McDaniel: We control the temperature, bringing it down with water. We bring the temperature down by application of one watering period since the top soil has highest temperature during the heat of the day.

Chairman Webster: The theory used to be that we do our irrigating early in the day. Is this necessary, or can it be done during the heat of the day?

Lanquist: One time we had trouble raising white pine. The ground seemed to form heat lesions. Someone hit on the idea of cooling the soil by sprinkling to control surface soil temperature. Soil temperature as high as 120°. Sprinkling solved our problem.

Rindt: Lake State Experiment Station ran experiments on that subject. It was believed that we had to water in the cool of the day, thinking that cold water on a hot day would injure the plants. This seems not to be true. I have watered when air temperature was 107 and soil temperature 125 in the heat of the day on 1-0 and 2-0 stock with no harmful effect.

Chapin: We use overhead sprinkling in lieu of shading and have not shaded for 10 years. We are raising spruce, pine, fir and have had no trouble in 10 years.

Deffenbacher: We have done away with shade frames.

Chairman Webster: Do you watch your soil temperatures at each application?

McDermitt: I have lost trees by letting the soil temperature get too high before applying water.

Chairman Webster: Thank you, Walter, for a job well done. The subject was very interesting and I believe that from the discussion some of us picked up a few pointers that will save our employers considerable money. Our next topic is Stock Distribution - Lifting and Grading, and will be presented by Norman Bjorklund and Earl McDermitt of the Nisqually Nursery, the only industry nursery represented here today.

STOCK DISTRIBUTION - LIFTING AND GRADING

by

Norman Bjorklund and Earl McDermitt

Since inception of the Nisqually Nursery in 1941 by the West Coast Lumbermen's Association to provide planting stock for reforestation of idle private forest lands, lifting and grading methods have been developed from experience and through experimentation to handle a seedling crop which now averages six to eight million trees per year. Practices being used currently will be changed as needed.

Lifting

Lifting operations generally start at the Nursery about the fifteenth of November and continue until the first part of April. By November 15th the trees are in a dormant condition and have hardened off to the extent that they can be handled without appreciable damage. By early April, spring growth is beginning and further lifting is stopped. Lifting operations are coordinated with packing orders on a week to week basis, as the storage facilities at the Nursery are

limited to about five hundred thousand 1-0 seedlings. Twenty-five percent of the stock is lifted for fall and early winter planting, and the remainder is left for spring planting.

The initial step in lifting is the loosening of the soil in the bed by use of a lifting blade. At Nisqually this blade is attached directly to the frame of a crawler tractor. A gear mechanism enables the operator to control the depth of the blade which is usually kept at eight to nine inches below the soil surface. A slight downward tilt of the blade and uplift prongs on the rear of the blade aid in loosening the soil. After the soil has been loosened, the trees are pulled carefully and by hand and placed in field boxes which have an average capacity of about 1200 trees. Layers of two to three inches of trees in the field boxes are separated by sheets of thirty-one pound white wax paper to prevent matting of the roots. The top layer is covered with a piece of wet burlap sacking to prevent moisture loss. In the pulling operation trees are shaken lightly to remove loose dirt, and are exposed to the air for as short a time as possible. As soon as several boxes have been filled, they are loaded on a tractor trailer for hauling to the packing shed. In freezing weather, beds which are to be lifted the next day are covered with burlap strips to prevent freezing.

Ease of lifting and pulling depends on both class and density of stock. By species Port Orford cedar is the easiest to lift, Douglas fir being the next with Sitka spruce and Noble fir the most difficult. One-0 stock and dense beds are more easily pulled as the root systems are not so extensive or entwined. Prior to the start of the lifting season, the beds are thoroughly cleaned of all weeds and grass, as the sodding action of their roots greatly increases the difficulty of pulling. Appreciable snow or continued freezing weather suspends lifting operations. Fortunately similar conditions prevail on the planting sites, and the demand for stock subsides.

Grading

Grading and packing are accomplished by a continuous production line process. Equipment for grading and packing includes two identical units consisting of an endless belt grading table, two types of tree counters, a small packing bench and a tying table.

Along the twenty-four foot grading table are stalls for four feeders and one grader arranged with convenient racks on dead rolls for field boxes. Feeders place trees on marks which are spaced at one-foot intervals on the endless belt. The grader carefully checks all trees placed on the belt and replaces all those which do not come up to the standards. Grading standards have been developed from past experience and are modified each year to fit the condition of the current stock. An annual meeting of planting supervisors formulates such modifications. Standards are based on top length, root structure and length, top-root ration, and general condition and vigor. The endless belt of the grading table delivers one hundred fifty trees per minute to the packers. An average day's production for one table is sixty thousand trees, and for both tables approximately one hundred ten thousand trees.

Counting

An option of two methods of counting stock is available; a mechanical counter and an electric-eye. The mechanical method, which automatically trips a revolving catch-basin when fifty trees have been deposited, is normally used as it stabilizes the production rate to the speed of the grading belt. However, in processing of stock which is difficult to feed on the belt because of entwined or

exceedingly muddy roots, the electric-eye has been found to be most practical. One disadvantage in using the electric-eye has been that small stock does not break the beam long enough to trip the counter every time, and a consequent over-run results.

Packing

A packing crew of two takes two bunches of fifty trees from the catch-basin, trims the roots to a nine-inch length with a heavy knife built on the order of a paper cutter, covers the roots with wet peat moss from a chute-type reservoir and wraps the hundred trees in thirty-five pound Wax Kraft paper. These packages are then placed in a metal receptacle lined with a sheet of ordinance wrapping material. When ten packages have been placed in the container with half the packages aligned in each direction so that all the roots are protected, the bundle of one thousand trees is ready for tying. The bundle is pushed down an inclined dead roll to the tying table. The bundler tightens the ordinance material around the trees; ties each with a manila rope; stamps the bundle as to class, origin, quantity of stock, and date of packing; tallies them and immediately transfers them to the storage room. Waterproof, strong and extremely resistant to wear and tear, the ordinance material makes a bundle which is neat, compact and protective for the trees during shipment. The average bundle of one thousand 1-0 stock weighs twenty-five pounds.

Stock Distribution

Stock distribution is handled by one of two methods as determined by the purchaser. Stock may be shipped by common carrier truck which will stop at the nursery so that the trees can be loaded directly from the storage room to the truck; or the purchaser may pick up the trees directly from the nursery, using his own transportation, thus insuring prompt delivery to the planting site.

Question: What is the name of the mechanical counter?

McDermitt: We had it made and it is just a little switch on the belt. We also count trees by use of an electric eye. It speeds up the job of counting.

Question: Can you speed up the belt when your employees are fresh?

McDermitt: No, the opposite is true.

Kindt: What is your output per employee?

McDermitt: We usually have three men in the field and eight inside producing about 68 thousand per day on one belt.

Chairman Webster: It might be interesting to make some comparisons on lifting and grading of the different nurseries.

Augenstein: Before the war we had our average count of 15 thousand per man-day. The past year is 10 thousand per man-day. We do all field pulling, sorting and tieing 100 in a bunch. We allow 5 either way in 100 on the counting. Some forests do not count, they estimate their beds. We have tried on a weighing basis, but do not like it.

McDermitt: In lifting or tieing in the field, do you get as good stock as you do running them over the belt?

Augenstein: We have used the belt during CCC days, but it is too slow. Our roots intermingle quite a bit and we do not try to separate in the field. Lateral roots are sometimes 15 inches long.

Wells: We get 15 thousand to 20 thousand per day. We are not satisfied with the count; we get lots of complaints. We get a new crew about every year and it is difficult to train each man.

Chairman Webster: How does that production stack up with ours, Homer?

Ward: The crew this year did not hold up to 10 thousand per man, but some individuals pull, grade and count 20 thousand under favorable conditions.

Augenstein: Has anyone built a tree-pulling machine yet?

McDermitt: Have never heard of one. It would probably be quite a project, as the trees are very tender.

Augenstein: We have been thinking of something on the order of the potato digger. Just loosen the trees and have men sitting on each side of the machine. It would save some of the hair roots.

Wells: If you get steady employees, you could soon pick out a crew that would average 17 to 20 thousand a day.

McDermitt: The average person, who is a good fast worker, is hard to hold because of the wages he would be able to get elsewhere. When we pay $1 an hour and he is able to get $1.45 elsewhere, he will leave.

Hagenstein: We use ordnance cloth for baling. It was used in the Army for wrapping tools for overseas shipment. It is a dark green, coated with heavy wax. I do not believe it is available now.

Deffenbacher: We use "ocean wrap." It is a cheese cloth with a layer of cellophane on either side. The cellophane is waxed. It is very stout and durable. Absolutely moisture-proof, and it can be re-used. We wrapped some bundles in burlap and some in ocean wrap and set them outside over the winter. They were out about four and one-half months. In the bundle in ocean wrap there was practically no mold. The roots were in good condition. In the bundle in burlap there was considerable mold and small hair roots had completely deteriorated. Ocean wrap keeps them much better than burlap. Cost is $21 per roll, 36 inches wide - 300 feet. It is war surplus material. We cut it in two and use the 18-inch strips.

Dill: Do you notice any difference in stock that is packed in shingle tow and peat moss?

Augenstein: The shingle tow is claimed to have a toxic effect. It kills fungi and should be beneficial and does not seem to affect the trees. Shingle tow is not injurious as a packing medium.

Engstrom: You spoke of establishing a standard for each species.

McDermitt: Standards are set by themselves. Any tree is a good tree if the roots are well established. We throw lots of trees away because they do not come up to standard. The development of the trees depends on the seed

McDermitt: (cont'd) from which it is grown. If the seed was good, you can expect good seedlings. I am a strong advocate of good seed. You cannot get good stock from poor seed. We are planting a great deal of seed that is not good enough.

Chairman Webster: Thank you, Norman and Earl. Our next topic on Seedling Storage will be presented by Forrest Deffenbacher, Nurseryman, Wind River Nursery of the U.S. Forest Service, R-6.