

From PMC to Tech Guide

Lodgepole pine is a two-needled pine that can grow in various environmental conditions.

A lodgepole pine progeny test plot at the Northern Great Plains Research Lab (NGPRL) was evaluated in 2006 by Plant Materials Center staff. Cones were harvested from the 13 accessions (seed sources) that had the greatest height, cone production, canopy density, and vigor. Amazingly, most of the accessions visually selected by PMC staff scored in the top half of the group when evaluated in 1995 by Dr. Richard Cunningham, NGPRL, USDA-ARS, Mandan, North Dakota. Only 6 of 13 accessions provided sufficient seed for seedling production. The Towner State Nursery grew seedlings for the PMC. Three trial plantings were established in North Dakota and South Dakota in 2008 from the seedlings. Ponderosa pines were planted in the trial for comparison. After six years of observation, growth rates of both species were similar but lodgepole pine was a bit harder to establish than ponderosa pine (80% survival and 90% survival, respectively). Foliage of lodgepole pine was also slightly darker green. Neither pine performed well on heavy textured soils. Both species were relished by deer.

The performance was good overall for lodgepole pine in the trial plantings so seedlings were offered in 2014 to field offices in North Dakota, South Dakota, and Minnesota for “on farm” field plantings. A limited number are available for 2015 field plantings. Successful plantings are anticipated on well drained silt loams and coarser soil textures. The PMC hopes to gain information on the range of soils and the climatic conditions where lodgepole pine is adapted. Several years of successful geographically diverse field plantings would mean lodgepole pine could be added to the Field Office Technical Guide.



Three-year-old lodgepole pine at Hettinger, North Dakota

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ARS Lodgepole Seed Orchard

A lodgepole pine progeny test at the Northern Great Plains Research Station has been renovated by NRCS Plant Materials staff and many partners. This 2-acre stand of 500 trees was planted in 1980 by Dr. Richard Cunningham to evaluate the suitability of 25 different seed sources as conservation trees for the Northern Great Plains. Since then the trees grew; some died; they began competing with one another; and were at risk to catastrophic wildfire. By summer 2014,



ARS lodgepole pine seed orchard before pruning

180 trees had died from the crowded conditions.

The renovation goals were to:

- Thin the stand reducing tree densities to those appropriate for the soils.
- Prune lower limbs to reduce ladder fuels (fire risk).
- Prune and thin to allow access for maintenance and harvest equipment.
- Install “permanent” tree identification on each tree.

The lowest scoring seed sources as identified in the 1995 evaluation were all removed. (80% had died naturally.) About 140 trees with good genetics had to be removed to provide more growing space. Trees were selected and removed



ARS lodgepole pine seed orchard after 2014 pruning and clean-up

so that each remaining seed tree had at least one side not competing with an adjacent tree. Seedlings grown from seed collected from this stand were provided to field offices for field plantings in North Dakota, South Dakota, and Minnesota in 2014 and 2015.

Foxtail Dalea

Foxtail dalea (*Dalea leporina*) is an annual legume that is native to much of the eastern Great Plains including the Dakotas and Minnesota. It is scattered to common in moist, alluvial, sandy soils of disturbed sites. It can grow in somewhat acid soils. Plants have an erect growth habit. Flowering is late in the growing season. In the 1930s, foxtail dalea was successfully used as a green manure crop in Iowa.

With the great interest in cover crops and soil health, the PMC began evaluating the potential of foxtail dalea as a cover crop species for the Northern Great Plains.

A small plot of foxtail dalea was planted at the PMC on June 3, 2014, to evaluate its growth and performance. The plants were approximately 3 feet tall at maturity in October. Flowering was in late August and early September. Mature seed was produced, probably as a result of the extended warm fall temperatures and late frost. Foxtail dalea was also added to a mix of cover crop species that were planted at the Burleigh County Soil Conservation District farm (Menoken). Plant heights were much shorter in the mixed planting. They remained as an understory plant among the taller cover crop species. The variety ‘Sundance’ was used in both plantings. It is a release developed by South Dakota State University from seed collected in extreme southeastern South Dakota.



Foxtail dalea planted as part of the cover crop mix at the Burleigh County SCD farm at Menoken, North Dakota

Plans for 2015 include planting foxtail dalea at the PMC again to further evaluate its growth in monocultures and mixtures. The PMC is also offering seed to anyone willing to incorporate it into a planting. Some suggested plantings include cover crops, green manure, between tree rows, and pollinator or prairie seedings. Please let the PMC know if any producer would like to take part in evaluating foxtail dalea.



Foxtail dalea in the PMC plot

PMC Publications

Are you looking to find technical information written by the Bismarck Plant Materials Center? All Bismarck PMC publications can be found on the [Bismarck PMC homepage](#). This information can also be found by [topic](#) on the [national Plant Materials webpage](#) along with publications from other Plant Materials Centers. A document titled [Publications Available from the Bismarck Plant Materials Center](#) lists all the publications currently available and the web link for each. This document is updated as new technical information is published.

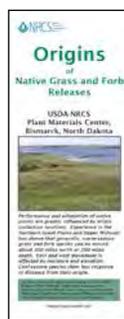
Check out several recently published fact sheets: [A Guide to Understanding Seed Tags](#), [Reclaiming Disturbed Sites](#), and [Big Bluestem Varieties for Minnesota](#). The [Conservation Seed/Plant Vendors List for North Dakota, South Dakota, and Minnesota](#) as well as the [Prairie Landscaping Seed/Plant Vendors List](#) have been updated with some new vendors and the most current website, email, and phone contact information.

Highlighted below are some suggested publication resources to assist in planning next season's grass/forb seedings:



[A Guide to Understanding Seed Tags](#)

This is a 2-page flyer which explains the components of a seed tag. Tag information helps verify the amount and quality of seed in the bag. Seed mixture information is also shown with details on calculating the Pure Live Seed weight of each species in the mix.



[Origins of Native Grass and Forb Releases](#)

This is a 12-page booklet listing 20 native grass and forb species released cooperatively by the Bismarck PMC. Knowing the origins of a plant release can assist conservation planners in recommending the best adapted plant material for a particular objective.



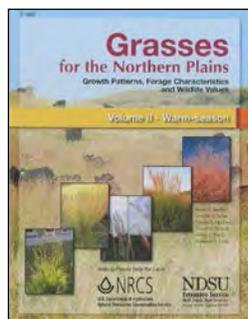
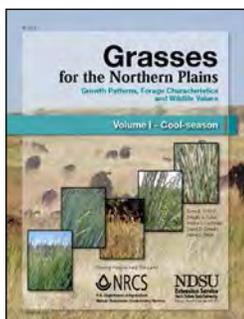
[Five Keys to Successful Grass Seeding](#)

This brochure provides useful information for establishing a grass seeding. It explains the importance of proper seeding date, seedbed preparation, seeding depth, seed quality, and weed control. This is a good reference for all producers interested in seeding grass.



[Seeding Pollinator Plots](#)

This flyer provides information on forb and legume seed, seedbed preparation, and drilling/broadcasting of the seed. It gives examples of seed mixes and some key points for establishing a successful pollinator planting.



[Grasses for the Northern Plains, Growth Patterns, Forage Characteristics, and Wildlife Values \(Volume I: Cool-season and Volume II: Warm-season\)](#)

This two-volume set provides hard-to-find information on growth cycles, salinity tolerances, and other performance characteristics of grasses. Selection of the proper species and variety is an important step when choosing a grass seeding mixture.

Herbaceous Species Distribution by the Bismarck PMC in 2014

Species	Type	Purpose	Amount	Unit
Grass	Plants	Demo/Research	371	each
Grass	Plants	Cultural (sweetgrass)	638	each
Grass	Rhizomes	Demo/Research	1390	each
Grass	Seed	Demo/Research	273	PLS pounds
Grass	Seed	Grower Increase	3092	PLS pounds
Forb	Seed	Demo/Research	250	grams
Forb	Plants	Demo/Research	649	each
Forb	Plants	Cultural (white sage)	85	each

Foundation Seed Distribution

Throughout its history, cultivar development and foundation seed production and distribution have been major workloads of the Bismarck Plant Materials Center. Once the PMC makes a release, it grows foundation class (or equivalent) seed. The foundation seed is distributed to commercial growers. The seed growers increase the seed and distribute it for conservation plantings to vendors such as elevators and seed houses, or directly to other farmers and ranchers. Hundreds of pounds of seed can be produced from one pound of seed distributed by the PMC. As a result, hundreds of acres can be planted for conservation.

As space is limited at the PMC, releases are rotated in and out of seed production. The size of each foundation field at the PMC is generally ½ to 2 acres. Any seed grown is cleaned and then stored in a temperature and humidity controlled cooler. Seed distributed in a particular year is not from that year's harvest. Seed produced in 2014 will be cleaned and available in 2015. Foundation seed production in 2014 was generally good. There were 7 warm-season and 5 cool-season grass releases harvested.

Following is a list of the Bismarck PMC grass and forb releases made throughout the years and the amount of seed distributed to seed growers in 2014 and cumulatively from 1996-2014. Although thousands of pounds of seed were distributed prior to 1996, that was the year North Dakota Foundation Seedstocks became a partner in Foundation seed distribution from the PMC.

SPECIES	RELEASE	Seed Distribution 2014 PLS pounds	Seed Distribution 1996-2014 PLS pounds
Native Warm-Season Grass			
big bluestem	Bison	50	3974
big bluestem	Bonilla	300	1826
big bluestem	Bounty	40	55
blue grama	Bad River ecotype	90	2446
Indiangrass	Tomahawk	831	3334
little bluestem	Badlands ecotype	0	1332
little bluestem	Itasca germplasm	0	50
prairie cordgrass	Red River germplasm	0	1152
sideoats grama	Pierre	200	3737
switchgrass	Dacotah	0	3232
switchgrass	Forestburg	0	3717
Native Cool-Season Grass			
Canada wildrye	Mandan	0	3205
green needlegrass	Lodorm	0	4235
western wheatgrass	Rodan	0	1553
Introduced Cool-Season Grass			
crested wheatgrass	Nordan	0	969
intermediate wheatgrass	Manifest	837	2297
intermediate wheatgrass	Reliant	484	2679
pubescent wheatgrass	Manska	45	6135
Russian wildrye	Mankota	215	927
Forbs			
purple coneflower, narrow leaved	Bismarck germplasm	0	27
purple prairieclover	Bismarck germplasm	0	448
Maximilian sunflower	Medicine Creek germplasm	0	258
stiff sunflower	Bismarck germplasm	0	64

Plant Material Tested for Anticipated Release

Following is a list of grasses being evaluated for eventual release and naming. All listed grasses and forbs are perennial species native to the tall grass prairie region.

Sand bluestem (*Andropogon hallii*) is a warm-season, sod forming grass. It can thrive in dry, sandy soils. Current available cultivars are from Kansas and do not consistently produce seed in the Northern Great Plains. Seeds were collected from 21 sites throughout North Dakota, South Dakota, and Minnesota. An assembly of 159 plants was established from the collections. Ten plants were selected from the assembly. These were divided, and planted to a separate crossing block. Upon evaluation in 2014, many of the plants in the crossing block appeared to be big bluestem or a cross of big bluestem and sand bluestem. These will be removed in early spring of 2015. Flowering and seed set for the remaining plants will be evaluated in 2015.



Sand bluestem assembly

Indiangrass (*Sorghastrum nutans*) is a warm-season, bunch grass. Plants (25) with origins from 12 Minnesota collection sites were selected from an assembly at the PMC. Selection criteria included leafiness, flowering date, and vigor. Selected plants were divided to establish a crossing block. Plants with extremely late or early flowering dates were removed. Seeds harvested from the crossing block were planted in 2013 to begin an increase field. Establishment has been slow and green foxtail infestation has been severe in the increase field. Seed harvest from the crossing block continued in 2014. A portion of the increase field was also harvested. Seedling vigor and seed dormancy will be evaluated the next few years. The selected population appeared to produce more leaf biomass than ‘Tomahawk’ in preliminary comparisons. A variety trial to compare the selection to ‘Chief’ and Tomahawk was planted in 2014. Data will be collected in 2015. Opportunities for producers to participate in “on farm” field trials will likely begin in 2016.

Prairie sandreed (*Calamovilfa longifolia*) is a warm-season, sod forming grass. Plants (7) with origins from five counties in Minnesota were selected from an assembly of over 300 plants at the PMC. Plants were selected for lack/ tolerance of foliar diseases, vigor, flowering date, and seed production. The selected plants were divided into 50 plantlets (each) and relocated to form a breeder population. Small amounts of seed are being harvested. A trial to compare the selected population to the releases ‘Goshen’, ‘Koch’, and ND95 was planted in 2014 at the PMC. A duplicate trial will likely be planted in 2015. Data from the variety trial will determine whether pursuing a new release is advantageous.

Virginia wildrye (*Elymus virginicus*) is a cool-season, bunch grass that is generally short lived. Plants (581) from 80 locations across South Dakota, North Dakota, and Minnesota were selected from a large assembly of plants at the PMC. Selection criteria included upright stature, culm and seed production, flowering date, and vigor. An increase field was planted in 2013 from seed produced on the selected plants. An abundant amount of seed was harvested in 2014 from the increase field. A trial comparing the selected Virginia wildrye to ‘Mandan’ Canada wildrye was planted at the PMC in 2014. Seed is being offered to producers for 2015 “on farm” field trials.

Prairie dropseed (*Sporobolus heterolepis*) is a warm-season bunch grass of short stature. The original seed collections were from various plants at single locations in North Dakota (Burleigh County), Minnesota (Mahnommen County), and South Dakota (Day County). Plants were propagated from the collections and seed was harvested from the propagated plants. Large seeds were selected from several years’ harvests and propagated to establish the breeder population. The species has been known to have poor seedling vigor and short lived seed. Seed harvested from the breeder population from 2011-2014 will be used to evaluate germination, and stand establishment in 2015.

Cupplant (*Silphium perfoliatum*) is a square-stemmed forb that can grow to 7 feet in height. The leaves are joined at the stem to form cups where water can accumulate. It produces large amounts of biomass and has an extensive root system. Seed was collected in 2011 from a native stand in Ransom County, North Dakota. This is on the northern edge of its natural range. A seed increase field was established in 2012 from greenhouse propagated seedlings. Plants in the field produced 25 PLS pounds of seed in 2013. The 2014 harvest, which is not cleaned, is expected to yield 25 PLS pounds or greater. In 2014, beetles thought to be Northern corn root worm adults were abundant on the flowers, particularly the petals. They did not appear to cause damage to seed production. No other insect predators were noted. Parameters, including insect predation and biomass production, will be evaluated in 2015.

Outreach

Seventeen cooperators from 11 tribal communities submitted requests for plant materials in 2014. Most requests were for sweetgrass and white sage. Other requests included prairie cordgrass plugs for streambank/riparian protection, fruit trees and shrubs for community food production, and assorted native grass seed and transplants of PMC releases. Several plantings included youth and adult volunteer involvement with planting, maintenance, and cultural education components of these projects. Tribal interest in native and cultural plants continues to be robust in this part of the country.



Planting 'McKenzie' black chokeberry at Crow Creek tribal community

Conservation Field Trials

The Bismarck Plant Materials program continues to provide support and assistance for field trial plantings across North Dakota, South Dakota and Minnesota. These field plots typically include grass, forb, and legume species. They provide opportunities to promote PMC releases and potential releases and to further compare and evaluate their potential in off-center locations. Assistance includes: providing PMC seeds and plant materials; seeding assistance; staff time for seeding plots, clipping, analyzing plot production, and plant evaluation. Specific information and data collected from each of the trials is included in the annual PMC Technical Report, and a final report will be provided as each field trial is concluded.

The PMC provided technology and seeding assistance for the Plankinton, South Dakota outdoor classroom. It is located on conservation district property and is utilized for demonstration and educational purposes. Forty different plots of individual grasses and grass and forb combinations were seeded May 2012. The district also planted a number of tree and shrub species adjacent to the herbaceous plots. Seeding at this location occurred in an extremely dry spring and summer, and many of the warm-season species did not emerge soon enough to compete with a heavy flush of annual weeds. Most wheatgrass and wildrye species, and creeping foxtail, green needlegrass, AC Saltlander, reed canarygrass, and meadow brome established well. The cicer milkvetch and yellow alfalfa also look good at this location. The other cool-season species (orchardgrass, timothy, and tall fescue) had poor stands in the 3rd year of evaluation. There is a fair stand of sideoats grama, but the big bluestem, Indiangrass, switchgrass and blue grama are very poor and will be replanted. Two of the three forb mixes have fair stands. The PMC is working with the district on plans to reestablish those plots that did not establish in 2012, and will continue to provide technical assistance related to maintenance and evaluation of these plots in 2015.

The Marshall County Conservation District established a grass and forb conservation field trial in June 2013 located on County Fairground property at Warren, Minnesota. The Bismarck PMC provided seed, seeding equipment, and technical assistance to prepare the seed mixes and seed the plots. Twenty individual species plots and 7 plots with different program and pollinator mixes were established for demonstration and education purposes. Several potential PMC releases are included for evaluation and comparison purposes in this trial. Carlson Seed Farm (an area commercial seed vendor) donated seed for most of the program mixes in these plots. The PMC continues to provide technical assistance for annual evaluation and maintenance advice. Detailed information is include in the annual PMC technical report.



First year forb mix planting at Warren, Minnesota field plots

Warm-Season Grass Seeding Date Trial

A trial to evaluate warm-season grass establishment at different seeding dates and seedbed covers has begun at the PMC. The warm-season grasses are big bluestem, switchgrass, little bluestem, sideoats grama, and blue grama. Canada wildrye, a cool-season species, is a check. Seeding dates are late summer, late fall (dormant), and spring. The three seedbed covers are black fallow, barley/foxtail millet stubble, and barley stubble. The trials began in 2013 with barley and millet plantings to create the seedbeds. The first grass planting was a late summer seeding on August 20, 2013. The

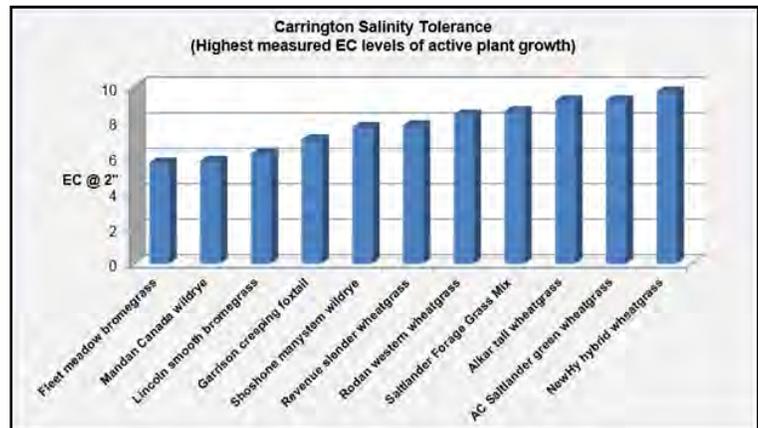
dormant seeding was November 5, 2013. The spring seeding was May 27, 2014.

In 2013, very few seedlings emerged from the late summer seeding. The only grass with substantial emergence was Canada wildrye, in black fallow. The plots had very little weed pressure in 2013. Foxtail barley became a severe weed problem in 2014 for all grasses and seedbed types, but particularly in the black fallow. A small number of seedlings were visible in 2014 in most plots. Initial emergence was visibly best in the spring seeding. Weed residue will be removed in early 2015 and seedlings will be counted for each grass in each cover type.

As a means to further evaluate grass performance, planting of duplicate plots began in 2014. The late summer seeding was August 13, 2014. The dormant seeding was November 20, 2014. The spring seeding will be in May 2015. As the weather conditions were wetter and temperatures more favorable for germination, seedlings of all species emerged for the late summer seeding. A section of row from each of the entries was counted and the same section will be counted again in the spring of 2015. The spring counts are a way to determine whether seedlings emerged from late summer seedings are adequately developed to overwinter.

Salinity Study

The Carrington, North Dakota salinity trial is a study that was established in 2010 to evaluate establishment, production, and quality of different grasses and legumes seeded in saline gradient soils. The NDSU Carrington Research Extension Center and area soil conservation districts are partners in this study that will be concluded after final annual sampling in 2015. There are two replicated sites, one near Buchanan, and the other near the Carrington pasta plant. The PMC assists with annual clipping of the individual alfalfa and cool-season grass varieties and with recording the data. Preliminary data on salinity tolerance of the cool-season grasses is shown in the adjacent chart. It provides support for the hybrid grasses (AC Saltlander and NewHy) that were developed to be more saline tolerant than most of the typical cool-season grasses currently available for NRCS conservation plantings. These two hybrids continue to perform well in this difficult soils environment. They also exhibit good production and above average forage quality as compared to the average of all the grasses in these plots. Final results and observations will be provided in a summary report in 2016.



Salt Tolerant Hybrid Poplars

Saline soils across the Great Plains complicate tree planting efforts. Dr. Ron Zalezney with the USFS Research Lab at Rhinelander, Wisconsin, has been researching the use of hybrid poplars for bioremediation of contaminated soils. Some of his poplar clones have exhibited salinity tolerance as high as 9 mmhos/cm. Poplars currently listed in the Field Office Technical Guide in North Dakota, South Dakota and Minnesota exhibit reduced growth with soil salinities as low as 2 mmhos/cm.

A study began near Bismarck, North Dakota to test Dr. Zalezney's material. He provided 25 cuttings each of 7 clones. Robusta poplar (very sensitive) and Russian olive (very tolerant) were included in a randomized study across 3 ranges of naturally occurring salinity (<4 mmhos/cm, 4-6 mmhos/cm, and 6.1-10 mmhos/cm). Trees were planted on a 10-foot x 10-foot spacing with 5-foot tree shelters for deer predation and 6-foot x 6-foot weed barrier fabric squares installed for weed control. To evaluate potential impacts of fabric on salinities, 73 plots contained no trees and no fabric.



Jenna and Kevin installing fabric weed control squares

Salinities were measured at each plot at planting and three more times through the growing season. Since moisture affects salinity, moisture readings were also taken at each plot. (Note: the moisture meter would not record moisture percentages when the site was at or above saturation or salinities were high.)

Current findings include: 1) salinities change throughout the season and in response to rain events; 2) most trees are still alive but some are showing dieback; 3) one accession was also showing dieback in the surplus stock carried over in the

PMC lath house; and 4) soil salinities, within 2 mmhos, can be determined from observing existing vegetation.

Observations and data collection will continue and statistical analysis will be completed with preliminary results available in 5 years. Thanks to Bill Haase and the North Dakota Game and Fish Department for providing the land for the test plot.

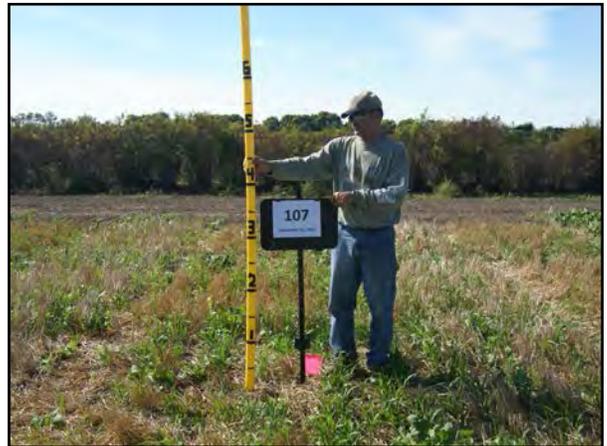
Soil Health Study

A soil health study designed by the National Plant Materials program began at the Bismarck PMC in 2012. Other participating PMCs are in the states of California, Maryland, Missouri, Oregon, and Washington. The objective is to determine the effects that different cover crop mixes and their seeding rates have on soil health. There are three cover crop mixes being tested at three seeding rates. The mixes are: a two-species mix of triticale and red clover; a four-species mix of triticale, red clover, hairy vetch, and radish; and a six-species mix of triticale, red clover, hairy vetch, radish, rape, and oat. The seeding rates are 20, 40, and 60 seeds/ft² for each mix.



**Cover crop plot #107,
September 2012**

Each year a commodity crop is planted in the spring using no-till methods. In North Dakota, the commodity crop is barley. Once the barley grain is harvested and yields are determined, cover crops are planted. At frost, forage from the cover crops is sampled



Cover crop plot #107, September 2014

to determine biomass production of each planted species. The forage and radish roots are also tested for % N. Soil samples are gathered at the beginning and end of the growing season and after each harvest or planting. The soils are measured for a host of traits. Some of these are: moisture, nitrogen, organic matter, bulk

density, resistance, and soil biota. Cover crops planted in 2012 had excellent growth overall. The red clover and hairy vetch were very small and contributed very little biomass or root material. In 2013 lodging and grain shattering produced a volunteer barley stand that outcompeted the cover crops. Radishes competed best with the barley. Other species remained small. The plots with two species produced less biomass in 2014 compared to 2012. Radish was the dominant crop in 2014 as opposed to triticale in 2012. At present, soils data is being analyzed. Glancing at the data, there appears to be a slight improvement in bulk density for plots with radish. Statistical analysis will need to be completed to detect any significant changes taking place in the soil or in biomass.

As soils and yields can be slow to show changes, the study is scheduled to continue for at least 2 more years.

Tree Seed Production

Tree seed production was down and on some species nonexistent in 2014. Reevaluation of on-the-shelf seed supply further reduced the need for widespread seed harvest.

For the 2nd consecutive year, Prairie Harvest Germplasm and 'Oahe' hackberry produced no seed.

Another very popular plant that produced very little seed was 'McKenzie' black chokeberry. This plant, usually a very heavy seed producer, is in big demand across the upper Midwest and Great Plains. All conservation nurseries supplying chokeberry to Minnesota, South Dakota, and North Dakota are currently out of stock.

Two conifers that show potential for release in the future provided excellent quantities of seed. One accession of Douglas fir yielded 485 grams of clean seed. Harvest from an ARS seed orchard produced 300 pounds of lodgepole pine cones.



300 pounds of lodgepole pine cones

Smaller seed amounts of four other tree and shrub species were processed.

Field Plantings

Field plantings provide opportunity to assess a variety of plant materials at numerous, environmentally diverse off-center locations across our region. Conservation districts continue to be supportive partners, soliciting and assisting local cooperators interested in providing sites for these plantings. Recent field plantings of tree and shrub species are being evaluated as potential additions to the NRCS list of species approved for conservation plantings. The PMC also offered a selection of Virginia wildrye, potentially a new release, for field plantings in 2014 and 2015. These plantings are evaluated annually by the cooperating districts for a period of 3 years for herbaceous species, and 5 years for woody species. In 2014, 33 cooperators planted 462 Meyer’s spruce, 618 Mongolian Scots pine, and 545 lodgepole pine in 60 plantings. Including previous entries, there are a total of 66 cooperators with 114 active tree and shrub field plantings in this region. There were two cooperators that requested the Virginia wildrye in 2014. The three-state summary of the woody evaluations is shown in the following table.



Standing Rock tribal cooperator's field planting of Meyer's spruce

Summary of 2014 Field Planting Evaluations

Year(s) Planted	Species	Total Plantings (Ave. 25 plants/ planting)	Active Plantings 12/31/14	% of Plantings Still Active	% Survival Active Plantings	Performance Rating Active Plantings (1-10; 1 = Best)
2010/11	Common ninebark	28	13	46	89	3.1
2010/11	White poplar	9	5	56	89	2.2
2013/14	Meyer's spruce	37	32	86	78	3.4
2013/14	Mongolian pine	44	39	89	78	3.3
2014	Lodgepole pine	19	19	100	65	4.6

Douglas Fir – A Tall Tree That’s Been Here for Nearly a Century

One of the most common requests from field offices in North and South Dakota is, “We need more tall trees for windbreaks.” Perhaps we have a promising tall tree to meet those needs. Douglas fir has been quietly growing at several locations in North Dakota for 60-90 years.

Douglas fir *Pseudotsuga menziesii* var. *glauca* is performing quite well in four distinct stands across the state and a few younger plantings are doing well at additional locations.



Douglas fir cones at the tree top

In 2013, nine gallons of cones harvested from the ten 90-year-old trees at the Northern Plains Research Station yielded 14 grams of clean seed. This seed was planted and grown for one season by Towner State Nursery and the resulting seedlings are available for field plantings by districts in the spring of 2015.

In 2014, three bushels of cones from the five 63-year-old trees in Hillside Park at Bismarck yielded 485 grams of clean seed. Towner State Nursery will again grow seedlings which will be available for spring 2016 field plantings.

Though this species is adapted to our climate, the range of soils on which it will grow well is not



An opened Douglas fir cone

known. It is believed that the most suitable sites would be well drained loams to loamy fine sands but information is also needed on how well they grow on clay loams and clays. Field planting trials are utilized to discover the range of sites on which trial plants do well.

Stockpiling Grasses and Forbs for Winter Grazing

The PMC continues to work with South Dakota producer Curt Knight, NDSU Extension, and the Miller, South Dakota field office on a field trial to evaluate grasses and legumes and their potential for stockpiling for winter grazing. Individual plots of grasses, mixed grasses, and grass-forb mixes are being evaluated to determine which combinations of species and harvest scenarios provide optimum production and quality for a winter grazing program. A benchmark clipping for forage quality was completed in July 2012. Individual plots are sampled for production and quality on a bimonthly schedule from June through March each year. Samples are collected from areas of the plots where no forage has been removed by summer harvest, and from regrowth areas that received a summer harvest. The PMC is providing technical assistance with evaluating, sampling, and collecting data. Hopefully, results will provide more plant options for livestock producers.



September clipping of AC Saltlander regrowth in Knight plots

Demonstration and Special Plantings

The plant materials program assists partners in developing community educational and/or demonstration projects that have a conservation plant materials focus. These plantings promote PMC releases and other conservation plant materials to growers, producers, and the public. The Plant Materials program also provides valuable information on local adaptability that can be considered for inclusion in the NRCS FOTG and publications. The PMC provided seed and plants of native grasses and forbs to meet requests from nine conservation district partners for community demonstration and educational purposes.

Planting for Pollinator Habitat

A planting at Morris, Minnesota was completed May 2014 after two years of intensive management to control invasive plants. This project was initiated by, and is located on the University of Minnesota West Central Research and Outreach Center farm campus. Other partners include Minnesota NRCS; the Morris field office; and the USDA Ag Research Station, Morris. The PMC provided some of the seed and technical assistance for planning, and for seeding the different plots with the PMC's new no-till plot drill. The planting includes separate plots containing 4 different program seed mixes of 25, 50, 75, and 100% forbs to grasses. An annual oilseed plot is included. Each plot is replicated once. This field trial was the host site for the Minnesota Area 2 Plant Materials Training Tour in September. PMC staff participated in this event by providing training and presentations on plant identification and planning, seeding, and maintenance of pollinator plantings. Participants viewed the plots and identified species that were visible. Many of the forbs and all of the native grasses were present and doing well. The annual oilseed plots contained a mix of four different species, and these plots attracted a host of pollinators throughout the growing season. The PMC will continue to provide technical assistance for evaluation and maintenance in the near future.



Plant identification training for Minnesota Area 2 field day event at U of M plots, Morris, Minnesota

Field Office Work Detail/Training

Two separate four-day PMC detail opportunities were provided at the PMC for field staff during the first two weeks of August. Participants assisted PMC staff with plot maintenance, seeding, harvest, evaluation, and a host of other activities conducted in the grass seed increase plots and grass and tree study plots. They also participated in soil health activities at the Burleigh SCD Menoken Farm.

Off-Center Evaluation Plantings (OCEPs)

Evaluation of new and existing tree and shrub species are ongoing at three locations (Becker, Minnesota; Brookings, South Dakota; Dickinson, North Dakota). Four new species were added where they were not already present in each of the three locations: ‘Catskill’ sand cherry, grey birch, swamp white oak, and lodgepole pine. Currently, there are 51 accessions of 37 species at the Brookings, South Dakota site; 118 accessions of 95 species at the Becker, Minnesota site; and 96 accessions of 69 species at the Dickinson, North Dakota site. All plots were evaluated in early September, and some maintenance was performed. Tree shelters were added to species subject to animal predation so they would remain viable for evaluation purposes. Evaluation data is utilized to determine potential species for conservation use and is included in the annual PMC technical report.



**2nd year sycamore trees at Brookings
Off-Center Evaluation Planting**

Growing Cottonwoods on Dewatered Flood Plains

This study evaluates three cottonwood planting materials and planting techniques on flood plains no longer subject to flooding and where ground water may be 4-12 feet deep. The 3 treatments were: 1) 6-foot long unrooted cuttings planted via waterjet to 5.5-foot depths; 2) 5-foot tall potted trees planted with the bottom of the root ball 4 feet deep; and 3) regular conservation stock, 20-in³ plugs, planted traditionally.

Additionally, to evaluate the impacts of dense brome *Bromus inermis* on tree growth, sod was controlled with 6-foot weed barrier fabric squares on half of each stock type.

The first four blocks (144 trees) were planted in 2013. Since none of the planting stock ever reached the water table, 3 more blocks (108 trees) were planted in 2014 where where most of the deep pots and unrooted cuttings reached the water table or the capillary fringe above the water table.

Observations at the end of 2014 include:

- Most of the 2013 unrooted cuttings died since the water table was never close to the cuttings at any time of the season.
- The deep pot material exhibited 100% survival the first year, with no difference between the weed control treatments. Surprisingly, there was a big difference in survival between weed treatments on the deep pot stock at the end of the second year. Survival of the deep pot stock without fabric was 96% while only 63% of the deep pot stock with fabric were alive at the end of 2014. This relationship did not show on the other stock types. Such a result is contrary to all our experiences and to the literature we have researched.
- Some of the unrooted cuttings, planted in 2014 grew out of the top of 4-foot tree shelters within 3 weeks after planting since base ends reached the water table at planting.
- The 4-foot tree shelters are not tall enough for preventing deer browse. Most of the trees were repeatedly browsed at the top of the shelters.



**Cottonwoods in the Nature Conservancy
block 4 in September 2013**

Conservation Priorities

Current work at the PMC focuses on ten major conservation priorities: Streambank & Lakeshore Stabilization; Warm-Season Grass Promotion and Development; Alternative & Specialized Use of Conservation Plants; Tree & Shrub Related Technology; Native Prairie Ecosystem Restoration; Saline & Alkaline Tolerant Plant Materials; Wetland and Riparian Plant Materials; Filter Strips & Nutrient Management; Information, Education & Outreach; and Urban Conservation.

Who We Are

The Bismarck Plant Materials Center is one of 27 Plant Materials Centers operated by the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). The Center serves the States of Minnesota, North Dakota, and South Dakota. It is the mission of the Plant Materials Program to develop plant materials and plant science technology for the conservation of our natural resources.

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