

2015 Progress Report of Activities

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New Plant Release

The Bismarck Plant Materials Center (PMC) is a cooperator in the new South Dakota State University (SDSU) release of ‘Sholty’ yellow alfalfa [*Medicago sativa* subsp. *falcata* (L.) Arcang. (syn. *M. falcata* L.)]. The Bismarck PMC was an active participant in evaluating this selection in both on-center and off-center plots. Rose Lake PMC also cooperated in this release, working on strategies to improve seed production. Sholty is a leafy, productive, drought-tolerant yellow-flowered alfalfa that performed extremely well in a 5-year comparison with other legumes in a grass/forb field trial near Bison, South Dakota. This persistent legume also performed well in trials near Brookings, South Dakota. Foundation seed of Sholty will be managed by the South Dakota Foundation Seed Stocks Division, Brookings, South Dakota. Information on the yellow-flowered alfalfa species can be found in the [plant guide](#). Detailed information about the cultivar Sholty can be found in the [release brochure](#).



‘Sholty’ yellow-flowered alfalfa in plots near Bison, South Dakota

National Cover Crop Study

Trials to compare the effects of cover crop mixes and seeding rates on soil health have been ongoing since 2012 at the Bismarck PMC. Other PMCs participating in this national project include California, Florida, Missouri, Maryland, Oregon, and Washington. The mixes at the Bismarck PMC are as follows: 2-species mix (triticale, red clover); 4-species mix (triticale, red clover, hairy vetch, radish); 6-species mix (triticale, red clover, hairy vetch, radish, oats, rape). Seeding rates are 20 seeds/ft², 40 seeds/ft², and 60 seeds/ft². Soil parameters measured are bulk density, moisture and temperature, organic matter, nitrogen, carbon, soil biota along with others. Soil samples are taken when commodity crop and cover crops are planted and when cover crops are terminated. Solvita and soil health are calculated by Dr. Richard Haney, USDA-ARS, Temple, Texas. A grain crop planted each year is harvested in early August and the cover crops are no-till planted into the stubble. Cover crops are terminated at frost and biomass is separated and the yield of each component is calculated.

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Stockpiling Grasses and Forbs for Winter Grazing

The PMC continues to work with South Dakota producer, Curt Knight, NDSU Extension Service, and the Miller, South Dakota Field office on a field trial to evaluate stockpiling of grasses and forbs for winter grazing. Individual plots of grasses, mixed grasses, and grass/forb mixes are being evaluated to determine which species combinations and harvest dates provide optimum production and quality for winter grazing. Individual plots are sampled for production and quality on a regular basis. Samples are collected from plots where no forage was 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, the gathered data will provide more plant options for livestock producers.

Uses for Foxtail Dalea

Foxtail dalea (*Dalea leporina*) is a self-pollinating, annual legume found in the eastern Great Plains including Minnesota and the eastern portions of the Dakotas. It is native to the western hemisphere from Canada to Argentina. Site preference is moist, alluvial, sandy soils of prairies and disturbed sites. It is a relative of the perennial purple and white prairieclovers. The growth habit is erect and seedling vigor is good. It is a relatively late bloomer, flowering from July to September. It is a prolific seed producer and readily reseeds if seed matures before frost. ‘Sundance’ is a cultivar released



Foxtail dalea

by South Dakota State University that has origins from Union County in southeastern South Dakota. As a way to further evaluate potential uses of foxtail dalea, seed was received from SDSU and distributed for field and demonstration plantings in North Dakota, South Dakota, and Minnesota. Seed was used in cover crop mixes, pollinator plantings, solid seedings, and prairie mixes. Stands were good at most locations. Plants were vigorous and grew to greater than 2 feet tall at several sites. Plants flowered and seed was produced at most of the plantings, though seed did not always mature. Plantings were in the following counties: Todd, Lyman, Roberts, and Perkins in South Dakota; Slope, Burleigh (2014), and Rolette in North Dakota; Sherburne, Chisago, and Hennepin in Minnesota. The plantings represented a wide array of soils and climatic conditions. Plants at the PMC were also vigorous and had root nodules by the end of the

growing season in 2015. Seed for field plantings will be offered again in 2016. Site visits by PMC personnel are planned for 2016 plantings. Depending on additional data gathered, the species may be one to consider adding to future plantings. Currently, seed is not available on the commercial market.

Herbaceous Plants Evaluated for Release Potential

Sand bluestem (*Andropogon hallii*), prairie sandreed (*Calamovilfa longifolia*), Virginia wildrye (*Elymus virginicus*), Indiangrass (*Sorghastrum nutans*), prairie dropseed (*Sporobolus heterolepis*), and cupplant (*Silphium perfoliatum*) collections continue to be evaluated for release potential. All are native, perennial species.

Sand bluestem

Sand bluestem is a warm-season, rhizomatous grass important for erosion control on sandy soils. Currently available sand bluestem cultivars are sporadic seed producers and winter hardiness is marginal in the Northern Great Plains.

Sand bluestem seed was collected in 2003 and 2004 from 21 locations across South Dakota, North Dakota, and Minnesota. Plants propagated from the collections were evaluated for parameters including vigor, size, species integrity, flowering and seed set. In 2011, rhizomes of ten selected plants were divided and moved to a field for cross pollinating. Based on visual observations in 2014 and 2015, it was evident that some plants of the selected population were big bluestem or hybrids, not sand bluestem. Unlike big bluestem, sand bluestem seed heads are usually yellowish, and awns are very short or absent. Heads are fuzzy due to dense hairs between the seed units and leaves are generally bluish in color. Plants obviously not sand bluestem were removed from the crossing block in 2015. Plants remaining will be evaluated in 2016 for flowering date and seed set.

Prairie sandreed

Prairie sandreed is a warm-season, rhizomatous grass important for erosion control on dry sandy soils. Rust and foliar diseases often become a problem when currently available prairie sandreed cultivars are planted in the eastern Dakotas and Minnesota.

Native seed collections of prairie sandreed were made in 2003 and plants were propagated in 2004. Plants with seed originating from five counties in Minnesota (Sherburne, Polk, Norman, Douglas, and Chisago) were selected as the breeder population based on leaf and stem disease tolerance, plant vigor, and seed production. Seed is currently being harvested from the selected block and plants continue to be monitored for disease. A variety trial was planted in 2014 and

again in 2015 to compare the releases of Goshen, Koch, ND95, and the PMC selection. Weeds have been a problem in the plantings. Comparison data will be collected in 2016 if stands are adequate.

Virginia wildrye

Virginia wildrye is a cool-season bunch grass that tolerates shade and full sun. It is a short lived perennial that can establish quickly.

The native collections made in 2008-2009 were from 81 diverse sites across South Dakota, North Dakota, and Minnesota. Selected plants grown from these collections became the breeder population. Selection criteria included forage, height, overall vigor, and flowering. The selected population is quite diverse. A 1.2-acre seed increase field planted in 2013 yielded 574 PLS pounds in 2014. Seed harvested in 2015 has not been cleaned yet, but is expected to be similar to 2014 yields. A variety trial was planted at the PMC in 2014 and again in 2015 to compare the PMC selection with 'Omaha', a Nebraska release, and 'Mandan' Canada wildrye. Data collected from the variety trial in 2015 included leaf to stem ratio, which is a quality indicator. Additional forage quality and seed production data will be collected in 2016. Field trials were planted in



***PMC selection of Virginia wildrye
in a cover crop planting***

2015 in the following counties: Yankton, Lyman, Todd, and Roberts counties in South Dakota; Slope and Towner counties in North Dakota; and Benton, Chisago, St. Louis, and Mahnomen Counties in Minnesota. A diversity of planting types were represented in the field plantings. Plantings were visited in 2015 and observed for emergence. Field plantings will be evaluated in 2016 for establishment, vigor, seed set, and overall performance.

Indiangrass

Indiangrass is a warm-season grass of the tall grass prairie. Collections were made and superior plants with Minnesota origins were selected as the breeder population. Selection criteria included leafiness and flowering date. Plants selected were leafier than the North Dakota cultivar 'Tomahawk'. The target flowering date was to be slightly later (1-2 weeks) than Tomahawk, which blooms and matures seed earlier than other available cultivars. After observation of the breeder population and small increase field, the selection has been found to be quite variable in flowering date and poor in seedling vigor. As a result, a new breeder population will be selected. Seed size will initially be used as selection criteria. Plans for the next few years include separating for large seed, greenhouse experiments to observe seedling vigor, screening for flowering date, and establishing a new breeder population.

Prairie dropseed

Prairie dropseed is a short, warm-season bunchgrass. Lack of stem material gives it a mop-like appearance. The seeds are round and shiny. The species would add diversity in prairie seedings, and would provide habitat to pollinators and food to birds and other wildlife.

Seed collections were made in Burleigh County, North Dakota; Mahnomen County, Minnesota; and Day County, South Dakota. Plants produced from the collections were observed for several years at the PMC and seed was produced. As seedling vigor is generally poor for the species, large seed was separated from the produced seed in anticipation of greater seedling vigor. Plants propagated from the large seed became the breeder population. Future plans are to plant seeds in the germinator, greenhouse, and field plots to evaluate emergence and vigor. The influence seed age may have on seedling vigor will also be studied.

Cupplant

Cupplant is a large forb of the tall grass prairie that produces a large amount of biomass. It prefers moist soils of prairies or along streams or riparian areas. Its leaves are fused to form a cup that can hold water. The small sunflower-like flowers attract various pollinator species. It has an extensive root system. The leaves are edible by livestock and wildlife.

Currently, plants established at the PMC from a Ransom County, North Dakota seed collection are producing seed. Approximately 25-30 PLS pounds of seed have been harvested each year beginning in 2013. Often populations in natural stands are plagued with insect problems and disease. At Bismarck, North Dakota we have observed many insects on the plants but they have not appeared detrimental to flowering or seed production, thus far. Harvested seed will be used for future plantings to evaluate potential of the species for use in pollinator mixes, biomass production, and riparian plantings.

Conservation Field Trials

The Plant Materials Program in Bismarck continues to provide support and assistance for conservation field trials in the region. These typically include individual grass, forb, and legume plots and/or plots with mixtures of these. They provide opportunities to promote PMC releases and potential releases, and to further compare and evaluate their potential in off-center locations across the three-state region. PMC assistance often includes: providing PMC foundation 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 in a final report that summarizes the findings after these field trials are concluded.

2015 Tree/ Shrub Seed Harvest

With respect to the amount of seed harvested, 2015 was a pretty good year. The following table shows what was harvested. These seeds are available to growers wishing to establish seed orchards.

Species	Location	Amount
Douglas Fir	Hillside Park, Bismarck, ND	180 gm
Douglas fir	ARS, Mandan, ND	44 gm
'McKenzie' chokeberry	PMC, Bismarck, ND	4.6 lb
'Prairie Red' plum	PMC, Bismarck, ND	42.5 lb
Prairie Harvest Germplasm hackberry	Fisher, MN	7.35 lb
Mongolian Scots pine	Becker, MN	25 gm (est.)
Mongolian scots pine	Morris, MN	25 gm (est.)
Gray birch	Becker, MN	34 gm



Douglas fir cones from 2015 harvest

Mongolian Scots Pine

Scots pine in the Midwest is succumbing to *Bursaphelenchus xylophilus*, pine nematode native to North America. As a result, many states no longer recommend Scots pine for windbreaks or forestry plantings.

A 1989 research study by Yang Baojun and Wang Qouli of the Research Institute of Forestry looked at the nematode impacts on assorted native Chinese and introduced pines. Their study involved inoculating trees ranging from 2 to 5 years old with a Chinese isolate of the nematode. Results indicated that *Pinus sylvestris* var. *mongolica* was only moderately susceptible to the nematode (10% mortality). Species of pine native to North America were generally resistant. Pines not native to North America showed greater than 50% mortality.

To evaluate the pine nematode resistance of Mongolian Scots pine planted in the United States, cones were collected from three Minnesota accessions that originated from Mongolia, northeastern China. Since pine nematode is not present in North Dakota, we have been unable to test for nematode resistance locally. The Plant Materials Center will offer seeds or seedlings to universities, state forestry agencies, and other plant materials centers for testing in the heart of the pine nematode infestation.



Mongolian Scots pine



Mature Douglas fir

Douglas Fir

Douglas fir *Psuedotsuga menziesii* var. *glauca* is a conifer native to the interior Rocky Mountains. Several stands in the Bismarck-Mandan area have grown here for over 60 years. That would indicate adaptation to the climate of North Dakota. In 2015 seedlings grown from the ARS seed source were made available in 3 states for field plantings. As no seed was produced on the ARS trees in 2014, seedlings available to field offices in 2016 have seed origins from trees growing at Hillside Park, Bismarck, North Dakota. These field plantings will be indispensable in determining how far east this species will perform and the range of soils on which this species will perform and grow satisfactorily.

Demonstration and Special Plantings

The Plant Materials Program assists partners in developing community educational and/or demonstration plots that have a conservation plant materials focus. These plantings promote PMC releases, technologies, and conservation plant materials to growers, producers, and consumers in local communities. The PMC provided transplants and seed of several releases to 4 different entities in 2015. In addition, the PMC provided seed, and used the no-till plot drill to seed two demonstrations. One site near Bison,



Cover crop demonstration planting in Rolette County, North Dakota

South Dakota was sponsored by the Perkins County Conservation District; and another near Rolla, North Dakota, sponsored by the Bottineau County Soil

Conservation District. The plots were planted on private land adjacent to major highways for easy access and visibility. The plantings contained 24 individual cover crop species plots and two or three mixed species plots. Species were determined by input from PMC and NRCS staff, and local producers/landowners. Both plantings were highly promoted to local and area producers and utilized for on-site education through either self-guided tours or field day events. Twenty-five producers and eight NRCS/conservation district staff attended a field day event at Bison and received

training on species characteristics and cover crop benefits to soil health. The Rolla planting looked outstanding with good establishment and growth of all species. More specific information on these plantings will be included in the 2015 PMC Technical Report.



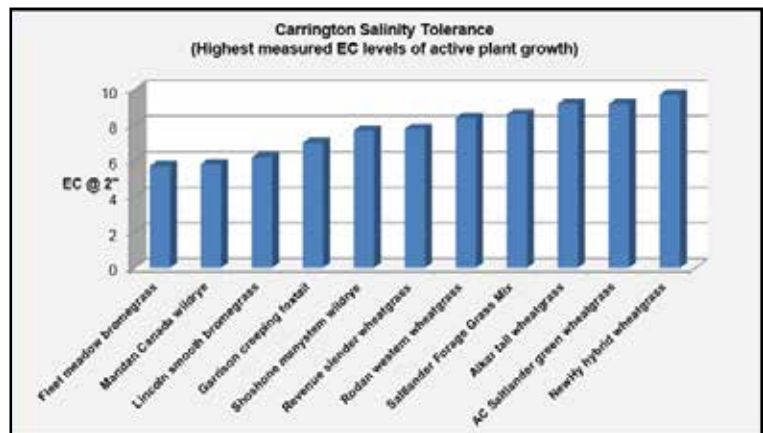
Flowering foxtail dalea plants

Salinity Study

A cooperative saline study with area soil conservation districts and NDSU Carrington Research Extension Center includes two different plot locations near Carrington, North Dakota. It was developed to evaluate which forages best establish from seed and continue to grow and develop in saline-affected soils. The PMC assists cooperators with annual clipping of forage to determine production and forage quality of species/varieties at different salinity gradients. Data collection on alfalfas and cool-season grass species began in 2010 and was completed in 2015.

Preliminary data on salinity tolerance of the cool season grasses is shown in the adjacent table.

The data supports previous evidence that some hybrid grasses (NewHy and AC Saltlander) are more tolerant of soil salinity than many of the more commonly planted grass species. These varieties continue to perform well in the difficult soils environment of the study. They also exhibit good production and above average forage quality when compared to the average of all species within the study plots. A summary report will be completed in 2016.



Off-Center Evaluation Plantings (OCEPs)

Formal evaluation of tree and shrub species continues at three locations: Becker, Minnesota; Brookings, South Dakota; and Dickinson, North Dakota. Two new entries were added at each location this spring: a Dutch elm disease resistant variety of American elm, 'Prairie Expedition', and a ARS selection of Douglas fir. The plantings were evaluated in August. Limited maintenance was included in those visits. At the Becker location, seed was harvested from gray birch, with the intent of growing transplants for evaluating in the other OCEP locations and in future field plantings. Evaluation data is included in the PMC's annual technical report and the information is utilized to determine potential species for conservation use.

Warm-Season Grass Seeding Date Study

A study to compare warm-season grass establishment with different seeding dates and seedbed covers began at the PMC in 2013. The warm-season grasses are big bluestem, sideoats grama, blue grama, Indiangrass, and switchgrass.



Canada wildrye was used as a check

Canada wildrye, a cool-season species, is planted as a check. There are three seedbeds; barley stubble, barley/millet stubble, and black tilled. The seeding dates are spring, late summer, and late fall (dormant).

Plantings were made in 2013 and 2014 and another will be seeded in 2016. Emergence and growth for the 2013 seeding was slow due to weed pressure from foxtail barley and dry conditions. The 2014 planting was off to a better start, with seedlings emerging before frost for the summer seeding date. Counts were made for the summer seeding in late fall 2014 and again in July 2015 to determine seedling survival. Survival of summer seeded seedlings was quite variable among species. Counts in 2014 were also complicated by additional seeds germinating before counts were made. Generally, survival was greatest in stubble. Switchgrass seeded in late summer had the poorest survival, ranging from 0-21 percent.

Plant counts were made in early October 2015 for both plots using a method that determines minimum plants/ft². The spring planting produced the most plants for all species at both locations. In most cases, the dormant seeding produced the next highest number of plants. There was no consistency in performance related to seedbed cover. Seeding difficulties resulting from uneven, thick mulch and the drill's inability to cut through it may have been a contributing factor. In the plots planted in 2013, more plants were counted in stubble than in bare ground. In plots seeded in 2014, more plants were counted in the black tilled seedbed. Perhaps the mulch was more beneficial in the dry conditions of 2013.

An additional plot will be planted in 2016 at the PMC. Generally, the current seeding date recommendation for planting warm-season grasses in the Northern Great Plains is spring. Thus far, data from this study reinforces that recommendation.

Forest Management Plan for USDA-ARS Northern Great Plains Research Laboratory

For nearly half of a century the USDA-ARS Northern Great Plains Research Laboratory (ARS) at Mandan, North Dakota has cooperated with the Plant Materials program on tree and grass releases to meet the needs of landowners in the Northern Great Plains. Currently, ARS has about 20 acres of tree research plots up to 80 years old that contain seed sources from the Midwest, Great Plains, Rocky Mountains and Canada. With nearly a century of tree research behind them, their existing tree plots greatly speed our search for plants to meet identified conservation needs, now and in the future. The PMC has worked jointly with ARS on lodgepole pine as an additional tall tree for windbreaks for the past 8 years. Other species that show potential are Douglas fir, Scots pine, Rocky Mountain juniper, eastern red cedar, Siberian larch, bur oak, and hackberry.



**Aerial view of main campus of
USDA-ARS Northern Great Plains
Research Laboratory**

At the request of ARS, employees from the North Dakota Forest Service, NDSU Extension Service, NRCS engineering staff and NRCS Plant Materials staff conducted an inventory of forest resources and erosion and wildfire risks at the station. Because of the large acreage of trees, shrubs and grasses to the northwest, wildfire is a very real threat to the buildings and the forest research plots. Main concerns of ARS were wildfire and renovation needs of the main windbreak around the building. Overall, resources were in good shape and had been managed effectively. PMC staff provided erosion control alternatives and consulted on the windbreak renovation needs. NDFS staff prepared the final plan.

Currently there is no active agroforestry research at ARS, but the tree plots are being maintained in hopes that future researchers from USDA, states or universities might be able to utilize the material in future studies. For those public entities who might be interested in working with the woody material on the station, contact Matt Sanderson at matt.sanderson@ars.usda.gov.

Field Office Work Detail/Training

The PMC will offer a one-week on-site plant materials training opportunity for NRCS and Conservation District staff in August 2016. Requests for off-site and/or VTC training will also be considered.

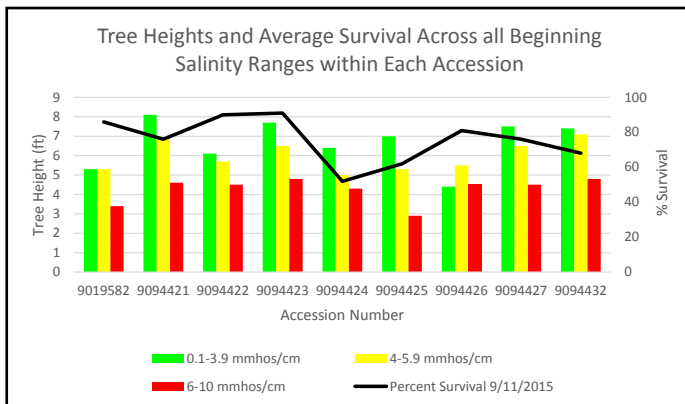
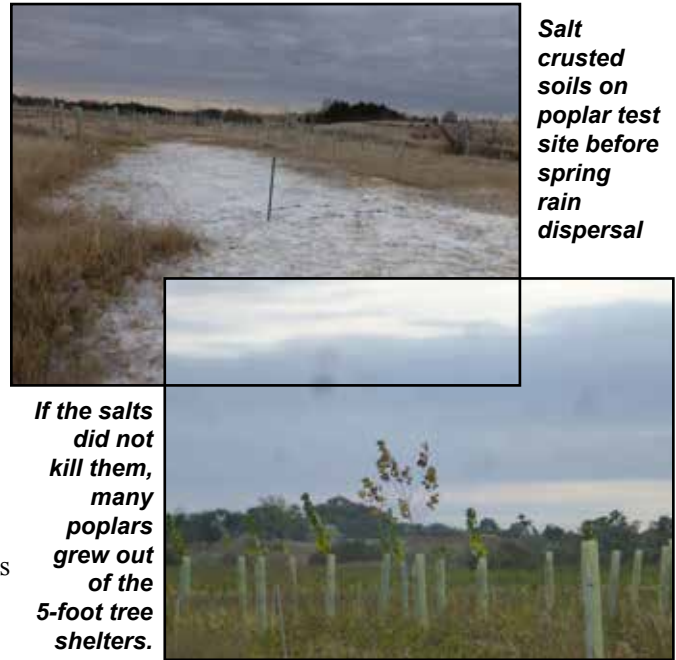
Hybrid Poplar Salinity Tolerance Evaluation

Saline soil conditions affect all growing plants. Few tree species adapted to the Northern Great Plains perform well at 4 mmhos/cm or above.

Previous bioremediation trials by the US Forest Service in Rhineland, Wisconsin found clones of hybrid poplars that exhibited saline tolerance to 9 mmhos (Zelesny 2013). Seven of these clones were provided to the PMC. They were planted in a field trial near Bismarck where salinity ranged from less than 1 mmhos/cm to greater than 10 mmhos. Location conditions are typical of saline sites in the Great Plains. Russian olive, which is quite saline tolerant, and Robusta poplar, which is saline sensitive, were also planted at the site. Soil and leaf samples were collected for laboratory analysis. The salt levels of the leaf samples will be correlated to the soil salinity levels at each tree.

Though measurements have not been statistically analyzed, following are a few observations:

- Salinity readings at a 9-inch depth generally decreased as the season progressed.
- Burned leaf margins were found on a few trees growing on the “hotter” (more saline) sites by mid July 2014.
- Multiple leaders at 2 feet or below after the main stem died were exhibited in a large percentage (estimated 33-50%) of the poplars by October 2015. Possible causes could be late season freeze, tree shelters preventing hardening off, and clonal difference.
- Trees over 8 feet tall by September 2015 were mostly single stemmed.
- Survival and height differences were found between clones after 2 growing seasons. See chart. Survival figures are the average survival of all plants of each accession measured across all 3 initial salinity ranges.
- Mortality loss was greater in 2015 compared to 2014. Overall poplar mortality through September 2015 was 46 trees. This may be a result of overwinter loss compounded by a late freeze. Weather for 2015 was close to normal with wide fluctuations of high and low temperatures throughout the year, warm early with a late hard freeze in the spring. Precipitation equaled long time averages, but late growing season rains were reduced.



with wide fluctuations of high and low temperatures throughout the year, warm early with a late hard freeze in the spring. Precipitation equaled long time averages, but late growing season rains were reduced.

Many questions remain related to salinity tolerance of these hybrid poplar clones. Data collection will continue to further evaluate salinity tolerance. Finding any hybrid poplar clones to be tolerant to some level of salinity would be beneficial. It would be a useful addition to the FOTG for agroforestry plantings in saline areas. Successful plantings could reduce salinization through reduced soil surface evaporation and greater transpiration. They would capture more snow which may further dilute surface salinity while providing protection to roads and building sites.

Cottonwood Regeneration Study

This study evaluates three methods of native cottonwood establishment on dewatered flood plains adjacent to major streams. This trial complements other studies conducted by PMCs at Bridger, Montana; Los Lunas, New Mexico; and Aberdeen, Idaho.

Three different stock types were evaluated (traditional conservation grade planted by hand; deep pots with the root ball planted 4 feet deep and 12-20 inches of top above ground; and 6-foot long unrooted cuttings water jetted to a 5.5-foot depth). Planting occurred in 2013 and 2014. Site preparation on all sites consisted of a glyphosate application. Each stock type planted received approximately 1 gallon water at planting and 4-foot tall protective tree shelters after planting. Half of each stock type received 6-foot by 6-foot fabric weed control squares.

The findings after three growing seasons are:

- 4-foot tall tree shelters do not provide adequate deer browse protection.
- Weed control impacts survival of conservation stock but has minimal impact on stock planted deeper.
- Weed control affects growth rates on all stock.
- Unrooted cuttings must be young 1-year old stock, preferably harvested from stooling beds. The younger stock initiates rooting from lenticels easier. Stooling bed stock from a nursery is straighter and easier to plant with a water jet stinger.
- Unrooted cuttings take time to cut and delimb, and must be long enough to reach the water table.
- Unrooted cuttings are easy to plant and places stock in/or near the water table.
- Unrooted cuttings require specialized machinery (water jet stinger) and water to plant.
- Unrooted cuttings exhibit best survival and growth on sandy sites where the lower end of the cutting is in the water table at planting time.
- Deep pot material may provide success on a wider range of site conditions than either of the other stock types.
- Deep pot material requires starting cuttings in a greenhouse, transplanting to larger pots, and growing outdoors for one season.
- Deep pot material is heavier and bulkier than the other two stock types to transport.
- Deep pot material takes longer to plant (drilling a 4-foot deep hole and hand tamping the back fill).
- Deep pot material must be planted within or near the capillary fringe. Submerging the root mass in the water table may drown the plant.
- Conservation stock is readily available at conservation nurseries, is the least expensive, and takes only a few seconds to plant.
- Conservation stock survival and growth is quite low on sandy sites with water tables too deep to reach, even with fabric weed control.



Repeated deer browse. Does this affect survival, or just height growth?

Overall, deer predation is a big hindrance to reforestation dewatered river bottoms with cottonwood. Of equal importance is the difficulty finding sites with a water table close enough to benefit the new plants. On the Missouri River where this study is located, only old stream channels (5% +/- of the dewatered flood plain) are suitable for cottonwood. Between the old channels, the land surface is 10 feet or more above the water table and is only suitable to more drought-tolerant plants.

Planting for Pollinator Habitat

A planting for pollinator habitat was seeded at Morris, Minnesota in May 2014, after two years of intensive management to control invasive plants. The 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, Minnesota field office; and the USDA Agricultural Research Station, Morris. The PMC provided some of the seed, technical assistance in planning, and plot seeding with a no-till plot drill. This planting includes separate plots containing four different program seed mixes of 25, 50, 75, and 100% forbs to grasses. It also includes plots containing a mix of four annual



A plot in the pollinator planting at Morris, Minnesota

oilseed species that are very pollinator friendly. Each plot is replicated once in the trial. Evaluations in 2015 indicate plots are well established and mostly weed free. Most forb and grass species were present, with a few exceptions. The annual oilseed plots seeded in 2014 still had good stands as a result of volunteers establishing from seed produced the previous year. College faculty and students monitored insect activity during the summer and results of their findings will be provided in future reports. The annual oilseed plots appeared to attract greater numbers of pollinators and negatively impact the activity of pollinators on the perennial forb/grass plots. The PMC will continue to monitor plant community changes and pollinator activity. The site was host to the Minnesota Area 2 Plant Materials Field Tour in September 2014 and continues to be monitored and evaluated by college faculty and staff, NRCS, and by community residents who utilize the walking trail that meanders through the plots.

Field Plantings

Field plantings provide opportunity to assess a variety of plant materials at environmentally diverse off-center locations across our region. They also provide valuable information for NRCS Field Office Technical Guides (FOTG) and related publications. The PMC appreciates how field offices continue to support off-center evaluation plantings of new or untested plant materials. They assist us in soliciting and working with area landowners to plan and install each planting. They also provide oversight and annual evaluation of each species/variety during the first three (grass/forb) or five (woody) years of the planting. Many field plantings in the service area consist of tree and shrub species evaluated for potential inclusion on the approved species list in the FOTG. Recently, the PMC offered interested cooperators an acres-worth of seed of two herbaceous species: a PMC selection of Virginia wildrye that is being tested and evaluated for future release; and ‘Sundance’ foxtail dalea, an annual legume with the potential to add diversity and a plant source of nitrogen to cover crop and perennial grass/forb plantings. The following table provides a summary of the tree and shrub evaluations for 2015.

Year(s) Planted	Species and Number of Years Evaluated	Total Plantings (Ave. 25 plants/planting)	No. of Active Plantings 12/31/15	% Survival in Active Plantings	Performance Rating Active Plantings (1-10; 1 = Best)
2010/11	Common ninebark (5)	28	4	90	2.3
2010/11	White poplar (5)	9	3	47	4.3
2013/14	Meyer’s spruce (3)	37	31	74	3.7
2013/14	Mongolian pine (2)	44	37	59	3.8
2014/15	Lodgepole pine (2)	25	19	31	7.1
2015	Douglas fir (1)	13	13	76	4.1

Fifteen cooperators planted the PMC Virginia wildrye and/or the foxtail dalea in 10 different plantings in 2015. These were either used in cover crop mixes or perennial grass/forb mixes across all three states. The Virginia wildrye looked very good in every planting. Some of the grass/forb plantings that included the foxtail dalea were clipped for weed control, so results were mixed. Plots that were not clipped looked good, as did the dalea in the demonstration cover crop planting in Bottineau County, North Dakota. These two species will again be offered for field plantings in select locations in 2016.

Foundation Seed Update

Foundation class seed production continues at the PMC. Foundation seed must meet state seed certification standards.



New seeding of a ‘Dacotah’ switchgrass foundation field

It is only allocated to producers for the purpose of seed production. In 2015, there were 13 fields producing foundation seed at the PMC. Specific releases are rotated in and out of production based on stored inventory and grower demand. Seed harvested in 2015 is currently being cleaned and tested. Seed has been distributed since the PMC began. Approximately 48,000 pounds of seed from 24 cooperative grass and forb releases has been distributed in the past 20 years. For conservation planners, farmers, and ranchers, this means that a

diverse list of species in adequate supply are normally available for various plantings. Seed from 17 tree and shrub releases are also harvested and available to conservation nurseries. Growers interested in producing grass or forb seed can contact the PMC for details.



Harvesting Indiangrass with a seed stripper

Lodgepole Pine for Windbreaks?

For many years, lodgepole pine *Pinus contorta* var. *latifolia* has been of interest to the agroforestry professionals in the Bismarck-Mandan area. It has performed well for 30 years in a provenance test at the Northern Great Plains Research Lab (ARS) and eight years in multiple test plots by NRCS. For many years, in three NRCS trials, it competed equally



Open wounds on lodgepole pine three years after hail damage event

with ponderosa pine in growth rates and exhibited a brighter green foliage than ponderosa or Mongolian pines. A hail storm in 2013 that impacted the multiple species tree planting at Hettinger, North Dakota, quite vividly showed a difference in each specie’s ability to withstand weather related stress.

When inventoried in October 2015, many of the lodgepole pines still showed severe scar damage and exposed xylem after three growing seasons. Both Mongolian Scots pine and ponderosa pine had entirely callused over the injury sites. One had to look close to detect the callus tissue on the two species. Interestingly, the hail storm affected each species differently with respect to injury response. Following the hail storm, the lodgepole pine initiated double leaders on 39% of the trees, the Mongolian Scots pine initiated double leaders on 38% of the trees while the ponderosa pine showed no double leaders. According to a USFS geneticist, some species when moved off site will survive for quite a few years and perform well until impacted by a set of climatic events such as early freeze, late freeze, extreme drought or wet, or hail, or heavy snows and high winds etc.

The lodgepole pine still shows promise and further observations will be noted.

Grass/Forb Field Trial at Marshall County, Minnesota

A grass/forb field trial was established in June 2013 by the Marshall County, Minnesota Conservation District. The plots are located on county fairground property at the eastern edge of 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 seven plots containing different program and pollinator mixes were established for demonstration and education purposes. Several species of potential PMC releases were included for evaluation and comparison purposes. Carlson Seed Farm (a local commercial seed vendor) donated seed for most of the program mixes. Staff from the PMC participated in the Minnesota NRCS Area I Plant Materials Field Tour that was held at the fairground location on September 9th. The field event provided training opportunities for plant selection, plant identification, and establishment and management considerations for successful plantings. The tour also included stops at three area fields that were seeded with different drills and different program mixes. Detailed information on the fairground plot is included in the 2015 PMC Technical Report.



Plant materials staff provided training at the Warren, Minnesota plots during an Area 1 field tour.

Outreach

Twelve cooperators from ten tribal communities submitted requests for plant materials in 2015. Most requests were for sweetgrass plants and prairie cordgrass plugs for stream bank/riparian protection. Fruiting shrubs were distributed to enhance local food production. Seed and transplants of various grass and forbs were also allocated. Youth and adult volunteers were involved with planting, maintenance, and cultural education components of these projects. There is ongoing tribal interest in native and cultural plants and plant technologies that contribute to the well-being of their respective communities. NRCS and the Plant Materials staff are committed and active participants in this endeavor.

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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