

## Project ND06210

### Species-site Adaptation Study of Woody Plants for North Dakota

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#### Research Summary

1999 marked the thirteenth year of the statewide cooperative woody plant evaluation program. Sixty-three accessions have been planted at the Dickinson Research/Extension Center since the program began in 1987. Forty-seven of these are still being evaluated. Test plant material includes seedling populations of several species, some clonal material plus potential and/or recently named woody plant introductions. Two additional accessions were planted in 1999 at this site. Nine of the twelve (75%) Dakota Pinnacle<sup>®</sup> Birch, a recent introduction from NDSU, have survived five growing seasons and are still producing excellent growth. Data showed no significant differences in survival, mean growth or mean crown diameter between Prairie Radiance™, a recent NDSU introduction of Winterberry Euonymus and a numbered selection of the same species. Two NDSU accessions of Honey-locust had significantly greater % survival after five years compared to Imperial<sup>®</sup> used as the standard comparison clone. NDSU selection 919A had the greatest mean growth, mean crown diameter and mean stem caliper, though not significantly different from the two other honey-locusts. Only 35 % of the Manchurian Walnut seedlings have survived after five years. Manchurian Viburnum was removed from the evaluation list due to high mortality from drought stress. A seedling population of Kentucky Coffeetree from Hannover, IL had 83% survival after five years compared to 75% and 25% for two other sources. The former accession did show some dieback, though not significantly different from the Fargo source which had the greatest growth.

#### Introduction

Statewide testing is important to determine adaptation of woody plants. The project goal is to conduct replicated trials in order to systematically evaluate native, domestic, and foreign woody plant accessions for cold and drought hardiness, establishment and survival, growth rate, vigor and potential for landscape, community forestry and shelter use under varying climatic and edaphic conditions throughout the state. Performance data enables valid woody plant recommendations to be made to wholesale growers, retail nurseries and

garden centers, parks, golf courses and public consumers, based on regional adaptation zones in North Dakota. Some accessions being tested can be recommended throughout the state and region while others can only be recommended for certain portions of the state. Data is reinforcing the concept of introducing regionally selected cultivars.

## Materials and Methods

Two new accessions were added in 1999. These included *Malus x* Centurian (Centurian Crabapple) and *M. x* Red Baron (Red Baron Crabapple). Replacements were made in the 1997 plot, including seedlings of *Betula pendula* (European White Birch) and three seedling accessions of *Gymnocladus dioica* (Kentucky Coffeetree). Newly planted items were hand watered after planting to aid in establishment. Data collected included percent survival, mean growth measured as height increase and plant vigor. Five-year mean stem diameter and mean crown diameter measurements were collected from the eight accessions in the 1995 plot.

## Results and Discussion

Adequate moisture for successful plant establishment and sustained growth of plantings continues to be a concern at this site. Management practices which could reduce plant mortalities caused by drought stress include: (1) in-row cultivation, (2) the use of a ring of organic mulch such as bark chips around individual plants and (3) greater attention to the water needs of young stock. Recommendations regarding the implementation of such practices continue to be offered.

A synopsis of plant performance of accessions planted from 1987 to 1994 are presented as part of the 1998 report in this publication. The following writeup details performance of accessions planted in 1995, 1997 and 1999. 1998 is absent since no additional plantings were made in that year. Dakota Pinnacle birch has had 75% survival through five growing seasons (see accompanying table). Remaining trees averaged 30.7" of new growth with a mean stem diameter of 2.5". No bronze birch borer problems have occurred to date. Dakota Pinnacle, a recent NDSU introduction, produces trees with quality foliage and a distinct narrow columnar growth habit.

No significant differences in % survival, mean growth or mean crown diameter were observed in 1999 between Prairie Radiance™ Winterberry Euonymus (*Euonymus bungeana* Verona) and an NDSU advanced selection of this species grown for comparison. Two NDSU clonal accessions of Honey-locust had survival rates significantly greater than Imperial, the comparison cultivar. The former clones also had greater mean growth, mean crown diameter and mean stem diameter than Imperial, though not significantly different. Only 35% of the Manchurian Walnut (*Juglans mandshurica*) seedlings have survived after five years. They are still struggling to establish and produced only minimal growth.


Manchurian Viburnum (*Viburnum burejaeticum*) did not establish at this site due mainly to drought-stress related problems. It has been dropped from the Dickinson evaluation. Plants of this species have performed best at Langdon with poorer performance at Carrington and Minot. Plants of a clonal accession of European White Birch (*Betula pendula*) have been struggling to establish and have produced minimal growth since 1997 at this site. This accession is again performing much better at Langdon and Minot where more favorable conditions exist.

Of the three seedling accessions of Kentucky Coffeetree (*Gymnocladus dioica*) at this site, the Hanover, IL source has had the best survival to date (83%) compared to the Seneca, IL source (75%) and the Fargo source (25%). This species usually grows slowly during early establishment years and may benefit greatly from adequate watering plus the use of mulch around tree bases to reduce moisture stress. The two Illinois sources both had negative mean growth, indicating branch dieback (see accompanying table). The Fargo source had no dieback but produced minimal growth in 1999. All Centurian and Red Baron crabapple plants were alive in the fall of 1999. Both clones averaged 4-6" of new growth. These two cultivars are highly recommended for eastern North Dakota but have not been fully tested in western ND. Plants of both the Thornless Cockspur Hawthorn (*Crataegus crus-galli* Inermis) and Snowbird Hawthorn (*C. x mordenensis* Snowbird) produced slightly over one foot of mean growth their first year. Like the crabapples, the latter two have performed well in eastern ND and need to be evaluated more fully in the western part of the state. Survival will be recorded in the fall of 2000 for both the crabapple and hawthorn clones.

In terms of plant establishment and sustained growth of tree and shrub species, the Dickinson Research/Extension Center site is by far the most difficult of the seven sites currently used for cooperative woody plant evaluations. The implementation of recommended management practices could significantly reduce mortality rates on many of the current accessions and any accessions planted in the future at this site.

**DICKINSON RESEARCH EXTENSION CENTER  
WOODY PLANT COOPERATIVE EVALUATION PROGRAM  
1999 GROWTH AND SURVIVAL DATA**

				<u>FIVE-YEAR MEAN</u>	
PLANT ACCESSION	YEAR PLTD	% MEAN SURVIVAL	MEAN GROWTH (inches)	Crown Diameter (inches)	Stem Caliper (inches)
<b>DAKOTA PINNACLE</b> <sup>2/1</sup> <b>BIRCH</b> ( <i>Betula platyphylla</i> 'Fargo')	1995	75	30.7	45.1	2.5
<b>WINTERBERRY EUONYMUS</b> ( <i>Euonymus bungeana</i> ) PrairieRadiance <sup>2/1</sup> (NDSU-92360) Sel #4 NDSU-92362	1995	83a <sup>W</sup>	5.3a <sup>W</sup>	34.0a <sup>W</sup>	X
	1995	100a	7.9a	37.6a	X

<b>HONEY-LOCUST</b> ( <i>Gleditsia triacanthos var. inermis</i> ) Sel. NDSU-919 (Source 1) Sel. NDSU-9110 (Source 2) Imperial  (Source 3)	1995 1995 1995	88a <sup>W</sup> 67b 22b	6.6a <sup>W</sup> 4.7a -5.3a	57.7a <sup>W</sup> 32.5a 20.3a	2.3a <sup>W</sup> 1.4a 1.2a
<b>MANCHURIAN WALNUT</b> ( <i>Juglans mandshurica</i> )	1995	35	6.3	16.4	0.6
<b>MANCHURIAN VIBURNUM</b> ( <i>Viburnum burejaeticum</i> )	1995	0	0	0	0
<b>EUROPEAN WHITE BIRCH</b> ( <i>Betula pendula</i> )	1997	92	2.2	y	y
<b>KENTUCKY COFFEETREE</b> ( <i>Gymnocladus dioica</i> ) Fargo, ND (Source 1) Hannover, IL (Source 2) Seneca, IL (Source 3)	1997 1997 1997	25b <sup>W</sup> 83b 75ab	0.9a <sup>W</sup> -0.3a -10.6a	y y y	y y y
<b>CRABAPPLE</b> ( <i>Malus</i> ) Hybrid 'Centurion' 'Red Baron'	1999 1999	z z	4.6a <sup>W</sup> 6.2a	y y	y y
<b>HAWTHORN</b> ( <i>Crataegus crusgalli</i> & c. <i>X mordenensis</i> ) 'Intemis' 'Snowbird'	1999 1999	z z	12.4a <sup>W</sup> 14.2a	y y	y y

<sup>W</sup> Column values followed by the same letter were not significant at the 0.1% level based on Student Newman Kuels Multiple Range Test.

X Caliper not taken on this accession which typically grows multiple-trunked.

Y Five-year data collected only for items planted in 1995.

Z Survival data for 1999 accessions will be collected in the fall of 2000.

