NRCS Bismarck Plant Materials Center

2017 Progress Report of Activities

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Plant Materials Program Mission

The Natural Resources Conservation Service (NRCS) Plant Materials program mission is to develop plant materials and related technologies that can be applied to conservation of our nation's natural resources. As one of 25 plant centers in the nation, the Bismarck Plant Materials Center (PMC) supports conservation activities across Minnesota, North Dakota, and South Dakota, with a primary focus on soil health and grazing land health. Plant Materials Center activities are based on priority needs identified by NRCS, conservation districts, and partners. Activities include plant testing and selection, Foundation seed production, plant technologies training, and development of printed and online resources that support the mission.

Bismarck Plant Materials Center co-located with Lincoln Oakes Nursery

Events in 2017

This year was a time of change at the Bismarck Plant Materials Center (PMC). Rachel Bergsagel (Biological Technician), and Craig Stange (Forester) retired in the spring. Their expertise and years of experience are greatly missed. Dwight Tober, a retired, longtime Plant Materials Manager and Specialist, passed away late in 2017. He was a great mentor and friend. Selected buildings at the PMC got a facelift with new paint, roofs, and lighting. Drought affected Foundation seed production, plot establishment, and data collection. Installation of a linear irrigation system was initiated in 2017 and should be functional in 2018 when the pipeline is completed. Tree rows between grass fields are scheduled for 2018 removal to allow for travel of the new irrigation system between fields. The upcoming removal of the tree and shrub rows prompted the PMC to start a new tree and shrub orchard in 2017.

New linear irrigation system will supply water to grass fields

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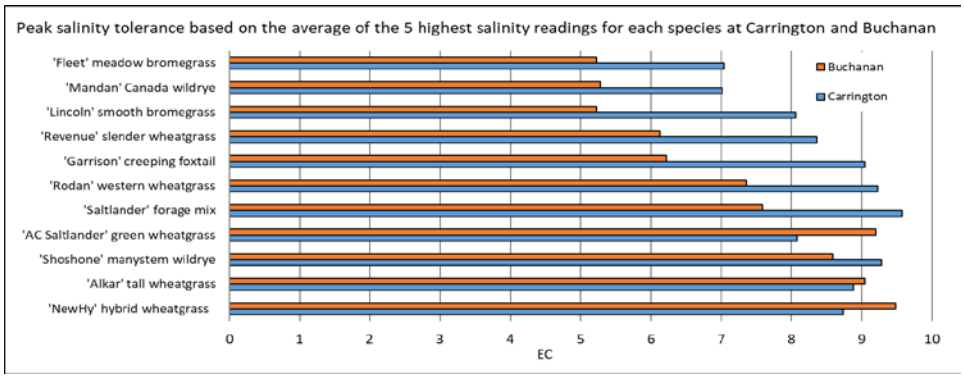
Warm-Season Grass Establishment

The goal of this study is to determine seeding dates and type of seedbed that will provide the best opportunity for a successful planting of perennial warm season grasses. This is a 5-year study with replicated plots seeded annually in spring, summer, and dormant seeding windows. Seeding is done in both conventional till fallow, and no-till stubble. Results to date indicate that spring seeding is most successful and summer seeding is least successful. Results have been mixed between the two seedbed types. Weed pressure has been greater on tilled plots, but residue issues on some no-till plots illustrate the importance of good residue management tools on the no-till drill. Final plot seeding will be done in 2018, and results will not be summarized until 2020, allowing at least one full growing season before evaluating the 2018 dormant seeding.

Spring seeded warm-season grasses

Carrington Salinity Study

Ten selected cool season grass species and mixes were planted and performance was compared in plots composed of saline discharge soils near Buchanan and Carrington, North Dakota. Data was collected from 2012-2016. Forage production and forage quality were calculated from samples taken each year at plant maturity (July). Soil salinity concentrations were also recorded at each sample point. A fact sheet and final report with detailed information on the results of this study will be available from the PMC and/or the PMC website soon. Findings from this study support FOTG recommendations on best species to establish in saline conditions, and provide additional information for revision to the current NRCS Tech Note, "Plant Materials for Salt-Affected Sites". The following chart summarizes the average salinity tolerances of the grasses included in the trial.



Prairie Cordgrass Establishment in Saline Soils

In 2016, the Bismarck PMC provided prairie cordgrass transplants of Red River Germplasm and a South Dakota State University selection to evaluate establishment success in selected saline locations in North Dakota and South Dakota. Two locations experienced total transplant losses the first year due to drought conditions. The four remaining plantings were evaluated in 2017. There was more than 50% survival despite extreme drought conditions through mid-July. The PMC will continue to monitor progress of these plantings for establishment success in tough, saline environments.

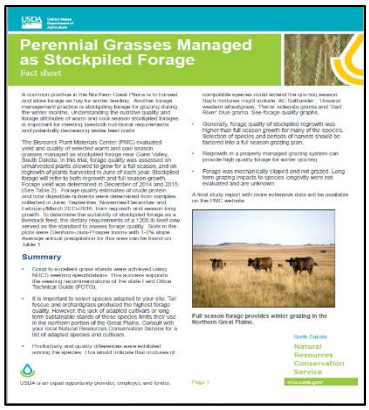
Planting Grasses in Stubble

The purpose of this study is to evaluate establishment of perennial grass species when no-till seeded into previous crop stubble. Stubble of various annual crops typically grown in the region are being used. Initial seeding and harvesting of the annual crops was completed in 2017. In 2018, these plots will be cross seeded with individual grass species and a multi-species grass mix. The seeded grasses will be evaluated for stand, vigor, weed pressure, and disease presence during the initial and 2nd growing seasons. This will be replicated again in 2018-19.

Different stubble types for planting perennial grasses

Stockpiled Forages for Winter Grazing

A study to evaluate stockpiling grasses and forbs for winter grazing has been ongoing with a local producer near Gann Valley, South Dakota, since 2013. Data collection was completed in 2016. A fact sheet with summarized results from the data that was collected over a 3-year period, has just been completed. It is currently available from the PMC and will be available on the PMC publications website soon.


Perennial Grasses Managed as Stockpiled Forage

Fact sheet

Planting for Pollinators


Pollinator forbs planted at Morris, Minnesota

A pollinator habitat**,** was established in 2014 at the University of Minnesota West Central Research and Outreach Center farm campus. The PMC provided seed, technical assistance with planning, and no-till seeding of the plots that included NRCS program seed mixes of 25, 50, 75, and 100 % forbs to grasses. The plots provided excellent training opportunities for the public, agency personnel, and students. University students monitored pollinator insect activity and individual plant species populations over a 2-year period. A recent herbicide application to control a crown vetch infestation eliminated many of the forbs that were present in this planting. Summary information is available on the University web site as a PDF file, Flowering and pollinator attractiveness of four NRCS native forb mixes at the WCROC

Forb Establishment for Pollinators

Recent evaluation of several established fields of mixed grasses and forbs, in various ecological regions of North Dakota, revealed that almost 50% of the forb species in the seed mixes were not present. A field trial was initiated at the PMC in 2016 to compare different ratios of grasses to forbs, and different seeding rates of each. The goal is to compare these results with what has been observed in the field, and utilize the information to adjust seed mix recommendations in the NRCS FOTG. Data collection will continue in 2018.


Forb mixes clipped and not clipped

Cover Crop Variety Trial

Cultivars (varieties) of various cover crop species were compared in a replicated trial at the PMC in 2017. The plots were planted June 5, 2017. There were 8 Austrian winter peas, 6 hairy vetch, 15 rye, 2 black oats, 12 daikon radish, 8 red clover, 6 crimson clover, and 2 balansa clover cultivars. Each cultivar was planted in a separate row. The same cultivars are being compared at other Plant Materials Centers across the United States. Emergence, date at 50% flowering, and any pest problems were recorded. Overwintering survival will be recorded in the spring of 2018. The winter peas germinated but developed severe disease by early summer. The most noted difference in the hairy vetch was the lack of flowers at Bismarck for two cultivars; 'Villana' and 'TNT'. As the plots were spring planted, the rye cultivars produced few heads overall. 'FL401' and 'Merced' rye produced abundant heads but had very little vegetative forage material. All of the daikon radishes were 2-3 ft. tall by the end of the growing season. The radish cultivar 'Graza' produced abundant foliage and underground root material but did not produce any flowers. All other radishes produced flowers. Most of the red clovers had very similar size and flowering dates. Forage for the crimson clover was not abundant. Seed was produced for most crimson clover entries. Black oats became quite diseased. The two balansa clover cultivars were quite varied in flowering and growth. 'Fixation' was more vigorous, taller, and later flowering than 'Frontier' balansa clover. Plans for 2018 include overwintering data for the cultivars planted in 2017. An identical planting will be made in 2018 so two years of data can be gathered for each cultivar.


'Villana' hairy vetch did not flower at Bismarck, North Dakota

Herbaceous Plant Release Candidates

Sand bluestem-Sand bluestem is a warm-season, native grass that grows well on sandy sites where its rhizomes help stabilize the soil. It is palatable and nutritious for livestock. Development of a sand bluestem release adapted to the Northern Great Plains continues at the PMC. Evaluation, selection, and reselection of plants propagated from native collections made in 2003 have been ongoing. Selection criteria has included plant vigor, leafiness, flowering date, and seed set. Leaf to stem ratios have been recorded and forage has been tested for various quality parameters. Comparison of big bluestem and sand bluestem quality show the two species to be similar. In 2017, stem material of sand bluestem averaged 8.9 % crude protein and leaf material averaged 11.4% crude protein. 'Bonilla' big bluestem leaf material averaged 9.2 % crude protein and leaf material averaged 13.2% crude protein. Seed harvested in October 2017 from the selected sand bluestem plants will be planted in 2018 to further evaluate and refine the population for release in the next few years.

Selected population of sand bluestem flowering at Bismarck, North Dakota

Indiangrass-Selection and release of an Indiangrass adapted to the Northern Great Plains and leafier than the cultivar 'Tomahawk' has been hindered due to variability within the selected population. Accession 9094358 is a composite of plant material with Minnesota origins that the PMC selected as a breeder population. Flowering and ripening dates were found to be quite variable once planted in the field. To refine the selected population, seed was stripped rather than combine harvested in 2015 and 2016 from the field. It is thought that this material might be less variable in seed ripeness. Trials are planned for 2018 to compare combine harvested seed of 9094358, flail vac stripper harvested seed of 9094358, and 'Tomahawk'.

Prairie dropseed-A release of a prairie dropseed could be useful in prairie restorations. Seed size was the criteria used in selecting a breeder population. In 2017, plants were shorter and fewer seed heads were produced in the breeder plot. Seed production appears to be enhanced by burning residue every few years to open the dense crown. Due to limited demand, continuation toward release of a prairie dropseed is being evaluated.

Virginia wildrye-A population (9094359) of Virginia wildrye adapted to the Northern Great Plains has been selected for potential release. It was selected from plant material collected in 2008 and 2009 from the Dakotas' and Minnesota. Field Plantings were made by producers beginning in 2014 to gather data in "on farm" conditions. It was planted as a component of a grass/forb mix in most field plantings. Reports indicate that Virginia wildrye emerged in all plantings and is thriving in most of them. Leaf material sampled at the PMC on 7/18/2017 averaged 15.9% crude protein and stem material averaged 4.2% crude protein. Crude protein for leaves of Canada wildrye averaged 15% and stem material averaged 4.2% crude protein. A seed increase field of the selected population was planted in 2013 at the PMC. Seed production in 2014-2016 averaged over 400 PLS lb/ac each year. In 2017, seed production was reduced due to drought and possibly the short-lived nature of the species. Plans for 2018 include evaluation of forage production and further data collection from field plantings. The name Tober Germplasm has been cleared for the anticipated 2019 release.

Virginia wildrye is a leafy bunchgrass

Cupplant-Cupplant is commonly found in moist prairies, floodplains, near streambeds and open woodlands. Its native range is the Eastern United States and Canada. It is native to the far eastern portion of the Dakotas' but not the west. This large sunflower-like plant's name is derived from the water holding cup formed when leaves clasp the square stem. It has an extensive root system. Many pollinator species and birds visit the plant for food and water. Plants with Ransom County, North Dakota origins (9094396) have been growing at the PMC and producing seed since 2013. Plants averaged less than 4 feet tall in 2017 compared to 7 feet tall in previous years. The short stature was attributed to the severe drought. In 2016, accession 9094396 seed was planted near Mahnomen, Minnesota in the lower portion of a road right-of-way. Many vigorous plants were observed during a 2017 site visit. In 2018, seed is being offered for additional field planting trials. Potential uses might include filter strips, pollinator plantings, riparian plantings, livestock feed, and streambank stabilization.

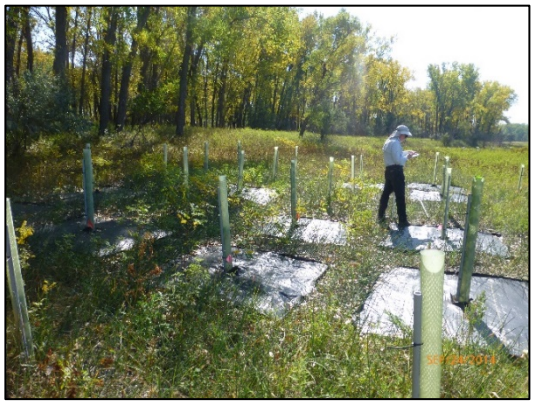
Saline Poplar Study

Very few trees perform well on saline soils. In this study, poplars are being screened for saline tolerance at a field site near Bismarck, North Dakota. The US Forest Service in Rhinelander, Wisconsin provided seven clones of hybrid poplars that they determined to have some saline tolerance in Wisconsin trials. After four years of observation at the Bismarck site, trees from three seed sources have survived and grown well on beginning salinities as high as 3.5 mmhos/cm. So far, the study has confirmed that there are very few trees that perform well on saline soils. Further data analysis will be done this winter. Yet to be determined is long term survival as root systems expand into a mosaic of saline soils.

Saline tolerant poplar

Cottonwood Restoration Study

Many conservationists and agencies across North America lament the demise of cottonwoods on streams below big dams. Big dams change regularly-flooding streams into drainage ditches. Natural regeneration of cottonwoods rarely occurs due to declining water table and dense sod from introduced grasses. In this study, three different stock types and two weed control measures were evaluated. The stock types were: traditional conservation stock, potted stock planted 4' deep, and unrooted cutting planted 6' deep. Half of each stock type received 6'x 6' weed control fabric squares. Following are observations and conclusions based on gathered data.



Cottonwood restoration plots

-Soil mottling, indicative of fluctuating water tables can be a relic representing moisture conditions from 100 years prior.

-Existing mature cottonwoods have extensive root systems that strongly compete with new seedlings.

-Cottonwood roots must have access to the capillary fringe of a water table or to heavier textured soils that hold water.

-Dewatered Missouri River flood plains are no longer Conservation Tree and Shrub Group (CTSG) soils of 1, 1s, or 2 but rather CTSG 5 or 7 soils. Species selection on these sites should reflect current moisture/soil conditions. The sites are now more suited to pines rather than cottonwoods.

Mongolian Scots Pine Seed Available

Scots pine across the US are suffering extreme die-off because of the pine wilt nematode. The PMC has a seed source of Mongolian Scots pine with origins from northeastern China. Based on a Chinese research study, this source appears resistant to the nematode. Currently, North Dakota has not experienced die-off due to nematodes. Therefore, the PMC is offering seed for field plantings to forestry personnel across the mid and northeastern US where the nematode likely occurs. Field plantings across a wide geographic area will give a better indication of nematode resistance of this particular seed source.

Mongolian Scots pine
Pinus sylvestris var*. 'Mongolica'*

Tree Seed Harvest in 2017

Seed was collected from seven species of trees and shrubs in 2017. Seed is harvested for distribution to tree nurseries for seed orchards or for propagating seedlings that are planted in windbreaks.

2017 Seed Harvest

Promising Tree Species

Grey Birch-Grey birch is a species not being used or available for conservation plantings in the Dakotas' or Minnesota. It grows well on sites considered too sandy for paper birch. It has performed well at all off center test sites being monitored by the PMC. Bare root tree seedlings will be available for field plantings in the spring of 2019.

Arborvitae-Arborvitae is a coniferous species that grows well on moist sites and has a narrow, columnar form. Often, this species experiences winter burn. Trees on a fairly exposed site have grown well and shown no winter burn for 25 years. Arborvitae seedlings will be available for field plantings in the spring of 2020.

New Tree Seed Orchard

Establishment of a new tree and shrub orchard at the PMC began in the spring of 2017. This was planted to replace field windbreaks that are being removed to make way for a new linear irrigation system. Although seed production will be lost for a few years, trees can be managed in a manner best for the trees and not the adjacent grass fields.

New Tree/Shrub Orchard, Bismarck PMC

Woody Field Plantings

The purpose of a field planting is to assess the conservation potential of plant materials and plant technologies under a variety of soil, climatic and land uses. They are planted on a producers land. Data for woody species is collected by the producer or field office staff for 5 years. In 2017, no new woody species were offered for field plantings. The species still being evaluated include Meyers spruce, Mongolian pine, lodgepole pine, and Douglas fir.

Off-Center Tree Evaluation Plantings

Off Center Evaluation Plantings (OCEP) are long term plantings that are located off the PMC but evaluated by PMC staff. Annual evaluation of tree and shrub species continued at plots near Becker, Minnesota, Brookings, South Dakota, and Dickinson, North Dakota. There were no woody additions in 2017 at any of the sites. The current Becker, MN site is being converted to commercial property so the agreement is being discontinued. Tree planting and evaluation at Becker will cease. Site specific information is available in each locations annual report.

Outreach

The PMC provided plant materials and technical assistance for special plantings to several tribal, conservation district, and agency partners in 2017. They were utilized as living demonstration, education, and public awareness plantings in local communities to promote conservation of native plant materials. Fruiting shrubs were also included to encourage local harvest opportunities for potential community development

Youth planting white sage

Foundation Seed Production

The Bismarck PMC continues to grow and clean foundation and selected class seed. In 2017, there were fourteen different releases being grown on site. In 2017, there were 1643 pounds of seed from previous harvests distributed through North Dakota Foundation Seedstocks to area seed growers.

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