In conclusion, he discussed briefly "sports" in the Douglas fir. Mutant seedlings were passed out for the group to examine, and slides were shown of the mutant Douglas fir he had picked out as seedlings and grown separately. Some of the views shown were of "sports" 4 to 6 years old. Mr. Long commented that they die in the natural stands but seem to be fairly hardy in the nursery. In another year he plans to try grafting to attempt to increase them in that way. Mr. Long's paper follows:

SOME OBSERVATIONS ON EXOTICS AND MUTANT
DOUGLAS FIR AT THE DUNCAN NURSERY
by
J. R. Long, Nursery Superintendent

With the rapid depletion of our virgin forests here in the Northwest, many foresters have become concerned with competition in the world markets. Timber is now being produced in countries where the crop rotations are shorter and transportation costs, wage scales, etc. are considerably less than those in the Northwest.

In order for us to continue to hold our present advantage in the world markets, we must keep every acre of forest land productive and as far as possible endeavor to shorten our rotation.

I think most of us will agree, at the present time, that the best approach to these problems from the viewpoint of reforestation is through the proper use of our native species. Considerable improvement is possible in the plantations of the future through more careful selection of the trees from which cones are collected and the use of seed from superior strains. Closer attention should also be paid to the climatic conditions of the seed source in relation to the area to be reforested. In addition, methods of stand improvement, such as pruning and thinning, will further help us to obtain better plantations with increase in both yield and quality.

Although we have more or less conceded that our native species should have priority in reforestation, we should not overlook the possibilities in the introduction of exotic species.

In British Columbia our limited experience with exotic species has not produced any outstanding results, but this should not discourage us from further experimentation. Failures do not necessarily mean that certain species are not suited. Too often conclusions are reached from the results of one or two small plantations, sometimes on sites not suited to the species planted. Some of the failures, no doubt, could also be traced to the seed source. So before deciding that a particular species is of little value, careful study should be made of its site requirements and full consideration given to the various strains that might be available.

We feel that experimental plantings of exotics on some of our problem sites should be encouraged. Many of our high quality sites have been taken over since logging by brush and herbaceous cover to the extent that species indigenous to the area are not able to compete. Some exotic species may be found that would be able to compete and thus put these areas back into production without the costly and doubtful procedure of trying to eradicate the deciduous cover.

Also, we have many low quality sites where it is almost impossible to establish plantations of local species. Here again, introduced species might be the answer.

The question that naturally arises is: What exotic species should we try? First, we should consider what the climatic limitations of the various species are. I think we should confine our initial experiments to those species from which we may at least expect some reasonable success. There is little point in experimenting with species which are too far removed from their climatic range.

At the Duncan Nursery we have grown a few exotic species from time to time, some of which have been planted out around the nursery area. Last year we sowed several different species, the majority of which were pines. It was probably a good year to really test their hardiness as there was an exceptionally heavy frost in mid-November. Since that time considerable interest has been shown in these trees and in some cases, I might say, the interest has been greater since they died than when they were living.

We have listed the various species growing at our Nursery and endeavored to assess the amount of damage sustained by each during last winter's severe frosts. We have tried to do this without taking into consideration those seedlings lost by frost heaving or other mechanical injury. We felt that this type of damage could occur in the most hardy species so should not be used as an indication of hardiness. We have found it a little difficult, at this late date, to estimate the percentage of loss. However, we feel, where percentages have been given, the figure is close enough to at least give a rough comparison.

I might point out that our nursery site is not too well suited for the growing of some conifers since the soil is rather heavy and the water table high. This is particularly true in respect to the pines. In spite of these conditions, however, we have found that a number of species have come through the winter with little or no damage. These might be considered frost hardy for this region. Others on the list, had they been grown under more favorable nursery conditions and planted out on suitable sites, might also prove to be sufficiently hardy. When we consider the injury sustained by our local species during the same period, it is surprising that some of these exotics survived at all.

In conclusion, I would like to discuss briefly "sports" in the Douglas fir. You all know that in both the plant and animal world unusual forms occasionally arise. If such forms breed true, they are known as mutations and they can be of great value to the plant and animal breeder.

Some years ago I noticed that some Douglas fir seedlings in the 2-0 seedbeds were markedly different in appearance from the remainder. I picked these seedlings out and have grown them separately. In the slides which I am going to show; you will note that they are shrublike in form with short succulent needles. No cytological work has yet been carried out on these seedlings, but we are hoping to start in the near future and find out a little more about them.

Each year I have been able to find a few of these mutant Douglas Fir, or sports as they may be called, in the seedbeds at Duncan. I would be interested to hear if any other nurserymen have noticed unusual forms in their seedbeds.

NAME	NATURAL RANGE	AGE	FROST DAMAGE
Cedrus deodara (deodar cedar)	Himalayas	1-0	50% loss
Chamaecyparis lawsoniana (Port Orford)	South Oregon and North California	2-0	25% complete loss 50% of remainder injured.
Cupressus arizonica	Arizona New Mexico	6 yrs.	None
Macrocarpa (Monterey cypress)	Monterey, California	6 yrs.	100% loss
Eucalyptus gigantea (4000')	Australia and Tasmania	1-0	100% loss
Larix decidua (European larch)	Central Europe	1-0 6	(Germany) Slight (Czechoslovakia) 20% good 20% damaged Remainder killed.
Libocedrus decurrens	South Oregon and California	1-0 2-0	100% loss Slight damage.
Pinus coulteri (Big Cone Pine)	California	5 yrs.	2 of 7 trees killed, remainder damaged.
densiflora	Japan and Korea	1-0	Slight damage
jeffreyi (Jeffreys pine)	South Oregon and California	6 yrs.	None
koraiensis (Korean pine)	Japan and Korea	5 yrs. 1-0	None Slight
lambertiana (Sugar pine)	West Oregon and California	1-0 2-1	50% loss None
muricata (Bishop pine)	California Coast	1-0	100% loss
nigra (Austrian pine)	Central and South Europe		None
pinaster (Cluster pine)	France, Portugal and Mediterranean	1-0	France - 60% loss England - 20% loss (1) Spain - 20% loss (2) Spain - very slight

NAME	NATURAL RANGE	AGE	FROST DAMAGE
Pinus	Interior British	1-0	None
ponderosa (Ponderosa pine)	Columbia Southward	8 yrs.	None
radiata (Monterey pine)	California Coast	1-0	100% loss
resinosa (Red or Norway pine)	Nova Scotia to Manitoba south to Pennsylvania	2-1	None
sylvestris (Scots pine)	Europe and West Asia	6 yrs.	None
thunbergii (Japanese Black Pine)	Japan	1-0	Slight
Hybrid Pines			
attenuradiata Knob X Monterey	South Oregon and California	1-0	100% loss
echinata X taeda Short leaf x loblolly	echinata - New York to Florida taeda - New Jersey to Florida	1-0	Slight
Murraybanksiana contorta x jack	murrayana - California to Yukon banksiana - E. Canada to McKenzie River	1-0	None
rigida x taeda	rigida - New Brunswick to Georgia taeda - New Jersey to Florida	1-0	Slight

Mr. Long's comments when showing slides:

(Slide on "sport"). These trees are very interesting, and I have a lot of fun with them. I try to get people to tell me what they are.

(Slide on 4-year-old "sport"). You don't find these in the natural stands. Everyone of them die, and yet in the nursery they seem to be fairly hardy.

(Slide on 6-year-old "sport"). This last winter they took quite a beating from frost. Up until last year they were like little bulbs. In another year I am going to try grafting and try to increase them in that way.

(Another slide). There are 2 branches on this one. This is the regular Douglas fir growth, and this one is a mutation. The normal type is about twice the size of the mutation.

Mr. Long reviewed list of exotics. Among those he commented on were:

Eucalyptus (took loss).

Mr. McDaniel commented: Years ago we received 28 different species and we raised them from seedlings and some species got up to 2 feet in 1 year. We found Gunii was the hardiest. In the past few years they have all died.

Regarding Cypress Mr. McDaniel commented: Going back through the history of this particular species, years ago the majority of ornamental trees were cypress. They are very susceptible to scale and they have given us nothing but trouble. We have thrown them out of the nursery.

Regarding Larch, Mr. Long stressed the importance of watching the seed source.

Coulteri - Took rather severe damage.

Slides were shown of pines; also hybrids and inbred pines.

Mr. Long: That's it. I haven't tried to draw any conclusions from any of this. I hoped you might get something out of it.

Mr. Roy Silen was introduced by the Chairman.

Mr. Silen spoke on "A Species Improvement Program." He spoke of reversing the process of negative selection, and said the bulk of the natural regeneration still comes from the dregs left behind after the best trees are taken for logs. He thought the forester and the forest owner should decide what kind of tree they want and the location of the best specimens having the traits they want.

Mr. Silen stressed the difficulty in selecting superior material. He discussed in detail genetic control of traits and the possibility of improvement of desirable characteristics by genetic means. In growth rate he said the evidence is that genetic control is relatively small as compared with environmental control - small but important. It was personally felt that more accomplishments would be made by the forest geneticists in the fields of breeding for resistance and specialized products than anywhere else.

In discussing ways of doing the job of tree improvement, he used sketches of six "schemes" that have been proposed for obtaining seed from desirable trees.

The first scheme consisted of picking the most desirable stand in a forest area and collecting all the seed needed for planting from this stand. The rest of the schemes are based on individual tree selection. As this would narrow the genetic base on which future stands are built, he felt that foresters should consider it very carefully. In selecting a desirable stand, there were many advantages, but also many disadvantages.

The most popular scheme, based on individual tree selection, is the seed orchard. The low cost seed is the main advantage, but there are many disadvantages.

The other schemes he discussed were mass hand pollinations, mass rooting of cuttings, continuous seed tree selection, and "jumbo" seedling selection at the nursery. In summary, he pointed out the jobs everyone could do:

1. Help in stopping negative selection.
2. Preserve the best material we find.
3. Help promote some local scheme of getting seed from the best trees.
4. Don't sell nature's "natural selection" short.
5. Keep abreast of the present work the foresters are doing in tree improvement and help, if possible.
6. Need for intensive study on the subject.
7. Nurserymen could help by finding ways to bring down the cost of handling small lots of seeds.

Mr. Silen's paper follows:

A SPECIES IMPROVEMENT PROGRAM

by
Roy Silen
Willamette Research Center
Pacific Northwest Forest and Range Experiment Station

In order to move quickly into this subject, it is assumed that almost everyone here is in agreement that species improvement based on genetics is desirable. On that basis we can start right out talking about the fields of activity where improvement can be made; what we know about ways to improve trees; and how the job can be done if we all aim our efforts the same general direction.

Talking about tree improvement based on genetics is a little absurd until two other steps are taken. Both of these are the proper activities of the average forester and forest worker. The first of these steps is to reverse the process of negative selection in the conventional forest practices. How can we be really serious about forest genetics when we all are aware that the bulk of the cones collected for our nursery-grown seedlings come from the trees whose main attribute is that they are easy to harvest - small, limby, and squat, - or are chosen on the