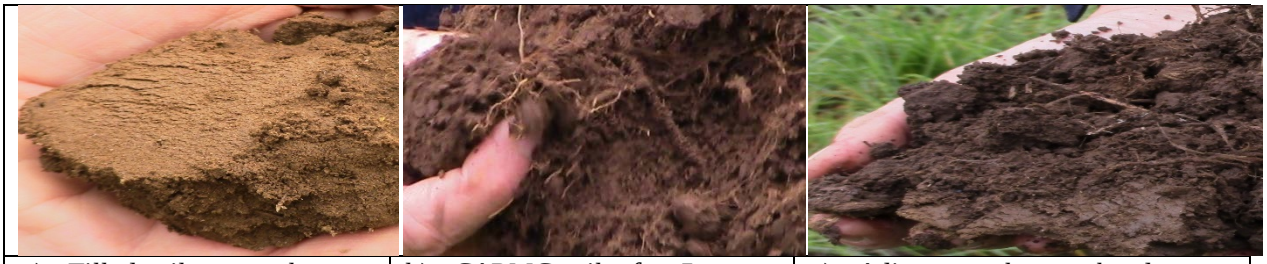
United States Department of Agriculture

NRCS Lockeford Plant Materials Center
2015 Progress Report of Activities January 2016

Although 2015 saw a continuation of drought conditions into the fifth year for California, a heavy rainfall event in early December 2014 provided enough moisture to the soil for plant growth to continue even with a dry spring. This report highlights some of the activities at the Lockeford Plant Materials Center (PMC) during fiscal year 2015.

Soil Health

Soil Health is a primary focus of the PMC and over the past five years, we have been transitioning to no-till systems, with cover crops over the winter. Our soils are improving, increasing in organic matter and structure as shown in Figure 1 below: a) tilled soil with soil organic matter (SOM) of 0.9%, b) after 5 years no-till with winter cover crops and no irrigation SOM of 1.3%, c) adjacent walnut grove with the same soil type no-till and diverse winter cover crops, amendments of manure and prunings after 20 years has an SOM >4%. Cover crops in combination with other practices have the potential to improve soils at the PMC, and throughout California.



a) *Tilled soil, note pale coloration and lack of structure*	b) *CAPMC soil after 5 years no till, note increased structure, roots and darker color.*	c) *Adjacent walnut orchard, note dark coloration and good structure with numerous pores and roots*

Figure 1. Examples of Columbia fine sandy loam soils at the CAPMC and neighboring Locke Ranch.

The Mediterranean climate of California and the recent drought makes soil health improvements particularly challenging and our studies are focused on learning what will be most effective. Technology transfers from other areas in the US will require adaptions for California conditions. Our Studies and demonstrations during 2015 included a National Soil Health Study, a Drought Tolerant Cover Crop study and Cover Component Demonstration with 55 different plots with cover crop components and mixtures.

National Soil Health Study - Final Year: 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. The main findings are as follows:

a) Seeding rates of 20, 40 and 60 seeds/ft^2 resulted in no significant differences in cover or biomass at termination. Therefore the lower seeding rate could be recommended under most conditions.
b) The 20 and 40 seeds/ft^2 seeding rate had significantly lower cover at 30 days, indicating that a higher seeding rate is appropriate when early weed control is a requirement for a cover crop.

c) Cereal rye dominated the cover crop mixtures during the second and third years; preventing conclusions on the effectiveness of diversity to improve soil health.
d) The three year period of the trial did not result in statistically significant improvements to soil health including bulk density, soil moisture, soil resistance, and total nitrogen.

Drought Tolerant Cover Crop Study - Farmers in California's Central Valley grow winter cover crops infrequently, with water availability a significant limiting factor. This trial was the second year to assess selected cover crops for drought tolerance and adaptability to the Central Valley. 'Triticale' is commonly grown due to its drought tolerance and above ground to below ground biomass ratio. 'Cucamonga' brome and 'Braco' white mustard are commercially available, and perform well under drought conditions as seen at the Lockeford PMC in 2014. Hairy vetch is a legume known for high levels of spring residue production, mineralized nitrogen contribution, and weed suppression. The cover crops were planted on January 28, 2015. The experimental design was a randomized block design with four replications. There were nine treatments, a high biomass cover control, triticale, 'Cucamonga' brome, hairy vetch and 'Braco' white mustard as single species plantings; two component mixes of each grass and legume; and three component mixes of each grass with the legume and the mustard. There was no applied irrigation and rainfall was less than 3 inches over the course of the trial.

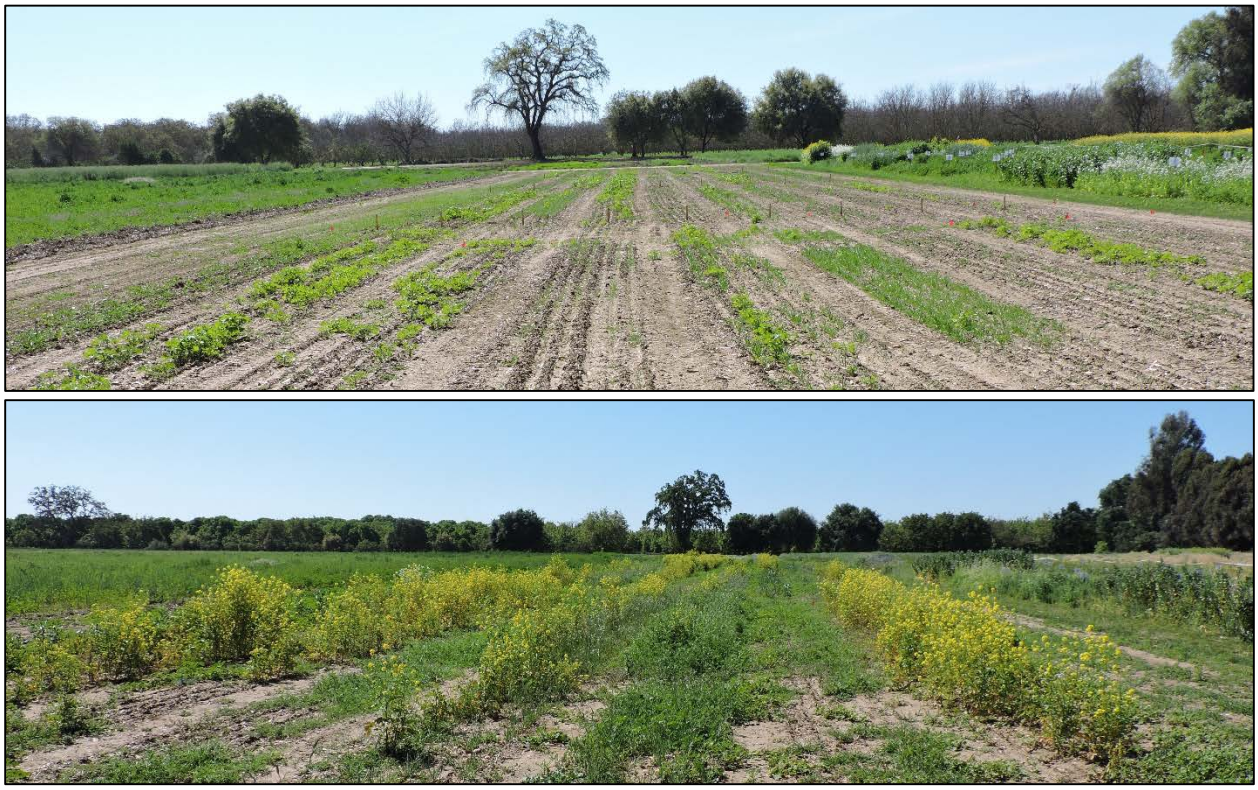


Figure 2. Drought Tolerant Cover Crop Study plots taken on 3/19/15 (50 DAP) and 4/28/15 (90 DAP) at the Lockeford PMC.

Canopy cover was recorded every two weeks after planting, and biomass samples were collected at termination, 105 days after planting (DAP). 'Cucamonga' brome had consistently higher percentages of total canopy cover for the entirety of the trial. Hairy vetch plots had the highest total biomass for all treatments, and mixes had consistently higher biomass than 'Triticale' and 'Cucamonga' brome alone; however, no significant differences were found in total biomass between treatments. Soil moisture levels fell between 30 and 45 days but then stabilized around 12% until 90 DAP. This study confirmed that selected cover crops can be grown successfully at the Lockeford PMC even under extreme drought conditions with no additional irrigation. More information is needed about soil moisture use by specific cover crops, to document the optimum time for termination.

Commercial Pollinator Mix Demonstration - Pollinator habitat requires an array of plants that flower throughout the growing season, providing a source of nectar for adult pollinators and a diversity of herbaceous material important for immature pollinator life stages and nesting. The objective of this study was to evaluate commercially available seed mixtures for adaptation and production of suitable pollinator habitat. The section included four Central Valley mixes containing both annual and perennial species, and four almond mixes. The almond mixes are composed of annuals and provide the following, early bloom, around February to provide floral resources around almond bloom, be low growing or support mowing to provide frost protection, and the plant residues must break down prior to almond harvest to provide a 'clean' orchard floor for harvest. Seed will germinate with fall precipitation.

Table 1. Commercial Pollinator Mixtures and Seeding Rates and Costs used in Commercial Pollinator Mix Study at the Lockeford PMC, planted in 2014.

	Almond Mixes				**Central Valley Mixes**			
	Project ApisM clover	Project ApisM mustard	Kamprath almond	Xerces (S&S seeds)	Peaceful Valley Flowers	Peaceful Valley Native	Renees Garden	Xerces (Hedgerow Farms)
Seeding Rate* lb./acre	15	12	12	11.8	21.8	21.8	6.8	15.46
Cost /lb.	$3.45	$2.31	$20.65	$15	$30	$40	$138	$45
Cost/acre	$52	$28	$248	$177	$654	$872	$938	$696

**Seeding rate recommended for each commercial mix.*

Jeff Borum and Earth Team volunteer Marissa Vosmer monitor a Central Valley plot for bee visitation.

Almond mix developed by Xerces and sold by S&S seeds, with California poppy, crimson clover and five spot in bloom.

Figure 3. Monitoring of the Pollinator Plots for bloom and bee visitation will continue through 2016.

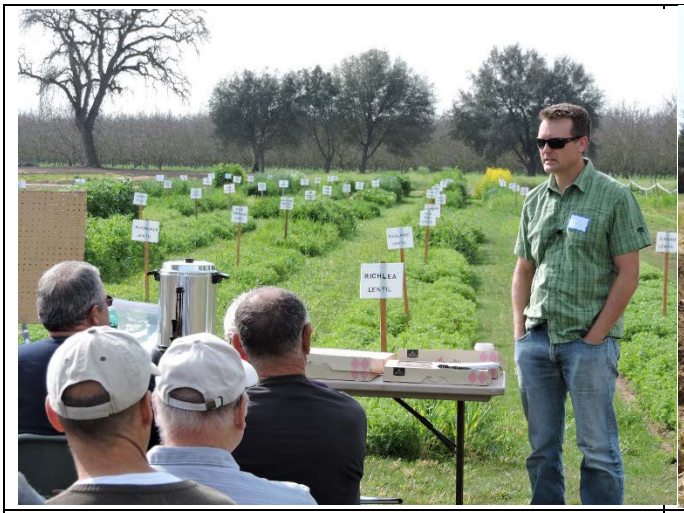
Partners

Activities at the PMC depend upon our partnerships and collaborations with other groups and these continued to expand in 2015. Active partners during 2015 included the Resource Conservation Districts, with especial thanks to the San Joaquin County and East Stanislaus RCDs. University of California Extension, with thanks to Dr. Jeff Mitchell. Non-profit organizations who worked with us included the Xerces Society, Sustainable Conservation and the Center for Land Based Learning, who held a FARMS (Farming, Agriculture and Resource Management for Sustainability) training day at the PMC, and the

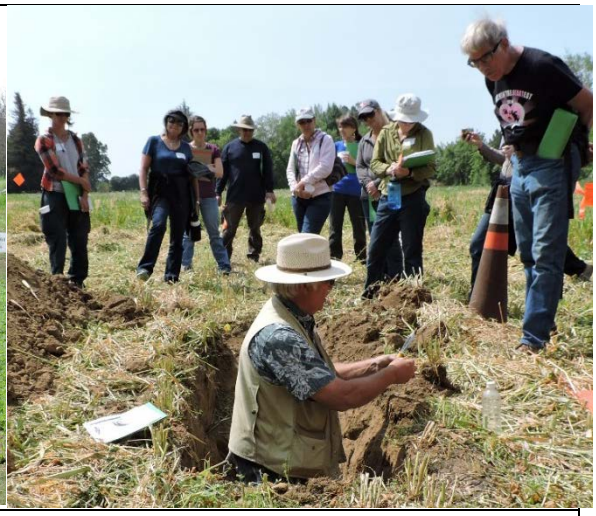
Intertribal Agriculture Council. Our federal partners included Bureau of Land Management and the National Park Service.

Presentations, Trainings and Tours-

We hosted a cover crops Field Day on March 10, with invitations to local producers, we has a range of invited speakers (Figure 4a). Our Open House and Watershed Field Day for 2015 was hosted in April and covered the topics of Soil Health and our commercial pollinator trials (Figure 4b).



a) *Cover Crop Field Day. Chris Storm, Viticulturist from Vino Farms describes his experience of cover crops in vineyards, in front of the CAPMC demonstration cover crop planting.*



b) *Open House. Sid Davis, Assistant State Soil Scientist explaining Soil Health from a soil pit in a PMC field maintained as organic with winter cover crops.*

Figure 4. Scenes from our Field Day and Open House at the PMC during 2015.

The PMC hosted a variety of other tours and groups, including; Orientation for New Employees, FARMS Leadership Day with students from local High Schools and trainee mentors, a local 4H Group, and a Restoration Ecology class from Humboldt State University. The Bureau of Land Management held a Seeds of Success Training and Tour and there was a NEDC Soil Survey Geomorphology Training.

Technical Documents

During 2015 publications completed by the CAPMC completed included three Study Reports: National Soil Health Study, Drought Tolerant Cover Crops Study, and Sainfoin Study. These publications are available on the Lockeford PMC Publications Page.
http://www.nrcs.usda.gov/wps/portal/nrcs/main/plantmaterials/pmc/west/capmc/.

In addition two important eFOTG publications were developed with assistance from the CAPMC:
Agronomy Tech Note 80: Soil Health Field Assessment Worksheet
Agronomy Tech Note 81: Common cover crops for California

eVeg Guide improvements and updates are ongoing with the assistance of staff from CalFlora. During 2015 significant updates were made to Practices 340 Cover Crop, and 550 Range Planting. Be sure to use the map feature when using the eVeg Guide as this provides extra information that is helpful for plant selection.

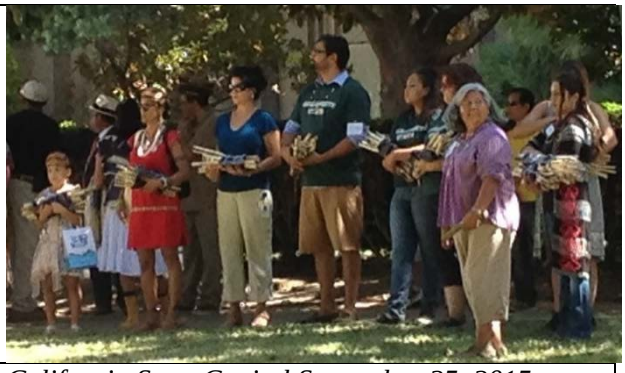
Tribal Outreach

Our collaboration with California Native American tribes continued during 2015 as we work to support their interest in promoting plants of cultural significance. During 2015 we hosted an undergraduate intern,

Abreanna Gomes, through the Yocha Dehe Endowed Chair in California Indian Studies at UC Davis with the collaboration of the Intertribal Agriculture Council. She worked with the elders of her tribe, the Kashia Band of Pomo Indians of Stewarts Point Rancheria, and with selected Plant Materials at the PMC to propagate various plants to develop a basketry Hedgerow.

The PMC welcomes tribal members to gather plant materials, with prior arrangement and at appropriate times during the year. During 2015 we hosted representatives mainly from local Miwok tribes, they harvested white sedge for baskets, grapevine for construction of a Round House at Chaw'se State Park and elderberry clapper sticks.

Round House at Chaw'se State Park under construction, by the Jackson Rancheria using traditional methods, showing the use of grapevine from the PMC to secure the roof beams.



California State Capitol September 25, 2015. Elderberry clapper sticks, gathered from plants growing at the PMC, wait for distribution to Tribal elders.

Figure 5. Plant Materials from the PMC are used by Tribes in California.

The Lockeford Plant Materials Center

The Lockeford Plant Materials Center 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.

Lockeford PMC Staff Changes

There have been several staff changes over the past year. Our current staff, and those who left in 2015 are listed below:
Manager: Margaret Smither-Kopperl
Technician and Gardener: Dennis Frommelt
Technician: Shirley Alvarez (left 2/15)
Technician: Jeff Borum (2/15 -10/15) Now Soil Health Network Coordinator: soilhealth@eaststanrcd.org
Technician/Farm Manager: Benjamin Hudson (started 11/15)
Technician and Farm Assistant: Larry Sell (started 10/15)
Administrative Assistant: Shawn Vue
Summer Intern: Michal Tutka (5/15 – 10/15)
Joined by Agronomist: Valerie Bullard in January 2016.

Contact Information

For more detailed information please contact the CAPMC at the address below, or email Margaret.Smither-Kopperl@ca.usda.gov

Lockeford Plant Materials Center
21001 N. Elliott Road,
(P.O. Box 68)
Lockeford,
CA 95237
Tel: 209 727 5319
Fax::844-206-6967