

Cover crop selection

By Grayson Messenger, UC Davis Gaudin Agroecology Lab

How can we use cover crops to achieve our goals?

Cover crop
traits

On-farm goals: Weed suppression,
water infiltration, nitrogen fixation, etc.

What is a cover crop trait?

- Cover crop traits are root, leaf, and growth characteristics
- Trait examples: root length and diameter, root nodules, leaf area, flowering timing, emergence timing
- Traits determine the cover crop's abilities and **functions**



Specific goals, or many goals at once? - the ecology

Achieving a specific goal:

- **Redundancy** is key: have multiple species with similar traits
 - Using three different legume species to add soil nitrogen is stronger than using one
 - If one doesn't show up, the others can still fix nitrogen

Achieving many goals at once

- **Diversity** is key: have multiple species with different traits
 - Using wheat, pea, and canola (above) can meet many goals at once

At UC Davis, we tested redundancy and diversity for 10 goals

- 3 mixes with redundant traits (all grasses, all legumes, or all brassicas)
- 2 mixes with diverse traits (mixtures of grass, legume, and brassica))
- controls: weeds, herbicide
- 3-years, winter-season
- Planted annually in October, terminated by mowing in May
- Cover crops were only rainfed

UC Davis Cover Crop Trial: Results

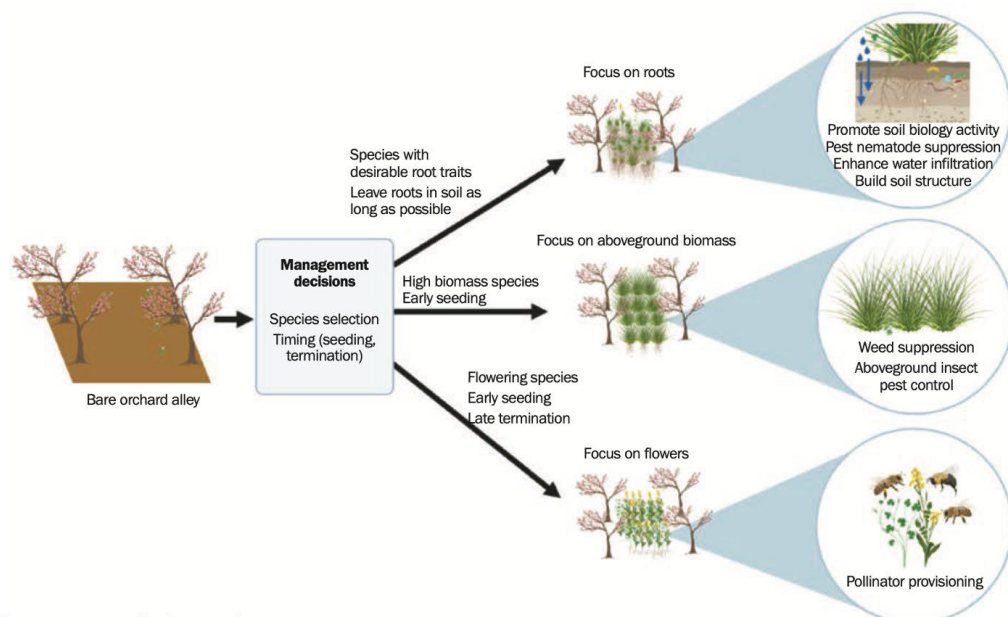
- What we seeded was **not** what we got
 - In Davis, legumes were few in some years. Composition will depend on the environment.

Goals	Grasses	Legumes	Brassicas	Diverse Mix 1 Grass, 1 Legume, 1 Brassica	Diverse & Redundant Mix 3 Grass, 3 Legume, 3 Brassica	Weeds	Herbicide
Store Carbon							
Store and Cycle Nitrogen							
Available Soil Fertility (P, K, Mg)							
Reduce Salinity							
Improve Water Infiltration							
Reduce Compaction							
Support Soil Biodiversity							
Support Pollinators							
Control Navel Orangeworm							
Suppress Weeds							
Outcome Stability Over Time							
	(100 lbs/acre) oats (50%) beardless barley (25%) beardless wheat (25%)	(100 lbs/acre) faba bean (50%) spring pea (40%) common vetch (10%)	(15 lbs/acre) yellow mustard (45%) black mustard (45%) canola (10%)	(100 lbs/acre) spring pea (60%) oats (35%) yellow mustard (10%)	(100 lbs/acre) oats (15%), wheat (10%), barley (10%) vetch (5%), pea (25%), faba (30%) y. mustard (2%) b. mustard (2%) canola (1%)	Excellent	Fair
						Poor	

- Tradeoffs:** grasses, legumes, and brassicas have their strengths, and their weaknesses
- Redundancy was key** for targeting specific goals!
 - In the 3-species diverse mix, we did not get 3 species every year- sometimes only 2 species grew
 - In the 9-species diverse & redundant mix performed better at multiple goals
- We saw higher **stability of many outcomes** in the diverse mixes

Choosing the Right Mix:

“What should I plant?” ... Not a single correct answer.



Western cover crop selection tool is great to find species well-suited for your goals:



Grayson Messenger
gmessenger@ucdavis.edu
Gaudin Lab, UC Davis