



112 - 112 Research Drive  
Saskatoon, SK S7N 3R3  
Canada

T: (306) 955 0702 F: (306) 955 1596

[www.okc-sk.com](http://www.okc-sk.com)

# Memorandum

---

**To:** Garnet Cornell – Environment Supervisor, New Gold Inc.

**From:** Janna Lutz, Intermediate Scientist

**Cc:** Lindsay Tallon – Okane Consultants

**Our ref:** 1003-018-009

**Date:** January 25, 2021

**Re:** **Rainy River Mine - 2020 Vegetation Trial Monitoring Summary Rev1**

---

New Gold Inc. (New Gold) has established a vegetation trial at the Rainy River Mine (RRM) to investigate the performance of locally significant species with operationally feasible cover system configurations. It is anticipated that learnings from the trial will serve to inform the closure plan, and that 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. Construction at the trial was finished in September 2019, and many of the experimental tree plots were planted in late October 2019. The purpose of this memorandum is to summarize monitoring activities completed by Okane Consultants (Okane) in 2020 and to document baseline conditions observed.

## Background

The vegetation trial is designed as a randomized block study on a plateau. Combinations of four soil treatments and nine vegetation treatments are arranged in three replicates. A destructive plot area is designated for destructive root sampling and investigation as the trial progresses. Slopes surrounding the block study have been seeded with various methods and

are used to qualitatively evaluate operational seeding techniques, vegetation establishment and erosion. Planned arrangement of the trial area is presented for reference in Figure 1-3.



Figure 1: Arrangement of soil treatments in experimental tree plots

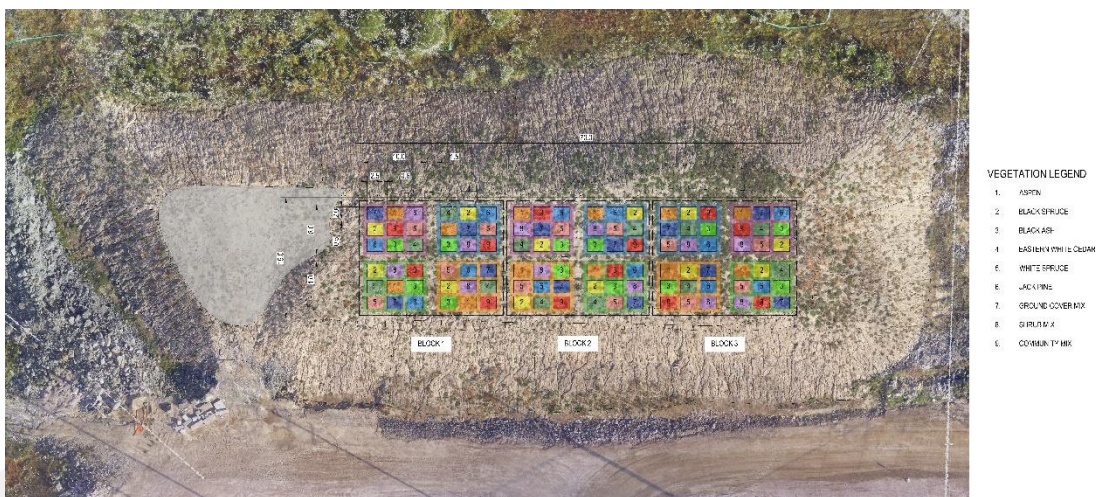
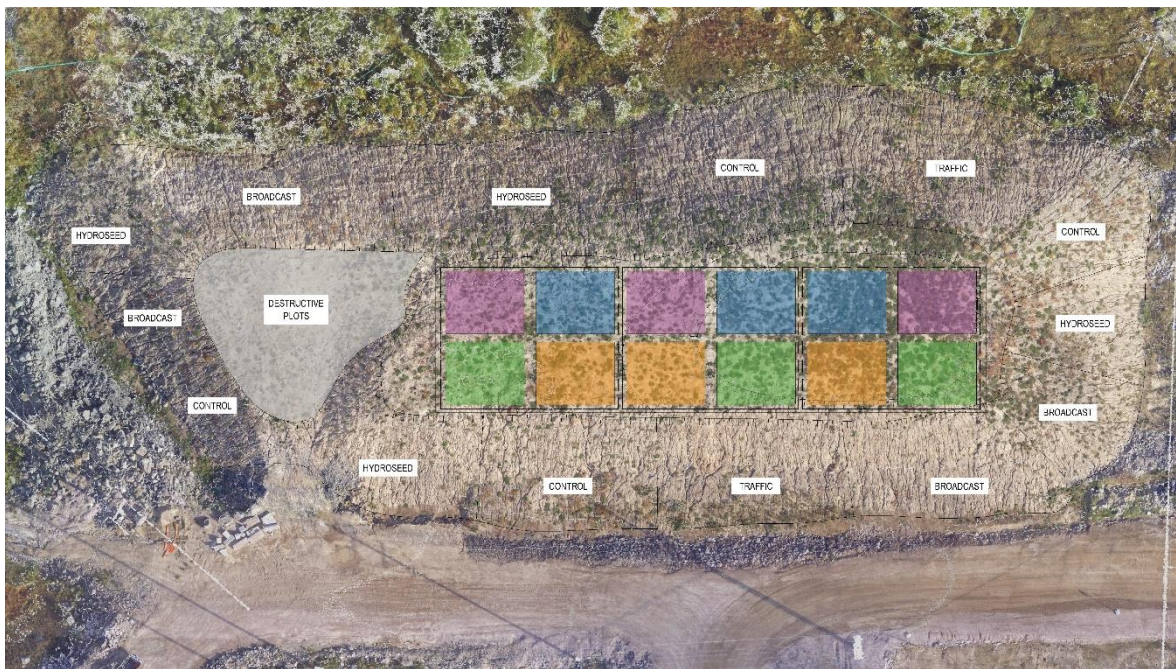


Figure 2: Arrangement of vegetation treatments in experimental tree plots





**Figure 3: Arrangement of slope treatments**

The general cover system configuration planned for use on the Rainy River site 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<sub>2</sub>) ingress to the mine rock. The enhanced 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<sub>2</sub> ingress by effectively eliminating advective gas transport.

The vegetation trial was constructed in 2019 using the same cover system design, with clay overburden used for both the barrier and growth medium layers. Four soil treatments 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) Black ash;
- 4) Eastern white cedar;
- 5) White spruce;
- 6) Jack pine;
- 7) Ground Cover Mix – may include species typical for the ecosystem, such as bearberry, blueberry, ground cedar, or Labrador tea;
- 8) Shrub Mix – includes available species typical of the ecosystem, such as high bush cranberry, Saskatoon berry, beaked hazelnut, alder or red osier dogwood;
- 9) Community Mix – culturally significant species selected by local communities, not necessarily found in local area.

Experimental tree plot planting on the plateau commenced in late October 2019 but was not completed that year. Plot planting was delayed in 2020 due to Covid19 access restrictions and other delays with the third-party contractor. Planting was completed in November 2020, after Okane's last visit to the vegetation trial site in late September 2020. Of note, Tobacco and Juniper species were not planted and are planned to be excluded from the trial; as there is limited commercial availability of these species, it would not be feasible to include them in large-scale reclamation operations.

The slope areas surrounding the trial were hydroseeded in late September 2019 and included a test of commercially available ProGanics Biotic Soil Media from Profile Products. Other sections of the landform slopes were broadcast seeded, track packed, or left unseeded as a control. In September 2020, all slopes were treated with ProGanics Biotic Soil Media to prevent 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.

## Monitoring Activities

Okane personnel visited the vegetation trial in spring 2020 to perform an establishment survey and inventory vegetation that had been planted, and again in late summer / early fall to record baseline growth indicator measurements.

## Establishment Survey

The purpose of the establishment survey was to perform an initial quality check on the planted vegetation, make general observations regarding health and establishment of the trial plots and measure erosion. Haley Cunningham and Jill Dand visited the site and recorded observations on June 29, 2020.

### Slopes

In general, significant erosion was observed on the sloped areas of the trial. Measured erosional features are included in Table 1. Vegetation ground coverage ranged from <5% to 80% over select sections of slopes; general observations are included in Table 2.

**Table 1: Major erosion features on slope treatments (S-sheet, R-rill, G-gully)**

Slope Orientation	Hydroseed	Broadcast	Traffic	Control
North	<b>S, R, G</b> ~150 x 40 major feature ~Up to 60 x 30-40 at toe	<b>S, R, G</b> Major features ~180 x 70 plateau ~100 x 110 at center slope	<b>S, R</b> Up to ~15 x 10, uniform erosion	<b>S, R, G</b> Up to ~50 x 30 (West) ~30 x 15-20 (East)
		<b>S, R, G</b> Up to ~60 x 40 uniform erosion		
East	<b>S, R</b> Up to ~10 x 5 uniform, shallow erosion	<b>S, R</b> Up to ~10 x 5 uniform erosion	n/a	<b>S</b> Minimal erosion through center, max ~5-10 x 5
South	<b>S, R, G</b> ~30 x 10-15 west side along extent of slope ~10-30 x 30 through center of slope	<b>S, R, G</b> ~20-50 x 25-30 through center of slope ~20 x 20-30 at toe of slope Relatively uniform erosion	<b>S, R</b> ~15 x 15-30 ~30 x 30 SE corner Deeper uniform erosion paths, waste rock exposure SW bottom corner	<b>S, R</b> ~10 x 5 for all erosion paths, uniform across slope
West	<b>S, R</b>	<b>S, R</b>	n/a	<b>S, R, G</b>

Slope Orientation	Hydroseed	Broadcast	Traffic	Control
	~15 x 7 toward toe of slope	~20 x 15 uniform erosion		~100 x 60 major feature, generally more erosion than

All erosion feature measurements expressed in cm, as width x depth

**Table 2: Estimated percent cover on slope treatments**

Slope Orientation	Hydroseed	Broadcast	Traffic	Control
North	<b>25%</b> Mostly short grass, uniform	<b>50%</b> Uniform distribution of tall grass and lush weeds <b>&lt;5%</b> Very sparse	<b>10%</b> Short grasses and weeds, sparse and uniform	<b>5%</b> Various grass spp., weeds, sparse and sporadic.
East	<b>10%</b> Various weeds and grass spp., sparse and sporadic	<b>10% / 50%</b> Various weeds and grass spp. towards plateau, denser thorned vegetation towards toe (up to 70cm tall)	n/a	<b>25%</b> Sparser towards plateau, denser in center of slope, short and tall grasses
South	<b>10%</b> Sparse, even coverage	<b>&lt;5%</b> Sparse and sporadic	<b>&lt;5%</b> Vegetation growing in erosion paths, otherwise sparse and sporadic	<b>10% / 80%</b> Lush grass spp. From toe to half way up the slope, sparse vegetation toward the plateau
West	<b>&lt;5%</b> Pocket of vegetation on west slope, otherwise sparse grass, weed spp.	<b>&lt;5%</b> Pocket of tall grasses, otherwise sparse	n/a	<b>&lt;5%</b> Very little vegetation present

## Plateau

Total plants per plot and a gauge of general health is provided in Table 3. White spruce and jack pine plots were not planted at the time of the field visit. It appears that in the Block 3 filled topsoil treatment, black spruce was planted in the sub-plot designated for white

spruce. The Community Mix plots were not planted, except for some grass species in select plots. Of note, the Ground Cover Mix plots appear to have been planted with a tree species, and two shrub species, not typical of ground cover. When planting is finished in 2021, all species will be quality checked with planting records and plot plan figures updated accordingly.

Generally, planted vegetation appeared to be in good health, with the notable exception of eastern white cedar, of which all trees observed were in poor condition. Additionally, although still appearing in good health at the time of the field visit, some trees were leaning severely and partially uprooted (see Figure 4).

**Table 3: General health of planted trees and shrubs (H-healthy, S-struggling, D-dead)**

Vegetation Treatment	Soil Treatment	Block 1	Block 2	Block 3	Comment
Aspen	Thin Topsoil	10 H	10 H	11 H	
Aspen	Tilled Topsoil	10 H	10 H	10 H	
Aspen	Fertilized Overburden	10 H	10 H	10 H, 1 S	1 S appears to have shifted after planting due to heavy rain
Aspen	Control	10 H	10 H	10 H	
Black Spruce	Thin Topsoil	10 H	10 H	-	Block 3 planted in white spruce sub-plot
Black Spruce	Tilled Topsoil	6 H, 4 S	10 H	10 H	1 tree coming out of soil
Black Spruce	Fertilized Overburden	10 H	10 H	10 H	
Black Spruce	Control	10 H	10 H	10 H	
Black ash	Thin Topsoil	10 H	10 H	10 H	
Black ash	Tilled Topsoil	10 H	10 H	10 H	
Black ash	Fertilized Overburden	10 H	10 H	10 H	
Black ash	Control	10 H	10 H	10 H	
Eastern white cedar	Thin Topsoil	10 S	10 S	11 S	
Eastern white cedar	Tilled Topsoil	10 S	10 S	10 S	
Eastern white cedar	Fertilized Overburden	10 S	10 S	11 S	



Vegetation Treatment	Soil Treatment	Block 1	Block 2	Block 3	Comment
Eastern white cedar	Control	10 S	10 S	11 S	
White spruce	Thin Topsoil	-	-	10 H	Black spruce
White spruce	Tilled Topsoil	-	-	-	
White spruce	Fertilized Overburden	-	-	-	
White spruce	Control	-	-	-	
Jack pine	Thin Topsoil	-	-	-	
Jack pine	Tilled Topsoil	-	-	-	
Jack pine	Fertilized Overburden	-	-	-	
Jack pine	Control	-	-	-	
Ground Cover Mix	Thin Topsoil	6 H	4 H, 2 S	6 H	1 tree species 2 shrub species
Ground Cover Mix	Tilled Topsoil	6 H	6 H	6 H	1 tree species 2 shrub species
Ground Cover Mix	Fertilized Overburden	6 H	5 H	6 H	1 tree species 2 shrub species
Ground Cover Mix	Control	6 H	6 H	6 H	1 tree species 2 shrub species
Shrub Mix	Thin Topsoil	4 H	4 H	4 H	2 shrub species
Shrub Mix	Tilled Topsoil	4 H	4 H	4 H	2 shrub species
Shrub Mix	Fertilized Overburden	4 H	4 H	4 H	2 shrub species
Shrub Mix	Control	4 H	4 H	4 H	2 shrub species
Community Mix	Thin Topsoil	-	-	3 H	Grass
Community Mix	Tilled Topsoil	-	3 H	3 H	Grass
Community Mix	Fertilized Overburden	2 H	-	3 H	Grass
Community Mix	Control	3 H	-	3 H	Grass





**Figure 4: Uprooted tree in Block 1 - Tilled Topsoil - Ground Cover Mix plot**

### Destructive Plot

Minimal erosion was observed on the destructive plot, and trees and shrubs were planted evenly throughout. Some light ground cover was beginning to establish but was only estimated to be approximately 10%. A tree count and health gauge for the destructive plot is provided in Table 4. When planting is finished in 2021, all species will be quality checked with planting records.

**Table 4: General health of trees and shrubs planted in the Destructive Plot (H-healthy, S-struggling, D-dead)**

Species	Destructive Plot
Aspen	10 H, 2 S
Black spruce	7 H, 7S*
Black ash	22 H
Eastern white cedar	11 S

Species	Destructive Plot
White spruce	-
Jack pine	11 S
Shrub (1)	8 H
Shrub (2)	20 H

\*Total black spruce noted as 14, health gauge for 7 unavailable

## Baseline Condition Measurements

The purpose of the late summer / early fall site visit was to collect a comprehensive set of baseline condition measurements that can be used to quantify vegetation growth in the experimental tree plots at regular annual intervals. General observations were also noted along the slopes and at the Destructive Plot. Site visits were combined with other work on site for optimization; as such, measurements were completed over several weeks. Haley Cunningham and Hal Cooper collected measurements from Blocks 1 and 2 on August 26-27, 2020. Lyndsey Thorson and Matt McKeown collected measurements from Block 3 on September 7, 2020, and Haley Cunningham finished collecting measurements at Block 3 on September 20-22, 2020.

### Slopes

In general, similar erosion was observed on the sloped areas of the trial during the spring and autumn surveys. Measured erosional features are included in Table 1. Vegetation ground coverage generally increased, ranging from 25% to 75% over the slopes; observations are included in Table 6. Of note, all of the slopes were treated with ProGanics Biotic Soil Media in September 2020 to minimize further erosion.

**Table 5: Major erosion features on slope treatments (S-sheet, R-rill, G-gully)**

Slope Orientation	Hydroseed	Broadcast	Traffic	Control
	<b>R, G</b>	<b>R, G</b>	<b>R</b>	<b>R, G</b>
North	~5-20 x 5-35 75% coverage	~5-15 x 5-15 50% coverage, mid-full length of slope	~2-10 x 2-10 50% coverage, full length of slope	~5-10 x 2-30 50% slope coverage, full slope length
	<b>R</b>	<b>R</b>		<b>R</b>
East	~2-10 x 3-10 <50% coverage, mid-full length of slope	~2-10 x 3-10 50% slope coverage, mid- full length of slope	n/a	~2-10 x 2-5 50% coverage, mid-full slope length
South	<b>R, G</b>	<b>R, G</b>	<b>R, G</b>	<b>R</b>

Slope Orientation	Hydroseed	Broadcast	Traffic	Control
	~10-35 x 10-30 full and half slope length gullies	~5-15 x 5-30 75% slope face, full length	~5-15 x 2-20 75% of face, 75- 100% slope length	~10-20 x 3-15 Minimal erosion, some rills mid- slope length
West	<b>R, G</b> ~10-30 x 5-35 50% coverage, full slope length	<b>R, G</b> ~10-25 x 10-35 50% coverage, heavier on mid- bottom slope, mid-full slope length	n/a	<b>R, G</b> High erosion

All erosion feature measurements expressed in cm, as width x depth

**Table 6: Estimated percent cover on slope treatments**

Slope Orientation	Hydroseed	Broadcast	Traffic	Control
North	<b>25%</b> Scattered short grasses	<b>75%</b> 10-30 cm grasses	<b>50%</b> Short grasses, some weeds and flowers	<b>25%</b> Scattered weeds, flowers, few grasses
East	<b>25%</b> Very patchy, short vegetation, with some 10- 30cm tall, grasses and weeds, few flowers	<b>50%</b> Patchy thistles, few grasses, weeds and flowers	n/a	<b>50%</b> Denser vegetation on upper slope, lower slope scattered, 10-30 cm tall, grasses and weeds, few flowers
South	<b>25%</b> 6m width of concentrated vegetation, otherwise scattered grass, weeds, flowers	<b>0-25%</b> Little vegetation, some weeds	<b>25%</b> Little grass, primarily weeds, scattered	<b>75%</b> Grasses, weeds, flowers 30-40 cm tall
West	<b>25%</b> Scattered weeds and grasses	<b>25%</b> Scattered vegetation, some concentration in upper corner, few grasses, flowers, weeds	n/a	<b>25%</b> Some scattered grasses and weeds, higher concentration on north edge

## Plateau

A general health check was performed during the baseline survey. Vegetation was rated on a qualitative 5-point scale to gauge if the tree/ 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 the majority 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.

Table 7 provides a summary of gauged health observed during the experimental tree plot survey. Generally, some vegetation loss and health decline was observed between Spring and Autumn 2020. However, a notable improvement was seen in some eastern white cedar plots.

**Table 7: General health of planted trees and shrubs (H-healthy, S-struggling, D-dead)**

Vegetation Treatment	Soil Treatment	Block 1	Block 2	Block 3	Comment
Aspen	Thin Topsoil	9 H, 1 D	6 H, 1 H/S, 3 S/D	10 H, 1 D	
Aspen	Tilled Topsoil	10 H	9 H, 1 S/D	9 H, 1 S	
Aspen	Fertilized Overburden	9 H, 1 D	10 H	10 H, 1 D	
Aspen	Control	9 H, 1 D	10 H	10 H	
Black Spruce	Thin Topsoil	10 H	10 H	10 H*	*Planted in white spruce design plot
Black Spruce	Tilled Topsoil	9 H, 1 D	3 H, 6 S, 1 D	10 H	
Black Spruce	Fertilized Overburden	10 H	10 H	9 H, 1 H/S	
Black Spruce	Control	10 H	10 H	10 H	
Black ash	Thin Topsoil	10 H	9 H, 1 H/S	9 H, 1 D	
Black ash	Tilled Topsoil	10 H	9 H, 1 D	10 H	



Vegetation Treatment	Soil Treatment	Block 1	Block 2	Block 3	Comment
Black ash	Fertilized Overburden	10 H	10 H	10 H	
Black ash	Control	10 H	10 H	9 H, 1 H/S	
Eastern white cedar	Thin Topsoil	10 S	10 H	11 H/S	
Eastern white cedar	Tilled Topsoil	10 S	10 H	10 S/D	
Eastern white cedar	Fertilized Overburden	10 H	10 H	11 H/S	
Eastern white cedar	Control	10 H/S	10 H	11 H/S	
White spruce	Thin Topsoil	-	-	-	Black spruce planted in Block 3 plot
White spruce	Tilled Topsoil	-	-	-	
White spruce	Fertilized Overburden	-	-	-	
White spruce	Control	-	-	-	
Jack pine	Thin Topsoil	-	-	-	
Jack pine	Tilled Topsoil	-	-	-	
Jack pine	Fertilized Overburden	-	-	-	
Jack pine	Control	-	-	-	
Ground Cover Mix	Thin Topsoil	6 H	6 H	6 H	
Ground Cover Mix	Tilled Topsoil	4 S, 1 S/D, 1 D	5 H, 1 D	6 H/S	
Ground Cover Mix	Fertilized Overburden	6 H	4 H, 1 H/S	6 H	
Ground Cover Mix	Control	4 H, 2 S	5 H, 1 H/S	6 H	
Shrub Mix	Thin Topsoil	4 H	4 H	4 H	
Shrub Mix	Tilled Topsoil	4 H	4 H	4 H	
Shrub Mix	Fertilized Overburden	4 H	4 H	4 H	
Shrub Mix	Control	4 H	4 H	4 H	
Community Mix	Thin Topsoil	-	-	3 H	

Vegetation Treatment	Soil Treatment	Block 1	Block 2	Block 3	Comment
Community Mix	Tilled Topsoil	-			Block 2 or 3 health not noted
Community Mix	Fertilized Overburden	2 H	-		Block 3 health not noted
Community Mix	Control	3 H		3 H	

Several growth indicator measurements were recorded during the autumn survey to provide a comprehensive record of baseline conditions:

- Root Collar – the diameter of the tree base at the widest part of the root collar (where the root joins the stem), or just above the ground surface, whichever is higher;
- Total 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;
- Diameter at Breast Height (DBH) – the diameter of the tree at 1.3 m above the base; and
- Crown Diameter – the average horizontal width of the crown.

A summary of growth indicator measurements by plot are provided in Appendix A. Average indicator measurements by species are included in Table 8.

**Table 8: Mean tree growth indicator measurements +/- standard deviation**

Tree Species	Root Collar (mm)	Height (cm)	DBH (mm)	Crown Diameter (cm)
Aspen	21.5 +/- 2.0	258.6 +/- 26	14 +/- 1.6	24.6 +/- 10.2
Black spruce	22.5 +/- 3.1	99.5 +/- 17.8	n/a	26.7 +/- 7.5
Black ash	21.6 +/- 2.4	219.6 +/- 30.4	10.8 +/- 2.2	29.9 +/- 9
Eastern white cedar	22 +/- 4.7	99.4 +/- 10.8	n/a	16.3 +/- 6.1
White spruce			Not planted	
Jack pine			Not planted	

Measurements expressed as mean +/- SD

Ground cover was estimated at each plot during both the spring and autumn surveys. During the spring survey, cover was estimated at less than 10% for all plots. During the

autumn survey, ground cover increased in all plots, and most notably in plots including topsoil (Table 9). Figures 5-8 compare plots from each soil treatment group as observed during the spring and autumn 2020 surveys.

**Table 9: Average ground coverage observed in Autumn 2020**

Soil Treatment	Block 1	Block 2	Block 3	Average
Thin Topsoil	67	75	75	72
Tilled Topsoil	75	75	64	71
Fertilized Overburden	17	17	25	19
Control	19	17	22	19



**Figure 5: Block 2 – Thin Topsoil – Eastern white cedar plot as observed on June 29, 2020 (left), and August 28, 2020 (right)**





**Figure 6: Block 1 – Tilled Topsoil – Black Spruce plot as observed on June 29, 2020 (left) and August 26, 2020 (right)**



**Figure 7: Block 2 – Fertilized Overburden – Black ash plot as observed on June 29, 2020 (left) and August 28, 2020 (right)**





**Figure 8: Block 3 – Control – Aspen plot as observed on June 29, 2020 (left) and September 20, 2020 (right)**

One sample was taken from each soil treatment in all three blocks and sent to Stratford Agri Labs for analysis. Levels of percent organic matter, potassium, and calcium were higher on average in treatments that included topsoil. Results are summarized in Table 10.

**Table 10: Baseline soil analysis results**

Analyte	Treatment	Block 1	Block 2	Block 3	Average
pH	Thin Topsoil	7.8	7.8	7.6	7.7
	Tilled Topsoil	7.7	7.7	7.8	7.7
	Fertilized Overburden	8.1	7.9	7.7	7.9
	Control	8.1	8	7.9	8.0
Organic Matter %	Thin Topsoil	5.7	6.6	6.7	6.3
	Tilled Topsoil	6.5	6.2	2.2	5.0
	Fertilized Overburden	0.6	0.4	1.2	0.7
	Control	0.6	0.6	0.8	0.7
Phosphorus (ppm)	Thin Topsoil	8	8	9	8
	Tilled Topsoil	8	8	7	8
	Fertilized Overburden	8	20	9	12
	Control	9	8	8	8
Potassium (ppm)	Thin Topsoil	212	189	214	205
	Tilled Topsoil	208	215	133	185
	Fertilized Overburden	116	73	177	122

Analyte	Treatment	Block 1	Block 2	Block 3	Average
	Control	127	99	78	101
Calcium	Thin Topsoil	933	963	1068	988
	Tilled Topsoil	978	979	658	872
	Fertilized Overburden	479	323	753	518
	Control	479	436	499	471

## Destructive Plot

Minimal erosion was observed in the destructive plot, with the exception of some down-slope erosion on the north edge of the plot. Vegetation was generally noted to have established well. Only general observations of poor health were noted during the autumn visit; Table 11 includes a summary of general health, extrapolating the number of healthy trees from the totals recorded in June. Estimated percent ground cover increased from 10% in the spring to 75% during the autumn survey.

**Table 11: General health of trees and shrubs planted in the Destructive Plot (H-healthy, S-struggling, D-dead)**

Species	Destructive Plot
Aspen	8 H, <b>4 S</b>
Black spruce	14 H
Black ash	21 H, <b>1 S</b>
Eastern white cedar	<b>11 S</b>
White spruce	-
Jack pine	10 H, <b>1 S</b>
Shrub (1)	8 H
Shrub (2)	20 H

Only struggling or dead trees were noted in the autumn survey (**bolded**), all other specimens were labelled as healthy.

## Closure

We trust information provided in this memorandum is satisfactory for your requirements. Please do not hesitate to contact me at (780) 881-3772 or jlut@okc-sk.com should you have any questions or comments.

## **Appendix A**

### **Plot Growth Indicator Measurements & General Health**





Block 1	Fertilized Overburden	Jack pine	8/26/2020	-	-	-	-	-	-	-	-	-	-	0%	
Block 1	Fertilized Overburden	Ground Cover Mix	8/26/2020	27.5 +/- 3.2	250 +/- 14.1	13.1 +/- 1.2	27.5 +/- 3.2	2	-	-	-	-	2	25%	Trees
				8.6 +/- 4.1	114.3 +/- 21.5	n/a	8.6 +/- 4.1	4	-	-	-	4	Shrubs		
Block 1	Fertilized Overburden	Shrub Mix	8/26/2020	17.3 +/- 7.6	102.5 +/- 26.3	n/a	17.3 +/- 7.6	4	-	-	-	-	4	25%	
Block 1	Fertilized Overburden	Community Mix	8/26/2020	-	-	-	-	2	-	-	-	-	2	0%	
Block 1	Control	Aspen	8/27/2020	22.2 +/- 1.3	260.6 +/- 15.5	14.2 +/- 0.8	21.6 +/- 4.9	9	-	-	-	1	10	25%	
Block 1	Control	Black spruce	8/27/2020	24.3 +/- 2.4	102.9 +/- 11.5	n/a	30.5 +/- 5	10	-	-	-	-	10	25%	
Block 1	Control	Black ash	8/27/2020	22.6 +/- 2.2	235 +/- 13.5	12.1 +/- 1.3	29.6 +/- 5.4	10	-	-	-	-	10	25%	
Block 1	Control	Eastern white cedar	8/27/2020	24.2 +/- 4.5	100.5 +/- 9.1	n/a	12 +/- 4	-	10	-	-	-	10	25%	
Block 1	Control	White spruce	8/27/2020	-	-	-	-	-	-	-	-	-	-	0%	
Block 1	Control	Jack pine	8/27/2020	-	-	-	-	-	-	-	-	-	-	0%	
Block 1	Control	Ground Cover Mix	8/27/2020	29.7 +/- 1.9	275 +/- 0	17.9 +/- 1.2	29.7 +/- 1.9	2	-	-	-	-	2	25%	Trees
				8.2 +/- 3.7	81.8 +/- 40.2	n/a	8.2 +/- 3.7	2	-	2	-	4	Shrubs		
Block 1	Control	Shrub Mix	8/27/2020	17.2 +/- 3.7	122.5 +/- 14.4	n/a	17.2 +/- 3.7	4	-	-	-	-	4	25%	
Block 1	Control	Community Mix	8/27/2020	-	-	-	-	3	-	-	-	-	3	25%	
Block 2	Thin Topsoil	Aspen	8/27/2020	20.8 +/- 1.7	261 +/- 32	13.8 +/- 1.4	21.9 +/- 7.1	6	1	-	3	-	10	75%	
Block 2	Thin Topsoil	Black spruce	8/27/2020	20.9 +/- 3.3	105.1 +/- 22.5	n/a	32 +/- 6.7	10	-	-	-	-	10	75%	
Block 2	Thin Topsoil	Black ash	8/27/2020	19.6 +/- 2.1	191.2 +/- 32	10.7 +/- 1.9	33.8 +/- 8.6	9	1	-	-	-	10	75%	
Block 2	Thin Topsoil	Eastern white cedar	8/27/2020	11.8 +/- 2.9	94.6 +/- 13.1	n/a	23 +/- 7.5	10	-	-	-	-	10	75%	
Block 2	Thin Topsoil	White spruce	8/27/2020	-	-	-	-	-	-	-	-	-	-	75%	
Block 2	Thin Topsoil	Jack pine	8/27/2020	-	-	-	-	-	-	-	-	-	-	75%	
Block 2	Thin Topsoil	Ground Cover Mix	8/27/2020	26.7 +/- 1.7	240 +/- 7.1	12.7 +/- 2.5	26.7 +/- 1.7	2	-	-	-	-	2	75%	Trees
				11 +/- 3.5	100.3 +/- 12.3	n/a	11 +/- 3.5	4	-	-	-	4	Shrubs		
Block 2	Thin Topsoil	Shrub Mix	8/27/2020	14.5 +/- 3.3	95.8 +/- 21.6	n/a	14.5 +/- 3.3	4	-	-	-	-	4	75%	
Block 2	Thin Topsoil	Community Mix	8/27/2020	-	-	-	-	-	-	-	-	-	-	75%	
Block 2	Tilled Topsoil	Aspen	8/27/2020	20.9 +/- 2.1	257.3 +/- 25.1	14.3 +/- 1.4	23.7 +/- 5.9	9	-	-	1	-	10	75%	
Block 2	Tilled Topsoil	Black spruce	8/27/2020	21.9 +/- 2	102.8 +/- 12.1	n/a	21.1 +/- 4.9	3	-	6	-	1	10	75%	
Block 2	Tilled Topsoil	Black ash	8/27/2020	20.8 +/- 1.2	216.2 +/- 28.7	11.2 +/- 1.1	34.5 +/- 9.4	9	-	-	-	1	10	75%	
Block 2	Tilled Topsoil	Eastern white cedar	8/27/2020	20.7 +/- 4.8	104.2 +/- 8.8	n/a	16.5 +/- 3.4	10	-	-	-	-	10	75%	
Block 2	Tilled Topsoil	White spruce	8/27/2020	-	-	-	-	-	-	-	-	-	-	75%	
Block 2	Tilled Topsoil	Jack pine	8/27/2020	-	-	-	-	-	-	-	-	-	-	75%	
Block 2	Tilled Topsoil	Ground Cover Mix	8/27/2020	17.8 +/- 8	175 +/- 58	9.7*	17.8 +/- 8	2	-	-	-	-	2	75%	Trees
				9.1 +/- 3.4	94.3 +/- 10	n/a	9.1 +/- 3.4	3	-	-	-	1	4		Shrubs

Block 2	Tilled Topsoil	Shrub Mix	8/27/2020	13.5 +/- 2.2	112.3 +/- 24.3	n/a	13.5 +/- 2.2	4	-	-	-	-	4	75%	
Block 2	Tilled Topsoil	Community Mix	8/27/2020	-	-	-	-	-	-	-	-	-	-	75%	
Block 2	Fertilized Overburden	Aspen	8/27/2020	20.9 +/- 1.5	258.3 +/- 15.8	14.5 +/- 0.7	24.2 +/- 7.7	10	-	-	-	-	10	25%	
Block 2	Fertilized Overburden	Black spruce	8/27/2020	22.6 +/- 2.6	105.1 +/- 13.3	n/a	21 +/- 5.7	10	-	-	-	-	10	25%	
Block 2	Fertilized Overburden	Black ash	8/27/2020	21.2 +/- 2.1	194.9 +/- 31.1	10.1 +/- 1.9	29 +/- 6.6	10	-	-	-	-	10	25%	
Block 2	Fertilized Overburden	Eastern white cedar	8/27/2020	20.6 +/- 2.6	99.5 +/- 10.5	n/a	15 +/- 4.1	10	-	-	-	-	10	25%	
Block 2	Fertilized Overburden	White spruce	8/27/2020	-	-	-	-	-	-	-	-	-	-	0%	
Block 2	Fertilized Overburden	Jack pine	8/27/2020	-	-	-	-	-	-	-	-	-	-	0%	
Block 2	Fertilized Overburden	Ground Cover Mix	8/27/2020	25.5 +/- 0.4	229.5 +/- 17.7	15.5 +/- 1	25.5 +/- 0.4	2	-	-	-	-	2	25%	Trees
				12.2 +/- 5.6	86 +/- 33.8	n/a	12.2 +/- 5.6	2	1	-	-	-	3		Shrubs
Block 2	Fertilized Overburden	Shrub Mix	8/27/2020	15.5 +/- 3.1	99.8 +/- 6.1	n/a	15.5 +/- 3.1	4	-	-	-	-	4	25%	
Block 2	Fertilized Overburden	Community Mix	8/27/2020	-	-	-	-	-	-	-	-	-	-	0%	
Block 2	Control	Aspen	8/27/2020	21.1 +/- 1.1	278.5 +/- 8.5	14.4 +/- 0.9	36.7 +/- 9.2	10	-	-	-	-	10	25%	
Block 2	Control	Black spruce	8/27/2020	20.3 +/- 2.5	99.1 +/- 13.9	n/a	26.5 +/- 5.8	10	-	-	-	-	10	25%	
Block 2	Control	Black ash	8/27/2020	21.8 +/- 2.5	208 +/- 42.4	11 +/- 1.7	29 +/- 7.1	10	-	-	-	-	10	25%	
Block 2	Control	Eastern white cedar	8/27/2020	21.6 +/- 3.1	100 +/- 11.5	n/a	19.5 +/- 9	10	-	-	-	-	10	25%	
Block 2	Control	White spruce	8/27/2020	-	-	-	-	-	-	-	-	-	-	0%	
Block 2	Control	Jack pine	8/27/2020	-	-	-	-	-	-	-	-	-	-	0%	
Block 2	Control	Ground Cover Mix	8/27/2020	25.3 +/- 0.8	228.5 +/- 43.1	12 +/- 3.8	25.3 +/- 0.8	2	-	-	-	-	2	25%	Tree
				15.2 +/- 9.7	127.8 +/- 16.5	n/a	15.2 +/- 9.7	3	1	-	-	-	4		Shrubs
Block 2	Control	Shrub Mix	8/27/2020	14.5 +/- 3.8	104.8 +/- 13.5	n/a	14.5 +/- 3.8	4	-	-	-	-	4	25%	
Block 2	Control	Community Mix	8/27/2020	-	-	-	-	-	-	-	-	-	-	0%	
Block 3	Thin Topsoil	Aspen	9/20/2020	21.4 +/- 1.9	245.9 +/- 24.6	13.7 +/- 1.8	16.8 +/- 4.5	10	-	-	-	1	11	75%	
Block 3	Thin Topsoil	Black spruce	9/20/2020	23.1 +/- 4.8	102 +/- 11.8	n/a	19.5 +/- 4.4	10	-	-	-	-	10	75%	Planted in white spruce design plot
Block 3	Thin Topsoil	Black ash	9/20/2020	22.6 +/- 2.4	235 +/- 7.5	11 +/- 2.2	25.5 +/- 3.6	9	-	-	-	1	10	75%	
Block 3	Thin Topsoil	Eastern white cedar	9/20/2020	22.8 +/- 3.7	96.9 +/- 7.5	n/a	11.8 +/- 4	-	11	-	-	-	11	75%	
Block 3	Thin Topsoil	White spruce	9/20/2020	-	-	-	-	-	-	-	-	-	-	75%	
Block 3	Thin Topsoil	Jack pine	9/20/2020	-	-	-	-	-	-	-	-	-	-	75%	
Block 3	Thin Topsoil	Ground Cover Mix	9/20/2020	27.5 +/- 0.1	242.5 +/- 24.7	13.3 +/- 1.2	27.5 +/- 0.1	2	-	-	-	-	2	75%	Tree
				9.7 +/- 2.6	114.8 +/- 14.4	n/a	9.7 +/- 2.6	4	-	-	-	-	4		Shrubs

Block 3	Thin Topsoil	Shrub Mix	9/20/2020	10.1 +/- 1.6	111.8 +/- 22.6	n/a	10.1 +/- 1.6	4	-	-	-	-	4	75%	
Block 3	Thin Topsoil	Community Mix	9/20/2020	-	-	-	-	3	-	-	-	-	3	75%	
Block 3	Tilled Topsoil	Aspen	9/7/2020	22.5 +/- 1.6	253.6 +/- 34.2	14.3 +/- 1.8	39.3 +/- 14.8	9	-	1	-	-	10	50%	
Block 3	Tilled Topsoil	Black spruce	9/7/2020	24.3 +/- 2.8	100.5 +/- 17	n/a	32.7 +/- 3.3	10	-	-	-	-	10	75%	
Block 3	Tilled Topsoil	Black ash	9/7/2020	21 +/- 1.7	226.5 +/- 24.1	10.7 +/- 2	42.4 +/- 7	10	-	-	-	-	10	75%	
Block 3	Tilled Topsoil	Eastern white cedar	9/7/2020	23.6 +/- 3.3	106.1 +/- 11.3	n/a	18.5 +/- 3.9	-	-	-	10	-	10	75%	
Block 3	Tilled Topsoil	White spruce	9/7/2020	-	-	-	-	-	-	-	-	-	-	50%	
Block 3	Tilled Topsoil	Jack pine	9/7/2020	-	-	-	-	-	-	-	-	-	-	50%	
Block 3	Tilled Topsoil	Ground Cover Mix	9/7/2020	25 +/- 0	221 +/- 5.7	14.1 +/- 0.7	25 +/- 0	-	2	-	-	-	2	50%	Trees
				27.4 +/- 10.2	79 +/- 33.7	n/a	27.4 +/- 10.2	-	4	-	-	-	4		Shrubs
Block 3	Tilled Topsoil	Shrub Mix	9/7/2020	15.2 +/- 3.7	102.8 +/- 18.2	n/a	15.2 +/- 3.7	4	-	-	-	-	4	50%	
Block 3	Tilled Topsoil	Community Mix	9/7/2020	-	-	-	-	-	-	-	-	-	-	100%	
Block 3	Fertilized Overburden	Aspen	9/22/2020	21.8 +/- 1.9	256 +/- 29.1	13.2 +/- 2.1	20.1 +/- 4.5	10	-	-	-	1	11	25%	
Block 3	Fertilized Overburden	Black spruce	9/22/2020	22.2 +/- 2.3	95.9 +/- 16.8	n/a	23.5 +/- 5.8	9	1	-	-	-	10	25%	
Block 3	Fertilized Overburden	Black ash	9/22/2020	21.2 +/- 2.8	235.3 +/- 26.1	9.9 +/- 1.8	21 +/- 5.4	10	-	-	-	-	10	25%	
Block 3	Fertilized Overburden	Eastern white cedar	9/22/2020	24.4 +/- 2.3	100.8 +/- 11	n/a	15.7 +/- 5.3	-	11	-	-	-	11	25%	
Block 3	Fertilized Overburden	White spruce	9/22/2020	-	-	-	-	-	-	-	-	-	-	25%	
Block 3	Fertilized Overburden	Jack pine	9/22/2020	-	-	-	-	-	-	-	-	-	-	25%	
Block 3	Fertilized Overburden	Ground Cover Mix	9/22/2020	27.3 +/- 3.3	248.5 +/- 0.7	12.4 +/- 0.4	27.3 +/- 3.3	2	-	-	-	-	2	25%	Trees
				9.4 +/- 3.4	104.5 +/- 33.9	n/a	9.4 +/- 3.4	4	-	-	-	-	4		Shrubs
Block 3	Fertilized Overburden	Shrub Mix	9/22/2020	14.6 +/- 5	98.3 +/- 20.6	n/a	14.6 +/- 5	4	-	-	-	-	4	25%	
Block 3	Fertilized Overburden	Community Mix	9/22/2020	-	-	-	-	-	-	-	-	-	-	25%	
Block 3	Control	Aspen	9/20/2020	22.3 +/- 2.5	257.5 +/- 26	13.6 +/- 1.6	17.1 +/- 5.8	10	-	-	-	-	10	25%	
Block 3	Control	Black spruce	9/20/2020	22.6 +/- 3.3	95.7 +/- 34	n/a	25.5 +/- 5	10	-	-	-	-	10	25%	
Block 3	Control	Black ash	9/20/2020	20.5 +/- 2.6	209 +/- 33.5	8.2 +/- 3.1	18.2 +/- 5.7	9	1	-	-	-	10	25%	
Block 3	Control	Eastern white cedar	9/20/2020	23.1 +/- 2.2	99.7 +/- 12.1	n/a	13 +/- 3.7	-	11	-	-	-	11	25%	
Block 3	Control	White spruce	9/20/2020	-	-	-	-	-	-	-	-	-	-	0%	
Block 3	Control	Jack pine	9/20/2020	-	-	-	-	-	-	-	-	-	-	25%	
Block 3	Control	Ground Cover Mix	9/20/2020	24.4 +/- 1.6	223.5 +/- 0.7	11.9 +/- 1.1	24.4 +/- 1.6	2	-	-	-	-	2	25%	Trees
				10 +/- 5	99.5 +/- 30	n/a	10 +/- 5	4	-	-	-	-	4		Shrubs

Block 3	Control	Shrub Mix	9/20/2020	11.6 +/- 1.9	116.3 +/- 20.5	n/a	11.6 +/- 1.9	4	-	-	-	-	4	25%
Block 3	Control	Community Mix	9/20/2020	-	-	-	-	3	-	-	-	-	3	25%

\*Only one tree tall enough for DBH, no SD given