



United States Department of Agriculture

Great Basin
Plant Materials Center
2055 Schurz Highway, Fallon, NV 89406
Phone 775-423-7957

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/plantmaterials/pmc/west/>

2017 Annual Progress Report of Activities

January 2018

Who We Are

The Great Basin Plant Materials Center (GBPMC) is one of 25 Plant Materials Centers (PMC) operated by the USDA-Natural Resources Conservation Service (NRCS). Each PMC is strategically located in an ecologically distinct area, creating a network of PMCs uniquely positioned to address local, regional, and national natural resource concerns. Our objective is to evaluate plants and vegetative technologies to support NRCS conservation programs and practices. The GBPMC is specifically tasked with resource concerns in the Great Basin, with a focus on rangeland restoration, soil health, and water conservation.



Figure 1: Snow covering tractors and greenhouse at the GBPMC

The GBPMC opened in 2006 and is the newest PMC in the nation. We are located in a cold desert in the rain shadow of the Sierra Nevada Mountains where we receive about five inches of annual precipitation, mostly in the winter. We manage 79 flood irrigated acres, 3 non-irrigated acres, and we conduct off-center field trials as needed.

Lease Change

The GBPMC is located on land leased from the University of Nevada Reno (UNR). The lease was established in 2006 for the duration of fifty years, and has an associated Memorandum Of Understanding (MOU) that is renewed every five years. The original lease included all fields inside the purple and red outline of figure 2. The MOU was renewed at the beginning of 2017 with a slight reduction in GBPMC management area. Field 1, 4, E, and B, outlined in purple, were returned to UNR for a total reduction of 7.8 acres. The adjustment was made to mitigate issues associated with historic structures as well as to provide the UNR experiment station more land for their studies. The GBPMC retains management over 82.2 acres, outlined in red.



Figure 2: Map of the GBPMC. Purple: area returned to UNR in 2017. Red: Area currently managed by the

GBPMC Studies

Cover Crop Studies

Cover crops are a key component of Soil Health. The benefits of cover crops include reduced erosion, increased organic matter, increased biological activity, increased water holding capacity, improved soil structure, organic tilling such as with radishes, nitrogen fixing with legumes, and carbon sequestration. The National Plant Materials program has recognized soil health and the use of cover crops as a national resource concern. To meet the needs of this resource concern, PMCs nationwide have been conducting extensive cover crop adaptation trials.

The GBPMC conducted four related cover crop trials in 2017. We participated in the National Cover Crop trial that included 60 varieties of 9 species; we conducted a summer cover crop trial with 90 varieties and 8 mixes; we conducted a summer off-site trial in Smith Valley, just south of Yerington, NV, that included 34 varieties of 12 species and 5 mixes; and we coordinated with the Southwest PMCs to evaluate the Tepary Bean, a traditional Tohono O’odham crop. Below are the highlights of those studies. Full reports are pending.

Cover Crop data collected included germination at 28 Days After Planting (DAP), frost survival, cover, pest resistance, weed resistance, height at 50% bloom, date at 50% bloom, and biomass. Germination and Cover data was ranked by percentage of plot with 0-25% = 0 (Poor), 30-60% = 1 (Moderate), 65-85% = 2 (Good), and >90% = 3(Excellent).

National Cover Crop Study

The GBPMC has been participating in the national cover crop study for the past three years. First as an initial evaluation of 34 varieties in 2016, and later expanding to 60 varieties for 2017 and 2018. 2017 was not irrigated and planted just after the first winter rains near the end of October (2016). In general, clovers, daikon radishes, and oats performed the worst. While they ranged from poor to excellent for germination, they had very low frost survival and poor cover by May. Cereal rye did the best, with excellent germination, 100% frost survival, and Excellent cover for all varieties (except ‘Guardian’). The other cover crop performance depended on variety. Austrian winter pea cultivars was the most variable, ranging from poor to excellent in cover (Fig 3). Table 1 has the top 3 performers for the cover crops species tested. Balansa clover and red clover were not listed due complete stand failures for all varieties.

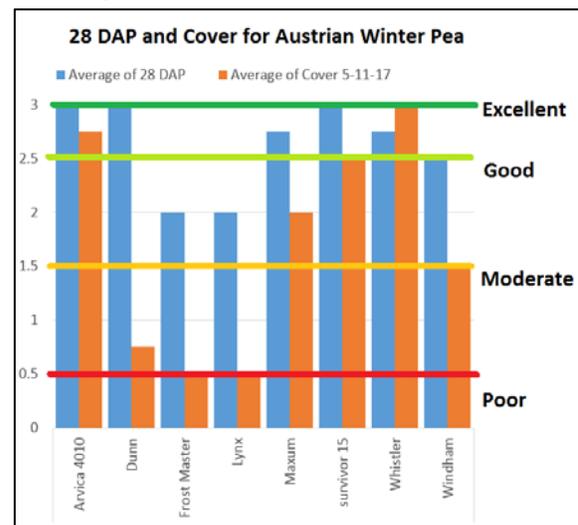


Figure 3: 28 Days after planting and Cover results for Austrian winter pea

This study was not irrigated, but it should be noted that our 2017 winter was wet, with 5.15 in for the water year by the end of May. The 2018 winter cover crop study, planted in September 2017, will be different in that it was planted a month earlier and irrigated. The difference is due to the regional availability of water. 2017’s wet winter allowed for 100% irrigation water to be available throughout the year.

Table 1: Top three performing cover crop varieties per species

Common Name	Cultivar	Germination at 28 DAP	Cover 5-11-17	50% Flowering DAP	Height (in)	% plot survival to flowering	Dry Weight Lb/A
Austrian winter pea	Arvica 4010	Excellent	Excellent	219	24	75%	
	Maxum	Excellent	Good	219	13	50%	
	Whistler	Excellent	Excellent	219	11	50%	
Crimson Clover	AU Robin	Good	Poor	196	4	100%	
	AU Sunrise	Good	Moderate	194	4	100%	
	Kentucky Pride	Excellent	Moderate	204	5	75%	
Hairy Vetch	Lana	Excellent	Excellent	191	9	100%	
	Purple Bounty	Good	Excellent	206	14	75%	
	Purple Prosperity	Excellent	Excellent	204	13	100%	
Daikon Radish	Concorde	Excellent	Poor	206	10	75%	
	Control	Excellent	Moderate	200	10	100%	
	Defender	Excellent	Moderate	200	10	100%	
Cereal Rye	Maton	Excellent	Excellent	191	41	100%	9,389
	Rymin	Excellent	Excellent	204	36	100%	9,572
	Wheeler	Excellent	Excellent	211	46	100%	9,184

GBPMC Summer Cover Crops

The summer cover crop trial was planted on June 14th, 2017 and included 90 varieties of 21 species. Species tested included the 9 used in the winter trial as well as sunn hemp, cowpea, sunflower, gar, buckwheat, kale, rapeseed, berseem clover, subterranean clover, sorghum, and Sudangrass.

Weed pressure was extreme and contributed to poor performance in many of the species. Five species of clover, nineteen varieties, were tested and all had poor germination and failed to survive to flowering. Cereal rye, oats, and black oats had excellent germination, but failed to provide much cover. This may have more to do with the late planting date than weed pressure.

Table 2 includes the top performing varieties. ‘Concorde’ and ‘Control’ daikon radishes had 100% cover by the end of the summer, but they produced relatively small tubers of about 4 in. Daikon radishes with poor to moderate cover seemed to have much bigger tubers (8-12 in) regardless of weed pressure. There may be a more optimal seeding rate than 9 lb./a to provide cover, weed resistance, and root production for organic tilling. Kale and rapeseed had excellent cover but never flowered, and thus flowering time and height at flower was not recorded.

Hairy vetch had poor to moderate cover at 79 DAP and showed no sign of suppressing weeds. However, hairy vetch still has potential as a cover crop in Nevada if it is given enough time to grow. It has been observed at the GBPMC that if given over 100 days to grow, the hairy vetch will outgrow the surrounding weeds and cover them completely. It may be possible to achieve this result in a mix of cover crops as opposed to growing on weeds.

Table 2: Top performing cover crops for summer 2017

Common Name	Cultivar	7-17-17 33 DAP	50% Flowering DAP	Height at 50% Flower (in)	9-1-17 79 DAP crop cover
Sunn hemp	AU Golden Sunn Hemp	Good	54	47	Good
Sunflower	Mammoth Grey Stripe	Good	79	114	Excellent
	Peredovik	Good	64	52	Good
Daikon radish	Concorde	Excellent	51	29	Excellent
	Control	Excellent	90	41	Excellent
	Defender	Excellent	73	38	Good
	Groundhog	Excellent	113	26	Good
Kale	Bayou Hybrid	Excellent	x	x	Excellent
Rapeseed	Trophy	Excellent	x	x	Excellent
Sudangrass	Piper	Excellent	71	105	Excellent
	AS 9301	Excellent	73	88	Excellent
	Sorgrow C4	Excellent	76	97	Excellent
Sorghum	Silo Pro'	Excellent	85	75	Excellent
Sorghum-sudangrass	Latte BMR	Excellent	86	110	Excellent

Smith Valley Cover Crops

In February 2017 we gave a presentation at a small agriculture conference in Reno, NV. After the presentation, we were approached by Gunnar Garms who was interested planting cover crops between spring wheat and winter wheat. This gave a very narrow growing season of sixty days, starting in June. We put together a list of fast growing varieties that we thought may work. Gunnar was also interested in organic tilling options, so we included 12 daikon radish varieties into the study. Clovers were not included as Gunnar worried that clovers could escape and become a problematic weed.

The study was planted on June 20th and included 35 varieties of 13 species and five mixes. The study was flood irrigated four times in the first 30 days, then non-irrigated for the final 30 days. The study was terminated on Day 60. Weed pressure was low, but predation from rabbits was high. Table 3 has the top performers for this study. Special shout out to the California PMC. They sent Dennis Frommelt to assist with the planting. We would not have been able to get this study off the ground without that assistance.

Sunn hemp, guar, and sunflower all failed. Sunflower had clear signs of heavy herbivory, but the others only had evidence that hinted at possible herbivory (rabbit fecal matter in the plots). Hairy vetch failed as well, but this was likely due to not having enough time to grow. It is a slower growing cover crop and was only included because of a possibility of extending the study to 120 days.

All the grasses had excellent cover, but heights were stunted for cereal rye and oats. This may be due to the later planting date. Sudangrass and Sorghum-Sudan hybrid did better and produced over 6000 lb./a of dry matter in 60 days. The two legumes tested, 'Black' and 'Iron clay', had Excellent and Good cover and produced 1489 and 1765 lb./a respectively.

Daikon radish varied from poor to excellent cover, with the best ('Concorde') producing 1969 lb./a dry matter. Most radishes showed signs of water stress, indicating that the lack of irrigation for the final 30 days was problematic.

Table 3: Top performing Cover Crops for Smith Valley Summer 2017 study

Common Name	Variety	7/19/17 30 DAP Emergence	8/17/17 58 DAP Cover	8/17/17 58 DAP Height	lb/a	Rule of thumb nitrogen (clark, 2007) 4%
Cereal rye	Wheeler	Excellent	Excellent	5.67	1008	
	Wintergrazer 70	Excellent	Good	6.00	864	
Sudangrass	Piper	Excellent	Excellent	54.08	6113	
Sorghum-sudangrass	Latte BMR	Excellent	Excellent	34.67	6509	
Cowpeas	Black	Excellent	good	11.42	1489	59.54
	Iron clay	Excellent	good	13.42	1765	70.58
Buckwheat	Lifago	Good	Moderate	10.25	1113	
	Mancan	Good	Good	14.58	1233	
Daikon radish	Concorde	Good	Good	7.92	1969	
	Control	Good	Good	8.42	1534	
	Defender	Good	Good	9.33	1705	
	Eco-till	Good	Moderate	5.67	1462	

Tepary Bean Adaptation Trial

The Tepary Bean is a native legume with a long history of cultivation. The range of the wild plant was the American southwest and northern Mexico, and it has been in cultivation for over 8,000 years. It has traditional and cultural significance for many native tribes in the southwest. These beans are very fast growing, with pods ready for harvest between 60-80 days. Tepary beans are renowned for being amongst the most drought and heat tolerant crops available, and is also known for being disease resistant and for having decent tolerance to cold, salinity, and alkaline conditions.

The Tepary bean study was a joint collaborative project with all southwestern PMCs. We planted two trials, one at the GBPMC and one off-site in Smith Valley. Our results were not very encouraging. We had complete stand failures in Smith Valley, possibly due to rabbit herbivory, and weeds completely covered the study by 60 DAP at the GBPMC.



Figure 4: Tepary Bean pulled out from under weeds

Tepary bean might still have some potential in Nevada. We dug out one of the plots (Fig 4) and made a "very" coarse estimate of bean production. Despite being completely covered by weeds, we had about 500 lb./a bean production. That is about half of the expected production out of some farms in Arizona. Evaluating the Tepary bean in a more proactively managed study could be interesting.

GBPMC Activities

Training

The GBPMC was co-host to two NEDC trainings in 2017. These included a four day “Nutrient and Pest Management” training (Module 7), and a three day “Soil Health and Sustainability for Field Employees” training (Fig 5). Both trainings required field visits to demonstrate details of management and soil health. The training was attended by NRCS field staff in and around Nevada, and even included someone from as far away as Michigan. Both events were successful. We were happy to play host and look forward to future training opportunities.



Figure 5: Soil health training. Erosion demonstration at the GBPMC

Events

The GBPMC assisted and spoke at a wide variety of events in 2017. The largest event was the 2017 Small Agriculture Conference where the NRCS had a booth. The GBPMC presented results from an earlier green manure trial and fielded questions on the importance of cover crops.

The GBPMC manned a booth at the UNR pollinator day and at a UNR Agriculture Day. Both events focused on education and outreach and the importance of Agriculture.

Finally, the GBPMC was on the expert panel at a Nevada Native Seed Forum meeting. This meeting discussed the importance of native seeds and introduced prospective seed producers to seed zones and how to obtain source verified native seeds.

Publications

In 2017 the GBPMC authored 22 articles for the bi-monthly Nevada NRCS newsletter; The Nevada Pipeline. Articles covered various topics from cover crops to fire ecology to insect plant pests. Some of these articles were turned into one to two page leaflets and placed in Nevada field offices. We also contributed an article to the Southwest regional newsletter; The Grama phone.

The GBPMC was a co-author on the Plant Guide “Scarlet Gilia”. That publication was senior authored by the good folks in Aberdeen and published January 2017.

Other publications included a YouTube video on our 60 day cover crop trial, newsletters articles in the local food coop, and the 2016 annual progress report.

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the bases of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, or all or part of an individual's income is derived from any public assistance program, or protected genetic information in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases will apply to all programs and/or employment activities.)

If you wish to file an employment complaint, you must contact your agency's [EEO Counselor](#) (PDF) within 45 days of the date of the alleged discriminatory act, event, or in the case of a personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

If you wish to file a Civil Rights program complaint of discrimination, complete the [USDA Program Discrimination Complaint Form](#) (PDF), found online at http://www.ascr.usda.gov/complaint_filing_cust.html, or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter to us by mail at U.S. Department of Agriculture, Director, Office of Adjudication, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, by fax (202) 690-7442 or email at program.intake@usda.gov.

Individuals who are deaf, hard of hearing or have speech disabilities and you wish to file either an EEO or program complaint please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

Persons with disabilities who wish to file a program complaint, please see information above on how to contact us by mail directly or by email. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.) please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

For any other information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, persons should either contact the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish or call the [State Information/Hotline Numbers](#).

For any other information not pertaining to civil rights, please refer to the listing of the [USDA Agencies and Offices](#) for specific agency information.

Helping People Help the Land

USDA IS AN EQUAL OPPORTUNITY PROVIDER AND EMPLOYER