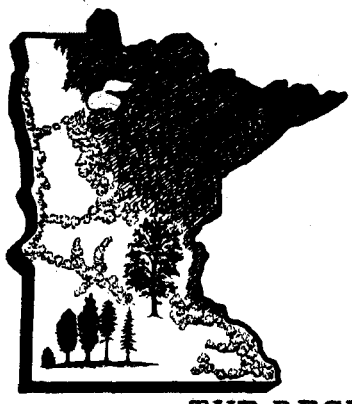

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THE REGENERATION OF ASPEN BY SUCKERING

Dixon Sandberg and Arthur E. Schneider (1)

Though seeding by aspen (Populus tremuloides Michx.) has undoubtedly been important in the spread of the species in northern Minnesota, suckering (sprouting from adventitious buds on the roots) is the chief means by which this important pulpwood tree reproduces. This regeneration process of aspen was the subject of investigation by the senior author under the 1950-51 Kimberly-Clark Corporation Graduate Research Fellowship in Forestry. The major findings of this study follow.

Aspen has a widely spreading and very shallow root system. Most of the well-developed lateral roots originate at the root collar of the parent tree and extend radially outward, growing generally parallel to minor contours of the ground surface. These roots taper abruptly down to a relatively small diameter, less than 1 inch, and then extend for varying greater distances with a very gradual reduction in diameter. The main lateral roots do not branch appreciably.

Aspen roots have a tremendous capacity to produce suckers. This capacity is markedly stimulated by severing the root from the parent tree or cutting the parent stem. There were no apparent anatomical characteristics or individual properties such as age, diameter or position of the root in the system, which prohibit or markedly inhibit suckering. In the areas studied suckers occurred most frequently on roots 0.3 to 0.7 inch in diameter. Most of the typical aspen root system falls within this range.

Suckers usually originate on portions of the root very close to the ground surface. Small increases in root depth appear to inhibit suckering. Root suckers originate in the region of the pericycle, near the cambium of the root bark. Though dormant (old, living) sucker buds may be present and locally numerous on a root, in laboratory tests 95 per cent of 174 successful suckers originated from buds formed in the same season. Suckers originating from new buds grew more vigorously in greenhouse tests than those arising from dormant buds stimulated to renewed growth. It was concluded that most suckers are formed and the aerial stem produced in the same growing season.

In the very early stages of growth the procambial strand of suckers was found to link (by cell differentiation) with the main cambium of the parent root. Although it appeared that secondary growth of the stem did not start until this cambial link was complete, extremely rapid primary growth of the sucker stem and leaves took place prior to that time.

New roots may originate from a parent aspen root or from the base of a new sucker stem. New roots from the parent root close to a sucker are re-activated dormant rootlets, originally formed in the primary stage of parent root growth. Roots originating from the base of new sucker stems are true adventitious roots.

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(1) *Former graduate student and Associate Professor, respectively, University of Minnesota School of Forestry.*

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Though most suckers were found to originate on roots 0.3 to 0.7 inch in diameter, they were observed on the root systems of felled aspen all the way from the parent stump to branch lateral roots less than a year old. Practically all suckering was found to occur on roots within the upper 3 inches of the ground surface and about 60 per cent within the upper 1 inch. There was some evidence that smaller roots can sucker from greater depth. The points of sucker origin were predominantly in the soil humus and in the extreme upper part of the mineral soil.

Suckers frequently originated in groups from a single localized area less than 2 or 3 inches in length on the root, but 1 or 2 of the new stems usually dominated. After 5 years of growth it was observed that sucker groups disappear almost entirely and that a single stem survives.

Individual suckers tend to develop independently and in many cases become separated from the parent root system of a felled tree in the early years of growth. This separation is effected by decay of the parent root. Suckers may rely on the parent root for the initial period during which the stem and new roots become established and may assimilate part of the parent root, especially the portion outward from the new stem, into their individual systems. Other portions of the parent root appeared to have no function in support of root suckers after the first 2 or 3 years of their existence.

In greenhouse tests it was found that suckers will originate, grow rapidly, and stimulate new root growth on 10-inch root cuttings from live aspen trees. Further laboratory work showed that reduction of light intensity on the soil surface where soil temperatures were the same did not appear to inhibit the formation of suckers on aspen root cuttings. Suckering was abundant in 50 per cent of full light, 25 per cent of full light, and under no direct light, as well as in full light.

Reductions in light intensity apparently do affect the successful very early growth of suckers. Increased light intensity stimulated the development of new roots from the parent root and from the base of new suckers and resulted in a more even rate of height growth and more rapid, firm secondary growth of sucker stems than occurred under reduced light intensities. Decreasing the light intensity inhibited new root development and vigorous, steady stem growth. Similarly, a study of ingrowth and rate of height growth of suckers in a cutover area indicated that both were more rapid and continued longer on exposed, bare sites than under partial shade.

In addition to the above detailed study of the suckering phenomenon, commercially cutover aspen areas investigated and analyzed in the vicinity of Cloquet, Cass Lake and Orr, Minnesota, were the basis for the following conclusions: (1) Suckering was most prolific where the total original stand basal area was relatively high (80 sq.ft. or more), where all or most of the aspen was cut and where few trees of any species were left after cutting. (2) Site quality and age of cut aspen had no apparent effect on sucker abundance 2 years after logging. (3) The number of suckers present on cutover areas 2 years after logging was practically the same for both winter-cut and summer-cut stands. (4) Most suckers originate during the first growing season following logging. (5) Maintenance of good stand density throughout the rotation to minimize invasion by herbaceous growth, brush and other tree species, and thorough clearcutting of all species favors abundant aspen root suckering and a thriftier selection of new stems.

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