



Figure 1. Lockeford Plant Materials Center.

The Lockeford Plant Materials Center (CAPMC) is a 106-acre facility located in the Central Valley of California and is the only PMC within the state. There are 27 PMCs around the country, with each one serving a specific ecological and geographic area. The CAPMC addresses the resource concerns within the Mediterranean climate areas of California. We work with NRCS field offices, public agencies, universities, conservation organizations, tribes, commercial seed producers and nurseries. This year we continued our studies in the areas of soil health, range, pollinator plantings and with seed production activities, mainly of native species.

Under the Plant Materials Center Improvement Plan announced this summer the CAPMC is one of nine PMCs designated as a Class "A" PMC. This will allow us to increase our staff from 2 full time to 4 or 5 full time employees. Our two primary areas of focus will be Soil Health and Water Quality, and this aligns well with the studies undertaken at the PMC over the past few years.

Soil Health

National Soil Health Study: The CAPMC is one of seven PMCs participating in a Nationwide Study to examine the effects of cover crop diversity and seeding rate on soil health. Plantings of cover crops were made in October 2012, 2013 and 2014. The cover crops were terminated by use of the roller crimper in April, and sweet corn was planted directly into the rolled cover crops. After harvest the corn residue was mowed and left on the surface. Fall cover crop planting used a no-till drill, with the same plot treatments planted each year.



Figure 2. Soil Conservationist Sonia Miller assists with soil sampling from residue covered trial plots.

Data is collected to determine the consequences of treatments on plant cover, species composition, and total biomass. Analysis on soil properties, fertility, and biological activity are taken at cover crop planting and termination to track changes in soil health over time.

Cover Crops

1. Demonstration Cover Crops: A demonstration of cover crop components as single cultivar cover crop plots have been planted in the fall of each year since 2011. Photo monitoring conducted at 15 day intervals provides information on growth and adaption, cover and weed suppression. The drought conditions during 2013 and 2014 were challenging for the cover crops and 1 inch of water was applied in January as the plants were exhibiting severe drought stress.



Figure 3. Demonstration Planting of Cover Crop Components, March 17 2014, note legumes in foreground and brassicas at rear, growth is less than in previous years due to drought.

During our Open House on April 1, 2014, NRCS Field Office staffers and farmers viewed the growth of 55 different potential components of cover crops and their suitability for use in this area. Many legumes performed poorly under the drought conditions of 2014, although a single lentil plot performed well.

2. Drought Tolerant Cover Crops Study: Water use is a major factor identified as preventing wider adoption of cover crops in California. We are working with Jeff Mitchell and the CASI (California Agriculture Systems Innovation) group of UC Davis to encourage wider use of cover crops.



Figure 5. Sainfoin in bloom. Growth stage on 4/21/14.

Energy – Biofuels Study

Crop production for biofuels is included in NRCS responsibilities for Energy, with programs such as BCAP (Biomass Crop Assistance Program) providing incentives for farmers to grow oil-seed crops. Energy Specialist Jacqui Gaskill has worked with Nic George from UC Davis, to install studies of camelina, *Camelina sativa* and canola *Brassica napus* at the CAPMC in 2013.



Figure 6. Camelina trial, showing camelina plots on March 17, yellow flowers to the left are the canola trial..

Camelina was harvested in 2014 and the PMC location was one of several around California that provided information about the best adapted varieties. The canola trial was a disappointment as bird predation was extreme once the seed had ripened. The trial has been replanted in fall of 2014.



Figure 4. Drought tolerant cover crop study at CAPMC Open House, 'Bracco' mustard flowering in foreground.

The five species included triticale (frequently used for drought tolerant plantings), and two CAPMC releases, 'Cucamonga' California brome and 'Blando' soft brome, with 'Scimitar' burr clover and 'Bracco' white mustard. These were planted as single species and mixtures of each grass with the legume and mustard. In our first trial, the 'Cucamonga' brome outperformed the triticale, the 'Bracco' mustard also performed well, but the 'Scimitar' burr clover grew poorly.

Range Planting - Sainfoin Study

Sainfoin (*Onobrychis vicifolia*) is a non-bloating legume, originally from Europe, used for range plantings in the Northern Plains and considered to be drought tolerant. A study to evaluate sainfoin in the Central Valley was planted with State Range Specialist, Ceci Dale-Cesmat, in the fall of 2012. It included three cultivars of sainfoin inter-planted with non-native, 'Berber' orchard grass, and native purple needlegrass, with an alfalfa control. The study was not irrigated during 2014 and was terminated in the summer.

Pollinator Plantings

The CAPMC has developed a strong partnership with the Xerces Society and entomologists from UC Davis in support of pollinator habitat. State Biologist Tom Moore led the planting of the pollinator hedgerows in 2009 and four ~0.25 acre plots pollinator meadows planted in fall of 2011. The plots contain mixtures of annuals and perennials and are monitored for establishment/cover and bloom phenology as well as insect visitation. Based on findings from these studies, new seed mixtures of almonds and a conservation cover for the Central Valley were developed. Additional plots were planted at the CAPMC in the fall of 2013. The almond mix is comprised of annuals to bloom early in the spring and set seed so that the plants can be mowed down prior to harvest, and regrow with the next rains (Figure 7). The Central Valley Mix contains a mixture of annuals and perennials designed to provide long term bloom under the conditions of the Central Valley (Figure 8).



Figure 7. Almond Mix Planting



Figure 8. Central Valley Pollinator Mix.

Seed and Plant Production

During 2013, the CAPMC continued to work with the BLM and the National Park Service on seed production. This work benefits NRCS with additional funds and provides the opportunity for the CAPMC to investigate native plants with potential application for conservation programs. Seed was harvested for the BLM program from stands of native grasses included blue wild-rye (*Elymus glaucus*), and purple needlegrass (*Nassella pulchra*), spike bentgrass (*Agrostis exarata*), and gumweed (*Grindelia camporum*).



Figure 9. Planting grass seed Dennis Frommelt with a Planet Junior Planter behind the tractor.

In support of restoration activities in Sequoia/Kings Canyon National Park, we grew seed of blue wild rye (*Elymus glaucus*), California brome (*Bromus carinatus*) and miniature lupine (*Lupinus bicolor*). The lupine was grown in weed mat, (Figure 10 and 11) and 49 lb of seed was harvested. For Yosemite National Park the PMC grew blue wildrye and naked buckwheat (*Eriogonum nudum*) with an additional planting of squirreltail, (*Elymus elymoides*) made it in fall 2014.



Figure 10. Shawn Vue uses a vacuum to harvest lupine seed.



Figure 11. Lupine seed on weed mat prior to harvest.

Outreach

The CAPMC received recognition at a National level with our pollinator plantings featured in an article in the New York Times in April. In addition, two international delegations visited the PMC, a group from Tajikistan with interests in irrigation systems and a group from Mexico. Tours were also provided for groups of students from Humboldt State University and the University of the Pacific.

Trainings

A series of six Plant Materials webinars on the topics of plant selection and planning and implementing a seeding were delivered to California NRCS staff. There were two visits for Orientation for New Employees to the PMC, on March 14 and June 20. The students learned about the Plant Materials Program and received a tour of the PMC. In addition the PMC served as a site for training in Soil Health and Bee monitoring workshop.



Figure 12. Attendees at a bee monitoring workshop in the conference room at the CAPMC.

Open House

The CAPMC held an Open House for NRCS and RCD staff on April 1, with morning and afternoon sessions on plantings of cover crops and soil health. 100 people attended among them were local farmers



Figure 13. Soil Specialist, Jennifer Wood explains aspects of soil health during the CAPMC Open House

Speakers on soil health included, State Specialists Dennis Chessman, Steve Hill, Greg Norris and Jennifer Wood. Cover crops demonstration speakers included

Tom Johnson, from Kamprath Seed and Margaret Smither-Kopperl, the PMC Manager. San Joaquin Valley Resource Conservation District sponsored the event and John Brodie gave a lunch time update on the Status of the Irrigated Lands Regulatory Program.

Riparian Restoration with FARMS

The FARMS (Farms, Agriculture Resource Management and Sustainability) Leadership Program is a high school leadership program organized by the Center for Land Based Learning in Winters, California. A group of students visited the PMC in November they had a tour of the CAPMC and then worked to clean wood duck boxes installed the previous year as part of a riparian restoration. They also cleared vegetation around the boxes and planted seed of purple needlegrass.



Figure 14. Biological Science Technician, Shirley Alvarez demonstrates clearing out a wood duck box for FARMS students.

Tribal Outreach

Our collaboration with California Native American tribes continued during 2014 as we work to support their interest in promoting plants of cultural significance. The PMC allows tribal members to gather plant materials, with prior arrangement and at appropriate times during the year. We had a tribal spring gathering and a Native Youth Summer Field Day was held in June with students attending from the Stockton Unified School District. Students learned about culturally significant plants.

Publications

Information, including publications are available on the CAPMC website: <http://plant-materials.nrcs.usda.gov/capmc>.