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ABSTRACT

Twelve red maple sprout clump stump/root systems were excavated and dissected at Acadia Forest Experiment Station, New Brunswick. Sprouts of all six 10-year age-classes sampled (0-70) were supported by both younger (newer) and healthy, vigorous older roots from previous generations. A large mass of decaying stump and root wood was a hindrance to healthy resprouting. Thinning is recommended. At least three successive generations of stump sprouts can thrive on the same regenerating root system.

RESUME

Douze cépées de rejets de souche/racine d'érable rouge ont été extraites du sol et disséquées à la Station d'expérimentation forestière d'Acadia, au Nouveau-Brunswick. Les rejets de toutes les classes d'âge de 10 ans échantillonnées (0-70) étaient supportés par des racines plus jeunes (nouvelles) et saines ainsi que des racines vigoureuses plus vieilles provenant de générations antérieures. L'étude démontre qu'une prépondérance de pourriture sur la souche et le bois des racines entrave la production de nouveaux rejets vigoureux. On recommande d'éclaircir. Au moins trois générations successives de rejets de souches peuvent facilement se dévélopper sur le même système régénérateur de racine.

INTRODUCTION

Red maple (Acer rubrum L.) is the most abundant hardwood tree species in New Brunswick and Nova Scotia (Lees 1978). It accounts for 40.2 million m^3 (1,420 million cu ft) of wood volume (more than 10 cm (4 in) dbh) in New Brunswick and 31.6 million m^3 (1,115 million cu ft) in Nova Scotia. The wood is useful for manufacturing boards, boxes, pallets, mine-packs, railroad ties, traps and barrels, but is not preferred over sugar maple (Acer saccharum, L.). It is acceptable as stock for bleached kraft pulp and flakeboard, and as frame stock for upholstered furniture.

Because of a history of land clearing, wildfire, and contemporary clearcutting, much of the red maple in the Maritime Provinces is of stump sprout or root sucker origin. But it is also a prolific seeder and is thus a significant component of seedling regeneration on the margins of clearcuts, and under partially cut stands. It is a common inhabitant of imperfectly drained heavily vegetated sites where stump sprouting may be an advantage over seedling regeneration. However, there is doubt that repeated sprout culture over shorter and shorter rotations can maintain acceptable growth rates, stem form, and wood quality. Tatler (1973) suggests that sprout red maple can be thinned to minimize defects in identified crop stems by: (1) selecting only sprouts with small, well-healed branch stubs; (2) rejecting sprout clumps with extremely defective bases; and (3) leaving one or two dominant sprouts in each clump.

Decay of sprout red maple does not pass through the stump base from one sprout to another (Shigo 1965), probably because of incompatibility of decay organisms in stump and shoot.[1] Processes by which decays are compartmentalized and may be stopped by a barrier zone are described for hybrid poplar by Eckstein et al. (1979) and for red pine by Tippett and Shigo (1980). These are also active in the red maple sampled in this study.[2]

SPROUTING STUDY

The pattern of resprouting and the fate of sprout stems were examined at Acadia Forest Experiment Station (AFES) near Fredericton, New Brunswick. Fires, and fuelwood cutting by internees at the Station during World War II, have given rise to sprout stems of various ages. An example of red maple sprouting, excavated at AFES for display purposes in 1978, is shown in Fig. 1. Two, 55-year-old sprouts originating from fire in 1923 were cut in 1977, and resprouted immediately to produce many stems.

In 1979, two red maple stump sprout clumps in each of 6, 10-year age classes from 0-70 were located. The stems were cut back to about 1 m high with a chain saw, the stump/root system was pushed out of the ground with a D6C bulldozer, and forwarded to roadside with a front-end loader and bucket. After being washed with a fire-pump and hose, the samples were moved indoors and dissected using an electric chain saw. These procedures are shown in Figs. 2-6.

Ages of stump sprouts and about 6-10 healthy sustaining roots were determined. It was soon apparent that the new sprouts had:

1) adopted certain existing roots immediately;

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[1] Pers. comm. R.E. Wall, pathologist, Maritimes Forest Research Centre, Can. For. Serv. 1980.

[2] Pers. comm. J.T. Tippett, pathologist, Northeast Forest Experiment Station USDA, 1980.

2) discarded certain degrading roots entirely;
3) enclosed certain degrading shoot and root stubs; and
4) sent out new roots into,
   a) the surrounding soil, and
   b) the decaying old stemwood found in the centre of the original sprout clump, which included well humified litterfall.

Where new sprout and root regrowth was begun without delay the previous stump and root wood decayed most quickly and, without careful dissection, was often difficult to find in 20-40-year-old material. The presence of a large mass of partially decayed stump and root wood appeared to hinder the adoption of old roots, and the successful establishment of healthy new sprouts and roots. The many examples of root grafting which were found indicate a high level of competition among sprout roots. The drop-out rate of new sprouts because of competition is high (from >50 down to 3-5 per stump, within 30-50 years).

Mean sprout and mean and maximum root ages for each sample clump are shown in Fig. 7. There is no apparent correlation between shoot age and root age. Shoots, which developed after disturbance by fire or cutting, are supported by both old and new roots. If the shoots were about the same age as the roots, the regression would approximate the 45° line as indicated. However, 50-60-year-old stems were commonly found on root wood twice as old. Figures 8-10 show the distinct tidemark or barrier zone of compartmentalization of decay in root and stemwood. Figures 11 and 12 show the quantity of rocks commonly included in the wood of such stump/root systems as they occur on the outwash gravels at Acadia Forest Experiment Station.

CONCLUSION

It is thus concluded for red maple on these imperfectly drained tills that;

1) at least three generations of stump sprouts can thrive on the same regenerating root system,

2) sprouts do not necessarily establish a root system independent of the existing roots at any particular stage in the rotation,

3) sprout wood is healthy and of acceptable quality,

4) the closer the sprouts approach single stem characteristics, the better the stem form; thinning will accomplish this,

5) an extensive mass of decaying stump/root wood is a barrier to healthy sprouting.

This study substantiates the work of Shigo (1965), Bjorkbom (1972), Tatler (1973), Wendel (1975), and Lamson (1976). Coppice systems of silviculture may be appropriate for red maple in the production of traditional hardwood forest products. Thinnings provide fuelwood. Further study of sprouting responses is needed if shorter (30-year) rotations for fibre production are proposed. These may approximate the repeated 12-18 year coppice rotations in oak, ash, beech, and chestnut common in 18th century Europe. Such practices led to root degradation, to low shoot vigour, and of necessity, to the development of the coppice-with-standards system which allows periodic replacement of old sprout/root systems with new seedling regeneration.

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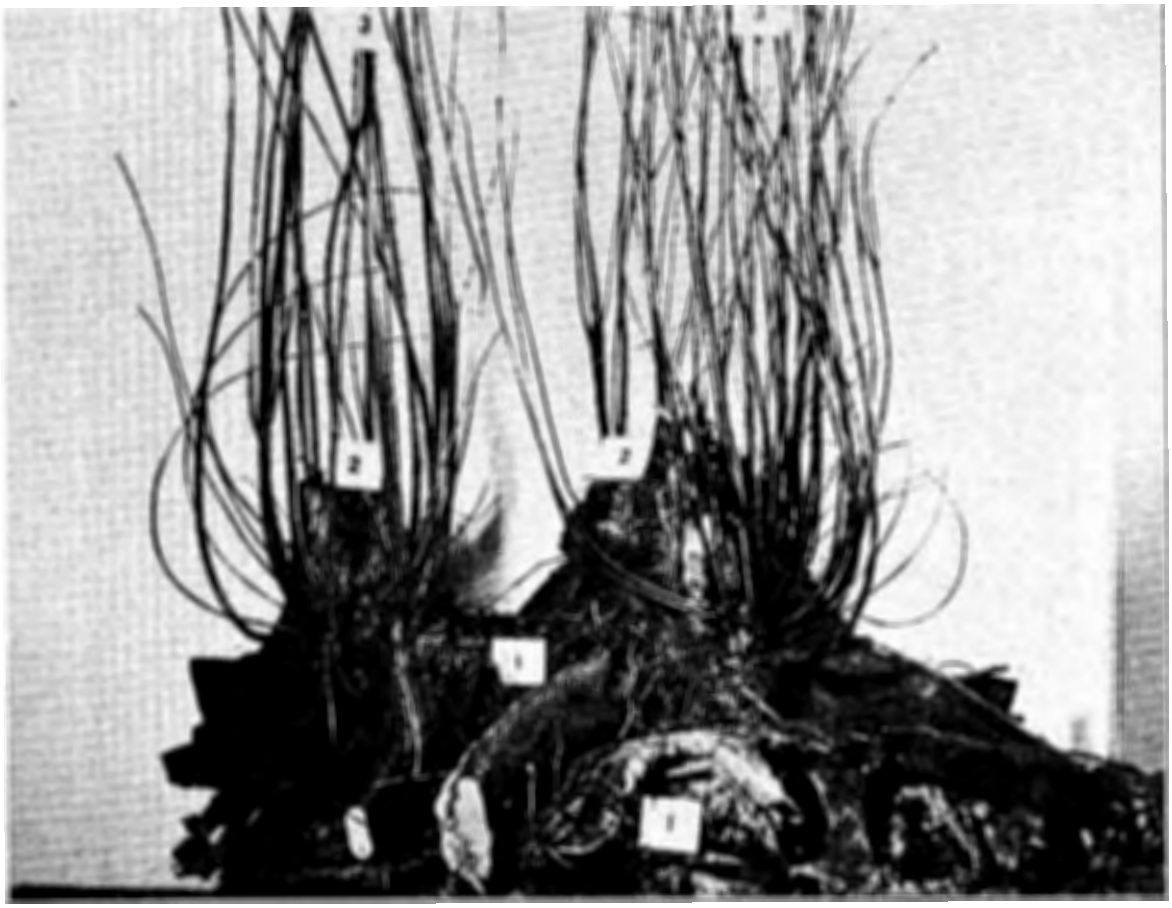

Fig. 1. A sprout clump, including sprout and root wood from three generations.

Fig. 2.
An excavated sprout clump ready for loading.

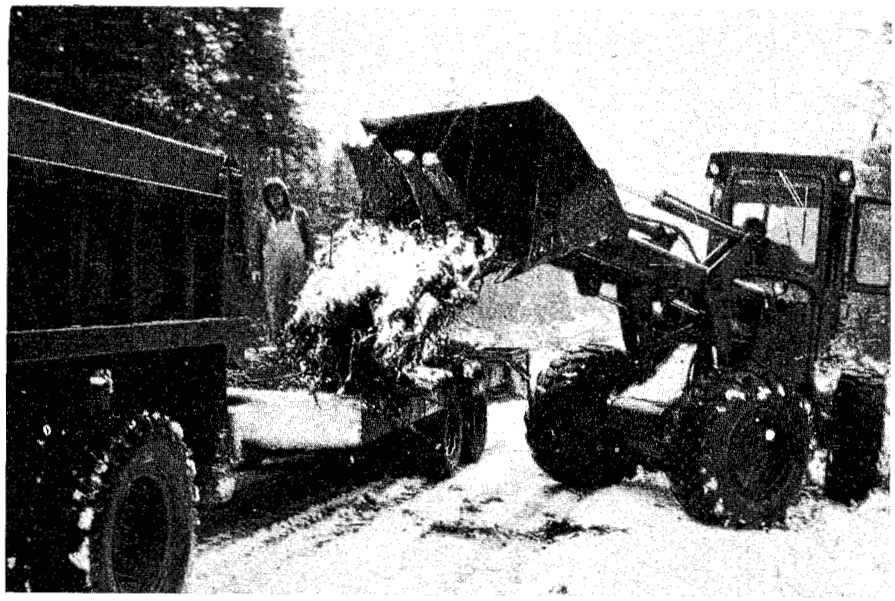

Fig. 3. Loading.

Fig. 4.
The sprout clumps assembl for washing.

Fig. 5.
A washed root system.

Fig. 6.
A dissected root system.

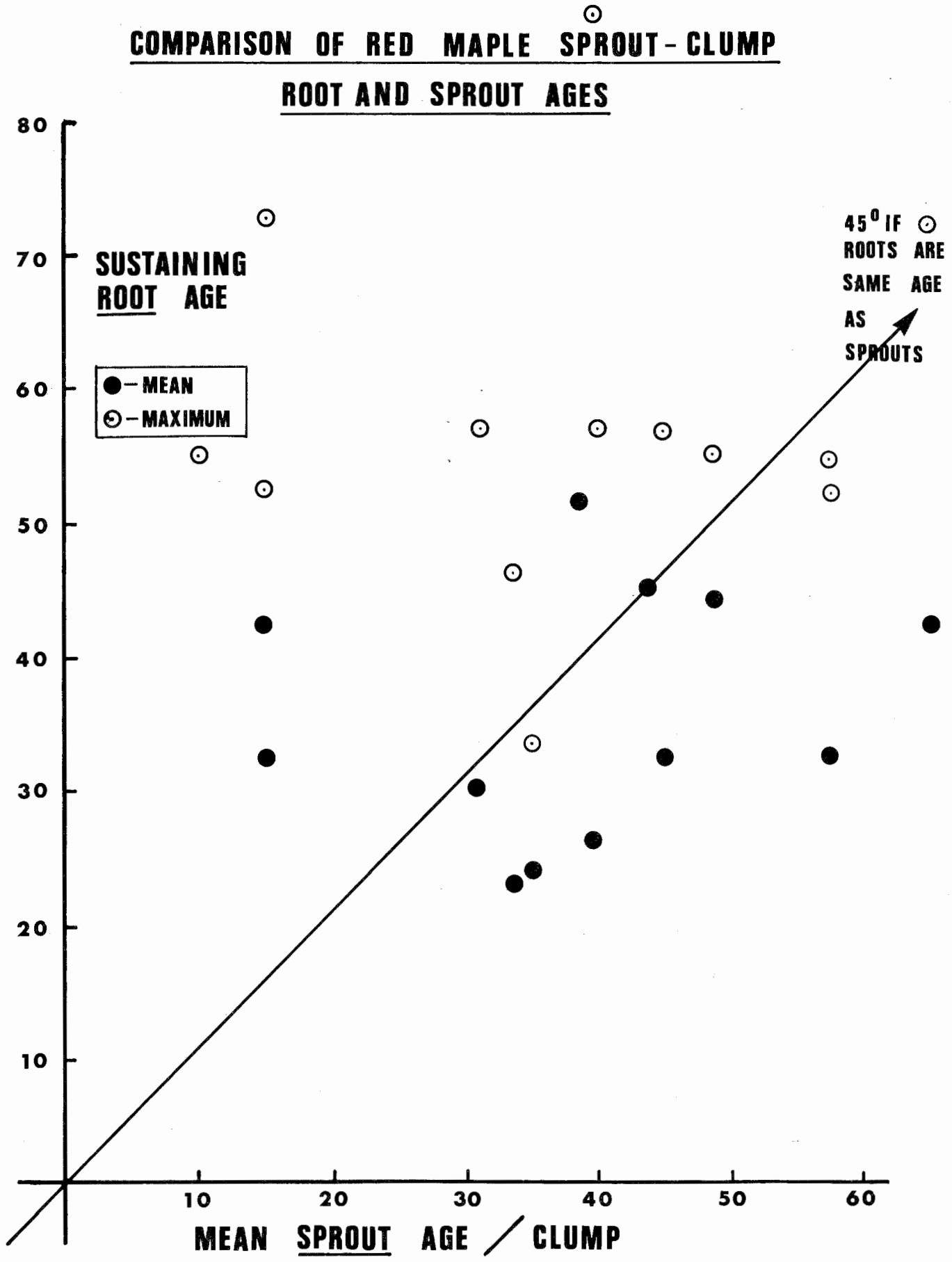

Fig. 7. The relationship between sprout and root ages.

Fig. 8.
Original (decayed) and fresh stump/root wood.

Fig. 9.
Decay effectively compartmentalized.

Fig. 10.
Old (decayed) root wood included in new tissue.

Fig. 11.
Rock included in the root wood.

Fig. 12.
Rocks removed from one cross section.