



Foothills Growth and Yield Association *Quicknote # 5* **Pre-commercial Thinning Trials**

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A network of long-term lodgepole pine silvicultural trials in Alberta, developed over the past 6 decades, is providing important information on lodgepole pine response to thinning and fertilization treatments. The trials (see Table 1) were established between 1941 and 1984 by the Canadian Forest Service (CFS) and the Alberta Forest Service (now part of Alberta Sustainable Resource Development, ASRD). Results from these long-term field trials are invaluable as input to and validation of models forecasting stand development, growth and yield, and timber supply. This note examines the potential for increases in productivity resulting from pre-commercial thinning (PCT).

Table 1. Long-term lodgepole pine pre-commercial thinning trials

Trial name	Year established	Age (years) at establishment	Treatments
Gregg 63 ¹	1963	7	Spaced to 494, 988, 1977, 3954 and 7907 stems per ha (sph) on low, medium and high sites
Teepee Pole ²	1967	25	Same as Gregg 63, on flat, north and south aspects
Gregg 84	1984	28	Spaced to 988, 1977, 2965, and 3954 sph on low, medium and high sites
MacKay ³	1954	22	Thinned to 747, 1680, 2986, 2986 + re-thinning to 70% basal area, and 4444 sph. Non-thinned control (11308 sph)
Swan Lake ⁴	1977	9	3 scarification tools (anchor chains, shark-fin barrels, Rome disks) with 1 and 2 passes. Non-thinned control (10833 sph)
McCardell ⁵	1984	40	Non-thinned (5270 sph) vs. thinned (2130 sph), crossed with fertilization treatments
Takyi 7008	1980	24	Non-thinned (15000-25000 sph) vs. thinned (1600 sph), crossed with fertilization treatments
Takyi 7009	1980	24	Non-thinned (15000-25000 sph) vs. thinned (1600 sph), crossed with fertilization treatments

Beginning in 2002, the trials have been maintained and measured cooperatively by CFS, ASRD and the Foothills Growth and Yield Association. Previous data was compiled from government and company archives. Recent re-measurements were combined with older data to create a standardized database. In the following tables, mean annual increment of stem volume in m³ per ha per year (MAI) is used as an

¹ Johnstone, W.D. 1981a. Effects of spacing 7-year-old lodgepole pine in west-central Alberta, Inf. Rep. NOR-X-236. Environ. Can., Can. For. Serv., Edmonton, Alberta, 24 p.

Yang, R.C. 1991. Early stand development of lodgepole pine spaced at age 7 in west-central Alberta, Inf. Rep. NOR-X-322. For. Can., North. For. Cent., Edmonton, Alberta, 18 p.

² Johnstone, W.D. 1982. Juvenile spacing of 25-year-old lodgepole pine in western Alberta, Inf. Rep. NOR-X-244. Environ. Can., Can. For. Serv., Edmonton, Alberta.

Yang, R.C. 1986. Growth of 25-year-old lodgepole pine after juvenile spacing in western Alberta, For. Manag. Note No. 38. Can. For. Serv., North. For. Cent., Edmonton, Alberta, 8 p.

³ Johnstone, W.D. 1981b. Pre-commercial thinning speeds growth and development of lodgepole pine: 25-year results, Inf. Rep. NOR-X-237. Environ. Can., Can. For. Serv., Edmonton, Alberta, 36 p.

⁴ Bella, I.E. 1990. Thinning Lodgepole Pine by brute force: three implements in a decade's perspective. For. Chron. 66:611-615.

⁵ Yang, R.C. 1998. Foliage and stand growth responses of semi-mature lodgepole to thinning and fertilization. Can. J. For. Res. 28:1794-1804.

indicator of growth response. For more details on experimental designs, treatments, analyses and results, consult the referenced publications and/or contact the author.⁶

In half of the trials, PCT appeared to result in an increase in total volume MAI, and in the other half a decrease in MAI (see Table 2). However, the increase was only significant in one trial, Gregg 63 Low. The other 3 observed significant differences were all decreases in MAI. It should be noted that culmination has yet to be reached in all 4 of the trials that showed significant differences, and it is possible that these results may change as stands develop. In 6 cases, PCT realized significant improvements in merchantable volume MAI (see Table 3). In the 4 cases with non-significant results, only in the McCardell and Teepee Pole South sites is there any indication of MAI being less in the best thinning regime than in the non-thinned. Note that in only 2 of the trials has maximum MAI been reached, and in all other cases, the results could change with time.

Table 2. Effect of pre-commercial thinning on total volume MAI

Trial/site	Age at Treatment / Response time	Maximum MAI - non-thinned	Maximum MAI of best thinning treatment	Best thinning treatment prescription	Percent improvement from thinning
Gregg 63 Low	7 / (38)	1.76 * a	3.57 b	7907 sph	99
Gregg 63 High	7 / 33	5.83 a	6.99 * a	7907 sph	20
TP Pole Flat	25 / 30	6.15 * a	7.20 * a	7907 sph	17
TP Pole North	25 / 30	4.65 * a	5.25 * a	7907 sph	13
Takyi 7009	24 / (19)	2.18 a	2.30 a	1600 sph	6
MacKay	22 / 42	4.33 * a	4.09 * a	4444 sph	-6
TP Pole South	25 / 26	6.67 * a	6.09 * a	3954 sph	-9
Swan Lake	9 / (27)	6.58 a	5.91 b	Barrel 1-way	-10
McCardell	40 / (15)	6.22 a	5.33 b	2130 sph	-14
Takyi 7008	24 / (19)	4.72 a	3.51 b	1600 sph	-26

Asterisk (*) indicates that the stand has reached culmination. Response time is the time from establishment to culmination or to the latest observation (in parentheses) for thinned plots. Within each row, values followed by the same letter are not significantly different from each other.

Table 3. Effect of pre-commercial thinning on merchantable volume MAI

Trial/site	Age at Treatment / Response time	Maximum MAI - non-thinned	Maximum MAI of best thinning treatment	Best thinning treatment prescription	Percent improvement from thinning
Gregg 63 Low	7 / (38)	0 a	1.82 b	1977 sph	—
Takyi 7009	24 / (19)	0.26 a	1.66 b	1600 sph	538
Swan Lake	9 / (27)	0.51 a	2.44 b	Disc 2-way	378
Gregg 63 High	7 / (38)	1.48 a	4.71 b	7907 sph	218
Takyi 7008	24 / (19)	1.11 a	2.86 b	1600 sph	158
MacKay	22 / (49)	2.46 a	3.44 b	2986 sph	40
TP Pole Flat	25 / 30	4.04 * a	5.21 * a	7907 sph	29
TP Pole North	25 / (37)	3.04 a	3.48 a	3954 sph	14
McCardell	40 / (15)	4.80 a	4.63 a	2130 sph	-4
TP Pole South	25 / 30	5.24 * a	4.98 * a	3954 sph	-5

Asterisk (*) indicates that the stand had reached culmination. Response time is the time from establishment to culmination or to the latest observation (in parentheses) for thinned plots. Within each row, values followed by the same letter are not significantly different from each other. Merchantable volumes are based on the 13/7 utilization standard (i.e. 13 cm minimum stump diameter outside bark and a 7 cm minimum top diameter inside bark).

Pre-commercial thinning may or may not increase the long-run sustained yield of merchantable timber, but it certainly can speed up the rate at which stands reach merchantability.

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