

Herbaceous Evaluation

Evaluation and plant selection by the Plant Materials Program provides adapted, vigorous, and productive plant releases for conservation use. Several herbaceous species are in various stages of the plant release process. Herbaceous species currently being evaluated and the progress made toward release are found in the table below.

SPECIES	USE	COLLECTIONS		SELECTIONS	2011	2012	2013 Plans
		START YEAR	NO.				
Prairie sandreed <i>Calamovilfa longifolia</i>	sandy soils	2003 (seed)	38	7 (MN)	breeder seed harvest (1.2 lb)	breeder seed harvest, comparison with Koch	comparison with Koch variety, seed harvest
Sand bluestem <i>Andropogon hallii</i>	sandy soils, rangeland, landscape	2003 (seed) 2004 (seed)	21	10 (SD, ND, MN)	established breeder plot	re-selection of breeder population	greenhouse propagation, establish breeder field
Indiangrass <i>Sorghastrum nutans</i>	forage, landscaping	2005 (veg)	41	25 (MN)	established breeder plot, rogued early	seed harvest	seed increase field
Prairie dropseed <i>Sporobolus heterolepis</i>	prairie restoration, wildlife, landscaping	1998-2005 (seed)	3	large seed (SD, ND, MN)	seed harvest	seed harvest	seed increase field, rogue off-types, seed harvest
Prairie junegrass <i>Koeleria macrantha</i>	early forage, prairie restoration	2006 (seed) 2007 (seed)	97	pending	preselection breeder population	survival poor, harvest seed	greenhouse propagation
Virginia wildrye <i>Elymus virginicus</i>	wildlife, prairie seeding, forage, tree rows, shady sites	2008 (seed) 2009 (seed)	34 47	pending	breeder population seed harvest	seed harvest	seed harvest, plant increase field
fourwing saltbush <i>Atriplex canescens</i>	range	1999 (seed)	1 (SD)	none	seed harvest	seed harvest	remove, store germplasm
cupplant <i>Silphium perfoliatum</i>	biomass, prairie, water, pollinator, wildlife	2012	1 (ND)	none	native collection	greenhouse propagation, evaluation field planted	data collection, seed harvest, native collection

Prairie sandreed varieties recommended in the region originate from dry climates. They often develop severe leaf and stem rust when planted in the eastern Dakotas and Minnesota. The PMC collection originates from counties in Minnesota. It is anticipated to be less disease prone.

Sand bluestem grows in very sandy sites. No release of sand bluestem consistently produces viable seed in the Northern Great Plains. Collections are being screened for seed production, rhizome spread and forage production.

Indiangrass that is a better forage producer than the variety 'Tomahawk' and is adapted to Minnesota and the Eastern Dakotas is the goal of a future release.

Prairie dropseed is a bunch-type, warm-season grass. No releases are currently available for use in the Northern Great Plains. Seedling vigor can be poor for the species. Large seed has been selected as means to improve establishment.

Prairie junegrass produces very early forage for livestock. No adapted variety is currently available for use in the Northern Great Plains. The dry, cold winter of 2011 and the short-lived nature of the species contributed to mortality of most plants by the spring of 2012. Seed harvested from surviving plants will be propagated and further evaluated.

Virginia wildrye is a vigorous cool-season bunch grass that tolerates both moist and dry sites, and shade and full sun. The breeder population is a genetically diverse composite of vigorous plants from South Dakota, North Dakota, and Minnesota.

Fourwing saltbush is a half shrub that occupies dry rangeland and is palatable to livestock. Seed harvest challenges have halted release development at this time.

Cupplant is a tall, coarse forb of the tall grass prairie. Leaves form "cups" at the stem axil that hold water for wildlife and pollinators. It has large biomass production and can uptake large amounts of water. A collection from southeastern North Dakota is currently under evaluation. Additional collections of northern North Dakota and Minnesota origins are being sought.

Another Tall Tree for Great Plains Windbreaks?

Lodgepole pine looks promising as another windbreak species after five years of replicated field trials at three sites. Replicated trials were planted at Hettinger, ND; Angostura Reservoir near Hot Springs, SD; and a ranch site near Richardton, ND. All sites were well prepared for tree planting. Trees tested at the three sites were propagated from seed collected at a mature provenance test at the ARS station, Mandan, ND. The provenance test trees were rated and seed was collected from the best performing trees. Their origins ranged from Colorado to British Columbia.

Following are a few observations from the replicated trials. Growth rate of lodgepole pine was similar, but survival was slightly less than ponderosa pine in the replicated trials and in the provenance test. Deer protection was essential at all sites. Lodgepole pine was less able to compete with sod forming weeds than ponderosa or Mongolian Scotch pine. Trees at Hettinger were protected from weeds by 6-foot wide fabric strips and mowed blue grama seeding between strips. Trees at Angostura were protected by 3-foot by 3-foot fabric squares and trees at Richardton were protected by 6-foot wide fabric strips. Smooth brome grew to the edge of the fabric at Angostura and Russian thistle and brome grew back to the edges and out the fabric openings at Richardton. Weed growth to the edge of the fabric confirms that weed control is essential for successful tree plantings.

Seed from the original provenance test will be collected, grown and distributed as field trials in 2014.

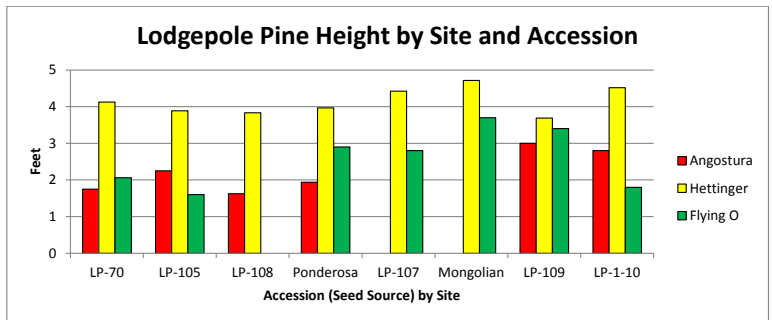
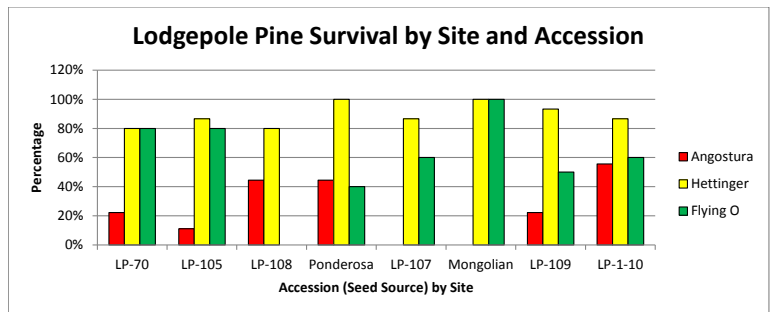
Depending on performance of the field trials, the provenance test may be converted to a seed orchard in future years.

We wish to acknowledge the very cooperative staff at the Mandan Agricultural Research Service. The contribution of plant material, maintenance, equipment and personnel greatly assists our ability to find new conservation materials.

ARS Bur Oak Provenance Test Shifting to Seed Orchard

The bur oak study is one step closer to becoming a seed orchard (a source of superior seed for nursery production). Over the past several years, the bur oak provenance study at the Mandan Agricultural Research Station has been prepared for conversion to a seed orchard. The first step was to score the plants with respect to height, survival, and diameter. Those scoring highest were chosen to remain as a seed orchard. Low scoring plants will be removed as time permits.

The following tables show seed sources for those bur oaks that scored high enough to be kept as seed trees as well as seed sources that will be removed. As anticipated, the seed sources closest to North Dakota or points north provided the preponderance of high scoring plant material.



Origins of Individual Trees					
Selected for Seed Orchard			Not Selected for Seed Orchard		
Source	# of Accessions	# of Living Trees	Source	# of Accessions	# of Living Trees
Saskatchewan	2	3	South Dakota	3	10
Manitoba	12	19	Oklahoma	6	1
North Dakota	3	34	Nebraska	3	12
South Dakota	7	10	North Dakota	3	12
Nebraska	9	20	Missouri	8	11
Kansas	6	8	Kansas	6	15
Minnesota	5	9	Iowa	1	3
Iowa	1	4	Saskatchewan	1	3
			Manitoba	3	11
			unknown	1	4

The original study contained 360 trees from 90 seed sources in a randomized complete block design with one 2-tree plot per replication. After planting, trees were protected with 3-foot fabric squares and 2-foot Tubex and deer fence around the

perimeter. Trees show some mechanical injury from mowing. Raising the canopy, maintaining a weed free patch under the canopy with herbicide, and thinning the stand should reduce future injuries. Tubex shelters were removed at about year ten. The perimeter fence which is no longer needed has been removed.

Potential seed orchard trees were treated with glyphosate to control brome sod and increase growth, health, and vigor. This has been done twice a year for the past two years. After one season of weed control, treated trees appeared to have more dark green foliage and appeared to have grown more than non-treated trees, verifying the need for weed control in successful tree plantings.

ARS bur oak seed orchard showing chemically killed sod



Specialist Update

The complexities of this new position resulted in 2012 being a year of transition. I have greatly appreciated the assistance provided by the quality staff at the Bismarck Plant Materials Center, and for the assistance from retired specialist, Dwight Tober, who donates time and expertise as a PMC volunteer. This is such a dedicated group of people who always give more than they take credit for, and it is certainly revealed in the quantity and quality of their work.

The 2012 growing season provided relief from the historic rainfall and flooding events of the previous year, to the detriment of many areas in our region that experienced hot and dry weather reminiscent of the 1988 drought. Banked subsoil moisture made the difference this year as crops fared much better in most localities this time around. Southern South Dakota and Minnesota were more severely impacted by temperature and moisture extremes than more northern locations. Most growers reported 20-90 percent below-normal production of grasses and forbs, with southern locations in our area experiencing the greatest losses.

New Plant Release - Bounty Germplasm big bluestem: The Bismarck PMC released this big bluestem selection for conservation use in native plantings throughout the Northern Great Plains and Upper Midwest. Bounty Germplasm big bluestem (*Andropogon gerardii* Vitman) is a selected class pre-varietal release developed from an original seed composite from 49 counties in Minnesota and eastern South Dakota. It provides considerable species diversity to enhance long-term stability and greater area of adaptation. Conservation uses include: prairie and ecological re-vegetation, livestock forage, wildlife habitat, and native landscaping. Bounty is a leafy, fine-stemmed, early-maturing selection that ranks high in protein and feed value when compared to other big bluestem varieties adapted to this region. Bounty is expected to perform well as a high quality, native warm-season grass in this region.

Field Plantings: There were no new field planting offerings in 2012, but evaluations continued on 88 active field plantings of the following species: black cherry, pin cherry, common ninebark, white poplar, American black currant, and fourwing saltbush. A majority of these field plantings continue to perform well under good management. Pest issues most often reported included weeds, deer, grasshopper, and webworm predation. Other conditions impacting performance on some sites included herbicide damage, winter dieback, and drought. Where these conditions were present, performance was negatively impacted, but they did not have a noticeable impact on survival. Poor survival and performance were most impacted on sites that experienced severe weed and grass competition, water-logged soils (in 2011), and/or heavy deer browsing.

Off-Center Evaluation Plantings (OCEP's): 'Princeton' elm, pin cherry, and 'Carmine Jewel' cherry were added to the existing plantings at the Becker, Brookings, and Dickinson off-center locations. The addition of Princeton elm provides another possible species to fill the need for additional tall tree diversity. It is advertised as somewhat resistant to Dutch elm disease. It is looking good in this first season of evaluation. All three tree locations are well maintained. Two sites have blue grama and sideoats grama planted between the fabric tree rows, and this practice appears to be a very good alternative to cultivation. Although we prefer to mimic normal field practices, we chose to use tree shelters and in-row fabric to minimize weed/grass competition and predator damage to enhance survival so we have something to evaluate in future years. Several species planted in previous years will have to be replaced, as deer browsing has decimated existing plants. We also witnessed cultivator blight where it is used as the key maintenance practice. Craig Stange and I performed evaluations at all three sites in August, and also assisted with pruning and maintenance at the Brookings and Dickinson locations. The Dickinson OCEP contract between PMC and the Dickinson Research Extension Center was renewed for another 15 years. With the new agreement, additional acreage was committed to PMC tree evaluation. The area was seeded to blue grama in spring 2012 and four 15-foot strips of weed barrier were hand stapled in preparation for future evaluations.

Conservation Field Trials: The plant materials program provided support and assistance for 13 different conservation field trial plantings across our three-state area. Assistance included providing PMC foundation seeds and plant materials, equipment, manpower for seeding plots, clipping, analyzing plot production,



Seeding a conservation field trial at Plankinton, South Dakota

and evaluation of the sites. The Central Lakes College biofuel research project at Staples, MN, continues to evaluate a variety of plants for biomass production. The PMC provided 50 pounds of cleaned field pennycress seed to analyze for biofuel potential. The PMC provided 'Forestburg' switchgrass seed for their newest biomass production field. We assisted the Plankinton, SD, field office with planting a new outdoor classroom site that includes 40 different plots of individual grasses and grass and forb combinations. We assisted with clipping and collecting production and/or forage quality data on grass samples from field sites at Carrington, ND (salinity trial), Bison, SD (grasses and forbs), Wessington Springs, SD (winter forage quality), and Parkston, SD (salinity trial). The big sage project continued with the PMC involved in growing and transplanting 300 big sage on producer land near Belle Fourche, SD. Evaluation results on all 5,500 plants that have been transplanted to date in North Dakota indicate good survival for plantings done in early spring or fall dormant, while late summer plantings did not fare well. Most plants were transplanted into less-than-ideal soil and moisture environments yet still established quite well.

Special/Demonstration Plantings: We received a variety of requests for seed and transplants of grasses and forbs for demonstration plantings. It included 500 plants for a riparian site, seed of two PMC releases for a sizeable hay/pasture demonstration planting, grasses and forbs for native landscape demonstration plantings, and "People's Garden" plantings. There were several requests for seed for research purposes.

Tribal Outreach: Plants and seed were provided for cultural plantings at nine tribal locations in this region. The PMC delivered more than 300 sweetgrass, white sage, and Indian breadroot plants, in addition to a lesser amount of several other species. Several of these included youth involvement in the planting, maintenance and cultural education components of these projects.

The plant materials program continues to assist partners in developing future educational and/or demonstration projects that include plant materials. These plantings promote PMC releases and other plant materials to growers and producers, and provide additional opportunities to evaluate these plant materials under local growing conditions. They provide valuable information on local adaptability; information that can be considered for inclusion in NRCS technical guides and published materials.

Trainings/Presentations: The PMC provided two one-day training events for approximately 80 field staff at two Minnesota locations last June. Topics included seed quality, understanding seed labels, establishment, drill calibration, post-establishment maintenance, grass identification, and soil health. The PMC provided field and plot tours for several groups during the year, and set up a booth display at the Mandan ARS summer field day event.



Outdoor classroom plots at Plankinton, South Dakota



Planting cultural plants at Upper Sioux Tribal Headquarters, Granite Falls, Minnesota



One-day training sessions were held at two locations in Minnesota

Quack/NewHy Study

Palatable forage species adapted to saline sites are limited. AC Saltlander and NewHy are recent releases adapted to saline conditions. AC Saltlander was developed by researchers in Utah and Saskatchewan. The original seed collection, which was from Turkey, was determined to be a natural hybrid between the Eurasian bluebunch wheatgrass complex (*Pseudoroegneria strigosa*, *P. geniculata*, *P. stiffolia*) and quackgrass (*Elytrigia repens*). Its common name is green wheatgrass and the species name given the cross is *Elymus hoffmannii*. Plants from the original collection were selected for bunched growth, vegetative vigor, leafiness, seed set, uniform plant color and freedom from plant pests. It was further selected for resistance to root zone salinity, winter hardiness, and other desirable plant traits. The physical characteristics of the seed are similar to quackgrass, but genetically it is different from quackgrass. It has a limited degree of rhizomatous growth.

Newhy was developed by USDA forage breeders in Utah. It was synthetically developed by crossing quackgrass with the native North American bluebunch wheatgrass (*Pseudoroegneria spicata*). Field trials in Utah, Idaho, and Montana suggest it is suitable for sites with moderate to severe salinity which receive at least 13 inches of moisture. Though they were selected for bunch type growth, questions have been raised concerning the growth and spread of these two releases in the Northern Great Plains.

The PMC planted a replicated trial (4 replications) in 2012 comparing AC Saltlander, NewHy, Rebound smooth brome, and quackgrass. Seedlings were grown in the greenhouse and planted to a field plot. Plants of each entry were planted in groups

of 10 within each replication. Data from 2012 is found in the table. Caution should be used when interpreting first year data as plants undergo transplant shock and establishment growth and usually don't represent overall long-term performance. Except for the short height of quackgrass, the data indicated that first year growth among the entries was very similar. Though data was not collected in October, visual observations showed tremendous growth of all entries during the cool, fall period. The spread and growth will be captured in data collected in 2013 and 2014. Compilation of the data collected at the Bismarck PMC and from additional literature searches is anticipated for 2014/2015.

Data Collection - 2012 (First Year Data)					
Date	Entry	(inches) Height	(inches) Width	rating Vigor*	rating Culms**
9/12/2012	AC Saltlander	15.85	31.13	3.90	6.83
9/12/2012	NewHy	18.15	31.93	3.85	6.03
9/12/2012	Quackgrass	9.80	28.68	5.25	7.30
9/12/2012	Rebound smooth brome	21.20	26.13	4.35	6.20

*Vigor: 1=best; 9=poor
**Culms: 1=many; 9=none

References

Steppuhn, H., P.G. Jefferson, A.D. Iwaasa, and J.G. McLeod. 2006. AC Saltlander green wheatgrass. Can. J. Plant Sci. 86:1161-1164.
 Asay, K.H, D.R. Dewey, W.H. Horton, K.B. Jensen, P.O. Currie, N.J. Chatterton, W.T. Hansen II, and J.R. Carlson. 1991. Registration of 'NewHy' RS Hybrid Wheatgrass. Crop Science 31:1384-1385.

National Park Projects

The PMC continues to partner with National Parks. Three National Parks (Badlands, Theodore Roosevelt and Grand Teton) have cooperative agreements with the Bismarck Plant Materials Center. These agreements allow the PMC to grow, harvest, and clean seed collected in the park. The seed is distributed back to the individual parks for reclaiming sites after construction activities within the park. The PMC is currently growing mountain brome, slender wheatgrass and bluebunch wheatgrass for the Grand Teton National Park; western wheatgrass, green needlegrass, blue grama and sand dropseed for Badlands National Park; and western wheatgrass, sideoats grama, blue grama, and prairie junegrass for Theodore Roosevelt National Park. There was 2,050 pounds of seed harvested from 6.2 acres at the PMC in 2012 for the three parks. All agreements with the parks expire in 2013.



Combining a field of slender wheatgrass from Grand Teton National Park

After the Flood

The Missouri River hopped out of its banks in May 2011 and stayed out until September. We received many questions about tree, shrub, soil, and grass management. The following fact sheets were developed and distributed to states and field offices along the upper Missouri to address some of these issues. These flyers may be of value to others experiencing severe flooding. Various state and city agencies will monitor natural revegetation (plant succession) for the next several years.

- *After the Flood – Managing Tree Regeneration* lists what to expect, addresses the rapid changes that will occur the first few years, and gives appropriate management methods resulting in a healthy riparian forest.
http://efotg.sc.egov.usda.gov/references/public/ND/After_the_Flood_Managing_Tree_Regeneration.pdf
- *After the Flood – Managing Weeds* discusses cultural, mechanical, grazing, and chemical weed control options to control annual and perennial weeds that rapidly colonize flood areas as the water recedes.
http://efotg.sc.egov.usda.gov/references/public/ND/After_the_Flood_Managing>Weeds.pdf
- *After the Flood – References* provides links to 16 different references, giving details on specific management.
http://efotg.sc.egov.usda.gov/references/public/ND/After_the_Flood_References.pdf
- *After the Flood – Seeding Grasses* addresses methods to establish or manage grasses after the water recedes.
http://efotg.sc.egov.usda.gov/references/public/ND/After_the_Flood_Seeding_Grasses.pdf



PVC Tree Shelter Stakes

Many people across the Great Plains have experienced the damage deer do to a tree planting. For most of North Dakota, it is impossible to plant oak or hackberry (alternatives to green ash) without tree protection. Several manufacturers provide good quality tree protectors. The problem has been the stake. Metal is expensive and can damage the tree. Wood breaks or rots. Traditionally, white oak stakes are available. They are effective and usually last as long as needed without rotting. However, they can break and are rigid, and do not allow the tree to develop wind hardiness until it emerges from the tube. Additionally, freight charges may double the cost of the stakes.

To solve these problems, the use of ¾-inch electrical PVC (polyvinyl chloride) as a tree shelter stake is being evaluated at the PMC and three off-center sites. The idea comes from a forester in Georgia. When purchased from a box store, PVC stakes are about the same price as oak stakes without the oak stake shipping charge. Generally, PVC stakes should be about 1 foot longer than the shelter they support, meaning they are driven into the soil a bit deeper than standard wood stakes. If the soil is moist and not sandy, they can be pushed in by hand. PVC comes precut to 5-foot lengths, which works well with 4-foot shelters. Six-foot stakes for five-foot shelters can easily be cut from the standard 10-foot pieces. Three 10-foot pipes yield five 6-foot stakes by joining the molded ends.

PVC stakes do not rot, are UV-resistant, and flex in the wind or when bumped by deer and machinery. They drive into the ground easily the first time, and are reusable. Their ability to withstand bumps or wind when extremely cold is not known. They will be evaluated for a few more years to see how they perform once the trees have grown out the top. So far they look quite promising.



Testing electrical PVC tree shelter stakes

International Windbreak Renovation and Innovation Conference

The International Windbreak Renovation Conference was held at the International Peace Gardens in 2012. The Bismarck Plant Materials Center provided staff and machinery for the conference. Eighty-five people attended the three-day event while 30 individuals participated via internet and phone connections. Attendees came from three Canadian provinces and ten states.



Canadian biobaler making big round bales of pine trees

Speakers addressed biofuels, carbon sequestration, wood utilization, new species, worldwide disease and insect risks, and planting and renovation techniques. The “hands on” part of the event was an all-day field tour where specialists and practitioners demonstrated varied techniques and machinery. There was lively discussion as trees were removed without dozers, new seedlings were planted between the stumps, and weed control



The PMC skid loader is used to cut off a Siberian elm

fabric was installed over the stumps. A highlight of the field day was the demonstration of the Canadian Biobaler. If the 200 HP armor-plated tractor could drive over the tree, it could chew it up and put it in a big round bale. The Canadians use this method to bale woody biomass from willow bogs that they use to heat nearly one acre of greenhouse.

Discussions and demonstrations have resulted in additional workshops, webinars, exchange of machinery, and requests for machinery and tool blueprints. Roy Stoner, NRCS regional forester, attended and plans to conduct a similar workshop or conference in the southern Great Plains.

In keeping with the NRCS emphasis on soil health and erosion control, none of the renovation methods involved tillage, leveling, or major disturbance. Essentially everything was no-till. Contact: craig.stange@nd.usda.gov.



Spruce planted no-till into chem-fallowed sod



A planting hole is drilled among stumps with a modified Tre-Ro-Weeder

Foundation Seed Report

The newest PMC release is Bounty Germplasm big bluestem. Bounty is a very diverse genetic big bluestem release that originates from seed collected from native stands in Minnesota and eastern South Dakota. Seed of Bounty Germplasm should be available in the spring of 2014. You may want to consider giving Bounty a try, especially in Minnesota and eastern Dakota plantings. Foundation seed production at the PMC was considered fair due to the dry conditions and lack of irrigation water. Damage from the 2011 flood to the irrigation system was repaired in July but came a little late for seed production in 2012. The PMC has a good inventory of seed from past years production available for commercial increase. Any growers in need of foundation seed should have a good selection. For those of you not familiar with our role in seed production, here is an example of how NRCS, specifically the PMC, plays a vital role in ensuring adequate quantities of quality seed for conservation plantings. Let's use Bad River blue grama as an example. Bad River blue grama was released in 1996 by the Bismarck PMC. The PMC currently has a 0.65-acre foundation field of Bad River. The harvest in 2012 was 90 PLS pounds. The 90 PLS pounds of seed was distributed to a commercial seed grower in 2012 to start a field. The grower will plant approximately 45 acres from the PMC seed. This commercial seed grower could expect to harvest an average of 100 PLS pounds per acre from that field in 2013. This would total 4,500 PLS pounds of Bad River seed that would be commercially available for conservation plantings. The results from our small 0.65-acre foundation field of Bad River blue grama returns a fairly large supply of commercial seed for conservation plantings. The benefits of the PMC releasing and producing foundation seed is a steady supply of high quality seed for your conservation plantings.



Bad River blue grama foundation field

Cover Crop

The Bismarck PMC in conjunction with five other PMCs began a multi-year cover crop study in 2012. Effects of crop diversity and seeding rates on soil health will be measured. The study consists of 3 cover crop mixes, 3 seeding rates and a control, resulting in 40 plots. Data on soils, biomass production, canopy cover, and forage quality is being gathered to compare the different seeding rates and cover crop mixes. Soil health specialists are assisting in gathering data for various soil parameters.

Baseline soil data was collected prior to planting the cover crops in 2012. Cover crops were planted August 2, 2012, at the Bismarck PMC. Canopy cover, soil, and dry matter production data was gathered until frost. The tables below list 2012 averages for dry matter yield of the three cover crop mixes and the quality of separate species within the mixes.

Beginning in 2013, barley will be no-till planted each spring into each plot. The barley will be harvested and the cover crop will be planted into the stubble in late July/early August. Soils and forage data collection will be ongoing.



Cover crop plot after a couple of hard frosts

Species Mix	Seeds/ft ²	DM/Acre
triticale, red clover	20	3488
	40	3457
	60	3873
triticale, red clover, hairy vetch, radish	20	3737
	40	3965
	60	4523
triticale, red clover, hairy vetch, radish, oats, rapeseed	20	4015
	40	4062
	60	4133

2012 PMC Cover Crop Nutrient Data						
Wet Chemistry Analysis (dry matter basis)						
Species	% Moisture	% Dry Matter	% Crude Protein	% ADF	% NDF	% Crude Fiber
hairy vetch	8.57	91.43	30.36	23.9	33.6	19.08
radish	13.83	86.12	27.9	19.2	20.5	15.33
peas	13.55	86.45	18.23	26.6	31.7	21.27
rape	13.35	86.65	30.6	14.5	14.5	11.62
red clover	9.1	90.1	29.53	20.6	30.6	16.52
triticale/oats	14.58	85.42	22.86	24.6	47.9	16.65

*Cover crop seeded 8/2/12 and sampled 9/21/12; field peas were more mature as they were planted May 2012 in a separate cover crop mix.

Putting Cottonwoods Back in the Riparian Zone

The Nature Conservancy (TNC) has teamed with the PMC to evaluate several methods of cottonwood restoration. Since the construction of main stem dams on the Missouri River, water tables in the riparian zone have dropped. The existing cottonwoods started growing 60 years ago on mud flats and sandbars formed after a flood. Lack of flooding, dropping water table, and dense stands of smooth brome grass and canary grass currently make the area inhospitable for cottonwood recruitment.



Mature, dewatered, brome grass-choked, riparian forest

The study will begin in the spring of 2013. Three types of planting material and methods will be evaluated:

unrooted 6-foot long cottonwood whips planted using a water jet stinger; deep pot grown cottonwood planted 4 feet deep, and traditional conservation grade cottonwood planted 6-10 inches deep. Four replications will be planted using a complete randomized block design. Half of each plot within each replication will have 6-foot fabric squares for weed control. Two replications will be in overflow channels and two replications will be on the higher elevation sand flats between the overflow channels. All plants will be protected from deer with 5-foot tall tree shelters.

Reaching the capillary fringe of the water table is anticipated with the deeper plantings but not the shallower conservation plantings. The assumption that the deeper plantings utilize water beneath the brome grass and therefore the fabric squares may not be needed will be refuted or confirmed by the fabric placement. Two to three years of data collection on the planting method, planting material, and fabric placement will be beneficial in determining ways to restore cottonwood on river zones lacking traditional flooding. Another answer may be to plant different species on these sites. Currently, the areas between the overflow channels exhibit soil characteristics of high dry pine sites and not riparian characteristics. Should drought tolerant conifers be planted on former deciduous riparian sites?

Thanks to the Bridger PMC, Aberdeen PMC, and Los Lunas PMC for consultation and development of the techniques being tested in this study.

Tree/Shrub Seed Harvest

Tree seed production at the Bismarck PMC was reduced due to dry conditions and lack of available irrigation. Seed was collected from 12 different accessions, though in most cases yields were reduced. Ironically, the PMC release most in demand, Prairie Harvest hackberry, did not set a single fruit nor did any hackberry located across the state. The irrigation system has been repaired and tree management has been completed so we anticipate better production next year.

'Centennial' cotoneaster in full fruit is ready to harvest



Cottonwood saplings in 4-inch x 4-inch x 14-inch deep pots



Emerging cottonwood seedlings



Skunkbush Sumac Study

A skunkbush sumac (*Rhus trilobata*) study was planted in 2010 to compare leaf disease resistance between various seed sources. This replicated study contains 280 plants from 24 seed sources. Data has been collected for three seasons. Though the data has not been analyzed, the following have been observed:

- There is a marked difference in growth and form between sources.
- Leaf spot incidence between sources is not readily observable.
- 'Bighorn' sumac, the standard of comparison, exhibits more stem breakage than others.
- 'Konza', a Manhattan PMC (Kansas) release shows good color, form, and growth.

To reduce maintenance, the area between rows was seeded to blue grama in 2011. This short season, short stature grass controls erosion, reduces weed control efforts, and does not require mowing. Casoron was applied each fall in 3-foot diameter circles around each plant. Clopyralid was broadcast to control a Canadian thistle infestation in the summer of 2011. Russian thistle sprouts were cut and the stump was treated in 2012.



Stem breakage on 'Bighorn' sumac

Chokecherry Virus X Disease Study

For nearly 10 years the Bismarck PMC and North Dakota State University have cooperated on a chokecherry/virus X disease study. Virus X is endemic throughout the Great Plains and kills large numbers of chokecherry thickets. If a thicket has bright red leaves in August, it is likely infected with Virus X. Much of the research by NDSU pathologist Jim Walla has been via tissue culture in the lab. In the spring of 2013, there should be promising plant material for field planting and further study.

Growing out and inoculation of clones in the greenhouse continues. For further details, contact: j.walla@ndsu.edu

Of 41 clones (39 from PMC):	Of 14 clones inoculated in greenhouse trials in 2009:
6 severely diseased in field	2 showed severe disease
4 developed severe symptoms, but recovered	1 clone recovered from disease
19 developed light symptoms, but remained vigorous	7 were symptomatic but vigorous
11 never developed symptoms	4 never showed symptoms

Salinity Demonstration

The Carrington Research Extension Center, Bismarck Plant Materials Center, Foster and Stutsman County SCDs, and the North Dakota NRCS are conducting salinity demonstrations near Carrington and Buchanan. Establishment and yield (over time) of selected perennial grass and legume species is being evaluated across a salinity gradient.

Salinity is a soil property referring to the amount of soluble salt in the soil. It is generally a problem of arid and semiarid regions. Electrical conductivity (EC) is the most common measure of soil salinity and is indicative of the ability of an aqueous solution to carry an electric current. By agricultural standards, soils with an EC > 4 dS/m are considered saline. In actuality, salt-sensitive plants may be affected by conductivities < 4 dS/m and salt tolerant species may not be impacted by concentrations of up to twice this maximum agricultural tolerance limit.

Sites were mapped for EC with a Veris machine and ground truthed with laboratory testing to determine the field gradient. This information was used to determine the proper placement and orientation of demonstration across the salinity gradient prior to seeding. Plots (10 feet by 200 feet) were seeded May 22 and June 10, 2010. Salinity, stand, and forage production will be tracked over several seasons to help determine the most appropriate species for various salinity levels and targeted end uses.

Establishment observations to date:

- The larger seeded wheatgrasses were the easiest to seed and establish across the salinity gradient
- The manystem wildrye was more difficult to establish but showed good tolerance
- Switchgrass, creeping foxtail, and meadow brome showed to be the most sensitive species tested
- All alfalfa entries established similarly but are not as saline tolerant as many of the grasses tested

Harvest observations to date:

- Plots with adequate stands were harvested at the approximate stage for hay production for each species
- EC readings were taken in plots the same day they were harvested for yield
- The wheatgrasses and manystem wildrye continue to provide stable yields across the salinity gradient
- The wheatgrasses tested (except tall), the bromegrasses, and the wildryes provided forage with adequate quality to maintain a dry or early gestation beef cow

Want more information? Please contact Ezra Aberle at the Carrington Research Extension Center (701) 652-2951 or the Plant Materials staff.

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.

Helping People Help the Land

List of Entries
Smooth bromegrass - Rebound
Meadow bromegrass - Fleet
Canada wildrye - Mandan
Manystem wildrye - Shoshone
Creeping foxtail - Garrison
Switchgrass - Forestburg
Prairie cordgrass - Red River Germplasm
Prairie cordgrass - CREC Germplasm
Tall wheatgrass - Alkar
Slender wheatgrass - Revenue
Western wheatgrass - Rodan
Hybrid wheatgrass - NewHy
Green wheatgrass - AC Saltlander
Strawberry clover - O'Connors
AC Saltlander Commercial mix (50% AC Saltlander, 20% Revenue slender wheatgrass, 30% Cortney tall fescue)
Alfalfa - 12 varieties/lines

Bismarck PMC Staff

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January 2013