



# 2013

## Progress Report of Activities

### Manhattan, Kansas, Plant Materials Center

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### Cover Crop Study

The Manhattan Plant Materials Center (PMC) has initiated a multi-year cover crop study to document growth characteristics, plant production, and plant carbon/nitrogen levels. The study is evaluating 25 cover crop species as monoculture plantings. Two additional plantings consist of mixtures of these 25 species. The study was planted in two parts; spring, April 1, 2013; and summer, June 25, 2013. The plan is to complete cover crop evaluations every 30 days. Evaluations included taking samples for yield and carbon—nitrogen testing. Photos were taken at least every 30 days to document plant growth.

Cover crop species planted in spring plots:

- |                     |                    |
|---------------------|--------------------|
| -Forage oats        | -Nitro radish      |
| -Yellow sweetclover | -Spring barley     |
| -Lentils            | -Triticale         |
| -Yellow mustard     | -Spring forage pea |
| -Crimson clover     | -Ethiopian cabbage |
| -Cover crop mix     |                    |

Cover crop species planted in summer plots:

- |                         |                  |
|-------------------------|------------------|
| -Sudangrass             | -German millet   |
| -Pearl millet           | -Sunn hemp       |
| -Flax                   | -Rapeseed        |
| -Turnip, Winfred hybrid | -Mung beans      |
| -Turnip, purple top     | -Buckwheat       |
| -BMR sorghum sudan      | -Non-GMO soybean |
| -Safflower              | -Nitro radish    |
| -Sorghum sudan          | -Cowpeas         |
| -Cover crop mix         |                  |



Crimson clover in study plot



Cowpeas in study plot

The first evaluations and clippings for the cover crop planted April 1 were completed 60 days following planting due to insufficient growth that is attributed to cool temperatures. Slow germination and emergence need to be a consideration with planting spring cover crops.

Forage yield and carbon/nitrogen (C/N) ratios for 11 cool- and 17 warm-season cover crop entries for 2013 at the PMC

Entry	Planting Date	Forage Yield (lbs/acre)			C/N Ratio		
		Days After Planting					
		30	60	90	30	60	90
Barley	4/01/13		1,078	2,121		20.9	38.5
Cover mix (spring)			1,040	2,665		15.9	34.1
Crimson clover			944	1,686		15.9	24.6
Ethiopian cabbage			908	3,196		12.9	40.7
Lentils			717	3,975		11.6	19.6
Oats			582	2,822		22.3	42.2
Pea, spring forage			1,150	4,382		14.0	30.0
Radish, nitro (spring)			1,460	2,079		18.8	35.6
Triticale			635	993		17.3	21.0
Yellow mustard			935	1,341		17.0	26.9
Yellow sweetclover			818	1,570		14.3	15.4
Buckwheat		6/25/13	1,523	5,115		19.5	34.4
Cover mix (summer)	1,953		10,553		14.6	28.1	
Cowpeas	1,449		5,207		14.9	16.2	
Flax	238		1,700		8.7	37.0	
Millet, German	1,974		9,882		14.0	43.8	
Millet, pearl	2,197		11,889		21.7	53.9	
Mung bean	1,414		5,911		14.7	31.3	
Radish, nitro (summer)	1,983		2,725		11.8	14.6	
Rapeseed	1,223		4,091		12.3	27.7	
Safflower	1,697		4,113		9.7	23.7	
Sorghum-sudangrass	1,256		13,516		29.0	74.6	
Sorghum-sudangrass, BMR	2,212		15,692		32.0	70.4	
Soybean, non GMO	678		6,597		10.8	31.0	
Sudangrass	2,623		22,993		34.2	56.2	
Sunn hemp	1,474		9,819		10.6	20.7	
Turnip, purple top	1,341	4,344		10.5	30.9		
Turnip, Winfred hybrid	927	4,458		8.0	25.5		

### Cover Crop Termination

Because the PMC cover crop study is also evaluating soil health, all tillage from site preparation to cover crop termination, has been eliminated. The use of chemicals can be used to control weeds within the study. As much as possible, a crimper roller is used to terminate cover crops. It has proven to be very effective in terminating covers once plants begin to develop seed. Young plants are difficult to control with the crimper roller as plants tend to sprout or continue to grow. The roller crimper must break the flow of nutrients through the plant.



Oat cover crop being terminated with a crimper roller

## PMC Soil Health

So, how long does it take to see an improvement in soil health? Based on the slake test to evaluate soil aggregate stability, the PMC is beginning to see slight improvement in aggregate stability after just one growing season. Soils planted to legumes are showing the biggest improvement.



Soil sample showing tillage layers from years of tillage



Slake test L to R: cowpeas, sunn hemp, pea/barley, yellow sweetclover, tilled soil, undisturbed soil

## Photo Documentation of Cover Crops

A photo history of the PMC cover crop species was completed for each species in the study. Photos start at emergence and end with seed development and root development. Photo documentation of the PMC cover crop study can be found at:

[www.nrcs.usda.gov/wps/portal/nrcs/detail/ks/technical/ecoscience/agronomy/](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/ks/technical/ecoscience/agronomy/).

Crimson clover (days following planting 4/1/2013)



30 days



63 days



109 days



121 days, root nodules

## No-Till Drill

The PMC purchased a new no-till drill for use in cover crop and native grass/forb studies. The drill has multi-boxes for use with small seeds, fluffy seeds, and cereal grains. It is capable of drilling through high-residue covers. This drill will be used for studies at the PMC and will be available for NRCS field offices to use for cover crop studies. Contact the PMC for additional details on the drill.



No-till drill

## Sandy Study

Evaluation continues in the Kearney County, Kansas, sandy-site study planting. The study has expanded from the evaluation of native species to include planting methods, irrigation scheduling, and cover crops. Due to the continued drought and sandy soils of these sites in southwest Kansas, a stand of native grass that stabilizes these soils remains difficult to establish and maintain. This study was initiated after seeding failures under the Conservation Reserve Enhancement Program (CREP) in Kansas.



Formerly irrigated cropland planted to native grass

## Blue Grama/Forb Study

In 2008, a blue grama/forb study was planted in several locations in Nebraska, Kansas, and Oklahoma. The study included two potential releases of blue grama from the PMC, one potential release from the Agriculture Research Service and two known varieties, Bad River Ecotype and 'Hachita'. Initial results indicate that Bad River and Hachita are doing as well or better than the potential new releases.

In the study are collections of New Jersey tea, dotted gayfeather, leadplant, and compass plant. In the North Platte study, compass plant was the only forb to survive.



Jeff Nichols, Resource Conservationist, North Platte, Nebraska, evaluating compass plant

## Shale Site Study

Monitoring of the blue shale site study continues in Jewel County, Kansas. With soil pH averaging between 2.8 and 3.9 on this heavily eroded site, establishing vegetation on these soils has been a challenge. Starting in 2000, a planting of common reed, *Phragmites australis*, was established with rhizomes. These rhizomes, along with a livestock exclusion fence, have stabilized the site. With reduced erosion and grazing exclusion, native species such as little bluestem, big bluestem, and switchgrass are beginning to establish on the site. As this is happening, there is a reduction in the density of the common reed. With proper management, including prescribed burning and grazing, the site should continue to stabilize and improve with native grasses.



Little bluestem begins to establish on blue shale soils

## Woody Adaptation Study

A study to evaluate the adaptation of trees and shrubs continues near Chadron, Nebraska. The first planting took place in 2011 with an additional planting of shrubs, trees, and conifers in 2013. The PMC and U.S. Forest Service's Bessey Nursery in Halsey, Nebraska, provided materials for the planting. The purpose of the study is to evaluate the adaptability of woody species to the northwestern part of the PMC service area.

Species in the study included: pecan, hawthorn, dwarf Russian almond, river birch, New Jersey tea, black current, wax current, 'McKenzie' black chokeberry, white poplar, ninebark, black cherry, hazelnut, sea buckthorn, silky dogwood, gray dogwood, buttonbush, chokeberry, Kentucky coffeetree, 'Lippert' bur oak, Shungtang maple, gamble oak, red oak, swamp white oak, wafer ash, Chickasaw plum, southwest white pine, red pine, Balkan pine, limber pine, and bristlecone pine.



Trees and shrubs being planted

## Milkweed Study

Due to the decline of milkweeds and nectar sources for pollinators, the PMC has established a study of swamp milkweed, *Asclepias incarnata* L. and green antelopehorn *Asclepias viridis*, with materials supplied by Monarch Watch. Little is known about the biology of these milkweed species in contrast to growing them in cultivated situations. The study will determine best propagation methods and techniques needed to plant, manage, harvest, and process seed produced by these plants.



Pollinator on a milkweed bloom

## Who We Are

The PMC is one of 27 centers nationwide that uses plants to solve natural resource problems. It is owned and operated by the NRCS. The PMC offers services to a diverse region of the Heartland including Kansas, Nebraska, northern Oklahoma, and northeastern Colorado (see map at right). It is located on 169 acres of sandy loam soil in the Kansas River Valley, south of Manhattan, Kansas.



## What We Do

The mission of the Plant Materials Program (PMP) is to develop and deliver plant science technology to meet the nation's natural resource conservation needs. The PMP vision is "Productive Lands—Healthy Environment." The PMP is recognized as the nation's leading technical source of plant solutions and plant technology. This includes the production of improved

varieties of plants for commercial use and the development of plant science technology for incorporation into the Field Office Technical Guide (FOTG). Plant and technology development objectives of the PMC include:

- Water quality improvement
- Erosion control
- Range and pasture improvement
- Native American outreach
- Plant variety selection and production
- Soil health

## Seeking Vegetative Solutions to Conservation Problems

### Contact Information

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### Plant Materials Program Web site:

<http://www.plant-materials.nrcs.usda.gov>

### PMC Tours

Tours of the PMC are available Monday through Friday during regular business hours. Advance reservations are recommended for individual or group tours.



NRCS Resource Conservation Area Specialist meeting and tour at the PMC



Nitro radish in PMC cover crop study