

SIMULATIONS OF THINNING IN COASTAL DOUGLAS-FIR INFECTED WITH PHELLINUS ROOT ROT

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INTRODUCTION

This report deals with the effects of thinning (juvenile spacing) on coastal Douglas-fir infected with *Phellinus* root rot through simulation with the TASS-ROTSIM model described in a previous report (W.J. Bloomberg, Incorporation of *Phellinus* root rot impacts in the tree and stand simulator (TASS), Progress Report, Contract #49782, March 31, 1991). The latter report examined the effects of inoculum level (number, size, and spatial distribution of infected stumps). A second report dealt with effects of stand density and site index on root rot (W.J. Bloomberg, Preliminary yield tables for coastal Douglas-fir infected with *Phellinus* root rot, Contract #69198, June 10, 1991).

METHODS

Methods for simulating root rot in stands and calculating effects on stocking (stems/ha) and volume (cu. m/ha) are described in the above reports. To examine the effects of thinning, three initial stocking levels - 1500, 2000, and 2500 stems/ha - were simulated with each of six root rot severity classes - healthy, very light, light, moderate, heavy, and very heavy. These classes are defined in the above reports. At stand age 15, each stocking level-root rot class combination was subjected to a light thinning (to 1000 stems/ha) and a heavy thinning (to 500 stems/ha). In addition, a stocking level of 1000 stems/ha was thinned to 500. All stands had a site index of 35m, corresponding to a good site.

RESULT

Results are shown as selected graphs for comparisons of stocking and unthinned stands over age, and as a table of impacts (percent of healthy) in stands with very heavy root rot. Scatter plots for each density and thinning regime are shown in Appendix 1 for the following parameters; stems/ha volume. Maps of distribution of root rot prior to and after thinning and at rotation age 90, are shown in Appendix 2.

In very heavy root rot, at 1500 stems/ha initial stocking, heavy thinning resulted in slightly less stems/ha than light thinning (258 vs 293) and about the same as no thinning (Fig. 1). At higher initial stocking, light (310 vs 205 at 2000 sph, 322 vs 247 at 2500 sph) and more stems/ha than no thinning (Figs. 2 and 3).

Stand volumes at 90 yr were higher after heavy thinning than after light or no thinning (Figs. 4-6). Differences among regimes increased as initial stocking increased (880 vs 769 cu.m/ha for heavy and light thinning, respectively, at 1500 stems/ha, and 884 vs 516 and 943 vs 424 for 2000 and 2500 sph initial stocking, respectively). The effect of thinning regime was even more marked expressed as impact (Table 1).

T A B L E 1 .

EFFECT OF THINNING ON IMPACT OF V. HEAVY ROOT ROT IN DIFFERENT STAND DENSITIES

	Unthinned		At 15 yr, stand thinned to:			
			1000 sph		500 sph	
	Stocking	Volume	Stocking	Volume	Stocking	Volume
Initial stems/ha	Impact (% of healthy) at stand age 90					
1000	43.7	46.7			89.1	84.8
1500	58.5	69.7	52.5	70.4	87.1	69.2
2000	56.2	58.0	41.6	45.4	86.9	69.8
2500	44.9	46.0	50.7	33.8	86.1	80.9

The principal reason for the effect of heavy thinning in reducing impact relative to light or no thinning appears to be the greater resultant distance between trees. There appears to be little effect by removing infected trees (compare infection immediately before thinning and five years later in Appendix 2).

Differences in impact among root rot severity classes were greater after light than after heavy thinning. For example, at stand age 90 and 2500 stems/ha initial stocking, impact on stocking after light thinning ranged from 50.7% of healthy for very heavy root rot to 92.8% for very light disease, whereas after heavy thinning, the range was 86.1 - 94.3%. Corresponding ranges for impact on volume were 33.8 - 88.4% after light thinning vs 76.0 - 94.8% after heavy thinning. The spread increased with increasing initial stocking. By limiting rate of root rot spread, heavy thinning reduced the differences due to inoculum level.

CONCLUSIONS

Because there are no long-term data on effects of thinning on root rot in coastal Douglas-fir, direct validation of the simulation results is difficult. Field observations in a few situations suggest that wide spacing has slowed the rate of disease spread. Heavy thinning may act as a crude partial control of root rot. More field studies are necessary.

FIGURE 1.

EFFECT OF THINNING ON STEMS/HA IN DOUGLAS-FIR WITH VERY HEAVY ROOT ROT -

Initial Stocking 1500 sph Site Index 35m

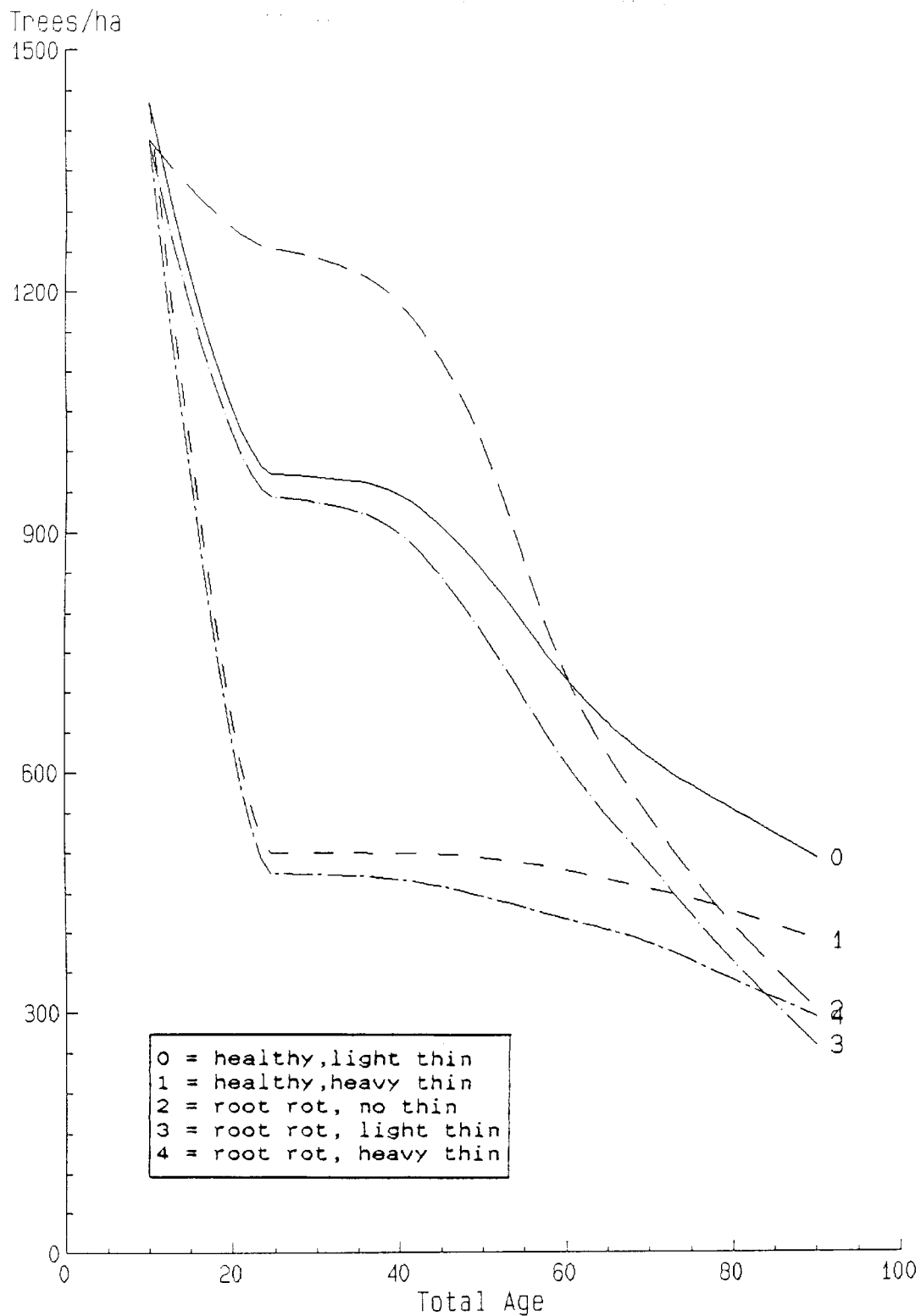


FIGURE 2

EFFECT OF THINNING ON STEMS/HA IN DOUGLAS-FIR WITH VERY HEAVY ROOT ROT –

Initial Stocking 2000 sph Site Index 35m

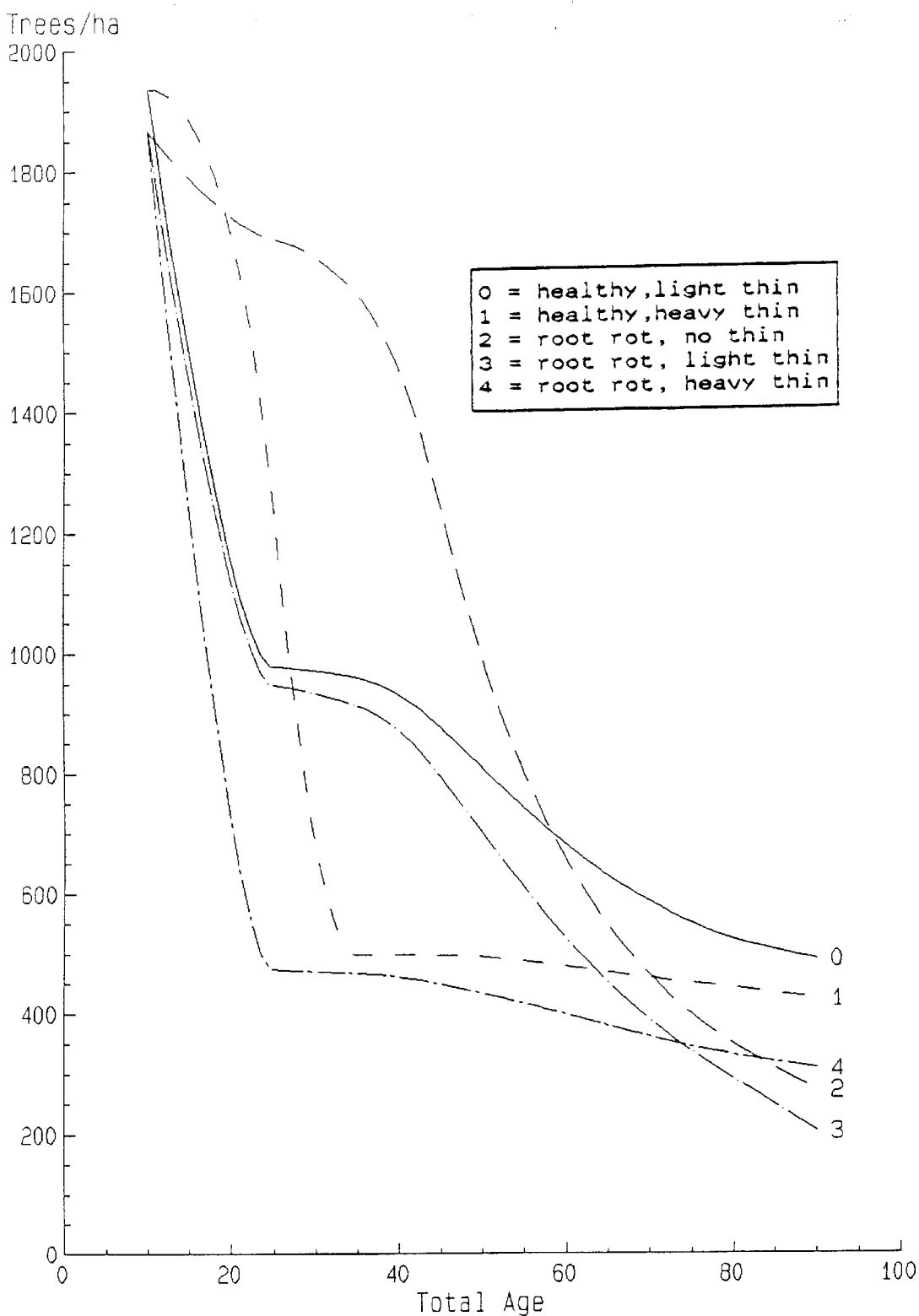


FIGURE 3

EFFECT OF THINNING ON STEMS/HA IN DOUGLAS-FIR WITH VERY HEAVY ROOT ROT –

Initial Stocking 2500 sph Site Index 35m

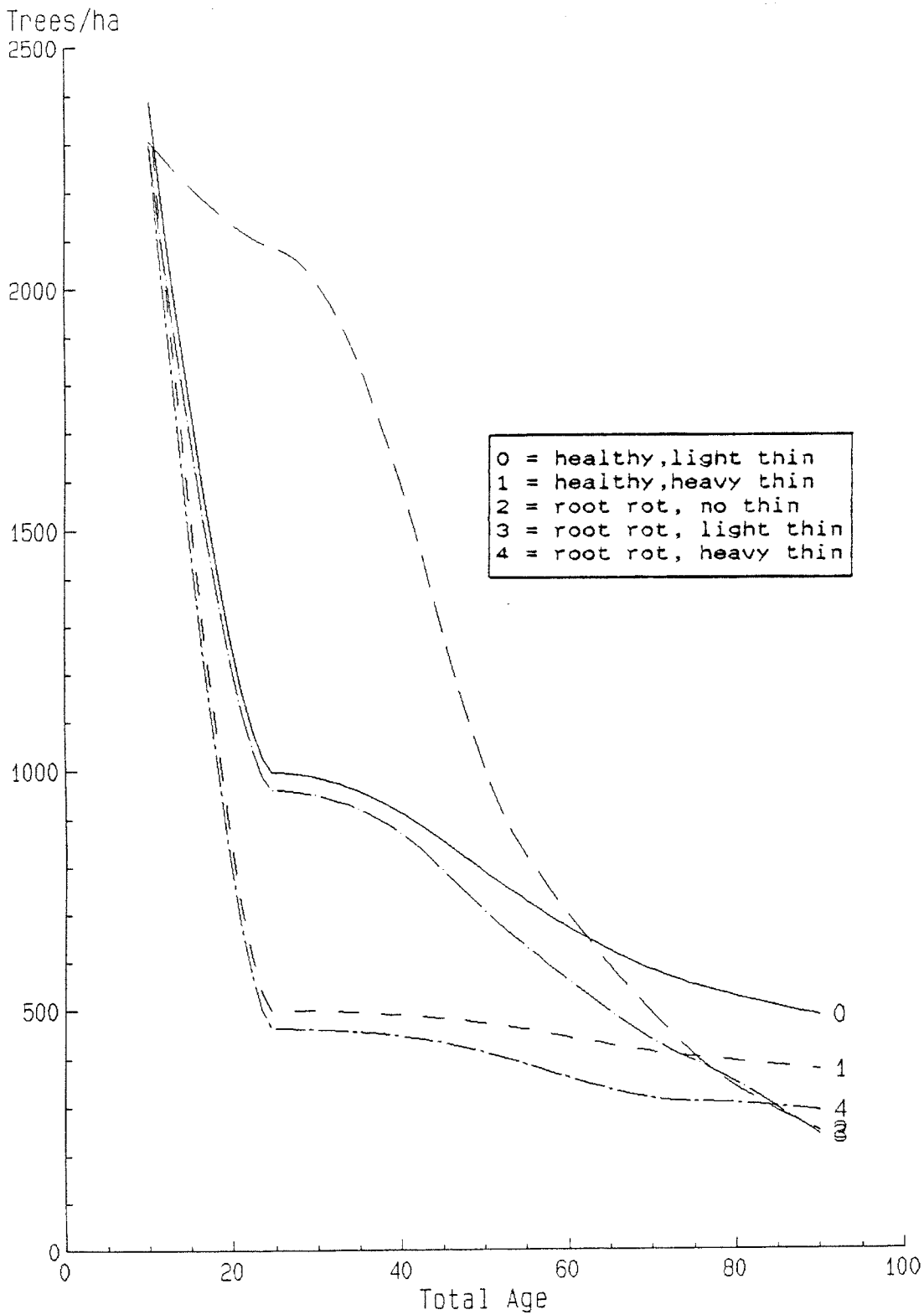


FIGURE 4.

EFFECT OF THINNING ON VOLUME IN DOUGLAS-FIR WITH VERY HEAVY ROOT ROT –

Initial Stocking 1500 sph Site Index 35m

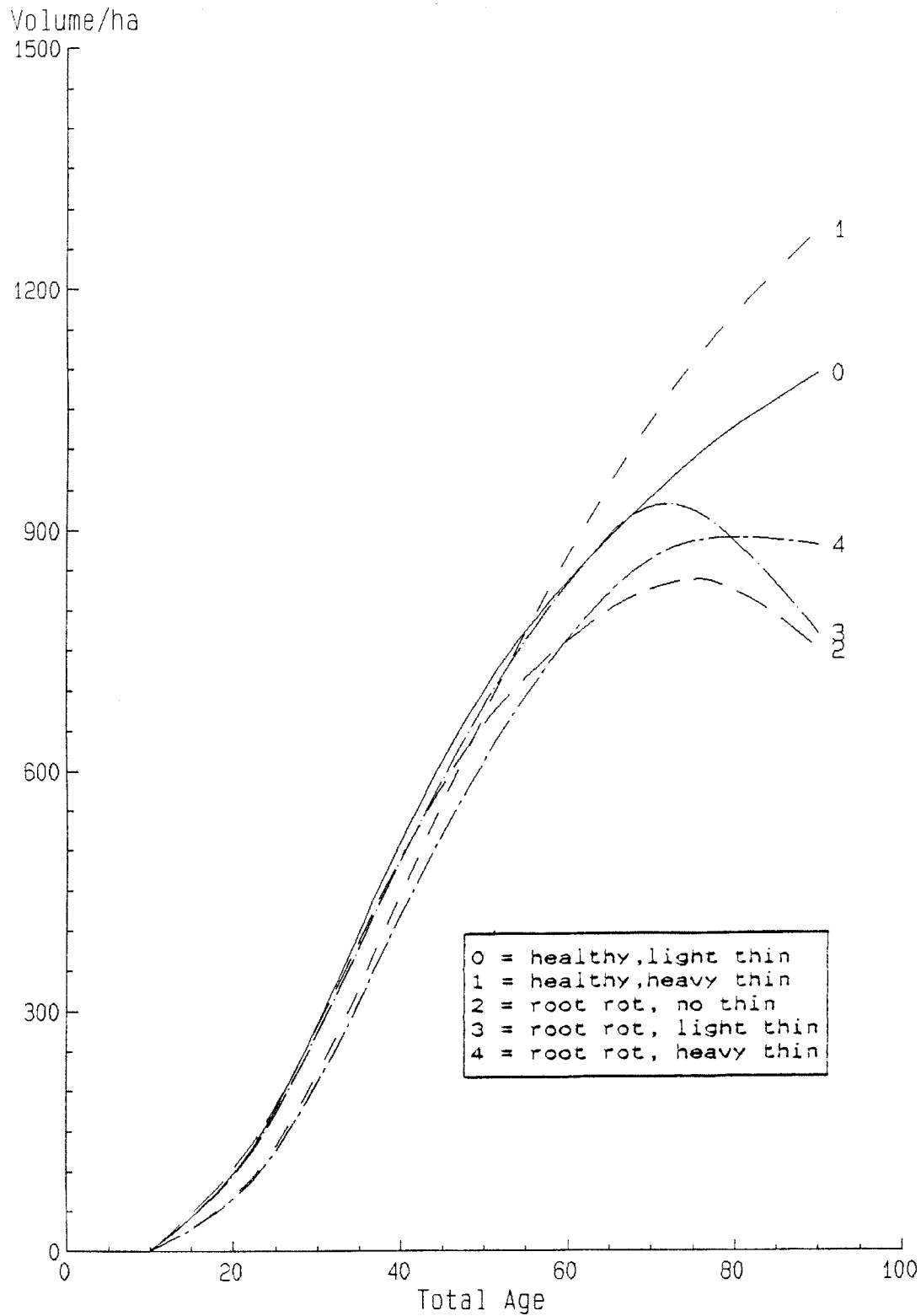


FIGURE 5

EFFECT OF THINNING ON VOLUME IN DOUGLAS-FIR WITH VERY HEAVY ROOT ROT –

Initial Stocking 2000 sph Site Index 35m

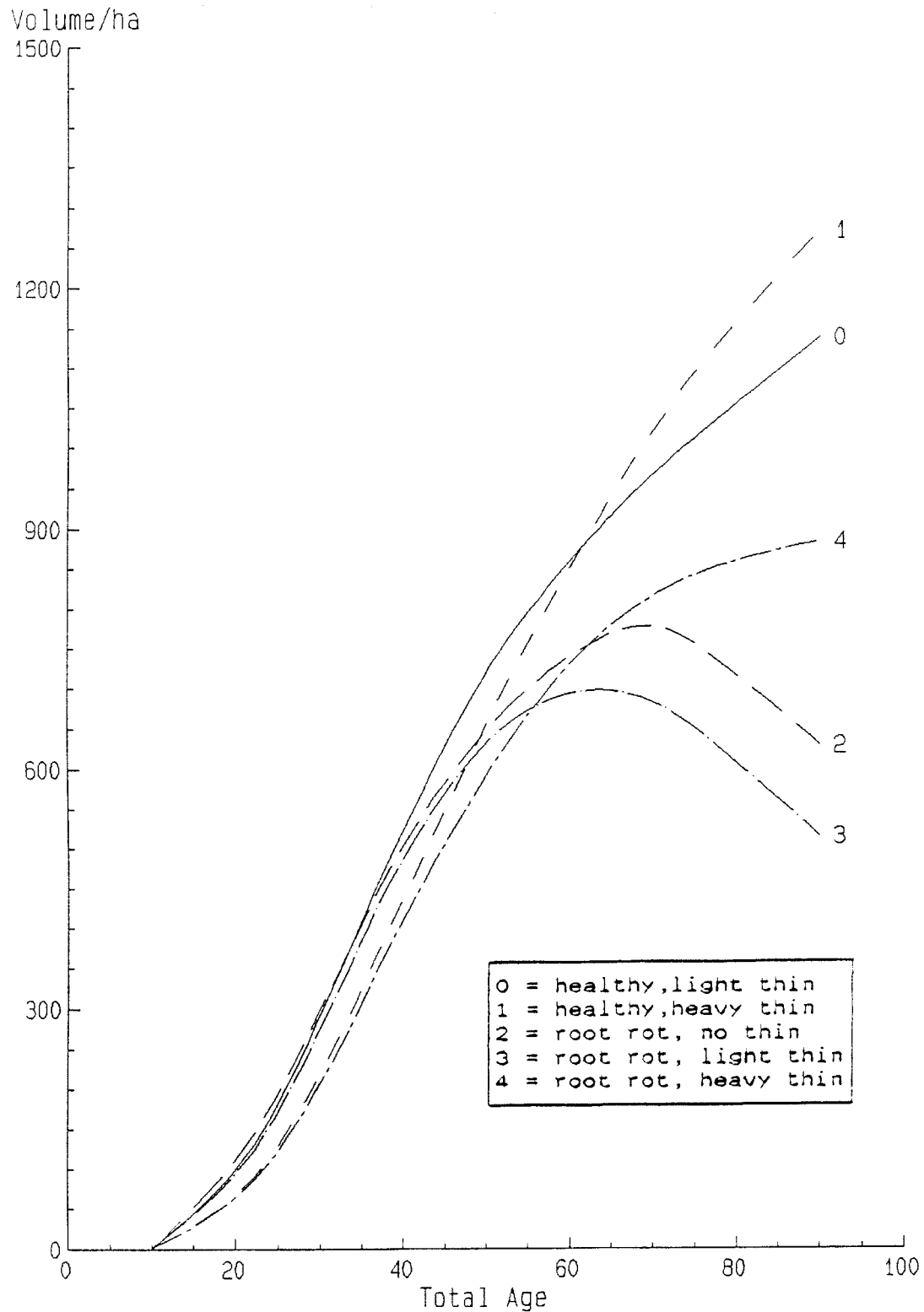


FIGURE 6

EFFECT OF THINNING ON VOLUME IN DOUGLAS-FIR WITH VERY HEAVY ROOT ROT –

Initial Stocking 2500 sph Site Index 35m

