Sprague Creek Fen, Wetland Complex Restoration

Compensatory Mitigation Strategy for the Roseau Lake Restoration Project

Proposed By:

Roseau River Watershed District

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Introduction

The Roseau River Watershed District (RRWD) and Minnesota Dept of Natural Resources (MNDNR) are partners on a flood damage reduction/natural resource enhancement project, the Roseau Lake Rehabilitation Project in the former Roseau Lake Basin. Roseau Lake was drained in the early 1900s for agriculture production; however, current flow regimes within the basin lend an opportunity to enhance water storage for the flood damage reduction and natural resource enhancement. The project is located within the basin, aligns with former shorelines, and utilizes existing roads and ditches where available to minimize cost and impacts to both natural and cultural resources. As the project is located on a former shallow lake, there are significant wetland impacts resulting from construction of dikes, drainageways, and excavation for building material. Avoidance of wetlands on this site would result in a "no-build" scenario, hence every effort is being made to minimize impacts within the project footprint by incorporating existing infrastructure wherever possible to minimize total impacts. The wetland delineation has been completed for the total project infrastructure and total acres of wetland impact will be identified once a preferred alignment has been selected by the project team.

Background

Due to the anticipated magnitude of wetland impacts that will result from Roseau Lake Rehabilitation project, a site of considerable size needs to be identified for compensatory mitigation. The Sprague Creek site (Figure 1 – Site Map) was identified as an opportunity to provide a functional lift to a large complex of wetlands extending from the former Roseau Lake Basin northeasterly into Manitoba, Canada. The wetland types within the site include but are not limited to Spring Fen, Shrub Carr, Wet Meadow, Conifer Swamp and Sedge Meadow. The composition and diversity of wetland types are reflected by groundwater discharge sourced from shallow sand and gravel aquifers. The mitigation site is dissected by three laterals of Judicial Ditch 61(JD61). This legal ditch was constructed in the early 1900s to encourage settlers to homestead in the region and bolster agriculture. The ditches currently serve as a conduit, conveying groundwater and surface water from the large expanse of peat lands located north of the basin. The goal of the project is restoration of hydrology by reconnecting severed surface and subsurface flows to mirror a pre-drainage hydrological regime. Restoration of hydrology will require multiple strategies for restoring and maintaining water tables throughout the site. These hydrologic improvements will result in restoration of native vegetation in a large expanse of brushland such that community dynamics will be restored to a large wetland complex.

Wetland Characteristics

Vegetation

Sprague Creek Site

Vegetation within the mitigation site (Figure 2 – Vegetation List) is dominated by hydrophytic communities with diverse species composition. The northern extent of the site wetlands are dominated by Tamarack, Black Spruce, Sphagnum Moss, Small Cranberry and Pitcher Plant. In the southern extent, Canada Bluejoint and Meadow Willow are dominant in un-drained wetlands while Reed Canary Grass and Hybrid Cattail are dominant in corridors of disturbance. Between the north and south extents there is a mosaic of emergent and shrub dominated wetland communities exhibiting varying degrees of alteration as a result of drainage and previous attempts to cultivate the landscape. There was a direct correlation found during the 2017 field season in a loss of wetland function from one side of a legal ditch to another (Figure 3 Floristic Quality Assessment Report). To assess upstream and downstream impacts on the overall quality of wetlands, field observations were from transects in wetland communities that were dissected by legal drains.

Roseau Lake Site

In contrast to the higher species diversity within the mitigation site, the Roseau Lake Project scored relatively low in quality (Figure 3). Wetlands within the former lake basin range from farmed wetlands with little wetland species present to medium/low quality Shrub Carr. Typical wetlands that would be affected by dike construction or ditch and borrow excavation are dominated by Reed Canary Grass with Lake Sedge and Meadow Willow as co-dominant species.

Soils

Sprague Creek Site

Identified as very poorly drained according to the Roseau County Soil Survey, wetland soils within the mitigation site are dominated by Seelyeville-Seelyeville ponded, Mooselake mucky peat, Cathro muck and Lupton-Lupton ponded complex (Figure 4 Roseau County Soil Survey). These soil units are formed from herbaceous and woody organic matter that overly glaciolacustrine deposits.

Peat sampling was completed in the summer of 2018, information collected can be found in Figure #21.

Roseau Lake Site

Soils found in wetlands within the drained lake basin consist of Lallie mucky silt loam, Sago muck, Cathro muck, and Sax muck (Figure 4). These soils are formed of organic materials

over glaciolacustrine deposits and are designated as very poorly drained according to the Roseau County Soil Survey.

Hydrology

Sprague Creek Site

Wetlands within the restoration site receive hydrology from groundwater discharge and precipitation (Figure 5 Hydrology Atlas). The fen communities in the northern extent are indicative of groundwater-dependent species that flourish under conditions of groundwater discharge. Plant communities down gradient from the fen are consistent with slope wetlands that are fed both by groundwater and precipitation. In addition to the lateral effect of the legal ditch system accelerated drainage is attributed to small laterals, gullies, and surface drains.

Hydrology monitoring was conducted during the 2018 growing season to collect baseline data of the proposed restoration site. Information gathered in 2018 can be found in Figure 21.

Roseau Lake Site

Wetland hydrology within the Roseau Lake Basin is heavily influenced by the stage of the Roseau River. The basin fills either partially or completely at a 2-year flood frequency. Floods are generally more common during the spring runoff; however, the basin has flooded in midsummer and during the fall months. Aside from the influence of the river, the geomorphic position, (shallow depression) of these wetlands promote standing water or saturation near the surface throughout the growing season. Previous attempts to farm the basin have resulted in extensive ditching of depressed areas, which continue to drain wetlands during dry periods.

Floristic Quality Assessment

During the 2017 field season five transects were surveyed within the mitigation site to identify and record vegetation across different plant communities and in different landscape context to assess hydrologic impact on vegetation (Figure 3). Vegetation metrics for the transect locations incorporated the weighted Coefficient of Conservatism (wC) to determine value of plant communities. The wC is the sum of each species abundance within the study area multiplied by each species assigned Coefficient of Conservatism (C) score. The C score is a numerical rating from 0-10, based on a species tolerance to disturbance and its correspondence to a specific habitat. All transects were located on public land, none of which were located within the SNA. The purpose of the survey was to determine if there was measurable difference in the species composition of vegetation on either side of the ditch.

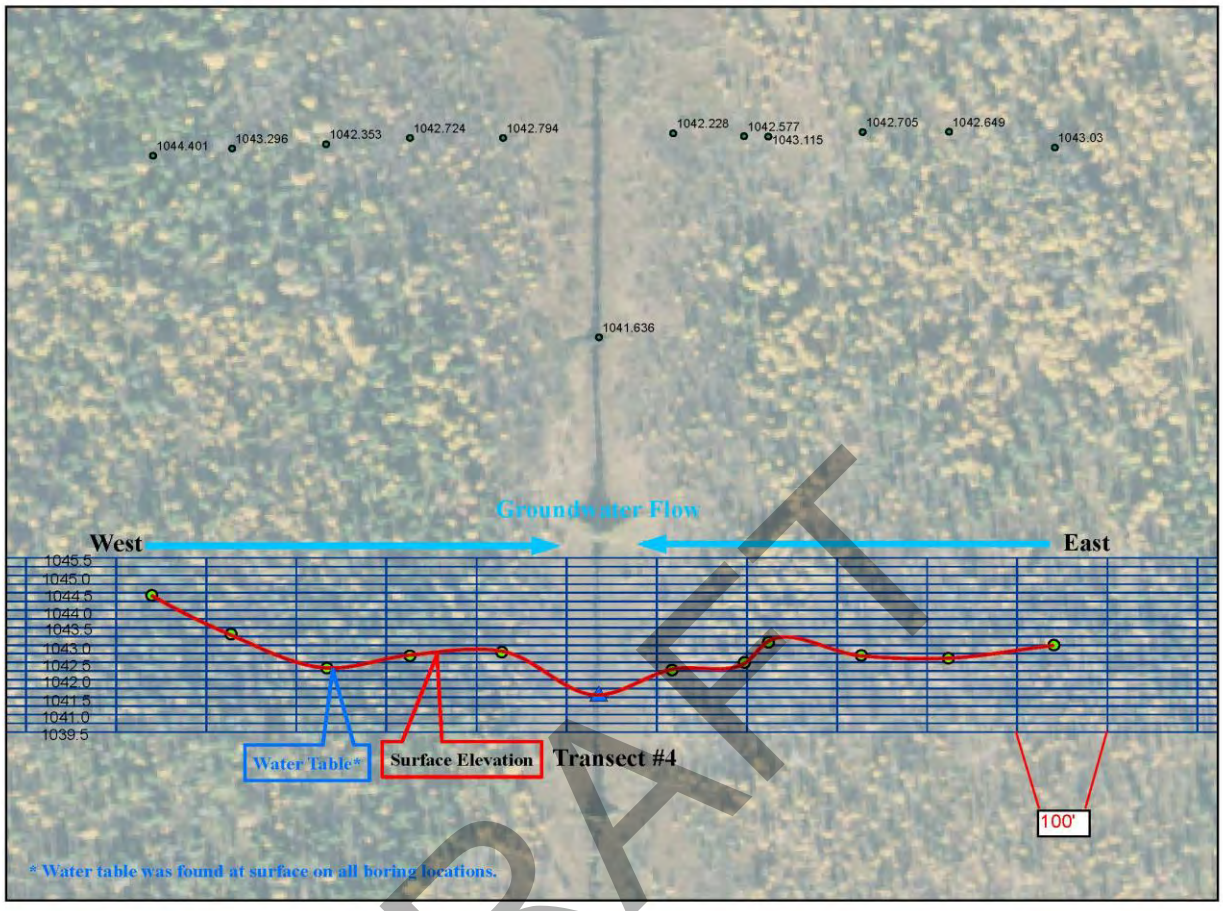
RESTORATION STRATEGY

Due to the varying wetland communities within the mitigation site and the different ways each ditch affects its associated wetlands, there is no overarching single strategy to be employed across the entire restoration site (Figure 1). For example, Lateral 7 Branch 1, runs east-to-west with the natural grade running north to south. Lateral 6 runs north-to-south with the natural grade draining northeast to southwest. Lateral 5B is aligned north-to-south with the surrounding land draining to the ditch corridor. The strategy for hydrological restoration of each segment is outlined in the following pages.

Lateral 5B

Centrally-located within the project limits, Lateral 5B of Judicial Ditch 61 extends from the Roseau River on the south, north to the Sprague Creek SNA. This ditch drains a longitudinal path through the wetlands within its alignment, requiring surface and groundwater flows to run within, or parallel to, the ditch corridor. Lateral 5B contrasts with the other laterals, which run perpendicular to or at an angle to surface water or groundwater flow.

(Graphic #1) Transect #4 Cross Section, Lateral 5B Jurisdictional Ditch 61



Based upon elevation data collected in the field and cross sections derived from LiDAR data, there is substantial subsidence in ground elevation along the ditch corridor. This is likely a result of periodic, partial, or complete drying of the upper peat layers causing decomposition and/or flushing of organic material downstream. As a product of this decomposition process, the land on both sides of the ditch slopes gradually toward the channel. This potentially exacerbates dewatering impact on the landscape as surface water drainage increases over time.

Beaver Impact and Invasive Vegetation, Lateral 5B

The dominant plant community along Lateral 5B consists of emergent communities punctuated with dense to moderate stands of Meadow Willow, Red-osier Dogwood, and Bog Birch. This landscape is ideal habitat for beaver, as evident in historical aerial photos. Beavers have resided in the ditch since prior to the 1940's. Fidelity of beaver to specific dam locations is highly variable on this lateral, with dams failing in one section and new ones sprouting up nearby. Other reaches, particularly in the northern extent, are consistently dammed and grow throughout the years.

Beaver activity on this lateral affects the wetland communities along the ditch. Periodic fluctuation in water levels as a result of dam construction or failure influence plant communities. In areas where dams are constructed above the elevation of the surrounding land, there is evidence of peat separation and migration; at these sites there are greater densities of cattail species within the ditch. Another observation of beaver dam impact on the wetlands within the Lateral 5B corridor is the colonization of Reed Canary Grass on and near the dams. The occurrence of Reed Canary Grass is specific to the dams with the exception of one large stand along the northern portion of the ditch. Dams are likely suitable for Reed Canary Grass as they are capped with peat and the root mass growing on this cap is slightly elevated from the surrounding landscape thus providing ideal conditions for this invasive to establish a monoculture.

Proposed Restorative Strategy, Lateral 5B

The beaver dams have provided some hydrologic modification within the Lateral 5B corridor that, while slowing discharge, have negative impacts on species composition of the wetland community. There is no spoil available along the ditch corridor, which complicates opportunities for installing ditch plugs. Hydrology modification in the ditch will target maintaining the water table near the elevation of the top of bank, essentially wetting the peat while not promoting separation from mineral soil or the ditch bank.

The proposed strategy would enlist shearing of the brushland on the west side of the ditch and placing the brush within the ditch corridor (Figure 6, Brush Plug Exhibit). The brush will be placed in the ditch and compressed with the assistance of amphibious equipment. The brush will provide a medium for accumulation of organic material within the open channel. A secondary effect of loading the ditch with brush will be to discourage beaver dispersal within the system. In conjunction with the brush placement, the tops of beaver dams would be pressed to match grade with the top of bank. The larger dams that extend 20+ feet beyond the ditch will be addressed by removing the spoil from the dam and placing it into the ditch. The principle of this practice is to maintain a consistent water level throughout the length of the ditch while hindering the beavers' ability to create pools in the ditch. Pressing the dams to existing ground level and removing excess dam material will limit the production of Reed Canary Grass seed stock by drowning the root structure of the invasive plant.

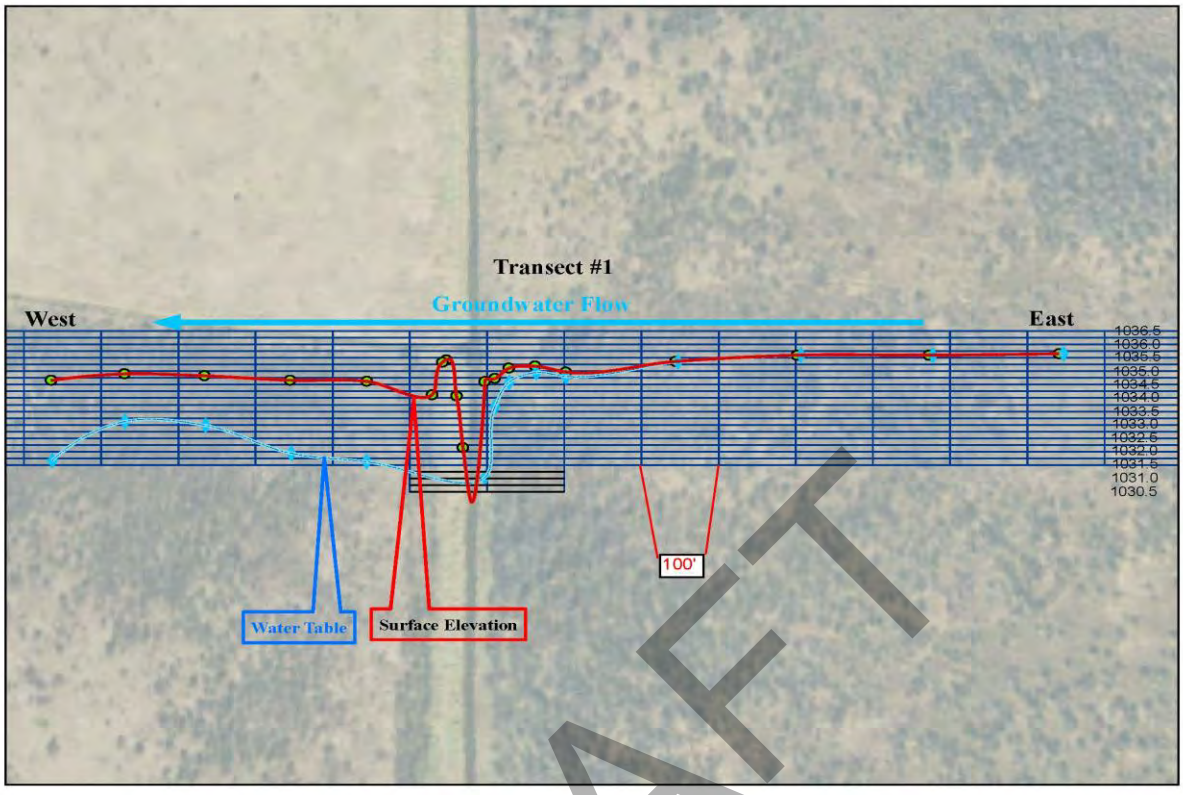
The northern half mile of Lateral 5B is located near the SNA and presents unique challenges to establish target water levels. There are limited spoil reserves located along the ditch corridor, which is relatively narrow. The preferred strategy for restoring hydrology to the adjacent ground surface is to install cedar dams in series at each 1 foot drop in elevation (Figure 7, Cedar Dam Exhibit). Cedar dams provide the least impact to the site, can be installed either by hand or with the assistance of light equipment, and can be set to a specific elevation that will persist for decades, thus allowing the channel to fill in with organic material.

Lateral 6

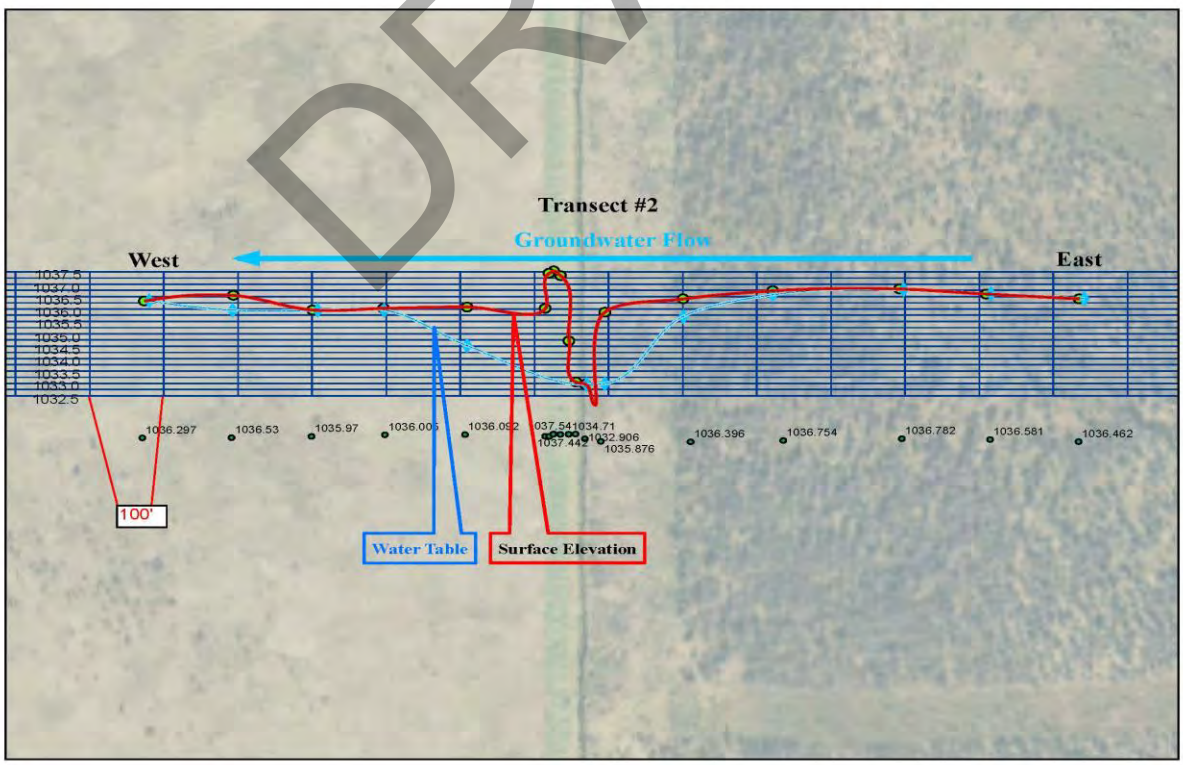
Lateral 6 is located in the western portion of the project. This lateral ditch to JD 61 extends from the Roseau River northward to approximately one half mile from the Canadian border. This legal drain has a varying depth ditch on the east side of the corridor of disturbance with excavated spoil on the west side of the ditch that has been leveled to provide a 4x4 and ATV-suitable road. The landscape within the Lateral 6 corridor slopes from northeast to southwest with the ditch and road acting as a dam and diversion, forcing flows southward to the river.

Data collected during the 2017 field season identified hydrologic and vegetative impacts as a result of the ditch and spoil road. Impacts to the east of the ditch are typical of wetlands degraded by lateral effect. Vegetation condition, based on wC, is lower close to the ditch and improves as the transects extended further from the ditch. Wetlands east of Lateral 6 also exhibit a decrease in the water table the closer to the ditch. West of the ditch and road, there was a measurable impact on the water table and the wC scores of the plant communities. The lower wC scores and decrease in groundwater elevation is likely due to groundwater being intercepted by the ditch while the road composed of compacted peat, acts as a aquatard further compounding the loss of hydrology west of the road. There is an observable rise in groundwater levels as the transects extended further westward, likely due to groundwater pressure pushing upwards as it moves beyond the ditch and roadway.

(Graphic #2) Transect #1 Cross Section, Lateral 6, Jurisdictional Ditch 61



(Graphic #3) Transect #2 Cross Section, Lateral 6, Jurisdictional Ditch 61



Beaver Impact and invasive vegetation, Lateral 6

Similar to Lateral 5B, Lateral 6 currently experiences beaver activity, with evidence of dams found throughout aerial photo review back to 1940. Impacts as a result of dams on Lat 6 are focused east of the ditch as the spoil/road is higher than the dams, impeding inundation to the west. Beaver dams within this corridor are more prone to removal, either by individuals or the ditch authority, due to accessibility of the reach.

Invasive vegetation within this region of the wetland is focused within the corridor of disturbance, with densities tapering off as one travels east or west from the ditch. Reed Canary Grass is the dominant invasive observed in this region. Canada Thistle and Hybrid Cattail were also identified in the corridor of disturbance. The greatest densities of Reed Canary Grass were concentrated on the spoil material (road) and on the opposite top of bank. Reed Canary's aerial coverage diminished as the transects extend away from the ditch and is likely due to hydrology. The closer the water table to ground surface, the less likely Reed Canary Grass is encountered. Thistle and cattails are primarily found on the spoil and in the ditch channel respectively, with occasional individuals or clusters of either invasive found in the adjacent wetlands.

Proposed Restorative Strategy, Lateral 6

Lateral 6 has on-site plug material to provide a suitable medium to re-establish, in part or wholly, hydraulic connectivity to wetlands on either side of the ditch. The spoil material is sourced from the ditch. It is porous to semi-porous organic material that is preferred to hauling in clay or other off-site fill. There are areas where peat has subsided or eroded from the spoil bank, therefore it is unlikely the spoil would completely fill the ditch cut in all locations. Where suitable material is available, spoil will be placed in-channel up to the level of the east top of bank in order to establish a stable grade transition. In the former road bed, the top layer of peat will likely require agitation to encourage flows in the upper 10cm, mimicking natural conditions.

There will certainly be areas where insufficient spoil is available or the degree of subsidence makes transitioning hydrology from east to west across the corridor of disturbance difficult. To address this, log diverters will be installed in the former corridor of disturbance to aid reestablishment of flow direction (Figure 8, Log Diverter Exhibit). Logs will be sourced from within the property, likely with the aid of DNR Forestry to identify suitable stands. Tamarack or Black Spruce are the preferred species due to their slow rate of decay and abundance. Onsite conifer logs are preferable to fill in order to prevent introduction of invasive vegetation and promote a suitable medium for remnant invasive stock to re-colonize the site.

The log diverter structures will be installed at each 1-foot-drop in elevation, at 215° from true north to align with the surface grade of wetlands on either side of the ditch (Figure 8). The logs will be 50 ft long with a minimum top diameter of 12" and will be installed with the base to the north and the top to the south. The total length of each diverter will be approximately 390ft to ensure ground elevations from the east wetlands are tied to west wetlands and restrict potential

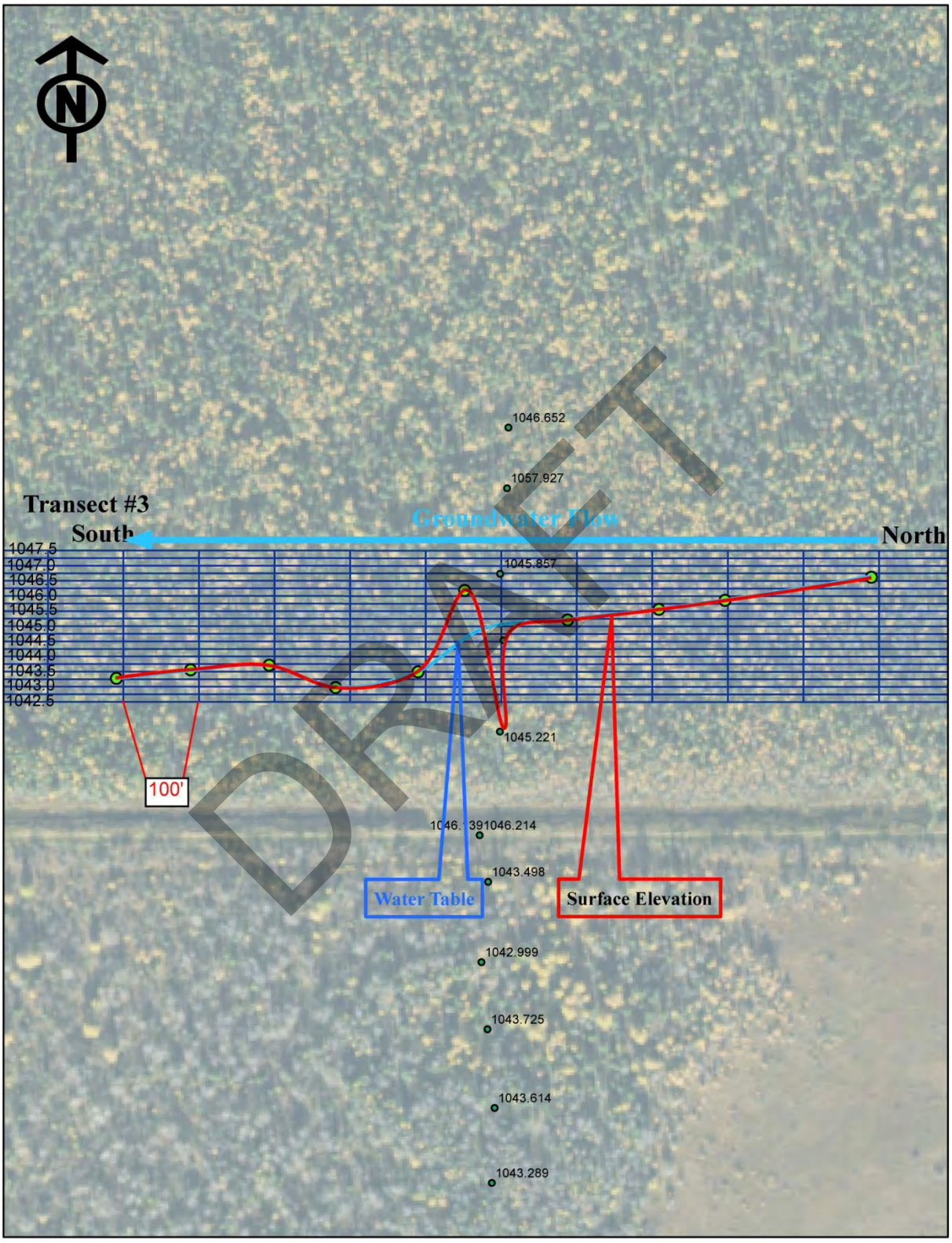
southward flow in the former channel corridor. Anchors, comprised of log tops will be driven into the peat and secured to the diverter logs to prevent migration or blow out of the logs. Ponding of water should not occur at diverter locations as the logs will provide a permeable dam.

Lateral 7 Branch 1

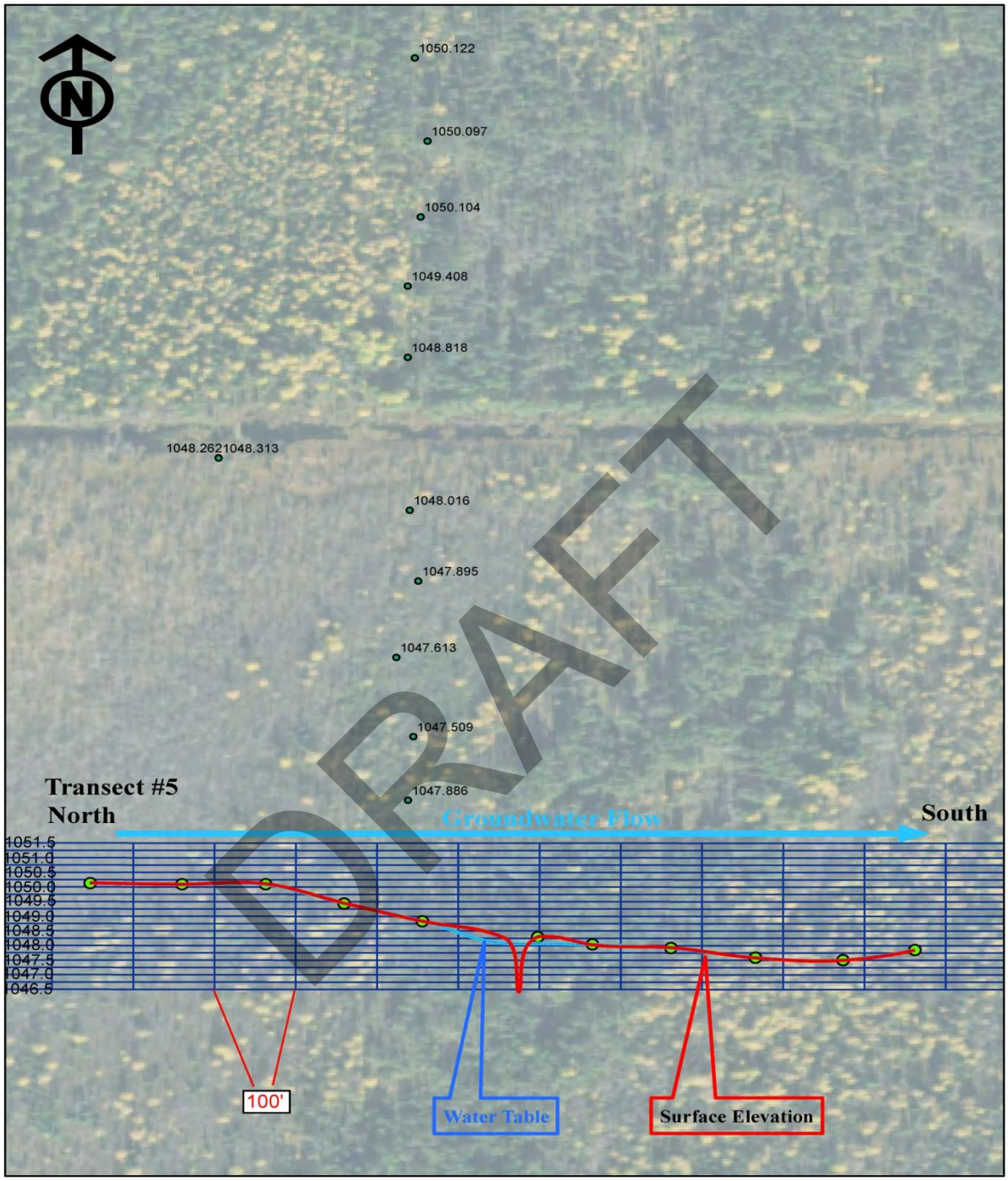
Lateral 7 Branch 1 extends from east-to-west on the northern portion of the site bissecting the spring channels and conifer islands characterizing the uniqueness of the wetland (Figure 1). This lateral varies in depth from 2 to 8 feet due to sedimentation with the ditch spoil placed on the south side of the ditch. There is a grant-in-aid snowmobile trail that is located to the south of the spoil on the west end of the site, which then transitions onto the spoil east of Lateral 5B. The west mile of Lateral 7 Branch 1 is characterized as shallow, 2-4 feet, with little remaining spoil on the site, and is nearly inaccessible by ATV or snowmobile.

Data collected from transects #3 and #5 provided information upgradient and downgradient of the lateral to determine if there is any impact on vegetation due to altered hydrology. Transect #3 is located to the east of the SNA and reflects similar plant communities that characterize the Sprague Creek SNA. On the north side of the ditch, the plant communities are dominated by high-quality native vegetation with no occurrences of invasive species. South of the ditch, the wetlands have more generalized species and invasives; high-quality vegetation was still present but at lower densities. Transect #5 is located west of the SNA and exhibits similar characteristics to Transect #3. A more complete analysis can be found in the FQA exhibit.

(Graphic #4) Transect #3 Cross Section, Lateral 7 Branch 1, Jurisdictional Ditch 61



(Graphic #5) Transect #5 Cross Section, Lateral 7 Branch 1, Jurisdictional Ditch 61



Beaver Impact and Invasive Vegetation, Lateral 7 Branch 1, Jurisdictional Ditch 61

Beaver dams have ranged widely across the lateral over the available aerial photo record. Dams have been damaged or removed in the past, either due to natural causes or ditch maintance resulting in wetland impacts from altered hydrology on the ditch fringe. Beaver dam impacts on wetlands typically occur through water level fluctuation or flushing. This is evident in separation and movement of large chunks of peat.

Invasive vegetation found within and along this lateral include: Reed Canary Grass, Canada Thistle and Hybrid Cattail. Canada Thistle is found primarily on the east and west ends of the lateral on top of the spoil piles. Hybrid cattail can be found along the edges of the open ditch, with erratic colonies found in disturbed peat. Reed Canary Grass can be found primarily on the spoil piles and atop the beaver dams. There are sporadic stands south of the ditch near Transect #3.

Proposed Restorative Strategy

Connecting hydrology from wetlands north of the ditch to wetlands south of the ditch is the primary goal for restoration. Restoring hydrologic connections will be achieved through plugging the ditch at strategic locations to halt east-to-west flows and force a north-to-south flow regime (Figure 9 & Figure 10). Plugs in the lateral will be placed at locations where the Black Spruce/Tamarack Islands intersect the ditch or in areas where no current or former spring channels have been identified. In areas where spring channels have been identified, the ditch will be left open (unplugged) to promote southerly flows.

Spoil and the timber growing on portions of it will provide material for ditch plugs while restoring grade of filled wetlands within the corridor of disturbance. Peat underneath the spoil is likely compacted and may require agitation of the top 10 cm to mimic the blonde layer of peat where the bulk of groundwater flow occurs. In areas where spoil is not available or insufficient, cedar dams will be installed to promote north-to-south flows. Spoil material is more readily available in the east 2 miles of the ditch. Being relatively large, the ditch may require a great deal of material. Conversely, the west mile of the lateral has very little spoil, but the ditch channel is substantially vegetated. Cedar dams in the west mile of Lateral 7, Branch 1 will provide the intended connectivity of hydrology while not disturbing the site and keeping vegetation within the channel from migrating.

Compensatory Mitigation

Generation of adequate wetland credits at the Sprague Creek Site for mitigation at the Roseau Lake Site will be achieved through multiple restoration strategies of a large complex of wetlands thereby adopting a "watershed approach". Crediting will be contingent on restoring hydrologic connections to a large expanse of wetlands in conjunction with targeted vegetation management promoting a mosaic of high quality wetlands (See Figure #20). Hydrologic modifications within the legal drains will restore connectivity of disjointed wetlands, while shearing and prescribed burning of a large expanse of shrub-carr will promote graminoid/herb dominated wetland communities. Generation of surplus credits for use in future projects or to generate income is not proposed for this project. Determination of credit will quantify benefits of mitigation activities compared to loss of wetland functions from construction of the Roseau Lake Project.

Performance Standards

Peatlands generally take a significant period of time for vegetation to react to hydrologic restoration, making the standard monitoring timeline (5-10 years) problematic for measuring change. Another challenge to monitoring the site is the sheer size of the wetland complex and the miles of former open ditch to evaluate. Due to the constraints posed by this site, strategic groundwater monitoring pre and post project will determine effectiveness of hydrologic restoration. Hydrologic targets for the mitigation site will be measurable water tables at or within 12 inches of the surface spanning 14 consecutive days during the growing season in the former corridors of each lateral. In order to assess hydrologic performance, a series of dataloggers at equal intervals will be installed on either side of and within the former ditch corridor to measure water tables pre and post project.

Vegetation management goals for the property will be the conversion of a large tract of wetland invaded by brush to a sedge-dominated wetland. Monitoring of vegetative performance will utilize drone technology to record video and capture images at target locations to determine the success of conversion. The target vegetative performance standard will be measured by aerial coverage of 20% or less of shrub stratum within the limit of designated brush shearing.

Public Input/Acceptance

There are several socio-political considerations that would affect outcomes on the mitigation site. Among these considerations are; legal ditch systems bisecting the site, private lands within and abutting, public lands, and existing and potential recreational opportunities within the limits of the site (Figure 12, Landowner Input Map).

Ditch Authority/Local Government

Judicial Ditch 61 is administered by Roseau County, therefore any activity that affects the intended function of the ditch must be brought to their attention, and procedure detailed in "Ditch Law" (103E) will be followed. The project sponsors have reviewed the current proposal with the Roseau County Highway Dept, and presented to the Board of Commissioners. Feedback from the ditch authority has been incorporated into the proposal.

Private Property

Impacts on private land are a concern for this project as one parcel is located entirely within the project limits and along with multiple properties that border the project. The landowner within the project scope has been managing the property to promote native vegetation and has actively controlled Reed Canary Grass within his property. He has showed favor towards the project and would be willing to have his property incorporated if the proper terms and payment are met on a conservation easement. The landowners bordering the mitigation site have all been contacted and have met with watershed staff to learn about the proposal. None of the landowners voiced opposition to the proposal. Their reactions ranged from positive to cautious and reserved. All bordering landowners stated that, as long as the project does not pond water on their property or re-route water across their land they, had no problem with the project.

Public Use/Recreation

Recreational opportunities within the property include public hunting and trapping, bird watching, hiking and snowmobiling. There is a designated snowmobile trail located in the northern limits of the project crossing the SNA and was "grandfathered" in at the time of the SNA's registry. Retaining access for the users of the snowmobile trail is a priority consideration for the project. This not only retains public support but provides an avenue for public access to the resource. The state land surrounding the SNA is a part of the Lost River State Forest, a notable bird watching hotspot that is identified in the Pine-to-Prairie Bird Trail. The trail head on the eastern extreme of the project limits has been outfitted with signage and roosting poles.

There is potential to enhance recreational use and public benefit of public land surrounding the SNA through the development of the mitigation site.

In promoting responsible recreation within the project, the snowmobile trail needs to be addressed. Currently, there are existing span bridges on JD 61 that are prone to damage during spring melt and high precipitation events. Replacement of the span bridges with plugs would provide for reliable crossings for the trail groomer reducing increasing maintenance costs for the snowmobile club as a result of repairing damaged bridges. In the areas of the trail where plugs aren't feasible, new bridges will be required in order to span the intersection of spring channels (Figure 13 Grant-in-aid Trail Bridge Exhibit). The additional wood span bridges will prevent impact to hydrology due to rutting or compaction as a result of trail grooming. The local trail club will benefit from the additional bridges, as wet spots in the trail have been stated as a primary issue in maintaining the route.

A local landowner proposed an idea regarding a bog walk utilizing the existing ditch corridor. This idea was gleaned from bog walks near Washkish and Sax Zim and the positive response that those sites have received over the years since their inception. The existing location of birding trail signage would provide a suitable access location for the public. Coupling the bog walk with a known birding location would likely enhance public use/engagement.

Natural Resource Considerations

Forestry Impacts

The project is located within the Lost River State Forest. Timber reserves within the site are managed by the local DNR Forestry office in Warroad, MN. Alteration of hydrology and its impact on existing timber resources requires special consideration both from an ecological and economic standpoint. Subtle changes in depth and duration of surface or groundwater can diminish stand density, encourage succession of non target species or result in a total loss of timber resource.

As a result of these potential concerns, the project partners met with the local forest manager to assess the existing resources within the project limits and what impacts could occur through altering hydrology (Figure 14, Forestry Impact Map). During the initial meeting and site visit, there were no resource concern issues that were raised. One-third of the site contains potentially marketable timber resources including Black Spruce, Cedar and Tamarack, all of which are tolerant to hydric conditions. The remaining two-thirds of the site is covered with brush and emergent vegetation. The local forestry office provided shapefile data on cover types within the state land which corroborated the information from the site visit.

Based on initial meetings and correspondence with the Division of Forestry, impacts to the existing timber resources within the project scope will likely be minimal. However, Forestry maintains an opportunity to review the proposal and participate in coordination if the project is constructed. The proposal calls for utilization of onsite woody material requiring dialogue and coordination with the forestry supervisor to ensure any restitution (if required) for timber used in project construction.

Scientific And Natural Area Considerations

Sprague Creek Scientific and Natural Area is located in the northern extent of the project and is a crucial component to a "watershed based" restoration approach. Identified on the core peatland areas' map in the 1984 commissioner report; "Recommendations for the Protection of Ecologically Significant Peatlands in Minnesota" (MS.84.036), preservation and protection of this resource is of high priority.

In accordance with the " Minnesota Peatland Protection Act" (MS84.035-.036) activities within SNAs are highly restricted to existing corridors of disturbance and must not significantly alter water level, flows, chemistry, species, or communities within the SNA unless approved by the commissioner. Currently the Sprague Creek SNA has one corridor of disturbance consisting

of the legal ditch, ditch spoil, and snowmobile trail. The proposed restoration activities within the confines of the SNA would occur entirely within the corridor of disturbance.

Options listed in statute for restorative activities within designated SNAs include:

84.035 Subd. 8. Ditch Abandonment – The ditch abandonment option would require a petition from the commissioner to the ditch authority to cease maintenance of the ditch system. The process for abandonment would require public hearings and likely an agreement between the commissioner and the ditch authority on appropriation of costs as a result of the abandonment.

84.035 Subd. 5(b) Activities allowed (5) – *Improvements to a public drainage system in existence on the effective date of Laws 1991, chapter 354, only when its for the protection and maintenance of the ecological integrity of the peatland scientific and natural area and when included in a management plan adopted by the commissioner under subdivision 6.* This subdivision would allow for installation of structures within the legal ditch system with the specific intent of protecting and maintaining the ecological integrity of the site.

Based on discussions with the ditch authority, the Roseau County Board of Commissioners and the Roseau County Highway Department, the second option would be preferred to abandonment proceedings. There are two procedural avenues that will need to be addressed if hydrologic restoration is to occur, the first is a management plan adopted by the commissioner, and the second, approval of a petition to impound or divert drainage system waters (103E.227) by the drainage authority.

Summary

Restoration of a large complex of wetlands requires various practices installed at strategic locations to restore and re-route hydrology in order to mimic dynamics of the landscape pre-drainage. By focusing efforts in the corridors of disturbance, the potential for adverse impacts to intact native communities is avoided. Where feasible, spoil excavated from the ditch will be replaced in the channel to restore grade and altered drainage. In areas where spoil is unavailable or unsuitable, strategies such as cedar dams and brush placement in channel will be adopted to maintain target water levels and promote paludification of open water channels.

The Sprague Creek Site has been partially drained for over 100 years, resulting in subsidence of peat soils and reduction in species richness. Due to the degree of peat loss and the slow response rate of vegetation in organic soils to rewetting, it is unlikely that the wetland can be fully restored to pristine condition. Although full restoration is not feasible, functional lift can be achieved by reconnecting groundwater flows throughout the mitigation site. Hydrologic restoration will also provide resiliency to unique species and communities within the SNA that may be susceptible to artificial inundation or prolonged dry periods.

Through restoration of hydrology, vegetative management and establishment, and perpetual conservation easements, the Sprague Creek Site will generate 1,747.35 credits, which will be adequate to provide compensatory mitigation for wetland impacts from The Roseau Lake Project.

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Figure #1

Site Map

Judicial Ditch 61 Lat 7 Br 1

Judicial Ditch 61 Lat 7 Br 1

Judicial Ditch 61 Lat 6

Judicial Ditch 61 Lat 5B

Site Map
All Restorative Practices

2017 Aerial Photo
1 inch = 1,500 feet

N

- Recent Beaver Dam Locations
- Cedar Dam
- Ditch Fill w/ brush
- Ditch Fill w/ spoil
- Extent of plugs
- Fen channels
- Public Ditches and Waters
- Log diversions
- Fen hydrology reconnect
- Hydrology Rehabilitation
- Vegetation Restoration
- Project Scope
- Sprague Creek SNA

0 750 1,500 3,000 Feet

Figure #2

Vegetation List

Spraque Creek Vegetation - Recorded During FQA Assessment

Scientific Name	Common Name	Indicator Status	Native Status	Wetland Type
Asclepias purpurascens	Purple Milkweed	FACU	Native	2
Betula papyrifera	Paperbirch	FACU	Native	7
Betula pumila	Bog Birch	OBL	Native	2,6,7
Bromus ciliatus	Fringed Brome	FACW	Native	2,6
Calamagrostis candensis	Canada Bluejoint	OBL	Native	2,6
Carex hystercina	Porcupine Sedge	OBL	Native	2,6
Carex lacustris	Lake Sedge	OBL	Native	2,6
Carex lasiocarpa	Bog wire sedge	OBL	Native	2,6
Carex stricta	Hummock Sedge	OBL	Native	2,6
Cirsium arvense	Canada Thistle	FACU	Introduced	2
Cornus sericea	Red-osier Dogwood	FACW	Native	2,6,7
Dasiphora fruticosa	Marsh Ciquefoil	FACW	Native	2,6,7
Equisetum fluviatile	Water Horsetail	OBL	Native	2,6,7
Eriophorum angustifolium	Cottongrass	OBL	Native	2
Eutrochium maculatum	Spotted Joe-pye weed	OBL	Native	2,6
Glyceria striata	Fowl Manna Grass	OBL	Native	2,6
Gymnocarpium intermedium	Oak fern	-	Native	7
Iris versicolor	Blue Flag Iris	OBL	Native	2,6,7
Larix laricina	Tamarack	FACW	Native	7
Ledum groenlandicum	Labrador Tea	OBL	Native	7
Menyanthes trifoliata	Buckbean	OBL	Native	7
Muhlenbergia racemosa	Marsh Timothy	FACU	Native	2,6
Phalaris arundinacea	Reed Canary Grass	FACW	Introduced	2,6
Phragmites australis	Common Reed Grass	FACW	Native	2,6
Picea mariana	Black Spruce	FACW	Native	6,7
Populus tremuloides	Quaking Aspen	FAC	Native	7
Prunus virginiana	Chokecherry	FACU	Native	6,7
Ribes americanum	Black Currant	FACW	Native	2,6,7
Rosa blanda	Wild Rose	FACU	Native	2
Salix discolor	Lowland Pussy Willow	FACW	Native	2,6
Salix petiolaris	Meadow Willow	FACW	Native	2,6
Silphium terebinthinaceum	Prairie Dock	FAC	Native	2,6,7
Solidago gigantea	Giant Goldenrod	FACW	Native	2
Sphagnum sp.	Sphagnum Moss	-	Native	7
Thalictrum dasycarpum	Tall Meadow Rue	FACW	Native	2,6
Thuja occidentalis	White Cedar	FACW	Native	7
Urtica dioica	Stinging Nettle	FAC	Introduced	2

Roseau Lake Wetland Vegetation - Recorded in Wetland Delineation Transects

Scientific Name	Common Name	Indicator S	Native Status	Wetland Type
Acer negundo	Ash-leaf Maple	FAC	Native	7
Amphicarpea bracteata	American Hog-peanut	FAC	Native	2
Anemone canadensis	Round-Leaf Thimbleweed	FACW	Native	2
Apocynum cannabinum	Indian-Hemp	FAC	Native	2
Asclepias incarnata	Swamp Milkweed	OBL	Native	2
Asclepias syriaca	Common Milkweed	UPL	Native	2
Beckmannia syzigachne	American Sloughgrass	OBL	Native	2
Carex bebbi	Bebb's Sedge	OBL	Native	2
Carex lacustris	Lakebank Sedge	OBL	Native	2,3
Carex stricta	Uptight Sedge	OBL	Native	2
Cirsium arvense	Canada Thistle	FACU	Introduced	2
Cirsium muticum	Swamp Thistle	OBL	Native	2
Echinochloa crus-galli	Large Barnyard Grass	FAC	Introduced	2
Elymus virginicus	Virginia Wild Rye	FACW	Native	2,7
Equisetum fluviatile	Water Horsetail	OBL	Native	2
Eutrochium maculatum	Spotted Trumpetweed	OBL	Native	2
Fraxinus nigra	Black Ash	FACW	Native	7
Glycine max	Soybean	-	Introduced	-
Juncus interior	Inland rush	FAC	Native	2
Lotus americana	Birds-foot trefoil	FACU	Native	2
Mentha arvensis	American Wild Mint	FACW	Native	2
Persicaria lapathifolia	Dock-leaf Smartweed	FACW	Native	2
Persicaria pensylvanica	Pinkweed	FACW	Native	2
Phalaris arundinacea	Reed Canary Grass	FACW	Introduced	2,6
Phragmites australis	Common Reed	FACW	Native	2,3
Poa compressa	Canada Bluegrass	FACU	Native	2
Poa palustris	Fowl Blue Grass	FACW	Native	2,6
Poa pratensis	Kentucky Blue Grass	FACU	Introduced	2
Potentilla anserina	Silverweed	FACW	Native	2
Prunus americana	American Plum	UPL	Native	6
Salix bebbiana	Gray Willow	FACW	Native	6
Salix discolor	Pussy Willow	FACW	Native	2,6
Salix interior	Sandbar Willow	FACW	Native	2,6
Salix nigra	Black Willow	OBL	Native	7
Schoenoplectus tabernaemontani	Softstemm Clubrush	OBL	Native	2
Spartina pectinata	Freshwater Cordgrass	FACW	Native	2
Taraxacum officinale	Common Dandelion	FACU	Introduced	2
Trifoleum repens	White Clover	FACU	Native	2
Typha Latifolia	Broad-leaf Cattail	OBL	Native	2,3
Typha X glauca	Hybrid Cattail	OBL	Introduced	2,3

Figure #3

Floristic Quality Assessment (FQA)

Sprague Creek Floristic Quality Assessment

Watershed staff conducted a Floristic Quality Assessment (FQA) using methods modified from the Floristic Quality Assessment Manual and Rapid Floristic Quality Assessment Manual. Metrics calculated for the purpose of this analysis focused on the weighted Coefficient of Conservatism (wC). The Coefficient of Conservatism (C) is a measure of habitat fidelity, rated on a scale of 0-10. A C-value of 10 indicates a species highly dependent on a specific undisturbed community, whereas a C-value of 0 indicates a species with wide tolerances. The wC metric provides a value based on the proportional abundance of species within a specific plot or community. The wC metric was found to be to be a more responsive indicator of a wetland condition than Mean C or FQI (Bourdaghs 2012).

Sample plots were inventoried within wetlands that may be impacted from construction of flood features. The transect location and Corp of Engineers data forms were used to assess community types and value of wetlands that may require compensatory mitigation. Transect data from the 2017 field delineation provides a range of typical vegetative community data to determine functions lost as a result of a future project.

Within the proposed mitigation site 5 transect lines were investigated to assess wC values within 500 feet of legal ditches to determine influence of drainage on adjacent wetlands. 5 plots, spaced in 100ft increments were sampled on either side of the ditch. Vegetation, elevation and soil information were collected at each plot to assess restoration potential and impact of drainage. Sampling on both the impact and mitigation site consisted of recording species and aerial coverage using a 5-ft radius for herbaceous stratum, 15-ft radius for shrubs and 30-ft radius for trees.

Sprague Creek Restoration Transects

The Sprague Creek Site presents a complex of wetland communities that vary from Calcerous Fens to Shrub/Carr and Fresh Meadow. The site is home to the Sprague Creek Scientific and Natural Area, noted as one of 5 Spring Fen wetlands categorized as a SNA. The site also boasts approximately 8.5 miles of legal ditches that drain portions of the SNA and surrounding wetlands, and diverting hydrology away from other wetlands which would historically receive gradient flow across the upper 10 inches of peat.

Transect #1 (1-b2 – 1-b12)

Is located to the south of Transect #2 and is perpendicular to Judicial Ditch 61 Lateral 6 (JD61 L3). West of JD61 L3 the wetland is primarily shrub/carr with some open pockets of wet meadow, dominated by Meadow Willow, Bog Birch and Canada Bluejoint. East of the ditch, the wetlands transition from dense shrub communities along the ditch to open sedge/fresh meadow as the transect extends eastward.

Transect #2 (2-b1 – 2-b11)

Is Located approximately 2,000ft north of Transect #1, also runs perpendicular to JD 61 L3. West of JD61 L3 the transect is dominated by Canada Bluejoint with Wire Sedge, Joe-pye weed and sporadic willows. Wetlands in the west half of the transect are consistent with a Fresh Meadow community, it appears that the local DNR office has been managing the tract to promote herbaceous stratum and hinder shrub

communities (evidence of shearing and prescribed burning). East of the JD61 L3 the wetland community typical of a Sedge Mat, it is dominated by Wire Sedge with Joe-pye weed, Lake Sedge, Bog Birch, Willow and Muhly Grass commonly found at sample plots.

Transect #3 (3-b1 – 3-b10)

This transect is located approximately 3,000 ft west of State Hwy 310 and runs perpendicular to Judicial Ditch 61 Lateral 7 Branch 1. North of the Judicial ditch, the plant community consists of Tamarack and Black Spruce dominating the tree stratum with Sphagnum Moss, Small Cranberry, Labrador Tea and Pitcher Plants dominating the herbaceous stratum. South of the Judicial ditch, the plant community is a mix of the Black Spruce, Tamarack, Bog Birch, and Red-osier dogwood in the tree and shrub stratum, with Labrador Tea, Sphagnum Moss, Canada Bluejoint and Sedge Sedge Species found in the herbaceous stratum.

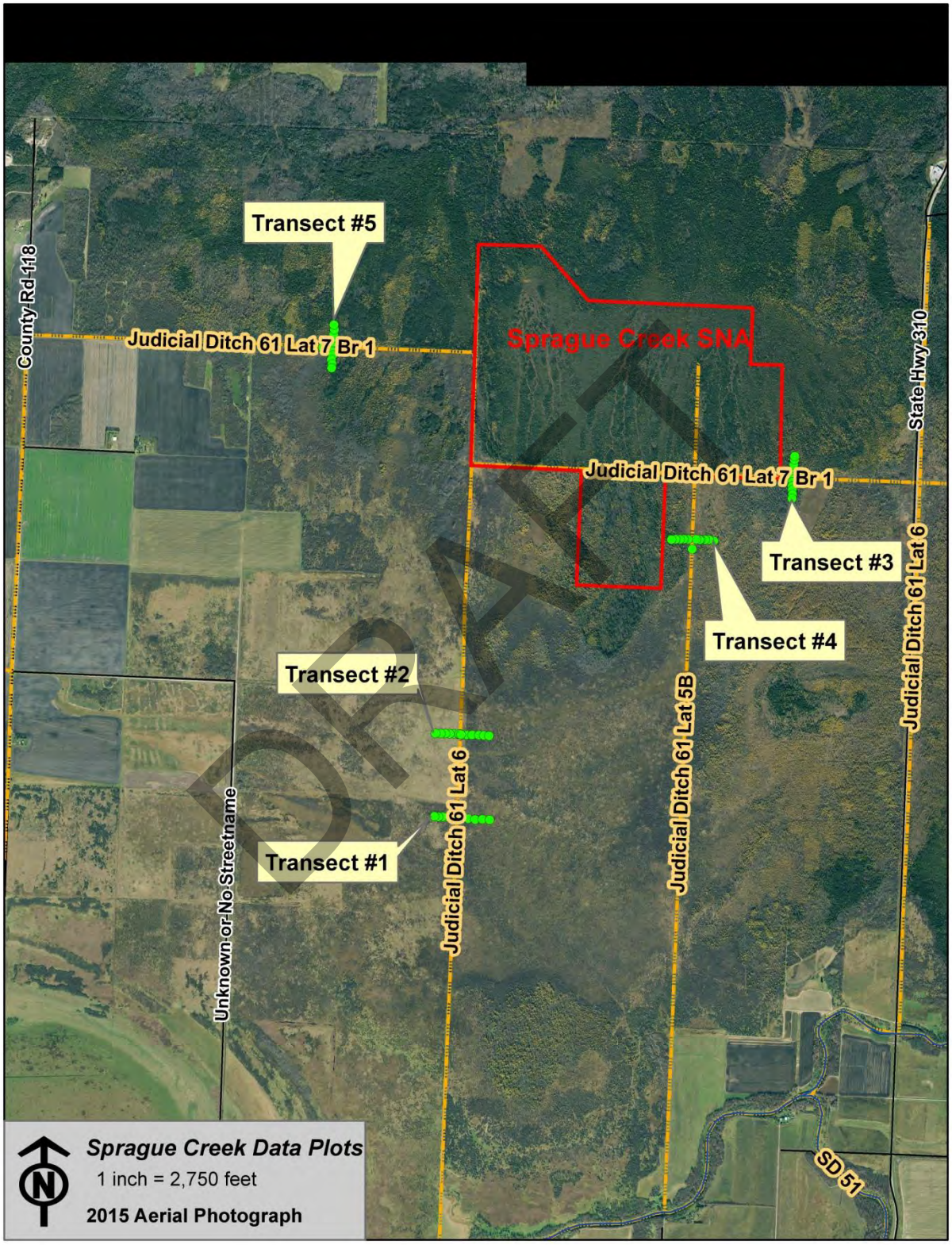
Transect #4 (4-b1 – 4-b10)

Is located approximately 3,000 ft southwest of Transect #3 and runs perpendicular to Judicial Ditch 61 Lateral 5B. East of the ditch, wetland communities transition from Sedge Mat and Fresh Meadow in the west to Shrub-Carr and eventually Coniferous Swamp in the east. Vegetation communities were dominated by Tamarack and Black Spruce, Bog Birch and Balsam Willow , Sphagnum Moss and sedge species in the various wetland types. West of the ditch the plant communities transition in similar fashion as the sampling extends away from the ditch. However the community transitions were noticeably more abrupt and there was increased density of Sphagnum Moss, White Cedar and Labrador Tea on the west limits of the transect.

Transect #5 (5-b1 – 5-b10)

This transect is located approximately 1.4 miles east of County Rd 118 and runs perpendicular to Judicial Ditch 61 Lateral 7 Branch 1. North of the ditch the plant community is dominated by Sphagnum Moss, Labrador Tea, and Small Cranberry in the herbaceous stratum with Tamarack, Black Spruce, White Cedar and Balsam Fir dominating the tree and shrub stratum. South of the ditch the plant community is dominated by Sphagnum Moss and Labrador Tea in the herbaceous stratum, Choke cherry and Black Spruce in the shrub stratum and Tamarack, Black Spruce and Paper Birch in the tree stratum.

Transect Location Map:



Transect Tables

Transect #1 & #2 - Green Cell denote plots on upgradient (east) of the ditch, the red cell is a plot sampled in ditch edge/spoil, yellow cells represent plots west of the ditch.

wC Metric table calculates the average wC score for either side of the ditch, the average minus high/low accounts for potential for an extremely high or low scoring plot to sway the average. The percentage cells in orange illustrate the potential loss in function from one side of the ditch to the other.

Transect #1			
ID	Wc	gnss	station
1-b12	5.2	1035.652	5605
1-b11	6.4	1035.609	5440
1-b10	6.4	1035.312	5270
1-b9	5.5	1035.353	5110
1-b8	*5.1*	1034.995	4970
1-b7	1.7	1034.582	4860
1-b2	4	1034.61	4710
1-b3	4.6	1034.651	4610
1-b4	4.9	1034.803	4500
1-b5	4.9	1034.877	4390
1-b6	4.6	1034.688	4300

wC metric		
	average	average minus high/low
US of ditch	5.72	5.7
DS of ditch	4.6	4.7
%	0.804196	0.8245614

Transect #2			
ID	Wc	gnss	station
2-b11	5.6	1036.462	4290
2-b10	6.3	1036.581	4170
2-b9	6.1	1036.782	4050
2-b8	6.5	1036.754	3890
2-b7	5.3	1036.396	3770
2-b6	2.7	1035.876	3650
2-b1	4	1036.092	3460
2-b2	4.4	1036.005	3350
2b3	5.4	1035.97	3260
2-b4	3.6	1036.53	3150
2-b5	6.4	1036.297	3030

wC metric		
	average	average minus high/low
Us of ditch	5.96	6
DS of ditch	4.76	4.466667
%	0.798658	0.744444

Transect #3 - Green Cell denote plots on upgradient (north) of the ditch and yellow cells represent plots south of the ditch.

Transect #3			
ID	Wc	gnss	station
3-b10	6.8	1043.289	3030
3-b9	3.6	1043.613	2930
3-b8	6.1	1043.725	2830
3-b7	6.8	1042.999	2740
3-b6	5.5	1043.498	2630
3-b1	6.9	1045.221	2430
3-b2	7	1045.559	2310
3-b3	7.2	1045.857	2220
3-b4	7.3	1046	2110
3-b5	7.2	1046.652	2030

wC metric		
	average	average minus high/low
US of Ditch	7.12	7.133333
DS of Ditch	5.76	6.133333
%	0.808989	0.859813

Transect # 4 - Green Cell denote plots on upgradient (east) of the ditch and yellow cells represent plots west of the ditch.

Transect #4			
ID	Wc	gnss	station
4-b10	7	1044.401	2020
4-b9	6.5	1043.296	1930
4-b8	6.2	1042.353	1830
4-b7	6.5	1042.724	1740
4-b6	5.8	1042.794	1630
4-b5	5.5	1042.228	1450
4-b4	4.3	1043.115	1340
4-b3	5.5	1042.705	1230
4-b2	6.3	1042.649	1140
4-b1	5.1	1043.031	1020

wC metric		
	average	average minus high/low
west of ditch	6.4	6.4
east of ditch	5.34	5.366667
%	0.834375	0.838542

Transect #5 - Green Cell denote plots on upgradient (north) of the ditch and yellow cells represent plots south of the ditch.

Transect #5			
ID	Wc	gnss	station
5-b10	7.4	1050.122	1010
5-b9	6.7	1050.097	900
5-b8	6.5	1050.104	800
5-b7	7.1	1049.408	700
5-b6	7.6	1048.818	610
5-b1	3.9	1048.016	400
5-b2	5	1047.895	300
5-b3	4.9	1047.613	200
5-b4	4.9	1047.509	90
5-b5	6.3	1047.886	0

wC metric		
	average	average minus high/low
US of Ditch	7.06	7.066667
DS of Ditch	5	4.933333
%	0.708215	0.698113

Roseau Lake COE Transect Tables

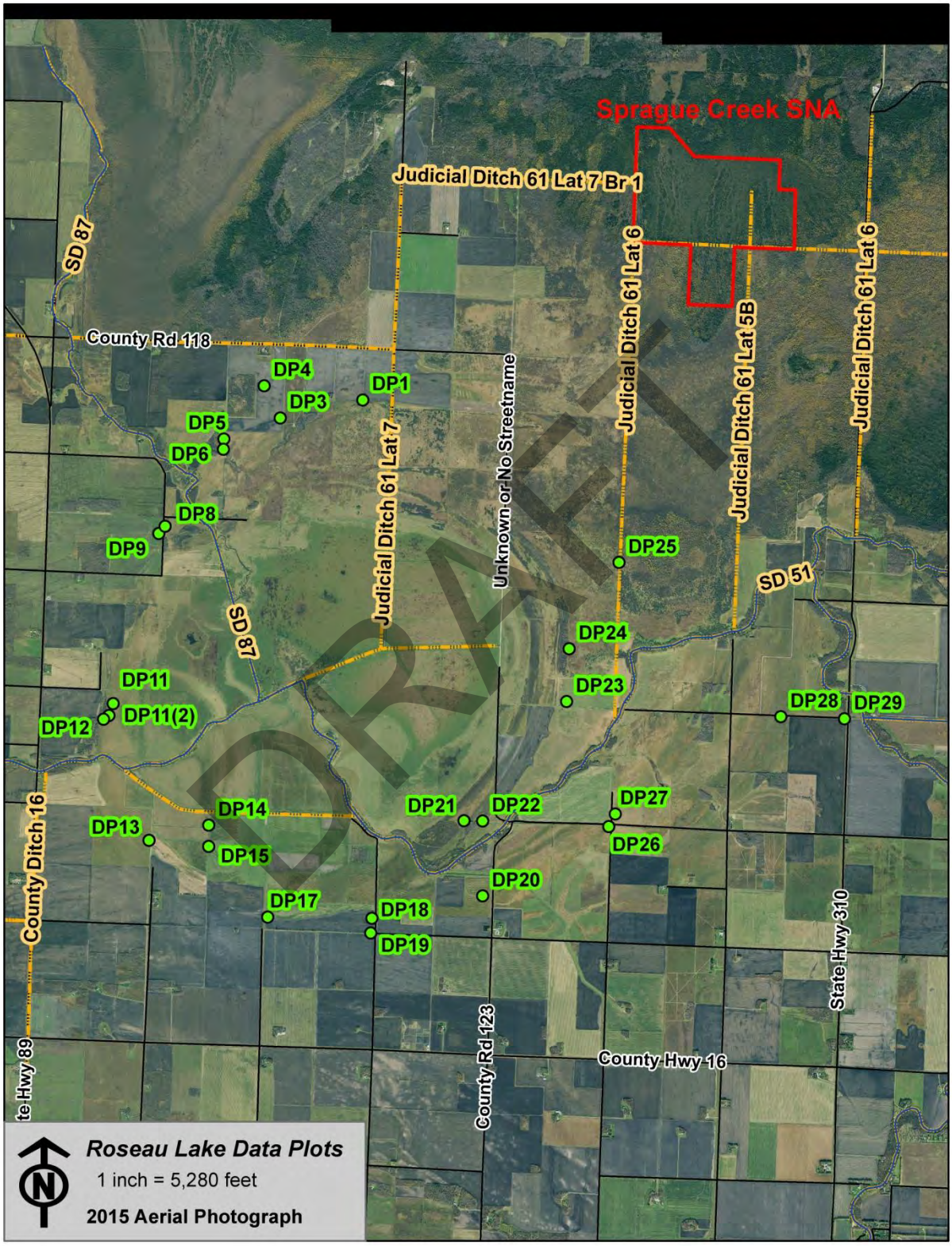
Vegetation information collected during the 2017 wetland delineation was entered into the FQA calculator to determine an average function/value of wetlands that may be impacted by a future project. The Average wC across all wetland transects were calculated along with separate averages for cropped wetlands and non-cropped wetland within the delineation scope.

Average wC	Average wC cropped wetlands	Average wC non-cropped wetlands
0.921428571	0.775	0.945833333

ID	wC
DP1	0
DP2	1
DP3	0
DP4	1.1
DP5	1.1
DP6	3.2
DP8	3.5
DP9	2
DP10	0
DP11	0.1
DP12	1.4
DP13	0.6
DP14	0
DP15	0.1

ID	wC
DP16	2.4
DP17	0
DP18	0
DP19	0
DP20	0
DP21	1.6
DP22	2.3
DP23	0
DP24	1.1
DP24(2)	0
DP25	0.9
DP27	1.3
DP28	1.3
DP29	0.8

Transect Location Roseau Lake Site



Sprague Creek FQA Transect Data

Transect - 1B2

Eggers & Reed Plant Community Type: Fresh Meadow
Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Phalaris arundinacea	Reed Canary Grass	3	>5 - 25%	15	Introduced	Herb	FACW	FACW	FACW	0	0.1195	0
2	Eupatorium perfoliatum	Common Boneset	5	>50 - 75%	62.5	Native	Herb	FACW	OBL	FACW	4	0.498	1.992
3	Eupatorium perfoliatum	Common Boneset	3	>5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.1195	0.4781
4	Betula pumila	Bog Birch	3	>5 - 25%	15	Native	Shrub	OBL	OBL	OBL	7	0.1195	0.8367
5	Bromus ciliatus	Fringed Brome	2	>1 - 5%	3	Native	Herb	FAC	FACW	FACW	6	0.0239	0.1434
6	Salix petiolaris	Meadow Willow	3	>5 - 25%	15	Native	Shrub	OBL	OBL	FACW	5	0.1195	0.5976

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	4.0	0.0	0.0
Numerical Condition Category	3	#N/A	#N/A
Condition Category	Fair	#N/A	#N/A
Additional Metrics			
Native Species Richness	5	0	0
Introduced Species Richness	1	0	0
Mean C	4.3	#DIV/0!	#DIV/0!
FQI	9.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	125.5	0	0
Total Introduced Spp. Cover	15	0	0
Proportion of Introduced Cover	0.12	#DIV/0!	#DIV/0!

Transect - 1B3

Eggers & Reed Plant Community Type: Fresh Meadow
Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Eupatorium perfoliatum	Common Boneset	6	> 75 - 95%	85	Native	Herb	FACW	OBL	FACW	4	0.5045	2.0178
2	Salix petiolaris	Meadow Willow	5	> 50 - 75%	62.5	Native	Shrub	OBL	OBL	FACW	5	0.3709	1.8546
3	Betula pumila	Bog Birch	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	7	0.089	0.6231
4	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0178	0.0712
5	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0178	0.0712

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	4.6	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	5	0	0
Introduced Species Richness	0	0	0
Mean C	4.8	#DIV/0!	#DIV/0!
FQI	10.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	168.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 1B4

Eggers & Reed Plant Community Type: Fresh Meadow
Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI GP	NWI-MW	NWI-NCNE	C	p	pC
1	Eupatorium perfoliatum	Common Boneset	6	> 75 - 95%	85	Native	Herb	FACW	OBL	FACW	4	0.5215	2.0859
2	Salix petiolaris	Meadow Willow	4	> 25 - 50%	37.5	Native	Shrub	OBL	OBL	FACW	5	0.2301	1.1503
3	Betula pumila	Bog Birch	4	> 25 - 50%	37.5	Native	Shrub	OBL	OBL	OBL	7	0.2301	1.6104
4	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0184	0.0736

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	4.9	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	4	0	0
Introduced Species Richness	0	0	0
Mean C	5.0	#DIV/0!	#DIV/0!
FQI	10.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	163	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 1B5

Eggers & Reed Plant Community Type: Fresh Meadow
Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Eupatorium perfoliatum	Common Boneset	6	> 75 - 95%	85	Native	Herb	FACW	OBL	FACW	4	0.4521	1.8085
2	Salix petiolaris	Meadow Willow	5	> 50 - 75%	62.5	Native	Shrub	OBL	OBL	FACW	5	0.3324	1.6622
3	Betula pumila	Bog Birch	4	> 25 - 50%	37.5	Native	Shrub	OBL	OBL	OBL	7	0.1995	1.3963
4	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.016	0.0638

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	4.9	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	4	0	0
Introduced Species Richness	0	0	0
Mean C	5.0	#DIV/0!	#DIV/0!
FQI	10.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	188	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 1B6

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Eupatorium perfoliatum	Common Boneset	6	> 75 - 95%	85	Native	Herb	FACW	OBL	FACW	4	0.605	2.4199
2	Salix pellolaris	Meadow Willow	4	> 25 - 50%	37.5	Native	Shrub	OBL	OBL	FACW	5	0.2669	1.3345
3	Betula pumila	Bog Birch	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	7	0.1068	0.7473
4	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0214	0.0854

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	4.6	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	4	0	0
Introduced Species Richness	0	0	0
Mean C	5.0	#DIV/0!	#DIV/0!
FQI	10.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	140.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 1B7

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Phalaris arundinacea	Reed Canary Grass	5	> 50 - 75%	62.5	Introduced	Herb	FACW	FACW	FACW	0	0.6158	0
2	Eupatorium perfoliatum	Common Boneset	3	> 5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.1478	0.5911
3	Eupatorium perfoliatum	Common Boneset	3	> 5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.1478	0.5911
4	Betula pumila	Bog Birch	2	> 1 - 5%	3	Native	Shrub	OBL	OBL	OBL	7	0.0296	0.2069
5	Salix petiolaris	Meadow Willow	2	> 1 - 5%	3	Native	Shrub	OBL	OBL	FACW	5	0.0296	0.1478
6	Rubus pubescens	Dwarf Red Raspberry	2	> 1 - 5%	3	Native	Herb	FACW	FACW	FACW	6	0.0296	0.1773

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	1.7	0.0	0.0
Numerical Condition Category	3	#N/A	#N/A
Condition Category	Fair	#N/A	#N/A
Additional Metrics			
Native Species Richness	5	0	0
Introduced Species Richness	1	0	0
Mean C	4.3	#DIV/0!	#DIV/0!
FQI	9.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	101.5	0	0
Total Introduced Spp. Cover	62.5	0	0
Proportion of Introduced Cover	0.62	#DIV/0!	#DIV/0!

Transect - 1B8

Community #1

Eggers & Reed Plant Community Type: Shrub Carr

Percent of AA Occupied by Type.

Spp #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Salix petiolaris	Meadow Willow	5	> 50 - 75%	62.5	Native	Shrub	OBL	OBL	FACW	5	0.4699	2.3496
2	Carex lacustris	Lakebank Sedge	4	> 25 - 50%	37.5	Native	Herb	OBL	OBL	OBL	5	0.282	1.4098
3	Eupatorium perfoliatum	Common Boneset	3	> 5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.1128	0.4511
4	Betula pumila	Bog Birch	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	7	0.1128	0.7896
5	Bromus ciliatus	Fringed Brome	2	> 1 - 5%	3	Native	Herb	FAC	FACW	FACW	6	0.0226	0.1353

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Shrub Carr	0	0
wC	5.1	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	5	0	0
Introduced Species Richness	0	0	0
Mean C	5.4	#DIV/0!	#DIV/0!
FQI	12.1	#DIV/0!	#DIV/0!
Total Midpoint % Cover	133	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 1B9

Community #1

Eggers & Reed Plant Community Type: Shrub Carr

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Eupatorium perfoliatum	Common Boneset	5	> 50 - 75%	62.5	Native	Herb	FACW	OBL	FACW	4	0.3463	1.385
2	Salix petiolaris	Meadow Willow	4	> 25 - 50%	37.5	Native	Shrub	OBL	OBL	FACW	5	0.2078	1.0388
3	Betula pumila	Bog Birch	5	> 50 - 75%	62.5	Native	Shrub	OBL	OBL	OBL	7	0.3463	2.4238
4	Equisetum fluviatile	Water Horsetail	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.0831	0.5817
5	Typha latifolia	Broad-Leaf Cat-Tail	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	2	0.0166	0.0332

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Shrub Carr	0	0
wC	5.5	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	5	0	0
Introduced Species Richness	0	0	0
Mean C	5.0	#DIV/0!	#DIV/0!
FQI	11.2	#DIV/0!	#DIV/0!
Total Midpoint % Cover	180.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 1B10

Community #1

Eggers & Reed Plant Community Type: Shrub Carr

Percent of AA Occupied by Type:

Spp #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Carex lasiocarpa	Woolly-Fruit Sedge	6	> 75 - 95%	85	Native	Herb	OBL	OBL	OBL	7	0.4474	3.1316
2	Salix petiolaris	Meadow Willow	4	> 25 - 50%	37.5	Native	Shrub	OBL	OBL	FACW	5	0.1974	0.9868
3	Betula pumila	Bog Birch	4	> 25 - 50%	37.5	Native	Shrub	OBL	OBL	OBL	7	0.1974	1.3816
4	Equisetum fluviatile	Water Horsetail	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.0789	0.5526
5	Eupatorium perfoliatum	Common Boneset	3	> 5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.0789	0.3158

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Shrub Carr	0	0
wC	6.4	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	5	0	0
Introduced Species Richness	0	0	0
Mean C	6.0	#DIV/0!	#DIV/0!
FQI	13.4	#DIV/0!	#DIV/0!
Total Midpoint % Cover	190	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 1B11

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Carex lasiocarpa	Woolly-Fruit Sedge	6	> 75 - 95%	85	Native	Herb	OBL	OBL	OBL	7	0.4337	3.0357
2	Salix pellotaris	Meadow Willow	4	> 25 - 50%	37.5	Native	Shrub	OBL	OBL	FACW	5	0.1913	0.9565
3	Betula pumila	Bog Birch	4	> 25 - 50%	37.5	Native	Shrub	OBL	OBL	OBL	7	0.1913	1.3393
4	Equisetum fluviatile	Water Horsetail	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.0765	0.5357
5	Eupatorium perfoliatum	Common Boneset	3	> 5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.0765	0.3061
6	Gaultheria hispidula	Creeping-Snowberry	2	> 1 - 5%	3	Native	Herb	FACW	FACW	FACW	8	0.0153	0.1224
7	Gaultheria hispidula	Creeping-Snowberry	2	> 1 - 5%	3	Native	Herb	FACW	FACW	FACW	8	0.0153	0.1224

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	6.4	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	7	0	0
Introduced Species Richness	0	0	0
Mean C	6.6	#DIV/0!	#DIV/0!
FQI	17.4	#DIV/0!	#DIV/0!
Total Midpoint % Cover	196	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 1B12

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Eupatorium perfoliatum	Common Boneset	5	> 50 - 75%	62.5	Native	Herb	FACW	OBL	FACW	4	0.4223	1.6892
2	Salix petiolaris	Meadow Willow	4	> 25 - 50%	37.5	Native	Shrub	OBL	OBL	FACW	5	0.2534	1.2669
3	Carex lasiocarpa	Woolly-Fruit Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.1014	0.7095
4	Equisetum fluviatile	Water Horsetail	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.1014	0.7095
5	Betula pumila	Bog Birch	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	7	0.1014	0.7095
6	Rumex britannica	Greater Water Dock	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	6	0.0203	0.1216

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	5.2	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	6	0	0
Introduced Species Richness	0	0	0
Mean C	6.0	#DIV/0!	#DIV/0!
FQI	14.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	148	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 2B1

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Eupatorium perfoliatum	Common Boneset	6	> 75 - 95%	85	Native	Herb	FACW	OBL	FACW	4	0.9659	3.8636
2	Salix petiolaris	Meadow Willow	2	> 1 - 5%	3	Native	Shrub	OBL	OBL	FACW	5	0.0341	0.1705

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	4.0	0.0	0.0
Numerical Condition Category	3	#N/A	#N/A
Condition Category	Fair	#N/A	#N/A
Additional Metrics			
Native Species Richness	2	0	0
Introduced Species Richness	0	0	0
Mean C	4.5	#DIV/0!	#DIV/0!
FQI	6.4	#DIV/0!	#DIV/0!
Total Midpoint % Cover	88	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 2B2

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Eupatorium perfoliatum	Common Boneset	6	> 75 - 95%	85	Native	Herb	FACW	OBL	FACW	4	0.0252	3.301
2	Carex lasiocarpa	Woolly-Fruit Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.1456	1.0194
3	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0291	0.1165

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	4.4	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	3	0	0
Introduced Species Richness	0	0	0
Mean C	5.0	#DIV/0!	#DIV/0!
FQI	8.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	103	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 2B3

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Carex lasiocarpa	Woolly-Fruit Sedge	5	50 - 75%	62.5	Native	Herb	OBL	OBL	OBL	7	0.5365	3.7554
2	Eupatorium perfoliatum	Common Boneset	3	5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.1288	0.515
3	Phragmites australis	Common Reed	3	5 - 25%	15	Native	Herb	FACW	FACW	FACW	1	0.1288	0.1288
4	Eupatorium perfoliatum	Common Boneset	2	1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0258	0.103
5	Salix petiolaris	Meadow Willow	3	5 - 25%	15	Native	Shrub	OBL	OBL	FACW	5	0.1288	0.6438
6	Bromus ciliatus	Fringed Brome	2	1 - 5%	3	Native	Herb	FAC	FACW	FACW	6	0.0258	0.1545
7	Iris versicolor	Harlequin Blueflag	2	1 - 5%	3	Native	Herb	OBL	OBL	OBL	4	0.0258	0.103

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	5.4	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	7	0	0
Introduced Species Richness	0	0	0
Mean C	4.4	#DIV/0!	#DIV/0!
FQI	11.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	116.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 2B4

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Eupatorium perfoliatum	Common Boneset	6	> 75 - 95%	85	Native	Herb	FACW	OBL	FACW	4	0.6693	2.5772
2	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0236	0.0945
3	Rumex britannica	Greater Water Dock	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	6	0.1181	0.7087
4		#N/A	2	> 1 - 5%	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.0236	#N/A
5		#N/A	3	> 5 - 25%	15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.1181	#N/A
6		#N/A	2	> 1 - 5%	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.0236	#N/A
7	Iris versicolor	Harlequin Blueflag	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	4	0.0236	0.0945

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	3.6	0.0	0.0
Numerical Condition Category	3	#N/A	#N/A
Condition Category	Fair	#N/A	#N/A
Additional Metrics			
Native Species Richness	4	0	0
Introduced Species Richness	0	0	0
Mean C	4.5	#DIV/0!	#DIV/0!
FQI	9.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	127	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 2B5

Community #1

Eggers & Reed Plant Community Type. Fresh Meadow

Percent of AA Occupied by Type

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Carex lasiocarpa	Woolly-Fruit Sedge	6	> 75 - 95%	85	Native	Herb	OBL	OBL	OBL	7	0.7203	5.0424
2	Eupatorium perfoliatum	Common Boneset	3	> 5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.1271	0.5085
3	Rumex britannica	Greater Water Dock	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	6	0.1271	0.7627
4	Salix petiolaris	Meadow Willow	2	> 1 - 5%	3	Native	Shrub	OBL	OBL	FACW	5	0.0254	0.1271

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	6.4	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	4	0	0
Introduced Species Richness	0	0	0
Mean C	5.5	#DIV/0!	#DIV/0!
FQI	11.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	118	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 2B6

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Phalaris arundinacea	Reed Canary Grass	4	> 25 - 50%	37.5	Introduced	Herb	FACW	FACW	FACW	0	0.3676	0
2	Eupatorium perfoliatum	Common Boneset	4	> 25 - 50%	37.5	Native	Herb	FACW	OBL	FACW	4	0.3676	1.4706
3	Salix petiolaris	Meadow Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	FACW	5	0.1471	0.7353
4	Carex lacustris	Lakebank Sedge	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	5	0.0294	0.1471
5	Salix discolor	Pussy Willow	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.0294	0.0882
6	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0294	0.1176
7	Bromus ciliatus	Fringed Brome	2	> 1 - 5%	3	Native	Herb	FAC	FACW	FACW	6	0.0294	0.1765

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	2.7	0.0	0.0
Numerical Condition Category	3	#N/A	#N/A
Condition Category	Fair	#N/A	#N/A
Additional Metrics			
Native Species Richness	6	0	0
Introduced Species Richness	1	0	0
Mean C	3.9	#DIV/0!	#DIV/0!
FQI	9.4	#DIV/0!	#DIV/0!
Total Midpoint % Cover	102	0	0
Total Introduced Spp. Cover	37.5	0	0
Proportion of Introduced Cover	0.37	#DIV/0!	#DIV/0!

Transect - 2B7

Community #1

Eggers & Reed Plant Community Type. Fresh Meadow

Percent of AA Occupied by Type. _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Carex lacustris	Lakebank Sedge	4	> 25 - 50%	37.5	Native	Herb	OBL	OBL	OBL	5	0.3247	1.6234
2	Carex lasiocarpa	Woolly Fruit Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.1299	0.9091
3	Salix petiolaris	Meadow Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	FACW	5	0.1299	0.6494
4	Poa palustris	Fowl Blue Grass	3	> 5 - 25%	15	Native	Herb	FACW	FACW	FACW	5	0.1299	0.6494
5	Betula pumila	Bog Birch	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	7	0.1299	0.9091
6	Thalictrum dasycarpum	Purple Meadow-Rue	3	> 5 - 25%	15	Native	Herb	FAC	FACW	FACW	4	0.1299	0.5195
7	Salix discolor	Pussy Willow	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.026	0.0779

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	5.3	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	7	0	0
Introduced Species Richness	0	0	0
Mean C	5.1	#DIV/0!	#DIV/0!
FQI	13.6	#DIV/0!	#DIV/0!
Total Midpoint % Cover	115.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 2B8

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow
Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FOA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Bromus ciliatus	Fringed Brome	2	> 1 - 5%	3	Native	Herb	FAC	FACW	FACW	6	0.0226	0.1353
2	Carex lasiocarpa	Woolly-Fruit Sedge	6	> 75 - 95%	85	Native	Herb	OBL	OBL	OBL	7	0.6391	4.4737
3	Salix petiolaris	Meadow Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	FACW	5	0.1128	0.5639
4	Poa palustris	Fowl Blue Grass	3	> 5 - 25%	15	Native	Herb	FACW	FACW	FACW	5	0.1128	0.5639
5	Betula pumila	Bog Birch	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	7	0.1128	0.7895

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	6.5	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	5	0	0
Introduced Species Richness	0	0	0
Mean C	6.0	#DIV/0!	#DIV/0!
FQI	13.4	#DIV/0!	#DIV/0!
Total Midpoint % Cover	133	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 2B9

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Thalictrum dasycarpum	Purple Meadow-Rue	2	> 1 - 5%	3	Native	Herb	FAC	FACW	FACW	4	0.0287	0.1148
2	Carex lasiocarpa	Woolly-Fruit Sedge	5	> 50 - 75%	62.5	Native	Herb	OBL	OBL	OBL	7	0.5991	4.1986
3	Salix petiolaris	Meadow Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	FACW	5	0.1435	0.7177
4	Rumex britannica	Greater Water Dock	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	6	0.0287	0.1722
5	Glyceria striata	Fowl Manna Grass	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	4	0.1435	0.5742
6	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0287	0.1148
7	Bromus ciliatus	Fringed Brome	2	> 1 - 5%	3	Native	Herb	FAC	FACW	FACW	6	0.0287	0.1722

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	6.1	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	7	0	0
Introduced Species Richness	0	0	0
Mean C	5.1	#DIV/0!	#DIV/0!
FQI	13.6	#DIV/0!	#DIV/0!
Total Midpoint % Cover	104.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 2B10

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Glyceria striata	Fowl Manna Grass	3	5 - 25%	15	Native	Herb	OBL	OBL	OBL	4	0.1304	0.5217
2	Carex lasiocarpa	Woolly-Fruit Sedge	6	75 - 95%	85	Native	Herb	OBL	OBL	OBL	7	0.7391	5.1739
3	Salix discolor	Pussy Willow	2	1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.0261	0.0783
4	Thalictrum dasycarpum	Purple Meadow-Rue	2	1 - 5%	3	Native	Herb	FAC	FACW	FACW	4	0.0261	0.1043
5	Betula pumila	Bog Birch	2	1 - 5%	3	Native	Shrub	OBL	OBL	OBL	7	0.0261	0.1826
6	Salix petiolaris	Meadow Willow	2	1 - 5%	3	Native	Shrub	OBL	OBL	FACW	5	0.0261	0.1304
7	Bromus ciliatus	Fringed Brome	2	1 - 5%	3	Native	Herb	FAC	FACW	FACW	6	0.0261	0.1565

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	6.3	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	7	0	0
Introduced Species Richness	0	0	0
Mean C	5.1	#DIV/0!	#DIV/0!
FQI	13.6	#DIV/0!	#DIV/0!
Total Midpoint % Cover	115	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 2B11

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Thalictrum dasycarpum	Purple Meadow-Rue	3	> 5 - 25%	15	Native	Herb	FAC	FACW	FACW	4	0.0896	0.3582
2	Carex lasiocarpa	Woolly-Fruit Sedge	5	> 50 - 75%	62.5	Native	Herb	OBL	OBL	OBL	7	0.3731	2.6119
3	Potentilla anserina	Silverweed	3	> 5 - 25%	15	Native	Herb	FACW	FACW	FACW	4	0.0896	0.3582
4	Carex vulpinoidea	Common Fox Sedge	3	> 5 - 25%	15	Native	Herb	FACW	FACW	OBL	3	0.0896	0.2687
5	Betula pumila	Bog Birch	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	7	0.0896	0.6269
6	Salix petiolaris	Meadow Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	FACW	5	0.0896	0.4478
7	Bromus ciliatus	Fringed Brome	3	> 5 - 25%	15	Native	Herb	FAC	FACW	FACW	6	0.0896	0.5373
8	Carex pellita	Woolly Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	4	0.0896	0.3582

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	5.6	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	8	0	0
Introduced Species Richness	0	0	0
Mean C	5.0	#DIV/0!	#DIV/0!
FQI	14.1	#DIV/0!	#DIV/0!
Total Midpoint % Cover	167.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 3B1

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	4	25 - 50%	37.5	Native	Tree	FACW	FACW	FACW	7	0.3333	2.3333
2	Larix laricina	American Larch	3	5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1333	0.9333
3	Salix candida	Sage Willow	3	5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.1333	1.2
4	Salix discolor	Pussy Willow	3	5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.1333	0.4
5	Vaccinium oxycoccos	Small Cranberry	3	5 - 25%	15	Native	Herb	OBL	OBL	OBL	8	0.1333	1.0667
6	Equisetum fluviatile	Water Horsetail	3	5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.1333	0.9333

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	6.9	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	6	0	0
Introduced Species Richness	0	0	0
Mean C	6.8	#DIV/0!	#DIV/0!
FQI	16.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	112.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 3B2

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	4	> 25 - 50%	37.5	Native	Tree	FACW	FACW	FACW	7	0.2976	2.0833
2	Larix laricina	American Larch	4	> 25 - 50%	37.5	Native	Tree	FACW	FACW	FACW	7	0.2976	2.0833
3	Salix candida	Sage Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.119	1.0714
4	Salix discolor	Pussy Willow	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.0238	0.0714
5	Vaccinium oxycoccos	Small Cranberry	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	8	0.119	0.9524
6	Carex lacustris	Lakebank Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	5	0.119	0.5952
7	Iris versicolor	Harlequin Blueflag	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	4	0.0238	0.0952

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	7.0	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	7	0	0
Introduced Species Richness	0	0	0
Mean C	6.1	#DIV/0!	#DIV/0!
FQI	16.3	#DIV/0!	#DIV/0!
Total Midpoint % Cover	126	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 3B3

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	4	> 25 - 50%	37.5	Native	Tree	FACW	FACW	FACW	7	0.4098	2.8689
2	Larix laricina	American Larch	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1639	1.1475
3	Salix candida	Sage Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.1639	1.4754
4	Salix discolor	Pussy Willow	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.0328	0.0984
5	Vaccinium oxycoccos	Small Cranberry	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	8	0.1639	1.3115
6	Carex lacustris	Lakebank Sedge	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	5	0.0328	0.1639
7	Carex lacustris	Lakebank Sedge	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	5	0.0328	0.1639

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
*w*C	7.2	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	7	0	0
Introduced Species Richness	0	0	0
Mean C	6.3	#DIV/0!	#DIV/0!
FQI	16.6	#DIV/0!	#DIV/0!
Total Midpoint % Cover	91.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 3B4

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow
Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	4	> 25 - 50%	37.5	Native	Tree	FACW	FACW	FACW	7	0.2389	1.672
2	Larix laricina	American Larch	5	> 50 - 75%	62.5	Native	Tree	FACW	FACW	FACW	7	0.3981	2.7868
3	Salix candida	Sage Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.0955	0.8599
4	Salix discolor	Pussy Willow	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.0191	0.0573
5	Equisetum fluviatile	Water Horsetail	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	7	0.0191	0.1338
6	Carex interior	Inland Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.0955	0.6688
7	Carex lacustris	Lakebank Sedge	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	5	0.0191	0.0955
8	Sarracenia purpurea	Purple Pitcherplant	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	9	0.0955	0.8599
9	Menyanthes trifoliata	Buck-Bean	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	9	0.0191	0.172

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	7.3	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	9	0	0
Introduced Species Richness	0	0	0
Mean C	7.0	#DIV/0!	#DIV/0!
FQI	21.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	157	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 3B5

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	4	> 25 - 50%	37.5	Native	Tree	FACW	FACW	FACW	7	0.3049	2.1341
2	Larix laricina	American Larch	4	> 25 - 50%	37.5	Native	Tree	FACW	FACW	FACW	7	0.3049	2.1341
3	Salix candida	Sage Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.122	1.0976
4		#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
5	Equisetum fluviatile	Water Horsetail	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.122	0.8537
6	Carex interior	Inland Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.122	0.8537
7	Carex lacustris	Lakebank Sedge	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	5	0.0244	0.122

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	7.2	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	6	0	0
Introduced Species Richness	0	0	0
Mean C	7.0	#DIV/0!	#DIV/0!
FQI	17.1	#DIV/0!	#DIV/0!
Total Midpoint % Cover	123	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 3B6

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1613	1.129
2	Larix laricina	American Larch	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1613	1.129
3	Salix candida	Sage Willow	2	> 1 - 5%	3	Native	Shrub	OBL	OBL	OBL	9	0.0323	0.2903
4	Salix discolor	Pussy Willow	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.1613	0.4839
5	Carex lasiocarpa	Woolly-Fruit Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.1613	1.129
6	Betula pumila	Bog Birch	2	> 1 - 5%	3	Native	Shrub	OBL	OBL	OBL	7	0.0323	0.2258
7	Carex lacustris	Lakebank Sedge	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	5	0.0323	0.1613
8	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0323	0.129
9	Bromus ciliatus	Fringed Brome	2	> 1 - 5%	3	Native	Herb	FAC	FACW	FACW	6	0.0323	0.1935
10	Ribes americanum	Wild Black Currant	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	4	0.0323	0.129
11	Salix discolor	Pussy Willow	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.1613	0.4839

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	5.5	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	11	0	0
Introduced Species Richness	0	0	0
Mean C	5.6	#DIV/0!	#DIV/0!
FQI	18.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	93	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 3B7

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1288	0.9013
2	Larix laricina	American Larch	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1288	0.9013
3	Equisetum arvense	Field Horsetail	3	> 5 - 25%	15	Native	Herb	FAC	FAC	FAC	1	0.1288	0.1288
4	Salix discolor	Pussy Willow	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.0258	0.0773
5	Carex interior	Inland Sedge	5	> 50 - 75%	62.5	Native	Herb	OBL	OBL	OBL	7	0.5365	3.7554
6	Betula pumila	Bog Birch	2	> 1 - 5%	3	Native	Shrub	OBL	OBL	OBL	7	0.0258	0.1803
7	Ribes americanum	Wild Black Currant	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	4	0.0258	0.103

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	6.0	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	7	0	0
Introduced Species Richness	0	0	0
Mean C	5.1	#DIV/0!	#DIV/0!
FQI	13.6	#DIV/0!	#DIV/0!
Total Midpoint % Cover	116.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 3B8

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Salix candida	Sage Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.1149	1.0345
2	Larix laricina	American Larch	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1149	0.8046
3	Eupatorium perfoliatum	Common Boneset	3	> 5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.1149	0.4598
4	Salix discolor	Pussy Willow	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.1149	0.3448
5	Carex interior	Inland Sedge	4	> 25 - 50%	37.5	Native	Herb	OBL	OBL	OBL	7	0.2874	2.0115
6	Betula pumila	Bog Birch	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	7	0.1149	0.8046
7	Bromus ciliatus	Fringed Brome	2	> 1 - 5%	3	Native	Herb	FAC	FACW	FACW	6	0.023	0.1379
8	Ribes americanum	Wild Black Currant	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	4	0.1149	0.4598

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	6.1	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	8	0	0
Introduced Species Richness	0	0	0
Mean C	5.9	#DIV/0!	#DIV/0!
FQI	16.6	#DIV/0!	#DIV/0!
Total Midpoint % Cover	130.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 3B9

Community #1

Eggers & Reed Plant Community Type. Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1695	1.1864
2	Larix laricina	American Larch	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1695	1.1864
3	Eupatorium perfoliatum	Common Boneset	4	> 25 - 50%	37.5	Native	Herb	FACW	OBL	FACW	4	0.4237	1.6949
4	Phalaris arundinacea	Reed Canary Grass	3	> 5 - 25%	15	Introduced	Herb	FACW	FACW	FACW	0	0.1695	0
5	Ribes americanum	Wild Black Currant	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	4	0.0339	0.1356
6	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0339	0.1356

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	4.3	0.0	0.0
Numerical Condition Category	2	#N/A	#N/A
Condition Category	Good	#N/A	#N/A
Additional Metrics			
Native Species Richness	5	0	0
Introduced Species Richness	1	0	0
Mean C	4.3	#DIV/0!	#DIV/0!
FQI	9.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	88.5	0	0
Total Introduced Spp. Cover	15	0	0
Proportion of Introduced Cover	0.17	#DIV/0!	#DIV/0!

Transect - 3B10

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1167	0.8171
2	Larix laricina	American Larch	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1167	0.8171
3	Salix candida	Sage Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.1167	1.0505
4	Carex interior	Inland Sedge	5	> 50 - 75%	62.5	Native	Herb	OBL	OBL	OBL	7	0.4864	3.4047
5	Ribes americanum	Wild Black Currant	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	4	0.0233	0.0934
6	Bromus ciliatus	Fringed Brome	2	> 1 - 5%	3	Native	Herb	FAC	FACW	FACW	6	0.0233	0.1401
7	Thalictrum dasycarpum	Purple Meadow-Rue	3	> 5 - 25%	15	Native	Herb	FAC	FACW	FACW	4	0.1167	0.4659

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
*w*C	6.8	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	7	0	0
Introduced Species Richness	0	0	0
Mean C	6.3	#DIV/0!	#DIV/0!
FQI	16.6	#DIV/0!	#DIV/0!
Total Midpoint % Cover	128.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 4B1

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	3	5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1103	0.7721
2	Larix laricina	American Larch	4	25 - 50%	37.5	Native	Tree	FACW	FACW	FACW	7	0.2757	1.9301
3	Salix discolor	Pussy Willow	3	5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.1103	0.3309
4	Eupatorium perfoliatum	Common Boneset	5	50 - 75%	62.5	Native	Herb	FACW	OBL	FACW	4	0.4596	1.8382
5	Ribes americanum	Wild Black Currant	2	1 - 5%	3	Native	Shrub	FACW	FACW	FACW	4	0.0221	0.0882
6	Bromus ciliatus	Fringed Brome	2	1 - 5%	3	Native	Herb	FAC	FACW	FACW	6	0.0221	0.1324

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	5.1	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	6	0	0
Introduced Species Richness	0	0	0
Mean C	5.2	#DIV/0!	#DIV/0!
FQI	12.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	136	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 4B2

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Carex lacustris	Lakebank Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	5	0.1538	0.7692
2	Larix laricina	American Larch	4	> 25 - 50%	37.5	Native	Tree	FACW	FACW	FACW	7	0.3846	2.6923
3	Parnassia palustris	Marsh Grass-of-Parnassus	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	8	0.1538	1.2308
4	Carex lasiocarpa	Woolly-Fruit Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.1538	1.0769
5	Ribes americanum	Wild Black Currant	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	4	0.0308	0.1231
6	Salix discolor	Pussy Willow	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.0308	0.0923
7	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0308	0.1231
8	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0308	0.1231
9	Typha latifolia	Broad-Leaf Cat-Tail	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	2	0.0308	0.0615

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	6.3	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	9	0	0
Introduced Species Richness	0	0	0
Mean C	4.9	#DIV/0!	#DIV/0!
FQI	14.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	97.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 4B3

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Carex lacustris	Lakebank Sedge	4	> 25 - 50%	37.5	Native	Herb	OBL	OBL	OBL	5	0.4098	2.0492
2	Larix laricina	American Larch	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1639	1.1475
3	Picea mariana	Black Spruce	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1639	1.1475
4	Parnassia palustris	Marsh Grass-of-Parnassus	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	8	0.0328	0.2623
5	Salix discolor	Pussy Willow	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.0328	0.0984
6	Eupatorium perfoliatum	Common Boneset	3	> 5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.1639	0.6557
7	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0328	0.1311

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	5.5	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	7	0	0
Introduced Species Richness	0	0	0
Mean C	5.4	#DIV/0!	#DIV/0!
FQI	14.4	#DIV/0!	#DIV/0!
Total Midpoint % Cover	91.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 4B4

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Eupatorium perfoliatum	Common Boneset	3	> 5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.1515	0.6061
2	Larix laricina	American Larch	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1515	1.0606
3	Betula pumila	Bog Birch	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	7	0.1515	1.0606
4	Phalaris arundinacea	Reed Canary Grass	3	> 5 - 25%	15	Introduced	Herb	FACW	FACW	FACW	0	0.1515	0
5	Carex lacustris	Lakebank Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	5	0.1515	0.7576
6	Salix petiolaris	Meadow Willow	2	> 1 - 5%	3	Native	Shrub	OBL	OBL	FACW	5	0.0303	0.1515
7	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0303	0.1212
8	Ribes americanum	Wild Black Currant	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	4	0.0303	0.1212
9	Salix discolor	Pussy Willow	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.1515	0.4545

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	4.3	0.0	0.0
Numerical Condition Category	2	#N/A	#N/A
Condition Category	Good	#N/A	#N/A
Additional Metrics			
Native Species Richness	8	0	0
Introduced Species Richness	1	0	0
Mean C	4.3	#DIV/0!	#DIV/0!
FQI	12.3	#DIV/0!	#DIV/0!
Total Midpoint % Cover	99	0	0
Total Introduced Spp. Cover	15	0	0
Proportion of Introduced Cover	0.15	#DIV/0!	#DIV/0!

Transect - 4B5

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow
Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Betula pumila	Bog Birch	5	> 50 - 75%	62.5	Native	Shrub	OBL	OBL	OBL	7	0.3521	2.4648
2	Carex lacustris	Lakebank Sedge	5	> 50 - 75%	62.5	Native	Herb	OBL	OBL	OBL	5	0.3521	1.7606
3	Eupatorium perfoliatum	Common Boneset	4	> 25 - 50%	37.5	Native	Herb	FACW	OBL	FACW	4	0.2113	0.8451
4	Salix petiolaris	Meadow Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	FACW	5	0.0845	0.4225

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	5.5	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	4	0	0
Introduced Species Richness	0	0	0
Mean C	5.3	#DIV/0!	#DIV/0!
FQI	10.5	#DIV/0!	#DIV/0!
Total Midpoint % Cover	177.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 4B6

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow
Percent of AA Occupied by Type: _____

Spp #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Parnassia palustris	Marsh Grass-of-Parnassus	4	> 25 - 50%	37.5	Native	Herb	OBL	OBL	OBL	8	0.2698	2.1583
2	Carex lacustris	Lakebank Sedge	5	> 50 - 75%	62.5	Native	Herb	OBL	OBL	OBL	5	0.4498	2.2492
3	Eupatorium perfoliatum	Common Boneset	3	> 5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.1079	0.4317
4	Salix petiolaris	Meadow Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	FACW	5	0.1079	0.5396
5	Bromus ciliatus	Fringed Brome	2	> 1 - 5%	3	Native	Herb	FAC	FACW	FACW	6	0.0216	0.1295
6	Larix laricina	American Larch	2	> 1 - 5%	3	Native	Tree	FACW	FACW	FACW	7	0.0216	0.1511
7	Picea mariana	Black Spruce	2	> 1 - 5%	3	Native	Tree	FACW	FACW	FACW	7	0.0216	0.1511

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	5.8	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	7	0	0
Introduced Species Richness	0	0	0
Mean C	6.0	#DIV/0!	#DIV/0!
FQI	15.9	#DIV/0!	#DIV/0!
Total Midpoint % Cover	139	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 4B7

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Parnassia palustris	Marsh Grass-of-Parnassus	5	> 50 - 75%	62.5	Native	Herb	OBL	OBL	OBL	8	0.4699	3.7594
2	Carex lacustris	Lakebank Sedge	4	> 25 - 50%	37.5	Native	Herb	OBL	OBL	OBL	5	0.282	1.4098
3	Eupatorium perfoliatum	Common Boneset	3	> 5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.1128	0.4511
4	Larix laricina	American Larch	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1128	0.7895
5	Salix discolor	Pussy Willow	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.0226	0.0677

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	6.5	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	5	0	0
Introduced Species Richness	0	0	0
Mean C	5.4	#DIV/0!	#DIV/0!
FQI	12.1	#DIV/0!	#DIV/0!
Total Midpoint % Cover	133	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 4B8

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1068	0.7473
2	Carex lacustris	Lakebank Sedge	5	> 50 - 75%	62.5	Native	Herb	OBL	OBL	OBL	5	0.4448	2.2242
3	Salix candida	Sage Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.1068	0.9609
4	Salix discolor	Pussy Willow	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.0214	0.0641
5	Picea mariana	Black Spruce	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1068	0.7473
6	Larix laricina	American Larch	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1068	0.7473
7	Equisetum fluviatile	Water Horsetail	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.1068	0.7473

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	6.2	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	7	0	0
Introduced Species Richness	0	0	0
Mean C	6.4	#DIV/0!	#DIV/0!
FQI	17.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	140.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 4B9

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	4	>25 - 50%	37.5	Native	Tree	FACW	FACW	FACW	7	0.3012	2.1084
2	Carex lacustris	Lakebank Sedge	3	>5 - 25%	15	Native	Herb	OBL	OBL	OBL	5	0.1205	0.6024
3	Betula pumila	Bog Birch	3	>5 - 25%	15	Native	Shrub	OBL	OBL	OBL	7	0.1205	0.8434
4	Eupatorium perfoliatum	Common Boneset	3	>5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.1205	0.4819
5	Eupatorium perfoliatum	Common Boneset	2	>1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0241	0.0964
6	Larix laricina	American Larch	2	>1 - 5%	3	Native	Tree	FACW	FACW	FACW	7	0.0241	0.1687
7	Equisetum fluviatile	Water Horsetail	2	>1 - 5%	3	Native	Herb	OBL	OBL	OBL	7	0.0241	0.1687
8	Salix candida	Sage Willow	3	>5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.1205	1.0843
9	Salix discolor	Pussy Willow	2	>1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.0241	0.0723
10	Picea mariana	Black Spruce	3	>5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1205	0.8434

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	6.5	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	10	0	0
Introduced Species Richness	0	0	0
Mean C	6.0	#DIV/0!	#DIV/0!
FQI	19.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	124.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 4B10

Community #1

Eggers & Reed Plant Community Type. Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	6	> 75 - 95%	85	Native	Tree	FACW	FACW	FACW	7	0.7025	4.9174
2	Carex interior	Inland Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.124	0.8678
3	Picea mariana	Black Spruce	2	> 1 - 5%	3	Native	Tree	FACW	FACW	FACW	7	0.0248	0.1736
4	Salix candida	Sage Willow	2	> 1 - 5%	3	Native	Shrub	OBL	OBL	OBL	9	0.0248	0.2231
5	Salix candida	Sage Willow	2	> 1 - 5%	3	Native	Shrub	OBL	OBL	OBL	9	0.0248	0.2231
6	Larix laricina	American Larch	2	> 1 - 5%	3	Native	Tree	FACW	FACW	FACW	7	0.0248	0.1736
7	Eupatorium perfoliatum	Common Boneset	2	> 1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0248	0.0992
8	Poa palustris	Fowl Blue Grass	2	> 1 - 5%	3	Native	Herb	FACW	FACW	FACW	5	0.0248	0.124
9	Carex interior	Inland Sedge	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	7	0.0248	0.1736

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	7.0	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	9	0	0
Introduced Species Richness	0	0	0
Mean C	6.9	#DIV/0!	#DIV/0!
FQI	20.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	121	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 5B1

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.137	0.9589
2	Salix discolor	Pussy Willow	4	> 25 - 50%	37.5	Native	Shrub	FACW	FACW	FACW	3	0.3425	1.0274
3	Betula papyrifera	Paper Birch	3	> 5 - 25%	15	Native	Tree	FACU	FACU	FACU	3	0.137	0.411
4	Salix discolor	Pussy Willow	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.137	0.411
5	Eupatorium perfoliatum	Common Boneset	3	> 5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.137	0.5479
6	Bromus ciliatus	Fringed Brome	2	> 1 - 5%	3	Native	Herb	FAC	FACW	FACW	6	0.0274	0.1644
7	Carex lacustris	Lakebank Sedge	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	5	0.0274	0.137
8	Larix laricina	American Larch	2	> 1 - 5%	3	Native	Tree	FACW	FACW	FACW	7	0.0274	0.1918
9	Populus tremuloides	Quaking Aspen	2	> 1 - 5%	3	Native	Tree	FAC	FAC	FAC*	2	0.0274	0.0548

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	3.9	0.0	0.0
Numerical Condition Category	3	#N/A	#N/A
Condition Category	Fair	#N/A	#N/A
Additional Metrics			
Native Species Richness	9	0	0
Introduced Species Richness	0	0	0
Mean C	4.4	#DIV/0!	#DIV/0!
FQI	13.3	#DIV/0!	#DIV/0!
Total Midpoint % Cover	109.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 5B2

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	3	5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1115	0.7807
2	Salix discolor	Pussy Willow	5	50 - 75%	62.5	Native	Shrub	FACW	FACW	FACW	3	0.4647	1.3941
3	Menyanthes trifoliata	Buck-Bean	3	5 - 25%	15	Native	Herb	OBL	OBL	OBL	9	0.1115	1.0037
4	Salix discolor	Pussy Willow	3	5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.1115	0.3346
5	Salix candida	Sage Willow	3	5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.1115	1.0037
6	Eupatorium perfoliatum	Common Boneset	2	1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0223	0.0892
7	Carex interior	Inland Sedge	2	1 - 5%	3	Native	Herb	OBL	OBL	OBL	7	0.0223	0.1561
8	Larix laricina	American Larch	2	1 - 5%	3	Native	Tree	FACW	FACW	FACW	7	0.0223	0.1561
9	Eupatorium perfoliatum	Common Boneset	2	1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0223	0.0892

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	5.0	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	9	0	0
Introduced Species Richness	0	0	0
Mean C	5.9	#DIV/0!	#DIV/0!
FQI	17.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	134.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 5B3

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	4	>25 - 50%	37.5	Native	Tree	FACW	FACW	FACW	7	0.2907	2.0340
2	Salix discolor	Pussy Willow	4	>25 - 50%	37.5	Native	Shrub	FACW	FACW	FACW	3	0.2907	0.8721
3	Populus tremuloides	Quaking Aspen	3	>5 - 25%	15	Native	Tree	FAC	FAC	FAC*	2	0.1163	0.2326
4	Salix discolor	Pussy Willow	3	>5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.1163	0.3488
5	Salix candida	Sage Willow	3	>5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.1163	1.0465
6	Bromus ciliatus	Fringed Brome	2	>1 - 5%	3	Native	Herb	FAC	FACW	FACW	5	0.0233	0.1395
7	Eupatorium perfoliatum	Common Boneset	2	>1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0233	0.093
8	Eupatorium perfoliatum	Common Boneset	2	>1 - 5%	3	Native	Herb	FACW	OBL	FACW	4	0.0233	0.093

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	4.9	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	8	0	0
Introduced Species Richness	0	0	0
Mean C	4.8	#DIV/0!	#DIV/0!
FQI	13.4	#DIV/0!	#DIV/0!
Total Midpoint % Cover	129	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 5B4

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	4	> 25 - 50%	37.5	Native	Tree	FACW	FACW	FACW	7	0.3571	2.5
2	Salix discolor	Pussy Willow	4	> 25 - 50%	37.5	Native	Shrub	FACW	FACW	FACW	3	0.3571	1.0714
3	Populus tremuloides	Quaking Aspen	2	> 1 - 5%	3	Native	Tree	FAC	FAC	FAC*	2	0.0286	0.0571
4	Eupatorium perfoliatum	Common Boneset	3	> 5 - 25%	15	Native	Herb	FACW	OBL	FACW	4	0.1429	0.5714
5	Equisetum fluviatile	Water Horsetail	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	7	0.0286	0.2
6	Menyanthes trifoliata	Buck-Bean	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	9	0.0286	0.2571
7	Betula papyrifera	Paper Birch	2	> 1 - 5%	3	Native	Tree	FACU	FACU	FACU	3	0.0286	0.0857
8	Larix laricina	American Larch	2	> 1 - 5%	3	Native	Tree	FACW	FACW	FACW	7	0.0286	0.2

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
*w*C	4.9	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	8	0	0
Introduced Species Richness	0	0	0
Mean C	5.3	#DIV/0!	#DIV/0!
FQI	14.8	#DIV/0!	#DIV/0!
Total Midpoint % Cover	105	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 5B5

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	5	> 75 - 95%	85	Native	Tree	FACW	FACW	FACW	7	0.7798	5.4587
2	Salix discolor	Pussy Willow	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.1376	0.4128
3	Equisetum fluviatile	Water Horsetail	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	7	0.0275	0.1927
4	Larix laricina	American Larch	2	> 1 - 5%	3	Native	Tree	FACW	FACW	FACW	7	0.0275	0.1927
5	Phragmites australis	Common Reed	2	> 1 - 5%	3	Native	Herb	FACW	FACW	FACW	1	0.0275	0.0275

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
*w*C	6.3	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	5	0	0
Introduced Species Richness	0	0	0
Mean C	5.0	#DIV/0!	#DIV/0!
FQI	11.2	#DIV/0!	#DIV/0!
Total Midpoint % Cover	109	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 5B6

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.3297	2.3077
2	Salix candida	Sage Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.3297	2.967
3	Bromus ciliatus	Fringed Brome	2	> 1 - 5%	3	Native	Herb	FAC	FACW	FACW	6	0.0659	0.3956
4	Vaccinium oxycoccos	Small Cranberry	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	8	0.0659	0.5275
5	Larix laricina	American Larch	2	> 1 - 5%	3	Native	Tree	FACW	FACW	FACW	7	0.0659	0.4615
6	Picea mariana	Black Spruce	2	> 1 - 5%	3	Native	Tree	FACW	FACW	FACW	7	0.0659	0.4615
7	Equisetum fluviatile	Water Horsetail	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	7	0.0659	0.4615
8	Abies balsamea	Balsam Fir	1	> 0 - 1%	0.5	Native	Tree	FAC	FACW	FAC	4	0.011	0.044

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	7.6	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	8	0	0
Introduced Species Richness	0	0	0
Mean C	6.9	#DIV/0!	#DIV/0!
FQI	19.4	#DIV/0!	#DIV/0!
Total Midpoint % Cover	45.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 5B7

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	4	> 25 - 50%	37.5	Native	Tree	FACW	FACW	FACW	7	0.3086	2.1605
2	Salix candida	Sage Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.1235	1.1111
3	Carex interior	Inland Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.1235	0.8642
4	Vaccinium oxycoccos	Small Cranberry	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	8	0.1235	0.9877
5	Larix laricina	American Larch	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1235	0.8642
6	Picea mariana	Black Spruce	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1235	0.8642
7	Glycera striata	Fowl Manna Grass	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	4	0.0247	0.0988
8	Abies balsamea	Balsam Fir	2	> 1 - 5%	3	Native	Tree	FAC	FACW	FAC	4	0.0247	0.0988
9	Salix discolor	Pussy Willow	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.0247	0.0741

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
WC	7.1	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	9	0	0
Introduced Species Richness	0	0	0
Mean C	6.2	#DIV/0!	#DIV/0!
FQI	18.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	121.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 5B8

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1124	0.7865
2	Salix candida	Sage Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.1124	1.0112
3	Carex interior	Inland Sedge	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	7	0.0225	0.1573
4	Vaccinium oxycoccos	Small Cranberry	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	8	0.1124	0.8989
5	Larix laricina	American Larch	4	> 25 - 50%	37.5	Native	Tree	FACW	FACW	FACW	7	0.2809	1.9663
6	Picea mariana	Black Spruce	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1124	0.7865
7	Glyceria striata	Fowl Manna Grass	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	4	0.0225	0.0899
8	Abies balsamea	Balsam Fir	3	> 5 - 25%	15	Native	Tree	FAC	FACW	FAC	4	0.1124	0.4494
9	Salix discolor	Pussy Willow	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.1124	0.3371

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	6.5	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	9	0	0
Introduced Species Richness	0	0	0
Mean C	6.2	#DIV/0!	#DIV/0!
FQI	18.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	133.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 5B9

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1724	1.2069
2	Salix candida	Sage Willow	2	> 1 - 5%	3	Native	Shrub	OBL	OBL	OBL	9	0.0345	0.3103
3	Salix candida	Sage Willow	2	> 1 - 5%	3	Native	Shrub	OBL	OBL	OBL	9	0.0345	0.3103
4	Vaccinium oxycoccos	Small Cranberry	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	8	0.1724	1.3793
5	Larix laricina	American Larch	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1724	1.2069
6	Picea mariana	Black Spruce	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1724	1.2069
7	Cypripedium reginae	Showy Lady's-Slipper	2	> 1 - 5%	3	Native	Herb	FACW	FACW	FACW	8	0.0345	0.2759
8	Abies balsamea	Balsam Fir	3	> 5 - 25%	15	Native	Tree	FAC	FACW	FAC	4	0.1724	0.6897
9	Salix discolor	Pussy Willow	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.0345	0.1034

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	6.7	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	9	0	0
Introduced Species Richness	0	0	0
Mean C	6.9	#DIV/0!	#DIV/0!
FQI	20.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	87	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - 5B10

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Picea mariana	Black Spruce	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1205	0.8434
2	Salix candida	Sage Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.1205	1.0843
3	Carex lacustris	Lakebank Sedge	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	5	0.0241	0.1205
4	Vaccinium oxycoccos	Small Cranberry	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	8	0.1205	0.9639
5	Larix laricina	American Larch	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	7	0.1205	0.8434
6	Picea mariana	Black Spruce	4	> 25 - 50%	37.5	Native	Tree	FACW	FACW	FACW	7	0.3012	2.1084
7	Sarracenia purpurea	Purple Pitcherplant	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	9	0.0241	0.2169
8	Abies balsamea	Balsam Fir	2	> 1 - 5%	3	Native	Tree	FAC	FACW	FAC	4	0.0241	0.0964
9	Salix discolor	Pussy Willow	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.0241	0.0723
10	Salix candida	Sage Willow	3	> 5 - 25%	15	Native	Shrub	OBL	OBL	OBL	9	0.1205	1.0843

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	7.4	0.0	0.0
Numerical Condition Category	1	#N/A	#N/A
Condition Category	Exceptional	#N/A	#N/A
Additional Metrics			
Native Species Richness	10	0	0
Introduced Species Richness	0	0	0
Mean C	6.8	#DIV/0!	#DIV/0!
FQI	21.5	#DIV/0!	#DIV/0!
Total Midpoint % Cover	124.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Roseau Lake Wetland Delineation Transect Data

Transect - DP1

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Typha X glauca		0	4 > 25 - 50%	37.5	Introduced	Herb	OBL	OBL	OBL	0	1	0
2		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
4		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
5		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
6		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
7		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
8		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
9		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
11		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
12		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
15		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	0.0	0.0	0.0
Numerical Condition Category	4	#N/A	#N/A
Condition Category	Poor	#N/A	#N/A
Additional Metrics			
Native Species Richness	0	0	0
Introduced Species Richness	1	0	0
Mean C	0.0	#DIV/0!	#DIV/0!
FQI	0.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	37.5	0	0
Total Introduced Spp. Cover	37.5	0	0
Proportion of Introduced Cover	1.00	#DIV/0!	#DIV/0!

Transect - DP2

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Phalaris arundinacea	Reed Canary Grass	4	> 25 - 50%	37.5	Introduced	Herb	FACW	FACW	FACW	0	0.1744	0
2	Salix discolor	Pussy Willow	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.0698	0.2093
3	Salix interior	Sandbar Willow	6	> 75 - 95%	85	Native	Shrub	FACW	FACW	FACW	2	0.3953	0.7907
4	Poa pratensis	Kentucky Blue Grass	5	> 50 - 75%	62.5	Introduced	Herb	FACU	FAC	FACU	0	0.2907	0
5	Taraxacum officinale	Common Dandelion	3	> 5 - 25%	15	Introduced	Herb	FACU	FACU	FACU	0	0.0698	0
6		#N/A	*	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
7		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
8		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
9		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
11		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
12		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	1.0	0.0	0.0
Numerical Condition Category	4	#N/A	#N/A
Condition Category	Poor	#N/A	#N/A
Additional Metrics			
Native Species Richness	2	0	0
Introduced Species Richness	3	0	0
Mean C	1.0	#DIV/0!	#DIV/0!
FQI	1.4	#DIV/0!	#DIV/0!
Total Midpoint % Cover	215	0	0
Total Introduced Spp. Cover	115	0	0
Proportion of Introduced Cover	0.53	#DIV/0!	#DIV/0!

Transect - DP3

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Echinochloa crus-galli	Large Barnyard Grass	4	> 25 - 50%	37.5	Introduced	Herb	FAC	FACW	FAC	0	1	0
2		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
4		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
5		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
6		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
7		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
8		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
9		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	0.0	0.0	0.0
Numerical Condition Category	4	#N/A	#N/A
Condition Category	Poor	#N/A	#N/A
Additional Metrics			
Native Species Richness	0	0	0
Introduced Species Richness	1	0	0
Mean C	0.0	#DIV/0!	#DIV/0!
FQI	0.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	37.5	0	0
Total Introduced Spp. Cover	37.5	0	0
Proportion of Introduced Cover	1.00	#DIV/0!	#DIV/0!

Transect - DP4

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Echinochloa crus-galli	Large Barnyard Grass	4	> 25 - 50%	37.5	Introduced	Herb	FAC	FACW	FAC	0	0.7143	0
2	Beckmannia syzigachne	American Slough Grass	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	4	0.2857	1.1429
3		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
4		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
5		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
6		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	1.1	0.0	0.0
Numerical Condition Category	4	#N/A	#N/A
Condition Category	Poor	#N/A	#N/A
Additional Metrics			
Native Species Richness	1	0	0
Introduced Species Richness	1	0	0
Mean C	2.0	#DIV/0!	#DIV/0!
FQI	2.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	52.5	0	0
Total Introduced Spp. Cover	37.5	0	0
Proportion of Introduced Cover	0.71	#DIV/0!	#DIV/0!

Transect - DP5

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Phalaris arundinacea	Reed Canary Grass	5	>75 - 95%	85	Introduced	Herb	FACW	FACW	FACW	0	0.7203	0
2	Anemone canadensis	Round-Leaf Thimbleweed	3	>5 - 25%	15	Native	Herb	FACW	FACW	FACW	3	0.1271	0.3814
3	Poa palustris	Fowl Blue Grass	3	>5 - 25%	15	Native	Herb	FACW	FACW	FACW	5	0.1271	0.6356
4	Mentha arvensis	American Wild Mint	2	>1 - 5%	3	Native	Herb	FACW	FACW	FACW	3	0.0254	0.0763
5		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
6		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	1.1	0.0	0.0
Numerical Condition Category	4	#N/A	#N/A
Condition Category	Poor	#N/A	#N/A
Additional Metrics			
Native Species Richness	3	0	0
Introduced Species Richness	1	0	0
Mean C	2.8	#DIV/0!	#DIV/0!
FQI	4.8	#DIV/0!	#DIV/0!
Total Midpoint % Cover	118	0	0
Total Introduced Spp. Cover	85	0	0
Proportion of Introduced Cover	0.72	#DIV/0!	#DIV/0!

Transect - DP6

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Salix bebbiana	Gray Willow	5	> 50 - 75%	62.5	Native	Shrub	FACW	FACW	FACW	6	0.3378	2.027
2	Salix interior	Sandbar Willow	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	2	0.0811	0.1622
3	Salix discolor	Pussy Willow	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.0811	0.2432
4	Phalaris arundinacea	Reed Canary Grass	5	> 50 - 75%	62.5	Introduced	Herb	FACW	FACW	FACW	0	0.3378	0
5	Impatiens capensis	Spotted Touch-Me-Not	3	> 5 - 25%	15	Native	Herb	FACW	FACW	FACW	2	0.0811	0.1622
6	Equisetum fluviatile	Water Horsetail	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	7	0.0811	0.5676
7		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	3.2	0.0	0.0
Numerical Condition Category	3	#N/A	#N/A
Condition Category	Fair	#N/A	#N/A
Additional Metrics			
Native Species Richness	5	0	0
Introduced Species Richness	1	0	0
Mean C	3.3	#DIV/0!	#DIV/0!
FQI	7.5	#DIV/0!	#DIV/0!
Total Midpoint % Cover	185	0	0
Total Introduced Spp. Cover	62.5	0	0
Proportion of Introduced Cover	0.34	#DIV/0!	#DIV/0!

Transect - DP8

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Salix bebbiana	Gray Willow	5	> 50 - 75%	62.5	Native	Shrub	FACW	FACW	FACW	6	0.3247	1.9481
2	Poa palustris	Fowl Blue Grass	4	> 25 - 50%	37.5	Native	Herb	FACW	FACW	FACW	5	0.1948	0.974
3	Apocynum cannabinum	Indian-Hemp	3	> 5 - 25%	15	Native	Herb	FAC	FAC	FAC	3	0.0779	0.2338
4	Phalaris arundinacea	Reed Canary Grass	5	> 50 - 75%	62.5	Introduced	Herb	FACW	FACW	FACW	0	0.3247	0
5	Carex lacustris	Lakebank Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	5	0.0779	0.3896
6		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	3.5	0.0	0.0
Numerical Condition Category	3	#N/A	#N/A
Condition Category	Fair	#N/A	#N/A
Additional Metrics			
Native Species Richness	4	0	0
Introduced Species Richness	1	0	0
Mean C	3.8	#DIV/0!	#DIV/0!
FQI	7.6	#DIV/0!	#DIV/0!
Total Midpoint % Cover	192.5	0	0
Total Introduced Spp. Cover	62.5	0	0
Proportion of Introduced Cover	0.32	#DIV/0!	#DIV/0!

Transect - DP9

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Persicaria lapathifolia	Dock-Leaf Smartweed	5	> 50 - 75%	62.5	Native	Herb	OBL	FACW	FACW	2	1	2
2		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
*w*C	2.0	0.0	0.0
Numerical Condition Category	3	#N/A	#N/A
Condition Category	Fair	#N/A	#N/A
Additional Metrics			
Native Species Richness	1	0	0
Introduced Species Richness	0	0	0
Mean C	2.0	#DIV/0!	#DIV/0!
FQI	2.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	62.5	0	0
Total Introduced Spp. Cover	0	0	0
Proportion of Introduced Cover	0.00	#DIV/0!	#DIV/0!

Transect - DP10

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Phalaris arundinacea	Reed Canary Grass	7	> 95 - 100%	97.5	Introduced	Herb	FACW	FACW	FACW	0	0.9949	0
2	Carex stricta	Upright Sedge	1	> 0 - 1%	0.5	Native	Herb	OBL	OBL	OBL	5	0.0051	0.0255
3		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	0.0	0.0	0.0
Numerical Condition Category	4	#N/A	#N/A
Condition Category	Poor	#N/A	#N/A
Additional Metrics			
Native Species Richness	1	0	0
Introduced Species Richness	1	0	0
Mean C	2.5	#DIV/0!	#DIV/0!
FQI	2.5	#DIV/0!	#DIV/0!
Total Midpoint % Cover	98	0	0
Total Introduced Spp. Cover	97.5	0	0
Proportion of Introduced Cover	0.99	#DIV/0!	#DIV/0!

Transect - DP11

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Phalaris arundinacea	Reed Canary Grass	7	> 95 - 100%	97.5	Introduced	Herb	FACW	FACW	FACW	0	0.9701	0
2	Apocynum cannabinum	Indian-Hemp	2	> 1 - 5%	3	Native	Herb	FAC	FAC	FAC	3	0.0299	0.0896

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
*w*C	0.1	0.0	0.0
Numerical Condition Category	4	#N/A	#N/A
Condition Category	Poor	#N/A	#N/A
Additional Metrics			
Native Species Richness	1	0	0
Introduced Species Richness	1	0	0
Mean C	1.5	#DIV/0!	#DIV/0!
FQI	1.5	#DIV/0!	#DIV/0!
Total Midpoint % Cover	100.5	0	0
Total Introduced Spp. Cover	97.5	0	0
Proportion of Introduced Cover	0.97	#DIV/0!	#DIV/0!

Transect - DP12

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Salix interior	Sandbar Willow	5	> 50 - 75%	62.5	Native	Shrub	FACW	FACW	FACW	2	0.3324	0.6649
2	Anemone canadensis	Round-Leaf Thimbleweed	3	> 5 - 25%	15	Native	Herb	FACW	FACW	FACW	3	0.0798	0.2394
3	Asclepias incarnata	Swamp Milkweed	3	> 5 - 25%	15	Native	Herb	FACW	OBL	OBL	4	0.0798	0.3191
4	Phalaris arundinacea	Reed Canary Grass	5	> 50 - 75%	62.5	Introduced	Herb	FACW	FACW	FACW	0	0.3324	0
5	Amphicarpaea bracteata	American Hog-Peanut	3	> 5 - 25%	15	Native	Herb	FACU	FAC	FAC	2	0.0798	0.1596
6	Cirsium arvense	Canadian Thistle	3	> 5 - 25%	15	Introduced	Herb	FACU	FACU	FACU	0	0.0798	0
7	Cornus alba	Red Osier	2	> 1 - 5%	3	Native	Shrub	FACW	FACW	FACW	3	0.016	0.0479
8		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	1.4	0.0	0.0
Numerical Condition Category	3	#N/A	#N/A
Condition Category	Fair	#N/A	#N/A
Additional Metrics			
Native Species Richness	5	0	0
Introduced Species Richness	2	0	0
Mean C	2.0	#DIV/0!	#DIV/0!
FQI	4.5	#DIV/0!	#DIV/0!
Total Midpoint % Cover	188	0	0
Total Introduced Spp. Cover	77.5	0	0
Proportion of Introduced Cover	0.41	#DIV/0!	#DIV/0!

Transect - DP13

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Phalaris arundinacea	Reed Canary Grass	6	> 75 - 95%	85	Introduced	Herb	FACW	FACW	FACW	0	0.8763	0
2	Carex stricta	Upright Sedge	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	5	0.0309	0.1546
3	Potentilla anserina	Silverweed	2	> 1 - 5%	3	Native	Herb	FACW	FACW	FACW	4	0.0309	0.1237
4	Spartina pectinata	Freshwater Cord Grass	2	> 1 - 5%	3	Native	Herb	FACW	FACW	FACW	5	0.0309	0.1546
5	Carex stricta	Upright Sedge	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	5	0.0309	0.1546
6		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	0.6	0.0	0.0
Numerical Condition Category	4	#N/A	#N/A
Condition Category	Poor	#N/A	#N/A
Additional Metrics			
Native Species Richness	4	0	0
Introduced Species Richness	1	0	0
Mean C	3.8	#DIV/0!	#DIV/0!
FQI	7.6	#DIV/0!	#DIV/0!
Total Midpoint % Cover	97	0	0
Total Introduced Spp. Cover	85	0	0
Proportion of Introduced Cover	0.88	#DIV/0!	#DIV/0!

Transect - DP14

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow
Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Phalaris arundinacea	Reed Canary Grass	7	> 95 - 100%	97.5	Introduced	Herb	FACW	FACW	FACW	0	1	0
2		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	0.0	0.0	0.0
Numerical Condition Category	4	#N/A	#N/A
Condition Category	Poor	#N/A	#N/A
Additional Metrics			
Native Species Richness	0	0	0
Introduced Species Richness	1	0	0
Mean C	0.0	#DIV/0!	#DIV/0!
FQI	0.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	97.5	0	0
Total Introduced Spp. Cover	97.5	0	0
Proportion of Introduced Cover	1.00	#DIV/0!	#DIV/0!

Transect - DP15

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Phalaris arundinacea	Reed Canary Grass	7	> 95 - 100%	97.5	Introduced	Herb	FACW	FACW	FACW	0	0.9701	0
2	Schoenoplectus tabernaemontani	Soft-Stem Club-Rush	2	> 1 - 5%	3	Native	Herb	OBL	OBL	OBL	4	0.0299	0.1194
3		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	0.1	0.0	0.0
Numerical Condition Category	4	#N/A	#N/A
Condition Category	Poor	#N/A	#N/A
Additional Metrics			
Native Species Richness	1	0	0
Introduced Species Richness	1	0	0
Mean C	2.0	#DIV/0!	#DIV/0!
FQI	2.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	100.5	0	0
Total Introduced Spp. Cover	97.5	0	0
Proportion of Introduced Cover	0.97	#DIV/0!	#DIV/0!

Transect - DP16

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Acer negundo	Ash-Leaf Maple	4	> 25 - 50%	37.5	Native	Tree	FAC	FAC	FAC	1	0.2632	0.2632
2	Fraxinus nigra	Black Ash	3	> 5 - 25%	15	Native	Tree	FACW	FACW	FACW	6	0.1053	0.6316
3	Salix nigra	Black Willow	3	> 5 - 25%	15	Native	Tree	FACW	OBL	OBL	4	0.1053	0.4211
4	Elymus virginicus	Virginia Wild Rye	4	> 25 - 50%	37.5	Native	Herb	FAC	FACW	FACW	4	0.2632	1.0526
5	Phalaris arundinacea	Reed Canary Grass	4	> 25 - 50%	37.5	Introduced	Herb	FACW	FACW	FACW	0	0.2632	0

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	2.4	0.0	0.0
Numerical Condition Category	3	#N/A	#N/A
Condition Category	Fair	#N/A	#N/A
Additional Metrics			
Native Species Richness	4	0	0
Introduced Species Richness	1	0	0
Mean C	3.0	#DIV/0!	#DIV/0!
FQI	6.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	142.5	0	0
Total Introduced Spp. Cover	37.5	0	0
Proportion of Introduced Cover	0.26	#DIV/0!	#DIV/0!

Transect - DP21

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Salix bebbiana	Gray Willow	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	6	0.2222	1.3333
2	Persicaria pensylvanica	Pinkweed	3	> 5 - 25%	15	Native	Herb	FACW	FACW	FACW	1	0.2222	0.2222
3		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
4		#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
5	Phalaris arundinacea	Reed Canary Grass	4	> 25 - 50%	37.5	Introduced	Herb	FACW	FACW	FACW	0	0.5556	0

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	1.6	0.0	0.0
Numerical Condition Category	3	#N/A	#N/A
Condition Category	Fair	#N/A	#N/A
Additional Metrics			
Native Species Richness	2	0	0
Introduced Species Richness	1	0	0
Mean C	2.3	#DIV/0!	#DIV/0!
FQI	3.3	#DIV/0!	#DIV/0!
Total Midpoint % Cover	67.5	0	0
Total Introduced Spp. Cover	37.5	0	0
Proportion of Introduced Cover	0.56	#DIV/0!	#DIV/0!

Transect - DP24

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Phalaris arundinacea	Reed Canary Grass	5	> 50 - 75%	62.5	Introduced	Herb	FACW	FACW	FACW	0	0.6545	0
2	Carex lacustris	Lakebank Sedge	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	5	0.1571	0.7853
3	Typha latifolia	Broad-Leaf Cat-Tail	3	> 5 - 25%	15	Native	Herb	OBL	OBL	OBL	2	0.1571	0.3141
4	Phragmites australis	Common Reed	2	> 1 - 5%	3	Native	Herb	FACW	FACW	FACW	1	0.0314	0.0314

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	1.1	0.0	0.0
Numerical Condition Category	4	#N/A	#N/A
Condition Category	Poor	#N/A	#N/A
Additional Metrics			
Native Species Richness	3	0	0
Introduced Species Richness	1	0	0
Mean C	2.0	#DIV/0!	#DIV/0!
FQI	3.5	#DIV/0!	#DIV/0!
Total Midpoint % Cover	95.5	0	0
Total Introduced Spp. Cover	62.5	0	0
Proportion of Introduced Cover	0.65	#DIV/0!	#DIV/0!

Transect - DP25

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type: _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Salix interior	Sandbar Willow	3	>5 - 25%	15	Native	Shrub	FACW	FACW	FACW	2	0.1128	0.2256
2	Phalaris arundinacea	Reed Canary Grass	6	>75 - 95%	85	Introduced	Herb	FACW	FACW	FACW	0	0.6391	0
3	Phragmites australis	Common Reed	3	>5 - 25%	15	Native	Herb	FACW	FACW	FACW	1	0.1128	0.1128
4	Eutrochium maculatum	Spotted Trumpetweed	3	>5 - 25%	15	Native	Herb	OBL	OBL	OBL	4	0.1128	0.4511
5	Carex stricta	Upright Sedge	2	>1 - 5%	3	Native	Herb	OBL	OBL	OBL	5	0.0226	0.1128

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	0.9	0.0	0.0
Numerical Condition Category	4	#N/A	#N/A
Condition Category	Poor	#N/A	#N/A
Additional Metrics			
Native Species Richness	4	0	0
Introduced Species Richness	1	0	0
Mean C	2.4	#DIV/0!	#DIV/0!
FQI	4.8	#DIV/0!	#DIV/0!
Total Midpoint % Cover	133	0	0
Total Introduced Spp. Cover	85	0	0
Proportion of Introduced Cover	0.64	#DIV/0!	#DIV/0!

Transect - DP27

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Poa pratensis	Kentucky Blue Grass	4	> 25 - 50%	37.5	Introduced	Herb	FACU	FAC	FACU	0	0.2072	0
2	Phalaris arundinacea	Reed Canary Grass	5	> 50 - 75%	62.5	Introduced	Herb	FACW	FACW	FACW	0	0.3453	0
3	Phalaris arundinacea	Reed Canary Grass	3	> 5 - 25%	15	Introduced	Herb	FACW	FACW	FACW	0	0.0829	0
4	Apocynum cannabinum	Indian-Hemp	3	> 5 - 25%	15	Native	Herb	FAC	FAC	FAC	3	0.0829	0.2486
5	Potentilla anserina	Silverweed	3	> 5 - 25%	15	Native	Herb	FACW	FACW	FACW	4	0.0829	0.3315
6	Salix interior	Sandbar Willow	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	2	0.0829	0.1657
7	Cirsium muticum	Swamp Thistle	3	> 5 - 25%	15	Native	Herb	FACW	OBL	OBL	6	0.0829	0.4972
8	Anemone canadensis	Round-Leaf Thimbleweed	2	> 1 - 5%	3	Native	Herb	FACW	FACW	FACW	3	0.0166	0.0497
9	Mentha arvensis	American Wild Mint	2	> 1 - 5%	3	Native	Herb	FACW	FACW	FACW	3	0.0166	0.0497

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	1.3	0.0	0.0
Numerical Condition Category	3	#N/A	#N/A
Condition Category	Fair	#N/A	#N/A
Additional Metrics			
Native Species Richness	6	0	0
Introduced Species Richness	3	0	0
Mean C	2.3	#DIV/0!	#DIV/0!
FQI	5.7	#DIV/0!	#DIV/0!
Total Midpoint % Cover	181	0	0
Total Introduced Spp. Cover	115	0	0
Proportion of Introduced Cover	0.64	#DIV/0!	#DIV/0!

Transect - DP28

Community #1

Eggers & Reed Plant Community Type. Fresh Meadow

Percent of AA Occupied by Type. _____

Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Poa pratensis	Kentucky Blue Grass	5	> 50 - 75%	62.5	Introduced	Herb	FACU	FAC	FACU	0	0.3666	0
2	Phalaris arundinacea	Reed Canary Grass	4	> 25 - 50%	37.5	Introduced	Herb	FACW	FACW	FACW	0	0.2199	0
3	Salix discolor	Pussy Willow	4	> 25 - 50%	37.5	Native	Shrub	FACW	FACW	FACW	3	0.2199	0.6598
4	Asclepias incarnata	Swamp Milkweed	3	> 5 - 25%	15	Native	Herb	FACW	OBL	OBL	4	0.088	0.3519
5	Cirsium arvense	Canadian Thistle	2	> 1 - 5%	3	Introduced	Herb	FACU	FACU	FACU	0	0.0176	0
6	Salix discolor	Pussy Willow	3	> 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	3	0.088	0.2639

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	1.3	0.0	0.0
Numerical Condition Category	4	#N/A	#N/A
Condition Category	Poor	#N/A	#N/A
Additional Metrics			
Native Species Richness	3	0	0
Introduced Species Richness	3	0	0
Mean C	1.7	#DIV/0!	#DIV/0!
FQI	2.9	#DIV/0!	#DIV/0!
Total Midpoint % Cover	170.5	0	0
Total Introduced Spp. Cover	103	0	0
Proportion of Introduced Cover	0.60	#DIV/0!	#DIV/0!

Transect - DP29

Community #1

Eggers & Reed Plant Community Type: Fresh Meadow

Percent of AA Occupied by Type:

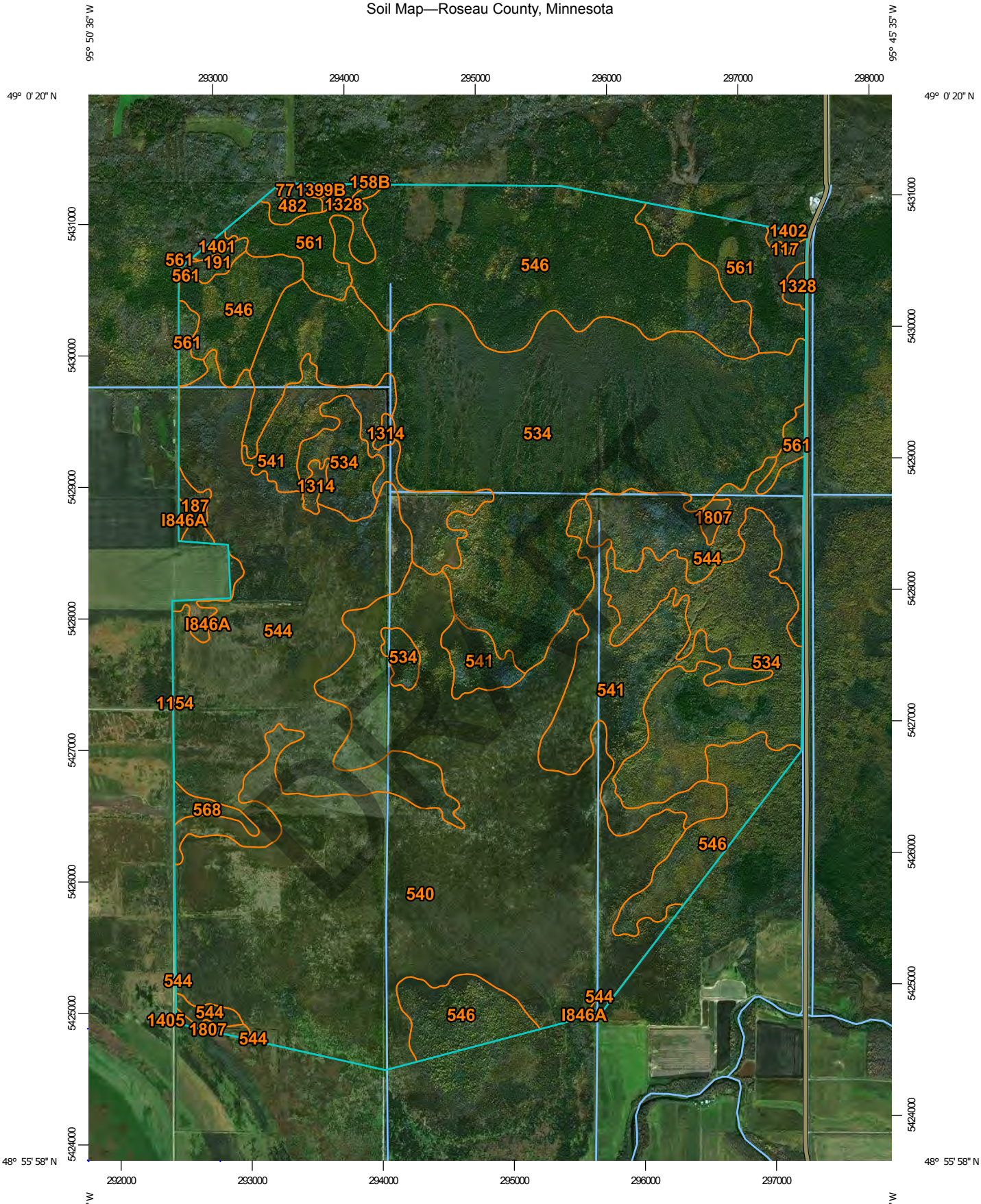
Spp. #	Scientific Name	Common Name	Cover Class	CC Range	Midpoint CC	Native Status	Rapid FQA Stratum	NWI-GP	NWI-MW	NWI-NCNE	C	p	pC
1	Salix bebbiana	Gray Willow		3 > 5 - 25%	15	Native	Shrub	FACW	FACW	FACW	5	0.1304	0.7826
2	Typha X glauca		0	5 > 50 - 75%	62.5	Introduced	Herb	OBL	OBL	OBL	0	0.5435	0
3	Phalaris arundinacea	Reed Canary Grass		4 > 25 - 50%	37.5	Introduced	Herb	FACW	FACW	FACW	0	0.3261	0

Metric Summary & Community Assessments

	Community #1	Community #2	Community #3
Community Type	Fresh Meadow	0	0
wC	0.8	0.0	0.0
Numerical Condition Category	4	#N/A	#N/A
Condition Category	Poor	#N/A	#N/A
Additional Metrics			
Native Species Richness	1	0	0
Introduced Species Richness	2	0	0
Mean C	2.0	#DIV/0!	#DIV/0!
FQI	2.0	#DIV/0!	#DIV/0!
Total Midpoint % Cover	115	0	0
Total Introduced Spp. Cover	100	0	0
Proportion of Introduced Cover	0.87	#DIV/0!	#DIV/0!

Figure #4

Soils Map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95° 45' 35" W
49° 0' 20" N
48° 55' 58" N
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294000
295000
296000
297000
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5431000
5430000
5429000
5428000
5427000
5426000
5425000
5424000
771
1399B
158B
482
1328
1401
561
191
546
1402
117
1314
534
541
187
I846A
1807
544
568
540
1154
Map Scale: 1:39,500 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 500 1000 2000 3000
Feet
0 1500 3000 6000 9000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Roseau County, Minnesota
Survey Area Data: Version 15, Oct 4, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

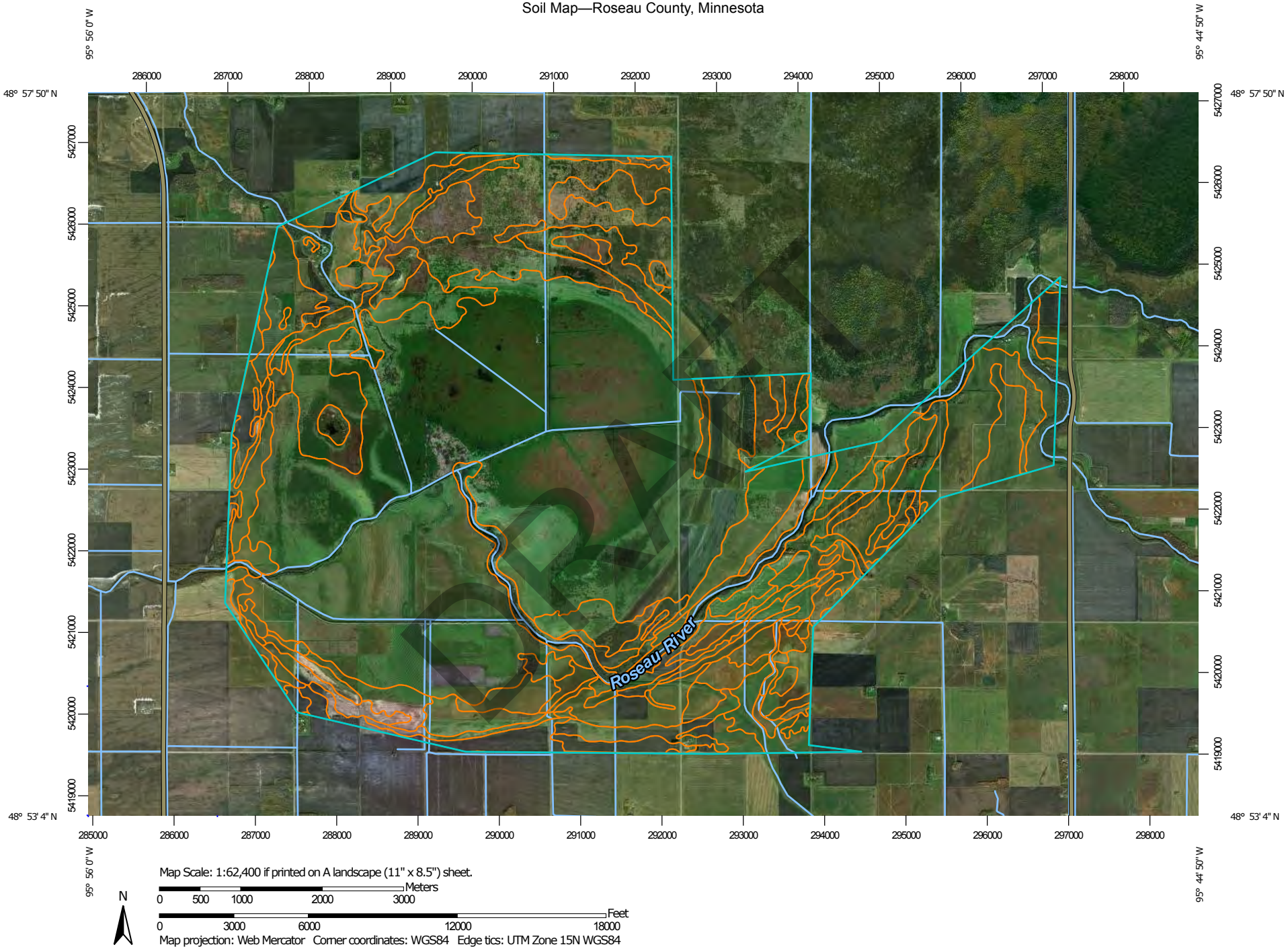
Date(s) aerial images were photographed: Dec 31, 2009—Oct 23, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
77	Garnes fine sandy loam, 0 to 3 percent slopes	2.4	0.0%
117	Cormant loamy fine sand, 0 to 2 percent slopes	9.0	0.1%
158B	Zimmerman fine sand, 1 to 6 percent slopes	3.7	0.1%
187	Haug muck, 0 to 1 percent slopes	20.3	0.3%
191	Epoufette sandy loam, 0 to 2 percent slopes	17.1	0.2%
482	Grygla loamy fine sand, 0 to 2 percent slopes	20.5	0.3%
534	Mooselake mucky peat, 0 to 1 percent slopes	1,901.9	26.8%
540	Seelyeville-Seelyeville, ponded, complex, 0 to 1 percent slopes	1,921.5	27.1%
541	Rifle-Rifle, ponded, complex, 0 to 1 percent slopes	555.0	7.8%
544	Cathro muck, occasionally ponded, 0 to 1 percent slopes	1,154.5	16.3%
546	Lupton-Lupton, ponded, complex, 0 to 1 percent slopes	1,069.9	15.1%
561	Bullwinkle muck, 0 to 1 percent slopes	300.9	4.2%
568	Zippel very fine sandy loam, 0 to 2 percent slopes	21.1	0.3%
1154	Sax muck, 0 to 1 percent slopes	0.2	0.0%
1314	Tacoosh mucky peat, map 22-30, 0 to 1 percent slopes	19.1	0.3%
1328	Northwood muck, wooded, 0 to 1 percent slopes	19.2	0.3%
1399B	Two Inlets loamy sand, noncalcareous substratum, 0 to 6 percent slopes	6.5	0.1%
1401	Grygla mucky loamy fine sand, depressional, 0 to 1 percent slopes	7.6	0.1%
1402	Leafriver muck, wooded, 0 to 1 percent slopes	0.1	0.0%
1405	Lallie mucky silt loam, map 18-22, 0 to 1 percent slopes	2.8	0.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1807	Cathro muck, ponded, map 22-30, 0 to 1 percent slopes	17.8	0.3%
I846A	Borup silt loam, Aspen Parkland, 0 to 1 percent slopes	23.5	0.3%
Totals for Area of Interest		**7,094.6**	**100.0%**



Map Scale: 1:62,400 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 500 1000 2000 3000

Feet
0 3000 6000 12000 18000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
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- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
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- Local Roads

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- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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Soil Survey Area: Roseau County, Minnesota
Survey Area Data: Version 15, Oct 4, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Oct 23, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
532	Sago muck, 0 to 1 percent slopes	215.8	1.8%
540	Seelyeville-Seelyeville, ponded, complex, 0 to 1 percent slopes	143.3	1.2%
544	Cathro muck, occasionally ponded, 0 to 1 percent slopes	1,055.8	8.6%
563	Northwood muck, 0 to 1 percent slopes	79.0	0.6%
568	Zippel very fine sandy loam, 0 to 2 percent slopes	358.4	2.9%
569	Wabanica silt loam, 0 to 2 percent slopes	341.7	2.8%
1154	Sax muck, 0 to 1 percent slopes	715.8	5.9%
1182	Warroad fine sandy loam, 0 to 2 percent slopes	113.2	0.9%
1405	Lallie mucky silt loam, map 18-22, 0 to 1 percent slopes	5,949.5	48.7%
I16F	Fluvaquents,frequently flooded-Hapludolls complex, 0 to 30 percent slopes	458.4	3.8%
I55A	Rosewood fine sandy loam, Aspen Parkland, 0 to 1 percent slopes	20.0	0.2%
I79A	Berner, Cathro and Haug soils, ponded, 0 to 1 percent slopes	111.9	0.9%
I82A	Cathro muck, dense till, 0 to 1 percent slopes	145.3	1.2%
I84A	Percy loam, 0 to 1 percent slopes, very cobbly	19.7	0.2%
I86A	Percy mucky loam, 0 to 1 percent slopes	9.4	0.1%
I95A	Kratka and Strathcona soils, dense till, 0 to 1 percent slopes	3.5	0.0%
I101A	Foxhome sandy loam, dense till, 0 to 2 percent slopes	5.6	0.0%
I103A	Kratka fine sandy loam, dense till, 0 to 1 percent slopes	31.1	0.3%
I106A	Enstrom loamy fine sand, dense till, 0 to 2 percent slopes	4.6	0.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
I109A	Fluvaquents, 0 to 2 percent slopes, frequently flooded	202.9	1.7%
I110A	Augsburg, Borup and Colvin soils, very poorly drained, 0 to 1 percent slopes	111.0	0.9%
I114A	Foldahl fine sandy loam, dense till, 0 to 2 percent slopes	101.7	0.8%
I117A	Skagen loam, dense till, 0 to 2 percent slopes, very cobbly	0.7	0.0%
I125A	Skagen loam, dense till, 0 to 2 percent slopes	12.5	0.1%
I127A	Percy loam, 0 to 1 percent slopes	174.3	1.4%
I467A	Bearden silt loam, 0 to 2 percent slopes	45.8	0.4%
I629A	Colvin silty clay loam, Aspen Parkland, 0 to 1 percent slopes	557.6	4.6%
I682A	Borup-Glyndon complex, 0 to 2 percent slopes	109.4	0.9%
I704A	Glyndon very fine sandy loam, Aspen Parkland, 0 to 2 percent slopes	244.9	2.0%
I741A	Boash clay loam, dense till, 0 to 1 percent slopes	42.5	0.3%
I846A	Borup silt loam, Aspen Parkland, 0 to 1 percent slopes	834.6	6.8%
IWa	Water	3.6	0.0%
Totals for Area of Interest		**12,223.4**	**100.0%**

Figure #5

Hydro Atlas Map

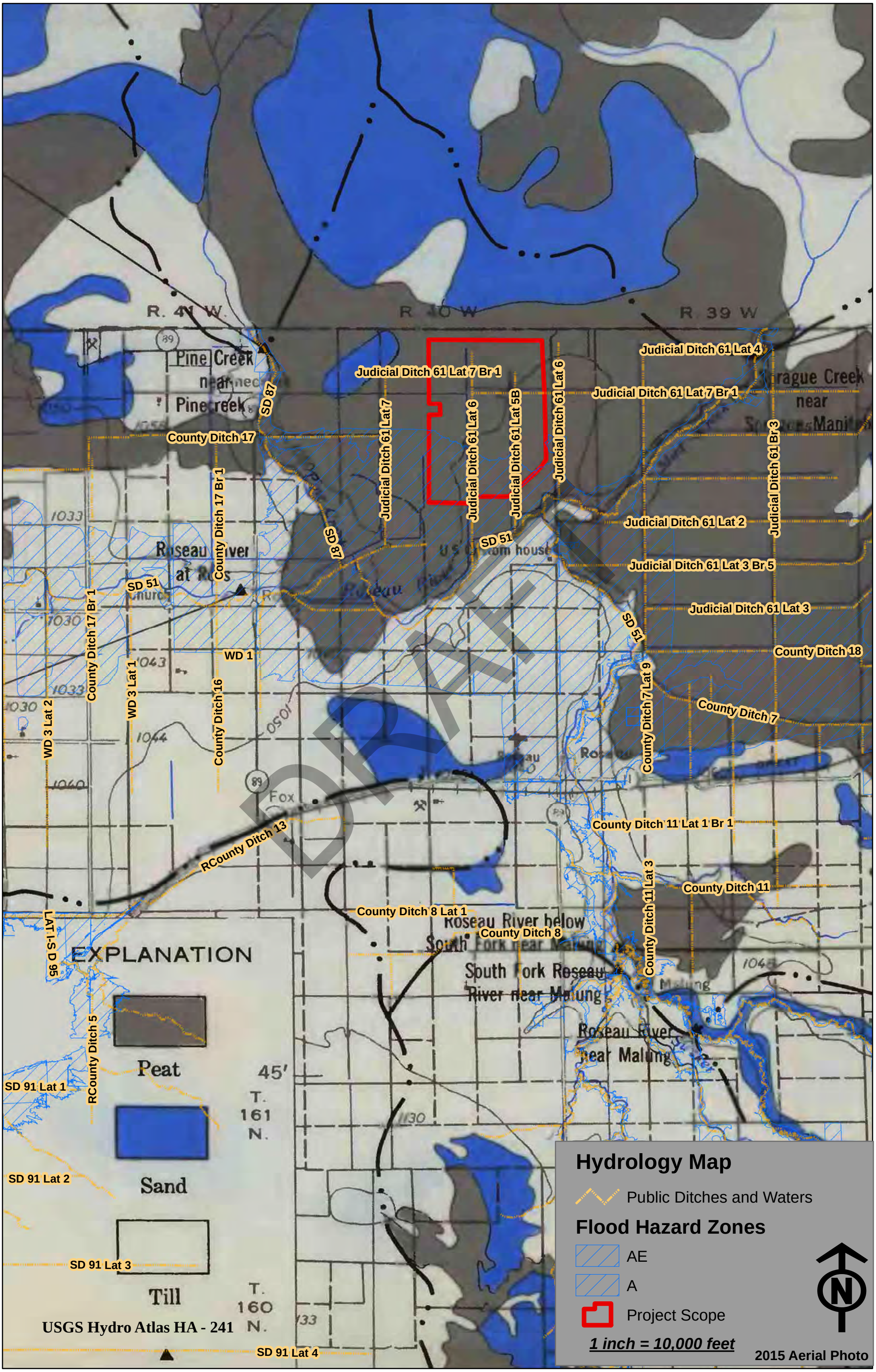
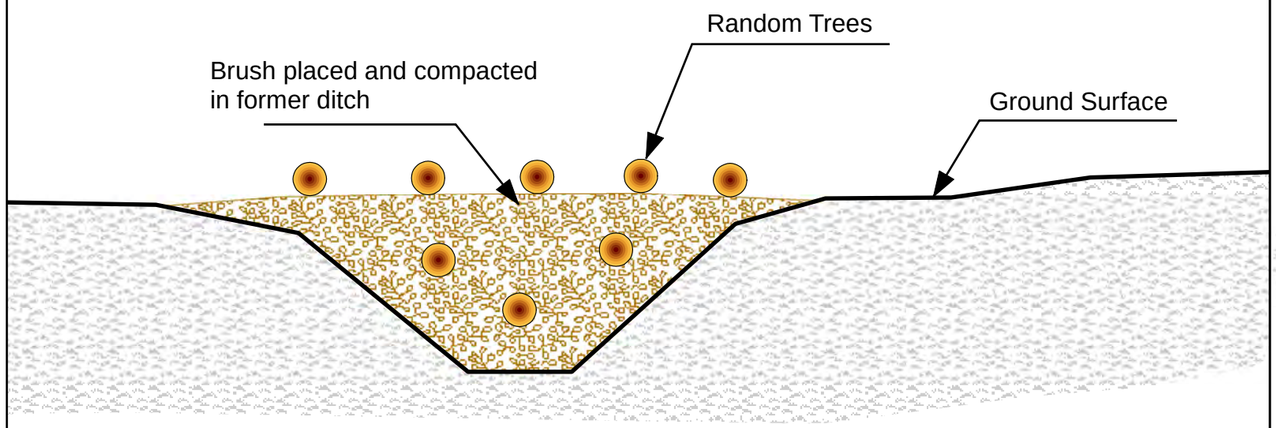

R. 41 W.
R 40 W
R 39 W
Pine Creek
near
Pine creek
Judicial Ditch 61 Lat 7 Br 1
Judicial Ditch 61 Lat 4
Judicial Ditch 61 Lat 7 Br 1
SD 87
County Ditch 17
Judicial Ditch 61 Lat 7
Judicial Ditch 61 Lat 6
Judicial Ditch 61 Lat 5B
Judicial Ditch 61 Lat 6
Judicial Ditch 61 Br 3
Judicial Ditch 61 Lat 2
SD 51
Judicial Ditch 61 Lat 3 Br 5
Judicial Ditch 61 Lat 3
County Ditch 18
County Ditch 17 Br 1
County Ditch 16
WD 1
WD 3 Lat 1
WD 3 Lat 2
County Ditch 7 Lat 9
County Ditch 7
Fox
RCounty Ditch 13
County Ditch 11 Lat 1 Br 1
County Ditch 11 Lat 3
County Ditch 11
County Ditch 8 Lat 1
County Ditch 8
Roseau River below
South Fork Roseau
River near Malung
Roseau River
near Malung
EXPLANATION
Peat
Sand
Till
RCounty Ditch 5
SD 91 Lat 1
SD 91 Lat 2
SD 91 Lat 3
SD 91 Lat 4
45′
T. 161 N.
T. 160 N.
USGS Hydro Atlas HA - 241
Hydrology Map
Public Ditches and Waters
Flood Hazard Zones
AE
A
Project Scope
1 inch = 10,000 feet
2015 Aerial Photo
DRAFT

Figure #6

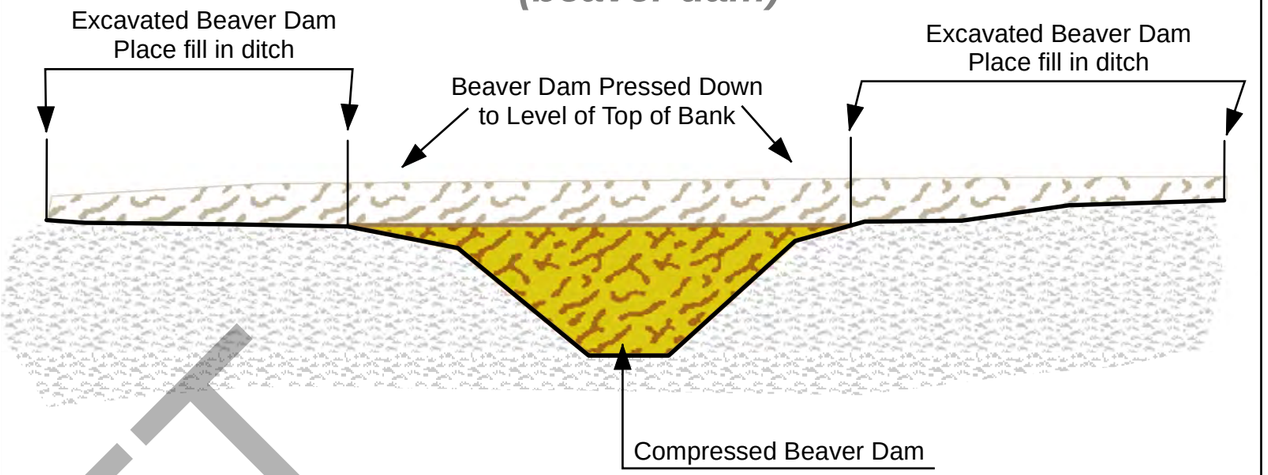
Brush Plug Exhibit

Channel Longitudinal View (open ditch)

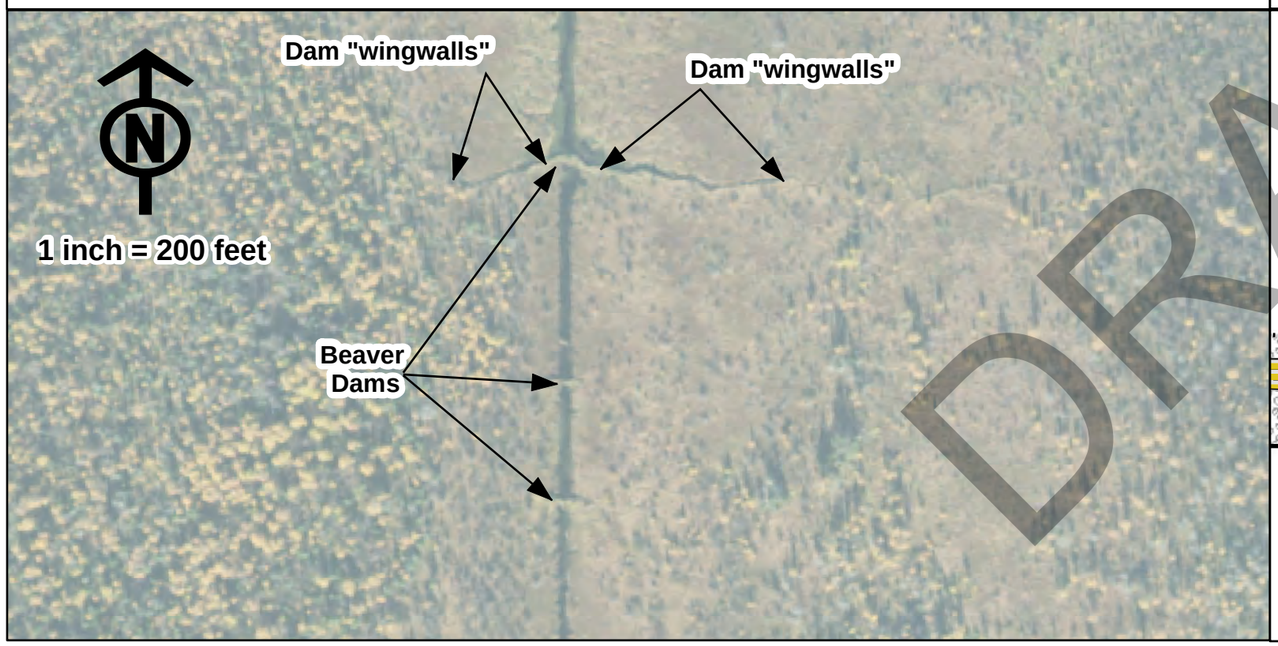


*- NOT TO SCALE

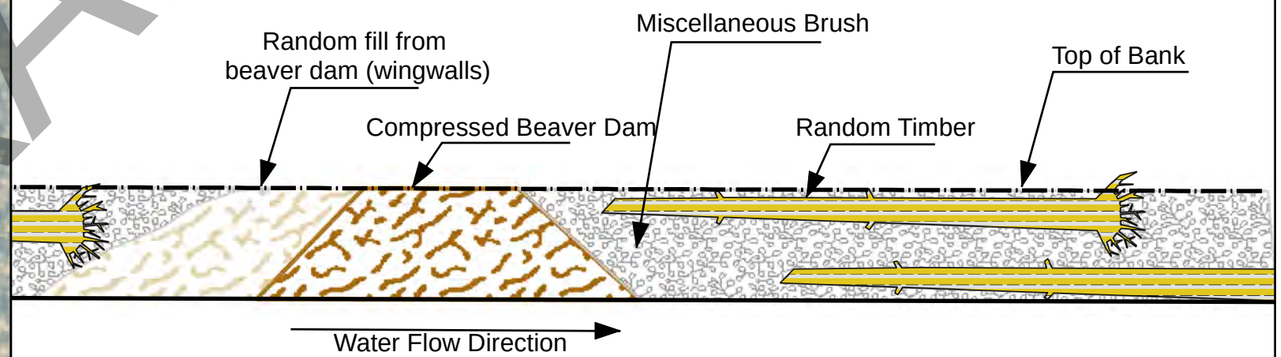
Channel Longitudinal View (beaver dam)



*- NOT TO SCALE



Channel Cross Section View



*- NOT TO SCALE

Brush Plugging Design

Construction Notes

1. Brush will be placed and compressed within the open channel. Brush will be sourced from adjacent grove. Random timber shall be placed with the brush to aid compression and anchor the woody debris.
2. Beaver Dams where encountered will be compressed to the elevation of the channel top of bank. The center of the dam shall be pressed 6"-8" below the top of bank to prevent erosion on edge of bank.

Construction Notes (cont.)

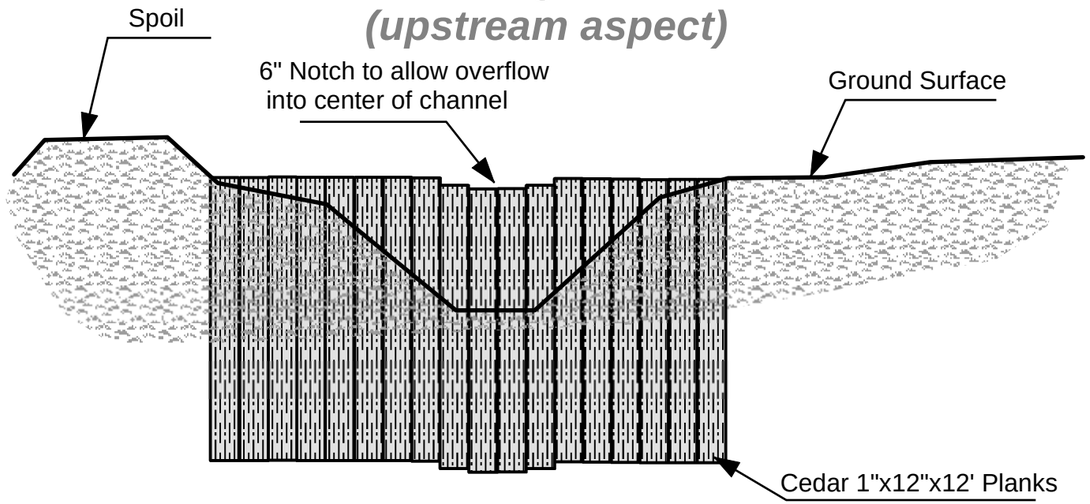
3. Larger Beaver Dams that extend far beyond the ditch (wingwalls) will require excavation of fill and placement in the ditch, upstream of the compressed dam. Where channels are present along the dam, dam material may be placed in the channel to restore grade.
4. All brush and timber materials will be sourced from the property, timber will be flagged or identified for harvest. Brush will be sourced from large grove along the souther 2/3rds of the corridor.

Draft Template

Figure #7

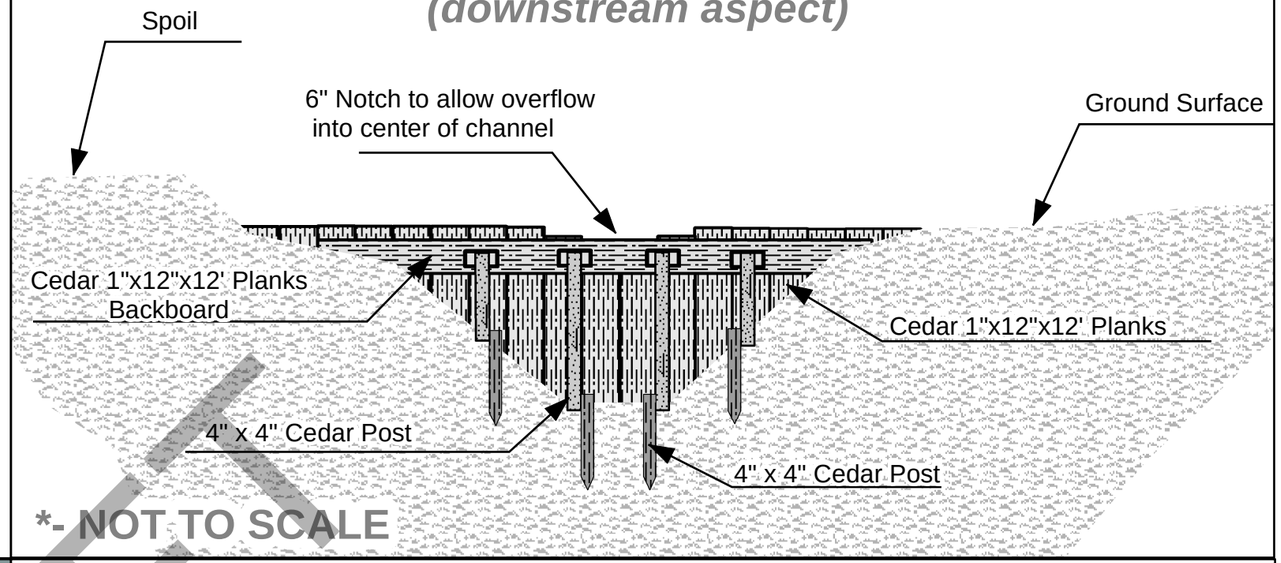
Cedar Dam Exhibit

Channel Longitudinal View (upstream aspect)



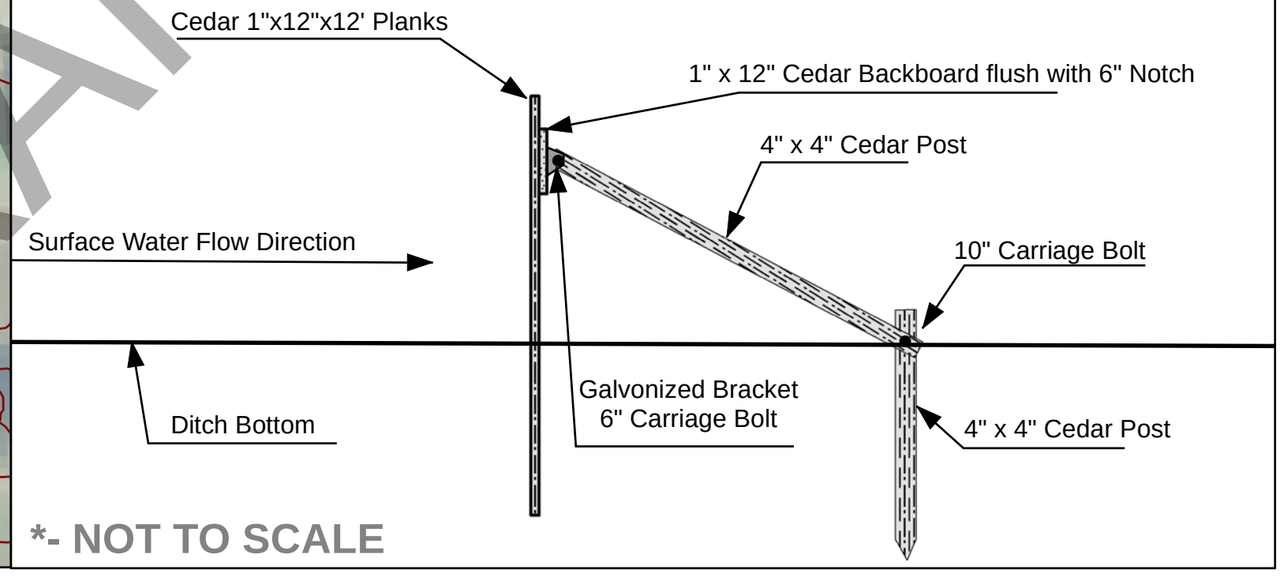
*- NOT TO SCALE

Channel Longitudinal View (downstream aspect)



*- NOT TO SCALE

Channel Cross Section View



*- NOT TO SCALE

Cedar Dams Design

Construction Notes

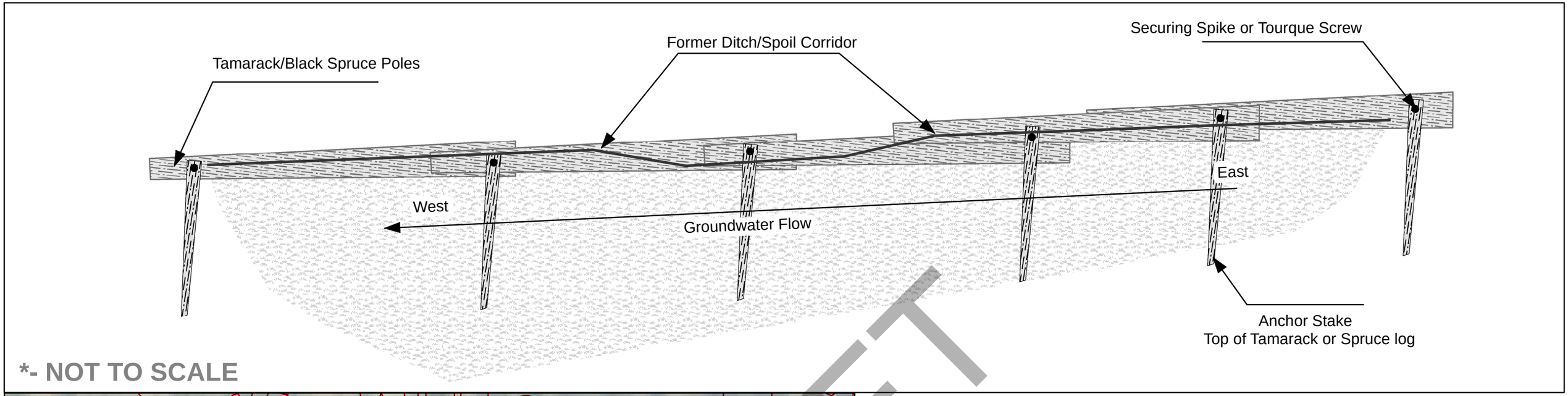
1. Dam will be constructed from 1"x12" Cedar Boards driven at minimum 50% into the substrate. Backboad will be secured to provide support for the dam, and will be installed 6" below the adjacent ground elevation.
2. 4"x4" Cedar Post will be installed 4' OC across the open ditch dimension to limit flexing or potetial seperation of 1"x12" boards. Support post will be secured on the backboard by a galvonized bracket and 6" carriage bolt.

Construction Notes (cont.)

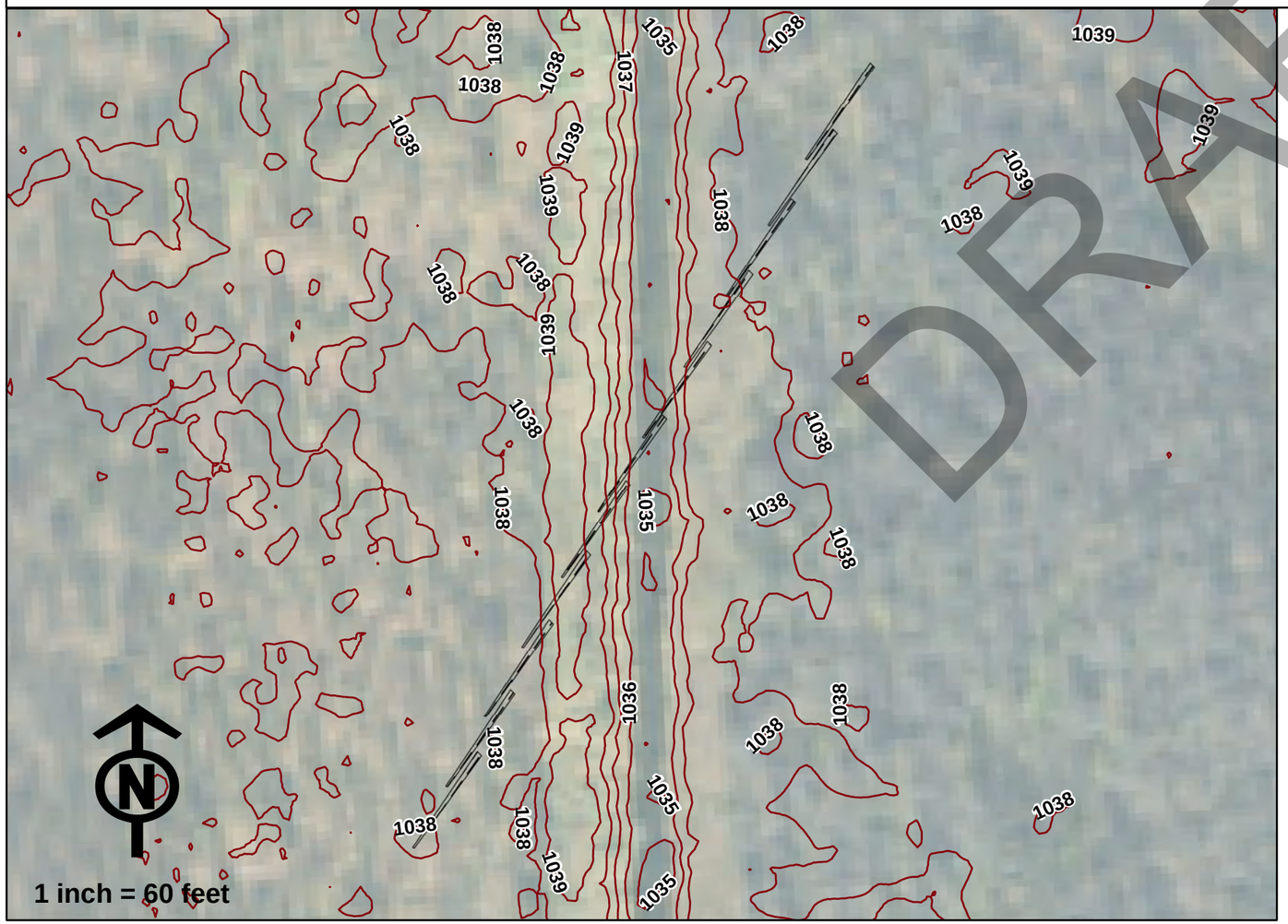
3. 4"x4" (3'-4') cedar post will be sharped on one end and driven into the substrate leaving 6"-8" exposed. 10" Carriage bolt will be used to secure the support post from the dam to the aligned anchor post driven into the substrate.
4. Cedar boards must be "keyed" into the adjacent channel banks to ensure that surface waters do not cut around the dam resulting in potential failure.

Figure #8

Log Diverter Exhibit



*- NOT TO SCALE



Log Diversion Structure Design

Construction Notes

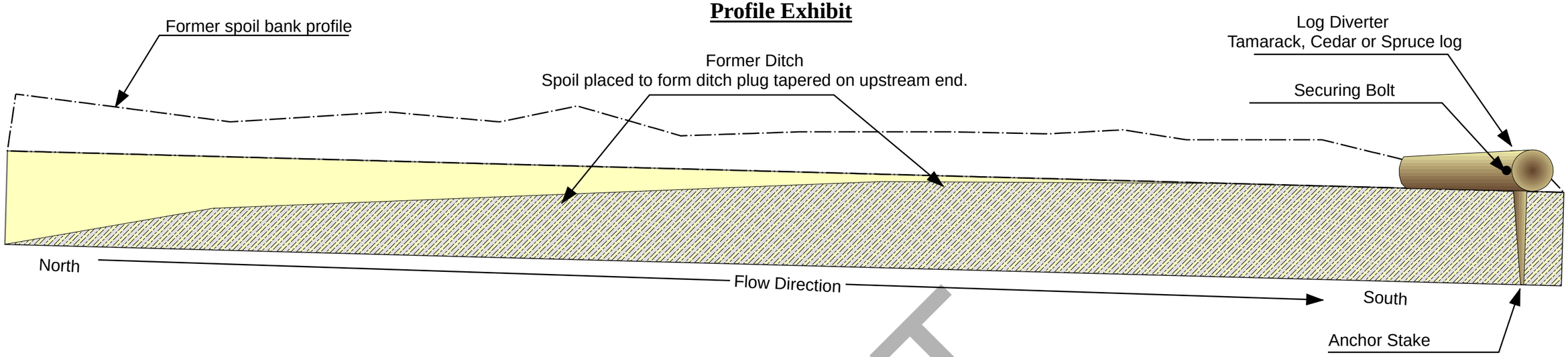
1. Logs harvested will consist of de-limbed Tamarack or Black Spruce
2. Minimum thickness of logs shall be no less than 12" top diameter
3. Logs shall placed with the base oriented to the east, with the top angled at 215° from true north. Logs will be lapped with first log installed at the east station, each subsequent log will be placed south of the log before it.
4. Stakes comprised of the upper 4' of Tamarack or Spruce will be driven 3.5' into the peat, pole shed spikes or long torque screws will be driven through the stakes and into the logs to anchor the structure in place
4. Stakes will be installed 1' from the base of the log, for each individual log. An additional stake will be installed on the top of the westernmost log, this will prevent potential rotation and/or damage.

Draft Template

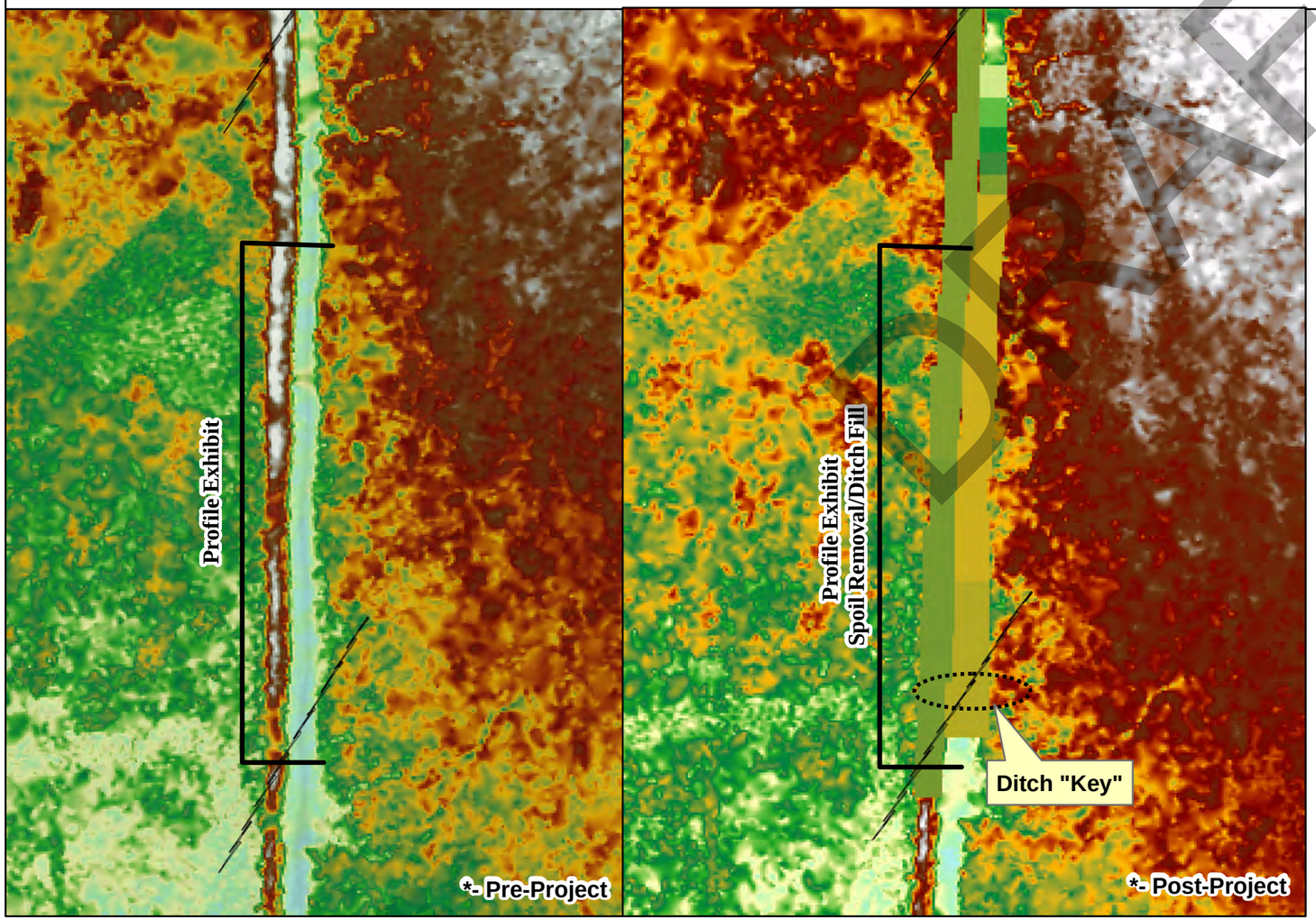
Figure #9

Ditch Plug with Log Diverter Exhibit

Profile Exhibit



*- NOT TO SCALE



Ditch Plug and Log Diversion Structure Design

Construction Notes

1. Spoil shall be placed in the open ditch, level with the east landward grade. All spoil on the west side of ditch must be placed in the open ditch. In the even there is insufficient spoil to fill the open ditch, preference will be given to the downstream portion of the plug, (ie log diverter location) The spoil deposited on the northern limit of the plug will be tapered to provide gradual transition up into the plug.

2. A key shall be excavated at the intersection of the log diverter and the plug. The ditch key, extending to the former limits of the spoil bank and of equal distance into the opposite bank will consist of organic material compressed by heavy equipment. Key will provide additional anchoring of material, reducing potential erosion or seperation of fill.

3. Logs harvested will consist of de-limbed Tamarack or Black Spruce

4. Minimum thickness of logs shall be no less than 12" top diameter

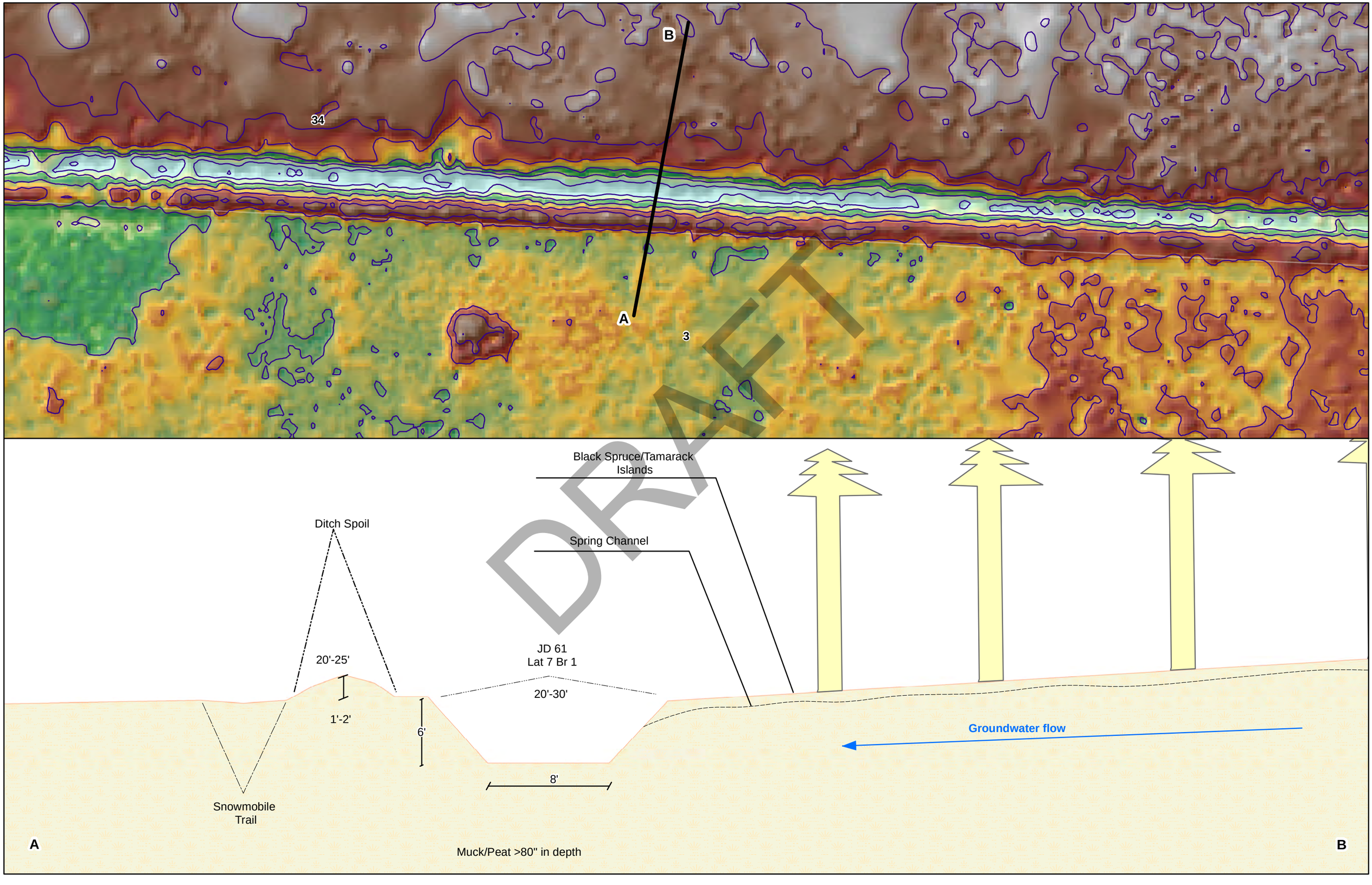
5. Logs shall placed with the base oriented to the east, with the top angled at 215° from true north. Logs will be lapped with first log installed at the east station, each subsequent log will be placed south of the log before it.

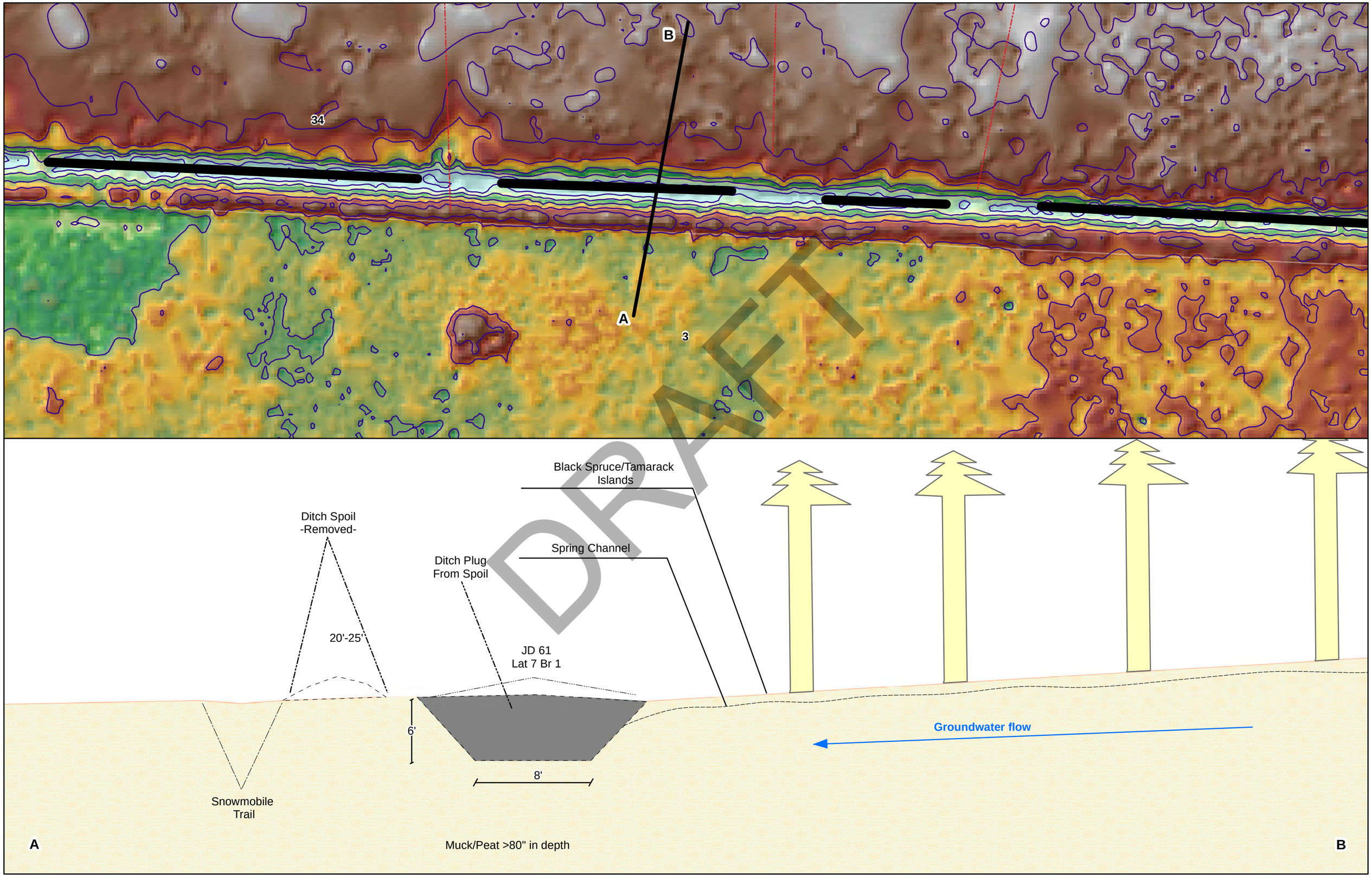
6. Stakes comprised of the upper 4' of Tamarack or Spruce will be driven 3.5' into the peat, pole shed spikes or long torque screws will be driven through the stakes and into the logs to anchor the structure in place

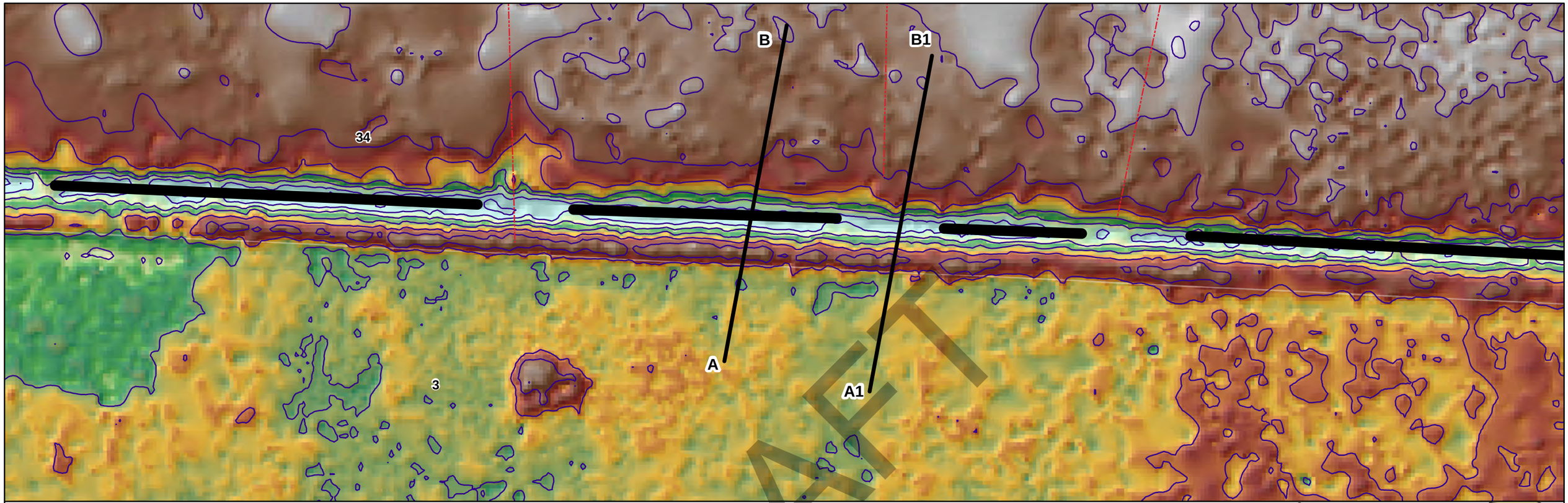
7. Stakes will be installed 1' from the base of the log, for each individual log. An additional stake will be installed on the top of the westernmost log, this will prevent potential rotation and/or damage.

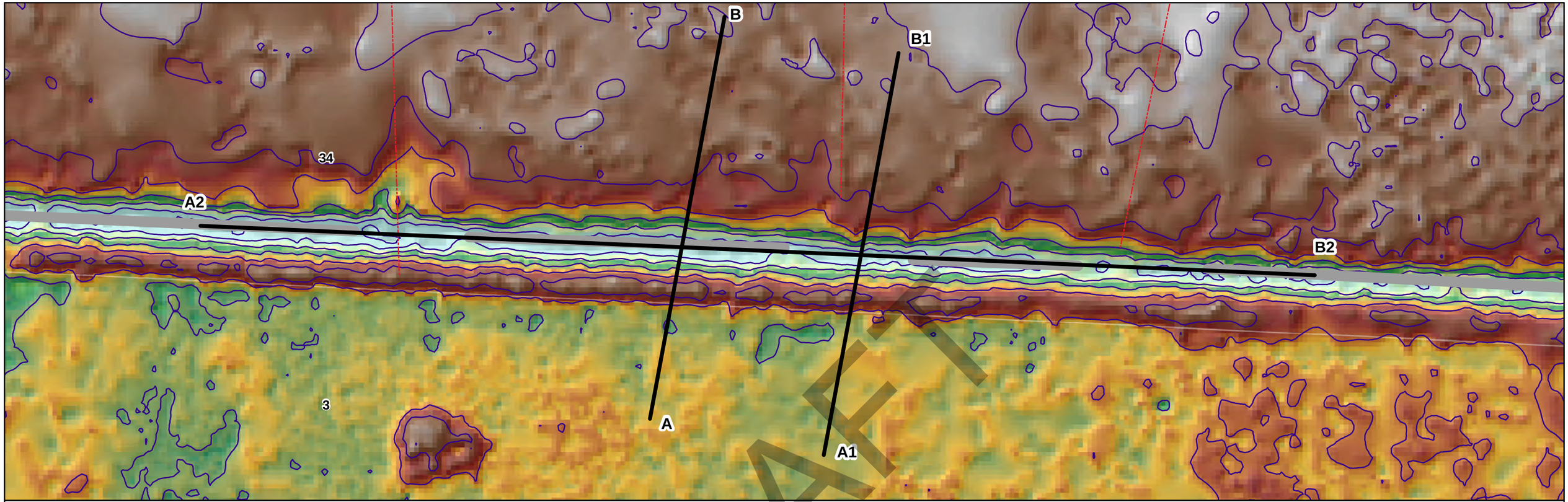
Figure #10

Ditch Plug Exhibit


B
A
34
3
Black Spruce/Tamarack
Islands
Ditch Spoil
Spring Channel
JD 61
Lat 7 Br 1
20'-25'
1'-2'
6'
20'-30'
8'
Groundwater flow
Snowmobile
Trail
A
Muck/Peat >80" in depth
B


B
A
34
3
Black Spruce/Tamarack
Islands
Ditch Spoil
-Removed-
Spring Channel
Ditch Plug
From Spoil
20'-25'
JD 61
Lat 7 Br 1
6'
8'
Groundwater flow
Snowmobile
Trail
A
Muck/Peat >80" in depth
B


B
B1
34
A
A1
3
Black Spruce/Tamarack
Islands
Ditch Spoil
-Removed-
Ditch Plug
Not installed at intersection
of channels and ditch
Spring Channel
20'-25'
JD 61
Lat 7 Br 1
6'
8'
Groundwater flow
Snowmobile
Trail
A1
Muck/Peat >80" in depth
B1


B
B1
34
A2
B2
3
A
A1

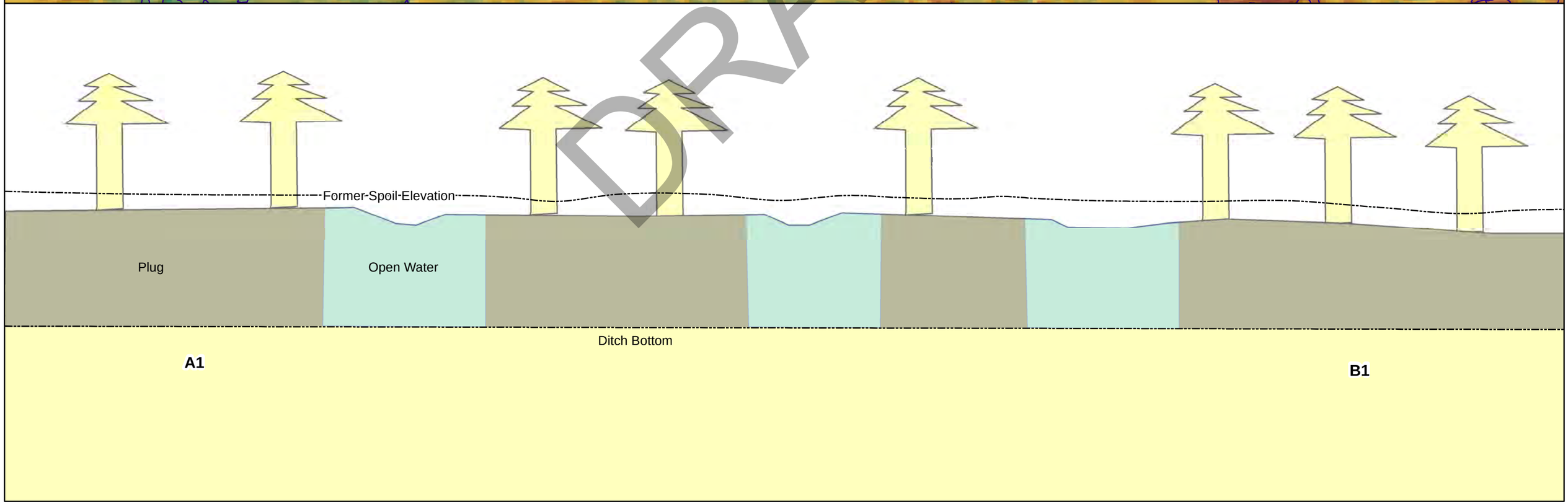
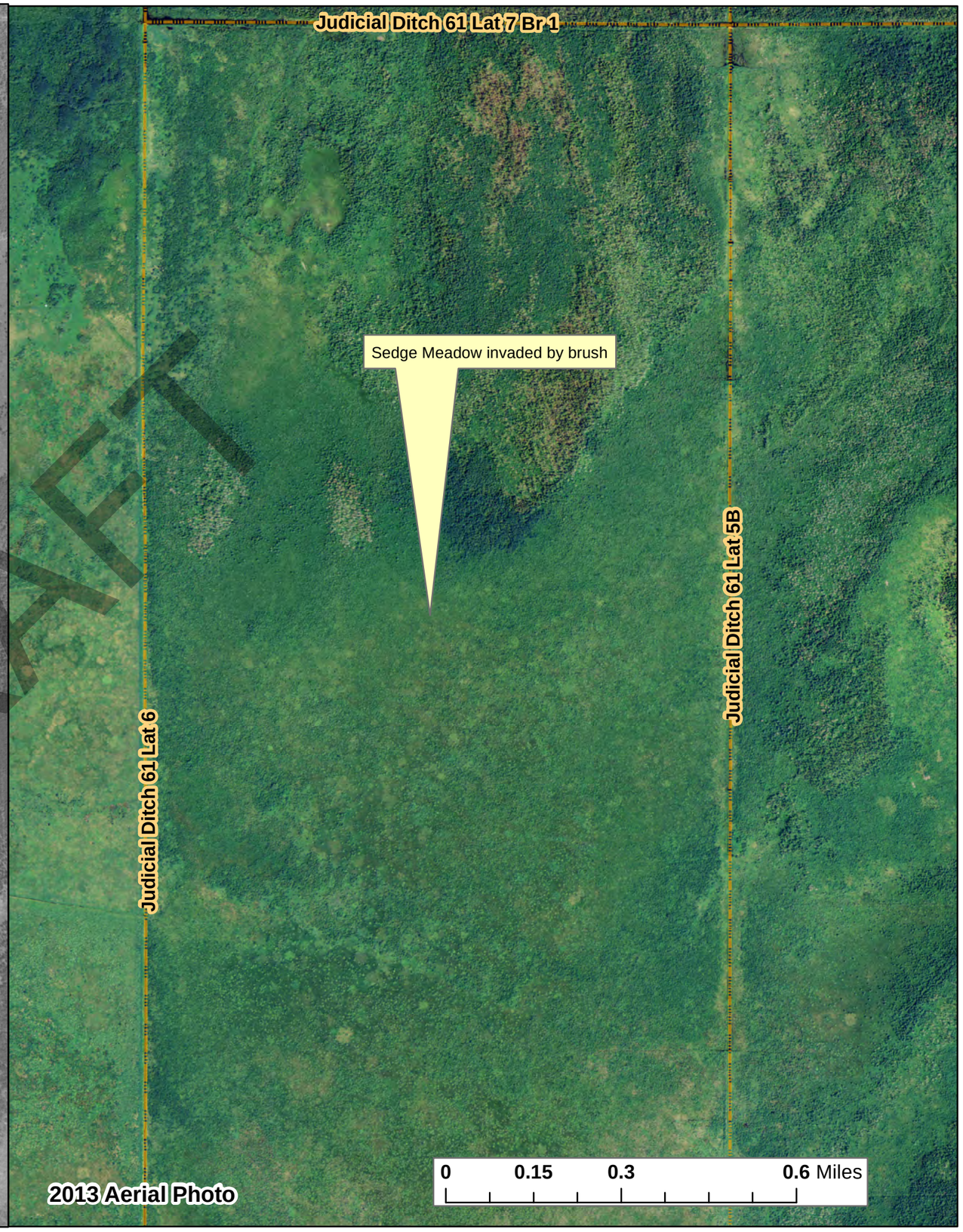

Former-Spoil-Elevation
Plug
Open Water
Ditch Bottom
A1
B1

Figure #11

Historical Aerial Photos


Brush evident near ditches
Sedge Meadow showing signs of recent burn
DRAFT
Vegetation Succession Map
Sedge Meadow to Shrub Carr
1940 Aerial Photo


Judicial Ditch 61 Lat 7 Br 1
Sedge Meadow invaded by brush
Judicial Ditch 61 Lat 6
Judicial Ditch 61 Lat 5B
2013 Aerial Photo
0
0.15
0.3
0.6 Miles

Sedge Meadow showing signs of succession from 1940 photo

Brush establishing in Sedge Meadow

Vegetation Succession Map
Sedge Meadow to Shrub Carr

1966 Aerial Photo

Judicial Ditch 61 Lat 7 Br 1

Sedge Meadow invaded by brush

Judicial Ditch 61 Lat 6

Judicial Ditch 61 Lat 5B

2013 Aerial Photo

0 0.15 0.3 0.6 Miles

Channel appears dominated by Graminoids

Open Channels

Succession of shrub stratum beginning to occur

Vegetation Succession Map
Spring Fens

N

1940 Aerial Photo

Channel dominated by Stunted White Cedar

Remnant Graminoid Communities

Channels Invaded by Tamarack

Judicial Ditch 61 Lat 5B

Judicial Ditch 61 Lat 7 Br 1

Intersection between Spring Channel and Legal Ditch lack of definable channel

0 0.05 0.1 0.2 Miles

2015 Aerial Photo

Channel appears dominated by Graminoids

Open Channels

Succession of shrub stratum beginning to occur

Vegetation Succession Map
Spring Fens

N

1966 Aerial Photo

Channel dominated by Stunted White Cedar

Remnant Graminoid Communities

Channels Invaded by Tamarack

Judicial Ditch 61 Lat 5B

Judicial Ditch 61 Lat 7 Br 1

Intersection between Spring Channel and Legal Ditch lack of definable channel

0 0.05 0.1 0.2 Miles

2015 Aerial Photo

Visible channels south of Lat7 Br 1

Visible channels south of Lat7 Br 1

Judicial Ditch 61 Lat 7 Br 1

Channels invaded by brush and trees

Judicial Ditch 61 Lat 5B

Vegetation Succession Map
Spring Fens

1940 Aerial Photo

2015 Aerial Photo

0 0.075 0.15 0.3 Miles

Visible channels south of Lat7 Br 1

Visible channels south of Lat7 Br 1

Vegetation Succession Map
Spring Fens

1966 Aerial Photo

Judicial Ditch 61 Lat 7 Br 1

Channels invaded by brush and trees

Judicial Ditch 61 Lat 5B

2015 Aerial Photo

0 0.075 0.15 0.3 Miles

Figure #12

Landowner Input Map

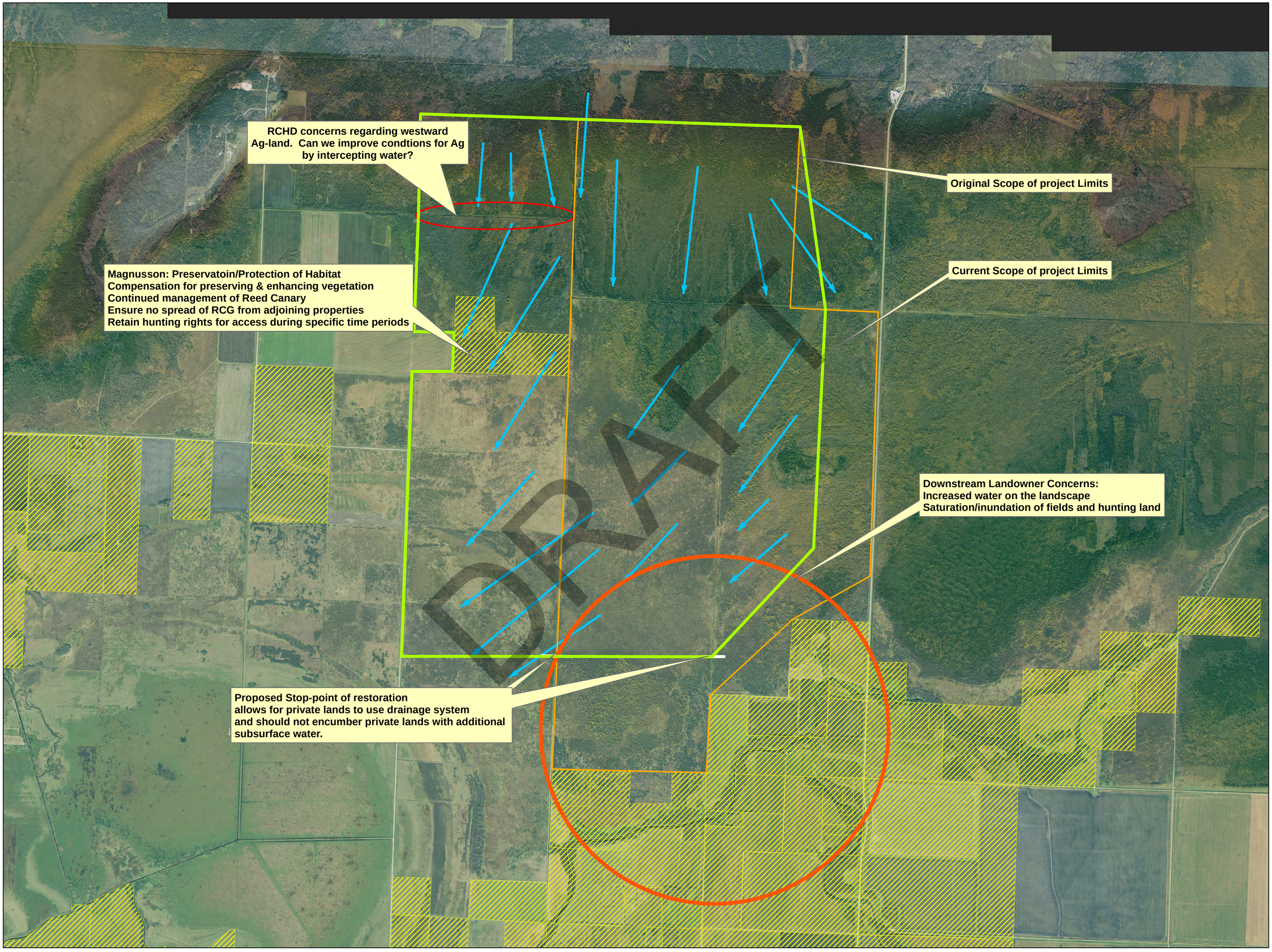
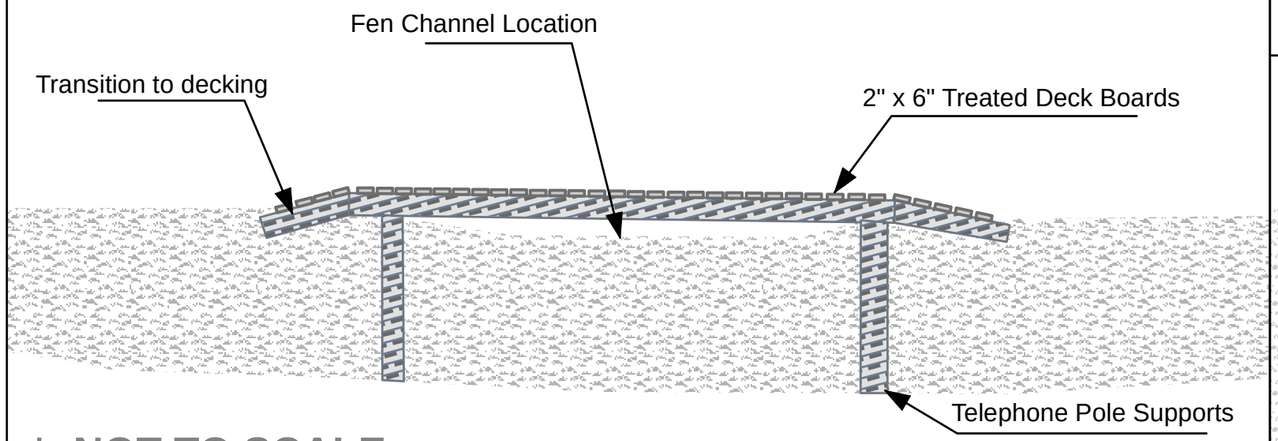

RCHD concerns regarding westward Ag-land. Can we improve condtions for Ag by intercepting water?
Original Scope of project Limits
Current Scope of project Limits
Magnusson: Preservatoin/Protection of Habitat
Compensation for preserving & enhancing vegetation
Continued management of Reed Canary
Ensure no spread of RCG from adjoining properties
Retain hunting rights for access during specific time periods
Downstream Landowner Concerns:
Increased water on the landscape
Saturation/inundation of fields and hunting land
Proposed Stop-point of restoration
allows for private lands to use drainage system
and should not encumber private lands with additional
subsurface water.
DRAFT

Figure #13

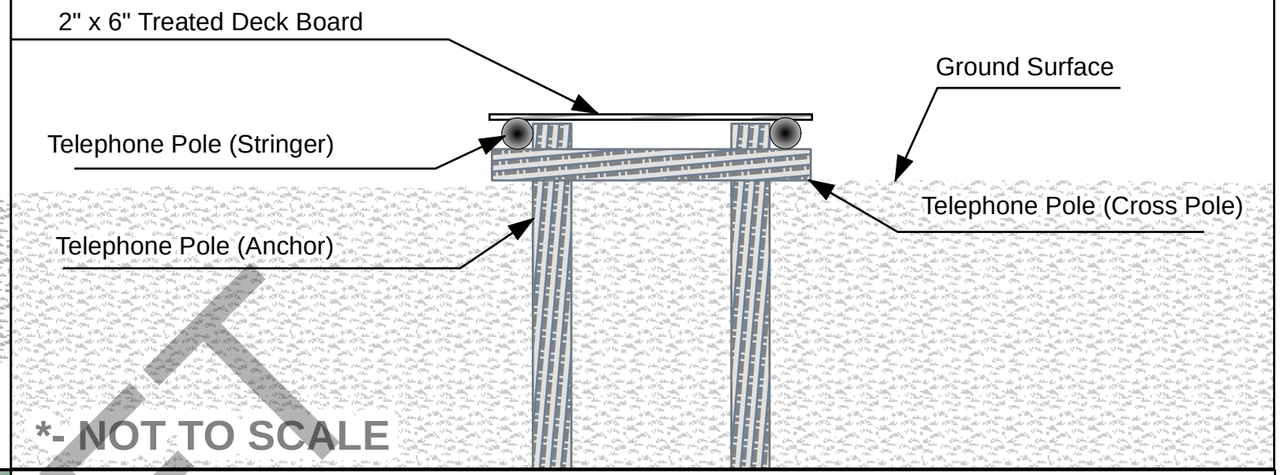
Grant-in-aid Trail Bridge Exhibit

Grant In Aid Trail Bridge (Longitudinal View)

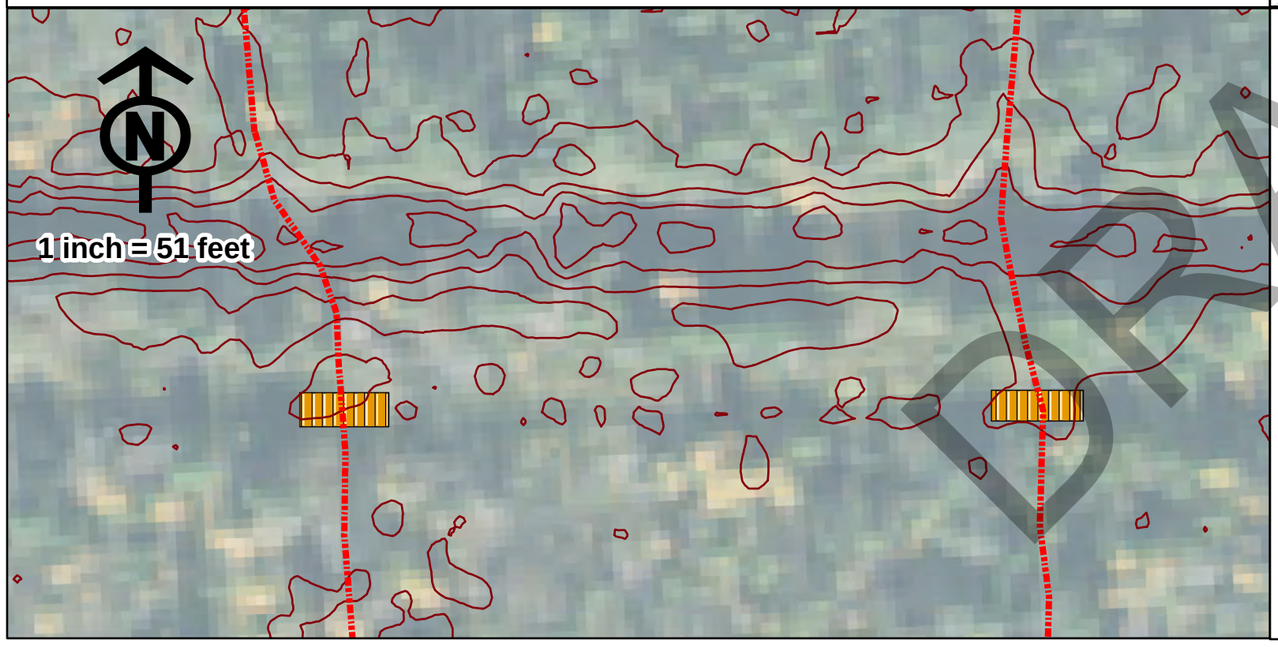


*- NOT TO SCALE

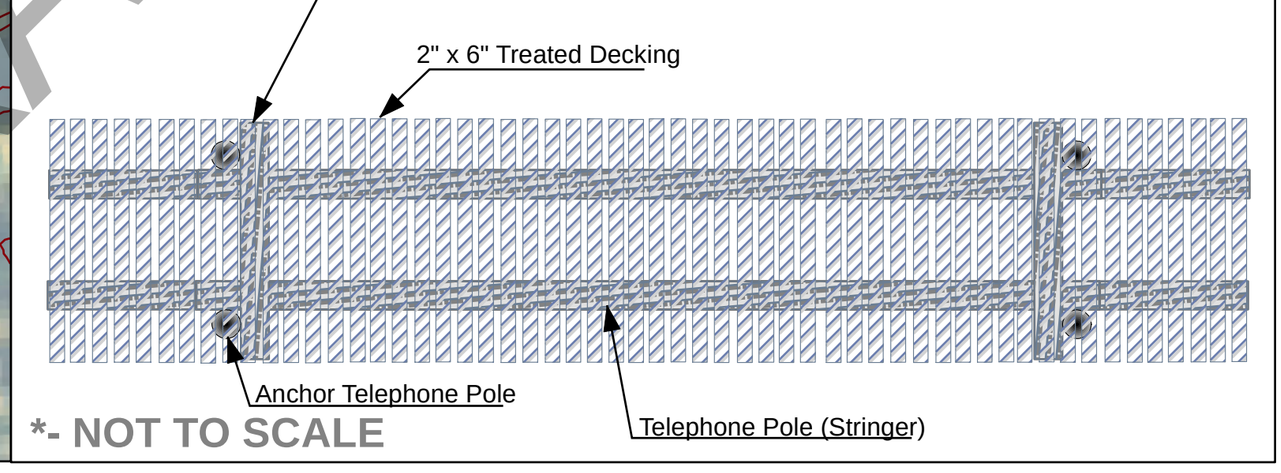
Grant In Aid Trail Bridge (Cross Section)



*- NOT TO SCALE



Grant In Aid Trail Bridge (Top View)



*- NOT TO SCALE

Trail Bridge Design

Construction Notes

1. Bridge will be constructed from treated telephone poles strung across the channel intersection with the trail. Telephone pole stringers will be decked with 2" x 6" Treated boards
2. Telephone poles shall be driven into the ground to secure the bridge location. See Achor Poles. A cross pole will be secured at ground level to the anchor poles, stringer poles will rest on the cross pole.

Construction Notes (cont.)

3. Transition/Ramp will be constructed by shortened poles secured to the stringers that angle into the existing grade of the trail.
   Transition will be decked with 2" x 6" treated boards.

Figure #14

Forestry Impact Map

Potential Forest Impacts due to Hydrology Restoration

SNA Boundary

MN_CTYPE

- 12 (Aspen) 1.7 acres
- 71 (Black Spruce Lowland) 923 acres -442 acres in SNA-
- 72 (Tamarack) 590 acres - 32 acres in SNA-
- 73 (White Cedar) 24 acres
- 75 (Stagnant Spruce) 471 acres - 311 acres in SNA-
- 76 (Stagnant Tamarack) 31 acres - 31 acres in SNA-
- 77 (Stagnant Cedar) 8.4 acres
- 78 (Offsite Aspen) 7.3 acres
- 83 (Lowland Grass) 492 acres
- 85 (Lowland Brush) 2758 acres - 11.3 acres in SNA-
- 91 (Agriculture) 0.001 acres
- 98 (Marsh) 14 acres

2015 Aerial Photograph

Figure #15

Vicinity Map


Sprague Creek SNA
Unknown or No Streetname
County Rd 118
Unknown or No Streetname
Unknown or No Streetname
Roseau Lake
State Hwy 310
County Hwy 28
County Hwy 16
Unknown or No Streetname
County Rd 123
Roseau, MN
6th St NE
3rd St NW
3rd St NE
Main Ave
5th Ave SW
Main St S
9th Ave SE
11th Ave SE
State Hwy 11
County Hwy 15
Vicinity Map
1 inch = 3,500 feet
DRAFT

Figure #16

National Wetland Inventory Map

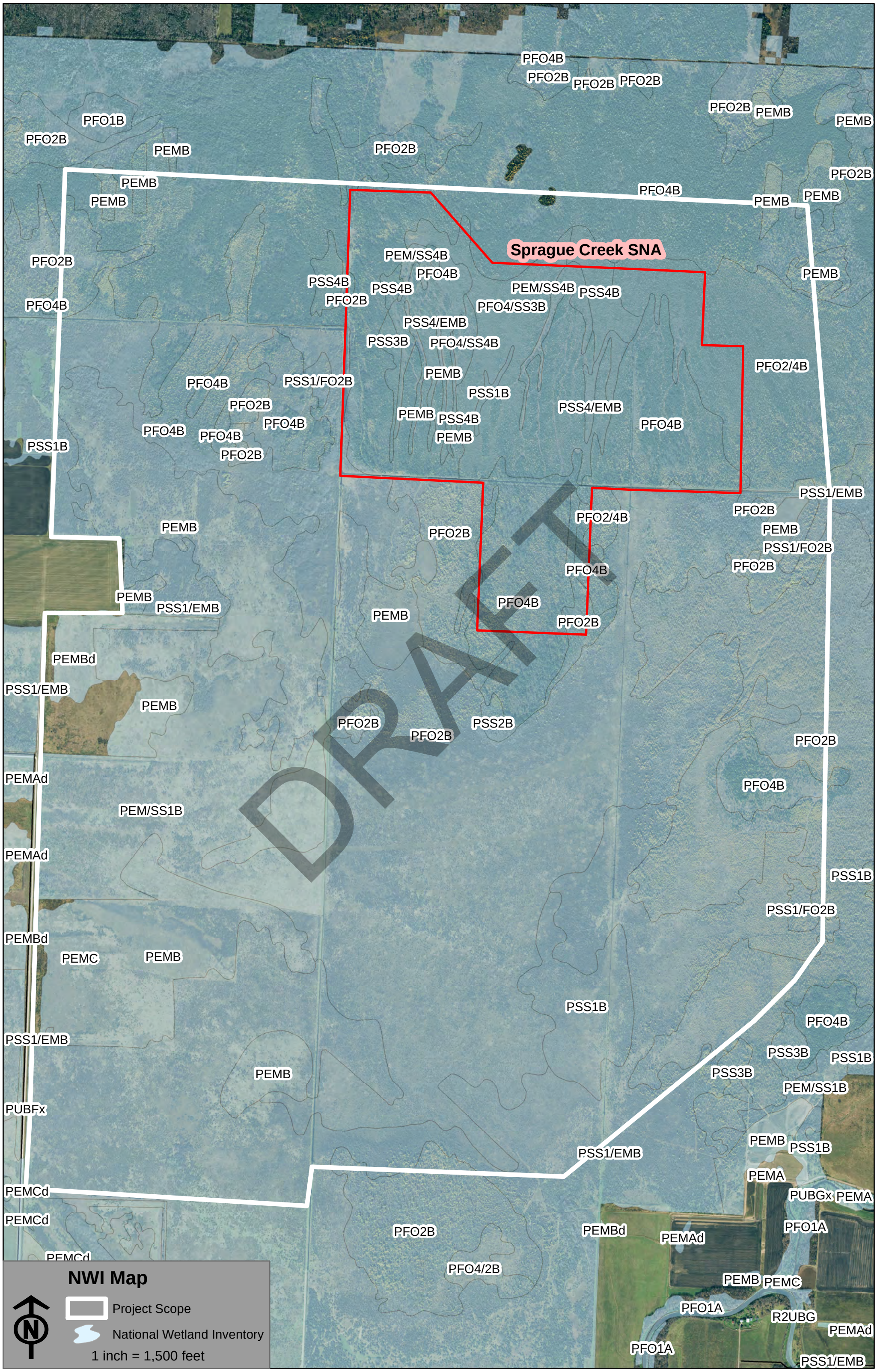

Sprague Creek SNA
PFO4B
PFO2B
PFO2B
PFO2B
PFO2B
PEMB
PEMB
PFO1B
PFO2B
PEMB
PFO2B
PFO2B
PEMB
PEMB
PFO4B
PEMB
PEMB
PFO2B
PEM/SS4B
PFO4B
PSS4B
PSS4B
PFO2B
PEM/SS4B
PSS4B
PFO4/SS3B
PFO4B
PEMB
PFO4B
PSS4/EMB
PSS3B
PFO4/SS4B
PFO2/4B
PEMB
PFO4B
PSS1/FO2B
PFO2B
PFO4B
PFO4B
PSS1B
PFO2B
PSS1B
PSS4/EMB
PEMB
PSS4B
PFO4B
PEMB
PFO2B
PSS1/EMB
PFO2B
PEMB
PFO2B
PEMB
PSS1/FO2B
PFO2B
PFO4B
PFO4B
PEMB
PSS1/EMB
PFO2B
PEMBd
PSS1/EMB
PEMB
PFO2B
PFO2B
PSS2B
PFO2B
PEMAd
PFO4B
PEM/SS1B
PEMAd
PSS1B
PSS1/FO2B
PEMBd
PEMC
PEMB
PSS1B
PFO4B
PSS1/EMB
PSS3B
PSS1B
PSS3B
PEM/SS1B
PEMB
PUBFx
PSS1/EMB
PEMB
PSS1B
PEMA
PEMCd
PUBGx
PEMA
PEMCd
PFO2B
PEMBd
PFO1A
PEMAd
PEMCd
PFO4/2B
PEMB
PEMC
PFO1A
R2UBG
PEMAd
PFO1A
PSS1/EMB
NWI Map
Project Scope
National Wetland Inventory
1 inch = 1,500 feet
DRAFT

Figure #17

LiDAR Topographic Map

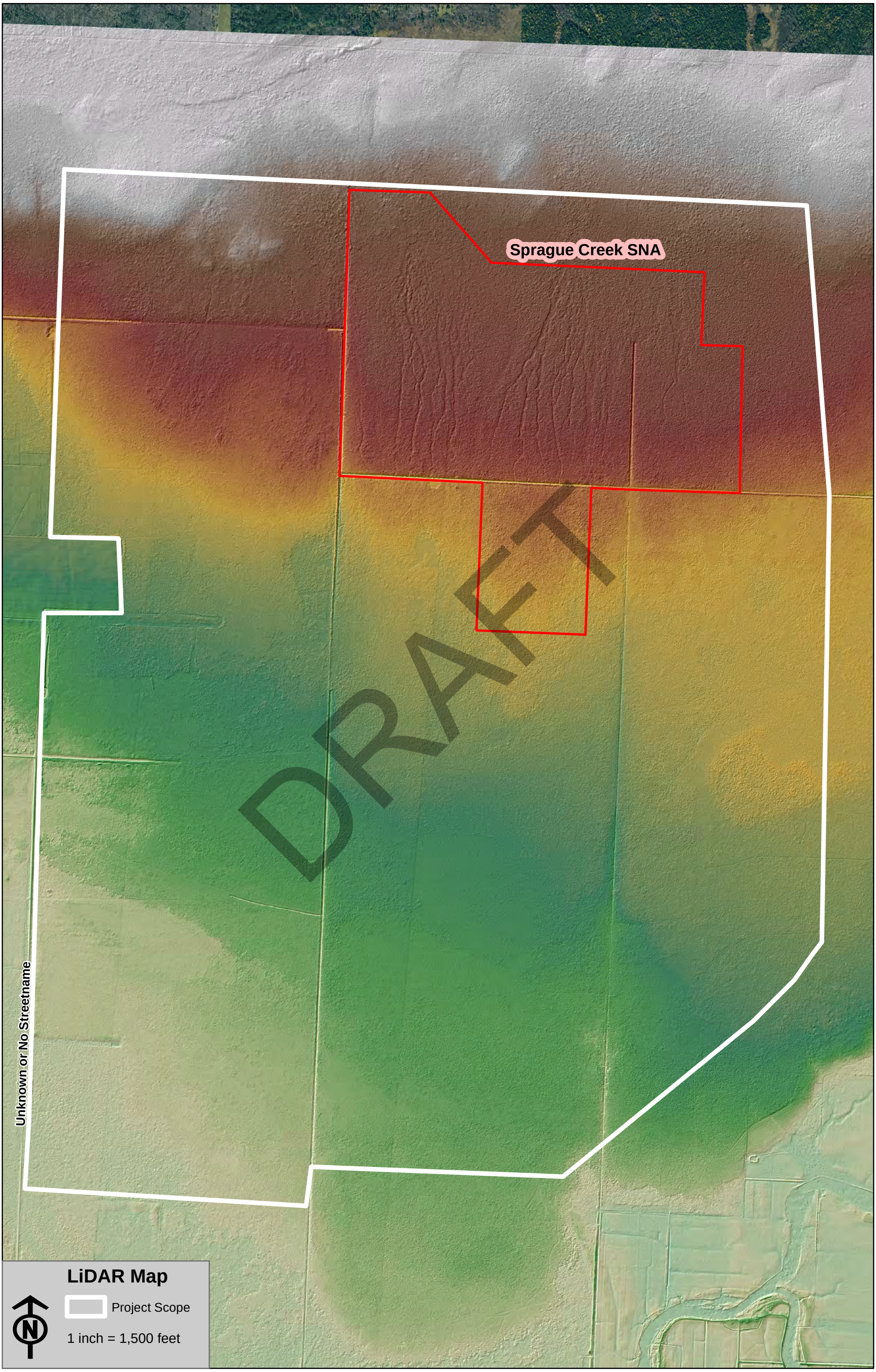

Sprague Creek SNA
DRAFT
Unknown or No Streetname
LiDAR Map
Project Scope
1 inch = 1,500 feet

Figure #18

Scientific and Natural Area (SNA) Fact Sheet

Minnesota Scientific and Natural Areas Patterned Peatlands

The vast peatlands of northern Minnesota are some of the most intriguing landscapes in the world and one of the state's most extensive ecosystems. They cover more than 10% of the state.

Unlike Minnesota's other large ecosystems such as prairies and broadleaf forests, most of Minnesota's peatlands have not been cleared or fragmented by development. The expansive, mostly unaltered patterned peatlands of the Lake Agassiz Lowlands are recognized internationally for their significance. They present a rare opportunity in Minnesota for landscape-scale conservation and research on peatland development.

Extensive glacial lake plains lie within the Laurentian Mixed Forest Province of Minnesota providing an ideal setting for the development of peatlands. An intricate relationship between vegetation, subtle topography, hydrology and climate has formed some of the largest and best developed peatlands in North America.

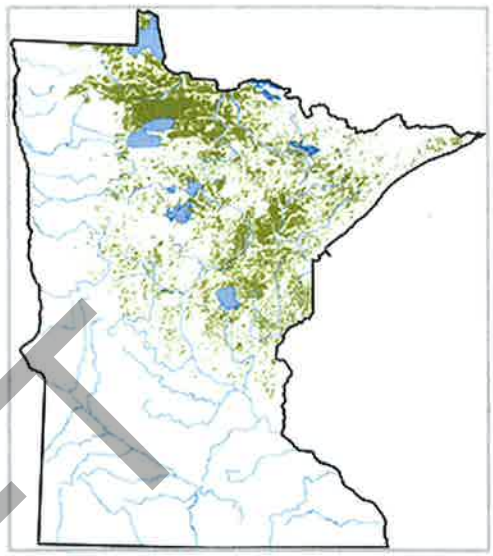
Formation

Minnesota's peatlands began to form 5-6,000 years ago when the climate cooled and precipitation increased significantly. This change in climate helped facilitate the formation of the large peatlands we see today. Peat formation exists on all continents and at all latitudes, including tropical marshes and swamps. Variations in climate, hydrology, native species, and other factors result in the considerable variety of peatland communities found around the world. Peatlands in Minnesota and latitudes farther north in Canada, Europe, and Siberia are characterized as boreal peatlands.

Peat formation requires low-oxygen conditions that prevent normal decomposition of plant debris. This occurs in areas of poor drainage where precipitation exceeds evaporation. The water table lies at or near the surface in these areas, saturating dead plant material. As a result, organic materials accumulate year-after-year, forming the partially decomposed mass known as peat.

A useful source of information on these fascinating ecosystems can be found in the book, The Patterned Peatlands of Minnesota. The book was edited by H.E. Wright, Jr., Barbara Coffin, and Norman E. Aaseng, and published by the University of Minnesota Press in 1992. Most of the information in the following discussion comes from this source.

Significance



At over 6 million acres, Minnesota has more peatlands than any other state in the U.S. except Alaska. The large, mostly unaltered peatlands of northern Minnesota are recognized regionally and internationally for their expansiveness and spectacularly patterned landscape. They provide excellent opportunities to study and understand intricate hydrological patterns that can develop over large peatland areas with diverse water chemistry, flow patterns, and ecological processes. They are also important for research on how peatlands affect the world's climate.

Minnesota's northern peatlands are more accessible to researchers relative to other large boreal peatlands in places such as Siberia and Canada's Hudson Bay lowlands. They are also relatively free of development, unlike accessible peatlands in northern Europe, which have been altered by commercial use. Minnesota's large peatlands are also among the few patterned peatlands in the world not underlain by permafrost. Permafrost makes it difficult to investigate groundwater hydrology and the subtle drainage systems essential to peatland formation and development.

By accumulating dead organic matter as peat, peatlands play a significant role in carbon sequestration and the global carbon cycle, and scientists are extremely interested in understanding any effects of climate change on the world's peatlands. Minnesota's large peatlands are unusual in North America in their proximity to the prairie-forest border. The highly developed and patterned Red Lake Peatland in north central Minnesota is, in fact, within 50 miles of the prairie border. At this boundary, evapotranspiration begins to exceed precipitation and conditions become unfavorable for peatland development. As a result, these peatlands are considered especially vulnerable to fluctuations in climate and may provide scientists with early indication of the effects of climate change on North America's peatlands.

Peatlands also offer opportunities to research the complex adaptations of living organisms to their environment, as harsh environmental conditions in peatlands present challenges to plant and animal species. Among the species that are adapted to peatland environments in Minnesota are a number of uncommon animals, including northern bog lemming, short-eared owl, yellow rail, and Wilson's phalarope, which rely on peatlands for shelter, food, breeding habitat, and migration corridors. Minnesota's peatlands also provide refuges for several endangered, threatened, or special concern plant species in the state, including linear-leaved sundew, English sundew, coastal sedge, twig rush, bog rush, sooty colored beak-rush, and montane yellow-eyed grass.

In recognition of their significance, the legislature enacted the Wetland Conservation Act of 1991 (WCA), which established 18 peatland Scientific and Natural Areas.

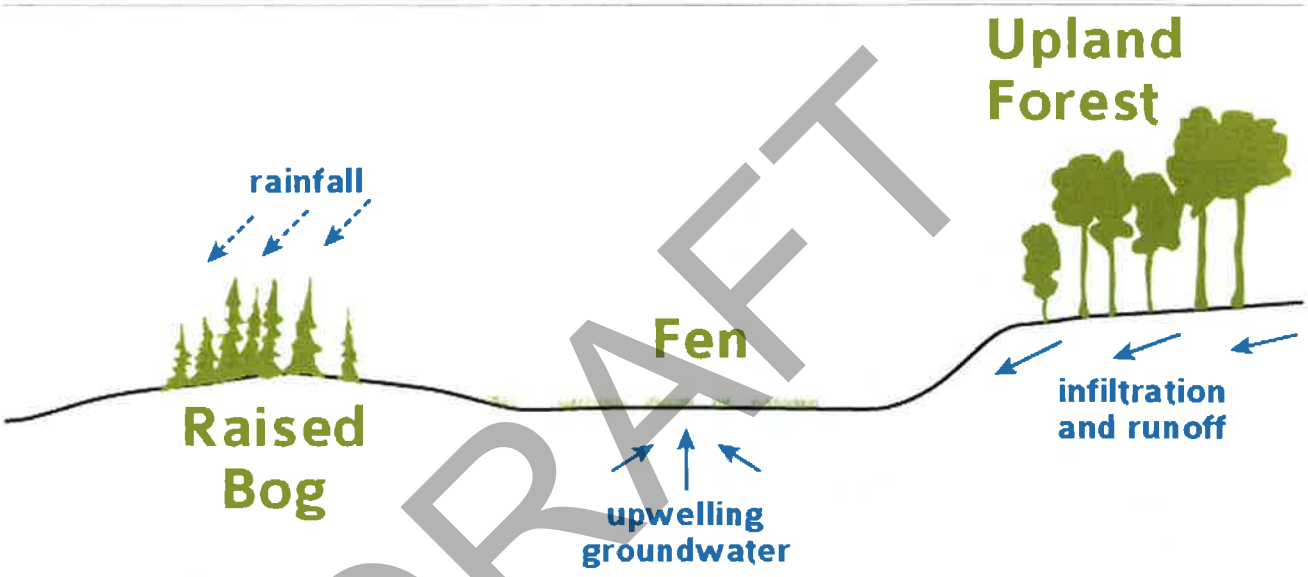
Bogs and Fens

Peatland vegetation reflects the relationships among plants, topography, climate, and water, which are very different from those found on other Minnesota landscapes. Boreal peatland plant communities can be divided into two groups, bogs and fens.

Bogs develop where peat builds up over time and the peat surface becomes elevated, isolating it from mineral-rich runoff or groundwater. In these settings, all nutrient inputs come solely from precipitation and wind-blown dust. Surface water in these systems is very acidic (pH <4.2). Fewer plants and animals have adapted to these conditions than in fens and other wetland communities. Sphagnum mosses, ericaceous shrubs (plants in the heath family such as leather leaf), and sedges dominate the ground layer. Bogs may either be forested, with sparse to patchy canopies of stunted (less than 30 feet tall) black spruce and occasional tamarack trees; or open, with trees either absent or scattered and short.

Fens have groundwater that has percolated through mineral soil, flowing continuously at or near the surface and in contact with plant roots. Surface water pH is moderately acidic to neutral, ranging from 5.6 to 7.0. Fens appear like saturated meadows, with abundant sedges, rushes, and other grass-like plants, as well as occasional shrubs, and scattered stunted trees, such as tamarack.

Water flow and sources in bogs and fens



Peatland Landforms

The amount of moving water varies throughout peatlands, and complex patterns can develop in response to subtle gradients in water flow and chemistry. These patterned peatlands are composed of complexes of bogs and/or fens. Three landforms are common in Minnesota's northern peatlands: raised bogs, water tracks, and spring fens. They can occur individually within a peatland or together in complexes of various combinations and stages of development.

Raised bogs are one of Minnesota's most prominent peat landforms. These forested areas are domed in cross section, isolating the bog surface from mineral-rich runoff draining from adjacent uplands. When a bog has developed sufficiently in elevation, it forms a **crest** of black spruce that radiates out from the center, when viewed from aerial photos. Trees gradually become more stunted downslope from the crest as the peat becomes more saturated. At the lower margins, spruce trees give way to non-forested sphagnum lawns (muskeg). Raised bogs can also occur as **circular** or, **egg-shaped ovoid islands** that lack crests of black spruce. Circular or ovoid islands

generally form when adjacent to water tracks (see below).

Water tracks are fen areas in peatlands that look like river channels on aerial photos. They are concave in cross section and oriented downslope in the direction of water flow. Water flow is imperceptible on the ground because of the very subtle change in topography (1 foot in elevation for every 1,000 to 2,000 feet of distance). Water tracks are often bordered by swamp forests or raised bogs. A water track may be patterned or featureless:

Patterned water tracks or fens contain networks of peat ridges (known as ribs or strings) and pools (known as flarks) that form perpendicularly to the slope and flow of water. These patterns resemble ripples when viewed from aerial photos. These water tracks may also contain **teardrop-shaped tree islands**, that are oriented parallel to the prevailing slope and flow of water.

- **Featureless water tracks** lack the ripple patterns of patterned water tracks, although they may have linear bands of tree islands parallel to the flow of water.

Spring fens develop where groundwater wells up strongly, through the peat layer. The flow of discharging groundwater forms a network of narrow **channels** that flow through and dissect black spruce and tamarack swamp forest. The channels often rejoin as they flow, creating small linear-shaped swamp forest **islands**. The water in spring fens is cold, oxygen poor, and highly calcareous (alkaline), reflecting the ground water source.

The table below shows the kinds of landforms in each of Minnesota's 18 peatland SNAs.

Peatland Landforms in Minnesota Peatland SNAs

Peatland SNA	Raised bogs			Water track fens			Spring fens
	Crested bog	Ovoid island	Circular island	Patterned water track	Featureless water track	Teardrop island	Channels/ islands
East Rat Root River	★				★		
Hole in the Bog	★						
Lost Lake	★			★	★		
Lost River	★			★	★	★	★

Luxemberg				★	★		
Mulligan Lake				★	★	★	
Myrtle Lake	★	★	★	★	★	★	★
Nett Lake							★
Norris Camp				★	★		
North Black River	★	★		★	★		
Pine Creek				★	★		★
Red Lake	★	★	★	★	★	★	
Sand Lake	★			★	★		
South Black River	★			★	★		
Sprague Creek							★
Wawina	★	★			★		
West Rat Root River	★				★		
Winter Road Lake				★	★		

Peatland Plants

Despite the harsh conditions of peatland environments, a variety of plants are well adapted to these wetland types. Most plants are evergreen to retain scarce nutrients, in contrast with deciduous plants, which lose nutrients when leaves are shed. Many plants, such as the ericaceous shrubs leather leaf and Labrador tea, have thick leathery leaves and alkaloids in leaf tissue to reduce browsing. Most peatland plants are adapted to survive with very low nutrient concentrations. A few characteristic peatland species, such as pitcher plant, sundews, and bladderworts, have developed ways of capturing and digesting insects to supplement nutrients.

Characteristic bog and fen plants

Characteristic	Bog	Fen
Forest	Black spruce or occasional tamarack (in forested bogs)	Usually absent or small and scattered if at all present
Shrubs	Ericaceous species including, Labrador tea, leatherleaf, swamp laurel, and bog rosemary	Bog birch, willows
Ground layer	Sedges, cotton grasses, and a nearly continuous mat of sphagnum moss species	Sedges, brown mosses (sphagnum moss species are not abundant if present), and aquatic species

Peatland Animals

Peatlands provide relatively sparse cover and food for large animals, so **few large mammals** are associated with peatlands. Woodland caribou did thrive in Minnesota's large peatlands until their migration routes to Canadian breeding grounds were cut off in the 1900s. The small bands that were stranded in Minnesota peatlands died off. Moose and timber wolves inhabit the edges of the peatlands, where forest cover and browse species are available. Construction of ditches during early statehood has allowed beaver and muskrat to increase in numbers in peatlands, along with predators, otter and mink.

As with large mammals, few **small mammals** species inhabit peatlands. Many mammals require dry nest sites, shelter, upland food sources, or sites for burrowing, which peatlands do not provide. Bog lemmings are one of the few small mammals specifically adapted to peatland habitats. Some species of shrews and voles also inhabit peatlands. Although animals of the peatlands may be difficult to observe directly, watchful visitors can find evidence of their activity, such as sedge "haystacks" piled in the sun (bog lemmings), heaps of spruce cone bracts (red squirrel), or pruned alder stems (snowshoe hare).

Migratory **bird species** bring interest to the peatlands in spring and summer breeding months. Their preferences for food and cover draw them to bog or fen habitats, as shown in table below. Great gray owls are permanent residents of northern Minnesota's peatlands, nesting in forested peatlands. No federal or state endangered or threatened bird species occur in Minnesota's peatlands, although 14 state special concern species use open fen or peatland forest habitat.

Preferred peatland habitat of bird species

Vegetation	Birds that prefer bogs	Birds that prefer fens
Trees or shrubby habitat	Connecticut warbler Yellow-rumped warbler Nashville warbler Palm warbler Hermit thrush Yellow-bellied flycatcher Dark-eyed junco	Alder flycatcher Swamp sparrow Common yellow-throated LeConte's sparrow Yellow Warbler

	Chipping sparrow Lincoln's sparrow	
Meadow or grassy habitat	Savannah sparrow	Savannah sparrow Bobolink Sandhill Sedge wren

Amphibians and reptiles that inhabit peatlands are relatively limited. More frogs and toads are adapted to this environment than turtles, lizards, and snakes. Species' requirements for moisture, pH levels, temperature, and nutrition govern distribution. For example, terrestrial burrowers and aquatic species that require deep water that does not freeze to the bottom are generally absent. Species that need to breed early in spring to reproduce successfully are limited by the short summer season. Acidity of bog water affects the survival of creatures using it as a breeding medium.

Insects inhabit the peatlands in abundance, though there remains much to be learned about them. Visitors will find ample mosquitoes, damselflies, dragonflies, and deerflies.

OPn93

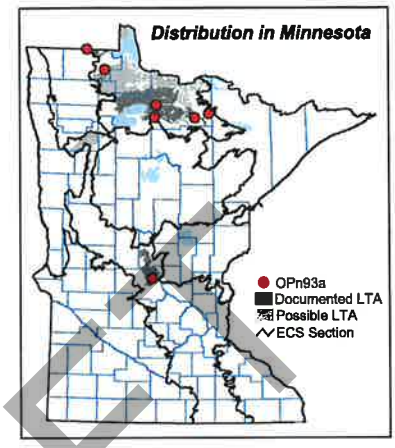
OPEN RICH PEATLAND SYSTEM
Northern Floristic Region

Northern Extremely Rich Fen

Open peatlands dominated by fine-leaved graminoids scattered in channels of standing water. Present in areas of calcium-rich groundwater discharge in large patterned peatlands.

Vegetation Structure & Composition

Description is based on summary of vascular plant data from 8 plots (relevés).



- **Moss layer** is dominated by brown mosses such as *Scorpidium scorpoides*.
- **Graminoid layer** is characterized by fine-leaved graminoids such as candle-lantern sedge *(Carex limosa)*, tufted bulrush *(Scirpus cespitosus)*, twig rush *(Cladium mariscoides)*, and fen wiregrass sedge *(Carex lasiocarpa)* scattered in channels of standing water.
- **Forb layer** is sparse, usually with < 25% cover. Pitcher plant *(Sarracenia purpurea)*, buckbean *(Menyanthes trifoliata)*, and intermediate bladderwort *(Utricularia intermedia)* are typically present, with seaside arrowgrass *(Triglochin maritima)* common.
- **Shrub** cover is sparse (< 5%), with bog birch *(Betula pumila)* typically present and shrubby cinquefoil *(Potentilla fruticosa)* occasional.
- **Tree layer** is sparse (< 5% cover), with scattered stunted white cedar typically present and tamarack common.
- **Notes:** High Ca^{++} concentrations in groundwater discharge create conditions favorable for calciophilic species such as tufted bulrush *(Scirpus cespitosus)*, Kalm's lobelia *(Lobelia kalmii)*, grass-of-Parnassus *(Parnassia* spp.), and rare species such as twig rush *(Cladium mariscoides)*, sterile sedge *(Carex sterilis)*, hair-like beak rush *(Rhynchospora capillacea)*, marsh arrowgrass *(Triglochin palustris)*, and beaked spikerush *(Eleocharis rostellata)*.

Landscape Setting & Soils

OPn93 is rare, occurring mainly in large patterned peatlands in the MOP that have an interconnecting network of nonforested channels draining through conifer swamp forests. OPn93 has also been documented in a few smaller peatlands in areas of calcareous glacial till south and west of the MOP. Substrate is deep peat (> 15in [40cm]). Calcium carbonate precipitates are common, forming marl in pools.

Natural History

OPn93 develops in areas where highly calcareous groundwater is discharged from underlying calcareous mineral soil and forced through peat by artesian pressure. Water in OPn93 is characterized by high pH (> 7.0) and high Ca^{++} concentrations, providing conditions favorable for calciophilic species. Cold water temperatures, low dissolved oxygen content, and high water levels likely minimize competition from species that dominate fen areas lacking significant calcareous groundwater discharge. The unique hydrological conditions of sites where OPn93 occurs are very rare.

Similar Native Plant Community Classes

- **OPp93 Prairie Extremely Rich Fen**

OPp93 and OPn93 are both calcareous fens and have similar hydrology and water chemistry. OPp93 occurs within the prairie region of Minnesota and has prairie species that are absent from OPn93. Conversely, OPn93 has a number of species from the

northern forest region that are absent from OPp93.

OPn93 Indicator Species	(freq%) OPn93	OPp93
Bog rosemary *(Andromeda glaucophylla)*	89	-
Intermediate bladderwort *(Utricularia intermedia)*	78	-
White cedar (U)	67	-
White beak rush *(Rhynchospora alba)*	44	-
Twig rush *(Cladium mariscoides)*	67	4
Buckbean *(Menyanthes trifoliata)*	78	6
Pitcher plant *(Sarracenia purpurea)*	89	9
Candle-lantern sedge *(Carex limosa)*	89	13

OPp93 Indicator Species	(freq%) OPn93	OPp93
Spotted Joe pye weed *(Eupatorium maculatum)*	-	71
Mat muhly grass *(Muhlenbergia richardsonis)*	-	69
Flat-topped aster *(Aster umbellatus)*	-	67
Narrow reedgrass *(Calamagrostis stricta)*	-	54
Big bluestem *(Andropogon gerardii)*	-	49
Northern bedstraw *(Galium boreale)*	-	47
Riddell's goldenrod *(Solidago riddellii)*	-	45
Marsh arrowgrass *(Triglochin palustris)*	-	38

- **OPn91 Northern Rich Fen (Water Track)**

Graminoid-dominated occurrences of OPn91 (OPn91b) are similar to OPn93 but occur in water tracks and do not have upwelling of groundwater discharge or marl precipitates.

OPn93 Indicator Species	(freq%) OPn93	OPn91
Beaked spikerush *(Eleocharis rostellata)*	38	-
Slender sedge *(Carex echinata)*	25	-
Sterile sedge *(Carex sterilis)*	25	-
White cedar (U)	75	4
Dwarf alder *(Rhamnus alnifolia)*	25	2
American grass-of-Parnassus *(Parnassia glauca)*	25	2
Twig rush *(Cladium mariscoides)*	75	7
Shrubby cinquefoil *(Potentilla fruticosa)*	38	7

OPn91 Indicator Species	(freq%) OPn93	OPn91
Water horsetail *(Equisetum fluviatile)*	-	47
Bog willow *(Salix pedicellaris)*	-	36
Leatherleaf *(Chamaedaphne calyculata)*	-	29
Marsh cinquefoil *(Potentilla palustris)*	-	22
Slender cottongrass *(Eriophorum gracile)*	-	22
Creeping sedge *(Carex chordorrhiza)*	13	69
Scheuchzeria *(Scheuchzeria palustris)*	13	60
Small cranberry *(Vaccinium oxycoccos)*	13	42

Native Plant Community Types in Class

- **OPn93a Spring Fen**

OPn93a is the only community type recognized in this class.

OPn93 Northern Extremely Rich Fen – Species Frequency & Cover

	freq%	cover
Forbs		
Pitcher plant *(Sarracenia purpurea)*	89	•
Intermediate bladderwort *(Utricularia intermedia)*	78	•
Buckbean *(Menyanthes trifoliata)*	78	••
Kalm's lobelia *(Lobelia kalmii)*	56	•
Seaside arrowgrass *(Triglochin maritima)*	56	•
Marsh grass-of-Parnassus *(Parnassia palustris)*	44	•
Horned bladderwort *(Utricularia cornuta)*	33	•
Round-leaved sundew *(Drosera rotundifolia)*	33	•
English sundew *(Drosera anglica)*	33	•
Bog aster *(Aster borealis)*	33	•
American grass-of-Parnassus *(Parnassia glauca)*	22	•
Spatulate-leaved sundew *(Drosera intermedia)*	22	•
Marsh bellflower *(Campanula aparinoides)*	11	•
Labrador bedstraw *(Galium labradoricum)*	11	•
Wild calla *(Calla palustris)*	11	•
Marsh cinquefoil *(Potentilla palustris)*	11	•
Lesser bladderwort *(Utricularia minor)*	11	•
Sticky false asphodel *(Tofieldia glutinosa)*	11	•
Grasses & Sedges		
Candle-lantern sedge *(Carex limosa)*	89	•
Tufted bulrush *(Scirpus cespitosus)*	78	•••
Fen wiregrass sedge *(Carex lasiocarpa)*	78	••••
Flattened spikerush *(Eleocharis compressa)*	67	•
Twig rush *(Cladium mariscoides)*	67	•••
Common reed grass *(Phragmites australis)*	56	••
Lead-colored sedge *(Carex livida)*	44	•
White beak rush *(Rhynchospora alba)*	44	•
Interior sedge *(Carex interior)*	33	•
Hudson Bay bulrush *(Scirpus hudsonianus)*	33	•
Beaked spikerush *(Eleocharis rostellata)*	33	•••
Creeping sedge *(Carex chordorrhiza)*	22	•
Clustered muhly grass *(Muhlenbergia glomerata)*	22	•
Slender sedge *(Carex echinata)*	22	•
Coastal sedge *(Carex exilis)*	22	••
Sterile sedge *(Carex sterilis)*	22	••
Prairie sedge *(Carex prairea)*	11	•
Soft stem bulrush *(Scirpus validus)*	11	•
Low Shrubs		
Bog rosemary *(Andromeda glaucophylla)*	89	•
Labrador tea *(Ledum groenlandicum)*	22	•
Small cranberry *(Vaccinium oxycoccos)*	22	•
Tall Shrubs		
Bog birch *(Betula pumila)*	78	•
Shrubby cinquefoil *(Potentilla fruticosa)*	33	••
Dwarf alder *(Rhamnus alnifolia)*	22	•
Tree Seedlings or Saplings (< 6ft)		
White cedar	67	•
Tamarack	56	•••
Black spruce	33	•

Figure #19

Spring Channel Longitudinal Profile Assessment

Sprague Creek Scientific and Natural Area (SNA)

Spring Channel Longitudinal Profile Assessment

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Comparison of Hydrologic Restoration Strategies, Sprague Creek SNA and The Superior Wetland Bank

Spring Channel (#16) South Aspect, Sprague Creek SNA February 2018

Photo located approximately 2,000ft north of JD61 Lat7 BR1

Prepared by: Torin McCormack – Roseau River Watershed District (RRWD)

In Collaboration with: Randy Prachar – Roseau River Wildlife Management Area (RRWMA)

Introduction

The Sprague Creek SNA and surrounding wetlands were identified as a wetland mitigation opportunity to compensate unavoidable wetland impacts from the Roseau Lake Restoration Project. The potential for restoration and by effect mitigation credit, is predicated on restoring hydrologic connectivity to large wetland complexes impacted by excavation of ditches and compaction of spoil.

The project partners (RRWMA & RRWD) submitted a draft mitigation proposal for review by all divisions of natural resources that would have jurisdiction, expertise, or administrative roles in any actions occurring in the scope of work. Following the draft submittal, a conference call occurred on March 2nd to discuss the project potential, concerns, information gaps, and necessary monitoring required.

The information provided in the first portion of the report analyzes the profile elevation along identified spring channels across the legal ditch system (Judicial Ditch 61, Lateral 7, Branch 1). The information generated will aid in determining potential adverse impacts of removing spoil bank and re-routing hydrology on a southward gradient. There were concerns raised the March 2nd conference call regarding impounding water inadvertently through proposed restoration, and the adverse effects that changes in hydroperiod and depth could have on unique plant species/communities.

The second portion of the report analyzes a watershed scale peatland restoration at The Superior Wetland Bank and its implications on design and selection of restoration practices. The latter portion of the report analyzes issues realized on a completed site, and how these issues have informed decision making for the Sprague Creek site.

Spring Channel Longitudinal Profile Assessment

Methods

Conducting a traditional field survey within the Sprague Creek SNA would be ineffective and inefficient at collection of elevation data. There are 23 channels identified within the scope of this report which are set in undulating terrain with low slope (0-2%). Nearly all the channels are unidentifiable near ditch intersection, due to forest succession.

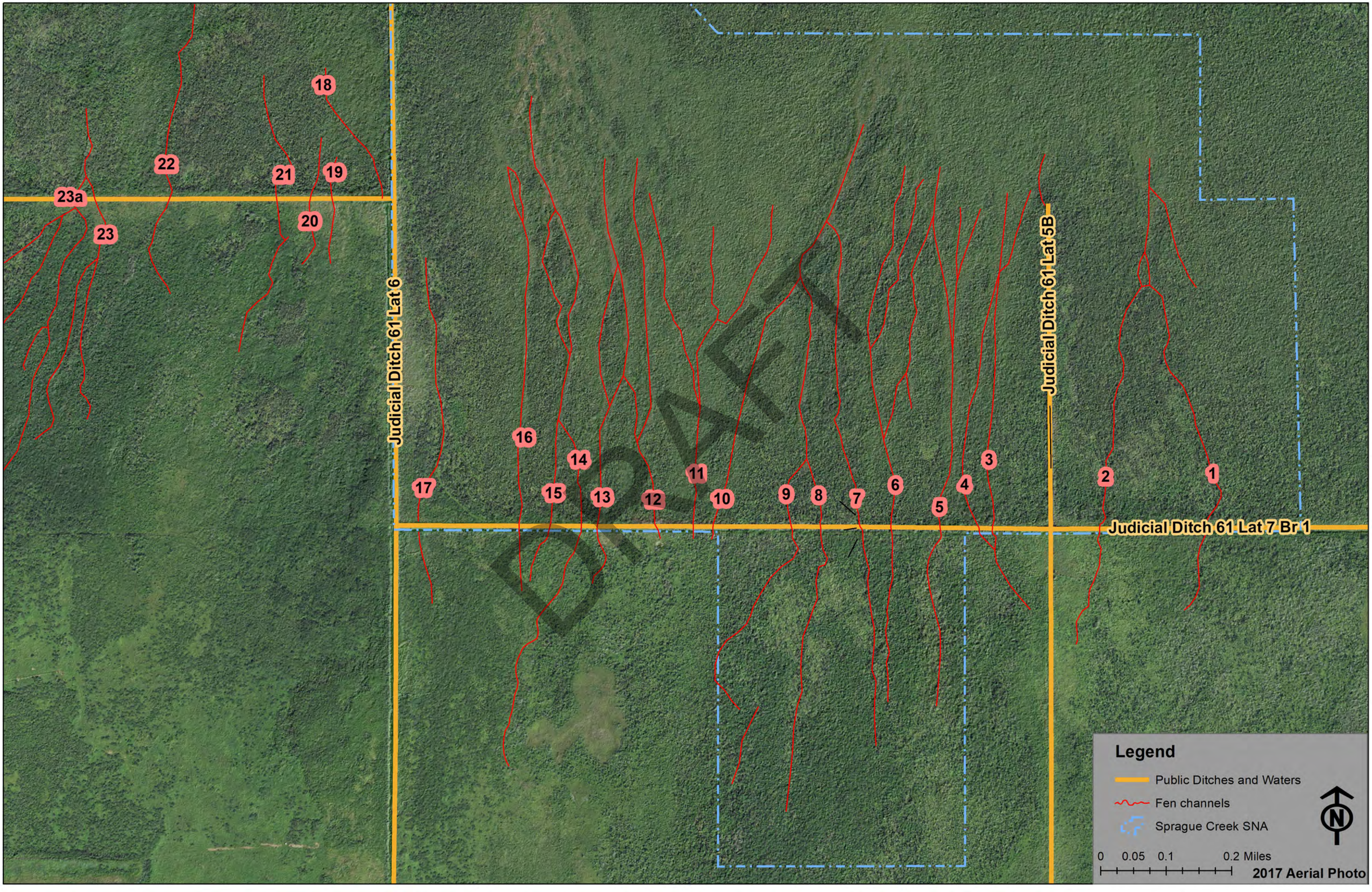
Due to the characteristics of the site and degree of succession, terrain analysis utilizing 1 Meter Digital Elevation Model (DEM) was the preferred method of collecting elevation data. This process involves converting the DEM raster data into gridded vector data in GIS.

The first step in the process was clipping the DEM to the limits of the study area. Second, the DEM was converted from raster to vector data, creating a grid of points at the centroid of each pixel of the original DEM. The third step involved converting the spring channels line data to points data in equal intervals, this was completed using Hawth's Tools (paths to points) to create 1-meter stations along the spring channel. The stations were then snapped to the nearest centroid manually in editor, to overlay the stations with a centroid value. The final step within ArcGIS was running a spatial join of the station points and centroids, which creates a dataset and attribute table including the station id (length) with elevation data (height).

The attribute table generated from each channels profile were exported into Microsoft excel, elevation data originally in meters was converted to feet, and graphs were generated to provide a visual representation of the terrain.

Discussion

Profiles were generated for 23 spring channels (1-17,19-23a) beginning 30-60 meters north of the ditch and extending 30-40 meters south of the spoil. Profile alignments were delineated from historical aerial photography and LiDAR interpolation. Ten of the profiles included an addition profile (Noted in chart as *LiDAR adjustment*) to provide terrain derived alignments addressing potential downstream discrepancies in elevation. The graphs for each spring channel illustrate elevation over distance, with the x-axis illustrating station numbers in meters and the y-axis depicting elevation above mean sea level.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Sprague Creek SNA
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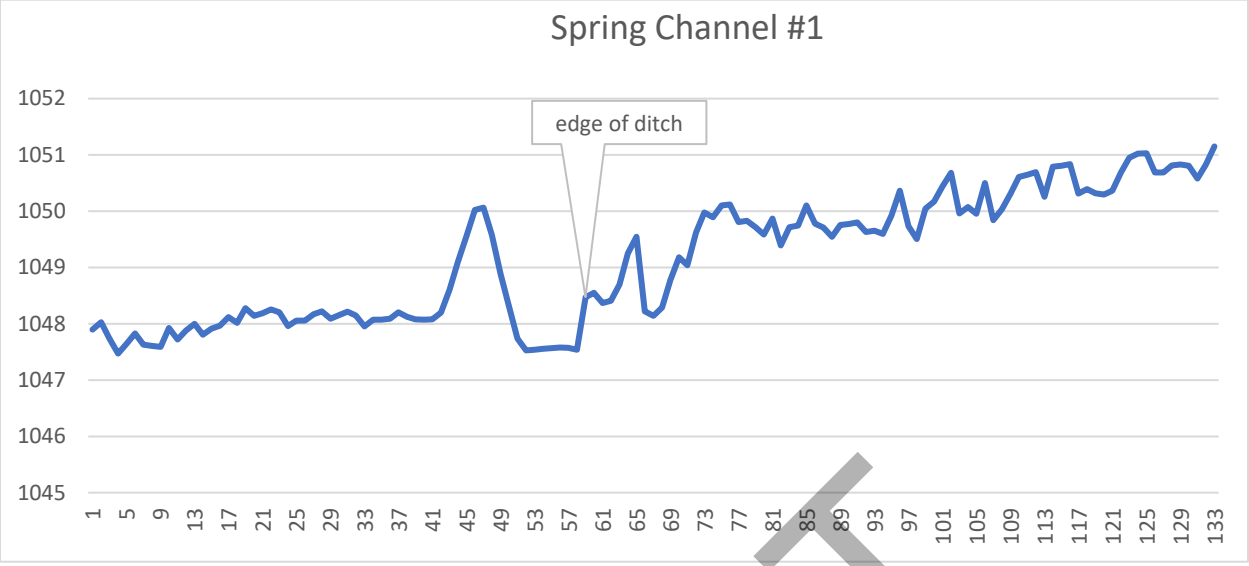
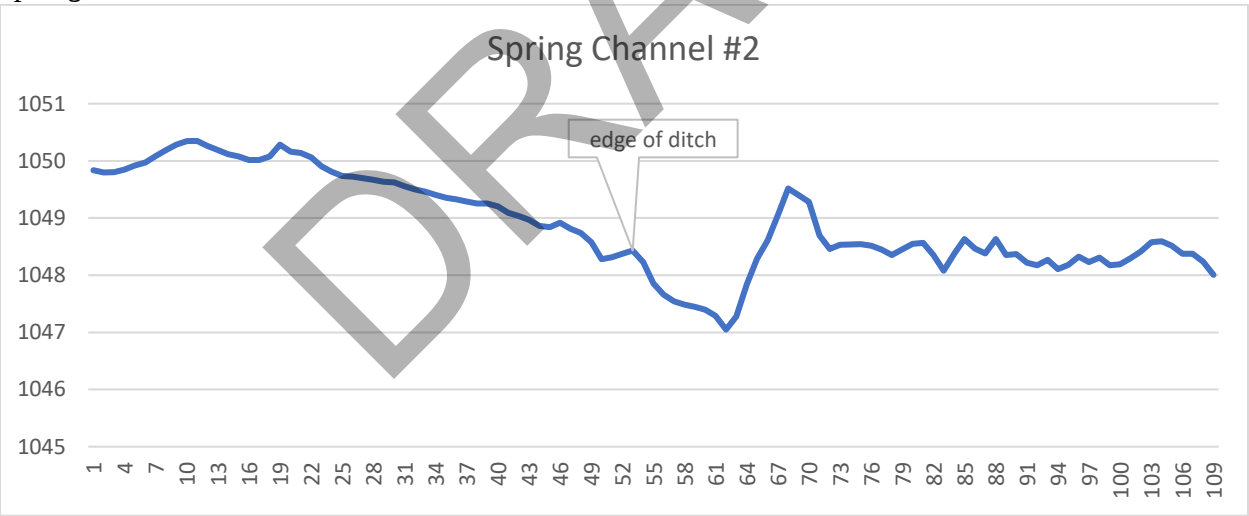
2017 Aerial Photo

Spring Channel #1



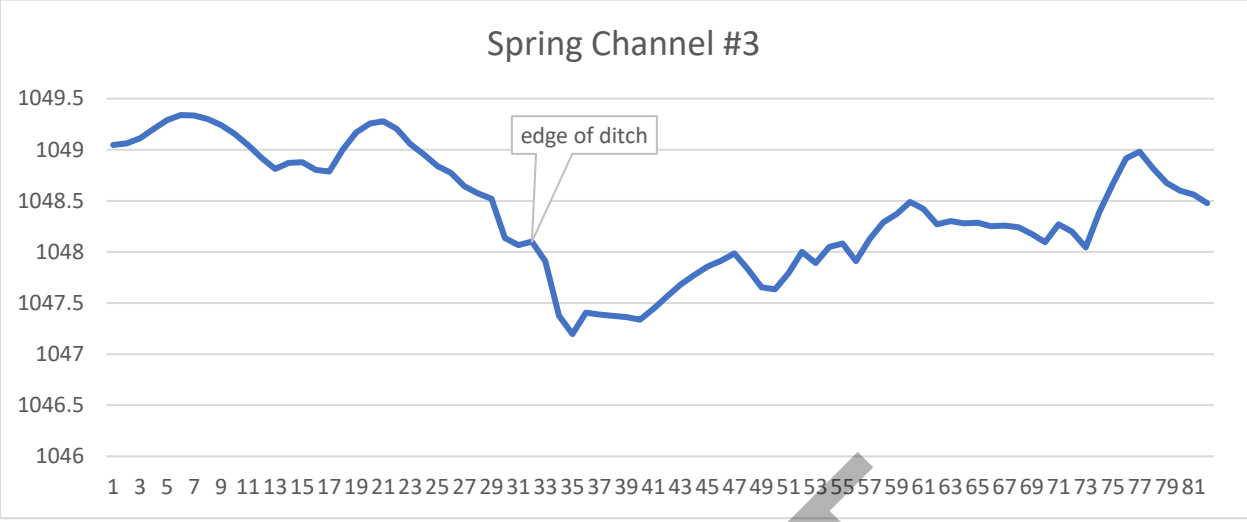
Channel #1 is the easternmost channel within the project. The profile shows elevation from south to north (left to right) of ground or water surface. Based on the elevation of the north edge of ditch in relation to land immediately south of the spoil bank, there should be no backwatering impact on land to the north from a potential ditch plug.

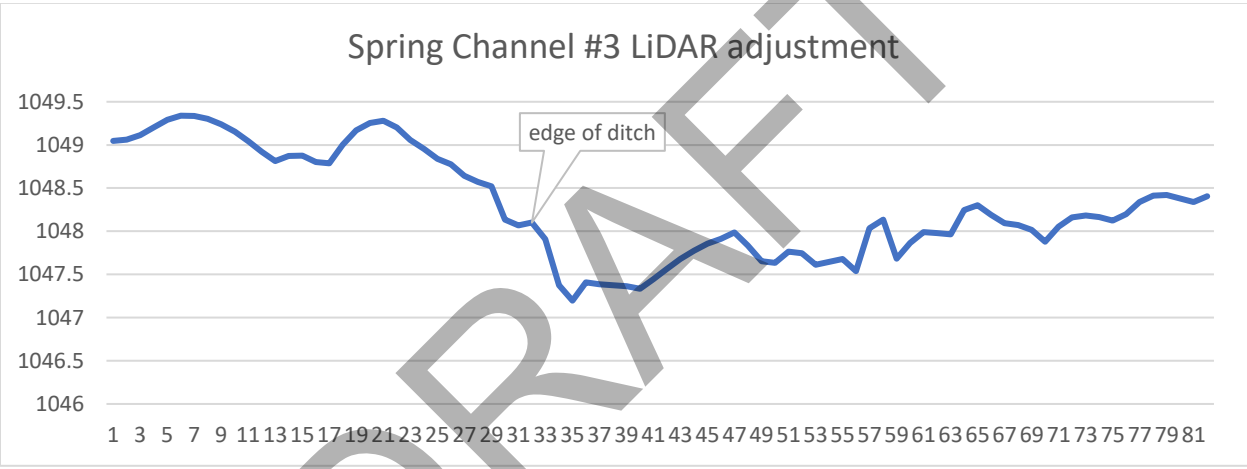
Spring Channel #2



The profile depicts elevation from north to south (left to right). Based on the elevation of the north ditch edge and the ground south of the spoil, plugging the ditch adjacent to the channel may impound 0.1-0.2” of surface water along 3 meters of the ditch fringe.

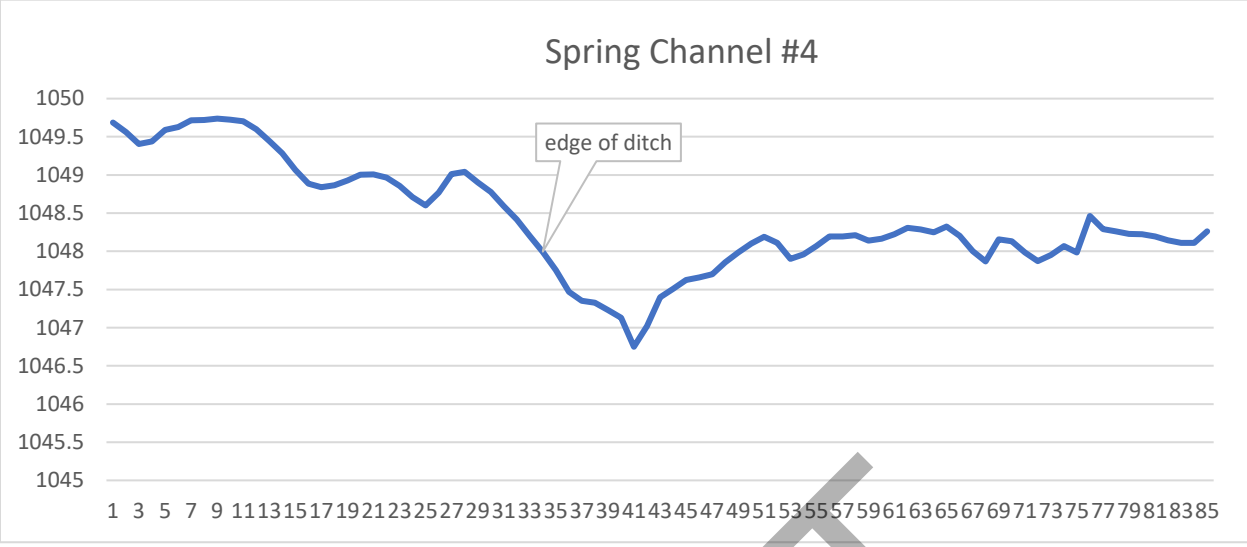
Spring Channel #3

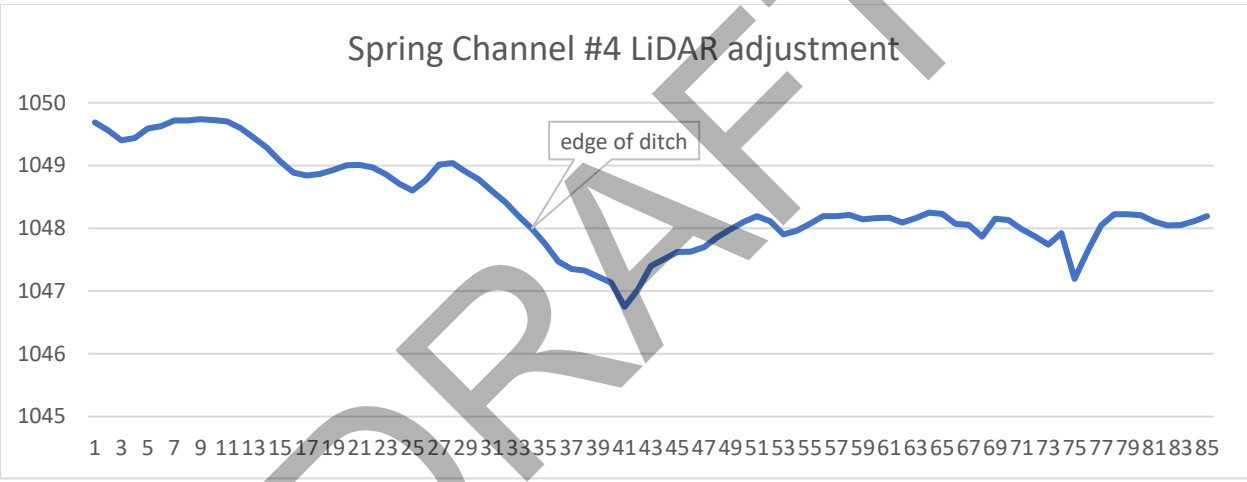




The profile depicts elevation from north to south (left to right). The original channel alignment depicted a rise in terrain south of the ditch, the rise would potentially impound 9 meters of the north ditch fringe. Depth of inundation would be approximately 0.5 feet for 3 meters of the fringe and 1 foot the remaining 6 meters. To determine if the potential inundation reflected the terrain, a LiDAR adjustment downstream of the ditch routed channel #3 along the path of "least resistance". The adjusted profile did encounter inundation, however only to a depth of 0.5ft for 4 meters of fringe.

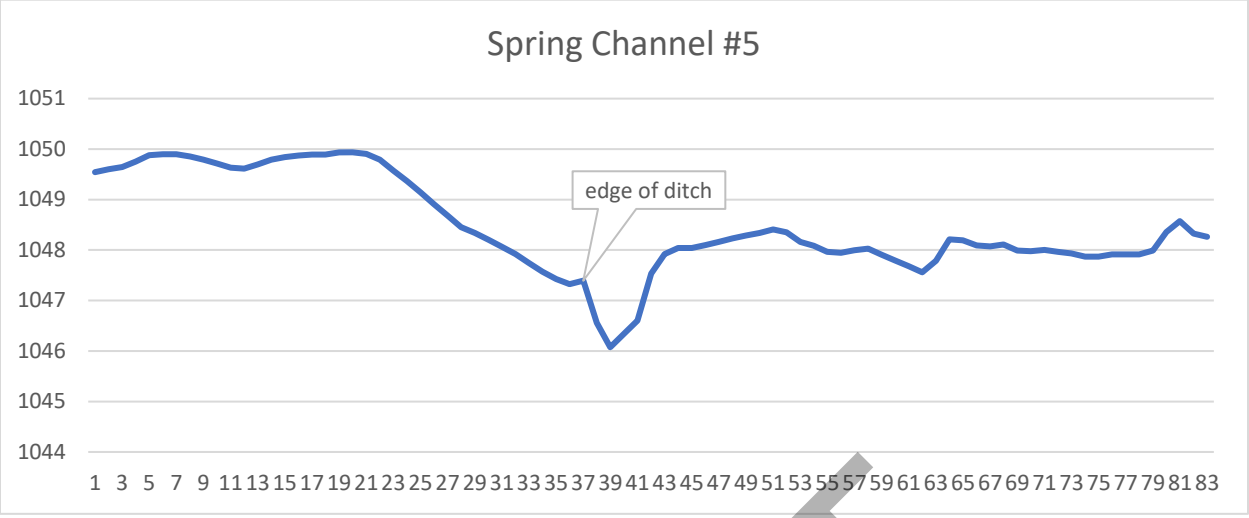
Spring Channel #4

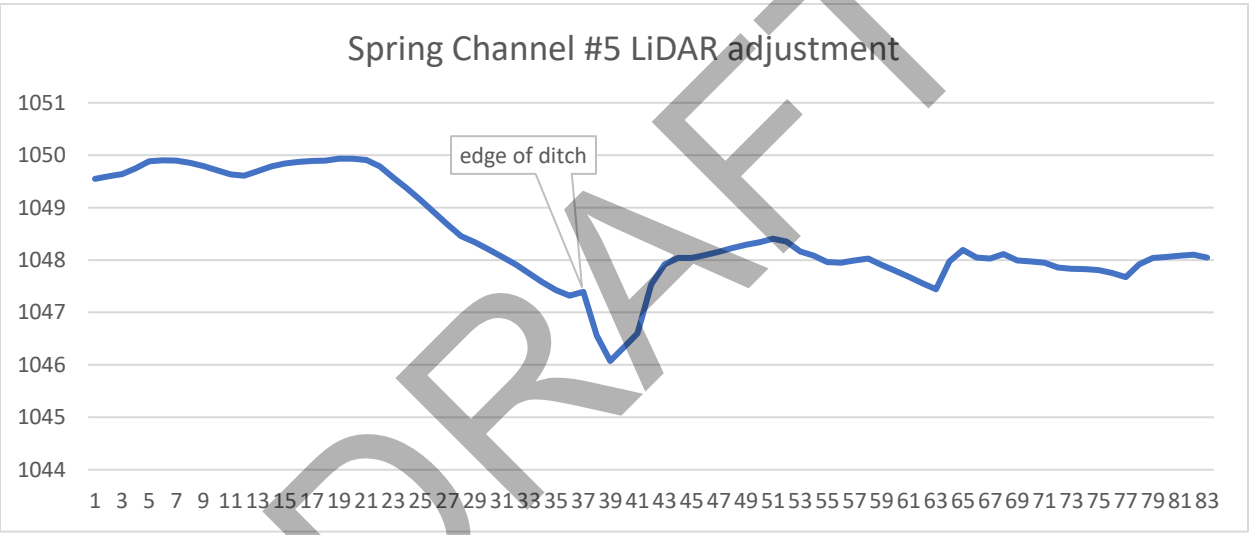




The profile depicts elevation from north to south (left to right). The original channel alignment depicted a rise in terrain south of the ditch, the rise would potentially impound 2 meters of the north ditch fringe to a depth of 0.5 feet. To determine if the potential inundation reflected the terrain, a LiDAR adjustment downstream of the ditch routed channel #4 along the path of "least resistance". The adjusted profile did encounter inundation, however only to a depth of 0.2ft for <1 meter of fringe.

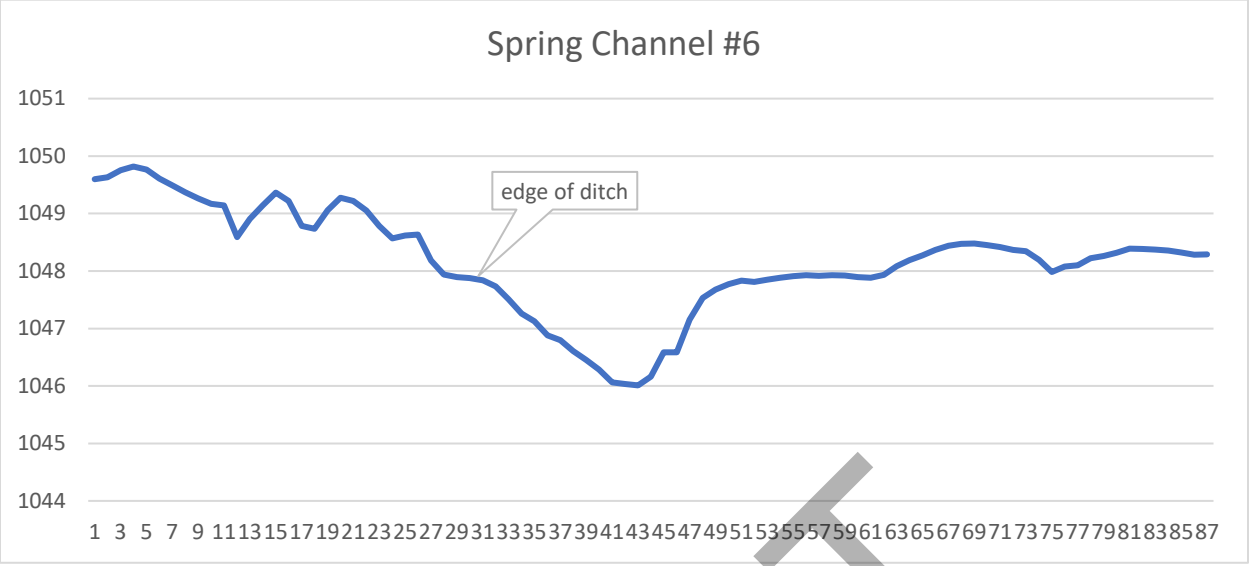
Spring Channel #5

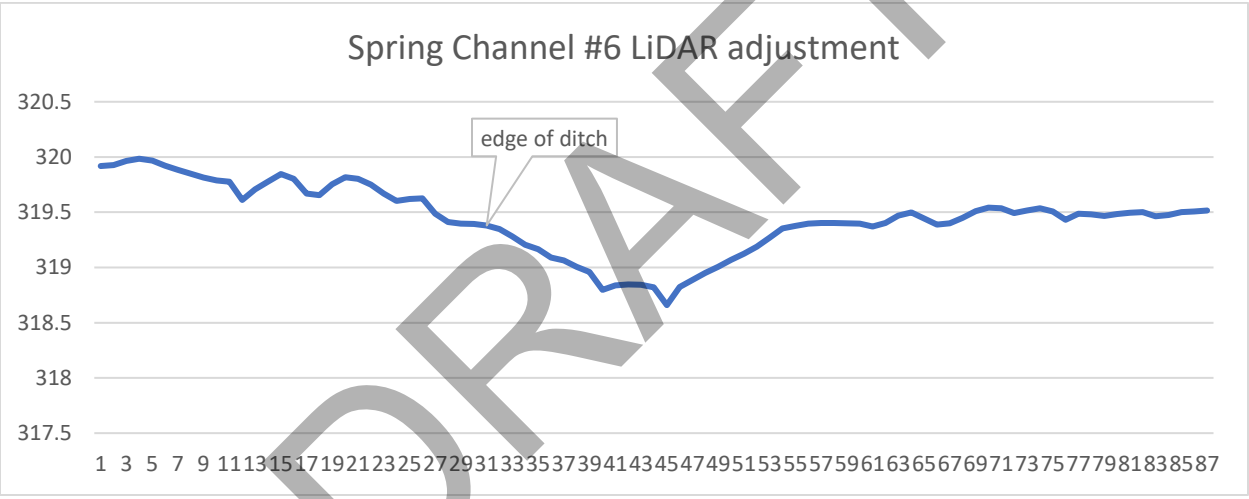




The profile depicts elevation from north to south (left to right). The original channel alignment depicted a rise in terrain south of the ditch, the rise would potentially impound 7 meters of the north ditch fringe. Depth of inundation would be approximately 0.5 foot for 4 meters of the fringe and 1 foot the remaining 3 meters. To determine if the potential inundation reflected the terrain, a LiDAR adjustment downstream of the ditch routed channel #5 along the path of "least resistance". The adjusted profile did encounter inundation, however only to a depth of 0.7ft for 5 meters and 0.2ft for 1 meter of fringe.

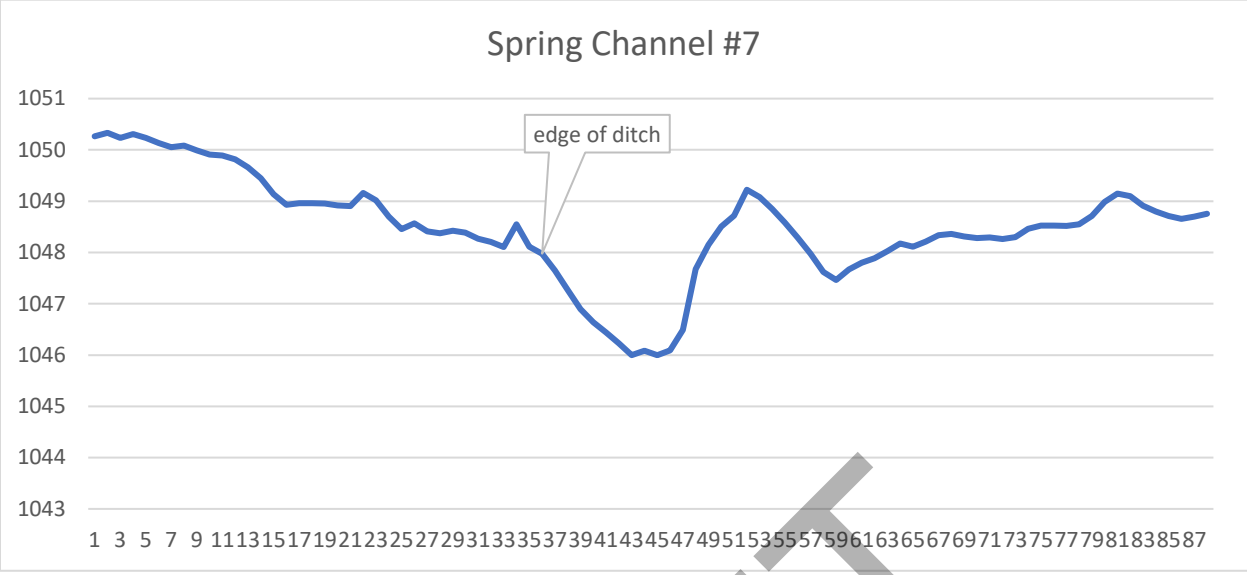
Spring Channel #6

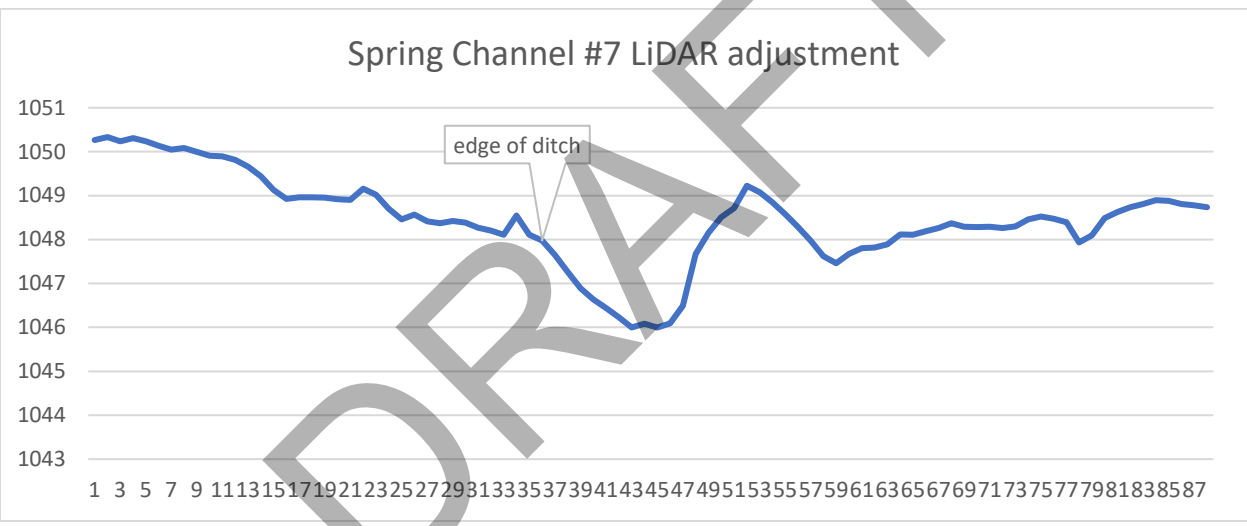




The profile depicts elevation from north to south (left to right). The original channel alignment depicted a rise in terrain south of the ditch, the rise would potentially impound 4 meters of the north ditch fringe. Depth of inundation would be approximately 0.5 foot for 4 meters of the fringe. To determine if the potential inundation reflected the terrain, a LiDAR adjustment downstream of the ditch routed channel #6 along the path of "least resistance". The adjusted profile did encounter inundation, however only to a depth of 0.2ft for 4 meters of fringe.

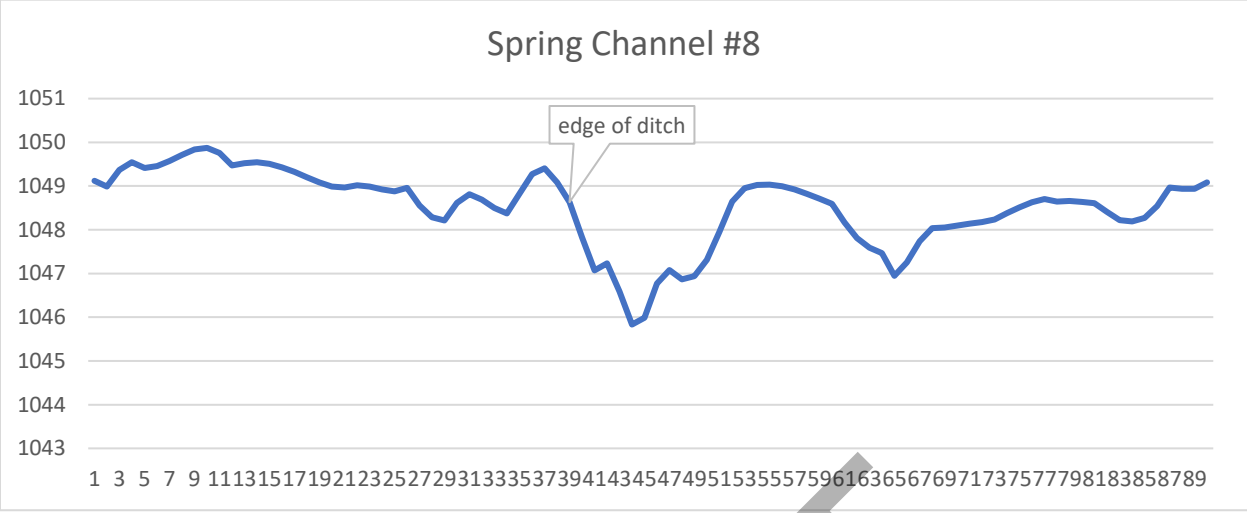
Spring Channel #7

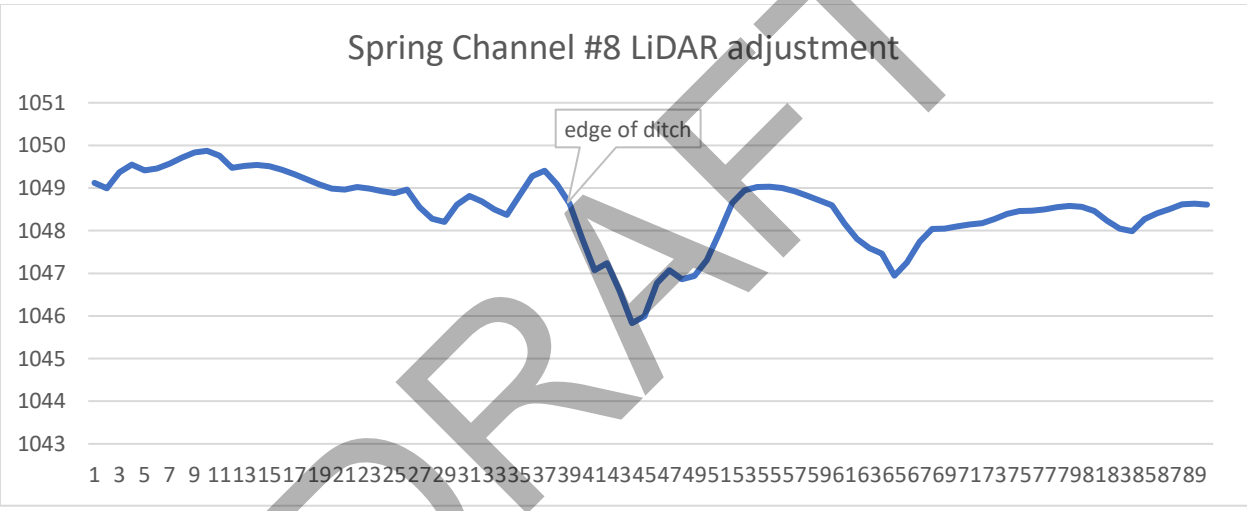




The profile depicts elevation from north to south (left to right). The original channel alignment depicted a rise in terrain south of the ditch, the rise would potentially impound 14 meters of the north ditch fringe. Depth of inundation would be approximately 0.5 feet for 12 meters of the fringe and 1 foot the remaining 2 meters. To determine if the potential inundation reflected the terrain, a LiDAR adjustment downstream of the ditch routed channel #7 along the path of "least resistance". The adjusted profile did encounter inundation, however only to a depth of 0.5ft for 10 meters and 1 foot for 2 meters of fringe.

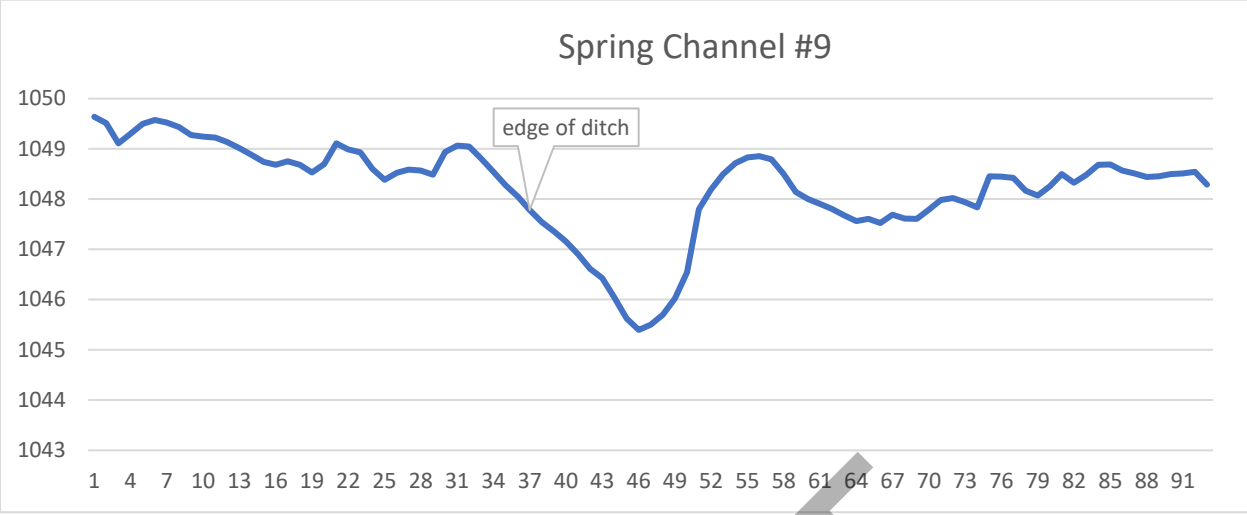
Spring Channel #8

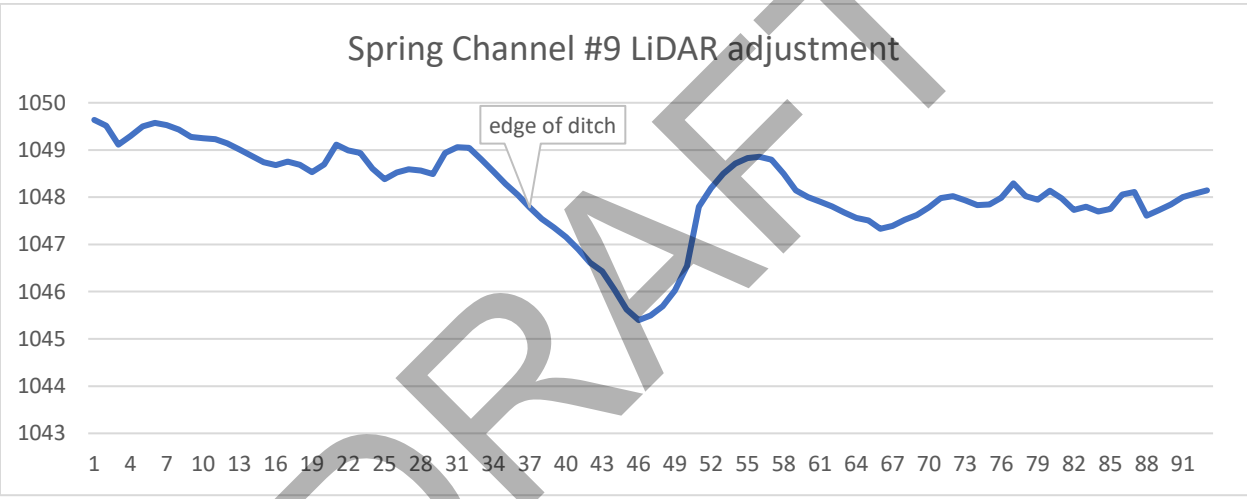




The profile depicts elevation from north to south (left to right). The original channel alignment depicted a rise in terrain south of the ditch, the rise would potentially impound 1 meter of the north ditch fringe. Depth of inundation would be approximately 0.5 foot for the 1 meter of fringe. To determine if the potential inundation reflected the terrain, a LiDAR adjustment downstream of the ditch routed channel #8 along the path of "least resistance". The adjusted profile did not encounter inundation.

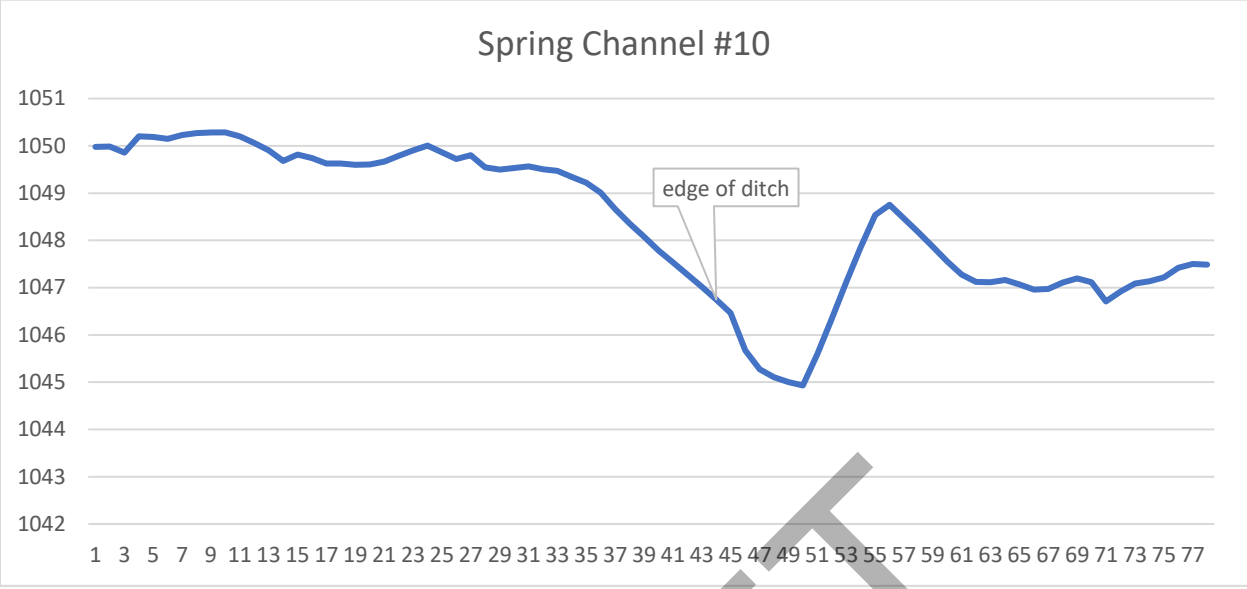
Spring Channel #9





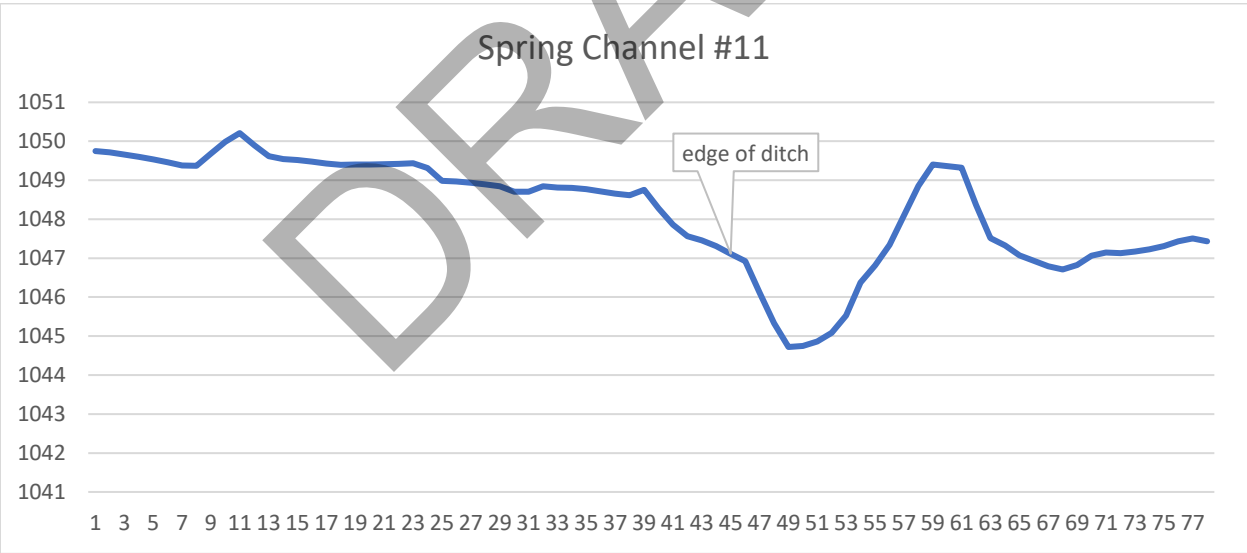
The profile depicts elevation from north to south (left to right). The original channel alignment depicted a rise in terrain south of the ditch, the rise would potentially impound 4 meters of the north ditch fringe. Depth of inundation would be approximately 0.5 foot for 2 meters of the fringe and 1 foot the remaining 2 meters. To determine if the potential inundation reflected the terrain, a LiDAR adjustment downstream of the ditch routed channel #9 along the path of "least resistance". The adjusted profile did encounter inundation, however only to a depth of 0.5ft for 2 meters of fringe.

Spring Channel #10



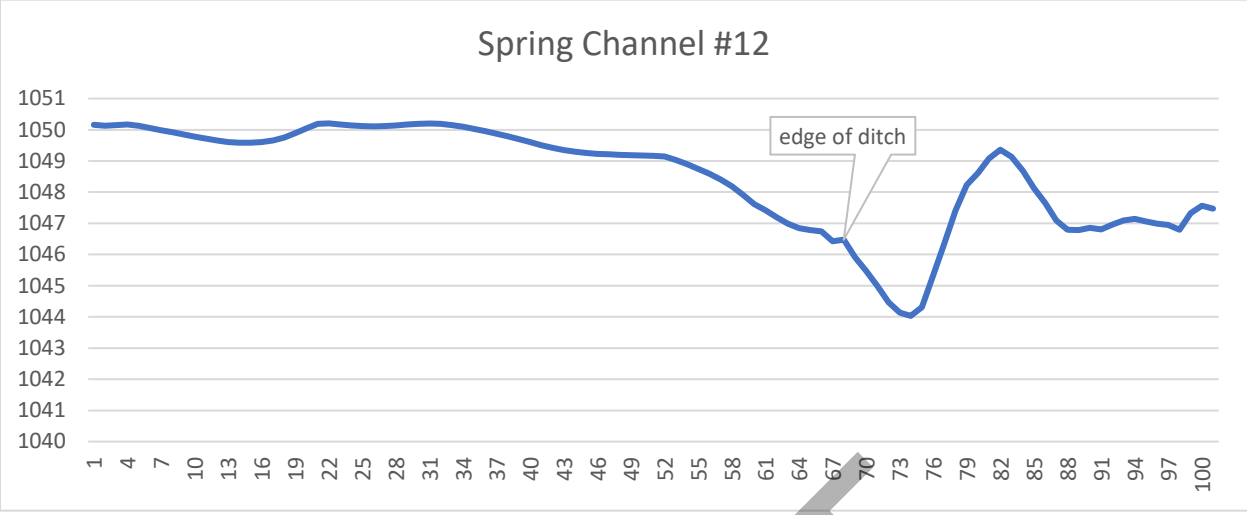
The profile depicts elevation from north to south (left to right). Based on the elevation of the north ditch edge and the ground south of the spoil, plugging the ditch adjacent to the channel may impound 0.2-0.7" of surface water along 2 meters of fringe.

Spring Channel #11



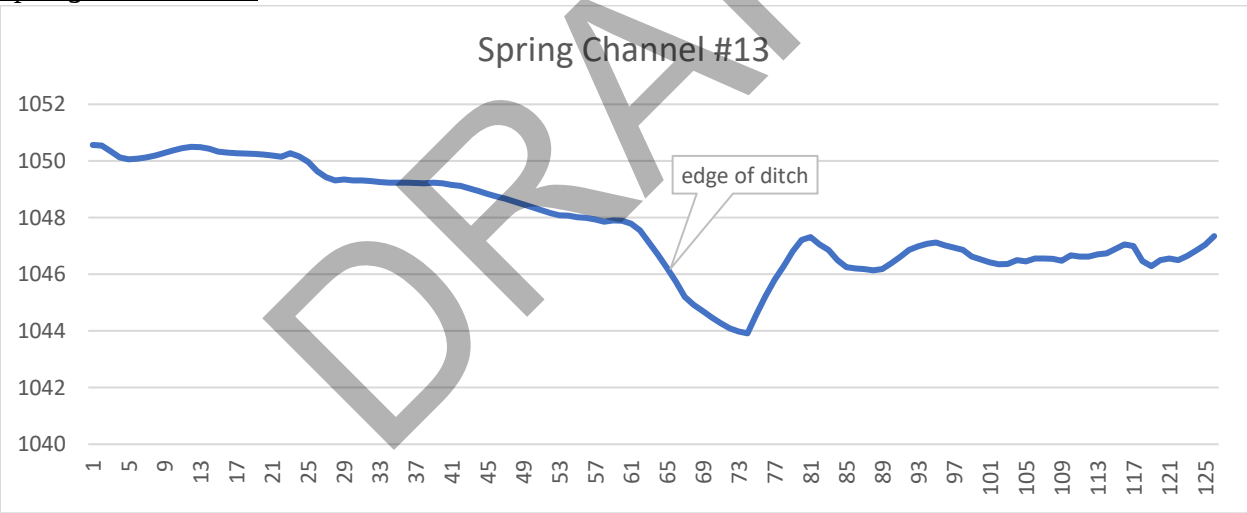
The profile depicts elevation from north to south (left to right). Based on the elevation of the north ditch edge and the ground south of the spoil, plugging the ditch adjacent to the channel may impound 0.2-0.5" of surface water along 2 meters of fringe.

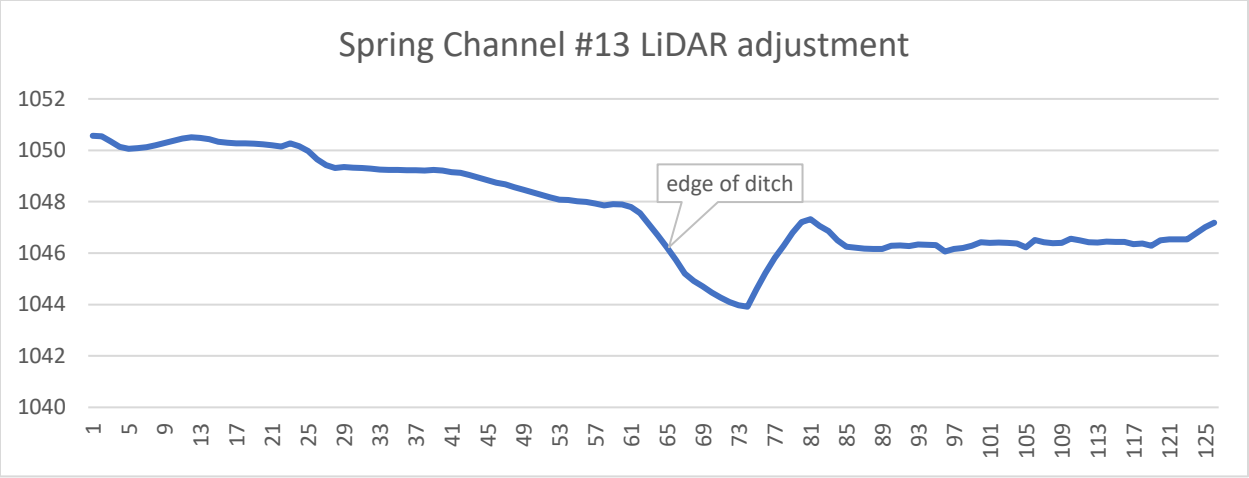
Spring Channel #12



The profile depicts elevation from north to south (left to right). Based on the elevation of the north ditch edge and the ground south of the spoil, plugging the ditch adjacent to the channel may impound 0.2-1.0" of surface water along 7 meters of ditch fringe.

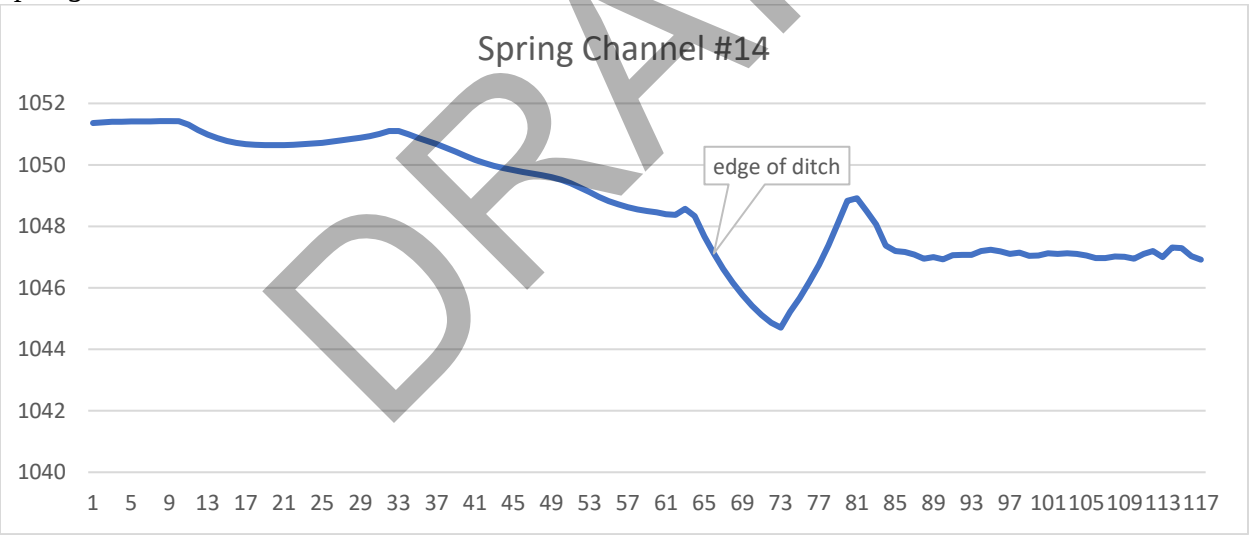
Spring Channel #13





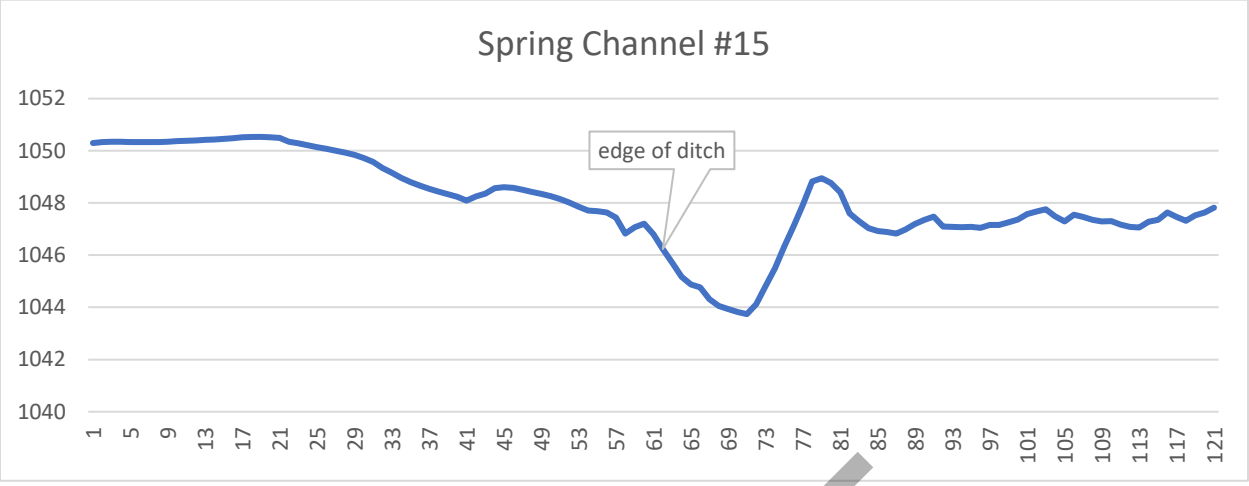
The profile depicts elevation from north to south (left to right). The original channel alignment depicted a rise in terrain south of the ditch, the rise would potentially impound 3 meters of the north ditch fringe. Depth of inundation would be approximately 0.2-0.8 ft for the 3 meters of fringe. To determine if the potential inundation reflected the terrain, a LiDAR adjustment downstream of the ditch routed channel #13 along the path of "least resistance". The adjusted profile did encounter inundation, however only to a depth of 0.6 ft for 2 meters of fringe.

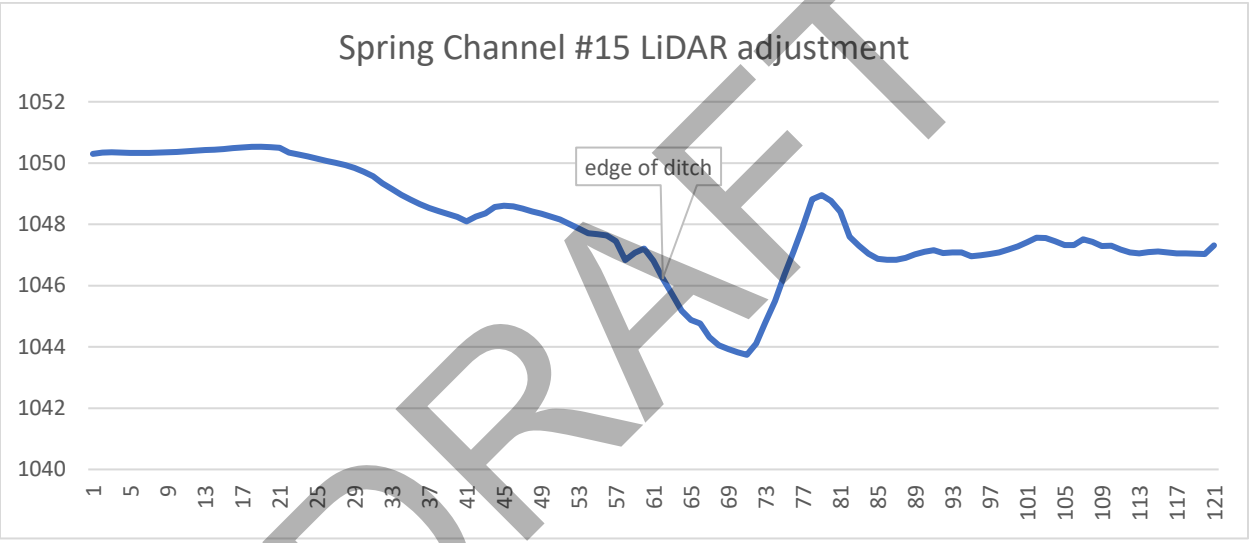
Spring Channel #14



The profile depicts elevation from north to south (left to right). Based on the elevation of the north edge of ditch in relation to land immediately south of the spoil bank there should be no backwatering impact on land to the north.

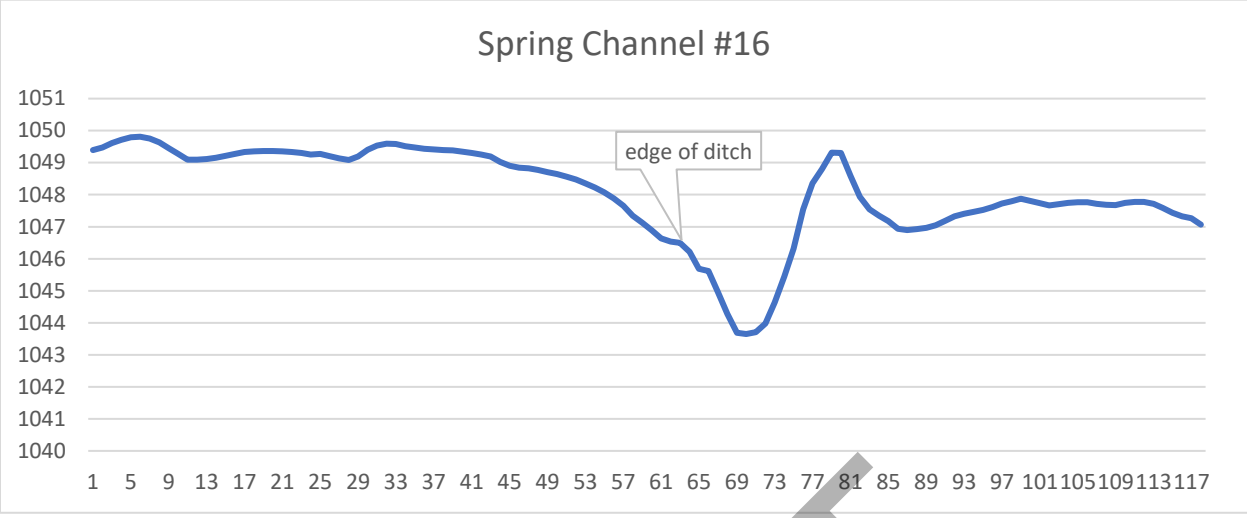
Spring Channel #15

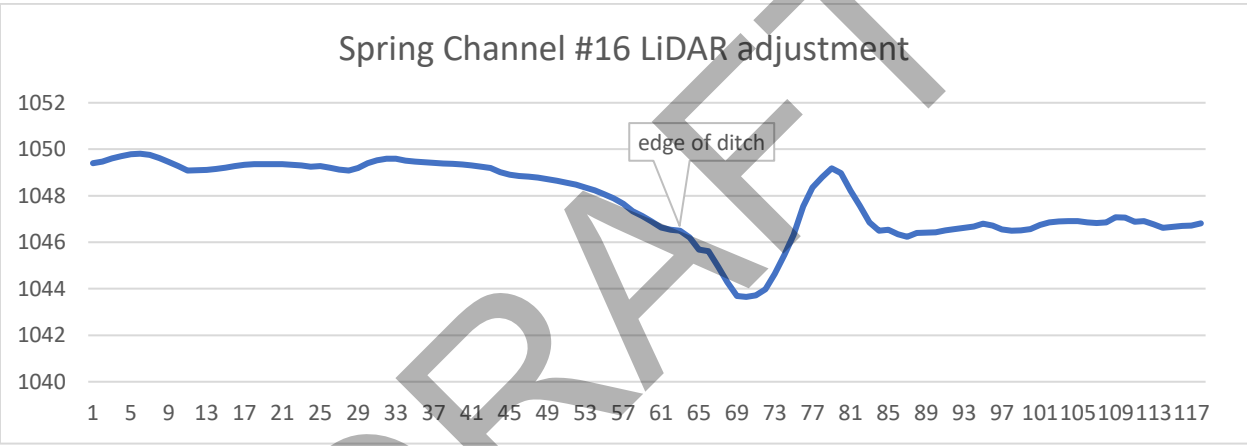




The profile depicts elevation from north to south (left to right). The original channel alignment depicted a rise in terrain south of the ditch, the rise would potentially impound 9 meters of the north ditch fringe. Depth of inundation ranges from 0.1-0.8 feet for the fringe. To determine if the potential inundation reflected the terrain, a LiDAR adjustment downstream of the ditch routed channel #15 along the path of "least resistance". The adjusted profile did encounter inundation, however only to a depth of 0.1-0.5ft for 3 meters of fringe.

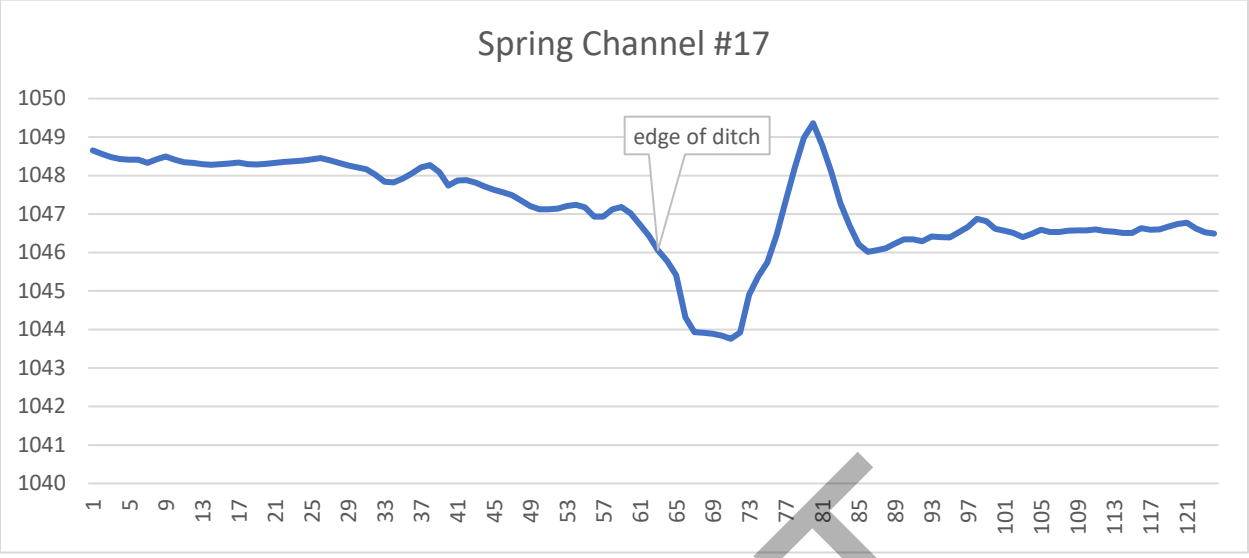
Spring Channel #16





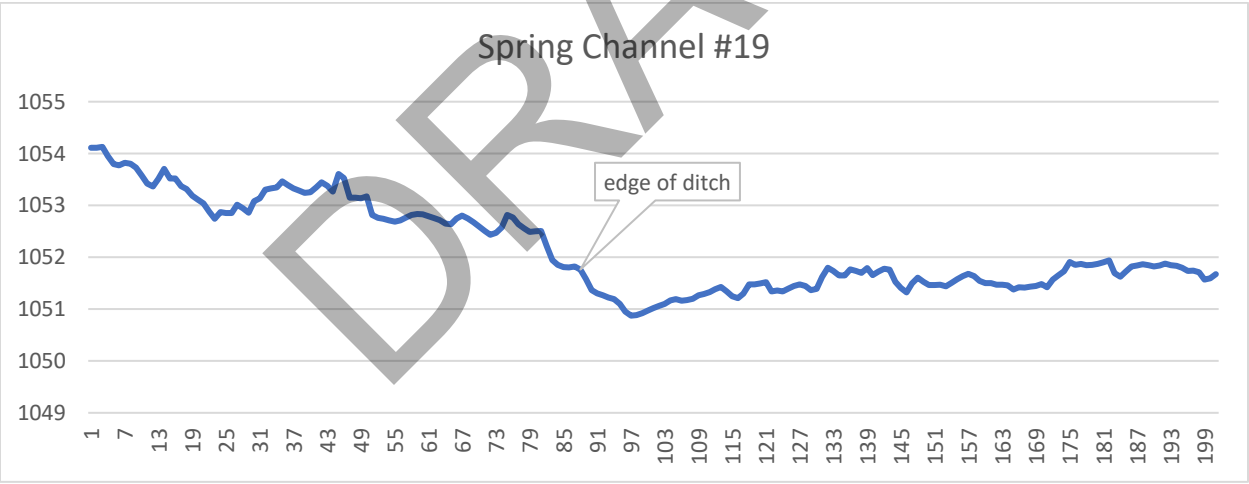
The profile depicts elevation from north to south (left to right). The original channel alignment depicted a rise in terrain south of the ditch, the rise would potentially impound 7 meters of the north ditch fringe. Depth of inundation would be approximately 0.2-1.5 feet of fringe. To determine if the potential inundation reflected the terrain, a LiDAR adjustment downstream of the ditch routed channel #16 along the path of "least resistance". The adjusted profile did encounter inundation, however only to a depth of 0.2ft for 4 meters of fringe.

Spring Channel #17



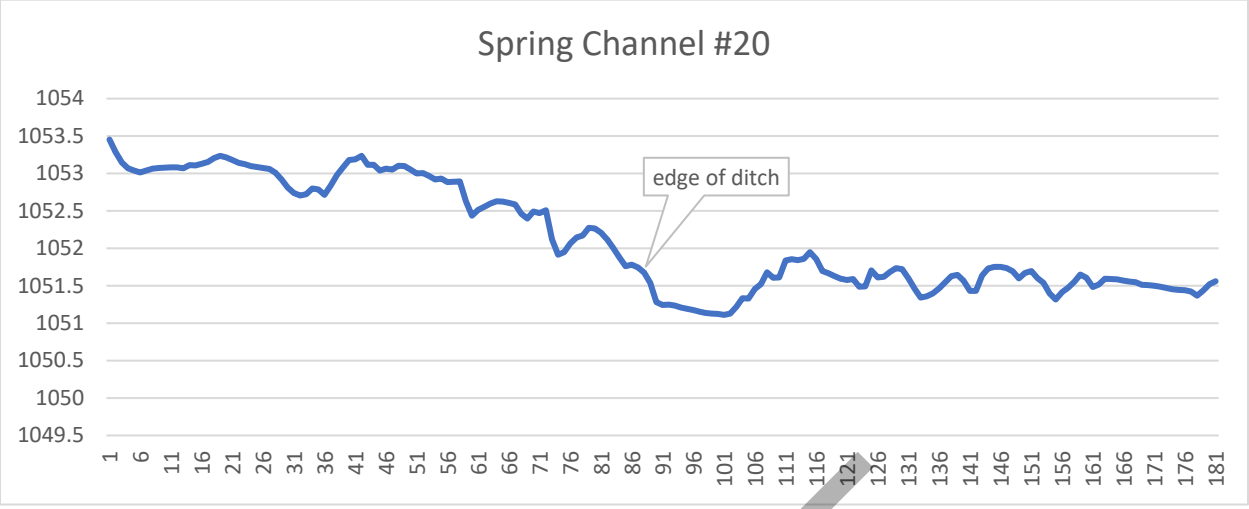
The profile depicts elevation from north to south (left to right). Based on the elevation of the north ditch edge and the ground south of the spoil, plugging the ditch adjacent to the channel may impound 0.1-1.0" of surface water along 2 meters of ditch fringe.

Spring Channel #19



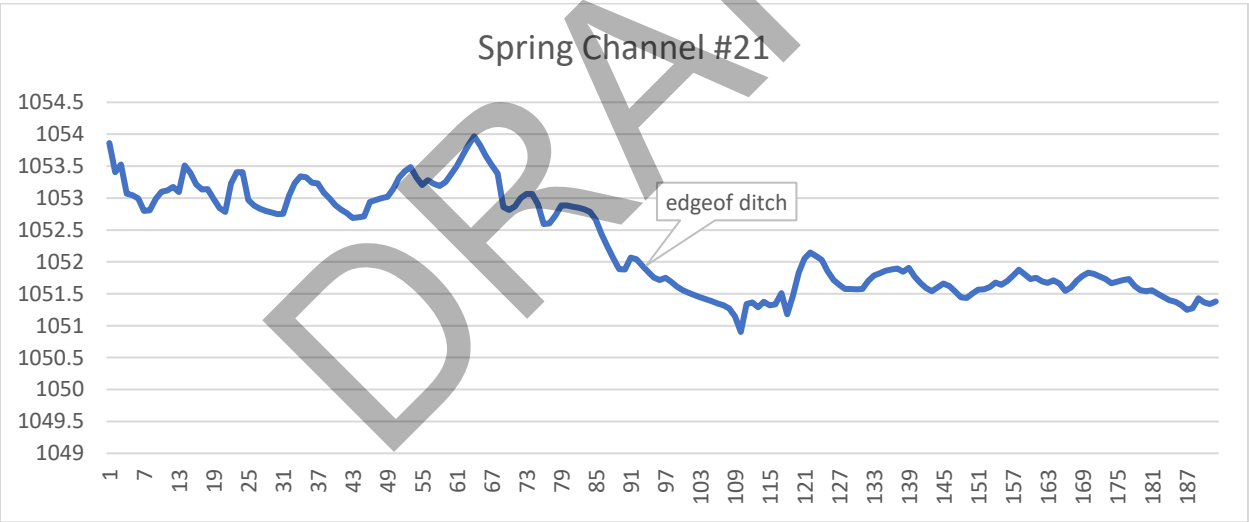
The profile depicts elevation from north to south (left to right). Based on the elevation of the north ditch edge and the ground south of the spoil, plugging the ditch adjacent to the channel may impound 0.1-0.2" of surface water along 4 meters of ditch fringe.

Spring Channel #20



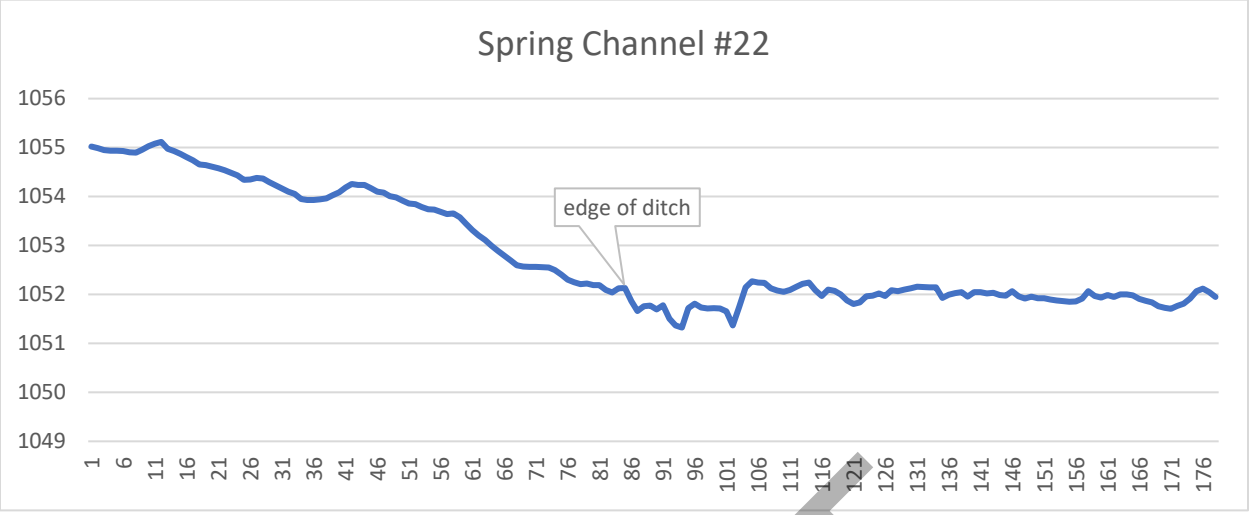
The profile depicts elevation from north to south (left to right). Based on the elevation of the north ditch edge and the ground south of the spoil, plugging the ditch adjacent to the channel may impound 0.1-0.2" of surface water along 4 meters of ditch fringe.

Spring Channel #21



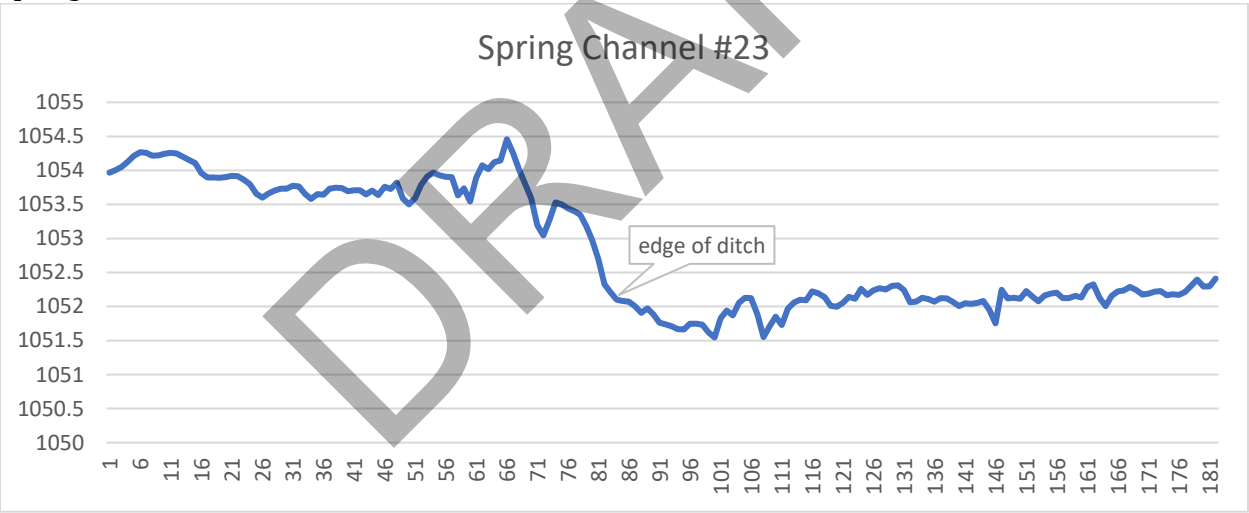
The profile depicts elevation from north to south (left to right). Based on the elevation of the north ditch edge and the ground south of the spoil, plugging the ditch adjacent to the channel may impound 0.1-0.2" of surface water along 1 meter of ditch fringe.

Spring Channel #22



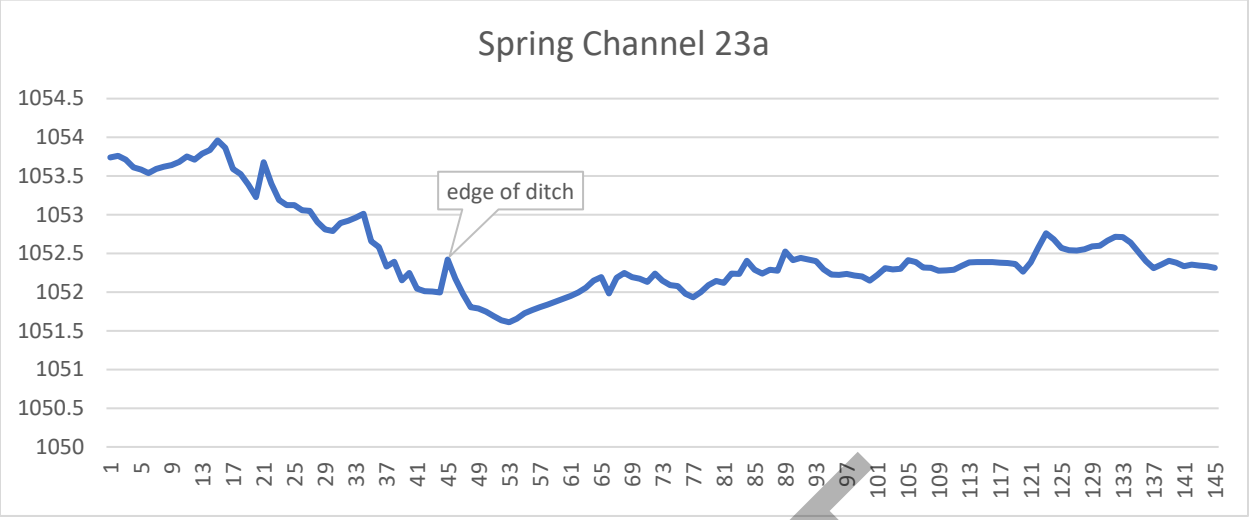
The profile depicts elevation from north to south (left to right). Based on the elevation of the north ditch edge and the ground south of the spoil, plugging the ditch adjacent to the channel may impound 0.1-0.2" of surface water along 10 meters of ditch fringe.

Spring Channel #23



The profile depicts elevation from north to south (left to right). Based on the elevation of the north ditch edge and the ground south of the spoil, plugging the ditch adjacent to the channel may impound 0.1-0.2" of surface water along 2 meters of ditch fringe.

Spring Channel #23a



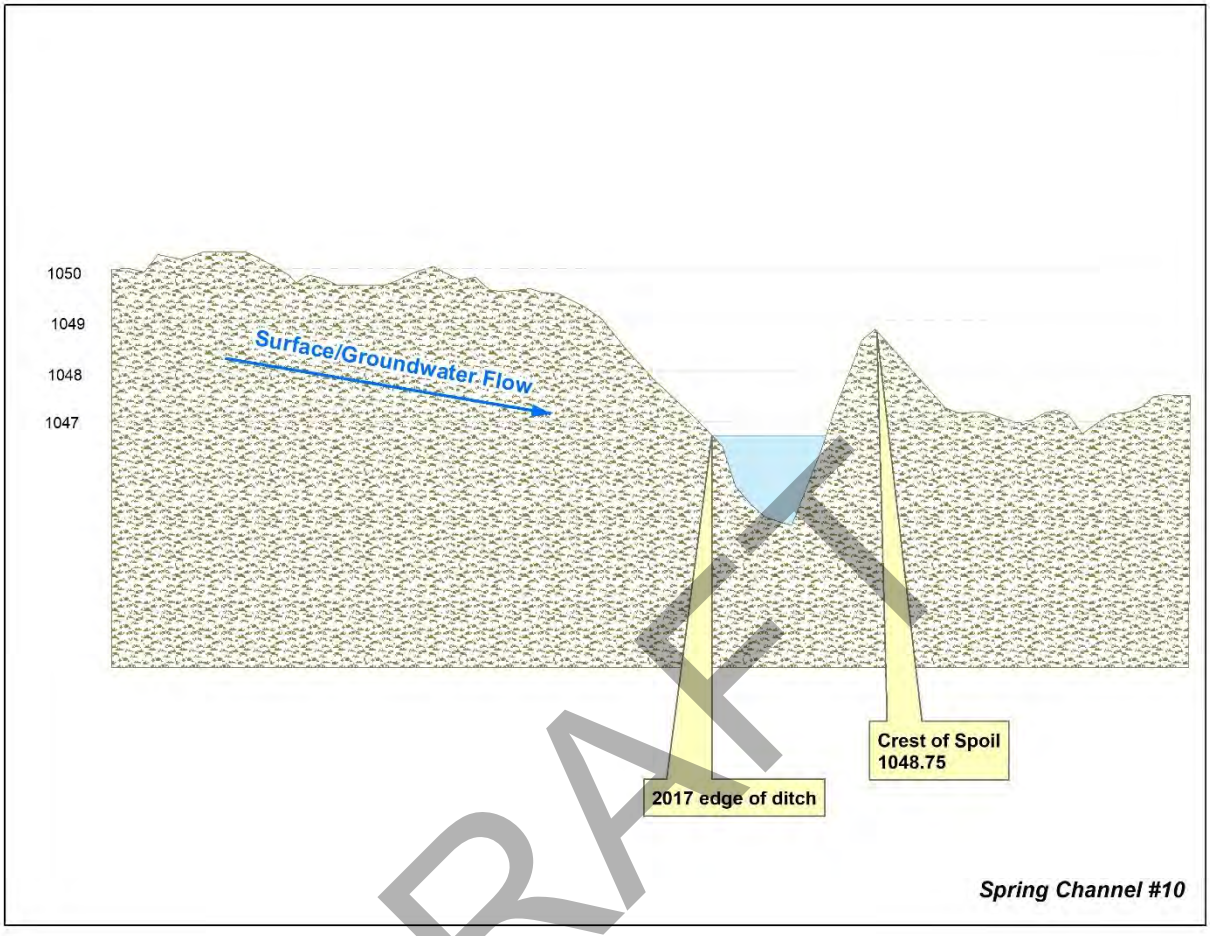
The profile depicts elevation from north to south (left to right). Based on the elevation of the north ditch edge and the ground south of the spoil, plugging the ditch adjacent to the channel may impound 0.1-0.5" of surface water along 10 meters of ditch fringe.

Spring Channel Profile Results

Review of the spring channel profiles illustrated that there are locations where impounding water may occur to some effect on the north edge of the ditch (fringe). However, the depth is less than 1 foot and affects a couple meters along the fringe of the ditch. The profiles illustrated a pronounced spoil bank in channels #1-#2 and #7-#17, with a minimal or no spoil bank in channels #3-#6 and #19-#23a.

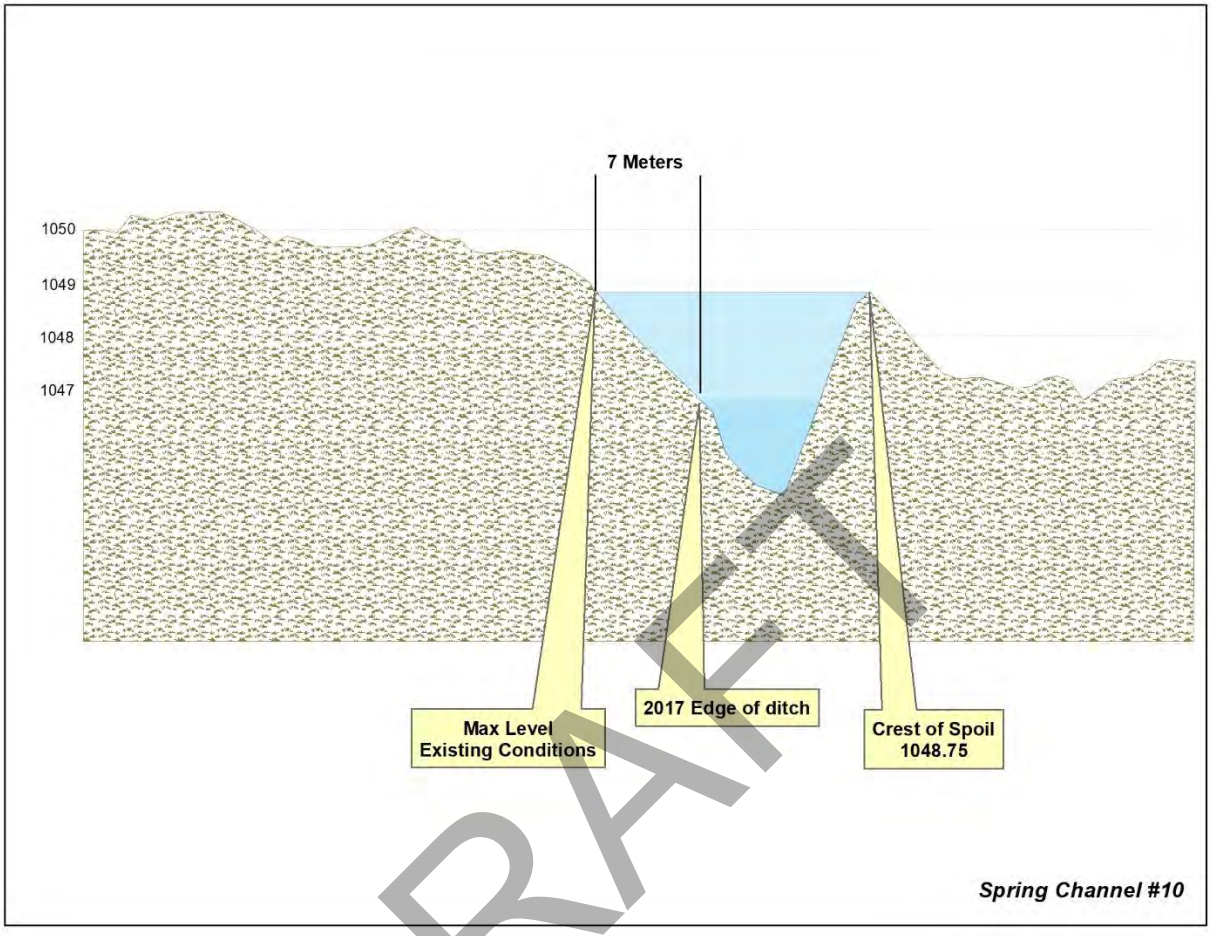
Based on the depth and scope of inundation there is low potential for impact to peat due to buoyancy and/or separation from mineral soil. Installation of ditch blocks adjacent to the channel/ditch intersection should be a constructed to a elevation which ensures overflows extend southward.

Graphic #1



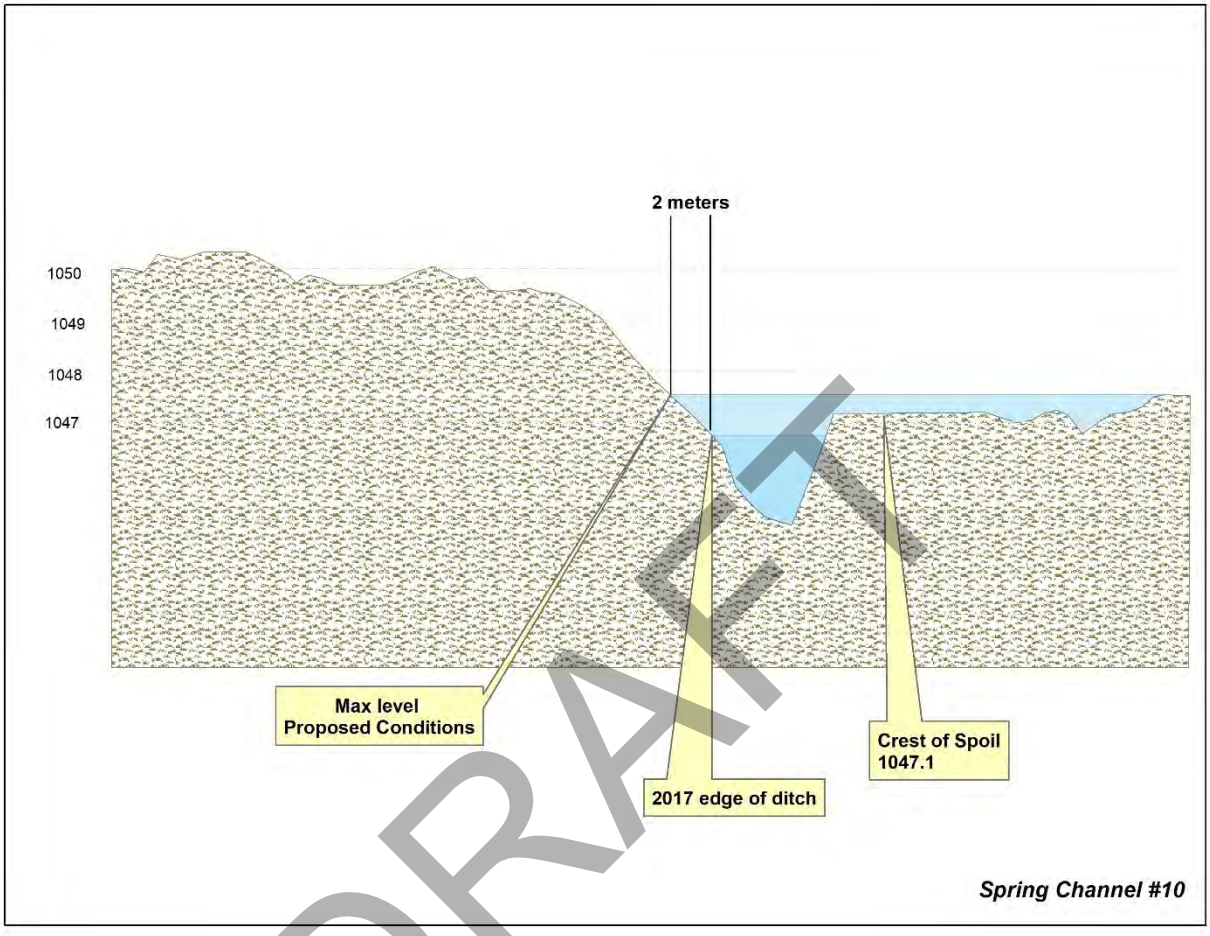
Graphic #1 illustrates a typical cross section of a Spring Channel within the Sprague Creek SNA. Terrain within the SNA slopes from north to south (left to right) with ditch spoil buttressing the south side of the ditch. Water levels within the ditch can fluctuate 2-3ft depending on discharge into the ditch and condition of beaver dams within the channel.

Graphic #2



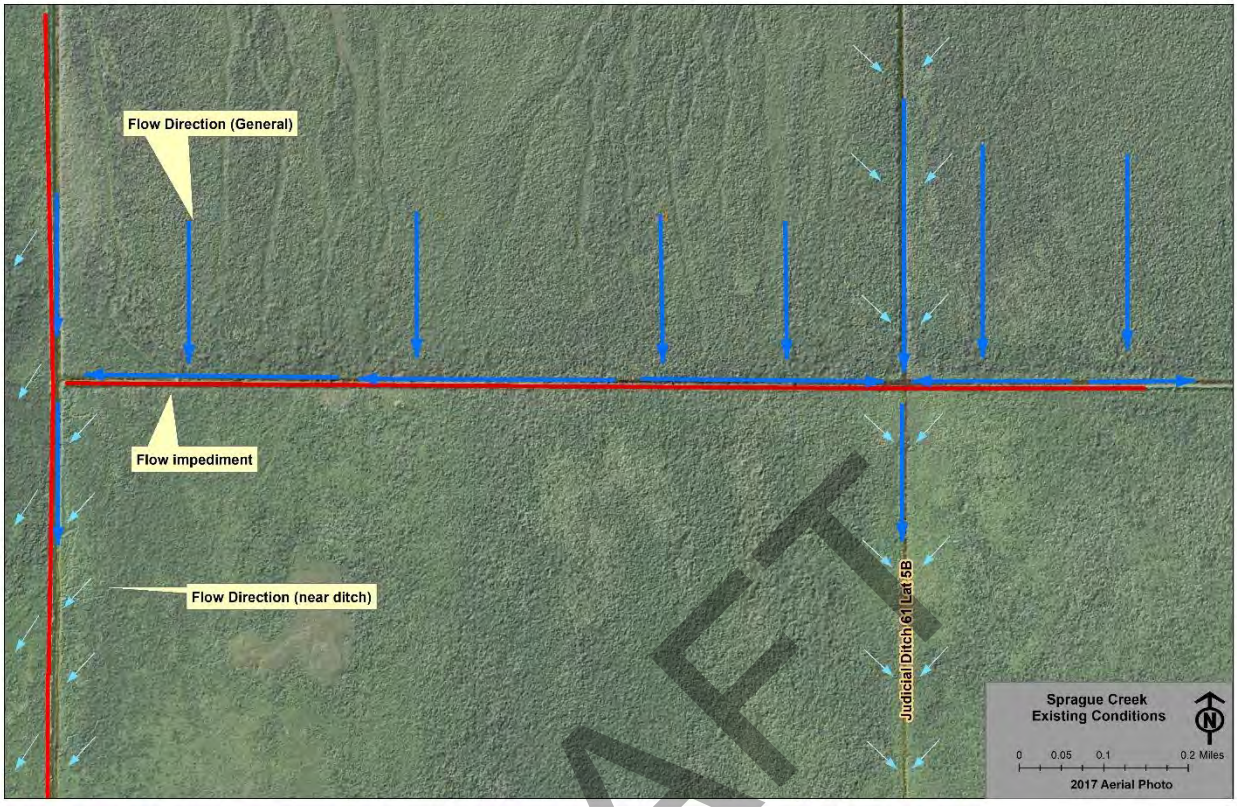
Graphic #2 illustrates maximum potential impact to the fen, north of the ditch. During a large discharge event, or if a beaver dam where constructed to the crest of the spoil, a 7 meter wide band of the fen would be inundated. Conversely, if the ditch were to be cleaned or the beaver dams removed from the system entirely the northern edge of the ditch could experience further desiccation.

Graphic #3



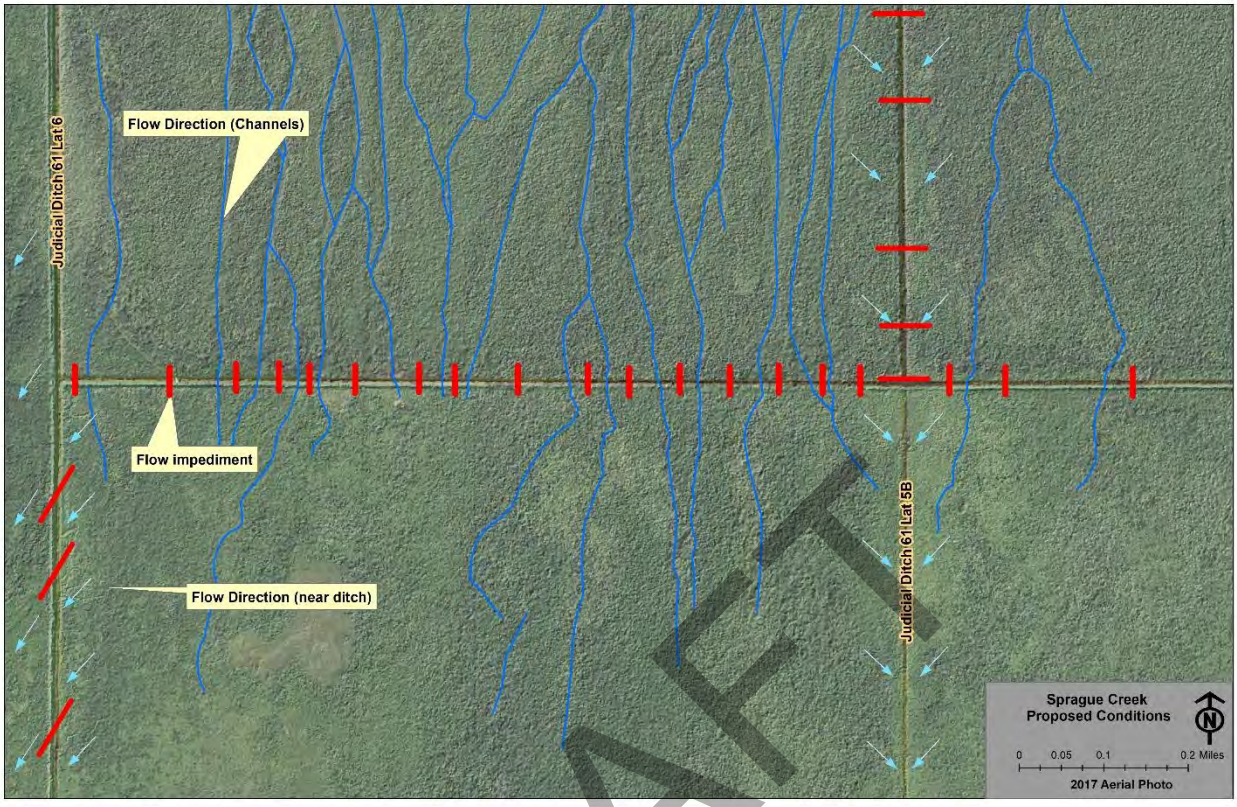
Graphic #3 is the maximum potential impact to the spring channel, post restoration. Note that the band of inundation has been reduced from 7 meters to 2 meters. The hydraulic gradient through the cross section would be coaxed southward by installation of plugs east and west of the channel, the former spoil location would have the upper layers agitated to mimic pre-impact conditions. The combination of ditch plugs and agitating the compacted peat in the former spoil alignment will promote a more stable hydrograph and re-establish hydrologic connectivity to wetlands south of the ditch.

Graphic #4



The above graphic depicts simplified surface hydrology, with the primary flow direction in dark blue, flow obstructions (spoil) in red, and secondary flow near the ditch illustrated in light blue. Interception and redirection of hydrology is evident along Lateral 7 Branch 1 of JD 61. Remnant northeast to southwest gradient is still somewhat intact along the Lateral 6 corridor, while the terrain along Lateral 5B has subsided, subsidence has resulted in focal flow southward along the ditch corridor.

Graphic #5



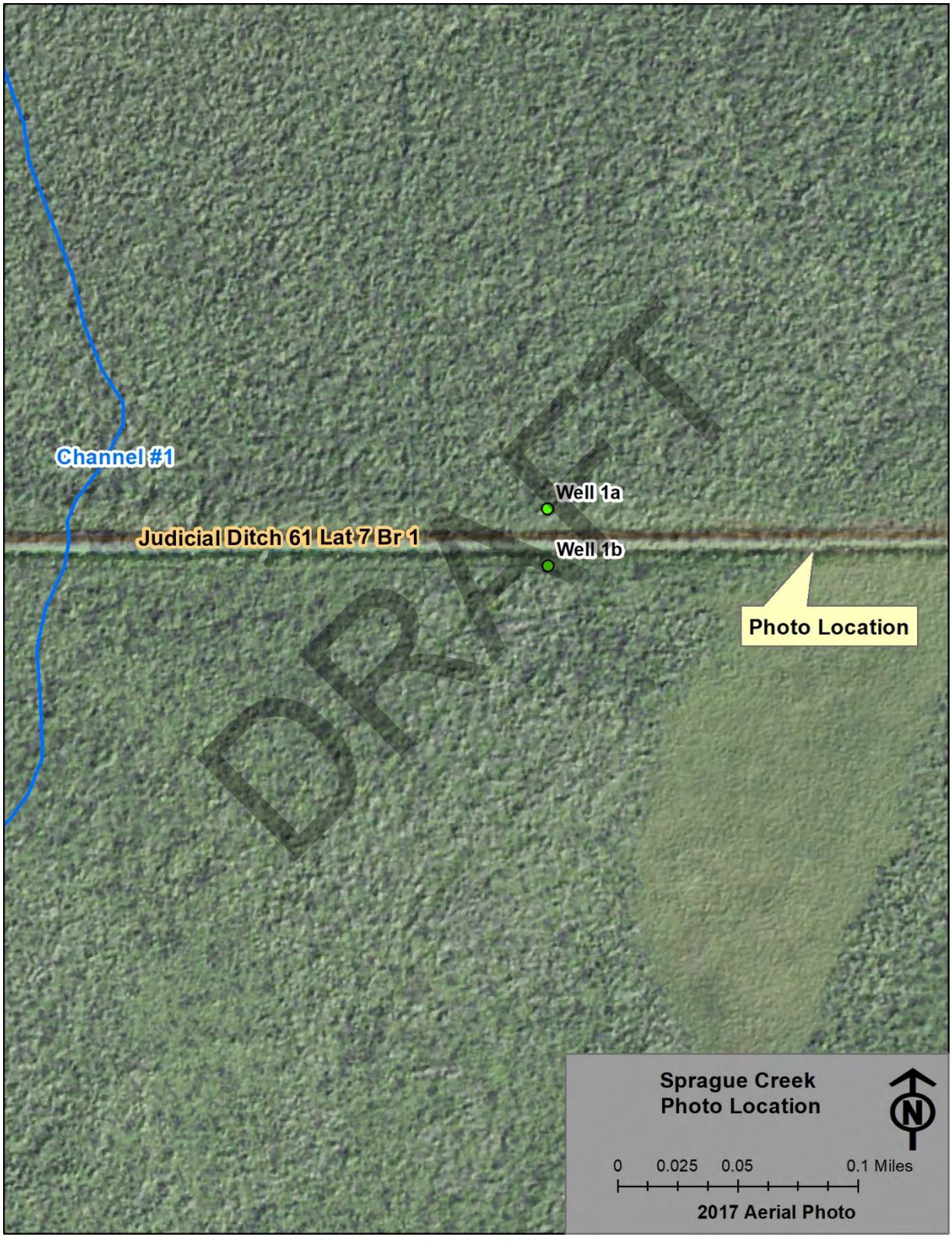
Graphic #5 depicts the alignment of proposed obstruction of existing drainage to mimic pre drained hydrology. Graphic #5 omits hydrologic modifications in Lateral 6 north of Lateral 7 Branch 1, and Lateral 5B south of Lateral 7 Branch. Omitted modifiers consisted of replacing spoil in Lateral 6 to restore grade, and placement of brush and woody debris in Lateral 5B in lieu of spoil placement.

Spoil along the entirety of Lateral 7 Branch 1 would be removed from the south ditch bank. Spoil would be replaced in the open ditch system between the identified channels in areas identified as Spruce/Tamarack islands (see red vertical lines). The lines depicting the spoil locations due not represent extent of fill placement, simply the strategy of placement between channels.

The flow impediments in Lateral 6 depict log diverters that would coax hydrology to restore connectivity east to west of the ditch corridor. Log diverters would be placed atop spoil replaced within the former channel, to ensure excess surface water transitions ditch corridor as compared to southward drainage along the former ditch.

Flow impediments on Lateral 5B north of Lateral 7 Branch 1 denotes cedar dams that control grade of surface water draining southward.

Graphic #6


Channel #1
Judicial Ditch 61 Lat 7 Br 1
Well 1a
Well 1b
Photo Location
DRAFT
Sprague Creek
Photo Location
N
0
0.025
0.05
0.1 Miles
2017 Aerial Photo

Graphic #6 is a photo location to provide context for the photos in Graphic #7 and #8. The Photo location is approximately 1,600 ft east of Spring Channel #1. Photos were taken atop the spoil bank, at the intersection of the spoil and a large beaver dam constructed prior to 2003.

Graphic #7

Image taken from spoil bank facing north towards Spruce and Tamarack dominated wetland communities. Note, the change in surface water elevation from the left side of the beaver dam to the right side of the dam. This particular beaver dam has been in existence long enough for grass species to colonize the muck and debris.

Graphic #8

Image from same location shown in Graphic #6 and #7 with a westward aspect along the Lateral 7 Branch 1 corridor. Surface water elevation at the photo location was within 6" of overtopping the spoil at the date of the image. Evidence of weeping were encountered on the south side of the spoil, likely due to inconsistencies or decomposition of peat within the spoil alignment.

Comparing Hydrologic Restoration Strategies of the Sprague Creek SNA and The Superior Wetland Bank.

Graphics #9 through #12 focus on the Superior Wetland bank located between the communities of Sax and Zim, Minnesota. The Superior Wetland Bank represents a large 'Watershed' scale peatland restoration focused on restoring hydrology through strategic blocking of open ditches in organic soil.

Sax Zim
Superior Wetland Bank
Vicinity Map

Transect 1 points

Transect 2 points

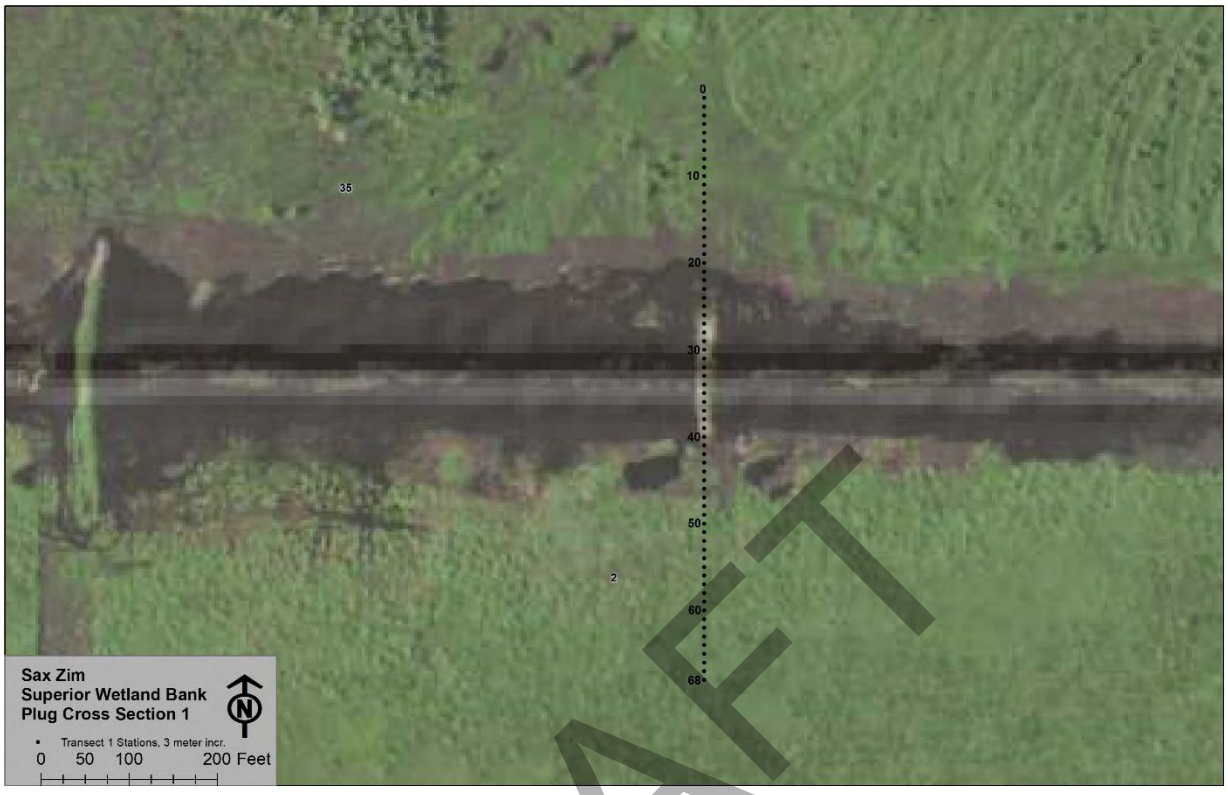
0 0.5 1 2 Miles

Zim, MN

Sax, MN

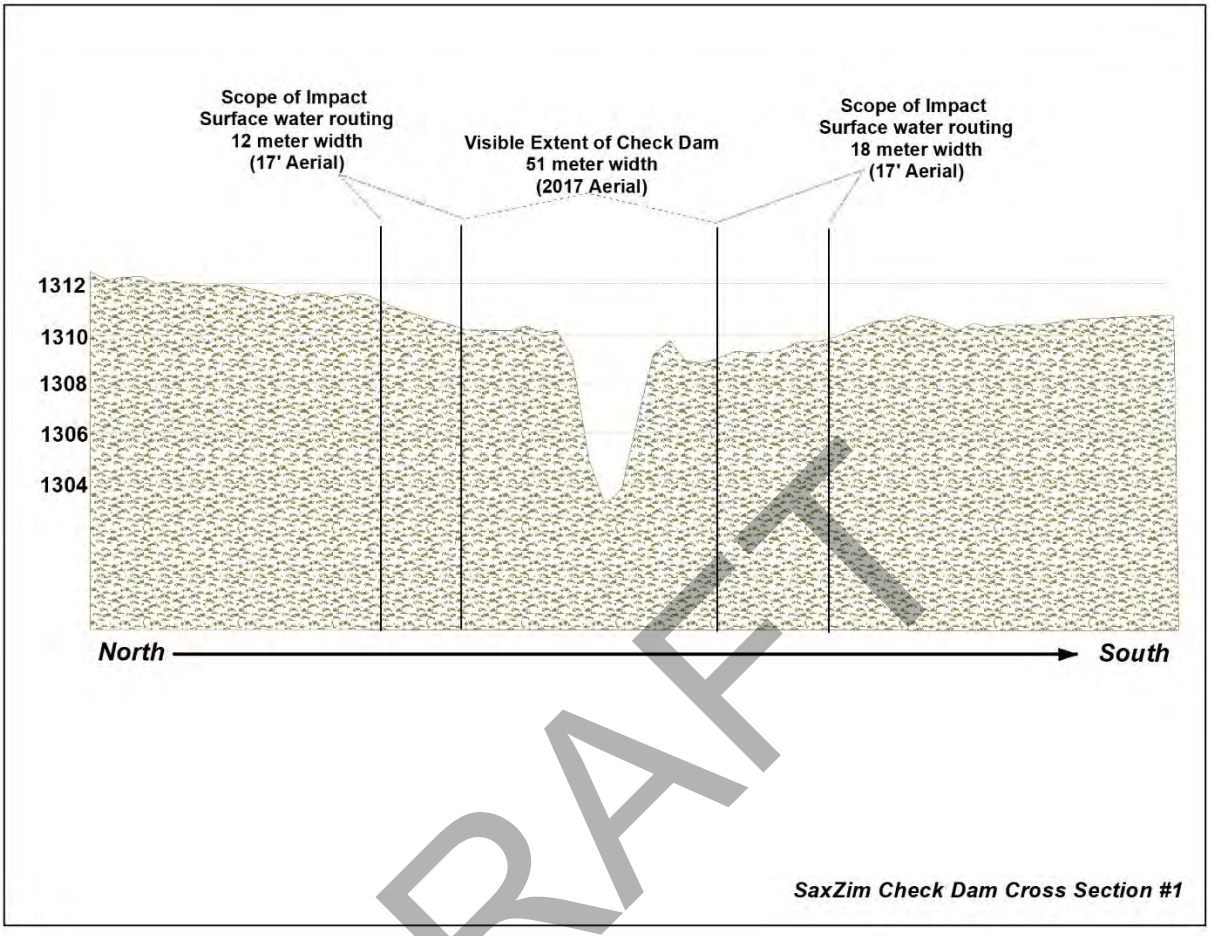
N Yoki Rd
S Yoki Rd
W Tark Rd
Carlson Rd
Holso Rd
Mc Davitt Rd
S Admiral Rd
CSAH 7
T-3475
USTH 53
T-5838
Melrude Rd
Lindstrom Rd
Sax Rd
Dass Rd
Kingsley Rd
Range Rd
Stickney Rd
Keeor Rd
Gray Rd
Moberg Rd
Randall Rd
Murphy Rd
Arkola Rd
Duane Rd
Peary Rd
Glen Rd
T-3425
Bug Creek Rd

Graphic #10



Cross Section 1 depicts a ditch check located approximately ¼ east of CSAH 7 (See Graphic 9) which has encountered erosion due to surface water flows over or around the check dam. The imagery collected in 2017 shows evidence of inundation beyond the limits of the check dam which has prompted concerns of impact to peat communities along the ditch and the potential success of the restoration targets. A cross section was collected using LiDAR data, specifically 3meter digital elevation model (DEM), the DEM was converted to grid points in the same fashion as the profiles collected in the spring channels. Stations (3 meter spacing) are shown in the graphic.

Graphic #11

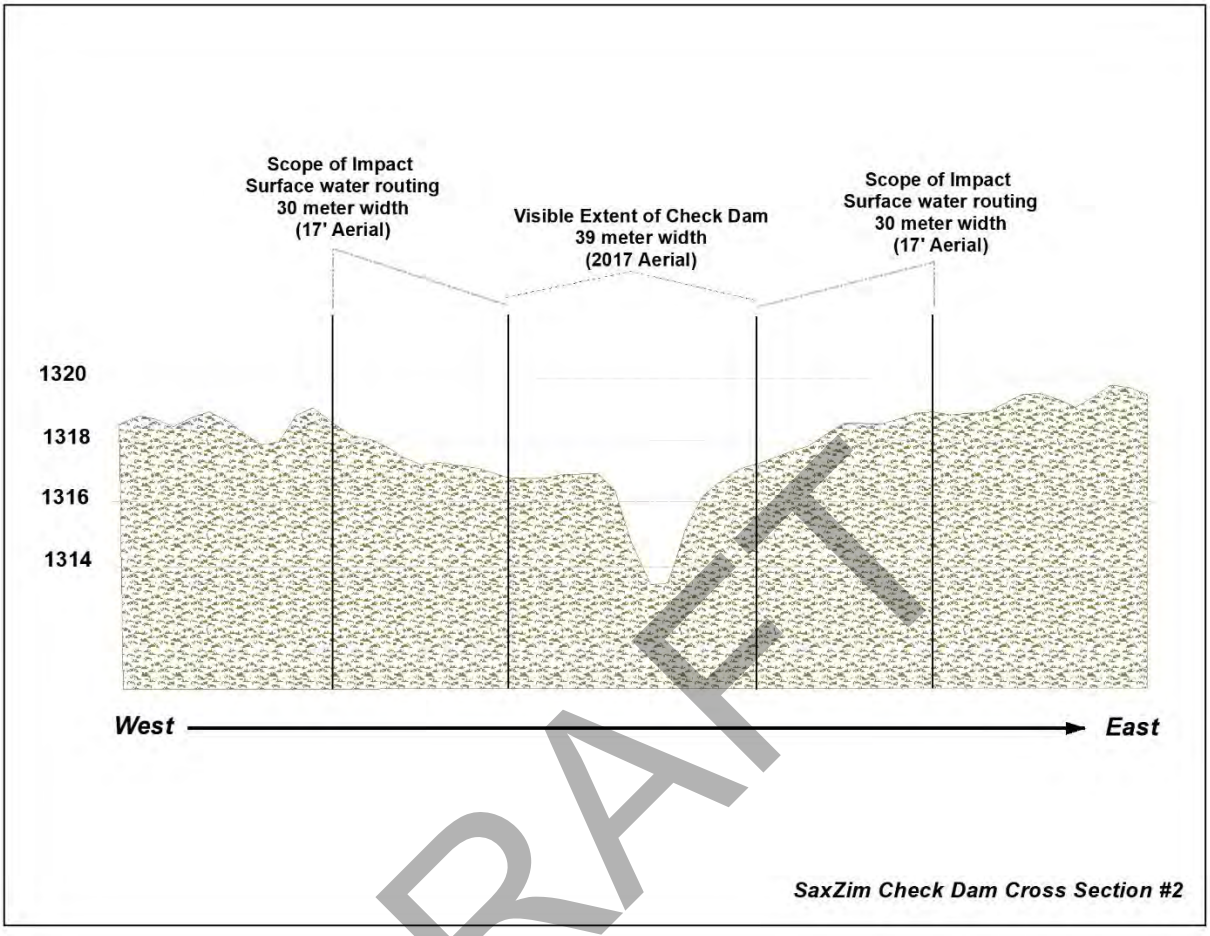


Elevation data collected from LiDAR grids were converted into excel to generate a graph and eventually a profile of the peat surface across the transect. The LiDAR data identified the width of the particular ditch plug as approximately 51 meters (167 feet) and the impact from surface water routing as 12 meters (39 feet) and 17 meters (56 feet) wide respectively.

Graphic #12

Cross Section 2 is located 1 mile east of CSAH 7 and 1 mile north of Cross Section 1 (See Graphic #10). The image of the ditch check illustrates the ditch check has been substantially overwhelmed by ground or surface water flows. Cross section data was collected using the same methodology as Cross Section 1.

Graphic #13



Graphic #13 illustrates the ditch profile at Cross Section 2. The profile illustrates that the check may have been adequately sized, or the width of inundation was outside the design scope of the check dam. The width of the check (based on aerial imagery) is 39 meters (127 feet) long and the surface water routing around check dam was 30 meters (98 feet) wide on either side of the check.

Observations

Lake Superior Wetland Bank

When addressing erosion and peat degradation concerns, there are potential lessons to be learned from the Superior Bank Site.

The check dams and the woody material (trees with root disc) used to restore hydrology within the former ditch channels have been successful in raising the water table within the former zone of lateral effect. However, surface water appears to be flowing around the checks and plug material. Surface water flows may result in unintended nutrient flushing and subsequent impact, or the areas exhibiting open water may be subject to paludification and by affect, heal themselves. It will likely take multiple growing seasons to determine the long term response of the wetlands. There are 3 potential reasons for the surface water problems faced in the Superior Bank Site: 1) Buoyancy of the check and fill material, 2) hydrologic yield for the site was greater than estimated/modeled, and 3) compaction along the edge of the former ditch during construction.

Buoyancy of the material used to restore hydrology, may have resulted in the material in the channel being at a higher elevation than the surrounding terrain. The effect is, surface water flows along the edges of the plugs and checks. Buoyancy could occur during the growing season, simply due to woody material being less dense than the surrounding water logged organic material. The annual freeze thaw cycle could a primary or contributing factor to such an issue as well, if the ditch bottom freezes it is prone to 'heave' or 'boil', elevating material that may have been previously compacted.

Misjudging the hydrologic yield could certainly have attributed to the issues being faced at the Superior Site. Whether the yield to the ditch corridors is long term or resulting from a single large precipitation event, modeling or predicting the response of large wetlands is inherently problematic.

Compaction, as result of construction may have lowered the elevation along the ditch promoting the surface water signature observed in the 2017 aerial photo. Due to intensity of work that occurred on site, there was substantial disruption along the ditch bank. This may have resulted in surface water following vehicle routes along the channel, which may be slightly depressed or exhibit less vegetative aerial coverage due to disruption.

Sprague Creek SNA

The Sprague Creek Restoration Proposal identifies multiple strategies to mimic pre-drainage hydrology and restore/enhance function to a large wetland complex. The site poses challenges as the ditch networks run parallel, perpendicular and at a tangent to surface and subsurface flows. There are variable supplies of spoil available across the site, with greater spoil available in the center of the restoration, and little or no spoil on Lateral 5B and the western limits of Lateral 7 Branch 1.

The location of greatest restoration concern is the Lateral 7 Branch 1 corridor within the confines of the SNA. The corridor aligns perpendicular to the flow direction of spring channels and redirects flows east and west, robbing hydrology from wetlands south of the ditch. Modification of hydrology within this region of this area will consist of completely removing spoil from the south side of the ditch, removed spoil will be replaced in the open ditch, in areas identified as former tamarack/spruce islands. Spoil in the ditch will be placed in a manner to ensure the elevation of restored islands will be higher than the former spoil location at each individual channel. Restoring the islands at a slightly higher elevation will ensure flows are focused in their former southern direction. No spoil will be placed in the intersections of spring channels and the ditch.

Lateral 6, aligned north to south, and bordering the SNA to the west, provides a substantial supply of former ditch spoil for the purpose of ditch plugging. It is unlikely that there will be sufficient spoil on site to completely fill the entire ditch corridor, therefore ditches will be completely filled at 1-foot benchmarks and partially filled in the remainder of the ditch as source material allows. The former ditch area between the 1-foot benchmarks will be filled to the extent possible, ensuring to taper material at a greater than 12:1 slope where insufficient material is experienced to prevent erosion. The Lateral 6 corridor will also incorporate log diverters to align any surface flows in a southwest direction. The combination of fill and use of log diverters will re-direct surface and subsurface flows to best re-establish hydrologic connectivity across the former ditch channel. The northern ½ mile of the ditch will incorporate cedar dams to maintain hydrology at target levels. The dams will be installed to match grade with the lands on either side, with a constructed notch in the center of the dam to provide overflows at the center of the former channel. The notch will allow excess surface water a controlled location to overtop, preventing the occurrence of end-routing the dams.

Lateral 5B, aligned north to south, located 1 mile east of Lateral 6, has no spoil available south of the SNA boundary and substantial spoil available within the SNA. Hydrologic restoration within this corridor is the most difficulty do the lack of spoil in the southern portions of the ditch alignment. The Lateral 6 corridor also has the distinction of being the soul ditch in the project that has measurable subsidence on both sides of the ditch, creating focal flow within the ditch corridor. The result of this focal flow is an inability to transition ground water flows across the ditch to mimic pre-impact conditions. The proposed restorative action on the southern portion of Lateral 6 is to fill the open channel with brush and woody debris, this will reduce the efficiency (ie. discharge) of the ditch and allow a medium for organic material to accumulate, initiating paludification. The use of woody material will allow for some flow-through of the system, which will eventually decrease overtime as organic matter accumulates within and along the former ditch channel. In conjunction with the placement of the debris in the channel, the existing beaver dams will be pressed down to match the adjoining ground elevation. The pressing of the beaver dams serves two purposes; first, lowering the elevation of the dam will reduce flashiness on the upstream side of the dam, and second, beaver dams within the site are typically colonized by Reed Canary Grass which typically become stressed when root zones are no longer perched.

Lateral 5B, within the confines will require a different approach to address hydrologic restoration compared to the southern portion. While this section of the ditch has suitable spoil to plug the ditch, it is nearly void of invasive vegetation. There is always the potential to introduce invasive vegetation when sites are disturbed through construction. Therefore, in this segment of the ditch cedar dams are proposed in order to 'step-down' the surface water elevation in the ditch. The cedar dams will provide the target water level within the ditch and have the added benefit on being minimally invasive to install, with a low probability of introducing non-native species. The dams with span the entire ditch and be keyed into the banks. A notch will be located in the center on dams, the notch will be 6" below the adjoining natural grade. The notch will provide a controlled location for overflows in the center of the ditch channel, preventing end-routing of surface water on the dams.

Lateral 7 Branch 1, located to the west of the SNA is nearly void of spoil material. This section of ditch provides the unique challenge of lacking plug material, however the open ditch appears to be in the process of paludification. The pre-drainage gradient allows surface and subsurface flows to extend from north to south, currently the ditch intercepts southward flows and routes it east and west. In the absence of spoil, cedar dams would be used to halt the east to west flows and coax southward flows. The elevation of the cedar dams would be slightly elevated in relation to the surrounding landscape as opposed to the 'notched' strategy utilized in the upper reaches of Lateral 7 Branch 1.

Conclusions

Restoration of hydrology within large peatlands is complex and poses significant challenges due to organic soils varied reaction to drainage. There are certainly lessons to be learned from previous restoration projects, the success of different strategies, and in what situations they are most applicable. One of the primary concerns raised when the Sprague Creek restoration was first proposed, regarded negative impacts that may be realized as a result of hydrologic restoration strategies.

As a result of these concerns the spring channels were assessed to determine potential effects of removing and replacing spoil in the former open ditch. All spring channels exhibited either a reduction or no change in potential impact to native communities along the north fringe of the channel. The native plant communities along this northern fringe currently experience impact as a result of beaver dam construction and failure, this encourages bounce that may destabilize the organic substrate and/or promote succession of undesired species through inundation or drying.

This report reviewed restorative actions on the Superior Wetland Bank to determine what factors may have led or erosion of peat on check dams and surface water flows routing around ditch plugs. The review was intended to identify potential fatal flaws within the Superior Bank's strategy and ensure that they were not repeated on the Sprague Creek Site. From the review of the Superior Site's existing issues, it was determined that constructing plugs with woody material (whole trees), with the intent to raise water table and halt drainage was problematic. The woody material creates an obstruction to excess flows, forcing surface water to flow around it. This may be a result of buoyancy, disturbance from construction, underestimates in hydrology, or a combination of these factors.

To address the concerns raised from the Superior Bank, the Sprague Creek site employs strategies that either provide neutrally buoyant (waterlogged organic material) fill within the former ditch, or utilize anchored woody material (cedar dams, log deflectors) to re-direct flows. The only section of ditch that will utilized brush and trees to fill the channel, will not completely halt flows, this allows for excess water to continue along the corridor without impacting adjoining wetlands. The brush and trees are intended to slow flows over time and accumulated organic material, promoting long term paludification as opposed to immediate restoration of water table to near-surface condition.

The Sprague Creek Site differs from the Superior Site as the majority of the ditches run perpendicular or tangential to the natural gradient. The ditch alignments coupled with the grade of the surrounding landscape and the available spoil, bolster the potential to transition hydrology across the former ditch locations. Restoration strategies within Sprague Creek were tailored to specific reaches of individual ditches to ensure long term functional lift would be achieved. Each strategy was selected to provide an excess surface water contingency to prevent negative impacts as result of modifying hydrology.

Figure #20

Supplement – Crediting Wetland Restoration Sprague Creek Subwatershed

Supplement: Crediting Wetland Restoration Sprague Creek Subwatershed

Generation of adequate wetland credits at the Sprague Creek Site for mitigation at the Roseau Lake Site will be achieved through multiple restoration strategies of a large complex of wetlands thereby adopting a "watershed approach". Crediting will be contingent on restoring hydrologic connections to a large expanse of wetlands in conjunction with targeted vegetation management promoting a mosaic of high quality wetlands. Hydrologic modifications within the legal drains will restore connectivity of disjointed wetlands, while shearing and prescribed burning of a large expanse of shrub-carr will promote graminoid/herb dominated wetland communities. Generation of surplus credits for use in future projects or to generate income is not proposed for this project. Determination of credit will quantify benefits of mitigation activities compared to loss of wetland functions from construction of the Roseau Lake Project.

Army Corps of Engineers

Mitigation credits can be generated in accordance with the *St. Paul District Mitigation Policy* through restoration and enhancement activities within the scope of the project.

Restoration via Re-Establishment – Removal of fill (spoil) material and placement of the material into the open ditch will re-establish wetlands that were impacted due to fill and excavation respectively. Within the project scope there is approximately 19.08 acres of wetland impacted due to spoil and 21.78 acres of open ditch in former wetlands. Re-establishment of wetlands within these existing impacted acres are eligible for up to 40.86 acre/credit at a 1:1 ratio.

Enhancement – Vegetative management that provides a functional lift to existing wetland will result in restoring large tracts of former herb-dominated wetlands that have been invaded by shrub vegetation. Enhancement will be completed through mechanical shearing of brush during winter months to ensure adequate removal of shrub species while not rutting or damaging the ground. There are 2,092.75 acres of enhancement which would generate 1,046.38 acre/credit at 2:1 ratio. Restoration of hydrology will likely aid in hindering resurgence of shrubs within the managed tracts.

Restoration via Rehabilitation – Restoration of hydrology through plugging of artificial drains and reconnection of spring channels will provide hydrology to wetlands that have been partially drained or their water source diverted. For the rehabilitation component, three features within the project scope were reviewed; Lateral effect of JD61, Lateral 5B, 6, and 7 (Branch 1), and diverted hydrology from the southern lobe of Fen and plugging firebreaks.

Restoring wetlands affected by lateral drainage from the legal ditch system, will consist of plug/dam installation and spoil removal at strategic locations to reconstruct groundwater connectivity. The affects of the ditch and spoil have resulted in a variable impact footprint ranging from 100ft- 867ft from the edge of the corridor of disturbance. The lesser impact (ie.

100 ft) is specific to Lateral 5B south of the intersection of Lat 7 Branch 1 and the east bank of Lateral 6 south of Lat7 Branch1. The 100ft designation for impact was derived by the FQA assessment which indicated measurable degeneration of plant species richness within 100 feet upgradient of artificial drainage. A 500ft buffer of wetlands downgradient of the ditch systems were identified as impacted through the FQA assessment, this is likely due to a loss in hydrology. A 766ft corridor was designated for the wetlands north of Lat 7 Branch 1, was calculated through review of historical and present aerial photos to determine the scope of tree succession within the spring channels. Comparing the historical photos to the most recent (1991-2015) photos measured a length of channel that was indistinguishable from the ditch. Field truthing on a sample of the spring channels verified succession was occurring in the channels to an average of 766ft from the edge of the ditch. The largest footprint calculated was for Lateral 5B and Lateral 6 north of Lateral 7 Branch 1. The effect of drainage on wetlands within this region were determined measuring vegetation conversion from 1940 to present within the spring channels. There was notable change in stratum composition within the spring channels which, when averaged, measured 867 feet on either side of the ditch. Combined, all areas impacted by lateral drainage that could be restored totaled 703.48 acres, which at a 2:1 ratio generate 351.74 credits.

The second feature in factoring restoration is the effect of reconnecting spring channels to the southern limits of the fen. Review of aerial photos from 1940 to 2015 has shown the channels south of Lateral 7 Branch 1 have nearly, entirely disappeared (Figure 10 – Historical Aerial Photos). Channel disappearance is likely due to the loss of sufficient hydrology necessary to maintain the channel/island dynamic occurring in intact spring fens. The project will restore connectivity to the southern portions of the fen. Extent of the proposed rehabilitation is measured based on the intersection of the historic channels with a 1-foot contour interval. On the southern lobe west of Lateral 6 the elevation is 1045' while the lobe east of Lateral 6 is 1044'. The total acres identified for rehabilitation by this practice is 597.61 acres, at a 2:1 ratio the yield is 298.81 credits.

Impacts as a result of firebreaks were assessed at an average 100ft on either side of the disturbance. The 100ft designation was adopted as a result of the previously mentioned FQA report.

The combination of re-establishing ditched and filled wetlands along with enhancement to vegetation has the potential to generate 1,747.35 credits to mitigate impacts resulting from the Roseau Lake Project.

MN Wetland Conservation Act

Credits generated in accordance with the Minnesota Conservation Act consist of restoration on drained and filled wetlands and restoration of exception resources.

8420.0526 Subp 8. Restoration and protection of exceptional resource value – This provision states that the Technical Evaluation Panel (TEP) may allocate credit based restoration or protection of an exceptional natural resource. The Sprague Creek Site, being one of five spring fen SNA's within the state, would qualify as an exceptional resource. Being the SNA is bisected by a legal ditch system impacts to wetlands are realized both through diversion and drainage. Restoration and protection of this unique resource will contribute to the value and sustainability of sensitive plant communities. Since crediting under Subp 8 is at the discretion of the TEP, determining credit ratios is somewhat subjective. Therefore to align with crediting proposed through the Army Corps standards, the following method is suggested; crediting 3:1 for restoration of hydrology and protection through perpetual easement (including ditch corridor) for the entirety of the project scope exempting the SNA. This would generate 1747.35 credit from the 5,242.05 acres surrounding the SNA and provide protection/preservation of sensitive wetland complexes within and adjoining the SNA.

(Table #1) Proposed Credit Tables

ACOE Compensatory Mitigation

Activity	Acres	Ratio	Credit
Restoration via Re-Establishment	40.86	1:1	40.86
Enhancement with financial assurance for 10 years	2,092.75	2:1	1046.38
Restoration via rehabilitation (Lateral effect from ditch)	703.48	2:1	351.74
Restoration via rehabilitation (Restoring hydrology to southern limits of Fen)	597.61	2:1	298.81
Restoration via rehabilitation (Plugging firebreaks)	19.12	2:1	9.56
Totals	**3,453.82**	-	**1747.35**

WCA Compensatory Mitigation

Activity	Acres	Ratio	Credit
Restoration and protection of exceptional resource value	5,242.05	3:1	1747.35
Totals	**5242.05**	-	**1747.35**

Figure #21

Pre-project Peat Sampling and Hydrology Monitoring.

2018 Monitoring – Sprague Creek Peatland Proposed Restoration Project

Introduction

The Minnesota Department of Natural Resources (MNDNR) and the Roseau River Watershed District (RRWD) have partnered on a proposed project to manage the drained Roseau Lake for wildlife enhancement and flood damage reduction. The proposed project in the drained lake will have unavoidable wetland impacts requiring compensatory mitigation for lost wetland functions within the project limits. The project partners identified the Spraque Creek SNA and surrounding wetland complexes as a potential location to restore, enhance and preserve wetland functions sufficiently to offset or exceed functions lost within the drained lake. The MNDNR and RRWD have submitted a draft proposal to agency staff(within DNR) to identify potential issues that may arise with restoration strategies, land use, plant communities or other features that may inform a final wetland restoration proposal. The data exhibits attached in this document were the result of comments from DNR staff concerning groundwater fluctuations within the Sprague Creek Site and the degree of humification present in the peat profile.

Water Level Monitoring

12 Piezometers (monitoring wells) were installed within the proposed wetland restoration site (See Attached Site Map), the Piezometers were arranged in 6 pairs, with one well on the upgradient side of a legal ditch and the second on the downgradient side. All wells were equipped with Hobo water level loggers, which record water depths up to 6 meters. The wells were labeled "A" to indicate upgradient and "B" to label downgradient respectively. There were two stilling wells installed within the ditches, stilling well #1 is located in the southwest limits of the SNA, stilling well #3 is located between monitoring well 3A and 3B. The stilling wells provided information on the flashiness of the ditch systems and could be compared with the data collected in the piezometers throughout the site. A weather station was also installed near monitoring well 3A, the weather station was equipped with a barometric pressure sensor. This sensor allows the water level logger data to be post processed accurately to account for high pressure and low pressure weather systems that can skew water level readings. The weather station had a system failure in the first week and was not utilized in post processing due to the minimal coverage it recorded during deployment.

Peat Humification Sampling

Humification is a measure in the rate of decomposition of peat soils, the degree of humification is determined by the physical characteristics of each horizon. Collection of peat humification data is critical in determining the hydraulic conductivity of the soil, hydraulic conductivity is the ability for water to move through the peat medium. Specific to this project, a potential issue for restoration could arise if the peat is too decomposed near the surface to pass lateral water flows from one side of a plugged ditch to another.

For the purposes of this analysis the Von Post Method was used in the field to describe the physical characteristics of the peat. A grab sample was retrieved from each distinct horizon on

peat, the sample was formed into an egg shape in the palm of the observer's hand, the peat was squeezed and the result of water and material expressed was recorded, the condition and identifiable parts from the squeezed sample were also recorded. The observer recorded all characteristics in a field notebook, this data was then compared with a Humification chart upon return from the field. Post field review of humification was adopted, as it allowed for more data to be collected per site visit, and increased accuracy of classifying humification by relying on technical resources.

Discussion/Results

Well Data

The 2018 growing season experienced below average precipitation. It is unknown how the climatological conditions vary compared to "normal conditions" aka average precipitation, as 2018 was the first year of monitoring. There were 3 wells that were destroyed by Black Bears, one of the loggers catalogued then event in the data, the wells will be repaired in 2019.

Wells 1,2,4 & 6 encountered a stable decline in the "B" downgradient wells through the growing season, by comparison water levels with their upstream conterparts were more stable or exhibited less decline comparatively.

Wells 3A and 3B were the only transect on a ditch where the gradient flow was inline with the ditch, ie the natural grade was not draining perpendicular to the ditch. Well 3a was located east of the ditch, had no spoil bank obstructing flow and therefore was flashier in comparison to 3B. Well 3B did illustrate fluctuations complimenting ditch levels and the recordings of 3A, however they were more muted or prolonged. Stilling well #3 is located between the two monitoring wells, the recordings from the stilling well show a general downward trend, with a jump in the ditch following precipitation events with a return to its former trend after 3-4 days. It should be noted that there is a beaver dam located immediately upstream of the wells that may be influencing the results, either buffering water levels or otherwise influencing results.

Well #5 experienced a different trend in comparison to the other wells (1,2,4,6), Well 5B did not record and general downward trend in water levels through the growing season. Well 5A did show a slight downward trend through the growing season, this could be a normal trend through the growing season as seen in other wells, or may be lateral effect from the adjacent ditch. The data from 5B is peculiar in that the water level rises gradually later in the growing season, this may be the result of upwelling near the well. The wetland complex is known for its diverse groundwater interactions with the landscape and this could be the reason for the anomaly.

Stilling well #1 was certainly the most erratic of all the sites monitored within the project scope. The recorder illustrated water levels spiked immediately following a precipitation event and fell within 3-4 days. This stilling well was the only location that was not influenced in whole or in part by beaver dams or ditch blockage in any way. Stilling well #1 represents the discharge characteristic if the ditch were maintained in accordance with Minn Statute 103E.

Peat Humification

Peat profiles were sampled at all well locations to correlated substrate characteristics with water level dynamics. In addition to the well locations, 2 control samples, one north of the ditch and another south of the ditch were collected to provide a baseline of peat features outside the influence of ditches. The controls were collected approximately 500ft from the ditch, and adjacent to the SNA to provide the best comparative sample feasible.

Based on literature review, hydraulic conductivity of peat is correlated with bulk density which can be illustrated in H-values. An H-value of 5 or greater is the transition point in which water transport within peat is severely limited. Therefore determining the existence and depth of limiting layers is important in evaluating the potential success of restoration.

The north control sample, represents the most pristine sample possible as there is no evidence of human alteration or existence for that matter. The sample found a deep layer of H-1 essentially live peat, with underlying H-2 and a sharp transition to H-4.5. The south control by comparison is outside the direct influence of the ditch, however the plant community is drastically different from its counterpart potentially due to the 100 year alteration in hydrology. The sample at south control found H-3 and H-4 near the surface and H-4.5 – H-5 below.

When comparing the "A" wells to the "B" wells there were some general trends identified. In the "A" wells H-5 ranged in depth from 25"-50" and there was not always a sequential transition through the scale of H-values as the samples extended deeper. Most of the samples recorded from the up gradient side of the ditch had a H-1 to H-2 value through the upper 2 feet of the profile, this would likely become deeper as one extends further away from the ditch. On the down gradient side of the ditch, the "B" wells found H-5 values from 18"-60" from the surface with 30" depth being the average. The "B" wells often exhibited a low H-value profile imbedded within two higher value profiles, this is likely due in part to spoil from ditch construction overlying the original peat. "B" samples were taken adjacent to spoil banks, therefore its likely some deposition of peat from the spoil bank had partially buried the sample location.

Well 5B was once again an outlier compared to the other wells peat profiles. 5B encountered a layer of intact peat immediately below an H-5 value. This anomaly was keyed out at an H-1 value, and is likely the original grade prior to ditch excavation and spoil deposition. Well 5B is located in a corridor where the spoil bank is diffuse and was either levelled or eroded to near level with surrounding landscape. The buried H-1 may be the cause or an indicator of groundwater dynamics that were recorded in Well 5B.

Figure 1

Site Map

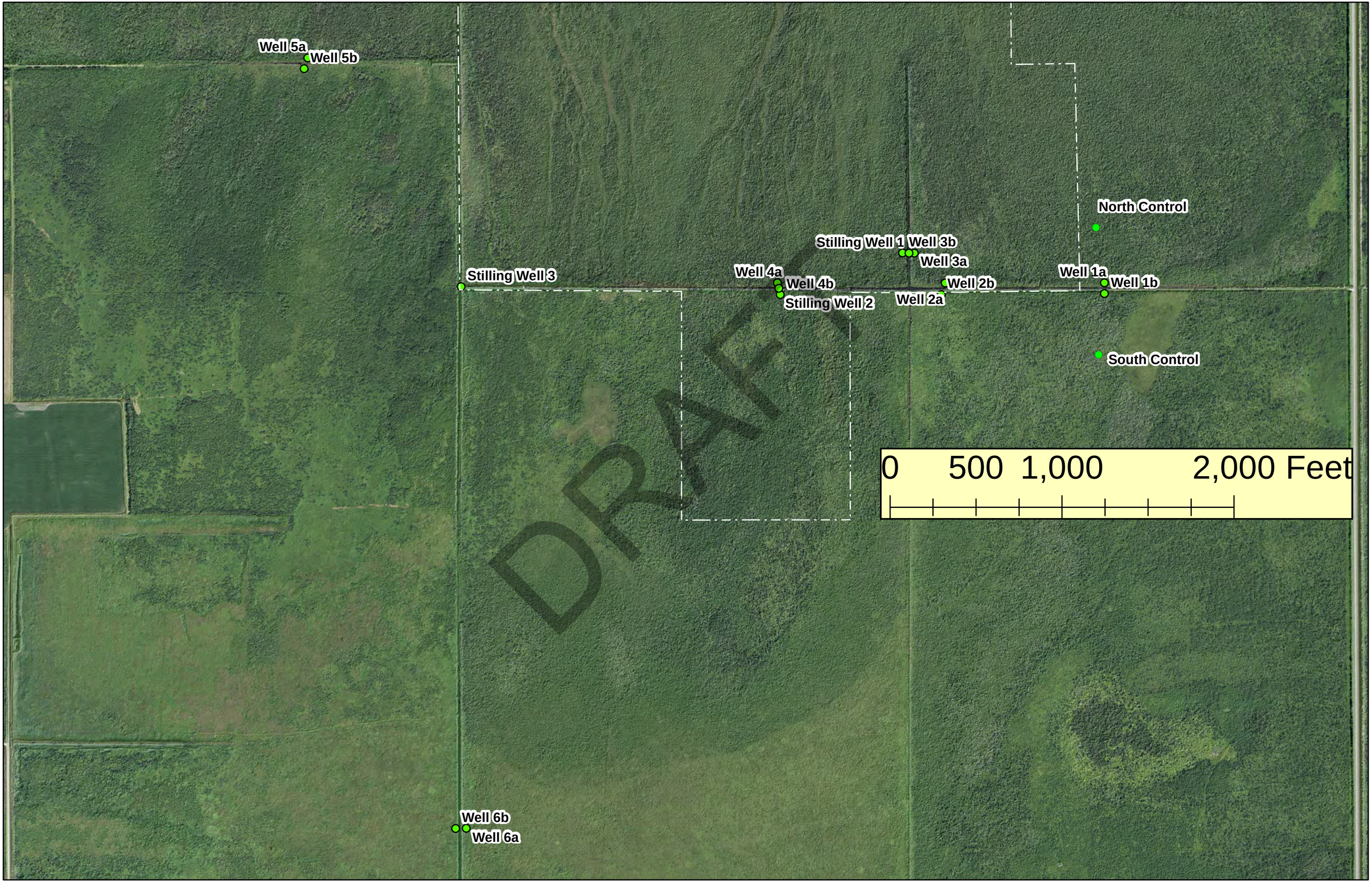
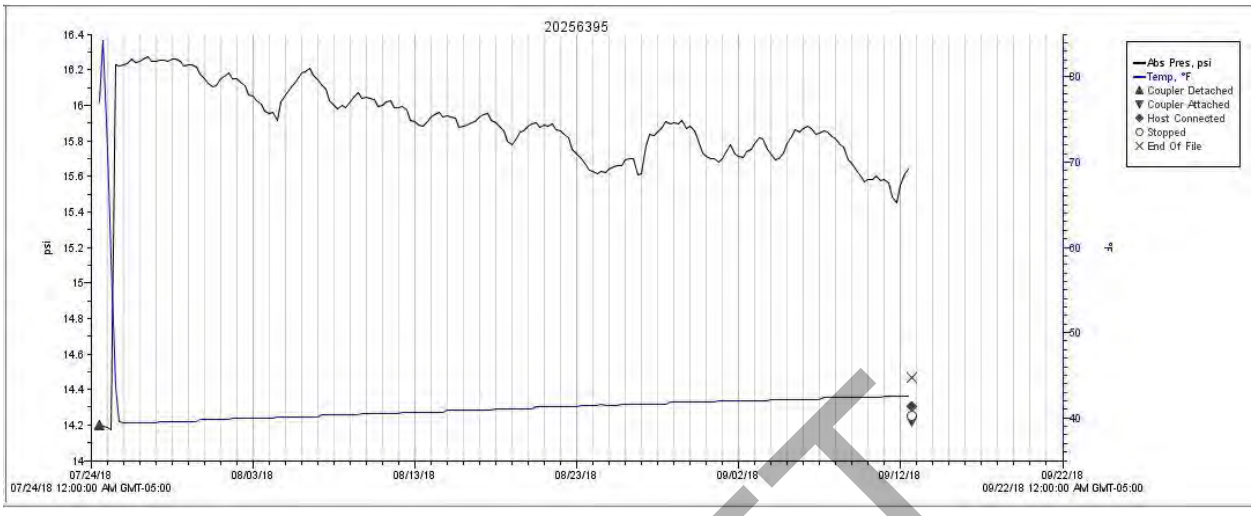

Well 5a
Well 5b
Stilling Well 3
Well 4a
Well 4b
Stilling Well 2
Stilling Well 1
Well 3b
Well 3a
Well 2b
Well 2a
North Control
Well 1a
Well 1b
South Control
Well 6b
Well 6a
DRAFT
0 500 1,000 2,000 Feet

Figure 2

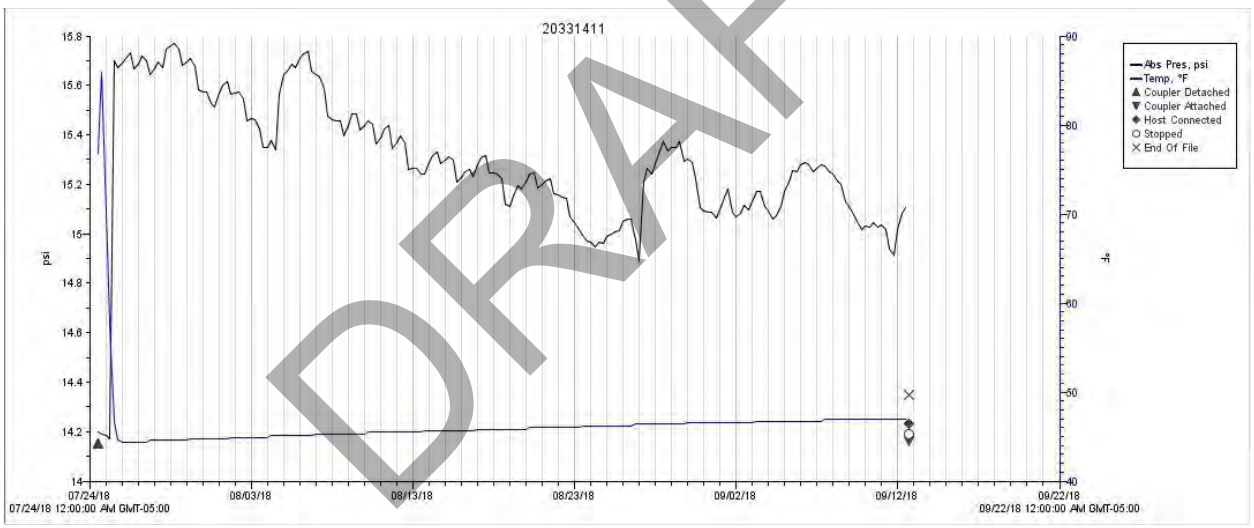
Well Data

Sprague Creek 2018 Monitoring Well Data

Well 1A



Well 1B



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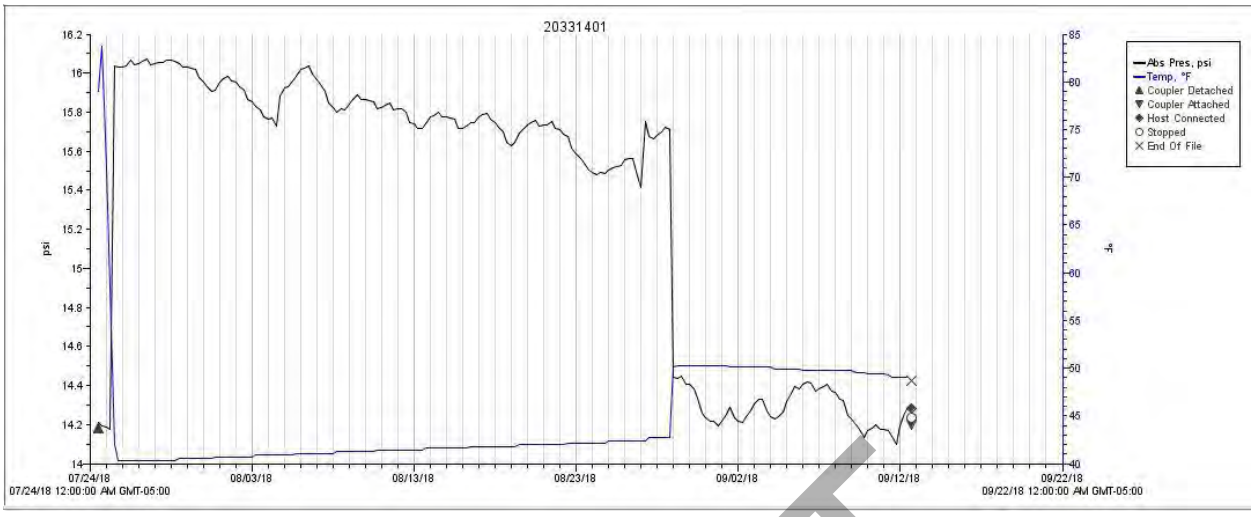
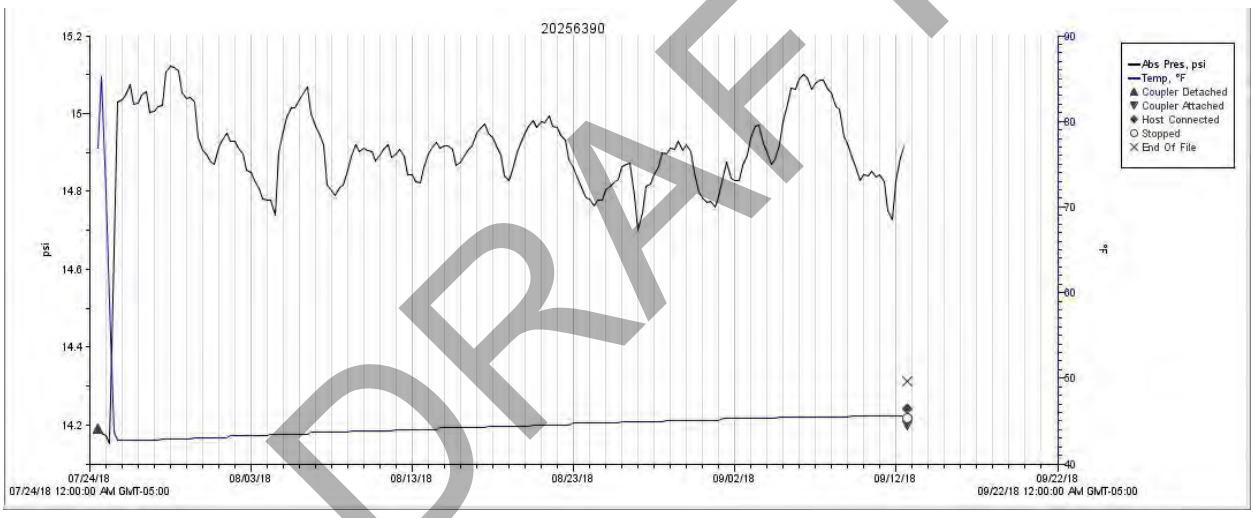
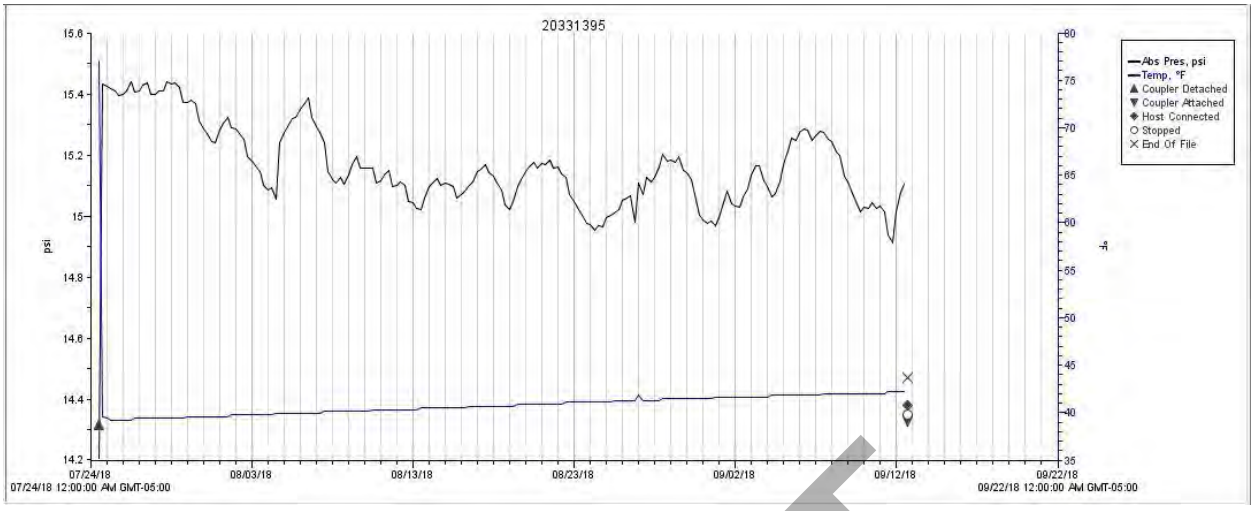


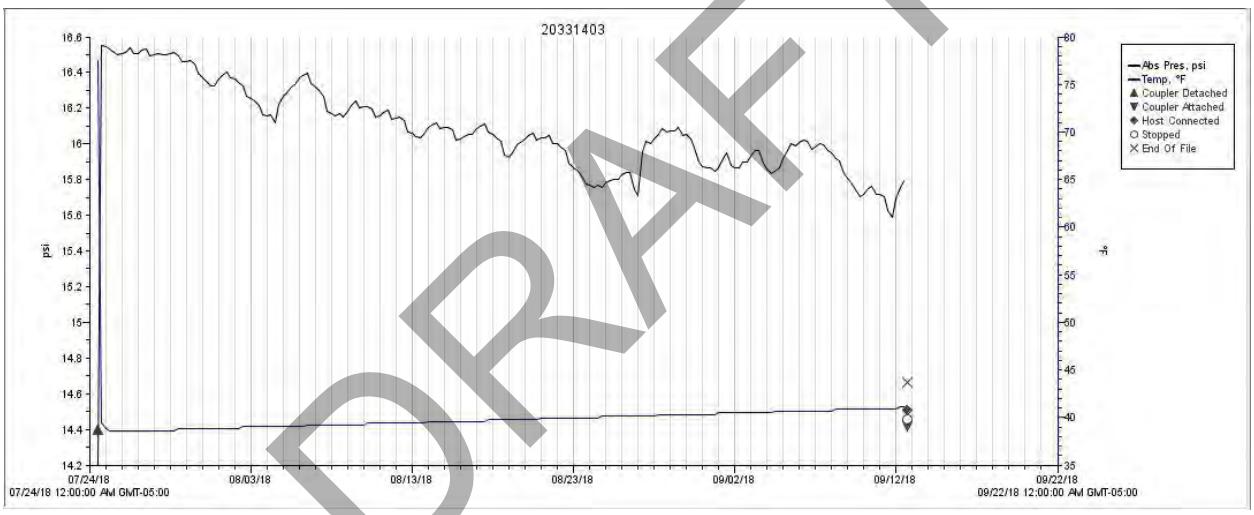
Well 2B



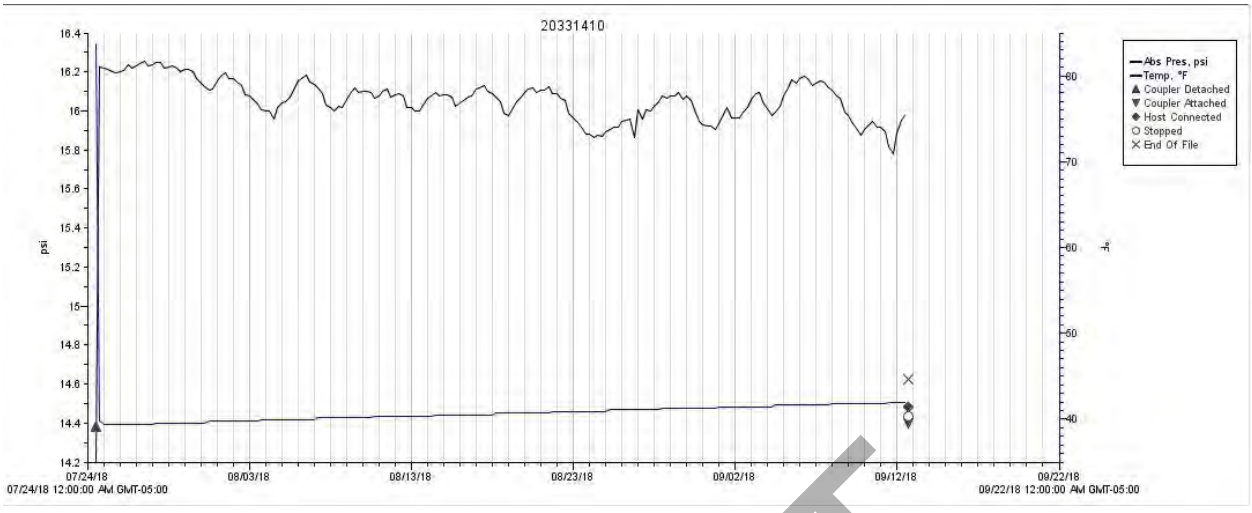
Well 3A



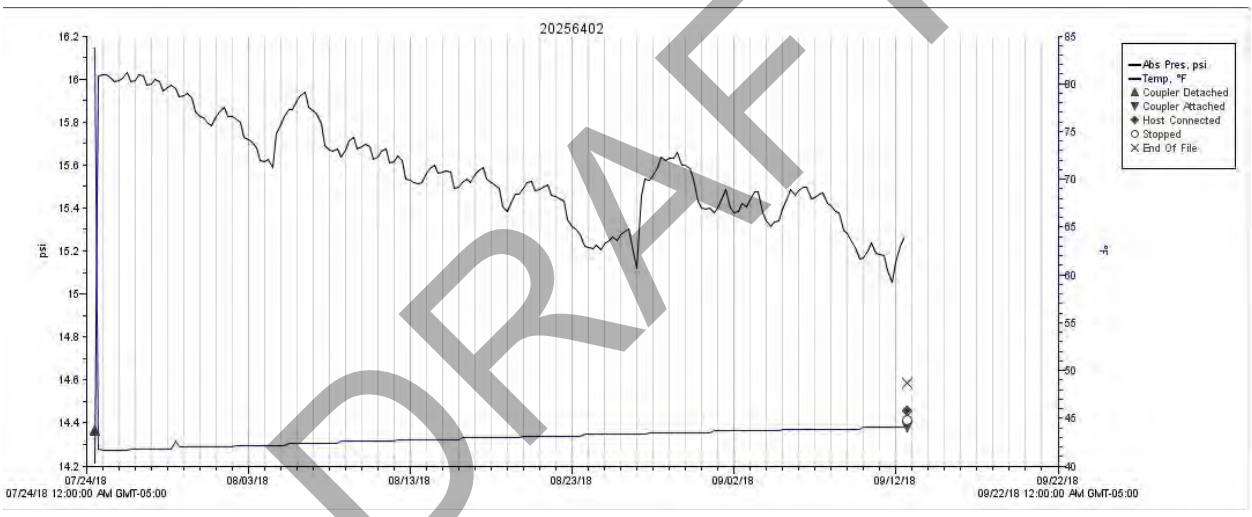
Well 3B



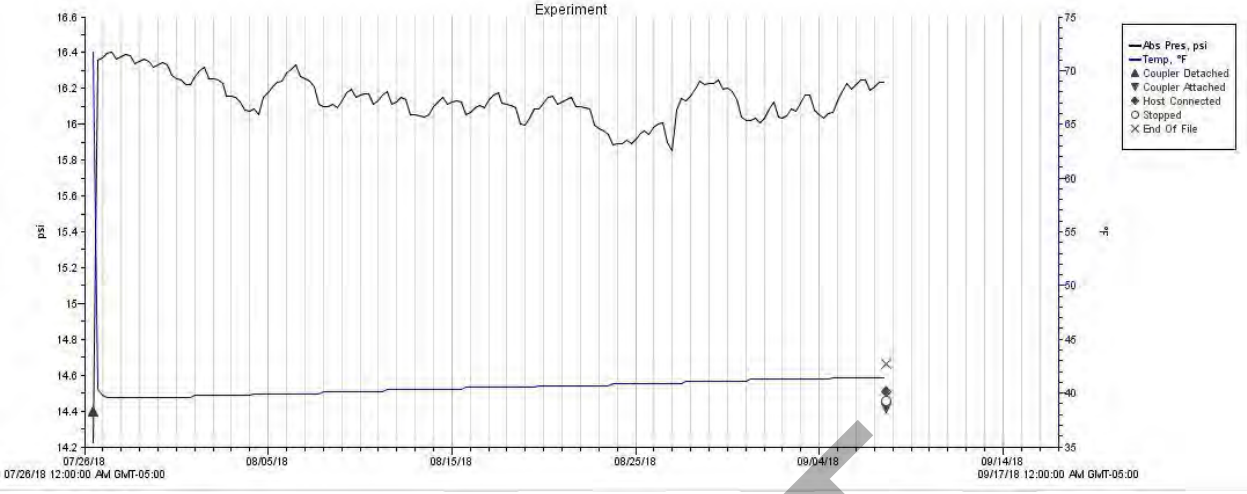
Well 4A



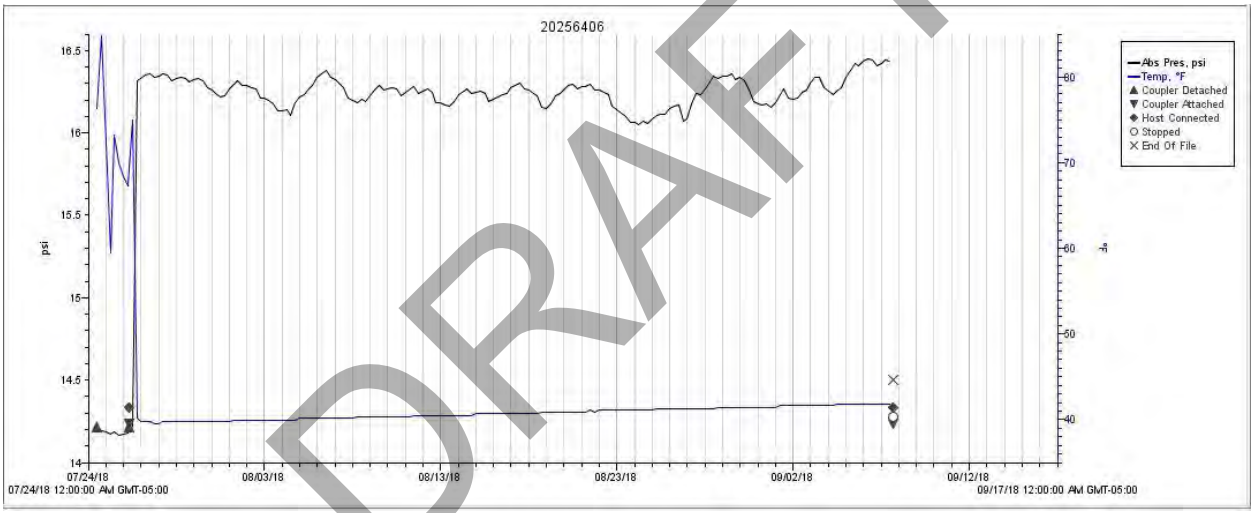
Well 4B



Well 5A



Well 5B



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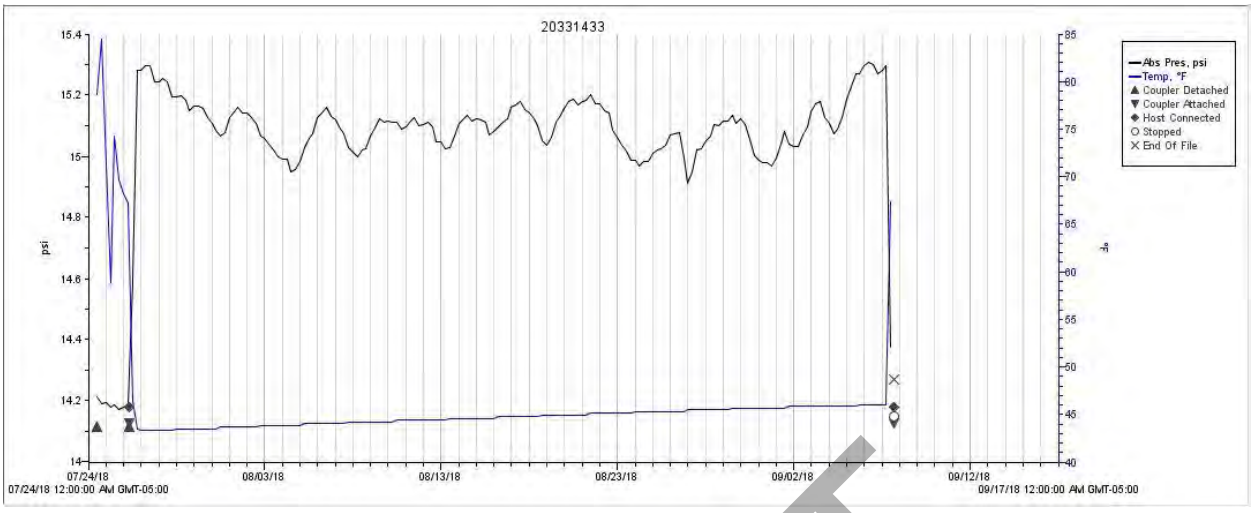

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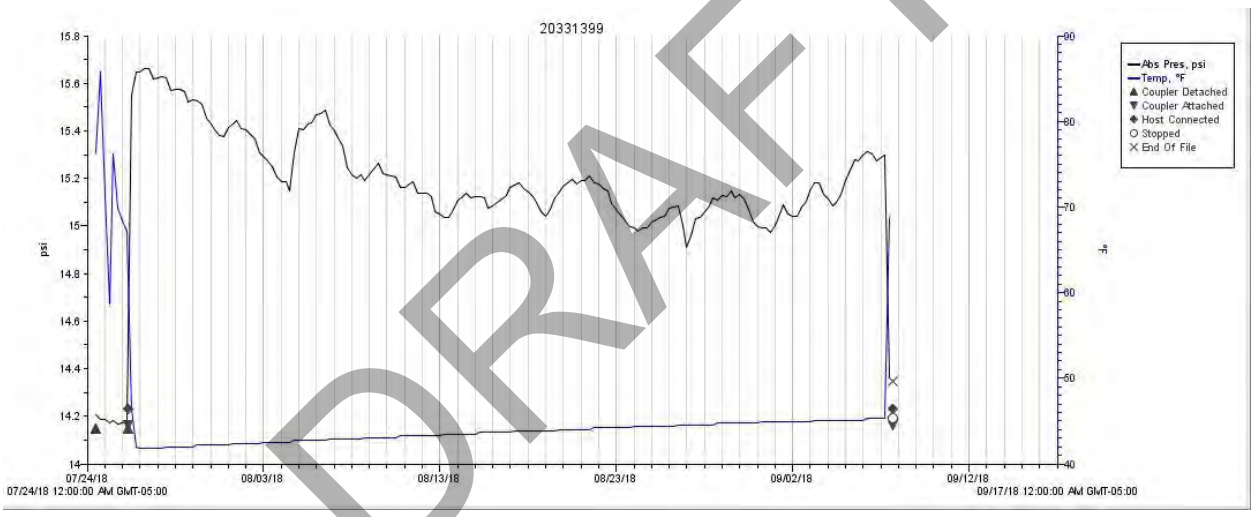
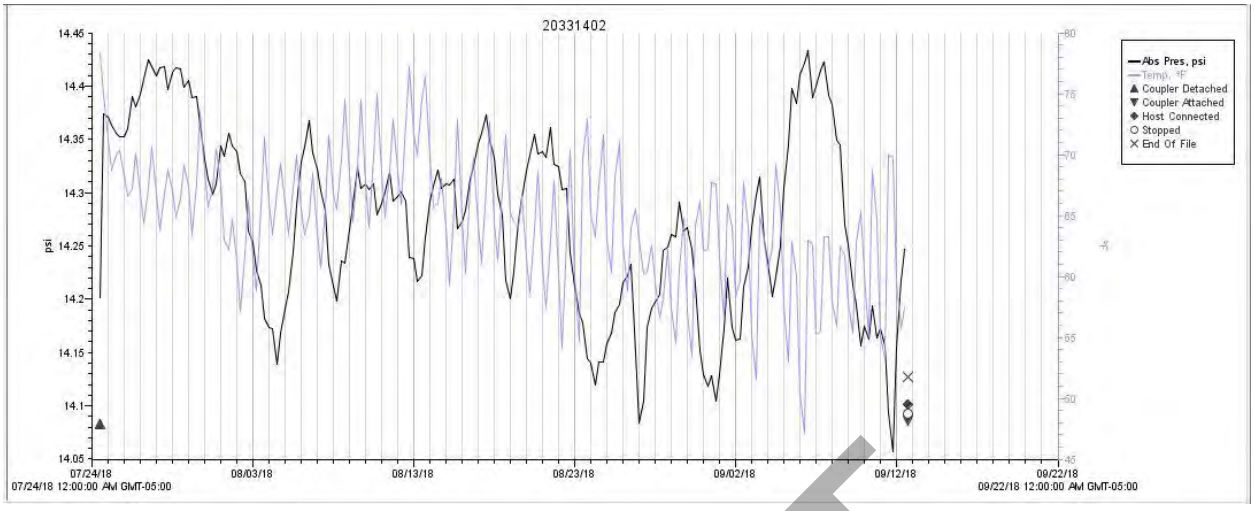


Stilling Well #1



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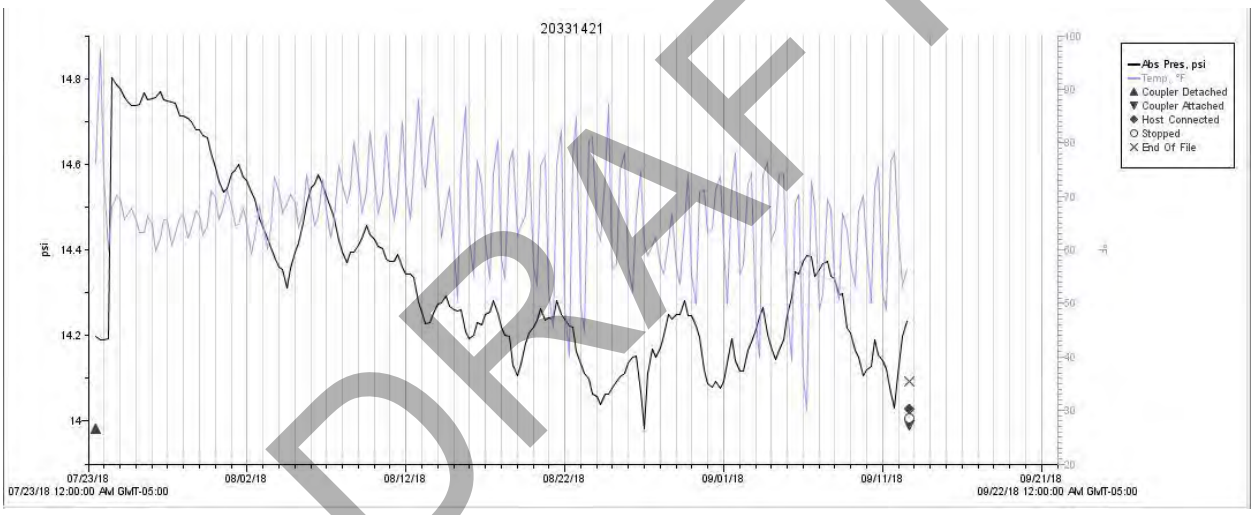


Figure 3

Humification Chart

Table 02: Von Post Field Evaluation Adapted for Hydraulic Conductivity in the Mid-Range (H4-H7.5).

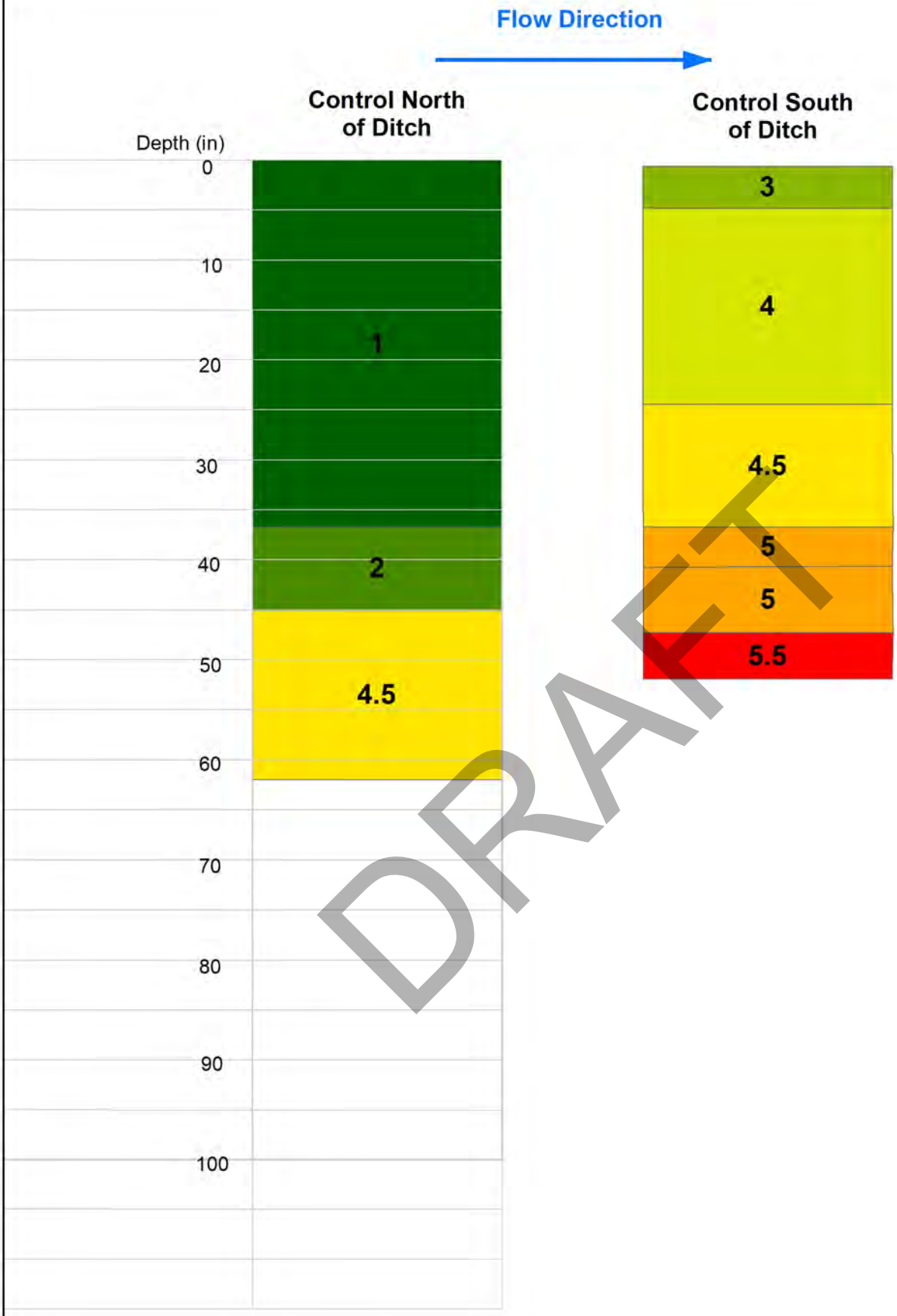
Degree of Decomposition	USDA SCS Classification	Nature of water expressed on squeezing	Proportion of peat extruded between fingers	Nature of peat residues	Decomposition description	Volume Passing through Fingers (%)	Additional Description of Free Water Expressed to the Second Hand
H1	Fibric	Clear, colorless	None, elastic	Unaltered, fibrous	Undecomposed	0	Expressed water is clear to almost clear and yellow-brown in color. Slowly open the second hand and observe color as the water depth thins
H2	Fibric	Almost clear, yellow-brown	None	Almost unaltered	Almost undecomposed	0	
H3	Fibric	Slight turbid, brown	None	Most remains easily identifiable	Very slightly decomposed	0	Water is muddy brown and retained fiber is not mushy
H4	Hemic	Turbid, brown	None	Most remains identifiable	Slightly decomposed	0	Very turbid, muddy water and retained fiber is somewhat mushy
H4.5	Hemic					1	Amorphous material primarily stays on outside of squeezed fingers
H5	Hemic	Strongly turbid, contains a little peat in suspension	Very little	Bulk of remains difficult to identify	Moderately well decomposed	2-10	Use the volume of amorphous material passed. As "With H4 and H4.5, water at the edges of the amorphous material is very turbid and muddy
H5.5	Hemic					11-25	
H6	Hemic	Muddy, much peat in suspension	One third	Bulk of remains unidentifiable	Well decomposed	26-35	
H6.5	Sapric					36-45	
H7	Sapric	Strongly muddy remains	One half	Relatively few identifiable	Strongly decomposed	46-55	Water around the amorphous material is thick, soupy, and very dark
H7.5	Sapric					56-65	
H8	Sapric	Thick mud, little free water	Two thirds	Only resistant roots, fibers, and bark, etc., identifiable	Very strongly decomposed	66-75	There is essentially no free water; it is all amorphous material
H9	Sapric	No free water	Almost all	Practically no identifiable remains	Almost completely decomposed	76-95	There is no free water associated with the amorphous material
H10	Sapric	No free water	All	Completely amorphous	Completely decomposed	95-100	

MN DNR. 2007. Peat Inventory Data - Minnesota. Microsoft (MS) Access Database ver. 2007, contains data about peat core samples and their chemical analysis. Minnesota Department of Natural Resources, Division of Lands and Minerals. Site records 7.115 (including Aitkin County and the AW Peatlands). http://www.lmic.state.mn.us/chouse/metadata/peatinv.html

Verry, E.S., D.H. Boelter, J. Päivänen, D.S. Nichols, T.Malterer, and A.Gafni 2011. Physical Properties of Organic Soils. Chapter 5, In: Kolka, R.K, S.D. Sebestyen, E.S. Verry, and K.N. Brooks. Peatland Biogeochemistry and Watershed Hydrology at the Marcell Experimental Forest. CRC Press, pp 135-176.

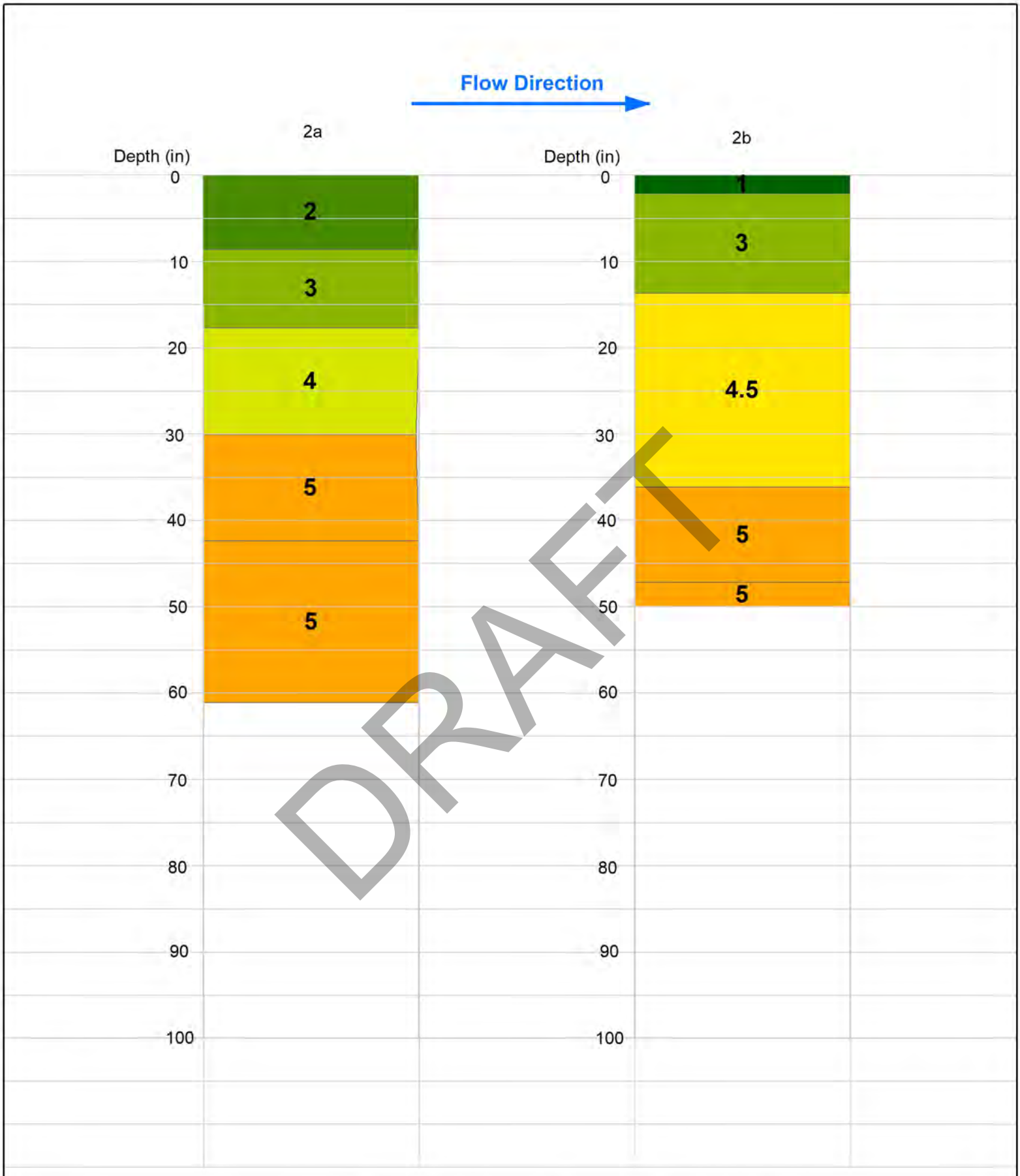
Figure 4

Von Post Sample Graphics

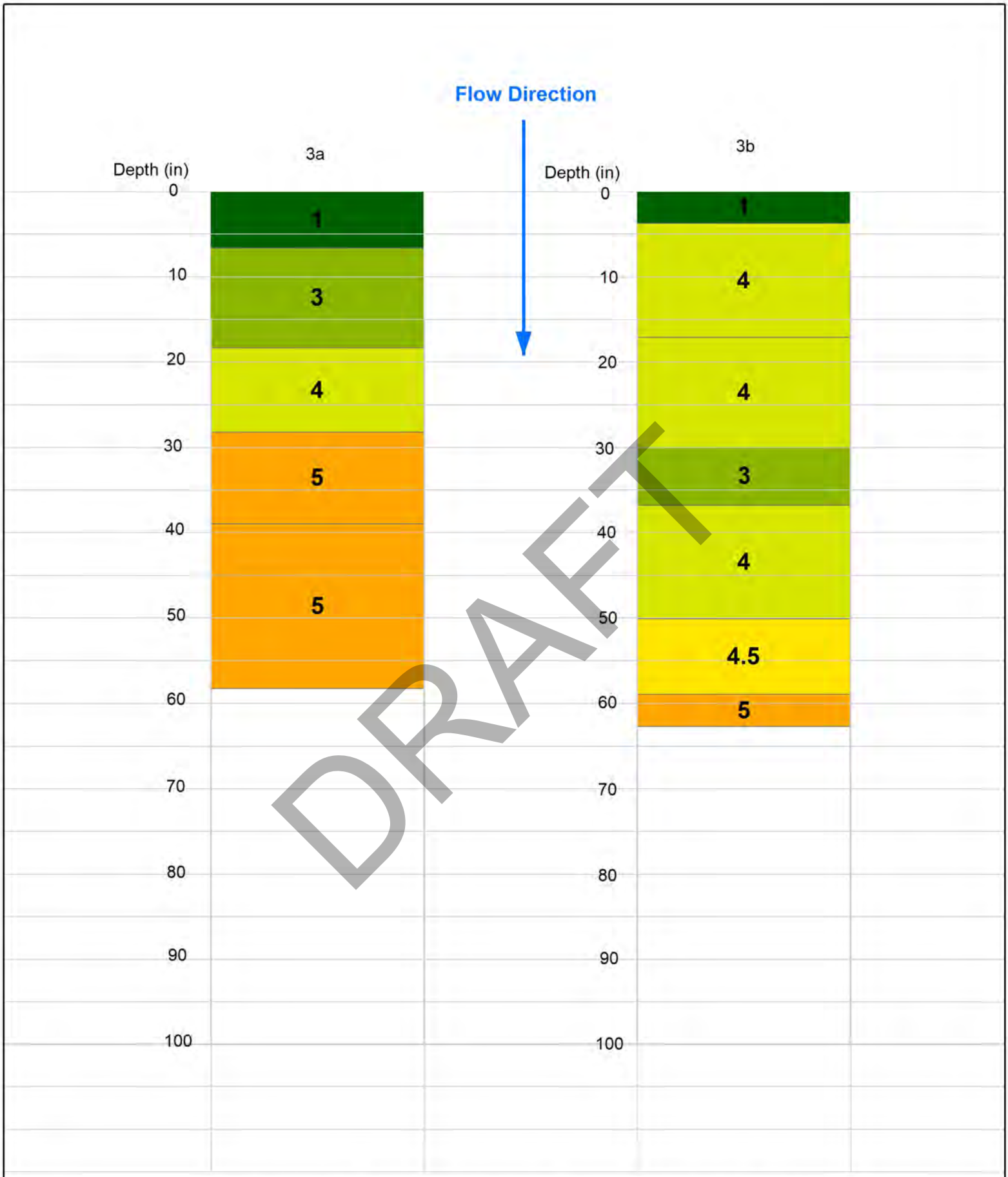


Control Samples Sprague Creek Peatland
Peat Humification - Von Post Values

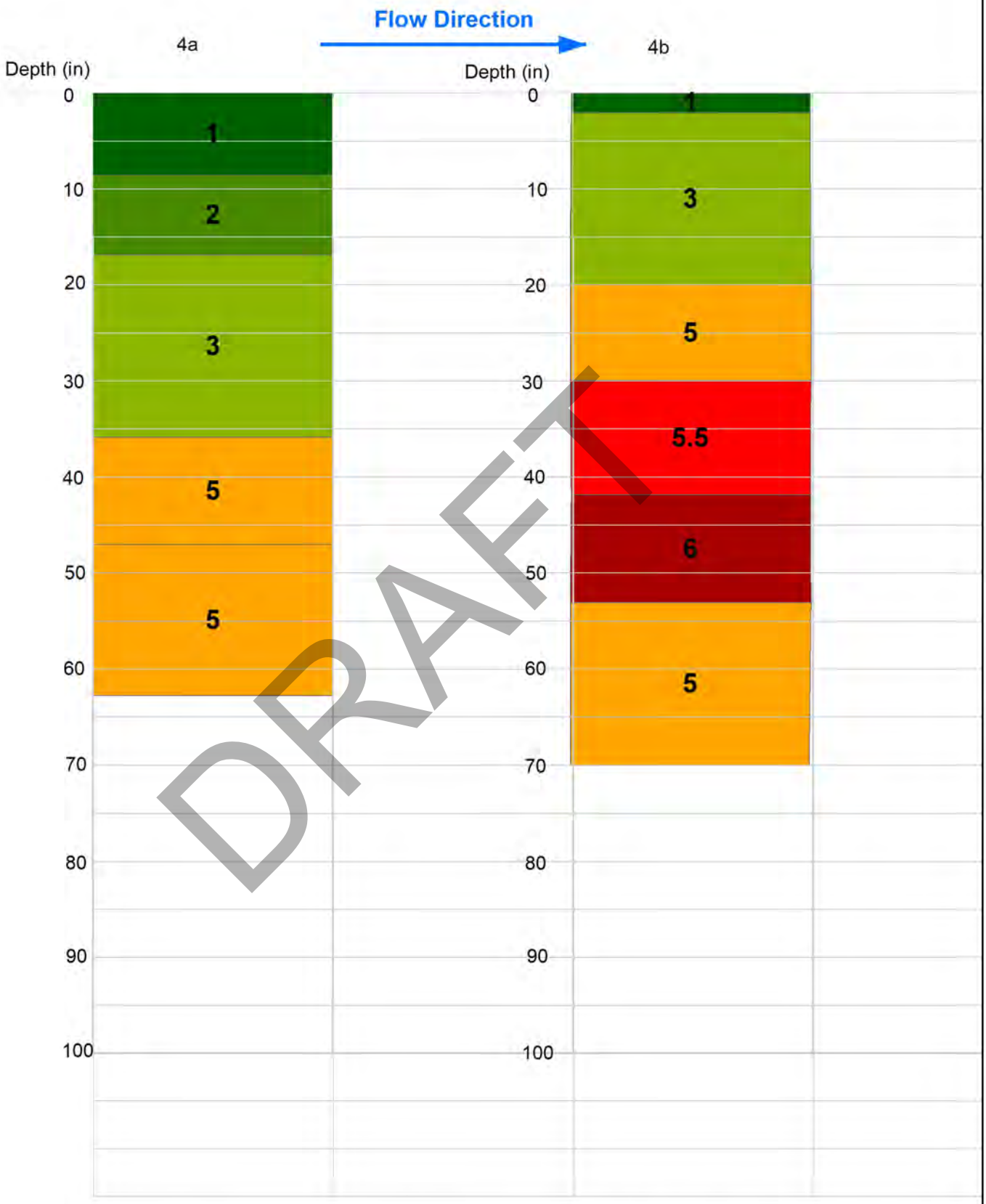
Transect #1 Sprague Creek Peatland
Peat Humification - Von Post Values



Transect #2 Sprague Creek Peatland
Peat Humification - Von Post Values



Transect #3 Sprague Creek Peatland
Peat Humification - Von Post Values



Transect #4 Sprague Creek Peatland
Peat Humification - Von Post Values

Transect #5 Sprague Creek Peatland
Peat Humification - Von Post Values

Transect #6 Sprague Creek Peatland
Peat Humification - Von Post Values

Figure 5

Precipitation Data

Precipitation data for target wetland location:
county: **Roseau** township number: **163N**
township name: **Dieter** range number: **41W**
nearest community: **Ross** section number: **27**

To create a **precipitation documentation worksheet** using the three-prior-month (NRCS) method, select the date of the site visit or aerial photograph and click on "create worksheet".

2018 ▾ September ▾ 12 ▾ create worksheet

precipitation totals are in inches

color key:
total is in lowest 30th percentile of the period-of-record distribution
total is => 30th and <= 70th percentile
total is in highest 30th percentile of the period-of-record distribution

multi-month totals:
WARM = warm season (May thru September)
ANN = calendar year (January thru December)
WAT = water year (Oct. previous year thru Sep. present year)

A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.

Period-of-Record Summary Statistics

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
30%	0.41	0.34	0.52	0.83	1.56	2.41	2.20	1.87	1.27	0.87	0.57	0.50	12.59	18.73	18.99
70%	0.92	0.72	1.08	1.83	3.02	4.13	3.80	3.48	2.88	1.94	1.09	0.91	15.99	23.47	23.48
mean	0.72	0.58	0.88	1.41	2.47	3.51	3.17	2.91	2.45	1.56	0.98	0.75	14.51	21.43	21.37

1981-2010 Summary Statistics

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
30%	0.46	0.43	0.50	0.99	2.10	2.86	2.57	1.77	1.57	1.01	0.55	0.63	14.44	21.22	22.06
70%	1.04	0.73	1.06	1.48	3.34	5.14	4.21	3.73	2.75	2.33	1.31	1.07	17.39	26.07	26.63
mean	0.78	0.63	0.90	1.27	2.97	4.22	3.38	3.14	2.55	1.99	1.16	0.85	16.26	23.84	23.74

Year-to-Year Data

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
2018	0.43	0.52	1.05	0.25	3.03	2.54	2.28	1.52R	2.20R	2.78R			11.57		17.73
2017	1.42	1.59	0.59	1.05	0.96	6.23	0.95	1.64	6.66	1.48	0.86	1.57	16.44	25.00	26.72
2016	0.49	0.97	1.50	1.35	2.93	5.30	4.38	2.66	4.47	1.25	1.34	3.04	19.74	29.68	29.76
2015	0.94	0.45	0.89	0.68	4.91	4.37	6.17	4.74	2.16	2.21	1.95	1.55	22.35	31.02	28.23
2014	1.18	0.54	1.67	1.93	3.80	4.84	3.01	2.53	2.66	1.20	0.57	1.15	16.84	25.08	25.38
2013	1.43	1.31	1.12	1.55	4.71	1.92	2.44	3.21	2.51	1.09	1.19	0.94	14.79	23.42	26.24
2012	0.52	0.87	1.42	1.22	1.64	2.92	2.39	1.77	0.17	4.49	1.00	0.55	8.89	18.96	14.70

Precipitation Worksheet Using Gridded Database

Precipitation data for target wetland location:
county: **Roseau** township number: **163N**
township name: **Dieter** range number: **41W**
nearest community: **Ross** section number: **27**

Aerial photograph or site visit date:
Wednesday, September 12, 2018

Score using 1981-2010 normal period

values are in inches A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	first prior month: August 2018	second prior month: July 2018	third prior month: June 2018
estimated precipitation total for this location:	1.52R	2.28	2.54
there is a 30% chance this location will have less than:	1.77	2.57	2.86
there is a 30% chance this location will have more than:	3.73	4.21	5.14
type of month: dry normal wet	dry	dry	dry
monthly score	3 * 1 = 3	2 * 1 = 2	1 * 1 = 1
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	6 (Dry)		