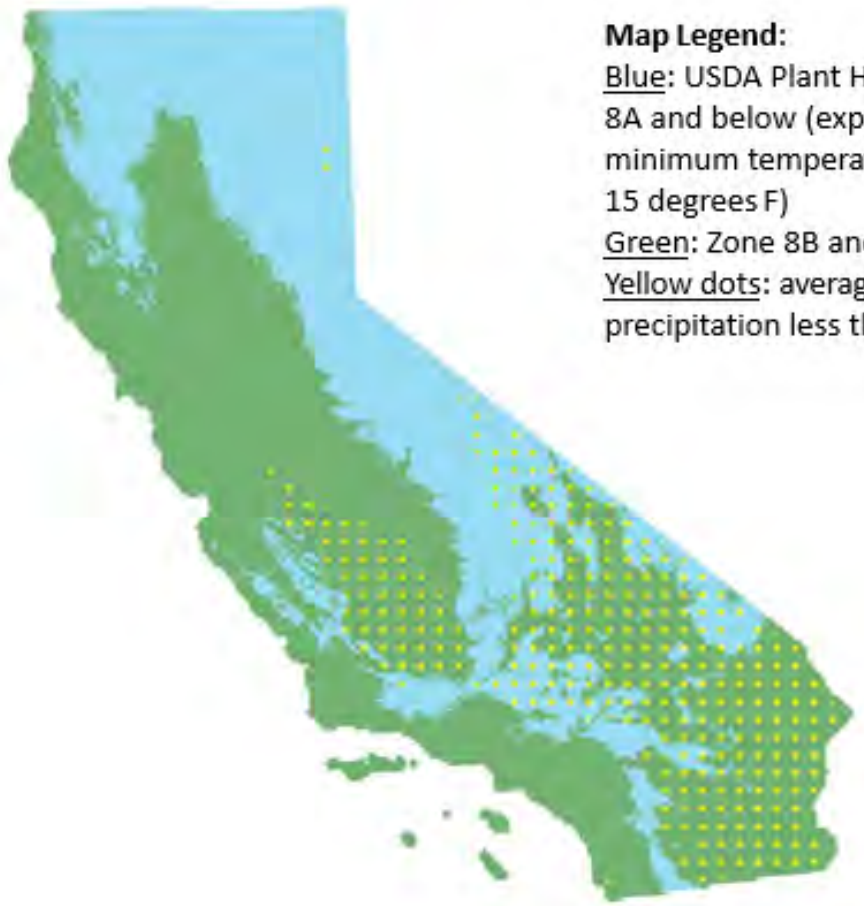
Cover Crop Chart:

Common Cover Crops for California



Map Legend:
Blue: USDA Plant Hardiness Zone 8A and below (expected annual minimum temperature less than 15 degrees F)
Green: Zone 8B and above.
Yellow dots: average annual precipitation less than 10 inches

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California Cover Crop Chart*

The California Cover Crop Chart is designed to give NRCS planners a relatively easy-to-access resource that provides an overview of commonly used California cover crop species. It is not intended to be a replacement for, or duplication of eVegGuide, but is offered as a planning aid that compliments the details in eVegGuide. The Cover Crop Chart includes information that is not included in eVegGuide, may be helpful to the planner such as growth form, relative drought and salinity tolerance, establishment and management concerns and considerations, the primary and associated benefits, external sources for additional species information, and pest concerns. The Cover Crop Chart can be used as a "first step" in the cover crop planning process to help identify species that can meet the goals of the grower, and work within the constraints of the system.

Not all species and varieties that can be useful as cover crops in California are included in the chart and . Instead, species that are most commonly used and have been grown and tested at the Lockeford Plant Materials Center (PMC) are detailed. Also, not all species included in the chart can be grown equally well in all parts of the state. The two primary constraints on growth are temperature and moisture. The figure on page 1 provides the approximate locations where cold temperature ('blue') or lack of moisture ('yellow dots') are particularly severe and will likely limit growth of some species. Planting dates may need to be modified in colder areas, and supplemental irrigation may be required in drier areas.

Another consideration when selecting cover crops is potential for invasiveness, and whether the species may serve as a crop pest host. The information in the Cover Crop Chart should not be used prescriptively to replace planner discretion. Each farm and field are unique and should be planned accordingly. NRCS California has determined that eVegGuide is the authoritative source of information when planning and implementing any vegetative conservation practice in the state, and the planner should defer to it if there is a discrepancy with the Cover Crop Chart.

*The concept and format for the California Cover Crop Chart is taken directly from the cover crop chart created by Mark Liebig, Holly Johnson and others at USDA-ARS in Mandan, ND (http://www.ars.usda.gov/Services/docs.htm?docid=20323).

Replaces Cover Crop Chart: Common Cover crops for California 2015 Prepared by: Chessman, D., S.Smithm M. Smither-Kopperl and V. Bullard.

Prepared by: Smither-Kopperl, M. Manager, Lockeford Plant Materials Center, 21001 N. Elliott Road, Lockeford CA 95237

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Cover Crop Chart for California

←----------Cool season----------→					←----------Warm season----------→			
	←----------Broadleaf----------→							
Grass		**Legumes**					**Grass**	
Annual Grasses	California poppy (Native)	Field pea	Berseem clover		Cowpea			
Barley	Flax	Lentil	Crimson clover	Fava Bean	Sunn hemp		Japanese millet	
Cereal rye	Phacelia (Native)	Lupines	Persian clover	Common vetch	Bigpod sesbania (Native)		Proso millet	
Oats	Brassicas Mustards	Lupines (Native)	Red clover	Hairy Vetch	Lablab bean	Buckwheat	Pearl millet	Sorghum
Triticale	Radish	Medics burr clover	Rose clover	Purple vetch	Lima bean	Safflower	Foxtail millet	Sudan grass
Wheat	Turnip	Balansa clover	Subterra-nean clover	Woolly pod vetch	Tepary bean (Native)	Sunflower (Native)	Browntop millet	Teff

‘Blando’ soft brome

Bromus hordeaceus L. ssp. *hordeaceus*

- Cool season, annual grass, naturalized in California
- Height: 8 – 24 inches tall
- Good drought tolerance
- Typically planted: Early fall
- Seeding depth: 0.5 inch
- Seeding rate: 5 – 10 lbs./acre
- Maturity: Medium to early maturing
- Termination Strategies:
    - Multiple mows at mid- to late- bloom
    - Grazing
    - Tillage
    - Applying herbicide in mid to late spring
- Purpose:
    - Erosion control
    - Increase organics
    - Capture nutrients
    - Reduce soil compaction
- ‘Blando’ soft brome Release brochure
- UC SARAP Cover Crop database

Figure 1. Soft brome ('Blando') at the Lockeford PMC.

Pest Alert

- Weediness: Cal IPC rating: “limited invasive”.
- Will reseed.

‘Cucamonga’ California brome

Bromus carinatus Hook. & Arn.

- Cool season, annual, native grass
- Height: 1 – 3 feet tall
- Excellent drought tolerance
- Typically planted: Early to mid-fall
- Seeding depth: 0.5 – 1 inch
- Seeding rate: 10 – 20 lb/acre
- Maturation: Early
- Termination Strategies: Must be prior to seed set or plants may regenerate next fall.
- Mowing at mid- to late- bloom (multiple mows will be required)
- Grazing
- Tillage
- Applying herbicide in late spring
- Purpose: Erosion control, increase organics, capture nutrients, reduce soil compaction.
- Note: California brome is generally perennial.
- ‘Cucamonga’ California brome release brochure
- UC SARAP Cover Crop database

Figure 2. Cucamonga brome at Lockeford PMC.

Pest Alert

- Weediness: If allowed to mature and drop seed, will reseed and may be weedy.

Italian ryegrass

Festuca perennis (L.) Columbus & Sm., *Lolium perenne* L. ssp *muliflorum* (Lam.) Husnot

- Cool season grass, naturalized in California
- Height: 2 -4 feet tall
- Thrives on heavy soils, survives drought
- Typically planted: Early to mid-fall
- Seeding depth: 0.5 - 1 inch
- Seeding rate: 4.4 – 8.8 lb/acre
- Biomass: 4,700-8,500 lb/acre
- N content depends on cultivar
- Maturation: May-June
- Termination strategies:
- Mowing at mid- to late- bloom (multiple mows)
- Grazing
- Tillage
- Applying herbicide in late spring
- Purpose: Erosion control, suppress weeds, increase organics, capture nutrients, reduce soil compaction.
- UC SARAP Cover Crop database,
- http://covercrops.cals.cornell.edu

Figure 3. Italian ryegrass at Lockeford PMC.

Pest Alert Weediness

- Cal-IPC rating: “moderately invasive”
- Very difficult to eradicate.
- Resistant to common herbicides. May compete excessively with grape vines and perennial tree crops.

Annual Fescue

Vulpia myuros L.

- Cool season, annual grass, naturalized in California
- Height: 10 to 20 inches tall
- Excellent drought tolerance, and can tolerate flooding.
- Typical planting: October 1 – November 15
- Seeding depth: 0.5 – 1 inch
- Seeding rate: 6 -10 lb/acre
- Maturity: March – June.
- Termination strategies:
    - Multiple mows before maturation.
    - Tillage.
- Purpose: Erosion control, suppress weeds, increase organics, capture nutrients, reduce soil compaction maintains dry cover over the summer.
- 'Zorro' is a commonly used variety in California, especially for Conservation cover in vineyards, as it regrows reliably with fall rains.
- 'Zorro' annual fescue release brochure
- UC SARAP Cover Crop database

Figure 4. 'Zorro' fescue at Lockeford PMC.

Pest Alert

- Weediness: Cal IPC rating moderately invasive.
- Difficult to eradicate once established.
- Resistant to common herbicides.

Barley

Hordeum vulgare L.

- Cool season grass
- Height: 2 – 4 feet tall
- Good drought and salinity tolerance
- Arbuscular mycorrhizal associations
- Typically planted: Early fall
- Seeding depth: 0.75 – 2 inches
- Seeding rate: 60 – 90 lb/acre)
- Biomass: 6,800 – 12,900 lb/acre
- Maturity date: Varies with variety.
- Termination Strategies:
    - Mowing, will continue to set heads until soil moisture is exhausted
    - Tillage
    - Herbicide in late spring
- Purpose: Erosion control, suppress weeds, increase organics, capture nutrients, reduce soil compaction.
- UC-SAREP cover crop database barley
- Barley Plant Guide

Figure 5. Barley (UC 937) 150 days after planting, Lockeford PMC

Pest Alert

- Insects: Harbors oat aphid (*Rhopalosiphum padi*).
- Nematodes: Host for *Meloidogyne javonica*, minor host *M. arenaria*.
- Weeds: Will volunteer.

Cereal rye

Secale cereale L.

- Cool season grass
- Height: 3 – 6 feet tall
- May be allelopathic to small-seeded species
- Arbuscular mycorrhizal associations
- Moderate drought tolerance
- Fair salinity tolerance
- Typically planted: Mid-fall
- Seeding depth: 1 inch
- Seeding rate: 60 – 90 lb/acre
- Biomass: 4,000 – 10,000 lb/acre
- Maturity date: Early, varies with cultivar
- Termination strategies:
    - Mow or roller-crimp at soft dough stage
    - Grazing
    - Tillage
    - Herbicides
- Purpose: Erosion control, suppress weeds, increase organics, capture nutrients, reduce soil compaction.
- Plant Guide for Cereal Rye (*Secale cereale* L.)
- UC SARAP Cover Crop database

Figure 6. Cereal rye (Merced) at the Lockeford PMC.

Pest Alert

- Insects: Harbors bird cherry and oat aphid
- Nematodes: Host for *Meloidogyne javonica*, minor host *M. arenaria*.
- Weeds: May become weedy if sets seed.
- Allelopathic: May inhibit following crops.

Oats

Avena sativa L.

- Cool season grass
- Height: 2 – 5 feet tall
- Allelopathic: Can slow the germination of lettuce, cress, timothy, rice, wheat, and peas
- Fair drought and salinity tolerance
- Arbuscular mycorrhizal associations
- Typically planted: Mid-fall to early winter
- Seeding depth: 1 – 2 inches
- Seeding rate: 60 – 90 lb/acre
- Biomass: 8,000 – 12,000 lb/acre
- Maturity date: Late variable, spring and fall cultivars
- Termination Strategies:
    - Mow
    - Roller crimper at dough stage systems)
    - Grazing
    - Tillage
    - Herbicide
- Purpose: Erosion control, suppress weeds, increase organics, capture nutrients.
- UC SARAP Cover Crop database
- http://covercrops.cals.cornell.edu

Figure 7. Oats (Cayuse) at Lockeford PMC.

Pest Alert

- Insects: Harbors bird cherry - oat aphid (*Rhopalosiphum padi*), and English grain aphid (*Sitobian avance*).
- Weeds: Regrowth if sets seed.

Triticale

x *Triticosecale* Wittm.

- Cool Season annual, wheat x rye hybrid
- Height: 3-5 feet tall
- Good drought and salinity tolerance
- Robust root system,
- Arbuscular -mycorrhizal associations
- Typically planted: Mid-fall
- Seeding depth: 0.5 – 2 inches
- Seeding rate: 80 lbs./acre
- Maturity: Variable with spring and fall cultivars
- Termination strategies:
    - Mow prior to seed maturation
    - Grazing
    - Tillage
    - Herbicide
- Purpose: Erosion control, suppress weeds, increase organics, capture nutrients, reduce soil compaction.
- Well adapted to CA Central Valley
- http://covercrops.cals.cornell.edu

Figure 8. Triticale (Juan) 120 days after planting, Lockeford PMC.

Pest Alert

- Weediness: Will regrow if sets seed.
- Nitrogen tie-up can occur if vegetable crops are planted too soon after incorporation.

Wheat

Triticum aestivum L.

- Cool season annual grass
- Height: 3-4 feet tall
- Fair drought tolerance
- Fair to good salinity tolerance
- Arbuscular-mycorrhizal association
- Typically planted: Fall to early winter or spring
- Seeding depth: 0.5 – 1.5 inches
- Seeding rate: 50 – 100 lb/acre
- Biomass: 4,500 - 12,500 lb/acre
- Maturity:varies with winter and spring cultivars
    - Termination:
    - Mow
    - Roller crimper at soft-dough stage or later
    - Herbicide
    - Tillage
- Purpose: Erosion control, suppress weeds, increase organics, capture nutrients, reduce soil compaction.
- http://covercrops.cals.cornell.edu

Figure 9. Wheat (Dirkwin) at the Lockeford PMC.

Pest Alert

- Weediness: Will regrow if sets seed.
- Nitrogen tie-up can occur if vegetable crops are planted too soon after incorporation.

Canola, Oilseed Rape

Brassica napus L.

- Cool season broadleaf, non-legume
- Annual (Spring-type) or Biennial
- Height: 1 – 3 feet tall
- Fair drought and good salinity tolerance
- Deep tap root
- No arbuscular mycorrhizal associations
- Typically planted: Mid-fall
- Seeding depth: 0.25 – 1 inch
- Seeding rate: 6 – 12 lb/acre
- Biomass: 6,000 lb/acre
- C:N ratio: leaf 12–16, stem 21–37, root 24–43
- Maturity date: Early
- Termination strategies:
    - Mowing before full flower
    - Incorporation by tillage
    - Herbicide
- Purpose: Increase organics, capture nutrients, reduce soil compaction, suppress weeds. Early bloom attracts pollinators.
- UC SARAP Cover Crop database
- http://covercrops.cals.cornell.edu

Figure 10. Canola at the Lockeford PMC.

Pest Alert

- Weediness. Potential exists if sets seed.
- Disease: Potential host for *Sclerotinia sclerotiorum*.
- Do not use brassicas in rotation with one another.

Brown Mustard

Brassica juncea (L.) Czern.

- Cool season broadleaf, non-legume
- Height: 3 to 6 feet tall
- Good drought tolerance
- Poor salinity tolerance
- Strong taproot (1 – 3 ft.)
- No arbuscular mycorrhizal associations
- Typically planted: Mid-fall to early winter
- Seeding depth: 0.25 – 0.5 inches
- Seeding rate: 9 – 18 lb/acre
- Biomass: 8,500 – 12,000 lb/acre
- N content of 3.5% and a C:N ratio: 10 – 30
- Maturity: Intermediate
- Termination strategies:
    - Mow before full flower
    - Tillage before full flower
    - Herbicide
- Purposes: Increase organics, capture nutrients, reduce soil compaction, suppress weeds. Potential nematode and disease suppression.
- Flowers attract honeybees, and hoverflies
- UC SARAP Cover Crop database
- http://covercrops.cals.cornell.edu

Figure 11. Brown mustard (Nemfix) at the Lockeford PMC.

Pest Alert

- Do not use with other brassicas in rotation.
- Allelopathic: may suppress following crops.
- Insects: Can attract flea beetles and diamond-back moths, apple skinworm (*Argyrotaenia citrana*).
- Disease: Potential host for *Sclerotinia sclerotiorum*.
- Weediness: Will volunteer if sets seed.

Black mustard, Oriental Mustard

Brassica nigra (L.) Koch.

- Cool season broadleaf, non-legume
- Height: 3 to 6 feet tall
- Good drought tolerance
- Strong taproot (1 – 3 ft.)
- No arbuscular mycorrhizal associations
- Typically planted: Mid-fall to early winter
- Seeding depth: 0.25 – 0.5 inches
- Seeding rate: 9 – 18 lb/acre
- Maturity: Intermediate
- Termination strategies:
    - Mow before bloom
    - Tillage before full flower
    - Herbicide
- Purpose: Increase organics, capture nutrients, reduce soil compaction, suppress weeds. Produce glucosinolates, may suppress soil-borne pathogens and plant parasitic nematodes.
- Flowers attract honeybees, and hoverflies
- UC SARAP Cover Crop database
- http://covercrops.cals.cornell.edu

Figure 12. Black, Oriental mustard at the Lockeford PMC

Pest Alert

- Do not use brassicas in rotation with one another.
- Allelopathic: may suppress following crops.
- Insects: Can attract flea beetles and diamond-back moths. Apple skinworm may overwinter on mustard.
- Disease: Potential host for *Sclerotinia sclerotiorum*.
- Weediness. May volunteer allowed to set seed.

Field Mustard, Common Mustard

Brassica rapa L. *var. rapa*

- Cool season broadleaf, non-legume
- Height: 1 – 5 feet tall
- Drought tolerance depends on cultivar
- Salinity tolerance depends on cultivar
- Strong tap root
- Typically planted: Mid-fall
- Seeding depth: 0.25 – 0.5 inches
- Seeding rate: 6 – 12 lb./acre
- Maturity: Varies with cultivar
- Termination:
    - Mowing before full flower
    - Tillage before full flower
    - Herbicide
- Purpose: Increase organics, capture nutrients, reduce soil compaction, suppress weeds. Potential nematode and soil-borne disease suppression
- Flowers attract pollinators
- Plant Guide Field Mustard
- UC SARAP Cover Crop database

Figure 13. Common mustard at the Lockeford PMC.

Pest Alert

- Do not use other brassicas in rotation.
- Insects: Can attract flea beetles and diamond-back moths. Allows overwintering of orange tortrix/apple skin worm (*Argyrotaena citrana*).
- Disease: Potential host for *Sclerotinia sclerotiorum*.
- Weediness: Mustards frequently volunteer if set seed.

Turnip, Forage Turnip

Brassica rapa L. *var. rapa*

- Cool season broadleaf, non-legume
- Height: 1 – 3 feet tall
- Drought tolerance depends on cultivar
- Salinity tolerance depends on cultivar
- Large tap root, swollen at crown
- Typically planted: Mid-fall
- Seeding depth: 0.25 – 0.5 inches
- Seeding rate: 6 – 12 lb./acre
- Maturity: Varies with cultivar
- Termination:
    - Mowing before full flower
    - Tillage before full flower
    - Herbicide
- Purpose: Increase organics, capture nutrients, reduce soil compaction, suppress weeds. Potential nematode and soil-borne disease suppression
- Flowers attract pollinators
- Plant Guide Field Mustard
- UC SARAP Cover Crop database

Figure 14. Turnip at the Lockeford PMC.

Pest Alert

- Do not use brassicas in following rotation.
- Insects: Can attract flea beetles and diamond-back moths.
- Disease: Potential host for *Sclerotinia sclerotiorum*.
- Weediness: May volunteer if sets seed.

White Mustard

Sinapis alba L.

- Cool season broadleaf, non-legume
- Height: 3 to 6 feet tall
- Excellent drought tolerance
- Poor salinity tolerance
- Strong taproot (1 – 3 ft.)
- No arbuscular mycorrhizal associations
- Typically planted: Mid-fall to early winter
- Seeding depth: 0.25 – 0.5 inches
- Seeding rate: 10 lb/acre
- Biomass: 8,500 – 12,000 lb/acre
- Maturity: Intermediate
- Termination:
    - Mow before full flower
    - Tillage before full flower
    - Herbicide
- Purposes: Increase organics, capture nutrients, reduce soil compaction, suppress weeds.
- Flowers attract honeybees, and hoverflies
- UC SARAP Cover Crop database
- http://covercrops.cals.cornell.edu

Figure 15. White mustard (Bracco) at Lockeofrd PMC.

Pest Alert

- Do not use brassicas in rotation with each other.
- May be allelopathic to following crops.
- Insects: Can attract flea beetles and diamond-back moths. Apple skinworm may overwinter.
- Disease: Potential host for *Sclerotinia sclerotiorum*.
- Weediness. May volunteer if set seed.

Radish, Tillage Radish, Daikon

Raphanus sativus L.

- Cool season broadleaf, non-legume
- Height: 2 – 3 feet tall
- Poor drought and salinity tolerance
- Major types: Oilseed (var. *oleiformis*)
    - Forage (var. *niger*)
    - Oilseed (var. *oleiformis*)
- Large tap root up to 6 feet deep
- No arbuscular mycorrhizal associations
- Good Nitrogen scavenging, N released rapidly
- Typically planted: Mid-fall
- Seeding depth: 0.25 – 0.5 inches
- Seeding Rate: 10 - 20 lb/acre (lower seeding rates important for reducing compaction)
- Biomass: above ground 8,000 lb/acre
- Purpose: Nitrogen scavenger, increase organics, capture nutrients, reduce soil compaction, suppress weeds.
- Flowers attract pollinators
- Plant Guide oilseed Radish
- http://covercrops.cals.cornell.edu

Figure 16. Mature radish with tap root at the Lockeford PMC.

Pest Alert

- Do not use in rotations with brassica vegetable crops.
- Insects: Can attract flea beetles
- Weediness: May volunteer at some locations if sets seed.

California Poppy

Eschscholzia californica Cham.

- Cool season native, broadleaf, non-legume
- Annual/perennial varieties
- Height: 6 inches – 2 feet tall
- Good drought tolerance,
- Arbuscular mycorrhizal associations
- Typically planted: Mid-fall to early spring
- Seeding depth: 0.25 inches
- Seeding rate: 4 lbs/acre, drilled; 8 lbs/acre broadcast
- Maturity: blooms early until moisture is gone
- Termination strategies:
    - Mowing (not tolerant of mowing)
    - Tillage
    - Herbicide
- Purpose: Erosion reduction, increase organics, nutrient cycling, increase biodiversity, suppress weeds.
- Pollinator and supports beneficial insects.
- UC SARAP Cover Crop database
- California Poppy Plant Guide

Figure 17. California poppy at the Lockeford PMC.

Pest Alert

- Weediness: Not a strong competitor with other species, especially grasses, but will set seed and may become weedy.

Flax

Linum perenne L.

- Cool season broadleaf, non-legume
- Height: 1 – 4 feet tall
- Fair drought and salinity tolerance
- Benefits from arbuscular mycorhizal associations
- Typically planted: Mid-fall to early winter
- Seeding depth: 0.5 – 1.5 inches
- Seeding rate: 10 – 20 lb/acre
- Typical Life cycle of flax:
    - 45- to 60-day vegetative period
    - 15- to 25- day flowering period
    - 30- 40-day maturation period
- Termination strategies:
    - Mow
    - Tillage
    - Herbicide
- Purpose: Increase organics, nutrient cycling, increase biodiversity as part of a mix.
- Flowers attract pollinators and beneficial insects
- Plant Guide for Common Flax (*Linum perenne L.*)

Figure 18. Flax at the Lockeford PMC.

Pest Alert

None

Phacelia, Lacy Phacelia

Phacelia tanacetifolia Benth.

- Cool season native, broadleaf, non-legume
- Height: 1 – 3 feet tall
- Fair drought tolerance, low salinity tolerance
- Arbuscular mycorrhizal associations
- Will outcompete weeds including *Malva* spp.
- Typically planted: Mid-fall to early winter
- Seeding depth: 0.25 inches
- Seeding rate: 7 - 12 lb drilled; 11 - 18 lb broadcast
- Biomass: 3,300 – 6,000 lb/acre
- Maturity: Late
- Termination strategies:
    - Mow prior to flowering
    - Grazing
    - Tillage
    - Herbicide
- Purpose: Erosion reduction, increase organics, nutrient cycling, increase biodiversity, suppress weeds.
- Pollinator for European and native bees.
- UC SARAP Cover Crop database
- Lacy phacelia - *Phacelia tanacetifolia* Benth.

Figure 19. Lacy phacelia at the Lockeford PMC.

Pest Alert

- Insects: May host lygus bugs, as well as beneficial insects.
- Disease: Alternative host for *Rhizoctonia* and *Sclerotina* spp, should not be intercropped with susceptible plants such as lettuce.

Field Pea, Spring Pea, Winter Pea

Pisum sativum L.

- Cool season, legume
- Height: 20 – 28 inches tall
- Good drought tolerance
- Poor salinity tolerance
- Forms arbuscular mycorrhizal associations
- Typically planted: Early fall to late fall
- Seeding depth: 1 -2 inches
- Seeding rate: 50 lb/acre
- Biomass: 6,000 – 8,500 lb/acre
- N fixation around 150 lb/acre
- Maturity: Late
- Termination strategies:
    - Mowing after full bloom
    - Grazing
    - Tillage
    - Herbicide
- Purpose: Nitrogen fixation, increase organics, suppress weeds.
- Pollinator plant, flowers attract bees.
- Plant Guide Pea
- UC SARAP Cover Crop database

Figure 20. Spring pea (Dundale) at Lockeford PMC.

Pest Alert

- Insects: Harbors pea aphid.
- Disease: Host for *Sclerotinia minor*.

Lentil

Lens culinaris Medik.

- Cool season, legume
- Excellent drought tolerance
- Poor salinity tolerance
- Forms arbuscular mycorrhizal associations
- Poor competitor with weeds.
- Typically planted: Mid-Fall
- Seeding depth: 0.5- 1.5 inches
- Seeding rate: 20 lb/acre
- Maturity: Intermediate
- Many cultivars available.
- Termination strategies:
    - Mow
    - Tillage
    - Herbicide
- Purpose: Increase organics, nitrogen fixation.
- Plant Guide, Lentil
- UC SARAP Cover Crop database

Figure 21. Lentil (Viceroy) at the Lockeford PMC.

Pest Alert

- No problems in California.
- Weediness: may volunteer if they set seed.

Lupines

White lupine (*L albus* L.); Yellow lupine (*L. luteus* L.); Blue lupine (*L. angustifolius* L.)

- Cool season annual legumes
- Height: white lupine 47”, yellow lupine 10 – 31”, blue lupine 8 – 59”
- Good drought tolerance
- Prefer acid soils
- Deep taproot
- Typically planted: Early to late Fall
- Seeding depth: 0.5 – 1 inch
- Seeding rate: varies with species
- Maturity: Late
- Termination
    - Mow prior to seed maturation or leave for reseeding annuals
    - Disc
    - Herbicide
- Purpose: Increase organics, nitrogen fixation, suppress weeds, reduce soil compaction.
- Flowers attract bees and beneficial insects
- UC SARAP Cover Crop database
- Plant Guide White lupine

Figure 22. White lupine cover crop at the Lockeford PMC.

Pest Alert

- Livestock: Some species contain toxins and should not be grazed.
- Nematodes: Some species susceptible to nematodes

California Native Lupines

Bicolored lupine*, Lupinus bicolor,* Sky lupine, *L. nanus* and Arroyo lupine *L. succulentus*

- Cool season annual/perennial legumes
- Height: Bicolor 8 - 15",sky lupine 6-24", arroyo lupine 12-30"
- Good drought tolerance
- Prefer acid soils
- Deep taproot
- Typically planted: Early to late Fall
- Seeding depth: 0.25 – 0.5inches
- Seeding rate: varies with species
- Maturity: variable with spcies
- Termination
    - Mow prior to seed maturation or leave for reseeding annuals
    - Disc
    - Herbicide
- Purpose: Increase organics, nitrogen fixation, suppress weeds, reduce soil compaction.
- Flowers attract bees and beneficial insects
- UC SARAP Cover Crop database

Figure 23. Arroyo lupine at theLockeford PMC.

Pest Alert

- Weediness: If allowed to set seed, will volunteer in following years.

Burclover, Gama Medic, Barrelclover

Medicago polymorpha L., *M. rugosa* L., *M. truncatula* Gaertn.

- Cool season, annual legumes
- Height: 4 – 24 inches tall
- Good drought tolerance
- Fair salinity tolerance
- Arbuscular mycorrhizal associations
- Typically planted: Early to mid-fall
- Seeding depth: 0.25 inch
- Seeding rate: 10 lb/acre
- Biomass: 2,000 – 8000 lb/acre
- Maturity: Late
- Termination strategies:
    - Mowing at late bloom stage
    - Tillage
    - Herbicide
- Purpose: Increase organics, nitrogen fixation, suppress weeds, reduce soil compaction.
- Flowers attract pollinators and beneficial insects.
- Plant Guide Burclover
- UC SARAP Cover Crop database

Figure 24. Barrel medic (Sultan) at the Lockeford PMC.

Pest Alert

- Insects: May host lygus bugs, two-spotted spider mites, attractive to Egyptian alfalfa weevil.
- Weediness. May become weedy.

Balansa clover

Trifolium michelianum Savi

- Cool season, legume
- Height: Up to 24 inches tall
- Good drought tolerance
- Fair salinity tolerance
- Forms arbuscular mycorrhizal associations
- Typically planted: Mid-fall
- Seeding depth: 0.5 – 1 inch
- Seeding rate: 2.2 – 4.4 lb/acre
- Biomass: up to 15,500 lb/acre
- Maturity: Early
- Termination strategies:
    - Tillage
    - Undercut, mowing will not kill
    - Herbicide
- Purpose: Erosion control, suppress weeds, increase organics, nitrogen fixation.
- Pollinator and insectary plant for beneficial insects
- Balansa clover: cover crop for no-till systems

Figure 25. Balansa clover (Frontier) at the Lockeford PMC.

Pest Alert

- Insects: Can harbor flower thrips.
- Weediness: Moderately hard seeded, limited reseeding.

Berseem Clover, Egyptian Clover

Trifolium alexandrinum L.

- Cool season, legume
- Height: Up to 24 inches tall
- Good drought tolerance
- Fair salinity tolerance
- Forms arbuscular mycorrhizal associations
- Typically planted: Mid-fall
- Seeding depth: 0.5 – 1 inch
- Seeding rate: 8-10 lb/ac
- Biomass: up to 15,500 lb/acre
- Maturity: Early
- Termination strategies:
    - Undercut, mowing will not kill
    - Herbicides
    - Multiple disking
- Purpose: Nitrogen fixation, increase organics, suppress weeds.
- Flowers attract bees and beneficial insects.
- Plant Guide Berseem Clover
- UC SARAP Cover Crop database

Figure 26. Berseem clover at the Lockeford PMC.

Pest Alert

- None identified.

Crimson Clover

Trifolium incarnatum L.

- Cool season, legume
- Height: 12 – 20 inches tall
- Typically planted: Mid-fall
- Seeding depth: 0.5 inches
- Seeding rate: 7-10 lbs./acre
- Biomass: 4,500 – 5,000 lbs./acre
- Nitrogen: 70 -150 lbs./acre
- Maturity: Intermediate to late
- Termination strategies:
    - Mowing after early bud stage
    - Grazing
    - Tillage
    - Herbicide
- Purpose: Nitrogen fixation, increase organics, suppress weeds.
- Flowers attract pollinators and beneficial insects.
- Plant Guide, Crimson Clover
- UC SARAP Cover Crop database

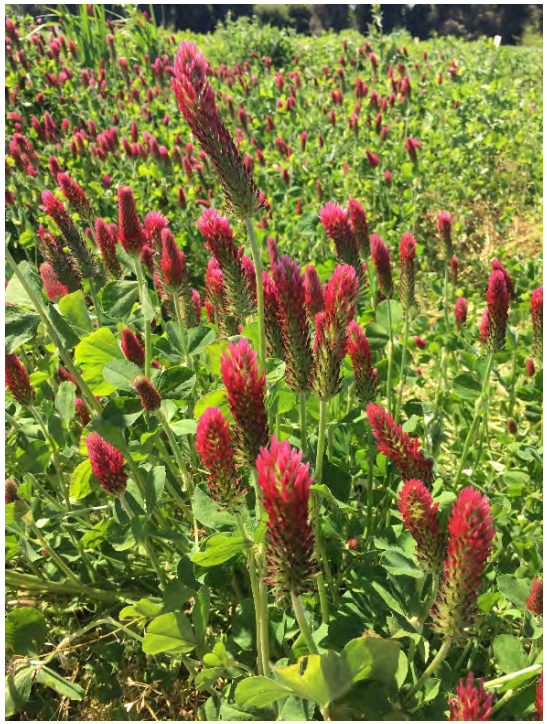

Figure 27. Crimson clover at the Lockeford PMC.

Pest Alert

- Insects: Can harbor flower thrips and can attract Western tarnished plant bug.
- Disease: May host *Sclerotinia*.
- Weediness: Least hard seeded of clover species, limited reseeding.

Persian Clover, Reverse Clover

Trifolium resupinatum L.

- Cool season, legume
- Height: 10 – 24 inches tall
- Low drought tolerance
- Grows best on alkaline soils above pH 6
- Typically planted: Mid-fall
- Seeding depth: 0.25 - 0.5 inches
- Seeding rate: 5 lbs./acre
- Biomass: 3,500 lbs./acre
- Nitrogen: 70 -150 lbs./acre
- Maturity: Intermediate to late
- Termination strategies:
    - Mowing
    - Grazing
    - Tillage
    - Herbicide
- Purpose: Nitrogen fixation, increase organics, suppress weeds.
- Flowers attract pollinators and beneficial insects.
- Persian clover Oregon

Figure 28. Persian clover (Lightning) at the Lockeford PMC.

Pest Alert

- Weediness: May be weedy if sets seed.

Red Clover

Trifolium pratense L.

- Cool season, legume
- Biennial, short-lived perennial
- Height: 12 – 30 inches tall
- Forms arbuscular mycorrhizal associations
- Typically planted: Mid-fall
- Seeding depth: 0.5 inches
- Seeding rate: 4 lb/acre
- Maturity: Late bloomer
- Termination:
- Grazing
- Is not killed by mowing except after bloom
- Tillage
- Herbicide
- Purpose: Nitrogen fixation, increase organics, reduce soil compaction.
- Flowers attract pollinators and beneficial insects.
- Plant Guide Red Clover
- http://covercrops.cals.cornell.edu

Figure 29. Red clover at the Lockeford PMC.

Rose Clover

Trifolium hirtum All.

- Cool season, legume
- Height: 6 – 18 inches tall
- Good drought tolerance.
- Tolerant of infertile soils
- Typically planted: Mid-fall
- Seeding depth: 0.5 inches
- Seeding rate: 7 lb/acre
- Biomass: to 6,200 lb/acre
- Maturity: Intermediate
- Termination strategies:
    - Mowing
    - Tillage
    - Herbicide
- Purpose: Nitrogen fixation, increase organics, reduce soil compaction.
- Flowers attract pollinators and beneficial insects such as the minute pirate bug.
- Plant Guide Rose Clover
- UC SARAP Cover Crop database

Figure 30. Rose clover (Hykon) at the Lockeford PMC.

Pest Alert

- Insects: Can harbor lygus bug.
- Weediness: Hard seeded tends to be invasive, naturalized in some areas.

Subterranean Clover

Trifolium subterranean L.

- Cool season, legume
- Height: 6 – 15 inches tall
- Tolerant to shade
- Tolerant to acid and infertile soils
- Some cultivars extremely drought tolerant
- Typically planted: Fall
- Seeding depth: 0.25 inches
- Seeding rate: 25 lb/acre
- Biomass: to 5,000 - 9,600 lb/acre
- Maturity: Varies by cultivar
- Termination strategies:
    - Mowing after mid-bloom stage
    - Tillage
    - Herbicide
- Purpose: Nitrogen fixation, increase organics, reduce soil compaction, suppress weeds.
- Flowers attract pollinators and beneficial insects.
- Plant Guide Subterranean Clover
- UC SARAP Cover Crop database

Figure 31. Subterranean clover (Antas) at the Lockeford PMC.

Pest Alert

- Weediness: Hard seeded can reseed if seed matures

Fava bean, Bell, Tick, Horse bean,

Vicia faba L.

- Cool season, legume
- Upright growth form
- Height: 2 – 6 feet tall
- Low drought tolerance, requires rain or irrigation for establishment.
- Deep-rooted, noted for reducing compaction.
- Somewhat tolerant of poor drainage
- Typically planted: Mid-fall
- Seeding depth: 1 – 2 inches
- Seeding rate: 80 lb/acre
- Maturity: Late
- Termination strategies:
    - Mowing
    - Tillage
    - Herbicide
- Purpose: Increase organics, nitrogen fixation, suppress weeds, reduce soil compaction.
- Good pollinator plant, especially bumble bees. Attracts beneficial insects.
- Plant Guide Fava Bean
- UC SARAP Cover Crop database

Figure 32. Fava (Bell) bean at the Lockeford PMC.

Pest Alert

- Insects: Harbors bean aphid
- Disease: May be attacked by bacterial blast in CA
- Nematodes: May host *Meloidogyne spp*.

Common Vetch

Vicia sativa L.

- Cool season, annual legume
- Height: 2 feet in monoculture and up to 6 feet if supported by large cereal grain
- Good drought tolerance
- Poor salinity tolerance
- Forms arbuscular mycorrhizal associations
- Typically planted: Mid-fall
- Seeding depth is 0.5 – 2 inches
- Seeding rate: 15 lb/acre
- Biomass: 8,000 – 9,000 lb/acre
- Maturity: Late
- Termination strategies:
    - Mowing close to the ground at full bloom.
    - Tillage
    - Herbicide
- Purpose: Nitrogen fixation, increase organics, reduce soil compaction, suppress weeds.
- Flowers attract pollinators, bees and beneficial insects.
- UC SARAP Cover Crop database

Figure 33. Common vetch at the Lockeford PMC.

Pest Alert

- Insects: Can attract Western tarnished plant bug and two-spotted spider mite.
- Nematodes: Can host reniform nematode
- Weediness: Least hard seeded of vetch cultivars.

Hairy Vetch

Vicia villosa L.

- Cool season, annual legume
- Height: 12 – 20 inches tall
- Good drought tolerance, more drought resistance than other vetches
- Taproot that reaches depths of 1 -3 ft.
- Typically planted: Early to mid-fall
- Seeding depth: 0.5 – 1.5 inches
- Seeding Rate: 15 lb/acre
- Biomass: 4,300 – 7,000 lb/acre
- Maturity: Late
- Termination strategies:
    - No-till rolling stalk chopper
    - No-till delayed kill: roller/crimper
    - Herbicides
    - Mowing low to ground at full bloom
- Purpose: Nitrogen fixation, increase organics, reduce soil compaction, suppress weeds.
- Flowers attract bees, other pollinators, and beneficial insects.
- Plant Guide Hairy Vetch
- UC SARAP Cover Crop database

Figure 34. Hairy vetch at the Lockeford PMC.

Pest Alert

- Insects: Can attract Western tarnished plant bug and two-spotted spider mite.
- Nematodes: Can host reniform nematode.
- Weediness: 10-20% seed is hard seeded, can be weedy

Purple Vetch

Vicia benghalensis L.

- Cool season annual legume
- Height: 23 inches tall, but will climb
- Poor drought tolerance
- Typically planted: Mid-fall
- Seeding depth: 0.5 – 1.5 inches
- Seeding Rate: 15 lb/acre
- Biomass: 3,000 – 7,000 lb/acre
- Maturity: Late
- Termination Strategies:
    - Mowing close to the ground at full bloom.
    - Tillage
    - Herbicide
- Purpose: Nitrogen fixation, increase organics, reduce soil compaction, suppress weeds.
- Flowers attract pollinators.
- Harbors beneficial insects.
- UC SARAP Cover Crop database

Figure 35. Purple vetch at the Lockeford PMC.

Pest Alert

- Insects: Can harbor two-spotted spider mite.
- Weediness: May be weedy if sets seed. Hard seeded

Woollypod Vetch

Vicia villosa Roth. subsp. *varia*

- Cool season broadleaf, annual legume
- Height: 18 -27 inches tall, but will climb
- Fair drought tolerance
- Typically planted: Early to mid-Fall,
- Seeding rate: 25 lb/acre
- Seeding depth: 0.75 inches
- Biomass: 8,000 lb/acre
- ‘Lana’ vetch contributes 100 -300 lbs.N/acre
- Maturity: varies with cultivar
- Termination strategies:
    - Low cut at full bloom,
    - Tillage
    - Herbicide
- Purpose: Nitrogen fixation, increase organics, reduce soil compaction, suppress weeds and will smother other plants.
- Flowers attract pollinators, especially attractive to European honeybees
- Plant Guide Woollypod Vetch
- UC SARAP Cover Crop database
- 'Lana' Woollypod Vetch Release Brochure

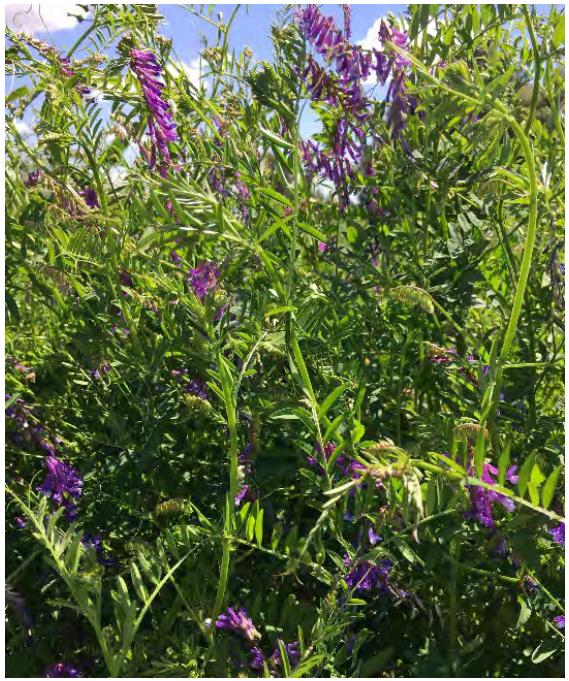

Figure 36. Woollypod vetch (Lana) at the Lockeford PMC.

Pest Alert

- Insects: Can attract Western tarnished plant bug and two-spotted spider mite.
- Disease: Potential host for *Sclerotinia minor*.
- Weediness: Most harded seeded vetch and will persist in California’s Central Valley. Some populations tolerant to glyphosate.

Cowpea, Black-eyed pea

Vigna unguiculata L.

- Warm season broadleaf, annual legume
- Height: 19 – 24 inches tall in a monoculture
- Tolerance to drought and high temperatures
- Poor salinity tolerance
- Forms arbuscular mycorrhizal associations
- Plant: Into moisture after last threat of frost
- Irrigation needs: 4 -10 inches.
- Seeding depth: 0.5 – 1 inch
- Seeding rate: 45 lb/acre
- Biomass: 3,800 – 4,800 lb/acre
- Can fix up to 100 – 150 lb N/acre
- Maturity: Varies on variety from 90 -240 days.
- Termination strategies:
    - Mowing
    - Herbicides
    - Shallow tillage may be required
- Purpose: Nitrogen fixation, increase organics, suppress weeds.
- Plant Guide Cowpea
- UC SARAP Cover Crop database

Figure 37. Cowpea (Red ripper) at the Lockeford PMC.

Pest Alert

- Insects: Host to cowpea aphid.
- Disease: Cowpea is a host for *Rhizoctonia* spp. *Macrophomina* spp. and *Fusarium* spp.

Sunn hemp

Crotalaria juncea L.

- Warm season broadleaf, annual legume
- Height: 4 – 8 feet tall
- Performs best on well drained sandy soils down to pH 5, tolerates moderate alkalinity
- Forms arbuscular mycorrhizal associations
- Plant: Into moisture after last threat of frost through late summer.
- Seeding depth is 0.5 – 1 inch
- Seeding rate: 40 lb/acre
- Biomass: 12,500-14,000 lb/acre
- Can fix up to 100 – 150 lb N/acre
- Maturity: Flowering in August-September
- Termination strategies:
    - Mowing
    - Herbicides
    - Shallow tillage may be required
    - Will winterkill with frost
- Purpose: Nitrogen fixation, increase organics, suppress weeds.
- Flowers attract pollinators
- UC SARAP Cover Crop database
- Sunn hemp Plant Guide

Figure 38. Sunnhemp (Tropic sun) at the Lockeford PMC.

Pest Alert

- Insects: Flowers attract lygus bugs.
- Weediness: Seldom sets viable seed in California.

Bigpod Sesbania

Sesbania herbacea (Mill.) McVaugh

- Warm season native, broadleaf, legume
- Height: 3 - 10 feet tall
- Prefers moist well drained sandy soils.
- Prefers hot and dry summers.
- Forms arbuscular mycorrhizal associations
- Typically planted: Into moisture after last threat of frost through late summer.
- Seeding depth is 0.5 – 1 inch
- Seeding rate: 10 – 25 lbs./acre
- Biomass: 2-3 tons/acre
- Can fix up to 90 – 130 lbs.N/acre
- Maturity: Flowering in August-September
- Termination strategies, woody after 60 days:
    - Mowing
    - Herbicides
    - Shallow tillage
    - Will winterkill with frost
- Purpose: Nitrogen fixation, increase organics, suppress weeds. Flowers attract pollinators and beneficial insects.
- UC SARAP Cover Crop database
- Bigpod Sesbania Plant Guide

Figure 39. Bigpod sesbania at the Lockeford PMC.

Pest Alert

- Weediness: Is perennial in warmer climates. If sets seed, it may become weedy in moist areas.
- Toxicity: Contains saponins, may be toxic to livestock.

Lablab

Lablab purpureus (L.) Sweet

- Warm season, annual/perennial legume
- Height:3 feet, vines up to 25 ft.
- Tolerance to drought and shade.
- Poor salinity tolerance.
- Typically planted: Into moisture after last threat of frost
- Seed inoculum: cowpea-strain.
- Seeding Rate: 11-18lbs per acre
- Planting Depth: 1-4 inches
- Biomass: Variable with variety and irrigation.
- Termination Methods.
    - Mow
    - Tillage
    - Herbicide
    - Winterkill cold temperatures.
- Purpose: Nitrogen fixation, increase organics, suppress weeds.
- Flowers attract pollinators and beneficial insects.

Figure 40. Lablab bean at the Lockeford PMC.

Pest Alert

- Host for root-knot nematode
- Insects: Host for *Heliothis* sp., mirids, and thrips. .

Lima Bean, Sieva Bean

Phaseolus lunatus L.

- Warm season, annual legume
- Height:3 -16 feet, bush and vine types
- Drought tolerant.
- Poor salinity tolerance.
- Planting: Into moisture, soil temperatures above 60 F.
- Seeding Rate: 25 – 50 lbs per acre
- Planting Depth: 1-2 inches
- Maturity: Depends on variety.
- Biomass: Depends on variety and irrigation
- Termination Methods.
    - Mow
    - Tillage
    - Herbicide
    - Winterkill cold temperatures.
- Purpose: Nitrogen fixation, increase organics, suppress weeds.
- Flowers attract pollinators and beneficial insects.
- Lima Bean in California

Figure 41. Lima bean (small) at the Lockeford PMC.

Pest Alert

- Insects: Host for two-spotted spider mite and lygus.
- Nematodes: host for nematode species.

Tepary Bean

Phaseolus acutifolius A. Gray

- Warm season native, annual legume
- Height: 12 inches, some cultivars are vining
- Drought and salinity tolerant
- Prefers hot and dry summers.
- Deep root system
- Forms arbuscular mycorrhizal associations
- Typically planted: Into moisture after frost
- Seeding depth is 0.5 – 1 inch
- Seeding rate: 10 – 25 lbs/acre
- Can fix up to 90 – 130 lbs N/acre
- Maturity: Varies with cultivar.
- Termination strategies, woody after 60 days:
    - Mowing
    - Herbicides
    - Shallow tillage
    - Will winterkill with frost
- Purpose: Increase organics, suppress weeds. (Tepary bean will fix nitrogen in AZ and NM, does not in Central California.) Flowers attract pollinators and beneficial insects.
- UC SARAP Cover Crop database
- Tepary Bean Plant Guide

Figure 42. Tepary bean at Lockeford PMC.

Pest Alert

- Diseases: Host for bean mosaic virus.

Buckwheat

Fagopyrum esculentum Moench

- Warm season broadleaf, annual non-legume
- Height: 12 – 22 inches tall
- Fair drought tolerance
- Poor salinity tolerance
- Mobilizes phosphrous
- Deep taproot
- No arbuscular mycorrhizal associations
- Typically planted: After last threat of frost
- Seeding depth: 0.5 inches
- Seeding rate: 50 lb/acre
- Biomass: 2,000 – 3,000 lb/acre
- Maturity: Bloom starts 45 days after planting
- Termination strategies:
    - Mow 7 – 10 days after flowering begins
    - Herbicides
    - Will winterkill
- Purpose: Increase organics, capture nutrients, suppress weeds.
- Flowers attract pollinators, and beneficials
- UC SARAP Cover Crop database
- Buckwheat Plant Guide

Figure 43. Buckwheat at the Lockeford PMC.

Pest Alert

- Insects: Attractive to lygus bugs and aphids.
- Weediness: will volunteer in limited amounts if allowed to set seed.

Safflower

Carthamus tinctorius L.

- Warm season broadleaf, non-legume
- Height: 2-4 feet tall
- Fair drought and good salinity tolerance
- Strong taproot (8 – 10 ft.)
- Forms arbuscular mycorrhizal associations
- Typically planted: fall or early to late spring
- Seeding depth: 1 – 1.5 inches
- Seeding rate: 80 lb/acre
- Maturity: Variable with cultivar.
- Manageable biomass as a cover crop for tomato
- Termination strategies:
    - Mow
    - Tillage
    - Herbicide
- Purpose: Increase organics, capture nutrients, suppress weeds, reduce soil compaction.
- Flowers attract pollinators
- Safflower Field Crop
- Safflower in California

Figure 44. Safflower at the Lockeford PMC.

Pest Alert

- Insects: Host for lygus bug.

Sunflower

Helianthus annuus L.

- Warm season broadleaf, non-legume
- Height: -6 9 feet, depending on cultivar
- Fair drought tolerance (cultivar dependent)
- Fair salinity tolerance
- Strong taproot (can be 6.5 ft. deep)
- Forms arbuscular mycorrhizal associations
- Typically planted: After the last frost
- Seeding depth: 1 – 2.5 inches
- Seeding rate: 7 lb/acre (depends on cultivar)
- Maturity: Depends on cultivar
- Termination strategies:
    - Will winterkill
    - Mow
    - Tillage
    - Herbicide
- Purpose: Increase organics, capture nutrients, suppress weeds, reduce soil compaction.
- Flowers attract pollinators and beneficial insects.
- Sunflower Plant Guide
- Sunflower pests and diseases

Figure 45. Sunflower (black oil) at the Lockeford PMC.

Pest Alert

- Insects include melon and sunflower aphids and lygus bug as well as the Glassy-winged sharpshooter.

Japanese Millet

Echinochloa esculenta (Braun.) Scholz

- Warm season, annual grass
- Height: 3-5 feet tall
- Good drought tolerance
- Grows best in soils from pH 4.6 – 7.4
- Typically planted: After the last frost
- Seeding depth: 0.25 - 0.5 inch
- Seeding rate: 20 – 25 lb/acre
- Maturity: 60 – 90 days
- Termination strategies:
    - Will winterkill with first frost
    - Tillage
    - Undercut, mowing will not kill
    - Herbicide
- Purpose: Erosion control, increase organics, capture nutrients, suppress weeds, reduce soil compaction.
- May act as a smother crop, for weeds including yellow nut sedge
- Insectary plant for beneficial insects
- Plant Guide Japanese Millet
- UC SARAP Cover Crop database

Figure 46. Japanese millet at the Lockeford PMC.

Pest Alert

- Nematodes: May be a host for root knot nematode.
- Weediness: May become weedy especially in wetland situations.

Proso Millet

(Panicum miliaceum L.*)*

- Warm season, annual grass
- Height: 1 - 3.5 feet tall
- Excellent drought tolerance
- Poor tolerance to high salinity
- Forms arbuscular mycorrhizal associations
- Typically planted: After the last frost
- Seeding rate: 35 lb/acre
- Seeding depth: 0.5 - 0.75 inches
- Maturity: Depends on variety 45-70 days after planting
- Termination strategies:
    - Will winterkill with first frost
    - Tillage
    - Undercut, mowing will not kill
    - Herbicide
- Purpose: Erosion control, increase organics, capture nutrients, suppress weeds, reduce soil compaction.
- Insectary plant for beneficial insects.
- Plant Guide Proso Millet

Figure 47. Proso millet at the Lockeford PMC

Pest Alert

- Weediness: High potential to reseed and become weedy. Considered a noxious weed in Colorado and Oregon. Has developed some herbicide resistance.
- Seeds attract birds.

Pearl Millet

Pennisetum glaucum (L.)R. Br.

- Warm season grass
- Height: 4-8 feet tall
- Tolerance: One of the most drought resistant grains. Can survive low pH and fertility,
- Typically planted: Early May to mid-July
- Maturity Date: 80-90 days after planting
- Seeding Rate: 20lbs/acre drilled, 30-40 lbs/acre broadcast
- Planting Depth: 0.5 – 0.75 inch
- Termination Methods:
    - winter kill termination
    - mowing
    - tilling
- Purpose: High root density, well suited to break up compacted soil, cover crop/green manure, rotation crop and erosion reduction.
- Pearl Millet Plant Guide
- UC-SAREP cover crop database millet

Figure 48. Hybrid pearl millet, Tifleaf 3 at Lockeford PMC.

Pest Alert

- Insect pests: may be affected by fall armyworm
- Diseases: possible rust, or leafspot

Foxtail Millet

Setaria italica (L.) P. Beauv.

- Warm season grass
- Height: 3-7 feet tall
- Tolerance: High tolerance to salinity
- Has a shallow root system.
- Typically planted: Late spring to early summer
- Nitrogen Scavenger
- Maturity Date: Depends on variety 60 -90 days after planting
- Seeding rate: 15-20 lbs/acre drilled, 20-30lbs/acre broadcast
- Seeding depth: 0.25 – 0.5 inch
- Biomass (maybe)
- Termination Methods: Winter kill, mowing or rolling with crimper during the green seed stage (Creamer and Baldwin, 1999)
- Purpose: Erosion control, increase organics, capture nutrients, suppress weeds, reduce soil compaction.
- Foxtail millet Plant Guide,
- UC-SAREP cover crop database millet

Figure 49. Foxtail millet (German) at the Lockeford PMC.

Pest Alert

- Summer annual weeds are competitive with foxtail millet. Plant into well prepared weed-free seed bed (Lee and Henning, 2014)
- Can be stunted or killed by Pyricularia leaf spot (Vollmer et al., 2010).
- May host wheat curl mite when planted near wheat (Anderson and Volesky, 2013)
- May attract undesirable herbivores like rodents and deer.

Browntop Millet

Urochloa ramosa (L.) Nguyen

- Warm season annual/perennial
- Height: 3 feet tall
- Tolerance: Grows best in sandy loam soils
- Fibrous roots that can grow 2 feet deep
- Typically planted: May 1 – June 15
- Seeding rate: 14-30 lbs/acre
- Seeding depth: 0.5 – 1 inch
- Maturity: 60 – 90 days
- Biomass: Depends on irrigation water.
- Termination Methods:
    - Winter kill termination
    - Mowing
    - Tilling.
    - Herbicide
- Purpose: Erosion control, increase organics, capture nutrients, suppress weeds, reduce soil compaction, wildlife habitat
- Plant Guide Browntop millet
- UC-SAREP cover crop database millet

Figure 50. Browntop millet days after planting, Lockeford PMC.

Pest Alert

- Insect pests: may become infested with armyworms and grasshoppers.
- Diseases: susceptible to mung bean yellow mosaic bigeminivirus

Sorghum

Sorghum bicolor (L.) Moench)

- Warm season, grass
- Height: 3 – 12 feet tall
- Good drought tolerance
- Tolerates high soil pH and salinity
- Benefits from arbuscular mycorrhizal associations
- Typically planted: Soil temp reaches 60 – 65 F
- Seeding depth: 0.5 – 2 inches
- Seeding rate: 80 lb/acre
- Maturity: Around 90 – 120 days
- Termination strategies:
    - Will winterkill with first frost
    - Tillage
    - Undercut, mowing will not kil
    - Herbicide
- Purpose: Erosion control, increase organics, capture nutrients, reduce soil compaction, provide surface residue, suppress weeds, may suppress rootknot nematode.
- UC SARAP Cover Crop database
- Sorghum Plant Guide

Figure 51. Sorghum at the Lockeford PMC.

Pest Alert

- Allelopathic residues may reduce growth of following crops.

Sudan Grass

Sorghum bicolor L. Moench ssp. *drummondii*

- Warm season, annual grass
- Height: 5 – 12 feet tall
- Good drought tolerance
- Tolerates high soil pH and salinity
- Arbuscular mycorrhizal associations
- Typically planted: After last threat of frost
- Seeding depth: 1 inch
- Seeding rate: 42 lb/acre
- Maturity: Around 65 days
- Termination strategies:
  - Will winterkill with first frost
  - Tillage
  - Undercut, mowing will not kill
  - Herbicide
- Purpose: Erosion control, increase organics, capture nutrients, suppress weeds, reduce soil compaction, provide surface residue, may reduce root knot nematode.
- UC SARAP Cover Crop database
- https://plants.usda.gov/home/plantProfile?symbol=SOBID

Figure 52. Sudan grass (Piper) at the Lockeford PMC.

Pest Alert

- Allelopathic residues may reduce growth of following crops.

Teff

Eragrostis tef (Zuccagni) Trotter

- Warm season, annual grass
- Height: 1 - 2 feet tall
- Good drought tolerance
- Benefits from arbuscular mycorrhizal associations
- Typically planted: After last threat of frost
- Seeding depth: 0.25 inch (requires fine firm seedbed)
- Seeding rate: 8-10 lb/ac coated seed
- Termination strategies:
  - Will winterkill with first frost
  - Tillage
  - Grazing
  - Herbicide
- Purpose: Erosion control, increase organics, capture nutrients, suppress weeds, reduce soil compaction.
- Note: Seedlings are relatively drought-tolerant after 3 weeks.
- http://eol.org/pages/1114367/overview
- http://covercrops.cals.cornell.edu/Teff.php

Figure 53. Teff (Excaliber) at the Lockford PMC.

Pest Alert

- None identified

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