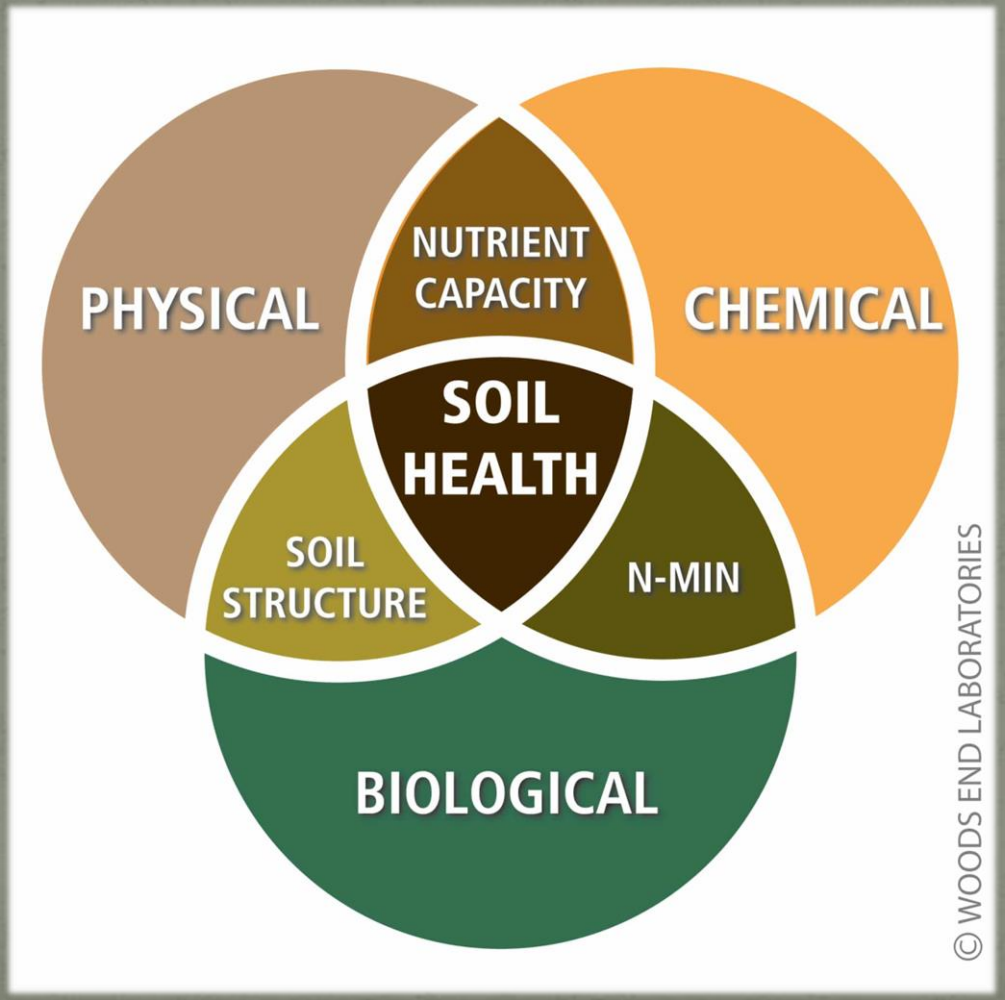
Soil Health in Utah

What is working, What's Not.

Tony Richards
Resource Coordinator Zone 1

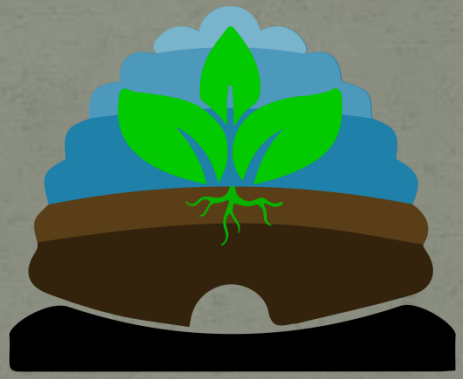
Soil Health ?


PHYSICAL
NUTRIENT CAPACITY
CHEMICAL
SOIL HEALTH
SOIL STRUCTURE
N-MIN
BIOLOGICAL
© WOODS END LABORATORIES

Principles of Soil Health

- **Maximize Soil Cover**
- **Minimize Soil Disturbance**
- **Maximize Biodiversity**
- **Keep a Living Root**
- **Integrate Livestock**

Soil Health in Utah?



Utah Soil Health Partnership

Working Together to Improve Utah's Soils

EXTENSION

UtahStateUniversity

BUILDING KNOWLEDGE.
IMPROVING LIVES.

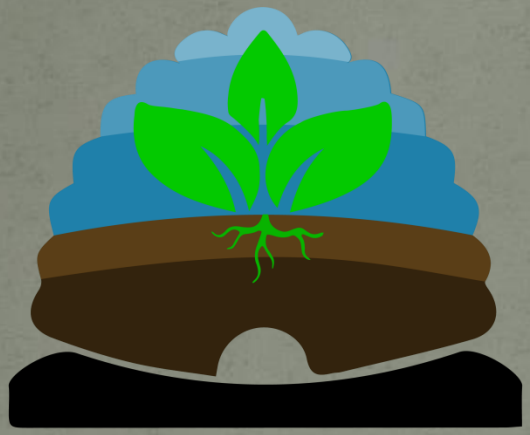
UACD

Utah Association of Conservation Districts

WESTERN SARE

Sustainable Agriculture Research & Education

Utah Soil Health Partnership



Utah Soil Health Partnership

Working Together to Improve Utah's Soils

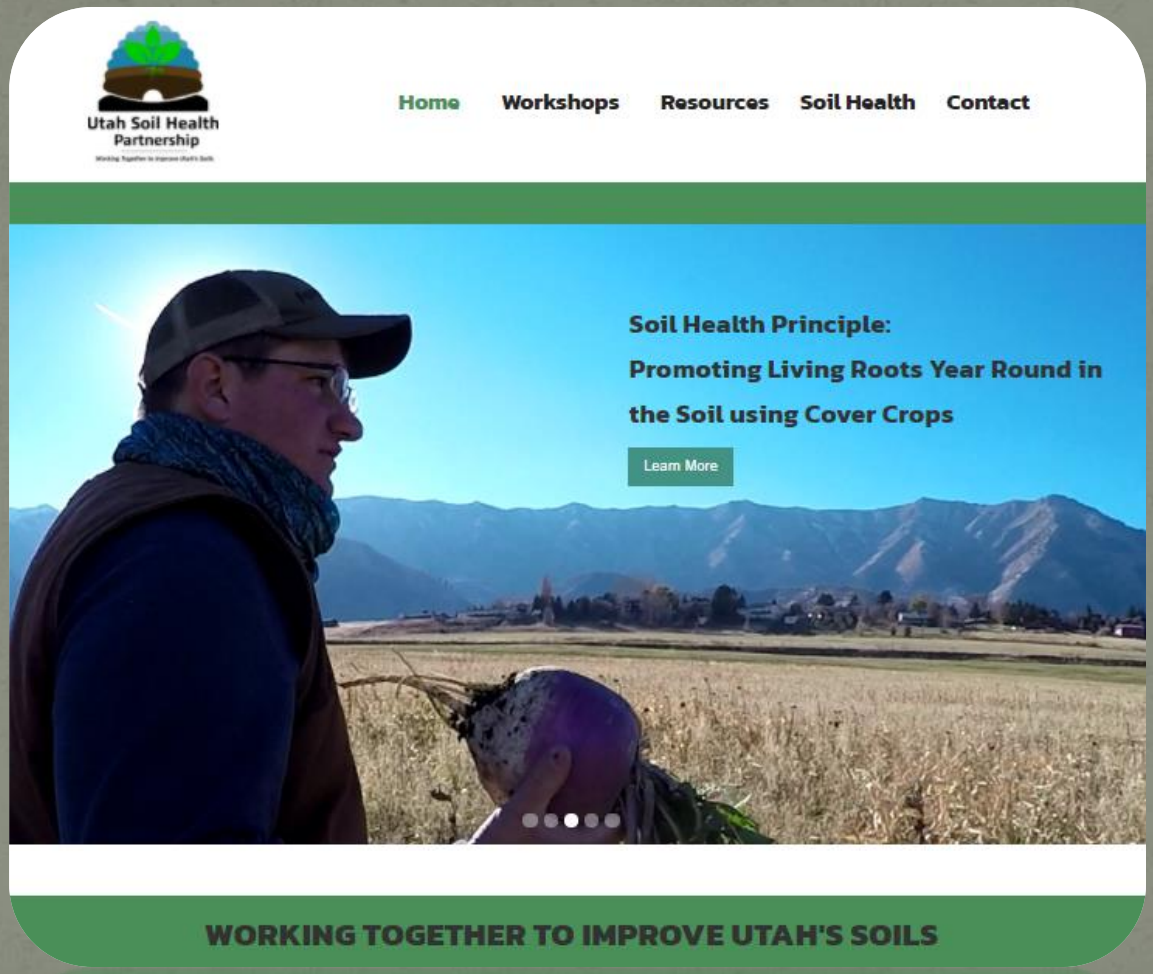
Mission

- Improve and protect Utah soils through building localized knowledge and collaborative research of soil health principles

Objectives

- Bring together farmers, agencies, industry and others in collaborative effort to move soil health forward in Utah.
- Research and evaluate soil health practices for their local applicability.
- Build a network of on-farm research and demonstration sites to evaluate and demonstrate soil health principles at work through Utah.

www.utahsoilhealth.org



Soil Health in Dryland Crops

- Wheat / Fallow System
  - Converted to No-Till
  - Replaced Fallow with Cover Crops
  - Integrate Grazing
- Soil Moisture Sensors
  - Installed at 4”, 12”, 24”
    - Control plot / Cover Crop plot
    - Since 2018

Soil Health in Dryland Crops

- Cover Crop
  - $34/ac seed cost
  - 45 lb /acre
  - Planted October following wheat

SPECIES	LBS/ACRE
Hairy Vetch CS-B | Full: 19 | 12k/lb | $1.90/lb	4.75
Winter Peas CS-B | Full: 48 | 4k/lb | $0.50/lb	12
Cereal Rye -northern CS-G | Full: 77 | 22.1k/lb | $0.22/lb	19.25
Forage Collards CS-B | Full: 8 | 175k/lb | $1.90/lb	2
Flax CS-B | Full: 29 | 83.0k/lb | $0.60/lb	7.25

Soil Health in Dryland Crops

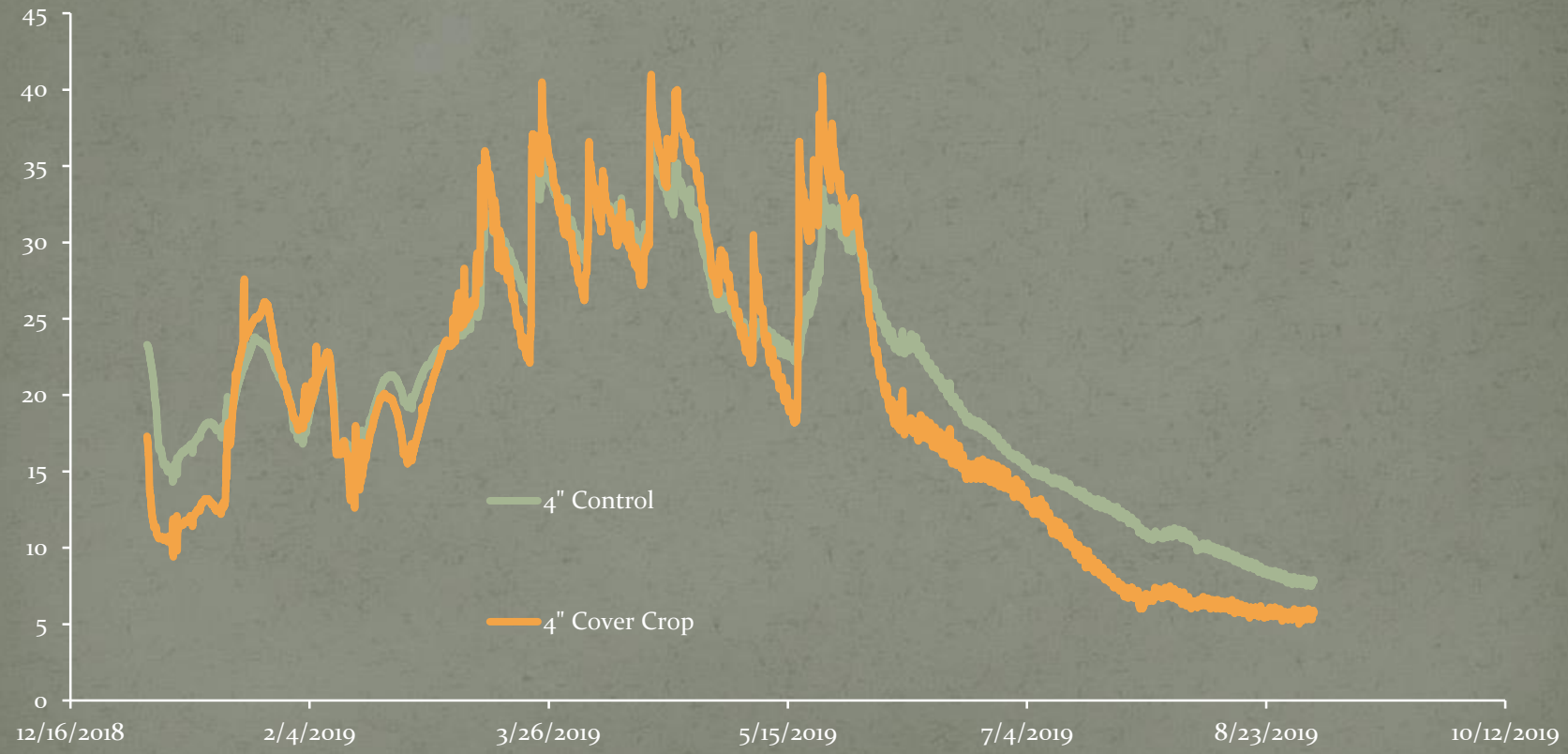
- Cover Crop Planted Fall 2018

Cover Crop Growth 4-24 to 5-23

Yield: 1.25 ton/ac (hayed)
Originally was to be grazed. haying was delayed caused volunteer seed issue.

Soil Health in Dryland Crops

- Soil Moisture / Infiltration During Cover Crop



Soil Health in Dryland Crops

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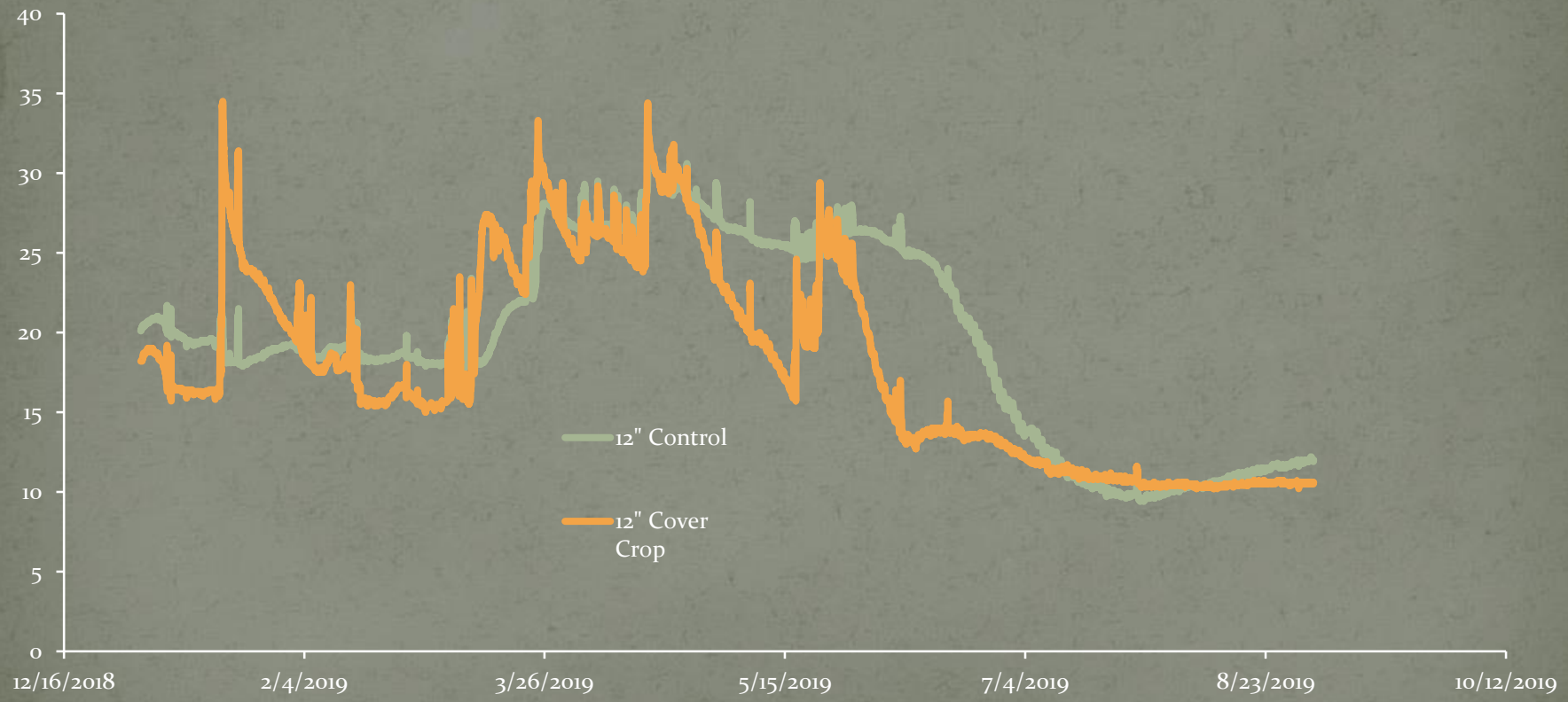

Soil Health in Dryland Crops

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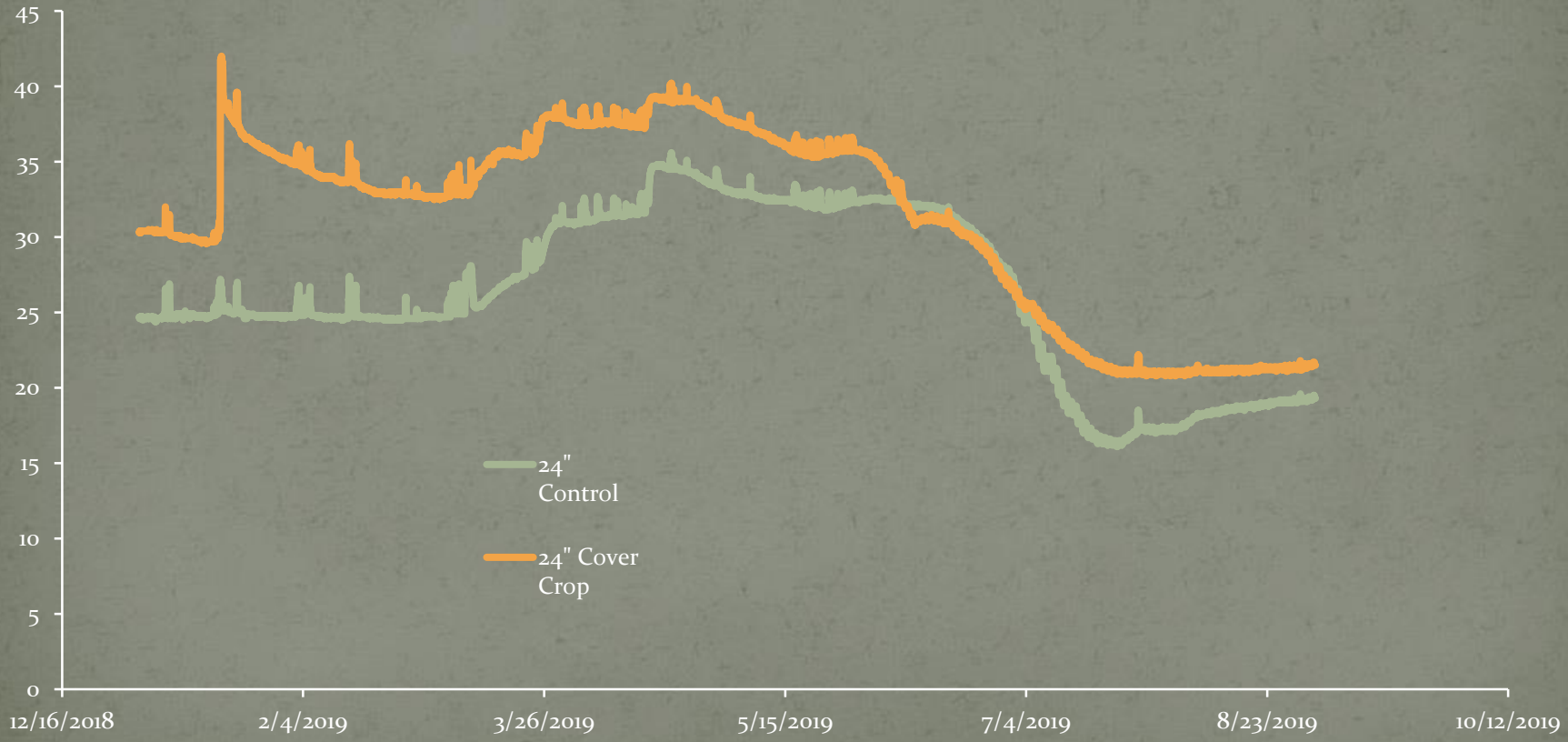
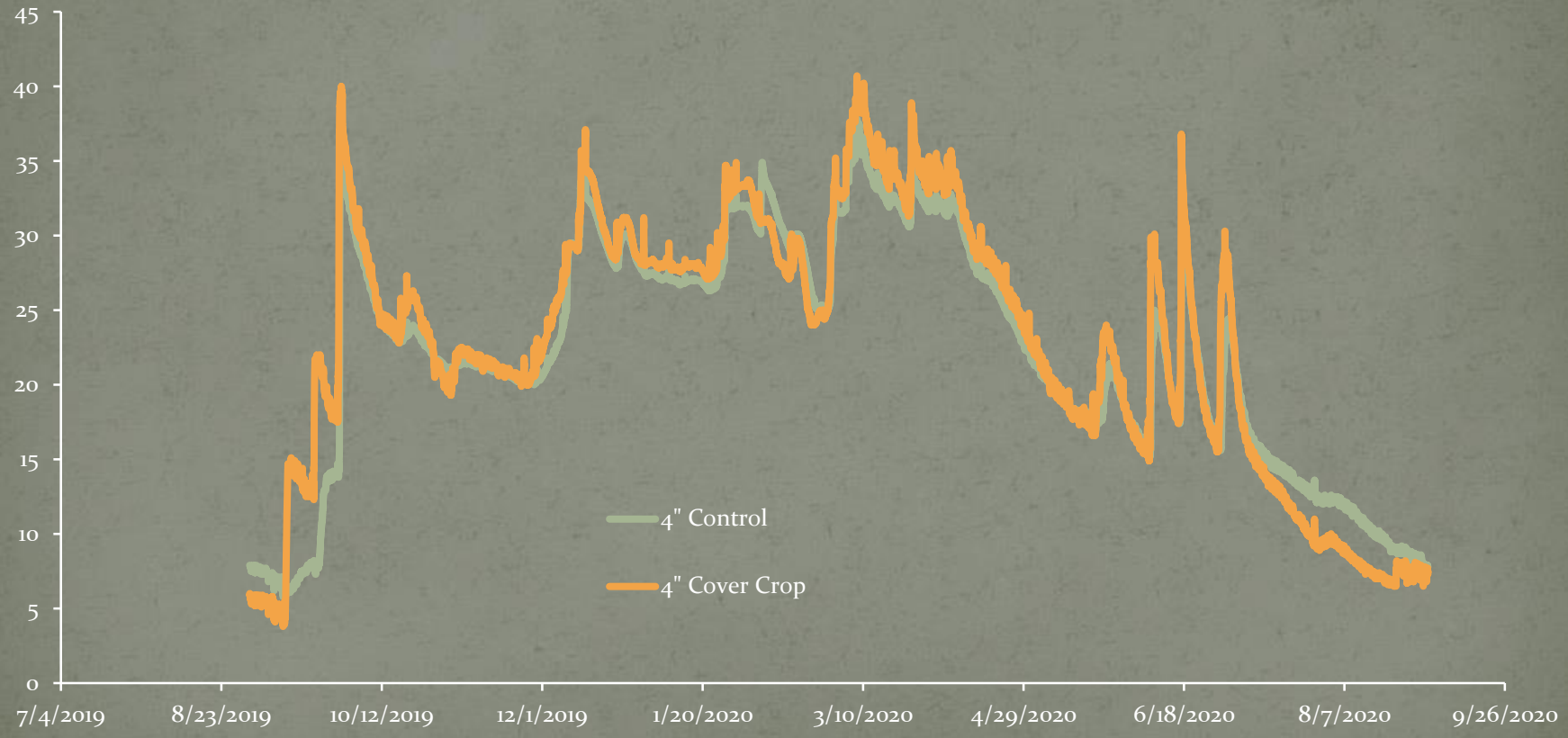


Soil Health in Dryland Crops

- Soil Moisture / Infiltration during Winter Wheat



Soil Health in Dryland Crops

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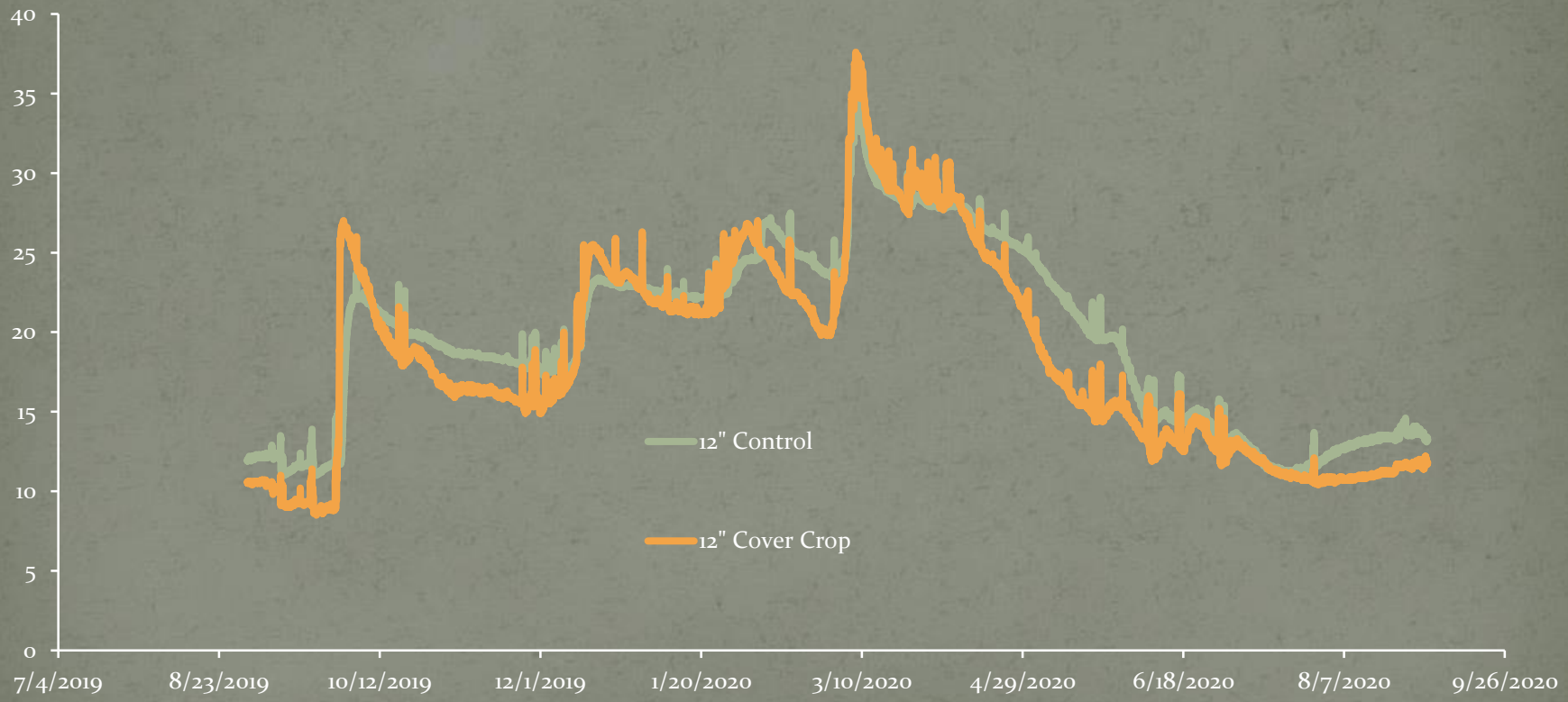


Soil Health in Dryland Crops

- Soil Moisture / Infiltration during Winter Wheat

Soil Health in Dryland Crops

- Winter Wheat Yield 2020
  - Control Plot : 10 bu /ac
  - Cover Crop Plot: 12 bu/ac
- Cover Crop net income $78/ac

- Issues
  - Volunteer from cover crops
    - Triticale
    - Rye
  - Weed issues from annual grasses from conversion to no-till

- Lessons Learned
  - Be flexible and have multiple termination options available
  - Keep dryland cover crop price $20 / acre or less

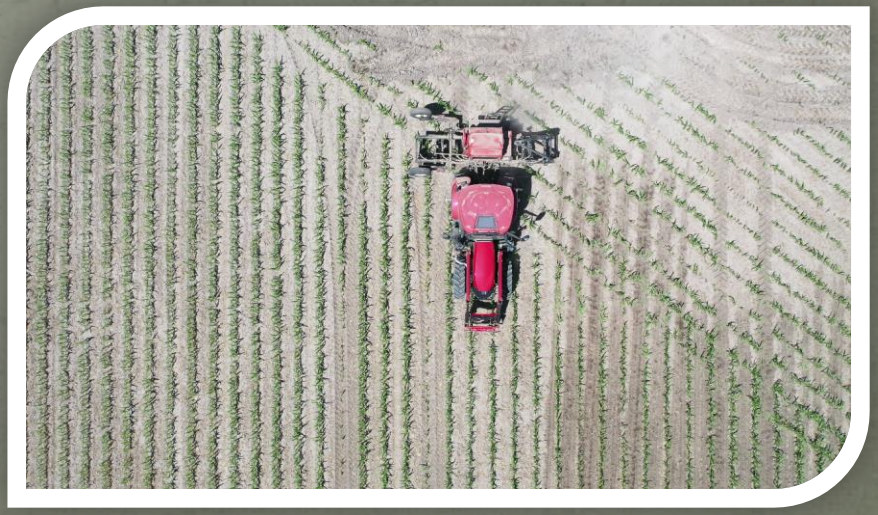
Interseeding Cover Crops in Corn

- 20020 – Planted 300 acres
  - on 10 Farms in Cache Valley
- 18 lbs /acre mix
  - $30 per acre
- Cover Crop Planted 2nd week of July
  - Corn v4-v6 stage

Interseeding Cover Crops in Corn

Interseeder

- 15ft wide
  - 12 Cover crop rows between 6 corn rows
- Pneumatic Seeder
  - Double disk openers



Interseeding Cover Crops in Corn

- Purpose
  - Increase biodiversity
  - Keeping a living root
  - Provide additional forage
  - Weed Control
  - Nutrient Retention and Cycling

Interseeding Cover Crops in Corn

20 days after planting

43 days after planting

75 days after planting

Interseeding Cover Crops in Corn

Harvest

Interseeding Cover Crops in Corn

After Harvest

10/13/2020

10/21/2020

Interseeding Cover Crops in Corn

- Grazing
  - Increases nutrient cycling
  - Increases soil biology
  - Increases profitability

	Not Grazed	Grazed
Total Microbes ng/g	1823.21	3750.53
Diversity Index	0.991	1.639
Total Bacteria	669.29	2047
Gram +	550.49	1091.88
Gram -	118.8	956
Total Fungi	26.6	553.52
AMF	0	150.77
Saprophytes	26.6	402.75
Protozoa	0	83.9

Interseeding Cover Crops in Corn

- Lessons Learned
  - Timing is critical
  - Optimum **v4**-v6

Interseeding Cover Crops in Corn

- Lessons Learned
  - Seed Depth
  - Soil Contact
  - Row Placement

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Summer Cover Crop for Grazing

- Spring Cover Crop
  - Planted instead of spring wheat (followed corn)
- $39 / acre in seed
- Planted 20 acres
- Cover Crop Induced
  - Balansa Clover
  - Hairy Vetch
  - Pearl Millet
  - Grazing Corn
  - Sorghum
  - Teff
  - Italian Ryegrass
  - Diakon Radish
  - Turnip
  - Collards
  - Buckwheat

Summer Cover Crop for Grazing

- Grazed Aug 3rd
  - Duration for 7 days

Summer Cover Crop for Grazing

- Grazed Aug 23rd
  - Duration 10 days

Summer Cover Crop for Grazing

- Total of 17 days of grazing
  - 100 head of late lactation cows
- Gained additional 5 lbs / day in milk
  - Est. Extra 85 cwt of milk
- $779 in seed cost vs $1,105 in extra milk ($13/cwt)

Summer Cover Crop for Grazing

- Lessons Learned
  - Teff Grass was mature by the time started grazing (low utilization)
  - Observing a reduction in corn root worm pressure following a grass cover crop.

Summer Grazed 8 Way / No-till Corn

- 8 Way Mix planted spring after winter grazing.
  - No Fertilizer added
  - Irrigated 3 times
  - No-tilled

Summer Grazed 8 Way / No-till Corn

- 8 Way Mix $48/ac seed + planting
- 50% Grass 50% Legumes
  - Sorghum Sudan
  - Cow Peas
  - Common Vetch
  - Berseem Clover
  - German Millet
  - Buckwheat
  - Sun Hemp
  - Teff
  - Kale
  - Forage Collards

Summer Grazed 8 Way / No-till Corn

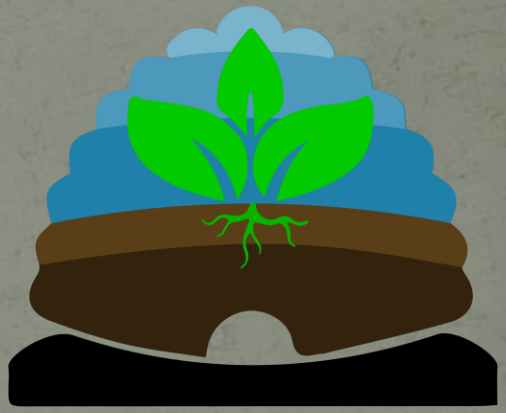
- Forage yield
  - 12 ton/ac (50% moisture)
    - 7 ton/ac (15% moisture)
- Total Cost $148 / acre
  - Includes land rental, seed, and labor.
    - Feed cost of $21 per ton
  - Produced 90 lbs beef / acre
    - Direct Marketed

Summer Grazed 8 Way / No-till Corn

- No-till Corn planted 2nd year following 8 way mix
  - No Starter Fertilizer added
  - Only 90 unit of N applied with irrigation around tasseling
- Yield 196 bu/ac
  - 1/3 of the fertilizer used 4 yrs ago.

Looking Forward

- Dryland Soil Health and Water Quality Project in Clarkston / Netwon Watershed
  - Effects on Soil Moisture / Infiltration, Water holding capacity and aggregate stability
- Using Interseeded Cover Crops to Address Phosphorus Loading
  - AFO / CAFO nutrient management
- No-till vegetable production
  - No-till transplanter
  - Cover Crops / Roller Crimper
- Utah Soil Health Network
  - 16 statewide on-farm demonstration sites
  - Agronomic and economic data collection



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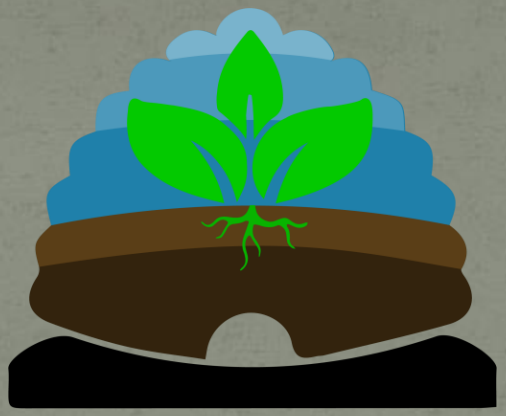
Soil Health Equipment Rental

- Blacksmith Fork CD
  - No-till Drill
  - Range Drill
- North Cache CD
  - Interseeder
- Northern Utah CD
  - No-till Drill
  - Range Drill
- Weber/Davis/Morgan CDs
  - Interseeder
- Price River CD
  - No-till Drill
  - Aerator
- San Juan CD
  - Aerator
- Green River CD
  - No-Till Drill
  - Flex Wing Mower
- San Rafael CD
  - 2 No-till Drills
  - Pasture Reconidtioner
- Twin M CD
  - No-Till Range Drill
- Dagget
  - No-Till Drill
- Duchesne
  - 2 No-till Drill
- Uintah CD
  - No-Till Drill
- Sevier CD
  - No-Till Drill
- Piute CD
  - No-till Drill
- Sanpete CD
  - 2 No-till Drill
  - Range Drill
- Kamas CD
  - No-till Drill



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Questions?