

winter hardiness and other superior qualities. He has just named and released "Blue Haven." The crosses made at Beltsville are now all tested on the Galletta Brothers plantation at Hammonton, New Jersey. At the present time this cooperator has about 20,000 seedlings under observation, as well as about 500 acres of blueberries in production. A selection named and approved for release next spring is "Lateblue." In return for furnishing the land, cultivation and care of the seedlings and years of observation, the cooperator has, when a variety is released, the only source of plants for sale. There is also a new early variety which will probably be released next spring. A supposedly good early variety, Earliblue, released several years ago, did not live up to expectation. Because some older varieties become obsolete and new varieties are being introduced, there is a market for plants and we have found that softwood cuttings are the best method of propagation for us.

MODERATOR TUKEY: The final speaker for this afternoon will be Dr. Albert Johnson of the University of Minnesota, St. Paul, Minnesota.

#### **VARIATION IN CLONES OF RED-OSIER DOGWOOD**

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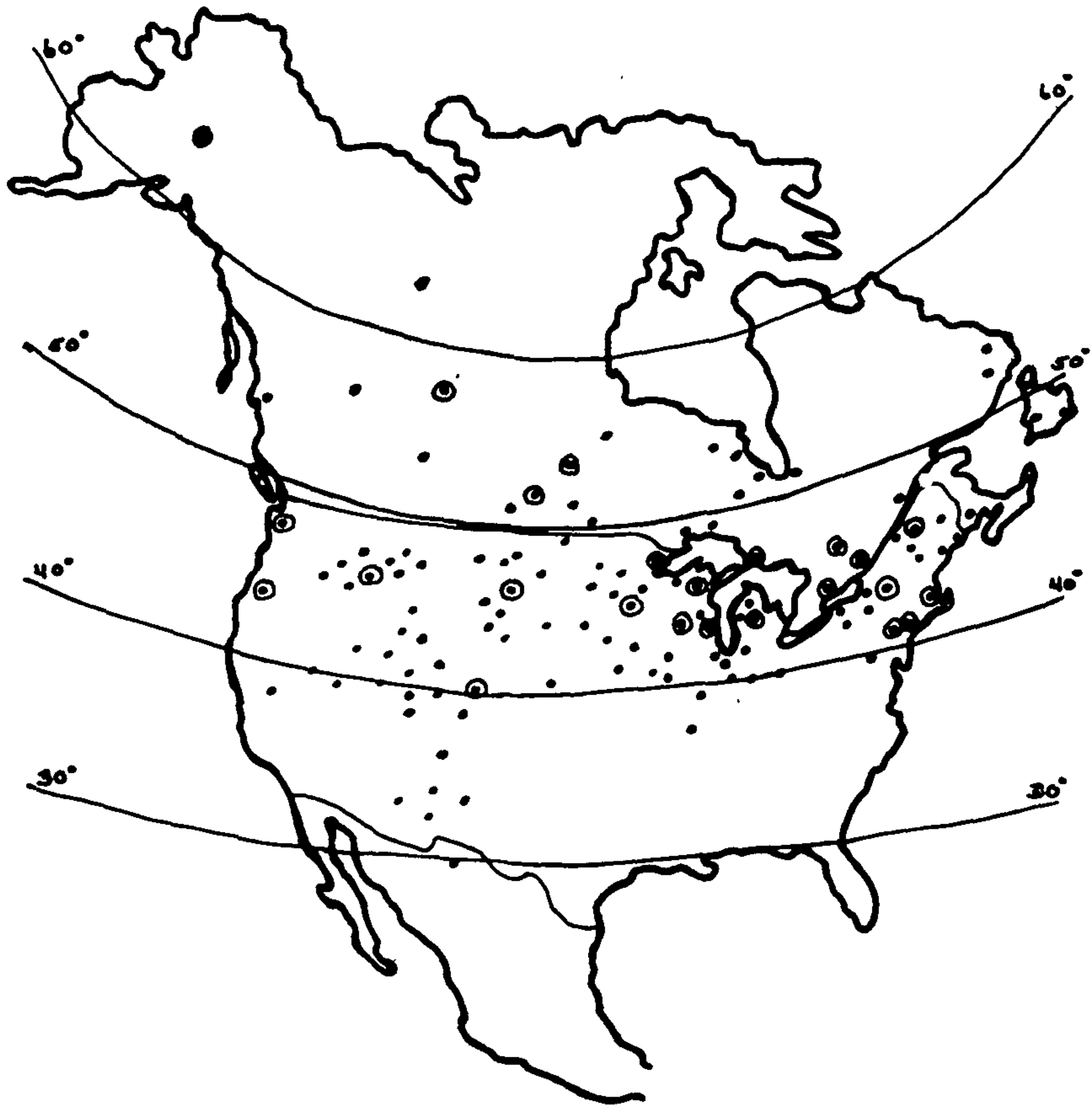
*St. Paul, Minnesota*

Nurserymen have long recognized the importance of using plants well adapted to their local climatic conditions in order to produce attractive and fully hardy specimens. Presently, there is an increasing interest in the use of native plant materials. For this reason knowledge of factors relating to the geographic origin of plants used for propagating purposes is of growing concern.

In 1963 we obtained dormant cuttings of red-osier dogwood from points both in the United States and Canada. Figure one indicates the collection points of dogwood and the source of specimens in the University of Minnesota Herbarium. The resulting plants were grown in the greenhouse and then transplanted in a randomized block design into the experimental plots.

Variations both in plant form and growth rate were noted during the first growing season. The extremes in variation in form are evident when comparing a typical plant from the Minneapolis area (Figure two) with those of the same age from Alaska (Figure three) and Seattle, Washington (Figure four).

Total growth by October, 1963 was determined by measuring all stem material in excess of three centimeters. Figure five indicates total increment of all clones studied. In comparing increment with climatic parameters such as length of grow-



**Figure 1 Collections of Red-osier Dogwood from Throughout Its Range**

• - From the University of Minnesota Herbarium

⊙ - Collections Made for the Present Study

Figure 1. Collection Points of Red-osier dogwood

ing season, winter minimal temperatures and latitude it was found that closer correlation exists between increment and both growing season length and winter minima than between increment and latitude. This type of correlation was found in all other observations included in this study.

Observations were made during the late summer and fall of variations in onset of winter buds, red bark color appearance and leaf abscission. Those from northern sources produced winter buds, turned red and dropped their leaves much sooner than those from farther south. Extremes were noted in plants from Alaska, which stopped growing in early August, as compared to those from Seattle which did not stop grow-

ing until November and held their leaves all winter.

Cuttings of each clone were brought into the laboratory and slowly cooled in a freezing chamber in a series of Dewar flasks. Temperatures were slowly lowered and cuttings removed at certain temperatures. The cuttings were then placed in humid chambers where their viability was noted.

This procedure was begun in September 9 and repeated at two week intervals (except for a period in October when the freezer was inoperable) until December 4. As fall progressed the temperature range was lowered for each test run until by October 17 the lowest obtainable temperature ( $-90^{\circ}\text{C}$ ) was reached.

It was determined that all clones, even those from mild climates such as Seattle, Washington, became hardened to the



Figure 2. Red-osier dogwood from Twin City Area.



Figure 3. Red-osier dogwood from College, Alaska

lowest temperature the freezer could measure ( $-90^{\circ}\text{C}$ ), but that there were statistically significant differences in the date at which each clone became hardened. In order to provide statistically comparable data it was necessary to express the results as the date at which clones reached a given level of hardiness. Figure six thus indicates the date at which all clones of dogwood became hardy to  $-27$  degrees centigrade. Although in the spring there was variation in dates at which summer green bark color returned there were no differences in dates of bud break. This may have been due to the fact that we had a cold April and a rapid rise in temperatures in May causing a telescoping of phenological events. We did, however, bring material in a controlled environment chamber in February and under the temperatures and photoperiods tested (see



Figure 4. Red-osier dogwood from Seattle Washington.

Figure 5 Variation in Total Growth Between Clones.

Measurements Taken on October 6, 1963

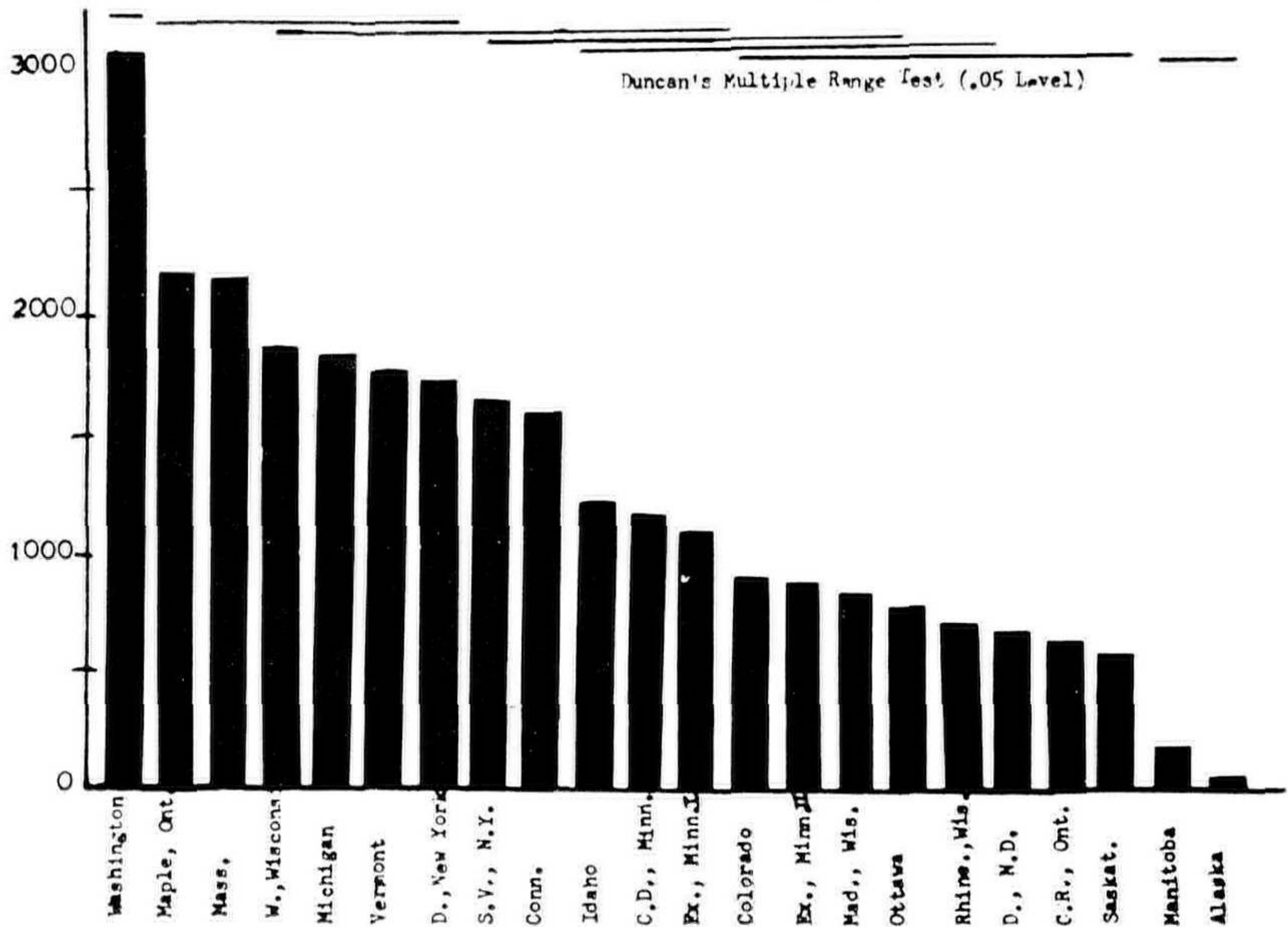


Figure 5. Variation in Total Growth Between Clones. Duncan's Multiple Range Test—those means not underscored by the same line are statistically significantly different from all others.

below) there was no significant difference in time to bud break.

- Test 1. 70° Day one chamber at 8 hours and one  
 55° Night at 16 hours photoperiod  
 Test 2. 55° Day Same photoperiod as Test 1.  
 36° Night

In summation, there are important variations in both growth and dates of phenological events in different clones of red-osier dogwood indicating the desirability of using locally adapted materials as sources of propagating stock.

Figure 6. Variation in Dates at Which Clones Became Cold Acclimated at -27°F.

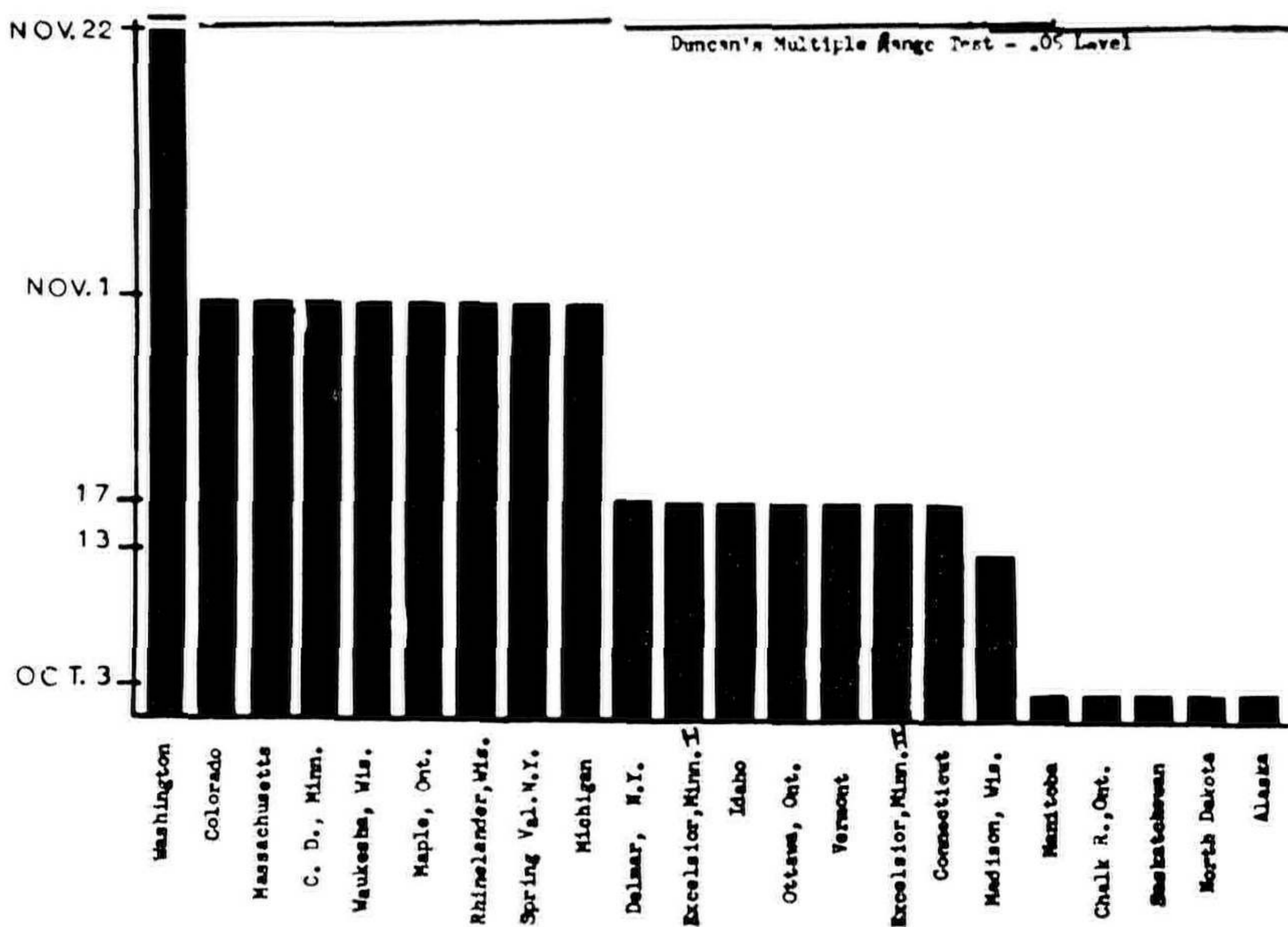


Figure 6. Variation in Dates at which clones became cold acclimated to -27°F.

MODERATOR TUKEY: Are there any questions for our previous three speakers?

JOHN ZELENKA: I would like to ask Mr. Law if they have used airplane spraying or have they had any experiments with it?

JIM LAW: No, John, none at all. We have done dusting by airplane in our plant at Oklahoma where we have extensive acreage but we have done no airplane or helicopter spraying for two years. We did have 80 acres in one block which was very wet and we did dust that because we were not able

to get to it on the ground. It is difficult to use airplane spraying because we have such a range of crops and we just could not do an adequate job of spraying with one formulation for all of the crops.

VOICE: I understand there has been some airplane spraying for rabbit control. Have you heard anything about this?

JIM LAW: No, we fence everything, even material that is to be dug in the fall. It takes about 5000 feet of fence each year just to keep up with the fencing program.

RALPH SHUGERT: I'd like to make a comment in regards to rabbit control. Last year was the first time in the history of Plumfield Nursery that not a fence was put up. We had complete control of rabbit damage by spraying the blocks with Arasan and a spreader sticker. What we did was to just go around the blocks and spray into them. It was not necessary to go up and down each row. This worked for apple, pear, linden, euonymus, and other plants which are very susceptible to rabbit damage. I would like to ask Jim what you are doing for control of pear blight?

JIM LAW: We are dormant spraying; that is when growth completely stops. It is usually in November. There may be leaves on the trees and the bud scars have not completely suberized over. We spray with an 8-10 Bordeaux mixture.

BILL CURTIS: We don't have a rabbit problem but we are troubled by deer. Has anyone used a spray for deer control?

JIM LAW: We hang a small bag of blood meal on each tree. That's about the only thing that we have had any reasonable success with.

JOERG LEISS: We have had good success using Arasan at  $\frac{1}{4}$  the rate that is normally used for rabbit control. It does a very good job.