HUGH STEAVENSON: You've heard your next speaker before and he was so good he was asked to come back again this year. Dr. Harrison Flint.

TESTING LANDSCAPE PLANTS FOR HARDINESS IN VERMONT'S CLIMATIC ZONES[1]

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This program was started in 1962, shortly after I arrived at the University of Vermont. At that time it was apparent that one of Vermont's greatest horticultural needs was more accurate information on the hardiness of some of the better landscape plants. A testing program started at the University of Vermont ten years earlier had been carried on actively for three years, and then had lain dormant because of a personnel change.

For such a program to be of value to the majority of people in the state, it was necessary to test not only at the University of Vermont (in the Lake Champlain Valley) but in other parts of the state as well, since Vermont includes a range of average annual minimum temperatures from -10 to -15° F. in the southeastern corner, to -30 to -35°F. in the northeastern corner.

Fortunately, quite a number of species had been observed previouly in Vermont, due to the efforts of local nurserymen and other people willing to experiment with new plants. Additional information was available from arboreta in other areas having a climate at least roughly similar to that of Vermont, including the Arboretum of the Canada Department of Agriculture in Ottawa, the Montreal Botanical Garden, the George Landis Arboretum, and the University of Minnesota Landscape Arboretum. Information from such sources narrowed the selection of test species and enabled us to include species whose hardiness was most in doubt.

Cooperators were selected by invitation, to insure a good sampling from the hardiness zones in question. In the spring of 1963, the first plants were distributed. From the beginning of the program until July 1, 1966, approximately 2800 individual plants were distributed for trial. These represented 157 taxa, and were distributed to a total of 43 cooperators. A list of taxa, including the number of cooperators testing each and the number of plants under test, is available from the author.

Most of the plants distributed were propagated at the research greenhouses of the University of Vermont and were grown outdoors in pots to a size where they could be planted in final location. During this time they were over-wintered

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[2]Present address Arnold Arboretum, Jamaica Plain, Massachusetts

in a frost-free greenhouse to eliminate any possibility of winter damage before distribution. Most were distributed when they were well-established in a one-half or one-gallon size pot. Plants were distributed in late spring to allow them nearly a full season in which to grow and become established before the first winter. Since many cooperators did not have nursery facilities it would not have been practical to use smaller plants.

Each winter a checklist of available plants was sent to the cooperators, who then checked those they were interested in testing. Distribution lists were prepared from the responses. In this way, once the cooperators were selected, the entire program was kept on a voluntary basis. Cooperators were not asked to prepare written reports. Instead, University personnel made observations annually at the time new plants were distributed.

One of the secondary benefits of this kind of work is that those engaged in the field work have an opportunity to observe existing landscape plantings in the hardiness zones in question. The comments below are based more upon observations of existing plantings then upon results of the tests in this program. Obviously, a program so young cannot have had enough time to furnish much reliable information. Most of the results will be be seen in following years. Hardiness zones designations following each plant description are those currently recommended in Vermont[1], and are subject to revision as the range of useful hardiness of some is extended into colder areas.

SLIDE PRESENTATION:

1. *Pyracantha* 'Kazan' When I first arrived in Vermont, the last plant I expected ever to have use for again was *Pyracantha*. Then I made a visit to Gardenside Nurseries at Shelburne, Vermont, south of Burlington, and found a plant of *Pyracantha* 'Kazan' that was considerably taller and wider than I am. Some of the staff of the Arnold Arboretum had thought for some time that this cultivar might be hardier than most. We propagated it and distributed more than two hundred plants to Vermont nurseries. To date it has done well in almost every location. Zone 4B. Other cultivars of *Pyracantha* have not been tested. Perhaps some of these will be found equally useful.

2. *Euonymus alata* is known to be exteremely hardy and is a fine shrub for fall and winter interest. Zone 4A. The point here is that the compact form, *Euonymus alata* 'Compacta', is considerably less hardy than the species. In central Vermont (Zone 4A[1]), this plant is killed back every year — in some years nearly to the ground.

3. *Elsholtzia stauntonii* is killed to the ground every winter in Vermont but this doesn't keep it from being a useful

[1]U S D A Plant Hardiness Zone Map

and interesting plant. A member of the mist family. Elsholtzia has the fragrant foliage that one would expect, and the happy habit of waiting until September to flower. Because of winter damage it remains a low shrub — not a disadvantage today. Zone 4B.

4. *Prunus* 'Hally Jolivette' is one of the best and hardiest flowering cherries. While this plant is not as showy as some of the Japanese flowering cerries, it holds its flowers much longer. When the first flowers to open have passed, there are still unopened flower buds on the plant. In Burlington, the plant is reasonably showy for 2 to 3 weeks. Zone 5A.

5. *Viburnum fragrans* is both a surprise and a puzzle. This plant has long been considered none-too-hardy in parts of southern New England and it is especially prone to late spring frosts because it flowers so early. But it has been growing and flowering very well in Shelburne, Vermont. It has now been distributed to many other parts of the state and will bear watching further as time goes on. Apparently one important factor in its success is that it must be planted in perfectly drained soil. Zone 5A.

Viburnum species known to be fully hardy in Vermont include: *V. acerifolium, V. alnifolium, V. cassinoides, V. dentatum, V. lantana, V. lentago, V. opulus, V. prunifolium* and *V. trilobum.* Others hardy in all but the coldest parts are: *V. burkwoodii, V. carlesii,* and *V. sieboldii.* More than 40 species and varieties of *Viburnum* are currently under test at the University of Vermont.

6. *Rhododendron calendulaceum* and some of its hybrids are proving hardy in central Vermont. Zone 4 B.

Other azaleas that are hardy in the coldest parts of Vermont include three natives: *Rhododendron canadense,* Rhodora, *Rhododendron roseum,* Roseshell Azaleas or Mountain Pink, and *Rhododendron viscosum,* the Swamp Azalea. Others that are hardy in all but the very coldest parts of the state include *Rhododendron japonicum* and *Rhododendron nudiflorum.* Still others that have proved useful in the mildest parts of Vermont include *Rhododendron kosterianum, Rhododendron vaseyi* and *Rhododendron schlippenbachii,* although the latter frequently loses its flower buds to spring frosts even in the warmer parts of the state.

7. *Pyrus calleryana* 'Bradford' has been very successful in the Champlain Valley thus far, although the oldest plants observed are between 10 and 15 years old. It appears that this may be just as fine a small shade tree in Vermont as it has been reported to be farther south. Zone 5A.

8. *Acer ginnala* is one of the hardiest small trees. It often takes a few years to begin to assume its interesting round-headed shape, but when it does, it is outstanding. Both its form and the red color of its fruits are quite variable among individual plants, but all that we've seen have good scarlet fall foliage. It would probably be useful to select outstanding

variant forms and propagate them vegetatively — this maple is easily propagated by cuttings. Zone 3 B and colder.

9. *Castanea mollissima*, the Chinese chestnut, has been a topic of conversation among plantsmen in recent years, since it and its hybrids are expected to be the source of future edible chestnuts in this country. Growing seasons in Vermont are seldom long enough to allow nuts to mature. However, this does not detract from the ornamental value of the tree, and we may see it used more in the warmer parts of the state. Zone 5 B.

10. *Cladrastis lutea*. This American native has been tried very little in northern New England but has been perfectly hardy for 15 years in Burlington, Vermont, and is a welcome addition to the list of shade trees for northern areas. Zone 5A.

11. *Magnolia soulangiana* is doing very well in the Champlain Valley in areas having good air drainage. Remember that the Champlain Valley is prime apple-growing country, and not especially prone to late spring frosts. Zone 5A.

12. *Phellodendron amurense* is native to the Amur River border region between Manchuria and Siberia, where temperatures fall far lower than in northern New England. Once established, this tree is successful, but vigorous young plants can be injured by early fall freezes. Zones 3B.

13. *Syringa amurensis japonica*, the Japanese Tree Lilac, is one of the finest small ornamental trees and has done well for many years in even the coldest parts of Vermont. Zone 4A.

14. *Sorbus alnifolia*, the Korean Mountain Ash, is considered by some to be the finest species of *Sorbus* available. It has an interesting broad pyramidal habit, long lasting red-orange fruits and good orange fall foliage color, and seems to be highly resistant to borer attack. The limits of its hardiness have not been too well known but it is growing well in Ottawa, Canada, and is currently under test in western Vermont. Zone 4B.

15. *Pinus nigra*, the Austrian Pine, is one of the finest evergreen trees in Vermont. It is especially useful for windbreaks or large-scale hedgerows and may find more use in highway planting, along with the native Red Pine, *Pinus resinosa*. Zone 4A.

16. *Mahonia aquifolium*, the Oregon Hollygrape, has been very successful in certain parts of Vermont, especially where it is protected by reliable snow cover. It has been observed in quite a few spots in the south-eastern and east-central parts of the state and is now under test and so far doing well in the Champlain Valley. Zone 5A.

17. *Pieris floribunda*, the Mountain Andromeda, seems to be perfectly hardy in much of Vermont. Zone 4 B. The Japanese Andromeda, *Pieris japonica*, has not been successful.

18. *Rhododendron catawbiense* is perhaps the hardiest species of large-flowered *Rhododendron* and has been observed doing reasonably well even in areas frequently experiencing

35 degrees below zero. Zone 4A. Exposure is important for many rhododendrons in many areas, but it becomes especially important on the fringes of the useful hardiness ranges. Other species of *Rhododendron* doing well in the warmer parts of the state are *R. mucronulatum* and *R. smirnowii.*

19. *Rhododendron maximum,* the *Rosebay Rhododendron* is native to Vermont and is found in one colony as far north as Troy, just a few miles from the Canadian border. It grows under a partial forest canopy, however, and when brought out into cultivation sometimes winterburns severely in exposed spots. If placed in protected spots, it does well in cultivation, but is not outstanding as an ornamental. Zone 4A.

HUGH STEAVENSON: Thank you Dr. Flint for that beautiful and informative talk. Unfortunately the next speaker shown on your program, Mr. Maurice Wilsey, could not be with us. But we have what I like to think of as a second generation Harvey Templeton, Mr. Werner Rexer.

AQUA-VAPOR CONTROL

WERNER REXER
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Based on the principal of contraction and expansion of a special type of cordage, is the new misting and watering device, known as the Aqua-Vapor Control. The cordage in the wet stage, is approximately two percent shorter as compared when dry. (See Figure 1.) The control is equipped with a subminiature microswitch of one ounce release force, rated at a maximum of 5 amperes and 250 volts. It has a life expectancy of over ten million on-off operations and is completely enclosed in a waterproof housing. A plunger connected to the cordage actuates the microswitch through a diaphragm. (See Figure 2.). The total travel required is five one thousandths of a inch. The contraction and expansion of the cordage is one eighth of an inch when changing from a wet to a dry condition. This allows for variation caused by heat or cold, and makes the unit self adjustable. The control is hooked up directly to the curent of any type and to a solenoid valve, or a motor and pump. In the latter case, a relay is necessary.

The adjustments are made by placing the control in various locations from the mist nozzle, it is designed to range from 5 to 30 seconds on at any one time. The off or drying period is the same as that of the cuttings; in hot, dry surroundings with high light intensity it may operate as many as 40 times an hour, or as little as once every two or three hours on a rainy cool day, or at night. Further adjustments can be made by covering part or all but one of the holes of the perforated tube. This extends both the on and the drying period. One hole must remain open to receive the mist.

For hardening off, all the holes on top and the side away