



United States  
Department of  
Agriculture

Natural Resources Conservation Service

# Cover Cropping for Vineyards

**Margaret Smither-Kopperl,**  
Manager,  
Lockeford Plant Materials Center  
[Margaret.smither-kopperl@usda.gov](mailto:Margaret.smither-kopperl@usda.gov)

Natural  
Resources  
Conservation  
Service



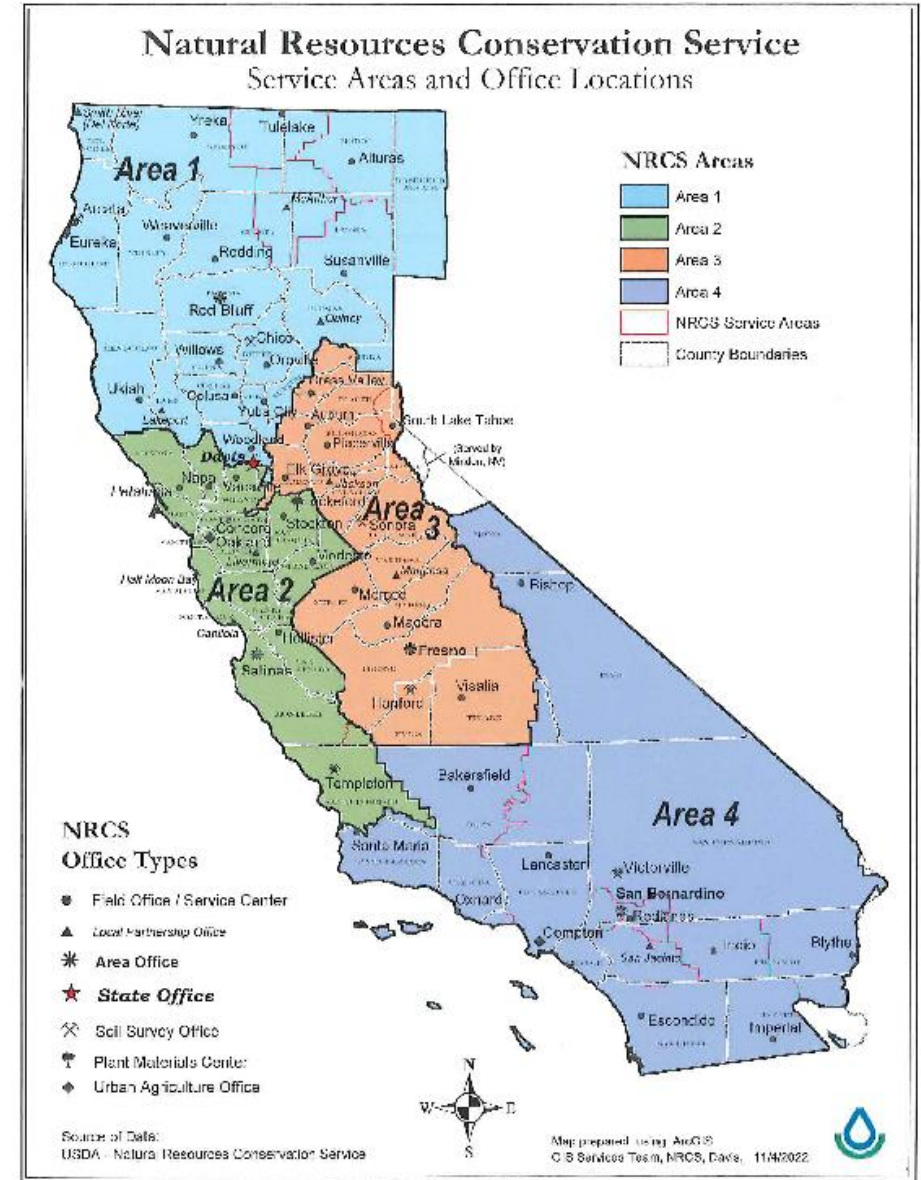
- NRCS in California
- Benefits of cover crops for soil, water, air quality and pollinators.
- Cover crop selection information:
  - Annual Cover Crops
    - Cereals and grasses
    - Legumes and nitrogen
    - Pollinator plants, Brassicas
  - Conservation Cover
- Planting and Termination options
- Example: Drone seeding of a cover crop mix for sheep grazing in vineyards.
- Cover cropping for success
- Questions



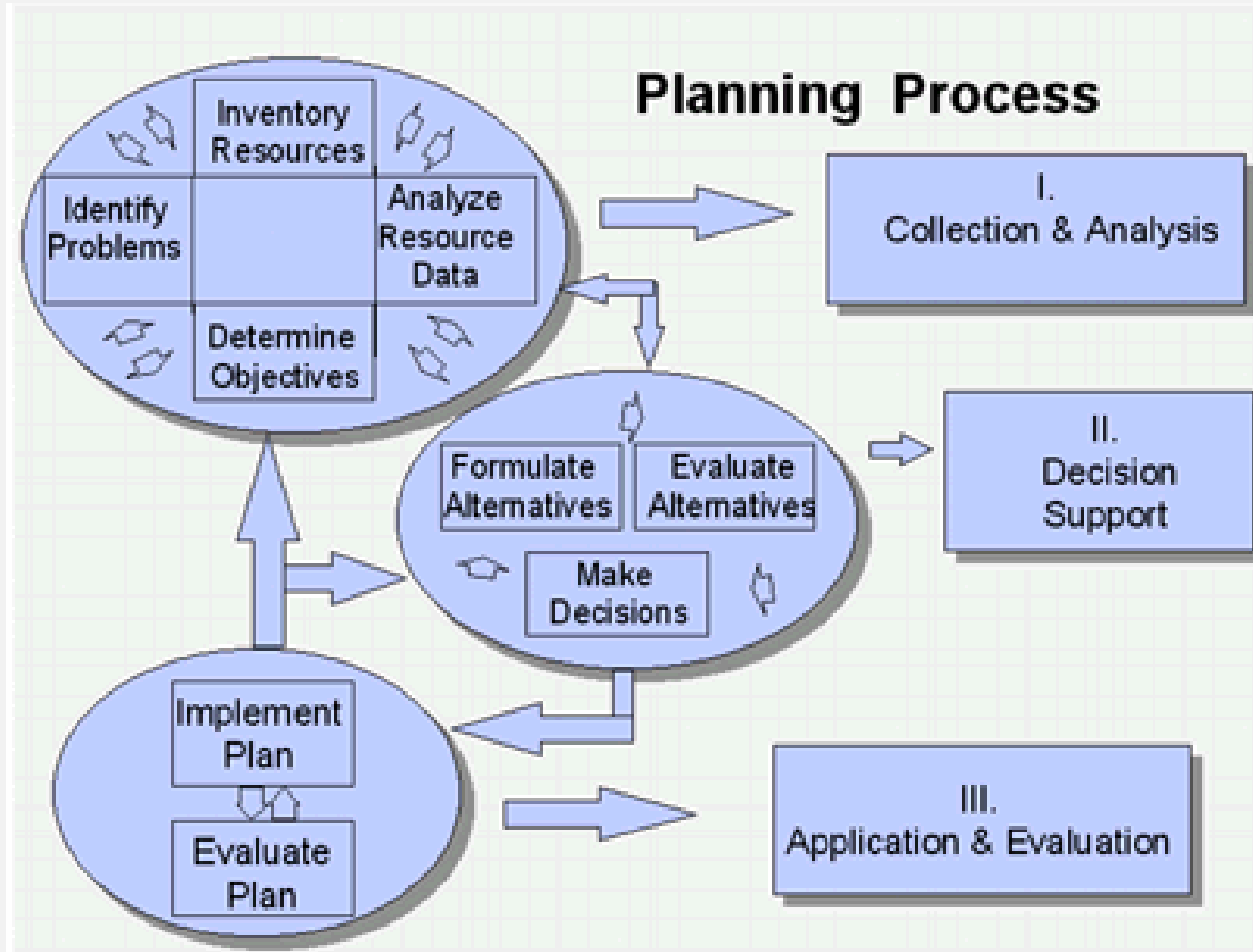
# NRCS California

## Who we are...

- During the Dust Bowl of the 1930s, Natural Resource Conservation Service (NRCS) was called the Soil Conservation Service.
- NRCS provides America's farmers, ranchers and landowners with financial and technical assistance to put conservation on the ground and protect natural resources.
- NRCS Practices enhance sustainability on farm, vineyard, grazing, and forest lands.
- Assistance for El Dorado County, Placerville Field Office, (530) 295-0120.



# NRCS Conservation Planning



**A non-economic crop planted within a permanent crop, or in rotation of a field crop, for the purpose(s) of:**

- Reducing Erosion (wind & water)
- Increasing Infiltration
- Increasing Soil Organic Matter
- Nitrogen Fixation
- Capture/Redistribute nutrients
- Breaking up Soil Compaction
- Weed suppression
- Soil pest suppression
- Pollinator and Beneficial insects
- Forage.



# NRCS - COVER CROPS AND CONSERVATION COVER

## Cover Crops – Practice 340 - Duration: one year

### DEFINITION

Crops including grasses, legumes, and forbs for seasonal cover and other conservation purposes.

### PURPOSE

- Reduce erosion from wind and water.
- Increase soil organic matter content.
- Capture and recycle or redistribute nutrients in the soil profile.
- Promote biological nitrogen fixation and reduce energy use.
- Increase biodiversity.
- Suppress Weeds.
- Manage soil moisture.
- Minimize and reduce soil compaction.

### CONDITIONS WHERE PRACTICE APPLIES

All lands requiring seasonal vegetative cover for natural resource protection and or improvement. This practice does not apply to plantings for forage production.

## Conservation Cover – Practice 327 -Duration: 5 years

### DEFINITION

Establishing and maintaining permanent vegetative cover.

### PURPOSE

This practice is applied to support one or more of the following purposes:

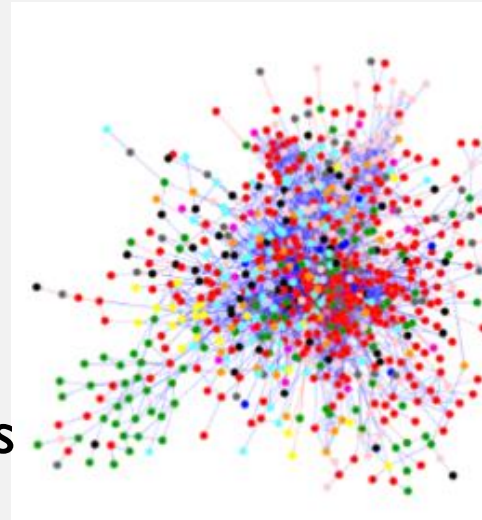
- Reduce sheet, rill, and wind erosion and sedimentation.
- Reduce ground and surface water quality degradation by nutrients and surface water quality degradation by sediment.
- Reduce emissions of particulate matter (PM), PM precursors, and greenhouse gases.
- Enhance wildlife, pollinator and beneficial organism habitat.
- Improve soil health.

### CONDITION WHERE PRACTICE APPLIES

This practice applies on all lands needing permanent herbaceous vegetative cover. This practice does not apply to plantings for forage production or to critical area plantings. This practice can be applied on a portion of the field.

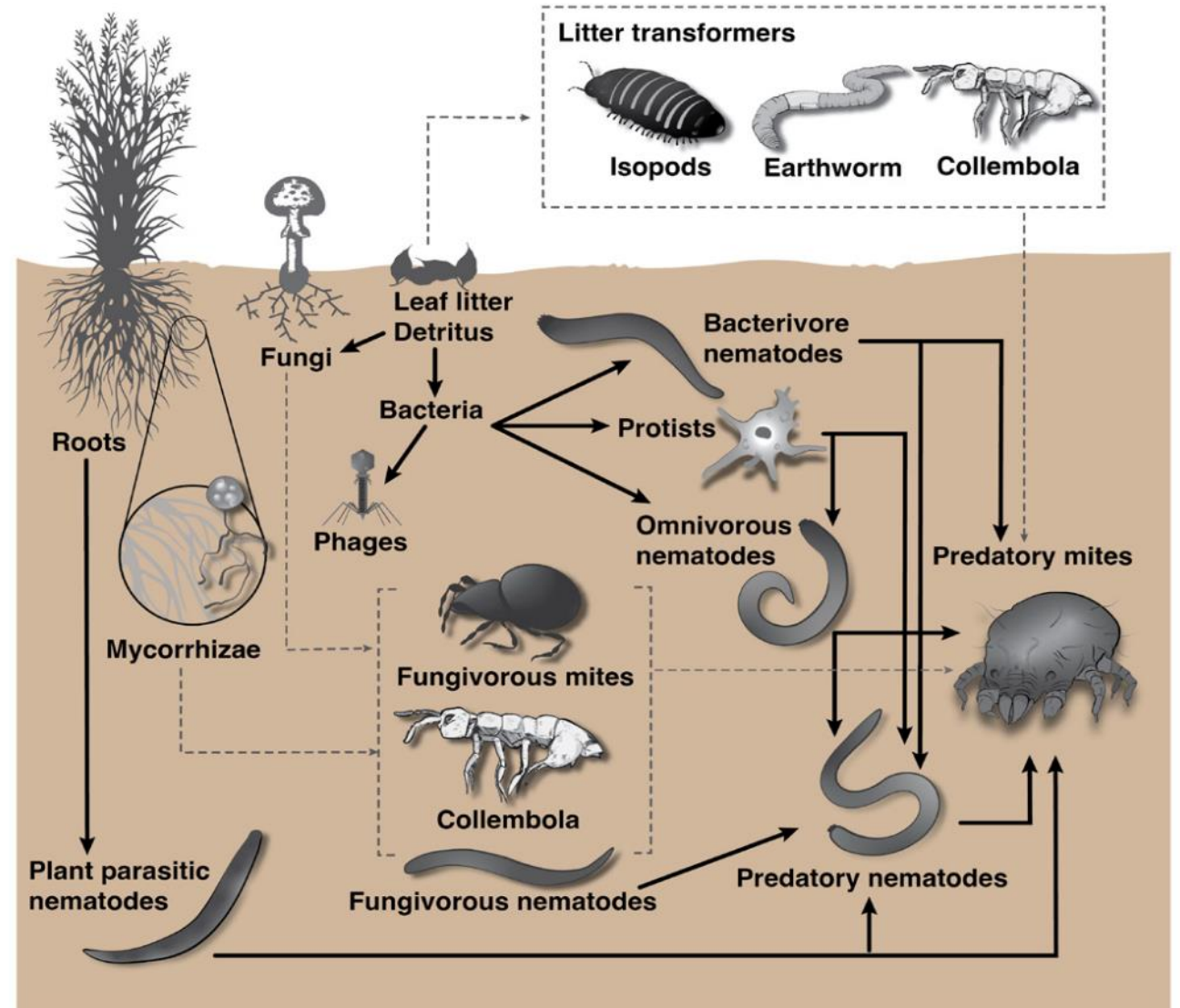
Heathy Soils are composed of networks.  
Network examples:

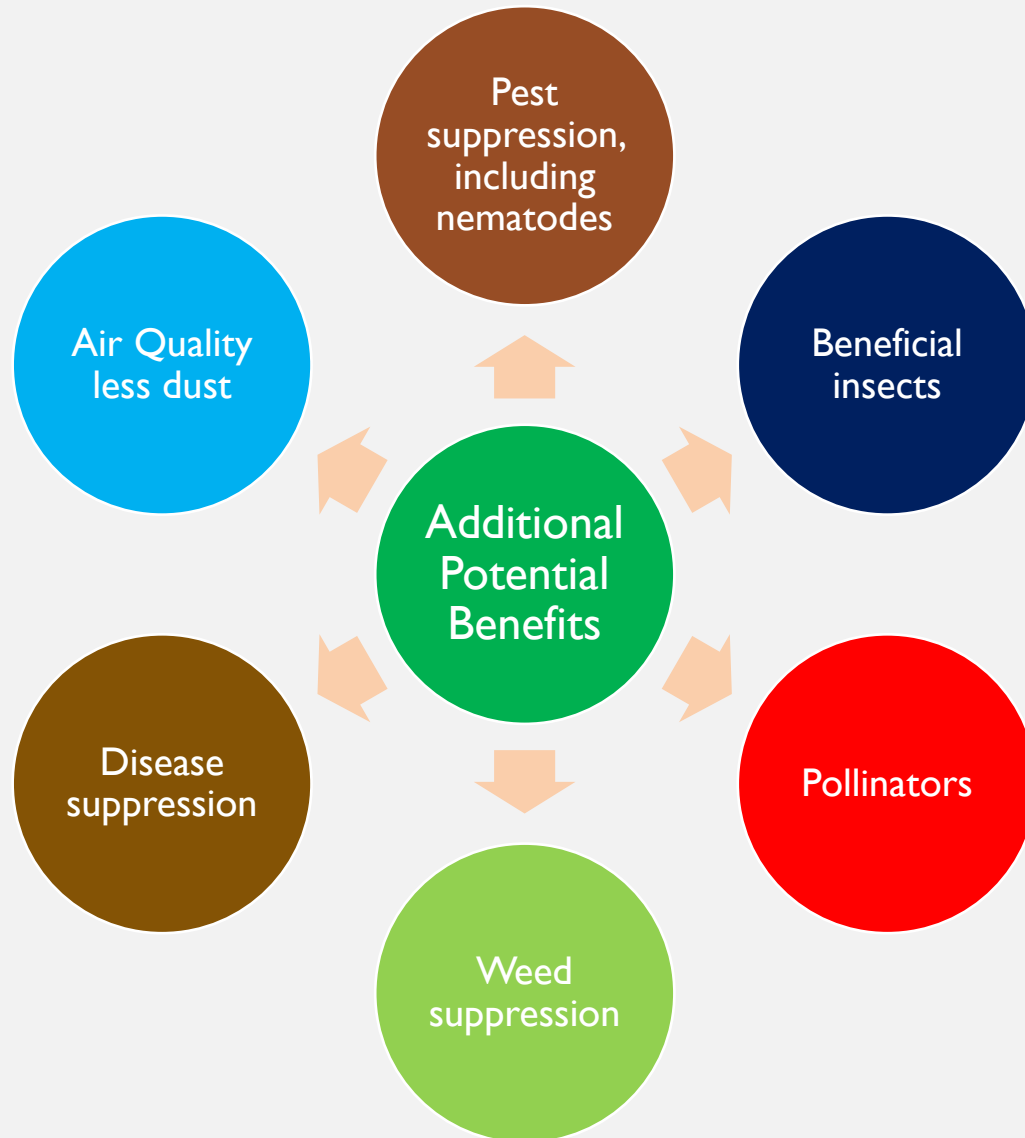
- Plant roots
- Microbial networks
  - Soil bacteria
  - Fungal hyphae
  - Mycorrhizae
- Earthworm channels
- Nematode groups



Soil Microbial network

Plants transfer carbon, through photosynthesis, into the soil by plant and root growth, root exudates and plant residues.





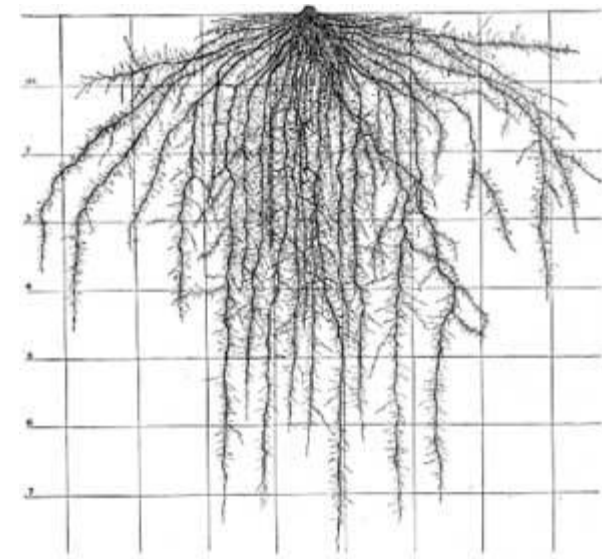
## Water Use and Cover Crops

- During winter months, ET of cover crops and bare ground is similar.
- Infiltration is increased and run off reduced by up to 40%.
- Cover crop residues reduce evaporation from soil.
- Timing of cover crop termination is critical for retaining soil moisture.



## Grasses & Cereals:

- Reduce Erosion (quick emergence & roots in the ground holding the soil)
- Increase water infiltration.
- Increase Soil Organic Matter (fibrous root systems in grasses)
- Increase water holding capacity
- Capture and Recycle Nutrients (scavenge excess nitrogen)
- Weed suppression
- Disease suppression
- Root depth will vary with species.



Cereal cultivars such as wheat, oats, barley, cereal rye or triticale.



Annual ryegrass,  
*Lolium perenne*,  
*Festuca perennis*.



Annual, rat-tail fescue.  
*Festuca myuros*



Soft chess/blando brome,  
*Bromus hordeaceus*.



Cucamonga brome.  
*Bromus carinatus*,  
'Cucamonga'

# Cool Season Legumes as Cover Crops



Peas (spring)



Lupine



Crimson clover and hairy vetch



Bell bean

# Legumes for Annual Cover Crops

## Advantages

- Nitrogen Fixation - Symbiotic Association with Rhizobium Bacteria 'fix' nitrogen in root nodules.
- Reduce and Break up Compaction (large tap root)
- Capture and Recycle Nutrients (large tap root collects nutrients and decomposes quickly)
- Reduce Erosion (large roots hold soil)
- Some species support:
  - Pollinators and beneficial insects
  - Pest suppression (nematodes and fungal pathogens)
  - Weed suppression



## Caution:

- Additional nitrogen may cause too much vine vigor and reduce quality of grapes.
- Some species may harbor pests and diseases.
- Some species are “hard seeded”, will not all germinate in first year and may persist.
- Vetches may try and grow up into the vines.
- May encourage rodents (clovers).

**Cool Season brassicas:**

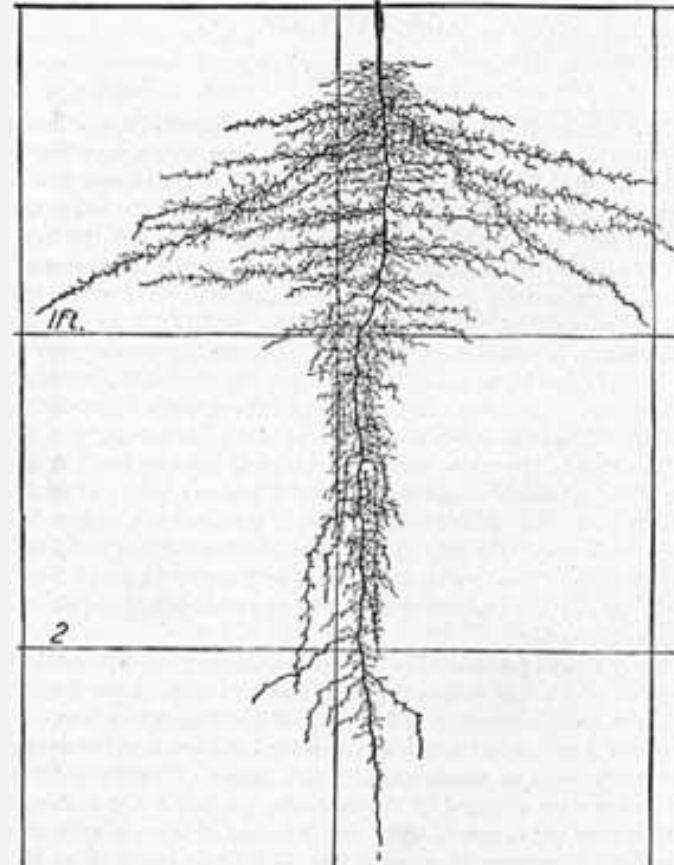
Yellow mustard and daikon radish. Other examples: white mustard, black mustard, and canola.



# Brassicas for Annual Cover Crops

## Advantages

- Strong tap root
- Reduce soil compaction
- Nitrogen scavenger
- Increase infiltration
- Increase water holding capacity
- Some species:
  - Host Pollinators and beneficial insects
  - Pest suppression
  - Weed suppression
  - May discourage rodents



## Caution:

- Species can be weedy if allowed to set seed.

# Annual Pollinators as Cover Crops

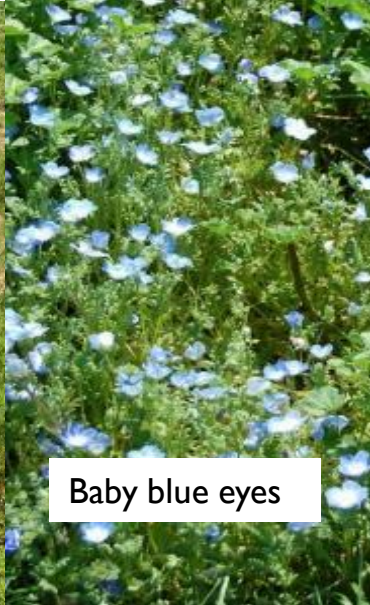
Forbs increase diversity, attractive to pollinators, mine nutrients, weed competitive



Lacy Phacelia



CALIFORNIA  
POPPY



Baby blue eyes



Great Valley  
Phacelia



Batchelors buttons



Bee monitoring in a pollinator planting

# California Cover Crop Selection Chart (Annual Species)

Link: <https://www.nrcs.usda.gov/plantmaterials/capmctn13333.pdf>

-----Cool Season-----				-----Warm Season-----				
---Grass---		-----Broadleaf-----						---Grass---
---Forbs---		-----Legume-----					---Forbs---	
Annual grasses	Forbs	Legume					Forbs	Corn
Barley	Brassicas	Fava bean						Japanese millet
Cereal Rye	Flax	Field pea	Balansa clover	Red clover	Common vetch	Chickpea	Amaranth	Proso millet
Oats	Phacelia	Lentil	Berseem clover	Rose clover	Hairy vetch	Cowpea	Buckwheat	Sorghum
Triticale	Radish	Lupine	Crimson clover	Sweetclover	Purple vetch	Soybean	Safflower	Sudangrass
Wheat	White mustard	Medic/burr clover	Persian clover	Subterranean clover	Woollypod vetch	Sunnhemp	Sunflower	Teff



- Advantages
  - Select species to solve resource concerns
  - 'Free Nitrogen', fixed or recycled
  - Easy to establish in tough conditions, large seeded
  - Relatively fast growth
  - Good winter weed competition
  - Purchase ready mixed or design your own.
- Disadvantages
  - Lots of biomass to deal with may hinder management and termination
  - May require seedbed preparation operations

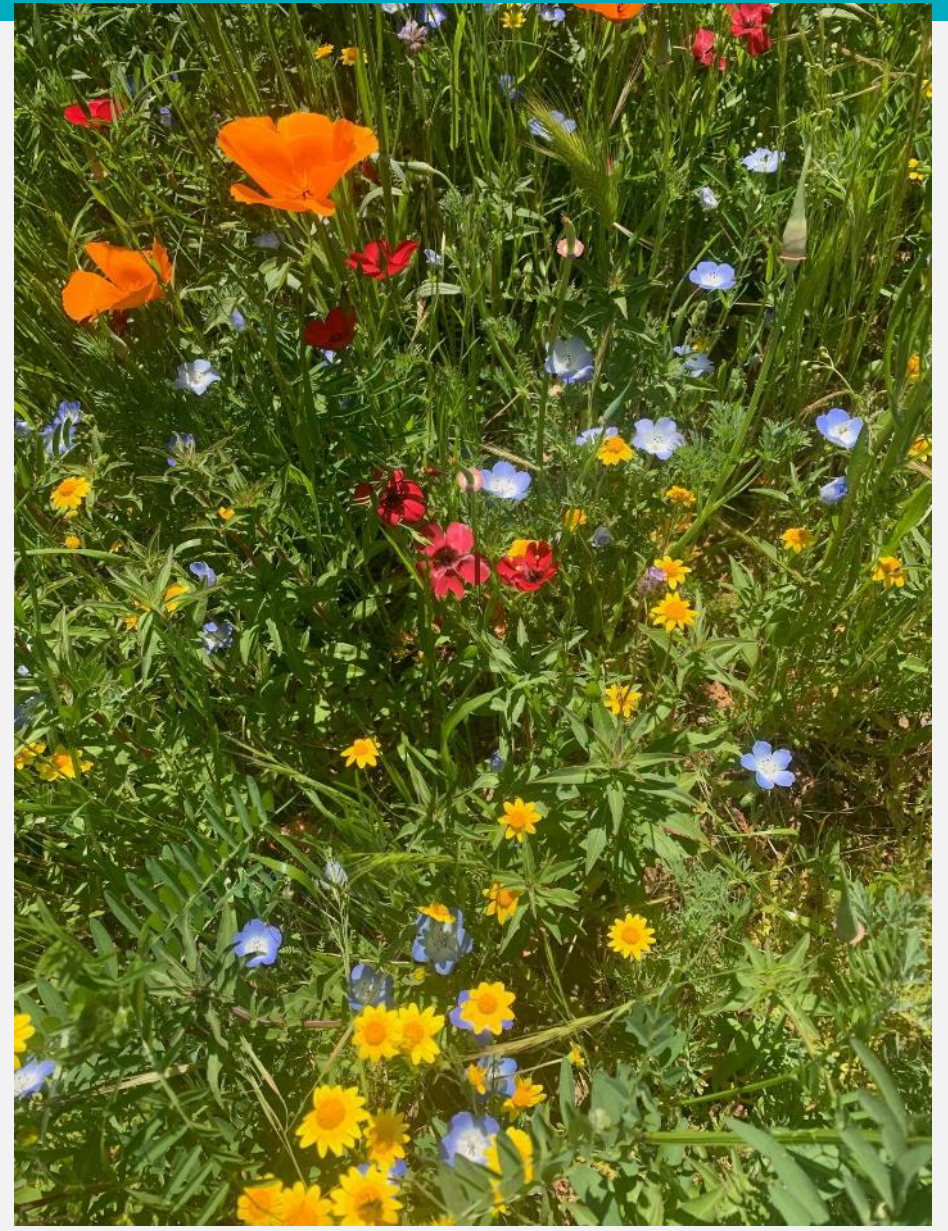


Traditional: Bell beans, Peas, Vetch, Cereal grain

Alternatives or Additions: Cereal grain only,  
Mustard, Radish

# Annual Reseeding Cover Crop Mixes

- **Advantages**
  - Select species to solve resource concerns
  - Natives are typically included.
  - Great for pollinators and beneficial insects
  - Purchase ready mixed or design your own
- **Disadvantages**
  - Small seed may be hard to establish
  - Early successional species
  - May not re-establish
  - Seed is expensive



## Perennial Grasses

- Turf Grasses such as Perennial Ryegrass and Fescues
- Orchardgrass
- Oakville Bluegrass, dormant in summer.

## Perennial Forbs including legumes

- Native Species (Study in Progress at PMC)
- Perennial clover and lupine species, produce nitrogen



Photo: Valerie Bullard

## Direct Drill into firm seed bed or no-till

- Disked soil.

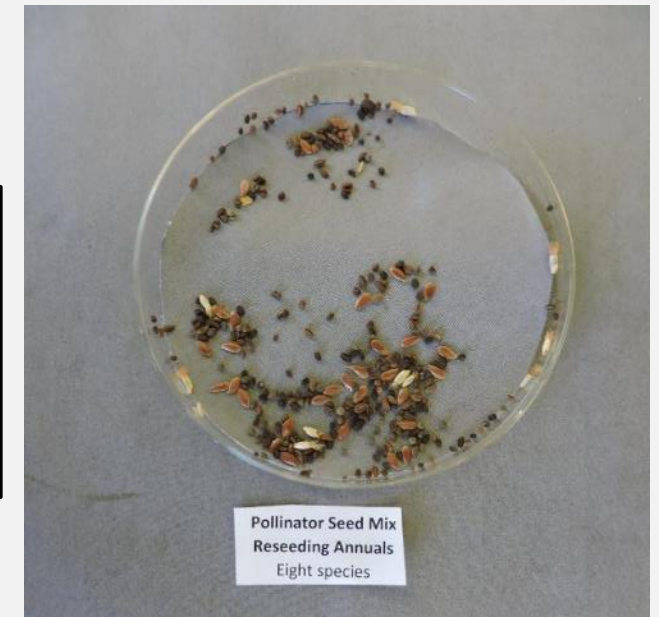
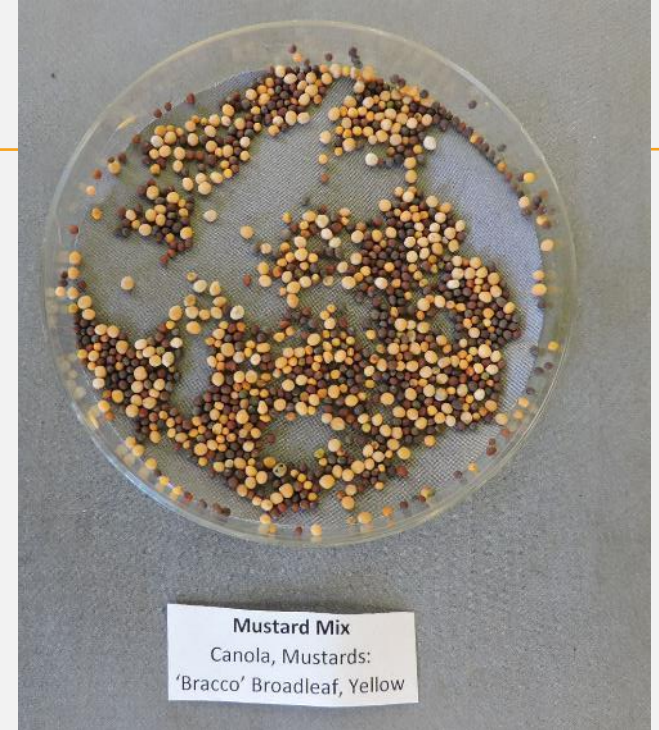
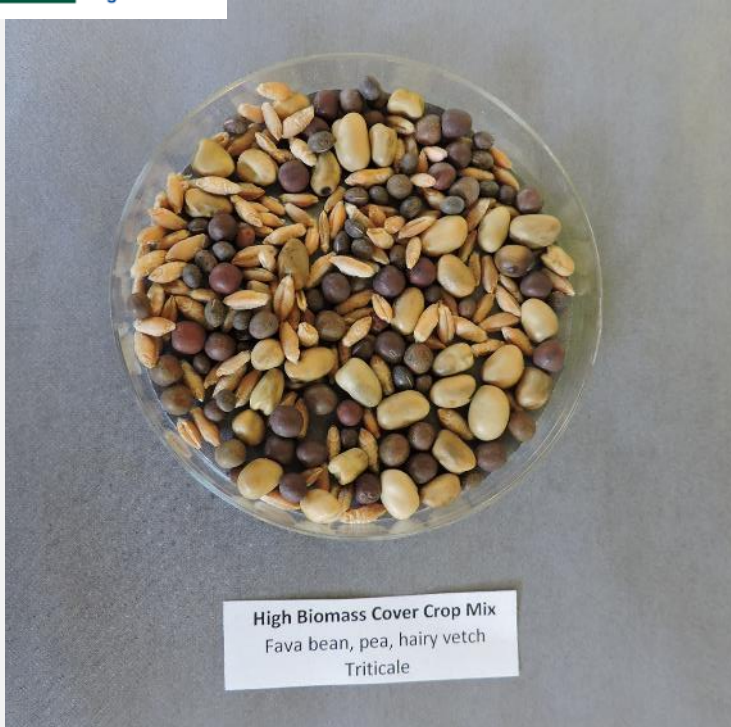


No-till drill

## Broadcast Seeding Methods



# Seed Size and Planting Equipment



Seed size is highly variable between species, and sometimes between cultivars.

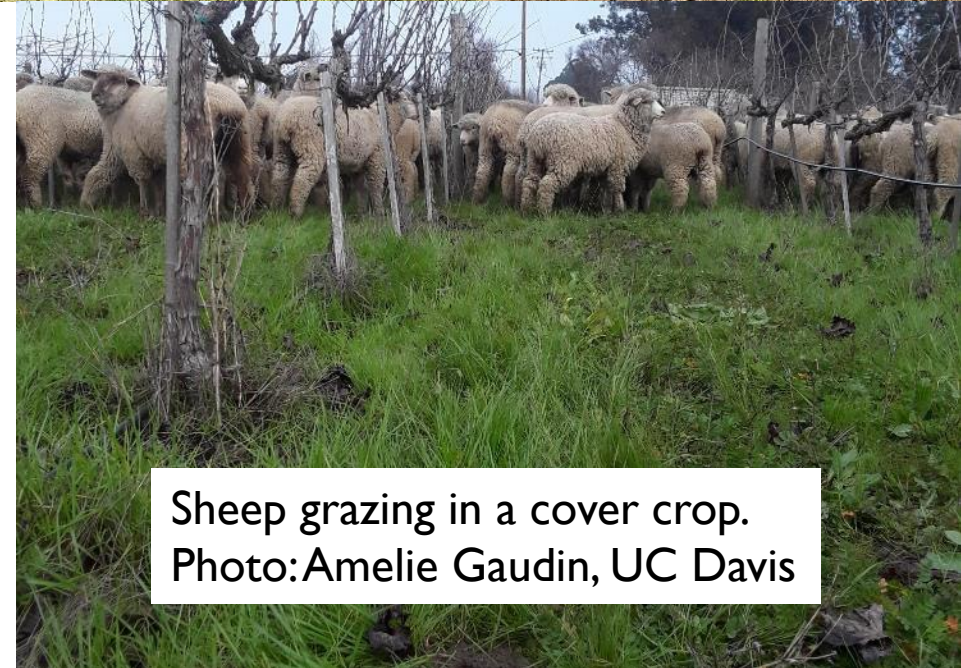
Equipment chosen for planting must be compatible with seed size.

Seed size determines optimum planting depth.

## Rule of Thumb:

Planting depth should be twice the diameter of the seed.

- Mowing or swathing
  - Chopped material remains as residue on surface.
  - Root structure of cover crop undisturbed.
  - Residue can keep soil surface cooler.
  - Time for residue breakdown depends upon C/N ratio.
- Roller crimper – widely used in mid-West.
- Disk under (traditional, row crops, organic)
  - Soil structure destroyed.
  - Lead to loss of carbon and soil moisture.
  - Increased risk for erosion.
  - Depending on soil type, soil crusting leading to reduced infiltration.
- Winterkill (warm season only).
- Chemical herbicide.
- Grazing (compatible with NRCS cover crop practice).



Sheep grazing in a cover crop.  
Photo: Amelie Gaudin, UC Davis

**Planting onto disked  
and cultipacked soil,  
free from weeds,  
with good soil  
moisture.**

**Date: December 21,  
2023.**

**No irrigation or  
weeding since then.**

- <https://youtu.be/ZqGJkigagS4>
- Drone Seeding Video of a planting of a buckwheat cover crop at the PMC.
- April 3 2024,



## Sheep Forage Mix for Grasses + (Kamprath Seed)

Ryegrass, annual – 28%

‘Blando’ Soft brome - 25%

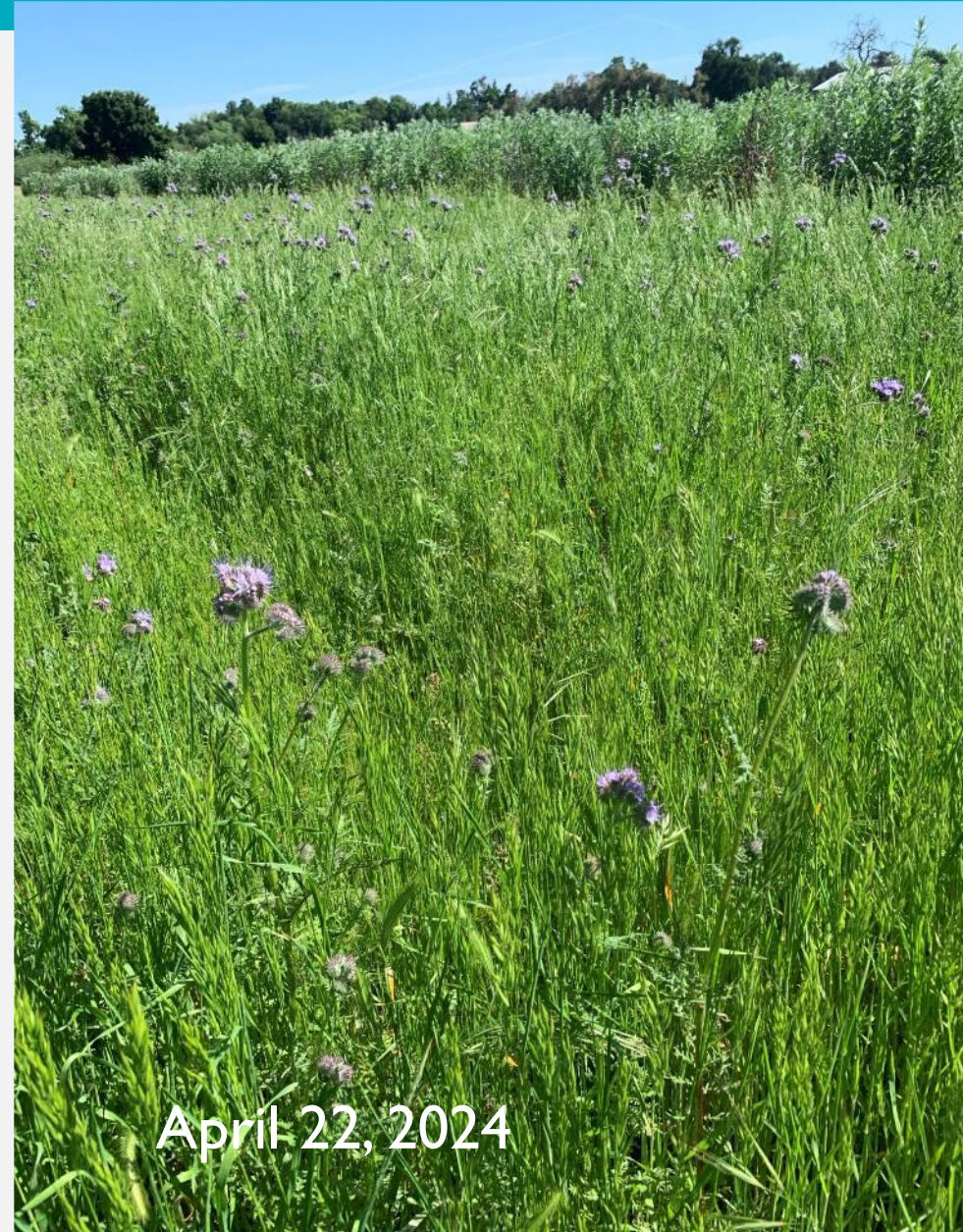
Rescue grass - 15%

Ryegrass, perennial - 15%

Medic -3%

Subterranean clover - 3%

Lacy Phacelia - 1.5 %.





- Good Soil to Seed Contact is essential (see right).
- Consider Seed Size – seed planting depth  $\sim$ x2 the diameter of the seed.
- Direct drill or Broadcast seeding?
- Use good quality seed from a reputable seed dealer. This will come with a tag and a recent seed test can be requested.
- Plant at the recommended seeding rate.
- Read seed tag for seed purity and germination. Adjust seeding rate for PLS (pure live seed) if needed.
- **Calibrate the seeder!!!!**



Drone seeded buckwheat: 4/3/24  
Disked soil, cultipacked on right.  
Photo: 4/28/2024.

- Think how cover crops can be integrated into your cropping system.
- Speak to other producers, seed company representatives, extension, CCA **with experience of cover crops.**
- Don't worry about growing the perfect cover crop.
- Consider return on investment, for example: nitrogen added, weed suppression, reduced irrigation, beneficial insects to reduce insect pests.
- When you find a system that works, build on your success!
- Incorporate new plants and changes to improve the system if you can.
- Variations will occur from year to year depending on the weather.
- Be patient!

Thank you

Select Publications

## Contact Information

Margaret Smither-Kopperl, Manager Phone: 209 400-1531

Email: [Margaret.smither-Kopperl@usda.gov](mailto:Margaret.smither-Kopperl@usda.gov)

Website: <https://www.plant-materials.nrcs.usda.gov/capmc>

### Cover Crop Chart: Common Cover Crops for California



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

### TECHNICAL NOTES

U.S. Department of Agriculture Natural Resources Conservation Service

TN - PLANT MATERIALS - CA - 85

November 2016  
Revised January 2023

#### Cover Crop Seed and Native Seed Vendors for California

Obtaining cover crop seed or native seed is a requirement when implementing many NRCS conservation practices. Cover crop seed is recommended by NRCS for use in agronomic practices to improve soil health, increase water holding capacity, suppress weeds, reduce surface evaporation, provide forage, and prevent soil erosion. California native seed is used in many NRCS wildlife habitat improvement, restoration, and stabilization projects.

Locating a vendor who sells cover crop seed or native seed may be tricky if you are unsure where to look. The purpose of this Technical Note is to provide producers, landowners, and planners with a list of vendors who sell cover crop seed and native seed for California. The cover crop seed list includes sources for conventional, organic, and untreated seed. If you are interested in buying native plants, refer to the [California Native Link Exchange](#) to find vendors in your area. If any of the information is no longer accurate, or new seed vendors need to be added to the list please, contact Annie Edwards at ph: (209) 727-5319 or email: [Annie.Edwards@usda.gov](mailto:Annie.Edwards@usda.gov), or contact Margaret Smither-Kopperl at ph: (209) 727-5319 or email: [Margaret.Smither-Kopperl@usda.gov](mailto:Margaret.Smither-Kopperl@usda.gov). This list does not constitute an endorsement of the vendors, nor does it guarantee the reliability or quality of products.

### TECHNICAL NOTES

U.S. Department of Agriculture Natural Resources Conservation Service  
 LOCKEFORD, CALIFORNIA DATE: February 2021

TN - PLANT MATERIALS - CA - 88

#### Planting Seed Using A No-Till Drill

Matthew Bronson, Lockeford Plant Materials Center, CA

##### Introduction

Planting with a No-Till Planter/Drill gives you a wide variety of planting options to maximize plant establishment and yields. As with any piece of equipment, it is important to understand the seed or seed mix you are planting. The seed drill manufacturer's owner's manual is a great place to start during set up, as it will provide guides on how to adjust the seeder for your seed mix. If the manual cannot be located, usually the manufacturer's website will have a PDF version you can download.



Fig. 1. Custom cover crop seed drill designed and built by Leslie Miller, cover crop and no-till cover crop farmer, 2020.

## Cover Crop Planning Support

The following questions are intended to guide a discussion with the producer to help select a cover crop species or mix of species that best fits their needs. When requesting assistance from a specialist, this information along with site specific climate and soils data, will ensure best outcomes for your customer. Please provide as much detail as possible.

1. For what identified resource concern(s) is a cover crop being planned to address (from NRCS list of currently approved RC's):
2. What is the primary purpose (from standard) of cover crop (check all that apply):
  - Erosion protection
  - Increase SOM
  - Nutrient capture/recycle/distribution
  - Nitrogen fixation
  - Increase biodiversity
  - Suppress weeds
  - Manage soil moisture
  - Minimize/reduce soil compaction

In the PRODUCER'S words, what is the purpose of the cover crop planting, and how do they imagine it (e.g. how tall, upright/more creeping growth pattern, with/without flowers, diverse mix or one or two species, lots of biomass, just enough to cover ground, biomass that is readily decomposed or likely to persist, etc.)?

3. In what months does the producer want living cover?
4. In what kind of cropping system will cover crops be planted?
  - Annual crops (e.g. vegetables, cotton, tomatoes, strawberries)
  - Perennial crops (e.g. vineyard, orchard)?

Please describe the operation (e.g. crop, current rotation, planting/harvest dates, on raised beds, direct seeded/transplanted, major disease/pest issues, etc.). Also explain what will happen when the cover crop is growing (e.g. harvest, spray, prune, etc.) and how critical a particular planting date for following cash crop is after cover crop termination (in annual systems). For perennial systems include how many years the crop has been established.

5. Where will cover crop be planted?
  - Whole field (common in annual crops)
  - In row middles (common in perennial/vineyard crops)
  - On semi-permanent raised beds

6. Do any of the following apply to the planned site:
  - Salt affected soils (e.g. sodic, saline)
  - Evidence of soil crusting
  - High nitrogen soil
  - Low fertility
  - Low/high pH
  - Poor drainage
  - Droughty soil
  - Possible residual herbicide

Any other factors noted or mentioned by the producer? Please describe.

7. What production factors (e.g. disease carry over, host of cash crop pest, residue at planting/harvest, impact on pollinators for cash crop, frost risk) must be considered for the cover crop to be successful?
8. What equipment/infrastructure is available to support the cover crop for the following:
  - Planting:
  - Termination:
  - Irrigation (during establishment and/or growth):
9. Where will a producer get cover crop seed?
10. Has the producer planted cover crops in the past? What was their experience? Do they have any specific concerns arising from that experience or other observations of cover crops?

### THINGS TO CONSIDER...

In many perennial systems, it is important for growers to have access to the crop nearly year round, for example in citrus, harvest may occur periodically throughout the year. Other activities such as spraying and pruning crops may also require activity in a production block. It is critical to understand how vegetative cover may impact the ability to complete essential activities, considering things such as:

- How tall does a cover crop get? When is it at maximum height?
- How does it grow (upright, creeping)?
- How quickly will residue break down? Will it delay planting of following crop?
- Is there risk of it becoming a weed issue if termination is not fully successful?

Cover Crops (340) and Conservation Cover (328) may serve similar purposes. In general, Conservation Cover includes perennial species as they are intended to persist for the lifespan of the practice (10 years), and may be more appropriate than cover crop in perennial system middles (e.g. between rows of trees and vines).