



2024 Annual Report

Woody Plant Materials

Off-Center Evaluation Planting

Eastern South Dakota Soil & Water Research Farm

Brookings, South Dakota

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Introduction

Tree and shrub species are annually evaluated by the Bismarck Plant Materials Center (PMC) and its partners at off-center sites. Currently, there are two active sites; Brookings, South Dakota and Dickinson, North Dakota. Each location provides an off-center evaluation site representative of Major Land Resource Areas of their respective State. The plantings provide an opportunity to formally evaluate plant materials under uniform soil, culture, and management conditions. They provide performance and adaptation information that can be used as supporting data for Natural Resources Conservation Service (NRCS) Field Office Technical Guide (FOTG) approved cultivars/species lists and future cooperative tree/shrub releases. The plant performance information assists cooperating nurseries and plant researchers in determining the range of adaptation of many accessions and cultivars.

The plots are located at the Eastern South Dakota Soil and Water Research Farm. The 80-acre farm is a nonprofit organization governed by 15 Eastern South Dakota Conservation Districts (CD). It is located near the town of Brookings, approximately 2 ½ miles north of the South Dakota State University campus. It is in Major Land Resource Area 102A, Rolling Till Prairie. The soils at the site are classified as a Vienna-Brookings Complex silt loam. The soils are characteristic of those found in East Central South Dakota and West Central Minnesota and in the Northern Corn Belt region. They are in conservation tree and shrub groups 1 and 3. Long-term (years 1981-2010) average precipitation at Brookings is 24.31 inches. The evaluation site is divided into two areas, a south plot and a west plot. Trees and shrubs were first planted in the south plot in 2004 and continue to be added annually. Tree planting began in the west plot in 2023. The existing ground cover is smooth brome grass (*Bromus inermis* Leyss) sod. Strips in the sod are chemically killed with glyphosate, and then tree fabric is laid to control weeds. Holes are opened in the fabric to plant new entries. Within the row, trees are spaced 10 feet apart and shrubs are spaced 5 feet apart. Generally, 5 plants of each accession are planted. Measurements and notes are taken at the end of each growing season.

This planting site provides an opportunity to formally evaluate the adaptability and performance of trees and shrubs for conservation use in Eastern North Dakota and South Dakota and surrounding States. It also provides a single, easily accessible location where Soil and Water CD cooperators and the public can view and compare numerous species for use in windbreaks, critical areas, streambank stabilization, and urban agroforestry.

Objectives

1. Evaluate the adaptation and performance of selected woody plant materials for conservation purposes
2. Select superior performing woody strains and conduct advanced evaluation progeny testing
3. Release improved plant materials for public use
4. Provide a location for tours and other educational purposes

2024 Progress and Actions

2024 New Entries

- 9094479 Turkey fir (*Abies nordmanniana* subsp. *equi-trojani*) (Asch. & Sint. ex Boiss.) Coode & Cullen
- 9094482 Turkey fir (*Abies nordmanniana* subsp. *equi-trojani*) (Asch. & Sint. ex Boiss.) Coode & Cullen
- 9094483 northern white cedar (*Thuja occidentalis* L.)
- 9094484 American elderberry (*Sambucus canadensis* L.)

Turkey fir is a straight trunked, pyramidal conifer native to Northwestern Turkey. Turkey fir produces dark green needles. The accessions planted at the OCEP were received from the North Central Regional Plant Introduction Station at Ames, IA; who is distributing them to various locations in the Midwest and Great Plains for adaptation testing.

Northern white cedar is a conifer that is native to the Northeastern United States and Eastern Canada. Branchlets are flattened and are bright green on top and pale green on the bottom (Fig. 1). The species



Figure 1 Northern white cedar at the time of planting.

is susceptible to winter windburn, which turns branchlets yellow or brown. The species prefers cool, moist soils, and protection from wind. In the Dakotas, the species is commonly used as a landscape plant with success likely due to wind protection and ample water. Using the species as a conservation plant has been challenging, as there is usually less wind protection and water in these types of plantings. Native American tribes in the Dakotas and Minnesota have used northern white cedar for various purposes and are seeking sources better adapted to their locations. The accession planted at the OCEP was received from the North Central Regional Plant Introduction Station at Ames, IA; with the intent of evaluating its potential drought tolerance.

American elderberry is a shrub native to North America. It requires moist, well drained soils. Leaves are bright green, long, narrow, and paired opposite of each other (Fig. 2). Flowers are white and develop in clusters. Fruit ripens into purple-black fruit that attracts birds. The fruit is used for preserves, jellies, pies, and wines. Heavy snow loads will crush this species to the ground, but if plants are trimmed, they can recover from the roots. This should be taken into consideration



Figure 2 American elderberry after one growing season.

when using the species in a conservation planting. Planting this species in the OCEP plot is a way to better observe the plant in a typical conservation setting.

On 14 June 2024, Brody Patterson, Ryan Forbes, and Ed Bahm planted four new tree entries.; northern white cedar, American elderberry and two accessions of Turkey fir (Fig. 3). Additionally, four of the five dead Norway spruce planted in 2023 were replaced with trees of the same accession. Herbicide was sprayed on white poplar suckers that had sprouted since removal of white poplar in 2022. Suckers were quite prevalent in the western half of the south plot. Sucker production will need close monitoring in future years. Thanks to those that helped with tree planting and maintenance.

2024 Data Collection

On 10 September 2024, data was collected on 25 tree accessions by Laura Bosworth, Kyle Hammert, Rayma Daigle, Zack Vilkauskas and Ed Bahm (Fig. 4) Measurements and ratings included height, crown spread, vigor, survival, and wildlife damage. Data is collected annually on a rotational basis.

On 11 September 2024, South Dakota NRCS and partners conducted a training titled “Windbreak Establishment and Technology”. A component of the training was a tour of the Brookings OCEP. Participants learned about the purpose of the plots and had interactive discussion on the species that they observed.

2024 Tree/Shrub Performance

A species that stands out in the Brookings plot is sycamore. After 10 years, there was 100% survival and trees were 25 feet tall (Fig. 5). However, there were slight signs of dieback.



Figure 5 Sycamore trees that are ten years old.

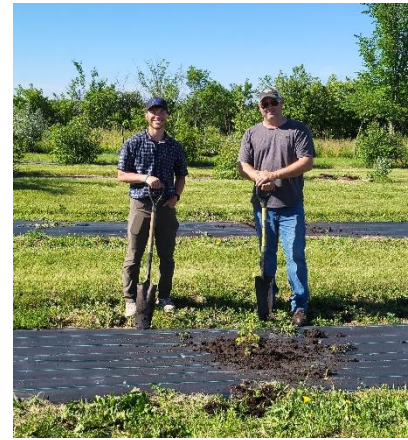


Figure 3 (left to right) Brody Patterson and Ryan Forbes planting new woody species.



Figure 4 (left to right) Zack Vikauskas, Rayma Daigle, Laura Bosworth, and Kylie Hammett collecting data.

Sycamore is native to the Eastern United States. It is a moderately fast-growing tree and prefers moist soils. It is common for patches of the outer bark to peel off and expose white inner bark. Sycamore has the potential to be a fast-growing deciduous tree in windbreaks. Adaptation to drier and colder climates than experienced in Brookings needs further testing. Sycamore has had poor performance at test sites near Becker, MN and Dickinson, ND.

Northern catalpa has done well in planting sites close to its native range. It is a medium/tall deciduous tree that produces large leaves, white flowers, and long seed pods when mature. Even though they are not well protected from wind at the Brookings OCEP, catalpa trees had 100% survival and averaged 5.75 feet tall after two growing seasons (Fig. 6). Northern catalpa trees planted in the early 2000's near the OCEP site, which are extremely protected by other windbreak species, are also growing quite well (Fig. 7). If adapted, catalpa would provide a fast-growing deciduous tree option for shelterbelts and windbreaks. The effects of heavy snow load will be of particular interest in future years.



Figure 6 Two years growth on northern catalpa.

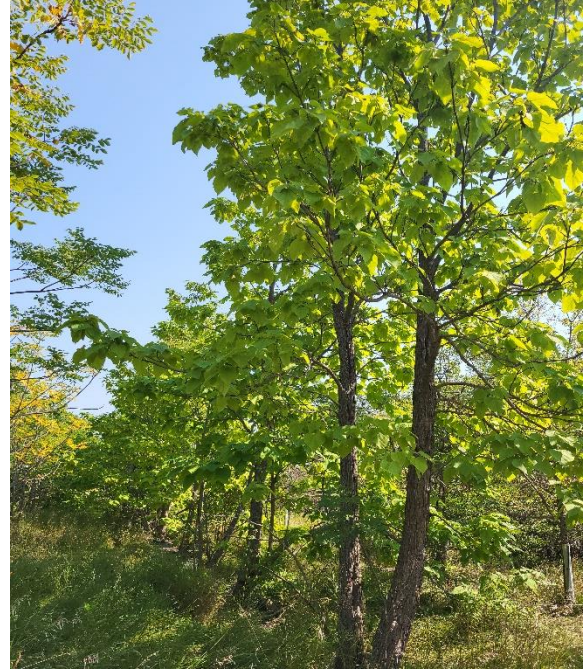


Figure 7 Trees of catalpa approximately 25 years old.

Black chokeberry is a medium sized shrub, native to Eastern North America. Leaves are deep, glossy green. Berries are purplish black in color and are about half an inch or less in diameter. 'McKenzie' black chokeberry, a Bismarck Plant Materials Center release, was planted in the Brookings OCEP in 2008. As early as 2009 and nearly every scheduled evaluation year since then, abundant fruit production has been noted. As of 2024, survival was 100%, average height was 8.5 feet and average canopy width was 7.5 feet. Plants were growing vigorously (Fig. 8).

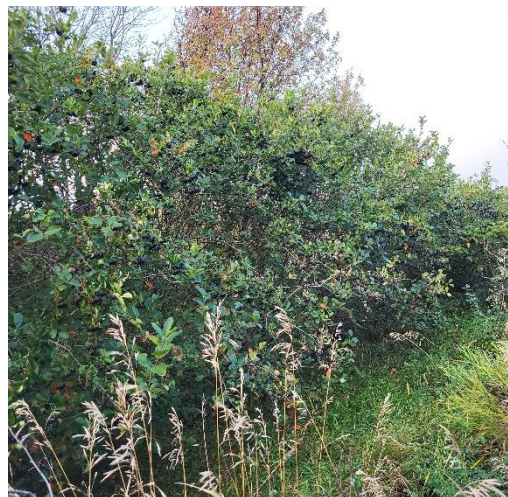


Figure 8 'McKenzie' black chokeberry with abundant fruit.

Planning and Maintenance-2025 Goals

2025 New Entries

- 9094481 Scotch pine-Mongolian source (*Pinus sylvestris* L.)
- Mongolian oak (*Quercus mongolica* Fisch.ex Ledeb.)

Scotch pine is a tall, introduced conifer species to North America. Trees have a pyramidal shape and are commonly used as Christmas trees and in conservation windbreaks. Scotch pine is highly susceptible to pine wilt disease that affects many introduced pine trees in North America. The disease is native to North America and does not adversely affect native species of pine. Its causal pathogen is the pine wilt nematode (*Bursaphelenchus xylophilus*) that is transmitted by pine sawyer beetles (*Monochamus galloprovincialis*). Pine wilt disease affects the water conduction vessels within a tree. Tree death usually progresses from the top of the tree downward. Needle discoloration is one of the first signs. Needles turn grayish green and then tan. The dead needles remain on the tree. Symptoms of the disease are usually expressed in trees 10 years or older (Fig. 9). Trees that contract the disease usually die within a few years. Trees that are under stress in conjunction with hot and humid weather are most susceptible to the disease.



Figure 9 Pine wilt disease in mature Scotch pine at Watertown, SD.

The Bismarck Plant Materials Center has Scotch pine trees located on the Center that originated from Eastern Mongolia. Research has indicated that trees in this area of Mongolia could be resistant to pine wilt disease (Fig. 10). The potentially resistant Mongolian Scotch pine and Scotch pine originating from other parts of Europe and Asia that are known to be susceptible to pine wilt disease will be compared in the Dickinson and Brookings OCEP's and in field plantings in the Dakotas. Presence of the disease in the planting area will be indicated by symptom expression in the Scotch pine accession known to be susceptible to pine wilt disease.



Figure 10 Ten-year old Mongolian Scotch pine growing near Taylor, ND are healthy and vigorous.

Mongolian oak is native to Eastern Asia. Literature suggests performance of Mongolian oak and bur oak will be similar. Bur oak (*Quercus macrocarpa* Michx.) is native to the area and commonly planted in local windbreaks. In recent plantings within the area, Mongolian oak has had



Figure 12 Mongolian oak leaves turn a showy red color in fall. Photo by Jeff Smette

good survival and shown potential for fast growth (Fig. 11). It has good fall color (Fig. 12). Plans are to compare survival and growth of Mongolian oak and bur oak trees planted at the same time and of the same age. If adapted, Mongolian oak would provide another species option for windbreaks.



Figure 11 Mature Mongolian oak on the campus of North Dakota State University. Photo by Greg Morgenson

2025 Data Collection

Data is collected on a rotational basis. Tree height, crown width, vigor, survival, wildlife damage, and observational notes will be recorded for 20 trees/ shrub entries in 2025.

Maps and Entries

Table 1 is a list of actively growing entries in 2024. Brookings OCEP maps are Fig. 13 and Fig. 14.

Table 1 Trees/Shrubs at Brookings OCEP in 2024

Common name	Species	Accession	Row
mugo pine	<i>Pinus mugo</i>	9082889	S1
common ninebark	<i>Physocarpus opulifolius</i>	9082891	S1
wayfaring bush	<i>Viburnum lantana</i>	9082642	S1
seaberry	<i>Hippophae rhamnoides</i>	9082887	S1
American hazelnut	<i>Corylus americana</i>	9082888	S1
American black currant	<i>Ribes americanum</i>	9082687	S1
Missouri gooseberry	<i>Ribes missouriense</i>	9082746	S1
gray dogwood	<i>Cornus racemosa</i>	9082890	S1
gray dogwood	<i>Cornus racemosa</i>	9082738	S1
roundleaf hawthorn	<i>Crataegus cyclophylla</i>	9076686	S1
arrowwood viburnum	<i>Viburnum dentatum</i>	9091976	S2
winterberry	<i>Ilex verticillata</i>	9082711	S2
shadblow serviceberry	<i>Amelanchier canadensis</i>	9091975	S2
black chokeberry	<i>Aronia melanocarpa</i>	9091971	S2
chokecherry	<i>Prunus virginiana</i>	9008183	S2
common juniper	<i>Juniperus communis</i>	9019593	S2
olive hybrid	<i>Elaeagnus 'Jeffmorg'</i>	9092054 'Silverscape'	S2
staghorn sumac	<i>Rhus typhina</i>	9092053	S2
ironwood	<i>Ostrya virginiana</i>	9082739	S2
skunkbush sumac	<i>Rhus trilobata</i>	9091964	S2
roughleaf dogwood	<i>Cornus drummondii</i>	9094355	S3
horizontal juniper	<i>Juniperus horizontalis</i>	9012606	S3
highbush cranberry	<i>Viburnum trilobum</i>	9094281	S3
black chokeberry	<i>Aronia melanocarpa</i>	'McKenzie'	S3
plum	<i>Prunus spp.</i>	'Prairie Red'	S3
nannyberry	<i>Viburnum lentago</i>	9092141	S3

Table 1 (continued)

Common name	Species	Accession	Row
elderberry	<i>Sambucus nigra</i>	9094333	S3
Korean mountain ash	<i>Sorbus alnifolia</i>	9092140	S3
Meyers spruce	<i>Picea meyeri</i>	9094356	S4
cherry	<i>Prunus fruticose x cerasus</i>	'Carmine Jewel'	S4
pie cherry	<i>Prunus cerasus</i>	9092162	S4
American elm	<i>Ulnus americana</i>	9094406 'Princeton'	S4
Freeman maple	<i>Acer x fremanii</i>	9094336	T5
American linden	<i>Tilia americana</i>	9094334	T5
littleleaf linden	<i>Tilia cordata</i>	9094335	T5
Kentucky coffeetree	<i>Gymnocladus dioicus</i>	9091968	T5
Manchurian ash	<i>Fraxinus mandshurica</i>	9094417	6
American sycamore	<i>Platanus occidentalis</i>	90944176	6
American hazelnut	<i>Corylus americana</i>	9094418	6
sand cherry	<i>Prunus pumila</i>	'Catskill' 9051508	6
swamp white oak	<i>Quercus bicolor</i>	9094441	6
gray birch	<i>Betula populifolia</i>	9094442	6
shagbark hickory	<i>Carya ovata</i>	9094459	7
bitternut hickory	<i>Carya cordiformis</i>	9094460	7
American elm	<i>Ulmus americana</i>	Prairie Expedition® 9094417	7
gray birch	<i>Betula populifolia</i>	9082667	7
juniper	<i>Juniperus scopulorum</i>	Bridger Select	T9
ponderosa pine	<i>Pinus ponderosa</i>	Hunter Germplasm	T9
shagbark hickory	<i>Carya ovata</i>	9094459	T9
bitternut hickory	<i>Carya cordiformis</i>	9094460	T9
maidenhair	<i>Ginkgo biloba</i>	'Magyar'	T10
northern white cedar	<i>Thuja occidentalis</i>	9094452	T10
Norway spruce	<i>Picea abies</i>	9094478	T10
Turkey fir	<i>Abies nordmanniana subsp equi-trojani</i>	9094479	T10
hackberry	<i>Celtis occidentalis</i>	Prairie Harvest Germplasm	SWCD 4
hackberry	<i>Celtis occidentalis</i>	'Oahe'	SWCD 4
hackberry	<i>Celtis occidentalis</i>	9094282	SWCD 4
northern catalpa	<i>Catalpa speciosa</i>	9094477	W5
northern white cedar	<i>Thuja occidentalis</i>	9094483 (WLP2484)	W5
Turkey fir	<i>Abies nordmanniana subsp equi-trojani</i>	9094479 Ames 35992	W5
Turkey fir	<i>Abies nordmanniana subsp equi-trojani</i>	9094482 Ames 36225	W5
American elderberry	<i>Sambucus canadensis</i>	9094484	W6

2024	Brookings OCEP	West Plot Map										
Row	350 Ft											
W1	Conservation District Trees											
W2	Conservation District Trees											
W3	Conservation District Trees											
W4	Conservation District Trees											
W5					northern catalpa 9094477		northern white cedar 9094483 Ames WLP 2484		Turkey fir 9094479 Ames 35992		Turkey fir 9094482 Ames 36225	
W6					American elderberry 9094484							
Between row spacing= 25 feet												
Within row spacing= trees 10 feet; shrubs 5 feet												

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