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STAND CLEANING WITH HUSQVARNA 165RX CLEARING SAWS IN NORTHERN ALBERTA

Sylvi D. Holmsen, R.P.F.*

Summary and Conclusions

In August 1987, FERIC monitored a motor-manual vegetation control project in a six-year-old white spruce (Picea glauca) plantation near Grande Prairie in northern Alberta. This project was initiated by the Alberta Forest Service to employ fire suppression crews for silvicultural work during quiet periods in the fire season. Pretreatment deciduous stand density was 38 200 stems/ha; white spruce density was 1300 stems/ha. Slope and ground conditions were easy, but grass cover often made it difficult for saw operators to see the spruce seedlings. Productivity averaged 0.049 ha/Productive Hour (PH) or 0.30 ha per eight-hour shift at 77% utilization. The cost per hectare was $400 based on an hourly cost of $15.04 calculated by FERIC. Post-treatment assessment showed that press-down of spruce seedlings by cleaning slash was a serious problem with 13% of the measured seedlings affected.

Introduction

For many sites, successful reforestation requires vegetation management programs to free the coniferous seedlings from competing vegetation. Motor-manual cleaning treatments can play an important role in plantation management. This report evaluates the productivity and cost of using the Husqvarna clearing saw for brushing and weeding a young spruce plantation.

The Clearing Saw

The clearing saw used in this operation was the Husqvarna 165RX. This saw is the largest professional model that Husqvarna produces and has an engine displacement of 65 cc and an empty weight of 10.4 kg. It reaches maximum

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* Author: Sylvi D. Holmsen is a Researcher, Silvicultural Operations, Western Division.

FOREST ENGINEERING RESEARCH INSTITUTE OF CANADA
INSTITUT CANADIEN DE RECHERCHES EN GENIE FORESTIER
143 Place Frontenac, Pointe Claire, Québec, Canada H9R 4Z7, (514) 694-1140
201-2112 West Broadway, Vancouver, B.C., Canada V6K 2C8, (604) 732-3711
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power at an engine speed of 8400 r.p.m. The saw is designed to operate on a 50:1 gas/oil mixture; however, in this study the saws used the synthetic oil Optimal and operated on a 100:1 mixture. The saw has a one-litre fuel tank and can operate for approximately 45 minutes before refueling is required.

The 165RX comes equipped with a MAXI 225 blade. This blade is 22.5 cm in diameter and is suitable for cutting trees up to 10 cm in diameter with one cut. Larger trees may be felled using an undercut method.

The saw is carried by means of a harness designed to distribute the saw's weight evenly on the operator's shoulders. When the tank is full and the harness and saw fastenings are correctly adjusted, the saw is balanced with the blade directly in front of the operator and about 30 cm above the ground (Figure A). The operator controls the cutting action of the saw by using his hip and body to move the saw horizontally. Hands are used to provide additional direction and control to the cutting operation.

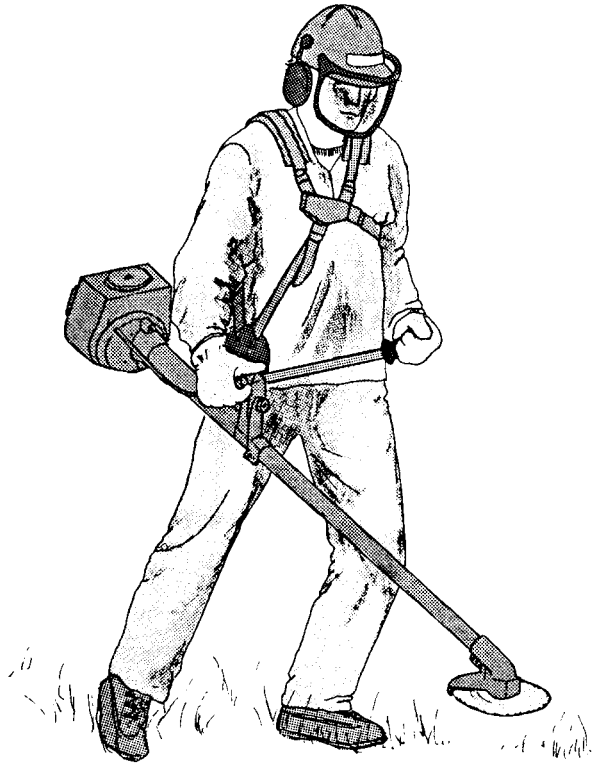

FIGURE A. Operator and Clearing Saw Ready for Clearing.

The Site

The study area is located in the Saddle Hills Supplemental Area north of Grande Prairie. This area is a series of low, rolling hills with few slopes exceeding 25%. The soils are fine textured and moist to very moist, typical of the Peace River Region. The study site was part of a project to convert areas of mixed aspen (Populus tremuloides) and balsam poplar (P. balsamifera) to conifer plantations. The site was cleared, windrowed, and burned in 1980.

White spruce seedlings were planted in the prepared areas in 1981. Since planting, balsam poplar, willow (Salix spp.), aspen, and alder (Alnus spp.) had become re-established on the site and overtopped the seedlings by approximately 2 m.

FERIC established 50-m^2 circular sample plots for pretreatment assessments on a 50 m x 100 m grid with the start located randomly. This provided two plots per ha on a total area of 4.3 ha. Slopes on the study site ranged from 2-8% with an average of 5%. Slash and obstacles on the site were rare and occurred only in the remains of the windrow piles. Ground roughness, using Canadian Pulp and Paper Association classification, was Roughness Class 1 (very even) (Mellgren 1980). Access to the working areas was very good. The study site was crossed by numerous seismic lines, a pipeline, and several small roads.

The density, composition, and size of the deciduous and coniferous components of the stand are presented in Table 1. Grass was the most common ground cover, particularly in the more open areas where it was sufficiently thick to make it difficult to walk and to see the spruce seedlings. Rose (Rosa spp.), fireweed (Epilobium angustifolium), and pea (Lathyrus spp.) were also common throughout the site.

TABLE 1. Stand Composition

Deciduous component	% Stems	Stand Data
Balsam poplar	36.6	38 200 stems/ha
Willow	34.3	Avg ht 2.5 m
Alder	16.6	Avg dgh[a] 2.2 cm
Aspen	9.3	
Coniferous component		
White spruce	3.2	1300 stems/ha Avg ht 0.64 m

[a] Diameter at ground height.

Crew Organization

The Alberta Forest Service fire suppression crews carried out the stand cleaning operation. Each crew was organized into squads consisting of one foreman and five members. Each person was assigned a clearing saw and was responsible for its maintenance. The crew, trained by Husqvarna representatives prior to commencing the project in July, had approximately four weeks' experience when the study began.

Each squad was assigned an area which was divided into 30- to 50-m wide flagged strips. The operators cleared alternate strips as a safety precaution. Within each area the operators worked systematically along a

face, cutting all of the deciduous stems while attempting to prevent damage to the spruce seedlings (Figure B). During this study, three operators were monitored for one week.

FIGURE B. Clearing-Saw Operator Working Along Cutting Face.

Productivity and Time Study

The results of the timing and productivity assessment are presented in Table 2. The average productivity was 0.049 ha/PH. Based on an eight-hour shift at the 77% utilization level experienced in this project, the average production was 0.30 ha/shift and ranged from 0.23 to 0.37.

Although no major problems were encountered in the operation of the saws during the study, several saw engines had seized during the training period prior to the study. The speed setting is critical on these engines and unless set using a tachometer, early engine failure can occur. Also, prior to the study, the angle gears were damaged on several clearing saws as a result of a manufacturing problem (B. MacDonald, Alberta Forest Service, pers. comm. Aug. 1987).

The majority of the non-productive time during the study can be attributed to scheduled weekly and daily maintenance, extended lunch and coffee breaks, walking between the camp site and work areas, and staff meetings. Although it is considered non-productive time, the time used to carry out weekly and daily maintenance ensures that each saw is thoroughly checked and serviced.

TABLE 2. Summary of Time and Productivity Assessment

Activity	% of total time		
Productive time			
Clearing time			
Cutting time	54.0		
Push/pull tree	2.8		
Move within plot	3.4		
Clear saw blade	0.2		
Total clearing time		60.4	
Delay time[a]			
Mechanical	0.7	0.7	
Non-Mechanical			
Refueling	4.6		
Saw and blade maintenance	5.7		
Breaks	4.1		
Personal	0.3		
Direction	0.7	15.4	
Total delay time		16.1	
TOTAL PRODUCTIVE TIME		76.5	88.78 h
TOTAL NON-PRODUCTIVE TIME		23.5	27.22 h
TOTAL AREA (ha)		4.33	
Productivity (ha/PH)		0.049	
Ha/manday (based on an 8-hour shift @ 77% utilization)		0.30	

[a] Delays only include those less than 15 min. Delays larger than 15 min. were not considered productive time and thus excluded from the sample.

Costs

The hourly owning and operating costs for the Husqvarna 165RX clearing saw were calculated using FERIC's standard costing procedure (Table 3). The purchase price for a new saw, including the harness, tool kit, blade guard, and one blade can vary depending on the dealer and the number of saws purchased. Replacement blades are listed at $20 each and can be expected to last 3-5 weeks. An hourly rate of $15.04, excluding interest, is required to cover the owning and operating expenses for this clearing saw and includes an operator at a contract rate of $10.00/hr. Supervision costs have not been included in this calculation as they vary with the level of supervision provided. The cost of stand cleaning was $400/ha based on an eight-hour day at the productivity determined in Table 2.

FIGURE F. Balsam Poplar Stump Shoots.

LITERATURE CITED

Mellgren, P.G. 1980. Terrain classification for Canadian forestry. Canadian Pulp and Paper Association, Montreal, Quebec. 13 p.

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TABLE 3. Cost Analysis for Husqvarna 165RX Clearing Saw

Actual Costs During Project			
Ownership costs--input		**Ownership costs--results**	
Purchase price (P)	$900.00	Average investment (AVI) = (P + S)/2	$540.00
Salvage value (S), (20% of P)	$180.00	Loss in resale value = (P - S)/h	$ 0.48/h
Expected life (yr)	1	Interest = (Int*AVI)/(h/yr)	$ 0.03/h
Expected life (h)	1,500	Insurance = (Ins*AVI)/(h/yr)	$ 0.01/h
Interest rate (I), (%)	11		
Insurance rate (Ins), (%)	3		
Operating and repair costs--input		**Operating and repair costs--results**	
Hourly fuel consumption (L/h)	1.0	Hourly fuel cost = (L)*($/L)	$0.75/h
Fuel cost ($/L)	$0.75	Operating cost = O/(h/yr)	$0.13/h
Annual operating cost (O)	$200	Repair & maintenance cost = R/(h/yr)	$0.17/h
Annual repair & maintenance cost (R)	$250	Labour cost = (W)*[(WBL/100)]	$13.50/h
Wages (W), ($/h)	$10.00		
Wage benefit loading (WBL), (%)	35	TOTAL OPERATING AND REPAIR COSTS	$14.55/h
Total costs--results			
Loss in resale value	$0.48/h		
Insurance	$0.01/h		
Operating and repair costs	$14.55/h		
Total equipment cost (excluding interest)	$15.04/h		
Total equipment cost (including interest)	$15.07/h		

Post-Treatment Assessment

During post-treatment assessment slash and stumps created by the clearing operation were examined, as well as the damage to the spruce seedlings. Clearing the deciduous vegetation resulted in a moderate slash cover of 53% with an average depth of 0.3 m. The average stump height was 17 cm (Figure C). Slash and stumps created by the cleaning operation did not provide a serious impediment to operator movement on the study site although some slash accumulations were 1.0 m deep.

FIGURE C. Clearing Slash and Stumps on Site. Length of tape is 1.4 m.

Although several saw-damaged seedlings were observed outside the post-treatment sample plots (Figure D), no saw-damaged seedlings were measured within the sample plots. However, 13% of the seedlings measured in the post-treatment sample plots were deeply covered by slash and debris (Figure E). Clearly, seedling damage due to slash press-down presented a more serious potential problem than direct saw damage.

FIGURE D. Seedling with Leader Cut off by Saw.

FIGURE E. Seedling Pressed Down by Slash.

Visibility may have been a factor affecting the press-down. Tall, dense grass often hid the seedlings from the operator's view making the trees susceptible to both press-down and saw damage. Press-down could be avoided if seedlings were seen prior to cutting and deciduous material could be directed away from them. Or, if the operator was able to note seedling location before cutting, the operator could manually remove covering slash. Saw damage was light because seedlings were generally visible while cutting near them. Initially the operators ribboned seedlings prior to cutting the deciduous cover and this enabled them to see the seedlings before, during, and after cutting. However, the operators found ribboning time consuming and discontinued it. Both press-down damage and saw damage could be reduced by treating the stand earlier when the competing vegetation is smaller.

The long-term effectiveness of the cleaning treatment will be determined by the Alberta Forest Service. Deciduous regrowth was present on stumps six weeks after cutting (Figure F). Some of these sprouts were up to 30 cm in height and were very dense on the stumps. The survival of these shoots may be affected by frost damage during the fall of 1987 as the shoots were still actively growing at the time of the study (August 1987) when frosts were occurring on the site.