Washington's
Soil Health Initiative
&
Climate Smart Estimator

Jadey Ryan
Leslie Michel and Dani Gelardi
WADE Conference
June 13, 2023

WaSHI offers **research, outreach, education, policy support,** and **funding opportunities,** to help farmers, the environment, and the people of Washington.

Goal 1: Increase awareness of soil health

Leslie Michel

Goal 2: Document the state of the soils

Leslie Michel

Goal 3: Improve understanding of soil health building practices

Leslie Michel

Goal 4: Increase adoption of soil health building practices

Leslie Michel

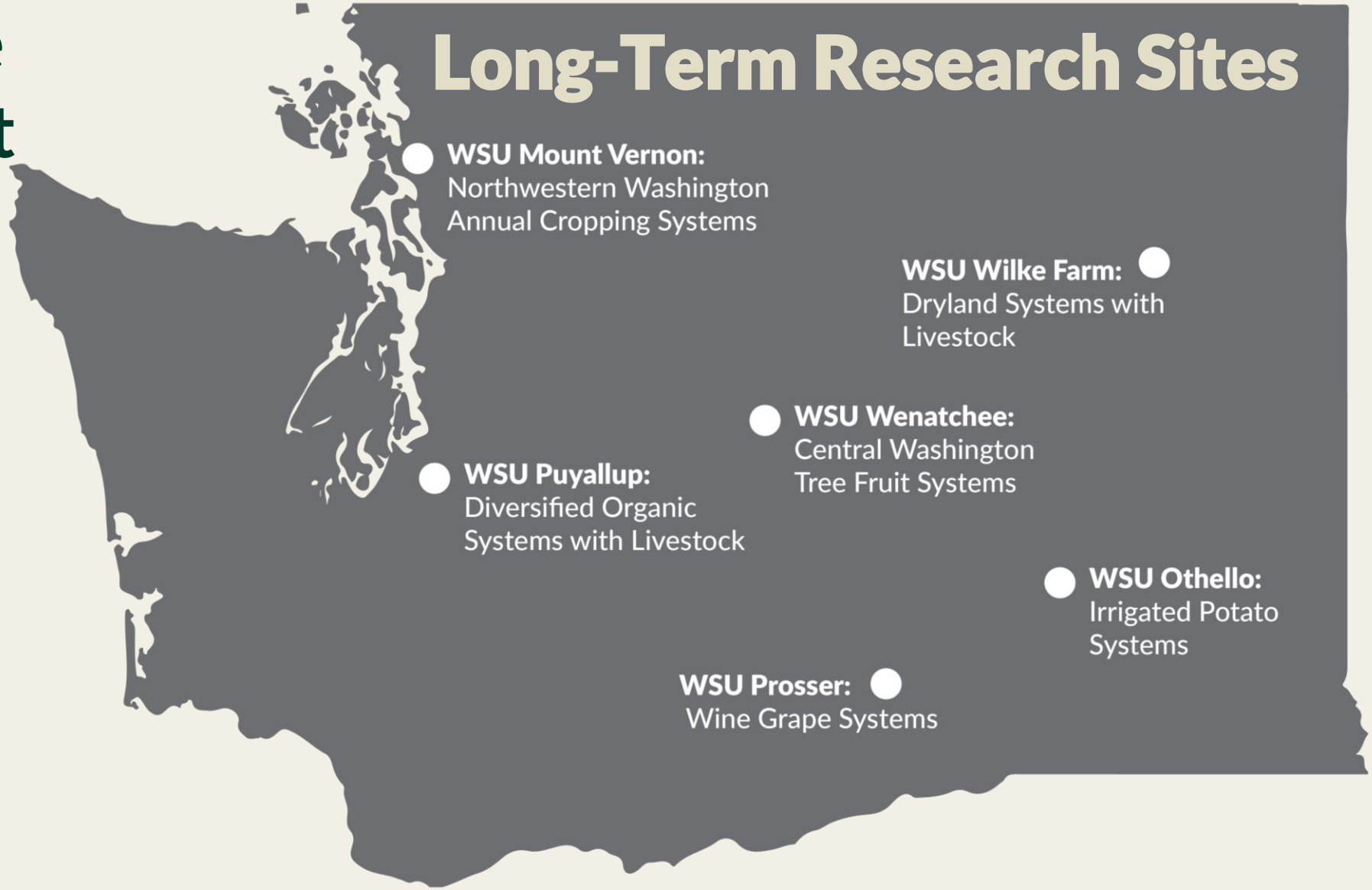
We need diverse solutions for diverse soils.

Washington Soil Health Initiative

The Soil Health Roadmap identifies **challenges**, **knowledge gaps**, and **goals** for improving soil health.

Red raspberry will be added
to the roadmap soon!

WaSHI has the **country's most densely populated** network of LTAREs to measure management impacts over time.



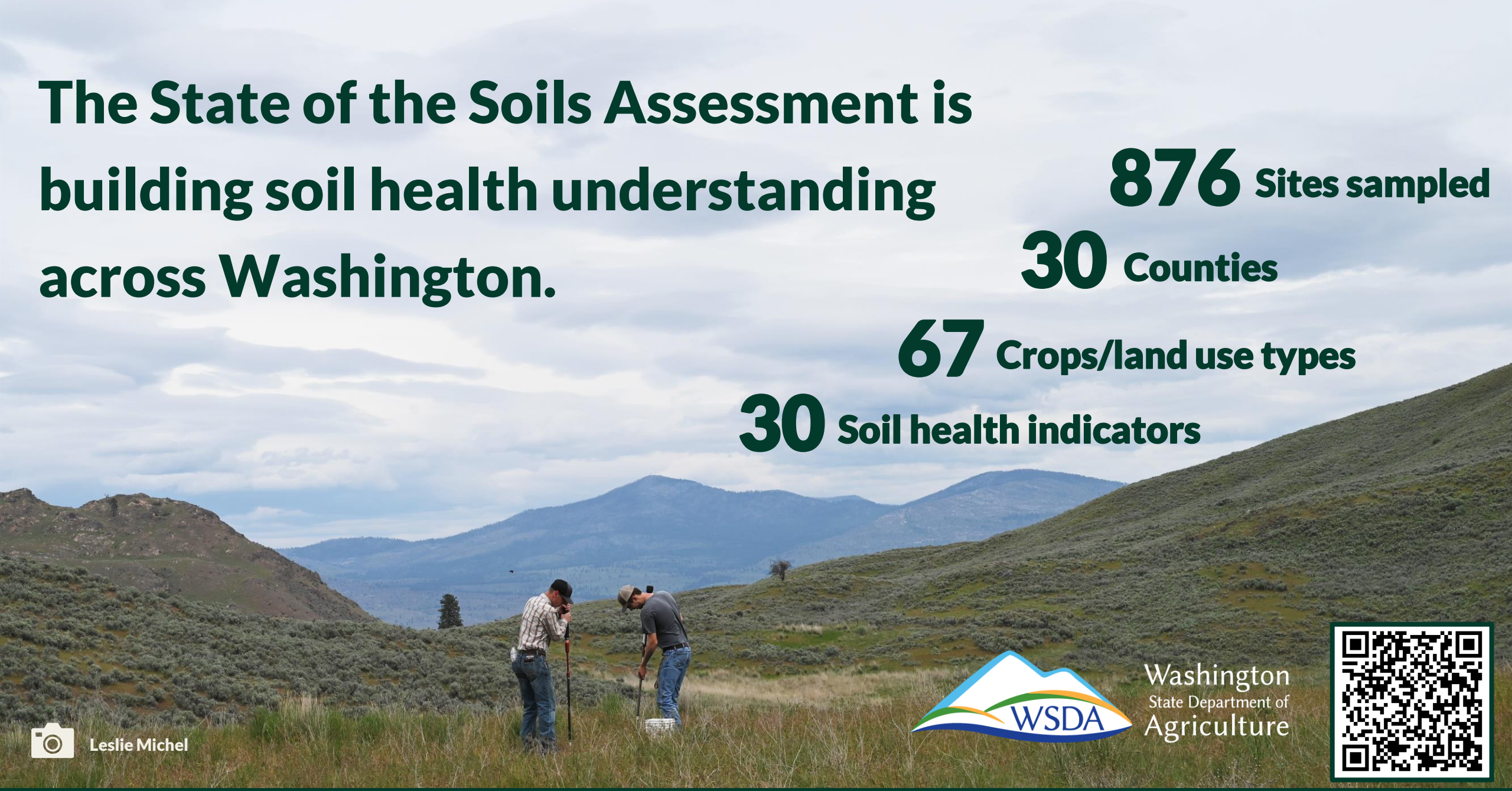
The State of the Soils Assessment is building soil health understanding across Washington.

876 Sites sampled

30 Counties

67 Crops/land use types

30 Soil health indicators



Leslie Michel

Washington State Department of Agriculture

Washington Soil Health Initiative

State of the Soils Assessment

Dashboard created by WSDA

Filter by county
All counties

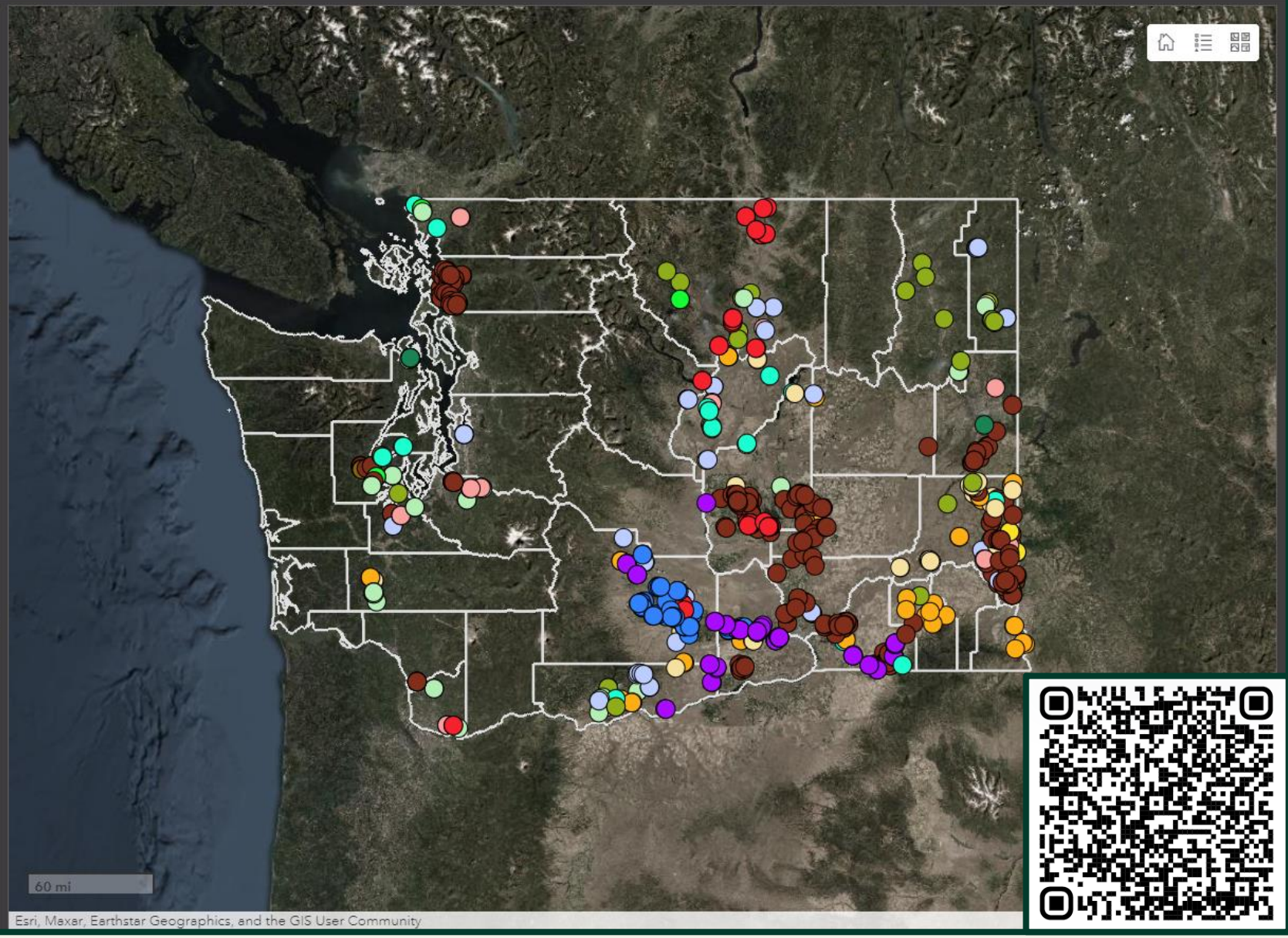
Filter by crop group
All crop groups

Filter by crop type
All crop types

702
Samples

26
Counties

50
Crop Types



Washington Soil Health Initiative

Dani Gelardi (WSDA)
WSDA
Agriculture
Understanding soil tests
SCC Center for Technical Development
Dani Gelardi, WSDA Senior Soil Scientist
Deirdre Griffin LaHue, WSU Assistant Professor
March 14th, 2023
WASHINGTON
SOIL
HEALTH INITIATIVE
1:36 / 55:06 • Intro

STAR will create economic opportunities for Washington producers.

STAR is a free, voluntary program created by farmers for farmers to reward healthy land management.

WE ARE HIRING

First review June 12
Continuous recruitment

Soil Health Economic Development Coordinator

Join Washington State Department of Agriculture to implement, promote, and coordinate the nationally recognized, Saving Tomorrow's Agricultural Resources program in Washington.

Washington State Department of Agriculture

WASHINGTON SOIL HEALTH INITIATIVE

Apply at: bit.ly/soilhealthecon

STAR improves the business case for soil health to ensure thriving Washington economies and ecosystems.

STAR Science Committee forms July 2023

Producer enrollment begins June 2024

WaSHI Resource Roundup

Newsletter

NEW WaSHI WEBSITE COMING SOON!

@WSU_SoilHealth

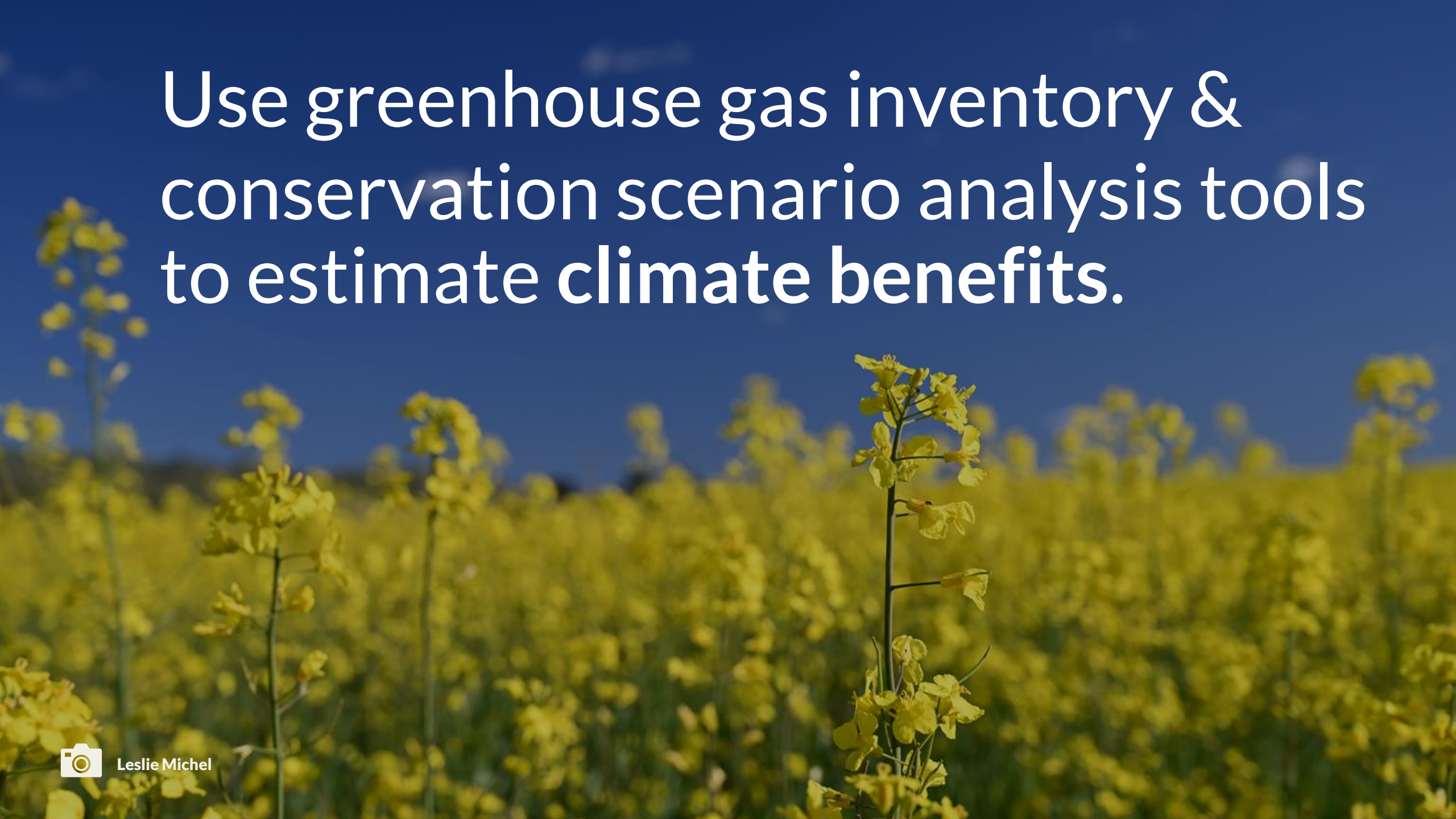
WSDA Soil YouTube

@WSU_SoilHealth

Questions? Comments? Ideas?

Dani Gelardi
dgelardi@agr.wa.gov

Leslie Michel


Use greenhouse gas inventory & conservation scenario analysis tools to estimate **climate benefits**.
Leslie Michel

There are three primary tools.

COMET Farm | USDA United States Department of Agriculture Natural Resources Conservation Service | Colorado State University | Whole Farm and Ranch Carbon and Greenhouse Gas Accounting System.

COMET-Planner | USDA Natural Resources Conservation Service U.S. DEPARTMENT OF AGRICULTURE | COLORADO STATE UNIVERSITY

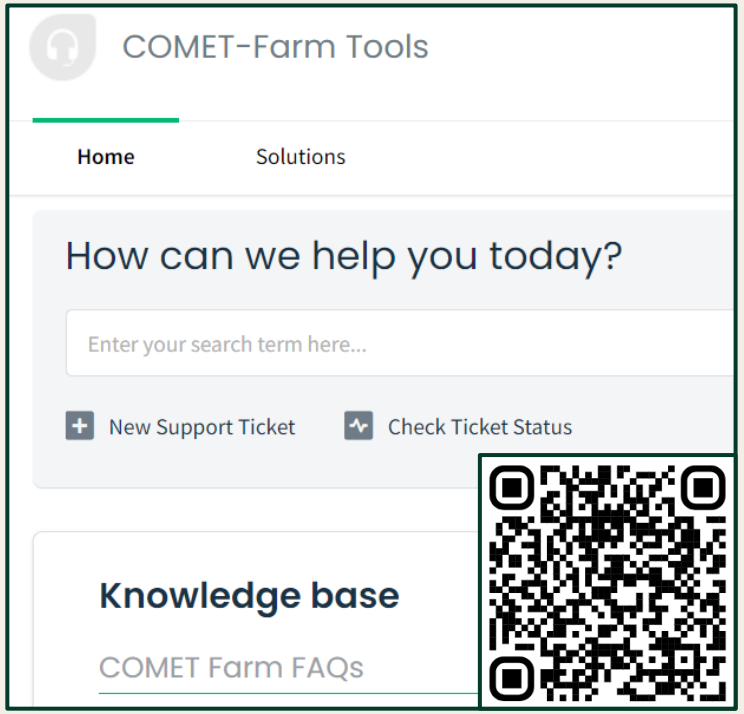
WaCSE

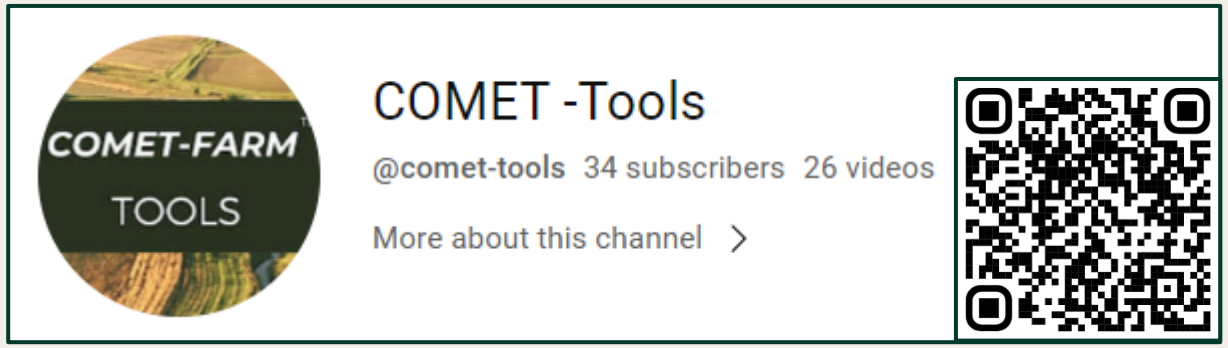
There are many use cases for climate benefit estimates.

- Incentive Programs
- Conservation Farm Plans
- Decision Making
- Carbon Market

Leslie Michel

COMET Methods & Resources





Why make another tool?

Visualize & interpret results

Compare climate benefits

Explore more with less

Washington State Conservation Commission

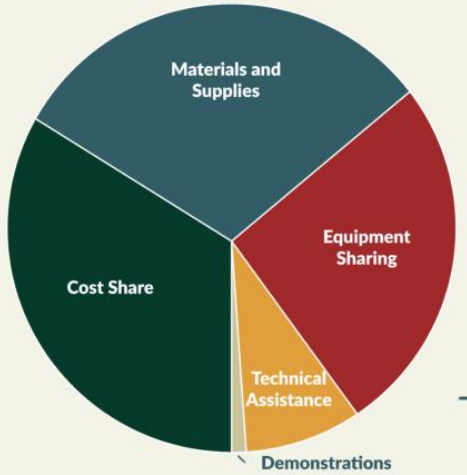
Sustainable Farms and Fields 2023 Funded Projects

The Sustainable Farms and Fields program provides technical and financial assistance and funds shared equipment to make it easier and more affordable for farmers and ranchers to implement climate smart practices – or those that increase carbon sequestration and reduce greenhouse gas emissions

What are the projects?

$1.8 million awarded to **53** projects

% of total funding for each category



12 projects for equipment sharing

12 projects for technical assistance

How are the climate impacts of projects being estimated?

WaCSE

Anticipated impacts estimated using Washington's Climate Smart Estimator

Is there funding available for next year?

$1.5 million anticipated for 2024

For the first fiscal year, funding awarded to

25/45

Washington's Conservation Districts and one County government

Eligible land use types:

Aquaculture Tideland

Rangeland

Farmland

COMET and WaCSE Comparison

User Interface

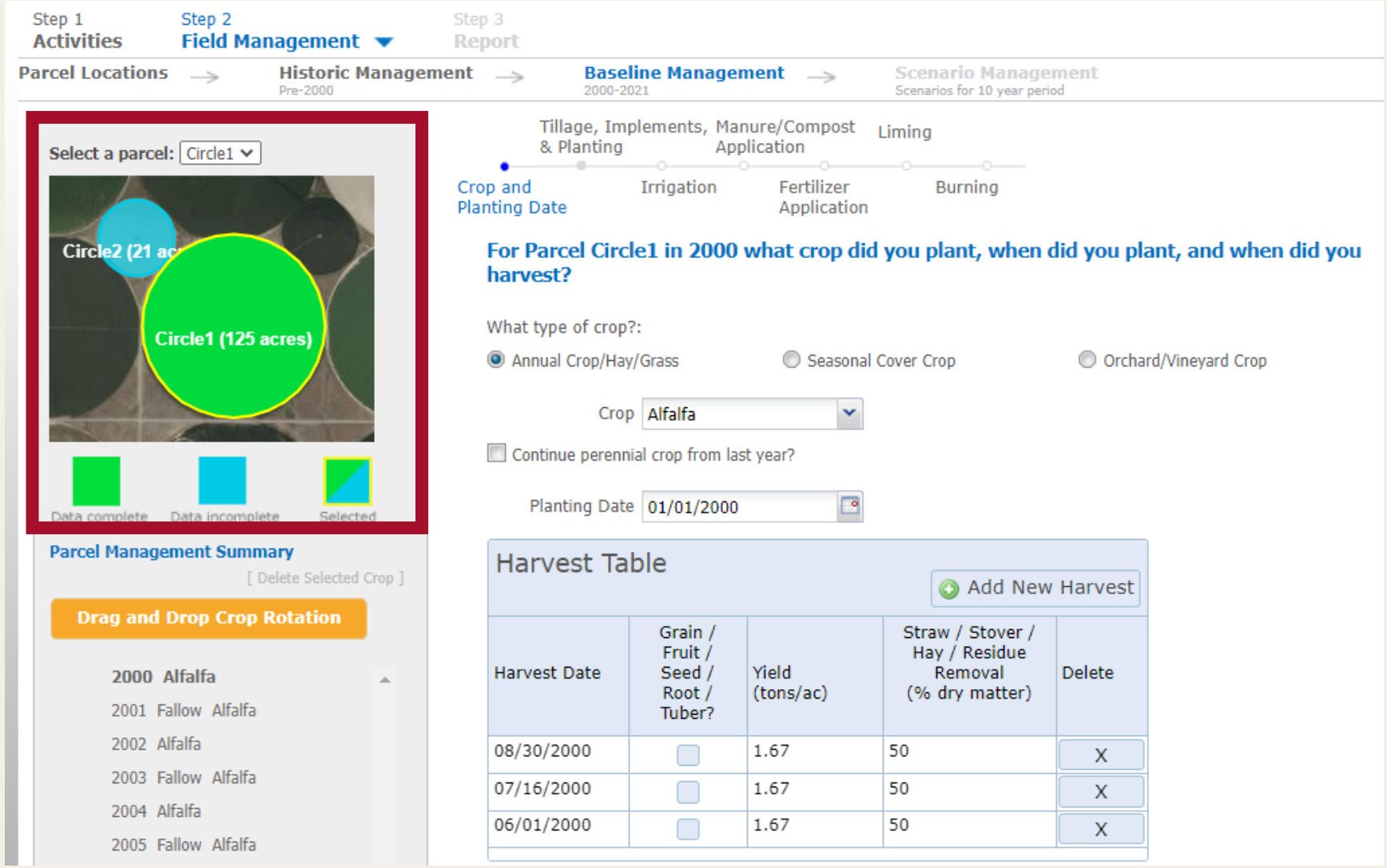
Visualization

Data

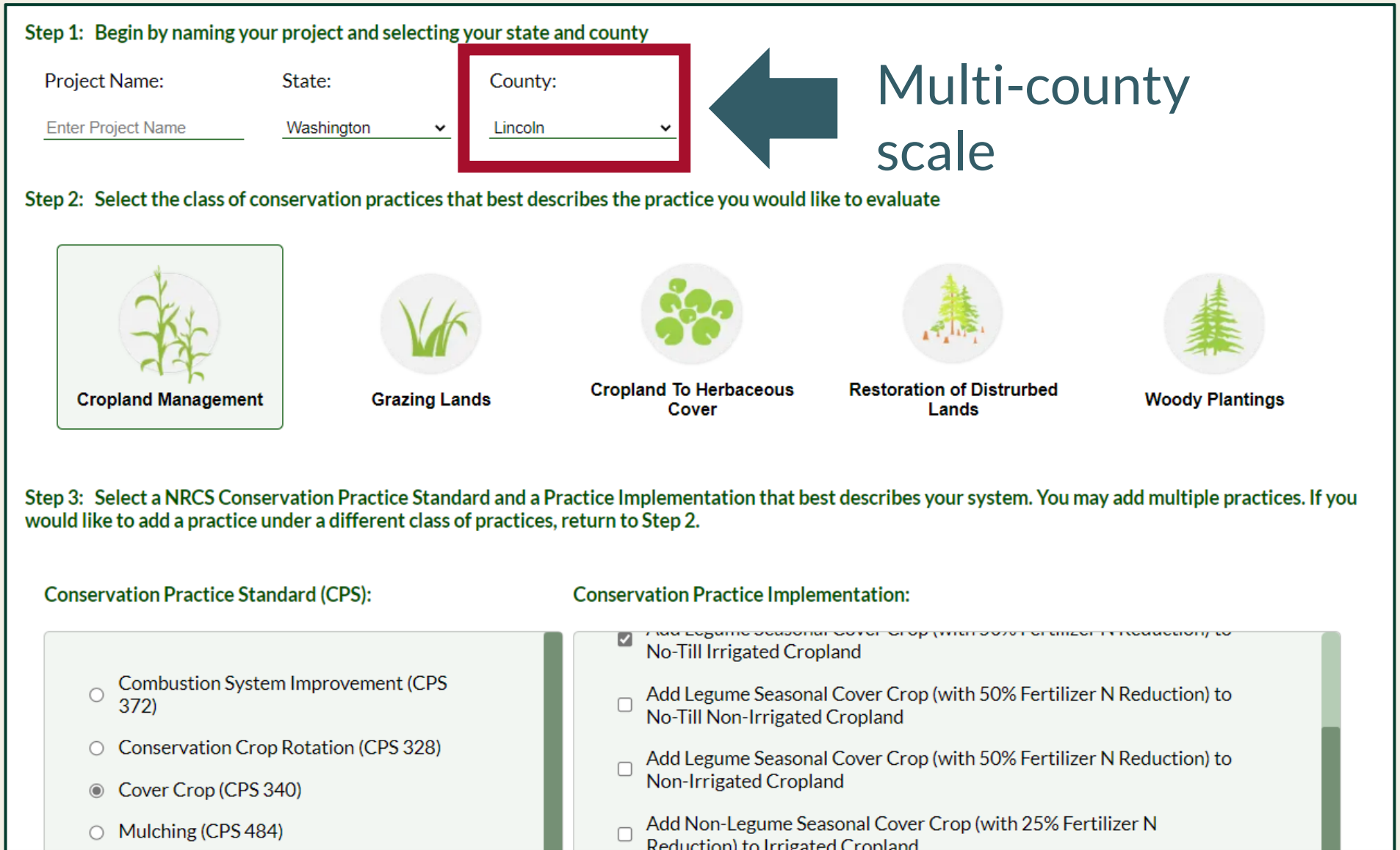
Report

COMET-Farm requires **20 years of historical management** to generate a **10-year prediction.**

Farm scale



COMET-Planner requires **no management history** to generate an **annual average over 10 years.**



Multi-county scale

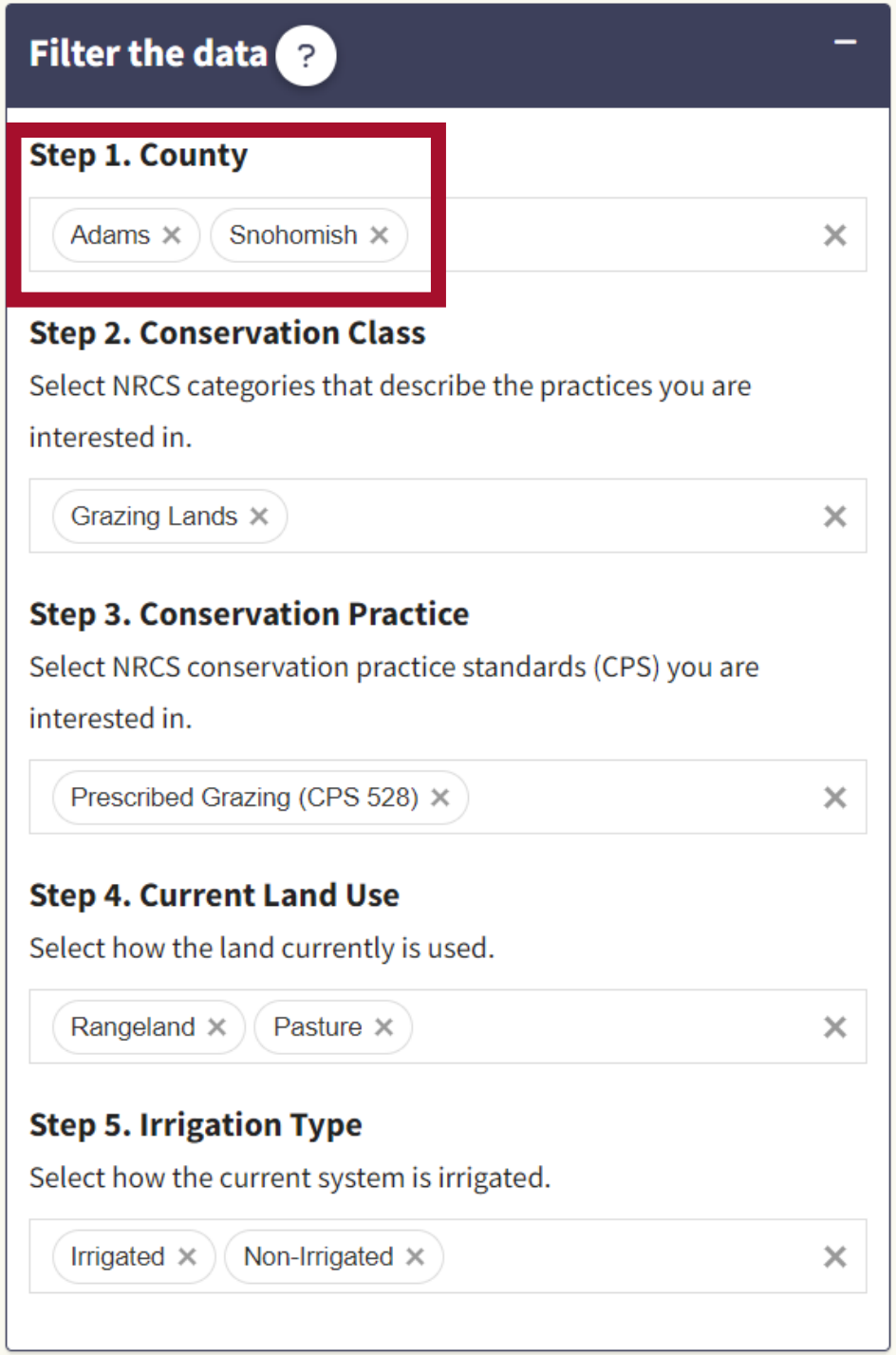
COMET-Planner uses **generalized** COMET-Farm outputs.

COMET Farm → COMET-Planner

WaCSE uses COMET-Planner data (**filtered to WA**).

COMET-Planner

WaCSE



WaCSE uses similar inputs as COMET-Planner but allows **county comparison.**

COMET-Planner includes **only** tables.

Approximate Carbon Sequestration and Greenhouse Gas Emission Reductions*

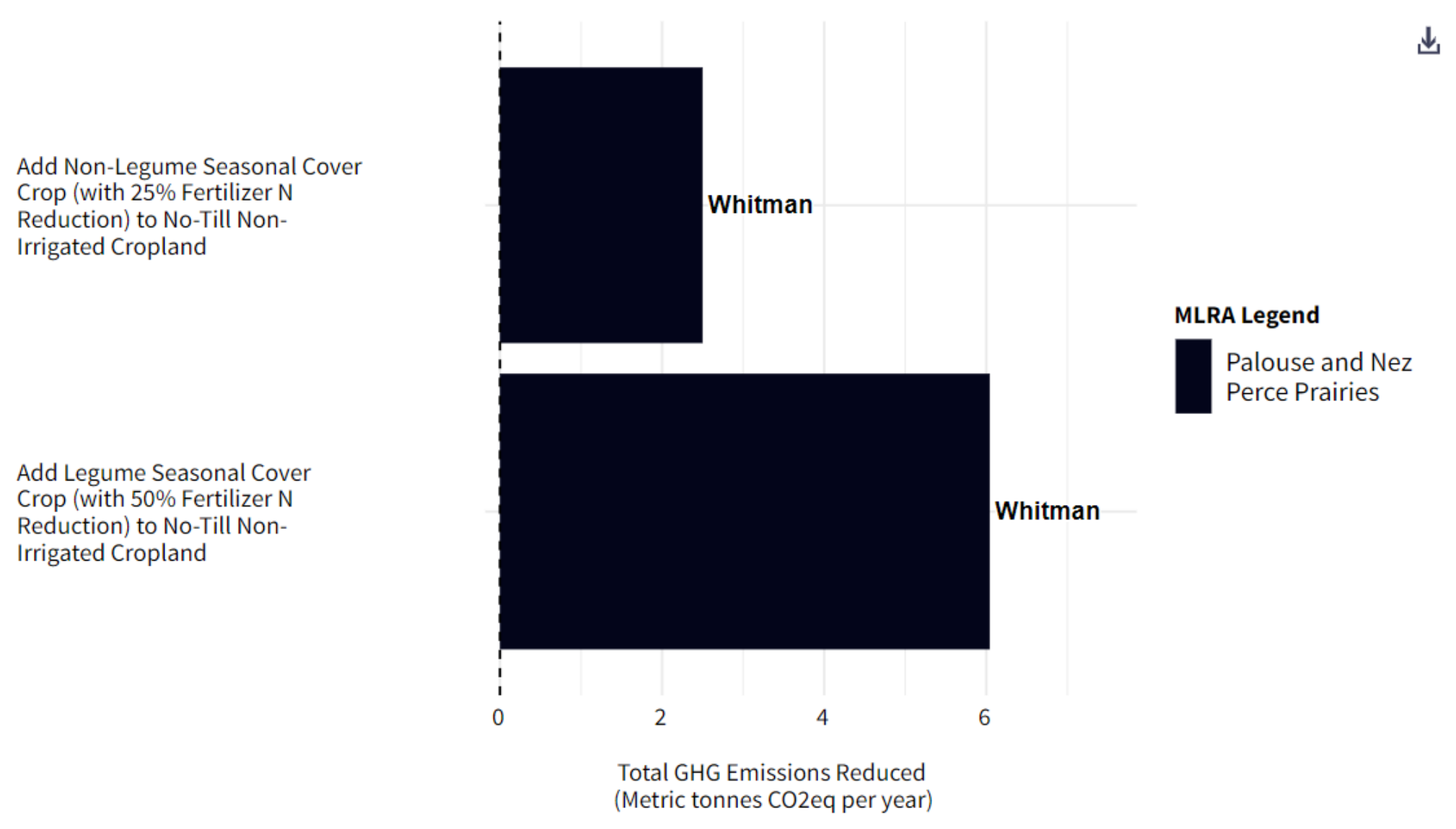
(tonnes CO_2 equivalent per year)

NRCS Conservation Practices	Acreage	Carbon Dioxide	Nitrous Oxide	Methane	Total CO_2 Equivalent
Add Legume Seasonal Cover Crop (with 50% Fertilizer N Reduction) to No-Till Non-Irrigated Cropland	100 ac	-8	14	0	6
Add Non-Legume Seasonal Cover Crop (with 25% Fertilizer N Reduction) to No-Till Non-Irrigated Cropland	100 ac	-5	8	0	3
Totals	200	-13	22	0	9

WaCSE includes tables.

County*	Conservation Practice	Practice Implementation	Acres	Carbon Dioxide	Nitrous Oxide	Methane	Total GHG
				*Emission reductions in MT CO2eq/yr***			
Whitman	Cover Crop (CPS 340)	Add Legume Seasonal Cover Crop (with 50% Fertilizer N Reduction) to No-Till Non-Irrigated Cropland	100	-8.02	14.06	0.00	6.04
Whitman	Cover Crop (CPS 340)	Add Non-Legume Seasonal Cover Crop (with 25% Fertilizer N Reduction) to No-Till Non-Irrigated Cropland	100	-5.47	7.97	0.00	2.50

WaCSE also includes plots.



WaCSE also includes EPA's equivalency calculator.

8.5 metric tonnes of CO2eq is equivalent to CO2 emissions from:

1.7
Homes' electricity use for one year

956
Gallons of gas consumed

1,033,962
Number of smartphones charged

8.5 metric tonnes of CO2eq is equivalent to GHG emissions avoided by:

2.9
Tons of waste recycled instead of landfilled

0.4
Trash bags of waste recycled instead of landfilled

322
Incandescent lamps switched to LEDs

8.5 metric tonnes of CO2eq is equivalent to carbon sequestered by:

141
Tree seedlings grown for 10 years

10
Acres of US forests in one year

0.1
Acres of US forests preserved from conversion to cropland in one year

COMET-Planner's report only includes the table.

COMET-Planner Report: Approximate Carbon Sequestration and Greenhouse Gas Emission Reductions

Project Name:

State: Washington

County: Whitman

Date: 2023/6/12 23:9:3

NRCS Conservation Practices	Acreage	Carbon Dioxide	Nitrous Oxide	Methane	Total CO2 Equivalent
Add Legume Seasonal Cover Crop (with 50% Fertilizer N Reduction) to No-Till Non-Irrigated Cropland	100	-8	14	0	6
Add Non-Legume Seasonal Cover Crop (with 25% Fertilizer N Reduction) to No-Till Non-Irrigated Cropland	100	-5	8	0	3
Totals	200	-13	22	0	9

And a table footnotes.

*Negative values indicate a loss of carbon or increased emissions of greenhouse gases
**Values were not estimated due to limited data on reductions of greenhouse gas emissions from this practice

For more information on how these estimates were generated, please visit www.comet-planner.com.

Page 1 of 1

WaCSE's report includes background info.

Washington Climate Smart Estimator Report
wsda.shinyapps.io/WaCSE

Demo Project report generated by **Demo Farm** on June 12, 2023

Who and what is WaCSE for?

The Washington State Department of Agriculture developed WaCSE for the Washington State Conservation Commission to use in the Sustainable Farms and Fields (SFF) program. Intended users are the Conservation Commission, conservation districts, growers, and anyone interested in reducing agricultural greenhouse gas (GHG) emissions. This interactive tool estimates the reduction of GHG emissions from different conservation practices across Washington's diverse counties.

What are carbon dioxide equivalents?

Carbon dioxide equivalent (CO2eq) is a unit used to compare various greenhouse gases based on their relative global warming potential.

What are total greenhouse gases?

Total greenhouse gases (GHG) are the sum of carbon dioxide, methane, and nitrous oxide in units of CO2eq. Estimates include those associated with soils and woody biomass, but do not include off-site emissions like those from transportation.

What are emission reduction coefficients?

Emission reduction coefficients were calculated by COMET-Farm, which uses USDA greenhouse gas inventory methods. More information on quantification methods can be found in the COMET-Planner Report.

What are major land resource areas?

Major Land Resource Areas (MLRA) are defined by the NRCS as regions with similar physiography, climate, soils, biological resources, and land use (USDA-NRCS 2006). The GHG emission reduction estimates were calculated at the spatial scale of these multi-county MLRAs (Swan et al. 2022).

Counties within the same MLRA will have the same estimate, unless the county falls within multiple MLRAs. Visit WSDA's online map to identify which county is in which MLRA.

and tables

View your estimated GHG emission reductions

Table Notes

- Counties are grouped by dominant MLRA.
- **Emission Reduction Calculation**: Area (Acres) × Emission Reduction Coefficient (ERC)
- Negative emission reductions indicate a loss of carbon or increased emissions of GHG.
- "Not estimated" indicates the NRCS has not evaluated this county and practice.

Table 1: Summary of Estimated Total Greenhouse Gas (GHG) Emission Reductions by County

MLRA	County	Unique Practice Implementations	Total Acres	Total GHG (MT CO2eq/yr)
Palouse and Nez Perce Prairies	Whitman	2	200	8.5
Totals		**2**	**200**	**8.5**

Table 2: Estimated Greenhouse Gas (GHG) Emission Reductions

				(Metric tonnes CO2eq per year)			
County	**Practice**	**Implementation**	**Acres**	**Carbon Dioxide**	**Nitrous Oxide**	**Methane**	**Total GHG**
Whitman	Cover Crop (CPS 340)	Add Legume Seasonal Cover Crop (with 50% Fertilizer N Reduction) to No-Till Non-Irrigated Cropland	100	-8.0	14	0	6.0

and plots

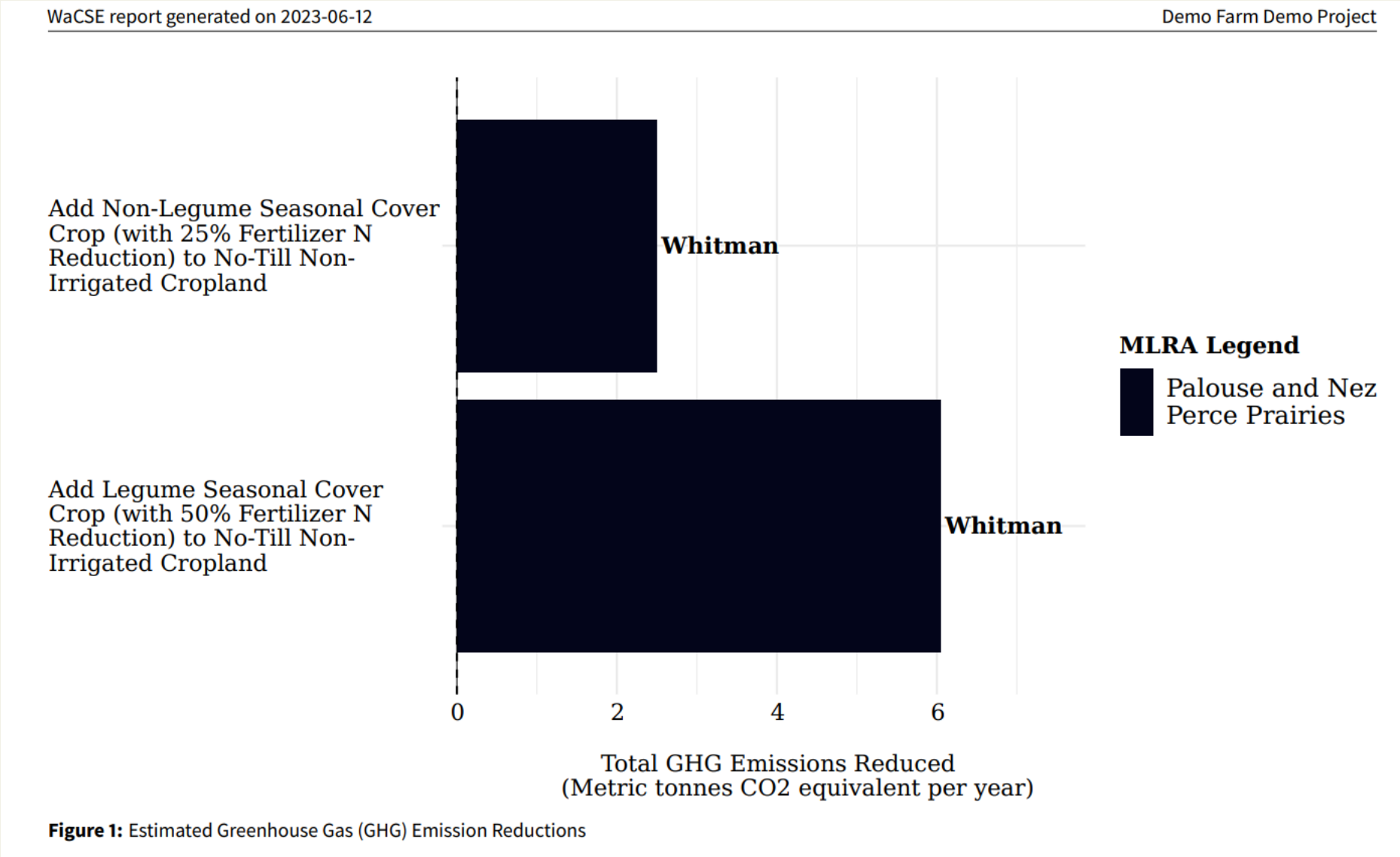


Figure 1: Estimated Greenhouse Gas (GHG) Emission Reductions

and the EPA equivalencies.

Understand your impact

The values shown here are your total estimated esmissions reductions converted into terms you are more likely familiar with. Assumptions and equations used to calculate these values are provided in the Environmental Protection Agency's (EPA) Greenhouse Gases Equivalencies Calculator. Results may differ slightly from those returned by EPA's calculator due to rounding.

Your total estimated GHG emission reduction is: 8.5 metric tonnes CO2eq per year.

This is equivalent to CO2 emissions from:	
1.7	homes' electricity use for one year
961	gallons of gas consumed
1,038,992	number of smartphones charged
This is equivalent to GHG emissions avoided by:	
3	tons of waste recycled instead of landfilled
0.4	trash bags of waste recycled instead of landfilled
324	incandescent lamps switched to LEDs
This is equivalent to carbon sequestered by:	
141	tree seedlings grown for 10 years
10	acres of US forests in one year
0.1	acres of US forests preserved from conversion to cropland in one year

Washington Climate Smart Estimator

Demo

WaCSE

https://wsda.shinyapps.io/WaCSE/

Which tool should you use?

COMET-Planner

WaCSE

- Farm details not known
- Quick and dirty estimate

COMET Farm

- Farm details known
- Detailed analysis

Ball, K.R. et al. (2022) provides a detailed tool comparison, starting on page 35.

	Site & Climate		Soil		Land Management			Cropping			Inputs				Other GHG Sources		Useability		
	Climate & Weather	Geographical Location	Texture / Water Holding Capacity / Bulk Density	Initial SOC / SOM Content	Historical Management	Conservation Practice Status	Tillage / Ground Operations	Crop Type	Crop Rotation	Planting & Harvest Dates	Fertilizer	Organic Amendments	Irrigation	Grazing	Fuel & Energy	Transport	Predictive Scope (years)	Data Requirement	Required Operational Skill Level
DAY-CENT	Fully user-defined via manual entry or input flexibility	Fully user-defined via manual entry or input flexibility	Fully user-defined via manual entry or input flexibility	Fully user-defined via manual entry or input flexibility	Fully user-defined via manual entry or input flexibility	Fully user-defined via manual entry or input flexibility	Fully user-defined via manual entry or input flexibility	Defined from external data/other related tools	Fully user-defined via manual entry or input flexibility	Fully user-defined via manual entry or input flexibility	Fully user-defined via manual entry or input flexibility	Fully user-defined via manual entry or input flexibility	Fully user-defined via manual entry or input flexibility	Fully user-defined via manual entry or input flexibility	Not defined	Not defined	100+ years	High	High
COMET Farm	Defined from external data/other related tools	Defined from external data/other related tools	Defined from external data/other related tools	Defined from external data/other related tools	Defined through drop down (restricted choices)	Defined through drop down (restricted choices)	Defined through drop down (restricted choices)	Defined through drop down (restricted choices)	Defined through drop down (restricted choices)	Fully user-defined via manual entry or input flexibility	Fully user-defined via manual entry or input flexibility	Defined through drop down (restricted choices)	Fully user-defined via manual entry or input flexibility	Defined through drop down (restricted choices)	Defined from external data/other related tools	Defined from external data/other related tools	10 years	Low	Med.
COOL Farm	Not defined	Not defined	Defined through drop down (restricted choices)	Fully user-defined via manual entry or input flexibility	Not defined	Defined through drop down (restricted choices)	Defined through drop down (restricted choices)	Defined through drop down (restricted choices)	Not defined	Not defined	Fully user-defined via manual entry or input flexibility	Defined through drop down (restricted choices)	Fully user-defined via manual entry or input flexibility	Defined from external data/other related tools	Defined from external data/other related tools	Defined from external data/other related tools	1 year	Low	Low
WaCSE	Defined from external data/other related tools	Defined through drop down (restricted choices)	Defined from external data/other related tools	Defined from external data/other related tools	Not defined	Defined through drop down (restricted choices)	Defined through drop down (restricted choices)	Not defined	Not defined	Not defined	Defined through drop down (restricted choices)	Defined through drop down (restricted choices)	Defined through drop down (restricted choices)	Defined through drop down (restricted choices)	Defined through drop down (restricted choices)	Not defined	1 year	Low	Low

Fully user-defined via manual entry or input flexibility

Defined from external data/other related tools

Defined through drop down (restricted choices)

Not defined

Try WaCSE Out for Yourself!

https://wsda.shinyapps.io/WaCSE/

Leslie Michel

Questions? Comments? Ideas?

Jadey Ryan
jryan@agr.wa.gov

Leslie Michel