



CWFC Facts 008

Canadian Wood Fibre Centre

Fibre Facts

Lodgepole pine legacy research guides management for the post-beetle era

Natural Resources Canada – Canadian Wood Fibre Centre (CWFC) is collaborating with partners in Alberta to remeasure a network of lodgepole pine trials established over the past six decades. Jim Stewart, CWFC research scientist, is working in collaboration with Alberta Sustainable Resource Development, the Foothills Growth and Yield Association, and Hinton Wood Products (a division of West Fraser Timber) who provided previous measurement data. This Fibre Fact Note describes the results from remeasurements of 12 experimental sites established between 1941 and 1984 and remeasured under a new cooperative management agreement beginning in 2002. Results indicate potential productivity increases in merchantable volume of lodgepole pine of 500%, 50%, and 115% from pre-commercial thinning (PCT), PCT combined with commercial thinning (CT), and fertilization in combination with thinning respectively. CT alone had little influence on merchantable volume.

The experimental sites were established by the Canadian Forest Service and the then Alberta Forest Service with locations from the MacKay region west of Edmonton in the north to the Kananaskis region west of Calgary in the south. The majority of sites are in the Hinton and Rocky Mountain House regions of Alberta. The sites cover poor to medium nutrient regimes and submesic to mesic-subhygric soil moisture regimes. Age at time of treatments varied from 7 to 40 years old for PCT, 37 to 85 for CT, and 15 to 72 for fertilization and thinning trials. Densities tested varied from a low of 494 stems/ha (sph) to highs in natural stands of 25,000+ sph. Fertilizers tested included nitrogen, phosphorus, potassium, and sulphur in various combinations. The broad range of sites, ecological conditions, and treatments combined with the passage of time since treatment makes the database a source of valuable information for current and future managers.

Table 1 Results from 12 lodgepole pine experimental sites in west-central Alberta

Treatment	Number of trials	Age at time of treatment (years)	Change in merchantable volume increment	
			Average increase (m ³ /ha/yr)	Range (m ³ /ha/yr)
Pre-commercial thinning (PCT)	10	7 to 40	1.17	-0.3 to +3.2
PCT then CT	1	22 (PCT), 37 (CT)	1.28	-----
Commercial thinning (CT)	2	77 to 85	0.03	-0.16 to +0.15
Fertilization	8	15 to 72	0.67	-0.25 to +1.53





Foresters examining the results of half a century of lodgepole pine response to thinning at the CFS MacKay 1954 Thinning Trial.

Results: Thinning

PCT can certainly speed up the rate at which stands reach maturity although it may or may not increase the long-run sustained yield of merchantable timber. The results of these trials indicate that CT can increase the total yield of merchantable volume in some but not all cases, but particularly when used in conjunction with PCT. Trees responded to thinning at all of the ages tested. Greater growth of individual trees at wider spacings usually did not make up for the reduction in the number of stems and therefore stand growth (basal area or volume) increased with increasing stand densities; although usually not up to the densities of unthinned plots.

Results: Fertilization

The results from these trials indicate that N fertilization can improve lodgepole pine productivity in west-central Alberta, with or without thinning and suggest an optimal range of application rate of 250 to 400 kg/ha. Fertilization had more effect on growth and yield in unthinned than in thinned stands and was often associated with increased mortality and appeared to inhibit the development of ingrowth. Fertilization was generally associated with increased diameter growth, but this effect was not always reflected in increased basal area or volume because of the increased mortality. These results suggest that thinning may not always be necessary for effective fertilization treatments.

Conclusions

The current high lodgepole pine mortality due to the mountain pine beetle outbreak is expected to result in future unbalanced lodgepole pine age class structure in western Canada. However, young and regenerating stands are likely to survive and will contribute to future timber supplies. Fertilization, PCT and CT treatments might be useful in accelerating the growth of these lodgepole pine stands to make them ready for commercial harvesting sooner, and help fill the potential wood supply gap.

Next steps

Current work on these sites includes determining how wood quality and fibre attributes are affected by stand density management and fertilization. The Canadian Wood Fibre Centre is further investigating how new remote sensing techniques can improve our inventory to predict wood and fibre characteristics.



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