Potential of Oregon Croplands to Sequester Carbon and Reduce GHG Emissions

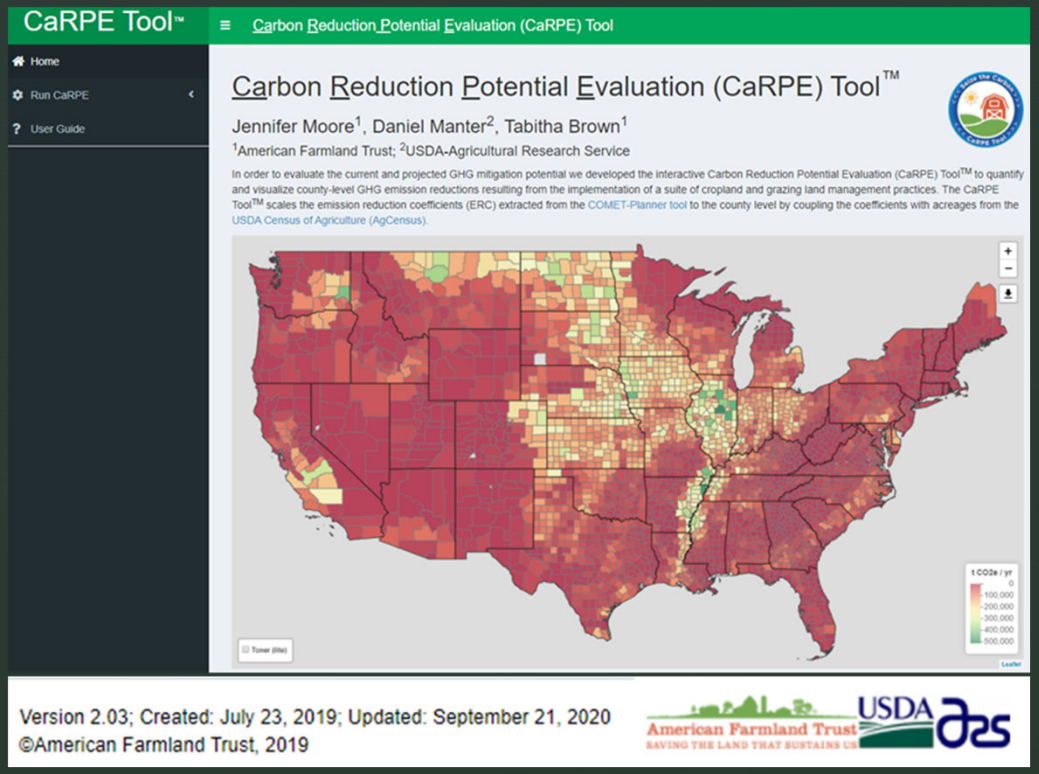
Jennifer M. Moore, Ph.D.

Oregon Global Warming Commission Meeting, 16 April 2021

Sound Management of our Soils Can Help Mitigate Climate Change

- Increase plant productivity throughout the year and protecting the soil increases C sequestered.
- How much and how quickly is dependent on soil type, climate, management, topography, etc.
- Co-benefits include positive impacts on air & water quality (& quantity) & overall resilience.

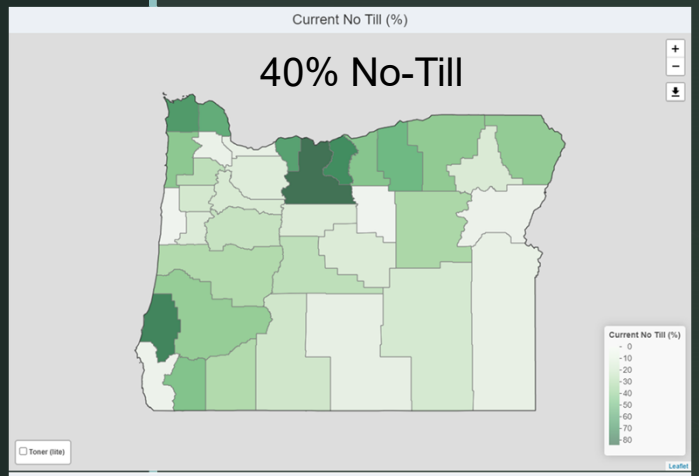
Carbon Reduction Potential Evaluation (CaRPE) Tool

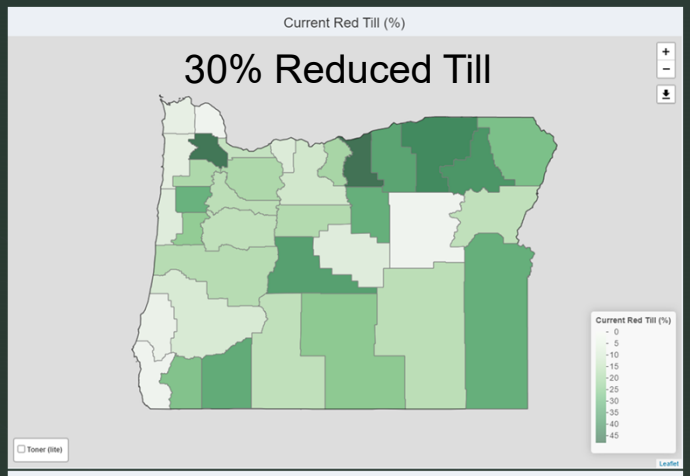


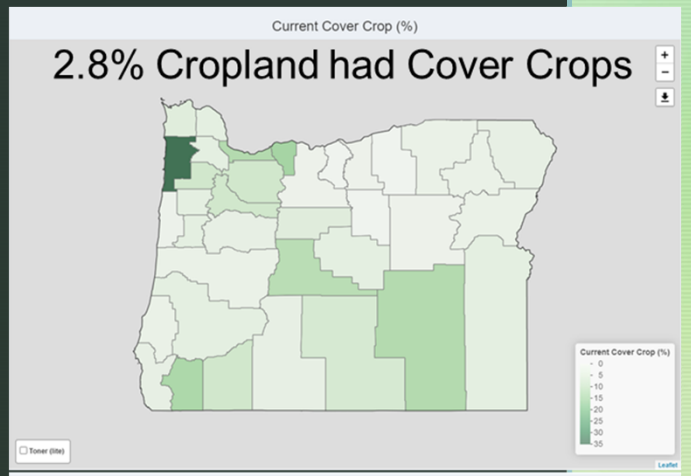
- Couples COMET-Planner with AgCensus Data
- Quantify adoption & emission reduction potential
- Visualize results to help inform action

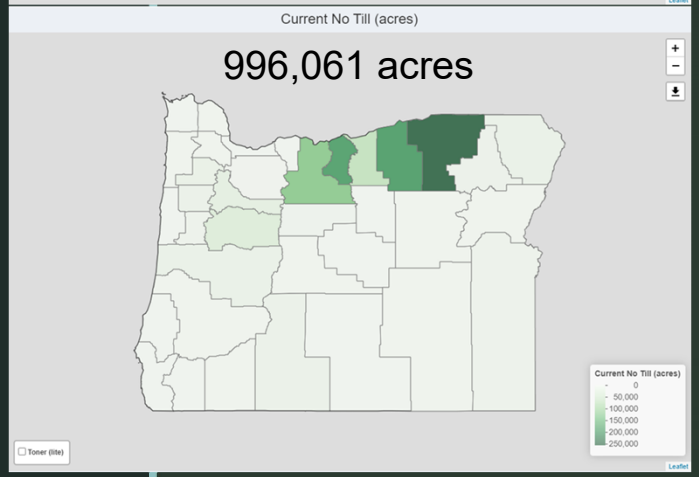
https://carpe.shinyapps.io/CarpeTool/

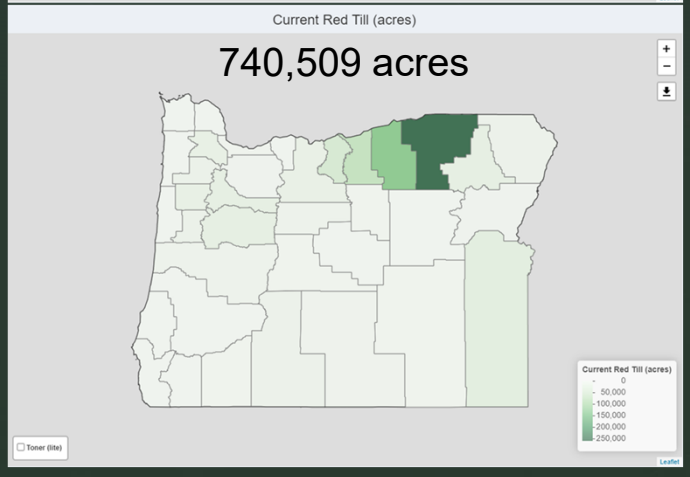
2017 No-Till, Reduced Till, & Cover Crop Adoption

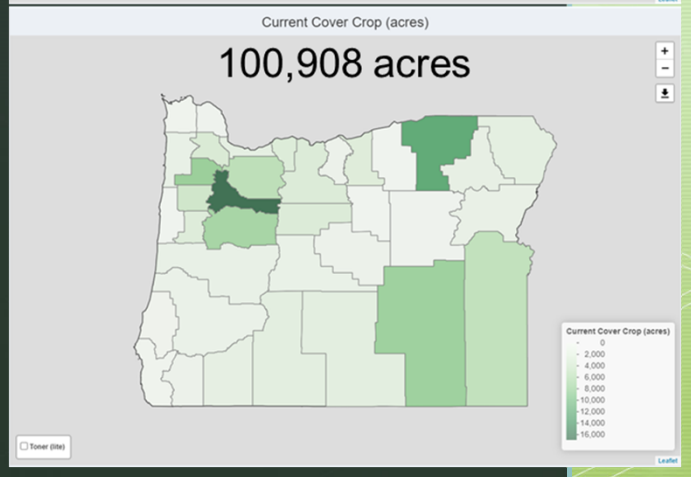




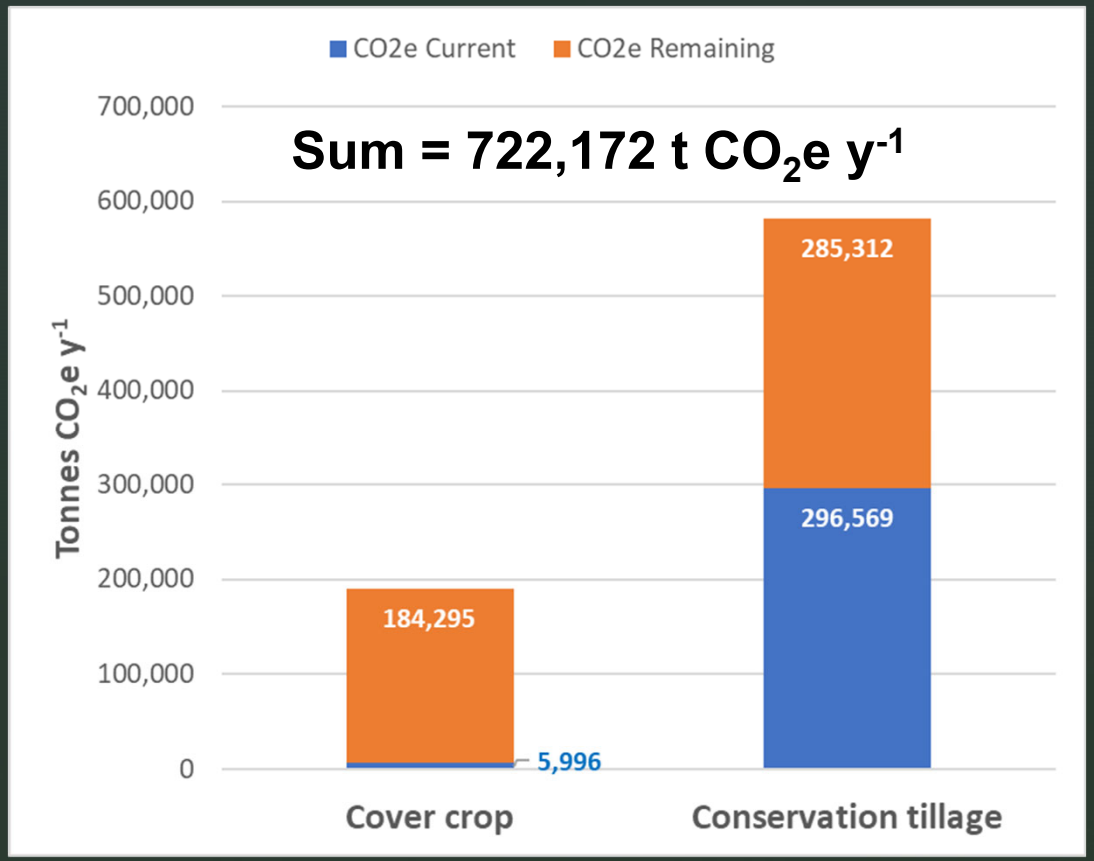




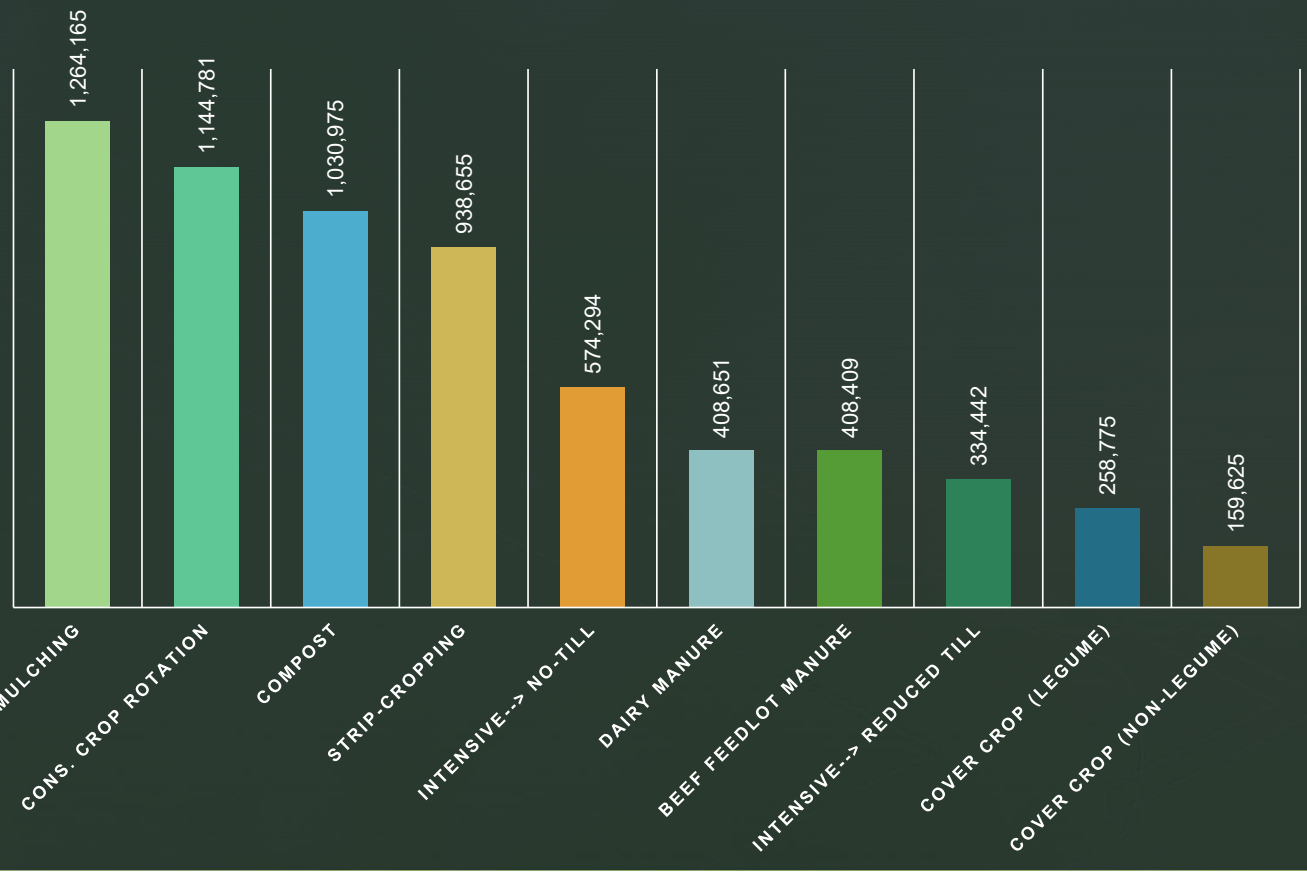




Theoretical Maximum CO_2e Reduction Potential (Tonnes per year)



Theoretical Maximum CO_2e Reduction Potential (Tonnes per year)



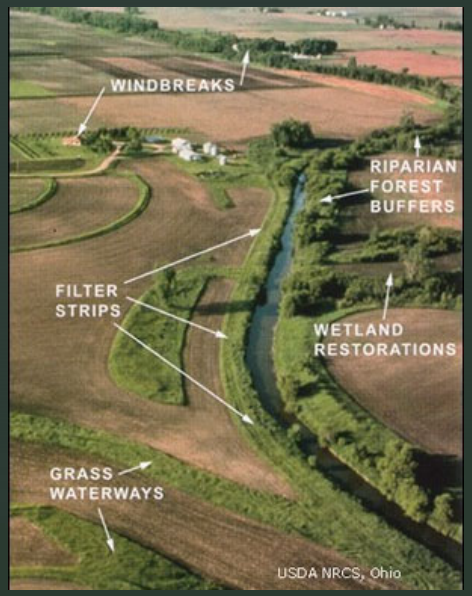
Row crop scenario with 7 conservation practices on a total of 1.2 million acres

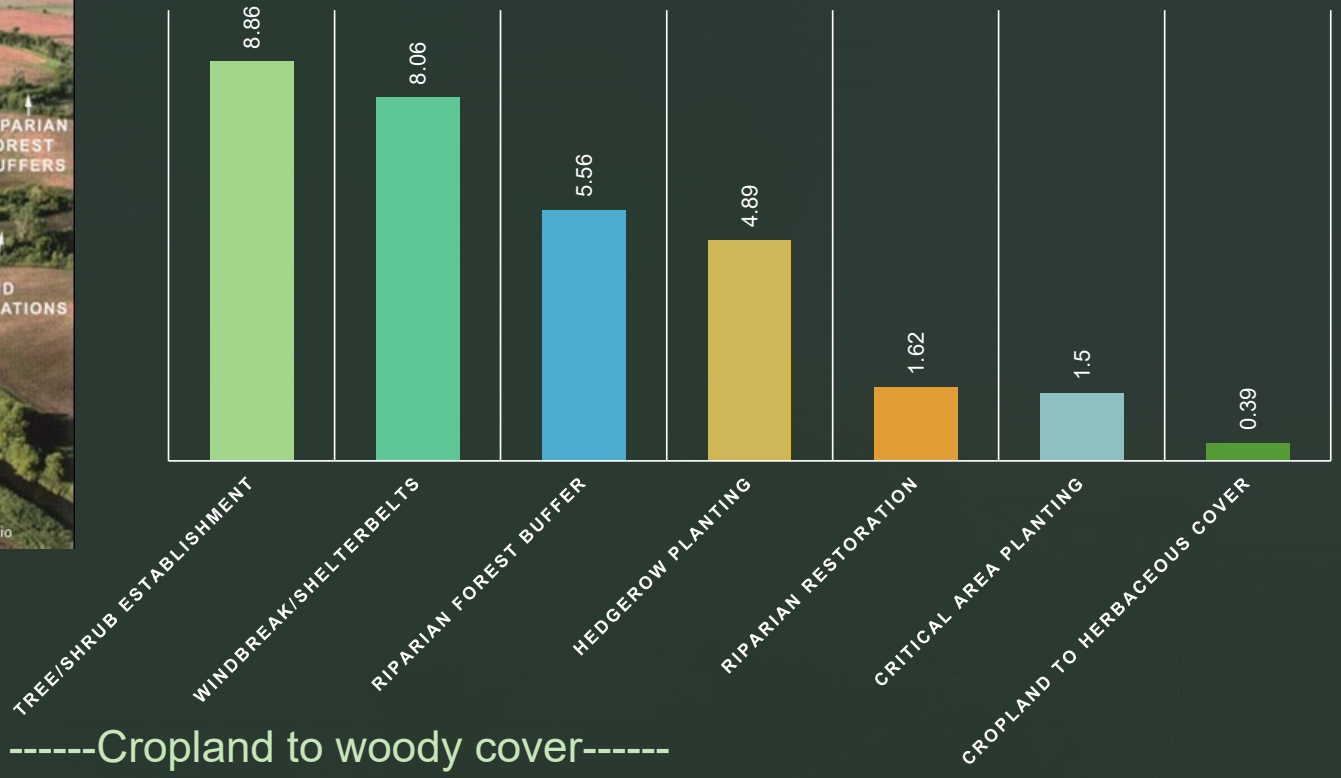
Practice	Scenario acres	% of Selected Acres	CO_2e (tonnes y^{-1})
No-till	498,587	50	107,598
Conservation crop rotation	199,435	20	48,627
Mulching	99,717	10	26,220
Cover crop (25:75)[1]	249,294	25	12,166
Stripcropping	49,859	5	9,738
Dairy manure[2]	99,717	10	9,288
Compost 20:1	49,859	5	8,995
Sum	1,246,468	N/A	222,633

Total is equivalent to C sequestered by 3.7 million tree seedlings grown for 10y or to removing over 48,000 cars from the road for 1 year

Restoration Practices & Converting Marginal Cropland to Woody or Herbaceous Cover

(Tonnes per acre per year)





------Cropland to woody cover------

Ecological and Economic Benefits from Cover Cropping and Nutrient Management: IL Corn-Soy Case Study (825 ac)

Drill for cover crop seeding

Earthworms on a root ball

Soil Health Case Study

Jim, Julie, and Josh Ifft, Ifft Yorkshires, IL

FEBRUARY 2020

Introduction

Jim Ifft started farming in 1975 and currently farms with his wife, Julie, and son, Josh. The family grows corn and soybeans on 1,800 acres in northcentral Illinois, leasing over 1,600 them. They use soil health practices on all the acres, rented and owned.

Jim has always had an interest in conservation and employs an adaptive management approach. Jim wanted to diversify his corn-soybean rotation as part of this approach and knew he was on the right track when he discovered cover crops. He started by planting cereal rye after his corn harvest on 80 acres in 2014, and now does so on 825 acres. Jim and Josh were so pleased with the cover crops, they started their own cover crop seed dealership providing custom seed drilling services for surrounding farmers.

Jim credits cover crops for helping them try no-till corn. Although the Iffts transitioned to no-till on their soybean fields in the early 1990s, they continued with a vertical-tillage pass each fall and spring for their corn until 2018, when they planted no-till on corn for the first time. Jim said, "We wouldn't have attempted no-tilling corn if not for the improved soil structure we've noticed from our use of cover crops." Jim adds that, "Cover crops are the key to reducing our inputs." The Iffts have reduced their herbicide inputs because of ample weed control provided by the cereal rye. Jim notes his first attempts at covers in 2014 weren't very successful, but he continued to seek advice from producers using covers successfully and kept at it.

The Iffts have also applied their adaptive approach to nutrient management, having switched to variable rate technology (VRT) application of phosphorus (P) and potassium (K) in 2010. The Iffts haven't applied any nitrogen (N) in the fall for decades, but they have recently adapted their N program to include a starter application at planting in addition to a subsequent side-dress application, thus ensuring the N is available when the plant needs it.

Josh holding his daughter, Julie, and Jim

Soil Health, Economic, Water Quality, and Climate Benefits

Partial budgeting was used to analyze the marginal benefits and costs of adopting cover crops and nutrient management on the Ifft Farm. The study was limited to only those income and cost variables affected by the adoption of these practices. The table on page two presents a summary of these economic effects, revealing that due to the two soil health practices, Jim's net income increased by $22 per acre per year or by $35,685 annually on the 1,650-acre study area, achieving a 123% return on investment.

The study area is restricted to where Jim has planted covers the longest, thereby providing an accurate picture of the soil health practices he has successfully integrated into his operation. Additionally, although Jim's use of covers has allowed him to switch to no-till corn, we did not

Farm at a Glance

COUNTY: Livingston, IL

WATERSHED: Vermillion Headwaters

CROPS: Corn & soybeans

FARM SIZE: 1,800 acres cropland

SOILS: Silt loam & silty clay loam soils on flat to slightly rolling fields

SOIL HEALTH PRACTICES: Cover crops & nutrient management

USDA United States Department of Agriculture Natural Resources Conservation Service

American Farmland Trust

- **Cover cropping and VRT** estimated to reduce N, P, & sediment losses by 23, 33, and 37%, respectively (NTT on 80-ac parcel)
- **35% reduction in total CO_2e** emissions (COMET-Farm on 80-ac parcel)
- **20% lower P & K applications** from VRT resulted in savings of \$20 ac^{-1}
- **Cover cropping** promoted weed control→ herbicide savings nearly \$15 ac^{-1}
- **5 bu ac^{-1} yield increase** in soybean attributed to cover crops

https://farmlandinfo.org/publications/soil-health-case-studies/

Summary

- Estimates provided are modeled values
- Oregon's diverse cropping systems, soils, and climate offer numerous opportunities but also warrant additional research to fill gaps
  - Soils have a maximum amount of C they can sequester
  - Quantifying current emissions from ag remains a major hurdle
- Investing in resilient agricultural systems not only helps combat climate change but also provides numerous environmental, economic, and societal co-benefits.

Thank You

Jennifer.Moore@usda.gov

541-738-4180 (office)