

ESTABLISHMENT OF DOUGLAS-FIR (PSEUDOTSUGA MENZISII) AT NORTH DAKOTA SITES

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SUMMARY

VALUE OF DOUGLAS-FIR TO NORTH DAKOTA

Christmas tree growers -- Eight percent of the Christmas trees sold annually are produced by North Dakota growers (Scotch Pine makes up to 41% of North Dakota trees). There is room for expansion in North Dakota's share of the market and will require a more diverse available varieties of tree species. The fir trees grown national are desired due to their soft needles, pyramidal form and fragrant smell. (Source: ND Forest Service, 1987 - North Dakota Christmas Tree Marketing Survey.) Nationally the top three sellers include Scotch pine, Douglas-fir and a true fir of choice depending on region (Balsam fir in northeast U.S. Source: US Forest Service).

Ornamental Landscape/Nursery -- The mature Douglas-fir resembles Colorado spruce in form, texture and color. Advantage is Douglas-fir needles are flat and not harsh to the touch as pointed needles of spruce. These characteristics allow it to be used more in landscaping, complimenting the spruces. Douglas-fir mixed into spruce planting will add diversity and break spruce disease cycles.

Windbreak/Conservation Tree Plantings -- Spruce like other trees, are planted for density in windbreaks. Close spacings within the row and between the row create a micro-climate of limited air circulation, high humidity and shading which favor the development of disease fungi. Particular diseases (*Rhizosphaera needle cast*, *Cytospora canker*) are common problems under these conditions in spruce plantings. Planting spruce alternating with Douglas-fir trees may be valuable in breaking disease cycles or provide a back-up tree species preventing total loss of a tree row and wind protection.

SEED SOURCE

Douglas-fir is not a commonly planted tree species in North Dakota. Yet there are several locations across the state and under various conditions where mature trees have been growing successfully. Seed collection from many of these sites has been variable and may be a part of the program as a cooperative effort with Lincoln-Oakes Nursery, Bismarck, or North Dakota Forest Service Nursery, Towner.

LOCATION	COUNTY	APPROXIMATE AGE
Wheatland Cemetery	Cass	35- 40 Years
Bowmand Haley Dam	Bowman	30- 35 Years
Karl Larson Farm	LaMoure	80- 100 Years
Lowe Tree Calim	Ward	80- 100 Years
(Near) Crystal	Pembina	80- 100 Years
Veterans Hospital, Fargo	Cass	35- 40 Years
(Yard) Hebron	Morton	40 -50 Years
Windbreak	Williams	30- 40 Years

The seed source used in the 1994 trial plantings is from the Kaniksua National Forest in northern Idaho. These source trees are growing on the east slopes of the Rocky Mountains which are drier and trees are at a high altitude with cold hardiness equal to or cooler to North Dakota conditions. The seed was collected and grown at Lawyer Nurseries, Plains, Montana. Dr. Doug Kenfield stated that this source is commonly used in plantings across Montana. The scientific name is given as *Pseudotsuga menziesii* variety *glauca* or 'Blue' Douglas-fir.

Therefore, if a reliable seed source of Douglas-fir can be found it would be valuable for conservation/windbreak plantings, Christmas tree/forest plantations and landscape/-ornamental plantings throughout most of North Dakota.

Seedling Establishment


Determining planting techniques that will insure the highest survival and establishment is important. Some work with chemical root dips/slurries have been done with valuable success in North Dakota.

Various root treatments were made to the trees for evaluation of their effectiveness in tree survival and growth through their establishment period (1 to 3 years). Not all treatments were used at all sites -- only at the Absaraka site were all treatments used. Each treatment was accompanied by an equal number of control trees at each site. The treatments were as follows:

1. Control trees, water soak prior to planting
2. Roots²¹, a root starter fertilizer that is used to initiate root growth mixed with water.
3. Native prairie grass soil mixed with water into a slurry -- many types of mycorrhizae are associated with prairie grasses. It was suggested that some may associate with Douglas-fir seedlings.
4. Douglas-fir duff (soil, needles and cone compost) mixed with water into a slurry. The duff was collected from underneath mature Douglas-fir trees in the cemetery north of Wheatland in Cass County. The value of this slurry is to find associated mycorrhizae fungi with mature Douglas-fir trees growing successfully under North Dakota soil conditions.

1994 Douglas-fir establishment trial via root treatments at various North Dakota Locations

Location	Control	Native Prairie Soil Slurry	Mature Tree Duff Slurry	Roots Starter
1. Dave Anderson Farm South of Regent	50 Trees	50 Trees		
2. Kurt Olson Farm South of Regent	50 Trees			50 Trees
3. NDSU Experiment Station Dickinson	32 Trees			32 Trees

4. NDSU Horticulture Research Farm* near Absaraka	72 Trees	72 Trees	72 Trees	72 Trees
Total Trees/Treatment	203 Trees Control	122 Trees Native Prairie	72 Trees Tree Duff	153 Trees Roots 
<p>*At the first tow sites weed barrier was placed on 1/2 of the control trees and 1/2 of the treated trees.</p> <p>*At the Absaraka site and two Regent plantings, trees were planted into weed barrier.</p>				


Future Research

Evaluation of these Douglas-fir trials will be valuable throughout maturity in striving to know more about this species adaptation to North Dakota.

Other potential research:

- Selection of trees of superior characteristics for various uses or performances under North Dakota conditions
- Thinning responses
- Christmas tree culture - pruning - spacing, ect.
- Cover crops performamnce in Douglas-fir

Data Collection

Survival rate was quite high at 93.75% with losses of only two trees/treatment due to close cultivation. Growth data was collected from the Dickinson Experiment Station site on August 4, 1994. Due to variability in seedling stock and genetic variability there was no significant differences in growth between the control and Roots  Fertilizer treatment. This initial year's data will be compared with future years' growth when significant differences may occur.

First Growing Season's Growth Data from Douglas-fir Planting at the NDSU Experiment Station, Dickinson, North Dakota, 1994.

	Control		Roots $\frac{27}{31}$ Fertilizer	
	Average	Range	Average	Range
Height	18.2"	15.5 - 22.5"	18.3"	15.5 - 23.0"
Caliper	.33 $\frac{27}{31}$ "	.25 - .50"	.36"	.25 - .50"
Terminal Growth	2.57"	1.25 - 4.5"	2.63 $\frac{1}{3}$ "	.25 - 4.5"
Terminal of Lateral Growth	2.16"	.5 - 3.75"	2.45"	1.50 - 3.25"

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