

VIII. Mr. Dave Wallinger, substituting for John Revel, gave a report on: Planting Study of 2-0 Douglas Fir Culls

PLANTING STUDY OF 2-0 DOUGLAS FIR CULLS

by
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(Paper given by Mr. Dave Wallinger, B.C. Forest Service)

Each year in excess of 3 million 2•0 Douglas fir seedlings are culled in nurseries on the coast of British Columbia. These seedlings represent a substantial waste of seed, nursery space and labor, and add significantly to

the cost of planting stock. Changes in nursery practice to reduce the proportion of sub-standard seedlings, and reassessment of existing culling standards will reduce the proportion of culls and provide more, better and cheaper planting stock.

In 1961 a problem analysis of planting stock standards was undertaken and the validity of culling some types of seedlings was questioned (B.C. Forest Service, Research Review 1962). At that time interim minimum standards were formulated for 2+0 Douglas fir, and this study was initiated to test the validity of culling all seedlings with multiple tops, forked tops, torn lateral roots, and spindly stems. (See Appendix A)

It was anticipated that seedlings with multiple tops, but otherwise strong and vigorous, would survive and grow equally as well as those leaving the nursery with single tips. Over 50 per cent of all seedlings planted on the coast of British Columbia are browsed shortly after planting, develop multiple tops as a result, and outgrow this condition within a few years.

A large portion of culls results from root damage during lifting in wet, muddy conditions or dense beds. The majority of this damage occurs in the largest seedlings of any population and reduction in vigour as a result of the damage might be offset by their above average quality. Seedlings incurring root damage which does not seriously reduce their root mass were expected to survive well, provided that wounds healed quickly and did not present an entry point for disease.

A low minimum stem diameter (3/32" - 2.4 MMS) was established in the interim standards and spindly seedlings were tested in the study to determine if higher standards were necessary.

TREATMENTS

Control - normal 2+0 stock (above interim minimum standards).

Torn Roots (light damage) - root wounds less than 15 MMS in length, less than 3 MMS in width, provided that damage did not remove a major proportion of the root mass.

Torn Roots (heavy damage) - root wounds 15 MMS + in length, 3 MMS in width, substantial loss of root mass.

Multiple Tops (dominance) - seedlings with more than two leaders, one of which was dominant, rigid and "woody."

Multiple Tops (no dominance) - seedlings with more than two weak spindly leaders, none of which was dominant.

Forked Tops - seedlings with two leaders, neither of which was dominant.

Spindly Stems - spindly stems (less than 3/32" - 2.4 MMS in diameter) at the root collar.

METHODS

Culls were selected from seedlings rejected during normal lifting operations at Duncan, Green Timbers, and Campbell River nurseries in Autumn 1961, and were held in cold storage in multi-wall bags until planted.

Fourteen blocks were established in Autumn 1961 and were widely distributed on Vancouver Island and the Lower Mainland. Each block contained 100 seedlings per treatment (2 rows x 50) in a completely randomized design.

Nursery lifting dates ranged from September 27 to November 24, 1961. Length of storage ranged from 3 to 38 days. Planting dates ranged from October 5 to December 7, 1961. Thirteen different seed-lots were tested.

- Planting sites ranged - from 450 to 3300' elevation,
- from Site 80 to 170' (at 100 yrs.)
 - wide variation of slope, aspect, burning history, and cover.

Fourteen different planters of average experience (one per block) were used to plant at approximately 800 trees per man day with the standard planting hoe.

MEASUREMENT

Survival and the total height and current maximum leader growth of each survivor were measured at the end of the first and second seasons after planting.

After two growing seasons, ten seedlings were carefully excavated at random from each treatment in each of four blocks.

Total height, leader growth, stem diameter, and oven dry weights were measured, and the occurrence of multiple tops and the formation of callous tissue over wounds were recorded.

Five seedlings from each of three treatments: Control, Torn Roots light damage, and Torn Roots heavy damage, were excavated at random from each of four blocks. Sections were prepared from beneath and adjacent to original wounds and were cultured on malt agar blocks to isolate pathogens.

RESULTS

After one growing season, the majority of control seedlings had multiple tops as a result of browsing.

After two growing seasons there was no difference in the frequency of multiple or forked tops between any of the treatments. All multiple or forked seedlings had exhibited single leader dominance unless browsed by game.

Significantly lower survival and shorter leader growth were recorded for seedlings with multiple tops no dominance and spindly stems. (Fig. 1, Table 1)

TABLE 1. SUMMARY OF SURVIVAL AND INITIAL GROWTH OF CULLS

Treatment	Survival 2nd Season (%)	Total Height 2nd Season (feet)	Leader Growth	
			1st Season	2nd Season
Control	74	1.13	0.16	0.34
Torn Roots light damage	73	1.11	0.17	0.33
Torn Roots heavy damage	69	1.10	0.15	0.32
Multiple Tops dominance	76	0.91	0.13	0.29
Multiple Tops no dominance	63	0.75	0.11	0.25
Forked Tops	71	0.92	0.15	0.29
Spindly Stems	60	0.80	0.12	0.23

Poor development of seedlings with Multiple Tops (no dominance) or spindly stems was further demonstrated by their morphological assessment after two growing seasons (Fig. 2). No harmful pathogens were isolated from sections of Torn Root treatments and complete and vigorous callous tissue was observed on over 95 per cent of the wounds. All injured seedlings had a reddish-brown, pitch-like stain below the scar extending inwards toward the pith.

Conclusions and Recommendations

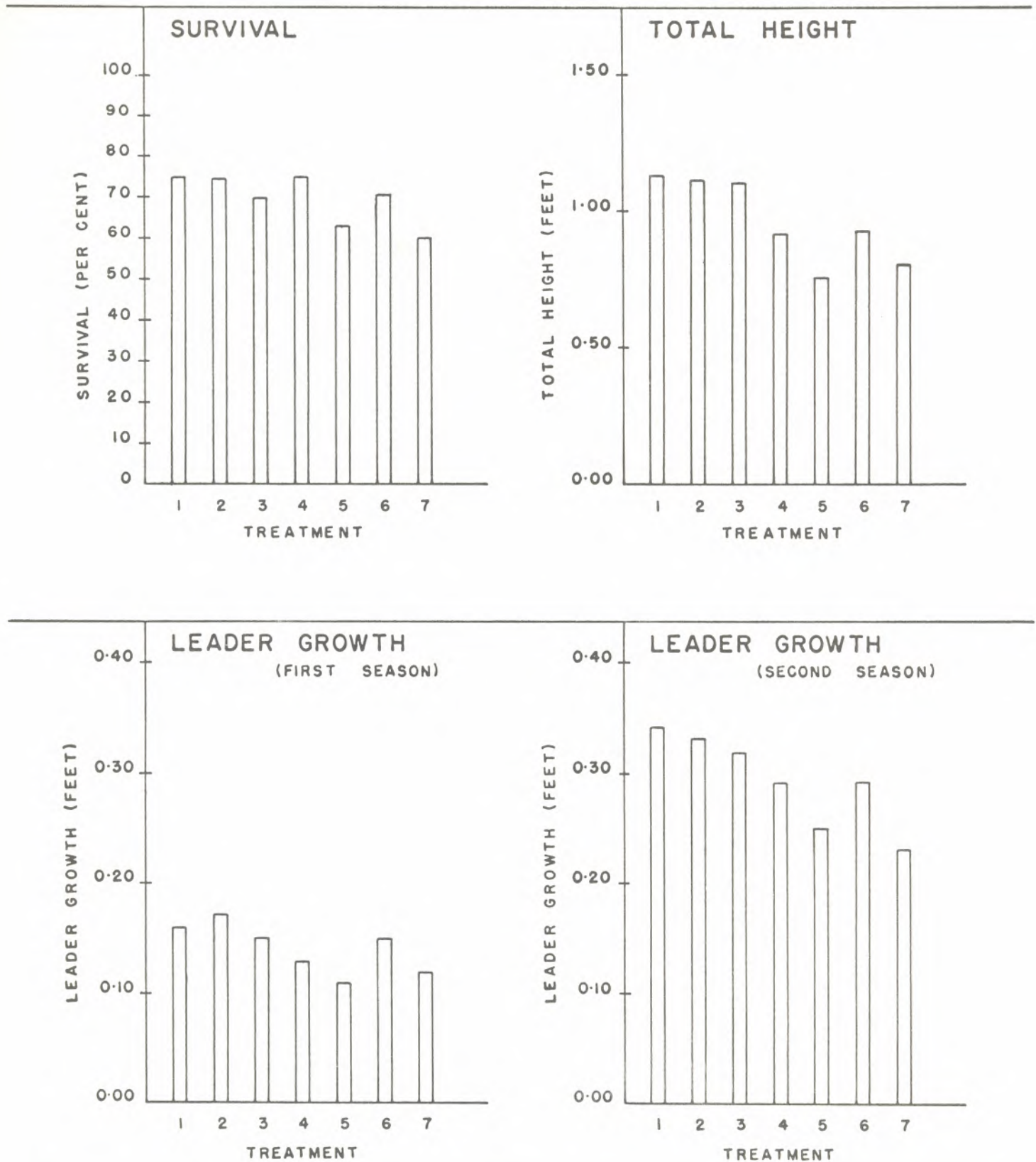
On the basis of this study, seedlings with light root damage, multiple tops dominance, and forked tops should not be culled unless they fail to meet other specifications. Although seedlings with heavy root damage did not succumb and grow relatively well, it is recommended that they are culled. Spindly seedlings and those with several weak tops should be culled. The minimum stem diameter for 2+0 Douglas fir seedlings should be increased from 2.4 to 3.0 MMS. This increase would eliminate the majority of spindly and weak multiple-topped seedlings.

If a plantation was established exclusively from the culls which are recommended for acceptance, its survival and initial growth might be slightly lower than that for one established from normal 2+0 seedlings. However, when these culls are included in a plantation which will be approximately 90 per cent normal seedlings, it is doubtful if minor differences could be detected in the over-all performance of the plantation.

Continued efforts to obtain uniform densities of approximately 40 seedlings per square foot in nursery beds will eliminate the majority of spindly seedlings and reduce the amount of roots damaged. during lifting.

Twenty-five seedlings of each treatment in each of six blocks have been tagged and will be examined 5, 10 and 15 years after planting to study the long-term effect of culls on tree development.

FIG. 1 SURVIVAL AND INITIAL GROWTH OF 2+0 DOUGLAS FIR CULLS 2 YEARS AFTER PLANTING



1	2	3	4	5	6	7
CONTROL	TORN ROOTS LIGHT	TORN ROOTS HEAVY	MULTIPLE TOPS DOMINANCE	MULTIPLE TOPS NO DOM.	FORKED	SPINDLY

BASIS: 800 SEEDLINGS PER TREATMENT (100 X 8 BLOCKS)

APPENDIX A

INTERIM MINIMUM STANDARD FOR CULLING
2-0 DOUGLAS FIR STOCK FOR PLANTING ON THE B. C. COAST

1. Top

- Minimum length 5" (from ground line to top)
- no forked tops
- accept all seedlings with multiple tops provided one leader shows definite dominance and is not succulent
- no frosted tips on the current terminal

2. Stem

- minimum diameter 3/32" (2.4 mms.)
- no frost scars, heat lesions or swollen areas
- no deformed stems

3. Roots

minimum length 5"

- maximum length 8"
- diffuse and fibrous
- no obvious torn lateral root damage
- no roots with excessive or abrupt right-angle kinks
- no long single tap roots with absence of good lateral roots
- no poorly balanced seedlings, must have a good root system

4. Colour

- no definite chlorotic yellow tops

Tree Farm Forestry Committee,
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