ESTABLISHING A COMMERCIAL CROP OF TREES ON TEMPORARY ACCESS ROADS IN THE B.C. INTERIOR

FREP

EXTENSION NOTE #33

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This extension note outlines simple and direct ways for resource professionals, managers, and decision makers to address long-term difficulties associated with managing abandoned roads. It also provides managers and enforcement personnel with information regarding the meaning of "unsuitable for rehabilitation."

INTRODUCTION

Widespread application of simplified rehabilitation methods to temporary roads can provide important benefits compared to standard road deactivation, and may significantly lower risks of drainage structure degradation and road-related slope failures, as well as lessen the need to monitor the state of disused roads. Successful rehabilitation can also dramatically reduce ongoing use of deactivated temporary access roads by motorized recreationists. This is an important consideration in areas where subdued topography allows the easy circumvention of road barricades.

Disused, abandoned, and unmaintained roads found on Crown land in the Interior of British Columbia have a wide range of resource management implications, including effects on wildlife habitat (e.g., grizzly bears and caribou), increased occurrences of slope failures, increased stream turbidity, and increased channel dynamics that could possibly affect public infrastructure (roads, bridges, and community water systems). The loss of this formerly productive land base (Thompson 2013) also represents reduced harvesting opportunities for future generations, and a significant lost opportunity for carbon sequestration (Thompson 2014). Under the Forest Renewal BC program in the 1990s, road rehabilitation was widely implemented to mitigate off-site effects and to put land into crop tree production. Since then, levels of rehabilitation have declined sharply.

Soil disturbance from logging and forest road construction in British Columbia is governed by the Forest Planning and Practices Regulation.[1] This regulation defines "temporary roads" as those used for a single harvest opportunity. These roads are considered as a soil disturbance occurring on the productive land base (i.e., net area to be reforested). The regulation defines "permanent roads" as those providing access for future harvest opportunities and, as such, are excluded from the productive land base. A recent review of 5–10-year-old temporary haul roads in a 600 000 ha area in central and northern British Columbia described these roads as "abandoned," not restocked with crop trees, and without maintained drainage structures (Thompson 2013). These temporary roads occupied 2–5% of the net area to be reforested, depending on cutblock size and configuration (Thompson 2014).

Current regulation does not require rehabilitation of temporary structures unless soil disturbance limits have been exceeded (Chapman et al. 2014). When limits are exceeded, rehabilitation is not required where the soil materials in these structures are considered unsuitable for rehabilitation; however, the regulation provides little elaboration on what constitutes "unsuitable for rehabilitation." In addition, guidance documentation is not easily accessible even though many trials have been put in place since the Forest Practices Code *Soil Conservation Guidebook* was prepared (B.C. Ministry of Forests 2001). Over the last 15 years, we have come to understand that achieving adequate tree growth in rehabilitated areas may not be as difficult as once believed. For example, the costly step of topsoil conservation offers little advantage on many soil types when planting to lodgepole pine in the temperature-limited ecosystems common in the province's Interior.

This extension note deals primarily with the rehabilitation of temporary roads and roads that have been "lightly"

1 Forest and Range Practices Regulation (B.C. Reg. 14/2004). See: http://www.bclaws.ca/Recon/document/ID/freeside/14_2004.

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constructed for short-term use as defined in the *Interior Appraisal Manual*, which determines the amount paid for trees on Crown land (B.C. Ministry of Forests, Lands and Natural Resource Operations 2014). It reports on the results of rehabilitation done using very basic techniques on landings that, for many decades, were widely considered as unsuitable for rehabilitation (Chapman 2000). The information presented here addresses some technical issues related to road rehabilitation and also touches on economic considerations by focussing on the simplest (least-expensive) rehabilitation approaches. The decompaction treatments outlined are equivalent to "road ripping," a road management activity already allowed under the *Interior Appraisal Manual* (B.C. Ministry of Forests, Lands and Natural Resource Operations 2014). Temporary roads are part of the net area to be reforested and therefore should qualify for the basic silviculture allowance. Therefore, the cost of these simple rehabilitation activities may, in some circumstances, already be covered under the existing appraisal structure.

METHODS

The seven landings assessed in this trial were treated in 1997 and planted with 1+0 lodgepole pine the following year. These landings, which had been decompacted with a crawler tractor fitted with ripper teeth or an excavator fitted with a brush rake, were randomly selected from the subset of treated landings in the Horsefly and Blackwater variants of the Sub-Boreal Spruce dry warm biogeoclimatic subzone (SBSdw1&2) near Williams Lake, B.C.

The landings had been stripped of topsoil and, at the time of treatment, still had very compact soil from machine traffic during harvesting. Soils were medium textured (high compaction hazard), but a typically dense and finer-textured soil layer was left at or near the surface when the topsoil was stripped away during landing construction. The landings had not naturally regenerated (often after decades), and most had been planted to standard range grass mixes several years before treatment. The landings represented a good analog for forestry roads engineered to short-term specifications (as defined in the *Interior Appraisal Manual*) because the topsoil had been removed, the surface was compacted from repeated machined traffic, and road ballast had not been applied.

At each site, three 5.64 m radius plots were equally spaced on a transect oriented to span the longest possible distance across the landing. On each plot, we measured the diameter at breast height on all co-dominant trees, and sampled four trees for height, increment, DBH, and age above breast height. The largest diameter (undamaged) tree on the plot was selected as representative of site index following standard sampling guidelines (B.C. Ministry of Forests 1995). In addition to the site index trees, we also sampled the smallest-diameter tree, the tree closest to plot centre, and the tree closest to where the transect entered the plot. Site index was determined from published site index tables.[2]

RESULTS

Table 1 summarizes the key growth indices for the sampled landings. Site index for lodgepole pine on the sampled landings ranged from 22 to 29 (Figure 1). Average site index for the main biogeoclimatic subzone surveyed (SBSdw2) was at or above the Site Index by BEC Site Series estimate of 19.6 and very close to the recently determined pine site index of 21 in the SBSdw2 (T. Newsome, Research Silviculturist, B.C. Ministry of Forests, Lands and Natural Resource Operations, pers. comm., unpublished data for EP841.07). Observations suggest that growth on the landings was equal to (or better than) the surrounding areas; however, no measurements were made on trees off the landing at the 15-year remeasurement. All plots on all landings were adequately stocked except one plot for which the low stocking could be attributed to cattle damage.[3] Almost all sampled trees on the landings were planted as very few naturally established trees were evident. At age 15, the rehabilitated landings planted with lodgepole pine will likely produce a commercially valuable crop of trees that is comparable to or exceeds growth in the surrounding area. Figures 2 and 3 show typical growth at two different landings, which are representative of results observed on the other five surveyed landings.

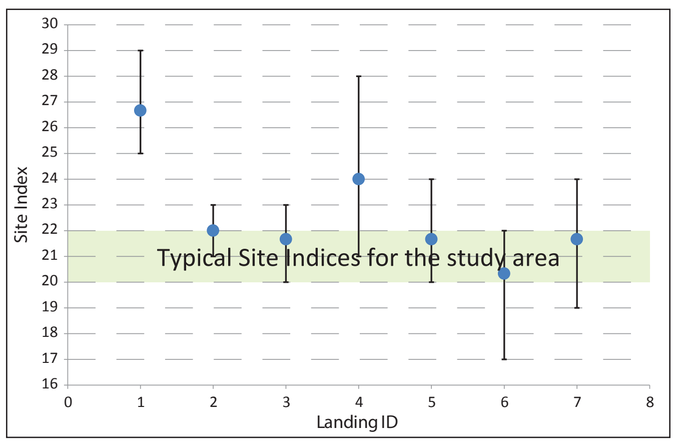

Figure 1: *Site index for 15-year-old lodgepole pine on the sampled rehabilitated landings. The circles show site index based on an average of three trees, one from each of three plots. The error bars show the maximum and minimum site index. Minimum site index was 17 or greater at all sites.*

[2] Available at: https://www.for.gov.bc.ca/hfd/pubs/docs/Fgi/Fgi06.htm.

[3] Since most of the rehabilitated landings had been seeded to grass before the implementation of this trial, cattle had become habituated to using the landings for forage and bedding. The tillage operations used in the trial temporarily reduced grass cover but cattle were still drawn to the most productive landings and cattle damage had previously been identified as one of the major obstacles to rehabilitation.

Table 1. Summary of averages for key growth indices[a]

Landing ID	Stems per hectare	Site index	Total height (cm)	DBH (mm)	3-year increment (% of total)	3-year increment (cm)	3-year increment/3 (cm)
1	1533	29	537	82	36	191	64
2	1000	23	502	85	30	151	50
3	900	23	397	70	32	129	43
4	1933	28	581	92	27	159	53
5	833	24	563	102	26	144	48
6	800	22	455	70	26	120	40
7	700	24	529	87	27	145	48

* Average DBH is based on a measure of all co-dominant trees in each plot. Site index is based on top height as defined in the standard provincial methodology for determining site index, and height growth measures are based on 12 trees per landing (four per plot).

Figure 2 *Growth of 15-year-old lodgepole pine on Landing 4. The average total tree height on this landing was 581 cm, 3-year increment was 159 cm, and average site index was 28.*

Figure 3 *Landing 5 seen from an adjacent (temporary) haul road. On this well-stocked landing, average total height was 563 cm, 3-year increment was 144 cm, and average site index was 24.*

DISCUSSSION

As cited in the examples below, our project findings are consistent with other recent studies in British Columbia. Numerous trials in the province's Interior have demonstrated that simple, low-cost rehabilitation techniques work well across various conditions when planting to lodgepole pine. Low-intensity tillage was the best rehabilitation practice on Southern Interior landings where the topsoil was removed and not replaced (Krzic et al. 2009). Growth rate and total height of trees growing on rehabilitated landings were usually not significantly different than pine growth in adjacent areas on coarser-textured soils in the southeast (Bulmer and Curran 1999). In the northeast, somewhat reduced growth of lodgepole pine was evident on landings compared to the adjacent harvested areas, but grass seeding at the time of rehabilitation may have reduced lodgepole pine growth compared to the unseeded, cultivated landings (Bulmer and Krzic 2003). On a wide variety of soil types, simple rehabilitation will enable establishment of merchantable lodgepole pine with similar productivity to other pine stands in the vicinity.

Although silvicultural treatments generally yield an uncertain return on investment (McWilliams and McWilliams 2011), road rehabilitation has the potential to give a 100% incremental increase in production. When deciding where to invest scarce silvicultural dollars, resource managers should consider the merits of road rehabilitation versus other, less predictable investments. If implemented, road rehabilitation typically makes most economic sense when undertaken along with, or shortly after, replanting the block.

Rehabilitated roads planted to lodgepole pine should be considered as part of the productive land base with a capacity similar to the surrounding cutblock, and the allowable annual cut should reflect this. Additional benefits of crop tree production on rehabilitated roads are increased carbon sequestration, reduced potential for slope failure and soil erosion, reduced potential for water quality degradation, and improved wildlife habitat and visual quality.

BEST MANAGEMENT PRACTICES FOR REHABILITATION

Routine rehabilitation of temporary roads should be considered as one of the most economical and direct approaches to addressing the many well-documented problems associated with road proliferation on the forested landscape of British Columbia. The following practices are recommended for such rehabilitation.

- Rehabilitate temporary roads by ripping to decompact the former running surface.
- Planting to lodgepole pine will easily bring many Interior soil types into production.
- Consider road rehabilitation as a silvicultural investment.
- Explore simple road rehabilitation as a form of deactivation. Road management costs outlined in the *Interior Appraisal Manual* might be adequate to cover this option. Rehabilitated temporary access structures are part of the net merchantable area, and should be eligible for the basic silvicultural allowance.
- If access to a cutblock is required beyond the permanent roads, provide ATV access to key areas.
- Undertake systematic monitoring of rehabilitated areas to determine which types of materials cannot be practicably rehabilitated.

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