

PROJECT ND06203 - SPECIES-SITE ADAPTATION STUDY OF WOODY PLANTS FOR NORTH DAKOTA

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SUMMARY

1994 marked the eighth year of the woody plant statewide cooperative evaluation program. From a total of 50 accessions planted at the Dickinson Research Center, 43 accessions are still under evaluation. Accessions represent numerous species of seedlings and clonal material as well as potential and/or newly named introductions of woody plants. Accessions which have performed well to date include three new NDSU green ash cultivars namely Dakota Centennial-'Wahpeton', Prairie Dome-'Leeds' and Prairie Spire-'Rugby' ash. Prairie Gem-'MorDak', an ornamental flowering pear recently released by NDSU has also done well. Other more recently planted accessions which show promise include 'Flame' willow, three aphid-resistant clonal selections of honeysuckle from NDSU, a hardier source of winterberry *Euonymus* and a native seed source of paper birch. Seven seedling-grown accessions have lacked cold or drought hardiness and have failed to establish. This serves to emphasize the importance of selecting proper seed source. An experiment to test the effectiveness of commercial Tubex tree shelters on conifer establishment and growth has shown no significant differences in survival or growth between sheltered and non-sheltered red pine or Swiss Mountain pine.

Statewide testing is important to determine adaptation of woody plants. Performance data enables valid recommendations to be made to wholesale growers, retail nurseries and garden centers, parks, golf courses and public consumers regarding specific accessions in the various sectors of the state. Some accessions being tested can be recommended throughout the state and region while others can only be recommended for certain portions of

the state.

PROJECT OBJECTIVES:

1. To conduct replicated trials to evaluate species and cultivars of trees and shrubs 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.
2. To provide performance data for making valid woody plant recommendations based on regional adaptation zones in North Dakota.

This project was initiated in 1987 in order to systematically evaluate native, domestic, and foreign woody plant accessions for hardiness and adaptation under the varied conditions throughout North Dakota. The research project is unique since it is the only one to specifically determine adaptation of woody plants in an experimental, replicated plot format. Data is reinforcing the concept of introducing regionally selected cultivars.

MATERIALS AND METHODS:

Three additional woody plant accessions were planted on May 18, 1994 at the Dickinson site. These included one seedling accession of *Phellodendron piriforme* (Pearfruit Corktree), and two seedling accessions of *Syringa reticulata* (Japanese Tree Lilac). All material was hand planted at a spacing of 15 feet x 20 feet. Plants were hand watered immediately 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 were collected from plants in the 1990 plot. Plant replacements were made in the 1992 and 1993 plots.

RESULTS AND DISCUSSION:

The three new NDSU green ash cultivars listed earlier have performed well and will be relocated to a permanent location where further observations will continue. Seedling-grown accessions of nannyberry, black walnut, european black alder, jack pine, lodgepole pine, sugar maple and douglas-fir failed to establish because they either lacked cold or drought hardiness. This reinforces the importance of proper provenance or seed source in the ultimate

establishment or failure of any seedling-grown accession. Since the program began in 1987, plant establishment at the Dickinson site has been difficult. The lack of adequate moisture continues to be the primary limiting factor in the successful establishment of many woody plants at this site. The accompanying table provides performance data for the plots planted from 1990 through 1994, including information on percent mean survival and mean growth.

'Mancana' Manchurian ash has performed poorly under field conditions at this site because of its above average moisture requirements. Of the three tree-type willows being tested, 'Flame' has had the best survival. This cultivar has a medium growth rate, attractive orange branches and an upright-oval form. The cultivars 'Austree' and 'Prairie Cascade' lack either cold or drought hardiness and cannot be recommended for southwestern ND. All four honeysuckle cultivars under test have had excellent survival and have shown resistance to the Russian honeysuckle aphid. 'Freedom' is a somewhat rank growing cultivar compared to the three NDSU selections. Selection #10 produces a very dense, more dwarf form than the other three clones. *Pinus uncinata* (Swiss Mountain pine), the tree form of mugo pine, has shown a 90% survival after four years in the field. It is slower growing than *Pinus resinosa* (red pine) which has a 70% survival rate. Two clonally propagated accessions of *Salix pentandra* (laurel willow) from near Brinsmade, ND have survival ranging from 92-100%. The control clone and a selection from St. Cloud, MN have relatively low survival. Performance of all four clones has been poor at Dickinson compared to growth and survival at several other ND sites. Low field moisture conditions the last two years have resulted in poor performance of two cultivars of purpleosier willow (*Salix purpurea*). Survival and growth response has been considerably less for both cvs at Dickinson compared to three other sites, especially Langdon and Minot. Although initial growth has been slow for allegheny serviceberry (*Amelanchier laevis*), a small tree relative of our native juneberry, this species has 96% survival after three years. Three cultivars of red osier dogwood, including the recent 'Cardinal' from the University of Minnesota have grown slowly under low moisture conditions. 'Gary' has the highest survival (92%) and may show promise as a cultivar better adapted in drier climate situations.

A seedling accession of *Fraxinus americana* (White Ash) from a Wisconsin seed source has had severe dieback over two winters. This source does not have sufficient hardiness and will probably be removed. A Minnesota seedling accession of black cherry (*Prunus serotina*) has had good survival and may prove to have sufficient hardiness to be recommended. In the birch group the Killdeer Mountain source of paper birch had a significantly higher % survival and a better growth response compared to a native Nebraska source. Sand birch (*Betula alba* 'Kamtschatka') had 100% survival after one winter. Survival of a hybrid birch (*Betula x piperi*) with glossy leaves and

good growth potential was 83% through the first winter.

Replacements will be made in 1995 as further observations continue. A clonally propagated accession of arborvitae (*Thuja occidentalis*) from Fargo showed a negative growth response. This was due partly to winter dieback and partly from deer browse. Growth was negligible on the accessions planted in 1994. Plants of the pearfruit corktree (*Phellodendron piriforme*) were under severe drought stress in late August and high winter mortality is expected.

Possible woody plants scheduled for planting in 1995 include seedling accessions of oak (*Quercus*), cranberrybush (*Viburnum*), walnut (*Juglans*) and some potential future releases of clonally propagated winterberry Euonymus (*Euonymus bungeana*).

WOODY PLANT COOPERATIVE EVALUATION PROGRAM 1994 GROWTH AND SURVIVAL DATA					
Plant Accession	Year Pltd	Mean Survival (%)	Mean Growth (in.)	Five-Year Mean	
				Stem Caliper (in.)	Crown Diameter (in.)
DOUGLAS FIR	1990	0	0	Failed to establish	
MANCHURIAN ASH 'Mancana'	1990	11	8	1	17
WILLOWS					
'Austree' (Hyb)	1990	67 a*	3 a	0.9 a	25 a
'Flame'	1990	83 a	2 a	0.4 a	30
'Prairie Cascade' (Hyb)	1990	0	0	Failed to establish	
HONEY SUCKLE					
NDSU Sel. #1	1991	100 a	4 a	Five-Year Data collected only for items planted in 1990 so the rest of these two columns are blank for the 1994 data set.	
NDSU Sel. #10	1991	100 a	2 a		

NDSU Sel. #22	1991	100 a	5 a
'Freedom' (Control)	1991	100 a	6 b
RED PINE			
With Tubex	1991	67 a	5 a
Without Tubex	1991	90 a	2 a
LAUREL WILLOW			
Brinsmade #1	1991	92 a	7 a
Brinsmade #2	1991	100 a	6 a
St. Cloud Sel.	1991	27 b	12 a
Control Clone	1991	8 b	11 a
PURPLE OSIER WILLOW			
'Gracilis'	1991	58 a	7 a
'Nana'	1991	83 b	7 a
ALLEGHENY SERVICEBERRY			
Amelanchier laevis	1992	96	2
RED OSIER DOGWOOD			
'Cardinal'	1992	75 a	8 a
'Gary'	1992	92 a	4 a
'Isanti'	1992	83 a	0.4 a
WHITE ASH			
Fraxinus americana	1992	50	8

*Column values followed by the same letter were not significant at the 0.05% level based on Student Newman Kuels Multiple Range Test.

PLANT ACCESSION	YEAR PLTD	MEAN SURVIVAL (%)	MEAN GROWTH	FIVE-YEAR MEAN	
				Stem Caliper (in.)	Crown Diameter (in.)
BLACK CHERRY	1992	100	6		
SAND BIRCH	1993	100	15		
PAPER BIRCH Nebraska Source	1993	52 a*	1 a		
PAPER BIRCH N.D. Source	1993	96 b	12 a		
PIPERI HYBRID BIRCH	1993	83	10		
ARBORVITAE Rivsd Cemtry (Sor 3)	1993	92	-4		
JAPANESE TREE LILAC Smith Nursery Source	1994	Survival data for 1994 will be taken in the fall of 1995	2 a		
JAPANESE TREE LILAC St John's Colg Source	1994		2 a		
PEARFRUIT CORKTREE	1994		4		

* Column values followed by the same letter not significant at the 0.05% level based on Student Newman Kuels Multiple Range Test.

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