NEW GOLD RAINY RIVER MINE
APPENDIX E
2024 VEGETATION TRIAL SUMMARY MEMO

Rainy River Mine - 2024 Vegetation Trial Summary

February 25, 2025

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okane

Integrated Mine Closure and Relinquishment Solutions

Rainy River Mine - 2024 Vegetation Trial Summary

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EXECUTIVE SUMMARY

New Gold Inc. (New Gold) established a vegetation trial at the Rainy River Mine (RRM) to investigate the performance of locally common species with operationally feasible cover system configurations. It is anticipated that learnings from the trial will inform the closure plan, and this work will contribute to New Gold's commitment to demonstrate to government regulators and community stakeholders that vegetation can be re-established during progressive reclamation and closure.

The vegetation trial is designed as a randomized block study and is situated on the plateau of a dedicated research area. Slopes surrounding the block study have been seeded using various methods to qualitatively evaluate operational seeding techniques, vegetation establishment, and erosion. Construction of the trial was completed in September 2019, and many plots were planted in late October 2019. Hydroseeding of the slopes was completed in the Fall of 2020. The purpose of this report is to summarize monitoring activities completed by New Gold and Okane in 2024, document conditions observed, and provide recommendations based on the year's observations.

Below is a high-level summary of the vegetation trials:

Sloped Areas

In 2024 no active erosion was observed. The historical erosion features from previous years were difficult to identify in 2024 due to dense vegetative ground coverage covering all previous rills, sheets, and gullies. All sloped areas had 100% vegetative ground coverage.

Species composition was assessed on sloped areas, revealing the prevalence of noxious weeds such as Canada thistle and sow thistle across all slopes. Birdsfoot trefoil and sweet clover was the most dominant species, followed by Canada Wild Rye. While not considered noxious, Birdsfoot trefoil and sweet clover are non-native and were not part of the reclamation seed mix. Canada Wild Rye, included in the reclamation mix, showed strong growth on the south slope, indicating its suitability for future inclusion. The highest proportion of native species was found on the north slope, followed by the west and east slopes, with the lowest on the south slope. The north slope, adjacent to naturalized areas, had more native species, suggesting that native plant communities can naturally colonize reclaimed areas. In contrast, areas near disturbances, such as mine roads, may face higher pressure from invasive species, which could outcompete native vegetation

Plateau Plots

Overall, the general health of the planted species generally increased compared to previous years, with higher percentages of healthy and healthy/struggling specimens and lower percentages of dead. The shrub mix, composed of willow and red osier dogwood, boasted the highest percentages of healthy specimens and lowest percentages of dead specimens, particularly in fertilized overburden and control soil treatments. Aspen and birch had higher percentages of healthy specimens and lower percentages

of dead than the other trees. Additionally, high bush cranberry and pincherry, making up the groundcover mix, had a medium to high percentage of healthy and healthy/struggling specimens with a low percentage of dead. These results suggest that willow, red osier dogwood, aspen, birch, high bush cranberry, and pincherry trees are promising candidate species for large-scale reclamation across the mine site.

Noxious weed density distributions were noted for 2024, and over the plateau plots have increased in density compared to 2023. Canada thistle and sow thistle were the noxious species found within the vegetation trial. Noxious weed density distribution was uniform across plots with no clear pattern of increasing or decreasing prevalence depending on soil treatment or vegetation type.

Plant available nutrients, organic parameters, and salinity parameters were measured in each soil treatment in all three blocks in 2024. Growth, both in height and diameter at breast height, has been minimal across species and soil treatments for the duration of the vegetation trials, and continued to be minimal in 2024.

Tree mortality does not appear to be influenced by nutrient concentrations, organic matter, or carbon levels in the immediate or short term. The use of topsoil as a growth medium is highly beneficial for establishing herbaceous ground cover in the short term, though it has a lesser effect on trees and shrubs, which showed greater growth in the fertilized and control plots with unfertilized overburden. This indicates that nutrient availability is not a limiting factor in the successful establishment of planted specimens. Rather, the primary driver of higher rates of healthy specimens in the control and fertilized overburden plots is likely the rate of ground cover establishment, including herbaceous species and noxious weeds, which outcompete the planted specimens before they can establish successfully.

Vegetation is not being impacted by salinity-related issues, and all soil treatments are considered suitable as a growth media with respect to salinity.

Soil and vegetative tissue testing for metals was initiated this year. As there are no specific guidelines or limits for metals in vegetation, tissue samples at the trial and off-site reference location were analyzed to establish a baseline for monitoring changes over time. Continued sample collection in future years will help assess the potential toxicity effects of overburden constituents on vegetation. Soil samples showed elevated boron and vegetation tissue samples showed elevated boron, cadmium, molybdenum, and zinc concentrations when compared to soil quality guidelines. Metals exceedances are for discussion purposes only and are not indicative of toxicity levels.

Destructive Plot

No erosion was observed in the destructive plot. Vegetation was well established, with 100% ground coverage across the destructive plot in 2024.

Rooting depth did not extend into the compacted clay layer and remained within the overlying overburden.

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1 INTRODUCTION

New Gold's Rainy River Mine (RRM) is attempting to demonstrate to government regulators and community stakeholders that vegetation can successfully be re-established as part of ongoing progressive reclamation and closure. Potential failure modes for revegetation strategies of the covered mine rock stockpiles were identified during a failure modes and effects analysis (FMEA) (Okane, 2018). Uncertainties that remained following identifying specific failure modes were scheduled to be addressed as part of the vegetation trial (Okane, 2018). The following report summarizes observations of the ongoing vegetation trials developed to address the revegetation-related failure modes.

1.1 Project Objectives and Scope

The overall closure objective for establishing vegetation on closure landforms at RRM is to meet land use expectations for desired vegetation community structures that mimic surrounding community types where feasible. A specific objective of closure revegetation is reestablishing a natural functioning vegetation community that supports local land use and wildlife. Therefore, the objectives of the vegetation trial are to test the cover system configurations and vegetation mixes that are most likely to result in a self-sustaining ecosystem that is compatible with and comparable to the surrounding area (Okane, 2018).

Building on the previous years, monitoring activities at the vegetation trials and progressive reclamation area were undertaken by both New Gold and Okane Personnel. Monitoring activities included an invasive and problem weed assessment, sapling transplanting, revegetation assessment of the progressive reclamation area on the East Mine Rock Stockpile (EMRS), vegetation trial monitoring, and soil and vegetative tissue sampling.

1.2 Report Organization

For convenient reference, this report has been subdivided into the following sections:

Section 1 – Introduces the Project objectives and scope and includes pertinent background information;

Section 2 – Outlines the methodologies utilized during the field program;

Section 3 – Summarizes the results of the 2024 monitoring activities;

Section 4 – Provides discussion and conclusions regarding the 2024 activities with respect to the identified failure modes and effects; and

Section 5 –Provides recommendations for continuing to assess the identified failure modes and effects.

1.3 Background

The requirement for conducting a vegetation trial resulted from a risk to the success of the closure system identified during the FMEA workshop (Okane, 2018). The FMEA workshop identified that a failure to establish vegetation on the final closure landform represented a sufficient risk such that mitigation measures were required. Thus, the vegetation trial described herein is meant to serve as a means of mitigating these risks through researching the most effective methods to reestablish vegetation on closure landforms.

The vegetation trial is designed as a randomized block study and is situated on the plateau of a waste rock stockpile constructed as a dedicated trial area. Combinations of four soil treatments and nine vegetation treatments are arranged in three replicates, totalling 108 plots. A destructive plot area was designated for destructive root sampling and investigation throughout the duration of the trial. Slopes surrounding the block study have been seeded using various methods to evaluate operational seeding techniques, vegetation establishment, and sediment and erosion control. The arrangement of the trial area is presented for reference in Figure 1.1, Figure 1.2, and Figure 1.3.

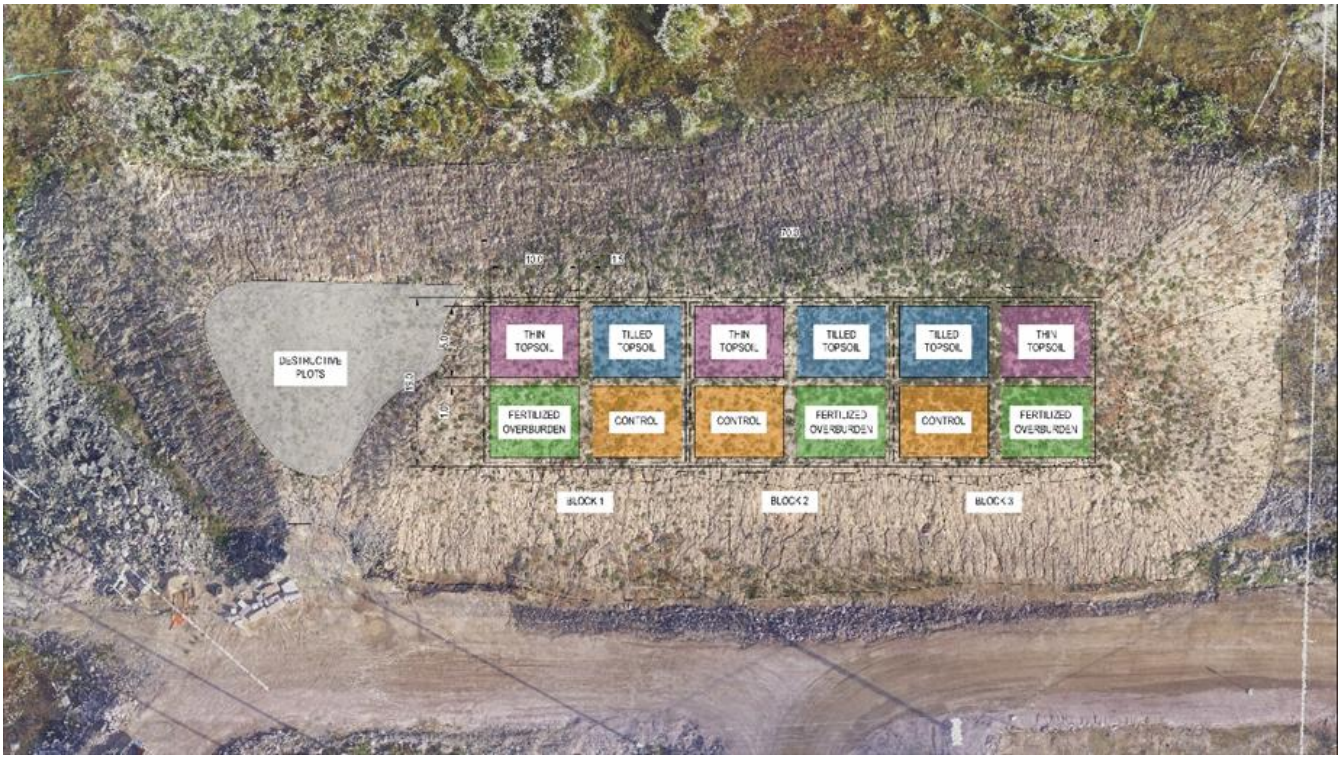

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Figure 1.1: Arrangement of Soil Treatments in Plots

(Okane, 2019)

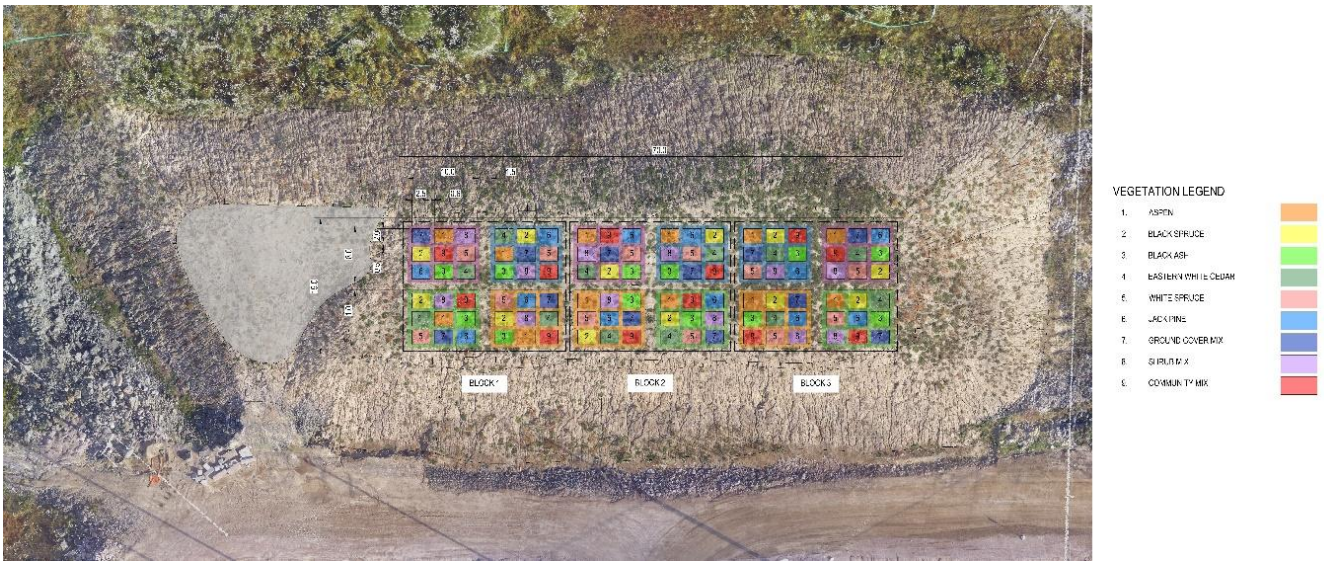


Figure 1.2: Arrangement of Vegetation Treatments in Plots

(Okane, 2019)

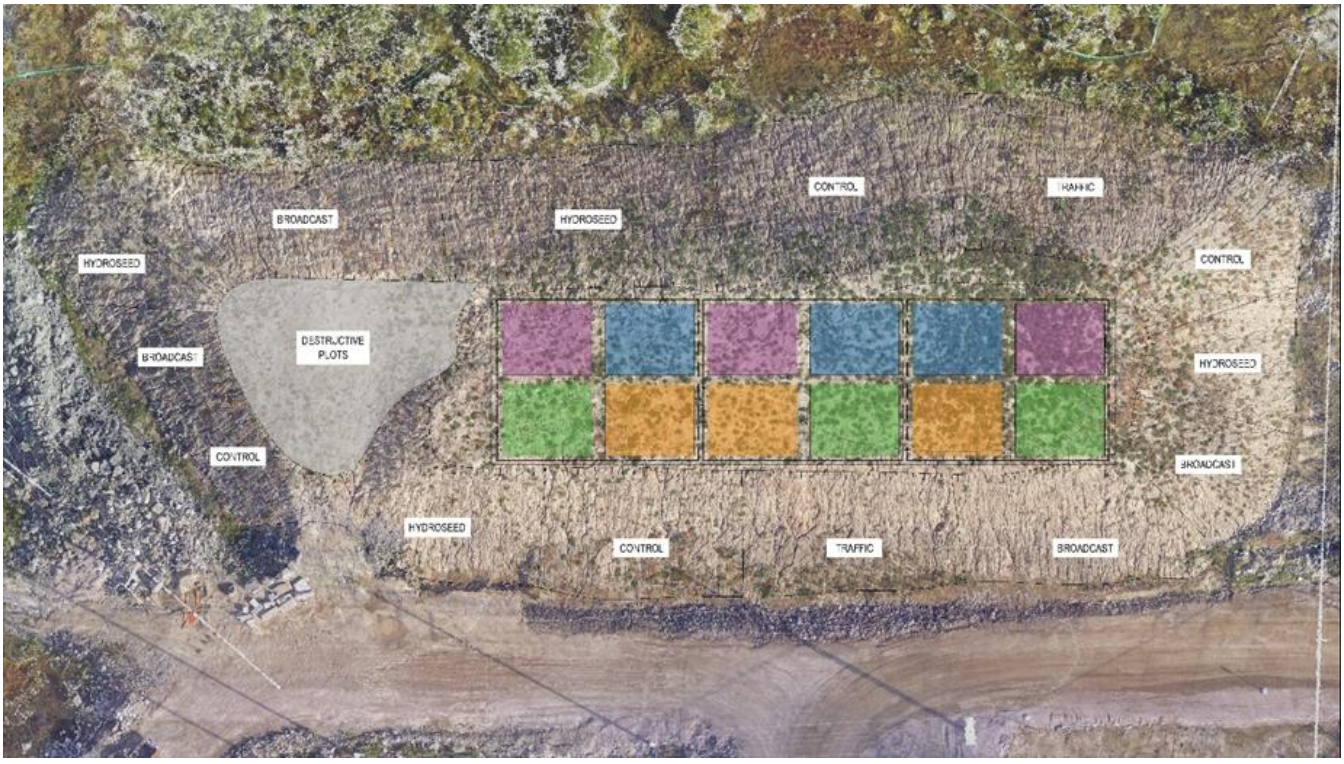


Figure 1.3: Arrangement of Slope Treatments

(Okane, 2019)

The general cover system configuration planned for use on the RRM stockpiles consists of a 0.5 m barrier layer overlain by a 1.0 m growth medium layer, designed to limit net percolation (NP) and control oxygen (O_2) ingress to the mine rock. The enhanced store-and-release cover system uses both moisture store-

and-release and enhanced runoff principles to achieve reduced NP. The barrier layer within the cover system controls O_2 ingress by effectively eliminating advective gas transport.

The vegetation trial was constructed in 2019 using the same cover system design, with compacted clay overburden used for the barrier layer and non-compacted clay overburden for growth medium layers. Four soil treatments applied to the plateau plot areas were chosen to represent potential options for operational revegetation:

1) Thin topsoil – a 0.15 m layer of topsoil was applied to the surface;
2) Tilled topsoil – a 0.15 m layer of topsoil was applied to the surface and then mixed into the overburden using a skid steer tiller;
3) Fertilized overburden – a commercial mix of fertilizer, mainly comprised of bonemeal, was applied to the overburden surface using a skid steer tiller; and
4) Control – no amendment or modification to the overburden surface.

The species chosen for inclusion in the trial represent locally common or significant species:

1) Aspen;
2) Black spruce;
3) Paper birch (formally referred to as black ash in previous reports, but was identified in 2023 and 2024 as paper birch and is herein referred to as birch);
4) Eastern white cedar;
5) White spruce;
6) Jack pine;
7) Groundcover mix – includes species common to the local ecosystem, specifically high bush cranberry and pincherry trees;
8) Shrub mix – includes species common to the local ecosystems, specifically willow and red osier dogwood; and
9) Community mix – culturally significant species selected by local communities, not necessarily found in the local area. These plots appear to have been planted with several species including red raspberry, but the exact mix planted is unknown.

Experimental tree plot planting on the plateau commenced in late October 2019 and was completed in November 2020. Of note, tobacco and juniper species were not planted and are excluded from the trial. These species were excluded because commercial availability is limited and as such it is unfeasible to include them in large-scale reclamation operations.

The vegetation trial is representative of an upland-type habitat on the closure landscape as per recommendations by the Ontario Ministry of Natural Resources and Forestry (MNRF) (Amec Foster Wheeler, 2015). Therefore, a general native seed mix was used to seed the slopes. The general native seed mix composition is listed in Table 1.1.

Table 1.1: General native seed mix used for seeding the slopes.

Common Name	Species	Seed Species Composition[1] (%)
Slender Wheat Grass	*Elymus trachycaulus*	6.58
Big Bluestem	*Andropogon gerardii*	5.92
Canada Wild Rye	*Elymus canadensis*	5.26
Virginia Wild Rye	*Elymus virginicus*	8.55
Fowl Bluegrass	*Poa palustris*	1.58
Poverty Oatgrass	*Danthonia spicata*	1.05
Fringed Brome	*Bromus iliates*	3.95
	Total Grasses	**32.89**
Black-eyed Susan	*Rudbeckia hirta*	0.75
Blue Vervain	*Verbena hastata*	0.56
	Total Forbs	**1.31**
Annual Oats (nurse crop) (replace with winter wheat when applied Aug 15 to Oct 15)	*Avena Sativa*	65.79

[1]: Seed species composition may vary based on the commercial availability of seeds at the time of construction. Species removed from the seed mix per MNRF comments received on May 21, 2015, include Showy Tick Trefoil (*Desmodium canadense*) and Wild Bergamot (*Monarda fistulosa*). Additional species diversity is expected through natural colonization.

The slope areas surrounding the trial were split into four separate seeding treatment options to inform on potential sediment and erosion control methods. These treatment options, executed in September 2019, consisted of hydroseeding, broadcast seeding, trafficked surface (compacted growth media using equipment), and a control section where no seeding occurred. The hydroseed method used the commercially available product ProGanics® Biotic Soil Media from Profile Products. In September 2020, after high erosion rates were observed on sloped areas across all seeding treatments, ProGanics® Biotic Soil Media was applied to all sloped areas to control further erosion.

Construction of the overburden destructive plot was completed in autumn 2019. Some species were planted on the plot in late October 2019, and planting was completed in November 2020.

The following observations have been noted moving forward with the revegetation trials:

- It was noted that in the block 3 - tilled topsoil treatment, black spruce was planted in the plot designated for white spruce. These plots have been reclassified as black spruce for data analysis.
- In previous years it was stated that the community mix plots were not planted, except for selected graminoid species in select plots. However, after visiting the sites and further assessing the species growth along with the historical data, it appears several species including red raspberry were originally planted in the community mix plots. The complete plant mix remains unknown.
- Paper birch trees were planted instead of black ash and in this report, black ash plots were renamed to birch.

2 METHODOLOGY

The vegetation trial assessment methodology is based in part on the Ecological Land Classification (ELC) Field Sampling Methods (Lee et al, 1998), which outline standardized protocols for sampling site, vegetation, and community characteristics to describe, identify, and classify ecological land units in Southern Ontario. In addition to core vegetation and community assessments, tallies of management and disturbance characteristics will be incorporated to evaluate ecosystem recovery. Sampling methods align with detailed descriptions provided in the ELC manual, ensuring consistency and accuracy in data collection. This approach ensures alignment with approved field methods and supports comprehensive ecological evaluations.

2.1 Vegetation Assessment

2.1.1 Plant species list

Develop a running list of all plant species present by conducting a botanical reconnaissance of each plot.

2.1.2 Plant Heath

A general health check was performed during the survey. Planted tree species were rated on a qualitative 5-point scale to gauge if the tree or shrub had established well:

- Healthy (H) – the specimen generally appeared to be in good health;
- Healthy / Struggling (H/S) – the specimen was not in prime condition, showing some sign(s) of poor health;
- Struggling (S) – the specimen was in poor condition, with most of the plant showing signs of wilting, lost leaves, or discolouration;
- Struggling / Dead (S/D) – the specimen was in very poor health or unclear if the plant had died; and
- Dead (D) – the specimen was clearly dead or had been completely uprooted.

2.1.3 Woody Stem Measurements

Three trees were randomly selected in each plot to measure growth indicators. Two growth indicator measurements were recorded during the autumn survey for annual growth comparisons:

- Tree Height – the distance between the root collar and the base of the terminal bud (of the tallest stem). For leaning trees, this distance was measured along the slope of the stem; and
- Diameter at Breast Height (DBH) – the diameter of the tree at 1.3 m above the base;

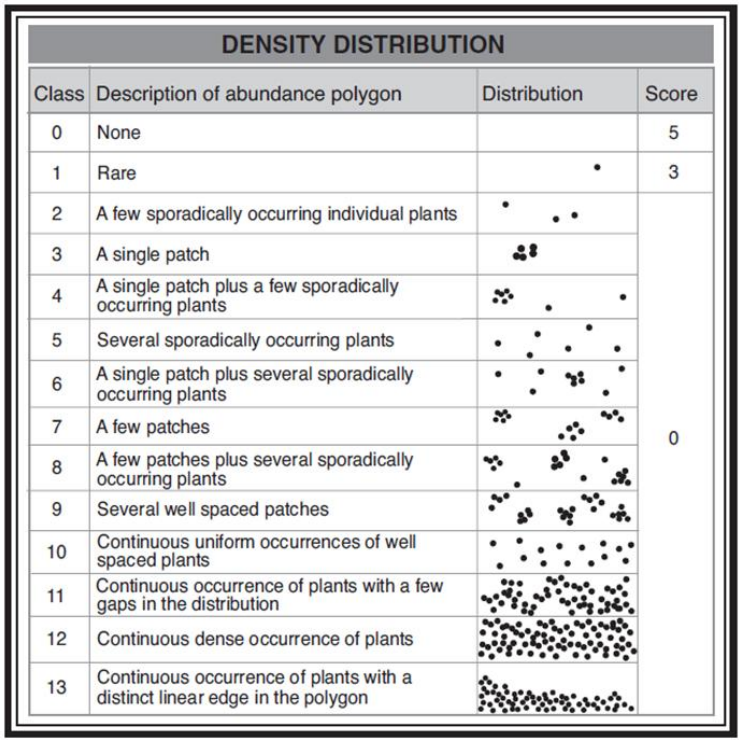
2.1.4 Ground Cover

The absolute cover of the ground layer plants was estimated by determining the proportion of the ground area covered by these plants, expressed as a percentage. This measure of absolute cover refers to the area of the ground surface that is covered by the vertical projection of the plant canopy. By monitoring ground cover over time, the methodology assesses progress toward reclamation goals, identifies areas requiring additional interventions, and provides a basis for evaluating overall ecosystem recovery and site stability.

2.1.5 Invasive Weed Density

An additional assessment of noxious weed density and distribution was conducted during the 2024 survey to expand upon the data collected in 2023. Density distribution was classified according to the categories outlined in Figure 2.1.

To assess the presence and impact of invasive species, weed densities are measured annually across all vegetation trial plots. This approach tracks trends over time, evaluates the effectiveness of control measures, and identifies areas where invasive species persist or spread. Data is collected systematically using sampling plots and transects to ensure consistency. The results inform adaptive management strategies, enabling targeted interventions and adjustments to reclamation practices, while supporting compliance with regulatory requirements.



DENSITY DISTRIBUTION			
Class	Description of abundance polygon	Distribution	Score
0	None		5
1	Rare		3
2	A few sporadically occurring individual plants		0
3	A single patch		
4	A single patch plus a few sporadically occurring plants		
5	Several sporadically occurring plants		
6	A single patch plus several sporadically occurring plants		
7	A few patches		
8	A few patches plus several sporadically occurring plants		
9	Several well spaced patches		
10	Continuous uniform occurrences of well spaced plants		
11	Continuous occurrence of plants with a few gaps in the distribution		
12	Continuous dense occurrence of plants		
13	Continuous occurrence of plants with a distinct linear edge in the polygon		

Figure 2.1: Classes of Weed Density Distribution

(Alberta Government, 2017)

2.2 Erosion Assessment

Erosion was assessed across all slope treatments by measuring the depth and length of rills and gullies. For each feature, the length was recorded from the point of origin to the furthest extent of visible erosion. The depth of each feature was measured at the deepest point using a standard depth gauge or ruler. Measurements were taken on each slope treatment to ensure a comprehensive assessment of erosion across different surface conditions. The data collected was then used to quantify the severity and extent of erosion in the study area, enabling comparisons between the various slope treatments.

2.3 Soil Sampling

Soil samples were collected in 2024 from all soil treatment plots at two depths: 0 to 0.2 meters below ground surface (mbgs) and 0.3 to 0.5 mbgs. Samples were also collected from a background location (415467.72, 5407128.36 UTM 15U). Using a soil auger, composite samples were created for each soil treatment by combining samples from multiple points within the treatment area. This approach ensured that the samples were representative of each soil treatment.

All samples were submitted to an accredited laboratory for analysis. The laboratory measured plant-available nutrients, soil organic parameters, metals concentrations, salinity parameters, total organic carbon, and physical parameters including particle size.

2.4 Vegetation Tissue Sampling

Samples were collected from a background location (415467.72, 5407128.36 UTM 15U) with no known historical contamination, out of the wind dispersal zone of dust from the mine, and with plentiful specimens for sample collection. At the trials, samples of leaves from three species were collected from each respective soil treatment type. In total, 15 samples were collected for analysis.

Three species were selected for sampling because of their consumption by humans and wildlife and availability within the vegetation trial plateau plots. Leaves from each species were collected. The species chosen were red raspberry, willow, and aspen. Red raspberries produce edible and desired berries consumed by several wildlife species and foraged by members of the surrounding community. Willow and aspen are foraged by whitetail deer and moose – both are wild game hunted by local hunters and the surrounding First Nation communities (New Gold, 2015).

All samples were submitted to an accredited laboratory for analysis. To test for elements in tissue, samples were analyzed using inductively coupled plasma mass spectrometry. A cold vapour atomic fluorescence test was performed to test for mercury in tissue.

2.5 Root Investigation

Three random locations within the destructive plot were selected, and a 1.0 x 1.0 m grid was established at each location. At each grid, a different tree species was selected for excavation to conduct a root investigation. During this process, the spread and depth of the roots were measured.

2.6 Tree Species Transplanting

As part of the 2024 field season, white spruce and alder saplings were transplanted from the surrounding forested area onto the vegetation trials.

White spruce was transplanted directly onto white spruce plots that had experienced 100% mortality. White spruce was chosen for transplanting for the following reasons:

- Near total mortality was observed across the plots;
- The species is very prevalent across the surrounding area and as such is a desirable species;
- White spruce saplings are very susceptible to winter kill and data suggests that the original planting may have taken place very late in the year, not allowing for enough development time; and
- White spruce trees generally have a shallow rooting zone making it an ideal species for cover system revegetation.

Additionally, alder saplings were also transplanted. Alder was chosen for transplanting as it is widely known to be an early pioneer species on disturbed landscapes. Additionally, due to its nitrogen fixing abilities, may help improve the quality of nutrient poor soils and increase vegetation rates of establishment.

All saplings, both white spruce and alder, are estimated to be approximately one to three years old.

3 MONITORING RESULTS

Okane personnel conducted two visits to the vegetation trial site in 2024. During the July site visit, activities included an assessment of invasive and problematic weeds, the transplantation of saplings from the surrounding forest into the trial plots, and an evaluation of revegetation success in the progressive reclamation area of the East Mine Rock Stockpile (EMRS).

In September, Okane conducted a fall site visit to perform a quality assurance and quality control (QA/QC) assessment of vegetation trial data collected by New Gold personnel. A random subset of plots was selected for data collection to compare against the data gathered by New Gold. Additionally, Okane collected soil and vegetation tissue samples to assess potential metal leaching, migration, and bioaccumulation in plants

3.1 Plateau Plots

Data collected at the plateau plots included a comprehensive plant species list, assessments of plant health, ground cover measurements, and evaluations of invasive weed density.

3.1.1 Plant Species List

Species, in addition to the vegetation treatment planted, were identified in 2024. Other species present and noxious weeds present in addition to the vegetation treatment planted is presented in Table 3.1.

Table 3.1: Plant species within each trial plot.

Block	Soil Treatment	Vegetation Treatment	Other Species Present	Noxious Weeds Present
1	Control	Aspen	Birdsfoot Trefoil, Sage	Canada Thistle, Sow Thistle
		Birch	Birdsfoot Trefoil	Canada Thistle
		Black Spruce	Birdsfoot Trefoil	Canada Thistle, Sow Thistle
		Community Mix	Birdsfoot Trefoil, Red Clover, Timothy, Aster	Canada Thistle
		Eastern White Cedar	Birdsfoot Trefoil, Aster, Red Clover	Canada Thistle, Sow Thistle
		Groundcover Mix - includes Pincherry Tree and High Bush Cranberry	Birdsfoot Trefoil, Timothy, Red Raspberry, Red Clover	Canada Thistle, Sow Thistle
		Jack Pine	Birdsfoot Trefoil, Fringed Loosestrife, goldenrod, Red Clover, Common Bent, Aster	None
		Shrub Mix - includes Red Osier Dogwood and Willow	Birdsfoot Trefoil, Red Clover	Canada Thistle, Sow Thistle
		White Spruce	Birdsfoot Trefoil, Red Clover, Timothy, Horsetail	None
	Fertilized Overburden	Aspen	Birdsfoot Trefoil, Volunteer Trembling Aspen, Sweet Clover	None
		Birch	Birdsfoot Trefoil, Goldenrod, Red Clover	Canada Thistle, Sow Thistle
		Black Spruce	Birdsfoot Trefoil, Red Clover, Aster	Canada Thistle, Sow Thistle
		Community Mix	Birdsfoot Trefoil, Red Clover, Goldenrod, Wild Rose, Sage	None
		Eastern White Cedar	Birdsfoot Trefoil, Clover, Canada Wild Rye, Goldenrod	Sow Thistle
		Groundcover Mix - includes Pincherry Tree and High Bush Cranberry	Birdsfoot Trefoil, Goldenrod, Red Clover	Canada Thistle, Sow Thistle

Block	Soil Treatment	Vegetation Treatment	Other Species Present	Noxious Weeds Present
		Jack Pine	Red Clover, Birdsfoot Trefoil, Canada Wild Rye	Canada Thistle, Sow Thistle
		Shrub Mix - includes Red Osier Dogwood and Willow	Red Clover, Birdsfoot Trefoil, Goldenrod, Timothy	Canada Thistle
		White Spruce	Birdsfoot Trefoil, Clover, Volunteer Trembling Aspen, Canada Wild Rye	Canada Thistle, Sow Thistle
	Thin Topsoil	Aspen	Birdsfoot Trefoil, Fringed Loosestrife, Red Clover, Red Raspberry, Volunteer Trembling Aspen, Wild Rose	Canada Thistle, Sow Thistle
		Birch	Red Columbine, Timothy, Red Clover, Birdsfoot Trefoil, Goldenrod, Fringed Loosestrife	Canada Thistle, Sow Thistle
		Black Spruce	Birdsfoot Trefoil, Fringed Loosestrife, Red Columbine, Red Raspberry, Timothy, Virginia Wild Rye, Spotted Water Hemlock, Canada Anemone	Canada Thistle, Sow Thistle
		Community Mix	Birdsfoot Trefoil, Red Clover, Yarrow, Fringed Loosestrife, Oxeye Daisy, Sage, Red Raspberry	Canada Thistle, Sow Thistle
		Eastern White Cedar	Birdsfoot Trefoil, Timothy, Common Bent, Fringed Loosestrife, Red Raspberry, Red Clover	Canada Thistle, Sow Thistle
		Groundcover Mix - includes Pincherry Tree and High Bush Cranberry	Birdsfoot Trefoil, Goldenrod, Timothy, Fringed Loosestrife	Canada Thistle, Sow Thistle
		Jack Pine	Birdsfoot Trefoil, Fringed Loosestrife	Canada Thistle, Sow Thistle
		Shrub Mix - includes Red Osier Dogwood and Willow	Goldenrod, Birdsfoot Trefoil, Unidentified Grass Sps.	Sow Thistle
		White Spruce	Birdsfoot Trefoil, Timothy, Fringed Loosestrife, Red Raspberry, Red Clover	Canada Thistle, Sow Thistle

Block	Soil Treatment	Vegetation Treatment	Other Species Present	Noxious Weeds Present
	Tilled Topsoil	Aspen	Goldenrod, Birdsfoot Trefoil, Red Raspberry, Fringed Loosestrife, Timothy	Canada Thistle, Sow Thistle
		Birch	Goldenrod, Aster, Red Osier Dogwood, Canada Anemone, Red Raspberry, Timothy	Canada Thistle, Sow Thistle
		Black Spruce	Birdsfoot Trefoil, Fringed Loosestrife, Canada Anemone, Red Raspberry, Timothy	Canada Thistle, Sow Thistle
		Community Mix	Birdsfoot Trefoil, Meadow Rue, Fringed Loosestrife, Timothy	Canada Thistle, Sow Thistle
		Eastern White Cedar	Spotted Water Hemlock, Red Raspberry, Birdsfoot Trefoil, Finger Loosestrife, Red Clover	Canada Thistle, Sow Thistle
		Groundcover Mix - includes Pincherry Tree and High Bush Cranberry	Birdsfoot Trefoil, Red Raspberry, Cicer Milkvetch	Canada Thistle, Sow Thistle
		Jack Pine	Birdsfoot Trefoil, Red Raspberry	Canada Thistle, Sow Thistle
		Shrub Mix - includes Red Osier Dogwood and Willow	Aster, Birdsfoot Trefoil, Red Raspberry, Fringed Loosestrife, Timothy, Common Bent, Canada Wild Rye	Canada Thistle, Sow Thistle
		White Spruce	Birdsfoot Trefoil, Aster, Red Raspberry, Timothy, Canada Wild Rye	Canada Thistle, Sow Thistle
2	Control	Aspen	Birdsfoot Trefoil, Red Clover	Sow Thistle
		Birch	Birdsfoot Trefoil, Red Clover, Goldenrod, Quack Grass, Timothy, Marsh Woundwort, White Meadowsweet	Canada Thistle, Sow Thistle
		Black Spruce	Birdsfoot Trefoil, Red Clover	Canada Thistle
		Community Mix	Birdsfoot Trefoil, Timothy, Canada Wild Rye, Forest Pea, Peavine, Red Raspberry	Canada Thistle, Sow Thistle
		Eastern White Cedar	Birdsfoot Trefoil, Timothy, Canada Wild Rye, Common Bent, Red Raspberry	None

Block	Soil Treatment	Vegetation Treatment	Other Species Present	Noxious Weeds Present
		Groundcover Mix - includes Pincherry Tree and High Bush Cranberry	Birdsfoot Trefoil, Red Clover, Red Raspberry, Timothy, Common Bent, Quack Grass	Canada Thistle
		Jack Pine	Birdsfoot Trefoil, Red Clover, Timothy, Common Bent, Red Raspberry	Canada Thistle, Sow Thistle
		Shrub Mix - includes Red Osier Dogwood and Willow	Birdsfoot Trefoil, Red Clover	Canada Thistle, Sow Thistle
		White Spruce	Birdsfoot Trefoil, Common Bent, Black Pea	None
	Fertilized Overburden	Aspen	Birdsfoot Trefoil, Goldenrod, Timothy, Common Bent, Red Clover	Canada Thistle, Sow Thistle
		Birch	Birdsfoot Trefoil, Goldenrod, Red Clover, Common Vetch	Canada Thistle
		Black Spruce	Birdsfoot trefoil, Timothy, Black Pea, Red Clover	Canada Thistle, Sow Thistle
		Community Mix	Birdsfoot Trefoil, Red Clover, Timothy, Raspberry, Common Bent, Canada Anemone,	Canada Thistle
		Eastern White Cedar	Birdsfoot Trefoil, Canada Wild Rye, Common Bent, Timothy	Canada Thistle, Sow Thistle
		Groundcover Mix - includes Pincherry Tree and High Bush Cranberry	Birdsfoot Trefoil, Canada Wild Rye, Black Pea, Raspberry, Black Eyed Susan	Canada Thistle, Sow Thistle
		Jack Pine	Birdsfoot Trefoil, Common Bent, Red Raspberry, Timothy, Fringed Loosestrife	Canada Thistle
		Shrub Mix - includes Red Osier Dogwood and Willow	Birdsfoot Trefoil, Timothy, Goldenrod	Canada Thistle, Sow Thistle
		White Spruce	Birdsfoot trefoil, Canada Wild Rye, Raspberry	Canada Thistle, Sow Thistle

Block	Soil Treatment	Vegetation Treatment	Other Species Present	Noxious Weeds Present
	Thin Topsoil	Aspen	Birdsfoot Trefoil, Black Currant, Red Raspberry, Timothy, Common Bent, Black Pea, Marsh Woundwort, Burdock	Canada Thistle, Sow Thistle
		Birch	Birdsfoot Trefoil, Goldenrod, Red Clover	Canada Thistle
		Black Spruce	Birdsfoot Trefoil, Fringed Loosestrife, Red Clover, Canada Anemone, Water Hemlock, Red Raspberry, Peavine, Bulgarian columbine, Quack Grass	Canada Thistle, Sow Thistle
		Community Mix	Birdsfoot Trefoil, Goldenrod, Red Raspberry, Peavine, Red Clover, Quack Grass	Canada Thistle, Sow Thistle
		Eastern White Cedar	Birdsfoot Trefoil, Red Raspberry, Black Currant, timothy	Canada Thistle, Sow Thistle
		Groundcover Mix - includes Pincherry Tree and High Bush Cranberry	Birdsfoot Trefoil, Red Raspberry, Fringed Loosestrife, Canada Anemone, Goldenrod	Canada Thistle, Sow Thistle
		Jack Pine	Birdsfoot Trefoil, Red Raspberry, Common Bent, Canada Wild Rye, Quack Grass	Canada Thistle, Sow Thistle
		Shrub Mix - includes Red Osier Dogwood and Willow	Birdsfoot Trefoil, goldenrod, Fringed Loosestrife, Red Raspberry, Unidentified Grass Sps.	Canada Thistle, Sow Thistle
		White Spruce	Birdsfoot Trefoil, Timothy, Fringed Loosestrife, Clover	Canada Thistle, Sow Thistle
	Tilled Topsoil	Aspen	Birdsfoot Trefoil, Goldenrod, Burdock	Canada Thistle
		Birch	Birdsfoot Trefoil, Goldenrod, Timothy, Fringed Loosestrife, Canada Wild Rye, Common Bent, White Meadowsweet	Canada Thistle, Sow Thistle
		Black Spruce	Birdsfoot Trefoil, Goldenrod, Common Bent, Common Vetch, Timothy, Red Raspberry, Spotted Water Hemlock	Canada Thistle, Sow Thistle
		Community Mix	Birdsfoot Trefoil, Common Bent, Timothy, Marsh Woundwort, Red Raspberry, Fringed Loosestrife	Sow Thistle

Block	Soil Treatment	Vegetation Treatment	Other Species Present	Noxious Weeds Present
		Eastern White Cedar	Birdsfoot Trefoil, Canada Wild Rye, Timothy, Canada Anemone, Fringed loosestrife Raspberry	Canada Thistle, Sow Thistle
		Groundcover Mix - includes Pincherry Tree and High Bush Cranberry	Birdsfoot trefoil, Timothy, Raspberry, Fringed Loosestrife, Spotted Water Hemlock, Northern Burdock	Canada Thistle, Sow Thistle
		Jack Pine	Birdsfoot Trefoil, Burdock, Fringed Loosestrife, Red Raspberry, Goldenrod, Red Clover, Timothy, Quack Grass, Common Bent	Canada Thistle, Sow Thistle
		Shrub Mix - includes Red Osier Dogwood and Willow	Birdsfoot Trefoil, Timothy, Red Clover, Spotted Water Hemlock, Quack Grass, Fringed Loosestrife	Canada Thistle, Sow Thistle
		White Spruce	Red Raspberry, Timothy, Quack Grass, Birdsfoot Trefoil, Fringed Loosestrife, Canada Anemone, Common Bent, Wood Avens	Canada Thistle, Sow Thistle
3	Control	Aspen	Birdsfoot Trefoil, Red Clover, Canada Wild Rye, Timothy	Canada Thistle, Sow Thistle
		Birch	Birdsfoot Trefoil, Canada Wild Rye, Red Clover	Canada Thistle, Sow Thistle
		Black Spruce	Birdsfoot Trefoil, Common Bent, Red Clover	Canada Thistle, Sow Thistle
		Community Mix	Birdsfoot Trefoil, Canada Wild Rye, Timothy, Common Vetch	Canada Thistle
		Eastern White Cedar	Birdsfoot Trefoil, Canada Wild Rye Common Bent, Timothy, Quack Grass	Canada Thistle, Sow Thistle
		Groundcover Mix - includes Pincherry Tree and High Bush Cranberry	Birdsfoot Trefoil, Goldenrod, Quack Grass, Timothy, Highbush Cranberry	None
		Jack Pine	Birdsfoot Trefoil, Red Clover, Timothy, Common Bent	Canada Thistle

Block	Soil Treatment	Vegetation Treatment	Other Species Present	Noxious Weeds Present
		Shrub Mix - includes Red Osier Dogwood and Willow	Birdsfoot Trefoil, Quack Grass, Canada Wild Rye, Timothy, Canada thistle	Canada Thistle, Sow Thistle
		White Spruce	Birdsfoot Trefoil, Canada Wild Rye, Timothy, Common Bent, Red Clover	Canada Thistle
	Fertilized Overburden	Aspen	Birdsfoot Trefoil, Red Clover, Timothy, Common Bent, Goldenrod, Quack Grass	
		Birch	Birdsfoot Trefoil, Red Raspberry, Timothy, Common Bent, Goldenrod, Red Clover	Canada Thistle, Sow Thistle
		Community Mix	Birdsfoot Trefoil, Canada Wild Rye, Timothy, Quack Grass	Canada Thistle, Sow Thistle
		Eastern White Cedar	Birdsfoot Trefoil, Canada Wild Rye, Quack Grass, Common Bent, Timothy, Red Raspberry	Canada Thistle, Sow Thistle
		Groundcover Mix - includes Pincherry Tree and High Bush Cranberry	Birdsfoot Trefoil, Red Raspberry, Goldenrod, Canada Wild Rye, Common Bent, Quack Grass	Canada Thistle, Sow Thistle
		Jack Pine	Birdsfoot Trefoil, Timothy, Canada Wild Rye, Common Bent, Unidentified Grass Sps., Red Raspberry	Canada Thistle, Sow Thistle
		Shrub Mix - includes Red Osier Dogwood and Willow	Birdsfoot Trefoil, Timothy	Canada Thistle
		White Spruce	Birdsfoot Trefoil, Timothy	Canada Thistle
		White Spruce	Birdsfoot Trefoil, Red Raspberry, Timothy, volunteer aspen, Quack Grass, Common Bent, Fringed Loosestrife, Hedge Bedstraw	Canada Thistle, Sow Thistle
	Thin Topsoil	Aspen	Common tansy, Birdsfoot Trefoil, Red Raspberry, Quack Grass, Spotted Water Hemlock, Common Bent, Canada Wild Rye, Timothy	Canada Thistle, Sow Thistle

Block	Soil Treatment	Vegetation Treatment	Other Species Present	Noxious Weeds Present
		Birch	Birdsfoot Trefoil, Red Raspberry, Timothy, Quack Grass, Common Bent, Fringed Loosestrife, Canada Anemone	Canada Thistle, Sow Thistle
		Black Spruce	Birdsfoot Trefoil, Red Raspberry, Common Bent, Quack Grass, Pin Cherry	Canada Thistle, Sow Thistle
		Community Mix	Birdsfoot Trefoil, Vetch Sps., Red Raspberry, Red Clover	None
		Eastern White Cedar	Birdsfoot Trefoil, Red Raspberry, vetch, Fringed Loosestrife, Common Bent, Quack Grass, Sedge Sps.	None
		Groundcover Mix - includes Pincherry Tree and High Bush Cranberry	Birdsfoot Trefoil, Red Raspberry, vetch, Fringed Loosestrife	Canada Thistle, Sow Thistle
		Jack Pine	Birdsfoot Trefoil, Common Bent, Timothy, Quack Grass, Fringed Loosestrife, Canada Wild Rye	Canada Thistle, Sow Thistle
		Shrub Mix - includes Red Osier Dogwood and Willow	Goldenrod, Birdsfoot Trefoil, Quack Grass, Timothy, Red Clover, Fringed Loosestrife, Red Raspberry	Sow Thistle
		White Spruce	Birdsfoot Trefoil, Timothy, Quack Grass, Spotted Water Hemlock, Red Raspberry, Fringed Loosestrife, vetch	Canada Thistle, Sow Thistle
	Tilled Topsoil	Aspen	Birdsfoot Trefoil, Red Clover, Common Bent, volunteer Red Osier Dogwood	Canada Thistle, Sow Thistle
		Birch	Birdsfoot Trefoil, Red Clover, Quack Grass, Fringed Loosestrife, Spotted Water Hemlock, Timothy, Downy Yellow Violet, dandelion	Canada Thistle, Sow Thistle
		Black Spruce	Birdsfoot Trefoil, Red Raspberry, Common Vetch, Quack Grass, Common Bent	None
		Community Mix	Birdsfoot Trefoil, Red Raspberry, vetch, Timothy, Black Currant, Quack Grass, Canada Anemone, Common Bent	Canada Thistle, Sow Thistle

Block	Soil Treatment	Vegetation Treatment	Other Species Present	Noxious Weeds Present
		Eastern White Cedar	Birdsfoot Trefoil, Red Raspberry, Red Clover, Fringed Loosestrife, Red Osier Dogwood	Canada Thistle, Sow Thistle
		Groundcover Mix - includes Pincherry Tree and High Bush Cranberry	Birdsfoot Trefoil, Goldenrod, Red Clover, Timothy, Common Bent	Canada Thistle, Sow Thistle
		Jack Pine	Birdsfoot Trefoil, Red Clover, Timothy, Quack Grass, Common Bent, Red Raspberry, Fringed Loosestrife, Canada Anemone	Canada Thistle
		Shrub Mix - includes Red Osier Dogwood and Willow	Birdsfoot Trefoil, Goldenrod, Fringed Loosestrife, Bulgarian Columbine, Timothy, Common Bent	Canada Thistle, Sow Thistle
		White Spruce	Birdsfoot Trefoil, Red Raspberry, Timothy, Fringed Loosestrife, Red Clover	Canada Thistle, Sow Thistle

3.1.2 Plant Health

Overall, the general health of the planted species appeared to have increased compared to previous years, with higher percentages of healthy and healthy/struggling specimens and lower percentages of dead. Figure 3.1 and Figure 3.2 provide graphical summaries of general health observed during the experimental tree plot survey across plant species.

Aspen, birch, shrub mix (dogwood and willow), and groundcover mix (pincherry and high bush cranberry) had the highest percentage of healthy and healthy/struggling specimens and lower percentages of dead specimens. In 2024, on average across soil treatments aspen had 88% healthy and healthy/struggling and 10% dead, shrub mix had 86% healthy and healthy/struggling and 14% dead, and groundcover mix had 64% healthy and healthy/struggling and 19% dead.

Overall, eastern white cedar, jack pine, white spruce, and black spruce are the tree species with lower percentages of healthy and healthy/struggling specimens, with jack pine and white spruce having the highest percentages of dead specimens. In 2024, on average across soil treatments eastern white cedar had 7% healthy and healthy/struggling and 6% dead, jack pine had no healthy and healthy/struggling and 100% mortality, white spruce had 28% healthy and healthy/struggling and 54% dead, and black spruce had 49% healthy and healthy/struggling and 48% dead.

Eastern white cedar, although having a relatively low percentage of dead specimens (6% dead on average across soil treatments in 2024), has demonstrated low percentages of healthy and healthy/struggling specimens since the onset of the trials (7% health and healthy/struggling on average across soil treatments in 2024). Black spruce in thin and tilled topsoil plots has a high percentage of dead specimens (75% dead on average across thin and tilled topsoil in 2024), however continuing the trend observed in 2023, had a significant increase in percentages of healthy and healthy/struggling specimens in control and fertilized overburden plots (74% healthy and healthy/struggling on average across control and fertilized overburden plots in 2024 compared to 32% in 2023 and 77% in 2022).

Across the plateau plots, the establishment of ground coverage was nearly 100%, with slightly higher percentages of ground coverage in plots treated with topsoil (97% ground coverage in thin topsoil, 99% in tilled topsoil, 88% in fertilized overburden, and 91% in control plots for 2024).

COMMUNITY MIX

No specimens planted.

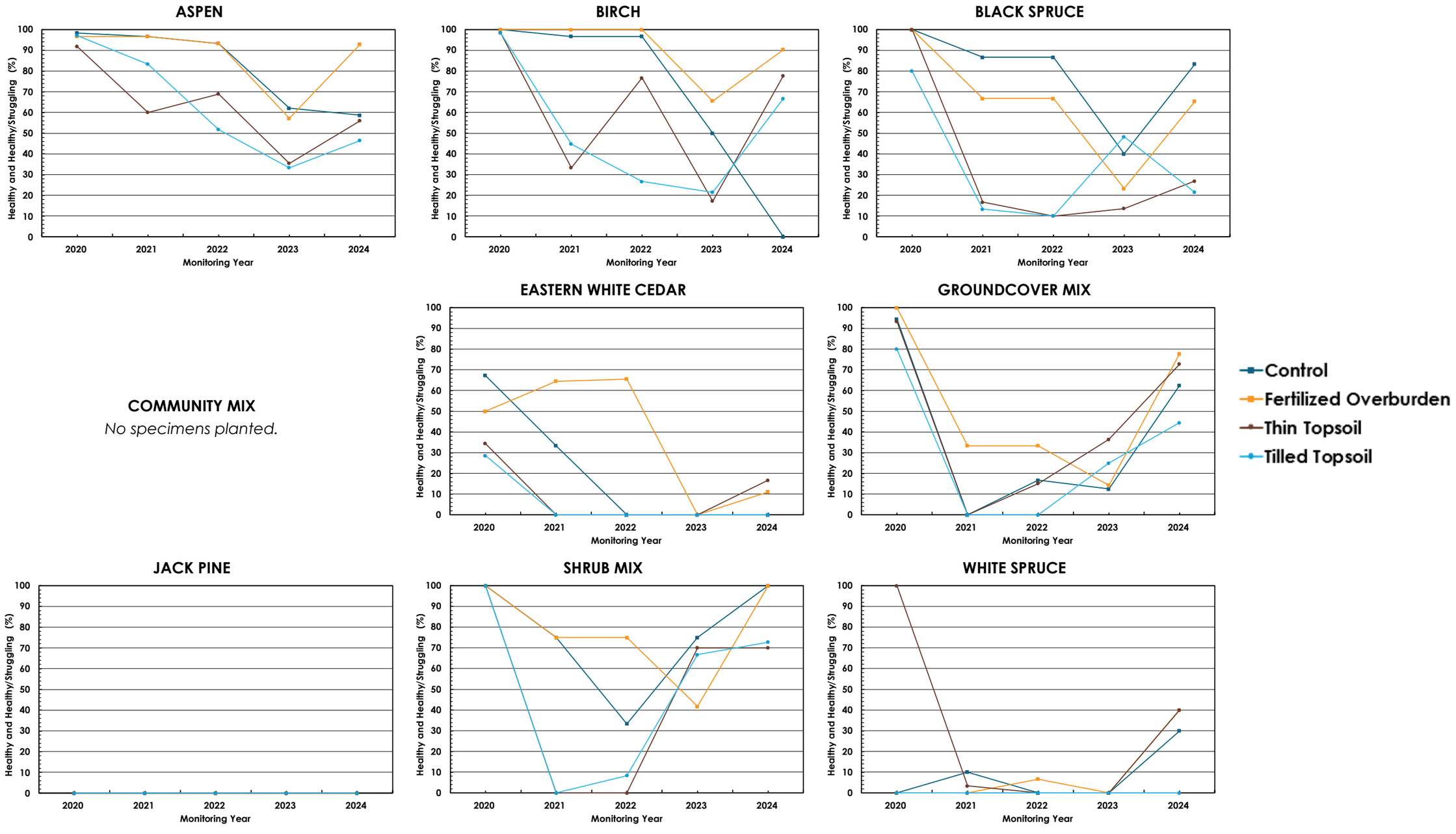
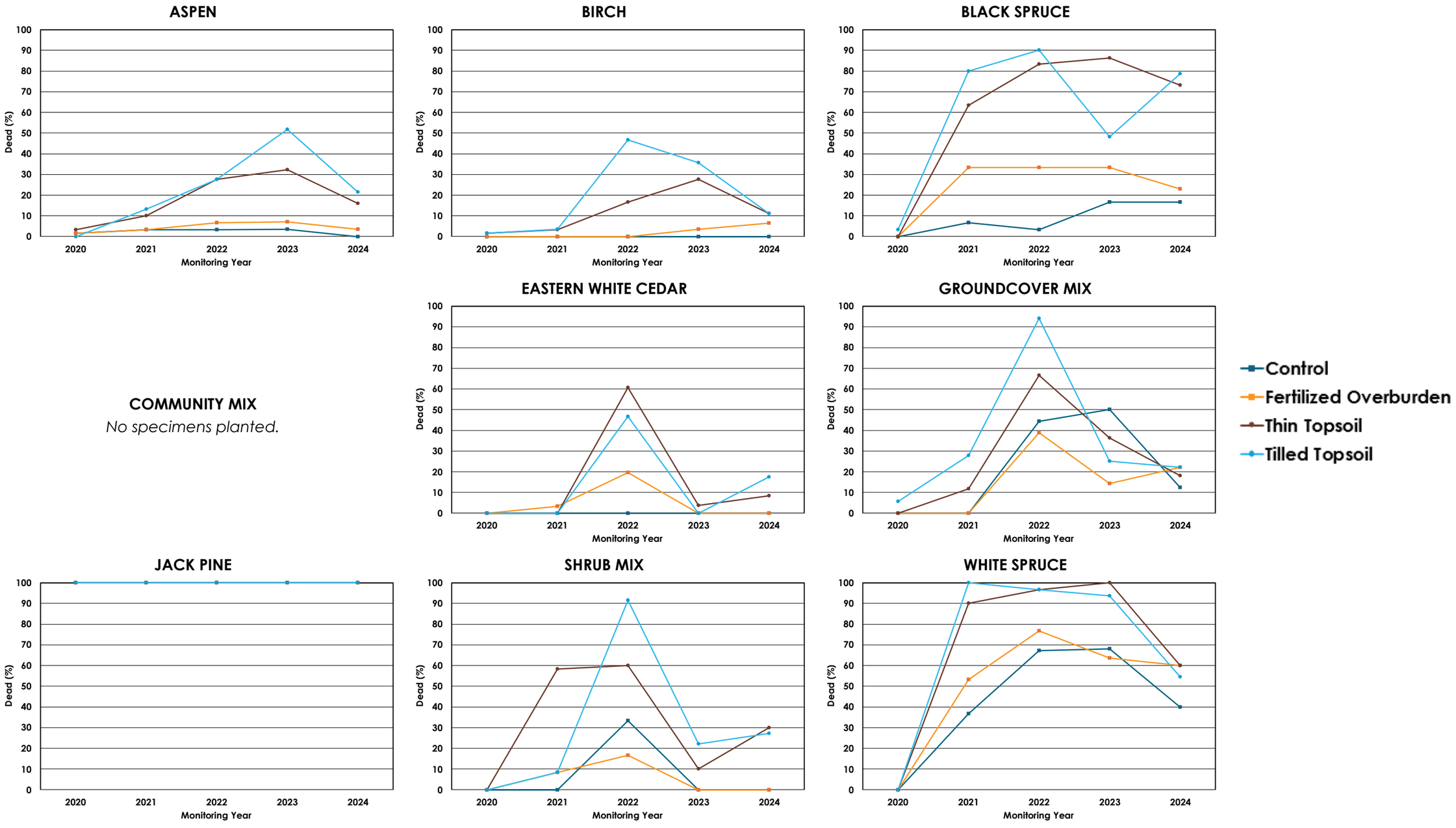


Figure 3.1: Percentage (%) of Healthy and Healthy/Struggling Specimens Across Blocks for Each Vegetation Type



COMMUNITY MIX

No specimens planted.

Figure 3.2: Percentage (%) of Dead Specimens Across Blocks for Each Vegetation Type by Year

3.1.3 Woody Stem Measurements

The planted trees and shrubs have experienced little to no year-over-year growth with respect to both tree height and DBH since being planted. All measurements in 2022, 2023, and 2024 were within the standard deviation of 2021 measurements, (2021 measurements were taken the season following planting). Average measurements by species are included for height in Figure 3.3, and DBH in Figure 3.4. For DBH, several measurements are blank because the plants did not meet the 1.3 m tall threshold. Planted species within the community mix plots are not known therefore these plots are not represented in Figure 3.3 or Figure 3.4.

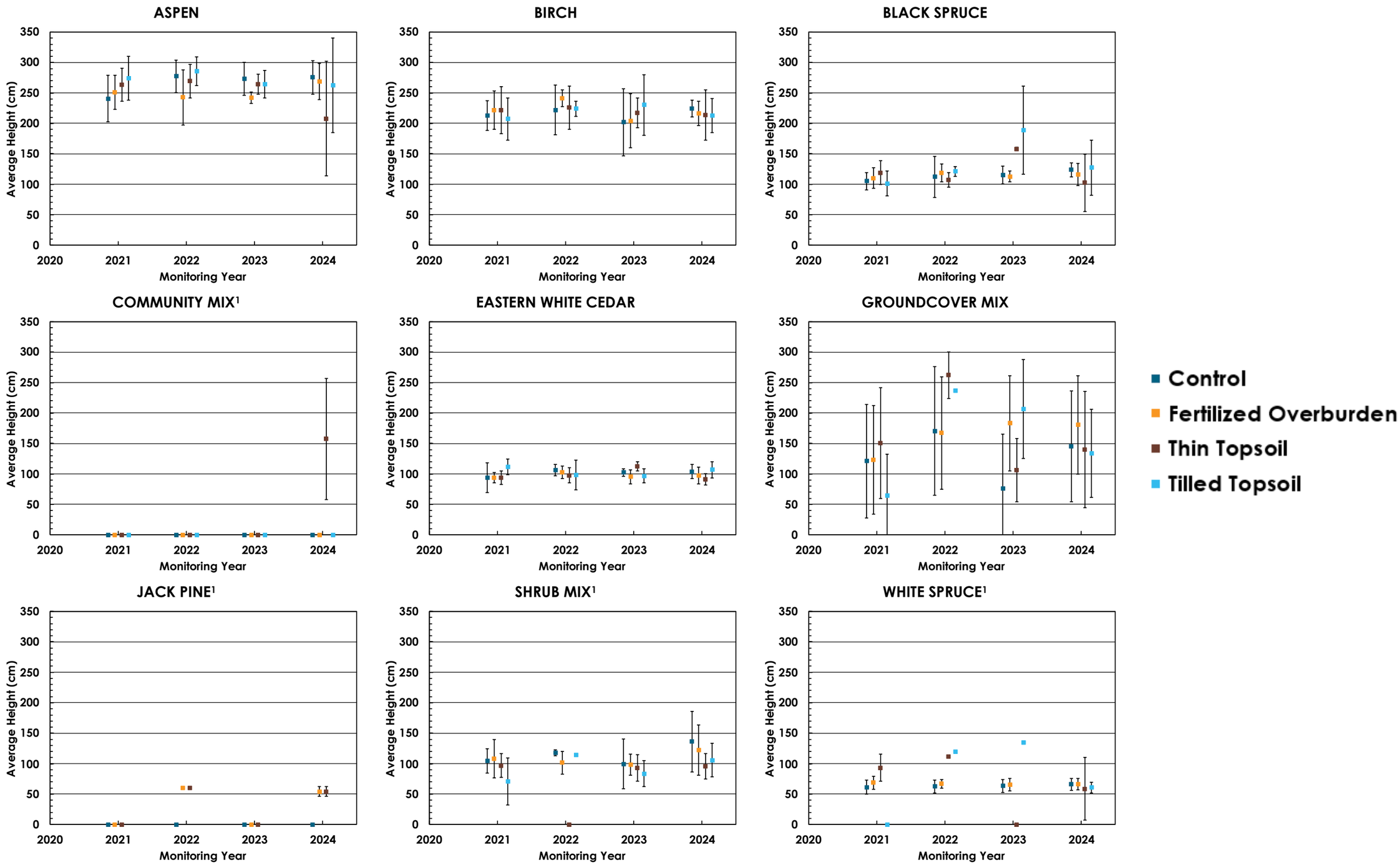


Figure 3.3: Average Tree Height and Standard Deviation of Specimens Across Blocks for Each Vegetation Type by Year

1: Average heights of zero indicate no specimens were available for measuring tree height.

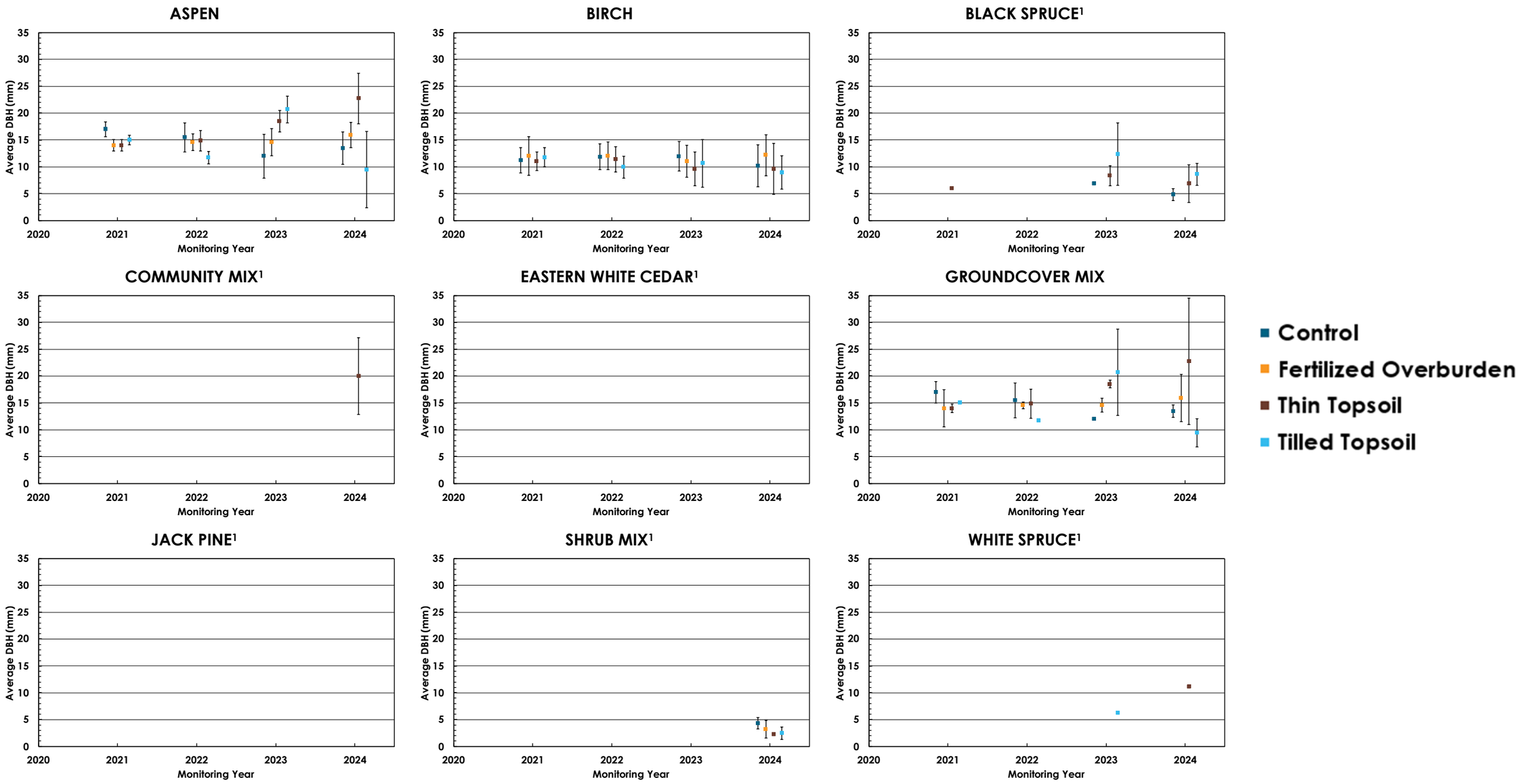


Figure 3.4: Average Diameter at Breast Height (DBH) and Standard Deviation of Specimens Across Blocks for Each Vegetation Type by Year

1: Blanks indicate no specimen was over 1.3m within the plot to obtain a DBH.

3.1.4 Ground Cover

During the 2024 survey, vegetative ground coverage remained high across all plots (>85%) and increased across the control and tilled topsoil plots from 77% to 91% for the control and from 90% to 99% for tilled topsoil (Table 3.2). Figure 3.5 displays the average vegetative ground coverage percentage from 2020 to 2024 across all blocks and vegetation types by soil treatment type.

Table 3.2: Average Vegetative ground coverage (%) observed in Autumn 2020, 2021, 2022, 2023, and 2024.

Soil Treatment	Block 1					Block 2					Block 3					Average				
	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024
Control	8	22	32	80	84	7	22	25	60	92	7	19	38	90	97	7	21	32	77	91
Fertilized Overburden	8	19	30	80	70	7	22	33	100	94	7	19	65	100	100	7	20	43	93	88
Thin Topsoil	7	75	93	100	92	8	75	95	100	98	7	75	100	100	100	7	75	96	100	97
Tilled Topsoil	7	75	95	90	100	7	75	97	90	100	7	75	100	90	98	7	75	97	90	99

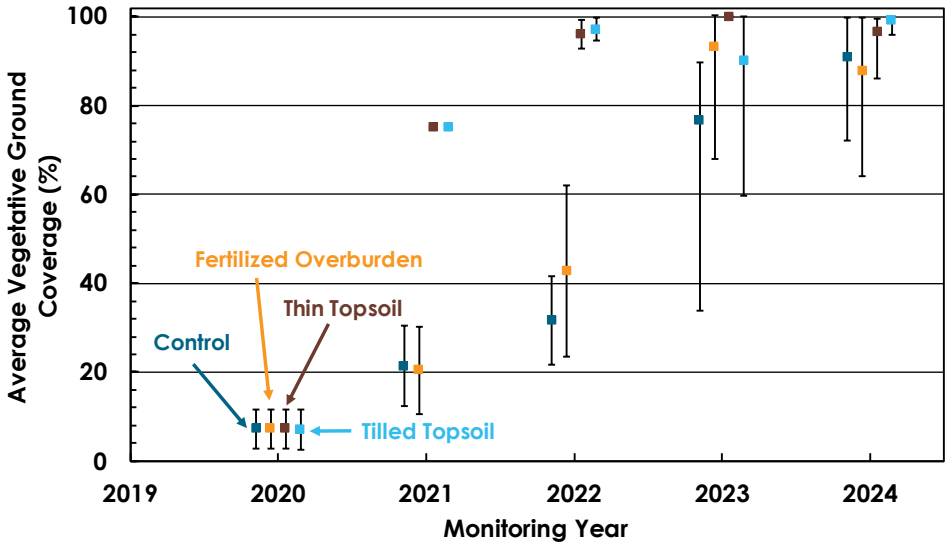


Figure 3.5: Average and Standard Deviation of Vegetative Ground Coverage Percent From 2020 to 2024 Across All Blocks and Vegetation Types

3.1.5 Noxious Weed Density

Noxious weeds, both Canada and sow thistle, were observed across all plots, with a range of density classifications from 4 to 12. Figure 3.6 displays the density distribution of noxious weeds identified during the 2023 and 2024 surveys as an average across blocks and by vegetation and soil type. Figure 3.7 provides an average density distribution across vegetation treatment types and blocks by soil treatment type.

The density distribution of noxious weeds has increased across plots, regardless of vegetation or soil treatment type. In 2023, the average density distribution was seven, and in 2024, it increased to ten. The highest density distribution of 12 was seen in aspen tilled topsoil, community mix tilled topsoil and control, eastern white cedar thin topsoil, groundcover mix fertilized overburden, shrub mix thin topsoil, and white spruce tilled topsoil and control plots. The lowest density distribution of six was seen in birch control, black spruce fertilized overburden, and shrub mix fertilized overburden plots.

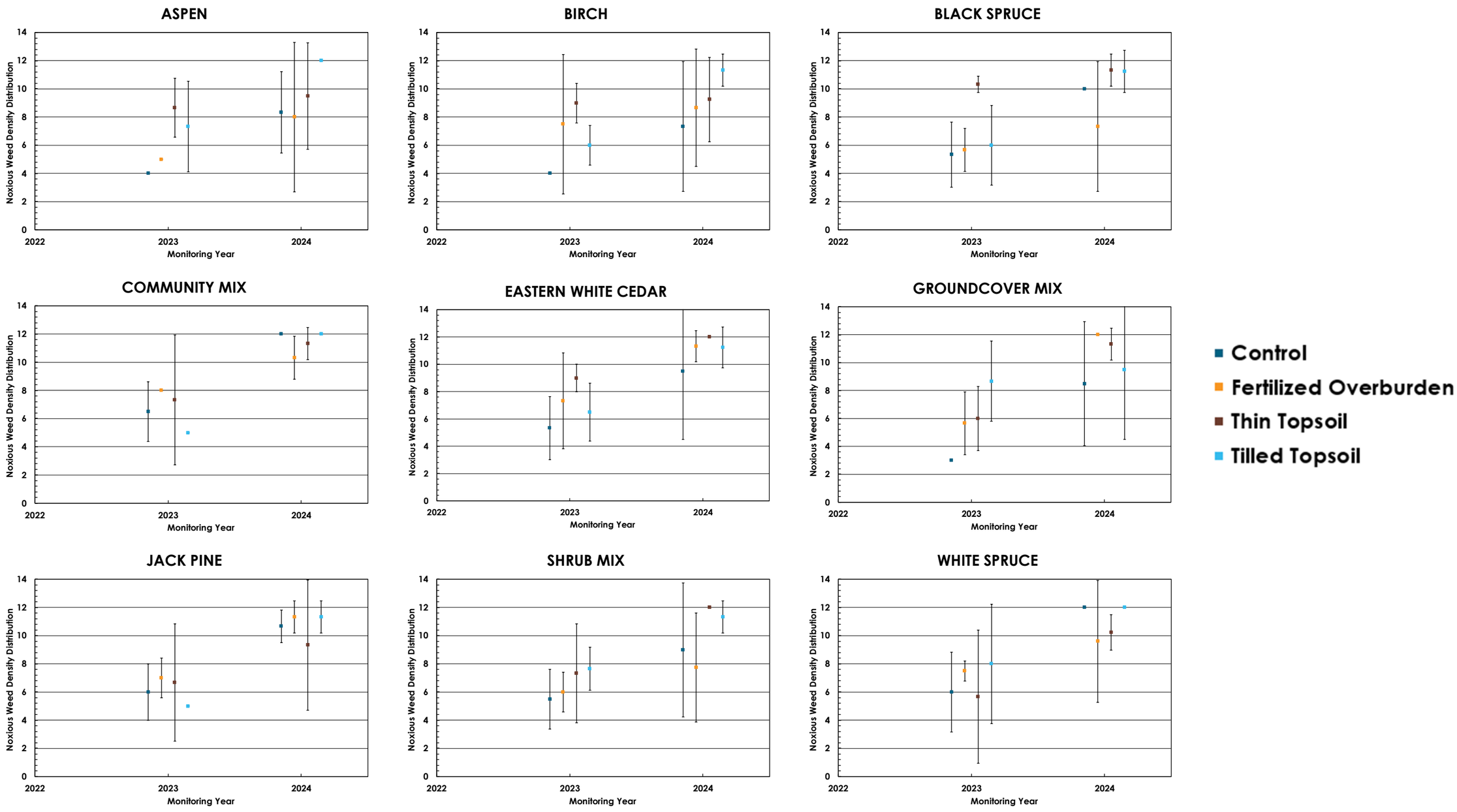


Figure 3.6: Average and Standard Deviation of Noxious Weed Density Distribution Across Blocks for Each Vegetation Type by Year

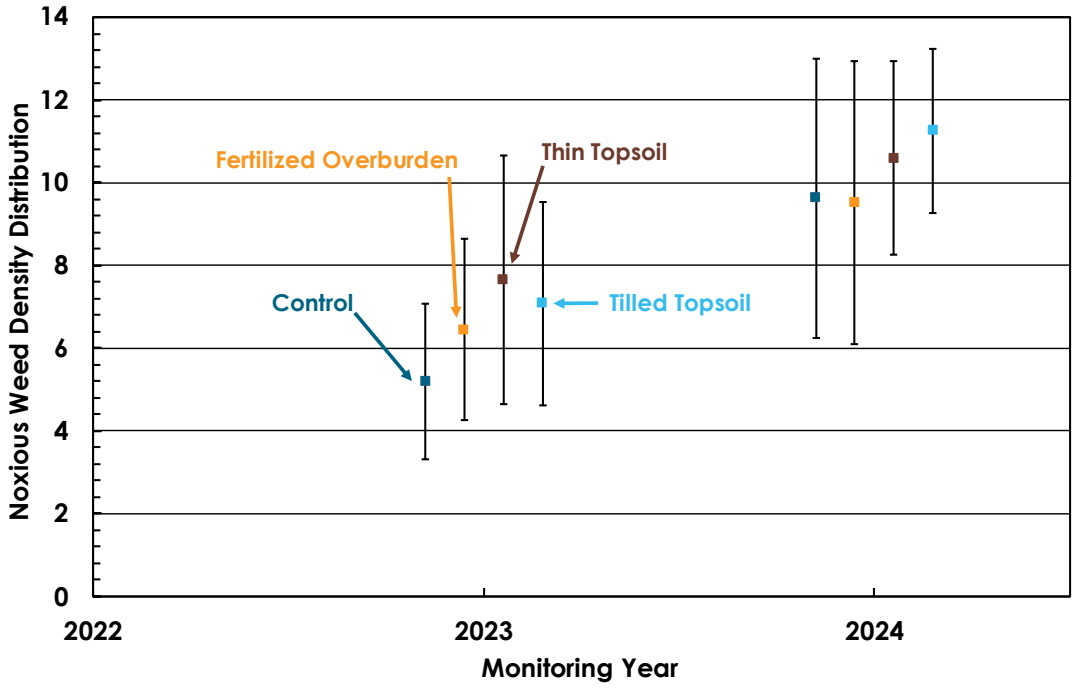


Figure 3.7: Average and Standard Deviation of Noxious Weed Density Distribution Across Vegetation and Blocks by Soil Treatment Type

3.2 Sloped Areas Erosion Survey

In general, significant erosional features were observed on the sloped areas of the trial in previous years. However, in 2024, no active erosion was observed and all historical erosion features remain fully vegetated and stable. Historical erosion features were challenging to identify across the trial due to dense vegetative coverage. Photos of the sloped areas can be found below in Figure 3.8, Figure 3.9, Figure 3.10, and Figure 3.11.

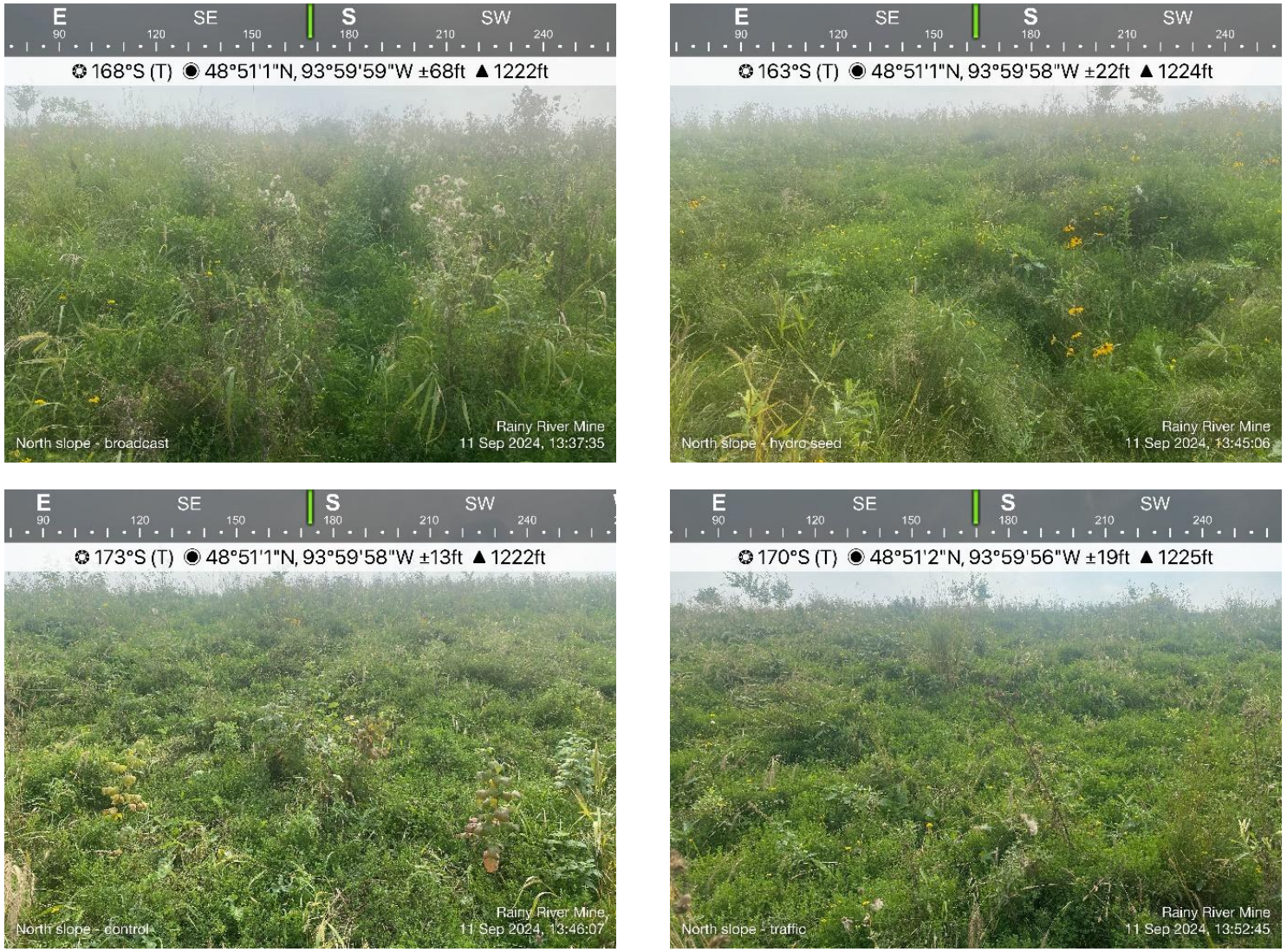


Figure 3.8: Site Photos of North Slope: Broadcast (top left), Hydroseed (top right), Control (bottom left), and Traffic (bottom right)

Figure 3.9: Site Photos of East Slope: Control (top left), Hydroseed (top right), and Broadcast (bottom)

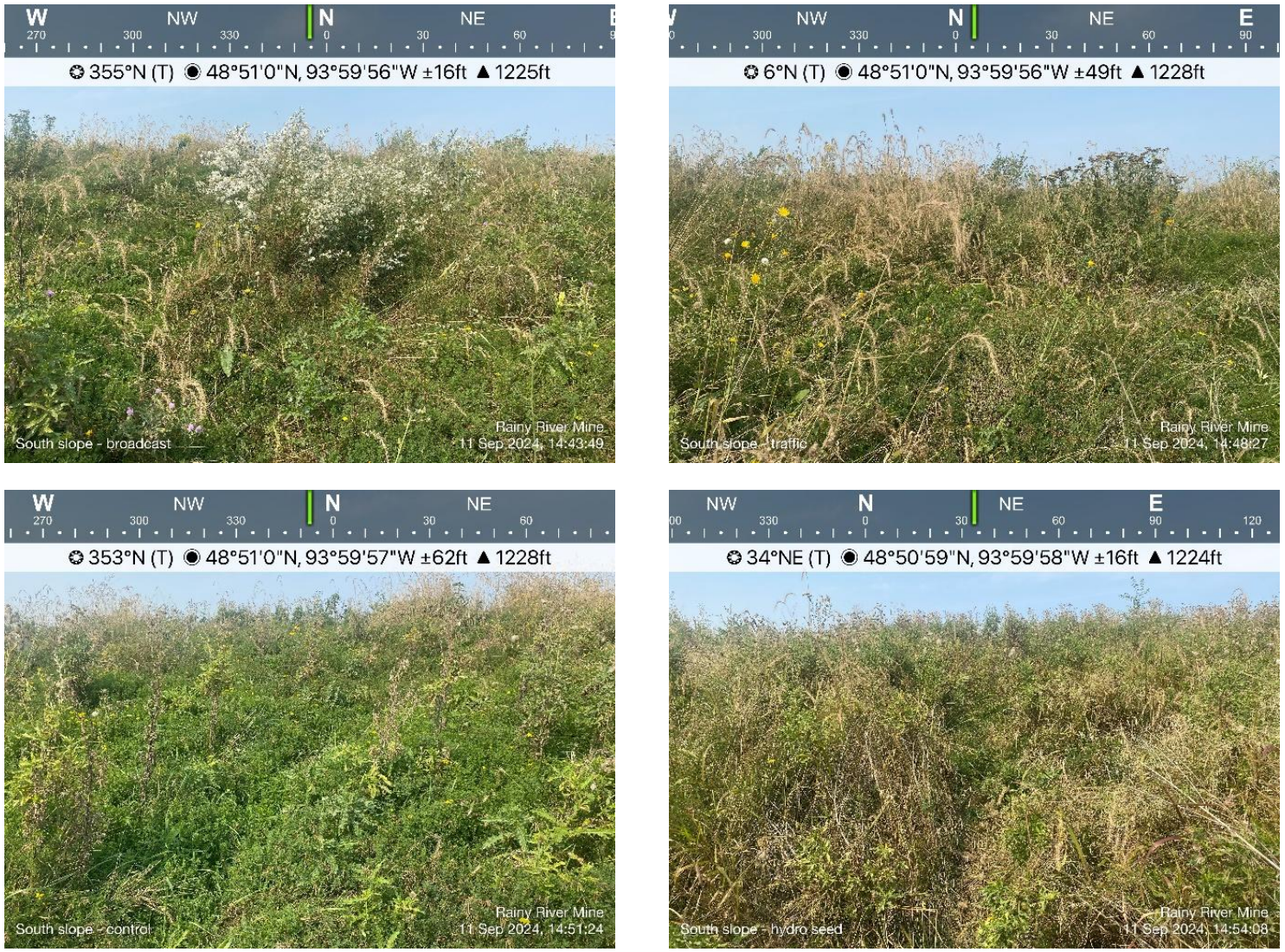


Figure 3.10: Site Photos of South Slope: Broadcast (top left), Traffic (top right), Hydroseed (bottom right), Control (bottom left)

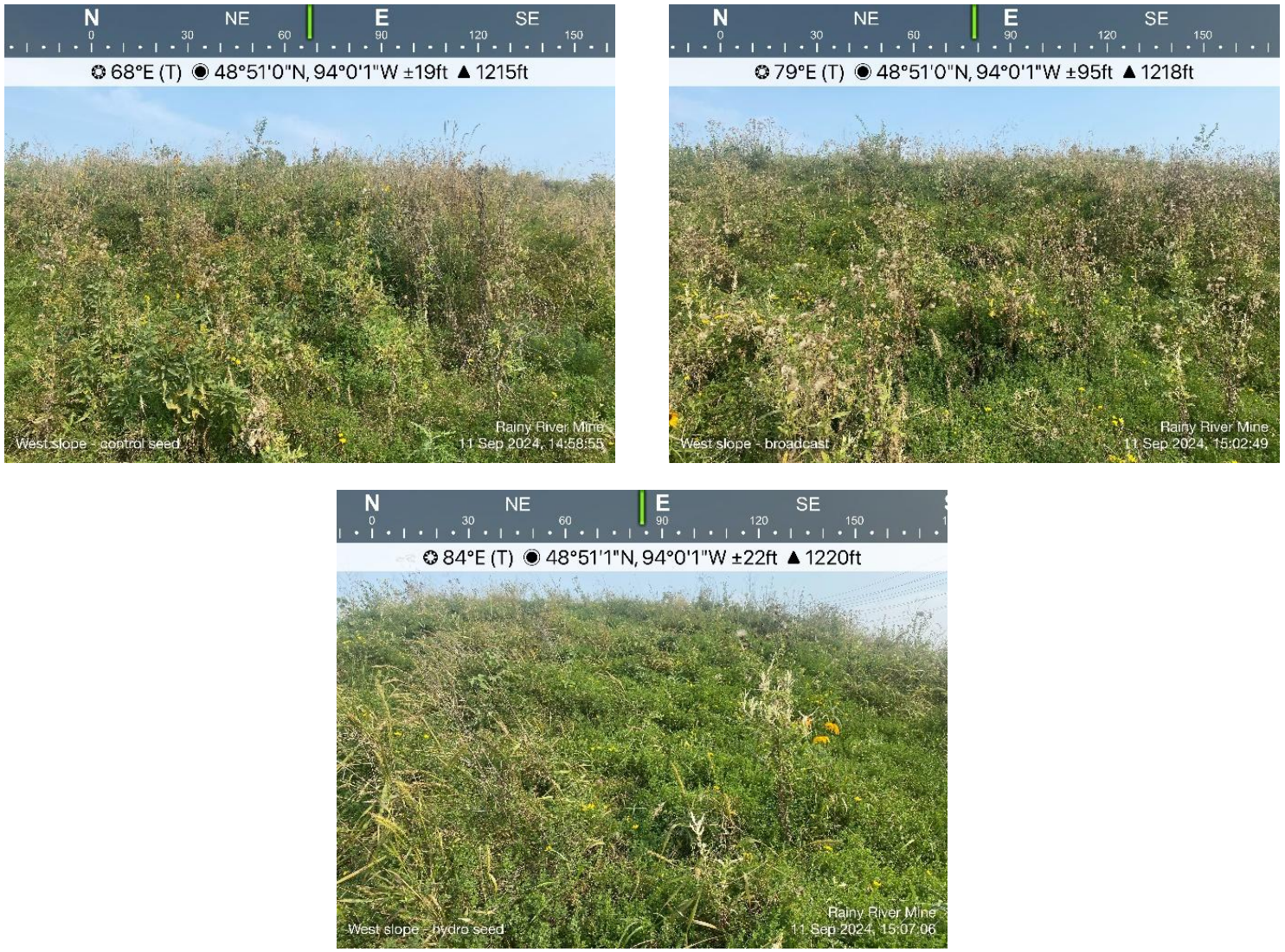


Figure 3.11: Site Photos of West Slope: Control (top left), Broadcast (top right), and Hydroseed (bottom)

3.3 Plant Growth Measurements Across Sloped Areas

Vegetative ground coverage increased to 100% across all sloped areas, and species composition was evaluated. As shown in Table 3.3, all slopes had two species of noxious weed, Canada thistle and sow thistle, and a variety of volunteer species and species from the general native seed mix used for seeding the slopes (Table 1.1). The north slope, followed by the west and the east, boasted the highest numbers of volunteer and general native seed mix species, whereas the south slope had the lowest. Birdsfoot trefoil was the dominant species across the slopes; it is a non-native volunteer species in the legume family and was observed to be prevalent in the surrounding area to the trials and mine site (Northern Ontario Plant Database, 2024; Walter Muma, n.d.). On some slopes, Canada Wild Rye was a dominant species; it was part of the general native seed mix used for seeding. Generally, slopes hydroseeded initially appear to have more volunteer and general native seed mix species than other slope treatments, followed by the control slopes. Trafficked slopes had the lowest number of native species present. Of note, all slopes were treated with ProGanics® Biotic Soil Media in September 2020 to minimize further erosion.

Table 3.3: Dominant species, minor species, and noxious weed composition on sloped areas.

Slope	Hydroseed	Broadcast	Traffic	Control
North	**Dominant Species:** Birdsfoot Trefoil **Minor Species:** Common Burdock, Dandelions, Dock Species, Field Horsetail, Fowl Bluegrass, Minor Sweet Clover, Ox-Eye Daisy, Slender Wheat Grass, Unidentified Grass Species, Virginia Wild Rye, Aster species, Black Eyed Susan, Blue Vervain, Canada Wild Rye, Dogwood Species, Golden Rod, Willow species **Noxious Weeds:** Canada Thistle, Sow-thistle Species	**Dominant Species:** Birdsfoot Trefoil **Minor Species:** Annual Oats, Common Burdock, Dandelions, Dock Species, Fowl Bluegrass, Minor Sweet Clover, Slender Wheat Grass, Unidentified Grass Species, Virginia Wild Rye, Aster Species, Black Eyed Susan, Canada Wild Rye, Golden Rod, Red Clover, Red Raspberry, Willow species **Noxious Weeds:** Canada Thistle, Sow-thistle Species	**Dominant Species:** Birdsfoot Trefoil **Minor Species:** Field Horsetail, Fowl Bluegrass, Marsh Woundwort, Reed Canary Grass, Unidentified Grass Species, Black Eyed Susan, Canada Wild Rye, Red Clover, Vetch Species **Noxious Weeds:** Canada Thistle, Sow-thistle Species	**Dominant Species:** Birdsfoot Trefoil **Minor Species:** Field Horsetail, Fowl Bluegrass, Slender Wheat Grass, Unidentified Grass Species, Virginia Wild Rye, Alder Species, Black Eyed Susan, Blue Vervain, Canada Wild Rye, Golden Rod, Red Clover, Red Raspberry, Willow Species **Noxious Weeds:** Canada Thistle, Sow-thistle Species
East	**Dominant Species:** Birdsfoot Trefoil **Minor Species:** Dandelions, Fowl Wheat Grass, Slender Wheat Grass, Unidentified Grass Species, Big Bluestem, Canada Wild Rye **Noxious Weeds:** Canada Thistle, Sow-thistle Species	**Dominant Species:** Birdsfoot Trefoil **Minor Species:** Dandelions, Fowl Bluegrass, Reed Canary Grass, Slender Wheat Grass, Unidentified Grass Species, Red Raspberry **Noxious Weeds:** Canada Thistle, Sow-thistle Species	n/a	**Dominant Species:** Birdsfoot Trefoil **Minor Species:** Dandelions, Field Horsetail, Fowl Bluegrass, Slender Wheat Grass, Black Eyed Susan, Canada Wild Rye, Vetch Species **Noxious Weeds:** Canada Thistle, Sow-thistle Species
South	**Dominant Species:** Birdsfoot Trefoil, Fowl Bluegrass, Canada Wild Rye **Minor Species:** Slender Wheat Grass, Virginia Wild Rye **Noxious Weeds:** Canada Thistle, Sow-thistle Species	**Dominant Species:** Birdsfoot Trefoil, Canada Wild Rye **Minor Species:** Fowl Bluegrass, Aster Species, Black Eyed Susan, Golden Rod, Red Clover, Red Raspberry **Noxious Weeds:** Canada Thistle, Sow-thistle Species	**Dominant Species:** Birdsfoot Trefoil, Canada Wild Rye **Minor Species:** Common Tansy, Dandelion, Fowl Bluegrass, Ox-Eye Daisy, Black Eyed Susan, Golden Rod **Noxious Weeds:** Canada Thistle, Sow-thistle Species	**Dominant Species:** Birdsfoot Trefoil **Minor Species:** Black Eyed Susan, Blue Vervain, Canada Wild Rye, Golden Rod **Noxious Weeds:** Canada Thistle, Sow-thistle Species

Slope	Hydroseed	Broadcast	Traffic	Control
West	**Dominant Species:** Birdsfoot Trefoil **Minor Species:** Fowl Bluegrass, Slender Wheat Grass, Unidentified Grass Species, Virginia Wild Rye, Alder Species, Aster Species, Black Eyed Susan, Canada Wild Rye, Golden Rod, Red Clover, Red Raspberry, Vetch Species, Willow Species **Noxious Weeds:** Canada Thistle, Sow-thistle Species	**Dominant Species:** Birdsfoot Trefoil **Minor Species:** Fowl Bluegrass, Slender Wheat Grass, Black Eyed Susan, Canada Wild Rye, Golden Rod, Vetch Species **Noxious Weeds:** Canada Thistle, Sow-thistle Species	n/a	**Dominant Species:** Birdsfoot Trefoil **Minor Species:** Unidentified Grass Species, Aster Species, Black Eyed Susan, Blue Vervain, Canada Wild Rye, Golden Rod, Red Clover, Red Raspberry **Noxious Weeds:** Canada Thistle, Sow-thistle Species

In addition to identifying the presence of noxious weeds, the respective density distribution across slopes and treatment types was assessed. Density distributions ranged from 5 to 12. Generally, the south and west slopes had the highest noxious weed densities (an average density distribution of 9 across treatments on the south slope and 7 for the west slopes). In contrast, the north and east slopes had the lowest noxious weed densities (an average density distribution of 6 across treatments on the north slope and 5 for the east). Figure 3.12 presents noxious weed density distribution across slopes and treatment types. Photos of slope vegetation ground cover from 2020 to 2024 can be found below in Figure 3.13, Figure 3.14, Figure 3.15, and Figure 3.16.

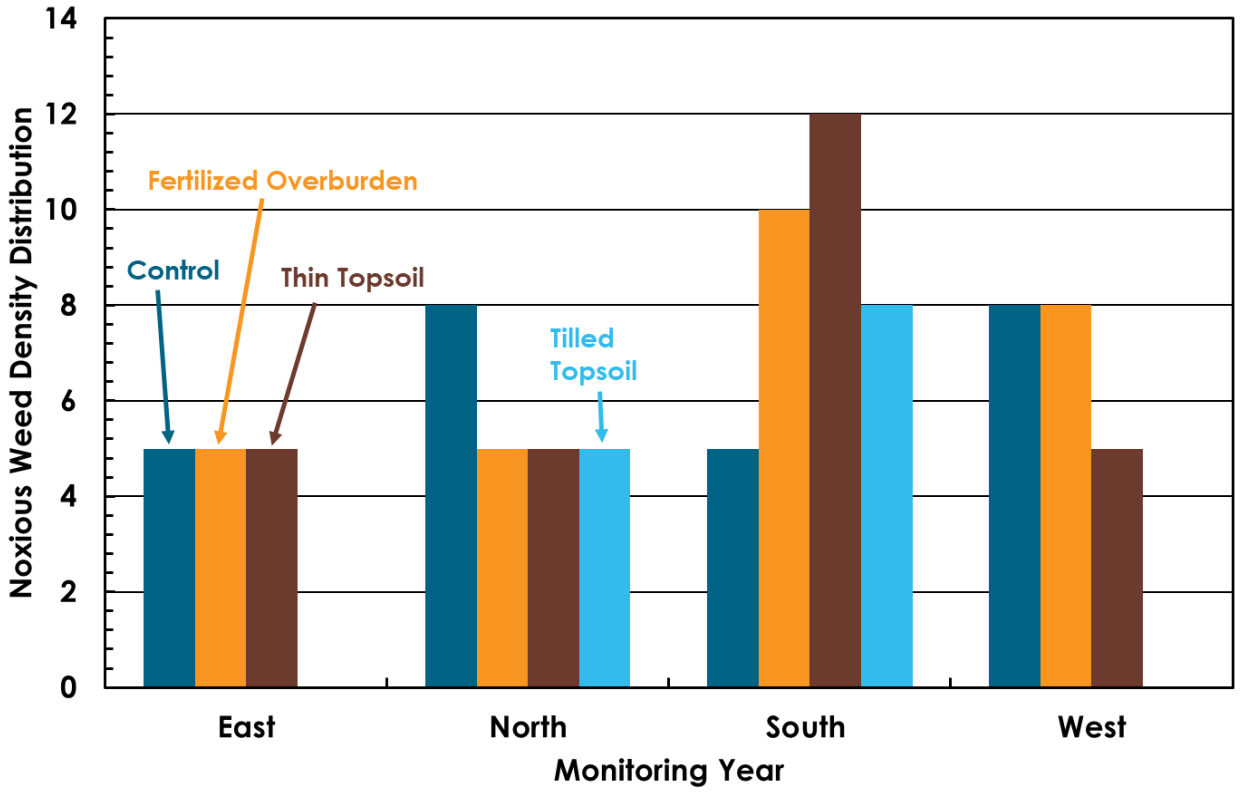


Figure 3.12: Noxious Weed Density Distribution Across Slopes and Treatment Types in 2024

Figure 3.13: South Slope Vegetative Ground Coverage on Hydroseeded Slopes: August 26, 2020 (top left), August 18, 2021 (top right), August 9, 2022 (middle left), September 7, 2023 (middle right), and September 11, 2024 (bottom)

Figure 3.14: East Slope Vegetative Ground Coverage on Hydroseeded Slopes: August 26, 2020 (top left), August 18, 2021 (top right), August 9, 2022 (middle left), September 7, 2023 (middle right), and September 11, 2024 (bottom)

Figure 3.15: North Slope Vegetative Ground Coverage on Hydroseeded Slopes: August 26, 2020 (top left), August 18, 2021 (top right), August 9, 2022 (middle left), September 7, 2023 (middle right), and September 11, 2024 (bottom)

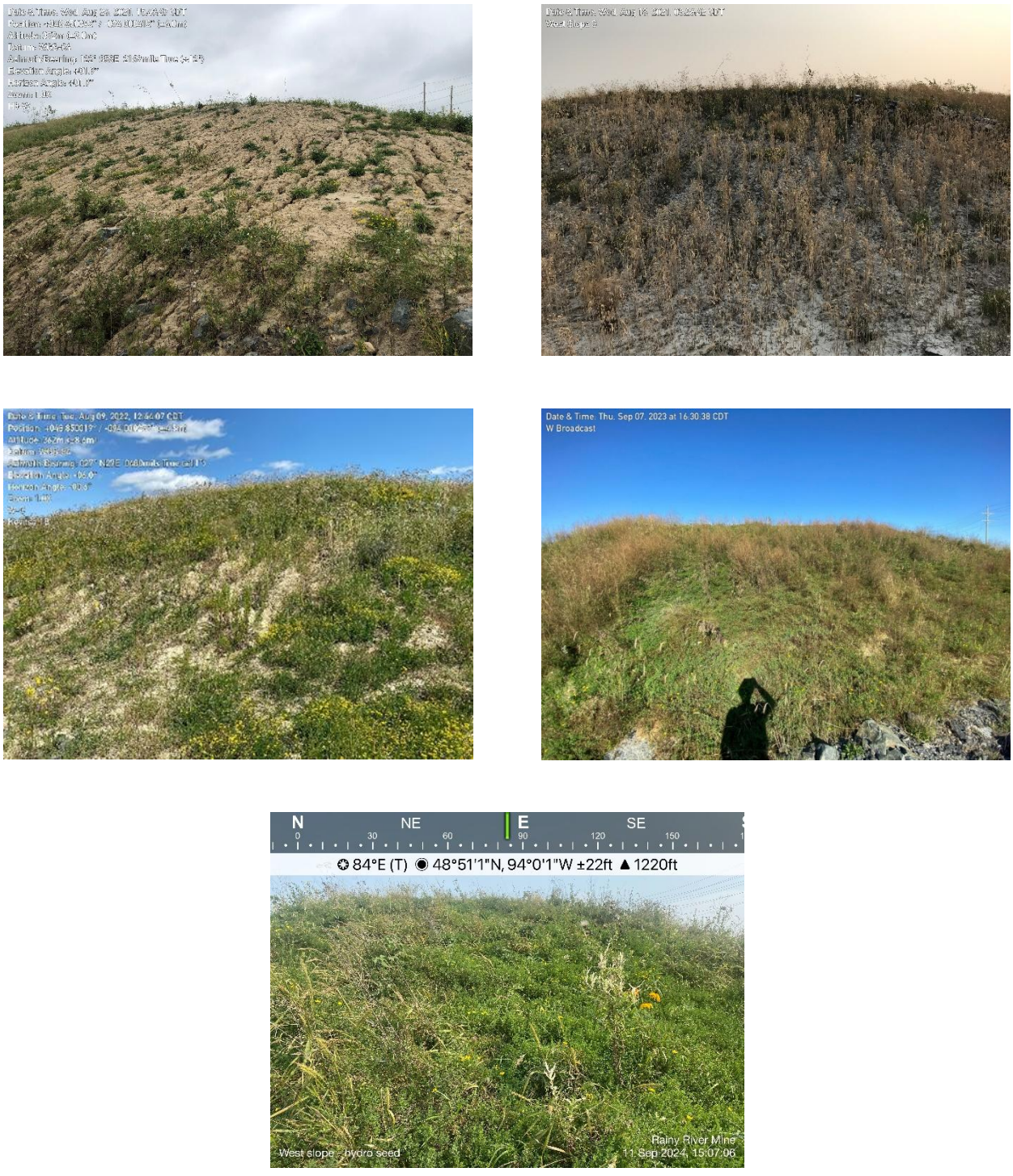


Figure 3.16: West Slope Vegetative Ground Coverage on Hydroseeded Slopes: August 26, 2020 (top left), August 18, 2021 (top right), August 9, 2022 (middle left), September 7, 2023 (middle right), and September 11, 2024 (bottom)

3.4 Destructive Plot

The data presented in Table 3.4 summarizes the root investigation conducted within the destructive plot. In 2024, three grids were analyzed, each featuring a distinct plant species: black spruce, birch, and dogwood. The black spruce exhibited the greatest root depth (48 cm) and root spread (59 cm), while the birch displayed a root depth of 40 cm, and a comparatively smaller root spread of 23 cm. The dogwood had the shallowest root depth (19 cm) but a moderate root spread of 51 cm.

In addition, the total ground coverage was estimated. Vegetation was generally well established, and ground cover remained at 100% in 2024 like it was in 2023 across the destructive plot.

Table 3.4: 2024 destructive plot root investigation.

Tree Species	2021			2022			2023			2024		
	Root Depth (cm)	Root Spread (cm)	Ground Coverage (%)	Root Depth (cm)	Root Spread (cm)	Ground Coverage (%)	Root Depth (cm)	Root Spread (cm)	Ground Coverage (%)	Root Depth (cm)	Root Spread (cm)	Ground Coverage (%)
Aspen	3	8		61	28		37	23		-	-	
Black Spruce	3	5		64	76		-	-		48	59	
Birch	3	13		41	51		-	-		40	23	
Dogwood Shrub	-	-		-	-		-	-		19	51	
Eastern White Cedar	3	8	75	-	-	75	-	-	100	-	-	100
Jack Pine	-	-		-	-		-	-		-	-	
Pincherry Tree	-	-		-	-		22	18		-	-	
White Spruce	3	8		-	-		-	-		-	-	
Willow	-	-		-	-		45	75		-	-	

-: Root investigations were not performed on these species in this monitoring year.

Additionally, no evidence of erosion was observed within the destructive plot. A summary of general tree health from the destructive plot survey is presented in Table 3.5. The findings indicate a higher number of healthy specimens observed in 2024 compared to 2023.

Table 3.5: General health of trees and shrubs planted in the destructive plot (H-healthy, S-struggling, D-dead).

Species	2020[1]	2021[1]	2022[1]	2023	2024
Aspen	8 H, **4 S**	7 H, 2 S, **3 D**	4 H, **2 S, 4 D**	1H, 3H/S, 2 S/D	2H, 2S, 2 S/D, 1D
Black spruce	14 H	5 H, 3 H/S, **6 D**	4 H, **3 S, 4 D**	1H, 1H/S, 2S, 1S/D	1H, 1H/S, 1D
Black ash	21 H, **1 S**	1 H/S, **13 S, 1 S/D, 6 D**	5 H, 2 H/S, **2 S, 12 D**	4S, 3S/D	4H, 2 H/S, 4S
Eastern white cedar	**11 S**	**8 S/D**	**1 S/D, 5 D**	5S/D, 2D	2S, 4S/D, 2D
White spruce	-	**6 D**	**6 D**	-	1H/S
Jack pine	10 H, **1 S**	**1 S/D, 10 D**	**1 S/D, 8 D**	3S/D, 1D	-
Shrub (1)[2]	8 H	**8 S/D**	**2 S, 9 D**	-	-
Shrub (2)[3]	20 H	-	-	-	-
Cherry	-	-	-	5S/D, 2D	2S, 6D
Dogwood	-	-	-	5H, 3 H/S	10H, 1S
Cranberry	-	-	-	2H	3H
Willow	-	-	-	3H, 2H/S	5H

-: Species were not found in the destructive plot to assess health.

1: For 2020, 2021, and 2022 only struggling or dead trees were noted in the autumn survey **(bolded),** all other specimens were labelled as healthy.

2: Shrub (1) assumed to be raspberry bushes.

3: Shrub (2) are unidentified shrub species.

3.5 Vegetation Tissue and Soil Sampling

In 2024, To further inform on the knowledge gaps identified during the failure modes and effects analysis, a new aspect of the Vegetation Trial was initiated, testing vegetation tissue and soil samples to inform on any toxicity from metal leaching into soils or vegetation (Okane, 2018). Full analytical results are provided in Appendix A, and lab reports in Appendix B.

3.5.1 Vegetation Tissue Sampling

Samples of vegetative tissue were tested for metals, including mercury, and results provide a baseline for assessing if accumulation of metals is occurring in plant tissue within the trials over time. There is no

set guidance or series of recommendations for the level of metals and mercury found in vegetation tissue due to many variables affecting concentration, such as differences between species and sections of plant tested. Therefore, the vegetation tissue sampling results in 2024 will be compared year over year and assessed for any changes in concentration. However, for discussion purposes only, metal concentrations in vegetation tissue will also be compared to the Canadian Council of Ministers of the Environment (CCME) soil quality guidelines (CCME, 2024).

Aspen reported cadmium concentrations in exceedance of the guidelines in thin topsoil (1.53 mg/kg), and the control (2.26 mg/kg). Willow reported cadmium concentrations in exceedance of the guidelines in thin topsoil (2.87 mg/kg), tilled topsoil (1.94 mg/kg), fertilized overburden (4.24 mg/kg), the control (4.99 mg/kg), and the background (5.21 mg/kg). No cadmium exceedances were reported in raspberry.

Raspberry reported molybdenum concentrations in exceedance of the guidelines in thin topsoil (8.34 mg/kg), tilled topsoil (6.35 mg/kg), fertilized overburden (6.29 mg/kg), the control (9.75 mg/kg), and the background (5.24 mg/kg). Willow reported molybdenum concentrations in exceedance of the guidelines in thin topsoil (5.06). No molybdenum exceedances were reported in aspen.

Aspen reported zinc concentrations in exceedance of the guidelines in thin topsoil (536 mg/kg), tilled topsoil (398 mg/kg), fertilized overburden (372 mg/kg), and the control (468 mg/kg). Willow reported zinc concentrations in exceedance of the guidelines in thin topsoil (304 mg/kg), tilled topsoil (322 mg/kg), fertilized overburden (372 mg/kg) and the control (359 mg/kg). No zinc exceedances were reported in raspberry.

Boron exceeded the applicable guidelines in all samples. All remaining vegetation tissue samples reported concentrations below the CCME soil quality guidelines for agricultural and industrial areas (CCME, 2024). Appendix A provides the results from the vegetation tissue sampling, and Appendix B provides the lab reports.

3.5.2 Soil Sampling

Soil samples were tested for metals, including mercury, and results provide a baseline for assessing if accumulation of metals is occurring in soils within the trials over time. Boron concentrations exceeded the applicable agricultural soil quality guidelines in all samples. All remaining analytical results were below the CCME soil quality guidelines for agricultural and industrial areas (CCME, 2024. Electrical conductivity (EC) and sodium absorption ratio (SAR) values in all soil treatment plots were low and comparable to background values, suggesting that salinity levels were within acceptable ranges. These findings indicate that, with respect to salinity, all soil treatment options are suitable as a growth media for vegetation establishment in the immediate to short term.

Analysis revealed differences in nutrient and physical parameters between soil treatments and the background location. Nitrogen and phosphorus concentrations were highest in the background

samples and were greater in thin topsoil and tilled topsoil plots compared to fertilized overburden and control plots. Potassium levels were comparable across all soil treatments. Total organic carbon was highest in the background location, followed by tilled topsoil, and was comparable across fertilized overburden, thin topsoil, and control plots. Both nitrate and phosphorus were higher in the samples collected at 0 to 0.2 mbg, as compared to samples collected deeper at 0.3 to 0.5 mbg. Samples were collected at these different depths to investigate differences between the overlying topsoil (0 to 0.2 mbg) and underlying overburden (0.3 to 0.5 mbg).

Moisture content was lowest in the control plots but similar across the background, fertilized overburden, thin topsoil, and tilled topsoil plots. Soil texture varied, with the background location classified as clay, while vegetation trial plots exhibited textures of sandy clay loam, loam, or clay loam.

Figure 3.17, Figure 3.18, Figure 3.19, summarizes plant-available nutrient concentrations at 0 to 0.2 mbg, and Figure 3.20, Figure 3.21, and Figure 3.22 summarizes plant available nutrient concentrations at 0.3 to 0.5 mbg, respectively. Detailed analytical results are provided in Appendix A, and complete laboratory reports are included in Appendix B.

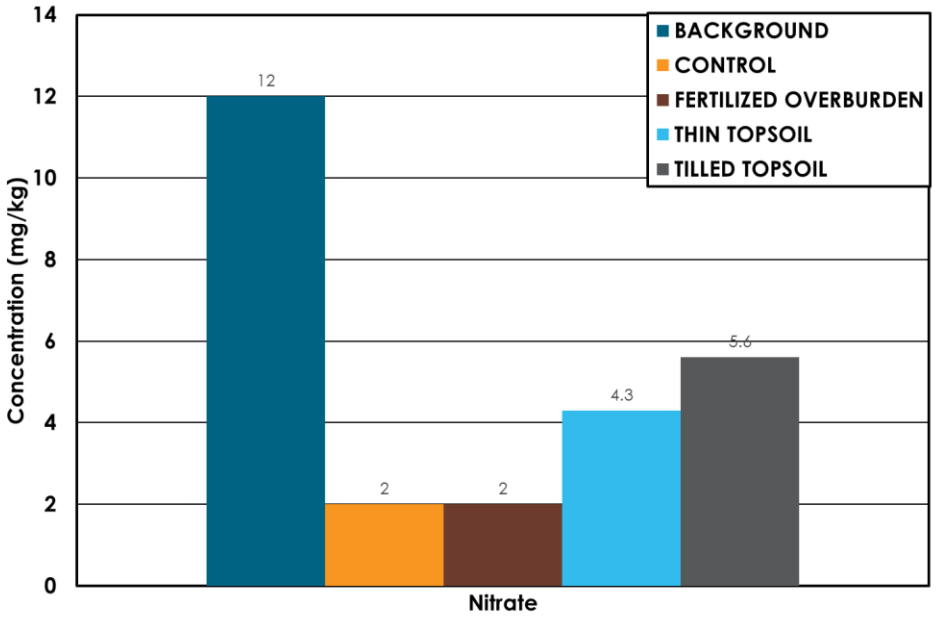


Figure 3.17: Plant Available Nitrate Concentrations in mg/kg in Soil at a Depth of 0 to 0.2 mbgs

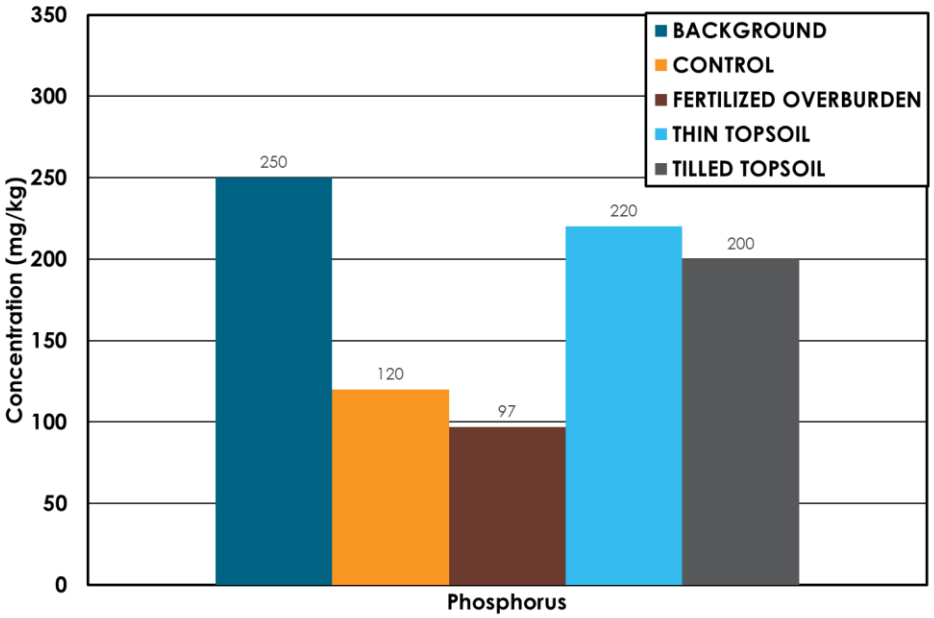


Figure 3.18: Plant Available Phosphorus Concentrations in mg/kg in Soil at a Depth of 0 to 0.2 mbgs

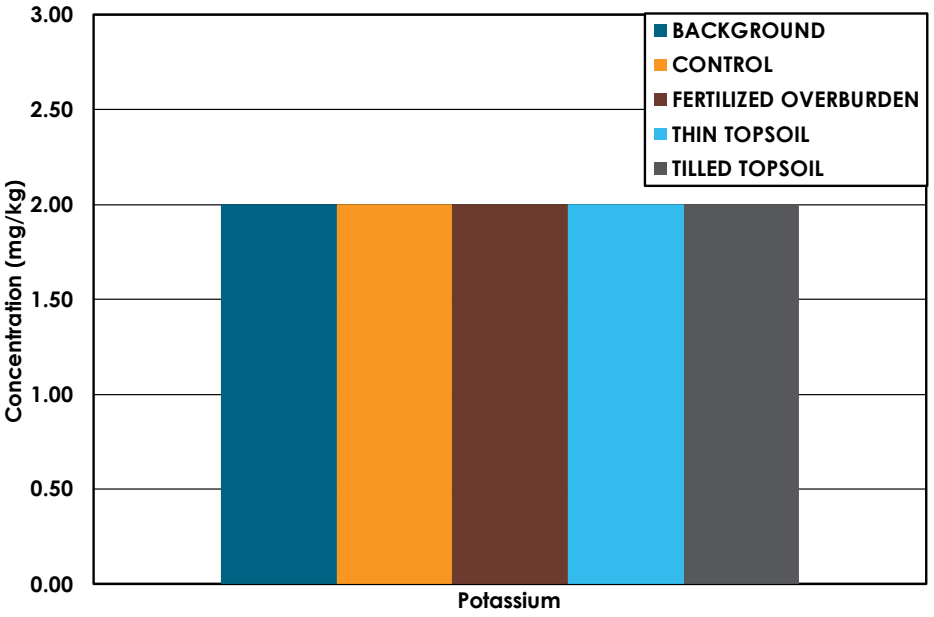


Figure 3.19: Plant Available Potassium Concentrations in mg/kg in Soil at a Depth of 0 to 0.2 mbgs

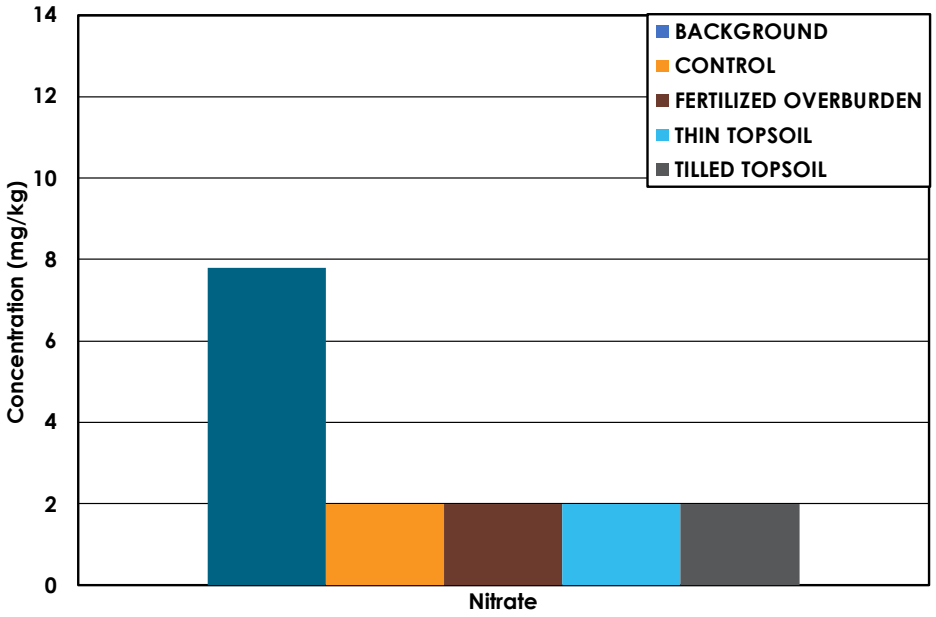


Figure 3.20: Plant Available Nitrate Concentrations in mg/kg at a Depth of 0.3 to 0.5 mbgs

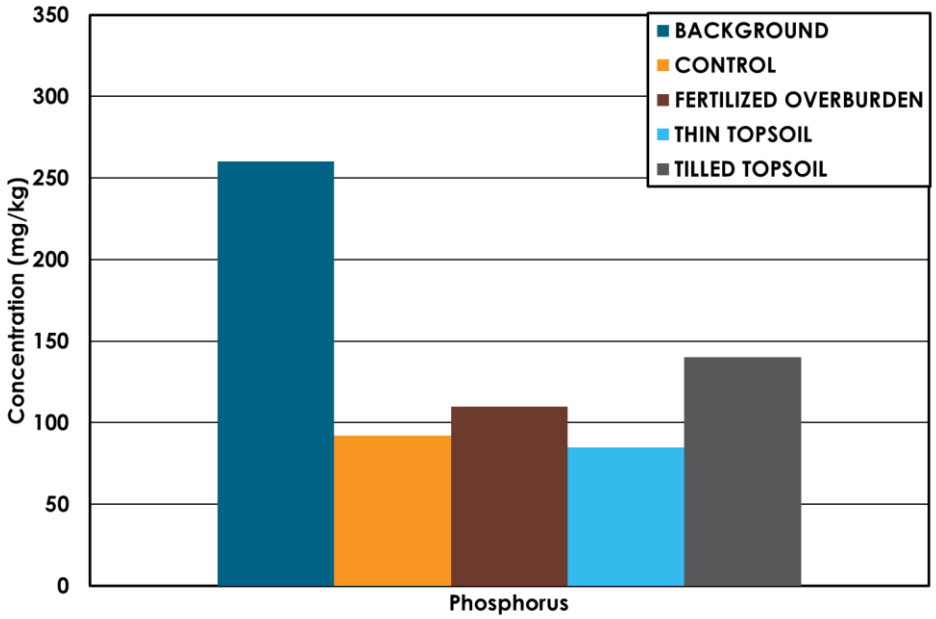


Figure 3.21: Plant Available Phosphorus Concentrations in mg/kg at a Depth of 0.3 to 0.5 mbgs

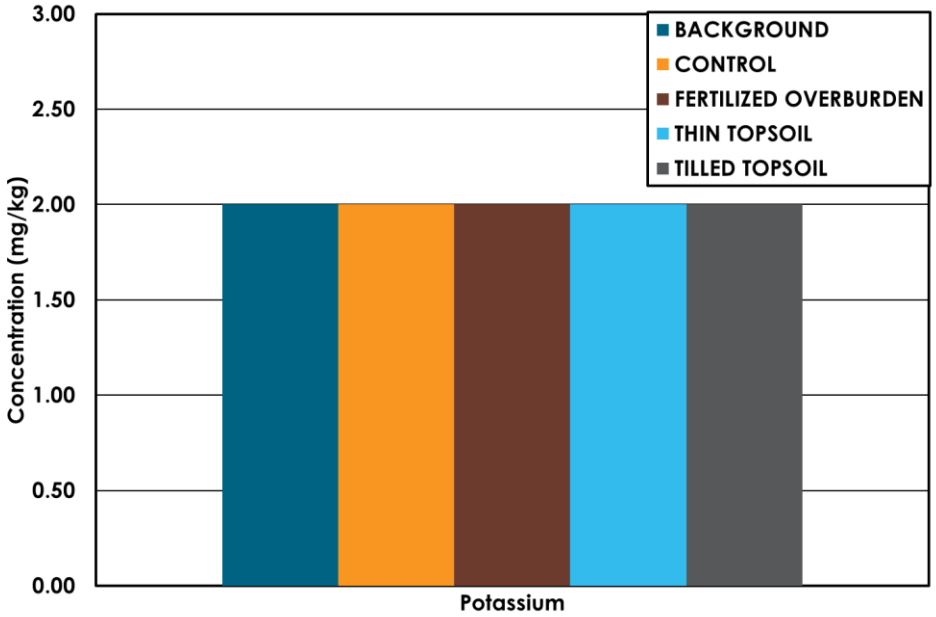


Figure 3.22: Plant Available Potassium Concentrations in mg/kg at a Depth of 0.3 to 0.5 mbgs

3.6 Transplanting

Three white spruce saplings were planted in block 3 - thin topsoil - black spruce plot, and block 3 - thin topsoil - white spruce plot. Two white spruce saplings were planted in the block 1 - thin topsoil - white spruce plot. Three alder saplings were planted in the block 1 - thin topsoil - jack pine plot. Species were transplanted during the July 2024 visit and assessed for health during the September 2024 visit. Figure 3.23 shows the transplanted species circled in black within their respective plots during the September 2024 visit. All transplanted specimens survived except for one transplanted white spruce in the block 2 plot. The health, height, and DBH of these transplanted specimens will be monitored in upcoming years. Information gleaned from these transplanted specimens will help better understand how young saplings, planted during the active growing season, establish on reclaimed areas and compete against dense vegetative groundcover.

Table 3.6: Summary of transplanted saplings.

Block	Soil Treatment	Original Vegetation Type	Transplanted Sapling Species	Number of Specimens Transplanted	Successful Transplants (Alive in September)
3	Thin Topsoil	Black Spruce	White Spruce	3	3
2	Thin Topsoil	White Spruce	White Spruce	3	2
1	Thin Topsoil	White Spruce	White Spruce	2	2

Block	Soil Treatment	Original Vegetation Type	Transplanted Sapling Species	Number of Specimens Transplanted	Successful Transplants (Alive in September)
1	Thin Topsoil	Jack Pine	Alder	3	3

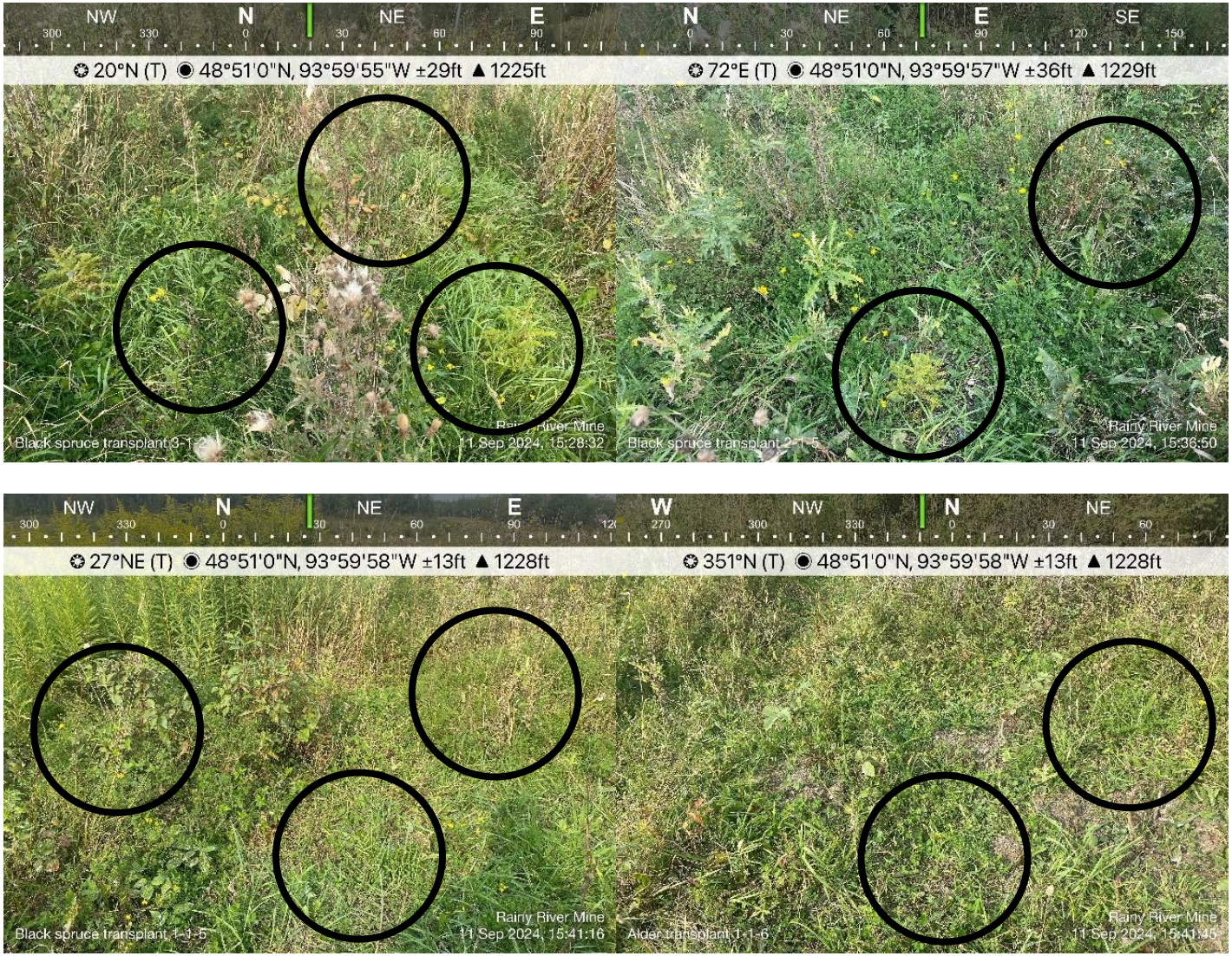
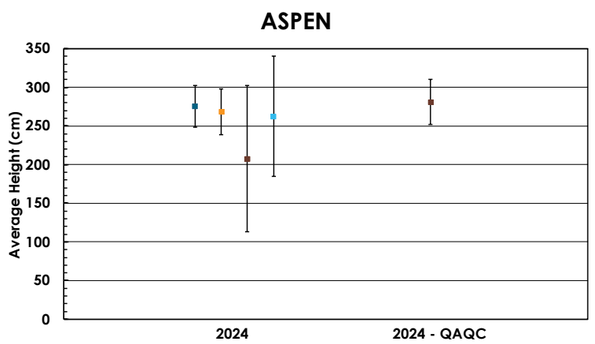
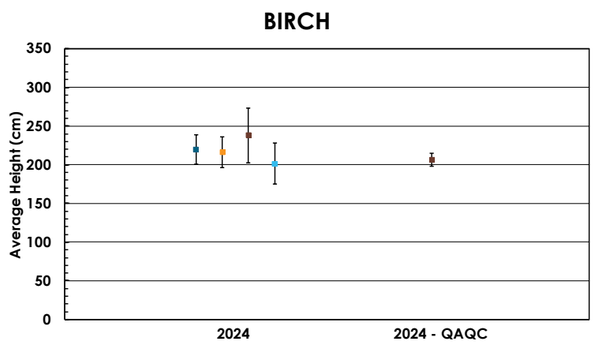


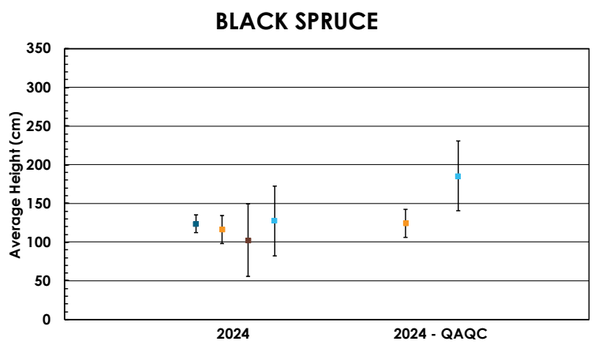
Figure 3.23: Specimens that Survived Transplanting are Circled in Black: Block 3 - Thin Topsoil - Black Spruce Plot (Top Left), Block 2 - Thin Topsoil - Black Spruce Plot (Top Right), Block 1 - Thin Topsoil - White Spruce Plot (Bottom Right), and Block 1 - Thin Topsoil - Jack Pine Plot (Bottom Left)

3.7 Quality Assurance and Quality Control

In 2024, New Gold undertook data collection for the vegetation trials. To ensure data is consistent with previous years, Okane completed a quality assurance and quality control (QAQC) assessment in September 2024. Okane personnel visited the site and selected a random subset of plots to collect data and compare against New Gold's data. As illustrated in Figure 3.24 and Figure 3.25, data collected by New Gold fell within the standard deviation of the averages for data collected by Okane during the QAQC assessment and no significant outstanding issues with the 2024 data were found.

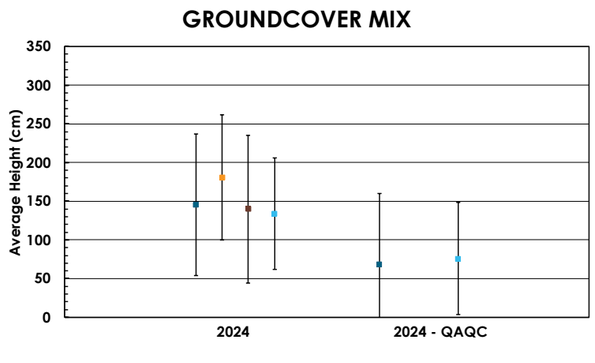




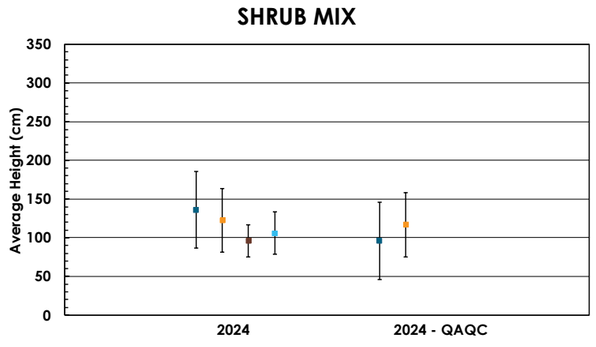


COMMUNITY MIX
Not Selected for Data QAQC

EASTERN WHITE CEDAR
Not Selected for Data QAQC



JACK PINE
Not Selected for Data QAQC



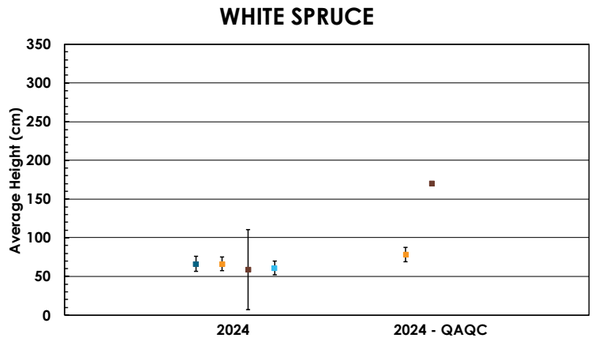
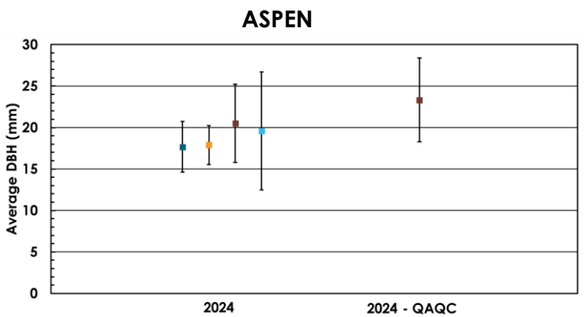
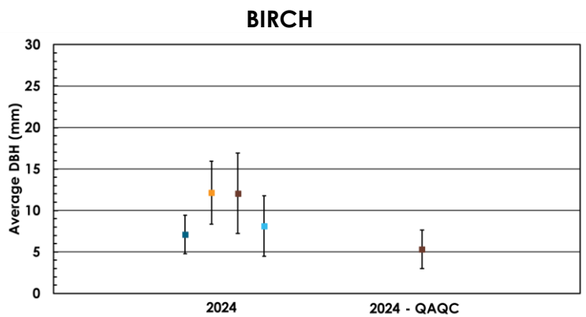
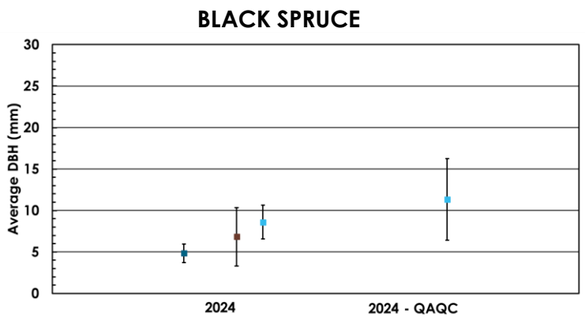


Figure 3.24: QAQC of Average Heights with Standard Deviations







COMMUNITY MIX
Not Selected for Data QAQC

EASTERN WHITE CEDAR
Not Selected for Data QAQC

GROUNDCOVER MIX
No Specimens Within QAQC Selected Plots Above 1.3 m to Record DBH

- Control
- Fertilized Overburden
- Thin Topsoil
- Tilled Topsoil

JACK PINE
Not Selected for Data QAQC

SHRUB MIX
No Specimens Within QAQC Selected Plots Above 1.3 m to Record DBH

WHITE SPRUCE
No Specimens Within QAQC Selected Plots Above 1.3 m to Record DBH

Figure 3.25: QAQC of Average Diameters at Breast (DBH) with Standard Deviations

4 DISCUSSION AND CONCLUSIONS - FAILURE MODES AND EFFECTS

The requirement for conducting vegetation trials arose from needing to mitigate risks identified during the Failure Modes and Effects Analysis Workshop (Okane, 2018). As identified in the Detailed Design, the failure modes addressed with the vegetation trials include:

- Establishment and persistence of vegetation
- Effects of vegetation on erosion
- Effects of roots on a compacted clay layer
- Availability of plant nutrients in the overburden
- Toxicity effects of overburden constituents on vegetation
- Effect of density from vehicle traffic on plant establishment and survival

A summary with respect to each failure mode and recommendations to better assess and test the respective failure mode in future vegetation surveys has been provided below.

4.1 Establishment and Persistence of Vegetation

4.1.1 Plateau plots

Some general observations for the various planted species over 2024 include:

- Shrub Mix – Boasted the highest percentages of healthy specimens (86%) and lowest percentages of dead specimens (14%), particularly in fertilized overburden and control soil treatments (100% healthy or healthy/struggling and 0% dead in fertilized overburden and control plots.
- Aspen and Birch – Both species had higher percentages of healthy specimens (63% for aspen and 59% for birch) and lower percentages of dead compared to the other trees (10% for aspen and 7% for birch).
- Black Spruce – The percentage of dead trees was highly variable across the different soil treatment areas (17 -79% dead). However, the highest percentage of dead trees was in the thin (73% dead) and tilled topsoil soil treatments (79% dead) compared to the control (17% dead) and fertilized overburden (23% dead) plots.

- White Spruce – Most specimens are dead (54% average across all soil treatments), with no healthy or healthy/struggling specimens in either the fertilized overburden or tilled topsoil soil treatments.

- Eastern White Cedar – The percentage of dead specimens is low (6% average across all soil treatments). However, a small percentage of trees are healthy or healthy/struggling (7% average across all soil treatments).

- Jack Pine – All specimens died in 2020 shortly after planting.

- Groundcover Mix – High bush cranberry and pincherry trees, making up the ground cover mix, had a medium to high percentage of healthy and healthy/struggling specimens (64% average across all soil treatments) with a low percentage of dead (19% average across all soil treatments).

- Community Plots - Planted species are not known however it appears a mix of plants including red raspberries had been planted. As a result, community plots are not represented in Figure 3.1 or Figure 3.2.

As the vegetation trial is located on an elevated, well-drained upland plateau, black spruce and eastern white cedar's poorer performance could be related to their preference for lowland swampy areas with ample water supply and significant competition for resources from herbaceous ground cover plants. The poor performance of white spruce may be linked to its preference for sheltered environments and its sensitivity to frost damage during early growth stages (Ministry of Natural Resources and Forestry, 2023). Furthermore, the late planting of white spruce in the 2020 season may have provided insufficient protection and time for successful establishment. Significant mortality of eastern white cedar and jack pine suggest these species may not be strong candidates for use in large-scale reclamation across the site, while the use of white spruce and black spruce likely requires additional considerations such as earlier season planting and ground cover competition mitigation measures.

Aspen and birch are more tolerant of upland environments and a range of soil conditions than other tree species, such as white spruce, jack pine or eastern white cedar. The successful establishment of aspen, birch, dogwood, willow, pincherry, and high bush cranberry suggest these species are strong candidates for widespread use in large-scale reclamation across the site.

The prevalence of healthy red raspberry specimens signifies that this berry species could also be a strong candidate for use in large-scale reclamation across the site.

The density distribution of noxious weeds has increased in 2024 compared to 2023, suggesting that the noxious weeds are spreading year over year. Control and fertilized overburden plots have more bare ground than other treatments, and this appears to allow for the successful establishment of planted species, which limits noxious weed establishment. Conversely, for the thin and tilled topsoil plats, the rapid succession of ground cover – including noxious weeds – outcompetes planted species and results

in the persistence and spread of noxious weeds in successive years. If aggressive weed management is not undertaken early in the trials, then the establishment of noxious weeds over desired species occurs, and these undesirable species persist, spread, and continue to outcompete desired species.

4.1.1.1 Thin Topsoil

Findings from the 2024 monitoring of the vegetation trials at thin topsoil plots include:

- Black spruce and eastern white cedar had the lowest percentage of healthy and healthy/struggling specimens in thin topsoil across blocks.
- Birch, shrub mix (dogwood and willow species), and ground cover mix (pincherry and high bush cranberry) had the highest proportion of healthy or healthy/struggling specimens.
- White spruce, black spruce, and jack pine had the highest percentage of dead specimens in 2024.
- Minimal to no growth (both height and DBH) was seen across specimens in thin topsoil from 2023 to 2024.
- Thin topsoil had a slightly higher noxious weed density distribution than other soil treatments.
- Thin topsoil had a high percentage (approximately 97%) of vegetative ground cover.

The incorporation of topsoil into the trial plots has resulted in the rapid establishment of herbaceous plants, particularly noxious and problematic weeds. Late-seral stage species, such as spruce and pine, struggle to compete for resources under these conditions. In contrast, early- and mid-seral stage shrubs have shown greater adaptability to competition and are thriving.

4.1.1.2 Tilled Topsoil

Findings from the 2024 monitoring of the vegetation trials at tilled topsoil plots include:

- Aspen and birch had the highest proportion of healthy and healthy/struggling specimens.
- White and black spruce had the highest proportion of dead specimens.
- Eastern white cedar had no healthy or healthy/struggling specimens.
- No to minimal growth was observed for all species from 2023 to 2024.
- Tilled topsoil had a comparable density distribution of noxious weeds to other soil treatments.
- Tilled topsoil had a high percentage (99%) of vegetative ground cover.

The incorporation of topsoil into the trial plots has resulted in the rapid establishment of herbaceous plants, particularly noxious and problematic weeds. Late-seral stage species, such as spruce and pine, struggle to compete for resources under these conditions. In contrast, early- and mid-seral stage shrubs have shown greater adaptability to competition and are thriving.

4.1.1.3 Fertilized Overburden

Overall, the 2024 monitoring results include:

- Aspen, birch, and the shrub mix (dogwood and willow) had the highest proportion of healthy and healthy/struggling specimens with very few dead specimens.
- White spruce had the highest proportion of dead specimens.
- Black spruce had higher rates of healthy specimens in fertilized and control plots compared to thin or tilled topsoil plots.
- Eastern white cedar had a low proportion of healthy or healthy/struggling specimens.
- No to minimal growth was observed for all species from 2023 to 2024.
- Tilled topsoil had a comparable average percentage of noxious weed density distribution compared to other soil treatments.
- Tilled topsoil had the lowest average vegetative ground cover of all soil treatments at 88%.

Since 2020, herbaceous ground cover has established more slowly in overburden plots compared to those with topsoil. This reduced competition has supported the successful establishment of late-seral stage planted trees, such as black spruce and birch, as well as the strong growth of shrubs. Fertilizing overburden helps establish planted species, with trees and shrubs showing better health compared to control plots.

4.1.2 Sloped Areas

Birdsfoot trefoil and sweet clover was the most dominant species across slopes, followed by Canada Wild Rye. Birdsfoot trefoil and sweet clover, although not considered noxious weeds, are not native to the area and were not part of the reclamation seed mix. This would indicate that the sloped and disturbed areas are highly prone to infestations of non-native and agronomic species, which are very effective at outcompeting more desirable seeded species. Canada Wild Rye was part of the reclamation seed mix and its relative dominance on the south slope suggests it is a highly suitable species to continue including in the reclamation seed mix.

The most significant proportion of native species occurred on the north followed by the west and east slopes, and the lowest on the south slope. The north slope is adjacent to naturalized areas, whereas the south is adjacent to mine roads. The higher prevalence of native species on the north slopes highlights the potential ability of native volunteer plant communities to encroach onto reclaimed and disturbed areas. Conversely, areas adjacent to disturbances, such as mine roads, may experience increased pressure from non-native and invasive species spread from the disturbed area, which can outcompete native vegetation. These disturbances often create conditions unfavourable for native plants, such as altered soil composition, increased human activity, and the introduction of invasive propagules. As a result, the south slope illustrates how proximity to human-induced disturbances can limit the recovery and establishment of native plant communities, emphasizing the importance of managing and mitigating such disturbances in reclamation efforts.

4.2 Effects of Vegetation on Erosion

Vegetation ground coverage across all sloped areas increased from 75– 100% in 2023 to 100% in 2024. No erosion was observed in 2024, and previous areas with sheet and rill erosion were covered in vegetation and showed no signs of further erosion. The stabilization of erosional features correlates directly with the establishment of dense herbaceous ground cover. Hydroseeding, especially during the growing season, helps establish dense herbaceous cover on steep slopes to prevent erosion. Using ruderal agronomic species in hydroseeding promotes quick vegetative growth that controls erosion. Short-lived ruderal species should be considered to support the establishment of long-term native plants. Reseeding with native species after hydroseeding can further encourage native growth and reduce the risk of noxious weeds once erosion control is achieved.

Results from the immediate and short-term indicate that herbaceous ground cover is highly effective at reducing and eliminating effects due to erosion, especially when established immediately after landform construction.

4.3 Effects of Roots on Compacted Clay Layer

The rooting depth was limited to the 1.0 m thick growth media layer above the compacted clay layer. There was no indication of root penetration into the underlying compacted clay layer, with all root development confined to the overlying growth media. Over the years, root depth and spread have remained consistent and have not trended toward a depth that would interact with the compact clay layer. As roots have not yet reached the base of the growth media layer, their potential interaction with the compacted clay layer remains uncertain and will continue to be evaluated.

4.4 Availability of Plant Nutrients in the Overburden

The results highlight the potential influence of soil treatment types on vegetation health and growth. Background soil, characterized by higher nitrogen, phosphorus, total organic carbon, and clay texture, provides a baseline against which soil treatments can be compared.

The control and fertilized overburden plots demonstrated better support for vegetation health, with a greater proportion of healthy specimens and improved growth than other soil treatments. This suggests that nutrient availability is not a limiting factor influencing the healthy establishment of planted specimens. Alternatively, the higher rates of healthy specimens in control and fertilized overburden plots are likely due to faster ground cover establishment, including herbaceous species and noxious weeds, which outcompete the planted species before they can establish

The variability in soil texture between the background and trial plots also warrants consideration, as the finer clay texture of the background soil may retain more nutrients and moisture compared to the sandy clay loam or clay loam textures found in the trial plots.

Future work should continue to focus on competition by herbaceous plants and changes in nutrient availability and organic carbon over time to assess the long-term sustainability of these soil treatments for vegetation growth. Additional studies should also explore how soil texture and nutrient dynamics interact to influence plant health and productivity across different treatments.

4.5 Toxicity Effects of Overburden Constituents on Vegetation

While the soil sampling and analysis confirmed that boron concentrations exceeded CCME soil guidelines, it should be noted that elevated concentrations were also observed in the background samples. The background concentrations would suggest that boron may be naturally elevated in the area.

As there are no established guidelines for metals in vegetation tissue, results will be used to establish a baseline for future monitoring. This baseline data is critical for assessing potential changes in metal concentrations over time and understanding the long-term effects of overburden constituents on vegetation health. Although concentrations have been compared to soil quality guidelines, this is for discussion purposes only. Concentrations in vegetation tissue in exceedance of the soil quality guidelines are not indicative of toxicity levels. Elevated boron concentrations in vegetation tissue may be correlated with elevated concentrations in soil, however no discernable correlations between soil and vegetation tissue concentration have been observed with respect to cadmium, molybdenum, or zinc.

Salinity, although naturally occurring, can be toxic to vegetation at elevated levels and can inhibit naturally occurring soil-forming processes. However, the low EC and SAR values reported across all soil treatment plots indicate that salinity is unlikely to pose a risk to plants and soil in the short term. Continued monitoring of salinity parameters will be essential to ensure their long-term suitability as growth media.

Future assessments should prioritize the collection and analysis of soil and vegetative tissue samples in subsequent years to monitor potential toxicity effects and better understand the interactions between underlying mine rock, soil treatment constituents, and surface vegetation.

4.6 Effect of Density from Vehicle Traffic on Plant Establishment and Survival

Lower vegetative coverage on trafficked slopes compared to the other sloped areas in 2020, before additional hydroseeding, suggests that vegetative coverage is slower to establish on trafficked sloped areas.

By 2023, the vegetative ground coverage on the trafficked-sloped areas increased to 100%, comparable to all other sloped areas. It is likely that the hydroseeding of all slopes in 2020, including on trafficked slopes, played a significant role in increasing the vegetative ground coverage.

In 2020, some graminoids and weeds were present, like other sloped areas, but it is unclear what species composition was present in the trafficked-sloped area compared to the other sloped areas. In 2024, the trafficked-sloped area had a comparable prevalence and composition of noxious weeds to other slopes. The composition of vegetative ground coverage, before and after hydroseeding, on trafficked-sloped areas has been comparable to the other sloped areas.

In 2020, both the north and south trafficked slopes had undergone less immediate-term erosion compared to the surrounding sloped surfaces. However, over the short to medium term, erosion across all sloped surfaces has developed comparably. By 2024, north and south trafficked sloped areas had no signs of active erosion, like surrounding sloped surfaces.

Rapid establishment of plants appears to be the primary driver in preventing erosion on sloped surfaces. Therefore, ensuring that growth media is decompacted during placement is highly beneficial, and subsequent compaction activities like vehicle traffic should be eliminated.

5 SUMMARY OF RECOMMENDATIONS

1) Continue monitoring vegetation through field surveys to identify the most successful herbaceous plants on the slopes and plateau plots for application in large-scale reclamation.

2) Design and implement a noxious weed management strategy as per applicable management plans.

3) Monitor the transplanted plots to assess how transplanted saplings withstand competition from the herbaceous ground cover.

4) Due to limited tree supply on the destructive plot, tree root investigation monitoring frequency should be decreased from annually to once every three years, shrubs and aspen should be assessed during each periodic root investigation.

5) Continue the soil sampling program within the plots to assess any changes in soil nutrient concentrations and the effects of vegetation growth on soil properties.

6) Continue the soil and vegetative tissue sampling program to assess ecotoxicity effects and bioaccumulation of metals in vegetation materials. This sampling program will help better understand if any migration or leaching of toxic compounds from the overburden and/or underlying waste rock is occurring.

7) Apply early findings of the vegetation trial to the progressive reclamation area in accordance with the reclamation and closure plan.

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7 CLOSURE

We trust information provided is satisfactory for your requirements. Please do not hesitate to contact the undersigned at 825-945-3691 for further information or questions.

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Appendix A

Analytical Lab Tables

Appendix B

Laboratory Data Reports

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