

PROJECT ND06204 - SPECIES-SITE ADAPTATION STUDY OF WOODY PLANTS FOR NORTH DAKOTA

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SUMMARY:

Since the woody plant statewide cooperative evaluation program began in 1987, a total of 57 accessions have been planted at the Dickinson Research Center. Forty seven of these are still under evaluation. 1996 marked the tenth year of the program. Numerous species of seedlings and clonal material as well as potential and/or newly named introductions of woody plants make up the test plant list. Eight additional accessions were planted in 1995. No new accessions were added to the site in 1996. Based on early performance data, the following accessions have shown good survival and adaptability to the Dickinson area and should be considered for ornamental plantings, especially in urban sites as boulevard or specimen plants: Dakota Centennial-'Wahpeton' ash, Prairie Dome-'Leeds' ash and Prairie Spire-'Rugby' ash plus Prairie Gem-'MorDak' pear, an ornamental flowering type from NDSU. Other accessions which show promise include two aphid-resistant honeysuckle clones from NDSU and a hardier source of winterberry euonymus. In areas where some supplemental water can be provided, 'Flame' willow (a white willow cultivar from Minnesota) and three clonal accessions of laurel willow (two from NDSU and one from Minnesota) also look promising. Seedling paper birch grown from seed collected off of native trees in the Killdeer Mountains north of Dickinson had significantly greater survival and better growth than an out-of-state seed source. Seven seedling-grown accessions and three clonally propagated accessions have lacked cold or drought hardiness and have failed to establish, emphasizing the importance of provenance or proper seed source.

Woody plant adaptation can best be determined by statewide testing. 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. Certain accessions under evaluation can be recommended throughout the state and region. 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:

Eight additional woody plant accessions were planted in the spring of 1995 at the Dickinson site. These included Dakota Pinnacle Birch, two colonel accessions of Winterberry euonymus, three clonal accessions of Honey-locust, one seedling accession of Manchurian walnut, and one seedling accession of Manchurian viburnum. 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 1992 plot. Plant replacements were made in the 1994 and 1995 plots.

RESULTS AND DISCUSSION:

The three green ash cultivars from Dr. Dale Herman's woody plant selection program performed well for the first seven years with excellent survival and modest growth. These were lifted with a tree spade and relocated to

permanent sites in the Dickinson area where further observations will continue. Seedling-grown accessions of black walnut, european black alder, jack pine, lodgepole pine, Douglas-fir, 'Mancana' manchurian ash, 'Austree' willow, 'Prairie Cascade' willow, and dwarf arctic willow 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. Though somewhat slow growing, sixty eight percent of the red pine and 64% of the Swiss Mountain pine were still surviving after five years. Better after-planting care may have resulted in higher survival rates. 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 following discussion details performance data for woody plots planted from 1992 through 1995 at the Dickinson site. Common names only are used in the text. Scientific names are included in the accompanying table.

Allegheny serviceberry has 96% survival after five years but has been very slow growing. Survival and growth of 'Bergeson Dwarf', 'Cardinal', and 'Isanti' dogwoods, three shrubby cultivars, has been poor due to weed competition, mower damage and drought stress. Seedling white ash from a Wisconsin seed source have had severe die back annually or died completely, indicating a lack of cold hardiness. These will be discarded. A black cherry seedling accession from Minnesota has had 84% survival after five years. It had negligible growth in 1996.

A 1993 planted seedling accession of sand birch obtained from Lawyer Nursery(Plains, MT) has performed well to date with 96% survival and 15" mean growth in 1996. Of the two seedling accessions of paper birch currently being evaluated, the native Killdeer Mountain seed source has had significantly greater survival (96%) compared to the Nebraska source (24%). Mean growth in 1996 was 21" for the ND source compared to a -6" for the NB source.

Poor winter survival (17%) for a hybrid birch being tested suggests this clone may lack sufficient cold hardiness for southwestern ND. Deer and rabbit browse coupled with winter browning and dieback have all contributed to the poor performance of an American arborvitae clonal accession from Fargo.

Lack of adequate moisture during the 1995 growing season produced minimal growth and subsequent low vigor for the pearfruit corktree, resulting in 100% mortality for this accession. It will be dropped from the evaluation list at this site. Slight dieback was recorded on both seedling accessions of Japanese tree lilac. Survival ranged from 95% for

the Smith Nursery source to 85% for the Minnesota source. This species is often slow to establish and some dieback can often occur during establishment.

First year survival (92%) of Dakota Pinnacle birch, a new release from NDSU, indicates good potential for southwestern ND. One of the two honey-locust clones from NDSU produced significantly greater survival (89%) compared to Imperial²¹, the standard cultivar currently popular in the nursery trade. Manchurian walnut seedlings had a survival rate of 85% and a mean growth of -8", indicating some dieback. Drought conditions in 1995 produced low fall vigor for the Manchurian viburnum seedlings. As a result, only 55% of the plants were alive in 1996. With plant vigor again being very low in the fall of 1996, additional mortality is expected in 1997.

Possible woody plants scheduled for planting in 1997 include seedling accessions of Kentucky coffeetree, St. John's-wort and oak.

WOODY PLANT COOPERATIVE EVALUATION PROGRAM 1996 GROWTH AND SURVIVAL DATA					
PLANT ACCESSION	YEAR PLT	% MEAN SURVIVAL	MEAN GROWTH (in.)	FIVE-YEAR MEAN	
				CROWN DIAMETER (in.)	STEM CALIPER (in.)
ALLEGHENY SERVICEBERRY <i>(Amelanchier laevis)</i>	1992	96	2	21	0.6
REDOSIER DOGWOOD <i>(Cornus sericea)</i>					
'Bergeson Dwarf'	1992	73 a ^x	-3 a ^x	25 a ^x	Z
'Cardinal'	1992	58 a	-2 a	29 a	Z
'Isanti'	1992	42 a	2 a	25 a	Z
WHITE ASH	1992	0	0	0	0


<i>(Fraxinus americana)</i>					
BLACK CHERRY <i>(Prunus serotina)</i>	1992	84	1	26	0.8
SAND BIRCH <i>(Betula platyphylla</i> 'Kamtschatka')	1993	96	15	y	y
PAPER BIRCH <i>(Betula papyrifera)</i> Nebraska Source N.D. Source (Killdeer Mts.)	1993 1993	24 a ^x 96 b	-6 a ^x 21 a	y y	y y
HYBRID BIRCH (<i>Betula</i> <i>x piperi</i>)	1993	17	-13	y	y
ARBORVITAE <i>(Thuja occidentalis)</i> Rivsd Cemtry (Sor 3)	1993	25	-3	y	y
PEARFRUIT CORKTREE <i>(Phellodendron</i> <i>piriforme)</i>	1994	0	0	y	y
JAPANESE TREE LILAC <i>(Syringa reticulata)</i> Smith Nursery (Sor 1) St. Johns College (Sor 2)	1994 1994	95 a ^x 85 a	-1 a ^x -4 a	y y	y y
DAKOTA PINNACLEBIRCH <i>(Betula platyphylla</i> 'Fargo')	1995	92	3	y	y

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

^y Five-Year data collected only for items planted in 1992.

^z Stem caliper not taken for shrubs.

WOODY PLANT COOPERATIVE EVALUATION PROGRAM 1996 GROWTH AND SURVIVAL DATA

PLANT ACCESSION	YEAR PLT	% MEAN SURVIVAL	MEAN GROWTH (in.)	FIVE-YEAR MEAN	
				CROWN DIAMETER (in.)	STEM CALIPER (in.)
WINTERBERRY EUONYMUS (<i>Euonymus bungeana</i>) Sel #2 NDSU-92360 Sel #4 NDSU-92362	1995	83 a ^x	-3 a ^x	y	y
	1995	83 a	7 a	y	y
HONEY-LOCUST (<i>Gleditsia triacanthos</i> <i>var. inermis</i>) Sel. NDSU-919 Sel. NDSU-9110 Imperial 	1995	89 a ^x	-9 a ^x	y	y
	1995	44 b	-22 a	y	y
	1995	0 c	0	y	y
MANCHURIAN WALNUT (<i>Juglans mandshurica</i>)	1995	85	-8	y	y
MANCHURIAN					

VIBURNUM (<i>Viburnum</i> <i>burejaeticum</i>)	1995	55	-11	y	y
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^x Column values followed by the same letter were not significant at the 0.05% level based on Student Newman Kuels Multiple Range Test.

^y Five-Year data collected only for items planted in 1992.

[Back to 1997 Research Reports Table of Contents](#)

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