

# Lateral Root Pruning — A Promising Forest Nursery Practice

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## Abstract

*The regeneration and growth of pruned roots of Douglas-fir seedlings were studied under nursery conditions. Root pruning did not decrease the height increment of seedlings. For the best development of dense and compact root systems, the bottom pruning should be done early in spring and the side pruning around the middle of June, on both sides of the row simultaneously.*

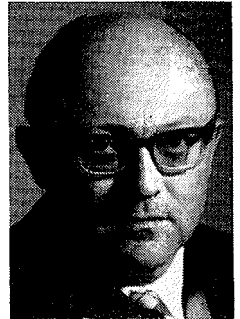
## Extrait

*Dans une pépinière à Duncan, Colombie Britannique, des semis 1-0 de Douglas en rangées espacées de 7 pouces furent suivis quant à la régénération des racines et la croissance des semis après que l'auteur eut sectionné les racines à 6 pouces sous le sol et, aussi, latéralement dans les sillons à mi-chemin entre les rangées. La croissance des semis ne fut pas retardée du tout et les racines se sont le mieux régénérées lorsque les sectionnements en dessous eurent lieu au début du printemps et lorsque les coupures latérales furent effectuées à la mi-juin.*

Until 1948 root pruning of coniferous nursery stock was generally considered harmful even at planting time, and care was taken to lift and plant the seedlings with as little damage as possible (Toumey and Korstian, 1942; Hendemann-Gade, 1948). Huntly (1960) concluded that root pruning at planting time did not affect adversely the subsequent survival or growth of shoots and roots of Douglas fir transplants.

During recent years, due to the increasing demand for planting stock and the high cost of labour, nurseries have placed greater emphasis on the production of seedlings than on transplants. Many nurseries have become highly mechanized and new ways of treating plants are being developed. Bottom pruning of the tap root has become an established practice especially in pine nurseries. Side pruning also has been tried on a small scale (Stone and

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Schubert, 1966) as well as an operational procedure (Stoekeler and Jones, 1957; Stefansson, 1964).

Several experiments on artificial regeneration (e.g., Eis, 1966) failed to prove the superiority of nursery grown transplants over nursery seedlings to similar size. The transplants had more compact and denser root systems, were easier to plant and had a slightly higher survival rate. Seedling stock of the same age was larger and, after out-planting, had better height growth. It was expected that root pruning would combine the advantages of both types of stock; that it would produce dense and compact root systems without costly transplanting in the nursery, and that the growth check resulting from being transplanted twice in two consecutive years would be reduced.

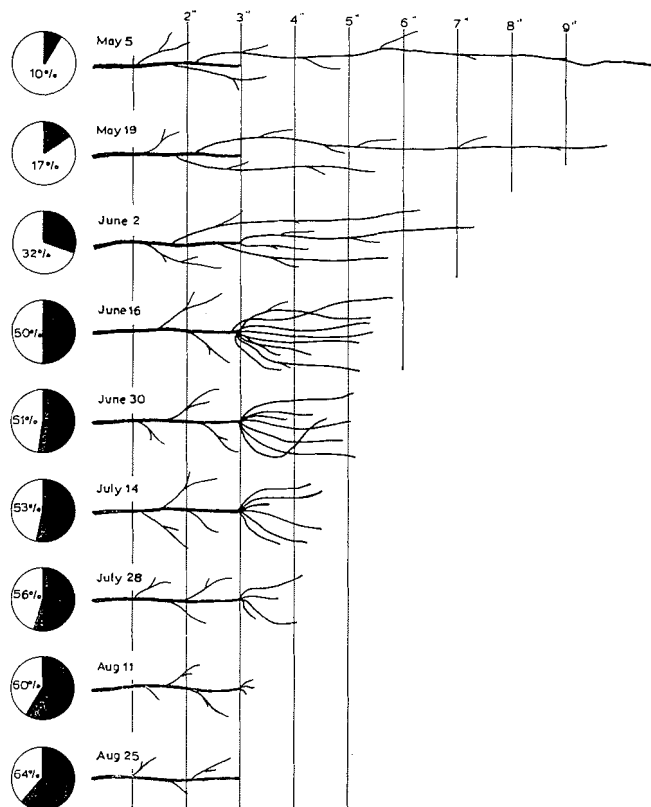
In the spring of 1967 an experiment was conducted in the British Columbia Forest Service nursery at Duncan to study (a) the effect of root pruning on the growth of seedlings, (b) the regeneration and growth of severed roots during the remainder of the growing season, (c) the time of the year when root pruning should be done for best results, (d) whether the root pruning could be performed simultaneously on both sides of the row or only one side at a time, and (e) the optimal time lapse between pruning of alternate sides.

Douglas-fir 1-0 seedlings, drill-sown in rows 7 inches apart, on soil described as Koksilah sandy loam (Fyles, 1955), were bottom pruned the last week in April at a depth of 6 inches. Each week from April 29 to September 8, approximately 50 seedlings were side pruned on both sides and 150 on one side only. The latter were pruned on the other side, in groups of 50, at subsequent intervals of two, four and six weeks. A sharp rectangular spade was driven vertically between the rows to a depth of about 9 inches. All seedlings were lifted on October 16 and measured in the following three days.

## Results

The development of the roots of seedlings growing in rows was generally bilateral with fewer roots extending along the row than perpendicular to it. The pruning of the roots between rows did not significantly affect the height growth of seedlings regardless of the time of year it was done or whether the roots were pruned on one side only or on both sides simultaneously; but the timing of root pruning greatly influenced the root regeneration.

Lateral roots of one-year-old Douglas-fir seedlings have an average length of 2-3 inches. In early May side pruning the roots 3½ inches from the rows affected only 10% of the trees. However, the growth was rapid in spring and the proportion of seedlings which had their roots cut rapidly increased. By mid-June about 50% of seedlings were affected by two-side pruning. At that time the root growth appeared to slow down, and until the end of July there was a period of relative inactivity in root growth (Fig. 1).



**Figure 1.** Percentage of root pruned seedlings at shown dates and regeneration of the lateral roots by the end of the growing season.

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The roots appeared to elongate again in August, but this elongation lacked the vigor of the spring growth. Although the proportion of root pruned seedlings steadily increased, on September 8, when the last root pruning was done, 33% of the seedlings still had not extended their lateral roots beyond 3½ inches.

After spring pruning, the formation of new roots was poor, but the growth of remaining roots was greatly stimulated. Usually one of two existing root branches originating back from the severed tip started to grow rapidly, and by fall were as much as 12 inches long. Seedlings pruned in June and July formed new roots near the point of severance. Optimal development of new roots resulted from pruning from June 9-23; at that time an average of 8 new unbranched roots were formed around each cut. Regeneration of the roots declined from the beginning of July, and was almost non-existent on roots pruned later than mid-August.

Side pruning in May appears ineffective, whereas bottom pruning in spring stimulates the growth of lateral roots and prevents the regeneration of the tap root. Bottom pruning at the depth of 6 inches leaves a rather long tap root, and the depth could be reduced to about 5 inches.

Seedlings with poorly developed root systems responded better to root pruning and replaced the severed roots more abundantly than those with good root systems. Seedlings pruned on both sides simultaneously developed better root systems than the ones pruned on one side at a time. Pruning in two-week intervals produced better root systems than pruning in four- or six-week intervals; the latter frequently resulted in unilateral root development on the side pruned first.

A sharp pruning blade produced a clean cut and favored development of new rootlets; cutting should be accomplished by a sliding motion, rather than by pressure. The beds should not be watered for several days before root pruning. In wet soil, the pressure of the blade loosens the root ends and pushes them downward without cutting.

In addition to producing dense and compact root systems, side pruning is effective in separating the rows. It also prevents the tangling of roots between rows and reduces damage during lifting. When the seedlings were lifted in the fall, the soil naturally opened only the cuts. The soil in the cuts remained porous and the new roots usually spread in the cut, without penetrating the more compact sides.

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