

# FIELD TRIP ON THE KELLOGG FOREST OF MICHIGAN STATE UNIVERSITY NEAR AUGUSTA, MICHIGAN

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When the Kellogg Forest was established in 1932, 90 percent of the farmland in the locality was idle. The original tree cover had been oak-hickory on the upland areas and basswood, white ash, American elm, and black cherry on the lower, more fertile areas. Agricultural activities had begun between 1830 and 1850. Since then, continued cropping had resulted in severe erosion and eventual abandonment of most of the farms.

The first objective of the Forest was to demonstrate reforestation practices for erosion control and production of usable crops. Since 1948, however, the primary function of the Forest has been research. Much of the area now is devoted to forest tree improvement research plots. Those plots visited by members of the Conference are described in the following pages.<sup>2</sup>

## Placerville Hybrid Pines (CPT. 25° D)

In the late 1940's the Institute of Forest Genetics at Placerville, California, artificially produced pine hybrids of several combinations.

Seeds of some of these hybrids were received and sown in the Michigan State University Nursery in the spring of 1950. In April 1953, the 3-0 stock was hand-planted in furrows on a sandy loam with a heavy sod cover. Two local seedlots were included as controls.

The following hybrids have been tested:

*P. ponderosa* X *P. arizonica* (mostly dead now from repeated winter injury).

*P. ponderosa* X *P. apachea* (exhibit a moderate amount of damage).

*P. ponderosa* X *P. ponderosa* var. *scopulorum* (growing very well).

*P. contorta* X *P. banksiana* (show no hybrid vigor but superior form).

*P. monticola* (California origin) X *P. strobus* (mostly dead).

*P. monticola* (Idaho origin) X *P. strobus* (excellent growth the last 2 years).

## Scotch Pine Provenance Tests

(MSFGP 2/3/4 — 61, MSFGP 3/4 — 63)

The first 121 seedlots were sown in the nursery in the spring of 1959 and field planted in 1961. The next 68 seedlots were sown in 1961 and field planted in 1963. Much of the material was included in

NC-51 tests and therefore is represented in a number of States.

Scotch pine has a very large natural range, stretching from Spain and Scotland in the West to Turkey in the Southeast and Eastern Siberia in the East. In the Northern and Eastern parts, the range is continuous. In the Western and Southern parts the range is discontinuous; it comprises a number of isolated stands on mountains. Based on the test plantings, results to date are about as follows:

1. There are distinct source-related differences in a number of characteristics. In height, needle color, and needle length a very small proportion of the total variance may be due to interaction between seedlot and plantation.

2. The genetic variation pattern for the species appears to be discontinuous.

3. The average 6-year (from seed) heights of the different varieties show that the tallest is variety *haguenensis* from the Vosges Mountains of France and adjacent Germany.

4. There is a general relationship between height and sawfly attack.

5. Growth-chamber experiments show that the foliage change from winter yellow to summer green takes place in light if the daytime temperature reaches 45°F.

## European Black Pine Provenance Test

(MSFGP-5 - 61)

European black pine is the most widespread pine species of southern Europe. Its natural range extends from Spain to the Crimea and Turkey. Generally it grows on calcareous soils and to the south of, or at lower elevations than, Scotch pine. The usual common name is Austrian pine.

Twenty-seven seedlots were received from Greece, Spain, Corsica, France, Yugoslavia, Austria, Turkey, and the Crimea. The seedlings were field planted as 2-0 stock in the spring of 1961. Half the trees in each plot at Kellogg were given a nitrogen fertilizer in the spring of 1964.

Results so far seem to indicate six varieties within the species: (1) Austria and Yugoslavia, (2) Eastern Mediterranean, (3) Southern Italy, (4) Corsica, (5) French mainland, and (6) Spain.

The Corsican sources have produced trees very different from the rest and generally of rather poor hardiness. The Spanish seedlots are also rather distinct from the balance of the sources. The commonly used Austrian source is among the slowest

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<sup>2</sup>Further details about plots visited can be obtained from Jonathan Wright.

growing of all the hardy seedlots. The fertilizer trials show no significant fertilizer-genotype interactions.

#### **White Pine Provenance Test (MSFGP-3-60)**

In April 1959, the Northeastern Forest Experiment Station shipped 2-0 seedlings of 15 seedlots of eastern white pine to Michigan State University. This material is part of the rangewide provenance study started by the U.S. Forest Service in 1955.

The stock was lined out for a year in the nursery at East Lansing and field planted in April 1960.

Results of the field planting through age 6 indicate that (1) the Georgia and Tennessee seedlots are the fastest growing; (2) flowering first started in 1965; (3) there are significant differences in time of leaf fall as between sources; (4) mortality has been fairly low, but has been greatest for the very slow-growing Minnesota and Nova Scotia origins and the very fast-growing southern Appalachian origins.

#### **Virginia Pine Provenance Study (MSFGP-1-60)**

Twenty seedlots of Virginia pine were field planted in April 1960 as 1-1 stock. Results to date have been as follows:

1. Most of the mortality has occurred in the southern origins (Mississippi, Alabama, Tennessee, western Kentucky, and western North Carolina).

2. Winter burn is noticeable on the needles of southern origins every spring.

3. There are significant between-origin differences in average height at age 8. The slowest growing sources are southern but the pattern is not clear.

4. Flowering started in 1962 at age 5 from seed and has been light on three southern seedlots.

5. There appear to be no significant differences among seedlots in mycorrhizal developments.

#### **Ponderosa Pine Provenance Test**

In the fall of 1959, seed was obtained from the Institute of Forest Genetics at Placerville, California, from 300 single trees in 60 different stands over the ponderosa pine range. Stock was grown and field planted in April 1962.

Results so far indicate a number of distinct ecotypes within the species as follows: (1) California-Nevada, (2) coastal Oregon, (3) interior parts of the Pacific Northwest, (4) Arizona, southern New Mexico, (5) Utah, and (6) eastern Montana, Black Hills, and Nebraska.

#### **Limber-Border Pine Provenance Test (MSFGP-11-64)**

The limber-border pine work was started in 1959 by J. W. Andresen under a National Science Foundation grant. During 1959 and 1960 open-pollinated seeds were collected from 500 individual

trees and about 60 stands scattered throughout the Rocky Mountain Region. Stock grown from these seeds was field planted in the spring of 1964 as 2-1 transplants.

Field planting results indicated a clear separation between a fast-growing, long-needed, many-cotyledon, blue-green, slightly serrated type from Arizona-New Mexico and the slower growing types to the north. The northern population has been called *Pinus flexilis* James and the southern one, border pine, *P. strobiformis* Engelmann. Within either species there is some evidence of races. The *P. strobiformis* has survived considerably better and grows faster than the *P. flexilis*.

#### **Red Pine Provenance Test (MSFGP-2-63)**

Ninety-three seedlots covering most parts of the red pine range were sowed in the nursery at East Lansing and field planted as 3-0 stock in 1963.

No results from the field planting are yet available, but the 2- and 3-year data in the nursery showed greater height growth for provenances from southern Michigan and central Wisconsin than for other origins.

#### **Austrian-Japanese Red Pine Hybrids**

The natural hybrids occur on the north and west sides of a 30-year-old *Pinus nigra* stand. They apparently resulted from natural pollination by a *P. densiflora* stand of similar age about 300 feet to the west.

The growth rate of the older hybrids (7 or more years old) is very promising. The tallest tree is 18 feet and growing nearly 3 feet per year. The second tallest grew 63 inches in the past 2 years. The form seems very good; better than that of either parent.

#### **Himalayan White Pine**

In 1959 it was noted that 13 trees in 40 acres of eastern white pine plantations were Himalayan white pine (*Pinus griffithii* McClcl.). Compared to the eastern white pines growing closest to them, the Himalayan white pines are slightly shorter, slightly larger in diameter, and definitely more heavily weevilled (difference significant). Interest in the Himalayan white pine centers around its (1) known greater resistance to blister rust, (2) hybridization possibilities with *P. strobus*, and (3) hybridization possibilities with *P. flexilis*.

#### **Japanese Larch Provenance Test (MSFGP-2-60, 1-61)**

Japanese larch is native to a relatively small area in the mountains of central Honshu. It grows at 4,000 to 7,000 feet elevation in scattered stands within a 140-mile-square area.

Seven seedlots were received in 1957 and 22 in 1958. These were field planted in 1960 and 1961,

respectively. Results so far indicate, (1) interesting and contradictory facts about site preference, (2) fairly consistent genetic uniformity, (3) consistently less winter dieback and earlier leaf fall in seedlots from the northeastern part of the native range, (4) statistically significant variation of growth rates among origins, and (5) strong interaction with environment as to flowering.

#### **White Spruce Provenance Tests, Ontario and Rangewide (MSFGP-1-60, 5.6.7-63)**

Stock from an Ontario-wide provenance study was planted as 2-2-2 in April 1960. 1965 height measurements subjected to analysis of variance showed that differences were significant at the 2-percent level. Cones appeared in 1962 and their numbers have increased since, but between-origin differences have not been significant.

Stock from the entire range of white spruce was field planted as 2-3 transplants in April 1963. The source from near Petawawa, Ontario, has been the fastest growing but is not significantly better than several others. Trees from Alaska, Labrador, and western Provinces of Canada are smaller than average. Slight color differences between origins are statistically significant.

#### **Douglas-Fir Provenance Test (MSFGP-16-35)**

The trials include one set of 142 seedlots and a second set of 60 seedlots from the entire United States range and part of the Canadian range. Results indicate one or more different ecotypes in each of the following areas: (1) coastal section of Oregon, Washington, and British Columbia (generally not very hardy), (2) inland sections, with the fastest growing types from eastern Washington, northern Idaho, and northwestern Montana, (3) Colorado and northern New Mexico, and (4) Arizona and southern New Mexico areas (the

fastest growing types are on these areas). The second outplanting also indicated more favorable growth for a source from New Mexico.

#### **White Fir Provenance Test**

Stock of several *Abies concolor* seed origins was planted in 1963. Because of heavy mortality, it was replanted in 1965 with 1-2 stock of 12 origins from Utah, New Mexico, Colorado, and Arizona.

#### **Grand Fir Provenance Study**

Five lots of *Abies grandis* from Montana, northern Idaho, and eastern Washington were planted in 1963, but all origins have suffered severe winter-foliage burn in the nursery and results have not been too promising. There were evidences of a considerable range in height growth within the Rocky Mountain population.

#### **English Oak—White Oak Plantation (MSFGP-2-63)**

*Quercus robur* grown from acorns collected on the Michigan State University Campus and *Q. alba* from the Russ Forest were planted in pairs. From the start, the English oak trees have outgrown the native white oak.

#### **Red Oak Provenance Test (MSFGP-2-62)**

As a part of the rangewide red oak provenance test organized by Howard Kriebel of the Ohio Agricultural Research and Development Center, 16 sources of 2-0 stock were planted in 1962 and 5 more sources in 1963. No valuable genetic data are yet forthcoming, partly as a result of heavy rabbit, and some deer, damage.