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# **2025 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) along with its partners at off-center evaluation plantings (OCEPs). Currently, there are two active OCEP 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 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, 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 DREC, 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.

## 2025 Progress and Actions

### 2025 New Entries (all were planted in West Block)

- 9094491 Mongolian oak (*Quercus mongolica*)
- 9094490 Bur oak (*Quercus macrocarpa*)
- 9094489 Scotch pine (*Pinus sylvestris*)
- 9094481 Scotch pine (Mongolian) (*Pinus sylvestris*)

On 29 May 2025, James Winther, Justin Feld, Derek Oliver, Lucas Schmiesing, Nancy Jensen, and Ed Bahm planted 5 trees each of Mongolian oak, bur oak, Mongolian sourced Scotch pine, and Scotch pine acquired from the North Dakota Forest Service Nursery in Towner, North Dakota. Wire cages were placed around the new entries to prevent deer damage.

Mongolian oak is a medium to large deciduous tree native to Eastern Asia. It is very similar to bur oak (*Quercus macrocarpa*) in acorn development, leaf pattern, and adaptability to colder climates. In Arboretum Reviews from the University of Minnesota (Snyder, 1973) it is described as a very hardy and sturdy tree with a growth habit of a miniature bur oak. Bur oak is native to most of North America and is commonly planted in local windbreaks. In recent plantings within North Dakota, Mongolian oak has had good survival and fall color (Figure 1). Along with evaluations at the OCEP, survival and growth of Mongolian oak and bur oak trees of the same age and planted on the same site will be compared in Field Planting trials beginning in 2026. If adapted, Mongolian oak would be an additional species option in a diverse windbreak.



Figure 1 Mongolian oak leaves turn a showy red in the fall. Photo by Jeff Smette

Scotch pine is a tall, introduced conifer species in 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. Symptoms of the disease in Scotch pine are usually expressed in trees that are 10 or more years old (Figure 2). Tree death usually progresses from the top of the tree downward. Needle discoloration is one of the first signs, with needles turning grayish green and then tan, with dead needles remaining on the tree. Once trees show symptoms, they are usually dead within a few years. Trees experiencing stress, combined with high temperatures and humidity, are most susceptible to the disease.

Scotch pine trees, propagated from seed collected in Eastern Mongolia, where trees have shown potential pine wilt disease resistance, were planted at the PMC several years ago. Seeds harvested from the PMC trees were propagated and seedlings were distributed for Field Planting trials in the Dakotas and for planting at OCEP in Dickinson, North Dakota and Brookings, South Dakota in 2025. In these trials, Scotch pine originating from other parts of Europe and Asia with known susceptibility to pine wilt are being compared to the potentially resistant Mongolian pine.

### 2025 Data Collection

Data was collected for 13 entries on 23 September 2025 by Jon Fetting, Nancy Jensen, and Ed Bahm. 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.

### 2025 Tree/Shrub Performance

Shagbark hickory (*Carya ovata*) and bitternut hickory (*Carya cordiformis*) are tall deciduous trees native to the eastern half of the United States and eastern Minnesota. Both species were planted at the Dickinson OCEP in 2022 and 2023. Performance has been poor, mortality has been extensive and surviving trees show no growth and have poor vigor. Poor tree performance was likely due to drier weather conditions at Dickinson compared to its native range.

Siberian larch (*Larix sibirica*) has had outstanding longevity and vigor at the Dickinson OCEP. Siberian larch is a large pyramidal conifer that is native to Russia and Siberia. Interestingly, Siberian larch needles naturally turn yellow and shed each fall. Entries planted in 1978 at the Dickinson OCEP were 30 to 35 feet tall and vigorous (Figure 3) when evaluated in 2025. Trees of Siberian larch planted in 1998 struggled initially and only 20 percent survived the first two years. Surviving trees were 25 feet tall and vigorous when evaluated in 2025. The species provides a good, tall conifer option for conservation plantings and is readily available from conservation nurseries in the region. In the Dakotas and Minnesota, it is recommended that Siberian larch be planted on loamy soils that do not have restrictive characteristics such as poor drainage or salinity.



Figure 2 Pine wilt disease in mature Scotch pine at Watertown, South Dakota.



Figure 3 Siberian larch trees are vigorous and healthy at 48 years old.



Northern white cedar (*Thuja occidentalis*) is an evergreen conifer. Its primary native range is eastern Canada and adjacent New England States and the Great Lakes Region. The species is culturally significant to Native Americans. Northern white cedar generally grows well in wind protected sites that are watered, such as in towns, but has performed poorly in prior windbreak trials in the Dakotas and Minnesota. In 2024, trees received from the North Central Regional Plant Introduction Station at Ames, Iowa (9094483) were planted at the Dickinson OCEP. Surprisingly, these trees were doing well in 2025 (Figure 4). Additional time and evaluation will be needed to determine long-term persistence and performance.



Figure 4 Northern white cedar the second year after planting has healthy green growth.

## Planning and Maintenance-2026 Goals

### 2026 Activities

**June 2026:** Repair torn tree fabric on row 13 in west block before vegetation starts to grow. Remove cages from Northern catalpa (*Catalpa speciosa*). Control weeds on dead entries and hand-weed around small Scotch pine (accession 9094489).

**August 2026:** Data collection

### 2026 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 2026.

## Maps and Entries

Figure 5 is an aerial overview of the plots. Table 1 is a list of all actively growing entries in 2025. Figure 6 and Figure 7 are maps of the West Plot and East Plot, including location of each entry within the plot.

## References

Snyder, L.C. (1973) Oak (Arboretum Review No. 17-1973). Agricultural Extension Service, University of Minnesota.



Figure 5 Dickinson Off Center Evaluation Planting aerial overview of West Block and East Block.

Table 1 Trees/Shrubs present at the Dickinson Off-Center Evaluation Planting in 2025.

| ommon 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   |
| 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   |

Table 1 (continued)

| Common name             | Species                                             | Accession               | Block   | Row |
|-------------------------|-----------------------------------------------------|-------------------------|---------|-----|
| black ash               | <i>Fraxinus nigra</i>                               | 9063116                 | East 4  | 5   |
| Kentucky coffeetree     | <i>Gymnocladus dioicus</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   |
| hackberry               | <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 mandschurica</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   |
| Norway spruce           | <i>Picea abies</i>                                  | 9094478                 | West    | 5   |
| Turkey fir              | <i>Abies nordmanniana</i> subsp <i>equi-trojani</i> | 9094479<br>(Ames 35992) | West    | 5   |
| Turkey fir              | <i>Abies nordmanniana</i> subsp <i>equi-trojani</i> | 9094482<br>(Ames 36225) | West    | 5   |
| northern white cedar    | <i>Thuja occidentalis</i>                           | 9094483 (WLP 2484)      | West    | 6   |
| Mongolian oak           | <i>Quercus mongolica</i>                            | 9094491                 | West    | 6   |
| bur oak                 | <i>Quercus macrocarpa</i>                           | 9094490                 | West    | 6   |
| Douglas fir             | <i>Pseudotsuga menziesii</i>                        | 9094434                 | West    | 12  |
| Douglas fir             | <i>Pseudotsuga menziesii</i>                        | 9094435                 | West    | 12  |
| Scotch pine             | <i>Pinus sylvestris</i>                             | 9094489                 | West    | 12  |
| Scotch pine (Mongolian) | <i>Pinus sylvestris</i>                             | 9094481                 | 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  |

|     | 2025                                                     | Dickinson OCEP                                                                                   |                                                      | West Block |                                            |         |        |  |
|-----|----------------------------------------------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------|------------|--------------------------------------------|---------|--------|--|
| Row | 25 feet                                                  | 25 feet                                                                                          | 25 feet                                              | 25 feet    | 25 feet                                    | 25 feet |        |  |
| 1   | 9094419<br>'Berry Blue'<br>honeyberry                    | 9094420<br>'Cinderella'<br>honeyberry                                                            | 9094418<br>American<br>hazelnut                      | Fabric     | Fabric                                     | Fabric  | N<br>↑ |  |
| 2   | 9094417 Manchurian ash                                   |                                                                                                  | 9082667 gray birch                                   |            | 9094442 gray birch                         |         |        |  |
| 3   | 9094441 swamp white<br>oak                               |                                                                                                  | Prairie Expedition'<br>American elm                  |            | 9094461 'Magya' Ginko<br>biloba maidenhair |         |        |  |
| 4   | 9094459 shagbark hickory                                 |                                                                                                  | 9094460 bitternut hickory                            |            | 9094477 Northern<br>Catalpa                |         |        |  |
| 5   | 9094478 Norway Spruce                                    |                                                                                                  | 9094479 Turkey Fir Ames<br>35992                     |            | 9094482 Turkey Fir Ames<br>36225           |         |        |  |
| 6   | 9094483 northern white<br>cedar Ames WLP 2484            |                                                                                                  | 9094491 Mongolian oak                                |            | 9094490 bur oak                            |         |        |  |
| 7   |                                                          |                                                                                                  |                                                      |            |                                            |         |        |  |
| 8   |                                                          |                                                                                                  |                                                      |            |                                            |         |        |  |
| 9   |                                                          |                                                                                                  |                                                      |            |                                            |         |        |  |
| 10  |                                                          |                                                                                                  |                                                      |            |                                            |         |        |  |
| 11  |                                                          |                                                                                                  |                                                      |            |                                            |         |        |  |
| 12  | (tree 1missing)<br>9094434 Douglas fir (tree 2, 3,<br>4) |                                                                                                  | 9094489 Scotch pine (Towner<br>source) (tree 6,8,10) |            | 9094481                                    |         |        |  |
|     | 9094489 Scotch pine (Towner<br>Source) (tree 5)          |                                                                                                  | 9094435 Douglas fir (tree 7)                         |            | Mongolian Scotch Pine                      |         |        |  |
| 13  | 9051508<br>'Catskill'<br>sand cherry                     | 9094459 shagbark<br>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.<br>In-row spacing: trees-10 feet; shrubs=5 feet. |                                                      |            |                                            |         |        |  |
|     | fabric                                                   | Between row spacing is 25 feet except row 11<br>which will be 20 feet                            |                                                      |            |                                            |         |        |  |

Figure 6 Dickinson Off-Center Evaluation Planting West Block



|                                                                                                   | 2025 Dickinson OCEP        |                        | East Block            |                            |                         |                            |                              |                          |                                |                          |                       |                      |                       |
|---------------------------------------------------------------------------------------------------|----------------------------|------------------------|-----------------------|----------------------------|-------------------------|----------------------------|------------------------------|--------------------------|--------------------------------|--------------------------|-----------------------|----------------------|-----------------------|
| ROW                                                                                               | 100 feet                   |                        | 20                    | 100 feet                   | 20                      | 100 feet                   | 20                           | 100 feet                 | 20                             | 100 feet                 | 20                    | 100 feet             |                       |
| 1                                                                                                 |                            |                        |                       | ND1729 Siberian larch      |                         |                            |                              |                          |                                |                          | SD 156 green ash      | ND 1734 green ash    | N<br>↑                |
| 2                                                                                                 | 9082885 aspen              | 9082619 green ash      |                       | SL 383-T Siberian larch    |                         | 9082684 smooth sumac       | 9008183 Sheridan chokecherry | McDermid' Ussurian pear  |                                |                          | Cardan' green ash     | ND 1759 green ash    |                       |
| 3                                                                                                 |                            |                        |                       | ND1765 Siberian larch      |                         |                            |                              |                          |                                |                          |                       | ND 1432 Ohio buckeye |                       |
| 4                                                                                                 | ND 3796 white poplar       |                        |                       | ND1763 ponderosa pine      | ND1565 bristlecone pine |                            |                              | Konza' aromatic sumac    | Legacy' late lilac             |                          | ND1879 honey locust   |                      |                       |
| 5                                                                                                 |                            | 9069090 quaking aspen  | A<br>L<br>L<br>E<br>Y | 9057413 ponderosa pine     | 9069169 Siberian pine   | A<br>L<br>L<br>E<br>Y      |                              |                          | Sakakawea' silver buffaloberry | Magenta' crabapple       | A<br>L<br>L<br>E<br>Y | 9063116 black ash    |                       |
| 6                                                                                                 |                            | Assiniboine poplar     |                       | 9069172 scots pine         | 9092231 lodgepole pine  |                            | 9057406 rugosa rose          | 9082638 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' ponderosa pine     | Bridger Select juniper |                       | 9091967 pin cherry         |                         | 9063142 Japanese cherry    |                              | Prairie Red' plum        | ND629 amur maple               |                          | Gahe' hackberry       |                      |                       |
| 9                                                                                                 | 9069164 Scotch pine        | 9069168 Siberian larch |                       | 9063148 corktree           | ND211 nanny berry       | Homestead' Arnold hawthorn |                              | ND1873 amur maple        | ND686 pekin lilac              |                          | SD 175                |                      |                       |
| 10                                                                                                |                            | 9082889 mugopine       |                       | 9069081 little leaf linden | 9063126 Japanese elm    | common juniper             | bitter sweet                 | 9069129 amur chokecherry | 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=10feet; shrubs=5feet |                            |                        |                       |                            |                         |                            |                              |                          |                                |                          |                       |                      |                       |
| In-row spacing: trees=10feet shrubs=5feet                                                         |                            |                        |                       |                            |                         |                            |                              |                          |                                |                          |                       |                      |                       |
| Between row spacing: 25feet                                                                       |                            |                        |                       |                            |                         |                            |                              |                          |                                |                          |                       |                      |                       |

Figure 7 Dickinson Off-Center Evaluation Planting East Block.