



2024 Annual Report Woody Plant Materials Off-Center Evaluation Planting Dickinson Research Extension Center Dickinson, North Dakota

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Introduction

Tree and shrub species are annually evaluated by the Bismarck Plant Materials Center (PMC) with 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 Dickinson Research Extension Center (DREC) is the only active off-center evaluation planting (OCEP) site in North Dakota. It provides an opportunity to formally evaluate the adaptability and performance of trees and shrubs for conservation use in western North Dakota and South Dakota. It also provides a single, easily accessible location where area staff from North Dakota State University, Natural Resources Conservation Service (NRCS), Conservation Districts, other agencies, and the public can view and compare numerous species for use in windbreaks, critical area plantings, stream-bank stabilization projects, and urban agroforestry plantings.

The plots are located south of Interstate Highway 94, at the western edge of the town of Dickinson. The soil type is a Parshall fine sandy loam, which is in North Dakota Conservation Tree and Shrub Group 5. The NRCS originally signed an agreement in 1977 with the Dickinson Research Extension Center, formerly the North Dakota Experiment Station for evaluation of woody plants at the Center. The PMC started evaluating trees and shrubs in 1978. The latest agreement was signed in September 2012 and expires in September 2027. Since 1978, the PMC and field office staff have planted 128 species of trees and shrubs. At the present time, 90 accessions and 65 species are under evaluation.

Woody species previously tested at the Dickinson OCEP are not included in this summary report. A compilation of species planted and evaluated at the Dickinson OCEP and three other OCEP sites from 1978-2010 can be found in a report titled "Trees and Shrubs Tested in Western North Dakota and South Dakota" (<https://www.nrcs.usda.gov/plantmaterials/ndpmcpu9423.pdf>).

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.)

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 (Fig 1).

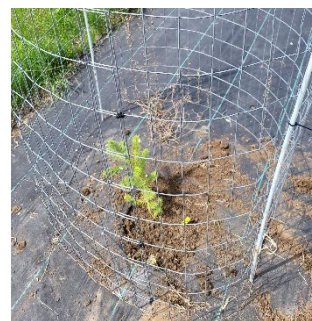


Figure 1 Turkey fir at the time of planting.

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. The species 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.



Figure 2 Northern white cedar at time of planting.



Figure 3 Northern white cedar had significant growth in 2024.

On 16 May 2024, Derek Oliver, Nancy Jensen and Ed Bahm planted 5 trees of each of the new entries (listed above) of Turkey fir and northern white cedar at the site. Wire cages were placed around all the new entries to prevent deer damage (Fig 2; Fig 3). There was replacement of 3 trees of 9094478 Norway spruce due to death loss over winter.

2024 Data Collection

Data was collected for 20 entries on 5 September 2024 by Derek Oliver, Ed Bahm, and Selin Petrosian. Measurements and ratings included height, crown spread, vigor, survival, and wildlife damage. Data is collected on a rotational basis rather than annually for all entries in the trial.

2024 Tree/Shrub Performance

An entry that stood out in the Dickinson plot was northern catalpa. It is a medium/tall deciduous tree that produces large leaves, white flowers, and long seed pods when mature. Although Dickinson is well west of its native range, trees were 4.5 feet tall after two growing seasons (Fig. 4). The effects of heavy snow load winters on northern catalpa will be of particular interest in future years.

Another entry that is looking good in Dickinson is Prairie Expedition[®] American elm. American elm is a common, native deciduous tree to the



Figure 5 Prairie Expedition[®] elm with dark green leaves during a dry fall.

Central and Eastern United States and Canada. The species has spreading branches and dark green leaves. American elm is highly susceptible to Dutch elm disease. In 2004, North Dakota State University released Prairie Expedition[®] American elm. It is a registered release of American elm that is resistant to Dutch elm disease. Prairie Expedition[®] was planted in 2015 at the Dickinson OCEP. In 2024, 100% of trees were surviving and had an average height of 14.5 feet (Fig. 5).

Gray birch is a native deciduous tree to the Northeastern United States and Eastern Canada. Gray birch has white to grayish bark on the central leader and can grow rapidly in most well drained soils. In the spring of 2021, many of the gray birch growing in the surrounding area exhibited dieback in the top branches. Early spring warm-up followed by an extended cold period was the likely cause of dieback. The tops of several trees with dieback started to grow again and produce leaves. However, the tops of the trees at the Dickinson OCEP did not recover or produce leaves but the lower portion, not affected by the dieback, was quite vigorous in 2024 (Fig. 6).



Figure 4 Northern catalpa tree after 2 years growth.



Figure 6 Gray birch with top branches that did not recover from dieback.

Planning and Maintenance-2025 Goals

2025 Activities

July 2025: Remove/suppress weeds around more recently planted trees in the West Block. Remove minor woody contaminants in the East Block.

August 2025: Data collection

2025 New Entries

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

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 good survival and shown potential for fast growth (Fig. 7). It has good fall color (Fig. 8). 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 an additional species option in a diverse windbreak.



Figure 7 Mature Mongolian oak on the campus of North Dakota State University. Photo by Greg Morgenson



Figure 8 Mongolian oak leaves turn a showy red color in fall. Photo by Jeff Smette

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 PMC 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 that is known to be susceptible to pine wilt disease.



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

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 trees/ shrub entries scheduled for evaluation in 2025.

Maps and Entries

Figure 11 is an aerial overview of the plots. Table 1 is a list of all actively growing entries in 2024. Figure 12 and Figure 13 are maps of the West Plot and East Plot, including location of each entry within the plot.

Figure 11. Dickinson OCEP aerial overview of West Plot and East Plot

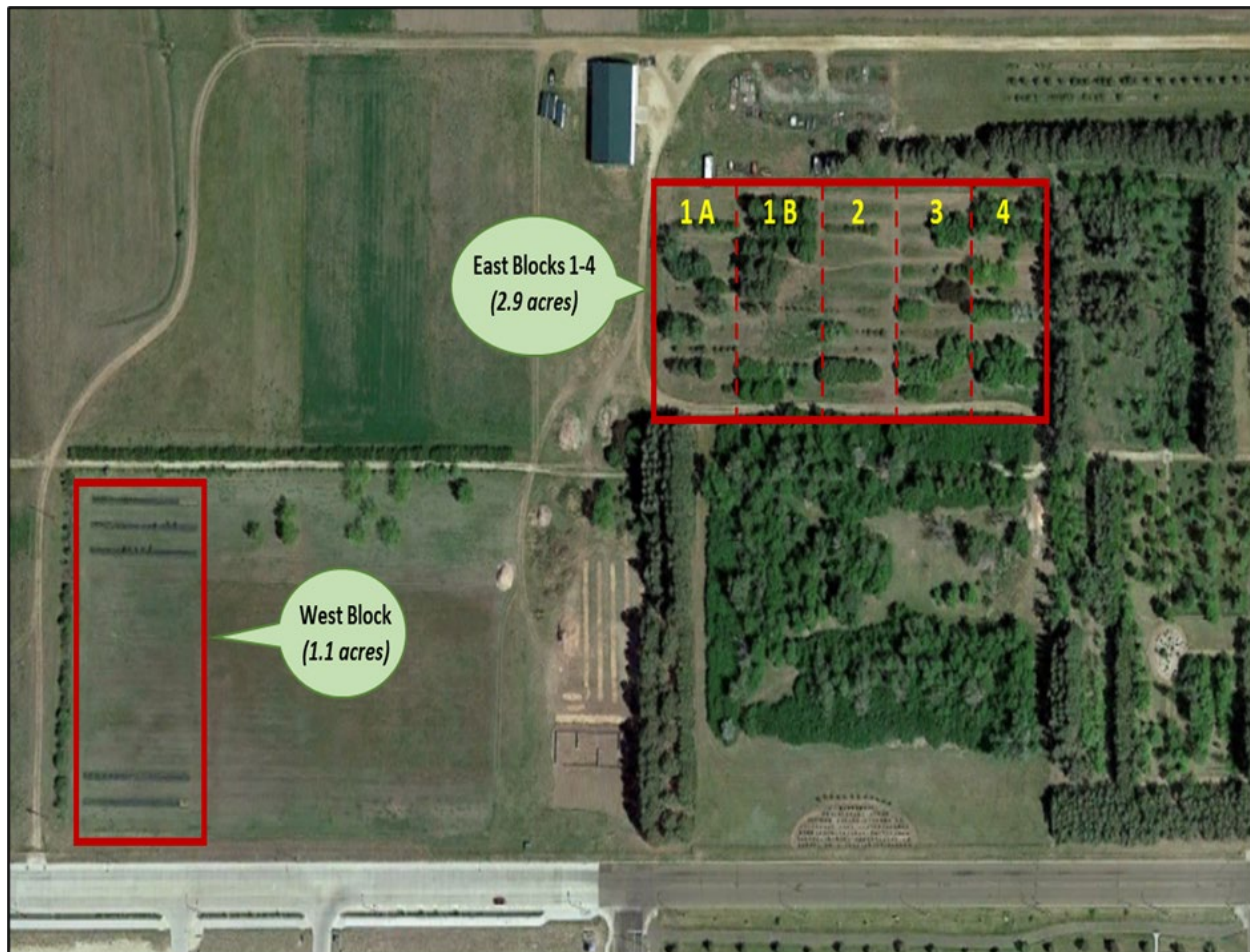


Table 1 Trees/Shrubs present at the Dickinson OCEP in 2024.

Common name	Species	Accession	Block	Row
Siberian larch	<i>Larix sibirica</i>	ND1729	East 1B	1
green ash	<i>Fraxinus pennsylvanica</i>	SD156	East 4	1
green ash	<i>Fraxinus pennsylvanica</i>	ND1734	East 4	1
aspen (quaking)	<i>Populus tremuloides</i>	9082885	East 1A	2
green ash	<i>Fraxinus pennsylvanica</i>	9082619	East 1A	2
Siberian larch	<i>Larix sibirica</i>	SL383T	East 1B	2
smooth sumac	<i>Rhus glabra</i>	9082684	East 2	2
chokecherry	<i>Prunus virginiana</i>	9008183	East 2	2
Ussurian pear	<i>Pyrus ussuriensis</i>	'McDermant'	East 3	2
green ash	<i>Fraxinus pennsylvanica</i>	'Cardan'	East 4	2
green ash	<i>Fraxinus pennsylvanica</i>	ND1759	East 4	2
Siberian larch	<i>Larix sibirica</i>	ND1765	East 1B	3
Ohio buckeye	<i>Aesculus glabra</i>	ND1432	East 4	3

Table 1 (continued)

Common name	Species	Accession	Block	
white poplar	<i>Populus alba</i>	ND3796	East 1A	4
ponderosa pine	<i>Pinus ponderosa</i>	ND1763	East 1B	4
bristlecone pine	<i>Pinus aristata</i>	ND1565 (9006036)	East 1B	4
aromatic sumac	<i>Rhus aromatica</i>	'Konza'	East 3	4
late lilac	<i>Syringa villosa</i>	'Legacy'	East 3	4
honey-locust	<i>Gleditsia triacanthos</i>	ND1879	East 4	4
quaking aspen	<i>Populus tremuloides</i>	9069090	East 1A	5
ponderosa pine	<i>Pinus ponderosa</i>	9057413	East 1B	5
Siberian pine	<i>Pinus sibirica</i>	9069169	East 1B	5
silver buffaloberry	<i>Shepherdia argentea</i>	'Sakakawea'	East 3	5
crabapple	<i>Malus sp.</i>	'Magenta'	East 3	5
black ash	<i>Fraxinus nigra</i>	9063116	East 4	5
Kentucky coffeetree	<i>Gymnocladus dioica</i>	9091968	East 4	5
poplar (hybrid)	<i>Populus x 'Assiniboine'</i>	Assiniboine	East 1A	6
Scotch pine	<i>Pinus sylvestris</i>	9069172	East 1B	6
lodgepole pine	<i>Pinus contorta</i>	9092231	East 1B	6
rose (rugosa)	<i>Rosa rugosa</i>	9057406	East 2	6
western blue elderberry	<i>Sambucus mexicana</i>	9082638	East 2	6
Tatarian maple	<i>Acer tataricum</i>	9076726	East 3	6
Russian peashrub	<i>Caragana frutex</i>	9091969	East 3	6
green ash	<i>Fraxinus pennsylvanica</i>	9063115	East 4	6
Russian olive	<i>Elaeagnus angustifolia</i>	9076727	East 4	6
eastern cottonwood	<i>Populus deltoides</i>	9063141	East 1A	7
black cherry	<i>Prunus serotina</i>	9076737	East 2	7
chokeberry	<i>Aronia melanocarpa</i>	'McKenzie'	East 2	7
common ninebark	<i>Physocarpus opulifolius</i>	9082891	East 3	7
ponderosa pine	<i>Pinus ponderosa</i>	Hunter Germplasm	East 1A	8
juniper	<i>Juniperus</i>	Bridger Select	East 1A	8
pin cherry	<i>Prunus pensylvanica</i>	9091967	East 1B	8
Japanese cherry	<i>Prunus serrulata</i>	9063142	East 2	8
plum (hybrid)	<i>Prunus sp.</i>	'Prairie Red'	East 3	8
Amur maple	<i>Acer ginnala</i>	ND629	East 3	8
hackberry	<i>Celtis occidentalis</i>	'Oahe'	East 4	8
Scotch pine	<i>Pinus sylvestris</i>	9069164	East 1A	9
Siberian larch	<i>Larix sibirica</i>	9069168	East 1A	9
corktree (Amur)	<i>Phellodendron amurense</i>	9063148	East 1B	9
nannyberry	<i>Viburnum lentago</i>	ND21	East 1B	9
Arnold hawthorn	<i>Crataegus mollis</i>	'Homestead'	East 2	9
Amur maple	<i>Acer ginnala</i>	ND1873	East 3	9
Peking lilac	<i>Syringa pekinensis</i>	ND686	East 3	9
SD75	<i>Celtis occidentalis</i>	SD75	East 4	9
mugo pine	<i>Pinus mugo</i>	9082889	East 1A	10
littleleaf linden	<i>Tilia cordata</i>	9069081	East 1B	10
Japanese elm	<i>Ulmus davidiana</i> var. <i>japonica</i>	9063126	East 1B	10
common juniper	<i>Juniperus communis</i>	ND3742 (9019593)	East 2	10
bittersweet	<i>Celastrus scandens</i>	9082712	East 2	10
Amur chokecherry	<i>Prunus maackii</i>	9069129	East 3	10
roughleaf dogwood	<i>Cornus drummondii</i>	9094355	East 3	10
Meyers spruce	<i>Picea meyeri</i>	9094356	East 4	10
haskaps	<i>Lonicera caerulea</i>	'BerryBlue' 9094419	West	1
haskaps	<i>Lonicera caerulea</i>	'Cinderella' 9094420	West	1
American hazelnut	<i>Corylus americana</i>	9094418	West	1
Manchurian ash	<i>Fraxinus manschurica</i>	9094417	West	2
gray birch	<i>Betula populifolia</i>	9082667	West	2
gray birch	<i>Betula populifolia</i>	9094442	West	2
swamp white oak	<i>Quercus bicolor</i>	9094441	West	3
American elm	<i>Ulmus americana</i>	Prairie Expedition®	West	3
maidenhair tree	<i>Ginkgo biloba</i>	'Magyar'	West	3
shagbark hickory	<i>Carya ovata</i>	9094459	West	4
bitternut hickory	<i>Carya cordiformis</i>	9094460	West	4
northern catalpa	<i>Catalpa speciosa</i>	9094477	West	4

Table 1 (continued)

Common name	Species	Accession	Block	Row
Norway spruce	<i>Picea abies</i>	9094478	West	5
Turkey fir	<i>Abies nordmanniana</i> subsp <i>equi-trojani</i>	9094479 Ames 35992	West	5
Turkey fir	<i>Abies nordmanniana</i> subsp <i>equi-trojani</i>	9094482 (Ames 36225)	West	5
northern white cedar	<i>Thuja occidentalis</i>	9094483 (WLP 2484)	West	6
Douglas fir	<i>Pseudotsuga menziesii</i>	9094434	West	12
Douglas fir	<i>Pseudotsuga menziesii</i>	9094435	West	12
sand cherry	<i>Prunus besseyi</i>	'Catskill' 9051508	West	13
shagbark hickory	<i>Carya ovata</i>	9094459	West	13
bitternut hickory	<i>Carya cordiformis</i>	9094460	West	13

Figure 12 Dickinson OCEP West Block

	2024		Dickinson OCEP		West Block		
Row	25 feet	25 feet	25 feet	25 feet	25 feet	25 feet	
1	9094419 'Berry Blue' honeyberry	9094420 'Cinderella' honeyberry	9094418 American hazelnut	Fabric	Fabric	Fabric	N 
2	9094417 Manchurian ash		9082667 gray birch		9094442 gray birch		
3	9094441 swamp white oak		Prairie Expedition® American elm		9094461 'Maga' Ginkgo biloba maidenhair		
4	9094459 shagbark hickory		9094460 bitternut hickory		9094477 northern catalpa		
5	9094478 Norway spruce		9094479 Turkey fir Ames 35992		9094482 Turkey fir Ames 36225		
6	9094483 northern white cedar Ames WLP 2484		Fabric	Fabric	Fabric	Fabric	
7							
8							
9							
10							
11							
12	9094434 Douglas fir		9094435 Douglas fir		Fabric	Fabric	
13	9051508 'Catskill' sand cherry	9094459 shagbark hickory			9094460 bitternut hickory		
	25 feet	25 feet	25 feet	25 feet	25 feet	25 feet	
	1 tree	Trees numbered and data collected west to east.					
		In-row spacing: trees-10 feet; shrubs=5 feet.					
	fabric	Between row spacing is 25 feet except row 11 which will be 20 feet					

Figure 13. Dickinson OCEP East Block

2024		Dickinson OCEP		East Block									
ROW	100 feet		20'	100 feet		20'	100 feet		20'	100 feet			
1			ALLEY	ND1729 Siberian Larch		ALLEY			ALLEY				
2	9082885 aspen	9082619 green ash		SL-383-T Siberian larch			9082684 smooth sumac	9008183 Sheridan chokecherry		'McDermant' Ussurian pear	'Cardan' green ash	ND1759 green ash	
3				ND1765 Siberian larch								ND1432 Ohio buckeye	
4	ND3796 white poplar			ND1763 ponderosa pine	ND1565 bristlecone pine					'Konza' aromatic sumac	'Legacy' late lilac	ND1879 honey-locust	
5		9069090 quaking aspen		9057413 ponderosa pine	9069169 Siberian pine					'Sakakawea' silver buffaloberry	'Magenta' crabapple	9063116 black ash	9091968 KY coffeetree
6		Assiniboine poplar		9069172 Scotch pine	9092231 lodgepole pine		9057406 rugosa rose	9082638 western blue elderberry		9076726 Tatarian maple	9091969 Russian peashrub	9063115 green ash	9076727 Russian olive
7	9063141 eastern cottonwood						9076737 black cherry	'McKenzie' chokeberry		9082891 common ninebark			
8	Hunter Germplasm ponderosa pine	Bridger Select juniper		9091967 pin cherry			9063142 Japanese cherry			'Prairie Red' plum	ND629 Amur maple	'Oahe' hackberry	
9	9069164 Scots pine	9069168 Siberian larch		9063148 corktree	ND21 nanny-berry		'Homestead' Arnold hawthorn			ND1873 Amur maple	ND686 Peking lilac	SD175 hackberry	
10		9082889 mugo pine		9069081 littleleaf linden	9063126 Japanese elm		common juniper	bitter-sweet		chokecherry 9089129 Amur	9094355 rough leaf dogwood	9094356 Meyers spruce	
Block 1A		Block 1B		Block 2		Block 3		Block 4					
1 tree		Trees numbered and data collected west to east. In-row spacing: trees=10 feet; shrubs=5 feet											
		In-row spacing: trees=10 feet shrubs=5 feet											
		Between row spacing: 25 feet											