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TREE PLANTERS' NOTES

A Publication for Nurserymen and Planters of Forests and Shelterbelts

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U. S. DEPARTMENT OF AGRICULTURE
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TREE PLANTERS' NOTES NO 8

Tree Seed

This issue of Tree Planters' Notes presents five articles on tree seed, a list of commercial dealers in forest tree seed and seedlings, and notice of the availability of a new publication on seed collection and storage. These items are:

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Copy attached:

Commercial Dealers in Forest Tree Seed and Seedlings

Available for the asking:

Storing Southern Pine Seed — Philip C. Wakeley
(U, S. F, S. Southern Forest Experiment Station, Occasional Paper 123)

This newly issued paper on the collection and storage of southern pine seeds will prove invaluable to anyone who handles tree seed, no matter in what part of the country he does his work . Although the paper is only 13 pages in length it is like the seed of which it treats -- a powerful, valuable force inside a small package. Copies can be obtained by writing the Experiment Station at 704 Lowich Building, 2026 St. Charles Avenue, New Orleans 13, Louisiana.

A PROOF THAT GEOGRAPHIC ORIGIN AFFECTS GROWTH

Philip C. Wakeley

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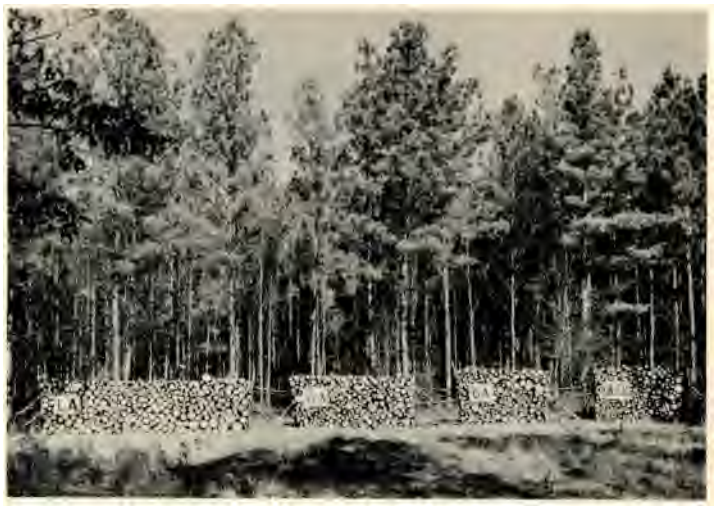
Loblolly pine plantations at Bogalusa, La., clearly show the benefits of using seed from local sources, at least for loblolly pine. In 22 years, trees from seed secured locally (Livingston Parish, 50 miles from Bogalusa) produced 41.8 cords of merchantable pulpwood per acre. Those from Montgomery County, Tex. , seed produced 22.7 cords; those from seed from Clarke County, Ga. , and Howard County, Ark. , 17.7, and 15.4 cords, respectively.

The climate at the Texas seed source is similar to that at Bogalusa, but drier. The Arkansas and Georgia seed sources have lower average temperatures and shorter growing seasons than Bogalusa. The seed from all four sources were shipped to Bogalusa in the cone, extracted and sown in a nursery there. In the winter of 1926-27, the 1-year-old seedlings were planted at 6 x 8' spacing.

In the winter of 1948-49, trees from Louisiana seed averaged 46' in height and 6.7" d.b.h. Those from Texas seed ran second best, 41' high and 5.2" d.b.h. Trees from Georgia seed averaged 38' high and 5.2" d.b.h . Those from Arkansas seed were 36' high and 4.7" d.b.h.

Survival was 82-84% for all except Georgia stock, which averaged 77%. The Georgia stock proved very susceptible to southern fusiform rust; 37% had stem cankers. Only 4-6% of the trees from other seed sources had such cankers.

Difference in height



Difference in volume

EFFECT OF GEOGRAPHIC SOURCE OF SEED

Seed source both pictures, L. to R. - La. (local); Texas; Georgia; Arkansas

NURSERY BEHAVIOR OF RED PINE STOCK OF DIFFERENT SEED ORIGINS

Paul O. Rudolf

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The importance of seed origin is becoming more widely recognized in American forestry. Since 1939 the U. S Department of Agriculture has had a seed policy which stressed this matter. Tree seed certification laws were enacted by the States of New York in 1939 and Georgia in 1941. In 1949 a group of West Coast forest industries set up their own tree seed certification rules.

Aside from these formal rules and regulations, a great many foresters have begun to believe in the need for growing trees from seed of good origin. As a result, forest nurserymen have had to segregate their seed and stock more closely than before.

This trend raises an important question for forest nurserymen. Is there any way in which they can distinguish seeds of different origin or stock grown from such seeds? To shed some light on this question, data from 28 sources of red pine (Pinus resinosa) were assembled (table 1). The sources were grouped into 8 seed-collecting regions and were compared on the basis of number of cleaned seeds per pound, germination in the laboratory and in the nursery, tree percent for 1-0 stock, and average weight of 1-0 seedlings.

There are broad indications of a relationship between region and seed size In general, the seed from the southern parts of the range of red pine (Brainerd-Cameron, central Wisconsin, Lower Michigan, and New England) is larger than that from more northerly areas. More data from the different collection regions, which have not yet been completely analyzed, might strengthen these trends, especially for those regions which are represented by only two or three observations.

Since there is also a distinct trend for larger seeds to produce larger 1-0 seedlings, there may seem to be some possibilities of distinguishing seed or stock from different collection zones. However, when the variation within collection regions is considered, it is obvious that assignment of any individual seed sample to a definite area on the basis of seed or seedling size would be very hazardous. Furthermore, neither laboratory germination, nursery germination, nor tree percent show any racial relationship. All showed considerable local variation within collecting regions.

Table 1.--Seed and stock characteristics of red pine from several seed origins[1/]

Seed collecting region	Sources	Cleaned seeds per pound	Germination		Tree percent 1-0 stock	Average dry weight 1-0 seedlings
			Laboratory	Nursery		
	Number	Number	Percent	Percent	Percent	Mg.
Brainerd-Cameron	2	47,250(45,600-48,900)	84(71-96)	66(54-78)	56(36-76)	46(42-51)
N. E. Minnesota	5	55,940(49,500-63,000)	68(42-92)	53(44-60)	42(34-50)	42(37-46)
Head-of-Lakes	5	55,040(51,400-59,500)	51(30-70)	50(24-62)	45(23-59)	43(32-59)
Northern Upper Peninsula, Mich.	2	61,200(59,800-62,600)	47(40-54)	54(51-56)	47(44-50)	38(31-44)
N. E. Wisconsin - Southern U.P. Mich.	5	54,520(52,400-57,200)	58(46-67)	53(44-59)	42(33-54)	52(47-55)
Central Wisconsin	4	46,625(40,400-49,560)	49(35-64)	52(25-67)	47(20-69)	55(46-69)
Lower Michigan	3	51,900(47,900-55,600)	55(24-72)	46(24-62)	31(19-58)	49(42-54)
New England	2	48,500(46,800-50,200)	75(70-80)	66(65-68)	51(50-52)	56(55-56)
Total	28	52,990(40,400-63,000)	59(24-96)	54(24-78)	44(19-76)	48(31-69)

1/ Stock was grown in the Cass Lake Nursery, Chippewa National Forest, Minnesota.
Figures in parentheses represent the range of values upon which the averages are based.

The results boil down to this. If a nurseryman has a lot of red pine seed, he cannot tell its origin from ocular or readily measurable characteristics. If the cleaned seed runs over 56,000 per pound, it probably is from the northern part of the range, and if it runs below 49,000 per pound, it probably is from the southern part of the range. Even these statements must be made as probable rather than absolute diagnoses. Similarly, if he has 1-0 seedlings which are larger than average, they may be from southern seed; if they are smaller than average, on the other hand, they may well be from northern seed. Specific sizes or weights would have to be worked out for individual nurseries.

This lack of good diagnostic characteristics of red pine seed or stock is not unusual. The same general condition has been found for Scotch pine in Europe, where this problem has been given a great deal of study in many countries. Physical, chemical, and physiological tests, while they have given some leads, all have failed to provide reliable bases for determining provenience, or origin, of seed or nursery stock.

The inevitable conclusion is that there is no substitute for seed certification. The nurseryman must have reliable evidence that the seed he obtains is from the locality named. (Seed of unknown source should not be used.) This may mean collection by his own agency, legal certification (where state laws are in effect), or purchase from known reliable collectors or dealers.

TREE SEED LAWS AND POLICY

Editor's note ---Tree Planters' Notes invites articles on laws, regulations, and. policies concerning seed origin and labeling from all localities and organizations which have such, even if they are not observed.

Extracts of the laws from Georgia and New York follow, The laws themselves are too long and ramified to be printed in their entirety here, but copies of. the complete law can be had by writing the State.

THE GEORGIA SEED LAW

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Georgia Forestry Commission, Atlanta

The Seed Law enacted by the General Assembly of Georgia in 1941 contained, among other things, a provision that each container of certain forest tree seeds as defined

by the Act (including longleaf pine, slash pine, loblolly pine and shortleaf pine), which is sold, offered for sale, or exposed for sale within this State for sowing purposes shall be labeled with the following information.

1. State and county origin
2. Name of collector
3. Date of collection including year and month
4. Technical generic and specific names in official use by the U. S. Department of Agriculture
5. Purity of seeds expressed as the percentage by weight of whole, normal seeds
6. Germination percentage

The effectiveness of the law can only be estimated as the market for forest tree seed is limited, the principal buyers being State organizations. During the past few years, because of the scarcity of seed and the greatly increased planting program, it was necessary to buy all seed available whether in strict conformance to the law or not. As far as is known to the writer, the only provisions that might not have been followed strictly in all cases were those pertaining to purity and germination percent.

NEW YORK STATE TREE SEED LAW

Section 140-b of Article 9, Agriculture & Markets Law

An amendment to the seed law was enacted covering tree and shrub seeds and became effective September 1, 1939 (Laws of 1939, Ch. 527). This amendment is designed to protect the buyer in this State against certain poor and unfit seed and is really a labeling law. The wording of the law is as follows:

"Each separate container of the seeds of forest, fruit, shade, or other trees and shrubs that are usually grown in this state or may later be grown in this state which are sold, offered or exposed for sale within this state for seeding purposes shall be clearly and plainly labeled in the English language to show:

1. The kind of seed, and the variety.
2. The approximate percentage of weight of pure seed.
3. The approximate percentage of germination.
4. The year of collection of such seed.
5. The specific locality (state and county in the U. S., or nearest equivalent political unit in the case of foreign countries) in which the seed was collected.
6. The name and address of the vendor of such seeds."

U. S. DEPARTMENT OF AGRICULTURE SEED POLICY

In 1939 the United States Department of Agriculture adopted the following forest seed policy:

"Recognizing that trees and shrubs, in common with other food and fiber plants, vary in branch habit, rate of growth, strength and stiffness of wood, resistance to cold, drought, insect attack, and disease, and in other attributes which influence their usefulness and local adaptation for forest, shelterbelt, and erosion-control use, and that such differences are largely of a genetic nature, it shall be the policy of the United States Department of Agriculture insofar as practicable to require for all forest, shelterbelt, and erosion-control plantings, stocks propagated from segregated strains or individual clones of proven superiority for the particular locality or objective concerned.

Furthermore, since the above attributes are associated in part with the climate and to some extent with other factors of environment of the locality of origin, it shall be the policy of the United States Department of Agriculture.

1. To use only seed of known locality of origin and nursery stock grown from such seed.

2. To require from the vendor adequate evidence verifying place and year of origin for all lots of seed or nursery stock purchased, such as bills of lading, receipts for payments to collectors, or other evidence indicating that the seed or stock offered is of the source represented When purchases are made from farmers or other coil ctors known to operate only locally, a statement capable of verification will be required as needed for proof of origin.

3 To require an accurate record of the origin of all lots of seed and nursery stock used in forest, shelterbelt, and erosion-control plantings, such records to include the following minimum standard requirements to be furnished with each shipment:

(1) Lot number
(2) Year of seed crop
(3) Species
(4) Seed Origin:
    State
    County
    Locality
    Range of elevation
(5) Proof of origin

4 To use local seed from natural stands whenever available unless it has been demonstrated that seed from another specific source produces desirable plants

for the locality and uses involved. Local seed means seed from an area subject to similar climatic influences and may usually be considered as that collected within 100 miles of the planting site and differing from it in elevation by less than 1,000 feet.

5. When local seed is not available, to use seed from a region having as nearly as possible the same length of growing season, the same mean temperature of the growing season, the same frequencies of summer droughts, with other similar environment so far as possible, and the same latitude.

6. To continue experimentation with indigenous and exotic species, races, and clones to determine their possible usefulness, and to delimit as early as practicable climatic zones within which seed or planting stock of species and their strains may be safely used for forest, shelterbelt, and erosion-control.

7. To urge that States, counties, cities, corporations, other organizations, and individuals producing and planting trees for forest, shelterbelt, and erosion-control purposes, the expense of which is borne wholly or in part by the Federal Government, adhere to the policy herein outlined."

CONNECTICUT ESTABLISHES A SEED ORCHARD

Silviculturist, State Park & Forest Commission
Hartford 15, Conn

In 1950 the Forestry Division of the Connecticut State Park and Forest Commission began exploring the possibility of obtaining seed for its forest nursery from local seeds. Nursery stock raised for forest planting in Connecticut is entirely coniferous, and as most of the species used are not native to this State it will be necessary either to collect seed from plantations already established or to establish seed orchards for future collections. For the present, advantage will be taken of the occasional seed years to collect from selected plantations where the trees seem well adapted to local conditions. We recognize that this is at best a stop-gap procedure. Little, if anything, will be known concerning the origin of parent trees; closed stands produce small quantities of cones making the seed collection difficult and expensive, It therefore seems logical that we should explore the possibility of establishing seed orchards.

Since the beginning of World War II a great many landowners have become interested in establishing Christmas tree plantings. Locally grown tees have, for ten years, found a ready and profitable market. The local requirements for Christmas trees are that they be one of the firs or spruces and that they have

1. Blue-green foliage
2. Compact branching habit

White spruce fits these specifications well and the market is already accustomed to this species. Christmas trees are usually grown on a 12-year rotation, With this background in mind and with hopes of obtaining relatively speedy results, the first seed orchard selection was a 1935 planting of white spruce, 2 acres in size on the Natchaug State Forest in Eastern Connecticut.

Here briefly is what is known concerning the selected area and what we hope to accomplish in the way of future development of this stand:

1. The plantation is known to have borne viable seed in 1948 and again in 1950; in fact, the 1950 crop was collected and produced over 100 pounds of clean seed.

2. The area is fully stocked with trees 8 - 20 feet in height, a high percentage of which are desirable in form and color.

3. The area is level, relatively stone free, and accessible in all parts to trucks.

4. Late spring frosts are not an important factor on this site.

5. There are no other stands of white spruce in the immediate vicinity.

Future plans include:

1. Removing all trees not phenotypical (blue-green foliage, compact branching).

2. The establishing of a trial spacing of about 30 feet between seed trees.

trees during or following cone harvest. An arbitrary maximum height of 25 feet has been set.

4. Seed collection from truck-mounted ladders.

5. Running progeny test to ascertain the percentage of desirable Christmas tree stock resulting from seed collected.

TEST OF SEEDING GERMINATED WESTERN WHITE PINE SEED

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Present recommended methods of direct-seeding western white pine call for planting in the fall following the control of seed-eating rodents by poisoning. The Northern Rocky Mountain Forest and Range Experiment Station began field tests in 1948 to determine the practicability of spring-sowing germinated white pine seed as a method of avoiding the need for direct rodent control. A series of four plots was seeded from 1948 to 1950 on two freshly burned sites within the white pine type, In all, 2, 200 seed spots were planted in the test.

The two major factors studied in the tests were (1) advance preparation of seed (germinated versus nongerminated seed) and (2) protection from rodents (screened versus unscreened seed spots.)

In the 1948 test, seed coats were cracked and the seeds were stratified to induce prompt germination. Cracking of seed coats was abandoned in the later tests because it was found to be unnecessary. In 1949 and 1950, the seeds were stratified in moist sand for three months. At the end of the stratification periods, half of the seeds were exposed to room temperature until germination occurred, As soon as the radicles appeared through the seed coats, the seeds were returned to refrigeration to arrest further development until time for field planting.

The seeds were sown on scraped spots and covered with about three-eighths inch mineral soil. Ten seeds per spot were sown on sub-blocks receiving germinated seeds, and 20 seeds per spot were sown on sub-blocks receiving ungerminated seed . The seeds were sown as early as possible in the spring.

To follow germination and survival, spots were checked two weeks, one month, and two months after seeding. The proportion of spots on each sub-block that contained at least one established seedling was the measure of stocking used in the analysis.

Differences in stocking among sub-blocks were tested by the analysis of variance method to determine the effect of different treatments.

RESULTS

The experiment showed that sowing germinated seed did not eliminate the necessity for rodent control, The proportion of screened spots stocked with one or more seedlings two months after seeding was nearly seven times greater than of the unscreened spots (table 1). The increase in stocking due to screening was as great with germinated as with ungerminated seed. Inspection of the seed spots two days after the seeds were sown showed that 80 and 96 percent of the unprotected spots were molested by rodents in

1948 and 1949 respectively. Rodent population studies made at the time of sowing

habitat in the white pine type. Hence, the great amount of rodent damage to the unscreened spots was not the result of an abnormally large rodent population.

In this experiment, no increase in stocking resulted from sowing germinated seed Stocking varied considerably between plots and within plots, but the average stocking from germinated and ungerminated seed was practically the same.

Table 1. -- Proportion of seed spots containing one or more white pine seedlings two months after sowing with germinated and nongerminated seed. 1/

Plot location and year of sowing	Nongerminated seed		Germinated seed		All treatments
	Unscreened	Screened	Unscreened	Screened	
	Percent	Percent	Percent	Percent	Percent
Blickensderfer Creek					
1948	5	12	4	23	13
1949	4	33	6	52	24
1950	8	81	6	59	38
Meadow Creek					
1950	15	54	9	53	33
Average 2/	7	46	6	46	26

1/ Basis: percent values given for Blickensderfer Creek are each based on 150 seed spots; for Meadow Creek, 100 seed spots.
2/ Weighted average of 11 subplots.

Invitation

All persons who work in reforestation, or who are interested in it or some allied field are invited to send in material for publication in Tree Planters Notes. If their material is not yet in final form for publication, they are invited to at least send a letter to Tree Planters' Notes and tell what they are doing and what manner of information should be published. The address is: Chief, Forest Service, U, S. Department of Agriculture, Washington 25, D C

Subscriptions and Mailing List

Tree Planters' Notes will be sent upon request to persons and organizations doing reforestation work, and to libraries, forest schools, and similar appropriate places. The address is given above.