michigan Forestry

No. 23
March, 1962

DEPARTMENT OF FORESTRY SCHOOL OF NATURAL RESOURCES UNIVERSITY OF MICHIGAN ANN ARBOR

DEPTH AND DIAMETER OF THE PARENT ROOTS OF ASPEN ROOT SUCKERS

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Studies of the Populus tremuloides root system by Day (1944), Sandberg (1951) and Barnes (1959) have all shown lateral roots extending as much as 30 feet from tree base. These roots may branch extensively and sometimes exhibit an "undulating" growth habit. According to the above authors, suckers occur on the segments of these lateral roots which are closest to the soil surface. The objective of this investigation was to quantitatively determine root depth and diameter at the point where suckering occurs. Both trembling aspen (P. tremuloides) and bigtooth aspen (P. grandidentata) were studied.

METHODS

Bigtooth and trembling aspen root suckers were excavated and examined during their first growing season on three sites near The University of Michigan Biological Station, Pellston, Michigan. Parent root diameter was measured to the nearest 0.1 inch, and parent root depth to the nearest 0.5 inch.

Site No. 1, where 134 P. grandidentata suckers were examined, is located on the middle slope of a glacial outwash area. Site No. 2 is immediately below Site No. 1 on old lake bed material, the difference in elevation being about 50 to 75 feet. A swampy area lies adjacent to this second and lower site where 156 P. tremuloides suckers were measured. The soil on the outwash site is classified as Kalkaska gravelly sandy loam and that on Site No. 2 as Saugatuck sand (Foster, 1939). The aspen on both areas had been clear-cut 1 year prior to the study.

On Site No. 3, a total of 631 suckers from 3 clones each of P. grandidentata and P. tremuloides were excavated. This site is a gently rolling plateau immediately south of Douglas Lake, Michigan. The soil here is classified as Rubicon sand (Foster, 1939), and the vegetation consists of scattered quaking and bigtooth aspen clones separated by open areas. P. grandidentata (mean d.b.h., 5.1 inches) exhibited better growth on this dry site than P. tremuloides (mean d.b.h., 3.6). The suckers examined on Site No. 3 had developed followint the clear-cutting of selected clones.

RESULTS AND CONCLUSIONS

Table 1 summarizes the results of the investigation; distribution of the data is shown in figures 1 and 2. The following conclusions can be drawn on the basis of the findings:

(1) On Site No. 3, where both species were studied together, roots of P. tremuloides which suckered were smaller in diameter than those of P. grandidentata. But P. tremuloides suckers on the more moist Site No. 1 had the same mean parent-root diameter as P. grandidentata suckers on both Sites 2 and 3. This difference in P. tremuloides parent-root diameter is interpreted as being due to dissimilar site conditions.

(2) Clonal differences in parent-root depth were statistically significant in P. grandidentata on Site No. 3, as were differences between root diameter in Clone F and the other bigtooth clones. (Analysis of variance was used as a statistical test.) Parent-root diameter in Clone 19 was significantly smaller than in the other quaking aspen clones, but clonal differences in root depth were not significant. These clonal differences, exhibited on a fairly uniform site, are indicative of genetic variation in rooting habit.

(3) P. tremuloides roots suckered nearer the soil surface than those of P. grandidentata, and very few of the quaking aspen roots suckered below 1 inch in depth. However, this difference in species response is at least partly due to the fact that bigtooth aspen roots were deeper than those of quaking aspen on the sites studied. ~~A fairly even distribution of~~

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~~quaking aspen on the sites studied~~. A fairly even distribution of bigtooth suckering between depths of 0.5 and 3.0 inches indicates that roots of this species probably occupy the total "A" horizon more completely than lateral roots of quaking aspen. Such a species difference in root distribution may be of ecological significance on dry sites where the upper portion of the "A" horizon often has a low moisture content. On such sites it would seem that bigtooth aspen with its deeper lateral roots would have considerable advantage over quaking aspen during the dryer part of the growing season. This advantage may account for part of the species difference in growth rate exhibited on Site No. 3 and other similar sites in northern Michigan.

LITERATURE CITED

Barnes, B. V. 1959. Natural variation and clonal development of Populus tremuloides and P. grandidentata in northern lower Michigan. Unpublished doctoral dissertation, The University of Michigan.

Day, M. W. 1944. The root system of the aspen. Amer. Mid. Nat. 32: 502-509.

Foster, Z. C. 1939. Soil Survey: Cheboygan County, Michigan. U.S.D.A., Bureau of Chemistry and Soils.

Sandberg, D. 1951. The regeneration of quaking aspen by root suckers. Unpublished masters thesis. University of Minnesota.

TABLE 1
Occurrence of aspen suckers in relation to root depth and root diameter

Species		Mean depth of parent root (Inches)	Mean diameter of parent roots (Inches)	Basis (No. suckers measured)
		Site No. 1		
P. tremuloides		0.8	0.4	156
		Site No. 2		
P. grandidentata		1.7	.4	134
		Site No. 3		
P. tremullides				
Clone 24		.7	.3	65
Clone 19		.5	.1	142
Clone 23		.6	.3	117
	Mean	0.6	0.2	
P. grandidentata				
Clone 20		2.6	.4	105
Clone C		2.1	.4	105
Clone F		1.7	.5	97
	Mean	2.1	0.4	

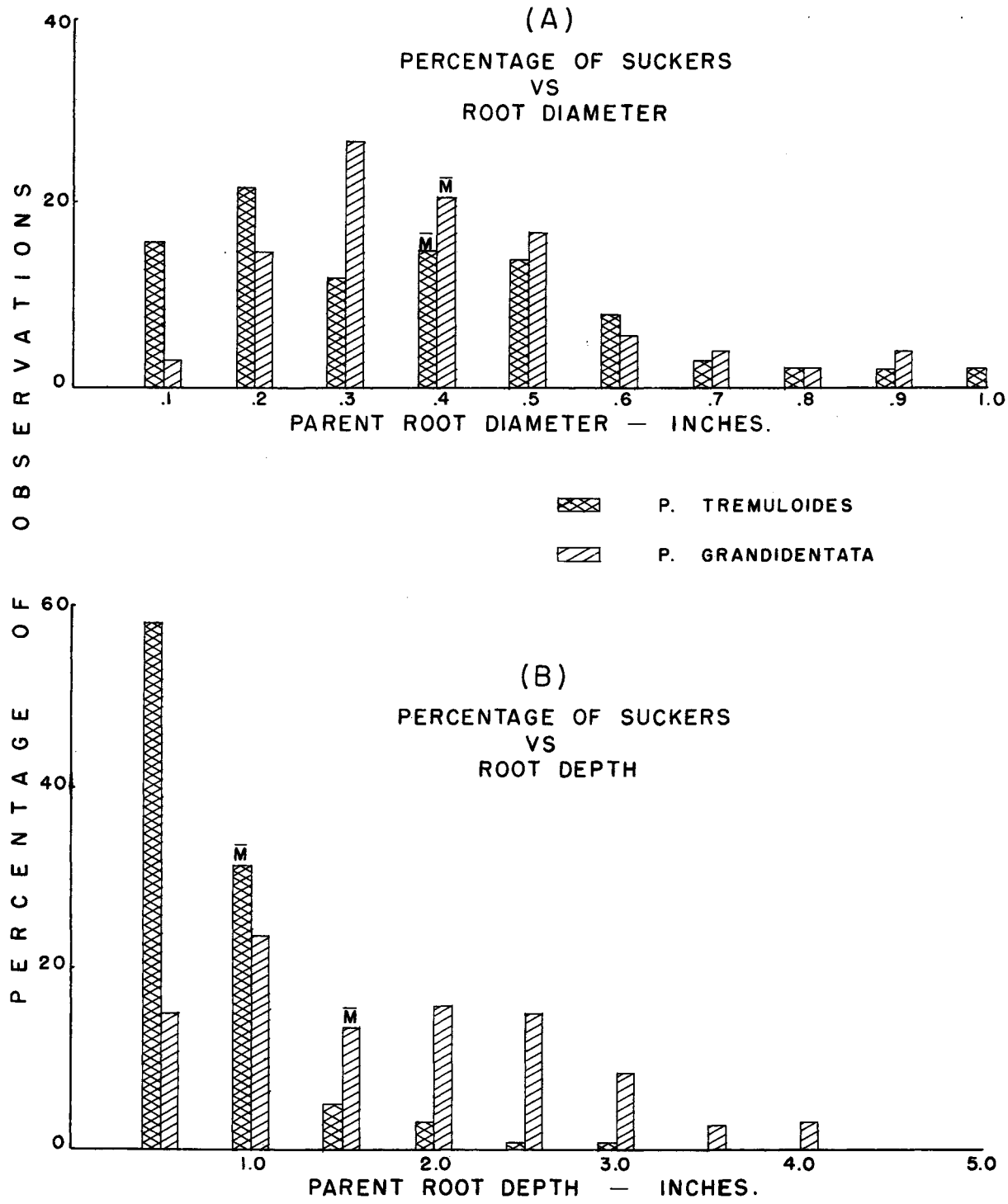

Figure 1.1. Frequency distribution of root suckers on Sites No. 1 and 2 plotted in relation to parent root diameter (A) and depth (B).

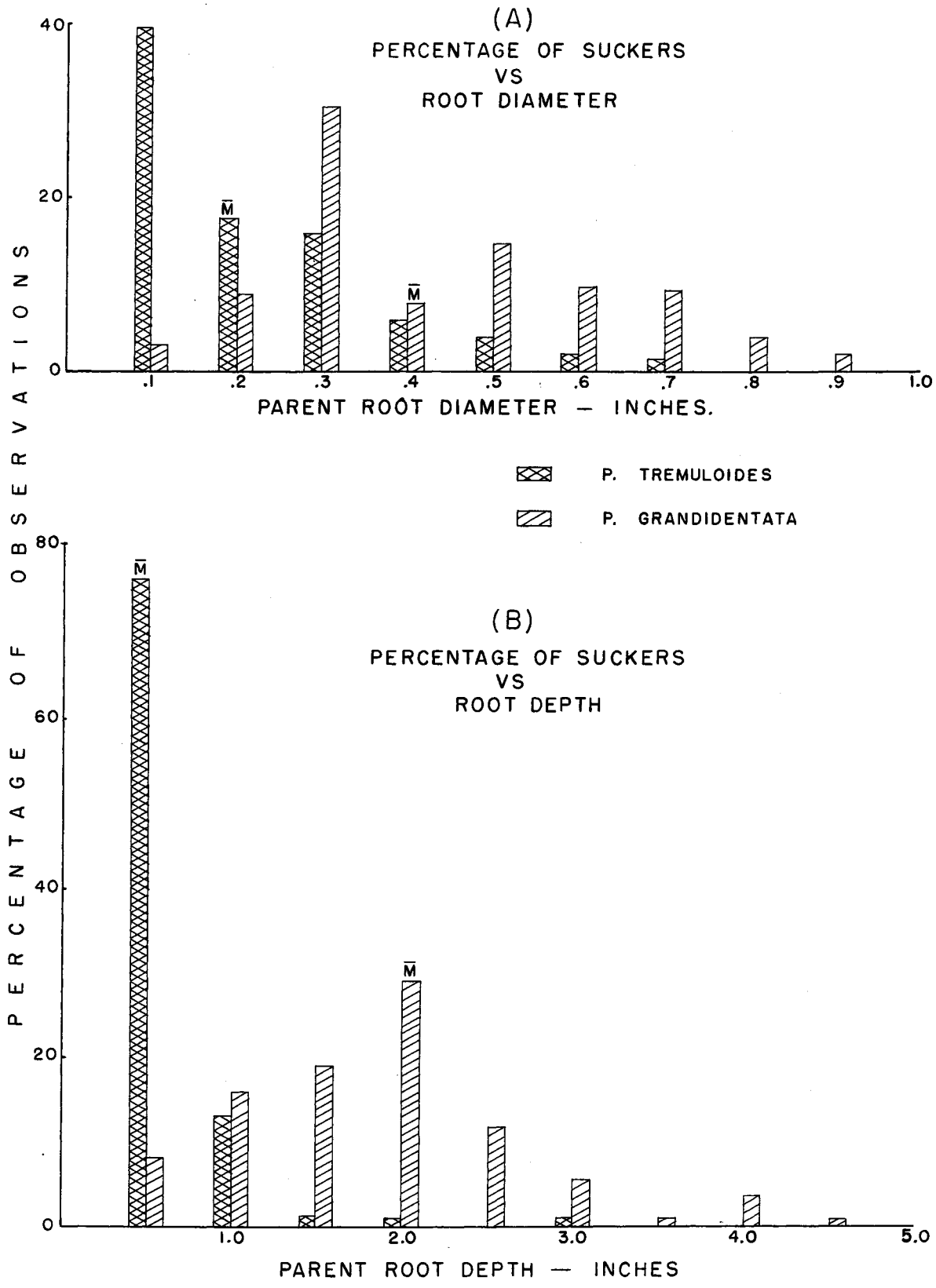

Figure 1.2. Frequency distribution of root suckers on Site No. 3 plotted in relation to parent root diameter (A) and depth (B).