Canfor Vanderhoof 2014 Direct Seeding Trials 1-2 Year Results

January 29, 2016 – Technical Report No. 14

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ABSTRACT

FPInnovations partnered with Canfor Vanderhoof and Doug Brophy Contracting Ltd. to install a high-density lodgepole pine direct seeding trial in the spring and fall of 2014. Two blocks were seeded at rates of 20 000 and 40 000 seeds/ha using the Bracke s35.a seeder mounted on a disc trencher. At the end of the 2015 growing season, total stocking was 6 630 and 5 170 st/ha respectively, of which 46% and 57% came from direct seeding. Further natural ingress and delayed germination are expected to increase stocking to target levels.

ACKNOWLEDGEMENTS

This project was financially supported by Natural Resources Canada under the NRCan/FPInnovations Contribution Agreement and the Province of British Columbia under the B.C./FPInnovations Contribution Agreement. The authors would also like to thank Jesse Ahtiainen, Nicholas Plett and Doug Brophy for their expertise and support during the trial.

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INTRODUCTION

The mountain pine beetle infestation, the subsequent fibre salvage, and the increase in forest fires that B.C. has experienced in recent years have had a devastating impact on large areas of forest land in interior B.C. Forest licence holders, finding themselves under pressure to find cost-effective ways of regenerating these areas, are revisiting the concept of direct seeding as a reforestation tool.

In northern B.C., direct seeding is particularly of interest for its potential use in western gall rust-prone lodgepole pine stands, where reforestation targets can be as high as 10 000 st/ha to offset disease-caused mortality. With the low marginal cost of seeding at higher seed rates, higher stocking levels can be achieved more cost-effectively than with traditional reforestation methods.

It has been shown that the practice of direct seeding can be successful if certain operational conditions are met and the correct sites are chosen. To date, most research has focused on direct seeding of lodgepole pine in the Cariboo-Chilcotin. To bridge the knowledge gap and expand the research on direct seeding to other regions, FPInnovations has partnered with Canfor Vanderhoof and Doug Brophy Contracting Ltd. to install a high-density direct seeding trial in two blocks near Vanderhoof and Fort St. James.

OBJECTIVES

FPInnovations was tasked with planning and installing a lodgepole pine direct seeding trial in two Canfor blocks, with the objective of determining overall success of direct seeding in meeting reforestation objectives.

METHODS AND SITE DESCRIPTIONS

Two blocks were identified for a direct seeding trial planned for mid-June 2014. Both were harvested in 2012 and chosen for the research trial on the basis of having low vegetation competition, lodgepole pine as the preferred species, easy terrain for site preparation, and easy access for future monitoring.

Figure 1. Aerial view of block BAR005.

Y3G-BAR005

This block is located near Vanderhoof in the SBSmc2/01 (Babine Moist Cold Sub-Boreal Spruce) BGC zone. It features gentle slopes and some small areas of wet ground. Stratified lodgepole pine stand seed (Table 1) was sown at 5 seeds/m (20 000 seeds/ha) in mid-June. Germination was measured in the fall of 2015, two growing seasons after seeding.

99L-99L006

This block is located near Fort St. James in the SBSmk1/06 (Mossvale Moist Cool Sub-Boreal Spruce) BGC zone. It was harvested during the summer of 2012. The block boasts gentle slopes and patches of wet ground and sandy soils. Given the unusually dry and hot weather experienced in the area after BAR005 was completed, seeding in 99L006 was delayed until October 2014 over fears that the dry weather may be unfavourable for germination. Non-stratified lodgepole pine stand seed was sowed at 10 seeds/m, a density of approximately 40 000 seeds/ha. Germination was measured in the fall of 2015, one growing season after seeding.

Figure 2. Aerial view of block 99L006.

Both sites were seeded at high seed rates due to a high incidence of western gall rust in the original stands, which is expected to prevail in subsequent stand establishments. To offset disease-caused mortality, the co-operator is managing for high establishment rates of up to 10 000 st/ha at free to grow.

A pre-treatment site assessment was carried out with 10 transect plots, each measuring 20 m, placed in a representative area of each block. The line intersect method was used to assess the volume of slash and slash height. Other site factors such as stoniness and depth to rock were measured within a fixed area rectangular plot placed around the transect in order to assess ground roughness.

Direct seeding in both blocks was completed using a John Deere 748G-III skidder equipped with the Bracke S35.a seeder. Site preparation implements on the machine were TTS disc trenchers and a V-blade with 11” retractable teeth for moving slash. Trenching was carried out with low pressure on the mattock wheels, as the main site preparation objective in direct seeding is light scarification.

Early during the seeding operations in BAR005, the contractor reported having issues with the moist stratified seed (Table 1). The excess moisture caused jams in the seed chamber and blocked the passage of seed through the seeder. Mould was also an issue – the operator reported evidence of mould after leaving the seed in the seeder overnight. The operator solved these problems by drying the seed enough to be able to continue the treatment.

Table 1. Seed specifications

	Seedlot	Species	Class	Germination capacity (%)	Seed size (Seeds/gram)	Treatment
BAR005	44376	Pli	B	97	339	Stratification
99L006	44376	Pli	B	97	347	N/A

Post-treatment measurements of the trench dimensions were sampled during germination measurements in 2015.

RESULTS AND DISCUSSION

Pre-treatment site conditions are found in Table 2. The sites were very similar in slash levels, roughness class, soil depth, LFH layer depth, etc. Block 99L006 had more variation in soil texture, with patches of sandy soil along the southern boundary of the block (Figure 3).

Table 2. Pre-treatment site conditions

	BAR005	99L006
Slash loading (m^3/ha)	226.9	209.4
Slash heights (cm)	20.2	20.2
Roughness class	1	1
Soil texture	Silty clay	Silty loam, sand
LFH layer depth (cm)	6.4	5.4
Soil depth to rock (cm)	19.3	19.0
Rockiness (%)	69	48

Figure 3. High variation in soil texture in block 99L006.

Average trench dimensions, trench spacing and trench density are given in Table 3. The differences in distance between passes between the two blocks can be attributed to having different operators, as site conditions and equipment remained the same.

Table 3. Post-treatment site preparation dimensions and spacing

Unit	Trench width (cm)	Berm width (cm)	Distance between trenches (cm)	Distance between passes (cm)	Treatment density (rows/ha)
BAR005	63	93	210	621	32
99L006	64	66	200	524	38

In BAR005, germination from seed measured after the second growing season resulted in 3020 st/ha, of which 940 st/ha were well-spaced (Table 4). Total stocking, including naturals, was 6630 st/ha. Most of the assessed seeded germinants showed signs of having germinated during the second growing season after seeding. Only 18% of assessed germinants showed adult needles and leader growth (Figure 4), evidence of 2014 germination. Such low first-year germination is likely due to a prolonged drought in the area that lasted most of the summer of 2014. These results suggest that stratified lodgepole pine seeds are capable of surviving on the ground and germinating at least one year after seeding. Further monitoring will be necessary to assess further delays in germination in the following years.

Figure 4. 2014 germinant (Left) and 2015 germinant (Right) in BAR005.

Seeded stocking and average height in 99L006 were not different from BAR005 results despite having had only one growing season at the time of measurement. Germination from seed in 99L006 after the first growing season resulted in 2970 st/ha, of which 900 st/ha were well-spaced (Table 4). Total stocking, including naturals, was 5170 st/ha. Average height of seeded germinants in both BAR005 and 99L006 was 2.7 cm and ranged from 1 to 8 cm.

Table 4. Stocking summary

	BAR005	99L006
Total stocking (st/ha)	6630 (±2224)	5170 (±1631)
Total natural stocking (st/ha)	3610 (±2013)	2200 (±1521)
Total seeded stocking (st/ha)	3020 (±625)	2970 (±397)
Well-spaced stocking (no M) (st/ha)	1260 (±548)	1080 (±464)
Well-spaced stocking (with M) (st/ha)	1140 (±256)	1040 (±337)
Well-spaced seeded stocking (st/ha)	940 (±348)	900 (±396)
Average natural height (cm)	16.0	22.0
Average seeded height (cm)	2.7	2.7

Note: BAR005 numbers reflect stocking after two growing seasons, whereas 99L006 results reflect stocking after one growing season.

Seeded germinants in both blocks were evenly distributed between the bottom and the hinge of the trench, or positions 3 to 6 on Figure 5. At the time of measurement, neither aspect nor position along the trench profile had any significant effects on seeded germinant height. Future measurements may help determine the ideal germinant position on the trench for increased survival and growth rates at later development stages.

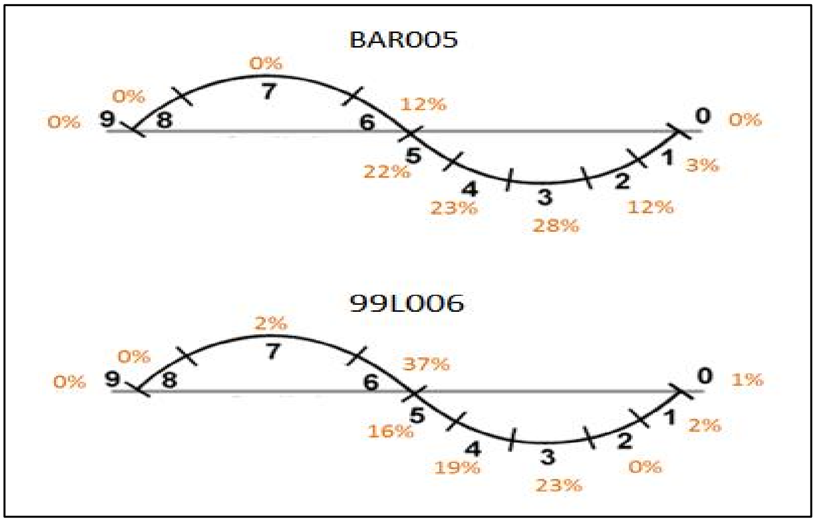

Figure 5. Distribution of seeded germinants along the trench profile.

CONCLUSION

FPInnovations partnered with Canfor Vanderhoof and Doug Brophy Contracting Ltd. to test the use of direct seeding as a reforestation tool in western gall rust-prone stands. Results show that direct seeding helps leverage natural ingress to reach the higher stocking levels required in these high risk stands. Of the total stocking in BAR005, 46% came from direct seeding, whereas in 99L006 the percentage was higher, at 57%. Further natural ingress coupled with delayed germination from seeding are expected to increase the stocking to near the forest manager's target of 10 000 st/ha. The study blocks will be revisited at the 5-year mark to assess whether direct seeding helped meet silvicultural objectives.

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