memo

Project Name |	Mendel Road Wetland	**Date** |	11/25/2020
To / Contact info |	BCWD Board		
Cc / Contact info |	Karen Kill – BCWD District Administrator Camilla Correll – District Engineer		
From / Contact info |	Kevin Biehn and Jason Naber – EOR		
Regarding |	DRAFT MEMO - Floristic Inventory & Site Survey Findings		

BACKGROUND

The BCWD and the Washington Conservation District have had interest in restoring/conserving the 'Mendel Road Wetland' (Figure 1) for some time. Portions of the wetland are of high floristic quality, containing a viable stand of Tamarack (*Larix laricina*). The wetland is directly drained to Brown's Creek and the conjecture is that restoring a more stable wetland hydrology will reduce nutrient loading and/or reduce thermal loading and/or improve the quality (functions and values) of the wetland.

At its 9/9/2020 Board meeting the BCWD Board approved the following scope to address initial questions of the District, Landowners and/or stakeholders relative to potential conservation measures. This memo articulates the findings of Task 1 & 2. Task 3 has not been initiated and awaiting Board decision on whether to proceed given District interest.

1. Initial Reconnaissance (survey critical elevations and determine current effective drainage of ditch system)
2. Floristic Survey
3. Preliminary Modeling of Conceptual Outlet Alterations

Figure 1 – General location of 'Mendel Road Wetland', which is NE of the Manning Avenue and Hwy 96 intersection

EXECUTIVE SUMMARY

The Mendel wetland is a large bog and fresh meadow wetland complex that has been altered by an artificial drainage system. It has a mix of good quality and highly degraded plant communities. EOR staff investigated the vegetative communities, sampled soils to interpret affects of drainage and surveyed the outlet ditch. Although not readily verifiable it is our interpretation that this wetland historically drained to the west prior to the excavation of the ditch that exits the wetland in the southeast corner. Construction of the ditch drained a large portion of the wetland and cause the peat to degrade due to loss of hydrology. In areas where the peat was shallow, drainage was particularly effective and caused the peat to decay (humify) and subside in elevation. Subsidence (lower elevation) can be observed from the survey work conducted by EOR and by reviewing LiDAR elevation data. In areas where drainage was effective, EOR observed relatively low-quality plant communities. Interestingly we also observed very highly degraded (due to glossy buckthorn invasion) bog plant communities in the center of the basin, well distal from the ditch.

Hydrology restoration (removal or reduction of artificial drainage) coupled with invasive species management would enhance this wetland and would also likely reduce nutrient and thermal loading to Brown's Creek. The disabling of artificial drainage and resulting hydrology change would not noticeably impact the use/condition of most of the ~80-acre wetland, but it may impact (reduced forage and/or access) a portion of the ~15 acres currently grazed.

A restoration project for the Mendel wetland provides some ecological benefits and may have the potential for a wetland banking project. Aside from the landowner approval there are relatively minor challenges to a simple wetland restoration project that provides ecological and hydrologic benefits to the District. A wetland banking project creates additional challenges that would require hydrologic and vegetative restoration standards be met with in a relatively short, 5-year time frame. The extent of invasive species in basin as well as the relative long-time frame required for bog restoration certainly are challenges to be aware of if wetland banking is considered for this site.

Figure 2 – 9/25/2020 photograph of an area (near Soil Test Pit #205) of the wetland with higher floristic quality

FLORISTIC QUALITY ASSESSMENT

EOR completed a Floristic Quality Assessment (FQA) and plant community mapping for the Mendel Road wetland. The FQA was completed on September 25, 2020 and consisted of fourteen 10 x 10 meter plots along three transects running perpendicular to the ditch (Figure 3). Percent cover was recorded and FQI indices for each species present within a plot and FQI indices were calculated from these data. Condition scores were assigned to each plot based on FQA criteria outlined by the MPCA (Bourdaughs et al. 2019) and are summarized in Figure 4 and Table 1. Condition scores are assigned based on the Eggers and Reed Plant Community of the FQA plot (Table 2). Vegetation mapping was completed based on field observations and aerial imagery.

Results and Discussion

Three different wetland plant communities were mapped within the Mendel Road wetland: Coniferous Bog, Fresh Meadow, and Shallow Marsh. An area of Shallow Open Water was identified in aerial imagery in the northeast corner of the wetland, and non-wetland areas included a trail and an aspen-dominated upland. Results indicate a diversity of wetland types and conditions, which are discussed below for the three wetland plant communities documented by FQA plots.

Coniferous Bog

Coniferous Bog of poor and fair quality were identified within FQA plots. The quality was mostly dependent on dominance or presence of the invasive shrub glossy buckthorn. Vast areas are severely invaded and almost entirely glossy buckthorn with a few remnant bog and wet-meadow species, but no tamarack. Such areas are mapped as Bog/Shrub-Carr (Glossy Buckthorn-Invaded). Despite the presence of glossy buckthorn, many areas dominated by tamarack and other bog species remain. Condition scores appear low, since they are relative to statewide quality of Coniferous Bogs. However, FQI indices such as weighted Coefficient of Conservatism (wC) are quite high relative to good and excellent Fresh Meadow communities of the Mendel Road wetland. In general, even a poor-quality Coniferous Bog harbors unique and often rare species which are sensitive to disturbance and uncommon in the metro area. If glossy buckthorn was removed from the fair quality FQA plots, they would meet or approach standard for good quality Coniferous Bog.

Fresh Meadow

Fresh Meadow occupies much of the wetland along the edges of the basin and contains a range of poor to excellent quality plant communities. Three main types of Fresh Meadow were encountered: native-dominated, invasive reed canary grass-dominated, and grazed. Native-dominated Fresh Meadow was in good to excellent quality and scattered throughout the entire wetland complex. A diversity of Fresh Meadow types was present, with a mosaic of patches dominated by lake sedge, wiregrass sedge, beaked sedge, pointed broom sedge, or bluejoint. A floating sedge mat dominated the northern area of Fresh Meadow. Reed canary grass was mostly present throughout, but some areas were absent such as plot 2D. However, many areas in the south and near the ditch are dominated by reed canary grass with few other species. A grazed pasture is present in the eastern portion of the wetland. Reed canary grass is common to dominant in the grazed Fresh Meadow, but many native perennial species are present and floristic quality is higher than ungrazed Fresh Meadow farther to the south.

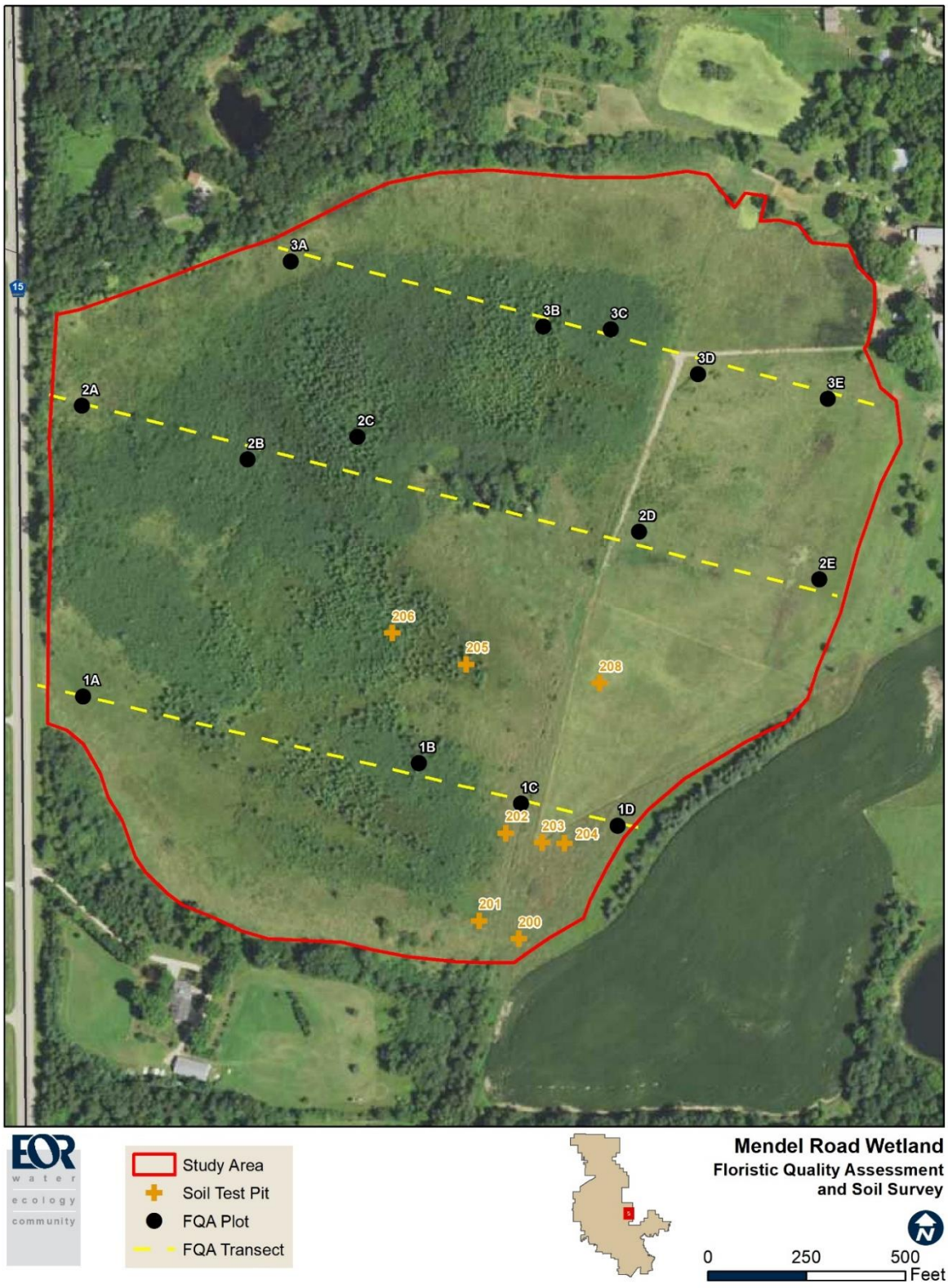

Figure 3 – FQA plot and soil survey pit locations

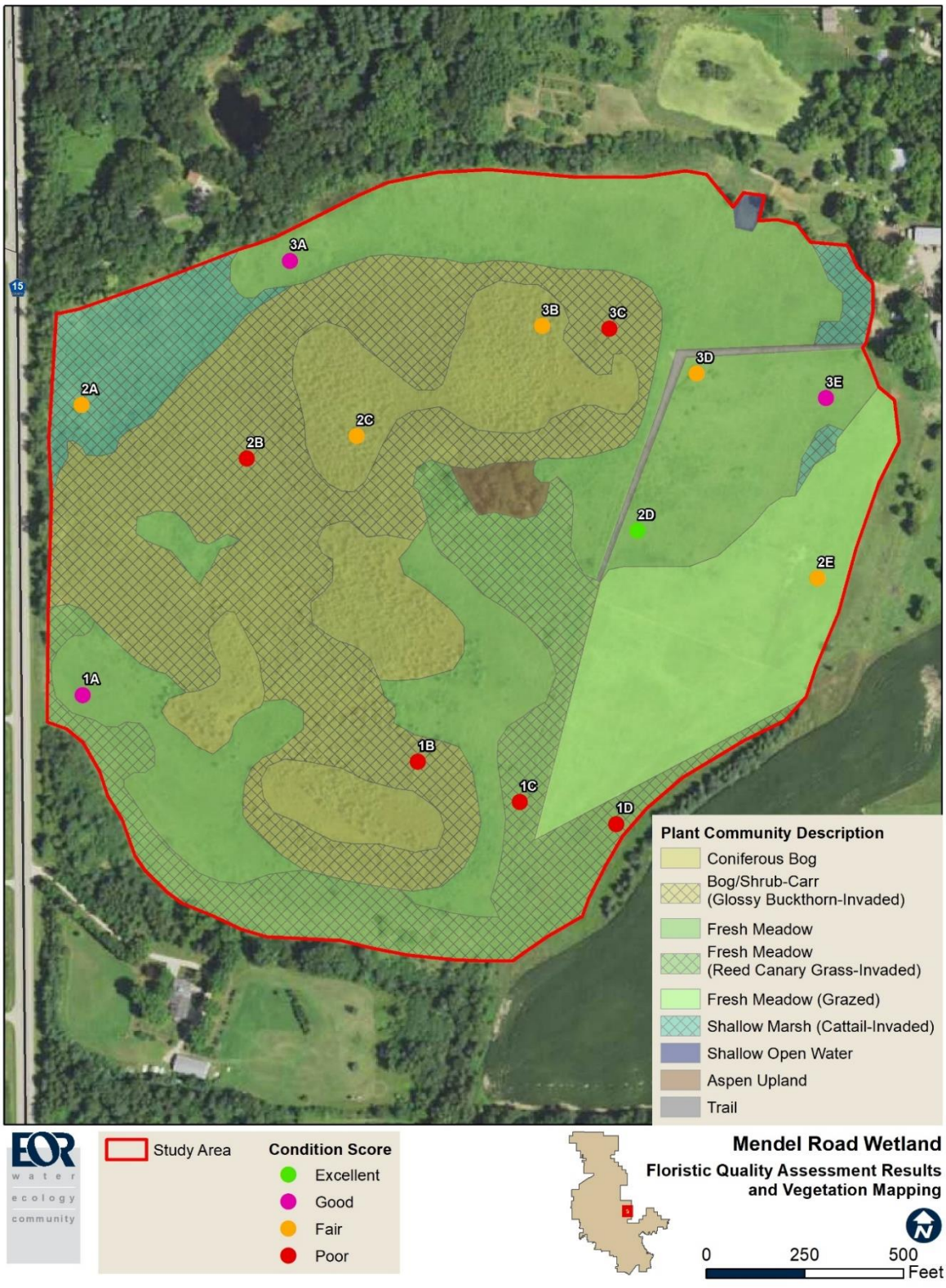

Figure 4 – FQA and plant community mapping results

Table 1- FQA Results

Plot	Eggers and Reed Plant Community	*wC**	FQA Condition Score	Notes
1A	Fresh Meadow	4.4	Good	Dominated by native graminoids beaked sedge, bluejoint, woolgrass, and invasive reed canary grass.
1B	Coniferous Bog	1.6	Poor	Dominated by dense canopy of invasive shrub glossy buckthorn with dense cover of Sphagnum moss in ground layer. Bog species tamarack, bog wiregrass sedge, tawny cottongrass, leatherleaf are present.
1C	Fresh Meadow	0.3	Poor	Dominated by invasive reed canary grass.
1D	Fresh Meadow	0.1	Poor	Dominated by invasive reed canary grass.
2A	Shallow Marsh	2.9	Fair	Dominated by invasive cattail with reed canary grass but with good species diversity. Common native species include bluejoint, wiregrass sedge, bog birch, and meadow willow.
2B	Coniferous Bog	2.6	Poor	Dominated by dense canopy of invasive shrub glossy buckthorn. Woolgrass, bristle-stalked sedge and Sphagnum moss dominate the ground layer.
2C	Coniferous Bog	6.4	Fair	Dominated by a canopy of tamarack. Glossy buckthorn is common in the sub-canopy. Ground layer cover is Sphagnum moss with bog species Labrador tea, bog wiregrass sedge, and lowbush blueberry.
2D	Fresh Meadow	6.6	Excellent	Dominated by native graminoids lake sedge and wiregrass sedge, with good diversity of minor species. The only invasive present is reed canary grass but is less than 1% cover.
2E	Fresh Meadow	2.0	Fair	Grazed pasture with seasonally flooded basins. Dominated by reed canary grass, blunt spikerush, and nodding bur-marigold. Good diversity of perennial native species common to pastures.
3A	Fresh Meadow	4.9	Good	Dominated by native graminoids beaked sedge, bluejoint, woolgrass, and invasive reed canary grass.
3B	Coniferous Bog	6.0	Fair	Dominated by a canopy of tamarack. Glossy buckthorn is common in the sub-canopy. Ground layer cover is Sphagnum moss with bog species tawny cottongrass, bog wiregrass sedge, and leatherleaf, with generalist species woolgrass and swamp beggarticks also common.
3C	Coniferous Bog	N/A	Poor	Inaccessible due to density of glossy buckthorn and floating peat, but clearly dominated by almost exclusively glossy buckthorn.
3D	Fresh Meadow	2.9	Fair	Dominated by native graminoids pointed broom sedge and bluejoint and invasive reed canary grass.
3E	Fresh Meadow	6.0	Good	Dominated by native graminoids wiregrass sedge and bluejoint, with good minor species diversity. Invasive cattail and reed canary grass are present. Stand of invasive cattail nearby to the east.

*wC = weighted Coefficient of Conservatism. Condition score is determined by wC.

Shallow Marsh

Shallow Marsh is present in the northwestern corner of the wetland and occurs in patches in the northeastern area. Most of the Shallow Marsh is dominated by invasive cattail and is in poor to fair condition. The northwestern Shallow Marsh contains a high diversity of native species that buoy its condition score of Fair. However, invasive cattail is a serious threat to overrun the Shallow Marsh and invade Fresh Meadow, particularly the floating sedge mat in the northern portion of the wetland.

Finding of Note

A rare herbaceous plant species was found via the floristic survey. No further documentation of the species can be communicated without landowner permission, and the exact species cannot be specified due to restrictions placed by MnDNR for rare species protection.

Summary

- Tamarack-dominated Coniferous Bog, a regionally rare plant community, is present in the wetland in fair condition.
- Glossy buckthorn dominates large areas of the wetland and threatens to completely overtake remaining Coniferous Bog.
- Good to excellent quality Fresh Meadow is present in a mosaic of diverse patches, though some Fresh Meadow is dominated by reed canary grass and of poor quality.
- Shallow Marsh is largely dominated by invasive cattail with good native diversity intermixed in some areas. Invasive cattail threatens to overrun Shallow Marsh and encroach on Fresh Meadow.
- There are several Scots pine (Pinus sylvestris) specimens, a non-native species that has been planted and/or naturalized in the wetland. This relatively benign species should be removed if the wetland is managed/enhanced. If hydrology is restored this species would not likely survive.

Bourdaughs, M., J.A. Genet, M.C. Gernes. 2019. Status and Trends of Wetlands in Minnesota: Minnesota Wetland Condition Assessment (2011/12-2016). wq-bwm1-11, Minnesota Pollution Control Agency, St. Paul, MN.

Table 2 – Condition score criteria (Bourdaughs et al. 2019) based on Eggers and Reed Plant Community

	Community						
Condition Category	**Shallow Open Water**	**Deep Marsh**	**Shallow Marsh**	**Fresh Meadow**	**Wet Prairie**	**Calcareous Fen**	**Rich Fen**
Exceptional			> 4.9*	> 4.2*	> 4.8*	> 7.0*	> 6.4*
Good	> 5.0	> 4.1	> 4.2	> 4.2	> 4.1	> 6.4	> 5.9
Fair	≤ 5.0	≤ 4.1	1.9 - 4.2	1.4 - 4.2	1.4 - 4.1	5.9 - 6.4	1.8 - 5.9
Poor			< 1.9	< 1.4	< 1.4	< 5.2	< 1.8
	Community						
Condition Category	**Open Bog**	**Coniferous Bog**	**Shrub-Carr**	**Alder Thicket**	**Hardwood Swamp**	**Coniferous Swamp**	**Floodplain Forest**
Exceptional	> 7.4*	> 7.3*	> 4.5*	> 4.2*	> 4.6*	> 5.8*	> 4.2*
Good	> 7.0	> 7.1	> 4.5	> 3.9	> 4.2	> 5.6	> 2.7
Fair	5.4 - 7.0	5.9 - 7.1	3.2 - 4.5	2.3 - 3.9	2.5 - 4.2	5.6 - 3.8	2.1 - 2.7
Poor	< 5.4	< 5.9	< 3.2	< 2.3	< 2.5	< 3.8	< 2.1
* Total non-native species cover < 1 percent							

Figure 5 - 9/25/2020 photograph of an area (near Soil Test Pit #205) with a rich Sphagnum moss composition

Figure 6 – Representative 9/25/2020 photograph of colonization by Glossy buckthorn (*Frangula alnus*), an invasive species that dominates the wetland

SITE SURVEY

The ditch that drains the wetland was survey on 10/27/2020. Do to access limitations the entire ditch was not surveyed, but the key reach in determining drainage was characterized. Two products (Wetland Overview and Ditch Plan & Profile) have been produced from this survey and are included in the Appendix. The following takeaways have been derived from the survey:

- Prior to ditching the wetland likely drained westward, across present day Manning Avenue to Brown's Creek.
- A culvert across Manning Avenue was located and surveyed. Based on visual observations and professional judgment this culvert does not appear to frequently carry flow.
- The high point or control elevation in the ditch is ~898.5' (at roughly Station 7+00). It appears that this is an artificial high point caused by deposition of sediment and that the ditch was deeper (0.5' to 1.0') and historically more effectively drained the wetland.

SOIL SAMPLE OBSERVATIONS

Soils can provide clues as to whether wetlands are drained and how effective that drainage has been. Soil samples near and adjacent to the ditch were taken on 9/25/2020. The location of the seven soil samples can be seen in Figure 3 and the hand borings are characterized in **Error! Reference source not found.**. T he following takeaways have been derived from the sampling:

- The most degraded peat (H10, H8, muck) was found in shallower depths over a more porous sand or silty sand.
- Reed canary grass (RCG) has invaded many of the same areas where the peat has degraded to muck. This may be from past landuse or it may be the fact that when peat decomposes/humifies it has more available nutrients providing a competitive advantage for RCG.
- The only notable observation to be made about depth to free water is that both soil sample points taken near the ditch on the west side had a measurable water table (#201=16" and #202=18"). #208 also showed a water table at 16" on the east side of the ditch farther north.

EFFECTIVE DRAINAGE ASSESSMENT

Our speculation here is that the ditch may be pulling water towards it and therefore exceeds evapotranspiration. There is not a measurable lateral effect ellipse in this case since we did not find free water as expected in a typical scenario, farther from the ditch.

The surveyed ditch cross-sections (found in Appendix) indicate there is no meaningful subsidence adjacent to the ditch. In typical drainage scenarios the lowered drain depth caused by a ditch would lower water table, cause subsidence, and thereby exhibit lower ground elevations near the ditch compared to areas farther away from the ditch.

If it is fair to say the outlet of this basin was to the west historically and therefore the southeast portion of the basin should be higher than the westerly portion. However, via the Wetland Plan Overview (found in the Appendix), the lowest wetland elevations albeit broad and subtle are in the southeast

Table 3 – Soil Sample Logs

	Vegetation			Soil				
Point	Plant Community	Dominant Vegetation	Veg Coverage	Soil Depth (inches)	Soil Type	Von Post	Notes	Distance From Ditch (Approx ft)
200	Fresh Meadow (Reed Canary Grass-Invaded)	Reed Canary Grass	100%	0-11	Decayed Peat/Muck	H10		East 50
		Stinging Nettle	5%	11+	Depleated Sand	NA		
201	Fresh Meadow	Lake Sedge	100%	0-20	Peat	H4	water @16"	West 50
		Canada Blue Joint	2%					
202	Fresh Meadow (Reed Canary Grass-Invaded)	Reed Canary Grass	5%	0-20	Peat	H3	saturated to surface	West 50
		Steeplebush (Spire	10%				water @ 18"	
		Wiregrass Sedge	25%					
		Canada Blue Joint	5%					
		Wool Grass	2%					
		Sphagnum moss	1%					
203	Fresh Meadow (Reed Canary Grass-Invaded)	Reed Canary Grass	90%	0-2	roots	NA	no free water	West 50
		Lake Sedge	5%	2-6	Peat	H8		
		Wool Grass	5%	6-20	Peat	H5		
204	Fresh Meadow (Reed Canary Grass-Invaded)	Reed Canary Grass	100%	0-2	roots		no free water	West 100
				2-9	Peat	H8		
				9-20	Mucky Silt	H10		
				20+	Silty Sand	NA		
205	Fresh Meadow/Bog	Sphagnum Moss	90%	0-10	Peat	H4	no free water	West 250
		Lake Sedge	70%	10+	Peat	H2		
		Bog Birch	20%					
		Wool Grass	5%					
		Tamarack	20%					
206	Coniferous Bog	Spagnum	90%	0-11	Peat	H5	no free water	West 400
		Glossy Buckthorn	100%	11+	Peat	H2		
		Tamarack	50%					
		Paper Birch	1%					
208	Fresh Meadow (Grazed)	Reed Canary Grass	90%	0-2	roots	NA	water@ 16"	East 75
		Beggartick	5%	2-10	Mucky Silt	H10		
		Woolgrass	5%	10-16	Depleated sand	NA		

portion of the wetland, closest to the ditch outlet. What appears to be somewhat supported by the limited soil samples observed, is that the ditch was cut into a porous sand layer, thus providing an effective drain through the sand layer. This essentially evenly lowered the water table that dewatered the surface peat and caused broad subsidence/humification.

As stated previously, the ditch has likely aggraded and therefore the original depth of the ditch was more effective at draining wetland. This excavated depth could have caused a broad dewatering of the southeast portion of the basin that has shallow peat over sand.

CONCLUSION/RECOMMENDATION

Disabling the ditch exiting from the southeast portion of this wetland would initiate a slow paludification process (rebuilding of peat). Vegetative species better adapted to a stable water table, lower nutrient, and lower pH regime would start to gain an advantage over species such as reed canary grass. For the fresh meadow portions of the site, this would improve floristic quality and diversity. For the bog areas, a more stable water table with a permanently saturated layer of sphagnum peat would favor native species such as tamarack over glossy buckthorn. To stabilize water tables and start developing conditions more favorable to native plant species would best be accomplished by blocking the artificial ditched outlet. Ideally this outlet would be blocked completely to divert runoff and subsurface flow to the west, through the bog, before reaching Brown's Creek. The ditch could provide an emergency outlet if needed to protect infrastructure. Furthermore, disabling the ditch would theoretically reduce nutrient & thermal loading to Brown's creek.

Blocking the ditch to normal flows and only utilizing the ditch for flood water release creates opportunities for wetland restoration but also creates constraints on the useability of the lands affected. For example, portions of the site that exhibit vegetation and hydrologic improvements may be eligible for wetland restoration credits if pre-enrolled in a qualified banking program. The drawback to this restorative approach is the loss of some active livestock grazing. Since the entire basin is privately owned, easements or fee title acquisition would be necessary.

Whether there was interest in pursuing a wetland banking project or more simply restoring a degraded wetland for other ecological benefits, vegetation management work will be needed. Reestablishing the natural hydrologic regime is needed for sustainability of the site long term but the timeline for vegetative response might be several human lifetimes. Because bogs have such a long recovery period, it is common to employ vegetative restoration activities to realize ecological benefits in a perceivable timeframe. Management and control of glossy buckthorn is the highest priority. Altering the hydrologic regime as discussed above will disfavor this invasive species over the native species but other tactics for control are also recommended. Glossy buckthorn can be sprayed with an herbicide during leaf-on conditions, or it can be cut and then stems/stumps treated with an herbicide in the fall. These options are very labor intensive and costly. Promising research is being conducted at the University of Minnesota on the use of oat crown rust as a biocontrol for both glossy buckthorn and reed canary grass. It is our recommendation to follow the ongoing research and possibly consider utilization of this type of biocontrol on the site in the future.

If a more proactive restoration approach is preferred, our recommendation is to first focus on reestablishing the hydrology by disabling or partially disabling the ditch. This will start to alter hydrologic

conditions in favor of the native species; a more proactive approach to managing the invasive species can be a follow-up activity. The only exception to the protracted approach of allowing hydrologic restoration to favor native vegetation is if a wetland banking project is pursued. Wetland banks typically need to meet pre-project designated performance standards within 5 years in order to receive credits. As mentioned above, bogs are very slow to reestablish compared to other wetland types.

Traditional methods of managing buckthorn and reed canary grass (both invasive species found on the site) are labor intensive and costly. Promising research is ongoing at the University of Minnesota that may show some promise for a biological control agent that attacks both glossy buckthorn and reed canary grass. It is our recommendation that the District prioritize hydrologic restoration of this basin by modifying the artificial drainage caused by the ditch and keep close watch on the invasive species control research which may prove to be more cost-effective than traditional management approaches.

APPENDIX

1. Site Survey – Plan Overview

2. Site Survey - Ditch Plan & Profile

APPROXIMATE WETLAND ELEVATION LEGEND

901.0 TO 902.0

900.0 TO 901.0

26" RCAP
INV: 900.37

26" RCAP
INV: 900.56

906.73
Top Bank

902.03
Toe

907.51
CL ' Rd

906.95
Top Bank

901.50
Toe

CONTINUATION OF DITCH - NOT SURVEYED

PROPERTY
LINE (TYP.)

MANNING AVE

BROWNS CREEK

SURVEYED WETLAND OUTLET

11+43
11+00
10+00
9+00
8+00
7+00
6+00
5+00
4+00
3+00
2+00
1+00
0+00

SCALE IN FEET
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NOT FOR CONSTRUCTION

SUBMISSION DATE: 10-30-2020

DRAWN BY BR

EOR PROJECT NO. 0041-0378

Emmons & Olivier Resources, Inc.
1919 Univ. Ave W #300
St Paul, MN 55014
Tele: 651.770.8448
www.eorinc.com
water ecology community

BROWN'S CREEK WATERSHED DISTRICT

MENDEL ROAD WETLAND
BROWNS CREEK WATERSHED DISTRICT, WASHINGTON COUNTY, MINNESOTA

STATE PROJECT NO. ---

CITY PROJECT NO. ---

PLAN OVERVIEW

SHEET 01 OF 02 SHEETS

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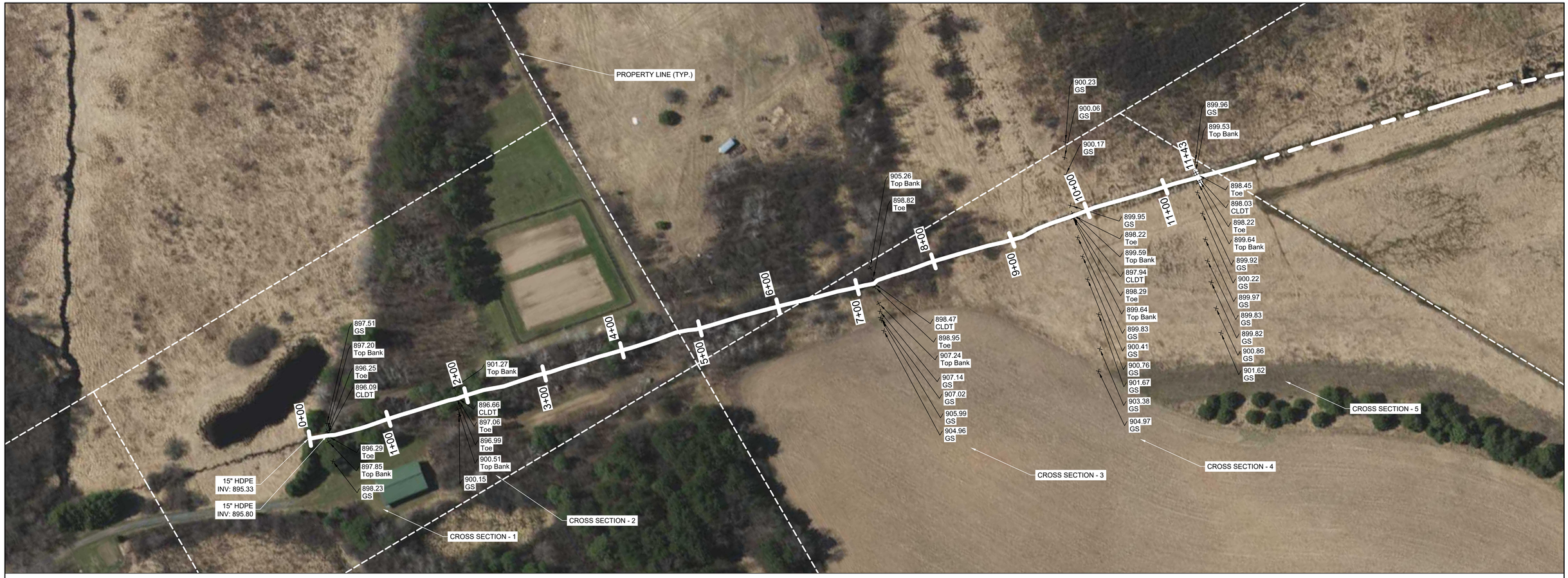

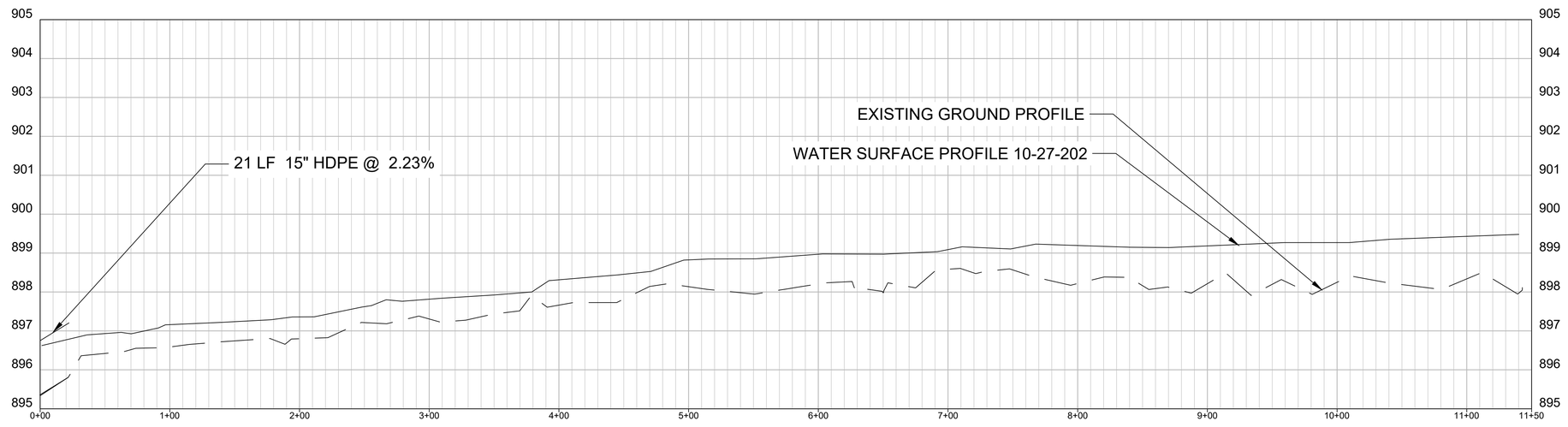

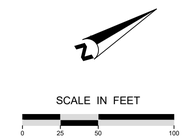

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NOT FOR CONSTRUCTION

SUBMISSION DATE: 10-30-2020

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BROWN'S CREEK WATERSHED DISTRICT

MENDEL ROAD WETLAND
BROWNS CREEK WATERSHED DISTRICT, WASHINGTON COUNTY, MINNESOTA

STATE PROJECT NO. ---

CITY PROJECT NO. ---

PLAN AND PROFILE

SHEET 02 OF 02 SHEETS

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