EFFECT OF HARVEST TIMING ON YIELDS AND REVENUES IN WESTERN CANADA'S ASPEN STANDS

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Introduction

Western Canada's large aspen /Populus tremuloides Michx./ resource-with annual allowable cut /AAC/ in northeastern B.C. 3.5 milion m^3, Alberta 8.4 milion m^3, Saskatchewan 2.6 milion m^3, and Manitoba 1.8 milion m^3--bypassed until recently, is now being harvested at an accelerating rate /Ondro 1989, 1991/. For example, in Alberta nearly 6 milion m^3 of aspen will be cut annually by the mid 1990's. Almost half of this huge resource is in stands over 90 years old /Alberta Forestry Lands and Wildlife 1991/. Generally, in mature stands, decay and heart rot increases with age /Hiratsuka and Leman 1991/; 5 to 15 % between 70 and 90 years, from one quarter to one third between 100 and 130 years and over 1/3 of the volume by age 150.

Although aspen can be managed in a simple silviculture system of clearcutting that generally ensures abundant coppice regeneration, the forester in managing the present aspen resource in western Canada has to make at least two important decisions: /1/ what to do with, or how to harvest overmature stands; /2/ what densities to strive for in new stands to achieve near maximum growth and final yield.

This paper examines values of usable aspen volume and losses from cull in mature aspen stands, and the financial implications of harvesting such stands under three different scenarios.

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SCENARIO I - HARVESTING AT 60 YEARS

All aspen is felled but only sound logs are removed. Mean annual increment /MAI/ is only slightly past maximum so volume losses from this source are small; and cull losses are about 10 % /Table 1 and 2, and Figure 1/. This option yields 418 m^3/ha; and the highest MAI 7.0 m^3/ha. Cull volume is relatively small, and so is the cost of felling cull. At Ł1/m^3 stumpage, the value of losses and the cost of felling cull is about Ł320/ha.

SCENARIO II - HARVESTING AT 90 YEARS

All aspen is felled at 90 years and only sound logs are removed. Cull volume losses may add up to 15 % or more. Usable total volume yield may be about 75 m^3/ha higher than if the stands are harvested at 60 years /Table 1/. The clear cost of felling cull comes to about Ł960/ha; felling cost Ł870, plus Ł90 for stumpage at Ł1/m^3 /Tables 1 and 2/. If cull is felled in a second entry just before site preparation, felling cost may rise 50 %; e.g., from Ł870/ha if all trees are cut at harvest, to Ł1305/ha if there is a second entry. Although the nominal stumpage value of usable volume is slightly higher in this option than at harvesting at 60 years, substantially lower discounted stumpage values of usable volumes make harvesting aspen at 90 years financially less attractive /Table 2/. The stumpage value losses at 90 years in comparison with 60 years may amount to 50 % /Table 2/.

Table 1. Estimation of yield loss from cull in mature aspen stands for three harvest age scenarios on good sites

Harvest option	Potential total volume /m^3/ha/	Cull[2] /m^3/ha/	Cull /%/	Cull felling cost[3]	Usable tot.vol. /m^3/ha/	Usable MAI /m^3/ha/
I. Harvest all aspen at 60 years	450	32	7	320	418	7.0
II.a Harvest all aspen at 90 years	580	87	15	870	493	5.5
II.b Harvest only sound aspen at 90 years	580	87	15	1305[4]	493	5.5
III. Do nothing now and harvest at 120 years	600[5]	150	25	1500	450	3.8

[1]Total volume from Plonski's /1974/ yield tables

[2]From Fig. 1

[3]Average 1991 felling cost of two confidential industry sources from Alberta

[4]Includes site clearing

[5]Assuming 0.3 m^3/ha annual increment from 100 to 120 years

Table 2. The value of usable aspen volume for three harvest age scenarios on good sites

	Harvest option	Potential total volume[1]	Usable Volume /m^3/ha/	Assumed stumpage /$/$m^3$/	Stumpage from usable volume: Nominal /$/ha/	Stumpage from usable volume: Discounted[2] /$/ha/	Value loss[3] /%/
I.	Harvest all aspen at 60 years	450	418	1	418	418	
				5	2 090	2 090	
				10	4 180	4 180	
II.a	Harvest all aspen at 90 years	580	493	1	493	203	51
				5	2 465	1 014	
				10	4 930	2 029	
II.b	Harvest only sound aspen at 90 years	580	493	1	58	24	
				5	2 030	835	
				10	4 495	1 850	
III.	Do nothing now and harvest at 120 years years	600	450	1	450	76	89
				5	2 250	382	
				10	4 500	764	

[1]From Plonski's /1974/ yield tables

[2]Discounted revenue at 3 % annual rate for 30 years /90 year-old stands/ and for 60 years /120 year-old stands/

[3]Base of comparison is usable volume yield and usable volume values and losses at 60 years

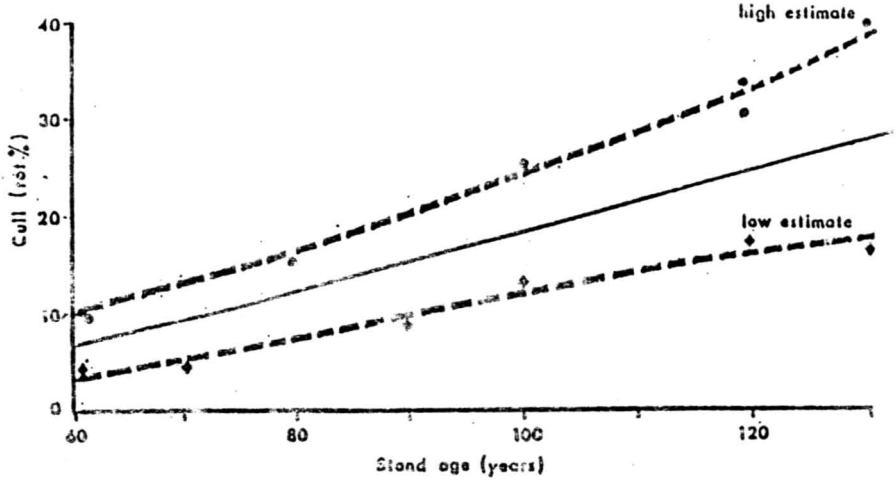

Figure 1: Estimate of cull in natural aspen standz in Alberta
Note: Cull estimates are based on usable merchantable volume recoveries at harvest in stands with no more than two thirds of cull volume
Sources: T. Wakeland, Millar Western Industries Ltd., N. Denney, Weyerhaeuser Canada Ltd., R. Brooks, MacMillan Bloedel, N. O'Rourke, Weldwood of Canada Ltd., S. Luchka, Daishowa Canada Co. Ltd., August 1990.

SCENARIO III - DO NOTHING NOW; HARVEST AT 120 YEARS

All aspen is felled at 120 years and only sound logs are removed. In comparison with harvesting at 60 years, volume loss in this option from cull /25 %/ are high, and so are the cull felling costs /Table 1/. Harvest at 120 years yields 450 m^3/ha usable total volume. The value losses from cull between 60 and 120 years are high, as are losses from felling cost of cull. Harvesting at 120 years will become even less attractive financially than harvesting at 60 or 90 years, as revenues from usable volumes need to be discounted appropriately by 60 or 30 years /Table 2/. The stumpage value losses at 120 years in comparison to 60 years may amount to 90 % /Table 2/.

CONCLUSION

Harvesting aspen at 60 years is the best option. At that time, mean annual increment, yield, and revenue are near maximum while cull is still low. Harvesting all trees at 90 years would mean initially higher costs than if only sound aspen were felled, but the overall cost would be at least 50 % greater because of the necessity of another entry to remove defective stems. For example, cost can increase from $870/ha when all trees are cut at harvest; to $1305/ha with a second entry. Although the nominal stumpage revenues at 90 and 120 years are slightly higher than for those at 60 years, holding these stands another 30 or 60 years and discounting revenues may lead to losses between 50 to 90 %.

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