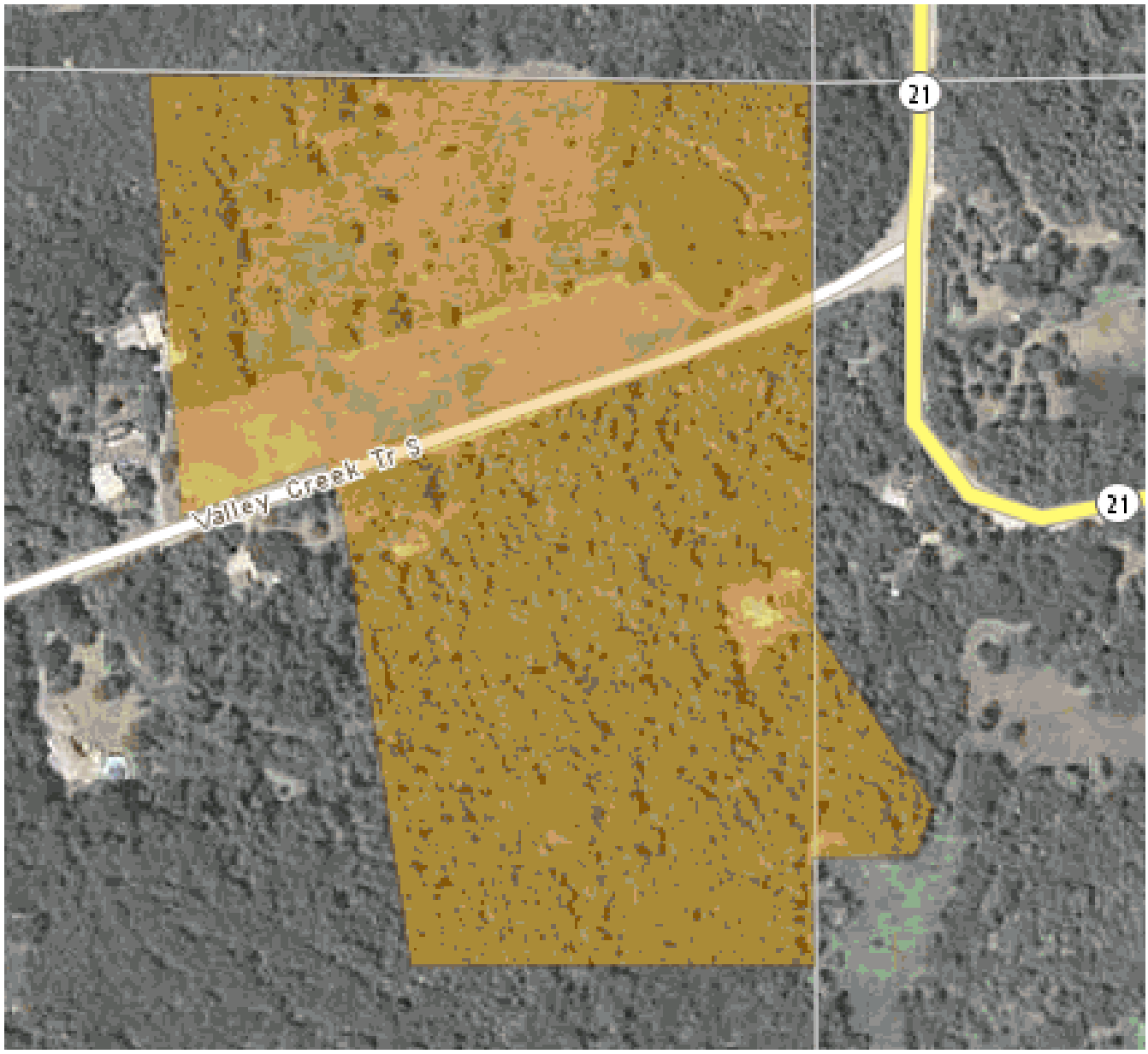


Figure 2 – Figure of the project location as included in the CPL Grant application.

Table 2 – Meander survey plant species list for north-facing slope FDs37 Southern Dry-Mesic Oak (Maple) Woodland, south of Valley Creek Trail.

Scientific Name	Common Name	Cover Class	Seeded? (Y/N)	Status
Acer negundo	box elder	0-1%	No	Native
Acer rubrum	red maple	5-25%	No	Native
Achillea millefolium	yarrow	0-1%	No	Native
Alliaria petiolata	garlic mustard	0-1%	No	Invasive
Antennaria plantaginifolia	plantain-leaved pussytoes	0-1%	No	Native
Aquilegia canadensis	columbine	0-1%	No	Native
Arisaema triphyllum	Jack-in-the-pulpit	0-1%	No	Native
Athyrium filix-femina var. angustum	lady fern	0-1%	No	Native
Berberis thunbergii	Japanese barberry	1- 5%	No	Invasive
Bromus pubescens	hairy brome	0-1%	No	Native
Calamagrostis canadensis	bluejoint	0-1%	No	Native
Carex pensylvanica	Pennsylvania sedge	5-25%	No	Native
Carex rosea	starry sedge	1- 5%	No	Native
Circaea lutetiana var. canadensis	common enchanter's nightshade	1- 5%	No	Native
Desmodium glutinosum	pointed-leaved tick trefoil	5-25%	No	Native
Elymus hystrix	bottlebrush grass	0-1%	No	Native
Elymus virginicus var. virginicus	Virginia wild rye	0-1%	No	Native
Elymus wiegandii	Weigand's wild rye	0-1%	No	Native
Festuca subverticillata	nodding fescue	0-1%	No	Native
Galium boreale	northern bedstraw	1- 5%	No	Native
Galium concinnum	shining bedstraw	1- 5%	No	Native
Geranium maculatum	wild geranium	1- 5%	No	Native
Geum canadense	white avens	1- 5%	No	Native
Goodyera pubescens	downy rattlesnake plantain	0-1%	No	Native
Hackelia virginiana	Virginia stickseed	1- 5%	No	Native
Juglans nigra	black walnut	0-1%	No	Native
Juniperus virginiana var. virginiana	eastern red cedar	5-25%	No	Native
Lathyrus ochroleucus	pale vetchling	0-1%	No	Native
Lilium michiganense	Michigan lily	0-1%	No	Native
Lonicera tatarica	tartarian honeysuckle	1- 5%	No	Invasive
Oryzopsis asperifolia	moutain rice grass	0-1%	No	Native
Osmunda claytoniana	interrupted fern	5-25%	No	Native
Persicaria hydropiperoides	mild waterpepper	0-1%	No	Native
Phalaris arundinacea	reed canary grass	5-25%	No	Invasive
Physalis heterophylla var. heterophylla	clammy ground cherry	0-1%	No	Native
Pinus resinosa	red pine	1- 5%	No	Nonnative
Populus tremuloides	quaking aspen	5-25%	No	Native
Prunus serotina	black cherry	1- 5%	No	Native
Prunus virginiana	chokecherry	1- 5%	No	Native
Pteridium aquilinum var. latiusculum	bracken	1- 5%	No	Native
Pyrola elliptica	elliptic shinleaf	0-1%	No	Native

Quercus alba	white oak	1- 5%	No	Native
Quercus rubra	northern red oak	5-25%	No	Native
Ranunculus abortivus	kidney-leaved buttercup	0-1%	No	Native
Ribes missouriense	Missouri gooseberry	1- 5%	No	Native
Salix nigra	black willow	0-1%	No	Native
Sanguinaria canadensis	bloodroot	0-1%	No	Native
Symphyotrichum urophyllum	tail-leaved aster	1- 5%	No	Native
Teucrium canadense	germander	0-1%	No	Native
Urtica dioica subsp. gracilis	stinging nettle	1- 5%	No	Invasive
Uvularia sessilifolia	pale bellwort	0-1%	No	Native
Verbascum thapsus	common mullein	0-1%	No	Nonnative
Veronica officinalis	common speedwell	1- 5%	No	Nonnative

Table 3 – Meander survey observed plant species for area bordering Valley Creek (floodplain/terrace).

Scientific Name	**Common Name**	**Cover Class**	**Seeded? (Y/N)**	**Status**
Acer negundo	box elder	5-25%	No	Native
Ageratina altissima var. altissima	white snakeroot	1- 5%	No	Native
Alliaria petiolata	garlic mustard	5-25%	No	Invasive
Amphicarpaea bracteata	hog peanut	5-25%	No	Native
Asclepias syriaca	common milkweed	0-1%	No	Native
Athyrium filix-femina var. angustum	lady fern	0-1%	No	Native
Carex blanda	charming sedge	0-1%	No	Native
Cirsium arvense	Canada thistle	0-1%	No	Invasive
Galium aparine	cleavers	1- 5%	No	Native
Galium concinnum	shining bedstraw	1- 5%	No	Native
Geum canadense	white avens	0-1%	No	Native
Glechoma hederacea	creeping charlie	5-25%	No	Invasive
Hesperis matronalis	dame's rocket	1- 5%	No	Invasive
Juniperus virginiana var. virginiana	eastern red cedar	1- 5%	No	Native
Leersia oryzoides	rice cut grass	0-1%	No	Native
Leonurus cardiaca	common motherwort	1- 5%	No	Invasive
Muhlenbergia frondosa	swamp muhly grass	0-1%	No	Native
Phalaris arundinacea	reed canary grass	1- 5%	No	Invasive
Pinus resinosa	red pine	1- 5%	No	Nonnative
Quercus ellipsoidalis	northern pin oak	1- 5%	No	Native
Rhamnus cathartica	common buckthorn	1- 5%	No	Native
Robinia pseudoacacia	black locust	5-25%	No	Invasive
Rubus idaeus var. strigosus	red raspberry	1- 5%	No	Native
Tilia americana	basswood	0-1%	No	Native
Vitis riparia	wild grape	5-25%	No	Native

Table 4 – Meander survey plant species list for south-facing prairie/savanna area, on the north side of Valley Creek Trail.

Scientific Name	Common Name	Cover Class	Seeded? (Y/N)	Status
Acer negundo	box elder	5-25%	No	Native
Actaea rubra	red baneberry	0-1%	No	Native
Ageratina altissima var. altissima	white snakeroot	5-25%	No	Native
Alliaria petiolata	garlic mustard	1- 5%	No	Invasive
Andropogon gerardii	big bluestem	0-1%	No	Native
Arctium minus	common burdock	0-1%	No	Invasive
Asclepias syriaca	common milkweed	1- 5%	No	Native
Bromus pubescens	hairy brome	0-1%	No	Native
Carex blanda	charming sedge	1- 5%	No	Native
Carex brevior	short sedge	1- 5%	No	Native
Cirsium arvense	Canada thistle	5-25%	No	Invasive
Cirsium discolor	field thistle	0-1%	No	Native
Elymus canadensis var. canadensis	nodding wild rye	1- 5%	No	Native
Elymus hystrix	bottlebrush grass	1- 5%	No	Native
Elymus repens	quackgrass	1- 5%	No	Invasive
Elymus villosus	downy wild rye	0-1%	No	Native
Eragrostis spectabilis	purple lovegrass	0-1%	No	Native
Festuca subverticillata	nodding fescue	0-1%	No	Native
Fraxinus pennsylvanica	green ash	5-25%	No	Native
Galium aparine	cleavers	1- 5%	No	Native
Galium boreale	northern bedstraw	1- 5%	No	Native
Galium concinnum	shining bedstraw	0-1%	No	Native
Geum canadense	white avens	1- 5%	No	Native
Glechoma hederacea	creeping charlie	1- 5%	No	Invasive
Hackelia virginiana	Virginia stickseed	1- 5%	No	Native
Hypericum punctatum	spotted St. John's-wort	1- 5%	No	Native
Juniperus virginiana var. virginiana	eastern red cedar	5-25%	No	Native
Linaria vulgaris	butter-and-eggs	1- 5%	No	Invasive
Maianthemum canadense	Canada mayflower	0-1%	No	Native
Muhlenbergia mexicana	Mexican muhly grass	1- 5%	No	Native
Populus deltoides subsp. monilifera	cottonwood	0-1%	No	Native
Populus tremuloides	quaking aspen	5-25%	No	Native
Prunus serotina	black cherry	1- 5%	No	Native
Quercus ellipsoidalis	northern pin oak	1- 5%	No	Native
Quercus macrocarpa	bur oak	5-25%	No	Native
Rhamnus cathartica	common buckthorn	5-25%	No	Invasive
Rhus glabra	smooth sumac	0-1%	No	Native
Rubus idaeus var. strigosus	red raspberry	5-25%	No	Native
Sambucus racemosa var. pubens	red-berried elder	0-1%	No	Native
Solidago canadensis	Canada goldenrod	5-25%	No	Native
Solidago gigantea	giant goldenrod	5-25%	No	Native
Symphyotrichum ontarionis var. ontarionis	Ontario aster	0-1%	No	Native

Triosteum perfoliatum	late horse gentian	0-1%	No	Native

Site Photographs

Photo 6 – View of forest along Valley Creek, looking northeast illustrating the open character of the shrub layer following invasive woody removal.

Photo 7 – View of southern dry-mesic oak (maple) woodland with lowland forest along Valley Creek in the distance. View is looking northwest, toward Valley Creek Trail.

Photo 8 – Looking south and upslope in southern dry-mesic oak (maple) forest. Common trees in the picture include red maple, oak, and paper birch. A few cut stumps of buckthorn are evident in the bottom center part of the photo.

Photo 9 – View of prairie/savanna restoration looking south from Valley Creek Trail. In a 1947 aerial photograph, the area in the foreground appeared to be plowed. Invasive brush/trees were removed from the savanna area upslope in this photo. Patchiness of native, weedy, and nonnative vegetation is evident at left-center of photo (Source: Google Maps, image November 2021)

Photo 5 – View of ecologists during the native plant meander – Looking southwest towards the southern dry-mesic oak (maple) forest. Common trees in the picture include red maple, basswood, black cherry and paper birch.

Photo 6 – View of Valley Creek in the southern terrace forest looking south towards the southern dry-mesic oak (maple) forest. Invasive brush/trees were removed from the riparian area and planted with native trees species.

3 Belwin Conservancy Lake Edith Forest Enhancement

Project Background

Project Name: Belwin Conservancy Lake Edith Forest Enhancement

Project Site: Lake Edith area, Belwin Conservancy

Township/Range Section: Township 28N Range 20W Section 4

Project Manager / Affiliated Organization: Justin Sykora / Belwin Conservancy

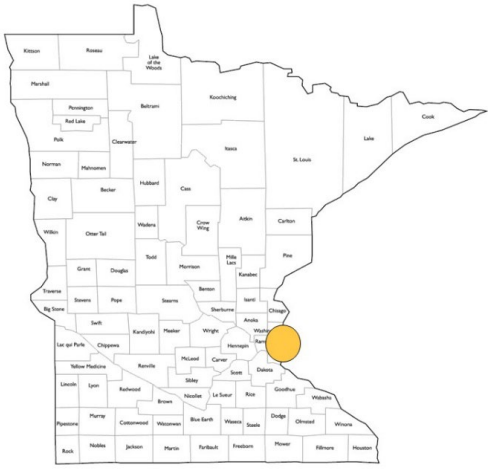
Fund: OHF - CPL ***Fiscal Year Funds:*** 2019

Project Start Date: December 2019

Predominant Habitat type: Forest

Additional Habitat types: Prairie / Savana / Grassland

Project Status: Post Establishment Phase



County: Washington

Primary Activity: Forest Enhancement

Project Size: 130 acres

Project Completed: October 2020

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Winter cut/treat and forestry mulching of invasive, nonnative brush (primarily European buckthorn and Tatarian honeysuckle in 2018), follow-up foliar treatment of invasive woody resprouts/seedlings.
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Belwin Conservancy has records on file of restoration design and work with restoration contracting company.
   - CPL Restoration and Management Plan
   - CPL Accomplishment Report
3. ***What are the stated goals of the project?***

   The CPL Grant application includes the following: *"The overall goal of the project is to restore the woodlands and savannas in this area to a near native state…maintain less than 25% cover of woody invasive species and 10% herbaceous invasive species to promote an understory composed of appropriate native species".*

4. ***What are the desired outcomes of achieving the stated goals of the project?***

   The CPL Grant application includes the following: *"By restoring the habitat to native species, we will enhance the health of the wetlands, stream, and native habitat, benefiting fish species, pollinators, native plants, shrubs and trees, and overall water quality in the watershed."*
   From the CPL Accomplishment Report: *"By removing and controlling regrowth of buckthorn and other woody invasive species, the native plant species will begin to thrive."*

5. ***Were measures of restoration success identified in plans? Yes***
   If yes, list specific measurements.

   The CPL grant application includes the following as stated measures of success: *"Bur oak should be the dominant canopy tree in the savanna areas, mixed hardwoods will be dominant in other areas. In the long-term, we want to maintain less than 25% cover of woody invasive species and 10% herbaceous invasive species to promote an understory composed of appropriate native species specific to the ecology of the area. These species include red osier dogwood, gray dogwood, high bush cranberry, wild bergamot, prairie rose, and common milkweed."*

6. ***Are plan Sets available?*** No ***Have project maps been created?*** Yes
   If yes, provide in "site maps" and list maps provided:
   No formal plan/specification set was developed as part of this project. Restoration design is in the form of narrative.
   - CPL Restoration and Management Plan
   - CPL Accomplishment Report
7. ***Provide list of best management practices, standards, guidelines identified in plan set?***
   Best management practices utilized:
   - Buckthorn removal using cut stump/herbicide treatments
   - Forestry mowing for high density and large infested areas
   - Follow-up herbicide treatments over multiple years to control resprouts and seedlings
   - Inter-seeding/planting of local native seed mix

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   Yes
   The original CPL Grant application includes $5,000 of in-kind "seeding and planting" match. The final accomplishment report for the project makes no note of enrichment seeding being conducted.
9. ***In what ways did alterations change the proposed project outcome?***
   It appears that the relatively species-poor herbaceous layer would have benefited from enrichment seeding and increased overall wildlife habitat value.

Site Assessment

Field Review Date: 10/11/2022

Field Visit Attendees: Lynette Anderson – Belwin Conservancy; Cooper Crose – Belwin Conservancy; Wade Johnson – MNDNR; Keegan Lund – MNDNR; Paul Bockenstedt – Stantec

10. ***Surrounding Landscape Characteristics:***
    The project is centered around a large cattail marsh. During the field visit, two portions of the project area were visited; one on the south-facing slope between a reconstructed prairie to the north and a large cattail marsh to the south; the second unit is a woodland on rolling topography that occurs on the southeast side of the outlet on the east side of the cattail marsh.
11. ***Site Characteristics:***
    a. ***Soil Series:***
    Soils in the north unit are primarily Chetek sandy loam and Emmert gravelly loamy coarse sand and Chetek sandy loam.
    b. ***Topography:***
    The north unit is a south-facing slope of moderate steepness. The southeast unit is moderately rolling with some steeper short slopes near the cattail marsh.
    c. ***Hydrology:***
    The project area is dry with soils categorized as excessively or somewhat excessively drained.
    d. ***Vegetation: Plant Communities, Dominant Species & Invasives % Cover:***
    Both areas visited during the field evaluation are perhaps best characterized as moderate quality FDs37 Southern Dry-Mesic Oak (Maple). Both have mature bur oak as the dominant tree in a nearly closed to closed canopy. Quaking aspen is also common as a canopy tree with lesser amounts of pin oak, basswood, black cherry and green ash. The shrub layer is mostly sparse, although there are some moderately dense patches of native shrubs and tree saplings in some areas (particularly in the southeast unit). The herbaceous layer varies from sparse to well vegetated. The sparsest areas may coincide with areas that might have had abundant invasive brush seedlings/resprouts and were aggressively treated resulting in non-target damage to the herbaceous layer. The south-facing slope is relatively species-poor compared to the southeast area. Please refer to the species list in the appendix for additional details on plant species observed.
12. ***Is the plan based on current science?*** Yes
    Removal of invasive/nonnative shrubs and follow-up foliar treatment of invasive woody seedlings and resprouts are consistent with good initial restoration activities for oak woodlands.
13. ***List indicators of project goals at this stage of project:***
    Total cover of invasive/nonnative brush species is well below 5% total cover of the management area.
14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***
    Yes, invasive/nonnative brush species have been significantly controlled. It appears that there was likely non-target damage to native herbaceous vegetation, presumably from the need to aggressively treat invasive woody resprouts and seedlings. Supplemental seeding/planting was included in the original CPL Grant application but appears to not have been implemented based on the 2022 grant Accomplishment Report. Enrichment of the herbaceous layer through supplemental seeding would have contributed to further achieving the stated goals.
15. ***Are corrections or modifications needed to achieve proposed goals?***
    No. Proposed goals have been substantially achieved. Sustaining gains for the long-term is likely with Belwin Conservancy staff regularly monitoring and actively managing the area.

16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***
    Implemented and anticipated future restoration activities (ongoing treatment of invasive species and potentially prescribed fire) should continue to benefit the quality of this oak woodland area. No supplemental native seeding was conducted following invasive brush removal. Conducting native species enrichment after initial invasive woody management may have had the potential of speeding recovery and diversifying habitat/resources for wildlife.
17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No. Implemented and planned activities should all contribute toward improved quality of native habitat.
18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    No. Project results were good, and the active management of this area by Belwin Conservancy staff should ensure maintaining or further improving the quality of this area.
19. ***Additional comments on the restoration project.***
    Information was not available to review team about why supplemental seeding/planting was not conducted.

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Achieved the stated goals.
21. ***The project will:***
    Meet proposed outcomes.
    Confidence of outcome determination:
    High.
22. ***Provide explanation of reason(s) for determination.***
    There is a minimal level of invasive, nonnative woody vegetation at this time. Belwin Conservancy has dedicated staff/resources to ongoing management of natural areas should ensure the ability to sustain gains into the future.
23. ***Site Assessor(s) conducting field review:***
    Paul Bockenstedt – Stantec

Site Maps, Project Plans or Vegetation Tables

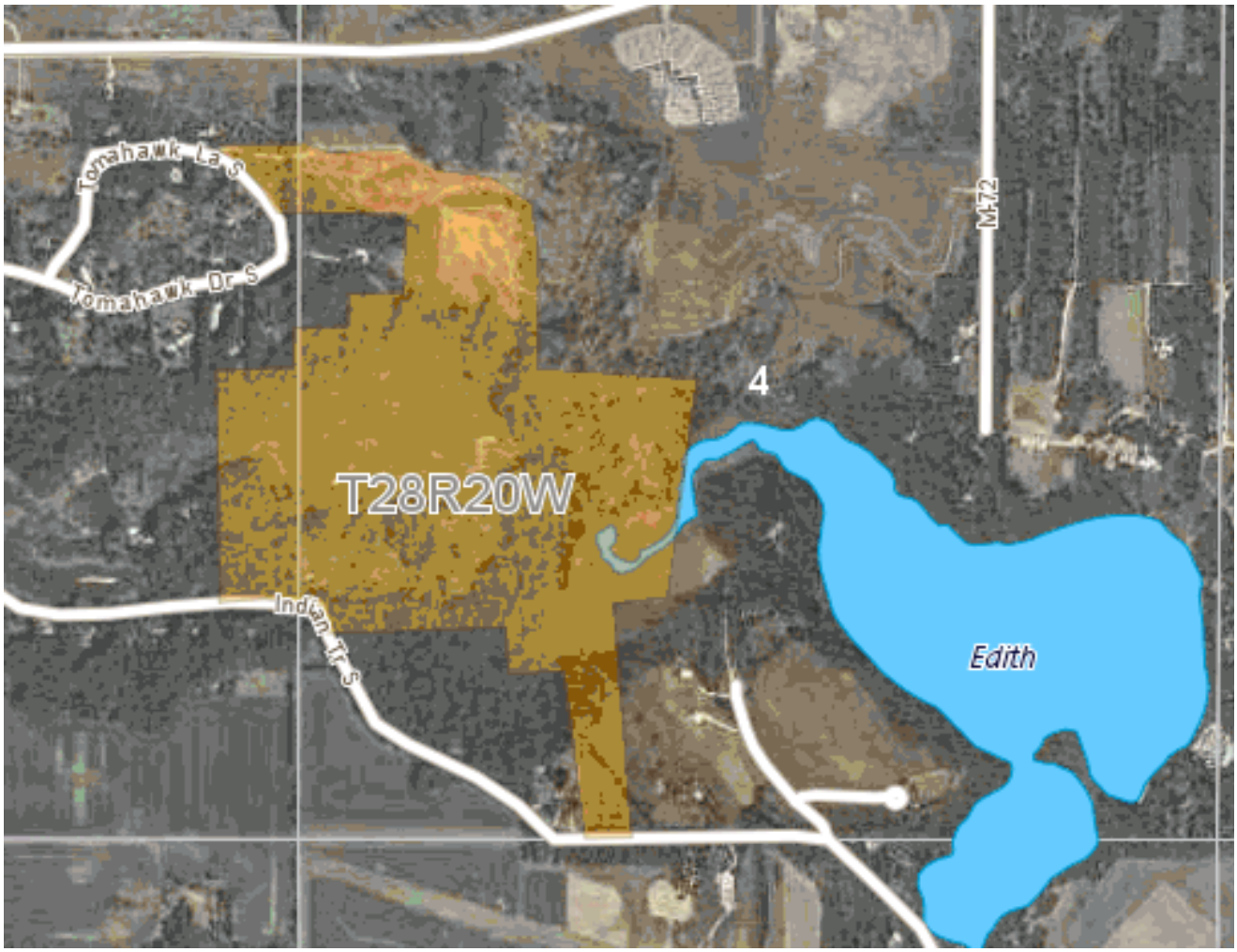


Figure 3 – Map of the 160-acre project area, as included in the 2019 CPL Grant application.

Table 5 – Plant species observed during meander survey in the Belwin Conservancy Lake Edith restoration units.

Scientific Name	Common Name	Cover Class	Seeded? (Y/N)	Status
Actaea rubra	red baneberry	0-1%	No	Native
Ageratina altissima var. altissima	white snakeroot	5-25%	No	Native
Allium tricoccum	wild leek	0-1%	No	Native
Amaranthus retroflexus	redroot amaranth	0-1%	No	Native
Carduus nutans	nodding thistle	0-1%	No	Native
Carex blanda	charming sedge	1- 5%	No	Native
Carex eburnea	ivory sedge	0-1%	No	Native
Circaea lutetiana var. canadensis	common enchanter's nightshade	0-1%	No	Native
Cirsium arvense	Canada thistle	1- 5%	No	Invasive
Cornus racemosa	gray dogwood	1- 5%	No	Native
Elymus canadensis var. canadensis	nodding wild rye	1- 5%	No	Native
Elymus hystrix	bottlebrush grass	1- 5%	No	Native
Elymus virginicus var. virginicus	Virginia wild rye	1- 5%	No	Native
Erechtites hieraciifolius var. hieraciifolius	pilewort	0-1%	No	Native
Eutrochium purpureum	sweet-scented Joe pye weed	0-1%	No	Native
Festuca subverticillata	nodding fescue	1- 5%	No	Native
Fraxinus pennsylvanica	green ash	1- 5%	No	Native
Galium aparine	cleavers	0-1%	No	Native
Galium triflorum var. triflorum	sweet-scented bedstraw	0-1%	No	Native
Geum macrophyllum var. perincisum	big-leaved avens	0-1%	No	Native
Hackelia virginiana	Virginia stickseed	0-1%	No	Native
Hesperis matronalis	dame's rocket	0-1%	No	Invasive
Hypericum punctatum	spotted St. John's-wort	1- 5%	No	Native
Juniperus virginiana var. virginiana	eastern red cedar	1- 5%	No	Native
Laportea canadensis	woodnettle	0-1%	No	Native
Linaria vulgaris	butter-and-eggs	0-1%	No	Native
Lonicera tatarica	tartarian honeysuckle	1- 5%	No	Invasive
Lotus corniculatus	bird's-foot trefoil	1- 5%	No	Invasive
Monarda fistulosa	wild bergamot	0-1%	No	Native
Osmorhiza claytonii	Clayton's sweet cicely	1- 5%	No	Native
Parthenocissus vitacea	woodbine	0-1%	No	Native
Poa compressa	Canada bluegrass	1- 5%	No	Invasive
Populus tremuloides	quaking aspen	5-25%	No	Native
Prunus serotina	black cherry	1- 5%	No	Native
Prunus virginiana	chokecherry	1- 5%	No	Native
Quercus ellipsoidalis	northern pin oak	5-25%	No	Native
Quercus macrocarpa	oak	25-50%	No	Native
Rhamnus cathartica	common buckthorn	1- 5%	No	Invasive
Ribes missouriense	Missouri gooseberry	1- 5%	No	Native
Rubus occidentalis	black raspberry	1- 5%	No	Native
Solidago canadensis	Canada goldenrod	1- 5%	No	Native

Tilia americana	basswood	1- 5%	No	Native
Toxicodendron radicans subsp. negundo	common poison ivy	0-1%	No	Native
Vitis riparia	wild grape	1- 5%	No	Native
Zanthoxylum americanum	prickly ash	1- 5%	No	Native
Zizia aurea	golden alexanders	0-1%	No	Native

Site Photographs

Photo 10 – Picture looking northwest on the east side of the project area near the outlet from the large cattail marsh (that flows into Lake Edit to the east). This photo illustrates the open shrub layer following invasive brush removal following work that occurred 2020-2022.

Photo 11 – Photo taken in 2019 by Belwin Conservancy staff, following initial invasive woody management. Photo is believed to have been taken on the north side of the project site.

Photo 12 – Photo reportedly taken in 2019 by Belwin Conservancy staff, following initial invasive woody management. Photo is on the north side of the project site, looking south across the large cattail marsh.

Photo 13 – Photo taken in 2019 by Belwin Conservancy staff, following initial invasive woody management. Photo is believed to have been taken on the north side of the project site, on the south-facing slope above a large cattail marsh.

4 St. Croix Tanglewood Preserve Forest Restoration

Project Background

Project Name: St. Croix Tanglewood Preserve Forest Restoration

Project Site: Tanglewood Preserve and St. Croix Watershed Research Station (SCWRS)

Township/Range Section: Township 31 Range 19 Section 18; Township 31 Range 20 Section 13

Project Manager / Affiliated Organization: Shawn Schottler – Science Museum of Minnesota

Fund: OHF - CPL ***Fiscal Year Funds:*** 2015

Project Start Date: 2016

Predominant Habitat type: Forest

Additional Habitat types: Wetland , Prairie / Savana / Grassland

Project Status: Post Establishment Phase

County: Washington

Primary Activity: Forest Restoration

Project Size: 72

Project Completed: 2019

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Specific components included restoration of ~65 acres of buckthorn-invaded oak woodland, oak forest, and black ash seepage swamp and 7.5 acres of dry-mesic prairie. Treatments in oak woodland, oak, forest, and black ash seepage included cut/treat of woody invasives via hand cutting and forestry mulching, native seeding (including supplemental two years post initial seeding), 3 years of follow-up foliar spot treatments, and prescribed burning. Treatments in dry-mesic prairie included site-preparation burn followed by seeding, 3 years of invasive spot treatments, and post-establishment prescribed burn.
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   2016 Work Summary (2016); Summary of Management Activities (2019); CPL Accomplishment Report (2019)
3. ***What are the stated goals of the project?***

From 2019 CPL Accomplishment Report: *Conduct fish, game & wildlife habitat restoration on 72 acres at St. Croix Watershed Research Station/ Tanglewood Preserve, including restoration of oak forest/woodland, hardwood seepage swamp, terrace forest and dry bluff prairie.*

4. ***What are the desired outcomes of achieving the stated goals of the project?***
   None stated. Presumably to reduce cover of invasive vegetation and increase native vegetation cover and diversity.
5. ***Were measures of restoration success identified in plans? No***
6. ***Are plan Sets available?*** **No** ***Have project maps been created?*** **Yes**
   If yes, provide in "site maps" and list maps provided:
   Figure 1: St. Croix Watershed Research Station project area
   Figure 2: Tanglewood Preserve project area
7. ***Provide list of best management practices, standards, guidelines identified in plan set?***
   No plan set, but seed mix is provided

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   Yes
   Additional forestry mulching was conducted in the 2.2-acre area south of 152nd Street (Figure 1) beyond what was proposed in initial plans. A supplemental seeding was conducted in 2019 across the entire project area following the initial seeding in 2017.
9. ***In what ways did alterations change the proposed project outcome?***
   Additional forestry mulching expanded the restoration area. Supplemental seeding likely aided in native vegetation establishment.

Site Assessment

Field Review Date: **11/3/2022**

Field Visit Attendees: Wade Johnson – MNDNR; Adam Heathcote – St. Croix Watershed Research Station; Jimmy Marty – Emmons & Olivier Resources, Inc.

10. ***Surrounding Landscape Characteristics:***
    The surrounding landscape consists of the St. Croix River, oak forest/woodland, rural residential, pasture/grassland, and row crop agriculture
11. ***Site Characteristics:***
    a. Soil Series:
    SCWRS project area: Copaston loam, 0-6% slopes (100B); Burkhardt sandy loam, 3-9% slopes (151B); Chetek sandy loam, 1-6% slopes (155B); Chetek sandy loam, 6-12% slopes (155C); Chetek sandy loam, 12-25% slopes (155D); Mahtomedi loamy sand, 0-6% slopes (454B); Poskin silt loam (507); Seelyeville muck (540)
    Dominant textures include silt loam, sandy loam, loam, and muck

Tanglewood project area: Chetek sandy loam, 1-6% slopes (155B); Chetek sandy loam, 6-12% slopes (155C); Mahtomedi loamy sand, 0-6% slopes (454B); Mahtomedi loamy sand, 6-12% slopes (454C); Mahtomedi loamy sand 12-25% slopes (454D)

Dominant textures include sandy loam and loamy sand

Source: Web Soil Survey

b. Topography:

SCWRS project area: Topography slopes gently (<5%) to the east toward the St. Croix River with a level terrace along the river.

Tanglewood project area: Topography is rolling and steep with frequent grades greater than 10%. Aspect is generally south to southwest and dissected by several north-south oriented draws.

c. Hydrology:

SCWRS project area: Receives surface water runoff and significant groundwater discharge. A perennial spring-fed stream is located just east of the project area. Groundwater influence is evident in southeast and central portions of the project area dominated by hardwood seepage swamp plant community.

Tanglewood project area: Surface water runoff from adjacent woodland and agricultural land. No water resources observed on site. Ephemeral draws drain to the south and southwest.

d. Vegetation: Plant Communities, Dominant Species & Invasives % Cover:

SCWRS project area: A complex of oak woodland (FDs37), oak forest (MHs37), and hardwood seepage swamp (WFs57a). Oak woodland and seepage swamp are intermixed in the western and southern portions of the project area, with areas of high-water table or discharge dominated by seepage communities. Oak forest is located along level areas adjacent to the St. Croix River. Dominant species are generally bur oak, red oak, and pin oak, with black ash dominating the seepage areas (Table 1 and Table 2). Cover in the understory ranged from 5-75% cover during the November site assessment. The most abundant native species were grasses included in the restoration seed mix. Invasive species cover was below 5%, with cover of 2-3-foot-tall buckthorn resprouts at 1-5%. Oak forest along the level terrace had less native understory establishment, potentially due to denser shade. In seepage areas where buckthorn removals were limited by sensitive soils, buckthorn cover was 5-50% and often consisted of mature individuals or resprouts greater than 6-foot tall.

Tanglewood project area: This project area consists of mostly oak woodland (FDs37) with an area of restored dry-mesic prairie (UPs13). Dominant canopy species include pin oak, bur oak, big-tooth aspen, and quaking aspen (Table 3). Cover in the understory ranged from 5-75% cover during the November site assessment. The most abundant native species were white snakeroot and grasses included in the restoration seed mix. Native understory establishment was less dense in some areas where the canopy was younger and denser, potentially due to increased shade. Invasive species cover was below 5%, with cover of 2-3-foot-tall buckthorn resprouts at 1-5%. Buckthorn cover sometimes exceeded 5% cover within steep areas of draws where forestry mulching access was likely limited. Native understory establishment was less dense in some areas where the canopy was younger and denser, potentially due to increased shade.

12. ***Is the plan based on current science?*** Yes

The project integrated aggressive buckthorn removal with reintroduction of ecological processes (prescribed fire) and multiple, diverse seedings to provide competition with buckthorn and fuel for prescribed fire. The project implemented adequate site preparation prior to native seeding and recognized the need for supplemental seeding based on the amount of aggressive re-sprout treatments

applied in the years following initial treatment. The project also adopted several different removal approaches depending on the landscape, severity of buckthorn invasion, and presence of native vegetation. The overall approach aligns with latest science and numerous case studies demonstrating that buckthorn removal alone is not enough to meet long-term restoration goals, and that persistent and specific removal strategies combined with reintroduction of ecological processes is necessary to achieve buckthorn reductions.

13. ***List indicators of project goals at this stage of project:***
    Buckthorn cover has been significantly reduced throughout the project area to less than 5% cover. Pre-project photos indicate the project areas were often 100% cover of mature buckthorn. Native vegetation cover has increased through combination of seeding, buckthorn removal, and prescribed burning.
14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***
    Yes, reduction of invasive species and increase in native species cover has been achieved via the proposed plan.
15. ***Are corrections or modifications needed to achieve proposed goals?***
    No.
16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***
    No specific management plan exists for future management, but Adam Heathcote of SCWRS indicated management is ongoing and planned. Challenges include preventing re-invasion by buckthorn and other non-natives, as well as re-establishing tree seedlings and conservative understory species. Opportunities to improve project goals and outcomes include continued use of prescribed fire and/or spot treatments to manage buckthorn regrowth at existing levels; supplemental planting and seeding of native trees and understory species; coordination with University of Minnesota “Cover it Up” researchers regarding site-specific results such as efficacy of deer fencing on native tree seedling recruitment; and hand removal of buckthorn from sensitive black ash seepage locations.
17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    Non-target effects of foliar spot-treatments must be weighed against need for buckthorn resprouts. In general, methods used to date have been effective at limiting resprouts while maintaining good native vegetation cover of seeded species.
18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    No.
19. ***Additional comments on the restoration project.***
    No.

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Exceeded the stated goals.
21. ***The project will:***
    Meet proposed outcomes.
    Confidence of outcome determination:
    High.
22. ***Provide explanation of reason(s) for determination.***
    Invasive species cover was less than 5% in primary project areas and dominated by native species in the understory, including many of the seeded grass species. The project exceeded stated goals based on the acreage expansion of the project area and additional seeding to further enhance native vegetation establishment.
23. ***Site Assessor(s) conducting field review:***

Jimmy Marty (EOR)

Site Maps, Project Plans or Vegetation Tables

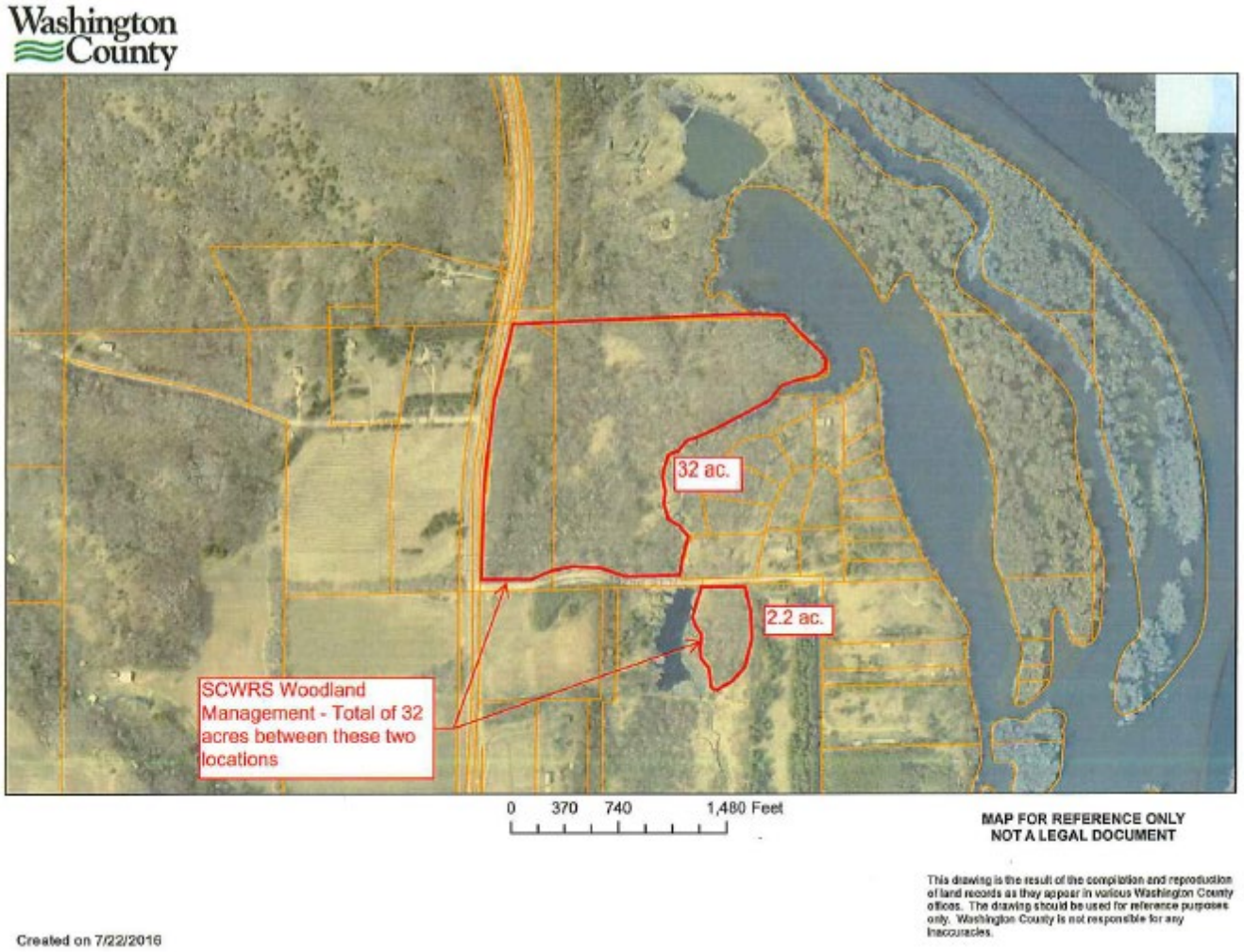


Figure 4 St. Croix Watershed Research Station (SCRWS) project area.

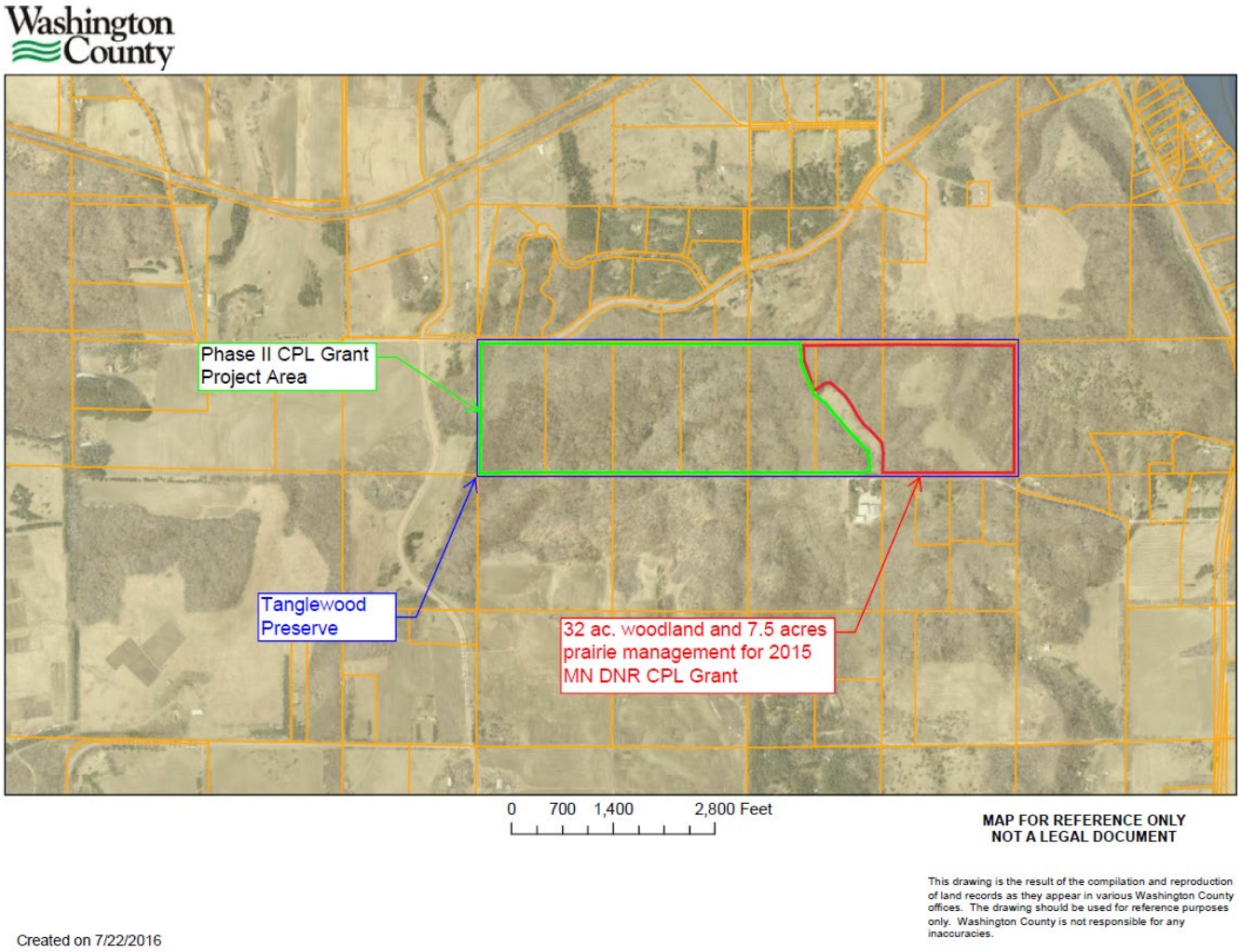


Figure 5. Tanglewood Preserve project area.

Table 6. Meander survey results, SCRWS project area, oak woodland/forest. Taxonomy follows DNR MNTaxa (2013). "cf." indicates uncertain identification. See Appendix A for planted seed mix species.

Scientific Name	Common Name	Cover Range	Species Planted/Seeded	Species Status
Acer saccharum	sugar maple	0-1	No	Native
Ageratina altissima	white snakeroot	1-5	No	Native
Alliaria petiolata	garlic mustard	0-1	No	Invasive
Athyrium filix-femina	lady fern	0-1	No	Native
Bromus pubescens	hairy woodland brome	5-25	Yes	Native
Carex cf. *blanda*	charming sedge	0-1	No	Native
Carex cf. *deweyana*	Dewey's sedge	0-1	No	Native
Carex pensylvanica	Pennsylvania sedge	0-1	No	Native
Carex rosea	starry sedge	0-1	No	Native
Elymus hystrix	bottlebrush grass	5-25	Yes	Native
Elymus cf. *villosus*	downy wild rye	0-1	No	Native
Elymus virginicus	Virginia wild rye	5-25	Yes	Native
Fraxinus nigra	black ash	1-5	No	Native
Galium aparine	cleavers	0-1	No	Native
Glechoma hederacea	creeping charlie	0-1	No	Invasive
Hackelia virginiana	Virginia stickseed	0-1	No	Native
Hesperis matronalis	dame's rocket	0-1	No	Invasive
Juniperus virginiana	eastern red cedar	0-1	No	Native
Leonurus cardiaca	common motherwort	0-1	No	Invasive
Matteuccia struthiopteris	ostrich fern	0-1	No	Native
Muhlenbergia cf. *mexicana*	Mexican muhly grass	5-25	Yes	Native
Osmorhiza claytonii	Clayton's sweet cicely	0-1	No	Native
Ostrya virginiana	ironwood	0-1	No	Native
Penstemon digitalis	foxglove beard tongue	0-1	Yes	Native
Potentilla sp.	cinquefoil sp.	0-1	No	Invasive
Prunus serotina	black cherry	1-5	No	Native
Prunus serotina seedling	black cherry seedling	0-1	No	Native
Quercus alba	white oak	1-5	No	Native
Quercus ellipsoidalis	northern pin oak	5-25	No	Native
Quercus macrocarpa	bur oak	5-25	No	Native
Quercus rubra	northern red oak	5-25	No	Native

Ranunculus cf. *abortivus*	kidney-leaved buttercup	0-1	No	Native
Rhamnus cathartica	common buckthorn	1-5	No	Invasive
Rubus occidentalis	black raspberry	0-1	No	Native
Solidago cf. *canadensis*	Canada goldenrod	0-1	No	Native
Symphyotrichum spp.	aster	0-1	No	Native
Thalictrum sp.	meadow-rue	0-1	Likely (*T. dasycarpum*)	Native
Ulmus americana	American elm	1-5	No	Native
Urtica dioica	stinging nettle	0-1	No	Invasive
Verbascum thapsus	common mullein	0-1	No	Invasive
Verbena urticifolia	white vervain	0-1	No	Native
Zizia aurea	golden alexanders	0-1	Yes	Native

Table 7. Meander survey results, SCRWS project area, hardwood seepage swamp areas. Taxonomy follows DNR MNTaxa (2013). "cf." indicates uncertain identification.

Scientific Name	Common Name	Cover Range	Species Planted/Seeded	Species Status
Angelica atropurpurea	angelica	1-5	No	Native
Athyrium filix-femina	lady fern	0-1	No	Native
Bolboschoenus fluviatilis	river bulrush	5-25	No	Native
Carex cf. *cristatella*	crested sedge	0-1	No	Native
Carex lacustris	lake sedge	25-50	No	Native
Dryopteris carthusiana	spinulose shield fern	0-1	No	Native
Epilobium sp.	willowherb sp.	0-1	No	Native
Fraxinus nigra	black ash	25-50	No	Native
Geum canadense	white avens	0-1	No	Native
Matteuccia struthiopteris	ostrich fern	0-1	No	Native
Rhamnus cathartica	common buckthorn	25-50	No	Invasive
Solidago gigantea	giant goldenrod	1-5	No	Native
Urtica dioica	stinging nettle	1-5	No	Invasive

Table 8. Meander survey results, Tanglewood project area, oak woodland. Taxonomy follows DNR MNTaxa (2013). "cf." indicates uncertain identification.

Scientific Name	Common Name	Cover Range	Species Planted/Seeded	Species Status
Achillea millefolium	common yarrow	0-1	No	Native
Agastache sp.	giant hyssop	0-1	Likely (*A. scrophulariaefolia*)	Native
Ageratina altissima	white snakeroot	5-25	No	Native
Bromus pubescens	hairy woodland brome	5-25	Yes	Native
Carduus nutans	nodding thistle	0-1	No	Invasive
Carex blanda	charming sedge	0-1	No	Native
Carex pensylvanica	Pennsylvania sedge	1-5	Yes	Native
Cirsium discolor	field thistle	0-1	No	Native
Elymus hystrix	bottlebrush grass	5-25	Yes	Native
Elymus virginicus	Virginia wild rye	1-5	Yes	Native
Fragaria virginiana	common strawberry	0-1	No	Native
Galium aparine	cleavers	0-1	No	Native
Monarda fistulosa	wild bergamot	0-1	Yes	Native
Muhlenbergia cf. *mexicana*	Mexican muhly grass	5-25	Yes	Native
Nepeta cataria	catnip	0-1	No	Invasive
Penstemon digitalis	foxglove beard tongue	0-1	Yes	Native
Poa pratensis	Kentucky bluegrass	0-1	No	Invasive
Populus deltoides	cottonwood	1-5	No	Native
Populus grandidentata	big-toothed aspen	5-25	No	Native
Populus tremuloides	quaking aspen	5-25	No	Native
Prunus serotina	black cherry	1-5	No	Native
Quercus ellipsoidalis	northern pin oak	5-25	No	Native
Quercus macrocarpa	bur oak	5-25	No	Native
Quercus rubra	northern red oak	1-5	No	Native
Rhamnus cathartica	common buckthorn	1-5	No	Invasive
Rubus occidentalis	black raspberry	0-1	No	Native
Rudbeckia hirta	black-eyed susan	0-1	Yes	Native
Scrophularia cf. *lanceolata*	early figwort	0-1	Yes	Native
Solidago cf. *canadensis*	Canada goldenrod	0-1	No	Native
Symphyotrichum cf. *ericoides*	heath aster	0-1	No	Native
Symphyotrichum spp.	aster	0-1	No	Native
Thalictrum sp.	meadow-rue	0-1	Likely (*T. dasycarpum*)	Native
Tilia americana	basswood	0-1	No	Native
Ulmus americana	American elm	1-5	No	Native
Zanthoxylum americanum	prickly ash	0-1	No	Native
Zizia aurea	golden alexanders	0-1	Yes	Native

SCWRS WDLND Seeding

SCWRS Woodland Seed Mix

Genus	Species	Common Name	Seeds/oz.	OZ./Ac.	Est. Seeds/SF
GRAMINOIDS					
Bromus	pubescens	Hairy Wood Chess	7600	16.7112	2.92
Elymus	hystrix	Bottlebrush Grass	7600	12.268	2.14
Elymus	virginicus	Virginia Wild Rye	4200	17.066	1.65
Muhlenbergia	mexicana	Leafy Satin Grass	175000	4	16.07
				GRAMINOID SUBTOTAL	22.77
FORBS					
Agastache	scrophulariaefolia	Purple Giant Hyssop	93000	0.2665	0.57
Aquilegia	canadensis	Columbine	38000	0.1813	0.16
Aster	drummondii	Drummond's Aster	80000	0.0105	0.02
Campanula	americana	Tall Bellflower	170000	0.0355	0.14
Gentiana	flavida	Cream Gentian	140000	0.1776	0.57
Heliopsis	helianthoides	Early Sunflower	6300	1.0667	0.15
Monarda	fistulosa	Wild Bergamot	70000	0.3555	0.57
Penstemon	digitalis	Foxglove Beardtongue	130000	1.0667	3.18
Rudbeckia	hirta	Black-eyed Susan	92000	1.06675	2.25
Rudbeckia	triloba	Brown-eyed Susan	34000	0.888	0.69
Scrophularia	lanceolata	Early Figwort	185000	1.06675	4.53
Thalictrum	dasycarpum	Purple Meadow Rue	11000	1.06675	0.27
Veronicastrum	virginicum	Culver's Root	800000	0.228	4.19
Zizia	aurea	Golden Alexanders	11000	1.77765	0.45
				SUBTOTAL	18.32
				TOTAL	41.10

Table 9. Image of woodland Seed Mix planted at Tanglewood project area.

Site Photographs

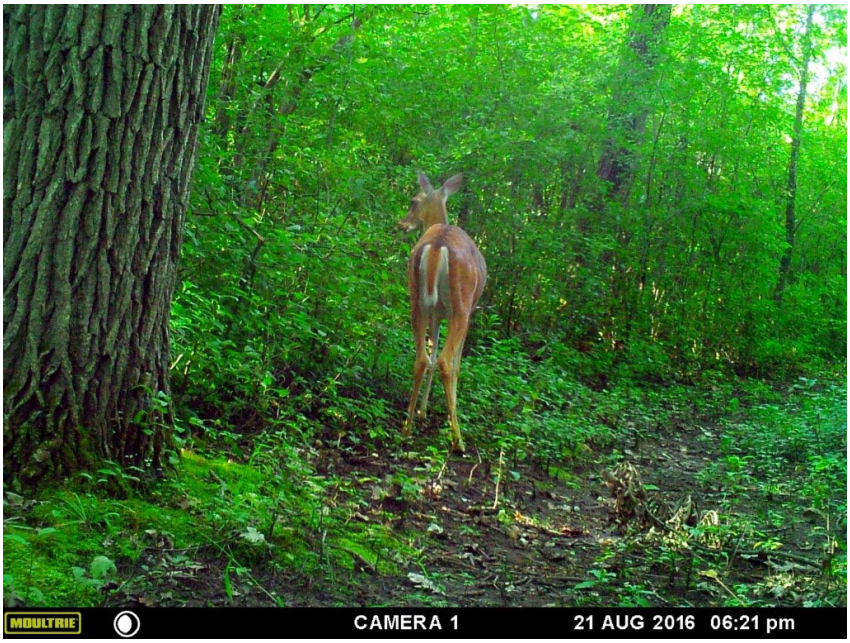


Photo 14. Trail camera image along trail within SCWRS project area prior to project (SCWRS project area, photo taken 8/21/2016).

Photo 15. Representative overview of SCWRS oak woodland project area with 25-50% cover of native seeded grasses and 5% cover of 2-foot tall buckthorn resprouts. (SCWRS project area, photo taken 11/3/2021).

Photo 16. Overview of SCWRS oak woodland project area border with wetter seepage area to the left. Transition to from native grass understory to buckthorn resprouts is clearly visible from right to left. (SCWRS project area, photo taken 11/3/2021).

Photo 17. Overview of SCWRS seepage project area with some 5-25% buckthorn cover and understory of lake sedge. (SCWRS project area, photo taken 11/3/2021).

Photo 18. Representative overview of Tanglewood project area with canopy of oak and aspen and understory of seeded native grasses with white snakeroot. Buckthorn cover is less than 5%. (Tanglewood project area, photo taken 11/3/2021).

Photo 19. Overview of Tanglewood project area along a steeper slope with similar understory establishment and buckthorn reduction to more level areas. (Tanglewood project area, photo taken 11/3/2021).

Photo 20. Overview of Tanglewood project area with younger age class of trees and less established native seeded grasses. (Tanglewood project area, photo taken 11/3/2021).

Photo 21. Overview of Tanglewood project area along parcel boundary. The right half of the image received no buckthorn treatment. The left half the image includes the proposed project. (Tanglewood project area, photo taken 11/3/2021).

5 Indian Mounds Forest Enhancement

Project Background

Project Name: Indian Mounds Forest Enhancement

Project Site: Indian Mounds Regional Park

Township/Range Section: Township 28N Range 22W Section 3 & 4

Project Manager / Affiliated Organization: Adam Robbins – City of St. Paul, Dept of Parks and Recreation

Fund: OHF - CPL ***Fiscal Year Funds:*** 2016

Project Start Date: 2016

Predominant Habitat type: Forest

Additional Habitat types: Prairie / Savana / Grassland

Project Status: Post Establishment Phase

County: Ramsey

Primary Activity: Forest Enhancement

Project Size: 60 acres

Project Completed: 2019

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Invasive woody species removal via hand removal (cut) and follow up foliar spray within 60 acres of project area; Figure 1); goat grazing of buckthorn within two areas (total 13.5 acres, 2017/2018; Figure 2); tree planting within canopy gaps and treatment areas; native understory seeding applied to goat grazing areas; prescribed woodland burn of eastern goat grazing areas (Figure 3); herbaceous invasive species control (foliar spray).
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Mounds Park Management Plan (2007); CPL Accomplishment Reports (2018 & 2019); CPL Restoration and Management Plan
3. ***What are the stated goals of the project?***

   High level goals are identified in the 2007 Mounds Park Management Plan:

   - *Clear shrubs in woodland area and return native savanna plants (Savanna Restoration)*
   - *Control invasive species and increase native diversity (Forest Restoration)*

- *Restore native oak savanna in areas dominated by non-natives (Expand Savanna)*

The project goals are to suppress buckthorn resprouting and regeneration through goat grazing, prescribed burning, and foliar treatments of herbaceous non-natives.

4. ***What are the desired outcomes of achieving the stated goals of the project?***
   Increase woodland species diversity, maintain the overstory hardwood canopy, maintain remnant native plant communities.

   From CPL Accomplishment Report: "*The Indian Mounds Regional Park Woodland Enhancement project will enhance and manage sixty acres of mesic oak woodland habitat (FDs37, MHs37), inclusive of seven acres of southern dry savanna (UPs14) and scattered wet mesic hardwood forest (MHs49) along the Mississippi River bluff within Indian Mounds Regional Park.*"
5. ***Were measures of restoration success identified in plans?*** No
6. ***Are plans available?*** Yes ***Have project maps been created?*** Yes
   If yes, provide in "site maps" and list maps provided:

   Figure 1. Project area.
   Figure 2. Goat grazing treatment areas.
   Figure 3. Prescribed burn within eastern goat grazing area.
   Figure 4. Amur cork trees mapped. No individuals were observed during the site assessment
7. ***Provide list of best management practices, standards, guidelines identified in plan set?***
   Accomplishment Report outlines best management practices:
   - Buckthorn removal using cut stump/herbicide treatments
   - Goat grazing as buckthorn suppression tool
   - Site preparation using prescribed fire
   - Supplemental seeding/planting of local native seed mix, trees and shrubs in woodland areas

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   No
9. ***In what ways did alterations change the proposed project outcome?***
   None

Site Assessment

Field Review Date: 10/17/2022

Field Visit Attendees: Wade Johnson – MNDNR; Keegan Lund – MNDNR; Adam Robbins - City of St. Paul, Dept of Parks and Recreation; Patrick Williamson - City of St. Paul, Dept of Parks and Recreation; Jimmy Marty – Emmons & Olivier Resources, Inc.

10. ***Surrounding Landscape Characteristics:***

The surrounding landscape consists of urban residential, parks and open space, railroad corridor, and roadways

11. Site Characteristics:

a. Soil Series:

Mahtomedi-Kingsley complex, 25-40% slopes (896F); Mahtomedi-Kingsley complex, 12-25% slopes (896D); Kingsley sandy loam, 6-12% slopes (342C); Udorthents, wet substratum (1027)

Dominant textures include sandy loam, loamy sand, and sand

Source: Web Soil Survey

b. Topography:

Topography primarily consists of relatively steep bluffs and hillslopes dissected by several ridges and draws. Aspect is predominantly south-facing with east/west variability along draws. Elevation ranges from approximately 890 feet above mean sea level (amsl) at the top of the slopes near Mounds Boulevard to 730 feet amsl at the toe of the slope along Warner Road.

c. Hydrology:

The project area receives stormwater discharge from urban land use to the north. Draws/ravines of the project area discharge generally south toward the Mississippi River. No groundwater discharge was observed during the field assessment though the 2007 management plan/inventory noted presence of seeps at the base of the slopes. The only surface water basin is an open water area at the base of the slope along Warner Road.

d. Vegetation: Plant Communities, Dominant Species & Invasives % Cover:

Based on review of the 2007 management plan and meander survey results, plant communities comprise a mosaic of disturbed deciduous woodland along with native plant communities of FDs37 - Southern Dry-Mesic Oak (Maple) Woodland, MHs37 – Southern Dry-Mesic Oak Forest, UPs14 – Southern Dry Savanna, and MHs49 – Southern Wet-Mesic Hardwood Forest. Dominant canopy species in woodland areas include northern red oak, white oak, bur oak, pin oak, and eastern cottonwood (Table 1 and Table 2). Northern red oak, white oak, and eastern cottonwood are also canopy dominants in the dry-mesic forest areas (Table 3). Common buckthorn dominates the understory in most woodland/forest areas. Western areas and those that did not receive multiple treatments (combination of goat grazing, chemical treatment, and/or prescribed fire) frequently had buckthorn cover of 75-100%. Areas with most effective treatment/better initial site condition had 5-25% buckthorn cover, with localized areas of less than 5% cover and areas with greater than 50% cover. Incidental species observations in UPs14 and disturbed deciduous woodland areas are provided in Table 4.

12. *Is the plan based on current science?* Yes

At the time (2016), goat grazing was an emerging practice for woody invasive control. Implementation recommendations have since been refined to more targeted and integrated applications such as combination with multiple foliar sprays and frequent prescribed burning. The project likely did not integrate sufficient follow-up treatments in most areas based on the amount or regrowth.

13. List indicators of project goals at this stage of project:

No quantitative measures are tracked. Though buckthorn remains an understory dominant or co-dominant in many areas, most other woody invasives historically noted as issues at the site (exotic honeysuckle, black locust) are at low density or were not observed (Amur cork). Few large mature buckthorn individuals remain within the project site. Buckthorn cover has been reduced within eastern goat grazing areas and the understory is frequently dominated by a mix native vegetation with low buckthorn cover. Notably, the eastern goat grazing area is more accessible to hand crews and was

burned, and this combination may have resulted in more effective treatment. The eastern goat grazing area may have also been in better initial site condition and was burned by a wildfire prior to the CPL grant.

14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***
    The project has advanced the site along a trajectory of woodland enhancement. Continued woody invasive management is necessary. In areas of good buckthorn control (5-50% cover), the project has made implementation of other management tools (e.g. brush mowing) and ecological processes (e.g. prescribed fire) more feasible.
15. ***Are corrections or modifications needed to achieve proposed goals?***
    Continued woody invasive management is necessary to achieve the goals of suppressing buckthorn.
16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***
    Yes, though no specific management plan exists beyond general guidance provided in the 2007 management plan. Use of a drone brush mower along with continued chemical treatments and prescribed fire were discussed by the site managers during the site assessment. The project would benefit from assigning specific goals and priorities for the project area to best direct resources so that follow up management can efficiently advance the site along a trajectory toward less invasive species cover and increased native plant diversity.
17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No
18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    No
19. ***Additional comments on the restoration project.***
    No

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Minimally achieved the stated goals.
21. ***The project will:***
    Minimally meet proposed outcomes.
    Confidence of outcome determination:
    Medium.
22. ***Provide explanation of reason(s) for determination.***
    Considering that initial site conditions were highly degraded and dominated by mature woody shrubs, the project is minimally meeting the stated goals of enhancing woodlands through invasive species removal and increased native plant diversity. The initial actions temporarily accomplished invasive

removal and reduced invasive cover of mature buckthorn so that other management tools are more feasible. For example, the east goat grazing area has met stated goals of reduced invasive cover through combination of hand removal, goat grazing, follow up chemical treatment, and prescribed fire. Other woody invasives such as black locust, exotic honeysuckle, and Amur cork appear to have been adequately controlled. However, a large portion of the site remains dominated by re-sprouted buckthorn as the project was unable to implement sufficient follow-up management. Meeting proposed outcomes will rely on multiple consecutive years of invasive management (specifically buckthorn) with herbicide and continued reintroduction of fire or best available analogs (given the urban location of the site) such as brush mowing and goat grazing.

23. ***Site Assessor(s) conducting field review:***

Jimmy Marty – EOR

Site Maps, Project Plans or Vegetation Tables

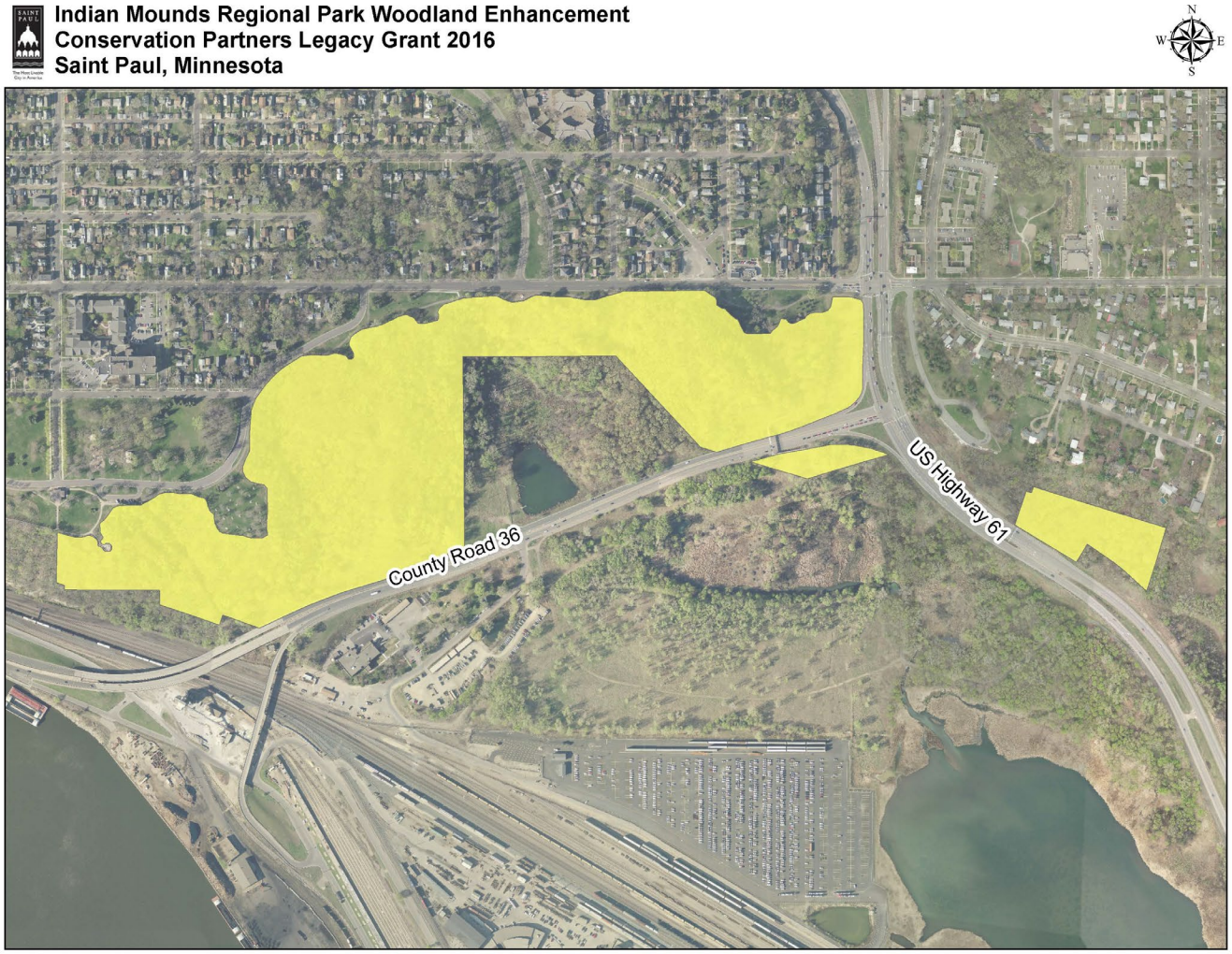


Figure 6. Project area.

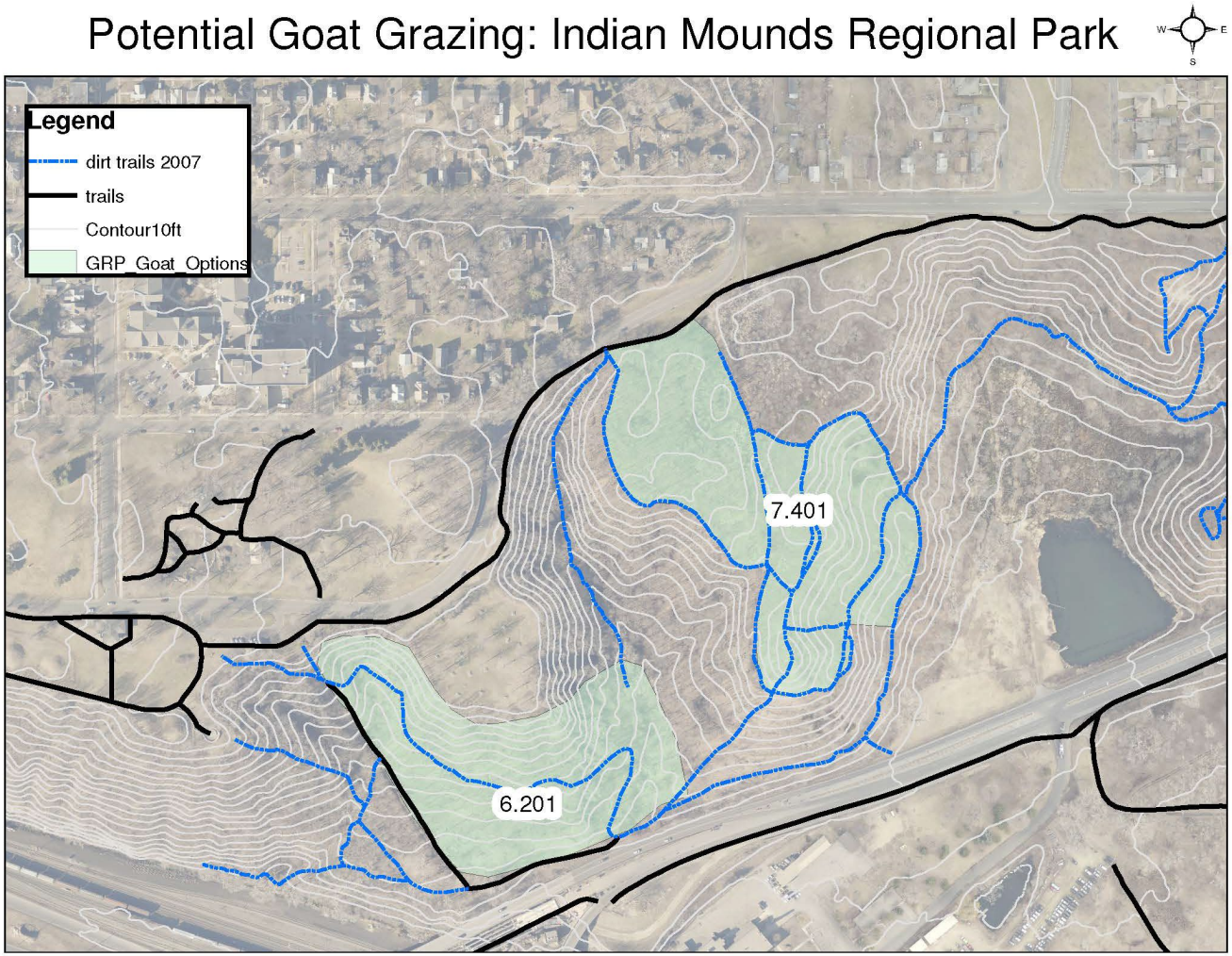


Figure 7. Goat grazing treatment areas.

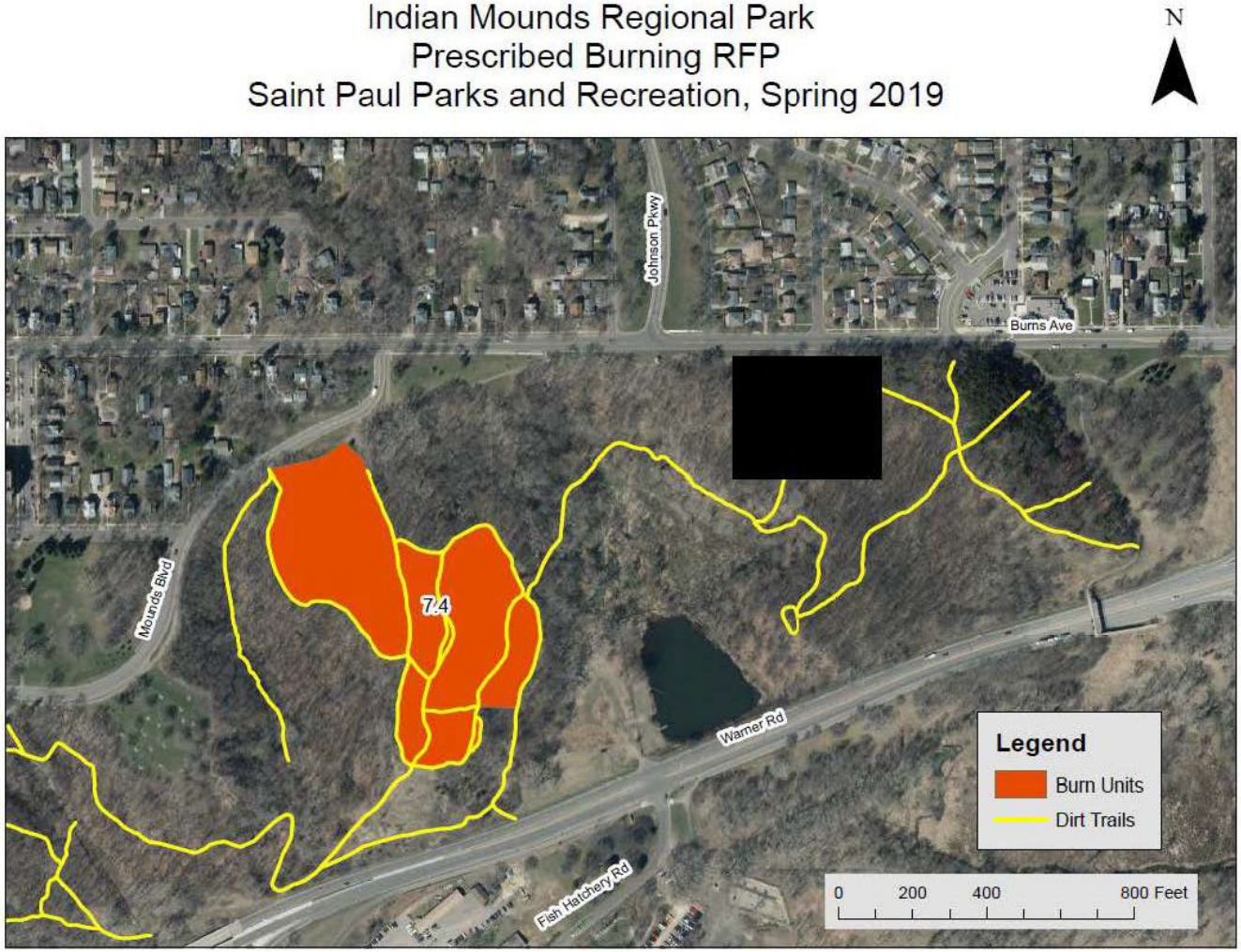


Figure 8. Prescribed burn within eastern goat grazing area.

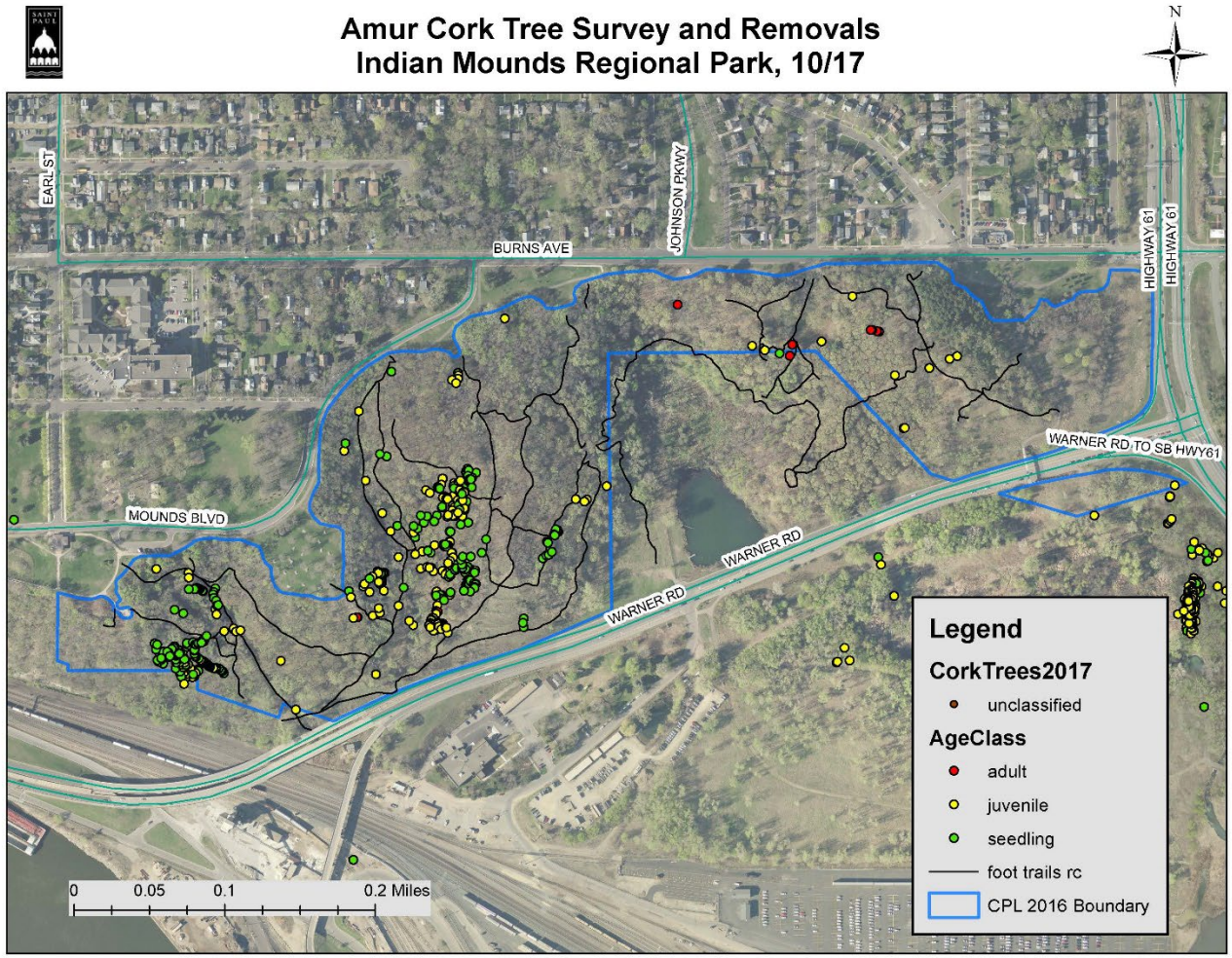


Figure 9. Amur cork trees mapped. No individuals were observed during the site assessment

Table 10. Meander survey results, west goat grazing area, FDs37. Taxonomy follows DNR MNTaxa (2013). "cf." indicates uncertain identification.

Scientific Name	Common Name	Cover Range	Species Status
Acer negundo	box elder	1-5	Native
Ageratina altissima	white snakeroot	1-5	Native
Andropogon gerardii	big bluestem	0-1	Native
Arctium minus	common burdock	1-5	Invasive
Carex blanda	charming sedge	0-1	Native
Carex pensylvanica	Pennsylvania sedge	1-5	Native
Catalpa speciosa	cigar tree	0-1	Non-native
Celtis occidentalis (saplings)	hackberry	1-5	Native
Celtis occidentalis (subcanopy)	hackberry	0-1	Native
Elymus hystrix	bottlebrush grass	0-1	Native
Elymus virginicus	Virginia wild rye	0-1	Native
Erigeron annuus	annual fleabane	0-1	Native
Geum canadense	white avens	1-5	Native
Hydrophyllum virginianum	Virginia waterleaf	0-1	Native
Juglans nigra	black walnut	0-1	Native
Leonurus cardiaca	common motherwort	0-1	Invasive
Muhlenbergia sp.	muhly grass	0-1	Native
Parthenocissus quinquefolia	Virginia creeper	0-1	Native
Persicaria virginiana	Virginia knotweed	5-25	Native
Populus deltoides	cottonwood	5-25	Native
Quercus alba	white oak	5-25	Native
Quercus ellipsoidalis	northern pin oak	25-50	Native
Quercus macrocarpa	bur oak	1-5	Native
Quercus rubra	northern red oak	5-25	Native
Quercus spp. (seedlings)	red/pin/white oak	0-1	Native
Rhamnus cathartica	common buckthorn	75-100	Invasive
Ribes missouriense	Missouri gooseberry	0-1	Native
Robinia pseudoacacia	black locust	0-1	Invasive
Rubus spp.	raspberry	1-5	Native
Sambucus sp.	elder	0-1	Native
Solidago cf. *canadensis*	Canada goldenrod	0-1	Native
Solidago flexicaulis	zigzag goldenrod	0-1	Native
Solidago gigantea	giant goldenrod	0-1	Native
Symphyotrichum cf. *cordifolium*	heart-leaved aster	0-1	Native
Symphyotrichum cf. *lateriflorum*	side-flowering aster	0-1	Native
Toxicodendron rydbergii	western poison ivy	0-1	Native
Ulmus americana	American elm	1-5	Native
Ulmus pumila	Siberian elm	0-1	Invasive
Vitis riparia	wild grape	0-1	Native

Table 11. Meander survey results, east goat grazing area, FDs37. Taxonomy follows DNR MNTaxa (2013). "cf." indicates uncertain identification.

Scientific Name	Common Name	Cover Range	Species Status
Agrimonia sp.	agrimony	0-1	Native
Amphicarpaea bracteata	hog peanut	0-1	Native
Anemone cylindrica	long-headed thimbleweed	0-1	Native
Arctium minus	common burdock	0-1	Invasive
Berberis thunbergii	Japanese barberry	0-1	Invasive
Bromus ciliatus	fringed brome	0-1	Native
Carex blanda	charming sedge	0-1	Native
Carex pensylvanica	Pennsylvania sedge	5-25	Native
Celtis occidentalis	hackberry	0-1	Native
cf. *Triosteum* sp.	horse gentian	0-1	Native
Cornus racemosa	gray dogwood	0-1	Native
Elymus canadensis	nodding wild rye	0-1	Native
Elymus hystrix	bottlebrush grass	0-1	Native
Eutrochium purpureum	sweet-scented Joe pye weed	0-1	Native
Galium boreale	northern bedstraw	1-5	Native
Helianthus strumosus	woodland sunflower	0-1	Native
Hesperis matronalis	dame's rocket	0-1	Invasive
Juniperus virginiana	eastern red cedar	0-1	Native
Leersia virginica	white grass	0-1	Native
Leonurus cardiaca	common motherwort	0-1	Invasive
Monarda fistulosa	wild bergamot	0-1	Native
Muhlenbergia sp.	muhly grass	0-1	Native
Parthenocissus quinquefolia	Virginia creeper	1-5	Native
Persicaria virginiana	Virginia knotweed	0-1	Native
Populus deltoides	cottonwood	1-5	Native
Prunus serotina	black cherry	1-5	Native
Prunus virginiana	chokecherry	1-5	Native
Quercus alba	white oak	5-25	Native
Quercus ellipsoidalis	northern pin oak	5-25	Native
Quercus macrocarpa	bur oak	5-25	Native
Quercus rubra	northern red oak	5-25	Native
Quercus spp. (seedlings)	red/pin/white oak	0-1	Native
Rhamnus cathartica	common buckthorn	25-50	Invasive
Ribes cynosbati	prickly gooseberry	0-1	Native
Ribes missouriense	Missouri gooseberry	0-1	Native
Smilax sp.	carrion flower	0-1	Native
Symphoricarpos sp.	snowberry	1-5	Native
Symphyotrichum cf. *cordifolium*	heart-leaved aster	0-1	Native
Symphyotrichum cf. *lateriflorum*	side-flowering aster	0-1	Native
Tilia americana	basswood	1-5	Native
Veronicastrum virginicum	Culver's root	0-1	Native

Viburnum lentago	nannyberry	0-1	Native

Table 12. Meander survey results, MHs37 between goat grazing areas. Taxonomy follows DNR MNTaxa (2013). "cf." indicates uncertain identification.

Scientific Name	Common Name	Cover Range	Species Status
Acer saccharum	sugar maple	0-1	Native
Alliaria petiolata	garlic mustard	0-1	Invasive
Arctium minus	common burdock	1-5	Invasive
Carex blanda	charming sedge	0-1	Native
Carex pensylvanica	Pennsylvania sedge	1-5	Native
Carya cordiformis	bitternut hickory	0-1	Native
Celtis occidentalis	hackberry	0-1	Native
Eutrochium purpureum	sweet-scented Joe pye weed	0-1	Native
Hesperis matronalis	dame's rocket	0-1	Invasive
Hydrophyllum virginianum	Virginia waterleaf	0-1	Native
Leonurus cardiaca	common motherwort	0-1	Invasive
Parthenocissus quinquefolia	Virginia creeper	1-5	Native
Persicaria virginiana	Virginia knotweed	0-1	Native
Populus deltoides	cottonwood	25-50	Native
Prunus serotina	black cherry	5-25	Native
Prunus virginiana	chokecherry	1-5	Native
Quercus alba	white oak	5-25	Native
Quercus rubra	northern red oak	5-25	Native
Rhamnus cathartica	common buckthorn	5-25	Invasive
Ribes cynosbati	prickly gooseberry	0-1	Native
Ribes missouriense	Missouri gooseberry	0-1	Native
Symphyotrichum cf. *cordifolium*	heart-leaved aster	0-1	Native
Tilia americana	basswood	5-25	Native
Ulmus americana	American elm	1-5	Native
Viburnum lentago	nannyberry	0-1	Native
Viburnum trilobum	highbush cranberry	0-1	Native
Vitis riparia	wild grape	0-1	Native
Zanthoxylum americanum	prickly ash	0-1	Native

Table 13. Incidental plant species observations from UPs14 and disturbed deciduous forest. Taxonomy follows DNR MNTaxa (2013). “cf.” indicates uncertain identification.

Scientific Name	Common Name	Species Status
Amorpha canescens	leadplant	Native
Bouteloua curtipendula	side-oats grama	Native
Bromus inermis	smooth brome	Invasive
Campanula americana	tall bellflower	Native
Celastrus orbiculatus	Asian bittersweet	Invasive
Cynoglossum officinale	hound's tongue	Invasive
Dichanthelium sp.	panic grass	Native
Gleditsia triacanthos	honey locust	Non-native
Hesperostipa spartea	porcupine grass	Native
Menispermum canadense	Canada moonseed	Native
Poa pratensis	Kentucky bluegrass	Invasive
Rhus spp.	sumac	Native
Schizachyrium scoparium	little bluestem	Native
Sorghastrum nutans	Indian grass	Native

Site Photographs

Photo 22 West goat grazing area with moderate treatment efficacy (25-50% buckthorn cover) in foreground and 75-100% buckthorn cover farther upslope where rubble dumping/poor footing may have limited accessibility (Indian Mounds Regional Park, photo taken during site visit 10/17/2022).

Photo 23 Small area within west goat grazing area with understory dominated by jumpseed (*Persicaria virginiana*). (Indian Mounds Regional Park, photo taken during site visit 10/17/2022).

Photo 24 West goat grazing area where re-sprouted buckthorn cover is 100%. (Indian Mounds Regional Park, photo taken during site visit 10/17/2022).

Photo 25 Overview of east goat grazing area where prescribed burn was completed. Buckthorn resprouts are more variable. The foreground is dominated by native species such as Pennsylvania sedge, snowberry (*Symphoricarpos* sp.), and aster (*Symphyotrichum* sp.). The background is co-dominated with 25-50% cover of buckthorn. (Indian Mounds Regional Park, photo taken during site visit 10/17/2022).

Photo 26 Overview of east goat grazing area where prescribed burn was completed. Re-sprouted buckthorn comprises 50-75% cover. (Indian Mounds Regional Park, photo taken during site visit 10/17/2022).

Photo 27 Looking approximately south along the boundary of the goat grazing/prescribed burn treatment area. The area to the left was grazed, chemically treated (by roving hand crew), and burned; the area to the right only received chemical treatment by roving handing crew. (Indian Mounds Regional Park, photo taken during site visit 10/17/2022).

6 Agassiz Lowlands Prairie Enhancement

Project Background

Project Name: Agassiz Lowlands Prairie Enhancement

Project Site: Lake of the Woods High School

Township/Range Section: Township 160N Range 31W Section 4

Project Manager / Affiliated Organization: Jenny Moorman (LOW High School retired educator), Corryn Trask (LOW SWCD)

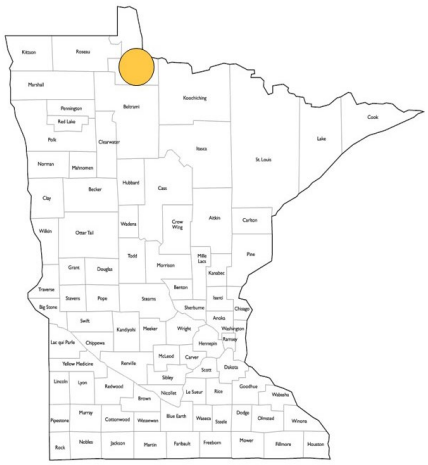
Fund: OHF - CPL ***Fiscal Year Funds:*** 2012

Project Start Date: 3/31/2012

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Wetland , Forest

Project Status: Post Establishment Phase



County: Lake of the Woods

Primary Activity: Prairie Enhancement

Project Size: 32 acres

Project Completed: 6/15/2014

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Narrative description from CPL Accomplishment Plan:
   "The 32-acre site was sheared to remove the over-mature brush canopy. The prescribed burn was initially done in May of 2013. However, due to changing weather conditions, the initial burn was less than successful in removing anticipated undergrowth. The committee decided to re-shear the acreage and set up a prescribed burn schedule."
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   CPL Accomplishment Plan
   Aerial DNR Site Map
3. ***What are the stated goals of the project?***
   Reduce woody species through brush shearing.
4. ***What are the desired outcomes of achieving the stated goals of the project?***
   Maintain open grassland habitat to benefit key species such as sharp-tailed grouse and short-eared owl.
5. ***Were measures of restoration success identified in plans?*** *No*

6. ***Are plan Sets available?*** Yes ***Have project maps been created?*** Yes
   If yes, provide in "site maps" and list maps provided:
   Aerial DNR Site Map
7. ***Provide list of best management practices, standards, guidelines identified in plan set?***
   No best management practices were outlined in the plans however brush shearing is an effective practice to initially remove woody species. However, without prescribed fire and/or herbicides to provide long term suppression of woody species (willow, aspen, balsam poplar) the duration of the shearing efforts will be temporary and require continual removal efforts.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   Yes
   A second brush shearing was conducted in 2013 as the initial prescribed burn was unsuccessful.
9. ***In what ways did alterations change the proposed project outcome?***
   As stated above a longer-term management practice to suppress woody species in this grassland system is needed such as the incorporation of fire or herbicides.

Site Assessment

Field Review Date: 8/30/2022

Field Visit Attendees: Wade Johnson - MNDNR, Keegan Lund - MNDNR, Corryn Trask – LOW SWCD, Chad Severts - BWSR

10. ***Surrounding Landscape Characteristics:***
    Deciduous forest to the north and west. Agricultural row crops across County Road 35 to the south.
11. ***Site Characteristics:***
    a. ***Soil Series:***
    Percy fine sandy loam (95.8%), Roliss loam, depressional (4.2%) – source: Web Soil Survey
    b. ***Topography:***
    Generally flat.
    c. ***Hydrology:***
    Flat sandy uplands with patches of Type 2 and Type 6 wetlands.
    d. ***Vegetation: Plant Communities, Dominant Species & Invasives % Cover:***
    Upland grassland and forb communities interspersed with willow, poplar, and dogwood clumps in more low-lying areas.
12. ***Is the plan based on current science?*** Yes
    Management goals of achieving more open grassland communities through brush shearing is an accepted practice.
13. ***List indicators of project goals at this stage of project:***

Predominant cover on the site is open grass and forb species with intermittent woody vegetation. The woody vegetation has been significantly reduced from prior conditions as is evident in the before and after aerial photos from the brush shearing effort (See Figures 2 & 3 below).

14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***
    Yes, however ongoing control of woody species is needed to maintain this site as an open grassland.
15. ***Are corrections or modifications needed to achieve proposed goals?***
    Yes, woody species will require more intensive control efforts to significantly reduce encroachment over time.
16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***
    One potential improvement to control efforts alongside intermittent shearing would be incorporating prescribed fire to set back woody species and encourage grasslands species to become more dominant. Another consideration to control woody species more effectively may be through selective herbicides targeting woody vegetation. This property is owned by the Lake of the Woods School District, and they may require the assistance of project partners (DNR Wildlife and Lake of the Woods SWCD) to achieve long term management goals.
17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No
18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    No
19. ***Additional comments on the restoration project.***
    Partnerships that consider the long-term control of woody species will be essential to maintain this habitat complex in grassland cover.

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Achieved the stated goals.
21. ***The project will:***
    Minimally meet proposed outcomes.
    Confidence of outcome determination:
    Medium.
22. ***Provide explanation of reason(s) for determination.***
    The goal of woody species cover reduction on the site was accomplished by the 2 brush shearings. This project was begun by an educator with LOW School District who has since retired. She was able to leverage local partnerships to complete the brush shearings on this site. Without ongoing supervision and management, this site will likely revert to a woody species dominant habitat.

23. Site Assessor(s) conducting field review:

Wade Johnson - MNDNR, Keegan Lund - MNDNR

Site Maps, Project Plans or Vegetation Tables

Figure 10. Aerial image before brush shearing from DNR Wildlife, 6/2011. Project site is denoted by the red boundary (Agassiz Lowlands Grassland Enhancement).

Figure 2. Google Earth image one year *before* the first brush shearing event (dated 4/2011). Note the site is dominated by woody vegetation with some open grassland areas (Agassiz Lowlands Grassland Enhancement).

Figure 3. Google Earth image (dated 9/2014) showing site *after* second brush shearing event. Note the site is open and largely devoid of woody species (Agassiz Lowlands Grassland Enhancement).

Table 14. Vegetation table from plant meander survey during site visit on 8/30/2022.

Scientific Name	Common name	Cover Range %	Species Status
Agrostis gigantea	redtop	5-25	Non-native
Apocynum androsaemifolium	spreading dogbane	5-25	Native
Asclepias incarnata	marsh milkweed	1-5	Native
Asclepias syriaca	common milkweed	5-25	Native
Bromus inermis	smooth brome	5-25	Invasive
Carex lacustris	lake sedge	5-25	Native
Carex spp.	sedge	5-25	Native
Castilleja coccinea	Indian paintbrush	1-5	Native
Conyza canadensis	Canadian horseweed	5-25	Native
Cornus sericea	Red osier dogwood	5-25	Native
Doellingeria umbellata	flat-topped aster	1-5	Native
Elymus repens	quackgrass	5-25	Invasive
Equisetum pratense	meadow horsetail	1-5	Native
Eutrochium maculatum	joe-pye weed	0-1	Native
Fragaria virginiana	wild strawberry	1-5	Native
Frangula alnus	glossy buckthorn	1-5	Invasive
Lotus corniculatus	birds-foot trefoil	1-5	Invasive
Lycopus americanus	American water horehound	0-1	Native
Medicago sativa	alfalfa	5-25	Non-native
Melilotus alba	white sweet clover	5-25	Invasive
Phalaris arundinacea	reed canary grass	5-25	Invasive
Phleum pratense	timothy	5-25	Non-native
Poa compressa	Canada bluegrass	5-25	Non-native
Populus balsamifera	balsam poplar	5-25	Native
Prunella vulgaris	self heal	5-25	Native
Salix bebbiana	Bebb's willow	50-75	Native
Salix discolor	pussy willow	5-25	Native
Salix interior	sandbar willow	5-25	Native
Solidago canadensis	Canada goldenrod	5-25	Native
Solidago gigantea	giant goldenrod	5-25	Native
Solidago speciosa	showy goldenrod	1-5	Native
Sonchus arvensis	perennial sowthistle	5-25	Non-native
Symphyotrichum lanceolatum	panicled aster	1-5	Native
Symphyotrichum lateriflorum	calico aster	1-5	Native
Symphyotrichum oolentangiense	sky blue aster	0-1	Native
Trifolium pratense	red clover	1-5	Non-native

Site Photographs

Photo 1. Looking north from County Hwy 35 at the project site showing largely 50-75% grassland cover (Agassiz Lowlands Grassland Enhancement, photo taken during site visit 8/30/2022).

Photo 2. Looking north midway through the site meander survey showing 75-100% grassland cover, indicating high success in this area from the brush shearing (Agassiz Lowlands Grassland Enhancement, photo taken during site visit 8/30/2022).

Photo 3. Looking northeast at the end of the site meander survey showing 25-50% grassland cover but dominated by willow species (Agassiz Lowlands Grassland Enhancement, photo taken during site visit 8/30/2022).

Photo 4. Close-up photo of goldenrods. Approximately 30 different grass and forb species identified during the vegetation meander survey including 11 nonnative species (Agassiz Lowlands Grassland Enhancement, photo taken during site visit 8/30/2022).

Photo 5. Looking northeast off Hwy 35 during the site visit with BWSR and Lake of the Woods SWCD staff (Agassiz Lowlands Grassland Enhancement, photo taken during site visit 8/30/2022).

7 East Haul and Oxcart Unit Fencing - Conservation Grazing

Project Background

Project Name: East Haul and Oxcart Unit Fencing for Conservation Grazing

Project Site: Glacial Ridge NWR

Township/Range Section: Township 149N Range 44W Section 24

Project Manager / Affiliated Organization: Benjamin Walker/USFWS, Travis Issendorf/TNC

Fund: OHF ***Fiscal Year Funds:*** 2018

Project Start Date: 2019

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types:

Project Status: Post Establishment Phase

County: Polk

Primary Activity: Prairie Enhancement

Project Size: 1084 acres

Project Completed: April 2020

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

24. What are the specific project components and treatments?

Installation of fencing for livestock to bring more acreage within the Glacial Ridge National Wildlife Refuge (NWR) into conservation grazing practices.

Narrative description from Glacial Ridge National Wildlife Refuge project description:

These projects *"expanded the Refuge's grazing capability through the installation of a 3-strand barbed fence, using steel T-posts, wood corners and H-braces, as well as steel/wood gates."*

25. What plans / record of project decisions / prescription worksheets are available? Provide location for the data?

Glacial Ridge National Wildlife Refuge Project Description document
Glacial Ridge National Wildlife Refuge Habitat Management Plan
CPL Accomplishment Report

26. What are the stated goals of the project?

Utilize grazing as a disturbance regime within the NWR, specifically in those units where prescribed fire is difficult to implement.

Narrative description from Glacial Ridge National Wildlife Refuge Habitat Management Plan:

5.2.2 Management Strategies

As mentioned above, grassland species of the northern tallgrass prairie evolved under periodic disturbance and defoliation from fire and large, grazing ungulates (i.e., elk, bison). Grazing can create a more diverse vegetation structure than is normally possible with mowing or burning; cattle have uneven grazing patterns related to factors like the distribution of preferred and unpalatable plants. Grazing can be used to reduce litter build-up, stimulate desired plant species, control invasive species, and reduce vegetation height and density. Grazing can also control Canada thistle, sweetclover, and some shrubs. Livestock may even serve as dispersal agents of native seeds, thereby creating patches of desirable plants (Archer and Pyke 1991). Furthermore, cattle will consume early growing cattail and break down residual vegetation through hoof action. Cattail control is most effective when the cattle are confined to the wetland area of interest.

Ideally, we would use prescribed grazing in combination with prescribed fire. Historically, herds of bison and other grazing ungulates would follow fires because of the highly palatable and nutritious vegetation that grows immediately after a burn. This is not always feasible, usually because of logistical issues such as a lack of cattle in the area, poor fence, or no access to water. In other situations, grazing is the only feasible management option (e.g., when prescribed fire is not safe or access is difficult).

27. What are the desired outcomes of achieving the stated goals of the project?

Restore a diverse native grass and forb plant community in previously farmed and ranched landscapes, improve habitat for game and non-game species, increase plant and wildlife diversity on the landscape.

28. ***Were measures of restoration success identified in plans?*** *Yes*

If yes, list specific measurements.

Broad habitat management goals (as stated in question 3 above) outline measures of restoration success in prairie systems throughout the broader Glacial Ridge National Wildlife Refuge.

29. ***Are plan Sets available?*** Yes ***Have project maps been created?*** Yes

If yes, provide in "site maps" and list maps provided:

- Figure 1. Glacial Ridge National Wildlife Refuge project map (USFWS Map)
- Figure 2. East Haul fencing schematic (TNC/USFWS Map)
- Figure 3. Oxcart fencing schematic (TNC/USFWS Map)

30. Provide list of best management practices, standards, guidelines identified in plan set?

There was no plan set developed for this project. However, the NWR Habitat Management Plan outlines a series of disturbance-based management regimes to implement on the landscape including conservation grazing. Conservation grazing, if implemented effectively, is an effective tool to reduce grassland litter, control invasive species and stimulate the growth of certain native prairie species.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

31. ***Were alterations made to the plan during project implementation?***
    No
32. ***In what ways did alterations change the proposed project outcome?***
    NA

Site Assessment

Field Review Date: 10/26/2022

Field Visit Attendees: Keegan Lund – MNDNR, Benjamin Walker – USFWS, Alexandra Wardwell – Audubon, Travis Issendorf – TNC

33. ***Surrounding Landscape Characteristics:***

    Glacial Ridge National Wildlife Refuge (NWR) is in the Tallgrass Aspen Parklands of MN and contains approximately 5,000 acres of remnant prairie and savanna and approximately 20,000 acres that have been restored from marginal cropland to native grassland communities. The East Haul and Oxcart Unit reside within the NWR and historically was ditched agricultural and/or grazed pasture before acquisition of the land and restoration efforts began. The surrounding landscape consists of lowland and upland grasslands and cattail marshes.

34. ***Site Characteristics:***
    a. ***Soil Series:***

    Dominant textures include Hedman-Fram complex (0-3% slopes), Strathcona fine sandy loam (0-1% slopes), Rosewood fine sandy loam, Aspen Parkland (0-1% slopes), Hedman loam (0-2% slopes) Fram loam (1-3% slopes)

    Source: Web Soil Survey

    b. ***Topography:***

    Topography of the Glacial Ridge NWR is overall flat with elevation ranging from 373 meters above sea level in the southern portion to 357 meters at Maple Lake. Site conditions visited on the Oxcart and East Haul Unit were flat.

    c. ***Hydrology:***

    No specific sources of surface water or open water features were noted during the site visit other than a historic drainage ditch (Judicial Ditch 66) that bisected the East Haul Unit. A small northern portion of the East Haul Unit and the southern portion of the Oxcart Unit were cattail marshes.

    d. ***Vegetation: Plant Communities, Dominant Species & Invasives % Cover:***

    The project area is dominated by cool season/invasive grasses interspersed with native grasses and forbs. Native grass species observed during the survey included Indian grass, little bluestem, side-

oats grama, prairie dropseed and big bluestem. Very sparse woody species (willows and cottonwoods) were observed during the site visit.

35. ***Is the plan based on current science?*** Yes

    Conservation grazing, if implemented effectively, is an effective tool to reduce grassland litter, control invasive species and stimulate the growth of certain native prairie species.

36. ***List indicators of project goals at this stage of project:***

    Very few woody species were observed during the site visit. However, the site is dominated by cool season invasive grasses (smooth brome, reed canary grass, Kentucky bluegrass). The project host noted that the stocking rate of cattle was too low in 2022. In addition, cattle were likely introduced onto the landscape too late to provide tangible reductions in the cool season grasses.

37. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***

    Yes, the project plan of installing fencing to provide the capacity for conservation grazing is reasonable.

38. ***Are corrections or modifications needed to achieve proposed goals?***

    No.

39. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***

    Initial project goals of livestock fencing installation and the integration of conservation grazing were achieved. However continued and early grazing will be needed to reduce the cool-season invasive grasses dominating these prairies. The difficulty in finding livestock producers to graze this landscape at sufficient stocking rates and introduce the cattle early enough remains a challenge. The project host is also incorporating prescribed fire to these units to manage the invasive grasses. These planned management efforts (continued prescribed burning, cool-season grass management, and conservation grazing) should continue to shift this restored landscape towards a more diverse grassland. Potential challenges include continued invasive species management (non-native cool season grasses) and the ability to accomplish prescribed burning at necessary frequencies.

40. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***

    No.

41. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***

    Yes, the goal of increasing native plant diversity in this prairie system is still unmet and will require revisit in approximately 2-3 growing seasons.

42. ***Additional comments on the restoration project.***

    None

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

43. The project has:

Achieved the stated goals.

44. The project will:

Meet proposed outcomes.

Confidence of outcome determination:

Medium.

45. Provide explanation of reason(s) for determination.

Significant staffing, organization partnerships, and resources are available to ensure long term continuity of the prairie management goals put in place by the Glacial Ridge National Wildlife Refuge Habitat Management Plan.

46. Site Assessor(s) conducting field review:

Keegan Lund - MNDNR

Site Maps

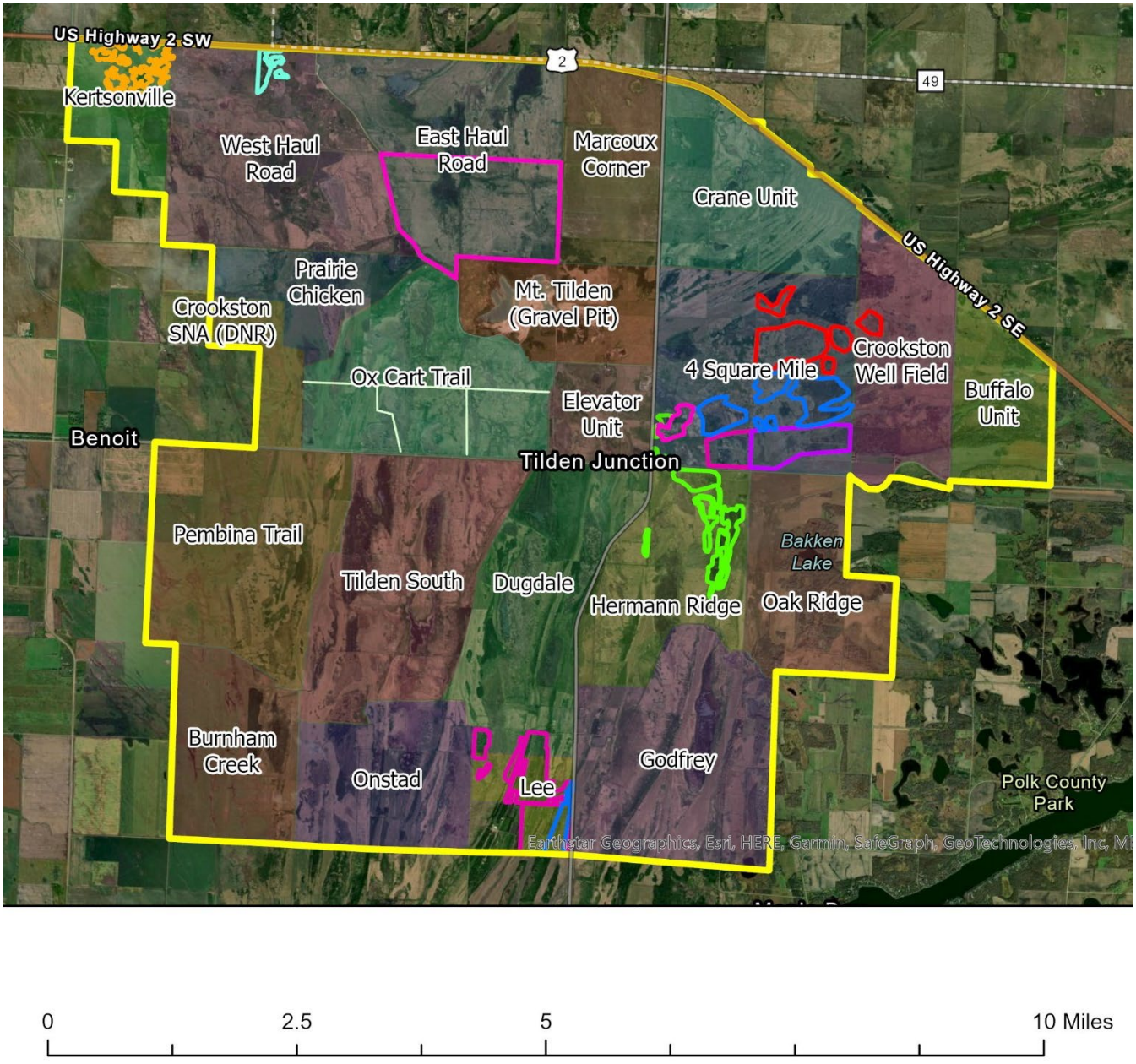


Figure 11. Aerial image of entire OHF project overview by Management Unit at the Glacial Ridge National Wildlife Refuge. Refuge acquisition area denoted in yellow. Image from USFWS, 2023.

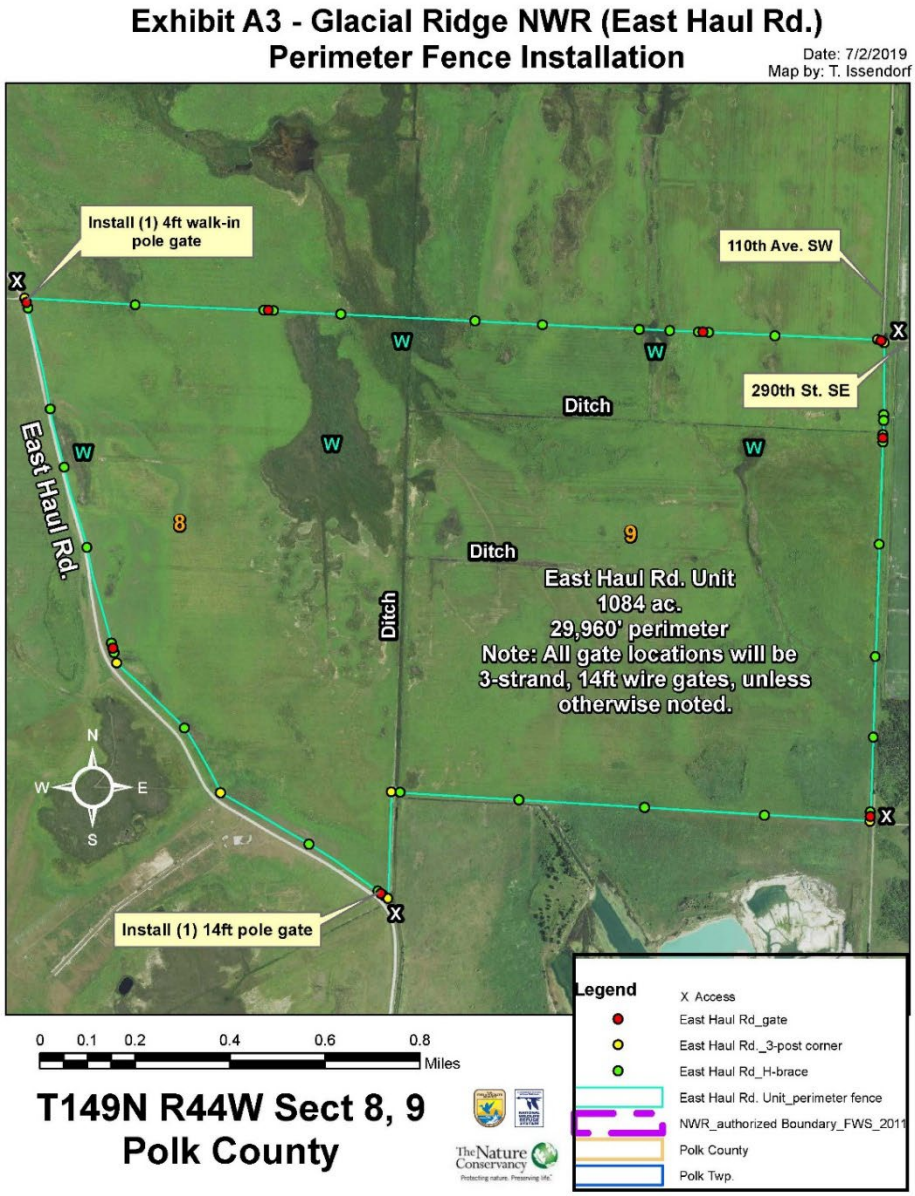
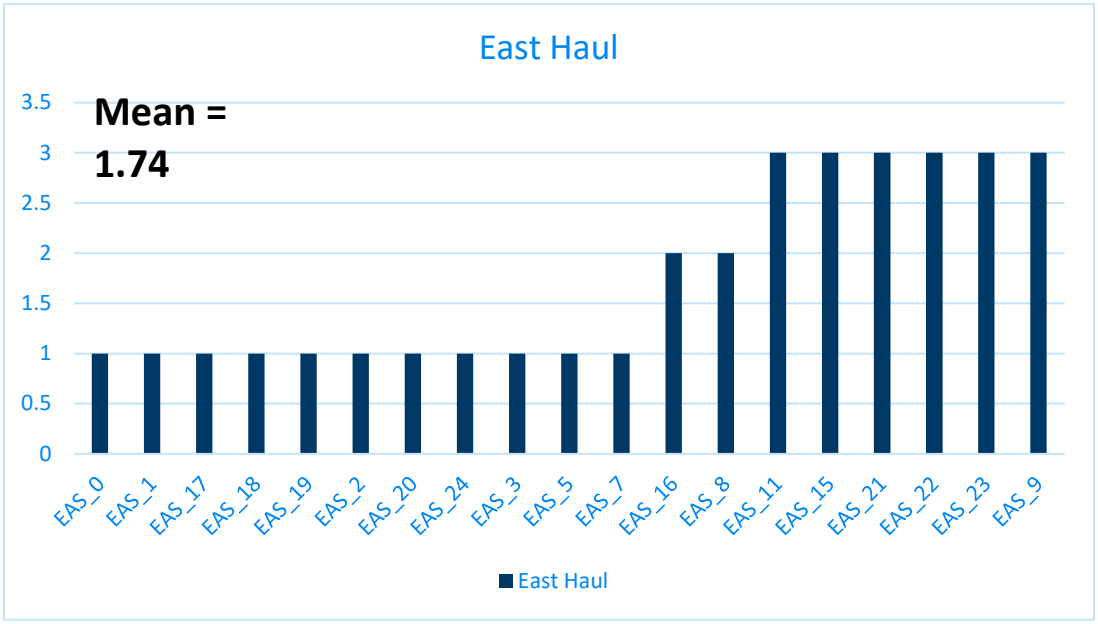


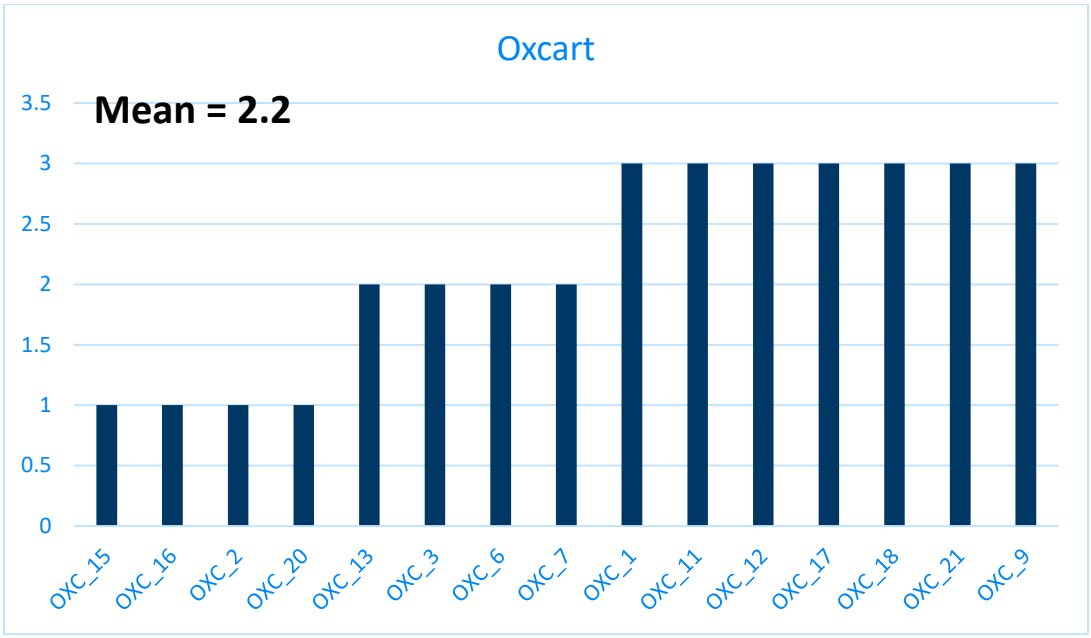
Figure 12. East Haul Unit where approximately 29,960 feet of perimeter fencing was installed (map from TNC/USFWS).

Figure 13. Oxcart Unit Site interior fence construction in light green (map from TNC/USFWS).

Vegetation Surveys Plant Community Data from USFWS

Vegetation surveys below were provided by USFWS (Ben Walker) and utilize the Grasslands Monitoring Team's belt transect community assessment method. Each transect is 25 meters and is assessed at ½ meter intervals totaling 50 plot assessments. At each plot, the percent community cover (e.g., native vs. invasive, grass vs forb) is observed and given a score. The mode of all scores is then compared to the previous survey assessment and based on the community cover percentage change an assessment of 1 (Improve), 2 (No Change) or 3 (Degrade) is made. Each bar on the below graph represents the change between the 2 survey years along individual transects. Surveys are from 2018 & 2022 and broadly denote a slight improvement in the East Haul Unit and no change in the Oxcart Unit between community assessment surveys.





Site Photographs

Photo 28. East Haul Unit fencing looking towards the east near Judicial Ditch 66 (10/26/2022).

Photo 29. Reinforced corners and cattle gates installed as part of the conservation grazing (East Haul Unit – 10/26/2022).

Photo 30. Grassland after one season of grazing (Oxcart Unit – 10/26/2022)

Photo 31. Livestock utilized for conservation grazing summer 2022 on both Oxcart and East Haul Units (10/26/2022).

Photo 32. Project Hosts Travis Issendorf (TNC) and Ben Walker (USFWS) from site visit (10-26/2022). Note the mowed burn break for the coming 2023 prescribed burn season.

8 Four Square Mile Unit Prairie Enhancement and Restoration

Project Background

Project Name: Four Square Mile Prairie Enhancement and Restoration

Project Site: Glacial Ridge NWR

Township/Range Section: Township 149N Range 44W Section 24

Project Manager / Affiliated Organization: Benjamin Walker / USFWS, Alexandra Wardwell / Audubon, Daryl Peterson/ Minnesota Land Trust, Wayne Ostlie/ Minnesota Land Trust

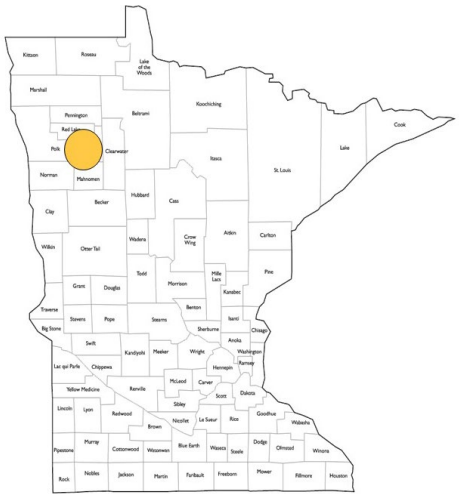
Fund: OHF ***Fiscal Year Funds:*** 2018

Project Start Date: September 2018

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types:

Project Status: Establishment Phase



County: Polk

Primary Activity: Prairie Enhancement

Project Size: 918 acres

Project Completed: July 2022

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***

   Tree/shrub removal of both native and invasive species, aerial and terrestrial herbicide control of woody species, wild parsnip management and native plant seeding on portions of this 981-acre site within the Glacial Ridge National Wildlife Refuge. The projects are also in the Glacial Ridge Prairie Core and the Glacial Ridge Important Bird Area, a globally significant area for birds. Work was begun September 2018 with aerial application targeting invasive trees and woody species followed by tree and brush removal on the prairie using heavy equipment and went through July 2022 when wild parsnip was chemically treated.

   <u>Narrative description from Glacial Ridge National Wildlife Refuge project description:</u>

   These projects *"focused on the reduction of standing dead and live trees and woody vegetation…this project mechanically cut and removed the standing dead woody vegetation*

utilizing heavy equipment, chainsaws, shears, and mulching cutter attachments and chippers. A wildfire burned the unit before prescribed burning could begin which created the perfect situation in which to seed locally harvested mesic and wet prairie forbs, sedges, and grasses."

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***

   Glacial Ridge National Wildlife Refuge Project Description document
   Glacial Ridge National Wildlife Refuge Habitat Management Plan
   CPL Accomplishment Report
   OHF Final Report- Protecting and Restoring Minnesota's Important Birds Areas

3. ***What are the stated goals of the project?***

   Remove non-native and undesirable woody trees and shrubs, seed certain areas with native grass and forb mix, remove noxious weeds from site.

   Narrative description from Glacial Ridge National Wildlife Refuge project description:

   Reconstruct new acquisitions within five years by utilizing local ecotype seed mixes in which forbs make up a minimum of 40% PLS and grass seed does not exceed 60% total PLS. Aim to include 5-15% total PLS of cool season grass and forbs. Use best management practices to allow establishment of the reconstruction with the aim of ≥50% native seeded cover by year five after reconstruction. Strive to achieve 75 percent comparability to the native plant communities as described in the Field Guide to the Native Plant Communities of Minnesota (MNDNR 2005b) in 50 percent of the restorations, within 10 years of each initial seeding effort.

4. ***What are the desired outcomes of achieving the stated goals of the project?***

   Restore a diverse native grass and forb plant community in previously farmed and enhanced landscapes across four square miles, improve habitat for game and non-game species, and increase plant and wildlife diversity on the landscape.

5. ***Were measures of restoration success identified in plans?*** *Yes*
   If yes, list specific measurements.

   Broad habitat management goals (as stated in question 3 above) outline measures of restoration success in prairie systems throughout the broader Glacial Ridge National Wildlife Refuge.

6. ***Are plan Sets available?*** Yes ***Have project maps been created?*** Yes
   If yes, provide in "site maps" and list maps provided:

   - Figure 1. 261-acre enhancement (Audubon/USFWS Map)
   - Figure 2. 200-acre restoration (Audubon/USFWS Map)
   - Figure 3. 90-acre restoration (Audubon/USFWS Map)
   - Figure 4. 19-acre enhancement (Audubon/USFWS Map)
   - Figure 5. 308-acre enhancement (Audubon/USFWS Map)
   - Figure 6. 40-acre enhancement (Audubon/USFWS Map)

7. ***Provide list of best management practices, standards, guidelines identified in plan set?***

   While there was no plan set developed for this project, project narrative and habitat management plan outline best management practices for restoration of this type of prairie. Practices used are as follows:

   - Woody shrub and tree removal using selective aerial foliar application and mechanical removal using hand cutting, forestry mowers, skidsteers, tractors, and other heavy equipment.
   - Selective herbicide spot treatment of noxious weeds.

- Portions were seeded using a locally harvested native seed mix and supplemented with seeds grown in Minnesota from Prairie Moon Nursery and Minnesota Native Landscapes.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   No
9. ***In what ways did alterations change the proposed project outcome?***
   NA

Site Assessment

Field Review Date: 10/26/2022

Field Visit Attendees: Keegan Lund – MNDNR, Benjamin Walker – USFWS, Alexandra Wardwell – Audubon, Travis Issendorf – TNC

10. ***Surrounding Landscape Characteristics:***

    Glacial Ridge National Wildlife Refuge (NWR) is in the Tallgrass Aspen Parklands of MN and contains approximately 5,000 acres of remnant prairie and savanna and approximately 20,000 acres that have been restored from marginal cropland to native grassland communities. The Four Square Mile Unit resides within the NWR and historically was ditched agricultural and/or grazed pasture before acquisition of the land and restoration efforts began approximately 20 years ago. The surrounding landscape consists of agricultural row-crop fields, cattail marshes and lowland and upland grasslands. Much of the adjoining land of the project area resides within the NWR however to the southeast the privately owned land is agricultural croplands/forested areas. The projects are also in the Glacial Ridge Prairie Core and the Glacial Ridge Important Bird Area, a globally significant area for birds.

11. ***Site Characteristics:***
    a. ***Soil Series:***

    Dominant textures include Radium loamy sand (0-2% slopes), Rosewood fine sandy loam, Aspen Parkland (0-1% slopes), Sandberg-Radium complex (0-6% slopes), Grimstad fine sandy loam (0-2%), Ulen loamy fine sand (0-2%),

    Source: Web Soil Survey

    b. ***Topography:***

    Topography of the Glacial Ridge NWR is overall flat with elevation ranging from 373 meters above sea level in the southern portion to 357 meters at Maple Lake. Site conditions visited on the Four Square Mile Unit were flat.

    c. ***Hydrology:***

No specific sources of surface water or open water features were noted during the site visit although portions of the Four Square Mile Unit were cattail marshes or wet meadows.

d. Vegetation: Plant Communities, Dominant Species & Invasives % Cover:

The project area is a mix of cool season/invasive grasses interspersed with native grasses, native sedges and native forbs. Native grass species observed during the survey included Indian grass, little bluestem, and big bluestem. Woody species observed were patches of willow and poplar shoots.

12. ***Is the plan based on current science?*** Yes

Removal of large tracts of woody species using helicopter applied herbicides and subsequent mechanical removal, prescribed fire and seeding are accepted practice for restorations of grassland communities.

13. List indicators of project goals at this stage of project:

Very few woody species were observed during the plant meander survey. In addition, some planted native grass and forb species were observed. Because some areas were seeded (restorations) and some were not (enhancements) the plant diversity was variable across the landscape but represents a continuation of prairie restoration efforts across this broad 918 acre project area.

14. Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?

Yes, the project plan of removing woody tree species and seeding the project area have achieved the proposed goals of shifting this area towards a more restored prairie.

15. Are corrections or modifications needed to achieve proposed goals?

No. However, continued efforts in controlling smooth brome and cool season invasive grasses will be required and are planned for in terms of future management efforts.

16. Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?

Initial project goals of largescale woody species removal on the site have been achieved. Continued invasive and woody species management will be necessary to maintain this area as open grassland. In addition, planned future restoration efforts (continued prescribed burning, cool-season grass management and seeding) should continue to shift this restored landscape towards a more diverse grassland. Potential challenges include continued invasive species management (non-native cool season grasses) and the ability to accomplish prescribed burning at necessary frequencies.

17. Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.

No.

18. Are follow-up assessments by the Restoration Evaluation Program needed? Explain.

Yes, the goal of increasing native plant diversity in this prairie system is still unmet and will require revisit in approximately 2-3 growing seasons.

19. Additional comments on the restoration project.

None

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. The project has:

Achieved the stated goals.

21. The project will:

Meet proposed outcomes.

Confidence of outcome determination:

Medium.

22. Provide explanation of reason(s) for determination.

Broad goals of woody species removal were achieved throughout project areas of the Four Square Mile Unit. USFWS and partners continue to push this landscape towards the trajectory of a diverse restored prairie through their continued efforts of woody species control, prescribed burning and seeding efforts to improve grass and forb diversity. Significant staffing, organization partnerships, and resources are available to ensure long term continuity of the prairie management goals put in place by the Glacial Ridge National Wildlife Refuge Habitat Management Plan.

23. Site Assessor(s) conducting field review:

Keegan Lund - MNDNR

Site Maps, Project Plans or Vegetation Tables

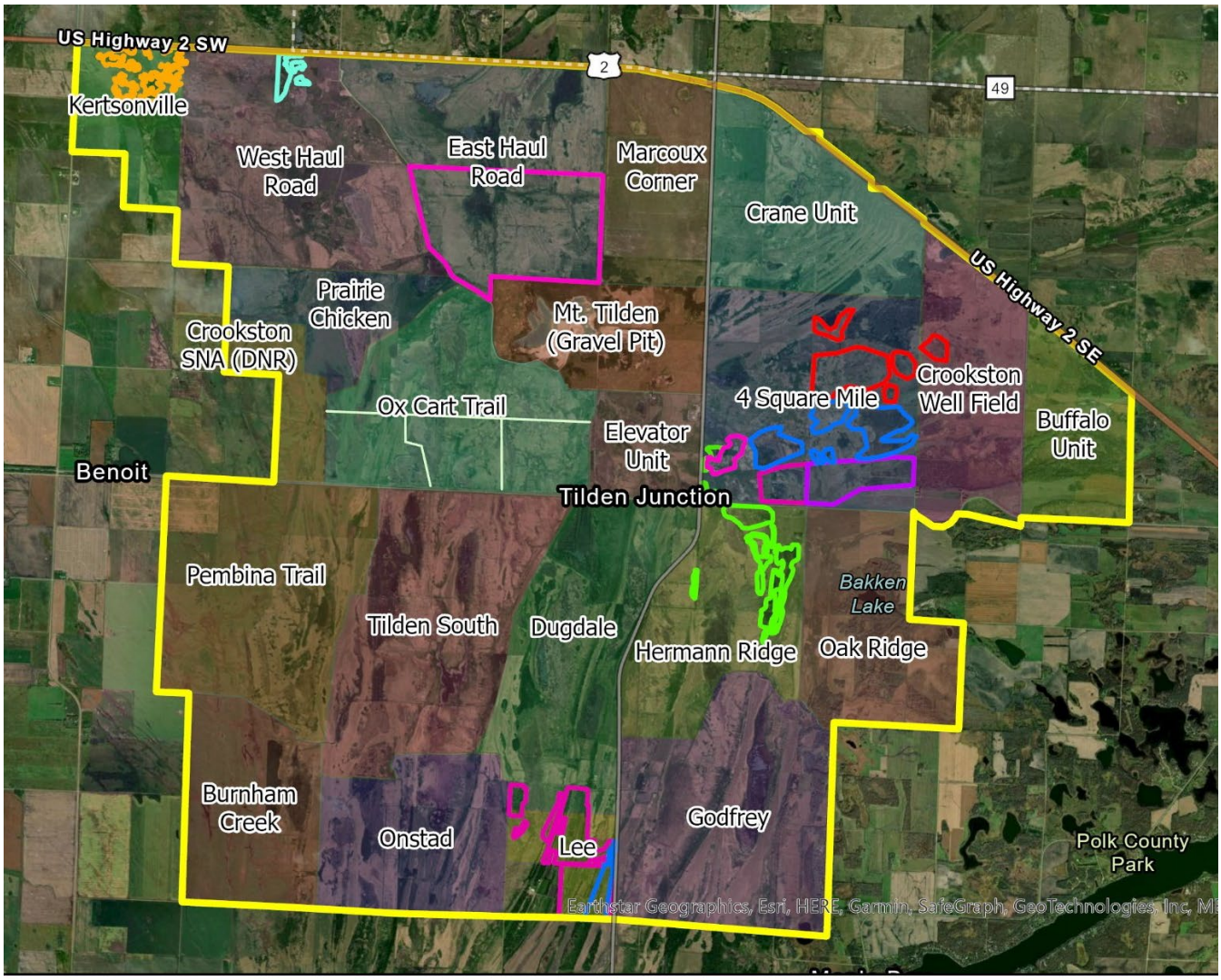


Figure 14. Aerial image of entire OHF project overview by Management Unit at the Glacial Ridge National Wildlife Refuge. Refuge acquisition area denoted in yellow. Image from USFWS, 2023.

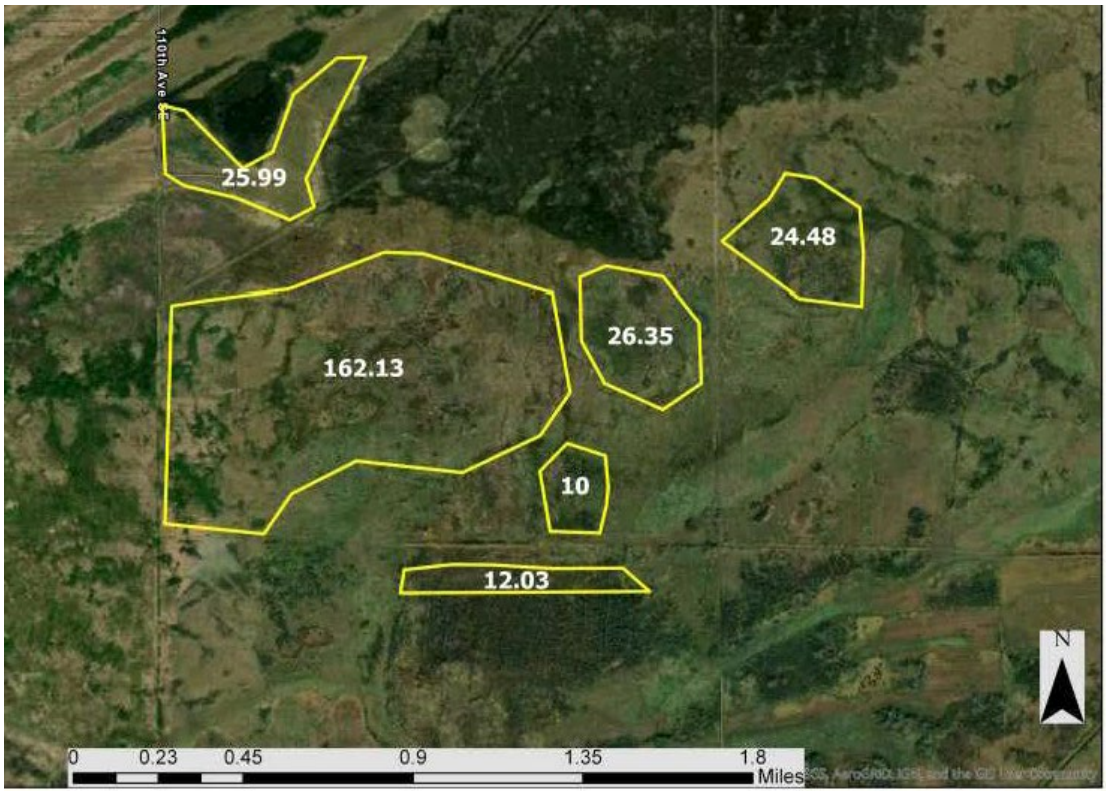


Figure 15. Site where approximately 261 acres of woody tree removal occurred via chainsaws, heavy equipment, forestry shears, chippers, and a mulching cutter attachment (Four Square Mile Unit Prairie Enhancement – map from Audubon/USFWS).

Figure 16. Site where approximately 200 acres of woody tree removal occurred via heavy equipment, forestry shears, and a mulching cutter attachment. The site was burned and seeded with a locally native mesic and wet prairie mix (Four Square Mile Unit Prairie Restoration – map from Audubon/USFWS).

Figure 17. Site where approximately 90 acres of woody invasives were removed. The site was also prepped by burning and seeded with a locally harvested seed mix (Four Square Mile Unit Prairie Restoration – map from Audubon/USFWS).

Figure 18. Site where approximately 19 acres of woody invasives were removed (Four Square Mile Unit Prairie Enhancement – map from Audubon/USFWS).

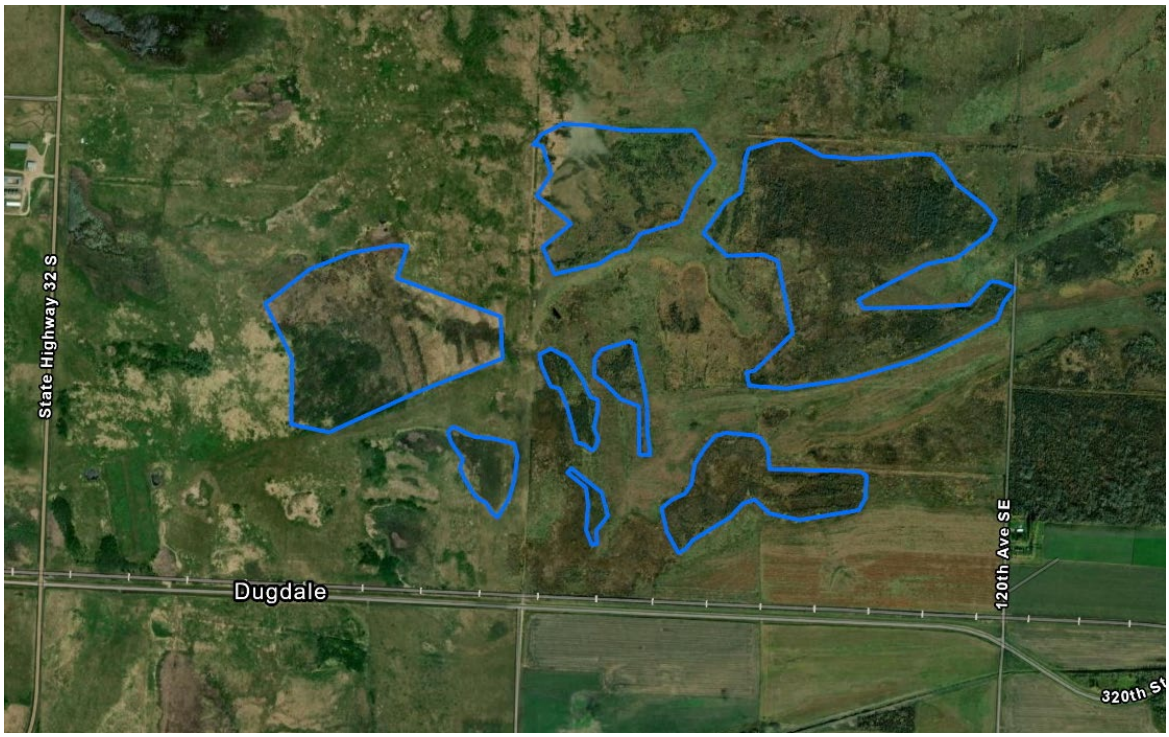


Figure 19. Site where approximately 308 acres of woody invasives were removed via aerial herbicide application via helicopter followed by brush and tree removal and prescribed fire (Four Square Mile Unit Prairie Enhancement – map from Audubon/USFWS).

Figure 20. Site where approximately 40 acres of woody tree removal occurred via heavy equipment, forestry shears, and a mulching cutter attachment. (Four Square Mile Unit Prairie Enhancement – map from Audubon/USFWS).

Table 15 Plant species observed during plant meander survey at Four Square Mile Unit, Glacial Ridge National Wildlife Refuge – 10/26/2022.

Scientific Name	Common name	Cover Range	Planted/ Seeded	Species Status
Agrostis gigantea	redtop	5-25	N	I
Ambrosia artemisiifolia	common ragweed	1-5	N	NN
Ambrosia trifida	giant ragweed	1-5	N	NN
Andropogon gerardii	big bluestem	1-5	Y	N
Anemone cylindrica	thimbleweed	0-1	Y	N
Arctium minus	common burdock	0-1	N	NN
Artemisia campestris	field sagewort	1-5	N	N
Artemisia ludoviciana	white sage	1-5	N	N
Asclepias syriaca	common milkweed	0-1	Y	N
Avens aleppicum	yellow avens	0-1	N	N
Berteroa incana	hoary alyssum	0-1	N	NN
Bromus inermis	smooth brome	50-75	N	I
Carex sp.	sedge species	5-25	N	N
Centaurea stoebe	spotted knapweed	1-5	N	I
Cirsium arvense	Canada thistle	1-5	N	I
Elymus repens	quackgrass	25-50	N	I
Glycyrrhiza lepidota	wild licorice	0-1	Y	N
Melilotus alba	sweet clover	1-5	N	I
Muhlenbergia cuspidata	plains muhly	1-5	Y	N
Panicum virgatum	switchgrass	1-5	Y	N
Phalaris arundinacea	reed canary grass	5-25	N	I
Poa pratensis	Kentucky bluegrass	50-75	N	I
Populus deltoides	Eastern cottonwood	1-5	N	N
Populus tremuloides	quaking aspen	1-5	N	N
Pycnanthemum virginianum	Virginia mountain mint	0-1	N	N
Quercus macrocarpa	bur oak	1-5	N	N
Ratibida columnifera	prairie coneflower	0-1	Y	N
Rumex crispus	curly dock	1-5	N	NN
Salix interior	sandbar willow	1-5	N	N
Schizachyrium scoparium	little bluestem	1-5	Y	N
Solidago altissima	tall goldenrod	1-5	Y	N
Solidago canadensis	Canada goldenrod	1-5	Y	N
Solidago rigida	stiff goldenrod	1-5	Y	N
Sorghastrum nutans	Indian grass	1-5	Y	N
Verbascum thapsus	common mullein	1-5	`N	NN

Site Photographs

Photo 33. Prairie following woody tree removal. In this project area, trees were removed from the prairie and the stumps were chemically treated (Four Square Mile Unit - 10/26/2022).

Photo 34. Woody debris piles post prairie enhancement and restoration efforts slated for burning (Four Square Mile Unit - 10/26/2022).

Photo 35. Willows shoots that will require future control efforts (Four Square Mile Unit - 10/26/2022).

Photo 36. The prairie community in this enhancement area is still largely dominated by cool-season invasive grasses since it was not restored but enhanced. Smooth brome stands will require future restoration efforts (Four Square Mile Unit - 10/26/2022).

Photo 37. Bur oak stump sprouts observed during the site visit (Four Square Mile Unit - 10/26/2022).

9 Lee Unit Prairie Enhancement and Restoration

Project Background

Project Name: Lee Unit Prairie Enhancement and Restoration

Project Site: Glacial Ridge NWR

Township/Range Section: Township 148N Range 44W Section 8 and Section 5

Project Manager / Affiliated Organization: Benjamin Walker / USFWS, Alexandra Wardwell / Audubon, Daryl Peterson/ Minnesota Land Trust, Wayne Ostlie/ Minnesota Land Trust

Fund: OHF ***Fiscal Year Funds:*** 2015

Project Start Date: September 2019

Predominant Habitat type: Prairie / Savanna / Grassland

Project Status: Establishment Phase

County: Polk

Primary Activity: Prairie Restoration

Project Size: 283 acres

Project Completed: May 2021

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***

   Tree and shrub removal of both cultivar and invasive nursery species from the Lee Unit of the Glacial Ridge National Wildlife Refuge which contains the remains of a former commercial landscape nursery. This area was formerly prairie. Approximately 300 acres of selective aerial spraying of nursery trees planted in close rows using a helicopter, mechanical tree removal, stump grinding, and seeding with native grassland seed mix on 50 acres.

<u>Narrative description from Glacial Ridge National Wildlife Refuge project description:</u>

"The Lee Unit was managed as an ornamental plant nursery until the U.S. Fish and Wildlife Service purchased the land in 2012. What was once a vast landscape of prairie habitat was turned into tree rows of over 250 species that are not native to the region. Audubon Minnesota in partnership with Minnesota Land Trust and Glacial Ridge NWR developed a strategic plan to remove non-native trees and transform the landscape to be more closely aligned to the prairie conditions that were once present. Lee Unit Aerial Treatment Date Completed - 09/19/2019. Selective herbicides were used to treat the standing woody vegetation in preparation for

removal. The application of herbicides at this stage reduces the follow up needed for re-sprouts, allows cutting operations to move at a fast rate, and reduces exposure to personnel on the ground. We have found that this method in combination with mechanical removal and prescribed fire is the best combination for long-term woody control."

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***

   Glacial Ridge National Wildlife Refuge Project Description – OHF Site Visit
   Glacial Ridge National Wildlife Refuge Habitat Management Plan
   OHF Final Report- Protecting and Restoring Minnesota's Important Birds Areas

3. ***What are the stated goals of the project?***

   Remove non-native and undesirable woody trees and shrubs, seed a portion of the area with regionally native grass and forb mix, remove noxious weeds from site.

   Narrative description from Glacial Ridge National Wildlife Refuge project description:

   Reconstruct new acquisitions within five years by utilizing local ecotype seed mixes in which forbs make up a minimum of 40% PLS and grass seed does not exceed 60% total PLS. Aim to include 5-15% total PLS of cool season grass and forbs. Use best management practices to allow establishment of the reconstruction with the aim of ≥50% native seeded cover by year five after reconstruction. Strive to achieve 75 percent comparability to the native plant communities as described in the Field Guide to the Native Plant Communities of Minnesota (MNDNR 2005b) in 50 percent of the restorations, within 10 years of each initial seeding effort.

4. ***What are the desired outcomes of achieving the stated goals of the project?***

   Re-establish a diverse native grass and forb plant community at the site of the historic tree nursery, improve habitat for game and non-game species, increase plant and wildlife diversity on the landscape.

5. ***Were measures of restoration success identified in plans?*** *No*
   If yes, list specific measurements.

   Broad habitat management goals (as stated in question 3 above) outline measures of restoration success in prairie systems throughout the broader Glacial Ridge National Wildlife Refuge, the Glacial Ridge Important Bird Area which is of global importance to grassland birds, and the Glacial Ridge Prairie Core.

6. ***Are plan Sets available?*** Yes ***Have project maps been created?*** Yes
   If yes, provide in "site maps" and list maps provided:

   - Figure 1. Glacial Ridge Site Map (USFWS)
   - Figure 2. 50-acre restoration (Audubon Map)
   - Figure 3. 72-acre enhancement (Audubon Map)
   - Figure 4. 58-acre enhancement and restoration (Audubon Map)
   - Figure 5. 28-acre enhancement (Audubon Map)
   - Figure 6. 61-acre enhancement (Audubon Map)

7. ***Provide list of best management practices, standards, guidelines identified in plan set?***
   While there was no plan set developed for this project, project narrative and habitat management plan outline best management practices for restoration of this type of prairie. Practices used and dates are as follows:

- (Fall 2019-Spring 2021) Woody shrub and tree removal using selective aerial foliar application and mechanical removal using hand cutting, forestry mowers, skidsteers and tractors, and other heavy equipment.
- (Fall 2020-Spring 2021) Additional site preparation in the form of stump grinding.
- (Spring 2021) Prescribed fire to prepare site for seeding.
- (Spring 2021) Prairie seeding using a locally harvested native seed mix and supplemented with seeds from Prairie Moon Nursery and Minnesota Native Landscapes.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   No
9. ***In what ways did alterations change the proposed project outcome?***
   NA

Site Assessment

Field Review Date: 10/26/2022

Field Visit Attendees: Keegan Lund – MNDNR, Benjamin Walker – USFWS, Alexandra Wardwell – Audubon, Travis Issendorf – TNC

10. ***Surrounding Landscape Characteristics:***

    The surrounding landscape consists of agricultural row-crop fields, cattail marshes and lowland and upland grasslands.

11. ***Site Characteristics:***
    a. ***Soil Series:***

    Dominant textures include Hamar loamy fine sand, Aspen Parkland (0-1% slopes), Karlsruhe sandy loam (0-2% slopes) loamy sand, Radium loamy sand (0-2% slopes) and Rosewood fine sandy loam, Aspen Parkland (0-1% slopes).

    Source: Web Soil Survey

    b. ***Topography:***

    Topography of the Glacial Ridge NWR is overall flat with elevation ranging from 373 meters above sea level in the southern portion to 357 meters at Maple Lake. Site conditions of the Lee Unit were flat.

    c. ***Hydrology:***

    No specific sources of surface water or open water features were noted during the site visit although portions of the Lee Unit maintained an emergent plant community indicative of a Type 2 wetland or wet meadow.

d. Vegetation: Plant Communities, Dominant Species & Invasives % Cover:

Glacial Ridge National Wildlife Refuge (NWR) is in the Tallgrass Aspen Parklands of MN and contains approximately 5,000 acres of remnant prairie and savanna and approximately 20,000 acres that have been restored from marginal cropland to native grassland communities. The Lee Unit resides within the NWR and was agricultural land utilized as a tree nursery prior to restoration efforts. The adjacent landscape from the Lee Unit includes low-lying ditched wetlands to the west, restored grasslands to the north and east, and agricultural croplands/forested areas to the south. Based on the plant meander survey the plant community is dominated by cool season/invasive grasses, weeds and successional species suggesting the infancy of this prairie restoration effort. Native grass species observed during the survey at low densities included switchgrass, little bluestem, and big bluestem.

12. ***Is the plan based on current science?*** Yes

Removal of large tracts of woody species using helicopter applied herbicides and subsequent mechanical removal, prescribed fire and seeding are accepted practice for restorations of grassland communities.

13. List indicators of project goals at this stage of project:

No invasive trees or woody species were observed during the plant meander survey. In addition, some planted native grass and forb species were observed although at low densities presumably due to the drought conditions when it was seeded in 2021.

14. Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?

Yes, the project plan of removing invasive tree species, integrating prescribed burning, and seeding have achieved the proposed goals of shifting this altered cropland nursery towards a restored prairie.

15. Are corrections or modifications needed to achieve proposed goals?

No.

16. Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?

Initial project goals of largescale woody species removal on the site have been achieved. Continued invasive and woody species management will be necessary to maintain this area as open grassland. In addition, planned future restoration efforts (continued prescribed burning, cool-season grass management and seeding) should continue to shift this restored landscape towards a more diverse grassland. Potential challenges include continued invasive species management (non-native cool season grasses) and the ability to accomplish prescribed burning at necessary frequencies.

17. Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.

No.

18. Are follow-up assessments by the Restoration Evaluation Program needed? Explain.

Yes, the goal of increasing native plant diversity in this prairie system is still unmet and will require revisit in approximately 2-3 growing seasons as the seeding is still very new.

19. Additional comments on the restoration project.

None

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. The project has:

Achieved the stated goals.

21. The project will:

Meet proposed outcomes.

Confidence of outcome determination:

High.

22. Provide explanation of reason(s) for determination.

The Lee Nursery restoration efforts are phase one of restoring this heavily altered agricultural landscape to a restored grassland plant community. Overall, efforts to remove remnants of the commercial tree/shrub nursery were highly successful and subsequent efforts of prescribed burning and seeding this landscape will continue to restore the landscape to a more diverse prairie habitat. Significant staffing, organizational partnerships, and resources are available to ensure long term continuity of the prairie management goals put in place by the Glacial Ridge National Wildlife Refuge Habitat Management Plan.

23. Site Assessor(s) conducting field review:

Keegan Lund - MNDNR

Site Maps, Project Plans or Vegetation Tables

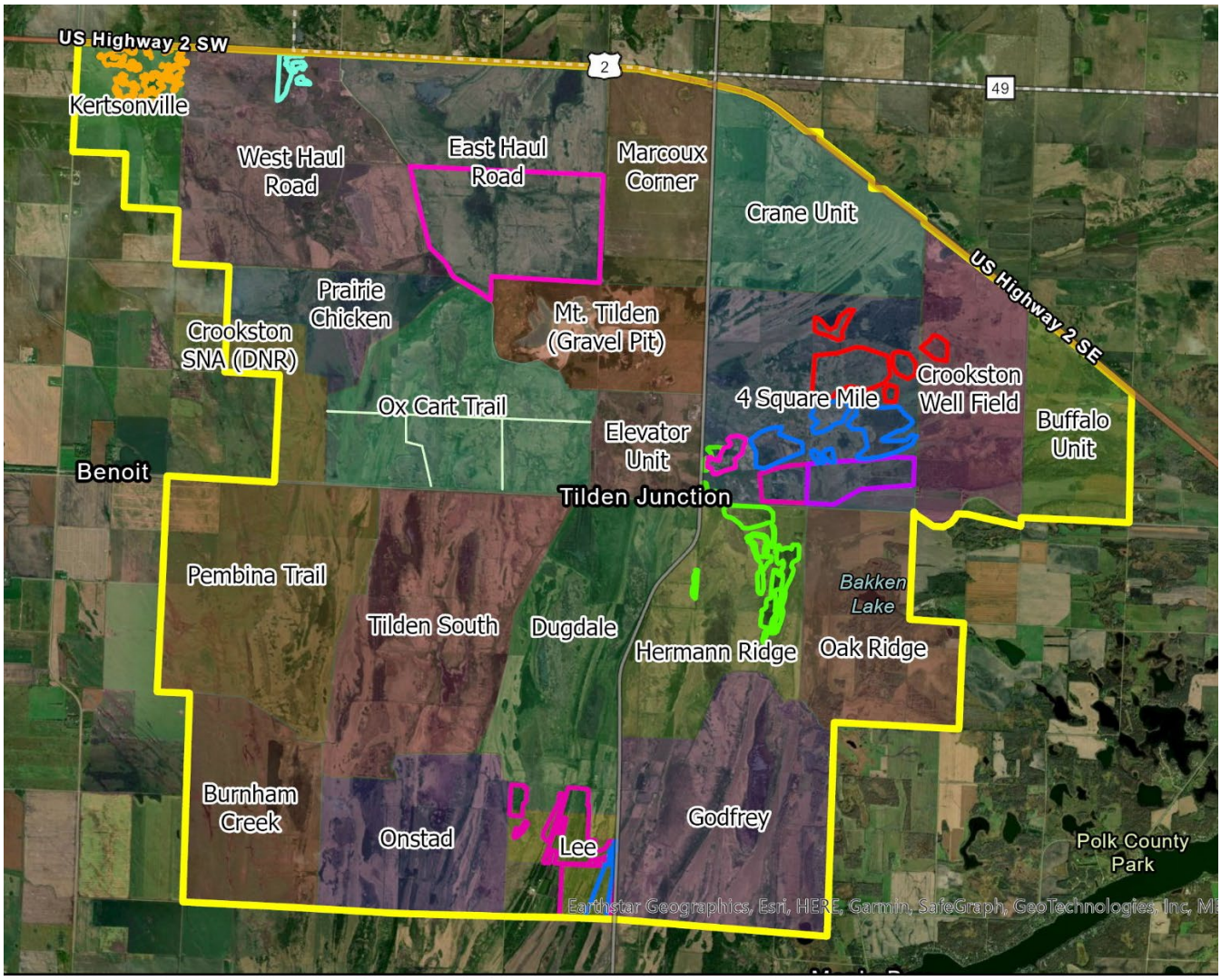


Figure 21. Aerial image of entire OHF project overview by Management Unit at the Glacial Ridge National Wildlife Refuge. Refuge acquisition area denoted in yellow. Image from USFWS, 2023.

Figure 22. Site where approximately 50 acres of woody tree removal occurred and was planted with a high diversity/locally harvested native seed mix (Lee Unit Prairie Restoration – map from Audubon).

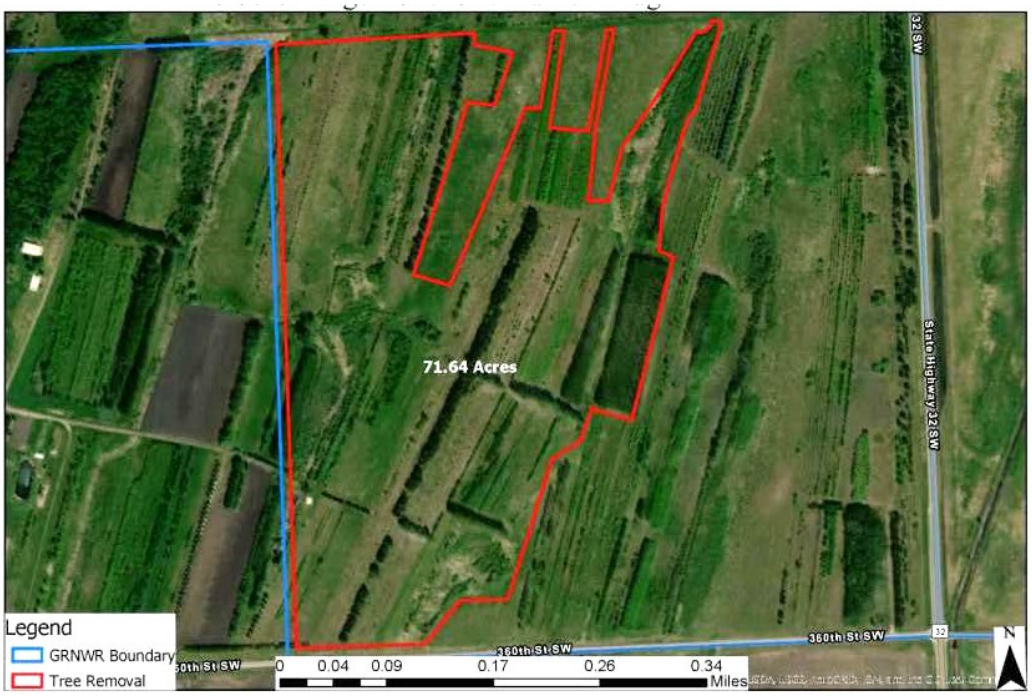


Figure 23. Site where approximately 72 acres of woody tree and shrub removal occurred (Lee Unit Prairie Brush and Tree Removal – map from Audubon).

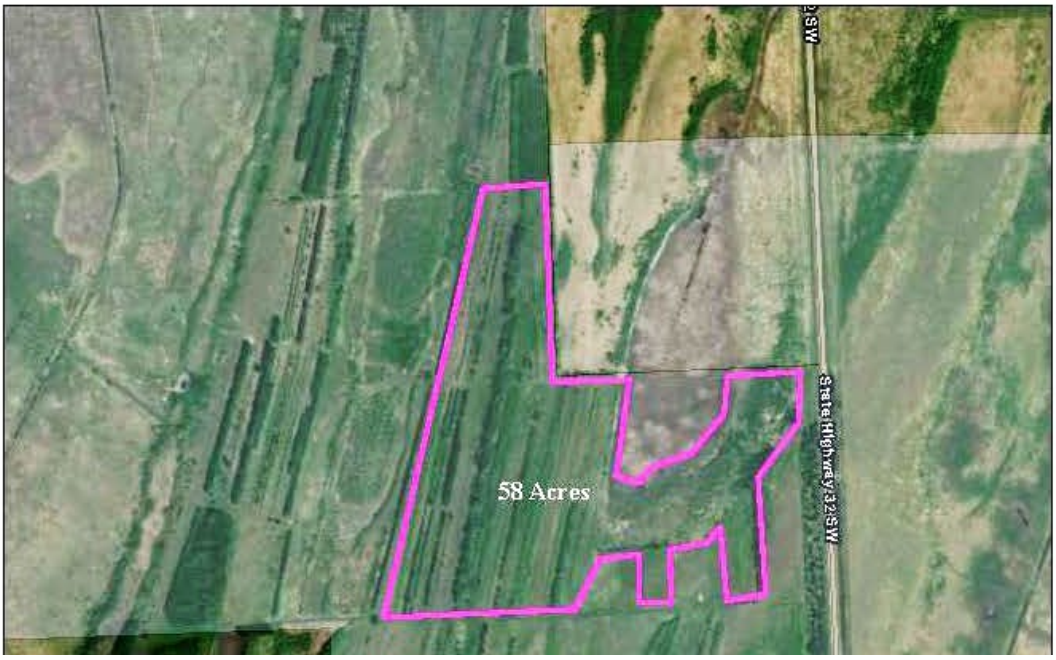


Figure 24. Site where approximately 58 acres of trees and shrubs were treated and removed. Along with woody removal, 8 of these acres were planted with a high diversity/locally harvested native seed mix (Lee Unit Prairie Enhancement and Restoration – map from Audubon)

Figure 25. Site where approximately 28 acres of woody tree removal occurred. (Lee Unit Prairie Tree and Brush Removal – map from Audubon).

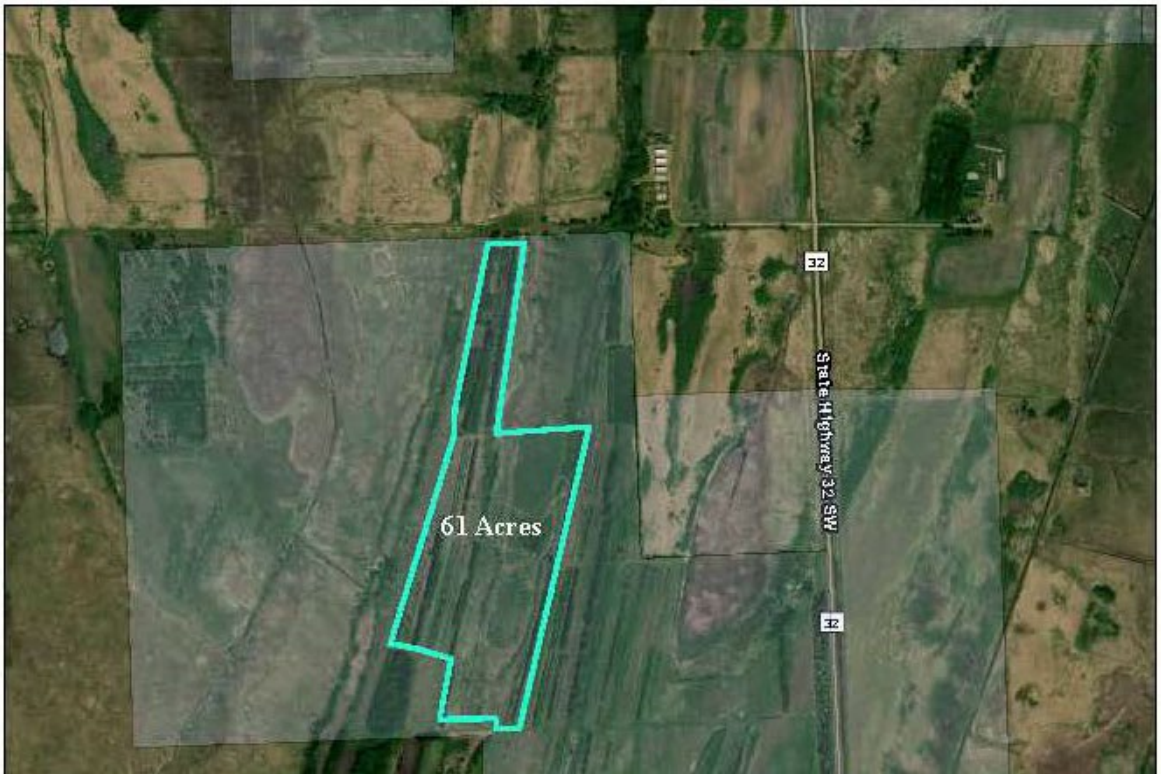


Figure 26. Site where approximately 61 acres of woody tree and shrub removal occurred. (Lee Unit Prairie Tree and Brush Removal – map from Audubon).

Figure 27. Aerial imagery from Google Earth (2015) before restoration efforts had taken place. Note the presence of rowed tree crops throughout much of the former tree nursery area.

Figure 28. Aerial imagery from NRCS Web Soil Survey (image from September 6, 2022) post tree and shrub removal. Note the absence of rowed tree crops throughout much of the former tree nursery area. The farmstead in the lower left corner of the image is still owned privately and is not part of the Lee Unit Prairie Restoration and Enhancement project area.

Figure 29. Lee Nursery before/after tree removal, from Project Descriptions/OHF Site Visit document.

Figure 30. Lee Nursery before/after tree removal, from Project Descriptions/OHF Site Visit document.

Figure 31. Lee Nursery before/after tree removal, from Project Descriptions/OHF Site Visit document.

Figure 32. Lee Nursery before/after tree removal, from Project Descriptions/OHF Site Visit document.

Table 16 Plant species observed during plant meander survey at Lee Unit, Glacial Ridge National Wildlife Refuge – 10/26/2022.

Scientific Name	Common name	Cover Range	Planted/ Seeded	Species Status
Agrostis gigantea	redtop	25-50	N	I
Ambrosia artemisiifolia	common ragweed	5-25	N	NN
Ambrosia trifida	giant ragweed	5-25	N	NN
Andropogon gerardii	big bluestem	1-5	Y	N
Arctium minus	common burdock	1-5	N	NN
Artemisia campestris	field sagewort	5-25	N	N
Artemisia ludoviciana	white sage	1-5	N	N
Berteroa incana	hoary alyssum	0-1	N	NN
Bolboschoenus fluviatilis	river bulrush	5-25	N	N
Bromus inermis	smooth brome	5-25	N	I
Carex sp.	sedge species	5-25	N	N
Centaurea stoebe	spotted knapweed	0-1	N	I
Chenopodium album	Lamb's-quarter	5-25	N	NN
Cirsium arvense	Canada thistle	0-1	N	I
Fragaria virginiana	wild strawberry	0-1	N	N
Geum aleppicum	yellow avens	0-1	N	N
Helianthus pauciflorus	stiff sunflower	0-1	Y	N
Lepidium densiflorum	green-flowered peppergrass	1-5	N	N
Melilotus alba	sweet clover	1-5	N	I
Muhlenbergia cuspidata	Plains muhly	1-5	Y	N
Oenothera biennis	common evening primrose	1-5	Y	N
Packera plattensis	prairie ragwort	1-5	N	N
Panicum virgatum	switchgrass	1-5	Y	N
Phalaris arundinacea	reed canary grass	1-5	N	I
Poa pratensis	Kentucky bluegrass	5-25	N	I
Potentilla norvegica	rough cinquefoil	0-1	Y	N
Rumex crispus	curly dock	1-5	N	NN
Salix serissima	autumn willow	1-5	N	N
Schizachyrium scoparium	little bluestem	1-5	Y	N
Setaria pumila	yellow foxtail	5-25	N	NN
Solidago altissima	tall goldenrod	1-5	Y	N
Solidago canadensis	Canada goldenrod	5-25	Y	N
Solidago nemoralis	gray goldenrod	5-25	Y	N
Solidago rigida	stiff goldenrod	5-25	Y	N
Verbascum thapsus	common mullein	1-5	N	NN

Zizia aurea	golden alexander	0-1	Y	N

Site Photographs

Photo 38. Alex Wardwell, Prairie Project Manager for Audubon, showing the project area post tree row and shrub removal. Photo is looking west and in the distance is the remaining privately owned farmstead which is not part of project area (Lee Unit Prairie Restoration and Enhancement, photo taken during the site visit on 10/26/2022).

Photo 39. Photo looking north where project managers discuss the early stages of this prairie establishment during plant meander survey (Lee Unit Prairie Restoration, photo taken during the site visit on 10/26/2022).

Photo 40. Photo looking northwest outside the restoration area. Note the abundance of smooth brome, an invasive grass, demonstrating the need for additional prairie restoration efforts (Lee Unit Prairie Restoration and Enhancement, photo taken during the site visit on 10/26/2022).

10Lake Bemidji South Shore Restoration

Project Background

Project Name: Lake Bemidji South Shore Restoration

Project Site: Lake Bemidji south shore

Township/Range Section: Township 146N Range 33W Section 15

Project Manager / Affiliated Organization: Nate Mathews / City of Bemidji Manager, Marcia Larson / City of Bemidji Parks and Recreation Director

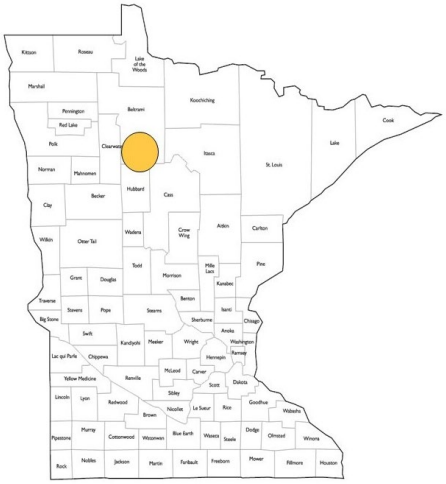
Fund: OHF ***Fiscal Year Funds:*** 2016

Project Start Date: August 2015

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Aquatic

Project Status: Post Establishment Phase



County: Beltrami

Primary Activity: Lake Shore Restoration

Project Size: 8.5 acres

Project Completed: August 2018

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   This historic site on the south shore of Lake Bemidji was the location of a logging and sawmill operations from approximately 1900-1950. The City of Bemidji has been trying to restore this degraded area for the past 20 years and OHF funding was granted for the purposes of improving aquatic and waterfowl habitats.
   Narrative description from OHF Accomplishment Plan:

   Woody Debris Removal from Lake Bemidji: "Approximately 9,400 cubic yards of woody debris was removed and replaced with sand. The excavated area extended 200 feet out from the shore, covering 1,440 feet of shoreline and depth of 1 to 4 feet. Overall, 240,000 square feet of Lake Bemidji was cleaned up and restored. The woody debris was sampled and primarily used as clean backfill on site or properly disposed of if contaminated. Approximately 400 tons of contaminated soil and 750 tons of contaminated sediment/wood debris was managed and disposed of at a permitted landfill."
   Upland Prairie Restoration:
   - Site monitoring
   - Site preparation and regrading

- Treatment of weeds and invasives
- Installation of native seed mixes
- Installation of 10,000 native plugs
- Planting 800 (#2) shrubs
- Planting 10 (#10) native trees
- Weed control
- Installation of erosion control

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   - OHF Accomplishment Plan
   - Lake Bemidji South Shore Restoration and Enhancement plan sets – Anderson Engineering
   - Existing Vegetation Assessment report – Anderson Engineering
   - Post restoration PowerPoint presentations: *2019 CGMC South Shore Lake Bemidji* & *South Shore Lake Bemidji APA Conference 2015*
3. ***What are the stated goals of the project?***
   Goals of the project were to remove wood debris and contamination from the lakebed, restore native vegetation and control shoreline erosion.
4. ***What are the desired outcomes of achieving the stated goals of the project?***
   Improve water quality and fish habitat, establish an upland area that stabilizes the shoreline and offers both ecological and public benefit.
5. ***Were measures of restoration success identified in plans?*** *No*
6. ***Are plan Sets available?*** Yes ***Have project maps been created?*** Yes
   If yes, provide in "site maps" and list maps provided:

   Images from the: *2019 CGMC South Shore Lake Bemidji* PowerPoint

7. ***Provide list of best management practices, standards, guidelines identified in plan set?***
   Accomplishment Report outlines restoration practices including:
   - Shoreland restoration including retaining existing shoreline trees, site regrading, and planting/plug installation of native trees, shrubs, forbs, and grasses
   - Woody debris removal and utilization of non-contaminated dredged material for upland fill

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   No
9. ***In what ways did alterations change the proposed project outcome?***
   NA

Site Assessment

Field Review Date: 8/31/2022

Field Visit Attendees: Wade Johnson - MNDNR, Keegan Lund - MNDNR, Nate Mathews – City of Bemidji, Marcia Larson – City of Bemidji, Tyler Luedke - MNL

10. ***Surrounding Landscape Characteristics:***
    Mix of developed, urbanized shoreline to the west and a DNR Aquatic Management Area to the east.
11. ***Site Characteristics:***
    a. ***Soil Series:***
    Urban land – Graycalm complex, 1 to 6 percent slopes.
    b. ***Topography:***
    Gently sloping towards Lake Bemidji.
    c. ***Hydrology:***
    Dry upland areas next to the lake.
    d. ***Vegetation: Plant Communities, Dominant Species & Invasives % Cover:***
    Upland grassland and forb communities interspersed with a forested riparian strip next to the lakeshore. Submersed aquatic plant community dominated by native plant species.
12. ***Is the plan based on current science?*** Yes
    Yes, the first goal of addressing the contamination and wood debris in the lakebed through dredging is an appropriate approach to restore this degraded lakebed. Utilization of the non-contaminated dredging material in the upland areas, and regrading of this urbanized site to establish an upland prairie community are also appropriate practices to improve habitat. Site prep, species selection, frost seeding and follow up spot herbicide management are aligned with current science practices for this project type and location.
13. ***List indicators of project goals at this stage of project:***
    - Seeded and planted vegetation was well established after a 4-year period from planting.
    - Wood waste upon underwater field inspection was not visible in the dredging area of the lakebed. In addition, native aquatic plants were established in the dredged areas.
14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***
    Yes, the City of Bemidji has an ongoing site maintenance agreement with Minnesota Native Landscapes to manage weedy and non-native species throughout the planted upland prairie. Vegetation management includes plans for burning/mowing and spot spraying of weedy species.
15. ***Are corrections or modifications needed to achieve proposed goals?***
    No modifications are needed. The goals of establishing upland grassland areas and controlling erosion, in addition to the removal of the woody debris from the lakebed have been achieved. Continued maintenance and management are appropriate to maintain the established prairie planting.
16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***
    Yes. City of Bemidji parks plan to continue to manage the planted areas as prairie. Potential challenge includes the difficulty to burn these sites due to the urban nature of the project location.
17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    This project has improved both upland and aquatic habitats from pre-project conditions.
18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***

No. Continued commitment to management from project managers indicates a high likelihood of project success.

19. ***Additional comments on the restoration project.***
    NA

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Achieved the stated goals.
21. ***The project will:***
    Meet proposed outcomes.
    Confidence of outcome determination:
    Medium.
22. ***Provide explanation of reason(s) for determination.***
    Continued commitment from the City of Bemidji and their contractors to manage the planted grasslands will likely contribute to continued habitat benefits.
23. ***Site Assessor(s) conducting field review:***

    Wade Johnson - MNDNR, Keegan Lund - MNDNR

Site Maps, Project Plans or Vegetation Tables

Figure 33. Master Plan image from *2019 CGMC South Shore Lake Bemidji* PowerPoint.

Figure 34. Aerial Image of proposed project site from the *2019 CGMC South Shore Lake Bemidji* PowerPoint.

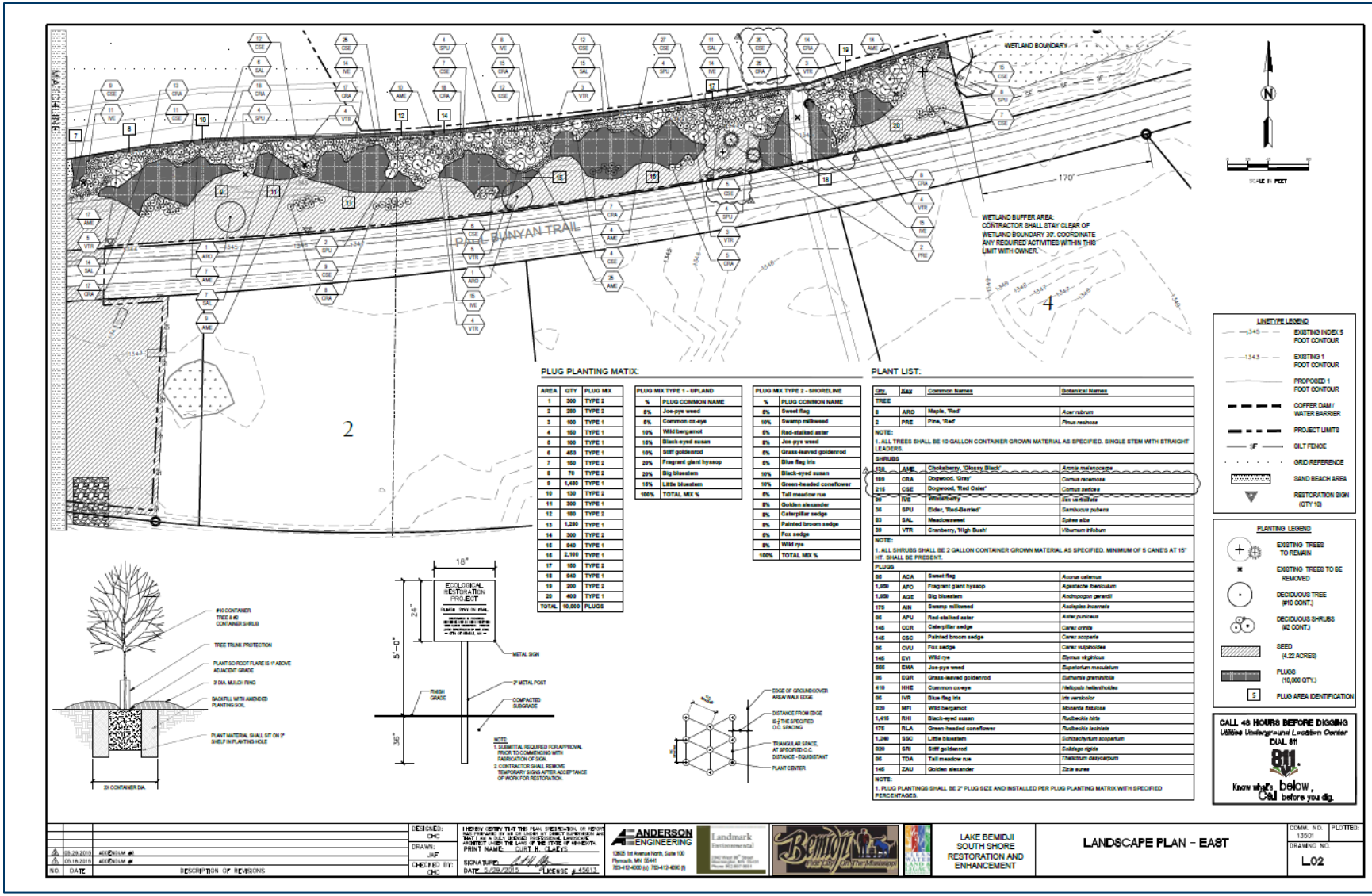


Figure 35. Landscape planting plan from the *2019 CGMC South Shore Lake Bemidji* PowerPoint.

Table 17. Plant species observed during plant meander survey at Lake Bemidji Shoreline Restoration on 8/31/2022.

Scientific Name	Common name	Cover Range %	Planted/ Seeded	Species Status
Acer negundo	box elder	0-1	N	N
Achillea millefolium	common yarrow	0-1	Y	N
Agastache foeniculum	blue giant hyssop	1-5	Y	N
Andropogon gerardii	big bluestem	5-25	Y	N
Apocynum androsaemifolium	spreading dogbane	5-25	N	N
Artemisia campestris	field sagewort	0-1	N	N
Asclepias incarnata	swamp milkweed	1-5	Y	N
Asclepias syriaca	common milkweed	1-5	N	N
Astragalus Canadensis	Canada milkvetch	5-25	Y	N
Berteroa incana	hoary alyssum	1-5	N	NN
Betula papyrifera	paper birch	0-1	N	N
Betula pumila	bog birch	1-5	Y	N
Bolboschoenus fluviatilis	river bulrush	1-5	N	N
Bouteloua curtipendula	side-oats grama	5-25	Y	N
Bouteloua gracilis	blue grama	1-5	Y	N
Bromus inermis	smooth brome	5-25	N	I
Carex sp.	sedge species	5-25	N	N
Conyza Canadensis	horseweed	1-5	N	N
Coreopsis palmata	prairie coreopsis	0-1	N	I
Cornus sericea	red-osier dogwood	5-25	Y	N
Dalea candida	white prairie clover	5-25	Y	N
Dalea purpurea	purple prairie clover	1-5	Y	N
Elymus repens	quackgrass	1-5	N	I
Elymus trachycaulus	slender Wheatgrass	1-5	N	N
Elymus virginicus	Virginia wild rye	0-1	Y	N
Eutrochium maculatum	spotted Joe-Pye Weed	5-25	Y	N
Equisetum hyemale	tall scouring rush	1-5	N	N
Helianthus giganteus	giant sunflower	0-1	Y	N
Helianthus maximiliani	Maximilian sunflower	5-25	Y	N
Helianthus petiolaris	prairie sunflower	0-1	Y	N
Heliopsis helianthoides	smooth oxeye	0-1	Y	N
Koeleria macrantha	junegrass	5-25	Y	N
Larix laricina	tamarack	1-5	Y	N
Liatris punctata	dotted Blazing Star	1-5	Y	N
Linaria vulgaris	butter and eggs	1-5	N	I

Lotus corniculatus	bird's-foot trefoil	1-5	N	I
Matricaria discoidea	pineapple-weed	1-5	N	NN
Medicago lupulina	black Medick	1-5	N	NN
Melilotus officinalis	yellow sweet clover	1-5	N	I
Monarda fitulosa	wild bergamot	5-25	Y	N
Panicum virgatum	Switch grass	1-5	Y	N
Parthenocissus inserta	Woodbine	1-5	N	N
Penstemon grandiflorus	large beardtongue	0-1	Y	N
Phalaris arundinacea	reed canary grass	1-5	N	I
Populus deltoides	cottonwood	1-5	N	N
Physalis virginiana	ground Cherry	0-1	N	N
Prunus virginiana	chokecherry	0-1	N	N
Ratibida pinnata	gray-headed Coneflower	5-25	Y	N
Rosa arkansana	prairie Rose	1-5	Y	N
Rudbeckia hirta	black-eyed Susan	0-1	Y	N
Rudbeckia laciniata	cut-leaf coneflower	0-1	Y	N
Rumex crispus	Curly Dock	0-1	N	NN
Salix nigra	black willow	1-5	N	N
Salix interior	sandbar willow	5-25	N	N
Salix lucida	shining willow	1-5	N	N
Schizachyrium scoparium	little bluestem	25-50	Y	N
Solidago canadensis	Canada goldenrod	1-5	Y	N
Solidago gigantean	giant Goldenrod	1-5	N	N
Solidago rigida	stiff goldenrod	1-5	Y	N
Spartina pectinata	prairie cordgrass	1-5	Y	N
Sporobolus heterolepis	prairie dropseed	1-5	Y	N
Symphyotrichum ericoides	heath aster	1-5	N	N
Symphyotrichum lanceolatum	panicled aster	1-5	Y	N
Symphyotrichum novae-angliae	New England aster	1-5	Y	N
Tanacetum vulgare	common tansy	1-5	N	I
Thalictrum dasycarpum	tall meadow rue	0-1	Y	N
Tilia americana	basswood	1-5	N	N
Toxicodendron radicans	Poison Ivy	5-25	N	N
Tradescantia occidentalis	spiderwort	0-1	Y	N
Trifolium repens	white clover	1-5	N	N
Verbascum thapsus	common mullein	0-1	N	NN
Verbena hastata	blue vervain	1-5	Y	N
Verbena stricta	hoary vervain	5-25	Y	N

Zizia aurea	golden Alexanders	5-25	Y	N

Site Photographs

Photo 41. AquaBarrier® installation at Lake Bemidji prior to lake sediment dredging (Lake Bemidji South Shore Enhancement – photo from City of Bemidji).

Photo 42. Excavation of lake sediment after work site was pumped (Lake Bemidji South Shore Enhancement – photo from City of Bemidji).

Photo 43. Drone photo showing excavation of lake sediment. Non contaminated sediment was used in the upland prairie planting site (Lake Bemidji South Shore Enhancement – photo from City of Bemidji).

Photo 44. Aerial photo looking northeast along shore after grading was completed with non-contaminated dredged materials (Lake Bemidji South Shore Enhancement – photo from City of Bemidji).

Photo 45. Aerial photo looking west along shore after grading was completed (Lake Bemidji South Shore Enhancement – photo from City of Bemidji).

Photo 46. Site visit on 8/31/2022 (Lake Bemidji South Shore Enhancement).

Photo 47. Site visit on 8/31/2022 (Lake Bemidji South Shore Enhancement).

Photo 48. Site visit on 8/31/2022 showing upland prairie planting (Lake Bemidji South Shore Enhancement).

11 Grand Marais Creek Stream Channel Restoration Revisit

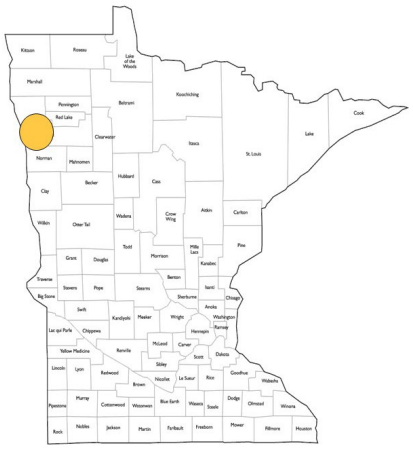
Legacy Fund Restoration Evaluations

See Appendix C for Project Background and Initial Project Evaluation

Project Name: Grand Marias Creek Stream Channel Restoration

Project Manager / Affiliated Organization: Myron Jesme / Red Lake River Watershed District Administrator

Fund: OHF ***Fiscal Year Funds:*** 2013



County: Polk

Primary Activity: Stream/River Restoration

Project Size: 6 miles

Project Completed: September 2015

Revisit Site Assessment

Field Review Date: 10/25/2022

Field Visit Attendees: *Keegan Lund (MnDNR), Jason Vinje (MnDNR), Myron Jesme (Red Lake River Watershed District), Tony Nordby (Houston Engineering)*

1. ***What are the stated goals of the project?***

- Reconstruct six miles of natural channel based on sound scientific principles of natural channel design, hydrology and fluvial geomorphology.
- Divert flows from the existing outlet channel or Cutoff Ditch and restore hydrology to the original Grand Marais Creek channel. The downstream end of the project is located at the original outlet of the Grand Marais Creek into the Red River.
- Minimize/control flood impacts throughout the channel restoration segment through establishment of flowage easements and isolated setback levees.
- Diversion structure is designed to accommodate all flows from the cutoff ditch up to a two-year event.
- Stream outlet and grade stabilization structures at the Red River are designed to provide for fish passage up Grand Marais Creek.

2. ***What are the desired outcomes of achieving the stated goals of the project?***

- Restore and sustain aquatic habitat conditions in the channel and on up to 400 acres of riparian corridor habitats, which were abandoned and mostly farmed for the past 50+ years.

- Maintain or slightly reduce existing flood stages immediately upstream of the project limits by increasing conveyance abilities during flood events and decreasing the potential to impact personal property or farmland.
- Restore permanent/seasonal fish spawning and juvenile habitat as well as habitat for a variety of other aquatic/terrestrial species through stream outlet, grade control structures and stream crossing designs.
- Provide improved channel connectivity between the Red River and more than 20 miles of upstream riverine and wetland habitats in Grand Marais Creek.

3. Please note any substantive changes to the site characteristics since last site assessment.
No substantive changes were observed since the last site assessment. There was little to no observed channel movement.

4. *Is the plan based on current science?* Yes

FROM INITIAL SITE EVALUATION:
• *Channel Design:* Channel design was developed by a team of river restoration professionals familiar with the characteristics of regional stream geomorphology. It appears the channel was designed using current science practices. These include channel sizing and cross section design that closely mimicked natural stream channel morphology from the region and engineered structural components based on design floods and regional conditions.

• In conversation with Luther Aadland (DNR Stream Restoration Specialist), the channel is likely to function most often like a tidal wetland with backwaters from the flooded Red River filling the valley during the spring, followed by a steady flushing of the system through the summer months.

• *Floodplain Habitat Restoration:* The project, as implemented, is likely to provide for the creation of functioning hydrological floodplain where none had been present for more than a century.

• *Fish Passage, Habitat:* Given the expected flood regime of the Grand Marais Valley in relation to the Red River Valley, fish passage into the newly created/restored channel will likely occur during high waters in spring and early summer before water levels recede below the high stream gradient of the rocked channel at the confluence with the Red River. Channel catfish habitat is expected to be abundant along muddy bottoms within the channel. Following regeneration of emergent plant species within the channel, Northern Pike habitat should be available. Restoration of Grand Marais Creek with buffers will provide protection of habitat for Northern Pike, often under threat of drainage or dredging and removal of aquatic vegetation.

5. List indicators of project goals at this stage of the project.
From the previous evaluation it was noted that no measures of restoration success for vegetation restoration, fish usability/habitat creation or channel stability were defined. However, upon revisit we observed most of the stream channel was re-vegetated despite not being seeded (see photos below). In addition, aquatic and emergent wetland plants were observed throughout the channel restoration indicating that the goal of habitat creation was achieved.

6. Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?
Overall, the project plan was achieved by reestablishing approximately 6 miles of cut-off Grand Marais Creek back on-line and in doing so habitat connectivity for game fish and flood mitigation measures were improved.

7. Are corrections or modifications needed to meet proposed outcomes?
No.

8. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***
   The Red Lake Watershed District continues to manage invasive species along the channel using herbicides. There are potential considerations to conduct a prescribed burn in the upland RIM prairie easement areas if resources become available.
9. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
   No.
10. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    No.
11. ***Additional comments on the restoration project.***
    None.

Revisit Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

12. ***The project has:***
    Achieved the stated goals.
13. ***The project will:***
    Meet proposed outcomes.
    Confidence of outcome determination:
    High.
14. ***Provide explanation of reason(s) for determination.***
    Despite the management plan not indicating measure of success in terms of channel stability no major undercutting or movement of the streambed was observed. In addition, the bank stabilization techniques utilized such as incorporating riffles and toe-wood were intact and showed no indication of failure in the past 7 years.
15. ***Site Assessor(s) Conducting Review:***
    Jason Vinje & Keegan Lund (MnDNR)

Site Maps, Project Plans or Vegetation Tables

Figure 36. Aerial imagery of 6-mile channel restoration along Grand Marais Creek. Imagery from *Houston Engineering Final Engineer's Plan Report*.

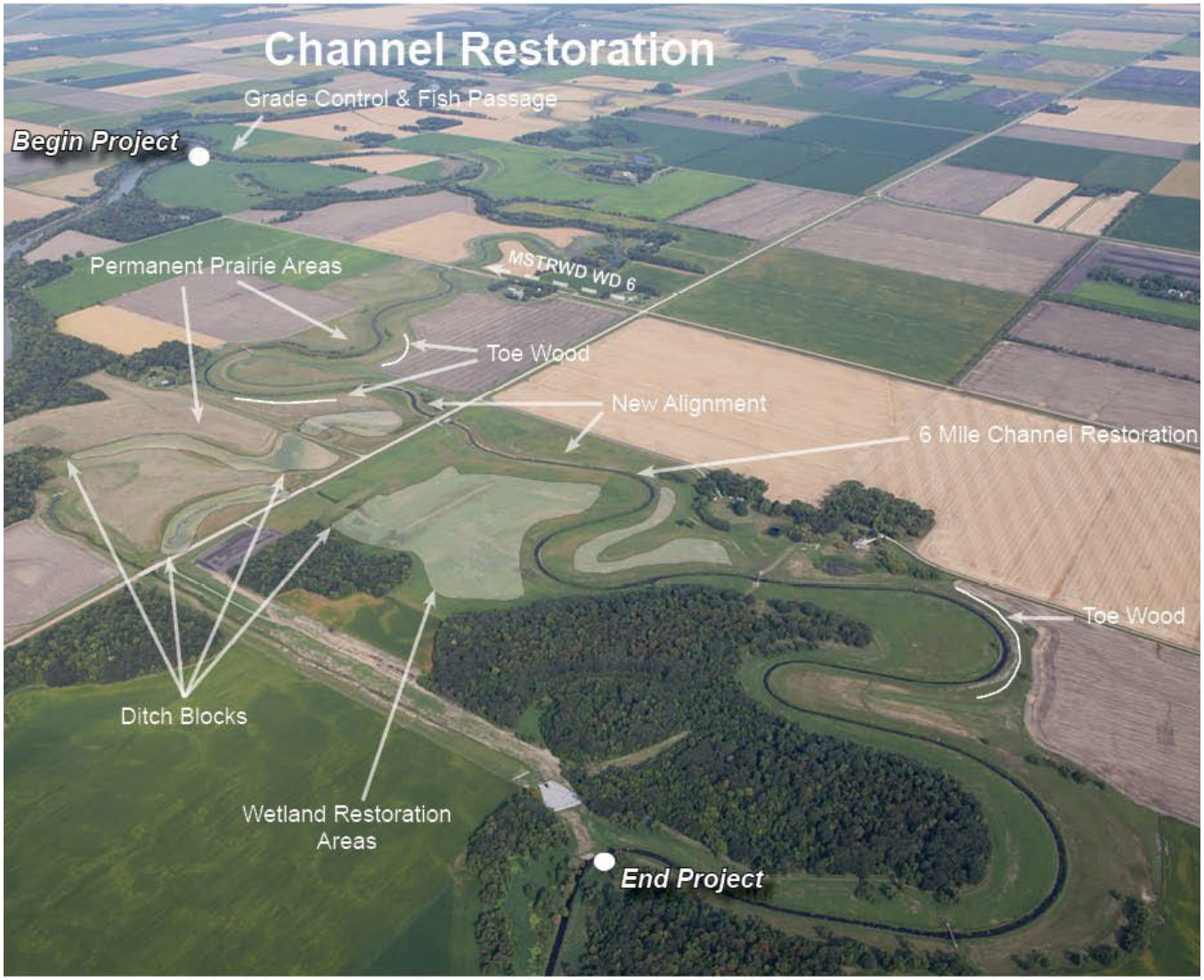


Figure 37. Aerial imagery of 6-mile channel restoration along Grand Marais Creek. Imagery from *Final MAWD Presentation*.

Vegetation Table from Meander Survey

Scientific Name	Common name	Cover Range	Planted/ Seeded	Species Status
Acer negundo	box elder	0-1	N	N
Agrostis gigantea	redtop	1-5	N	I
Alisma triviale	common water plantain	0-1	N	N
Ambrosia trifida	giant ragweed	1-5	N	N
Andropogon gerardii	big bluestem	5-25	Y	N
Apocynum androsaemifolium	spreading dogbane	1-5	N	N
Arctium minus	common burdock	1-5	N	NN
Bidens frondosa	leafy beggarticks	5-25	N	N
Bolboschoenus fluviatilis	river bulrush	5-25	N	N
Bromus inermis	smooth brome	5-25	N	I
Carex sp.	sedge species	5-25	N	N
Cirsium arvense	Canada thistle	0-1	N	I
Echinochloa crus-galli	barnyard grass	1-5	N	NN
Echinocystis lobata	wild cucumber	0-1	N	N
Elymus trachycaulus	slender wheatgrass	5-25	Y	N
Elymus virginicus	Virginia wild rye	0-1	Y	N
Equisetum arvense	field horsetail	0-1	N	N
Fraxinus pennsylvanica	green ash	1-5	N	N
Helianthus petiolaris	prairie sunflower	0-1	Y	N
Lotus corniculatus	bird's-foot trefoil	0-1	N	I
Muhlenbergia cuspidata	Plains muhly	0-1	N	N
Panicum capillare subsp. capillare	witch grass	1-5	N	N
Panicum virgatum	switchgrass	1-5	Y	N
Persicaria pensylvanica	Pennsylvania smartweed	1-5	N	N
Phalaris arundinacea	reed canary grass	1-5	N	I
Populus deltoides	cottonwood	1-5	N	N
Quercus macrocarpa	bur oak	0-1	N	N
Rumex crispus	curly dock	0-1	N	NN
Salix interior	sandbar willow	5-25	N	N
Setaria pumila	yellow foxtail	0-1	N	NN
Schoenoplectus tabernaemontani	soft stem bulrush	0-1	N	N
Solidago gigantea	giant goldenrod	1-5	Y	N
Sparganium eurycarpum	giant bur-reed	0-1	N	N
Symphoricarpos occidentalis	wolfberry	1-5	N	N

Scientific Name	Common name	Cover Range	Planted/ Seeded	Species Status
Symphyotrichum ericoides	heath aster	0-1	N	N
Symphyotrichum lateriflorum	calico aster	0-1	N	N
Thalictrum dasycarpum	tall meadow-rue	0-1	N	N
Tilia americana	basswood	0-1	N	N
Ulmus americana	American elm	1-5	N	N
Ulmus pumila	Siberian elm	1-5	N	I
Vicia sativa	spring vetch	0-1	N	NN
Xanthium strumarium	cocklebur	0-1	N	N

Table 18 Vegetation observed during the site revisit meander survey from 10/25/2022.

Revisit Site Photographs

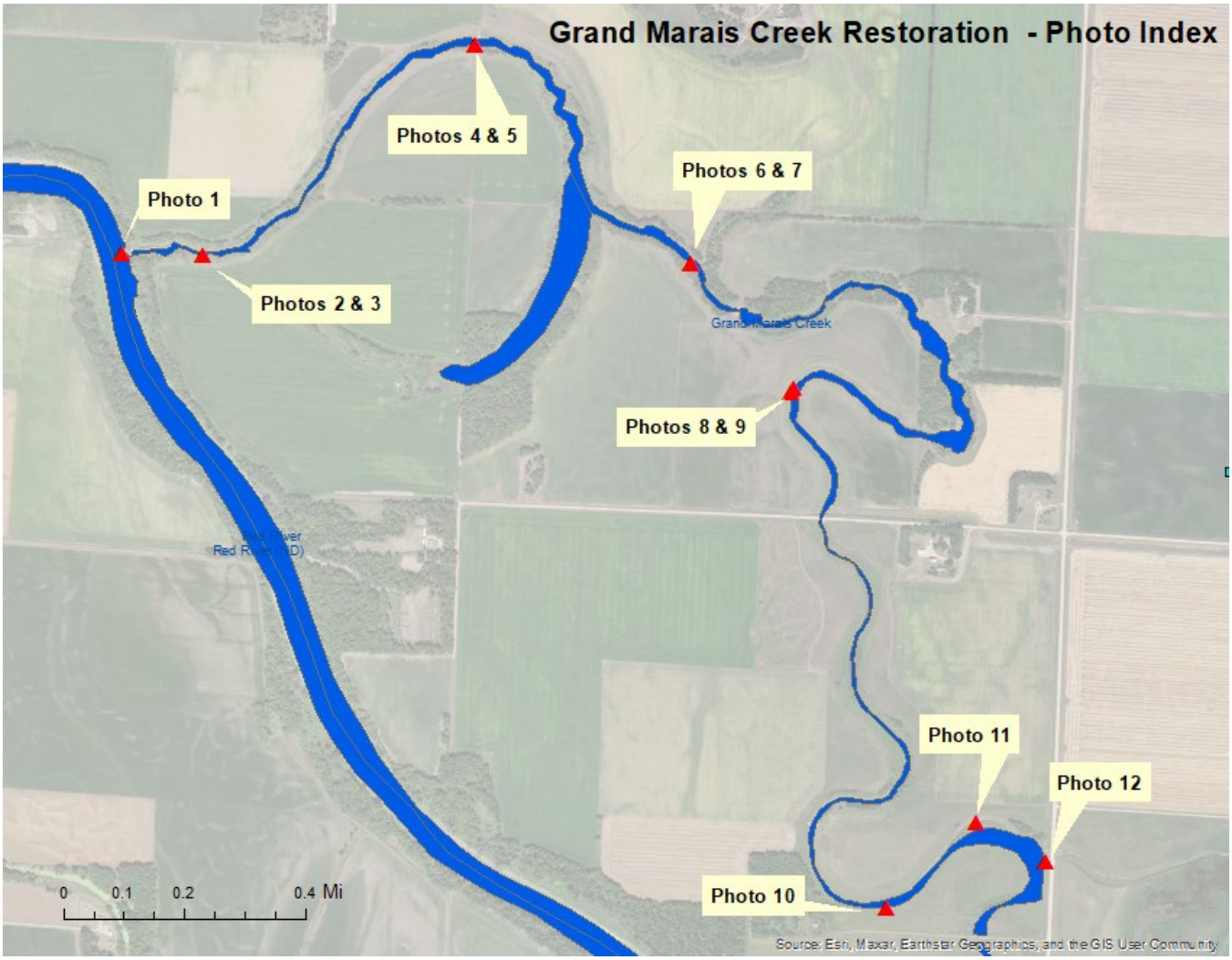


Figure 38. Aerial map of photo locations during site visit from 10/25/2022.

Photo 49. Riprap outflow area of Grand Marais Creek at the Red River. Photo taken on 10/25/2022.

Photo 50. Densely vegetated riparian area and rock installations along toe approximately 500 feet upstream from the outlet to the Red River. Photo taken on 10/25/2022 and is looking east.

Photo 51. Rock bars along Grand Marais Creek approximately 500 feet upstream from the outlet to the Red River.

Photo 52. Grand Marais Creek looking west. Photo taken on 10/25/2022.

Photo 53. Grand Marais Creek looking east. Photo taken on 10/25/2022.

Photo 54. Grand Marais Creek looking northwest. Photo taken on 10/25/2022.

Photo 55. Grand Marais Creek looking southeast. Photo taken on 10/25/2022.

Photo 56. Grand Marais Creek looking north. Photo taken on 10/25/2022.

Photo 57. Grand Marais Creek looking south. Photo taken on 10/25/2022.

Photo 58. Toe wood installations along Grand Marais Creek. Photo taken on 10/25/2022.

Photo 59. Grand Marais Creek flowing through grassland area looking east. Photo taken on 10/25/2022.

Photo 60. Grand Marais Creek flowing through grassland area looking west. Photo taken on 10/25/2022.

Appendix A: Initial Project Evalation

RESTORATION EVALUATION PROGRAM

Minnesota Board of Water and Soil Resources

Minnesota Department of Natural Resources

Project Evaluation Form

Field Review: September 16, 2015

Project Background

Project Name: Grand Marais Creek Stream Channel Restoration

Project Location: Polk County, Minnesota

Township/Range Section: T153N, R50W Sections 15, 16, 22, 23 and 26

Project Manager / Affiliated Organization, Contact: Red Lake Watershed District

Fund: OHF **Fiscal Year Funds**: 2013 **Project Start Date:** 2013

Predominant Habitat type: Prairie / Savanna / Grassland Wetland Aquatic

Project Status: Post Establishment Phase

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

- What are the specific project components?
  - *Diversion Structure/Weir:* Diversion structure directs all flows up to a 2-year event into the original Grand Marais Creek channel. The weir is 100 ft. in length, constructed of compacted clay, sheet piling, rip rap, structurally armored spillway, vegetated slopes and controlled drawdown culvert.
  - *Channel Restoration:* 6.0 miles of channel is restored/created to approximate pre-1900 cross section, sinuosity and profile grade. Specifically, components include:
    - Restored gradient of 0.5 to 1 foot per mile slope.
    - 400,000 cubic yards of material was expected to be removed from the channel and placed in adjacent uplands. It was expected that removal of fill from the lowest 1.5 miles of the channel would be minimal.
    - Alignment roughly follows channel alignment recorded at the time of U.S. expansion and settlement into the area with an exception for the preservation of an existing

building/crossing. Channel is a relict of former Red Lake River and has had low flows for this alignment since prior to farming expansion.
    - Channel realignment primarily occurred in uplands. Pre-project alignment has been retained and will persist as oxbow type wetlands.
    - All excavated material was spread into adjacent fields and blended into the landscape allowing high water to rise and retreat back into the channel naturally.
- *Grade Stabilization Structures:* Two grade control structures are added to reduce potential for headcutting and bank failures. These structures are placed near the confluence with the Red River. Fish Passage is incorporated into design in consultation with DNR staff.
- *Road and Trail Crossings:* Two public road bridges were constructed in consultation with county and township authorities. Private agricultural and recreational crossings used flat railcars to span creek at grade and spanning the low flow channel. These crossings are intended to allow for frequent overtopping.
- *Plantings:* The Channel Restoration project utilized used three seed mixes
    - Mixture Special (PLS) native seed mix on adjacent RIM easements (see spec book 5.2-21)
    - CP23A native seed mix on adjacent CRP land
    - MnDOT 250 (currently MnDOT Mix 25-141) non-native grassland mix along the set back levies north of 130th St.

    MnDOT 110 (currently MnDOT 21-111) Oats cover crop was used on all disturbed areas in combination with the MnDOT mixes.

  The Diversion Structure Plantings utilized MnDOT 130 (currently MnDOT 21-113) Soil Building Cover (Oats & Field Pea) and MNDOT Mix 280 (currently MnDOT Mix 24-142) Agricultural Roadside Mix to provide erosion control and vegetative stabilization.

  Mixes MnDOT 250 & 280 include Smooth Brome Grass, a species listed by the MnDNR as invasive. Live stake willow and wattling was used adjacent to the private agricultural road crossings.

- *Consultation with Agencies:* Project proposers and engineers worked closely with DNR stream restoration specialists to develop stream profile design and specifications.

- **What plans / record of project decisions / prescription worksheets are available?**

  Final Engineer's Plan Report: Red Lake Watershed District Project 60F: Grand Marais Outlet Restoration. July 2012

  Construction Plans for Grand Marais Creek Channel Restoration Project (As-Built Plan): Red Lake Watershed District Project No. 60F, Esther Township, Polk County.

  Project Manual: Grand Marais Creek Channel Restoration Project: RLWD Project No. 60F

  Project Specifications: Grand Marais Creek Channel Restoration Project (Phase 2-Diversion Structure). Red Lake Watershed District Project No. 60F

Red Lake WD letter to MN DNR *Re: Grand Marais Outlet Restoration seeding.* March 22, 2016

- **What are the stated goals of the project?**
  - Reconstruct six miles of natural channel based on sound scientific principles of natural channel design, hydrology and fluvial geomorphology.
  - Restore and sustain aquatic habitat conditions in the channel and on up to 400 acres of riparian corridor habitats, which were abandoned and mostly farmed for the past 50+ years.
  - Divert flows from the existing outlet channel or Cutoff Ditch, and restore hydrology to the original Grand Marais Creek channel. The downstream end of the project is located at the original outlet of the Grand Marais Creek into the Red River.
  - Maintain or slightly reduce existing flood stages immediately upstream of the project limits by increasing conveyance abilities during flood events on the Grand Marais Creek.
  - Minimize/control flood impacts throughout the channel restoration segment through establishment of flowage easements and isolated setback levees.
  - Restore permanent and seasonal fish spawning and juvenile habitat as well as habitat for a variety of other aquatic and terrestrial species.
  - Original Grand Marais channel reconstruction is designed for the following Natural Resources Enhancement purposes: riparian corridor, aquatic habitat, fish passage.
  - Connected to the Outlet Improvement Project, the channel is designed to accommodate diverted flows in the creek without increasing upstream flood stage water levels with their potential to impact personal property or farmland.
  - Diversion structure is designed to accommodate all flows from the cutoff ditch up to a two year event.
  - Stream outlet and grade stabilization structures at the Red River are designed to provide for fish passage up Grand Marais Creek.
  - All stream crossings are designed to meet hydraulic requirements as well as fish passage and other aquatic habitat needs.
  - RIM program was used to acquire sufficient habitat for riparian and aquatic restoration needs.
  - Setback levees are incorporated to contain diverted flows and create a buffer between channel and agricultural lands.
  - The restored channel corridor will also provide a more functional, reliable connection between the Red River and more than 20 miles of upstream riverine and wetland habitats in Grand Marais Creek.
  -
- **Were measures of restoration success identified in plans?** Yes
- **If yes, list specific measurements. Are these measures adequate to assess future success?**
- Measures of Restoration Success were listed in the *Grand Marais Accomplishment Plan*. Timeline goals relating to public meetings, environmental assessments, permitting and project construction have all been completed.
- *Measurable Project Goals include:*

- *Measurement 1:* Linear feet of river channel is reestablished with flow measurements along restored channel, acres of riparian area reestablished from agricultural use. (Area and linear calculations)
- *Measurement 2:* Linear feet of river channel established. Increased gamefish populations in Red River and Grand Marais Creek. Target species include Northern Pike and Channel Catfish. Given that most of the project is new channel restoration, this parameter should be met at time of construction completion.
- *Measurement 3:* Project Progress Reports sent to County Board, Township Board and Watershed District Board, Local agricultural communities. Assess long and short term reception to the project from surrounding stakeholders. (Progress reports and stakeholder feedback)

- *Measurements not defined*
  - No measures of success were specified for vegetative restoration including the restoration of floodplain habitats.
  - No measurements for channel stability were defined, only that creation would occur.
  - Measures for success of fish habitat were not specified, only that habitats would be created.
  - It is not clear that reference sites were identified or consulted for the development of plans.

- **Are plan Sets available?** Yes **Have new GIS maps been created?** Yes
- **If yes, provide in Appendix A and list Maps provided:**
  - Map 1: Soils Texture
  - Map 2: Site Topography
  - Map 3-6: Site Visit Notes

- **Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science? If not, what parameters diverge from these practices? Do these divergences affect outcomes?**
  - *Best Management Practices:*

1. NPDES Stormwater Pollution Prevention Plan was incorporated into the plan set for the project and incorporates a range of Best Management Practices for erosion control and timing of project activities.
2. Project engineers worked closely MnDNR stream experts in developing plan and profiles for stream configurations. U channel cross section design and careful placement of riffle and control structure along with bank stabilization techniques are in-line with best management practices.
3. Stream reconstruction occurred “off-line” of active stream flows, minimizing the likelihood of channel blowouts and increased sedimentation into the Red River

  - *Practices that diverge from best current science:*

1. Slope stabilization within channel areas specified primarily using “hydraulic soil stabilizer”. This method is considered a questionable method for slope stabilization. The practice was not used

and no alternative for slope stabilization or slope seeding was specified (See Red Lake WD letter to MN DNR March 22, 2016 for a discussion of decision making).

2. Plans did not identify wetland plant species for either seeding or shrub live staking. This allowed for replacement by non-native seed mixes and instances of unknown/unspecified plantings.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

- **Were alterations made to the original plan during construction? Discuss changes to the following:**
  - **Grading alterations:** Yes A small "field fix" change to the stream configuration was made between station 233 and 248. The change appears to have been made to accommodate field road crossing. This does not appear to have significant effect on the project. Many of the bank stabilization techniques were considered field fix approaches, including the uses and locations for Toe Wood, live staking and willow fascines.
  - **Elevation of structures or other components:** No None Noted.
  - **Changes to vegetation plan:** Yes Two seed mixes were specified in project specifications. "Seed Mixture Special" is a native seed mix designed for use in upland areas above the channel, primarily RIM easements. MnDOT 110 Oats cover crop was specified on all disturbed areas. No wetland or wet soils seed mix was specified. CRP mix CP-23A was substituted for "Seed Mixture Special" on 15.4 acres on Miles Gulbranson property. CP-23A is a native seed mix that meet specifications for programs under the Conservation Reserve Program, it is not clear what specific species were contained in this mix. The as-builts show the use of MnDOT seed mix 250 on upland areas adjacent to the top bank. This mix is a predominantly non-native mix comprised of Smooth Brome (DNR Invasive), Timothy, Canada Bluegrass, Kentucky Bluegrass, White Clover, Redtop, Perennial Rye, Alfalfa, Switchgrass and Slender Wheatgrass (See Red Lake WD letter to MN DNR March 22, 2016 for a discussion of decision making). Specifications for Willow staking do not specify species to be used. Sandbar willow appears to have been exclusively installed.
  - **Fill Material:** No Spoil areas were identified in plan and assume were used as specified.
  - **Others**: Yes. Side Inlet Channels were designed with Corrugated Metal Pipe (Culverts). These were not used but were replaced instead with Rock Chutes. The plan set allowed for either of these options to be used.
- **In what ways did alterations to the plan or implementation change the proposed project outcome? Did this change derive from a desire to change outcomes?**

  Seed Mixes: Use of MnDOT mix 250 was clearly intended to provide rapid stabilization of bare soils with perennial seed along setback levees. CP-23A was not specified and it is not clear what species were planted though the timothy dominates these areas. Seed for use in the "Hydraulic Soil Stabilizer" was not specified. No "wetland" or "saturated soils" seed mix was specified. As a project that is expected to function predominantly as a flow through wetland with minimal in-tact remnant soils at the surface, vegetative cover is essential for holding the ground surface in

place. However, the use of MnDOT mixture 250 will prevent the establishment of diverse riparian habitats comprised with native plant species, thus limiting the effectiveness of one project goal. This change did not derive from a desire to change project outcomes, but rather occurred due to planning oversight that did not clearly specify seed and plant stock species in project specifications (See Red Lake WD letter to MN DNR March 22, 2016 for a discussion of decision making).

Decision to not use Hydraulic Soil Stabilizer with Seed: The Watershed District engineers determined that Hydraulic Soil Stabilizer with Seed was not to be used based on past poor performance in the projects in the area. Rather than replace the practice and seed/provide slope protection, no alternative was implemented. Lower slopes and banks were not seeded and in most cases, no stabilization practices were used. The Watershed District and engineers and considered the risk of destabilizing established volunteer vegetation in the channel to be a greater threat to channel profile stability then the potential benefits of establishing new vegetation (See Red Lake WD letter to MN DNR March 22, 2016 for a discussion of decision making).

Bioengineering: Shift in location of specific bioengineering components (Toe Wood, fascines, live staking) does not appear to have changed project outcomes as these were field fit components.

Site Assessment

Field Review: September 16, 2015

- **Surrounding Landscape Characteristics:**

  The surrounding landscape is a mix of forested floodplain, CRP grasslands and tilled agriculture.

- **Site Characteristics:**

  9a. Soils: Soils in the project area are entirely finely textured soils with predominately fine silts within the restored channel area. K Factors of the soils within the entire channel are considered moderately erodible (K Factors from 0.24 to 0.28), though on the low side of the range. In general, early successional and annual native and non-native species are present, but in many portions of the lower slopes, bare soils are common. Up to 50% of the entire project area in the zone immediately above the bankfull elevation is bare soil. Small rills are present throughout, but these tend to be very small, perpendicular to the channel and very widespread. No large rills were noted along the channel where the project had been constructed. A gully was noted at roughly station 197. The gully appears to precede the project activities and is not likely project related (see Photo SR 28).

  9b. Topography: Topography in the project area is very flat, with steep slopes found only within stream channels. Oxbows and former river channels are present throughout the surrounding landscape, but are typically gently sloping topography with minimal remnant stream bank. Low areas have been restored to wetland, and upland CRP to mostly native grasslands and are generally

enrolled in conservation programs. Within the restored stream, since seeding was not used, nor were slope stabilization practices widely conducted, the success of establishment of the project will rely on the channel design, cross sections, bio-engineering practices and structural components. Limited vegetated cover poses a risk during spring flooding and elevated flows as river levels drop and channel flow is at its greatest. At this time, defining the "cutbank" elevation is difficult since nearly the entire channel has been recently created. Natural channel cross-sections should form in the coming years when annual flows are introduced.

9c. Hydrology: During site visit, water is present in the channel in low flow conditions. Based on conversations with the project team, site hydrology during the visit is as expected for late summer with perennial base flow from the Grand Marais Creek watershed. The overflow into the Cut Channel outlet is designed to occur when flood stages exceed the two year mark, providing protection for the restored channel and upstream farmland.

9d. Vegetation A:

- Within the wetted channel, rooted, native and non-native emergent vegetation is established or establishing where velocities are minimal.
- Along the lower banks, early successional and annual native and non-native species are present along most of the slopes, but bare soils are common.
- Above excavated channel elevations, non-native dominated grasslands are most typical. In the upper reaches of the project early establishment of the Special Mixture Seed mix comprised of predominantly native species appears to be establishing with some success. In these areas, cover crops predominate, but the species contained within the mix are present.
- In the lower reaches of the project, (approximately STA 172 to 270) MnDOT Mix 250 "Mesic General Roadside" is establishing rapidly and will likely become the dominant cover within a short time. Between approximately STA 270 and 310, reed canary grass is more common along the upper banks of the stream and fewer native species are obvious.

9e. Vegetation B: No vegetation monitoring protocols have been established for the project. During the site evaluation, plant species common within various project areas were noted on the maps, and lists of these species are provided below. Species lists were generated during meander review of project area and are not all inclusive. Generalized locations are shown in Maps 3-6

SR1

Common Name	Scientific Name	Abundance	Native/ Non-native	Plan Seed Mix (Y/N)
Yellow Foxtail	*Setaria glauca*	D	Non-native	N
Horsetail	*Conyza Canadensis*	C	Native	N

Tall Sunflower	*Helianthus giganteaus*	U	Native	Y
Cocklebur	*Xanthium* sp.	C	Native	N
Barnyard Grass	*Echinochloa crus-galli*	C	Non-native	N
Big Bluestem	*Andropogon gerardii*	U	Native	Y
Plains Coreopsis	*Coreopsis tinctoria*	C	Native	Y
Slender Wheatgrass	*Elymus trachycaulus*	D	Non-native	Y
Giant Ragweed	*Ambrosia trifida*	U	Native	N
Bull Thistle	*Cirsium vulgare*	C	Non-native	N
Canada Thistle	*Circium arvense*	U	Non-native	N
Switchgrass	*Panicum virginianum*	C	Native	Y
Reed Canary Grass	*Phalaris arundinacea*	D	Non-native	N
Sandbar Willow	*Salix interior*	C	Native	N
White Clover	*Trifolium repens*	C	Non-native	N
Side-oats Grama	*Bouteloua curtipendula*	U	Native	Y
Smooth Brome	*Bromus inermis*	C	Non-native	N
Site Setting/Description: Area between forest and stream, graded in 2013/4 and seeded in spring, 2015. Very densely vegetated with scattered native grasses. Some native grasses from the seed mix are present, but in very low numbers.				

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR2

Common Name	Scientific Name	Abundance	Native/ Non-native	Plan Seed Mix (Y/N)
Barnyard Grass	*Echinochloa crusgalli*	D	Non-native	N
Canada Lettuce	*Lactuca Canadensis*	C	Native	N
Plains Coreopsis	*Coreopsis tinctoria*	C	Native	N
Beggar's Ticks	*Bidens cernua*	C	Native	N
Common Plantain	*Plantago major*	C	Non-native	N
River Bulrush	*Bolboschoenus fluviatilis*	C	Native	N
Curly Dock	*Rumex crispus*	C	Non-native	N
Reed Canary Grass	*Phalaris arundinacea*	C	Non-native	N
Prairie Sunflower	*Helenium paucifolia*	C	Native	Y
Cocklebur	*Xanthium* sp.	C	Native	N
A Sedge Species	*Carex* sp.	C	Native (likely)	N
Site Setting/Description: East Bank of channel constructed in 2013. Vegetation is very dense. Along embankment, spoil is dominated by Reed Canary Grass with minimal other species. Away from the channel, Barnyard Grass dominates. Site appears wetter than most species in the Special Seed Mix would be adapted to. Prairie Sunflower, a species of the seed mix is present as is Plains Coreopsis, which is common to most of the other areas planted to the Special Seed Mix.				

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR3

Common Name	Scientific Name	Abundance	Native/ Non-native	Plan Seed Mix (Y/N)
Yellow Foxtail	*Setaria glauca*	D	Non-native	N
Smooth Brome	*Bromus inermis*	D	Non-native	N
Big Bluestem	*Andropogon gerardii*	C	Native	Y
Scattered Bunch Grasses	-	C	Native (likely)	Y (likely)
Field Thistle	*Sonchus arvensis*	U	Native	N
Side Oats Grama	*Bouteloua curtipendula*	U	Native	Y
Common Milkweed	*Asclepias syriaca*	C	Native	N
Barnyard Grass	*Echinochloa crusgalli*	C	Non-native	N
Field Thistle	*Sonchus arvensis*	U	Non-native	N
Cocklebur	*Xanthium* sp.	U	Native	N
Plains Coreopsis	*Coreopsis tinctoria*	U	Native	N
Curly Dock	*Rumex crispus*	U	Non-native	N
Prairie Sunflower	*Helenium paucifolia*	U	Native	Y
Canada Thistle	*Circium arvensis*	U	Non-native	N
Site Setting/Description: Upland seeded with Mixture Special. Yellow Foxtail is dominant and appears that it may have been used as a “cover crop”. Bunch grasses are present under foxtail. Big Bluestem and Sideoats Grama are present with seed heads.				

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR4

Common Name	Scientific Name	Abundance	Native/ Non-native	Plan Seed Mix (Y/N)
Yellow Foxtail	*Setaria glauca*	D	Non-native	N
Barnyard Grass	*Echinochloa crusgalli*	C	Non-native	N
Field Thistle	*Sonchus arvensis*	U	Non-native	N
Plains Coreopsis	*Coreopsis tinctoria*	U	Native	N
Water Plantain	*Polygonum aquatic*	U	Native	N
River Bulrush	*Bolboschoenus fluviatilis*	U	Native	N
Curly Dock	*Rumex crispus*	U	Non-native	N
Reed Canary Grass	*Phalaris arundinacea*	U	Non-native	
Prairie Sunflower	*Helenium paucifolia*	U	Native	Y
Site Setting/Description: Upland seeded with Mixture Special. Yellow Foxtail is absolutely dominant and appears that it may have been used as a "cover crop".				

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR5

Common Name	Scientific Name	Abundance	Native/ Non-native	Plan Seed Mix (Y/N)
Hybrid Cattail	*Typha x glauca*	D (channel)	Non-native	N

A Sedge Species	*Carex* sp.	C (channel)	Native (likely)	N
Curly Dock	*Rumex crispus*	C	Native	N
Horeweed	*Conyza Canadensis*	D	Native	N
Beggar's Ticks	*Bidens cernua*	C	Native	N
Alfalfa	*Medicago* sp.	D	Non-native	N
Squirrel Tail	*Hordeum jubatum*	C	Native	N
Reed Canary Grass	*Phalaris arundinacea*	U	Non-native	N
Smooth Brome	*Bromus inermis*	D	Non-native	N
Giant Ragweed	*Ambrosia trifida*	U	Native	N
Slender Wheatgrass	*Elymus trachycaulus*	D	Non-native	Y
Site Setting/Description: Streambank and stream channel vegetation. Bare soil is common along lower sloping banks. Small rills have formed and are common all along bank.				

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR6

Common Name	**Scientific Name**	**Abundance**	**Native/ Non-native**	**Plan Seed Mix (Y/N)**
Smooth Brome	*Bromus inermis*	D	Non-native	N
Canada Wild Rye	*Elymus Canadensis*	D	Native	Y
Alfalfa	*Medicago* sp.	C	Non-native	N

Slender Wheatgrass	*Elymus trachycaulus*	D	Native	Y
Yellow Foxtail	*Setaria glauca*	C	Non-native	N
Foxtail Barley	*Hordeum jubatum*	C	Native	N
Sandbar Willow	*Salix interior*	C	Native	N
Prairie Sunflower	*Helianthus pauciflora*	U	Native	Y
Site Setting/Description: Established CRP plot. Dominated by Canada Wild Rye. Very dense vegetation above recent channel construction.				

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR7

Common Name	**Scientific Name**	**Abundance**	**Native/ Non-native**	**Plan Seed Mix (Y/N)**
Smooth Brome	*Bromus inermis*	C	Non-native	N
Plains Coreopsis	*Coreopsis tentorius*	U	Native	N
Alfalfa	*Medicago* sp.	C	Non-native	N
White Clover	*Trifolium repens*	C	Native	Y
Yellow Foxtail	*Setaria glauca*	D	Non-native	N
Foxtail Barley	*Hordeum jubatum*	C	Native	N
Site Setting/Description: Area seeded in early summer 2015. Strongly dominated by Yellow Foxtail. Assume this species was in the seed mix, though not specified.				

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR8

Common Name	Scientific Name	Abundance	Native/ Non-native	Plan Seed Mix (Y/N)
Channel				
Hybrid Cattail	*Typha x glauca*	D (patchy)	Non-native	N
Softstem Bulrush	*Schoenoplectus tabernaemontani*	D (patchy)	Native	N
River Bulrush	*Bolboschoenus fluviatilis*	D (patchy)	Native	N
Open Water in channel	-	D (60%)	-	-
Bank				
Reed Canary Grass	*Phalaris arundinacea*	C	Non-native	N
Horseweed	*Conyza Canadensis*	C	Native	N
Giant Ragweed	*Ambrosia trifida*	U	Native	N
Pigweed	*Xanthium* sp.	C	Native	N
Beggar's Ticks	*Bidens cernua*	D	Native	N
Calico Aster	*Symphyotrichum lateriflorum*	C	Native	N
Cottonwood	*Populus deltoides*	C	Native	N
Site Setting/Description: Streambank below bankfull elevation. South bank at outside bend treated with Tow Wood. Inside bank forming shelf. Cross section shows no shelf in construction plans. May be forming				

during first season of water flows. Generally, monotypic stands of Softstem Bulrush, Hybrid Cattail and River Bulrush are forming.

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR9

Common Name	Scientific Name	Abundance	Native/ Non-native	Plan Seed Mix (Y/N)
Yellow Foxtail	*Setaria glauca*	D	Non-native	N
Barnyard Grass	*Echinochloa crusgalli*	C	Non-native	N
Field Thistle	*Sonchus arvensis*	U	Non-native	N
Plains Coreopsis	*Coreopsis tinctoria*	U	Native	N
Water Plantain	*Polygonum aquatic*	U	Native	N
River Bulrush	*Bolboschoenus fluviatilis*	U	Native	N
Curly Dock	*Rumex crispus*	U	Non-native	N
Reed Canary Grass	*Phalaris arundinacea*	U	Non-native	N
Prairie Sunflower	*Helenium paucifolia*	U	Native	Y
Site Setting/Description: Upland seeded with Mixture Special. Yellow Foxtail is dominant.				

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR10

Common Name	Scientific Name	Abundance	Native/ Non-native	Plan Seed Mix (Y/N)
River Bulrush	*Bolboschoenus fluviatilis*	D	Native	N
Rye (cover)	*Secale cereal*	U	Non-native	N
Plains Coreopsis	*Coreopsis tentorium*	C	Native	N
Witchgrass	*Panicum capillare*	C	Native	N
Curly Dock	*Rumx crispis*	C	Native	N
Reed Canary Grass (on spoil)	*Phalaris arundinacea*	C	Non-native	N
Prairie Sunflower	*Helianthus paucifolia*	U	Native	Y
Site Setting/Description: Area above bankful elevation as excavated. This area is dominated by river bulrush. Presumably this area was low prior to channel excavation and is a remnant wetland.				

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR11

Common Name	Scientific Name	Abundance	Native/ Non-native	Plan Seed Mix (Y/N)
Channel				
Hybrid Cattail	*Typha x glauca*	D	Non-native	N
Softstem Bulrush	*Schoenoplectus tabernaemontani*	C	Native	Y
River Bulrush	*Bolboschoenus fluviatilis*	C	Native	Y

Bank				
American sloughgrass	*Beckmannia syzigachne*	C	Native	N
Pigweed	*Amaranthus* sp.	C	Non-native	N
Giant Ragweed	*Ambrosia trifida*	C	Native	N
River Bulrush	*Bolboschoenus fluviatilis*	C	Native	
Redtop	*Agrostis gigantea*	C	Non-native	N
Alfalfa	*Medicago* sp.	U	Non-native	N
White Clover	*Trifolium repens*	U	Non-native	N
Common Plantain	*Plantago major*	U	Non-native	N
Reed Canary Grass	*Phalaris arundinacea*	C (upper slope)	Non-native	N
Curly Dock	*Rumex crispus*	C	Native	N
Calico Aster	*Symphyotrichum lateriflorum*	U	Native	N
Field Sow-thistle	*Sonchus arvensis*	U	Non-native	N
Cottonwood	*Populus deltoides*	U	Native	N
Bare Ground (50%)	-	-	-	-
Site Setting/Description: Mostly vegetated slopes above bankful. Species dominated by native and non-native species. Mostly early pioneer annual grass species dominate. Channel has abundant rooted River Bulrush and Softstem Bulrush. Exposed bank is limited to area immediately above water surface, whereas slopes above are well vegetated.				

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR12

Common Name	Scientific Name	Abundance	Native/ Non-native	Plan Seed Mix (Y/N)
Smooth Brome	*Bromus inermis*	D	Non-native	Y
Reed Canary Grass	*Phalaris arundinacea*	D	Non-native	N
Curly Dock	*Rumex crispus*	C	Native	N
Snowberry	*Symphorocarpus alba*	C	Native	N
Calico Aster	*Symphyotrichum lateriflorum*	U	Native	N
Site Setting/Description: Upland along restored stream channel. Seeded to MnDOT Mesic Roadside Mix in 2014. Reed Canary Grass is dominant along the upper slopes of channel restoration and into the field. Presume this was dominant prior to channel restoration.				

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR13

Common Name	Scientific Name	Abundance	Native/ Non-native	Plan Seed Mix (Y/N)
River Bulrush	*Bolboschoenus fluviatilis*	C	Native	N
Softstem Bulrush	*Schoenoplectus tabernaemontani*	U	Native	N
Reed Canary Grass	*Phalaris arundinacea*	D	Non-native	N
Giant Ragweed	*Ambrosia trifida*	C	Native	N
Pigweed	*Amaranthus* sp.	C	Non-native	N

Redtop	*Agrostis gigantea*	C	Non-native	N
Barnyard Grass	*Echinochloa crus galli*	C	Non-native	N
Bare Ground (50%)	-	-	-	-
Site Setting/Description: Most of the areas along the banks are comprised of bare soils with annualy weedy species. In some locations, Reed Canary is growing to the water's edge and presumably holding the banks. River Bulrush and Softstem Bulrush are scattered within the channel.				

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR14

Common Name	Scientific Name	Abundance	Native/ Non-native	Plan Seed Mix (Y/N)
Horseweed	*Conyza canadensis*	D	Native	N
Pigweed	*Amaranthus* sp.	C	Non-native	N
River Bulrush	*Bolboschoenus fluviatilis*	C	Native	N
Barnyard Grass	*Echinochloa crusgalli*	U	Non-native	N
Redtop	*Agrostis gigantea*	C	Non-native	N
Great Ragweed	*Ambrosia trifida*	U	Native	N
Alfalfa	*Medicago* sp.	U	Non-native	N
Calico Aster	*Symphyotrichum lateriflorum*	U	Native	N
Reed Canary Grass	*Phalaris arundinacea*	C	Non-native	N

Site Setting/Description: Restored stream within wooded area. Riffle Boulder Vane is located immediately downstream of railcar bridge. Area was not seeded. There is no evidence that erosion control blanket was used. Dominated by annual weedy species. River Bulrush is common in the channel, though not dominant.

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR15

Common Name	Scientific Name	Abundance	Native/ Non-native	Plan Seed Mix (Y/N)
Beggar's Ticks	*Bidens cernua*	D	Native	N
Horseweed	*Conyza canadensis*	D	Native	N
Reed Canary Grass	*Phalaris arundinacea*	C	Non-native	N
Barnyard Grass	*Echinochloa crusgalli*	C	Non-native	N
Curly Dock	*Rumex crispus*	C	Non-native	N
Water smartweed	*Plygonum aquatilis*	C	Native	N
Burdock	*Arctium* sp.	C	Non-native	N
River Bulrush	*Bolboschoenus fluviatilis*	U	Native	N
Sandbar Willow	*Salix interior*	C	Native	Y

Site Setting/Description: Very weedy and densely vegetated bank dominated by Beggar's Ticks and Horseweed. This section of the creek required tree clearing up to the point where design slopes were achieved. Will staking and willow fascines were installed. These appear to have been exclusively comprised of Sandbar Willow. These are greening up with some success (30%). Where Reed Canary Grass is present, it forms thick montypic stands. In a few locations, River Bulrush is present and forms dense stands, but limited in size.

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR16

Common Name	Scientific Name	Abundance	Native/ Non-native	Plan Seed Mix (Y/N)
Smooth Brome	*Bromus inermis*	D	Non-native	Y
Yellow Foxtail	*Setaria glauca*	D	Non-native	N
Water Smartweed	*Polygonum aquatilis*	C	Native	N
Giant Ragweed	*Ambrosia trifida*	C	Native	N
Reed Canary Grass	*Phalaris arundinace*	C	Non-native	N
Curly Dock	*Rumex crispus*	C	Native	N
Hybrid Cattail (channel)	*Typha x glauca*	C	Non-native	N
Broadleaf Arrowhead	*Sagittaria latifolia*	U	Native	N
Alfalfa	*Medicago* sp.	C (patchy)	Non-native	N
Site Setting/Description: This area is located between the wooded forests upstream, and just above the point at which the rocked channel begins. The site is located in an opening with agricultural fields on either side of the creek.				

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

SR17

Common Name	Scientific Name	Abundance	Native/ Non-native	Plan Seed Mix (Y/N)
Beggar's Ticks	*Bidens cernua*	C	Native	N

Pigweed	*Amaranthus* sp.	C	Non-native	N
Yellow Nutsedge	*Cyperus esculentus*	C	Native	N
Cottonwood	*Populus deltoides*	C	Native	N
Water Smartweed	*Polygonum aquatilis*	C	Native	N
Horseweed	*Conyza Canadensis*	C	Native	N
Alfalfa	*Medicago* sp.	C	Non-native	N
Slender Wheatgrass	*Elymus trachycaulus*	C	Native	Y
A Sedge Species	*Carex* sp.	C	Native (likely)	N
Canada Thistle	*Circium arvensis*	C	Non-native	N
White Clover	*Trifolium repens*	C	Non-native	N
Smooth Brome	*Bromus inermis*	C	Non-native	N
Reed Canary Grass	*Phalaris arundinacea*	C	Non-native	N
Calico Aster	*Symphyotrichum lateriflorum*	U	Native	N
Cocklebur	*Xanthium* sp.	C	Native	N
Common Plantain	*Plantago major*	U	Non-native	N
Site Setting/Description: Heavily vegetated slopes above the rock lined channel.				

*Abundance: D=dominant (>26%), C=Common (5-25%), U=Uncommon (0-5%)

- **Is the plan based on current science?** Portions

- **Explain.**

  Yes:

  - *Channel Design:* Channel design was developed by a team of river restoration professionals familiar with the characteristics of regional stream geomorphology. It appears as though the channel was designed using current science practices. These include channel sizing and cross section design that closely mimicked natural stream channel morphology from the region and engineered structural components based on design floods and regional conditions.
  - In conversation with Luther Aadland (DNR Stream Restoration Specialist), the channel is likely to function most often like a tidal wetland with backwaters from the flooded Red River filling the valley during the spring, followed by a steady flushing of the system through the summer months.
  - *Floodplain Habitat Restoration:* The project, as implemented, is likely to provide for the creation of functioning hydrological floodplain where none had been present for more than a century.
  - *Fish Passage, Habitat:* Given the expected flood regime of the Grand Marais Valley in relation to the Red River Valley, fish passage into the newly created/restored channel will likely occur during high waters in spring and early summer before water levels recede below the high stream gradient of the rocked channel at the confluence with the Red River. Channel catfish habitat is expected to be abundant along muddy bottoms within the channel. Following regeneration of emergent plant species within the channel, Northern Pike habitat should be available. Restoration of Grand Marais Creek with buffers will provide protection of habitat for Northern Pike, often under threat of drainage or dredging and removal of aquatic vegetation.
- **No:**
  - *Vegetation Species Selection:* Project planners neglected to specify seeding in large portions of the project area allowing for inappropriate seed mixes to be used. As a result, the project will likely not meet the goal of a fully functioning ecologically restored floodplain habitat. Fully functional ecological restoration of the floodplain would provide for structural diversity in the plant communities that will likely be lacking given the current planting trajectory. Greater structural diversity offers more niches, refugia, nectar sources and community stability for animal and plant species, over sites lacking diversity of native vegetation. Additionally, import of non-native invasive species degrades surrounding landscapes by maintaining and increasing undesirable seed sources. Structural diversity in the plant communities would presumably provide greater resilience of the slopes and soils as a wider range of species would be more adapted to a the wide range of hydrological characteristics present in the floodplain setting with extended periods of high water, extended drawdowns and annual sediment loads. Ideally, plant species adapted to wet conditions would have been specified and seeded/planted in areas where soil and surface saturation are to be expected.
-
-
- **List indicators of project outcomes at this stage of project:**

- *Fish Passage:* Given the expected flood regime of the Grand Marais Valley in relation to the Red River Valley, fish passage into the newly created/restored channel will provide the roughly six miles of intended habitat for species adapted to low gradient, sediment laden streams.
- *Stream Channel Restoration:* Side slopes along the channel appear to be stable with minimal soil loss but widespread development of small rills perpendicular to the flow of water. Bioengineering practices including Toe Wood, Willow Fascines and Live Staking were applied in select locations. These practices appear to be on track though springtime flows have not yet inundated the channel. Monitoring by the Watershed District and engineer in 2016 is essential and Technical Panel review in 2017 should occur to assess in stream stability.
- *Floodplain Habitat Restoration:*
    - Most of the project area is vegetated at this time with the exception of an area immediately above open water but within the excavated channel. This unvegetated area typically extends between 2 and 6 feet up the slope from the water's edge. Above this elevation, vegetation is typically thicker. In some areas the unvegetated area extends to the upper limits of excavation. With the low gradient of the stream in all but the final ½ mile above the Red River Confluence and well considered channel geometry and cross sectional design, it is likely that the channel may shift some until vegetation establishes.
    - Upland areas within the Floodplain Habitat Restoration areas in the upper reaches of the channel are dominated by annual and pioneering weed species typical of first year restorations. In most of these areas upstream (south) of the crossing at 130th Street NW, native bunch grasses and native forbs are emerging in the seeded mix. Downstream of this crossing, upland areas were seeded to MnDOT 250 and are densely vegetated with species of this mix. Areas seeded to the species in this mix provide little improvement or change to conditions prior to project initiation.
    - Within the open water channel, a mix of native (Bulrushes) and non-native (Hybrid Cattail) and emergent plant species is taking hold. These species will provide habitat within the channel for fish and other aquatic/terrestrial species of stream and wetland settings.
- *Community Support for the Project:* The project team reports continued support for the channel restoration by local landowners.
    -
- *Summary:* As long as slope stability and vegetation on the banks remain somewhat stable, and grade control structures within the channel function as planned, the project appears to be on track to provide for the six miles of stream channel restoration intended with no effect to flood stage levels, agricultural or personal property. Habitat restoration along the upper reaches of the channel is on track to meet project goals. Downstream of 130th St NW, habitat restoration is hindered by the use of non-natives seed in mixes.

- **Does the project plan / implementation of the project plan reasonable allow for achieving proposed project outcome?**

- The project is likely to achieve the proposed outcomes of stream channel reconstruction, hydrological floodplain restoration and landowner approvals; however, lack of vegetation on lower slopes presents a potential hazard for the project outcomes and the project has not yet been 'on-line' through spring runoff. Given that the stream is very low gradient, with the exception of the 500 linear feet above the Red River, it is likely that the channel will retain it's intended geometry and sediment loads.
- The site should be inspected for bank failure issues two to three times during the first three years of establishment to ensure stability and make corrections.
- Floodplain habitat restoration for a wide range of ecological functions is minimized by the planting of low diversity seed mixes that include aggressive, non-native, invasive species.
- The current contract specifies only one additional site treatment (mowing) within the seeded areas. While it appears that areas seeded to the Mixture Special Seed Mix are on a trajectory toward the successful establishment of the desired native species, this is not a certainty. The Watershed District should consider additional monitoring and followup vegetation management options.

- **Are corrections or modifications needed to meet proposed outcomes?**
  - The site should be revisited in 2016 to assess bank stability and develop corrective actions if needed.
  - Project managers should convene further technical review with State Agency partners and others to assess appropriateness of additional or redoing portions of vegetation restoration on the project. Two areas where this may be appropriate is in areas below the channel grading where species adapted to wet conditions may be appropriate, and in areas where MnDOT mix 250 was planted.

- **Do proposed or planned future steps, including long term management appear practical and reasonable? What are the potential challenges, limitations?**
  - **Yes.** Should slope failure occur, a reassessment of options should take place, using techniques that stabilize slopes in the short term and provide long term, appropriate plantings to provide long term stability.

- **Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.**
  - *Yes.*
  - Lack of wetland plantings/seedings in specifications or as implemented has the potential to cause short term stability issues prior to vegetation establishment, though given the low gradient nature of the stream it is likely that the channel will remain stable.
  - Long term issues may persist if deep rooted perennial vegetation does not establish. Bank failure and associated erosion may continue to occur until slopes are permanently stabilized.
  - Failure to develop and use native plant seed mixes appropriate to the project area detract from the potential to create high quality floodplain habitat with multiple ecosystem functions.

- **Are follow-up assessments needed? Explain.**
  - **Yes.**

    Local Review:

    - Followup assessments of the site should occur on the local level by the watershed district to ensure that slopes remain stable.
    - Site review of areas seeded to native species to assess potential management strategies that favor native seed plantings.

    State/Partners Technical Review:

    A Restoration Evaluation review of the site should occur in 2017 to assess the following project parameters:

    - *Streambank and Channel stabilization:* the project should be reassessed in 2017 to determine the effectiveness of channel design and implementation, particularly slope stability.
    - *Vegetation:* An assessment of the project should occur in 2017 to assess the status of seeded areas.
    - *Development of long term measurable project goals:* The goals outlined for the project were achieved at the time of construction, i.e. channel construction, seeding of surrounding floodplain and resident/watershed board communications. These goals do not provide a measure of the long term success of the project. In order to assess the long term success of the project, the project managers, State Agencies and other partners should consider a set of measurable parameters for future site visits.
    -

Project Determinations

- The project will:

a. Likely not meet proposed outcomes ☐
b. Minimally meet proposed outcomes ☐
c. Meet proposed outcomes ☒
d. Likely exceed proposed outcomes ☐

- Confidence of outcome determination

a. Low ☐
b. Medium ☒
c. High ☐

- **Provide explanation of reason(s) for determination.**
- The stated goals of the Project that have been met, or are likely to be met in the short term are: the creation of six miles of stream channel, creation of new fish habitat specifically for Northern Pike and Channel Catfish and strong communications with surrounding communities and residents, the project is on track to meet proposed outcomes. At present, given abundant exposed banks, a reassessment of the site is needed to ensure project meets these outcomes.

- The creation of ecologically functional floodplain habitats will be limited in locations where MnDOT 250 seed mix was used and potentially in unseeded areas. In those areas seeded to the "Mixture Special Mix" (primarily upstream of 130th St NW), it appears as though the project will likely meet proposed outcomes. The local team should consider short term monitoring and management (timed mowing, targeted herbicide applications or burning) to favor the native species in the mix. In those areas within the constructed channel not seeded, the likelihood of undesirable species, particularly Reed Canary Grass becoming dominant is high.
- **Site Assessor(s) Conducting Review:**
- Anthony Randazzo: HDR Engineering.

Figure 1: Site Topography

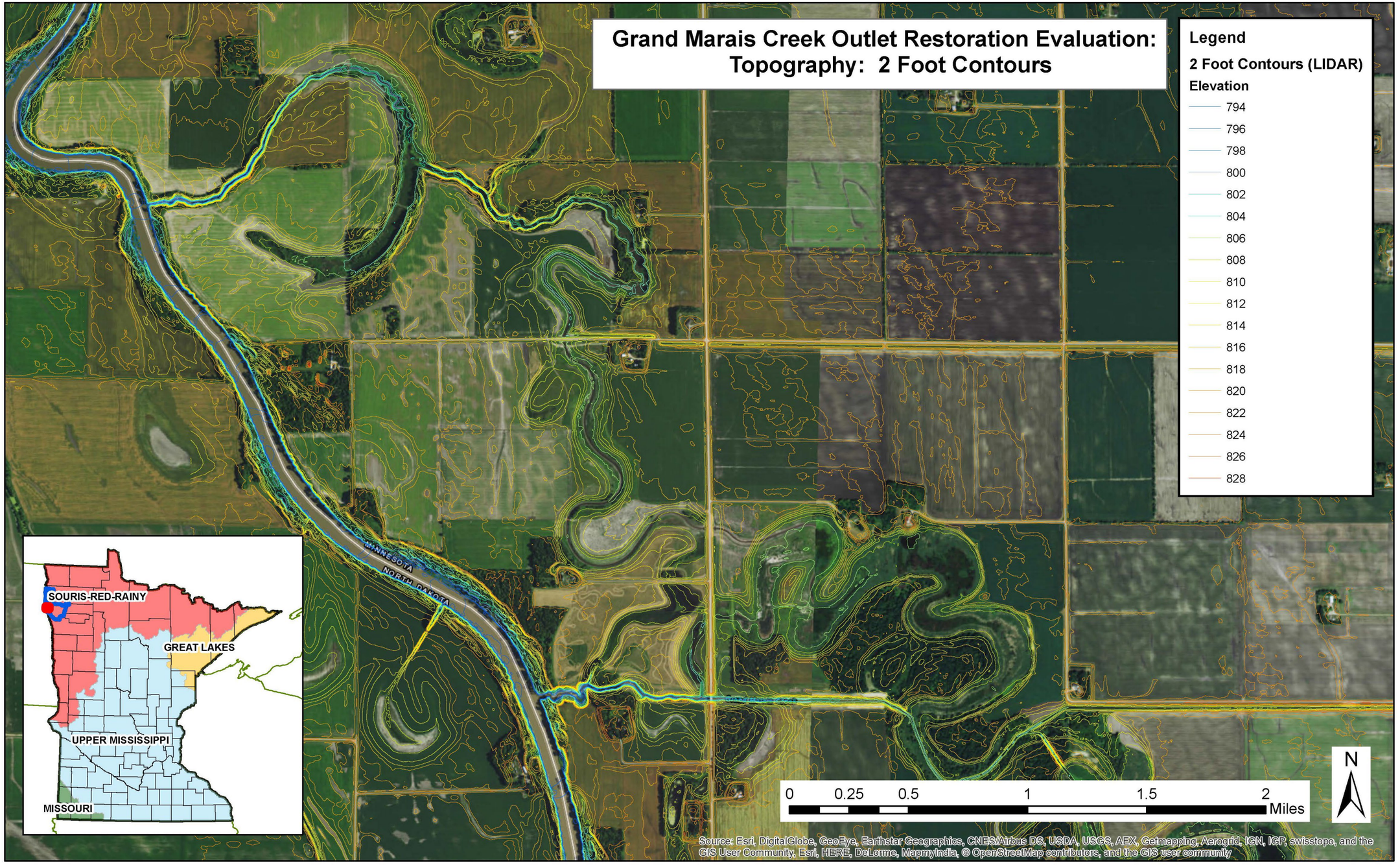


Figure 2: Soil Textures

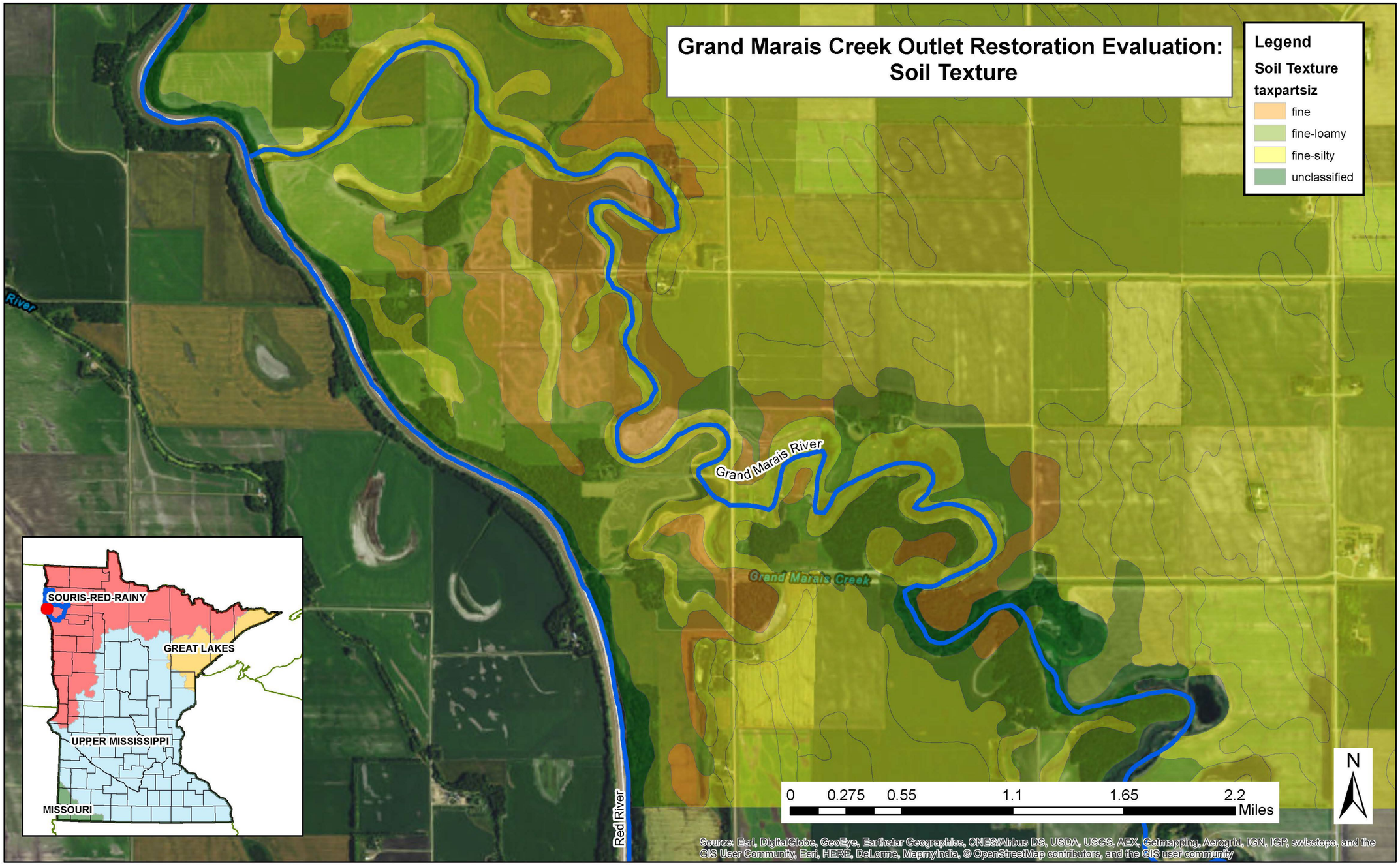


Figure 3: Site Visit Maps

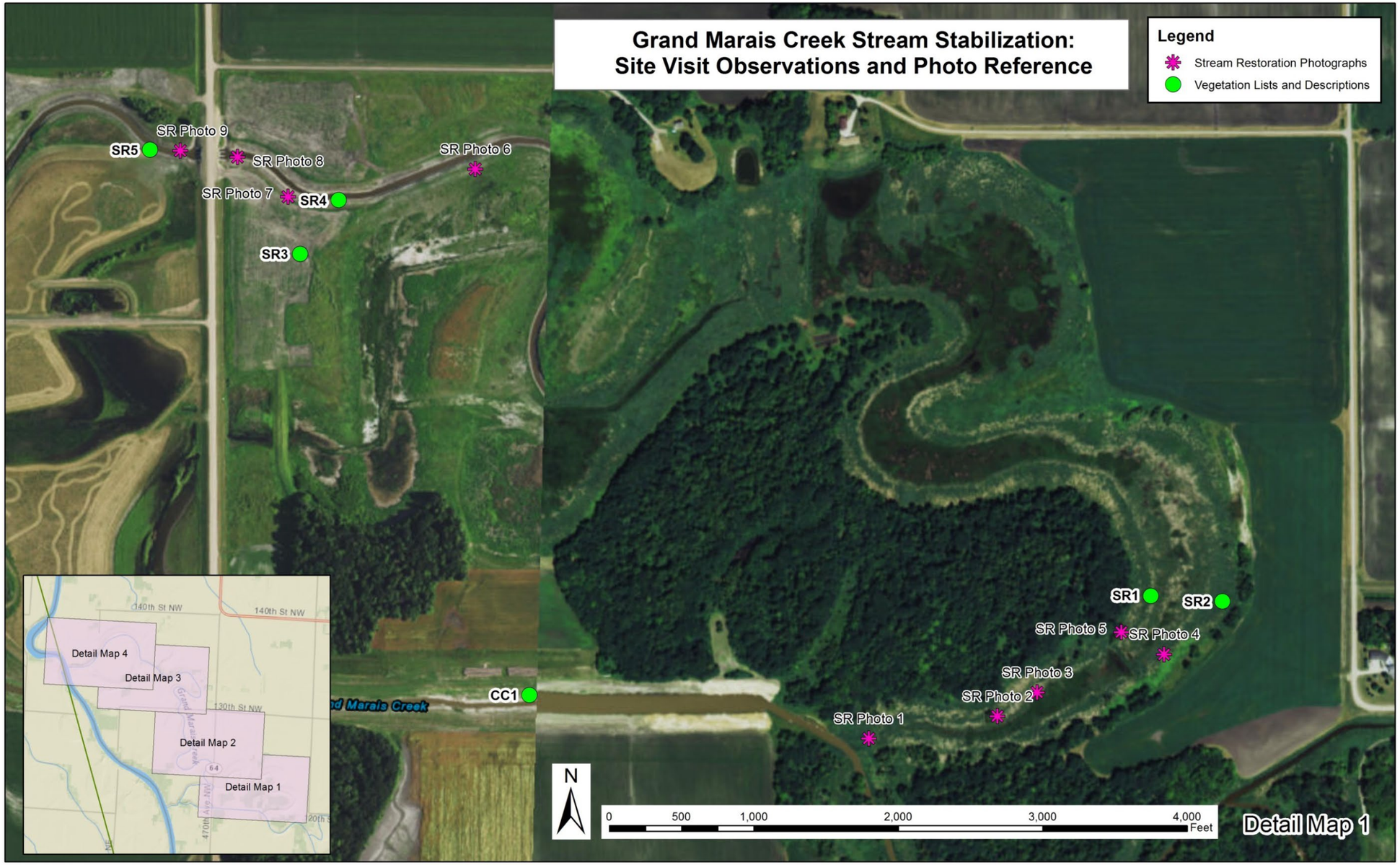


Figure 4: Site Visit Maps

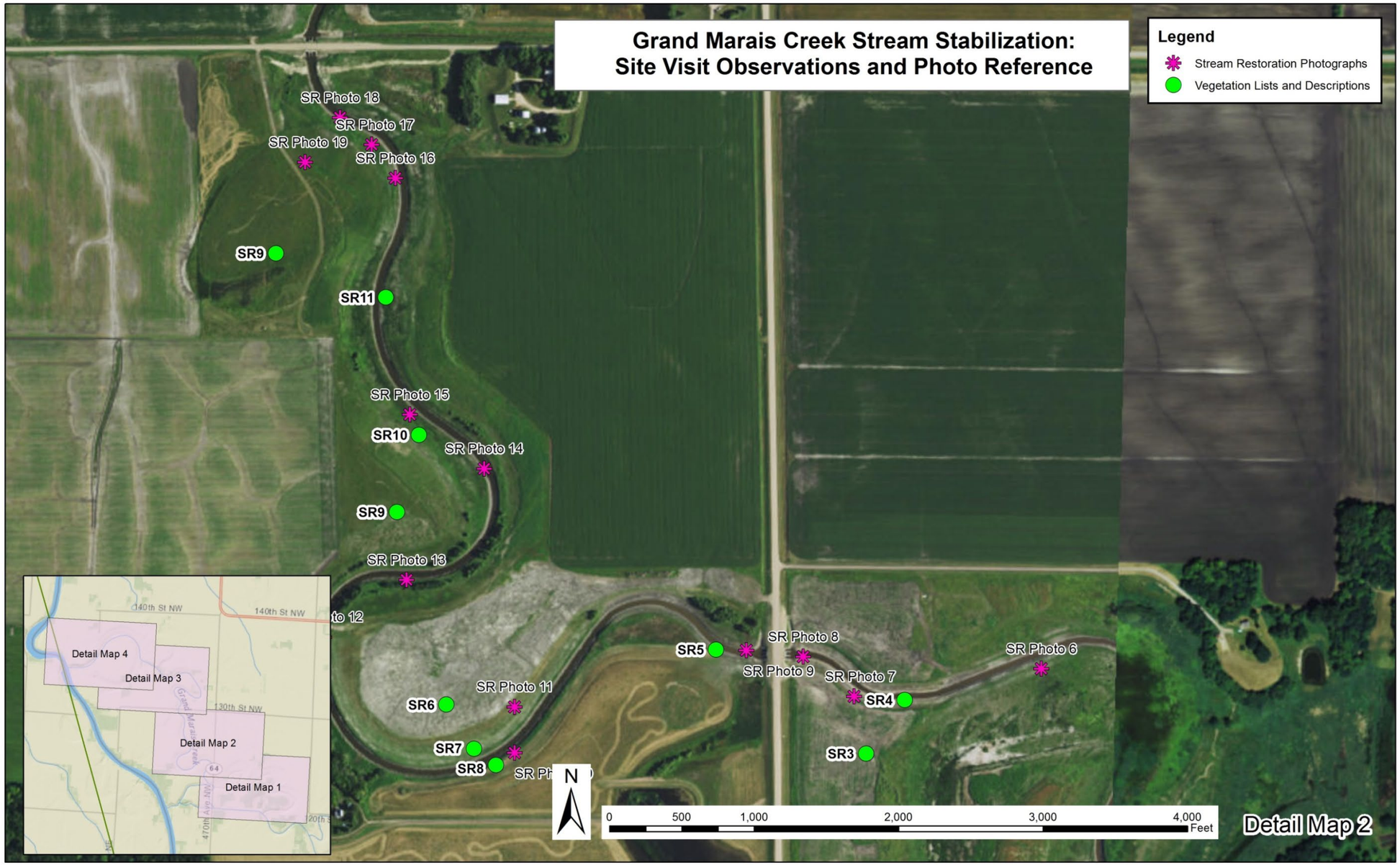


Figure 5: Site Visit Maps

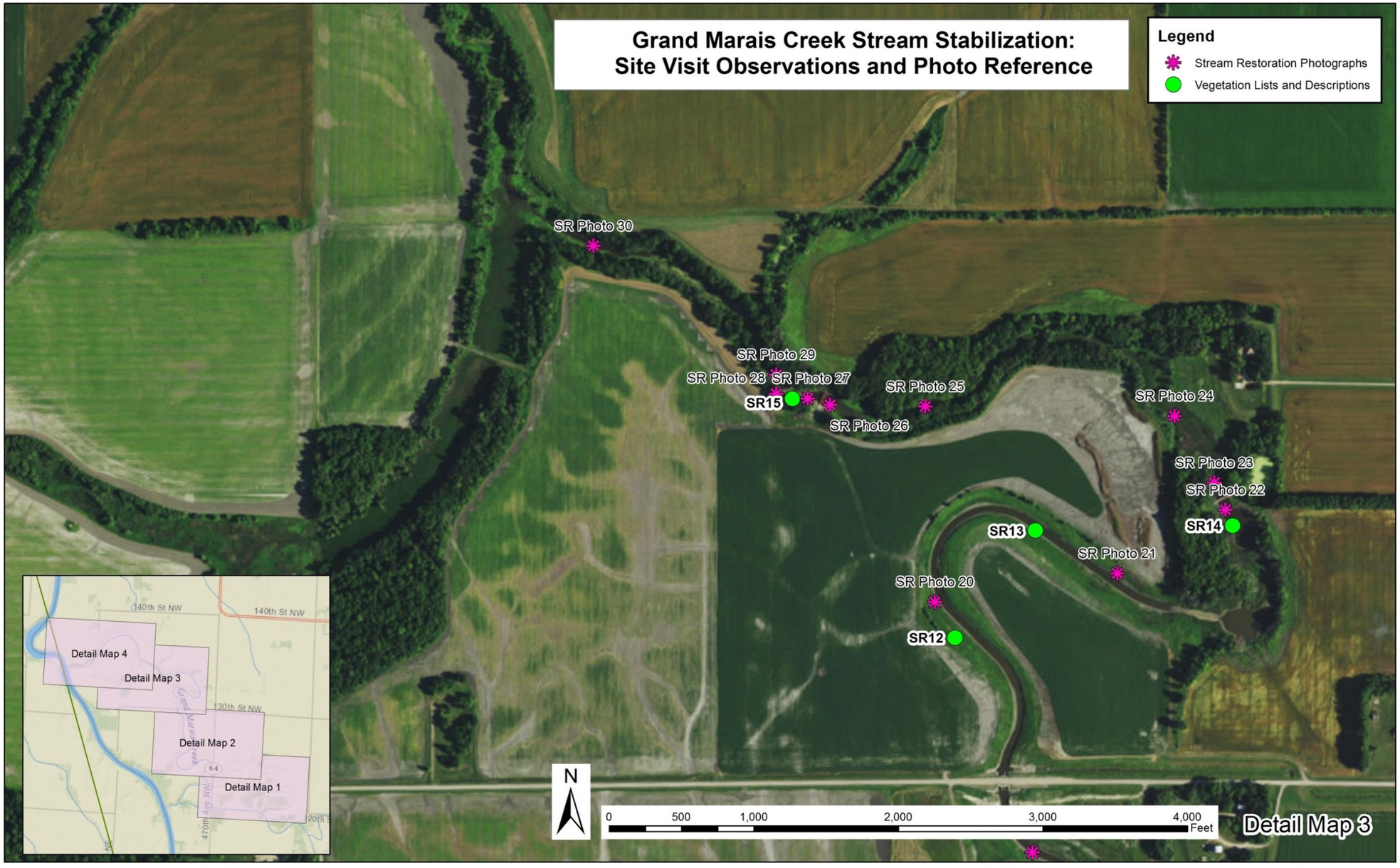
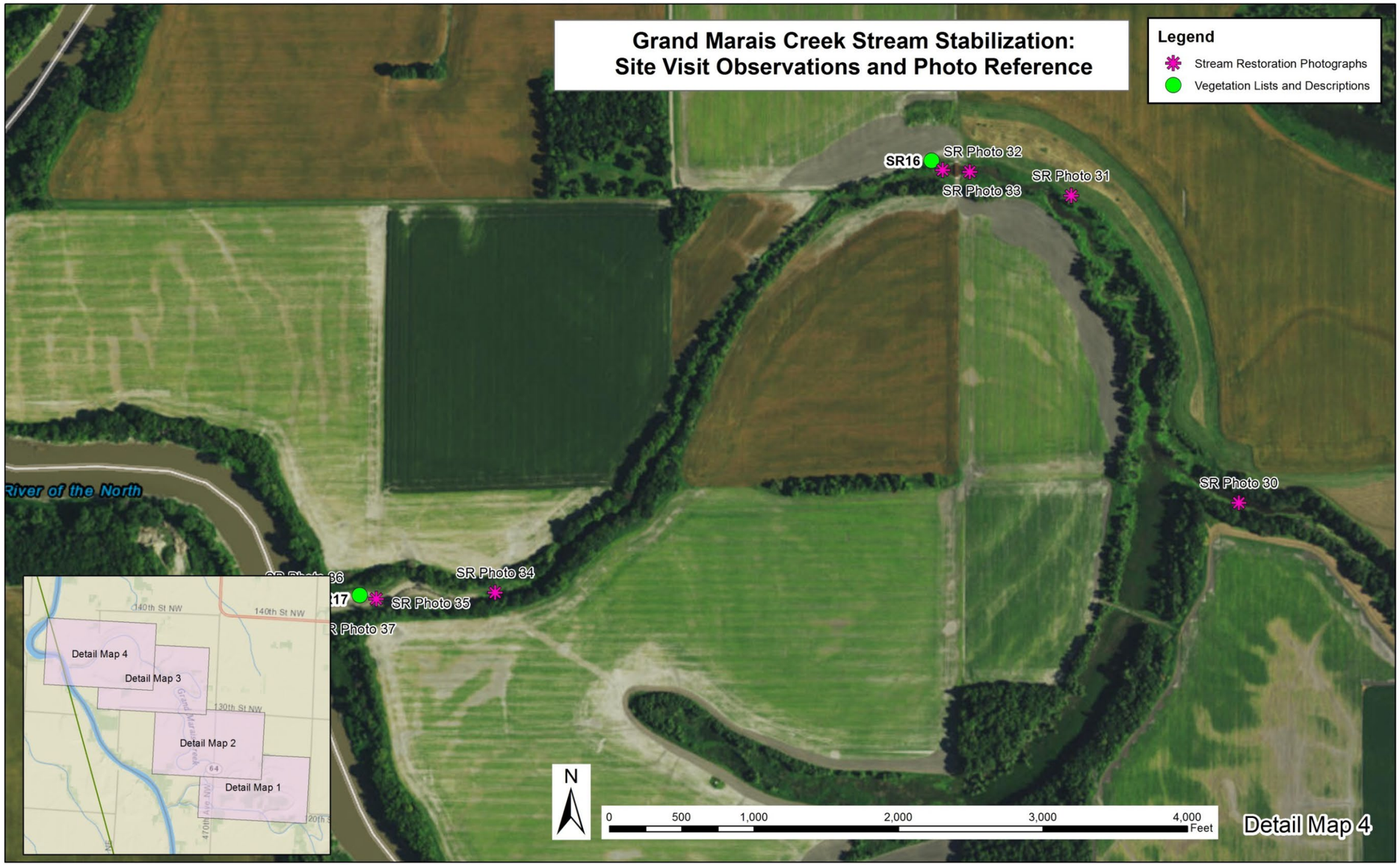


Figure 6: Site Visit Maps



Site Photographs

SR Photo 1: Grand Marais Creek at location of Diversion Structure.

SR Photo 2: Vegetated slopes in upper project area immediately downstream of Diversion Structure.

SR Photo 3: Area beneath vegetated bank dominated by reed canary grass.

SR Photo 4: East bank immediately downstream of Diversion Structure.

SR Photo 5: West bank immediately downstream of Diversion Structure.

SR Photo 6: Constructed Channel. Upper areas seeded to “Special Seed Mix”. Lower slopes not seeded, channel dominated by Hybrid Cattail.

SR Photo 7: Constructed channel. Above

SR Photo 8: Constructed Channel looking east from 470th Avenue NW. Seeded upland, unseeded channel.

SR Photo 9: Constructed channel looking west from 470th Avenue NW. Channel dominated by Softstem Bulrush.

SR Photo 10: Constructed Channel. Toe wood treatment on opposite bank.

SR Photo 11: Seeding areas above the channel restoration. Note three zones of seeding. Appears to have been seeded at different times with very different species composition.

SR Photo 12: Ellipse Channel Riffle at 171+25. Vegetation is volunteer.

SR Photo 13: Unseeded slope at excavated channel.

SR Photo 14: Unseeded slopes revegetating with predominantly annual weedy species.

SR Photo 15: Bare slopes where unseeded.

SR Photo 16: American Sloughgrass *Bechmannia syzigachne* dominates the lower unseeded slope in this location.

SR Photo 17: Softstem Bulrush in channel and saturated zone. Mostly annual weedy species inhabit the zone above.

SR Photo 18: Stream channel upstream of the road crossing at 130th St. NW.

SR Photo 19: Upland area south of 130th St. NW. Appears to be seeded to CP-23A, similar to adjacent areas seeded to this mix, and not areas seeded to “Mixture Special Mix”. *Setaria glauca* dominates.

SR Photo 20: Restored Channel north of 130th Street NW. Above the channel, Seed Mix MnDOT 250 was used. Uplands largely dominated by Smooth Brome with Reed Canary grass common near/in channel.

SR Photo 21: Dense Smooth Brome above channel with bare soils below.

SR Photo 22: Excavated channel in cleared woodlands. Immediately above water, annual weedy species dominate. River bulrush is common in channel.

SR Photo 23: Riffle Boulder Vane below railroad car bridge.

SR Photo 24: Vegetating slopes dominated by annual forbs.

SR Photo 25: Exposed banks where channel was excavated in forested areas.

SR Photo 26: Graded channel in cleared woods. Annual pioneer species dominate.

SR Photo 27: Railroad car bridge with Boulder Vane in channel below.

SR Photo 28: Gully above construction area in wooded area. Likely predates project as it is above existing exposed roots.

SR Photo 29: Channel graded in cleared woods.

SR Photo 30: C

SR Photo 31: Heavily vegetated banks in the openings below cleared woods. Annuals dominate.

SR Photo 32: Exposed banks along slopes downstream of cleared woods.

SR Photo 33: Rocked channel border above Boulder Vane.

SR Photo 34: Entering the V Channel Riffle at downstream portion of project.

SR Photo 35: V Channel Riffle

SR Photo 36: V Channel immediately upstream of confluence with the Red River. Note scour at base of cottonwood tree at top of slope.

SR Photo 37: V Channel at outlet to Red River.

SR Photo 38: Outlet to Red River. Sediment above constructed rock outlet assumed to be material deposited by Red River Floods in spring and scoured by Grand Marais Creek after coming on-line. Note change in water clarity between Grand Marais Creek and Red River at confluence.

12 Lebanon Hills Regional Park Buck Pond Wetland Restoration

Project Background

Project Name: Lebanon Hills Regional Park Buck Pond Wetland Restoration

Project Site: Lebanon Hills Regional Park, Carriage Hills Drive, Eagan, MN

Township/Range Section: Township 27N Range 23W Section 34

Project Manager / Affiliated Organization: Scott Hagen / Dakota County Parks

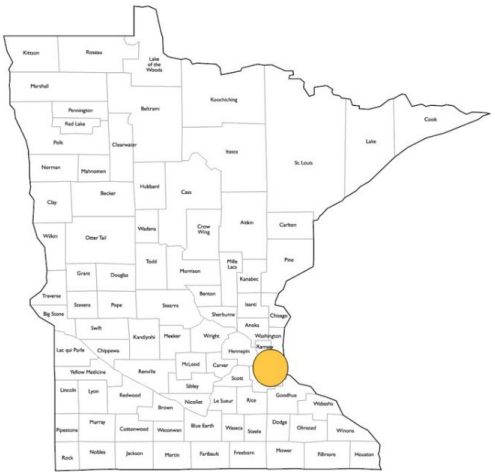
Fund: OHF - CPL ***Fiscal Year Funds:*** 2015

Project Start Date: 2016

Predominant Habitat type: Forest

Additional Habitat types: Wetland

Project Status: Post Establishment Phase



County: Dakota

Primary Activity: Wetland Restoration

Project Size: 172 acres

Project Completed: 2016

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***

This overall project included restoration of woodland, prairie and wetland. This review was primarily focused on the Buck Pond restoration activity of the CPL Grant. The 2015 CPL Grant application indicates the following treatments were to be employed:
"Invasive vegetation will be controlled around Buck Pond through herbicide application, controlled burns, and an introduction of native wetland species by volunteers and ICWC labor. This restoration will be completed in two sections in order to minimize the negative effects on the herp[tile] population."

The 2018 CPL Grant Final Accomplishment Report also included the following:
"The wetland restoration component will be accomplished using a modified wetland scrape method. This method will significantly speed up establishment management by removing the majority of reed canary grass root mass and propagules, while exposing the remnant native seed bank to sunlight."

"*While the wetland scrape may have been a cost-prohibitive or impractical approach in many situations, several site-specific factors make this an ideal candidate for this method: (1) Access to the site for heavy equipment was relatively easy. (2) A historic borrow pit is located a few hundred feet from the pond (but outside the pond's watershed) within the prairie reconstruction project area. This provides an ideal location to deposit scraped materials. An un-looked for benefit was that this material also softened the steep, difficult to manage sideslopes of the pit. This area will undergo extensive site prep prior to seed installation, so the transport of these propagules is not a great concern. (3) Buck Pond is isolated from other water bodies, significantly reducing the future reed canary grass propagule pressure. We are optimistic that once controlled, vigilance and timely maintenance will keep reed canary grass populations extremely low in the future. (4) Soil cores, limited seed bank assay and historic aerial photo analysis allowed us to reconstruct the history of sediment deposition from the relatively light upland soils that were in row crop production until the 1970s and posit that at least some of the native wetland seed bank remains intact beneath this sediment layer. If we are successful in this method, the value of this local ecotype seed source to the project and the park will be immense, and certainly worth the extra effort and risk involved."*

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   A narrative generally summarizing restoration activities was provided for this review, along with Annual Accomplishment report copies. Additional records may be on file with Dakota County Parks but were not available for this review effort.
3. ***What are the stated goals of the project?***
   The 2015 CPL Grant application indicated the following: *"restoring degraded fields and a wetland by removing exotic invasive species and replacing them with over 100 species of native forbs, sedges, and grasses."*
4. ***What are the desired outcomes of achieving the stated goals of the project?***
   The 2015 CPL Grant application indicated the following: *The small wetland restoration will provide an oasis to small numbers of waterfowl, deer, amphibians, and shoreline birds.*"
5. ***Were measures of restoration success identified in plans? No***
   If yes, list specific measurements.
   No specific/quantitative measures of success were identified in the CPL Grant application for the Buck Pond restoration effort.
6. ***Are plan Sets available?*** **No** ***Have project maps been created?*** **No**
   If yes, provide in "site maps" and list maps provided:
   This project did not include plans and specifications (e.g., engineering design)
7. ***Provide list of best management practices, standards, guidelines identified in plan set?***
   While there was no plan/specification set developed for this project, project narrative and personal communications from Dakota County Parks staff included the following activities that can be considered best practice for restoration of this type of isolated, depressional wetland:
   - Conduct field soil profile sampling to determine estimated depth and condition of fill soils over historic native wetland soils
   - Ecologist is present at the time and guides/directs heavy equipment operator on the depth of sediment/material to be removed
   - Lightly mulch excavated areas to minimize risk of erosion
   - Monitor excavated areas to determine level of recruitment of seedlings from near-surface, historic soil seed bank

- Supplemental seeding/planting design and seed/live plant installation based on observed volunteer native seedling recruitment
- Follow-up spot treatment of invasive reed canary grass

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   Yes
   The original work plan proposed in the CPL Grant application indicates restoration of Buck Pond would be accomplished "*through herbicide application, controlled burns, and an introduction of native wetland species by volunteers and ICWC labor*." The actual work conducted included the above-listed activities, as well as sediment scrape around portions of the perimeter around Buck Pond.

9. ***In what ways did alterations change the proposed project outcome?***
   The proposed project outcomes of reducing invasive plant cover while increasing native plant cover/diversity, along with improving wildlife habitat, remained the same.

Site Assessment

Field Review Date: 10/6/2022

Field Visit Attendees: Joe Walton, Dakota County Parks; Wade Johnson Keegan Lund, and Steve Kloiber, MN DNR; Paul Bockenstedt, Stantec

10. ***Surrounding Landscape Characteristics:***
    Buck Pond occurs within a relatively small, closed watershed and is surrounded by a mix of oak/deciduous woodland and reconstructed prairie.
11. ***Site Characteristics:***
    a. ***Soil Series:***
    Upland soils around Buck Pond are primarily sandy loam, loamy sand, and loamy fine sand. Buck Pond itself is mapped as Quam silt loam.
    b. ***Topography:***
    Slopes surrounding Buck Pond vary from moderate to moderately steep. Areas closest to the pond itself generally have more shallow slopes.
    c. ***Hydrology:***
    Buck Pond is an isolated, depressional wetland. While it is not completely clear, it appears that the hydrology of the wetland is primarily surface water-driven, although groundwater may also contribute to the hydrology of the wetland itself.
    d. ***Vegetation: Plant Communities, Dominant Species & Invasives % Cover:***
    At the time of the field visit, the water levels in Buck Pond were quite low, with abundant exposed mud flats on the margin. Despite this, there were numerous desirable native species of emergent and submergent plant species observed, including several species of pond weeds and water shield.

The wetland fringe included a mix of native grasses, sedges, rushes and forbs, some of which were expressed from the newly exposed seed bank, others were from native seeding efforts that followed the wetland edge scrape to remove deposited sediments. The water levels in Buck Pond have fluctuated dramatically in recent years, including a resent high-water phase that created a bottleneck for wetland fringe plant species – it appears some longer-lived native plants were negatively impacted and present in relatively low numbers in much of the wetland fringe, while adventitious species like beggar-ticks and tearthumb have been able to jump into the open spaces left after high water receded. Additional information on plant species present and their relative abundance is included at the back of this form.

12. ***Is the plan based on current science?*** Yes
    One of the current accepted practices for restoration of isolated, depressional wetlands that were historically surrounded (and negatively impacted) by land that was row cropped includes removal of sediment transported from crop ground and deposited in wetland areas.
13. ***List indicators of project goals at this stage of project:***
    There was an obvious contribution from the seed bank for soils exposed following sediment removal. Reed canary grass total cover has been significantly reduced and remains very low as a result of ongoing spot herbicide treatments.
14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***
    Yes, initial restoration activities and ongoing maintenance activities
15. ***Are corrections or modifications needed to achieve proposed goals?***
    At the time of the field review, it did not appear that corrections or modifications are necessary at this time.
16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***
    Yes, planned/future steps of spot treating invasive plant species appears to be the most practical long-term management activity at this point.
17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No, implemented and planned activities do not detract from achieving goals and maintaining desired condition.
18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    No additional assessments are recommended at this time. Vegetation appears to be in good condition, considering the hydrologic dynamics of this wetland. Ongoing maintenance as planned by Dakota County Parks will help ensure long-term success and stability.
19. ***Additional comments on the restoration project.***
    The project documents indicated that there were 10,000 native plant plugs installed at Buck Pond. While the review team did not have access to the list of species or quantities of plant plugs installed, a period of unusually high water since planting and the observations of plant species present would tend to indicate that some (perhaps significant) portion of planted plugs were likely lost as a result of sustained high water level in the wetland.

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Achieved the stated goals.
21. ***The project will:***
    Meet proposed outcomes.
    Confidence of outcome determination:
    High.
22. ***Provide explanation of reason(s) for determination.***
    Native plants were dominant in restored area, with only a very small amount of invasive vegetation (reed canary grass).
23. ***Site Assessor(s) conducting field review:***
    Wade Johnson, Keegan Lund, Steve Kloiber of MN DNR; Paul Bockenstedt, Stantec

Site Maps, Project Plans or Vegetation Tables

Table 19 – Plant species observed at Buck Pond in wetland fringe and emergent plant zone

Scientific Name	Common Name	Cover Class	Seeded/ Planted* (Y/N)	Status
Acer negundo	box elder	5-25%	No	Native
Agrostis stolonifera	spreading bentgrass	1- 5%	No	Nonnative
Alisma subcordatum	heart-leaved water plantain	0-1%	?	Native
Asclepias incarnata var. incarnata	swamp milkweed	0-1%	?	Native
Bidens connata	swamp beggarticks	5-25%	?	Native
Brasenia schreberi	watershield	0-1%	No	Native
Calamagrostis canadensis	bluejoint	1- 5%	?	Native
Carex bebbii	Bebb's sedge	5-25%	?	Native
Carex scoparia var. scoparia	pointed broom sedge	5-25%	?	Native
Ceratophyllum demersum	common coontail	5-25%	No	Native
Cirsium discolor	field thistle	0-1%	No	Native
Eleocharis acicularis	least spikerush	5-25%	?	Native
Eleocharis palustris	marsh spikerush	5-25%	?	Native
Epilobium coloratum	purple-leaved willow herb	0-1%	?	Native
Erechtites hieraciifolius var. hieraciifolius	pilewort	1- 5%	No	Native
Eupatorium perfoliatum	common boneset	5-25%	?	Native
Glyceria grandis var. grandis	tall manna grass	1- 5%	?	Native
Glyceria striata	fowl manna grass	1- 5%	?	Native
Heteranthera dubia	water stargrass	0-1%	No	Native
Hypericum majus	large St. John's-wort	1- 5%	No	Native
Leersia oryzoides	rice cut grass	5-25%	?	Native
Lycopus americanus	cut-leaved bugleweed	5-25%	?	Native
Mimulus ringens var. ringens	blue monkey flower	0-1%	?	Native
Persicaria pensylvanica	Pennsylvania smartweed	0-1%	No	Native
Persicaria sagittata	arrow-leaved tearthumb	0-1%	No	Native
Phalaris arundinacea	reed canary grass	0-1%	No	Invasive
Poa palustris	fowl bluegrass	1- 5%	?	Native
Populus tremuloides	quaking aspen	1- 5%	No	Native
Potamogeton amplifolius	large-leaved pondweed	0-1%	No	Native
Potamogeton illinoensis	Illinois pondweed	5-25%	No	Native
Potamogeton natans	floating pondweed	0-1%	No	Native
Potamogeton zosteriformis	flat-stemmed pondweed	0-1%	No	Native
Rorippa palustris	Icelandic yellow cress	0-1%	No	Native
Rubus idaeus var. strigosus	red raspberry	5-25%	No	Native
Rudbeckia hirta var. pulcherrima	black-eyed Susan	0-1%	?	Native
Rumex crispus	curly dock	0-1%	No	Invasive
Sagittaria rigida	sessile-fruited arrowhead	5-25%	?	Native
Salix nigra	black willow	5-25%	No	Native
Scirpus cyperinus	woolgrass	0-1%	?	Native

Scutellaria lateriflora	mad dog skullcap	0-1%	?	Native
Solanum dulcamara	bittersweet nightshade	0-1%	No	Invasive
Solidago gigantea	giant goldenrod	1- 5%	No	Native
Typha ×glauca	hybrid cattail	0-1%	No	Invasive
Urtica dioica subsp. gracilis	stinging nettle	0-1%	No	Invasive
Verbena hastata	blue vervain	5-25%	?	Native

**Seeding/planting list(s) were unavailable at the time of review. Species marked as "No" are either nonnative or native and presumed volunteered from the seed bank.*

Site Photographs

Photo 61 – Standing within excavated wetland margin on south end of Buck Pond, looking northeast. Group is standing roughly at elevation of highest water level in recent years, juxtaposed with the unusually low water level in October 2022 after two years of substantially below normal rainfall.

Photo 62 – Photo of east side of Buck Pond wetland edge where deposited sediment was removed. Mud flat area includes abundant cover by spike rushes, while the emergent zone has a large amount of rigid arrowhead.

Photo 63 – Project review team members Steve Kloiber (left) and Keegan Lund (right) as well as Joe Walton of Dakota County Parks (center) discussing native plant establishment.

Photo 64 – Former barrow area that was filled with sediment excavated from the fringes of Buck Pond. Dakota County continues to treat reed canary grass that volunteers from this sediment with the long-term goal of establishing desirable native vegetation in this area.

13 Spring Lake Park Bison Paddock Prairie Enhancement

Project Background

Project Name: Spring Lake Park Bison Paddock Prairie Enhancement

Project Site: Pine Bend Trail, Rosemount, MN 55068

Township/Range Section: Township 115N Range 18W Section 22

Project Manager / Affiliated Organization: Tom Lewanski / Dakota County Parks, Natural Resources Manager, Tom.Lewanski@CODAKOTA.MN.US

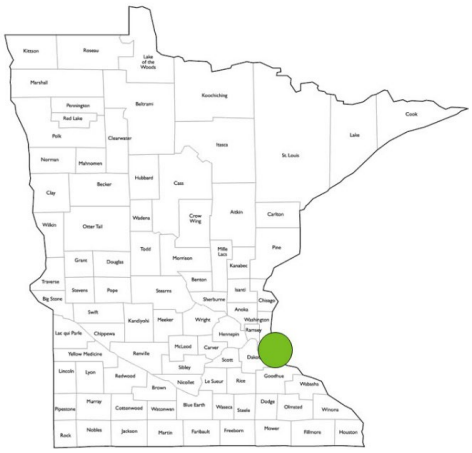
Fund: PTF ***Fiscal Year Funds:*** 2012

Project Start Date: 2012

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Forest

Project Status: Post Establishment Phase



County: Dakota

Primary Activity: Prairie Enhancement

Project Size: 40.6 acres (Archery Range only)

Project Completed: 2014

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Woody species control as initial phase of restoring prairie (savanna).
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Spring Lake Park South Archery Trail – Ecological Restoration Plan, from Dakota Co Parks Nat Resources. Specific actions for woody removal were guided by *Project Schedule pg. 34* of plan.
3. ***What are the stated goals of the project?***
   Create open prairie and savanna structure through woody removal and thinning. The 2017 project evaluation noted: "Create structure and conditions to facilitate restoration of *Southern Dry-Mesic Oak Forest MHs37* and *Southern Dry Prairie UPs13".* Based on the landscape setting and vegetation composition observed at the time of the 2022 evaluation, the woodland areas appear to be more closely allied with and trending toward fire-dependent oak-dominated woodland (e.g., FDs37 Southern Dry-Mesic Oak (Maple) Woodland).
4. ***What are the desired outcomes of achieving the stated goals of the project?***

To have substantially completed initial, intense restoration activities in the process of achieving the long-term goal of accomplishing restoration of composition, structure and function of desired MHs37 and Ups13 native plant communities.

5. ***Were measures of restoration success identified in plans?*** Choose an item.
   If yes, list specific measurements.
   All shrubs and trees were cut and stump treated except selected oak, American hazel, and black walnut (black walnut is planned to be phased out over time).
6. ***Are plan Sets available?*** No ***Have project maps been created?*** No
7. ***Provide list of best management practices, standards, guidelines identified in plan set?***

Formal design plans and specifications were not created as a part of this project. However, the *Spring Lake Park South Archery Trail – Ecological Restoration Plan* is reported by Dakota County Parks staff to outline the restoration activities that were completed during this PTF Grant-funded effort, including:

- Initial cutting and stump treatment of invasive trees and brush
- Residual woody material was removed or piled and burned on site.

Additional funding sources (other than PTF dollars) were utilized to accomplish forestry mowing, disking, broadcast and drilled seeding as well as follow-up prescribed burning.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   No
   None were reported in the 2017 evaluation and Scott Hagen, representing Dakota County Parks during the review, was unaware of any alterations.
9. ***In what ways did alterations change the proposed project outcome?***
   Not applicable – no alterations were reported

Site Assessment

Field Review Date: 9/29/2022

Field Visit Attendees: Scott Hagen, Dakota County Parks; Wade Johnson, MN DNR, Paul Bockenstedt, Stantec

10. ***Surrounding Landscape Characteristics:***
    The site occurs on a terrace of the Mississippi River and Spring Lake Park which lies to the north. The area to the east is part of an industrial complex operated by Mosaic and includes woodland areas that have, in the past, been actively managed to restore natural area quality. Park land occurs to the southeast. A bluff occurs to the south that is private land and characterized by disturbed deciduous woodland – the Rosemount Outwash Plain occurs at the top of this slope, extending to the southwest.
11. ***Site Characteristics:***
    a. ***Soil Series:***

The project area is predominantly Hubbard loamy sand (excessively drained) and Sparta loamy fine sand (excessively drained). The southeast portion of the area also includes Port Byron silt loam, Waukegan silt loam and Hawick loamy sand.

b. Topography:

The site is nearly level for some distance from Pine Bend Trail and then modestly slopes toward the Mississippi before flattening out again.

c. Hydrology:

The majority of soils at the site are considered excessively drained.

d. Vegetation: Plant Communities, Dominant Species & Invasives % Cover:

Vegetation of the area at the start of the project was characterized by a mix of historically planted vegetation (nonnative, cool season pasture grasses and with scattered volunteer trees and shrubs). Native graminoids and forbs were seeded to the site after woody removal funded by the PTF-funded. Please refer to the meander survey plant species list in Table 1 for additional details on plant species composition.

12. *Is the plan based on current science?* Yes

The sequencing of restoration activities is consistent with current restoration science. Initial invasive tree and brush clearing was used to prepare the site for subsequent restoration activities.

13. *List indicators of project goals at this stage of project:*

The absence of most of the undesirable woody species in the project area was followed by site preparation (helicopter-applied herbicide in open, former crop ground areas) and native prairie/savanna seeding. At the time of the project evaluation, dry and dry-mesic prairie species was present relatively broadly in most areas. There is an area that had higher density of trees and shrubs at the start of the project – this area continues to struggle more with residual tree/brush seedlings and saplings, nonnative grasses, and areas where the native seed mix establishment was spotty. Across this restoration area (Unit 4 in Figure 1) native plant cover ranges from about 40-90%. Ongoing active management of undesirable woody species will contribute to sustained progress of the restoration process. This restoration area is now part of a bison paddock where bison will be grazed in the future on a rotational basis. Bison may assist with brush control and/or modify native vs. nonnative plant species composition, as well.

14. *Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?*

Yes. As implemented, the plan has generally achieved restoring dry and dry-mesic prairie and oak woodland. Areas of lagging development occur in the eastern portions of this Unit.

15. *Are corrections or modifications needed to achieve proposed goals?*

No. Current conditions and planned future management activities should continue to contribute to maintaining and improving over native habitat quality of the area.

16. *Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?*

Planned future management as related by Dakota County Parks staff is reasonable and consistent with maintaining or improving the overall composition, structure and function of this restoration. It is unclear at this point what influences/impacts bison will have on the overall vegetation of this restoration area. Monitoring by Dakota County Parks staff is anticipated to help gather actionable data.

17. *Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.*

No. It is unclear what impact bison grazing will have on the overall plant species composition, but the County's intention is that implemented and planned activities, including bison grazing, will not detract from the habitat value of the project area.

18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    Not likely. Invasive, nonnative plant species specifically noted in the 2017 evaluation (Amur maple, spotted knapweed, leafy spurge, garlic mustard) were not observed in 2022, with the exception of spotted knapweed which was observed at low levels. Other invasive/nonnative plant species noted in 2017 Friends of the Mississippi River plant survey that generally pose concern for restorations include nonnative, cool season grasses smooth brome (*Bromus inermis*).
19. ***Additional comments on the restoration project.***
    Overall, this restoration appears to continue trending toward improved native plant composition as well as overall native habitat structure and function.

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Achieved the stated goals.
21. ***The project will:***
    Meet proposed outcomes.
    Confidence of outcome determination:
    High.
22. ***Provide explanation of reason(s) for determination.***
    Based on observable conditions and planned management activities as related by Dakota County Parks staff, it seems reasonable to expect that the gains in tree/brush removal can be sustained.
23. ***Site Assessor(s) conducting field review:***
    Wade Johnson, MN DNR; Paul Bockenstedt, Stantec

Site Maps, Project Plans or Vegetation Tables

Figure 39 – Spring Lake Park habitat types for restoration target areas. Woody vegetation removal/clearing activities completed as a part of PTF grant activates occurred, and were evaluated, in the Savanna and Prairie habitats on the eastern edge of the property. Prairie habitat south and east of the forested habitat near the center of the property were not included in the evaluation. Map provided by Dakota County Parks Natural Resource staff (2017 review).

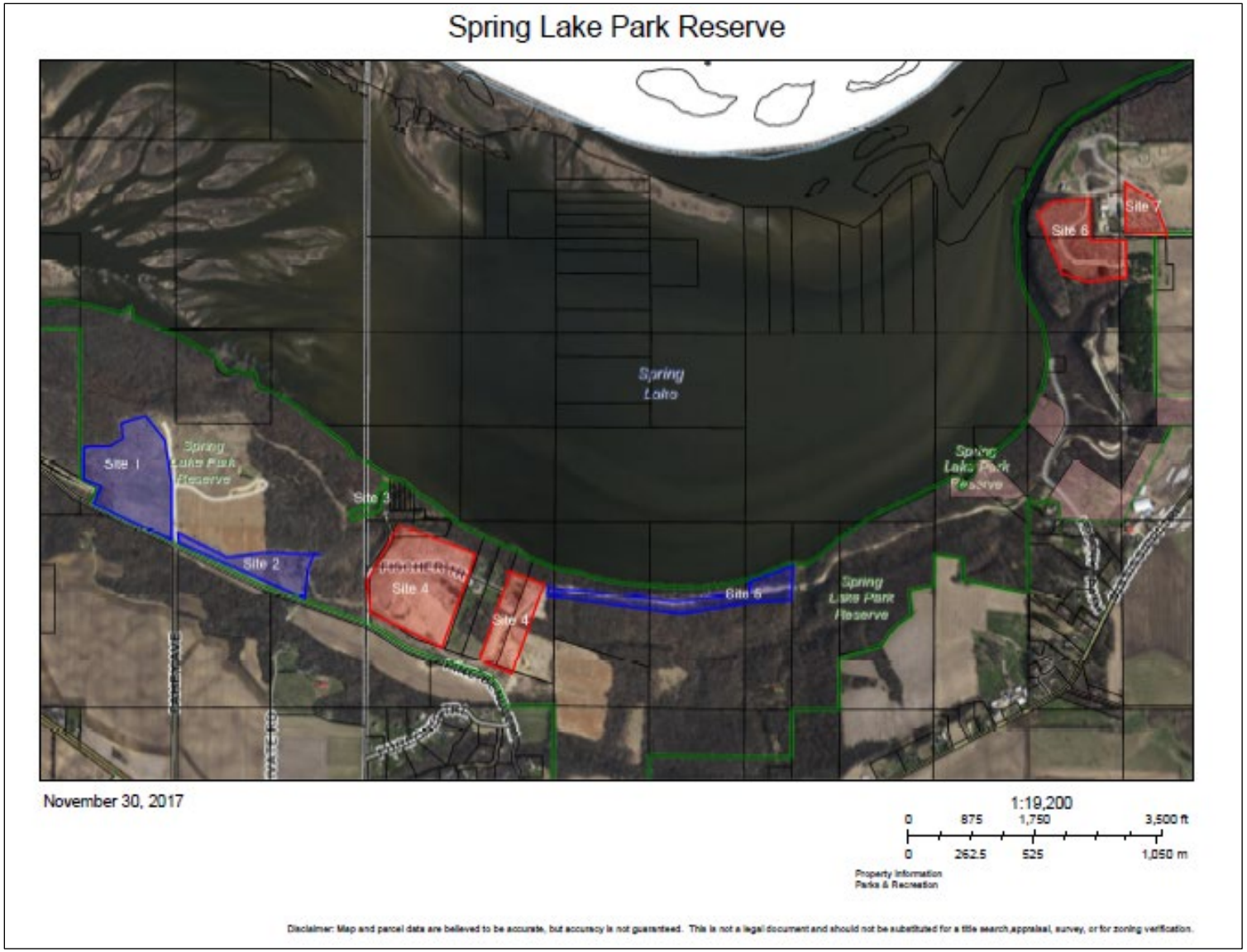


Figure 40 – Spring Lake Park work sites for activities funded with Parks and Trails Funding. Woody vegetation clearing/thinning activities occurred in Sites 1, 2, 4, and 5. Information about activities completed in each site can be found in Table 2. Map provided by Dakota County Parks Natural Resource staff (2017 review).

Table 20 -Work completed in Dakota County Parks funded by Parks and Trails Funding. Woody vegetation removal/clearing activities completed in Spring Lake Park (SPPR) are highlighted in yellow. Tasks that do not include exact site information were performed at a park-wide or county-wide level. Data provided by Dakota County Parks Natural Resource staff. Location of each SLPR site can be found in Figure 2. (2017 review).

FY2012	
Crew Labor	Other Purchases
SLPR -Clearing trees and brush prior to MRFR Grant - Site 2	SLPR - Bur oak trees - Site 6 and 7
MRPR -brush/tree removal in Bluff Prairie remnant and future CPL16 grant site - Site 11	SLPR - Seed for 15 acre prairie restoration - Site 6
LHRP - Brush removal at Buck Pond - Site 8	MRPR - Seed for washouts - Site 12
LHRP - Brush removal at Maple Bottom - Site 9	
LHRP - Brush removal at NE Savanna - Site 10	
LBRP - Cedar Removal - Site 13	

FY2013	
Crew Labor	Other Purchases
SLPR - Clearing BT and HS for archaeological digs prior to trail construction - Site 5	SLPR - Seed for 22 acre prairie - Site 6
SLPR - brush and tree removal - Sites 1 and 2	
LHRP - Prairie Maintenance and Seed collection	
LHRP - Seeding NE Savanna - Site 10	
LHRP - Tree and brush removal in rattlebox prairie - Site 8	
LHRP - BT removal throughout the park	
WWRP - Seeding - Site 16	
LBRP - Prairie maintenance and Siberian elm removal	
LBRP - Cut BT and HS - Site 15	
LBRP - Removed amur maples - Site 14	
LBRP - Cedar removal - Site 13	
MRPR - Prairie Maintenance and seed collection	

FY2014	
Crew Labor	Other Purchases
* ICWC Crew 1	Herbicide for BT and HS removal
LHRP Buckthorn Blitz 35 days	Seeding and plugging of raingardens at WWRP - Site 17
Invasive Herbaceous Removal 4 days	
Trail Maintenance 55 days	
Invasive Tree Removal WWRP 13 days	
Erosion Control MRPR 1 day - Site 12	
Raingarden Maintenance 1 day	
**ICWC Crew 2	
LHRP Buckthorn Blitz 19 days	
Trail Maintenance 20 days	
Invasive Tree Removal WWRP 8 days	
Raingarden Maintenance 4 days	
Brush Removal WWRP 5 days	
MRPR Erosion Work 2 days - Site 12	
Invasive Herbaceous Removal 4 days	
***ICWC Crew 1	
LHRP Buckthorn Blitz 44 days	
Trail Maintenance/Hazard Trees 18 days	
Invasive Herbaceous Removal 8 days	
Buckthorn Removal TCP 7 days	
WWRP Tree Planting 4 days	
Raingarden Maintenance 2 days	
Erosion Control SLPR 2 days - Site 3	
****ICWC Crew 2	
LHRP Buckthorn Blitz 54 days	
Invasive Herbaceous Removal 11 days	
Honeysuckle Removal SLPR 11 days - Site 1 and 2	
Trail Maintenance 3 days	
Tree Planting LHRP 1 day	
*****ICWC Crew 1	
LHRP Buckthorn Blitz 48 days	
Trail Maintenance 21 days	
SLPR Fence Removal 9 days - Site 4	
MRFR Tree Work 9 days - Site 2	
Buckthorn Removal TCP 8 days	
Oak Wilt LHRP 2 days	
******ICWC Crew 2	
LHRP Buckthorn Blitz 65 days	
Buckthorn Removal TCP 8 days	
Trail Maintenance 7 days	
Oak Wilt LHRP 3 days	
STS Crew	
SLPR Invasive brush removal at archery range - Site 1	

Table 21 – Plant species at Spring Lake Park during 2022 field evaluation.

Scientific Name	Common Name	Cover Class	Seeded?* (Y/N)	Status
Acer negundo	boxelder	1- 5%	No	Native
Achillea millefolium	yarrow	5-25%	?	Native
Agastache scrophulariaefolia	purple giant hyssop	0-1%	?	Native
Andropogon gerardii	big bluestem	5-25%	?	Native
Artemisia ludoviciana subsp. ludoviciana	white sage	1- 5%	?	Native
Asclepias syriaca	common milkweed	1- 5%	?	Native
Asclepias tuberosa var. interior	butterflyweed	0-1%	?	Native
Baptisia lactea var. lactea	white wild indigo	1- 5%	?	Native
Berteroa incana	hoary alyssum	1- 5%	No	Nonnative
Bouteloua curtipendula var. curtipendula	side-oats grama	1- 5%	?	Native
Bromus inermis	smooth brome	1- 5%	No	Invasive
Carex brevior	short sedge	1- 5%	?	Native
Centaurea stoebe subsp. micranthos	spotted knapweed	1- 5%	No	Invasive
Cirsium discolor	field thistle	1- 5%	?	Native
Conyza canadensis	horseweed	1- 5%	No	Native
Coreopsis palmata	bird's foot coreopsis	0-1%	?	Native
Dalea candida	white prairie clover	0-1%	?	Native
Dalea purpurea var. purpurea	purple prairie clover	1- 5%	?	Native
Dichanthelium oligosanthes	Scribner's panic grass	0-1%	No	Native
Echinacea angustifolia	narrow-leaved purple coneflower	0-1%	Yes	Native
Echinacea pallida var. pallida	pale purple coneflower	1- 5%	?	Native
Elymus canadensis var. canadensis	nodding wild rye	1- 5%	?	Native
Elymus virginicus var. virginicus	Virginia wild rye	1- 5%	?	Native
Eragrostis spectabilis	purple lovegrass	1- 5%	No	Native
Eryngium yuccifolium	rattlesnake master	1- 5%	?	Native
Fragaria virginiana	common strawberry	1- 5%	?	Native
Fraxinus pennsylvanica	green ash	1- 5%	No	Native
Helianthus giganteus	giant sunflower	0-1%	?	Native
Helianthus pauciflorus	stiff sunflower	1- 5%	?	Native
Heliopsis helianthoides var. scabra	ox-eye	0-1%	?	Native
Hypericum punctatum	spotted St. John's-wort	0-1%	?	Native
Juglans nigra	black walnut	1- 5%	No	Native
Lactuca canadensis	Canada wild lettuce	1- 5%	No	Native
Lespedeza capitata	round-headed bush clover	1- 5%	?	Native
Liatris pycnostachya var. pycnostachya	great blazing star	0-1%	?	Native
Lonicera tatarica	tartarian honeysuckle	5-25%	No	Invasive
Medicago lupulina	black medick	0-1%	No	Nonnative
Monarda fistulosa	wild bergamot	1- 5%	?	Native
Oenothera biennis	common evening primrose	1- 5%	?	Native
Panicum virgatum	switchgrass	1- 5%	?	Native
Parthenium integrifolium	wild quinine	0-1%	Yes	Native
Penstemon grandiflorus	large-flowered beard tongue	1- 5%	?	Native
Physalis heterophylla var. heterophylla	clammy ground cherry	1- 5%	?	Native

Poa pratensis subsp. pratensis	Kentucky bluegrass	5-25%	No	Invasive
Potentilla recta	rough-fruited cinquefoil	1- 5%	No	Nonnative
Pycnanthemum virginianum	Virginia mountain mint	1- 5%	?	Native
Quercus ellipsoidalis	northern pin oak	1- 5%	No	Native
Quercus macrocarpa	bur oak	1- 5%	No	Native
Ratibida columnifera	prairie coneflower	0-1%	?	Native
Ratibida pinnata	gray-headed coneflower	0-1%	?	Native
Rhus glabra	smooth sumac	5-25%	No	Native
Rubus flagellaris	northern dewberry	1- 5%	No	Native
Rubus occidentalis	black raspberry	5-25%	No	Native
Schizachyrium scoparium var. scoparium	little bluestem	5-25%	?	Native
Setaria faberi	giant foxtail	0-1%	No	Nonnative
Silphium integrifolium	rosinweed	0-1%	Yes	Native
Silphium laciniatum	compass plant	1- 5%	Yes	Native
Silphium perfoliatum var. perfoliatum	cup plant	1- 5%	Yes	Native
Solidago canadensis	Canada goldenrod	5-25%	No	Native
Solidago gigantea	giant goldenrod	1- 5%	?	Native
Solidago speciosa	showy goldenrod	1- 5%	?	Native
Sorghastrum nutans	Indian grass	5-25%	?	Native
Sporobolus compositus var. compositus	rough dropseed	1- 5%	?	Native
Symphyotrichum ericoides	heath aster	1- 5%	?	Native
Symphyotrichum laeve	smooth blue aster	1- 5%	?	Native
Symphyotrichum lanceolatum	panicled aster	1- 5%	?	Native
Symphyotrichum novae-angliae	New England aster	1- 5%	?	Native
Symphyotrichum pilosum	awl aster	1- 5%	?	Native
Trifolium arvense	rabbit's foot clover	1- 5%	No	Nonnative
Ulmus americana	American elm	1- 5%	No	Native
Ulmus pumila	Siberian elm	5-25%	No	Invasive
Verbascum thapsus	common mullein	0-1%	No	Nonnative
Verbena stricta	hoary vervain	5-25%	?	Native
Veronicastrum virginicum	Culver's root	1- 5%	?	Native
Vicia cracca	tufted vetch	0-1%	No	Invasive

**No seed mixes/lists were available for this review*

Site Photographs

Photo 65 – Area on the west side of the “Unit 4” area where trees and brush were removed looking northeast, which includes a mix of nonnative grasses and native grasses/forbs.

Photo 66 – Area on the west side of the “Unit 4” area where trees and brush were removed looking southeast toward bison paddock fence and paved recreational trail.

Photo 67 – View of an area on the east side of the “Unit 4” area where trees and brush were removed. This particular area has residual woody resprouts and new tree/brush volunteers. This area is inside of the bison paddock.

14Spring Lake Park Archery Trail Prairie Enhancement

Project Background

Project Name: Spring Lake Park (Archery Trail)

Project Site: Fahey Ave S, Rosemount, MN 55068

Township/Range Section: Township 115N Range 18W Section 21-22

Project Manager / Affiliated Organization: Tom Lewanski / Dakota County Parks, Natural Resources Manager, Tom.Lewanski@CODAKOTA.MN.US

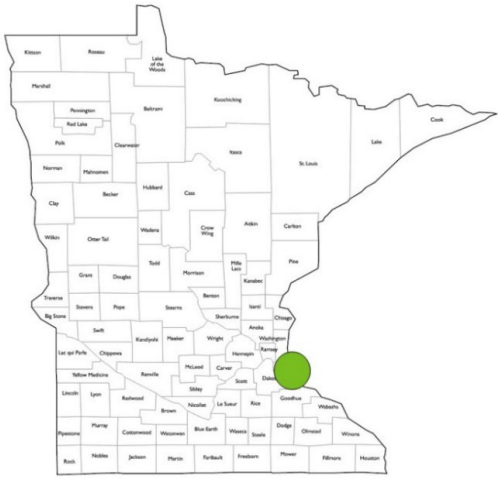
Fund: PTF ***Fiscal Year Funds:*** 2012

Project Start Date: 2012 (2013)

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Forest

Project Status: Post Establishment Phase



County: Dakota

Primary Activity: Prairie Enhancement

Project Size: 40.6 acres (Archery Range only)

Project Completed: 2017

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Woody species control as initial phase of restoring savanna and prairie.
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Spring Lake Park South Archery Trail – Ecological Restoration Plan, from Dakota Co Parks Nat Resources. Specific actions for woody removal were guided by *Project Schedule pg. 34* of plan.
3. ***What are the stated goals of the project?***
   Create open prairie and savanna structure through woody removal and thinning. The 2017 project evaluation noted: "Create structure and conditions to facilitate restoration of *Southern Dry-Mesic Oak Forest MHs37* and *Southern Dry Prairie UPs13".* Based on the landscape setting and vegetation composition observed at the time of the 2022 evaluation, the woodland areas appear to be more closely allied with and trending toward fire-dependent oak-dominated woodland (e.g., FDs37 Southern Dry-Mesic Oak (Maple) Woodland).
4. ***What are the desired outcomes of achieving the stated goals of the project?***

To have substantially completed initial, intense restoration activities in the process of achieving the long-term goal of accomplishing restoration of composition, structure, and function of desired MHs37 and Ups13 native plant communities.

5. ***Were measures of restoration success identified in plans?*** Choose an item.
   If yes, list specific measurements.
   All shrubs and trees cut and stump treated except selected oak, American hazel, and black walnut (black walnut is planned to be phased out over time).
6. ***Are plan Sets available?*** No ***Have project maps been created?*** No
7. ***Provide list of best management practices, standards, guidelines identified in plan set?***

Formal design plans and specifications were not created as a part of this project. However, the *Spring Lake Park South Archery Trail – Ecological Restoration Plan* is reported by Dakota County Parks staff to outline the restoration activities that were completed during this PTF Grant-funded effort, including:

- Initial cutting and stump treatment of invasive trees and brush
- Residual woody material was removed or piled and burned on site.

Additional funding sources (other than PTF dollars) were utilized to accomplish forestry mowing, disking, broadcast and drilled seeding as well as follow-up prescribed burning

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   No
   None were reported in the 2017 evaluation and Scott Hagen, representing Dakota County Parks during the review, was unaware of any alterations.
9. ***In what ways did alterations change the proposed project outcome?***
   Not applicable – no alterations were reported

Site Assessment

Field Review Date: 9/29/2022

Field Visit Attendees: Scott Hagen, Dakota County Parks; Wade Johnson, MN DNR, Paul Bockenstedt, Stantec

10. ***Surrounding Landscape Characteristics:***
    The site occurs on a terrace of the Mississippi River and Spring Lake Park which lies to the north. The area to the east is part of an industrial complex operated by Mosaic and includes woodland areas that have, in the past, been actively managed to restore natural area quality. Park land occurs to the southeast. A bluff occurs to the south that is private land and characterized by disturbed deciduous woodland – the Rosemount Outwash Plain occurs at the top of this slope, extending to the southwest.
11. ***Site Characteristics:***
    a. ***Soil Series:***

The project area is predominantly Hubbard loamy sand (excessively drained), with lesser amounts of Sparta loamy fine sand (excessively drained), and Dickinson sandy loam (well drained). Coarse sand and gravel were noted at the soil surface in some areas during the field visit.

b. Topography:

The site is nearly level to very gently rolling.

c. Hydrology:

The majority of soils at the site are considered excessively drained.

d. Vegetation: Plant Communities, Dominant Species & Invasives % Cover:

Vegetation of the area is characterized by a mix of historically planted vegetation (nonnative, cool season pasture grasses and trees with planted trees and shrubs), as well as remnant native vegetation (e.g., pin oak and bur oak trees, remnant sand-gravel prairie vegetation such as Scribner's panic grass), and native graminoids and forbs seeded to the site during the PTF-funded restoration effort. Please refer to the meander survey plant species list in Table 1 for additional details on plant species composition.

12. ***Is the plan based on current science?*** Yes

The sequencing of restoration activities is consistent with current restoration science. Initial invasive tree and brush clearing was used to prepare the site for subsequent restoration activities.

13. List indicators of project goals at this stage of project:

The absence of most of the undesirable woody species in the project area was followed by site preparation and native enrichment seeding. At the time of the follow-up project evaluation, dry and dry-mesic prairie species generally dominated the east side of the archery trail area. Ongoing management of undesirable woody species is contributing to sustained progress of the restoration process. Thinning of residual (historically planted) black walnut trees was identified as a goal for this site – it was unclear at the time of the field visit if there has been any subsequent black walnut thinning/removal since the PTF-funded restoration project was closed out in 2014.

14. Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?

Yes. As implemented, the plan has substantially achieved restoring dry and dry-mesic prairie and oak woodland.

15. Are corrections or modifications needed to achieve proposed goals?

No. Current conditions and planned future management activities should continue to contribute to maintaining or improving the overall quality of this area.

16. Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?

Planned future management as related by Dakota County Parks staff is reasonable and consistent with maintaining or improving the over composition, structure and function of this restoration (additional phased tree removal, invasive/noxious weed management, prescribed burning, and similar). Being more aggressive with black walnut removal during the initial phase of restoration had the potential to result in greater initial gains and limit the risk of subsequent (incremental) black walnut removal being excessively delayed or potentially not occurring.

17. Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.

No. Implemented and planned activities will not detract from the habitat value of the project area.

18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    Not likely. Invasive, nonnative plant species specifically noted in the 2017 evaluation (Amur maple, spotted knapweed, leafy spurge, garlic mustard) were not observed in 2022, with the exception of spotted knapweed which was observed at low levels. Other invasive/nonnative plant species noted in 2017 Friends of the Mississippi River plant survey that generally pose concern for restorations include smooth brome (*Bromus inermis*) and tufted (cow) vetch (*Vicia cracca*) – both of these nonnative/invasive species were only observed at low levels during the September 2022 meander survey.
19. ***Additional comments on the restoration project.***
    Overall, this restoration appears to continue trending toward improved native plant composition, as well as good overall native habitat structure and function.

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Achieved the stated goals.
21. ***The project will:***
    Meet proposed outcomes.
    Confidence of outcome determination:
    High.
22. ***Provide explanation of reason(s) for determination.***
    Based on information in the 2017 evaluation, it appears that the native composition of the Archery Range restoration area continues to improve
23. ***Site Assessor(s) conducting field review:***
    Wade Johnson, MN DNR; Paul Bockenstedt, Stantec

Site Maps, Project Plans or Vegetation Tables

Figure 41 – Spring Lake Park habitat types for restoration target areas. Woody vegetation removal/clearing activities completed as a part of PTF grant activates occurred, and were evaluated, in the Savanna and Prairie habitats on the eastern edge of the property. Prairie habitat south and east of the forested habitat near the center of the property were not included in the evaluation. Map provided by Dakota County Parks Natural Resource staff (2017 review).

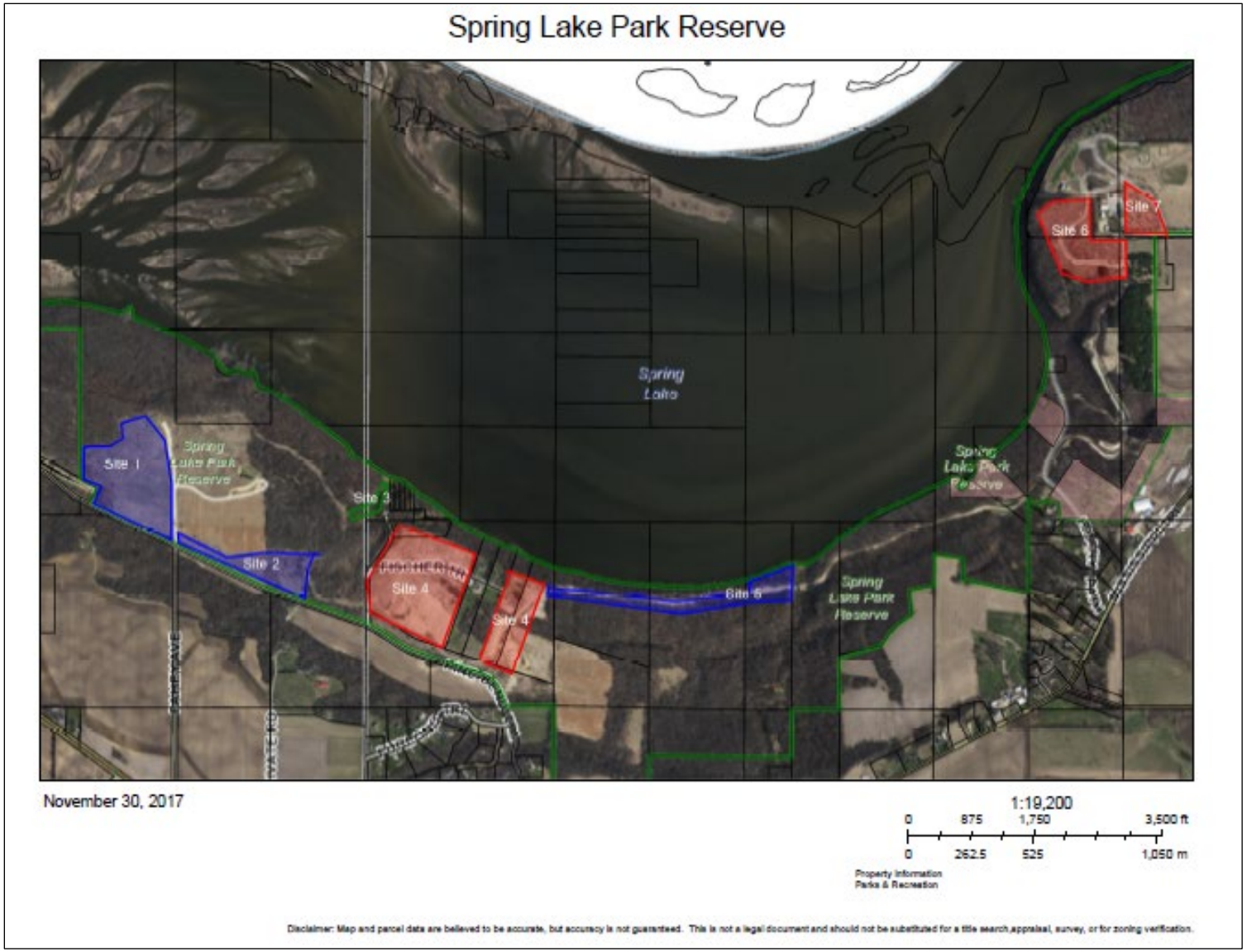


Figure 42 – Spring Lake Park work sites for activities funded with Parks and Trails Funding. Woody vegetation clearing/thinning activities occurred in Sites 1, 2, 4, and 5. Information about activities completed in each site can be found in Table 2. Map provided by Dakota County Parks Natural Resource staff (2017 review).

Figure 43 – Existing land cover for Archery Trail prior to implementation of restoration plan from the Spring Lake Park Reserve Ecological Restoration Plan for South Archery Trail. Archery Trail is located on the east side of the parcel where woody vegetation was cleared/thinned as a part of the project. (2017 review).

Figure 44 – Restoration goal communities for Archery Trail prior to implementation of restoration plan from the Spring Lake Park Reserve Ecological Restoration Plan for South Archery Trail. Archery Trail is located on the east side of the parcel where woody vegetation was cleared/thinned as a part of the project. (2017 review).

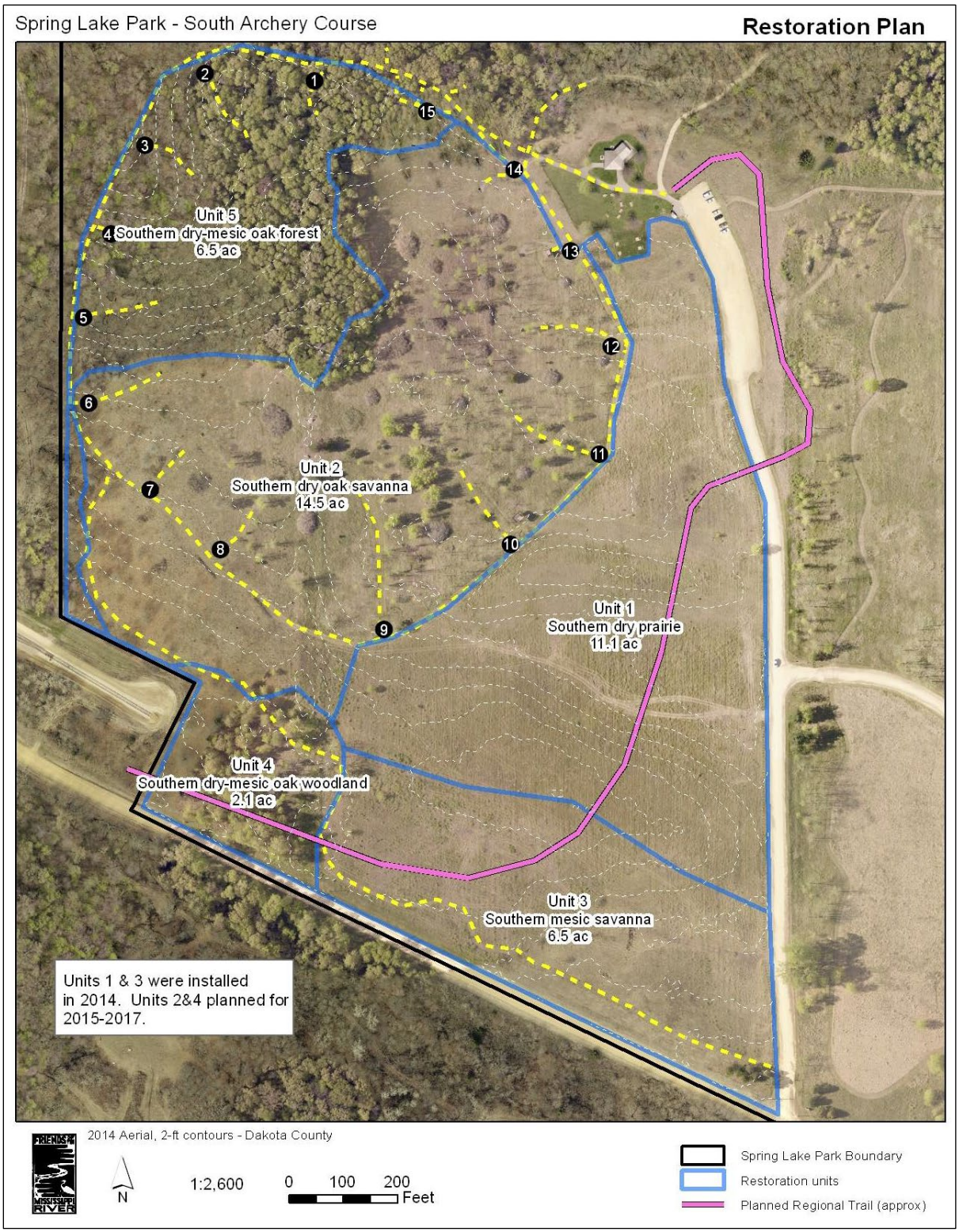


Figure 45 – Updated restoration plan for Archery Trail prior to implementation of restoration plan. Map from the LCCMR Restoration Evaluation Monitoring 2017 Report by Friends of the Mississippi River. Archery Trail is located on the east side of the parcel where woody vegetation was cleared/thinned as a part of the project. (2017 review).

Table 22 – Original proposed project schedule and cost estimates for woody removal from the Spring Lake Park Reserve Ecological Restoration Plan for South Archery Trail. Archery Trail is located on the east side of the parcel where woody

vegetation was cleared/thinned as a part of the project. Woody removal activities outlined in this table represent the range of woody vegetation removal/clearing activities implemented across the project. (2017 review).

PHASE 1: WOODY REMOVAL

YR	Season	Unit	Activity	Ac	Est Cost/ac	Est cost
1	Fall/Wtr	I	Cut & stump-treat all trees & shrubs **except** oaks. Chip wood. Brush-cut sumac (do not treat)	10.4	$900.00	$9,360.00
1	Fall/Wtr	II	Cut & stump-treat all trees **except** oak, hazelnut, selected black walnuts and selected shrubs. Chip wood. Brush-cut sumac (do not treat)	15.1	$1,300.00	$19,630.00
1	Fall/Wtr	III	Cut & stump-treat all trees **except** oaks, hazelnut and selected black walnut, selected shrubs, and pines at entry. Chip wood. Brush-cut sumac (do not treat)	6.5	$1,000.00	$6,500.00
1	Fall/Wtr	IV	Cut & stump-treat non-native trees and shrubs. Chip wood.	2.1	$800.00	$1,680.00
1	Fall/Wtr	V	Cut & stump-treat non-native trees and shrubs. (primarily buckthorn and honeysuckle). Chip wood.	6.5	$900.00	$5,850.00
2&3	Fall	IV, V	Follow-up treatment of resprouts.	8.6	$400.00	$3,440.00
TOTAL ESTIMATE FOR PHASE 1						**$46,460.00**

Table 23 -Work completed in Dakota County Parks funded by Parks and Trails Funding. Woody vegetation removal/clearing activities completed in Spring Lake Park (SPPR) are highlighted in yellow. Tasks that do not include exact site information were performed at a park-wide or county-wide level. Data provided by Dakota County Parks Natural Resource staff. Location of each SLPR site can be found in Figure 2.(2017 review).

FY2012	
Crew Labor	Other Purchases
SLPR -Clearing trees and brush prior to MRFR Grant - Site 2	SLPR - Bur oak trees - Site 6 and 7
MRPR -brush/tree removal in Bluff Prairie remnant and future CPL16 grant site - Site 11	SLPR - Seed for 15 acre prairie restoration - Site 6
LHRP - Brush removal at Buck Pond - Site 8	MRPR - Seed for washouts - Site 12
LHRP - Brush removal at Maple Bottom - Site 9	
LHRP - Brush removal at NE Savanna - Site 10	
LBRP - Cedar Removal - Site 13	

FY2013	
Crew Labor	Other Purchases
SLPR - Clearing BT and HS for archaeological digs prior to trail construction - Site 5	SLPR - Seed for 22 acre prairie - Site 6
SLPR - brush and tree removal - Sites 1 and 2	
LHRP - Prairie Maintenance and Seed collection	
LHRP - Seeding NE Savanna - Site 10	
LHRP - Tree and brush removal in rattlebox prairie - Site 8	
LHRP - BT removal throughout the park	
WWRP - Seeding - Site 16	
LBRP - Prairie maintenance and Siberian elm removal	
LBRP - Cut BT and HS - Site 15	
LBRP - Removed amur maples - Site 14	
LBRP - Cedar removal - Site 13	
MRPR - Prairie Maintenance and seed collection	

FY2014	
Crew Labor	Other Purchases
* ICWC Crew 1	Herbicide for BT and HS removal
LHRP Buckthorn Blitz 35 days	Seeding and plugging of raingardens at WWRP - Site 17
Invasive Herbaceous Removal 4 days	
Trail Maintenance 55 days	
Invasive Tree Removal WWRP 13 days	
Erosion Control MRPR 1 day - Site 12	
Raingarden Maintenance 1 day	
**ICWC Crew 2	
LHRP Buckthorn Blitz 19 days	
Trail Maintenance 20 days	
Invasive Tree Removal WWRP 8 days	
Raingarden Maintenance 4 days	
Brush Removal WWRP 5 days	
MRPR Erosion Work 2 days - Site 12	
Invasive Herbaceous Removal 4 days	
***ICWC Crew 1	
LHRP Buckthorn Blitz 44 days	
Trail Maintenance/Hazard Trees 18 days	
Invasive Herbaceous Removal 8 days	
Buckthorn Removal TCP 7 days	
WWRP Tree Planting 4 days	
Raingarden Maintenance 2 days	
Erosion Control SLPR 2 days - Site 3	
****ICWC Crew 2	
LHRP Buckthorn Blitz 54 days	
Invasive Herbaceous Removal 11 days	
Honeysuckle Removal SLPR 11 days - Site 1 and 2	
Trail Maintenance 3 days	
Tree Planting LHRP 1 day	
*****ICWC Crew 1	
LHRP Buckthorn Blitz 48 days	
Trail Maintenance 21 days	
SLPR Fence Removal 9 days - Site 4	
MRFR Tree Work 9 days - Site 2	
Buckthorn Removal TCP 8 days	
Oak Wilt LHRP 2 days	
******ICWC Crew 2	
LHRP Buckthorn Blitz 65 days	
Buckthorn Removal TCP 8 days	
Trail Maintenance 7 days	
Oak Wilt LHRP 3 days	
STS Crew	
SLPR Invasive brush removal at archery range - Site 1	

Table 24 - Vegetation monitoring for Archery Trail following restoration. Data from the LCCMR Restoration Evaluation Monitoring 2017 Report by Friends of the Mississippi River. Archery Trail is located on the east side of the parcel where

woody vegetation was cleared/thinned as a part of the project. Location of vegetation monitoring units in Archery Trail can be found in Figure 5.

Spring Lake Park. Vegetation monitoring 2017, Units 1 and 3. MeCC7.

6/7 & 7/26/2017	Of recorded spp, also on NPC list		Scientific Name	Common Name
			FORBS & SMALL SHRUBS	
		1	*Agastache foeniculum*	blue giant hyssop
		2	*Allium stellatum*	Prairie Wild Onion
		3	*Amorpha canescens*	lead plant
		4	*Anemone cylindrica*	long-headed thimbleweed
		5	*Anemone patens*	pasque flower
		6	*Antennaria plantaginifolia*	plantain-leaved pussytoes
		7	*Artemisia caudata*	wormwood
1	x	8	*Artemisia ludoviciana*	prairie sage
1	x	9	*Asclepias syriaca*	common milkweed
		10	*Asclepias tuberosa*	butterfly milkweed
1	x	11	*Asclepias verticillata*	whorled milkweed
0.5	x	12	*Aster ericoides*	heath aster
		13	*Aster oblongifolius*	aromatic aster
1	x	14	*Aster oolentangiensis*	skyblue aster
0.5	x	15	*Aster sericeus*	silky aster
0.5		16	*Astragalus canadensis*	Canada milk vetch
		17	*Astragalus crassicarpus*	ground plum
		18	*Ceanothus americanus*	American New Jersey tea
0.5		19	*Chamaecrista fasciculata*	partridge pea
1	x	20	*Coreopsis palmata*	bird's foot coreopsis
1	x	21	*Dalea candida*	white prairie clover
2	x	22	*Dalea purpurea*	purple prairie clover
0.5	x	23	*Dalea villosa*	Silky prairie-clover
		24	*Delphinium virescens*	Prairie larkspur
0.5	x	25	*Eryngium yuccifolium*	rattlesnake master
1	x	26	*Euphorbia corollata*	flowering spurge
		27	*Froelichia floridana*	cottonweed
1	x	28	*Galium boreale*	northern bedstraw
		29	*Geum triflorum*	prairie smoke
		30	*Gnaphalium obtusifolium*	sweet everlasting
1	x	31	*Helianthus pauciflorus*	stiff sunflower
		32	*Heuchera richardsonii*	alumroot
		33	*Kuhnia eupatorioides*	false boneset
		34	*Lespedeza capitata*	round-headed bush clover
0.5	x	35	*Liatris aspera*	rough blazing star
		36	*Liatris punctata*	dotted blazing star
0.5		37	*Lobelia spicata*	rough-spiked lobelia
2		38	*Lupinus perennis*	wild lupine
2	x	39	*Monarda fistulosa*	wild bergamot
		40	*Oenothera rhombipetala*	rhombic petaled evening primrose
		41	*Oxalis violacea*	violet wood sorrel
		42	*Penstemon gracilis*	slender penstemon
2	x	43	*Penstemon grandiflorus*	large-flowered beard tongue
		44	*Phlox pilosa*	prairie phlox
		45	*Potentilla arguta*	tall cinquefoil
1		46	*Ratibida columnifera*	prairie coneflower
2	x	47	*Ratibida pinnata*	gray-headed coneflower
		48	*Rosa arkansana*	prairie rose
2		49	*Rudbeckia hirta*	black-eyed susan
		50	*Sisyrinchium campestre*	field blue-eyed grass

Table 3 – Continued

1	x	51	*Solidago (Oligoneuron) rigida*	stiff goldenrod
1	x	52	*Solidago nemoralis*	gray goldenrod
1	x	53	*Solidago speciosa*	showy goldenrod
1		54	*Tradescantia ohiensis*	Ohio spiderwort
1	x	55	*Verbena stricta*	hoary vervain
		56	*Viola pedatifida*	bearded birdfoot violet
			GRAMINOIDS	
		1	*Andropogon gerardii*	big bluestem
2	x	2	*Bouteloua curtipendula*	side-oats grama
		3	*Bouteloua hirsuta*	hairy grama
		4	*Bromus kalmii*	kalm's brome
		5	*Calamovilfa longifolia*	Sand reed grass
1		6	*Carex brevior*	plains oval sedge
3	x	7	*Dicanthelium oligosanthes*	Scribner's panic grass
2	x	8	*Elymus canadensis*	nodding wild rye
2	x	9	*Koeleria pyramidata*	junegrass
2	x	10	*Schizachyrium scoparium*	little bluestem
2	x	11	*Sorghastrum nutans*	Indian grass
		12	*Sporobolus heterolepis*	prairie dropseed
1	x	13	*Stipa(Hesperostipa) spartea*	porcupine grass
			Other native spp (not seeded)	
2	x		*Achillea millefolium*	yarrow
2	x		*Ambrosia psilostachya*	western ragweed
1			*Cirsium discolor*	field thistle
1	x		*Conyza canadensis*	horseweed
1	x		*Desmodium canadense*	showy tick trefoil (from east resto)
0.5	x		*Erigeron strigosus*	daisy fleabane
2	x		*Fragaria virginiana*	
0.5			*Mirabilis*	4'Oclock
0.5			*Monarda punctata*	dotted bergamot (from east resto)
0.5	x		*Parthenocissus quinquefolia*	Virg creeper
1	x		*Physalis virginiana*	clammy ground cherry
1	x		*Rhus glabra*	smooth sumac
1			*Rubus ideaus*	red raspberry
1	x		*Solidago canadensis*	Canada goldenrod
1			*Solidago gigantea*	late goldenrod
1			*Vitis riparia*	grapevine
1	x		*Eragrostis spectabilis*	purple lovegrass
1	x		*Panicum virgatum*	switchgrass
		Invasive score	***Non-native***	
0.5			*Convulvulus sp*	bindweed
0.5			*Potentilla recta*	sulfphur cinquefoil
1			*Rumex acetosella*	red sorrel
0.5			*Rumex crispus*	curly dock
0.5			*Ulmus pumila*	Siberian elm
1			*Verbascum thapsis*	mullein - few patches
1		3	*Vicia cracca*	cow vetch - not much
1		3	*Bromus inermis*	smooth brome
63	41	6		

Table 25 – Plant species at Spring Lake Park during 2022 field evaluation.

Scientific Name	Common Name	Cover Class	Seeded?* (Y/N)	Status
Acer negundo	boxelder	1- 5%	No	Native
Achillea millefolium	yarrow	5-25%	?	Native
Agastache scrophulariifolia	purple giant hyssop	0-1%	?	Native
Andropogon gerardii	big bluestem	5-25%	?	Native
Artemisia ludoviciana subsp. ludoviciana	white sage	1- 5%	?	Native
Asclepias syriaca	common milkweed	1- 5%	?	Native
Asclepias tuberosa var. interior	butterfly weed	0-1%	?	Native
Baptisia lactea var. lactea	white wild indigo	1- 5%	?	Native
Berteroa incana	hoary alyssum	1- 5%	No	Nonnative
Bouteloua curtipendula var. curtipendula	side-oats grama	1- 5%	?	Native
Bromus inermis	smooth brome	1- 5%	No	Invasive
Carex brevior	short sedge	1- 5%	?	Native
Centaurea stoebe subsp. micranthos	spotted knapweed	1- 5%	No	Invasive
Cirsium discolor	field thistle	1- 5%	?	Native
Conyza canadensis	horseweed	1- 5%	No	Native
Coreopsis palmata	bird's foot coreopsis	0-1%	?	Native
Dalea candida	white prairie clover	0-1%	?	Native
Dalea purpurea var. purpurea	purple prairie clover	1- 5%	?	Native
Dichanthelium oligosanthes	Scribner's panic grass	0-1%	No	Native
Echinacea angustifolia	narrow-leaved purple coneflower	0-1%	Yes	Native
Echinacea pallida var. pallida	pale purple coneflower	1- 5%	?	Native
Elymus canadensis var. canadensis	nodding wild rye	1- 5%	?	Native
Elymus virginicus var. virginicus	Virginia wild rye	1- 5%	?	Native
Eragrostis spectabilis	purple lovegrass	1- 5%	No	Native
Eryngium yuccifolium	rattlesnake master	1- 5%	?	Native
Fragaria virginiana	common strawberry	1- 5%	?	Native
Fraxinus pennsylvanica	green ash	1- 5%	No	Native
Helianthus giganteus	giant sunflower	0-1%	?	Native
Helianthus pauciflorus	stiff sunflower	1- 5%	?	Native
Heliopsis helianthoides var. scabra	ox-eye	0-1%	?	Native
Hypericum punctatum	spotted St. John's-wort	0-1%	?	Native
Juglans nigra	black walnut	1- 5%	No	Native
Lactuca canadensis	Canada wild lettuce	1- 5%	No	Native
Lespedeza capitata	round-headed bush clover	1- 5%	?	Native
Liatris pycnostachya var. pycnostachya	great blazing star	0-1%	?	Native
Lonicera tatarica	Tartarian honeysuckle	5-25%	No	Invasive
Medicago lupulina	black medick	0-1%	No	Nonnative
Monarda fistulosa	wild bergamot	1- 5%	?	Native
Oenothera biennis	common evening primrose	1- 5%	?	Native
Panicum virgatum	switchgrass	1- 5%	?	Native
Parthenium integrifolium	wild quinine	0-1%	Yes	Native
Penstemon grandiflorus	large-flowered beard tongue	1- 5%	?	Native
Physalis heterophylla var. heterophylla	clammy ground cherry	1- 5%	?	Native

Poa pratensis subsp. pratensis	Kentucky bluegrass	5-25%	No	Invasive
Potentilla recta	rough-fruited cinquefoil	1- 5%	No	Nonnative
Pycnanthemum virginianum	Virginia mountain mint	1- 5%	?	Native
Quercus ellipsoidalis	northern pin oak	1- 5%	No	Native
Quercus macrocarpa	bur oak	1- 5%	No	Native
Ratibida columnifera	prairie coneflower	0-1%	?	Native
Ratibida pinnata	gray-headed coneflower	0-1%	?	Native
Rhus glabra	smooth sumac	5-25%	No	Native
Rubus flagellaris	northern dewberry	1- 5%	No	Native
Rubus occidentalis	black raspberry	5-25%	No	Native
Schizachyrium scoparium var. scoparium	little bluestem	5-25%	?	Native
Setaria faberi	giant foxtail	0-1%	No	Nonnative
Silphium integrifolium	rosinweed	0-1%	Yes	Native
Silphium laciniatum	compass plant	1- 5%	Yes	Native
Silphium perfoliatum var. perfoliatum	cup plant	1- 5%	Yes	Native
Solidago canadensis	Canada goldenrod	5-25%	No	Native
Solidago gigantea	giant goldenrod	1- 5%	?	Native
Solidago speciosa	showy goldenrod	1- 5%	?	Native
Sorghastrum nutans	Indian grass	5-25%	?	Native
Sporobolus compositus var. compositus	rough dropseed	1- 5%	?	Native
Symphyotrichum ericoides	heath aster	1- 5%	?	Native
Symphyotrichum laeve	smooth blue aster	1- 5%	?	Native
Symphyotrichum lanceolatum	panicled aster	1- 5%	?	Native
Symphyotrichum novae-angliae	New England aster	1- 5%	?	Native
Symphyotrichum pilosum	awl aster	1- 5%	?	Native
Trifolium arvense	rabbit's foot clover	1- 5%	No	Nonnative
Ulmus americana	American elm	1- 5%	No	Native
Ulmus pumila	Siberian elm	5-25%	No	Invasive
Verbascum thapsus	common mullein	0-1%	No	Nonnative
Verbena stricta	hoary vervain	5-25%	?	Native
Veronicastrum virginicum	Culver's root	1- 5%	?	Native
Vicia cracca	tufted vetch	0-1%	No	Invasive

**No seed mixes/lists were available for this review*

Site Photographs

Photo 68 – View of Spring Lake Park Archery Trail prairie restoration area looking north toward parking area. This area has had a significant reduction of invasive/woody cover and the overall native prairie species composition is good.

Photo 69 – Additional view of restored prairie looking north northeast toward parking area. Photo illustrates the limited regrowth of invasive woody growth, in this case smooth sumac.

Photo 70 – Scott Hagen of Dakota County Parks (left) and Wade Johnson of MN DNR (right) standing in a shallow swale area. The short stature of the vegetation is a result of an unusually dry growing season in 2022.

15 Kenilworth Channel Shoreline Restoration

Project Background

Project Name: Kenilworth Channel Shoreline Restoration

Project Site: Kenilworth Channel, Minneapolis

Township/Range Section: Township 29 Range 24 Section 32

Project Manager / Affiliated Organization: Daniel Elias / Minneapolis Park and Recreation Board (MPRB), Maren Hancock / Interfluve

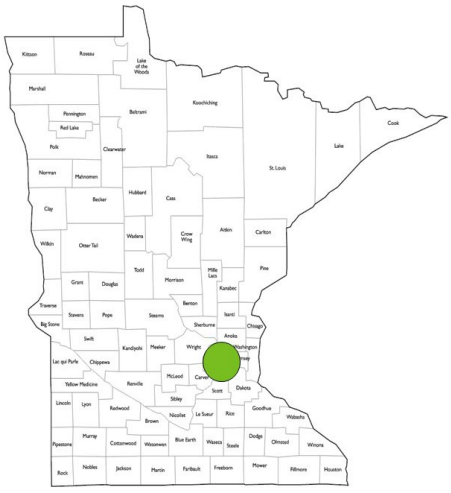
Fund: PTF ***Fiscal Year Funds:*** 2019

Project Start Date: 2020

Predominant Habitat type: Aquatic Habitat

Additional Habitat types: Forest

Project Status: Establishment Phase



County: Hennepin

Primary Activity: Lake Shore Restoration

Project Size: 1.6 acres

Project Completed: 2021

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Dredging, grading, stabilization, and re-vegetation of riparian slopes along Kenilworth channel. Slopes were stabilized using fabric encapsulated soil lifts in addition to blanketed with non-woven coir fabric and interplanted with plugs, shrubs and seeded.
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Kenilworth Channel Naturalization and Shoreline Stabilization Final Design – Interfluve

   Vegetation Management Plan for Kenilworth Channel – Minnesota Native Landscapes
   Geotechnical Soil Survey – Haugo GeoTechnical Services
   Project Map – MPRB
   Kenilworth Channel Naturalization and Stabilization Project Description – Interfluve, Alliant Engineering
   Technical Memorandum – Interfluve
3. ***What are the stated goals of the project?***
   Goals are to address the failing retaining walls and erosive shorelines through the stabilization of the channel soil and restore the native plant community. Long-term stabilization and native plant

restoration of Kenilworth Channel also includes reshaping the channel to maintain recreational access for non-motorized watercraft.

FROM KENILWORTH CHANNEL NATURALIZATION AND SHORELINE STABILIZATION PROJECT:

• Promote ecological uplift throughout the corridor and maximize naturalized shoreline habitat for as much of the channel shoreline as feasible.
• Design a channel that allows a minimum of two-way direction, single file recreational usage for non-motorized boats and boats with electric trolling motors.
• Use existing shoreline tie-in locations and ecologically appropriate shoreline sloping, maintain as much open water as feasible. At a minimum maintain an "operational" channel width of 20 feet without reducing existing channel depths within the proposed channel footprint. Maintain a minimum total open-water width, including shallower side-slope areas, of approximately 30 feet. Channel width may vary throughout the corridor and should be maximized wherever possible.
• Maintain a vegetated buffer of at least 10 feet from the shoreline
• Minimize desirable tree removal and have no resulting canopy gaps. Provide a minimum 1:1 replacement (per tree) for any removed trees (regardless of species) and replace with trees determined to be appropriate for each specific location. Provide additional tree plantings to fill canopy gaps and enhance ecology of corridor.

4. ***What are the desired outcomes of achieving the stated goals of the project?***
   Reduced shoreline erosion, maintain recreational access, improved habitat, increased native plant diversity.
5. ***Were measures of restoration success identified in plans?*** *No*
   If yes, list specific measurements.
   No specific measures of restoration success were identified in the plans.
6. ***Are plan Sets available?*** Yes ***Have project maps been created?*** Yes
   If yes, provide in "site maps" and list maps provided:
   See map of project extent and site map (Figures 1 & 2)
7. ***Provide list of best management practices, standards, guidelines identified in plan set?***
   From the *Final Plan Set*:
   - Dewatering, water diversion and installation of silt curtains
   - Installation of FES (Fabric Encapsulated Soil) lifts to replace erosive slopes and decayed wooden retaining wall
   - Soil filled stone toe and coir fabric installation
   - Planting and seeding of native grasses, forbs, shrubs, and trees
   - Protection of native plants with fencing

   From the *Vegetation Management Plan for Kenilworth Channel:*
   - Site will be managed for invasive plants using spot cut/treat method for a three-year period
   - Weed species will be maintained through spot spraying, hand weeding and spot weed whipping
   - Irrigation as needed throughout the growing season to maintain native plantings

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   No
   No substantive alterations were mentioned during the site visit or identified in the plans.
9. ***In what ways did alterations change the proposed project outcome?***
   NA

Site Assessment

Field Review Date: 9/23/2022

Field Visit Attendees: Wade Johnson and Keegan Lund (MN DNR), Daniel Elias (MPRB), Maren Hancock (Interfluve)

10. ***Surrounding Landscape Characteristics:***
    Urban neighborhood with forested canopy along a riparian corridor connecting two urban lakes.
11. ***Site Characteristics:***
    a. ***Soil Series:***
    Urban land – Malardi complex, 0 to 8% slopes (L55B) from the USDA Web Soil Survey
    b. ***Topography:***
    Topography primarily consists of moderate hills sloping towards the Kenilworth Channel along both the northern and southern shores. Aspect is predominantly north and south facing throughout the channel corridor.
    c. ***Hydrology:***
    The project area is a riparian corridor with a channel that connects two urban lakes that receive stormwater discharge from urban land use to the north.
    d. ***Vegetation: Plant Communities, Dominant Species & Invasives % Cover:***
    Forested corridor with mature cottonwoods, boxelder, silver maples and basswood. Understory dominated by planted native shrubs forbs, grasses and sedges. The emergent plant community was comprised of planted arrowhead, water plantain and rush species.
12. ***Is the plan based on current science?*** Yes
    Plan implementation was based on current accepted practices of shoreline stabilization using encapsulated soil lifts, coir fabric, soil-filled stone toe and native plantings.
13. ***List indicators of project goals at this stage of project:***
    No appreciable erosion to the slope or the immediate shoreline was observed during the site visit and the FES lifts were completely intact. In addition, the rocked toe was vegetated by a variety of emergent plugs that were thriving (see *Photos 4 & 5*). During the site visit, projects hosts identified challenges with more upland native plant survivorship due to drought and herbivory by geese. Additional protection measures were put in place in the form of added fencing. These measures appeared to be protecting the native plants we observed during this establishment phase.
14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***

Yes, erosion of the sloping hillside through the FES lifts and the rocked toe are a reasonable and sound approach in this type of riparian restoration and will likely halt future erosion. Practices including the FES lifts, rocked tow and coir blanketing appeared to be installed very well. In addition, the high planting density of plugs, trees and shrubs should produce a diverse native plant assemblage along Kenilworth channel.

15. ***Are corrections or modifications needed to achieve proposed goals?***
    Continued irrigation of planted trees, shrubs and plugs coinciding with management of invasive species will be necessary to maintain the native plant/shrub mix as well as suppress invasives over time.
16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***
    Yes, future invasive species management under contract from MNL will likely lead to the successful establishment of native species along the corridor. Challenges in native plant establishment as mentioned were geese herbivory of planted plugs along with drought during planted establishment periods.
17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No.
18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    No.
19. ***Additional comments on the restoration project.***
    None.

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Achieved the stated goals.
21. ***The project will:***
    Meet proposed outcomes.
    Confidence of outcome determination:
    High.
22. ***Provide explanation of reason(s) for determination.***
    Replacement of the degraded wooden retaining walls through the bioengineering has stabilized the shoreline, this in conjunction with the high-density planting of native trees, forbs, grasses and shrubs will meet the proposed outcomes of shoreline stabilization and habitat improvement.
23. ***Site Assessor(s) conducting field review:***

    Wade Johnson - MNDNR, Keegan Lund - MNDNR

Site Maps, Project Plans or Vegetation Tables

Figure 46. Map of project work area located between Cedar Lake and Lake of the Isles in Minneapolis (Kenilworth Channel Shoreline Stabilization Project).

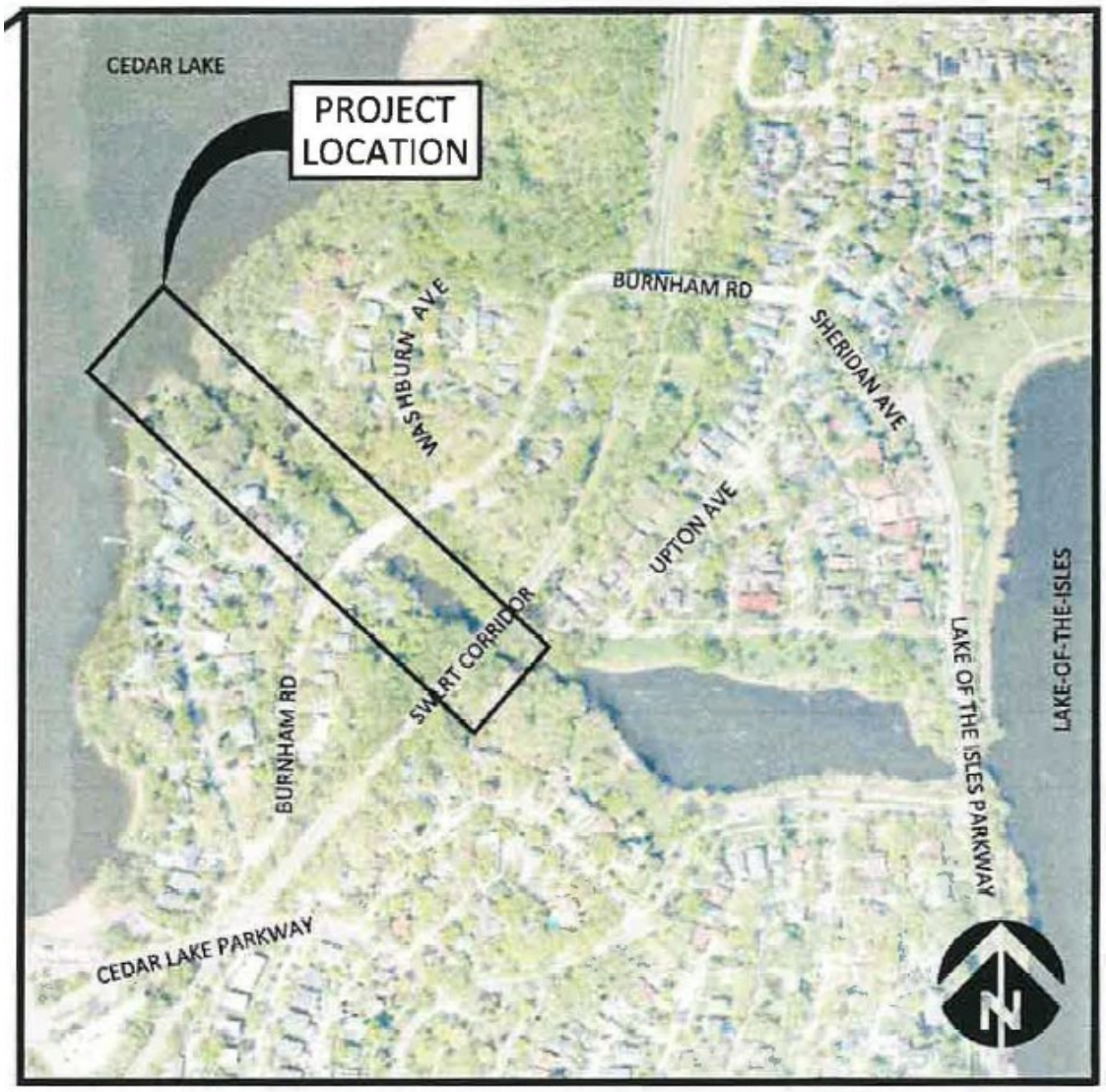


Figure 47. Aerial image of project site map from as-builts (Kenilworth Channel Shoreline Stabilization Project).

Table 26. Plant species observed during meander survey from site visit – 9/23/2022.

Scientific Name	Common name	Cover Range	Planted/ Seeded	Species Status
Acer saccharinuum	silver maple	5-25	N	Native
Acorus americanus	sweet flag	5-25	Y	Native
Agastache nepetoides	yellow giant hyssop	1-5	Y	Native
Agastache scrophularifolia	purple giant hyssop	1-5	Y	Native
Ageratina altissima	white snakeroot	5-25	N	Native
Alisma subcordatum	water plantain	5-25	Y	Native
Alliaria petiolata	garlic mustard	1-5	N	Invasive
Amaranthus retroflexus	redroot pigweed	5-25	N	Non-Native
Amorpha fruticosa	false indigo	1-5	Y	Native
Aquilegia canadensis	columbine	1-5	Y	Native
Blephilia hirsuta	hairy wood mint	1-5	Y	Native
Carex molesta	field oval sedge	1-5	Y	Native
Carex radiata	eastern star sedge	1-5	Y	Native
Celtis occidentalis	hackberry	1-5	Y	Native
Ceratophyllum demersum	coontail	5-25	N	Native
Chenopodium album	lamb's-quarters	5-25	N	Non-native
Cornus alternifolia	pagoda Dogwood	1-5	Y	Native
Cornus racemosa	gray Dogwood	1-5	Y	Native
Cornus sericea	red Osier Dogwood	1-5	Y	Native
Cyperus esculentus	yellow nut sedge	5-25	N	Invasive
Fraxinus pennsylvanica	green ash	25-50	N	Native
Geum canadense	white avens	1-5	N	Native
Hydrophyllum virginianum	Virginia waterleaf	5-25	N	Native
Leonurus cardiaca	motherwort	5-25	N	Non-native
Lobelia siphilitica	blue lobelia	1-5	N	Native
Lycopus americanus	American water horehound	1-5	N	Native
Medicago lupulina	black medic	1-5	N	Non-native
Melilotus sp.	sweet clover sp.	1-5	N	Non-native
Oxalis stricta	yellow wood sorel	5-25	N	Native
Parthenocissus quinquefolia	Virginia creeper	1-5	N	Native
Persicaria sp.	smartweed sp.	5-25	N	Native
Populus deltoides	cottonwood	5-25	N	Native
Prunus virginiana	Chokecherry	1-5	Y	Native
Quercus macrocarpa	bur oak	1-5	N	Native
Rudbeckia triloba	brown-eyed Susan	5-25	Y	Native
Rumex crispus	curly dock	5-25	N	Non-native

Sagittaria latifolia	broad-leaved arrowhead	5-25	Y	Native
Salix alba	weeping willow	1-5	N	Non-Native
Solanum ptychanthum	black nightshade	1-5	N	Non-native
Spartina pectinata	prairie cord grass	5-25	Y	Native
Symphoriacarpos albus	snowberry	1-5	Y	Native
Eurybia macrophylla	large-leaved aster	1-5	Y	Native
Thalictrum dioicum	early meadow rue	1-5	Y	Native
Tilia americana	basswood	1-5	N	Native
Viburnum trilobum	highbush cranberry	1-5	Y	Native
Viola sororia	common blue violet	5-25	N	Native
Zizia aurea	golden Alexanders	1-5	N	Native

Site Photographs

Photo 71. Looking to the southeast along Kenilworth Channel towards Burnham Road bridge. Note the snow fencing alongside the rocked toe to protect the native plantings from both geese and public disturbance (Kenilworth Channel Shoreline Stabilization, photo taken during site visit 9/23/2022).

Photo 72. Looking to the northwest along Kenilworth Channel towards Cedar Lake outlet. Note the project goal of maintaining significant canopy cover of mature silver maples and cottonwoods throughout construction (Kenilworth Channel Shoreline Stabilization, photo taken during site visit 9/23/2022).

Photo 73. Site visit photo with projects hosts Maren Hancock (Interfluve) and Dan Elias (MPRB) alongside Wade Johnson from the Restoration Evaluation Program. During the site visit there appeared to be substantial mortality of planted plugs potentially due to drought and/or geese herbivory (Kenilworth Channel Shoreline Stabilization, photo taken during site visit 9/23/2022).

Photo 74. Looking towards Kenilworth Channel at the outlet location of Cedar Lake. Note the presence of planted emergent plugs such arrowhead, prairie cordgrass and sweet flag (Kenilworth Channel Shoreline Stabilization, photo taken during site visit 9/23/2022).

Photo 75. Looking to the northwest along Kenilworth Channel towards Cedar Lake outlet. Note the rocked toe as well as the FES (Fabric Encapsulated Soil) lifts alongside the channel (Kenilworth Channel Shoreline Stabilization, photo taken during site visit 9/23/2022).

Photo 76. Looking to the southwest along Kenilworth Channel near the Cedar Lake outlet. Significant efforts by the project managers were undertaken to protect the native plantings including snow fencing along the channel as well as netting surrounding the trees and shrub planting (Kenilworth Channel Shoreline Stabilization, photo taken during site visit 9/23/2022).

16Lower Rice Creek Stabilization

Project Background

Project Name: Lower Rice Creek Stabilization Enhancement

Project Site: Sites 1-12A

Township/Range Section: Township 30 Range 24 Section 11, 12, 13

Project Manager / Affiliated Organization: Matt Kocian- RCWD, Jeff Weiss & Jessica Olsen- Barr

Fund: CWF ***Fiscal Year Funds:*** 2019

Project Start Date: 2019

Predominant Habitat type: Aquatic Habitat

Additional Habitat types: Wetland , Forest

Project Status: Post Establishment Phase

County: Anoka (Locke County Park)

Primary Activity: Stream/River Enhancement

Project Size: ~ 4 acres across 13 sites

Project Completed: stream: 2019, planting: 2021

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Stabilized 13 individual stream banks along Rice Creek using a combination of stabilization practices including bank re-grading and soil lifts, native plantings, toewood, boulder toe, and rock vanes. Tree thinning occurred along access routes for site access
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Barr Engineering record drawing / plan set
3. ***What are the stated goals of the project?***
   Project goals included stabilizing eroding stream banks and reducing sedimentation within the project reach and downstream waterbodies, reestablishing native riparian vegetation, and limiting erosion near existing infrastructure including foot bridges, trails, and residential back yards.
4. ***What are the desired outcomes of achieving the stated goals of the project?***
   Prevent further bank erosion within the project reach and minimize lateral bank migration near existing infrastructure, reestablish native riparian vegetation, and reduce sediment & nutrient loading in Rice Creek.
5. ***Were measures of restoration success identified in plans?*** *No*
6. ***Are plan Sets available?*** **Yes** ***Have project maps been created?*** Yes

If yes, provide in "site maps" and list maps provided:
See figures 1-5 from the Barr Engineering record drawing

7. ***Provide list of best management practices, standards, guidelines identified in plan set?***
   See figures 2 & 3 for the project stormwater pollution prevention plan

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   Yes
   See figures 4, 6, 7, and 8 from the record drawing. Access roads were changed to gain better access to the sites and to minimize tree disturbance. Rock vanes were excluded for some stabilization areas with additional riprap installed at other stabilization areas. These changes were made to further stabilize eroding banks and protect existing infrastructure beyond what was originally proposed in the plan.
9. ***In what ways did alterations change the proposed project outcome?***
   The alterations listed above did not negatively impact the project outcome. All sites visited were in a stable state with native vegetation well established above the placed riprap.

Site Assessment

Field Review Date: **10/28/2022**

Field Visit Attendees: Wade Johnson - DNR, Keegan Lund - DNR, Michelle Jordan - BWSR, Matt Kocian - RCWD, Mike Majeski - EOR

10. ***Surrounding Landscape Characteristics:***
    Floodplain forest surrounded by mixed residential & urban land use
11. ***Site Characteristics:***
    a. ***Soil Series:***
    Urban land-Zimmerman complex fine sand & Fordum-Winterfield complex fine sandy loam (source: Websoil Survey)
    b. ***Topography:***
    Outwash plains & alluvial flats on floodplains
    c. ***Hydrology:***
    Primarily surface water with occasional seeps & springs at base of steep banks
    d. ***Vegetation: Plant Communities, Dominant Species & Invasives % Cover:***
    Floodplain forest surrounded by southern mesic oak-basswood forest in the uplands. Dominant tree species include eastern cottonwood, silver maple, boxelder, northern pin oak, basswood, green ash. 5-10 % invasive cover on average.
12. ***Is the plan based on current science?*** Yes
    Practices implemented included toewood, rock vanes, bankfull benches, native plantings, and boulder toe stabilization with soil lifts.
13. ***List indicators of project goals at this stage of project:***

The stream banks are stable, and no further bank erosion was observed. Native vegetation has become well established.

14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***
    Yes, the installed riprap and bioengineering practices achieved the goal to stabilize eroding stream banks and the soil lifts and bank re-grading has allowed for establishment of native vegetation. Existing infrastructure was protected.
15. ***Are corrections or modifications needed to achieve proposed goals?***
    No
16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***
    Future management of the site may include occasional repositioning of riprap (if movement occurs) or vegetation maintenance through cutting or hand pulling of invasive species. Some areas are difficult to access due to steep slopes and density of mature deciduous trees.
17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    Overhanging streambank vegetation would improve aquatic habitat for fish & invertebrates but is limited along the riprapped stabilization areas due to the extent of rock used for the project.
18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    No follow up is needed at this time.
19. ***Additional comments on the restoration project.***
    Some native plugs were replaced due to drought conditions during the vegetation establishment phase of the project. Also, heavy shade occurs at several stabilization areas which limits the density of herbaceous vegetation along the stream banks.

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Achieved the stated goals.
21. ***The project will:***
    Meet proposed outcomes.
    Confidence of outcome determination:
    High.
22. ***Provide explanation of reason(s) for determination.***
    Each work area was stable, and no bank erosion was observed during the site visit. The upper banks were well vegetated at most stabilization areas and contained a diversity of native species.
23. ***Site Assessor(s) conducting field review:***

Mike Majeski- EOR

Site Maps, Project Plans or Vegetation Tables

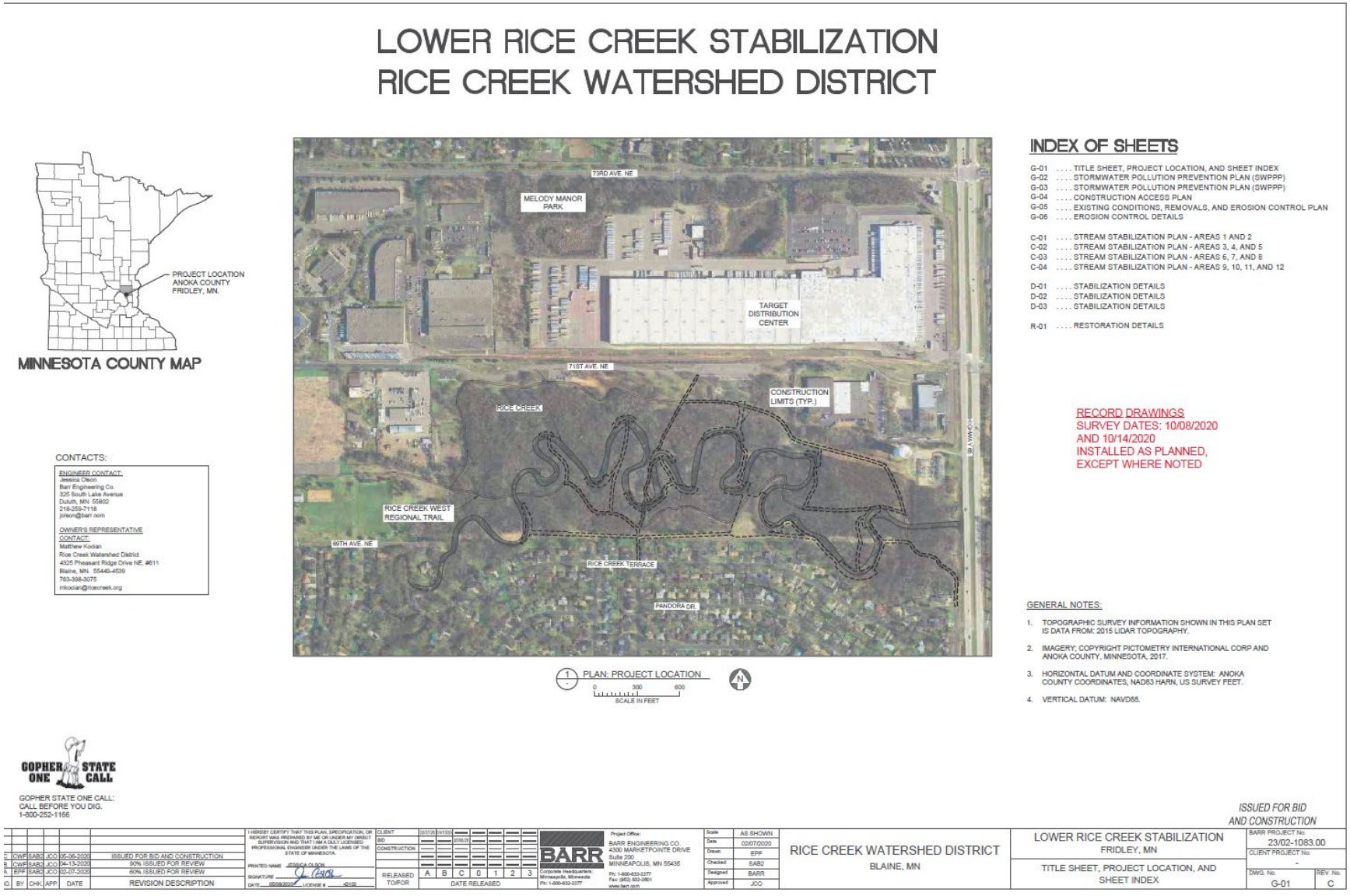


Figure 48. Construction plan title sheet.

1.0 GENERAL CONSTRUCTION ACTIVITY INFORMATION:

THIS STORMWATER POLLUTION PREVENTION PLAN (SWPPP) HAS BEEN PREPARED IN COMPLIANCE WITH THE MINNESOTA GENERAL STORMWATER PERMIT FOR CONSTRUCTION ACTIVITY NO. MNR100001 (GENERAL PERMIT), AS REQUIRED BY THE MINNESOTA POLLUTION CONTROL AGENCY (MPCA) UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM/STATE DISPOSAL SYSTEM (NPDES/SDS) PROGRAM.

THE PROJECT IS LOCATED IN THE CITY OF FRIDLEY, ANOKA COUNTY, MINNESOTA. PROPOSED CONSTRUCTION ACTIVITIES WILL TAKE PLACE ALONG RICE CREEK BETWEEN HIGHWAY 65 AND UNIVERSITY AVENUE. THE APPROXIMATE CENTROID OF THE PROJECT HAS A LATITUDE OF 45.094908 AND A LONGITUDE OF -93.250203.

THIS PROJECT INVOLVES EROSION CONTROL, CLEARING AND GRUBBING, REGRADING OF SLOPES, INSTALLATION OF TOEWOOD, VRSS, RIPRAP TOE PROTECTION, AND BOULDER VANES AND SITE RESTORATION . THE PROJECT AS PROPOSED HAS A TOTAL DISTURBANCE AREA OF 6.74 ACRES. EROSION PREVENTION AND SEDIMENT CONTROL MEASURES ARE REQUIRED TO MINIMIZE SEDIMENT FROM BEING TRANSPORTED INTO RICE CREEK, WHICH IS AN IMPAIRED WATER. REFER TO PROJECT DRAWINGS FOR FURTHER DETAILS. (CSW PERMIT PART III.A.1)

1.1 PROJECT SIZE AND CUMULATIVE IMPERVIOUS SURFACE:
- THE ANTICIPATED AREA OF DISTURBANCE IS APPROXIMATELY 6.74 ACRES.
- THE TOTAL AREA OF PRE-CONSTRUCTION IMPERVIOUS AREA IS APPROXIMATELY 0.3 ACRES.
- THE TOTAL AREA OF POST-CONSTRUCTION IMPERVIOUS AREA IS APPROXIMATELY 0.3 ACRES.
- THE TOTAL NEW IMPERVIOUS AREA IS APPROXIMATELY 0 ACRES.

1.2 DATES OF CONSTRUCTION:
- ANTICIPATED START DATE: TBD   ANTICIPATED END DATE: TBD

1.3 CONTACT INFORMATION:
OWNER: RICE CREEK WATERSHED DISTRICT
MAILING ADDRESS: 4235 PHEASANT RIDGE DR. NE, #611
CONTACT PERSON: MATTHEW KOCIAN   TITLE: PROJECT MANAGER
PHONE NUMBER: (763) 398-3075   EMAIL ADDRESS: MKOCIAN@RICECREEK.ORG
ALTERNATE CONTACT PERSON: TBD   TITLE: TBD
PHONE NUMBER: TBD   EMAIL ADDRESS: TBD

OPERATOR / GENERAL CONTRACTOR (WILL OVERSEE IMPLEMENTATION OF THE SWPPP): TBD
MAILING ADDRESS:
CONTACT PERSON: TITLE:
PHONE NUMBER: EMAIL ADDRESS:

PARTY RESPONSIBLE FOR LONG-TERM OPERATION AND MAINTENANCE OF THE PERMANENT STORMWATER MANAGEMENT SYSTEM:
RICE CREEK WATERSHED DISTRICT
MAILING ADDRESS: 4325 PHEASANT RIDGE DR. NE, #611
CONTACT PERSON: MATTHEW KOCIAN   TITLE: PROJECT MANAGER
PHONE NUMBER: (763) 398-3075   EMAIL ADDRESS: MKOCIAN@RICECREEK.ORG

2.0 RECEIVING WATERS:

WATERS WITHIN ONE MILE (NEAREST STRAIGHT LINE DISTANCE) THAT ARE LIKELY TO RECEIVE STORMWATER RUNOFF FROM THE PROJECT SITE (CSW PERMIT ITEM 5.10) INCLUDE:

NAME OF WATER BODY	TYPE (1)	WATER BODY ID (2)	SPECIAL WATER? (3)	IMPAIRED WATER? (3)	PUBLIC WATER WITH WORK IN WATER RESTRICTIONS?
RICE CREEK	CREEK	07010206-584	NO	YES	NO
LOCKE LAKE	LAKE	02-0077-00	NO	NO	NO

(1) TYPE EXAMPLES: DITCH, POND, WETLAND, CALCAREOUS FEN, LAKE, STREAM, RIVER
(2) WATER BODY IDENTIFICATION (ID) MIGHT NOT BE AVAILABLE FOR ALL WATER BODIES. USE THE SPECIAL AND IMPAIRED WATERS SEARCH TOOL AT: HTTPS://WWW.PCA.STATE.MN.US/WATER/STORMWATER-SPECIAL-AND-IMPAIRED-WATERS-SEARCH
(3) REFER TO CSW PERMIT SECTION 23. IMPAIRED WATER FOR THE FOLLOWING POLLUTANT(S) OR STRESSOR(S): PHOSPHORUS (NUTRIENT EUTROPHICATION BIOLOGICAL INDICATORS), TURBIDITY, TOTAL SUSPENDED SOLIDS (TSS), DISSOLVED OXYGEN, OR AQUATIC BIOTA (FISH BIOASSESSMENT, AQUATIC PLANT BIOASSESSMENT, AND AQUATIC MACROINVERTEBRATE BIOASSESSMENT)

2.1 SPECIAL AND IMPAIRED WATERS: THE MPCA'S SPECIAL AND IMPAIRED WATERS SEARCH TOOL WAS USED TO LOCATE SPECIAL AND IMPAIRED WATERS WITHIN ONE MILE (AERIAL RADIUS MEASUREMENT) OF THE PROJECT SITE. RICE CREEK HAS AN EPA-APPROVED IMPAIRMENT FOR AQUATIC RECREATION AND AQUATIC LIFE. THESE IMPAIRMENTS ARE CONSIDERED CONSTRUCTION RELATED AND REQUIRE ADDITIONAL BEST MANAGEMENT PRACTICES (BMPS) OR PLAN REVIEW FOR COMPLIANCE WITH THE GENERAL PERMIT. (CSW PERMIT ITEM 2.7 AND SECTION 23)

ADDITIONAL BMPS OR OTHER SPECIFIC CONSTRUCTION RELATED IMPLEMENTATION ACTIVITIES IDENTIFIED IN AN APPROVED TOTAL MAXIMUM DAILY LOAD (TMDL) INCLUDE IMMEDIATE STABILIZATION OF EXPOSED SOIL AREAS AND CONSTRUCTION OF A TEMPORARY SEDIMENTATION BASIN FOR COMMON DRAINAGE LOCATIONS THAT SERVE AN AREA WITH 5 OR MORE ACRES . (CSW PERMIT ITEM 5.19)

2.2 PUBLIC WATERS WITH WORK IN WATER RESTRICTIONS: RICE CREEK IS A MINNESOTA PUBLIC WATER. APPLICATION 2020-0513 FOR DNR PUBLIC WATERS WORK PERMIT WAS SUBMITTED VIA MPARS SYSTEM MARCH 13,2020.

2.3 WETLAND IMPACTS: CONSTRUCTION MATTING WILL BE USED FOR ALL EQUIPMENT IN FLOODPLAIN WORK AREAS, SO THE PROJECT WILL NOT IMPACT WETLANDS.

2.4 ENVIRONMENTAL REVIEW AND OTHER REQUIRED REVIEWS: STORMWATER MITIGATION MEASURES ARE NOT REQUIRED AS A RESULT OF AN ENVIRONMENTAL REVIEW (E.G., EAW OR EIS), ENDANGERED OR THREATENED SPECIES REVIEW, ARCHEOLOGICAL SITE REVIEW, OR OTHER LOCAL, STATE, OR FEDERAL REVIEW CONDUCTED FOR THE PROJECT. (CSW PERMIT ITEMS 2.8, 2.9, AND 5.16)

2.5 KARST AREAS OR DRINKING WATER SUPPLY MANAGEMENT AREAS: THIS PROJECT DOES NOT INCLUDE ANY KARST OR DRINKING WATER SUPPLY MANAGEMENT AREAS. (CSW PERMIT ITEMS 16.19, 16.20, AND 18.10)

3.0 PROJECT PLANS AND SPECIFICATIONS:

REQUIRED FEATURE	SHEET NUMBER
• PROJECT LOCATION AND CONSTRUCTION LIMITS	G-01
• EXISTING AND FINAL GRADES, INCLUDING DRAINAGE AREA BOUNDARIES, DIRECTIONS OF FLOW AND ALL DISCHARGE POINTS WHERE STORMWATER IS LEAVING THE SITE OR ENTERING A SURFACE WATER	C-01 TO C-05
• SOIL TYPES AT THE SITE	G-03
• LOCATIONS OF IMPERVIOUS SURFACES	C-01 TO C-05
• LOCATIONS OF AREAS NOT BE BE DISTURBED (E.G., BUFFER ZONES, WETLANDS, ETC.)	C-01 TO C-05
• LOCATIONS OF AREAS OF STEEP SLOPES	C-01 TO C-05
• LOCATIONS OF AREAS WHERE CONSTRUCTION WILL BE PHASED TO MINIMIZE DURATION OF EXPOSED SOILS	NA
• PORTIONS OF THE SITE THAT DRAIN TO A PUBLIC WATER WITH DNR WORK IN WATER RESTRICTIONS FOR FISH SPAWNING TIMEFRAMES	NA
• LOCATIONS OF ALL TEMPORARY AND PERMANENT EROSION AND SEDIMENT CONTROL BMPS AS REQUIRED IN PERMIT SECTIONS 8 THROUGH 10 AND 14 THROUGH 19	G-04
• BUFFER ZONES AS REQUIRED IN PERMIT ITEMS 9.17 AND 23.11	C-01 TO C-05
• LOCATIONS OF POTENTIAL POLLUTION-GENERATING ACTIVITIES IDENTIFIED IN PERMIT SECTION 12	C-01 TO C-05
• STANDARD DETAILS FOR EROSION AND SEDIMENT CONTROL BMPS TO BE INSTALLED AT THE SITE	G-05

4.0 BEST MANAGEMENT PRACTICES (BMPS):

4.1 EROSION PREVENTION PRACTICES:
1. BEFORE LAND DISTURBING ACTIVITIES BEGIN, THE LIMITS OF THE AREAS TO BE DISTURBED DURING CONSTRUCTION WILL BE DELINEATED WITH FLAGS, STAKES, SIGNS, SILT FENCE, ETC.
2. TEMPORARY STABILIZATION OF SOILS AND SOIL STOCKPILES: (CSW PERMIT ITEMS 8.4, 8.5, AND 23.9)
   a. AREAS OF EXPOSED SOIL WILL BE STABILIZED WITH EROSION CONTROL BLANKET, PRESERVATION OF MATURE VEGETATION, MULCH OR EQUIVALENT MEASURES.
   b. IF PRESENT, SOIL STOCKPILES WILL BE STABILIZED WITH MULCH (SUCH AS STRAW MULCH, EROSION CONTROL BLANKETS OR EQUIVALENT MEASURES.
   c. TEMPORARY STOCKPILES WITHOUT SIGNIFICANT SILT, CLAY, OR ORGANIC COMPONENTS (E.G., CLEAN AGGREGATE STOCKPILES, DEMOLITION CONCRETE STOCKPILES, SAND STOCKPILES) AND THE CONSTRUCTED BASE COMPONENTS OF ROADS, PARKING LOTS, AND SIMILAR SURFACES ARE EXEMPT FROM THESE STABILIZATION REQUIREMENTS.
2. STABILIZATION OF DITCH AND SWALE WETTED PERIMETERS: (CSW PERMIT ITEMS 8.6 THROUGH 8.8)
   a. IF SOILS WITHIN EXISTING STORMWATER DITCHES OR SWALES ARE DISTURBED, THEY WILL BE STABILIZED WITH CHANNEL EROSION CONTROL BLANKET, RIPRAP, TURF REINFORCEMENT MAT OR EQUIVALENT MEASURES.
   b. MULCH, HYDROMULCH, TACKIFIER, POLYACRYLAMIDE, OR SIMILAR EROSION PREVENTION PRACTICES WILL NOT BE USED TO STABILIZE ANY PART OF AN EXISTING STORMWATER DITCH OR SWALE WITH A CONTINUOUS SLOPE OF GREATER THAN 2 PERCENT.
   c. THE LAST 200 LINEAL FEET OF LENGTH OF THE NORMAL WETTED PERIMETER OF ANY TEMPORARY OR PERMANENT DITCH OR SWALE THAT DRAINS WATER FROM ANY PORTION OF THE CONSTRUCTION SITE, OR DIVERTS WATER AROUND THE SITE, WITHIN 200 LINEAL FEET FROM THE PROPERTY EDGE, OR FROM THE POINT OF DISCHARGE INTO ANY SURFACE WATER WILL BE STABILIZED WITHIN 24 HOURS AFTER CONNECTING TO A SURFACE WATER OR PROPERTY EDGE.
   d. STABILIZATION OF THE REMAINING PORTIONS OF ANY TEMPORARY OR PERMANENT DITCHES OR SWALES WILL BE COMPLETED WITHIN 14 CALENDAR DAYS AFTER CONNECTING TO A SURFACE WATER OR PROPERTY EDGE AND CONSTRUCTION IN THAT PORTION OF THE DITCH HAS TEMPORARILY OR PERMANENTLY CEASED.
3. ENERGY DISSIPATION AT PIPE OUTLETS: ENERGY DISSIPATION AT PIPE OUTLETS WILL BE PROVIDED WITH ONE OR MORE OF THE FOLLOW METHODS: RIP RAP, SPLASH PADS, GABIONS, OR EQUIVALENT MEASURES. (CSW PERMIT ITEM 8.9)
4. EROSION PREVENTION IMPLEMENTATION TIMELINES: (CSW PERMIT ITEMS 5.4, 8.4 THROUGH 8.6, AND 23.9)
   a. STABILIZATION OF EXPOSED SOIL AREAS (INCLUDING STOCKPILES) WILL BE INITIATED IMMEDIATELY TO LIMIT SOIL EROSION WHENEVER ANY CONSTRUCTION ACTIVITY HAS PERMANENTLY OR TEMPORARILY CEASED ON ANY PORTION OF THE SITE AND WILL NOT RESUME FOR A PERIOD EXCEEDING 14 CALENDAR DAYS.
   b. IF THE EXPOSED SOIL AREAS DRAIN TO A DISCHARGE POINT THAT IS WITHIN ONE MILE (AERIAL RADIUS MEASUREMENT) OF A SPECIAL OR IMPAIRED WATER (SEE SECTION 2.0), STABILIZATION OF EXPOSED SOIL AREAS (INCLUDING STOCKPILES) WILL BE INITIATED IMMEDIATELY TO LIMIT SOIL EROSION WHENEVER ANY CONSTRUCTION ACTIVITY HAS PERMANENTLY OR TEMPORARILY CEASED ON ANY PORTION OF THE SITE AND WILL NOT RESUME FOR A PERIOD EXCEEDING 7 CALENDAR DAYS.
   c. THE FOLLOWING ACTIVITIES CAN BE TAKEN TO INITIATE STABILIZATION: PREPPING THE SOIL FOR VEGETATIVE OR NON-VEGETATIVE STABILIZATION, APPLYING MULCH OR OTHER NON-VEGETATIVE PRODUCT TO THE EXPOSED SOIL AREA, OR SEEDING OR PLANTING THE EXPOSED AREA.
5. ADDITIONAL EROSION PREVENTION MEASURES: THE FOLLOWING ADDITIONAL EROSION PREVENTION METHODS WILL BE IMPLEMENTED AT THE SITE DURING CONSTRUCTION: (CSW PERMIT ITEMS 8.2, 8.3, AND 8.10)
   a. SOIL DISTURBANCE WILL BE MINIMIZED WHEREVER POSSIBLE TO AID IN EROSION PREVENTION.
   b. EXISTING VEGETATION WILL BE PRESERVED WHEREVER POSSIBLE TO LIMIT EXPOSED SOIL AND THUS WILL SERVE AS NATURAL VEGETATIVE BUFFERS.
   c. EXPOSED SOIL ON STEEP SLOPES (≤3H:1V) WILL BE STABILIZED USING EROSION CONTROL BLANKETS AND SEEDING.
   d. HORIZONTAL SLOPE GRADING WILL BE UTILIZED TO MINIMIZE EROSION POTENTIAL.
   e. TERRACING WILL BE USED TO MINIMIZED EROSION POTENTIAL.

4.2 SEDIMENT CONTROL PRACTICES:
1. DOWNGRADIENT PERIMETER CONTROLS: (CSW PERMIT ITEMS 9.2 THROUGH 9.6)
   a. SEDIMENT CONTROL PRACTICES WILL BE ESTABLISHED ON ALL DOWNGRADIENT PERIMETERS AND LOCATED UPGRADIENT OF ANY BUFFER ZONES. PERIMETER SEDIMENT CONTROLS WILL INCLUDE: SILT FENCE, SEDIMENT CONTROL LOGS / BIOROLLS (FILLED WITH COMPOST, WOOD CHIPS, ROCK, ETC.), VEGETATIVE BUFFERS (RETAIN EXISTING VEGETATION WHERE POSSIBLE), OR EQUIVALENT MEASURES.
   b. PERIMETER SEDIMENT CONTROL PRACTICES MUST BE INSTALLED BEFORE ANY UPGRADIENT LAND-DISTURBING ACTIVITIES BEGIN AND REMAIN IN PLACE UNTIL PERMANENT COVER HAS BEEN ESTABLISHED.
   c. IF SEDIMENT CONTROL PRACTICES HAVE BEEN ADJUSTED OR REMOVED TO ACCOMMODATE SHORT-TERM ACTIVITIES (SUCH AS CLEARING, GRUBBING, OR PASSAGE OF VEHICLES), THE CONTROLS MUST BE RE-INSTALLED IMMEDIATELY AFTER THE SHORT-TERM ACTIVITY HAS BEEN COMPLETED. SEDIMENT CONTROL PRACTICES MUST BE RE-INSTALLED BEFORE THE NEXT PRECIPITATION EVENT, EVEN IF THE SHORT-TERM ACTIVITY IS NOT COMPLETE.
   d. IF THE DOWNGRADIENT SEDIMENT CONTROLS ARE OVERLOADED (BASED ON FREQUENT FAILURE OR EXCESSIVE MAINTENANCE REQUIREMENT), INSTALL ADDITIONAL UPGRADIENT SEDIMENT CONTROL PRACTICES OR REDUNDANT BMPS TO ELIMINATE THE OVERLOADING AND AMEND THE SWPPP TO IDENTIFY THESE ADDITIONAL PRACTICES.
2. SOIL STOCKPILE PERIMETER CONTROLS: TEMPORARY SOIL STOCKPILES WILL BE SURROUNDED BY: DOUBLE ROWS OF SILT FENCE, SEDIMENT CONTROL LOGS OR EQUIVALENT MEASURES, AND SHALL NOT BE PLACED IN ANY NATURAL BUFFERS OR SURFACE WATERS.(CSW PERMIT ITEMS 9.9 AND 9.10)
3. STORM DRAIN INLET PROTECTION: (CSW PERMIT ITEMS 9.7 AND 9.8)
   a. INLET PROTECTION BMPS WILL BE INSTALLED AROUND ALL STORM DRAIN INLETS DOWNGRADIENT OF CONSTRUCTION ACTIVITIES.
   b. STORM DRAIN INLETS WILL BE PROTECTED UNTIL ALL SOURCES WITH POTENTIAL FOR DISCHARGING TO THE INLET HAVE BEEN STABILIZED.
   c. INLET PROTECTION BMPS WILL BE: SEDIMENT CONTROL LOG, FILTER SACKS, OR EQUIVALENT MEASURES.
4. VEHICLE TRACKING BMPS: (CSW PERMIT ITEMS 9.11 AND 9.12)
   a. VEHICLE TRACKING BMPS WILL BE INSTALLED TO MINIMIZE THE TRACKING OUT OF SEDIMENT FROM THE CONSTRUCTION AREA AND WILL INCLUDE: ROCK PADS AND MUD MATS OR AN EQUIVALENT SYSTEM.
   b. IF SUCH VEHICLE TRACKING BMPS ARE NOT ADEQUATE TO PREVENT SEDIMENT FROM BEING TRACKED ONTO THE PAVED ROAD, STREET SWEEPING WILL ALSO BE EMPLOYED. SEDIMENT WILL BE REMOVED BY SWEEPING WITHIN 24 HOURS.
5. PROTECTION OF INFILTRATION AREAS: IF NECESSARY, ADDITIONAL SEDIMENT CONTROLS (E.G., DIVERSION BERMS) WILL BE INSTALLED TO KEEP RUNOFF AWAY FROM PLANNED INFILTRATION AREAS WHEN EXCAVATED PRIOR TO ESTABLISHING PERMANENT COVER WITHIN THE CONTRIBUTING DRAINAGE AREA. (CSW PERMIT ITEMS 16.4 AND 16.5)
6. MINIMIZATION OF SOIL COMPACTION AND PRESERVATION OF TOPSOIL: SOIL COMPACTION WILL BE MINIMIZED AND TOPSOIL WILL BE PRESERVED WHERE POSSIBLE. (CSW PERMIT ITEMS 5.24, 9.14, AND 9.15)
7. PRIORITIZATION OF ONSITE INFILTRATION AND SEDIMENT REMOVAL: (CSW PERMIT ITEM 9.16)
   a. PRIOR TO OFFSITE DISCHARGE, INFILTRATION AND SEDIMENT REMOVAL WILL BE IMPLEMENTED ONSITE WHERE POSSIBLE.
   b. DISCHARGES FROM BMPS WILL BE DIRECTED TO VEGETATED AREAS OF THE SITE (INCLUDING ANY NATURAL BUFFERS) IN ORDER TO INCREASE SEDIMENT REMOVAL AND MAXIMIZE STORMWATER INFILTRATION. IF EROSION IS NOTED TO OCCUR AS THE RESULT OF SUCH A DISCHARGE, VELOCITY DISSIPATION BMPS WILL BE CONSIDERED AND INSTALLED AS NECESSARY TO PREVENT EROSION.
8. BUFFER ZONE OR REDUNDANT SEDIMENT CONTROLS TO PROTECT SURFACE WATERS: (CSW PERMIT ITEM 9.17)
   a. A 50-FOOT NATURAL BUFFER WILL BE PRESERVED IN CONSTRUCTION AREAS DISCHARGING TO A NON-SPECIAL/NON-IMPAIRED SURFACE WATER OR WETLAND. IF A NON-SPECIAL/NON-IMPAIRED SURFACE WATER OR WETLAND IS LOCATED WITHIN 50 FEET OF THE PROJECT'S EARTH DISTURBANCES AND STORMWATER FLOWS TO THE SURFACE WATER, OR WHEN A BUFFER IS INFEASIBLE, REDUNDANT SEDIMENT CONTROLS WILL BE PROVIDED.
   b. A 100-FOOT NATURAL BUFFER WILL BE PRESERVED IN CONSTRUCTION AREAS DISCHARGING TO A SPECIAL OR IMPAIRED SURFACE WATER. IF A SPECIAL OR IMPAIRED SURFACE WATER IS LOCATED WITHIN 100 FEET OF THE PROJECT'S EARTH DISTURBANCES AND STORMWATER FLOWS TO THE SURFACE WATER, OR WHEN A BUFFER IS INFEASIBLE, REDUNDANT SEDIMENT CONTROLS WILL BE PROVIDED.
   c. REDUNDANT PERIMETER CONTROLS WILL BE INSTALLED AT LEAST 5 FEET APART UNLESS LIMITED BY LACK OF AVAILABLE SPACE.
9. USE OF SEDIMENTATION TREATMENT CHEMICALS (E.G., POLYMERS, FLOCCULANTS, ETC.) IS NOT ANTICIPATED AS PART OF THE PROJECT. (CSW PERMIT ITEMS 5.22 AND 9.18)
10. THE PROJECT WILL NOT INCLUDE 10 OR MORE ACRES OF DISTURBED SOIL DRAINING TO A COMMON LOCATION OR 5 OR MORE ACRES DRAINING TO A COMMONLOCATION WITHIN 1 MILE OR A SPECIAL OR IMPAIRED WATER THEREFORE TEMPORARY SEDIMENT BASINS ARE NOT REQUIRED. (CSW PERMIT ITEMS 5.6, 9.13, AND 23.10 AND SECTION 14)

4.3 DEWATERING AND BASIN DRAINING: NO DEWATERING OR BASIN DRAINING WILL OCCUR AS PART OF THIS PROJECT. (CSW PERMIT SECTION 10 AND ITEM 10.5)

4.4 BMP DESIGN FACTORS: THE FOLLOWING BMP DESIGN FACTORS HAVE BEEN CONSIDERED IN DESIGNING THE TEMPORARY EROSION PREVENTION AND SEDIMENT CONTROL BMPS:
1. EXPECTED AMOUNT, FREQUENCY, INTENSITY, AND DURATION OF PRECIPITATION.
2. NATURE OF STORMWATER RUNOFF AND RUN-ON AT THE SITE, INCLUDING FACTORS SUCH AS EXPECTED FLOW FROM IMPERVIOUS SURFACES, SLOPES, AND SITE DRAINAGE FEATURES.
3. STORMWATER VOLUME, VELOCITY, AND PEAK FLOW RATES TO MINIMIZE DISCHARGE OF POLLUTANTS IN STORMWATER AND TO MINIMIZE CHANNEL AND STREAMBANK EROSION AND SCOUR IN THE IMMEDIATE VICINITY OF DISCHARGE POINTS.
4. RANGE OF SOIL PARTICLE SIZES EXPECTED TO BE PRESENT.

(SEE PAGE 2 OF 2)

ISSUED FOR BID AND CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
C	CWF	SAB2	JCO	05-06-2020	ISSUED FOR BID AND CONSTRUCTION
B	CWF	SAB2	JCO	04-13-2020	90% ISSUED FOR REVIEW
A	EPF	SAB2	JCO	02-07-2020	60% ISSUED FOR REVIEW

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.
PRINTED NAME JESSICA OLSON
SIGNATURE [signature]
DATE 05/06/2020 LICENSE # 43102

RELEASED TO/FOR	A	B	C	0	1	2	3
CLIENT	02/07/20	04/13/20					
BID			05/06/20				
CONSTRUCTION							

DATE RELEASED

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Scale	AS SHOWN
Date	02/07/2020
Drawn	EPF
Checked	SAB2
Designed	BARR
Approved	JCO

RICE CREEK WATERSHED DISTRICT
BLAINE, MN

LOWER RICE CREEK STABILIZATION
FRIDLEY, MN

STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

BARR PROJECT No. 23/02-1083.00
CLIENT PROJECT No. -
DWG. No. G-02
REV. No. C

Figure 49. Stormwater Pollution Prevention Plan.

5.0 PERMANENT STORMWATER MANAGEMENT SYSTEM:

A PERMANENT STORMWATER MANAGEMENT SYSTEM IS REQUIRED IF THE PROJECT RESULTS IN ONE ACRE OR MORE OF NEW IMPERVIOUS SURFACES OR RESULTS IN A NET INCREASE OF ONE OR MORE ACRES OF CUMMULATIVE NEW IMPERVIOUS SURFACES IN TOTAL OR IF THE PROJECT IS PART OF A LARGER PLAN OF DEVELOPMENT. (CSW PERMIT ITEM 15.3)

5.1 A PERMANENT STORMWATER TREATMENT SYSTEM IS NOT REQUIRED. (CSW PERMIT ITEMS 5.15, 15.4-15.9, AND 23.14)

5.2 THIS IS NOT A LINEAR PROJECT WITH LACK OF RIGHT OR WAY. (CSW PERMIT ITEM 15.9)

5.3 THIS PROJECT DOES NOT DISCHARGE TO A TROUT STREAM (OR A TRIBUTARY TO A TROUT STREAM). (CSW PERMIT ITEM 23.12)

6.0 INSPECTION AND MAINTENANCE ACTIVITIES:

6.1 PERSONS WITH REQUIRED TRAINING: TRAINED INDIVIDUALS INCLUDE THOSE PARTIES RESPONSIBLE FOR INSTALLING, SUPERVISING, REPAIRING, INSPECTING, AND MAINTAINING EROSION PREVENTION AND SEDIMENT CONTROL BMPS AT THE SITE. TRAINED INDIVIDUALS ARE ALSO RESPONSIBLE FOR IMPLEMENTATION OF THE SWPPP AND COMPLIANCE WITH THE GENERAL PERMIT UNTIL THE CONSTRUCTION ACTIVITIES ARE COMPLETE, PERMANENT COVER HAS BEEN ESTABLISHED, AND A NOTICE OF TERMINATION (NOT) HAS BEEN SUBMITTED. (CSW PERMIT ITEMS 5.20, 5.21, AND 11.9 AND SECTION 21)

THESE INDIVIDUALS WILL BE TRAINED IN ACCORDANCE WITH THE REQUIREMENTS OF THE GENERAL PERMIT, INCLUDING THE REQUIREMENT THAT THE CONTENT AND EXTENT OF TRAINING WILL BE COMMENSURATE WITH THE INDIVIDUAL'S JOB DUTIES AND RESPONSIBILITIES.

BELOW IS A LIST OF PEOPLE RESPONSIBLE FOR THIS PROJECT WHO ARE KNOWLEDGEABLE AND EXPERIENCED IN THE APPLICATION OF EROSION PREVENTION AND SEDIMENT CONTROL BMPS.

TRAINED INDIVIDUAL	RESPONSIBILITY	TRAINING ENTITY*	TRAINING DATE
ERIC FITZGERALD	PREPARATION OF THE SWPPP	UNIVERSITY OF MINNESOTA	SEPTEMBER 2017
TBD	OVERSIGHT OF SWPPP IMPLEMENTATION, REVISION, AND AMMENDMENT	TBD	TBD
TBD	PERFORMANCE OF SWPPP INSPECTIONS	TBD	TBD
TBD	PERFORMANCE OR SUPERVISION OF INSTALLATION, MAINTENANCE, AND REPAIR OF BMPS	TBD	TBD

*TRAINING DOCUMENTATION AVAILABLE UPON REQUEST.

6.2 FREQUENCY OF INSPECTIONS: A TRAINED PERSON WILL ROUTINELY INSPECT THE ENTIRE CONSTRUCTION SITE. (CSW PERMIT ITEMS 11.2, 11.10, AND 23.13)

- AT LEAST ONCE EVERY 7 DAYS DURING ACTIVE CONSTRUCTION
- WITHIN 24 HOURS AFTER A RAINFALL EVENT GREATER THAN 0.5 INCHES IN 24 HOURS

INSPECTION FREQUENCY MAY BE ADJUSTED UNDER THE FOLLOWING CIRCUMSTANCES:

- WHERE PARTS OF THE CONSTRUCTION AREAS HAVE PERMANENT COVER, BUT WORK REMAINS ON OTHER PARTS OF THE SITE, INSPECTIONS OF THE AREAS WITH PERMANENT COVER MAY BE REDUCED TO ONCE PER MONTH.
- WHERE CONSTRUCTION AREAS HAVE PERMANENT COVER AND NO CONSTRUCTION ACTIVITY IS OCCURRING ON THE SITE, INSPECTIONS CAN BE REDUCED TO ONCE PER MONTH AND, AFTER 12 MONTHS, MAY BE SUSPENDED COMPLETELY UNTIL CONSTRUCTION ACTIVITY RESUMES.
- WHERE CONSTRUCTION ACTIVITY HAS BEEN SUSPENDED DUE TO FROZEN GROUND CONDITIONS, THE INSPECTIONS MAY BE SUSPENDED. THE REQUIRED INSPECTIONS AND MAINTENANCE SCHEDULE MUST BEGIN WITHIN 24 HOURS AFTER RUNOFF OCCURS AT THE SITE OR UPON RESUMING CONSTRUCTION, WHICHEVER COMES FIRST.

6.3 INSPECTION REQUIREMENTS: EACH CONSTRUCTION STORMWATER SITE INSPECTION WILL INCLUDE INSPECTION OF THE FOLLOWING AREAS: (CSW PERMIT ITEMS 11.3 THROUGH 11.8)

- ALL EROSION PREVENTION AND SEDIMENT CONTROL BMPS AND POLLUTION PREVENTION MANAGEMENT MEASURES
- SURFACE WATERS FOR EVIDENCE OF EROSION AND SEDIMENT DEPOSITION
- CONSTRUCTION SITE VEHICLE EXIT LOCATIONS FOR EVIDENCE OF OFFSITE SEDIMENT TRACKING
- STREETS AND OTHER AREAS ADJACENT TO THE PROJECT FOR EVIDENCE OF OFF SITE ACCUMULATIONS OF SEDIMENT

6.4 MAINTENANCE REQUIREMENTS: MAINTENANCE OF THE FOLLOWING AREAS AND BMPS WILL BE PERFORMED AS FOLLOWS: (CSW PERMIT ITEMS 11.3 THROUGH 11.8)

- NONFUNCTIONAL BMPS WILL BE REPAIRED, REPLACED, OR SUPPLEMENTED WITH FUNCTIONAL BMPS BY THE END OF THE NEXT BUSINESS DAY AFTER DISCOVERY OR AS SOON AS FIELD CONDITIONS ALLOW ACCESS.
- PERIMETER CONTROL DEVICES WILL BE REPAIRED, REPLACED, OR SUPPLEMENTED WHEN THEY BECOME NONFUNCTIONAL OR THE SEDIMENT REACHES 1/2 OF THE HEIGHT OF THE DEVICE.
- TEMPORARY AND PERMANENT SEDIMENTATION BASINS WILL BE DRAINED AND THE SEDIMENT REMOVED WHEN THE DEPTH OF SEDIMENT COLLECTED IN THE BASIN REACHES 1/2 THE STORAGE VOLUME.
- DELTAS AND SEDIMENT DEPOSITED IN SURFACE WATERS WILL BE REMOVED, AND THE AREAS WHERE SEDIMENT REMOVAL RESULTS IN EXPOSED SOIL WILL BE RE-STABILIZED. THE REMOVAL AND STABILIZATION WILL BE COMPLETED WITHIN 7 CALENDAR DAYS OF DISCOVERY UNLESS PRECLUDED BY LEGAL, REGULATORY, OR PHYSICAL ACCESS CONSTRAINTS. IF PRECLUDED DUE TO ACCESS CONSTRAINTS, REASONABLE EFFORTS TO OBTAIN ACCESS WILL BE USED. REMOVAL AND STABILIZATION WILL TAKE PLACE WITHIN 7 CALENDAR DAYS OF OBTAINING ACCESS.
- TRACKED SEDIMENT ON PAVED SURFACES WILL BE REMOVED WITHIN 1 CALENDAR DAY OF DISCOVERY.
- AREAS UNDERGOING STABILIZATION WILL BE RESTABILIZED AS NECESSARY TO ACHIEVE REQUIRED COVER.

6.5 RECORDKEEPING REQUIREMENTS: (CSW PERMIT ITEMS 11.11 AND 24.5 AND SECTIONS 6 AND 20)

1. ALL INSPECTIONS AND MAINTENANCE ACTIVITIES WILL BE RECORDED IN WRITING WITHIN 24 HOURS OF BEING CONDUCTED AND THESE RECORDS WILL BE RETAINED WITH THE SWPPP. RECORDS OF EACH INSPECTION AND MAINTENANCE ACTIVITY WILL INCLUDE THE DATE AND TIME; NAME OF INSPECTOR(S); FINDINGS OF INSPECTIONS; CORRECTIVE ACTIONS (INCLUDING DATES, TIMES, AND PARTY COMPLETING MAINTENANCE ACTIVITIES); AND DATE OF ALL RAINFALL EVENTS GREATER THAN 0.5 INCHES IN 24 HOURS AND THE AMOUNT OF RAINFALL FOR EACH EVENT.
   a. IF ANY DISCHARGE IS OBSERVED DURING THE INSPECTION, THE LOCATION AND APPEARANCE OF THE DISCHARGE (I.E., COLOR, ODOR, SETTLED OR SUSPENDED SOLIDS, OIL SHEEN, AND OTHER OBVIOUS INDICATORS OF POLLUTANTS) WILL BE DOCUMENTED AND A PHOTOGRAPH WILL BE TAKEN.
2. THE SWPPP WILL BE AMENDED TO INCLUDE ADDITIONAL OR MODIFIED BMPS TO CORRECT PROBLEMS OR ADDRESS SITUATIONS WHENEVER THERE IS A CHANGE IN DESIGN, CONSTRUCTION, OPERATION, MAINTENANCE, WEATHER, OR SEASONAL CONDITIONS THAT HAS A SIGNIFICANT EFFECT ON THE DISCHARGE OF POLLUTANTS TO SURFACE WATERS OR GROUNDWATER.
   a. THE SWPPP WILL BE AMENDED WHEN INSPECTIONS OR INVESTIGATIONS BY THE SITE OWNER, OPERATOR, OR CONTRACTORS OR BY USEPA/MPCA OFFICIALS INDICATE THAT THE SWPPP IS NOT EFFECTIVE IN ELIMINATING OR MINIMIZING THE DISCHARGE OF POLLUTANTS TO SURFACE WATERS OR GROUNDWATER; THE DISCHARGES ARE CAUSING WATER QUALITY STANDARD EXCEEDANCES; OR THE SWPPP IS NOT CONSISTENT WITH A USEPA APPROVED TMDL.
   b. ANY AMENDMENTS TO THE SWPPP PROPOSED AS A RESULT OF THE INSPECTION WILL BE DOCUMENTED AS REQUIRED WITHIN 7 CALENDAR DAYS.
   c. AMENDMENTS WILL BE COMPLETED BY AN APPROPRIATELY TRAINED INDIVIDUAL. CHANGES INVOLVING THE USE OF A LESS STRINGENT BMP WILL INCLUDE A JUSTIFICATION DESCRIBING HOW THE REPLACEMENT BMP IS EFFECTIVE FOR THE SITE CHARACTERISTICS.
3. RECORDS RETENTION: THE SWPPP, INCLUDING ALL CHANGES TO IT, AND INSPECTION AND MAINTENANCE RECORDS WILL BE KEPT AT THE SITE DURING CONSTRUCTION BY THE PERMITTEE WHO HAS OPERATIONAL CONTROL OF THE SITE. THE SWPPP CAN BE KEPT IN EITHER A FIELD OFFICE OR IN AN ON SITE VEHICLE DURING NORMAL WORKING HOURS.
4. RECORD AVAILABILITY: THE PERMITTEES WILL MAKE THE SWPPP, INCLUDING INSPECTION REPORTS, MAINTENANCE RECORDS, AND TRAINING RECORDS, AVAILABLE TO FEDERAL, STATE, AND LOCAL OFFICIALS WITHIN THREE DAYS UPON REQUEST FOR THE DURATION OF THE PERMIT COVERAGE AND FOR THREE YEARS FOLLOWING THE NOTICE OF TERMINATION.

7.0 POLLUTION PREVENTION MEASURES:

1. ANY CONSTRUCTION PRODUCTS AND LANDSCAPE MATERIALS THAT HAVE THE POTENTIAL TO LEACH POLLUTANTS WILL BE STORED UNDER COVER (E.G., PLASTIC SHEETING OR TEMPORARY ROOFS) TO PREVENT DISCHARGE OF POLLUTANTS THROUGH MINIMIZATION OF CONTACT WITH STORMWATER. STORAGE OF SUCH MATERIALS WITHIN THE PROJECT AREA WILL BE MINIMIZED TO THE EXTENT POSSIBLE. (CSW PERMIT ITEM 12.2)
2. PESTICIDES, FERTILIZERS, AND TREATMENT CHEMICALS WILL BE STORED UNDER COVER (E.G., PLASTIC SHEETING, TEMPORARY ROOFS, WITHIN A BUILDING, OR IN WEATHER-PROOF CONTAINERS) TO PREVENT DISCHARGE OF POLLUTANTS THROUGH MINIMIZATION OF CONTACT WITH STORMWATER. STORAGE OF SUCH MATERIALS WITHIN THE PROJECT AREA WILL BE MINIMIZED TO THE EXTENT POSSIBLE. (CSW PERMIT ITEM 12.3)
3. HAZARDOUS MATERIALS AND TOXIC WASTE (E.G., OIL, DIESEL FUEL, GASOLINE, HYDRAULIC FLUIDS, PAINT SOLVENTS, PETROLEUM-BASED PRODUCTS, WOOD PRESERVATIVES, ADDITIVES, CURING COMPOUNDS, AND ACIDS) WILL BE STORED AND DISPOSED OF IN COMPLIANCE WITH MINNESOTA RULES CHAPTER 7045, INCLUDING SECONDARY CONTAINMENT (AS APPLICABLE). HAZARDOUS MATERIALS WILL BE PROPERLY STORED IN SEALED CONTAINERS TO PREVENT SPILLS, LEAKS, OR OTHER DISCHARGES AND PREVENT PRECIPITATION FROM FALLING ONTO THE CONTAINERS OR STORED HAZARDOUS MATERIALS. (CSW PERMIT ITEMS 2.3 AND 12.4)
4. SOLID WASTE WILL BE COLLECTED, STORED, AND DISPOSED OF PROPERLY IN COMPLIANCE WITH MINNESOTA RULES CHAPTER 7035. THIS INCLUDES STORAGE WITHIN COVERED TRASH CONTAINERS AND DAILY REMOVAL OF LITTER AND DEBRIS. STORAGE OF SOLID WASTE WITHIN THE PROJECT AREA WILL BE MINIMIZED TO THE EXTENT POSSIBLE. (CSW PERMIT ITEM 12.5)
5. PORTABLE TOILETS WILL BE LOCATED AWAY FROM SURFACE WATERS AND POSITIONED AND SECURED TO THE GROUND SO THEY WILL NOT BE TIPPED OR KNOCKED OVER. SANITARY WASTE WILL BE DISPOSED OF IN ACCORDANCE WITH MINNESOTA RULES, CHAPTER 7041. PORTABLE TOILETS WILL BE PERIODICALLY EMPTIED AND THE WASTE HAULED OFF-SITE BY A LICENSED HAULER. (CSW PERMIT ITEM 12.6)
6. VEHICLE FUELING WILL ONLY OCCUR IN DESIGNATED AREAS. SPILL KITS SIZED APPROPRIATELY FOR THE AMOUNT OF REFUELING TAKING PLACE WILL BE LOCATED. SPILL KITS WILL BE CLEARLY LABELED AND CONTAIN MATERIALS TO ASSIST IN SPILL CLEANUP INCLUDING ABSORBENT PADS, BOOMS FOR CONTAINING SPILLS, AND HEAVY-DUTY PROTECTIVE GLOVES. SPILLS WILL BE REPORTED TO THE MINNESOTA DUTY OFFICER AS REQUIRED BY MINNESOTA STATUTES, SECTION 115.061. (CSW PERMIT ITEMS 2.3 AND 12.7)
   a. ANY FUEL TANKS BROUGHT ON-SITE WILL HAVE PROPERLY SIZED CONTAINMENT AND WILL NOT BE TOPPED OFF TO AVOID SPILLS FROM OVERFILLING. FUEL TANKS WILL MEET INDUSTRY STANDARDS (DESIGNED TO HOLD FUEL TYPE, PROPERLY MAINTAINED, NOT ILLEGALLY MODIFIED, NOT MISSING LEAK INDICATOR FLOATS FOR DOUBLE WALLED TANKS, SIGHT GAUGES NOT USED, ETC.) OR BE REMOVED FROM THE WORK AREA.
   b. GUIDELINES FOR SPILL PREVENTION AND RESPONSE INCLUDE:
      - TAKE REASONABLE STEPS TO PREVENT THE DISCHARGE OF SPILLED OR LEAKED CHEMICALS, INCLUDING FUEL, FROM ANY AREA WHERE CHEMICALS OR FUEL WILL BE LOADED OR UNLOADED, INCLUDING THE USE OF DRIP PANS OR ABSORBENTS UNLESS INFEASIBLE;
      - PERFORM REGULAR PREVENTATIVE MAINTENANCE ON TANKS AND FUEL LINES;
      - INSPECT PUMPS, CYLINDERS, HOSES, VALVES, AND OTHER MECHANICAL EQUIPMENT ON-SITE FOR DAMAGE OR DETERIORATION;
      - DO NOT WASH OR RINSE FUELING AREAS WITH WATER;
      - MAINTAIN ADEQUATE SUPPLIES TO CLEAN UP DISCHARGED MATERIALS AND PROVIDE AN APPROPRIATE DISPOSAL METHOD FOR RECOVERED SPILLED MATERIALS;
      - REPORT AND CLEAN UP SPILLS IMMEDIATELY AS REQUIRED BY MINNESOTA STATUTES, SECTION 115.061, USING DRY CLEAN UP MEASURES WHERE POSSIBLE; AND
      - MAINTAIN COPIES OF SAFETY DATA SHEETS (SDSS) FOR HAZARDOUS MATERIALS ON-SITE IN LOCATIONS READILY AVAILABLE TO EMERGENCY RESPONDERS.
7. IF VEHICLE AND EQUIPMENT WASHING IS NECESSARY, A VEHICLE WASH STATION WILL BE LOCATED IN A DESIGNATED AREA. RUNOFF FROM THE WASHING AREA WILL BE CONTAINED IN A SEDIMENT BASIN AND WASTE FROM THE WASHING ACTIVITY WILL BE PROPERLY DISPOSED OF. ANY SOAPS, DETERGENTS, OR SOLVENTS WILL BE PROPERLY USED AND STORED. ANY DETERGENTS AND OTHER CLEANERS NOT PERMITTED FOR DISCHARGE WILL NOT BE USED. (CSW PERMIT ITEMS 2.3 AND 12.8)
8. THE PROJECT WILL NOT RESULT IN CONCRETE OR OTHER WASHOUT ACTIVITIES. IF NECESSARY, A DESCRIPTION OF THE STORAGE AND DISPOSAL OF CONCRETE AND OTHER WASHOUT WASTES SO THAT WASTES DO NOT CONTACT THE GROUND WILL BE ADDED. (CSW PERMIT ITEMS 2.3 AND 12.9)

8.0 PERMANENT COVER AND PERMIT TERMINATION CONDITIONS:

1. THE AREAS DISTURBED DURING CONSTRUCTION WILL BE STABILIZED WITH PERMANENT COVER UPON COMPLETION OF WORK. PERMANENT COVER MAY BE VEGETATIVE OR NON-VEGETATIVE, AS APPROPRIATE. ESTABLISHMENT OF PERMANENT COVER MAY INCLUDE THE FOLLOWING ACTIVITIES: SEEDING, MULCHING, AND EROSION CONTROL BLANKETS. (CSW PERMIT ITEM 5.17)
2. FOR A CONSTRUCTION-SITE TO ACHIEVE "PERMANENT COVER", THE FOLLOWING REQUIREMENTS MUST BE COMPLETED PRIOR TO TERMINATION OF PERMIT COVERAGE: (CSW PERMIT SECTIONS 4 AND 13)
   a. ALL SOIL DISTURBING CONSTRUCTION ACTIVITIES HAVE BEEN COMPLETED AND PERMANENT COVER HAS BEEN INSTALLED OVER ALL AREAS. VEGETATIVE COVER CONSISTS OF A UNIFORM PERENNIAL VEGETATION WITH A DENSITY OF 70% OF ITS EXPECTED FINAL GROWTH. VEGETATION IS NOT REQUIRED WHERE THE FUNCTION OF A SPECIFIC AREA DICTATES NO VEGETATION (SUCH AS IMPERVIOUS SURFACES OR THE BASE OF A SAND FILTER).
   b. ALL SEDIMENT HAS BEEN REMOVED FROM CONVEYANCE SYSTEMS, INCLUDING CULVERTS.
   c. ALL TEMPORARY SYNTHETIC EROSION PREVENTION AND SEDIMENT CONTROL BMPS HAVE BEEN REMOVED. BMPS DESIGNED TO DECOMPOSE ON-SITE MAY BE LEFT IN PLACE.

WITHIN 30 DAYS AFTER THE TERMINATION CONDITIONS ARE COMPLETE, A NOTICE OF TERMINATION (NOT) FORM WILL BE SUBMITTED TO THE MPCA.

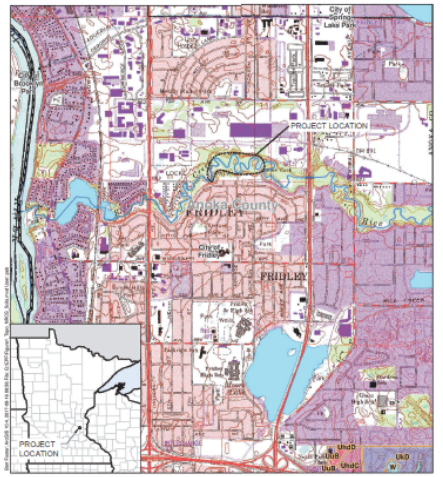


Figure 1

TOPOGRAPHIC MAP WITH SURFACE WATERS AND SOIL TYPES
Stormwater Pollution Prevention Plan
Anoka County, Minnesota

GOPHER STATE ONE CALL

GOPHER STATE ONE CALL:
CALL BEFORE YOU DIG.
1-800-252-1166

ISSSUED FOR BID AND CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
C	CWP	SAB2	JCO	05-06-2020	ISSUED FOR BID AND CONSTRUCTION
B	CWP	SAB2	JCO	04-13-2020	90% ISSUED FOR REVIEW
A	EPF	SAB2	JCO	02-07-2020	60% ISSUED FOR REVIEW

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.
PRINTED NAME: JESSICA OLSON
SIGNATURE:
DATE: 02/07/2020 LICENSE #: 42122

CLIENT / BID / CONSTRUCTION

RELEASED TO/FOR: A B C 0 1 2 3
DATE RELEASED

BARR
Project Office: BARR ENGINEERING CO. 4300 MARKETPOINTE DRIVE Suite 200 MINNEAPOLIS, MN 55435
Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277 Fax: (952) 832-2601 www.barr.com

Scale	AS SHOWN
Date	02/07/2020
Drawn	EPF
Checked	SAB2
Designed	BARR
Approved	JCO

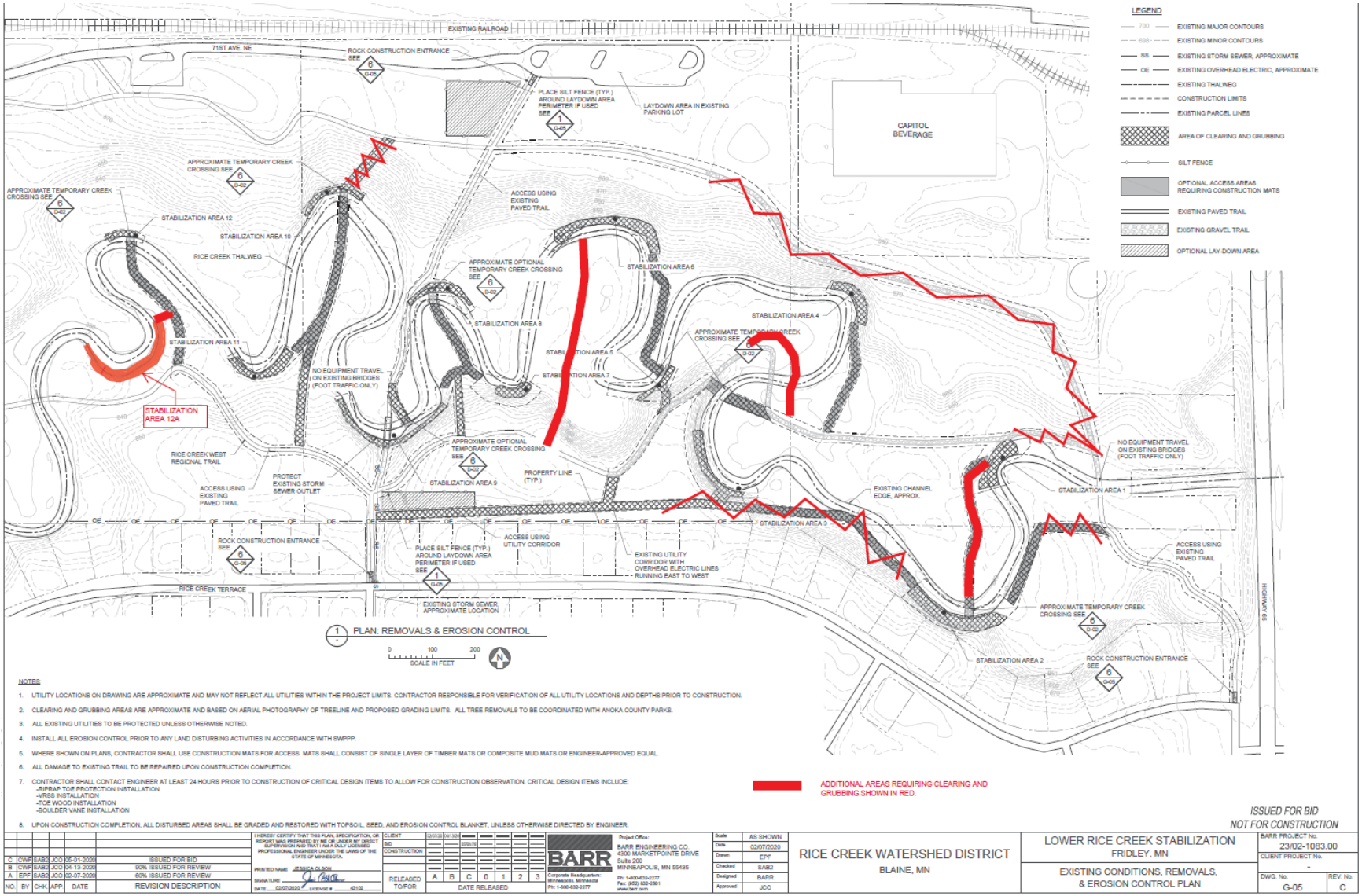
RICE CREEK WATERSHED DISTRICT
BLAINE, MN

LOWER RICE CREEK STABILIZATION
FRIDLEY, MN

STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

BARR PROJECT No. 23/02-1083.00
CLIENT PROJECT No. -
DWG. No. G-03
REV. No. C

Figure 50. Stormwater Pollution Prevention Plan.



NOTES:

1. UTILITY LOCATIONS ON DRAWING ARE APPROXIMATE AND MAY NOT REFLECT ALL UTILITIES WITHIN THE PROJECT LIMITS. CONTRACTOR RESPONSIBLE FOR VERIFICATION OF ALL UTILITY LOCATIONS AND DEPTHS PRIOR TO CONSTRUCTION.
2. CLEARING AND GRUBBING AREAS ARE APPROXIMATE AND BASED ON AERIAL PHOTOGRAPHY OF TREELINE AND PROPOSED GRADING LIMITS. ALL TREE REMOVALS TO BE COORDINATED WITH ANOKA COUNTY PARKS.
3. ALL EXISTING UTILITIES TO BE PROTECTED UNLESS OTHERWISE NOTED.
4. INSTALL ALL EROSION CONTROL PRIOR TO ANY LAND DISTURBING ACTIVITIES IN ACCORDANCE WITH SWPPP.
5. WHERE SHOWN ON PLANS, CONTRACTOR SHALL USE CONSTRUCTION MATS FOR ACCESS. MATS SHALL CONSIST OF SINGLE LAYER OF TIMBER MATS OR COMPOSITE MUD MATS OR ENGINEER-APPROVED EQUAL.
6. ALL DAMAGE TO EXISTING TRAIL TO BE REPAIRED UPON CONSTRUCTION COMPLETION.
7. CONTRACTOR SHALL CONTACT ENGINEER AT LEAST 24 HOURS PRIOR TO CONSTRUCTION OF CRITICAL DESIGN ITEMS TO ALLOW FOR CONSTRUCTION OBSERVATION. CRITICAL DESIGN ITEMS INCLUDE:
   -RIPRAP TOE PROTECTION INSTALLATION
   -VRSS INSTALLATION
   -TOE WOOD INSTALLATION
   -BOULDER VANE INSTALLATION
8. UPON CONSTRUCTION COMPLETION, ALL DISTURBED AREAS SHALL BE GRADED AND RESTORED WITH TOPSOIL, SEED, AND EROSION CONTROL BLANKET, UNLESS OTHERWISE DIRECTED BY ENGINEER.

NO.	BY	CHK	APP	DATE	REVISION DESCRIPTION
C	CWP	SAB2	JCO	05-01-2020	ISSUED FOR BID
B	CWP	SAB2	JCO	04-13-2020	90% ISSUED FOR REVIEW
A	EPF	SAB2	JCO	03-07-2020	60% ISSUED FOR REVIEW

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.
PRINTED NAME: JESSICA OLSON
SIGNATURE:
DATE: 05/07/2020 LICENSE #: 42132

CLIENT / BID / CONSTRUCTION
RELEASED TO/FOR: A B C 0 1 2 3
DATE RELEASED

BARR ENGINEERING CO.
4300 MARKETPOINTE DRIVE
Suite 200
MINNEAPOLIS, MN 55435
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	05/07/2020
Drawn	EPF
Checked	SAB2
Designed	BARR
Approved	JCO

RICE CREEK WATERSHED DISTRICT
BLAINE, MN

LOWER RICE CREEK STABILIZATION
FRIDLEY, MN

EXISTING CONDITIONS, REMOVALS, & EROSION CONTROL PLAN

BARR PROJECT No. 23/02-1083.00
CLIENT PROJECT No. -
DWG. No. G-05
REV. No. C

Figure 51. Construction plan record drawing overview.

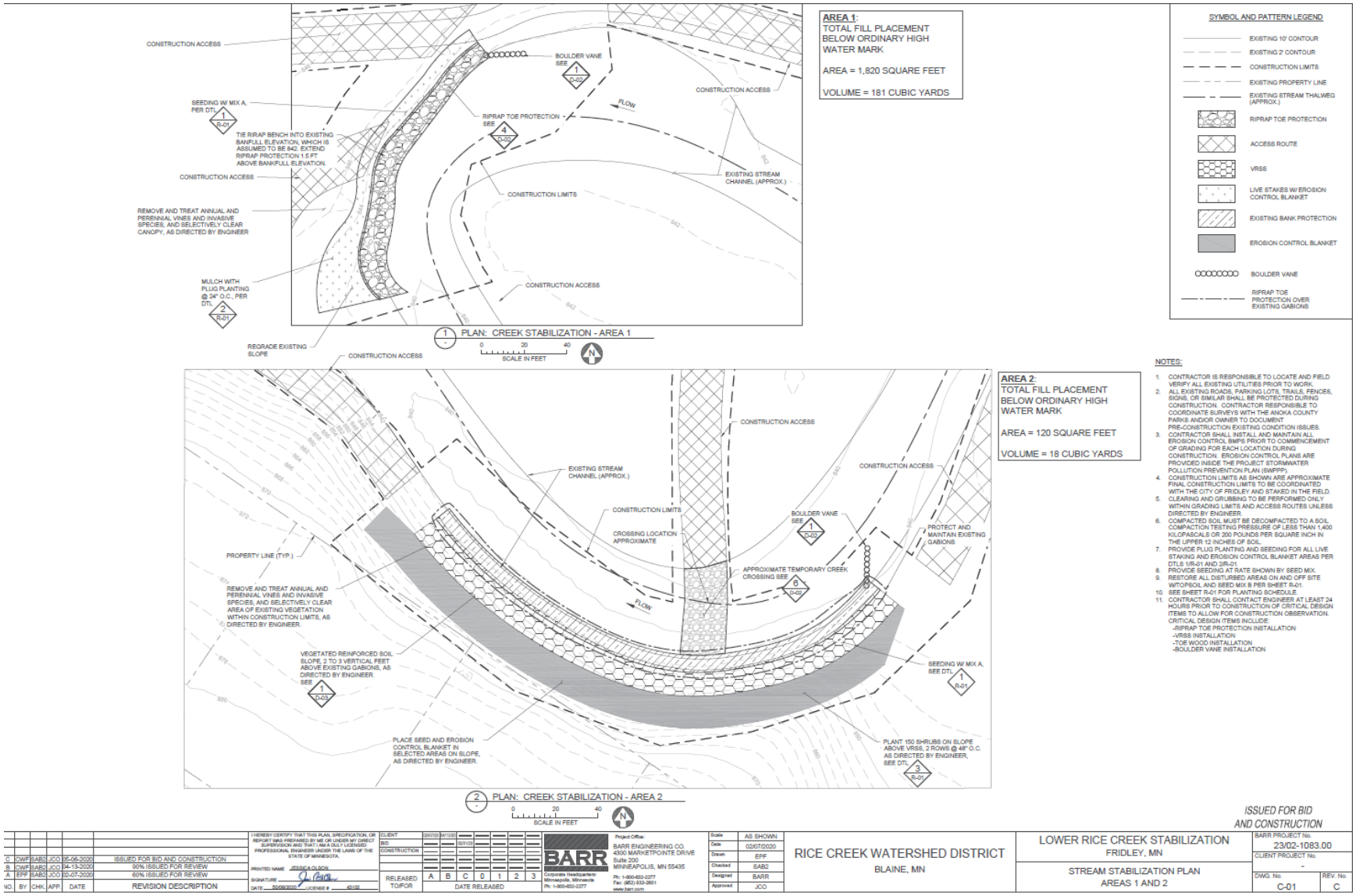


Figure 52. Construction plan record drawing: Areas 1-2.

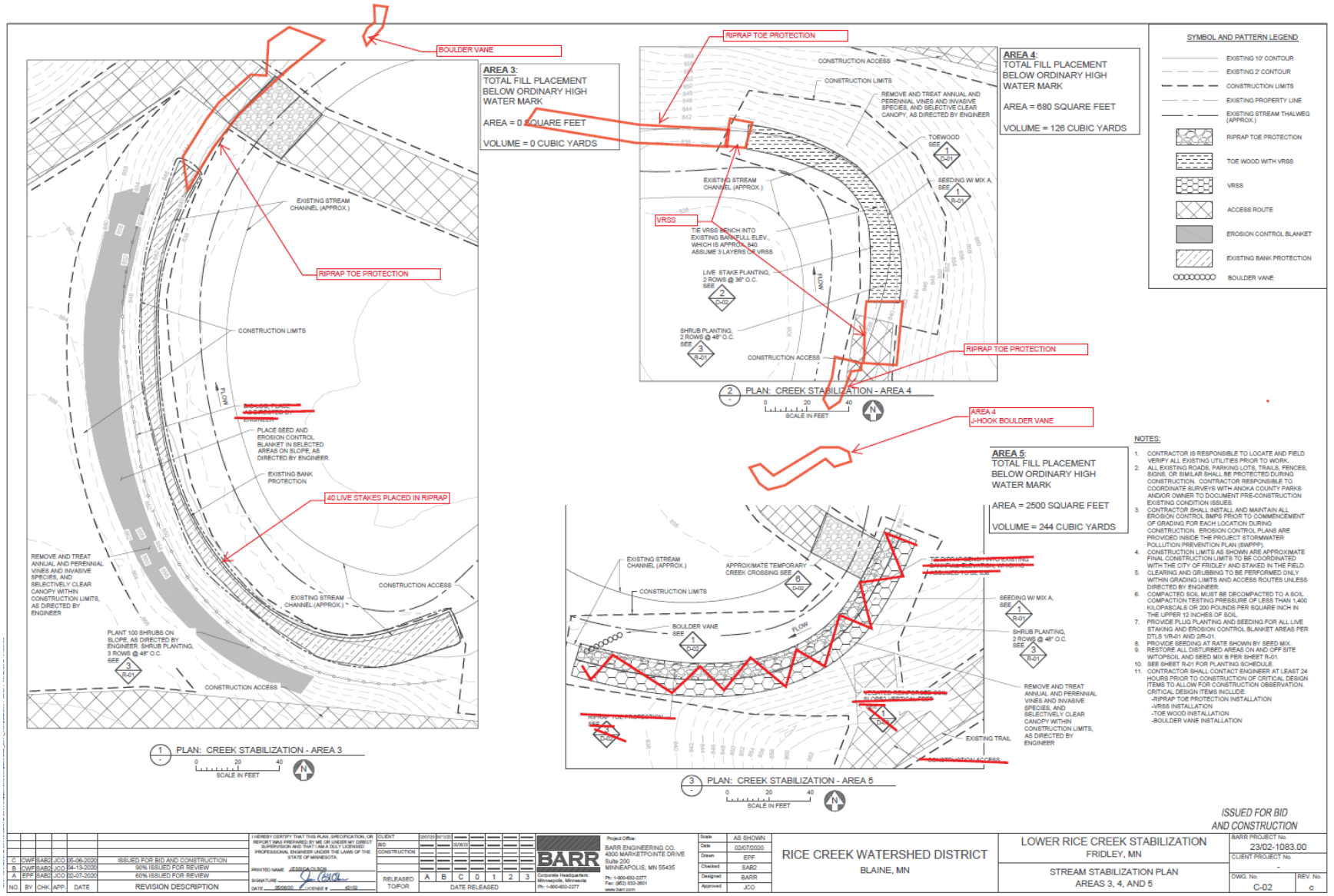


Figure 53. Construction plan record drawing: Areas 3-5.

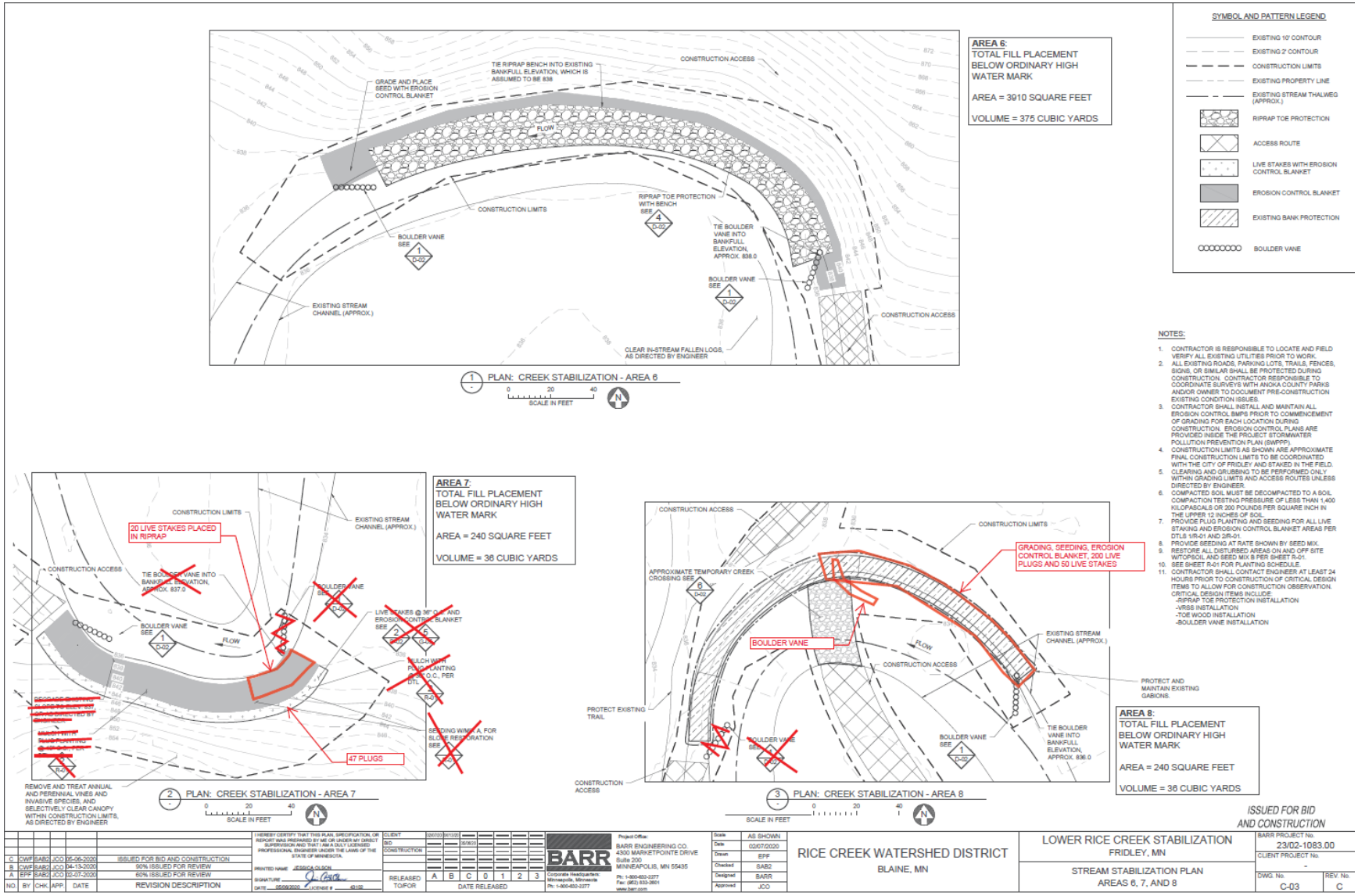


Figure 54. Construction plan record drawing: Areas 6-8.

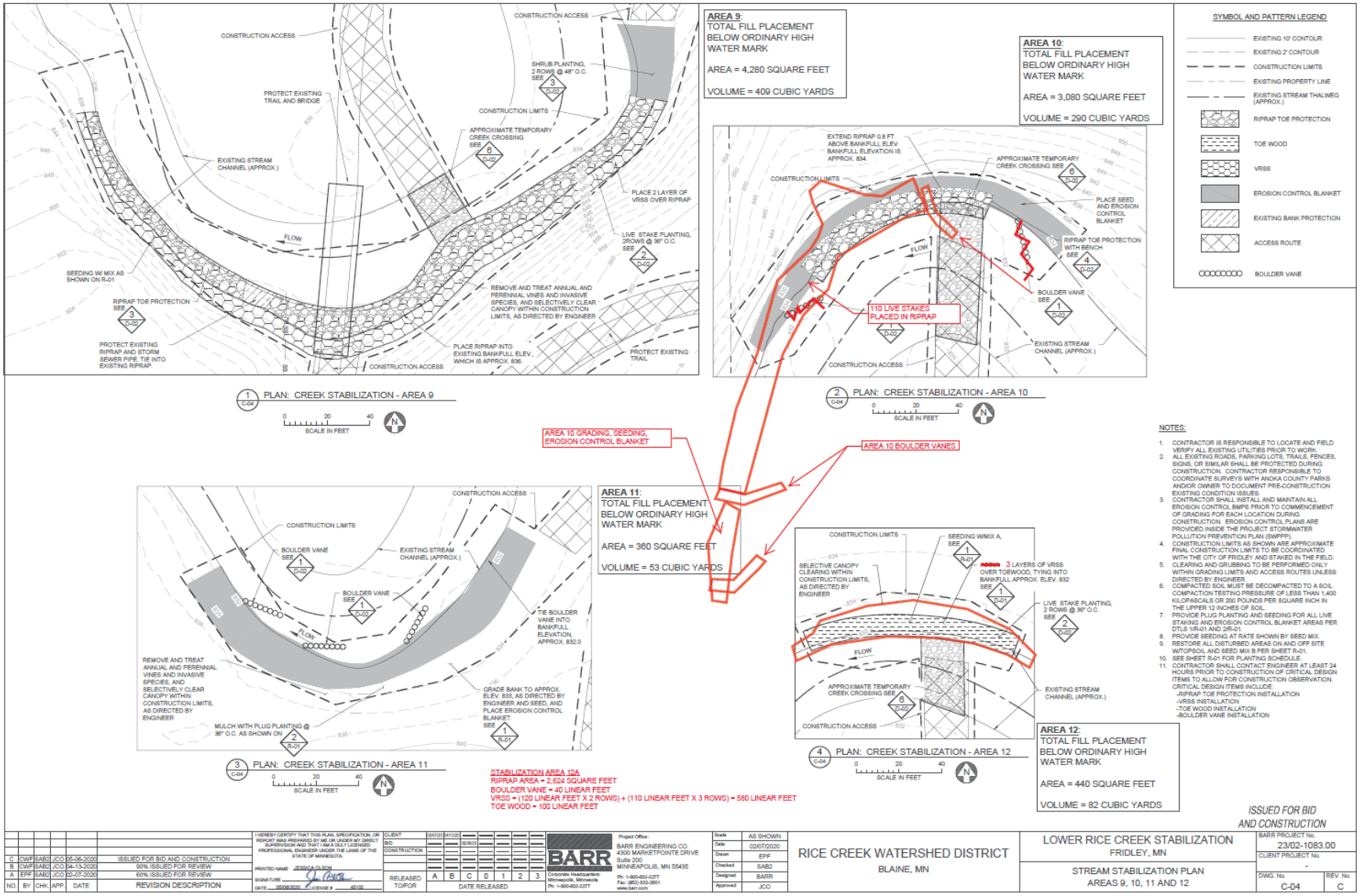


Figure 55. Construction plan record drawing: Areas 9-12.

Table 27. Vegetation observed during the project meander survey.

Scientific Name	Common Name	Cover Range	Species Planted/Seeded	Species Status
Acer negundo	boxelder	1-5	No	Native
Acer saccharinum	silver maple	1-5	No	Native
Achillea millefolium	common yarrow	0-1	Yes	Native
Agastache foeniculum	blue giant hyssop	0-1	Yes	Native
Ageratina altissima	white snakeroot	1-5	No	Native
Arctium minus	common burdock	1-5	No	Invasive
Asclepias incarnata	swamp milkweed	0-1	Yes	Native
Boehmeria cylindrica	small-spike false nettle	0-1	No	Native
Carex pensylvanica	Pennsylvania sedge	1-5	No	Native
Celtis occidentalis	hackberry	0-1	No	Native
Cerastium spp.	chickweed spp.	1-5	No	Invasive
Cirsium arvense	Canada thistle	0-1	No	Invasive
Cornus sericea	red-osier dogwood	1-5	Yes	Native
Elymus canadensis	Canada wild rye	1-5	Yes	Native
Elymus hystrix	bottlebrush grass	0-1	Yes	Native
Elymus virginicus	Virginia wild rye	1-5	Yes	Native
Equisetum spp.	horsetail spp.	1-5	No	Native
Eupatorium perfoliatum	common boneset	0-1	Yes	Native
Fraxinus pennsylvanica	green ash	1-5	No	Native
Galium spp.	bedstraw spp.	1-5	No	Native
Hackelia virginiana	Virginia stickseed	1-5	No	Native
Helenium autumnale	sneezeweed	1-5	Yes	Native
Hesperis matronalis	Dame's rocket	1-5	No	Invasive
Leersia oryzoides	rice cutgrass	1-5	Yes	Native
Leonurus cardiaca	common motherwort	1-5	No	Invasive
Lonicera tatarica	Tatarian honeysuckle	1-5	No	Invasive
Monarda fistulosa	wild bergamot	1-5	Yes	Native
Ostrya virginiana	ironwood	0-1	No	Native
Panicum virgatum	switchgrass	1-5	Yes	Native
Phalaris arundinacea	reed canary grass	5-10	No	Invasive
Populus deltoides	eastern cottonwood	1-5	No	Native
Populus tremuloides	quaking aspen	0-1	No	Native
Quercus ellipsoidalis	northern pin oak	1-5	No	Native
Rhamnus cathartica	common buckthorn	1-5	No	Invasive
Ribes missouriense	Missouri gooseberry	0-1	No	Native
Rudbeckia hirta	black-eyed Susan	1-5	Yes	Native
Rudbeckia laciniata	cut-leaf coneflower	1-5	Yes	Native
Salix interior	sandbar willow	0-1	Yes	Native
Scirpus atrovirens	dark green bulrush	1-5	Yes	Native
Sisymbrium spp.	mustard spp.	0-1	No	Invasive
Solanum dulcamara	bittersweet nightshade	0-1	No	Invasive
Solidago spp.	goldenrod spp.	1-5	No	Native
Sorbus aucuparia	European mountain ash	0-1	No	Invasive
Sorghastrum nutans	Indian grass	0-1	Yes	Native

Scientific Name	Common Name	Cover Range	Species Planted/Seeded	Species Status
Spartina pectinata	prairie cordgrass	1-5	Yes	Native
Symphyotrichum spp.	aster spp.	1-5	No	Native
Tilia americana	American basswood	1-5	No	Native
Ulmus americana	American elm	1-5	No	Native
Urtica dioica	stinging nettle	1-5	No	Native
Verbascum thapsus	common mullein	1-5	No	Invasive
Verbena hastata	blue vervain	1-5	Yes	Native
Verbena urticifolia	white vervain	1-5	No	Native
Vernonia fasciculata	prairie ironweed	0-1	Yes	Native
Zizia aurea	golden alexanders	1-5	Yes	Native

Site Photographs

Figure 56. Stabilization Area 9 showing riprap toe and vegetated bench upstream of trail bridge. Photo taken on 10/28/2022.

Figure 57. Stabilization Area 9 showing riprap toe and vegetated bench along cutbank downstream of trail bridge. Photo taken on 10/28/2022.

Figure 58. Stabilization Area 3 showing riprap along a previous cutbank. Photo taken on 10/28/2022.

Figure 59. Stabilization Area 4 showing toewood and boulder rock vane at upstream terminus of the toewood structure. Photo taken on 10/28/2022.

Figure 60. Stabilization Area 4 close-up of toewood and native vegetation. Photo taken on 10/28/2022.

Figure 61. Stabilization Area 2 showing existing rock gabions along the base of a steep bank and vegetated soil lifts placed above the rock gabions. Photo taken on 10/28/2022.

Figure 62. Stabilization Area 1 showing riprap toe and vegetated floodplain bench. Photo taken on 10/28/2022.

Figure 63. Stabilization Area 12 showing toewood and three soil lifts installed above the toewood structure. Photo taken on 10/28/2022.

17 Middle Sand Creek Restoration

Project Background

Project Name: Middle Sand Creek Restoration

Project Site: Middle Sand Creek, Coon Rapids

Township/Range Section: Township 31 Range 24 Section 11

Project Manager / Affiliated Organization: Justine Dauphinais – Coon Creek Watershed District

Fund: CWF ***Fiscal Year Funds:*** 2019

Project Start Date: March 2019

Predominant Habitat type: Aquatic Habitat

Additional Habitat types: Wetland , Forest

Project Status: Post Establishment Phase

County: Anoka

Primary Activity: Stream/River Restoration

Project Size: 4775 linear feet

Project Completed: December 2021

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***

   The Middle Sand Creek Corridor Restoration project was broken into two restoration approaches. The upper 1,600 feet above Olive St. NW used a combination of techniques that included: vegetated riprap, limited areas of just riprap, a cross vane, bank re-sloping, rootwads, and small areas of pollinator habitat.

   Downstream of Olive St. NW to the BNSF railroad grade, Natural Channel Design was applied to approximately 3,175 feet of stream to re-meander the stream across the floodplain over the course of two growing seasons to create a sinuous stream. Outside meandering banks were stabilized with coarse toewood. In-stream structures such as log vane j-hooks and constructed riffles were sued to create habitat, maintain stream pattern and provide streambed grade control.

   The riparian corridor along the downstream reached was enhanced by removing buckthorn and thinning approximately 26 percent of the tree canopy. Native plant species were installed following construction and tree removal activities, including larger stock native trees.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***

Construction plans for Middle Sand Creek Corridor Restoration Project – A 2019 plan set developed by the consultant selected by Coon Creek Watershed District to complete the design.Coon Creek Watershed District maintains copies of the plan set at their offices. Plans are also available on the District's website under the What We Do tab.

3. ***What are the stated goals of the project?***
   Reduce sediment and nutrient pollution from streambank erosion
   Enhance habitat for native species
   Lessen impacts of altered hydrology, while providing conveyance
4. ***What are the desired outcomes of achieving the stated goals of the project?***
   Contribute to Sand Creek meeting State standards for water quality and removing impairments for recreation and aquatic life.
5. ***Were measures of restoration success identified in plans? Yes***
   If yes, list specific measurements.
   Estimated reduction in phosphorus and sediment (Total Suspended Sediment) based on pre-construction site conditions and available water quality monitoring models.
6. ***Are plan Sets available?*** **Yes** ***Have project maps been created?*** Yes
   If yes, provide in "site maps" and list maps provided:
   Aerial map of project area
7. ***Provide list of best management practices, standards, guidelines identified in plan set?***

   In the upper reach above Olive St. NW, five different streambank stabilization practices were installed for the project. Rootwads with a tree trunk are installed in vegetation riprap. The rootwads provide bank protection, increase channel roughness, and provide aquatic habitat. Banks above the rootwads are re-graded to a less steep slope, seeded with native vegetation, and covered with an erosion control blanket.

   Vegetated riprap toe was used on banks with high shear stress. Vegetated riprap consists of installing stone riprap against the bank to protect the bank toe against further erosion. The height of the riprap was limited to the designated bankfull elevation. The bank above the riprap was re-graded to a less steep slope, seeded with native vegetation and covered with an erosion control blanket.
   Bank re-grading was used to reduced bank angle to a less steep slope to promote vegetation establishment. Re-graded banks were seeded with native vegetation and covered with erosion control blanket.

   An existing stone cross vane was reconfigured to function properly by providing grade control within the stream bed and directing flow into the center of the channel.
   Riprap and other stone protection were used on a limited basis on several outside bends to provide immediate bank protection.
   In the reach below Olive St. NW, the channel was re-meandered to increase stream length and establish an improved connection between the floodplain and Sand Creek through removing trees and grading throughout the floodplain. Reference reach data from a stable stream was used to set design parameters for stream pattern, profile, and dimension. The reference data along with existing stream conditions determined stream bed profile and necessary floodplain grading to improve the stream-floodplain connection.

   Outside bends of re-meandered channel were stabilized using a coarse wood toe treatment. The coarse wood toe is comprised of outwardly facing rootwads with coarse wood (treetops, branches) packed between the trunks of the rootwads. On top of the rootwads, the banks were re-sloped, seeded with native vegetation and covered with erosion control material.

Several constructed riffles using imported stone were installed to provide grade control. Log vane J-hooks were installed at several locations to direct flow into the center of the channel and provide bank protection upstream and downstream of the structure location.

The combination of stable reference reach data, re-meandering a channel in conjunction with increasing floodplain connection and stabilizing the streambanks and bed using coarse toe wood and in-stream structures follows the principles of Natural Channel Design.

The construction of the re-meandered channel occurred over two seasons so newly created sections of channel were allowed to re-vegetate off-line from the active stream flow for one season. Allowing a channel to remain off-line is a preferred practice to promote long-term channel stability. Leaving a channel off-line is not always feasible given project constraints. Taking advantage of the opportunity to phase the project was a benefit to the project.

In addition to streambank practices, the trees were thinned in the riparian canopy and invasive buckthorn was removed. Tree and shrub removal is a common riparian restoration practice used to promote increased herbaceous species understory growth and cover, which promotes soil stabilization and improved water quality. It was also necessary given the re-meandering and floodplain connection component to the project. Following construction practices native plant species were installed including limited tree planting to offset for tree removal during the construction process. The use of fewer, but larger size trees is not a typical practice, however, it is one that benefits the project because it improves tree survivability and accelerates the time for planted trees to provide ecological services like shading of streams to reduce water temperature. Following native plant installation, establishment practices were used including herbicide application to reduce invasive species were conducted for both herbaceous and woody (buckthorn) species.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   Yes
   MNDNR stream specialist was able to work with the contractor during construction to introduce variability into the stream dimensions for riffles and pools when he was on-site during construction support. Variability to channel dimensions was based on reference conditions of existing natural, stable streams of similar size and stream type.
9. ***In what ways did alterations change the proposed project outcome?***
   Building in some variability to stream dimensions based on the range of reference conditions adds habitat and ecological diversity to the stream.

Site Assessment

Field Review Date: **9/1/2022**

Field Visit Attendees: Keegan Lund – MNDNR, Nick Proulx – MNDNR, Steve Kloiber – MNDNR, Jon Janke – Coon Creek Watershed District, Mark Pranckus – Cardno now Stantec

10. ***Surrounding Landscape Characteristics:***

The Middle Sand Creek riparian corridor is fairly narrow, ranging from approximately 100 to 1200 feet wide consisting of mature trees, shrubs, and herbaceous vegetation. The entire project area is owned by the City of Coon Rapids. The surrounding landscaping is moderately dense residential development with scattered light commercial development.

11. ***Site Characteristics:***

    a. Soil Series:

    A mix of alluvial mixed floodplain soils and Sartell fine sand

    b. Topography:

    Relatively flat

    c. Hydrology:

    Sand Creek is a perennial stream. Riparian wetlands are present in locations where the riparian width increases.

    d. Vegetation: Plant Communities, Dominant Species & Invasives % Cover:

    The riparian corridor is well-vegetated with nearly 100 percent coverage on the floodplain and along the banks. Riparian vegetation is greater than 50 percent composed of grasses. Reed canary grass is the dominant grass along the lower banks. Along the upper banks where conditions are drier, native grasses are more dominant. Native shrubs are present but limited. In the re-meander section, the tree canopy has been partially removed because of grading activities Mature native trees are present including silver maple, green ash, and cottonwood. Planted trees using a larger stock size are also present. The tree canopy would be considered to be open.

12. ***Is the plan based on current science?*** Yes

    Sand Creek is an urban stream with a limited riparian corridor. The project occurred along a portion of the stream where public landownership (City of Coon Rapids) was available, which allowed for more of a holistic approach to stream restoration that is typically possible when multiple private landowners are involved. Using Natural Channel Design based on reference reach conditions to improve floodplain connection and re-meander a stream is one of the most preferred options when trying to improve stream and floodplain ecological health. Using stable reference reach parameter values to determine stream pattern, profile, and dimension is the appropriate application of Natural Channel Design. During the development of the design, the project consultant worked with MNDNR on stream design parameters and with MNBWSR on the appropriate re-vegetation strategy. The phasing of construction into two seasons for the re-meandering portion of the project follows a preferred, but often not available, construction sequence that improves the potential for long-term success.

13. ***List indicators of project goals at this stage of project:***

    Streambanks are stable and well-vegetated. Limited locations where banks are eroding.

14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***

    Yes. Streambank stabilization treatments and locations were correctly selected, designed, and installed. The use of reference reach data for the re-meandered section is a fundamental of Natural Channel Design. Phasing of the re-meandering into two growing seasons allowed for vegetation to get established in the new channel sections, which improves the potential for success. Accounting for follow up establishment and maintenance post-construction is important and well-supported by Coon Creek Watershed District. Reed canary grass is still common within the site and will likely continue to be present in the future. Controlling reed canary grass when there is a constant seed source from upstream is extremely difficult. Overall, Coon Creek Watershed District continues to be invested in the success of the project post-construction with continued monitoring and inspections.

15. ***Are corrections or modifications needed to achieve proposed goals?***
    No.
16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***
    No immediate future steps needed. In the future, trees may establish at a density that reduces herbaceous cover. Periodic mowing may be necessary to avoid future tree thinning activities. The well-established herbaceous vegetation may deter tree seedling establishment for a while.
17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No.
18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    No.
19. ***Additional comments on the restoration project.***
    Coon Creek Watershed District made a significant investment in the project including staff time during the initial stages through construction to have the public invested in the work including workshops and public meetings. Public outreach and education have made the community more mindful and aware of naturalized solutions for bank erosion.

    Coon Creek Watershed District has developed and maintained photo monitoring stations throughout the project site, which will aid in determining actions needed.
    The re-meandering occurred on the City of Coon Rapids property. The ability to re-meander an urban stream is great opportunity that may not always be available when private ownership abuts a narrow stream corridor.

    Phasing out the re-meander work over two seasons to allow vegetation to establish in the re-meandered areas before taking flowing water provided savings in erosion control practices to the project. It also allows promotes long-term project success because the vegetation can develop the resources (root density) to support the plants and provide long-term bank stabilization.
    The project is a good example of the Natural Channel Design process. Reference stream data were used to drive the design parameters. Knowledge of the ranges in stream parameters allowed for natural variability within a stable stream to be included during construction, which provides overall diversity and function.

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Achieved the stated goals.
21. ***The project will:***
    Meet proposed outcomes.
    Confidence of outcome determination:
    High.

22. ***Provide explanation of reason(s) for determination.***
    Banks where treatments occurred are generally stable and well vegetated. Upstream areas above Olive St. NW are performing well. The re-meandered section of Sand Creek between Olive St. NW and the BNSF railroad grade improved floodplain connection while restoring the stream. In-stream structures and coarse wood/toewood bank treatments have stabilized the bank. Streams are dynamic and changes can occur especially if there are changes in the hydrology due to land use changes. Allowing the stream to access a well-vegetated floodplain provides for as much resilience, possible.
23. ***Site Assessor(s) conducting field review:***

Mark Pranckus, Cardno now Stantec

Site Maps, Project Plans or Vegetation Tables

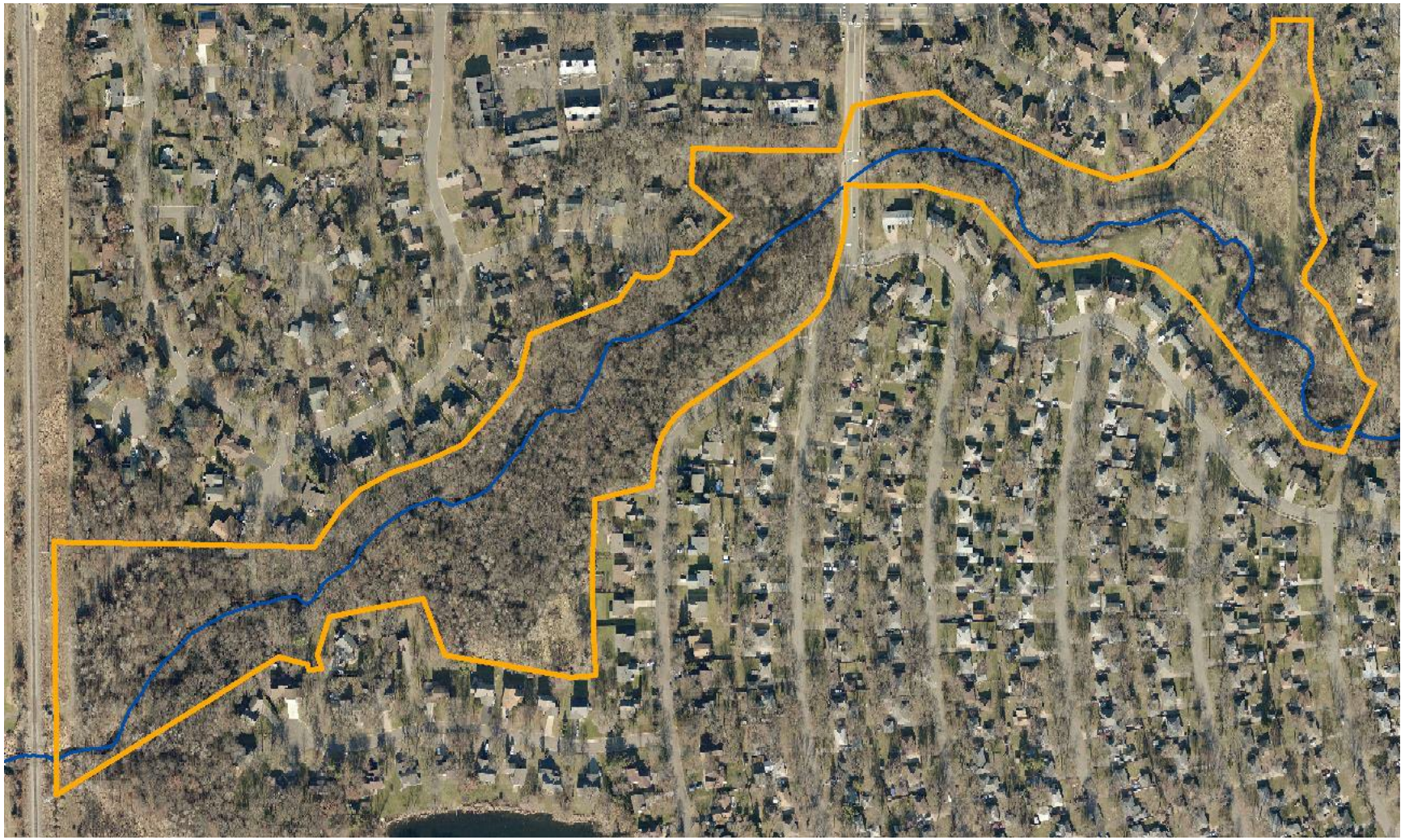


Figure 64. Map provided by Coon Creek Watershed District indicating the extent of the Middle Sand Creek Corridor Restoration project.

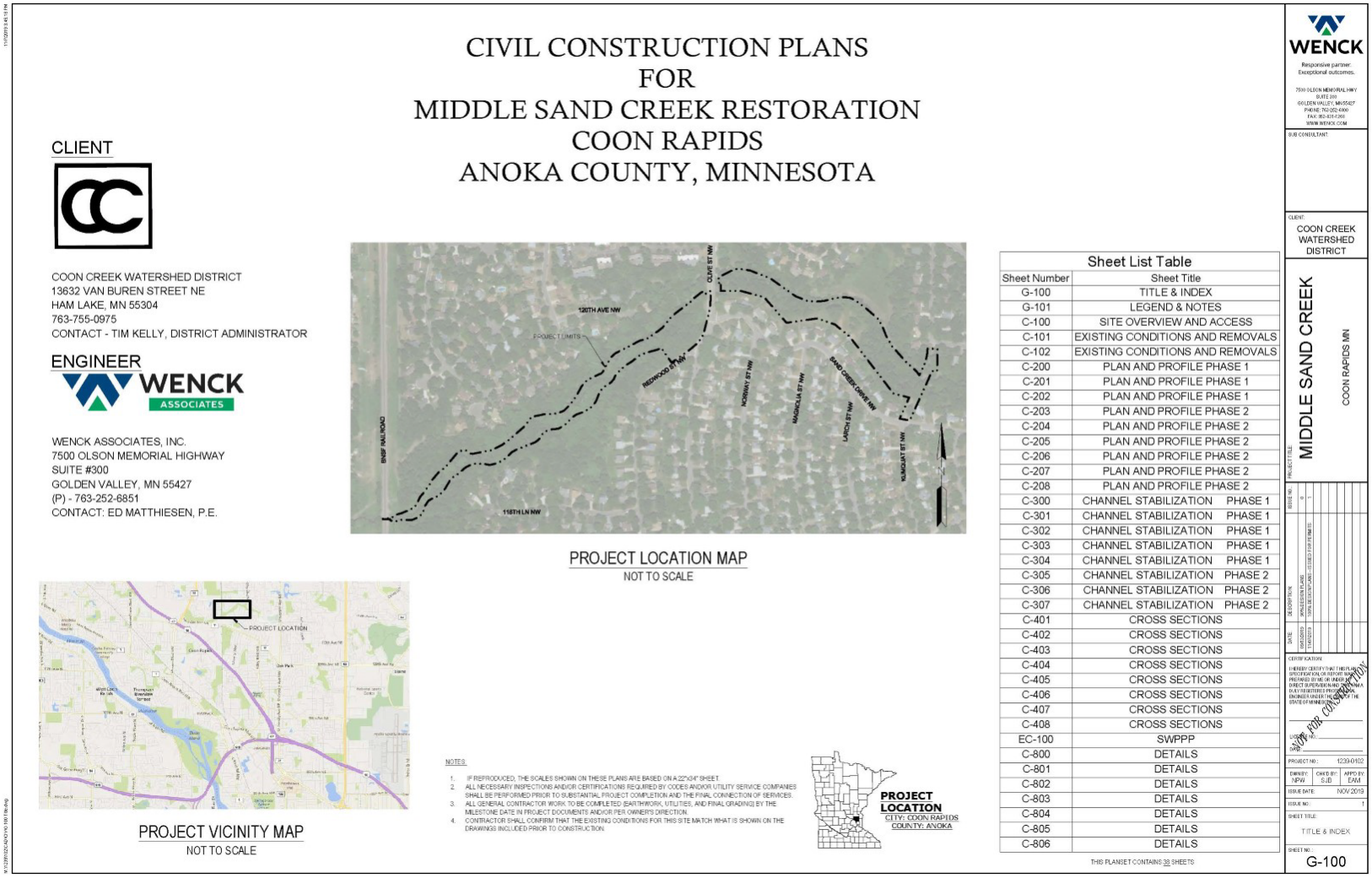


Figure 65. Sheet G-100 of the construction plan set outlining the project location and plan set contents.

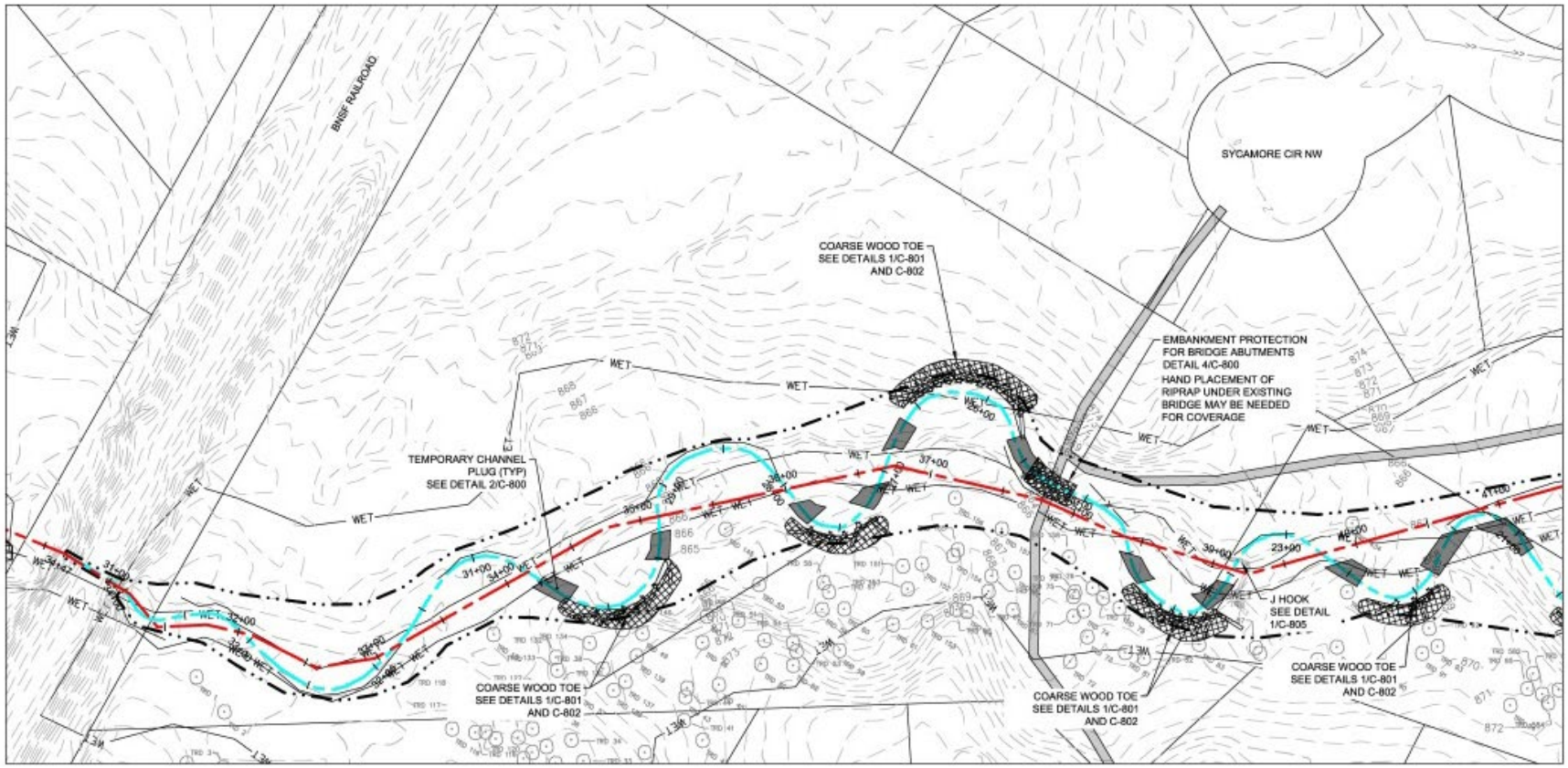


Figure 66. Sheet C-300 of the construction plan set detailing project treatment locations and construction details.

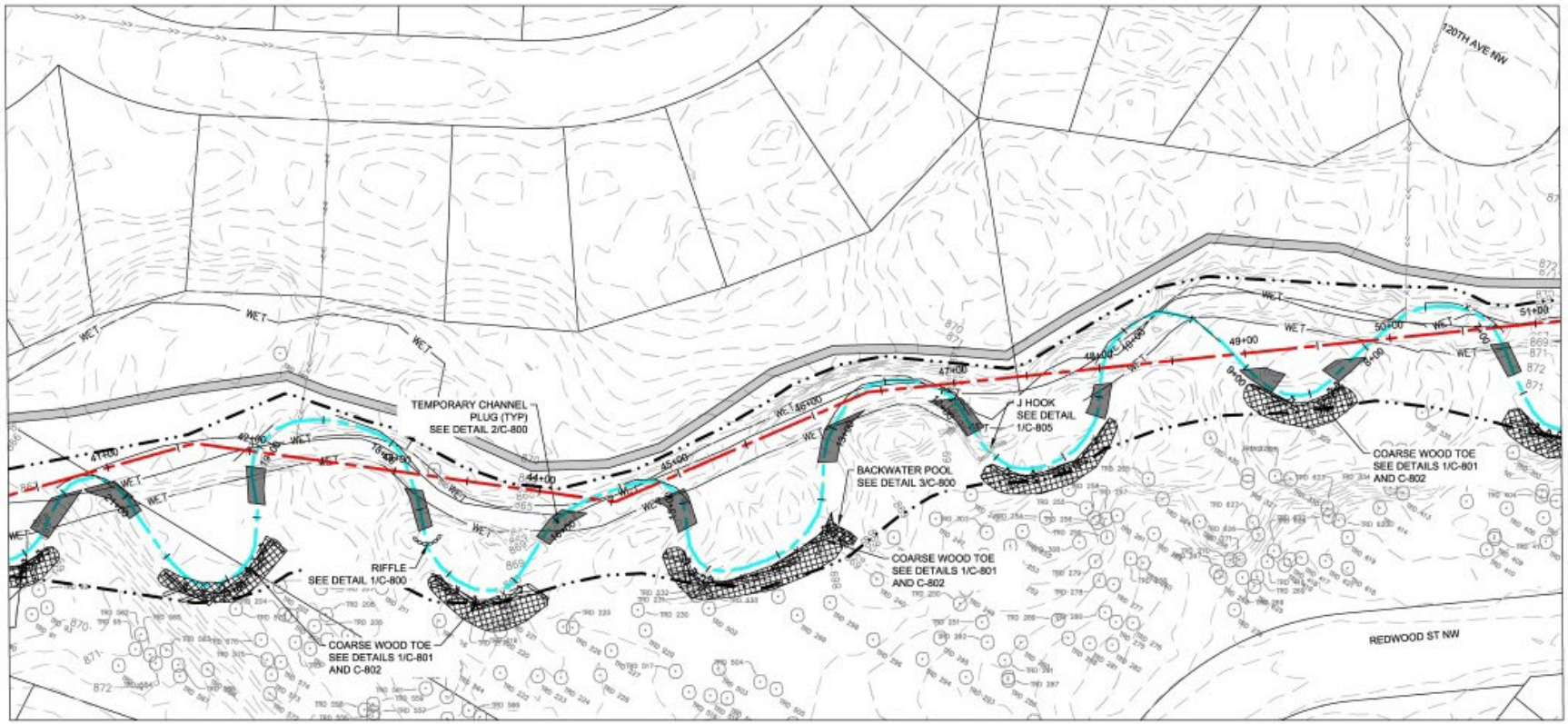


Figure 67. Sheet C-301 of the construction plan set detailing project treatment locations and construction details.

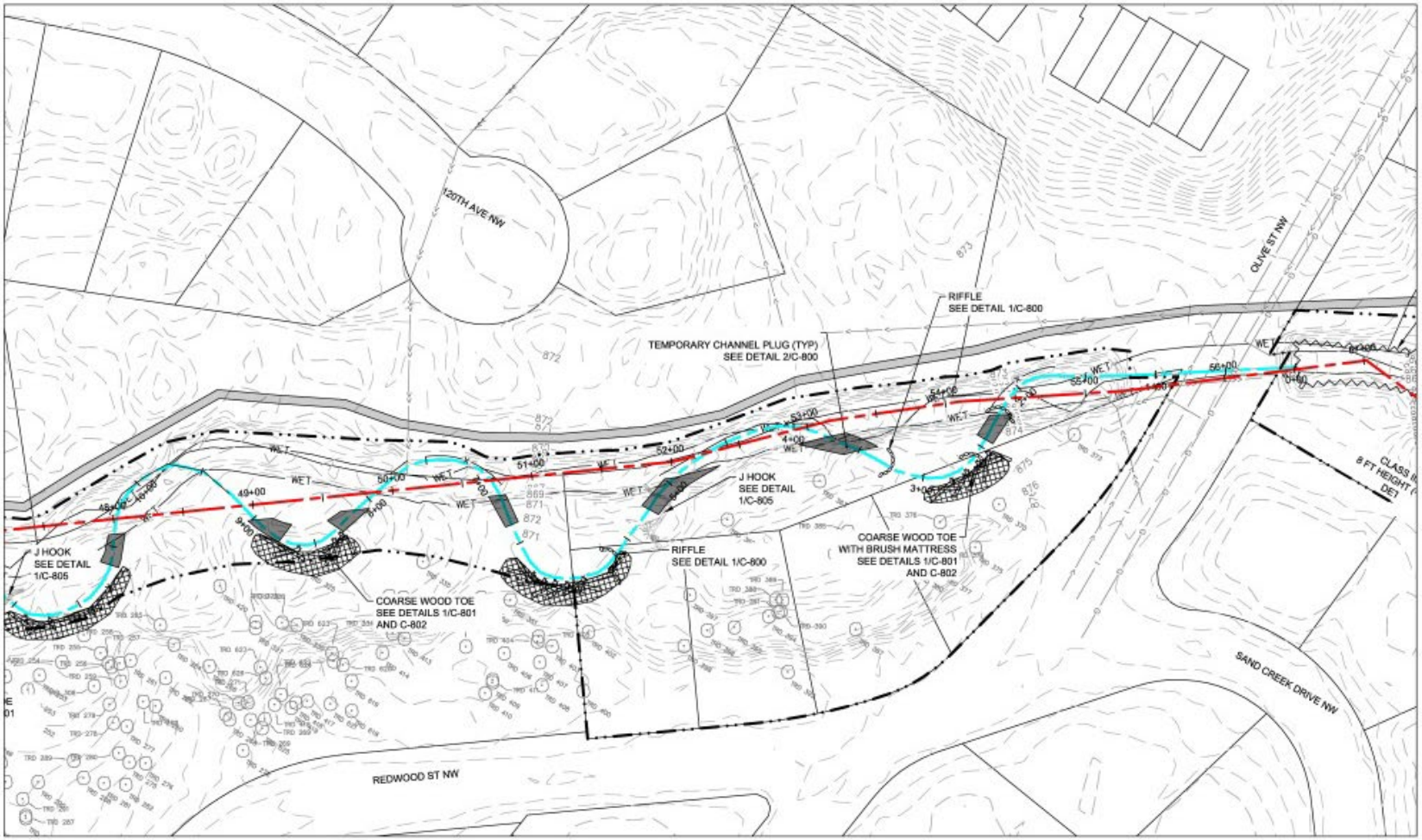


Figure 68. Sheet C-302 of the construction plan set detailing project treatment locations and construction details.

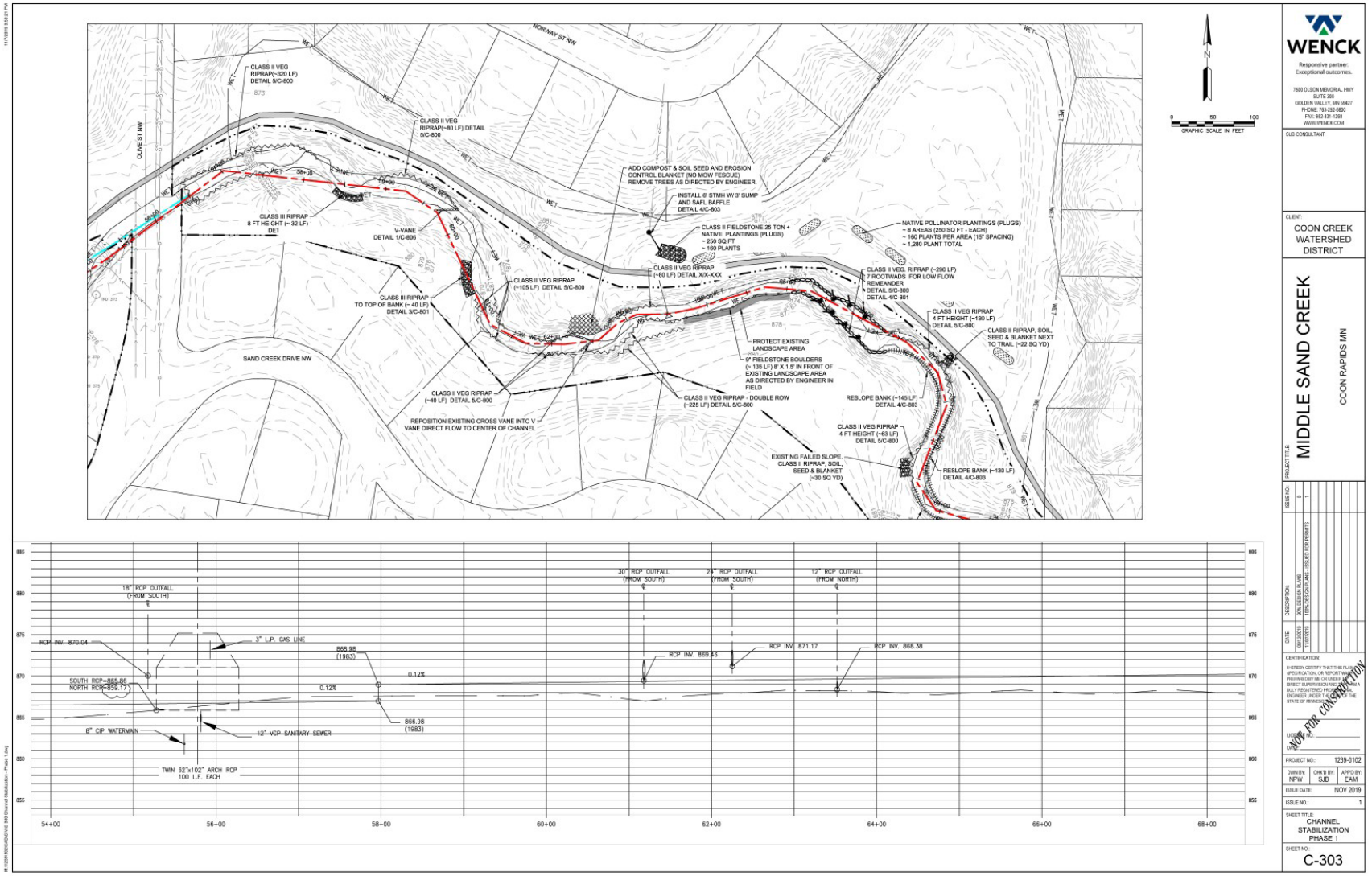


Figure 69. Sheet C-303 of the construction plan set detailing project treatment locations and construction details.

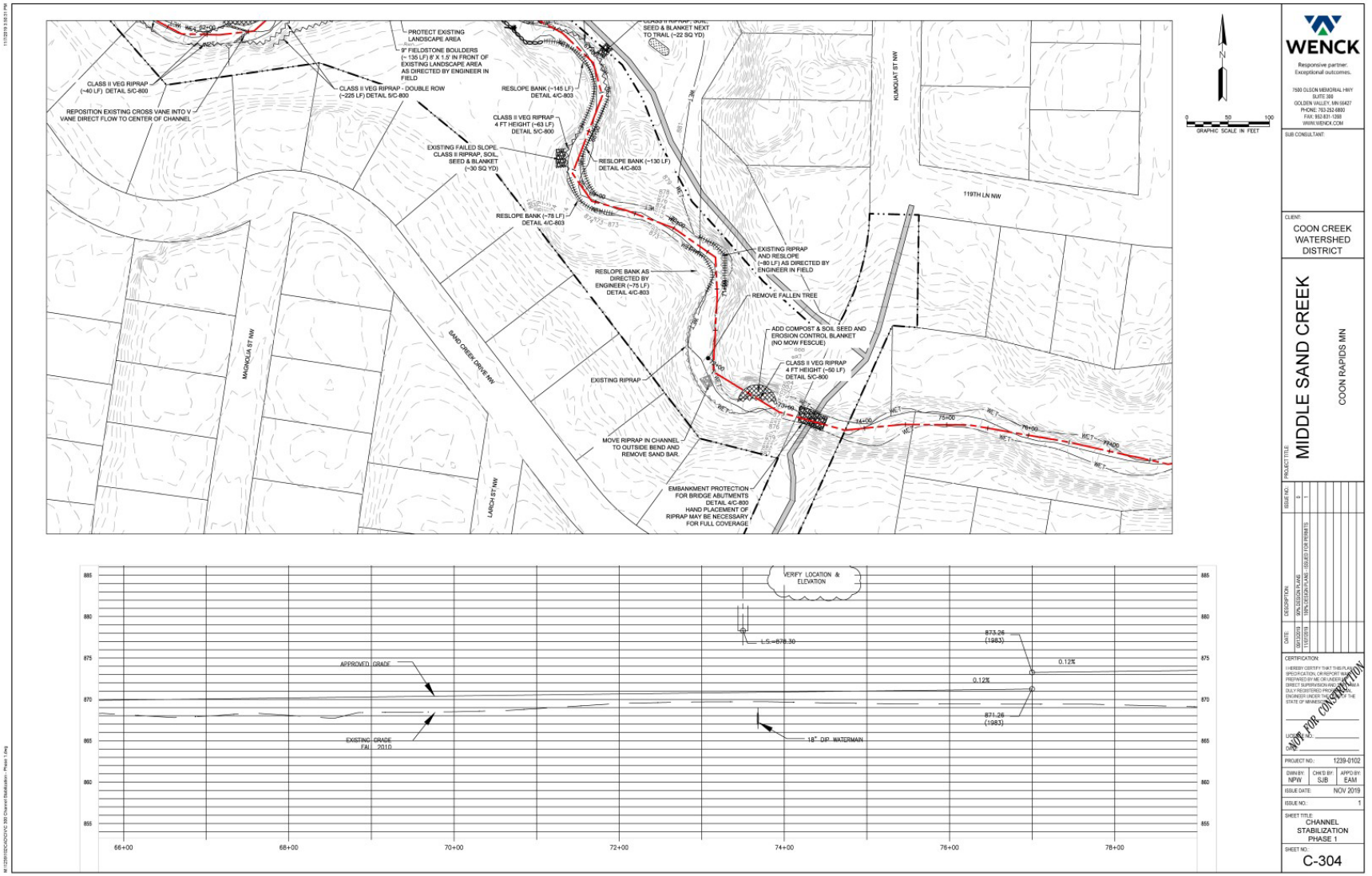


Figure 70. Sheet C-303 of the construction plan set detailing project treatment locations and construction details.

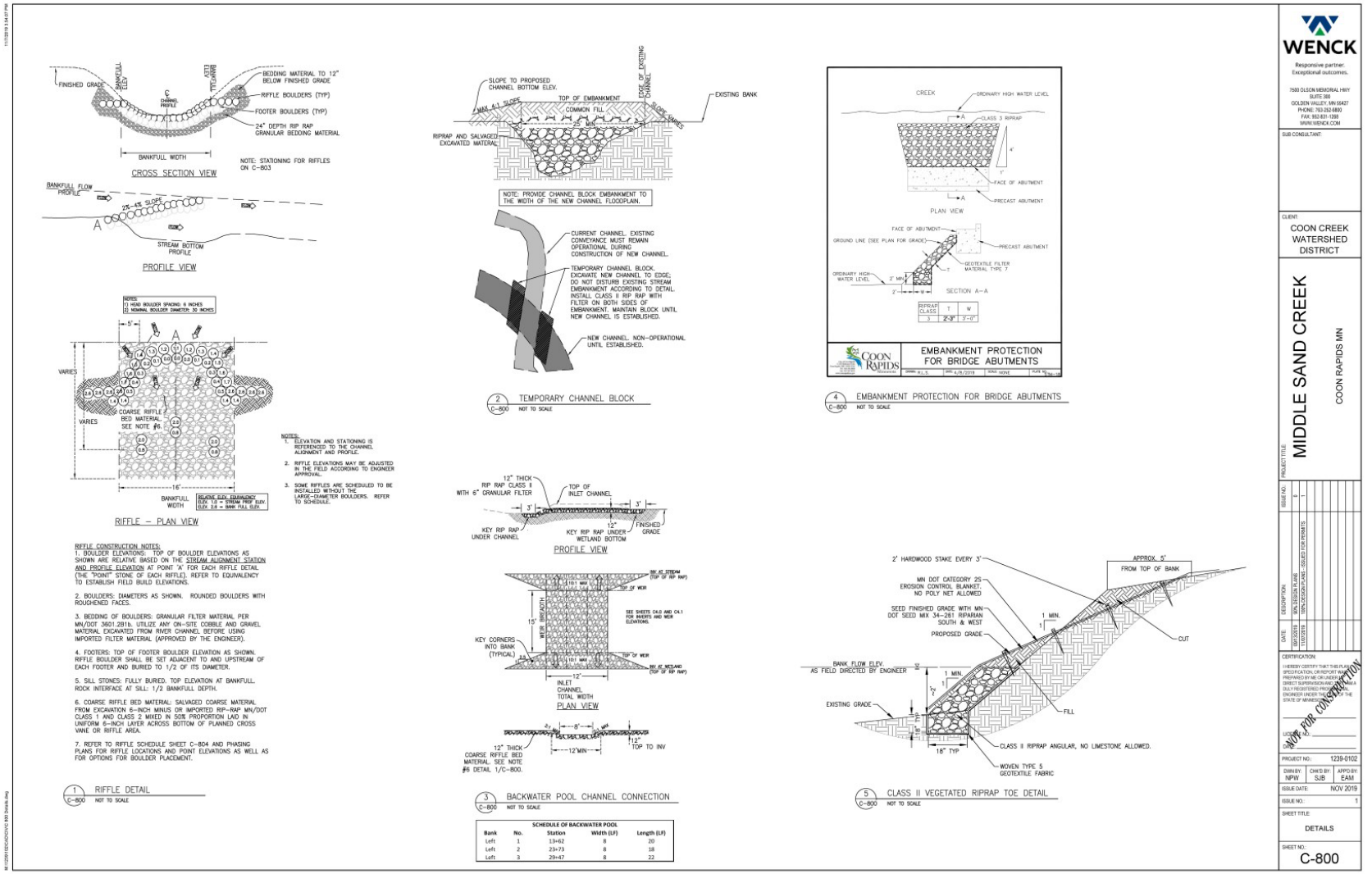


Figure 71. Sheet C-800 of the construction plan set providing details for construction of stream restoration and bank stabilization details.

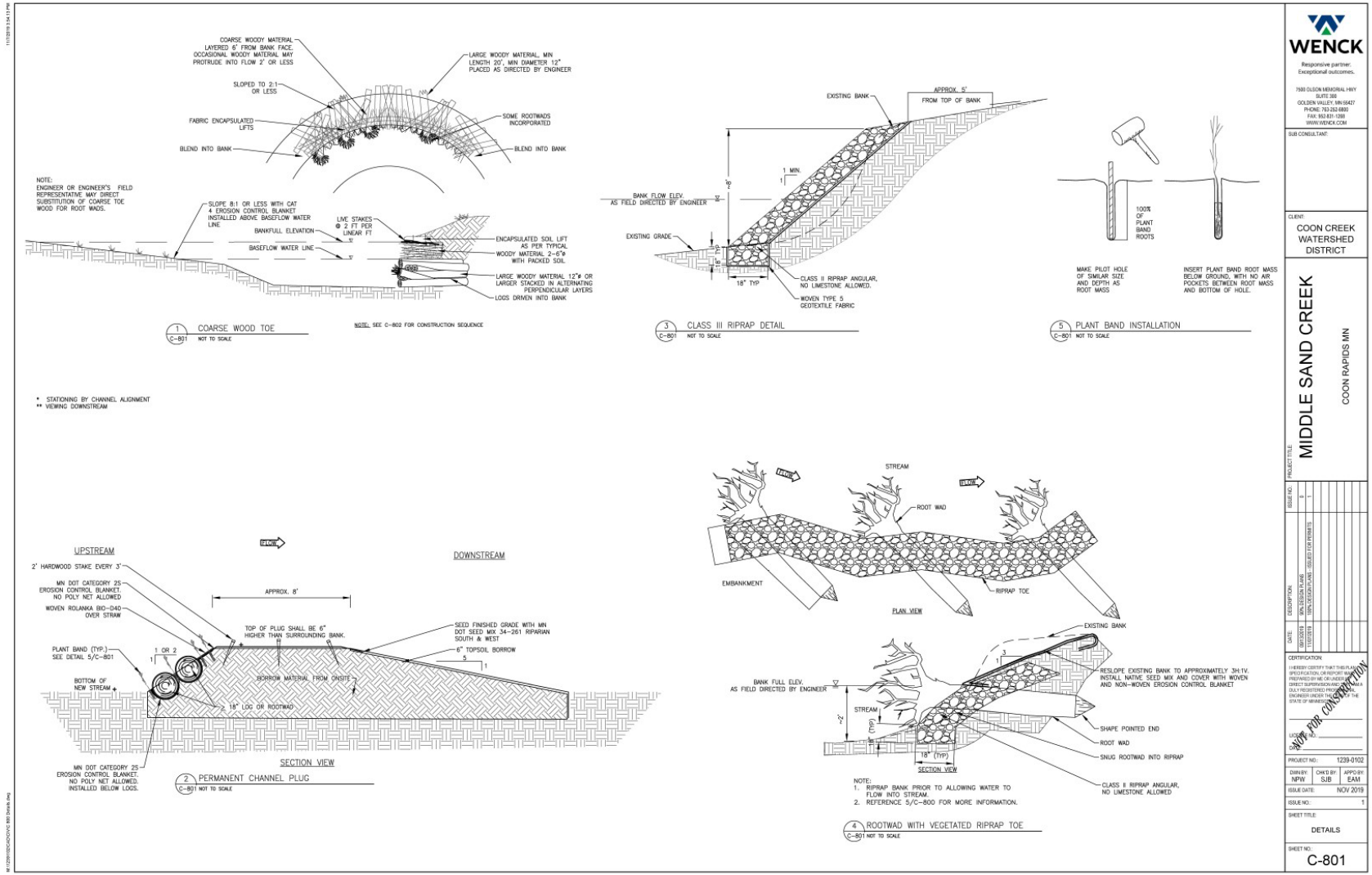


Figure 72. Sheet C-801 of the construction plan set providing details for construction of stream restoration and bank stabilization details.

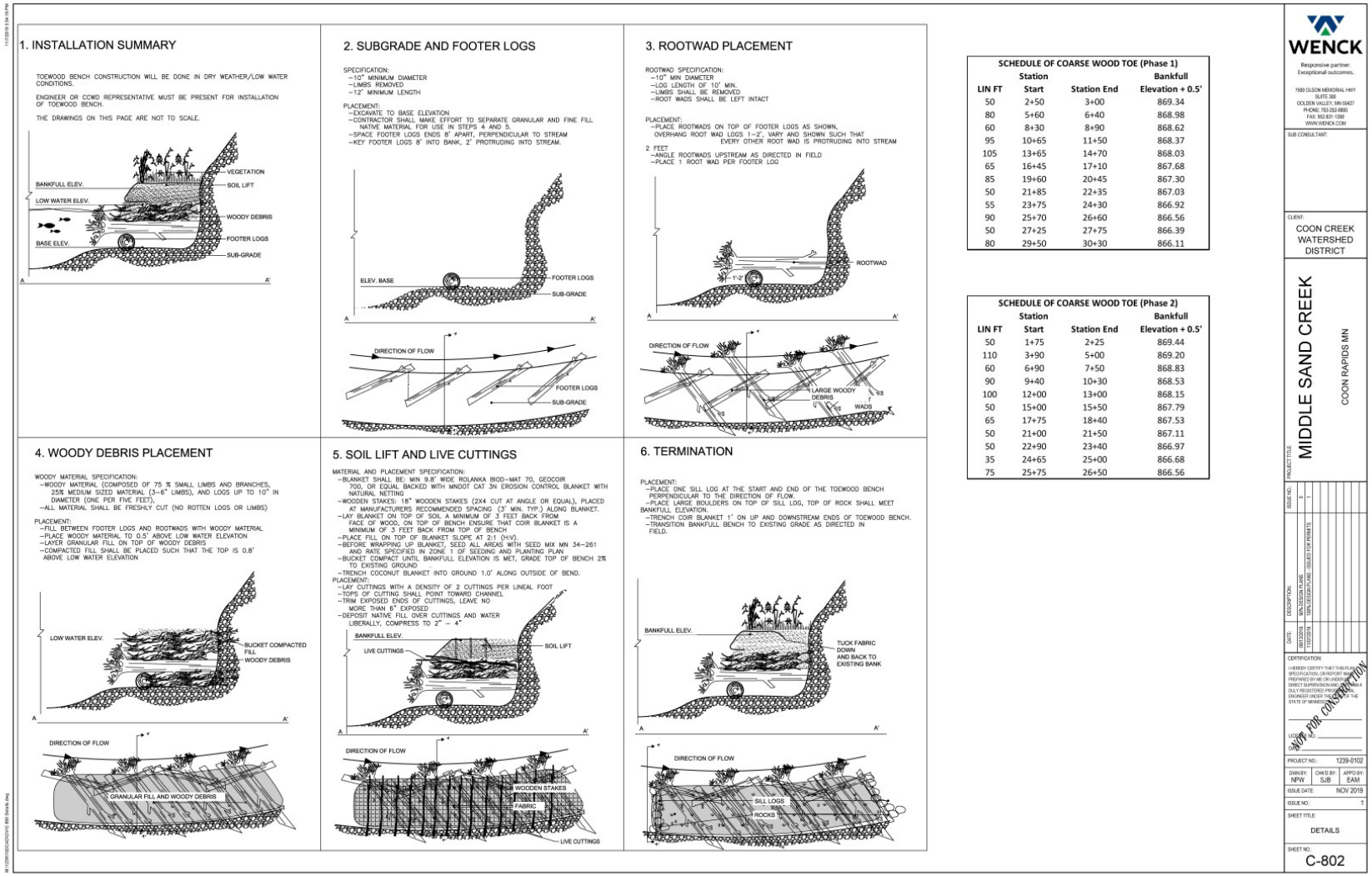


Figure 73. Sheet C-802 of the construction plan set providing details for construction of stream restoration and bank stabilization details.

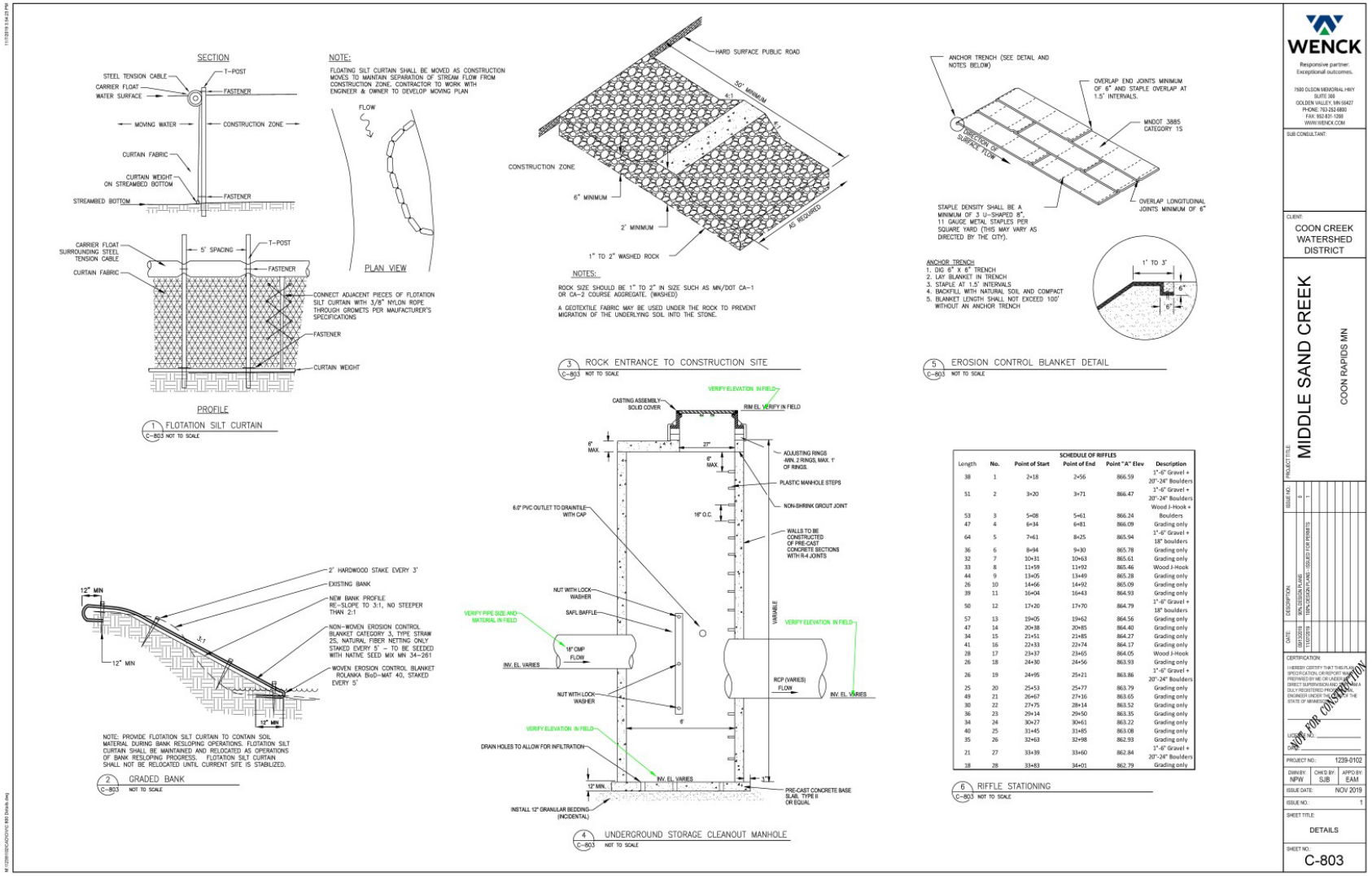


Figure 74. Sheet C-803 of the construction plan set providing details for construction of stream restoration and bank stabilization details.

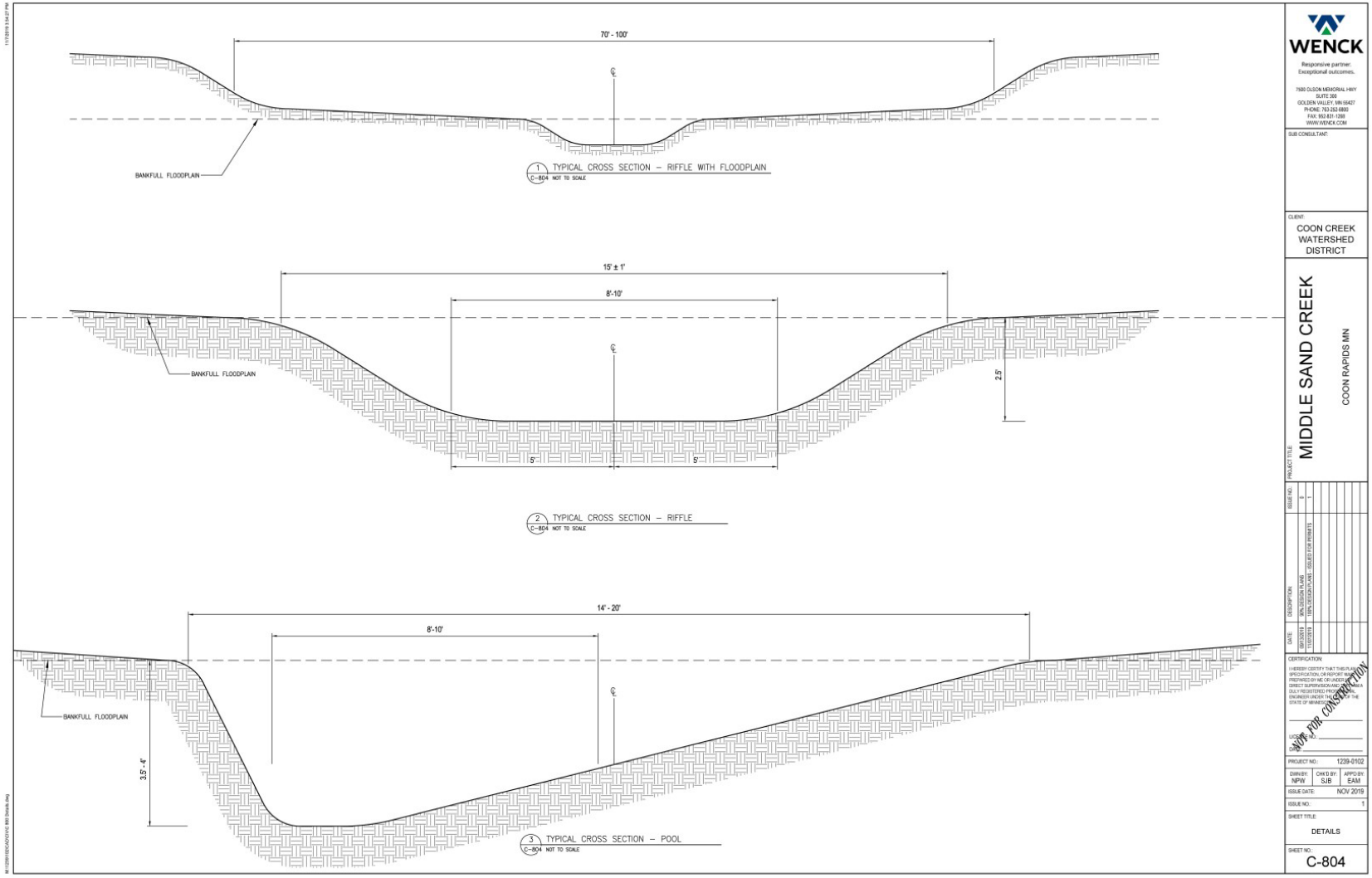


Figure 75. Sheet C-804 of the construction plan set providing details for construction of stream restoration and bank stabilization details.

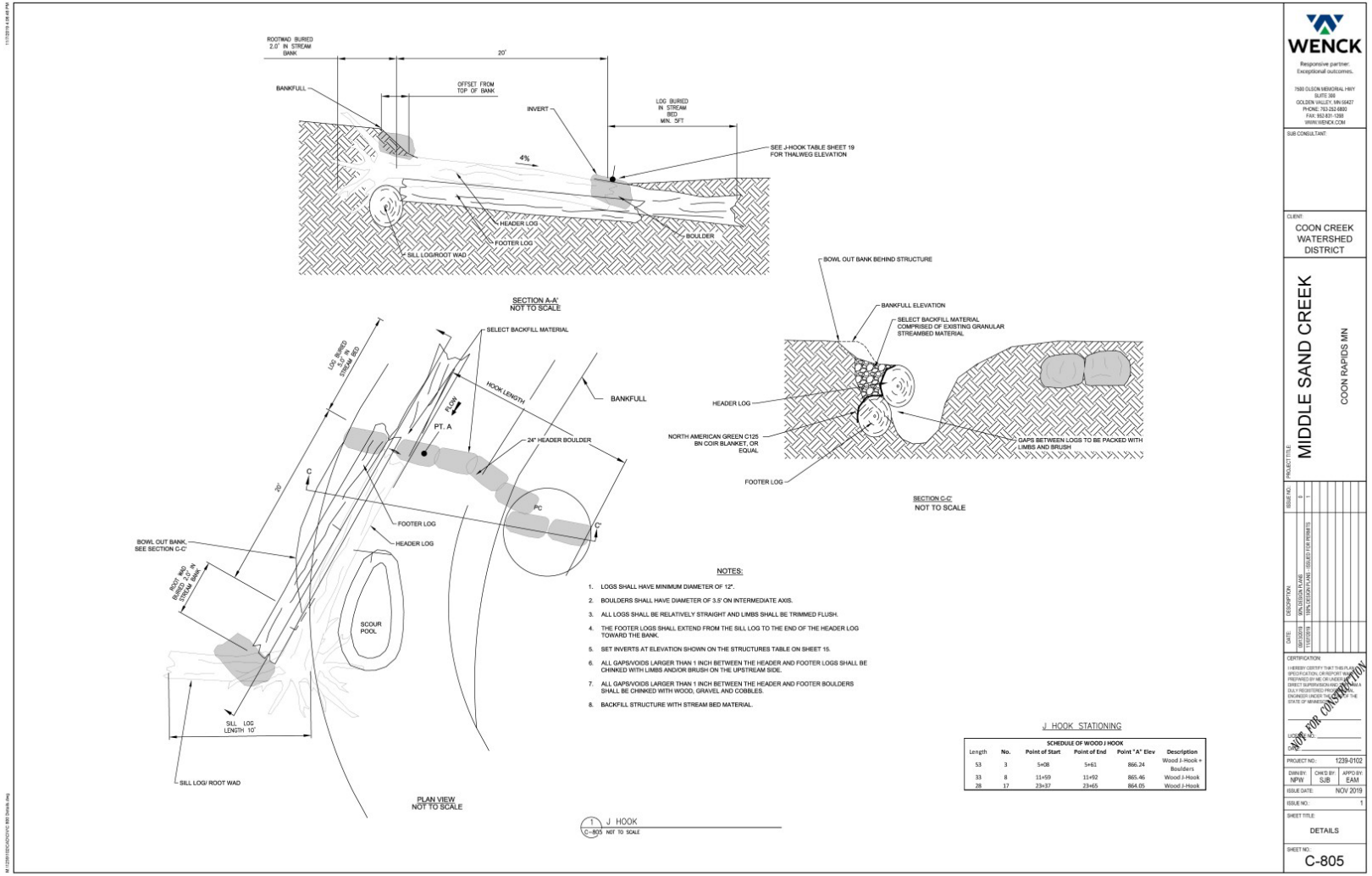


Figure 76. Sheet C-805 of the construction plan set providing details for construction of stream restoration and bank stabilization details.

Table 28 Plant species observed during a meander survey of the project site.

Scientific Name	Common Name	Cover Range	Species Planted/Seeded	Species Status
Acer negundo	Box Elder	1-5%		Native
Acer saccharum	Sugar Maple	1-5%		Native
Ambrosia trifida	Giant Ragweed	1-5%		Native
Amphicarpaea bracteata	American Hog Peanut	1-5%		Native
Asclepias incarnata	Marsh Milkweed	0-1%	Seeded	Native
Betula nigra	River Birch	0-1%		Native
Carex Spp.	Unk. Sedges	5-10%	Seeded	Native
Cirsium arvense	Canada Thistle	0-1%		Non-native
Conyza canadensis	Canada Horse Weed	0-1%		Native
Echinochloa crus-galli	Barnyard Grass	1-5%		Non-native
Elymus riparius	Riverbank Wild Rye	1-5%	Seeded	Native
Elymus virginicus	Virginia Wild Rye	5-10%	Seeded	Native
Eupatorium perfoliatum	Common Boneset	0-1%	Seeded	Native
Eupatorium rugosum	White Snakeroot	0-1%		Native
Eutrochium maculatum	Spotted joe pye weed	1-5%	Seeded	Native
Impatiens capensis	Spotted Touch-me-not	1-5%		Native
Leersia oryzoides	Rice Cut Grass	5-10%	Seeded	Native
Lobelia siphilitica	Blue Lobelia	1-5%	Seeded	Native
Oenothera biennis	Common Evening Primrose	0-1%		Native
Parthenocissus quinquefolia	Virginia Creeper	1-5%		Native
Phalaris arundinacea	Reed Canary Grass	25-50%		Non-native
Phragmites australis	Common Reed	0-1%		Non-native
Rudbeckia triloba	Brown-eyed Susan	0-1%		Native
Scirpus atrovirens	Dark Green Bulrush	0-1%	Seeded	Native
Solidago canadensis	Canada Goldenrod	1-5%		Native
Verbena hastata	Blue Vervain	5-25%	Seeded	Native

Site Photographs

Photo 77. Looking upstream along Sand Creek. Banks are well-vegetated. (Photo taken by Mark Pranckus, Cardno now Stantec, on 9/1/22).

Photo 78. Looking upstream along Sand Creek. Banks are well-vegetated. (Photo taken by Mark Pranckus, Cardno now Stantec, on 9/1/22).

Photo 79. Example of trees planted post-construction in the riparian corridor. Resources were spent on fewer, but larger trees, which may have a higher survival rate. (Photo taken by Mark Pranckus, Cardno now Stantec, on 9/1/22).

Photo 80. Example of the education signage placed along the Middle Sand Creek Corridor Restoration project area to tell the story of the project and promote awareness for water quality and naturalized bank stabilization practices. (Photo taken by Mark Pranckus, Cardno now Stantec, on 9/1/22).

18 Lower Sand Creek Restoration

Project Background

Project Name: Lower Sand Creek Restoration

Project Site: Lower Sand Creek, Coon Rapids

Township/Range Section: Township 31 Range 24 Section 11

Project Manager / Affiliated Organization: Justine Dauphinas – Coon Creek Watershed District

Fund: CWF ***Fiscal Year Funds:*** 2018

Project Start Date: April 2018

Predominant Habitat type: Aquatic Habitat

Additional Habitat types: Wetland , Forest

Project Status: Post Establishment Phase

County: Anoka

Primary Activity: Stream/River Restoration

Project Size: 4,200 linear feet

Project Completed: November 2020

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***

   Eroding streambanks were stabilized using three different methods: vegetated rock riprap, re-grading banks and seeding, and installing woody materials such as log toes, root wads and log revetments. Several in-stream rock cross vane structures were installed to create riffle and pool facets. Three backwater pools were created to provide additional off-channel habitat.

   The riparian corridor was enhanced by removing buckthorn and thinning approximately 50 percent of the tree canopy. Native plant species were installed following construction and tree removal activities.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Construction plans for Lower Sand Creek Corridor Restoration Project – A 2018 plan set developed by the consultant selected by Coon Creek Watershed District to complete the design.
   Coon Creek Watershed District maintains copies of the plan set at their offices. Plans are also available on the District's website under the What We Do tab.
3. ***What are the stated goals of the project?***

Reduce erosion
Enhance stream and riparian habitat for native species
Provide long-term channel stability and reduce the need for channel maintenance

4. ***What are the desired outcomes of achieving the stated goals of the project?***
   Contribute to Sand Creek meeting State standards for water quality and removing impairments for recreation and aquatic life.
5. ***Were measures of restoration success identified in plans? Yes***
   If yes, list specific measurements.
   Estimated reduction in phosphorus and sediment (Total Suspended Sediment) based on pre-construction site conditions and available water quality monitoring models.
6. ***Are plan Sets available?*** **Yes** ***Have project maps been created?*** Yes
   If yes, provide in "site maps" and list maps provided:
   Lower Rice Creek Plan Set – Wenck (Figures 1-6)
7. ***Provide list of best management practices, standards, guidelines identified in plan set?***
   Five different streambank stabilization practices were installed for the project. Log toe with rootwads were used on eroding banks with moderate shear stress and involves place logs and other woody material at the toe of the slope. Rootwads with a tree trunk are installed on top of the toe logs with the rootwad facing outward toward the stream. The rootwads provide bank protection, increase channel roughness, and provide aquatic habitat. Banks above the rootwads are re-graded to a less steep slope, seeded with native vegetation, and covered with an erosion control blanket.
   Vegetated riprap toe was used on banks with high shear stress. Vegetated riprap consists of installing stone riprap against the bank to protect the bank toe against further erosion. The height of the riprap was limited to the designated bankfull elevation. The bank above the riprap was re-graded to a less steep slope, seeded with native vegetation and covered with an erosion control blanket.
   In areas with reduced shear stress, bank re-grading was used. Bank re-grading reduced bank angle to a less steep slope to promote vegetation establishment. Re-graded banks were seeded with native vegetation and covered with erosion control blanket.
   Stone cross vanes were installed to provide grade control within the stream bed and to direct flow into the center of the channel. Cross vanes were installed every 2 feet of vertical drop in the stream bed. Cross vanes are typically used to reduce existing head cuts or prevent the chance of a head cut forming to de-stabilize the bed causing additional bank erosion.
   Stormwater outfalls entering the stream were stabilized with geotextile fabric and stone to reduce erosion to the stream bed and banks during storm events.
   Backwater pools were created adjacent to the main channel to provide off-channel habitat for turtles and other aquatic organisms. Within the pools, habitat features escape logs were installed to provide additional turtle habitat.
   In addition to streambank practices, the trees were thinned in the riparian canopy and invasive buckthorn was removed. Tree and shrub removal is a common riparian restoration practice used to promote increased herbaceous species understory growth and cover, which promotes soil stabilization and improved water quality. Following woody species thinning and removal, native plant species were installed. Following native plant installation, establishment practices were used including herbicide application to reduce invasive species were conducted for both herbaceous and woody (buckthorn) species.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   No
9. ***In what ways did alterations change the proposed project outcome?***
   NA

Site Assessment

Field Review Date: **9/1/2022**

Field Visit Attendees: Keegan Lund – MNDNR, Nick Proulx – MNDNR, Steve Kloiber – MNDNR, Jon Janke – Coon Creek Watershed District, Mark Pranckus – Cardno now Stantec

10. ***Surrounding Landscape Characteristics:***
    The lower Sand Creek riparian corridor is fairly narrow, ranging from approximately 100 to 900 feet wide consisting of mature trees, shrubs, and herbaceous vegetation. The surrounding landscaping is moderately dense residential development with scattered light commercial development.
11. ***Site Characteristics:***
    a. ***Soil Series:***
    Primarily alluvial mixed floodplain soils with areas of fine sand
    b. ***Topography:***
    Relatively flat
    c. ***Hydrology:***
    Sand Creek is a perennial stream. Riparian wetlands are present in locations where the riparian width increases. Through the project area, five stormwater outlets dump into the stream.
    d. ***Vegetation: Plant Communities, Dominant Species & Invasives % Cover:***
    The riparian corridor is well-vegetated with nearly 100 percent coverage on the floodplain and along the banks. Riparian vegetation is greater than 50 percent composed of grasses. Reed canary grass is the dominant grass along the lower banks. Along the upper banks where conditions are drier, native grasses are more dominant. Native shrubs are present but limited. The tree canopy of partially closed creating full to partial sun and full shade conditions. Mature native trees are present including silver maple, green ash, and cottonwood.
12. ***Is the plan based on current science?*** Yes
    Sand Creek is an urban stream with a limited riparian corridor and significant private ownership along the stream, which typically limits treatments to those that maintain the existing stream alignment and does not result in changes to established floodplain and floodway elevations. The Lower Sand Creek Corridor Restoration project used established bank stabilization techniques that minimize hard armoring to locations where it is required based on stream energy and shear stress while maximizing the use of natural materials (logs, rootwads, and perennial vegetation) to provide long-term bank stabilization and erosion control. The integration of additional riparian corridor restoration techniques such as tree thinning, invasive species control, native seeding, and off-channel aquatic habitat features provide benefits to Sand Creek beyond reducing erosion within the stream channel and banks.

13. ***List indicators of project goals at this stage of project:***
    Streambanks are stable and well-vegetated. Limited locations where banks are eroding.
14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***
    Yes. Streambank stabilization treatments and locations were correctly selected, designed, and installed. Tree thinning was done selectively and promotes understory and bank vegetation growth. Vegetation establishment practices helped to reduce the re-growth of buckthorn. Reed canary grass is still common within the site and will likely continue to be present in the future. Controlling reed canary grass when there is a constant seed source from upstream is extremely difficult.
15. ***Are corrections or modifications needed to achieve proposed goals?***
    No.
16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***
    No immediate future steps needed. In the future, trees may establish at a density that reduces herbaceous cover. Periodic mowing may be necessary to avoid future tree thinning activities. The well-established herbaceous vegetation may deter tree seedling establishment for a while.
17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No.
18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    No.
19. ***Additional comments on the restoration project.***
    Coon Creek Watershed District made a significant investment in the project including staff time during the initial stages through construction to have the public invested in the work including workshops and public meetings. Public outreach and education have made the community more mindful and aware of naturalized solutions for bank erosion.
    Coon Creek Watershed District has developed and maintained photo monitoring stations throughout the project site, which will aid in determining actions needed.

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Achieved the stated goals.
21. ***The project will:***
    Meet proposed outcomes.
    Confidence of outcome determination:
    High.
22. ***Provide explanation of reason(s) for determination.***

Banks where treatments occurred are generally stable and well vegetated. Tree thinning will continue to provide sunlight conditions that promote herbaceous vegetation. Streams are dynamic and changes can occur especially if there are changes in the hydrology due to land use changes. The project limits hard armoring to only the locations where it is necessary and relies on natural materials to provide long-term stabilization.

23. ***Site Assessor(s) conducting field review:***

Mark Pranckus, Cardno now Stantec

Site Maps, Project Plans or Vegetation Tables

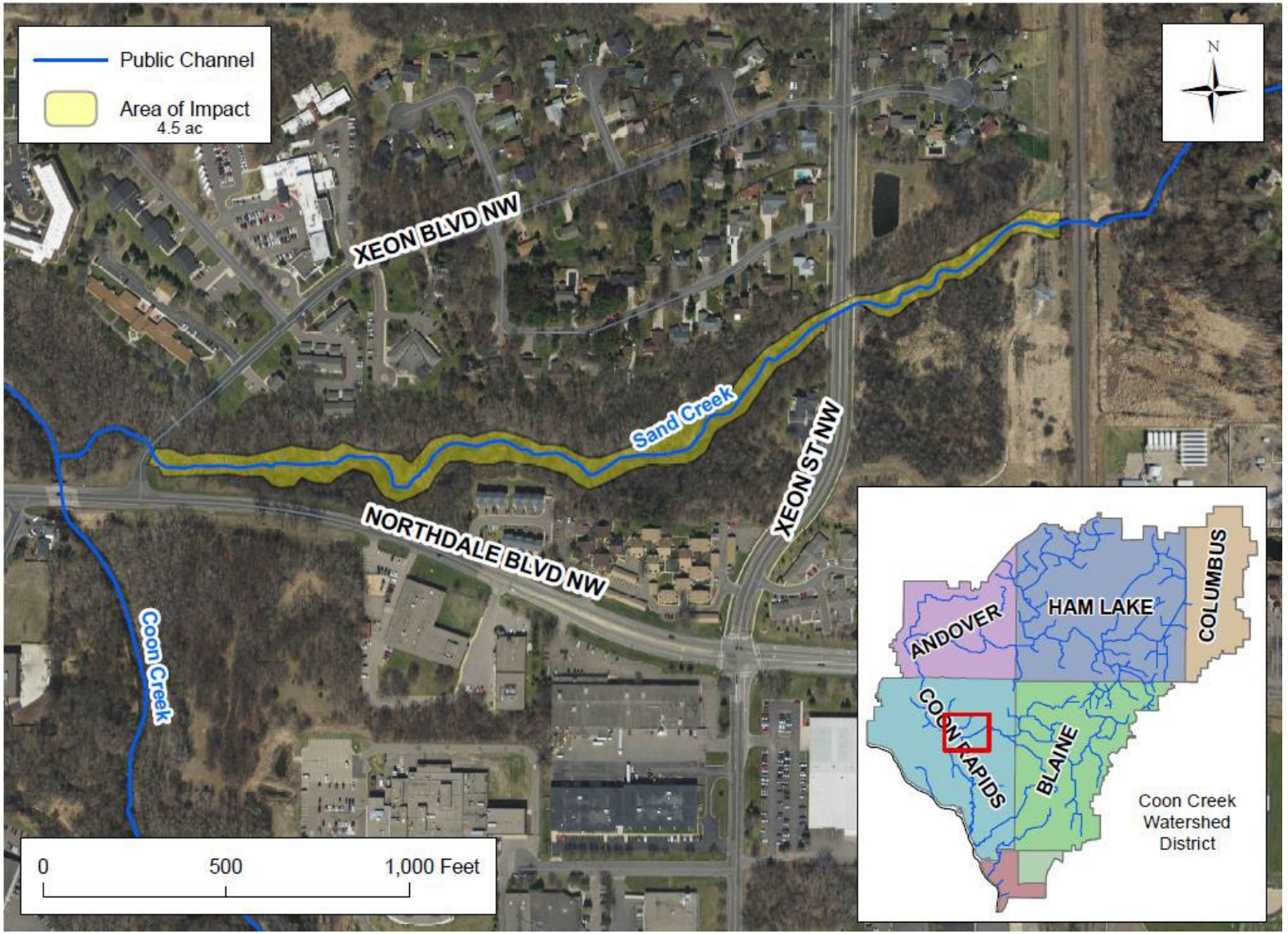


Figure 77. Map provided by Coon Creek Watershed District indicating the extent of the Lower Sand Creek Corridor Restoration project.

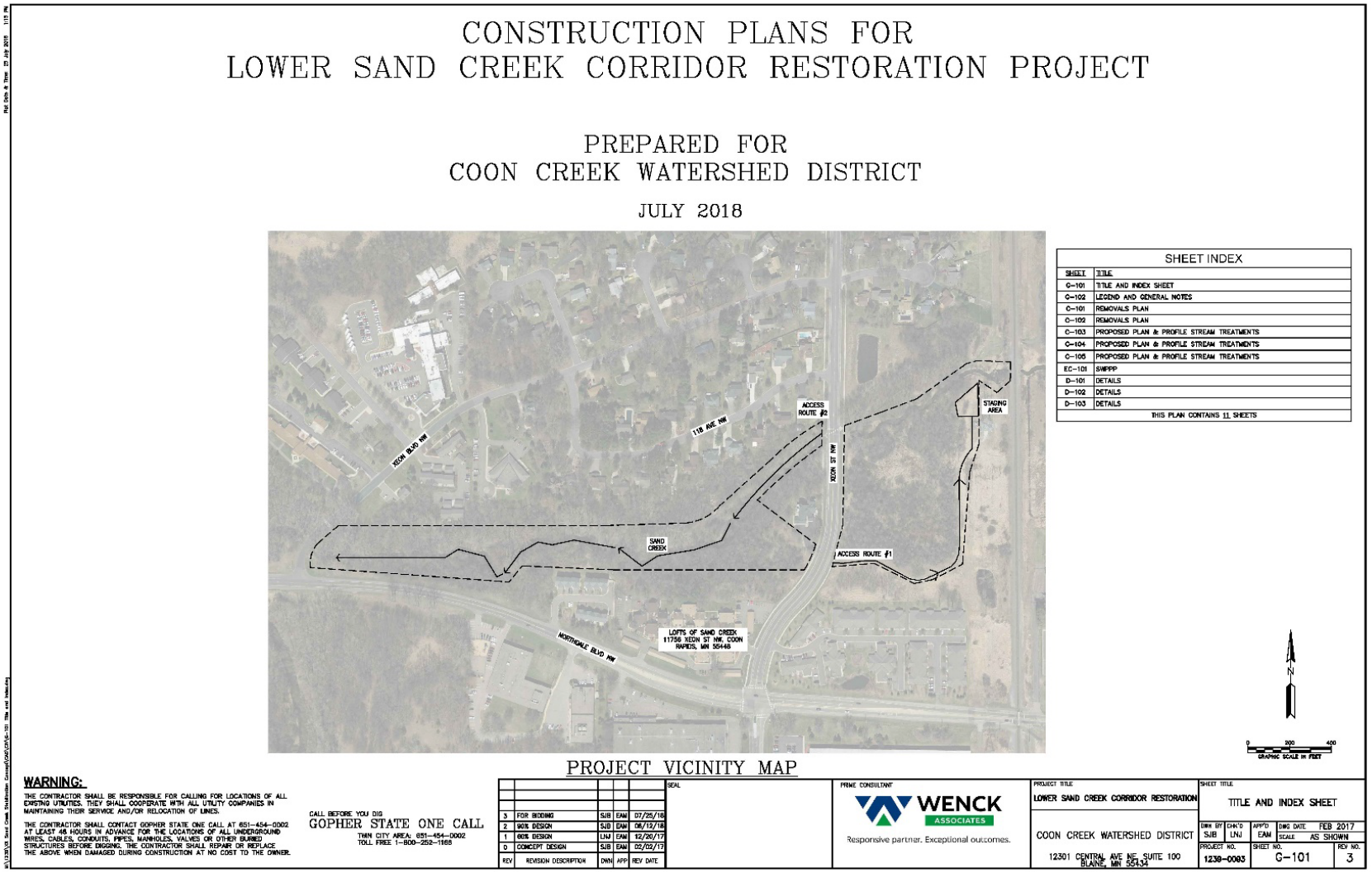


Figure 78. Sheet G-101 of the construction plan set outlining the project location and plan set contents.

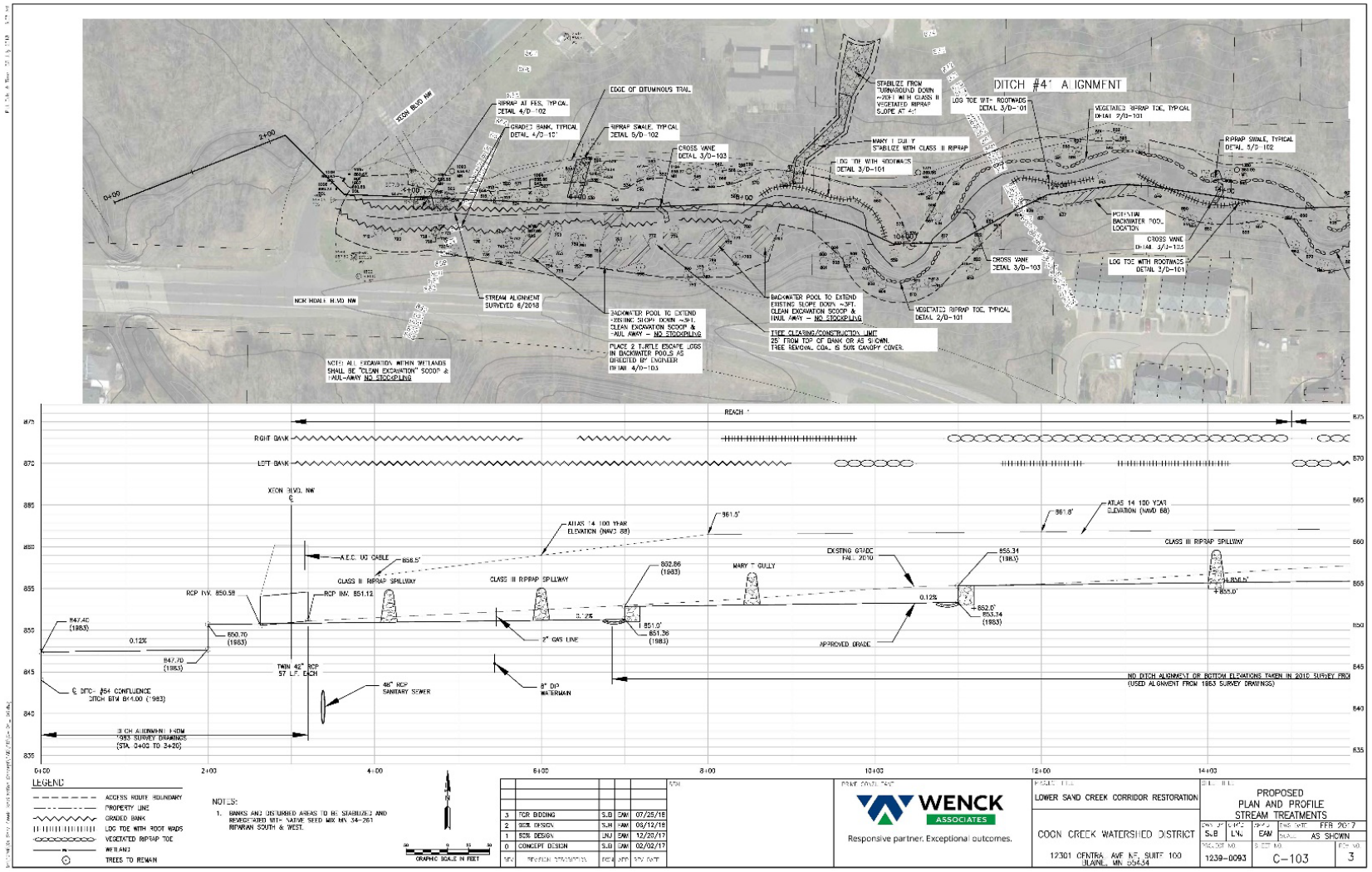


Figure 79. Sheet C-103 of the construction plan set detailing project treatment locations and construction details.

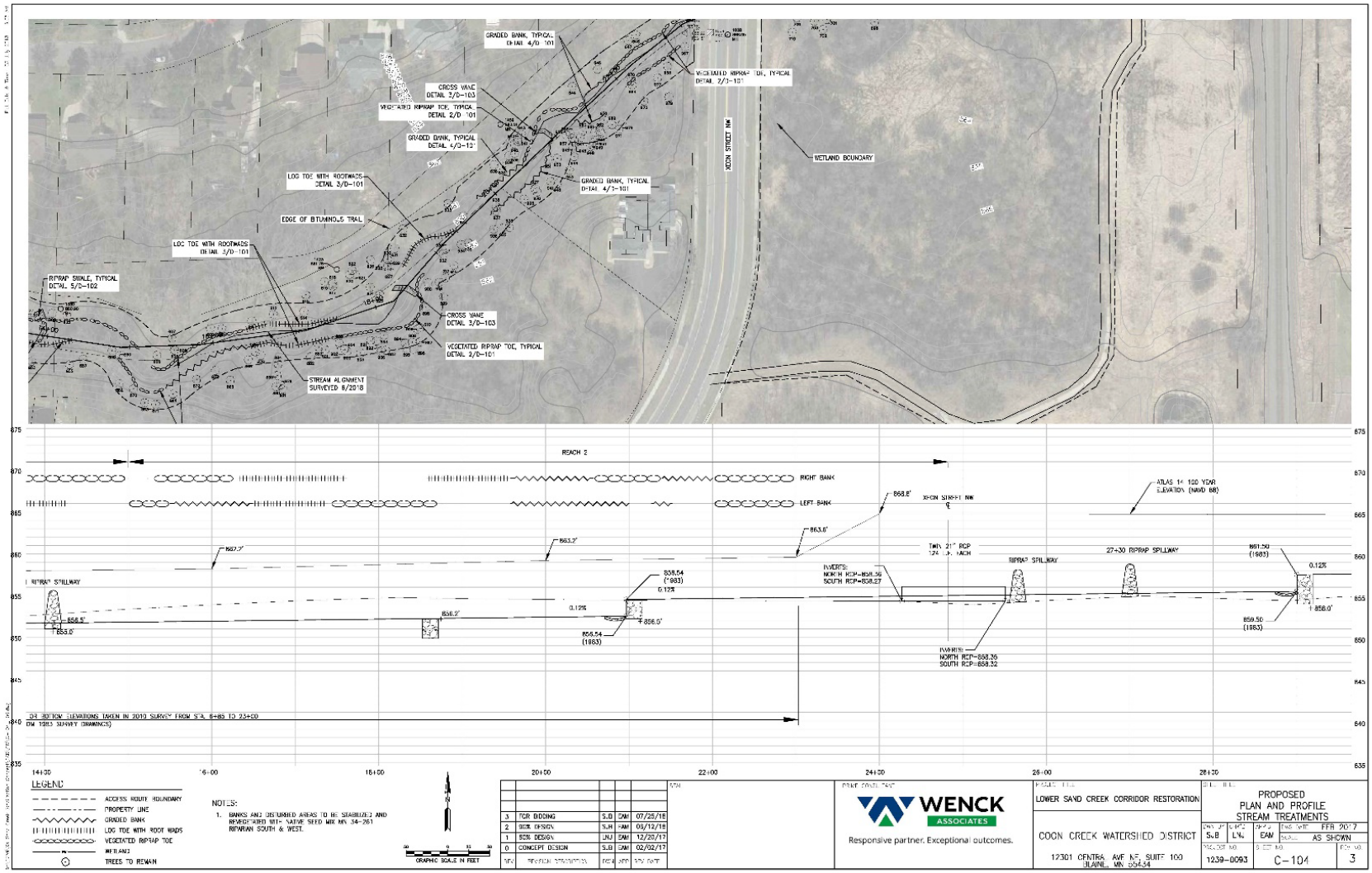


Figure 80. Sheet C-104 of the construction plan set detailing project treatment locations and construction details.

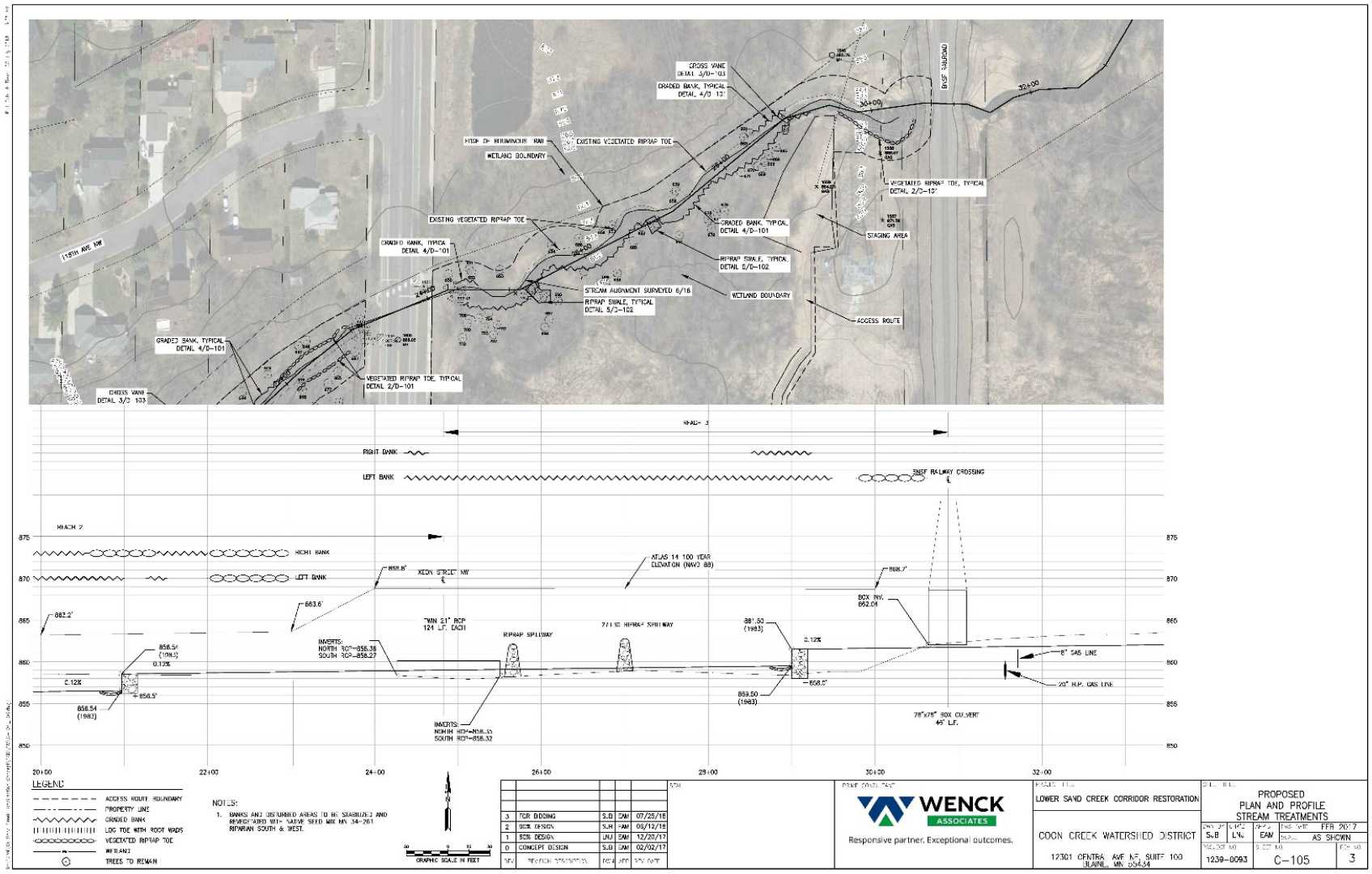


Figure 81. Sheet C-105 of the construction plan set detailing project treatment locations and construction details.

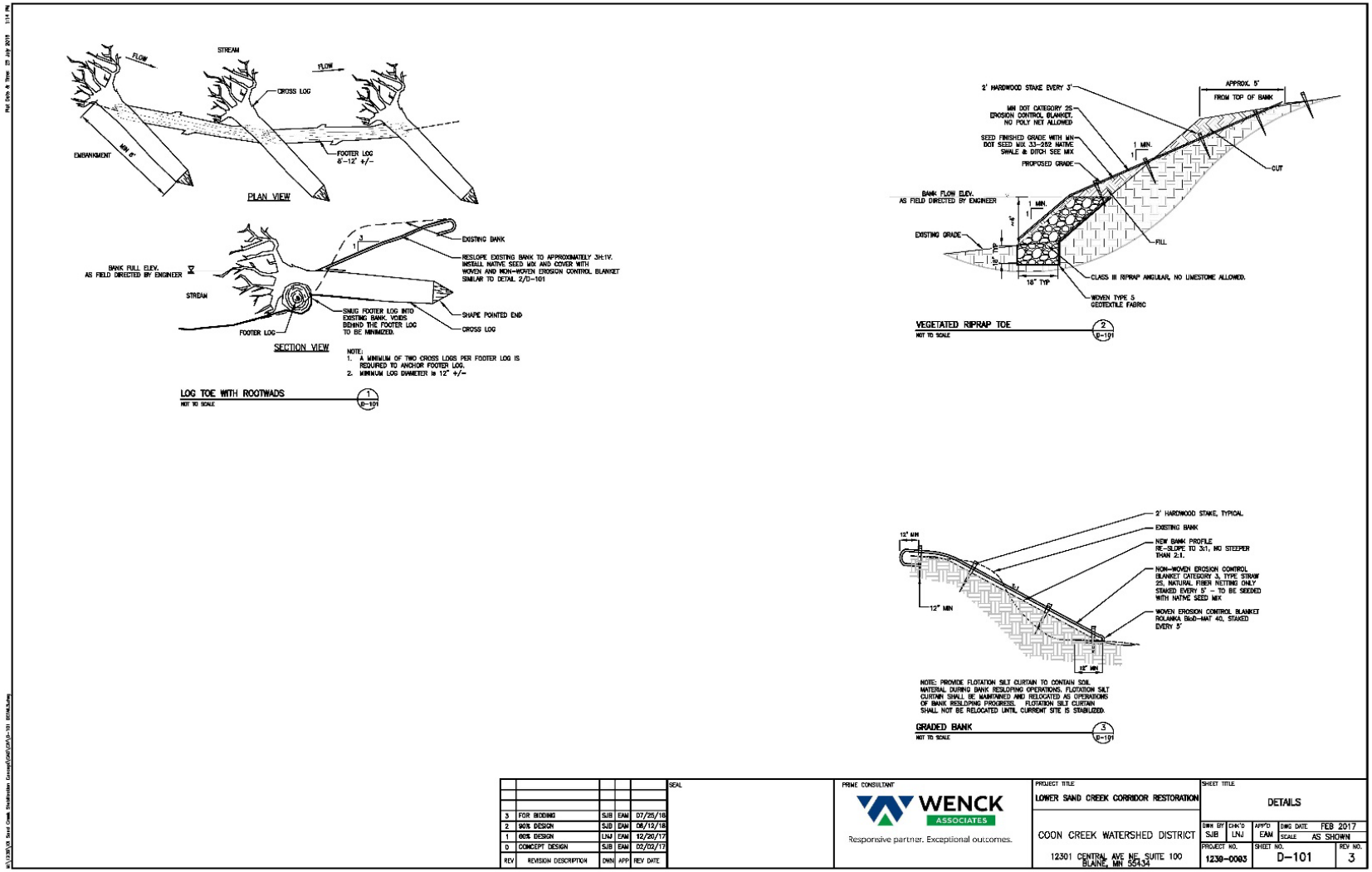


Figure 82. Sheet G-101 of the construction plan set providing details for log toe with rootwads, bank grading, and vegetated riprap toe treatments.

Table 29. Plant species observed during a meander survey of the project site.

Scientific Name	Common Name	Cover Range	Species Planted/Seeded	Species Status
Acer negundo	Box Elder	1-5%		Native
Ambrosia trifida	Giant Ragweed	1-5%		Native
Conyza canadensis	Canadian Horseweed	1-5%		Native
Elymus virginicus	Virginia Wild Rye	5-25%	Seeded	Native
Eupatorium perfoliatum	Common Boneset	0-1%	Seeded	Native
Eupatorium rugosum	White Snakeroot	1-5%		Native
Eutrochium maculatum	Spotted joe pye weed	0-1%	Seeded	Native
Glyceria grandis	American Manna Grass	0-1%	Seeded	Native
Helenium autumnale	Sneezeweed	0-1%	Seeded	Native
Helianthus giganteus	Giant Sunflower	1-5%	Seeded	Native
Impatiens capensis	Spotted Touch-me-not	1-5%		Native
Oenothera biennis	Common Evening Primrose	1-5%		Native
Parthenocissus quinquefolia	Virginia Creeper	1-5%		Native
Phalaris arundinacea	Reed Canary Grass	50-75%		Non-native
Rhamnus cathartica	Common Buckthorn	1-5%		Non-native
Scirpus atrovirens	Dark Green Bulrush	0-1%	Seeded	Native
Solidago gigantea	Giant Goldenrod	1-5%		Native
Urtica dioica	Stinging Nettle	1-5%		Native
Verbena hastata	Blue Vervain	1-5%	Seeded	Native
Vitis riparia	Wild Grape	1-5%		Native

Site Photographs

Photo 81. Looking downstream along Sand Creek. Banks are well-vegetated. Tree thinning has allowed for areas of full sun, partial sun, and shade over the course of the day, which provides conditions for a variety of plant species. (Photo taken by Mark Pranckus, Cardno now Stantec, on 9/1/22).

Photo 82. Example of stone grade control. The structure points upstream with the arms angled up and towards the bank to direct flows into the center of the channel and away from banks while providing grade control to the stream bed. (Photo taken by Mark Pranckus, Cardno now Stantec, on 9/1/22).

Photo 83. Looking upstream along Sand Creek. Tree thinning allows more sunlight to the riparian understory promoting herbaceous vegetation, which provides long-term bank stabilization. (Photo taken by Mark Pranckus, Cardno now Stantec, on 9/1/22).

Photo 84. Example of the education signage placed along the Lower Sand Creek Corridor Restoration project area to tell the story of the project and promote awareness for water quality and naturalized bank stabilization practices. (Photo taken by Mark Pranckus, Cardno now Stantec, on 9/1/22).

19Targeted Mississippi Riverbank Stabilization

Project Background

Project Name: Targeted Mississippi Riverbank Stabilization with a Focus on Bioengineering

Project Site: Mark Warzala Property

Township/Range Section: Township 32 Range 25 Section 34

Project Manager / Affiliated Organization: Mitch Haustein – Anoka County Conservation District

Fund: CWF ***Fiscal Year Funds:*** 2018

Project Start Date: March 2018

Predominant Habitat type: Aquatic Habitat

Additional Habitat types:

Project Status: Post Establishment Phase

County: Anoka

Primary Activity: Stream/River Restoration

Project Size: 109 linear feet

Project Completed: September 2020

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***

   The Warzala property is an eroding bank along the Mississippi River approximately 109 feet long. The banks are approximately 25 feet high. Prior to construction, the eroding slopes were steeper than a 1:1 (horizontal:vertical) slope. Components to the bank stabilization project included: a stone toe consisting of field or glacial stone 4 feet high from the toe of slope, a slope that was re-graded to a 1.5:1 slope and stabilized reinforced soil slope with in-sit soils treatment, seeded and planted with native vegetation to provide long-term stabilization.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Targeted Mississippi Riverbank Stabilization with a Focus on Bioengineering for Mark Warzala– A 2020 plan set developed by the consultant selected by Anoka County Conservation District to complete the design.
   Anoka County Conservation District maintains copies of the plan set at their office.
3. ***What are the stated goals of the project?***

The project was completed as part of a larger project by Anoka County Conservation District to target stabilization at interested landowners along the Mississippi River where erosion was considered severe and site conditions were contributing to TSS and turbidity impairments on the Mississippi River.
The overall project will stabilize approximately 500 feet of Mississippi River bank using bioengineering techniques. The Warzala property represents 22% of the overall project goal.

4. ***What are the desired outcomes of achieving the stated goals of the project?***
   Reduction of 2,000,000 lbs of TSS and 1,000 lbs of TP loading over the 10-year lifespan of the project.
5. ***Were measures of restoration success identified in plans? Yes***
   If yes, list specific measurements.
   Estimated reduction in phosphorus and sediment (Total Suspended Sediment) based on pre-construction site conditions and available water quality monitoring models.
6. ***Are plan Sets available?*** **Yes** ***Have project maps been created?*** **Yes**
   If yes, provide in "site maps" and list maps provided:
   Aerial map of project area
7. ***Provide list of best management practices, standards, guidelines identified in plan set?***

The project is located within the Mississippi River Corridor Critical Area (MRCCA), which has rules, standards and guidelines for activities that occur within the boundary including management of vegetation along the Mississippi River and land disturbing activities.

A stone toe consisting of MnDOT Class V rip rap was installed to an approximate height of 4 feet above the toe of slope. Field or glacial stone was used instead of quarried material that would be more angular. The sizing of the stone, height of the stone, and type of stone are consistent with standards outlined in the MRCCA guidelines and engineering design for stone stability.

The eroding slope was excavated and re-graded to a 1.5:1 slope. The reinforced soil slope with in-situ soils and topsoil backfill consisted of installing an engineered geotechnical product on the re-graded slope. The geotechnical product is called a geogrid and consists of a plastic matrix with cells that can be backfilled with various material including soil or stone, depending on the application. The plastic matrix is used to create structural integrity of the slope and prevent erosion. The cells of the geogrid were backfilled with soil (primarily sandy soils) from topsoil salvaged during grading activities. Additional topsoil was placed over the geogrid, seeded with a native seed mix and planted with native plugs. The native seed mix was provided by a local native seed nursery and designed to be quick-establishing for hard-to-grow areas. The native seed mix is very similar to BWSR's Native Construction seed mix in the number of native grass species and the seeds per square foot. The seed mix also contained 18 native forb species. The native seed mix was supplemented with native plant plugs including five forb species that were not included in the native seed mix.

Native trees and shrubs were installed at the top of the slope outside of the reinforced soil slope treatment to offset trees and shrubs that were removed during construction. Planting outside of the reinforced soil slope treatment reduces tree and shrub root intrusion into the geogrid matrix, which could compromise the integrity of the matrix if a tree were to fall in the future.

A variation of the reinforced soil treatment was installed to provide access for the landowner from the top of the slope to the river. Instead of bankfilling with topsoil, the geogrid cells were filled with stone. This provided a solid foundation for the construction of stairs by the landowner to access the river.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   No
9. ***In what ways did alterations change the proposed project outcome?***
   NA

Site Assessment

Field Review Date: **9/1/2022**

Field Visit Attendees: Keegan Lund – MNDNR, Steve Kloiber – MNDNR, Breanna Keith – Anoka County Conservation District, Mark Pranckus – Cardno now Stantec

10. ***Surrounding Landscape Characteristics:***
    The Warzala property is located on a bluff on an outside bend of the Mississippi River in a residential neighborhood. The watershed to the north is heavily developed commercial and retail land uses. To the west is additional residential neighborhoods. To the east, wooded natural area is present.
11. ***Site Characteristics:***
    a. ***Soil Series:***
    Dickman sandy loam
    b. ***Topography:***
    Steep
    c. ***Hydrology:***
    Site is located on the Mississippi River with an approximate 10-foot difference between the ordinary high water level and the highest water level.
    d. ***Vegetation: Plant Communities, Dominant Species & Invasives % Cover:***
    Vegetation cover within the project site was nearly 100%. The dominant species were early successional native species such as evening primrose and common ragweed and early successional non-native species such as lamb's quarter and other weedy species. Native planted species make up less than 5% of the total vegetation cover.
12. ***Is the plan based on current science?*** Yes
    The design follows standard practices associated with bioengineered slopes. The height of the stone toe was limited by standards in the MRCCA rules to no higher than the regulated flood protection elevation. This standard practice limits the hard armoring of slopes while allowing for the minimal structural protection of stone at the toe and maximum opportunity for re-vegetation.
    The extent that the eroding slope could be re-graded to a less slope was limited by site constraints. Ideally a 2:1 is the maximum slope to establish vegetation with a 3:1 or 4:1 slope being preferred. Steeper slopes may become unstable before vegetation can become established without any additional engineering controls. The reinforced soil slope using the geogrid product is a common practice to stabilize slopes such as the 1.5:1 re-graded slope. The plastic matrix provides the structural support to allow vegetation to be established. Backfilling the cells and covering the slope with topsoil

salvaged from the site is a common practice and typically saves on project cost. The existing soils on site were primarily sandy soils.

The native seed mix used is designed to establish quickly on hard-to-grow sites. The number of species, seeds per square foot, and species composition was appropriate for the site and similar to other native seed mixes used for establishment following construction. Planting native plugs, shrubs and trees is a common re-vegetation practice used to supplement the seed mix and accelerate the re-vegetation process. Locating trees and shrubs outside of the geogrid matrix is also a standard practice.

Native vegetation typically requires three to five years to establish. During the first several years, annual and perennial weed control of both native and non-native aggressive species is required through either mowing, cutting or herbicide treatments. The site appears to not have received any vegetation establishment practices based on the percent cover of weedy species. Project documents indicate that management proposal by a native vegetation contractor was provided, but it is unclear if the landowner executed the contract or is attempting to self-perform the work.

13. ***List indicators of project goals at this stage of project:***

No areas of erosion.

Planted and seeded vegetation present, but sparse.

Control of invasive and aggressive weedy plant species should be prioritized.

14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***

Yes. The engineered components of the project are functioning properly. There was little evidence of stone being scoured away. The reinforced soil slope with aggregate backfill was stable. The reinforced soil slope with in-situ soils and topsoil backfill did show some signs of being unstable, but that was primarily due to the steep slope and lack of established vegetation. Long-term goal achievement may be difficult, if establishment and maintenance activities are not completed as the engineering components to the slope start to degrade through natural processes.

The steep slope is a challenge for establishment and maintenance activities.

15. ***Are corrections or modifications needed to achieve proposed goals?***

Yes.

16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***

Establishment and maintenance activities of the planted vegetation on the slope is necessary. The steepness of the slope may present an obstacle for the landowner to self-perform the work, depending on their capabilities or interest. Vegetation management work may need to be contracted out to professionals that have both the knowledge base for native plant management techniques and the equipment and capacity to work under difficult conditions.

Given the height of the riverbank and the location within a neighborhood, grading the banks back to a less steep slope would be impractical and result in a significant loss in the property's amenities. Addition grading would also be problematic because property dimensions prevent properly grading of side slopes without cross property boundaries, additional resulting in loss of neighboring property amenities.

Post-construction, the steepness of the 1.5:1 slope presents a potential obstacle to management activities associated with vegetation establishment, which may decrease the long-term goal of reducing erosion because the permanent vegetation cover, a key component to bioengineering doesn't develop. One potential opportunity to improve the project outcome could have considered

incorporating some type of soil lift/terrace system into the slope to act as slope breaks and provide both easier access for management activities and areas within the slope where vegetation more easily develops. A soil lift/terrace system could fit within the site constraints because the lifts/terraces provide a vertical lift up the slope over a short horizontal distance, creating a stairstep-type feature. At this point, it is difficult to comment on a cost:benefit analysis of one approach over the other without greater detail.

Another potential opportunity to improve the project outcome could have been to use imported topsoil to backfill the geogrid cells and put a top cover over the slope. Re-use of existing topsoil is a common practice; however, the existing sandy soils are poor quality and may limit vegetation establishment. Using a quality topsoil would provide a medium that would allow for vegetation to establish and more easily provide the long-term soil stabilization that would represent a desired outcome of the project.

17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No. If effort is placed on establishment and maintenance during the first 3 to 5 years, the potential for the native vegetation to persist and stabilize the eroding bank will continue.
18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    No. The project is part of a larger Anoka County Conservation District project. Further evaluation and follow up should be handled as part of their routine monitoring and follow up of the program.
19. ***Additional comments on the restoration project.***
    Anoka County Conservation District worked with the landowner to identify the site and get the landowner to agree to participate given the final design. The design had to consider both technical site constraints and the landowner's preferences for maintaining usable yard space, preserving trees, and maintaining river access. The design and implementation did an adequate job of addressing the project design constraints. Additional follow up management activities are required to establish the planned vegetation, which will provide the long-term slope stabilization. Failure to get perennial vegetation established may make the site susceptible to not the desired goals in the future. The steepness of the slope presents an obstacle to management activities. Contracting with an outside party may be necessary to ensure that management activities get completed.

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Minimally achieved the stated goals.
21. ***The project will:***
    Minimally meet proposed outcomes.
    Confidence of outcome determination:
    Low.
22. ***Provide explanation of reason(s) for determination.***

The immediate goals of reducing phosphorus and sediment loading the Mississippi River have been achieved by the engineered and structural components (stone, geogrid) of the project. Long-term stabilization may not be achieved, if perennial vegetation is not established.

23. ***Site Assessor(s) conducting field review:***

Mark Pranckus, Cardno now Stantec

Site Maps, Project Plans or Vegetation Tables

Figure 83. Map provided by Anoka County Conservation District indicating the location of the project.

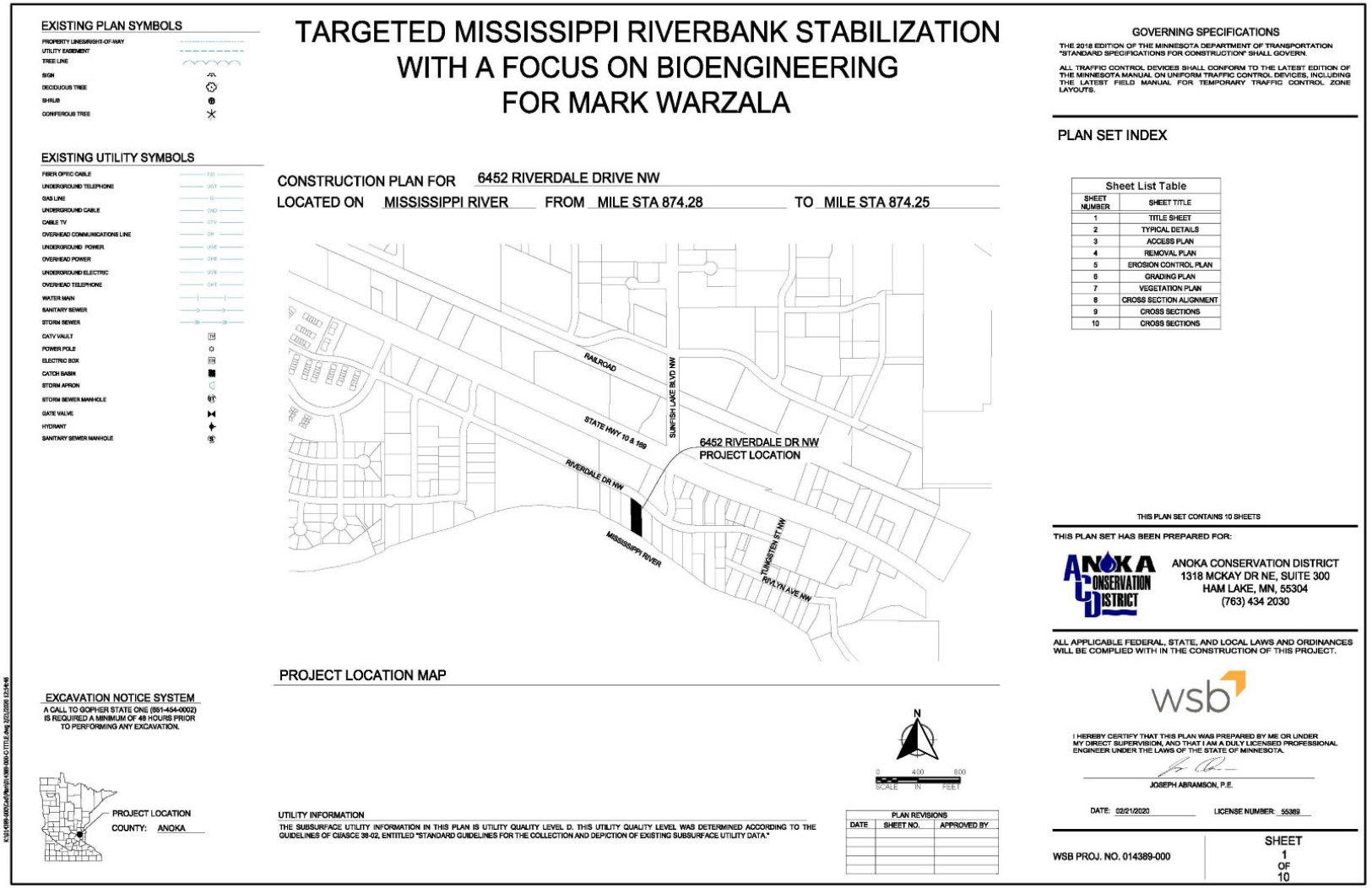


Figure 84. Sheet 1of the construction plan set outlining the project location and plan set contents.

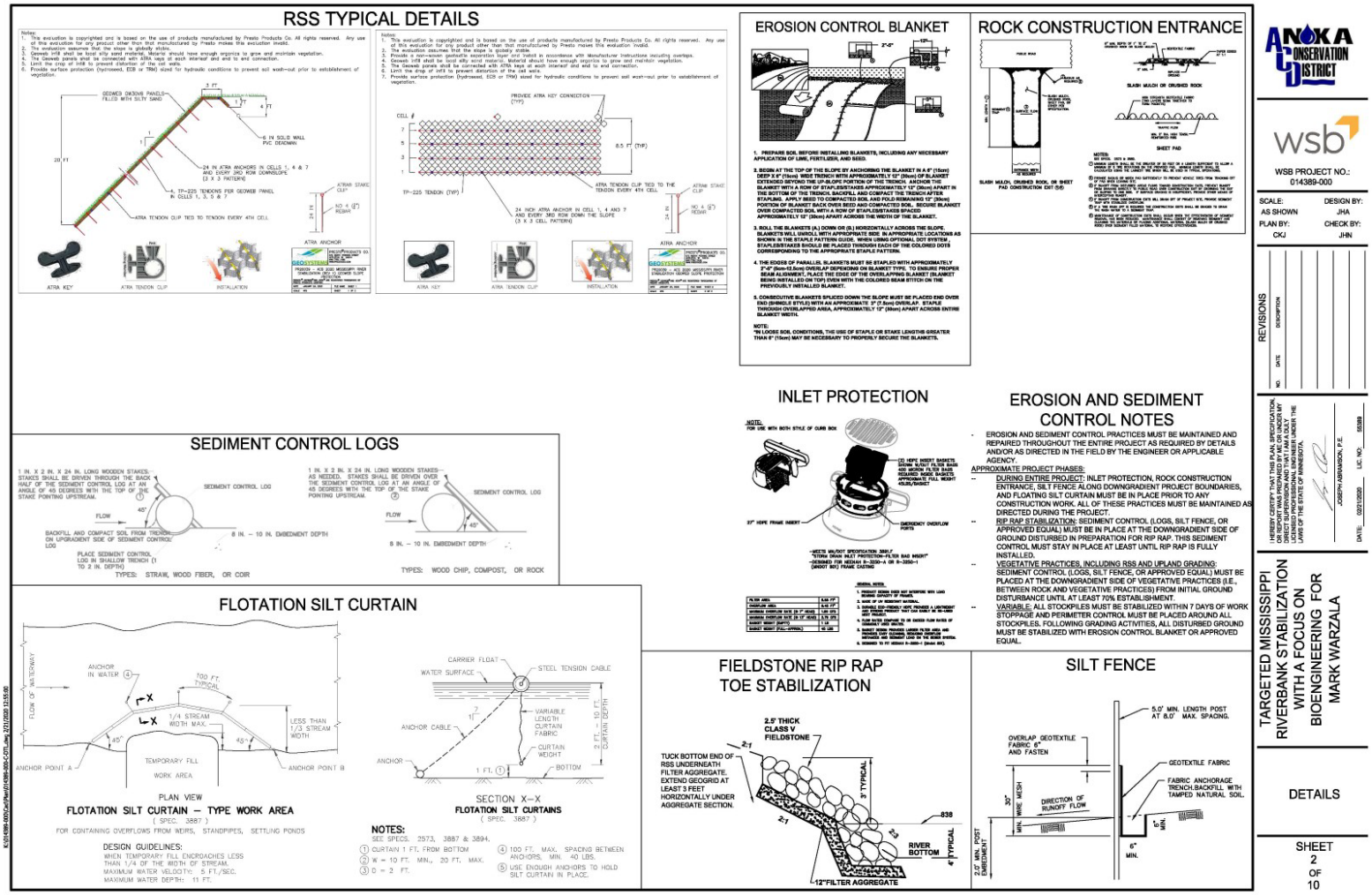


Figure 85. Sheet 2 of the construction plan set detailing construction details.

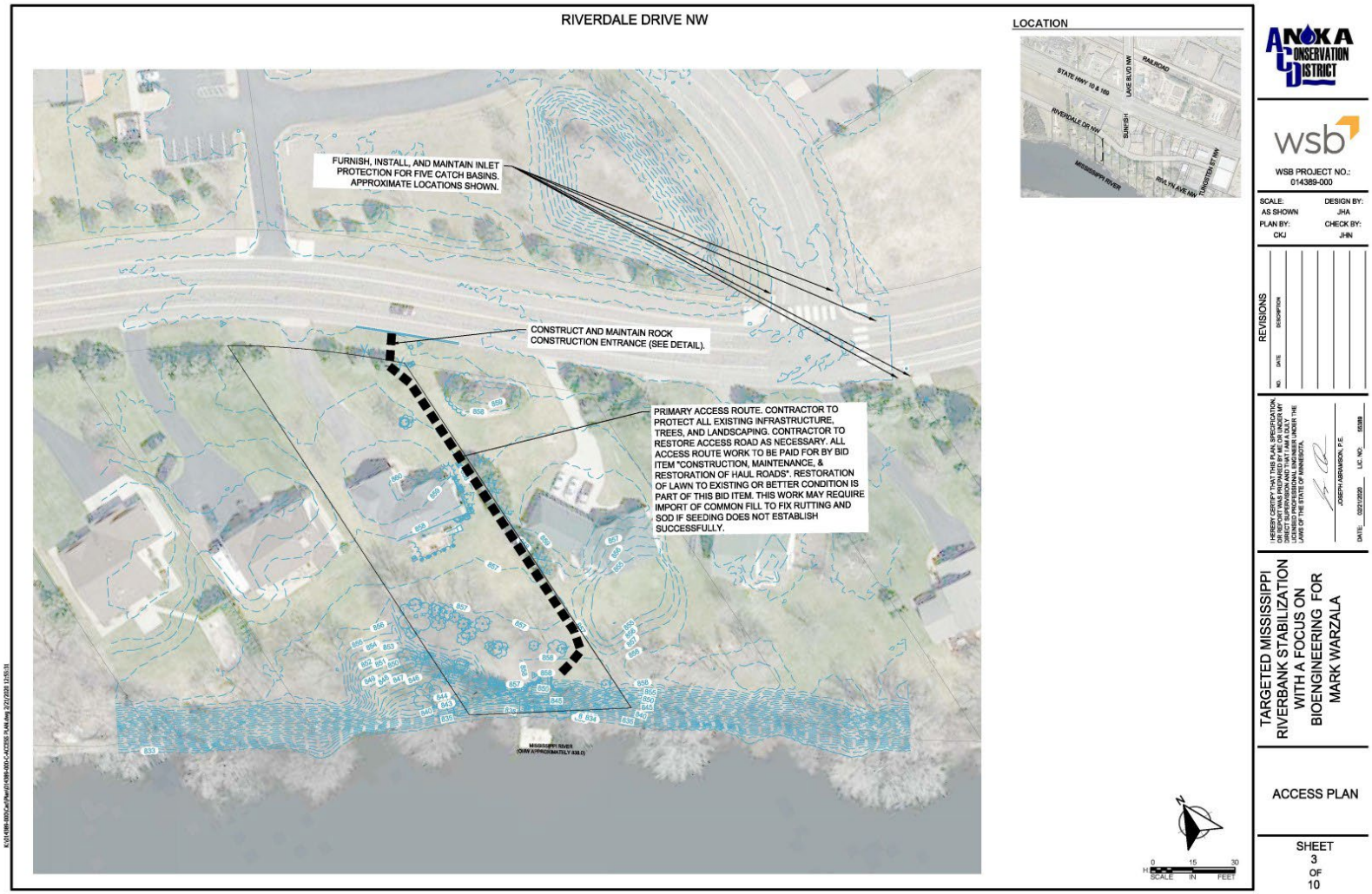


Figure 86. Sheet 3 of the construction plan set detailing how equipment should access the site.

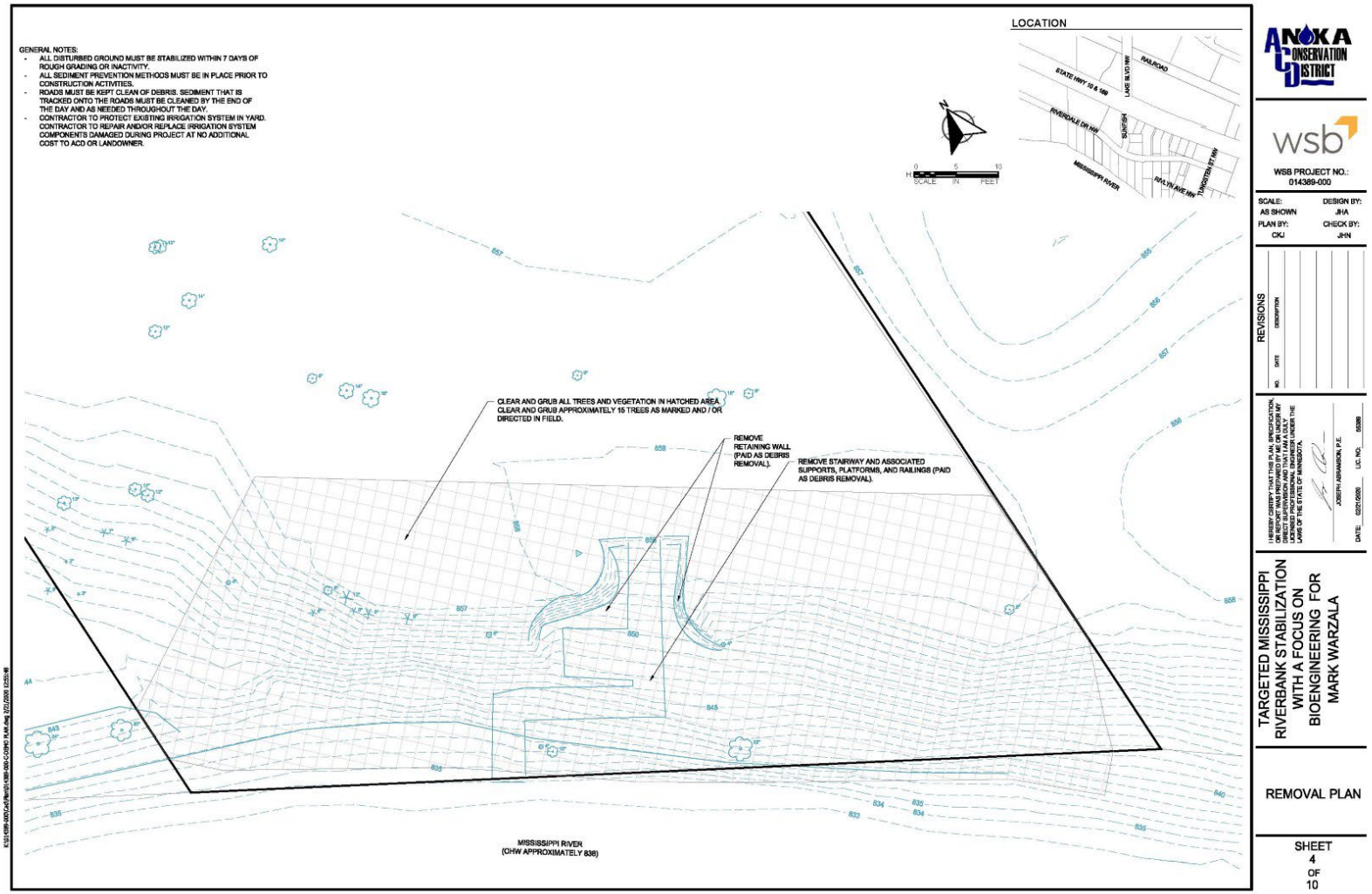


Figure 87. Sheet 4 of the construction plan set detailing the construction limits for grading activities.

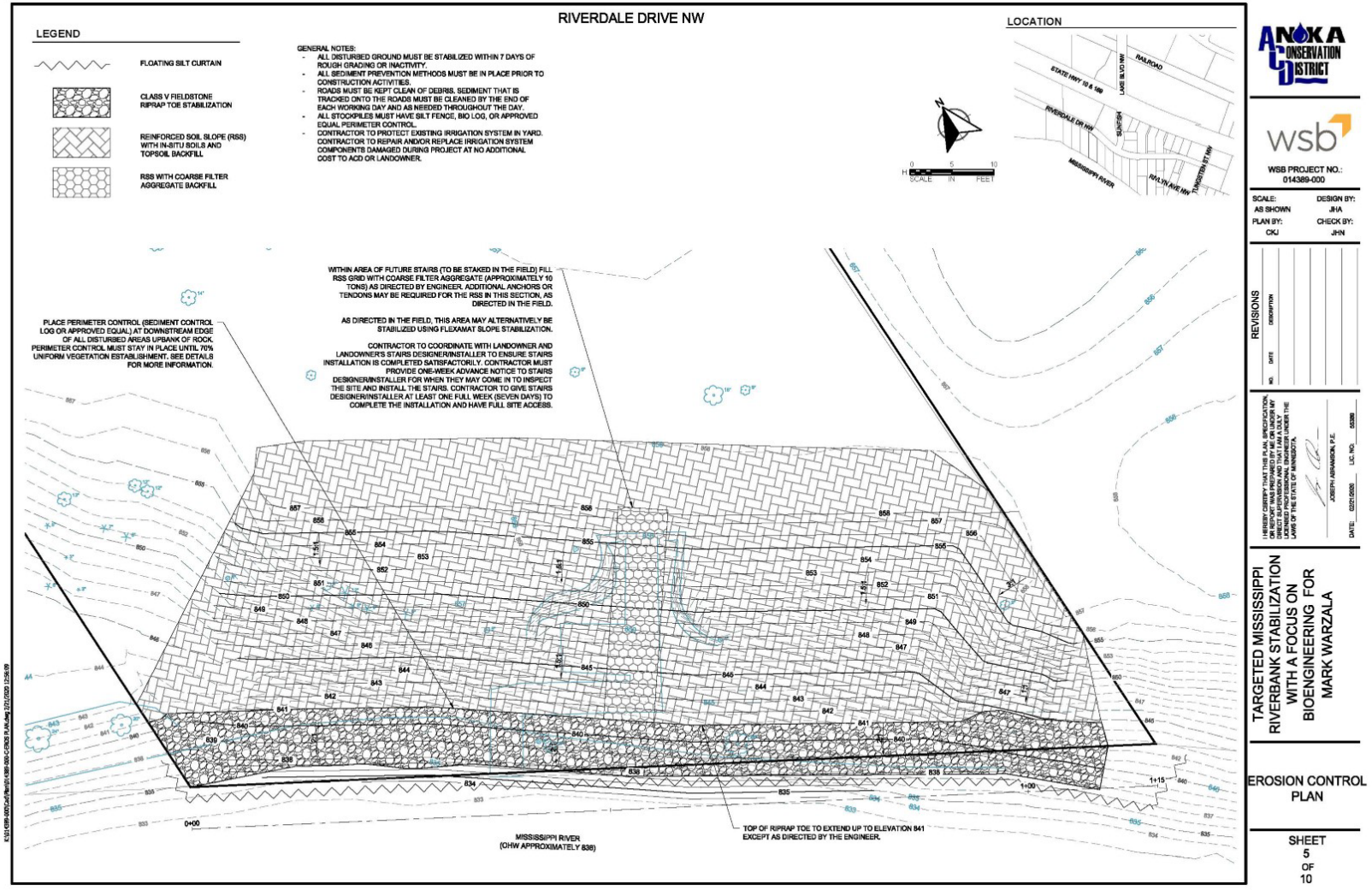


Figure 88. Sheet 5 of the construction plan set detailing project treatment locations.

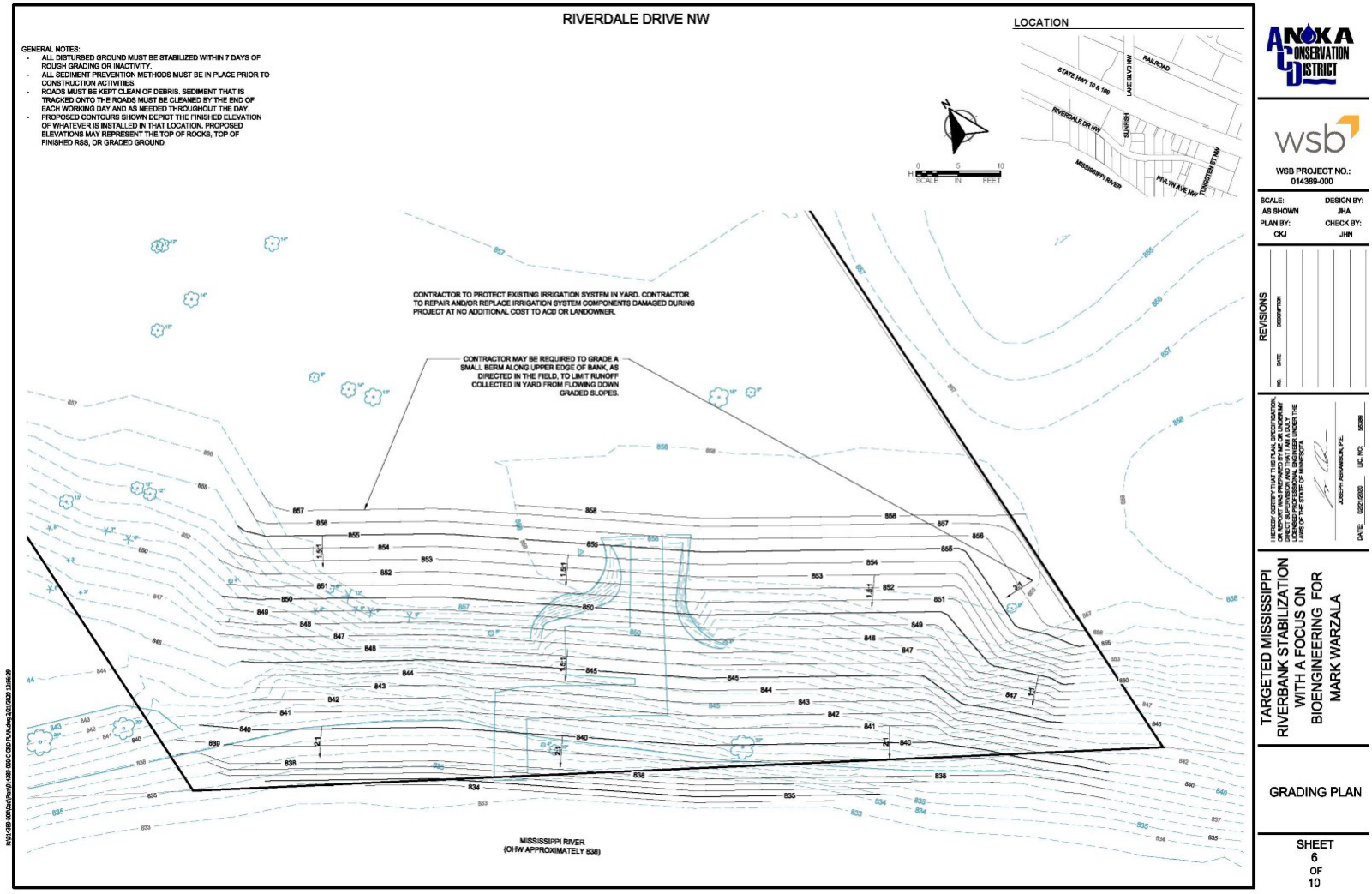


Figure 89. Sheet 6 of the construction plan set detailing the grading plan.

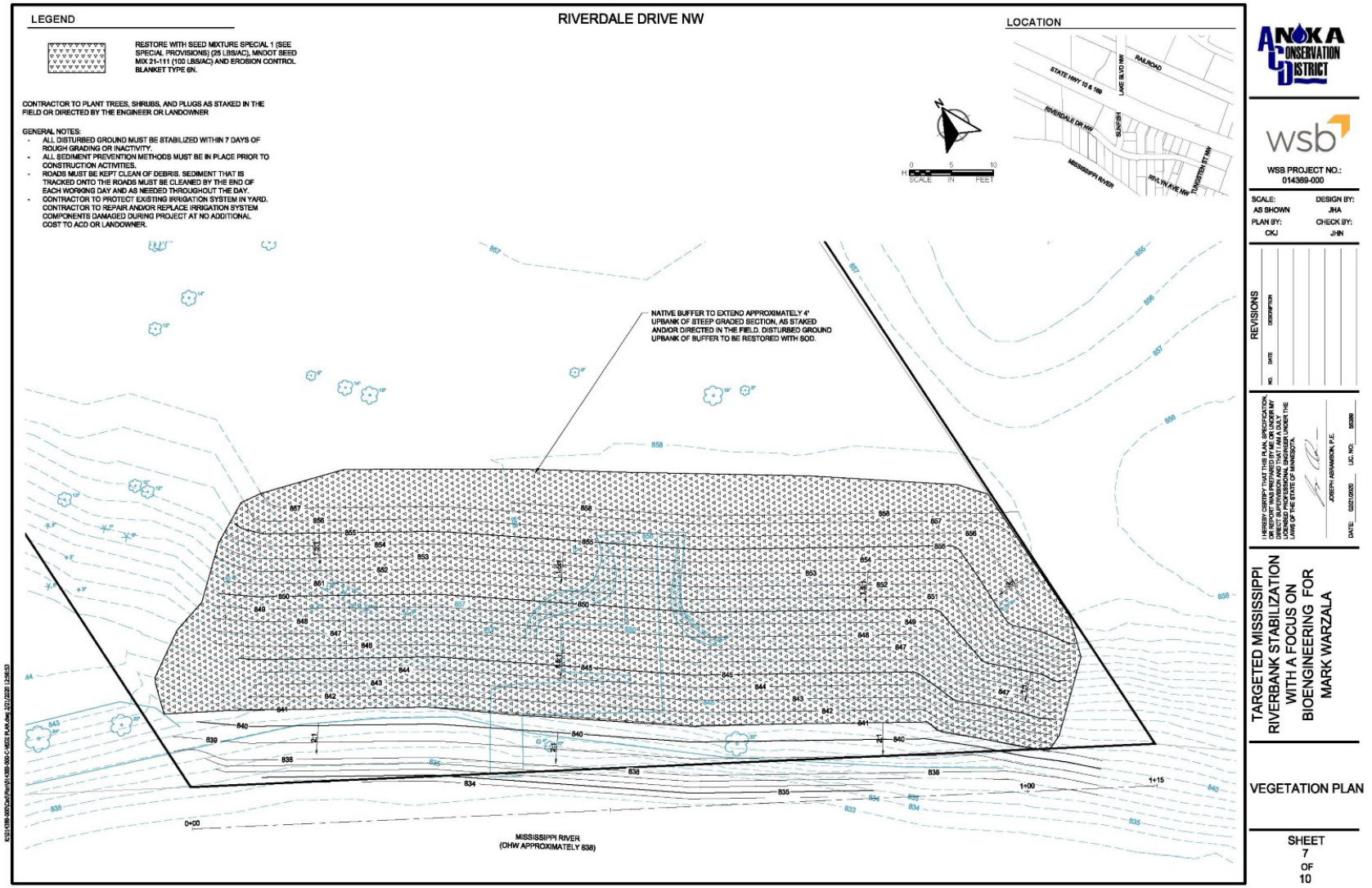


Figure 90. Sheet 7 of the construction plan showing the seeding plan.

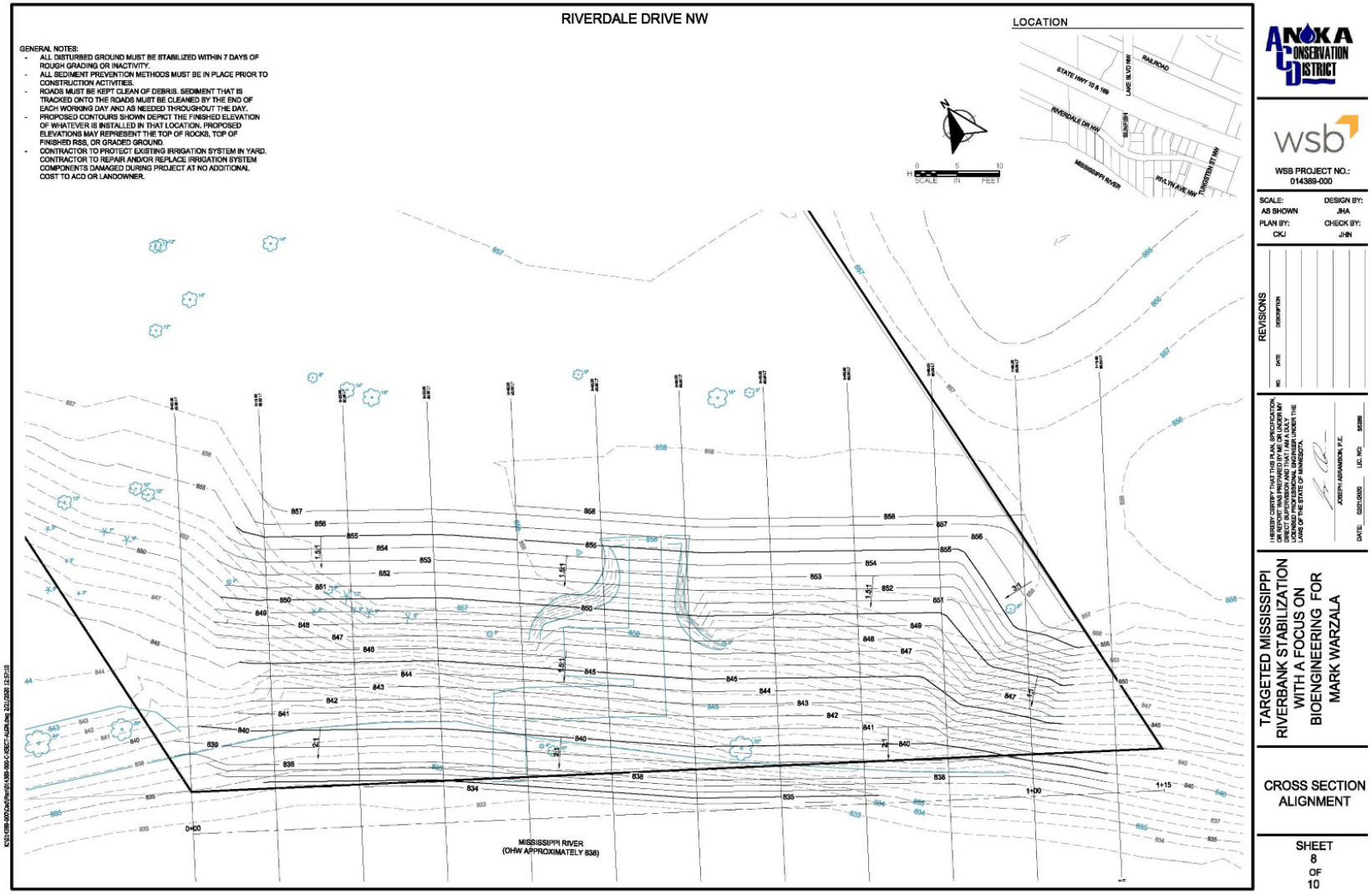


Figure 91. Sheet 8 of the construction plan set showing locations of the cross sections.

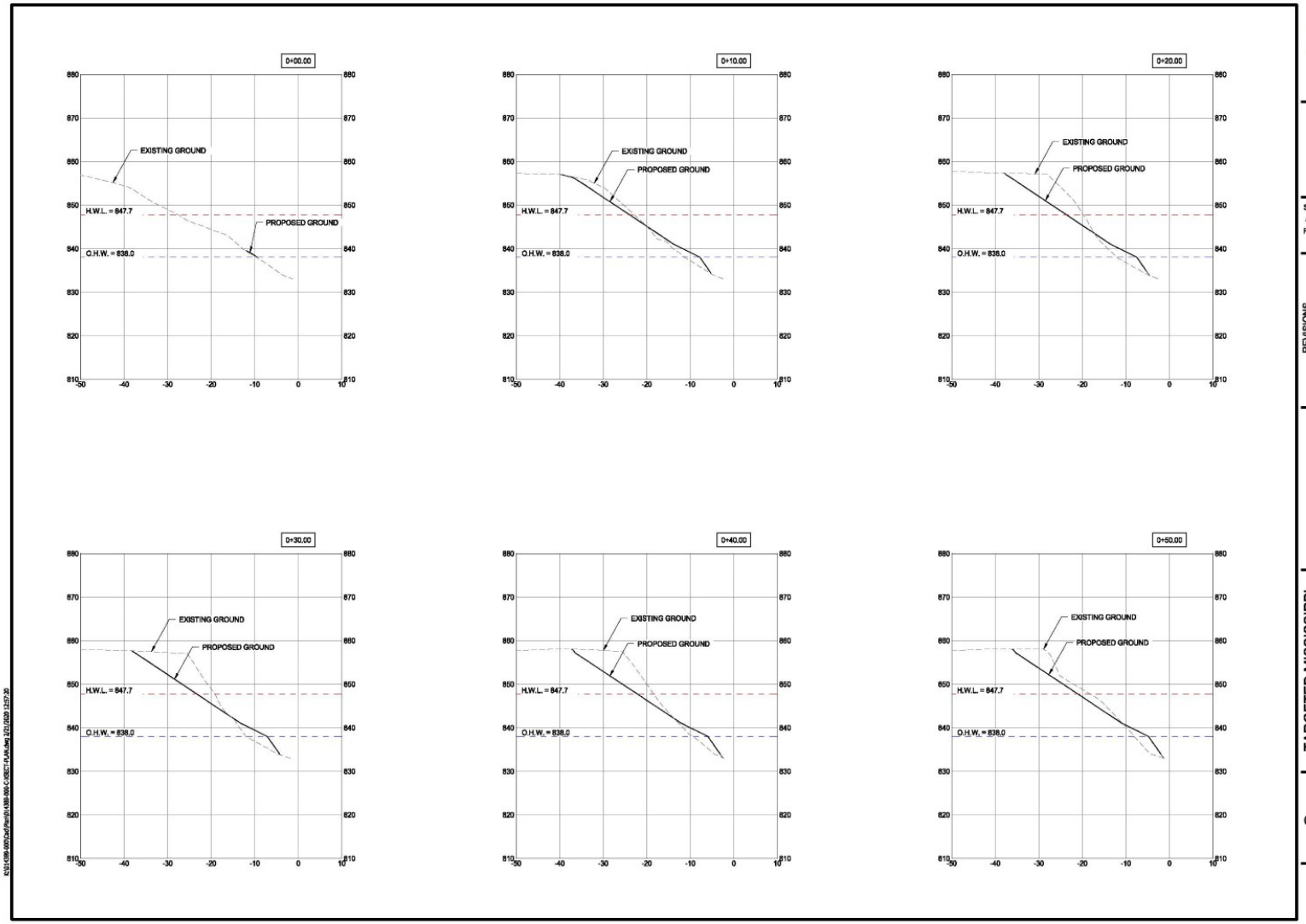


Figure 92. Sheet 9 of the construction plan set showing proposed cross sections for the bank stabilization.

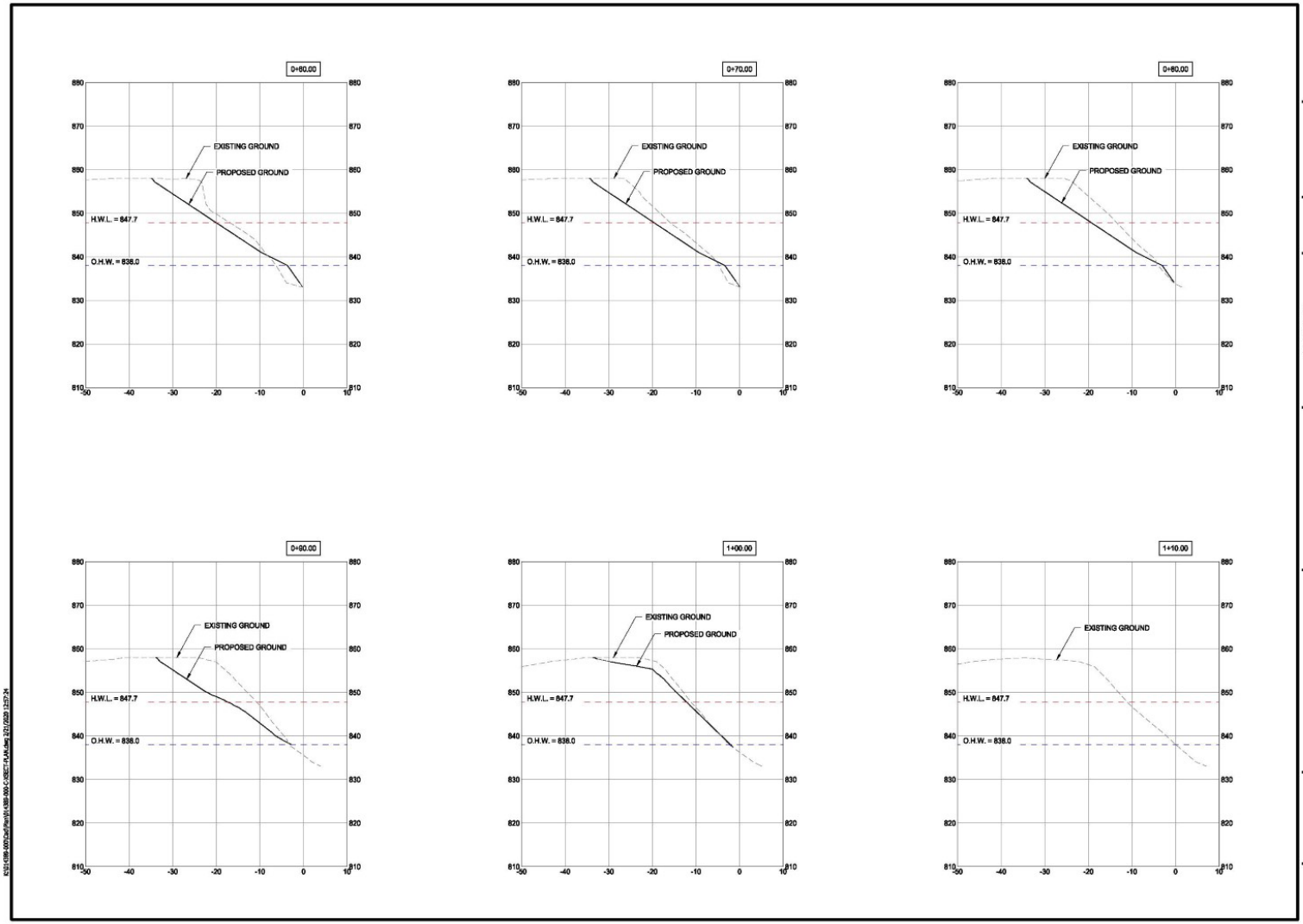


Figure 93. Sheet 10 of the construction plan set showing proposed cross sections for the bank stabilization.

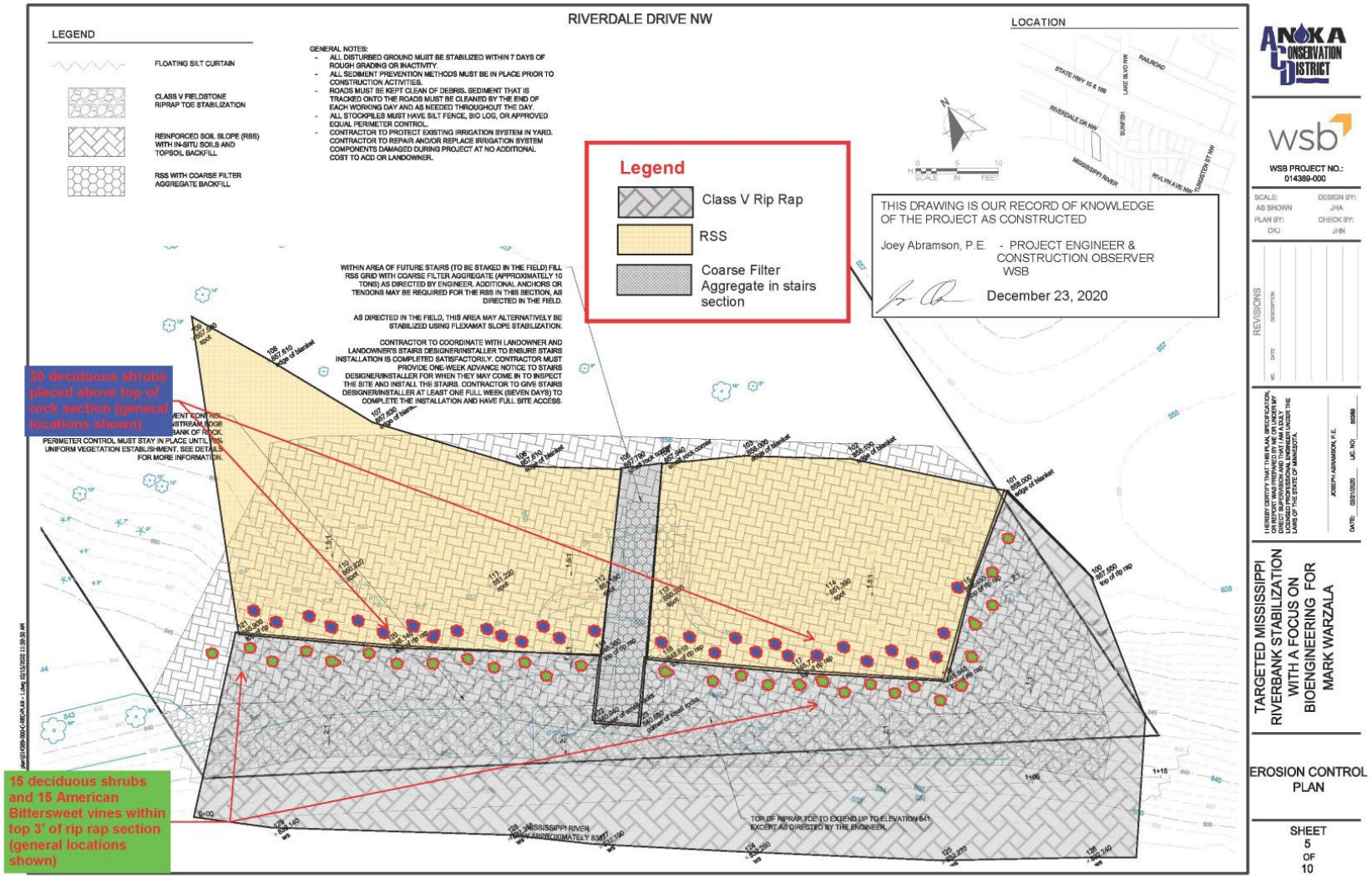


Figure 94. As-built drawings showing the final conditions as constructed.

Table 30. Plant species observed during a meander survey of the project site.

Scientific Name	Common Name	Cover Range	Species Planted/Seeded	Species Status
Ambrosia artemisiifolia	Common Ragweed	25-50%		Native
Barbarea vulgaris	Yellow Rocket	1-5%		Non-native
Berteroa incana	Hoary Alyssum	1-5%		Non-native
Chenopodium album	Lamb's-quarters	10-25%		Non-native
Desmodium canadense	Showy Tick-trefoil	1-5%	Seeded	Native
Elymus canadensis	Canada Wilde Rye	1-5%	Seeded	Native
Helianthus maximiliani	Maximillian's Sunflower	1-5%	Seeded	Native
Monarda fistulosa	Wild Bergamot	1-5%	Seeded	Native
Oenothera biennis	Common Evening Primrose	10-25%		Native
Ratibida pinnata	Yellow Coneflower	1-5%	Seeded	Native
Rudbeckia hirta	Black-eyed Susan	1-5%	Seeded	Native
Rumex crispus	Curly Dock	1-5%		Non-native
Setaria pumila	Yellow Foxtail	1-5%		Non-native
Setaria viridis	Green Foxtail	1-5%		Non-native
Silene latifolia	Bladder Campion	1-5%		Non-native
Silphium perfoliatum	Cup Plant	0-1%	Seeded	Native
Solidago canadensis	Canada Goldenrod	5-10%		Native
Verbascum thapsus	Common Mullein	1-5%		Non-native

Site Photographs

Photo 85. Prior to construction example of how steep the eroding banks were. (Photo provided by Anoka County Conservation District 5/7/2019).

Photo 86. Example of bank eroding before construction. (Photo provided by Anoka County Conservation District, 3/18/2020).

Photo 87. Example of the reinforced soil slope with in-situ soil bioengineering treatment during construction (Photo provided by Anoka County Conservation District, 9/16/2020).

Photo 88. Site post-construction after stabilization measures have been implemented. (Photo Anoka County Conservation District, 9/24/2020).

Photo 89. Example of the existing vegetation along the slope. Site is vegetated primarily by weedy, early successional species. (Photo taken by Mark Pranckus, Cardno now Stantec, on 9/1/2022).

Photo 90. Example of the existing vegetation along the slope. Site is vegetated primarily by weedy, early successional species. (Photo taken by Mark Pranckus, Cardno now Stantec, on 9/1/2022).

20Bostic Watershed Ditch Stabilization

Project Background

Project Name: Bostic Watershed Ditch Stabilization

Project Site: Bostic Creek Grade Stabilization

Township/Range Section: Township 162 Range 32 Section 31

Project Manager / Affiliated Organization: Corryn Trask / Lake of the Woods SWCD

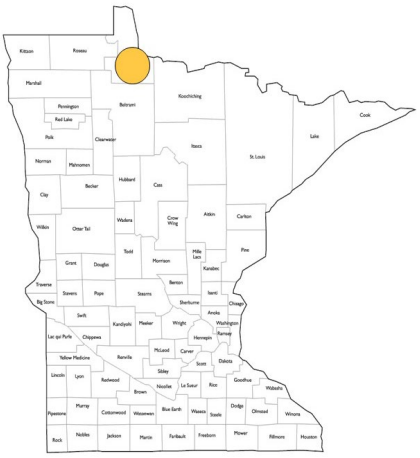
Fund: CWF ***Fiscal Year Funds:*** 2018

Project Start Date: July 2020

Predominant Habitat type: Aquatic Habitat

Additional Habitat types:

Project Status: Post Establishment Phase



County: Lake of the Woods

Primary Activity: Stream/River Restoration

Project Size: 2 miles

Project Completed: September 2020

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Install and/or reshape 13 rock riffles to control grade and stabilize a 2-mile channelized reach of Judicial Ditch 28 of the Bostic Watershed. In addition, Judicial Ditch 28 was regraded to create a 2-stage ditch.
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   - Bostic Creek Grade Stabilization Construction Plans
   - Project Summary PowerPoint presentation

3. ***What are the stated goals of the project?***
   - Restoration/improvement of hydrology in the watershed.
   - Stabilize the drainage system by controlling channel incision.
   - Reduce sediment transport into Bostic Bay and improve navigation/reduce dredging costs for resorts.
   - Improve fish habitat and connectivity. Suckers and northern pike spawn in this reach.
4. ***What are the desired outcomes of achieving the stated goals of the project?***
   - Reduced Total Suspended Solids (TSS) contributions to the impaired reach of Bostic Creek.
   - Improved water quality. Lake of the Woods is currently impaired for nutrients and mercury.

5. ***Were measures of restoration success identified in plans?*** *No*
   If yes, list specific measurements.
   Measures of restoration success were not directly identified/quantified in the plans. Success of the project will be indirectly measured by the rate that sedimentation is reduced in Bostic Bay. Also, effectiveness monitoring will be conducted in cooperation with the MPCA to track flows and water quality.
6. ***Are plan Sets available?*** Yes ***Have project maps been created?*** Yes
   If yes, provide in "site maps" and list maps provided:
   Project Summary PowerPoint aerial site maps (see Figures 1 & 2 below).
7. ***Provide list of best management practices, standards, guidelines identified in plan set?***
   See "Bostic Creek Grade Stabilization – Technical Specifications 2020-2-11" document.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   No
   No alterations were made to the plan during project implementation, but minor adjustments were made on-the-fly at the transition areas at the upstream and downstream ends of the two-stage ditch project reach, where it tied into the existing conditions. Also, the sod mat installation was not working effectively (sod was drying out and vegetation was dying), so that practice was abandoned, and the vegetation was allowed to establish naturally.
9. ***In what ways did alterations change the proposed project outcome?***
   Neither of the adjustments in question 8 had an impact on the final project outcome.

Site Assessment

Field Review Date: 8/30/2022

Field Visit Attendees: Jason Vinje, Wade Johnson, Keegan Lund – MN DNR, Corryn Trask (Lake of the Woods SWCD), Chad Severts (BWSR), Anthony Pirkl (LOW Director of Public Works)

10. ***Surrounding Landscape Characteristics:***
    Judicial Ditch 16/28 is a public drainage system that flows into Bostic Creek and receives hydrologic inputs from the highly erosive soils of the Graceton Bog Wildlife Management Area which was once part of Glacial Lake Agassiz. The hydrology of the Graceton Bog WMA has been altered due to these drainages, and a county road divides the bog into two segments. The ditch was cut through agricultural, bog and forested lowlands.

    Initial project scoping looked at creating a meandering channel or restoring natural flow dispersion through the bog and abandoning the ditch. However, after consulting with groundwater and peatland experts, it was determined that the peat bog adjacent to the county road was dried-out, compacted, and likely irreversible. Trying to restore flows to the bog could lead to excessive sediment and nutrient inputs into the system and may further degrade the quality of the peat along the proposed

cut channel. This has the potential to be counterproductive and exacerbate the problems that the grade stabilization project is designed to alleviate.

11. ***Site Characteristics:***

    a. Soil Series:

The soil parent material is a mix of interlayered glacial till, sandy near-shore lacustrine deposits, clayey lacustrine deposits, and highly organic soils. SURGO soils present include 544 - Cathro muck (organic over till), 541 - Rifle mucky peat (organic), 630 - Wildwood mucky peat (organic over glaciolacustrine), 543 - Markey muck (organic over glaciolacustrine), 563 - Northwood muck (organic over glaciolacustrine), and 481 - Kratka fine sandy loam (glaciolacustrine over till).

b. Topography:

Very flat topography adjacent to JD 16/JD 28 but steeper side slopes within the confines of the ditch.

c. Hydrology:

Hydrology within the Bostic Creek system has been significantly altered via ditching and land use changes. Flow was historically dispersed through Graceton bog but is now concentrated and confined to JD 16/JD 28. Flows within the ditch are flashy, and the lower end of the project reach is subject to backwatering when Lake of the Woods water levels are high, such as in 2022. Bostic Creek never dries up, but base flows can be very low or non-existent (i.e., water becomes stagnant.)

d. Vegetation: Plant Communities, Dominant Species & Invasives % Cover:

The surrounding landscape is composed of primarily agricultural fields, low-lying shrublands and bogs. Plant community of the actual site was seeded and composed primarily of non-native grassland and forb species (DOT Mesic General Roadside #25-141). In addition, the ditched area that contained water was composed of a more emergent and submersed native plant community.

12. ***Is the plan based on current science?*** Yes

    Retrofitting an existing and failing ditch to a 2-stage ditch and installing grade control structures are accepted practices to reduce erosion and associated pollutant loads in ditched systems.

13. ***List indicators of project goals at this stage of project:***

    Overall, the ditch is primarily stable, and the 2-stage benches are functioning. During the site visit we viewed 3 riffles (grade-control structures) where high spring flows from 2022 floods scoured around the rock riffles. It appeared on the southern side of these riffles that there was mounding of the rock. This mounding may have created a constriction where water was potentially eddying upstream above the riffle. We also observed downstream scouring below the riffles likely due to this constriction point. Lastly, certain segments of the 2-stage benches were eroded likely due to flooding events as well.

14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***

    Yes, the plans are aligned with the accepted practices of a 2-stage ditch which should stabilize the ditch, reduce sedimentation, and convey water to Bostic Bay.

15. ***Are corrections or modifications needed to achieve proposed goals?***

    Spring flooding in 2022 produced several areas that will require corrections. LOW County staff during the site visit discussed the need to acquire funding (potential FEMA funding) to correct the aforementioned areas where erosion has occurred. These riffles and erosion of certain benches along the 2-stage ditch will require restructuring/reshaping in order the to maintain functionality in accordance with the plans.

16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***
    Proposed corrections as mentioned in question 15 are reasonable and necessary. Long term maintenance of the 2-stage ditch includes annual mowing to be performed by the county. Potential challenges or limitations moving forward include addressing the erosion observed during the site visit. 3 of the riffles appeared to be mounded on the south side of the channel causing constriction (see *Photos 12-15* below). Without having more information in terms of how the riffles were constructed (i.e., as-builts) we are unclear if this was a construction failure or a result of high spring flows. However, the channel will convey adequate flow and reduce erosion as it was constructed. Lastly, there was erosion observed alongside benches after spring flooding (see *Photos 10-11* below) that will need to be addressed.
17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    The plan for the 2-stage ditch specifies a 32-foot-wide bankfull channel which may be overly wide but likely will not conflict with the goal of the project to reduce sedimentation to Bostic Bay. However, the width of this channel may not be ideal for habitat connectivity during low-flow periods from an ecological perspective. Overly wide channels lead to aggradation of the channel bottom and shallow areas where sediment deposits that may fill in with vegetation. These conditions are not conducive for fish connectivity (i.e., warmer water temperatures and insufficient water depth) nor do they provide holding cover or refuge for many fish species.
18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    Yes, the program should revisit the riffles after repairs have been completed.
19. ***Additional comments on the restoration project.***
    None

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Achieved the stated goals.
21. ***The project will:***
    Meet proposed outcomes.
    Confidence of outcome determination:
    Medium.
22. ***Provide explanation of reason(s) for determination.***
    The 2-stage ditch overall is functioning despite some issues that will require correction. Goals of the projects such as reduce sediment transport and prevent further erosion of the ditched systems will likely be met.
23. ***Site Assessor(s) conducting field review:***

Wade Johnson, Jason Vinje, Keegan Lund - MNDNR

Site Maps, Project Plans or Vegetation Tables

Figure 95. Aerial image of project area (Bostic Creek Grade Stabilization – image from Construction Plans).

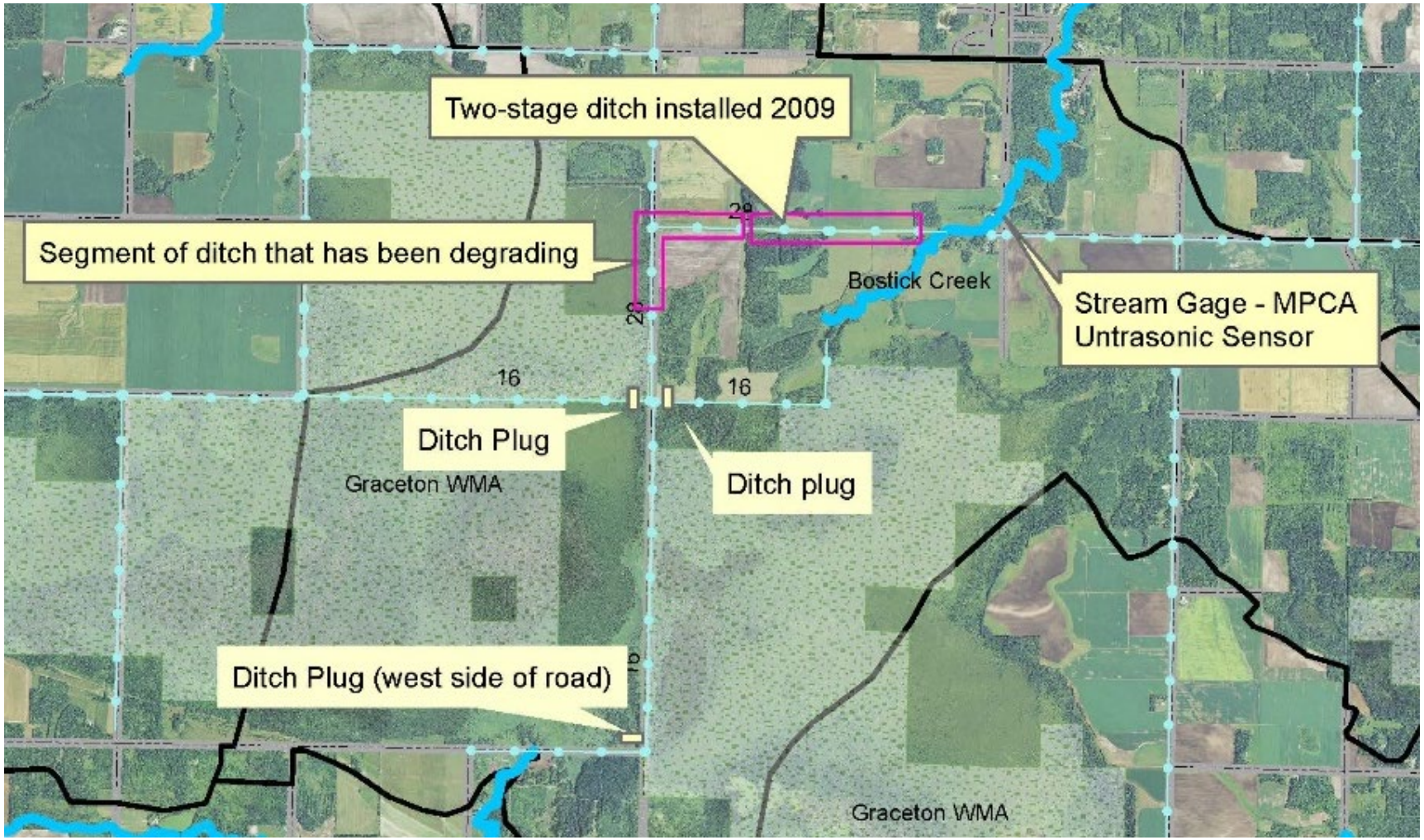


Figure 96. Aerial image of project site noted in purple (Bostic Creek Grade Stabilization – image from Project Summary PowerPoint).

Photo 91. Construction photo looking east (Bostic Creek Grade Stabilization – photo from Project Summary PowerPoint).

Photo 92. Construction photo looking east (Bostic Creek Grade Stabilization – photo from Project Summary PowerPoint).

Photo 93. Construction photo looking east (Bostic Creek Grade Stabilization – photo from Project Summary PowerPoint).

Photo 94. Construction photo looking east alongside bench of 2-stage ditch (Bostic Creek Grade Stabilization – photo from Project Summary PowerPoint).

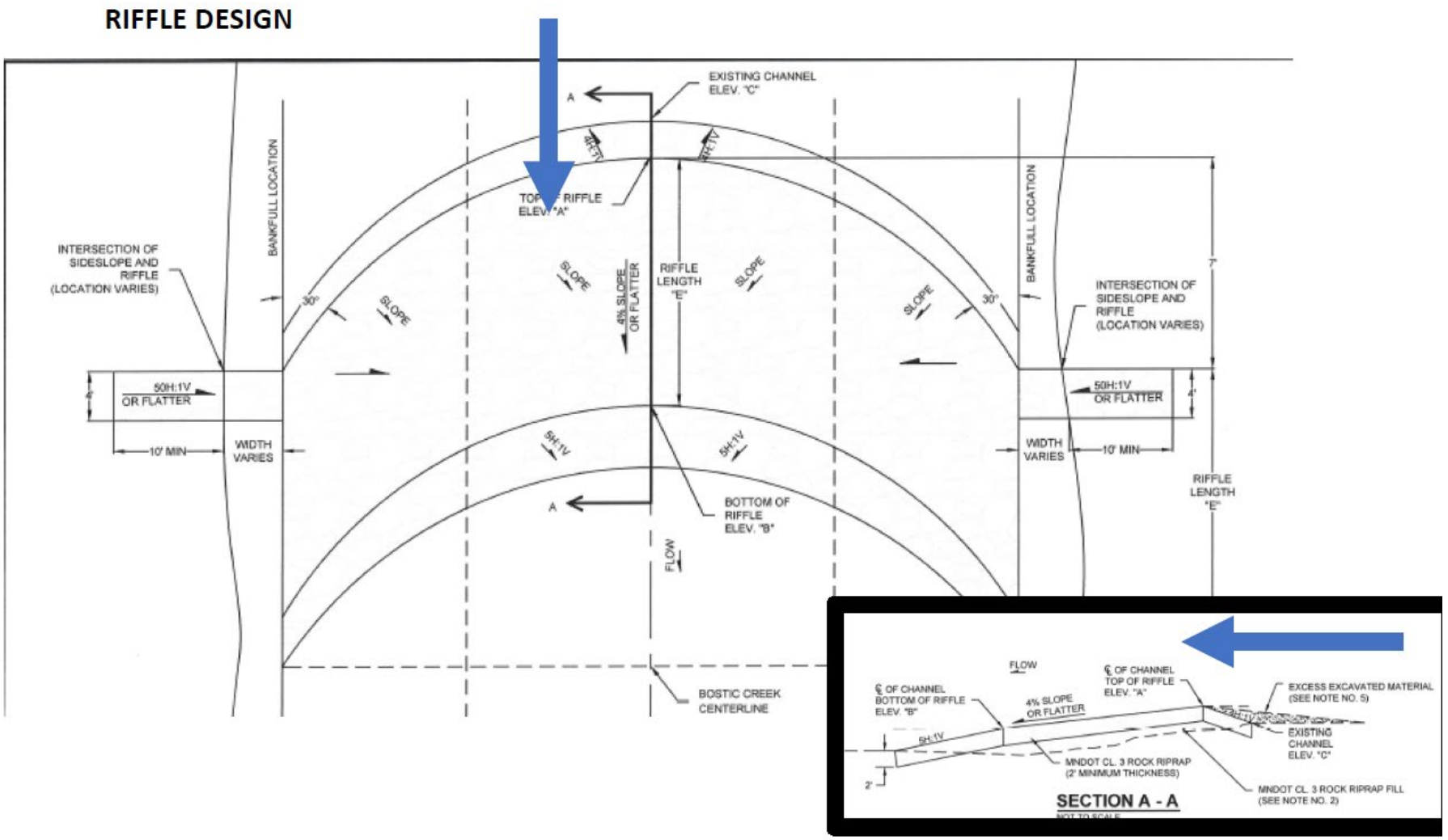


Figure 97. Riffle design schematic taken from project plans (Bostic Creek Grade Stabilization – photo from Project Summary PowerPoint).

Photo 95. Riffle construction photo looking southwest (Bostic Creek Grade Stabilization – photo from Project Summary PowerPoint)

Table 31. Observed plant species from vegetation meander survey. Site visit on 8/30/2022.

Scientific Name	Common name	Cover Range	Planted/ Seeded	Species Status
Agrostis gigantea	redtop	1-5	N	Non-native
Alisma triviale	northern water plantain	1-5	N	Native
Asclepias incarnata	marsh milkweed	1-5	N	Native
Bidens cernua	nodding bur-marigold	1-5	N	Native
Bromus inermis	smooth brome	5-25	Y	Invasive
Carex echinata	star sedge	5-25	N	Native
Carex sp.	sedge species	5-25	N	Native
Cirsium arvense	Canada thistle	1-5	N	Invasive
Echinochloa crus-galli	barnyard grass	1-5	N	Non-native
Echinocystis lobata	wild cucumber	1-5	N	Native
Eleocharis acicularis	needle spikerush	5-25	N	Native
Eleocharis palustris	common spikerush	5-25	N	Native
Elodea canadensis	Canadian waterweed	5-25	N	Native
Elymus repens	quackgrass	5-25	N	Non-Native
Elymus trachycaulus	slender wheatgrass	5-25	Y	Native
Equisetum sp.	horsetail species	1-5	N	Native
Erigeron strigosus	prairie fleabane	0-1	N	Native
Euthamia graminifolia	grass-leaved goldenrod	1-5	N	Native
Eutrochium maculatum	joe-pye weed	0-1	N	Native
Juncus tenuis	path rush	1-5	N	Native
Lolium perenne	perennial ryegrass	5-25	Y	Native
Lotus corniculatus	birds-foot trefoil	1-5	N	Native
Medicago sativa	alfalfa	5-25	Y	Non-Native
Melilotus alba	white sweet clover	5-25	N	Non-Native
Phalaris arundinacea	reed canary grass	5-25	N	Invasive
Phleum pratense	timothy	5-25	Y	Non-native
Plantago major	common plantain	1-5	N	Non-native
Poa compressa	Canada bluegrass	5-25	Y	Non-native
Poa pratensis	Kentucky bluegrass	5-25	Y	Non-native
Populus balsamifera	balsam poplar	1-5	N	Native
Potamogeton natans	floating-leaf pondweed	5-25	N	Native
Rosa acicularis	prickly wild rose	1-5	N	Native
Sagittaria cuneata	arum-leaved arrowhead	5-25	N	Native
Sagittaria latifolia	broad-leaved arrowhead	5-25	N	Native
Salix bebbiana	Bebb's willow	5-25	N	Native

Salix discolor	pussy willow	5-25	N	Native
Salix interior	sandbar willow	5-25	N	Native
Schoenoplectus tabernaemontani	softstem bulrush	5-25	N	Native
Scirpus atrovirens	great green bulrush	1-5	N	Native
Scirpus cyperinus	woolgrass	5-25	N	Native
Solidago canadensis	Canada goldenrod	5-25	N	Native
Solidago gigantea	giant goldenrod	1-5	N	Native
Solidago speciosa	showy goldenrod	1-5	N	Native
Sonchus arvensis	perennial sowthistle	1-5	N	Native
Sparganium eurycarpum	giant bur-reed	1-5	N	Native
Stachys palustris	marsh hedge nettle	0-1	N	Native
Symphyotrichum lanceolatum	panicled aster	1-5	N	Native
Toxicodendron rydbergii	poison ivy	1-5	N	Native
Trifolium pratense	red clover	1-5	N	Native
Trifolium repens	white clover	25-50	Y	Non-native
Typha angustifolia	narrow-leaf cattail	5-25	N	Invasive
Urtica dioica	stinging nettle	0-1	N	Native
Verbena hastata	blue vervain	0-1	N	Native
Verbena stricta	hoary vervain	0-1	N	Native

Site Photographs

Photo 96. Looking north from County Hwy 4 (Graceton Beach Rd) at a rock bar installed downstream from a culvert (Bostic Creek Grade Stabilization, photo taken during site visit 8/30/2022).

Photo 97. Looking south from County Hwy 4 (Graceton Beach Rd) at the other end of the drainage culvert (Bostic Creek Grade Stabilization, photo taken during site visit 8/30/2022).

Photo 98. Looking east from County Hwy 4 (Graceton Beach Rd) where the 2-stage ditch begins (Bostic Creek Grade Stabilization, photo taken during site visit 8/30/2022).

Photo 99. Looking east along 2-stage ditch at Bostic Creek. Note the emergent vegetation including softstem bulrush, norther water plantain and narrow-leaf cattail (Bostic Creek Grade Stabilization, photo taken during site visit 8/30/2022).

Photo 100. Looking southeast along 2-stage ditch at Bostic Creek where erosion has occurred along southern portion of the bench (Bostic Creek Grade Stabilization, photo taken during site visit 8/30/2022).

Photo 101. Looking east along 2-stage ditch where spring flooding cut into the bank (Bostic Creek Grade Stabilization, photo taken during site visit 8/30/2022).

Photo 102. Looking south along riffle where erosion was observed after spring flooding (Bostic Creek Grade Stabilization, photo taken during site visit 8/30/2022).

Photo 103. Looking east along 2-stage ditch where spring rains washed out 3 riffles at Bostic Creek (Bostic Creek Grade Stabilization, photo taken during site visit 8/30/2022).

Photo 104. Looking southeast along stream bank at same site where riffle was washed out due to spring flooding (Bostic Creek Grade Stabilization, photo taken during site visit 8/30/2022).

Photo 105. Looking east/downstream below failed riffle where scouring occurred during spring flooding (Bostic Creek Grade Stabilization, photo taken during site visit 8/30/2022).

21 Little Rock Lake - Sartell Pool Drawdown

Project Background

Project Name: Little Rock Lake – Sartell Pool Drawdown

Project Site: Little Rock Lake, Hwy 10 Boat Launch

Township/Range Section: Township T37N Range R31W Section 15

Project Manager / Affiliated Organization: Eric Altena, MN DNR

Fund: CWF ***Fiscal Year Funds:*** FY 2020

Project Start Date: 8/1/2019

Predominant Habitat type: Aquatic Habitat

Additional Habitat types: Wetland

Project Status: Post Establishment Phase

County: Benton

Primary Activity: Lake Shore Enhancement

Project Size: 14.16 ac

Project Completed: September 2019

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***

   Little Rock Lake drawdown project sought to plant 46,000 aquatic plants vegetation in four locations along the shoreline. The 3-foot drawdown lasted 6 weeks and returned to normal levels after 2.5 days. *Processing near-shore nutrients, compacting sediment, and exposing a native seed bank of desirable native plants* were identified by the MN DNR as beneficial outcomes of the drawdown. An increase in emergent/submergent plants was expected to decrease levels of phosphorus in the waterbody after the project was completed.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Little Rock Lake – Sartell Pool Drawdown Feasibility Study
3. ***What are the stated goals of the project?***
   50% increase in water clarity
   30% reduction in phosphorus
   Improvement in fish and aquatic species habitat
4. ***What are the desired outcomes of achieving the stated goals of the project?***

Increased water quality by reducing severity of blue-green algae blooms. Reduced shoreline erosion and runoff into the lake once vegetation is established. An overall healthier ecosystem for fish and other aquatic species.

5. ***Were measures of restoration success identified in plans?*** Yes
   If yes, list specific measurements.
   50% increase in water clarity
   30% reduction in phosphorus
6. ***Are plan Sets available?*** No ***Have project maps been created?*** Yes
   If yes, provide in "site maps" and list maps provided:
   Planting location map.
7. ***Provide list of best management practices, standards, guidelines identified in plan set?***
   A plan set was not created; however, the best management practices and guidelines were outlined in the Projects and Practices Application.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

8. ***Were alterations made to the plan during project implementation?***
   No
9. ***In what ways did alterations change the proposed project outcome?***
   Alterations during the implementation of the project did not occur. However, the goose fencing around the planted plugs was removed before the plants had enough time to establish. The level of pressure from geese feeding on the newly planted plugs was unexpected and resulted in high plant mortality.

Site Assessment

Field Review Date: 9/15/2022

Field Visit Attendees: Keegan Lund - MN DNR, Peter Lechnir - Stantec, Eric Altena - MN DNR, Gerry Maciej - Benton County SWCD, Darren Mayers - MN BWSR, Christine Jurek - MN DNR, Annie Felix-Gerth – MN BWSR

10. ***Surrounding Landscape Characteristics:***
    The majority of the shoreline of Little Rock Lake is vegetated with trees and shrubs, with houses throughout. There are 830 residents on the lake and many of them have native vegetation buffers in between their lawns and the lake. A large portion on the east side of the main basin of the lake is an undeveloped lowland. Highway 10 and a BNSF railroad cross the lake. Beyond the lake and its shoreline are small housing developments, farming operations, a golf course, and the undeveloped community of Watab.
11. ***Site Characteristics:***
    a. ***Soil Series:***
    Isan-Isan, Seelyeville and Markey, and Glendorado loamy sand soil types are present around the land. The lake basin itself is muck/silt, with sections containing sand.
    b. ***Topography:***

The surrounding area of the lake is mostly flat, with rolling hills. The lake sits within a roughly 67,650-acre watershed.

c. Hydrology:

Little Rock Creek enters the lake from the north and the southern portion of the lake spills into the Mississippi River.

d. Vegetation: Plant Communities, Dominant Species & Invasives % Cover:

The submergent vegetation within the lake is sparse and is difficult to see given the water quality. Naturally occurring emergent plants in the shallow sections of the are minimal. Non-native species in yards are present, but overall percentage is low in comparison to native species. The shrub and tree species surrounding the lake are consistent with what one would find in central Minnesota. E.g., *Populus tremuloides, Salix exigua, Quercus ellipsoidalis, Pinus resinosa, etc.*

12. ***Is the plan based on current science?*** Yes
    Transplanting procedures followed customary planting best practices. Planting as well as monitoring efforts were clearly defined and followed.
13. ***List indicators of project goals at this stage of project:***
    Secchi disk reading of ~7 ft in May 2021. This is a measurable increase in clarity from the historical readings of 0-3".
14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project goals?***
    Yes, the stated goals were achievable and able to be monitored after project implementation.
15. ***Are corrections or modifications needed to achieve proposed goals?***
    If there is another planting, plugs need to be protected from geese for a longer period so that they can become well established prior to any feeding pressure.
16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? Were or are there any opportunities to improve project goals/outcomes? What are the potential challenges or limitations?***
    Lake monitoring and reporting is in place for assessment in future years. Defining a target for the acreage of vegetation cover or a percentage for plant survivorship over the subsequent years following planting would assist in evaluating whether the third goal of increasing aquatic species habitat was reached.
17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    Based on the field observations, discussions with staff involved, and current science, the project would have had a higher level of success if the plug plantings would have had more time to establish prior to removal of goose protection fencing. In addition, the duration of the drawdown was likely not long enough to consolidate sediments and have lasting nutrient reductions and water clarity improvements. However, the lake drawdown did yield benefits such as a documented increase in golden algae and an increase in water clarity. However, it appears these benefits were not long lasting, and the lake is reverting to an algal dominated eutrophic system.
18. ***Are follow-up assessments by the Restoration Evaluation Program needed? Explain.***
    No, a thorough assessment can be made at this time. The field visit occurred two years after the drawdown period. Plant survivorship and water quality improvements were able to be assessed during the field visit.
19. ***Additional comments on the restoration project.***

Even though lake drawdowns are not overly common throughout the state, there are valuable takeaways from this drawdown such as the temporary improvement in water clarity. The level of geese herbivory in the lake post-planting was difficult to predict and is a problem that can be fixed with fencing for a longer duration.

Project Evaluation

Projects can be designated as likely to not meet proposed outcomes, minimally meet proposed outcomes, meet proposed outcomes, or exceed proposed outcomes with a low, medium, or high degree of confidence in the determination.

20. ***The project has:***
    Minimally achieved the stated goals.
21. ***The project will:***
    Minimally meet proposed outcomes.
    Confidence of outcome determination:
    Medium.
22. ***Provide explanation of reason(s) for determination.***
    The reason the project did not meet the stated goals was likely due to the limited duration of the drawdown in addition to geese feeding on planted plugs throughout the lake. Water clarity benefits from the drawdown in 2019 showed improved clarity measurements but these were not long lasting. Overall, emergent plant survivorship was low and did not improve aquatic habitat as much as it would have if there was better protection and establishment of planted material. However, some small patches of emergent vegetation were observed and documented during the site visit.
23. ***Site Assessor(s) conducting field review:***

Keegan Lund, MN DNR; Peter Lechnir, Stantec

Site Maps, Project Plans or Vegetation Tables

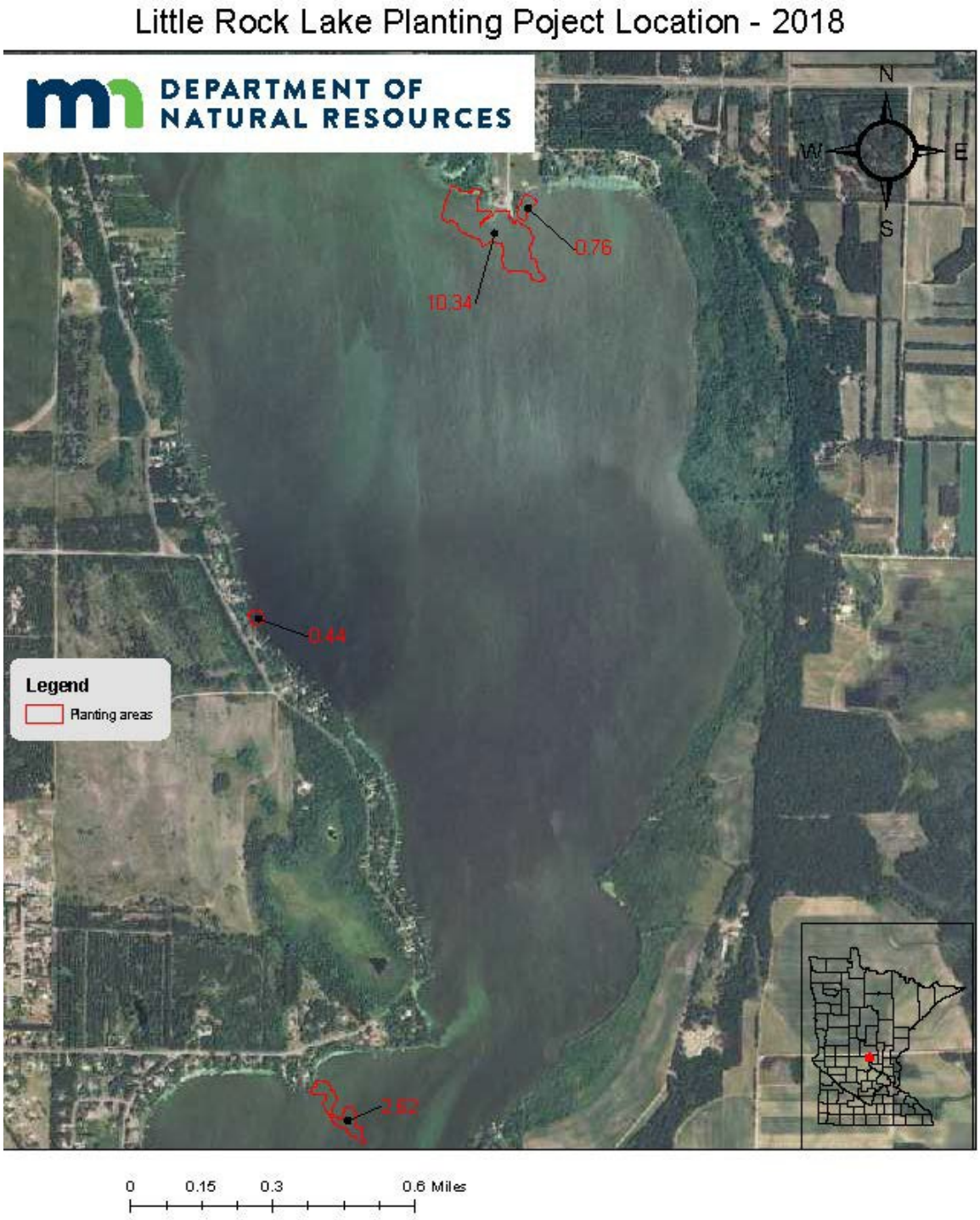


Figure 98 Aerial photo of plug planting areas in Little Rock Lake. Total acreage of 14.16 and planted with six emergent species. Map provided by Minnesota Department of Natural Resources.

Table 32 Emergent and submergent species planted observed during site visit on 9/15/2022.

Scientific Name	Common Name	Estimated Survival	Species Planted/Seeded	Species Status
Schoenoplectus tabernaemontani	Soft Stem Bulrush	5-10%	Planted	Native
Sparganium eurycarpum	Great Bur Reed	<5%	Planted	Native
Spartina pectinata	Prairie Cord Grass	<5%	Planted	Native
Iris versicolor	Blue Flag Iris	<5%	Planted	Native
Schoenoplectus acutus	Hardstem Bulrush	5-10%	Planted	Native
Pontederia cordata L.	Pickerelweed	<5%	Planted	Native
Nymphaea odorata	White water lily	1%	No	Native
Myriophyllum sibiricum	Northern watermilfoil	1%	No	Native
Nuphar variegata	Bullhead pond lily	1%	No	Native

Site Photographs

Photo 1 Taken east of the Hwy 10 bridge during the site visit on 9/15/22. The planting along this stretch had roughly 50% survival of bulrush. Note the occurrence of a severe algal bloom when the photo was taken in September.

Photo 2 The largest planting area towards the north end of the lake with low plant survival**.** This area was 10.34 acres in size and wrapped around the peninsula in the center of the photo. To the left of the peninsula, in front of the house, is a section of planted prairie cord grass and bulrush near shore that did survive but was limited in scale.

Photo 3 View of 3, small plantings installed by homeowners on the east side of the main lake basin. These plantings were not installed in the designated planting locations but were able to establish which is a positive outcome of this project.

Photo 4 Hardstem and softstem bulrush collected from a planted area on the eastern shoreline of the main lake basin.