



United States Department of Agriculture

Lockeford Plant Materials Center



2025 Report of Activities

21001 N. Elliott Road, Lockeford, CA 95237

December 2025

The mission of the USDA NRCS Plant Materials Program is to develop and transfer effective state-of-the-art plant science technology to meet customer and resource needs. The Lockeford Plant Materials Center (CAPMC) provides information about adapted plants and conservation practices to NRCS staff and their clients, producers, landowners, and tribes of California. We are a 106-acre facility located in the Central Valley of California and the only PMC within the state. The CAPMC is responsible for the Mediterranean areas of California. Northwest California is covered by ORPMC, Corvallis, OR; the Great Basin and High Desert by GBPMC, Fallon, NV; and the southern desert areas by AZPMC, Tucson, AZ.

Our staff are Margaret Smither-Kopperl, PMC Manager, Shawn Vue, Farm Foreman and Ashley Koenigs, Biological Science Technician.

Seeding Rate/Planting Date Studies for Cereal Rye and Hairy Vetch

The CAPMC participated in two national studies to evaluate various seeding rates and planting dates for establishing cereal rye and hairy vetch. Cereal rye, the most widely used cover crop in the U.S., is used in California along the Central Coast region. 2025 was the second year for the cereal rye study (Figure 1), and the first year for hairy vetch (Figure 2).

Plans were in place and fields prepared to repeat these studies in 2026, but unfortunately, due to the government shut down, planting was not possible on the required dates, and the studies must be postponed until 2027.



Figure 1. Cereal rye plots at the Lockeford Plant Materials Center. March 25, 2025



Figure 2. Hairy vetch trial at the Lockeford PMC 3/25/2025. Photos Ashley Koenigs.

Nitrogen Contribution from Cover Crops Terminated by Mowing or Disking

In California's Mediterranean climate and intensive agricultural systems, information is lacking on the timing and amount of nitrogen released from cover crops. Without taking cover crop nitrogen contribution into consideration, synthetic nitrogen fertilizer may be applied in excess, costing money and damaging the environment through contamination of surface and groundwater. CAPMC is conducting a replicated study, in partnership with the Nutrient Management group at UC Davis, to investigate nitrogen contribution from a high biomass mix consisting of legumes (bell bean, pea and vetch) with oats. High biomass cover is typically terminated by disking in annual cropping systems and mowed in orchards and vineyards. After termination of the winter cover crop, pearl millet was planted over the plots to track uptake of nitrogen into the biomass. The study was replanted on 11/26/25 and will be repeated in 2026. The UC Davis group is responsible for data collection to quantify the mineralization and availability of nitrogen from a high biomass cover crop mix and its legume and cereal component.



Figure 3. Nitrogen contribution study, September 9, 2025, showing growth of pearl millet. Photo, CAPMC.

Conservation Cover for Orchards and Vineyards

Conservation cover is an NRCS practice (327) to establish and maintain permanent vegetative cover that may be used in orchards and vineyards. 2025 was the fourth year of a 5-year study (first planted in 2021) to evaluate 8 commercially available mixes of grasses and pollinator species, including perennials and reseeding annual species. The study has 10 x 40-foot plots with 8 replications in a Latin square design. The only irrigation applied was 2 inches by sprinkler during drought conditions in February 2022. Management is limited to mowing to 4 inches every February (to coincide with mowing for frost abatement), and in late April or early May, with an optional mow in November. Data collected is limited to line-point intercept data each April, and soils will be collected for analyses in 2026. The most successful mixes are those with native pollinators. Persistent species include yarrow, Great Valley gumplant, golden lupine and California poppy (Figure 4).



Figure 4. Plot planted with Central Valley mix. Photo: CAPMC 4/25/25.

Warm Season Cover Crop Mix Study

Warm season cover crops are sown between the time of soil warm-up in spring and cooling temperatures in fall. The cover crops selected are drought tolerant and adapted to high temperatures with high growth rates and minimal irrigation requirements. In 2025, the CAPMC evaluated twelve cover crop species in six mixes to assess their performance individually and in a mix. Six mixes were planted in a randomized complete block trial with 10 x 300-foot plots and 4 replications. Irrigation water applied was 1.75 inches prior to planting on July 15, followed by an additional 4 x 0.5 inches 9, 14, 25 and 37 days after planting (DAP). Cover was assessed using line point intercept data with a 50-foot tape at 33 and 66 DAP. Total planted cover is shown at 33 and 66 DAP (Figure 5). The early maturing mix provided the best cover both at 33 and 66 DAP, followed by long-term cover at 66 DAP. Biomass was collected at 67 DAP and there were no significant differences between the mixes.

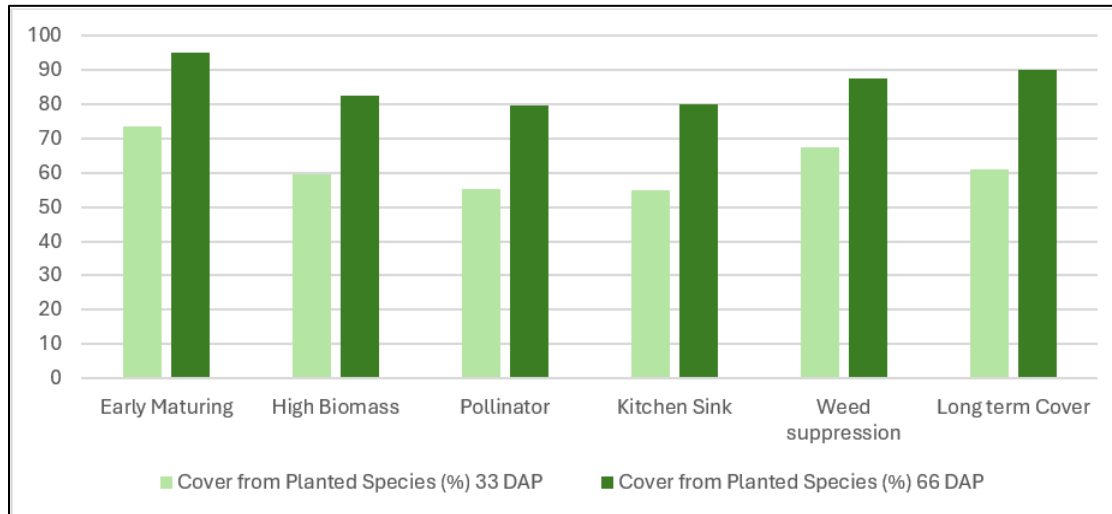


Figure 5. Cover (%) for planted species in six cover crop mixes at 33 and 66 DAP.

The individual species breakdown is shown for three of the mixes at 66 DAP in figures 6-8. The early maturing mix was composed of 2 species: proso millet and buckwheat. Proso millet dominated with 71% cover. The pollinator mix consisted of 4 species: buckwheat, cowpea and sunn hemp (which are legumes), and sunflower at 5% of the mix. Buckwheat composed 48% of the cover at 66DAP, followed by cowpea at 25% and sunn hemp at 7%. Sunflowers were present, but at lower frequency. One observation was that deer browsing on the mix preferred cowpeas and sunn hemp to the buckwheat. The long-term cover mix was designed to see if inclusion of 2 cool season cover crop species, triticale and spring pea, could result in long-term cover over the winter and into the following spring. At 66 DAP, proso millet was the most abundant component at 42% of the mix; spring pea and triticale both comprised 7% cover.

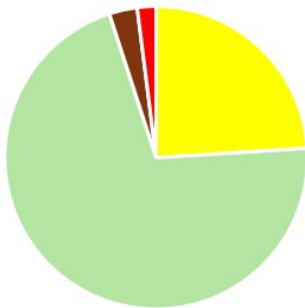


Figure 6. Early maturing mix.

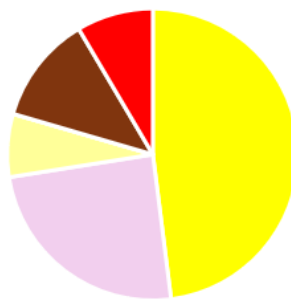


Figure 7. Pollinator mix.



Figure 8 Long-term cover mix.

■ Buckwheat ■ Cowpea ■ Sunnhemp ■ Pea ■ Proso millet ■ Pearl millet ■ Triticale ■ Bare ground ■ Weeds

Proso millet was the most effective of the warm season cover crops tested in reducing weeds and providing cover up to 66 DAP in all of the mixes. As it reaches maturity at 45-60 DAP the cover it provides will decline. The cool season cover crop components are still present and growing in December and will increase in cover over the winter and spring, while the warm cover crops die and decompose. This shows some potential of combining warm and cool season cover crops to provide continuous cover over the winter, increasing infiltration from winter rains and preventing erosion.

Presentations and Training

- Incorporation of soil building conservation practices: Using cover crops as tools. For farmers and Crop Advisors, Stockton, 1/17/2025.
- Introduction to the [eVeg Guide](#) (plant selection tool for NRCS staff in California), 1/27/2025.
- Establishment of perennial pollinator species from plugs in California's Mediterranean Climate. National Native Seed Conference, 2/26/2025.
- Cover Crop Management. Presentation as part of NRCS Soil Health and Sustainability course, 4/9/2025.
- Hands-on training: Soil Health and Sustainability Course, 4/21/2025.
- Cover Crops as Tools for Regenerative Agriculture, at Regenerative Agriculture Workshop, University of California, Merced, 7/1/2025.
- Adaptation of warm season cover crops to the arid Southwestern US. International Conference Soil and Water Conservation Society, 8/4/2025.
- Fall Field Day on September 10, 2025 – included a drone seeding demonstration (Figure 9), a warm season cover crop mix study (Figure 10), the nitrogen contribution from cool season cover crops terminated by mowing and disking (Figure 11) and forage plantings of perennial warm season grasses (Figure 12).



Figure 9. Field day participants watching a drone seeding demonstration.



Figure 11. Learning about nitrogen contribution from cover crops.



Figure 10. Warm season cover crop mix and field day participants.



Figure 12. Theresa Becchetti, UCCE Range Specialist explains a warm season perennial grass planting.

Publications and Technical Products

The [CAPMC website](#) contains numerous publications from the entire Plant Materials Program, with keywords used to search on specific locations and topics.

New additions for 2025 are listed below:

Plant Guides

[Purple needlegrass Plant Guide \(14191\)](#)

[Sticky whiteleaf manzanita Plant Guide \(14164\)](#)

[Triticale Plant Guide](#)

Study Reports

[Adaptation of Warm Season Cover Crops for California's Central Valley \(14224\)](#)

Technical Notes

[Cover Crop Chart: Common Cover Crops for California \(14223\)](#)

[Cover Cropping in California's Water Scarce Environments \(14978\)](#)

[Establishment of Annual and Perennial Pollinator Species from Plugs in a Spring Planting \(14165\)](#)

Plant Selection Tools for NRCS Practices

[NRCS eVeg Guide](#)

[Cover Crop Selection Tool for the Western Region](#) Western Cover Crops Council

Contact us: For more information please contact: Margaret.Smith-Kopperl@usda.gov or Shawn.Vue@usda.gov.

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