

COVER CROPS IN CENTRAL OREGON

Central Oregon Farm Fair – February 6, 2019



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Situation in Central Oregon

- Irrigated, annual (*often*) cropping systems that are intensively managed
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- Irrigated, annual (*often*) cropping systems that are intensively managed
- Require excellent soil quality to be productive
- Central Oregon soils tend to be:
 - Shallow, low in organic matter, sandy, irrigated, subject to frequent tillage
= *susceptible to degradation!*

Enter the intermediate, non-cash crop...



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“Where no kind of manure is to be had, I think the cultivation of lupines will be found the readiest and best substitute. If they are sown about the middle of September in a poor soil, and then plowed in, they will answer as well as the best manure”

- Columella, 1st Century, Rome

What are Cover Crops?

Nutrient
scavenger

Dual
purpose

Pest fighter

Green manure

Weed
suppressor

Allelopathic

Soil builder

Erosion
fighter

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- Suppress weeds and soil borne pathogens -> brassicas

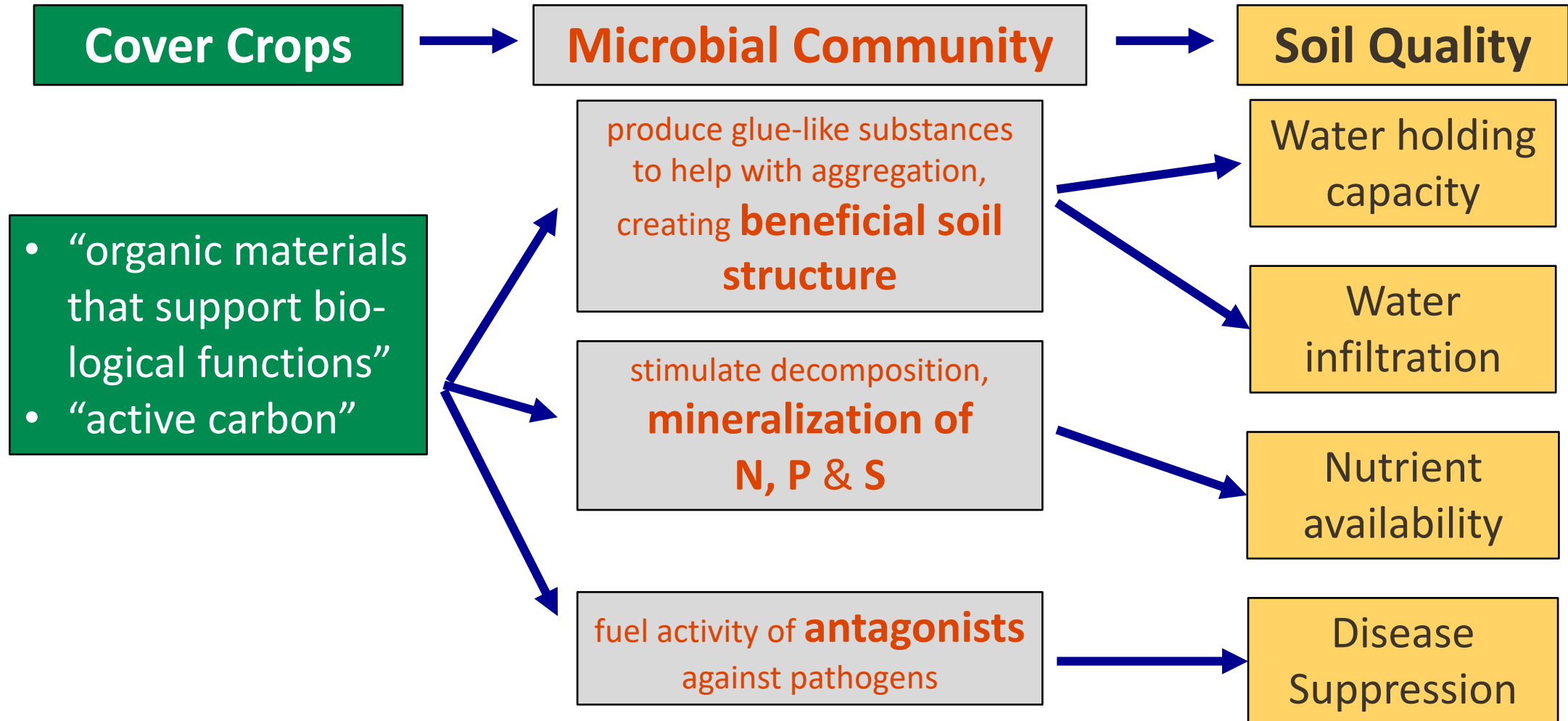
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- **Add carbon to the soil system -> including *active C***

How do cover crops support the system?



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- Short season cover crops before carrot, bluegrass or mint planting
- Overwintering cover crops that provide grazing
- Anecdotal evidence of increased water holding capacity or water infiltration, and improved yields



Planted May 14, picture taken
June 22...

< 6weeks of growth!





Planted May 1, picture
taken June 22...

Rolled and disked



Discussion with a couple neighbors...

- What appeals to you about using cover crops?
- What are your hesitations?

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- Objectives: Establishment, Weed suppression, Biomass production
- Different species/varieties, different planting times
 - Brassica, legume, grass
 - Spring, summer, fall planting

A photograph of a large agricultural field with rows of green cover crops. In the background, there are yellow-flowered plants, a brown field, and distant mountains under a blue sky. A white text box with orange text is centered over the green crops.

Spring Cover Crop Trial

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- Planted April 16, 2018, 2" soil temp 47°F
 - Organic fertilizer— applied 40lbs N/ac, 20lbs P/ac, 20lbs S/ac

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- 6 replicated species (3 reps), 6 demonstration plots
 - Planted with 5' drill, plots 10ft x 60ft

Spring Cover Crop Trial

- Species planted
 - 'Attack' Mustard
 - 'Anaconda' Radish
 - 'Caliente' Mustard**10lbs/ac**
- Crimson Clover – **20lbs/ac**
- 'Horizon' Spring Pea
 - Cereal Rye**70lbs/ac**

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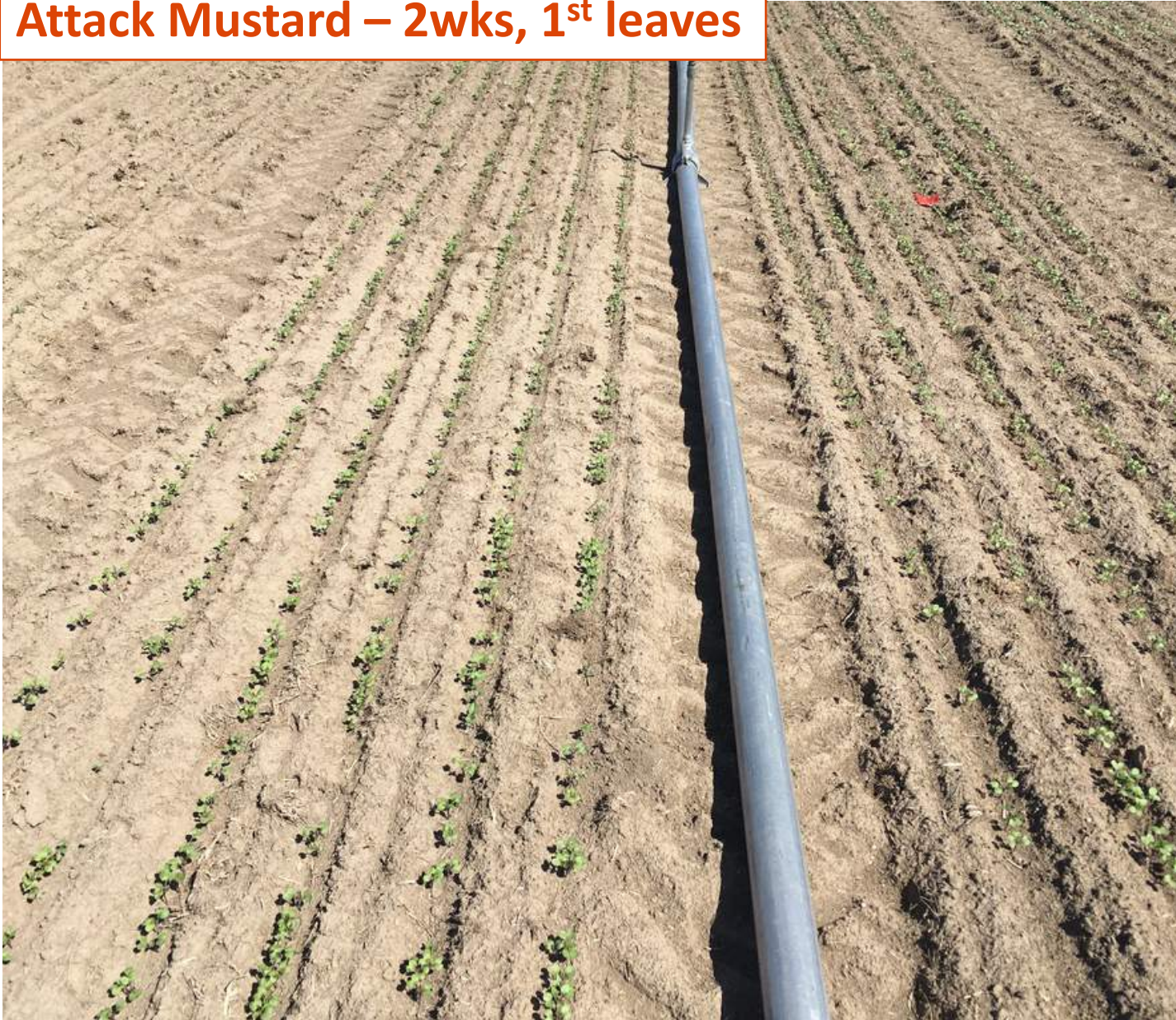


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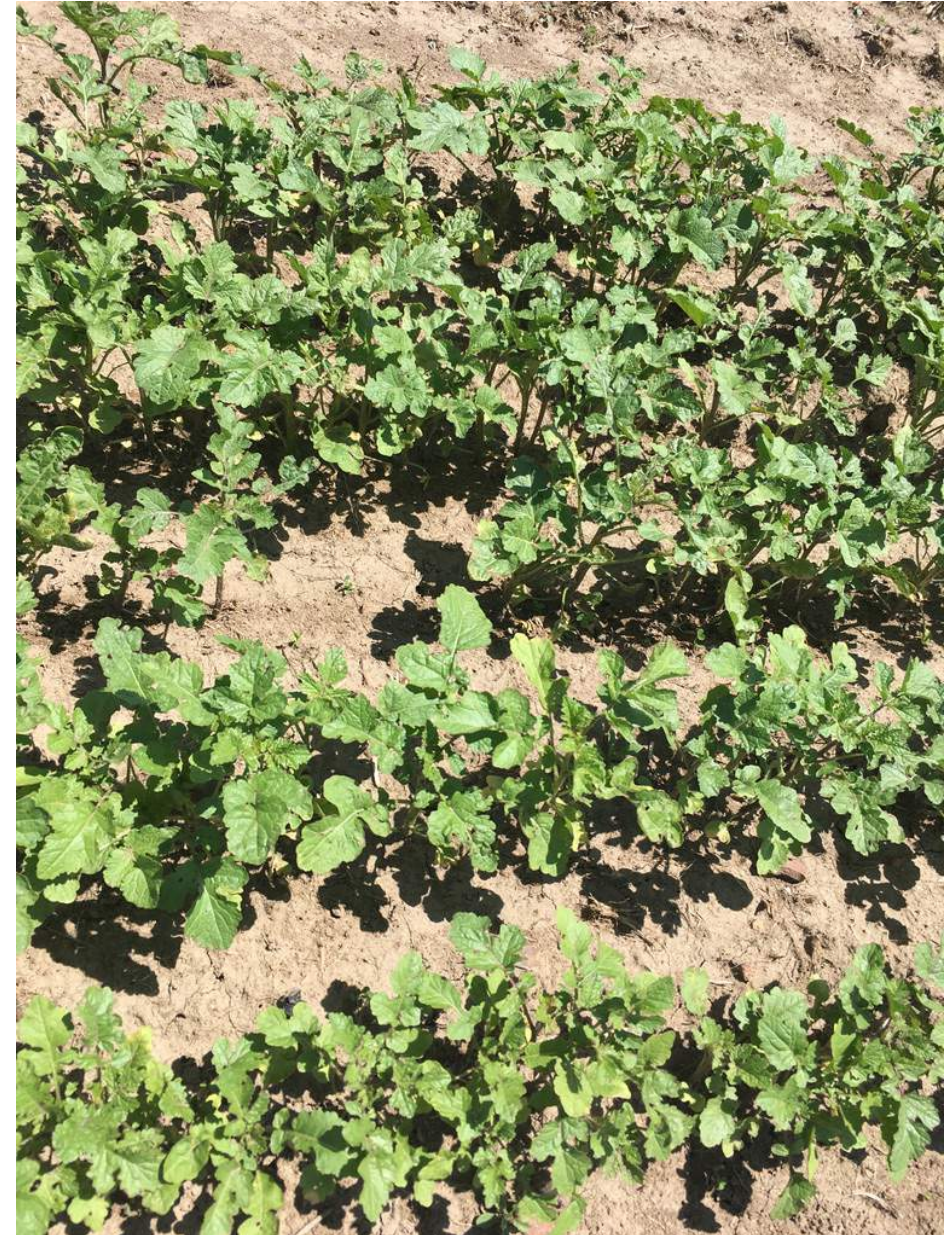
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Attack Mustard – 2wks, 1st leaves



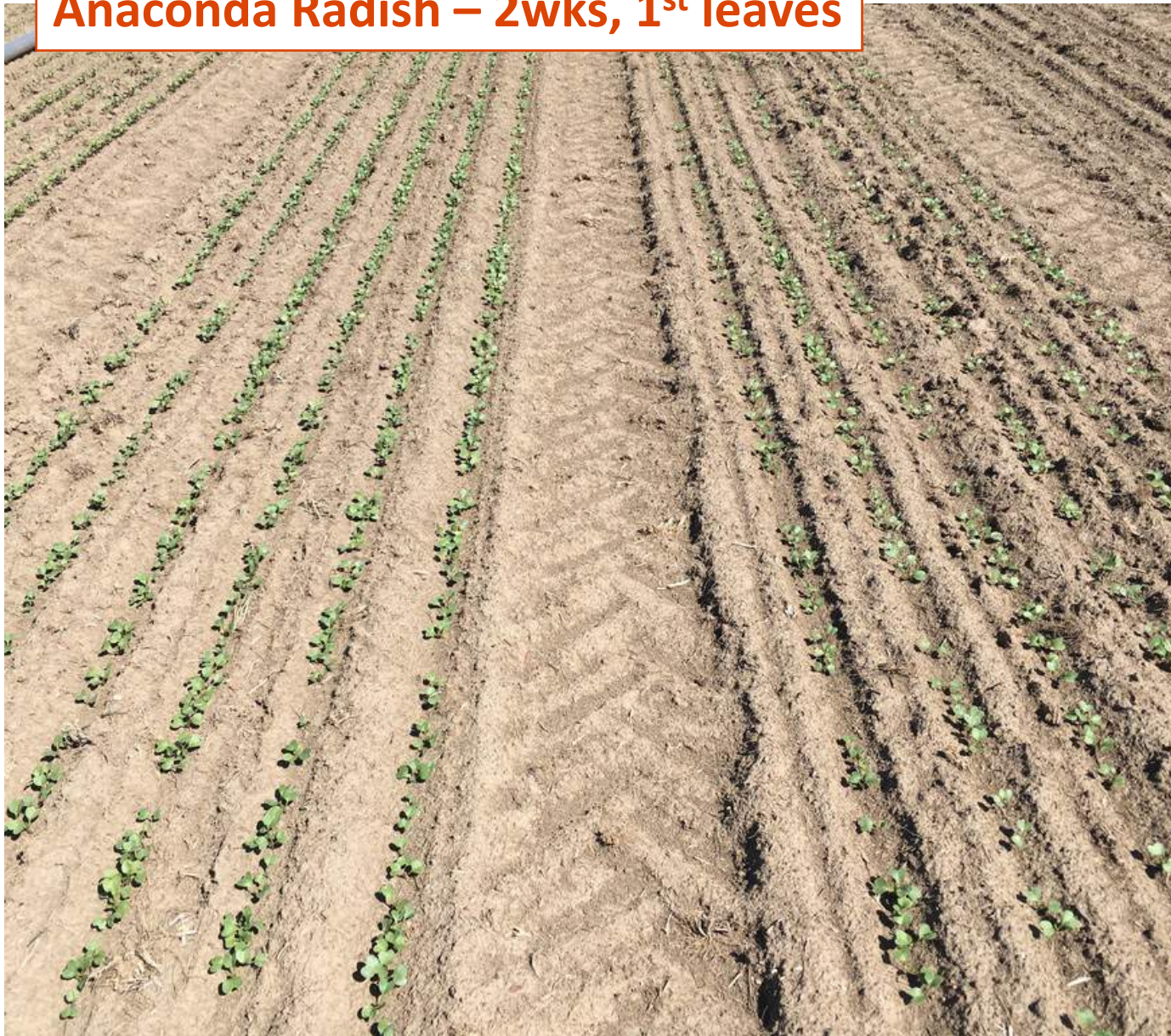
Attack Mustard – 4wks, ~6"



Attack Mustard – 8wks, ~40"



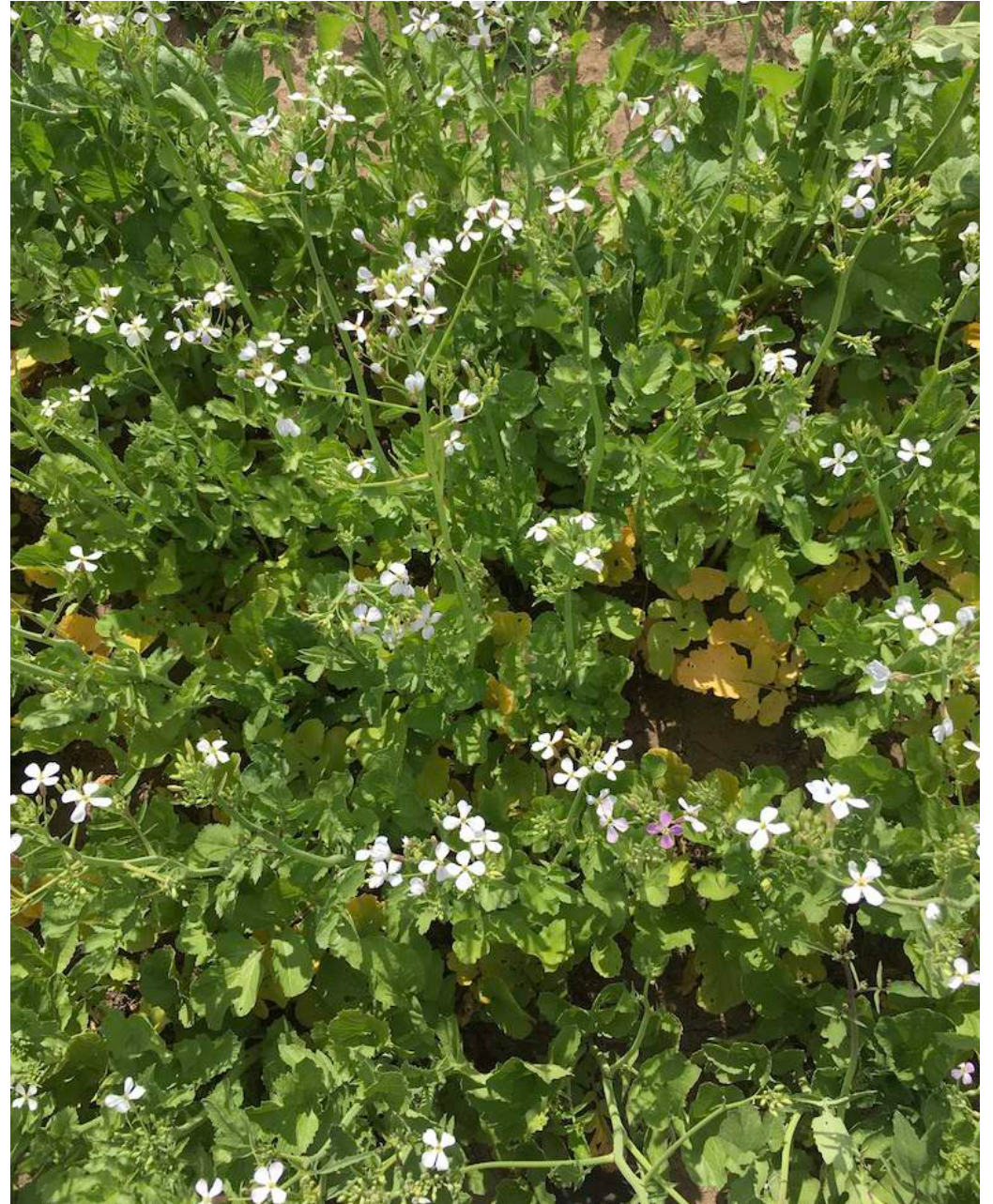
Anaconda Radish – 2wks, 1st leaves



Anaconda Radish – 4wks, ~5"



Anaconda Radish – 8wks, ~32"



Cereal Rye – 2wks, ~2.5"



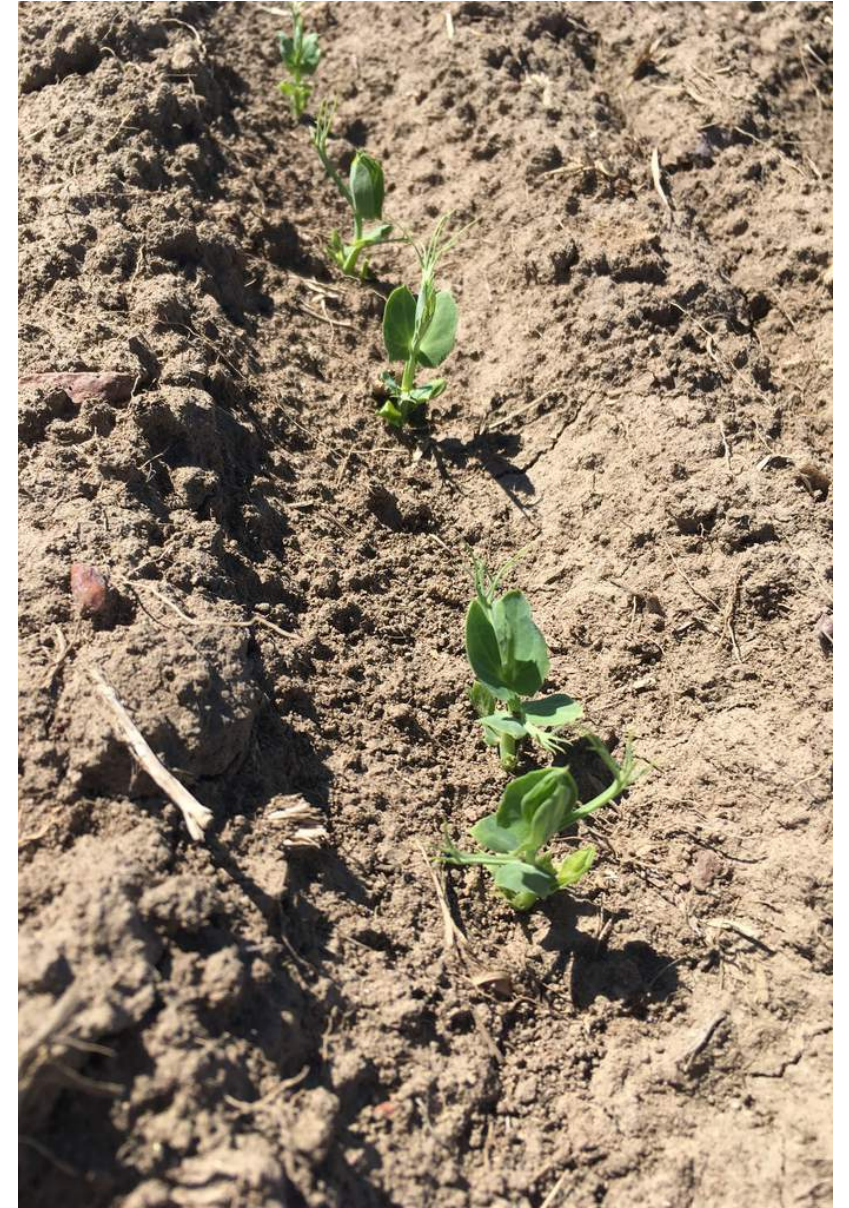
Cereal Rye – 4wks, ~4"



Cereal Rye – 8wks, ~8"



Spring Pea – 2wks, 1st/2nd shoot



Spring Pea – 4wks, ~6"



Spring Pea – 8wks, ~28"



Spring Trial – measurements taken

- Plant samples taken at full flower, two 0.5m² quadrats/plot
 - Mustard and radish plots sampled 8 weeks after planting (6/12/18)
 - Cereal rye and pea plots sampled 9 weeks after planting (6/19/18)
- Weed counts conducted at termination, two 0.5m² quadrats/plot
- Soil samples taken at termination and 2 weeks after termination

Spring Trial Results

Cover crop	Biomass (lb/ac)	Crop height (inches)	C to N ratio	Total N (lb/ac)	Weed count (plant/ft ²)
Mustard	2267	40	27	35	1.7
Radish	2322	32	23	39	0.6
Spring pea	2691	28	13	90	1.8
Cereal rye	1335	8	22	25	1.1

Spring Trial Results

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Mustard	
Radish	
Spring pea	
Cereal rye	



	Weed count (plant/ft ²)
	1.7
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- Attack mustard and Horizon spring pea plots had more upright growth habits that allowed for more weed growth

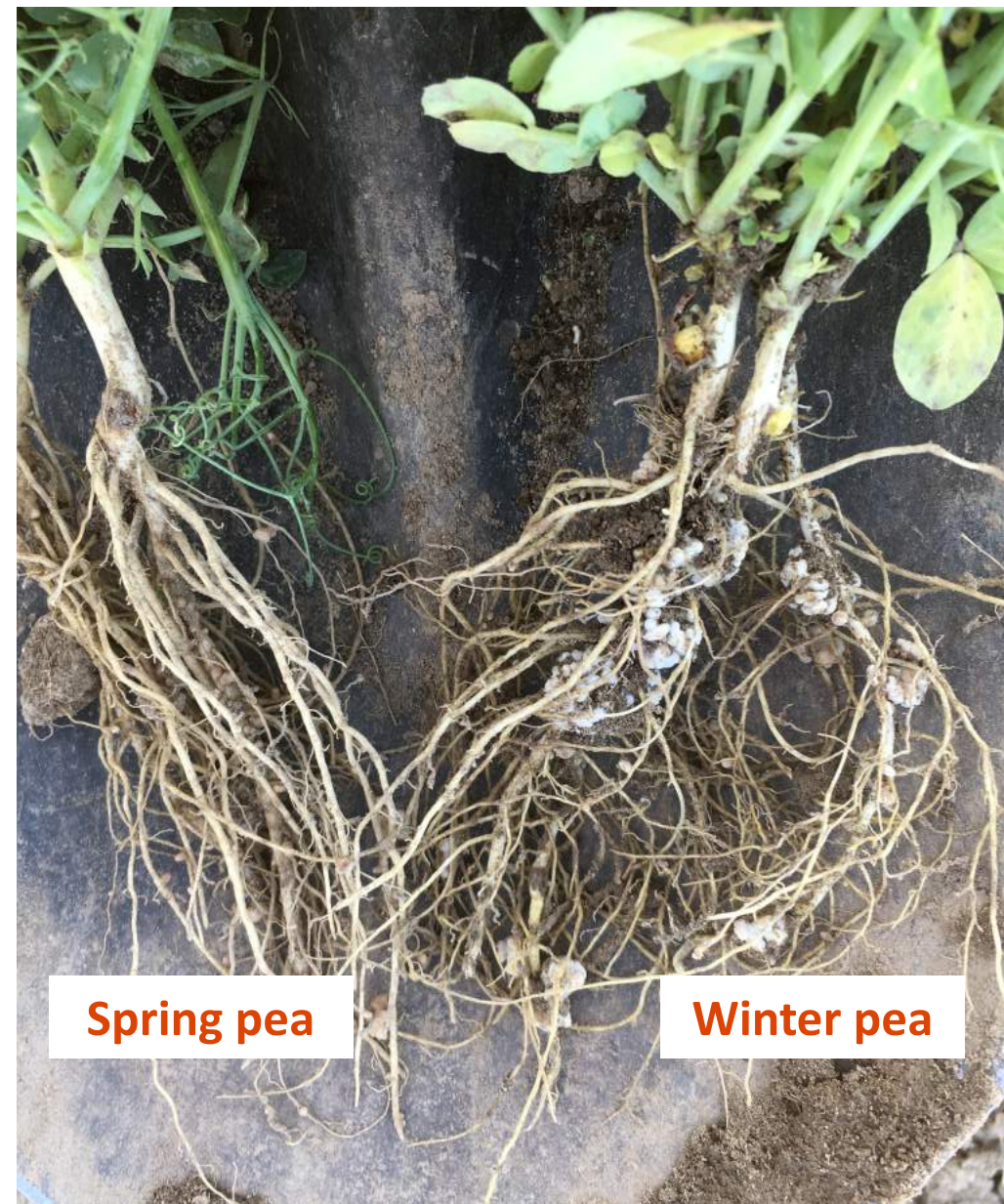
Spring Trial Results

- Austrian winter pea provided comparable biomass (2668 lb/ac) to the spring pea, and improved weed suppression (0.5 weeds/ft²)

Winter pea



Spring pea



Spring Trial Results

- Austrian winter pea provided comparable biomass (2668 lb/ac) to the spring pea, and improved weed suppression (0.5 weeds/ft²)
- Cereal rye/pea and mustard/radish mixtures did not produce as much biomass as the single species counterparts





A photograph of a summer cover crop trial field. The foreground is filled with rows of cover crops. On the left, there is a dense field of purple-flowered plants, likely vetch. To the right, there are rows of green, leafy plants, possibly sorghum or a similar cereal cover crop. The field is divided into sections by narrow paths. In the background, there is a flat landscape with some distant buildings and hills under a clear blue sky with a few wispy clouds.

Summer Cover Crop Trial

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- Planted June 6, 2018, soil temp 71°F
 - Organic fertilizer – applied 40lbs N/ac, 20lbs P/ac, 20lbs S/ac

Summer Cover Crop Trial

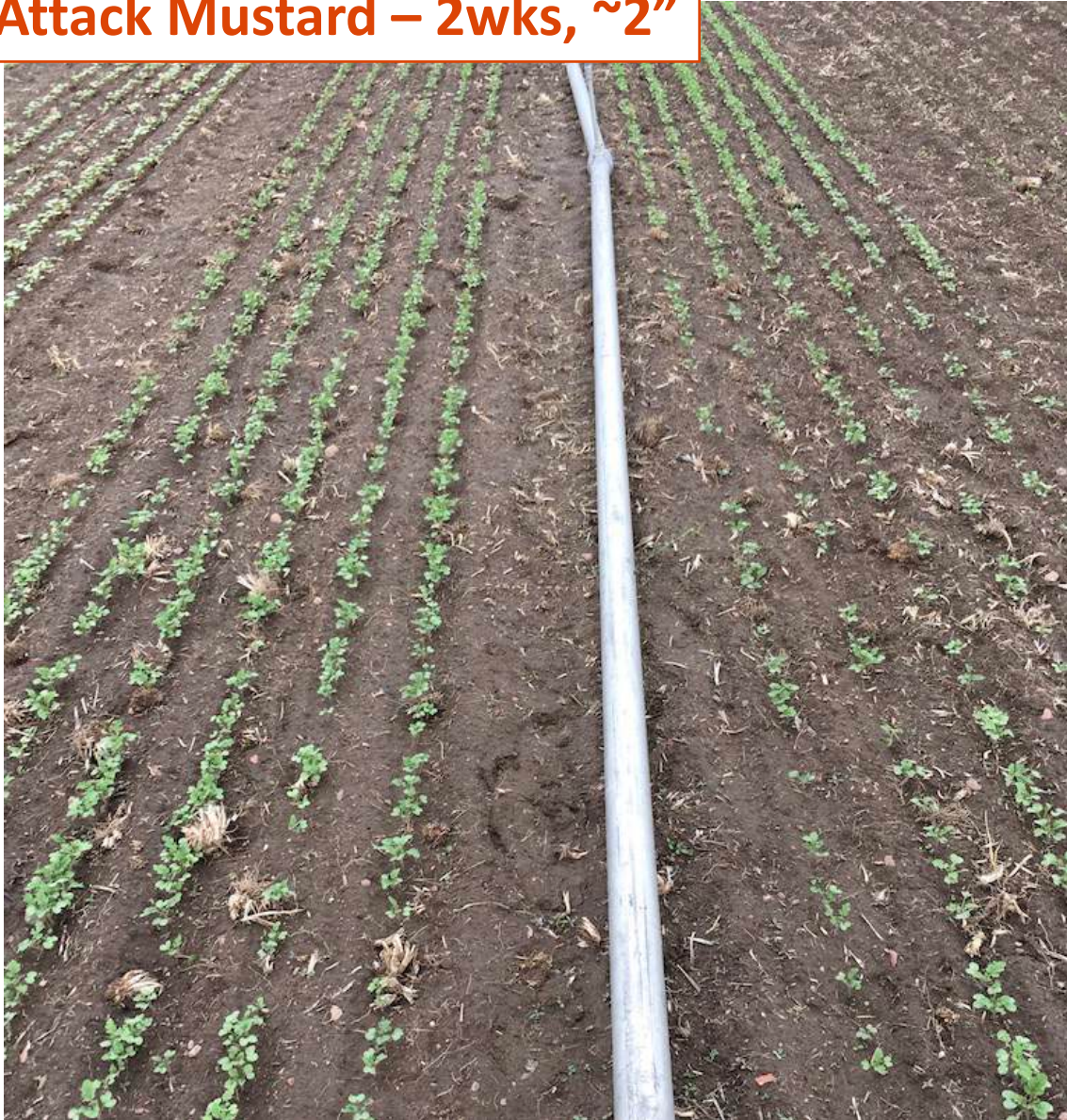
- Planted June 6, 2018, soil temp 71°F
 - Organic fertilizer – applied 40lbs N/ac, 20lbs P/ac, 20lbs S/ac
- 6 replicated species (3 reps), 6 demonstration plots
 - 3 fails: cowpea, sorghum, sunn hemp

Summer Cover Crop Trial

- Species planted (successful)
 - 'Attack' Mustard – **10lbs/ac**
 - Buckwheat– **60lbs/ac**
 - Phacelia – **5lbs/ac**
 - Sudangrass – **35 lbs/ac**



Attack Mustard – 2wks, ~2"



Attack Mustard – 4wks, ~14"



Attack Mustard – 7wks, ~38"



Buckwheat – 2wks, ~2"



Buckwheat – 4wks, ~12”



Buckwheat – 7wks, ~35”



Phacelia – 2wks, ~1"



Phacelia – 4wks, ~5"



Phacelia – 7wks, ~23"



Sudangrass – 2wks, ~2"



Sudangrass – 4wks, ~14"



Sudangrass – 7wks, ~46"



Summer Trial – measurements taken

- Plant samples taken at full flower, two 0.5m² quadrats/plot
 - All plots sampled 7 weeks after planting (7/25/18)
- Weed counts conducted at termination, two 0.5m² quadrats/plot
- Soil samples taken at termination

Summer Trial Results

Cover crop	Biomass (lb/ac)	Crop height (inches)	C to N ratio	Total N (lb/ac)	Weed count (plant/ft ²)
Mustard	1810	38	21	38	5.3
Buck wheat	2141	35	17	50	4.1
Phacelia	1750	23	17	39	2.8
Sudan grass	2096	46	35	26	4.0

Summer Trial Results

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- Summer annual weed pressure was very heavy, especially from redroot pigweed

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- Emergence was less successful in the summer planting than the spring trial, with several species struggling to establish well
- Summer annual weed pressure was very heavy, especially from redroot pigweed
- Of the four replicated treatments, buckwheat and sudangrass produced the most biomass (~2100 lb/ac)

Summer Trial Results

- All four species struggled to be as competitive against weeds as compared to the spring planting date, but phacelia provided the most weed suppression
- Caliente mustard in the demonstration plots produced the most biomass in the summer series (2850 lb/ac), and Anaconda radish provided the most weed suppression (<2 weeds/ft²)

Trial Thoughts So Far...

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- Anaconda radish and Austrian winter pea great spring choices for weed suppression
- Summer cover crops have advantage of fitting in a tight growing window, but weed competition is more of a challenge
- Buckwheat and sudangrass both good biomass options, buckwheat more \$ but offers pollinator benefit
- Crimson clover not suited as short season cover crop

Fall Trial

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- Planted September 14, 2019
- 8 replicated treatments that are single and mixed species of legumes, brassicas, and cereals
- Seeing which species/varieties overwinter, will take in depth soil measurements in spring

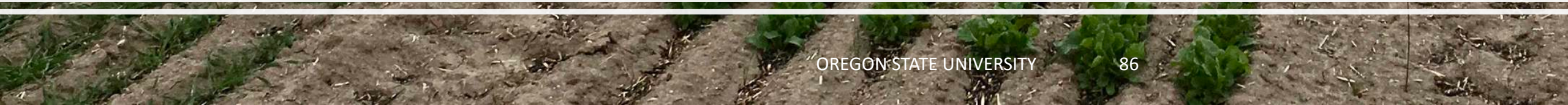


Fall Trial





Cover crops: a technology to supply soil with active carbon



Cover Crops and Soil Quality

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- Conduct a comprehensive soil quality assessment spanning the full range of physical, biological and chemical soil properties
- Goal to develop a type of ‘cover crop **technology**’:
 - system of interdependent decision tools based on a thorough understanding of the underlying processes of how a certain cover crop improves certain soil functions

Next Steps

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- Develop an **efficient cover crop technology** that:
 - Aims to address not just one soil deficiency but a multitude of benefits
 - Closely matches the rotations, soils, climate & economic constraints of region

Next Steps

- Continue and initiate research related to cover crops and soil quality
- Intention of working directly with growers and industry on research to develop needed technologies
- Specifically interested in working with a group of growers with similar rotations for on-farm research – please let me know!

Next Steps

- Continue and initiate research related to soil quality, right here in Jefferson County
- Intention of working directly with growers and industry on research to develop needed technologies
- Desire to collaborate with growers & industry using ***participatory research*** – make new steps

Questions?



Thank you for your attention!

Clare Sullivan

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