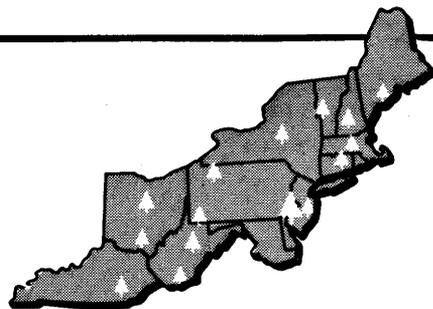


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# Northeastern Forest Experiment Station



FOREST SERVICE, U.S. DEPT. OF AGRICULTURE, 6816 MARKET STREET, UPPER DARBY, PA. 19082

## SIX-YEAR RESULTS OF A WHITE PINE SEED-SOURCE TEST IN WEST VIRGINIA

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**Abstract:**—The best white pine growth during a 6-year period in a West Virginia outplanting was obtained with seedlings grown from seed collected in Tennessee, Georgia, and North Carolina. These seed sources are recommended for plantings in West Virginia.

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Early results of the USDA Forest Service rangewide white pine provenance study showed that trees from southern Appalachian seed sources grew extremely well as far north as southern Pennsylvania and lower Michigan and throughout the Ohio Valley in Indiana, Illinois, and Ohio (*King and Nienstadt 1968; Funk 1971; Garrett and others 1973; Funk and others 1975*).

To determine which areas in the southern Appalachians produced white pine (*Pinus strobus* L.) seed best adapted to Michigan, Jonathan Wright of Michigan State University obtained seed from 200 southern Appalachian white pine stands in 1965. Seeds from 63 of these stands were made available to the Northeastern Forest Experiment Station and to West Virginia University for an outplanting in West Virginia. In addition, seeds from 35 other West Virginia sources were included in the study. In most cases cones were collected from individual trees in the stands, and the

mother-tree identity was maintained in the nursery and field outplanting.

This is a report on the 6-year performance of seedlings grown from the 98 seedlots that were outplanted in West Virginia.

### The Study

The study area is an 11-acre, steep, cutover, south-facing slope on the Fernow Experimental Forest near Parsons, West Virginia. Oak site index for the area is 65.

Preplanting site preparation consisted of basal spraying all hardwood trees with 2,4,5-T before felling, to reduce stump sprouting. The sawlogs and pulpwood were removed from the

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area, and all the trees smaller than 5 inches dbh were felled.

The area was divided into seven 1-acre square blocks. By careful layout, the variation in site conditions within a block was kept small. Blocks were separated by unplanted areas 30 to 65 feet wide.

Seedlings, grown in the Clements State Tree Nursery near Point Pleasant, West Virginia, were 2 years old when outplanted in the spring of 1968.

In each block a seedlot was represented by four trees planted 8 feet apart in a row perpendicular to the contour. Rows were also spaced 8 feet apart. The identities of the seedlots by parent trees were maintained in the nursery except for a few seedlots that were represented by composite samples of seed from several trees. Seedlot identity was also maintained in the outplanting.

A two-tree-wide border of undesignated seedlings was planted around the outside of each block.

In the second summer after outplanting (1969), each block was mistblown with 2,4,5-T at a concentration of 2.4 pounds acid per acre in a water-oil emulsion applied at a rate of 7 gallons per acre to reduce the dense cover of blackberries, greenbrier, and hardwood sprouts. A follow-up treatment was made in the summer of 1970 to cover areas missed or only lightly treated in 1969.

Survival was measured annually. Height measurements to the nearest 0.1-foot were recorded at the end of the second growing season and then annually through the sixth growing season. Data were analyzed by an analysis of variance.

## Results

*6-year survival.*—Average survival for all blocks after six growing seasons was 84.2 percent. Eleven percent of the mortality was due to transplanting shock and 3 percent was due to the 2,4,5-T spray (Wendel and Cech 1975). About 1 percent mortality was attributed to frost-heaving, browsing, "buck rub", and white pine root decline (*Verticicladiella procera*).

*6-year total height.*—An analysis of vari-

ance over all blocks and seedlots showed a highly significant difference (1-percent level) among blocks and sources.

The data were grouped by stands, and an analysis of variance was computed for each stand that was represented by seedlings from more than one parent tree. In about half of the stands there was a significant difference in 6-year height between seedlings originating from different parents within a stand (table 1).

When the heights of seedlings from a given stand were combined, we found that the tallest trees originated from seed collected in Anderson County, Tennessee (table 1). These trees averaged 7.9 feet and were 22 percent taller than the mean height for all stands. However, the within-stand height difference was significant, which indicates that certain parents yielded better-growing progeny than others—a factor that must be considered when making seed collections from this stand.

In general, the seedlings grown from Georgia, North Carolina, and Tennessee seeds have performed better in our outplanting than those from collections in West Virginia.

An exception was that one bulked seedlot from Raleigh County, West Virginia (No. 64), averaged 6 percent taller than the mean of all progeny. Even so, it should be pointed out that there were progenies from some parent trees in these poor stands that were considerably taller than the average tree for all stands. In effect, grouping of the progenies from all parent trees within a stand has tended to mask the performance of progeny of individual parent trees in that stand.

## Discussion

After 6 years, survival was good; and there were no differences in survival due to seed origin. Significant differences in survival among blocks can be attributed mostly to planting difficulties. Three percent of the mortality was due to herbicide damage. Mist-blowing release treatments were very effective, and most of the trees were in a free-to-grow position at the end of 6 years.

In general, the overall vigor of the plantation is good. The seedlots from the southern

Table 1.—Mean 6-year total height of seedlings from southern Appalachian white pine seedlots

| MSFG number <sup>a</sup> | County        | Stand location |         | Average 6-year total height | Percent of mean height | Within stand Variance <sup>b</sup> |
|--------------------------|---------------|----------------|---------|-----------------------------|------------------------|------------------------------------|
|                          |               | Lat.           | Long.   |                             |                        |                                    |
|                          |               | °              | '       | Feet                        | Pct.                   |                                    |
| 3534-3541                | Anderson TN   | 36 00 N        | 84 10 W | 7.9                         | 122                    | * (6) <sup>c</sup>                 |
| 3487                     | Burke NC      | 35 52 N        | 81 46 W | 7.7                         | 119                    | —                                  |
| 3513-3521                | Fannin GA     | 34 35 N        | 84 10 W | 7.5                         | 115                    | NS (8)                             |
| 3545                     | Union GA      | 34 43 N        | 84 06 W | 7.5                         | 114                    | —                                  |
| 3495-3502                | Polk TN       | 35 00 N        | 84 25 W | 7.3                         | 112                    | NS (6)                             |
| 3551                     | Madison NC    | 35 50 N        | 82 40 W | 7.3                         | 111                    | —                                  |
| 3544                     | Fannin GA     | 34 44 N        | 84 09 W | 7.1                         | 110                    | —                                  |
| 3452                     | Graham NC     | 35 20 N        | 83 52 W | 7.1                         | 110                    | —                                  |
| 3503-3512                | Monroe TN     | 35 20 N        | 84 10 W | 7.1                         | 108                    | ** (10)                            |
| 64                       | Raleigh WV    | — — N          | — — W   | 6.8                         | 106                    | —                                  |
| 3439-3443                | Henderson NC  | 35 00 N        | 82 50 W | 6.9                         | 106                    | NS (5)                             |
| 3423                     | Caldwell NC   | 31 30 N        | 81 30 W | 6.7                         | 103                    | —                                  |
| 3449                     | Whitley KY    | 36 55 N        | 84 15 W | 6.6                         | 101                    | —                                  |
| 3420                     | Carter TN     | 36 20 N        | 82 04 W | 6.4                         | 98                     | —                                  |
| 3416-3417                | Buncombe NC   | 35 30 N        | 82 30 W | 6.4                         | 98                     | NS (2)                             |
| 3548                     | Rabun GA      | 34 54 N        | 83 30 W | 6.3                         | 97                     | —                                  |
| 67                       | Raleigh WV    | — — N          | — — W   | 6.3                         | 97                     | —                                  |
| 3422                     | Burke NC      | 35 51 N        | 81 51 W | 6.2                         | 95                     | —                                  |
| 3552                     | Burke NC      | 35 51 N        | 81 30 W | 6.1                         | 95                     | —                                  |
| 3407                     | Montgomery VA | 37 14 N        | 80 27 W | 6.1                         | 95                     | —                                  |
| 94-98                    | Braxton WV    | 38 45 N        | 80 30 W | 6.1                         | 95                     | ** (5)                             |
| 3570, 68-76              | Wetzel WV     | 39 30 N        | 80 45 W | 6.1                         | 95                     | ** (9)                             |
| 81-86                    | Pocahontas WV | 38 20 N        | 79 30 W | 6.1                         | 95                     | NS (6)                             |
| 3554, 87-93              | Pleasants WV  | 39 25 N        | 81 07 W | 6.0                         | 94                     | NS (8)                             |
| 77-80                    | Greenbrier WV | 38 00 N        | 80 14 W | 5.8                         | 91                     | NS (4)                             |
| 3522-3531                | Cherokee NC   | 35 10 N        | 84 10 W | 5.8                         | 91                     | ** (6)                             |
| 65                       | Greenbrier WV | — — N          | — — W   | 5.6                         | 88                     | —                                  |
| 66                       | Greenbrier WV | — — N          | — — W   | 5.0                         | 78                     | —                                  |
| 3470                     | Botetourt VA  | 37 31 N        | 79 37 W | 4.9                         | 75                     | —                                  |
| 3590                     | Pocahontas WV | 38 20 N        | 79 53 W | 4.7                         | 73                     | —                                  |
| 3460, 3462, 3463         | Greenbrier WV | 37 58 N        | 80 08 W | 4.6                         | 72                     | * (3)                              |
| 3453                     | Greenbrier WV | 38 28 N        | 79 48 W | 2.8                         | 44                     | —                                  |

<sup>a</sup> Michigan State University Numbers. Seedlots 64 to 98 are West Virginia collections and do not have MSFG numbers.

<sup>b</sup> \* = significant at 5-percent level; \*\* = significant at 1-percent level; NS = not significant.

<sup>c</sup> Numbers in parentheses indicate number of parent trees in the stand.

Appalachians—those from Tennessee, Georgia, and North Carolina—are growing at a much faster rate than the best of the local West Virginia sources after 6 years. The better growth of trees from these seedlots was evident after the first year and is still evident after 6 years.

The data from this trial and earlier trials (Garrett and others 1973; Funk and others 1975) showed that seedlings from Tennessee, Georgia, and North Carolina sources were the best performers in Iowa, Illinois, Indiana, Kentucky, and West Virginia. However, generalizations can be risky, and it would be best to specify stand and parent tree to obtain the best seed because in some cases the progenies

from one parent tree in a stand might grow better than the progenies from other trees. For example, in 6 of the 13 stands represented in this study, there was a significant difference in 6-year seedling height among parent trees within a stand.

The plantation in this study is located on a fair site (site index 65 for oak) whereas the West Virginia plantation in the study reported on by Garrett and others (1973) is on a good river bottom site; yet the more southern Appalachian sources rank high in both situations.

As a general rule we recommend that seedlings grown from Tennessee, Georgia, and North Carolina seedlots be used for plantings

in West Virginia. The generally better juvenile growth of progenies from these areas would be advantageous in competing with other vegetation, particularly on cutover sites where rapidly growing hardwood sprouts often are a problem.

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