WOODY PLANT COOPERATIVE TESTING PROGRAM

Larry J. Chaput, Dr. Dale Herman, Dr. Jerry Tuskan [1]/

Woody plant research has been an ongoing program at NDSU for many years. Since North Dakota is predominantly a prairie state, the need for continued research is as important today as it was during the early settlement and development of the state. More land is cleared each year and put into crop production. Wind and soil erosion continue to be a problem. New plantings need to be made to replace old ones or to provide shelter and/or ornamental value to newly developed areas. The search for new tree and shrub species and their cultivars or better adapted native species is needed if the best genetic material is to be used. Continued research is needed to find the best adapted plant material for the various soil and climatic areas of the state. Test sites and personnel to evaluate this material once it has been identified is critical to the effectiveness of a good woody plant research program.

A new cooperative testing program has been established between the NDSU Department of Horticulture and Forestry, the North Dakota Forest Service, selected branch experiment stations and selected city forestry programs within the state. These cooperating agencies, in conjunction with the test sites at or near the cities of Bismarck, Carrington, Dickinson, Fargo, Grand Forks, Langdon and Minot, should provide an avenue to test new or worthy plant materials for possible adaptation to the state. More specifically, the major objectives of this new program are:

1. To conduct initial evaluation of new lines, selections or cultivars of woody tree and shrub materials for cold and drought hardiness, establishment success, growth rate, vigor and potential for shelterbelt and/or ornamental use; and
2. To compare the adaptability and performance of these woody plants over a wide range of climatic sites; and
3 To provide a pool of germplasm for additional selection and testing; and
4. To provide the basis for developing a list of recommended tree or shrub species and/or their cultivars for planting in North Dakota.

Site selection for the Fargo, Langdon and Minot locations was made in 1986; these sites were clean cultivated during the 1986 growing season. Site selection at Bismarck, Carrington, Dickinson and Grand Forks was made in the spring of 1987. Ground previously in sod was broken up at the Bismarck, Dickinson and Grand Forks sites. Alfalfa ground at the Carrington location was rotovated twice before planting. Species selection for the 1987 planting season was determined primarily on availability of material. The decision was made to test the following plants at selected locations:

1. Four advanced selections of green ash [Fraxinus pennsylvanica (Marsh.)], which were graft propagated on green ash seedling rootstocks. Each selection was collected from an individual mature green ash tree located in the following cities:

Selection 7240 – Wahpeton, ND	Selection 7265 – Rugby, ND
Selection 7263 – Rugby, ND	Selection 7276 – Mayville, ND

2. One seedling accession of Buerger Amur Maackia [Maackia amurensis var. Buergeri (Maxim.)] propagated from two plants received originally from the Arnold Arboretum, Jamaica Plain, MA.

3. One cutting propagated clonal accession of a seedling winterberry euonymus [Euonymus bungeana (Maxim.)] growing as a tree form at McCrory Gardens, Brookings, SD.

4. Three accessions of amur maple (Acer ginnala (Maxim.) with the following background:

   a) A ND forest service accession produced from a bulk seed lot collected from the Interstate 94 planting at Mandan, ND. Parent material has performed well and has exhibited good fall color.

   b) 'Flame' - a seed propagated cultivar introduced by the SCS Plant Materials Center at Elsberry, MO. This cultivar is characterized by bright red fruit (seed) development and fiery red autumn leaf color.

   c) 'Redwing' - a seed propagated cultivar introduced by the SDSU Department of Horticulture and Forestry at Brookings, SD. This cultivar is characterized by the attractive red-colored winged seeds and good fall color.

5. One accession of nannyberry Viburnum lentago (L.) produced from a bulk seed lot collected from the Turtle Mountains of north central North Dakota. Parent trees were selected for good height growth and single stem tree form.

Because of limited availability of some material, not all of the above items were tested at all locations except the four green ash selections which were planted at all sites. The winterberry euonymus was planted at Bismarck and Grand Forks; the amur maackia at Carrington, Fargo and Minot, the amur maple at Carrington, Dickinson and Langdon, and the nannyberry at Dickinson and Minot. Experimental design was a complete randomized block. Since the experiment station sites have one acre per year allocated for these trial plants, clonal material was replicated 4 times with 4 trees per replication. Seedling material was replicated 5 times with 6 trees per replication. At the forestry sites which have only 0.1 acres for planting each year, clonal material had 3 replicates of 3 plants each, while the seedling material had 4 reps of 4 plants each. All material was hand planted. A tractor mounted soil auger was used to dig planting holes at all sites. Spacing at experiment station sites was 20 feet between rows with an in-row spacing of 15 feet for trees and 10 feet for shrubs. Trees at the three city forestry sites were planted at a spacing of 15 feet between rows and 10 feet within rows. Planting was done at the various sites on the following dates:

Experiment Stations		**Forestry Sites**	
Carrington	6/4/87	Bismarck	5/26/87
Dickinson	5/28/87	Fargo	5/7/87
Langdon	5/14/87	Grand Forks	6/5/87
Minot	5/19/87		

Plant material at all sites was watered after planting to aid in establishment. Initial height measurements were recorded. Replacement of plants failing to establish was done in July, if material was available. A few additional replacements were made in September at some sites, especially in the amur maple replications. Seasonal growth measurements were recorded between August 27 – September 30 at the seven locations. A deer/rodent repellent consisting of 2 cups white interior latex paint, 2 tablespoons of Elmer's type glue and 1 tablespoon finely ground cayenne pepper per gallon of water was applied until run off to all test material after growth measurements were taken. Because of continued deer browse problems at the Carrington location, a six foot high, 5-wire electrified fence was installed at this site in November, 1987. Plans are to install a similar fence at the Grand Forks site to reduce deer browsing at that location.

Data were analyzed to determine mean growth using the Student-Newman-Kuels test to separate location, source, and/or treatment differences. One variable analyzed for green ash was mean growth for container-grown versus field-grown stock. Although data showed no significant difference in seasonal growth between these treatments, percent growth for container-grown material was significantly greater than field-grown ash, despite a markedly larger root system on most of the field-grown material. This perhaps suggests that container-grown material spent less time getting established, resulting in greater increase in percent growth. Data also showed that location had an effect on seasonal ash growth, with plant material at the Langdon site having significantly greater mean growth (35cm) and percent mean growth (76.5%) than plants at the other six locations. This may have resulted from the high fertility level of the site since the Langdon plot was an abandoned feedlot area. Seasonal ash growth of all clones at the Grand Forks site was significantly less than the other sites. This was probably due to two factors: namely that deer browse eliminated the bulk of new growth and that tree vigor was much reduced. The latter condition may have resulted from these ash plants being planted too deep in a heavy clay soil, causing oxygen starvation in the roots.

Another variable analyzed showed that although comparison of percent growth differences by source alone was not significant, source by location interaction was significant. Selection 7240 from Wahpeton produced the largest % growth at Bismarck, Fargo, and Langdon and was tied with Selection 7263 for the greatest % growth at Carrington. All NDSU ash selections had significantly greater % growth than the control ('Marshall's Seedless') at all locations except Grand Forks. Selection 7263 from Rugby had the greatest % growth at Dickinson and Grand Forks and tied with Selection 7240 for the greatest % growth at Carrington. Selection 7265 (also from Rugby) had the greatest % growth at Minot.

Comparison of amur maple data showed that mean growth at Langdon (21.4cm) and Dickinson (19.4cm) was significantly greater than growth at Carrington (12.9cm). Deer browse at Carrington could partly explain some of this difference. Of the three cultivars of maple tested, mean growth on ′Redwing′ (23.5cm) was greatest but not significantly greater than ′Flame′ (22.2cm). Both however had significantly greater mean growth this first season compared to the North Dakota Forest Service source (6.3cm).

Winterberry euonymus mean growth was not significantly different between the two sites.

Mean growth of amur maackia at the Minot site (15.3cm) was not significantly greater than Fargo (12.3cm), but was significantly greater than mean growth at the Carrington location (9.7cm). Winter hardiness of this species will be a key factor in its adaptability.

Mean growth of nannyberry between the two locations was not significant during the 1987 growing season.

The list of species to be tested in next year's program include Jack pine, Lodgepole pine, European black alder, Black walnut, and Sycamore.

1/ Personnel of the Horticulture Dept., North Dakota State University.