



MINNESOTA FORESTRY NOTES

COPY 2



No. 162

April 15, 1965

NC-51 SCOTS PINE SEED SOURCE TESTS IN MINNESOTA I. 1/

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In cooperation with Michigan State University several seed source tests of Scots pine (*Pinus sylvestris* L.) were established in Minnesota as part of the regional forest tree improvement project, NC-51 (Forest Tree Improvement through Selection and Breeding). In 1961 2-0 stock of about 100 Scots pine range-wide seed sources was supplied by Michigan State University. One 10-replicate outplanting of 96 sources was established near Rice, Minn. in 1961 and the surplus plants were lined-out in the North Central Experiment Station at Grand Rapids. In 1962 this 2-1 stock was used for replacements in the Rice planting and other outplantings. About 40 sources were established in outplantings at Blackberry (near Grand Rapids), the Cloquet Forest Research Center, and the North Branch Tree Farm (near North Branch). This report is concerned with the performance of these 1962 outplantings based on measurements following the 1963 growing season, i.e., at the age of five years from seed.

The Blackberry and North Branch plantations were established on old fields with a light sod requiring no preplanting treatment. The Cloquet planting was made on an aspen and brush area that was clear-cut in 1961. No chemical was applied prior to planting but a directed amizine spray (rate ca. 7 lbs./acre) was applied to a 3-ft. diameter area at the base of each test tree in late summer, 1963. This treatment has effectively controlled weed growth.

Stock for the three outplantings was lifted and outplanted within a 24-hour period in late April or early May, 1962. A randomized complete block design of 4-tree row plots with 8' x 8' spacing was used. The Cloquet planting consisted of 10 replicates; five replicates were established in the Blackberry and North Branch plantations.

First-year mortality was low in all plantations, ranging from 4 to 7 percent. Available replacements with 2-2 stock made in 1963 reduced mortality in all plantings to less than 3 percent. Variance in mortality due to seed source, based on data following the 1963 growing season, was highly significant in the Blackberry and Cloquet plantings. Low survival of Spanish source 219 at Blackberry (15 of 20 test trees frost-killed) and Spanish sources 218 and 219 at Cloquet (41 of 80 test trees frost-killed) were the major sources of variance. In contrast only one of 20 test trees of the single Spanish source No. 219 planted at North Branch was frost-killed in the less rigorous climate of that planting site. Other mortality at North Branch was caused chiefly by the root-feeding of gophers and was randomly distributed among sources.

Analysis of variance for height growth showed that variance due to seed source was highly significant in all plantations. Orthogonal comparisons of mean heights between 5° latitudinal source classes were also made (Table). These comparisons indicate that the sources from the region between 50° and 55° N. Lat. have shown the best height growth in all plantations, whereas poorest growth was found in the high latitude Scandinavian sources and the surviving frost-damaged Spanish sources.

Winter foliage color was scored in the Blackberry plantation in December, 1964 (Table).

1/ Establishment and maintenance support for this study was provided in part by the Charles K. Blandin Foundation, Grand Rapids, Minnesota.

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Based on these data and observations in the other plantations, the generalization may be made that northern Scandinavian and Siberian sources are typically the yellowest and southern European sources the greenest. Sources from mid-European latitudes are in general intermediate and highly variable between and within sources.

Table. Seed source data, 5-year height from seed, and winter foliage color for Scots pine seedlots represented in the Blackberry, Cloquet, and North Branch Plantations.

| MSFG Seedlot No.; Country of origin | North Lat. (degrees) | East Long. (degrees) | Elev. (ft.) | Mean Ht. (cm) April/64 | | | Color Grade ^{1/} |
|-------------------------------------|----------------------|----------------------|-------------|------------------------|-----------------|-----------|---------------------------|
| | | | | Blackberry | Cloquet | N. Branch | |
| <u>60°-61.5° N. Latitude</u> | | | | | | | |
| 201 NOR | 60.5 | 3.2 | 100 | 43 | 45 | 30 | 26 |
| 274 NOR | 60.3 | 9.9 | 600 | 37 | 41 | 35 | 18 |
| 276 NOR | 59.8 | 11.6 | 700 | 49 | 39 | 40 | 40 |
| 273 NOR | 59.7 | 9.5 | 600 | 44 | 44 | 42 | 46 |
| 522 SWE | 60.9 | 16.5 | 700 | 50 | 34 | 36 | 42 |
| 544 SWE | 60.4 | 14.9 | 800 | 48 | -- | 33 | 34 |
| 545 SWE | 60.4 | 12.9 | 800 | 36 | 36 | 40 | 24 |
| 222 SWE | 60.2 | 15.0 | 800 | 55 | 45 | 36 | 40 |
| 521 SWE | 60.0 | 18.0 | 100 | 33 | 38 | -- | 0 |
| 543 SWE | 59.9 | 12.9 | 700 | 46 | 39 | -- | 40 |
| 233 FIN | 61.5 | 26.0 | --- | -- | 30 | -- | -- |
| 230 FIN | 60.5 | 22.4 | 100 | 40 | 31 | 34 | 18 |
| 228 FIN | 60.4 | 25.4 | 100 | 46 | 42 | 33 | 26 |
| <u>55°-60° N. Latitude</u> | | | | | | | |
| 550 SWE | 55.9 | 14.1 | 100 | 58 | 60 | 44 | 56 |
| 224 LAT | 57.7 | 26.3 | 100 | 47 | 44 | 45 | 34 |
| 223 LAT | 57.5 | 25.8 | 100 | 51 | -- | -- | 34 |
| 234 SIB | 56.0 | 95.0 | --- | -- | 36 | -- | -- |
| <u>50°-55° N. Latitude</u> | | | | | | | |
| 318 BEL | 51.2 | 5.5 | --- | -- | -- | 64 | -- |
| 202 GER | 53.0 | 10.6 | 400 | -- | 64 | 62 | -- |
| 204 GER | 50.8 | 9.7 | 1300 | -- | 72 | -- | -- |
| 208 GER | 50.6 | 9.7 | --- | 74 | 68 | 47 | 58 |
| 209 GER | 50.3 | 12.2 | 6200 | 67 | 65 | 62 | 58 |
| 312 CZE | 50.9 | 15.1 | 2000 | 71 | 70 | 58 | 66 |
| 311 CZE | 50.5 | 14.7 | 1000 | -- | -- | 53 | -- |
| 308 CZE | 50.2 | 15.0 | 700 | 72 | 69 | 67 | 62 |
| 307 CZE | 49.9 | 17.9 | 800 | -- | -- | 62 | -- |
| 211 POL | 53.8 | 20.3 | --- | 77 | -- | 52 | 58 |
| 317 POL | 53.7 | 20.5 | --- | 67 | 61 | 53 | 50 |
| 227 SIB | 54.0 | 94.0 | 500 | 36 | -- | -- | 14 |
| <u>45°-50° N. Latitude</u> | | | | | | | |
| 235 FRA | 48.2 | 9.2 | 2200 | -- | 56 | -- | -- |
| 239 FRA | 45.3 | 3.7 | 3300 | -- | -- | 42 | -- |
| 252 GER | 49.3 | 7.9 | 1300 | 73 | 72 | 63 | 82 |
| 253 GER | 49.1 | 7.8 | 1300 | 56 | 63 | 64 | 72 |
| 248 GER | 48.5 | 9.8 | --- | 72 | 62 | 63 | 76 |
| 203 GER | 48.2 | 8.3 | --- | 54 | 52 | 43 | 74 |
| 306 CZE | 49.2 | 14.0 | 1500 | 73 | 72 | 68 | 64 |
| 305 CZE | 49.0 | 14.7 | 1300 | 62 | 61 | 56 | 66 |
| 314 CZE | 48.9 | 20.5 | 2700 | -- | -- | 45 | -- |
| 553 HUN | 47.7 | 16.6 | 1000 | -- | 77 | -- | -- |
| <u>40°-45° N. Latitude</u> | | | | | | | |
| 242 YUG | 43.9 | 19.4 | 4000 | -- | -- | 42 | -- |
| 218 SPA | 40.3 | -5.2 | 3700 | -- | 27 ² | -- | -- |
| 219 SPA | 40.8 | -4.0 | 4900 | 32 ² | 33 ² | 43 | 80 |

Key to names of countries: AUstria, BELgium, CZEchoslovakia, FINland, FRAnce, GERmany, HUNgary, LATvia, NORway, POLand, SIBeria, SWEden, YUGoslavia.

¹ Color grades scored in December, 1964 in the Blackberry Plantation.
Grade 0 = yellow; grade 90 = dark blue-green with yellow tips.

² Mean of surviving frost-damaged plants.

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