For the benefit of the guests, I should like to say that we have three classifications of members: Junior members, Commercial Members, and Non-commercial members. One requires for full membership a minimum of five years of practical experience, research or association with the science and art of plant propagation. The provisions of junior membership are liberal in that the applicant is credited with any portion of the five years' experience which he has when he applies and we, therefore, have a system whereby a person might be a junior for an entire five years; on the other hand, he might be a junior only one year, depending upon the judgment of the Membership Committee.

It is customary for persons to be invited as guests so that they may, if they so desire, communicate with members of the Membership Committee and secure the signatures of three members on their applications.

To welcome the members and guests to the Annual Meeting is a very graceful way for the previous year's president to retire, so I shall now retire and thereby allow President Scanlon to proceed with the Sixth Annual Meeting. (Applause).

PRESIDENT SCANLON: Thank you, Dick, for starting our meeting. The first speaker this morning is Mr. Aart Vuyk of Musser Forest, Inc., Indiana, Pennsylvania. His subject is "Mass Production of Forest Tree Seedlings"

MR. VUYK: Mr. President and members and guests, it is pleasure to be here again at an annual meeting of the Society and to be able to talk to you

Mr. Vuyk presented his paper entitled "Mass Production of Forest Tree Seedlings." (Applause).

MASS PRODUCTION OF FOREST TREE SEEDLINGS

AART VUYK
Musser Forest, Inc,
Indiana,' Pennsylvania

SOURCE OF THE SEED: Good seed is one of the most important factors in producing a good seedling Special attention should be given to elevation, climate, and characteristics of the parent trees. Years ago growers didn't care too much where the seeds came from, but we have learned that the source of seeds is of most vital importance, and cannot be overlooked by the serious grower who wants to sell a good product.

We, at Musser's, try to buy or gather the seeds in locations comparable to our own general conditions of climate and elevation. When the harvest is good, we buy seeds for years ahead and keep them under refrigeration. To give you an idea of the importance of good seed, let us take a look at one of the best selling pines in the trade, the Scotch pine. As most of you know, there are few races of Scotch pine, and if you start out with seeds from a race not well adapted to your own location, the results can be disastrous. Irregular and reduced growth, crooked stems, and even late spring frost damage may occur when the

seeds come from a location with earlier spring and warmer summer conditions than you have.

This also applies to Norway Spruce. We discovered a very well adapted Norway Spruce. Two-year seedlings graded 5-10 inches, whereas the regular Norway Spruce seedlings never graded over 3-6 inches

Canadian Hemlock is also very sensitive, especially as a one-year seedling, when seeds are obtained from the wrong source. One must pay particular attention to the source in buying or collecting seeds of all forest trees.

STORAGE. We store the cones on racks and put them in a gas heated room, at a temperature approximately of 120°F After the cones open, extraction is effected by a tumbler, preferably on a day with low humidity. Many varieties of pines and spruces may be stored for several years without losing much viability. The opposite is true for the firs, which lose a high percentage of their viability in one or two years, usually about 50% after two years storage.

We store the seeds in five gallon jugs and label for species, year of seed crop, origin, etc. We maintain a temperature of about 35 to 40°F, and make sure that the moisture content is low when seeds are put into the jars.

AMOUNT OF SEED PER 400 SQUARE FEET: To determine the amount of seed used per bed, we use two seed tests, one made by one of the State Universities, and one made by our foreman in the nursery. We count exactly one hundred seeds for each test, and determine the amount of seed according to the outcome. As a rule, the tests don't vary much and we go by the better one.

Two years ago we had some seed of Nordman fir (*Abies Nordmanniana*). The test from the University showed zero, and our foreman got four out of a hundred. We decided after a cut test to sow the seeds anyway, and got a fairly good stand. So don't throw your seeds out the window before you try twice.

Some Examples of the Amount of Seed to be Used Per 400 sq. ft. are:

Scotch Pine	1½ - 2 lbs.
White Pine	1¾ - 2 lbs
Austrian Pine	2 - 2½ lbs.
Am. Red Pine	1¼ - 1½ lbs.
Mugho Pine	1½ lbs.
Norway Spruce	1½ - 2 lbs.
White Spruce	1 lb
Colorado Blue Spruce	1 - 1¼ lbs.
Canadian Hemlock	1 - 1¼ lbs.
Balsam Fir	2 - 3 lbs.
Douglas Fir	2½ - 3 lbs.
Concolor Fir	4 lbs. (Old seed 6lbs. at 40%)
Cedrus atlantica	5 - 6 lbs. (+5600 Per Lb.)
Japanese Larch	2 lbs
Tulip Poplar	10 - 12 lbs. (Mostly only 7-8% viability)

The Oak varieties and Chestnut are hand planted, and the maple varieties are sown on sight.

STRATIFICATION. Through the years we have made quite a number of tests, and gone throuh a lot of books and advice from different seed dealers as to cold treatments, hot treatments, etc. Now we are back to mother nature and some old fashioned stratification methods, and we are satisfied with the results.

The hard-coated seeds like taxus, *Ilex*, etc., are stratified in peat and sand in boxes in a cool place or sometimes in the seedbed. Many items like dogwood, maple, barberry, oak, chestnut, birch, poplar, locust, elm, linden, and some pines, are sown in the fall as soon as the seeds are collected or received. Due to the tremendous amount of work in the spring, it's a relief that this fall seeding gives us good results. Three years ago, we decided to grow Chinese chestnuts. We got advice from our seed-dealer as to how to stratify in cold storage, checked every two weeks for mold, and turned them over in containers. A lot of work and complete failure was experienced. Last year, the day after we got the seeds in, they were sown The result was a 97% stand. The way it looks now, we are going to stay old-fashioned, as far as stratification is concerned.

PROCESS OF SEEDLING: After plowing the field, we make up the beds with a Gravely Garden Tractor (a bedmaker doesn't work in our tough soil), and then rake them out by hand The size of the bed is 100 ft. by 4 ft. We use mushroom manure or cow manure which ever is available, bonemeal and a 6-10-4 fertilizer. In order to distribute the seeds evenly over the bed, we use a 10 by 4 ft. square with the amount of seed divided in 10 equal, parts. All seeds are coated with red lead for protection against rodents. The seeds are covered with a sand-shaker which straddles the beds. They are then covered with salt hay, and shad-racks are placed on top to prevent the salt hay from being blown away by the wind. The sand coverage is determined by the size of the seed. As soon as the seeds start to germinate, the salt hay is taken away, and the shade is raised to 18 inches. For the evergreen seedlings, shade remains until about the second week of September. On all hardwood seedlings, however, shade is taken away as soon as the danger of frost is past. Also, there are some varieties which require no shade at all.

MAINTENANCE: All the seedbeds are under irrigation during the summer months. We use a portable overhead sprinkler system. At Nursery No. 3, the water is supplied by a man-made lake of 29½ acres, and at Nursery No 2 there are two reservoirs holding 4,000,000 gallons of water. The waterlines there are underground. Weeding is done by hand labor, and a program which employs weed-killers is now in progress on a large scale. The seedbeds are watched very closely for disease and a spraying program is maintained during the summer season.

In the Fall all one year evergreen seedlings are mulched with salt hay. This coat remains until about the 15th of March to prevent heaving. When the mulch is taken off, the shade racks are put back on,

and stay there during the hottest part of the summer, and are permanently removed in early Fall.

By then, one should have a sturdy two-year seedling which can stand the weather. In early Fall, a considerable amount of transplanting is done in the beds, because we could not take care of all this work in the Spring All those transplants are mulched, as for one year evergreen seedlings. Additional transplanting is done in May when the busy shipping season is over.

Wherever possible, the seedbeds are lifted with a bedlifter, and the remaining beds are root-pruned. In the counting room little trees are graded over a conveyor-belt to find their way to the Christmas tree plantations, the transplant-beds, and our customers.

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(Editor's note: Mr. Vuyk showed a series of beautiful slides illustrating various nursery operations, including the use of DDT for insect control, fly ash (a byproduct of coal mining) as a soil conditioner for clay soils, and special planting boards to facilitate the transplanting of small seedlings Many of the following questions were discussed while these slides were being shown.)

MR. FILLMORE: How deep do you plant the seeds?

MR. VUYK: We cover the seeds according to the size of the seed. If they are small, we use a very light cover, no thicker than the seed. Larger size seed are covered accordingly. We put more sand on top of the coarse seed than we do the fine seed.

MR. MARTIN VAN HOF (Rodhe Island Nurseries, Newport, R.I.). How many seedlings can be planted per day with the planting boards?

MR. VUYK: I can't tell you about transplanting seedling since it is not my department. However, we transplant rooted cuttings from the greenhouse. Planting boards are not used however. By hand, two men plant approximately 260 rows of about 20 cuttings per row.

Question: Do you spray the pine seedlings?

MR. VUYK: Yes, we apply DDT about the time the pine shoot moth comes out. This treatment is to prevent the insect since we don't have them yet.

Question: How do you space Scotch pine for Christmas tree production?

MR VUYK. They are spaced five feet by five feet. These trees will remain six or seven years before they are cut. They will then be five to six foot trees.

Question: Is Scotch pine still your favorite for Christmas tree planting?

MR. VUYK: Yes, about 900 of a thousand will be Scotch Pine. Others include white, red, and Austrian pine.

Question: Do you have Balsam fir?

MR. VUYK: We have sold some Balsam fir, but needle drop is a problem. Because of needle drop we never start cutting spruce before December 6th or 7th. Cutting pine usually starts on December 1st, however, one year we started cutting as early as October 15th. If there are several rainy days, pines can be cut and placed in piles. We have never grown Douglas fir as a Christmas tree

Question: Do you plant Christmas trees by hand or by machine?

MR.VUYK: Machine planting is used whenever possible. If the hill is too steep, we plant by hand.

MR. RICHARD VAN HEININGEN (Van Heiningen Nurseries, Deep River, Conn.) Do you pick seed from your own plants?

MR. VUYK: Yes, we do, especially Scotch pine, Norway spruce, and hemlock. We allow the cones to dry and open in a heated room Sometimes we give the cones to a seed dealer to process for us.

MR. VAN HOF. What fungicide do you generally use?

MR VUYK: Mostly Fermate, but also Captan.

MR. VAN HOF: How much care is required?

MR. VUYK: Approximately 1800 trees can be planted to the acre if a five by five square is used. We start shearing the pines and spruces the fourth year. If we think a plant will be good in the seventh year we don't shear the sixth year.

Question: Do you spray for spruce gall?

MR. VUYK: No. It is not necessary if they are cut.

Quetion: Can pines be cut if they have pine shoot moth?

MR. VUYK: I am not sure, but I think you can't cut them.

Question: What was the black material you put in the soil?

MR. VUYK. It is fly ash, a product from coal mines It is used to condition our heavy clay soils

MR. JOHN VERMEULEN (John Vermeulen and Son, Neshanic Station, New Jersey): How do you use the red lead for rodents?

MR. VUYK: It is applied in dry, powdered form. We add some red lead powder to a bucket of seed and mix it until all seeds are coated

MR HANS HESS (Hess' Nurseries, Mountain View, New Jersey): What do you use to get the red lead to stick on the seeds?

MR. VUYK: If you stir the seeds or shake them in a box, they will become completely covered. It is not necessary to use anything

MR. HESS. It has been our experience that the red lead will not stick on smooth-coated seeds, such as pine and spruce, unless we add a very small quantity of linseed oil to coat the seed first and then apply the red lead. By this procedure the red lead sticks on long enough so that the birds will not eat the germinating seed in the spring.

MR. VUYK: Well, the birds are not a problem in our seedling at all, because our seeds are always covered with salt hay The birds can't touch them. After they germinate, as a rule, the birds don't bother the seed.

MR. HANS HESS: To discuss this thing a little further as far as birds are concerned, in our area we cannot grow a spruce, pine, hemlock

or yew seedling without either treating with red lead or covering the bed with a fine mesh wire to keep out the sparrows. They will clean a bed of seedlings in a 24-hour period. They will absolutely destroy every seedling which has emerged, removing the seed head, leaving just the stem After eating the seedlings, they will proceed to scratch in the bed and eat whatever seeds are left. That has been a problem with us for the last ten years. I know there are more fellows who have that same problem. Before that time, we had no difficulty at all, and as each year progresses, the birds find more things that they will eat and destroy. For years they haven't bothered hemlock. Last year, they cleaned us out of hemlock seed.

MR. C. H. HENNING (Park Department, Niagara Falls, Ontario): What is salt hay?

MR. VUYK: Salt hay is a product of the swamps of New Jersey. It does not contain any kind of weed seeds

MR. LOUIS VANDERBROOK (Vanderbrook Nurseries, Manchester, Conn.): Why do you use DDT to certify your nursery?

MR. VUYK: We are not in a Japanese beetle area, but they are moving in closer and closer

Question: Do you think DDT is better than Aldrin?

MR. VUYK: We have used both. DDT handles better and is effective for a longer period of time

MR. VANDERBROOK: Where do you get sufficient labor for this enormous operation?

MR. VUYK All weeding of the seed beds is done by girls The boys take care of spraying and the more heavy work.

MR. FILLMORE: Do you practice the same root pruning procedure on deciduous seedligs, such as oaks and chestnuts, as you practice on the narrow-leaf evergreens?

MR. VUYK: We undercut pin oak and Norway spruce. The blade is set deeper than for the evergreens.

MR. HAROLD HICKS (The Cottage Gardens, Lansing, Michigan): What is the fertilization program for these seed beds?

MR. VUYK: It is not a big fertilization program. When we make the seed beds we use mushroom manure, or cow manure if we can get it. Just before seeding, we apply 6-10-4 at a rate of about twelve pounds per bed.

We make two applications of 20-20-20 to the two-year old seedlings. The first application is made late in May or early June and the second in July. We once made the mistake of continuing the fertilization program.

MR THOMAS PINNEY (Evergreen Nursery Co., Sturgeon Bay, Wisconsin): How do you control damping-off?

MR VUYK: In my opinion, when damping-off has started, it is hard to control. We spray all one year seedlings with Fermate or Captan whether or not they are diseased. We don't give the same application twice. If the first spray is with Fermate, then the second would be Captan.

MR. PINNEY: We have been coating the seed with Tersan or Semesan. Do you use wires to support the shades for the seed beds?

MR. VUYK: No. The shades are on pegs as cross pieces.

MR. LESLIE HANCOCK (Woodland Nurseries, Cooksville, Ontario): Dusting seeds with sulfur is as good for controlling damping-off as anything we have used. It is very cheap and equally as good as commercial materials. With Austrian pine, sulfur treated seeds gave nearly a 100 percent stand, whereas an untreated lot was almost a complete loss.

MR. C. S. INGELS (The Home Nursery, Lafayette, Ind.): How was the sulfur for control of birds?

MR HANCOCK: There isn't a single answer for everything. You have to use the red lead for control of the birds. Perhaps the two materials could be applied at the same time.

MR. D. D. QUINN (Willo' dell Nursery, Ashland, Ohio): When do you prune the pines?

MR. VUYK: The pines for Christmas trees are pruned just once a year. Our pruning operation starts about June 15th and continues until about July 15th. The spruce are pruned during July. We have never pruned pines during the winter.

PRESIDENT SCANLON: Because of the time it will be necessary to conclude this session. If there are further questions, I am sure that Aart Vuyk will be glad to answer them individually during the remainder of our meeting We thank you, Aart, for a very interesting and informative presentation. The afternoon session will convene at 1:30 p.m.

The session recessed at 11:55 a.m.