REPORT OF THE NEFTIC COMMITTEE ON LARCH

The basic objective of forest tree improvement should be to reverse that time-honored, deteriorating tendency to "cut the best and leave the rest." We should strive to add to the good traits of our trees, subtract from the bad ones; to develop trees that are not only commercially better but also cheaper to grow. Maximum growth is of prime importance, for volume is what the forest manager sends to market. But we must not underrate production costs for return is not just a matter of initial investment, but rather the difference between total input and total output. Silviculture can do a lot for form $_s$ pruning crown size and even pest abatement, but only genetics can provide added vigor. And in our selection, we must be careful that a gain in one characteristic is not bought at the price of a loss in another. The ultimate objective is not what the tree breeder thinks is important, but what the purchaser of our timber demands.

There seems to be a growing trend among foresters and their friends-and particularly among the younger men,--to heed Agassizs admonition to "study Nature, not books". This has led to an increasing appreciation of the tremendous forestry values of larch--something that is hard to find in textbooks but easy to find in the field. The 1961 report of our Experiment Station notes that in

western Pennsylvania, "red pine, Japanese larch and European larch can be named as among the best species". On graded strip-mine banks, "Scotch pine, Japanese larch and black locust generally grew best..." Throughout our Region Larch is showing up as one of the best of our planted trees, native or exotic.

The rule of thumb, that in juvenile growth larch will outgrow red pine by 3 to 2, other species by 2 to 1, is now pretty well accepted. Increasingly, we are beginning to see that this may be true of volume growth as well. But exactly how well the larch will do is not always appreciated. At the experimental plots of Boyce Thompson Institute at Yonkers, N. Y., some of the best trees have attained the following dbh:

Larix decidua	13 years--5.5", 5.4", 5.3"
L. leptolepsis	13 years--8.0", 7.6", 6.7"
L. eurolepsis	13 years--8.3", 8.1", 7.4"
Hybrids	12 years--7.4", 6.5", 6.4"
Hybrids	11 years--7.0", 6.5", 6.2"

At Silver Lake, W, Va., Genys has measured a group of European larch that at 28 years, averages 73 feet in height and 17.2 inches dbh. Admittedly,, these are nearly open-grown but the data do indicate great timber-producing potential. Eliason has recently measured 25-year experimental plantings in Saratoga County, N.Y. These indicate a very wide difference in volume production between the several species and races of larch, with Jap doing the best; then the Dunkeld hybrid; then European of Scottish, Silesian and Dolomite origin; and lastly Dahurian larch. The volume, unadjusted for survival, varies from less than 1/2 cord per acre per year for Dolomite European and for Dahurian to better than 2 cords for the Japanese -- a fourfold difference. For sure, in planting larch, it pays to plant the right race! And in the continental climate of the Northeast, two cords per acre is doing all right!

Consider some of the silvicultural and economic advantages of the larches:

Cones are borne over the whole crown, are reasonably easy to collect, have a workable crop every third year.

The seed can be readily extracted and stores well,

2-0 seedlings, and in some circumstances 1-0 seedlings, are suitable for field planting.

The larches do well on a wide variety of sites, spectacularly on the better ones. And the plantings either do well or they fail--poor stands are rare.

They can be successfully grown from relatively wide initial spacing: 600-700 trees per acre. However,, this demands careful planting and uniformally good stock.

Larch gets off to a fast start and has very rapid juvenile growth.

It is exceptionally easy and cheap to prune; the slash is light and decays quickly.

It has few serious enemies--this is especially true of Jap.

The better genetic combinations produce stems of excellent form.

It is cheap and easy to log.

It yields high-quality, versatile timber.

It yields exceptionally high volume on relatively short rotations: 35 to 40 years on Site +I.

In watershed management, it is a conifer that acts like a hardwood.

For wildlife, it permits the growth of a light understory of browse.

What more could one ask of a forest tree-of the species just as they are? nd what other species suited to the Northeast can do so well? How often do we hear some experienced forest manager say, "I wish I had more of it?"

To these silvicultural and economic merits we can add some important genetic ones:

Larch flowers early--males at 8 years, females at 10, substantial numbers by 15--so seedling generations can be had at 10-1 years.

Cones are a one-year crop, vary with the tree but yield a workable quantity every 3 years.

As 20 seedlings, at least a crude genetic selection is possible, either in the seedbed or on the sorting table.

There are several distinct species that are hardy in our Region. European larch has at least two and perhaps three races, with nice adjustment to length of day. Jap larch is more variable than generally reputed--and considerably better.

In at least one cross (Jap and European) the F-1 generation exhibits hybrid vigor and this carries over into subsequent generations and into backcrosses. Selling appears to be genetically depressing.

Larch can be grafted and cuttings from at least some young trees will root.

Where else can the tree improver get so much in one genus?

Your Committee is pleased to report some recent works in the study of Larch. Obviously, these can be no more than high spots and mostly represent items with which the members have personal knowledge and concern. We often wish that our lines of communication, both among ourselves and with the field forces, were better.

For a very long time, there has been confusion about the status of the tamarack (Larix laricina) at the extreme southeast limits of its range. Such trees should be of special interest to the geneticist, as they represent populations that are acclimated to the relatively long growing season and short summer day of latitudes below 42 degrees. Genys has located three relic stands in the mountains of western Maryland;: one now reduced to two trees. These represent the lowest latitude but are at relatively high altitude. The team of Cook, Smith and Stone has been compiling and checking the records from southeastern New York and northern New Jersey, where Larix laricina is found at low elevations the work is nearing completion.

In connection with this survey, District Director Earl D. Brockway of Poughkeepsie located a stand of tamarack in a swamp on the property of the Harlem Valley State Hospital at Wingdale, N. Y., where the trees are of exceptional vigor and where their progeny are successfully invading adjacent upland. Through the courtesy of the Hospital authorities, nine of these seedlings were dug by Dr. Chandler and successfully replanted on the Dutchess County Farm of Boyce Thompson Institute. At five years old, the two largest seedlings are 8'11" and 8'6"; 1961 increments were 27" and 28.5". Other seedlings in the area grew 3 feet, Could be that there are races of tamarack that have a real place in our silviculture; and outside the swamps too, This spring, pollen from these trees was used extensively in Boyce Thompson's program. Cones (60) are developing to fully controlled po1lina tions. A few cones have been dissected but only dead embryos or live larvae (unidentified) were found in the developing seed. Other cones will be examined when they are fully mature.

On this site, seedlings with "wobbly" stems were observed under a large tree with a "wobbly" trunk, while the seedlings mentioned above were dug from around a tree with a straight stem This may be a bit of evidence, from a natural situation, that the wobbly stem character is genetically controlled and that it is inherited through the female parent. Facts on this point are especially important in evaluating stem form in Sudetan European and in Japanese larch where the "wobble" can be a real problem.

In Maryland Genys has several larch provenance trials in operation:

Two origins of Larix decidua planted in Baltimore County in 1958 had poor survival. One from Brenner Austria showed at an early age, very significantly (1% level) better growth than that from the western Alps in France.

Sixteen origins of L. leptolepis are being tested in two localities in cooperation with Dr. J. W Wright planted 1962, with satisfactory survival.

Four provenances of L. decidua from seed accumulated by Cook and grown by DeLong in Pennsylvania, were planted at two locations in 1962 with good survival.

In the spring of 1962, seed for a new experiment was sown, including 5 lots of Larix decidua, 5 of L. leptolepis, 3 of L. occidentalis, 2 of L. eurolepis, and one each of L. gmelini, L. siberica and L. lyallii.

Seed of Sudeten larch from ten sources in Czechoslovakia have been received, to which will be added a number of lots of Polish larch.

Our Committee member from Pennsylvania, T. S. DeLong reports as follows:

"Japanese larch has gained a very favored position in the seedling production schedule of the Pennsylvania Forest Tree Nurseries. Of the total annual production of twenty million seedlings Japanese larch along with native white pine heads the list in the greatest number at five million each. Japanese larch is in strong demand particularly because of its success in establishment and growth when planted on areas affected by open pit mining. European larch production is set at one million.

"Presently the seed for both larch species has been purchased on the open market and there is no certainty of the exactness of the stated area of collection. The Pennsylvania Department of Forests and Waters has recently initiated a program of seed orchards and of the six species in which the Department is primarily interested both Japanese larch and European larch are included.

"Front the European larch seed of four separate seed sources supplied by Mr. David Cook of the New York State Conservation Department, the Pennsylvania Department of Forests and Waters grew about 3,500 seedlings each which were distributed to several cooperating agencies. The State of Maryland included some of these seedlings in a provenance study in an outplanting this past spring Seedlings were also supplied to the Mead Corporation in Chillicothe Ohio. The remaining seedlings were planted on land owned by the Pennsylvania Department of Forests and Waters.

"The Department of Forests and Waters now has employed a forest geneticist, Mr. John Winieski, a forester with a Master of Science degree, who studied under Dr. Klaehn of Syracuse University. Future efforts in larch advancement will be placed on the selection of superior or plus trees to be used by the Department in a program of forest genetics work toward the establishment of seed orchards."

Dr. Chandler of Boyce Thompson Institute is certainly our most active practitioner in the genetic improvement of larch. At the Institutes Dutchess County (N. Y.) farm, field plantings of approximately 2,600 specially selected seedlings are getting established. This planting includes seedlings from fully controlled hybrid seed and open pollinated seed from seed parent trees used in breeding experiments. All seedlings were grown in the nursery and planted as 2- or 3-year--old seedlings Height measurements were made in October 1961 and will be made each fall for data on rate of growth. Cuttings in a small clonal test placed in the field on April 18, 1960 are well established and are up to 10'4" in height. The best growth obtained last year (1961) was 51 inches.

Approximately 1,400 hybrid seedlings are now in their nursery. Some 800 cuttings for clonal tests are ready for field planting in the spring of 1963. A total of 2,14146 rooted cuttings were planted in the nursery this spring.

Six thousand cuttings are in the propagation bench at the time of this report. There is a definite variation in the rootability of cuttings from hybrid larch seedlings of the same age. Cuttings of L. decidua are difficult to root under the present conditions used for propagating other species and hybrids. This last finding may account for the dim view that European workers take of cuttings as a method for increasing their better trees.

In New York, in 1962, three clonal seed orchards were set out under the direction of Eliason, with material prepared by K1aehn. One at Syracuse was made with several selected clones of Larix decidua; two at Saratoga with L. leptolepis and L. decidua, each from selected trees.

It rarely happens that all the shippable Larch in the New York nurseries, in any one year, is from a single seed lot; but it did happen in 1962. Seed lot #528 was collected on State Forest Cattaraugus 16-D processed and grown as "Japanese larch". But the 2-0 seedlings proved to be something different and a recheck on the ground indicated an error in the field record. S. L. #528 is, in fact, the progeny of trees of S. L #122 - from hybrid larch in Scotland. So, in 1962, the larch planters in New York received an unexpected bonus.

Some of the hazards of open-pollinated larch seed are exemplified by Plantation No. 40 at Cooxrox Forest. In 1950 cones were collected from a plus tree known as "Edger No. 20" in a stand of Jap larch planted in 1936. This fine tree is surrounded by other Japs of No. 20; not far away are trees of two lots of hybrid larch and a plantation of superior European larch. The seedlings were planted out in the spring of 1954. By the time these trees were 5 feet tall it was evident from winter twig color that they were hybrid. Even though the opportunity for pollination by Japs standing within 25 feet would seem to be better than for pollination by Europeans 100 feet or more away, the progeny are F-1 hybrid.

In 1962, at age 12 years from seed, at least two trees are bearing cones one with red edges on the scales, one solid green; the cones are of European type and 1-1/2" long.

While both the silviculture and the genetics of larch still present real problems, it seems that the time is ripe for both the forest administrator and the tree improver to take a long second look at the genus Larix for some of the answers to our timber production and land management problems.

Clyde Chandler,, Boyce Thompson Institute, Yonkers, N. Y.
Thomas E. DeLong, Dept., of Forests & Waters, Harrisburg, Pa.
John B. Genys, University of Maryland, Annapolis, Md.,
David B. Cook, Chairman, Conservation Dept., Albany, N. Y.