



United States Department of Agriculture  
Natural Resources Conservation Service

Plant Materials Center  
Bismarck, North Dakota

# Technical Report, 2011-2012

Part 2 of 2: Trees and Shrubs



Silver buffaloberry  
*Shepherdia argentea*

USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. 3 vols. Charles Scribner's Sons, New York. Vol. 2: 577.

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**United States Department of Agriculture  
Natural Resources Conservation Service  
Bismarck Plant Materials Center**

**Technical Report**  
**Part II (Trees and Shrubs)**  
**2011-2012**

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PART II

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# **INTRODUCTION**

## **INTRODUCTION: TECHNICAL REPORT – 2011-2012**

### **Objectives and Functions**

The USDA Natural Resources Conservation Service (NRCS), Plant Materials Center (PMC), Bismarck, North Dakota, primarily serves the States of Minnesota, North Dakota, and South Dakota. Activities are directed toward meeting the needs and priorities set forth in the three States' long range programs.

The objectives and functions of the Plant Materials Center are to:

1. Identify, select, and improve plants to meet the resource conservation needs of the three States.
2. Determine techniques for successful propagation and establishment of these plants.
3. Assemble and comparatively evaluate materials on and off the Center.
4. Make comparative field plantings for final testing of promising plants and techniques with conservation districts and cooperators.
5. Work with universities, experiment stations, and other State and Federal agencies to cooperatively release improved conservation plants.
6. Produce limited quantities of foundation or foundation quality seed. This seed is made available to conservation districts, state seed certifying organizations, commercial seed growers, or other agencies for establishing seed increase fields or seed orchards.
7. Encourage conservation districts, commercial seed growers, and commercial and State nurseries to produce adapted plant materials and named cultivars.
8. Promote improved conservation plant materials in conservation programs.

One of the major objectives of the PMC is to improve the quality and quantity of native and introduced trees and shrubs available for field and farmstead windbreaks, erosion control on cropland and critical areas, recreation areas, wildlife habitat, edible fruits and nuts, and barrier plantings.

The NRCS has agreements with soil conservation districts, State universities, and other State, Federal, and local agencies at four locations in Minnesota, North Dakota, and South Dakota to provide cooperative off-center sites with long-term land tenure for testing woody plant materials. These agreements provide sites for assembly and initial evaluation of trees and shrubs under diverse soil and climatic conditions. They represent major land resource areas and key windbreak suitability groups. Initial evaluations are recorded on individual spaced plants or rows under uniform culture and management conditions.

**PLANT MATERIALS CENTER LONG RANGE PLAN  
BISMARCK, NORTH DAKOTA  
2006-2010**

**I. Introduction**

The mission of the Plant Materials Program is to develop and transfer effective state-of-the-art plant science technology to meet customer and resource needs. The purpose of the Plant Materials Program is to carry out specialized activities in resource conservation, as part of the overall program of the Natural Resources Conservation Service (NRCS). It is the responsibility of the Plant Materials Center (PMC) to:

1. Assemble, test, and release plant materials for conservation use.
2. Determine techniques for the successful use and management of conservation species.
3. Facilitate the commercial increase of conservation species.
4. Provide for the development and transfer of applied plant science technology to solve conservation problems.
5. Promote the use of plant science technology to meet the goals and objectives of the USDA and NRCS Strategic Plans.

The PMC Long Range Plan (LRP) identifies, guides, and directs PMC operation toward solving high-priority resource problems identified in the States' PMC LRP. The PMC LRP is consistent with goals and objectives identified in the NRCS Strategic Plan, National Plant Materials Program Strategic Plan, and State Strategic Plans. Recommended action items and specific products are identified in individual State Annual Plans which are reviewed and updated annually.

**II. Long Range Plan Development**

The LRP is in accordance with the revised National Plant Materials Manual, Part 540.22. This plan acts as a guide for directing PMC activities within Minnesota, North Dakota, and South Dakota. NRCS representatives from all three states met in Fargo, North Dakota, on March 8, 2006, to determine the basis for this plan. Feedback in the form of survey questionnaires was received from various NRCS offices, conservation districts, and partners in the three States. The "*Plant Materials Program Strategic Plan Survey Responses*" publication (2/7/05) was also used to provide insight and guidance to the decision making process.

**General Description of the Service Area**

**Climate** – USDA Plant Hardiness Zones 2, 3, 4, and 5 are within the area serviced. Precipitation is quite varied both in annual amount and in seasonal distribution, and predominantly occurs in the form of rainfall. Long-term average annual precipitation varies from 12 inches to 35 inches. The growing season ranges from 95 days to 155 days. The titles of the four Land Resource Regions include:

- Northern Great Plains Spring Wheat
- Western Great Plains Range and Irrigated
- Central Feed Grains and Livestock
- Northern Lake States Forest and Forage

A detailed description of the major land resource areas, land use, and climate may be found in the reference "*Land Resource Regions and Major Land Resource Areas of the United States,*" Agricultural Handbook 296.

### **III. Goals**

Three broad-based goals have been identified.

#### **Goal 1:**

- Identify and evaluate plants and develop technology for their successful establishment and maintenance to solve natural resource problems.

#### **Goal 2:**

- Provide plant materials and plant technology that are economically feasible for solving conservation problems and to meet emerging energy and environmental needs.

#### **Goal 3:**

- Provide equal access for all Americans to the Plant Materials Program. All products and services must be delivered fairly and equitably. Promote the increased use of plant materials to address human health, safety, cultural, and aesthetic issues.

### **IV. Plant Materials Priorities and Resource Concerns**

#### Native Prairie Ecosystems Restoration

- Identify additional species and develop sources.
- Develop establishment and management protocol.
- Market PMC releases.

#### Warm-Season Grass Promotion and Development

- Promote economic as well as conservation benefits.
- Promote the benefits of big bluestem.
- Promote proven management techniques to minimize invasive species.
- Select a switchgrass or other native species as alternatives to smooth brome grass in grassed waterways.

#### Tree and Shrub Related Technology

- Increase species diversity in windbreaks.
- Identify/develop additional tall tree species.
- Identify/develop additional native shrub species.
- Identify and promote alternatives for invasive species.

#### Wetland and Riparian Plant Materials

- Identify/develop additional species.
- Develop establishment and management protocol.

#### Saline/Alkaline Tolerant Plant Materials

- Develop and distribute information.

#### Filter Strips/Nutrient Management

- Develop/promote effective plants for nutrient uptake.

#### Streambank and Lakeshore Stabilization

- Develop establishment and management protocol.

Information, Education, and Outreach

- Promote the value of PMC releases.
- Identify and promote perennial plants for wildlife food plots.
- Remarket older plant releases.
- Target specific outreach opportunities to non-traditional clientele.

Alternative and Specialized Use of Conservation Plants

- Utilize agroforestry technology.
- Recognize alternative income species.
- Promote switchgrass as a biomass fuel for energy savings.

Urban Conservation

- Provide information on effective species/varieties.
- Promote native landscaping as low energy and reduced maintenance.
- Sell the economic as well as the environmental benefits.

**V. Partners and Cooperators**

Plant Materials Program activities are conducted in cooperation with universities, State and Federal agencies, industries, conservation groups, soil and water conservation districts and associations, and others. The primary customers are the NRCS field offices in Minnesota, North Dakota, and South Dakota. Improved plant materials will be released with cooperating agencies, Agricultural Experiment Stations, and State crop improvement associations. Seed growers and conservation nurseries will be kept informed of the availability of new plants and production techniques.

Approved by: Bismarck Plant Materials Center Advisory Committee

  
WILLIAM HUNT, NRCS State Conservationist, St. Paul, Minnesota 8/31/06  
Date

  
JANET OERTLY, NRCS State Conservationist, Huron, South Dakota 8/31/06  
Date

  
J.R. FLORES, NRCS State Conservationist, Bismarck, North Dakota 8-31-06  
Date

## **Location**

The Bismarck Plant Materials Center is located in south central North Dakota, near the center of the North American landmass. It is on the east bank of the Missouri River in a shallow basin 7 miles wide and 11 miles long. Elevation is 1,647 feet, latitude 46°46'N and longitude 100°45'W.

## **Physical Facilities and Evaluation Sites**

The PMC does not own land but manages a total of approximately 60 acres on Lincoln-Oakes Nursery. Four off-center evaluation sites are located in Minnesota, South Dakota, and North Dakota.

1. Lincoln-Oakes Nursery, Bismarck, North Dakota. The USDA Natural Resources Conservation Service, Plant Materials Center operates under a cooperative working agreement with the North Dakota Association of Soil Conservation Districts (NDASCD). The Association owns and operates the Lincoln-Oakes Nursery which in turn provides the PMC with 60 acres of land located on the nursery. This site is primarily used by the PMC for foundation quality grass seed production. The PMC shares a building site with the Nursery, with the NRCS buildings located on the north part of the acreage. Buildings include an office, greenhouse, lathhouse, old office/storage building, machine storage shed (housing tree and seed storage refrigeration units), seed cleaning building, chemical storage shed, and a two equipment storage buildings with one including containing a shop.
2. Off-center evaluation sites in Minnesota, South Dakota and North Dakota. These four off-center evaluation sites, located in the three-State area, are cooperative with various State and Federal agencies. These locations provide long-term testing sites for trees, shrubs, and grasses evaluated under uniform culture and management. Refer to map, page 12.

## **Soils**

At the PMC, the soil type is a Mandan silt loam. The Mandan series typically consists of deep, well-drained soils formed in silty sediments on uplands and terraces. The surface layer is dark grayish-brown and grayish-brown silt loam 20 inches thick. The subsoil is grayish-brown silt loam 9 inches thick. The underlying material is 28 inches of light brownish-gray silt loam over light brownish-gray loam. Slopes range 0 to 7 percent. Ordinarily, surface runoff is medium and fertility is high. Controlling erosion is the major concern in management. Both soil blowing and water erosion are hazards. This soil is well-suited to small grain, corn, and alfalfa. Capability unit IIe5, windbreak group 3.

## **Climatological Information and Weather Summary**

Climate of the area is semiarid, typically continental in character. During the summer, there are a few hot and humid days, but the winters are quite cold and fairly long. The relative humidity during the summer is generally low, and high temperature and high humidity are seldom experienced together.

Normal precipitation is 16.84 inches per year. Refer to Table 1 on page 7 for 2011-2012 weather data. More than 75 percent of this falls during the six-month period of April through September, and 50 percent normally falls in May, June, and July. Most summer precipitation occurs during thunderstorms that occur about 34 days per year. Damaging hail occurs about once in 10 years.

The winter season begins in late November and continues until late March. Nearly all winter precipitation is snow, often associated with strong winds and low temperatures. Snow has been reported for all months except July and August. Occasional winter blizzards can be severe.

Temperatures range from an average mean of 6.7 degrees F in January to a mean of 70.4 degrees F in July. During short periods, the temperatures may climb as high as 100 degrees F in summer or drop as low as -40 degrees F in winter. Frequent clear and partly cloudy days contribute to a high percentage of possible sunshine, with the total annual average about 2,700 hours out of a possible 4,470 hours. The average wind speed is a little less than 11 miles

per hour, with a prevailing direction from the west-northwest. April and May are the windiest months. The average freeze-free period is 134 days from mid-May to late September.

<b>Table 1: 2011-2012 Weather Summary - Official Station - Bismarck, North Dakota</b>								
<b>Month</b>	<b>Mean Temperature</b>			<b>Precipitation (inches)</b>				
	<b>(degrees Fahrenheit)</b>			<b>Actual</b>			<b>Deviation from Normal</b>	
	<b>2011</b>	<b>2012</b>	<b>Normal*</b>	<b>2011</b>	<b>2012</b>	<b>Normal*</b>	<b>2011</b>	<b>2012</b>
January	9.7	22.7	10.2	1.13	0.30	0.45	0.68	-0.15
February	12.1	22.2	18.1	0.57	0.48	0.51	0.06	-0.03
March	21.2	43.2	29.7	1.56	0.53	0.85	0.71	-0.32
April	40.1	47.1	43.3	2.35	1.71	1.46	0.89	0.25
May	52.4	55.2	56.0	2.32	1.98	2.22	0.10	-0.24
June	62.7	67.2	64.7	3.19	2.15	2.59	0.60	-0.44
July	71.6	75.7	70.4	5.24	2.65	2.58	2.66	0.07
August	69.2	67.7	69.0	4.02	2.33	2.15	1.87	0.18
September	57.7	59.0	57.7	0.96	0.05	1.61	-0.65	-1.56
October	48.9	42.7	45.2	1.35	1.02	1.28	0.07	-0.26
November	31.4	28.6	28.0	0.06	1.07	0.70	-0.64	0.37
December	25.1	15.3	15.2	0.47	0.63	0.44	0.03	0.19
<b>Annual</b>	<b>41.8</b>	<b>45.6</b>	<b>42.3</b>	<b>23.22</b>	<b>14.90</b>	<b>16.84</b>	<b>6.38</b>	<b>-1.94</b>
* National Climate Data Center 1971-2000 Monthly Normals								
			<u>2011</u>	<u>2012</u>				
Last Frost (28 degrees)			n/a	22-Apr				
First Frost (28 degrees)			n/a	22-Sep				
Frost Free Period			n/a	152 days				

## **REGIONAL DESCRIPTION**

## **REGIONAL DESCRIPTION: TECHNICAL REPORT – 2010-2012**

### **Major Land Resource Areas**

The three States served by the PMC, Minnesota, North Dakota, and South Dakota, include portions of 23 Major Land Resource Areas in four Land Resource Regions. They are the Northern Great Plains Spring Wheat Region, Western Great Plains Range and Irrigated Region, Northern Lake States Forest and Forage Region, and the Central Feed Grains and Livestock Region.

### **Potential Natural Vegetation**

Most of central and western North and South Dakota support a mixed grass prairie of predominantly western wheatgrass (*Pascopyrum smithii*), green needlegrass (*Nassella viridula*), needleandthread (*Hesperostipa comata*), slender wheatgrass (*Elymus trachycaulus*), and prairie junegrass (*Koeleria macrantha*). Little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), plains muhly (*Muhlenbergia cuspidata*), sedge (*Carex*), and blue grama (*Bouteloua gracilis*) are the principal climax species on xeric soils, steeper eroded slopes or thin uplands. Prairie sandreed (*Calamovilfa longifolia*) is important on sandy soils throughout the region. Moist sites support such species as big bluestem (*Andropogon gerardii*) and prairie cordgrass (*Spartina pectinata*). Whitetop (*Scolochloa festucacea*), bulrushes (*Scirpus*), and common reed (*Phragmites australis*) are typical of lowland meadows and marshes. Western snowberry (*Symphoricarpos occidentalis*), rose (*Rosa*), buffaloberry (*Shepherdia argentea*), and chokecherry (*Prunus virginiana*) are abundant shrubs in draws and narrow valleys. Rocky Mountain juniper (*Juniperus scopulorum*) is common in the western Badlands. Eastern South Dakota, southern Minnesota, and the Red River Valley support vegetation dominated by tall grass prairie species; principally big bluestem, switchgrass (*Panicum virgatum*), and Indiangrass (*Sorghastrum nutans*). Other important species include little bluestem, prairie dropseed (*Sporobolus heterolepis*), porcupine grass (*Stipa spartea*), green needlegrass, and prairie cordgrass. Bur oak (*Quercus macrocarpa*), basswood (*Tilia americana*), hackberry (*Celtis occidentalis*), cottonwood (*Populus deltoides*), and willow (*Salix*) follow major draws and floodplains. Green ash (*Fraxinus pennsylvanica*) is found in all three states. In the western Dakotas it comprises up to 70 percent of the tall trees in forests. The presence of emerald ash borer (*Agrilus planipennis*) in Minnesota puts the ash resource at risk.

Two distinct forested regions occur within the three-State area. The first is the Black Hills of South Dakota where Ponderosa pine forest (*Pinus ponderosa*) and pine/oak savannas dominate. The second is the northern and eastern sections of Minnesota, which support mixed hardwood and conifer forests. Principal species include oak (*Quercus*), maple (*Acer*), elm (*Ulmus americana*), aspen (*Populus*), jackpine (*Pinus banksiana*), red pine (*Pinus resinosa*), and balsam fir (*Abies balsamea*). Black spruce (*Picea mariana*), tamarack (*Larix laricina*), and white cedar (*Thuja occidentalis*) are typical of lowlands and swamps.

### **Climate and Species Adaptation**

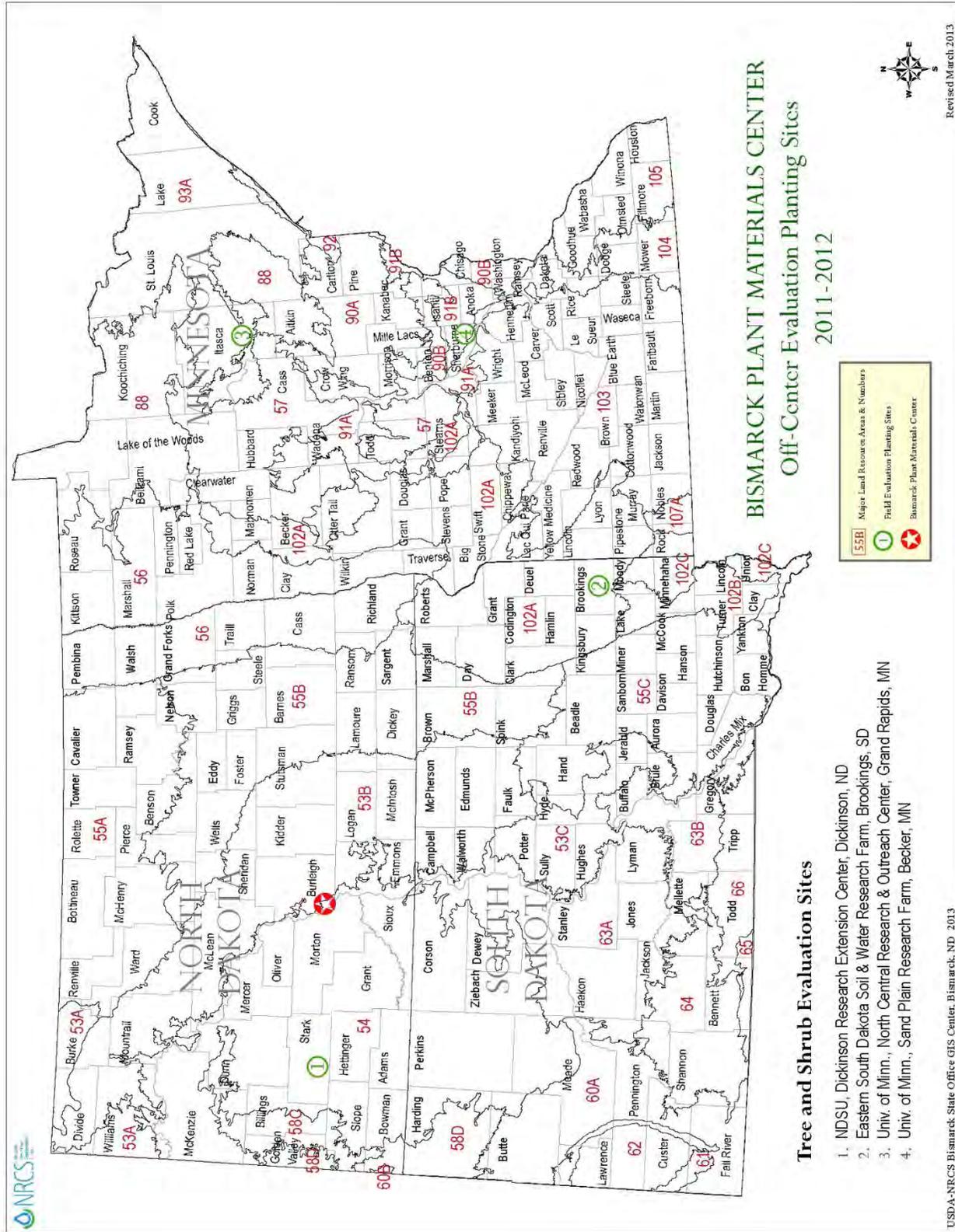
North Dakota and Minnesota are the two coldest States in the nation excluding Alaska. Mean annual temperatures range from 36 degrees F to 48 degrees F for all reporting stations. Plant hardiness zones (USDA) vary from 2 to 5 with mean minimum temperatures between -10 degrees F and -50 degrees F. Annual precipitation varies from 13 inches in western North Dakota to 30 inches or more in southeast Minnesota. Growing seasons are short, averaging from 110 to 150 days. The central and western Dakotas are principally semiarid in nature while the eastern Dakotas and Minnesota are considered subhumid.

The diversity of woody species is limited because of cold and drought, especially in the Dakotas. The scarcity of native tall tree species for windbreaks has relegated at least a portion of the tree improvement effort in the Northern Great Plains to improving upon existing cultivars of native species or increasing survival and pest resistance of hardy exotics such as Siberian elm. Species from Siberia, Russia, Manchuria, or Mongolia are among the most viable introductions for prairie plantings where precipitation is generally less than 20 inches annually. There is generally little shortage of shrub species suited for shelterbelt, barrier, or wildlife plantings except in the most hostile environments or specific cases related to pest resistance.

The short growing season limits the potential annual growth rate of trees. Late spring frosts can affect fruit set of early flowering fruit trees following a week or so of warm temperatures. However, hardy native shrubs like plum, chokecherry, and hawthorn are well adapted and regularly produce abundant crops. Indigenous species may rely on a secondary bud flush to produce foliage in some years. Winter dessication of needle leaved evergreens is not uncommon on exposed sites, making conifer establishment a challenge for vast areas of the Northern Plains. Symptoms of winter injury on hardwoods may be as mild as tip dieback on exterior limbs to complete death of above ground stems and subsequent resprouting. Damaged trees are ideal sites for insects and disease infection.

The importance of adapted seed sources and the need for provenance tests is especially critical in the extreme and variable environment of the Northern Plains. In the three-State region served by the PMC, winter hardy, drought, and pest resistant cultivars are in demand by the nursery trade. Seed sources from regions further south frequently express superior growth rates but are more susceptible to winter injury.

## **MAPS**



## **ASSEMBLY AND INITIAL EVALUATION**

### **Off-Center Evaluation Plantings**

## **OFF-CENTER EVALUATIONS: TECHNICAL REPORT – 2011-2012**

Study 38I316K North Dakota State University, Dickinson Research Extension Center, Dickinson, North Dakota.

Study Title: Field Evaluation of Woody Plant Materials.

Introduction: There is a need to evaluate the performance of shrub and tree species/cultivars for windbreaks, wildlife, and recreational plantings under diverse soil and climatic conditions. To meet this need, field evaluation planting sites representative of the Major Land Resource Areas were located in the three States served by the PMC. These sites provide planting locations under long-term land tenure, for assemblies of trees and shrubs to be evaluated under uniform culture and management. New material can be added on an annual basis. Comparisons are then made with previously released cultivars and area of adaptation determined.

Objective: The objective is to assemble and evaluate woody plant materials for conservation use. Superior cultivars will be selected and released for increase by commercial nurseries.

Cooperators: The USDA Natural Resources Conservation Service, Plant Materials Center, Bismarck, North Dakota, in cooperation with the North Dakota State University, Dickinson Research Extension Center, Dickinson, North Dakota. The cooperative agreement expired January 20, 2010, and a new agreement was finalized in 2012..

Location: This project is located on the west edge of Dickinson, North Dakota, on the NDSU Dickinson Branch Experiment Station. Legal description: NE 1/4 sec. 5, T. 139 N., R. 96 W., Stark County, North Dakota.

Major Land Resource Area: The site is located in Major Land Resource Area 54, Rolling Soft Shale Plain. This moderately dissected rolling plain is underlain by calcareous shales and sandstones. Strongly dissected areas of sharp local relief or badland topography border major streams and valleys in some areas. Elevation is 2,411 feet. Sixty percent of the area is rangeland.

Soils: The soil type is a Parshall fine sandy loam. The Parshall series consists of deep, well-drained soils formed in fine sandy loam alluvium on terraces and outwash plains and in upland swales. The surface layer and subsoil is dark grayish-brown fine sandy loam. The underlying material is dark grayish-brown fine sandy loam and loamy fine sand. Permeability is moderately rapid. The available water capacity is moderate. Organic matter is high and fertility is medium. This soil is in North Dakota windbreak suitability group 5.

Climate: For MLRA 054, the average annual precipitation is 13 to 19 inches; increasing from west to east for this semiarid area. Rainfall is highest from late spring to midsummer and very low during the rest of the year. Winter precipitation is snow. Average annual temperature is 40 to 45 degrees F. Average freeze-free period is 110 to 135 days. The plant hardiness zone is 4a, with an average annual minimum temperature of -30 to -20 degrees F. Climatic data for 2011-2012 recorded at Dickinson Research Extension Center, Dickinson, North Dakota, is shown in Table DI-1.

### **Methods and Materials**

Assembly: Refer to Table DI-2 for a list of woody species planted from 1978 through 2012.

Planting Plan: Plots are not randomized or replicated but systematically arranged for ease of evaluation and demonstration purposes. The planting site is approximately 500 feet long and 200 feet wide. The area is divided into five blocks. Each block consists of single row, non-replicated plots. Each plot contains a minimum of 5 plants. Row length is 100 feet and spacing between rows is 20 feet. Block 1A contains mainly tall tree accessions. Block 1B contains conifers. Block 2 contains shrubs and small trees. Block 3 contains medium sized trees. Block 4 contains tall trees. Refer to the plot map in Figure DI-1 and the aerial map in Figure DI-2. All trees are spaced ten feet within row and shrubs are spaced five feet within row. All rows run from west to east. Like species and standards of comparison are established in adjacent plots whenever possible.

Plot Preparation: A clean, firm planting site is prepared annually by disking and harrowing.

Planting Method: All trees and shrubs are hand planted using approved forestry methods.

Planting Date: Refer to Table DI-2 for planting dates of woody species planted from 1978 through 2012. Replacement stock is planted after establishment year if available.

Fertilization: No fertilizer has been applied to planting area.

Weed Control: Initially, no herbicide was been applied to any plot during year of establishment or in succeeding years. Weeds were controlled by clean cultivating between rows, within row, and in fallow areas. Four to six tillage operations were performed each year in the months of May through August. A minimum of hand hoeing was done to control weeds in rows. Since 2011 modest amounts of glyphosate were applied as directed spray to control weeds and sods under canopies where tillage was not possible.

Pest Control: No animal repellent or insecticide was applied in 1978. In the fall 1979, an animal repellent, Arasan 50, was sprayed on fruit trees to discourage rodent damage. Browsing by deer and rabbits was not a serious problem prior to 2000. From 2010 on we anticipate installing protective shelters on species likely to be browsed by deer and rabbits.

1980-1981: On November 6, 1980, and October 29, 1981, Arasan 50 was applied to the trunks and lower limbs of fruit trees to deter rodents from damaging bark and cambium. Conifers also received this spray treatment to discourage animal browse. No insecticides were applied. Hand cutting and stump treatment with glyphosate were applied to woody contaminants in test plantings. Two days of work have cleaned up the worst of the contaminated plantings.

1982-2012: No animal repellents or insecticides have been applied.

Irrigation: Each year, newly planted materials were watered with a portable tank. No water was added following year of establishment. During the drought years of 1988-1991, the trees were watered in the summer by station personnel.

Crop Residue Management: During 1990 and 1991, a cover crop was maintained to prevent soil erosion. Regular tillage for the past several decades has kept overall weed pressure reduced, but each tillage operation seems to damage the test plantings by tilling out material, breaking or bruising limbs and trunks or by removing ID stakes.

Silvicultural Practices: Extensive pruning was done in 1979-1980 to reshape trees damaged by animals. Dead trees and broken branches were cut and removed each year for sanitation. In 1988, some Russian olive accessions were treated with Tordon, using a hypo-hatchet, with unsuccessful results. In 1989, those treated accessions were cut down, but resprouted. These trees were removed by tractor in 1993. In June 2001, a front end loader was used to remove poorly performing accessions. Because of damage caused by a snowstorm in October 2005, considerable pruning was done on the trees, both in the fall and in the spring of 2006. The most damage at the site occurred in the southeast corner where the hackberry trees are planted. A number of the hybrid poplars have started to die. Trees have been cut, but stumps still remain. In 2008, many of the declining and dead poplars were removed. Low hanging, forked and damaged limbs were pruned from the hackberry, oak, ash, pear, and some crabapple in 2011.

In 2011, extensive sanitation was performed over two days to remove contaminant plants from accessions. Top growth was removed by chainsaw, hand saw, or loppers and stumps were treated with a 50% solution of glyphosate. In 2012, tree shelters were installed on newly planted tree species presumed susceptible to deer browse. The hackberry in IV/10/6-10 was removed since it conflicted with the road and most had been damaged with tillage.

Research Center staff used 2011 to chemically and mechanically fallow a 5-acre plot immediately west of the current study area. Part of this area will be used as an expanded tree research area for the PMC. In spring 2012, PMC staff seeded the entire area to blue grama. In early summer, PMC staff stapled to the ground four 150' strips of weed barrier in preparation for future planting. Using blue grama and weed barrier, similar to operations at Becker and Brookings, will reduce the risk of mechanical damage to planted stock. It should also reduce Research Center maintenance time.

In 2012, a new 15-year agreement was finalized between North Dakota State University, Dickinson Research Extension Center, Dickinson, North Dakota and the Bismarck Plant Materials Center.

### Evaluations and Measurements

Previous years: Records of planting date, survival, vigor, canopy width, height, cold hardiness, animal damage, insect damage, disease symptoms, and unusual or outstanding features have been maintained since 1978 and are listed in Table DI-2. Plant performance data is recorded during the growing season for the first three years. After the third year, data is gathered according to a specific schedule. Select data appears in this report. Annual summary reports have been prepared since 2006 and can be requested from the PMC.

#### 2012 Plant Specific Notes and Observations:

<b>Accession</b>	<b>Species</b>	<b>Scientific Name</b>	<b>Notes</b>
9082739	ironwood	<i>Ostrya virginiana</i>	Cultivated out. Need to try again.
9006043	ponderosa pine	<i>Pinus ponderosa</i>	Looks good. No need for more notes.
9057413	ponderosa pine	<i>Pinus ponderosa</i>	Looks good. No need for more notes.
9063148	corktree	<i>Phellodendron sachalinense</i>	Looks good so far. Need to place in additional sites for further testing.
9069081	littleleaf linden	<i>Tilia cordata</i>	Looks amazingly good for this site. Need more west ND plantings for further study.
9005996	red tatarian honeysuckle	<i>Lonicera tatarica sibirica</i>	Could be removed. Data collection done.
9005994	red tatarian honeysuckle	<i>Lonicera tatarica sibirica</i>	Could be removed. Data collection done.
9082684	smooth sumac	<i>Rhus glabra</i>	Performs well. Try for west river field plantings?
9011852	honeysuckle	<i>Lonicera</i>	Could be removed. Data collection done.
9019978	honeysuckle	<i>Lonicera xylosteum mollis</i>	Could be removed. Data collection done
9006079	Russian almond	<i>Prunus tenella</i>	No need for more data. Just measuring suckers. Could be removed.
9005993	Amur honeysuckle	<i>Lonicera maackii</i>	Could be removed. Data collection done.
9082638	western blue elderberry	<i>Asmbucus nigra ssp. caerulea</i>	Looks promising. Perhaps it is ready for field planting trials in 1-2 years.
9006003	Manchurian crabapple	<i>Malus mandshurica</i>	No need for more data. This could be maintained as seed orchard.
Midwest 9006004	Red Splendor crabapple	<i>Malus X</i>	Could be removed. Data collection done. Vigor has declined over years. Possibly too dry.
9006001	Siberian crabapple	<i>Malus baccata</i>	Could be removed. Data collection done. Vigor has declined over years. Possibly too dry.
9006095	Ussurian pear	<i>Pyrus ussuriensis</i>	Looks good. No need for more notes.
'McDermand' 9057424	honeysuckle	<i>Lonicera korolkowii</i>	Could be removed. Data collection done.
Freedom 9063143	Tatarian honeysuckle	<i>Lonicera tatarica</i>	Could be removed. Data collection done.
9008041	false indigo	<i>Amorpha fruticosa</i>	Has been released. Only measuring suckers.
Survivor germplasm 9069080	Arnolds red honeysuckle	<i>Lonicera tatarica</i>	Could be removed. Data collection done
PI-477981 'Konza'	aromatic sumac	<i>Rhus aromatica</i>	No need for further measurements. Maintain to complement skunkbush study

PI-478003 'Scarlet'	Mongolian cherry	<i>Prunus fruticosa</i>	No need for further measurements. Maintain as source of foundation seed.
9006228 'Legacy'	late lilac	<i>Syringa villosa</i>	No need for further measurements. Maintain as source of foundation seed.
9047203 'Prairie Red'	hybrid plum	<i>Prunus</i>	Measuring only suckers. Has been released. Seed source at PMC. Could be removed.
9005645	Amur maple	<i>Acer ginnala</i>	Maintain for survival and longevity testing on WSG-5 soils.
9005648	Amur maple	<i>Acer ginnala</i>	Maintain for survival and longevity on WSG-5 soils.
9005890	green ash	<i>Fraxinus pennsylvanica</i>	No need for further measurements. Maintain as potential EAB resistant seed source.
9005891	green ash	<i>Fraxinus pennsylvanica</i>	No need for further measurements. Maintain as potential EAB resistant seed source.
9005895 'Cardan'	green ash	<i>Fraxinus pennsylvanica</i>	No need for further measurements. Maintain as potential EAB resistant seed source.
9005893	green ash	<i>Fraxinus pennsylvanica</i>	No need for further measurements. Maintain as potential EAB resistant seed source.
9005887	black ash	<i>Fraxinus nigra</i>	Not looking good. No need for further measurements. Maintain as potential EAB resistant seed source
9005658	Ohio buckeye	<i>Aesculus glabra</i>	Only one tree left, but looking good. May be used as seed tree.
9011850	honeylocust	<i>Gleditsia triacanthos</i>	Has looked good for 33 years. Consider using this as a seed source for wider trials.
9005725	hackberry	<i>Celtis occidentalis</i>	No need for further data collection. Maintain trees as needed.
9005713	hackberry	<i>Celtis occidentalis</i>	No need for further data collection. Maintain trees as needed.
9057410	hackberry	<i>Celtis occidentalis</i>	The few surviving trees have been removed.

## Results

Plant Performance: Currently, 93 accessions of 66 species are under evaluation. This site is fairly well maintained by the Dickinson Experiment Station. Very little weed competition has occurred within row. A favorable microclimate is provided by surrounding shelterbelts. This undoubtedly reduces exposure to extreme temperatures and winds and desiccation and winter injury. The drought years of 1988 and 1989 severely hampered establishment and performance. With the continued dry weather in 1990 and 1991, much of the original windbreak of spruce planted on the border died out. A number of planted accessions also died. After the drought, precipitation was above normal for several years. The soils at the plot are a Parshall fine sandy loam, which is in Windbreak Suitability Group (WSG) 5. The white poplar seems to be drought-resistant. Also, the closely related quaking aspen seems to be doing better than the hybrid poplars. Other trees that are growing well on this fine sandy loam are many of the conifers, especially the Siberian larch and ponderosa pine. The following accessions exhibit potential for further evaluation and use:

<u>Accession Number</u>	<u>Genus/Species Origin/Source</u>	<u>Plot Location</u>
ND-1765 9005980	Siberian larch <i>Larix sibirica</i> USDA, FS, Shelterbelt Lab., Bottineau, ND	1B/03/1-10
ND-1873 9005648	Amur maple <i>Acer ginnala</i> Lincoln-Oakes Nursery, Bismarck, ND	3/09/1-5

SD-156 9005890	green ash <i>Fraxinus pennsylvanica</i> Deuel Co., Clear Lake, SD	4/01/1-5
ND-1879 9011850 PI-503531	honeylocust <i>Gleditsia triacanthos</i> ARS Field Station, Woodward, OK	4/04/1-5
SD-75 9005713	hackberry <i>Celtis occidentalis</i> Potter Co., SD	4/9/1-10
9069090	quaking aspen <i>Populus tremuloides</i> Lee Nursery, Fertile, MN	1A/5/6-10
9069168	Siberian larch <i>Larix sibirica</i> Altai Region, Russia	1A/09/6-10
9057413	Ponderosa pine <i>Pinus ponderosa</i> Glendive, MT NDFS	1B/05/1-5
ND-3803	white poplar <i>Populus alba</i> USDA, NRCS, PMC, Bismarck, ND	1B/07/6-10
9063148	corktree <i>Phellodendron sachalinense</i> Clay Co., MN	1B/09/1-5
9076737	black cherry <i>Prunus serotina</i> Apple Valley OCEP, ND Lincoln-Oakes Nursery, Bismarck, ND	II/07/1-5
9092231 14070 ARS	lodgepole pine <i>Pinus contorta var. latifolia</i> Routt National Forest, Salida, CO	1B/06/6-10
9069081	littleleaf linden <i>Tilia cordata</i> Lee Nursery, Fertile, MN	1B/10/1-5
9082638	western blue elderberry <i>Sambucus nigra ssp. caerulea</i> Lincoln Oakes Nursery, Bismarck, ND	II/06/11-15

**Figure DI-1. Off Center Evaluation Planting Map at Dickinson Research Extension Center, Dickinson, North Dakota**

	Block 1A		Block 1B		Block 2		Block 3				Block 4	
<b>Row 1</b>			ND-1729 Siberian larch		ND-313 red tatarian honeysuckle	ND-1730 red tatarian honeysuckle	'Midwest' Manchurian crabapple		'Red Splendor' crabapple		SD-156 green ash	ND-1734 green ash
<b>Row 2</b>	9082885 aspen	9082619 green ash	SL-383-T Siberian larch		9082684 smooth sumac	9008183 Sheridan source chokecherry	ND-1731 Siberian crabapple		'McDermant' Ussurian pear		'Cardan' green ash	ND-1759 green ash
<b>Row 3</b>	14392 Walker poplar	Canam Walker poplar	ND-1765 Siberian larch		ND-26 honeysuckle/ ND-452 honeysuckle	ND-170 cotoneaster	'Freedom' honey- suckle	9063143 red tatarian honey- suckle	Survivor false indigo	'Arnolds Red' honey- suckle	ND-647 black ash	ND-1432 O.buckeye/ 9092162 pie cherry
<b>Row 4</b>	ND-3796 white poplar	Raverdeau poplar	ND-1763 ponderosa pine	ND-1565 bristlecone pine	9082711 winterberry euonymus	'Regal' Russian almond	'Konza' aromatic sumac	'Scarlet' Mongolian cherry		'Legacy' late lilac	ND-1879 honeylocust	Carmine Jewel dwarf cherry
<b>Row 5</b>	9082640 Gambel oak	9069090 quaking aspen	9057413 ponderosa pine	9069169 Siberian pine	ND-11 amur honeysuckle	'Centennial' cotoneaster	'Sakakawea' silver buffaloberry		'Magenta' crabapple		9063116 black ash	9091968 Kentucky coffeetree
<b>Row 6</b>	9087732 bur oak	Assiniboine poplar	9069172 Scots pine	9092231 lodgepole pine	9057406 rugosa rose	9082638 western blue elderberry	9076726 tatarian maple		9091969 Russian peashrub		9063115 green ash	9076724 Russian olive
<b>Row 7</b>	9063141 eastern cottonwood		9094406 Princeton elm	ND-3803 white poplar	9076737 black cherry	'McKenzie' chokeberry	9082891 common ninebark		9082653 skunkbush sumac		Prairie Harvest hackberry	9069166 Russian olive
<b>Row 8</b>	Hunter ponderosa pine	Bridger- Select juniper	9091967 pin cherry	9082687 black currant	9063142 Japanese cherry	9082713 Siberian peach	'Prairie Red' plum		ND-629 amur maple		'Oahe' hackberry	
<b>Row 9</b>	9069164 Scots pine	9069168 Siberian larch	9063148 corktree	ND-21 nannyberry	'Homestead' Arnold hawthorn		ND-1873 amur maple		ND-686 Pekin lilac		SD-75 hackberry	
<b>Row 10</b>	9082641 pinyon pine	9082889 mugo pine	9069081 littleleaf linden	9063126 Japanese elm	/common juniper	salt tree/ bittersweet	9069129 amur chokecherry			9094355 roughleaf dogwood	9094356 Meyer spruce	
	<b>Block 1A</b>		<b>Block 1B</b>		<b>Block 2</b>		<b>Block 3</b>				<b>Block 4</b>	

updated 05/12

**Figure DI-2. Aerial Map of Off Center Evaluation Planting at Dickinson Research Extension Center, Dickinson, North Dakota**



Month	Mean Temperature (degrees Fahrenheit)			Precipitation (inches)				
	2011	2012	Normal*	Actual			Deviation from Normal	
				2011	2012	Normal*	2011	2012
January	11.8	23.8	12.0	0.47	0.12	0.35	0.12	-0.23
February	11.0	21.8	18.9	0.16	0.31	0.37	-0.21	-0.06
March	21.7	43.8	28.7	0.61	0.04	0.67	-0.06	-0.63
April	38.8	46.3	41.3	2.17	1.65	1.63	0.54	0.02
May	49.9	53.6	53.4	4.84	1.65	2.24	2.60	-0.59
June	60.8	65.1	62.4	3.54	2.35	3.57	-0.03	-1.22
July	69.9	75.1	68.1	2.43	1.13	2.20	0.23	-1.07
August	68.4	68.1	67.3	2.07	1.17	1.65	0.42	-0.48
September	58.3	59.9	55.4	0.66	0.17	1.62	-0.96	-1.45
October	48.3	41.8	43.3	0.31	1.34	1.31	-1.00	0.03
November	31.5	31.9	27.3	0.06	0.22	0.63	-0.57	-0.41
December	25.1	15.3	16.2	0.12	0.26	0.37	-0.25	-0.11
<b>Annual</b>	<b>41.3</b>	<b>45.5</b>	<b>41.2</b>	<b>17.44</b>	<b>10.41</b>	<b>16.61</b>	<b>0.83</b>	<b>-6.20</b>
* National Climate Data Center 1971-2000 Monthly Normals								
			2011	2012				
	Last Frost (28 degrees)		n/a	11-May				
	First Frost (28 degrees)		n/a	22-Sep				
	Frost Free Period		n/a	133				

**Key to Table DI-2. 38I316K Field Evaluation of Woody Plant Materials – Dickinson, North Dakota**

PLOT LOCATION = plot location of the plant material within the evaluation

ACCESSION NUMBER = any accession number, PI number or cultivar name assigned to the plant material

PLANT SYMBOL = plant symbol of the genus and species (asterisk indicates the symbol is not official)

GENUS/SPECIES = common name and scientific name of the plant material

ORIGIN/SOURCE = origin and/or source of the plant material

TRANS DATE = month and day the plant material was transplanted at the evaluation site

YR PLT = year the plant materials were transplanted at the evaluation site

YR REC = year of record

MATL PLTD = type of material planted, PLBR = bareroot, CONT = containerized

NO PLTS = number of plants planted in the plot

NO SRV = number of plants surviving

PCT SRV = percent of plants surviving

VI = plant vigor (1=excellent, 3=good, 5=fair, 7=poor, 9=very poor)

CAN COV (ft) = canopy cover measured in feet

PLT HT (ft) = plant height measured in feet

Table DI-2.

Project No.: 38I316K Field Evaluation of Woody Plant Materials, Dickinson, North Dakota

Year of Record: 2012

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
1A/01/1-5	9094337	QUMA	bur oak	12-May	10	10	PLBR	5	5	100	3	0.8	2.2	
	'West Bend'		<i>Quercus macrocarpa</i>		12				0	0				tilled out
			Big Sioux Nursery, Watertown, SD											
IA/02/1-5	9082885	POTR5	aspen	11-May	04			5	5	100	4	0.8	1.9	browsed off regrowing
			<i>Populus tremuloides</i>		05				3	60	3	2.1	3.5	
			NDFS Nursery, Towner, ND		06				5	100	4	2.0	2.7	
					08				3	60	4	2.0	2.5	
					10				3	60	4	3.3	3.9	
1A/02/6-10	9082619	FRPE	green ash	16-May	02		CONT	5	5	100	5	0.5	0.8	3,5 browsed by rabbit
			<i>Fraxinus pennsylvanica</i>		03				3	60	4	0.5	1.3	
			Jordan, MT		04				5	100	3	0.9	2.4	
			Valley Nursery, Helena, MT		06				5	100	3	2.1	4.3	
					08				5	100	4	2.7	5.6	
					12				5	100	2	7.8	12.9	
IA/03/1-5	'Manitou'	POPUL	poplar	9-May	90		PLBR	5	5	100	2	1.7	3.0	
	9058874		<i>Populus</i>		91				5	100	4	2.5	4.1	
	14392		USDA, ARS, Mandan, ND		92				5	100	4	1.6	3.2	
			Lincoln-Oakes Nursery, Bismarck, ND		94				5	100	2	9.5	16.2	
					96				5	100	3	11.7	24.6	anthracnose on leaves,
					99				5	100	3	12.2	35.2	leaves dropping on all trees
					04				5	100	5	11.8	24.6	
					09									mostly all dead
					10				2	40	3	15.5	27.4	
IA/04/1-5	9030611	POAL7	white poplar	15-May	92		CONT(P)	5	4	80	4	1.6	1.6	
	ND-3796		<i>Populus alba</i>		93				5	100	2	3.8	3.7	
			Turner Co., SD		94				4	80	3	6.3	5.9	
			USDA, NRCS, PMC, Bismarck, ND		96				4	80	6	8.7	7.7	dieback on all trees
					98				4	80	3	14.4	13.3	
					02				4	80	7	17.0	13.5	dieback from freezing on all
					06				4	80		16.0	15.2	
					12				4	80	3	16.1	21.6	

Project No.: 381316K Field Evaluation of Woody Plant Materials, Dickinson, North Dakota

Year of Record: 2012

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN		PLT HT	REMARKS
											COV VI	(ft)		
IA/05/1-5	9082640	QUGA	Gambel oak <i>Quercus gambelii</i> Lincoln-Oakes Nursery, Bismarck, ND	13-May	99	99	CONT	5	5	100	3	0.8	1.6	
											4	0.9	1.2	
											3	2.1	2.3	
											3	0.9	1.9	
											5	1.2	2.0	
											4	1.8	3.4	
IA/05/6-10	9069090	POTR5	quaking aspen <i>Populus tremuloides</i> Lee Nursery, Fertile, MN	15-May	93	93	PLBR	5	4	80	5	0.8	1.7	
											3	1.7	4.1	
											3	3.4	6.2	
											2	5.8	9.9	
											3	8.8	17.3	
											1	12.5	22.6	
											2	15.5	25.8	
											4	12.5	24.4	
IA/6/1-5	9087732	QUMA2	bur oak <i>Quercus macrocarpa</i> USDA, NRCS, PMC, Bridger, MT	6-May	09	09	PLBR	5	5	100	4	1.6	2.5	
											5	1.3	2.1	
											6	1.1	1.1	
IA/06/6-10	'Assiniboine' 9063147	POPUL	hybrid poplar <i>Populus</i> PFRA, Indianhead, Saskatchewan, Canada	10-May	93	93	PLBR	5	5	100	4	0.5	1.8	
											3	3.7	6.1	
											3	7.9	11.4	
											4	11.7	17.1	
											3	11.5	27.8	
											3	14.0	31.4	
											5	11.3	25.2	
											4	16.8	31.8	

Project No.: 381316K Field Evaluation of Woody Plant Materials, Dickinson, North Dakota

Year of Record: 2012

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
LOCATION	NUMBER	SYMBOL	ORIGIN/SOURCE	DATE	PLT	REC	PLTD	PLTS	SRV	SRV	VI	(ft)	(ft)	REMARKS
IA/07/1-5	9063141	PODE3	eastern cottonwood	10-May	93	93	PLBR	5	5	100	3	1.6	3.4	
			<i>Populus deltoides</i>			94			5	100	2	5.6	9.0	
			Lincoln-Oakes Nursery, Bismarck, ND			95			5	100	3	8.1	13.7	severe leaf rust
						97			5	100	2	15.7	22.4	
						99			5	100	2	13.5	31.8	
						02			5	100	2	18.0	37.4	2,3,4,5 have some leaf disease
						07			5	100	4	17.5	39.0	
						12			5	100	4	21.9	38.8	all multi-stemmed; dead tops 3,4
1A/07/6-10	9082739	OSVI	ironwood	8-May	08	08		5	1	20	8	0.5	1.3	
			<i>Ostrya virginiana</i>			09			1	20	4	0.8	2.0	
			Sertoma Park, Bismarck, ND			10			3	60	5	0.5	1.3	
			USDA, NRCS, PMC, Bismarck, ND			12			0	0				row cultivated out
IA/08/1-5	'Hunter Germplasm' 9081843	PIPOS	ponderosa pine	17-May	05	05		5	5	100	4	0.9	1.3	
			<i>Pinus ponderosa</i> var. <i>scopulorum</i>			06			5	100	3	1.1	1.8	
			USDA, NRCS, Bridger, MT			07			5	100	4	1.1	1.8	
						09			4	80	3	2.1	2.7	
						12			4	80	2	3.7	5.9	deer rub 4
1A/08/6-10	'Bridger-Select' 9078631	JUSC2	Rocky Mountain juniper	17-May	05	05		5	5	100	5	0.7	1.0	one mowed off
			<i>Juniperus scopulorum</i>			06			5	100	4	1.0	1.6	
			Bridger PMC, MT			07			4	80	3	1.1	1.9	
						09			4	80		2.1	2.8	
						12			4	80	2	4.4	5.5	
IA/09/1-5	9069164	PISY	Scots pine	4-May	98	98	CONT	5	4	80	4	0.8	1.2	
			<i>Pinus sylvestris</i> var. <i>mongolica</i>			99			4	80	4	1.0	1.5	
			Heilongjiang Province, China			00			4	80	3	1.6	2.0	
			USDA, NRCS, PMC, Bismarck, ND			02			4	80	3	3.0	4.0	
						04			5	100	3	4.2	5.7	
						07			5	100	3	7.5	10.4	
						12			5	100	1	12.3	18.7	

Project No.: 381316K Field Evaluation of Woody Plant Materials, Dickinson, North Dakota

Year of Record: 2012

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
IA/09/6-10	9069168	LASI3	Siberian larch	4-May	98	98	CONT	5	4	80	4	0.6	1.3	
			<i>Larix sibirica</i>			99			5	100	3	1.0	1.8	
			Altai region, Russia			00			1	20	2	1.4	2.8	
			USDA, NRCS, PMC, Bismarck, ND			02			1	20	1	3.0	6.5	
						04			1	20	1	4.5	9.0	
						07			1	20	2	8.0	10.2	
						12			1	20	1	14.0	20.0	
IA/10/6-10	9082889	PIMU80	Mugo pine	11-May	04	04		5	1	20	3	0.8	1.3	
			<i>Pinus mugo</i>			05			2	40	6	0.8	0.7	
			Big Sioux Nursery, Watertown SD			06			3	60	4	1.2	1.0	
						08			2	40	4	1.9	1.5	
						10			2	40	4	3.1	2.2	
IB/01/1-10	ND-1729 9005979	LASI3	Siberian larch	16-May	78	78	PLBR	10	9	90	3	0.7	2.0	
			<i>Larix sibirica</i>			79			10	100		0.7	1.4	
			NDFS State Nursery, Towner, ND			80			10	100	4	1.1	1.8	
						82			8	80	8	1.0	1.5	
						83			6	60	7	1.1	2.4	1 mowed off, moderate rodent
						84			6	60	4	1.3	3.0	damage
						87			6	60	6	3.0	6.5	
						92			5	50	4	7.7	11.4	
						97			5	50	2	13.1	17.9	
						02			5	50	2	17.5	25.8	
						07			5	50	4	16.0	26.2	
						12			5	50	3	20.1	28.7	

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PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
IB/02/1-10	SL-383-T	LASI3	Siberian larch	17-May	78	78	PLBR	10	10	100	3	0.6	2.2	
	Pallet No.		<i>Larix sibirica</i>			79			10	100		0.8	1.6	
	2392		Denbigh Exp. Forest			80			10	100	4	1.4	2.0	
	9005976		USDA, FS, Shelterbelt Lab., Bottineau, ND			82			9	90	6	1.5	2.3	
						83			9	90	6	2.0	3.9	1 mowed off, moderate rodent damage
						84			8	80	2	2.6	5.6	
						87			8	80	2	5.9	10.0	
						92			8	80	8	9.9	16.4	
						97			8	80	1	16.2	23.3	
						02			8	80	2	19.0	32.0	
						07			8	80	3	17.0	31.3	
						12			8	80	8	22.1	32.4	
IB/03/1-10	ND-1765	LASI3	Siberian larch	17-May	78	78	PLBR	10	10	100	3	0.6	1.4	
	9005980		<i>Larix sibirica</i>			79			10	100		1.1	1.6	
			USDA, FS, Shelterbelt Lab., Bottineau, ND			80			10	100	4	1.8	2.7	
						82			10	100	5	2.1	4.0	
						83			10	100	5	2.6	4.9	moderate rodent damage, best accession of larch
						84			10	100	4	3.6	6.1	
						87			9	90	2	7.0	11.0	
						92			9	90	2	10.4	17.5	
						97			9	90	2	15.6	24.2	
						02			9	90	2	22.0	32.0	
						07			9	90	3	21.0	30.2	dense canopy
						12			6	60		21.0	32.0	top dead 6

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PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		<u>REMARKS</u>	
											COV <u>VI</u>	PLT <u>(ft)</u>		
IB/04/1-5	ND-1763 9006043	PIPO	ponderosa pine <i>Pinus ponderosa</i> 757-5 Todd Co., SD USDA, FS, Shelterbelt Lab., Bottineau, ND	16-May	78	78	CONT	5	5	100	1	0.5	1.7	
												4	1.1	
												5	2.0	
												4	4.4	
												5	3.6	
												3	4.9	
												3	7.5	
												3	14.0	
												1	21.7	
												3	33.0	
												3	34.2	
												1	36.4	
animal damage														
IB/04/6-10	ND-1565 9006036	PIAR	bristle cone pine <i>Pinus aristata</i> USDA, FS, Shelterbelt Lab., Bottineau, ND	16-May	78	CONT	5	5	100	3	0.5	0.6		
											5	0.6		
											5	0.8		
											1	3.0		
											4	0.8		
											2	1.8		
											2	2.0		
											1	3.9		
											1	7.7		
											1	10.5		
											1	13.5		
											1	16.3		
mower damage on plt 3														
IB/05/1-5	9057413	PIPO	ponderosa pine <i>Pinus ponderosa</i> Glendive, MT NDFS	11-May	88	CONT	5	2	40	4	0.3	1.1		
											4	1.4		
											4	1.5		
											4	2.2		
											4	4.2		
											2	9.3		
											2	20.9		
											2	26.9		
											1	32.0		

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PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
IB/05/6-10	9069169	PISI3	Siberian pine	14-May	03	03		5	5	100				
			<i>Pinus sibirica</i>			04			5	100	3	0.6	0.8	
			Altai			05			5	100	4	1.0	0.9	
			USDA, NRCS, PMC, Bismarck, ND			07			5	100	3	0.8	1.0	
						09			2	40	4	1.5	1.1	
						12			2	40		2.3	2.9	
IB/06/1-5	9069172	PISY	Scots pine	6-May	97	97	CONT	5	5	100	2	0.5	1.2	
			<i>Pinus sylvestris</i>			98			4	80	3	1.2	1.7	
			Altai region, Russia			99			5	100	1	1.3	2.6	
			USDA, NRCS, PMC, Bismarck, ND			01			5	100	2	2.5	4.9	
						03			5	100	3	4.2	7.7	
						06			5	100	3	6.4	12.4	
						12			4	80	3	9.9	22.5	
IB/06/6-10	9092231	PICOL	lodgepole pine	6-May	09	09		5	5	100	4	0.5	1.0	
	14070 (ARS)		<i>Pinus contorta</i> var. <i>latifolia</i>			10			5	100	3	1.2	1.6	
			Routt National Forest, Salida, CO			12			5	100	3	2.2	3.1	
			Towner State Nursery, Towner, ND											
	9094406	ULAM	American elm	10-May	12	12		5	5	100	5	0.3	1.6	
	Princeton		<i>Ulmus americana</i>											
			Schumacher's Nursery, Heron Lake, MN											
IB/07/6-10	ND-3803	POAL7	white poplar	24-May	94	94	CONT	5	5	100	3	2.0	3.1	
	9030612		<i>Populus alba</i>			95			4	80	2	6.2	6.5	
			USDA, PMC, Bismarck, ND			96			4	80	5	4.4	4.4	
						98			4	80	3	11.2	11.1	
						00			4	80	2	14.0	17.3	
						03			4	80	2	19.4	21.1	
						08			4	80	3	31.0	27.3	suckering
IB/08/1-5	9091967	PRPE2	pin cherry	6-May	09	09		5	5	100	3	0.6	1.9	
			<i>Prunus pensylvanica</i>			10			4	80	5	0.9	1.5	
			Upper Red Lake, MN			12			5	60	5	0.5	1.5	wh poplar competition 3-5
			Big Sioux Nursery, Watertown, SD											

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				DATE	PLT	REC	PLTD	PLTS	SRV	SRV	VI	(ft)	
IB/08/6-10	9082687	RIAM2	black currant	9-May	07	07		5	0	0			
			<i>Ribes americanum</i>										
			Big Sioux Nursery, Watertown, SD										
IB/09/1-5	9063148	PHSA80	corktree	4-May	95	95	CONT	5	5	100	4	0.7	1.3
			<i>Phellodendron sachalinense</i>										
			Clay Co., MN										
IB/09/6-10	ND-21 9034900	VILE	nannyberry	7-May	86	86	PLBR	5	5	100	3	0.5	1.5
			<i>Viburnum lentago</i>										
			USDA, ARS, Mandan, ND										
			USDA, NRCS, PMC, Bismarck, ND										
IB/10/1-5	9069081	TICO2	littleleaf linden	10-May	93	93	CONT(P)	5	5	100	5	0.7	1.3
			<i>Tilia cordata</i>										
			Lee Nursery, Fertile, MN										

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											<u>VI</u>	<u>(ft)</u>						
IB/10/6-10	9063126	ULDAJ	Japanese elm	15-May	92	92	CONT(P)	5	3	60	4	1.7	1.7					
			<i>Ulmus davidiana</i> var. <i>japonica</i>				94					3	60		3	4.2	4.5	
			Manchuria				96					5	100		4	5.9	6.3	5 is sucker
			PFRA, Indianhead, Saskatchewan, Canada				98					4	80		5	12.0	10.7	dieback on 2,3,4
							01					4	80		4	14.8	11.7	all have dead branches
							06					4	80		4	16.0	12.9	dieback on 3,4; severe on 3
							12					3	60		3	20.1	19.9	
II/01/1-10	ND-313 9005996 PI-477999	LOTA	red tatarian honeysuckle	17-May	78	78	PLBR	10	9	90	1	1.5	1.6					
			<i>Lonicera tatarica sibirica</i>				79					9	90			2.0	2.4	
			USDA, ARS, Cheyenne, WY				80					10	100		3	3.2	2.4	
			USDA, NRCS, PMC, Bismarck, ND				82					10	100		4	5.3	4.5	
							83					10	100		3	5.9	5.4	good fruit
							84					10	100		4	7.4	5.5	moderate-severe insect
							87					10	100		3	5.6	6.7	defoliation, honeysuckle aphid
							92					10	100		5	6.8	7.3	
							97					10	100		5	15.3	9.0	
							02					10	100		3	15.5	11.6	
							07					10	100		7	14.0	10.5	
							12					8	80		6	5.3	10.0	
II/01/11-20	ND-1730 9005994	LOTA	red tatarian honeysuckle	17-May	78	78	PLBR	10	10	100	1	1.6	1.7					
			<i>Lonicera tatarica sibirica</i>				79					10	100			2.2	2.8	
			Lincoln-Oakes Nursery, Bismarck, ND				80					10	100		1	3.4	3.0	
							82					10	100		4	5.9	5.2	
							83					10	100		3	6.7	6.5	good vigor
							84					10	100		5	7.7	6.6	slight insect defoliation
							87					10	100		3	6.5	7.2	good fruit production,
							92					9	90		6	6.4	7.1	snow damage, aphid damage
							97					9	90		5	15.3	8.2	
							02					10	100		3	15.5	11.5	
							07					10	100		8	11.5	9.5	
							12					9	90		4	11.5	10.0	

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<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
II/02/1-5	9082684	RHGL	smooth sumac <i>Rhus glabra</i> Lincoln-Oakes Nursery, Bismarck, ND	14-May	03	03		5						weedy, poor survival
						04			5	100	3	3.0	2.6	
						05			5	100	4	4.8	3.6	
						07			5	100	2	6.0	6.0	
						09			5	100	2	7.0	6.8	
						12			5	100	2	8.8	8.0	
II/02/6-10	9008183	PRVI	common chokecherry <i>Prunus virginiana</i> Lincoln-Oakes Nursery, Bismarck ND	17-May	05	05		5	4	100	4	1.0	2.3	
						06			4	100	4	2.2	3.2	
						07			4	100	3	2.4	3.4	
						09			4	80	3	3.6	5.0	
						12			5	100	3	5.6	7.6	Schubert 5
II/03/1-10	ND-26 9011852	LONIC	honeysuckle <i>Lonicera</i> USDA, ARS, Mandan, ND	2-May	79	79	PLBR	10	10	100		1.1	1.4	
						80			10	100	5	2.0	1.7	
						81			10	100		2.6	2.9	
						83			10	100	4	4.5	4.8	leaf spot
						84			10	100	4	4.9	5.4	witches broom on plts 3,5,8
						88			10	100	4	7.5	7.0	moderate insect defoliation,
						93			10	100	5	10.5	9.0	grasshoppers, aphid damage
						98			10	100	4	15.4	10.5	aphid damage on 3
						03			10	100	4	21.0	11.8	
						08			10	100	5	18.0	11.0	
II/03/11-15	ND-452 9019978	LOXY	honeysuckle <i>Lonicera xylosteum mollis</i> USDA, ARS, Cheyenne, WY USDA, NRCS, PMC, Bismarck, ND	2-May	79	79	PLBR	5	5	100		1.2	1.3	
						80			5	100	3	2.3	1.5	
						81			5	100		3.2	2.9	
						83			5	100	4	5.5	5.5	witches broom on 1,2,3
						84			5	100	3	6.5	5.5	slight leaf spot, leaf
						88			5	100	5	7.5	6.7	blight, aphid damage
						93			5	100	6	9.3	7.6	
						98			5	100	6	11.5	8.4	severe aphid damage on 1,2
						08			3	60	5	11.5	9.0	

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<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
II/03/16-20	ND-170	COIN16	cotoneaster	9-May	90	90	CONT	5						
	9005728		<i>Cotoneaster integerrimus</i>			91			4	80	6	0.8	1.5	
			USDA, NRCS, PMC, Bismarck, ND			92			4	80	6	1.5	1.4	
						94			4	80	4	4.1	3.0	
						96			4	80	4	5.5	3.5	
						99			4	80	4	5.1	3.5	
						04			4	80	5	6.5	4.5	fireblight on 2, 3
						09			4	80	3	5.5	4.5	
II/04/1-5	9082711	EUBU6	winterberry euonymus	16-May	02	02	PLBR	5	4	80	4	1.0	1.7	
			<i>Euonymus bungeanus</i>			03			4	80	5	0.9	2.0	
			Lincoln-Oakes Nursery, Bismarck, ND			04			4	80	5	0.4	0.9	cut off #4
						06			4	80	5	0.3	1.4	2 chewed off, 3 heavily browsed
						08			3	60	3	1.8	2.4	
						12			1	20	4	1.5	4.8	chewed off; resprout
II/04/11-20	'Regal'	PRTE5	Russian almond	8-May	80	80	PLBR	10	10	100	5	0.8	2.2	
	ND-283		<i>Prunus tenella</i>			81			7	70		0.9	1.4	
	9006079		ND Game & Fish Dept.			82			10	100	4	1.8	2.3	
	PI-540442		USDA, NRCS, PMC, Bismarck, ND			83			8	80	4	3.9	3.5	few pests
						84			10	100	4	3.8	3.7	
						86			9	90	4	5.2	4.5	
						88			9	90	3	6.0	4.7	
						89			9	90	4	4.2	4.8	
						94			9	90	4	6.6	4.3	
						99			5		3	13.1	6.6	
						04			10	100	3	13.0	7.0	
						09			10	100	3	16.0	5.5	good seed crop

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LOCATION	NUMBER	SYMBOL	ORIGIN/SOURCE	DATE	PLT	REC	PLTD	PLTS	SRV	SRV	VI	(ft)	(ft)	REMARKS
II/05/1-10	ND-11	LOMA6	amur honeysuckle	7-May	81	81	CONT	10	10	100		0.7	0.6	
	9005993		<i>Lonicera maackii</i>			82			10	100	4	1.4	1.4	
	PI-477998		Res. Sta., Morden, MB, Canada			83			6	60	6	1.6	1.8	slight insect
						84			10	100	4	2.1	1.8	defoliation (grasshoppers)
						86			10	100	4	4.2	4.6	
						87			10	100	3	8.5	5.6	
						88			10	100	4	7.4	5.6	
						90			10	100	4	5.7	5.7	
						95			10	100	4	7.1	8.5	
						00			10	100	4	8.4	10.0	
						05			10	100	2	16.1	12.2	
						10			10	100	3	16.0	13.0	
II/05/11-20	'Centennial'	COIN16	cotoneaster	8-May	85	85	PLBR	10						no data
	ND-177		<i>Cotoneaster integerrimus</i>			86			8	80	4	2.3	2.2	
	9005729		Lincoln-Oakes Nursery, Bismarck, ND			87			7	70	3	4.0	3.3	
	PI-113095					88			10	100	4	3.2	3.0	
						89			8	80	4	4.5	3.5	
						91			7	70	5	5.3	4.3	
						94			7	70	4	7.5	7.6	
						99			7	70	4	12.5	10.2	
						04			7	70	5	12.0	10.5	fireblight on all 5
						09			7	70	3	12.0	10.5	
II/06/1-5	9057406	RORU	rugosa rose	16-May	02	02	CONT	5	5	100	5	1.0	1.4	
			<i>Rosa rugosa</i>			03			3	60	3	0.8	1.0	
			Lincoln-Oakes Nursery, Bismarck, ND			04			5	100	3	1.8	1.6	
						06			5	100	4	3.2	2.4	
						08			5	100	5	2.1	1.6	
						12			5	100	4	3.7	3.0	50% brown leaves & dead cones

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<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
II/06/11-15	9082638	SANIC5	western blue elderberry <i>Sambucus nigra</i> ssp. <i>caerulea</i> Lincoln-Oakes Nursery, Bismarck, ND	13-May	99	99	CONT	5						
						00			5	100	4	1.5	2.9	
						01			5	100	3	4.9	5.5	
						03			5	100	2	7.0	6.0	
						05			5	100	4	12.7	9.0	
						08			5	100	5	9.0	9.2	
II/07/1-5	9076737	PRSE2	black cherry <i>Prunus serotina</i> Apple Valley FEP, ND Lincoln-Oakes Nursery, Bismarck, ND	6-May	97	97	PLBR	5	4	80	3	1.1	1.7	
						98			5	100	4	2.8	3.0	
						00			5	100	3	6.6	7.9	
						03			5	100	2	12.4	12.5	
						06			5	100	2	16.0	15.0	
						12			5	100	2	14.8	18.7	
II/07/6-10	'McKenzie' 323957	PHME13	black chokeberry <i>Photinia melanocarpa</i> Lincoln-Oakes Nursery, Bismarck, ND	23-May	00	00	PLBR	5	5	100	3	0.9	1.7	
						01			5	100	4	1.8	1.7	
						02			5	100	3	0.9	1.7	
						04			5	100	3	4.3	3.6	
						06			5	100	2	5.4	4.6	
						09			5	100	3	4.8	5.5	
II/08/1-5	9063142	PRUNU	Japanese cherry <i>Prunus</i> Bottineau FEP, ND Lincoln-Oakes Nursery, Bismarck, ND	10-May	93	93	PLBR	5	5	100	4	1.2	2.0	
						94			5	100	4	1.7	2.6	
						95			4	80	4	2.6	3.0	
						97			3	60	6	1.6	2.3	
						99			2	40	4	3.0	3.3	
						02			2	40	5	5.1	3.0	1,4 have some dieback
						07			2	40	4	4.8	4.9	
						12			2	40	3	5.5	4.5	
II/08/6-10	9082713	PRPEP2	Siberian peach <i>Prunus persica</i> var. <i>persica</i> Lincoln-Oakes Nursery, Bismarck, ND	16-May	02	02	PLBR	5	5	100	2	1.6	2.7	
						03			5	100	4	4.1	4.0	
						04			4	80	2	6.1	5.8	
						06			4	80	4	7.8	6.8	
						08			4	80	4	6.9	7.7	
						12			4	80	6	6.6	6.4	some dead limbs/basal resprout

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PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
LOCATION	NUMBER	SYMBOL	ORIGIN/SOURCE	DATE	PLT	REC	PLTD	PLTS	SRV	SRV	VI	(ft)	(ft)	REMARKS
II/09/1-10	'Homestead'	CRAN6	Arnold hawthorn	9-May	84	84	CONT	10	10	100	4	0.7	0.3	
	ND-20		<i>Crataegus X anomala</i>			86			10	100	4	1.7	2.7	
	9005731		USDA, NRCS, PMC, Bismarck, ND			88			10	100	3	3.8	4.8	
	PI-503530					90			10	100	4	4.0	6.0	
						93			9	90	3	6.2	8.9	
						98			9	90	2	13.1	13.0	
						03			9	90	2	18.0	15.4	
						08			9	90	4	18.0	16.2	leaves dried up due to drought
II/10/2-6	ND-3742	JUCO6	common juniper	4-May	06	06	CONT	5	5	100	4	1.6	1.0	
	9019593		<i>Juniperus communis</i>			07			4	80	5	0.8	0.7	
						08			3	60	3	1.1	0.9	
						10			4	80	4	2.5	1.3	
						12			4	80	1	4.2	1.8	
II/10/6-10	9057438	HAHA8	Siberian salt tree	11-May	94	94	CONT	5	1	20	3	0.3	1.1	
			<i>Halimodendron halidendron</i>			95			4	80	4	0.6	1.3	
			PFRA, Indianhead, Saskatchewan, Canada			96			4	80	4	0.8	1.6	soil shallow to bedrock
						98			5	60	5	0.9	2.0	
						03			1	20	2	1.8	3.5	many pods left from 2002
						08			1	20	6	3.0	1.8	
II/10/11-15	9082712	CESC	bittersweet	16-May	02	02	PLBR	5	4	80	4	0.4	1.1	
			<i>Celastrus scandens</i>			03			5	100	4	0.7	1.7	
			Lincoln-Oakes Nursery, Bismarck, ND			04			5	100	3	0.7	1.4	
						06			5	100	3	2.0	2.1	
						08			5	100	5	1.5	1.5	
						12			5	100	1	5.5	3.4	

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Year of Record: 2012

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT			
LOCATION	NUMBER	SYMBOL	ORIGIN/SOURCE	DATE	PLT	REC	PLTD	PLTS	SRV	SRV	COV	HT	REMARKS		
III/01/1-5	'Midwest'	MAMA37	Manchurian crabapple	17-May	78	78	PLBR	5	3	60	2	0.5	2.0		
	9006003		<i>Malus mandshurica</i>			79			5	100		0.9	2.1		
	PI-478000		Echo Manchuria/Res. Sta.			80			5	100	3	1.9	2.8		
				Morden, MB, Canada			82			5	100	3	4.7	5.5	
				USDA, NRCS, PMC, Bismarck, ND			83			5	100	2	6.0	6.9	fall webworm on 1, few
							84			5	100	4	7.7	8.5	pests, good vigor,
							87			5	100	3	9.4	11.4	snow damage on 1,2,3
							92			2	40	8	6.0	7.3	
							97			2	40	3	13.8	13.9	
							02			2	40	4	15.5	14.6	
							07			2	40	8	12.0	12.9	many dead branches
							12			2	40	5	8.8	11.7	
III/01/6-10	'Red Splendor'	MABA	flowering crabapple	17-May	78	78	PLBR	5	5	100	2	1.6	2.2		
	9006004		<i>Malus X</i>			79			5	100		2.5	3.8		
				Lee Nursery, Fertile, MN			80			5	100	2	3.5	4.7	
							82			5	100	3	5.9	8.4	
							83			5	100	3	7.0	9.1	good fruit production, few pests
							84			5	100	3	8.6	10.9	snow damage 1,2; webworm 3,5
							87			5	100	2	10.3	12.2	
							92			5	100	6	9.3	11.2	
							97			5	100	4	13.8	14.0	
							02			5	100	4	14.5	15.6	
							07			5	100	6	13.0	14.1	
							12			3	60	7	11.5	13.3	only a few basal sprouts on 2

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PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN		PLT HT	REMARKS		
											COV	VI				
III/02/1-5	ND-1731 9006001	MABA	Siberian crabapple <i>Malus baccata</i> Lincoln-Oakes Nursery, Bismarck, ND	17-May	78	78	PLBR	5	4	80	2	1.9	2.2			
													2.8		3.1	
													4.1		4.1	
													5.8		8.2	
													7.5		10.5	good growth & vigor,
													10.1		10.8	few pests, fall webworm
													10.6		13.9	on 1,4,5
													9.2		13.7	
													13.7		14.4	
													15.5		16.8	
													12.5		16.5	
													4		80	6
		2	40	8	9.8	14.1	only 1 limb alive on 1									
III/02/6-10	'McDermant' ND-14 9006095 PI-478004	PYUS2	Ussurian pear <i>Pyrus ussuriensis</i> Harbin, Manchuria/Res. Sta. Morden, MB, Canada USDA, NRCS, PMC, Bismarck, ND	17-May	78	78	PLBR	5	5	100	6	0.9	2.5			
													1.8		3.6	
													3.0		4.6	
													6.4		8.9	
													8.0		11.0	good growth & vigor
													9.3		12.4	
													12.4		15.8	snow damage on 4
													10.9		13.2	
													18.7		17.2	
													25.0		22.0	
													21.0		21.6	
													5		100	4
III/03/1-5	'Freedom' 9057424	LOKO2	honeysuckle <i>Lonicera korolkowii</i> Univ. of MN	9-May	90	90	PLBR	5	5	100	5	1.0	1.1			
													1.4		1.6	
													3.3		3.1	
													6.6		6.1	
													8.5		7.8	minor dieback
													14.1		11.2	
													17.0		12.3	
													18.5		14.0	

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PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
III/03/6-10	9063143	LOTA	tatarian honeysuckle	10-May	93	93	PLBR	5	5	100	4	1.1	1.4	
			<i>Lonicera tatarica</i>			94			5	100	3	1.1	1.8	
			Iowa			95			5	100	4	2.2	2.8	
			Lincoln-Oakes Nursery, Bismarck, ND			97			5	100	3	3.5	4.2	
						99			5	100	4	4.3	6.1	
						02			5	100	3	6.5	6.5	
						07			5	100	5	6.0	9.3	
						12			5	100	5	9.5	9.5	
III/03/11-15	Survivor	AMFR	false indigo	6-May	87	87	PLBR	5	4	80		1.3	1.7	
	Germplasm		<i>Amorpha fruticosa</i>			88			5	100	5	2.8	2.1	
	9008041		USDA, NRCS, PMC, Aberdeen, ID			89			5	100	5	3.1	2.7	
						91			5	100	4	5.3	3.3	
						93			5	100	3	7.0	4.3	
						96			5	100	4	6.6	5.0	
						01			5	100	3	11.0	5.0	
						06								mostly dead, overgrown with other volunteers
						12			3	60	3	1.7	2.5	measured suckers
III/03/16-20	'Arnolds Red'	LOTA	red tatarian honeysuckle	10-May	93	93	PLBR	5	5	100	4	0.9	1.1	
	9069080		<i>Lonicera tatarica</i>			94			5	100	4	1.3	1.9	
			Lee Nursery, Fertile, MN			95			5	100	3	2.3	3.1	
						97			5	100	3	3.6	4.7	
						99			5	100	3	4.5	6.5	
						02			5	100	4	6.5	7.0	
						07			5	100	3	6.0	8.3	
						12			5	100	4	8.7	9.7	

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<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
III/04/1-5	'Konza' PI-477981	RHAR4	aromatic sumac <i>Rhus aromatica</i> USDA, NRCS, PMC, Manhattan, KS	6-May	87	87	PLBR	5	4	80		1.7	2.5	
									4	80	3	3.4	3.1	
									4	80	4	3.8	3.7	
									4	80	3	5.7	4.4	
									4	80	2	9.6	6.3	
									4	80	4	9.2	6.7	
									4	80	1	16.0	8.0	solid thicket
									5	100	3	17.0	8.0	
	5	100	3	16.0	8.5									
III/04/6-15	'Scarlet' PI-478003	PRFR2	Mongolian cherry <i>Prunus fruticosa</i> USDA, NRCS, PMC, Bismarck, ND	9-May	90	90	PLBR	10	9	90	3	0.6	1.6	
									9	90	5	0.8	1.3	
									9	90	4	1.3	1.7	
									9	90	4	2.2	2.3	
									8	80	4	3.1	2.6	
									3	30	3	5.2	3.3	
									04					original row gone, suckers on each side
III/04/16-20	'Legacy' ND-83 9006228 PI-540443	SYVI3	late lilac <i>Syringa villosa</i> USDA, NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	11-May	88	88	PLBR	5	2	40	6	1.0	1.7	
									2	40	6	0.4	1.1	
									5	100	5	0.7	1.1	
									3	60	4	1.9	1.9	
									3	60	3	4.2	4.4	
									3	60	3	8.1	6.9	
									3	60	2	11.0	10.0	
									3	60		11.0	9.8	
	3	60		9.0	11.7									
III/05/1-10	'Sakakawea' ND-10 PI-478005	SHAR	silver buffaloberry <i>Shepherdia argentea</i> USDA, NRCS, PMC, Bismarck, ND	9-May	90	90	PLBR	10	3	30	3	0.7	2.2	
									4	40	4	0.5	1.9	
									8	80	4	0.9	1.7	
									8	80	3	3.0	3.7	
									8	80	2	5.9	7.0	
									8	80	3	8.4	11.3	
									8	80	3	13.0	11.8	

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											COV VI	(ft)		
III/05/11-15	'Magenta' PI-514275	MALUS	crabapple <i>Malus</i> sp. USDA, NRCS, PMC, E. Lansing, MI	15-May	92	92	PLBR	5	5	100	5	0.5	1.1	
											3	1.6	3.0	
											3	2.2	3.6	
											5	3.9	5.2	
											3	4.4	6.9	
											4	9.0	10.0	
											2	16.0	15.2	
											4	18.9	16.0	
III/06/1-5	9076726	ACGI	tatarian maple <i>Acer ginnala</i> USDA, ARS, Mandan, ND	13-May	96	96	PLBR	5	5	100	3	1.0	0.9	
											5	2.2	1.7	
											4	2.8	2.0	
											3	3.5	2.3	
											4	5.5	4.0	
											4	8.2	6.5	
											4	13.5	11.1	
III/06/6-10	9091969	CAFR80	Russian peashrub <i>Caragana frutex</i> Big Sioux Nursery, Watertown, SD	17-May	05	05		5	5	100	4	0.8	3.4	
											6	0.6	2.6	
											5	0.9	2.6	
											4	0.9	2.9	
											6	1.4	3.8	
III/7/1-5	9082891	PHOP	common ninebark <i>Physocarpus opulifolius</i> Big Sioux Nursery, Watertown, SD	12-May	10	10		5	5	100	5	0.6	1.6	
												2.8	3.2	
III/07/6-10	9082653	RHTR	skunkbush sumac <i>Rhus trilobata</i> Harding Co., SD USDA, NRCS, PMC, Bismarck, ND	14-May	03	03		5	5	100				
											3	1.4	1.4	
											4	2.0	1.5	
											3	3.4	2.0	
											3	3.6	2.4	
											4	8.0	7.0	
											3	8.8	3.5	

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<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
III/08/1-5	'Prairie Red'	PRUNU	plum	8-May	85	85	PLBR	5						no data
	ND-1134		<i>Prunus</i>			86			5	100	8	0.5	1.3	
	9047203		Miller, SD			87			3	60	4	1.9	3.0	
			USDA, NRCS, PMC, Bismarck, ND			89			3	60	5	3.5	4.1	
						91			2	40	4	6.6	5.7	
						94			2	40	4	8.5	7.9	
						99			2	40	3	11.5	10.0	
						04			1	10	2	17.0	11.0	
						09			2	40	3	13.0	12.0	
III/08/6-10	ND-629	ACGI	amur maple	2-May	79	79	PLBR	5	5	100		1.0	1.5	
	9005645		<i>Acer ginnala</i>			80			0					
	PI-477992		Res. Sta., Morden, MB, Canada			81			4	80		1.3	1.9	
						83			4	80	3	6.0	6.0	
						84			4	80	4	9.9	7.5	
						88			4	80	4	13.0	10.8	
						93			3	60	5	13.1	12.0	
						98			3	60	3	18.4	17.4	
						03			3	60	3	24.5	16.4	
						08			3	60	5	32.0	16.2	
III/09/1-5	ND-1873	ACGI	amur maple	2-May	79	79	PLBR	5	5	100		1.6	2.2	
	9005648		<i>Acer ginnala</i>			80			5	100	3	2.8	3.0	
			Lincoln-Oakes Nursery, Bismarck, ND			81			5	100		4.2	4.3	
						83			5	100	2	7.2	7.4	good seed production
						84			5	100	3	10.0	8.8	
						88			5	100	4	13.2	11.7	
						93			5	100	4	10.0	9.9	
						98			5	100	3	16.1	13.4	
						03			5	100	3	19.9	14.6	
						08			5	100	4	18.0	14.5	

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<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>COV</u>	<u>HT</u>																
III/09/6-10	ND-686 9006225 PI-478008	SYPE4	pekin lilac <i>Syringa pekinensis</i> ND Game & Fish Dept.	2-May	79	79	PLBR	5	5	100	0.7	2.3																
III/10/1-5	9069129	PRMA9	Amur chokecherry <i>Prunus maackii</i> Big Sioux Nursery, Watertown, SD	11-May	94	94	PLBR	5	5	100	4	0.7	2.2															
III/10/16-20	9094355	CODR	roughleaf dogwood <i>Cornus drummondii</i> Big Sioux Nursery, Watertown, SD	4-May	12				5	100	7	0.4	0.9															
IV/01/1-5	SD-156 9005890	FRPE	green ash <i>Fraxinus pennsylvanica</i> Deuel Co., SD	17-May	78	78	PLBR	5	5	100	1	0.5	2.6															

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PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		<u>REMARKS</u>	
											COV <u>VI</u>	PLT <u>(ft)</u>		
IV/01/6-10	ND-1734 9005891	FRPE	green ash <i>Fraxinus pennsylvanica</i> Lincoln-Oakes Nursery, Bismarck, ND	17-May	78	78	PLBR	5	5	100	2	0.4	2.1	
												1.0	3.1	
												1.9	3.7	
												4.7	7.3	
												5.7	8.8	
												6.4	10.3	
												7.1	13.8	
												8.3	14.0	
												12.8	20.3	
												15.0	24.8	
												15.0	25.5	
IV/02/1-5	'Cardan' MDN-12002 9005895 PI-469226	FRPE	green ash <i>Fraxinus pennsylvanica</i> Wibaux Co., MT USDA, ARS, Mandan, ND	17-May	78	78	PLBR	5	5	100	2	0.3	2.3	
												1.7	3.4	
												3.0	5.1	
												7.5	10.1	
												8.4	11.4	
												9.7	13.8	
												9.5	18.1	
												10.9	22.5	
												15.1	25.1	
												20.0	33.3	
												16.7	32.5	

Project No.: 381316K Field Evaluation of Woody Plant Materials, Dickinson, North Dakota

Year of Record: 2012

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
IV/02/6-10	ND-1759	FRPE	green ash	17-May	78	78	PLBR	5	5	100	1	0.4	2.5	
	9005893		<i>Fraxinus pennsylvanica</i>			79			5	100		1.6	4.1	
			SD-156 X MDN-12002			80			5	100	3	3.1	5.2	
			USDA, NRCS, PMC, Bismarck, ND			82			5	100	4	5.8	8.1	
						83			5	100	3	7.9	10.7	competition from
						84			5	100	3	8.9	13.4	shelterbelt at north end
						87			5	100	3	9.0	15.8	
						92			5	100	3	10.2	19.0	
						97			5	100	2	15.6	25.1	
						02			5	100	3	17.0	29.4	
						07			5	100		20.0	30.2	
						12			5	100	4	18.1	30.2	
IV/03/1-5	ND-647	FRNI	black ash	17-May	78	78	PLBR	5	5	100	1	0.1	0.9	
	9005887		<i>Fraxinus nigra</i>			79			5	100		0.4	1.9	
			Res. Sta., Morden, MB, Canada			80			5	100	6	1.2	2.7	
						82			5	100	4	4.1	8.0	
						83			5	100	4	4.8	10.5	heat stress
						84			5	100	4	4.2	11.4	leaf scorch
						87			5	100	3	5.6	18.4	sun scald
						92			5	100	7	5.6	15.2	
						97			5	100	5	12.3	19.3	
						02			5	100	3	14.0	26.8	
						07			5	100	5	14.5	29.1	
						12			2	40	6	9.0	25.5	

**Project No.: 381316K Field Evaluation of Woody Plant Materials, Dickinson, North Dakota**

**Year of Record: 2012**

PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		<u>REMARKS</u>	
											COV <u>VI</u>	HT <u>(ft)</u>		
IV/03/6	ND-1432 9005658	AEGL	Ohio buckeye <i>Aesculus glabra</i> Res. Sta., Morden, MB, Canada	17-May	78	78	PLBR	5	3	60	8	0.0	0.2	
												0.1	0.5	
												0.5	0.4	
												1.5	2.1	
												1.6	2.3	
												3.3	3.3	
												6.2	5.4	
												7.9	7.2	
												12.8	10.5	
												12.5	15.5	
												14.5	15.5	
												17.0	23.8	
IV/03/7-11	9092162	PRUNU	pie cherry <i>Prunus</i> sp. Harding County, SD USDA, NRCS, PMC, Bismarck, ND	10-May	12	12	CONT	5	1	20	7	2.5	shelters & water on all	
IV/04/1-5	ND-1879 9011850 PI-503531	GLTR	honeylocust <i>Gleditsia triacanthos</i> Woodward, OK USDA, ARS, Mandan, ND	8-May	80	80	PLBR- CONT	5	1	20	9	0.3	0.5	good vigor
81	2	40	0.1	0.8										
82	5	100	4	1.4	2.2									
83	5	100	2	2.5	3.9									
84	5	100	3	3.2	5.7									
86	5	100	3	7.5	9.1									
89	4	80	4	8.1	12.8									
95	5	100	4	16.4	17.4									
04	5	100	3	19.2	26.5									
09	5	100	3	22.0	25.8									
IV/04/6-10	909440 Carmine Jewel	PRCE	dwarf cherry <i>Prunus cerasus</i> Big Sioux Nursery, Watertown, SD	10-May	12	12	PLBR	5	3	60	6	1.8	shelters & water on all	

Project No.: 381316K Field Evaluation of Woody Plant Materials, Dickinson, North Dakota

Year of Record: 2012

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
IV/05/1-5	9063116	FRNI	black ash <i>Fraxinus nigra</i> Itasca State Park, MN	11-May	94	94	CONT	5	5	100	4	0.3	1.2	
						95			5	100	4	0.9	1.4	
						96			4	80	4	1.1	1.7	broken leader on 4
						98			4	80	3	2.0	3.6	
						00			4	80	4	3.2	6.5	
						03			3	60	4	5.3	10.2	
						08			3	60	4	4.8	12.6	
IV/06/6-10	9091968	GYDI	Kentucky coffeetree <i>Gymnocladus dioicus</i> Big Sioux Nursery, Watertown, SD	4-May	11	12	PLBR	5	5	100	2	1.0	1.5	tip dieback, good limb growth
IV/06/1-5	9063115	FRPE	green ash <i>Fraxinus pennsylvanica</i> Itasca State Park, MN	11-May	94	94	CONT	5	5	100	3	0.7	1.7	
						95			5	100	3	1.5	3.3	
						96			5	100	2	2.5	4.5	
						98			5	100	2	7.1	9.7	
						00			5	100	3	8.9	13.4	
						03			5	100		13.6	19.4	
						08			5	100	3	14.5	24.4	
IV/06/6-10	9076724	ELAN	Russian olive <i>Elaeagnus angustifolia</i> USDA, ARS, Mandan, ND	13-May	96	96	PLBR	5	4	80	3	2.2	2.3	
						97			4	80	3	3.3	3.4	
						98			4	80	3	5.4	5.5	
						00			4	80	4	7.9	8.4	
						02			4	80	5	11.0	9.5	needs a new stake
						05			4	80	4	11.7	12.5	
						10			4	80	3	15.5	14.8	
IV/07/1-5	Prairie Harvest Germplasm 9034956	CEOC	hackberry <i>Celtis occidentalis</i> Polk County, MN	3-May	10	10	CONT	5	5	100	6	0.3	1.0	all heavily browsed
						12			5	100	6	0.3	0.4	nearly tilled out, need shelters

**Project No.: 381316K Field Evaluation of Woody Plant Materials, Dickinson, North Dakota**

**Year of Record: 2012**

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
<u>LOCATION</u>	<u>NUMBER</u>	<u>SYMBOL</u>	<u>ORIGIN/SOURCE</u>	<u>DATE</u>	<u>PLT</u>	<u>REC</u>	<u>PLTD</u>	<u>PLTS</u>	<u>SRV</u>	<u>SRV</u>	<u>VI</u>	<u>(ft)</u>	<u>(ft)</u>	<u>REMARKS</u>
IV/07/6-10	9069166	ELAN	Russian olive	13-May	96		CONT(S)	5	1	20	5	0.5	0.7	1-4 destroyed by cultivation
			<i>Elaeagnus angustifolia</i>		97				4	80	3	1.0	1.3	
			USDA, ARS, Mandan, ND		98				2	40	6	1.4	3.0	
					00				2	40	5	2.3	4.1	
					02				2	40	6	4.8	7.5	
					05				2	40	5	6.6	8.2	
					10				2	40	3	6.1	12.1	
IV/08/1-10	'Oahe'	CEOC	hackberry	8-May	80		PLBR	10	10	100		0.5	2.0	
	MDN-12003		<i>Celtis occidentalis</i>		81				9	90		0.1	0.5	
	9005725		USDA, ARS, Mandan, ND		82				8	80	6	1.3	1.6	
	PI-476982				83				8	80	6	1.9	3.0	
					84				7	70	4	2.9	4.6	
					86				4	40	3	9.2	10.3	
					89				5	50	4	8.7	11.7	
					95				5	50	4	14.3	19.0	
					99				5	50	5	14.0	20.3	
					04				5	50	4	16.8	25.4	
					09				5	50	5	17.5	23.5	
IV/09/1-10	SD-75	CEOC	hackberry	7-May	81		PLBR	10	10	100		0.1	1.2	
	9005713		<i>Celtis occidentalis</i>		82				7	70	6	0.9	1.4	
			Potter Co., SD		83				6	60	3	2.9	3.0	
					84				7	70	5	3.5	4.1	
					85				6	60	4	6.7	5.9	
					87				7	70	4	8.1	10.4	
					90				7	70	4	9.2	12.3	
					95				7	70	3	12.7	19.7	
					00				7	70	3	14.4	23.1	
					05				7	70	3	22.2	26.0	
					10				7	70	4	22.0	24.7	dead top 5,9
IV/10/1-5	9094356	PIME	Meyer's spruce	4-May	11		CONT	5	5	100	4	1.1	1.2	yellow needles on old growth
			<i>Picea meyeri</i>											
			Big Sioux Nursery, Watertown, SD											

**Project No.: 381316K Field Evaluation of Woody Plant Materials, Dickinson, North Dakota**

**Year of Record: 2012**

PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		PLT <u>HT</u>	<u>REMARKS</u>
											COV <u>VI</u>	HT <u>(ft)</u>		
IV/10/6-10	9057410	CEOC	hackberry	11-May	88		CONT	5	2	40	8	0.2	0.2	
			<i>Celtis occidentalis</i>		89				1	20	8	0.2	0.5	
			Bottineau Co., ND		90				3	60	8	0.2	0.7	
			NDFS		92				4	80	7	0.5	0.5	
					94				2	40	6	1.0	2.4	
					97				2	40	4	3.5	5.6	
					02				2	40	6	4.0	6.8	
					07				2	40	5	5.0	10.3	
					12				0	0				cut out and stumps treated

**OFF-CENTER EVALUATIONS: TECHNICAL REPORT – 2011-2012**

Study 38I346K University of Minnesota, North Central Research and Outreach Center, Grand Rapids, Minnesota.

Study Title: Field Evaluation of Woody Plant Materials.

This study has concluded and the agreement expired in 2010. Although no more data will be collected from this site, plans are to collect Mongolian Scots pine seed for several years to grow stock for distribution as field plantings. Perhaps this seed source of Scots pine will exhibit resistance to pine nematode that is destroying Scots pine locations throughout the Midwest.

Cooperators: The USDA Natural Resources Conservation Service, Plant Materials Center, Bismarck, North Dakota, in cooperation with the University of Minnesota, North Central Research and Outreach Center, Grand Rapids, Minnesota. The cooperative agreement expires June 13, 2011. Final evaluation occurred in 2010.

Location: University of Minnesota, North Central Experiment Station, Grand Rapids, Minnesota. Legal Description: NW ¼ SW ¼ sec. 14, T. 55 N., R. 25 W.

Potential further study: The following accessions exhibit potential for further evaluation and use. Though no longer part of an official study at this site, as long as the plants remain they could provide seeds or vegetative material for future researchers:

<u>Accession Number</u>	<u>Genus/Species Origin/Source</u>	<u>Plot Location</u>
ND-2103 PI-399414	European cranberrybush <i>Viburnum opulus</i> P.I. Station, Ames, IA USDA, NRCS, PMC, Bismarck, ND	II/07/1-5
ND-21 9034900	nannyberry <i>Viburnum lentago</i> USDA, NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	III/05/1-9
ND-428 9005970	black walnut <i>Juglans nigra</i> NDSU/USDA, NRCS, PMC, Bismarck, ND	IV/5/6-10
9063158	Scots pine <i>Pinus sylvestris</i> var. <i>mongolica</i> China NRCS, PMC, Bismarck, ND	I/5/1-5
9063126	Japanese elm <i>Ulmus davidiana</i> var. <i>japonica</i> PFRA, Indianhead, Saskatchewan, Canada NRCS, PMC, Bismarck, ND	IV/3/1-5
ND-3791 9030302	Norway spruce <i>Picea abies</i> U of MN, St. Paul, MN Grand Rapids, MN FEP	I/6/6-10

<u>Accession Number</u>	<u>Genus/Species Origin/Source</u>	<u>Plot Location</u>
9063151	Dahurian larch <i>Larix olgensis</i> China NRCS, PMC, Bismarck, ND	II/6/1-5
9069170	English oak <i>Quercus robur</i> Russia USDA, ARS, Mandan, ND	IV/3/6-10
9058847	black spruce <i>Picea mariana</i> U of MN, Cloquet, MN Grand Rapids, MN OCEP	I/4/1-8
9063156	Scots pine <i>Pinus sylvestris</i> Russia, Altai region USDA, NRCS, PMC, Bismarck, ND	1/5/6-10
9069164	Scots pine <i>Pinus sylvestris</i> var. <i>mongolica</i> China USDA, NRCS, PMC, Bismarck, ND	1/7/6-10
9006094	wafer ash <i>Ptelea trifoliata</i> Lincoln-Oakes Nursery, Bismarck, ND	II/7/6-10
9063115	green ash <i>Fraxinus pennsylvanica</i> Itasca State Park, MN USDA, NRCS, PMC, Bismarck, ND	IV/2/6-10
9082891	common ninebark <i>Physocarpus opulifolius</i> Big Sioux Nursery, Watertown, SD	II/9/31-35

**Figure GR-1. Grand Rapids Woody Field Evaluation Planting – Plot Layout**

Row	BLOCK I CONIFERS		BLOCK II SHRUBS		
12					
11					
10					↑ N
9	9019593 juniper	9082609 Meyer's spruce	winterberry bittersweet leadplant gr dogwood Freedom hynysuckle r.l.hawthorn ninebark		
8	9069162 Dahurian larch	9069163 Dahurian larch	caragana highbush cranberry	silky willow Siberian dogwood gray dogwood nannyberry	
7	9069172 Scotch pine	9069164 Scotch pine	ND-2103 highbush cranberry	hazel hybrids Bailey chokeberry	
6	9063151 Dahurian larch	ND-3791 Norway spruce	9063143 r.t.honeysuckle	McKenzie chokeberry	
5	9063158 scotch pine	9063156 scotch pine	Silver Sands sandbar willow	9019576 juneberry	
4	<-----9058847 black spruce ----->		redleaf rose rugosa rose	9076734 seaberry	
3	9069168 Siberian larch	9082610 Siberian larch	Legacy late lilac	Survivor false indigo	
2	open (too wet)	9082611 Siberian larch	Centennial cotoneaster	Indigo silky dogwood	
1	open (too wet)	9076718 Scotch pine	Arnolds Red   Regal Russian almond		
Row	BLOCK III MEDIUM TREES		BLOCK IV TALL TREES		
12					
11					
10					
9					
8		skunkbush sumac open			
7	9082631 Japanese birch	ND-624 wafer ash	9082639 N. pin oak	9092051 northern catalpa	open
6	9076737 black cherry	Shadblow svcbry Sheridan chokecherry	9091967 pin cherry	9082633 black ash	9092052 swamp white oak
5	<-----ND-21 nannyberry----->		9057412 bur oak	9005970 black walnut	9082674 sugar maple
4	9076722 Euro. white birch	9047209 chokecherry	9076742 butternut	9076743 chestnut	9082667 gray birch
3	Midwest Manch. crabapple	9069129 amur chokecherry	9063126 Japanese elm	9069170 English oak	9082675 Manchurian ash
2	McDermand Ussurian pear	Magenta crabapple	9069177 bur oak	9063115 green ash	9082650 S. poplar
1	Homestead a. hawthorn	9082739 ironwood	Oahe hackberry	Cardan green ash	9082892 white poplar

revised 6/09 (no new entries in 2010)

## **OFF-CENTER EVALUATION PLANTINGS: TECHNICAL REPORT – 2011-2012**

Study 38I347K University of Minnesota, Sand Plain Experimental Research Farm, Becker, Minnesota.

Study Title: Field Evaluation of Woody Plant Materials.

Introduction: There is a need to evaluate the performance of shrub and tree species/cultivars for windbreaks, wildlife, and recreational plantings under diverse soil and climatic conditions. To meet this need, field evaluation planting sites representative of the major land resource areas are located in the three States served by the PMC. These sites provide planting locations under long-term land tenure for assemblies of trees and shrubs to be evaluated under uniform culture and management. New material can be added on an annual basis. Comparisons are made with previously released cultivars and area of adaptation determined.

Objective: The objective is to assemble and evaluate woody plant materials for conservation use. Superior cultivars will be selected and released for increase by commercial nurseries.

Cooperators: The USDA Natural Resources Conservation Service, Plant Materials Center, Bismarck, North Dakota, in cooperation with the University of Minnesota, Sand Plain Experimental Research Farm, Becker, Minnesota. The cooperative agreement expired August 9, 2010, and is in the review and renewal process.

Location: University of Minnesota, Sand Plain Experimental Research Farm, Becker, Minnesota. Legal Description: NW 1/4 SW 1/4 sec. 31, T. 34 N., R. 28 W.

Major Land Resource Area: This site is located in Major Land Resource Area 91, Wisconsin and Minnesota Sandy Outwash. About 90 percent of this area is in farms. The area is nearly level, with elevations averaging around 980 feet above sea level.

Soils: The soils at this site are a Hubbard-Mosford complex. Hubbard is formed from leached coarse and medium sand outwash. Drought and wind erosion are major management problems. Hubbard and Mosford soils are in Conservation Tree/Shrub Suitability Group 7.

Climate: The average annual precipitation for Sherburne County is 26 to 30 inches. The average annual temperature is 40 to 45 degrees F, with an average freeze-free period of 135 days. The plant hardiness zone for this site is 4a, with an average annual minimum temperature of -30 to -40 degrees F. Climatic data for 2011-2012 at the nearest official weather station, Elk River, Minnesota, is shown in Table BE-1.

### **Methods and Materials**

Assembly: Refer to Table BE-2 for a list of woody species planted from 1998 to 2012.

Planting Plan: The plots are not randomized or replicated but organized systematically for evaluation and demonstration purposes (Figure BE-1). The site is divided into four blocks (refer to Figure BE-2). Block 1 is planted to shrubs, Block 2 to medium trees, Block 3 to tall trees, and Block 4 to conifers. Each block is arranged into single row, non-replicated plots. Each plot contains 1 to 10 plants. Spacing is 20 feet between rows and 5 feet within row for shrubs and 10 feet within row for trees. Row length is 100 feet. Like species and standards of comparison are planted in adjacent plots whenever possible.

Plot Preparation: A clean, firm planting site was prepared by roto-tilling.

Planting Method: All trees and shrubs were hand planted using approved forestry methods.

Planting Date: Refer to Table BE-2 for planting dates of woody species planted from 1998 to 2012.

Species and Rationale:

2011: May 4, planted the following species:

- Roughleaf dogwood (9094355), native to the north central US as a potential conservation shrub
- Kentucky coffeetree (9091968), native to eastern and Midwest US as a potential tall tree. Some large trees exist in the town of Bismarck.

2012: May 8, planted the following species:

- Pie cherry (9092162), a prolific large fruit tart cherry that produces lots of fruit from suckers. The source was a ranch headquarters just west of Camp Crook, SD. The goal is to find a selection that reproduces from seed and produces fruit similar to the parent plants.
- ‘Carmine Jewel’ (9094400), one of the Romance cherries released by Jeffries Nursery in Canada. Planted as a standard of comparison to the pie cherry.
- ‘Princeton’ elm (9094406), a 1922 release selected for its form in New Jersey, which was later found to be Dutch Elm Disease resistant. Evaluating its climatic adaptation.

Fertilization: No fertilizer has been applied to the planting area.

Weed Control: Mechanical weed control, rotary mowing between row, and roto-tilling and hand hoeing in row.

2010: Hand applied herbicides in narrow strips are used as needed to control grasses immediately around trees and shrubs.

Biological Control:

2011 and before: No insecticides have been applied. There has been very minor deer browse damage.

2012: Deer browse is quite heavy and has impacted quite a few accessions. Three-foot tree shelters were installed on new plantings in 2012. Deer still browsed off the elm and Carmine Jewel as they grew to the top of the tubes. In consultation with Bill Bronder, decided to install 5-foot tree shelters on susceptible species in 2013.

Irrigation: Trees have been hand watered at time of planting.

Crop Residue Management: On May 20, 2003, Block I (shrubs) was seeded between rows to a cover of 50 percent Bad River blue grama and 50 percent Pierre sideoats grama. In 2008, fescue seeded between rows in Blocks III and IV. Blue grama and sideoats seeded between rows in Blocks I and II is mowed and doing well.

Silvicultural Practices: Minor pruning has been done each year to remove dead or damaged branches. In 2011, 9069129 Amur chokecherry and 9082666 black birch were removed.

Evaluations and Measurements: Plant performance data is recorded during the growing season for the first three years. After the third year, data is gathered according to a specific schedule. The trees and shrubs were evaluated for survival, canopy width, plant height, vigor, insect and disease, and animal damage. Select data appears in this report. Annual summary reports have been prepared since 2006 and can be requested from the PMC.

Selected accessions were evaluated on August 25, 2011. All showed good survival and growth. Little if any animal browse was observed on the new plantings. Some older plantings showed considerable browse.

Twenty five accessions were evaluated on August 22, 2012. Carmine Jewel and Princeton elm were doing well. Pie cherry exhibited poor vigor, a few dead plants and minimal growth. Deer ate on all plants that grew close enough to shelter tops. Selected older plantings also showed deer damage.

## **Results**

Plant Performance: One hundred and sixteen accessions of 93 species are being evaluated. Maintenance on this site is excellent.

The following accessions exhibit potential for further evaluation and use. Seeds from 9069164 Scots pine have been collected, grown out and will be ready for field plantings in the spring of 2013. ‘McKenzie’ is currently in big demand by growers from across the globe. It is particularly prized by wineries. There are many requests to grow birch in conservation plantings. Continuing evaluations of 9082667 gray birch will determine adaptability to

conservation growing conditions. Further study of gray birch on a less droughty site would have merit (CTSG-1, 2, 3, and 4).

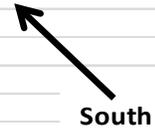
<u>Accession Number</u>	<u>Genus/Species Origin/Source</u>	<u>Plot Location</u>
'Schubert'	chokecherry <i>Prunus virginiana</i> Lincoln-Oakes Nursery, Bismarck, ND	II/1/6-10
9069164	Scots pine <i>Pinus sylvestris</i> var. <i>mongolica</i> China USDA, NRCS, PMC, Bismarck, ND	IV/3/6-10
9069162	Dahurian larch <i>Larix olgensis</i> China USDA, NRCS, PMC, Bismarck, ND	IV/2/6-10
'McKenzie' PI-323957	black chokeberry <i>Photina melanocarpa</i> Lincoln-Oakes Nursery, Bismarck, ND	IA/3/1-5
ND-170	European cotoneaster <i>Cotoneaster integerrimus</i> USDA, NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	I/5/11-20
9082667	gray birch <i>Betula populifera</i> Lawyer Nursery, Plains, MT	II/9/1-5
9082891	common ninebark <i>Physocarpus opulifolius</i> Big Sioux Nursery, Watertown, SD	IA/9/1-5

Figure BE-1. Sand Plain Experimental Farm plot layout



**Figure BE-2. Becker Woody Off Center Evaluation Planting – Plot Layout**

<b>Row</b>	<b>BLOCK IV CONIFERS</b>		
5			
4		Canaan fir	
3	9069163 Dahurian larch	9069164 Scotch pine	
2	9069168 Siberian larch	9069162 Dahurian larch	
1	9082610 Siberian larch	9082611 Siberian larch	
<b>Row</b>	<b>BLOCK III TALL TREES</b>		
14	9082739 ironwood	9092231 lodgepole pine	
13	9082639 northern pin oak	cedar	
12	9094334 American linden	Scotch pine	
11	ND-686 Pekin lilac	9094336 Freeman maple	
10	9082885 aspen (Towner)	9082633 black ash	
9	9082609 Meyer's spruce	9094335 littleleaf linden	
8	9076735 Ohio buckeye	9076737 black cherry	
7	9069178 red pine	9076731 bur oak	
6	Hunter ponderosa pine	9063148 amur corktree	
5	9063127 white ash	9076730 silver maple	
4	9063115 green ash	9063116 black ash	
3	Cardan green ash	9019586 green ash	
2	Oahe hackberry	9019578 hackberry	
1	9076739 oak hybrid	9069177 bur oak	
<b>Row</b>	<b>BLOCK II MEDIUM TALL TREES</b>		
9	9082667 gray birch	9092051 northern catalpa	
8	9092052 swamp white oak	9082675 Manchurian ash	
7	9094406 Princeton elm	Carmine Jewel dwarf cherry	
6	9091968 Kentucky coffeetree	9069121 mayday	
5	McDermand Ussurian pear	9076733 nannyberry	
4	Prairie Harvest hackberry	Oahe hackberry	
3	9047209 chokecherry	ND-1733 plum	
2	9030971 amur maple	Schubert chokecherry	
1	Roselow sarg. crabapple	Midwest Manch. crabapple	
<b>Row</b>	<b>BLOCK I SHRUBS</b>		<b>BLOCK 1A SHRUBS</b>
10	Legacy late lilac	9019621 lilac	apricot Caragana frutex skunkbush sumac pin cherry
9	Scarlet Mongolian cherry	9019579 Sib. pea shrub	TigerEyes sumac   nannyberry   MO hazelnut   MO plum
8	Konza aromatic sumac		com. ninebark Am. hazelnut PrairieRed plum staghorn sumac
7	9019576 juneberry	Shadblow svcbry arrowwood	mugo pine seaberry wayfaring bush roundleaf hawthorn
6	9019581 Pekin cotoneaster	9019605 sand cherry	pr. rose M. gooseberry pin cherry b.l. honeysuckle
5	Centennial E. cotoneaster	ND-170 Euro. cotoneaster	leadplant chokeberry chokecherry Red River pr.cordgr.
4	pie cherry roughleaf dogwd A Amber sk.sumac Am.h.cranb.		Nero chokbry Viking chokbry winterberry E.  bittersweet
3	9076729 gray dogwood (open)	9094333 elderberry	rugosa rose black currant cupplant
2	9019580 redosier dogwood	Indigo silky dogwood	chokeberry Sib.dogwood slough sedge   sweetgrass
1	Arnolds Red honeysuckle	9063143 r.t. honeysuckle	Survivor false indigo 9082632 Mong. pea shrub
			9019611 golden currant Silver Sands sandbar willow



Updated 5/12

**Table No. BE-1: 2011-2012 Weather Summary - Official Station - Buffalo, Minnesota**

Month	Mean Temperature (degrees Fahrenheit)			Precipitation (inches)				
	2011	2012	Normal*	Actual			Deviation from Normal	
				2011	2012	Normal*	2011	2012
January	8.2	21.0	10.2	1.28	0.44	0.78	0.50	-0.34
February	16.4	25.5	16.8	1.09	2.29	0.64	0.45	1.65
March	24.6	46.7	29.2	2.37	1.47	1.56	0.81	-0.09
April	43.3	48.2	44.2	3.67	2.31	2.30	1.37	0.01
May	55.3	61.0	57.9	7.97	10.75	3.26	4.71	7.49
June	65.6	68.4	67.2	3.53	1.82	4.39	-0.86	-2.57
July	74.9	76.3	71.4	6.55	6.74	3.91	2.64	2.83
August	69.6	67.7	68.9	4.53	1.67	4.24	0.29	-2.57
September	60.1	59.6	59.2	0.18	0.21	2.96	-2.78	-2.75
October	52.6	44.9	47.5	0.71	0.36	2.19	-1.48	-1.83
November	35.0	33.4	31.3	0.19	0.98	1.81	-1.62	-0.83
December	25.2	18.9	16.3	0.59	1.61	0.78	-0.19	0.83
<b>Annual</b>	<b>44.2</b>	<b>47.6</b>	<b>43.3</b>	<b>32.66</b>	<b>30.65</b>	<b>28.82</b>	<b>3.84</b>	<b>1.83</b>
* National Climate Data Center 1971-2000 Monthly Normals								
			<u>2011</u>	<u>2012</u>				
Last Frost (28 degrees)			n/a	12-Apr				
First Frost (28 degrees)			n/a	27-Sep				
Frost Free Period			n/a	167 days				

**Key to Table BE-2. 38I347K Field Evaluation of Woody Plant Materials – Becker, Minnesota**

PLOT LOCATION = plot location of the plant material within the evaluation  
ACCESSION NUMBER = any accession number, PI number or cultivar name assigned to the plant material  
PLANT SYMBOL = plant symbol of the genus and species (asterisk indicates the symbol is not official)  
GENUS/SPECIES = common name and scientific name of the plant material  
ORIGIN/SOURCE = origin and/or source of the plant material  
TRANS DATE = month and day the plant material was transplanted at the evaluation site  
YR PLT = year the plant materials were transplanted at the evaluation site  
YR REC = year of record  
MATL PLTD = type of material planted, PLBR = bareroot, CONT = containerized  
NO PLTS = number of plants planted in the plot  
NO SRV = number of plants surviving  
PCT SRV = percent of plants surviving  
VI = plant vigor (1=excellent, 3=good, 5=fair, 7=poor, 9=very poor)  
CAN COV (ft) = canopy cover measured in feet  
PLT HT (ft) = plant height measured in feet

Table BE-2.

Project No.: 381347K Field Evaluation of Woody Plant Materials, Becker, Minnesota

Year of Record: 2012

PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		<u>REMARKS</u>				
											COV <u>VI</u>	PLT <u>(ft)</u>					
I/1/1-10	'Arnolds Red' 9069080	LOTA	red tatarian honeysuckle	1-May 96	96		CONT(P)	10	10	100	4	2.0	2.1				
			<i>Lonicera tatarica</i>				97				10	100	5		1.8	2.1	
			Lee Nursery, Fertile, MN				98				10	100	2		2.6	4.1	
			USDA, NRCS, PMC, Bismarck, ND				00				10	100	4		4.4	5.3	
							02				10	100	3		4.8	6.1	All fair fruit; yellow leaf tips
							05				10	100	4		5.0	7.3	
I/1/11-20	'Hawkeye' 9063143	LOTA	red tatarian honeysuckle	1-May 96	96		CONT(P)	10	10	100	3	1.7	1.9				
			<i>Lonicera tatarica</i>				97				10	100	4		1.5	2.4	
			Iowa				98				10	100	2		2.2	3.0	
			Lincoln-Oakes Nursery, Bismarck, ND				00				10	100	2		5.1	5.2	
			USDA, NRCS, PMC, Bismarck, ND				02				10	100	2		5.8	6.5	
							05				10	100	3		6.7	7.7	good vigor
	10	10	100	6	3.2	7.1											
I/2/11-20	'Indigo' 468117	COAM2	silky dogwood	1-May 96	96		PLBR	10	10	100	4	1.7	2.1				
			<i>Cornus amomum</i>				97				9	90	2		3.2	2.9	
			USDA, NRCS, PMC, E. Lansing, MI				98				9	90	1		7.2	4.8	
							00				9	90	2		9.6	6.4	
							02				9	90	3		9.8	7.3	
							05				10	100	5		10.5	7.3	dieback on 1,2; resprout on 4
	10	10	100	6	5.0	6.2	50% dieback, mostly resprouts										
I/3/1-10	9076729	CORA6	gray dogwood	1-May 96	96		PLBR	10	10	100	3	1.4	1.9	browse on 2,3			
			<i>Cornus racemosa</i>				97				10	100	3		2.2	2.8	
			Lincoln-Oakes Nursery, Bismarck, ND				98				10	100	2		5.4	4.9	
							00				10	100	2		7.8	6.5	
							02				10	100	2		8.0	7.4	
							05				10	100	4		7.0	7.5	
	10	10	100	5	5.6	6.2											

**Project No.: 38I347K Field Evaluation of Woody Plant Materials, Becker, Minnesota**  
**Year of Record: 2012**

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN		PLT HT	REMARKS				
											COV	VI						
I/3/6-10	9094333	SANIC4	common elderberry	4-May	10	10	PLBR	5	3	60	6	0.5	0.5					
			<i>Sambucus nigra</i> ssp. <i>canadensis</i>				11					4	80		6	0.7	0.9	
			Big Sioux Nursery, Watertown, SD				12					5	100		5	0.8	1.0	deer browse heavy, need tubes
I/4/1-5	9092162	PRUNU	pie cherry <i>Prunus</i> sp. Harding County, South Dakota USDA, NRCS, PMC, Bismarck, ND	8-May	12	12	CONT	5	1	20	5	0.2	0.8	3' shelters, watered all 5/9/12				
1/4/6-10	9094355	CODR	roughleaf dogwood	4-May	11	11	PLBR	5	4	80	5	0.6	1.8					
			<i>Cornus drummondii</i> Big Sioux Nursery, Watertown, SD				12					5	100		2	1.1	1.7	
1/4/11-15	'Autumn Amber'	RHTR	skunkbush sumac	7-May	09	09		5	5	100	3	1.1	0.7					
			<i>Rhus trilobata</i>				10					5	100		3	1.1	1.0	
			USDA, NRCS, PMC, Los Lunas, NM				11					5	100		2	2.0	0.9	no leaf spot
1/4/16-20	9094281	VIOPA2	American highbush cranberry	7-May	09	09		5	5	100	3	1.4	1.6					
			<i>Viburnum opulus</i> var. <i>americanum</i>				10					5	100		4	1.8	1.6	
			Big Sioux Nursery, Watertown, SD				11					5	100		3	n/a	n/a	
I/5/1-10	'Centennial' 113095 9005729	COIN16	European cotoneaster	1-May	96	96	PLBR	10	10	100	5	1.6	1.6	browse on 7 some dieback on 2,7				
			<i>Cotoneaster integerrimus</i>				97					9	90		4	1.6	1.6	
			USDA, NRCS, PMC, Bismarck, ND				98					9	90		4	4.0	3.9	
			Lincoln-Oakes Nursery, Bismarck, ND				00					9	90		3	8.5	5.2	
							02					9	90		3	8.6	6.0	
							05					10	100		2	9.5	5.5	excellent fruit
							10					10	100		7	7.0	6.0	
I/5/11-20	ND-170 9005728	COIN16	European cotoneaster	1-May	96	96	PLBR	10	10	100	3	1.8	2.0	leaf spots 80% leaves gone 8/18				
			<i>Cotoneaster integerrimus</i>				97					10	100		5	2.1	2.0	
			USDA, NRCS, PMC, Bismarck, ND				98					10	100		4	3.7	2.9	
			Lincoln-Oakes Nursery, Bismarck, ND				00					10	100		2	7.3	4.1	
							02					10	100		2	7.2	4.5	
							05					10	100		3	6.3	4.5	
							10					10	100		7	6.0	4.0	

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PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN		REMARKS	
											COV VI	PLT HT (ft)		
I/6/1-10	9019581	COAC	Pekin cotoneaster <i>Cotoneaster acutifolia</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May	96	96	PLBR	10	10	100	5	1.0	1.6	
											3	1.7	2.2	dieback
											3	3.9	3.6	
											3	6.3	4.9	
											3	6.9	5.6	
											5	6.5	5.5	fireblight on 6,7
7	6.0	4.0	mostly resprouts											
I/7/1-10	9019576	AMAL2	juneberry <i>Amelanchier alnifolia</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May	96	96	PLBR	10	10	100	5	1.0	1.0	
											5	1.4	1.3	
											4	1.7	1.7	
											3	5.2	2.4	
											3	6.1	2.8	
											4	5.5	3.3	all are grown together
5	6.0	4.3												
1/7/6-10	9091975	AMLA9	serviceberry <i>Amelanchier lamarckii</i> Lincoln-Oakes Nursery, Bismarck ND	12-May	05	05		5	5	100	6	0.6	1.2	1,4 browsed
											7	0.4	1.0	
											4	0.6	1.4	
											5	0.8	1.0	
											4	1.5	1.6	
1/7/11-15	9091976	VIDE	arrowwood viburnum <i>Viburnum dentatum</i> Lincoln-Oakes Nursery, Bismarck, ND	12-May	05	05		5	5	100	6	0.6	1.7	dead leaves on 1,4
											5	0.8	1.4	
											4	1.3	2.1	
											4	1.3	2.1	
											3	1.8	2.3	
I/8/1-10	'Konza' 477981	RHAR4	aromatic sumac <i>Rhus aromatica</i> NRCS, PMC, Manhattan, KS Lincoln-Oakes Nursery, Bismarck, ND	1-May	96	96	PLBR	10	7	70	6	0.7	1.1	
											4	1.9	1.9	top dieback - winter injury
											3	5.2	3.5	leaf fungus on 5,6,7,9
												8.3	4.2	
											4	9.2	4.8	
											4	9.5	5.1	
											3	9.0	5.0	

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											COV	VI			
I/9/1-10	'Scarlet' 478003	PRFR2	Mongolian cherry <i>Prunus fruticosa</i> NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	97	PLBR	10	10	100	3	1.1	1.3		
												1.6	1.8	severe rabbit damage on 1	
												2.9	2.7	all suckering	
												6.8	3.2		
												6.8	3.8		
												7.3	4.4	variable heights	
I/9/11-20	9019579	CAAR18	Siberian pea shrub <i>Caragana arborescens</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	97	PLBR	10	10	100	5	0.8	2.0	browse on all	
												1.1	2.5		
												2.0	3.7	insect damage 4,5	
												4.2	5.0		
												6.1	6.2		
												6.5	6.9	leaf defoliation	
I/10/1-10	'Legacy' ND-83 540443 9006228	SYVI3	late (villosa) lilac <i>Syringa villosa</i> NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	97	PLBR	10	10	100	6	0.6	1.1	resprout on 7,9	
												10	0.7	1.3	
												4	1.3	1.9	
												4	3.5	3.2	
												4	4.6	4.1	
												5	4.5	4.2	variable heights
I/10/11-20	9019621	SYVU	common lilac <i>Syringa vulgaris</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	97	PLBR	10	10	100	5	1.0	1.6	better than late lilac	
												5	1.1	2.2	mildew on 1,8
												3	1.9	2.9	
												4	4.1	4.0	
												3	5.2	5.2	
												4	5.3	6.3	variable heights
5	4.7	5.5													

**Project No.: 381347K Field Evaluation of Woody Plant Materials, Becker, Minnesota**  
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PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		<u>REMARKS</u>	
											COV <u>VI</u>	PLT <u>(ft)</u>		
IA/1/1-10	9019611	RIAU	golden currant <i>Ribes aureum</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96		PLBR	10	10	100	4	1.2	2.1	
											6	2.0	2.4	
											7	3.0	3.7	
											3	5.2	4.2	
											4	5.6	4.4	
											5	4.7	4.5	leaves mostly gone-leaf spot
											5	4-6	3-6	leaves 95% gone 8/18
IA/1/11-20	Silver Sands Germplasm ND-3902 9035212	SAIN	sandbar willow <i>Salix interior</i> USDA, NRCS, PMC, Bismarck, ND	1-May 96	96		CONT(S)	10	0	0	5	1.1	2.0	
											6	0.8	1.3	rabbit browse on all
											2	8.4	5.2	
											2	9.1	6.4	
											2	9.0	7.5	
											3	10.0	7.0	
											3	10.0	7.0	
IA/2/1-10	Survivor Germplasm 9008041	AMFR	false indigo <i>Amorpha fruticosa</i> NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96		PLBR	10	10	100	3	2.3	2.7	browse on all
											4	3.0	2.2	
											3	6.3	3.6	
											3	8.2	4.4	
											3	9.6	5.0	
											2	10.0	5.5	
											5	8.4	4.2	
1A/2/11-20	9082632	CAIN	Mongolian peashrub <i>Caragana intermedia</i> Lawyer Nursery, Plains, MT	29-Apr 99	99		PLBR	10	10	100	3	0.8	1.0	
											3	2.1	1.7	
											4	3.6	2.6	
											4	4.8	3.4	
											3	6.0	3.9	
											4	7.3	4.4	dieback on 8, good seed on 10
											4	7.3	4.4	dieback on 8, good seed on 10

**Project No.: 381347K Field Evaluation of Woody Plant Materials, Becker, Minnesota**  
**Year of Record: 2012**

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN		REMARKS	
											COV VI	PLT (ft)		
1A/3/1-5	'McKenzie' 323957	PHME13	black chokeberry <i>Photinia melanocarpa</i> Lincoln-Oakes Nursery, Bismarck, ND	3-May	00	00	PLBR	5	5	100	2	1.6	1.7	
											3	2.3	2.4	
											2	3.6	2.9	
											2	4.1	3.2	
											2	6.4	4.2	
											2	6.8	4.9	
1A/3/6-10	9082664	COALS2	Siberian dogwood <i>Cornus alba</i> var. <i>sibirica</i> Lawyer Nursery, Plains, MT	5-May	00	00	PLBR	5	5	100	2	1.5	2.7	
											3	3.9	3.1	
											2	5.8	4.4	
											3	5.6	5.3	
											4	6.8	5.3	
											5	6.7	5.4	
1A/4/6-10	9057406	RORU	rugosa rose <i>Rosa rugosa</i> Lincoln-Oakes Nursery, Bismarck, ND	16-May	01	01	PLBR	5	5	100	4	1.2	1.2	
											3	2.7	2.0	
											3	3.6	2.2	
											3	5.3	3.0	good vigor
											2	7.6	3.5	
											2	10.0	4.0	
1A/4/11-15	9082687	RIAM2	black currant <i>Ribes americanum</i> Big Sioux Nursery, Watertown, SD	16-May	01	01	PLBR	5	5	100		1.5	1.9	
											3	4.0	2.6	
											3	3.6	3.2	
											3	5.5	3.5	
											3	5.9	3.9	
											3	5.5	3.5	
1A/4/16-20	9082714	SIPEP	cupplant <i>Silphium perfoliatum</i> USDA, NRCS, PMC, Bismarck, ND		02	02	CONT	5	5	100	3	0.6	0.3	
											3	1.1	3.5	
														all five okay, height varies
														all five okay, flowering
														good growth, some drought stress

**Project No.: 381347K Field Evaluation of Woody Plant Materials, Becker, Minnesota**  
**Year of Record: 2012**

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN		REMARKS					
											COV VI	PLT HT (ft)						
1A/5/1-5	'Nero' 9082719	PHME13	chokeberry <i>Photinia melanocarpa</i> Northwoods Nursery, Molalla, OR		02	02	PLBR	5	5	100	3	1.0	1.5					
						03						5	100		4	1.4	1.9	
						04						5	100		4	1.7	2.0	
						06						5	100		3	3.2	3.0	
						08						5	100		3	3.7	3.4	
				11		5	100	3	4.0	3.9	good fruit							
1A/5/6-10	'Viking' 9082720	PHME13	chokeberry <i>Photinia melanocarpa</i> Northwoods Nursery, Molalla, OR		02	02	PLBR	5	5	100	3	1.1	1.4					
						03						5	100		3	1.8	2.0	
						04						5	100		3	2.3	2.1	
						06						5	100		2	4.0	3.2	
						08						5	100		2	4.4	3.2	
				11		5	100	3	5.1	4.0	good fruit							
1A/5/11-15	9082711	EUBU6	winterberry euonymus <i>Euonymus bungeanus</i> Lincoln-Oakes Nursery, Bismarck, ND		02	02	PLBR	5	5	100	3	0.5	2.6					
						03						5	100		3	1.4	3.0	
						04						5	100		4	2.6	3.2	3 has seed
						06						5	100		4	4.1	4.1	dark pink fruit on 3
						08						5	100		3	4.5	4.6	upright form on 2
				11		5	100	3	4.6	5.6								
1A/5/16/20	9082712	CESC	bittersweet <i>Celastrus scandens</i> Lincoln-Oakes Nursery, Bismarck, ND		02	02	PLBR	5	5	100	3	0.5	1.0					
						03						5	100		3	1.2	2.4	
						04						5	100		4	1.2	3.2	berries on 4
						06						5	100		3	2.6	3.4	
						08						5	100		3	3.1	2.8	all female
				11		5	100	3	2.8	3.1								
1A/6/1-5	9082678	AMCA6	leadplant <i>Amorpha canescens</i> Lincoln-Oakes Nursery, Bismarck, ND		02	02	PLBR	5	5	100	2	0.6	1.0					
						03						5	100			1.4	1.3	
						04						5	100		4	1.5	1.3	
						06						5	100		3	1.9	2.2	
						08						5	100		3	3.0	2.2	
				11		5	100	4	3.3	2.4								

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											COV	VI			
1A/6/6-10	9091971	PHME13	black chokeberry <i>Photinia melanocarpa</i> Bailey Nurseries, Inc.	12-May	05	05		5	5	100	3	1.5	2.1		
											2	2.1	2.4		
											3	3.2	2.7		
											3	4.3	3.6		sprouts from layering
1A/6/11-15	9008183	PRVI	common chokecherry <i>Prunus virginiana</i> Lincoln-Oakes Nursery, Bismarck, ND Sheridan County, ND	12-May	05			5	5	100	3	0.8	1.8		
											5	1.5	2.6		
											3	2.2	3.8		1,5 yellow leaves; 3 powdery mildew
											4	4.5	5.5		tent caterpillars on 1
1A/7/1-5	9082706	ROAR3	prairie rose <i>Rosa arkansana</i> Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND		03	03		5	5	100	4	1.2	1.2		
											6	0.7	0.6		
											5	2.3	1.3		
											3	2.3	1.3		
											5	2.6	1.4		
3	4.1	1.2													
1A/7/6-10	9082746	RIMI	Missouri gooseberry <i>Ribes missouriense</i> Big Sioux River, Watertown, SD Big Sioux Nursery, Watertown, SD		03	03	PLBR	5	5	100	6	1.4	1.4		
											5	1.4	1.6		
												2.5	2.0		
											7	1.9	1.7		severe leaf spot on all
											needs removal				
1A/7/11-15	9091967	PRPE2	pin cherry <i>Prunus pensylvanica</i> Big Sioux Nursery, Watertown, SD	12-May	05			5	5	100	3	1.5	2.2		
											4	2.5	3.1		
											3	4.2	3.8		
											5	6.9	6.3		
											3	7.9	9.3		
1A/7/16-20	'Freedom'	LOKO2	blueleaf honeysuckle <i>Lonicera korolkowii</i> Lincoln-Oakes Nursery, Bismarck, ND		03	03	PLBR	5	5	100	4	2.2	2.2		
											3	4.7	4.0		
											2	5.5	4.9		clean leaves, no disease
											2	9.3	8.1		
											1	12.0	10.0		

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											COV VI	(ft)					
1A/8/1-5	9082889	PIMU80	Mugo pine <i>Pinus mugo</i> Big Sioux Nursery, Watertown, SD	12-May	04	04	PLBR	5	5			5	0.4	0.4	no measurements taken		
																4	80
																4	80
																4	80
																3	80
1A/8/6-10	9082887	HIRH80	seaberry <i>Hippophae rhamnoides</i> Lincoln-Oakes Nursery, Bismarck, ND	20-May	04	04	PLBR	5	5	100	4	0.6	1.6				
															4	100	
															4	80	
															3	80	
															3	80	
1A/8/11-15	9082642	VILA	wayfaring bush <i>Viburnum lantana</i> Lincoln-Oakes Nursery, Bismarck, ND	20-May	04	04	PLBR	5	5	100	5	0.9	1.3				
															5	100	
															4	100	
															5	100	
															6	100	
1A/8/16-20	9076686	CRCH	roundleaf hawthorn <i>Crataegus chrysocarpa</i> Lincoln-Oakes Nursery, Bismarck, ND	20-May	04	04	PLBR	5	4	80	4	0.6	0.7				
															4	100	
															5	100	
															5	100	
															5	100	
1A/9/1-5	9082891	PHOP	common ninebark <i>Physocarpus opulifolius</i> Big Sioux Nursery, Watertown, SD	20-May	04	04	PLBR	5	5	100	3	1.3	1.6				
															4	100	
															3	100	
															2	100	
															2	100	
1A/9/6-10	9082888	COAM3	American hazelnut <i>Corylus americana</i> Lincoln-Oakes Nursery, Bismarck, ND	20-May	04	04	PLBR	5	4	80	4	0.7	1.1				
															4	100	
															3	100	
															3	100	
															2	100	

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											COV <u>VI</u>	PLT <u>(ft)</u>							
IA/9/11-15	'Prairie Red' 9047203	PRUNU	hybrid plum	4-May	06	06	PLBR	5	5	100	3	0.8	1.6						
			<i>Prunus</i> sp.									07	5		100	3	1.0	1.8	
			Big Sioux Nursery, Watertown, SD									08	5		100	3	1.4	1.9	all browsed
												10	5		100	5	2.2	3.0	
												11	5		100	4	4.3	4.5	
IA/9/16-20	9092053	RHTY	staghorn sumac	4-May	06	06	PLBR	5	5	100	2	3.9	3.9						
			<i>Rhus typhina</i>									07	5		100	4	4.5	5.1	
			Lincoln-Oakes Nursery, Bismarck, ND									08	5		100	4	5.3	4.4	deer rub on 2
												10	5		100	4	6.0	6.2	
												12	5		100	3	7.3	6.6	
IA/10/1-5	9092143 Tiger Eyes	RHTY	staghorn sumac	May	07	07		5	1	20	3	1.5	1.0						
			<i>Rhus typhina</i>									08	5		100	3	0.9	1.2	
			S&B Nursery, Bismarck, ND (Bailey's, St. Paul, MN)									09	4		80	3	1.6	1.8	
												11	5		100	3	1.5	1.2	
1A/10/6-10	9092141	VILE	nannyberry	May	07	07		5	5	100	3	0.5	1.6	2,3,5 powdery mildew					
			<i>Viburnum lentago</i>									08	5		100	3	1.2	1.7	
			Schumacher's Nursery, Heron Lake, MN									09	5		100	4	0.8	1.8	powdery mildew on all
												11	5		100		1.9	2.8	powdery mildew on all
IA/10/11-15	Sun Harvest Germplasm 9083247	COAM3	American hazelnut	May	07	07		5	3	60	4	0.4	1.8						
			<i>Coylus americana</i>									08	5		100	4	0.7	1.6	all browsed
			USDA, NRCS, PMC, Elsberry, MO									09	5		100	5	2.1	1.7	
												11	5		100	3	4.2	3.4	
IA/10/16-20	Midwest Premium Germplasm 9083241	PRAM	American plum	May	07	07		5	3	60	4	0.4	1.3						
			<i>Prunus americana</i>									08	3		60	6	0.3	1.0	
			USDA, NRCS, PMC, Elsberry, MO									09	4		80	5	0.8	1.1	deer browse on all
												11	4		80	5	2.4	2.4	
IA/11/1-5	9082895	PRAR3	apricot	May	07	07		5	3	60	4	0.9	1.0						
			<i>Prunus armeniaca</i>									08	3		60	4	1.8	2.6	
			Rod O'Clair, Jamestown, ND									09	3		60	5	3.8	4.5	
			USDA, NRCS, PMC, Bismarck, ND									11	3		60		7.3	10.0	

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											COV <u>VI</u>	PLT <u>(ft)</u>							
IA/11/6-10	9091969	CAFR80	Russian peashrub	May	07	07		5	5	100	4	0.3	1.4						
			<i>Caragana frutex</i>									08	5		100	5	0.4	1.4	
			Big Sioux Nursery, Watertown, SD									09	5		100	4	0.6	1.5	
												11	4		80	6	0.7	1.6	
IA/11/11-15	9091964	RHTR	skunkbush sumac	May	07			5	5	100	2	0.9	1.8						
			<i>Rhus trilobata</i>									08	5		100	4	2.7	2.0	chlorosis
			Cave Hills, SD									09	5		100	4	3.8	2.4	
			USDA, NRCS, PMC, Bismarck, ND									11	5		100	3	3.8	2.6	
IA/11/16-20	9091967	PRPE2	pin cherry	8-May	08			5	5	100	4	0.4	1.7	all browsed					
			<i>Prunus pensylvanica</i>									09	4		80	4	0.8	1.6	
			Big Sioux Nursery, Watertown, SD									10	4		80	5	1.6	2.1	
												12	4		80	5	1.4	1.3	
II/1/1-5	'Roselow' PI-477986	MASA9	Sargent crabapple	1-May	96	PLBR		5	4	80	4	1.4	2.0	browse on 4					
			<i>Malus sargentii</i>									97	4		80	2	2.0	2.3	
			USDA, NRCS, PMC, East Lansing, MI									98	4		80	3	3.5	3.4	
												00	4		80	3	6.7	5.5	
			Lincoln-Oakes Nursery, Bismarck, ND									02	4		80	3	7.1	6.9	no leaf diseases
												05	4		80	3	6.0	8.1	
10	4	80	4	14.3	7.9														
II/1/6-10	'Midwest' 478000	MAMA37	Manchurian crabapple	1-May	96	PLBR		5	5	100	3	1.6	2.5	browse on 1,3					
			<i>Malus mandshurica</i>									97	5		100	2	3.4	3.6	
			USDA, NRCS, PMC, Bismarck, ND									98	5		100	1	5.0	6.4	
												00	5		100	3	7.8	9.1	
			Lincoln-Oakes Nursery, Bismarck, ND									02	5		100	2	9.0	10.2	
												05	5		100	3	9.8	13.3	
10	5	100	5	12.8	11.5														

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											COV VI	PLT (ft)		
II/2/1-5	9030971	ACGI	amur maple <i>Acer ginnala</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	96	PLBR	5	5	100	3	1.1	1.8	
											2	1.6	1.9	
											2	3.1	4.1	
											4	7.9	7.0	
											3	9.2	8.1	
											3	10.0	13.9	
II/1/6-10	'Schubert' 9012608	PRVI	chokecherry <i>Prunus virginiana</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	96	PLBR	5	5	100	4	0.7	2.1	
											1	1.5	2.6	
											1	2.4	3.5	
											2	5.8	6.5	
											2	8.1	9.0	
											2	10.0	11.8	
II/3/1-5	9047209	PRVI	chokecherry <i>Prunus virginiana</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	96	PLBR	5	5	100	3	0.7	2.0	
											3	1.5	3.5	insect damage on 4
											1	2.5	5.3	some suckers on 3,4
											4	6.8	8.1	
											3	9.1	10.8	
											3	12.0	13.2	yellow fruit on 1
II/3/6-10	ND-1733 9006060	PRAM	plum <i>Prunus americana</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	96	PLBR	5	5	100	3	1.3	2.4	
											3	2.8	3.4	insect, disease damage
											3	4.0	6.3	
											3	10.7	9.0	
											2	11.4	10.5	
											4	9.9	11.9	
II/4/1-5	Prairie Harvest Germplasm 9034956	CEOC	hackberry <i>Celtis occidentalis</i> Polk County, MN USDA, NRCS, PMC, Bismarck, ND	7-May 09	09	09		5	5	100	3	0.4	1.1	
											5	0.5	0.7	
											6	0.5	0.6	

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											COV <u>VI</u>	PLT <u>(ft)</u>			
II/4/6-10	Oahe	CEOC	hackberry	7-May	09	09		5	5	100	3	0.5	1.7		
			<i>Celtis occidentalis</i>									5	0.4		1.1
			Big Sioux Nursery, Watertown, SD									5	0.5		0.6
II/5/1-5	'McDermand' 478004	PYUS	Ussurian pear	1-May	96	96	PLBR	5	5	100	3	1.0	2.5	browse on 1 leaf damage	
			<i>Pyrus ussuriensis</i>									5	2.4		3.3
			NRCS, PMC, Bismarck, ND									5	2.9		5.2
			Lincoln-Oakes Nursery, Bismarck, ND									5	7.3		9.4
												5	10.0		11.8
												5	12.0		13.6
II/5/6-10	9076733	VILE	nannyberry	1-May	96	96	PLBR	5	5	100	5	0.3	0.7		
			<i>Viburnum lentago</i>									5	0.8		1.3
			Turtle Mountains, ND									5	1.3		2.9
			Lincoln-Oakes Nursery, Bismarck, ND									5	3.9		4.7
												5	4.4		5.4
												5	3.8		5.8
II/6/1-5	'Homestead' 9005731	CRAN6	Arnold hawthorn	1-May	96	96	PLBR	5	5	100	5	0.5	1.5	browse on 3,5 severe rabbit damage - all	
			<i>Crataegus X anomala</i>									4	0.4		1.4
			NRCS, PMC, Bismarck, ND									4	0.3		1.4
			Lincoln-Oakes Nursery, Bismarck, ND									4	1.2		1.6
												4	2.2		2.5
												2	1.8		3.0
II/6/1-5	9091968	GYDI	Kentucky coffeetree	4-May	11	11	PLBR	5	5	100	4	0.9	1.6		
			<i>Gymnocladus dioicus</i>									5			1.7
			Big Sioux Nursery, Watertown, SD												

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											COV VI	(ft)			
II/6/6-10	9069121	PRPA5	mayday <i>Prunus padus</i> Norway USDA, NRCS, PMC, Bismarck, ND	1-May 96	96	96	PLBR	5	5	100	5	0.4	0.6	browse on 4,5	
											4	1.1	1.7		
											3	1.6	3.2		insect damage on 3,4
											3	3.7	6.1		
											3	5.4	9.2		
											4	5.7	10.3		
6	5.8	7.6													
II/7/1-5	9069129	PRMA9	amur chokecherry <i>Prunus maackii</i> Big Sioux Nursery, Watertown, SD USDA, NRCS, PMC, Bismarck, ND	1-May 96	96	96	CONT(P)	5	5	100	1	2.2	4.1	moderate deer rub	
											1	4.4	5.6		
											1	6.3	8.6		
											2	10.6	11.5		
											3	13.2	12.4		
											4	11.5	11.9		3 is mostly dead
6	15.8	12.9													
0	0	0													
II/7/1-5	9094406 'Princeton'	ULAM	American elm <i>Ulmus americana</i> Schumacher's Nursery, Heron Lake, MN	8-May	12	12	PLBR	5	5	100	6	0.3	1.4	3' shelters and watered all 5/9/12	
II/7/6-10	9082666	BETUL	Asian black birch <i>Betula davurica</i> Lawyer Nursery, Plains, MT	16-May 01	01	01	CONT	5	5	100	3	1.0	1.3	1 is browsed	
											3	2.3	2.9		
											3	3.2	5.4		
											4	4.0	7.9		
											4	5.8	9.7		
											4	4.0	7.9		
0	0	0													
II/7/6-10	9094400 'Carmine Jewel'	PRCE	dwarf cherry <i>Prunus cerasus</i> Big Sioux Nursery, Watertown, SD	8-May 12	12	12	PLBR	5	5	100	2	0.3	3.2	3' shelter and watered all 5/9/12 deer eating buds	

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											COV <u>VI</u>	PLT <u>(ft)</u>			
II/8/1-5	9092052	QUBI	swamp white oak <i>Quercus bicolor</i> Lincoln-Oakes Nursery, Bismarck, ND	4-May 06	06		PLBR	5	4	80	3	0.6	1.2	5 chewed off	
											3	0.8	1.3		
											4	1.1	1.3		
											4	2.7	2.1		
											3	2.7	2.3		all hedged by deer
II/8/6-10	9082675	FRMA5	Manchurian ash <i>Fraxinus mandshurica</i> Lincoln-Oakes Nursery, Bismarck, ND	3-May 00	00		PLBR	5	5	100	2	0.8	2.2		
											4	1.2	2.3		
											4	2.0	4.0		
											5	1.9	5.7		
											5	2.6	6.4		
II/9/1-5	9082667	BEPO	gray birch <i>Betula populifera</i> Lawyer Nursery, Plains, MT	3-May 00	00		PLBR	5	5	100	2	1.3	3.6		
												3.7	6.4		
											2	5.4	9.8		
											3	8.1	14.5		
											3	9.6	16.4		drought stress
3	10.6	19.0													
II/9/6-10	9092051	CASP8	northern catalpa <i>Catalpa speciosa</i> Big Sioux Nursery, Watertown, SD	4-May 06	06		PLBR	5	5	100	3	0.6	0.8		
											3	0.8	1.0		
											4	4.0	1.6		
											3	2.0	2.8		
											3	2.6	3.4		yellow leaves
III/1/1-5	9076739	QUERC	oak hybrid <i>Quercus</i> E.T. Jacobson, MN USDA, NRCS, PMC, Bismarck, ND	30-Apr 98	98		CONT(P)	5	5	100	4	0.6	1.7		
											6	1.2	2.4		browse on 4
											3	2.4	3.9		
											5	3.9	6.2		
											6	4.5	7.3		acorns on 3
											4	6.6	8.3		
											4	8.8	10.5		2,4,5 basal sprouts, 5 hvy browse

**Project No.: 381347K Field Evaluation of Woody Plant Materials, Becker, Minnesota**  
**Year of Record: 2012**

PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		PLT <u>HT</u>	<u>REMARKS</u>
											<u>COV</u>	<u>VI</u>		
III/1/6-10	9069177	QUMA2	bur oak <i>Quercus macrocarpa</i> E.T. Jacobson, MN USDA, NRCS, PMC, Bismarck, ND	30-Apr 98	98		CONT(P)	5	5	100	6	0.5	1.0	browse on 3
												0.8	1.2	
												1.4	1.7	
												3.9	4.8	
												5.4		stem gall on 5
												6.6		
												8.7	9.8	deer browse & rub; rust on leaves
III/2/1-5	'Oahe' 476982	CEOC	hackberry <i>Celtis occidentalis</i> NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96		PLBR	5	5	100	5	1.0	2.7	
												1.7	2.7	4 browsed
												2.1	3.7	
												6.6	8.1	
												7.9	11.7	
												7.6	13.4	
												7.0	17.5	
III/2/6-10	9019578	CEOC	hackberry <i>Celtis occidentalis</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96		PLBR	5	5	100	6	0.5	1.7	browse on 2,3,5
												1.7	2.8	browse on 3,4,5
												2.5	3.9	
												6.2	7.1	
												10.3	13.2	leaf gall
												10.4	14.7	
												11.5	21.0	
III/3/1-5	'Cardan' 469226	FRPE	green ash <i>Fraxinus pennsylvanica</i> NRCS, PMC, Bismarck, ND Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96		PLBR	5	4	80	5	0.4	1.6	
												1.4	2.2	
												3.0	4.1	
												7.6	8.1	
												9.4	12.4	
												10.2	14.9	
												9.8	22.6	

**Project No.: 38I347K Field Evaluation of Woody Plant Materials, Becker, Minnesota**  
**Year of Record: 2012**

PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		<u>REMARKS</u>	
											COV <u>VI</u>	PLT <u>(ft)</u>		HT <u>(ft)</u>
III/3/6-10	9019586	FRPE	green ash <i>Fraxinus pennsylvanica</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	96	PLBR	5	5	100	3	1.0	2.6	2 browsed
												2.8	3.7	
												5.3	6.7	
												9.3	11.2	
												11.5	14.9	
												10.4	17.1	
												12.4	18.3	
7.6	27.2													
III/4/1-5	9063115	FRPE	green ash <i>Fraxinus pennsylvanica</i> Itasca State Park, MN USDA, NRCS, PMC, Bismarck, ND	1-May 96	96	96	CONT(P)	5	5	100	5	0.2	0.9	browse on 1,2,3,5 leaf damage on 2
												3	2.0	
												4	3.9	
												3	7.5	
												4	13.8	
												4	17.1	
												3	27.0	
III/4/6-10	9063116	FRNI	black ash <i>Fraxinus nigra</i> Itasca State Park, MN USDA, NRCS, PMC, Bismarck, ND	1-May 96	96	96	CONT(P)	5	5	100	5	0.3	1.3	browse on 2 browse on 1
												7	1.0	
												6	2.3	
												4	5.4	
												5	8.6	
												6	9.9	
												6	9.0	
III/5/1-5	9063127	FRAM2	white ash <i>Fraxinus americana</i> Wisconsin Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	96	PLBR	5	5	100	5	0.2	1.4	slight insect damage on 2
												4	2.3	
												4	3.8	
												5	8.9	
												4	12.9	
												4	14.9	
												3	20.8	

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**Year of Record: 2012**

PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		<u>REMARKS</u>	
											COV <u>VI</u>	PLT <u>(ft)</u>		
III/5/6-10	9076730	ACSA2	silver maple <i>Acer saccharinum</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96	96	PLBR	5	5	100	3	1.2	3.1	
											1	3.8	5.2	
											3	8.7	9.5	
											3	14.2	15.7	
											4	13.3	16.9	
											4	12.9	19.0	broke off stump sprout on 2
											4	14.4	19.3	2 very small, few weak leaves
III/6/1-5	Hunter Germplasm 9081843	PIPOS	ponderosa pine <i>Pinus ponderosa</i> var. <i>scopulorum</i> USDA, ARS, Bridger, MT	12-May 05	05	05		5	5	100	2	0.6	1.2	
											2	1.2	1.6	
											2	2.1	2.5	
												4.1	4.6	
											3	6.6	7.3	
III/6/6-10	9063148	PHAM2	amur corktree <i>Phellodendron amurense</i> Clay County, MN USDA, NRCS, PMC, Bismarck, ND	1-May 96	96	96	CONT(P)	5	5	100	5	0.4	1.2	browse on 5
											3	2.8	2.6	
											3	4.9	4.8	
											3	8.5	6.8	
											3	10.4	8.7	
											4	10.5	9.9	tractor damage on trunk of 5
											3	11.8	11.1	
III/7/1-5	9069178	PIRE	red pine <i>Pinus resinosa</i> USDA, NRCS, PMC, Bismarck, ND	29-Apr 99	99	99		5	5	100	4	1.0	1.3	
											4	1.0	1.3	
											3	2.9	3.0	
											3	4.7	5.4	
											2	6.2	8.5	
											3	3.0	3.5	
III/7/6-10	9076731	QUMA2	bur oak <i>Quercus macrocarpa</i> Black Hills, SD	1-May 96	96	96	PLBR	5	5	100	5	0.2	1.3	browse on 1,2
											6	0.8	1.3	
											5	1.6	2.1	mod-severe rabbit damage
											4	2.6	4.3	
											5	4.3	6.5	leaf spot
											5	4.8	6.9	acorns, leaf spot on all, dieback 5
											5	6.6	9.1	

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PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		<u>REMARKS</u>	
											COV <u>VI</u>	HT <u>(ft)</u>		
III/8/1-5	9076735	AEGL	Ohio buckeye <i>Aesculus glabra</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96		PLBR	5	5	100	4	0.2	0.6	
											8	0.7	0.6	
											6	0.7	1.0	
											4	1.6	1.5	
											6	1.9	1.8	
											6	1.0	1.4	
8	1.5	1.2	leaf burns/dieback on all											
III/8/6-10	9076737	PRSE2	black cherry <i>Prunus serotina</i> Apple Valley FEP Lincoln-Oakes Nursery, Bismarck, ND	1-May 96	96		PLBR	5	4	80	3	1.0	1.9	
											4	1.9	2.2	
											3	4.3	5.0	
											3	8.7	10.1	
											3	11.1	12.9	
											4	10.8	15.1	
3	10.0	17.3												
III/9/1-5	9082609	PICEA	Meyer's spruce <i>Picea meyeri</i> Itasca Greenhouse, Cohasset, MN	16-May 01	01		CONT	5	3	60	5	0.8	0.7	
												1.0	0.9	
												1.2	1.1	
											3	1.6	1.4	
											5	2.2	1.6	
											1	3.0	2.0	
III/9/6-10	9094335	TICO	littleleaf linden <i>Tilia cordata</i> Big Sioux Nursery, Watertown, SD	4-May 10	10		PLBR	5	5	100	8	0.5	0.9	
												0.5	0.8	
											6	0.4	0.4	
III/10/1-5	9082885	POTR5	aspen <i>Populus tremuloides</i> NDFS Nursery, Towner, ND	20-May 04	04		PLBR	5	3	60	4	0.7	2.1	
												1.1	1.9	
												1.4	2.2	
											4	1.8	2.2	
											4	2.4	1.6	

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**Year of Record: 2012**

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN		REMARKS	
											COV VI	PLT HT (ft)		
III/10/6-10	9082633	FRNI	black ash <i>Fraxinus nigra</i> Lawyer Nursery, Plains, MT	29-Apr	99			5	5	100	6	0.3	0.7	browse on 4
											4	0.9	1.0	
											4	1.0	2.1	
											4	1.1	3.2	
											5	1.7	3.5	
											4	1.1	3.2	
III/11/1-5	ND-686 478008	SYPE	Pekin lilac <i>Syringa pekinensis</i> Lincoln-Oakes Nursery, Bismarck, ND	1-May	96		PLBR	5	5	100	3	2.3	2.9	winter damage
											5	2.4	2.3	
											3	4.6	3.7	
											4	6.9	5.9	
											4	8.1	6.9	
											6	7.0	6.9	
III/11/6-10	9094336	ACFR	Freeman maple <i>Acer X freemanii</i> Big Sioux Nursery, Watertown, SD	4-May	10		PLBR	5	3	60	8	0.5	1.2	2 replants (5/4/11) deer eating leaves to ground
											5	0.3	1.4	
											7	0.3	0.3	
											4	7.8	6.9	
III/12/1-5	9094334	TIAM	American linden <i>Tilia americana</i> Big Sioux Nursery, Watertown, SD	4-May	10		PLBR	5	5	100	5	0.7	1.5	dieback on all deer eaten all veg, basal resprout
											8	0.6	0.7	
											4	0.6	0.5	
III/13/1-5	9082639	QUEL	northern pin oak <i>Quercus ellipsoidalis</i> Lincoln-Oakes Nursery, Bismarck, ND	29-Apr	99		PLBR	5	2	40	8	0.3	0.5	leaf galls, army worms/galls
											6	1.1	0.9	
											6	1.0	2.5	
											4	2.4	4.1	
											?	2.3	5.6	
											4	4.3	7.9	
III/14/1-5	9082739	OSVI	ironwood <i>Ostrya virginiana</i> Sertoma Park, Bismarck, ND USDA, NRCS, PMC, Bismarck, ND	May	07			5	2	40	4	0.9	2.1	deer browse, chlorosis on 1
											6	0.4	1.0	
											6	0.7	1.1	
											6	1.6	1.3	

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											COV <u>VI</u>	PLT <u>(ft)</u>		HT <u>(ft)</u>	
III/14/6-10	9092231	PICOL	lodgepole pine <i>Pinus contorta</i> var. <i>latifolia</i>	7-May	09	09		5	5	100	4	0.5	1.1	needle burn on 4	
											1	0.9	1.5		
											2	1.8	2.3		
IV/1/1-5	9082610	LASI	Siberian larch <i>Larix sibirica</i> NDFS Nursery, Towner, ND	30-Apr	98		CONT(S)	5	5	100	4	0.5	1.0		
											6	0.8	1.5		
											5	1.3	2.1		
											4	3.1	5.0		
											5	3.9	6.9		
											3	6.5	11.2		
12	10.3	16.9													
IV/1/6-10	9082611	LASI	Siberian larch <i>Larix sibirica</i> NDFS Nursery, Towner, ND	30-Apr	98		CONT(S)	5	5	100	3	0.5	1.2		
											6	0.7	1.4		
											5	1.0	1.6		
											5	1.8	2.7		
											5	2.4	3.7		
											5	3.9	6.6		
12	6.4	10.9													
IV/2/1-5	9069168	LASI	Siberian larch <i>Larix sibirica</i> Russia USDA, NRCS, PMC, Bismarck, ND	30-Apr	98		CONT(P)	5	1	20	4	0.3	1.3		
											6	0.7	1.4		
											5	1.1	1.9		
											4	2.6	4.0		
											4	3.2	6.6		
											2	6.8	11.9		
12	11.1	18.4	not as dark green as 9082610												
IV/2/6-10	9069162	LARIX	Dahurian larch <i>Larix olgensis</i> China USDA, NRCS, PMC, Bismarck, ND	30-Apr	98		CONT(P)	5	3	60	3	0.9	1.7		
											4	2.1	2.2		
											4	2.9	3.6		
											3	5.4	5.9		
											3	7.0	8.1		chlorotic, no leader on 4
											3	9.6	11.0		3 top dieback, deer damage 4
12	13.8	19.5	thinner foliage than others												

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											COV <u>VI</u>	HT <u>(ft)</u>	
IV/3/1-5	9069163	LARIX	Dahurian larch	30-Apr 98	98	99	CONT(P)	5	0	0			
			<i>Larix olgensis</i>						1	20	5	1.0	2.0
			China						4	80	5	1.3	2.0
			USDA, NRCS, PMC, Bismarck, ND						4	80	5	2.6	3.8
									4	80	6	4.2	6.8
									07	60	3	9.2	13.8
			12	60	2	14.2	25.2	medium dense foliage					
IV/3/6-10	9069164	PISYM	Scots pine	30-Apr 98	98	99	CONT(P)	5	2	40	4	0.6	1.0
			<i>Pinus sylvestris</i> var. <i>mongolica</i>						5	100	4	1.3	1.8
			China						5	100	3	2.4	2.7
			USDA, NRCS, PMC, Bismarck, ND						5	100	3	5.2	6.2
									5	100	3	7.9	10.9
									07	100	3	14.5	16.3
			12	80	1	20.8	23.1						
IV/4/1-5	9069172	PISY	Scots pine	30-Apr 98	98	99	CONT(P)	5	0	0			
			<i>Pinus sylvestris</i>						5	100	3	1.4	2.1
			Russia						5	100	3	2.2	2.9
			USDA, NRCS, PMC, Bismarck, ND						5	100	3	5.1	6.2
									5	100	3	7.7	10.9
									07	40	3	13.0	13.6
			12	0	0								

## **OFF-CENTER EVALUATION PLANTING: TECHNICAL REPORT 2011-2012**

### **Study NDPMC-T-0201-CP**

**Study Title:** Eastern South Dakota Soil & Water Research Farm, Brookings, South Dakota

**Purpose:** The purpose of the farm is to find solutions to national and regional concerns related to soil and water conservation and the efficiency and sustainability of agricultural production. Research and technology transfer activities on the farm are conducted by a partnership including: USDA Agricultural Research Service, USDA Natural Resources Conservation Service, South Dakota State University, South Dakota Agricultural Experiment Station, the Brookings County Conservation District, as well as 14 other County Conservation Districts from eastern South Dakota.

**History:** The Eastern South Dakota Soil and Water Research Farm, Inc. is a non-profit organization consisting of a Board of Directors elected from each of 15 Soil and Water Conservation Districts in eastern South Dakota. Brookings, Codington, Clark, Day, Deuel, Hamlin, Kingsbury, Lake, Lincoln, Marshall, McCook, Minnehaha, Minor, Moody, and Turner Soil and Water Conservation Districts are represented on the Board of Directors. The purpose of the corporation is to promote research of efficient farm production practices that conserve soil and water resources.

The corporation purchased 100 acres of land in Lake County, South Dakota, near the community of Madison in 1959. This land was leased to the USDA Agricultural Research Service. The work performed at the Madison farm included evaluation of the erosion of different soil types, development of tillage practices to conserve soil and water, determination of efficient crop production methods, and modeling plant-insect interactions. Research was conducted by scientists from the North Central Soil and Water Conservation Laboratory, ARS, Morris, MN; the Northern Grain Insects Research Laboratory, ARS, Brookings, SD; and the South Dakota State Agricultural Experiment Station.

In an effort to improve program efficiency and facilitate productive cooperative research programs that would more effectively solve some of the problems that are associated with agriculture in eastern South Dakota, the Board of Directors decided to relocate the research farm closer to the research laboratories. The Madison research farm was sold in 1987, and the Corporation purchased another tract of land in Brookings County.

The Brookings Research Farm consists of 80 acres located approximately one mile north of the campus of South Dakota State University. The soils on this farm are characteristic of those found in northeastern South Dakota and west central Minnesota and are similar to soils common to the northern Corn Belt. A new building was constructed in 2006. Some trees were removed during the construction.

### **Methods and Materials**

**Assembly:** The first tree planting trials were started in 2000 when 16 species were planted. An additional six species were planted in 2001. These trials were used to showcase different types of tree species and various weed control methods. Currently, 45 accessions of 33 different species are being evaluated.

In 2004, the PMC staff became involved in planting additional tree and shrub accessions that will be evaluated on an annual basis. Refer to Table BR-2 for entries planted from 2004-2012.

For the 2011 and 2012 weather summaries at Brookings, see Table BR-1.

#### **Species and Rationale:**

**2011:** May 5, planted the following species:

- Roughleaf (9094355) dogwood, native to the north central US as a potential conservation shrub
- Meyer's spruce (9094411), native to north central China as a potential alternative to Colorado blue spruce. Some literature suggests this species is more drought tolerant than blue spruce.

- Black cherry (9076737), native to eastern and central US as a medium/tall tree to potentially replace green ash.

2012: May 7, planted the following species:

- Pie cherry (9092162), a prolific large fruit tart cherry that produces lots of fruit from suckers. Source was a ranch headquarters just west of Camp Crook, SD. Hope is to find a selection that reproduces from seed and produces fruit similar to the parent plants.
- 'Carmine Jewel' (9094400), one of the Romance cherries released by Jeffries Nursery in Canada. Planted here as a standard of comparison to the pie cherry.
- 'Princeton' elm (9094406), a 1922 release selected for its form in New Jersey, which was later found to be Dutch Elm Disease resistant. Evaluating its climatic adaptation.

Planting Plan: The layout of the evaluation plots is shown in Figure BR-1 and Figure BR-2. The tree and shrub plots are in the northeastern area of the Research Farm.

Site Preparation: Strips to be planted are chemically killed with glyphosate, and then tree fabric is laid down.

Planting Method: All trees and shrubs are planted by hand, except those moved with a tree spade in 2008.

Weed/Pest/Plot Management:

2011: Several shrub accessions were cut off since they were no longer needed. Resprouts need to be sprayed over the next year or two so dead and rotted stump can be removed and newer accessions planted at that spot. The Brookings County Soil and Water Conservation District continues to do a good job of between row mowing and weed control.

2012: The local district agreed to add another strip of fabric for future expansion. At planting time observed a severe infestation of web worms that had completely stripped the leaves from the chokecherry. See photos in the annual report. Grass and weeds were removed from openings at fall evaluation date. The site would benefit from timely weed control prior to fall inventory. Three-foot tall tree shelters were installed on the Carmine Jewel, pie cherry, and Princeton elm at planting time. They were not tall enough to prevent deer browse. Pie cherry was not browsed since it did not grow close to the top of the tube. We will replace 3-foot shelters with 5-foot shelters as appropriate during 2013 planting.

Evaluations and Measurement: Plant performance data is recorded during the growing season for the first three years. After the third year, data is gathered according to a specific schedule. Records of planting date, survival, vigor, fruit (seed) amount, canopy width, plant height, winter injury, disease symptoms, and insect damage are recorded. Select data appears in this report. Annual summary reports have been prepared since 2006 and can be requested from the PMC.

2011: On August 25, selected accessions were evaluated. All showed good survival and growth. Little if any animal browse was observed on the new plantings. Some older plantings showed considerable browse.

2012: On August 21, selected accessions were evaluated. Carmine Jewel and Princeton elm were doing well. Pie cherry exhibited poor vigor, a few dead plants and minimal growth. Deer ate on all plants that grew close enough to shelter tops. Selected older plantings also showed deer damage.

**Figure BR-1. Brookings, South Dakota Off-Center Evaluation Plots**

Older tree plots to the southeast.  
Aerial photo/map created 2013



**Figure BR-2. USDA-NRCS, BISMARCK PLANT MATERIALS CENTER TREE AND SHRUB EVALUATION PLOTS, EASTERN SOUTH DAKOTA SOIL AND WATER RESEARCH FARM, BROOKINGS, SD**

**Short to Medium Shrubs (south side)**

**Row 1**

1. **(east end)** Mugo pine (9082889), introduced evergreen with conservation potential from Big Sioux Nursery.
2. Common ninebark (9082891), native species from Iowa grown by Big Sioux Nursery.
3. Wayfaring bush (9082642), introduced species grown by Lincoln-Oakes Nurseries from long-lived specimens growing at the Oakes Nursery.
4. Seaberry (9082887), introduced suckering shrub silver in color with orange fruit high in vitamin C content.
5. American hazelnut (9082888), native species from North Dakota grown by Lincoln-Oakes Nurseries.
6. American currant (9082687), native species from South Dakota grown by Big Sioux Nursery.
7. Missouri gooseberry (9082746), native species from South Dakota grown by Big Sioux Nursery.
8. Gray dogwood (9082890), native species from Minnesota grown by Big Sioux Nursery.
9. Gray dogwood (9082738), native species from Wisconsin grown by Lincoln-Oakes Nurseries.
10. Roundleaf hawthorn (9076686), native species from South Dakota selected by the Bismarck Plant Materials Center.
11. **(west end)** Pin cherry (9091967), native seed source from the northern Minnesota from Big Sioux Nursery.

**Row 2**

1. **(east end)** Arrowwood viburnum (9091976), Iowa seed source from Lincoln-Oakes Nursery.
2. Winterberry (9082711), original source from NDSU.
3. Shadblow serviceberry (9091975), commercial source from Lincoln-Oakes Nursery.
4. Chokeberry (9091971), from Bailey Nursery.
5. Chokecherry (9008183), Sheridan County, North Dakota, selected by Bismarck PMC for western-X resistance and high quality fruit yield.
6. Russian peashrub (9091969), suckering species from Big Sioux Nursery.
7. Common juniper (9019593) originates from Wilton Mine, Wilton, ND. Grown by PMC.
8. 'Silverscape' olive hybrid (9092054), Russian olive/silverberry hybrid. Grown by Lincoln-Oakes Nurseries.
9. Staghorn sumac (9092053), seed source from New York grown by Lincoln-Oakes Nurseries.
10. Ironwood (9082739) seed source from Sertoma Park, Bismarck, ND.
11. **(west end)** Skunkbush sumac (9091964) native species from Cave Hills, SD, grown by PMC.

**Row 3**

1. **(east end)** Cathedral Siberian/Japanese elm X (9092142), S&B Nursery, Bismarck/Bailey's Nursery, St. Paul, MN.
2. horizontal juniper (9012606), origin: Michigan PMC.
3. American highbush cranberry (9094281), from Big Sioux Nursery, Watertown, SD.
4. 'McKenzie' black chokeberry, 2008 release from PMC. (10 entries, measure east 5)
5. 'Prairie Red' plum, 2006 release from PMC (10 entries, measure east 5)
6. Nannyberry (9092141), from Schumachers Nursery, Heron Lake, MN.
7. Elderberry (9094333), from Big Sioux Nursery, Watertown, SD.
8. Korean mountain ash (9092140), commercial source from Big Sioux Nursery, Watertown, SD.

### **Medium to Tall Trees (north side)**

#### **Row 4 (fabric - no trees)**

#### **Row 5**

1. Freeman maple (9094336), naturally occurring hybrid of silver and red maple from Big Sioux Nursery, Watertown, SD.
2. Littleleaf linden (9094335), from Big Sioux Nursery, Watertown, SD.
3. American linden (9094334), from Big Sioux Nursery, Watertown, SD.
4. White poplar (9082892), from Big Sioux Nursery, Watertown, SD.

#### **Row 9**

1. **(east end)** Juniper (Bridger-Select), from Bridger PMC, Montana. (spaded 2007)
2. Ponderosa pine (Hunter), from Bridger PMC, Montana. (spaded 2007)

### **SWCD site**

#### **Row 4**

1. **(west end)** hackberry (9094282), South Dakota source, Pierre area.
2. 'Oahe' hackberry, release from PMC.
3. Prairie Harvest hackberry, to be released by PMC 2009, origin Polk County, MN.

**Table No. BR-1: 2011-2012 Weather Summary - Official Station - Brookings, South Dakota**

Month	Mean Temperature (degrees Fahrenheit)			Precipitation (inches)				
	2011	2012	Normal*	Actual			Deviation from Normal	
				2011	2012	Normal*	2011	2012
January	7.0	20.5	10.9	1.35	0.50	0.34	1.01	0.16
February	12.2	23.3	17.9	1.02	0.29	0.40	0.62	-0.11
March	24.5	43.7	30.1	0.82	0.54	1.29	-0.47	-0.75
April	42.1	48.6	44.2	2.64	2.77	2.03	0.61	0.74
May	54.5	59.8	56.7	6.17	6.94	2.95	3.22	3.99
June	65.3	69.0	66.1	3.98	1.59	4.23	-0.25	-2.64
July	75.9	77.2	70.7	4.88	1.40	3.11	1.77	-1.71
August	68.8	67.7	68.6	1.52	2.48	2.94	-1.42	-0.46
September	57.9	58.8	59.1	0.14	0.73	2.48	-2.34	-1.75
October	50.4	43.1	46.3	0.52	2.55	1.78	-1.26	0.77
November	33.4	32.9	30.0	0.12	0.45	1.00	-0.88	-0.55
December	25.2	18.1	16.3	0.22	1.39	0.26	-0.04	1.13
<b>Annual</b>	<b>43.1</b>	<b>46.9</b>	<b>43.1</b>	<b>23.38</b>	<b>21.63</b>	<b>22.81</b>	<b>0.57</b>	<b>-1.18</b>

\* National Climate Data Center 1971-2000 Monthly Normals

	2011	2012					
Last Frost (28 degrees)	n/a	12-Apr					
First Frost (28 degrees)	n/a	23-Sep					
Frost Free Period	n/a	163 days					

**Key to Table BR-2. 38I347K Field Evaluation of Woody Plant Materials – Brookings, South Dakota**

PLOT LOCATION = plot location of the plant material within the evaluation

ACCESSION NUMBER = any accession number, PI number or cultivar name assigned to the plant material

PLANT SYMBOL = plant symbol of the genus and species (asterisk indicates the symbol is not official)

GENUS/SPECIES = common name and scientific name of the plant material

ORIGIN/SOURCE = origin and/or source of the plant material

TRANS DATE = month and day the plant material was transplanted at the evaluation site

YR PLT = year the plant materials were transplanted at the evaluation site

YR REC = year of record

MATL PLTD = type of material planted, PLBR = bareroot, CONT = containerized

NO PLTS = number of plants planted in the plot

NO SRV = number of plants surviving

PCT SRV = percent of plants surviving

VI = plant vigor (1=excellent, 3=good, 5=fair, 7=poor, 9=very poor)

CAN COV (ft) = canopy cover measured in feet

PLT HT (ft) = plant height measured in feet

Table BR-2.

Study No.: NDPMC-T-0201-CP, Field Evaluation of Woody Plant Materials, Brookings, SD

Year of Record: 2012

PLOT <u>LOCATION</u>	ACCESSION <u>NUMBER</u>	PLANT <u>SYMBOL</u>	GENUS/SPECIES <u>ORIGIN/SOURCE</u>	TRANS <u>DATE</u>	YR <u>PLT</u>	YR <u>REC</u>	MATL <u>PLTD</u>	NO <u>PLTS</u>	NO <u>SRV</u>	PCT <u>SRV</u>	CAN		PLT <u>HT</u>	<u>REMARKS</u>	
											<u>VI</u>	<u>(ft)</u>			
S1-1	9082889	PIMU80	mugo pine <i>Pinus mugo</i> Big Sioux Nursery, Watertown, SD	18-May 04	04	PLBR		5	4	80	5	0.9	1.1		
											4	1.0	0.7		replant 3
											3	1.4	0.8		1 open form
											3	2.5	2.1		
											3	4.4	3.5		
S1-2	9082891	PHOP	common ninebank <i>Physocarpus opulifolius</i> Big Sioux Nursery, Watertown, SD	18-May 04	04	PLBR		5	6	100	2	1.4	1.9		
											2	3.7	3.5		
											3	5.0	5.0		1 blight on leaves, 4 good seed
											3	7.5	5.9		light mildew, spot
											2	8.8	6.8		
S1-3	9082642	VILA	wayfaring bush <i>Viburnum lantana</i> Lincoln-Oakes Nursery, Bismarck, ND	18-May 04	04	PLBR		5	5	100	3	0.7	1.2		
											3	1.3	1.7		leaf burn on all
											3	2.0	2.6		
											4	3.4	4.3		highly variable
											5	4.8	5.2		red leaves 2
S1-4	9082887	HIRH80	seaberry <i>Hippophae rhamnoides</i> Lincoln-Oakes Nursery, Bismarck, ND	18-May 04	04	PLBR		5	5	100	3	0.9	2.2		
											3	1.9	2.9		
											3	3.3	4.1		
											3	6.4	6.2		1-2 female, 3-5 male
												8.8	7.8		berries 1,2; 3-5 male
S1-5	9082888	COAM3	American hazelnut <i>Corylus americana</i> Lincoln-Oakes Nursery, Bismarck, ND	18-May 04	04	PLBR		5	5	100	7	0.3	0.6		
											5	0.6	0.7		1 browsed off
											3	1.0	1.4		leaf burn on all
											4	2.0	2.5		highly variable
											4	3.6	3.6		
S1-6	Riverview Germplasm 9082687	RIAM	American black currant <i>Ribes americanum</i> Bix Sioux Nursery, Watertown, SD	18-May 04	04	PLBR		5	5	100	2	1.2	1.8		
											3	4.0	2.6		mildew spot on all
											3	5.0	3.2		1,2 blight, leaf drop
											3	6.2	3.8		
											3	5.4	4.6		

Study No.: NDPMC-T-0201-CP, Field Evaluation of Woody Plant Materials, Brookings, SD

Year of Record: 2012

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN		PLT HT	REMARKS
											COV	VI		
S1-7	9082746	RIMI	Missouri gooseberry <i>Ribes missouriense</i> Big Sioux Nursery, Watertown, SD	18-May	04	04	PLBR	5	5	100	3	1.8	1.7	
												3.1	2.5	red fall color on all
												3.8	3.3	3-5 some leaf drop, blight
												4.5	3.7	early leaf drop
												4.1	3.6	
S1-8	9082890	CORA6	gray dogwood <i>Cornus racemosa</i> Big Sioux Nursery, Watertown, SD	18-May	04	PLBR	5	5	100	4	0.8	1.3	3 browsed	
											1.4	1.9	leaf spot on 5	
											2.2	2.6	1,2,5 leaf spot	
											3.8	3.9	highly variable; 4 very leafy	
											4.2	4.6		
S1-9	9082738	CORA6	gray dogwood <i>Cornus racemosa</i> Lincoln-Oakes Nursery, Bismarck, ND	18-May	04	PLBR	5	5	100	2	1.1	2.4		
											1.9	2.8	leaf spot on 1 and 5	
											3.4	3.8	1 bad leaf spot	
											5.0	5.3		
											5.2	6.0	leaf spot on all	
S1-10	9076686	CRCH	roundleaf hawthorn <i>Crataegus chrysocarpa</i> Lincoln-Oakes Nursery, Bismarck, ND	18-May	04	PLBR	5	5	100	4	0.4	0.5	heavily browsed	
											0.7	1.3	browsed	
											1.0	2.0	1 white aphid	
											2.3	3.9		
											2.8	5.6		
S1-11	9091967	PRPE2	pin cherry <i>Prunus pensylvanica</i> Big Sioux Nursery, Watertown, SD	10-May	05			5	5	100	3	2.9	2.9	5 close spacing
												4.2	4.1	4,5 leaf spot
												4.3	5.0	
												7.8	7.1	deer rub 1,4; 5 close spacing
												5.8	6.5	
S2-1	9091976	VIDE	arrowwood viburnum <i>Viburnum dentatum</i> Lincoln-Oakes Nursery, Bismarck, ND	10-May	05			5	5	100	3	0.9	2.2	1 and 4 has fruit
												2.2	2.6	clean leaves, no disease
												3.1	3.3	no fruit
												4.9	5.0	1 clean leaves, some fruit
												5.8	5.7	

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PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN		PLT HT	REMARKS				
											COV VI	(ft)						
S2-2	9082711	EUBU6	winterberry	10-May	05			5	5	100	4	0.7	1.2					
			<i>Euonymus bungeanus</i>								06	5	100		4	1.1	1.5	
			Lincoln-Oakes Nursery, Bismarck, ND								07	5	100		4	2.1	2.7	
											09	5	100		4	4.7	3.9	
											11	5	100		5	5.1	3.9	
S2-3	9091975	AMLA9	serviceberry	10-May	05			5	5	100	4	0.9	1.9	leaves chewed on				
			<i>Amelanchier lamarckii</i>								06	5	100		3	3.0	2.9	
			Lincoln-Oakes Nursery, Bismarck, ND								07	5	100		2	3.9	3.8	
											09	5	100		2	6.6	7.1	
											11	5	100		3	8.2	8.7	
S2-4	9091971	PHME13	black chokeberry	10-May	05			5	5	100	3	1.5	2.1	fruit on all				
			<i>Photinia melanocarpa</i>								06	5	100		3	2.2	2.7	
			Bailey Nurseries, Inc.								07	5	100		2	2.7	3.3	
											09	5	100		3	4.7	4.6	
											11	5	100		3	5.5	5.9	
S2-5	9008183	PRVI	common chokecherry	10-May	05			5	5	100	3	0.7	2.5					
			<i>Prunus virginiana</i>								06	5	100		3	2.0	4.0	shot hole on all
			Lincoln-Oakes Nursery, Bismarck, ND								07	5	100		3	2.6	5.4	shot hole on all
											09	5	100		4	5.1	8.4	
											11	5	100		3	6.0	10.5	
S2-6	9091969	CAFR80	Russian peashrub	10-May	05			5	5	100	4	0.5	2.2					
			<i>Caragana frutex</i>								06	5	100		6	0.4	1.3	
			Big Sioux Nursery, Watertown, SD								07	5	100		6	0.5	1.5	deer browse on all
											09	5	100		4	1.2	2.4	1,2,5 browsed
											11	5	100		6	1.1	3.2	
S2-7	9019593	JUCO6	common juniper	2-May	06	CONT		5	5	100	3	2.6	0.8					
			<i>Juniperus communis</i>								07	5	100		2	3.9	0.8	
			Wilton Mine, ND/McKenzie FEP, ND								08	5	100		2	5.8	1.5	
											10	5	100		3	8.0	2.3	
											12	5	100		2	9.0	2.5	

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											COV VI	(ft)		
S2-8	9092054 'Silerscape'	ELAEA	Russian olive/silverberry hybrid <i>Elaeagnus X 'Jefmorg'</i> Lincoln-Oakes Nursery, Bismarck, ND	2-May 06	06	POTD		5	2	40	2	3.1	4.3	2,3,5 recently dead, canker?
											6	1.4	2.6	
											5	3.9	4.6	
											4	6.2	6.8	
											3	7.3	6.8	
S2-9	9092053	RHTY	staghorn sumac <i>Rhus typhina</i> Lincoln-Oakes Nursery, Bismarck, ND	2-May 06	06	PLBR		5	5	100	3	3.8	5.0	clean leaves, no disease
											5	4.8	6.2	
											3	8.9	8.9	
											5	8.2	8.8	
											2	4.3	5.9	
S2-10	9082739	OSVI	ironwood <i>Ostrya virginiana</i> Sertoma Park, Bismarck, ND USDA, NRCS, PMC, Bismarck, ND	May 07	07		5	5	100		0.7	1.4	rabbit damage 1,5	
										4	0.7	1.9		
										4	1.7	2.3		
										6	2.3	2.8		
S2-11	9091964	RHTR	skunkbush sumac <i>Rhus trilobata</i> Cave Hills, SD USDA, NRCS, PMC, Bismarck, ND	May 07	07		5	5	100	3	0.8	1.3	2,5 leafed and died; 4 weeping 3 deer browse; 4 prostrate prostrate	
										3	1.9	1.6		
										3	1.9	1.4		
										4	5.0	2.0		
S3-1	'Cathedral' 9092142	ULMUS	Siberian/Japanese elm cross <i>Ulmus X 'Cathedral'</i> S& B Nursery, Bismarck, ND (Bailey's)	May 07	07		5	5	100	4	1.6	8.6	no leaves on 1 animal damage on all 2,3 herb damage, multi-stems removed spring 2011	
											6.1	5.1		
											10.5	8.3		
											0			
S3-1	9094355	CODR	roughleaf dogwood <i>Cornus drummondii</i> Big Sioux Nursery, Watertown, SD	5-May	11		5	5	100	3	0.9	2.2		
										2	2.6	3.9		
S3-2	9012606	JUHO2	creeping juniper <i>Juniperus horizontalis</i> Golden Valley County, ND		08		5	5	100	3	2.1	0.4		
										3	4.0	0.5		
										2	4.5	0.5		
										2	5.0	0.5		

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											COV	VI						
S3-3	9094281	VIOPA2	American highbush cranberry	7-May	09			5	5	100	3	1.6	2.0					
			<i>Viburnum opulus</i> var. <i>americanum</i>								10	5	100		4	2.5	3.2	
			Big Sioux Nursery, Watertown, SD								11	5	100		4	3.6	4.1	
S3-4	'McKenzie' 323597	PHME13	black chokeberry					5	5	100	2	2.8	2.5					
			<i>Photinia melanocarpa</i>								09	5	100		2	4.2	3.7	all large fruit
			USDA, NRCS, PMC, Bismarck, ND								10	5	100		2	4.8	4.2	
											12	5	100		2	5.2	4.9	no fruit
S3-5	'Prairie Red' 9047203	PRUNU	hybrid plum					5	5	100	3	3.6	5.1	highly variable				
			<i>Prunus</i> sp.								09	5	100		3	4.3	6.3	
											10	5	100		4	4.6	6.9	
											12	5	100		3	6.2	7.9	seed all gone, if any
S3-6	9092141	VILE	nannyberry	May	07			5	5	100	2	0.5	1.4					
			<i>Viburnum lentago</i>								08	4	80		2	1.0	3.0	
			Schumacher's, Heron Lake, MN								09	5	100		4	2.2	3.7	
											11	5	100		3	3.7	6.0	
S3-7	9094333	SANIC4	common elderberry					5	5	100	3	0.7	1.1					
			<i>Sambucus nigra</i> ssp. <i>canadensis</i>								11	5	100		4	2.1	3.5	
			Big Sioux Nursery, Watertown, SD								12	5	100		3	3.0	3.8	3,5 no seed, cupping on new leav
S3-8	9092140	SOAL9	Korean mountain ash	May	07			5	5	100	6	0.4	1.2	rabbits 1,5; no leaves 1,4				
			<i>Sorbus alnifolia</i>								08	2	40			0.9	1.5	
			Big Sioux Nursery, Watertown, SD								09	2	40		6	1.9	2.3	
											11	2	40		6	2.0	2.8	
4-1	9094356	PICEA	Meyer spruce	5-May	11	CONT		5	5	100	3	1.1	1.3					
			<i>Picea meyeri</i>								12	5	100		2	1.2	1.3	
4-2	9076737	PRSE2	black cherry	5-May	11	CONT		5	5	100	5	0.9	1.6					
			<i>Prunus serotina</i>		12				5	100	1	3.6	4.5	1 multi-stem; 40% leaf spot 2				
			Big Sioux Nursery, Watertown, SD															

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**Year of Record: 2012**

PLOT	ACCESSION	PLANT	GENUS/SPECIES	TRANS	YR	YR	MATL	NO	NO	PCT	CAN	PLT		
LOCATION	NUMBER	SYMBOL	ORIGIN/SOURCE	DATE	PLT	REC	PLTD	PLTS	SRV	SRV	VI	(ft)	(ft)	REMARKS
4-3	9094400	PRCE	dwarf cherry <i>Prunus cerasus</i> Big Sioux Nursery, Watertown, SD	7-May	12	12	PLBR	5	5	100	1	0.3	3.6	3' shelters & watered 5/8/12
4-4	9092162	PRUNU	pie cherry <i>Prunus</i> sp. Harding County, SD USDA, NRCS, PMC, Bismarck, ND	7-May	12	12	PLBR	5	1	20	2	0.3	2.3	3' shelters & watered 5/8/12
4-5	9094406	ULAM	American elm <i>Ulmus americana</i> Schumacher's Nursery, Heron Lake, MN	7-May	12	12	PLBR	5	5	100	2	0.6	4.3	3' shelters
5-1	9094336	ACFR	Freeman maple <i>Acer x freemanii</i> Big Sioux Nursery, Watertown, SD	6-May	10	10	PLBR	5	5	100	3	0.5	1.5	
											4	3.0	4.2	
											2	5.4	6.5	all multi-stemmed
5-2	9094334	TIAM	American linden <i>Tilia americana</i> Big Sioux Nursery, Watertown, SD	6-May	10	10	PLBR	5	5	100	3	1.1	1.8	
											6	1.0	1.6	
											1	3.3	3.5	all multi-stemmed
5-3	9094335	TICO2	littleleaf linden <i>Tilia cordata</i> Big Sioux Nursery, Watertown, SD	6-May	10	10	PLBR	5	5	100	5	0.5	1.0	tip dieback on 1
											5	2.3	2.8	
											4	2.4	3.6	leaf rust 1,2,5; severe rust 4
5-4	9082892	POAL7	white poplar <i>Populus alba</i> Big Sioux Nursery, Watertown, SD	6-May	10	10	PLBR	5	5	100	3	1.9	3.4	
												7.1	6.9	
											1	9.9	8.3	many basal and root sprouts
5-5	9091968	GYDI	Kentucky coffeetree <i>Gymnocladus dioicus</i> Big Sioux Nursery, Watertown, SD	5-May	11	11	PLBR	5	5	100		0.6	0.7	
												1.1	1.1	weed competition

Study No.: NDPMC-T-0201-CP, Field Evaluation of Woody Plant Materials, Brookings, SD

Year of Record: 2012

PLOT LOCATION	ACCESSION NUMBER	PLANT SYMBOL	GENUS/SPECIES ORIGIN/SOURCE	TRANS DATE	YR PLT	YR REC	MATL PLTD	NO PLTS	NO SRV	PCT SRV	CAN		PLT HT	REMARKS
											COV	VI		
T2-1	Bridger Select 9078631	JUSC2	Rocky Mountain juniper <i>Juniperus scopulorum</i> USDA, NRCS, Bridger, MT	10-May	05			5	5	100	2	0.8	1.5	good color
											2	1.5	2.8	
											2	1.9	3.2	
											4	3.1	4.5	
											3	4.1	5.9	
T2-2	Hunter Germplasm 9081843	PIPO	ponderosa pine <i>Pinus ponderosa</i> USDA, NRCS, Bridger, MT	10-May	05			5	5	100	3	0.6	1.2	
											2	1.3	1.8	
											2	1.6	2.1	
											3	3.1	4.2	
											4	5.0	6.7	
Row 4	9094282	CEOC	hackberry <i>Celtis occidentalis</i> South Dakota source Big Sioux Nursery, Watertown, SD	8-May	09			4	4	100	4		3.8	in Tubex
											3		5.6	in Tubex
											3	4.1	7.2	
Row 4	'Oahe'	CEOC	hackberry <i>Celtis occidentalis</i> Big Sioux Nursery, Watertown, SD	8-May	09			5	5	100	3		3.0	in Tubex
											3		5.4	
											4	4.8	7.0	
Row 4	Prairie Harvest Germplasm 9034956 ND-3878	CEOC	hackberry <i>Celtis occidentalis</i> Polk County, MN	8-May	09			5	5	100	3		3.5	in Tubex
											3		4.8	
											4	2.5	5.7	1-replant

## **OFF-CENTER EVALUATION PLANTING: TECHNICAL REPORT 2011-2012**

Study NDPMC-P-1001-WI Lodgepole Pine Evaluation

Study Title: Field Evaluation of Woody Plant Materials

Objective: Evaluate various selected seed sources of lodgepole pine in both replicated and non-replicated field trials in western North and South Dakota. Data collection will document both species performance in windbreaks and seed source differences.

Introduction: Lodgepole pine (*Pinus contorta* var. *latifolia*) is a native conifer species known for its long, slender trunk and high, thin crown. It grows on a wide variety of soils but does best on medium-textured soils derived from coarse parent materials. Lodgepole pine may have potential as an additional tall tree species for conservation use in the western parts of North and South Dakota.

Cooperators: The USDA Natural Resources Conservation Services, Plant Materials Center (PMC), Bismarck, North Dakota, in cooperation with NRCS field offices located at Dickinson and Hettinger, ND, and Hot Springs, SD; Lake Angostura State Park, SD; NDSU Hettinger Research Extension Center (HREC), ND; and the Flying O Ranch near Hebron, ND.

Location: Flying O Ranch, NW1/4, sec. 3, T140N, R91W, Hebron, ND (non-replicated); Hettinger Research and Extension Center, Sec. 14, T129N, R96W, Hettinger, ND (replicated); and, Angostura State Park, Sec. 28, T8S, R6E, Hot Springs, SD (replicated).

Major Land Resource Area (MLRA): The sites are located in MLRA 54, the Rolling Soft Shale Plain; and MLRA 61, the Black Hills Foot Slopes.

Soils: The Hebron site is a fine sandy loam. The Hettinger site is an Arnegard silt loam, and the Hot Springs planting is on a Savo silt loam.

Climate: The average annual precipitation for MLRA 54 is 12 to 17 inches with an average freeze-free period of 110 to 135 days. The average annual precipitation for MLRA 61 is 15 to 18 inches with an average freeze-free period of 110 to 140 days.

### **Methods and Materials**

Assembly: Cones were collected from superior trees (Table LP-1) in a provenance study at the Agricultural Research Service, Northern Great Plains Research Lab at Mandan, North Dakota. Cones were processed at the Bismarck PMC and the seed was separated. Towner State Nursery (TSN) grew out seedlings of each source and provided them for the study.

**Table LP-1. Selected Seed Sources**

<b>Accession</b>	<b>Origin</b>	<b>Seedlings</b>
14107(107)	British Columbia (Jacobie Creek)	500+
14108(108)	British Columbia (Lac le Jeune)	45
14109(109)	British Columbia (Clearwater)	400
14070 (070)	Colorado (Routt National Forest - Salida)	100
13351-10 (1-10)	Montana (Beaverhead National Forest – Dillon)	125
14105 (105)	Saskatchewan (Cypress Hills Provincial Park)	75
MP-718	Mongolian Scotch Pine	PMC
MP-158	Mongolian Scotch Pine	PMC
PP	Ponderosa Pine	TSN

#### Planting Plan:

Replicated (2 sites) – One site each in western North Dakota (Hettinger REC) and South Dakota (Angostura State Park). Total number of trees at each site equals 3-plant plots x 5 randomized replications x 8 seed sources = 120 trees at each site, 15 of each accession. Accession MP-718 (Mongolian pine) was included as part of the replicated study. Ponderosa pine was included as a standard of comparison.

Non-replicated (1 site) – The one non-replicated site in western North Dakota near Hebron had 5-plant plots for each entry. Accession 108 was not included due to stock shortages. Ten entries of accession 109 were included as a substitute for the missing accession 108. Ponderosa pine was used as a standard of comparison. A total of 40 trees were planted.

Plot Preparation: All three sites were cultivated. The Hebron site is near an existing windbreak by a farmstead. The trees were hand planted into weed barrier fabric. The Hettinger site is cropland on the outside of a deteriorating windbreak. The trees were hand planted into weed barrier fabric, and six-foot diameter by five-foot tall wire cages were placed around the trees to protect from deer. The area between the fabric strips was seeded to blue grama. The Angostura site is part of a recreation area. Trees were planted into six-foot wide bands of well tilled soil 3-foot fabric squares were placed around trees after planting.

Planting Dates: All plots were planted in the spring of 2008. The Hebron site was planted on May 16; the Hettinger site on May 12; and the Angostura site on May 14.

Irrigation: The trees are not irrigated.

#### Evaluations and Measurements:

2008: Survival, vigor ratings, and height measurements were taken the end of the growing season in 2008. See Tables LP-2 (Hebron), LP-5 (Hettinger), and LP-8 (Angostura) for 2008 evaluation data. Initial survival was greater than 80% at all sites. Vigor ratings were in the average range (3-5), and height averaged approximately .75 to 1 foot. Trees at Angostura State Park were browsed repeatedly by deer and killed during the fall and winter. Approximately 75% of the lodgepole pines were damaged and 50% of the ponderosa pines.

2009: Replacements at Angostura State Park were planted on May 15, 2009, in the first three replications. Most of the trees replanted in replications four and five were ponderosa pine. Animal repellent was sprayed on all the trees after replanting. Cages were later installed on the first three replications (south two rows). See Table LP-3 for 2009-2010 data collected at the Hebron site and Table LP-6 for 2009-2010 data collected at the Hettinger site. See Table LP-9 for 2009 data collected at Angostura State Park.

2010: Dead and missing plants in the spring were replanted at all sites to either Mongolian pine or ponderosa pine. Many of the plants at Hettinger had a major flush of annual weed growth in the hole of the fabric and on the edge. The heaviest infestations were removed, and granular Preen (trifluralin) was applied and incorporated by hand. Replacements at Hot Springs were planted in early June. Rainfall conditions were again good to excellent at the three sites. Dense growth of Russian thistle again provided protection from deer at Hebron. Overall, the plants were not vigorous at Hot Springs, and the 3-foot fabric squares may not provide adequate weed control in the sod. See Table LP-3 for 2009-2010 data collected at the Hebron site; Table LP-6 for 2009-2010 data collected at the Hettinger site; and Table LP-10 for 2010 data collected at Angostura State Park near Hot Springs, SD.

2011: Evaluations were completed. There was very good survival at Hettinger. The one time application of Preen was quite effective. Some Siberian elm has become established in the fabric openings. Seeding between fabric strips continues to be sparse, but the research center is controlling weeds effectively with mowing. No evaluations were conducted at Hebron. Tree growth rates and vigor continue to decline at Angostura. Brome has regrown to fabric edges. Plants where water can apparently pond are not doing well. Deer continue to decimate trees not protected with wire cages. See Table LP-4 for 2011-2012 data collected at the Hebron site; Table LP-7 for 2011-2012 data collected at the Hettinger site; and Table LP-11 for 2011-2012 data collected at Angostura State Park near Hot Springs, SD.

2012: This was a dry year at all three sites. Angostura was experiencing severe drought. Trees at Angostura continued to die. Dense brome was growing at edges of fabric squares and from many of the fabric openings. Some accessions have died completely. The Angostura location supports other research findings that 3-foot fabric squares

do not provide adequate weed control. Russian thistle had diminished at the Hebron site, replaced by dense stands of brome. Brome formed robust contiguous bands along the edges of the fabric and from many of the fabric openings. It appears the dense brome has hindered tree growth, resulting in the death of some. The planting at Hettinger is doing well. No additional mortality. Good growth on all. Factors favoring these good results include good weed control with the fabric, good weed control between the rows with the blue grama and mowing, and the fact of being planted on one of the better soils in the region. At evaluation time, the lodgepole pine exhibited a very dark green color. The ponderosa pine showed a green/grey color cast while the Mongolian Scots pine exhibited a yellow/green cast. Similar to what is found in the wild and what was observed at the ARS provenance test, 5-10% of the lodgepole pine at Hettinger showed tip damage from *Petrova luculentana* (pine pitch nodule maker). Unless this insect damages an apical tip it should have minimal impact on the planting.

See Table LP-4 for 2011-2012 data collected at the Hebron site; Table LP-7 for 2011-2012 data collected at the Hettinger site; and Table LP-11 for 2011-2012 data collected at Angostura State Park near Hot Springs, SD. For a graphical summary of the findings after five years, refer to Figures LP-1 through LP-4. For more specific details on overall heights, vigor, and survival, refer to Tables LP-2 through LP-11. Similar to findings in other studies, five years of data show that Scots pine grows the fastest, with survival rates similar to ponderosa pine. Both the lodgepole pine and the ponderosa grow at about the same rate, but lodgepole pine has a bit less survival percentage and is less able to exist with dense sod weed pressure.

**Table LP- 2. Lodgepole pine evaluation study, planted in 2008 near Hebron, North Dakota. Data collected 8/24/2008.**

*Thin diagonal stripe means dead plant at 2008 evaluation.*

Accession	Plant No.	Survival	Vigor 1= best 9 =worst	Height (ft)	Remarks
70	1	x	4.00	1.00	
70	2	x	4.00	1.00	
70	3	x	3.00	0.75	
70	4	x	3.00	1.00	
70	5	x	3.00	1.00	
105	1	x	4.00	0.75	
105	2	x	3.00	0.50	
105	3	x	3.00	0.50	
105	4	x	3.00	0.50	
105	5	x	5.00	0.50	
PP	1	x	4.00	1.00	
PP	2	<del>dead</del>	<del>9.00</del>	<del>1.00</del>	
PP	3	x	4.00	0.75	
PP	4	x	3.00	0.75	
PP	5	x	3.00	0.75	
107	1	x	3.00	0.75	
107	2	<del>dead</del>	<del>9.00</del>	<del>1.00</del>	
107	3	x	4.00	1.00	
107	4	x	4.00	1.00	
107	5	<del>dead</del>	<del>9.00</del>	<del>1.00</del>	
MP-158	1	x	3.00	1.00	
MP-158	2	x	3.00	1.00	
MP-158	3	x	4.00	1.25	terminal bud browsed
MP-158	4	x	3.00	1.25	
MP-158	5	x	3.00	1.25	
109	1	x	3.00	0.75	
109	2	x	5.00	0.75	
109	3	x	3.00	0.75	
109	4	x	6.00	0.50	browsed
109	5	x	8.00	0.50	
109	6	x	3.00	0.75	
109	7	x	4.00	0.50	buds gone
109	8	<del>dead</del>	<del>9.00</del>	<del>1.00</del>	
109	9	x	3.00	0.50	
109	10	x	3.00	0.50	
1(10)	1	x	3.00	1.00	
1(10)	2	<del>dead</del>	<del>9.00</del>	<del>1.00</del>	
1(10)	3	x	3.00	1.00	
1(10)	4	x	2.00	1.00	
1(10)	5	x	3.00	1.00	

**Table LP-3. Lodgepole pine evaluation study, planted in 2008 near Hebron, North Dakota.  
Data was collected on September 23, 2009, and September 26, 2010.**

Accession No.	Plant No.	Survival	Vigor (1=highest, 9=poorest)		Height (ft)		Remarks (2009)
			2009	2010	2009	2010	
70	1	x	3	2	1.00	1.75	
	2	x	3	2	1.50	1.75	
	3	x	3	3	1.00	1.25	
	4	x	3	4	1.50	1.25	
	5	x	3	5	1.00	1.25	
105	1	x	4	2	0.75	1.25	
	2	x	4	2	0.75	1.50	
	3	x	3	2	0.75	1.00	
	4	x	3	2	1.00	1.25	
	5	x	5	5	0.50	0.50	browsed
PP	1	x	3	2	1.75	2.50	
	2	x	3	9	1.00	0.00	
	3	x	3	3	1.00	1.50	
	4	x	4	9	1.00	0.00	
	5	x	3	2	1.25	1.25	
107	1	x	4	2	1.75	2.00	browsed
	2	x	3	9	1.75	1.25	
	3	x	3	3	1.25	1.25	
	4	x	5	3	1.00	1.00	
	5	x	4	1	1.50	2.00	
MP-158	1	x	3	3	1.25	1.50	
	2	x	3	2	1.25	2.00	
	3	x	2	1	1.75	3.25	
	4	x	2	1	1.75	2.25	
	5	x	2	2	1.75	1.75	
109	1	x	3	9	1.50	0.00	
	2	x	2	2	1.50	2.00	
	3	x	4	3	0.75	1.25	
	4	dead	NA	NA	NA	NA	
	5	dead	NA	NA	NA	NA	
	6	x	3	2	1.00	2.00	
	7	x	3	9	0.75	0.00	
	8	x	3	3	1.50	1.25	
	9	x	4	1	1.00	2.25	
	10	x	4	1	1.00	2.00	
1(10)	1	x	4	4	1.75	1.00	
	2	x	4	9	1.75	0.00	
	3	x	2	2	1.75	2.25	browsed
	4	x	3	4	1.50	1.25	
	5	x	4	4	0.75	0.75	

**LP-4. Lodgepole pine evaluation study near Hebron, North Dakota. Evaluated 10/16/2012.**

*Thin diagonal stripe means replanted to original accession, spring 2009.*

*Vigor rating: 1-9; 1=best, 9=poorest*

Accession	Plant #	Vigor rating	Height (ft)	Width (ft)	Notes
070	1	2	2.5	1	
070	2	1	2.25	1.25	
070	3	1	2.5	2.25	
070	4	9			dead at 2' tall
070	5	6	1	0.5	dense brome and browse
105	1	4	1	0.5	
105	2	2	2	2.25	
105	3	1	2.25	1.5	
105	4	3	1.25	1.25	
105	5	9			dead, small needles still on
PP	1	2	2.75	2	
<del>PP</del>	2	9			dead
PP	3	9			dead
PP	4	9			dead
PP	5	2	3	1.75	
107	1	2	3.25	1.5	
<del>107</del>	2	9			dead
107	3	1	3.25	1.75	
107	4	9			dead
<del>107</del>	5	3	2	0.5	
MP 158	1	4	2.5	3	yellow needle tips
MP 158	2	3	4.5	3	
MP 158	3	3	3.25	2.5	double leader
MP 158	4	3	4	3.5	short needles, open canopy
MP 158	5	3	4.25	3.5	
<del>109</del>	1	9			dead
<del>109</del>	2	2	2.25	2.25	
109	3	9			dead
<del>109</del>	4	9			dead
<del>109</del>	5	9			dead
109	6	2	3.25	3	
109	7	9			dead
<del>109</del>	8	2	2	1.75	double leader
109	9	2	4.75	2.25	
109	10	2	4.5	3	
<del>1-10</del>	1	3	1.5	1.25	
<del>1-10</del>	2	9			dead
<del>1-10</del>	3	3	1.75	1.25	
<del>1-10</del>	4	9			dead
1-10	5	3	2	1	

There appears to be a strong correlation between dense weeds in the opening and reduced vigor and height. Dense weeds and sod are found in most all openings and along fabric edges. There is a hard-to penetrate soil layer at 3" depth.

**Table LP-5. Lodgepole pine evaluation (replicated) near Hettinger, North Dakota. Data taken on 09/24/2008.**

*Thin diagonal stripe means dead plant at 2008 evaluation.*

Rep	Accession	Plant #	Survived	Vigor (1-9) 1=best	Height (ft)	Remarks
1	70	1	x	3	1.25	
1	70	2	x	3	1.00	
1	70	3	x	2	1.00	
1	105	1	x	3	1.25	floppy
1	105	2	x	4	1.00	droopy needles
1	105	3	x	3	1.00	
1	108	1	x	4	0.75	
1	108	2	x	2	1.25	
1	108	3	x	3	1.00	
1	PP	1	x	4	1.00	big Russian thistle
1	PP	2	x	2	1.00	R. thistle and S. elm
1	PP	3	x	3	1.00	
1	107	1	x	3	1.25	
1	107	2	x	3	1.25	
1	107	3	x	2	1.50	
1	MP-718	1	x	4	1.25	
1	MP-718	2	x	3	1.25	
1	MP-718	3	x	3	1.25	
1	<del>109</del>	1	dead			
1	109	2	x	3	1.00	
1	109	3	x	3	1.00	
1	1(10)	1	x	3	1.25	
1	1(10)	2	x	3	1.25	
1	1-10	3	x	4	1.00	
2	70	1	x	3	1.00	
2	70	2	x	3	1.00	
2	70	3	x	3	1.00	
2	105	1	x	2	1.25	
2	105	2	x	3	1.25	
2	105	3	x	4	1.00	
2	108	1	x	3	1.25	
2	108	2	x	4	0.75	
2	108	3	x	4	0.75	
2	PP	1	x	3	1.00	
2	PP	2	x	3	1.00	
2	PP	3	x	4	1.00	
2	<del>107</del>	1	x	3	1.25	
2	<del>107</del>	2	dead			
2	107	3	x	3	1.25	
2	MP-718	1	x	3	0.75	
2	MP-718	2	x	4	1.00	
2	MP-718	3	x	4	1.00	
2	109	1	x	3	1.00	floppy
2	109	2	x	2	1.25	
2	109	3	x	3	1.25	
2	1(10)	1	x	3	1.75	
2	1(10)	2	x	3	1.25	
2	1(10)	3	x	4	1.50	

Rep	Accession	Plant #	Survived	Vigor (1-9) 1=best	Height (ft)	Remarks
3	70	1	x	4	1.25	
3	70	2	x	3	1.25	
3	70	3	x	4	1.00	
3	105	1	x	4	1.00	
3	<del>105</del>	2	dead			
3	105	3	x	4	1.00	Siberian elm seedlings
3	108	1	x	3	0.75	
3	108	2	x	3	1.00	
3	108	3	x	6	0.75	bud gone
3	PP	1	x	4	1.00	
3	PP	2	x	3	0.75	
3	PP	3	x	5	0.75	big Russian thistle
3	107	1	x	4	1.00	top dieback
3	107	2	x	3	1.25	
3	107	3	x	3	1.25	weeds in fabric opening
3	MP-718	1	x	4	1.25	big pigweed
3	MP-718	2	x	2	1.25	Russian thistles
3	MP-718	3	x	3	1.00	
3	109	1	x	6	0.75	
3	109	2	x	4	0.75	
3	<del>109</del>	3	dead			
3	1(10)	1	x	5	1.00	
3	1(10)	2	x	4	1.25	
3	1(10)	3	x	3	1.00	
4	70	1	x	3	1.00	
4	70	2	x	3	0.75	
4	70	3	x	3	1.25	
4	105	1	x	3	1.00	
4	105	2	x	3	1.25	
4	105	3	x	3	1.50	
4	108	1	x	3	0.75	
4	108	2	x	3	0.75	
4	108	3	x	3	0.75	
4	PP	1	x	3	0.75	big weed
4	PP	2	x	3	1.00	
4	PP	3	x	3	1.00	
4	MP-718	1	x	3	1.50	
4	MP-718	2	x	4	1.25	
4	MP-718	3	x	3	1.75	
4	107	1	x	4	1.50	
4	107	2	x	4	1.25	
4	107	3	x	4	1.25	
4	109	1	x	3	1.00	
4	<del>109</del>	2	dead			
4	109	3	x	3	1.00	
4	1(10)	1	x	3	1.25	
4	1(10)	2	x	3	1.00	
4	1(10)	3	x	3	1.00	
5	70	1	x	4	1.00	
5	70	2	x	3	1.00	
5	70	3	x	3	1.00	

Rep	Accession	Plant #	Survived	Vigor (1-9) 1=best	Height (ft)	Remarks
5	105	1	x	3	1.00	
5	105	2	x	2	1.00	
5	105	3	x	3	1.00	
5	108	1	x	3	0.75	
5	108	2	x	4	0.75	
5	108	3	x	3	1.00	
5	PP	1	x	3	1.00	big Russian thistle
5	PP	2	x	3	1.00	
5	PP	3	x	5	0.75	
5	107	1	x	3	1.25	
5	<del>107</del>	2	dead			
5	107	3	x	3	1.25	
5	MP-718	1	x	3	1.25	
5	MP-718	2	x	3	1.25	
5	MP-718	3	x	3	1.25	
5	<del>109</del>	1	dead			
5	109	2	x	3	1.00	
5	109	3	x	3	0.75	
5	1(10)	1	x	3	0.75	
5	<del>1(10)</del>	2	dead			
5	<del>1(10)</del>	3	dead			

**Table LP-6. Lodgepole pine evaluation (replicated) near Hettinger, North Dakota.**  
**Data was collected on September 23, 2009, and September 27, 2010. Replants in 2010 are**  
**of different sources.**

Accession No.	Plant No.	Survival	Vigor (1=highest, 9=poorest)		Height (ft)		Remarks (2009)
			2009	2010	2009	2010	
<b>Rep 1</b>							
70	1	x	3	3	1.25	2.00	
	2	x	4	3	1.25	1.75	
	3	x	NA	2	1.25	1.75	30% brown needles
105	1	x	3	1	1.25	2.25	
	2	x	3	1	1.50	2.00	good growth
	3	x	3	1	1.25	2.25	good growth
108	1	x	2	2	1.25	2.00	
	2	x	2	1	1.40	2.50	good growth
	3	x	4	3	1.00	1.25	stressed
PP	1	x	5	4	1.00	1.25	
	2	x	2	1	2.00	2.75	
	3	x	3	1	1.50	2.50	
107	1	x	2	1	1.75	2.75	good growth
	2	x	3	1	1.25	2.25	
	3	x	3	1	1.25	2.25	
MP-718	1	x	3	3	1.50	2.50	
	2	x	3	3	1.50	2.50	
	3	x	3	2	1.40	2.75	
109	1	x	3	3	1.50	2.00	
	2	x	3	2	1.50	2.50	
	3	x	4	2	1.50	2.00	exposed roots
1 (10)	1	x	4	2	1.25	2.00	
	2	x	2	1	1.75	3.00	
	3	x	4	3	1.25	2.00	
<b>Rep 2</b>							
70	1	x	3	1	1.50	2.50	
	2	x	2	1	1.75	2.75	
	3	x	3	3	1.50	2.25	
105	1	x	2	3	2.00	3.00	
	2	x	3	1	1.50	2.50	
	3	x	3	3	1.25	1.75	yellowish
108	1	x	4	4	1.25	1.75	bud gone
	2	x	4	3	1.50	2.00	
	3	x	4	3	1.25	3.00	
PP	1	x	4	2	1.50	2.50	
	2	x	4	2	1.50	2.25	
	3	x	3	2	1.50	2.25	

Accession No.	Plant No.	Survival	Vigor (1=highest, 9=poorest)		Height (ft)		Remarks (2009)
			2009	2010	2009	2010	
107	1	x	3	1	2.00	3.00	
	2	x	3	2	1.50	2.25	
	3	x	2	2	1.25	2.00	
MP-718	1	x	3	3	1.25	3.00	
	2	x	3	3	1.50	2.25	
	3	x	4	4	1.25	1.25	
109	1	x	3	3	1.50	2.75	
	2	x	2	1	1.75	2.75	
	3	x	4	2	1.25	2.00	
1 (10)	1	x	3	3	2.00	2.25	
	2	x	4	2	1.50	2.25	
	3	x	3	2	1.50	2.25	
Rep 3							
70	1	x	4	2	1.25	1.75	dense Russian thistle
	2	x	3	1	1.50	2.25	dense Russian thistle
	3	x	4	2	1.25	2.25	dense Russian thistle
105	1	x	4	1	1.25	1.75	dense Russian thistle
	2	x	4	2	1.25	1.75	dense Russian thistle
	3	x	4	2	1.00	1.75	dense Russian thistle
108	1	x	4	2	1.00	2.50	dense Russian thistle
	2	x	3	1	1.75	2.25	dense Russian thistle
	3	x	4	4	1.25	1.75	dense Russian thistle
PP	1	x	4	3	1.25	1.75	dense Russian thistle
	2	x	4	2	1.50	2.25	dense Russian thistle
	3	x	5	3	1.00	1.25	dense Russian thistle
107	1	x	3	2	1.75	3.00	dense Russian thistle
	2	x	2	1	2.25	3.25	dense Russian thistle
	3	x	3	2	1.50	2.25	dense Russian thistle
MP-718	1	x	2	3	1.75	2.75	dense Russian thistle
	2	x	2	3	1.75	2.50	dense Russian thistle
	3	x	3	4	1.50	2.00	dense Russian thistle
MP 157	1	x	(Repl)	3	(Repl)	1.50	dense Russian thistle
109	2	x	4	2	1.00	1.25	dense Russian thistle
	3	x	4	1	1.25	1.75	dense Russian thistle
MP 158	1	x	(Repl)	2	(Repl)	1.50	dense Russian thistle
PP	2	x	(Repl)	3	(Repl)	0.75	dense Russian thistle
1 (10)	3	x	(Repl)	1	(Repl)	2.50	
Rep 4							
70	1	x	6	3	1.00	1.25	
	2	x	4	2	1.00	1.75	
	3	x	4	1	1.25	2.25	

Accession No.	Plant No.	Survival	Vigor (1=highest, 9=poorest)		Height (ft)		Remarks (2009)
			2009	2010	2009	2010	
105	1	x	3	1	1.50	2.25	
	2	x	2	1	2.00	3.25	
	3	x	3	1	1.50	2.25	
108	1	x	5	3	1.00	1.00	
	2	x	5	2	1.25	1.75	
	3	x	5	1	1.25	2.25	
PP	1	x	6	2	0.75	1.75	
	2	x	6	4	1.00	1.25	
	3	x	4	2	1.00	2.00	
MP-718	1	x	3	2	1.50	2.35	
	2	x	3	3	1.75	1.25	dense Russian thistle
	3	x	3	3	1.75	2.50	dense Russian thistle
107	1	x	4	1	1.50	2.50	dense Russian thistle
	2	x	6	2	1.25	1.25	dense Russian thistle
MP 157	3	x	(Repl)	2	(Repl)	1.50	dense Russian thistle
109	1	x	4	1	1.25	1.50	dense Russian thistle
	2	x	3	1	1.50	2.00	dense Russian thistle
	3	x	4	2	1.25	1.50	dense Russian thistle
1 (10)	1	x	3	1	1.75	2.25	dense Russian thistle
	2	x	4	1	1.50	2.25	dense Russian thistle
	3	x	5	2	1.25	1.75	dense Russian thistle
Rep 5							
70	1	x	6	2	1.25	1.50	brown needles
	2	x	6	1	1.25	1.50	no bud
	3	x	6	1	1.50	1.50	dense Russian thistle
MP 156	1	x	(Repl)	2	(Repl)	1.50	dense Russian thistle
MP 157	2	x	(Repl)	1	(Repl)	1.25	brown needles
105	3	x	5	4	1.50	1.00	dense Russian thistle
MP 157	1	x	(Repl)	2	(Repl)	1.25	dense Russian thistle
MP 154	2	x	(Repl)	1	(Repl)	1.50	dense Russian thistle
MP 157	3	x	(Repl)	1	(Repl)	1.25	dense Russian thistle
PP	1	x	4	1	1.50	1.50	dense Russian thistle
	2	x	4	1	1.25	1.50	dense Russian thistle
	3	x	4	4	1.25	1.50	dense Russian thistle
107	1	x	(Repl)	2	(Repl)	1.50	dense Russian thistle
	2	x	4	2	1.25	2.25	dense Russian thistle
	3	x	3	1	1.75	2.75	dense Russian thistle
MP-718	1	x	2	2	2.00	2.75	dense Russian thistle
	2	x	2	3	2.00	2.75	dense Russian thistle
	3	x	2	3	2.00	2.75	dense Russian thistle

Accession No.	Plant No.	Survival	Vigor (1=highest, 9=poorest)		Height (ft)		Remarks (2009)
			2009	2010	2009	2010	
109	1	x	3	1	1.50	2.50	dense Russian thistle
	2	x	4	1	1.75	2.50	dense Russian thistle
	3	x	5	5	1.00	1.00	
1 (10)	1	x	4	1	1.50	2.75	
	2	x	3	1	1.25	2.25	
	3	x	2	1	1.75	2.25	

**Table LP-7. Lodgepole pine evaluation (replicated) near Hettinger, North Dakota. 2011 and 2012 data**

indicates replanted accession as of 2010

\*\* Accession column lists all replant sources from 2008 and 2009 as well as originals. No further replants unless planted by owners.

Vigor rating (1-9): 1=best, 9=poorest

Site	Rep	Accession as of 2010**	Plant #	5/27/2011			10/16/2012			2012 Notes
				Vigor rating	Height (ft)	% brown top	Vigor rating	Height (ft)	Width (ft)	
Hettinger	1	070	1	3	2.25	15%	2	3.00	1.75	yellow with brown tips
Hettinger	1	MP-154	2	3	2.00	15%	2	2.75	1.75	
Hettinger	1	070	3	2	2.00	15%	4	3.75	2.00	
Hettinger	1	105	1	2	2.75	10%	2	4.25	3.00	
Hettinger	1	105	2	3	2.50	10%	2	3.25	2.50	
Hettinger	1	105	3	1	2.75	10%	2	4.25	2.75	
Hettinger	1	108	1	2	2.25	5%	2	3.50	2.25	
Hettinger	1	108	2	1	3.00	5%	2	5.00	3.75	
Hettinger	1	108	3	2	1.50	5%	2	2.75	1.25	
Hettinger	1	PP	1	3	1.25	10%	2	2.50	1.50	
Hettinger	1	PP	2	2	3.00	10%	2	5.75	4.50	
Hettinger	1	PP	3	2	2.75	10%	2	5.75	3.50	
Hettinger	1	107	1	1	3.25	< 5%	2	5.00	4.75	5% dead limbs
Hettinger	1	107	2	1	2.75	< 5%	3	4.75	2.50	
Hettinger	1	107	3	1	3.00	< 5%	1	4.75	3.50	
Hettinger	1	MP-718	1	1	3.00	< 5%	4	5.50	4.00	yellow needles
Hettinger	1	MP-718	2	1	3.00	< 5%	4	5.00	3.75	yellow needles
Hettinger	1	MP-718	3	1	3.25	< 5%	3	6.00	4.00	yellow needles
Hettinger	1	109	1	1	2.50	0%	2	4.25	3.50	
Hettinger	1	109	2	1	3.00	0%	2	5.00	4.00	
Hettinger	1	109	3	1	2.50	0%	2	4.75	3.00	
Hettinger	1	1-10	1	1	2.50	0%	2	5.50	3.00	
Hettinger	1	1-10	2	1	3.50	0%	2	5.50	4.50	
Hettinger	1	1-10	3	2	2.25	0%	2	4.75	3.25	
Hettinger	2	070	1	1	2.75	< 5%	2	4.75	2.75	
Hettinger	2	070	2	1	3.25	< 5%	2	6.00	3.75	
Hettinger	2	070	3	1	2.75	< 5%	2	4.75	2.50	

				5/27/2011			10/16/2012			
Site	Rep	Accession as of 2010**	Plant #	Vigor rating	Height (ft)	% brown top	Vigor rating	Height (ft)	Width (ft)	2012 Notes
Hettinger	2	105	1	2	3.50	0%	2	6.00	4.00	
Hettinger	2	105	2	1	3.00	0%	2	4.75	3.00	
Hettinger	2	105	3	3	3.00	0%	2	3.00	2.50	
Hettinger	2	108	1	5	2.00	10%	2	3.25	2.50	
Hettinger	2	108	2	3	2.25	10%	2	4.25	3.00	
Hettinger	2	108	3	3	2.25	10%	2	3.75	2.75	
Hettinger	2	PP	1	2	2.50	10%	2	5.00	3.75	
Hettinger	2	PP	2	2	2.50	10%	2	4.50	2.75	
Hettinger	2	PP	3	2	2.25	10%	2	4.75	4.50	
Hettinger	2	107	1	2	3.50	10%	2	5.00	3.50	
Hettinger	2	107	2	2	2.75	10%	2	4.25	3.00	
Hettinger	2	107	3	2	2.50	10%	2	4.00	2.75	
Hettinger	2	MP-718	1	4	2.75	20%	4	4.50	3.25	pale green with yellow tips
Hettinger	2	MP-718	2	3	2.50	20%	4	4.75	3.00	pale green with yellow tips
Hettinger	2	MP-718	3	4	2.00	20%	4	4.00	2.75	pale green with yellow tips
Hettinger	2	109	1	3	3.25	10%	5	4.75	4.00	30% laterals with live base and 6" dead tips
Hettinger	2	109	2	2	3.25	10%	3	5.00	4.50	10% laterals with live base and 6" dead tips
Hettinger	2	109	3	2	2.25	10%	3	4.25	3.00	5% laterals with live base and 6" dead tips
Hettinger	2	1-10	1	4	2.50	25%	4	4.00	3.25	20% laterals with live base and 6" dead tips
Hettinger	2	1-10	2	3	2.75	25%	3	4.25	2.25	5% laterals with live base and 6" dead tips
Hettinger	2	1-10	3	4	2.25	25%	3	4.00	3.25	
Hettinger	3	070	1	2	2.25	< 5%	2	3.75	2.75	
Hettinger	3	070	2	2	2.75	< 5%	2	5.25	3.25	grasshoppers ate 90% of needles on candle
Hettinger	3	070	3	2	2.50	< 5%	2	4.25	3.25	
Hettinger	3	105	1	2	2.00	< 5%	2	3.25	3.00	
Hettinger	3	105	2	2	2.00	< 5%	2	3.25	2.50	
Hettinger	3	105	3	2	2.00	< 5%	2	3.50	2.50	
Hettinger	3	108	1	3	3.00	< 5%	2	5.00	3.75	
Hettinger	3	108	2	1	2.75	< 5%	2	5.25	3.50	
Hettinger	3	108	3	3	1.75	< 5%	2	3.25	2.00	
Hettinger	3	PP	1	2	1.75	< 5%	2	4.25	3.00	

				5/27/2011			10/16/2012			
Site	Rep	Accession as of 2010**	Plant #	Vigor rating	Height (ft)	% brown top	Vigor rating	Height (ft)	Width (ft)	2012 Notes
Hettinger	3	PP	2	2	2.25	< 5%	2	5.25	2.75	
Hettinger	3	PP	3	3	1.25	< 5%	2	2.75	2.00	
Hettinger	3	107	1	3	3.50	< 5%	2	5.25	3.25	
Hettinger	3	107	2	2	3.75	< 5%	2	6.00	4.25	
Hettinger	3	107	3	3	2.75	< 5%	2	4.00	3.00	
Hettinger	3	MP-718	1	3	3.00	15%	3	4.75	3.00	yellow needles
Hettinger	3	MP-718	2	3	2.75	15%	3	5.00	3.00	yellow needles
Hettinger	3	MP-718	3	4	2.25	15%	3	4.00	3.00	yellow needles
Hettinger	3	MP-157	1	3	1.75	10%	5	3.50	2.25	pocket gopher under tree and yellow needles
Hettinger	3	109	2	4	1.75	10%	2	3.00	2.00	
Hettinger	3	109	3	4	2.25	10%	2	4.25	3.00	
Hettinger	3	MP-158	1	2	1.50	15%	3	3.25	2.25	5% laterals with live base and 6" dead tips
Hettinger	3	PP	2	3	1.00	15%	3	2.50	1.25	
Hettinger	3	1-10	3	3	3.00	15%	3	4.50	2.25	
Hettinger	4	070	1	4	1.50	20%	2	3.00	1.75	
Hettinger	4	070	2	3	2.00	20%	2	3.25	2.25	
Hettinger	4	070	3	2	2.75	20%	1	4.25	2.50	
Hettinger	4	105	1	2	2.75	10%	2	4.50	3.00	
Hettinger	4	105	2	2	3.75	10%	2	5.25	4.00	
Hettinger	4	105	3	2	2.25	10%	2	4.25	3.25	
Hettinger	4	108	1	5	1.00	20%	3	1.75	1.00	5% laterals with live base and 6" dead tips
Hettinger	4	108	2	3	2.25	20%	2	4.00	2.50	
Hettinger	4	108	3	3	2.75	20%	3	4.25	2.75	
Hettinger	4	PP	1	2	1.75	0%	3	3.75	2.75	smooth brome on edge of fabric
Hettinger	4	PP	2	5	1.25	0%	5	1.75	1.25	smooth brome on edge of fabric
Hettinger	4	PP	3	2	2.00	0%	3	4.00	3.00	smooth brome on edge of fabric
Hettinger	4	MP-718	1	2	2.50	20%	3	4.25	3.50	yellow needles
Hettinger	4	MP-718	2	4	1.50	20%	3	3.50	2.25	yellow needles
Hettinger	4	MP-718	3	3	3.00	20%	3	4.75	2.50	yellow needles
Hettinger	4	107	1	2	2.50	< 5%	4	3.50	1.50	limbs only on southeast side
Hettinger	4	107	2	3	1.25	< 5%	3	2.00	1.00	

				5/27/2011			10/16/2012			
Site	Rep	Accession as of 2010**	Plant #	Vigor rating	Height (ft)	% brown top	Vigor rating	Height (ft)	Width (ft)	2012 Notes
Hettinger	4	MP-157	3	3	1.75	< 5%	4	3.25	2.25	yellow needles
Hettinger	4	109	1	3	2.00	< 5%	3	2.75	1.75	
Hettinger	4	109	2	2	2.50	< 5%	2	3.75	3.00	bindweed
Hettinger	4	109	3	2	2.00	< 5%	3	3.00	2.25	bindweed
Hettinger	4	1-10	1	4	2.25	10%	3	3.50	1.75	bindweed
Hettinger	4	1-10	2	3	2.75	10%	4	4.00	2.25	bindweed
Hettinger	4	1-10	3	3	2.00	10%	4	4.00	1.75	bindweed
Hettinger	5	MP-154	1	2	1.75	0%	3	2.75	1.75	bindweed
Hettinger	5	MP-158	2	2	2.00	0%	3	3.75	2.75	bindweed
Hettinger	5	070	3	2	2.00	0%	2	3.50	1.25	bindweed
Hettinger	5	MP-156	1	3	1.75	10%	3	3.75	2.25	bindweed
Hettinger	5	MP-157	2	3	1.50	10%	4	2.25	1.50	bindweed
Hettinger	5	105	3	5	1.00	10%	7	1.00	0.50	bindweed
Hettinger	5	MP-157	1	2	1.50	0%	3	3.25	2.00	bindweed yellow needles
Hettinger	5	MP-154	2	2	1.75	0%	3	3.50	2.00	bindweed yellow needles
Hettinger	5	MP-157	3	3	1.50	0%	3	3.00	1.75	bindweed yellow needles
Hettinger	5	PP	1	3	1.50	0%	2	3.25	1.75	bindweed
Hettinger	5	PP	2	2	1.75	0%	2	3.25	2.50	bindweed
Hettinger	5	PP	3	4	1.50	0%	3	3.00	2.25	bindweed
Hettinger	5	UNKNOWN	1	3	1.75	10%	3	3.75	2.00	bindweed plus thistle
Hettinger	5	107	2	1	2.75	10%	2	4.25	2.50	bindweed
Hettinger	5	107	3	2	3.25	10%	3	4.75	2.75	bindweed 5% laterals with live base and 6" dead tips
Hettinger	5	MP-718	1	2	3.00	< 5%	2	5.00	3.75	bindweed yellow needles
Hettinger	5	MP-718	2	2	3.00	< 5%	3	4.75	4.00	bindweed yellow needles
Hettinger	5	MP-718	3	2	3.00	< 5%	3	5.00	4.00	bindweed yellow needles
Hettinger	5	109	1	3	3.00	10%	4	5.25	2.75	bindweed
Hettinger	5	109	2	3	3.00	10%	3	4.75	2.25	bindweed 15% laterals with live base and 6" dead tips
Hettinger	5	109	3	5	1.25	10%	4	1.75	1.00	bindweed
Hettinger	5	1-10	1	2	3.00	< 5%	2	4.75	2.75	
Hettinger	5	1-10	2	2	2.50	< 5%	2	4.75	3.25	
Hettinger	5	1-10	3	2	3.00	< 5%	2	5.25	3.25	

**Table LP-8. Lodgepole pine evaluation planted in 2008 at Angustora State Park near Hot Springs, South Dakota. Data was collected on October 31, 2008.**

Accession No.	Plant No.	Survival	Vigor (1 = highest, 9=poorest)	Height (ft)	Remarks
<b>Rep 1</b>					
70	1	dead	-	0.75	dead needles
70	2	x	6	1.00	
70	3	x	8	0.75	
105	1	dead	-		
105	2	x	7	1.00	
105	3	dead	-		
108	1	x	5	1.00	
108	2	dead	-		
108	3	x	4	1.00	
PP	1	x	4	1.25	
PP	2	x	3	1.25	
PP	3	x	3	1.25	
107	1	x	5	1.25	
107	2	x	5	1.25	needles at top only
107	3	x	5	1.25	needles at top only
MP-718	1	x	3	1.25	
MP-718	2	x	3	1.00	
MP-718	3	x	3	1.00	
109	1	x	4	1.50	
109	2	x	7	1.00	leader browsed
109	3	dead	-		
1 (10)	1	x	6	1.00	
1 (10)	2	x	7	0.75	
1 (10)	3	x	8	1.00	
<b>Rep 2</b>					
70	1	x	7	1.00	
70	2	x	8	1.00	
70	3	x	8	1.00	
105	1	dead	-		
105	2	dead	-		
105	3	dead	-		
108	1	x	5	0.75	
108	2	x	6	0.75	
108	3	x	6	1.00	
PP	1	x	2	1.50	
PP	2	x	3	1.00	
PP	3	x	3	1.00	
107	1	x	4	1.25	
107	2	x	5	1.50	needles on top only
107	3	x	6	1.25	
MP-718	1	x	4	1.25	
MP-718	2	x	4	1.25	
MP-718	3	x	5	1.00	

Accession No.	Plant No.	Survival	Vigor (1 = highest, 9=poorest)	Height (ft)	Remarks
109	1	x	6	1.00	
109	2	dead	-		
109	3	x	9	0.75	
1 (10)	1	x	6	0.75	
1 (10)	2	x	5	1.50	needles on top only
1 (10)	3	dead	-		
Rep 3					
70	1	x	9	0.50	
70	2	x	5	0.75	
70	3	x	6	1.00	
105	1	dead	-		
105	2	dead	-		
105	3	dead	-		
108	1	x	5	0.75	
108	2	x	3	0.75	
108	3	dead	-		
PP	1	x	3	1.25	
PP	2	x	4	1.00	
PP	3	x	3	1.00	
107	1	dead	-		
107	2	x	8	1.00	pulled out partially
107	3	dead	-		
MP-718	1	x	3	1.00	
MP-718	2	x	2	1.25	
MP-718	3	x	2	1.25	
109	1	x	4	1.00	
109	2	x	6	1.50	
109	3	dead	-		
1 (10)	1	x	4	1.25	
1 (10)	2	dead	-		
1 (10)	3	x	4	1.00	
Rep 4					
70	1	x	5	1.00	
70	2	dead	-		
70	3	x	5	1.00	
105	1	x	6	1.75	
105	2	x	6	0.75	
105	3	x	6	1.00	
108	1	x	9	0.50	
108	2	dead	-		
108	3	dead	-		
PP	1	x	2	1.25	
PP	2	x	3	1.00	
PP	3	x	3	1.00	
107	1	x	4	1.25	
107	2	x	6	1.00	

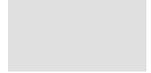
Accession No.	Plant No.	Survival	Vigor (1 = highest, 9=poorest)	Height (ft)	Remarks
107	3	x	5	1.25	
MP-718	1	x	4	1.25	
MP-718	2	x	4	1.75	leader browsed
MP-718	3	x	3	1.00	
109	1	x	6	1.25	
109	2	x	6	1.00	
109	3	dead	-		
1 (10)	1	x	7	1.00	
1 (10)	2	x	9	1.00	
1 (10)	3	dead	-		
Rep 5					
70	1	x	5	1.00	
70	2	x	6	1.00	
70	3	x	6	1.00	
105	1	x	3	0.75	
105	2	dead	-		
105	3	dead	-		
108	1	x	4	1.00	
108	2	x	3	0.75	
108	3	x	3	0.75	
PP	1	x	4	1.00	
PP	2	x	4	1.25	
PP	3	x	4	1.25	
107	1	x	7	1.25	
107	2	x	8	1.00	
107	3	dead	-		
MP-718	1	x	3	1.00	
MP-718	2	x	3	1.25	
MP-718	3	x	3	1.50	
109	1	x	6	0.75	
109	2	x	7	1.00	
109	3	dead	-		
1 (10)	1	x	7	1.00	
1 (10)	2	dead	-		
1 (10)	3	x	6	1.25	

**Table LP-9. Lodgepole pine evaluation at Angustora State Park near Hot Springs, South Dakota. Data was collected on 10/13/09. Most entries were replanted 5/6/09 due to deer damage. Protective cages were installed through most of replication 3 in 2009.**



= dead plant at 2009 inventory

= dead plant at 2008 inventory and replanted spring 2009



= original accession died between 2008 inventory and spring 2009; replanted to listed accession in spring 2009.

Rep	Accession	Plant #	Vigor (1-9) 1 = best; 9=worst	Height (feet)	Remarks
1	070	1	4	1.00	short with brown needles; protective cage
1	070	2	3	1.00	protective cage
1	070	3	4	1.25	very yellow but long needles; protective cage
1	105	1	4	1.00	protective cage
1	105	2	3	1.00	protective cage
1	105	3	2	1.00	protective cage
1	108	1	3	1.00	yellow but full; protective cage
1	108	2	4	0.75	short green needles; protective cage
1	108	3	2	0.00	protective cage
1	PP	1	3	1.25	protective cage
1	PP	2	4	1.00	laid over but alive; protective cage
1	PP	3	2	1.00	double leader; protective cage
1	107	1	9	0.00	protective cage
1	107	2	2	1.50	protective cage
1	107	3	9	0.00	protective cage
1	MP 158	1	3	1.50	protective cage
1	MP 718	2	4	0.50	only one branch not chewed; protective cage
1	MP 718	3	4	1.25	protective cage
1	109	1	9	0.00	protective cage
1	109	2	9	0.00	protective cage
1	109	3	2	1.75	protective cage
1	1-10	1	2	2.00	protective cage
1	1-10	2	2	1.50	protective cage
1	1-10	3	3	1.50	protective cage
2	070	1	3	1.00	protective cage
2	070	2	2	1.00	protective cage
2	070	3	9	0.00	protective cage
2	105	1	3	1.00	protective cage
2	105	2	9	0.00	protective cage
2	105	3	9	0.00	protective cage
2	108	1	3	1.25	protective cage
2	108	2	2	1.00	protective cage
2	108	3	3	1.00	protective cage
2	PP	1	3	1.00	protective cage
2	PP	2	3	1.25	protective cage
2	PP	3	3	1.00	protective cage

Rep	Accession	Plant #	Vigor (1-9) 1 = best; 9 = worst	Height (feet)	Remarks
2	107	1	9	0.00	protective cage
2	107	2	9	0.00	protective cage
2	107	3	2	1.25	protective cage
2	MP 158	1	3	1.50	protective cage
2	MP 158	2	3	1.50	protective cage
2	MP 718	3	4	0.75	protective cage
2	109	1	3	2.00	protective cage
2	<del>109</del>	2	<del>2</del>	<del>1.50</del>	protective cage
2	109	3	3	1.25	protective cage
2	1-10	1	2	2.00	protective cage
2	1-10	2	2	1.25	protective cage
2	<del>1-10</del>	3	<del>2</del>	<del>1.50</del>	protective cage
3	070	1	3	1.00	protective cage
3	070	2	3	1.00	protective cage
3	070	3	3	0.75	protective cage
3	<del>105</del>	1	<del>9</del>	<del>0.00</del>	protective cage
3	<del>105</del>	2	<del>9</del>	<del>0.00</del>	protective cage
3	<del>105</del>	3	<del>3</del>	<del>0.75</del>	protective cage
3	108	1	3	1.00	protective cage
3	108	2	3	1.00	protective cage
3	<del>108</del>	3	<del>4</del>	<del>0.50</del>	protective cage
3	PP	1	4	1.00	protective cage
3	PP	2	5	1.00	protective cage
3	PP	3	4	1.00	protective cage
3	<del>107</del>	1	<del>2</del>	<del>1.00</del>	protective cage
3	107	2	2	1.00	protective cage
3	<del>107</del>	3	<del>3</del>	<del>1.00</del>	protective cage
3	MP 158	1	3	1.50	no protective cage
3	MP 718	2	4	1.50	no protective cage
3	MP 718	3	4	1.00	no protective cage
3	109	1	5	1.50	very yellow; no protective cage
3	109	2	3	1.50	no protective cage
3	<del>109</del>	3	<del>3</del>	<del>1.75</del>	no protective cage
3	1-10	1	4	1.50	all yellow; no protective cage
3	<del>1-10</del>	2	<del>3</del>	<del>1.75</del>	no protective cage
3	1-10	3	4	1.00	no protective cage
4	PP	1	2	1.00	no protective cage
4	PP	2	<del>2</del>	<del>1.25</del>	no protective cage
4	PP	3	3	1.25	no protective cage
4	PP	1	2	1.25	no protective cage
4	PP	2	2	1.25	no protective cage
4	PP	3	3	0.75	no protective cage
4	PP	1	2	1.00	no protective cage

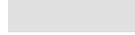
Rep	Accession	Plant #	Vigor (1-9) 1 = best; 9 = worst	Height (feet)	Remarks
4	PP	2	2	1.00	no protective cage
4	PP	3	2	1.25	no protective cage
4	PP	1	4	1.00	no protective cage
4	PP	2	4	1.00	2 plants in one hole or double leader; no cage
4	PP	3	3	1.00	no protective cage
4	PP	1	4	1.00	no protective cage
4	PP	2	3	1.00	no protective cage
4	PP	3	4	0.75	no protective cage
4	PP	1	2	1.00	no protective cage
4	PP	2	3	1.00	no protective cage
4	PP	3	3	0.75	no protective cage
4	PP	1	2	1.25	no protective cage
4	PP	2	6	0.25	only one live branch; no protective cage
4	PP	3	4	0.75	no protective cage
4	PP	1	2	1.00	no protective cage
4	PP	2	3	0.75	no protective cage
4	PP	3	2	0.75	no protective cage
5	PP	1	3	0.75	no protective cage
5	PP	2	3	1.00	no protective cage
5	PP	3	5	1.00	very bent; no protective cage
5	PP	1	3	1.00	no protective cage
5	PP	2	3	0.75	no protective cage
5	PP	3	5	1.00	no protective cage
5	PP	1	4	1.00	no protective cage
5	PP	2	4	1.00	no protective cage
5	PP	3	3	1.00	no protective cage
5	PP	1	5	1.00	no protective cage
5	PP	2	4	1.00	no protective cage
5	PP	3	4	1.25	no protective cage
5	PP	1	4	1.00	no protective cage
5	PP	2	4	1.00	no protective cage
5	PP	3	3	0.25	no protective cage
5	PP	1	2	1.00	no protective cage
5	MP 718	2	5	1.00	no protective cage
5	PP	3	3	1.00	no protective cage
5	PP	1	3	1.00	no protective cage
5	PP	2	3	1.00	no protective cage
5	PP	3	5	0.75	no protective cage
5	PP	1	3	0.75	no protective cage
5	PP	2	4	0.75	no protective cage
5	PP	3	4	1.00	no protective cage

**Table LP-10. Lodgepole pine evaluation at Angustora State Park near Hot Springs, South Dakota. Data was collected on 9/28/10. Replications 4 and 5 were replanted to ponderosa pine and are not included in this table.**

Accession No.	Plant No.	Survival	Vigor (1=highest, 9=poorest) 2010	Height (ft) 2010	Remarks 2010
Rep 1					
70	1	x	4	1.25	yellow foliage
	2	x	4	1.50	
	3	x	4	1.25	
105	1	x	8	1.00	2 green needles
	2	x	4	1.00	
	3	x	1	1.50	
108	1	x	4	1.50	
	2	x	7	0.75	
	3	dead	NA	NA	
PP	1	x	3	1.75	
	2	x	7	0.50	
	3	x	2	1.75	
107	1	x	4	1.50	
	2	x	3	2.00	
	3	dead	NA	NA	
MP 158	1	x	3	2.00	
MP 718	2	x	6	1.00	
MP 718	3	x	3	1.75	volunteer elm
109	1	x	5	1.75	
	2	x	5	1.50	
	3	x	3	2.25	
1 (10)	1	x	4	2.50	yellow foliage
	2	x	2	2.25	
	3	x	2	2.00	
Rep 2					
70	1	x	3	1.25	
	2	x	3	1.50	
	3	x	4	1.50	no cage, flood sediments
105	1	x	4	1.25	no id stake
	2	dead	NA	NA	no id stake
	3	dead	NA	NA	no id stake
108	1	x	2	1.50	flood sediments
	2	x	8	1.00	1 live limb
	3	x	3	1.25	
PP	1	x	4	1.25	
	2	x	3	1.50	
	3	x	3	1.00	

Accession No.	Plant No.	Survival	Vigor (1=highest, 9=poorest) 2010	Height (ft) 2010	Remarks 2010
107	1	dead	NA	NA	
	2	dead	NA	NA	
	3	x	1	1.75	
MP 158	1	x	3	2.25	
MP 158	2	x	4	2.00	yellow foliage
	3	x	5	1.00	yellow/brown foliage
109	1	x	3	2.25	
	2	x	3	2.00	
	3	x	8	2.25	
1 (10)	1	x	4	2.25	
	2	x	3	2.00	
	3	x	5	2.25	
Rep 3					
70	1	x	2	1.00	
	2	x	5	0.75	
	3	x	6	0.50	
105	1	x	8	1.75	few green needles
	2	x	8	1.50	few green needles
	3	x	5	1.25	yellow
108	1	x	3	1.50	
	2	x	3	1.25	
	3	dead	NA	NA	
PP	1	x	7	1.00	
	2	dead	NA	NA	
	3	x	6	1.00	
107	1	x	4	1.75	
	2	dead	NA	NA	
	3	x	5	1.25	
MP 158	1	x	4	1.00	
MP 718	2	x	4	1.50	
MP 719	3	x	3	2.00	
109	1	x	5	1.50	
	2	x	5	1.25	
	3	x	NA	NA	
1 (10)	1	x	5	1.25	
	2	x	NA	NA	
	3	x	NA	NA	

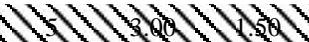
**Table LP-11. Lodgepole pine evaluation (replicated) at Angostura State Park near Hot Springs, South Dakota, 2011 and 2012 data.**

 original accession was replanted to listed accession in spring 2009.

Accessions marked **MP** were replanted to unknown accession of Mongolian pine by field staff on 5/14/2010.

 do not use the figures for analysis of accessions, since plant has been replaced with another unknown accession

Vigor rating: 1-9; 1=best, 9=worst

Site				5/26/2011		10/17/2012		
	Rep	Accession	Plant #	Vigor rating	Length (ft)	Vigor rating	Height (ft)	Width (ft)
Angostura	1	070	1	4	1.50	9		
Angostura	1	070	2	5	1.50	9		
Angostura	1	070	3	3	1.50	9		
Angostura	1	105	1	9		9		
Angostura	1	105	2	5	1.00	9		
Angostura	1	105	3	2	2.00	4	2.25	2.25
Angostura	1	108	1	3	1.75	5	1.75	1.00
Angostura	1	108	2	4	2.00	9		
Angostura	1	MP	3	4	2.00	9		
Angostura	1	PP	1	2	2.00	3	2.25	1.00
Angostura	1	PP	2	8	0.50	9		
Angostura	1	PP	3	7	2.00	3	2.50	2.00
Angostura	1	MP	1	6	1.75	9		
Angostura	1	107	2	2	2.25	9		
Angostura	1	107	3	9		9		
Angostura	1	MP 158	1	4	2.25	9		
Angostura	1	MP 718	2	9		9		
Angostura	1	MP 718	3	4	2.00	9		
Angostura	1	MP	1	6	1.75	9		
Angostura	1	MP	2	6	1.50	9		
Angostura	1	109	3	2	3.00	3	2.75	1.75
Angostura	1	1-10	1	3	3.00	3	3.25	1.75
Angostura	1	MP	2	3	2.75			
Angostura	1	MP	3	4	2.25			
Angostura	2	070	1	2	1.50	2	1.75	1.50
Angostura	2	070	2	3	1.75	4	1.75	1.50
Angostura	2	MP	3	8	1.50	9		
Angostura	2	MP	1	4	1.50	9		
Angostura	2	MP	2	9		9		
Angostura	2	105	3	9		9		
Angostura	2	108	1	4	1.50	3	2.00	1.25
Angostura	2	108	2	7	1.00	5	1.00	0.50
Angostura	2	108	3	3	1.50	3	1.75	1.00
Angostura	2	PP	1	5	1.25	8	1.25	0.50
Angostura	2	PP	2	4	1.75	3	1.75	1.25
Angostura	2	PP	3	4	1.25	9		

				5/26/2011		10/17/2012		
Site	Rep	Accession	Plant #	Vigor rating	Length (ft)	Vigor rating	Height (ft)	Width (ft)
Angostura	2	MP	1	9		9		
Angostura	2	107	2	9		9		
Angostura	2	107	3	2	2.50	9		
Angostura	2	MP 158	1	3	2.50	9		
Angostura	2	MP 158	2	4	2.25	9		
Angostura	2	MP 718	3	5	1.25	9		
Angostura	2	109	1	3	3.00	4	3.25	2.00
Angostura	2	109	2	4	2.25	9		
Angostura	2	109	3	9		9		
Angostura	2	1-10	1	5	2.75	5	2.50	1.25
Angostura	2	1-10	2	4	2.25	4	2.50	2.00
Angostura	2	1-10	3	6	2.75	9		
Angostura	3	070	1	4	1.75	9		
Angostura	3	070	2	9		9		
Angostura	3	070	3	9		9		
Angostura	3	MP	1	9		9		
Angostura	3	MP	2	9		9		
Angostura	3	105	3	8	1.50	9		
Angostura	3	108	1	4	1.75	9		
Angostura	3	108	2	5	1.50	9		
Angostura	3	108	3	9		9		
Angostura	3	PP	1	8	1.25	9		
Angostura	3	MP	2	9		9		
Angostura	3	PP	3	8	1.00	9		
Angostura	3	107	1	7	2.00	9		
Angostura	3	MP	2	9		9		
Angostura	3	107	3	9		9		
Angostura	3	MP 158	1	9		9		
Angostura	3	MP 718	2	9		9		
Angostura	3	MP 718	3	9		9		
Angostura	3	MP	1	9		9		
Angostura	3	MP	2	9		9		
Angostura	3	MP	3	9		9		
Angostura	3	1-10	1	8	1.50	9		
Angostura	3	MP	2	9		9		
Angostura	3	1-10	3	9		9		
Angostura	4	PP	1	4	1.75	9		
Angostura	4	PP	2	4	1.75	3	2.00	1.50
Angostura	4	PP	3	4	1.50	3	1.75	1.50
Angostura	4	PP	1	4	2.00	3	1.75	1.50
Angostura	4	PP	2	5	1.75	6	1.75	1.00
Angostura	4	PP	3	4	1.25	4	1.75	1.00
Angostura	4	PP	1	9		9		

				5/26/2011		10/17/2012		
Site	Rep	Accession	Plant #	Vigor rating	Length (ft)	Vigor rating	Height (ft)	Width (ft)
Angostura	4	PP	2	5	1.50	5	1.50	1.00
Angostura	4	PP	3	5	1.00	9		
Angostura	4	PP	1	4	1.25	5	1.75	1.00
Angostura	4	PP	2	9		9		
Angostura	4	PP	3	3	1.75	4	2.00	1.50
Angostura	4	PP	1	9		9		
Angostura	4	PP	2	9		9		
Angostura	4	PP	3	5	1.50	6	1.00	0.50
Angostura	4	PP	1	9		9		
Angostura	4	PP	2	9		9		
Angostura	4	PP	3	4	1.25	9		
Angostura	4	PP	1	4	2.00	6	2.00	1.25
Angostura	4	PP	2	9		9		
Angostura	4	PP	3	9		9		
Angostura	4	PP	1	8	0.25	9		
Angostura	4	PP	2	9		9		
Angostura	4	PP	3	8	0.75	6	1.00	0.50
Angostura	5	PP	1	9		9		
Angostura	5	PP	2	9		9		
Angostura	5	PP	3	8	0.75	8	1.00	0.25
Angostura	5	PP	1	9		9		
Angostura	5	PP	2	9		9		
Angostura	5	PP	3	9		9		
Angostura	5	PP	1	9		9		
Angostura	5	PP	2	9		9		
Angostura	5	PP	3	9		9		
Angostura	5	PP	1	9		9		
Angostura	5	PP	2	9		9		
Angostura	5	PP	3	9		9		
Angostura	5	PP	1	9		9		
Angostura	5	MP 718	2	9		9		
Angostura	5	PP	3	9		9		
Angostura	5	PP	1	9		9		
Angostura	5	PP	2	9		9		
Angostura	5	PP	3	9		9		
Angostura	5	PP	1	9		9		
Angostura	5	PP	2	9		9		
Angostura	5	PP	3	9		9		

Figure LP-1. 2012 Lodgepole pine survival summary by site and accession

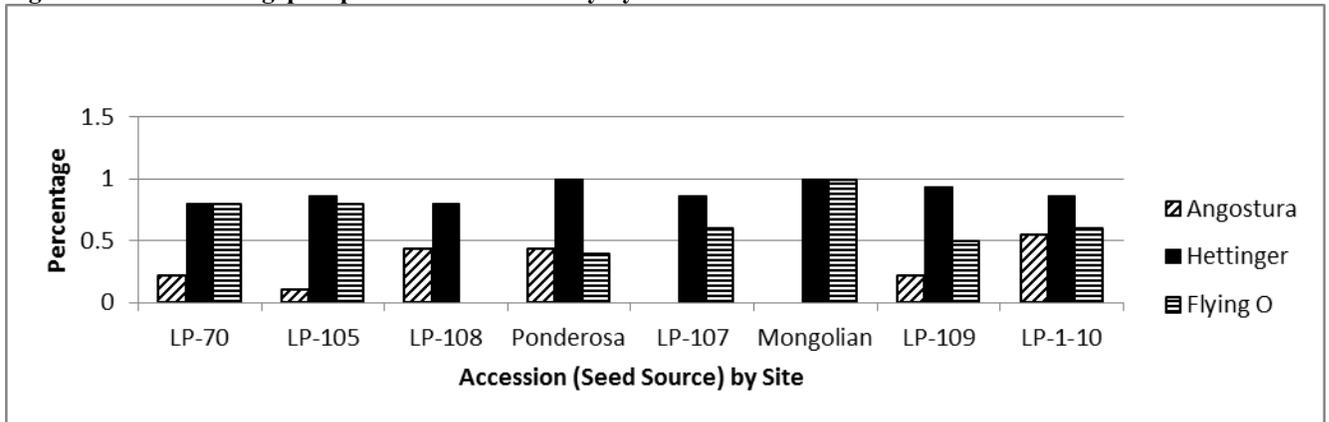


Figure LP-2. 2012 Lodgepole pine vigor summary by site and accession

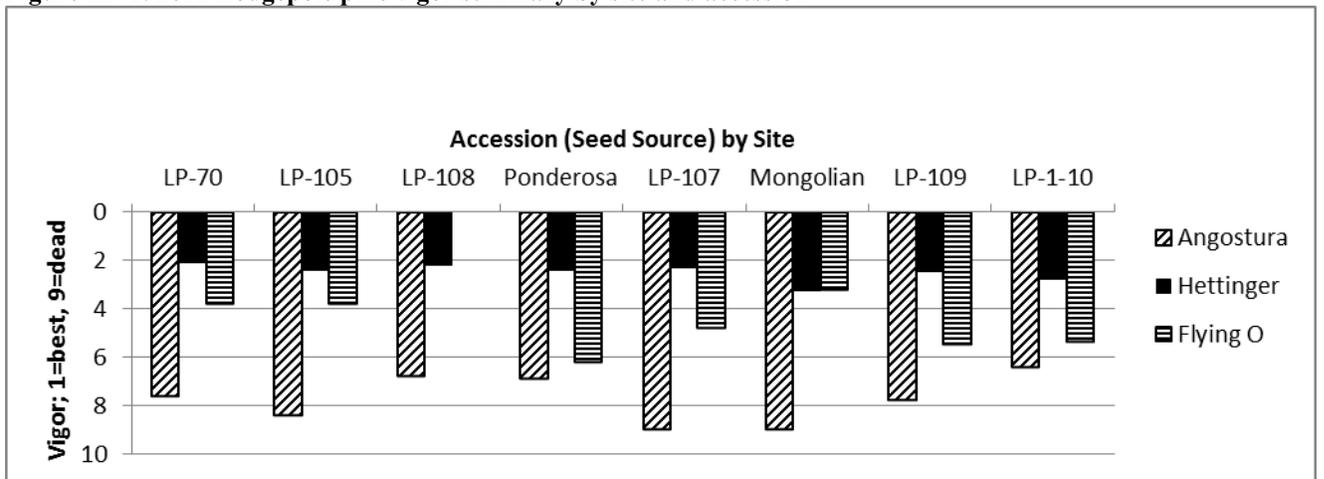


Figure LP-3. 2012 Lodgepole pine height summary by site and accession

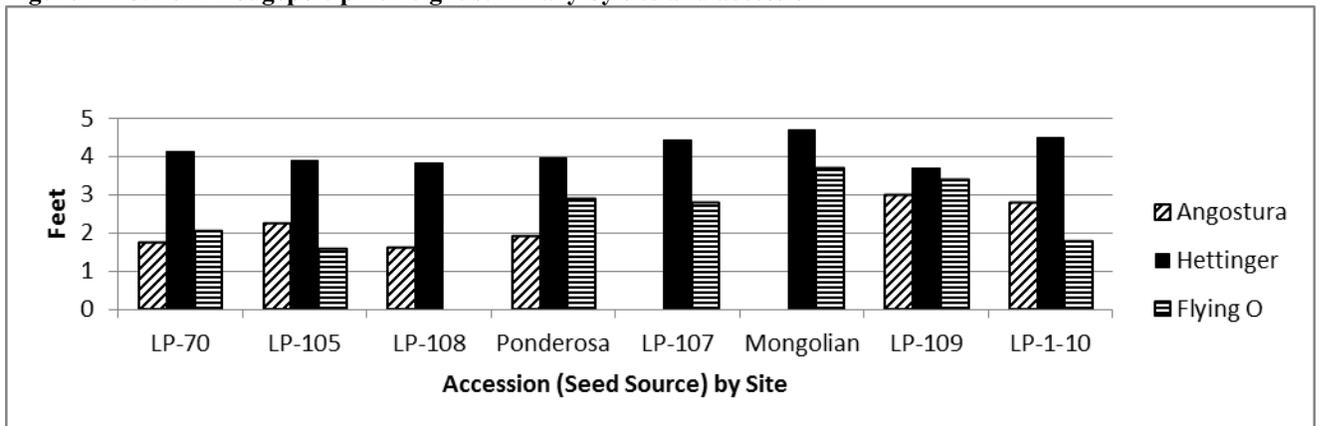
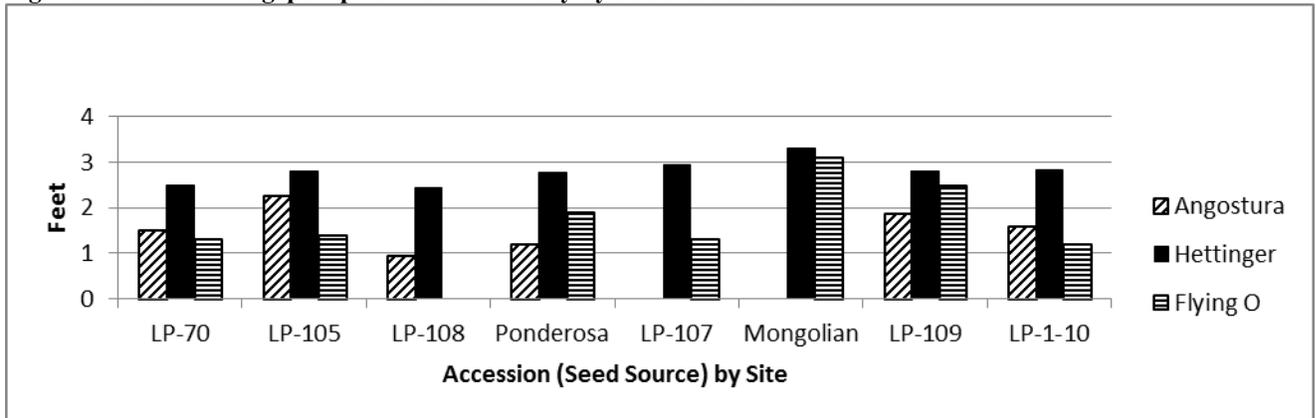


Figure LP-4. 2012 Lodgepole pine width summary by site and accession



## **ASSEMBLY AND INITIAL EVALUATION**

### **Major Seed Source Studies and Assemblies**

## **MAJOR SEED SOURCE STUDIES AND ASSEMBLIES: TECHNICAL REPORT 2011-2012**

### Study NDPMC-P-1102

Study Title: Evaluation of sandcherry

Objective: The purpose of this study is to evaluate and select improved source of sand cherry with increased fruit yield and longevity. Such plants would support local agroforestry markets of fruits and preserves while still being beneficial as a windbreak species and for wildlife. Once completed the study area could have been converted to a seed orchard.

Introduction: Western sandcherry *Prunus besseyi* is native from the central Great Plains to the Prairie Provinces. It exhibits inconsistent fruit yields and size across conservation plantings. Not all plants produce fruit each year.

Western sandcherry *Prunus besseyi* is found on rocky, cobbly sites, usually in sideslope positions. It does not compete with aggressive vegetation such as smooth brome, Kentucky bluegrass, crested wheatgrass or any of the suckering shrubs. Usually it is found on sites where some bare soil exists. It is often found in association with snowberry and poison ivy. Plants in the wild rarely have large fruit crops due in part to resident wildlife and rodents harvesting fruit before it is ripe. As with many *Prunus*, seed exhibits high incidences of seed weevil, sometimes exceeding 50% damaged seed.

Western sandcherry spreads slowly from basal sprouts. It does not sucker far from the plant. Some regeneration is from seed, especially in conservation plantings, if there is limited plant competition and appropriate bare soil. Eastern and northern seed sources might be *Prunus pumila* instead of *Prunus besseyi*.

Study Status: Seed from native sources and conservation plantings were to be planted into an initial evaluation nursery. Plants would have been selected for consistent high yields of large fruit. Fruit flavor could have been another selection criterion.

Due to changing priorities, staffing levels, land availability, normally short life of the plant, and funding, this study has been placed on hold. Seed had been collected in 2011 from 38 sites; 19 in ND, 3 in MT, 11 in SD, 1 in MN, and 4 in NE. Most seed collection came from conservation plantings. About 8 collections were from native stands.

From a Cornell web publication on sandcherry – “Superior clones selected were from the wild and used in a breeding program. As a result, the varieties Sioux, Brooks, and Black Beauty were released.” A question one should ask is, since the report was from Cornell, were the species actually selected *besseyi* or *pumila*. *Pumila* is the eastern sandcherry.

Pawnee Buttes, registered as a ground cover version is the only improved commercial variety available at this time (2011). There is also reference to a Hansen’s Dwarf cherry, which is a selection of *besseyi* that is available through Lawyers Nursery in Montana. Twenty four named releases have been identified, most from the early 20<sup>th</sup> century. Only the two discussed above remain available.

With the development of the sour cherries that continues today, there are many varieties of highly productive, edible fruit cherries on the market. Perhaps the need for a variety of sandcherry is quite small. Perhaps a more viable alternative would be to find commercial sour cherry varieties capable of withstanding conservation field conditions. Many of those varieties develop dense thickets. Depending upon varieties heights could reach ten feet. They produce large quantities of fruit. Ideally they should be propagated from seed to reduce costs.

The processed western sandcherry seed will be maintained with proper seed storage conditions at the Bismarck Plant Materials Center and will be available for future researchers. Our thanks go to those field office and other agency staff and individuals who helped with seed collection.

## **MAJOR SEED SOURCE STUDIES AND ASSEMBLIES: TECHNICAL REPORT – 2011-2012**

Study NDPMC-T-0008-WL

Study Title: Native Shrubs for Conservation, Skunkbush sumac *Rhus trilobata*

**Introduction:** Skunkbush sumac is a native shrub which has been used to a limited extent in wildlife plantings, as well as other conservation plantings. It has potential for use in riparian plantings. In 1979 the variety 'Bighorn' was released by the New Mexico PMC. This accession originated from Basin, Wyoming, where the precipitation is 6.7 inches. There is some indication Bighorn skunkbush sumac is affected by rust when planted in areas of higher precipitation.

**Objective:** The PMC would like to find a selection from the Dakotas, east of the Badlands. This species has been reported to occur as far east as Emmons County, ND. There is a need for a selection which is adapted to more humid climates than the original Bighorn source. Seed sources from the most northern and most eastern ecotypes will be collected.

**Cooperators:** USDA, NRCS Plant Materials Center and Lincoln-Oakes Nursery, Bismarck, ND.

**Species Description:** Skunkbush sumac is a deciduous, flowering native shrub. It grows 2 to 12 feet tall, but averages about 4 feet tall. It has a taproot and a fibrous root system. Roots are deep and extensively branched with somewhat shallow, spreading woody rhizomes. It sprouts readily from the root crown, especially after a severe disturbance. It is unlikely to reproduce vegetatively in the absence of disturbance. This sumac is reported to be dioecious. It is insect-pollinated. It reportedly has low seed production. It is estimated that only 5 to 15 percent of the flowers on the female plants actually produce seed. Acute drought may shorten twig growth and prevent fruit production. Sumac is tolerant of most soil textures, but prefers well-drained sites. It is intolerant of flooding and high-water tables.

**Collection/Assembly:** In September 1999, seed collections were made at 2 sites in the Cave Hills area of Harding County, SD. In September 2004, another collection was made, which was a composite of the two sites collected in 1999. In 2006, some collections were made in a number of locations, but possibly due to the drought, only small amounts were found. In South Dakota, seed was collected in Sully, Lyman, Todd, Ziebach, and Jones County. In North Dakota, seed was collected in Billings, Dunn, Slope, Golden Valley, and McKenzie County. One collection was also made in Powder River County, MT. In 2007, seed was collected in South Dakota from Corson and Sully Counties. North Dakota collections were from Dunn, McKenzie, Oliver, Slope, and Morton Counties.

Seedlings were grown of the Cave Hills collections. In the spring of 2001, only a few seedlings of 9082651 (north Cave Hills) were still alive. Survival of 9082653 (south Cave Hills) was much better. In 2003, seedlings of 9082653 were planted in the Off-Center Evaluation Plantings at Dickinson and Apple Valley. They are performing well.

Beginning on February 5, 2008, the seed lots collected in 2006 and 2007 were treated for 65 minutes with sulfuric acid. Following the acid treatment, the seed was cold stratified for 30 days, and the moved to the greenhouse. Table SS-1 lists the dates and numbers of plants emerged for each seed lot. Seed lots collected from the northern edge of the skunkbush sumac range in North Dakota had very poor germination. R.E. Farmer Jr. (1997) states that "pollination failure ... may be a common occurrence on the northern edge of a species' range." In 2009, seedlings were maintained in the lathhouse. At the end of the growing season, most accessions were tall enough to be planted in 2010. The height varied from 9 inches to 21 inches.

### **Plot Preparation:**

The site was clean tilled and plants were established in rows spaced 12 feet apart and a within row spacing of 8 feet.

### **Planting:**

Three-plant plots of 24 accessions of sumac were planted in three replications in May 2010 (see Figure SS-1). Most of these accessions were collected in 2006-2007. Several of the accessions planted in 2010 replaced original collections for which there were not sufficient plants. There were several other accessions that were short the

### Reference:

Farmer, R.E. Jr. 1997. Seed Ecophysiology of Temperate and Boreal Zone Forest Trees. DelRay, FL: St. Lucie Press. p.12

minimum number of nine plants. Riverview Germplasm American black currant was used fill to those few gaps in the planting.

#### Evaluations and Maintenance

2010: The sumac was evaluated in September. Notes were taken on survival, height, width and the presence of leaf spot. With above average rainfall and humidity this year, most of the plants had some leaf spot in 2010. In future evaluations, leaf diseases and fruit amount should be rated. Sumac does often produce a lot of fruit. If heavier producers could be found, selection could be made based on that characteristic.

#### 2011:

May: Seeded 10 pounds blue grama between the rows of sumac to control erosion and reduce maintenance time requirements.

Late May: Mowed the new grass. Blue grama is coming well in most places. There are scattered dense patches of wild lettuce and Canadian thistle with an increasing presence of kochia.

June 5: Replanted 3 accessions that were part of the study and 3 dead border plants. Each was replanted to the original accession. There are no more replacements of Todd County seed source (9092063). Nine American black currant were replaced with 'Konza' aromatic sumac, a named release from the Manhattan Plant Materials Center. The plant positions replanted to Konza were determined by drawing from a hat. Each replant received about 2 gallons of water. Skies were overcast with a light breeze. Later that afternoon temps dropped to the low 70's and received ½ inch rain.

Summer: Maintenance for remainder of the year was hoeing around each plant and mowing the blue grama. Plants have spread so much that only a push mower fits between plants. Old identification stakes were rotting off and replaced with embossed aluminum tags on fiberglass stakes.

July 15: Scored sumac with respect to disease presence.

August 12: Scored sumac with respect to disease presence. Since many of the leaves that were infected and yellowed before had fallen off, assumed half of previous score was added to presently observed score. Except for a few plants the incidence of disease did not increase much more than a single point (1=no disease present, 9=100% infected.)

November 1: Applied 1 teaspoon Casoron in a 2.5-ft diameter circle around each plant, including border rows to reduce hand hoeing needs around each plant.

#### 2012:

June 15: Applied 15 ml of Stinger in 3 gallons of water to 3000 square feet of plot. It took 5 batches of herbicide. Stinger was applied over top weeds and grasses and as a directed spray around the sumac avoiding sumac foliage as much as possible. Some sumac received a fair amount of Stinger as the plant was choked full of Canadian thistle.

July 5: Inventoried the entire planting. Generally, most plants showed 20-80% curled leaves, very similar to an herbicide injury. Several accessions showed fewer curled and small leaves. Generally, the north side of the plot had healthier looking plants. The Konza and several seed sources exhibited minimal herbicide damage symptoms. The Blue grama grass exhibited a yellow cast. The yellow cast on the blue grama may have been the impact of drought on a young seeding or the impact of clopyrilid on the warm season grass. Potential herbicide interactions are being discussed with the Dow Agro representative. Note: Lincoln-Oakes Nursery has applied Casoron to sumac for decades with no injury. "Sumac" is listed on the Transline (clopyrilid) label. Perhaps there is an interaction between the two chemicals or perhaps the sumac tested by Dow Agro was not skunkbush. Responses from Dow representative indicated "sumac" on Stinger label was probably 'Staghorn' as the studies were conducted in or around Virginia.

Fall: Clipped off Russian olive and other woody weeds treating stumps with 50% solution of Cornerstone.

December 21: Applied .024 lb casoron (150 lb/ac) in 3-foot diameter circles to all plants.

**Table SS-1. Skunkbush sumac seed source study (seed stratification schedule, following sulphuric acid treatment)**

lot #	accession	origin	insect holes in env.	medium	date start	date moved to greenhouse	date plants emerge	date of transplant	No.- April 1	Seed left (gr)	5/28/08 plants	Height Nov 08 (inches)
1	9092217	Corson Co., SD	x	potting soil	2/5/2008	3/11/2008	3/17/2008	3/31/2008	25	45.1	24	9
2	9092222	White Butte (Slope Co.)		potting soil	2/5/2008	3/11/2008	3/17/2008	3/31/2008	12	13.2	12	3.5
3	9092220	Sully Co., SD		potting soil	2/5/2008	3/11/2008	3/17/2008	3/31/2008	25	40	25	9
4	9092221	Arroda Lake (Oliver Co.)		potting soil	2/5/2008	3/11/2008					0	
5	BigHorn	Los Lunas PMC, NM		peat	2/5/2008	3/12/2008	3/18/2008	4/1/2008	13	25.6	13	10
6	9092218	Dunn Co., ND		peat	2/5/2008	3/12/2008	3/24/2008	4/1/2008	1		1	2.5
7	9092069	Powder River Co., MT	x	peat	2/5/2008	3/7/2008	3/12/2008	3/31/2008	25	11.6	25	2.5
8	9092128	Slope Co., ND	x	peat	2/6/2008	3/12/2008	3/20/2008	3/31/2008	5		5	4
9	9092068	McKenzie Co., ND		peat	2/6/2008	3/12/2008				3.4	1	2.5
10	9092067	Golden Valley Co., ND		peat	2/6/2008	3/12/2008	3/18/2008	4/1/2008	17	4	16	3
11	9092065	Jones Co., SD		peat	2/6/2008	3/14/2008	3/19/2008	4/1/2008	25	2	24	10
12	9092066	Billings Co., ND		peat	2/6/2008	3/14/2008	3/24/2008			7.5	8	5
13	9092064	Sully Co., SD		peat	2/6/2008	3/14/2008	3/20/2008	4/1/2008	25	10.4	20	5
14	9092058	Sully Co., SD		peat	2/6/2008	3/12/2008	3/18/2008	3/31/2008	25	16.7	25	7
15	9092059	Lyman Co., SD		peat	2/7/2008	3/18/2008	3/18/2008	4/1/2008	25	11.4	22	11
16	9092060	Todd Co., SD	x	peat	2/7/2008	3/20/2008	3/20/2008			4.8	14	9
17	9092130	Dunn Co., ND		peat	2/7/2008	3/19/2008	3/19/2008				9	2
18	9092063	Todd Co., SD	x	peat	2/7/2008	3/24/2008	3/24/2008	4/1/2008	25	15.3	25	8
19	9092062	Lyman Co., SD	x	peat	2/7/2008	3/11/2008	3/17/2008	3/31/2008	25	12.1	25	11
20	9092061	Ziebach Co., SD		peat	2/7/2008	3/14/2008	3/20/2008	4/1/2008	12		12	3
21	9092137	Dunn Co., ND		peat	2/7/2008	3/14/2008				3.6	0	
22	9092223	Morton Co., ND		peat	2/7/2008	3/14/2008	3/20/2008	4/1/2008	13		13	5
23	9092219	McKenzie Co., ND		peat	2/7/2008	3/14/2008	3/24/2008				10	8
24	9092129	Colorado		peat	2/7/2008	3/14/2008	3/20/2008	4/1/2008	1		1	19



**Table SS-2. Skunkbush sumac seed source study, performance data averaged 2010-2012**

Accession	Avg. Disease all plants by acc. 2012*	Accession	Avg. Vigor all plants by acc. 2012*	Accession	Avg % curled leaves by Acc 2012*	Accession	Avg width all plants by acc. 2012 (ft)	Accession	Avg height all plants by acc. 2012 (ft)
Konza	1.5	9094346	3.3	9009467	20	9094348	5.6	9092219	3.9
9092220	2.2	9092065	3.4	9092065	24	9094338	5.5	9094348	3.8
9092064	2.2	Konza	3.4	9094348	26	9092217	5.4	9094346	3.6
9092067	2.3	9092220	3.5	9094338	27	9092067	5.3	9092059	3.5
9092065	2.4	9092063	3.6	9094347	30	9092220	5.2	9094338	3.5
9092062	2.4	9094348	3.6	9092058	32	9094347	5.1	Bighorn	3.5
9092059	2.5	9094338	3.7	9094346	34	9092066	5	9092066	3.5
9009467	2.6	9092058	3.8	Konza	35	9092058	4.8	9094347	3.4
9094348	2.6	9092217	3.9	9092217	38	9092059	4.8	9092220	3.4
9092058	2.6	9092064	4	9092061	43	9092219	4.8	9092058	3.3
9094346	2.6	9094347	4	9092130	45	9092060	4.8	9092067	3.3
9092217	2.6	9092059	4.1	9092069	47	9094346	4.7	9092065	3.2
9092128	2.6	9092061	4.3	9092220	47	9092064	4.7	9092217	3.2
9094338	2.7	9092062	4.3	Bighorn	47	Bighorn	4.7	9092128	3.1
9092063	2.8	9092128	4.4	9092222	50	9092223	4.7	9092064	3
9092223	2.8	9092130	4.5	9092064	54	9092065	4.5	9092062	2.8
9092130	2.9	9092223	4.6	9092128	54	9092063	4.4	9092063	2.8
9092069	2.9	Bighorn	4.7	9092063	55	9092222	4.3	9092069	2.6
9092222	2.9	9092067	4.8	9092062	56	9092128	4.3	9092130	2.6
9092219	2.9	9092069	4.8	9092059	58	9092062	4.2	Konza	2.6
9092060	2.9	9092219	5	9092067	59	9092130	4	9092060	2.6
9092066	2.9	9092060	5.1	9092223	59	9092061	3.8	9092222	2.4
9094347	3.2	9092222	5.1	9092219	69	9092069	3.8	9092223	2.4
9092061	3.4	9009467	5.3	9092060	72	Konza	3.3	9092061	2.3
Bighorn	4	9092066	5.7	9092066	88	9009467	3.2	9009467	1.1

\*Low numbers are better. Scale is 1-9 (1= best vigor or no damage; 9= dead or about dead)

Note: Cupping and browning of leaf margins was noticed on most of the sumac and is reflected in Table SS-3.

Though differences between the top 50% of the seed sources were slight; Konza, a named release from the Manhattan Plant Materials Center and a source from Jones county, SD showed the best vigor, least disease, and least impact from a potential herbicide interaction. A seed source from Billings County, ND showed the most susceptibility to disease and herbicide injury and the lowest vigor of all seed sources. These plants have only grown for 3 years so further study is warranted before final conclusions are drawn. 2011 was extremely wet until mid-August. From that time through most of 2012 area precipitation was much below average..

**Table SS-3. Skunkbush sumac seed source study performance data, 2010-2012**

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Insect	Width	Height	% Curled brown leaves	Notes
9092061	1	1	1	2010 09 22	3	2			1.8	1.3		some leaf spot
9092061	1	1	1	2011 07 15		2						
9092061	1	1	1	2011 08 12		3						
9092061	1	1	1	2012 07 05	2	2		2			40	40% curled leaves
9092061	1	1	2	2010 09 22	3	2			2.6	1.6		some leaf spot
9092061	1	1	2	2011 07 15		3						
9092061	1	1	2	2011 08 12		5						
9092061	1	1	2	2012 07 05	3	2		2			60	60% curled leaves
9092061	1	1	3	2010 09 22	3	2			1.1	1.9		some leaf spot
9092061	1	1	3	2011 07 15		2						
9092061	1	1	3	2011 08 12		3						
9092061	1	1	3	2012 07 05	3	2		2			60	60% curled leaves
9092223	1	1	4	2010 09 27	4	2			1.8	1.1		disease more prevalent on interior and lower branches
9092223	1	1	4	2011 07 15		2						
9092223	1	1	4	2011 08 12		3						
9092223	1	1	4	2012 07 05	4	2		0	5.3	2.5	50	50% curled leaves possibly due to drought or herbicide
9092223	1	1	5	2010 09 27	4	2			2.2	1.8		disease more prevalent on interior and lower branches
9092223	1	1	5	2011 07 15		2						
9092223	1	1	5	2011 08 12		3						
9092223	1	1	5	2012 07 05	4	2		0	4.8	2.8	70	70% curled leaves possibly due to drought or herbicide
9092223	1	1	6	2010 09 27	4	2			2.4	1.4		disease more prevalent on interior and lower branches
9092223	1	1	6	2011 07 15		2						
9092223	1	1	6	2011 08 12		3						
9092223	1	1	6	2012 07 05	4	3		1	4.3	2	70	70% curled leaves possibly due to drought or herbicide
9092128	1	1	7	2010 09 27	3	6			1.8	1.6		disease more prevalent on interior and lower branches
9092128	1	1	7	2012 07 05	3	2		1			50	50% curled leaves possibly due to drought or herbicide
9092128	1	1	7	2012 07 15		2						
9092128	1	1	7	2012 08 12		3	2.6					
9092128	1	1	8	2010 09 27	3	1			2.3	2.1		disease more prevalent on interior and lower branches
9092128	1	1	8	2012 07 05	4	2		1			70	70% curled leaves possibly due to drought or herbicide
9092128	1	1	8	2012 07 15		2						

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Insect	Width	Height	% Curled brown leaves	Notes
9092128	1	1	8	2012 08 12		2						
Konza	1	1	9	2010 09 27								this spot had been planted to currant 20% curled leaves possibly due to drought or herbicide removed currant and replanted to Konza. Wanted to test Konza.
Konza	1	1	9	2012 07 05	6	2	1				20	
Konza	1	1	9	2012 07 15		1						
Konza	1	1	9	2012 08 12		1						
9094348	1	1	10	2010 09 27	2	1						10% curled leaves possibly due to drought or herbicide
9094348	1	1	10	2011 07 15		1						
9094348	1	1	10	2011 08 12		1						
9094348	1	1	10	2012 07 05	1	1		1	8	4.5	10	
9094348	1	1	11	2010 09 27	2	1						5% curled leaves possibly due to drought or herbicide
9094348	1	1	11	2011 07 15		1						
9094348	1	1	11	2011 08 12		1						
9094348	1	1	11	2012 07 05	1	1		1	6	4.5	5	
9094348	1	1	12	2010 09 27	3	2						10% curled leaves possibly due to drought or herbicide
9094348	1	1	12	2011 07 15		2						
9094348	1	1	12	2011 08 12		1						
9094348	1	1	12	2012 07 05	2	1		1	6.5	3.8	10	
9092130	1	2	1	2010 09 27	4	1			1.5	1.7		60% curled leaves possibly due to drought or herbicide
9092130	1	2	1	2011 07 15		2						
9092130	1	2	1	2011 08 12		3						
9092130	1	2	1	2012 07 05	3	1		1	2.8	2.3	60	
9092130	1	2	2	2010 09 27	4	1			1.8	2.1		20% curled leaves possibly due to drought or herbicide
9092130	1	2	2	2011 07 15		1						
9092130	1	2	2	2011 08 12		2						
9092130	1	2	2	2012 07 05	3	1		1	4.3	3.3	20	
Konza	1	2	3	2010 09 27	9							this spot had been planted to currant removed currant and replanted to Konza. Wanted to test Konza.
Konza	1	2	3	2011 07 15		1						
Konza	1	2	3	2011 08 12		1						
Konza	1	2	3	2012 07 05	4	1		1	4.5	2.8	40	
9092058	1	2	4	2010 09 27	4	2			1.6	1.9		
9092058	1	2	4	2011 07 15		2						

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092058	1	2	4	2011 08 12		2						
9092058	1	2	4	2012 07 05	3	2		1	5.8	4.3	50	50% curled leaves possibly due to drought or herbicide
9092058	1	2	5	2010 09 27	5	2			1.5	1.3		
9092058	1	2	5	2011 07 15		2						
9092058	1	2	5	2011 08 12		3						
9092058	1	2	5	2012 07 05	3	3		1	5.3	2.7	20	20% curled leaves possibly due to drought or herbicide
9092058	1	2	6	2010 09 27	4	2			2.8	1.8		
9092058	1	2	6	2011 07 15		2						
9092058	1	2	6	2011 08 12		3						
9092058	1	2	6	2012 07 05	3	2		1	5.8	3	30	30% curled leaves possibly due to drought or herbicide
9092220	1	2	7	2010 09 27	4	2			1.8	1.7		
9092220	1	2	7	2011 07 15		2						
9092220	1	2	7	2011 08 12		3						
9092220	1	2	7	2012 07 05	3	2		1	6.8	4.8		
9092220	1	2	8	2010 09 27	3	2			2.3	2.3		
9092220	1	2	8	2011 07 15		2						
9092220	1	2	8	2011 08 12		2						
9092220	1	2	8	2012 07 05	4	3		1	4	2.8		
9092220	1	2	9	2010 09 27	4	3			8.3	8.3		
9092220	1	2	9	2011 07 15		2						
9092220	1	2	9	2011 08 12		3						
9092220	1	2	9	2012 07 05	2	2		1	5.8	3.3		
9009467	1	2	10	2010 09 27	3	2			2.8	1.3		
9009467	1	2	10	2011 07 15		2						
9009467	1	2	10	2011 08 12		2						
9009467	1	2	10	2012 07 05	5	3		1			20	old affected leaves had fallen. New leaves not infected. 20% curled leaves possibly due to drought or herbicide
9009467	1	2	11	2010 09 27	3	2			4.4	0.7		
9009467	1	2	11	2011 07 15		2						
9009467	1	2	11	2011 08 12		2						
9009467	1	2	11	2012 07 05	5	3		1			20	old affected leaves had fallen. New leaves not infected. 20% curled leaves possibly due to drought or herbicide
9009467	1	2	12	2010 09 27	3	2			3.6	0.8		

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Insect	Width	Height	% Curled brown leaves	Notes
9009467	1	2	12	2011 07 15		2						old affected leaves had fallen. New leaves not infected. 60% curled leaves possibly due to drought or herbicide
9009467	1	2	12	2011 08 12		2						
9009467	1	2	12	2012 07 05	5	2		1			60	
9092064	1	3	1	2010 09 27	4	2			1.5	1.4		20% curled leaves possibly due to drought or herbicide
9092064	1	3	1	2011 07 15		2						
9092064	1	3	1	2011 08 12		2						
9092064	1	3	1	2012 07 05	5	1		1	3.8	2.8	20	
9092064	1	3	2	2010 09 27	4	2			2.5	1.8		40% curled leaves possibly due to drought or herbicide
9092064	1	3	2	2011 07 15		1						
9092064	1	3	2	2011 08 12		1						
9092064	1	3	2	2012 07 05	4	1		1	5	3	40	
9092064	1	3	3	2010 09 27	4	2			2.2	2.1		50% curled leaves possibly due to drought or herbicide
9092064	1	3	3	2011 07 15		2						
9092064	1	3	3	2011 08 12		2						
9092064	1	3	3	2012 07 05	4	1		1	5	3	50	
9092067	1	3	4	2010 09 27	4	2			1.6	1.5		60% curled leaves possibly due to drought or herbicide
9092067	1	3	4	2011 07 15		2						
9092067	1	3	4	2011 08 12		3						
9092067	1	3	4	2012 07 05	5	2		1	5.3	3.3	60	
9092067	1	3	5	2010 09 27	3	2			2	2.3		60% curled leaves possibly due to drought or herbicide
9092067	1	3	5	2011 07 15		2						
9092067	1	3	5	2011 08 12		3						
9092067	1	3	5	2012 07 05	4	1		1	5.8	4	60	
9092067	1	3	6	2010 09 27	4	2			1.6	1.7		60% curled leaves possibly due to drought or herbicide
9092067	1	3	6	2011 07 15		2						
9092067	1	3	6	2011 08 12		3						
9092067	1	3	6	2012 07 05	4	2		1	5	3	60	
9092069	1	3	7	2010 09 27	4	3			1.6	1.7		70% curled leaves possibly due to drought or herbicide
9092069	1	3	7	2011 07 15		2						
9092069	1	3	7	2011 08 12		2						
9092069	1	3	7	2012 07 05	5	1		1	4.8	2.8	70	

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092069	1	3	8	2010 09 27	4	3			1.9	1.9		
9092069	1	3	8	2011 07 15		2						
9092069	1	3	8	2011 08 12		3						
9092069	1	3	8	2012 07 05	3	2		1	4.8	3.5	20	20% curled leaves possibly due to drought or herbicide
9092069	1	3	9	2010 09 27	5	3			1.5	1.3		
9092069	1	3	9	2011 07 15		2						
9092069	1	3	9	2011 08 12		3						
9092069	1	3	9	2012 07 05	7	4		2	3.3	2.5	0	0% curled leaves possibly due to drought or herbicide
9094338	1	3	10	2010 09 27	3	2			2.7	2.5		
9094338	1	3	10	2011 07 15		2						
9094338	1	3	10	2011 08 12		3						
9094338	1	3	10	2012 07 05	2	2		1	6.5	3.8	10	10% curled leaves possibly due to drought or herbicide
9094338	1	3	11	2010 09 27	3	2			1.6	2.1		
9094338	1	3	11	2011 07 15		3						
9094338	1	3	11	2011 08 12		4						
9094338	1	3	11	2012 07 05	4	2		1	4.5	3.3	30	30% curled leaves possibly due to drought or herbicide
9094338	1	3	12	2010 09 27	2	2			2.8	3.2		
9094338	1	3	12	2011 07 15		2						
9094338	1	3	12	2011 08 12		2						
9094338	1	3	12	2012 07 05	3	2		1	6.5	4.5	10	10% curled leaves possibly due to drought or herbicide
9094347	1	4	1	2010 09 27	3	2			2.5	2.7		
9094347	1	4	1	2011 07 15		3						
9094347	1	4	1	2011 08 12		4						
9094347	1	4	1	2012 07 05	5	2		1	4.5	3.3	20	20% curled leaves possibly due to drought or herbicide
9094347	1	4	2	2010 09 27	3	2			2.1	2.3		
9094347	1	4	2	2011 07 15		3						
9094347	1	4	2	2011 08 12		4						
9094347	1	4	2	2012 07 05	4	3		1	5.8	4.3	60	60% curled leaves possibly due to drought or herbicide
9094347	1	4	3	2010 09 27	3	2			1.5	1.9		
9094347	1	4	3	2011 07 15		2						
9094347	1	4	3	2011 08 12		3						

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9094347	1	4	3	2012 07 05	4	3		1	4.8	3.5	40	40% curled leaves possibly due to drought or herbicide
9092219	1	4	4	2010 09 27		2			2.7	2.3		very "fine", thin leaves
9092219	1	4	4	2011 07 15		2						
9092219	1	4	4	2011 08 12		3						
9092219	1	4	4	2012 07 05	7	2		1	3.5	2.8	100	
9092219	1	4	5	2010 09 27		2			1.6	2		80% curled leaves possibly due to drought or herbicide
9092219	1	4	5	2011 07 15		2						
9092219	1	4	5	2011 08 12		3						
9092219	1	4	5	2012 07 05	6	2		1	5.5	4.5	80	
9092219	1	4	6	2010 09 27		2			1.6	2		sparse foliage
9092219	1	4	6	2011 07 15		3						
9092219	1	4	6	2011 08 12		5						
9092219	1	4	6	2012 07 05	5	2		1	4.8	4.5	60	
9092062	1	4	7	2010 09 27	3	2			2.1	2.2		5% curled leaves possibly due to drought or herbicide
9092062	1	4	7	2011 07 15		2						
9092062	1	4	7	2011 08 12		3						
9092062	1	4	7	2012 07 05	2	2		1	4.5	3.3	5	
9092062	1	4	8	2010 09 27	3	2			2.2	2.3		5% curled leaves possibly due to drought or herbicide
9092062	1	4	8	2011 07 15		2						
9092062	1	4	8	2011 08 12		3						
9092062	1	4	8	2012 07 05	2	2		1	6.3	3.3	5	
9092062	1	4	9	2010 09 27	4	2			1	1.3		100% curled leaves possibly due to drought or herbicide
9092062	1	4	9	2011 07 15		2						
9092062	1	4	9	2011 08 12		3						
9092062	1	4	9	2012 07 05	7	2		1	4.8	2.8	100	
9092063	1	4	10	2010 09 27	3	2			2.3	2.1		5% curled leaves possibly due to drought or herbicide
9092063	1	4	10	2011 07 15		3						
9092063	1	4	10	2011 08 12		4						
9092063	1	4	10	2012 07 05	3	2		1	5.3	3.5	5	
9092063	1	4	11	2010 09 27	3	2			2.3	1.8		
9092063	1	4	11	2011 07 15		2						

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092063	1	4	11	2011 08 12		4						
9092063	1	4	11	2012 07 05	3	2		1	5	3	5	5% curled leaves possibly due to drought or herbicide
9092063	1	4	12	2010 09 27	3	2			2.1	1.6		
9092063	1	4	12	2011 07 15		2						
9092063	1	4	12	2011 08 12		3						
9092063	1	4	12	2012 07 05	5	3		1	5	3	90	90% curled leaves possibly due to drought or herbicide
9092059	1	5	1	2010 09 27	3	4			2.2	2.4		
9092059	1	5	1	2011 07 15		2						
9092059	1	5	1	2011 08 12		3						
9092059	1	5	1	2012 07 05	5	3		1	4.5	3.3	60	60% curled leaves possibly due to drought or herbicide
9092059	1	5	2	2010 09 27	3	4			3.1	2.5		
9092059	1	5	2	2011 07 15		2						
9092059	1	5	2	2011 08 12		3						
9092059	1	5	2	2012 07 05	4	2		1	6.3	3.5	40	40% curled leaves possibly due to drought or herbicide
9092059	1	5	3	2010 09 27	3	4			1.2	2.7		
9092059	1	5	3	2011 07 15		3						
9092059	1	5	3	2011 08 12		4						
9092059	1	5	3	2012 07 05	3	2		1	5	4.3	40	40% curled leaves possibly due to drought or herbicide
9092060	1	5	4	2010 09 27	3	2			2.6	2.3		
9092060	1	5	4	2011 07 15		2						
9092060	1	5	4	2011 08 12		3						
9092060	1	5	4	2012 07 05	5	2		1	5.5	3	70	70% curled leaves possibly due to drought or herbicide
9092060	1	5	5	2010 09 27	4	2			1.8	1.8		
9092060	1	5	5	2011 07 15		2						
9092060	1	5	5	2011 08 12		4						
9092060	1	5	5	2012 07 05	7	3		1	4.8	2.8	80	80% curled leaves possibly due to drought or herbicide
9092060	1	5	6	2010 09 27	3	2			2.9	2.1		
9092060	1	5	6	2011 07 15		2						
9092060	1	5	6	2011 08 12		3						
9092060	1	5	6	2012 07 05	5	2		1	6.5	3.3	80	80% curled leaves possibly due to drought or herbicide
9092066	1	5	7	2010 09 27	3	4			2.3	2		

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092066	1	5	7	2011 07 15		2						
9092066	1	5	7	2011 08 12		2						
9092066	1	5	7	2012 07 05	8	2		1	5.5	3.3	100	100% curled leaves possibly due to drought or herbicide
9092066	1	5	8	2010 09 27	3	4			2.4	2.6		
9092066	1	5	8	2011 07 15		2						
9092066	1	5	8	2011 08 12		2						
9092066	1	5	8	2012 07 05	7	2		1	6	4	95	95% curled leaves possibly due to drought or herbicide
Konza	1	5	9	2010 09 27								this spot had been planted to currant
Konza	1	5	9	2011 07 15		1						removed currant and replanted to Konza. Wanted to test Konza.
Konza	1	5	9	2011 08 12		1						
Konza	1	5	9	2012 07 05	2	2		1	4.5	3.3	20	20% curled leaves possibly due to drought or herbicide
9092222	1	5	10	2010 09 27	4	2			2.8	1.8		
9092222	1	5	10	2011 07 15		2						
9092222	1	5	10	2011 08 12		3						
9092222	1	5	10	2012 07 05	4	2		1	4.8	3.5	60	60% curled leaves possibly due to drought or herbicide
9092222	1	5	11	2010 09 27	4	2			2.5	1.5		
9092222	1	5	11	2011 07 15		2						
9092222	1	5	11	2011 08 12		2						
9092222	1	5	11	2012 07 05	5	3		1	4.8	2.3	60	60% curled leaves possibly due to drought or herbicide
9092222	1	5	12	2010 09 27	4	2			3	1.6		
9092222	1	5	12	2011 07 15		2						
9092222	1	5	12	2011 08 12		3						
9092222	1	5	12	2012 07 05	4	3		1	5.5	2.8	50	50% curled leaves possibly due to drought or herbicide
9092065	1	6	1	2010 09 27	3	2			1.9	1.7		
9092065	1	6	1	2011 07 15		2						
9092065	1	6	1	2011 08 12		3						
9092065	1	6	1	2012 07 05	3	2		1	5.3	3.3	40	40% curled leaves possibly due to drought or herbicide
9092065	1	6	2	2010 09 27	3	2			1.8	2.4		
9092065	1	6	2	2011 07 15		2						
9092065	1	6	2	2011 08 12		4						
9092065	1	6	2	2012 07 05	3	2		1	3.8	3	10	10% curled leaves possibly due to drought or herbicide

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092065	1	6	3	2010 09 27	3	2			1.8	2.1		
9092065	1	6	3	2011 07 15		2						
9092065	1	6	3	2011 08 12		3						
9092065	1	6	3	2012 07 05	2	2		1	3.3	3	50	5% curled leaves possibly due to drought or herbicide
Bighorn	1	6	4	2010 09 27	2	4			3	2.7		broken branches
Bighorn	1	6	4	2011 07 15		2						
Bighorn	1	6	4	2011 08 12		4						
Bighorn	1	6	4	2012 07 05	4	2		1	6.5	4	50	50% curled leaves possibly due to drought or herbicide
Bighorn	1	6	5	2010 09 27	2	4			2.4	2.9		
Bighorn	1	6	5	2011 07 15		2						
Bighorn	1	6	5	2011 08 12		3						
Bighorn	1	6	5	2012 07 05	6	3		1	4.3	3	60	60% curled leaves possibly due to drought or herbicide
Bighorn	1	6	6	2010 09 27	2	4			3	2.8		
Bighorn	1	6	6	2011 07 15		3						
Bighorn	1	6	6	2011 08 12		4						
Bighorn	1	6	6	2012 07 05	5	3		1	7	4.8	20	20% curled leaves possibly due to drought or herbicide
9094346	1	6	7	2010 09 27		2			2.7	1.8		
9094346	1	6	7	2011 07 15		3						
9094346	1	6	7	2011 08 12		3						
9094346	1	6	7	2012 07 05	4	2		1	7	5	50	50% curled leaves possibly due to drought or herbicide
9094346	1	6	8	2010 09 27		2			1.7	2		suckers
9094346	1	6	8	2011 07 15		2						
9094346	1	6	8	2011 08 12		2						
9094346	1	6	8	2012 07 05	3	2		1	5.3	3.8	50	50% curled leaves possibly due to drought or herbicide
9094346	1	6	9	2010 09 27		2			2.7	2		suckers
9094346	1	6	9	2011 07 15		2						
9094346	1	6	9	2011 08 12		4						
9094346	1	6	9	2012 07 05	4	2		1	5.5	4.3	70	70% curled leaves possibly due to drought or herbicide
9092217	1	6	10	2010 09 27	2	2			2.4	2.5		
9092217	1	6	10	2011 07 15		2						
9092217	1	6	10	2011 08 12		3						

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092217	1	6	10	2012 07 05	3	2		1	4.8	4	30	30% curled leaves possibly due to drought or herbicide
9092217	1	6	11	2010 09 27	2	2			4	2.8		
9092217	1	6	11	2011 07 15		2						
9092217	1	6	11	2011 08 12		3						
9092217	1	6	11	2012 07 05	4	2		1	8	3.5	70	70% curled leaves possibly due to drought or herbicide
9092217	1	6	12	2010 09 27	2	2			3	2.2		
9092217	1	6	12	2011 07 15		2						
9092217	1	6	12	2011 08 12		3						
9092217	1	6	12	2012 07 05	3	2		1	5.5	3.5	70	70% curled leaves possibly due to drought or herbicide
9092060	2	1	1	2010 09 27	3	2			2.3	1.4		
9092060	2	1	1	2011 07 15		2						
9092060	2	1	1	2011 08 12		3						
9092060	2	1	1	2012 07 05	4	3		1	5	2.8	90	90% curled leaves possibly due to drought or herbicide
9092060	2	1	2	2010 09 27	3	2			3.1	2.3		
9092060	2	1	2	2011 07 15		2						
9092060	2	1	2	2011 08 12		3						
9092060	2	1	2	2012 07 05	4	3		1	5.5	3	90	90% curled leaves possibly due to drought or herbicide
9092060	2	1	3	2010 09 27	5	2			1.4	0.9		
9092060	2	1	3	2011 07 15		2						
9092060	2	1	3	2011 08 12		3						
9092060	2	1	3	2012 07 05	4	3		1	4.5	1.5	50	50% curled leaves possibly due to drought or herbicide
9092067	2	1	4	2010 09 27	3	2			2.5	2.1		
9092067	2	1	4	2011 07 15		2						
9092067	2	1	4	2011 08 12		3						
9092067	2	1	4	2012 07 05	5	2		1	6	3.8	80	80% curled leaves possibly due to drought or herbicide
9092067	2	1	5	2010 09 27	4	2			2.2	1.8		
9092067	2	1	5	2011 07 15		2						
9092067	2	1	5	2011 08 12		3						
9092067	2	1	5	2012 07 05	6	3		1	5	2.8	90	90% curled leaves possibly due to drought or herbicide
9092067	2	1	6	2010 09 27	4	2			1.8	2.2		
9092067	2	1	6	2011 07 15		2						

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092067	2	1	6	2011 08 12		4						
9092067	2	1	6	2012 07 05	5	2		1	4.5	3.3	80	80% curled leaves possibly due to drought or herbicide
9092219	2	1	7	2010 09 27	2	4			3.8	2.5		
9092219	2	1	7	2011 07 15		3						
9092219	2	1	7	2011 08 12		4						
9092219	2	1	7	2012 07 05	4	2		1	6.5	4.3	70	70% curled leaves possibly due to drought or herbicide
9092219	2	1	8	2010 09 27	3	4			2	1.9		
9092219	2	1	8	2011 07 15		3						
9092219	2	1	8	2011 08 12		4						
9092219	2	1	8	2012 07 05	5	2		1	4	3.3	70	70% curled leaves possibly due to drought or herbicide
9092219	2	1	9	2010 09 27	2	4			2.3	3.2		
9092219	2	1	9	2011 07 15		2						
9092219	2	1	9	2011 08 12		4						
9092219	2	1	9	2012 07 05	4	3		1	5.5	4.3	80	80% curled leaves possibly due to drought or herbicide
9092058	2	1	10	2010 09 27	3	4			2	2		
9092058	2	1	10	2011 07 15		2						
9092058	2	1	10	2011 08 12		3						
9092058	2	1	10	2012 07 05	5	2		1	4.5	3	70	70% curled leaves possibly due to drought or herbicide
9092058	2	1	11	2010 09 27	3	4			2.9	2.6		
9092058	2	1	11	2011 07 15		2						
9092058	2	1	11	2011 08 12		3						
9092058	2	1	11	2012 07 05	3	2		1	5.5	4	20	20% curled leaves possibly due to drought or herbicide
9092058	2	1	12	2010 09 27	3	4			1.8	2.2		
9092058	2	1	12	2011 07 15		2						
9092058	2	1	12	2011 08 12		3						
9092058	2	1	12	2012 07 05	5	2		1	5	3.8	40	40% curled leaves possibly due to drought or herbicide
9094346	2	2	1	2010 09 27	3	2			2.3	2.3		
9094346	2	2	1	2011 07 15		2						
9094346	2	2	1	2011 08 12		3						
9094346	2	2	1	2012 07 05	2	1		1	4.3	3.5	0	0% curled leaves possibly due to drought or herbicide
9094346	2	2	2	2010 09 27	3	2			1.9	2.4		

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9094346	2	2	2	2011 07 15		2						
9094346	2	2	2	2011 08 12		3						
9094346	2	2	2	2012 07 05	3	4		1	4	3.5	0	0% curled leaves possibly due to drought or herbicide
9094346	2	2	3	2010 09 27	4	2			1.8	1.2		
9094346	2	2	3	2011 07 15		2						
9094346	2	2	3	2011 08 12		3						
9094346	2	2	3	2012 07 05	4	2		1	4.5	2.8	90	90% curled leaves possibly due to drought or herbicide
9092064	2	2	4	2010 09 27		2			2	1.7		
9092064	2	2	4	2011 07 15		2						
9092064	2	2	4	2011 08 12		3						
9092064	2	2	4	2012 07 05	4	3		1	4.5	3	80	80% curled leaves possibly due to drought or herbicide
9092064	2	2	5	2010 09 27		2			2.1	1.8		
9092064	2	2	5	2011 07 15		2						
9092064	2	2	5	2011 08 12		3						
9092064	2	2	5	2012 07 05	3	1		1	4	3.3	80	80% curled leaves possibly due to drought or herbicide
9092064	2	2	6	2010 09 27		2			2.2	1.7		
9092064	2	2	6	2011 07 15		2						
9092064	2	2	6	2011 08 12		3						
9092064	2	2	6	2012 07 05	4	3		1	6	3.3	60	60% curled leaves possibly due to drought or herbicide
9094348	2	2	7	2010 09 27	4	2			1.5	1.8		
9094348	2	2	7	2011 07 15		2						
9094348	2	2	7	2011 08 12		3						
9094348	2	2	7	2012 07 05	5	4		1	4.3	4	50	50% curled leaves possibly due to drought or herbicide
9094348	2	2	8	2010 09 27	3	2			2.3	2.7		
9094348	2	2	8	2011 07 15		2						
9094348	2	2	8	2011 08 12		3						
9094348	2	2	8	2012 07 05	5	4			6.3	4	80	80% curled leaves possibly due to drought or herbicide
9094348	2	2	9	2010 09 27	4	2			1.5	1.9		
9094348	2	2	9	2011 07 15		2						
9094348	2	2	9	2011 08 12		3						
9094348	2	2	9	2012 07 05	4	3		1	7	3.8	50	50% curled leaves possibly due to drought or herbicide

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092066	2	2	10	2010 09 27	3	4			2.2	1.8		
9092066	2	2	10	2011 07 15		2						
9092066	2	2	10	2011 08 12		3						
9092066	2	2	10	2012 07 05	5	2		1	4.5	3.5	90	90% curled leaves possibly due to drought or herbicide
9092066	2	2	11	2010 09 27	3	4			2.1	2.5		
9092066	2	2	11	2011 07 15		3						
9092066	2	2	11	2011 08 12		3						
9092066	2	2	11	2012 07 05	4	3		1	5	4.3	80	80% curled leaves possibly due to drought or herbicide
Konza	2	2	12	2010 09 27								this spot had been planted to currant removed currant and replanted to Konza. Wanted to test Konza.
Konza	2	2	12	2011 07 15		2						
Konza	2	2	12	2011 08 12		2						
Konza	2	2	12	2012 07 05	4	2		1	3.3	2.8	80	80% curled leaves possibly due to drought or herbicide
9009467	2	3	1	2010 09 27	4	2			1.8	0.8		
9009467	2	3	1	2011 07 15		2						
9009467	2	3	1	2011 08 12		2						
9009467	2	3	1	2012 07 05	7	5		1	3.5	0.8	20	20% curled leaves possibly due to drought or herbicide
9009467	2	3	2	2010 09 27								plant # two not there according to notes replanted in spring 2011
9009467	2	3	2	2011 07 15		2						
9009467	2	3	2	2011 08 12		3						
9009467	2	3	2	2012 07 05	7	2		1	1.3	1.3	10	10% curled leaves possibly due to drought or herbicide
9009467	2	3	3	2010 09 27	4	2			1.9	1		
9009467	2	3	3	2011 07 15		2						
9009467	2	3	3	2011 08 12		2						
9009467	2	3	3	2012 07 05	5	4		1	3.3	0.8	20	20% curled leaves possibly due to drought or herbicide
9092220	2	3	4	2010 09 27	3	2			2.9	2.1		
9092220	2	3	4	2011 07 15		2						
9092220	2	3	4	2011 08 12		3						
9092220	2	3	4	2012 07 05	4	2		1	5.3	3.3	20	20% curled leaves possibly due to drought or herbicide
9092220	2	3	5	2010 09 27	3	2			2	2.1		
9092220	2	3	5	2011 07 15		2						
9092220	2	3	5	2011 08 12		3						

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092220	2	3	5	2012 07 05	3	2		1	5.3	3.3	50	50% curled leaves possibly due to drought or herbicide
9092220	2	3	6	2010 09 27	3	2			2.7	2.2		
9092220	2	3	6	2011 07 15		1						
9092220	2	3	6	2011 08 12		1						
9092220	2	3	6	2012 07 05	4	2		1	5.3	3.3	60	60% curled leaves possibly due to drought or herbicide
9092223	2	3	7	2010 09 27	3	1			3.2	1.7		
9092223	2	3	7	2011 07 15		2						
9092223	2	3	7	2011 08 12		2						
9092223	2	3	7	2012 07 05	4	4		1	5.5	3.3	20	20% curled leaves possibly due to drought or herbicide
9092223	2	3	8	2010 09 27	3	1			3.3	1.7		
9092223	2	3	8	2011 07 15		2						
9092223	2	3	8	2011 08 12		2						
9092223	2	3	8	2012 07 05	4	4		1	5.8	2.8	80	80% curled leaves possibly due to drought or herbicide
9092223	2	3	9	2010 09 27	4	1			2	1.2		
9092223	2	3	9	2011 07 15		3						
9092223	2	3	9	2011 08 12		3						
9092223	2	3	9	2012 07 05	7	5		1	4.3	2.3	90	90% curled leaves possibly due to drought or herbicide
9092130	2	3	10	2010 09 27		6						
9092130	2	3	10	2011 07 15		5						black spots, not much yellow
9092130	2	3	10	2011 08 12		6						
9092130	2	3	10	2012 07 05	5	4		1	2.3	1.8	50	50% curled leaves possibly due to drought or herbicide
9092130	2	3	11	2010 09 27		5						
9092130	2	3	11	2011 07 15		2						
9092130	2	3	11	2011 08 12		4						
9092130	2	3	11	2012 07 05	4	2		1	7.3	2.8	90	90% curled leaves possibly due to drought or herbicide
Konza	2	3	12	2010 09 27								this spot had been planted to currant
Konza	2	3	12	2011 07 15		1						removed currant and replanted to Konza. Wanted to test Konza.
Konza	2	3	12	2011 08 12		1						
Konza	2	3	12	2012 07 05	4	2		1	4	2.8	90	90% curled leaves possibly due to drought or herbicide
9092063	2	4	1	2010 09 27	4	2			1.5	1.2		
9092063	2	4	1	2011 07 15		1						

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092063	2	4	1	2011 08 12		2						
9092063	2	4	1	2012 07 05	2	2		1	3.5	1.8	5	5% curled leaves possibly due to drought or herbicide
9092063	2	4	2	2010 09 27	4	2			1.3	1.8		
9092063	2	4	2	2011 07 15		2						
9092063	2	4	2	2011 08 12		3						
9092063	2	4	2	2012 07 05	4	2		1	3.8	2.8	100	100% curled leaves possibly due to drought or herbicide
9092063	2	4	3	2010 09 27	4	2			1.4	1.4		
9092063	2	4	3	2011 07 15		3						
9092063	2	4	3	2011 08 12		4						
9092063	2	4	3	2012 07 05	3	2		1	4.8	2.3	80	80% curled leaves possibly due to drought or herbicide
9094338	2	4	4	2010 09 27		2			1.8	1.4		
9094338	2	4	4	2011 07 15		2						
9094338	2	4	4	2011 08 12		3						
9094338	2	4	4	2012 07 05	5	4		1	3.8	2.3	20	20% curled leaves possibly due to drought or herbicide
9094338	2	4	5	2010 09 27		2			1.8	1.7		
9094338	2	4	5	2011 07 15		4						
9094338	2	4	5	2011 08 12		5						
9094338	2	4	5	2012 07 05	5	2		1	5.3	2.8	80	80% curled leaves possibly due to drought or herbicide
9094338	2	4	6	2010 09 27		2			2	2.2		
9094338	2	4	6	2011 07 15		4						
9094338	2	4	6	2011 08 12		5						
9094338	2	4	6	2012 07 05	3	3		1	5.3	3.8	20	20% curled leaves possibly due to drought or herbicide
9092069	2	4	7	2010 09 27	4	4			1.5	1.7		
9092069	2	4	7	2011 07 15		3						
9092069	2	4	7	2011 08 12		4						
9092069	2	4	7	2012 07 05	2	2		1	4.5	2.8	20	20% curled leaves possibly due to drought or herbicide
9092069	2	4	8	2010 09 27	4	4			2.5	1.7		
9092069	2	4	8	2011 07 15		2						
9092069	2	4	8	2011 08 12		3						
9092069	2	4	8	2012 07 05	6	2		1	6	3	90	90% curled leaves possibly due to drought or herbicide
9092069	2	4	9	2010 09 27	4	4			1.3	1.7		

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092069	2	4	9	2011 07 15		2						
9092069	2	4	9	2011 08 12		3						
9092069	2	4	9	2012 07 05	5	2		1	3.5	3	90	90% curled leaves possibly due to drought or herbicide
9094347	2	4	10	2010 09 27	3	2			2.5	2.1		
9094347	2	4	10	2011 07 15		2						
9094347	2	4	10	2011 08 12		4						
9094347	2	4	10	2012 07 05	4	3		1	5.5	3.3	10	10% curled leaves possibly due to drought or herbicide
9094347	2	4	11	2010 09 27	2	2			2.3	2.8		
9094347	2	4	11	2011 07 15		2						
9094347	2	4	11	2011 08 12		5						
9094347	2	4	11	2012 07 05	3	3		1	5.8	3.8	20	20% curled leaves possibly due to drought or herbicide
9094347	2	4	12	2010 09 27	2	2			3	2.7		
9094347	2	4	12	2011 07 15		2						
9094347	2	4	12	2011 08 12		5						
9094347	2	4	12	2012 07 05	4	5		1	5.8	4.3	60	60% curled leaves possibly due to drought or herbicide
9092062	2	5	1	2010 09 27	4	2			1.8	1.4		
9092062	2	5	1	2011 07 15		2						
9092062	2	5	1	2011 08 12		3						
9092062	2	5	1	2012 07 05	5	3		1	3.5	2.3	90	90% curled leaves possibly due to drought or herbicide
9092062	2	5	2	2010 09 27	4	2			1.8	1.5		
9092062	2	5	2	2011 07 15		1						
9092062	2	5	2	2011 08 12		1						
9092062	2	5	2	2012 07 05	5	2		1	3.5	2.8	70	70% curled leaves possibly due to drought or herbicide
9092062	2	5	3	2010 09 27	4	2			1.3	1.3		
9092062	2	5	3	2011 07 15		3						
9092062	2	5	3	2011 08 12		4						
9092062	2	5	3	2012 07 05	6	2		1	2.8	2.3	100	100% curled leaves possibly due to drought or herbicide
9092059	2	5	4	2010 09 27	4	1			1.7	1.8		
9092059	2	5	4	2011 07 15		2						
9092059	2	5	4	2011 08 12		3						
9092059	2	5	4	2012 07 05	4	2		1	4.5	3	30	30% curled leaves possibly due to drought or herbicide

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092059	2	5	5	2010 09 27	4	1			1.8	2		
9092059	2	5	5	2011 07 15		3						
9092059	2	5	5	2011 08 12		4						
9092059	2	5	5	2012 07 05	6	2		1	3.5	2.3	90	90% curled leaves possibly due to drought or herbicide
9092059	2	5	6	2010 09 27	3	1			2.8	2.3		
9092059	2	5	6	2011 07 15		1						
9092059	2	5	6	2011 08 12		2						
9092059	2	5	6	2012 07 05	4	3		1	4.8	4	80	80% curled leaves possibly due to drought or herbicide
Bighorn	2	5	7	2010 09 27	3	5			2.8	2		broken branches (split at forks)
Bighorn	2	5	7	2011 07 15		3						
Bighorn	2	5	7	2011 08 12		4						
Bighorn	2	5	7	2012 07 05	4	4		1			30	30% curled leaves possibly due to drought or herbicide
Bighorn	2	5	8	2010 09 27	2	5			2.8	2.8		
Bighorn	2	5	8	2011 07 15		2						
Bighorn	2	5	8	2011 08 12		4						
Bighorn	2	5	8	2012 07 05	4	6		1			50	50% curled leaves possibly due to drought or herbicide
Bighorn	2	5	9	2010 09 27	3	5			3.1	2.1		
Bighorn	2	5	9	2011 07 15		5						
Bighorn	2	5	9	2011 08 12		7						
Bighorn	2	5	9	2012 07 05	5	6		1			50	50% curled leaves possibly due to drought or herbicide
9092061	2	5	10	2010 09 27	3				1.4	2		
9092061	2	5	10	2011 07 15		2						
9092061	2	5	10	2011 08 12		3						
9092061	2	5	10	2012 07 05	5	4		1	4.5	3.3	30	30% curled leaves possibly due to drought or herbicide
9092061	2	5	11	2010 09 27	4				1.2	1.4		
9092061	2	5	11	2011 07 15		3						
9092061	2	5	11	2011 08 12		5						
9092061	2	5	11	2012 07 05	7	5		1	3	2.3	80	80% curled leaves possibly due to drought or herbicide
9092061	2	5	12	2010 09 27	4	6			2.2	1.4		
9092061	2	5	12	2011 07 15		2						
9092061	2	5	12	2011 08 12		5						

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092061	2	5	12	2012 07 05	5	4		1	4.5	1.8	80	80% curled leaves possibly due to drought or herbicide
9092217	2	6	1	2010 09 27	3	2			1.8	1.3		
9092217	2	6	1	2011 07 15		3						
9092217	2	6	1	2011 08 12		5						
9092217	2	6	1	2012 07 05	5	2		1	4.3	2	5	5% curled leaves possibly due to drought or herbicide
9092217	2	6	2	2010 09 27	2	2			2.3	2.6		
9092217	2	6	2	2011 07 15		2						
9092217	2	6	2	2011 08 12		3						
9092217	2	6	2	2012 07 05	3	2		1	4	3.3	5	5% curled leaves possibly due to drought or herbicide
9092217	2	6	3	2010 09 27	4	2			1.4	1.3		
9092217	2	6	3	2011 07 15		2						
9092217	2	6	3	2011 08 12		3						
9092217	2	6	3	2012 07 05	5	4		1	3.8	2	20	20% curled leaves possibly due to drought or herbicide
9092222	2	6	4	2010 09 27	4	2			1.7	1.4		
9092222	2	6	4	2011 07 15		2						
9092222	2	6	4	2011 08 12		3						
9092222	2	6	4	2012 07 05	5	4		1	3	2	80	80% curled leaves possibly due to drought or herbicide
9092222	2	6	5	2010 09 27	4	2			2.7	1.8		
9092222	2	6	5	2011 07 15		2						
9092222	2	6	5	2011 08 12		5						
9092222	2	6	5	2012 07 05	6	5		1	4.3	2.8	60	60% curled leaves possibly due to drought or herbicide
9092222	2	6	6	2010 09 27	4	2			1.7	1.2		
9092222	2	6	6	2011 07 15		2						
9092222	2	6	6	2011 08 12		3						
9092222	2	6	6	2012 07 05	7	6		1	4.3	2	80	80% curled leaves possibly due to drought or herbicide
9092065	2	6	7	2010 09 27	3	2			2.9	2.3		
9092065	2	6	7	2011 07 15		2						
9092065	2	6	7	2011 08 12		4						
9092065	2	6	7	2012 07 05	4	2		1	5.8	3.3	0	0% curled leaves possibly due to drought or herbicide
9092065	2	6	8	2010 09 27	3	2			2.2	2.1		
9092065	2	6	8	2011 07 15		3						

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Insect	Width	Height	% Curled brown leaves	Notes
9092065	2	6	8	2011 08 12		5						
9092065	2	6	8	2012 07 05	4	3		1	4.5	3.3	0	0% curled leaves possibly due to drought or herbicide
9092065	2	6	9	2010 09 27	4	2			1.8	1.6		
9092065	2	6	9	2011 07 15		2						
9092065	2	6	9	2011 08 12		4						
9092065	2	6	9	2012 07 05	4	4		1	5.3	3.3	10	10% curled leaves possibly due to drought or herbicide
9092128	2	6	10	2010 09 27		2			1.5	1.3		
9092128	2	6	10	2011 07 15		2						
9092128	2	6	10	2011 08 12		4						
9092128	2	6	10	2012 07 05	5	3		1	4.5	3	50	50% curled leaves possibly due to drought or herbicide
	2	6	11	2010 09 27								this spot had been planted to currant
	2	6	11	2011 07 15								this spot remains currant
	2	6	11	2011 08 12								this spot remains currant
	2	6	11	2012 07 05								this spot remains currant
Konza	2	6	12	2010 09 27								this spot previously planted to currant
Konza	2	6	12	2011 07 15		1						removed currant and replanted to Konza. Wanted to test Konza.
Konza	2	6	12	2011 08 12		1						
Konza	2	6	12	2012 07 05	4	2		1	2.8	2	50	50% curled leaves possibly due to drought or herbicide
9092069	3	1	1	2010 09 27	4	4			2	1.3		
9092069	3	1	1	2011 07 15		3						
9092069	3	1	1	2011 08 12		5						
9092069	3	1	1	2012 07 05	5	4		1	3	2	70	70% curled leaves possibly due to drought or herbicide
9092069	3	1	2	2010 09 27	4	4			1	1.3		
9092069	3	1	2	2011 07 15		2						
9092069	3	1	2	2011 08 12		4						
9092069	3	1	2	2012 07 05	5	3		1	2	2	30	30% curled leaves possibly due to drought or herbicide
9092069	3	1	3	2010 09 27	4	4			0.9	1.6		
9092069	3	1	3	2011 07 15		2						
9092069	3	1	3	2011 08 12		4						
9092069	3	1	3	2012 07 05	5	2	2.9	1	2.5	2.3	30	30% curled leaves possibly due to drought or herbicide
9092061	3	1	4	2010 09 27	4	4			1.4	1.1		

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092061	3	1	4	2011 07 15		2						
9092061	3	1	4	2011 08 12		3						
9092061	3	1	4	2012 07 05	5	6		1	3	1.8	20	20% curled leaves possibly due to drought or herbicide
9092061	3	1	5	2010 09 27	4	4			1.9	1.6		
9092061	3	1	5	2011 07 15		2						
9092061	3	1	5	2011 08 12		4						
9092061	3	1	5	2012 07 05	4	4		1	4	2.3	10	10% curled leaves possibly due to drought or herbicide
9092061	3	1	6	2010 09 27	3	4			2.5	1.8		
9092061	3	1	6	2011 07 15		2						
9092061	3	1	6	2011 08 12		5						
9092061	3	1	6	2012 07 05	5	4	3.4	1	4	2.5	10	10% curled leaves possibly due to drought or herbicide
9092058	3	1	7	2010 09 27	4	2			2.3	1.5		
9092058	3	1	7	2011 07 15		2						
9092058	3	1	7	2011 08 12		3						
9092058	3	1	7	2012 07 05	5	3		1	4	2.3	40	40% curled leaves possibly due to drought or herbicide
9092058	3	1	8	2010 09 27	4	2			0.9	1.8		
9092058	3	1	8	2011 07 15		2						
9092058	3	1	8	2011 08 12		4						
9092058	3	1	8	2012 07 05	4	4		1	3	3.3	5	5% curled leaves possibly due to drought or herbicide
9092058	3	1	9	2010 09 27	4	2			1.5	1.9		
9092058	3	1	9	2011 07 15		3						
9092058	3	1	9	2011 08 12		5						
9092058	3	1	9	2012 07 05	4	3	2.6	1	4.5	3	10	10% curled leaves possibly due to drought or herbicide
9092059	3	1	10	2010 09 27	3	2			2.4	2.6		
9092059	3	1	10	2011 07 15		2						
9092059	3	1	10	2011 08 12		3						
9092059	3	1	10	2012 07 05	3	2		1	4.8	3.8	10	10% curled leaves possibly due to drought or herbicide
9092059	3	1	11	2010 09 27	3	2			1.8	2.3		
9092059	3	1	11	2011 07 15		2						
9092059	3	1	11	2011 08 12		3						
9092059	3	1	11	2012 07 05	4	3		1	5.3	4	80	80% curled leaves possibly due to drought or herbicide

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092059	3	1	12	2010 09 27	3	2			1.8	2.6		
9092059	3	1	12	2011 07 15		2						
9092059	3	1	12	2011 08 12		4						
9092059	3	1	12	2012 07 05	4	2	2.5	1	5	3.8	90	90% curled leaves possibly due to drought or herbicide
9092067	3	2	1	2010 09 28	4	2			2.7	1.8		
9092067	3	2	1	2011 07 15		2						
9092067	3	2	1	2011 08 12		3						
9092067	3	2	1	2012 07 05	5	4		1			5	5% curled leaves possibly due to drought or herbicide
9092067	3	2	2	2010 09 28	4	2			2.3	1.8		
9092067	3	2	2	2011 07 15		2						
9092067	3	2	2	2011 08 12		4						
9092067	3	2	2	2012 07 05	4	2		1			50	50% curled leaves possibly due to drought or herbicide
9092067	3	2	3	2010 09 28	4	2			2.1	2		
9092067	3	2	3	2011 07 15		1						
9092067	3	2	3	2011 08 12		3						
9092067	3	2	3	2012 07 05	5	2	2.3	1			50	50% curled leaves possibly due to drought or herbicide
9092062	3	2	4	2010 09 28	4	2			1.8	1.8		
9092062	3	2	4	2011 07 15		2						
9092062	3	2	4	2011 08 12		4						
9092062	3	2	4	2012 07 05	5	3		1			80	80% curled leaves possibly due to drought or herbicide
9092062	3	2	5	2010 09 28	4	2			2.3	1.8		
9092062	3	2	5	2011 07 15		2						
9092062	3	2	5	2011 08 12		3						
9092062	3	2	5	2012 07 05	4	2		1			50	50% curled leaves possibly due to drought or herbicide
9092062	3	2	6	2010 09 28	2	2			2.8	2.4		
9092062	3	2	6	2011 07 15		2						
9092062	3	2	6	2011 08 12		3						
9092062	3	2	6	2012 07 05	3	5	2.4	1			0	0% curled leaves possibly due to drought or herbicide
9092219	3	2	7	2010 09 28	3	3			1.3	2.3		
9092219	3	2	7	2011 07 15		2						
9092219	3	2	7	2011 08 12		3						

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092219	3	2	7	2012 07 05	4	2		1	4	4	5	5% curled leaves possibly due to drought or herbicide
9092219	3	2	8	2010 09 28	3	3			2.9	2.3		
9092219	3	2	8	2011 07 15		2						
9092219	3	2	8	2011 08 12		5						
9092219	3	2	8	2012 07 05	5	3	2.9	1	4.5	3.5	90	90% curled leaves possibly due to drought or herbicide
Konza	3	2	9	2010 09 28								this spot had been planted to currant removed currant and replanted to Konza. Wanted to test Konza.
Konza	3	2	9	2011 07 15		2						
Konza	3	2	9	2011 08 12		2						
Konza	3	2	9	2012 07 05	3	2		1	2.3	2	10	10% curled leaves possibly due to drought or herbicide
9094338	3	2	10	2010 09 28	4	2			2	1.4		some dead branches on 1
9094338	3	2	10	2011 07 15		2						
9094338	3	2	10	2011 08 12		4						
9094338	3	2	10	2012 07 05	4	3		1	5.8	3.5	5	5% curled leaves possibly due to drought or herbicide
9094338	3	2	11	2010 09 28	4	2			1.2	1.8		
9094338	3	2	11	2011 07 15		2						
9094338	3	2	11	2011 08 12		3						
9094338	3	2	11	2012 07 05	4	2		1	5	4	20	20% curled leaves possibly due to drought or herbicide
9094338	3	2	12	2010 09 28	4	2			2	2.1		some dead branches on 3
9094338	3	2	12	2011 07 15		2						
9094338	3	2	12	2011 08 12		3						
9094338	3	2	12	2012 07 05	3	3	2.7	1	6.8	4	50	50% curled leaves possibly due to drought or herbicide
9094348	3	3	1	2010 09 28	3	4			1.8	2.1		
9094348	3	3	1	2011 07 15		2						
9094348	3	3	1	2011 08 12		3						
9094348	3	3	1	2012 07 05	5	5		1	3.8	3	5	5% curled leaves possibly due to drought or herbicide
9094348	3	3	2	2010 09 28	3	4			1.8	2.7		
9094348	3	3	2	2011 07 15		4						
9094348	3	3	2	2011 08 12		6						
9094348	3	3	2	2012 07 05	5	5		1	3.8	3.5	5	5% curled leaves possibly due to drought or herbicide
9094348	3	3	3	2010 09 28	4	4			0.8	1.8		
9094348	3	3	3	2011 07 15		2						

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9094348	3	3	3	2011 08 12		4						
9094348	3	3	3	2012 07 05	4	3	2.6	1	4.5	3.3	20	20% curled leaves possibly due to drought or herbicide
9094346	3	3	4	2010 09 28	4	2			2.3	1.8		
9094346	3	3	4	2011 07 15		3						
9094346	3	3	4	2011 08 12		6						
9094346	3	3	4	2012 07 05	3	3		1	3.8	3	20	20% curled leaves possibly due to drought or herbicide
9094346	3	3	5	2010 09 28	4	2			1.8	1.5		
9094346	3	3	5	2011 07 15		2						
9094346	3	3	5	2011 08 12		4						
9094346	3	3	5	2012 07 05	4	4		1	4.3	2.8	20	20% curled leaves possibly due to drought or herbicide
9094346	3	3	6	2010 09 28	4	2			1.5	2.1		
9094346	3	3	6	2011 07 15		2						
9094346	3	3	6	2011 08 12		5						
9094346	3	3	6	2012 07 05	3	2	2.6	1	4	3.5	5	5% curled leaves possibly due to drought or herbicide
9092130	3	3	7	2010 09 28	5	2			1.2	1.2		
9092130	3	3	7	2011 07 15		2						
9092130	3	3	7	2011 08 12		3						
9092130	3	3	7	2012 07 05	4	5		1	3.5	3	20	20% curled leaves possibly due to drought or herbicide
9092130	3	3	8	2010 09 28	4	2			1.4	1.8		
9092130	3	3	8	2011 07 15		2						
9092130	3	3	8	2011 08 12		4						
9092130	3	3	8	2012 07 05	5	4	2.9	1	4.3	2.8	30	30% curled leaves possibly due to drought or herbicide
Konza	3	3	9	2010 09 28								this spot had been planted to currant
Konza	3	3	9	2011 07 15		1						removed currant and replanted to Konza. Wanted to test Konza.
Konza	3	3	9	2011 08 12		1						
Konza	3	3	9	2012 07 05	3	2		1	2.8	2.5	5	5% curled leaves possibly due to drought or herbicide
9092064	3	3	10	2010 09 28	3	2			2.7	2.4		
9092064	3	3	10	2011 07 15		2						
9092064	3	3	10	2011 08 12		3						
9092064	3	3	10	2012 07 05	3	3		1	5.5	3.3	20	20% curled leaves possibly due to drought or herbicide
9092064	3	3	11	2010 09 28	3	2			2.1	2.2		

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Insect	Width	Height	% Curled brown leaves	Notes
9092064	3	3	11	2011 07 15		2						
9092064	3	3	11	2011 08 12		2						
9092064	3	3	11	2012 07 05	4	6		1	4.8	3.3	50	50% curled leaves possibly due to drought or herbicide
9092064	3	3	12	2010 09 28	4	2			1.9	1.3		
9092064	3	3	12	2011 07 15		2						
9092064	3	3	12	2011 08 12		4						
9092064	3	3	12	2012 07 05	5	2	2.2	1	4	2	80	80% curled leaves possibly due to drought or herbicide
9092222	3	4	1	2010 09 28	4	2			2.1	1.6		
9092222	3	4	1	2011 07 15		2						
9092222	3	4	1	2011 08 12		3						
9092222	3	4	1	2012 07 05	5	3		1	4.3	2.3	0	0% curled leaves possibly due to drought or herbicide
9092222	3	4	2	2010 09 28	4	2			1.5	1.6		
9092222	3	4	2	2011 07 15		2						
9092222	3	4	2	2011 08 12		4						
9092222	3	4	2	2012 07 05	5	6		1	3.8	2	10	10% curled leaves possibly due to drought or herbicide
9092222	3	4	3	2010 09 28	5	2			1.2	1.1		
9092222	3	4	3	2011 07 15		2						
9092222	3	4	3	2011 08 12		5						
9092222	3	4	3	2012 07 05	5	6	2.9	1	3.8	2.3	50	50% curled leaves possibly due to drought or herbicide
9092065	3	4	4	2010 09 28	4	2			1.7	2		
9092065	3	4	4	2011 07 15		1						
9092065	3	4	4	2011 08 12		2						
9092065	3	4	4	2012 07 05	3	1		1	3.3	3	0	0% curled leaves possibly due to drought or herbicide
9092065	3	4	5	2010 09 28	4	2			1.5	1.8		
9092065	3	4	5	2011 07 15		2						
9092065	3	4	5	2011 08 12		4						
9092065	3	4	5	2012 07 05	4	2		1	4.3	3	50	50% curled leaves possibly due to drought or herbicide
9092065	3	4	6	2010 09 28	3	2			2.3	2.3		
9092065	3	4	6	2011 07 15		2						
9092065	3	4	6	2011 08 12		3						
9092065	3	4	6	2012 07 05	4	2	2.4	1	5	3.5	60	60% curled leaves possibly due to drought or herbicide

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092128	3	4	7	2010 09 28	3	4			3.3	2.1		
9092128	3	4	7	2011 07 15		2						
9092128	3	4	7	2011 08 12		3						
9092128	3	4	7	2012 07 05	5	4		1	4	3	30	30% curled leaves possibly due to drought or herbicide
9092128	3	4	8	2010 09 28	4	4			1.7	1.8		
9092128	3	4	8	2011 07 15		2						
9092128	3	4	8	2011 08 12		4						
9092128	3	4	8	2012 07 05	5	4		1	4.3	3.3	70	70% curled leaves possibly due to drought or herbicide
Konza	3	4	9	2010 09 28								this spot had been planted to currant
Konza	3	4	9	2011 07 15		2						
Konza	3	4	9	2011 08 12		3						
Konza	3	4	9	2012 07 05	1	1	1.5	1	2.8	2.8	0	0% curled leaves possibly due to drought or herbicide
9092063	3	4	10	2010 09 28	3	4			1.9	2		
9092063	3	4	10	2011 07 15		2						
9092063	3	4	10	2011 08 12		3						
9092063	3	4	10	2012 07 05	4	5		1	4.8	3	70	70% curled leaves possibly due to drought or herbicide
9092063	3	4	11	2010 09 28	4	4			1.1	1.3		
9092063	3	4	11	2011 07 15		2						
9092063	3	4	11	2011 08 12		3						
9092063	3	4	11	2012 07 05	4	5		1	4	2.8	70	70% curled leaves possibly due to drought or herbicide
9092063	3	4	12	2010 09 28	4	4			1.1	1.2		
9092063	3	4	12	2011 07 15		2						
9092063	3	4	12	2011 08 12		4						
9092063	3	4	12	2012 07 05	4	5	2.8	1	3.5	2.8	70	70% curled leaves possibly due to drought or herbicide
Bighorn	3	5	1	2010 09 28	1	4			3.7	3.4		
Bighorn	3	5	1	2011 07 15		2						
Bighorn	3	5	1	2011 08 12		6						
Bighorn	3	5	1	2012 07 05	5	5		1	3.8	2.5	80	80% curled leaves possibly due to drought or herbicide
Bighorn	3	5	2	2010 09 28	3	4			2.5	2.3		
Bighorn	3	5	2	2011 07 15		2						
Bighorn	3	5	2	2011 08 12		6						

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
Bighorn	3	5	2	2012 07 05	5	5		1	4.3	3.5	60	60% curled leaves possibly due to drought or herbicide
Bighorn	3	5	3	2010 09 28	2	4			2.5	3.1		
Bighorn	3	5	3	2011 07 15		3						
Bighorn	3	5	3	2011 08 12		6						
Bighorn	3	5	3	2012 07 05	4	4	4	1	2.5	3.3	20	20% curled leaves possibly due to drought or herbicide
9094347	3	5	4	2010 09 28	3	2			1.9	2.1		
9094347	3	5	4	2011 07 15		2						
9094347	3	5	4	2011 08 12		4						
9094347	3	5	4	2012 07 05	4	3		1	3.3	2.5	20	20% curled leaves possibly due to drought or herbicide
9094347	3	5	5	2010 09 28	3	2			2.2	2		
9094347	3	5	5	2011 07 15		2						
9094347	3	5	5	2011 08 12		7						
9094347	3	5	5	2012 07 05	4	6		1	6	3	20	20% curled leaves possibly due to drought or herbicide
9094347	3	5	6	2010 09 28	4	2			2.3	1.9		broken branch
9094347	3	5	6	2011 07 15		2						
9094347	3	5	6	2011 08 12		6						
9094347	3	5	6	2012 07 05	4	6	3.2	1	4.3	3.3	20	20% curled leaves possibly due to drought or herbicide
9092060	3	5	7	2010 09 28	3	4			2.4	2		
9092060	3	5	7	2011 07 15		2						Check to see if this is Todd Co. 063 or Todd Co. 060
9092060	3	5	7	2011 08 12		5						
9092060	3	5	7	2012 07 05	4	4		1	1.3	0.8	5	5% curled leaves possibly due to drought or herbicide
9092060	3	5	8	2010 09 28	3	4			2.4	1.9		
9092060	3	5	8	2011 07 15		2						
9092060	3	5	8	2011 08 12		5						
9092060	3	5	8	2012 07 05	4	2		1	5.5	3.5	80	80% curled leaves possibly due to drought or herbicide
9092060	3	5	9	2010 09 28	4	4			2.2	1.5		
9092060	3	5	9	2011 07 15		2						
9092060	3	5	9	2011 08 12		8						
9092060	3	5	9	2012 07 05	9		2.9				100	Dead
9092220	3	5	10	2010 09 28	2	2			2.6	2.6		
9092220	3	5	10	2011 07 15		2						

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092220	3	5	10	2011 08 12		2						
9092220	3	5	10	2012 07 05	3	2		1	4.8	4	50	50% curled leaves possibly due to drought or herbicide
9092220	3	5	11	2010 09 28	3	2			2	2.3		
9092220	3	5	11	2011 07 15		2						
9092220	3	5	11	2011 08 12		4						
9092220	3	5	11	2012 07 05	4	2		1	4.3	2.8	70	70% curled leaves possibly due to drought or herbicide
9092220	3	5	12	2010 09 28	3	2			1.4	2.2		
9092220	3	5	12	2011 07 15		1						
9092220	3	5	12	2011 08 12		3						
9092220	3	5	12	2012 07 05	3	3	2.2	1	4	3	30	30% curled leaves possibly due to drought or herbicide
9009467	3	6	1	2010 09 28	4	2			2.4	1.1		
9009467	3	6	1	2011 07 15		2						
9009467	3	6	1	2011 08 12		3						
9009467	3	6	1	2012 07 05	5	6		1	3.3	1.5	10	10% curled leaves possibly due to drought or herbicide
9009467	3	6	2	2010 09 28	4	2			2.6	1.5		
9009467	3	6	2	2011 07 15		2						
9009467	3	6	2	2011 08 12		3						
9009467	3	6	2	2012 07 05	5	6		1	3.5	1.5	10	10% curled leaves possibly due to drought or herbicide
9009467	3	6	3	2010 09 28	4	2			2.3	1.1		
9009467	3	6	3	2011 07 15		1						
9009467	3	6	3	2011 08 12		2						
9009467	3	6	3	2012 07 05	4	5	2.6	1	4.3	1	10	10% curled leaves possibly due to drought or herbicide
9092223	3	6	4	2010 09 28	4	4			2.3	1.4		
9092223	3	6	4	2011 07 15		2						
9092223	3	6	4	2011 08 12		3						
9092223	3	6	4	2012 07 05	5	4		1	3.5	1.5	40	40% curled leaves possibly due to drought or herbicide
9092223	3	6	5	2010 09 28	4	4			1.7	1.4		
9092223	3	6	5	2011 07 15		2						
9092223	3	6	5	2011 08 12		5						
9092223	3	6	5	2012 07 05	5	5		1	4.3	2.3	60	60% curled leaves possibly due to drought or herbicide
9092223	3	6	6	2010 09 28	3	4			3	2.2		

Accession	Rep	Row	Plants	Date	Vigor	Disease	Avg. Disease all plants by acc. 2012	Inset	Width	Height	% Curled brown leaves	Notes
9092223	3	6	6	2011 07 15		2						
9092223	3	6	6	2011 08 12		4						
9092223	3	6	6	2012 07 05	4	3	2.8	1	4.8	2.5	50	50% curled leaves possibly due to drought or herbicide
9092066	3	6	7	2010 09 28	3	2			3.4	2.3		
9092066	3	6	7	2011 07 15		2						
9092066	3	6	7	2011 08 12		4						
9092066	3	6	7	2012 07 05	5	4		1	6	4	80	80% curled leaves possibly due to drought or herbicide
9092066	3	6	8	2010 09 28	5	2			1.1	0.8		
9092066	3	6	8	2011 07 15		2						
9092066	3	6	8	2011 08 12		4						
9092066	3	6	8	2012 07 05	5	5	2.9	1	3.5	2.3	80	80% curled leaves possibly due to drought or herbicide
	3	6	9	2010 09 28								this spot had been planted to currant
	3	6	9	2011 07 15								this spot remains currant
	3	6	9	2011 08 12								this spot remains currant
	3	6	9	2012 07 05								this spot remains currant
9092217	3	6	10	2010 09 28	2	2			3.3	2.6		
9092217	3	6	10	2011 07 15		2						
9092217	3	6	10	2011 08 12		5						
9092217	3	6	10	2012 07 05	4	4		1	6.5	3.3	80	80% curled leaves possibly due to drought or herbicide
9092217	3	6	11	2010 09 28	3	2			3	1.9		
9092217	3	6	11	2011 07 15		2						
9092217	3	6	11	2011 08 12		4						
9092217	3	6	11	2012 07 05	4	3		1	5	3.3	5	5% curled leaves possibly due to drought or herbicide
9092217	3	6	12	2010 09 28	2	2			2.8	2.8		
9092217	3	6	12	2011 07 15		2						
9092217	3	6	12	2011 08 12		4						
9092217	3	6	12	2012 07 05	4	3	2.6	1	7	3.8	60	60% curled leaves possibly due to drought or herbicide

## **SELECTION AND INCREASE**

## SELECTION AND INCREASE: TECHNICAL REPORT – 2011-2012

### Promising Woody Plant Material

The following accessions show potential for further evaluation and potential release:

<b>Genus/species</b>	<b>Accession Number</b>	<b>Origin</b>	<b>Remarks</b>
Roundleaf hawthorn <i>Crataegus chrysocarpa</i>	9076678	5 South Dakota counties	Field plantings, seed increase
Bur oak <i>Quercus macrocarpa</i>	TBD, composite	Several states	Selected from ARS nursery
Chokecherry <i>Prunus virginiana</i>	TBD	TBD	NDSU breeding program
Chokecherry <i>Prunus virginiana</i>	9008183	Sheridan County, ND	Future uncertain
Black cherry <i>Prunus serotina</i>	9076737	Faribault and Anoka Counties, MN	Field plantings
Skunkbush sumac <i>Rhus trilobata</i>	TBD	TBD	Evaluation nursery
Common ninebark <i>Physocarpus opulifolius</i>	9082891	IA (seed source)	Field plantings, from Big Sioux Nursery, Watertown, SD
White poplar <i>Populus alba</i>	9082892	MN, IA (seed source)	Field plantings
Meyer spruce <i>Picea meyerii</i>	9094411	China	Field plantings. Perhaps more drought tolerant than blue spruce
Mongolian Scots pine <i>Pinus sylvestris</i> var. <i>mongolica</i>	9094403	China	Field plantings, composite of 9063158, 9069172, 9076719, 9076718, 9069164
Lodgepole pine <i>Pinus contorta</i> var. <i>latifolia</i>	9094433	Colorado to Canada	Has performed well at ARS and two 7-year trials in ND. Will initiate Off-Center testing and field plantings in 2014.