SEEDERS: CONIFER, HARDWOOD, BAND, AND BROADCAST

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The subject of seeders has been largely overlooked **in** past discussions at nurserymen's conferences. Possibly one reason is, on the surface, it appears to be quite elementary. Often dispersal of seeds has been left solely to the attention of the foreman who has little time to make improvements or to follow up the results. However, it seems unlikely that a lengthy discussion of basic seeding procedures is justified here. In preparing'this report, no effort was made to engage in correspondence with other nurserymen in regard to new methods and innovations which they have developed. It seems that this meeting should be used by the membership to announce successful developments.

For the benefit of a new nurseryman, it is suggested that he study the following references for information and design of forest tree seeders:

1. Planting the Southern Pines by P. C. Wakeley.

2. Forest Nursery Practice in the Lake States by J. H. Stoeckeler and G. W. Jones.

3. Forestry Equipment Notes A.21.60 - Methods and Machines Used in North American Nurseries by the Food and Agricultural Organization of the United Nations, May 1960. Reprinted from Unasylva, Vol. 14.

4. Tree Planters' Notes by U. S. Forest Service.

After reviewing the above literature, he must decide for himself whether sowing seeds broadcast, narrow drills at 6-inch centers, or 4-inch bands at 6-inch centers would best suit his purpose.

During my years as a nurseryman, I have used the old trailing-type Hazard Seeder, Planet Jr. Seeder, Whitfield Seeder with three point hitch, and the Gandy Broadcast Spreader-Seeder for sowing southern pine seed, except longleaf pine. Each model has its advantages. Large quantities of sweetgum seed have been successfully sown with the Whitfield Seeder. With a little encouragement, sycamore seed may be roughly scattered with the Planet Jr. Seeder by omitting the seed hole plate under the agitator wheel. Many hardwood seeds must still be sown by hand in mechanically formed furrows. Even the occasional use of the old "Bateman" seeding trough is necessary in the modern nursery where very small lots of progeny test seedlings are to be grown.

The best of the seeders currently is use may be calibrated to sow slash, loblolly, and shortleaf pine seeds to an accuracy of plus or minus one-tenth-pound per 400 square feet of bed space without difficulty, when sowing by weight per unit area. To my opinion, the accurate sowing of seed per unit of bed space and the uniform dispersal of seeds on the unit area is important and such a seeder has been needed for a number of years. Thus, wide variations in the resulting seedlings obtained per square foot would be reduced by more uniform planting of seed.

If all individual seeds sown had ample growing space after germination, it is quite obvious that a substantial decrease in the percentage of cull and suppressed seedlings would be achieved. A mechanical seeder that can spread seed accurately, at a prescribed rate, as well as at a more precise spacing, would be advantageous to modern nursery practice for the following reasons:

1. Provide adequate growing space for a larger percentage of seeds sown and reduce the number of culls at shipping time.

2. Make the shipment of bed-run seedlings more feasible.

3. Increase accuracy in inventory counts and reduce the total number of samples necessary for the limits of accuracy desired.

4. Reduce shipping labor costs.

5. Increase the number of plantable seedlings produced per pound of seed used and thereby reduce seed costs.

6. Aid in the satisfactory use of mechanical lifting equipment.

Those nurserymen who have sown valuable seed orchard seeds by hand at a fairly accurate spacing on seedbeds have noticed the resulting uniformity in seedling size and the smaller proportion of culls.

For band sowing, it is possible that an attachment could be made and installed at each of the eight furrow opening plows which would divide the run of seed dropping from the hopper into three rows per 4-inch band. A precise spacing of 1-inch x 1½-inch rectangles, which is a practical spacing, could not be expected. However, definite improvement could be made to eliminate seeds from falling in groups or clumps and avoid open spaces on seedbeds with single or few seeds. A study of seedling inventory tally sheets will indicate the need for more accurate spacing. Variations in the number of seedlings per square foot have been experienced from 2• to 46 in a typical seed lot, yet the desired 35 seedlings per square foot average was obtained. At such extremes in density, it is clear that all the seedlings could not be of plantable grade.

It may be of interest to nurserymen that substantial improvements are being made in seeding machinery in other phases of agriculture. For instance, the John Deere Company has developed a plateless planter device which meters out unsorted seed with spring-loaded pick up fingers. Each finger rotates through a seed reservoir, then flips a single seed through a small porthole into a compartmented wheel, which, in turn, delivers the seed to the opener below. An extreme example in seeding technique improvement was recently devised by a plastics manufacturer. A plastic tape with vegetable seed implanted at the proper spacing is unrolled on the seedbed and lightly covered. After germination, the tape serves as a mulch which later disintegrates. Although these ideas are designed for row crop planting, they might be adapted to seeding in forest tree nurseries. It is hoped that some type of mechanical precision seeding equipment will soon be developed that will satisfy forest nursery requirements.

The following five tables give data prepared from recent records at Hauss Nursery.

Table 1.--Degree of field sowing accuracy as obtained with the use of the Whitfield seeder [1/]

Species	Seed lot description	Seed size description	Computed sowing rate (per 400 sq. ft. bed)	Actual sowing rate (per 400 sq. foot bed)
			Pounds	Pounds
Slash	C.C.A.	large	1.9	1.7
Slash	T.R.M.	all	1.3	1.2
Slash	I.P. 3-112-271	all	1.4	1.3
Slash	Scott 1966	medium	1.5	1.4
Slash	Scott 1966	large	1.9	1.8
Slash	Scott 1967	all	1.5	1.5
Slash	Scott S.O.	medium	1.7	1.7
Slash	I.P. 4-111-271	all	1.1	1.1
Slash	Ala. 1967	medium	1.4	1.4
Slash	I.P. 3-111-271	all	1.8	1.7
Loblolly	A.C.C. ASAL-5	medium	1.1	1.1
Loblolly	T.R.M.	small	0.9	0.84
Loblolly	T.R.M.	medium	1.2	1.14
Loblolly	T.R.M.	large	1.7	1.7
Loblolly	Ala. S.Z.67	medium	.95	.98
Loblolly	Ala. S.Z.67	small	.9	.9
Loblolly	Ala. S.Z.67	large	1.6	1.6
Loblolly	C.C.A. X66-L	large	1.3	1.2
Loblolly	C.C.A. X66-L	medium	.98	.97
Loblolly	I.P. 4-790-121	medium & large	1.4	1.4

1/ Twenty (20) typical seed lots - spring 1968.

Table 2.--Variation in seedbed density obtained with Whitfield seeder (slash and loblolly pine lots)

Seedling density per sq. ft. (July 1, 1968)	Seedlings (M) in the various lots (Density goal of 35 seedlings per sq. ft.)	Total seedlings (M)
	Number	Number
26.0 - 26.9	(456)	456
27.0 - 27.9		
28.0 - 28.9	(233)	233
29.0 - 29.9	(308)	308
30.0 - 30.9		
31.0 - 31.9	(804)	804
32.0 - 32.9	(462) (282) (3,235) (522) (1,092) (1,034) (181) (1,498)	8,306
33.0 - 33.9	(5,104) (1,931)	7,035
34.0 - 34.9	(3,563) (775) (2,484) (966) (443) (623)	8,854
35.0 - 35.9	(523) (1,074) (1,549)	3,146
36.o - 36.9	(497) (609)	1,106
37.0 - 37.9	(517)	517
38.0 - 38.9		
39.0 - 39.9		
40.0 - 40.9	(951)	951
41.0 - 41.9	(632)	632
26.0 - 29.9		997
31.0 - 37.9		29,768
38.0 - 41.9		1,583

Note: Factors other than the capability of the seeder affected the above densities, such as non-existent or unreliable germination data caused by improper sampling. Above figures were at Hauss Nursery, 1968.

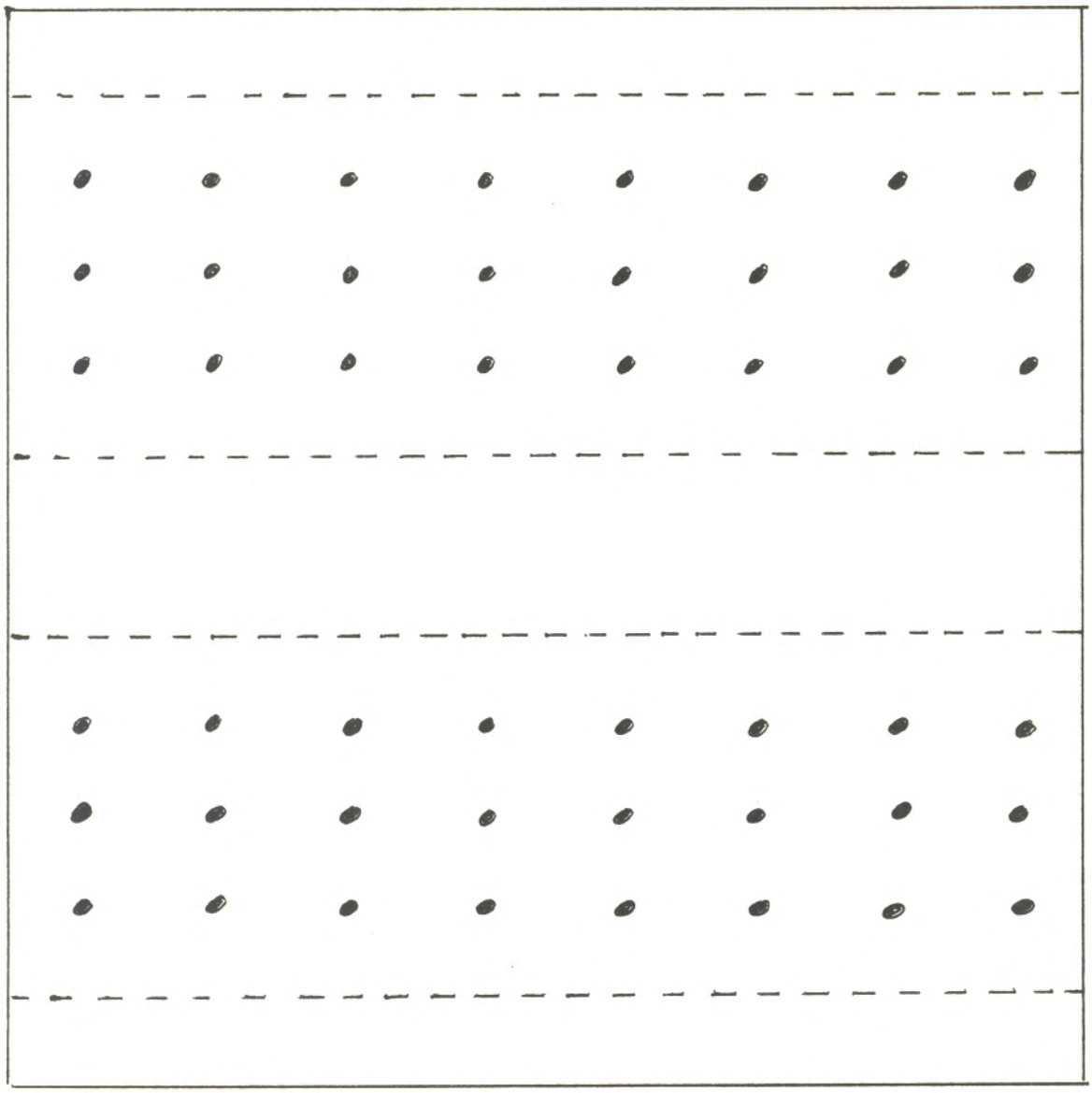
Table 3.--Average seedling density obtained and the extremes of density as per inventory tally [1/]

Species	Lot	Seedling density goal	Calculated seeds required per sq. ft. (to obtain 35 seedlings)	Density obtained as per July inventory	Variation in density extremes	
					High	Low
			Number	Average		
Slash	Ala. 66(L)	35	46	32.0	46	16
Slash	Ala. 66(M)	35	66	41.6	59	23
Slash	Scott S.O. 67(L)	35	51	35.8	46	23
Slash	Scott S.O. 67(S)	35	60	32.4	48	19
Slash	C.C.A. (L)	35	47	35.6	49	24
Slash	Scott (L)	35	46	34.6	49	18
Slash	Scott (M)	35	45	36.5	50	20
Loblolly	Ala. S.Z. 67(M)	35	48	34.7	62	12
Loblolly	Ala. S.Z. 67(S)	35	56	31.4	53	10
Loblolly	Ala. S.Z. 67(L)	35	51	32.1	47	16

1/ Ten (10) typical seed lots - Hauss Nursery, 1968.

Table 4.--Theoretically ideal seed dispersal spacing for 10 typical pine seed lots sown in 1968 at Hauss Nursery

Species	Seed lot description	Seeds required per sq. ft. to obtain seedling density of 35	Seeds divided into two bands (6-inch centers with 3 rows each)	Seed spacing design (1-inch by:)
		Number	Number	
Slash	Ala. 66(L)	46	8	1.5
Slash	Ala. 66(M)	66	11	1.1
Slash	Scott S.O. 67(L)	51	9	1.3
Slash	Scott S. O. 67(S)	60	10	1.2
Slash	Scott (L)	46	8	1.5
Slash	Scott (M)	45	8	1.5
Slash	C.C.A. (L)	47	8	1.5
Loblolly	Ala. S.Z. 67(M)	48	8	1.5
Loblolly	Ala. S.Z. 67(S)	56	9	1.3
Loblolly	Ala. S.Z. 67(L)	51	9	1.3



Sketch showing theoretical seed dispersal design on one square foot for banding a typical pine seed lot at seed spacing 1-inch x 1-1/2 inches. Sowing rate is 48 seeds per square foot for desired living seedling density of 35 in December. Twenty-five to 30 plantable grade seedlings per square foot at lifting time.