MINNESOTA

CLEAN WATER LAND & LEGACY AMENDMENT

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

Project Evaluations

Appendix C: 2018 Legacy Fund Restoration Evaluation Report

March 2019

Minnesota Department of Natural Resources
Minnesota Board of Soil and Water Resources
Restoration Evaluations
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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 $8,000 to prepare, including staff time, printing and mailing expenses.

Table of Contents

Fund Evaluation Summary

As directed in statute, projects are evaluated relative to: *the law, current science and stated goals.* Statute also directs the panel to determine: *any problems with the implementation.* An overview of the panels review is presented below. Detailed evaluations for each project are also provided in this appendix

All Funds

Projects described in this report include:

- three Clean Water Fund project sites
- 27 Outdoor Heritage Fund project sites, including 10 Conservation Partners Legacy project sites
- five Parks and Trails Fund project sites

Project habitat types of sites featured in this report include:

- 14 prairie / savannah / grassland project sites
- five aquatic project sites
- six wetlands project sites
- 10 forest project sites

Each of the three Legacy Funds has specific requirements pertaining to restoration projects (*Appendix B, Fund Attributes and Requirements*). The requirements most directly related to restorations are addressed for each Fund in the tables below.

Clean Water Fund

Statutory Direction	Compliance Method	Evaluated Project Compliance
Measureable outcomes	Typically modeled pollutant load reduction included in standard reporting in BWSR E-link system.	All projects reported measureable water quality outcomes for the specific project.
Plan for measuring and evaluating results	Routine, inspections conducted by local project management staff (typically annual) to confirm installation and maintenance per plan. Inspection forms are kept on file by project managers.	All projects had plans to monitor on a routine schedule and evaluate results.
Consistent with current science incorporating state-of-the-art technology	Planning and design are completed by professional engineers, or local technical/water resource specialists and reviewed by BWSR Conservationists, Clean Water Specialists and/or area technical assistance staff.	All projects evaluated utilized state of the art methods.

Outdoor Heritage Fund

Statutory Direction	Compliance Method	Evaluated Project Compliance
Prepare and retain restoration plans	Project manager's preparation and access to restoration plans.	For all projects managers provided plans to evaluators.
Establish diverse plant species	Project managers maintain records of species planted on site.	Diverse species were established on project sites.
Use current conservation science	Project managers record restoration methods with current science.	All projects evaluated partially or fully utilized current conservation science.

Parks and Trails Fund

Statutory Direction	Compliance Method	Evaluated Project Compliance
Measureable outcomes	Typically acres/feet of habitat type restored or treated for each project.	All projects reported measurable outcomes in acres of habitat treated and identified desired communities.
Plan for measuring and evaluating results	Project manager's documentation of ongoing monitoring and adaptive management activities.	Project managers maintained logs of work completed and or monitoring data.
Consistent with current science	Project managers record and systematically refine restoration methods with current science.	All practices evaluated were consistent with current restoration science.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

1) CWF Cascade Creek Stream Channel Restoration Meadow Lakes

Project Background

Project Name: Cascade Creek Stream Channel Restoration

Project Site: Cascade Creek, Olmsted County

Township/Range Section: Township 106 Range 14 Sections 4 and 5

Project Manager / Affiliated Organization: Skip Langer/Olmsted County SWCD

Fund: CWF ***Fiscal Year Funds:*** 2012

Project Start Date: 2012

Predominant Habitat type: Aquatic Habitat

Additional Habitat types: Wetland , Choose an item.

Project Status: Establishment Phase

County: Olmsted

Primary Activity: Channel Restoration

Project Size: 6,640 linear feet

Project Completed: 2018

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   The project consists of re-meandering the stream channel and reconnecting the channel to the floodplain. Components include constructed riffles, toe wood and constructed wetlands.
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***

Technical specifications for the rehabilitation of Cascade Creek, Rehabilitation of Cascade Creek Rochester, MN plan set, 2012 Clean Water Assistance detail report, Projects and Practices 2015 detail report, Reducing Sediment in Cascade Creek, and South Branch Cascade Creek Project Overview.

3. ***What are the stated goals of the project?***
   Sediment reduction, flood protection, improved water quality, channel stability, and improved ecological function are all goals stated for this project.
4. ***Were measures of restoration success identified in plans? Yes***
   If yes, list specific measurements.
   Hydrology- hydrograph shows a reduction in peak flows and runoff volumes
   Water Quality- sediment related water quality trends improve
   Geomorphology- stream channel is stable, streambank erosion decreases, rate of aggradation and/or degradation decreases
   Biology- stable or increasing fish/invertebrate IBI scores overtime, increase native perennial riparian native vegetative cover, aquatic habitat qualitative index scores improve, increase wildlife usage
   Connectivity- a decrease in the rate of sedimentation in Interlachen Lake, floodplain is accessible to the stream
   Social/Economic- expenditures for road crossing construction and long term maintenance decrease, accident reports decrease, decreased erodibility of road crossings, less damage reported in flood events.
5. ***Are plan Sets available?*** **Yes** ***Have new GIS maps been created?*** **No**
   If yes, provide in Appendix A and list Maps provided:
   Click here to enter text.
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   Grading the floodplain for lateral connectivity, installing constructed riffles, toe wood and constructed wetlands are all industry standards for channel restoration. A reference reach was used to guide design. Additionally, the new channel was constructed off-line and vegetation and transplants were planted and given time to grow before the stream was diverted into the new channel. Erosion control BMPs were also used throughout the project.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   Yes
   Minor alterations were made to the beginning section of the channel and floodplain construction.
8. ***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?***
   These changes were implemented to improve project outcomes with a better design.

Site Assessment

Field Review Date: **10/24/2018**

Field Visit Attendees: Skip Langer (Olmsted County SWCD), Wade Johnson (MN DNR), Anna Varian (Stantec), and John Smyth (Stantec)

9. ***Surrounding Landscape Characteristics:***
   The stream flows through an unconfined alluvial valley consisting primarily of cultivated crops. The project location was previously a golf course and is now owned by the City of Rochester.
10. ***Site Characteristics:***
    a. Soil Series:
    The soil at the project site is primarily Radford silt loam with a 0 to 1% slope, somewhat poorly drained and is partially hydric.
    b. Topography:
    Cascade Creek flows through a wide flat unconfined alluvial valley.
    c. Hydrology:
    Cascade Creek (M-034-071) at the project site has a drainage area of 18 mi2. Land use in the watershed is 68% cultivated crops, historic wetlands in the watershed have been converted to agricultural fields. Cascade Creek is a public water and is listed as impaired for turbidity for aquatic life.
    d. Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:
    Native seed mixes where planted throughout the site with different mixes designed for different hydrology across the project. A custom wet meadow mix was used in the floodplain and channel areas, emergent mix 34-181 was used around the constructed wetlands, mesic prairie 35-641 was planted in upland areas (see Figures 11-13 for specifics).
    Vegetation B: Meander Search Species List: Table **1**
11. ***Is the plan based on current science?*** Yes
    Grading the floodplain for lateral connectivity, installing constructed riffles, toe wood, using a reference reach to guide design and off channel wetlands are all components based on current science utilizing Natural Channel Design.
12. ***List indicators of project outcomes at this stage of project:***
    The stream is laterally connected to the floodplain, no longer incised and banks have been sloped to reduced erosion. Sediment and turbidity samples were collected pre-project and continue to be collected up and downstream of the project; however, analysis of data is not yet complete. Vegetation is growing along the channel, in the floodplain and in wetland areas. The channel has experienced bankfull flows since construction and pools are maintaining depth on outside bends, deposition is occurring on inside bends and no aggradation or degradation is evident.
13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    Yes, laterally connecting a stream channel to its floodplain will allow for better flood management, reduced sedimentation, reduced bank erosion, and stream stabilization which all lead to improved aquatic habitat.
14. ***Are corrections or modifications needed to meet proposed outcomes?***
    No.

15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    Yes, they do have a vegetative invasive species plan and they are currently mowing the floodplain to control invasives. Unfortunately, invasive species will be a continued problem as seeds are brought into the area by the stream itself, management of invasives will be a long-term problem.
16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No.
17. ***Are follow-up assessments needed? Explain.***
    A portion of the project was re-built in 2018 (see #18 below for more information), this area should be assessed again in 2019 for stability. Vegetation and sediment assessments should continue as planned to evaluate the success of the project.
18. ***Additional comments on the restoration project.***
    Overall this is a well thought out, well designed and coordinated project. This project was a result of project partners working closely together to improve Cascade Creek. The ongoing monitoring of sediment and turbidity in the stream is a process that is rarely done with stream restoration projects and shows the commitment of the project partners to ensure a successful project. The size and scope of the project also indicate the commitment of project partners to improve the watershed; many stream restoration projects do not attempt to tackle such a large area/problem.
    It should be noted that a small section of the channel had a partial failure in 2018 at a transitional location between two different channel types at the end of the restoration section. The SWCD and DNR responded quickly assessed the problem and the cause and repaired the problem with new elevations and dimensions to better fit the natural tendencies of the stream at this location.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***
    Reconnecting an incised stream channel with its floodplain will decrease erosion and decrease sedimentation by reducing the energy in the channel during high flows. Reducing erosion and sediment will improve aquatic habitat and water quality. Construction of wetlands will help retain water during
21. ***Site Assessor(s) Conducting Review:***
    Anna Varian, Stantec.

Appendix A: Site maps, Project plans or Vegetation tables

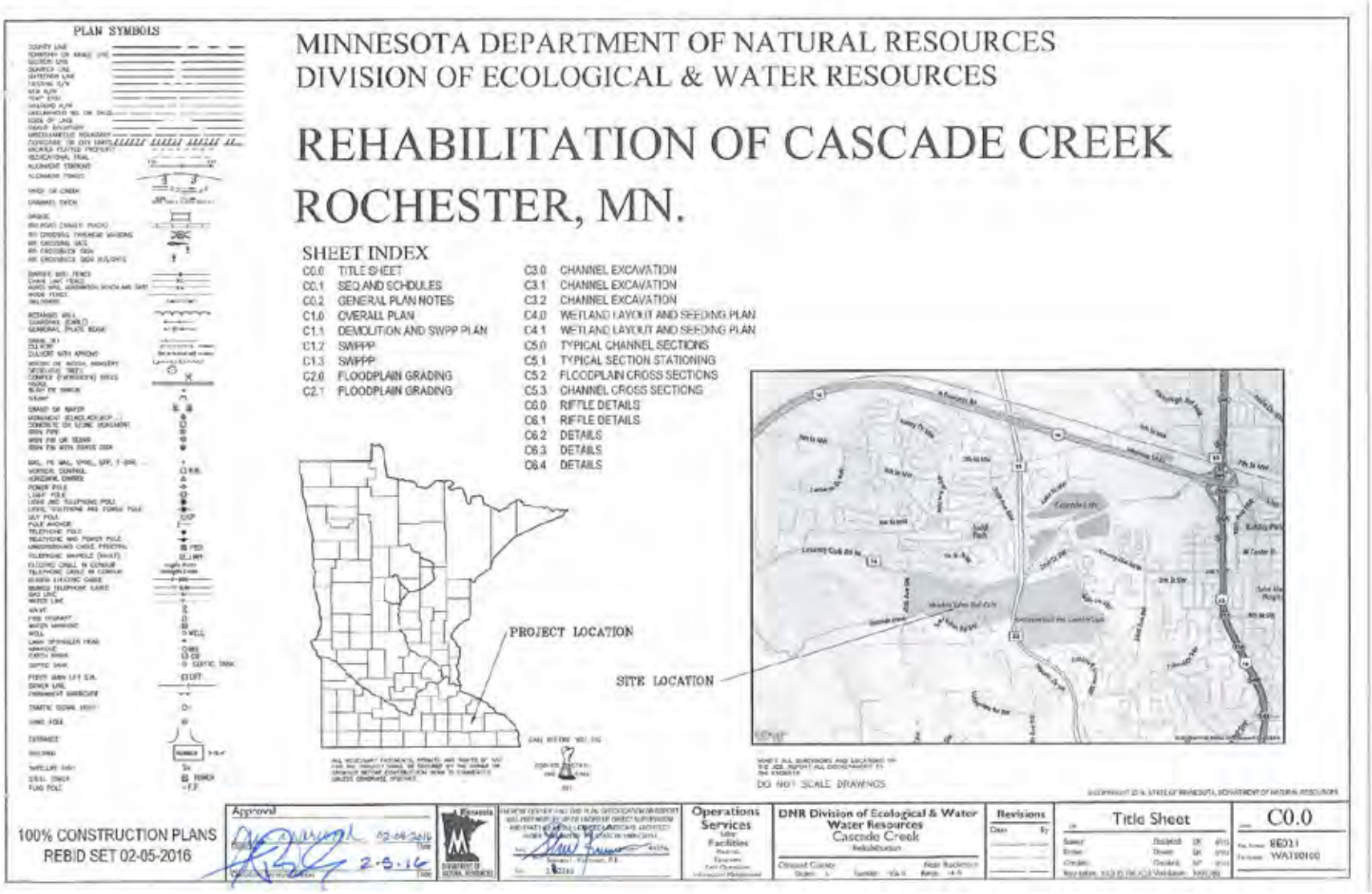


Figure 1-1 Construction plans sheet 1 of 23, title page.

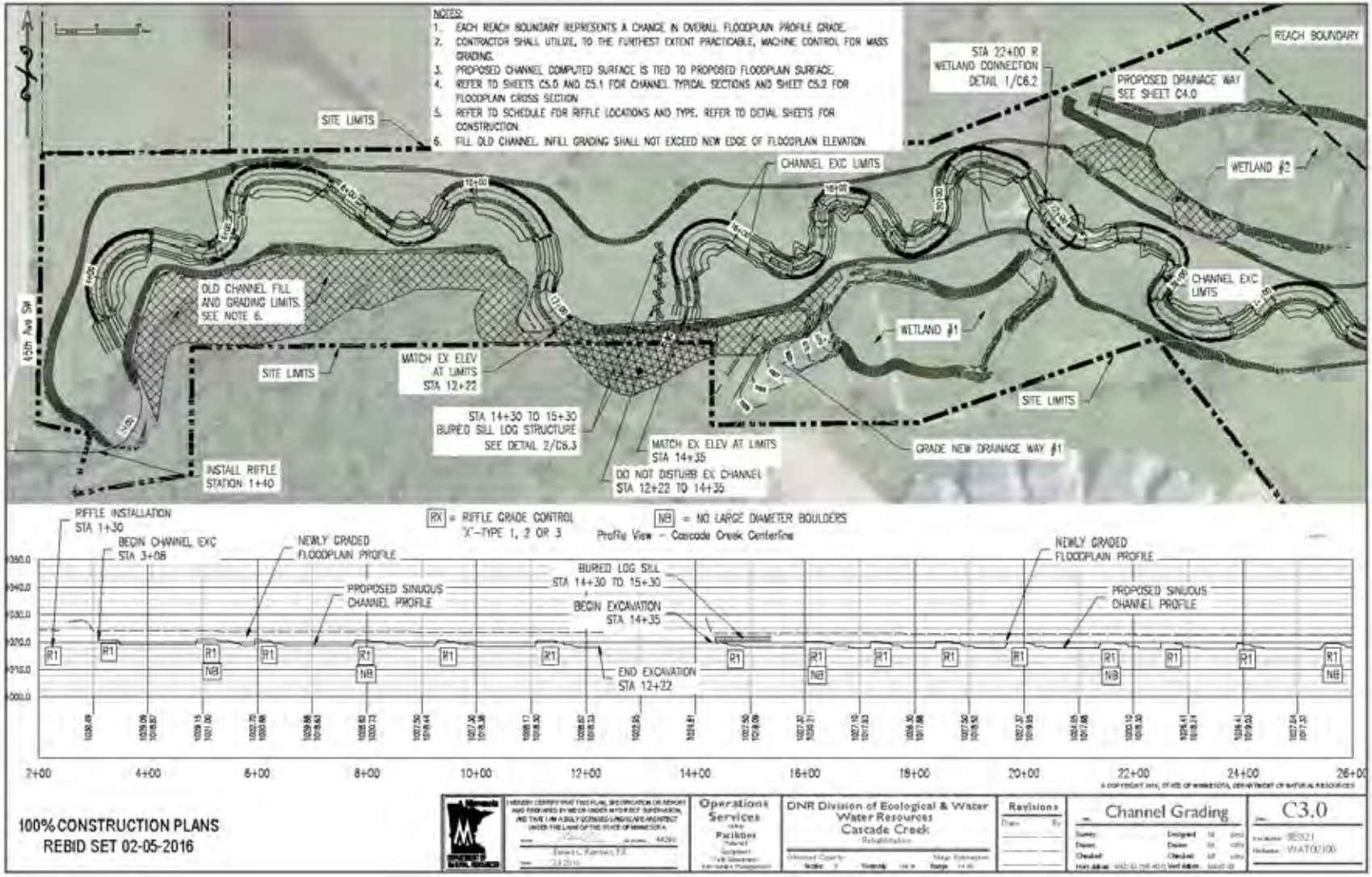


Figure 1-2 Construction plans sheet 10 of 23, plan and profile station 02+00 to 26+00.

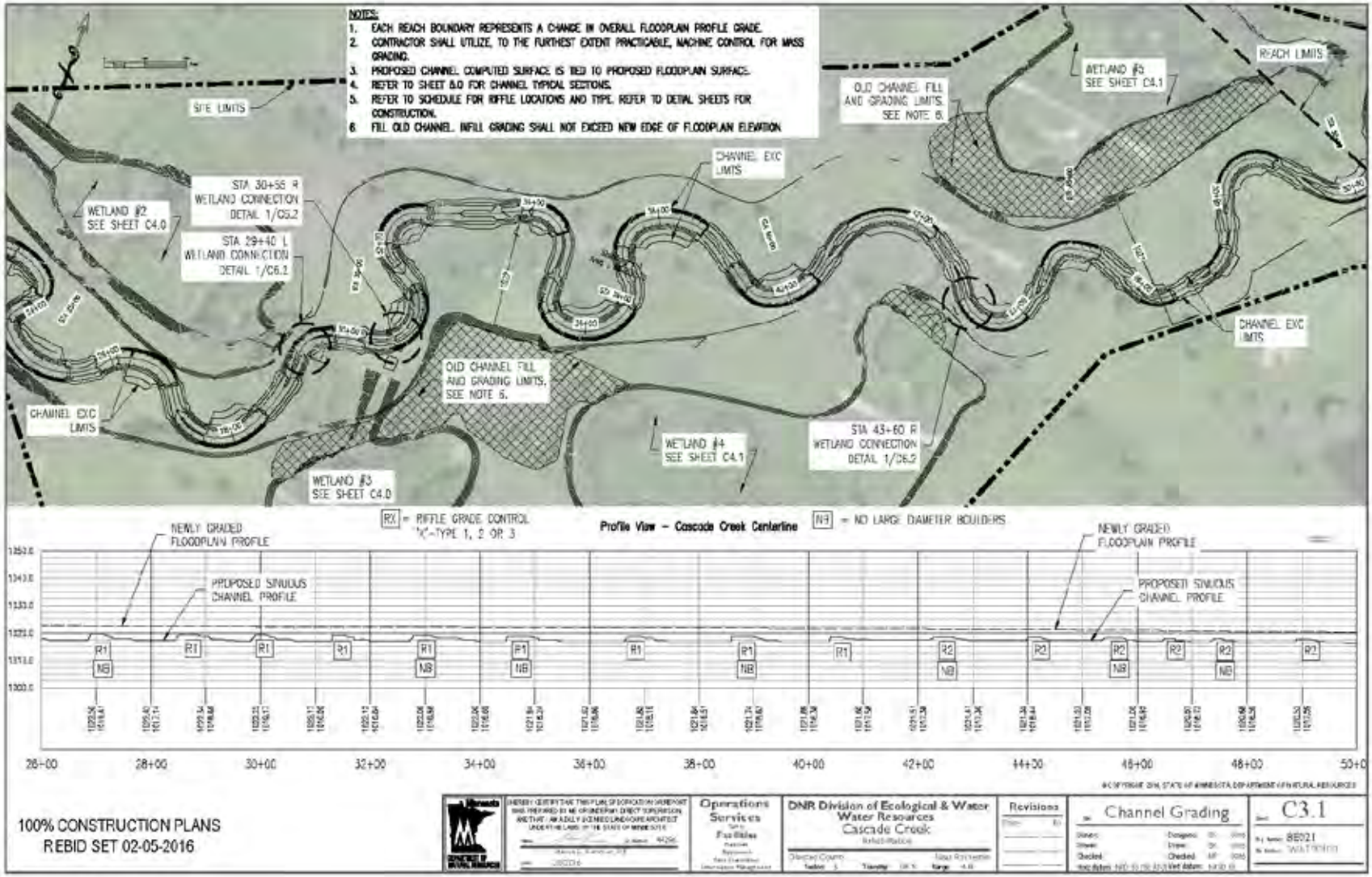


Figure 1-3 Construction plans sheet 11 of 23, plan and profile station 26+00 to 50+00.

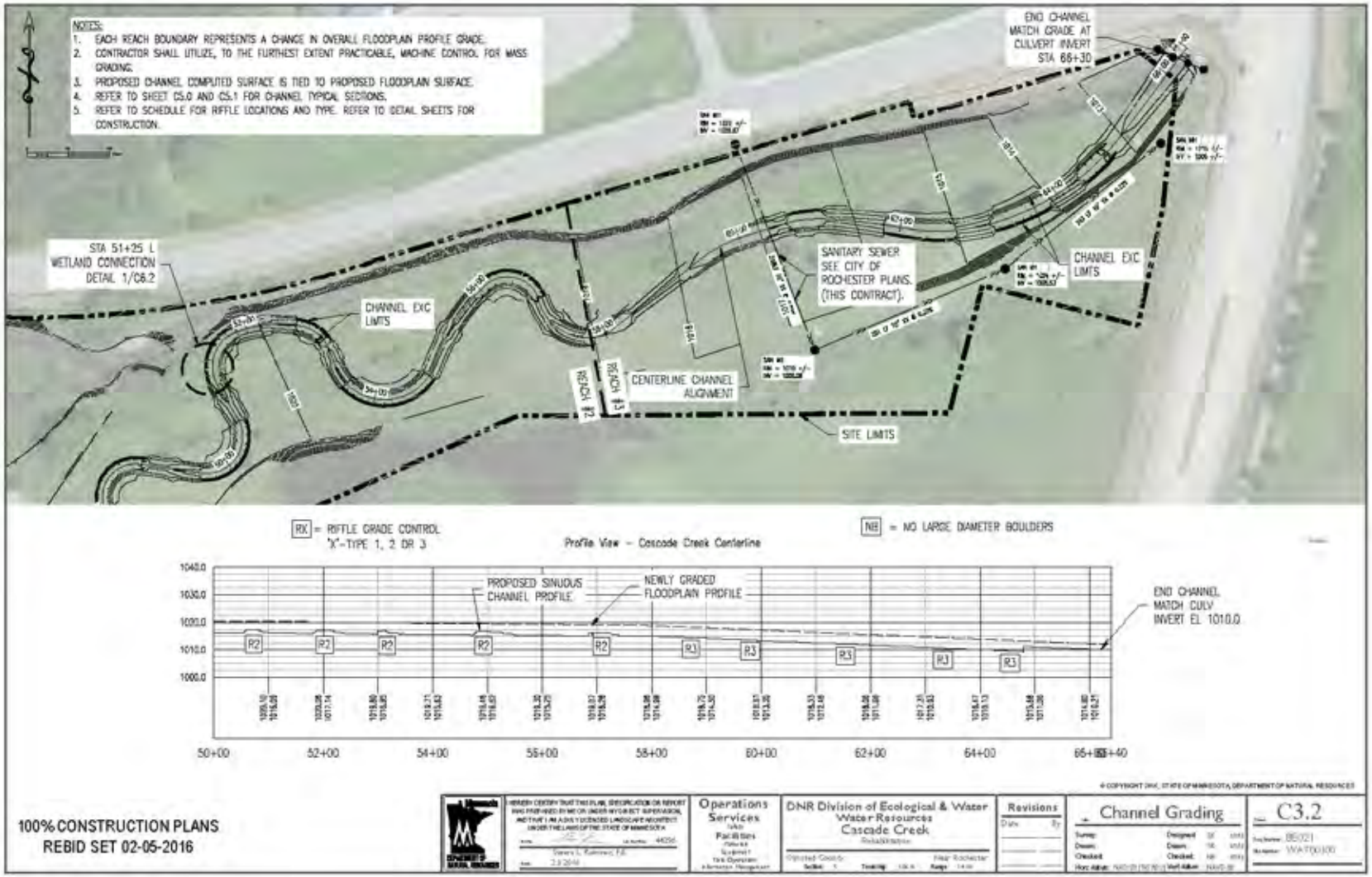


Figure 1-4 Construction plans sheet 12 of 23, plan and profile station 50+00 to 66+40.

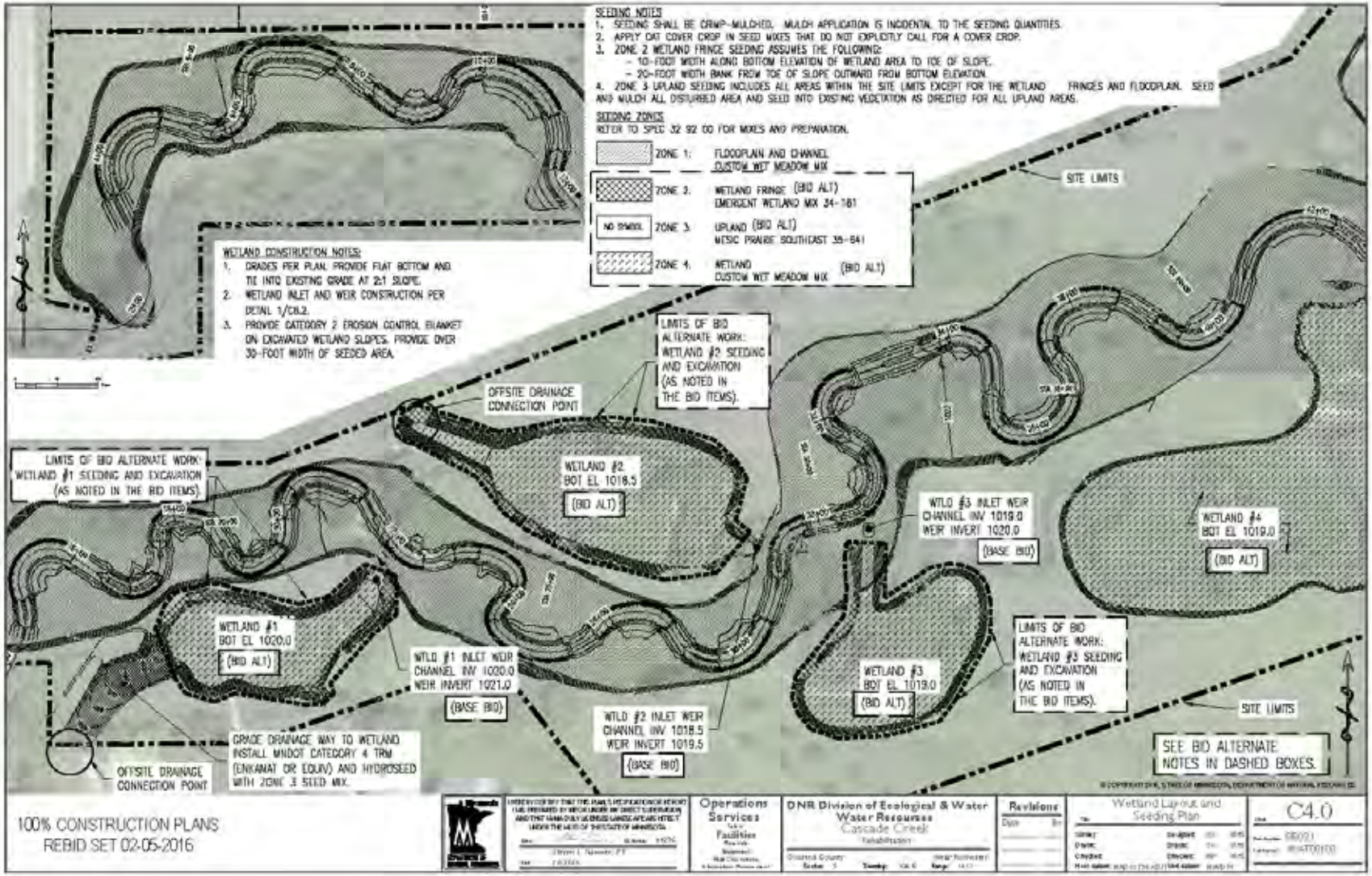


Figure 1-5 Construction plans sheet 13 of 23, wetland construction.

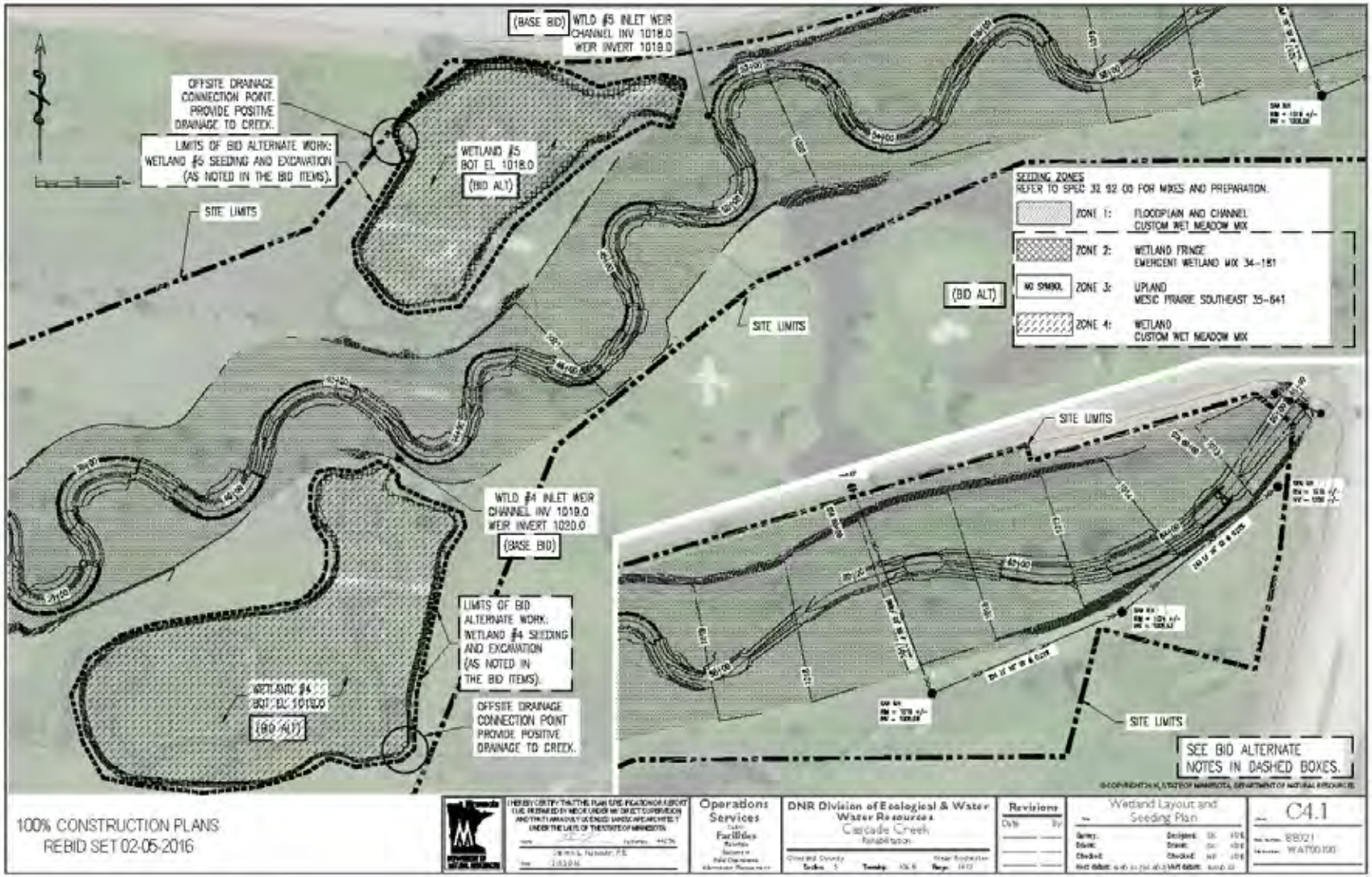


Figure 1-6 Construction plans sheet 14 of 23, wetland construction continued.

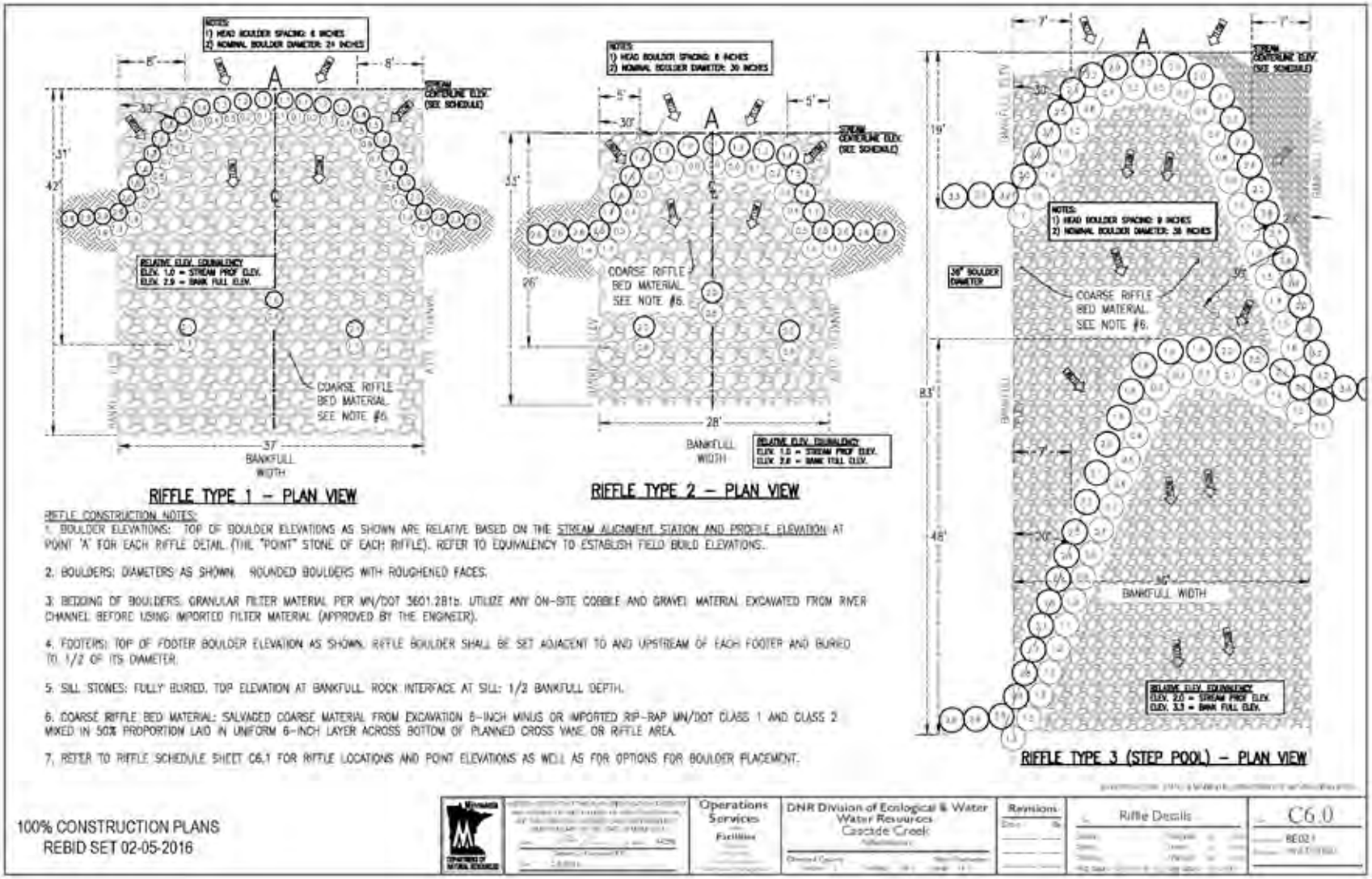
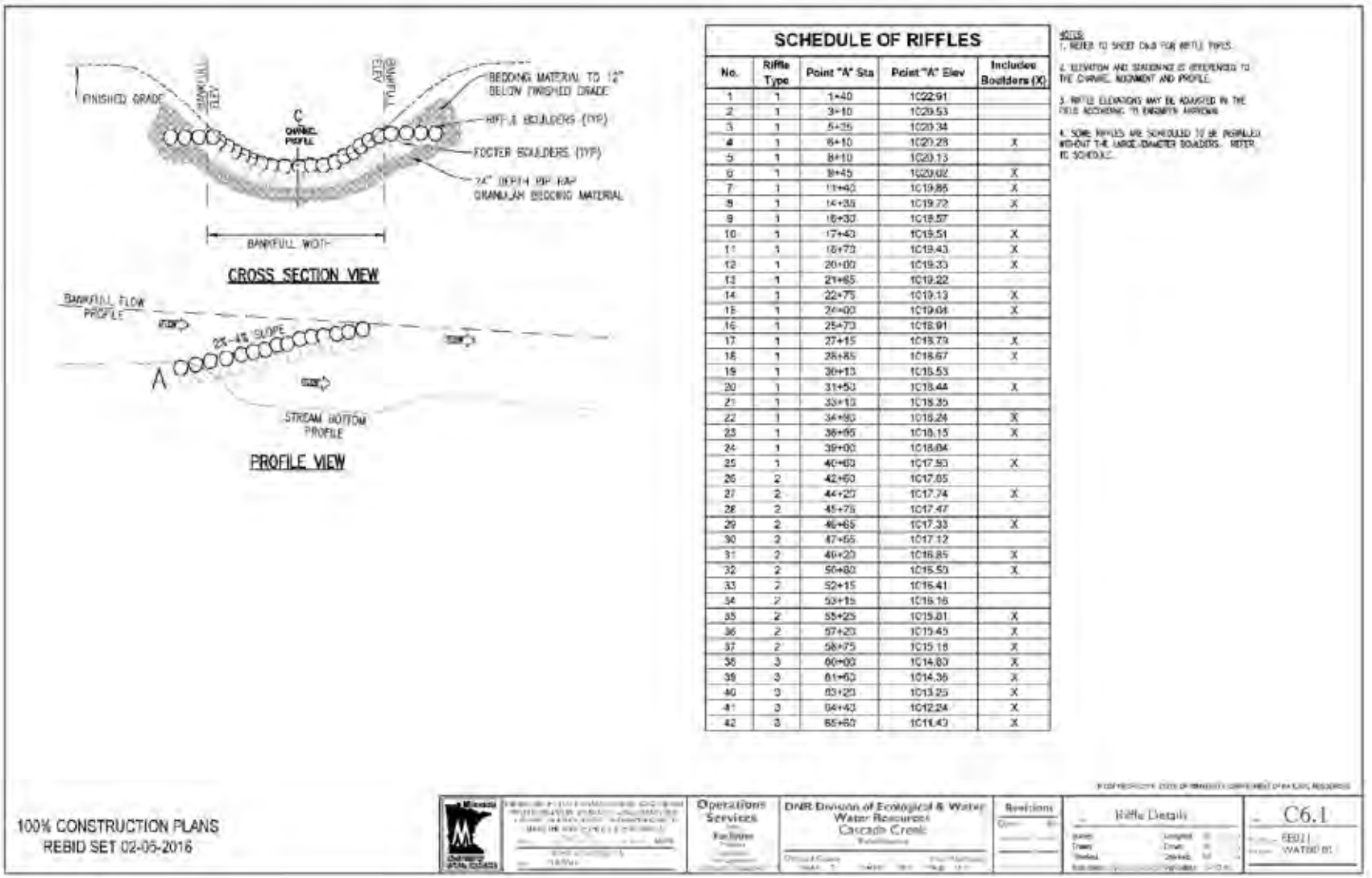


Figure 1-7 Construction plans sheet 19 of 23, riffle details.



No.	Riffle Type	Point "A" Sta	Point "A" Elev	Includes Boulders (X)
1	1	1+40	1022.91	
2	1	3+10	1020.53	
3	1	5+35	1020.34	
4	1	6+10	1020.28	X
5	1	8+10	1020.13	
6	1	9+45	1020.02	X
7	1	13+40	1019.86	X
8	1	14+35	1019.72	X
9	1	16+30	1018.57	
10	1	17+40	1019.51	X
11	1	18+70	1018.43	X
12	1	20+00	1019.33	X
13	1	21+65	1019.22	
14	1	22+75	1019.13	X
15	1	24+00	1019.04	X
16	1	25+70	1018.91	
17	1	27+15	1018.79	X
18	1	28+85	1018.67	X
19	1	30+13	1018.53	
20	1	31+50	1018.44	X
21	1	33+10	1018.35	
22	1	34+80	1018.24	X
23	1	36+95	1018.15	X
24	1	39+00	1018.04	
25	1	40+60	1017.93	X
26	2	42+60	1017.85	
27	2	44+20	1017.74	X
28	2	45+75	1017.47	
29	2	46+85	1017.33	X
30	2	47+55	1017.12	
31	2	49+20	1016.85	X
32	2	50+80	1015.53	X
33	2	52+15	1015.41	
34	2	53+15	1015.16	
35	2	55+25	1015.01	X
36	2	57+20	1015.45	X
37	2	58+75	1015.18	X
38	3	60+00	1014.80	X
39	3	61+60	1014.36	X
40	3	63+25	1013.25	X
41	3	64+40	1012.24	X
42	3	65+60	1011.40	X

Figure 1-8 Construction plans sheet 20 of 23, riffle details and table.

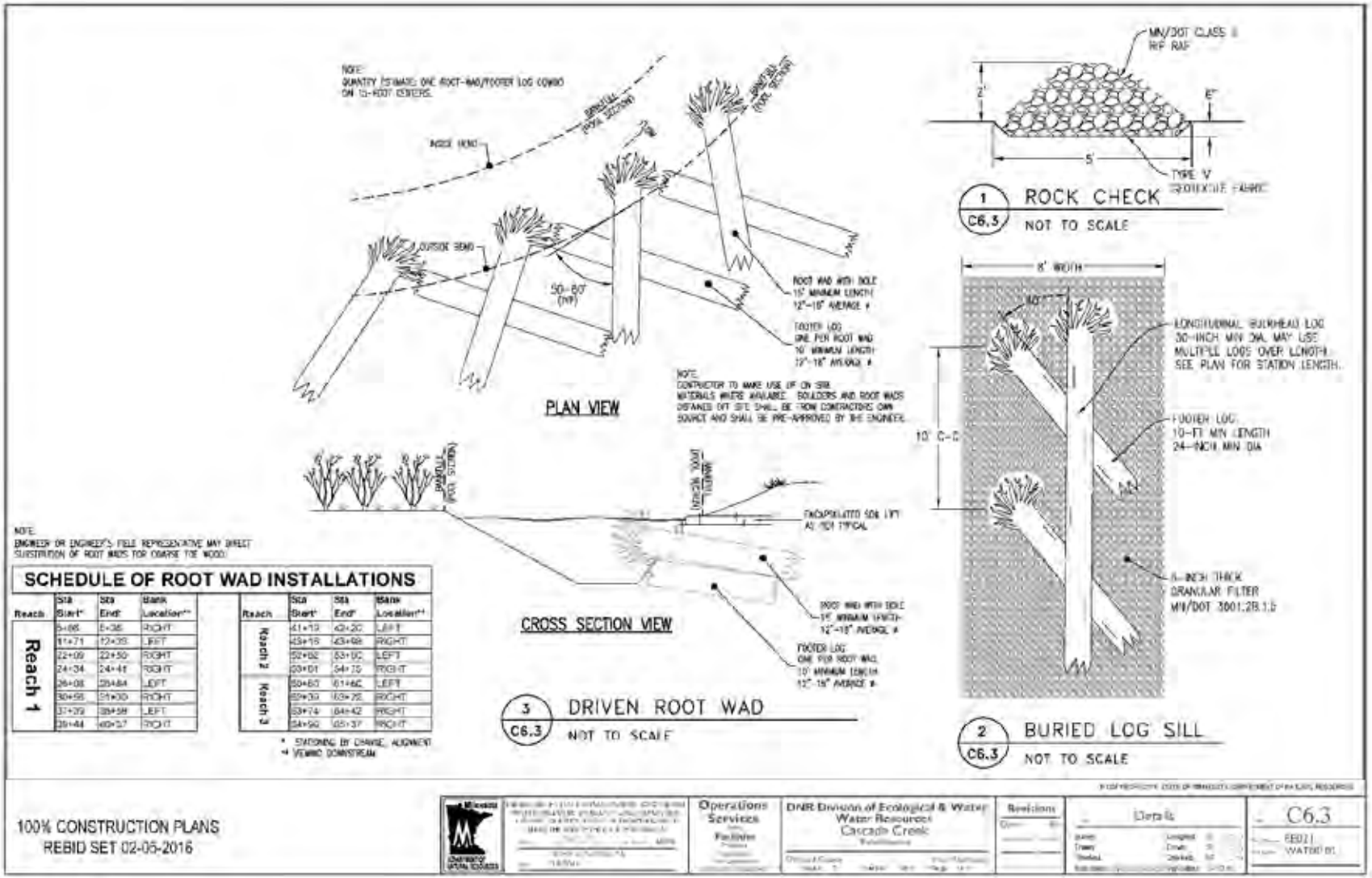


Figure 1-9 Construction plans sheet 22 of 23, root wad, rock check and buried log sill details.

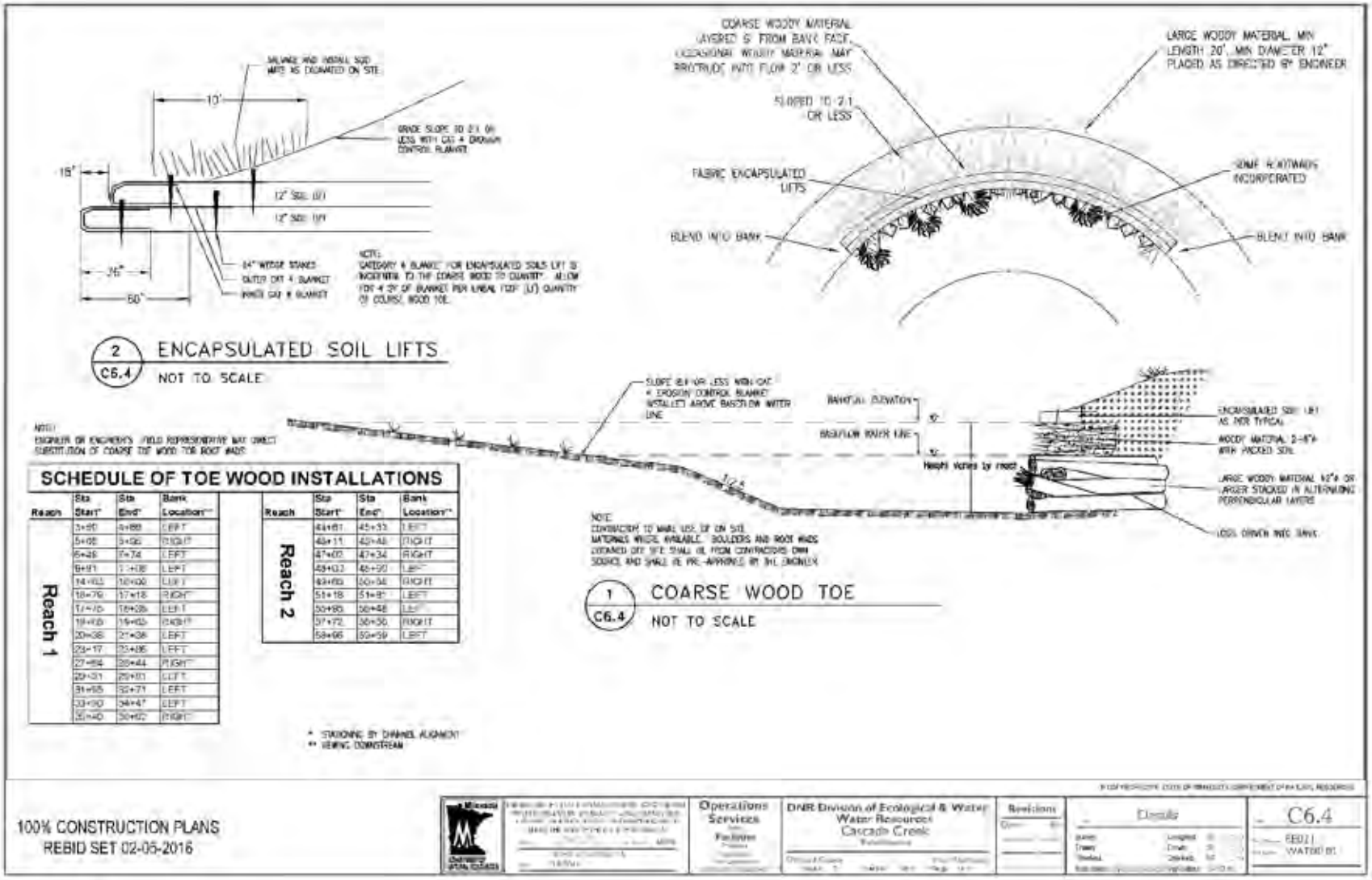


Figure 1-10 Construction plans sheet 23 of 23, soil lift and coarse wood toe details.

Table 1-1 Results of meander survey through project area. Cover ranges were estimated visually within the construction area. Survey occurred during site visit 9:30-10:30 AM, 10/24/18 by Wade Johnson, DNR.

Scientific Name	Common Name	Cover Range	Species Planted/Seeded	Species Status
Setaria pumila	Yellow Foxtail	25-50%	N	Nonnative
Symphyotrichum ericoides	Heath Aster	25-50%	Y	Native
Rubbeckia hirta	Common Black-eyed Susan	25-50%	Y	Native
Monarda fistulosa	Monarda	25-50%	Y	Native
Ratibida pinnata	Grey Headed Coneflower	25-50%	Y	Native
Verbena stricta	Blue Vervain	5-25%	Y	Native
Salix interior	Sandbar Willow	5-25%	N	Native
Symphyotrichum novae-angliae	New England Aster	5-25%	Y	Native
Rudbeckia laciniata	Cutleaf Coneflower	5-25%	N	Native
Ambrosia trifida	Great Ragweed	5-25%	N	Native
Medicago sativa	Alfalfa	5-25%	N	Nonnative
Rumex crispus	Curley Dock	5-25%	N	Nonnative
Melilotus sp	Sweet Clover	5-25%	N	Invasive
Phalaris arundinacea	Reed Canary Grass	1- 5%	N	Invasive
Panicum capillare	Witch Grass	1-5%	N	Native
Leersia oryzoides	Rice Cut Grass	1-5%	Y	Native
Setaria faberi	Giant Foxtail	1-5%	N	Nonnative
Echinochloa crus-galli	Barnyard Grass	1- 5%	N	Nonnative
Bolboschoenus fluviatilis	River Bulrush	1- 5%	Y	Native
Schoenoplectus tabernaemontani	Soft stem Bulrush	1- 5%	Y	Native
Erigeron strigosus	Daisy Fleabane	1- 5%	N	Native
Solidago gigantea	Giant Goldenrod	1-5%	N	Native
Heliopsis helianthoides	Common Ox Eye	1-5%	Y	Native
Urtica dioica	Stinging Nettles	1- 5%	N	Native
Populus deltoides	Cottonwood	1- 5%	N	Native
Taraxacum officinale	Dandelion	1- 5%	N	Nonnative
Plantago major	Common Plantain	1- 5%	N	Nonnative
Hypericum perforatum	Common St John's Wort	1-5%	N	Nonnative
Cirsium arvense	Canada Thistle	1-5%	N	Invasive
Daucus carota	Queen Anne's lace	1- 5%	N	Invasive
Pastinaca sativa	Wild Parsnip	1- 5%	N	Invasive

TABLE 32 92 00 - 1

Custom Wet Meadow Mix

Seeding Rate: 8.32 lb/acre (1,471 seeds/sq. ft.)

Common Name	Scientific Name	% of Mix By Weight	Seeds/SF
Grasses			
Big Bluestem	Andropogon gerardii	0.96%	0.3
Blue Joint Grass	Calamagrostis canadensis	2.88%	24.7
Virginia Wild Rye	Elymus virginicus	1.68%	0.2
American Manna Grass	Glyceria grandis	4.33%	9.3
Rice Cut Grass	Leersia oryzoides	1.44%	1.5
Switchgrass	Panicum virgatum	0.72%	0.3
Fowl Bluegrass	Poa palustris	31.85%	126.5
Prairie Cord Grass	Spartina pectinata	0.72%	0.1
Sedges & Rushes			
Bebb's Oval Sedge	Carex bebbii	1.08%	1.1
Bottlebrush Sedge	Carex comosa	0.96%	0.9
Porcupine Sedge	Carex hystericina	0.96%	0.9
Fox Sedge	Carex stipata	1.08%	1.1
Brown Fox Sedge	Carex vulpinoidea	4.09%	12.5
Green Bulrush	Scirpus atrovirens	4.69%	65.9
Woolgrass	Scirpus cyperinus	17.31%	899.2
Softstem Bulrush	Scirpus validus	0.60%	0.6
Wildflowers			
Swamp Milkweed	Asclepias incarnata	0.24%	0.0
New England Aster	Aster novae-angliae	1.32%	2.7
Nodding Bur Marigold	Bidens cernua	0.48%	0.3
Joe Pye Weed	Eupatorium maculatum	0.96%	2.8
Boneset	Eupatorium perfoliatum	1.56%	7.6
Sneezeweed	Helenium autumnale	2.64%	10.5
Great St. John's Wort	Hypericum pyramidatum	1.20%	7.0
Monkey Flower	Mimulus ringens	3.73%	261.9
Wild Bergamot	Monarda fistulosa	1.44%	3.1
Mountain Mint	Pycnanthemum virginianum	1.32%	8.9
Yellow Coneflower	Ratibida pinnata	1.20%	1.1
Black-eyed Susan	Rudbeckia hirta	3.73%	10.5
Brown-eyed Susan	Rudbeckia triloba	1.44%	1.5
Blue Vervain	Verbena hastata	2.64%	7.5
Common Ironweed	Vernonia fasciculata	0.72%	0.5

Figure 1-11 Seed specifications for floodplain and channel areas.

TABLE 32 92 00 - 2

Standard Mix 34-181 Emergent Wetland Mix

Seeding Rate: 5.00 lb/acre (110.1 seeds/sq. ft.)

Common Name	Scientific Name	% of Mix By Weight	Seeds/SF
Grasses			
American Sloughgrass	Beckmannia syzigachne	14.00%	12.9
American Manna Grass	Glyceria grandis	5.00%	6.4
Rice Cut Grass	Leersia oryzoides	6.00%	3.7
Sedges & Rushes			
Bottlebrush Sedge	Carex comosa	3.60%	2.0
Lake Sedge	Carex lacustris	1.20%	0.2
Tussock Sedge	Carex stricta	0.80%	0.8
Spike Rush	Eleocharis acicularis	2.00%	2.6
Great Spike Rush	Eleocharis palustris	2.00%	1.9
Torrey's Rush	Juncus torreyi	0.80%	23.5
Three Square Rush	Scirpus americanus	4.60%	1.0
Woolgrass	Scirpus cyperinus	1.00%	31.2
River Bulrush	Scirpus fluviatilis	15.20%	1.2
Softstem Bulrush	Scirpus validus	8.80%	5.0
Forbs			
Sweet Flag	Acorus americanus	5.60%	0.7
Northern Water Plantain	Alisma triviale	8.00%	9.7
Swamp Milkweed	Asclepias incarnata	5.60%	0.5
Common Arrowhead	Sagittaria latifolia	6.00%	6.7
Giant Bur Reed	Sparganium eurycarpum	9.80%	0.1

Figure 1-12 Seed specifications for wetland areas.

TABLE 32 92 00 - 3

Standard Mix 35-641 Mesic Prairie Southeast Mix

Seeding Rate: 12.00 lb/acre (39.2 seeds/sq. ft.)

Common Name	Scientific Name	% of Mix By Weight	Seeds/SF
Grasses			
Slender Wheatgrass	Agropyron trachycaulum	7.49%	2.3
Big Bluestem	Andropogon gerardii	7.49%	3.3
Sideoats Grama	Bouteloua curtipendula	11.40%	3.0
Canada Wild Rye	Elymus canadensis	8.74%	2.0
Switchgrass	Panicum virgatum	1.75%	1.1
Little Bluestem	Schizachyrium scoparium	10.57%	7.0
Indiangrass	Sorghastrum nutans	16.64%	8.8
Forbs			
Butterfly Milkweed	Asclepias tuberosa	0.50%	0.1
Whorled Milkweed	Asclepias verticillata	0.08%	0.0
Heath Aster	Aster ericoides	0.08%	0.7
Smooth Blue Aster	Aster laevis	0.42%	1.0
Canada Milk Vetch	Astragalus canadensis	1.33%	1.0
Partridge Pea	Chamaecrista fasciculata	4.99%	0.6
White Prairie Clover	Dalea candidum	0.08%	0.1
Purple Prairie Clover	Dalea purpurea	0.75%	0.5
Showy Tick Trefoil	Desmodium canadense	1.25%	0.3
Ox-eye Sunflower	Heliopsis helianthoides	0.42%	0.1
Button Blazingstar	Liatris aspera	0.25%	0.2
Prairie Blazingstar	Liatris pycnostachya	0.25%	0.1
Wild Bergamot	Monarda fistulosa	0.25%	0.8
Yellow Coneflower	Ratibida pinnata	0.17%	0.2
Black-eyed Susan	Rudbeckia hirta	0.42%	1.7
Stiff Goldenrod	Solidago rigida	0.17%	0.3
Prairie Spiderwort	Tradescantia bracteata	0.33%	0.1
Blue Vervain	Verbena hastata	0.33%	1.4
Hoary Vervain	Verbena stricta	0.83%	1.0
Golden Alexanders	Zizia aurea 0.58% 0.3		
Cover Crop			
Oats	Avena sativa	22.46%	1.2

Figure 1-13 Seed specifications for upland areas.

Appendix B: Site Photographs

Photo 1-1 Upper end of restoration project.

Photo 1-2 One of the constructed wetlands created in the old channel.

Photo 1-3 Constructed riffle.

Photo 1-4 View of portion of project reconstruction in 2018.

Photo 1-5 B channel riffle at end of project.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

2) CWF Cascade Creek Tweite Retention Project

Project Background

Project Name: Tweite Retention Project

Project Site: South Branch Cascade Creek (See Attachment A Plan Sheet 1 of 12), Olmsted County

Township/Range Section: Township T107N Range R15W Section Sec 31

Project Manager / Affiliated Organization: Skip Langer/Olmsted County

Fund: CWF ***Fiscal Year Funds:*** FY 12

Project Start Date: April 13, 2014

Predominant Habitat type: Wetland

Additional Habitat types: Aquatic , Choose an item.

Project Status: Post Establishment Phase

County: Olmsted

Primary Activity: Stream/River Restoration

Project Size: Click here to enter text.

Project Completed: 2013

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   This project involved construction of two off-line wetland retention basins. This is the same design approach as the downstream Geomaat Site.
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   The following plans were provided and on file at Olmstead SWCD:
   - Cascade Creek Watershed Improvements, Preliminary Site Plan. WHKS Engineers

- South Branch Cascade Creek Watershed Improvements, construction documents. WHKS Engineers
- Technical Specifications for South Branch of Cascade Creek Watershed Improvements. WHKS Engineers

3. ***What are the stated goals of the project?***
   Flood attenuation, sediment storage and habitat enhancement
4. ***Were measures of restoration success identified in plans? Yes***
   If yes, list specific measurements.
   Proposed reductions for the three projects including Tweite, Goemaat, and stream restoration in the Cascade Creek Watershed: 87 ft3/sec Hydrology, 4080 lbs/year Phosphorus and 2006 tons/year sediment
5. ***Are plan Sets available?*** **Yes** ***Have new GIS maps been created?*** **No**
   If yes, provide in Appendix A and list Maps provided:
   Click here to enter text.
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***

Yes, the components of this project as listed below are based on current science.

1. Excavation of basin with low flow channel for storage.
2. Riprap spillways from stream channel into site.
3. Outlet control structure to discharge back into channel.
4. Seeding State Mixes 34-181, 34-271, 21-112, and 33-261.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***
   Click here to enter text.

Site Assessment

Field Review Date: Click here to enter a date.

Field Visit Attendees: Click here to enter text.

9. ***Surrounding Landscape Characteristics:***

The Tweite Site is surrounded by cultivated land to the north, west, east, and south. Cascade Creek is located upstream and downstream of the site and flows through the site.

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

The area of the proposed improvement is predominately Otter Silt Loam, Channeled. Otter Silt Loam typically has 0-2% slopes and is frequently flooded and ponded.

b. Topography:

The Tweite Site is the low spot in the landscape. Slopes to the north of the site are 2 - 6% and flatten out to a 2% slope closer to the site. Slopes south of the site are 1 – 4%.

c. Hydrology:

The hydrology developed at the site is a shallow marsh with a wet meadow fringe resulting in a seasonally flooded water regime in the deepest portions of the basin with saturation within 12 inches of the surface near the fringe.

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

The site is adjacent to a CRP grassland buffer. The creek corridor is predominantly Reed Canary Grass with interspersed Willow shrubs. The retention basins are mix of seeded and weedy grasses and forbs (see Table 2, 3, 4 seed mixes). Hybrid Cattail appears to be increasing in cover in the basins.

e. Vegetation B: Meander Search Species List (as appropriate for site)

See Table 1

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

Typically rate control practices are on-line approaches and involve weirs across the channel to re-establish floodplains of the channels. This is a unique approach that creates the rate control off-line outside the channel. This was done because the MNDNR regulators did not allow a weir to be constructed in the channel which was a DNR protected waterway. The BMPs that were part of the design are based on current science.

12. List indicators of project outcomes at this stage of project:

This assessment was completed approximately 4 years after installation. Sedimentation was observed within the detention basin indicating it is capturing sediment and receiving flows.

13. Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?

The retention features appeared to be functioning as desired by taking flows from the stream during moderate size storm events and routing them through the detention basins prior to discharge back into the channel. There will be automated digital turbidity sampling taking place upstream and downstream of all the improvements that were part of the Cascade Creek Watershed Projects to help determine if these combined projects are going to achieve the proposed outcomes.

14. Are corrections or modifications needed to meet proposed outcomes?

No corrections needed currently, however the riprap spillway into the detention basins will need to be monitored and may require repair and maintenance. Corrections to fix the spillways have occurred once since construction after a large storm event. The depth of Class IV riprap was installed at 18-inches thick. The largest rock in this Class of riprap is approximately 24-inches. Often the depth of riprap is designed to be 1.5 times the largest rock (which would be 36 inches with Class IV riprap specification) to provide a gradation of riprap creating a more stable overflow point. In addition, the water is flowing through the riprap at lower elevations. The hope is that over time the riprap will fill with silt, so flows go over the top of the spillway rather than through the rock. A gradation of smaller rock and thicker depths of riprap may also help.

15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***

    The project site access is good, which makes long term management practical and reasonable. Some challenges include maintenance at the upstream spillways to insure they are overtopping during moderate sized storm events and are structurally stable. Sediment build up at the upstream spillway locations overtime could prevent moderate storm event flood flows from entering the detention basins. This was recognized by the project sponsor so removal of sediment, as well as inspections of these features by the county, are included in the Operations and Maintenance Agreement for the project.

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

    No

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

    No. The installed practices are functioning as designed and monitored by the Olmsted SWCD.

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

    This is a difficult site to manage for desired/seeded vegetation due to the abundant weed seed blowing and washing into the basins (esp. Reed Canary Grass and hybrid cattail). Continued monitoring and maintenance will be needed to sustain a more diverse plant community.

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.

19. ***The project will:***

    Meet proposed outcomes

    Confidence of outcome determination:

    High

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

There is evidence that the site is functioning as planned by the observations of flows entering the detention basins from the stream channel and observation of sediment within the detention basins. As with most BMPs there will be periodic maintenance required to sustain the functioning of the system, specifically at the overflow points into the basins.

21. ***Site Assessor(s) Conducting Review:***

    John Smyth, Stantec Water Resources Specialist, and Wade Johnson, DNR Restoration Evaluation Coordinator

Appendix A: Site maps, Project plans or Vegetation tables

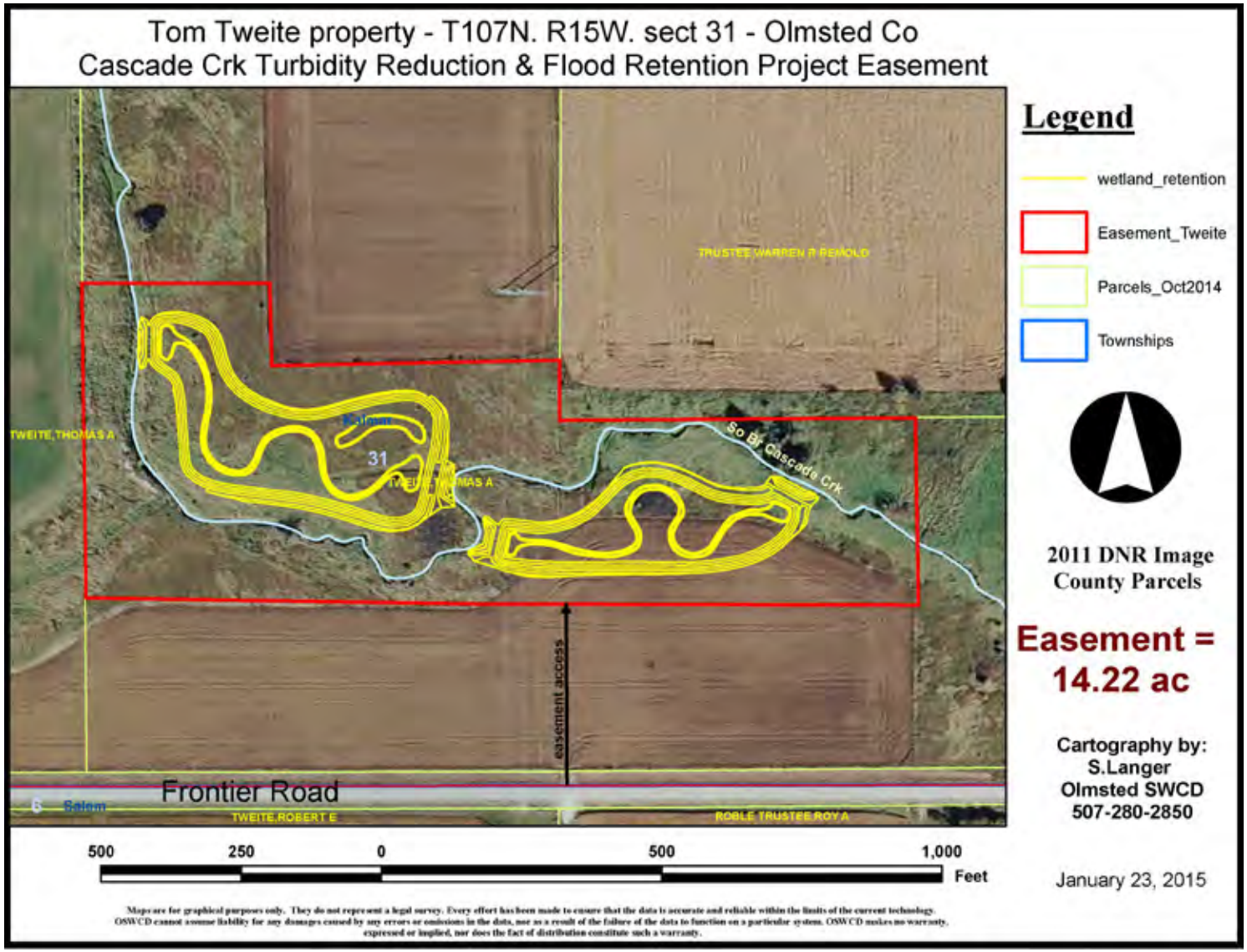


Figure 2-1 Overview of Tweite Retention site.

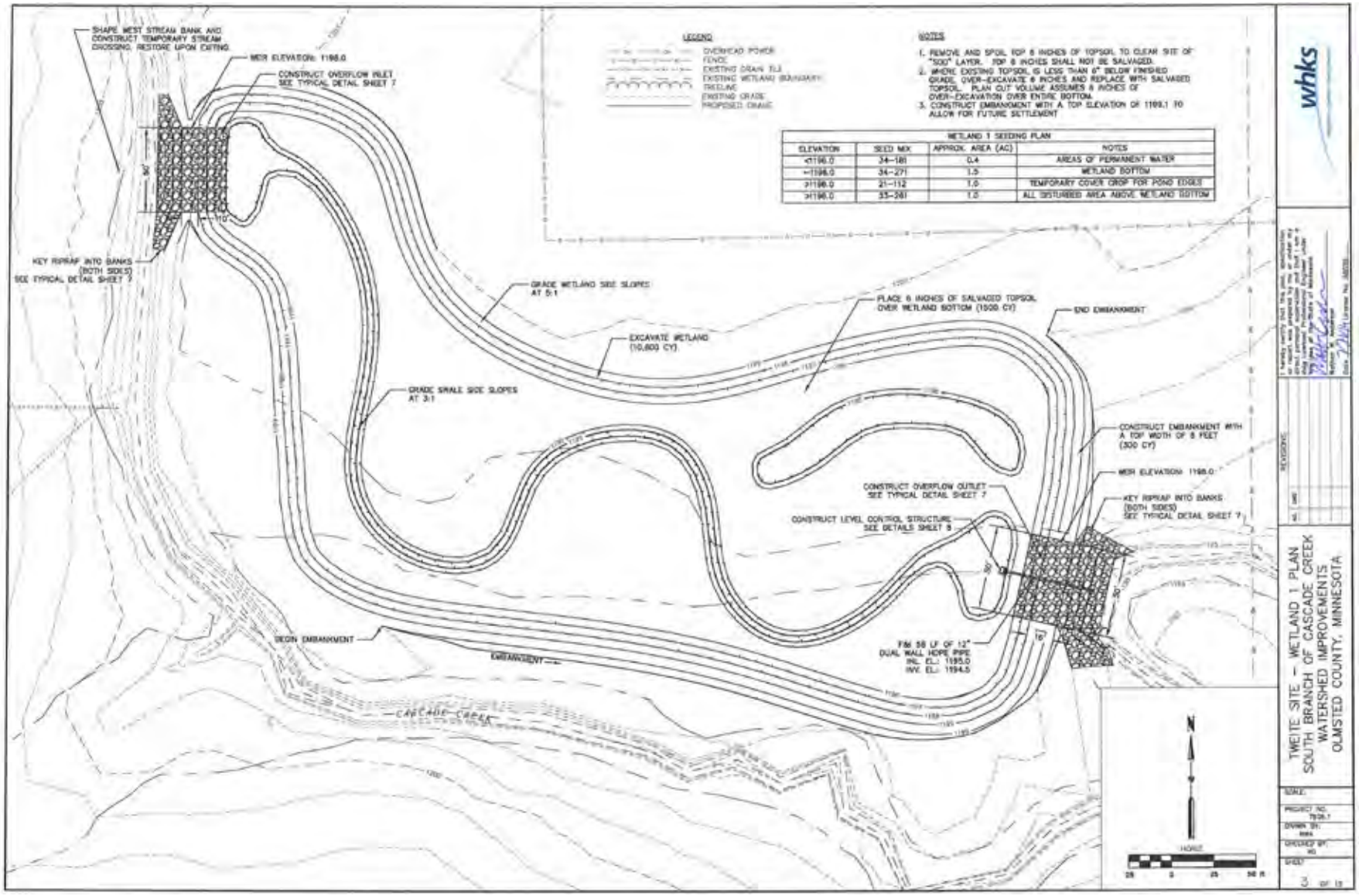


Figure 2-2 Tweite upper basin

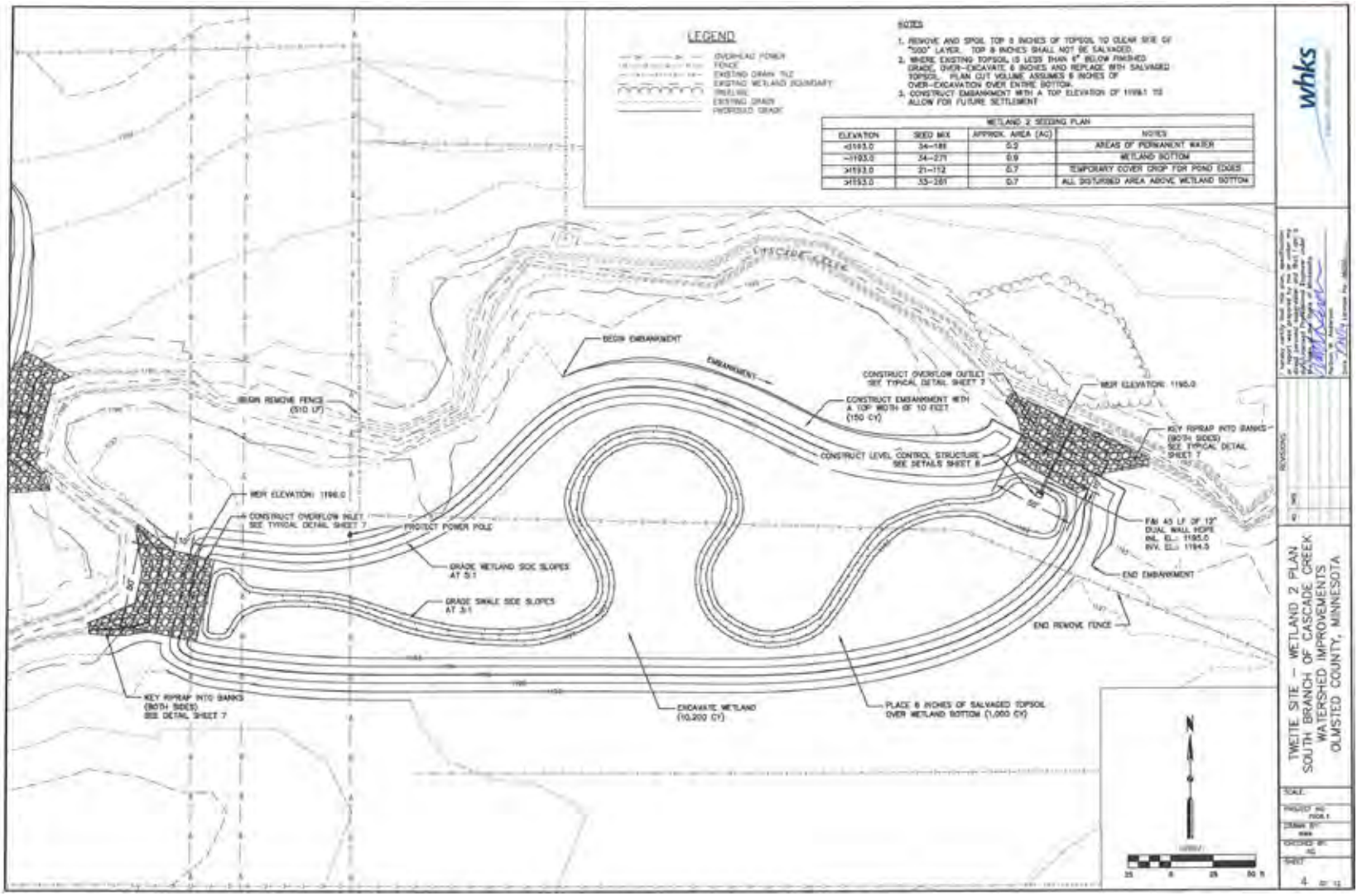


Figure 2-3 Tweite lower basin

Table 2-1 Results of meander survey through project area. Cover ranges were estimated visually within the construction area. Survey occurred during site visit 10/24/18 by Wade Johnson, DNR.

Scientific Name	Common Name	Cover Range	Species Planted/Seeded	Species Status
Phalaris arundinacea	Reed Canary Grass	50-75%	N	Invasive
Andropogon gerardii	Big Bluestem	25-50%	Y	Native
Typha ×glauca	Hybrid Cattail	25-50%	N	Invasive
Panicum virgatum	Switchgrass	25-50%	Y	Native
Symphyotrichum ericoides	Heath Aster	25-50%	Y	Native
Elymus virginicus	Virginia Wild Rye	5-25%	Y	Native
Spartina pectinata	Prairie Cord Grass	5-25%	Y	Native
Leersia oryzoides	Rice Cut Grass	5-25%	Y	Native
Bolboschoenus fluviatilis	River Bulrush	5-25%	Y	Native
Salix interior	Sandbar Willow	5-25%	N	Native
Zizia aurea	Golden Alexanders	5-25%	Y	Native
Solidago canadensis	Canada Goldendrod	5-25%	N	Native
Asclepias incarnata	Swamp Milkweed	5-25%	Y	Native
Schoenoplectus tabernaemontani	Soft stem Bulrush	1- 5%	Y	Native
Scirpus atrovirens	Dark Green Bulrush	1-5%	Y	Native
Urtica dioica	Stinging Nettles	1-5%	N	Native
Oenothera biennis	Evening Primrose	1-5%	N	Native
Bidens sp	Beggar Ticks	1-5%	N	Native
Rumex crispus	Curley Dock	1-5%	N	Nonnative
Symphyotrichum novae-angliae	New England Aster	1-5%	Y	Native
Populus deltoides	Cottonwood	1-5%	N	Native
Ambrosia trifida	Great Ragweed	1-5%	N	Native
Alisma subcordatum	Water Plantain	1-5%	Y	Native
Lobelia siphilitica	Blue Lobelia	1-5%	Y	Native

Table 2-2 Seed mix. MNDOT Mix 33-261 Stormwater South and West. 1 acre.

Scientific Name	Common Name	Origin	Mix Percent	Pure Live Seed pounds	Bulk pounds
Agropyron trachycaulum	Slender Wheatgrass	Canada	2.86	1	1.06
Andropogon gerardii	Big Bluestem	MN, WI	2.86%	1	1.06
Elymus virginicus	Virginia Wild Rye	MN	5.71%	2	2.43
Calamagrostis Canadensis	Blue Joint Grass	MN	0.17%	0.06	0.08
Panicum virgatum	switchgrass	MN	1.09%	0.38	0.61
Spartina pectinata	prairie cordgrass	MN	1.09%	0.38	0.61
Sorghastrum nutans	Indian grass	MN, IA	0.34%	0.12	0.15
Poa paulustris	Fowl Bluegrass	Canada	3.03%	1.05	1.15
Carex stipata	awl-fruited sedge	MN	0.71%	0.25	0.31
Scirpus atrovirens	dark green bulrush	MN	0.54%	0.19	0.20
Scirpus cyperinus	woolgrass	MN	0.17%	0.06	0.06
Zizia aurea	golden alexanders	IA	0.20%	0.07	0.08
Helenium autumnale	autumn sneezeweed	MN	0.37%	0.13	0.15
Asclepias incarnata	marsh milkweed	MN	0.31%	0.11	0.12
Bidens frondosa	beggarticks	MN	0.31%	0.11	0.12
Anemone canadensis	Canada anemone	IA	0.20%	0.07	0.08
Physostegia virginiana	obedient plant	MN	0.20%	0.07	0.08
Rudbeckia laciniata	tall coneflower	WI	0.20%	0.07	0.08
Symphyotrichum novae-angliae	New England aster	MN	0.37%	0.13	0.19
Eutrochium maculatum	spotted Joe pye weed	IA	0.17%	0.06	0.07
Verbena hastata	blue vervain	MN, IA	0.14%	0.05	0.05
Triticum aestivum	Winter Wheat	Cultivar	71.43%	25	27.31

Table 2-3 Seed mix. MNDOT Mix 34-271 Wet Meadow South and West. 4.2 Acres.

Scientific Name	Common Name	Origin	Mix Percent	Pure Live Seed pounds	Bulk pounds
Elymus virginicus	Virginia Wild Rye	MN	17.50%	8.82	10.05
Calamagrostis Canadensis	Blue Joint Grass	MN	0.42%	0.21	0.28
Glyceria grandis	Fowl Manna Grass	MN	0.38%	0.63	0.68
Leersia oryzoides	Rice Cut Grass	MN	2.08%	1.05	1.15
Poa paulustris	Fowl Bluegrass	Canada	2.92%	1.47	1.59
Carex comosa	Bottlebrush Sedge	MN	2%	1.01	1.19
Carex scoparia	Pointed-broom Sedge	MN	0.42%	0.21	0.23
Carex stipata	Fox Sedge	MN	1.42%	0.71	0.88
Carex vulpinoidea	Brown Fox Sedge	MN	1.17%	0.59	0.61
Juncus tenuis	Path Rush	WI	0.33%	0.17	0.18
Scirpus atrovirens	Green Bulrush	MN	1.5%	0.76	0.82
Scirpus cyperinus	Woolgrass	MN	0.67%	0.34	0.36
Asclepias incarnate	Swamp Milkweed	MN	2%	1.01	1.07
Aster puniceus	Swamp Aster	WI	1.42%	0.71	0.74
Symphyotrichum novae-angliae	New England Aster	MN	0.25%	0.13	0.18
Eutrochium maculatum	Joe Pye Weed	IA	0.17%	0.08	0.10
Eutrochium perfoliatum	Boneset	MN	0.17%	0.08	0.09
Helenium autumnale	Sneezeweed	MN	0.25%	0.13	0.15
Helianthus grosseserratus	Sawtooth Sunflower	IA	0.50%	0.25	0.62
Lobilia sipilitica	Great Blue Lobilia	MN	0.17%	0.08	0.10
Mimulus ringens	Monkey Flower	MN	0.08%	0.04	0.05
Mondarda fistulosa	Wild Bergamot	MN	0.5%	0.25	0.27
Solidago rigida	Stiff Goldenrod	MN	0.08%	0.04	0.05
Thalictrum dasycarpum	Purple Meadow Rue	MN	0.04%	0.04	0.05
Verbena hastata	Blue Vervain	MN, IA	1.08%	0.55	0.59
Vernonia fasciculata	Ironweed	MN	0.25%	0.13	0.15
Veronicastrum virginicum	Culver's Root	IA	0.08%	0.04	0.05
Zizia aurea	Golden Alexanders	MN	2.08%	1.05	1.19
Triticum aestivum	Winter Wheat	Cultivar	56.33%	29.40	32.12

Table 2-4 Seed mix. MNDOT 34-181 Emergent Wetland Mix. 1 acre.

Scientific Name	Common Name	Origin	Mix Percent	Pure Live Seed pounds	Bulk pounds
Beckmannia syzigadia	American Slough Grass	MN	14%	0.70	0.75
Glyceria gradis	American Manna Grass	MN	5%	0.25	0.26
Leersia oryzoides	Rice Cut Grass	WI	5%	0.30	0.33
Carex comosa	Bottlebrush	MN	4.4%	0.22	0.26
Carex lacustris	Lake Sedge	WI	1.2%	0.06	0.07
Eleocharis obtuse	Blunt Spike Rush	MN	2%	0.10	0.12
Juncus torreyii	Torrey's Rush	SD	0.5%	0.04	0.04
Scirpus americanus	Three Square Rush	SD	4.6%	0.23	0.25
Scirpus cyperinus	Woolgrass	MN	1%	0.05	0.05
Bolboschoenus fluviatilis	River Bulrush	MN	15.20%	0.75	0.82
Scirpus validus	Softstem Bulrush	MN	6.5%	0.44	0.46
Sparganium eurycarpum	Giant Bur Reed	MN	15.4%	0.77	0.83
Alisma subcordatum	Water Plantain	MN	5%	0.40	0.46
Asclepias incarnate	Swamp Milkweed	MN	5.6%	0.28	0.30
Sagittaria latifolia	Common Arrowhead	WI	5%	0.30	0.32

Appendix B: Site Photographs

Photo 2-1 Retention basin at inlet, 10/24/18.

Photo 2-2 Cascade Creek at upstream spillway, 10/24/18.

Photo 2-3 Outlet structure of retention wetland.

Figure 2-4 Project manager photo from site inspection 09/03/2015.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

3) CWF Cascade Creek Geomaat Retention Project

Project Background

Project Name: Geomaat Retention Project

Project Site: South Branch Cascade Creek (See Attachment A Plan Sheet 1 of 12), Olmsted County

Township/Range Section: Township T106N Range R15W Section Sec 9

Project Manager / Affiliated Organization: Skip Langer/Olmsted County

Fund: CWF ***Fiscal Year Funds:*** FY 12

Project Start Date: April 13, 2014

Predominant Habitat type: Wetland

Additional Habitat types: Aquatic , Choose an item.

Project Status: Post Establishment Phase

County: Olmsted

Primary Activity: Stream/River Restoration

Project Size: 3.5 acres

Project Completed: 2013

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   This project involved construction of an off-line wetland retention basins. This is the same design approach as the upstream Tweite retention site.
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   The following plans were provided and on file at Olmstead SWCD:
   - Cascade Creek Watershed Improvements, Preliminary Site Plan. WHKS Engineers

- South Branch Cascade Creek Watershed Improvements, construction documents. WHKS Engineers
- Technical Specifications for South Branch of Cascade Creek Watershed Improvements. WHKS Engineers

3. ***What are the stated goals of the project?***
   Flood attenuation, sediment storage and habitat enhancement
4. ***Were measures of restoration success identified in plans? Yes***
   If yes, list specific measurements.
   Proposed reductions for the three projects including Tweite, Goemaat, and stream restoration in the Cascade Creek Watershed: 87 ft3/sec Hydrology, 4080 lbs/year Phosphorus and 2006 tons/year sediment
5. ***Are plan Sets available?*** **Yes** ***Have new GIS maps been created?*** **No**
   If yes, provide in Appendix A and list Maps provided:
   Click here to enter text.
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***

Yes, the components of this project as listed below are based on current science.

1. Excavation of basin with low flow channel for storage.
2. Riprap spillways from stream channel into site.
3. Outlet control structure to discharge back into channel.
4. Seeding State Mixes 34-181, 34-271, 21-112, and 33-261.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***
   Click here to enter text.

Site Assessment

Field Review Date: Click here to enter a date.

Field Visit Attendees: Click here to enter text.

9. ***Surrounding Landscape Characteristics:***

The site is surrounded by cultivated land to the north, west, east, and south. Cascade Creek is located upstream and downstream of the site and flows through the site.

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

The area of the proposed improvement is predominately Otter Silt Loam, Channeled. Otter Silt Loam typically has 0-2% slopes and is frequently flooded and ponded.

b. Topography:

The site is the low spot in the landscape. Slopes to the north and south of the site are 0-1% and are 0-2% as you get closer to the channel.

c. Hydrology:

The hydrology developed at the site is a predominately wet meadow with some areas of shallow marsh resulting in a seasonally flooded water regime in the deepest portions of the basin with saturation within 12 inches of the surface in the wet meadow areas.

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

The adjacent creek riparian zone is predominantly Reed Canary Grass with interspersed Sandbar Willow. The retention basin is are mix of seeded and weedy grasses and forbs (see Table 2, 3, 4 seed mixes). Hybrid Cattail appears to be increasing cover in the basin, to around 40%

e. Vegetation B: Meander Search Species List (as appropriate for site)

See Table 1

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

Typically rate control practices are on-line approaches and involve weirs across the channel to re-establish floodplains of the channels. This is a unique approach that creates the rate control off-line outside the channel. This was done because the MNDNR regulators did not allow a weir to be constructed in the channel which is a DNR protected waterway. The BMPs that were part of the design are based on current science.

12. List indicators of project outcomes at this stage of project:

This assessment was completed approximately 4 years after installation. Sedimentation was observed within the detention basin indicating it is capturing sediment and receiving flows.

13. Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?

The retention features appeared to be functioning as desired by taking flows from the stream during moderate size storm events and routing them through the detention basins prior to discharge back into the channel. There will be automated digital turbidity sampling taking place upstream and downstream of all the improvements that were part of the Cascade Creek Watershed Projects to help determine if these combined projects are going to achieve the proposed outcomes.

14. Are corrections or modifications needed to meet proposed outcomes?

No corrections needed currently, however the riprap spillway into the detention basins will need to be monitored and may require repair and maintenance. Corrections to fix the spillways have occurred once since construction after a large storm event. The depth of Class IV riprap was installed at 18-inches thick. The largest rock in this Class of riprap is approximately 24-inches. Often the depth of riprap is designed to be 1.5 times the largest rock (which would be 36 inches with Class IV riprap specification) to provide a gradation of riprap creating a more stable overflow point. In addition, the water is flowing through the riprap at lower elevations. The hope is that over time the riprap will fill with silt, so flows go over the top of the spillway rather than through the rock. A gradation of smaller rock and thicker depths of riprap may also help.

15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***

    The project site access is good, which makes long term management practical and reasonable. Some challenges include maintenance at the upstream spillways to insure they are overtopping during moderate sized storm events and are structurally stable. Sediment build up at the upstream spillway locations overtime could prevent moderate storm event flood flows from entering the detention basins. This was recognized by the project sponsor so removal of sediment, as well as inspections of these features by the county, are included in the Operations and Maintenance Agreement for the project.

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

    No

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

    No. The installed practices are functioning as designed and monitored by the Olmsted SWCD.

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

    This is a difficult site to manage for desired/seeded vegetation due to the abundant weed seed blowing and washing into the basins (esp. Reed Canary Grass and hybrid cattail). Continued monitoring and maintenance will be needed to sustain a more diverse plant community.

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.

19. ***The project will:***

    Meet proposed outcomes

    Confidence of outcome determination:

    High

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

    There is evidence that the site is functioning as planned by the observations of flows entering the detention basins from the stream channel and observation of sediment within the detention basins. As with most BMPs there will be periodic maintenance required to sustain the functioning of the system, specifically at the overflow points into the basins.

21. ***Site Assessor(s) Conducting Review:***

    John Smyth, Stantec Water Resources Specialist, and Wade Johnson, DNR Restoration Evaluation Coordinator

Appendix A: Site maps, Project plans or Vegetation tables

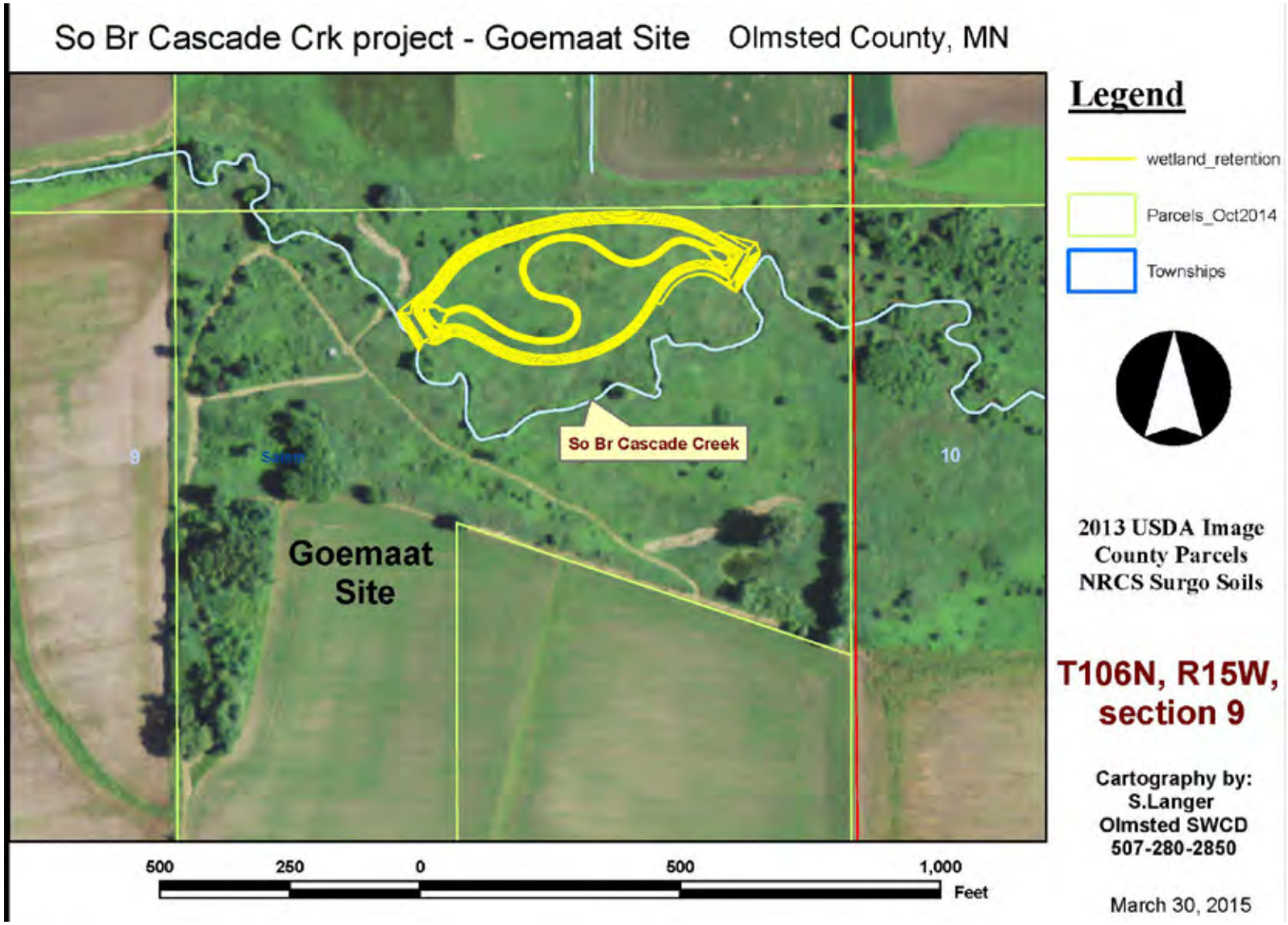


Figure 3-1 Overview of Geomaat Retention site.

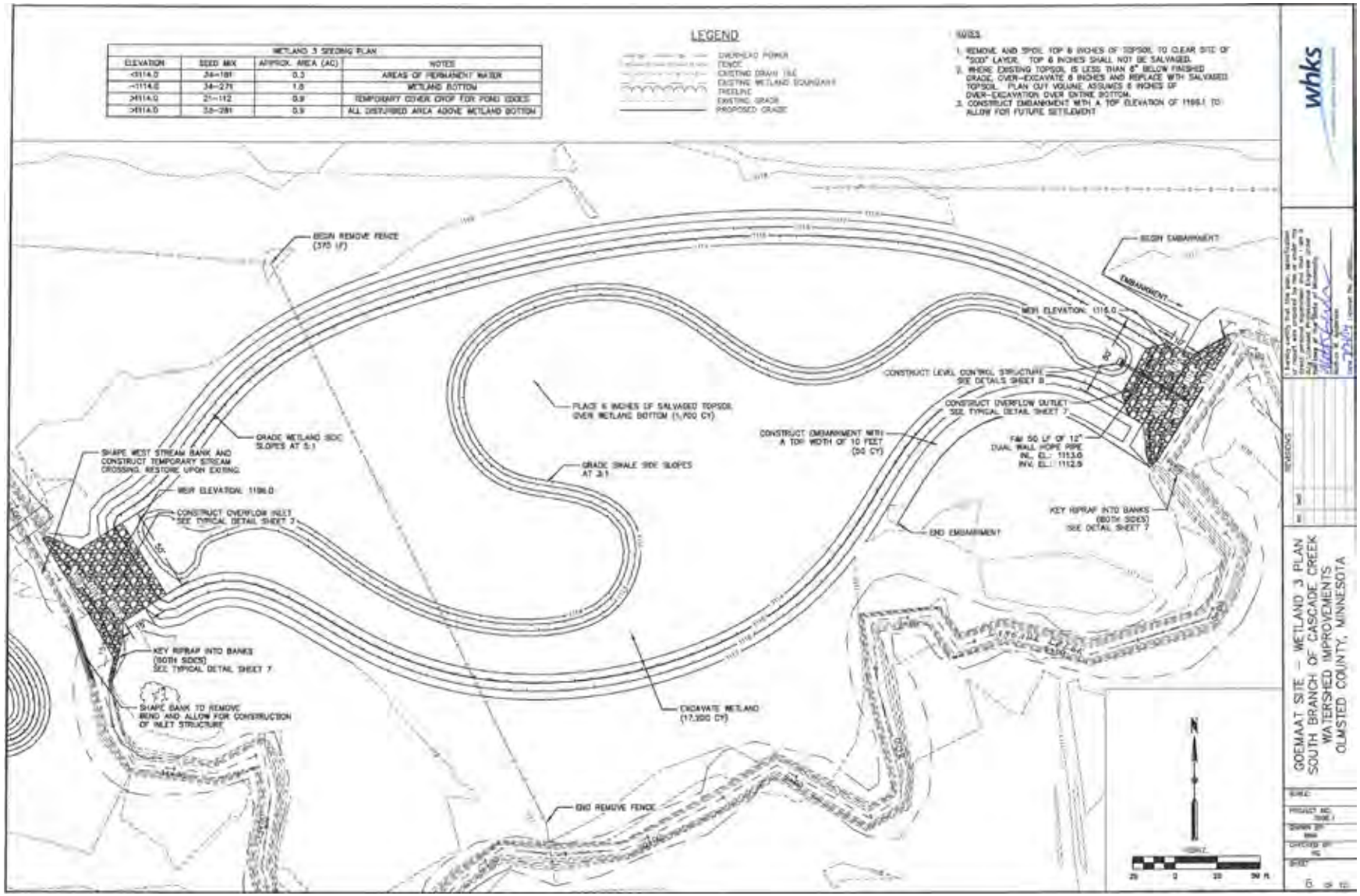


Figure 3-2 Tweite upper basin

Table 3-1 Results of meander survey through project area. Cover ranges estimated visually within the construction area. Survey occurred during site visit 10/24/18 by Wade Johnson, DNR.

Scientific Name	Common Name	Cover Range	Species Planted/ Seeded	Species Status
Phalaris arundinacea	Reed Canary Grass	25-50%	N	Invasive
Typha ×glauca	Hybrid Cattail	25-50%	N	Invasive
Elymus virginicus	Virginia Wild Rye	5-25%	Y	Native
Solidago canadensis	Canada Goldendrod	5-25%	N	Native
Bromus inermis	Smooth Brome	1-5%	N	Invasive
Bolboschoenus fluviatilis	River Bulrush	1-5%	Y	Native
Salix interior	Sandbar Willow	1-5%	N	Native
Ambrosia trifida	Great Ragweed	1-5%	N	Native
Schoenoplectus tabernaemontani	Soft stem Bulrush	1- 5%	Y	Native
Scirpus atrovirens	Dark Green Bulrush	1-5%	Y	Native
Urtica dioica	Stinging Nettles	1-5%	N	Native
Scirpus atrovirens	Dark Green Bulrush	1-5%	Y	Native
Bidens sp	Beggar Ticks		N	Native
Rumex crispus	Curley Dock		N	Nonnative
Ratibida pinnata	Grey Headed Coneflower		Y	Native
Symphyotrichum novae-angliae	New England Aster		Y	Native
Populus deltoides	Cottonwood		N	Native

Table 3-2 Seed mix. MNDOT Mix 33-261 Stormwater South and West. 1 acre.

Scientific Name	Common Name	Origin	Mix Percent	Pure Live Seed pounds	Bulk pounds
Agropyron trachycaulum	Slender Wheatgrass	Canada	2.86	1	1.06
Andropogon gerardii	Big Bluestem	MN, WI	2.86%	1	1.06
Elymus virginicus	Virginia Wild Rye	MN	5.71%	2	2.43
Calamagrostis Canadensis	Blue Joint Grass	MN	0.17%	0.06	0.08
Panicum virgatum	switchgrass	MN	1.09%	0.38	0.61
Spartina pectinata	prairie cordgrass	MN	1.09%	0.38	0.61
Sorghastrum nutans	Indian grass	MN, IA	0.34%	0.12	0.15
Poa paulustris	Fowl Bluegrass	Canada	3.03%	1.05	1.15
Carex stipata	awl-fruited sedge	MN	0.71%	0.25	0.31
Scirpus atrovirens	dark green bulrush	MN	0.54%	0.19	0.20
Scirpus cyperinus	woolgrass	MN	0.17%	0.06	0.06
Zizia aurea	golden alexanders	IA	0.20%	0.07	0.08
Helenium autumnale	autumn sneezeweed	MN	0.37%	0.13	0.15
Asclepias incarnata	marsh milkweed	MN	0.31%	0.11	0.12
Bidens frondosa	beggarticks	MN	0.31%	0.11	0.12
Anemone canadensis	Canada anemone	IA	0.20%	0.07	0.08
Physostegia virginiana	obedient plant	MN	0.20%	0.07	0.08
Rudbeckia laciniata	tall coneflower	WI	0.20%	0.07	0.08
Symphyotrichum novae-angliae	New England aster	MN	0.37%	0.13	0.19
Eutrochium maculatum	spotted Joe pye weed	IA	0.17%	0.06	0.07
Verbena hastata	blue vervain	MN, IA	0.14%	0.05	0.05
Triticum aestivum	Winter Wheat	Cultivar	71.43%	25	27.31

Table 3-3 Seed mix. MNDOT Mix 34-271 Wet Meadow South and West. 4.2 Acres.

Scientific Name	Common Name	Origin	Mix Percent	Pure Live Seed pounds	Bulk pounds
Elymus virginicus	Virginia Wild Rye	MN	17.50%	8.82	10.05
Calamagrostis Canadensis	Blue Joint Grass	MN	0.42%	0.21	0.28
Glyceria grandis	Fowl Manna Grass	MN	0.38%	0.63	0.68
Leersia oryzoides	Rice Cut Grass	MN	2.08%	1.05	1.15
Poa paulustris	Fowl Bluegrass	Canada	2.92%	1.47	1.59
Carex comosa	Bottlebrush Sedge	MN	2%	1.01	1.19
Carex scoparia	Pointed-broom Sedge	MN	0.42%	0.21	0.23
Carex stipata	Fox Sedge	MN	1.42%	0.71	0.88
Carex vulpinoidea	Brown Fox Sedge	MN	1.17%	0.59	0.61
Juncus tenuis	Path Rush	WI	0.33%	0.17	0.18
Scirpus atrovirens	Green Bulrush	MN	1.5%	0.76	0.82
Scirpus cyperinus	Woolgrass	MN	0.67%	0.34	0.36
Asclepias incarnate	Swamp Milkweed	MN	2%	1.01	1.07
Aster puniceus	Swamp Aster	WI	1.42%	0.71	0.74
Symphyotrichum novae-angliae	New England Aster	MN	0.25%	0.13	0.18
Eutrochium maculatum	Joe Pye Weed	IA	0.17%	0.08	0.10
Eutrochium perfoliatum	Boneset	MN	0.17%	0.08	0.09
Helenium autumnale	Sneezeweed	MN	0.25%	0.13	0.15
Helianthus grosseserratus	Sawtooth Sunflower	IA	0.50%	0.25	0.62
Lobilia sipilitica	Great Blue Lobilia	MN	0.17%	0.08	0.10
Mimulus ringens	Monkey Flower	MN	0.08%	0.04	0.05
Mondarda fistulosa	Wild Bergamot	MN	0.5%	0.25	0.27
Solidago rigida	Stiff Goldenrod	MN	0.08%	0.04	0.05
Thalictrum dasycarpum	Purple Meadow Rue	MN	0.04%	0.04	0.05
Verbena hastata	Blue Vervain	MN, IA	1.08%	0.55	0.59
Vernonia fasciculata	Ironweed	MN	0.25%	0.13	0.15
Veronicastrum virginicum	Culver's Root	IA	0.08%	0.04	0.05
Zizia aurea	Golden Alexanders	MN	2.08%	1.05	1.19
Triticum aestivum	Winter Wheat	Cultivar	56.33%	29.40	32.12

Table 3-4 Seed mix. MNDOT 34-181 Emergent Wetland Mix. 1 acre.

Scientific Name	Common Name	Origin	Mix Percent	Pure Live Seed pounds	Bulk pounds
Beckmannia syzigadia	American Slough Grass	MN	14%	0.70	0.75
Glyceria gradis	American Manna Grass	MN	5%	0.25	0.26
Leersia oryzoides	Rice Cut Grass	WI	5%	0.30	0.33
Carex comosa	Bottlebrush	MN	4.4%	0.22	0.26
Carex lacustris	Lake Sedge	WI	1.2%	0.06	0.07
Eleocharis obtuse	Blunt Spike Rush	MN	2%	0.10	0.12
Juncus torreyii	Torrey's Rush	SD	0.5%	0.04	0.04
Scirpus americanus	Three Square Rush	SD	4.6%	0.23	0.25
Scirpus cyperinus	Woolgrass	MN	1%	0.05	0.05
Bolboschoenus fluviatilis	River Bulrush	MN	15.20%	0.75	0.82
Scirpus validus	Softstem Bulrush	MN	6.5%	0.44	0.46
Sparganium eurycarpum	Giant Bur Reed	MN	15.4%	0.77	0.83
Alisma subcordatum	Water Plantain	MN	5%	0.40	0.46
Asclepias incarnate	Swamp Milkweed	MN	5.6%	0.28	0.30
Sagittaria latifolia	Common Arrowhead	WI	5%	0.30	0.32

Appendix B: Site Photographs

Photo 3-1 Spillway at upstream end of retention basin, 10/24/18.

Photo 3-2 Bottom edge of inlet spillway and wetland basin 06/02/2016

Photo 3-3 Sediment capture observed at bottom of inlet spillway, 10/24/18.

Photo 3-4 Outlet structure of Geomaat retention wetland, 10/24/2018.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

4) OHF Montevideo Dam Removal

Project Background

Project Name: Montevideo Dam Removal

Project Location: Chippewa County, Montevideo Dam

Township/Range Section: Township 117N Range 40W Section 18

Project Manager / Affiliated Organization: Steve Jones/City of Montevideo

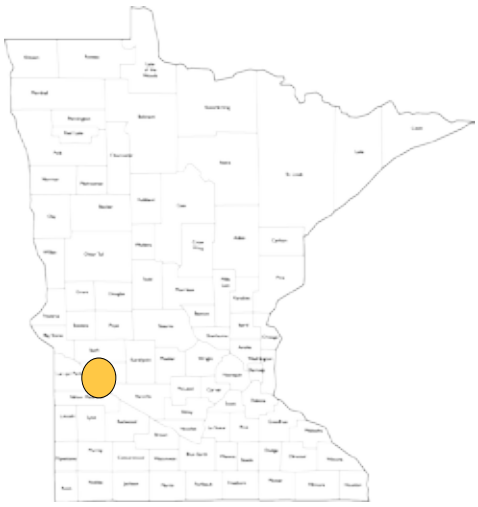
Fund: OHF – CPL ***Fiscal Year Funds:*** 2012

Project Start Date: Feb. 2012

Predominant Habitat type: Aquatic Habitat

Additional Habitat types: Choose an item. , Choose an item.

Project Status: Post Establishment Phase



County: Chippewa

Primary Activity: Stream/River Restoration

Project Size: 120 linear feet

Project Completed: October 2013

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   A low head Dam removal and installation of rock weirs over approximately 120 linear feet of the Chippewa river and native vegetation plantings along the bank.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   CPL grant Final Application, CPL grant Final Report, USFWS Montevideo Fish Passage Application, Dam Removal Plans May 2012, and Dam DOW Construction Report
3. ***What are the stated goals of the project?***
   The project goals are to:
   - Increase the diversity and abundance of native aquatic organisms in the lower Chippewa River
   - Improve stream habitat quality on approximately 10 acres of stream above the dam
   - Improve fishing for native game fish in the area
   - Improve canoeing/kayaking recreation on the lower Chippewa River
   - Removal of a dangerous dam
   - Return a portion of the Chippewa River to a more natural geomorphological state.
4. ***Were measures of restoration success identified in plans? Yes***
   If yes, list specific measurements.
   Removal of a dam and fisheries surveys where planned to assess fish passage.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** Choose an item.
   If yes, provide in Appendix A and list Maps provided:
   Selected construction plan set pages and a vegetation management plan are provided in Appendix A
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   The constructed rock riffle has been shown in several locations in MN to control grade and provide fish passage after a small dam removal and has become an industry standard. Work was conducted during low flow conditions. A not in the dam was created months before full construction to allow dewatering and settling of sediment.

Project Implementation

(Questions for Site Manager and Cooperating Professionals) List field visit attendees names and affiliations.

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***
   N/A

Site Assessment

Field Review Date: **5/7/2018**

Field Visit Attendees: Gina Quiram (DNR Restoration Evaluation Specialist), Brian Nerbonne (DNR Restoration Evaluation Panel Member), Chris Domeier (DNR Project partner), Steve Jones (City of Montevideo Project Manager), Anna Varian (Stantec Site Assessor)

9. ***Surrounding Landscape Characteristics:***
   The current land use is a city park with picnic areas, frisbee golf, and a few campsites. The city currently owns a substantial amount of land adjacent to the Chippewa River between the park and 1 mile downstream to the Minnesota River.

   The project is located in the Minnesota River subsection of the Ecological Classification System. The area consists of gently rolling ground moraines with the Minnesota River occupying a broad valley down the center of the subsection. Most of the area is covered by 100 to 400 feet of glacial drift, Cretaceous shales, sandstones, and clays are common.

10. ***Site Characteristics:***
    a. ***Soils:***
    The primary soil type within the project site is Calco silty clay loam with 0 to 2 percent slopes and occasionally flooded. This soil is poorly drained, not hydric and consists of alluvium.
    b. ***Topography:***
    This is a low-gradient area. A levee is located to the east of the project.
    c. ***Hydrology:***
    The Chippewa River (M-055-158) at this location has a drainage area of 2,077 mi^2 and is the largest tributary watershed to the Minnesota River. Land use in the watershed is primarily agricultural. The river commonly reaches flood stage at the project site. Flooding from the Minnesota River also tends to back up the Chippewa through this area.
    d. ***Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:***
    The contractor applied 22-4-10 slow release fertilizer at a rate of 300 lbs. per acre. MNDOT mixture 270 was applied at a rate of 150 lbs. per acre on all disturbed grass areas. MNDOT mixture 270 included 75% Kentucky Bluegrass, 17% perennial Rye-grass, and 8% Creeping Red Fescue. They also placed erosion control blankets (Category 1 – Wood Fiber RD 1S) over the seeded areas. High water during the site visit prevented inspection of vegetation growth but, project partners on site indicated that vegetation was growing in well.
    e. ***Vegetation B: Meander Search Species List (as appropriate for site)***
    Click here to enter text.
11. ***Is the plan based on current science?*** Yes
    The constructed rock riffle has been proven in several locations in MN to control grade and provide fish passage after a small dam removal and has become an industry standard.

12. ***List indicators of project outcomes at this stage of project:***

The dam is no longer in place. Observation of the high flows during the site visit gave clear evidence that fish, as well as other aquatic organism, passage upstream was possible. Passage of canoes and kayaks was also visibly possible. Project partners also indicated that vegetation has been growing well along the streambanks and anglers have been using the site.

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    Yes, the installation of a rock riffle has been proven to be a successful in creating fish passage. Dams are known to degrade river habitat and negatively affect fish and mussel populations. Removal of the dam will return this section river habitat to its natural state providing habitat for native species. Removal also eliminates the dangers of recirculating currents and hydraulic forces created by low head dams.
14. ***Are corrections or modifications needed to meet proposed outcomes?***
    No, monitoring of the site should continue to assess any changes in the river as it adjusts back to its natural state.
15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    Project partners continue to monitor the lower Chippewa River, identifying problem areas, and purchasing private property along the river subject to flooding. This continued work will help restore the river to a more natural state which will provide habitat to both aquatic and terrestrial native species.
16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No.
17. ***Are follow-up assessments needed? Explain.***
    No.
18. ***Additional comments on the restoration project.***
    Water levels were too high during the site visit to observe the constructed rock riffle; however, this method and the work conducted by Luther Aadland and the River Ecology Unit has been proven to be successful over and over again in Minnesota.

    Project partners expressed how smoothly citizen input on this project went, they observed no objections to the project (a rare event).

    The continued relationship between project partners, dedication to the river, and monitoring of project sites instills confidence that improvements of the lower Chippewa River will continue.

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.

19. ***The project will:***
    Meet proposed outcomes

Confidence of outcome determination:

High

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

    Goals of this project have clearly already been met, i.e. removal of a dangerous dam, returning the river to a more natural geomorphological state, and fish passage. Other goals such as increased diversity and abundance of native aquatic organisms in the lower Chippewa River and improving stream habitat quality have not been directly evaluated but by accomplishing the aforementioned goals these goals are likely to follow. Pre-dam removal fisheries data exists, and additional sampling is planned to assess fish passage.

21. ***Site Assessor(s) Conducting Review:***

    Anna Varian, Stantec

Appendix A: Site maps, Project plans or Vegetation tables

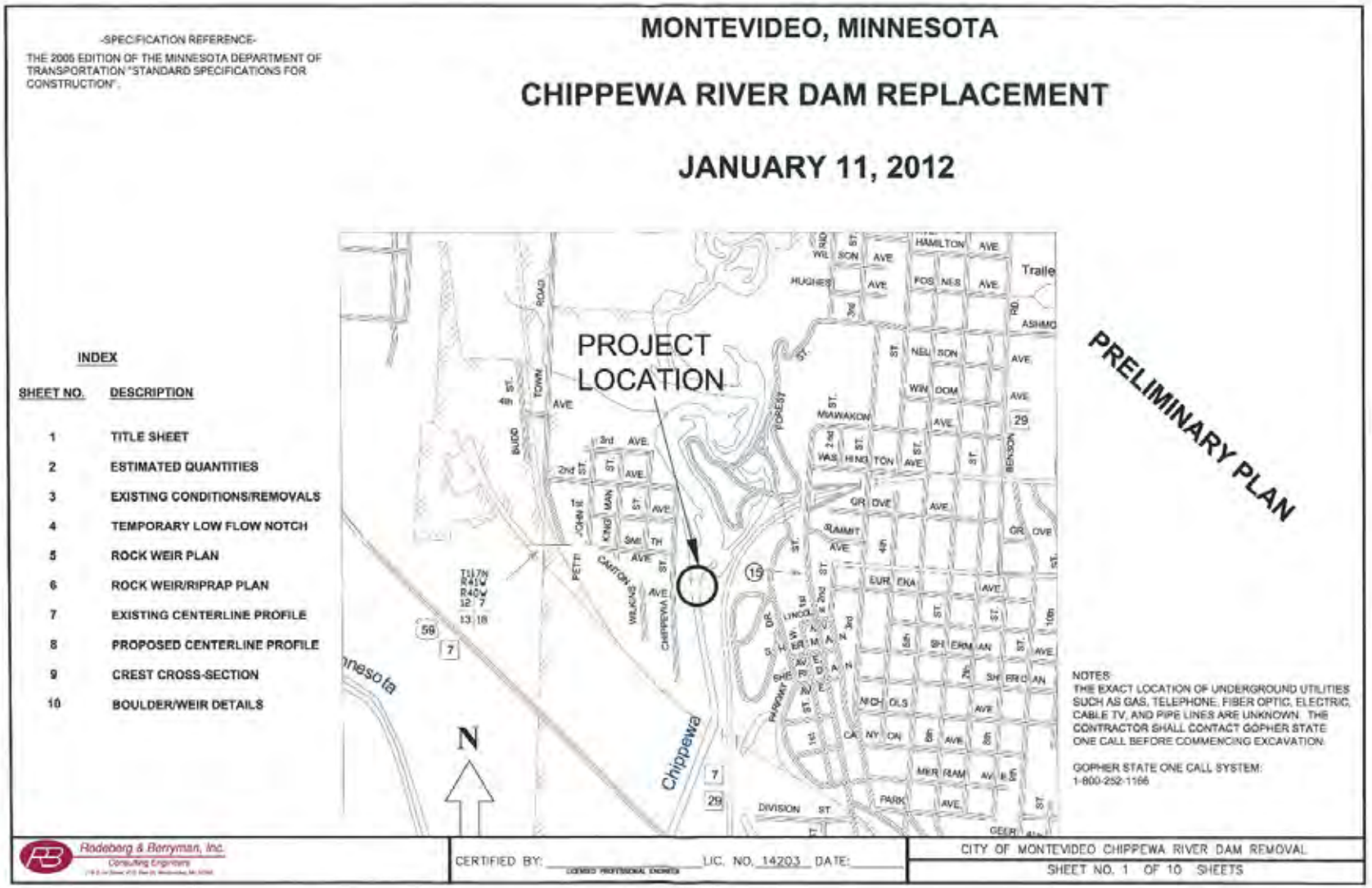


Figure 4-1 Construction plan set sheet 1 of 10, title page.

Figure 4-2 Construction plan set sheet 3 of 10, existing conditions.

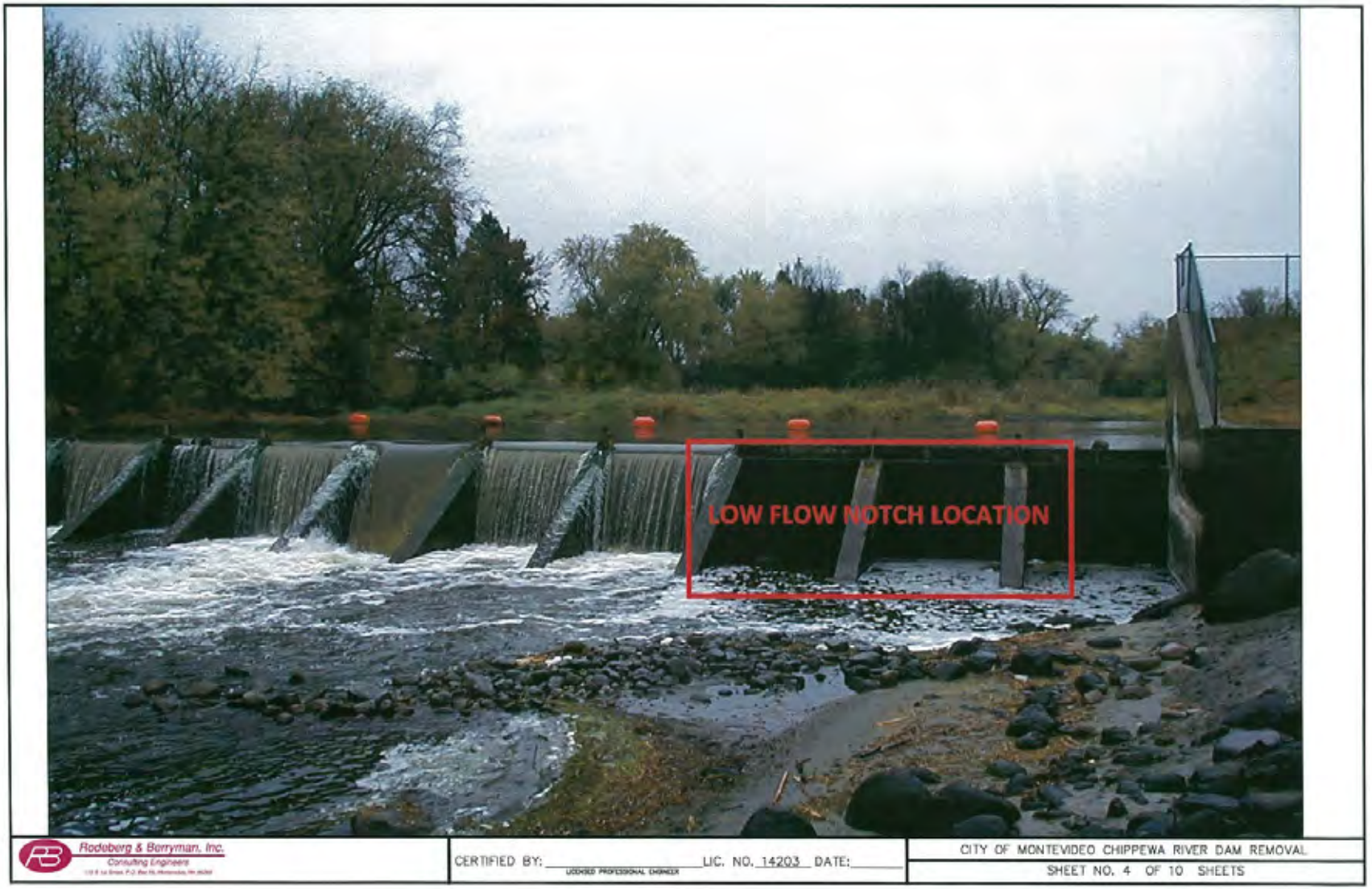


Figure 4-3 Construction plan set sheet 4 of 10, temporary low flow notch location.

Figure 4-4 Construction plan set sheet 5 of 10, rock weir plan.

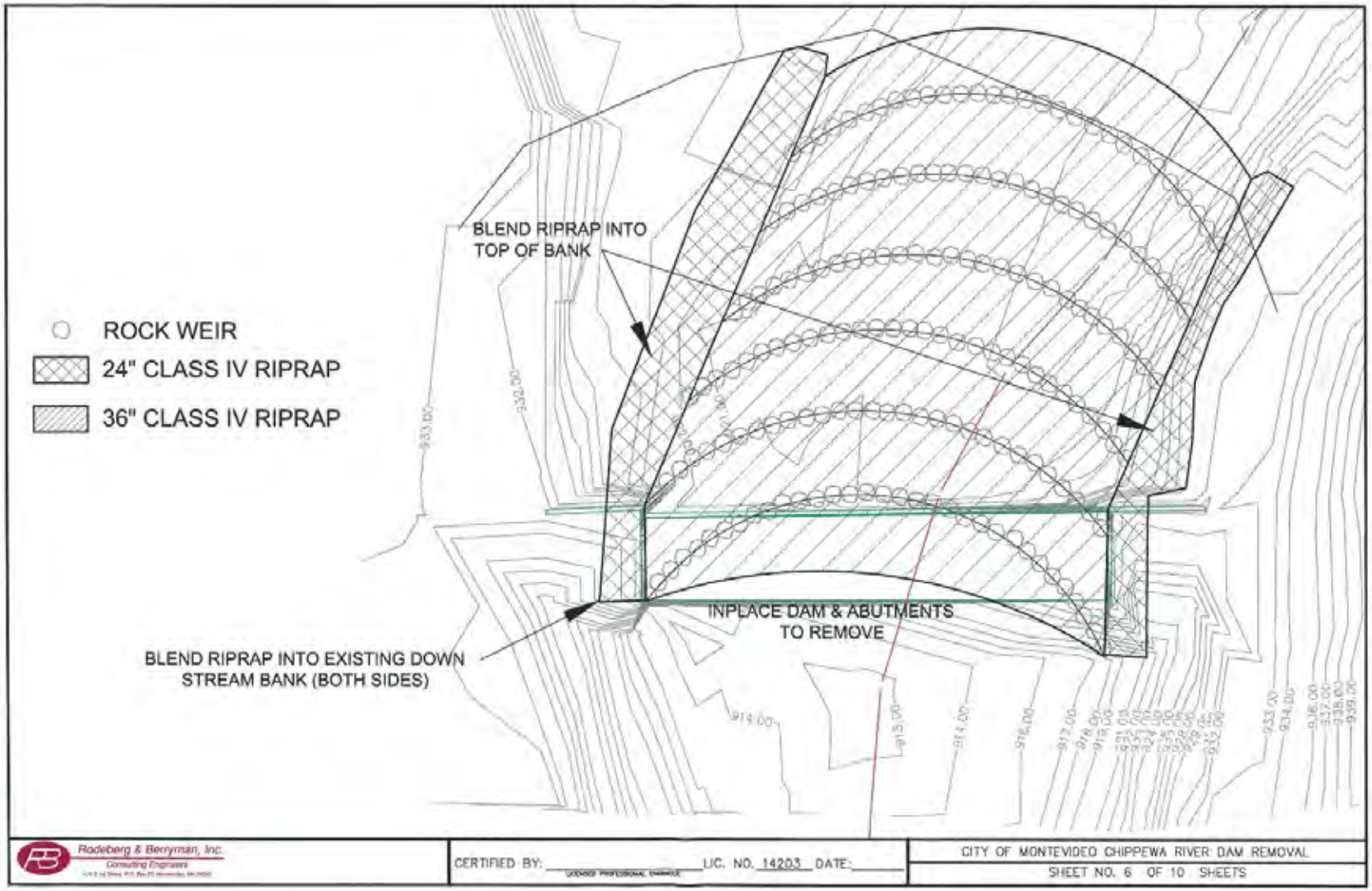


Figure 4-5 Construction plan set sheet 6 of 10, rock weir/riprap plan.

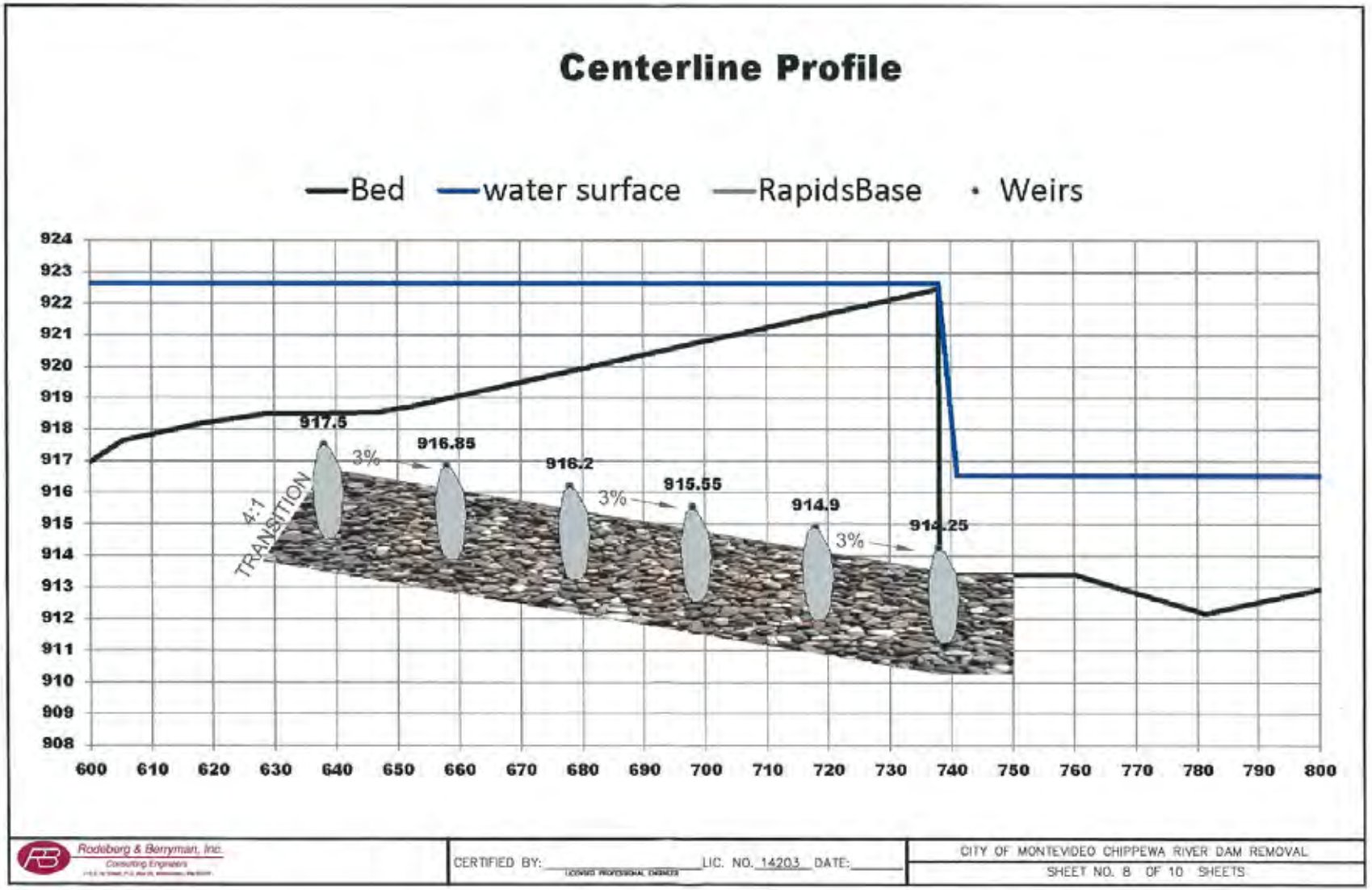


Figure 4-6 Construction plan set sheet 8 of 10, proposed centerline profile.

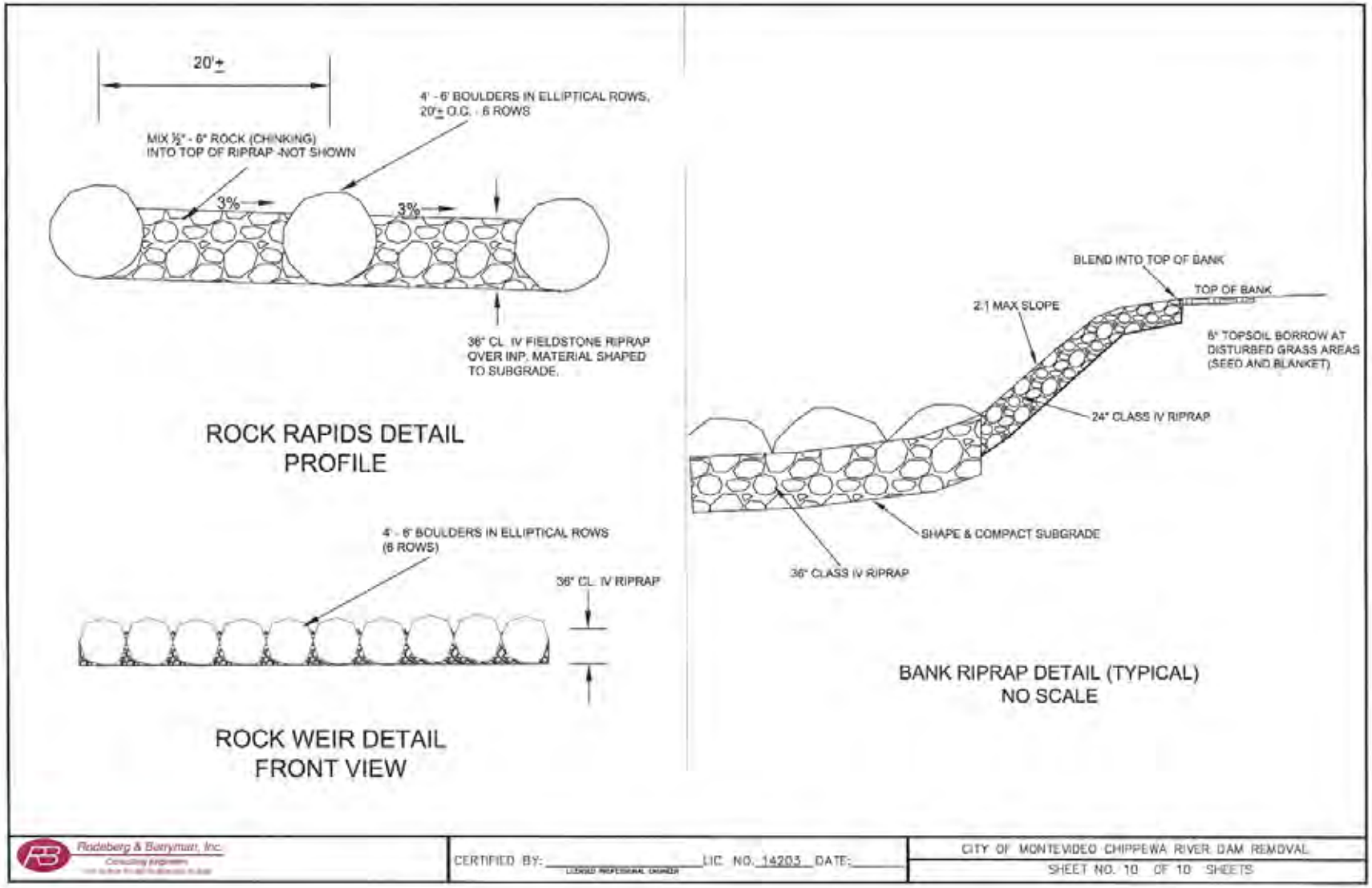


Figure 4-7 Construction plan set sheet 10 of 10, boulder/weir detail.

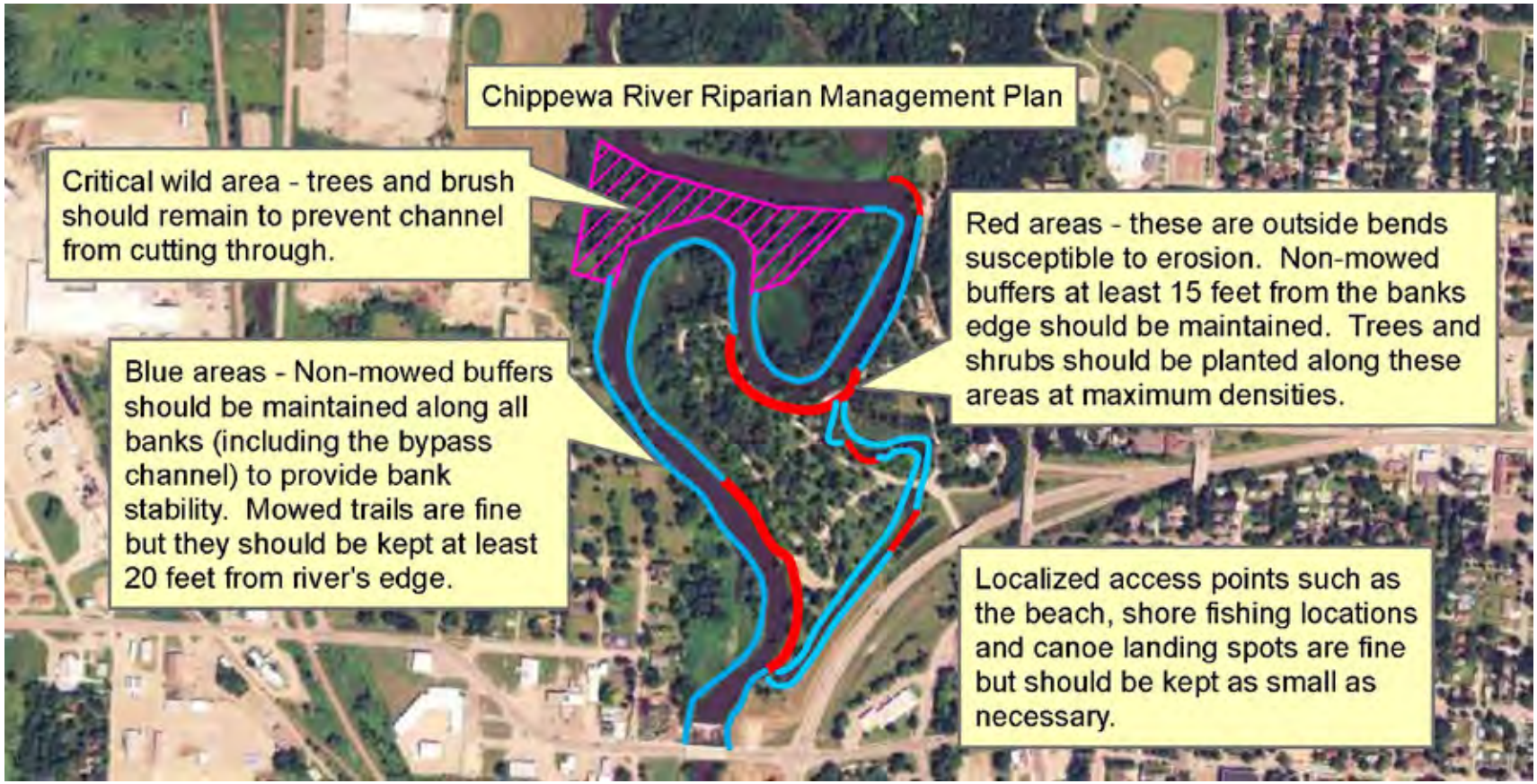


Figure 4-8 Vegetation management plan for area surrounding the project and upstream.

Appendix B: Site Photographs

Photo 4-1 View of location of former Montevideo dam5/7/2018.

Photo 4-2 View of location of former Montevideo dam, the constructed rock riffle was under several feet of water during the site visit 5/7/2018.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

5) OHF Montevideo Dam Bankfull Shelf

Project Background

Project Name: Montevideo Bankfull Shelf

Project Location: Chippewa county, Montevideo

Township/Range Section: Township 117N Range 40W Section 7

Project Manager / Affiliated Organization: Steve Jones/ City of Montevideo

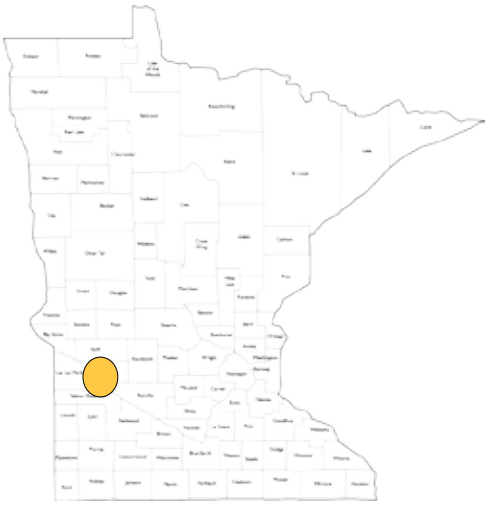
Fund: OHF - CPL ***Fiscal Year Funds:*** 2017

Project Start Date: Click here to enter text.

Predominant Habitat type: Aquatic Habitat

Additional Habitat types: Choose an item. , Choose an item.

Project Status: Establishment Phase



County: Chippewa

Primary Activity: Stream/River Restoration

Project Size: 420 linear feet

Project Completed: 2018

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   A bankfull shelf with toe wood extending out from an eroding bank along 420 feet of the Chippewa River with native plantings.
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Preliminary plans, Summary of work, CPL application revised work plan
3. ***What are the stated goals of the project?***

Improve instream fisheries habitat and stabilize banks.

4. ***Were measures of restoration success identified in plans?*** *Yes*
   If yes, list specific measurements.
   Provide quality fish habitat and a stable bank**.**
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   Preliminary plans, summary of work, and a vegetation management plan are provided in Appendix A
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***

Bankfull shelves with toe wood are an industry standard for stabilizing banks, creating fish habitat, and reducing sediment input. Jute mesh was used for erosion control while vegetation became established, also an industry standard.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***
   NA

Site Assessment

Field Review Date: **5/7/2018**

Field Visit Attendees: Gina Quiram (DNR Restoration Evaluation Specialist), Brian Nerbonne (DNR Restoration Evaluation Panel Member), Chris Domeier (DNR Project partner), Steve Jones (City of Montevideo Project Manager), Anna Varian (Stantec Site Assessor)

9. ***Surrounding Landscape Characteristics:***
   The current land use is a city park with picnic areas, frisbee golf, and a few campsites. The city currently owns a substantial amount of land adjacent to the Chippewa River between the park and 1.5 miles downstream to the Minnesota River. This project site is located about 0.6 miles upstream from the Montevideo Dam removal site. At the upstream end of the site a small side channel (constructed decades ago) diverts a small amount of flow through the eastern portion of the park and rejoins the main channel about 0.5 miles downstream.

   The project is located in the Minnesota River subsection of the Ecological Classification System. The area consists of gently rolling ground moraines with the Minnesota River occupying a broad valley down

the center of the subsection. Most of the area is covered by 100 to 400 feet of glacial drift, Cretaceous shales, sandstones, and clays are common.

10. ***Site Characteristics:***

    a. Soils:

    The primary soil type within the project area is Rauville silty clay loam with 0 to 2 percent slopes and frequently flooded. This soil consists of loamy alluvium over sandy and gravelly alluvium, is very poorly drained and hydric.

    b. Topography:

    This is a low-gradient area. A levee is located to the east of the project site.

    c. Hydrology:

    The Chippewa River (M-055-158) at this location has a drainage area of 2,077 mi^2 and is the largest tributary watershed to the Minnesota River. Land use in the watershed is primarily agricultural. The river commonly reaches flood stage at the project site. Flooding from the Minnesota River also tends to back up the Chippewa through this area.

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

    Willow stakes were planted in the project area but high water during the site visit prevented observation of those plantings.

    e. Vegetation B: Meander Search Species List (as appropriate for site)

    Click here to enter text.

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

Bankfull shelves with toe wood are an industry standard for stabilizing banks, creating fish habitat, and reducing sediment input. Jute mesh was used for erosion control while vegetation became established, also an industry standard.

12. ***List indicators of project outcomes at this stage of project:***

    Bank stability, the bankfull shelf appears to be collecting sediment as intended.

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***

    Yes, the use of toe wood and a bankfull shelf are common techniques used to improve fish habitat and stabilize eroding banks.

14. ***Are corrections or modifications needed to meet proposed outcomes?***

    No

15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***

    Project partners continue to monitor the lower Chippewa River, identifying problem areas, and purchasing private property along the river subject to flooding. This continued work will help restore the river to a more natural state which will provide habitat to both aquatic and terrestrial native species.

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

    No

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

    Yes, this project was only recently completed and high water prevented adequate evaluation of installation, a follow up will provide more information and confidence of project outcomes.

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

This project was a result of project partners working closely together to improve the Chippewa River in Montevideo. After a dam was removed downstream of this site the river began adjusting itself in unstable ways and project partner's continuous monitoring of the river allowed them to identify and fix a problem before it became too large to handle.

The continued relationship between project partners, dedication to the river, and monitoring of project sites instills confidence that improvements of the lower Chippewa River will continue.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    Medium
20. ***Provide explanation of reason(s) for determination.***
    Bankfull shelves with toe wood are an industry standard for stabilizing banks, creating fish habitat, and reducing sediment input; however, high water during the site visit prevented full evaluation of the project installation. The continued relationship between project partners, dedication to the river, and monitoring of project sites instills confidence that if any issues were to arise with this project they would be rectified.
21. ***Site Assessor(s) Conducting Review:***
    Anna Varian, Stantec

Appendix A: Site maps, Project plans or Vegetation tables

Chippewa River Bankfull Shelf Montevideo Lagoon Park Preliminary Plans

Aerial view of proposed project.

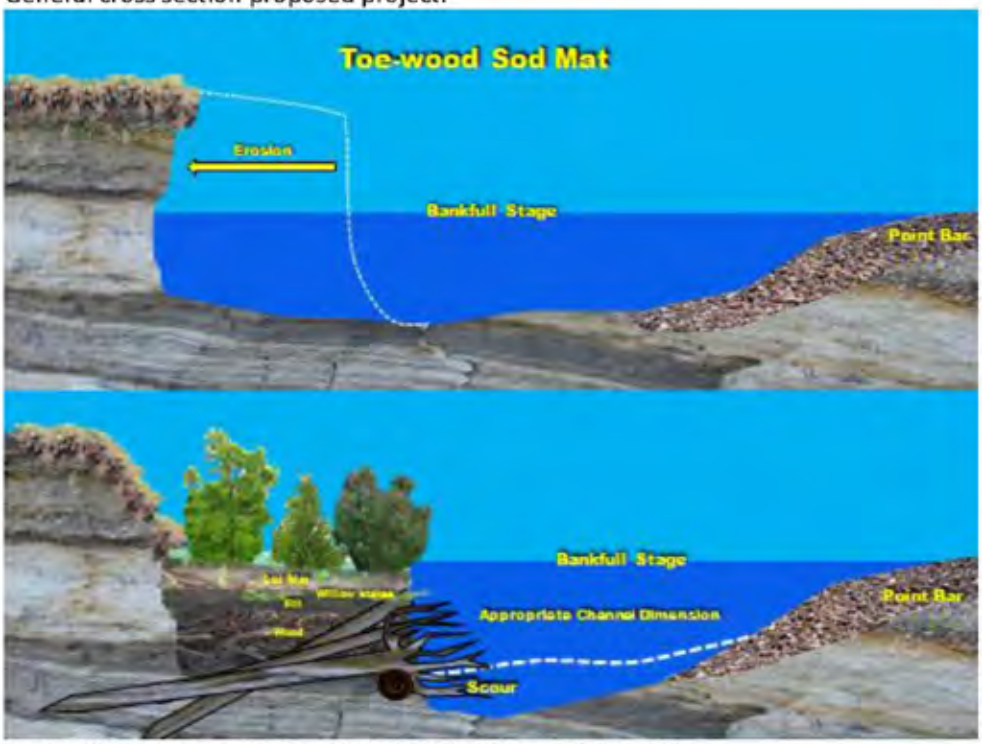
Photos of proposed project.

Upstream 200 feet of proposed bankfull shelf.

Figure 5-1 Preliminary plans showing conceptual design page 1 of 2.

Downstream 200 feet of proposed shelf.

General cross section proposed project.



Rock will also be incorporated into the shelf for added stability.

Figure 5-2 Preliminary plans showing conceptual design page 2 of 2.

SUMMARY OF WORK

1. PROJECT LOCATION

Site location is located in Lagoon Park, Montevideo, MN along the bank of the Chippewa River as indicated in the attached Project Location Map.

2. CONSTRUCTION NOTES

a. The work includes construction of a 15' x 380' bankfull shelf along an eroding bank of the Chippewa River as indicated on the plan. The shelf shall be constructed with rock, logs, woody debris and soil fill (river bed material). City will provide materials as indicated.

b. Contractor shall construct a toewood bench along eroded bank, 10' – 15' in width.

c. Contractor shall place 8" – 12" diameter footer logs and salvaged riprap over the bottom of the bench to support the toewood. Fill voids with salvaged riprap and river bed material. Place footer logs as indicated in plans downward into the bench 2-3 feet. City shall supply footer logs and woody debris.

d. Contractor shall drive approximately 20 logs (toewood) into the bank a minimum of 3 feet with rootends out. Logs shall be angled to face upstream as indicated. Logs shall be driven approximately 20' on center. Toewood logs shall be supplied by Contractor (15" – 18" diameter) by 23 feet long with root balls.

e. Contractor shall fill spaces between salvaged riprap/footer logs and toewood with small limbs and branches (4 inch diameter and smaller) and compact with excavator bucket and tracks.) Woody debris shall be supplied by City.

f. Contractor shall add salvaged rock and river bed material over woody debris (6" – 12" lift).

g. Contractor shall add another layer of woody debris as may be required to be covered with another lift of salvaged river bed material up to an elevation of approximately 1025.0.

h. Contractor shall cover the top of the uppermost layer with an approved jute mesh ECB temporarily staked into the upper layer. Jute mesh shall be staked with 2-3 foot live willow cuttings approximately 2 feet on center next Spring when willows have budded out. Payment shall be made per square foot of jute mesh furnished, installed and staked as specified above. Contractor to furnish staking materials.

Figure 5-3 Construction plans with contractor specifications page 1 of 7.

3. **BASIS OF PAYMENT**

Footer logs, woody debris, and rock boulders will be supplied by the City. The Contractor shall be responsible for hauling and placing material provided by the City. Payment will be made as indicated in the schedule of prices unless otherwise specified under a different item. Contractor shall supply toewood logs as specified above, jute mesh and all staking materials including willow cuttings next Spring.

Figure 5-4 Construction plans page 2 of 7.

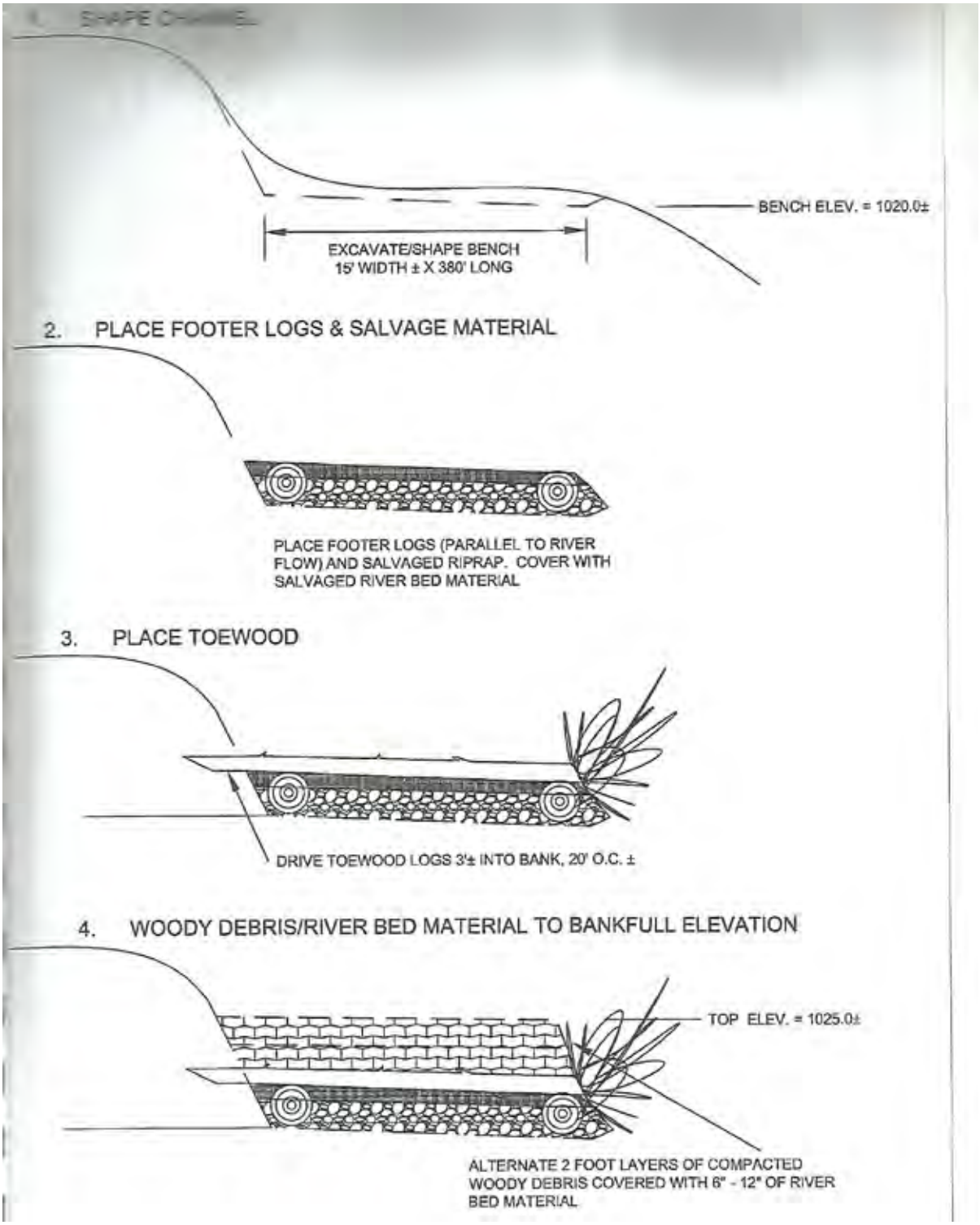


Figure 5-5 Construction plans showing sequence of construction for toe wood page 3 of 7.

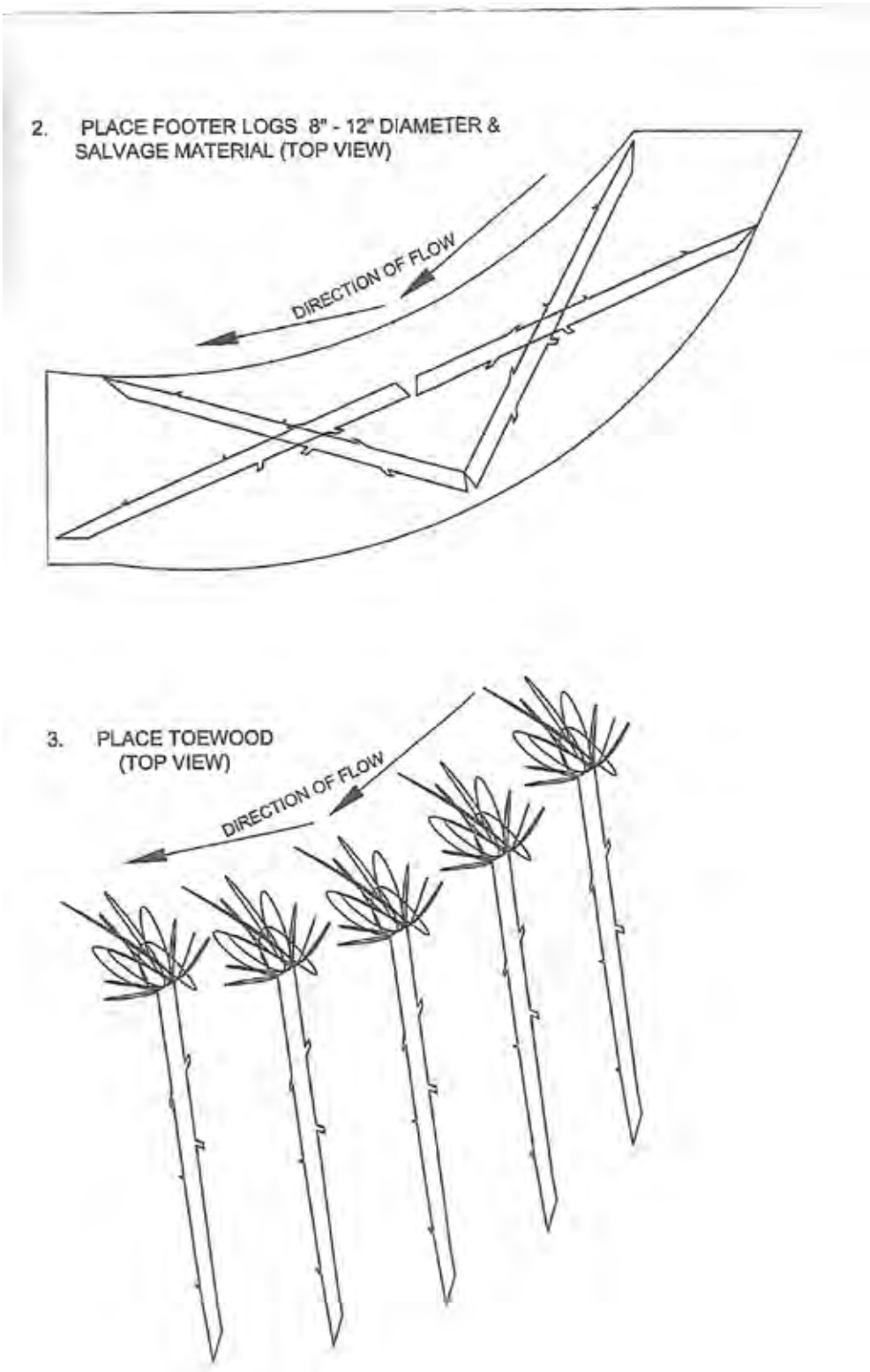


Figure 5-6 Construction plans showing toe wood construction sequencing page 4 of 7.

Figure 5-7 Construction plans with structure locations page 5 of 7.

Figure 5-8 Construction plans with structure locations page 6 of 7.

Figure 5-9 Vegetation management plan of project site and downstream areas.

Appendix B: Site Photographs

Photo 5-1 View of project site from upstream taken 5/7/18. Project location on left bank.

Photo 5-2 View of project site taken 5/7/18. Bankfull shelf is under water.

Photo 5-3 View of project site taken on 5/17/18. Water levels have receded, sediment is depositing on the bankfull shelf as intended.

Photo 5-4 View of project site taken 7/19/18. Abundant seedling germination on the bank includes herbaceous species as well as Silver Maples.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

6) OHF Spring Creek Instream Restoration and Bank Stabilization

Project Background

Project Name: Spring Creek

Project Location: Spring Creek, between Redwood Falls and New Ulm, MN

Township/Range Section: Township 111N Range 32W Section 19 and 20

Project Manager / Affiliated Organization: John Knisley/Brown County Planning and Zoning

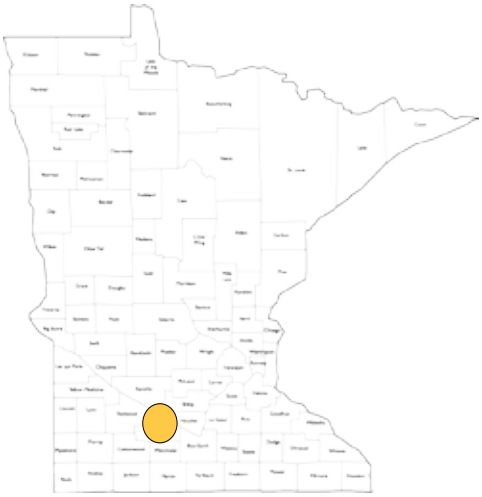
Fund: OHF - CPL ***Fiscal Year Funds:*** 2013

Project Start Date: Click here to enter text.

Predominant Habitat type: Aquatic Habitat

Additional Habitat types: Choose an item. , Choose an item.

Project Status: Establishment Phase



County: Brown

Primary Activity: Stream/River Restoration

Project Size: 3.75 acres

Project Completed: June 2016

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Concrete curb and constructed rock riffles for fish passage. Vanes, J-hooks, toe-wood, tree pins, willow stakes, cedar tree revetments, and brush mattresses for bank protection, flow re-direction, and fish habitat.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   CPL Final Accomplishment Report, Construction Plans for Spring Creek Trout Restoration February 2015, Pre-Construction Field Notes and comments from the DNR, Project goals and objectives against which project success can be measured, stream profile and topography from lidar, Stream Geomorphology presentation, MPCA Spring Creek hydrology and WRAPS report, and CPL evaluation and monitoring report.
3. ***What are the stated goals of the project?***
   Streambank stabilization, improved trout habitat, improved water quality, long term health of Spring Creek, and from the final accomplishment report "to serve as a catalyst for engaging area landowners about upstream best management practices that can be put into practice throughout the Spring Creek Watershed".
4. ***Were measures of restoration success identified in plans?*** *No*
   If yes, list specific measurements.
   Click here to enter text.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** Choose an item.
   If yes, provide in Appendix A and list Maps provided:
   Construction Plans for Spring Creek Trout Restoration February 2015
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   Toe wood, vanes, and J-hooks are industry standards for improving fish habitat, diverting flow from eroding banks and bank stabilization. Use of erosion control blankets and willow stakes is an industry standard.

Project Implementation

(Questions for Site Manager and Cooperating Professionals) List field visit attendees names and affiliations.

7. ***Were alterations made to the original plan during construction?***
   No.
   The project manager indicated that alterations were not made during construction; however, it does appear that fewer structures were put in than were originally planned and some other changes were made.
8. ***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?***
   They did not change the proposed project outcome.

Site Assessment

Field Review Date: **5/21/2018**

Field Visit Attendees: John Knisley (Brown County), Brian Nerbonne (DNR Restoration Evaluation Panel Member), Gina Quiram (DNR Restoration Evaluation Specialist), Anna Varian (Stantec Site Assessor)

9. ***Surrounding Landscape Characteristics:***

The stream flows through an unconfined alluvial valley with grasses, shrubs and trees in the riparian area. There is a DNR angling access easement along the creek 66 ft wide from the center of the stream on each side. There is a parking area for anglers on the east side of County Road 4 along with visible signage.

10. ***Site Characteristics:***

a. Soils:

The primary soil type within the project site is Kalmarville sandy loam consisting of coarse-loamy alluvium. This soil is hydric.

b. Topography:

Spring Creek flows through an unconfined alluvial valley.

c. Hydrology:

Spring Creek (M-055-108) at the project site has a drainage area of 34 mi^2 and is one of only a few trout streams in the area. Land use in the watershed is over 90% agricultural, the upper portion of the watershed is characterized by channelized drainage ditches and tiling with few wetlands remaining. This area of Spring Creek has several perennial springs contributing cold water to the creek.

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

The riparian area consists of grasses, shrubs and trees helping to stabilize banks.

e. Vegetation B: Meander Search Species List (as appropriate for site)

Click here to enter text.

11. ***Is the plan based on current science?*** Portions

The concept of using treatments described in #1 to create fish habitat and stabilize banks is based in science; however, the implementation of these treatments and addition of other treatments outside of industry standards are not based on current understanding of stream restoration practices.

12. ***List indicators of project outcomes at this stage of project:***

Some structures and treatments are performing as intended, pools have been created, fish passage into and through the culvert is possible, and one cedar tree revetment has collected sediment. Other structures are not performing as intended, vanes and other structures have partially blown out, portions of structures have sunk or dislodged, and erosion is occurring within and around structures and treatments (see photos in Appendix B).

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***

Yes and no. The plan to create fish habitat, stabilize banks and reduce erosion by use of the treatments described in #1 would reasonably allow achievement of project goals. The design and construction of the project fell short of meeting these goals.

The plan to create fish habitat may have been reasonably achieved in the form of new pools and woody habitat; however, a lack of details in the design plan limit the ability to assess how many pools and the depth of pools (fish habitat) that existed before construction. Toe wood used as bank protection will provide good fish habitat.

Improving water quality, stabilizing banks, and creating an example project for the watershed management practices were not reasonably achieved. Large unstable banks were left in place without any treatments, these banks, as evidence in site photos, are actively eroding. In some cases, the

treatment that was applied has created new erosion problems (see photos in Appendix B). Some treatments are not currently causing any new erosion but have clearly failed and are not functioning to stabilize banks or reduce erosion. It is unclear whether a lack of detail in design or construction lead to these failures.

While most of the treatments in the design were industry standards there were some structures and decisions that were not. At one location woody debris found in the stream was piled up on an outside bend to help catch sediment and move flow away from the bank. This type of structure is usually attached to the bank or stream bed in some manner in order to prevent wood from floating downstream and clogging culverts, no such tie downs were apparent or indicated by project manager, and this was not part of the original design.

Another treatment in the most downstream section that departs from industry standards was brush mattresses installed below bankfull level. It's unclear what these structures were intended to do but they have altered the natural pattern of the stream causing quick meanders, flow directed toward banks, and erosion problems (see photos in Appendix B). These structures also appear to have reduced the cross-sectional area of the stream, but due to the lack of details in the plan it is difficult to determine by how much. A specific note by the DNR during the design phase asks if structures will alter the cross-sectional area, this note was never answered by the designers and not addressed in the design plan. The plan details for these structures do not indicate a reference to bankfull or base flow elevation so it is unclear if they were constructed at the correct elevation or not. The plans do not include any example cross sections showing current and proposed grade that would allow for evaluation of cross-sectional area.

14. ***Are corrections or modifications needed to meet proposed outcomes?***
    Yes. Structures that have blown out or fallen apart should be fixed or removed all together. Stakes used to secure erosion control blanketing need to be driven into the ground further (see #18)
15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    There were no clear measures of success or monitoring identified in the paperwork provided other than to visit the site every year and visually inspect the project. Currently there are no plans to mitigate failed structures, this should be evaluated.
16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    Yes, some of the structures and treatments are causing new erosion.
17. ***Are follow-up assessments needed? Explain.***
    Yes. A baseline geomorphological survey was completed by the DNR pre-project, a second geomorphological survey should be conducted to determine if stability ratings or erosion estimates have changed.
18. ***Additional comments on the restoration project.***
    This project is a good example of good intentions with mixed results. Overall the decision to focus on smaller eroding banks rather than the large failing banks inhibits this project from ever really moving the bar when it comes to water quality. Large failing banks are continuing to contribute sediment and

instability to the stream. Parts of the project look good and are functioning as intended. Fish passage looks possible now through two culverts that were previously unpassable; however, plans to evaluate this were not stated in project documents and should be evaluated. Failure of some structures or treatments within a stream restoration project is not uncommon, slightly misplaced rocks or missed elevations can cause these issues but several failures and/or poorly installed structures leading to additional erosion problems is not common.

Stakes used for holding erosion control blanketing were left sticking close to a foot out of the ground. These stakes should be driven in to near ground level and if not possible at the time of installation due to frost, then a return visit to finish the work should have occurred as soon as possible. These stakes create an opportunity to catch debris flowing downstream and present a tripping hazard for anglers in the DNR fishing easement.

The plans used for permitting and construction were lacking key information such as a survey of the existing grade, example cross sections with proposed and existing grade, structure elevations, and in some locations the exact location of the structure. The construction plans indicate that some structures will be "field located by engineer", some level of field fitting is often necessary in stream restoration projects; however, an engineer or trained individual was not always on site as indicated by project manager. This level of detail may be sufficient for a small project with easily constructed industry standard treatments, known elevations, and trained individuals on site at all times, but this level of construction (spanning several thousand linear feet) should include more information. The DNR made several comments (50+) on design details before final construction documents were created, many of these comments were incorporated into the new design, some were not. Multiple comments regarding affects to the cross-sectional area where made by the DNR yet no example cross sections are in the construction documents.

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.

19. ***The project will:***
    Likely not meet proposed outcomes
    Confidence of outcome determination:
    Medium
20. ***Provide explanation of reason(s) for determination.***
    Multiple structures have already failed or are not functioning as intended and causing erosion issues and multiple large banks were left un-treated and are actively eroding. Together these conditions are likely not meeting the goal of improved water quality or creating project that can serve as an example of improvement in the watershed. The creation of pools and addition of toe wood structures has likely increased fish habitat, fish passage has improved giving fish the opportunity to access more habitat.
21. ***Site Assessor(s) Conducting Review:***
    Anna Varian, Stantec.

Appendix A: Site maps, Project plans or Vegetation tables

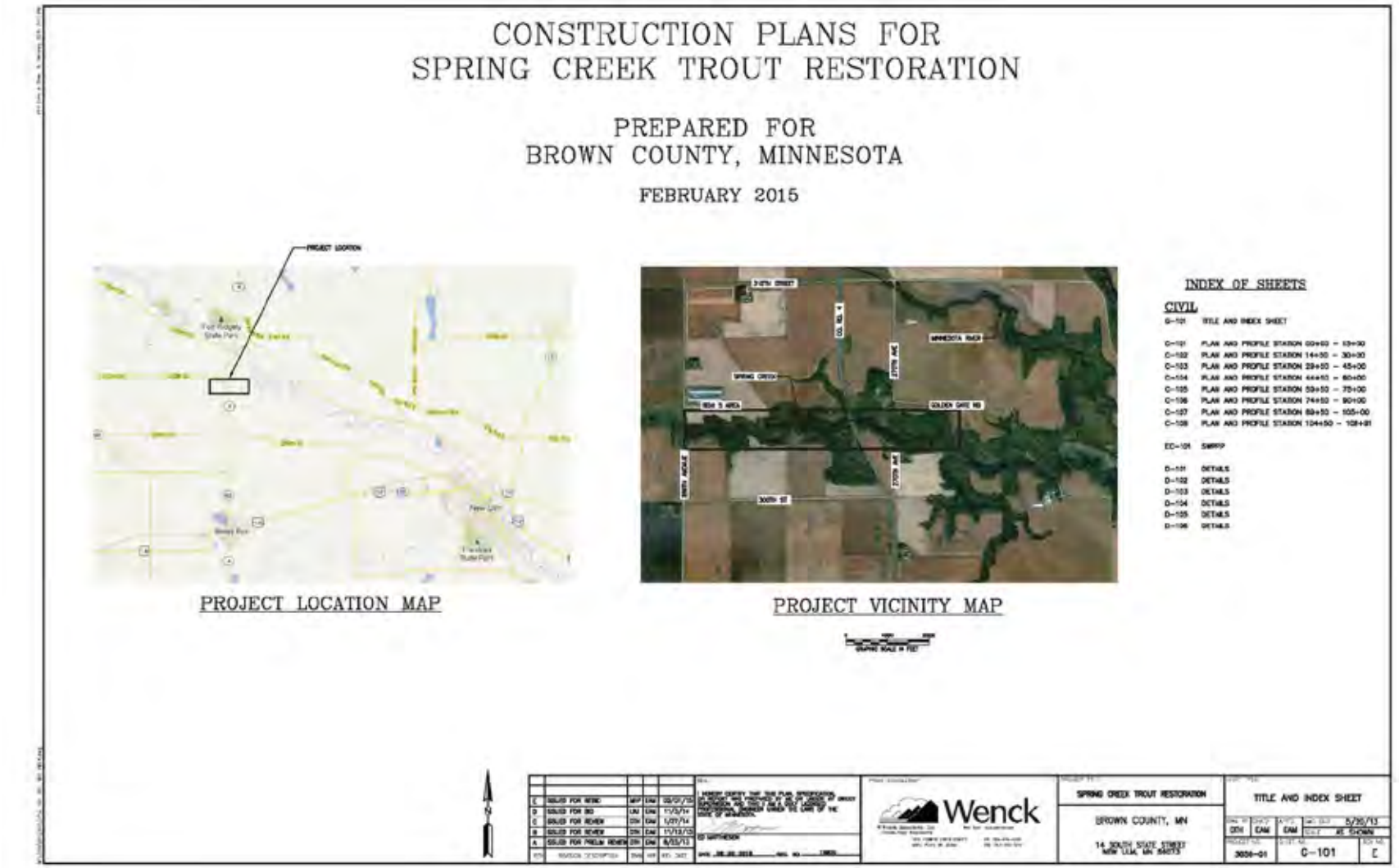


Figure 6-1 Construction plans sheet 1 of 16, title page.

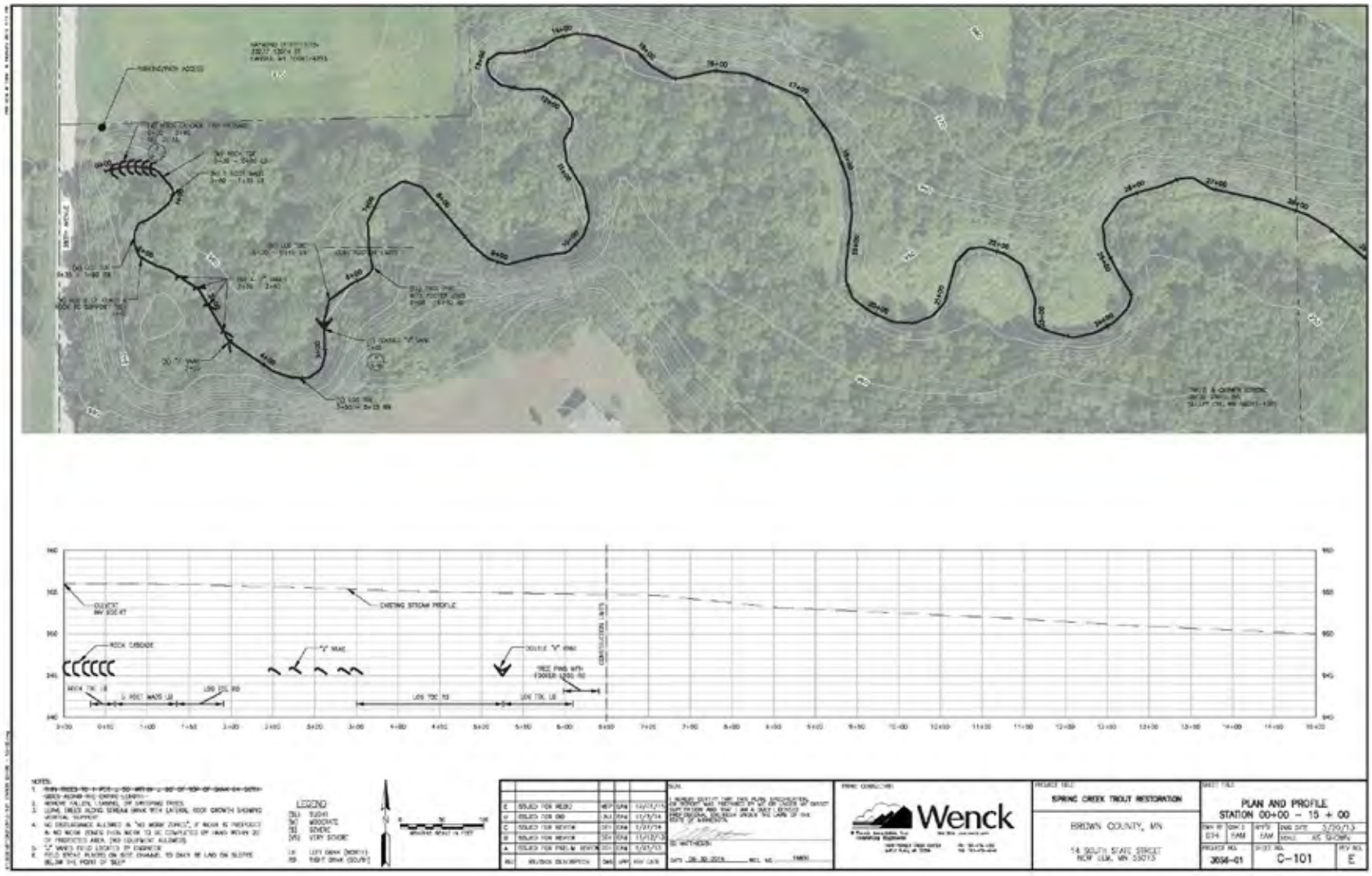


Figure 6-2 Construction plans sheet 2 of 16, plan and profile station 00+00 to 15+0.

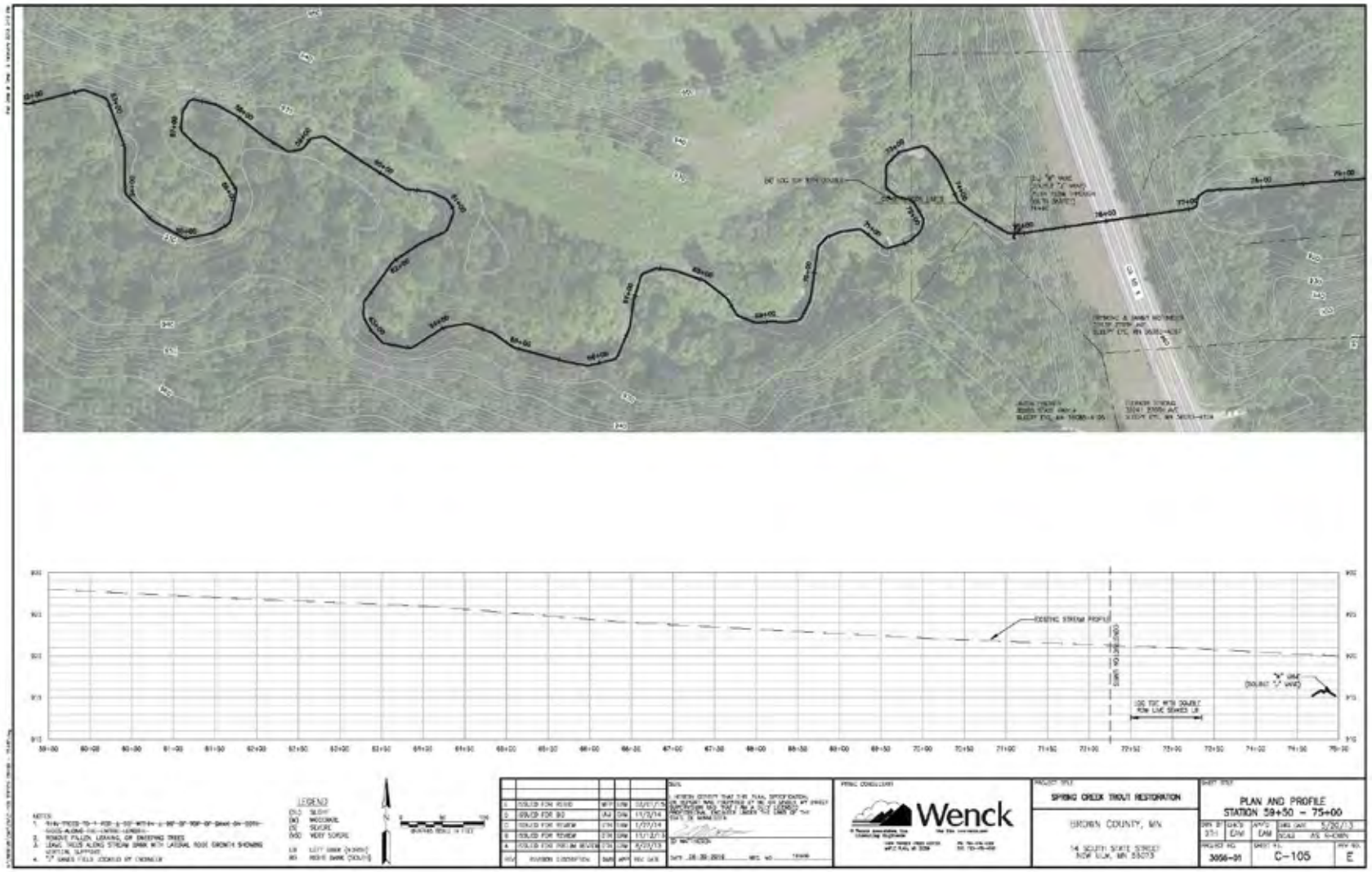


Figure 6-3 Construction plans sheet 6 of 16, plan and profile station 59+50 to 75+00.

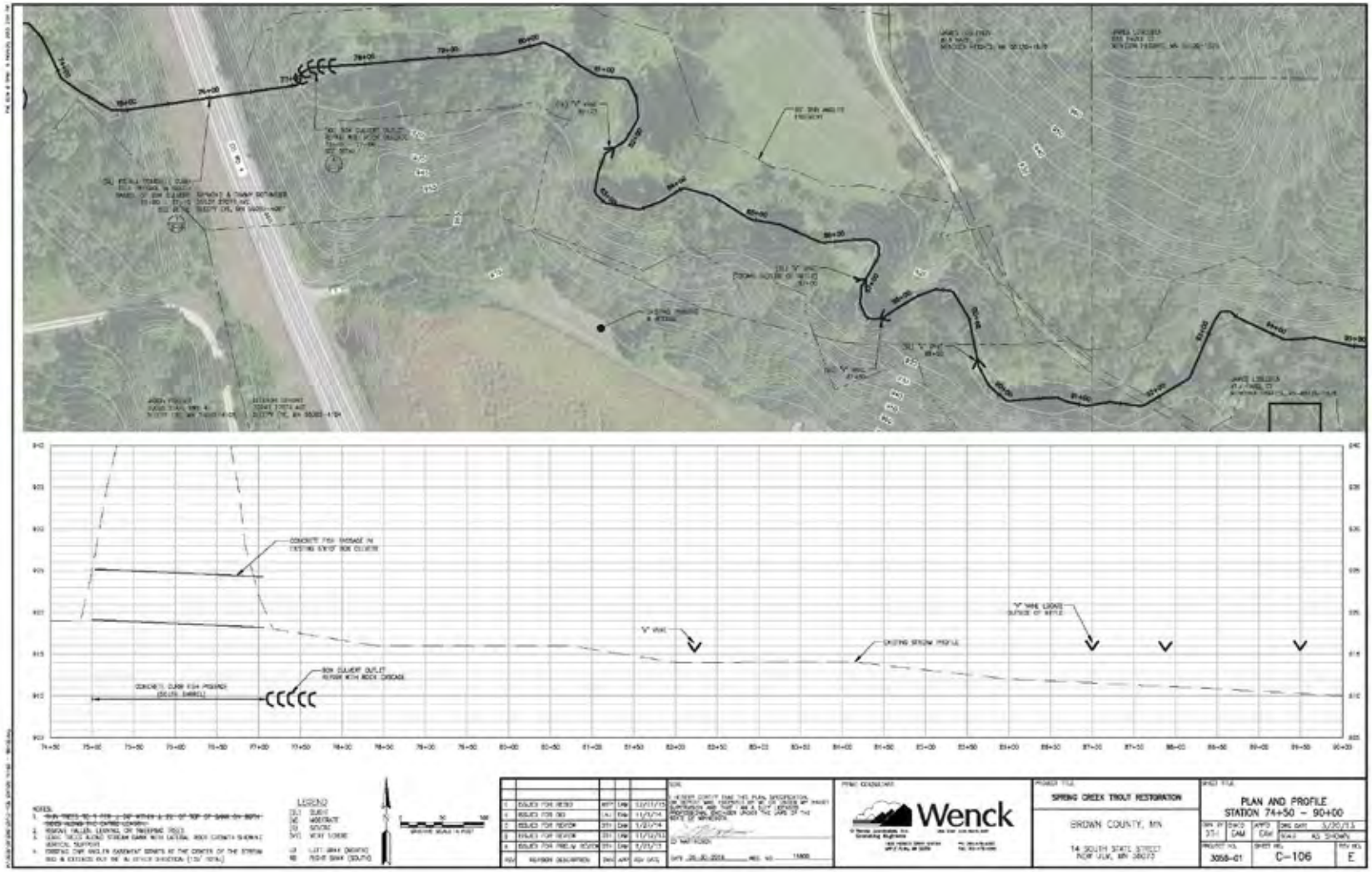


Figure 6-4 Construction plans sheet 7 of 16, plan and profile station 74+50 to 90+00.

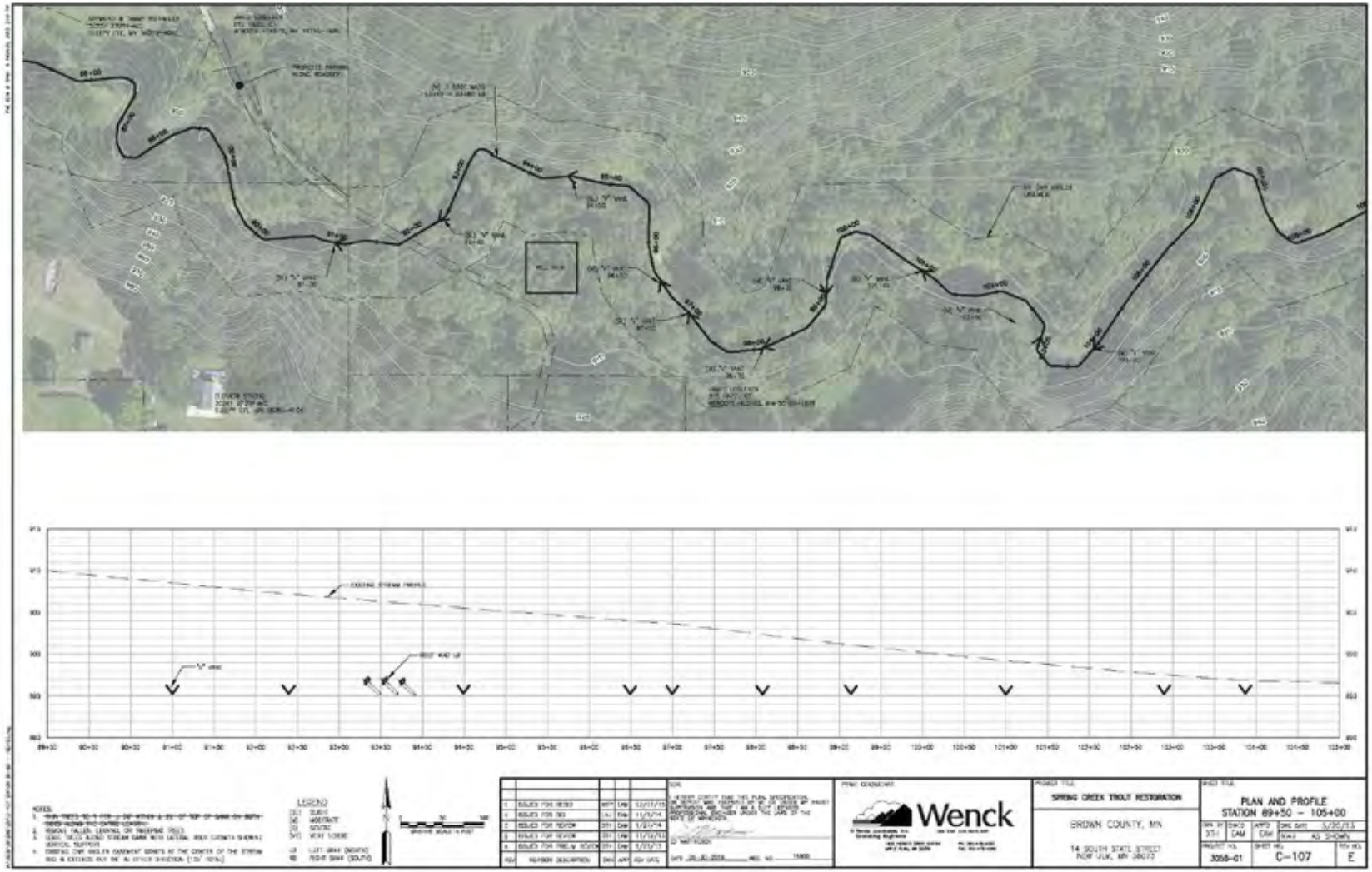


Figure 6-5 Construction plans sheet 8 of 16, plan and profile station 89+50 to 105+00.

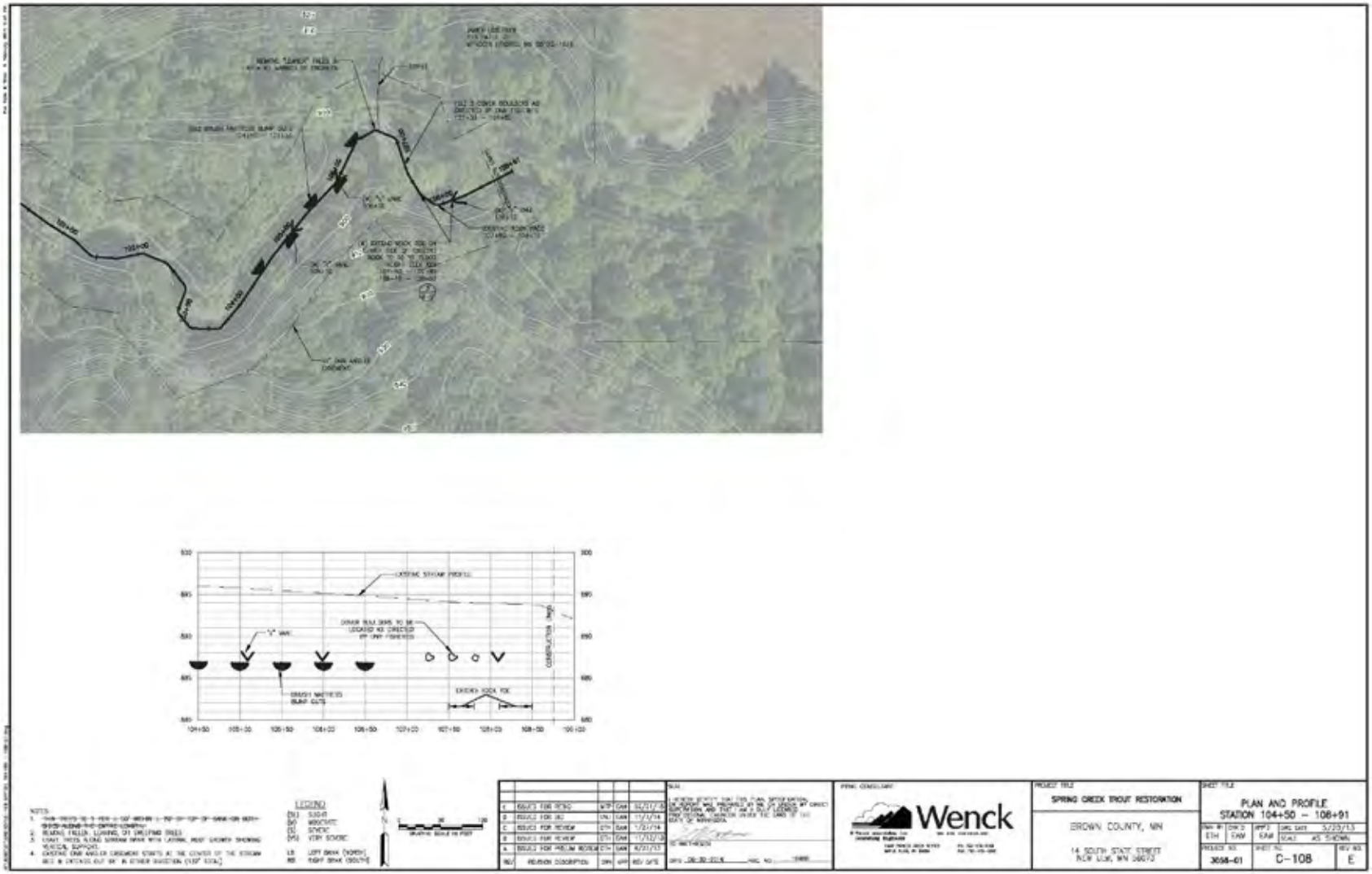


Figure 6-6 Construction plans sheet 9 of 16, plan and profile station 104+50 to 108+91.

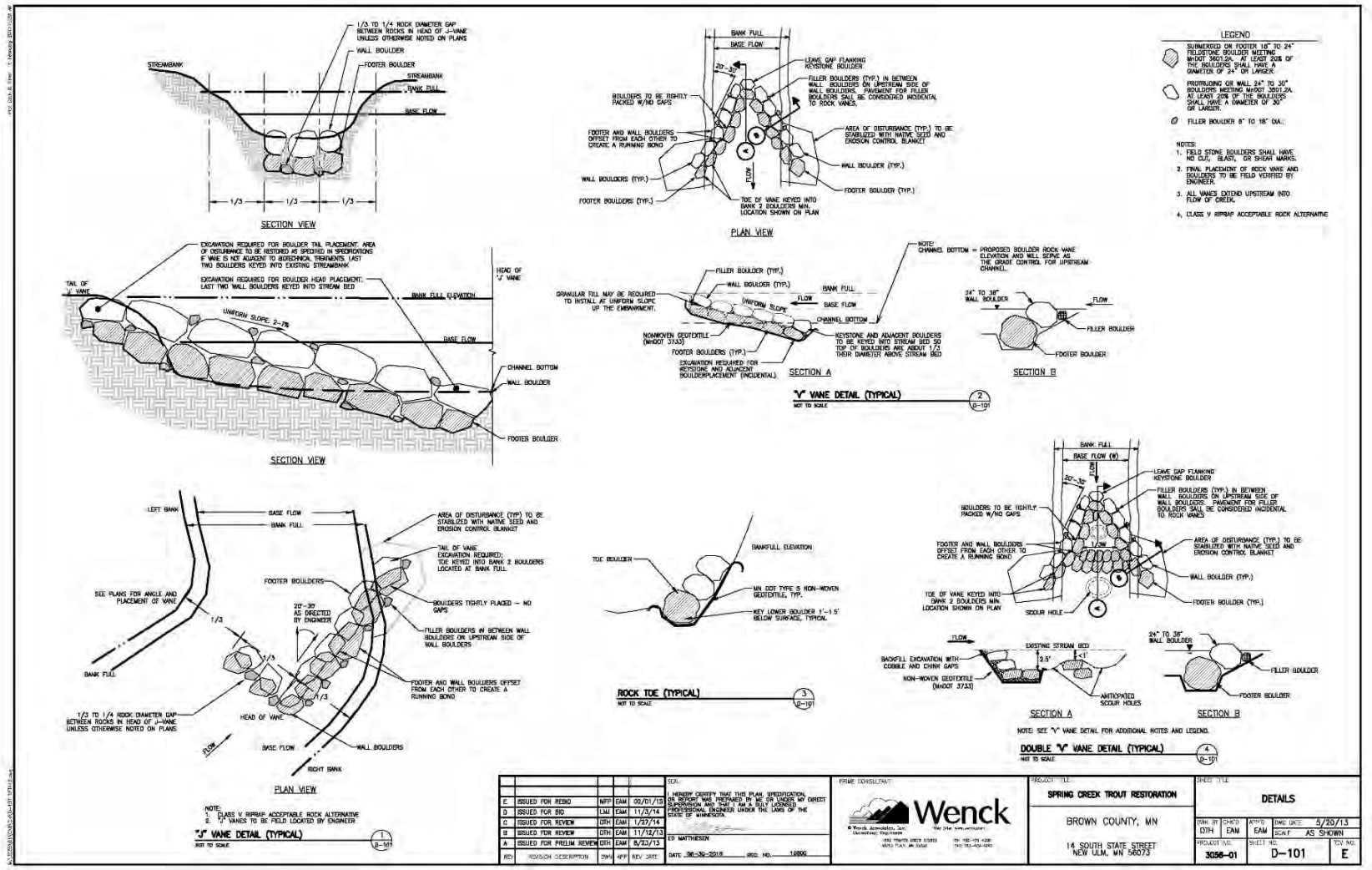


Figure 6-7 Construction plans sheet 11 of 16, "J", "V", and double "V" vane details.

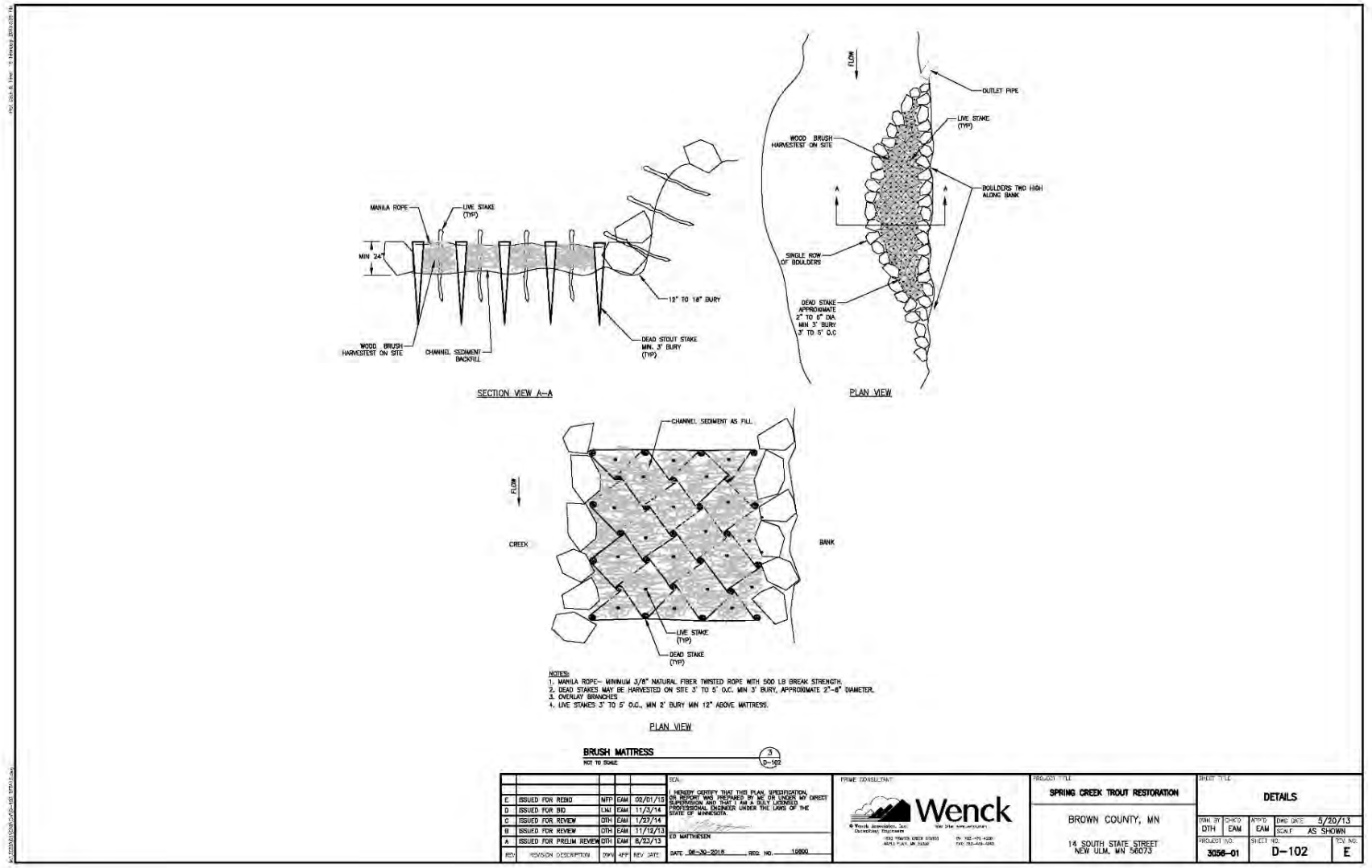


Figure 6-8 Construction plans sheet 12 of 16, brush mattress detail.

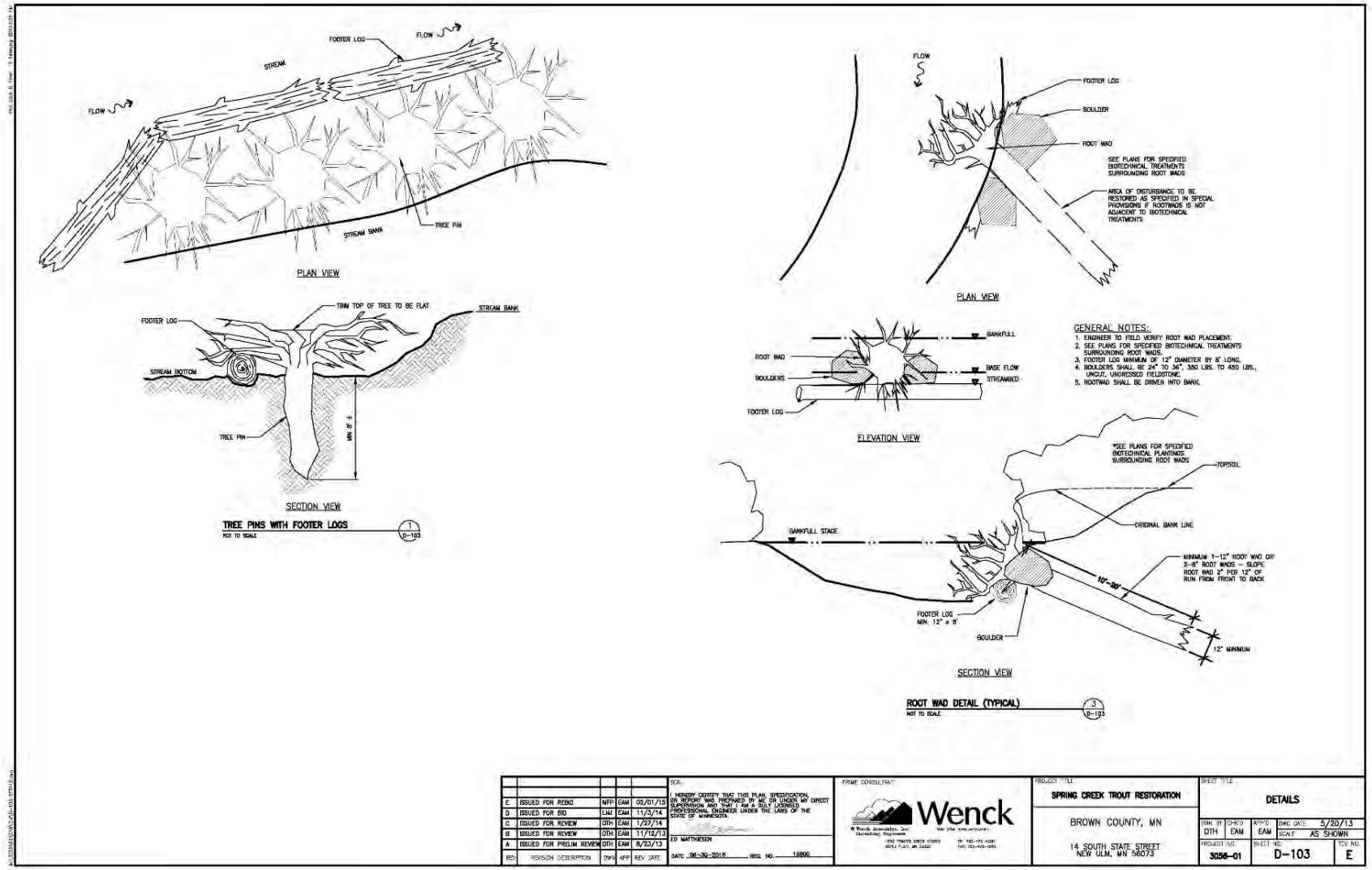


Figure 6-9 Construction plans sheet 13 of 16, tree pins with footer logs and root wads details.

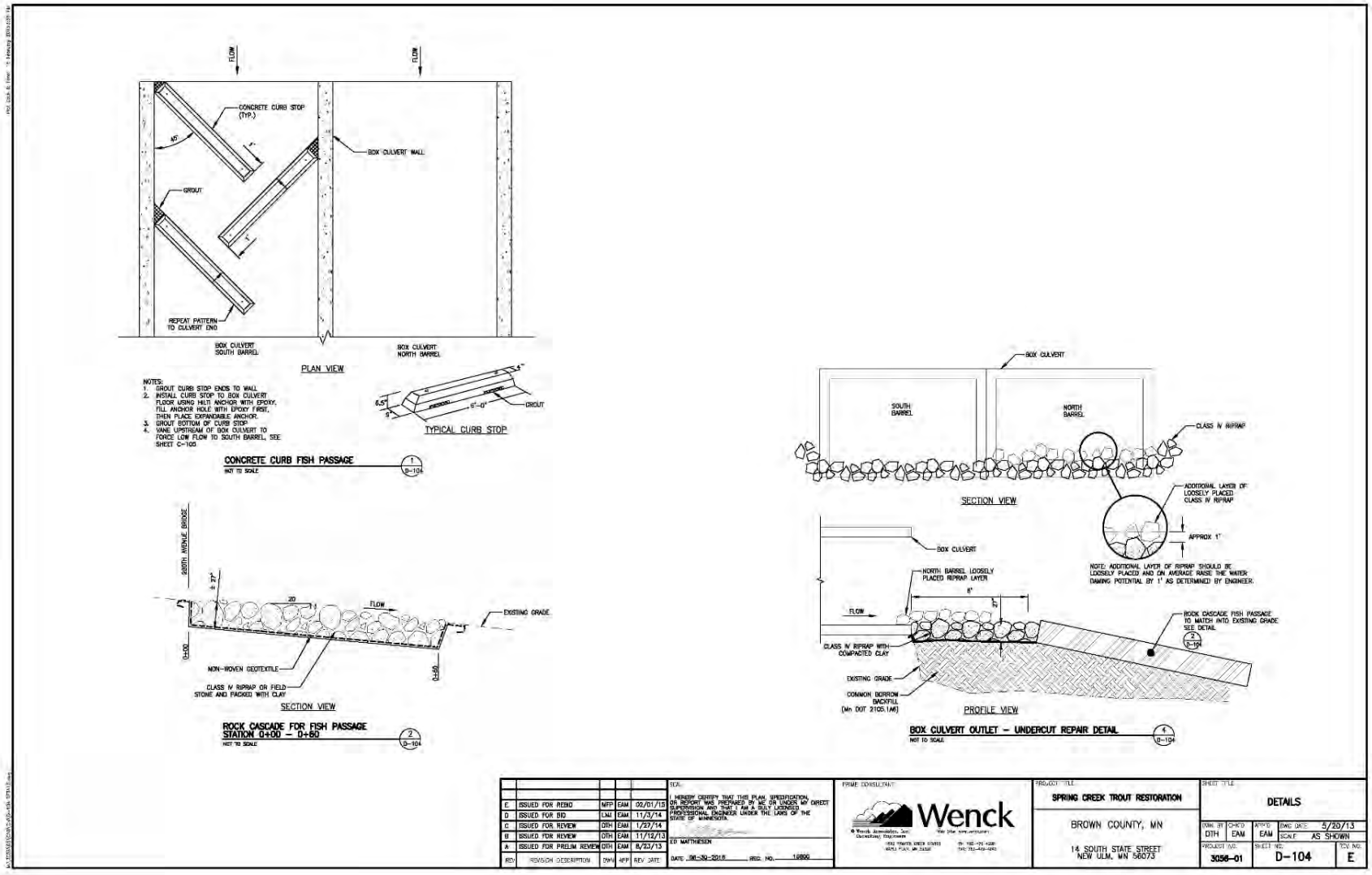


Figure 6-10 Construction plans sheet 14 of 16, curb stop and culvert outlet details for fish passage through culvert.

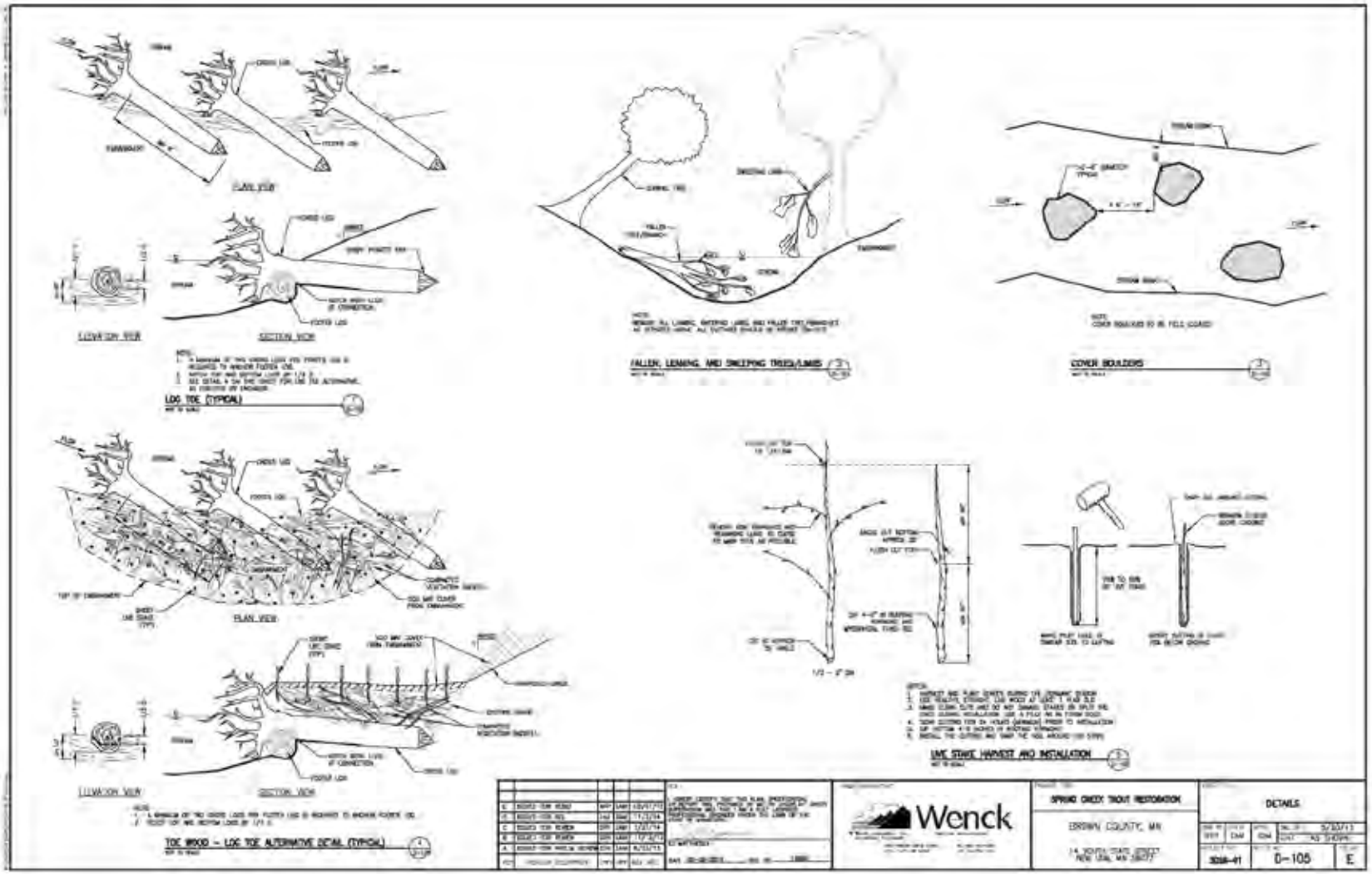


Figure 6-11 Construction plans sheet 15 of 16, log toe, toe wood, fallen trees, cover boulders, and live stake details.

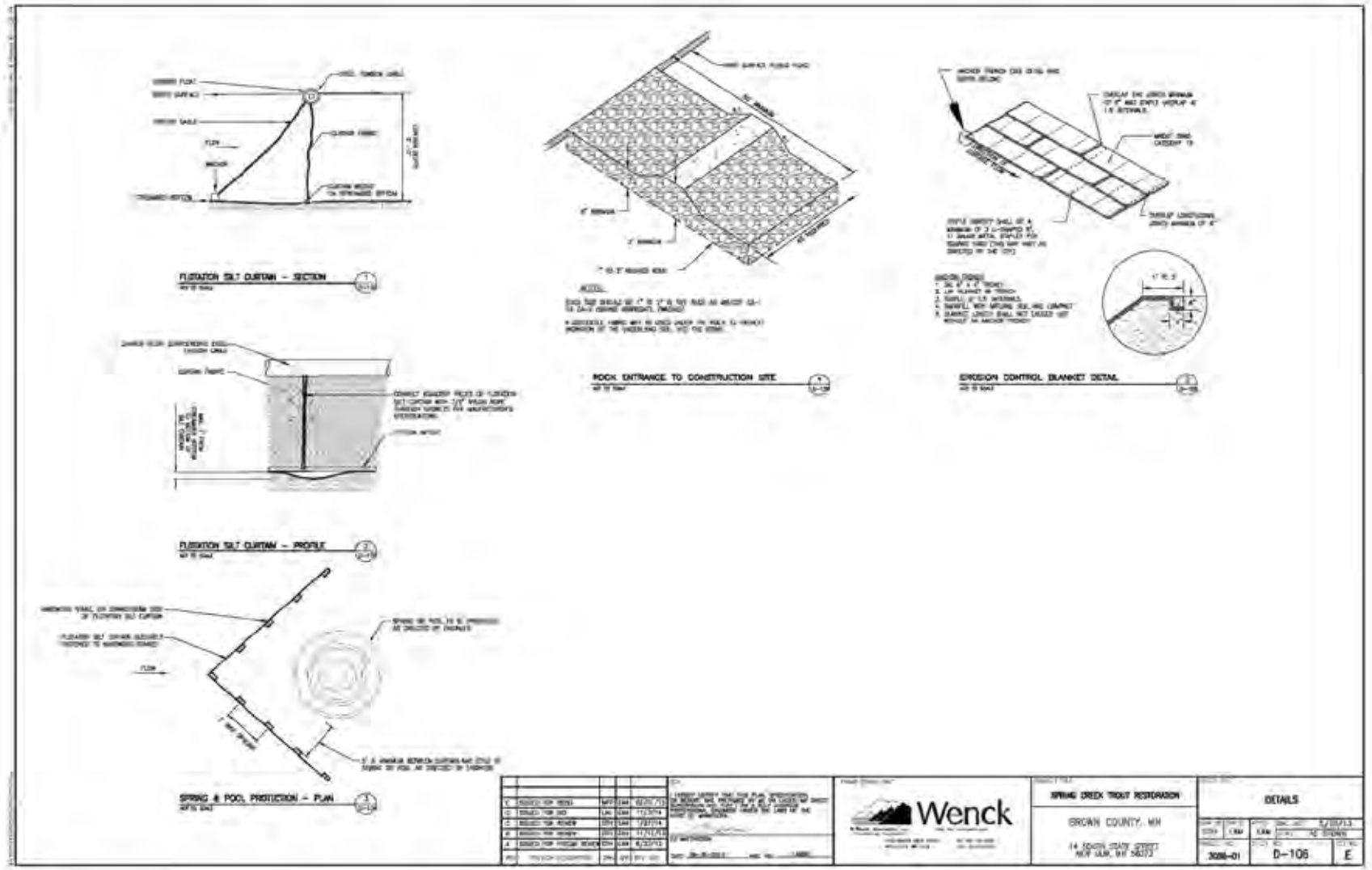


Figure 6-12 Construction plans sheet 16 of 16, details for erosion control during and after construction.

Spring Creek, 280th Ave – MN Hwy 4

Summary of field notes: September 26, 2013 (Garry Bennett, DNR Area Hydrologist & Brooke Hacker, DNR Regional Clean Water Legacy Specialist)

Bing Pictometry Image 2012. N↑

General comments and questions: This stream is somewhat of a reference for south central Minnesota and we want to ensure the stream is not adversely affected by proposed project(s). It's important not to disrupt the groundwater spring interaction with the channel and riparian zone. There are many areas where the stream is building its own floodplain bench, (We're working on showing the degree of incision (bank height ratio)). We think when Wenck's engineers visited the site on May 8, 2013, there was less vegetation growing on-site and the banks looked much more raw/exposed. Compared to what's typically observed, many of the banks are well vegetated with deep root protection. In addition, we want to request additional details on prosed bank re-sloping and seeding sites. Also, ask for clarification on the amount of woody debris to be removed. Will tree roots remain for protection? Provide examples of NCD/Rosgen style J hooks, cross vanes, and toe wood. Ask if proposed structures, such as root wads and log toe, will affect the cross sections area of the channel. If so, will channel be constructed maintain a common cross sectional area? Is it possible to use natural materials on site instead of hauling in the conifers for revetment structures? In summary, here are notes for each of the proposed structures:

From a stream stability (fluvial geomorphology) standpoint

0+00 = Perched culvert, proposed rock cascade 0+00-0+30, 10-1 slope. We recommend 20-1 and Class 5 rock. ~~Cascades are pointing the wrong way~~. D50 currently ~12". Possibly suggest a series of rock weirs or step pools. 20' spacing on the pools.

angular rock: class 4 20:1

0+50 = Deposition after scour. There's a cut bank after older rip-rap bank stabilization project.

0+60 = 5 Root wads proposed 0+60 - 1+135 LB. Clarify how far root wads will stick out into the channel. Will this affect the cross sectional area? Suggest moving root wads up to start at 0+50 starting where the rip rap previously ends. Site 50%+ covered with veg and woody root protection.

1+35 – 1+90 = Log toe proposed. See BEHI summary sheet. Clarify what will happen with existing large wood trees currently providing bank stabilization.

2+00 = Proposed add 2 CY class 3 rock to support tree. RB.

2+50 – 3+40 = 4 "J" vanes proposed on LB. Ask for additional clarification. Is this 20+30 degree horizontal angle tangent to river bank. 5:1 ratio is ok.

Are the J hooks really needed?

3+50 = Right bank proposed J vane. There is a convergence of wood debris and deposition feature. Question if J vane is needed here. Photo on right →

In our experience we don't always need J hooks before the toe protection.

Suggested grade control in upper reach, which is moderately to deeply incised. Try to reconnect w/ floodplain during high flows.

Figure 6-13 Comments from DNR on design, page 1 of 5. Under general comments and station 0+60 the DNR asks about cross sectional area, a width is given but neither current nor proposed cross sectional area is ever displayed in the design documents. Station 2+50 – 3+40, DNR asks about J hook angle, this angle is still incorrectly shown in design details.

4+50 = Right bank erosion occurring along valley wall, some clay. Log toe proposed. Toe protection needed. Woody debris is blocking middle of the channel.

Suggest toe wood bench?

5+00 = V vane proposed. Probably ok. Show cross vane example. Details says 18-24-36" rock. Ask about relationship to bankfull height. It says 18-24" rock will be submerged.

6+00 = Tree pins with footer pin. This site has established a floodplain bench. It doesn't seem tree pins are necessary. See photo. Possibly plant live stakes on the bench. →

6+80 – 8+20 = Log toe proposed. Ok, over hanging exposed bank with somewhat high sheer stress. Field stone along part of the bank could be used as a J vane. Clay outcrop is providing good pool habitat. Don't fill, observed spring, eddy pool.

8+70 = J vane. Is this listed on the wrong side? No erosive feature where J vane proposed.

8+75 - 10+40 = Cedar tree revetment, single row. Suggest reducing the length, springs downstream 10+00-11+00. Question if entirely necessary. Some debris blockage. Channel building its own bench along outside bend. Large debris could be used on building bench for additional protection. Spring comes in 12+00-50 Label spring/seeps on final plans.

12+80 -13+00 = Install 1 cy class 3 or field stone on side channel. Why fill the side channel behind Garry? Nice pools and riffles. →

Another seep 13+50

14+00 = Bank re-sloping and seeding proposed. Questionable. Seem like unnecessary impacts. Veg and protection looks fine. No reason observed, unless for fishing platform.

AVOID BANK Resloping.

19+00 – 21+00 = Proposed re-slope and seed. Boxelder trees will need to be cut. Tight contour spacing, 1:1 proposed? Located across from grass meadow. Unnecessary. Possible bench proposed.

21+50 = Clay outcrop observed, serving as grade control.

23+50 – 24+50 = Double row live stakes 100 plants. Buckthorn & sumac present. Clay toe. Valley wider, possible E channel here. Lower end near **24+50** would benefit from toe protection.

25+40 = J vane proposed. Pool observed 1.94' deep. Many fish.

24+50 – 27+00 = Is this incorrect? Should it be 26+00-27+00? Cedar tree revetment proposed. Suggest floodplain bench as alternative. Toe protection. Valley becomes more confined. Try to get thalweg away from bank. Very hard clay observed as good grade control around the bend. May have trouble installing tree revetment??

28+50 = Double row live stakes. Live stakes need more explanation. It looks very stable. Questionable.

29+50 = Plant live stakes in slope 150 sf 3' oc (25 plants) = ok, but questionable because it seems well vegetated.

29+70 = Proposed install 1 cy class 3 or field stone on 'side channel' to prevent head cutting. This has already formed head cut. Med to large cobble in ravine channel. 18-24" →

31+00 = Excess debris observed in channel. Narrow new channel flowing around debris and will eventually form new channel. Discussion on stabilizing new high flow channel.

31+00 - 32+00 = Log toe proposed. Tight radius of curvature. Concerns the new channel will cut off this area; therefore, log toe may not be necessary here as channel re-aligns.

32+90 - 33+40 = 4 V vanes proposed. Protect nice pool. Perfect trout habitat. Possible toe protection, 1 V vein okay, 4 not needed.

Pool before 4 proposed v vanes →

Figure 6-14 Comments from DNR on design, page 2 of 5. At station 6+00 the DNR comments that tree pins are not needed at this location, tree pins were installed, and the structure failed, see photo 16. Most of this work, from station 6+50 to 72+25, was eliminated from the final design.

35+00 – 35+50 = Possibly a good high bank for a toe wood bench, woody debris is channel, thalweg along eroding bank, and mature oak tree becoming unstable on high bank. However, bubbling spring 35+50, just downstream of eroding high bank. Nothing proposed here from Wenck. List seeps/springs on plans. Potential avoidance area because of GW springs

36+90 = Cedar revetment single row outside bend. Toe protection would help. Debris causing convergence of scour increasing NBS. We see spring seeps in this area. Consider minimizing activities in the area so we do not disrupt groundwater interaction.

40+90 – 42+50 = Proposed cedar tree revetment single row. Good pool @ 40+50. Bend currently has vegetated bench, except ~ 50' downstream. Consider starting 42+00ish. See BEHI.

42+00 = Large tree and roots on edge of bank. Heavy debris, confining channel, and splitting flow. Is Wenck proposing anything here?

46+50 – 48+00 = 5 cover boulders proposed. Riffle 46+50, pool ~47+50. Clarify what feature boulders will be placed in. Is this for fish habitat? Doesn't really seem necessary, but ask for additional details. Leave this decision up to Fisheries - Lee S.

49+50 = Proposed install Class 3 riprap or field stone at CMP outlet. We didn't see this in the field, or maybe missed it? Ask for details, clarification.

49+70 – 51+00 = Log toe LB. Toe vegetated already. Bank is stabilizing itself. Some medium woody debris edging into the channel.

51+00 – 51+90 = Reslope 3:1 and seed. Very questionable; is this is necessary? Good root density and veg. Already a low bank height. See Bank erosion estimates. NO

52+30 -53+00 = Log toe. Toe is already stabile with vegetation.

~~51+20 – 53+60~~ = 2 J vanes. Are these in pool or riffle. Riffles and pool in vicinity. Need explanation. NOT needed

55+10 – 56+70 = Cedar tree revetment is proposed, right bank. Medium size cobble is helping to stabilize the toe currently; suggest blf bench? Tight radius of curvature.

56+70 – 57+90 = Cedar tree revetment is proposed, left bank. 25' distance from radius of curvature to stream centerline. Suspect potential future channel cut off. Protection okay, but tight RC. Bench already starting to form in areas.

60+50 – 61+50 = Reslope to 2:1 and seed with live stakes. Not sure grading is needed. Radius of curvature 30'. Suggest possible toe root wads, toe protection. Clay bluff. See BEHI. tight radius maintain Xs area w/protection, if even used.

62+50 – 63+70 = Cedar tree revetment proposed. Okay.

65+00 – 66+60 = Reslope to 2:1 and seed. Not needed. Suggest root wads instead. Why not just use toe protection. Regrading will cause a lot of destruction with minimal benefit.

68+00 – 70+00 = Cedar Tree revetment proposed. Vegetation currently looks good, toe stabilizing and mostly healed over. Nice bench. Cedar revetment unnecessary here.

70+00 – 70+85 = Reslope to 2:1 and seed double row with live stakes. No sloping needed. Live staking okay. Upper section looks good at this time.

Private temporary crossing on Jason Fisher's land.

71+40 – 71+90 = Cedar tree revetment proposed. Ok. Good access from Fisher's trail.

72+50 – 73+35 = Log toe with double row live stakes. Okay.

74+90 = J Vane proposed to push flow through right/south barrel @ Hwy 4. Need explanation, why is this proposed. W instead one V set lower.

78+00 – 108+00 = Request additional information about the trail and angler platforms. Does this fit within the specs of the grant? Refer to: Lee Sundmark, DNR Fisheries

low impact trails, wetland delineation? Make sure no wetland impacts.

77+00 – 78+60 = Reslope 2:1 and seed. Is this needed for habitat or angle access. Live staking okay. High W\D ratio and aggradation observed downstream culvert.

Figure 6-15 Comments from DNR on design, page 3 of 5. Most of this work, from station 6+50 to 72+25, was eliminated from the final design.

Spring Creek, MN Hwy 4 – abandoned 270th

80+50 – 82+00 = Reslope and seed. Same questions. Excessive restoration? Short term degradation to channel? Quantify long term benefit?

83+00 = Cedar tree revetment. A good site for toe protection. Stream is up against the valley wall. We surveyed here last spring, first big bend after Hwy 4.

86+20 – 86+90 = Cedar tree revetment. Pool study bank with pins, surveyed April 2013.

87+00 = V vane proposed. Located around 660' on DNR's long pro, Apr 2013, in vicinity of a riffle.

87+00 – 88+00 = Cedar tree revetment, double row, right bank.

87+80 = V vane proposed.

89+50 = V vane, is it needed?

89+60 – 91+00 = Cedar revetment double row proposed.

There's concrete debris from the 'old road'. One angler platform between 92 & 93+00. Any possibility of removing old road remnants, culverts in channel? Or, removal possibly part of another future project?

105+10 = V vane

106+00 = V vane

106+50 – 107+00 = Cedar revetment proposed on RB. Highly unstable ravine outlets into the stream here. If large root exposed trees come down this could change the pattern and profile of the stream in this area. If this is viewed as a priority area, more survey work and design is needed.

Figure 6-16 Comments from DNR on design, page 4 of 5. The DNR recommended toe protection for a large valley wall at 83+00, no protection was included in the final design

107+30 -107+80 = 3 Cover Boulders proposed. Not necessary. Up to Fisheries

107+50 – 107+80 and 108+10 -108+50 = Extend rock toe on either side of existing rock to 10 yr flood height elevation XXX. Request additional details.

108+10 = V vane

108+30 – 108+91 = Double row of live stakes to be planted. OK

Example of difference vegetation cover –

September 26, 2013

May 8, 2013

General DNR comments

- Stream stability vs. H1 work
- Emphasize toe protection
- Minimize disruption to pool & riffle sequences
- Concentrate grade control features at head of glide.
  - Upper reach, reconnect w/ floodplain.
- V vanes – use class 5. Angle 15° off each bank.
- Allocate project funds to priority areas 1st.
- Bankfull indicators consistently 2.4' above WS on 7.26.2013. We can help identify bkf during construction staking, if needed.
- Discussion about amount of woody (trees) debris to be removed from riparian corridor. Visit with Lee Sundmark or Barry Bennett – maybe someone from DNR could assist w/ tree staking/removal.

Figure 6-17 Comments from DNR on design, page 5 of 5.

Appendix B: Site Photographs

Photo 6-1 Fish passage riffle at County Road 4. 5/14/18.

Photo 6-2 Stakes for erosion control blanketing sticking to far out of the ground.

Photo 6-3 Erosion occurring on upstream end of bank stabilizing treatment.

Photo 6-4 Toe wood currently high and dry due to sedimentation from an upstream structure changing the direction of flow.

Photo 6-5 Top photo taken 6/6/16 during CPL monitoring site visit, compare to same bank in photo below taken 5/14/18. Significant bank failure and erosion between photos, no structures or stabilizing treatments were applied directly to this bank.

Photo 6-6 Vane creating pool and fish habitat but constructed at wrong angle and directing flow into the bank. 5/14/18.

Photo 6-7 Vane creating pool habitat and diverting flow away from eroding bank.

Photo 6-8 Structure diverting flow away from eroding bank. 5/14/18.

Photo 6-9 Structures at eastern end of project altering stream pattern, pushing flow into banks and causing erosion. 5/14/18.

Photo 6-10 Structures at eastern end of project altering stream pattern, pushing flow into banks and causing erosion. 5/14/18.

Photo 6-11 Structure at eastern end of project has blown out. 5/14/18.

Photo 6-12 Vane on right side of channel creating pool habitat and diverting flow away from eroding bank. 5/14/18.

Photo 6-13 Partial failure of fish passage riffle at 280th Ave culvert, fish passage is still possible. 5/14/18.

Photo 6-14 Toe wood sticking well out of the water and higher then neighboring pieces possibly causing the erosion in-between the root wads. 5/14/18.

Photo 6-15 Erosion occurring at downstream end of toe wood. 5/14/18.

Photo 6-16 Failed tree pin structure. 5/14/18.

Photo 6-17 Failed vane structure causing bank erosion on left side of photo. 5/14/18.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

7) OHF Lawndale Creek Channel Restoration

Project Background

Project Name: Lawndale Creek Channel Restoration

Project Site: Wilkin County, MN

Township/Range Section: Township 136N Range 46W Section 34&35

Project Manager / Affiliated Organization: Neil Haugerd / MN DNR

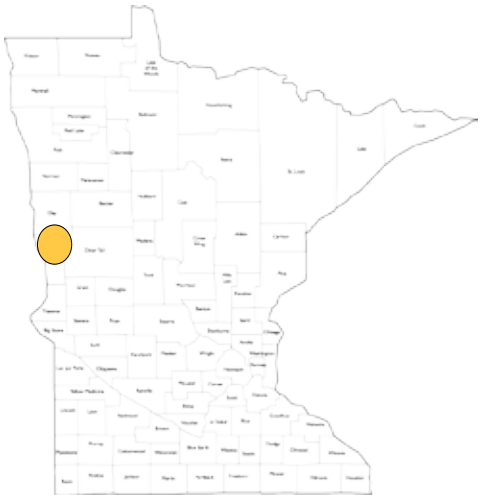
Fund: OHF ***Fiscal Year Funds:*** 2010

Project Start Date: Construction completed in 2011

Predominant Habitat type: Aquatic Habitat

Additional Habitat types: Wetland , Prairie / Savana / Grassland

Project Status: Post Establishment Phase



County: Wilkin

Primary Activity: Stream/River Restoration

Project Size: 5.5 km

Project Completed: 2011

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   The project involved excavating and realigning a public ditch (State Ditch 14) as a meandered stream channel (5.5 km) and diverting Lawndale Creek back to its historical location and out of another public ditch (County Ditch 40).
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***

- Construction Plan Set dated 3-22-2007
- Public Review Environmental Assessment Worksheet (EAW) dated 11.13.09
- 2012 Partnership for River Restoration and Science in the Upper Midwest (PRRSUM) presentation by Dr. Luther Aadlund
- Stream Restoration on WMAs The Lawndale Creek Example presentation by Don Scultz and Dr. Luther Aadland
- Published pre and post project monitoring data from:
    - Smiley, Peter and Lenhart, Christian. Ecological Restoration in the Midwest, Past Present and Future. University of Iowa Press - Bur Oak Books, 2018. Print.

3. ***What are the stated goals of the project?***
   The primary purpose of the project was to improve habitat for brook trout (*Salvelinus fontinalis*) and the associated cold-water stream community while enhancing stream function. The goal of the project was to enhance angling opportunities and increase brook trout catch rates within the project area. Restoration of hydrology through the site was also intended to enhance the adjacent wetlands and prairie.
4. ***Were measures of restoration success identified in plans?*** *Yes*
   If yes, list specific measurements.
   Specific metrics were not available to the evaluator, but the following measurements of success are readily inferable:
    - Expansion of brook trout populations and the associated cold-water stream community
    - Enhanced angling opportunities and increase brook trout catch rates
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   Sheets 1-3 & 10 of 11 from Construction Plan set dated 3/22/2007 included in Attachment A
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   Natural Channel Design (NCD) methodology was implemented to inform analysis & design. NCD is a standard industry methodology for stream restoration, most associated with Wildland Hydrology Consultants and Dave Rosgen.
   The practices employed, such as Toe-wood, are common practices used in stream restoration/stabilization in Minnesota.

Project Implementation

(Questions for Site Manager and Cooperating Professionals) List field visit attendees names and affiliations.

7. ***Were alterations made to the original plan during construction?***
   No
   Construction plans were not substantially deviated from, but the proposed design specification (Table 1) and/or stream pattern was inadvertently deviated from for the lower ~0.5 mile of the project.
8. ***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?***

The current resulting stability and habitat value of the lower reach is noticeably lower in comparison to the upstream ~5.0 miles. Higher width to depth ratios and less over bank cover is more common in this lower reach (Photo 3).

Site Assessment

Field Review Date: 5/21/2018

Field Visit Attendees: Neil Haugerud (MDNR), Wade Johnson (MDNR) and Kevin Biehn (EOR)

9. ***Surrounding Landscape Characteristics:***

Lawndale Creek is part of the Buffalo River Watershed (Hydrologic Unit Code 09020106). The watershed is largely agricultural (row crops and pasture), accounting for more than 70% of the overall watershed acres.

Lawndale Creek, located in Wilkin County, is classified by the state as a trout stream. Unique, cold water springs (Photo 2) within the Rothsay Wildlife Management Area form the headwaters of the creek. The reach of Lawndale Creek and the aforementioned springs reside on Campbell Beach of former of glacial Lake Agassiz.

The project site is mostly located within the Atherton Wildlife Management Area.

Site Characteristics:

a. Soils:

The Wilkin County Soil Survey identifies five different soils classifications within the project area. The Arveson loam and Hamerly loam (1 to 4%) soils are not present in large amounts within the project area. Haug muck, Vallers loam, and Urness mucky silt loam are the main soils in the project area. These soils are various degrees of poorly drain soils, which are expected of a wetland area.

b. Topography:

Project occurs on nearly level to gently sloping landscape.

c. Hydrology:

A majority of the Atherton WMA is identified as an emergent wetland on the National Wetlands Inventory. The entire project area is within this wetland area.

Stream base flow, predominately fed by the aforementioned spring, is ~5 cubic feet per second (cfs) and per project design specifications the channel forming discharge is 50 cfs.

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

The Atherton WMA is a nearly level wet/mesic prairie complex dominated by big bluestem and Indian grass. Forbs are abundant, but with low diversity. The property was hayed annually prior to its acquisition for a WMA.

e. Vegetation B: Meander Search Species List (as appropriate for site)

A floristic inventory was not completed as part of this evaluation.

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

- Natural Channel Design (NCD) methodology was implemented to inform analysis & design. NCD is a standard industry methodology for stream restoration, most associated with Wildland Hydrology Consultants and Dave Rosgen.
- The practices employed, such as Toe-wood, are common practices used in stream restoration/stabilization in Minnesota.

11. ***List indicators of project outcomes at this stage of project:***

    The biological response to the restoration has been substantial since the reconnection of the restored channel in August 2011. The following testaments to this response are excerpts from *Ecological Restoration in the Midwest, Past Present and Future*:

    - As of September, 2015, 30 species of native fish have been identified in the restored reach of Lawndale Creek. These include several regionally rare headwater species (i.e., northern pearl dace, river darter) and many common species.
    - Thirteen fish species were documented from County Ditch 40 from four surveys conducted between 2004 and 2010 (pre project). In contrast, 27 fish species were documented from the upper restoration reach and 24 fish species were documented from the lower restoration in five surveys conducted from 2011 to 2015 (post project).
    - Benthic aquatic macroinvertebrates colonized quickly, but their taxa composition changed with time. Initially, taxa were dominated by chironomids, blackfly larvae, and wetland species followed by increasing numbers and diversity of mayflies, caddisflies and stoneflies.
    - Native fatmucket mussels brought in by migrating host fish began colonizing riffles quickly.

    Post project geomorphic survey data was not available to the evaluator, but based on 5/21/2018 observations and professional judgment the stream pattern, profile and cross-section is generally stable and generally optimal for brook trout habitat at this stage of development.

12. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***

    The re-meandering of the channelized stream has restored natural channel geometry, reestablished instream habitat features beneficial to aquatic life, and increased stability and resilience. Construction was completed in 2011, but the restoration should continue to evolve and mature has natural processes, such bedload recruitment and sorting, predictably continue.

13. ***Are corrections or modifications needed to meet proposed outcomes?***

    If not already completed, the lower reach of the project should be further evaluated to determine if modifications are worthwhile (see response to Questions 7 & 8).

14. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***

    There are no planned future implementation or management activities known to the evaluator.

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

    No long-term detraction apparent

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

    Given the age of the restoration (~7 years) and high confidence in meeting proposed outcomes this project is not prioritized for further Legacy Fund evaluation.

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

    - Project construction cost was reported at ~$325,000. Based on the scale of this project (5.5km of new channel), this cost is well below industry norms and based on the professional opinion of the evaluator is a remarkable cost/benefit value.
    - The challenge and precedent of restoring a stream within a legal ditch system is noteworthy. Channelized streams that are part of the legal ditch system are assumed to provide drainage benefits to adjacent farmland by increasing hydraulic conveyance and any physical modifications are generally required to maintain drainage capacity. Traditional design of ditches focused on

preventing flooding of agricultural fields by separating connections between the streams and their floodplains by dredging channels deeper or wider. In contrast, stream restoration seeks to reconnect streams to their floodplains. The Buffalo-Red Watershed District played a critical role in working through the legal issues involved with working on a ditch system. Ultimately, the restoration was conducted as a diversion for public benefit, which is a provision within Minnesota drainage laws. The Wilkin County Highway Department, Trout Unlimited, and several landowners also were partners in making the project possible. State Ditch 14 was blocked with a series of plugs creating wetlands within the ditch. County Ditch 40 still remains, but flows were diverted into the restored channel.

- Planning and execution efforts to avoid, minimize and mitigate construction impacts, particularly soil & plant disturbance, is also noteworthy. The following actions where reportedly taken:
    - Thorough pre-project floristic assessment and utilization in design to avoid high quality areas;
    - Winter excavation and tracking of excavation equipment within newly excavated channel;
    - In areas of higher quality prairie fill was hauled to ditch plugs;
    - In segments with invasive species monocultures fill was sidecast and seeded with native forbs and grasses
- Toewood installations appeared to lack smaller diameter brush and fill material, which is essential for the stability and longevity of the installation. As such a few of the installations appear to be prematurely degrading, but no substantial bank instabilities were observed (Photo 3).
- Not necessary germane to this evaluation, but it should be noted that project proposers had to resolve a unique irrigation appropriation (up to 2 cfs or most of the stream's base flow) in order to support and accomplish the project. The Buffalo-Red Watershed District facilitated shift to existing well & low pressure system under water conservation program.
- Reference reach surveys identified the propensity and habitat value of hammerhead pools to brook trout. Hammerhead pools provide the deeper water refugia and cover for brook trout within Lawndale Creek. While this feature is naturally occurring within Lawndale Creek references reaches, creating a stable hammerhead poses significant challenges. Project proposers attempted creation via the inclusion of upstream riffle structures and toewood on the outside bank to maintain the radii of curvature (1.2-2.5) during establishment (Figure 4 & Photo 4).

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.

18. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    High
19. ***Provide explanation of reason(s) for determination.***
    Monitoring of the biotic community is showing very favorable results thus far and channel geomorphology was observed to be generally stable and possess favorable habitat. See response to question #11 for more specifics.
20. ***Site Assessor(s) Conducting Review:***
    Kevin Biehn (EOR)

Appendix A: Site maps, Project plans or Vegetation tables

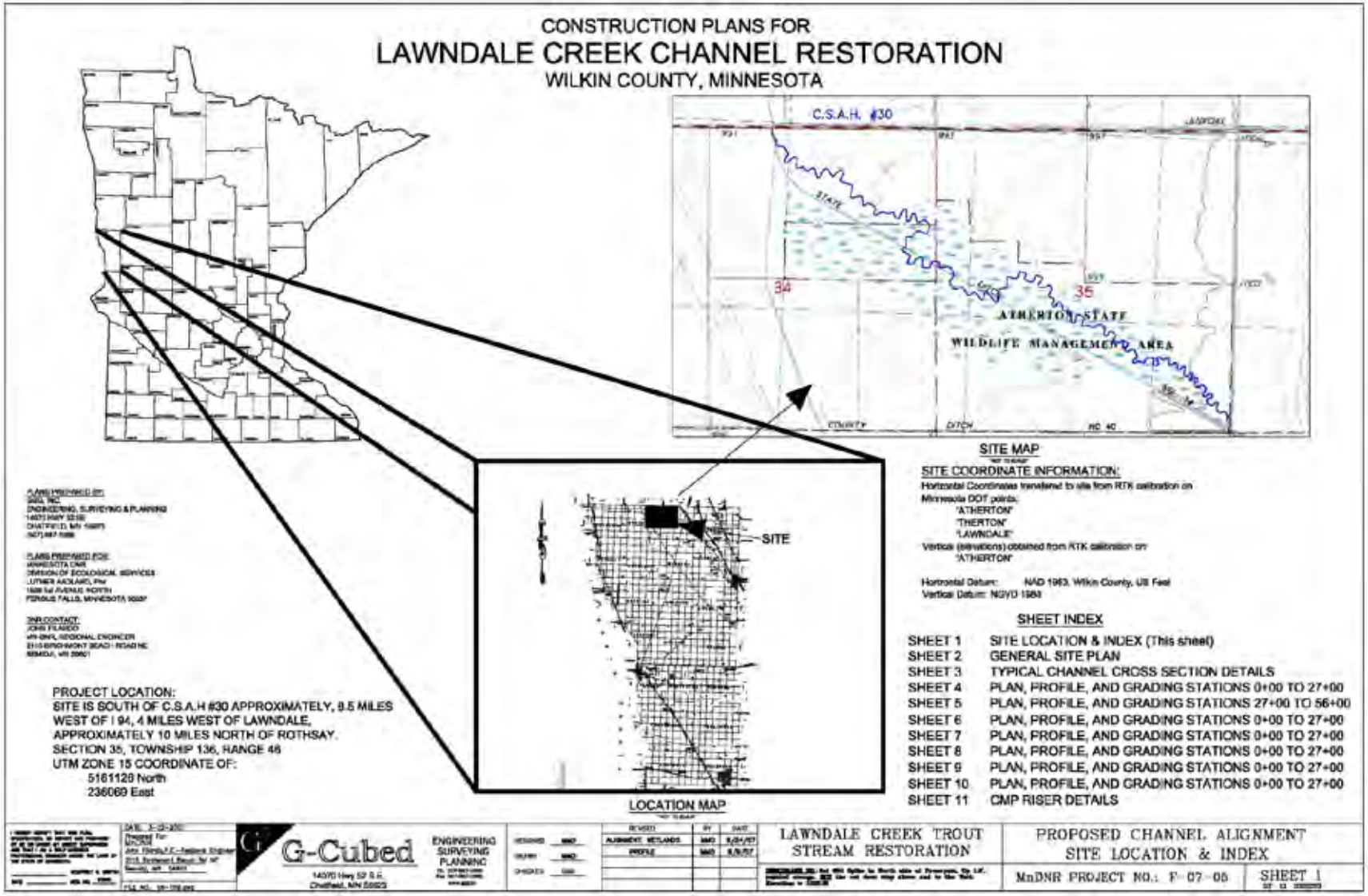


Figure 7-1 Sheet 1 of 11 (Cover Sheet) of the Construction Plan Set dated 3/22/2007

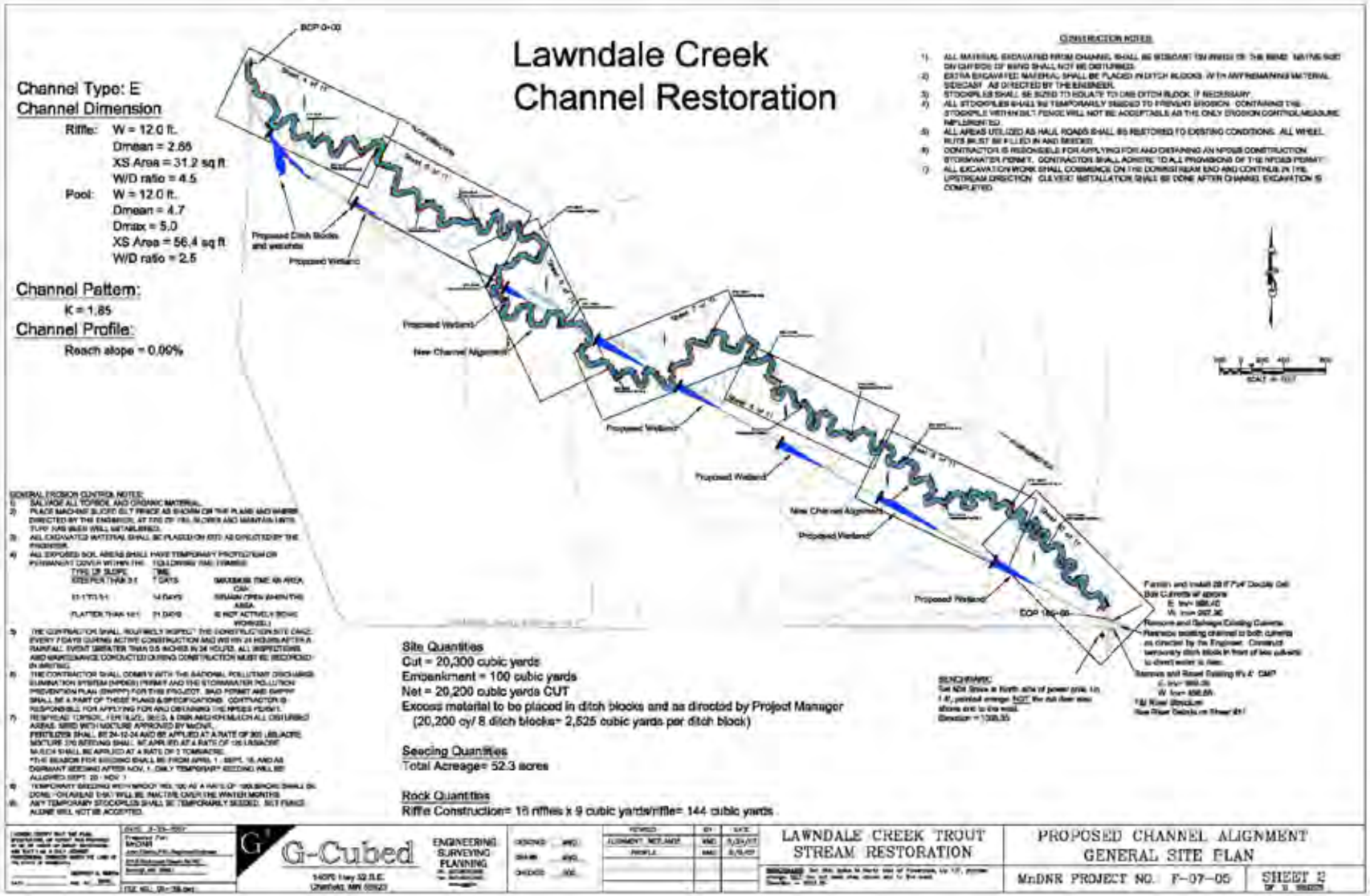


Figure 7-2 Sheet 2 of 11 (General Site Plan) of the Construction Plan Set dated 3/22/2007

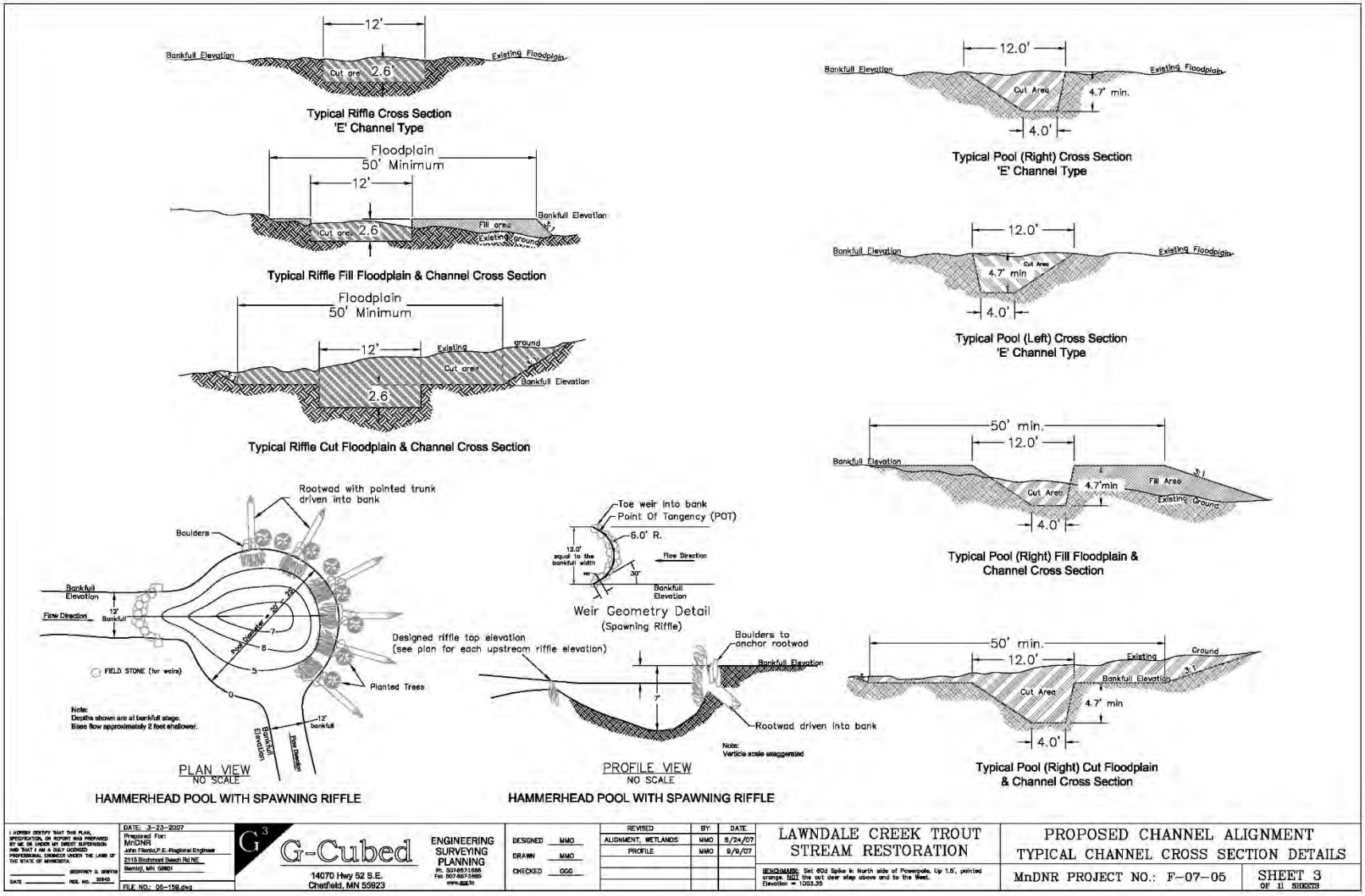


Figure 7-3 Sheet 3 of 11 (Typical Channel Cross Section Details) of the Construction Plan Set dated 3/22/2007

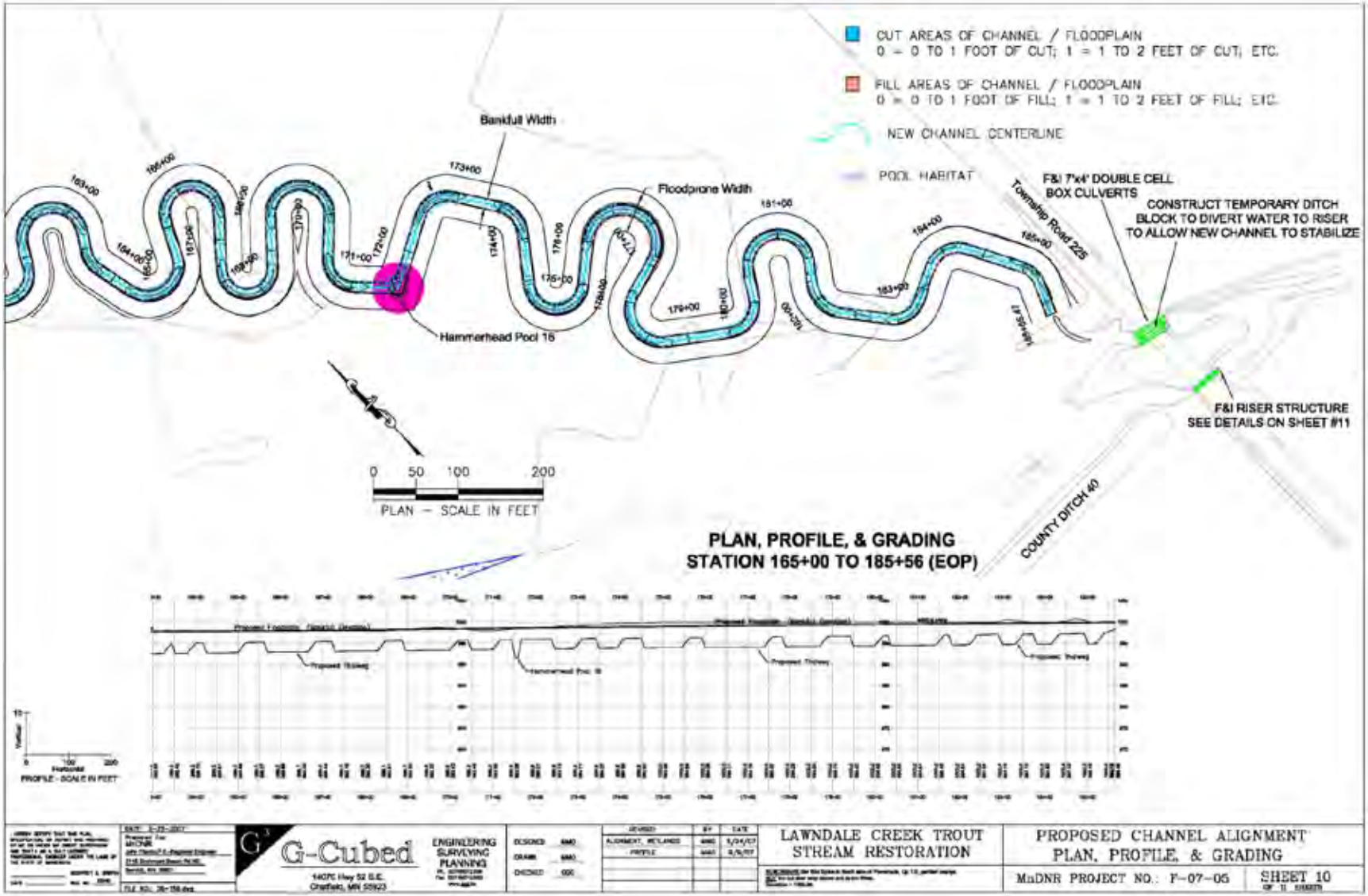


Figure 7-4 Sheet 10 of 11 (Representative Plan, Profile and Grading Sheet) of the Construction Plan Set dated 3/22/2007

Table 7-1 Project design specifications, excerpted from the Environmental Assessment Worksheet

Table 1
Lawndale Creek Habitat Enhancement Project Proposed Design Specifications

Drainage area	14.4 square miles
Channel forming discharge	50 cubic feet per second (cfs)
Bankfull width	12 feet
Bankfull mean depth	2.7 feet
Cross sectional area	32 square feet
Bankfull maximum depth	4 feet
Width/depth ratio	4.5
Floodprone width	≈ 200 feet
Average slope	0.09%
Hydraulic radius	21 feet
Bankfull mean velocity	1.5 feet per second
Critical shear stress	0.75 kg/m^2
Meander length	Range of 28 to 42 feet
Radius of curvature	Range of 28 to 42 feet
Belt width	240 feet
Sinuosity	1.85 (ratio)
Pool to pool spacing	Range of 60 to 70 feet; mean of 35 feet

Appendix B: Site Photographs

Photo 7-1 5/21/2018 Photograph of Lawndale Creek representative of the low width-to-depth ration and desirable overbank cover throughout the majority of the restoration.

Photo 7-2 5/21/2018 Photograph of Lawndale Creek representative of the lower ~1 mile of the project which is less stable and more entrenched.

Photo 7-3 5/21/2018 photograph of primary spring which forms the coldwater headwaters of Lawndale Creek

Photo 7-4 5/21/2018 photograph of toewood installation. Large voids present in ~7 year old installation, but bank is stable.

Photo 7-5 5/21/2018 photograph of a created hammerhead pool with a riffle/grade control structure in the foreground (upstream) and toewood installation in the background (downstream).

Minnesota Department of Natural Resources
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8) OHF Sauk Rapids Area Small Wetlands Pelican Lake WMA

Project Background

Project Name: Pelican Lake WMA Wetland Restoration

Project Location: Wright County, MN

Township/Range Section: Township 120N Range 25W Section 2, 3

Project Manager / Affiliated Organization: MN DNR, Fred Bengtson / Ducks Unlimited, Inc.

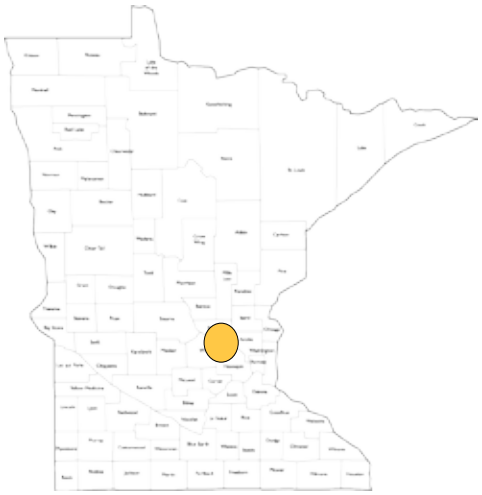
Fund: OHF ***Fiscal Year Funds:*** 2011

Project Start Date: 2013

Predominant Habitat type: Wetland

Additional Habitat types: Forest , Prairie / Savana / Grassland

Project Status: Post Establishment Phase



County: Wright

Primary Activity: Wetland Restoration

Project Size: 25 Wetland Acres

Project Completed: 2014

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Ducks Unlimited, Inc. contracted with Kieffer Contracting LLP to remove soil from within the bed of drained wetlands to create embankments. These activities restored drained wetlands by creating borrow sites with a depth of disturbance of one to two feet within the wetland bed side of the constructed embankments. Emergency spillways were constructed away from the embankments and required 1 foot or less cut. Wetlands were allowed to naturally revegetate with hydrophytic vegetation and were not seeded or planted.

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

   The following documents were made available and were reviewed as a part of this evaluation:

   Pelican Lake WMA Preliminary Construction Plan Set, Sheets 1-7 by Ducks Unlimited. 2-16-2009

   Pelican Lake WMA 2009 WCA Reporting Email

   Pelican Lake WMA Plan submittal Email

   Pelican Lake WMA 2009 WCA Checklist.

   Pelican Lake WMA MN Joint Project Application Form.

   Three pre-project digital images.

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

   From accomplishment plan: "These projects restore wetland habitat and enhance shallow lake habitat for wetland-dependent wildlife and migratory birds".
   Construction fill from within the bed of drained wetlands will be removed by contractors to create embankments. These activities will restore drained wetlands by creating borrow sites with a depth of disturbance of one to two feet within the wetland bed side of the constructed embankments. A total of 9 basins (Identified as A-I) will be restored or enhanced for a sum of 22.8 acres

4. ***Were measures of restoration success identified in plans? No***
   If yes, list specific measurements.
   None other than the goal of creating wetlands on the site
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   None, other than map found in plan set
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?*** Yes

   <u>Embankment:</u>

   - The approach uses immediately adjacent material to create an earthen berm to restrict surface water outflow and raise normal water level of depressional wetlands

   <u>Emergency Spillways:</u>

   - Creation of defined stabilized spillways for large events to exit the wetland without causing damage to the constructed earthen berms

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   No
   Not that could be identified during the site visit.

8. ***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?***
   None.

Site Assessment

Field Review Date: **5/22/2018**

Field Visit Attendees: identified Fred Bengston, MN DNR Sauk Rapids Area Wildlife Manager. Wade Johnson, MN DNR. Jason Naber, EOR Inc.

9. ***Surrounding Landscape Characteristics:***

Excerpts from https://www.dnr.state.mn.us/ecs/222Mb/index.html

And https://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/profiles/big_woods.pdf

This site is found within the Big Woods subsection of Eastern Broadleaf Forest. Oak woodland and maple-basswood forest were the most common vegetation types prior to European settlement. Today, most of this region is farmed, and only a small fraction of the original "Big Woods" remains. Forested areas are widely separated from each other, although a good deal of edge habitat remains. Remnants of this vegetation types are found adjacent to and within the southwest corner of the Pelican Lake WMA.

Topography in the surrounding landscape is characteristically gently to moderately rolling. Soils are formed in thick deposits of gray limey glacial till left by the Des Moines lobe. The primary landform is a loamy mantled end moraine associated with the Des Moines lobe of the Late Wisconsin glaciation. Parts of the moraine have ice disintegration features. The dominant landscape feature is circular, level topped hills bounded by smooth side slopes. Broad level areas between the hills are interspersed with closed depressions containing lakes and peat bogs. Drainage is often controlled by the lake levels (Dept. of Soil Science, Univ. of Minn., 1973). The soils are dominantly loamy, with textures ranging from loam to clay loam (Dept. of Soil Science, Univ. of Minn., 1973). Parent material is calcareous glacial till of Des Moines Lobe (Late Wisconsin glaciation) origin. They are classified primarily as Alfisols (soils developed under forests).

Excerpts from: https://www.dnr.state.mn.us/wmas/detail_report.html?id=WMA0137900

The Pelican Lake WMA borders Pelican Lake, a 4,000 acre shallow lake. Most of the upland has been restored to native prairie and oak savannah surrounding wetland restorations. The restored prairie grassland will be maintained by prescribed fire.

Pelican Lake is considered by many MN waterfowl biologists, hunters, and birders to be one of the few large shallow lakes in MN that is primary spring/fall migration habitat for diver duck species: lesser scaup, canvasback, redhead, and ring-necked duck. Pelican Lake is a very unique geographical migration stepping stone for the species listed above as well as puddle ducks, geese, trumpeter swans, etc. and wetland wildlife. As a result, the lake was designated as a state wildlife management lake in 1977.

10. ***Site Characteristics:***

The project area is comprised of former agricultural land and pasture. According to personal communications with DNR staff, the original tenants removed trees from the property for agricultural production. Currently the site is a mix of grasslands, forest, wetland and young trees that were direct seeded**.**

a. Soils:

Soils for the site are primarily loams with both hydric and nonhydric soil units represented. The predominant soil unit is Angus-Cordova (1094B) followed by Cordova Loam (1156). The undulating topography found on the site is well associated with the diversity of soil map units; with nonhydric soils in the higher elevations and hydric soils in the depressions

b. Topography:

Click here to enter text.

c. Hydrology:

The restored wetland basins have a mix of surface and subsurface hydrology. Basins F, G, H & I in the southeast and east portions of the site appear to be groundwater driven. The ground is very wet and spongy with sphagnum observed in many locations. Basins A, B, C, D, E appear to driven primarily by surface water from the immediate watershed. Surface water forms shallow pools in the excavated portions of each basin and is slightly impounded by the constructed embankments

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

The west and northwest upland portions of the site have been extensively direct seeded with oak. Although deer browsing appears to be suppressing seedling growth, there are many individuals exceeding 5 feet in height. The seedlings appear to be in sufficient density to reestablish a forest or savanna community. The prairie species currently found within these tree-seeded areas will likely succeed to more shade tolerant or savanna species. The wetlands may also transition from their current habitat to a forested ecosystem overtime. Big woods is the natural ecosystem for this area and without continued maintenance, this site will tend to transition to more forested habitat.

e. Vegetation B: Meander Search Species List (as appropriate for site)

Following is a brief list of dominant vegetation observed in each of the restored basins.

- Wetland A- 0.45 Acre Shallow Marsh
  - Reed canary grass
  - Narrow leaf cattail
  - Woolgrass
  - Bidens
  - Glyceria
- Wetland B- 0.86 Acre Shallow Marsh
  - Lake sedge
  - Narrow leaf cattail
  - Cocklebur
- Wetland C- 0.71 Acre Shallow Marsh
  - Reed canary grass
  - Narrow leaf cattail (few)
  - Cocklebur
  - Water plantain

    - Duckweed
- Wetland D- 0.67 Acre Shallow Marsh
    - Reed canary grass
    - Narrow leaf cattail
    - River bulrush
    - Cocklebur
    - Glyceria
- Wetland E- 1.00 Acre Wet Meadow
    - Reed canary grass
- Wetland F- 2.11 Acre Shallow Marsh
    - Lake sedge
    - Tussock sedge
    - Reed canary grass (edge only)
- Wetland G- 0.51 Sedge Meadow
    - Lake sedge
    - Tussock sedge
    - Reed canary grass
    - Woolgrass
    - Prairie cord grass
- Wetland H- 0.97 Sedge Meadow
    - Reed canary grass
    - Sedges
    - River bulrush
    - Smartweed
    - Sphagnum
    - Willow shrubs
- Wetland I- 15.50 Sedge Meadow & Shallow Marsh
    - Reed canary grass
    - Sedges
    - Cattails

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

Earthen embankments with defined stabilized spillways are a common practice for restoring and reestablishing pothole wetlands.

12. List indicators of project outcomes at this stage of project:

- All wetland restoration locations (A-I) within the site exhibit wetland hydrology and are dominated by hydrophytic vegetation
- Areas restored to wetland are no longer drained and used for crop production

The site currently provides excellent wildlife habitat. With very limited effort, 23 different bird species were observed during the 5/22/18 field visit. Species found utilizing the wetland areas included mallard, sora, sedge wren, common yellowthroat, red winged blackbird and blue-winged teal. A blue-winged teal nest was found in the upland grassland adjacent to one of the restored wetland basins. Grassland and woodland species were also observed throughout the site. Species represented included field sparrow, song sparrow, eastern kingbird, gray catbird, wild turkey and ring necked pheasant. Chorus frogs were actively calling in

the restored basins, many garter snakes were observed and pocket gophers mounds were found in several isolated areas.

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    Yes, wetland plant communities are present with each of the restored basins.
14. ***Are corrections or modifications needed to meet proposed outcomes?***
    Invasive species such as narrow leaf cattail and reed canary grass are found throughout the site. If enhanced vegetative integrity is desired, maintenance will be required.
15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    Several of these wetland basins are surrounded by areas direct seeded with forest species such as oak. As the tree species mature, these basins may transform from their current sedge meadow/shallow marsh types to forested wetland.
16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    The current wetland habitat may convert to another type or possibly non wetland in a future forested condition.
17. ***Are follow-up assessments needed? Explain.***
    Future assessment(s) are highly encouraged and will likely yield information that can be directly applied to similar future wetland restoration/ reestablishment projects.
18. ***Additional comments on the restoration project.***
    Contingency planning and funding allocation for managing the site should be secured to ensure proper response, should natural recovery not meet expectations.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    Medium
20. ***Provide explanation of reason(s) for determination.***
    Confidence of outcome is conservative at this stage. As tree cover matures, adaptive management may be necessary to retain current wetland habitat.
21. ***Site Assessor(s) Conducting Review:***
    Jason Naber – EOR, Wade Johnson – Minnesota Department of Natural Resources

Appendix A: Site maps, Project plans or Vegetation tables

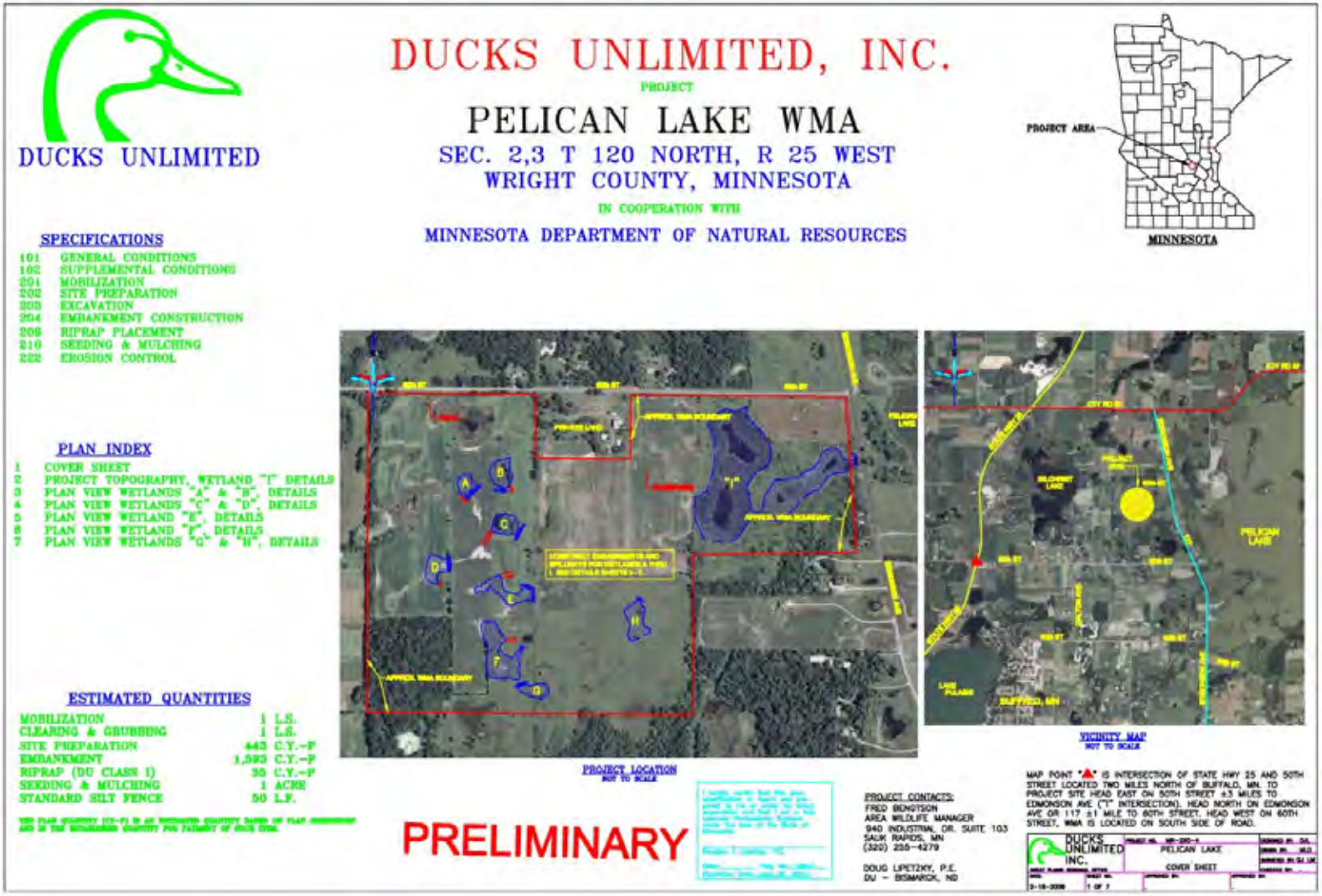


Figure 8-1 Title Sheet and Map from DU Plan Set.

Appendix B: Site Photographs

Photo 8-1 Wetland A Shallow Marsh.

Photo 8-2 Wetland B Shallow Marsh.

Photo 8-3 Wetland C (Photo of outlet Berm- wetland to left in photo) Shallow Marsh.

Photo 8-4 Wetland D Shallow Marsh.

Photo 8-5 Wetland E (downslope in photo) Wet Meadow.

Photo 8-6 Wetland F Shallow Marsh.

Photo 8-7 Wetland G Sedge Meadow.

Photo 8-8 Wetland H Sedge Meadow.

Photo 8-9 Wetland I Sedge Meadow & Shallow Marsh.

Photo 8-10 Pre-project photo, courtesy of MNDNR.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

9) OHF Whitewater WMA Crystal Springs Direct Seeding

Project Background

Project Name: Whitewater WMA- Crystal Springs Direct Seeding

Project Location: Winona County, MN

Township/Range Section: Township 107N / Range 10W / Section 14

Project Manager / Affiliated Organization: MN DNR / Christine Ann Johnson

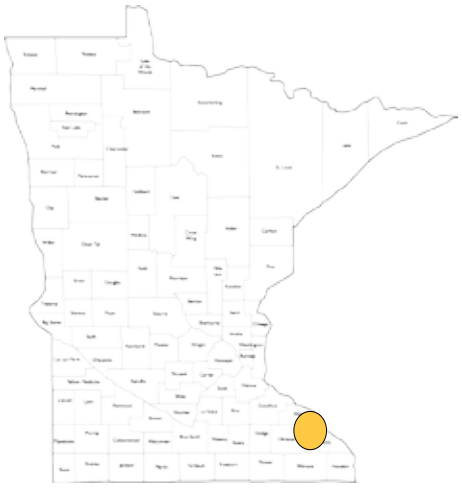
Fund: OHF ***Fiscal Year Funds:*** 2011

Project Start Date: Fall 2015

Predominant Habitat type: Forest

Additional Habitat types: Forest , Choose an item.

Project Status: Post Establishment Phase



County: Winona

Primary Activity: Forest Restoration

Project Size: 6 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?***

   This 6 acre agricultural field was previously farmed through a Cooperative Farming Agreement with corn being the primary crop produced. The area was direct seeded with oak, walnut and white pine in the fall of 2015. Subsequent spot spraying of herbicide and mowing occurred to control weeds.

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

The following documents were made available and were reviewed as a part of this evaluation:

Crystal Springs Direct Seeding Info- Minnesota Department of Natural Resources.

Crystal Springs Direct Seeding Map- Minnesota Department of Natural Resources.

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

   Project intends to reestablish a mesic forest community in a former agricultural field.

4. ***Were measures of restoration success identified in plans? Yes***
   If yes, list specific measurements.
   The site is reestablishing with a high diversity of woody species including walnut and oak. White pine were observed only in one location within the center portion of the site adjacent to a lone mature cherry tree. Other tree species observed included: boxelder, red elm, Siberian elm, trembling aspen, juneberry, common juniper. All tree species observed were short (less than one meter) but the site appears to be establishing with sufficient density to support a forest community.
5. ***Are plan Sets available?*** No ***Have new GIS maps been created?*** Yes
   If yes, provide in Appendix A and list Maps provided:
   Crystal Springs Direct Seeding Map
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?*** Yes

   <u>Direct Seeding:</u>
   - The restoration approach identified includes direct seeding of walnut and oak seeds.
   - White pine were also said to be direct seeded but individuals found within the site may have been hand planted.

   <u>Weed Control:</u>
   - Spot spraying of herbicide was used to control weeds
   - Mowing was used to control weeds.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   No
   Other than perhaps the white pine were hand planted rather than direct seeding. However, no documentation about this potential alteration is available.
8. ***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?***
   None.

Site Assessment

Field Review Date: **5/16/2018**

Field Visit Attendees: identified Christine Johnson, MN DNR. Wade Johnson, MN DNR. Jason Naber, EOR Inc.

9. Surrounding Landscape Characteristics:

Excerpts from https://files.dnr.state.mn.us/wildlife/areas/whitewater_wma_info.pdf

Overview

At about 27,000 acres, the Whitewater Wildlife Management Area is the eighth largest WMA in the state, providing habitat for a range of species. Located within two hours of the Twin Cities and halfway between Rochester and Winona, its proximity to much of the state's population also makes it one of the most popular units open to the public for hunting, trapping, wildlife watching and other activities.

Named for the Whitewater River, which flows through it the Whitewater WMA extends across portions of Winona, Wabasha and Olmsted Counties. It's located in rugged coulee country, a "driftless area" missed by glaciers in the last ice age 12,000 years ago. Because of this, the erosive forces of water and wind have carved valleys with elevation differences of 500 feet in some areas.

Habitat types

Whitewater includes a mosaic of plant communities and habitat types, including some that are rare or unique. Mixed hardwood forests of oak, hickory, maple, basswood and walnut cover the steep hillsides. Bluff prairies dot south-facing slopes, and trout streams dissect the valley floor. Seventeen wetlands (both naturally occurring and man-made) dapple the valley.

Wildlife

Whitewater is home to a variety of wildlife, including nearly 40 rare species. Commonly hunted species found there include white-tailed deer, turkeys, ruffed grouse and squirrels. Waterfowl, shorebirds, wading birds and aquatic furbearers benefit from the 15 water impoundments that are drawn down every few years to mimic natural drought cycles and to encourage aquatic plant regeneration that attracts invertebrates. Wildlife watchers can spot sandhill cranes, ducks, geese, swans, black terns, hawks, eagles, owls and many other birds, both residents and those passing through during spring and fall migrations.

Management activities

Typical management activities at Whitewater may include efforts to control invasive species such as garlic mustard and European buckthorn; prescribed fire to regenerate native plants; timber harvests to enhance forest wildlife habitat; cooperative farming agreements where food plots are consistent with management goals; maintaining or enhancing user access via improvements to parking and hunter trails; and water level manipulation in wetlands.

10. Site Characteristics:

The project area is located on a low terrace within a broad valley of the South Branch Whitewater River.

a. Soils:

The mapped soil unit is Becker Fine Sandy Loam.

b. Topography:

The site is fairly level with no visually discernable slope.

c. Hydrology:

The area is characterized as rarely flooded and is comprised of moderately well drained fine sandy loam soil.

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

Vegetation within the restoration areas was comprised of tree seedlings and a mix of native, weedy and invasive herbaceous plants. In addition to the seeded species (oak, walnut and white pine) several woody species such as boxelder, elm, aspen, juneberry were observed; with boxelder being the dominant. Invasive woody species included Siberian elm, relatively few buckthorn, *Ribes* and a few common juniper. The herbaceous layer was a diverse mix of species. For the most part weedy species such as catnip, dandelion, burdock, ground ivy, thistle, sweet clover, stinging nettle, reed canary grass and wild parsnip were found throughout the site. Native herbaceous species included *Monarda, Carex,* Indian grass, goldenrod, common milkweed, *Equisetum*, wild strawberry and violets.

e. Vegetation B: Meander Search Species List (as appropriate for site)

See species listed above. Meander survey not completed.

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

Forest reestablishment via direct seeding into an agricultural field is a common restoration practice.

12. List indicators of project outcomes at this stage of project:

- High density of seeded tree seedlings observed
- Area no longer used for crop production

13. Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?

The approach and executed work will trend toward a forest community over time. The density of seedlings observed indicates the forest reestablishment is on a positive trajectory. To fully realize forest establishment the site will require monitoring and intervention to control invasive species and support desired tree growth.

14. Are corrections or modifications needed to meet proposed outcomes?

Aside from continued vegetation monitoring and maintenance, no warranted corrections/modifications are apparent at this early phase

15. Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?

Managing invasive species and ensuring that desirable tree species such as oak and walnut out-compete undesirable species such as box elder and Siberian elm.

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

Conversion of crop land managed through a cooperative farming agreement removed a desirable forage crop (corn) for some wildlife.

17. Are follow-up assessments needed? Explain.

Future assessment(s) are highly encouraged and will likely yield information that can be directly applied to similar future direct seeding efforts. .

18. Additional comments on the restoration project.

Contingency planning and funding allocation for managing the site should be secured to ensure proper response should natural recovery not meet expectations.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    Medium
20. ***Provide explanation of reason(s) for determination.***
    Confidence of outcome is conservative at this stage of tree maturity, but based on professional judgment of early indicators, the project is expected to restore a forest community to support wildlife habitat and recreational use within the Whitewater WMA.
21. ***Site Assessor(s) Conducting Review:***
    Jason Naber – EOR

Appendix A: Site maps, Project plans or Vegetation tables

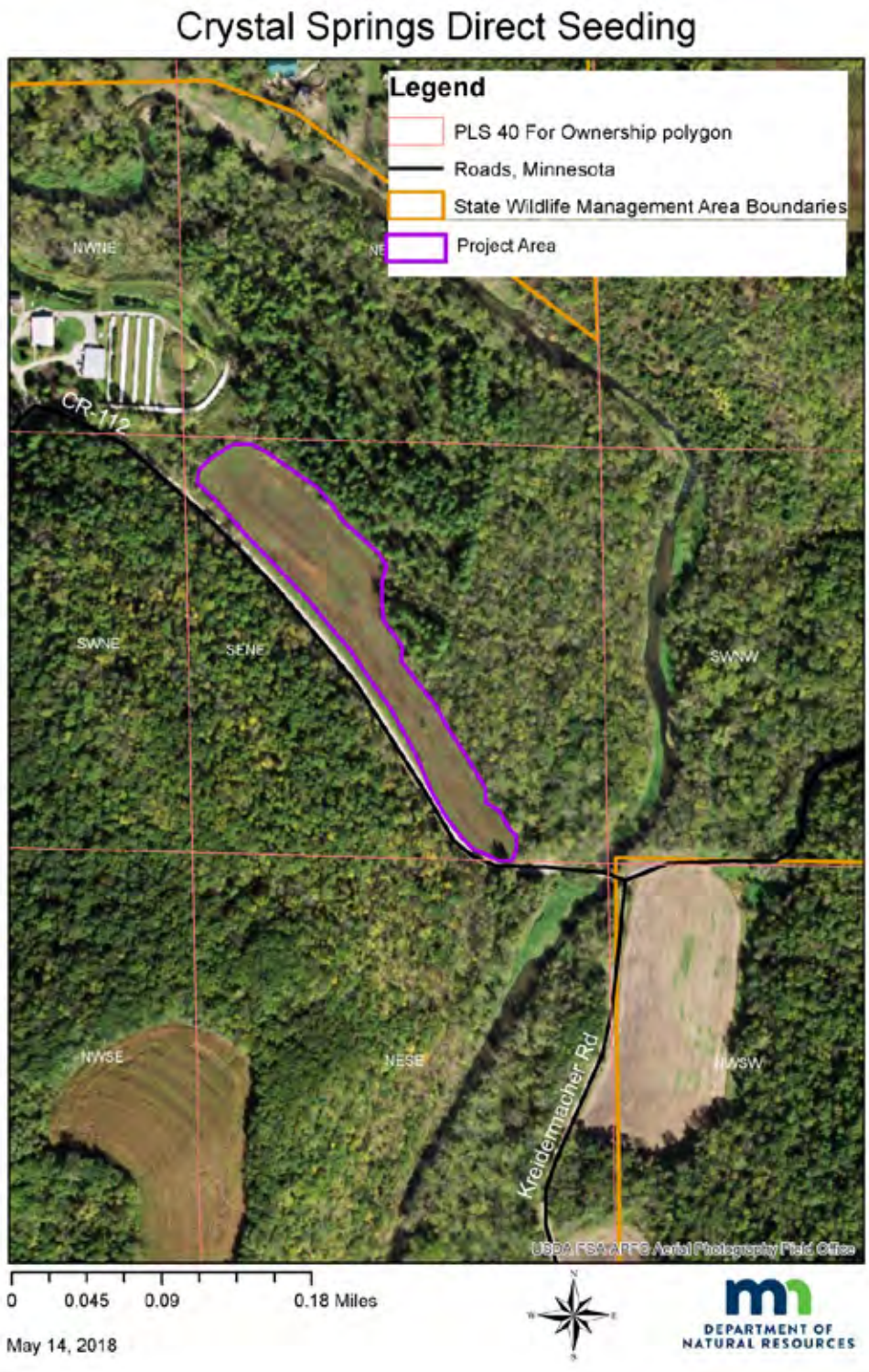


Figure 9-1 MNDNR GIS Map of Site.

Appendix B: Site Photographs

Photo 9-1 Site overview, weedy herbaceous species and boxelder are most visible.

Photo 9-2 Oak seedling and volunteer boxelder.

Photo 9-3 Wild parsnip found in relatively low density.

Photo 9-4 White pine seedlings found near lone mature cherry tree.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

10) OHF Gordy Yeager WMA Direct Seeding

Project Background

Project Name: Gordy Yeager WMA Direct Seeding

Project Location: Olmsted County, MN

Township/Range Section: Township 107N / Range 13W / Section 31

Project Manager / Affiliated Organization: MN DNR / Mike Tenney

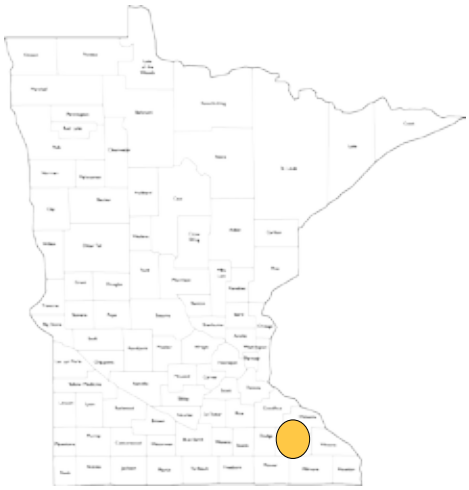
Fund: OHF ***Fiscal Year Funds:*** 2012 & 2014

Project Start Date: Fall 2012 and restart in Fall 2014

Predominant Habitat type: Forest

Additional Habitat types: Choose an item. , Choose an item.

Project Status: Post Establishment Phase



County: Olmsted

Primary Activity: Forest Restoration

Project Size: 16 Acres

Project Completed: 2014

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

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

   This 16 acre agricultural field was previously farmed through a Cooperative Farming Agreement with corn being the primary crop produced. The area was direct seeded with oak, walnut, hickory, black cherry, choke cherry, dogwood, nannyberry, hazelnut, hackberry and silver maple. Subsequent spot spraying of herbicide and mowing occurred to control weeds.

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

   The following documents were made available and were reviewed as a part of this evaluation:

   Gordy Yeager_directseed_Plan_Summary (6-6-17) - Minnesota Department of Natural Resources.

   Gordon W. Yeager WMA 2014 Direct Seeding Project GIS Map- Minnesota Department of Natural Resources

   Direct Hardwood Seeding Specifications 2014- Minnesota Department of Natural Resources.

   Direct Hardwood Seeding Specifications 2012- Minnesota Department of Natural Resources.

   FAW Pesticide Application Report (6-17-17) - Minnesota Department of Natural Resources.

   FAW Pesticide Application Report (6-6-15) - Minnesota Department of Natural Resources.

   Zumbro Valley Forestry, LLC Contracting documents and Invoice Fall 2014 to Spring 2015

   Vegetation Plot Data- Date unknown- Minnesota Department of Natural Resources

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

   Project intends to reestablish a floodplain forest community in a former agricultural field.

4. ***Were measures of restoration success identified in plans? Yes***
   If yes, list specific measurements.
   The site is reestablishing with a high diversity of tree species including oak, walnut, hickory, black cherry, hackberry and silver maple. Shrub species include: choke cherry, dogwood, nannyberry, and hazelnut. All tree species observed were small but the site appears to be establishing with sufficient density to support a forest community. Other woody species observed included: boxelder, Siberian elm, cottonwood, ash, amur maple and buckthorn.
5. ***Are plan Sets available?*** No ***Have new GIS maps been created?*** Yes
   If yes, provide in Appendix A and list Maps provided:
   Gordon W. Yeager WMA 2014 Direct Seeding Project GIS Map
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?*** Yes

   <u>Direct Seeding:</u>
   - The restoration approach identified includes direct seeding of multiple tree and shrub species.

   <u>Weed Control:</u>
   - Spot spraying of herbicide was used to control weeds.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***

Yes

Two seeding events 2012 and 2014 were needed since the 2012 seeding failed.

8. ***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?***

   None.

Site Assessment

Field Review Date: **5/16/2018**

Field Visit Attendees: identified Mike Tenney, MN DNR. Wade Johnson, MN DNR. Jason Naber, EOR Inc.

9. ***Surrounding Landscape Characteristics:***

Excerpts from: https://webapps15.dnr.state.mn.us/wahma/attachments/4655/public?1452540118

General Description: Much of the Gordon Yeager WMA is within the city limits of the City of Rochester and was once part of the Rochester State Hospital Farm. The WMA consists of rolling land wooded with oaks and black walnuts that was once used as pasture by the state hospital. Silver Creek transects the unit. The Quarry Hill Nature Center is nearby. The unit is located in the Paleozoic Plateau Landscape.

Management Emphasis: The WMA is managed to maintain a large, open space near an urban area for wildlife-related recreation. Native prairie has been established on several sites.

Special Features: One high point has goat prairie plants, including Pasque flower. Several uncommon snakes have been found here.

10. ***Site Characteristics:***

The project area is a low terrace adjacent to Silver Creek. This site was formerly an agricultural field.

a. Soils:

The primary mapped soil unit is Becker Fine Sandy Loam (63% of site), followed by Chaseberg silt loam (27%) and Lindstrom silt loam (10%).

b. Topography:

The site is fairly level with gentle slopes towards Silver Creek.

c. Hydrology:

The area is characterized as rarely flooded and is comprised of moderately well drained loam and silt loam soil. An overland drainage route crosses the western portion of the site from the north to Silver Creek.

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

Vegetation within the restoration areas was comprised of tree seedlings and a mix of native, weedy and invasive herbaceous plants. In addition to the multiple seeded species several woody species such as boxelder, elm, and cottonwood with boxelder being the dominant. Invasive woody species included Siberian elm, relatively few buckthorn, and a single amur maple. The herbaceous layer was a diverse mix of species. For the most part weedy species such as dandelion, thistle, stinging nettle, reed canary grass, garlic mustard s and wild parsnip were found throughout the site. Native herbaceous species included, common milkweed, golden rod, and violets. .

e. Vegetation B: Meander Search Species List (as appropriate for site)

See species listed above. Meander survey not completed.

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

    Direct seeding for forest reestablishment is a common restoration practice.

12. ***List indicators of project outcomes at this stage of project:***
    - High density of tree seedlings observed
    - Area no longer used for crop production
13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    The approach and executed work will trend toward a forest community over time. The density of seedlings observed indicates the forest reestablishment is on a positive trajectory. To fully realize forest establishment the site will require monitoring and intervention to control invasive species and support desired tree growth.
14. ***Are corrections or modifications needed to meet proposed outcomes?***
    Continued vegetation monitoring and maintenance will be needed to establish desirable plant communities, aside from this no warranted corrections/modifications are apparent at this early phase
15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    Invasive tree and management will continue to be management issue. Wild parsnip should eventually decline as the trees mature, however the garlic mustard and reed canary grass should be intensively managed since it will persist in a forested condition. Also, a drainage swale crosses the site is causing erosion. The drainage swale needs to be stabilized or preferably upstream storage created to reduce rate and volume of stormwater flow across the site.
16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    Conversion of crop land removed a desirable forage crop (corn) for wildlife.
17. ***Are follow-up assessments needed? Explain.***
    Future assessment(s) are highly encouraged and will likely yield information that can be directly applied to similar future direct seeding efforts. .
18. ***Additional comments on the restoration project.***
    Contingency planning and funding allocation for managing the site should be secured to ensure proper response should natural recovery not meet expectations.

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.

19. ***The project will:***
    Meet proposed outcomes

Confidence of outcome determination:

Medium

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

Confidence of outcome is conservative at this stage of tree maturity, but based on professional judgment of early indicators, the project is expected to restore a forest community to support wildlife habitat and recreational use within the Yeager WMA.

21. ***Site Assessor(s) Conducting Review:***

Jason Naber – EOR

Appendix A: Site maps, Project plans or Vegetation tables

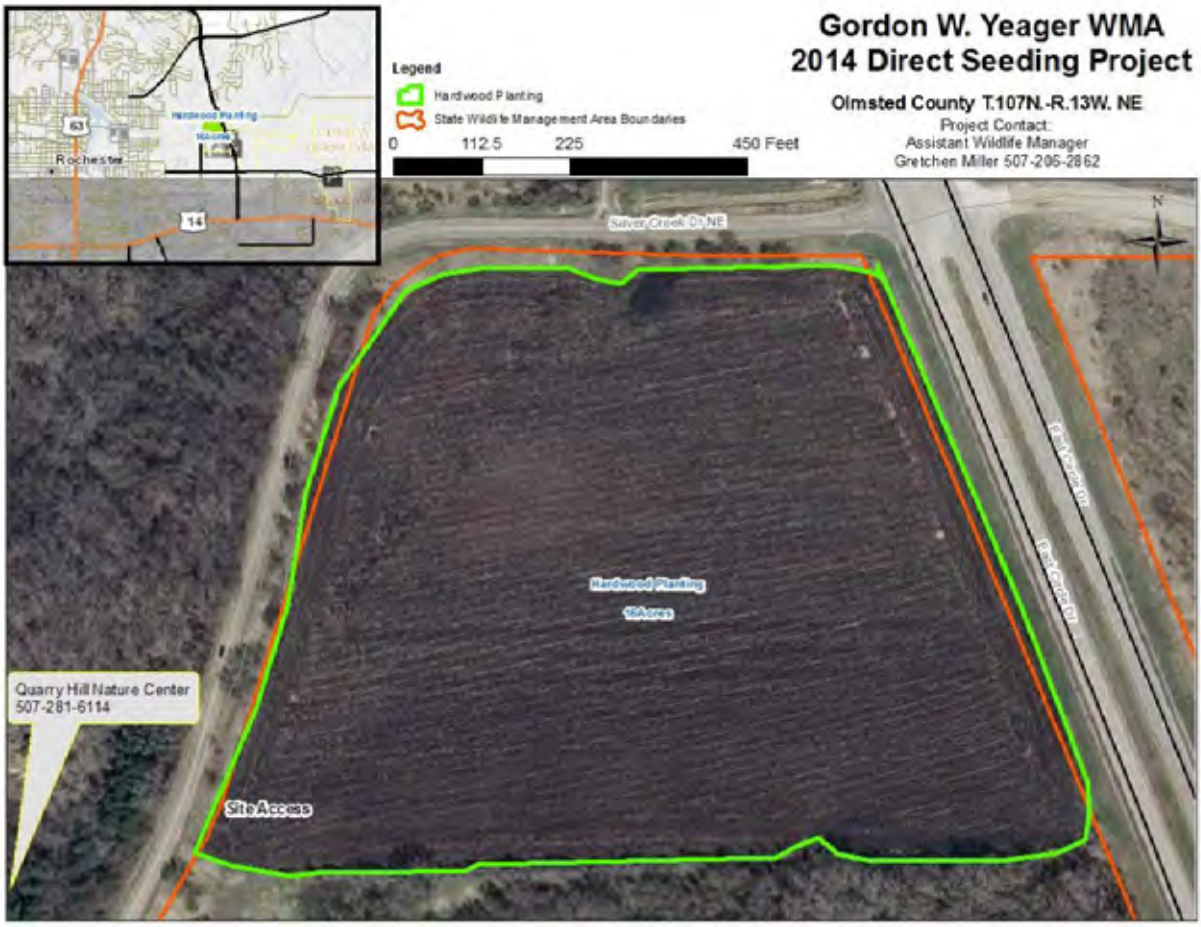


Figure 10-1 MNDNR GIS Map of Site

Appendix B: Site Photographs

Photo 10-1 Site overview weedy herbaceous species (Garlic Mustard in the foreground), Boxelder and Walnut are most visible seedlings.

Photo 10-2 Oak seedling and wild parsnip.

Photo 10-3 Garlic mustard patches found scattered throughout site.

Photo 10-4 Reed canary grass patches found scattered mostly on west portion of site.

Photo 10-5 Scour caused by excessive stormwater drainage crossing the west portion of site.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

11) OHF Perch Lake WPA Prairie Enhancement

Project Background

Project Name: Lincoln and Perch Lake WPA Restorations

Project Location: Perch Lake Waterfowl Production Area – North Site

Township/Range Section: Township T106N Range R26W Section NW 13

Project Manager / Affiliated Organization: Deborah Loon, Minnesota Valley National Wildlife Refuge Trust

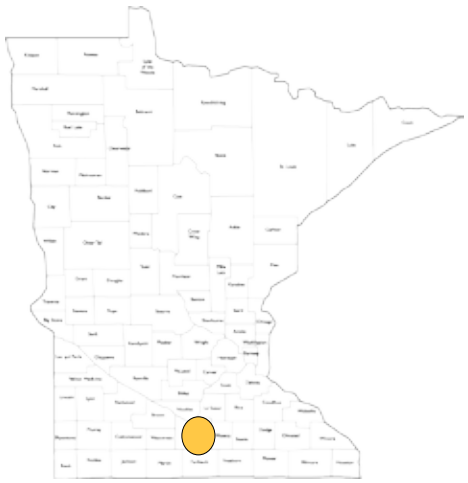
Fund: OHF - CPL ***Fiscal Year Funds:*** 2012

Project Start Date: 2012

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Wetland

Project Status: Post Establishment Phase



County: Blue Earth

Primary Activity: Prairie Enhancement

Project Size: 5 Acres

Project Completed: 2014

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Cut and treat trees surrounding an emergent marsh on the northwest side of Perch Lake WPA.
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***

Project information is retained in a management folder (3-ring binder), as well as electronic copies stored on the USFWS data management system.

3. ***What are the stated goals of the project?***
   For this particular area at Perch Lake WPA, the stated goal was tree removal around the wetland margin.
4. ***Were measures of restoration success identified in plans?*** *Yes*
   If yes, list specific measurements.
   Removal of all trees on wetland margin to restore appropriate habitat.
5. ***Are plan Sets available?*** No ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   Not applicable. Tree removal did not include a design component.
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   The most readily identifiable BMP in the project plan included "Chemical application of triclopyr will follow tree cutting to prevent resprouting."

Project Implementation

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***
   Not applicable – trees were cut, stumps treated, and woody material stacked and burned on site as planned/intended.

Site Assessment

Field Review Date: **5/25/2018**

Field Visit Attendees: USFWS Staff: Mike Malling Private Lands Biologist; Brooke Burrows Wildlife Refuge Specialist. Cody Burke Minnesota Waterfowl Association. Debrah Loon Executive Director Minnesota Valley Trust. MN DNR: Gina Quiram, Restoration Evaluation Specialist-Division of Ecological and Water Resources. Paul Bockenstedt, Ecologist (Stantec).

9. ***Surrounding Landscape Characteristics:***
   The area immediately surrounding the wetland is reconstructed prairie. Rowcrop agriculture dominates much of the landscape in the vicinity of the WPA.
10. ***Site Characteristics:***
    a. ***Soils:***
    According to Web Soil Survey, soils in the vicinity of the tree clearing area around the emergent marsh are silty clay loam to clay loam.
    b. ***Topography:***
    Topography of the WPA and surrounding area is gently to moderately rolling, interspersed with depressional wetlands and shallow lakes.

c. Hydrology:

The treatment area occupies a zone with fluctuations in hydrology. Trees that were removed occupied a transitional area at the upslope edge of saturated soils.

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

The wetland edge and reconstructed prairie are generally dominated by native species characteristic for prairie and wet prairie. A few patches of reed canary grass are present in the wetland edge areas and are likely persistent from prior agricultural land use of the area. Emergent vegetation is dominated by hybrid cattail.

e. Vegetation B: Meander Search Species List (as appropriate for site)

Wetland and wetland fringe areas are generally dominated by hybrid cattail and reed canary grass with switchgrass, big bluestem, sedge spp., side-flowering aster, red-stemmed aster, sneezeweed, and other natives observed occasionally. Upland areas are dominated by native species characteristic for prairie reconstructions, including: big bluestem, Indian grass, switchgrass, stiff goldenrod, wild bergamot, oxeye false sunflower, New England aster, marsh milkweed, Canada wildrye, Virginia mountain mint, golden Alexanders, and others.

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

    The plan includes information about methods for treating tree stumps to minimize the risk of woody resprouts, as well as the benefits of tree removal to important wildlife that utilize the area.

12. ***List indicators of project outcomes at this stage of project:***

    The CPL Accomplishment report submitted on June 30, 2015 indicated that tree removal was completed in a July 2012 to June 2013 time period. There were no observed resprouts of invasive woody plants. As well, there has been good establishment and backfilling of herbaceous vegetation, including desirable native species

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***

    Yes, in this particular area removal of the trees improves wildlife habitat, and the long-term prairie vegetation composition is sustainable through normal maintenance activities.

14. ***Are corrections or modifications needed to meet proposed outcomes?***

    No – the work in this particular area will meet or exceed proposed outcomes.

15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***

    Yes, the tree removal, in concert with upgrading the outlet structure for this particular wetland and conducting periodic maintenance with prescribed fire, are practical, reasonable and supportive of sustaining the gains made through tree removal.

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

    All of the proposed/completed activities are supportive of improved grassland/wetland habitat value compared to the pre-existing condition of large trees surrounding the wetland.

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

    No

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

    Friends of the Minnesota Valley, USFWS and other project partners took a comprehensive and holistic approach to restoration of Perch Lake, the upland prairies, and the wetland where the tree removal

occurred. They have done a great job of coordinating a variety of resources and project partners to cost-effectively conduct integrated resource management activities that are successful and sustainable.

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.

19. ***The project will:***
    Likely exceed proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***
    The tree removal was well planned and integrated with other activities. Additionally, the vegetation that reestablished in the area of the tree clearings included a large percentage of natives. The initial results were very good, and the long-term probability of sustaining or building on early results is very good.
21. ***Site Assessor(s) Conducting Review:***
    Paul Bockenstedt, Ecologist (Stantec); Gina Quiram, Restoration Evaluation Specialist (MN DNR)

Appendix A: Site maps, Project plans or Vegetation tables

Site Information

Land Ownership:	**Other**	Acres:	**5**
Site Name(s)	**Perch Lake WPA**	Open to Public Hunting?	**Yes - all**
Activity	**Restoration**	Open to Public Fishing?	**Yes - all**
Habitat	**Prairie**		

Figure 11-1 Soils map of project area showing approximate wetland fringe tree removal area on

Table 11-1 Meander species list from the May 25, 2018 field site assessment. Frequency categories: C=common (observed throughout the meander survey), O=Occasional (scattered individuals or small patches), R=rare (small number of individuals). **Nonnative plants in all capital letters*

Scientific Name	Common Name	Frequency of observation
Andropogon gerardii	big bluestem	C
Anemone canadensis	Canada anemone	O
Asclepias incarnata	marsh milkweed	O
CIRSIUM ARVENSE	CANADA THISTLE	O
Fraxinus pennsylvanica (seedlings)	Green ash	R
Geum avens	spring avens	R
MELILOTUS SPP.	SWEET CLOVER	O
PHALARIS ARUNDINACEA	REED CANERY GRASS	O
Silphium perfoliatum	cup plant	O
Solidago gigantea	giant goldenrod	C
Symphyotrichum laeteriflorum	white panicle aster	O
TYPHA x GLAUCA	HYBRID CATTAIL	O
Viola sororia	Common blue violet	O

Casual wildlife observations:
yellow-headed blackbird, Canada goose, bobolink, yellowthroat, eastern Kingbird, ring-neck pheasant, red-wing blackbird

Appendix B: Site Photographs

Photo 11-1 Tree removal area around wetland edge, viewed from east, northeast

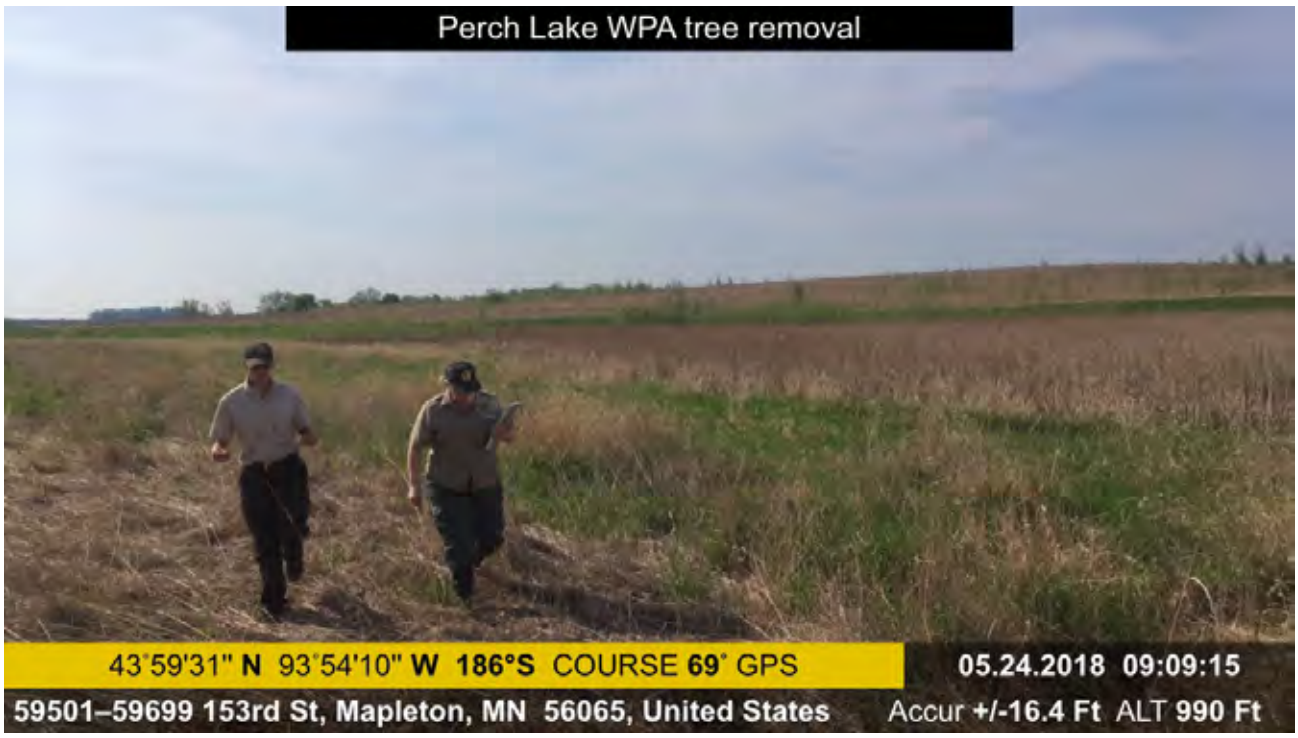


Photo 11-2 Tree removal area around wetland edge, viewed from north side of wetland looking southeast

Photo 11-3 Tree removal area around wetland edge, viewed from northeast

Photo 11-4 Tree removal area around wetland edge, viewed from southeast edge of wetland

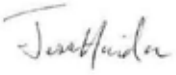
Photo 11-5 Tree removal area around wetland edge, viewed from north side of wetland looking east, southeast

Photo 11-6 Tree removal area around wetland edge, viewed from north side of wetland looking southwest

REPORT AUTHORS:

Paul Bockenstedt, Stantec Date: 5.29.18 Signature: 

Gina Quiram, MN DNR Date: 5.30.18 Signature: 

Jess Haider, Stantec (QA/QC) Date: 5.29.18 Signature: 

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

12) OHF Perch Lake WPA Homestead Prairie Restoration

Project Background

Project Name: Lincoln and Perch Lake WPA Restorations

Project Location: Perch Lake Waterfowl Production Area – Homestead Site

Township/Range Section: Township T106N Range R26W Section SW 13

Project Manager / Affiliated Organization: Deborah Loon, Minnesota Valley National Wildlife Refuge Trust

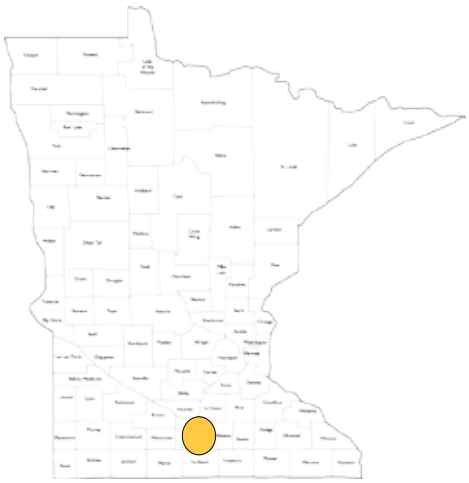
Fund: OHF - CPL ***Fiscal Year Funds:*** 2012

Project Start Date: 2012

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Wetland

Project Status: Post Establishment Phase



County: Blue Earth

Primary Activity: Prairie Enhancement

Project Size: 5 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?***

   The removal of trees and buildings will connect fragmented patches of prairie and eliminate structures that would normally attract nest predators such as raccoons, skunks, and crows.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Project information is retained in a hard copy management folder (3-ring binder), as well as electronic copies stored on the USFWS data management system.
3. ***What are the stated goals of the project?***
   For this particular area at Perch Lake WPA, the stated goal was tree and building removal followed by restoration of native prairie grasses and flowers to facilitate reduction in predator habitat, improve the quality and connectivity of grassland habitats, and improve nest success.
4. ***Were measures of restoration success identified in plans?*** Yes
   If yes, list specific measurements.
   Removal of all trees and building site components followed by restoration of native, herbaceous cover, i.e., "increased native plant diversity in uplands and wetlands through seeding, removal of trees, and increased diversity as measured by successive BioBlitzes."
5. ***Are plan Sets available?*** No ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   Not applicable. Tree removal and building site demolition removal did not include a design component.
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?*** Restoration activities are not specifically identified as BMPs and no design documents/plan sets were developed outside of custom seed mixes for the site. BMPs noted in work plan documents that relate to restoration techniques include treatment of cut tree stumps with triclopyr, grow-in maintenance mowing and similar.

Project Implementation

7. ***Were alterations made to the original plan during construction?***
   Yes
   Modifications were made to the project schedule. As noted by the project manager, challenges on the project included: "weather, changing field conditions and contractor availability and scheduling."
8. ***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?***
   Not applicable – farmstead was razed, and site regraded followed by native seeding.

Site Assessment

Field Review Date: **5/25/2018**

Field Visit Attendees: USFWS Staff: Mike Malling Private Lands Biologist; Brooke Burrows Wildlife Refuge Specialist. Cody Burke Minnesota Waterfowl Association. Debrah Loon Executive Director Minnesota Valley Trust. MN DNR: Gina Quiram, Restoration Evaluation Specialist-Division of Ecological and Water Resources. Paul Bockenstedt, Ecologist (Stantec).

9. ***Surrounding Landscape Characteristics:***
   The former homestead site lies on a ridge top between Perch Lake to the northeast and two wetland basins to the southeast and southwest. The USFWS-owned land surrounding the former homestead site includes

woodland (adjacent to Perch Lake) as well as reconstructed prairie and emergent marsh (cattail wetlands) to the southeast and southwest. Much of the land cover in the vicinity outside of the Waterfowl Production Area is dominated by row crop agriculture.

10. ***Site Characteristics:***

    a. Soils:

    According to USDA NRCS Web Soil Survey, soils in the vicinity of the former homestead area are Kilkenny clay loam and Shorewood silty clay loam. However, much of the site was disturbed and likely considered fill soils prior to the initiation of restoration activities.

    b. Topography:

    Topography of the WPA and surrounding area is gently to moderately rolling, interspersed with depressional wetlands and shallow lakes.

    c. Hydrology:

    The former homestead site occupies an upland ridge between Perch Lake to the northeast and two emergent marsh wetlands to the south.

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

    Prior to restoration, the homestead site was reported to be dominated by a mix of impervious surfaces, structures, and nonnative vegetation associated with the building site. The restored vegetation is comprised of a nearly equal mix of native and nonnative grasses and forbs. Current vegetation is largely free from invasive, noxious weeds (as recently as a few years ago, burdock, nonnative thistle, and Absinthe wormwood were fairly common around the restoration site).

    e. Vegetation B: Meander Search Species List (as appropriate for site)

    The regraded former homestead site includes a patchy and nearly equal mix of native plants from the restoration seed mix and residual/ volunteer nonnative plants. Upland areas are dominated by native species characteristic for prairie reconstructions, including: big bluestem, Indian grass, switchgrass, sideoats grama, Virginia wildrye, stiff goldenrod, wild bergamot, oxeye false sunflower, common milkweed, Canada wildrye, Virginia mountain mint, black-eyed Susan, and golden Alexanders. Additional information on plant species observed is included in Appendix A of this report.

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

    Restoring native vegetation to disturbed construction settings with regraded soils is typically problematic. The methods used at this site are customary and appropriate for this type of effort: removal of infrastructure, site grading, and respreading topsoil followed by site restoration seeding.

12. ***List indicators of project outcomes at this stage of project:***

    The CPL Accomplishment report submitted on June 30, 2015 indicated that tree and building removal was completed in a July 2013 to June 2014 time period. Removal of buildings/infrastructure followed by seeding of restoration seed mix was the major outcome for this site.

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***

    Yes, in this particular area removal of the trees and building infrastructure improves wildlife habitat, and the long-term prairie vegetation composition is sustainable through normal maintenance activities to be conducted by USFWS.

14. ***Are corrections or modifications needed to meet proposed outcomes?***

    No – the work in this particular area will meet or exceed proposed outcomes.

15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    Yes, periodic maintenance with prescribed fire and spot weed treatment are practical, reasonable and supportive of sustaining the habitat improvements made at this site.
16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    All of the proposed/completed activities are supportive of improved grassland habitat value compared to the pre-existing condition of a farmstead with trees surrounding that fragmented habitat that likely artificially supported predators.
17. ***Are follow-up assessments needed? Explain.***
    No
18. ***Additional comments on the restoration project.***
    Minnesota Valley National Wildlife Trust, USFWS and other project partners took a targeted, comprehensive and holistic approach to restoration of habitats at Perch Lake WPA. They have done a great job of coordinating a variety of resources and project partners to cost-effectively conduct integrated resource management activities that are successful and sustainable.

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.

19. ***The project will:***
    Likely exceed proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***
    The farmstead demolition, tree removal and site restoration was well-planned and integrated with other activities. Although the vegetation that reestablished in the area is a mix of native and nonnative plants, it represents a substantial improvement compared to the previous condition. Additionally, with ongoing management by USFWS, the long-term probability of sustaining or building on early results is very good.
21. ***Site Assessor(s) Conducting Review:***
    Paul Bockenstedt, Ecologist (Stantec); Gina Quiram, Restoration Evaluation Specialist (MN DNR)

Appendix A: Site maps, Project plans or Vegetation tables

Site Information

Land Ownership:	**Other**	Acres:	**5**
Site Name(s)	**Perch Lake WPA**	Open to Public Hunting?	**Yes - all**
Activity	**Restoration**	Open to Public Fishing?	**Yes - all**
Habitat	**Prairie**		

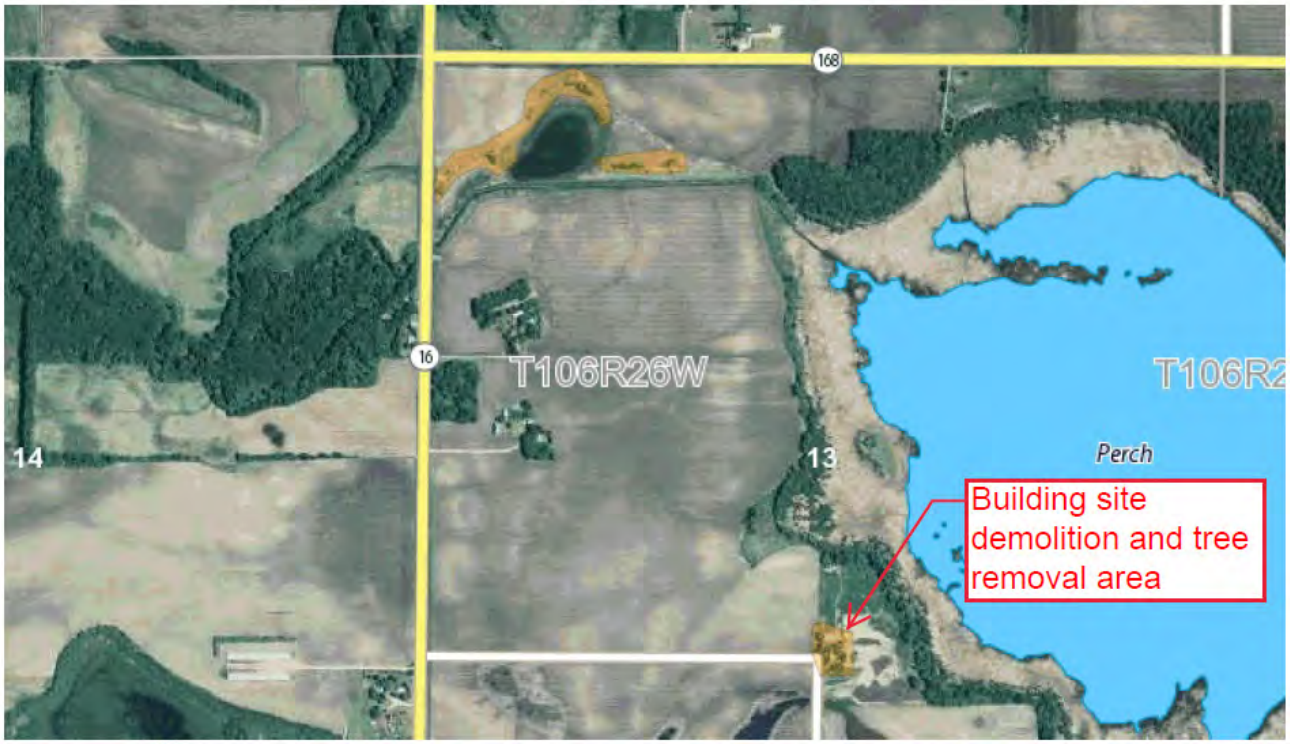


Figure 12-1 Map of building demolition and site restoration area.

Table 12-1 Custom native mix seeded at former home site from feder prairie seed 1740 Industrial Drive Blue Earth, MN 56013 (federprairieseed.com). USFWS1312 Upland Prairie Mix 29.00 Acres, 303.34 Total lb, 360.09 Bluk lb, 303.34 PLS lb. Purity 91.04%, Inert Matter 8.37%, Other Crop 0.58%, Weed Seed 0.01 %, Noxious Weeds/lb: None. Test Date 11/2012.

Common Name	Scientific Name	Origin	Mix %	PLS lb	Bulk lb
Big Bluestem	Andropogon gerardii	MN	14.91%	45.24	58.86
Sideoats Grama	Bouteloua curtipendula	MN	11.47%	34.80	40.02
Prairie Brome	Bromus kalmii	MN	9.56%	29.00	32.54
Virginia Wild Rye	Elymus virginicus	MN	5.74%	17.40	19.18
Switchgrass	Panicum virgatum	MN	7.65%	23.20	24.19
Little Bluestem	Schizachyrium scoparium	MN	17.21%	52.20	65.35
Indiangrass	Sorghastrum nutans	MN	11.47%	34.80	44.90
Blue Grama	Bouteloua gracilis	MN	1.43%	4.35	5.00
Prairie Dropseed	Sporobolus heterolepsis	MN	1.43%	4.35	5.69
Prairie Onion	Allium stellatum	MN	0.19%	0.58	0.63
Lead Plant	Amorpha canescens	MN	0.57%	1.74	1.84
Common Milkweed	Asclepias syriaca	MN	0.38%	1.16	1.20
Whorled Milkweed	Asclepias verticillata	MN	0.38%	1.16	1.42
Smooth Blue Aster	Aster laevis	MN	0.29%	0.87	1.04
New England Aster	Aster novae-angliae	MN	0.29%	0.87	1.02
Canada Milk Vetch	Astragalus canadensis	MN	0.57%	1.74	1.79
Cream Wild Indigo	Baptisia leucophaea	MN	0.29%	0.87	0.91
Partridge Pea	Chamaecrista fasciculata	MN	1.15%	3.48	3.59
Prairie Coreopsis	Coreopsis palmata	IA	0.29%	0.87	1.36
White Prairie Clover	Dalea candidum	MN	1.15%	3.48	3.59
Purple Prairie Clover	Dalea purpurea	MN	1.15%	3.48	3.57
Showy Tick Trefoil	Desmodium canadense	MN	0.76%	2.32	2.37
Rattlesnake Master	Eryngium yuccifolium	MN	0.57%	1.74	2.08
Cream Gentian	Gentiana flavida	MN	0.57%	1.74	1.89
Ox-eye Sunflower	Heliopsis helianthoides	MN	0.57%	1.74	1.97
Round-headed Bush Clover	Lespedeza capitata	MN	0.29%	0.87	1.02
Prairie Blazingstar	Liatris pycnostachya	IA	0.57%	1.74	1.89
Wild Bergamot	Monarda fistulosa	MN	0.57%	1.74	2.00
Common Ironweed	Vernonia fasciculata	MN	0.29%	0.87	1.03
Prairie Cinquefoil	Potentilla arguta	MN	0.29%	0.87	0.92
Mountain Mint	Pycnanthemum virginianum	IA	1.15%	3.48	4.04
Yellow Coneflower	Ratibida pinnata	IA	0.86%	2.61	2.71
Black-eyed Susan	Rudbeckia hirta	MN	1.15%	3.48	3.56
Compass Plant	Silphium laciniatum	IA	0.76%	2.32	2.71
Stiff Goldenrod	Solidago rigida	MN	0.57%	1.74	2.19
Showy Goldenrod	Solidago speciosa	IA	0.19%	0.58	0.62
Blue Vervain	Verbena hastata	MN	0.57%	1.74	1.98
Hoary Vervain	Verbena stricta	MN	0.96%	2.90	3.47
Heartleaf Alexanders	Zizia aptera	MN	0.57%	1.74	2.17
Golden Alexanders	Zizia aurea	MN	1.15%	3.48	3.75

Table 12-2 Meander species list from the May 25, 2018 field site assessment. Frequency categories: C=common (observed throughout the meander survey), O=Occasional (scattered individuals or small patches), R=rare (small number of individuals). **Nonnative plants in all capital letters*

Scientific Name*	Common Name	Frequency of Observtaion
Andropogon gerardii	big bluestem	O
ARCTIUM MINUS	BURDOCK	R
Asclepias syriaca	Common milkweed	O
Bouteloua curtipendula	Sideoats grama	O
BROMUS INERMIS	SMOOTH BROME	C
CIRSIUM ARVENSE	CANADA THISTLE	O
Elymus virginicus	Virginia wildrye	O
Fraxinus pennsylvanica (seedlings)	Green ash	O
Geum canadense	rough avens	R
MELILOTUS SPP.	SWEET CLOVER	O
Oligoneuron rigidum	Stiff goldenrod	O
POA PRATENSIS	KENTUCKY BLUEGRASS	O
Pycnanthemum virginianum	Virginia mountain mint	O
Ratibida pinnata	Yellow coneflower	O
Rudbeckia hirta	Black-eyed Susan	R
RUMEX CRISPUS	CURLY DOCK	O
Silphium laciniatum	compass plant	R
Solidago canadensis	Canada goldenrod	O
Solidago gigantea	giant goldenrod	C
Symphyotrichum laeteriflorum	white panicle aster	O
Symphyotrichum novae-angliae	New England aster	O
Verbena stricta	Hoary vervain	R
Viola sororia	Common blue violet	O
Zizia aptera	Heartleaf Alexanders	R

Casual wildlife observations:
yellow-headed blackbird, Canada goose, bobolink, yellowthroat, eastern Kingbird, ring-neck pheasant, red-wing blackbird

Appendix B: Site Photographs

Photo 12-1 Home site looking east.

Photo 12-2 Home site looking south.

Photo 12-3 Home site looking northwest.

Photo 12-4 Home site supports a mix of native and nonnative vegetation, but only small amounts of invasive/noxious weeds.

Photo 12-5 Former home site, viewed from east.

Photo 12-6 Former home site, looking north from east end.

Photo 12-7 Former home site, looking north.

Photo 12-8 Former home site looking west.

Photo 12-9 North side of former home site, looking south.

Photo 12-10 North side of former home site, looking north.

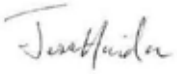
Photo 12-11 Former home site, looking northwest.

Photo 12-12 Former Home site, looking east.

REPORT AUTHORS:

Paul Bockenstedt, Stantec Date: 5.29.18 Signature: 

Gina Quiram, MN DNR Date: 5.30.18 Signature: 

Jess Haider, Stantec (QA/QC) Date: 5.29.18 Signature: 

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

13) OHF Lincoln WPA Prairie and Wetland Restoration

Project Background

Project Name: Lincoln and Perch Lake WPA Restorations

Project Location: Lincoln Waterfowl Production Area

Township/Range Section: Township T107N Range R29W Section 35, 36

Project Manager / Affiliated Organization: Deborah Loon, Minnesota Valley National Wildlife Refuge Trust

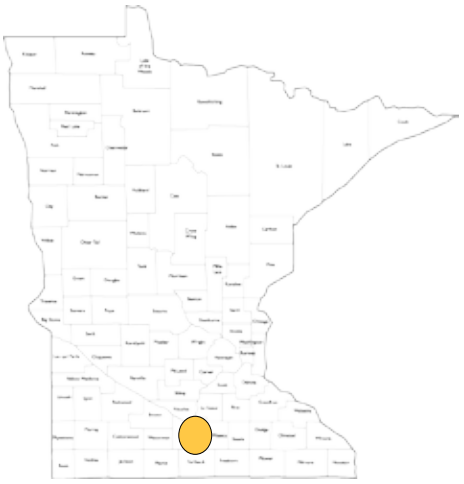
Fund: OHF ***Fiscal Year Funds:*** 2012

Project Start Date: 2012

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Wetland

Project Status: Post Establishment Phase



County: Blue Earth

Primary Activity: Prairie Restoration

Project Size: 196 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?***

This project included restoration and enhancement of 196 upland and wetland acres at the Lincoln Waterfowl Production Area. Project components included: restoration of hydrology to 18 wetlands in 40 acres, as well as vegetation restoration on 196 upland and wetland acres. Specific practices included disabling agricultural drainage systems (tile, ditch, berm), as well as dormant seeding of upland and wetland areas in winter/spring 2013-14 followed by grow-in mowing.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Project information is retained in a hard copy management folder (3-ring binder), as well as GIS data and electronic record copies stored on the USFWS data management system.
3. ***What are the stated goals of the project?***
   Improve the quality and quantity of grassland wildlife habitat complex for migratory waterfowl, non-game birds, and resident wildlife species through reduction of tree cover, increased diversity of grassland plant species, and restoration of historic hydrologic conditions of drained wetlands.
4. ***Were measures of restoration success identified in plans?*** Yes
   If yes, list specific measurements.
   Measures of success were tied to quantities of habitat restoration activities to be completed, including 196 acres of upland and wetland seeding and hydrologic restoration of 18 wetlands. The work plan also notes the overall goal of "increased native plant diversity in uplands and wetlands through seeding, removal of trees, and increased diversity as measured by successive BioBlitzes".
5. ***Are plan Sets available?*** No ***Have new GIS maps been created?*** Yes
   If yes, provide in Appendix A and list Maps provided:
   Information for seed mixes was available and maps were provided that illustrate the locations of native seeding, hydrologic restoration, and invasive woody plant removal.
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   No formal design plan sets were created for this project. BMPs noted in work plan documents that relate to restoration techniques include treatment of cut tree stumps with triclopyr, grow-in maintenance mowing, and similar activities.

Project Implementation

(Questions for Site Manager and Cooperating Professionals) List field visit attendees names and affiliations.

7. ***Were alterations made to the original plan during construction?***
   Yes
   Modifications were made to the project schedule. As noted by the project manager, challenges on the project included: "weather, changing field conditions and contractor availability and scheduling."
8. ***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?***
   Modification of the work plan was tied to project delays and contractor availability. These did not impact the project outcomes. Work plan changes were not an effort to change project outcomes.

Site Assessment

Field Review Date: **5/25/2018**

9. ***Field Visit Attendees:*** USFWS Staff: Mike Malling Private Lands Biologist; Brooke Burrows Wildlife Refuge Specialist. Cody Burke Minnesota Waterfowl Association. Debrah Loon Executive Director Minnesota Valley Trust. MN DNR: Gina Quiram, Restoration Evaluation Specialist-Division of Ecological and Water Resources. Paul Bockenstedt, Ecologist (Stantec).
10. ***Surrounding Landscape Characteristics:***
    Lincoln WPA lies at the top of a drainage in the Watonwan River watershed. The overall landscape is very gently rolling with abundant shallow depressional wetlands. The immediate surrounding land uses are primarily row crop agriculture.
11. ***Site Characteristics:***
    a. Soils:
    According to USDA NRCS Web Soil Survey, soils at Lincoln WPA include are fine sandy loam, sandy fine loam to silt loam to loam and clay loam in wetter, depressional areas.
    b. Topography:
    Topography of the WPA and surrounding area is very gently rolling with abundant depressional wetlands.
    c. Hydrology:
    The site lies at the top of a drainage (district) in the Watonwan River watershed. Prior to restoration activities, wetlands on Lincoln WPA had largely been historically altered to drain wetlands through drainage tile and open ditches. USFWS staff report that the area in which Lincoln WPA occurs had a historic average wetland density of 80 wetlands per square mile.
    d. Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:
    Prior to restoration, the different properties that comprise Lincoln WPA were largely row cropped. The restored upland and wetland vegetation is dominated by native grasses, sedges, rushes, and forbs from the four custom seed mixes developed for the site. Current vegetation is largely free from invasive, noxious weeds but does have areas with abundant brush (mostly willow in wet areas) and scattered small trees (e.g. green ash, lilac, boxelder and similar), especially near current or former farmstead windbreaks. Nonnative grass/plant cover is relatively low (~10-15%), patchy, and comprised primarily of nonnative cool season grasses, including Kentucky bluegrass, reed canary grass, and smooth brome. The aggressive natives giant and Canada goldenrod were locally common.
    e. Vegetation B: Meander Search Species List (as appropriate for site)
    Upland areas include abundant cover from the native seed mix, including big bluestem, Indian grass, switchgrass, stiff goldenrod, wild bergamot, oxeye false sunflower, Canada wildrye, Virginia mountain mint, black-eyed Susan, and golden Alexanders. A total of 40 of the 50 species listed in the upland seed mix were observed on site during an approximate 20 minute meander survey. A meander survey of areas seeded to wet prairie and wetland seed mixes documented a total of 20 (of 38 total) native plant species from the wet prairie and wet meadow seed mixes. Additional information on plant species observed is included in the appendix to this report.
12. ***Is the plan based on current science?*** Yes
    The site preparation, seeding, and grow-in maintenance techniques used on this project, as well as their timing and integration, were consistent with those successfully used by other restoration practitioners

in the region. During the field review, USFWS staff consistently underpinned their approach through their own successful experiences, those of other practitioners and/or research. USFWS staff used leading edge tools to help with locating and designing the wetland restorations, contributing to their success. Mike Malling (USFWS) uses his ArcCollector on his smart phone to field-locate the most effective spots to do things like find tile lines, where to build wetland restoration infrastructure and similar. The USFWS office uses LiDAR to build DEMs the Mike is uses on his phone. He also has geo-referenced historic air photos on his phone enabling him to mark historic wetland edges of drained wetlands, locate tile/ditches and similar.

13. ***List indicators of project outcomes at this stage of project:***
    Diverse, native vegetation has established well, hydrology has returned to wetland basins that were formerly drained, and the amount of woody cover (especially mature trees) has been significantly reduced.
14. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    Yes, the implementation of restoration activities at Lincoln WPA has dramatically improved the area and quality of wildlife habitat. The long-term prairie vegetation composition is sustainable through normal maintenance activities that will be conducted by USFWS.
15. ***Are corrections or modifications needed to meet proposed outcomes?***
    No – the work in this particular area will meet or exceed proposed outcomes.
16. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    Yes, periodic maintenance with prescribed fire, spot weed treatment, and cutting of volunteer woody growth that cannot be controlled through fire are practical, reasonable, and supportive of sustaining the habitat improvements made at this site.
17. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    All of the proposed/completed activities are supportive of developing and sustaining a complex of quality grassland and wetland habitats.
18. ***Are follow-up assessments needed? Explain.***
    No
19. ***Additional comments on the restoration project.***
    Minnesota Valley National Wildlife Trust, USFWS and other project partners utilized a targeted, comprehensive and holistic approach to restoration of habitats at Lincoln WPA. They have done an outstanding job of coordinating a variety of resources and project partners to cost-effectively conduct integrated resource management activities that are successful and sustainable.

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 will:***
    Likely exceed proposed outcomes

Confidence of outcome determination:

High

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

    Work at Lincoln WPA has resulted in the development of high quality, diverse native prairie and wetland vegetation, restoration of hydrology to drained wetlands and reduced woody cover that is detrimental to grassland wildlife.

22. ***Site Assessor(s) Conducting Review:***

    Paul Bockenstedt, Ecologist (Stantec); Gina Quiram, Restoration Evaluation Specialist (MN DNR)

Appendix A: Site maps, Project plans or Vegetation tables

Site Information

Land Ownership:	**Other**	Acres:	**196**
Site Name(s)	**Lincoln WPA**	Open to Public Hunting?	**Yes - all**
Activity	**Restoration**	Open to Public Fishing?	**Yes - all**
Habitat	**Prairie**		

Figure 13-1 Map of restoration areas at Lincoln WPA funded through this grant.

Table 13-1 Native sedge meadow mix seeded at Meixall North Unit, Lincoln WPA. Mix from feder prairie seed 1740 Industrial Drive Blue Earth, MN 56013 (federprairieseed.com). USFWS1313 Sedge Meadow Mix 50.00 Acres, 190 Total lb, 342.95 Bulk lb, 190.00 PLS lb. Purity 88.29%, Inert Matter, 11.17%, Other Crop 0.12%, Weed Seed 0.42%, Noxious Weeds/lb: 1 Giant Foxtail. Test Date 09/2012.

Common Name	Scientific Name	Origin	Mix %	PLS lb	Bulk lb
Blue Joint Grass	*Calamagrostis canadensis*	MN	1.32%	2.50	2.77
Prairie Cord Grass	*Spartina pectinata*	MN	21.67%	41.17	58.38
Prairie Cord Grass	*Spartina pectinata*	MN	4.68%	8.90	11.85
Rice Cut Grass	*Leersia oryzoides*	IA	2.64%	5.01	6.13
Reed Manna Grass	*Glyceria grandis*	MN	3.95%	7.51	8.86
Fowl Manna Grass	*Glyceria striata*	MN	1.32%	2.50	2.85
Prairie Dropseed	*Sporobolus heterolepsis*	MN	7.91%	15.02	19.66
Fowl Bluegrass	*Poa palustris*	Canada	7.91%	15.02	23.74
Bottlebrush Sedge	*Carex comosa*	MN	2.64%	5.01	5.88
Porcupine Sedge	*Carex hystericina*	MN	3.95%	7.51	8.49
Pointed-broom Sedge	*Carex scoparia*	MN	1.32%	2.50	3.46
Fox Sedge	*Carex stipata*	MN	2.64%	5.01	5.80
Brown Fox Sedge	*Carex vulpinoidea*	MN	5.27%	10.01	12.46
Common Rush	*Juncus effusus*	WI	0.79%	1.50	1.62
River Bulrush	*Scirpus fluviatilis*	MN	3.16%	6.01	6.83
Softstem Bulrush	*Scirpus validus*	MN	3.95%	7.51	8.35
Green Bulrush	*Scirpus atrovirens*	IA	2.11%	4.01	4.48
Woolgrass	*Scirpus cyperinus*	MN	0.53%	1.00	1.24
Water Plantain	*Alisma subcordatum*	MN	1.32%	2.50	2.72
Swamp Aster	*Aster puniceus*	MN	0.26%	0.50	0.77
Swamp Milkweed	*Asclepias incarnata*	MN	2.37%	4.51	4.73
New England Aster	*Aster novae-angliae*	MN	0.53%	1.00	1.17
Flat-topped Aster	*Aster umbellatus*	MN	0.26%	0.50	1.18
Panicled Aster	*Aster simplex*	MN	0.26%	0.50	1.66
Joe Pye Weed	*Eupatorium maculatum*	IA	0.66%	1.25	1.98
Boneset	*Eupatorium perfoliatum*	MN	0.26%	0.50	1.13
Sneezeweed	*Helenium autumnale*	MN	0.53%	1.00	1.87
Great St. John's Wort	*Hypericum pyramidatum*	MN	0.53%	1.00	1.09
Southern Blue Flag Iris	*Iris virginica shrevei*	WI	4.74%	9.01	9.59
Prairie Blazingstar	*Liatris pycnostachya*	IA	0.53%	1.00	1.09
Great Blue Lobelia	*Lobelia siphilitica*	IA	0.53%	1.00	1.10
Monkey Flower	*Mimulus ringens*	MN	0.13%	0.25	0.31
Mountain Mint	*Pycnanthemum virginianum*	IA	0.26%	0.50	0.58
Prairie Wild Rose	*Rosa arkansana*	MN	0.53%	1.00	1.25
Blue Vervain	*Verbena hastata*	MN	2.37%	4.51	5.13
Common Ironweed	*Vernonia fasciculata*	IA	1.32%	2.50	2.76
Golden Alexanders	*Zizia aurea*	MN	4.87%	9.26	9.97
Prairie Cord Grass (inert)	*Spartina pectinata*	MN	0.00%	0.00	39.00
Prairie Cord Grass (inert)	*Spartina pectinata*	MN	0.00%	0.00	61.00

Table 13-2 Native sedge meadow mix seeded at Meixall South Unit, Lincoln WPA. Species with an asterisks and highlighted in yellow were observed during the site visit. USFWS1336 Mixell South Sedge Meadow Miz for 70.00 acres from feder prairie seed 1740 Industrial Drive, Blue Earth, MN 56013 (federprairieseed.com). 266.00 total pounds, 441.13 bulk pounds, 266.00 PLS pounds with a purity of 56.14%, inert matter 34.2%, Other Crop 0.62%, Weed Seed 0.04%, Noxious Weeds/lb: None, test date 09/2013.

Common Name	Scientific Name	Origin	Mix %	PLS lb	Bulk lb
Blue Joint Grass	Calamagrostis canadensis	MN	1.32%	3.50	4.19
Prairie Cord Grass	Spartina pectinata	MN	26.35%	70.09	81.82
Rice Cut Grass	Leersia oryzoides	WI	2.64%	7.01	7.09
Reed Manna Grass	Glyceria grandis	MN	3.95%	10.51	11.83
Fowl Manna Grass	Glyceria striata	MN	1.32%	3.50	4.09
Fowl Bluegrass	Poa palustris	Canada	7.91%	21.03	26.08
Prairie Dropseed	Sporobolus heterolepsis	MN	7.91%	21.03	22.91
Bottlebrush Sedge	Carex comosa	MN	2.64%	7.01	7.24
Porcupine Sedge	Carex hystericina	MN	3.85%	10.51	11.91
Pointed-broom Sedge*	Carex scoparia	MN	1.32%	3.50	3.82
Fox Sedge*	Carex stipata	MN	2.64%	7.01	8.00
Brown Fox Sedge*	Carex vulpinoidea	MN	5.27%	14.02	14.77
Common Rush*	Juncus effusus	WI	0.79%	2.10	2.29
River Bulrush*	Scirpus fluviatilis	MN	3.16%	8.40	9.05
Softstem Bulrush	Scirpus validus	MN	3.95%	10.51	12.54
Green Bulrush	Scirpus atrovirens	MN	2.11%	5.61	6.15
Woolgrass	Scirpus cyperinus	MN	0.53%	1.40	1.44
Water Plantain	Alizma scbcordatum	MN	1.32%	3.5	3.99
Swamp Aster*	Aster puniceus	WI	0.26%	0.70	0.80
Swamp Milkweed*	Asclepias incarnata	MN	2.37%	6.31	6.62
New England Aster*	Aster novae-angliae	MN	0.53%	1.40	1.52
Flat-topped Aster	Aster umbellatus	MN	0.26%	0.70	0.87
Panicled Aster*	Aster simplex	IA	0.26%	0.70	0.83
Joe Pye Weed	Eupatorium maculatum	IA	0.66%	1.75	1.92
Boneset	Eupatorium perfoliatum	MN	0.26%	0.70	1.25
Sneezweed*	Helenium autumnale	MN	0.53%	1.40	2.38
Great St. John's Wort	Hypericum pyramidatum	MN	0.53%	1.40	1.42
Southern Blue Flag Iris	Iris virginica shrevel	IA	4.74%	12.62	13.34
Prairie Blazingstar	Liatris pycnostachya	MN	0.53%	1.40	1.66
Great Blue Lobelia*	Lobelia siphilitica	IA	0.53%	1.40	1.61
Monkey Flower	Mimulus ringens	MN	0.13%	0.35	0.41
Mountain Mint*	Pycnanthemum virginianum	MN	0.26%	0.70	0.86
Prairie Wild Rose*	Rosa arkansana	MN	0.53%	1.40	1.65
Blue Vervain*	Verbena hastata	IA	2.37%	6.31	6.72
Common Ironweed	Vernonia fasciculata	IA	1.32%	3.50	4.48
Golden Alexanders	Zizia aurea	WI	4.87%	12.97	13.54

Table 13-3 Custom native mix seeded at Meixall North Unit from feder prairie seed 1740 Industrial Drive Blue Earth, MN 56013 (federprairieseed.com). USFWS1312 Upland Prairie Mix 29.00 Acres, 303.34 Total lb, 360.09 Bluk lb, 303.34 PLS lb. Purity 91.04%, Inert Matter 8.37%, Other Crop 0.58%, Weed Seed 0.01 %, Noxious Weeds/lb: None. Test Date 11/2012.

Common Name	Scientific Name	Origin	Mix %	PLS lb	Bulk lb
Big Bluestem	Andropogon gerardii	MN	14.91%	45.24	58.86
Sideoats Grama	Bouteloua curtipendula	MN	11.47%	34.80	40.02
Prairie Brome	Bromus kalmii	MN	9.56%	29.00	32.54
Virginia Wild Rye	Elymus virginicus	MN	5.74%	17.40	19.18
Switchgrass	Panicum virgatum	MN	7.65%	23.20	24.19
Little Bluestem	Schizachyrium scoparium	MN	17.21%	52.20	65.35
Indiangrass	Sorghastrum nutans	MN	11.47%	34.80	44.90
Blue Grama	Bouteloua gracilis	MN	1.43%	4.35	5.00
Prairie Dropseed	Sporobolus heterolepsis	MN	1.43%	4.35	5.69
Prairie Onion	Allium stellatum	MN	0.19%	0.58	0.63
Lead Plant	Amorpha canescens	MN	0.57%	1.74	1.84
Common Milkweed	Asclepias syriaca	MN	0.38%	1.16	1.20
Whorled Milkweed	Asclepias verticillata	MN	0.38%	1.16	1.42
Smooth Blue Aster	Aster laevis	MN	0.29%	0.87	1.04
New England Aster	Aster novae-angliae	MN	0.29%	0.87	1.02
Canada Milk Vetch	Astragalus canadensis	MN	0.57%	1.74	1.79
Cream Wild Indigo	Baptisia leucophaea	MN	0.29%	0.87	0.91
Partridge Pea	Chamaecrista fasciculata	MN	1.15%	3.48	3.59
Prairie Coreopsis	Coreopsis palmata	IA	0.29%	0.87	1.36
White Prairie Clover	Dalea candidum	MN	1.15%	3.48	3.59
Purple Prairie Clover	Dalea purpurea	MN	1.15%	3.48	3.57
Showy Tick Trefoil	Desmodium canadense	MN	0.76%	2.32	2.37
Rattlesnake Master	Eryngium yuccifolium	MN	0.57%	1.74	2.08
Cream Gentian	Gentiana flavida	MN	0.57%	1.74	1.89
Ox-eye Sunflower	Heliopsis helianthoides	MN	0.57%	1.74	1.97
Round-headed Bush Clover	Lespedeza capitata	MN	0.29%	0.87	1.02
Prairie Blazingstar	Liatris pycnostachya	IA	0.57%	1.74	1.89
Wild Bergamot	Monarda fistulosa	MN	0.57%	1.74	2.00
Common Ironweed	Vernonia fasciculata	MN	0.29%	0.87	1.03
Prairie Cinquefoil	Potentilla arguta	MN	0.29%	0.87	0.92
Mountain Mint	Pycnanthemum virginianum	IA	1.15%	3.48	4.04
Yellow Coneflower	Ratibida pinnata	IA	0.86%	2.61	2.71
Black-eyed Susan	Rudbeckia hirta	MN	1.15%	3.48	3.56
Compass Plant	Silphium laciniatum	IA	0.76%	2.32	2.71
Stiff Goldenrod	Solidago rigida	MN	0.57%	1.74	2.19
Showy Goldenrod	Solidago speciosa	IA	0.19%	0.58	0.62
Blue Vervain	Verbena hastata	MN	0.57%	1.74	1.98
Hoary Vervain	Verbena stricta	MN	0.96%	2.90	3.47
Heartleaf Alexanders	Zizia aptera	MN	0.57%	1.74	2.17
Golden Alexanders	Zizia aurea	MN	1.15%	3.48	3.75

Table 13-4 Native upland prairie mix seeded at Meixell South Unit, Lincoln WPA. Plants with an asterix and highlighted in yellow were observed during meander made at both South and North portions of Meixell Unit. USFWS1335 Meixell South Upland Prairie Mix, 25.00 acres from feder prairie seed 1740 Industrial Drive, Blue Earth, MN 56013 (federprairieseed.com). Total lb 261.5, 315.39 bluk lb, 361.50 PLS lb. Purity 92.31%, Inert Matter 5.93%, Other Crop 1.68%, Weed Seed 0.08%, MN Noxious Weeds/lb: 10 Giant Foxtail, Test Date: 08/2013.

Common Name	Scientific Name	Origin	Mix %	PLS lb	Bulk lb
Big Bluestem*	Andropogon gerardii	MN	14.91%	39.00	47.20
Sideoats Grama	Bouteloua curtipendula	MN	11.47%	30.00	36.07
Prairie Brome	Bromus kalmia	MN	11.47%	30.00	36.07
Virginia Wild Rye*	Elymus virginicus	MN	5.74%	15.00	16.54
Switchgrass*	Panicum virgatum	IA	7.65%	20.00	20.89
Little Bluestem*	Schizachyrium scoparium	MN	17.21	45.00	64.67
Indiangrass*	Sorghastrum nutans	MN	11.47%	30.00	36.36
Blue Grama	Bouteloua gracilis	MN	1.43%	3.75	3.98
Prairie Dropseed	Sporobolus heterolepsis	MN	1.43%	3.75	4.09
Prairie Onion	Allium stellatum	MN	0.19%	0.50	0.57
Lead Plant*	Amorpha canescens	MN	0.57%	1.50	1.56
Common Milkweed*	Asclepias syriaca	MN	0.38%	1.00	1.04
Whorled Milkweed	Asclepias verticillata	MN	0.38%	1.00	1.23
Smooth Blue Aster*	Aster laevis	MN	0.29%	0.75	1.76
New England Aster	Aster novae-angliae	MN	0.29%	0.75	1.76
Canada Milk Vetch*	Astragalus canadensis	MN	0.57%	1.50	1.53
Cream Wild Indigo*	Baptisia leucophaea	MN	0.29%	0.75	0.85
Partridge Pea	Chamecrista fasciculata	MN	1.15%	3.00	3.13
Prairie Coreopsis*	Coreopsis palmate	MN	0.29%	0.75	0.90
White Prairie Clover*	Dalea candidum	MN	1.15%	3.00	3.09
Purple Prairie Clover*	Dalea purpera	MN	1.15%	3.00	3.06
Showy Tick Trefoil*	Desmodium canadense	IA	0.76%	2.00	2.08
Rattlesnake Master*	Eryngium yuccifolium	MN	0.57%	1.50	1.68
Cream Gentian*	Gentiana flavida	MN	0.57%	1.50	1.68
Ox-eye Sunflower*	Heliopsis helianthoides	IA	0.57%	1.50	1.55
Round-headed Bush Clover*	Lespedeza capitita	MN	0.29%	0.75	0.85
Prairie Blazingstar*	Liatris pycnostachya	MN	0.57%	1.50	1.77
Wild Bergamot*	Monarda fistulosa	MN	0.57%	1.50	1.54
Common Ironweed	Vernonia fasciculata	IA	0.29%	0.75	0.86
Prairie Cinquefoil*	Potentilla argute	MN	0.29%	0.75	0.86
Mountain Mint*	Pycananthemum virginianum	IA	1.15%	3.00	3.48
Yellow Coneflower*	Ratibida pinnata	IA	0.86%	2.25	2.37
Black-eyed Susan*	Rudbeckia hirta	IA	1.15%	3.00	3.10
Compass Plant*	Silphium laciniatum	MN	0.76%	2.00	2.47
Stiff Goldenrod*	Solidago rigida	MN	0.57%	1.50	1.65
Showy Goldenrod	Solidago speciose	MN	0.19%	0.50	0.55
Blue Vervain*	Verbena hastata	IA	0.57%	1.50	1.60
Hoary Vervain*	Verbena stricta	MN	0.96%	2.50	2.64
Heartleaf Alexanders*	Zizia aptera	MN	0.57%	1.50	1.87
Golden Alexanders	Zizia aurea	WI	1.15%	3.00	3.13

Table 13-5 List of plugs installed in wetland areas at Meixell Unit, Lincoln WPA. No wetland plugs were observed, presumably due to the fact that there was a relatively small number of plugs installed in any particular wetland fringe. A map is on file with USFWS denoting approximate plug planting locations.

Common Name	Scientific Name	Total Plugs	Price	Total Cost
Water Plantain	*Alisma subcordatum*	72.00 Plugs	$2.50	$180.00
Canada Anemone	*Anemone canadensis*	72.00 Plugs	$2.50	$180.00
Swamp Milkweed	*Asclepias incarnata*	24.00 Plugs	$2.50	$60.00
Broad-leaved Woolly Sedge	*Carex pellita*	60.00 Plugs	$2.50	$150.00
Tussock Sedge	*Carex stricta*	48.00 Plugs	$2.50	$120.00
Boneset	*Eupatorium perfoliatum*	60.00 Plugs	$2.50	$150.00
Northern Blue Flag Iris	*Iris versicolor*	84.00 Plugs	$2.50	$210.00
Obedient Plant	*Physostegia virginiana*	84.00 Plugs	$2.50	$210.00
Winged Loosestrife	*Lythrum alatum*	36.00 Plugs	$2.50	$90.00
Ditch Stonecrop	*Penthorum sedoides*	48.00 Plugs	$2.50	$120.00
Fringed Loosestrife	*Lysimachia ciliata*	24.00 Plugs	$2.50	$60.00
Wild Mint	*Mentha arvensis*	72.00 Plugs	$2.50	$180.00
Mountain Mint	*Pycnanthemum virginianum*	72.00 Plugs	$2.50	$180.00
Giant Bur Reed	*Sparganium eurycarpum*	72.00 Plugs	$2.50	$180.00

Appendix B: Site Photographs

Photo 13-1 Overhead view showing abundant native seedlings under existing plant cover

Photo 13-2 Wetland restoration (hydrology and vegetation) on Meixell Unit

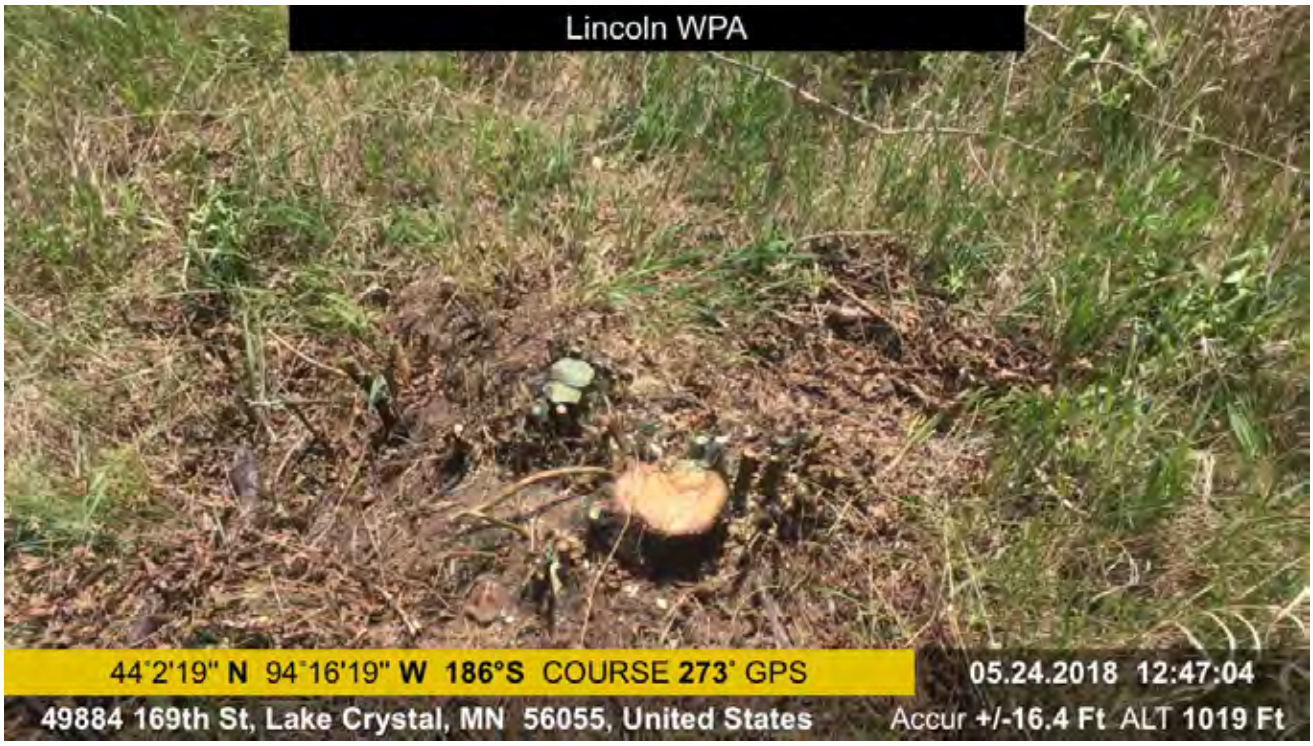


Photo 13-3 Invasive trees recently cut and stump treated with herbicide/dye

Photo 13-4 Meixell Unit of Lincoln WPA

Photo 13-5 View of low area in Meixell Unit with nonnative cool season grasses common

Photo 13-6 View of low area in Meixell Unit with nonnative cool season grasses common

Photo 13-7 Native plant and seedlings on Meixell Unit

Photo 13-8 South Meixell Unit view, looking south over area burned in spring 2018

Photo 13-9 Drier portion of upland prairie, south Meixell Unit burned in spring 2018

Photo 13-10 Native plant density is good in drier portion of upland prairie, south Meixell Unit burned in spring 2018

Photo 13-11 Mesic to wet-mesic prairie, south Meixell Unit burned in spring 2018

Photo 13-12 Wet meadow, south Meixell Unit burned in spring 2018

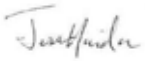
Photo 13-13 Wet meadow, south Meixell Unit burned in spring 2018

Photo 13-14 Wet meadow, south Meixell Unit burned in spring 2018

REPORT AUTHORS:

Paul Bockenstedt, Stantec Date: 5.29.18 Signature: 

Gina Quiram, MN DNR Date: 6.7.18 Signature: 

Jess Haider, Stantec (QA/QC) Date: 5.30.18 Signature: 

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

14) OHF Dutch Charley Creek WMA Savanna Restoration

Project Background

Project Name: Dutch Charley Creek WMA Savanna

Project Location: Dutch Charley Creek WMA, Redwood County

Township/Range Section: Township 109N Range 36W Section NW20

Project Manager / Affiliated Organization: Rick Horton, National Wild Turkey Federation

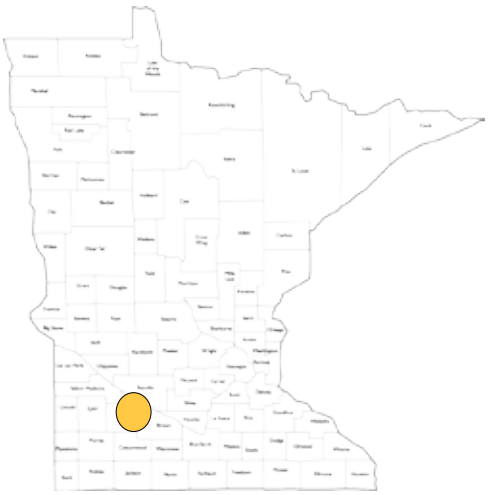
Fund: OHF –CPL ***Fiscal Year Funds:*** 2011

Project Start Date: Fall 2012

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Choose an item. , Choose an item.

Project Status: Post Establishment Phase



County: Redwood

Primary Activity: Savanna Restoration

Project Size: 32 Acres

Project Completed: 2013

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
    - Conduct a site preparation prescribed burn
    - Sow prairie forb seed
    - Install native trees and shrubs, including:

- 500 bur oak tree seedlings
- 1,000 hazelnut
- 100 gray dogwood
- 500 other mast-bearing shrubs

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Wildlife Area Manager, Jeff Zajac, has receipts on file for plant materials purchased, as well as maps of areas where restoration activities were conducted/plant materials installed.
3. ***What are the stated goals of the project?***
   Restore and enhance 19 acres of oak savanna habitat within the Dutch Charley Creek WMA in Redwood County.
4. ***Were measures of restoration success identified in plans?*** *No*
   If yes, list specific measurements.
   No specific goals or performance measures were listed among the documents provided for review.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   There were no ArcGIS-based maps developed. However, maps were developed using Google earth.
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   There were no BMP-based practices, standards or guidelines referenced in the planning documents provided for review.

Project Implementation

7. ***Were alterations made to the original plan during construction?***
   Yes
   Several adjustments were made:
   - Original proposed acres for the project were 19. Actual acreage managed reported was 32.
   - The Management Plan indicates broadcast seeding was to occur in November 2012 following the prescribed burn. The actual timing of the broadcast seeding was reported to be early 2013.
   - Original proposed number of bur oak trees to be planted was 500 – actual number installed was 400 (based on receipt from tree nursery).
   - Original proposed number of shrubs to be installed was 1,600 – actual number installed was 1,050 (based on receipt from tree nursery).
8. ***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?***
   Fewer trees and shrubs were planted than planned/proposed. Forb seed was broadcast across more total acres than originally proposed.

Site Assessment

Field Review Date: **5/21/2018**

Field Visit Attendees: Rick Horton, National Wild Turkey Federation; Jeff Zajac, MN DNR Area Wildlife Manager; Jessica Petersen MN DNR Wildlife; Gina Quiram, MN DNR Legacy Restoration Review Team; Paul Bockenstedt, Ecologist (Stantec)

9. ***Surrounding Landscape Characteristics:***
   The site includes upland and floodplain areas adjacent to Charley Creek. The surrounding land cover includes floodplain woodland/terrace forest adjacent to Charley Creek on the south and west sides of the project area. The area immediately to the north on MN DNR property includes a wildlife food plot area approximately one-half mile in width (east-west).
10. ***Site Characteristics:***
    a. Soils:
    USDA NRCS Web Soil Survey indicates soils in upland areas are primarily loam with clay loam present in some areas. The lower-lying floodplain areas are mapped as Spillville loam.
    b. Topography:
    The north portion of the site is moderately sloped toward Charley Creek. The south portion of the site is entirely within the floodplain of Charley Creek and is nearly flat with the lowest portion of the WMA being close to the base of the upland slope.
    c. Hydrology:
    The north portion of the site is entirely upland. The south portion of the site lies entirely within the floodplain of Dutch Charley Creek. Flotsam lines on trees and shrubs, as well as the vegetation composition, indicate that this lower area is flooded periodically, but probably infrequently and only for short periods of time as there are many non-hydrophytic plant species present.
    d. Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:
    The site is a pre-existing CREP planting that was reported by MN DNR staff to have been dominated by native, warm season grasses prior to this project. At the time of the site visit, the dominant vegetation continued to be native, warm season grasses, particularly in the upland areas. Native forbs from the supplemental seed mix occur in swaths/patches and locally comprise up to 100% of the plant cover, but these swaths/patches are widely separated in most instances. Nonnative, cool season grasses were commonly observed and estimated to comprise approximately one-fourth of the total cover (Kentucky bluegrass, smooth brome and reed canary grass). Other invasives included Canada thistle (uncommon), curly dock (present). The invasive natives Canada goldenrod and giant goldenrod were common to dominant in some portions of the planting area.
    e. Vegetation B: Meander Search Species List (as appropriate for site)
    The observed forbs from the 22-species seed mix included anise hyssop (Agastache foeniculum), Canada milkvetch (Astragalus canadensis), prairie coreopsis (Coreopsis palmata), wild bergamot (Monarda fistulosa); yellow coneflower (Ratibida pinnata); black-eyed Susan (Rudbeckia hirta); stiff goldenrod (Oligoneuron rigidum); common milkweed (Asclepias syriaca); and golden Alexanders (Zizia aurea). By far the most common forb to establish from the seed mix was wild bergamot. Other frequently observed forbs included anise hyssop, yellow coneflower.
11. ***Is the plan based on current science?*** Yes
12. ***List indicators of project outcomes at this stage of project:***

    The forb species from the enrichment seeding are concentrated in swaths and patches that appear to correspond to the paths of the equipment used for seeding. This tends to indicate that the area was likely not evenly seeded by the equipment operator as opposed to environmental factors such as snow

depth at the time of seeding. Overall, it is estimated that native forb cover from the supplemental seed mix comprises perhaps five to ten percent of the total cover or on average about one forb from the seed mix per three to five square feet. In areas where native forbs established well from the native seed mix, forb cover is nearly continuous, and seed rain into immediately adjacent areas is resulting in good secondary forb seedling recruitment and establishment. Only 8 of the 22 species listed in the forb enrichment seed mix were observed. These included anise hyssop (Agastache foeniculum), Canada milkvetch (Astragalus canadensis), prairie coreopsis (Coreopsis palmata), wild bergamot (Monarda fistulosa); yellow coneflower (Ratibida pinnata); black-eyed Susan (Rudbeckia hirta); stiff goldenrod (Oligoneuron rigidum); common milkweed (Asclepias syriaca); and golden Alexanders (Zizia aurea). By far the most common forb from the seed mix was wild bergamot.

Bur oak trees were planted with estimated 50-foot average spacing and protected with grow tubes and tree mats installed at the ground surface. Five-year survival rate is low and appears to be well under 20% for the bur oak seedlings.

Native shrubs were installed directly into the prairie sod by spacing them throughout the woody planting area for the project. The shrub seedlings did not receive additional protection or control of existing vegetation. No shrubs from the planting list were observed during the walk-through, so the survival rate is presumed to be a maximum of five-percent due to the chance that shrubs were present but not detected but may be even lower than five percent.

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    The restoration methodology utilized at this site had been successfully used by MN DNR Wildlife staff at other similar sites in southwest Minnesota. However, the particular attributes of this site and potentially weather conditions/hydrology gave poorer results compared to other sites.
14. ***Are corrections or modifications needed to meet proposed outcomes?***
    Not at this time.
15. ***Do proposed or planned future steps, including long-term management, appear practical and reasonable? What are the potential challenges or limitations?***
    Future management at this site is reported by MN DNR Wildlife Staff to include periodic prescribed fire applied on an approximate three to six-year rotation. This appears to be practical at this site and supportive of building on the gains made during the initial restoration effort, particularly to foster maintenance and expansion of the native forbs that were over seeded, which should continue to expand in total area.
16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No. The project is supportive of improving habitat for game and nongame wildlife species in the area and improving the native species richness of the 32 acres where the planting occurred.
17. ***Are follow-up assessments needed? Explain.***
    No additional assessments should be necessary.
18. ***Additional comments on the restoration project.***
    Robust, native warm season grass plantings can be challenging to enrich through supplemental seeding and/or direct planting without some type of perturbation to weaken their competitiveness, as well as follow-up management activities to ensure survival of seedlings and newly planted woody stock. While

the technique of simply burning and direct seeding of the site had been used successfully at other sites in the area, it is likely that the establishment rate of forbs and the survival rate of woody plants would have been improved through conducting pre- and post-management activities to weaken the native grasses such as: summer prescribed burn, light overspray of herbicide, periodic mowing following forb seeding, pre-treating tree and shrub planting locations and follow-up mowing around woody plants. The establishment of native forbs from the supplemental seed mix was also relatively low in terms of the number of species from the seed mix (8 of 22 species observed), weakening the pre-existing native warm season grasses. This followed by periodic mowing in the first growing season would likely have resulted in more species from the seed mix developing at the site. Overall, warm season native grass-dominated sites can be challenging to enrich. I believe the forb enrichment efforts at this site can be considered a success given the site challenges. Establishment of native trees and shrubs was largely unsuccessful due to the competitive surroundings that the seedlings were planted into. While a higher rate of establishment for forbs and better survival of woody plants would have been desirable, the results are within a range that would be considered within the standard of care for the ecological restoration industry. Importantly, the gains that were made at this site are highly likely to be sustained because there will be consistent active management with appropriate tools such as prescribed fire.

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.

19. ***The project will:***
    Minimally meet proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***
    The forb enrichment results were generally good with reasonable (albeit patchy) establishment of native forbs from the seed mix. However, only 8 of 22 species included in the seed mix were observed. As well, survival of the bur oak tree seedlings was poor and no planted shrub seedlings were observed during the field walk.
21. ***Site Assessor(s) Conducting Review:***
    Paul Bockenstedt, Ecologist (Stantec); Gina Quiram, Restoration Evaluation Specialist (MN DNR)

Appendix A: Site maps, Project plans or Vegetation tables

Figure 14-1 Location of prescribed burn and forb enrichment seeding (Source: MN DNR).

Figure 14-2 Tree and shrub seedling installation location.

Table 14-1 Forb enrichment seed mix. Species observed in field are noted with the following: c=common, o=occasional, r=rare. If there is no note next to a species, it was not observed in the field.

Species	Ounces per Acre	Acres to Seed	Total PLS Ounces Required	Cost Per Pound	Field Observation
Anise Hysopp	1.00	19	19	$10.5	Occasional
Canada Milkvetch	0.25	19	4.75	$2.70	Rare
Partridge Pea	1.50	19	28.5	$1.25	Not Observed
Showy Tick Trefoil	0.75	19	14.25	$12.5	Not Observed
Maximillian Sunflower	0.50	19	9.5	$4.50	Not Observed
Round Headed Bush Clover	0.30	19	5.7	$18.00	Not Observed
Prairie Coreopsis	1.00	19	19	$18.75	Rare
Rough Blazingstar	1.00	19	19	$40.75	Not Observed
Wild Bergamot	0.75	19	14.25	$15.75	Common
Purple Prairie Clover	8.00	19	152	$1.75	Not Observed
White Prairie Clover	6.00	19	114	$5.35	Not Observed
Yellow Coneflower	1.00	19	19	$3.25	Occasional
Black eyed Susan	1.00	19	19	$2.25	Occasional
Stiff Goldenrod	0.75	19	14.25	$4.75	Common
Common Milkweed	2.00	19	38	$8.15	Not Observed
Narrow leaved coneflower	2.00	19	38	$513.00	Not Observed
Showy Goldenrod	0.20	19	3.8	$15.75	Not Observed
Heart Leaved Alexanders	0.50	19	9.5	$6.75	Not Observed
Golden Alexanders	0.50	19	9.8	$5.50	Occasional
Lead Plant	1.00	19	19	$9.50	Not Observed
Smooth Blue Aster	1.00	19	19	$11.25	Not Observed
Butterflyweed	1.00	19	19	$40.75	Not Observed

Wildlife observations:

Clay-colored sparrow, dickcissel, yellowthroat, red-wing blackbird, ring-neck pheasant

Appendix B: Site Photographs

Photo 14-1 Representative dense native and nonnative grass cover at site.

Photo 14-2 Grass thatch showing secondary recruitment of native forb seedlings (small seedlings under thatch), especially bergamot.

Photo 14-3 Example of a successful establishment of a bur oak seedling and tree tube.

Photo 14-4 Example of a successful establishment of a bur oak seedling and tree tube.

Photo 14-5 View across Dutch Charley Creek floodplain/terrace. Tree tubes indicate location of bur oak seedling installation.

Photo 14-6 View across Dutch Charley Creek floodplain/terrace. Tree tubes indicate location of planted bur oak seedlings.

Photo 14-7 Area of heavy native grass thatch cover with good establishment of species from the supplemental forb seeding.

Photo 14-8 View of heavy native grass thatch cover with few native forb seedlings/plants.

Photo 14-9 View looking west showing landscape and tree planting tubes

Photo 14-10 View looking west showing landscape and tree planting tubes.

Photo 14-11 View looking southeast from ridge onto floodplain of Dutch Charley Creek.

REPORT AUTHORS:

Paul Bockenstedt, Stantec	Date: 5.29.18	Signature:
Gina Quiram, MN DNR	Date: 5.29.18	Signature:
Jess Haider, Stantec (QA/QC)	Date: 5.29.18	Signature:

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

15) OHF Artichoke Lake WPA Prairie Enhancement - Grazing

Project Background

Project Name: Artichoke Lake WPA Enhancement

Project Location: Swift County, Artichoke Lake Waterfowl Production Area

Township/Range Section: Township 122N Range 43W Section 31

Project Manager / Affiliated Organization: Angela Miner, The Nature Conservancy

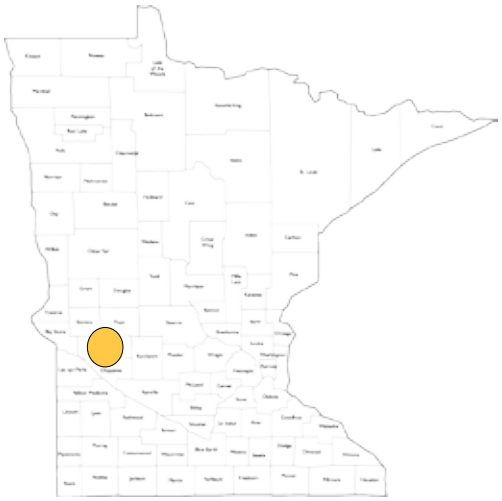
Fund: OHF ***Fiscal Year Funds:*** 2012

Project Start Date: 2014

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Wetland

Project Status: Post Establishment Phase



County: Swift

Primary Activity: Prairie Enhancement

Project Size: 264 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?***

   Grazing (264 acres)—4-paddock cattle grazing system with rotations in 2014 and 2015 (274 animal units per year).

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

Grazing System Paddock Map

Artichoke Lake WPA 2014-2015 Utilization Rate Calculations

3. ***What are the stated goals of the project?***
   Stated goals for the project from project documents included reducing the litter layer in seeded grasslands, suppression of invasive grasses, and stimulating natives. The TNC project manager also noted the additional goal of suppressing woody seedlings.

4. ***Were measures of restoration success identified in plans?*** *No*
   If yes, list specific measurements.
   Click here to enter text.
5. ***Are plan Sets available?*** No ***Have new GIS maps been created?*** Choose an item.
   If yes, provide in Appendix A and list Maps provided:
   Click here to enter text.
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***

   (1) Utilization rate calculations. A few additional metrics would be helpful to understand how the grazing treatments (number of grazing days and animal units) were determined in relation to the stated project goals. Because the paddocks range in size from 62 to 70 acres and vary in forage availability due to lakes, ponds, and wetlands within the project area, it would be helpful to know how average forage production was determined, as well as targets for harvest efficiency.
   (2) The rotational aspect of the project is based on science, but different objectives apply to each paddock depending upon the timing of their grazing treatment(s). Litter layer reduction is assumed to have occurred across all paddocks in both years. However, the same paddock rotation was used in both years, so one paddock received the best practice for suppressing invasive grasses through early season grazing when cool season grasses were at peak growth.

Project Implementation

(Questions for Site Manager and Cooperating Professionals) List field visit attendees' names and affiliations.

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***
   Click here to enter text.

Site Assessment

Field Review Date: **5/16/2018**

Field Visit Attendees: Angela Miner, TNC project manager, Gina Quiram, DNR restoration evaluation specialist, and Larissa Mottl, Stantec Consulting Services ecologist and assessor.

9. ***Surrounding Landscape Characteristics:***
   The WPA is surrounded by cultivated land to the north, east, and south, with Artichoke Lake directly west on the other side of county road 53.
10. ***Site Characteristics:***
    a. ***Soils:***
    Upland areas are primarily Ortonville-Vallers-Parnell and Ortonville loam on 0-3% slopes and Esmond-Heimdal-Sisseton complex on 2-6% slopes; generally well-drained to moderately drained loams formed in coarse loamy till in prairie vegetation; susceptible to erosion and rutting.
    b. ***Topography:***
    Gently rolling glacial moraine topography with slopes mostly less than 6%.
    c. ***Hydrology:***
    Pomme de Terre subbasin within the Minnesota River basin; one small lake (30 acres), freshwater emergent wetlands (about 130 acres), and about 20 acres of freshwater ponds throughout the project area.
    d. ***Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:***
    About six acres of the northwest corner of the northwest paddock were observed for vegetation within the paddock system. Dominant upland vegetation was smooth brome with scattered little bluestem (see Appendix B). Woody species composed less than 10% of the surveyed area and included western snowberry, and a few common buckthorn shrubs, all under four feet tall.
    e. ***Vegetation B: Meander Search Species List (as appropriate for site)***
    Scattered forb species included sky blue aster, stiff goldenrod, blue vervain, heath aster, wild licorice, and dogbane.
11. ***Is the plan based on current science?*** Portions
    Grazing in late spring to suppress cool season nonnative grasses during their peak growth. One of the four paddocks was grazed first in both 2014 and 2015--in early June of 2014 and then again in May of 2015. This paddock likely received the most effective treatment timing for targeting cool season nonnative grasses. The remaining three paddocks were grazed in the same order both years and would have coincided with peak native warm season grass growth.
12. ***List indicators of project outcomes at this stage of project:***
    This site assessment was completed after two years of rest from the grazing system. No information was available at the time of the assessment about the cover of invasive grasses and natives prior to project implementation. It is unclear whether the objectives for litter layer reduction, invasive grass suppression, and enhanced native species growth are being met.
13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    From further information provided during the field assessment, the USFWS project manager is striving to include this project site on a three to five-year cattle grazing rotation. The rotation will reasonably allow for reducing the litter layer and providing periodic disturbance for recruitment of native species. It is unclear whether this grazing frequency will significantly suppress invasive grasses and stimulate natives.
14. ***Are corrections or modifications needed to meet proposed outcomes?***

Incorporating some form of a baseline vegetation monitoring system that can be efficiently implemented and repeated would help determine whether the grazing system is meeting project objectives. The Grassland Monitoring Protocol (Option A) could provide a good feedback system for the project site. Photo point monitoring pre- and post-grazing and during rest years would be a simple tool for gathering qualitative measures.

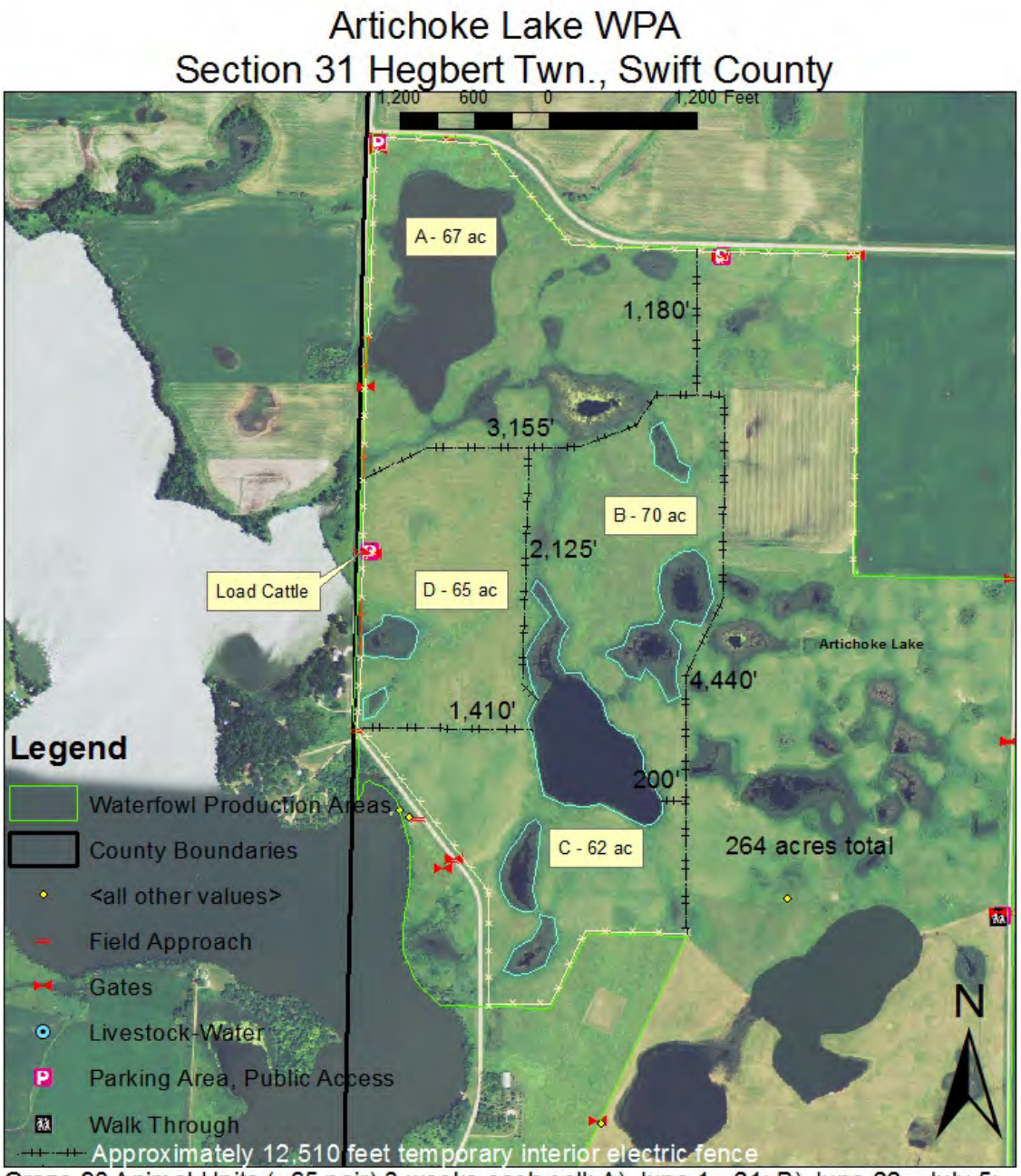
15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    Proposed future steps include rotating cattle through the paddocks every three to five years. This site is part of a larger complex of high quality conservation land, so it is considered a higher priority site than others that are more isolated. The infrastructure and access points for the site appear to be favorable for a practical grazing system.
16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No
17. ***Are follow-up assessments needed? Explain.***
    A follow-up assessment is recommended if a vegetation monitoring system is implemented prior to and after the next grazing treatments. Conservation grazing is increasingly promoted as a tool for grassland management and enhancement. This project site has great potential for further developing best management practices and guidance for grazing conservation land in west central Minnesota.
18. ***Additional comments on the restoration project.***
    Click here to enter text.

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.

19. ***The project will:***
    Minimally meet proposed outcomes
    Confidence of outcome determination:
    Medium
20. ***Provide explanation of reason(s) for determination.***
    With future implementation of the grazing rotation, the project is expected to accomplish disturbance and litter layer reduction. The conservative assessment and confidence in meeting proposed outcomes for invasive grass suppression and stimulation of natives is due to the lack of information about the vegetation at the site prior to the grazing treatments. This project has great potential to contribute to development of performance standards and expectations for grazing systems.
21. ***Site Assessor(s) Conducting Review:***
    Larissa Mottl, Ecologist, Stantec Consulting Services Inc.

Appendix A: Site Map, Utilization Rate Calculations Table



Graze 98 Animal Units (~65 pair) 3 weeks each cell: A) June 1 - 21; B) June 22 - July 5; C) July 6 - 26; D) July 27 - August 16, 2014 - 274.4 AUMs
A) May 3 - 23; B) May 24 - June 13; C) June 14 - July 4; D) July 5 - 25, 2015 - 274.4 AUMs
548.8 AUMs Total in 2014 & 2015

Figure 15-1 Paddock system at Artichoke Lake Waterfowl Production Area, Swift County, MN.

Table 15-1 Artichoke Lake WPA Utilization Rate Calculations and Grazing Objectives.

SUP# 23320

Artichoke Lake WPA 2014-2015 Utilization Rate Calculations

1,400# average Cow/calf pairs = 1.4 AUs; 1,500# bulls = 1.5 AUs

Cell	Dates	Grazing Days	Animal Units	AUMs
A	5/17 – 6/13	28	84 (60 pairs)	78.4
B	6/14 - 28	15	84 (60 pairs)	42
D	6/29 – 7/26	28	88.5 (60 pairs + 3 bulls)	82.6
C	7/27 – 8/23	28	88.5 (60 pairs + 3 bulls)	82.6
A - NW	8/24 – 28	5	88.5 (60 pairs + 3 bulls)	14.75
				300.35

Permittee bid and paid in full for 274.4 AUMs @ $7.69/AUM in 2014. Permittee received an additional 25.95 AUMs in 2015 at a gross fee of $199.55. Deductions include 430 feet of temporary fence at $.15/foot ($64.50) and a rotation deduction of $26.55 for a total of $91.05, and a net fee of **$108.50**.

Litter layer reduction in seeded grasslands. Invasive grasses suppression. Stimulate natives.

Appendix B: Site Photographs

Photo 15-1 North paddock on June 23, 2014 at the end of the first grazing rotation. Photo provided by the project manager.

Photo 15-2 North paddock on May 16, 2018 during site assessment, view from northwest corner to southeast.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

16) OHF Artichoke Lake WPA Prairie Enhancement - Woody Control

Project Background

Project Name: Artichoke Lake WPA Enhancement

Project Location: Swift County, Artichoke Lake Waterfowl Production Area

Township/Range Section: Township 122N Range 43W Section 31

Project Manager / Affiliated Organization: Angela Miner, The Nature Conservancy

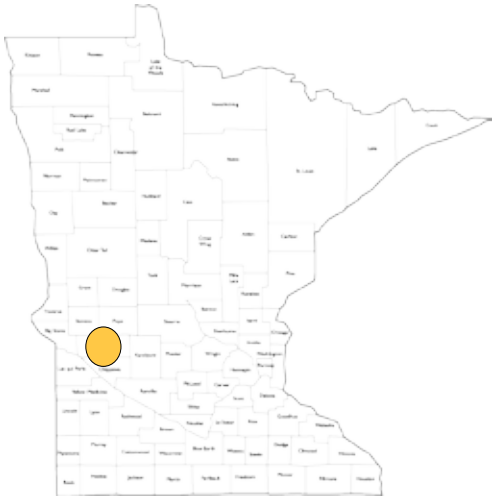
Fund: OHF ***Fiscal Year Funds:*** 2012

Project Start Date: 2014

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Wetland

Project Status: Post Establishment Phase



County: Swift

Primary Activity: Prairie Enhancement

Project Size: 160 Acres

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 (160 acres)—basal bark treatments of cottonwoods mid-summer.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   2014 CCM Artichoke Lake WPA Woody Control (Map)

3. ***What are the stated goals of the project?***
   The overarching goal for the WPA is high biodiversity restoration to improve nesting quality and cover for breeding waterfowl and other species. The specific goal for this project was to maintain high quality grassland cover specifically through control of woody species.
4. ***Were measures of restoration success identified in plans?*** *No*
   If yes, list specific measurements.
   Click here to enter text.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   2014 CCM Artichoke Lake WPA Woody Control (Map)
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   (1) Woody species control: Basal bark treatments on cottonwoods mid-summer.
   (2) Monitoring: Regular monitoring is planned by the USFWS to determine additional management needs.

   These practices are based on best current science for woody species control.

Project Implementation

(Questions for Site Manager and Cooperating Professionals) List field visit attendees' names and affiliations.

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***
   Click here to enter text.

Site Assessment

Field Review Date: **5/16/2018**

Field Visit Attendees: Angela Miner, TNC project manager; Gina Quiram, DNR restoration evaluation specialist; and Larissa Mottl, Stantec Consulting Services ecologist and assessor.

9. ***Surrounding Landscape Characteristics:***
   The WPA is surrounded by cultivated land to the north, east, and south, with Artichoke Lake directly west on the other side of county road 53. The 160-acre woody control project area is in the southeast

corner of the WPA and adjacent to a county gravel road. Directly east from the project area is a 30-acre plantation of cottonwoods on private land.

10. ***Site Characteristics:***

    a. Soils:

    The upland within the project area is primarily Ortonville-Vallers-Parnell loam on 0-3% slopes. The soil type is generally well-drained and formed in coarse-loamy till in prairie vegetation. It is susceptible to erosion and rutting.

    b. Topography:

    Gently rolling glacial moraine topography with slopes mostly less than 6%.

    c. Hydrology:

    The 160-acre project area within Artichoke Lake WPA contains several freshwater emergent wetlands.

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

    The west portion of the project area was observed for vegetation cover. The dominant upland vegetation cover was composed of native warm season grasses.

    e. Vegetation B: Meander Search Species List (as appropriate for site)

    No meander survey was conducted.

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

    Growing season basal bark treatments are effective for killing woody vegetation.

12. ***List indicators of project outcomes at this stage of project:***

    This assessment was completed three growing seasons after the basal bark treatments. The mature cottonwood trees were effectively killed by the treatment. Some regeneration from seed is occurring in the project area.

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***

    Yes, removing the seed source has likely slowed further woody encroachment.

14. ***Are corrections or modifications needed to meet proposed outcomes?***

    No.

15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***

    Future management plans may include scouting and basal bark treating any newly established saplings by summer seasonal crews and including the area in a prescribed burn rotation. The Nature Conservancy managed the initial woody control project and may be able to assist with future summer woody control treatments. Other management activities, including fire treatments, will need to be planned and implemented by USFWS staff.

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

    No.

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

    No.

18. ***Additional comments on the restoration project.***
    There is an approximately 30-acre plantation of cottonwood trees on private land directly east of the project area. This cottonwood stand is expected to be a continual seed source for cottonwood encroachment into the project area.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***
    The project accomplished a significant first round of cottonwood control in the project area. Periodic scouting and treatments by seasonal crews should be effective for preventing future woody encroachment and reduction of grassland habitat.
21. ***Site Assessor(s) Conducting Review:***
    Larissa Mottl, Stantec Consulting Services, and Gina Quiram, DNR.

Appendix A: Site map

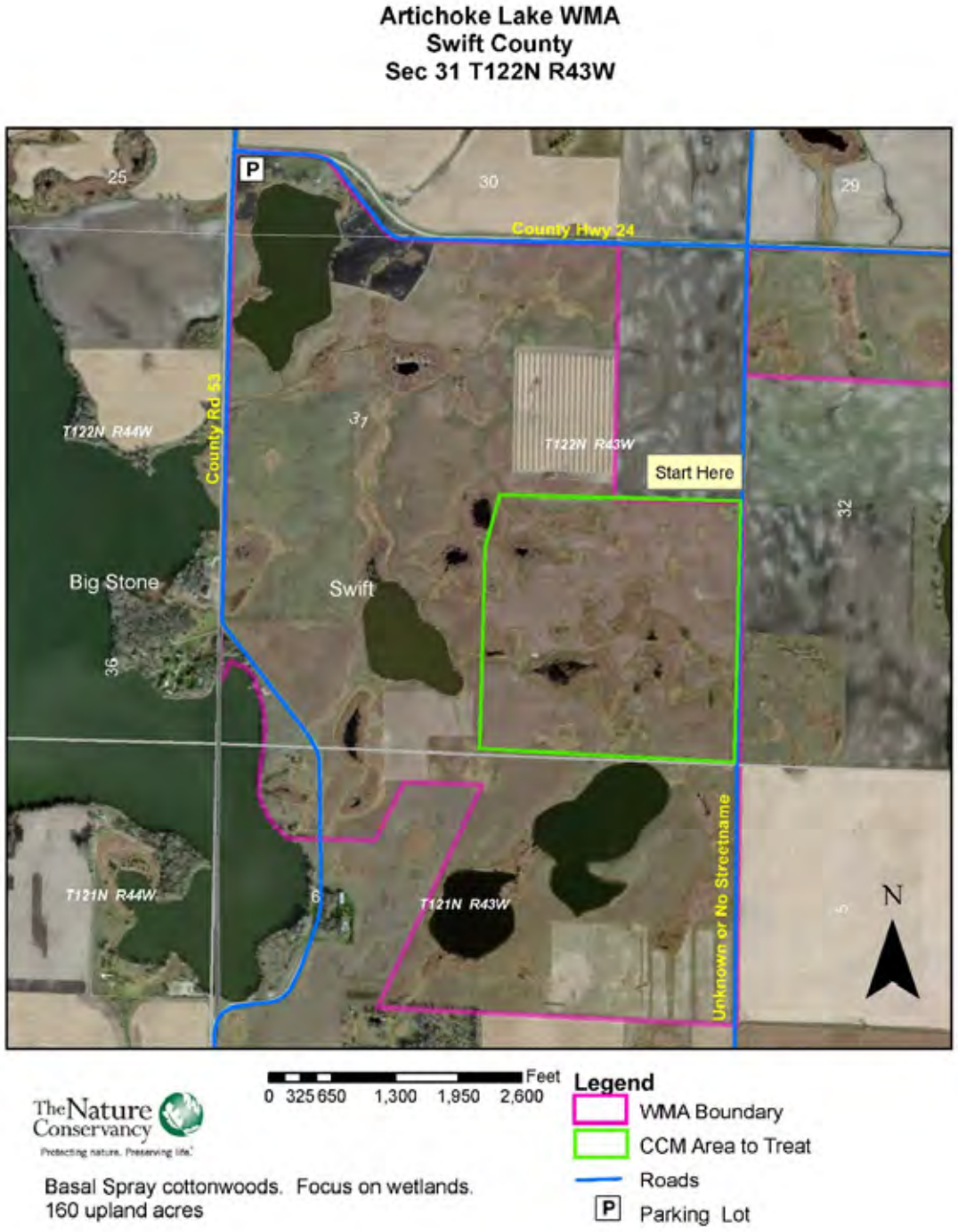


Figure 16-1 Site map for 160-acre area at Artichoke Lake WPA where cottonwoods were basal bark treated in 2014.

Appendix B: Site Photographs

Photo 16-1 Effects of basal bark treatments are shown by the brown leaves on cottonwoods at the edge of a wetland on the horizon. Photo was taken July 29, 2014 and provided by the project manager.

Photo 16-2 View looking west across the 160-acre area treated for cottonwoods in 2014. Photo taken May 16, 2018.

Photo 16-3 Cottonwoods on private land directly east of the 160-acre area treated for cottonwoods in 2014 at the Artichoke Lake WPA. Photo taken May 16, 2018.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

17) OHF Artichoke Lake WPA Prairie Restoration

Project Background

Project Name: Artichoke Lake WPA Enhancement

Project Location: Swift County, Artichoke Lake Waterfowl Production Area

Township/Range Section: Township 122N Range 43W Section 31

Project Manager / Affiliated Organization: Angela Miner, The Nature Conservancy

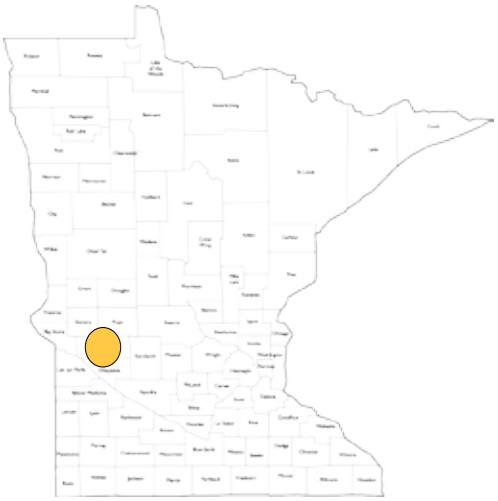
Fund: OHF ***Fiscal Year Funds:*** 2012

Project Start Date: 2014

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Wetland

Project Status: Post Establishment Phase



County: Swift

Primary Activity: Prairie Restoration

Project Size: 33 Acres

Project Completed: 2014

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

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

   Prairie restoration on 33 acres, including site preparation, seeding, and weed control through mowing.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Artichoke Lake WPA Restoration Management Plan
   Artichoke Lake Restoration Map

3. ***What are the stated goals of the project?***
   High biodiversity restoration to improve nesting quality and cover for breeding waterfowl and other species.
4. ***Were measures of restoration success identified in plans?*** *No*
   If yes, list specific measurements.
   Click here to enter text.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** Yes
   If yes, provide in Appendix A and list Maps provided:

   Artichoke Lake Restoration Map

6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   (1) Site preparation: Soybean crop rotation for weed control prior to seeding.
   (2) Seeding: Seed mix was drilled in the spring, which should facilitate seed/soil contact for native grass establishment.
   (3) Weed control during the first growing season included mowing twice to keep vegetation short and reduce weed competition during seedling establishment.
   (4) Long-term maintenance: The site is planned to be incorporated by the USFWS into fire and grazing rotations.
   (5) Monitoring: Regular monitoring is planned by the USFWS to determine additional management needs.

   These practices are based on best current science for prairie restoration.

Project Implementation

(Questions for Site Manager and Cooperating Professionals) List field visit attendees' names and affiliations.

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***
   Click here to enter text.

Site Assessment

Field Review Date: **5/16/2018**

Field Visit Attendees: Angela Miner, TNC project manager, Gina Quiram, DNR restoration evaluation specialist, Larissa Mottl, Stantec Consulting Services site assessor.

9. ***Surrounding Landscape Characteristics:***
   The WPA is surrounded by cultivated land to the north, east, and south, with Artichoke Lake directly west on the other side of county road 53. The 33-acre prairie restoration is in the northeast portion of the WPA. There is perennial vegetation cover to the north, west, and south and cultivated land to the east. Vegetation cover to the north of project area is a prairie restoration dominated by warm season native grasses. The Loose WPA is located 0.25 mile east of the project area and contains remnant prairie.
10. ***Site Characteristics:***
    a. ***Soils:***
    The upland within the project area is primarily Ortonville-Vallers-Parnell loam on 0-3% slopes. The soil type is generally well-drained and formed in coarse-loamy till in prairie vegetation. It is susceptible to erosion and rutting.
    b. ***Topography:***
    The WPA overall has gently rolling glacial moraine topography with slopes mostly less than 6%. The prairie restoration project area slopes gently to the west.
    c. ***Hydrology:***
    The project area is in an upland area of the WPA.
    d. ***Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:***
    A meander survey of a portion of the project area was conducted to observe overall vegetation cover and species present. The dominant vegetation cover was Kentucky bluegrass, smooth brome, and Canada wild rye.
    e. ***Vegetation B: Meander Search Species List (as appropriate for site)***
    See Table 3 for meander survey results.
11. ***Is the plan based on current science?*** Yes

    Site preparation, seeding, and first year weed control measures are based on current science for prairie reconstruction.

12. ***List indicators of project outcomes at this stage of project:***
    This assessment was completed early in the fifth growing season. The overall seed mix included over 50 species. The project area has consistent cover by native species but low species richness relative to the number of species seeded. Eleven species in the seed mix were observed (about 20% of the species in the mix), but some species may not have been detected at the time of the field assessment on May 16, 2018.
13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    Yes, there is consistent cover by native species, and plans for prescribed fire should aid in stimulating further growth and cover. Thatch is accumulating in the project area and should facilitate prescribed fire.
14. ***Are corrections or modifications needed to meet proposed outcomes?***
    The restoration was observed after four growing seasons and could be expected to have greater cover by warm season native grasses. A prescribed burn within the next 2 years would help increase overall

native graminoid cover and stimulate additional native forb flowering. Monitoring post-burn will aid in determining whether future interseeding should be planned to increase species richness.

15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    Future management steps include site monitoring by USFWS staff on a yearly basis to determine management needs. The TNC Prairie Recovery Specialist is available to assist USFWS staff with monitoring. The project area is included in grazing and burn rotation plans for the WPA, with those treatments expected to occur on roughly 3 to 5-year intervals or more frequently if required.

    The upland context of the restoration within the WPA and accessibility for equipment are factors that will make continued maintenance activities (mowing or spot treatments for weeds), prescribed burns, and grazing very practical.

16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No.
17. ***Are follow-up assessments needed? Explain.***
    No.
18. ***Additional comments on the restoration project.***
    The seed mix for this project was developed from a combination of partner-harvested seed and purchased seed (see Tables 1 and 2). The project manager strives for seed mixes containing 40 seeds per square foot with a graminoid to forb ratio of 1:1 and sedges. The seed mix for this project area accomplished those objectives. The purchased seed mix was labeled as Local Ecotype, MN Native. It contained seed with county origins from across MN (see Figure 2), in addition to Howard and Kossuth Counties in Iowa and fowl bluegrass from Canada. Overall, based upon PLS per square foot in the mix, the more locally harvested seed composed about 20% of the total seed mix.

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.

19. ***The project will:***
    Minimally meet proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***
    The project has achieved cover for breeding waterfowl and other species. Additional planned management activities, including prescribed fire, should help provide more continuous cover by native species. The current species composition of the project area does not reflect the species richness of the seed mix. However, the forbs that were observed are well-established and have added to overall biodiversity in the WPA. The disconnect between seed mix richness and species richness in reconstructions long-term may not be atypical. Similar observations have been documented for

experimental reconstructions ten years post-seeding in Minnesota and Iowa. See Diane Larson *et al.* 2011. Effects of planting method and seed mix richness on the early stages of tallgrass prairie restoration. *Biological Conservation* 144(12): 3127-3139.

21. Site Assessor(s) Conducting Review:

Larissa Mottl, Ecologist, Stantec Consulting Services Inc.

Appendix A: Site map, Seed mix tables

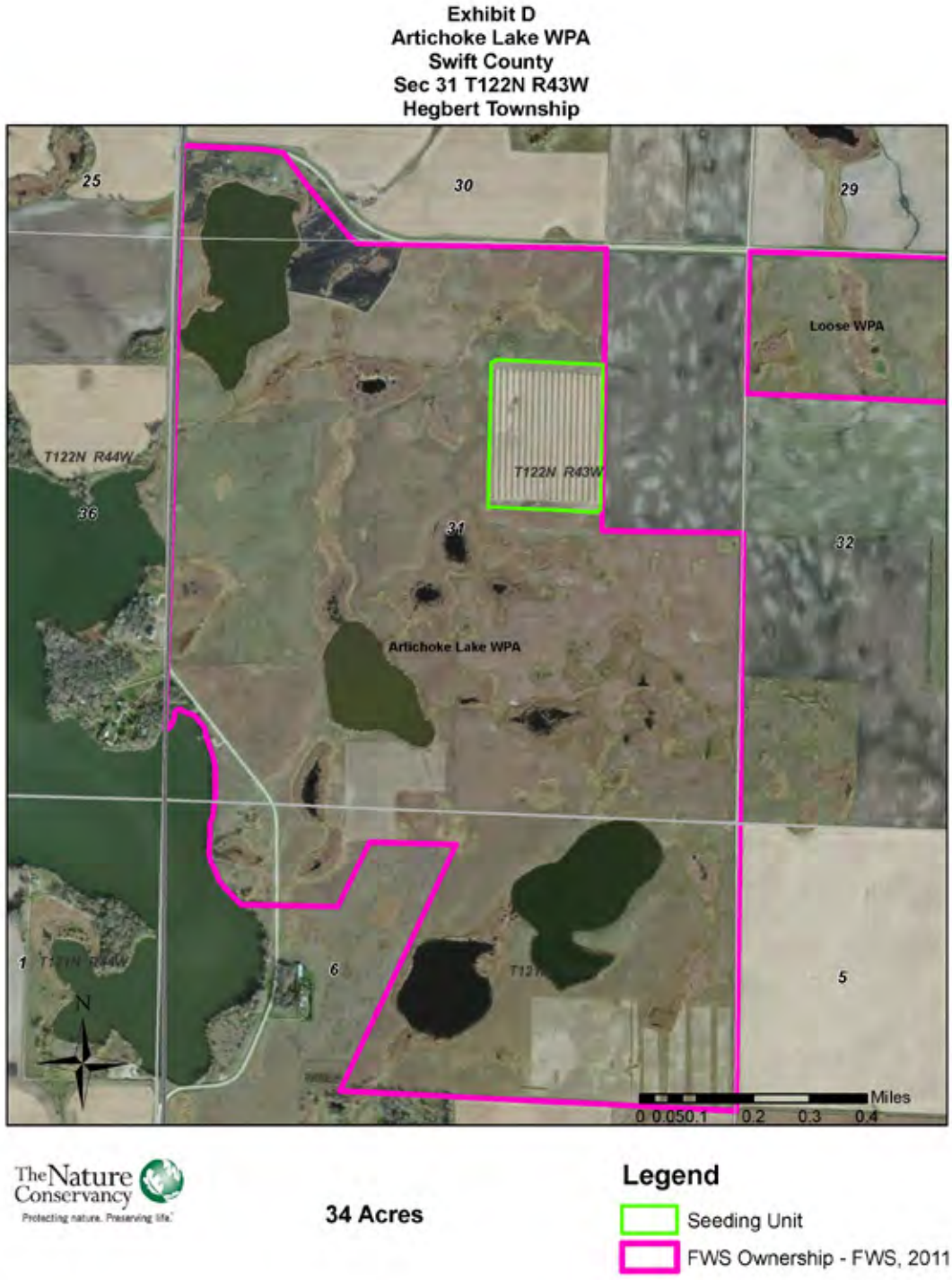


Figure 17-1 Site map for the 33-acre prairie restoration at Artichoke Lake WPA.

Table 17-1 Bulk harvested seed mix for the 33-acre prairie restoration at Artichoke Lake WPA. **Label Name:** TNC-14 (Colbert-10a, Artichoke Lake-33a, Big Slough-10a)**.**

----------Pure Live Seed Needs----------/----------Bulk Needs----------

Species	Variety/lot#	Cover Range		# PLS/ac	PLS / sq ft	% PLS	Bulk #/ac	Acres	Total Bulk #
Stiff Goldenrod	BSR11		.05	.5	1.83	2.9	53	155	Stiff Goldenrod
Prairie Species[2]			.16	1.1					Prairie Species[2]
Stiff Goldenrod	L8LE11		.01	.1	.7	2.79		148	Stiff Goldenrod
Switchgrass			.15	1.3	5.5				Switchgrass
Prairie Species^	5seeds/ft		.34	1.7	12.5				Prairie Species^
Big bluestem	B14NP11		.04	.18	3.98	1.2		64	Big bluestem
Indian grass			.14	.58	12.13				Indian grass
Sunflower			.05	.25	4.47				Sunflower
Prairie Species+			.06	.34	5.79				Prairie Species+
Max Sunflower	B14-MAX-NP10		.14	.68	14	1.03		55	Max Sunflower
Pr. Species*	B14-MAX-NP10		.02	.1	2.9	"		"	Pr. Species*
Bearded Slender Wht	Feder		.42	1.5	90	.47		25	Bearded Slender Wht
				8.33		8.39			
Switchgrass+[2]	R columnifera*^	Germander^							Switchgrass+[2]
L. bluestem+^[2]	Stiff goldenrod*+	Penstomen^							L. bluestem+^[2]
Indiangrass*^[2]	Tickclover^	Can Milkvetch[2]							Indiangrass*^[2]
Sideoats+^	Kalms brome^	Echinacea+							Sideoats+^
Tall dropseed*+^[2]	Big blue*^[2]	Bidens^							Tall dropseed*+^[2]
Pr dropseed*+	Mtn mint^	Goldenrods*+^[2]							Pr dropseed*+
Elymus+^[2]	Bugleweed+	Sedge sp+							Elymus+^[2]
Muhlenbergia	Gld Alexander*^[2]								Muhlenbergia
Leadplant*+^[2]	Onion*+								Leadplant*+^[2]
Pr clover*+^[2]	Tall cinquefoil*+^[2]								Pr clover*+^[2]
Wild bergamot+^[2]	Gentian*^								Wild bergamot+^[2]
Heliopsis^[2]	Rudbeckia*[2]								Heliopsis^[2]
Sunflower*+^[2]	Cordgrass*+								Sunflower*+^[2]
Liatris*+	Rattlesnake root+								Liatris*+
Vervain*^[2]	Canada bluejoint+								Vervain*^[2]
Asters*+^[2]	Primrose+[2]								Asters*+^[2]

Table 17-2 Purchased seed mix for the 33-acre prairie restoration at Artichoke Lake WPA.

Local Eco., MN Native	No Cultivars
CUSTOM	52 Acres- TNC
Varieties used	
% of mix (seeds/sqft)	
Amount seeded	
Milestone/Stinger tolerant	

	Seeded % of Mix	LBS/Acre Seeded	Seeds/Sq Ft (1 LB)	Mix Seeds/SqFt	Cool/ Warm	Variety	Origin
Big bluestem	7.02%	0.32	3.8	1.2	Warm	MN Native	Benton Co, MN
Indiangrass	11.08%	0.48	4.0	1.9	Warm	MN Native	Douglas Co, MN
Little bluestem	24.94%	0.72	6.0	4.3	Warm	MN Native	Wabasha Co, MN
Sideoats grama	20.32%	0.80	4.4	3.5	Warm	MN Native	Douglas Co, MN
Prairie cordgrass	6.14%	0.28	3.8	1.1	Warm	Red River	Kittson Co, MN
Canada wildrye	5.25%	0.35	2.6	0.9	Cool	MN Native	Kossuth Co, IA
Rough dropseed	9.51%	0.16	10.3	1.6	Cool	MN Native	Fairbault Co, MN
Prairie dropseed	5.45%	0.16	5.9	0.9	Cool	MN Native	Polk Co, MN
Bluejoint grass	5.25%	0.01	91.0	0.9	Cool	Lodorm	Aitkin CO, MN
Kalms brome	12.05%	0.72	2.9	2.1	Cool	MN Native	Polk Co, MN
	100.0%	4.06		17.3			

	Seeded % of Mix	OZ/Acre Seeded	Seeds/Sq Ft (1 OZ)	Mix Seeds/SqFt	PLS LBS	Latin Name	
Brown fox sedge	11.1%	0.24	2.30	0.551	0.015	Carex vulpinoidea	Winona Co, MN
Plains Oval Sedge	5.7%	0.72	0.39	0.281	0.045	Carex brevior	Wabasha Co, MN
Wool grass	75.7%	0.10	39.03	3.747	0.006	Scirpus cyperinus	Benton Co, MN
Fowl bluegrass	0.8%	0.24	0.17	0.041	0.015	Poa palustris	Canada
Fowl Manna Grass	1.1%	0.08	0.71	0.057	0.005	Glyceria striata	Winona Co, MN
American sloughgrass	5.6%	0.24	1.15	0.275	0.015	Beckmania syzigachne	Roseau Co, MN
	100.0%	1.52		5.0			

	Seeded % of Mix	OZ/Acre Seeded	Seeds/Sq Ft (1 OZ)	Mix Seeds/SqFt	PLS LBS	Latin Name	
Anise hyssop	5.3%	0.40	2.07	0.83	0.025	Agastache foeniculum	Ramsey Co, MN
Black-eyed Susan	9.7%	0.72	2.11	1.52	0.045	Rudbeckia hirta	Martin Co, MN
Blue vervain	8.7%	0.64	2.13	1.36	0.040	Verbena hastata	Martin Co, MN
Canada milk vetch	4.2%	1.68	0.39	0.66	0.105	Astragalus canadensis	Lac Qui Parle Co, M
Common evening primrose	6.4%	0.48	2.07	0.99	0.030	Oenothera biennis	Fairbault Co, MN
Common Meadow Rue	0.4%	0.24	0.25	0.06	0.015	Thalictrum dasycarpum	Fillmore Co, MN
Common milkweed	0.3%	0.48	0.09	0.04	0.030	Asclepias syriaca	Fairbault Co, MN
Culver's root	5.9%	0.05	18.37	0.92	0.003	Veronicastrum virginium	Fairbault Co, MN
Golden Alexanders	1.6%	1.00	0.25	0.25	0.063	Zizia aurea	Martin Co, MN
Great blue lobelia	7.3%	0.10	11.48	1.15	0.006	Lobelia siphilitica	Fairbault Co, MN
Heath aster	1.8%	0.06	4.59	0.28	0.004	Aster ericoides	Brown Co, MN
Hoary vervain	3.3%	0.80	0.64	0.51	0.050	Verbena stricta	Martin Co, MN
Ironweed	0.7%	0.20	0.55	0.11	0.013	Vernonia fasciculata	Fairbault Co, MN
Large flowered penstemon	0.2%	0.10	0.32	0.03	0.006	Penstemon grandiflorus	Brown Co, MN
Leadplant	0.8%	0.32	0.37	0.12	0.020	Amorpha canescens	Fairbault Co, MN
Long-headed coneflower	3.4%	0.56	0.96	0.54	0.035	Ratibida columnifera	Brown Co, MN
Maximillian sunflower	0.2%	0.08	0.30	0.02	0.005	Helianthus maximilliani	Blue Earth Co, MN
Meadow blazing star	0.1%	0.08	0.23	0.02	0.005	Liatris ligulistylis	Howard Co, IA
Mountain mint	2.6%	0.08	5.05	0.40	0.005	Pycnanthemum virginian	Blue Earth Co, MN
New England aster	1.6%	0.16	1.52	0.24	0.010	Aster novae-angliae	Martin Co, MN
Ox-eye sunflower	1.4%	1.60	0.14	0.22	0.100	Heliopsis helianthoides	Blue Earth Co, MN
Prairie blazingstar	0.4%	0.24	0.25	0.06	0.015	Liatris pycnostachya	Blue Earth Co, MN
Prairie cinquefoil	5.4%	0.16	5.30	0.85	0.010	Potentilla arguta	Brown Co, MN
Prairie onion	0.3%	0.16	0.25	0.04	0.010	Allium stellatum	Fairbault Co, MN
Prairie rose	0.1%	0.16	0.06	0.01	0.010	Rose Arkansana	Fairbault Co, MN
Prairie spiderwort	0.1%	0.08	0.23	0.02	0.005	Tradescantia bracteata	Houston Co, MN
Purple prairie clover	3.4%	1.28	0.41	0.52	0.080	Dalea purpureum	Blue Earth Co, MN
Rough blazingstar	0.4%	0.16	0.37	0.06	0.010	Liatris aspera	Blue Earth Co, MN
Showy goldenrod	1.4%	0.10	2.18	0.22	0.006	Solidago speciosa	Redwood Co, MN
Showy tick trefoil	0.7%	0.80	0.13	0.10	0.050	Desmodium canadense	Blue Earth Co, MN
Smooth blue aster	0.5%	0.06	1.26	0.08	0.004	Aster laevis	Blue Earth Co, MN
Sneezeweed	1.6%	0.21	2.98	0.72	0.015	Helenium autumnale	Fairbault Co, MN
Stiff goldenrod	1.4%	0.24	0.94	0.23	0.015	Solidago rigida	Fairbault Co, MN
White prairie clover	4.1%	1.44	0.44	0.63	0.090	Dalea candidum	Stearns Co, MN
Wild bergamot	10.4%	1.01	1.61	1.63	0.063	Monarda fistulosa	Houston Co, MN
Yarrow	1.3%	0.05	4.13	0.21	0.003	Achillea millefolium	Fairbault Co, MN
	100.0%	16.01		15.6			

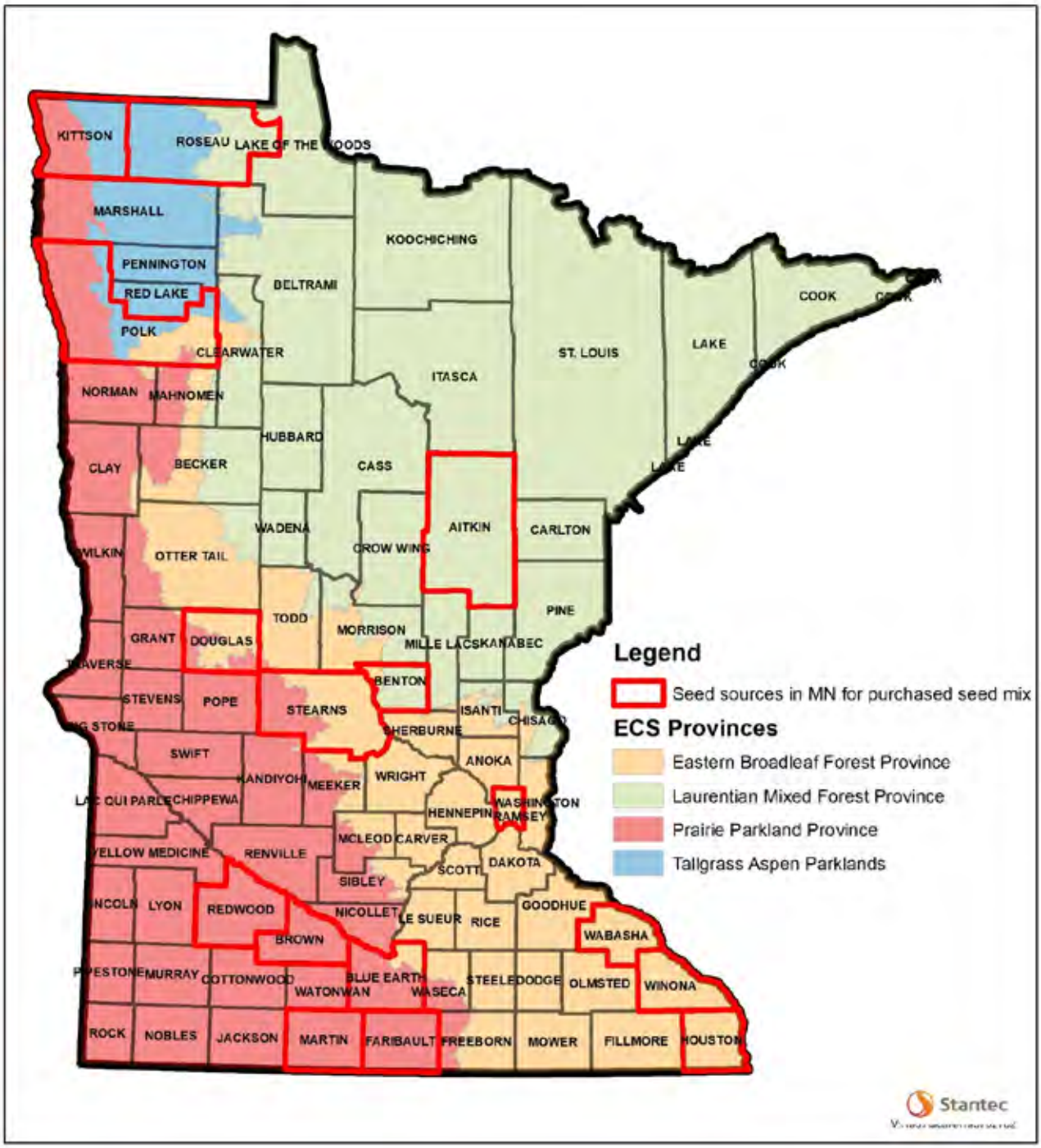


Figure 17-2 Seed origins for species included in the purchased seed mix for the prairie restoration at Artichoke Lake WPA. The mix also included seed from Kossuth and Howard Counties in Iowa.

Table 17-3 Meander survey results and observed abundance. Abundance categories: C=common (observed throughout the meander survey), I=infrequent (scattered occurrences), R=rare (fewer than 5 individuals observed).

Scientific Name	Common Name	Observed Abundance
Elymus canadensis	Canada wild rye	C
Panicum virgatum	Switchgrass	I
Phalaris arundinacea	Reed canary grass	I
Bromus inermis	Smooth brome	C
Poa pratensis	Kentucky bluegrass	C
Zizia aurea	Golden Alexanders	C
Heliopsis helianthoides	Ox-eye sunflower	C
Oligoneuron rigida	Stiff goldenrod	C
Achillea millefolium	Yarrow	C
Rudbeckia hirta	Black-eyed Susan	R
Oenothera biennis	Common evening primrose	R
Silphium perfoliatum	Cupplant	R
Soligado gigantea	Smooth goldenrod	I
Symphiotrichum lanceolatum	Eastern lined aster	I
Artemisia ludoviciana	White sage	I

Appendix B: Site Photographs

Photo 17-1 Prairie restoration at Artichoke Lake WPA. View from the northeast corner looking southwest. Photo was taken May 16, 2018.

Photo 17-2 Typical vegetation cover for the 33-acre prairie restoration at Artichoke Lake WPA. Photo taken May 16, 2018.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

18) OHF Sandvig Tract Savanna Enhancement

Project Background

Project Name: Sandvig Tract Savanna Enhancement

Project Location: Pope County, Sandvig Tract

Township/Range Section: Township 124N Range 39W Section 14

Project Manager / Affiliated Organization: Angela Miner, The Nature Conservancy

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

Project Start Date: Winter 2015

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Wetland , Choose an item.

Project Status: Treatment Phase

County: Pope

Primary Activity: Savanna Enhancement

Project Size: 97 Acres

Project Completed: 2018 Ongoing

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   The Sandvig Tract project site has been delineated into seven management units, A through G (see map in Appendix A). This evaluation focuses on treatments applied to Units A and B.
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   - Sandvig Tract Management Timeline

- Sandvig Planning Map
- Sandvig Basic Record Report

3. ***What are the stated goals of the project?***
   Restore the plant communities on the property (Sandvig Basic Report 2014).
4. ***Were measures of restoration success identified in plans?*** *No*
   If yes, list specific measurements.
   Click here to enter text.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   - Sandvig Tract Management Timeline
   - Sandvig Planning Map
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   (1) Buckthorn control. Initial mechanical removal through brush mowing was followed by herbicide treatments of resprouts. Additional follow-up practices, including grazing and prescribed fire, are incorporated into project plans and timeline.
   (2) Biennial weed control. Annual mowing of biennials (sweetclover and thistle) over multiple growing seasons to reduce seed production in grassland areas.
   (3) Oak savanna/woodland restoration. Reducing tree density (through removal of mesic species), combined with treatments of woody invasives (herbicide spot treatments, grazing, prescribed fire), and inter-seeding.
   (4) Monitoring. Plans specifically include monitoring activities to evaluate treatments in each unit within the project site.

Project Implementation

(Questions for Site Manager and Cooperating Professionals) List field visit attendees' names and affiliations.

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***
   Click here to enter text.

Site Assessment

Field Review Date: **5/16/2018**

Field Visit Attendees: Angela Miner, TNC; Gina Quiram, DNR restoration evaluation specialist; Larissa Mottl, ecologist, Stantec Consulting Services

9. ***Surrounding Landscape Characteristics:***

Glacial Lakes State Park is across County Hwy 41 to the east, and the site is bordered by privately-owned oak woodland pasture to the south, wetland and a gravel mining operation to the west, and a cultivated agricultural field to the north.

10. ***Site Characteristics:***

a. Soils:

Sandy clay loam and clay loam.

b. Topography:

The site topography reflects its position with the Alexandria Moraine.

c. Hydrology:

The site is located within the Chippewa River subbasin and Minnesota River basin. The site is composed of well-drained ridgelines that convey surface water to wetland swales. Groundwater discharge is present in two of the swales within the site supporting 1.7 acres of Prairie Extremely Rich Fen (OPp93) and about 0.5 acre of Rich Fen (Mineral Soil) (OPp91).

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

The TNC describes the tract as containing approximately 14 acres of grassland/gravel pit, 36 acres of woodland, and 46 acres of wetland. According to the Minnesota Department of Natural Resources Biological Survey (MBS), native plant communities include 0.8 acre of Dry Sand Gravel Prairie, 19.5 acres of Seepage Meadow/Carr, 1.7 acres of Prairie Extremely Rich Fen, 0.5 acre of Rich Fen (Mineral Soil), and 63 acres of Basswood-Bur Oak (Green Ash) Forest. The remainder is an old gravel pit and other habitat not mapped by MBS. Upland areas are dominated by smooth brome. Based on the density of fruiting stems from 2017 and observations conveyed by the project manager, burdock cover has been increasing in areas where the canopy was opened up by removal of non-oak trees. Garlic mustard is present in Unit E on north-facing slopes. Earthworms are also known to occur in Units E and F, per the project manager, but may not occur yet in Units A and B.

e. Vegetation B: Meander Search Species List (as appropriate for site)

Bur oak savanna—*Quercus macrocarpa, Tilia americana, Hydrophyllum virginianum, Caulophyllum thalictroides, Carex pensylvanica, Carex rosea/radiata, Aquilegia canadensis, Geum canadense, Actaea cf rubra, Arisaema triphyllum, Elymix hystris, Sanicula cf gregaria, Viola spp, Galium aparine, Hackelia,* and nonnative species *Rhamnus cathartica, Bromus inermis, and Arctium minus.*

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

(1) Site assessment. The site was assessed to determine native plant community restoration goals prior to implementation of any treatments. Canopy cover and the distribution of canopy species (bur oak, basswood, and ash) were mapped across the site. Peter Wykoff, biology professor with the University of MN, Morris, cored oak trees to determine the age structure and composition across the site and to establish goals for oak savanna tree density. The results of this work informed the culling strategy for further reducing canopy cover at the site through removal of younger, densely grown bur oaks and retaining older more open-grown individuals.

(2) Savanna restoration. Fire-intolerant trees were targeted for removal, along with all nonnative invasive shrubs (buckthorn, honeysuckle).

(3) Prescribed fire was re-introduced to the site in May of 2018 in Units A, B and C and is a practice based on science for maintaining and restoration savanna. All of the native plant communities are fire-dependent and are included in long-term plans for fire rotations.

(4) Interseeding is known to increase herbaceous layer diversity in savanna restorations and can provide competition for weeds during the early stages of canopy removal.
(5) Overall, the project manager is using frequent site monitoring to evaluate site responses to treatments and to apply adaptive management which is sound practice for restoration ecology.

12. ***List indicators of project outcomes at this stage of project:***
Invasive shrub cover is extremely minimal through Units A and B which were brush mowed in the spring of 2015 and winter of 2015/2016 and received follow-up resprout and seedling herbicide treatments in 2016. Canopy cover is indicative of bur oak savanna and savanna and woodland herbaceous species are present throughout the project area beneath the oaks.

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
Yes. Treatments were applied and have been staged effectively to provide long-term control of invasive species (woody and herbaceous) using fire, spot treatments of invasives, biological control, and conservation grazing.

14. ***Are corrections or modifications needed to meet proposed outcomes?***
Burdock, spotted knapweed, leafy spurge, and garlic mustard present the greatest challenges currently for the project site. These species threaten to inhibit successful development of a native herbaceous layer. The project manager has identified biological control measures for the knapweed, leafy spurge, and garlic mustard. Sheep will be grazed in areas with garlic mustard in the spring of 2018. Fencing was in place at the time of the May 16, 2018 site visit. Burdock may require a combination of herbicide spot treatments combined with interseeding native savanna grasses (*Elymus hystrix, Elymus villosus*) at high seeding rates to provide competition for burdock seedbank recruitment. Upland areas dominated by smooth brome were planned to be interseeded following the May 2018 prescribed burn. Monitoring will help determine whether the interseeding is effective at increasing native plant cover in those areas.

15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
Yes. Prescribed fire, grazing, biological controls for herbaceous invasives, spot mowing, and spot herbicide applications are all practical and reasonable for the site. With the open understory, continuous oak leaf litter, and increasing herbaceous layer cover, prescribed fire will be increasingly more feasible to implement. TNC has received additional funding through OHF for continued work at this site.

16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
No. The activities are increasing the quality and biological diversity overall of the oak savanna and reducing the risk of woody invasive establishment in and around the wetland habitats at the site.

17. ***Are follow-up assessments needed? Explain.***
No.

18. ***Additional comments on the restoration project.***
The use of sheep to control garlic mustard is part of work funded by a different OHF grant, but the results of the treatment at this site would be beneficial to share with restoration practitioners.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***
    The canopy thinning and woody invasive species control treatments conducted thus far appear to be improving the structure of bur oak savanna on 49 acres at this site. The herbaceous layer plants observed during the May 16, 2018 site visit indicate capacity for increased growth and spread. The recent prescribed burn reduced leaf litter cover and woody debris and will likely facilitate further growth and spread of the native herbaceous layer.
21. ***Site Assessor(s) Conducting Review:***
    Larissa Mottl, Ecologist, Stantec Consulting Services Inc, and Gina Quiram, DNR Restoration Evaluation Specialist

Appendix A: Site map and Project plan

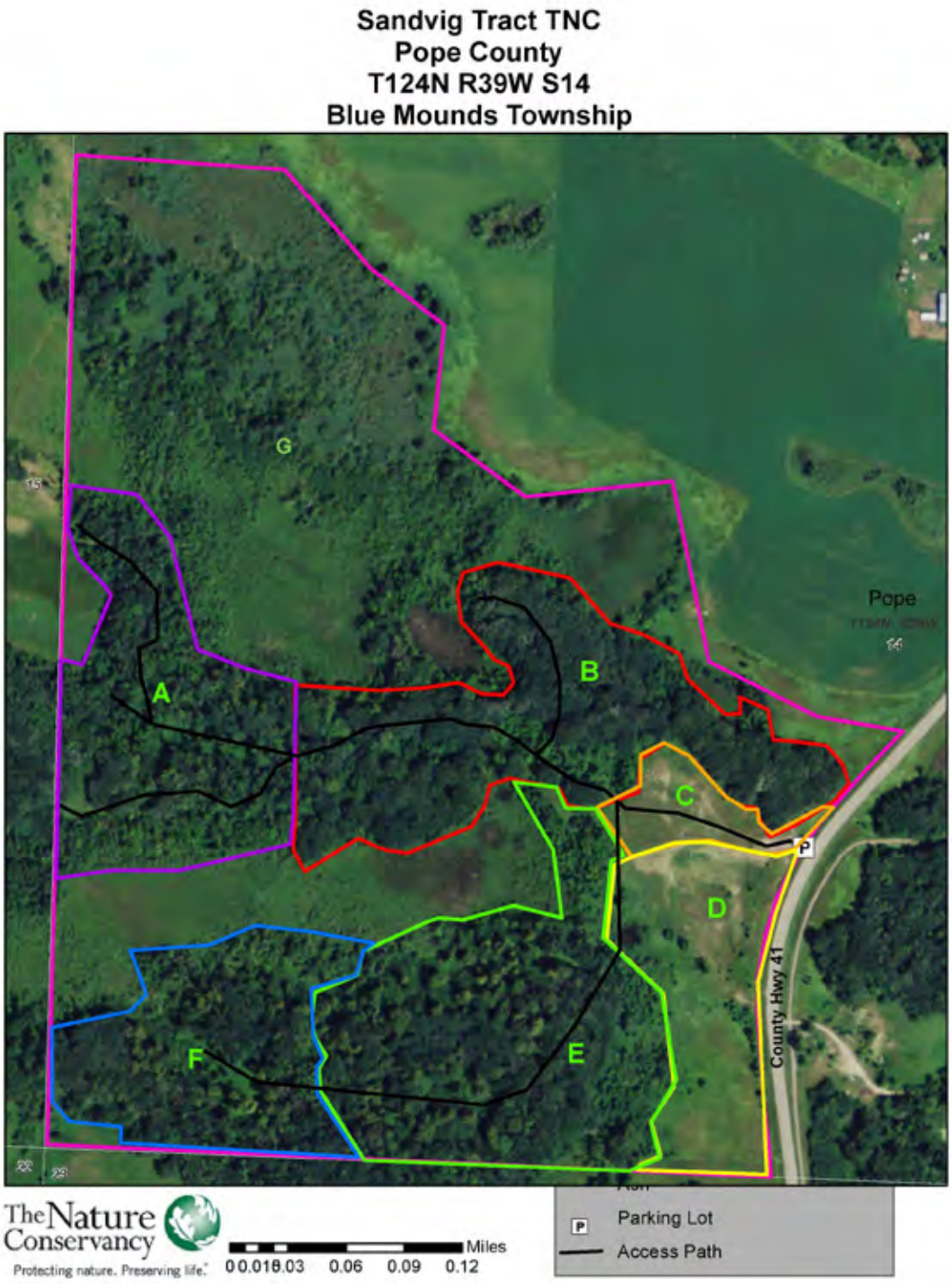


Figure 18-1 Project map for the Sandvig Tract. Refer to the project plan timeline below for the treatments and timing associated with each management unit.

Project Plan: Sandvig Tract Timeline

The following timeline for each management unit was provided by the TNC project manager. Units correspond with the map provided in Figure 1 above.

Unit A (~13.7 acres)

Sandy loam to clay loam soils. Aspen grove in the north transitioning into mixed oak, basswood, and ash and finally into ash grove in the south bordering the wetland. Understory of buckthorn and prickly ash.

Unit A Timeline and Actions:

1. Winter 2015/16 - Buckthorn and prickly ash mid story will be mowed down. (Contractor)
2. Spring 2016 – Survey tree density and flag trees to be saved. (TNC)
3. Winter 2016/17 – Ash Tree Removal (Contractor)
4. Summer 2016- Buckthorn resprout treatment.
5. 2017 – Treat buckthorn resprouts with herbicide in NW corner. (CCM)
6. Winter 2017/18- Ash and Boxelder Removal from north finger (Contractor)
7. Spring 2018- RX burn planned
8. Spring/Summer 2018- Interseed
9. Summer 2018-Future- Treat Leafy Spurge
10. Summer 2018-Future- Treat Buckthorn Resprouts
11. 2019- Unit to be fenced
12. 2020-Evaluate for conservation grazing
13. Fall 2021- Burn

Unit B (~10.7 acres)

Loamy soils. Mostly oak grove averaging between approximately 50-110 trees per acre. Some mixed basswood to the west and aspen in the center. There is an ash grove following the northern edge of the main trail that enters the forest. Mid-story of buckthorn and prickly ash.

Unit B Timeline and Actions:

1. Spring 2015 – Mow buckthorn and prickly ash mid story. (Contractor)
2. Summer 2015 – Survey tree density. (TNC)
3. Winter 2015/16- Remove non savannah tree species (Contractor).
4. 2016/17 - Thin oaks. Thin more on ridges and hilltops, less in low spots and steep sides. Ash groves will be left as is. (Contractor)
5. Spring 2016 – Prescribed burn (TNC)
6. 2016 – Treat buckthorn resprouts with herbicide. (CCM)
7. 2017- Treat resprouts in NW loop
8. 2017- Treat Purple Loosestrife/spotted knapweed.
9. Winter 2017/18- Oak thinning (Contractor)
10. 2018- Prescribed Burn Planned
11. Spring 2018- Interseed
12. 2018-Future- Treat buckthorn resprouts
13. 2018-Future- Treat Purple Loosestrife/spotted knapweed.

14. 2019- Unit to be fenced
15. 2020-Evaluate for conservation grazing
16. Fall 2021-Burn

Unit C (~2 acres)

Loamy soils. Invaded by thistle and sweet clover.

Unit C Timeline and Actions:

1. Spring 2016 – Partial prescribed burn with Unit B (TNC)
2. Spring/summer 2015/16/17/18 – Mow 2-3 times to target sweet clover and thistle. (TNC)
3. Summer 2016/17-Interseed
4. Spring 2018- Burn
5. Spring 2018- Interseed
6. Fall 2021-Burn

Unit D (~6.8 acres)

Sandy loam soils. Grassland invaded by cottonwood, Siberian elm, and other woodies. Old gravel pit with poor rocky soils in the NE, dugout in NW.

Unit D Timeline and Actions:

1. 2015- Remove scattered trees and shrubs. (TNC/CCM)
2. 2017- Remove scattered shrubs
3. Fall 2018- Burn
4. 2017/18/19-Treat woody regrowth
5. Spring 2019- Interseed
6. Fall 2022-Burn

Unit E (~14.5 acres)

Loamy soils. Mixed oak and basswood. Ash grove in north and east. Mid-story of buckthorn and prickly ash. Invaded by garlic mustard.

Unit D Timeline and Actions:

1. Spring 2015/2016/2017– Pull garlic mustard. (TNC)
2. Winter 2016/17 – Mow down buckthorn. (Contractor)
3. Fall 2017- Remove ash/select oaks/aspen
4. Fall 2018- Prescribed Burn (TNC)
5. 2018/19-Graze sheep for garlic mustard/woody regrowth.
6. Evaluate and retreat garlic mustard.
7. Evaluate efforts in Units A and B for use in E. Possibly thin oak and basswood stands to a higher density than A and B.

Unit F (~8.5)

Loamy soils. Mixed oak and basswood. Ash grove along northern slope and in center.

Unit D Timeline and Actions:

1. Winter 2017/18 – Mow down buckthorn, remove all non-savannah species. (Contractor)
2. 2018/19- Graze sheep for garlic mustard/woody regrowth
3. Fall 2018/Spring 2019 – Prescribed burn. (TNC)
4. Evaluate and Re-treat buckthorn resprouts.
5. Evaluate efforts in Units A and B for use in F.

Unit G

Northern lowland soils. Invaded with buckthorn. Wet in many places.

Unit G Timeline and Actions:

1. Spring 2018- Burn
2. Winter 2018/19- Buckthorn removal
3. 2019-2021- Monitor for buckthorn resprout treatments

Appendix B: Site Photographs

Photo 18-1 North slope in Unit B with bur oak canopy and patchy herbaceous layer. Photo was taken May 16, 2018, about two weeks after a prescribed burn.

Photo 18-2 Bur oak canopy and example of nearly continuous native herbaceous layer cover along a ridgeline in Unit B. Photo was taken May 16, 2018, about two weeks after a prescribed burn.

Photo 18-3 View west across the west end of Unit B. Photo was taken May 16, 2018, about two weeks after a prescribed burn.

Photo 18-4 View west across a valley in Unit A. Burdock fruiting stems from 2017 are dense throughout. Photo taken May 16, 2018, about two weeks after a prescribed burn.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

19) OHF Knutson Tract Prairie Restoration

Project Background

Project Name: Ordway-Knutson Tract Restoration

Project Location: Pope County, Knutson Tract

Township/Range Section: Township 123N Range 36W Section 30

Project Manager / Affiliated Organization: Angela Miner, The Nature Conservancy

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

Project Start Date: 2016

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Choose an item. , Choose an item.

Project Status: Establishment Phase

County: Pope

Primary Activity: Prairie Restoration

Project Size: 17 Acres

Project Completed: 2017

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   The project is a conversion of a 17-acre alfalfa hayfield and farm homestead (former grove and building site) to diverse prairie. Project components include site preparation, seeding, weed control, monitoring, and planning for long-term maintenance.
   (1) Site preparation. The site was plowed in the spring of 2016 and planted with glyphosate-resistant soybeans. During the summer of 2016, the site was sprayed with glyphosate to control weeds.

(2) Seeding. In the fall of 2016, the site was broadcast-seeded with a forb and grass mix with over 125 species at a rate of about 12 lbs/acre. A few additional species (pasque flower and needlegrass) were hand-seeded in the spring of 2017 from seed harvested in 2016.
(3) Weed control. The site was mowed twice during the 2017 growing season, and may be mowed during the 2018 growing season depending upon weed control needs.
(4) Monitoring. The site will be monitored at least annually by TNC in 2018 and going forward to determine management needs.
(5) Long-term maintenance. The Nature Conservancy plans to apply weed control as needed, and incorporate the site into grazing and prescribed burn rotations as needed. Preliminary plans are to burn the site in 2019 or 2020 and monitor for further needs in 2021.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Knutson Restoration Management Plan (doc)
   Knutson Management Timeline (xls)
   Knutson and Luptak Seed Mix 2016 (xls)
   The project plans and data are in TNC project files.
3. ***What are the stated goals of the project?***
   Restore prairie habitat to improve nesting quality and cover for breeding birds and other species.
4. ***Were measures of restoration success identified in plans? No***
   If yes, list specific measurements.
   Click here to enter text.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   The restoration project area is shown on a map included with the restoration management plan.
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   (1) Site preparation included BMPs for weed control and seedbed preparation prior to seeding.
   (2) Seed mix was exceptionally diverse and developed using seed harvested from local prairies (see Table 1).
   (3) Periodic disturbances (mowing, grazing, prescribed fire) are planned for facilitating establishment and long-term maintenance.

   The practices used thus far and planned for maintenance of the site reflect best current science for prairie restoration.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***

Click here to enter text.

Site Assessment

Field Review Date: **5/16/2018**

Field Visit Attendees: Angela Miner, TNC project manager, Gina Quiram, DNR restoration evaluation specialist, and Larissa Mottl, Stantec Consulting Services ecologist and site assessor.

9. ***Surrounding Landscape Characteristics:***
   Most of the surrounding landscape is conservation land or grazed private land in the Glacial Lakes area. The Knutson Tract is adjacent to the TNC Ordway Prairie Preserve.
10. ***Site Characteristics:***
    a. ***Soils:***
    The project area soils are Langhei-Bames loam complexes on moderately eroded 6-20% slopes. The southeast portion of the prairie restoration occurs on Sandberg loamy coarse sand.
    b. ***Topography:***
    The site has steep slopes associated with the hummocky terrain of the Alexandria moraine.
    c. ***Hydrology:***
    The project area is well drained due to soil types and topography.
    d. ***Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:***
    Vegetation cover was over 90% nonnative and native weed cover at the time of observation on May 16, 2018.
    e. ***Vegetation B: Meander Search Species List (as appropriate for site)***
    A meander species list is included in Table 2.
11. ***Is the plan based on current science?*** Yes
    As noted above, site preparation, seeding, and weed control activities conform to current best management practices for prairie restoration.
12. ***List indicators of project outcomes at this stage of project:***

    At this early stage in the project, the restoration has only had one growing season and was kept mowed in 2017. During the field assessment on May 16, 2018, sixteen seeded forb species were observed. It is likely that a few additional species were present but not detected.

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    Yes, the rich seed mix will likely result in expression of additional species in the second growing season.
14. ***Are corrections or modifications needed to meet proposed outcomes?***
    Possibly. The restoration consists of two areas, with one located north of the old driveway and encompassing the old homestead site and grove and the other on a ridgetop in the northwest corner of the Knutson Tract. The ridgetop area has heavy red clover and white clover cover that may be difficult to control long term.
15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***

Planned future steps include site monitoring, spot weed control, prescribed fire and cattle grazing for periodic disturbance. Portions of the project area were burned earlier in the day of the field assessment (woody debris in the burn unit was still burning). The project area is accessible and clearly practical for prescribed fire. Fence installation for the whole site is planned for 2018 or 2019 so the project area may be included in future cattle grazing rotations with conservation easement property adjacent to the south.

16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    Possibly. Since the project area was kept mowed in 2017 and partially burned in 2018, additional disturbance from grazing in 2019 may reduce or prohibit growth, flowering, and opportunity for seed production for some species, reduce nectar and pollen resources for pollinators, and limit overall habitat structure. However, the project area is within a larger landscape context that should provide suitable habitat for mobile species while the project area undergoes the planned disturbance treatments.
17. ***Are follow-up assessments needed? Explain.***
    A follow-up site assessment is recommended in two to three years. This restoration provides a great opportunity to evaluate establishment results for an area that has undergone standard practices for site preparation (cultivation and soybean crop) and seeding (fall broadcast) but has been seeded with an exceptionally diverse mix of over 125 species that were hand-harvested and combined from local sources. TNC is interested in increasing species richness in seed mixes and obtaining more local seed sources for prairie restoration projects. This area can help inform and prioritize future investments in seed harvest activities for TNC and other partners (DNR, USFWS).
18. ***Additional comments on the restoration project.***

The restoration site was formerly a farm with a house, barn, various outbuildings and a grove, so a portion of the south field of the prairie restoration area was cleared of buildings, debris, and trees prior to cultivation and the soybean crop. The debris removal and grading were done very well. There are no obvious indications of past land use apart from the gravel two-track lane that leads to the former home site.

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.

19. ***The project will:***
    Minimally meet proposed outcomes
    Confidence of outcome determination:
    Medium
20. ***Provide explanation of reason(s) for determination.***
    The prairie restoration is in the very early stages of establishment, and it is likely that some native species included in the mix were present but not detected during the May 16, 2018 site visit.
21. ***Site Assessor(s) Conducting Review:***
    Larissa Mottl, Ecologist, Stantec Consulting Services Inc.

Appendix A: Site map, Seed mix table, Meander survey table

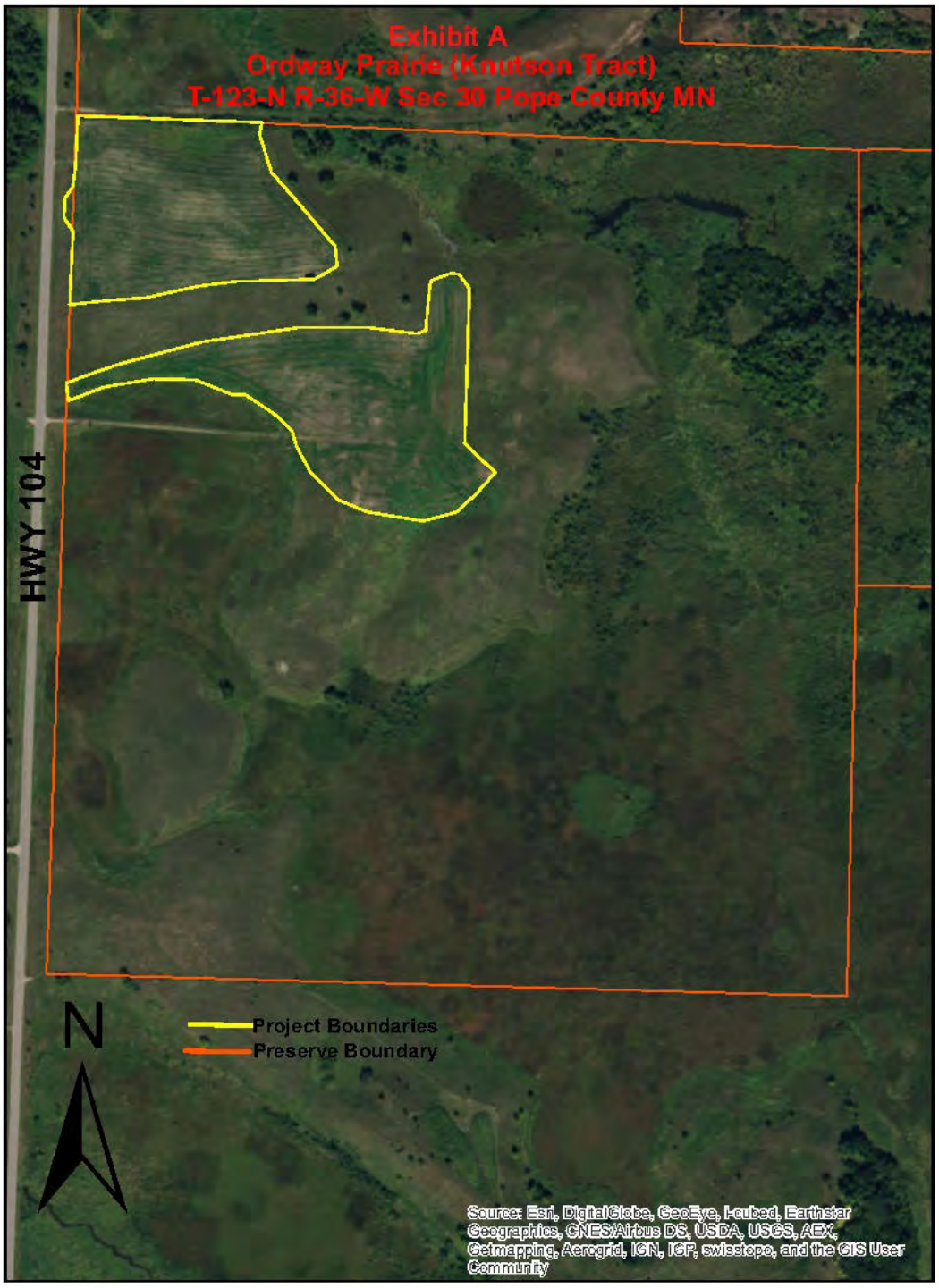


Figure 19-1 Site map for the 17-acre prairie restoration at TNC Knutson Tract in Pope County.

Table 19-1 Seed mix for hand-harvested and combined seed. Ten percent of species with an asterisk and highlighted in yellow was siphoned off for the Fish and Wildlife Service. All seed spread across 17 acres on Knutson and 13 acres on Luptak.

Species name	Mass (g)	Ounces	Common Name	Notes
Agalinis aspera	13	0.46	Rough False Foxglove	Mostly Plant material
Agastache foeniculum	37	1.31	Blue Hyssop	Mostly Plant material
Amorpha canescens*	873	30.79	Lead Plant	Seed Percent Unknown
Amorpha nana	53	1.87	Dwarf False Indigo	None
Anemone cylindrica	223	7.87	Thimbleweed	Mostly Plant material
Anemone patens*	36	1.27	Pasqueflower	None
Antennaria sp.	19	0.67	Pussytoes	Mostly Plant material
Artemisia ludoviciana	6	0.21	White Sage	None
Asclepias sp.*	279	9.84	Milkweeds	Common Milkweed (syriaca), Whorled Milkweed (verticillata), Swamp Milkweed, Green Milkweed (Primarily Common). Clean Seed
Asclepias sp.	36	1.27	Milkweeds	Common Milkweed, Whorled Milkweed, Swamp Milkweed, Green Milkweed (Primarily Common). Impure seed
Astragalus adsurgens	32	1.13	Prairie Millkvetch	Mostly Plant material
Astragalus canadensis	15	0.53	Canada Milkvetch	Minimal seed content (Bugs)
Astragalus crassicarpus*	92	3.25	Ground Plum	Some plant material, some seed from previous year
Bromus kalmia*	306	10.79	Downy Brome	None
Calamovilfa longifolia	13	0.46	Sand Reed Grass	None
Calylophus serrata	20	0.71	Yellow Sundrops	Mostly Plant material
Campanula rotundifolia	11	0.39	Harebell	Mostly Plant material
Carex sp.	2	0.07	Sedges	None
Castilleja sp.*	205	7.23	Painted Cups	Downy Painted Cup (Castilleja sessiflora), Indian Paintbrush (Castilleja coccinea)
Chaemerhodos erecta	2	0.07	Little Rose	Mostly Plant material
Cirsium flodmanii	112	3.95	Flodman's Thistle	Mostly Plant material
Cirsium pumilum var. hilli	14	0.49	Hills Thistle	Seed of poor quality
Comandra umbellata	1	0.04	Bastard Toadflax	None
Conyza canadensis	4	0.14	Canada Horseweed	Some plant material

Species name	Mass (g)	Ounces	Common Name	Notes
Dalea sp.*	1109	39.12	Prairie Clovers	Purple Prairie Clover (Dalea purpurea), White Prairie Clover (Dalea candida)
Delphinium carolinianum	2	0.07	Carolina Larkspur	None
Desmodium canadense	20	0.71	Showy Tick Trefoil	None
Dichanthelium sp.	0.5	0.02	Panic Grass	Leiberg's Panic Grass (Dichanthelium leibergii), Hairy Panic Grass (Dichanthelium acuminatum)
Doelleringia umbellata	7	0.25	Flat-topped Aster	None
Elymus trachycaulus*	264	9.31	Slender Wheatgrass	None
Eragrostis spectabilis	1	0.04	Purple Love Grass	None
Erigeron strigosus	15	0.53	Daisy Fleabane	None
Eutrochium maculatum	15	0.53	Spotted Jo-Pye Weed	None
Fallopia cilinodis	0.5	0.02	Fringed Black Bindweed	None
Gallium borealis	21	0.74	Northern Bedstraw	None
Gentiana andrewsii	35	1.23	Bottle Gentian	Mostly Plant material
Gentiana puberulenta	10	0.35	Downy Gentian	Mostly Plant material
Gentianopsis sp.	9	0.32	Fringed Gentian	Greater Fringed Gentian (Gentianopsis crinita), Lesser Fringed Gentian (Gentianopsis procera). Mostly Plant material
Geum aleppicum	107	3.77	Yellow Avens	None
Geum triflorum	68	2.40	Prairie Smoke	None
Glycyrrhiza lepidota	180	6.35	American Licorice	All in pod still
Heterotheca villosa	73	2.58	Hairy False Golden Aster	None
Heucheria richardsonii*	21	0.74	Alum root	None
Hedeoma hispida	10	0.35	False Pennyroyal	Mostly Plant material
Helenium autumnale	49	1.73	Sneezeweed	None
Lespedeza capitata	51	1.80	Round Headed Bush Clover	Mostly Plant material
Lilium philadelphicum	27	0.95	Wood Lily	Plant material
Lithospermum incisum	12	0.42	Fringed puccoon	None

Species name	Mass (g)	Ounces	Common Name	Notes
Linum sp.	31	1.09	Flax	Grooved yellow Flax(Linum sulcatum) Stiff Stemmed Yellow Flax (Linum rigidum)
Lithospermum canescens	2	0.07	Hoary puccoon	Some Plant material
Lobelia siphilitica	12	0.42	Big Blue Lobelia	Some Plant material
Lobelia spicata	15	0.53	Pale Spike Lobelia	Possibly indian Tobacco in there(Lobelia inflata)
Nothocalais cuspidata	5	0.18	Prairie False Dandelion	Downy Painted Cup (Castilleja sessiflora), Indian Paintbrush (Castilleja coccinea)
Oenothera sp.*	265	9.35	Evening Primrose	Mostly Plant material
Lactuca ludoviciana	0.5	0.02	Prairie Wild Lettuce	Pappus
Humulus lupulus	13	0.46	Common Hops	Mostly Plant material
Mirabilis albida	8	0.28	Hairy Four O'Clock	Some Plant Material
Muhlenbergia cuspidata	2	0.07	Plains Muhly	Some plant material
Lycopus americanus	1	0.04	American Water Horehound	Some plant material
Onosmodium molle*	114	4.02	False Gromwell	Pure Seed
Pedicularis canadensis	21	0.74	Wood Betony	Mostly Plant material
Oxytropis lambertii	2	0.07	Lambert's Locoweed	Still in Pods
Pediomelum esculentum	3	0.11	Prairie Turnip	Pure Seed
Oxalis stricta	4	0.14	Wood Sorrel	Mostly Seed
Packera paupercula	40	1.41	Balsam Ragwort	Pappus
Prenathes racemosa	17	0.60	Purple Rattlesnake Root	Pappus
Polygala senega	53	1.87	Seneca Snakeroot	Some plant material
Potentill argute*	223	7.87	Tall Cinquefoil	Mostly Seed
Phlox pilosa	15	0.53	Prairie Phlox	Some Plant Material
Physalis heterophylla	0.5	0.02	Clammy Ground Cherry	Some Plant Material
Pycnathemum virginicum	374	13.19	Virginia Mountain Mint	Mostly Plant material
Ratibida pinnata	67	2.36	Yellow Cone Flower	Mostly Seed
Rudbeckia hirta*	1032	36.40	Black Eyed Susan	Mostly Seed
Rudbeckia hirta	230	8.11	Black Eyed Susan	Mostly Plant material
Prunella vulgaris	106	3.74	Self Heal	Mostly Plant material
Scrophularia sp.	59	2.08	Figwort	Maryland(Marylandica), Lance leaved (Lanceolata), Mostly plant material
Sculleteria parvula	1	0.04	Leonard's Small Skullcap	Mostly Plant material

Species name	Mass (g)	Ounces	Common Name	Notes
Solidago canadensis	2	0.07	Canada Goldenrod	Pappus
Stachys palustris	21	0.74	Marsh Hedge Nettle	Some Plant Material
Zigadenus elegans	20	0.71	Death Camas	Mostly seed
Verbena urticifolia	19	0.67	White Vervain	Mostly seed'
Thalictrum dasycarpum	4	0.14	Tall Meadow Rue	Mostly seed
Viola pedata	0.5	0.02	Prairie Violet	Mostly seed
Veronicastrum virginicum	40	1.41	Culver's Root	Mostly seed
Zizia sp.*	729	25.71	Golden Alexander	Golden Alexander (Aurea), heart leaved (Aptera)., Mostly seed
Verbena stricta	24	0.85	Hoary vervain	Some Plant Material
Verbena hastata	19	0.67	Blue Vervain	Some Plant Material
Sisyrinchium sp.	109	3.84	Blue Eyed Grass	Mountain (Montanum) and Prairie (Campestre). Mostly Plant Material, seeds of questionable quality.
Achillea millefolium	238	8.40	Yarrow	Some Plant Material
Elymus canadensis	13	0.46	Canada Wild Rye	None
Solidago ptarmicoides	56	1.98	White Upland Goldenrod	Pappus
Rosa sp.	185	6.53	Rose	Mostly Prairie (Arkansana), some Early Wild Rose (blanda)Whole Rose Hips
Aristida basiramea	68	2.40	Fork Tipped 3 awn	Some Plnt Material
Anemone canadensis	0.5	0.02	Canada anemone	All Seed'
Allium stellatum	154	5.43	wild prairie onion	Mostly Plant material
Monarda fistulosa	750	26.46	Wild Bergamot	Mostly Plant material
Echinacea angustifolia*	2050	72.31	Narrow Leaved Purple Prairie Clover	Some plant material
Solidago sp.*	350	12.35	Goldenrods	Canada (Candensis), Showy (Speciosa), Gray (Nemoralis), Missouri (Missouriensis), White Upland (Ptarmicoides), Stiff (Rigida), Grass-leaved(Euthamia graminifolia). Pappus
Sisyrinchium sp.*	550	19.40	Asters	Sky Blue (Oolentangiense), Heath (Ericoides), Silky (Sericeum), Panicled (Lanceolatum), New England (Novae-Scotiae), Aromatic (Oblongifolium). Pappus
Coreopsis palmate*	750	26.46	Prairie Coreopsis	Some Plant Material
Heliopsis helianthoides	950	33.51	Yellow oxeye sunflower	Mostly Plant material

Species name	Mass (g)	Ounces	Common Name	Notes
Helianthus sp.*	1800	63.49	Sunflowers	Stiff(Pauciflorus), Maximilian's (Maximilianii), Sawtooth (Grosseserratus). Some Plant Material
Liatris sp.*	1350	47.62	Blazing Stars	Rough(Aspera), Prairie(Pychnostachy), Dotted(Punctata), Northern Plains(Ligulistylis), Cylindric(Cylindrica)
Bouteloua curtipendula*	5400	190.48	Side Oats Grama	None
Sporobolus heterolepis*	2050	72.31	Prairie Dropseed	None
Miscellaneous Late Season	10200	359.79	Misc	Sorghastrum nutans primarily, Dalea purpurea, Anemone cylindrica, Solidagos spp, Sisyrinchium spp.
Bouteloua sp.*	524	18.48	Grama	Hairy(Hirsuta), Blue(Gracilis)
Hesperostipa spartea*	2100	74.08	Porcupine Grass	Awns attached
Hesperostipa comata	93	3.28	Needle and Thread	Awns attached
Koeleria macrantha*	1500	52.91	June Grass	None
Asclepias sp.*	279	9.84	Milkweeds	Common Milkweed (syriaca), Whorled Milkweed (verticillata), Swamp Milkweed, Green Milkweed (Primarily Common). Clean Seed
Asclepias sp.	36	1.27	Milkweeds	Common Milkweed, Whorled Milkweed, Swamp Milkweed, Green Milkweed (Primarily Common). Impure seed

Table 19-2 Seed mix for combined seed. All bulk seed was broadcast on Luptak (13 acres) and Kuntson (17 acres) at approximately 12 lbs. per acre.

Common Name	Estimated % of mix
300 bulk lbs	100%
Indiangrass	50
Little Bluestem	35
Big Bluestem	6
Prairie Dropseed	Trace
Switchgrass	Trace
Aster spp	Trace
Goldenrod spp	Trace
Blazing Star spp	Trace
Sky Blue Aster?	Trace
60 Bulk lbs	Trace
Little Bluestem	50
Junegrass	Trace
Sideoats grama	Trace
Muhly	Trace
3 Aster spp	Trace
2 Goldenrod spp	Trace
Leadplant	Trace
Canada Wildrye	Trace
Coreopsis	Trace
Big Bluestem	Trace
Indiangrass	Trace
Dotted Blazing Star	Trace
Sunflower spp	Trace
Sky Blue Aster	Trace
Stiff goldenrod	Trace
Purple Prairie Clover	Trace
Heather Aster	Trace
Alumroot	Trace

Table 19-3 Meander species list from the May 16, 2018 field site assessment. Frequency categories: C=common (observed throughout the meander survey), I=infrequent (scattered occurrences), R=rare (fewer than 5 individuals observed). **not in the seed mix*

Scientific Name	Common Name	Frequency of occurrence
NONNATIVE SPECIES:		
Setaria glauca	Yellow foxtail	C
Phalaris arundinacea	Reed canary grass	I
Plantago cf major		C
Carduus cf acanthoides	Plumeless thistle	I
Barbarea vulgaris	Garden yellow-rocket	I
Daucus carota	Wild carrot	I
Verbascum Thapsus	Mullein	I
Oxalis sp	Wood-sorrel	C
Trifolium repens	White clover	C
Trifolium pretense	Red clover	C
Silene cf vulgaris	Bladder-campion	I
Melilotus sp	Sweetclover	I
NATIVE SPECIES:		
Elymus canadensis	Canada wild rye	I
Ambrosia artemisiifolia	Common ragweed	C
Symphyotrichum oolentagiense	Sky blue aster	R
Solidago gigantea	Smooth goldenrod	I
Solidago canadensis	Canada goldenrod	I
Symphyotrichum lanceolatum	Panicled aster	I
Scrophularia cf marilandica	Maryland figwort	R
Verbena stricta	Hoary Vervain	I
Helianthus pauciflorus	Stiff sunflower	I
Helianthus cf grossesserratus	Sawtooth sunflower	I
Heliopsis helianthoides	Ox-eye sunflower	I
Zizia aurea	Golden Alexander	I
Verbena hastata	Blue vervain	I
*Agrimonia cf gryposepala**	Tall hairy agrimony	I
Achillea millefolium	Yarrow	I
Rudbeckia hirta	Black-eyed Susan	I

Appendix B: Site Photographs

Photo 19-1 View west across the prairie restoration showing a recently burned portion of the prairie restoration. Photo taken May 16, 2018.

Photo 19-2 View west across the prairie restoration showing a recently burned portion of the prairie restoration at left. Photo taken May 16, 2018.

Photo 19-3 Example vegetation cover in a portion of the south field of the restoration that did not burn. Photo take May 16, 2018.

Photo 19-4 View towards the northeast of burned and unburned portions in the north field of the prairie restoration on May 16, 2018.

Photo 19-5 View towards the west of burned and unburned portions in the north field of the prairie restoration on May 16, 2018.

Photo 19-6 Example vegetation cover in the north field of the prairie restoration on May 16, 2018.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

20) OHF Stadsvold Easement Wetland Restorations

Project Background

Project Name: Stadsvold Easement

Project Location: Pope County, USFWS Stadsvold Easement

Township/Range Section: Township 123 Range 37 Section 36

Project Manager / Affiliated Organization: Dale Livingston, Friends of Morris Wetland Management District and Alex Galt, USFWS

Fund: OHF - CPL ***Fiscal Year Funds:*** 2011

Project Start Date: 2010

Predominant Habitat type: Wetland

Additional Habitat types: Prairie / Savana / Grassland

Project Status: Post Establishment Phase

County: Pope

Primary Activity: Wetland Restoration

Project Size: 30 Acres

Project Completed: 2011

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

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

30 acres of wetland restoration in two basins; treatments included installation of a dike for one basin, and a dike and tile riser for the second basin.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Project Summary_Stadsvold
   Wetland Restoration Contract_Stadsvold.pdf
   CPL Annual Report_FY11_Stadsvold
   CPL FY11 Stadsvold Accomplishment Report Excerpts.pdf
   CPL FY11 - Stadsvold Easement Enhancement - Friends of Morris Distict.pdf
   These documents reside with the USFWS and Friends of the Morris Wetland Management District.

3. ***What are the stated goals of the project?***
   The overall project goals for the Stadsvold Easement were to enhance native prairie and grassland habitat on 320 acres and restore two wetlands, totaling 30 acres. This evaluation focuses on the wetland restorations, referred to in this report as the "north wetland" and "south wetland" (see map in Appendix A). The goal for the wetland restorations was to "provide the maximum amount of waterfowl habitat possible on this site."
4. ***Were measures of restoration success identified in plans?*** *No*
   If yes, list specific measurements.
   Click here to enter text.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   Wetland Restoration Project Map
   Wetland Restoration Contract_Stadsvold.pdf
   The contract describes the specifications and performance expectations for installation of the ditch plugs and the tile riser.

6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   Installations of ditch plugs and tile risers are standard practice for wetland restorations by the USFWS. The practices are effective for impounding water and creating the hydrology of perennial emergent wetlands.

Project Implementation

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***
   Click here to enter text.

Site Assessment

Field Review Date: **5/17/2018**

Field Visit Attendees: Alex Galt, USFWS wildlife biologist, Gina Quiram, DNR restoration evaluation specialist, Sarah Winikoff, Graduate Assistant, University of Minnesota, and Larissa Mottl, Stantec Consulting Services, ecologist and site assessor.

9. ***Surrounding Landscape Characteristics:***
   Much of the surrounding landscape is protected conservation land or grazed private land in the Glacial Lakes area in Pope County. The site is within one mile of TNC Preserves (Ordway Prairie, Sheepberry Fen), several USFWS Waterfowl Production Areas, a DNR WMA (Simon Lake), and additional USFWS conservation easements. A gravel pit is located north of the site, on the other side of a county gravel road, and Hwy 104 forms the east boundary of the property. The wetland restorations are in the west third of the site in pasture composed of mostly nonnative cool-season grasses (see Appendix B).
10. ***Site Characteristics:***
    a. Soils:
    Most of the site (about 200 acres) has well-drained Langhei loam on 12-40% slopes with native prairie, or Langhei-Barnes moderately eroded loam complexes on 6-20% slopes. The north wetland basin of about 15 acres has Parnell silty clay loam which is typical for shallow marshes in moraine swales and other wetlands at the site. The south wetland has Vallers clay loam, which is typically associated with meadow vegetation.
    b. Topography:
    The site has steep slopes and swales associated with the hummocky terrain of the Alexandria moraine.
    c. Hydrology:
    The site has glacial moraine topography and hydrology with well-drained upland soils on hilltops and slopes and shallow marshes and wetlands within swales. Water flows north from the north wetland restoration into Mud Creek, and water from the south wetland flows south into a tributary of Mud Creek. Mud Creek generally flows southwest to the Chippewa River in the Minnesota River basin.
    d. Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:
    Hills throughout the eastern two-thirds of the project area are over 90% native prairie. The Minnesota Biological Survey mapped the remnant as dry sand – gravel prairie (southern) (UPs13b) in 2001. Fred Harris (DNR plant ecologist) described the area in 2001 as formerly heavily grazed pasture. The western third of the site where the wetland restorations are located is pasture dominated by smooth brome.
    e. Vegetation B: Meander Search Species List (as appropriate for site)
    Species observed around the north wetland basin included *Typha, Phragmites australis*, *Phalaris arundinacea*, and a few clumps of *Scirpus atrovirens*. The south basin contains willow trees within and around the north end and *Phalaris arundinacea*.
11. ***Is the plan based on current science?*** Portions

The method for restoring hydrology to the north wetland basin is based on science if the goal was to restore a perennial emergent wetland like the natural wetlands elsewhere at this site. However, wetland plant community restoration was not included in the project for either wetland. Native wetland plant diversity is very poor for both basins. The ditch plug for the south wetland is essentially a dam/dike that is impounding water and inundating large willow trees that were present along the former ditch. The basin is surrounded by reed canary grass and a few patches of smaller willows. Overall, the wetland created does not reflect the landscape position (head of a broad swale) and wet meadow that would be expected given the soil type. Based on observations in the field, the "restored" hydrologic conditions do not match the historic hydrologic conditions – the current water level impounds significant more water than would have been here, historically.

12. ***List indicators of project outcomes at this stage of project:***
    Hydrology has been restored to the north basin and altered to create the south basin. Both wetlands are attracting wildlife, including waterfowl. Woodducks were using the south basin and soras were heard frequently calling from within cattails of the north basin during the May 17, 2018 site visit. In terms of broader outcomes that could be expected for wetland restoration, however, the basins are very deficient in native wetland plant diversity.
13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    The project plan allowed for holding more water on the site and is attracting waterfowl. However, the plan did not reasonably allow for facilitating establishment of diverse native wetland vegetation for greater benefits for wildlife and waterfowl.
14. ***Are corrections or modifications needed to meet proposed outcomes?***
    Reed canary grass is the dominant vegetation around both wetland basins. It may not be feasible at this stage to introduce and establish native wetland plants. If there is interest in improving the quality of the wetlands, the best available science can be pursued in the future to develop and implement a detailed restoration plan that focuses on significantly increasing native plant diversity and cover.
15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    The wetlands are within pasture and the site looked like it was grazed during the 2017 growing season. No other information is available about the grazing system. USFWS staff plan to monitor the tile riser to make sure it is functional, and the outlet is not plugged.
16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No, although the south basin could have been a wet meadow restoration instead of an impoundment. Based upon review of soil maps and the DNR native plant community GIS layer, wet meadow appears to be rare within the landscape surrounding the site.
17. ***Are follow-up assessments needed? Explain.***
    No.
18. ***Additional comments on the restoration project.***
    Target wetland types need to be identified in project proposals to determine project designs, apply appropriate best management practices, and to measure outcomes.

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.

19. ***The project will:***
    Minimally meet proposed outcomes
    Confidence of outcome determination:
    Medium
20. ***Provide explanation of reason(s) for determination.***
    The project met the proposed outcome of restoring and altering hydrology and creating habitat for waterfowl. Higher quality habitat for waterfowl and other wildlife could have been achieved if restoration of native wetland vegetation had been a component of the project as well.
21. ***Site Assessor(s) Conducting Review:***
    Larissa Mottl, Stantec Consulting Services, and Gina Quiram, MN DNR

Appendix A: Site map, Contract specifications

Figure 20-1 Site map with locations for the two wetland restorations, including the ditch plugs and tile riser.

Friends of the Morris Wetland Management District
43875 – 230th Street, Morris Minnesota, 56267
Phone 320-589-1970

October 7, 2011

Contractor Work Agreement

Zacher Excavating Inc., P.O. Box 85, Alexandria, MN 56308 agrees to perform two wetland restorations on the site designated on the attached map in accordance with the following conditions and in accordance with directions or clarifications received from the U.S. Fish and Wildlife Service Project Manager. The project is located on the Stadsvold Easement Property in the South ½ of Section 36, T. 123 N R. 37 W, Gilchrist Township, Pope County. See attached aerial photograph and Easement Site Information. Access to the properties has been provided by Wildlife Management Agreement between the U. S. Fish & Wildlife Service and the Private Property owners.

Wetland #1 (south basin): Construct Ditch Plug between on-site survey stakes using the attached diagram and below specifications.

A) Embankment - The embankment shall have 4:1 or 5:1 side slopes with at least a 12 foot wide top. A minimum of 1 foot of soil should be cored out under the entire embankment down to mineral soil. Top soil shall be stripped and stock piled in order to cover the finished plug with black dirt. The embankment shall be squared up and level when completed. The ditch plug top should be at least 1.5 feet higher than the spillway elevation.

B) The emergency spillway shall be cut with a minimum of one dozer pass to create a flat area, about 10 feet wide that will accommodate the overflow out of a wetland. The inside of the spillway cut should occur at the elevation of the stake on either end of the plug. This ditch plug has two spillways that are both 10 feet wide on each end of the plug. The spillway will have 3:1 side slopes or broader that tie it into the surrounding landscape.

C) Embankment finish - The embankment shall be smoothly finished with a minimum of 3 inches of black dirt from the stock pile that was made when the site was stripped of its topsoil. The embankment will be seeded with the below mix once finished. Straw mats shall be laid across both spillways and shall be stapled down with biodegradable staples to prevent the spillway from eroding.

Wetland #2 (north basin):
Overflow structure: Construct Ditch Plug between on-site survey stakes using the attached diagram and below specifications.

A) Embankment - The embankment shall have 4:1 or 5:1 side slopes with at least a 12 foot wide top. A minimum of 1 foot of soil should be cored out under the entire embankment to mineral soil. Since there is an existing embankment. the

Figure 20-2 Wetland restoration contract specifications, page one of two.

core should occur immediately behind the existing plug and the old plug should be included to widen out this plug with the new material. Top soil shall be stripped and stock piled in order to cover the finished plug with black dirt. The embankment shall be squared up and level when completed. The ditch plug top should be at least 1.5 feet higher than the spillway elevation.

B) Emergency Spillway: The emergency spillway shall be cut with a minimum of three dozer passes to create a flat area, about 30 feet wide that will accommodate the overflow out of a wetland. The inside of the spillway cut should occur at the elevation of the stake on either end of the plug. This ditch plug has one 30' spillway on the east end of the plug. The spillway will have 3:1 side slopes or broader that tie it into the surrounding landscape. The landscape is very level east of the plug, so side slopes should not be an issue.

C) Embankment finish - The embankment shall be smoothly finished with a minimum of 3 inches of black dirt from the stock pile that was made when the site was stripped of its topsoil. The embankment will be seeded with the below mix once finished. Straw mats shall be laid across the spillway and shall be stapled down with biodegradable staples to prevent the spillway from eroding.

Primary Outlet, Wetland #2:

A) Tile Riser: 100 feet of existing 12 inch tile will be broken and removed from the existing location. The tile must be deposited outside of the trench that it was installed in. Survey stakes will mark both ends of the excavation. Once the tile has been removed, the remaining tile in the basin must be capped with concrete to prevent water movement. The outlet end of the tile will have non-perforated smooth walled tile installed for 50 feet upstream in order to create a distance where water cannot seep out of the wetland. A concrete collar shall be installed at the intersection of the new pipe and existing tile. The collar shall be grouted with concrete to ensure that this intersection does not separate. An anti-seep Diaphragm shall be installed half way between the riser and the existing tile. Elbows will be installed in order to get the riser on this tile to the surface elevation of 1103.0. The elbows shall be water tight or completed covered with concrete once installed. A large sleeve of steel pipe shall be installed vertically to hold the tile riser. The space between the tile and the steel pipe sleeve shall be filled with concrete so that the intersection with the elbows is covered with concrete and sealed completely up to the surface elevation of the tile. The soil will be back filled to within 1 foot of the top of the tile outlet. Fabric and rip rap will be placed around the tile inlet in a 3 foot by 3 foot space with the inlet in the center. A trash rack will be installed on top of the tile riser to prevent debris from plugging the tile. All disturbed soil will be seeded with the following mix.

Seed Mix:	Switch grass 5%	Canada Wildrye 20%
	Sideoats Grama 15%	Slender Wheatgrass 25%
	Virginia Wildrye 30%	Alfalfa 5%

Figure 20-3 Wetland restoration contract specifications, page two of two.

Appendix B: Site Photographs

Photo 20-1 South Wetland Restoration. View facing southeast from the top of the ditch plug towards the ditch that was plugged. The ditch is in the center of the photo. Water in the ditch flows to the south (to the upper right in the photo). Photo taken on May 17, 2018.

Photo 20-2 South Wetland Restoration. View facing north from the top of the ditch plug towards the impoundment. The inundated willow trees mark the location of the former ditch. Photo taken on May 17, 2018.

Photo 20-3 South Wetland Restoration. View facing southeast towards the ditch plug and water impoundment. The ditch plug is in the center of the photo. Photo taken on May 17, 2018.

Photo 20-4 South Wetland Restoration. Vegetation along the west side of the impoundment is nearly complete cover by reed canary grass, with a few scattered willow saplings. Photo taken on May 17, 2018.

Photo 20-5 South Wetland Restoration. View facing south towards the north end of the wetland showing landscape context within a broad valley with perennial nonnative grass cover. Photo taken on May 17, 2018.

Photo 20-6 North Wetland Restoration. View facing northeast across the wetland basin showing reed canary grass in the foreground and cattails and common reed at the horizon. Photo taken on May 17, 2018.

Photo 20-7 North Wetland Restoration. View facing south across the wetland basin from the ditch plug. The location of the former ditch is still evident as a linear strip of open water where there is less emergent vegetation cover at center in the photo. Photo taken on May 17, 2018.

Photo 20-8 North Wetland Restoration. View facing southeast across the wetland basin from the ditch plug. Photo taken on May 17, 2018.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

21) OHF Stadsvold Easement Prairie Enhancement

Project Background

Project Name: Stadsvold Easement Enhancement

Project Location: Pope County, Stadsvold Easement

Township/Range Section: Township 123 Range 37 Section 36

Project Manager / Affiliated Organization: Dale Livingston, Friends of Morris Wetland Management District

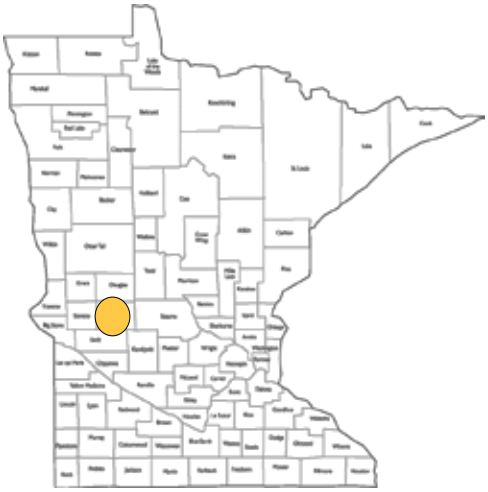
Fund: OHF - CPL ***Fiscal Year Funds:*** 2011

Project Start Date: 2010

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Wetland

Project Status: Post Establishment Phase



County: Pope

Primary Activity: Wetland Restoration

Project Size: 212 Acres

Project Completed: 2011 with ongoing grazing management plan

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   The grant-funded portion of the project involved removal of native and nonnative invasive trees from 212 acres of remnant prairie pasture with 12 wetland basins. The winter woody removal treatment was

completed in the spring of 2011. Prescribed fire treatments were implemented on the western 1/3 of the easement in April of 2012 and the eastern 2/3 of the easement in September of 2013 by USFS staff.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Project Summary_Stadsvold
   Prescribed burn map_Stadsvold
   Grazing plan map_Stadsvold
   Tree removal contract_Stadsvold
   CPL Annual Report_FY11_Stadsvold
   CPL FY11 Stadsvold Accomplishment Report Excerpts.pdf
   CPL FY11 - Stadsvold Easement Enhancement - Friends of Morris Distict.pdf

   These documents reside with the USFWS and Friends of the Morris Wetland Management District.

3. ***What are the stated goals of the project?***
   Remove invasive trees from 320 acres of grassland and native prairie.

4. ***Were measures of restoration success identified in plans?*** *No*
   If yes, list specific measurements.
   Click here to enter text.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   Prescribed burn map_Stadsvold
   Grazing plan map_Stadsvold
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   Reduction of nonnative and native woody species cover for prairie enhancement is based on best current science.

Project Implementation

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***
   Click here to enter text.

Site Assessment

Field Review Date: **5/17/2018**

Field Visit Attendees: Alex Galt, USFWS wildlife biologist, Gina Quiram, DNR restoration evaluation specialist, Sarah Winikoff, Graduate Assistant University of Minnesota, and Larissa Mottl, Stantec Consulting Services, ecologist and site assessor

9. ***Surrounding Landscape Characteristics:***
   Much of the surrounding landscape is conservation land or grazed private land in the Glacial Lakes area of Pope County. The site is within a mile of TNC Preserves (Ordway Prairie, Sheepberry Fen), several USFWS Waterfowl Production Areas, a DNR WMA (Simon Lake), and additional USFWS conservation easements. A gravel pit is located north of the site, on the other side of a county gravel road, and Hwy 104 forms the east boundary of the property.
10. ***Site Characteristics:***
    a. Soils:
    The hills are composed of well-drained Langhei loam on 12-40% slopes.
    b. Topography:
    The site has steep slopes associated with the hummocky terrain of the Alexandria moraine.
    c. Hydrology:
    The project area is well drained due to soil types and topography.
    d. Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:
    Hills throughout the project area are over 90% native prairie. The Minnesota Biological Survey mapped and classified the remnant as dry sand – gravel prairie (southern) (UPs13b) in 2001. The area was noted by Fred Harris as formerly heavily grazed pasture.
    e. Vegetation B: Meander Search Species List (as appropriate for site)
    The following species were observed on hilltops and slopes during about a mile-long meander survey through the project area: *Linum sulcatum or rigidum, Schizachyrium scoparium, Viola pedatifida, Geum triflorum, Symphyotrichum ericoides, Rosa cf arkansana, Sporobolis, Verbena stricta, Achillea millefolium, Symphoricarpos orbiculatus, Andropogon gerardii, Calamovilfa longifolia, Anemone cylindrica, Fragaria virginiana, Potentilla arguta, Onosmodium molle, Solidago nemoralis, Antennaria plantaginifolia, Anemone patens, Artemisia Elymus cf trachycaulus, Carex richardsonii, Carex inops, Allium stellatum, Comandra umbellata, Castilleja sessiliflora, Liatris cylindrica, Heuchera richardsonii, Dalea purpurea, Symphyotrichum sericeum, Lobelia spicata, Vicia americana, Carex meadii, Symphyotrichum novae-angliae, Packera plattensis, Cirsium flodmanii, Galium boreale, Oxalis violacea, Zigadenus elegans, Monarda fistulosa, Anemone canadensis, Astragalus crassicarpus, Zizia aptera, Nothocalais cuspidata, and Lithospermum canescens.* A few species noted in the swales (a thorough search was not conducted) included *Carex stricta, Spartina pectinata, Anthoxanthum hirtum,* and *Pycnanthemum virginianum.*

11. ***Is the plan based on current science?*** Yes
    Yes, removal of woody species in upland prairie is a proven method for enhancement of native prairie.
12. ***List indicators of project outcomes at this stage of project:***
    Except for boxelders that were specifically retained at a cattle loafing area near a gated entrance into the northeast corner of the project area, there were no trees or saplings in the 212 acres of remnant prairie. A few small shrubs (less than 2' tall) and red cedar seedlings (less than 6" tall) were observed occasionally during an approximately mile-long meander through the project area.

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    Yes, there is continuous cover of native prairie sod and extremely minimal occurrences of woody species across the project area after seven growing seasons. The prescribed burn in the fall of 2013 (two growing seasons after the woody removal) and subsequent cattle grazing have likely reduced new woody species establishment.
14. ***Are corrections or modifications needed to meet proposed outcomes?***
    No problem areas were identified.
15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    Future management activities include annual rotational cattle grazing. A paddock system was designed for the project area and installation of fencing and gates were included as match for the CPL funding used for the woody removal. Alex Galt (USFWS) noted that prescribed burns are not likely to be implemented in the future due to limited funding and staff capacity. The grazing system for this conservation easement is not monitored apart from occasional observations by staff while driving by the site.
16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    Possibly. All of the remnant prairie in the project area (about 200 acres) was burned at one time and late in the growing season (mid-September). Very small remnants to the south of the easement may have provided opportunities for re-colonization by less mobile prairie species, but other remnants are located across a gravel road or Hwy 104, which may be significant barriers for dispersal. It is possible that the burn was patchy and left some refugia.
17. ***Are follow-up assessments needed? Explain.***
    No.
18. ***Additional comments on the restoration project.***
    The timing of project activities—woody removal, rest period from cattle grazing for three years to build up fuel, and the prescribed burn treatment—was planned and executed very well for this project. It is likely that woody species recruitment from seed and stump sprouts was reduced by burning in the fall of the third growing season. However, all of the remnant prairie in the project area was burned at one time. General best practice for prescribed fire has been to leave at least half of a given habitat type unburned.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***

The initial woody removal, followed by a prescribed burn treatment, and subsequent annual rotational cattle grazing have effectively eliminated and prevented woody encroachment for over seven growing seasons.

21. ***Site Assessor(s) Conducting Review:***

Larissa Mottl, Stantec Consulting Services, and Gina Quiram, MN DNR

Appendix A: Site maps

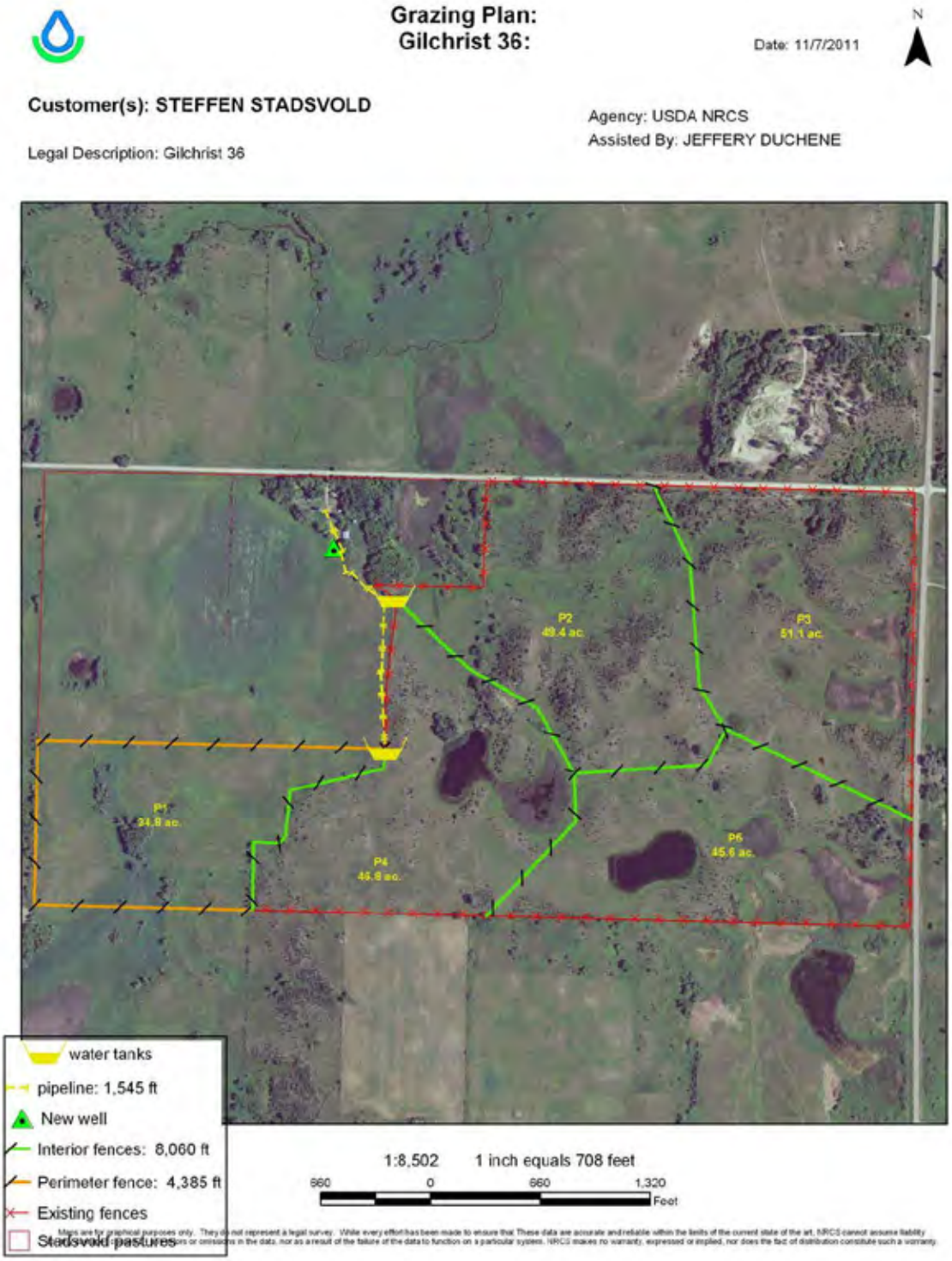


Figure 21-1 Site map illustrating the cattle grazing paddock system. Woody removal was implemented in 2011 in paddocks labeled P2 through P5.

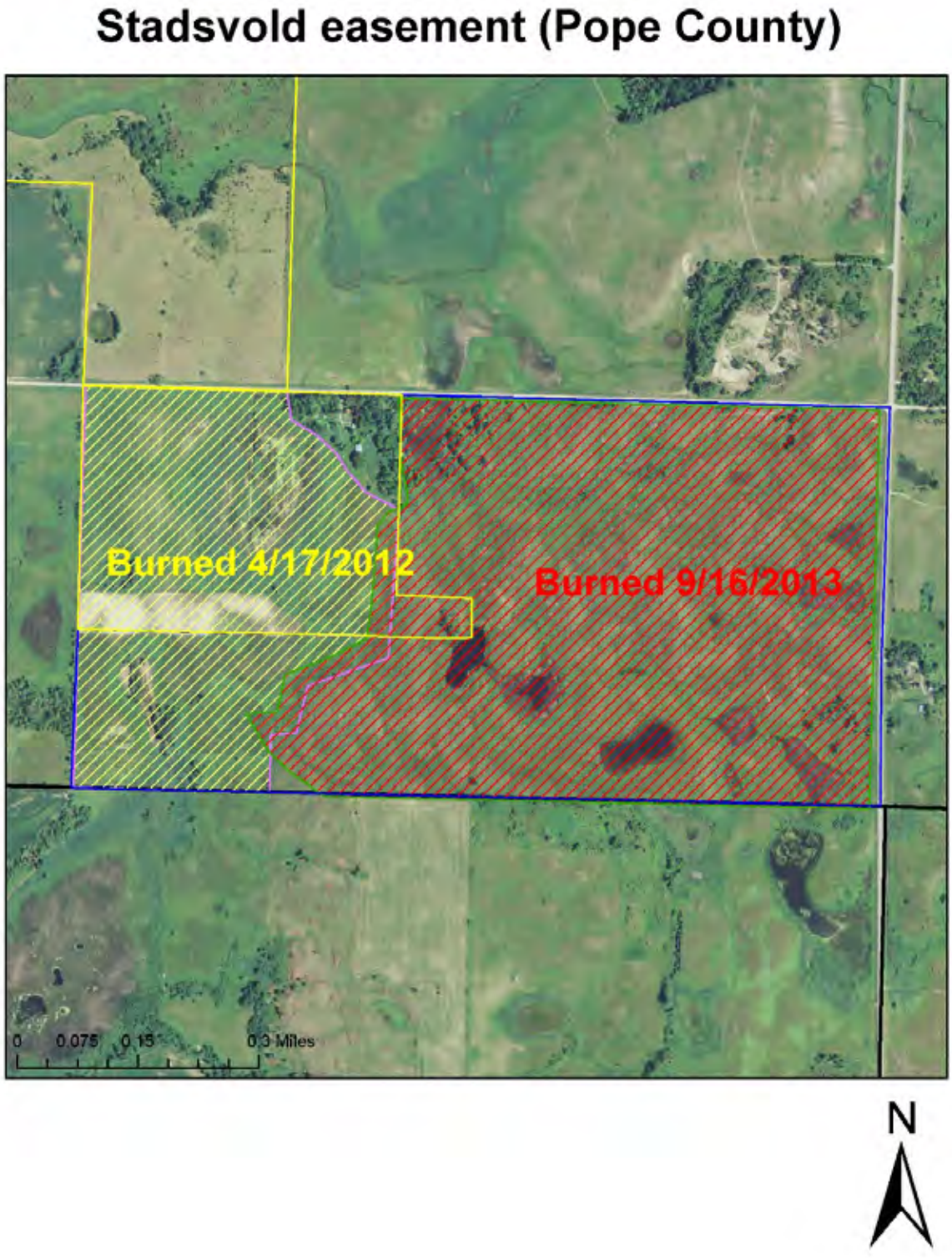


Figure 21-2 Locations of prescribed burn treatments at the Stadsvold Conservation Easement in 2012 and 2013.

Appendix B: Site Photograph

Photo 21-1 Landscape photo of the woody removal area at the Stadsvold USFWS conservation easement. Photo taken on May 17, 2018.

Photo 21-2 Alex Galt, USFWS project manager, with one of the 12 wetland basins on the USFWS conservation easement in the background. Photo taken on May 17, 2018.

Photo 21-3 Boxelder trees left on north east corner of the easement. The project manager noted that the property owner indicated they would be open to discussing removal if seedling recruitment became an issue in the future.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

22) OHF Frederickson Site Prairie Enhancement

Project Background

Project Name: Fredrickson Easement Enhancement

Project Location: Pope County, Frederickson Easement

Township/Range Section: Township 123 Range 37 Section 25 and 26

Project Manager / Affiliated Organization Dale Livingston, Friends of Morris Wetland Management District, and Alex Galt, USFWS.

Fund: OHF - CPL ***Fiscal Year Funds:*** 2011

Project Start Date: 2012

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Wetland , Choose an item.

Project Status: Post Establishment Phase

County: Pope

Primary Activity: Wetland Restoration

Project Size: 150 Acres

Project Completed: 2012 with ongoing grazing management plan

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Woody removal on approximately 150 acres of grassland in a 350-acre USFWS habitat conservation easement.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Frederickson project plan.pdf
   Frederickson_aerial photos.pdf (project area map)

   Documents are located with the USFWS Morris Wetland Management District office and with the Friends of the Morris Wetland Management District.
3. ***What are the stated goals of the project?***
   Enhance prairie through the removal of native and nonnative woody species.
4. ***Were measures of restoration success identified in plans? No***
   If yes, list specific measurements.
   Click here to enter text.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** Yes
   If yes, provide in Appendix A and list Maps provided:
   Frederickson Project Plan (project area map), provided by project manager
   Frederickson Site Evaluation Map (new GIS map)
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   Woody removal is a BMP for upland prairie enhancement. The project plan required that piles of woody material were not located on hilltops and slopes on native prairie vegetation.

Project Implementation

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***
   Click here to enter text.

Site Assessment

Field Review Date: **5/17/2018**

Field Visit Attendees: Alex Galt, USFWS wildlife biologist, Gina Quiram, DNR restoration evaluation specialist, and Larissa Mottl, Stantec Consulting Services, ecologist and site assessor

9. ***Surrounding Landscape Characteristics:***
   Much of the surrounding landscape is conservation land or grazed private land in the Glacial Lakes area of Pope County. The site is within a mile of TNC Preserves (Ordway Prairie, Sheepberry Fen), several USFWS Waterfowl Production Areas, a DNR WMA (Simon Lake) and additional USFWS conservation easements. The north fence line (and property line) and land adjacent to the north of the east portion of the project area has mature eastern red cedar trees. These trees are adjacent to the native prairie mapped by the DNR within the project area.

10. Site Characteristics:

a. Soils:

The woody removal work took place on hills composed of well-drained Langhei loam on 12-40% slopes, and Langhei-Barnes, moderately eroded loam on 12-20% slopes.

b. Topography:

The site has steep slopes associated with the hummocky terrain of the Alexandria moraine.

c. Hydrology:

The project area focused on upland areas that are well drained due to soil types and topography. The site overall is typical of hydrology in glacial moraine with several wetland basins throughout.

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

Of the approximately 150 acres included in the project for woody removal, about 60 acres are mapped by the DNR as dry sand-gravel prairie (UPs13b). Of those 60 acres, 30 acres were ground surveyed during the site evaluation and an additional nine acres were observed from nearby hilltops (see map in Appendix A). A list of species observed on a meander through native prairie is included in "Vegetation B". Nonnatives smooth brome and Kentucky bluegrass were dominant (over 75% cover) on hilltops within the surveyed area, with native prairie species common on the slopes, but highly variable in cover between hills. Based on aerial photo interpretation and visual estimation from afar during the site visit, about 90 acres of the project area are in perennial grassland cover that is likely dominated by smooth brome. Eastern red cedars are re-establishing on the native prairie in the surveyed areas (see photos for example density and cover in Appendix B). Most of the cedars are less than three feet tall. Common buckthorn and honeysuckle occur in areas in proximity to wooded valleys that were not included in the project work, and buckthorn was observed to be re-establishing in adjacent smooth brome-dominated grassland.

e. Vegetation B: Meander Search Species List (as appropriate for site)

Schizachyrium scoparium, Elymus trachycaulus, Sorghastrum nutans, Lithospermum canescens, L. incisum, Sisyrinchium campestre, Lithospermum molle, Packera sp, Oligoneuron rigidum, Solidago nemoralis, Viola pedatifida, Solidago canadensis, Verbena stricta, Cirsium flodmanii, Symphyotrichum oolentangiense, Comandra umbellata, Antennaria cf neglecta, Anemone patens, Astragalus sp., Calylophus serrulatus, Astragalus crassicarpus, and Geum triflorum.

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

Woody removal in upland prairie is a best management practice for enhancement of native prairie.

12. List indicators of project outcomes at this stage of project:

The woody removal treatment was thoroughly completed in 2012 and the results are shown by the 2013 aerial photos provided by the project manager (see Appendix B). However, eastern red cedars are re-establishing on native prairie in the project area. Follow-up mechanical removal of the cedars is needed and would be desirable to accomplish in the next 1-2 years while the trees are still small. Buckthorn and honeysuckle are still present in wooded valleys within the project site. They will be an on-going seed source for the project area and appear to be re-establishing in areas of nonnative grass cover adjacent to the valleys.

13. Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?

The project plan reasonably allows for a positive outcome but could have been improved with identification of follow-up measures for potential re-establishment of cedars. The cedars along the fence

line adjacent to the project area, and on land to the north, were indicators that cedar invasion would be a long-term issue at this site.

14. ***Are corrections or modifications needed to meet proposed outcomes?***
    Cedars on neighboring land will be an ongoing issue for native prairie maintenance at this site. If an easement is acquired for the neighboring land, it may be possible to pursue grant-funding to assist the landowner with cedar removal (if they are interested). Large tracts of native prairie are mapped by the DNR on the neighboring land and would benefit from cedar control. In the interim, periodic follow-up removal of cedars on this easement will need to be done to preserve the benefits of the 2012 project work.
15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    There are no proposed or planned future steps. Alex Galt noted that prescribed fire is not a feasible tool for woody species control at this site due to access constraints and interior fencing for cattle grazing. The primary challenge, noted above, is cedar cover adjacent to the site.
16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No.
17. ***Are follow-up assessments needed? Explain.***
    No.
18. ***Additional comments on the restoration project.***
    This site is being grazed and cattle grazing was underway at the time of the site visit on May 17, 2018. Cattle grazing activities are not currently monitored by the USFWS.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***
    The woody removal work met the proposed outcome of reducing woody cover on native prairie and grassland within the project site. It is not unusual for projects to be affected long-term by invasive species on neighboring properties. The cedar re-establishment has occurred over six growing seasons, the trees are still small, and native prairie and nonnative grass cover is continuous beneath them. Follow-up cedar removal, however, is needed to ensure longer-term positive outcomes for the project site.
21. ***Site Assessor(s) Conducting Review:***
    Larissa Mottl, Stantec Consulting Services, and Gina Quiram, MN DNR

Appendix A: Site maps

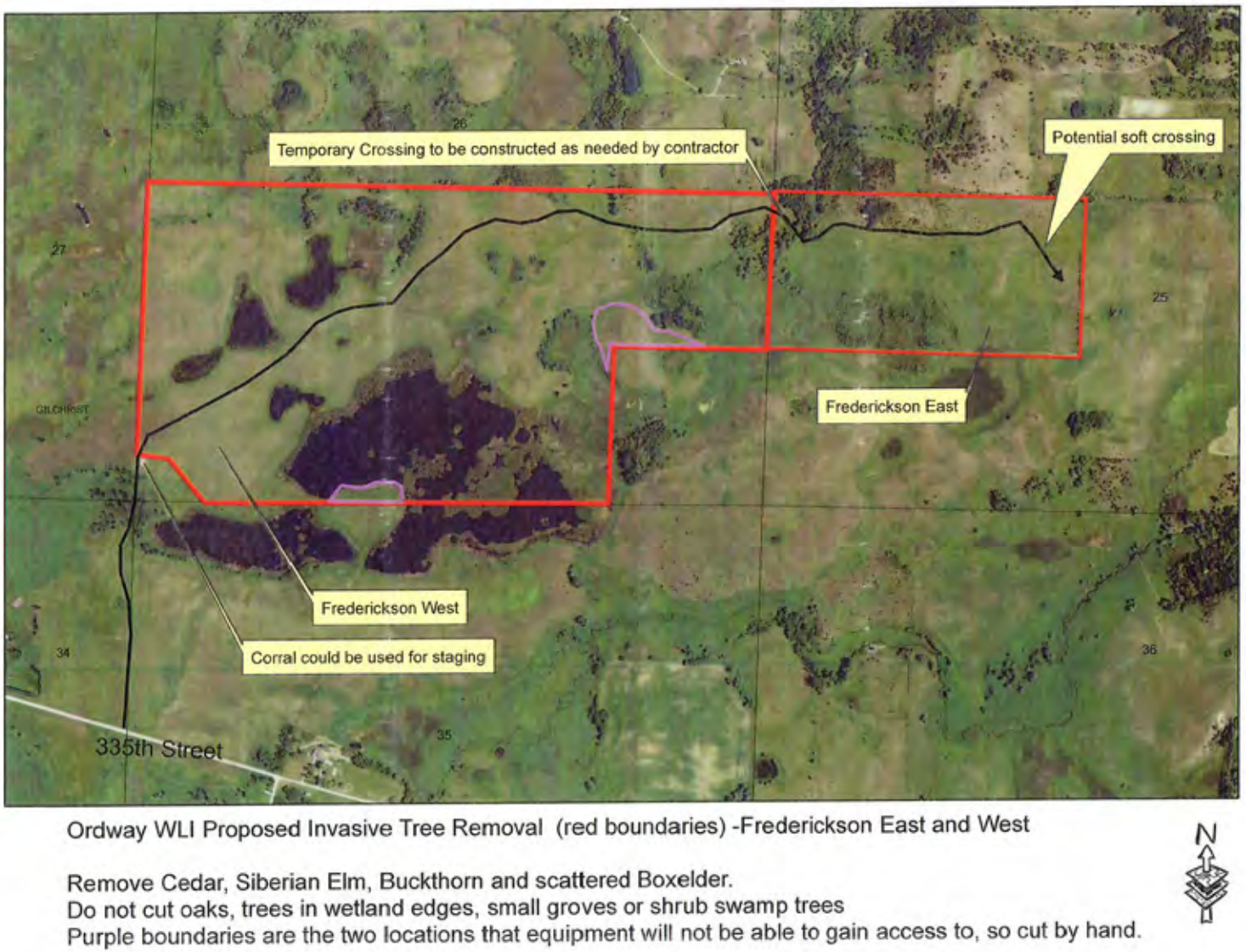


Figure 22-1 Site map for invasive tree removal at the USFWS Frederickson Conservation Easement. Map provided by the project manager.

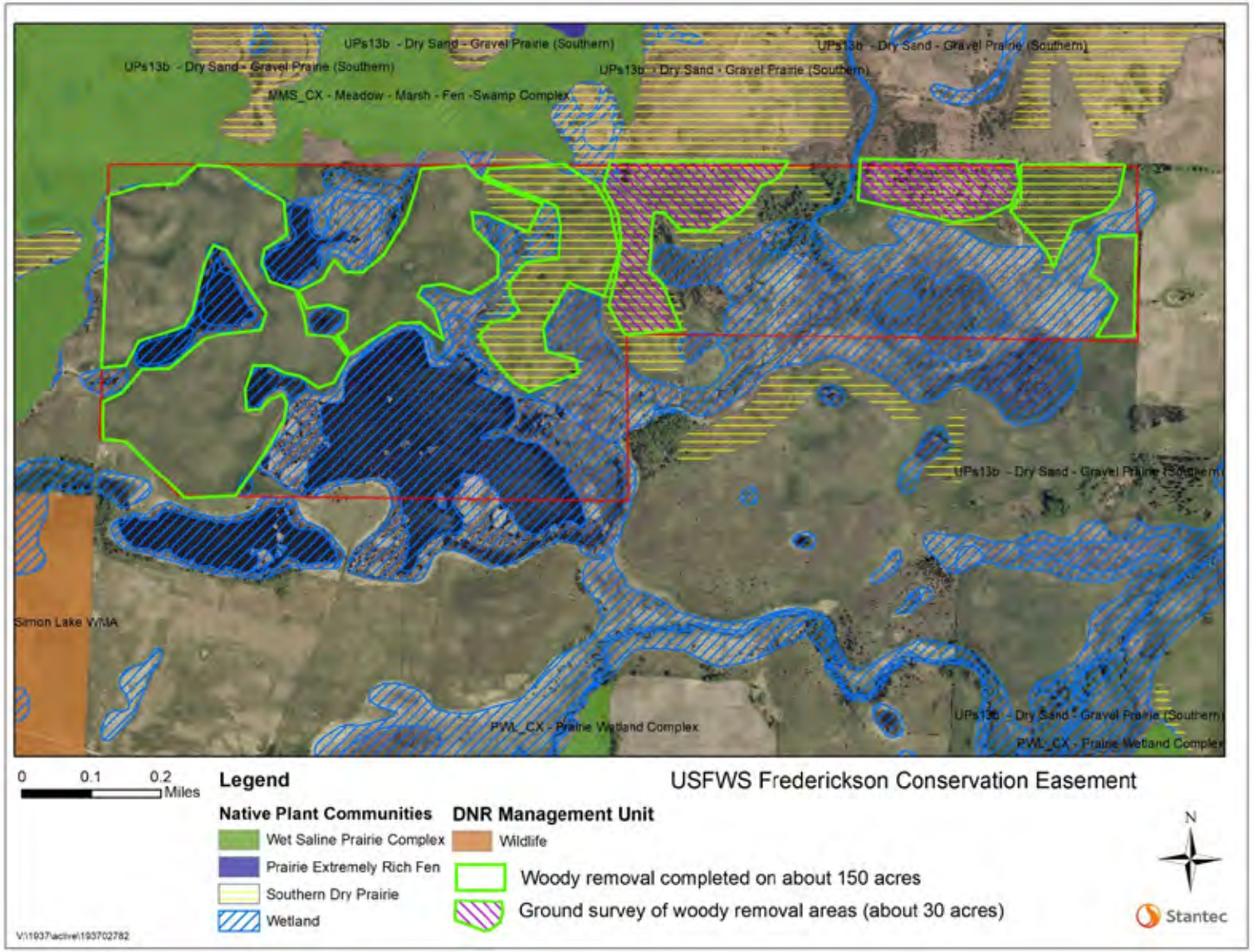


Figure 22-2 Site map for invasive tree removal at the USFWS Frederickson Conservation Easement, including locations of native dry sand-gravel prairie and the areas ground surveyed for this evaluation during a site visit on May 17, 2018.

Appendix B: Site Photographs

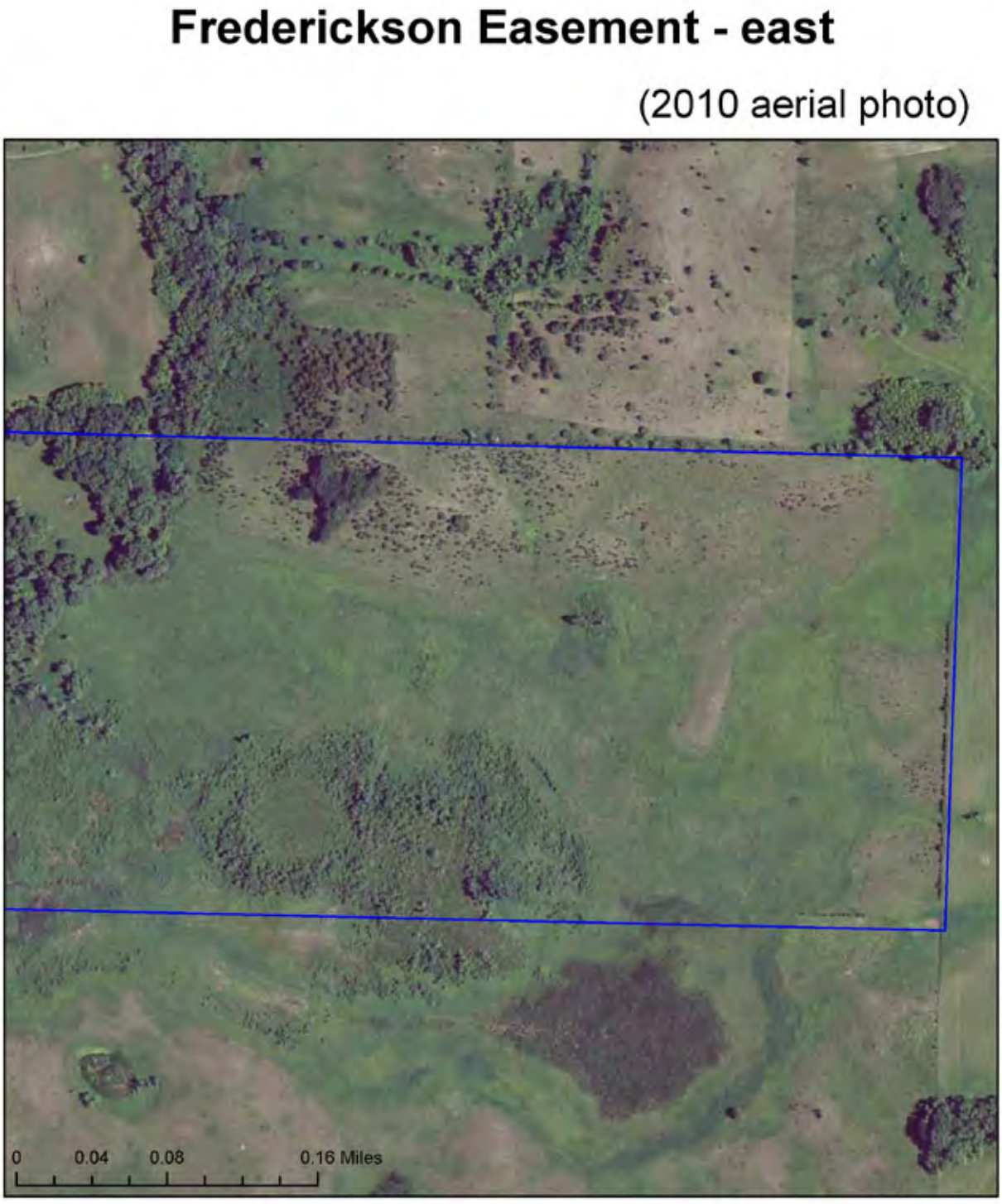


Photo 22-1 Aerial view of the east portion of the project area in 2010 prior to the invasive tree removal in 2012. Photo provided by the project manager.

Frederickson Easement - east

(2013 aerial photo)

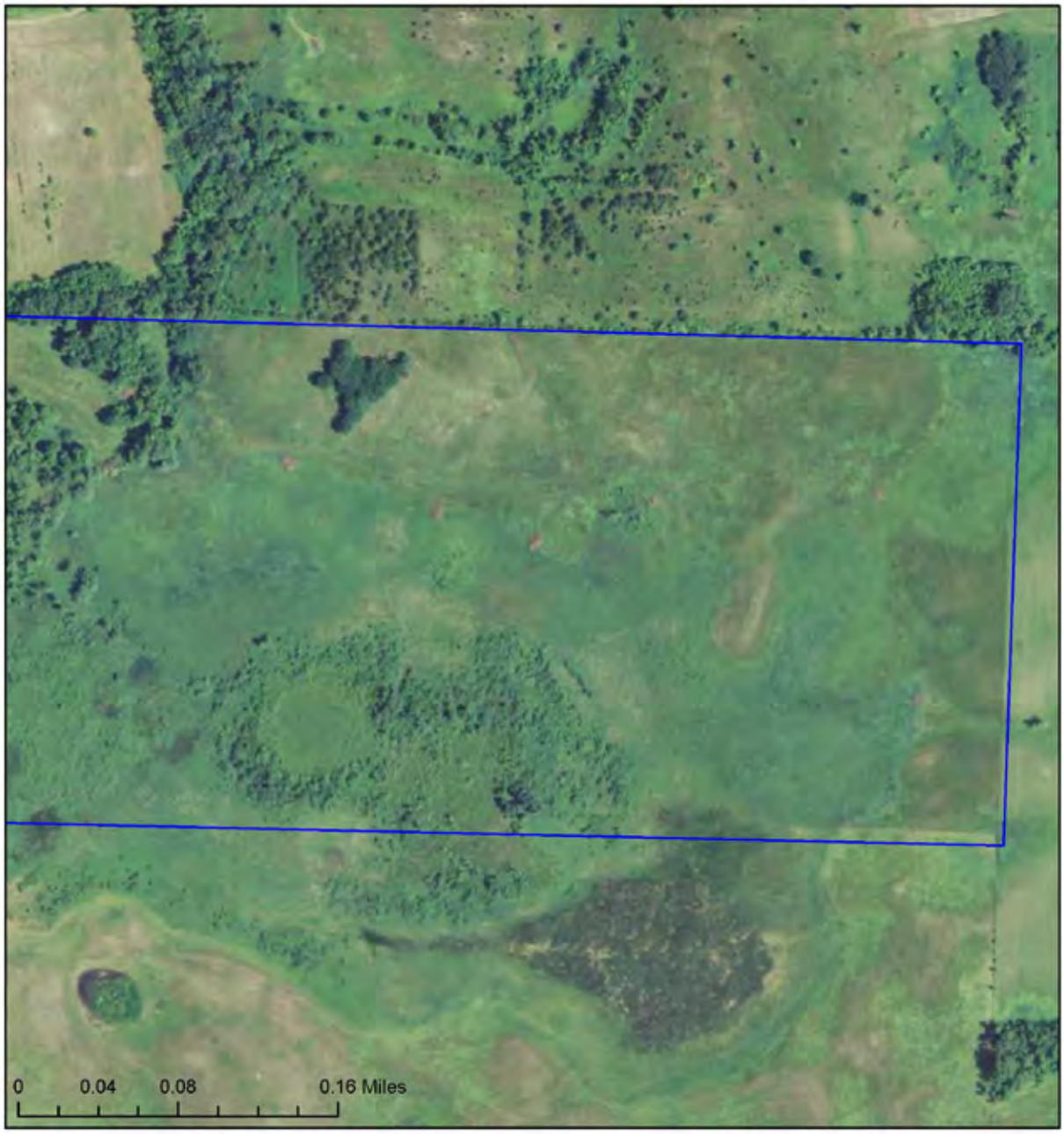


Photo 22-2 Aerial view of the east portion of the project area in 2013 after the invasive tree removal in 2012. Photo provided by the project manager. Tree piles are visible at the bases of hills in the project area.

Photo 22-3 Cedars are re-establishing on the hills in the project area shown along the horizon in the photo. Buckthorn is present in the foreground. Photo taken May 17, 2018.

Photo 22-4 Mature eastern red cedars along the north fence line of the project area. Photo taken May 17, 2018.

Photo 22-5 Smooth brome-dominated cover on hilltops in the project area. Photo taken on May 17, 2018.

Photo 22-6 Slope dominated by native prairie grasses and forbs with eastern red-cedars re-establishing. Photo taken May 17, 2018.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

23) OHF Fenmont WMA Wetland Restoration - Revisit

Legacy Fund Restoration Evaluations

See Appendix C for Project Background and Initial Project Evaluation

Project Name: OHF FY-11 4(a) Fund Accelerated Shallow Lake and Wetland Enhancement and Restoration: Fenmont WMA Wetland Restoration

Project Manager / Affiliated Organization: Jon Schneider/Ducks Unlimited; Bill Schuna, MN DNR Division of WIldlife bill.schuna@state.mn.us (Bill recently transferred into this area); (Ricky Lien ricky.lien@state.mn.us)

Fund: OHF ***Fiscal Year Funds:*** 2011

County: Nobles

Primary Activity: Wetland Restoration

Project Size: 39 acres

Project Completed: spring 2012

Follow Up Site Assessment

Field Review Date: 8/3/2018

Field Visit Attendees: Bill Schuna (MN DNR), Kent Schaap (MNDNR), Wade Johnson (MN DNR), Gina Quiram (MN DNR), Paul Bockenstedt (Stantec)

1. ***Please note any substantive changes to the site characteristics since last site assessment.***
   The most significant change in site characteristics since the last visit is that the restoration seeding in the wetland fringe area (as well as surrounding upland buffer areas) has continued to develop and mature.
2. ***Is the plan based on current science?*** Yes

Restoration of hydrology to approximate historic conditions, along with seeding of wetland fringe (and upland buffer) areas followed by grow-in maintenance of vegetation.

3. ***List indicators of project outcomes at this stage of the project.***
   Hydrology is stable and seasonally managed to benefit wildlife. Vegetation in the emergent and wetland fringe areas is largely stable and characteristic for restoration efforts at similar sites. The shallow lake is heavily used by wildlife, including shorebirds, waterfowl, pelicans and other wildlife. A total of seven out of 20 species included in the seed mix were observed. Seventeen other native plant species were observed, and total native cover comprised an estimated 40-50% of total cover. Two invasives, hybrid cattail and reed canary grass which comprised about half of the total plant cover. Of these, hybrid cattail was the most widespread and comprised the most total cover.
4. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
   Yes – the project area is currently in the maintenance phase and is expected to meet or exceed proposed outcomes into the future with planned management.
5. ***Are corrections or modifications needed to meet proposed outcomes?***
   No significant corrections or modifications will be necessary. Perhaps the most significant challenge that this site faces is persistence of reed canary grass in wetland fringe areas despite diligent spot treatment by DNR staff.
6. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
   Yes, future management of hydrology is intended to continue including seasonal water level manipulation to achieve wildlife habitat value objectives and to manage vegetation. Vegetation is intended to continue being managed through prescribed fire as well as spot treatment of invasive species (i.e. spot treatment of reed canary grass). No cattail treatments are planned at this time.
7. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
   The planned hydrology and vegetation management activities planned for the future are supportive of maintaining quality habitat value of the site.
8. ***Are follow-up assessments needed? Explain.***
   It does not appear that additional project assessments would be necessary or yield significant changes in current information.
9. ***Additional comments on the restoration project.***
   The upland prairie reconstruction surrounding the wetland restoration has turned out exceptionally well, adding value to the wetland restoration. MN DNR staff have been diligent with spot treatment of invasives in the wetland edge/buffer area – despite their efforts, reed canary grass still persists in some areas (especially the former pasture area on the north side of 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.

10. ***The project will:***

Meet proposed outcomes

Confidence of outcome determination:

High

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

    The restored wetland was observed and reported to be heavily used by shorebirds, pelicans, waterfowl and other wildlife. MN DNR staff have been diligent with monitoring site conditions and conducting targeted management with the resources they have available to attain the goal of continued development/improvement of the vegetation of the wetland and surrounding uplands during the coming years.

12. ***Site Assessor(s) Conducting Review:***

    Paul Bockenstedt, Ecologist (Stantec)

Appendix A: Revisit Site maps, Project plans or Vegetation tables

Figure 23-1 Restoration design drawing from Ducks Unlimited restoration design plan sheets.

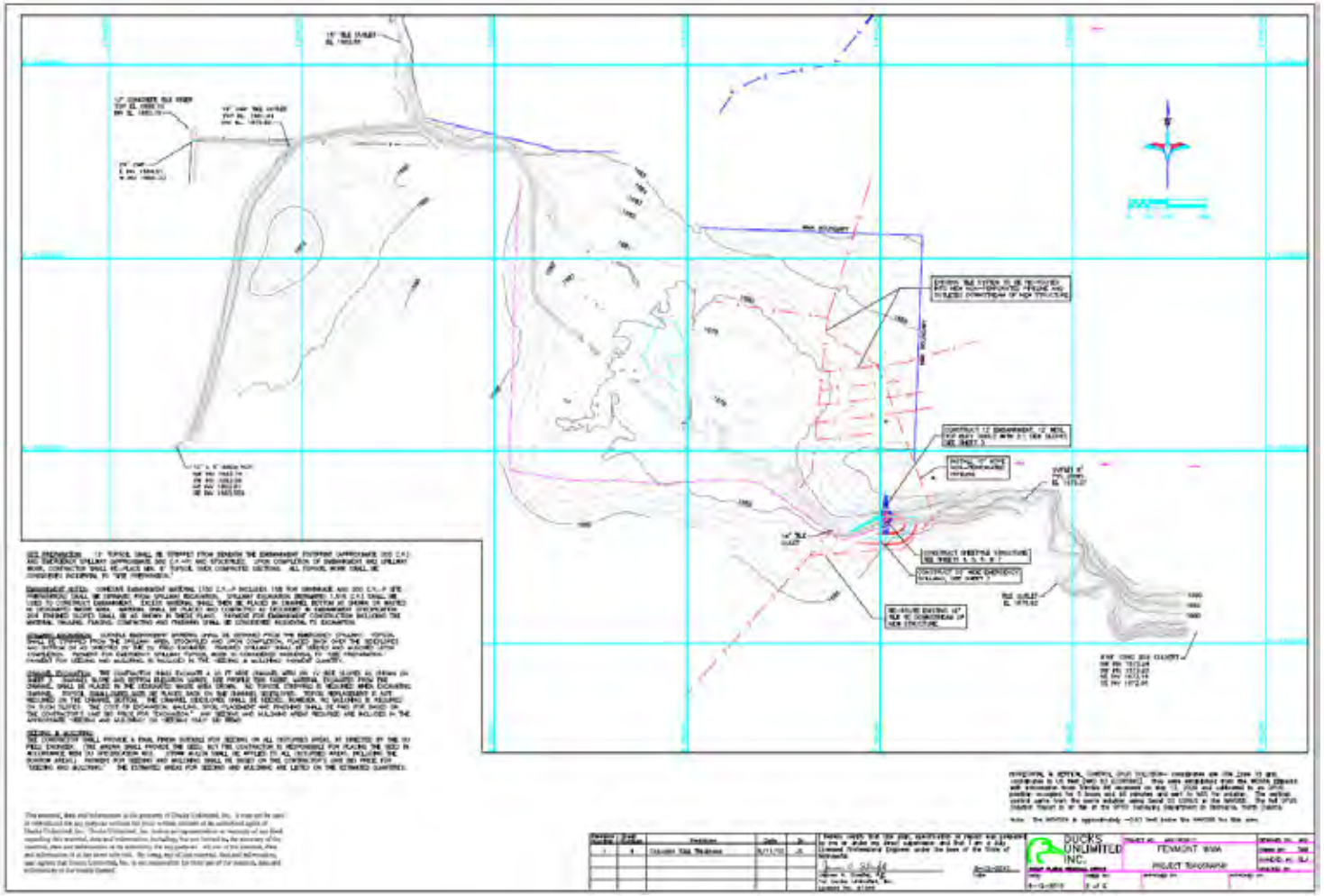
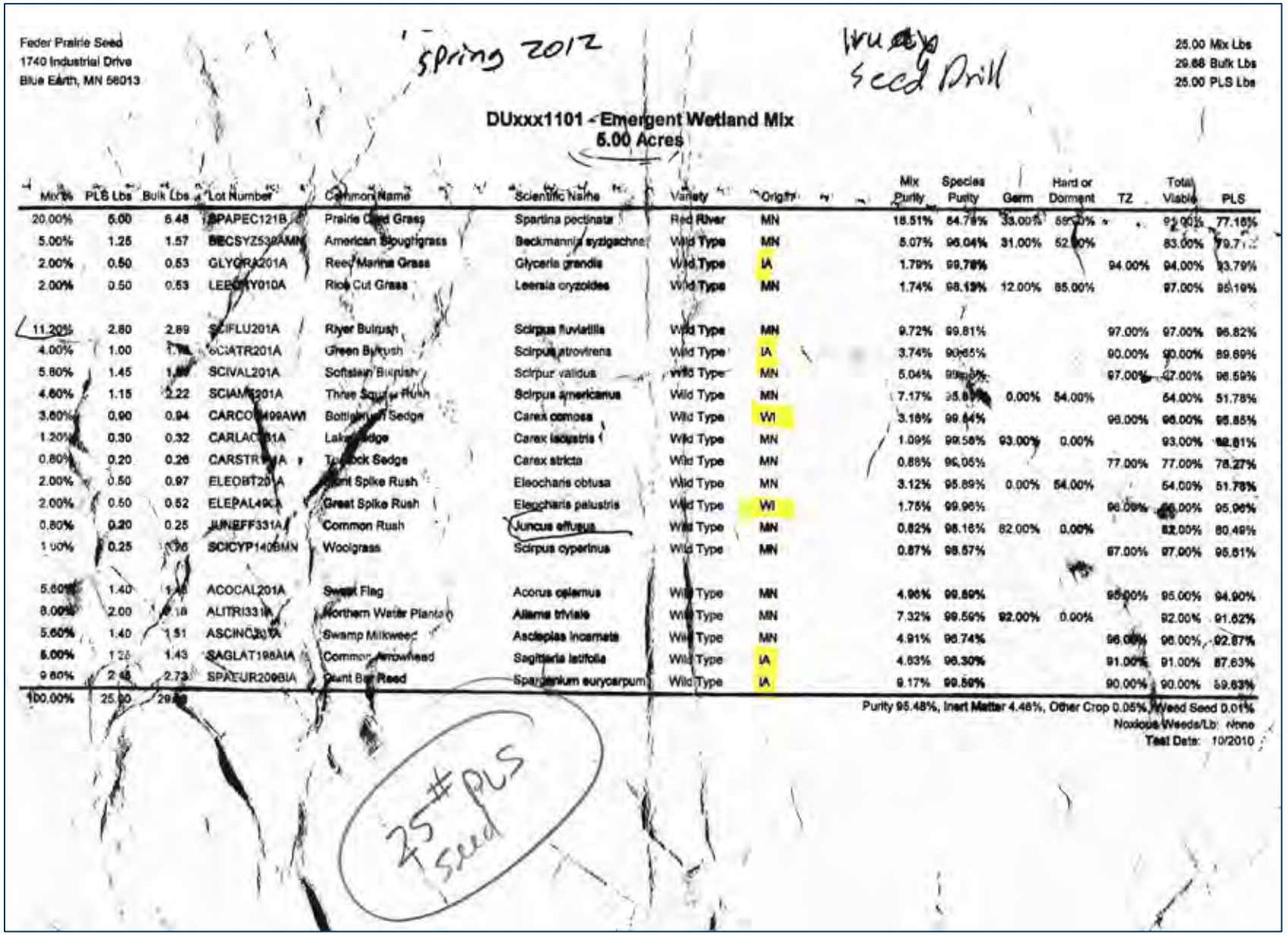


Figure 23-2 Tag for installed seed mix.



Feder Prairie Seed
1740 Industrial Drive
Blue Earth, MN 56013

spring 2012

truck
Seed Drill

25.00 Mix Lbs
29.88 Bulk Lbs
25.00 PLS Lbs

DUxxx1101 - Emergent Wetland Mix
5.00 Acres

Mix%	PLS Lbs	Bulk Lbs	Lot Number	Common Name	Scientific Name	Variety	Origin	Mix Purity	Species Purity	Germ	Hard or Dormant	TZ	Total Viable	PLS
20.00%	5.00	6.48	SPAPEC121B	Prairie Cord Grass	Spartina pectinata	Red River	MN	18.51%	84.78%	33.00%	59.00%		92.00%	77.16%
5.00%	1.25	1.57	BECSYZ538AMN	American Sloughgrass	Beckmannia syzigachne	Wild Type	MN	5.07%	96.04%	31.00%	62.00%		93.00%	89.71%
2.00%	0.50	0.53	GLYGRA201A	Reed Manna Grass	Glyceria grandis	Wild Type	IA	1.79%	98.79%			94.00%	94.00%	93.79%
2.00%	0.50	0.53	LEERAY010A	Rice Cut Grass	Leersia oryzoides	Wild Type	MN	1.74%	98.19%	12.00%	85.00%		97.00%	96.19%
11.20%	2.80	2.89	SCIFLU201A	River Bulrush	Scirpus fluviatilis	Wild Type	MN	9.72%	99.81%			97.00%	97.00%	96.82%
4.00%	1.00	1.03	SCIATR201A	Green Bulrush	Scirpus atrovirens	Wild Type	IA	3.74%	99.65%			90.00%	90.00%	89.69%
5.80%	1.45	1.50	SCIVAL201A	Softstem Bulrush	Scirpur validus	Wild Type	MN	5.04%	99.39%			97.00%	97.00%	96.59%
4.60%	1.15	2.22	SCIAM2201A	Three Square Rush	Scirpus americanus	Wild Type	MN	7.17%	25.81%	0.00%	54.00%		54.00%	51.78%
3.60%	0.90	0.94	CARCOM499AWI	Bottlebrush Sedge	Carex comosa	Wild Type	WI	3.18%	99.64%			96.00%	96.00%	95.85%
1.20%	0.30	0.32	CARLAC201A	Lake Sedge	Carex lacustris	Wild Type	MN	1.09%	99.58%	93.00%	0.00%		93.00%	92.61%
0.80%	0.20	0.26	CARSTR201A	Tussock Sedge	Carex stricta	Wild Type	MN	0.88%	96.05%			77.00%	77.00%	78.27%
2.00%	0.50	0.97	ELEOBT201A	Blunt Spike Rush	Eleocharis obtusa	Wild Type	MN	3.12%	95.89%	0.00%	54.00%		54.00%	51.78%
2.00%	0.50	0.52	ELEPAL499A	Great Spike Rush	Eleocharis palustris	Wild Type	WI	1.75%	99.96%			96.00%	96.00%	95.96%
0.80%	0.20	0.25	JUNEFF331A	Common Rush	Juncus effusus	Wild Type	MN	0.82%	98.16%	82.00%	0.00%		82.00%	80.49%
1.00%	0.25	0.26	SCICYP1499MN	Woolgrass	Scirpus cyperinus	Wild Type	MN	0.87%	98.57%			97.00%	97.00%	95.61%
5.60%	1.40	1.48	ACOCAL201A	Sweet Flag	Acorus calamus	Wild Type	MN	4.96%	99.89%			95.00%	95.00%	94.90%
8.00%	2.00	2.18	ALITRI331A	Northern Water Plantain	Alisma triviale	Wild Type	MN	7.32%	99.59%	92.00%	0.00%		92.00%	91.62%
5.60%	1.40	1.51	ASCINC201A	Swamp Milkweed	Asclepias incarnata	Wild Type	MN	4.91%	96.74%			96.00%	96.00%	92.87%
5.00%	1.25	1.43	SAGLAT199AIA	Common Arrowhead	Sagittaria latifolia	Wild Type	IA	4.63%	96.30%			91.00%	91.00%	87.63%
9.80%	2.45	2.73	SPAEUR2099IA	Giant Bur Reed	Sparganium eurycarpum	Wild Type	IA	9.17%	99.59%			90.00%	90.00%	89.63%
100.00%	25.00	29.88												

Purity 95.48%, Inert Matter 4.46%, Other Crop 0.05%, Weed Seed 0.01%
Noxious Weeds/Lb: None
Test Date: 10/2010

25# PLS
Seed

Figure 23-3 Location of seeding.

Table 23-1 Field vegetation observations for wetland fringe and wetland areas.

Scientific Name	Common Name	Cover Range	Species Planted/Seeded	Species Status
Typha ×glauca	hybrid cattail	50-75%	No	Invasive
Phalaris arundinacea	reed canary grass	5-25%	No	Invasive
Asclepias incarnata var. incarnata	swamp milkweed	1- 5%	Yes	Native
Helianthus grosseserratus	sawtooth sunflower	1- 5%	No	Native
Persicaria hydropiper	marsh waterpepper	1- 5%	Yes	Native
Solidago gigantea	giant goldenrod	1- 5%	No	Native
Spartina pectinata	prairie cordgrass	1- 5%	Yes	Native
Alisma triviale	common water plantain	0-1%	Yes	Native
Carex annectens	yellow-fruit sedge	0-1%	No	Native
Carex bebbii	Bebb's sedge	0-1%	No	Native
Carex vulpinoidea	fox sedge	0-1%	No	Native
Cirsium arvense	Canada thistle	0-1%	No	Invasive
Euthamia graminifolia	grass-leaved goldenrod	0-1%	No	Native
Juncus effusus	soft rush	0-1%	Yes	Native
Lemna minor	lesser duckweed	0-1%	No	Native
Mentha arvensis var. canadensis	common mint	0-1%	No	Native
Mimulus ringens var. ringens	blue monkey flower	0-1%	No	Native
Persicaria amphibia	water smartweed	0-1%	No	Native
Persicaria pensylvanica	Pennsylvania smartweed	0-1%	No	Native
Phragmites australis	common reedgrass	0-1%	No	Native
Potamogeton richardsonii	Richardson's pondweed	0-1%	No	Native
Ranunculus flabellaris	large yellow water crowfoot	0-1%	No	Native
Sagittaria latifolia	broad-leaved arrowhead	0-1%	Yes	Native
Salix interior	sandbar willow	0-1%	No	Native
Schoenoplectus tabernaemontani	soft stem bulrush	0-1%	Yes	Native
Symphyotrichum lanceolatum	panicled aster	0-1%	No	Native
Verbena hastata	hybrid vervain	0-1%	No	Native

Appendix B: Revisit Site Photographs

Photo 23-1 View of control structure with sheet piling and stop log structure. Most stoplogs were removed at the time of the field visit to mimic a summer drawdown intended to stimulate vegetation in mud flat conditions.

Photo 23-2 View looking northwest from the berm near the wetland outlet structure, showing the wetland during draw down condition.

Photo 23-3 View of mudflat looking southeast toward wetland outlet.

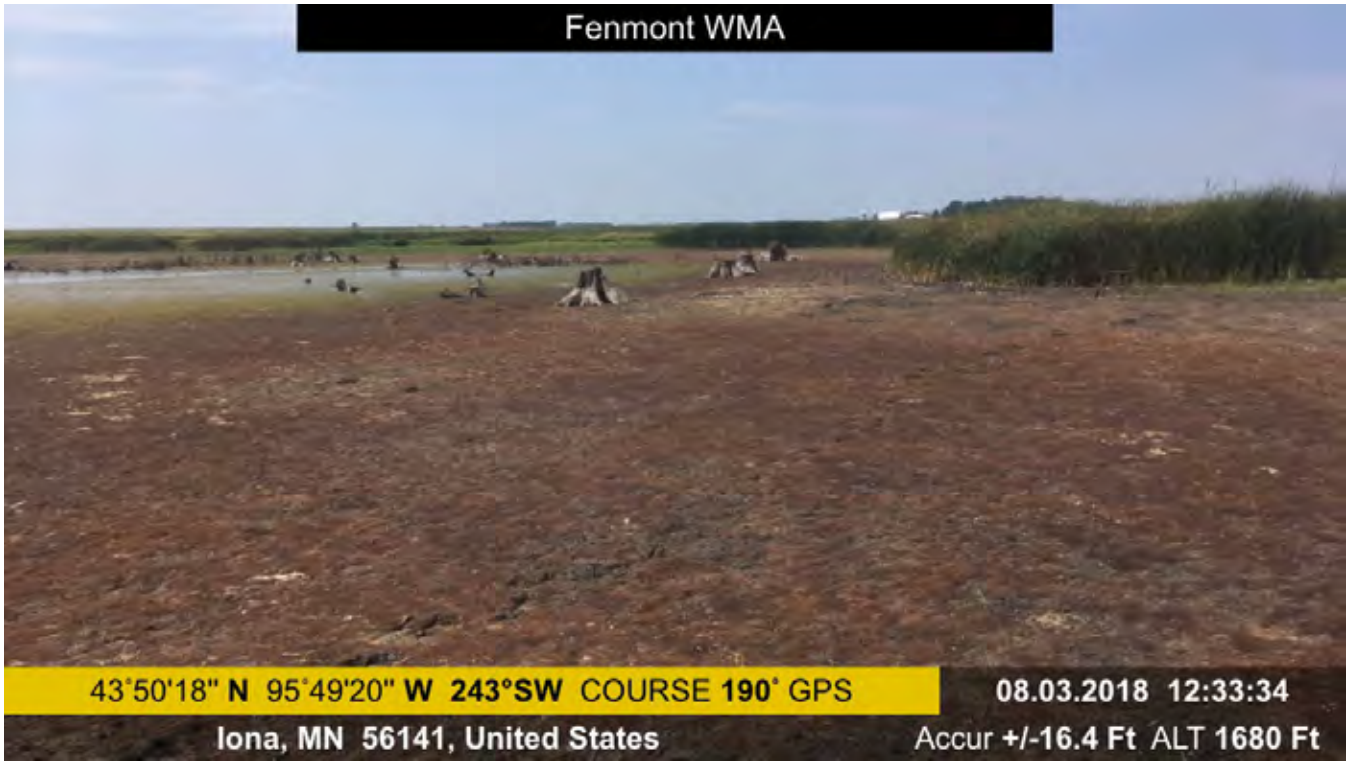


Photo 23-4 Mudflat looking south across drawn down wetland, showing stumps of trees cut at the time of hydrologic restoration as well as abundant dried submergent vegetation (sago pondweed) on mudflat.

Minnesota Department of Natural Resources
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Appendix C: Initial Project Evaluation

*Fields in original evaluation form may vary. Information was translated to newest version as applicable.

Project Background

Project Name: OHF FY-11 4(a) Fund Accelerated Shallow Lake and Wetland Enhancement and Restoration: Fenmont WMA Wetland Restoration

Project Location: Nobles County

Township/Range Section: Township 104N Range 42W Section 1

Project Manager / Affiliated Organization: Jon Schnieder DU, Ricky Lien MN DNR

Fund: OHF ***Fiscal Year Funds:*** 2011

Project Start Date: 2011

Predominant Habitat type: Wetland

Additional Habitat types: Prairie / Savana / Grassland , Choose an item.

Project Status: Establishment Phase

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Glyphosate herbicide treatment to suppress Reed Canary Grass, installing a water control structure to facilitate future manipulation of water levels, pet perimeter seeding.
   The Fenmont WMA site restored wetland hydrology to a 39 acre basin using a water control structure. The adjustable control structure allows wildlife managers to manipulate water levels to optimize habitat for target wetland obligate species, primarily waterfowl. Additionally water level control allows managers to inhibit rough fish (Carp) through drawdowns and undesirable plants (Reed Canary Grass) by

prolonged inundation. This type of hydrologic restoration is consistent with current science regarding wetland habitat restoration. The upland areas of Fenmont WMA have been restored to native grassland (with other funds) and provide a beneficial habitat transition and connectivity between the wetland and surrounding uplands. Prior to the hydrologic restoration, the low wet areas surrounding the wetland were dominated by Reed Canary Grass. These areas were repeatedly treated with Glyphosate herbicide to suppress the living plants. These treatments were conducted in accordance with established science based protocols for Reed Canary control in wetland restoration site preparation (generally accepted reference in BWSR guidance, Native Vegetation Establishment and Enhancement Guidelines. In spring of 2012 the wet perimeter zones of the wetland were seeded with a diverse native wetland seed mix. Approximately half of the seeded species were observed along the wetland perimeter during the site visit walk through in October 2013. Despite appropriate measures to control Reed Canary surrounding the wetland, this aggressive grass continues to dominate vegetative cover due to existing seed bank and continued inflow of seed from contributing ditch channels. DNR area wildlife managers continue to manage Reed Canary Grass with Glyphosate application. Managers should continue to monitor and manage the vegetation communities to maximize habitat value and minimize Reed Canary monoculture.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Complete plans and project records are available from DNR and DU staff.
3. ***What are the stated goals of the project?***
   Quantifiable objectives of the restoration – restore wetland hydrology to a 39 acre basin via water control structure.
4. ***Were measures of restoration success identified in plans?*** *Choose an item.*
   If yes, list specific measurements.
   Click here to enter text.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** Choose an item.
   If yes, provide in Appendix A and list Maps provided:
   Click here to enter text.
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   Outlet control structure to restore/manage wetland hydrology.
   Glyphosate herbicide protocols for Reed Canary control in wetland restoration site preparation (generally accepted reference in BWSR guidance – Native Vegetation Establishment and Enhancement Guidelines).

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***
   NA

Site Assessment

Field Review Date: **10/2/2013**

Field Visit Attendees: Greg Larson BWSR, Wade Johnson MN DNR, Josh Kavanagh DU, Matt Weegman DU, Wendy Krueger MN DNR (Former Slayton Area Wildlife Manager), John Beech MN DNR (Slayton Area Wildlife Tech)

9. ***Surrounding Landscape Characteristics:***
   Extensively drained cropland; corn and soybean production.
10. ***Site Characteristics:***
    a. Soils:
    Loamy calcareous glacial till. Hydric soil-dominated flats, depressions and swales comprise about 40 percent of the site.
    b. Topography:
    Gently rolling 0-6 percent slopes dominate the uplands.
    c. Hydrology:
    A near-surface water table dominate lower-lying landscape. The restored shallow lake is a flow-through wetland system predominantly sourced by a stream. Overland flow augments the stream.
    d. Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:
    BWSR wetland emergent mix planted 1.0 feet below to 1.5 feet above normal pool elevation. Uplands being restored to native prairie. There are minimal invasives except in drawdown area. Despite aggressive control, RCG persists. See point 13.
    e. Vegetation B: Meander Search Species List (as appropriate for site)
    Click here to enter text.
11. ***Is the plan based on current science?*** Yes
    Yes, outlet control structure to restore/manage wetland hydrology.
12. ***List indicators of project outcomes at this stage of project:***
    (a) hydrology has been stabilized through the control structure and (b) vegetation is becoming established with special attention given to areas where RCG persists
13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    Yes
14. ***Are corrections or modifications needed to meet proposed outcomes?***
    No
15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    Click here to enter text.
16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No
17. ***Are follow-up assessments needed? Explain.***
    No
18. ***Additional comments on the restoration project.***

Managers of this project faced significant challenges to the long-term integrity of this project. Examples: (1) To accept this project, adjacent landowners demanded rerouting of tile lines around the project. This action could potentially reduce hydrology to the pool but could also reduce nitrogen input. (2) The control structure is designed to allow drawdown of the pool. In this case, the extent and duration of drawdown presents a trade-off between the benefits of drawdown (desiccation of sediments) to marsh ecology and control of carp versus reestablishment of RCG. These challenges are typical of those faced by proponents of wetland restoration in heavily drained agriculture-dominated landscapes. The managers of this project have considered the tradeoffs and have implemented adaptive management to provide a reasonable balance. Carp control is being achieved and RCG is being controlled to the extent that the viable forb population is being maintained. Managers are to be commended for initiating water quality monitoring.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***
    The managers of this project have considered many "what ifs" and have developed appropriate adaptive management strategies. All projects have trade-offs, and this project is no exception. Post-establishment maintenance of OHF projects must be funded from general operating funds. To minimize long-term maintenance costs, it is incumbent on managers to be successful in the establishment phase. This prosecution of this project suggests a high likelihood of successful establishment with minimal long term maintenance.
21. ***Site Assessor(s) Conducting Review:***
    Greg Larson BWSR

Site Photographs

Photo 23-5 Water control structure installed to facilitate water level manipulation in the wetland upstream (left in the photo).

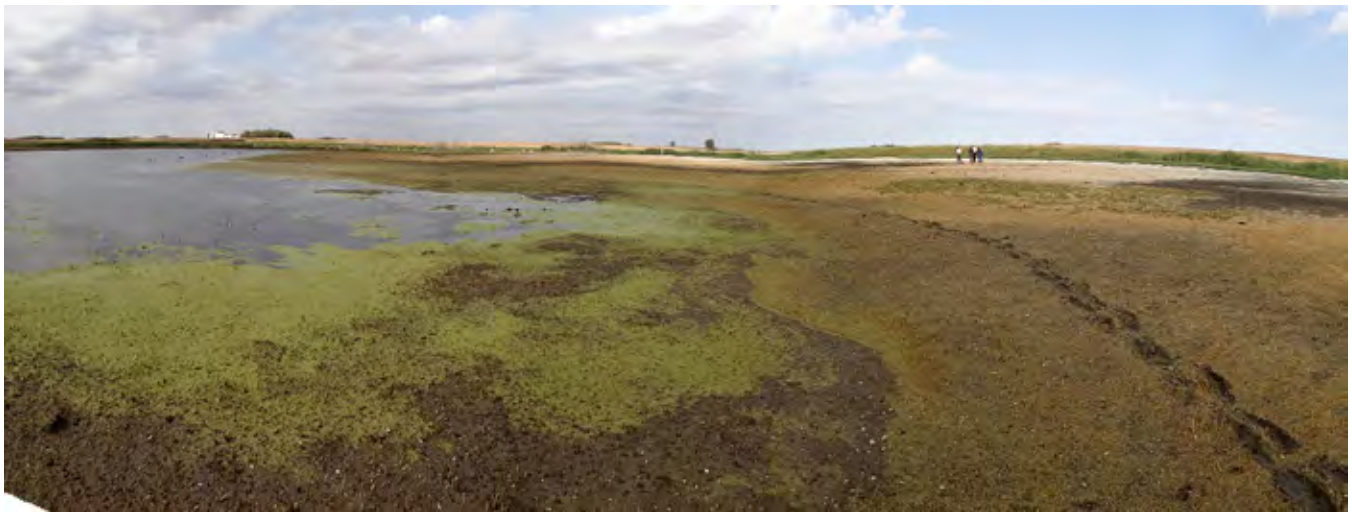

Photo 23-6 View of mudflat looking northwest into the wetland.

Photo 23-7 Reed Canary grass dominated vegetation on the north east side of the wetland.

Minnesota Department of Natural Resources
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24) OHF Four Corners WMA Wetland Restoration - Revisit

Legacy Fund Restoration Evaluations

See Appendix C for Project Background and Initial Project Evaluation

Project Name: OHF FY-11 4(a) Fund Accelerated Shallow Lake and Wetland Enhancement and Restoration (Four Corners WMA Wetland Restoration)

Project Manager / Affiliated Organization: Jon Schneider/Ducks Unlimited; Chad August chad.august@state.mn.us (Chad recently moved into this position with MN DNR); (Ricky Lien ricky.lien@state.mn.us)

Fund: OHF ***Fiscal Year Funds:*** 2011

County: Martin

Primary Activity: Wetland Restoration

Project Size: 27 acres

Project Completed: 2012

Follow Up Site Assessment

Field Review Date: 8/3/2018

Field Visit Attendees: Chad August (MNDNR), Wade Johnson (MN DNR), Gina Quiram (MN DNR), Paul Bockenstedt (Stantec)

1. ***Please note any substantive changes to the site characteristics since last site assessment.***

   The Four Corners WMA project restored wetland hydrology to five formerly drained wetland basins totaling 27 acres. Hydrologic restoration was achieved through the installation of five inline (subsurface) water control structures (agri-drains) connected to existing tile lines and construction of three earthen

embankments. Survey and engineering design work was completed by Ducks Unlimited. Drawdowns and intensive water level management will be used on the basins to provide an optimal balance of wildlife habitat and water quality, as directed by area wildlife managers. Upland areas disturbed during construction activities at the five restored basins were seeded with local ecotype grasses and forbs. Wetland areas were seeded by MN DNR staff between 2009 and 2011, before the wetland hydrology was restored. Wetland species were included in the mixes. Only the tile breaks and dike were reseeded post-construction. Wetland vegetation that came up established from the seed mix installed before construction, from seed bank, and other natural sources (i.e. natural seed dispersal). There are no readily accessible records of the seed mixes that were installed, just that seeding occurred and in which years it was accomplished.

There were no records available from the previous assessment that specifically described the composition of upland, wetland fringe or wetland vegetation so we're unable to address potential changes in vegetation composition since 2013. During this assessment visit, the composition of vegetation in upland, wetland fringe and emergent zone areas was comprised of a mix of native and nonnative vegetation.

The previous assessment noted that: "these basins have the potential to develop into dense hybrid cattail that would lower waterfowl habitat value" – several of the wetland basins did end up developing dense stands of nonnative/hybrid cattail that have been treated through a combination of fire, herbicide and water level manipulation in select locations. Wetland fringe areas include a mix of desirable native grasses, sedges, rushes and forbs, but also include stands of the invasive, nonnative reed canary grass which has not been specifically targeted for treatment. There are no records on file that indicate there was active management of wetland fringe vegetation since the time of seeding/hydrologic restoration.

Upland prairie restoration areas were generally in good or better condition at the time of the 2018 assessment with good stands of native grasses and forbs, which often occurred in solid stands. The primary invasive, nonnative plant present in upland areas was Canada thistle. MN DNR staff have been aggressively treating Canada thistle at appropriate times and with appropriate tools (mowing/spraying). DNR herbicide application records and observations indicate progress is being made to reduce Canada thistle levels in upland areas.

2. ***Is the plan based on current science?*** Portions
   Hydrologic restoration activities utilized best practices with hydrologic modeling, engineering design and construction. Seeding of wetland areas two to three years in advance of hydrologic restoration appears to be an uncommon practice. A current accepted best practice for establishing native vegetation is to conduct three to five years of active management after initial seeding – the limited ability to fully manage wetland and wetland fringe vegetation during the grow-in period (c. 2012-2015) may have in part enabled invasive vegetation to become well established in some portions of this site.
3. ***List indicators of project outcomes at this stage of the project.***
   The hydrology of the five restored wetlands indicates that the restoration of water regime is stable and successful. All wetlands are utilized by species of wildlife characteristic for the restored wetland types, including the larger wetlands that are being utilized by a wide variety of waterfowl during the fall migration period. Native plant species richness is generally good, particularly in upland and wetland fringe areas.
4. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***

Yes, the project plan and implementation of the plan has gone largely as envisioned and achieved the proposed hydrologic outcomes, as well as achieving the development of vegetation consistent with providing appropriate upland game and waterfowl habitat.

5. ***Are corrections or modifications needed to meet proposed outcomes?***
   The project, as it has been implemented, is satisfying the proposed outcomes. Hydrology of the five restored wetlands is as was intended during the design and MN DNR staff are actively managing hydrologic conditions for the benefit of wildlife and native plant communities.
6. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
   Yes, MN DNR staff intends to continue fostering development of native vegetation through the use of an appropriate set of integrated tools and techniques, as well as managing wetland water levels for the purpose of maintaining seasonally appropriate wildlife habitat and minimizing total nonnative, invasive plant cover (especially nonnative/hybrid cattail)
7. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
   All of the implemented activities have contributed to improvements in wildlife habitat and water quality, compared to prior existing conditions. MN DNR staff indicates that they will continue to manage the site using prescribed fire, spot mowing, spot weed treatment and water level management, all of which are compatible with maintaining quality prairie and wetland habitats.
8. ***Are follow-up assessments needed? Explain.***
   It does not appear that additional project assessments would be necessary or yield significant changes in current information. An exception to this might be if the sixth wetland basin identified for restoration in the original design documents (but not part of the OHF project) is restored it may be worth revisiting the site or re-interviewing MN DNR staff to see if the additional (future) wetland restoration results in any substantial changes to use of the area by wildlife or observed hydrologic conditions/characteristics.
9. ***Additional comments on the restoration project.***
   Considering the relatively low amount of active management work that available resources has enabled in wetland fringe areas, the total native (vs. invasive) cover is good. As predicted by the evaluator during the 2013 site visit, nonnative/hybrid cattail has gained a significant foothold in several wetlands (prompting active treatment of this invasive in at least one of the wetlands).

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.

10. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    High
11. ***Provide explanation of reason(s) for determination.***
    The restored wetlands in this project are reported to be heavily used by waterfowl and shorebirds during spring and fall migration, as well as by waterfowl during the breeding season. MN DNR Wildlife

staff are implementing thoughtful and targeted management with the resources they have available to attain the goal of continued development/improvement of the five wetland basins and surrounding uplands during the coming years.

12. ***Site Assessor(s) Conducting Review:***

    Paul Bockenstedt, Ecologist (Stantec)

Appendix A: Revisit Site maps, Project plans or Vegetation tables

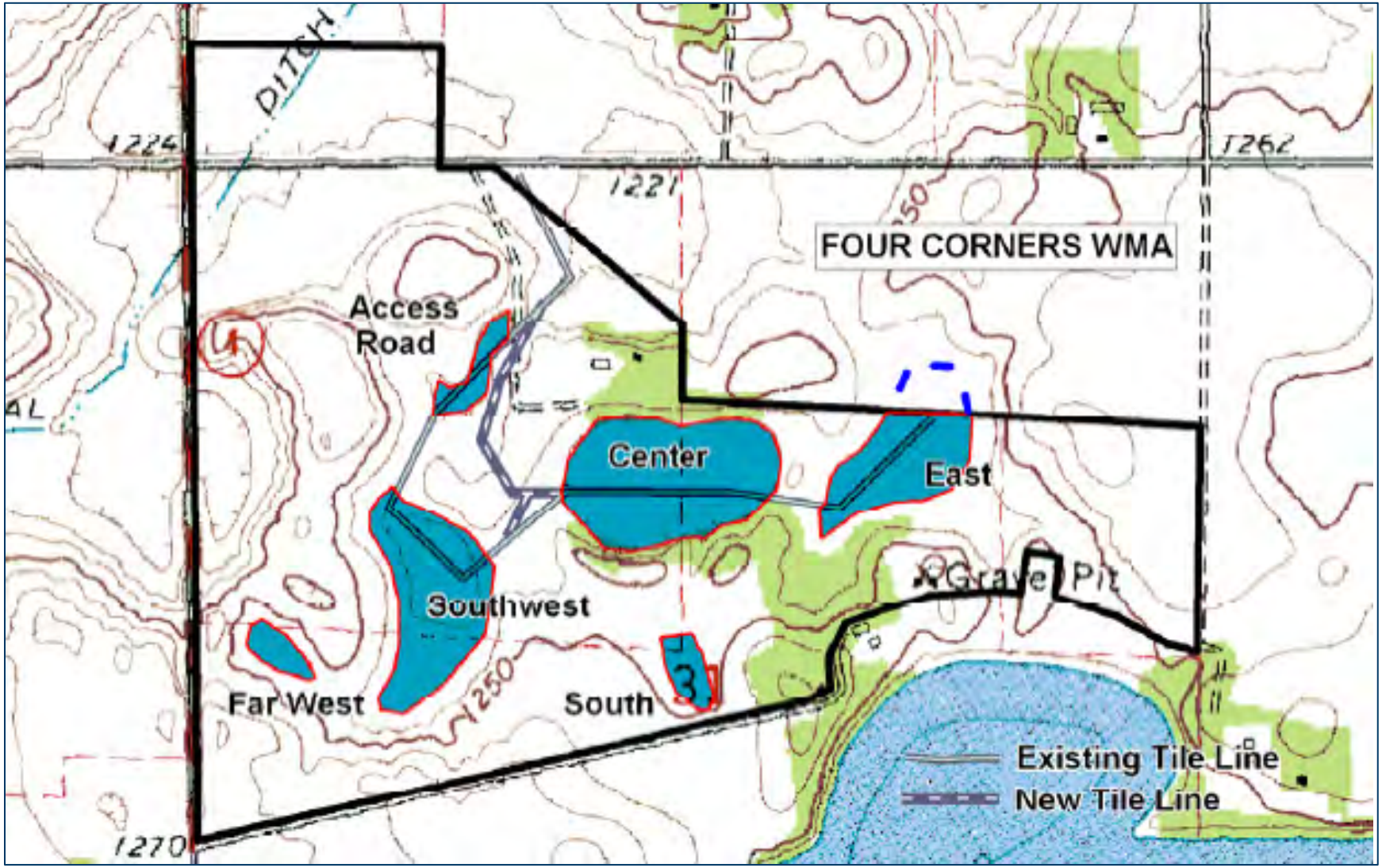

Figure 24-1 Excerpt from Ducks Unlimited site map showing names and location of restored wetlands.

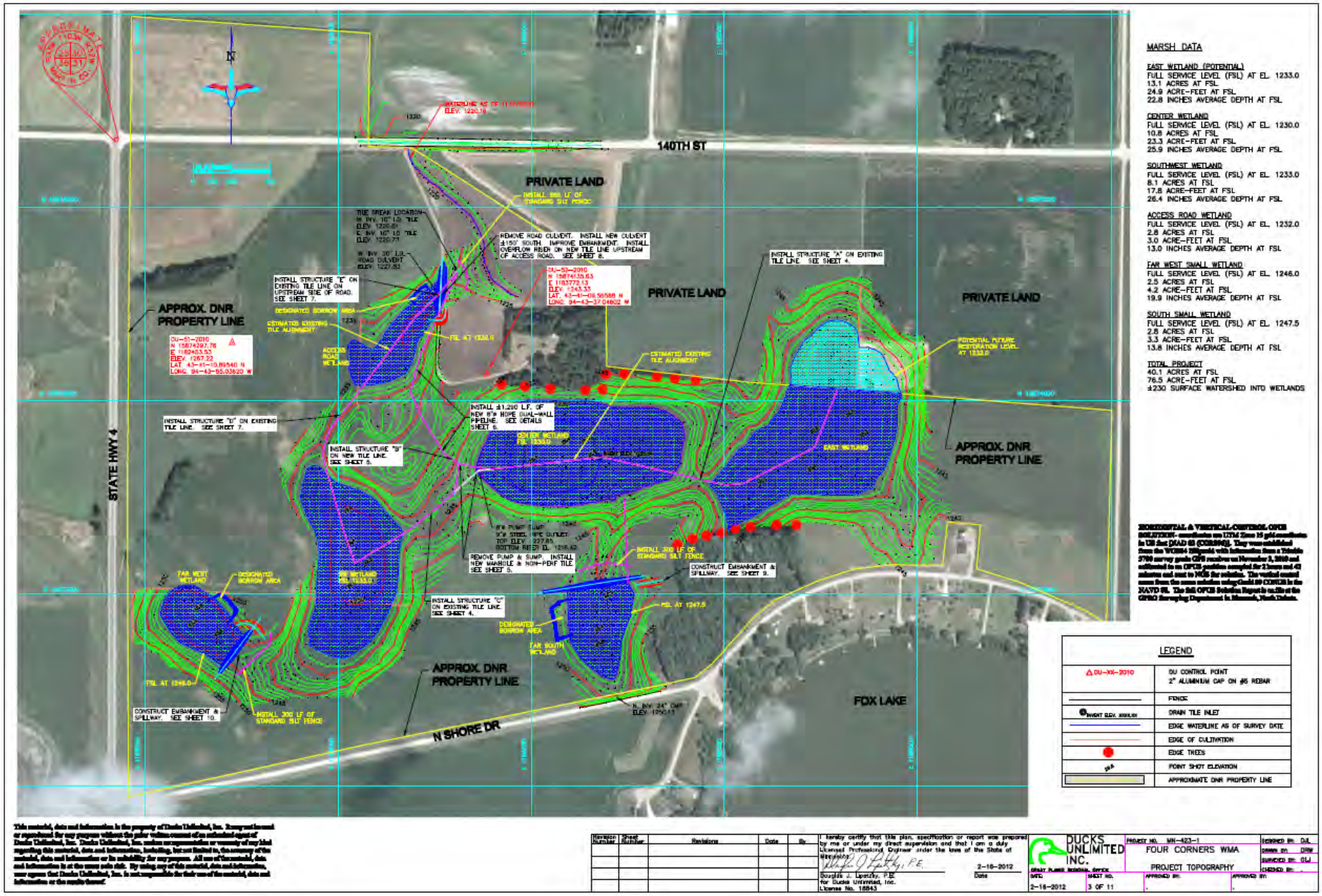

Figure 24-2 Plan sheet from restoration design set by Ducks Unlimited showing wetland basins restored, as well as proposed final contours (extent of grading).

Table 24-1 Plant species observed during site revisit.

Scientific Name	Common Name	Cover Range	Species Status
TYPHA ×GLAUCA	hybrid cattail	50-75%	Invasive
PHALARIS ARUNDINACEA	reed canary grass	25-50%	Invasive
Bolboschoenus fluviatilis	river bulrush	5-25%	Native
Alisma triviale	common water plantain	1- 5%	Native
Echinochloa crus-galli	cockspur barnyard grass	1- 5%	Native
Leersia oryzoides	rice cut grass	1- 5%	Native
Schoenoplectus tabernaemontani	soft stem bulrush	1- 5%	Native
Scirpus atrovirens	dark green bulrush	1- 5%	Native
Solidago gigantea	giant goldenrod	1- 5%	Native
Asclepias incarnata var. incarnata	swamp milkweed	0-1%	Native
Bidens connata	swamp beggarticks	0-1%	Native
Bidens frondosa	leafy beggarticks	0-1%	Native
Calamagrostis canadensis	bluejoint	0-1%	Native
Carex bebbii	Bebb's sedge	0-1%	Native
Carex lacustris	lake sedge	0-1%	Native
Carex vulpinoidea	fox sedge	0-1%	Native
CIRSIUM ARVENSE	Canada thistle	0-1%	Invasive
CYPERUS ESCULENTUS var. leptostachyus	cocoa cyperus	0-1%	Invasive
Eleocharis erythropoda	bald spikerush	0-1%	Native
Helianthus grosseserratus	sawtooth sunflower	0-1%	Native
Juncus effusus	soft rush	0-1%	Native
Juncus torreyi	Torrey's rush	0-1%	Native
Lemna minor	lesser duckweed	0-1%	Native
Lycopus americanus	cut-leaved bugleweed	0-1%	Native
Mimulus ringens var. ringens	blue monkey flower	0-1%	Native
Panicum virgatum	switchgrass	0-1%	Native
PERSICARIA MACULOSA	lady's thumb	0-1%	Invasive
Phragmites australis	common reedgrass	0-1%	Native
Potamogeton richardsonii	Richardson's pondweed	0-1%	Native
RUMEX CRISPUS	curly dock	0-1%	Invasive
Salix nigra	black willow	0-1%	Native
SONCHUS ARVENSIS	field sow thistle	0-1%	Invasive
Sparganium eurycarpum	giant bur-reed	0-1%	Native
Symphyotrichum lanceolatum	panicled aster	0-1%	Native
Typha latifolia	broad-leaved cattail	0-1%	Native
Verbena hastata	blue vervain	0-1%	Native

Appendix B: Revisit Site Photographs

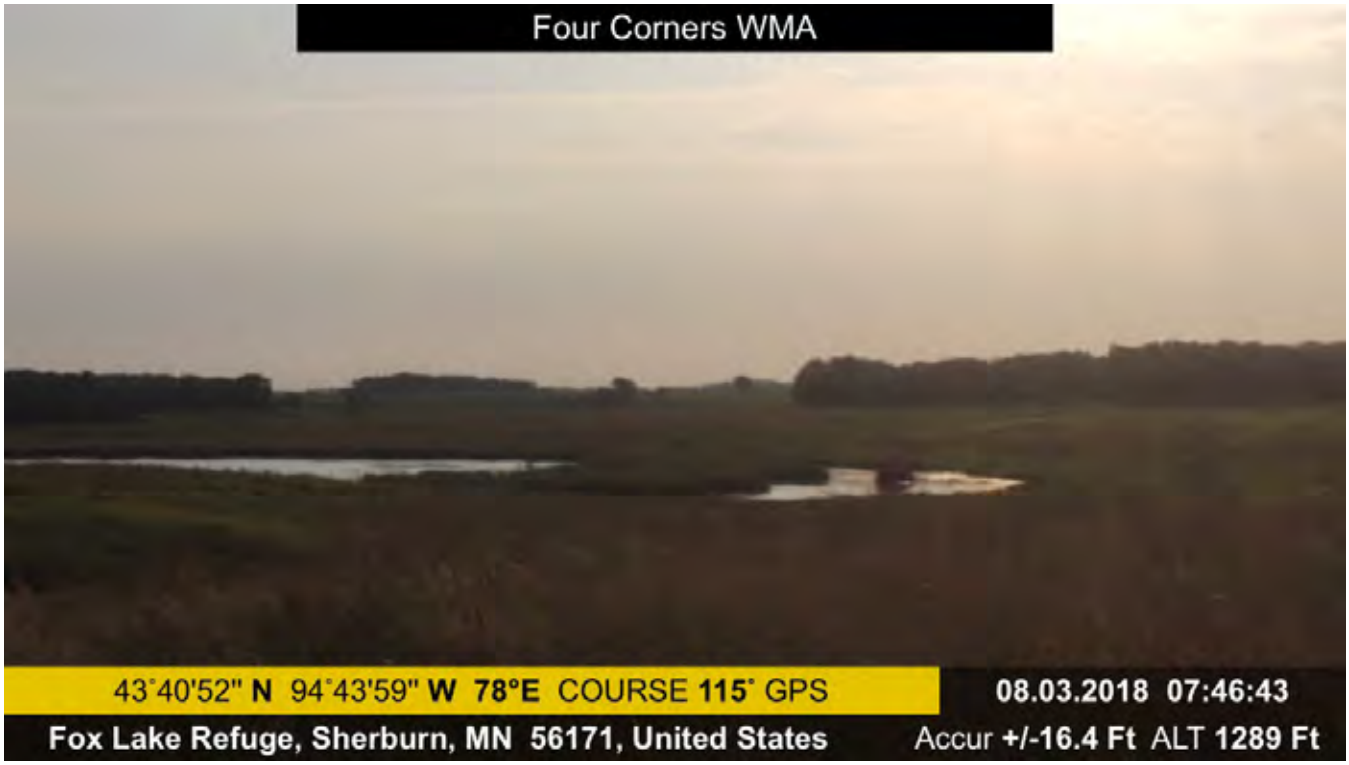

Photo 24-1 View from south, looking at Far West wetland restoration from distance showing open water and hydrid cattail.

Photo 24-2 View of Far West wetland vegetation with dense stand of hybrid cattail.

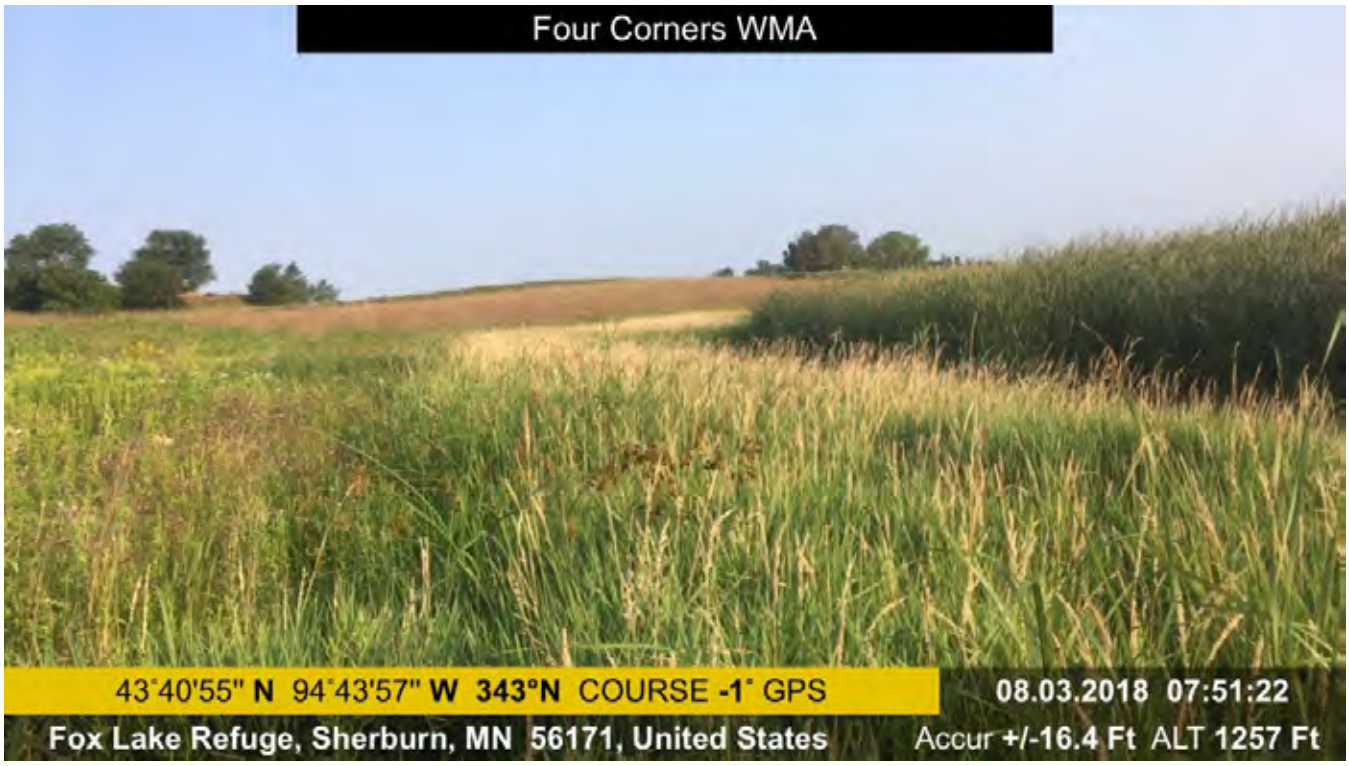

Photo 24-3 View illustrating characteristic wetland fringe vegetation, which is generally dominated by reed canary grass.

Photo 24-4 Looking northeast at South wetland restoration.

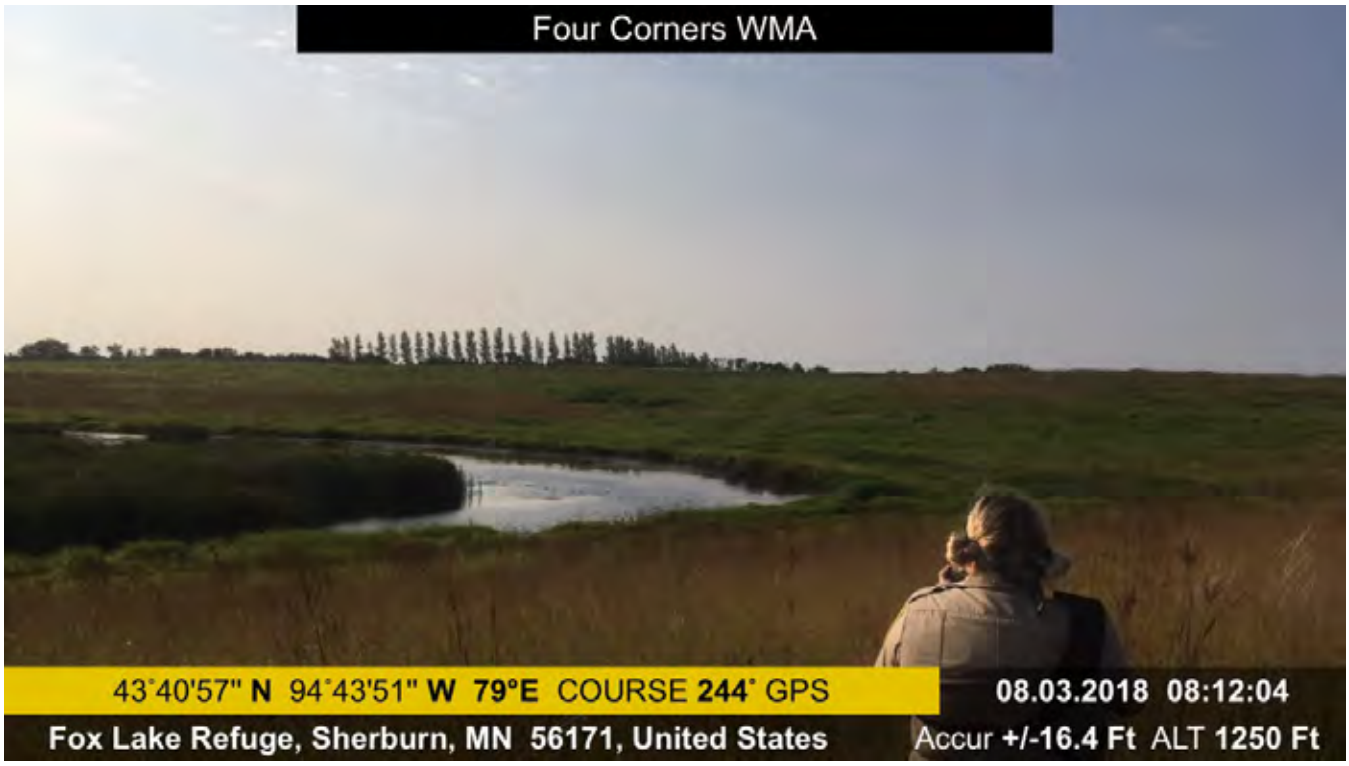

Photo 24-5 looking southeast at South wetland restoration.

Photo 24-6 West fringe of South wetland, looking north showing narrow transition zone into sloped upland. Wetland fringe includes mix of diverse native cover and the invasive reed canary grass.

Photo 24-7 Southwest edge of East wetland, looking south showing flooded reed canary grass and open water.

Photo 24-8 View of outlet structure location on northwestern most restored wetland with invasive reed canary grass dominant.

Photo 24-9 Close up view of outlet structure location on northwestern most restored wetland with invasive reed canary grass dominant.

Photo 24-10 View looking southwest from outlet control structure. Hybrid cattail have been treated in this wetland.

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Appendix C: Initial Project Evaluation

*Fields in original evaluation form may vary. Information was translated to newest version as applicable.

Project Background

Project Name: OHF FY-11 4(a) Fund Accelerated Shallow Lake and Wetland Enhancement and Restoration (Four Corners WMA Wetland Restoration)

Project Location: Martin County

Township/Range Section: Township 103N Range 32W Section 31

Project Manager / Affiliated Organization: Jon Schneider DU jschneider@ducks.org; Ricky Lien MN DNR Ricky.Lien@state.mn.us

Fund: OHF ***Fiscal Year Funds:*** 2011

Project Start Date: 2011

Predominant Habitat type: Wetland

Additional Habitat types: Prairie / Savana / Grassland , Choose an item.

Project Status: Establishment Phase

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

22. ***What are the specific project components and treatments?***
    The Four Corners WMA project restored wetland hydrology to five formerly drained wetland basins totaling 27 acres. Hydrologic restoration was achieved through he instillation of 5 inline (subsurface) water control structur4es (agri-drains) connected to existing tile lines and construction of three earthen

embankments. Survey and engineering design work was completed by Ducks Unlimited. Drawdowns and intensive water level management will be used on the basins to provide an optimal balance of wildlife habitat and water quality, as directed by the area wildlife managers. Upland areas disturbed during constructions were seeded with local ecotype grasses and forbs. Wetland areas were left unseeded to allow wetland vegetation regrowth from the natural seed bank. These basins have the potential to develop into dense hybrid cattail that would lower waterfowl habitat value. DNR Area Wildlife manager should monitor and manage vegetation in the naturally re-vegetation wetlands to avoid cattail monoculture.

23. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
    Complete plans and project records are available from DNR and DU staff.
24. ***What are the stated goals of the project?***
    Restore wetland hydrology to six basins totaling 27 acres via breaking historic drain tile and controlling water levels with 'Agri drains'
25. ***Were measures of restoration success identified in plans?*** *Choose an item.*
    If yes, list specific measurements.
    Click here to enter text.
26. ***Are plan Sets available?*** Choose an item. ***Have new GIS maps been created?*** Choose an item.
    If yes, provide in Appendix A and list Maps provided:
    Click here to enter text.
27. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
    Click here to enter text.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

28. ***Were alterations made to the original plan during construction?***
    No
    Click here to enter text.
29. ***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?***
    NA

Site Assessment

Field Review Date: 10/1/2013

Field Visit Attendees: Click here to enter text.

30. ***Surrounding Landscape Characteristics:***
    Click here to enter text.
31. ***Site Characteristics:***

f. Soils:

Loamy calcareous glacial till. Hydric soil-dominated flats, depressions and swales comprise about 20 percent of the site.

g. Topography:

Gently rolling 0-6 percent slopes dominate the uplands.

h. Hydrology:

A near-surface water table dominate lower-lying landscape. The restored shallow lake and wetlands are predominantly sourced by overland flow and the near surface water table. The use of agri-drain control structures greatly aids control of hydrology.

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

A wetland seed mix was not used. The managers relied on native seed bank. They used Big Bluestem sparingly as it is aggressive and tends to outcompete facultative hydrophytes. Uplands being restored to native prairie. There are minimal invasives. Foxtail is commonly found on more recently established areas. This is not a concern as older established areas show a dominance of native vegetation.

j. Vegetation B: Meander Search Species List (as appropriate for site)

Click here to enter text.

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

Restored wetland hydrology with adaptive controls (agri-drains) for modifying hydrology

33. List indicators of project outcomes at this stage of project:

(a) Hydrology has been restored by numerous control structures and (b) vegetation is becoming established with special attention given to areas where RCG and hybrid cattail persists.

34. Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?

Yes

35. Are corrections or modifications needed to meet proposed outcomes?

No

36. Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?

Yes

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

No

38. Are follow-up assessments needed? Explain.

No

39. Additional comments on the restoration project.

Managers have made innovative use of water control structures. In addition to restoring hydrology per se', water levels of individual basins can be regulated. In addition to enhancing hydrology, managers can use water level control to manage vegetation. To control hybrid cattail, managers are considering grazing, baling, burning and herbicide.

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.

40. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    High
41. ***Provide explanation of reason(s) for determination.***
    Post-establishment maintenance of OHF projects must be funded from general operating funds. To minimize long-term maintenance costs, it is incumbent on managers to be successful in the establishment phase. The execution of this project suggests a high likelihood of successful establishment with minimal long term maintenance. Managers have employed adaptive management to meet challenges of this project.
42. ***Site Assessor(s) Conducting Review:***
    Greg Larson

Site Photographs

Photo 24-11 Project managers and site assessors in front of the “Center” restored wetland.

Photo 24-12 Hybrid cattail emerging from one of the restored wetland basins.

Photo 24-13 Seedlings emerging in the wet fringe of one of the restored wetlands.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

25)OHF Crow Hassan Prairie Restoration

Project Background

Project Name: Crow-Hassan Prairie Complex Restoration and Enhancement

Project Location: Crow-Hassan Park Reserve

Township/Range Section: Township 120N Range 23W Section Click here to enter text.

Project Manager / Affiliated Organization: John Moriarty, Three Rivers Park District Senior Manager of Wildlife

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

Project Start Date: November 2014

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Choose an item. , Choose an item.

Project Status: Establishment Phase

County: Hennepin

Primary Activity: Prairie Restoration

Project Size: 246 acres

Project Completed: Spring 2018

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

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

Tree removal, site prep (including herbicide treatments), seeding, burning. These activities were completed to restore 246 acres of prairie and enhance/tie in woodlands to park burn units. This evaluation focused on the prairie restoration. Activities below were applied as a part of managing the larger habitat complex in the park.

- Brush/tree removal – November 2014 through January 2015
- Enhancement seeding – Early June 2015
- Herbicide Application – mid May 2015
- Prescribed burn – late July 2015
- Herbicide application early Sept 2015
- Seeding - late Sept 2015
- Enhancement seeding – early June 2016
- Mowing – mid June 2016
- Weed Control – mid July 2016
- Mowing – mid August 2016
- Weed control – mid September 2016
- Enhancement seeding – early June 2017
- Mowing – mid June 2017
- Weed Control – mid September 2017
- Woodland clearing / burn prep – October through November 2017
- Prescribed burn – May 2018
- Savanna Woodland seeding – early June 2018

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   LSOCH Accomplishment Plan (https://www.lsohc.leg.mn/FY2015/accomp_plan/index_2_approp.html)
   Project map set, prairie bids specs, prairie reconstruction timeline, final seed mix, tree removal bid, and a timeline series of photos all provided by the project manager and housed at Three Rivers Park District.
3. ***What are the stated goals of the project?***
   Continuing to restore old field areas as part of a larger prairie restoration landscape; increasing habitat for important pollinators, and often very specific pollinators including regal fritillary; treatments that lead to replicating the functions and diversity of native prairie for wildlife habitat (hognose and bull snakes, blandings turtles) and pollinator habitat.
   From the LSOCH Accomplishment Plan: "This project will convert an additional 246 acres of old field into prairie, and tie in 28 more acres of woodlands into the burn plan. When completed the project will create a fire managed complex in excess of 1100 acres, which includes over 200 acres of shallow lakes and wetlands. The complex will provide excellent nesting habitat for waterfowl, sandhill cranes, Trumpeter Swans, grassland birds, many of which are SGCNs, as well as, numerous species of mammals and reptiles, including state T&E species. The forb diversity on the existing and proposed restorations will provide excellent habitat for native pollinators."
4. ***Were measures of restoration success identified in plans?*** *No*
   If yes, list specific measurements.
   There are no stated measures of what success looks like; but from speaking with them they are doing some bee and regal fritillary survey work; the vast majority of species identified in seed mix were found

to be present and often abundant on site; park staff generally seemed pleased with outcomes of project.

5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** Yes
   If yes, provide in Appendix A and list Maps provided:
   Plan sets were available and new GIS maps were created that delineated restoration sites.
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   Restoration treatments, sequence and timing are consistent with current science and park staff coordinated with rare species experts.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   Yes
   Two species from the original list were not included in the mix (Dotted Blazing star and Golden Aster). Five species were added to the mix (Canada Milk Vetch, Meadow Blazing Star, Prairie Phlox, Prairie Cinquefoil and Showy Goldenrod). Minor adjustments were made to % of mix for a number of species.
8. ***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?***
   Alterations to the seed mix like this are common and in this case are not likely to change project outcomes.

Site Assessment

Field Review Date: **7/3/2018**

Field Visit Attendees: John Moriarty, Three Rivers Park District Senior Manager of Wildlife; Paul Kortebein, Three Rivers Park District Head Forester; Mark Cleveland, MN DNR Site Assessor; Michelle Martin, MN DNR Site Assessor; Sarah Strommen, MN DNR Assistant Commissioner; Wade Johnson, MN DNR Restoration Evaluation Program Coordinator; Gina Quiram, MN DNR Restoration Evaluation Specialist.

9. ***Surrounding Landscape Characteristics:***
   Restored prairie and oak savannah with pockets of forest and wetlands/small lakes; the whole site is along the Crow River.
10. ***Site Characteristics:***
    a. Soils:
    Sandy
    b. Topography:
    Rolling
    c. Hydrology:
    Mesic to wet
    d. Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:

Prairie dominated by native species 80%.

e. Vegetation B: Meander Search Species List (as appropriate for site)

Meander search species list in table below.

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

    Click here to enter text.

12. ***List indicators of project outcomes at this stage of project:***

    Good diversity present in the restored prairie; non-native species present but not dominant.

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***

    Yes.

14. ***Are corrections or modifications needed to meet proposed outcomes?***

    Perhaps the park could interseed to further increase species diversity.

15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***

    Yes, practical; potential limitations would include having the resources available to continue prescribed burning (but resources seem to be available and stable for the Park system).

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

    No

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

    Yes, another assessment in 5 years would be beneficial, especially to compare outcomes over time at this site (location meandered) but for other sites too. It would also be useful to see what pollinator responses to the restoration efforts are over a longer period of time.

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

    These planting have been very successful especially for such a young restoration; diversity is currently good and the distribution of plants across the restorations show variability which is typical of native plant communities.

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.

19. ***The project will:***

    Meet proposed outcomes

    Confidence of outcome determination:

    High

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

    Current state of restoration is very good and they seem to have the resources to maintain the investment.

21. ***Site Assessor(s) Conducting Review:***

    Mark Cleveland, MN DNR Site Assessor; Michelle Martin, MN DNR Site Assessor

Appendix A: Site maps, Project plans or Vegetation tables

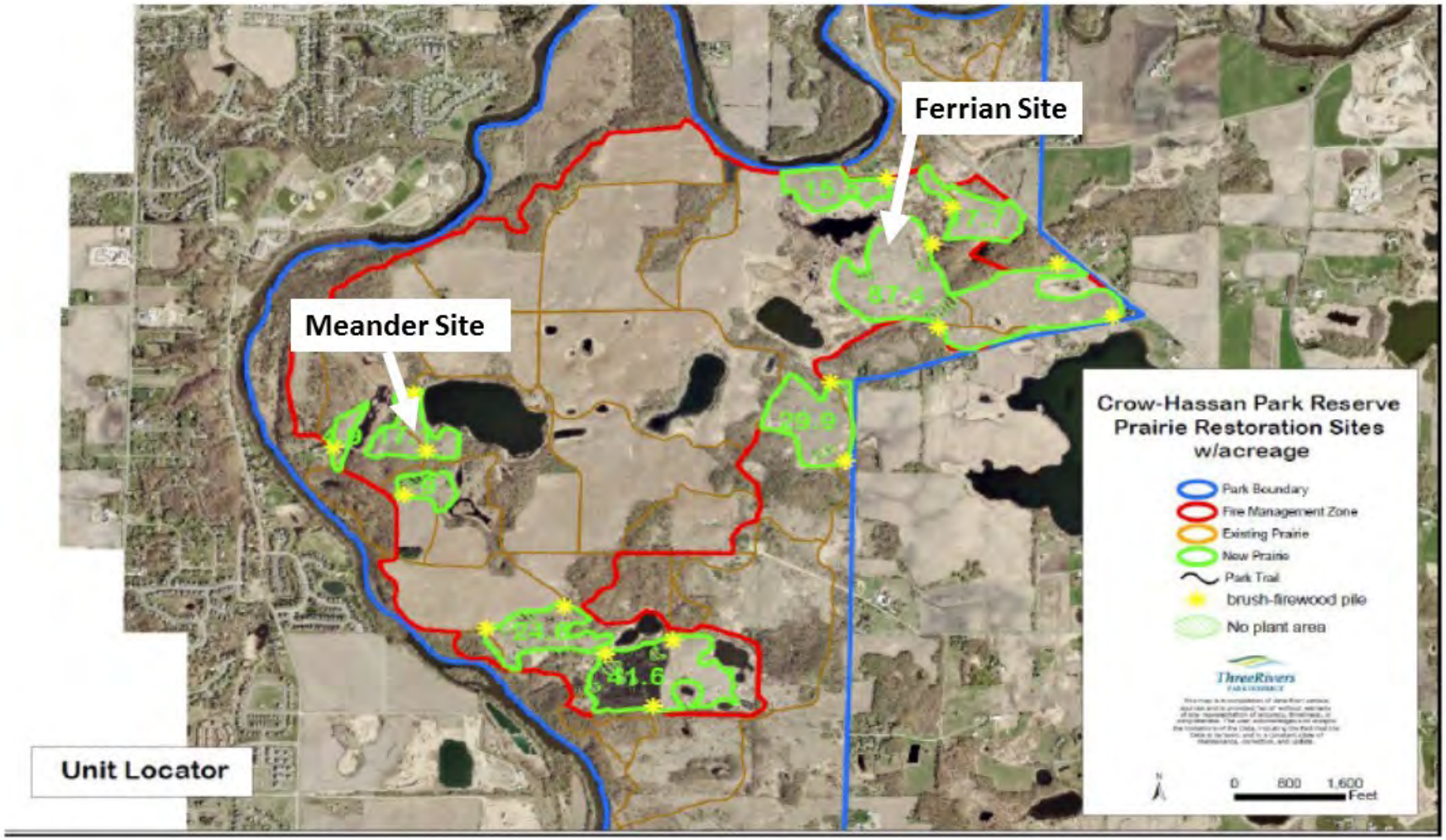


Figure 25-1 Restored prairie sites in relation to existing prairie and fire management zones in Crow-Hassan Park Reserve. Meander completed in unit 17.1 on the west side of the prairie complex in the restored area immediately west of the lake.

Table 25-1 Species from the seed mix observed during a 20 minute meander of one of the west units in the restored prairie area. Overall 32 of the 39 planted species had established (82%). All species planted, other than the cover crop used for site prep, are native to Minnesota.

Scientific Name	Common Name	Species Observed
Andropogon gerardii	Big Bluestem	Yes
Bouteloua curtipendula	Side-Oats Grama	Yes
Bromus kalmii	Prairie Brome	No
Elymus canadensis	Canada Wild Rye	Yes
Koeleria macrantha	Junegrass	Yes
Panicum virgatum	Switchgrass	Yes
Schizachyrium scoparium	Little bluestem	Yes
Sorghastrum nutans	Indian grass	Yes
Sporobolus heterolepis	Prairie Dropseed	Yes
Agastache foeniculum	Fragrant Giant Hyssop	No
Allium stellatum	Prairie Onion	No
Amorpha canescens	Leadplant	Yes
Anemone cylindrica	Long-Headed Thimbleweed	Yes
Asclepias tuberosa	Butterfly Milkweed	Yes
Asclepias verticillata	Whorled Milkweed	Yes
Aster ericoides	Heath Aster	Yes
Aster laevis	Smooth Blue Aster	No
Aster oolentangiensis	Sky-Blue Aster	No
Astragalus canadensis	Canada Milk Vetch	Yes
Coreopsis palmata	Prairie Coreopsis	Yes
Dalea candida	White Prairie Clover	Yes
Dalea purpurea	Purple Prairie Clover	Yes
Desmodium canadense	Canada Tick Trefoil	Yes
Geum triflorum	Prairie Smoke	Yes
Helianthus pauciflorus	Stiff Sunflower	Yes
Lespedeza capitata	Round-headed Bushclover	Yes
Liatris aspera	Rough Blazing Star	Yes
Liatris ligulistylis	Meadow Blazing Star	Yes
Lupinus perennis	Wild Lupine	Yes
Monarda fistulosa	Wild Bergamot	Yes
Penstemon grandiflorus	Showy Penstemon	Yes
Phlox pilosa	Prairie Phlox	Yes
Potentilla arguta	Prairie Cinquefoil	Yes
Ratibida pinnata	Yellow Coneflower	Yes
Rudbeckia hirta	Black Eyed Susan	Yes
Solidago nemoralis	Old Field Goldenrod	No
Solidago rigida	Stiff Goldenrod	Yes
Solidago speciosa	Showy Goldenrod	No
Verbena stricta	Hoary Vervain	Yes
Triticum aestivum	Winter Wheat	Cover Crop prior to planting

Table 25-2 – Purchased seed mix for the prairie restoration at Crow-Hassan Park Reserve. The mix was purchased on 8/12/2015 from MN Native Landscapes 8740 77th Street NE, Otsego, MN 55362. The total acres for the project were 250 10th 10 pounds per acre grasses and 1.5 pounds per acre forbs.

Plant Type	Scientific Name	Common Name	% of Mix	PLS lbs/ac	Genetic Origin/Variety
Grasses	Andropogon gerardii	Big Bluestem	10.00	1.00	Benton Co MN
Grasses	Bouteloua curtipendula	Side-Oats Grama	20.00	2.00	Pope/Douglas Co MN
Grasses	Bromus kalmii	Prairie Brome	2.50	0.25	Polk Co MN
Grasses	Elymus canadensis	Canada Wild Rye	15.00	1.50	Benton Co MN
Grasses	Koeleria macrantha	Junegrass	2.50	0.25	Benton Co MN
Grasses	Panicum virgatum	Switchgrass	5.00	0.50	MN - Forestburg/Dacotah
Grasses	Schizachyrium scoparium	Little Bluestem	25.00	2.50	Sherburne/Marshall Co MN
Grasses	Sorghastrum nutans	Indian Grass	15.00	1.50	Benton/Sherburne Co MN
Grasses	Sporobolus heterolepis	Prairie Dropseed	5.00	0.50	Ottertail Co MN
Forbs	Agastache foeniculum	Fragrant Giant Hyssop	2.25	0.03	McLeod Co MN
Forbs	Allium stellatum	Prairie Onion	0.30	0.00	McLeod Co MN
Forbs	Amorpha canescens	Leadplant	10.00	0.15	Kittson Co MN
Forbs	Anemone cylindrica	Long-Headed Thimbleweed	1.40	0.02	Hennepin/Dakota Co MN
Forbs	Asclepias tuberosa	Butterfly Milkweed	1.75	0.03	Benton/McLeod MN & Kossuth Co IA
Forbs	Asclepias verticillata	Whorled Milkweed	0.35	0.01	Fillmore Co MN/Allamakee Co IA
Forbs	Aster ericoides	Heath Aster	2.50	0.04	Kossuth Co IA
Forbs	Aster laevis	Smooth Blue Aster	3.00	0.05	Winona/Blue Earth Co MN
Forbs	Aster oolentangiensis	Sky-Blue Aster	2.00	0.03	Ottertail Co MN
Forbs	Astragalus canadensis	Canada Milk Vetch	1.50	0.02	Dakota/Rice Co MN
Forbs	Coreopsis palmata	Prairie Coreopsis	0.30	0.00	McLeod Co MN
Forbs	Dalea candida	White Prairie Clover	12.00	0.18	Stearns Co MN
Forbs	Dalea purpureum	Purple Prairie Clover	12.00	0.18	Polk Co MN
Forbs	Desmodium canadense	Canada Tick Trefoil	1.25	0.02	McLeod Co MN
Forbs	Geum triflorum	Prairie Smoke	0.30	0.00	Rice Co MN
Forbs	Helianthus pauciflorus	Stiff Sunflower	1.00	0.02	Kossuth Co IA
Forbs	Lespedeza capitata	Round-headed Bushclover	3.00	0.05	Dakota/Rice Co MN
Forbs	Liatris aspera	Rough Blazing Star	1.00	0.02	Dakota/Rice Co MN
Forbs	Liatris ligulistylis	Meadow Blazing Star	3.95	0.06	McLeod Co MN
Forbs	Lupinus perennis	Wild Lupine	2.00	0.03	Sherburne Co MN
Forbs	Monarda fistulosa	Wild Bergamot	4.00	0.06	McLeod Co MN
Forbs	Penstemon grandiflorus	Showy Penstemon	1.80	0.03	Brown Co MN
Forbs	Phlox pilosa	Prairie Phlox	0.10	0.00	Sherburne Co MN
Forbs	Potentilla arguta	Prairie Cinquefoil	1.00	0.02	Sherburne Co MN
Forbs	Ratibida pinnata	Yellow Coneflower	3.25	0.05	Dakota/Rice/Meeker Co MN
Forbs	Rudbeckia hirta	Black Eyed Susan	10.00	0.15	Martin Co MN/Madison Co IA
Forbs	Solidago nemoralis	Old Field Goldenrod	4.00	0.06	Sherburne Co MN
Forbs	Solidago rigida	Stiff Goldenrod	4.00	0.06	McLeod/Rice Co MN
Forbs	Solidago speciosa	Showy Goldenrod	2.00	0.03	Wilkin Co MN
Forbs	Verbena stricta	Hoary Vervain	8.00	0.12	Pope Co MN
Cover Crop	Triticum aestivum	Winter Wheat (bulk lbs)		15.00	MN

Appendix B: Site Photographs

Photo 25-1 Ferrian site dominated by brome grass in prior to reconstruction. Photo taken 8/7/2013.

Photo 25-2 Ferrian site after brush and tree removal in 2013/2014 and enhancement seeding applied in early June 2015. Photo taken 6/21/2015.

Photo 25-3 Ferrian site in August 2015 after herbicide application and prescribed burn for site prep. Photo taken 8/20/2015.

Photo 25-4 Ferrian site in April 2016. The site had been drill seeded the previous fall. Photo taken 4/10/2016.

Photo 25-5 Ferrian site in June 2016. Later in June the site was mowed, treated for weeds, and mowed a second time. Photo taken 5/30/2016.

Photo 25-6 Ferrian site August 2016. Forbs are establishing well. Weed control was completed the following month. Photo taken 8/22/2016.

Photo 25-7 Ferrian site April 2017. Photo taken 4/28/2017.

Photo 25-8 Ferrian site July 2017. After enhancement seeding the site had been mowed, controlled for weeds. Photo taken 6/28/2017.

Photo 25-9 Ferrian site June 2018. Now that the vegetation has been established the site will be incorporated into a burn cycle. Photo taken 5/30/2018.

Photo 25-10 Ferrian site July 2018. Photo taken 6/26/2018.

Photo 25-11 Well established forb and grass mix growing after spring burn at the meander site in the west unit of the prairie complex. Photo taken 7/3/2018.

Photo 25-12 Forb and grass mix growing over patches of bare ground and emerging seedlings at the meander site in the west unit of the prairie complex. Photo taken 7/3/2018.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

26) OHF Deer River Area Forest Enhancement Site 2

Project Background

Project Name: Accelerated Forest Wildlife Habitat Program, Phase 1

Project Site: Deer River Forestry – Site No. 2

Township/Range Section: Township 146 Range 27 Section 28

Project Manager / Affiliated Organization: Mark Spoden, MNDNR – Division of Wildlife

Fund: OHF ***Fiscal Year Funds:*** 2011

Project Start Date: July 2010

Predominant Habitat type: Forest

Additional Habitat types: Choose an item. , Choose an item.

Project Status: Post Establishment Phase

County: Itasca

Primary Activity: Forest Enhancement

Project Size: 14 acres

Project Completed: 2010

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Hand release of paper birch and red oak in mixed hardwood/conifer regeneration stand.
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   One page prescription sheet for the project treatment.
3. ***What are the stated goals of the project?***

Increase forest diversity through the release of paper birch and red oak in mixed hardwood/conifer regeneration stand. Increased forest diversity will improve habitat for ruffed grouse, whitetail deer, and other forest-dwelling birds that can utilize small patches within a predominately-forested landscape.

4. ***Were measures of restoration success identified in plans?*** No
   If yes, list specific measurements.
   Click here to enter text.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   See Appendix A for the one page project plan.
   Map provided in Figure 1, Appendix A is a general location map based on interpretation of project plan and aerial imagery.
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   Only a one page general description of specifications including targeted species and spacing was available.
   Best management practices were not identified in the project plan provided; however, based on on-site observations and interviews with one of the project partners (Mark Spoden), forestry best management practices appear to have been implemented such as keeping several mature trees as reserves and creating buffers around riparian areas by limiting work.
   Work was completed using labor, hand-equipment, and no follow-up herbicide to prevent re-growth of trees and shrubs cut.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***
   Not applicable.

Site Assessment

Field Review Date: **9/25/2018**

Field Visit Attendees: Gina Quiram, MN DNR (Ecological and Water Resources), Mark Spoden, MN DNR (Wildlife), and Mark Pranckus, Cardno (Contracted Assessor).

9. ***Surrounding Landscape Characteristics:***
   Generally, the site is located on a forested peninsula on the eastern edge of Lake Winnibigoshish. Approximately 1 mile of mixed hardwood and conifer forest is adjacent to the west and north of the site

before the lake's shoreline. The site is approximately 0.25 miles from the lake to the east. A large (approximately 450 acres) bog/wetland complex bounds the site to the south and southwest.

10. ***Site Characteristics:***

    a. Soil Series:

    Hiwood-Zimmerman

    b. Topography:

    Level to rolling

    c. Hydrology:

    Moderate to excessively well-drained.

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

    Regenerating mixed hardwood conifer forest stand with scattered, mature conifers as reserve trees. Subcanopy was dense and diverse with native shrub and re-generating tree species. Ground layer was moderately well-developed. Very little invasive species (less than 5%) were observed and limited to access routes to the project area and consisted primarily of Canada thistle and tansy.

    e. Vegetation B: Meander Search Species List (as appropriate for site)

    See Table 1 for species list.

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

    Hand release of select tree species to enhance forest regeneration is an accepted forestry management practice.

12. ***List indicators of project outcomes at this stage of project:***

    The most apparent indicator of a project outcome at this stage of the project is the presence of red oak, paper birch, and conifer individuals that were released by the hand cutting. Minimal presence of invasive plant species is a secondary and indirect outcome of the project at this stage. Without further documented pre-project objectives, further evaluation of project outcomes is limited to qualitative measures.

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***

    Yes. White pine, red pine, red oak, and paper birch individuals released through hand cutting have reached a size where into the future, they will become the dominant canopy tree species. A hand release of white pine and red pine would likely have been completed on this project site as part of standard forestry management practices. This would have resulted in increased growth rates for those two species and potentially decreased growth rates for red oak and paper birch through increased competition from surrounding vegetation and/or released pine trees, potentially decreasing the future canopy species diversity. Including paper birch and red oak as part of the hand release project allows those species the opportunity to get established above the existing vegetation and contribute to overall tree canopy species diversity.

14. ***Are corrections or modifications needed to meet proposed outcomes?***

    None recommended at this time.

15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***

    Yes. The site will be continued to be managed for timber stand production. No further management is planned until crop trees have reached the desired harvest age and size, which will not occur for at least another 40 years.

A potential challenge or limitation to future management includes a change in forestry management at this site that promotes single species forest management such as white pine.

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

    No. No further management activities are planned in the future.

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

    No.

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

    Project Communication and Collaboration

    The success of this project is significantly due to communication and collaboration between MN DNR Division of Wildlife and Division of Forestry.

    Pre-project communication was critical. Project partners were able to identify compromises such as the amount of red oak and paper birch that remained and what potential impacts, if any, that may have on pine species growth prior to the project. These discussions helped calibrate expectations and outcomes. Typical forestry management practices for this stand would not have included red oak and paper birch as crop trees, but rather focused on just conifer species. The extra funds provided by the LSOHC were used to offset increased project cost for including additional species to be released.

    Project Implementation

    Besides the initial planting of white and red pine in 2004, no other species were planted. Regeneration of the native vegetation has occurred naturally.

    One contributing factor to the success of the overall site is limited pressure from forest invasive plant species in the landscape. Species such as buckthorn, garlic mustard, and non-native honeysuckles are not common in the surrounding landscape. If invasive plants were to become more prevalent, the trees released by the 2010 project would likely not be impacted, but the enhanced forest habitat quality created by the project would decline.

    Importance of the Project in the Landscape Context

    In traveling around the area, the project contact (Mark Spoden) pointed out other areas where private or county timber stands are being managed in a different manner and where herbicide application to prep the site and reduce initial competition for planted white pine is used. This reduces the overall forest diversity in that stand and illustrates how a project Deer River Site 2 can balance forest stand production and forest stand and habitat diversity.

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.

19. ***The project will:***

    Meet proposed outcomes

    Confidence of outcome determination:

    High

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

Red oaks and paper birches released in 2010 have increased in height to where they are above the surrounding, competing vegetation. In the future, they will become a component in the subcanopy and canopy. Current and future seed and catkin production will provide food resources for a diverse group of wildlife species.

21. ***Site Assessor(s) Conducting Review:***

    Mark Pranckus, Cardno

Appendix A: Site maps, Project plans or Vegetation tables

Figure 26-1 General location map of Site 2 for hand release of red oaks and paper birch. Site is located on a forested peninsula out into Lake Winnibigoshish. A large wetland is located to the southeast of the site. Project boundaries in red are interpreted from the one page project plan. Aerial photography is from August 2013 and provided by Google Earth (link http://www.google.com/earth/download/ge/).

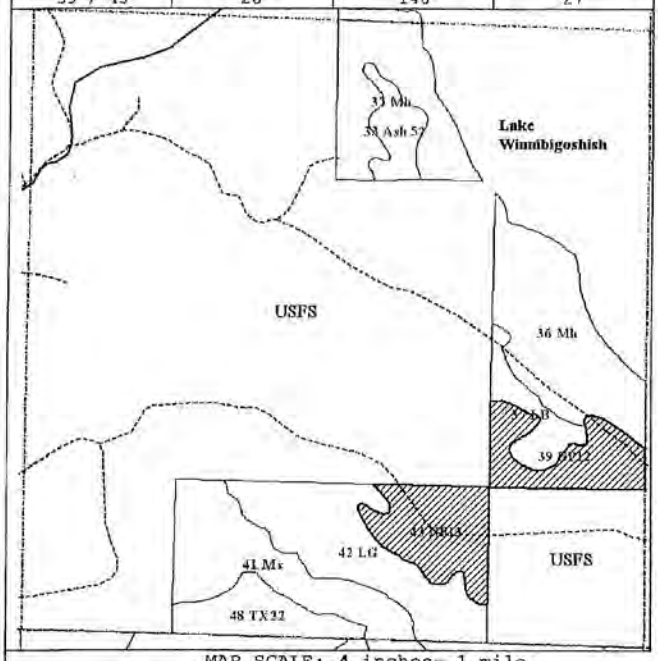
NA-02170-03 (draft 8/98)

Department of Natural Resources

Forest Development Proposal

2A-10
Deer River Forestry
#2

Stand(s)	Section	Township	Range
39 / 43	28	146	27



MAP SCALE: 4 inches= 1 mile

RAN	Project Number	Proposed Start Date
221		7/1/10

Acres	County	State Forest	Land Status
14	Cass	Bowstring	Trust

Cost Estimate	Project Type	FDM Presc.Code
	TSI-mech brushsaw	

Describe Past Silv. Work on Site:

Type	Date
Harvested	Winter 03/04
Planted	2004
TSI-mech release	2006

Remarks: **Funding from LOHC**

Crop Trees Type 39:
NP 200 per acre DBH 1-3", 3'
WP 33 per acre DBH 1-3", 2'
PB 850 per acre DBH 1-3", 7'
RO 33 per acre DBH 1, 3'

Crop Trees Type 43:
NP 590 per acre DBH 1-3" 3'
PB 500 per acre DBH 1-3" 4'
RO 45 per acre DBH 1, 2'

Competition:
Aspen 433 per acre DBH 0-1", 8'
Brush 1200 per acre 3'
Raspberry 3000 per acre 2'

Aspen 909 per acre DBH 0-1", 4'
Brush 5000 per acre 3'
Raspberry 3000 per acre 3'

Description of Adjacent Ownership:
USFS and State land.

Description of Access:
Good. ATV trail ¾ mi from Tamarack Pt Rd. No truck access to project area.

Description of Project: /// = Project Area

Fell competition using brush saws within 8 feet of Norway and white pine. Fell competition within 6 feet of paper birch and red oak. Space birch 6 x 6', reserving oak and pine. Keep felled vegetation off crop trees (lay flat on ground).

Best Management Practices:

Description of soils: Hiwood-Zimmerman | Drainage: moderate to excessively well-drained

Topography: Level to Rolling | Rock: Estimated percentage ground surface: < 5%

Recommended Species (by priority):

Site Index 50-60 (Norway pine)

HELISPOT LOCATION

Latitude:	Legal Description:
Longitude:	Ownership:

SEEDBED

Duff thickness__inches	Mineral soil Exposed___%	Sphagnum (mil acre stocked)__ _%

Submitted by:	Date:	Approved by:	Date:
Mike Aultman	3-16-10	Darren Neuman	3-16-10

Figure 26-2 The one page project plan used to complete the work in 2010. Plan describes site conditions, previous MN DNR forestry work, and specifies what tree species are to be released and the spacing around each tree. Information provided by MN DNR Division of Wildlife.

Table 26-1 Results of meander survey through project area. Cover ranges were estimated visually and focused primarily on canopy and subcanopy species. Meander survey occurred 9/25/18 by Mark Pranckus, Cardno. Meander times were 10:35 – 11:10.

Scientific Name	Common Name	Cover Range	Species Status
Pinus resinosa	Red Pine	25 – 50%	Native
Pinus strobus	White Pine	5 – 25%	Native
Betula papyrifera	Paper Birch	5 – 25%	Native
Quercus rubra	Red Oak	5 – 25%	Native
Abies balsamea	Balsam Fir	0 – 1%	Native
Acer rubrum	Red Maple	0 – 1%	Native
Populus grandidentata	Big-toothed Aspen	0 – 1%	Native
Cornus rugosa	Round-leaved Dogwood	0 – 1%	Native
Corylus cornuta	Beaked Hazelnut	0 – 1%	Native
Diervilla lonicera	Bush Honeysuckle	0 – 1%	Native
Salix humilis	Prairie Willow		Native
Cornus canadensis	Bunchberry		Native
Eurybia macrophyllum	Large-leaved Aster		Native
Fragaria virginiana	Wild Strawberry		Native
Lycopodium sp.	Groundpine		Native
Maianthemum canadense	Canada Mayflower		Native
Oryzopsis asperifolia	Rough-leaved Rice Grass		Native
Pteridium aquilinum	Bracken Fern		Native
Pyrola sp.	Pyrola species (round-leaved?)		Native
Rubus allegheniensis	Common Blackberry		Native
Rubus pubescens	Dwarf Raspberry		Native
Spiraea alba	White Meadowsweet		Native
Toxicodendron rydbergii	Western Poison Ivy		Native
Vaccinium angustifolium	Lowbush Blueberry		Native

Appendix B: Site Photographs

Photo 26-1 Example of existing forest structure. In the foreground left, a white pine likely released during the project. In the center, a paper birch released and now growing above the re-sprouting shrubs in the foreground (Bowstring State Forest, Photo taken during site visit 9/25/2018 by Mark Pranckus, Cardno).

Photo 26-2 In the foreground, an example of pine trees released as a result of the 2010 project. They have grown above the surrounding, competing vegetation. In the background, a mature tree left during the 2004 initial harvest to act as reserve tree to provide a seed source for stand regeneration. Photo taken at Bowstring State Forest on 9/25/2018 by Mark Pranckus, Cardno.

Photo 26-3 Example of the ground and understory vegetation at the project site indicating a well-developed layer that provides habitat structure and cover for wildlife species including non-game species. Photo taken at Bowstring State Forest on 9/25/2018 by Mark Pranckus, Cardno.

Photo 26-4 Example of an area within the project site likely not treated during the hand release due to the absence of the targeted pine, red oak, or paper birch species. In the foreground, a pine tree likely established from the reserve tree seed source or site seed bank after the release project. The understory structure and species contribute to the overall site diversity and habitat quality. Photo taken at Bowstring State Forest on 9/25/2018 by Mark Pranckus, Cardno.

Photo 26-5 Example of a mature pine tree in the background that was left following initial forest stand harvest in 2004 to act as a reserve tree to provide a seed source for stand regeneration. This is an example of overall site best management practices that occurred prior to the hand release project. Photo taken during site visit 9/25/18 at Bowstring State Forest by Mark Pranckus, Cardno.

Photo 26-6 Example of a riparian buffer best management practice used during the 2004 initial harvest and the 2010 release project to protect the adjacent wetland in the background. In the foreground, natural establishment of oak seedlings further adding to the forest and habitat diversity of the site. Photo taken during site visit 9/25/18 at Bowstring State Forest by Mark Pranckus, Cardno.

Photo 26-7 MN DNR project partner and contracted assessor reviewing a project map in the field for Deer River Site 2. Photo taken during site visit 9/25/18 at Bowstring State Forest by Gina Quiram, MN DNR.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

27) OHF Deer River Area Forest Enhancement Site 4

Project Background

Project Name: Accelerated Forest Wildlife Habitat Program, Phase 1

Project Site: Deer River Forestry – Site No. 4

Township/Range Section: Township 61 Range 24 Section 16

Project Manager / Affiliated Organization: Mark Spoden, MNDNR – Division of Wildlife

Fund: OHF ***Fiscal Year Funds:*** 2011

Project Start Date: July 2010

Predominant Habitat type: Forest

Additional Habitat types: Choose an item. , Choose an item.

Project Status: Post Establishment Phase

County: Itasca

Primary Activity: Forest Enhancement

Project Size: 15 acres

Project Completed: 2010

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Hand release of white spruce, balsam fir and white pine in mixed hardwood/conifer regeneration stand.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   One page prescription sheet for 15 acre tract.
3. ***What are the stated goals of the project?***
   Increase forest diversity through the release of white spruce, balsam fir, and white pine in mixed hardwood/conifer regeneration stand. Increased forest diversity will improve habitat for ruffed grouse, whitetail deer, and other forest-dwelling birds that can utilize small patches within a predominately-forested landscape.
4. ***Were measures of restoration success identified in plans?*** No
   If yes, list specific measurements.
   Click here to enter text.
5. ***Are plan Sets available?*** **Yes** ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   See Appendix A for the one page project plan.

   Map provided in Figure 1, Appendix A is a general location map based on interpretation of project plan and aerial imagery.

6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   A one page general description of specifications including targeted species and spacing was available.

   Best management practices were not identified in the project plan provided; however, based on on-site observations and interviews with one of the project partners (Mark Spoden), forestry best management practices appear to have been implemented such as keeping several mature trees as reserves. Work was completed using labor, hand-equipment, and no follow-up herbicide to prevent re-growth of trees and shrubs cut.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   Yes
   Birch trees around designated crop trees were allowed to remain.
8. ***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?***
   No. The alteration actually enhanced the desired outcome because in addition to releasing white pine, balsam fir, and white spruce, birch trees were allowed to remain a part of the future tree canopy composition, further increasing mixed stand diversity.

Site Assessment

Field Review Date: **9/25/2018**

Field Visit Attendees: Gina Quiram, MN DNR (Ecological and Water Resources), Mark Spoden, MN DNR (Wildlife), and Mark Pranckus, Cardno (Contracted Assessor).

9. ***Surrounding Landscape Characteristics:***
   The site is located within a mix of forest, lakes, and wetland complexes.
10. ***Site Characteristics:***
    a. ***Soil Series:***
    Cutaway loamy sand
    b. ***Topography:***
    Level
    c. ***Hydrology:***
    Well-drained soils
    d. ***Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:***
    Regenerating mixed hardwood conifer forest stand with scattered, mature conifers as reserve trees. Subcanopy was dense and diverse with native shrub and regenerating tree species. Ground layer was moderately well-developed. Invasive species made up less than 1% of the total cover and primarily consisted of tansy along the forest road.
    e. ***Vegetation B: Meander Search Species List (as appropriate for site)***
    See Table 1 for species list.
11. ***Is the plan based on current science?*** Yes
    Hand release of select tree species to enhance forest regeneration is an accepted forestry management practice.
12. ***List indicators of project outcomes at this stage of project:***
    The most apparent indicator of a project outcome at this stage of the project is the presence of white spruce and balsam fir that were released by the hand cutting. Minimal presence of invasive plant species is a secondary and indirect outcome of the project at this stage. Without pre-project objectives, further evaluation of project outcomes is limited to qualitative measures.
13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    Yes. White pine, white spruce, and balsam fir individuals released through hand cutting have reached a size where into the future, they will become the dominant canopy tree species. Without the release, slower growing species, specifically white spruce and balsam fir, would not grow as fast, potentially being suppressed by the surrounding vegetation, and individuals would not reach a significant size prior to the site being harvested.
14. ***Are corrections or modifications needed to meet proposed outcomes?***
    None recommended at this time.
15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    Yes. The site will be continued to be managed for timber stand production. No further management is planned until crop trees have reached the desired harvest age and size, which will not occur for at least another 40 years.
    A potential challenge or limitation to future management could include a change in forestry management at this site that promotes single species forest management such as white pine.

16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No. No further management activities are planned in the future.

17. ***Are follow-up assessments needed? Explain.***
    No.
18. ***Additional comments on the restoration project.***
    Project Collaboration and Communication
    - The success of this project is significantly due to communication and collaboration between MN DNR Division of Wildlife and Division of Forestry. Pre-project communication was critical.
    - Project partners were able to identify compromises such as MN DNR Forestry accepting MN DNR Wildlife's request to leave birch trees within the cut zone of crop trees prior to the project, which helped to calibrate expectations and outcomes.
    - Typical forestry management practices for this stand would not have included balsam fir and white spruce as crop trees, but rather focused on just white pine. The extra funds provided by the OHF were used to offset increased project cost for including additional species to be released.

    Project Implementation
    - Besides the initial planting of white pine in 2009, no other species were planted. Regeneration of the native vegetation has occurred naturally.
    - One contributing factor to the success of the overall site is limited pressure from forest invasive plant species in the landscape. If invasive plants were to become more prevalent, the trees released by the 2010 project would likely not be impacted, but the enhanced forest habitat quality created by the project would decrease.

    Project Impacts in Context of the Landscape
    - In traveling around the area, the project contact (Mark Spoden) pointed out other areas where private or county timber stands are being managed in a different manner and where herbicide application to prep the site and reduce initial competition for planted white pine is used. This reduces the overall forest diversity in that stand and illustrates how a project Deer River Site 4 can balance forest stand production and forest stand and habitat diversity.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***
    Balsam fir, white spruce, and white pine released in 2010 have increased in height to where they are above the surrounding, competing vegetation. In the future, they will become a component in the

subcanopy and canopy. In addition, not cutting birch trees during the release helps to maintain that species as a future canopy component.

21. ***Site Assessor(s) Conducting Review:***

    Mark Pranckus, Cardno

Appendix A: Site maps, Project plans or Vegetation tables

Figure 27-1 Aerial view of the project boundary for the 15-acre Deer River Site No. 4 following hand release in 2010. Unit boundaries are interpreted from project documentation. Aerial photography is from August 2013 and provided by Google Earth (link http://www.google.com/earth/download/ge/).

2A-9

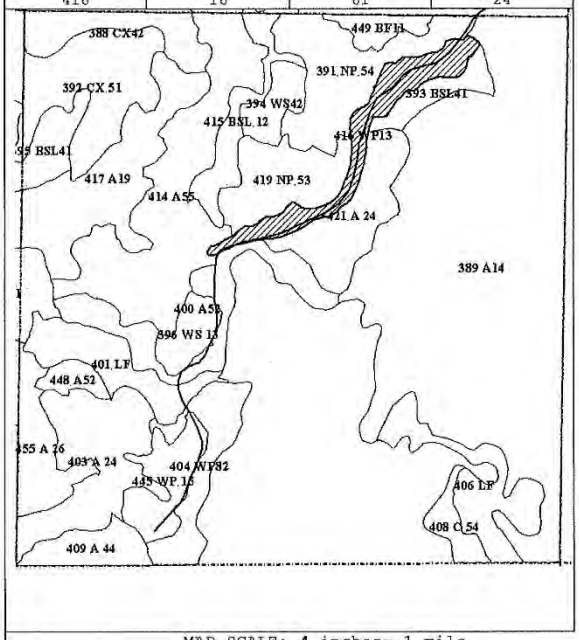
Deer River Forestry #4

NA-02170-03 (draft 8/98)

Department. of Natural Resources

Forest Development Proposal

Stand(s)	Section	Township	Range
416	16	61	24



MAP SCALE: 4 inches= 1 mile

RAN	Project Number	Proposed Start Date
221	221-403	Completed 11-9-11

Acres	County	State Forest	Land Status
14	Itasca	G.Washington	Trust

Cost Estimate	Project Type	FDM Presc.Code
	TSI-mech brushsaw	

Describe Past Silv. Work on Site:

Type	Date
Harvested	99
Site Prep-raked	00
Planted	01
Protection	03-10
TSI-mech brushsaw	04
Basal prune	09

Remarks: **Funding from LOHC**

Crop Trees:
WP 725 per acre DBH 1-3", 4'
BF 513 per acre DBH 1-3", 2.5'
WS 13 per acre DBH 1", 1.5'

Competition:
Aspen 900 per acre DBH 1-3", 5'
RM 80 per acre DBH 1-3", 4'
Raspberry 1500 per acre, 3'

Description of Adjacent Ownership:
USFS to the North, State land to East/West/South.

Description of Access:
Good. Woods trail from Hwy 6.

Description of Project: /// = Project Area

Fell competition (aspen, red maple, raspberry) using brush saws within 8 feet of white pine and white spruce. Reserve all balsam fir. Keep felled vegetation off crop trees (lay flat on ground).

Best Management Practices:

Description of soils: cutaway loamy sand	Drainage: well drained
Topography: level	Rock: Estimated percentage ground surface: < 5%

Recommended Species (by priority):

Site Index 60 (white pine)

HELISPOT LOCATION

Latitude:	Legal Description:
Longitude:	Ownership:

SEEDBED

Duff thickness__inches	Mineral soil Exposed____%	Sphagnum (mil acre stocked)__ _%

Submitted by:	Date:	Approved by:	Date:
John Berglund	3-16-10	Darren Neuman	3-16-10

Figure 27-2 The one page project plan used to complete the work in 2010. Plan describes site conditions, previous MN DNR forestry work, and specifies what tree species are to be released and the spacing around each tree. Information provided by MN DNR Division of Wildlife.

Table 27-1 Results of meander survey through project area. Cover ranges were estimated visually and focused primarily on canopy and subcanopy species. Meander survey occurred 9/25/18 by Mark Pranckus, Cardno. Meander times were 15:00 – 15:30.

Scientific Name	Common Name	Cover Range	Species Status
Pinus strobus	White Pine	25 - 50%	Native
Abies balsamea	Balsam Fir	1 - 5%	Native
Betula papyrifera	Paper Birch	5 - 25%	Native
Picea glauca	White Spruce	1 – 5%	Native
Populus tremuloides	Quaking Aspen	0 – 1%	Native
Acer rubrum	Red Maple	0 – 1%	Native
Acer spicatum	Mountain Maple	0 – 1%	Native
Corylus cornuta	Beaked Hazelnut	0 – 1%	Native
Diervilla lonicera	Bush Honeysuckle	0 – 1%	Native
Ribes americanum	Wild Black Currant	0 – 1%	Native
Ribes triste	Swamp Red Currant	0 – 1%	Native
Anemone americana	Round-lobed Hepatica		Native
Anemone quinqefolia	Wood Anemone		Native
Athyrium Filix-femina	Lady Fern		Native
Carex gracillima	Graceful Sedge		Native
Conyza canadensis	Horseweed		Native
Dryopteris carthusiana	Spinulose Wood Fern		Native
Eurybia macrophyllum	Large-leaved Aster		Native
Fragaria virginiana	Wild Strawberry		Native
Geum macrophyllum	Large-leaf Avens		Native
Maianthemum canadense	Canada Mayflower		Native
Mitchella repens	Partridge Berry		Native
Oryzopsis asperifolia	Rough-leaved Ricegrass		Native
Phalaris arundinacea	Reed Canary Grass		Non-native
Rubus pubescens	Dwarf Raspberry		Native
Trientalis borealis	Starflower		Native

Appendix B: Site Photographs

Photo 27-1 Example of white pines released on Deer River Site No. 4 in George Washington State Forest. In the center of the photo, MN DNR project manager. White pines in this area were at least 15 feet tall. Photo taken on 9/25/2018 by Mark Pranckus, Cardno.

Photo 27-2 Example of a balsam fir released on Deer River Site No. 4 in George Washington State Forest. The tree is approximately 8 feet tall. Without the release, this tree would likely be shorter and surrounded by competing vegetation at least as tall as it is. Photo taken on 9/25/2018 by Mark Pranckus, Cardno.

Photo 27-3 Example of a white pine in the left hand side of the photo that was targeted for release. The two adjacent birch trees were left, per request by MN DNR wildlife, which may impact the growth of this individual tree, but not the overall stand. Keeping birch likes these helps to increase forest stand diversity. Photo taken on 9/25/2018 at Deer River Site No. 4 in George Washington State Forest by Mark Pranckus, Cardno.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

28) OHF Deer River Area Adaptive Management Site

Project Background

Project Name: Accelerated Forest Wildlife Habitat Program, Phase 1

Project Site: Deer River Forestry – Two Mile Prescribed Burn

Township/Range Section: Township 146 Range 26 Section 20

Project Manager / Affiliated Organization: Mark Spoden, MNDNR – Division of Wildlife

Fund: OHF ***Fiscal Year Funds:*** 2011

Project Start Date: 2009

Predominant Habitat type: Forest

Additional Habitat types: Choose an item. , Choose an item.

Project Status: Post Establishment Phase

County: Itasca

Primary Activity: Forest Enhancement

Project Size: 13.5 acres

Project Completed: August 2013

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Prescribed burn of understory (two times) to 1) reduce the vigor of shrub and other vegetation that will compete with desired tree seedling species and 2) prepare the seed bed for natural white pine regeneration.

Harvest of a portion of the canopy trees following a prescribed burn, ideally when there is a high pine cone crop, using conventional methods to further prepare seed bed and reduce hazelnut understory, both coming from soil disturbance due to whole tree skidding on the site.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   One page MN DNR stand silvicultural prescription worksheet is available along with a prescribed burn plan.
   Seven page excerpt from a summary report called Adaptive Forest Management Projects: Assessments and Recommendations.
3. ***What are the stated goals of the project?***
   The overall goal is to produce a regenerating mixed age pine established naturally from seed stock produced on-site. The objective of the project was to use a combination of prescribed fire and tree harvest to prepare and seed the site.
4. ***Were measures of restoration success identified in plans?*** Yes
   If yes, list specific measurements.
   A general measure of restoration success identified in at least two locations in the project plans was to provide a desired forest condition (DFC) of a mixed-age regenerating pine stand from a natural (existing on-site) seed source. No additional details about measures of success were provided.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   Appendix A contains the following information:
   - Map provided in Figure 1, Appendix A is a general location map based on interpretation of project plan and aerial imagery.
   - One page Stand Silivcultural Prescription Worksheet
   - One page project description
   - MN DNR Prescribed Burn plan
   - MN DNR FIM Stand Report
   - Summary about the project that was included in a broader report about Adaptive Forest Management projects
   - Map provided by MN DNR of the treatment locations
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***

   Best Management Practices, standards and guidelines identified in the plan set:

   - The prescribed burn plan identified the objectives for the burn, site and weather conditions when the burn should occur, and steps to complete a safe and successful burn. The elements identified in the plan are standard for prescribed burns and generally align with requirements/recommendations by the National Wildfire Coordination Group for prescribed burn plans.
   - Generally, the project documents outlined guidelines for when the major activities should occur and how they should occur. For example, the prescribed burn would occur in the summer. The harvest of mature trees should occur in August through September when a good cone crop was present to provide an abundant seed source. Tree harvest techniques such as broad cast

skidding of whole trees were identified along with the rationale i.e. to promote soil disturbance and increase seed distribution on the site.

- Based on a review of the information provided, the guidelines are based on the best current science. One key component of this project is that it is acknowledged as being implemented as adaptive management so decisions were made at the start of the project with the best available knowledge. Monitoring that has occurred during the project will be used to guide future management of this site and add to the knowledge based used to make decisions for other sites.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   Yes
   One project document outlines that management units would be burned at least three times prior to harvesting the seed source trees. Due to a combination of limitations implementing multiple prescribed burns (weather, staff availability) and the production of a high cone crop year, two management units were harvested after one to two prescribed burns.
8. ***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?***
   Harvesting the trees after only one to two burns did not likely significantly alter the outcome of the project. Short-term effects of fire such as reducing the vigor of the shrub understory and decreasing the duff layer to prepare the seed bed were likely achieved. Due to natural variability in the effects of fire, it's difficult to determine that a third or fourth prescribed burn would have resulted in a different outcome. Taking advantage of a high cone crop year during the same year as the prescribed burn may have been more important because the timing of a high cone crop year can't necessarily be predicted ahead of time.

Site Assessment

Field Review Date: **9/25/2018**

Field Visit Attendees: Gina Quiram, MN DNR (Ecological and Water Resources), Mark Spoden, MN DNR (Wildlife), and Mark Pranckus, Cardno (Contracted Assessor).

9. ***Surrounding Landscape Characteristics:***
   The project site is located within a forest landscape with a small wetland complex (Two Mile Lake) directly to the west. Lake Winnibigoshish, Sand Lake, and Bowstring Lake lay to the west, north, and east of the site, respectively. All three lakes are within three to six miles from the project site.
10. ***Site Characteristics:***
    a. Soil Series:
    Zimmerman loamy fine sand (Unit 1)
    Eagleview and Menagha (Unit 2)
    b. Topography:

Relatively flat to gently sloping

c. Hydrology:

Well-drained

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

Native Plant Community FDn33 (Northern dry-mesic mixed woodland) throughout both management units 1 and 2. The overstory is patchy mature white pine, red pine, white spruce, paper birch, and trembling aspen that were left as reserve trees following the 2013 harvest. The subcanopy is sparse and consists of primarily trembling aspen with scattered red oaks. The understory is relatively dense in Unit 1 consisting of beaked hazelnut with regenerating pine seedlings. The understory for Unit 2 is relatively more open and less continuous than Unit 1, potentially due to increased fire intensity. Aspen is a larger component to the understory in Unit 2 and beaked hazelnut is reduced.

Invasive species consist of less than 1% of the site and are located primarily along the existing forest road and in areas where equipment and materials were stockpiled. Canada thistle was the primary invasive species.

e. Vegetation B: Meander Search Species List (as appropriate for site)

See Table 1 for species list.

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

Using prescribed burning to restore an ecological process that was responsible for stand regeneration is an accepted forestry and ecological restoration practice is applied across many pine ecosystems throughout the country. The combination of using prescribed burning to prepare the site for seeding timed with a high cone crop from existing trees along with harvest practices that further prepare the seed bed by providing additional soil disturbance provides a great opportunity to understand how these three factors can be leveraged to increase pine stand regeneration.

12. List indicators of project outcomes at this stage of project:

The desired forestry objective is a regenerating mixed-age pine stand resulting from natural seed source establishment. Throughout the assessment area, pine seedlings were observed to be growing.

From a wildlife habitat perspective, the scattered to open canopy with dense understory in Unit 1 and the patchy understory in Unit 2 resemble plant communities resulting from large gap creations such a medium to intense surface fires or the decline of short-lived species such as quacking aspen and jack pine. Because of the more intense fire in Unit 2, shrub layer density was patchier, creating increased local habitat diversity when considered in combination with Unit 1.

13. Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?

Yes. In 2015, an inventory of the re-generating site was completed. White pine seedlings were estimated to be at a density of 500 stems/acre and considered well-distributed across the site. Shrub species, including beaked hazelnut, were considered to be low density and distributed in a patchy pattern across the site.

14. Are corrections or modifications needed to meet proposed outcomes?

No. Currently the project appears to be on-track to meet the proposed project outcomes. No modifications are recommended at this time.

15. Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?

Yes. Once the seedlings for regeneration are established, mature reserve trees will further be harvested within the next ten years to increase growth of regenerating trees.

Potential limitations and challenges in the future include:

- Completing follow-up harvest in a manner that limits damage to regenerating trees. Tree harvest guidelines and specifications should be used to minimize damage. This should be a standard forestry practice and easily implemented.
- Introduction of invasive species during the follow-up harvest. Implementing best management practices including MN DNR policy on limiting the spread of invasive species should help to lower the probability that invasive species become a greater issue for the project area.
- Beaked hazelnut and other shrub species decrease the growth rate of regenerating species. Future management could use hand-release for pine species to keep the stand regeneration on track. Using techniques and prescriptions similar to those used on other sites in the MN DNR Deer River Area, where pines, oaks, and birch were released, may be successful to maintain both the growth of pine species and future forest habitat and diversity.

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

    No. Planned harvest of a portion of the remaining reserve trees should not likely detract from the potential habitat of the site, if the harvest is implemented using best practices that minimize disturbance to regenerating pine and other tree species of interest and do not introduce invasive species during the logging process.

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

    No additional assessments are needed in the short term because monitoring is already occurring on a regular basis. The project is a part of an effort to apply adaptive forestry management techniques so continuing to collect regular monitoring data should be a priority. The monitoring data inform future decisions about this site and others like it.

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

    <u>Prescribed Burning</u>

    Prescribed burning is a widely-accepted and important ecological land management tool because it can restore or support missing ecological processes. Based on discussions with the project representative (M. Spoden), the use of this tool can be enhanced by: Having a reliable and stable funding source to complete burns. Burns are weather-dependent. Access to the resources (staff and equipment) to adapt and respond to weather availability is key to using taking advantage of seasonal prescribed burn opportunities.

    - Continued coordination between MN DNR, USFS, and tribal agencies to leverage resources to complete prescribed burns.
    - Increasing staff with advanced prescribed burn training whose focus is habitat management. Currently, there are instances where staff that are capable of providing leadership on burns are required to prioritize fire suppression within the state and support national efforts during important biological windows, potentially missing opportunities that improve project success.

    <u>Project Implementation</u>

    In traveling around the area, the project contact (M. Spoden) pointed out other areas where private or county timber stands are being managed in a different manner and where herbicide application to prep the site and reduce initial competition for planted white pine is used. This reduces the overall forest

diversity in that stand and illustrates how a project like Deer River Two Mile Prescribed Burn can balance forest stand production and forest stand and habitat diversity.

The lack of herbicide use, limited site preparation, and using techniques that promoted local seed sources and preserving plant diversity are factors in providing quality wildlife habitat and healthy forest diversity while also reducing overall project cost.

Project Management

Implementing a project of this nature requires time (phases spaced out over a period of years), timing (responding to uncontrollable events such weather windows for prescribed burns and high cone crop production), and availability of contractors willing to harvest trees in a manner that promotes seed bed preparation and seed dispersal. Communication and flexibility among different MN DNR divisions and sections along with project partners is key to success.

This project was part of the adaptive management program by MN DNR Division of Forestry, but the prescribed burning element required LSOHC funds to complete the work. These additional funds are important for full implementation of an adaptive management program.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***
    The main objective of the project was create a regenerating mixed-age pine stand that was established from an on-site seed source. A 2015 MN DNR forestry stand inventory indicated that white pine seedling density was 500 stems/acre two years following the prescribed burn and tree harvest. Observations from 2018 assessment indicate that white pines, red pines, and other tree species are being established and can be enhanced or maintained in the future using standard forestry practices (hand-release).
21. ***Site Assessor(s) Conducting Review:***
    Mark Pranckus, Cardno

Appendix A: Site maps, Project plans or Vegetation tables

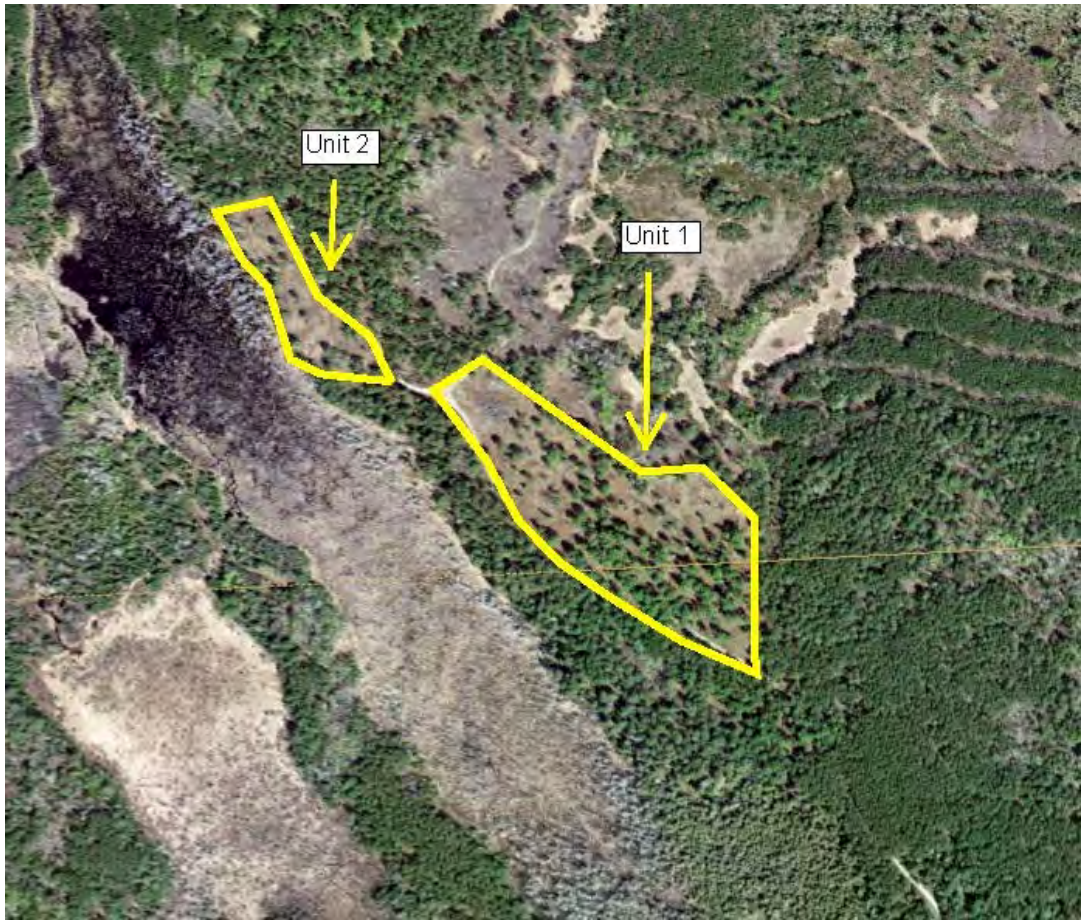


Figure 28-1 Aerial view of the project boundaries for Units 1 and 2 following the tree harvest in 2013. Unit boundaries are interpreted from project documentation. Aerial photography is from spring 2018 and provided by Itasca County GIS (https://maps.co.itasca.mn.us/PublicApp/).

Appendix B: Adaptive Forest Management Projects: Assessment and Recommendations

Prepared for Executive FRIT by

Emily Peters (EWR), Amber Ellering (FOR), Keith Wendt (OSD), Rick Klevorn (FOR), Jon Nelson (FOR), Bryan Lueth (FAW), and Regional AFMP Teams

13 April 2015

Executive Summary

Background

In 2008, Minnesota Department of Natural Resources (DNR) initiated an Adaptive Forest Management Project (AFMP) to establish a set of regional field trials to provide focused, on-the- ground forums for cooperation and coordination among DNR disciplines and staff at all levels.

Selected sites seek to demonstrate techniques to improve sustainable forest management in the face of emerging challenges such as climate change, invasive species, changing demographics, and expanding economic opportunities. Six AFMP sites were selected, two each in regions 1, 2 and 3; each project developed a core set of sustainability questions along with management and monitoring actions designed to answer those questions.

The Directors of Forestry, Fish and Wildlife and Ecological Resources served as executive sponsors to the projects, but broad strategic guidance and support has not been sustained over the last seven years. After a promising start, today there is a lack of overall DNR project leadership or structure to maintain momentum, obtain needed project resources, and effectively utilize and transfer project results. In response to this, Executive Forest Resources Issues Team (ExFRIT) directed Forest Issues Resolution Staff Team (FIRST) to organize this summary report of the AFMPs to date, with an emphasis on identifying lessons learned and needed resources.

This report is intended to help guide ExFRIT's decision-making with regards to the future direction of AFMPs, specifically, and adaptive management, more broadly, as an increasing departmental policy direction. The report is structured such that Section I provides a summary of the resource needs and lessons learned across all AFMPs, and recommended next steps.

Section II provides more detailed information about each AFMP.

Resources needed to complete the projects

- Time required for treatments to yield results.
- Staff time allocated to conduct effectiveness monitoring.
- Funding to implement silvicultural treatments at several AFMPs (e.g., prescribed burning, planting and seedling protection.)
- Database development, data management, and analysis support.
- Assistance communicating lessons learned to a wider audience.

Organizational lessons learned

- DNR staff involved in these projects take great pride in their work. These projects have provided an outlet for creative thinking, coordination, and discovery related to conducting operational-scale ecological forestry with multiple objectives.
- Implementation of non-traditional forestry techniques requires more oversight than traditional forestry approaches. An appointed leader is needed to keep such projects on track and in many cases supervise the implementation.
- The lack of access to funding was a key challenge for these projects. While some projects concluded that their silvicultural treatments were economically feasible, all projects had to seek additional funding for some aspect of their work (e.g., databases, monitoring data, tree planting, prescribed burns, herbicide). As a result, each project team developed its own solution to this challenge, which depended on theresource available to them. In some cases, this involved collaborating with external partners (USFS, TNC), which worked well but required more time in coordinating.
- As a general silvicultural tool, prescribed burns appear to be very effective atachieving various ecological objectives. However, key implementation challenges include: favorable weather conditions, access to qualified personnel to conduct the burns, and the necessary coordination leadership.
- Data management systems and analysis support are crucial weaknesses in our ability to assess lessons learned from these projects. A primary concern is the lack of an enterprise database system in which to store effectiveness monitoring data. In response, each project developed its own data management solutions, which over time will reduce the accessibility and efficacy of the project data.
- The ability to scale up forest management techniques used in these projects generally depends on the availability of qualified staff; resources prioritized to do the work, including staff time and on-the-ground project dollars; data management infrastructure and data governance practices; and focused communication approaches.

Scientific lessons learned

- For the most part, it is still too early to assess the effectivness of silvicultural treatments for a given project and report scientific lessons learned. Several projects are further along and report preliminary findings in this report, but lessons vary and are specific to the project objectives.

- The silvicultural techniques used in the projects vary in the degree to which they've been proven effective by the scientific community at large.
- Most teams think their project's results will be scalable by native plant community classification.

Recommendations

Adaptive forest management is a long-term endeavor based on the notion that decisions are often made with imperfect information, but we can learn by doing if we monitor and evaluate the decision, then modify management accordingly. After seven years, AFMP teams are just now beginning to be able to assess the effectiveness of their project's management approaches. To fully utilize AFMPs as a learning opportunity in how to operationalize adaptive management at the DNR, **we recommend that ExFRIT commit to providing long-term support to the six existing AFMPs.** In the short-term, we suggest the following next steps:

- Host an AFMP Forum to share and discuss lessons learned across a widerDNR audience.
- Encourage AFMPs to submit findings to the new University of Minnesota Sustainable Forest Education Cooperative (SFEC) web-based silvicultural prescription case study library.
- Provide more dependable financial support for the remaining management and monitoring needs at AFMPs.
- Provide short-term support (funding, staff time) and long-term support (see below) for data management and analysis of AFMP monitoring data. This is essential for DNR to benefit from the investment already made in establishing these projects.
- Provide direction to Regional FRITs to support and champion AFMPs going forward, and set up a structure of accountability for running the projects (e.g., prioritization of AFMPs in staff work plans, regular updates, project charters listing roles etc.).

Given that adaptive management is increasingly used as DNR policy direction in response to complex natural resource issues, including HCVF, climate change, and invasive species, **we recommend that ExFRIT apply lessons already learned from the AFMPs to better operationalize adaptive management at the DNR.** We suggest the following next steps:

- Establish a common set of definitions and standards for adaptive management, as applied to DNR's forest policy, planning, and management decisions. This was also a recommendation to ExFRIT by the Age-Class Monitoring Team in their Feb. 2014 report.
- Establish a standing, interdisciplinary forest monitoring technicalteam with a monitoring coordinator. This was another recommendation to ExFRIT by the Age-Class Monitoring Team in 2014. This team would work on increasing DNR's capacity to conduct implementation and effectiveness monitoring of forest management practices across DNR forestlands.

Deer River two mile prescribed burn (Region 2)

Mike Albers, Dan Hanson, Dan Herdle, Mark Spoden

The challenge

Over the past 80-100 years, fire suppression has altered the vegetative composition and structure of MN's forests, especially on fire-dependent upland sites, and has hindered the ability of some of these stands to naturally regenerate. SFRMPs commonly call for increased use of prescribed burning as a management tool on such sites. However, upland Rx burn accomplishment (number of sites and acres burned) remains at about the same level as before SFRMP implementation. This is due to a number of institutional barriers, including lack of a secure funding source and limited availability of qualified staff during the summer burning season. These barriers must be overcome in order to show progress toward meeting these SFRMP goals.

Objectives

- Demonstrate interdisciplinary collaboration in the use of prescribed fire as a management tool for timber production, wildlife habitat, and ecological function.
- Build institutional capacity for conducting prescribed burns (especially onupland sites).
- Show, by example, how to increase the connection between strategic direction (SFRMP teams) and tactical implementation (Area Staff).
- Promote natural regeneration of desired species, e.g. white pine, red pine, jack pine, and paper birch.

Project design and work completed

Study area: 27 acres of FDn33 in Chippewa Plains subsection. Harvest and burn treatments were applied to 10 acres. An unburned control area was established.

Silvicultural prescription: Periodic thinning harvests between 1960-2002. Two underburns in May 2009 and 2013. Partial harvest of overstory, leaving seed trees and preparing seedbed in August 2013. Aerial seed white pine if residual seed trees are insufficient, then harvest remaining white pine seed trees after regeneration established.

Monitoring: Pre-burn regeneration surveys, invasive species, hazel density, NPC richness, Diplodia, and turpentine beetles completed. Post-burn remeasurements of all items planned for summer 2015. 2015 assessment of tree damage and turpentine beetles is uncertain due to staff turnover.

What resources are needed to complete the project?

a. More time is needed to monitor the site and evaluate the results.
b. Forest Health staff need to re-assess post-burn tree damage and beetle populations.

Operational and scientific lessons learned

a. Key challenges for prescribed burns are favorable weather conditions, number of person hours required, and difficulties in coordinating these two complicated factors. Restrictions on working over-time complicate scheduling. Prescribed burns are high risk and require additional planning and funding beyond business-as-usual. Few people who advocate for prescribed fire are trained in how to manage it.
b. Collaborating with DNR Section of Wildlife and USFS worked well.

c. A dependable funding source is needed to continue.
d. Lots of white pine seedlings regenerated after 1st burn, but lots of hazel too. Need more time to assess the ecological success of the burns.

How scalable are the results?

Results from this project should be widely applicable to any FDn33 native plant community. Limiting factors are the availability of qualified people to plan and implement burns and a dependable source of funding.

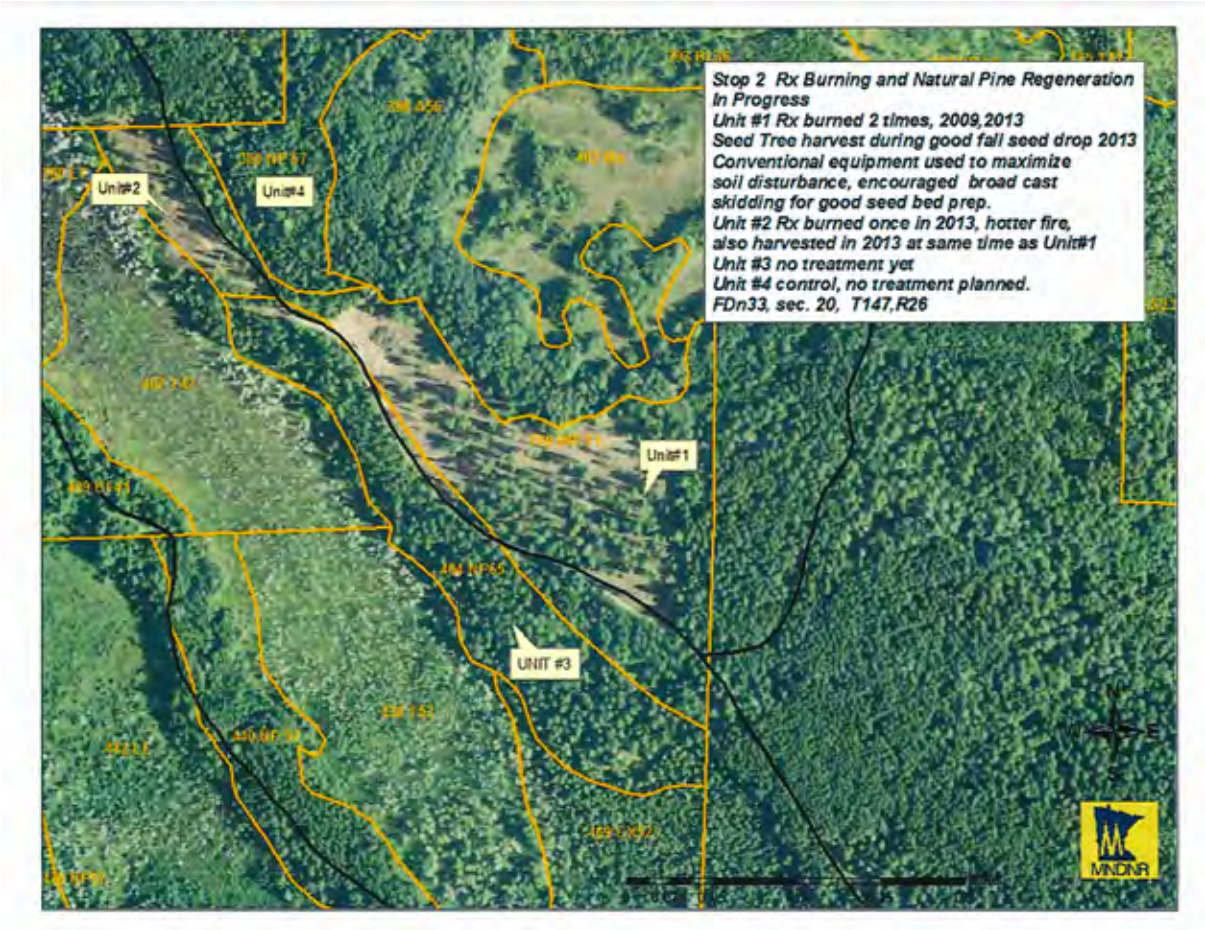
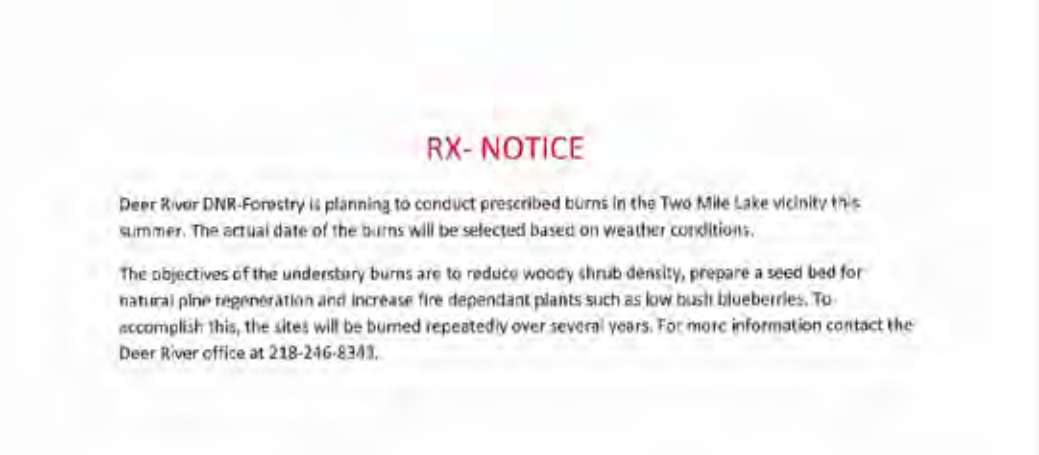


Figure 28-2 Map provided by MN DNR indicating project boundaries for Units 1 through 4. Text box in upper right hand corner provides information about when work occurred and what was done.

Figure 28-3 A photo provided by MN DNR taken during the prescribed burn at either Unit 1 or Unit 2 in 2013.

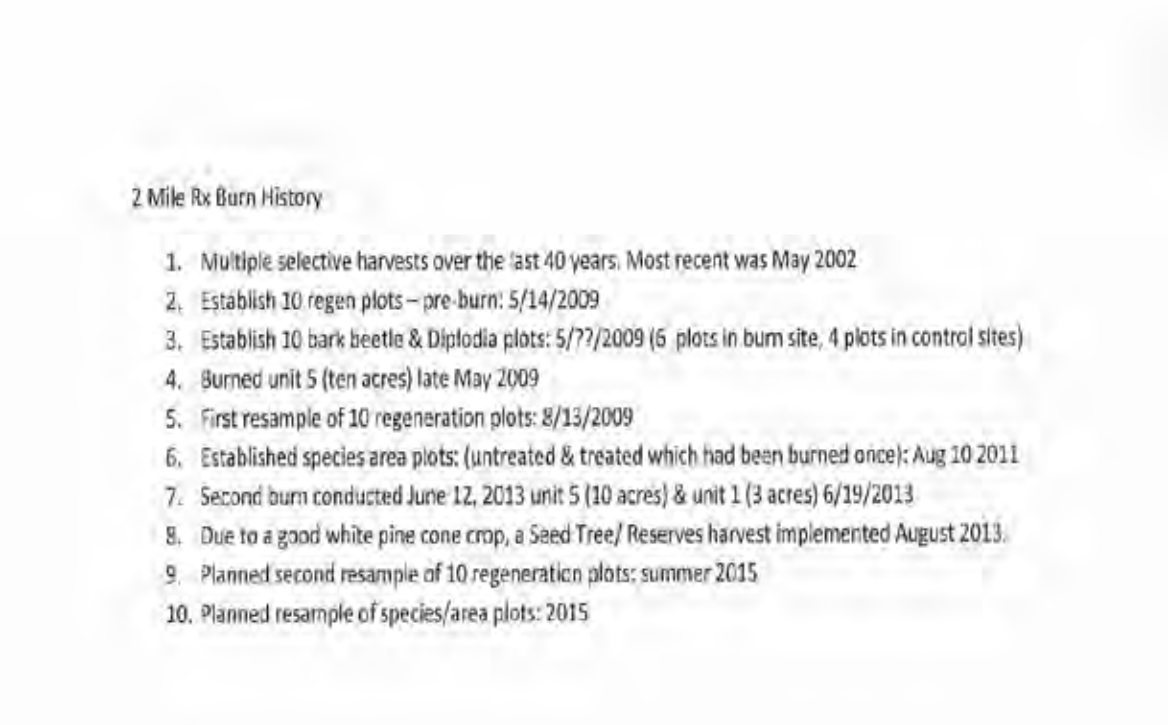


RX- NOTICE

Deer River DNR-Forestry is planning to conduct prescribed burns in the Two Mile Lake vicinity this summer. The actual date of the burns will be selected based on weather conditions.

The objectives of the understory burns are to reduce woody shrub density, prepare a seed bed for natural pine regeneration and increase fire dependant plants such as low bush blueberries. To accomplish this, the sites will be burned repeatedly over several years. For more information contact the Deer River office at 218-246-8343.

Figure 28-4 Prescribed burn notification provided to public for the Deer River Two Mile Prescribed Fire project site.



2 Mile Rx Burn History

1. Multiple selective harvests over the last 40 years. Most recent was May 2002
2. Establish 10 regen plots – pre-burn: 5/14/2009
3. Establish 10 bark beetle & Diplodia plots: 5/??/2009 (6 plots in burn site, 4 plots in control sites)
4. Burned unit 5 (ten acres) late May 2009
5. First resample of 10 regeneration plots: 8/13/2009
6. Established species area plots: (untreated & treated which had been burned once): Aug 10 2011
7. Second burn conducted June 12, 2013 unit 5 (10 acres) & unit 1 (3 acres) 6/19/2013
8. Due to a good white pine cone crop, a Seed Tree/ Reserves harvest implemented August 2013.
9. Planned second resample of 10 regeneration plots: summer 2015
10. Planned resample of species/area plots: 2015

Figure 28-5 Brief history prescribed fire provided by MN DNR for Deer River Two Mile Prescribed Fire project site.

Site #1 –Two Mile Seed Tree Harvest-Prescribed Burn Site
Native Plant Community = FDn33? LTA = Rosey Lake Till Plain Legal Description: S20-T147N-R26

Growth Stage: Mature – Age =106

Inventory: Current BA = 90 sq. ft/acre. Current Vol = RP 4.6MBF, 2.4MBF WP

History: Selective harvest completed in 2002 by Rajala Mill (250 M and 190cd removed). Decent cone crop in 2008. Burned in 2009 at a cost of $500/ac. Complete additional burn in 2011 followed by a selection harvest.

Management Objectives: Use prescribed fire in site preparation, shrub competition control, and duff exposure. Favor natural seeding approaches. Increase stand structural diversity. Increase presence of white pine. DFC= uneven-aged, mixed pine site.

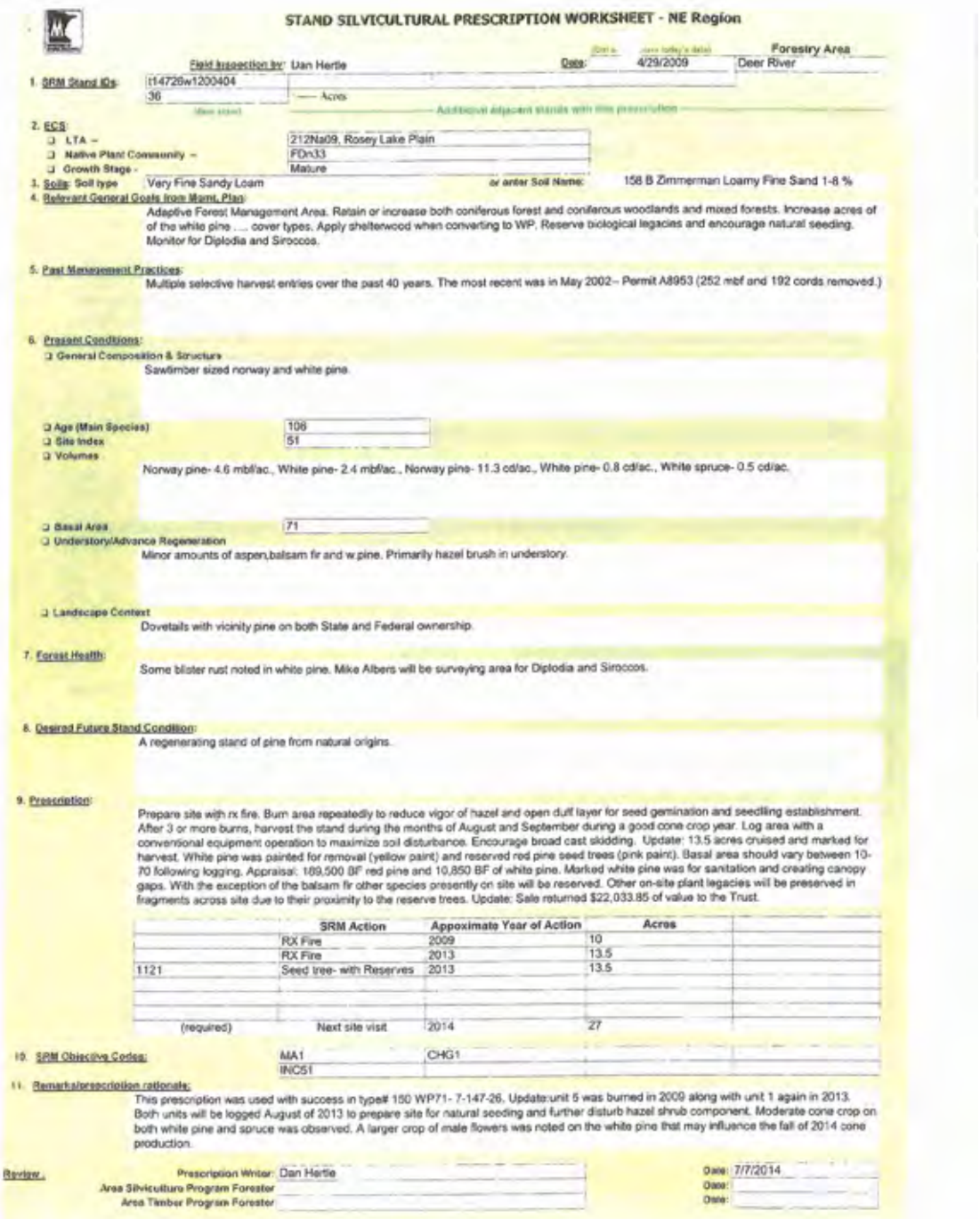
FDn33 Northern Dry-Mesic White Pine Regeneration Strategies:
http://files.dnr.state.mn.us/forestry/ecssilviculture/plantcommunities/FDn33.pdf
http://files.dnr.state.mn.us/forestry/ecssilviculture/communityTables_Figures/FDn33Tables_Figures.pdf

FDn33 sites provide ***excellent habitat*** for white pine trees. When present, white pine is an important co-dominant and sometimes dominant tree. White pine's primary regenerative strategy on FDn33 sites is to fill ***large-gaps***. It is most successful at this beneath other white pines, but also did well when gaps formed within the declining canopy of initial-cohort red pine and paper birch. In the historic PLS data this interpretation is supported by: (1) the fact that white pine abundance rises sharply in response to the decline of the initial cohort species where we presume the formation of large canopy-gaps (PLS-1, PLS-2), (2) it has high abundance at survey corners showing partial canopy loss (PLS-3), and (3) it shows peak establishment in the G-1 gap window rather than post-disturbance or ingress windows (PLS-5). The releve sampling of mature FDn33 forests also suggests that white pine is favored in large gaps. The regenerant and seedling indices are excellent meaning that establishment beneath a canopy is not a problem for white pine (R-2). The lowest index was for white pine saplings suggesting that recruiting white pine seedlings to heights taller than 2m is a regenerative bottleneck for white pine under a canopy. This bottleneck is typical of species that need a bit more light than is offered by single- or few-tree gaps in the undisturbed FDn33 forests that were sampled by releves.

Site 1 AFMP Prescribed Burn

NOTES:

Figure 28-6 Project site background information including rationale and references for prescribed fire and harvesting techniques for Deer River Two Mile Prescribed Fire project site.



STAND SILVICULTURAL PRESCRIPTION WORKSHEET - NE Region

Field Inspection by: Dan Hertle | Date: 4/29/2009 | Forestry Area: Deer River

1. SRM Stand IDs: t14T26w1200404 — 36 — Acres

2. ECS:
- LTA –
- Native Plant Community –: 212Na09, Rosey Lake Plain
- Growth Stage -: FDn33 / Mature

3. Soils: Soil type: Very Fine Sandy Loam — or enter Soil Name: 158 B Zimmerman Loamy Fine Sand 1-8 %

4. Relevant General Goals from Mgmt. Plan:
Adaptive Forest Management Area. Retain or increase both coniferous forest and coniferous woodlands and mixed forests. Increase acres of of the white pine ..., cover types. Apply shelterwood when converting to WP. Reserve biological legacies and encourage natural seeding. Monitor for Diplodia and Sirococs.

5. Past Management Practices:
Multiple selective harvest entries over the past 40 years. The most recent was in May 2002– Permit A8953 (252 mbf and 192 cords removed.)

6. Present Conditions:
- General Composition & Structure: Sawtimber sized norway and white pine.
- Age (Main Species): 108
- Site Index: 51
- Volumes: Norway pine- 4.6 mbf/ac., White pine- 2.4 mbf/ac., Norway pine- 11.3 cd/ac., White pine- 0.8 cd/ac., White spruce- 0.5 cd/ac.
- Basal Area: 71
- Understory/Advance Regeneration: Minor amounts of aspen,balsam fir and w.pine. Primarily hazel brush in understory.
- Landscape Context: Dovetails with vicinity pine on both State and Federal ownership.

7. Forest Health:
Some blister rust noted in white pine. Mike Albers will be surveying area for Diplodia and Sirococs.

8. Desired Future Stand Condition:
A regenerating stand of pine from natural origins.

9. Prescription:
Prepare site with rx fire. Burn area repeatedly to reduce vigor of hazel and open duff layer for seed germination and seedling establishment. After 3 or more burns, harvest the stand during the months of August and September during a good cone crop year. Log area with a conventional equipment operation to maximize soil disturbance. Encourage broad cast skidding. Update: 13.5 acres cruised and marked for harvest. White pine was painted for removal (yellow paint) and reserved red pine seed trees (pink paint). Basal area should vary between 10-70 following logging. Appraisal: 109,500 BF red pine and 10,850 BF of white pine. Marked white pine was for sanitation and creating canopy gaps. With the exception of the balsam fir other species presently on site will be reserved. Other on-site plant legacies will be preserved in fragments across site due to their proximity to the reserve trees. Update: Sale returned $22,033.85 of value to the Trust.

	SRM Action	Appoximate Year of Action	Acres	
	RX Fire	2009	10	
	RX Fire	2013	13.5	
1121	Seed tree- with Reserves	2013	13.5	
(required)	Next site visit	2014	27	

10. SRM Objective Codes: MA1 | CHG1 | INC51

11. Remarks/prescription rationale:
This prescription was used with success in type# 150 WP71- 7-147-26. Update:unit 5 was burned in 2009 along with unit 1 again in 2013. Both units will be logged August of 2013 to prepare site for natural seeding and further disturb hazel shrub component. Moderate cone crop on both white pine and spruce was observed. A larger crop of male flowers was noted on the white pine that may influance the fall of 2014 cone production.

Review:
- Prescription Writer: Dan Hertle — Date: 7/7/2014
- Area Silviculture Program Forester — Date:
- Area Timber Program Forester — Date:

Figure 28-7 Silvicultural prescription worksheet used to document previous management actions at Deer River Two Mile Prescribed Fire project site.

DRAFT

MN DNR Prescribed Burn Unit Plan

NA-01990-04

Burn Unit Name and ID:

Go/No Go Checklist

x	ALL burn prescription elements met.	x	ALL personnel have the required PPE with them.
x	ALL smoke management specifications met.	x	ALL pre-burn considerations (line preparation) identified in the plan addressed.
x	ALL current and projected fire weather forecasts have been obtained and are favorable.	x	ALL the required notifications been made (landowners, media, cooperators, sheriff etc)
x	ALL planned operations personnel and equipment on-site, available and operational.	x	ALL permits and approvals been obtained. (open burning permit, Non-DNR land permission)
x	APPROPRIATE contingency resources have been confirmed and are available	x	ALL on-site holding forces adequate for containment under the expected conditions.
x	ALL personnel briefed on the burn objectives, their assignment, safety hazards, escape routes, communications and contingency plans.	x	Burn Boss believes the burn can be carried out according to the Prescribed Burn Unit Plan and will meet the planned objectives.

Prescribed Burn Unit Report

Weather

	Time	Wind Direction	Wind Speed	Temperature	Relative Humidity	Comment
Forecasted Fire Weather	1600	NW	10-15 (20')	78	37	
Spot weather forecast	1300	NW	7-8	74	40	
Observed weather	1206	NW	1-3 eye level	78	33%	
	13:00	NW	1-3	76	37%	
	13:50	NW	1-3	73	38%	
Test Burn	15:15	N	1-3	74	33%	
	16:26	N/NW	1-3	75	32%	

Observed Fire Behavior

Time	Spread Rate	Flame Lengths	Scorch Height
15:15		6"-2' Head 6" back	2-3'-Hazel leaves curling

Acres Burned by Cover Type

Fuel Model	Completed Acres	ECS Type Sub Type	Completed Acres
FDn33	10		

Post Burn Observations

6/12/13 FFMC 88.7, DMC 14.3, DC 125.8, ISI 6.2, BUI 22.3, FWI 10.1

Hand ignition done at 1800.

7-16-13 70% top kill of hazel. No mortality in residual pine. Decent white pine cone crop. Area cruised and marked for seed tree harvest in August to further disturb suckering hazel and prepare seed bed.

Recommendations

Figure 28-8 2013 MN DNR prescribed burn plan for the Deer River Two Mile Prescribed Fire project site. Page 1 of 3.

DRAFT

MN DNR Prescribed Burn Unit Plan

NA-01990-04

Burn Unit Name and ID:	Two Mile Pine RX		
Sheriff	(218) 326-3477	Chip/Sup. Dispatch	(218) 327-4175
Medical	911	Sheriff- Itasca Co.	(218) 326-3477
Forestry Duty Officer	(218) 244-3790	Region 2 Duty Officer	(218)-327-7850

Personnel Needs

Burn Boss Level (Note: tied to the burn complexity level): MRxB2

Number Needed	Position	Names(Optional)
1	MRxB2	
1	MRxI2	
1	TVOP	
5	FFT2	
2	Igniters	

Equipment Needs

Number needed	Equipment Type	Source
1	J5	Forestry
2	Type 6 Engine	Forestry
1	Portable Pump	Forestry

Operations Plans

Pre-burn Site Preparation Plan: Dozer line along north and east edge of unit 8-10' width.

Ignition/Firing Plan: (Include provisions for a test fire, firing pattern, firing device, preferred wind direction, hazards/special considerations)
Everyone on the fire line will know where escape routes and safety zones are at all times and will watch for spot fires, creeping fire across the break and changing fire behavior as different fuels and fire break conditions are encountered.

1. All personnel assembled at test fire site, and equipment checked and ready to employ. LCES in place.
2. The Burn Boss and Ignition Specialist will determine the igniton pattern and plan the day of the burn.
3. Start a small test fire with a drip torch at an anchor point leading to or from a fire break , within the burn unit, downwind or opposite from the prevailing winds.
4. The Burn Boss makes a "GO or NO GO" decision after the test fire is started and fire behavior evaluated.
5. If a "GO", anchor test burn securely and start the two lighters lighting a strip backfire slowly into the wind.
6. Burn Boss will communicate between ignition specialist and holding forces to insure both are proceeding at the proper speed to ensure safe firing and that ignition is modified as fire behavior, wind or fuel loadings change.
7. If fire crosses the firebreak in any manner, firing operations will stop until under control and the Burn Boss gives the order to proceed.
8. Lighting will continue until ignition of unit is completed.

Holding Plan: (Staging area, holding lines, resources and positions)
Stage at forest road "y" in center of burn unit.
Holding lines are dozer line, forest road and wet timber swamp. After test fire is secure and firing starts the division resources will follow up and spread out under Burn Boss direction and as conditions on the fire line change.
Resources will patrol control lines with J5 and Type 6 engines. Egress is to the north and south on F.R.#2035.

Patrol/Mop-up Plan: (Mopup instructions, safety concerns, weather, contingency, rehab, patrol instructions)
Patrol unit with J5 and Type 6 engines. Utilize J5 on downwind side of unit, divide burn unit into thirds for patrol distances.
Initial mopup to 50' in from dozer line/ forest road. 100% mopup of site next day.
Report any significant weather changes, smoke dispersal changes or fire behavior to burn boss.

Contingency Plans

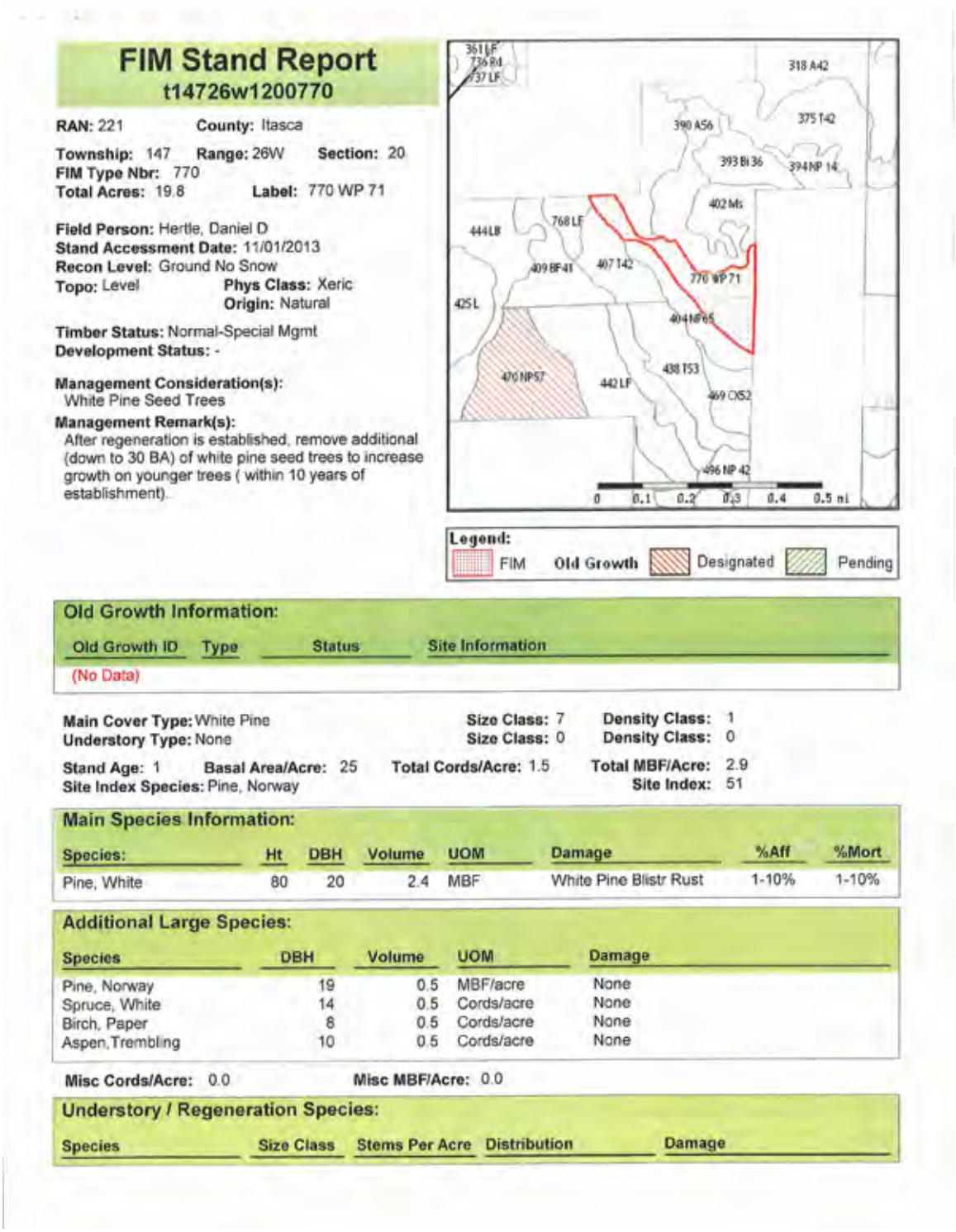
(Include secondary control lines, termination of ignition procedures, list of contingency resources and approximate response times, trigger points, backup plan for equipment failure etc.):
If fire goes across the line, burn boss will determine if ignition will end, holding forces will take action under direction from burn boss to anchor, flank, and pinch escape while containing existing burn unit. If fire is not contained within an hour by that action, contingency resources may be drawn from Effie, Deer River and Grand Rapids DNR Forestry. Approximate response times are 30-60 minutes. If conditions trigger continuing spot fires over the line, spot fires will be put out as well as prescribe fire and mopped up. If fire equipment fails, have one person work on failed equipment if fixable in the field.
Secondary control lines are wet timber swamps that surrounds unit at a distance of .25- 50 miles or Co. Rd. #35 and F.R.# 2156(White Bridge road).

Figure 28-9 2013 MN DNR prescribed burn plan for the Deer River Two Mile Prescribed Fire project site. Page 2 of 3.

DRAFT

Burn Boss Signature		
Name: Dan Hertle	Title: RXB2	Date: 7-16-13

Figure 28-10 2013 MN DNR prescribed burn plan for the Deer River Two Mile Prescribed Fire project site. Page 3 of 3.



FIM Stand Report
t14726w1200770

RAN: 221 **County:** Itasca

Township: 147 **Range:** 26W **Section:** 20
FIM Type Nbr: 770
Total Acres: 19.8 **Label:** 770 WP 71

Field Person: Hertle, Daniel D
Stand Accessment Date: 11/01/2013
Recon Level: Ground No Snow
Topo: Level **Phys Class:** Xeric
Origin: Natural

Timber Status: Normal-Special Mgmt
Development Status: -

Management Consideration(s):
White Pine Seed Trees

Management Remark(s):
After regeneration is established, remove additional (down to 30 BA) of white pine seed trees to increase growth on younger trees (within 10 years of establishment).

Old Growth Information:

Old Growth ID	Type	Status	Site Information
(No Data)			

Main Cover Type: White Pine **Size Class:** 7 **Density Class:** 1
Understory Type: None **Size Class:** 0 **Density Class:** 0

Stand Age: 1 **Basal Area/Acre:** 25 **Total Cords/Acre:** 1.5 **Total MBF/Acre:** 2.9
Site Index Species: Pine, Norway **Site Index:** 51

Main Species Information:

Species:	Ht	DBH	Volume	UOM	Damage	%Aff	%Mort
Pine, White	80	20	2.4	MBF	White Pine Blistr Rust	1-10%	1-10%

Additional Large Species:

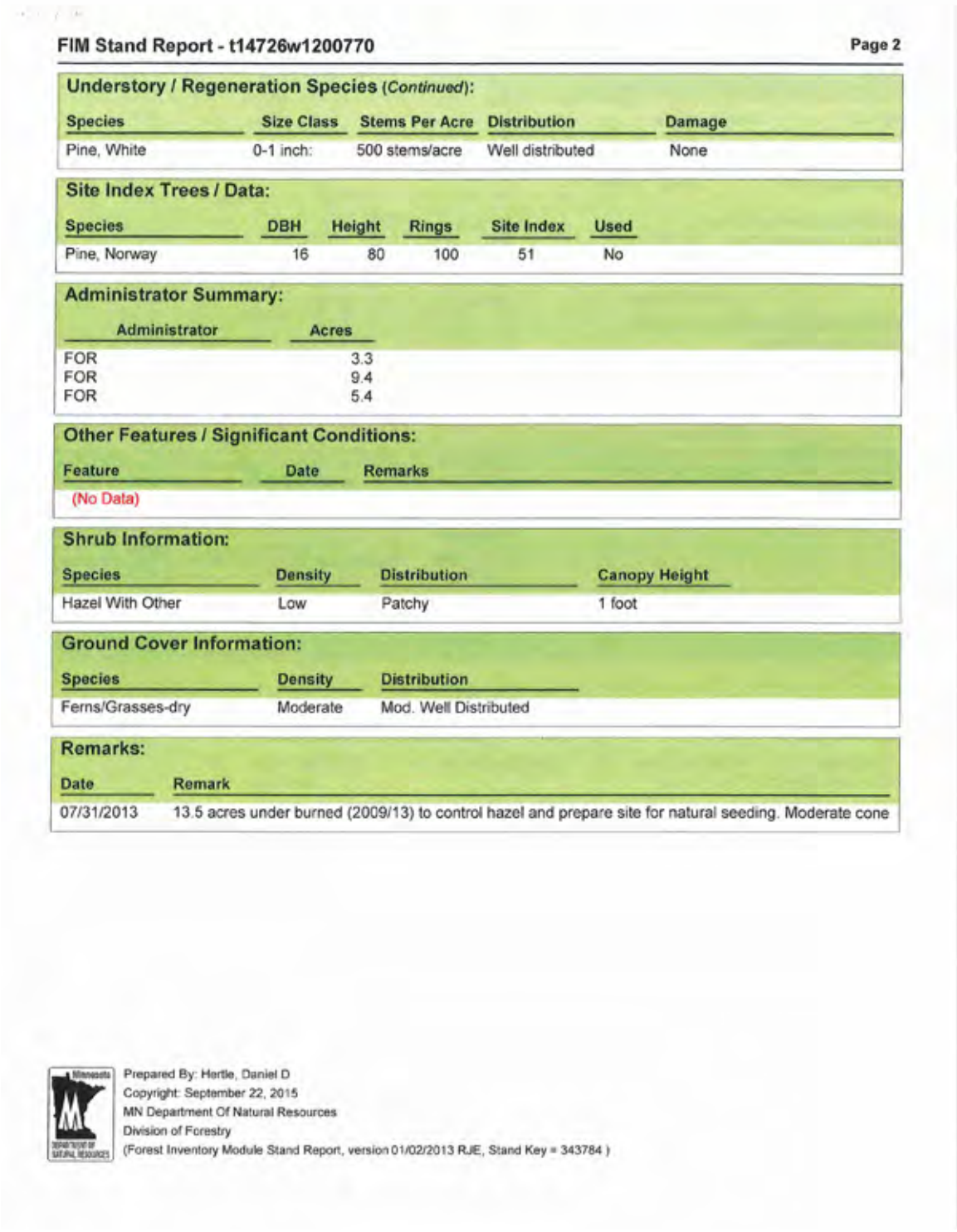
Species	DBH	Volume	UOM	Damage
Pine, Norway	19	0.5	MBF/acre	None
Spruce, White	14	0.5	Cords/acre	None
Birch, Paper	8	0.5	Cords/acre	None
Aspen,Trembling	10	0.5	Cords/acre	None

Misc Cords/Acre: 0.0 **Misc MBF/Acre:** 0.0

Understory / Regeneration Species:

Species	Size Class	Stems Per Acre	Distribution	Damage

Figure 28-11 2013 FIM stand report completed by MN DNR indicating the impacts of the harvest and prescribed fire on Units 1 and 2 of the Deer River Two Mile Prescribed Fire project site. Page 1 of 2.



FIM Stand Report - t14726w1200770 Page 2

Understory / Regeneration Species (*Continued*):

Species	Size Class	Stems Per Acre	Distribution	Damage
Pine, White	0-1 inch:	500 stems/acre	Well distributed	None

Site Index Trees / Data:

Species	DBH	Height	Rings	Site Index	Used
Pine, Norway	16	80	100	51	No

Administrator Summary:

Administrator	Acres
FOR	3.3
FOR	9.4
FOR	5.4

Other Features / Significant Conditions:

Feature	Date	Remarks
(No Data)		

Shrub Information:

Species	Density	Distribution	Canopy Height
Hazel With Other	Low	Patchy	1 foot

Ground Cover Information:

Species	Density	Distribution
Ferns/Grasses-dry	Moderate	Mod. Well Distributed

Remarks:

Date	Remark
07/31/2013	13.5 acres under burned (2009/13) to control hazel and prepare site for natural seeding. Moderate cone

Prepared By: Hertle, Daniel D
Copyright: September 22, 2015
MN Department Of Natural Resources
Division of Forestry
(Forest Inventory Module Stand Report, version 01/02/2013 RJE, Stand Key = 343784)

Figure 28-12 2013 FIM stand report completed by MN DNR indicating the impacts of the harvest and prescribed fire on Units 1 and 2 of the Deer River Two Mile Prescribed Fire project site. Page 2 of 2.

Table 28-1 Results of meander survey through project area. Cover ranges were estimated visually and focused primarily on canopy and subcanopy species. Meander survey occurred 9/25/18 by Mark Pranckus, Cardno. Meander times were 12:25 – 12:50 for Unit 1 and 12:55 - 13:20 for Unit 2. For some shrubs and ground vegetation, "X" indicates species was observed during the survey. Blank cells indicate species was not found in that unit during the survey.

Scientific Name	Common Name	Cover Range Unit 1	Cover Range Unit 2	Species Status
Pinus strobus	White Pine	50 - 75%	5 - 25%	Native
Acer rubrum	Red Maple	1 - 5%	0 - 1%	Native
Pinus resinosa	Red Pine	1 - 5%	5 - 25%	Native
Quercus rubra	Red Oak	0 - 1%	0 - 1%	Native
Populus tremuloides	Quaking Aspen	0 - 1%	5 - 25%	Native
Populus grandidentata	Big-toothed Aspen		5 – 25%	Native
Abies balsamea	Balsam Fir	0 - 1%	0 - 1%	Native
Betula papyrifera	Paper Birch	0 – 1%	0 – 1%	Native
Picea glauca	White spruce	0 - 1%	0 – 1%	Native
Corylus cornuta	Beaked Hazelnut	25 – 50%	5 – 25%	Native
Salix discolor	Pussy Willow	X		Native
Salix humilis	Prairie Willow		X	Native
Rubus allegheniensis	Common Blackberry	X	X	Native
Rubus pubescens	Dwarf Raspberry	X		Native
Vaccinium angustifolium	Lowbush Blueberry	X		Native
Rhododendron groenlandicum	Labrador Tea	X		Native
Diervilla lonicera	Bush Honeysuckle	X		Native
Lonicera canadensis	Fly Honeysuckle	X		Native
Lonicera dioica	Wild Honeysuckle		X	Native
Cirsium arvense	Canada Thistle	X		Non-native
Cornus canadensis	Bunchberry	X		Native
Eurybium macrophyllum	Large-leaved Aster	X		Native
Fragaria virginiana	Wild Strawberrry	X		Native
Galium boreale	Northern Bedstraw		X	Native
Gaultheria procumbens	Wintergreen	X		Native
Lycopodium sp.	Groundpine	X		Native
Oryzopsis asperifolia	Rough-leaved Rice Grass	X	X	Native
Pteridium aquilinum	Bracken Fern	X	X	Native

Appendix C: Site Photographs

Photo 28-1 Example of the understory consisting of beaked hazelnut, subcanopy of balsam fir, and remaining reserve white pine canopy trees in Unit 1, Two Mile Prescribed Burn project site, Bowstring State Forest. Photo illustrates how canopy gaps were created using a forest harvest and the shrub layer was reduced through prescribed fire. White pines, in particular, need larger gaps to establish. Photo taken by Mark Pranckus, Cardno 9/25/18.

Photo 28-2 Example of a reduced beaked hazelnut shrub layer in Unit 1, Two Mile Prescribed Burn project site, Bowstring State Forest. A fire scar from the prescribed burn in either 2009 or 2013 is present on the dark tree in the center of the photo. Remaining balsam firs and aspens provide subcanopy diversity and structure. Photo taken by Mark Pranckus, Cardno 9/25/18.

Photo 28-3 Example of white pine seedling establishment in Unit 1, Two Mile Prescribed Burn project site, Bowstring State Forest. In the center of the photo, several seedlings can be seen ranging in ages. In the background, beaked hazelnut that is regenerating following the prescribed fire in 2013. Photo taken by Mark Pranckus, Cardno 9/25/18.

Photo 28-4 Example of an oak seedling getting established in in Unit 1, Two Mile Prescribed Burn project site, Bowstring State Forest. In the center of the photo is a small oak seedling growing within a beaked hazelnut shrub. Future management may look to hand-release this seedling and other oaks, birch, and pines to increase the growth rate and promote a diverse mixed-age pine stand. In the foreground, an example of the ground cover and duff layer 5 years after the prescribed burn. Photo taken by Mark Pranckus, Cardno 9/25/18.

Photo 28-5 Example of the shrub and remaining reserve canopy layer in Unit 2, Two Mile Prescribed Burn project site, Bowstring State Forest. In this photo, the subcanopy of trees remaining after the burn and harvest in 2013 are fairly sparse. Photo taken by Mark Pranckus, Cardno 9/25/18.

Photo 28-6 Example of the shrub and remaining reserve canopy layer in Unit 2, Two Mile Prescribed Burn project site, Bowstring State Forest. In portions of Unit 2, the remaining reserve canopy trees were less dense than in other areas within the unit. The shrub layer and canopy layer is also more varied than in other parts of the unit. Photo taken by Mark Pranckus, Cardno 9/25/18.

Photo 28-7 In the center and foreground, an example of areas within Unit 2 where the regeneration of the shrub layer following the 2013 prescribed fire has been reduced compared to other areas. This may be due to the fire burning hotter than in other areas killing shrubs and temporarily sterilizing soil. This creates habitat diversity within the forest stand, but by require a longer time period for pine seedlings to establish. Photo taken at the Two Mile Prescribed Burn project site, Bowstring State Forest on 9/25/18 by Mark Pranckus, Cardno.

Photo 28-8 Example for a recent tree harvest during 2018 in Unit 3, which is adjacent to Unit 1 and 2. Unit 3 did not receive a prescribed burn prior to tree harvest so it will provide a reference to the effects of burning as a means to enhance seed bed preparation and improve seed establishment. Photo taken at the Two Mile Prescribed Burn project site, Bowstring State Forest on 9/25/18 by Mark Pranckus, Cardno.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

29) OHF Little Fork Area Forest Enhancement Site 1

Project Background

Project Name: Accelerated Forest Wildlife Habitat Program, Phase 1

Project Site: Pelland Brushland Management – Unit B

Township/Range Section: Township 69 Range 25 Section 8, 9

Project Manager / Affiliated Organization: Larry Petersen, MN DNR Division of Fish and Wildlife, Wildlife Section

Fund: OHF ***Fiscal Year Funds:*** 2011

Project Start Date: January 2013

Predominant Habitat type: Forest

Additional Habitat types: Wetland , Choose an item.

Project Status: Establishment Phase

County: Koochiching

Primary Activity: Forest Enhancement

Project Size: 150 acres

Project Completed: March 2013

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Mechanically shear rank and older-age shrub and brushland stands to create open, early successional site conditions for sharp-tailed grouse, deer, and other brushland species. The mechanical shearing also prepares the site for prescribed burning, which would further maintain the open, early successional site conditions.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   The following was provided for prior to the site assessment. Excerpts can be found in Appendix A.
   - Project proposal
   - Map of MN DNR sharp-tailed grouse priority areas and known leks
   - Aerial maps of pre- and post-project conditions
3. ***What are the stated goals of the project?***

The stated goal is to create open, early successional habitat for sharp-tailed grouse, deer, and other brushland-dependent species.

4. ***Were measures of restoration success identified in plans?*** No
   If yes, list specific measurements.
   Clear measures of success were not clearly identified in the project plans. It can be assumed that due to the simplicity of the task (shear brush) and oversight by MN DNR during the project that measures of success were communicated before and during the project with the selected contractor.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   See Appendix A for excerpts of project documents provided by MN DNR project manager.
   Map provided in Figure 1, Appendix A is a general location map based on interpretation of project plan and aerial imagery.

6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   Project best management practices and guidelines identified in the project planning documents include:
   - Invasive species management – required all equipment to be clean and free of soil and plant parts prior to mobilizing to the site.
   - Site management – referenced following guidelines identified in MN DNR Voluntary Site-level Forest Management guidelines and provided specifications on site access and management.
   - Implementation – provided guidance on minimum equipment requirements including size, horsepower, ground pressure, and blade type to complete the work in a satisfactory manner. Also information about how material was to be distributed around the site was provided.

   Best management practices were based on the best current science. Invasive species and site management guidelines are standard operating practices. Based on discussions with the MN DNR project manager, the specifications for the equipment used for the shearing were extremely important to achieve the desired results. Additionally, it sounded like that type of equipment isn't necessarily common within the industry as contractors are using different blades for their equipment.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   Yes

Work was suspended by MN DNR when site conditions changed (increasing temperatures) and site disturbance increased. When site conditions changed within an acceptable range, work proceeded.

8. ***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?***
   Suspending work was key to avoid unnecessary disturbance and damage to the site. Work needed to occur under frozen conditions within a peatland setting. If work would have been allowed to continue during suboptimal conditions, the potential for negative outcomes would have been damage to existing native plant communities beyond the desire disturbance intensity, increased potential for invasive species, altered hydrology (rutting), and extended recovery time for vegetation. The goal of the project was not to eliminate shrub and brushland vegetation; it was to set it back to an earlier successional stage.

Site Assessment

Field Review Date: **9/28/2018**

Field Visit Attendees: Gina Quiram, MN DNR (Ecological and Water Resources), Larry Petersen, MN DNR (Wildlife), and Mark Pranckus, Cardno (Contracted Assessor)

9. ***Surrounding Landscape Characteristics:***
   The project area is within a mix of forested, pastured or hayed, and wetland land uses. Directly to the east and approximately 3 miles to the west are large wetland, peatland complexes.
10. ***Site Characteristics:***
    - ***a. Soil Series:***
      Rifle and rifle ponded complex
      Dora and terric haplohemist
    - ***b. Topography:***
      Flat
    - ***c. Hydrology:***
      Very poorly drained.
    - ***d. Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:***
      Regenerating shrubs less than 6 feet in height were continuously distributed across the site and covered between 50 to 75% of the site. The understory and ground vegetation was well-developed and typical of a peatland setting. Sphagnum was present throughout the ground cover. A variety of grasses, sedges, and forbs made up the ground vegetation providing good variation in vegetation structure throughout the site. Reed canary grass was observed on the site and made up less than 1% of the site.
    - ***e. Vegetation B: Meander Search Species List (as appropriate for site)***
      See Table 1 for species list.
11. ***Is the plan based on current science?*** Yes
    Early successional cover types need to be maintained by frequent disturbance. For example, early brushland habitat may require a disturbance once every five to 10 years. Mechanical removal via shearing (removing the above ground vegetation while limiting below ground disturbance) is an accepted practice to re-set the existing vegetation when frequent fires are not possible or woody

vegetation has matured to a point where ground vegetation is reduced and unable to carry a fire, resetting the vegetation.

12. ***List indicators of project outcomes at this stage of project:***
    The project area was a large, open community with abundant shrubs that were typically less than 6 feet in height and the ground vegetation was dense and well-developed to provide habitat for sharp-tailed grouse, northern harriers, short-eared owls, moose, and other brushland-preferred wildlife species.
13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    Yes. Mechanical shearing creates open, early successional brushland habitat without creating additional, unnecessary disturbance. It also provides a tool that is less weather and resource-dependent that relying on prescribed burning alone.
    One key to this site is that work was completed at a scale (150 acres) to make a difference in available habitat for a species such as sharp-tailed grouse that are more dependent on landscape characteristics.
14. ***Are corrections or modifications needed to meet proposed outcomes?***
    No corrections needed at this time. As mentioned by the MN DNR project manager, the equipment used for shearing to achieve the desired results is being phased out of the construction industry. One recommendation would be for MN DNR staff to work with the construction/forestry industry to determine if there are additional pieces of equipment or techniques that can be used to create the same conditions, in the event that future management becomes limited by equipment availability and not funding or available contractors.
15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    Yes. Maintaining early successional habitat will require continual management over the long-term. Being flexible and taking advantage of opportunities such as ideal prescribed burning conditions or cold winters that allow for shearing with minimal site disturbance will be important.
    Future challenges and limitations include smaller weather windows to complete work due warmer and wetter conditions, longer periods between disturbances allowing vegetation to mature, which then requires additional work to return to an early successional stage, and establishment of invasive species that alter the existing plant communities.
16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No.
17. ***Are follow-up assessments needed? Explain.***
    No. None recommended at this time.
18. ***Additional comments on the restoration project.***
    Prior to MN DNR taking over management of this project area in the 1980s, local people maintained the open, early successional conditions through frequent fires. Based on the discussion with the MN DNR project manager, the burning wasn't prescriptive in nature but may have been done because it was something that previous generations had done. As conditions, resources, and logistics make it more difficult to complete a prescribed burn, techniques such as mechanical shearing will be more important. In 2017, MN DNR attempted a prescribed burn on the site. Conditions were too wet and the fire didn't carry well. The ability to consider the site for a burn was made possible by the mechanical shearing work done in the previous years.

The MN DNR project manager mentioned on several occasions how important a project of this scale was to species that require specific components of the landscape and that without OHF funding, the project would likely not have been done.
This work was done as a part of a larger group of contracts that MN DNR let during the same time period for winter site preparation and brushland management.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    Medium
20. ***Provide explanation of reason(s) for determination.***
    Currently the site is meeting proposed outcomes. Because the desired outcome is open, early successional brushland habitat, continued management will be required in the future. This is dependent on the availability of funds, resource staff able to manage the work, and contractors able to complete the work.
21. ***Site Assessor(s) Conducting Review:***
    Mark Pranckus, Cardno

Appendix A: Site maps, Project plans or Vegetation tables

Figure 29-1 Aerial view of the project boundary for the 150-acre Pelland brushland management project following the mechanical shearing in 2013. Unit boundary is interpreted from project documentation. Aerial photography is from August 2013 and provided by Google Earth (link http://www.google.com/earth/download/ge/).

Little fork #1

NA-01730-08 2/24/03

Wildlife Project Proposal

BID GROUP 2

Proposal Number
|D220|11|027|
Org FY Seq#

Project Description

Project Name Pelland Brushland Management – Unit B	Type of Work: Brushland Management ACI: 2W930
Mgmt. Unit Type | ____ | No.|	Proj. Sites: 1 Units: site
Name: State Forests	Quantities: 150 Units: acres
County: Koochiching	Twp: 69N Rge: 25W Sec: 8,9

Project justification, clarification or comments:

Lowland brush and offsite conifer will be sheared to set back succession and prepare for burning. The site is in a priority open land management area, and is within an existing brushland management complex that has been sheared and burned. Sharp-tailed grouse and other open land species will benefit from this project. There are several active leks nearby. This project is re-bid due to inoperable conditions in the winter of 2010-11.

Attach Map and Other Supporting Documents

Requirements

Status = (N)=Need, (P)=Pending, (C)=Completed or (NA) Not Applicable.

Requirement	Stat	Comments	Requirement	Stat	Comments
Engineering Req. Survey Req.	N/A		Heritage Database Review	C	
Water Permits Wetland Cons Act	N/A		Acquisition/ Easement	N/A	
Legal Agreement	N/A		Ditch/County Approval	C	
Pesticide Approval	N/A		Watershed Dist. Approval	N/A	

Cultural Resource Protection:

[X] Not an undertaking*	No ground disturbance.
[ ] Need Historic Property review	*Explain status of review:*

Funding Summary

Object Code	Requested Amount:	Other Fund:	Other Fund:	Explanation
Labor Salaries (1B0)				
Fleet/Equipment (2K40/2K0)	280			
Prof. Serv. Contracts (2D0/2S0)				
Construction Contracts (3C0)	9200			
Supplies (2J0)				
Other - Please specify				
Total	9480			

Approvals

Wildlife Position and Signature	Date	Position and Signature	Date
Area Mgr.: Larry Petersen	7/30/10		
Regional Mgr:			
Funding Approval:			

Figure 29-2 Project proposal document. Page 1 of 2.

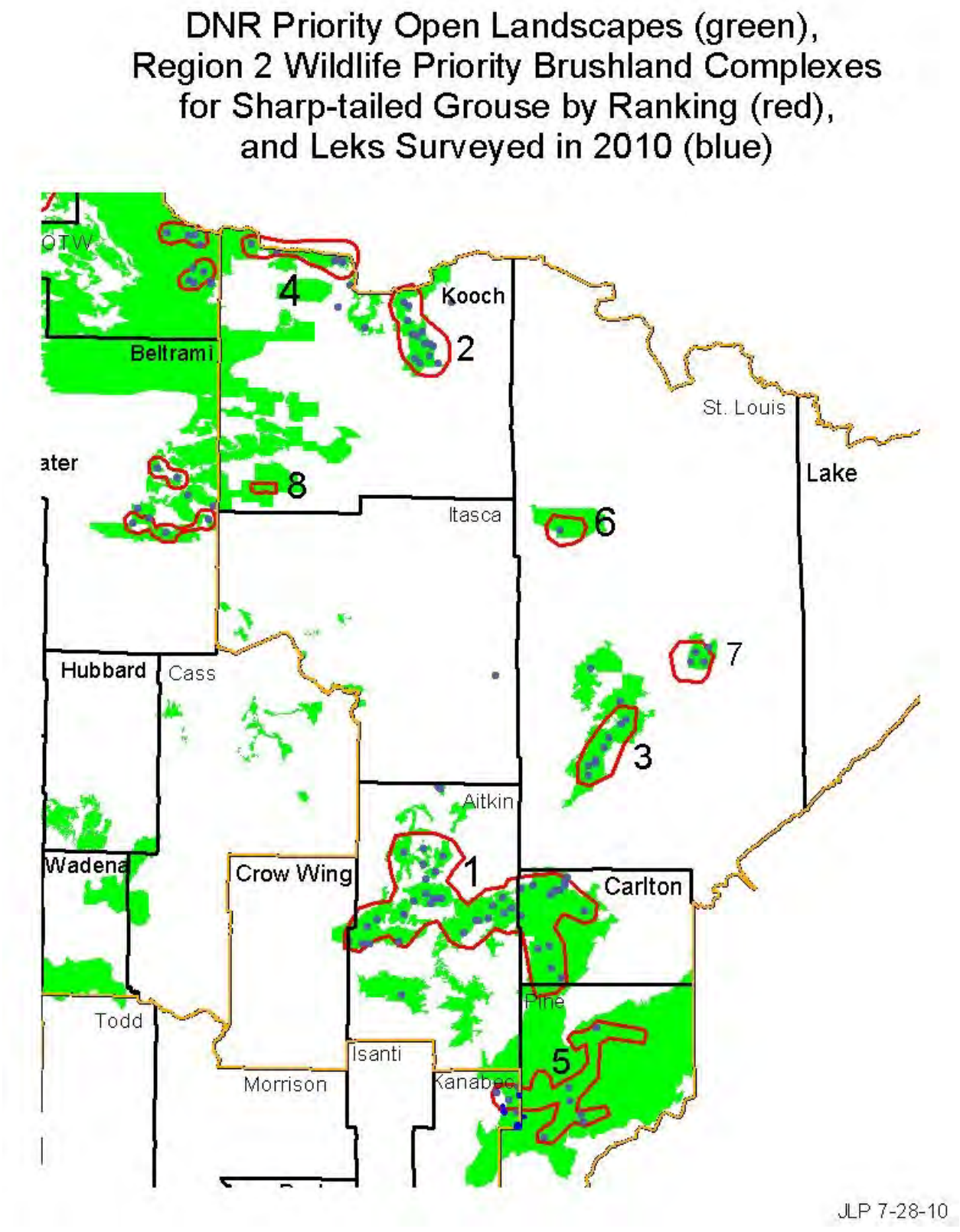


Figure 29-3 Map of MN DNR sharp-tailed grouse priority management areas and known leks.

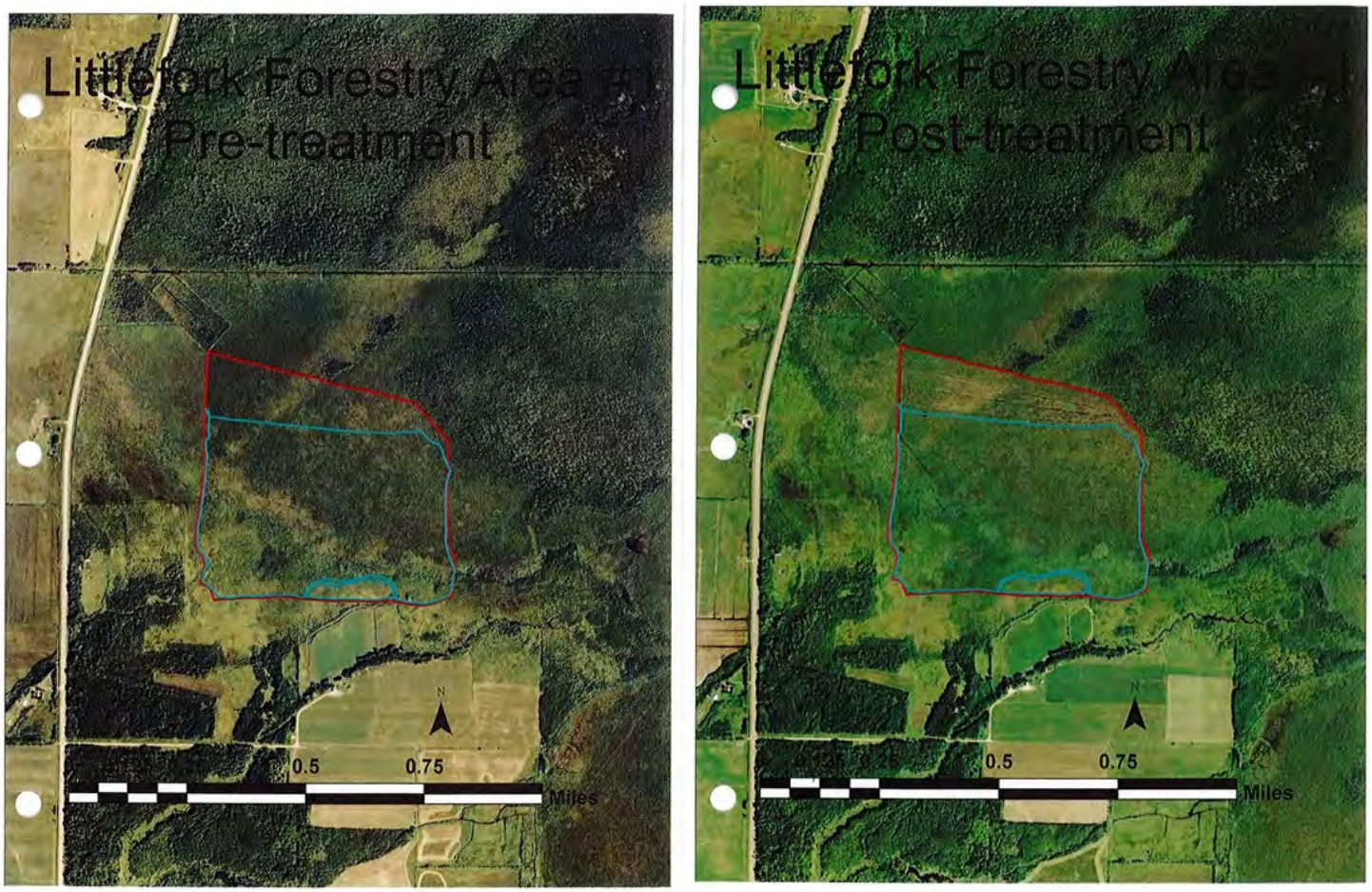


Figure 29-4 Aerial maps showing pre-project and post-project conditions at the Littlefork 150 acre brushland management site. The “red” line indicates the overall project boundary. The “blue” line indicates work that occurred after the project was suspended due to poor field conditions.

Table 29-1 Results of meander survey through project area. Cover ranges were estimated visually and focused primarily on canopy and subcanopy species. Meander survey occurred 9/28/18 by Mark Pranckus, Cardno. Meander time was 9:05 – 9:35 am.

Scientific Name	Common Name	Cover Range	Species Status
Alnus incana	Speckled Alder	25 – 50%	Native
Betula pumila	Bog Birch	25 - 50%	Native
Cornus sericea	Red-osier Dogwood	5 – 25%	Native
Salix discolor	Pussy Willow	5 – 25%	Native
Salix pyrifolia	Balsam Willow	5 – 25%	Native
Larix laricina	Tamarack	1 – 5%	Native
Bromus ciliatus	Fringed Brome		Native
Calamagrostis canadensis	Canada Bluejoint Grass		Native
Campanula aparinoides	Marsh Bellflower		Native
Carex lacustris	Lake Sedge		Native
Carex stricta	Tussock Sedge		Native
Chamadaephne calyculata	Leatherleaf		Native
Comarum palustre	Marsh Cinquefoil		Native
Cornus canadensis	Bunchberry		Native
Doellingeria umbellata	Flat-topped Aster		Native
Dryopteris cristata	Crested Wood Fern		Native
Eupatorium maculatum	Spotted Joe-pye Weed		Native
Eupatorium perfoliatum	Common Boneset		Native
Iris versicolor	Northern Blue Flag		Native
Myrica Gale	Sweet Gale		Native
Petasites frigidus	Sweet Coltsfoot		Native
Petasites sagittatus	Sweet Coltsfoot		Native
Phalaris arundinacea	Reed Canary Grass		Non-native
Rhododendron groenlandicum	Labrador Tea		Native
Ribes hirtellum	Swamp Gooseberry		Native
Rubus idaeus v. strigosus	American Red Raspberry		Native
Rubus pubescens	Dwarf Raspberry		Native
Solidago uliginosa	Bog Goldenrod		Native
Sphagnum sp.	Sphagnum moss		Native
Symphyotrichum puniceum	Swamp Aster		Native
Triadenum fraseri	Marsh St. Johns Wort		Native
Typha latifolia	Broad-leaved Cattail		Native
Vaccinium macrocarpon	Large Cranberry		Native
Viola renifolia	Kidney-leaved Violet		Native

Appendix B: Site Photographs

Photo 29-1 Example of the existing shrub community following mechanical shearing in 2013 and an attempted prescribed burn in 2017. All shrubs were typically less than 6 feet in height. Photo taken on 9/28/18 at the Pelland Brushland Management – Unit B site by Mark Pranckus, Cardno.

Photo 29-2 Example of the existing shrub community following mechanical shearing in 2013 and an attempted prescribed burn in 2017. All shrubs were typically less than 6 feet in height. Photo taken on 9/28/18 at the Pelland Brushland Management – Unit B site by Mark Pranckus, Cardno.

Photo 29-3 Example of the OHF sign posted at the northwestern corner of the site. Surrounding vegetation was not much taller than the sign and post because of the 2013 mechanical shearing project and follow up prescribed burn in 2017. Photo taken on 9/28/18 at the Pelland Brushland Management – Unit B site by Mark Pranckus, Cardno.

Photo 29-4 Example of the well-developed ground layer vegetation present on the site. Photo was taken in a location where shrub regeneration was not very dense. Open areas within the shrub re-growth are important feeding areas for wildlife species such as sharp-tailed grouse. Photo taken on 9/28/18 at the Pelland Brushland Management – Unit B site by Mark Pranckus, Cardno.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

30) OHF Little Fork Area Forest Enhancement Site 2

Project Background

Project Name: Accelerated Forest Wildlife Habitat Program, Phase 1

Project Site: Littlefork Project No. 2 – 5-acre Conifer Release Unit

Township/Range Section: Township 69 Range 23 Section 17

Project Manager / Affiliated Organization: Larry Petersen, MN DNR Division of Fish and Wildlife, Wildlife Section

Fund: OHF ***Fiscal Year Funds:*** 2011

Project Start Date: January 2012

Predominant Habitat type: Forest

Additional Habitat types: Choose an item. , Choose an item.

Project Status: Establishment Phase

County: Koochiching

Primary Activity: Forest Enhancement

Project Size: 5 acres

Project Completed: January 2012

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Hand-release conifers from a young aspen stand to increase growth rate and establishment.
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***

No project plans or prescription worksheets are available. A collection of information about invoicing and contracting comprises the majority of the project documentation.

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

   Based on on-site discussions with the MN DNR project manager, the goal of the project was to increase the amount of conifer trees within a forest stand to improve overwintering habitat for deer and birds. No stated goals in project documentation were available.

4. ***Were measures of restoration success identified in plans?*** No
   If yes, list specific measurements.
   No measures were identified.
5. ***Are plan Sets available?*** No ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:

   Map provided in Figure 1, Appendix A is a general location map based on interpretation of project documents, site visit, and aerial imagery.

6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   No project documentation was available to evaluate written best management practices, standards, or guidelines. This was a collaborative project between MN DNR Forestry and MN DNR Wildlife, with Wildlife staff primarily providing input on site selection and desire outcomes. MN DNR Forestry staff were the principal project managers. Unfortunately, at the time of this assessment, the entire MN DNR Forestry staff that was involved in the project have moved out of the area to another DNR station or are no longer working for the MN DNR. This resulted in a somewhat of an information gap between project implementation and the 2018 assessment. Based on discussions with the MN DNR Wildlife staff member that was involved in the initial phase of the project and on-site observations, the following best management practices were used during the project:
   - The project site was selected based on its location within the landscape to provide maximum benefits, given its scale, to wildlife. In other words, MNDNR wildlife staff evaluated and approved of project location.
   - Reserve trees such as large aspen and older spruce trees were left to provide both a seed source and diversity in tree age classes.
   - Regeneration of cut stumps indicates that herbicide was not used to treat (kill) cut stumps. No herbicide use helps to preserve site diversity.
   - No information about invasive species management during implementation is available; however, based on previous experience on similar projects, contractors likely had to follow standard operating procedures such as arriving with clean equipment. Since this is hand release work, equipment was limited to brush saws or other handheld equipment. No significant areas of invasive species were observed within the project boundary during the meander survey (Table 1), indicating that invasive species management practices were at a minimum successful in not introducing new species to the site.

   Best management practices appear based on the best current science and accepted practices.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   No
   Click here to enter text.
8. ***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?***
   No alterations were made during implementation. Based on observations during the assessment, there are no recommendations for alterations that may have been needed. The project appears to have been implemented as correctly as possible given the scope and scale.

Site Assessment

Field Review Date: **9/28/2018**

Field Visit Attendees: Gina Quiram, MN DNR (Ecological and Water Resources), Larry Petersen, MN DNR (Wildlife), and Mark Pranckus, Cardno (Contracted Assessor)

9. ***Surrounding Landscape Characteristics:***
   The project area is surrounded by predominately a forested landscape, where most of the forest stands have a high aspen component.
10. ***Site Characteristics:***
    a. ***Soil Series:***
    Kab-ratroot complex
    Kab-kooch complex
    b. ***Topography:***
    Flat
    c. ***Hydrology:***
    Poorly drained.
    d. ***Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:***
    The site consists of a mix of young, dense aspen trees, typically less than 3 inches in diameter at breast height (dbh), white spruce and other conifers between 3 and 12 feet tall, alders, and scattered mature white spruce and aspen trees. The ground layer is well-developed with a mix of grasses and forbs, except in a few areas where aspen tree density likely leads to shading out ground vegetation. Invasive species make up less than 1% of the total cover and consisted primarily of Canada thistle.
    e. ***Vegetation B: Meander Search Species List (as appropriate for site)***
    See Table 1 for species list.
11. ***Is the plan based on current science?*** Yes
    Hand release of targeted, desired trees species is a common forestry practice. Typically, this is done to increase growth rates for future timber harvest. In this example, it was done to reduce competition so slower growing tree species could be established in a fast-growing, young aspen stand.

12. ***List indicators of project outcomes at this stage of project:***
    Multiple examples of mixed-age class conifers that are at a size that they can compete with surrounding vegetation and be maintained in the future tree canopy composition.
13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    Yes. The hand release appears to have been successful in allowing conifers to get established and be maintained within this forest stand.
14. ***Are corrections or modifications needed to meet proposed outcomes?***
    No corrections needed at this time.
15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    Yes. The site will be continued to be managed for aspen and spruce timber stand production. No further management is planned until crop trees have reached the desired harvest age and size, which will not occur for at least another 30 to 40 years.
    The typical rotation age for white spruce is between 80 and 100 years. If the site is harvested before the typical rotation age, it would reduce the potential habitat value white spruce trees can provide. Future forest management and harvest practices should consider the value of leaving conifer stands within a primarily aspen-dominated landscape for longer periods of time before harvesting.
16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    Yes. Harvesting the white spruce prior to the typical rotation age reduces the potential habitat value they can provide.
17. ***Are follow-up assessments needed? Explain.***
    No. None recommended at this time.
18. ***Additional comments on the restoration project.***
    Due to the limited about of project documentation, the MN DNR Wildlife project contact provided two additional sites to review to provide context. Both sites were harvested around the same time period as the 5-acre project site and are managed as aspen and conifer mixed stands for timber production. One site was hand released. In the second site, no hand release work was done. Both sites had a higher young aspen component to the point where in some areas of the sites aspen comprised greater than 75% of the canopy. There were fewer conifers present and balsam fir was the most common conifer. When comparing the reference sites to the 5-acre project area, differences in the habitat value such as amount of snow shelter for deer and overwintering birds and nesting cover for birds can be observed with the 5-acre site providing significantly more value.

    The lack of project documentation made this site difficult to fully assess. It was further compounded because staff that worked directly on the project have moved on to other positions. Luckily, L. Petersen was able to provide some institutional knowledge about the project because he was initially consulted on site selection. Overall, it appears to be a good project and maximizes adding value to wildlife habitat within the existing landscape given its scope and scale.

    Based on a review of the project documentation, the 5-acre site was a part of a larger project completed by MN DNR on approximately 235 acres spread over multiple sites ranging from 3 acres up to 60 acres.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    Medium
20. ***Provide explanation of reason(s) for determination.***
    Conifers are well-established within the site and will provide habitat for deer and overwintering birds for the next 30 to 40 years. Currently, the two limitations to the site are the small size (5-acres) and the potential that it gets harvested prior to the white spruce reaching maturity.
21. ***Site Assessor(s) Conducting Review:***
    Mark Pranckus, Cardno

Appendix A: Site maps, Project plans or Vegetation tables

Figure 30-1 Aerial view of the project boundary for the 5-acre conifer release project. Unit boundary is interpreted from project documentation. Aerial photography is from July 2016 and provided by Google Earth (link http://www.google.com/earth/download/ge/).

Table 30-1 Results of meander survey through project area. Cover ranges were estimated visually and focused primarily on canopy and subcanopy species. Meander survey results for the two reference sites are also included. All meander surveys occurred on 9/28/18 and were completed by Mark Pranckus, Cardno. Meander time was 12:35 – 13:05 pm for the 5-acre site and 10:50 – 11:10 am and 11:15 - 11:30 am for the released and unreleased reference sites, respectively. For some shrubs and ground vegetation, "X" indicates species was observed during the survey. Blank cells for all species indicate species was not found in that site during the survey.

Scientific Name	Common Name	Cover Range 5-acre Conifer Release Site	Cover Range Reference Release Site	Cover Range Reference Unreleased Site	Species Status
Populus tremuloides	Quaking aspen	25 – 50%	75 – 100%	75 – 100%	Native
Picea glauca	White Spruce	25 – 50%	5 – 25%	0 – 1%	Native
Alnus incana	Speckled alder	5 – 25%		5 – 25%	Native
Salix bebbiana	Willow spp	0 – 1%	5 – 25%	5 – 25%	Native
Betula papyrifera	Paper Birch		5 – 25%		Native
Abies balsamea	Balsam Fir			0 – 1%	Native
Picea mariana	Black Spruce	1 – 5%	0 – 1%	0 – 1%	Native
Quercus macrocarpa	Bur Oak	0 – 1%			Native
Ulmus americana	American Elm			0 – 1%	Native
Cornus sericea	Red-osier Dogwood	1 – 5%			Native
Actaea rubra	Red Baneberry			X	Native
Anemone quinquefolia	Wood Anemone	X			Native
Athyrium Filix-femina	Lady Fern			X	Native
Calamagrostis canadensis	Canada Bluejoint Grass		X		Native
Carex gracillima	Graceful Sedge		X		Native
Carex lacustris	Lake Sedge	X		X	Native
Carex stricta	Tussock Sedge		X	X	Native
Chelone glabra	Turtlehead	X			Native
Cirsium arvense	Canada Thistle		X		Native
Cornus canadensis	Bunchberry	X	X		Native
Doellingeria umbellatus	Flat-topped Aster	X	X	X	Native
Dryopteris cristata	Crested Fern	X			Native
Equisetum arvense	Common Horsetail	X	X		Native
Equisetum sylvaticum	Woodland Horsetail	X			Native

Scientific Name	Common Name	Cover Range 5-acre Conifer Release Site	Cover Range Reference Release Site	Cover Range Reference Unreleased Site	Species Status
Eurybia macrophylla	Large-leaved Aster	X	X	X	Native
Fragaria virginiana	Wild Strawberry	X	X	X	Native
Galium asprellum	Rough Bedstraw			X	Native
Geum aleppicum	Yellow Avens		X		Native
Geum macrophyllum	Large-leaf Avens		X		Native
Glyceria canadensis	Rattlesnake Manna Grass			X	Native
Hypericum pyramidatum	Great St. Johnswort			X	Native
Lycopus uniflorus	Northern Bugleweed	X			Native
Maianthemum canadense	Canada Mayflower	X			Native
Petasites frigidus	Sweet Coltsfoot	X	X	X	Native
Phalaris arundinacea	Reed Canary Grass			X	Non-native
Poa palustris	Fowl Meadow Grass		X		Native
Ribes americanum	Wild Black Currant	X			Native
Ribes hirtellum	Swamp Gooseberry		X	X	Native
Ribes triste	Swamp Red Currant	X			Native
Rosa acicularis	Prickly Wild Rose	X			Native
Rubus idaeus v. strigosus	American Red Raspberry		X	X	Native
Rubus pubescens	Swamp Dewberry	X	X	X	Native
Scirpus cyperinus	Woolgrass		X		Native
Symphyotrichum ciliolatum	Northern Heart-leaved Aster		X		Native
Symphyotrichum cordifolium	Blue Wood Aster		X		Native
Symphyotrichum lanceolatum	Panicled Aster		X		Native
Typha latifolia	Broad-leaved Cattail		X		Native
Vicia americana	American Vetch		X		Native

Appendix B: Site Photographs

Photo 30-1 Example of conifers that were hand released in 2012. In the photo, woody vegetation competition is reduced allowing more light and resources for the trees to be established. Photo taken on 9/28/18 at the **Littlefork Site No. 2, 5-acre site** by Mark Pranckus, Cardno.

Photo 30-2 Example of conifers in the background that were hand released in 2012. In the photo, aspen density in this portion of the site is significantly reduced. Photo taken on 9/28/18 at the **Littlefork Site No. 2, 5-acre site** by Mark Pranckus, Cardno.

Photo 30-3 Example of an area within the site where conifers are not present and the aspen stand density is greater. There were several areas where aspens were extremely dense limiting other species. Photo taken on 9/28/18 at the **Littlefork Site No. 2, 5-acre site** by Mark Pranckus, Cardno.

Photo 30-4 Example of a regenerating aspen stump that was initially cut in 2012. Trees and shrubs like these were cut to reduce competition around desired tree species such as white spruce and other conifers. Photo taken on 9/28/18 at the **Littlefork Site No. 2, 5-acre site** by Mark Pranckus, Cardno.

Photo 30-5 Example of a conifers within the reference released stand. In the photo, three conifers are present, but the site is still predominately aspen. Photo taken on 9/28/18 at the **reference released site** by Mark Pranckus, Cardno.

Photo 30-6 Example of a conifers within the reference unreleased stand. In the photo, three conifers are present, but smaller in stature when compared to both the 5-acre release site and reference released site. If this site were to be released, all trees within a 6 feet radius of each conifer would be cut. Photo taken on 9/28/18 at the **reference unreleased site** by Mark Pranckus, Cardno.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

31) PTF Crow Hassan Mixed Hardwood Forest Restoration - Revisit

Legacy Fund Restoration Evaluations

See Appendix C for Project Background and Initial Project Evaluation

Project Name: Crow River Reforestation, Crow-Hassen Park Reserve

Project Manager / Affiliated Organization: John Barten 763-694-7841
jbarten@threeriversparkdistrict.org

Fund: PTF ***Fiscal Year Funds:*** 2010

County: Hennepin

Primary Activity: Forest Restoration

Project Size: 14.4 acres

Project Completed: Planted 2010

Follow Up Site Assessment

Field Review Date: **7/3/2018**

Field Visit Attendees: John Moriarty, Three Rivers Park District Senior Manager of Wildlife; Paul Kortebein, Three Rivers Park District Head Forester; Mark Cleveland, MN DNR Site Assessor; Michelle Martin, MN DNR Site Assessor; Sarah Strommen, MN DNR Assistant Commissioner; Wade Johnson, MN DNR Restoration Evaluation Program Coordinator; Gina Quiram, MN DNR Restoration Evaluation Specialist

1. ***Please note any substantive changes to the site characteristics since last site assessment.***

Tree and shrub survival remains high. There has been significant growth and a canopy is developing on the site.

2. ***Is the plan based on current science?*** Yes
   Forest restoration best practices were followed including high density planting of shrubby understory in addition to tree species, vole protection for more susceptible species, and spot treatment of invasives that move into the site. Diverse species were planted with a wide range of environmental tolerance. This was done to allow the species on the site to self-select/thin over time. Monitoring of species like Bog Birch which are typically found in wetter sites would help to inform future plantings.
3. ***List indicators of project outcomes at this stage of the project.***
   Woody species (trees and shrubs) have survived and some are starting to produce fruit/seed. A canopy is starting to develop providing shading and structural diversity one would expect in a mixed hardwood forest restoration. Over time, canopy closure and subsequent shading is likely to help control non-native herbaceous species, such as reed canary grass and thistle species that are not shade tolerant.
4. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
   Yes
5. ***Are corrections or modifications needed to meet proposed outcomes?***
   Tree density is high and project managers acknowledge that the species on the site may self-thin over time. Self-thinning of planted trees in the project area may also have a wildlife benefit due to an increase in dead standing trees. The park staff indicated they planted more disease resistant butternut, but butternut canker was observed on one of the planted trees during the site visit.
6. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
   Project managers indicated they had plans for ongoing monitoring and spot treatment for invasive species. This will be necessary as several species are in the park and adjacent properties.
7. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
   There will be an ongoing need for invasive species control (ie. Garlic mustard, tansy, Asian honeysuckles).
8. ***Are follow-up assessments needed? Explain.***
   Future monitoring may provide some lessons learned and help with future forest restoration projects which the grant recipient may find useful. In particular this project provides an opportunity to monitor a high density planting with a diverse set of species installed over time.
9. ***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.

10. ***The project will:***
    Meet proposed outcomes

Confidence of outcome determination:

High

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

    Current site conditions five years after the last evaluation have shown significant successes.

12. ***Site Assessor(s) Conducting Review:***

    Mark Cleveland, MN DNR Site Assessor; Michelle Martin, MN DNR Site Assessor

Revisit Site maps, Project plans or Vegetation tables

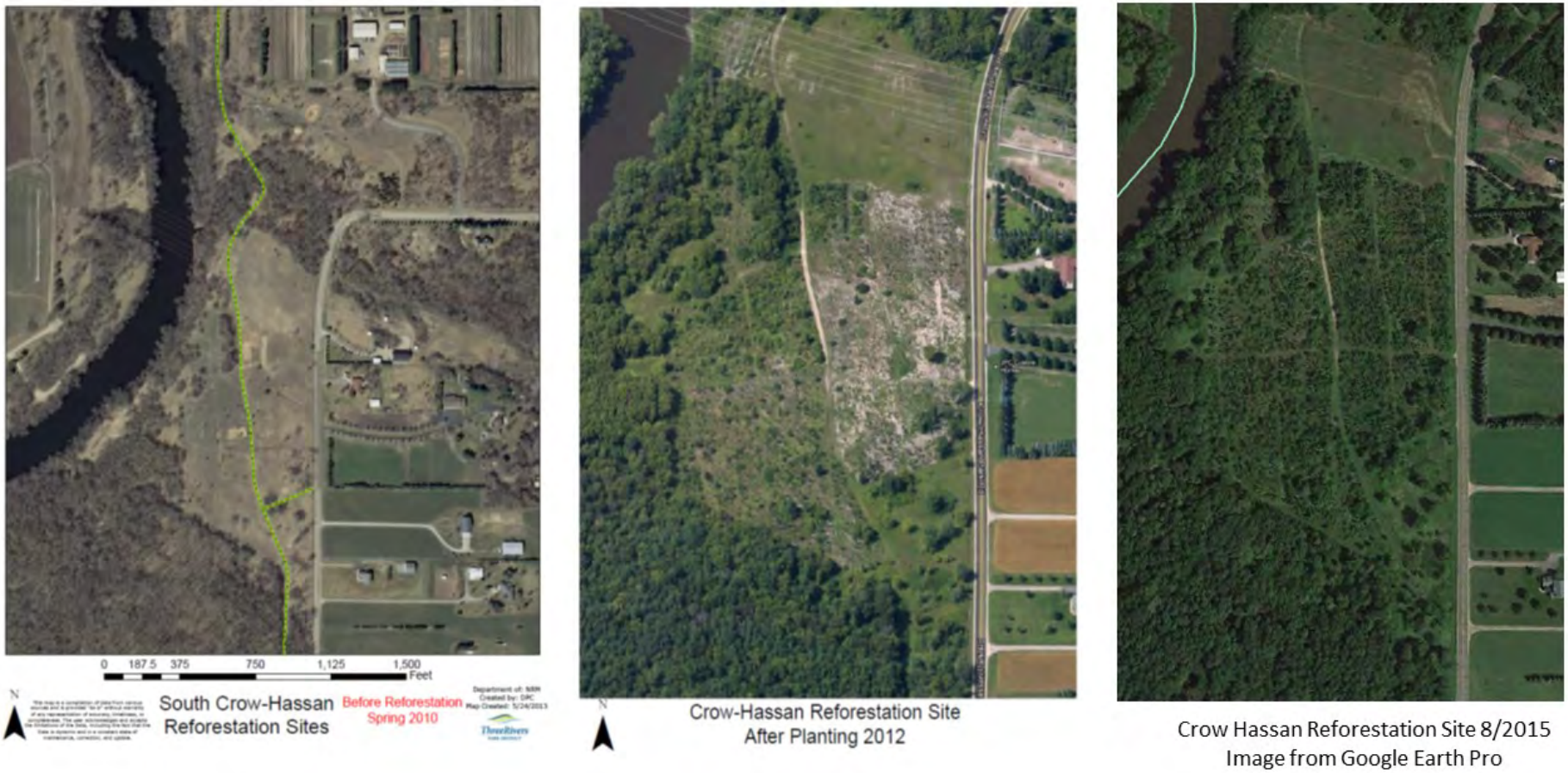


Figure 31-1 Time series of aerial photos of the site of the Crow Hassan Reforestation project. The images from before restoration (spring 2010) and after planting (2012) were provided by Three Rivers Park District. The 2015 image was obtained in Google Earth Pro.

Table 31-1 List of planted species, stocking rate, and if planted species were observed on site in 2018. Volunteer species observed included Red Cedar (*Juniperus virginiana*), Boxelder (*Acer negundo*), Enchanter's Nightshade (*Circaea lutetiana*), Grape (*Vitis riparia*), Common Yarrow (*Achillea millefolium*), Brome (*Bromus inermis*), Black Raspberry (*Rubus occidentalis*), Canada Goldenrod (*Solidago canadensis*), Cow Vetch (*Vicia cracca*), Mint (*Mentha spp.*), Prickly Ash (*Zanthoxylum americanum*), Garlic Mustard (*Alliaria petiolata*), Tansy (*Tanacetum vulgare*), Canada Thistle (*Cirsium arvense*), Avens (*Geum spp.*), Tartarian honeysuckle (*Lonicera tatarica*), Common Buckthorn (*Rhamnus cathartica*), Glossy Buckthorn (*Frangula alnus*), Siberian Elm (*Ulmus pumila*), Ironwood (*Ostrya virginiana*), Smooth Sumac (*Rhus glabra*), Reed Canary Grass (*Phalaris arundinacea*), Autum Olive (*Elaeagnus umbellata*), and Spotted Knapweed (*Centaurea stoebe*).

Scientific Name	Common Name	Number Planted	Observed July 3 2018
Acer rubrum	Red Maple	475	Yes
Acer saccharum	Sugar Maple	340	Yes
Acer saccharinum	Silver Maple	175	Yes
Alnus incana	Speckled Alder	75	Yes
Amelanchier laevis	Alleghany Serviceberry	72	
Aronia melanocarpa	Black Chokeberry	12	Yes
Betula alleghaniensis	Yellow Birch	5	
Betula pumila	Bog Birch	14	Yes
Betula papyrifera	Paper Birch	358	Yes
Carya cordiformis	Bitternut Hickory	92	Yes
Celtis occidentalis	Common Hackberry	274	Yes
Corylus americana	American Hazelnut	702	Yes
Cornus amomum	Silky Dogwood	84	
Cornus racemosa	Gray Dogwood	324	Yes
Cornus sericea	Red-osier Dogwood	66	Yes
Crataegus punctata	Dotted Hawthorn	120	
Euonymus atropurpureus	Eastern Wahoo	168	Yes
Fraxinus nigra	Black Ash	47	Yes
Fraxinus pennsylvanica	Green Ash	353	Yes
Ilex verticillata	Winterberry	12	
Juglans cinerea	Butternut	60	Yes
Juglans nigra	Black Walnut	155	Yes
Ostrya virginiana	Eastern Hornbeam	110	Yes
Aronia melanocarpa	Black Choke Berry	93	Yes
Physocarpus opulifolius	Common Ninebark	9	Yes
Populus grandidentata	Bigtooth Aspen	80	
Populus tremuloides	Trembling Aspen	505	Yes
Prunus americana	Wild Plum	285	Yes
Prunus pensylvanica	Pin Cherry	370	Yes
Prunus serotina	Black Cherry	210	Yes
Prunus virginiana	Chokecherry	205	Yes
Quercus alba	White Oak	529	
Quercus ellipsoidalis	Northern Pin Oak	292	Yes
Quercus macrocarpa	Bur Oak	1160	Yes
Quercus rubra	Red Oak	1013	Yes
Sambucus canadensis	American Elder	197	
Sambucus racemosa	Red-berried Elder	63	Yes
Spiraea alba	White Spiraea	24	
Tilia americana	American Basswood	400	Yes
Ulmus americana	American Elm	743	Yes
Viburnum lentago	Nannyberry	432	Yes
Viburnum opulus var. americanum	Highbrush Cranberry	52	Yes

Revisit Site Photographs

Photo 31-1 Project managers and state staff standing in an access road in forest restoration. (Photo taken during site visit 7/3/2018).

Photo 31-2 Vole guard remaining on a red maple tree. Vole guards were put on maple and basswood trees after planting. The majority of guards were removed in the first couple of years as planned. (Photo taken during site visit 7/3/2018).

Photo 31-3 Prickly ash regenerating in the planting area. Staff noted challenges in growing prickly ash stock because of the phototoxicity of the seeds but the species seems to have taken in this planting. (Photo taken during site visit 7/3/2018).

Photo 31-4 Butternut canker observed on a planted Butternut tree. (Photo taken 8/31/2018).

Photo 31-5 Michelle Martin standing near a Bog Birch. This particular tree appeared to be dying, but others were larger and appeared to be doing well in the planting. (Photo taken 8/31/2018).

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

Appendix A: Initial Project Evaluation

*Fields in original evaluation form may vary. Information was translated to newest version as applicable.

Project Background

Project Name: Crow River Reforestation

Project Location: Crow-Hassan Park Reserve, Three Rivers Park District

Township/Range Section: Township 120N Range 23W Section Click here to enter text.

Project Manager / Affiliated Organization: John Barten 763-694-7841 jbarten@threeriversparkdistrict.org

Fund: PTF ***Fiscal Year Funds:*** Click here to enter text.

Project Start Date: 2009

Predominant Habitat type: Forest

Additional Habitat types: Choose an item. , Choose an item.

Project Status: Post Establishment Phase

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

13. ***What are the specific project components and treatments?***
    Conversion of agricultural field to mixed hardwood forest. Planting 10,915 barefoot stock, mulching and herbicide application for weed/invasive control. Manager's aim for a 1,000 plant per acre stocking rate planted at 6 to 8 ft. spacing with a 50-50 shrub-tree mix. Vole guards were used on Maple and Basswood trees for the first couple of years. Previous reforestation efforts had been fenced to control deer browse but this site was not.
14. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***

"CCM 09-10 Accomplishments" # large bareroot planted.
Hennepin Parks Reforestation Summary Report 1
Hennepin Parks Reforestation Summary Report 2

15. ***What are the stated goals of the project?***
    Re-creation of 14.4 acres of Mixed Oak Woodland and Maple Forest. The site goal will result in additional benefits including creation of a larger contiguous woodland adjacent to the Crow River. Landscape fragmentation will be decreased.
16. ***Were measures of restoration success identified in plans?*** *No*
    If yes, list specific measurements.
    Click here to enter text.
17. ***Are plan Sets available?*** Choose an item. ***Have new GIS maps been created?*** Choose an item.
    If yes, provide in Appendix A and list Maps provided:
    Click here to enter text.
18. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
    Click here to enter text.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

19. ***Were alterations made to the original plan during construction?***
    No
    Click here to enter text.
20. ***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?***
    NA

Site Assessment

Field Review Date: 5/24/2013

Field Visit Attendees: Reviewers: Wade Johnson, Michelle Martin MNDNR Forestry, Mark Cleveland MN DNR SNA Program (lead assessor) – Project managers: John Barten, Jeff Warhol: Three Rivers Park District – Property owners: Three Rivers Park District.

21. ***Surrounding Landscape Characteristics:***
    Old agricultural field turned to brome grass field 30 years ago that is now under forest restoration. The site is adjacent to the Crow River. Mesic woodland to the east, south and north. East boundary is a county road. Adjacent land use along county road is a greenhouse facility and a mixture of small hobby farms and residential development. The forested buffer along the crow River had "weedy" but native vegetation (box elder, prickly-ask) with some invasive species (buckthorn, garlic mustard noted).
22. ***Site Characteristics:***
    k. Soils:
    Predominantly sandy silt. Project manager indicated soils become heavier silty-clay at the south east edge of the project area.

l. Topography:

Level to gently sloping.

m. Hydrology:

Upland, restoration site id 50 meters from the Crow River.

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

Former agricultural field dominated by cool season grasses including smooth brome grass ad Kentucky bluegrass. A mix of mostly deciduous species (planted) and volunteer red cedar and box elder (hard to judge if the box elder were mostly volunteers or planted) that were 3 feet to 20 feet tall depending on the species and level of browse.

o. Vegetation B: Meander Search Species List (as appropriate for site)

Meander; walked along established trails (hiking/horse trails and water line trails) and walked through the site to assess overall stand condition. No species list recorded

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

The park staff clearly thought about what was the best management approach given their budget and site conditions (adjacent to river, lots of brome). They considered other practices that are cheaper and are more commonly employed through the park but decided that planting large trees via augering, close spacing (6 x 7 ft), watering, and herbiciding grass competition was the best method for protecting the river resource, high density of deer, and quickly shading out the ground layer. They also put some thought into where species should be planted on site given soil type (oaks and cherries on dryer areas and sugar maple and basswood in the loamy areas). Although, the tree and shrubs seemed randomly planted from the reviewer's point of view (or it wasn't very obvious that planting was done in this way). While not the least expensive method for establishing a mesic oak/maple forest, due to site conditions, high deer populations and access to water, the use of larger trees and shrubs appears to be a reasonable choice.

24. List indicators of project outcomes at this stage of project:

Successful establishment of a wide variety of woodland tree and shrub species; growth of trees given browse pressure, degree of canopy closure; the site is strong on diversity of species that have been planted.

25. Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?

Yes. With the planting density, species variety and site maintenance. The park seems committed to adapting their plan to ensure a positive outcome but given the results thus far, the project seems like it is on track for achieving the objectives.

26. Are corrections or modifications needed to meet proposed outcomes?

It is too soon to tell. It is anticipated that some woody species will be more successful that others and are more likely to become the dominant canopy trees. Shade suppression will help control the current site dominance of brome grass. It is anticipated that understory plant community will require reintroduction of natural herbaceous plant species.

27. Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?

The benefits of this project could be better articulated. Current project conditions are favorable for long term success. Three Rivers staff did communicate that as trees and shrubs continue to be managed and mature on the site, staff will be used selective thinning to maintain tree health and form, especially for oak species. The park staff are allowing nature to sort the site out, but with help from some intensive

management (watering, herbicide) and in the future, they may weed out disease prone trees (ash, butternut, elm) if they see that they're outcompeting another native tree without the same disease potential.

28. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No, if anything, habitat has been improved over the brome field it once was. This site has greater diversity of plant species and vertical and horizontal structure than it once had.
29. ***Are follow-up assessments needed? Explain.***
    Evaluation and control of invasive herbaceous species and evaluation of woody species distribution would be useful. Part of the evaluation process should include analysis of success for each species planted, to assist in planning for future restoration projects.
30. ***Additional comments on the restoration project.***
    Restoration of this site for the goal stated was appropriate. A more specific plan with detailed objectives, maps, and treatments implemented (and future treatments planned) would be helpful from a reviewers stand point and for the long term success of a forest restoration project (although, I don't think this was a requirement for the funds). It was hard to track what was done when and why and how much money was spent doing each treatment. Also, a list of the species planted and at what density (and what size they were when planted) would be helpful too. We were given a list of planted stock, but the details of the planting were not clear. Some of the species planted were odd choices given the big woods landscape (bog birch, alder, spirea as some examples) but it will be interesting to see how "nature" sorts itself. Ariel photographs of the site Pre project and current projects would be useful. The planting density was high, but the post planting management direction appears to address this as would be the case in a direct seeding project. All in all, the park staff are enthusiastic about the project and are happy with the results thus far. It's clear that they have put a lot of effort into it's success and more importantly, seem very committed to seeing the project through to a successful ending.

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.

31. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    Medium
32. ***Provide explanation of reason(s) for determination.***
    Click here to enter text.
33. ***Site Assessor(s) Conducting Review:***
    Reviewers: Wade Johnson, Michelle Martin MNDNR Forestry, Mark Cleveland MN DNR SNA Program (lead assessor)

Site maps, Project plans or Vegetation tables

Figure 31-2 South Crow-Hassan Reforestation site in spring 2010, prior to restoration.

Figure 31-3 South Crow-Hassan Reforestation site in 2012, after restoration. Tree planting has occurred east of Crow-Hassan Park Road.

Site Photographs

Photo 31-6 Diverse northern Hardwood plantings in existing brome grass field (photo taken during site visit 05/24/2013).

Photo 31-7 Diverse northern Hardood plantings in existing brome grass field (photo taken during site visit 05/24.2013).

Photo 31-8 Crown dieback on trees planted as a part of the project (photo taken during site visit 05/24/2013).

Photo 31-9 Site assessors inspecting northern Hardwood plantings (photo taken during site visit 05/24/2013).

Photo 31-10 Northern Hardwood planting (photo taken during site visit 05/24/2013).

Photo 31-11 Drier upland area of northern Hardwood planting (photo taken during site visit 05/24/2013).

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

32) PTF Greenleaf Lake SRA Prairie Reconstruction

Project Background

Project Name: Greenleaf Lake SRA

Project Site: West 40 Prairie Reconstruction

Township/Range Section: Township 118N Range 30W Section 29

Project Manager / Affiliated Organization: Molly Tranel Nelson, MN DNR Parks and Trails

Fund: PTF ***Fiscal Year Funds:*** 2014

Project Start Date: 2014

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Forest , Choose an item.

Project Status: Post Establishment Phase

County: Meeker

Primary Activity: Prairie Restoration

Project Size: 40 acres

Project Completed: Complete

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Prior to site prep, the field was cropped with soybeans. The crop field was lightly disked and followed by prairie seeding of grasses and forbs with two establishment mows and spot spraying for thistles.
2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Greenleaf Lake State Recreation Area – West 40 Prairie Reconstruction – Audit document provided by DNR project manager Molly Tranel Nelson

3. ***What are the stated goals of the project?***
   Restore crop field areas to a reconstructed native prairie to at least a "B/C" level, i.e. a prairie with a mix of cool- and warm-season native grasses and a variety of forbs with minimal exotic weeds and grasses.
   From the Minnesota Biological Survey Upland Prairie System September 2014
   "B-rank occurrences have good ecological integrity. They include plant communities with modest degradation or that were degraded in the past but have recovered and now have relatively natural composition and structure. B-rank occurrences normally will return to A-rank condition with protection or appropriate management.
   C-rank occurrences have fair ecological integrity. They show strong evidence of human-caused degradation, but retain some characteristic species and have some potential for recovery with protection and management."
4. ***Were measures of restoration success identified in plans? Yes***
   If yes, list specific measurements.
   The reconstructed prairie will have a mix of cool- and warm-season native grasses and a variety of forbs with minimal exotic weeds and grasses.
5. ***Are plan Sets available?*** **Yes** ***Have new GIS maps been created?*** **Yes**
   If yes, provide in Appendix A and list Maps provided:
   - Greenleaf Lake SRA West 40 Prairie Reconstruction Area with boundaries of the mesic and dry prairie-seeded areas.
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   - Site prep: site was lightly disked in preparation for seeding
   - Spring seeding in 2014 using a Vicon broadcast seeder
   - Mowing during the summer following seeding to control weeds
   - Second-year spot mowing and spraying to control weeds, especially Canada Thistle
   - Planned prescribed burn in fall of 2018 (or mowing or conservation haying if burning is not feasible)
   - Planned mowing or stump cutting and treating of undesirable woody species

   These practices are consistent with prairie reconstruction best management practices.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   Yes
   A couple species were unviable and removed from the original seed mix e.g. western wheatgrass.
8. ***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?***
   Minimally; the unavailability of seed for a couple species did not change the overall project outcome.

Site Assessment

Field Review Date: **8/15/2018**

Field Visit Attendees: Gina Quiram (Restoration Evaluation Specialist DNR), Wade Johnson (Restoration Evaluation Program Coordinator DNR), Molly Tranel Nelson (Project Manager DNR), Kathleen Thompson (Intern BWSR), Eric Ogdahl (Site Assessor Great River Greening)

9. ***Surrounding Landscape Characteristics:***

   Adjacent land is a mix of privately owned wetlands, woodlands, and crop fields to the west and south. Land to the north and east is wetlands, old field, hardwood forest classified as MHs37 (Southern Dry-Mesic Oak Forest) and open water. There is a 40 acre Conservation Reserve Program (CRP) planting to the southeast.

10. ***Site Characteristics:***

    a. Soil Series:

    Soils are primarily well to poorly drained loams, including 239 LeSueur clay loam; 740 Hamel-Glencoe, depressional complex; 920B Clarion-Storden-Hawick complex; 960D2 Storden-Omsrud complex; 1204B Reedslake loam; 1213C Cokato-Storden complex; 1220C Cokato-Storden-Hawick complex; and L107A Canisteo-Glencoe, depressional complex. According to the United States Department of Agriculture's Natural Resources Conservation Service (USDA NRCS), these soils support a range of native vegetation, including tallgrass prairie and mixed northern hardwoods (Cokato, Reedslake, and Storden series), deciduous forests (LeSueur series), and wet prairies (Hamel, Glencoe, and Canisteo series) (USDA NRCS 2018).

    b. Topography:

    Gently rolling terrain with depressions on the southwest and northeast corners of the site

    c. Hydrology:

    The majority of the soils on the site are not hydric, except for depressions on the southwest and northeast corners of the site.

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

    Dominant species in areas seeded with a mesic prairie mix included seeded species Big Bluestem, Indian Grass, Canada Wild Rye, Ox-eye Sunflower, and Wild Bergamot. Native seeded species comprised approximately 85% of the mesic areas. Canada goldenrod, while not seeded, was another dominant species (approximately 5% of the mesic areas). Native woody species, such as Boxelder and Cottonwood, ranged in cover from 5-10%. Invasive cover ranged was approximately 5% and primarily Canada thistle. In the dry prairie seed mix area, Little Bluestem, Canada Wild Rye, Big Bluestem, Ox-eye Sunflower, Golden Alexanders, and Stiff Goldenrod were among the dominant seeded species. Native seeded species comprised approximately 85% of the dry areas. Native woody species ranged from 5-10% cover. Invasive cover was approximately 5% and primarily Canada thistle.

    e. Vegetation B: Meander Search Species List (as appropriate for site)

    In the mesic prairie seed mix areas, seven of the eight seeded graminoids were observed and 13 of the 16 seeded forbs were observed (Table 1). Twelve non-seeded natives and three non-natives were also observed. In the dry prairie seed mix area, six of the seven seeded graminoids were observed and 14 of the 18 seeded forbs were observed (Table 2). Nineteen non-seeded natives and three non-natives were also observed.

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

    The sequence of site preparation, seeding, mowing and spot spraying used on this site is consistent with current prairie restoration practices. These practices encourage the establishment of native grasses and forbs while controlling for non-native and weedy species.

12. ***List indicators of project outcomes at this stage of project:***

    The dominant cover in both the mesic and dry prairie seeded areas consists of the native seeded species, providing a seed source under future management activities (e.g. prescribed burns). While there is a presence of invasive and undesirable woody species, future planned management activities such as prescribed burning or forestry mowing should reduce the cover of undesirable species and encourage native seeded species.

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***

    Yes, the planned prescribed burn will help reduce the cover of undesirable woody species and further encourage native prairie grasses and forbs.

14. ***Are corrections or modifications needed to meet proposed outcomes?***

    If a prescribed burn is not feasible this fall, other management activities, such as forestry mowing or conservation haying, should be considered, as the project manager discussed during the site visit.

15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***

    Yes, fire as a management tool appears practical and is consistent with prairie best management practices. While the entire 40 acres of prairie reconstruction are planned to be burned as a unit, the project manager identified using the adjacent CRP land to the southeast as refugia; coordination with the CRP management is therefore key. In the case that smoke concerns or weather prevent fire, the project manager has identified other techniques such as mowing or conservation haying that will be used to control weeds and reduce aboveground biomass, as a burn alternative. Conservation grazing may also be considered.

    One potential challenge for the site includes woody encroachment from the adjacent forest, given the presence of volunteer tree species observed during the site visit. The plan provided by the project manager acknowledges this challenge and proposes allowing certain tree species to establish along the prairie-forest border to create a more natural or 'soft' transition from the forest to the prairie. This seems appropriate, as certain areas of the site appear to trend towards woody species. For undesirable woody species, the plan specifies species will be controlled by mowing or stump cutting and treating.

    An additional challenge may be the eventual control of Canada goldenrod. While the mesic areas appeared to have good establishment of native seeded grasses and forbs, Canada goldenrod was present and has been observed to spread and crowd out desirable native species in later stages of restorations with mesic soils. Timing and intensity of burns and burn alternatives appear to have a significant impact on Canada goldenrod control; Kentucky bluegrass (*Poa pratensis*) can be heavily associated with Canada goldenrod stands.

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

    No

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

No formal monitoring is planned at this time. However, follow-up assessments would be useful to identify the effect of fire (or haying or mowing) in reducing weeds and undesirable woody species. Special attention should also be given to the abundance of Canada goldenrod at the site, as this species has been observed in later stages of restorations to spread aggressively on sites with mesic soils.

18. ***Additional comments on the restoration project.***
    Click here to enter text.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***
    The establishment phase of prairie restoration was well implemented, with good establishment of native seeded grasses and forbs. The management plan has identified prescribed fire or fire alternatives such as conservation haying as a tool to maintain native prairie vegetation, as well as methods to control woody encroachment, such as forestry mowing, from the bordering forest to the east. All practices are consistent with current prairie best management practices.
21. ***Site Assessor(s) Conducting Review:***
    Eric Ogdahl, Great River Greening

References

United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS). 2018. Official Soil Series Descriptions.
https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/geo/?cid=nrcs142p2_053587

Appendix A: Site maps, Project plans or Vegetation tables

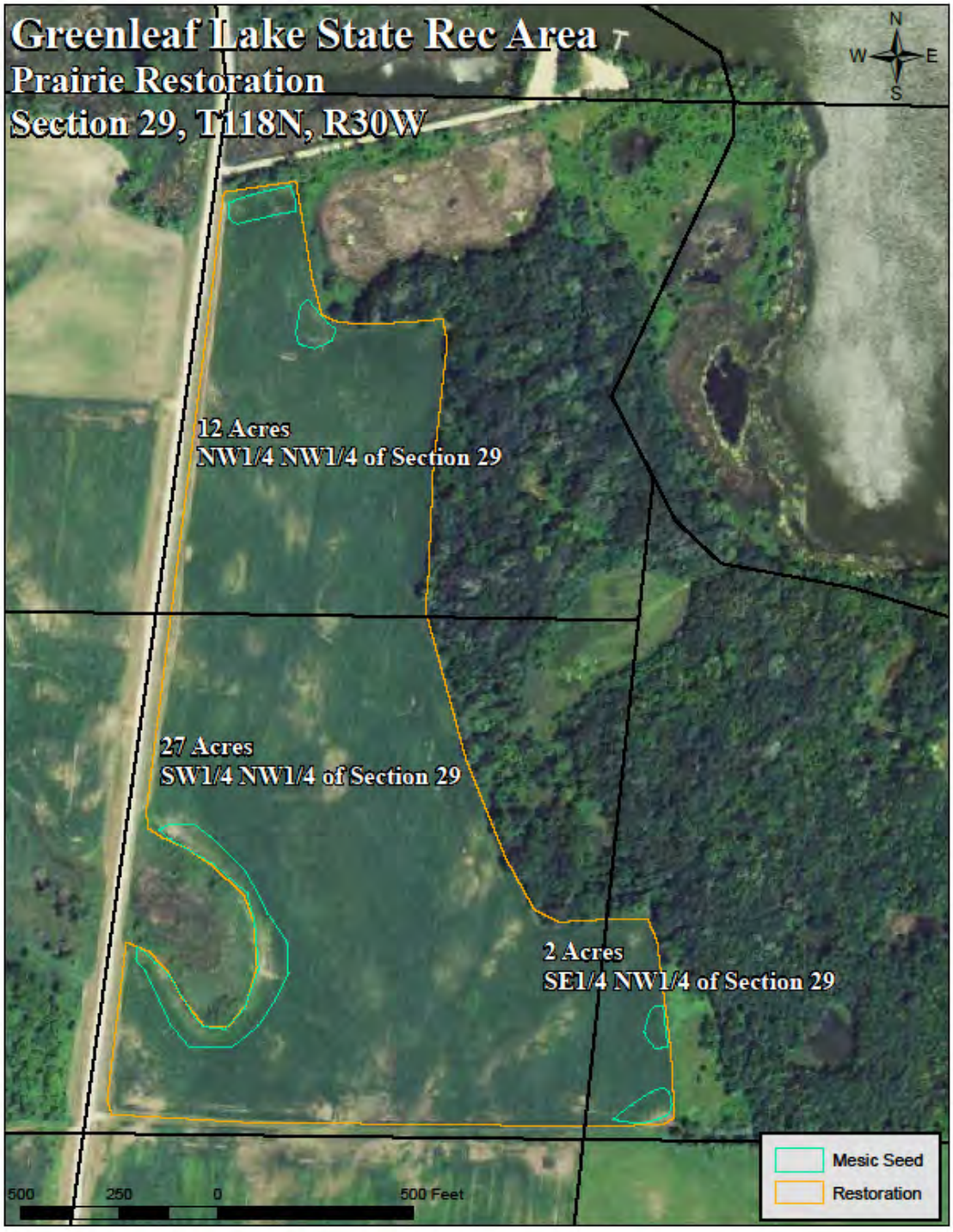


Figure 32-1 Greenleaf Lake SRA West 40 Prairie Reconstruction Area with boundaries of the mesic and dry prairie-seeded areas. Map provided by DNR Parks and Trails staff.

SHOOTING STAR
NATIVE SEEDS

20740 County Road 33 • Spring Grove, MN 55974
(507) 498-3944 Phone • (507) 498-3953 Fax • www.ssns.co

To: MN DNR - Parks & Trails
Ryan Anderson
1897 Camden Park Road
Lynd, MN 56157
507-865-4530 x5 Phone

ryan.t.anderson@state.mn.us

Quote Number	MNDNR1407B
Quote Date	3/19/2014
Order Date	
Total Acres	3.00
Total Lbs	36.00
Price/Lb	$41.00
Price/Acre	$492.00
Seed Total	$1,476.00

Description: Modified 35-541 Mesic Prairie Southwest Mix
Seeding Rate: 12 Lbs/Acre (61.2 Seeds/Square Foot)
Notes: Regional mesic prairie reconstruction for wetland mitigation, ecological restoration, or conservation program plantings.

Common Name	Scientific Name	Genetic Origin	% of Mix	Seeds/Ft	Total Lbs
Grasses					
Big Bluestem	Andropogon gerardii	Lincoln Co, MN	7.49%	3.3	2.70 PLS Lbs
Sideoats Grama	Bouteloua curtipendula	Douglas Co, MN	7.49%	2.0	2.70 PLS Lbs
Canada Wild Rye	Elymus canadensis	Kossuth Co, IA	7.46%	1.7	2.69 PLS Lbs
Slender Wheatgrass	Agropyron trachycaulum	Stevens Co, MN	7.46%	2.3	2.69 PLS Lbs
Prairie Cord Grass	Spartina pectinata	Grant Co, MN	4.74%	1.4	1.71 PLS Lbs
Switchgrass	Panicum virgatum	Kossuth Co, IA	4.38%	2.7	1.58 PLS Lbs
Little Bluestem	Schizachyrium scoparium	Wabasha Co, MN	12.50%	8.3	4.50 PLS Lbs
Indiangrass	Sorghastrum nutans	Dakota Co, MN	12.54%	6.6	4.51 PLS Lbs
Forbs					
Canada Milk Vetch	Astragalus canadensis	La Qui Parle Co, MN	0.53%	0.4	0.19 PLS Lbs
Canada Anemone	Anemone canadensis	Faribault Co, MN	0.84%	0.3	0.30 PLS Lbs
White Prairie Clover	Dalea candidum	Stearns Co, MN	0.24%	0.2	0.09 PLS Lbs
Purple Prairie Clover	Dalea purpurea	Blue Earth Co, MN	0.61%	0.4	0.22 PLS Lbs
Swamp Milkweed	Asclepias incarnata	Faribault Co, MN	0.45%	0.1	0.16 PLS Lbs
Purple Meadow Rue	Thalictrum dasycarpum	Fillmore Co, MN	0.65%	0.3	0.23 PLS Lbs
Ox-eye Sunflower	Heliopsis helianthoides	McLeod Co, MN	0.50%	0.1	0.18 PLS Lbs
Prairie Blazingstar	Liatris pycnostachya	McLeod Co, MN	0.49%	0.2	0.18 PLS Lbs
Wild Bergamot	Monarda fistulosa	McLeod Co, MN	0.29%	0.9	0.10 PLS Lbs
Stiff Goldenrod	Solidago rigida	Faribault Co, MN	0.28%	0.5	0.10 PLS Lbs
Culver's Root	Veronicastrum virginicum	Faribault Co, MN	0.61%	21.5	0.22 PLS Lbs
Black-eyed Susan	Rudbeckia hirta	Martin Co, MN	0.49%	2.0	0.18 PLS Lbs
Smooth Blue Aster	Aster laevis	Blue Earth Co, MN	0.25%	0.6	0.09 PLS Lbs
Blue Vervain	Verbena hastata	Martin Co, MN	0.61%	2.5	0.22 PLS Lbs
Hoary Vervain	Verbena stricta	Martin Co, MN	0.41%	0.5	0.15 PLS Lbs
Golden Alexanders	Zizia aurea	Martin Co, MN	2.06%	1.0	0.74 PLS Lbs
Cover Crop					
Oats	Avena sativa	MN	26.63%	1.4	9.59 PLS Lbs

Shipping and sales tax are not included. There is a $10.00 minimum per species if purchased individually. A $50.00 small mix fee will be added to mixes which cost less than $250.00. This price is good for 30 days. Thank you for your inquiry.

RECEIVED
MAR 25 2014
Parks & Trails
New Ulm

Figure 32-2 Purchased seed mix for mesic reconstruction areas after substitutions, based on BWSR mix 35-541 Mesic Prairie Southwest mix. Highlighted species were observed during the meander survey.

SHOOTING STAR
NATIVE SEEDS

20740 County Road 33 • Spring Grove, MN 55974
(507) 498-3944 Phone • (507) 498-3953 Fax • www.ssns.co

To: MN DNR - Parks & Trails
Ryan Anderson
1897 Camden Park Road
Lynd, MN 56157
507-865-4530 x5 Phone

ryan.t.anderson@state.mn.us

Quote Number	MNDNR1406B
Quote Date	3/19/2014
Order Date	
Total Acres	40.00
Total Lbs	500.00
Price/Lb	$42.00
Price/Acre	$525.00
Seed Total	$21,000.00

Description: Modified 35-521 Dry Prairie Southwest Mix
Seeding Rate: 12.5 Lbs/Acre (85.9 Seeds/Square Foot)
Notes: Regional dry prairie reconstruction for wetland mitigation, ecological restoration, or conservation program plantings.

Common Name	Scientific Name	Genetic Origin	% of Mix	Seeds/Ft	Total Lbs
Grasses					
Sideoats Grama	Bouteloua curtipendula	Douglas Co, MN	11.16%	3.1	55.80 PLS Lbs
Canada Wild Rye	Elymus canadensis	Kossuth Co, IA	9.63%	2.3	48.15 PLS Lbs
Slender Wheatgrass	Agropyron trachycaulum	Stevens Co, MN	7.99%	2.5	39.95 PLS Lbs
Switchgrass	Panicum virgatum	Kossuth Co, IA	6.02%	3.9	30.10 PLS Lbs
June Grass	Koeleria cristata	Benton Co, MN	5.45%	50.0	27.25 PLS Lbs
Little Bluestem	Schizachyrium scoparium	Wabasha Co, MN	11.96%	8.2	59.80 PLS Lbs
Prairie Dropseed	Sporobolus heterolepsis	Otter Tail Co, MN	5.72%	4.2	28.60 PLS Lbs
Forbs					
Whorled Milkweed	Asclepias verticillata	Dakota Co, MN	0.10%	0.1	0.50 PLS Lbs
Canada Milk Vetch	Astragalus canadensis	La Qui Parle Co, MN	0.51%	0.4	2.55 PLS Lbs
White Prairie Clover	Dalea candidum	Stearns Co, MN	0.46%	0.4	2.30 PLS Lbs
Purple Prairie Clover	Dalea purpurea	Blue Earth Co, MN	0.80%	0.6	4.00 PLS Lbs
Butterfly Milkweed	Asclepias tuberosa	Blue Earth Co, MN	0.36%	0.1	1.80 PLS Lbs
.ead Plant	Amorpha canescens	Faribault Co, MN	0.62%	0.5	3.10 PLS Lbs
Ox-eye Sunflower	Heliopsis helianthoides	Blue Earth Co, MN	0.35%	0.1	1.75 PLS Lbs
Round-headed Bush Clover	Lespedeza capitata	Watonwan Co, MN	0.27%	0.1	1.35 PLS Lbs
Button Blazingstar	Liatris aspera	Blue Earth Co, MN	0.18%	0.1	0.90 PLS Lbs
Meadow Blazingstar	Liatris ligulistylis	McLeod Co, MN	0.16%	0.1	0.80 PLS Lbs
Wild Bergamot	Monarda fistulosa	McLeod Co, MN	0.24%	0.8	1.20 PLS Lbs
Stiff Goldenrod	Solidago rigida	Faribault Co, MN	0.53%	1.0	2.65 PLS Lbs
Black-eyed Susan	Rudbeckia hirta	Martin Co, MN	0.52%	2.2	2.60 PLS Lbs
Heath Aster	Aster ericoides	Brown Co, MN	0.10%	0.9	0.50 PLS Lbs
Smooth Blue Aster	Aster laevis	Blue Earth Co, MN	0.24%	0.6	1.20 PLS Lbs
Prairie Spiderwort	Tradescantia bracteata	Houston Co, MN	0.13%	0.1	0.65 PLS Lbs
Hoary Vervain	Verbena stricta	Martin Co, MN	0.78%	1.0	3.90 PLS Lbs
Golden Alexanders	Zizia aurea	Martin Co, MN	1.68%	0.8	8.40 PLS Lbs
Cover Crop					
Oats	Avena sativa	MN	34.04%	1.9	170.20 PLS Lbs

Shipping and sales tax are not included. There is a $10.00 minimum per species if purchased individually. A $50.00 small mix fee will be added to mixes which cost less than $250.00. This price is good for 30 days. Thank you for your inquiry.

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MAR 25 2014
Parks & Trails
New Ulm

Figure 32-3 Purchased seed mix after substitutions for the dry prairie, based on BWSR mix 35-521 Dry Prairie Southwest Mix. Highlighted species were observed during the meander survey.

Table 32-1 Species observed during the meander survey of the mesic-seeded areas.

Scientific Name	Common Name	Cover Range	Species Planted/Seeded	Species Status
Ambrosia trifida	Giant Ragweed	5-25%	No	Native
Andropogon gerardii	Big Bluestem	5-25%	Yes	Native
Asclepias syriaca	Common Milkweed	5-25%	No	Native
Cirsium arvense	Canada Thistle	5-25%	No	Invasive
Elymus canadensis	Canada wild rye	5-25%	Yes	Native
Fraxinus pennsylvanica	Green Ash	5-25%	No	Native
Heliopsis helianthoides	Ox-eye Sunflower	5-25%	Yes	Native
Monarda fistulosa	Wild Bergamot	5-25%	Yes	Native
Panicum virgatum	Switchgrass	5-25%	Yes	Native
Solidago canadensis	Canada goldenrod	5-25%	No	Native
Solidago rigida	Stiff Goldenrod	5-25%	Yes	Native
Sorghastrum nutans	Indiangrass	5-25%	Yes	Native
Acer negundo	Boxelder	1-5%	No	Native
Astragalus canadensis	Canada Milk Vetch	1-5%	Yes	Native
Bouteloua curtipendula	Side-oats Grama	1-5%	Yes	Native
Cornus cf. sericea	Red-osier Dogwood	1-5%	No	Native
Echinocystis lobata	Wild Cucumber	1-5%	No	Native
Rudbeckia hirta	Black-eyed Susan	1-5%	Yes	Native
Spartina pectinata	Prairie Cord Grass	1-5%	Yes	Native
Symphyotrichum ericoides	Heath Aster	1-5%	No	Native
Symphyotrichum leave	Smooth Blue Aster	1-5%	Yes	Native
Verbena stricta	Hoary Vervain	1-5%	Yes	Native
Zizia aurea	Golden Alexander	1-5%%	Yes	Native
Asclepias incarnata	Swamp Milkweed	<1%	Yes	Native
Bromus inermis	Smooth Brome	<1%	No	Invasive
Eupatorium perfoliatum	Common Boneset	<1%	No	Native
Eutrochium maculatum	Spotted Joe-pye Weed	<1%	No	Native
Symphyotrichum lanceolatum	Panicled Aster	<1%	No	Native
Taraxacum officinale	Common Dandelion	<1%	No	Non-Native
Verbena hastata	Blue Vervain	<1%	Yes	Native
Veronicastrum virginicum	Culver's Root	<1%	Yes	Native
Vitis riparia	Wild Grape	<1%	No	Native

Table 32-2 Species observed during the meander survey of the dry-prairie-seeded area.

Scientific Name	Common Name	Cover Range	Species Planted/Seeded	Species Status
Acer negundo	Boxelder	5-25%	No	Native
Andropogon gerardii	Big Bluestem	5-25%	No	Native
Asclepias syriaca	Common Milkweed	5-25%	No	Native
Cirsium arvense	Canada Thistle	5-25%	No	Invasive
Dalea purpurea	Purple Prairie Clover	5-25%	Yes	Native
Elymus canadensis	Canada Wild Rye	5-25%	Yes	Native
Heliopsis helianthoides	Ox-eye Sunflower	5-25%	Yes	Native
Monarda fistulosa	Wild Bergamot	5-25%	Yes	Native
Populus tremuloides	Cottonwood	5-25%	No	Native
Schizachyrium scoparium	Little Bluestem	5-25%	Yes	Native
Solidago canadensis	Canada goldenrod	5-25%	No	Native
Solidago rigida	Stiff Goldenrod	5-25%	Yes	Native
Sorghastrum nutans	Indian Grass	5-25%	No	Native
Zizia aurea	Golden Alexander	5-25%	Yes	Native
Ambrosia artemisiifolia	Common Ragweed	1-5%	No	Native
Ambrosia trifida	Giant Ragweed	1-5%	No	Native
Astragalus Canadensis	Canada Milkvetch	1-5%	Yes	Native
Bouteloua curtipendula	Side-oats Grama	1-5%	Yes	Native
Cornus cf. sericea	Red-osier Dogwood	1-5%	No	Native
Dalea candidum	White Prairie Clover	1-5%	Yes	Native
Koeleria cristata	June Grass	1-5%	Yes	Native
Lespedeza capitate	Round-headed Bush Clover	1-5%	Yes	Native
Liatris ligulistylis	Meadow Blazingstar	1-5%	Yes	Native
Panicum virgatum	Switchgrass	1-5%	Yes	Native
Phalaris arundinacea	Reed Canary Grass	1-5%	No	Invasive
Rudbeckia hirta	Black-eyed Susan	1-5%	Yes	Native
Sporobulus heterolepsis	Prairie Dropseed	1-5%	Yes	Native
Symphyotrichum ericoides	Heath Aster	1-5%	Yes	Native
Verbena stricta	Hoary Vervain	1-5%	Yes	Native
Vitis riparia	Wild Grape	1-5%	No	Native
Amorpha canescens	Lead Plant	<1%	Yes	Native
Apocynum cannabinum	Indian Hemp	<1%	No	Native
Asclepias tuberosa	Butterfly Milkweed	<1%	Yes	Native
Eupatorium perfoliatum	Common Boneset	<1%	No	Native
Helianthus cf. pauciflorus	Stiff Sunflower	<1%	No	Native
Oenothera biennis	Common Evening Primrose	<1%	No	Native
Quercus macrocarpa	Bur Oak	<1%	No	Native
Ratibida columnifera	Long-headed Coneflower	<1%	No	Native
Ratibida pinnata	Grey-headed Coneflower	<1%	No	Native
Rhus sp.	Sumac	<1%	No	Native
Rumex crispus	Curly Dock	<1%	No	Non-Native
Symphyotrichum leave	Smooth Blue Aster	<1%	Yes	Native
Urtica dioica	Stinging Nettle	<1%	No	Native

Appendix B: Site Photographs

Photo 32-1 Site condition looking north, prior to restoration. May 29, 2014 (Photo courtesy of Molly Tranel Nelson).

Photo 32-2 Site condition looking north, prior to restoration. Corn in background is site. CRP in foreground is adjacent land. August 14, 2013 (Photo courtesy of Molly Tranel Nelson).

Photo 32-3 Site on July 7, 2014. Photo taken from 640th Ave looking southeast (Photo courtesy of Molly Tranel Nelson).

Photo 32-4 May 27, 2015. Close up of grasses and forbs after seeding (Photo courtesy of Molly Tranel Nelson).

Photo 32-5 First growing season weeds, June 106, 2015 (Photo courtesy of Molly Tranel Nelson).

Photo 32-6 August 20, 2015. Photo taken looking southeast from 640th Ave (courtesy of Molly Tranel Nelson).

Photo 32-7 Photo taken looking east/south east from the north end of the restoration (photo taken during site visit Aug. 15, 2018.

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

33) PTF Rice Lake State Park Prairie Reconstruction

Project Background

Project Name: Rice Lake State Park

Project Site: RMU 12 and 14

Township/Range Section (RMU 12): Township 107N Range 19W Section 12

Township/Range Section (RMU 14): Township 107N Range 18W Section 6-7

Project Manager / Affiliated Organization: Neil Slifka, Area Resource Specialist, Parks and Trails

Fund: PTF ***Fiscal Year Funds:*** 2014, 2015, 2017

Project Start Date: 2014-2017

Predominant Habitat type: Prairie / Savanna / Grassland

Additional Habitat types: Forest , Choose an item.

Project Status: Post Establishment Phase

County: Steele and Dodge

Primary Activity: Prairie Restoration

Project Size: RMU 12: 30 acres; RMU 14: 15 acres

RMU 12 Completed: 2014

RMU 14 Completed: 2015, 2016, and 2017

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   Prior to prairie reconstruction activities, the sites existed as old fields or former fallow pasture land. Several areas were tiled after the mid-1940s (including RMU 12) and work was done in the 1990s

through mid-2000s to break tile lines to restore local hydrology to several areas that were once ephemeral wetlands. RMU 12 and RMU 14 generally involved the same steps of prairie reconstruction from old fields. Site preparation involved summer mowing of vegetation, followed by a glyphosate application, a prescribed burn to remove thatch, and several diskings. Sites were seeded in the spring (various years) with hand-collected forbs and vac-collected grasses from within 12 miles of the state park, and followed by a summer maintenance mow. Maintenance during the following years involved additional maintenance mowing (or, in the case of RMU 14's 2015 planting, a prescribed burn), and spot treatment and pulling of non-native and invasive species, such as Wild parsnip. In late summer to fall, at the end of the third growing season after seeding, sites were overseeded with hand-collected sedges and forbs. RMU 12 was burned in April 2014, while prescribed planned for RMU 14 planting units in Fall 2018 or Spring 2019.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   Rice Lake State Park Prairie Reconstruction Evaluation: RMU 12 & 14 General Plan Outlines document provided by DNR Area Resource Specialist Neil Slifka
3. ***What are the stated goals of the project?***
   Restore old fields to a reconstructed prairies representative of other prairie reconstructions and remnants in the state park, many of which are grass-heavy. Prairies should be representative of native plant community types, with seed sourced from within approximately 12 miles of the park. These goals were outlined by the project manager during the site visit.
4. ***Were measures of restoration success identified in plans? No***
   If yes, list specific measurements.
   Click here to enter text.
5. ***Are plan Sets available?*** **Yes** ***Have new GIS maps been created?*** **Yes**
   If yes, provide in Appendix A and list Maps provided:

   - Figure – Rice Lake State Park management areas, labeled 1-15. Map provided by DNR Parks and Trails staff.
   - Figure – Rice Lake State Park Prairie Reconstructions: North Side. Polygons show the year in which the reconstructions were planted. Highlighted yellow polygons show the approximate location of the meander surveys in RMU 12 and RMU 14.

6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   List of practices provided for RMU 12:
   2013 (site preparation)
   - High mow during the summer of 2013, followed by glyphosate spray.
   - Seed collection via hand collecting of forbs and flail-vac of grasses from existing grass seed plots occurred from August to October. Grab sample testing of seeds following collection.
   - September: prescribed burn to remove thatch
   - September through October: disk site multiple times

   2014 (Final prep/seeding)
   - Spring: disk site at least 3 times, with resting periods between disking; lightly disk site once more for final seedbed prep
   - Late May: Broadcast seed using Vicon Pendulum Spreader at 10 lbs/acre bulk grasses (Big bluestem/Indian grass) and 6-8 lbs/acre of bulk forbs; cultipack immediately following seeding.

- July: High maintenance mow at 12 inches

2015 (Early maintenance/Establishment)

- Late June: Conservation Corps Minnesota and Iowa (CCMI) crew hand removal of wild parsnip
- July: High mow with flail to suppress annual weeds and limit Canada thistle
- Mid-July through October: Seed collection, sedges and forbs overseeding

2016 (Early maintenance/establishment)

- Late June: CCMI hand removal of wild parsnip and spot treat Canada thistle with Transline
- Mid-July through October: Seed collection, sedges and forbs for overseeding
- September through October: Establish prescribed-burn breaks around 2014 planting and adjacent 2012 and 2013 plantings.

2017:

- April: Prescribe burn 2014 planting unit along with two adjacent units planted in 2012 and 2013; overseed all three units with forbs and sedges
- Late June through July: Continue to monitor and treat problem invasives, including Canada thistle and wild parsnip; monitor for Queen Anne's Lace and Birdsfoot Trefoil.

The reconstructions for the RMU 14 sites generally follow the same steps as outlined above for RMU 12, with a few exceptions:

- RMU 14 2016 and 2017 plantings were burned to remove thatch in fall following summer site prep; the 2015 planting was burned the spring following site prep.
- RMU 14 2015 Planting was burned the second year (the year following seeding) instead of mowed; 2016 and 2017 plantings were both mowed in summer the year following seeding.

This series of reconstruction activities are consistent with prairie best management practices and based on current science. Mowing, spraying, and disking during site preparation reduces undesirable vegetation and prepares the site for subsequent seeding.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   Yes
   A portion of the RMU 14 2017 planting was inadvertently mowed in August.
8. ***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?***
   The planned burn for fall 2018 or spring 2019 may need to be delayed, since the vegetation will need to grow tall enough to carry fire. Given that the site was recently mowed prior to the site visit, we did not survey this area.

Site Assessment

Field Review Date: **8/27/2018**

Field Visit Attendees: Gina Quiram (Restoration Evaluation Specialist DNR), Neil Slifka (Project Manager DNR), Eric Ogdahl (Site Assessor Great River Greening)

9. ***Surrounding Landscape Characteristics:***
   RMU 12 is surrounded directly by hardwood forests to the north, east, south, and west, all within the Rice Lake State Park boundaries, with Rice Lake beyond to the east and south. RMU 14 is surrounded to the north and east by roads and agricultural fields beyond; to the south by a wetland and agricultural fields beyond; and to the west by what appear to be a farmstead and agricultural fields.
10. ***Site Characteristics:***
    a. ***Soil Series:***
    Soils primarily consist of silt clay loams. RMU 12 includes Blooming silt loam, Havana silt loam, Maxcreek silty clay loam, and Newry silt loam. According to the United States Department of Agriculture's Natural Resources Conservation Service (USDA NRCS), these soils support a range of native vegetation, including deciduous forest (Blooming, Havana, and Newry series), prairie (Havana and Maxcreek series), and oak savanna (Newry Series). RMU 14 includes M512A Menomin-Hayfield complex and M513A Meridian loam. Both Memomin and Meridian series are reported to support a mix of deciduous trees and prairie grasses (USDA NRCS).
    b. ***Topography:***
    Both RMU 12 and RMU 14 consist of gently rolling topography.
    c. ***Hydrology:***
    Both RMU 12 and 14 are primarily upland prairies. Several depressions were observed along the western boundary and in the southern portion of RMU 12.
    d. ***Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:***
    Dominant seeded species observed in RMU 12 included Indian grass, Big bluestem, Sawtooth sunflower, Wild Bergamot, and Stiff goldenrod. Native seeded species comprised approximately 85% of the site. Canada goldenrod, while not seeded, was another dominant species (approximately 5% of the site). Invasive cover was relatively low (<5%), with Wild parsnip and Reed canary grass being the primary species observed. In RMU 14, Indian grass, Big bluestem, Sawtooth sunflower, and Wild bergamot. Native seeded species comprised approximately 80% of the planting area. Canada goldenrod was also present in RMU 14, and comprised approximately 7% of the area. Invasive cover was approximately 5-7% with wild parsnip among the dominant species.
    e. ***Vegetation B: Meander Search Species List (as appropriate for site)***
    In RMU 12, three of the 16 graminoids present in the park and 17 of the 55 forbs present in the park were observed (Table 1). Nine native species not collected and 4 non-native species were also observed. In RMU 14, four of the 16 graminoids present in the park and nine of the 55 forbs present in the park. Two native species not collected and 5 non-native species were also observed. The establishment of forbs was generally in line with their presence in the overall state park, as noted in the project management files.
11. ***Is the plan based on current science?*** Yes

The sequence of site preparation, seeding, mowing, spot spraying, prescribed burning, and overseeding used on these sites is consistent with current prairie restoration practices. These practices encourage the establishment of native graminoids and forbs while controlling for non-native and weedy species.

12. ***List indicators of project outcomes at this stage of project:***
    The dominant cover in both RMU 12 and RMU 14 seeded areas consists of the native seeded species, providing a seed source under future management activities (e.g. prescribed burns). While there is a presence of invasive and aggressive native species, continued maintenance, such as spot spraying or pulling invasive species, future prescribed burns, and overseeding should further reduce the cover of undesirable species and encourage native seeded species.

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***
    Yes, planned continued maintenance such as spot spraying or pulling invasive species, future prescribed burns, and overseeding should further reduce the cover of undesirable species and encourage native seeded species.
14. ***Are corrections or modifications needed to meet proposed outcomes?***
    No, with ongoing planned management there is an opportunity for success in current and future restoration efforts.
15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***
    Yes, fire as a management tool appears practical and is consistent with prairie best management practices.

    One potential challenge noted by the project manager included the availability of CCMI crews to perform spot treatment of invasives, such as wild parsnip, within specific time windows, although instances of this seemed rare. Availability of shared DNR equipment, such as the flail vacuum seed harvester, was also notes as an occasional limitation; however, the project manager identified other methods of seed collection in these cases, such as hand collection or using smaller equipment.

    Another challenge may be the eventual control of Canada goldenrod. While areas generally appeared to have good establishment of native seeded grasses and forbs, Canada goldenrod was present and has been observed to spread and crowd out desirable native species in later stages of restorations with mesic soils. Timing and intensity of burns and burn alternatives, as the project manager mentioned, can have a significant impact on Canada goldenrod control; Kentucky bluegrass (*Poa pratensis*) can be heavily associated with Canada goldenrod stands.

    Overall, there is continued programmatic support for ongoing management, as indicated by the project manager.
16. ***Do any of the project activities, planned or implemented, likely detract from existing or potential habitat? Explain.***
    No; however, if not already done, coordination among reconstructions is key to ensure areas of refugia during prescribed burns.
17. ***Are follow-up assessments needed? Explain.***

The plan outline provided by the project manager includes plans for future monitoring for problem invasives.

18. ***Additional comments on the restoration project.***
    Click here to enter text.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***
    The establishment phase of prairie restoration was well implemented, with both of the visited reconstructions having dominant cover of native seeded grasses and forbs. Given that all seed is locally collected and the presence of seed plots within the state park, the availability of seed for additional overseedings and reconstructions appeared to be high. The management plan included appropriate methods for continued maintenance of the reconstructions—namely prescribed burning and monitoring and spot treatment of invasives—which are consistent with prairie best management practices. Additionally, there is continued programmatic and funding support for ongoing maintenance of the reconstructions.
21. ***Site Assessor(s) Conducting Review:***
    Eric Ogdahl, Great River Greening

Appendix A: Site maps, Project plans or Vegetation tables

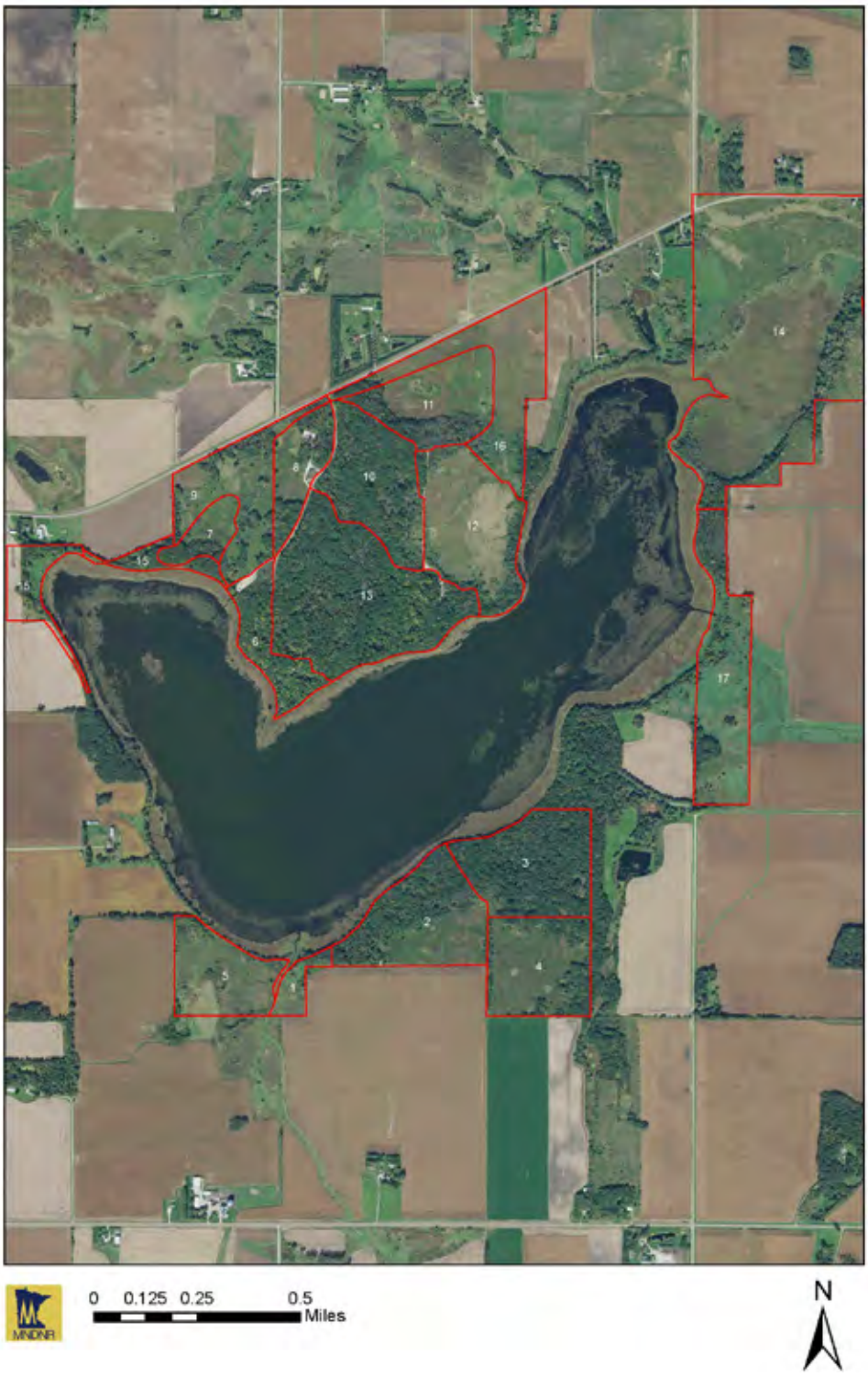

Figure 33-1 Rice Lake State Park management areas, labeled 1-15. Map provided by DNR Parks and Trails staff.

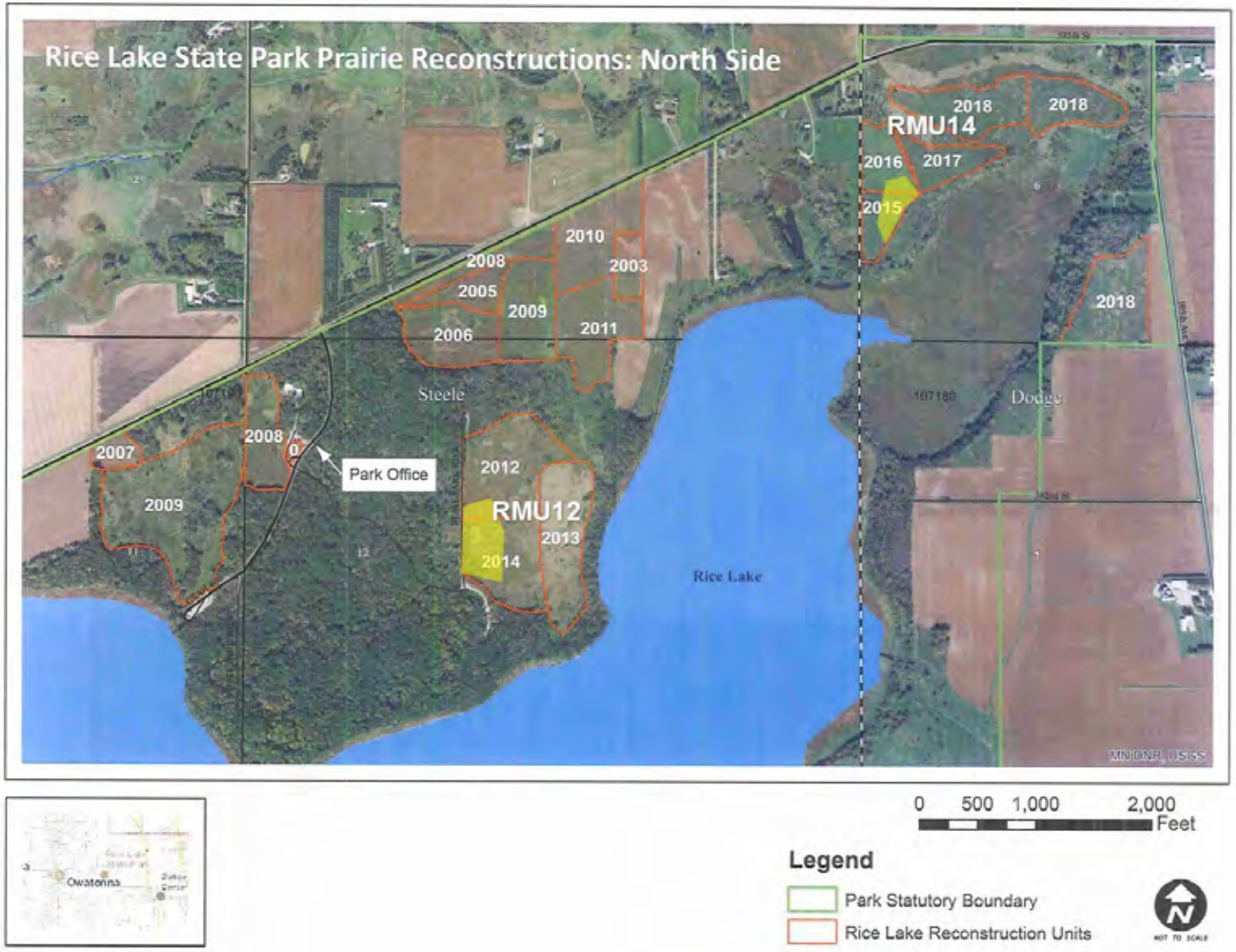

Figure 33-2 Rice Lake State Park Prairie Reconstructions: North Side. Polygons show the year in which the reconstructions were planted. Highlighted yellow polygons show the approximate location of the meander surveys in RMU 12 and RMU 14.

Table 33-1 Species observed during the meander surveys in RMU 12 and RMU 14.

Scientific Name	Common Name	RMU 12 Cover Range	RMU 14 Cover Range	Native Species Present Elsewhere in Rice Lake State Park	Species Status
Sorghastrum nutans	Indian grass	50-75%	25-50%	Yes	Native
Andropogon gerardii	Big bluestem	5-25%	5-25%	Yes	Native
Helianthus grosseserratus	Sawtooth sunflower	5-25%	5-25%	Yes	Native
Monarda fistulosa	Wild Bergamot	5-25%	5-25%	Yes	Native
Solidago canadensis	Canada goldenrod	5-25%	5-25%	No	Native
Pastinica sativa	Wild parsnip	1-5%	5-25%	No	Invasive
Solidago rigida	Stiff goldenrod	5-25%	1-5%	Yes	Native
Poa sp.	Bluegrass	1-5%	1-5%	No	Non-native
Ratibida pinnata	Grey-headed coneflower	1-5%	1-5%	Yes	Native
Symphyotrichum ericoides	Heath aster	1-5%	1-5%	Yes	Native
Gentiana flavida	Cream gentian	1-5%	<1%	Yes	Native
Asclepias syriaca	Common milkweed	1-5%	_	No	Native
Bromus inermis	Smooth brome	_	1-5%	No	Invasive
Carex vulpinoides	Fox sedge	1-5%	_	Yes	Native
Dalea purpurea	Purple prairie clover	1-5%	_	Yes	Native
Desmodium canadense	Showy tick trefoil	1-5%	_	Yes	Native
Elymus canadensis	Canada wild rye	_	1-5%	Yes	Native
Eryngium yuccifolium	Rattlesnake master	1-5%	_	Yes	Native
Helenium autumnale	Sneezeweed	1-5%	_	Yes	Native
Heliopsis helianthoides	Ox-eye sunflower	1-5%	1-5%	Yes	Native
Juncus tenuis	Path rush	1-5%	_	Yes	Native
Lespedeza capitate	Round-headed bush clover	1-5%	_	Yes	Native
Liatris ligulistylis	Meadow blazingstar	_	1-5%	Yes	Native
Lobelia spicata	Pale spike lobelia	1-5%	_	Yes	Native
Phalaris arundinacea	Reed canary grass	1-5%	_	No	Invasive
Pycnanthemum virginianum	Virginia mountain mint	1-5%	_	Yes	Native
Solidago speciosa	Showy goldenrod	1-5%	_	Yes	Native
Zizia aurea	Golden alexanders	1-5%	_	Yes	Native
Amphicarpaea bracteata	American hog peanut	_	<1%	No	Native
Cornus sp.	Dogwood	<1%	_	No	Native
Rosa cf. *arkansana*	Prairie rose	<1%	_	No	Native
Rubus idaeus	Wild red raspberry	<1%	_	No	Native
Toxicodendron radicans	Eastern poison ivy	<1%	_	No	Native
Vitis riparia	Riverbank grape	<1%	_	No	Native
Trifolium pratense	Red clover	<1%	<1%	No	Non-native
Verbascum thapsus	Common Mullein	_	<1%	No	Non-native
Ambrosia trifida	Giant ragweed	_	1-5%	No	Native
Rhus sp.	Sumac		1-5%	No	Native

Appendix B: Site Photographs

Photo 33-1 Rice Lake State Park RMU 12, looking east from the western boundary during site visit 8/27/2018

Photo 33-2 Rice Lake State Park RMU 14, looking south from the northern boundary during site visit 8/27/2018.

Photo 33-3 Rice Lake State Park forb seed plot in RMU 11 (photo taken during site visit on 9/27/2018).

Photo 33-4 Grass seed collected with a flail-vac in Rice Lake State Park seed plots (photo taken during site visit on 9/27/18).

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

34) PTF Hayes Lake State Park Jack Pine Restoration Tower Trail

Project Background

Project Name: Jack Pine Restoration

Project Site: Hayes Lake State Park

Township/Range Section : Township 160 N Range 38W Section 32

Project Manager / Affiliated Organization: Louis Peterson – MN DNR Parks and Trails

Fund: PTF ***Fiscal Year Funds:*** 2009

Project Start Date: 2010

Predominant Habitat type: Forest

Additional Habitat types: Choose an item. , Choose an item.

Project Status: Post Establishment Phase

County: Roseau

Primary Activity: Forest Enhancement

Project Size: 4 acres

Project Completed: 2011

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   The project had two main components 1) harvest dead, dying, and decadent jack pine from the project area and 2) replant with a mix of jack pine, white pine, and red pine seedlings and allow for natural re-generation of jack pine.

Two minor components were to monitor and control for invasive species and protect planted trees from deer browse.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   There is a brief, but informative report that describes the background into why the project was done, tree stocking plan, and summaries of post-harvest/planting monitoring.
   Information about the logistics of the project such as project specifications for tree harvest and planting or contract documents were not provided.

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

   The summary report provided four goals for the project (Note: Italicized text added by project assessor to provide additional context):

   1. Remove (harvest) dead and live decadent jack pine from two sites *(one 4-acre project site and one 19-acre project site*)
   2. Plant pine to ensure pine on these sites (hedge against drought etc.; this site should regenerate jack pine but planting ensures trees); include red/white pine in the stocking as these are found in this NPC, but were logged turn of the century with minimal regen. (*Plant a mix of pine species to supplement what may naturally regenerate to increase probability of project success*).
   3. Protect seedlings from deer browse, as needed.
   4. Monitor/control invasive species.

4. ***Were measures of restoration success identified in plans?*** *No*
   If yes, list specific measurements.
   No specific measures of restoration success were identified in the plan such as percent of trees damaged by browse or percent of coverage by invasive species. Not having measures of success outlined in the project plans did not detract from evaluating whether this project was successful because the goals were fairly straight forward.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   Appendix C includes all the information provided by MN DNR project manager including a summary of site treatments and forest regen survey data.
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   Tree harvest
   - Logging was completed using horse-drawn equipment instead of using mechanical equipment. The limited size of the site (4 acres) potentially reduced the interest from available, conventional logging contractors. The use of horse-drawn equipment for logging matched the scale of the project, site conditions, and availability of resources to complete the work (logging contractor).
   - Harvest activities occurred during the winter to minimize site disturbance.

   Tree planting

   - Planting occurred in the spring 2011.

- Local ecotype tree material was purchased from Badoura State Forest Nursery, which also collects seed material from Hayes Lake State Park.

Based on the information available, these guidelines appear to use the best science available. Harvesting in the winter is one of the best ways to minimize unnecessary disturbance to the site. Using local ecotype when seeding or planting is always ideal.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   Yes
   Tree protection from deer browse was considered, if necessary. Due to low local deer populations, widespread protection such as bud capping wasn't required to achieve project success.
8. ***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?***
   Not protecting trees from browse did not impact the proposed outcome because deer browse ended up not being a factor. In many situations where deer populations have a high density, bud capping is necessary to protect planted trees so they can survive. The implementation of this project coinciding with a low local deer herd population due to bovine tuberculosis management more than likely allowed the project to occur with reduced cost and increased success.

Site Assessment

Field Review Date: **9/27/2018**

Field Visit Attendees: Gina Quiram, MN DNR (Ecological and Water Resources), Louis Peterson, MN DNR (Parks and Trails), and Mark Pranckus, Cardno (Contracted Assessor).

9. ***Surrounding Landscape Characteristics:***
   The project site is located within Hayes Lake State Park, which is predominately forested. On a larger landscape scale, the majority of the land use direct to the west of the park is predominately agriculture while to the north, east and south of the park, it is predominately forested.
10. ***Site Characteristics:***
    a. Soil Series:
    Hiwood loamy fine sand
    Redby loamy fine sand
    b. Topography:
    Flat
    c. Hydrology:
    Moderately well-drained to somewhat poorly drained.
    d. Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:

The project area is considered to be Jack Pine Woodland –Sand (FDn12a). Following the tree harvest and planting, the site is sparsely scattered with mature conifers such as spruce and balsam fir. A few mature aspen and birch trees are sparsely scattered throughout the site. Jack pine, white pine, red pine, aspen and birch are the regenerating tree species. See Table 2 in Appendix A for a summary of monitoring results for pine tree densities. Ground vegetation is well-developed and consists of a combination of grasses and forbs. Invasive species consists of less than 1% of the site. Hayes Lake State Park staff monitor annually for invasive species and treat immediately. Bird's foot trefoil is the most common and problematic invasive species on the site. Rreed canary grass and Hungarian brome were also observed on the site during the meander survey.

e. Vegetation B: Meander Search Species List (as appropriate for site)

See Table 1 for species list.

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

    Winter harvest and spring tree planting are standard techniques in forest restoration. Using horses to skid logs is commonly used, but was a good fit for this site based on contractor availability and desire to complete the project at the original scale.

12. ***List indicators of project outcomes at this stage of project:***

    Regenerating jack pine was prevalent on the site and had a 2018 monitoring density of 250 stems/acre. Planted jack pine, white pine, and red pine were all present on the site at densities of at least 125 stems/acre. See Table 2 in Appendix A for additional information.

    Deer browse was observed and appeared to be more common than in the 19-acre jack pine site located within the state park.

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***

    Yes. Based on monitoring results, the project appears to be tracking toward a successful outcome.

14. ***Are corrections or modifications needed to meet proposed outcomes?***

    No. No recommendations at this point in time. Project sponsors are already planning to hand release trees in 2019 and may consider bud capping to reduce deer browse.

15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***

    Hand releasing pines and other desire tree species should be effective to increase growth rates to so that trees can become more resistant to deer browse. Bud capping may be effective as a means to help supplement released trees. Continued annual monitoring for invasive species followed by control is a practical and appropriate management scheme to limit the impact of invasive species. In a discussion with the park manager, it was mentioned that this site has greater invasive species pressure than the 19-acre site.

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

    No. Hand release of pines, potential bud capping and annual monitoring and treatment of invasive species should protect the site from degrading in quality. Jack pines are in the process of being well-established and should be allowed to grow until they naturally start to die (40 years from now) and resource managers at that time can determine on whether to start the cycle over again or let it transition to the next successional stage.

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

No. Regular monitoring for pine densities and invasive species completed by Parks and Trails staff is sufficient to document project status.

18. ***Additional comments on the restoration project.***
    Historically, jack pine stands were maintained by surface and crown fires. In today's landscape and with available resources, maintaining this community with fire is mostly infeasible. The combination of logging and treating planting was potentially the best surrogate possible to restore the jack pine community in this setting.
    Project success at this site may be aided by the reduction in the local deer herd through sharpshooters and intensive harvest to limit the spread of bovine tuberculosis in the deer herd. Naturally regenerating jack pine densities were significantly lower in this site compared to the 19-acre site. Assuming there was an adequate seed source/bank prior to harvest, one potential reason for the difference may be harvesting techniques. The use of horses may not have provided enough soil disturbance to stimulate seed dispersal and germination.
    One can understand the rationale for planting trees following harvest without waiting to see what naturally re-generates. The planted material was local ecotype, likely from the state park, itself, and was a relatively low-risk investment to insure project success. The argument could be made for waiting two to three growing seasons prior to planting to see what natural regeneration provided. For this site, planting immediately after tree harvest appears to be appropriate because planted trees made up a larger percentage of the total tree count than in the 19-acre project area.
    Although measures of project success weren't specifically outlined in the project goals, the monitoring of pine tree densities was tremendously valuable in quickly understanding the status of the project. The level of effort and frequency seemed appropriate and practical for the scale of the project. On future projects of similar scale, adding simple, but measureable attributes to the project goals and having an accompanying monitoring program will add to the ecological restoration knowledge base.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***
    Regenerating jack pine densities are 250 stems/acre and have reached a size where most trees are resistant to deer browse. Deer browse is somewhat common, but planned future management activities will provide additional support in the site reaching the desire outcome of jack pine restoration. Invasive species are limited and are being monitored on an annual basis.
21. ***Site Assessor(s) Conducting Review:***
    Mark Pranckus, Cardno

Appendix A: Site maps, Project plans or Vegetation tables

Figure 34-1 Aerial view of the project boundary for the 4-acre jack pine restoration following the tree harvest in 2010. Unit boundaries are interpreted from project documentation. Aerial photography is from July 2015 and provided by Google Earth (link http://www.google.com/earth/download/ge/).

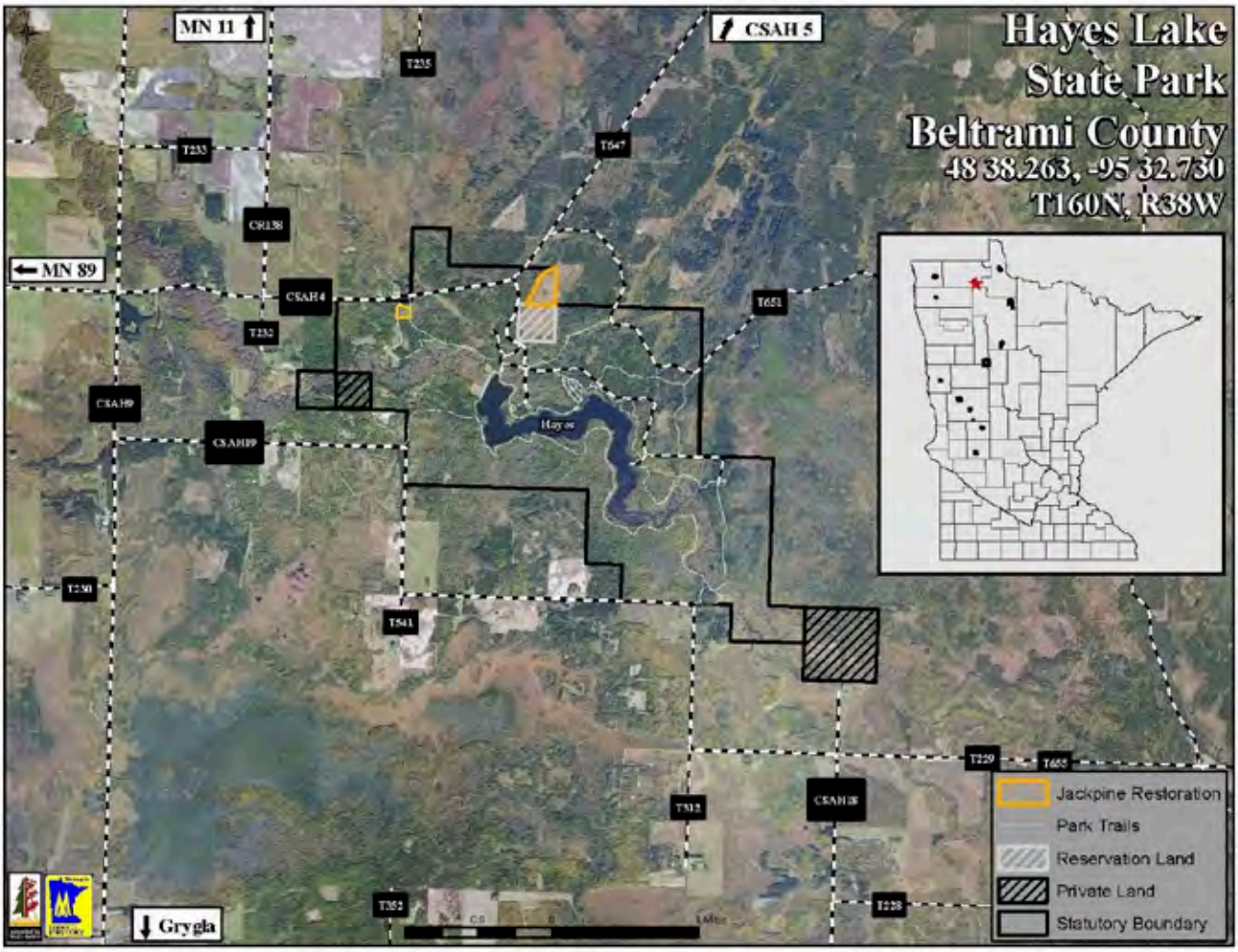

Figure 34-2 Page 5 of project documents provided by MN DNR project manager prior to site assessment field visit.

Table 34-1 Results of meander survey through project area. Cover ranges were estimated visually and focused primarily on canopy and subcanopy species. Meander survey occurred 9/27/18 by Mark Pranckus, Cardno. Meander time was 11:20 – 11:50 am.

Scientific Name	Common Name	Cover Range	Species Status
Pinus banksiana	Jack Pine	5 – 25%	Native
Pinus strobus	White Pine	5 – 25%	Native
Pinus resinosa	Red Pine	5 – 25%	Native
Populus tremuloides	Quaking Aspen	5 – 25%	Native
Betula papyrifera	Paper Birch	5 – 25%	Native
Picea glauca	White Spruce	1 – 5%	Native
Abies balsamea	Balsam Fir	0 – 1%	Native
Quercus macrocarpa	Bur Oak	0 – 1%	Native
Quercus rubra	Red Oak	0 – 1%	Native
Corylus cornuta	Beaked Hazelnut	5 – 25%	Native
Salix humilis	Prairie Willow	5 – 25%	Native
Diervilla lonicera	Bush Honeysuckle		Native
Rubus allegheniensis	Common Blackberry		Native
Vaccinium angustifolium	Lowbush Blueberry		Native
Bromus inermis	Hungarian Brome		Non-native
Cornus canadensis	Bunchberry		Native
Eurybia macrophyllum	Large-leaved Aster		Native
Fragaria virginiana	Wild Strawberry		Native
Linnaea borealis	Twinflower		Native
Phalaris arundinacea	Reed Canary Grass		Non-native
Pteridium aquilinum	Bracken Fern		Native

Table 34-2 Summary of pine tree density monitoring results from July 2012, August 2013, and July 2018 conducted by MN DNR Trails and Parks staff at the 19-acre Hayes Lake State Park jack pine restoration site. Jack pine trees were broken into individuals identified as coming from natural regeneration (seed) and individuals planted. Monitoring notes indicate that some "planted" trees may actually belong to the regeneration group and were misclassified because of their rapid growth leading monitors to believe they came from planted stock.

Plant Class	Initial Planting – 2011 Stems/acre	2012 Stems/acre	2013 Stems/acre	2018 Stems/acre
Jack pine – Regenerating	---	250	650	250
Jack pine – planted	160 (6-12" bare root stock)	375	375	125
Red pine – planted	160 (12-18" bare root stock)	125	750 (combined red and white pine)	750 (combined red and white pine)

Appendix B: Site Photographs

Photo 34-1 Example of pine regeneration within the 4-acre jack pine restoration site. Pictured are examples of jack pine, white pine and red pine tree specimens. Photo was taken on 9/27/18 at 4-acre jack pine restoration site, Hayes Lake State Park by Mark Pranckus, Cardno.

Photo 34-2 Example of areas within the 4-acre site where pine tree densities are lower than in other areas of the site. In this photo, little to no pine trees are present. This small gap will provide additional habitat diversity and a potential area for further pine establishment of individuals of a different age class from established trees. Photo was taken on 9/27/18 at 4-acre jack pine restoration site, Hayes Lake State Park by Mark Pranckus, Cardno.

Photo 34-3 Example the mature trees left during the 2010 horse logging tree harvest. There was a mix of both conifer and deciduous trees left. Photo taken on 9/27/18 at Hayes Lake State Park by Mark Pranckus, Cardno.

Photo 34-4 Example of where pine tree densities were highest within the 4-acre site. Mature birch trees remained within the site following logging. Photo taken on 9/27/18 at Hayes Lake State Park by Mark Pranckus, Cardno.

Appendix C: Project documents provided by MN DNR

Project: 2011 Jack Pine Restoration, Hayes Lake State Park

Site Background:

25% of the Hayes Lake State Park is classified as high quality Jack Pine Woodland-Sand (FDn12a), with a conservation status rank of S2 - imperiled.). Historically, these jack pine areas regenerated after stand replacement fires and are now falling apart without concurrent regeneration. This problem has been documented over the past 16 years, as can be seen in the 2002 site notes:

" … the mature jack pine stands at Hayes Lake are reaching over maturity and are falling down. The buildup of heavy fuels and resulting wildfire potential is increasing yearly. Some of the fuel was removed through firewood permits over the last few years, which resulted in an increase in brush with little pine regeneration. Standing dead jack pine is evident as well as more on the ground. Historically jack pine stands replaced themselves through a hot, total-stand replacement fire. Replicating this through prescribed burning would be difficult and high risk. As an alternative, fuel can be mechanically removed, the slash burned and then following up by seeding and planting jack pine and other species…"

-Excerpted from Vegetation Management for Hayes Lake State Park, March 12, 2002

Photo 34-5 Mature jack pine stand in Hayes Lake State Park with falling trees building heavy fuel loads.

Jack pine management efforts were accelerated in recent years to take advantage of reduced deer predation. Hayes Lake State Park lies within the 2007 Bovine Tuberculosis Management Zone where significant actions were taken to reduce the deer herd size.

2011 Jack Pine Restoration Project Goals

- Remove (harvest) dead and live decadent jack pine from 2 sites
- Plant pine to ensure pine on these sites (hedge against drought etc; this site should regenerate jack pine but planting ensures trees); include red/white pine in the stocking as these are found in this NPC but were logged turn of the century with minimal regen
- Protect seedlings from deer browse, as needed
- Monitor/control invasive species

Jack pine was logged from two sites in 2010…a 19 acre site in the NE area of the park and a 4 acre site where horse logging removed merchantable timber in the "tower" area. Both sites were planted, spring 2011, with limited amounts of jack, red and white pine seedlings as a hedge against no natural re- generation. All trees were purchased from Badoura State Forest Nursery, with the seeds coming from Zone 1 (Northwest) of the Badoura seed collection zones, which includes Hayes Lake State Park.

Stocking Plan:

- 3000 12" – 18" Red Pine
- 3000 6" – 12" Jack Pine
- 3000 5" – 12" White Pine

Photo 34-6 19 acre site, immediately following logging.

Photo 34-7 July 2018 panoramic photos of 19 acre jack pine site.

Post planting follow-up

The sites were visited twice in 2011 and once in 2012, 2013, and 2018. At all visits minimal deer predation was observed so there is no need for browse protection. Both sites are checked annually for invasive species and treated as needed.

July 2018 regeneration surveys show good natural regeneration and survival of planted seedlings at the 19 acres site, so no further stocking is planned for this site. The horse logging site showed a dip in planted jack pine but remained consistent in natural jack pine regen and planted red/white pine numbers.

The Horse logging site (4 acres) is planned for release in 2018 due to brush competition.

Regeneration survey, July 2012

19 acre site--Natural jack pine regeneration, 4525 stems per acre

- Planted jack pine, 400 per acre (note—some jack pine probably grew so quickly, they were identified as "planted" in the regen survey)
- Planted red pine, 125 per acre
- Planted white pine, 100 per acre

4 acre horse logging site—Natural jack pine regeneration, 250 stems per acre

- Planted jack pine, 375 per acre
- Planted red pine, 125 per acre
- Planted white pine, 125 per acre

Regeneration survey, August 2013

19 acre site--Natural jack pine regeneration, 4250 stems per acre

- Planted jack pine, 475 per acre (note—some jack pine probably grew so quickly, they were identified as "planted" in the regen survey)
- Planted red/white pine, 100 per acre
- Balsam/spruce, 75 per acre

4 acre horse logging site—Natural jack pine regeneration, 650 stems per acre

- Planted jack pine, 375 per acre
- Planted red/white pine, 750 per acre

Regeneration survey, July 2018

19 acre site--Natural jack pine regeneration, 1400 stems per acre

- Planted jack pine, 225 per acre (note—some jack pine probably grew so quickly, they were identified as "planted" in the regen survey)
- Planted red/white pine, 125 per acre
- Balsam/spruce, 25 per acre

4 acre horse logging site—Natural jack pine regeneration, 250 stems per acre

- Planted jack pine, 125 per acre
- Planted red/white pine, 750 per acre

Minnesota Department of Natural Resources
Minnesota Board of Water and Soil Resources

35) PTF Hayes Lake State Park Jack Pine Restoration NE

Project Background

Project Name: Jack Pine Restoration

Project Site: Hayes Lake State Park

Township/Range Section : Township 160 N Range 38W Section 27

Project Manager / Affiliated Organization: Louis Peterson – MN DNR Parks and Trails

Fund: PTF ***Fiscal Year Funds:*** 2009

Project Start Date: 2010

Predominant Habitat type: Forest

Additional Habitat types: Choose an item. , Choose an item.

Project Status: Post Establishment Phase

County: Roseau

Primary Activity: Forest Enhancement

Project Size: 19 acres

Project Completed: 2011

Project Goals and Planning

(Site Assessment Preparation from Plan Sets and Documents)

1. ***What are the specific project components and treatments?***
   The project had two main components 1) harvest dead, dying, and decadent jack pine from the project area and 2) replant with a mix of jack pine, white pine, and red pine seedlings and allow for natural re-generation of jack pine.
   Two minor components were to monitor and control for invasive species and protect planted trees from deer browse.

2. ***What plans / record of project decisions / prescription worksheets are available? Provide location for the data?***
   There is a brief, but informative report that describes the background into why the project was done, the tree stocking plan, and summaries of post-harvest/planting monitoring.
   Information about the logistics of the project such as project specifications for tree harvest and planting or contract documents were not provided.

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

   The summary report provided four goals for the project (Note: Italicized text added by project assessor to provide additional context):

   1. Remove (harvest) dead and live decadent jack pine from two sites *(one 19-acre project site and one 4-acre project site*)
   2. Plant pine to ensure pine on these sites (hedge against drought etc.; this site should regenerate jack pine but planting ensures trees); include red/white pine in the stocking as these are found in this NPC, but were logged turn of the century with minimal regen. (*Plant a mix of pine species to supplement what may naturally regenerate to increase probability of project success*).
   3. Protect seedlings from deer browse, as needed.
   4. Monitor/control invasive species.

4. ***Were measures of restoration success identified in plans?*** *No*
   If yes, list specific measurements.
   No specific measures of restoration success were identified in the plan such as percent of trees damaged by browse or percent of coverage by invasive species. Not having measures of success outlined in the project plans did not detract from evaluating whether this project was successful because the goals were fairly straight forward.
5. ***Are plan Sets available?*** Yes ***Have new GIS maps been created?*** No
   If yes, provide in Appendix A and list Maps provided:
   Appendix C includes all the information provided by MN DNR project manager including a summary of site treatments and forest regen survey data
6. ***Provide list of best management practices, standards, guidelines identified in plan set? Are these based on best current science?***
   Tree harvest
   - Dead and live decadent jack pines were harvested and brought to a central staging location within the project site where trees were processed into wood chips and stockpiled on-site.

   Harvest activities occurred during the winter to minimize site disturbance. Tree planting
   - Planting occurred in the spring 2011.
   - Local ecotype tree material was purchased from Badoura State Forest Nursery, which also collects seed material from Hayes Lake State Park.

   Based on the information available, these guidelines appear to use the best science available. Harvesting in the winter is one of the best ways to minimize unnecessary disturbance to the site. Using local ecotype when seeding or planting is always ideal.

Project Implementation

(Questions for Site Manager and Cooperating Professionals)

7. ***Were alterations made to the original plan during construction?***
   Yes
   Tree protection from deer browse was considered, if necessary. Due to low local deer populations, widespread protection such as bud capping wasn't required to achieve project success.
8. ***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?***
   Not protecting trees from browse did not impact the proposed outcome because deer browse ended up not being a factor. In many situations where deer populations have a high density, bud capping is necessary to protect planted trees so they can survive. The implementation of this project coinciding with a low local deer herd population due to bovine tuberculosis management more than likely allowed the project to occur with reduced cost and increased success.

Site Assessment

Field Review Date: **9/27/2018**

Field Visit Attendees: Gina Quiram, MN DNR (Ecological and Water Resources), Louis Peterson, MN DNR (Parks and Trails), and Mark Pranckus, Cardno (Contracted Assessor).

9. ***Surrounding Landscape Characteristics:***
   The project site is located within Hayes Lake State Park, which is predominately forested. Directly to the east is a 20-acre site where MN DNR removed trees in 2003 and directly to the south is 30-acre site that the Red Lake Band of Chippewa Indians removed trees in winter 2008/2009 to restore jack pine. On a larger landscape scale, the majority of the land use direct to the west of the park is predominately agriculture while to the north, east and south of the park, it is predominately forested.
10. ***Site Characteristics:***
    a. Soil Series:
    Wurtsmith loamy sand
    Meehan loamy sand
    b. Topography:
    Flat
    c. Hydrology:
    Moderately well-drained
    d. Vegetation A: Plant Communities, Dominant Species & Invasives % Cover:
    The project area is considered to be Jack Pine Woodland –Sand (FDn12a). Following the tree harvest and planting, the site is sparsely scattered with mature conifers such as jack pine, spruce, and balsam fir. Aspen that were likely subcanopy trees prior to the harvest, are sparsely scattered throughout the site. Jack pine, followed by white pine and red pine, makes up the majority of the regenerating tree species. See Table 2 in Appendix A for a summary of monitoring results for pine tree densities. Ground vegetation is well-developed and consists of a combination of grasses and

forbs. Invasive species consists of less than 1% of the site. Hayes Lake State Park staff monitor annually for invasive species and treat immediately. Bird's foot trefoil is the most common and problematic invasive species on the site. Hungarian brome was also observed during the meander survey.

e. Vegetation B: Meander Search Species List (as appropriate for site)

See Table 1 for species list.

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

    Winter harvest and spring tree planting are standard techniques in forest restoration.

12. ***List indicators of project outcomes at this stage of project:***

    Regenerating jack pine was prevalent on the site and had a 2018 monitoring density of 1,400 stems/acre. Planted jack pine, white pine, and red pine were all present on the site at densities of at least 125 stems/acre. See Table 2 in Appendix A for additional information.

    Deer browse was observed, but not a level that would require further action because trees have grown to a height above the browse line for deer.

13. ***Does the project plan / implementation of the project plan reasonably allow for achieving proposed project outcomes?***

    Yes. Based on monitoring results, the project appears to be tracking toward a successful outcome.

14. ***Are corrections or modifications needed to meet proposed outcomes?***

    No. No recommendations at this point in time.

15. ***Do proposed or planned future steps, including long term management, appear practical and reasonable? What are the potential challenges or limitations?***

    Proposed management including annual monitoring for invasive species followed by control is a practical and appropriate management scheme.

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

    No. Annual monitoring and treatment of invasive species should protect the site from degrading in quality. Jack pines are well-established and should be allowed to grow until they naturally start to die (40 years from now) and resource managers at that time can determine on whether to start the cycle over again or let it transition to the next successional stage.

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

    No. Annual monitoring for pine densities and invasive species completed by Parks and Trails staff is sufficient to document project status.

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

    Historically, jack pine stands were maintained by surface and crown fires. In today's landscape and with available resources, maintaining this community with fire is mostly infeasible. The combination of logging and treating planting was potentially the best surrogate possible to restore the jack pine community in this setting.

    Project success at this site may be tied to a combination of several factors including taking advantage of a natural opportunity (reduction in the local deer herd through sharpshooters and intensive harvest because to limit the spread of bovine tuberculosis in the deer herd). Harvesting a large enough area (19 acres) may have created enough soil disturbance or canopy release to stimulate the seed bank to germinate. The low deer population following planting helped to reduce browse pressure and reduced the need for long-term bud capping to protect the trees.

One can understand the rationale for planting trees following harvest without waiting to see what naturally re-generates. The planted material was local ecotype, likely from the state park, itself, and was a relatively low-risk investment to insure project success. The argument could be made for waiting two to three growing seasons prior to planting to see what natural regeneration provided. This information could be used to inform future restoration activities and scheduling.

Although measures of project success weren't specifically outlined in the project goals, the monitoring of pine tree densities was tremendously valuable in quickly understanding the status of the project. The level of effort and frequency seemed appropriate and practical for the scale of the project. On future projects of similar scale, adding simple, but measureable attributes to the project goals and having an accompanying monitoring program will add to the ecological restoration knowledge base.

One recommendation for future projects would be to make sure contract documents outline that the selected contractor is responsible for final disposal or use of the material generated from the site. The large mulch pile in the northeastern portion of the site does not detract from the overall project success, but is more of a visual impact that takes away from the "naturalness" of the project site.

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.

19. ***The project will:***
    Meet proposed outcomes
    Confidence of outcome determination:
    High
20. ***Provide explanation of reason(s) for determination.***
    Regenerating jack pine densities are 1,400 stems/acre and have reached a size where most trees are resistant to deer browse. Invasive species are limited and are being monitored on an annual basis.
21. ***Site Assessor(s) Conducting Review:***
    Mark Pranckus, Cardno

Appendix A: Site maps, Project plans or Vegetation tables

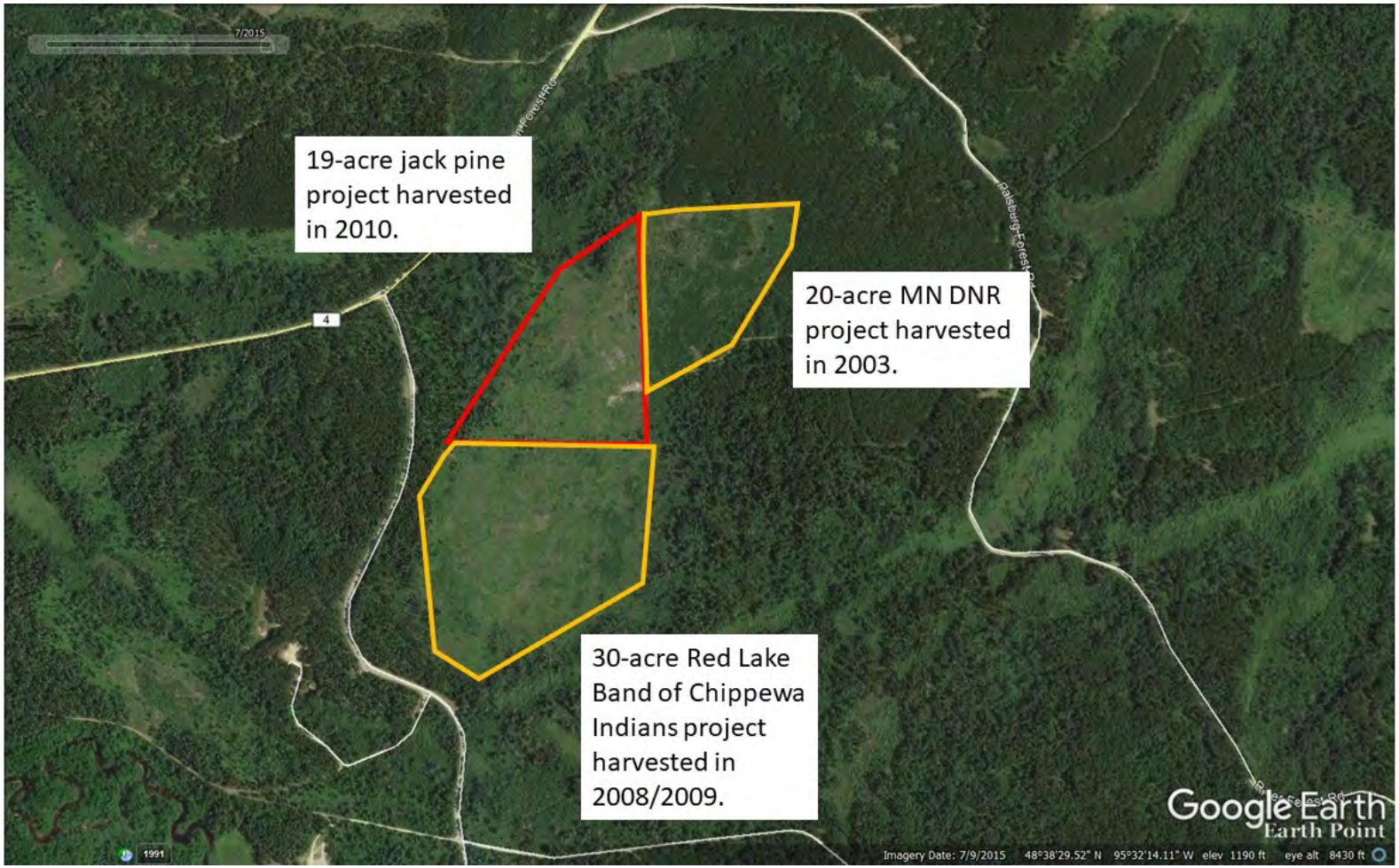

Figure 35-1 Aerial view of the project boundary for the 19-acre jack pine restoration following the tree harvest in 2010. Also included are similar type of projects adjacent to the 19-acre unit completed by MN DNR and the Red Lake Band of Chippewa Indians. Unit boundaries are interpreted from project documentation. Aerial photography is from July 2015 and provided by Google Earth (link http://www.google.com/earth/download/ge/).

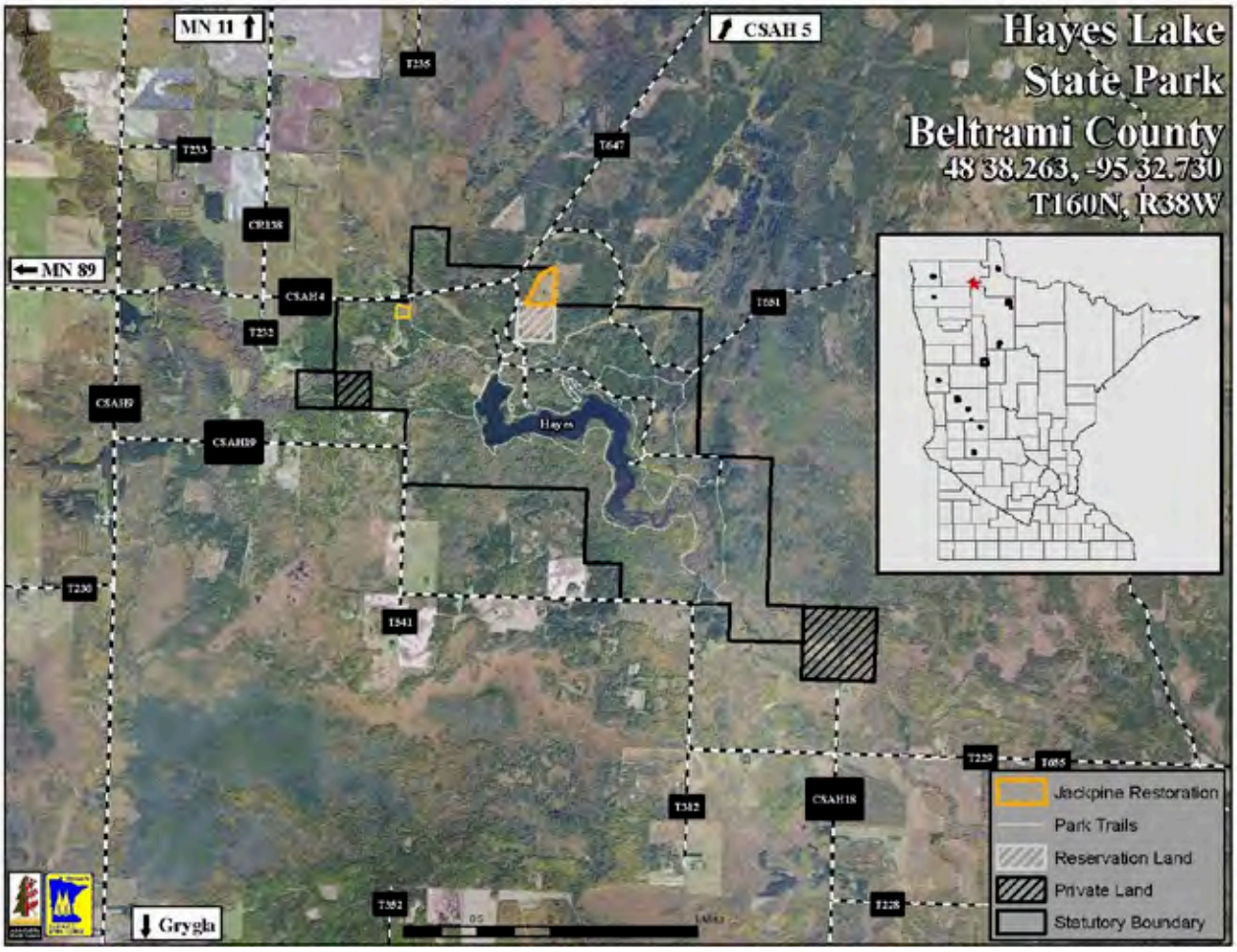

Figure 35-2 Page 5 of project documents provided by MN DNR project manager prior to site assessment field visit.

Table 35-1 Results of meander survey through project area. Cover ranges were estimated visually and focused primarily on canopy and subcanopy species. Meander survey occurred 9/27/18 by Mark Pranckus, Cardno. Meander time was 9:50 – 10:40 am.

Scientific Name	Common Name	Cover Range	Species Status
Pinus banksiana	Jack Pine	25 – 50%	Native
Pinus strobus	White Pine	1 – 5%	Native
Pinus resinosa	Red Pine	1 – 5%	Native
Populus tremuloides	Quaking Aspen	1 – 5%	Native
Betula papyrifera	Paper Birch	0 – 1%	Native
Picea glauca	White Spruce	0 – 1%	Native
Quercus macrocarpa	Bur Oak	0 – 1%	Native
Salix humilis	Prairie Willow	5 – 25%	Native
Corylus cornuta	Beaked Hazelnut	5 – 25%	Native
Prunus pumila	Sand Cherry	5 – 25%	Native
Vaccinium angustifolium	Lowbush Blueberry		Native
Alnus viridis	Green Alder		Native
Diervilla lonicera	Bush Honeysuckle		Native
Rosa acicularis	Prickly Wild Rose		Native
Arctostaphylos uva-ursi	Bearberry		Native
Bromus inermis	Hungarian Brome		Non-native
Campanula rotundifolia	Harebell		Native
Cornus canadensis	Bunchberry		Native
Danthonia spicata	Poverty Oats Grass		Native
Doelingeria umbellatus	Flat-topped Aster		Native
Eurybia macrophyllum	Large-leaved Aster		Native
Fragaria virginiana	Wild Strawberry		Native
Mitchella repens	Partridge Berry		Native
Oryzopsis asperifolia	Rough-leaved Ricegrass		Native
Pteridium aquilinum	Bracken Fern		Native
Rubus flagellaris	Northern Dewberry		Native

Table 35-2 Summary of pine tree density monitoring results from July 2012, August 2013, and July 2018 conducted by MN DNR Trails and Parks staff at the 19-acre Hayes Lake State Park jack pine restoration site. Jack pine trees were broken into individuals identified as coming from natural regeneration (seed) and individuals planted. Monitoring notes indicate that some "planted" trees may actually belong to the regeneration group and were misclassified because of their rapid growth leading monitors to believe they came from planted stock.

Plant Class	Initial Planting – 2011 Stems/acre	2012 Stems/acre	2013 Stems/acre	2018 Stems/acre
Jack pine – Regenerating	---	4,525	4,250	1,400
Jack pine – planted	130 (6-12" bare root stock)	400	475	225
Red pine – planted	130 (12-18" bare root stock)	125	100 (combined red and white pine)	125 (combined red and white pine)
White pine – planted	130 (5-12" bare root stock)	100	100 (combined red and white pine)	125 (combined red and white pine)
Balsam fir and spruce	---	---	75	25

Appendix B: Site Photographs

Photo 35-1 View looking south over the site from the northeastern boundary. Dark green vegetation represents the distribution of regenerating jack pine and planted pine trees. Light green is scatter shrubs. Tall trees in the foreground represent reserve seed trees that were left post-harvest. Note the observer in the lower right hand corner providing scale to the height of vegetation. Photo was taken from top of the mulch pile remaining from the tree harvest. Photo was taken on 9/27/18 at 19-acre jack pine restoration site, Hayes Lake State Park by Mark Pranckus.

Photo 35-2 View looking north over the site from the northeastern boundary. Dark green vegetation represents the distribution of regenerating jack pine and planted pine trees. Light green is scatter shrubs. Brown vegetation indicates were tree density is not as high, creating future canopy gaps and creating habitat diversity. Photo was taken from top of the mulch pile remaining from the tree harvest. Photo was taken on 9/27/18 at 19-acre jack pine restoration site, Hayes Lake State Park by Mark Pranckus.

Photo 35-3 Example of jack pine regeneration on the southwestern portion of the project site, Hayes Lake State Park. Jack pine present in the central portion of the photo were likely regeneration trees from on-site seed sources. Tall trees in the background represent the project boundary. Photo taken on 9/27/18 by Mark Pranckus, Cardno.

Photo 35-4 Example of jack pine regeneration on the northwestern portion of the project site, Hayes Lake State Park. Jack pine present in the central portion of the photo were likely regeneration trees from on-site seed sources. Trees in this portion of the site were smaller than in other areas likely due to local differences in soil and growing conditions, but adding to the overall structural diversity of the site. Photo taken on 9/27/18 by Mark Pranckus, Cardno.

Photo 35-5 Example of deer browse present on the site. The top of this small sapling was browsed by deer, which reduces growth rate and can, in cases, kill the tree. Deer browse like this was present on the site, but not prevalent. A significant percentage of trees have grown to a height that they are now more resistant to browse damage as the local deer herd recovers from herd reduction related to bovine tuberculosis management. Photo taken on 9/27/18 at the 19-acre jack pine restoration site in Hayes Lake State Park by Mark Pranckus, Cardno.

Photo 35-6 Example of the mulch pile that remains on-site following the project in 2010. Harvested trees were stockpiled here and processed into mulch. Future projects would look to make sure excess material like this gets removed as part of the original project scope.

Appendix C: Project documents provided by MN DNR

Project: 2011 Jack Pine Restoration, Hayes Lake State Park

Site Background:

25% of the Hayes Lake State Park is classified as high quality Jack Pine Woodland-Sand (FDn12a), with a conservation status rank of S2 - imperiled.). Historically, these jack pine areas regenerated after stand replacement fires and are now falling apart without concurrent regeneration. This problem has been documented over the past 16 years, as can be seen in the 2002 site notes:

" … the mature jack pine stands at Hayes Lake are reaching over maturity and are falling down. The buildup of heavy fuels and resulting wildfire potential is increasing yearly. Some of the fuel was removed through firewood permits over the last few years, which resulted in an increase in brush with little pine regeneration. Standing dead jack pine is evident as well as more on the ground. Historically jack pine stands replaced themselves through a hot, total-stand replacement fire. Replicating this through prescribed burning would be difficult and high risk. As an alternative, fuel can be mechanically removed, the slash burned and then following up by seeding and planting jack pine and other species…"

-Excerpted from Vegetation Management for Hayes Lake State Park, March 12, 2002

Photo 35-7 Mature jack pine stand in Hayes Lake State Park with falling trees building heavy fuel loads.

Jack pine management efforts were accelerated in recent years to take advantage of reduced deer predation. Hayes Lake State Park lies within the 2007 Bovine Tuberculosis Management Zone where significant actions were taken to reduce the deer herd size.

2011 Jack Pine Restoration Project Goals

- Remove (harvest) dead and live decadent jack pine from 2 sites
- Plant pine to ensure pine on these sites (hedge against drought etc; this site should regenerate jack pine but planting ensures trees); include red/white pine in the stocking as these are found in this NPC but were logged turn of the century with minimal regen
- Protect seedlings from deer browse, as needed
- Monitor/control invasive species

Jack pine was logged from two sites in 2010…a 19 acre site in the NE area of the park and a 4 acre site where horse logging removed merchantable timber in the "tower" area. Both sites were planted, spring 2011, with limited amounts of jack, red and white pine seedlings as a hedge against no natural re- generation. All trees were purchased from Badoura State Forest Nursery, with the seeds coming from Zone 1 (Northwest) of the Badoura seed collection zones, which includes Hayes Lake State Park.

Stocking Plan:

- 3000 12" – 18" Red Pine
- 3000 6" – 12" Jack Pine
- 3000 5" – 12" White Pine

Photo 35-8 19 acre site, immediately following logging.

Photo 35-9 July 2018 panoramic photos of 19 acre jack pine site.

Post planting follow-up

The sites were visited twice in 2011 and once in 2012, 2013, and 2018. At all visits minimal deer predation was observed so there is no need for browse protection. Both sites are checked annually for invasive species and treated as needed.

July 2018 regeneration surveys show good natural regeneration and survival of planted seedlings at the 19 acres site, so no further stocking is planned for this site. The horse logging site showed a dip in planted jack pine but remained consistent in natural jack pine regen and planted red/white pine numbers.

The Horse logging site (4 acres) is planned for release in 2018 due to brush competition.

Regeneration survey, July 2012

19 acre site--Natural jack pine regeneration, 4525 stems per acre

- Planted jack pine, 400 per acre (note—some jack pine probably grew so quickly, they were identified as "planted" in the regen survey)
- Planted red pine, 125 per acre
- Planted white pine, 100 per acre

4 acre horse logging site—Natural jack pine regeneration, 250 stems per acre

- Planted jack pine, 375 per acre
- Planted red pine, 125 per acre
- Planted white pine, 125 per acre

Regeneration survey, August 2013

19 acre site--Natural jack pine regeneration, 4250 stems per acre

- Planted jack pine, 475 per acre (note—some jack pine probably grew so quickly, they were identified as "planted" in the regen survey)
- Planted red/white pine, 100 per acre
- Balsam/spruce, 75 per acre

4 acre horse logging site—Natural jack pine regeneration, 650 stems per acre

- Planted jack pine, 375 per acre
- Planted red/white pine, 750 per acre

Regeneration survey, July 2018

19 acre site--Natural jack pine regeneration, 1400 stems per acre

- Planted jack pine, 225 per acre (note—some jack pine probably grew so quickly, they were identified as "planted" in the regen survey)
- Planted red/white pine, 125 per acre
- Balsam/spruce, 25 per acre

4 acre horse logging site—Natural jack pine regeneration, 250 stems per acre

- Planted jack pine, 125 per acre
- Planted red/white pine, 750 per acre