Minimum disturbance pipeline construction in boreal forests to reduce restoration challenges

SER-WC 2018 - Innovative Standards, Metrics and Approaches

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Abstract

Minimal surface disturbance (MSD) construction techniques are an integral practice in restoring habitat in the shortest possible duration. By leaving organic soils, root layers, and seed source undisturbed, these techniques help to maintain the building blocks necessary for the rapid recovery of natural systems.

Combining MSD with innovative solutions for access management along rights-of-way and incorporating post-construction monitoring activities leads to rapid revegetation and successful habitat restoration over time. This is especially important for the restoration of peatlands and habitat for Species at Risk, such as the woodland caribou.

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Introduction

TransCanada installs pipeline in the boreal peatlands of Alberta under challenging ground conditions

Minimal

Surface

Disturbance

A technique that aims to reduce the impacts to wetlands in the region.

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Why do we use MSD?

- Preserves and stabilizes organic soils
- Promotes regeneration of native vegetation
- Minimizes clean up and monitoring efforts
- Cost effective (no stripping, no seeding, no planting)
- Minimizes temporary and long-term impacts
- Reduces the spread of weeds

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Planning Hierarchy

1. Avoid

The goal is to avoid constructing through deep peatlands if possible

2. Minimize

Reduce the level of disturbance to the peatland through mitigations, altering construction methods and paralleling existing ROW's and linear disturbances.

Effects on peatlands are temporary and do not impede wetland function

Effects are also considered short-term in nature

3. Compensate

Only required as off-sets on NEB regulated projects in Caribou Range on residual disturbances created by brushing over the operating line

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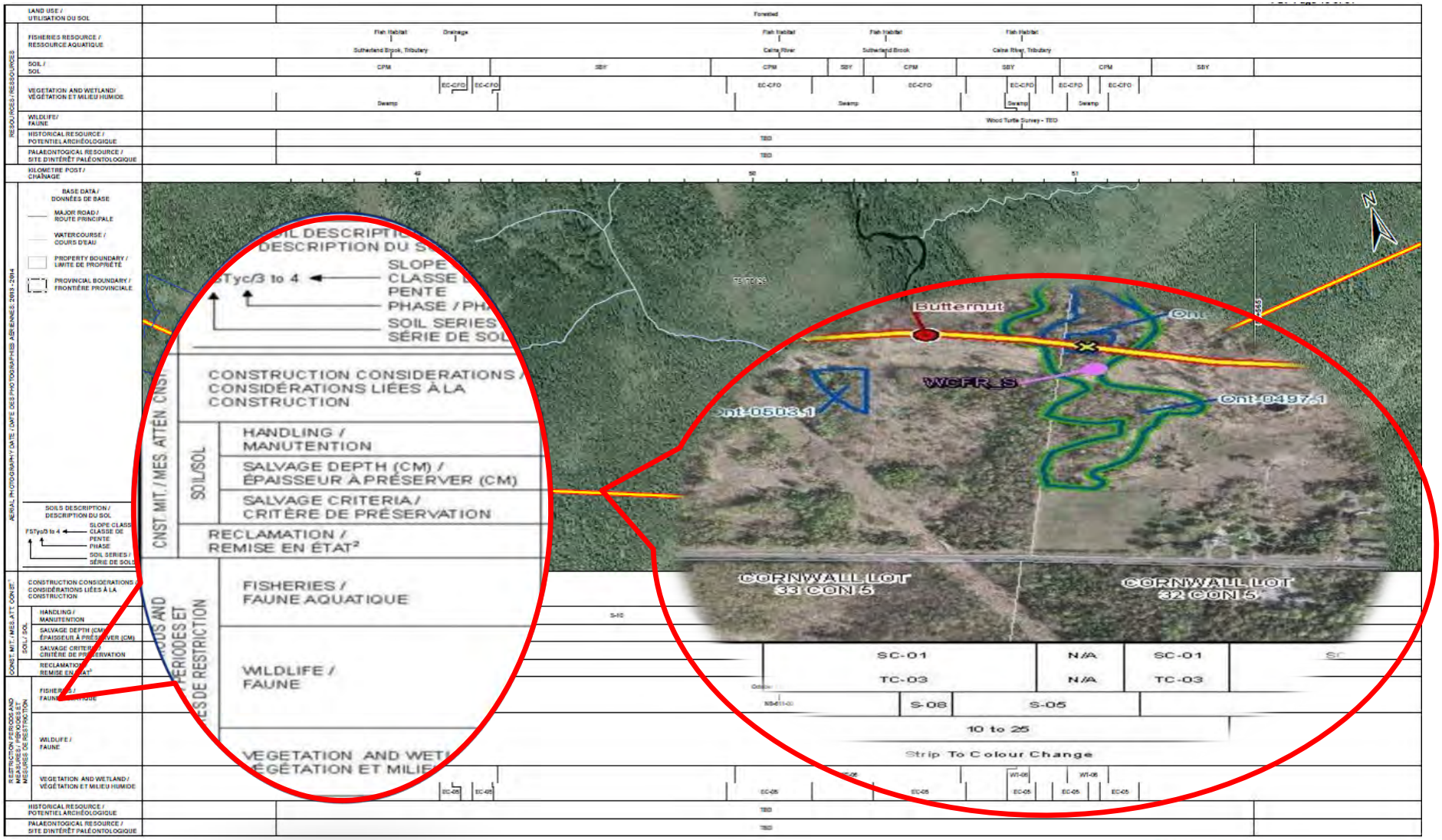
Planning Tools - Alignments



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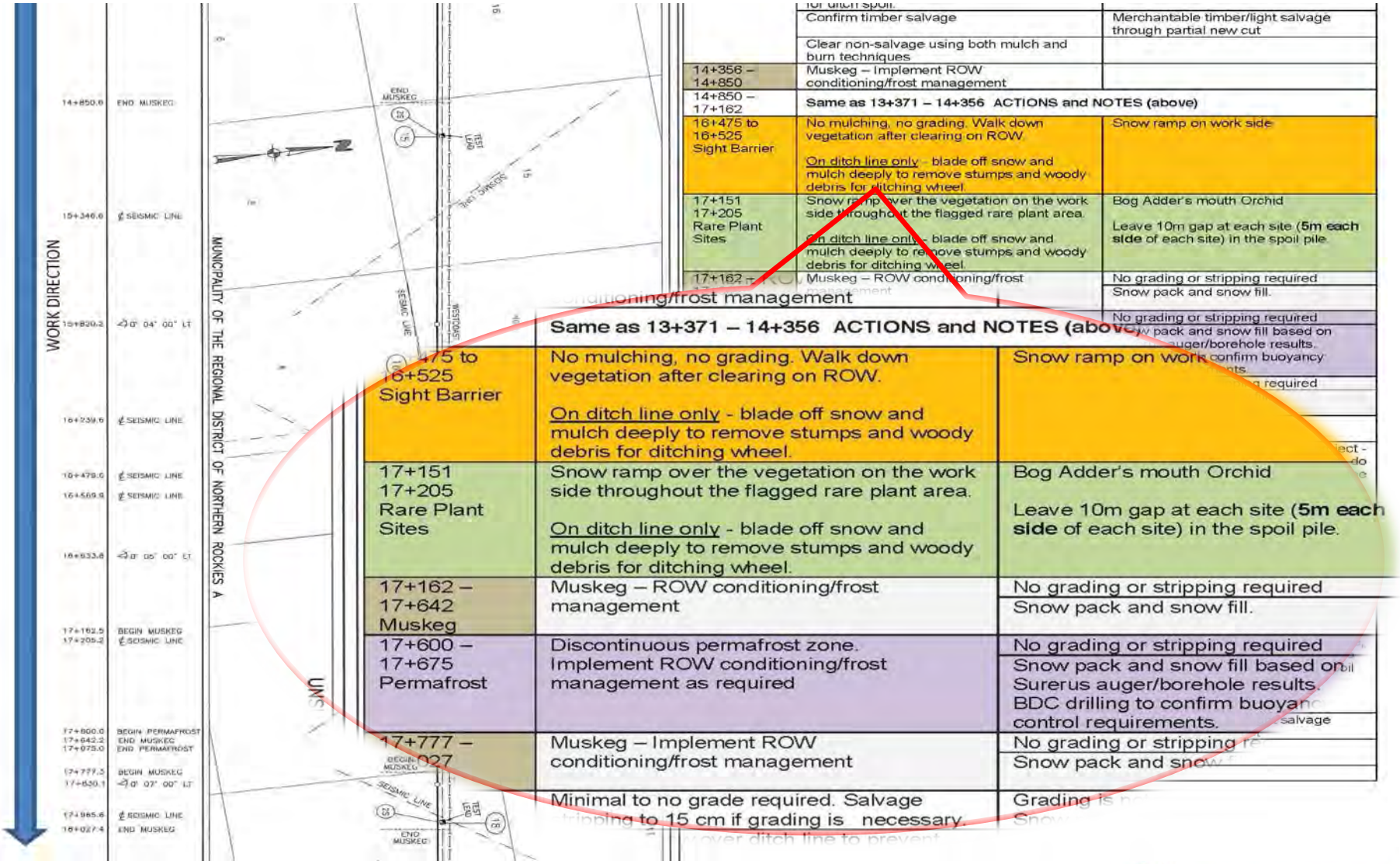
Planning Tools – Construction Plans



	Confirm timber salvage	Merchantable timber/light salvage through partial new cut
	Clear non-salvage using both mulch and burn techniques	
14+356 – 14+850	Muskeg – Implement ROW conditioning/frost management	
14+850 – 17+162	**Same as 13+371 – 14+356 ACTIONS and NOTES (above)**	
16+475 to 16+525 Sight Barrier	No mulching, no grading. Walk down vegetation after clearing on ROW. On ditch line only - blade off snow and mulch deeply to remove stumps and woody debris for ditching wheel.	Snow ramp on work side
17+151 17+205 Rare Plant Sites	Snow ramp over the vegetation on the work side throughout the flagged rare plant area. On ditch line only - blade off snow and mulch deeply to remove stumps and woody debris for ditching wheel.	Bog Adder's mouth Orchid Leave 10m gap at each site (**5m each side** of each site) in the spoil pile.
17+162 – 17+642 Muskeg	Muskeg – ROW conditioning/frost management	No grading or stripping required Snow pack and snow fill.
17+600 – 17+675 Permafrost	Discontinuous permafrost zone. Implement ROW conditioning/frost management as required	No grading or stripping required Snow pack and snow fill based on Surerus auger/borehole results. BDC drilling to confirm buoyancy control requirements.
17+777 –	Muskeg – Implement ROW conditioning/frost management	No grading or stripping Snow pack and sno
	Minimal to no grade required. Salvage	Grading

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MSD - Clearing

- **Select low ground pressure, light equipment**
  - Soft ground conditions early in construction season

- **Since there is usually very little merchantable timber in treed wetlands, brush is piled for burning.**

- **Ditchline area is cleared first and used for access while clearing**

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MSD - Matting

Mats are used in early season or shoulder season

- **may have to gain access with mats (rig mats) depending how frozen or soft the ground is**

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Mulching

- Conduct very light, single pass mulching to a depth no more than 5 cm, as excess can inhibit vegetation re-establishment
- Ideally mulching occurs under frozen conditions
- If ground is still wet, the mulcher has to keep the blades up to minimize damage to organic and root material

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Mulching Depth

Proper Mulching Depth

Mulching Too Deep

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Freezing In

Frost is driven into the ground to stabilize, compress and freeze the organic layer along the work side of the ROW for travel by heavy equipment

The following methods are used:

- **Dragging tires**
- **Spraying water**
- **Driving progressively heavier equipment along ROW**

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Freezing In

Provides opportunity for quicker response on natural regeneration

Lower cost of reclamation (possibly no seeding, no plantings; habitat for wildlife)

Less chance of invasive species competition

Applies only where grading is not required

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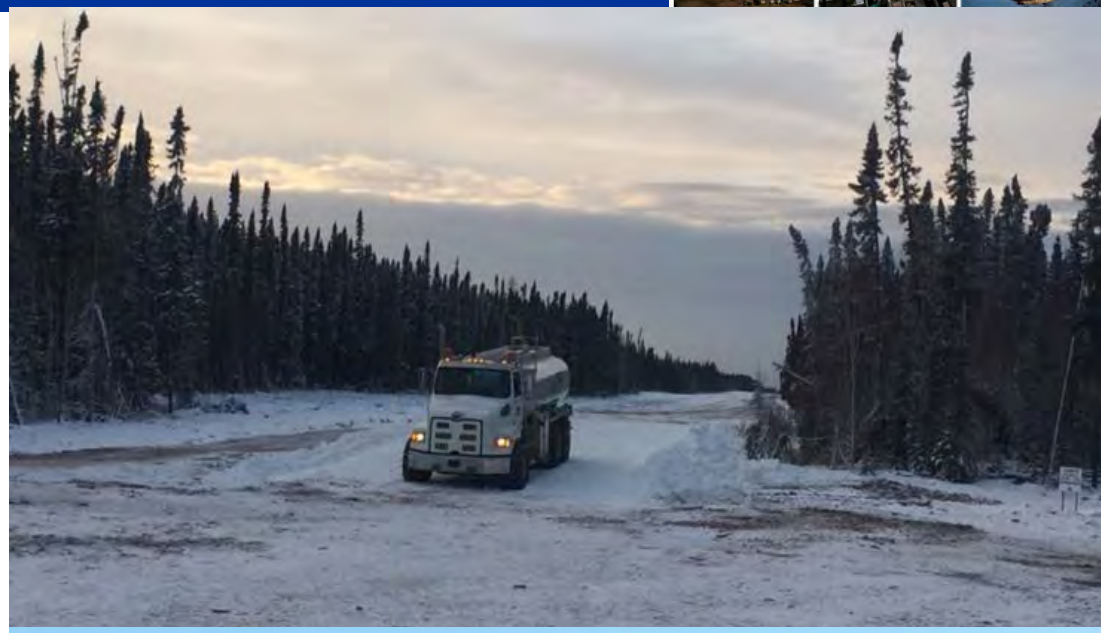
Crossings

- Snow fill or ice bridges are constructed at watercourse crossings to protect the banks and to promote revegetation
- Riparian areas are typically hand cut, not mulched
- Rig mats can also be used build the crossing



Grading

- **Grading is restricted to UPLAND areas only where required**
- **Organics in upland areas are salvaged and stockpiled separately**
- **Grading is STRICTLY PROHIBITED in lowland peatland areas**

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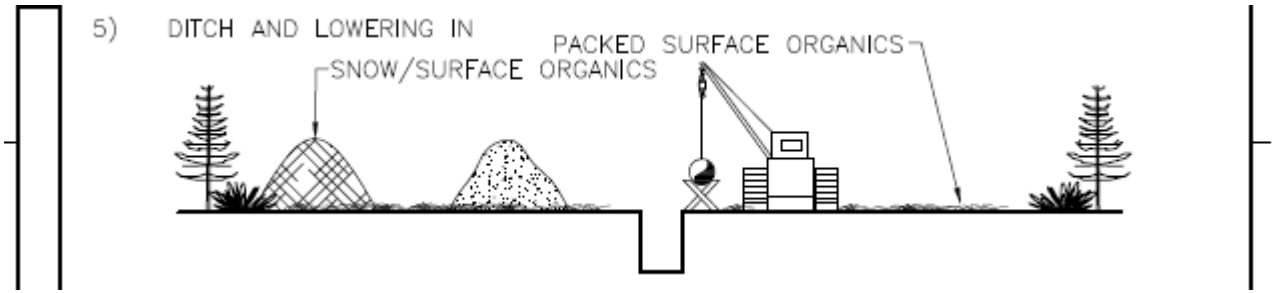
Ditching



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Backfilling

- **Materials are placed back into the ditch in the reverse order to what they were removed**

- **Frozen surface aides in minimizing disturbance**

6) BACKFILL AND ROACH THE DITCHLINE WITH ALL DITCH MATERIAL.

7) REPLACE SNOW/SURFACE ORGANICS EVENLY OVER THE AREAS WHERE IT WAS REMOVED DURING RIGHT-OF-WAY PREPARATION. REPLACE WOODY DEBRIS ACROSS THE ROW, WHERE APPROVED.

Considerations for Species at Risk

- Habitat restoration (planting and staking)
- Access management (rollback and mounding) to prevent continued human access to restoration areas
- Riparian area restoration
- Specialized monitoring

Habitat Restoration and Access Management

Planting conifers where needed for habitat restoration

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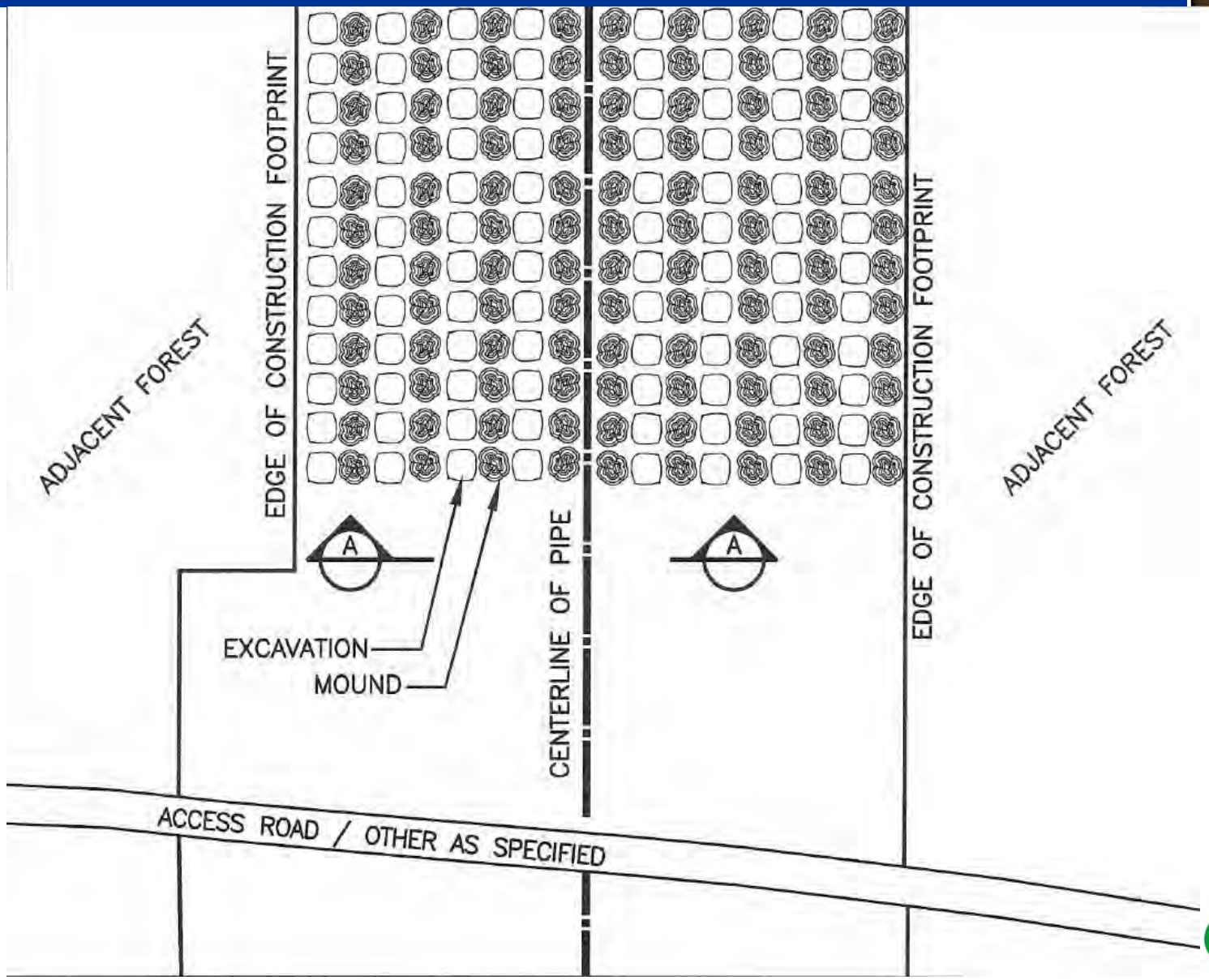
Planting with Access Management

- Mounding for access management
- Completed with an excavator during winter clean up
- Mounds are planted with seedlings

Mounding for Access Management



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Planting with Access Management

Access management with rollback installation and planting

Riparian Restoration

Willow and alder staking at watercourse crossings to restore riparian areas

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Results

- **Operational experience has demonstrated the success of the practices in the field**
- **Monitoring activities are underway to collect data on natural regeneration on areas constructed with MSD**

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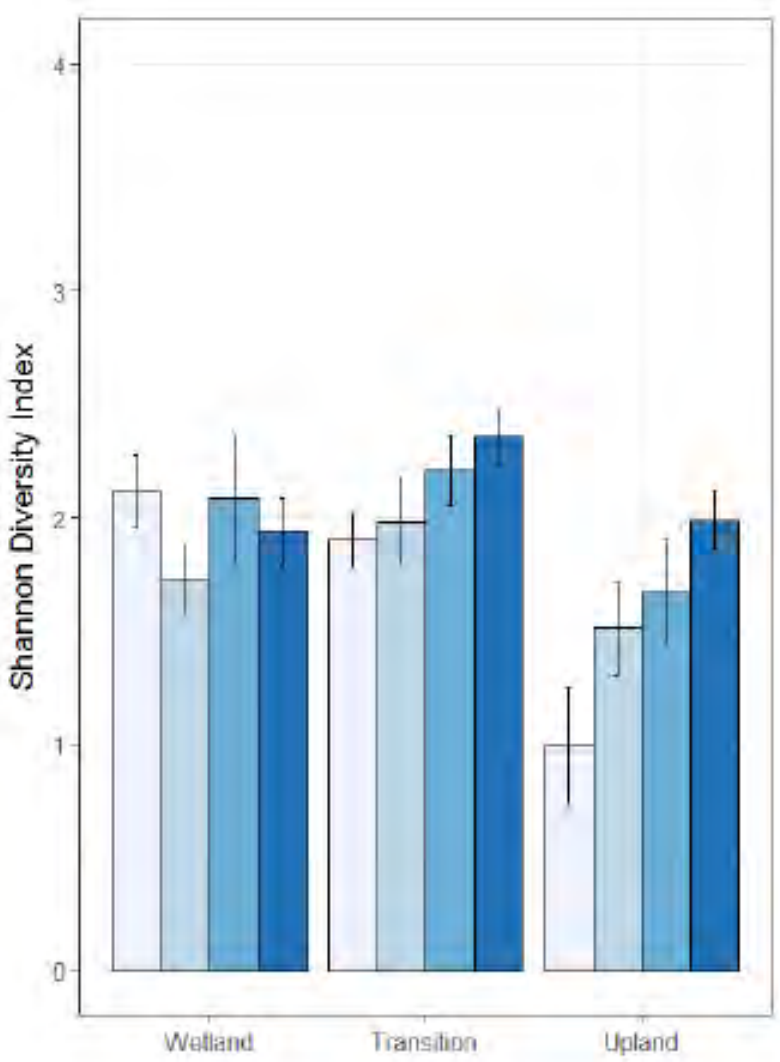
Results



- Vegetation plot data collected in years 1, 3, 5 and 8 after construction illustrate how transitional and wetland areas (the areas where MSD is utilized the most) have higher diversity index ratings than uplands (areas where MSD is used the least due to grading requirements)
- By year 8 upland areas have caught up to wetlands and transitional areas in terms of species diversity.

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Results – MSD 5 Years Post-Construction

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Results

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Results

Monitoring

- **Post Construction Monitoring activities (5 years)**
  - Wetlands, watercourses, rare plants, revegetation, weeds, erosion
- **SAR – Caribou Habitat**
  - short and long term monitoring program (up to 20 years)