

# 2010 Progress Report of Activities Great Basin Plant Materials Center

---

2055 Schurz Highway, Fallon, NV 89406, Tel. 775-423-7957, Fax 775-423-3430

---

## Mission and Objectives

The Great Basin Plant Materials Center is operated by the United States Department of Agriculture Natural Resources Conservation Service. It is NRCS policy to assemble, comparatively evaluate, release, and distribute for commercial increase new or improved plant materials for broad programs of resource conservation and development for agriculture, wildlife, urban, recreation, and other land uses and environmental needs. It is NRCS policy to conduct plant materials work in cooperation with other agencies of USDA, such as the Agricultural Research Service, and with other federal and state research agencies including state agricultural experiment stations.

To accomplish this mission, we identify superior accessions (collections) of adapted plants which are then tested both on the PMC and in a variety of habitats at off-PMC sites. Superior accessions identified through the testing program will then be produced as seed, cuttings, or transplants, depending upon the type of plant and its intended use. Plant materials are then released for commercial production by local growers to be made available for conservation plantings. We also provide technical guidance in plant production and management techniques.

Important conservation objectives addressed at the Great Basin PMC are to:

- Investigate native plant species for use in conservation practices
- Control erosion on range and crop land and stabilize critical areas
- Improve forage production on pasture and rangeland
- Improve habitat for fish, birds, insects, and other wildlife.

There are also PMC national initiative priority mission objectives:

Pollinator habitat conservation and improvement

Plant growth data for conservation planning tools and practice standards

- Transition to organic from conventional farming and ranching systems
- Energy plants for cellulosic biomass, carbon sequestration, and biofuels
- Air quality-plants to sequester carbon, reduce PM 10 and VOC emissions.

## About the Great Basin Plant Materials Center

GBPMC is on land that is leased from the University of Nevada, Reno. GBPMC has a land area of 95 acres with 80 acres irrigated.

Buildings completed for the GBPMC include a shop/warehouse building, a greenhouse with headhouse, and an equipment cover. Smaller structures include a pesticide storage module, a fueling station, and a flammable storage. A temporary 14 by 19 ft. office space is inside the shop warehouse building.



A 20 by 40 ft. greenhouse, with a headhouse nearby, completed in 2010.

Planned future construction includes an office building with a conference room for holding meetings and training sessions, with laboratory space for plant research.

Additional buildings that will be required include a building for seed cleaning, and a seed storage building.

### **New Farm Equipment at GBPMC**

At the end of the 2010 fiscal year we were very fortunate to be able to purchase some key pieces of larger farm equipment to improve our ability to conduct GBPMC field operations. Thanks to Bruce Petersen, the State Conservationist for Nevada, and all of the dedicated staff people of the Nevada State Office who helped to make these purchases possible.



110 HP diesel tractor with subsoil ripper.



Conventional grain drill.



One-pass seedbed preparation machine.



Laser scraper to improve irrigation.



Tandem disk for incorporating biomass.

## Demonstration of a Forage Soybean Green Manure Crop

In April, 2010, twenty acres in three fields on the PMC were plowed, disked, and laser leveled. Those field areas had particularly severe weed infestations and were also difficult to irrigate uniformly with the border-dike system of irrigation currently in use at the PMC. In order to continue to reduce the weed population and soil seedbank, 60 acres of forage soybean were planted at the PMC in 2010 and treated repeatedly with glyphosate. The soybeans flowered and some small pods formed before the plants were mowed and disked into the soil in September as a green manure crop.



The soybean plants grew over 4 ft. tall in some fields, but no viable seed was produced.

The maturity group 7 cultivars selected for use as a green manure crop do not produce seed at this latitude, 39° 27' N, because early

in the season the days are too long (nights too short) to induce flowering, and at the altitude of Fallon, 3960 ft. above sea level, the growing season is too short for soybean cultivars in this maturity group to mature. If a grower wanted to produce soybean for grain (seeds) in Fallon, a maturity group 2 or 3 would be more likely to flower and produce seed before a killing frost.

## Abandoned Cropland Restoration

At the Rosaschi Ranch restoration project, 2009, was our second year of planting plots in cooperation with USDA ARS. The study was planted in October in a factorial design that compares seed mixes of grass alone to grass plus forbs and shrubs, irrigated compared to non-irrigated, and crimped straw mulch compared to no mulch. Main plots are each 1.5 acre and are divided into sub-plots to compare direct seeding with seeding followed by straw mulch crimped into the soil using a rolling implement with scalloped coulters. Ten of the main plots receive sprinkler irrigation and the other ten are non-irrigated. Sub plots are divided and each half seeded with either grasses only (low functional diversity; with equal seeding rates of bottlebrush squirreltail, Indian ricegrass, basin wildrye, thickspike wheatgrass, and needle grass) or five grasses plus two forbs and two shrubs (high functional diversity; the same five grasses plus penstemon, globemallow, sagebrush, and fourwing saltbush). Ten plots were seeded in 2008 and an additional ten plots were seeded in 2009.

GBPMC assisted with weed control, spot spraying around the border areas outside the plots and using a wiper applicator to control weeds, mostly annual mustards, inside the plots. GBPMC also provided assistance in setting up the sprinkler irrigation system in the spring and dismantling the irrigation system in fall.

## **Aiding the Transition to Organic with Winter Cover Crop Demonstrations**

A major constraint on transitioning from conventional agronomic systems to organic production is the necessity of controlling weeds without using herbicides. A basic principle of weed control is that the least expensive weed control is a competitive crop. In the irrigated agricultural production around Fallon, sandy soils are vulnerable to wind erosion if they are left bare during winter. Winter cover crops provide dual benefits of crop competition with winter annual weeds and soil stabilization to prevent wind erosion during spring wind storms. The fibrous root system of winter grain crops helps to conserve nutrients that might otherwise leach to the groundwater during winter months. This work examines winter cover crops that could have application in helping Fallon area growers find profitable ways to make the transition to organic production. GBPMC can demonstrate the potential adaptation of crop plants to the cropping systems and economic opportunities that exist in the area.

### **Hard White Winter Wheat**

Cereal grains are rarely grown in the Fallon area because there is no grain elevator nearby to receive the crop. An economic opportunity exists for organic grain production to serve smaller markets such as regional organic bakeries. Hard white winter wheat cultivars are relatively new in the U.S. although they have been produced in other countries for several years. The white kernels allow millers to produce whole wheat flour that is whiter, while retaining more of the nutritious bran, resulting in better milling yield and better culinary quality in baked goods.

The major objection to hard white winter wheat in the established soft white winter

wheat production areas is the risk of contaminating the different classes of wheat, because they cannot be distinguished visually. If hard and soft wheat are accidentally mixed in the field, during transport, or at the elevator, the resulting blend will not meet the requirements for the desired end products; for example, noodles for soft wheat and bread for hard wheat. The only market for mixed grain is as feed for livestock. The risk of mixing market classes is low in the Fallon area because it is not currently a wheat production area.

In September, a forage soybean green manure crop was mowed and disked into the soil. Twenty acres of Field 6 was planted to 'Palomino' variety of hard white winter wheat on September 29 and 30. The seeding rate was 83 lb/acre, planted with a no-till drill with row spacing of 7.5 inches. The field was irrigated on October 1, and 2.32 inches of rain fell over the next two weeks. Uniform emergence of the wheat seedlings was observed on October 7. The field was irrigated again on October 22 when the crop was in the 3 to 4 leaf stage.

### **Winter Triticale**

Triticale is a hybrid of wheat and rye and exhibits hybrid vigor. Triticale was selected for Field 9 because it has saline soil in about 3 acres at the east end. It was thought that the rye genetics of the triticale hybrid might confer more salt tolerance than possessed by wheat.

Winter triticale can be a very versatile crop for a livestock operation, allowing the grower the option of winter or spring grazing, cutting in the boot stage for hay, or in later development for silage, or harvesting the grain for a high protein animal feed or human food grain. The "BB" designation means it is a beardless variety with very small awns that are less injurious to livestock.

Triticale variety 'TriCal 103 BB' was planted in 10 acres of Field 7 on October 12, and 11.5 acres of Field 9 on October 13. The previous crop was forage soybean that had been mowed and disked into the soil as a green manure crop. The seeding rate was 75 lb/acre, planted with a no-till drill with 7.5 inch row spacing. The soil had good moisture at planting from recent rains, and the fields were irrigated on October 22. Uniform emergence was observed on October 27. Triticale seedlings had produced numerous tillers by early December.

### **White Flowered Winter Pea**

The traditional winter pea has been the Austrian winter pea. That plant has purple flowers, purple pigment in the stem, and dark mottled seeds, which indicate the presence of bitter tannins. The Austrian winter pea is suitable for a green manure crop but the tannins make it undesirable as forage for animals and preclude its use for human food. Newer cultivars of winter pea have been developed that have white flowers. The white-flowered cultivars lack the bitter tannins and are a more desirable food for livestock and people.

A blend of 35% 'Whistler', 35% 'Nutrigrain', varieties of winter pea and 30% 'Journey' spring pea was planted in 18 acres of Field 7 in mid-October. The previous crop was forage soybean that had been mowed and disked into the soil as a green manure. The pea seed was inoculated with rhizobium supplied by the seed vendor. The seed was planted at 100 lb/acre using a no-till drill with rows spaced 7.5 inches.

The spring pea was included in the blend to provide rapid row closure after planting. The spring pea will be killed by freezing in winter. The winter pea cultivars are two new varieties with white flowers, lacking the bitter tannins of traditional Austrian winter

pea, so they are suitable for livestock or human food.

### **Weed Control in Native Grasses Grown for Seed Production**

The 0.5 acre Native Grass Herbicide trial was planted on 9 October 2009 in cooperation with the University of Nevada, Reno. Five species of native grasses were planted: *Poa secunda*, *Elymus elymoides*, *Achnatherum hymenoides*, *Pseudoroegneria spicata*, and *Lymus cinereus*.

The objective of the trial is to test different rates and dates of application of herbicides registered for use in rangeland to find effective treatments to control weeds, particularly annual grasses, especially downy brome *Bromus tectorum* (or "cheatgrass"), in native grass grown for seed production. Herbicide treatments are to be applied across the grass strips.

First year growth was good with some weed pressure developing. The trial was sprayed to control broadleaf weeds. The entire trial was mowed on July 16, and the mowed weed and grass residue was raked and baled and the bales were removed.



The native grass herbicide trial in early December.

In spring of 2011, when daytime highs are consistently above freezing, glyphosate treatments will be applied to investigate the

possibility of identifying a rate of glyphosate that will control the downy brome seedlings without injuring the established perennial native grass species.

### **Great Basin Accession Sandberg Bluegrass Study**

The PMC greenhouse and headhouse were completed in April, 2010. Our first project was to produce Sandberg bluegrass, *Poa secunda* plugs for planting into a common garden. The work is being conducted under an interagency agreement with the U.S. Forest Service Humboldt-Toiyabe National Forest. The seed was collected in the Great Basin by the U.S. Forest Service personnel.

Currently available accessions of *Poa secunda* are from north of the Great Basin, and the previous selection work was done in more northern locations. With regard to climate change, conservation efforts are more likely to have long-term success if plant materials are selected and moved from south to north, rather than from north to south. Our objective is to develop selections that represent local genetics and local adaptation for Great Basin restoration projects.

### **Sunn Hemp Seeding Rate Trial**

GBPMC participated in a nationwide PMC Intercenter study of a tropical legume called sunn hemp (*Crotalaria juncea* cv. Tropic Sun) developed by the Hawaii PMC. A seeding rate trial was conducted at GBPMC in 2010 to provide additional information about the adaptation and use of sunn hemp as a green manure crop. Data from Nevada GBPMC will be combined with results from other PMCs.

On July 7, 2010, inoculated seed of Sunn Hemp was planted in Field 5. The previous crop was forage soybean, which had been rototilled to prepare the seedbed. Nodulation

was observed on roots in mid-July. The study was flood irrigated July 7 immediately after planting, and again on July 14, July 27, August 17, and August 31.

Biomass was sampled at 45 and 63 days after planting (DAP) because there is interest in growing sunn hemp for a short duration to provide nitrogen for a crop planted after the sunn hemp. The first, 45 DAP, biomass sample was cut on August 20, from 1 M<sup>2</sup> with four replicates of two subsamples per subplot, when the average height of plants was 19.5 inches. Samples were air dried in a barn for 7 days, until weight loss stopped, and air dry weights were recorded.

The second, 63 DAP, biomass sample was cut on September 8, when the average plant height was 33.8 inches. Samples were air dried in a barn for two weeks until no further weight loss was observed.

Based on the results at this location, the highest seeding rate tested, 60 lb/acre, had the highest air dry biomass production, averaging 1500 lb/acre at 45 DAP and 2500 lb/acre at 63 DAP.

## Revegetation to Control Soil Erosion

GBPMC cooperated with the USFWS Stillwater National Wildlife Refuge to plant native grass mix on 113 acres this spring. The purpose of the study was to reduce wind erosion on land that had been taken out of agricultural production. The grass mix will provide soil stabilization and wildlife habitat. Stillwater NWR had the opportunity to apply irrigation water to the fields this year, in order to establish the planting.



A view of a non-cropped field in spring before reseeding with native grasses.



The same field in fall after reseeding with native grasses and one season of irrigation.

## Poplar Production for Biofuels

A poplar biomass trial continued this year, with some of the trees from the initial planting now completing their fourth year of growth. The purpose of the study is to evaluate the clones for their suitability to produce cellulosic feedstock for biofuel production. There is also interest in hybrid poplar clones for use as windbreak trees, for lumber products, for streambank stabilization, and for riparian habitat restoration.

Many poplar clones may not be suitable for growing in the saline soil, arid climate and short growing season of the Great Basin. The clones surviving in this trial will be evaluated for growth rate and resistance to pests and diseases to determine their adaptation and suitability for the area.

The poplar field was irrigated approximately every two weeks, and the trial area was mowed in both directions between the trees. The height to the nearest foot of the surviving poplars was measured in December. Average height of the 63 clones was 12.7 ft. and ranged from 5.6 to 18.5 ft (average of 4 trees/plot, replicated 4 times).

## Pollinator Conservation

Great Basin PMC established Nevada's first Monarch Waystation in 2009. The waystation is one of an international network of sites managed to provide a resting site and source of nectar to help monarch butterflies *Danaus plexippus* migrating north in the spring and back south in fall. The conservation organization Monarch Watch maintains an international registry of over 3,300 waystations for the monarch butterfly.



Showy milkweed in bloom at the first Monarch Waystation in Nevada.

### **Peoples' Garden National Initiative**

GBPMC planted a Peoples' Garden as part of a national USDA program. this year the People's Garden featured a "Three Sisters" planting of corn, beans, and squash planted together in the way of the Native Americans in the Southwest. There were also demonstrations of furrow and drip microirrigation systems.

The Peoples' Garden will become part of the PMC demonstration garden. The Peoples' Garden provides a way to teach vegetable production and offers a place for members of the community to gain hands-on experience in gardening. All vegetables produced in the Peoples' Garden are donated to charitable organizations.



Gary Pope-Sears, the Pastor of Epworth United Methodist Church in Fallon, accepts a donation of produce from the Peoples' Garden at GBPMC for the Daily Bread kitchen from Jennifer Hesselgesser, NRCS; Jessie Eckert, Lahontan/Stillwater SWCD; and Mat Humphrey, GBPMC.



Compost pile to provide mulch and organic material for next year's Peoples' Garden.

---

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 202509410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer. USDA is committed to making its information materials accessible to all USDA customers and employees.