Information on this document is available as an accessible webpage at https://washingtonsoilhealthinitiative.com/annual-report-fy25

Washington Soil Health Initiative

ANNUAL REPORT FY25

Activities from July 1st, 2024 to June 30th, 2025.

Find this report online at wasoilhealth.org

Finding Diverse Solutions for Diverse Soils

The Washington Soil Health Initiative is a partnership among the Washington State Conservation Commission, the Washington State Department of Agriculture, and Washington State University that brings a coordinated approach to healthy soil in Washington.

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WASHINGTON SOIL HEALTH INITIATIVE

LETTER FROM LEADERSHIP

We are proud of what we've accomplished, and in the coming year, we will continue to innovate, collaborate, and share knowledge.

As we reflect on Fiscal Year 2025, we are reminded of the power of collaboration and the resilience of Washington's agricultural community. The Washington Soil Health Initiative (WaSHI) continues to thrive as a partnership among the Washington State Conservation Commission, the Washington State Department of Agriculture, and Washington State University. Together, we are building a movement that values healthy soils as the foundation of a sustainable food system. Here we will reflect on a few successes from the year.

One of the year's highlights was honoring Anthony Reyes of Oxbow Farm as our Producer of the Year. Anthony's commitment to regenerative practices and community engagement exemplifies what soil stewardship looks like in action. His story reminds us that innovation often begins at the farm level—with individuals willing to lead by example.

Our Soil Health Ambassador Program grew stronger, amplifying the voices of producers who share their experiences and inspire others to adopt conservation practices. Through videos, field days, and peer-to-peer learning, these ambassadors are helping to turn knowledge into action.

This year marked the second year of the Washington STAR Program, a science-based rating system that connects producers to technical and financial resources. By recognizing and rewarding conservation efforts, STAR is creating a pathway for farmers to improve soil health while enhancing productivity and resilience.

Through Sustainable Farms and Fields (SFF), $1.2 million was allocated to support 36 projects across 20 conservation districts. These projects impacted over 37,000 acres and reduced greenhouse gas emissions equivalent to removing 4,500 cars from the road. This is more than a statistic—it's a testament to the collective impact of farmers, advisors, and conservation partners working toward climate solutions.

Our Long-Term Agroecological Research and Extension (LTARE) Network continued to generate new producer-relevant findings from six sites representing Washington's diverse agricultural systems. These research efforts are laying the groundwork for resilient farming practices to be implemented on commercial operations across the state.

And finally, events like SoilCon, the Making Soils Data Actionable Webinar Series, and our annual Advisory Team meetings brought hundreds of participants together to share insights and tackle region-specific challenges. Our Advisory Team continues to guide our work to meet the on-the-ground needs of producer, policymakers, conservation planners, and more. These conversations are shaping the future of soil health in Washington.

We are proud of what we've accomplished, and in the coming year, we will continue to innovate, collaborate, and share knowledge to ensure Washington's soils remain healthy for generations to come. Thank you for being part of our work.

Dani Gelardi, Washington State Department of Agriculture

Chris Benedict, Washington State University

Karen Hills, Washington State Conservation Commission

SOIL HEALTH AMBASSADOR PROGRAM

553 VIDEO VIEWS

Launched in 2023,the Soil Health Ambassador Program celebrates producers committed to soil health on their farms and in their communities.

Here are a few ways the Soil Health Ambassador Program fosters peer-to-peer learning.

-Sharing the stories of producers who have successfully implemented soil health practices.

-Informational videos and fact sheets, shared through our extensive social media and newsletter presence.

-Ambassadors support other producers interested in adopting the practice.

-Creating a network of Soil Health Ambassadors across regions, cropping systems, and practices.

-Soil Health Ambassadors receive a $1000 stipend for their time and are available to support other farmers interested in adopting a similar practice.

Tyler Morse from Brier Patch Farm

Compost production

Tyler finds composting a powerful tool for building soil health and has enjoyed the fun adventure of making his own. He has seen benefits of compost addition for soil health in his market gardening style of farming.

Anthony Reyes from Oxbow Farm

Compost and cover crops

Anthony uses a variety of soil health-oriented practices, including data-driven compost application and diverse cover crop mixes, and shares what he learns with farm visitors and partners.

Maynard Mallonee from Mallonee Family Farms

Diverse pasture plantings

A third-generation farmer, Maynard uses diverse pasture plantings, such as cover crops and crop rotation, to improve their soil health and livestock health. Healthier cows mean lower costs and higher outputs.

Reid Wilson from Hedges Family Farm

Undervine cultivation

Reid is rethinking soil management under the grape vines in his vineyards, utilizing a slew of practices including cover cropping, berm removal, and integrating chickens for weed control.

Producers interested in connecting with a current Ambassador or becoming a Soil Health Ambassador can email WaSHI@agr.wa.gov. WaSHI aims to highlight and uplift the voices of minorities, women, and indigenous producers across the state, and welcomes these communities to participate.

Making Soils Data Actionable

916 WEBINAR VIEWS

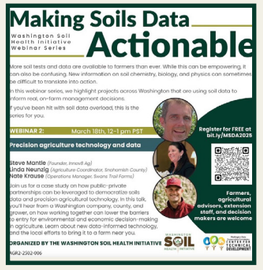
Washington Soil Health Initiative Webinar Series

Dani Gelardi, Washington State Deptartment of Agriculture.

In 2024, the Washington Soil Health Initiative created the Making Soils Data Actionable webinar series to help farmers harness the mountains of data that result from soil testing and translate the numbers into action.

Every week in March we highlight projects across Washington that use soil data to inform real, on-farm management decisions. The goal of the series is to bring together farmers, agricultural advisors, and decision makers to discuss the importance of collecting and using soils data. In 2025, the webinar series reached 916 people, with most attendees being agricultural professionals and university affiliates. This year's topics were expanded beyond the physical, chemical, and biological indicators of soil health, to provide actionable insights to farmers, agricultural advisors, extension staff, and land managers.

Three new webinars addressing the soil health data overload



Precision Agriculture Technology and Data

with Steve Mantle, Linda Neunzig, and Nate Krause

A case study on how public-private partnerships can be leveraged to democratize soils data and precision agricultural technology. In this talk, you'll hear from a Washington company, county, and grower, on how working together can lower the barriers to entry for environmental and economic decision-making in agriculture. Learn about new data-informed technology, and the local efforts to bring it to a farm near you.

Soil physical properties: Compaction

with Haly Neely and Natalie Sturm

In this webinar, Haly and Natalie share their research on soil compaction and the management strategies to reduce it – including how farmers can use similar approaches on their own operations. These WSU researchers also explain how identifying and managing soil compaction can benefit farmers and crop consultants around Washington state.

Soil chemistry meets biology: Nitrogen credits

with Rich Koenig and Savannah Crnick

Rich describes the origins, importance, and practical use of N credits in a fertilizer budgeting process. From irrigated to dryland systems, credits are the "money in the soil bank". You can also learn how South Yakima Conservation District implements this knowledge by using deep soil sampling to support growers in managing their crops, nutrients, and irrigation water.

Sustainable Farms and Fields

Karen Hills, Washington State Conservation Commission

This fiscal year marked the SCC's third year of Sustainable Farms and Fields ongoing funding. In FY25, $1.2 million was allocated to support 36 projects across 20 Washington conservation districts. You can see a complete list of funded projects in the Sustainable Farms Fiscal Year 2025 report on the SCC website.

The year 2025 also marks the close of the 2023-2025 biennium. Over the biennium, SFF funding directly resulted in 184 land managers implementing climate-smart practices on over 37,000 acres with an estimated collective impact of 19,409 metric tons carbon dioxide equivalent (CO_2e) – equivalent to taking 4,527 passenger vehicles off the road for one year. This funding also resulted in 2,392 land managers responsible for over 469,000 acres receiving technical assistance. Many funded projects involved collaboration among conservation districts. For instance, Snohomish Conservation District took the lead at development of carbon farm plan templates for use in future technical assistance and Pacific Conservation District led an effort to identify climate-smart best management practices relevant to shellfish producers. See the infographic on the next page for a more detailed report of program impacts over the biennium.

The SCC also contributed to two legislative reports related to SFF in FY25. SFF one-time proviso funding of $30,000,000 in 2023 from the Climate Investment Account supports emissions reduction through climate-smart livestock management. The first legislative report, titled *Impact of Climate-Smart Livestock Management Proviso Funding in Washington*, summarizes the grants awarded and the likely annual greenhouse gas emission reductions achieved as a result of funded projects. As of December 1, 2024, $4.5 million had been allocated to fund 51 projects across Washington state with a focus on climate-smart livestock management.

The Washington State Legislature tasked the SCC with reviewing "the current contribution that organic and climate-smart agriculture makes towards Washington's climate response goals, the potential there is for increasing this contribution, and how additional investments will help realize this potential, while supporting resiliency." The result is a second legislative report titled *Organic and climate-smart agriculture: Contribution towards Washington State climate response goals*. The literature review and report of agriculture stakeholder perspectives revealed strengths and shortcomings of SFF. Growers noted that although the program provides valuable financial assistance to support new practices, the grant funding cycle does not align with the growing season, making it difficult to access and utilize funds when they are most needed.

In the next fiscal year, SFF will continue to support additional projects with a positive impact on soil health and greenhouse gas emissions reduction implemented across the state. We look forward to engaging with conservation districts and other partners on this critical work. To keep up to date with this effort and all things Sustainable Farms and Fields, please sign up for our email list on the Sustainable Farms and Fields website.

FUNDED BY WASHINGTON'S CLIMATE COMMITMENT ACT

This opportunity is supported with funding from Washington's Climate Commitment Act. The CCA puts cap-and-invest dollars to work reducing climate pollution, creating jobs, and improving public health. Information about the CCA is available at www.climate.wa.gov

SUSTAINABLE FARMS & FIELDS PROGRAM

During the 2023-2025 biennium, Sustainable Farms and Fields (SFF) project funding totaled **$5,260,822** (including ongoing operating funds and Climate Commitment Act funds), supporting projects led by conservation districts across the state.

Types of assistance provided under SFF: Technical Assistance; Cost Share; Materials & Supplies; Demonstration; Equipment

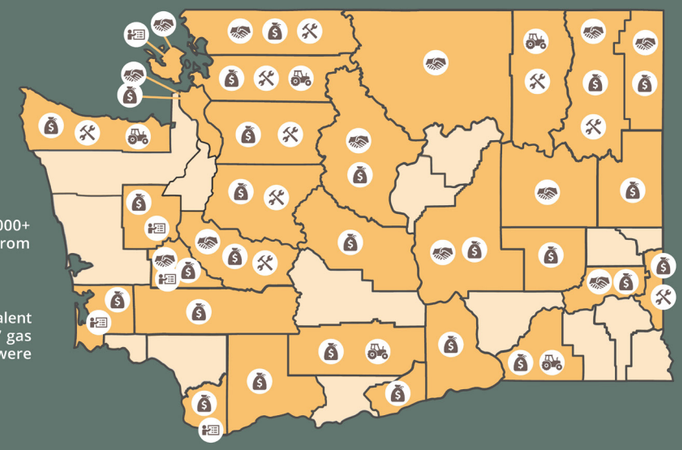
Conservation districts highlighted in **dark yellow** on the map below recived funding through the Sustainable Farms & Fields program.

111 Projects were completed by 30 conservation districts during the 2023-2025 biennium, using SFF funding.

184 Land managers implemented climate-smart practices on 37,000+ acres.

2,392 Land managers responsible for 469,000+ acres received technical assistance from districts.

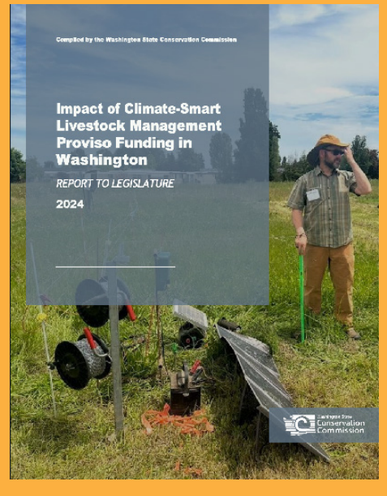
19,409 Metric tons of carbon dioxide equivalent (equal to the emissions from 4,527 gas-powered vehicles over one year) were removed from the atmosphere.



Quick Facts:

- **5,200 Acres** of prescribed grazing
- **7,600 Acres** of no-till implemented
- **23,000 Acres** of precision agriculture
- **1,600 Acres** of cover crops planted
- **34 Acres** with agroforestry implemented
- **9 Dairies** with waste separators installed
- **680 Acres** with soil carbon amendments

Sustainable Farms and Fields Legislative Reports



Impact of Climate-Smart Livestock Management Proviso Funding in Washington

Organic and climate-smart agriculture: Contribution towards Washington State climate response goals

Saving Tomorrow's Agriculture Resources

Dani Gelardi, Washington State Department of Agriculture

Washington STAR is a free and voluntary program that uses a science-based 1-to-5 STAR rating to evaluate a grower's engagement in conservation. Participants are connected to local technical and financial assistance to help them maintain or improve their STAR scores. The program has been developed by a diverse coalition of commodity groups, researchers, conservation districts, and producer networks.

At the heart of STAR is the Conservation Innovation Plan—a step in the STAR web tool that connects producers directly to local and national resources for customized support. Through this framework, STAR helps producers plan and improve their soil health practices. Washington STAR is currently developing a suite of STAR-exclusive financial incentives alongside partners in the supply chain.

Questionnaires are tailored using location- and crop-specific science, environmental outcomes, and agronomic feasibilities, ensuring that STAR remains relevant across diverse farming systems in Washington.

The Washington STAR program entered its second year in FY25, expanding to include producers from additional cropping systems The program will see exciting changes in 2025, including a new Marketing and Incentive Specialist who will support the program by pursuing market opportunities and developing economic incentives for soil health practitioners.

Enrollment is currently available for producers of:

- Grains & legumes (irrigated & non-irrigated)
- Tree fruit
- Juice & wine grapes

Enrollment will soon open for producers of:

- Vegetable row crops
- Root crops
- Grazing systems

SOILCON25

Making soil health science accessible for 5 years

In the age of cure-all solutions, Washington state producers and technical service providers are on the hunt for soil management information that is specific to their cropping systems and region. Organizers of SoilCon, a soil health event that has brought the latest soil health research to agricultural professionals for the last five years,

The fifth annual SoilCon looked quite a bit different from years past, while still including the online options for those who can't travel to a meeting. In-person SoilCon events were hosted across Washington at four different locations, based around the LTARE site network, each focusing their content on the soil health concerns and needs of that region.

"Good, non-biased research to help farmers make informed decisions for the future."

Attendees use hands-on activities to learn about tree fruit soil health.

SoilCon: Building Foundations for Agricultural Resiliency

Experts convened to discuss the role of soil and water data and tribal partnerships in building agricultural resilience to a changing climate.

SoilCon: Diversified Organic Systems
Puyallup, WA

Focused on pasture management practices that build soil health, including reduced tillage and legume cover crops.

SoilCon: NW Annual Cropping Systems
Mount Vernon, WA

Featured discussions about how to build resistance and resilience to soilborne pests and disease in small fruit and potato systems.

SoilCon: Dryland Systems
Davenport, WA

Explored the role of carbon markets in dryland cropping systems managed for resilience.

SoilCon: Tree Fruit Systems
Wenatchee, WA

Discussions and hands-on activities centered on building organic matter in Eastern WA tree fruit production.

255 online attendees
across five events in February—some attended multiple events

360 in-person attendees
across four sites in Washington in February

35 speakers
from many agencies and farms bringing a diverse perspective

59% of attendees intended to ***make changes*** to their soil management

55% of attendees improved their ***ability*** to implement soil health management strategies

55% of attendees improved their ***knowledge*** about soil health management

SPONSORED BY:
NRCS
Washington State Conservation Commission

Recipient of the 2024 WaSHI Producer of the Year Award

ANTHONY REYES

Oxbow Farm and Conservation Center

Leslie Michel, Washington State Department of Agriculture

The Washington Soil Health Initiative (WaSHI) annually honors a dedicated farmer or rancher who goes above and beyond to protect soils and improve soil health with the WaSHI Producer of the Year Award. This award is an effort to recognize and promote on-farm conservation practices, innovation, and community leadership.

Award winners receive:

- **Producer Spotlight**
- **Award Placard**
- **$1000 stipend**
- **Recognition at SoilCon**

What Producers are Eligible for the WaSHI Producer of the Year Award?

Farm in Washington
Candidates must farm in Washington and derive the majority of their income from agricultural production.

Working to Protect Soil Health
Candidates must have a demonstrated track record of using on-farm conservation practices.

Families or Individuals Welcome
Candidates can be individuals, couples, or families farming in partnership.

2024 Award Recipient

Anthony is the Agriculture Program Managerat Oxbow Farm and Conservation Center in Snoqualmie Valley in King County, Washington. Oxbow operates on 240 acres, with 30 acres actively managed each year in annual vegetable production, rotational fallow, and cover crop experiments. Oxbow produces certified organic mixed vegetables, herbs, and flowers, in addition to educating K-12 students, operating a native plant nursery, and overseeing ecological restoration projects.

With the many incredible farmers in Washington State, it was a tough decision for the WaSHI award committee. However, Anthony received more than 10 nominations from members of the community. His colleagues touted his knowledge and passion for soil health, as well as his infectious enthusiasm for igniting curiosity in the students that visit the farm.

One nominator noted: ***"Anthony is truly working in collaboration with the land and working to shift the community's understanding of farming toward collaboration as opposed to extraction."***

Anthony's commitments to soil health leadership are many. He has partnered with the Natural Resources Conservation Service (NRCS) Plant Materials Center and Washington State University (WSU) on cover crop trials. He serves as a mentor for farmers in the Transition to Organic Partnership Program and provides consultation to small farmers starting their own operations. Anthony frequently lectures in sustainable agricultural training programs, including at Organic Farm School on Whidbey Island. Anthony also published a Fertility Guide Companion to support farmers manage their crops and soils while reducing pollution.

Oxbow is committed to partnering and distributing their produce through hunger relief organizations while continuing to sustainably manage and improve their soils and resources and share learnings and (inevitable) pitfalls.

When asked what advice he would give to people interested in adopting soil health practices, Anthony says: ***"The advice I would give farmers and producers is to maintain curiosity and humility. The more you uncover with soil and soil health, it's just such a beautiful and vibrant and diverse community. It's going down a path of lifelong learning, which I find the most exhilarating and most exciting."***

Six sites across the state

Long-term agricultural research on soil health is essential for creating resilient food systems, tracking changes in soil carbon and measuring economic benefits. To truly understand the impact of management on soil health and productivity, we need research that goes beyond typical grant cycles.

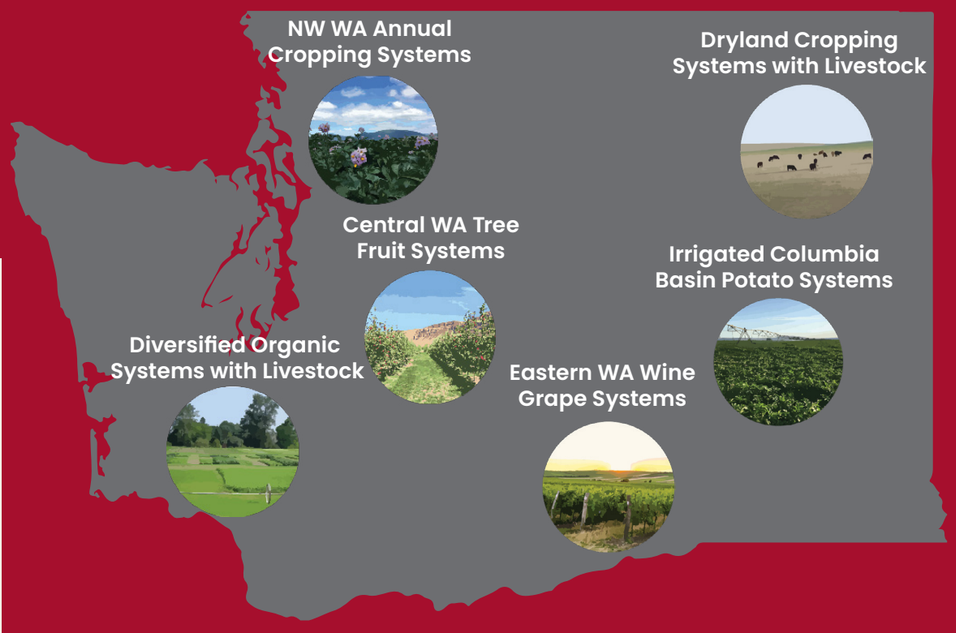
Measure the impact of conservation on soil health and farm profitability

Create cropping system specific guidance on soil health building practices

Representing

72%

of total cropland production value in Washington state



Learn more about each site. Read on.

LONG TERM AGROECOLOGICAL RESEARCH AND EXTENSION SITE NETWORK

Chris Benedict, Washington State University

WaSHI investing in rigorous long-term soil health research

The Long-Term Agroecological Research and Extension (LTARE) sites are the large investment that WSU makes in WaSHI's effort and are core to laying the foundation for future research and outreach activities. These six main experiments are designed to evaluate business as usual and compare variations, while representing commercial settings under respective environmental conditions.

Each site represents a major agroecological system found in Washington's diverse landscapes, but all sites perform a similar core of soil health assessments that are submitted to the same labs (if not done in-situ or at another WSU lab), which allows for common assessments across these systems. Additionally, many of the sites have common treatments as shown in the table (below) though the exact details of those treatments do vary across production systems. Lastly, each site will have a similar economic analysis that evaluates the associated costs and returns of investment in the treatments. In time, this analysis will help agricultural decision makers implement economically grounded practices that maintain soil

Soil health practices used at LTARE sites

	Mount Vernon	Othello	Prosser	Puyallup	Wenatchee	Wilke
Cover Crop	✓	✓	✓	✓	✓	✓
Organic Matter Additions	✓	✓	✓	✓	✓	✓
Reduced Tillage	✓		✓	✓		✓
Livestock Integration				✓		✓
Leaving Plant Residue	✓		✓	✓	✓	✓

NW WASHINGTON ANNUAL CROPPING SYSTEMS LTARE SITE

Barley harvest in the LTARE in August 2025. Photo by Austin Kerr.

Liz Myhre, Agricultural Research Technologist, and Gabe LaHue, Associate Professor of Soil Science, using a hydraulic probe to take deep soil cores to measure soil bulk density and ultimately, soil carbon stocks. Photo by Betsy Schacht

Mount Vernon LTARE Co-Lead Deirdre Griffin LaHue being filmed in the Mount Vernon LTARE for an episode of Washington Grown, which aired in January 2025.

Gabe LaHue & Deirdre Griffin LaHue, Washington State University

This was an exciting year for the Mount Vernon LTARE because the 2024 season marked four years since the inception of the trial. This is significant because the site is based on a 4-year crop rotation, and as such, all experimental plots have now been through the full rotation. For example, each plot in the most aspirational treatment now has had a 3-year perennial cover crop and compost application.

With this benchmark, we conducted our comprehensive soil sampling in spring 2025, using a hydraulic probe to get deep soil cores (down to 4 feet). These samples were divided into subsections representing different depths and are currently being analyzed for a variety of soil health parameters including soil carbon, microbial biomass, and respiration (also known as mineralizable carbon). We also collected separate samples to look at physical soil properties including infiltration, water-holding capacity, and the stability of soil aggregates (individual units of soil structure) when exposed to simulated rainfall and ponding. These are key variables in a region where compaction and flooding are issues.

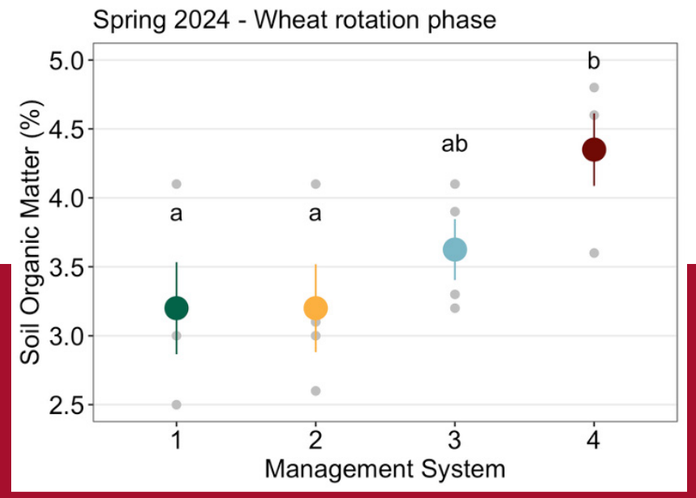


Figure 1. Soil organic matter content across management systems in spring 2024 going into the wheat rotation phase. During this phase, System 4 is planted to a perennial grass-clover cover crop rather than to winter wheat.

LTARE Site Team:

Gabe LaHue, Deirdre Griffin LaHue, Chris Benedict, Chakradhar Matupalli & Louie Nottingham, Liz Myhre, Ed Scheenstra, Bob Hulbert, Doug Jensen

While we are not yet seeing improvements in infiltration from our soil health management systems, we have observed higher soil organic matter with Management System 4, where a 3-year perennial grass-clover cover crop is grown in the years between potato crops. Soil organic matter can take years to build, so it's exciting to see measurable differences this early in the trial (Figure 1). Even more exciting, this difference in soil organic matter has started to translate into subtle, yet statistically significant, increases in soil moisture during the potato phase of the rotation (Figure 2).

In addition to soil properties, partnering scientists have been investigating the impact of our management systems on weed growth and weed seed banks, soilborne pathogen and nematode pressure, and beneficial and pest insect populations. Entomologist Louie Nottingham and M.S. student Adriana Barsan have found that the perennial cover crop (Management System 4) has increased the abundance and diversity of natural predator insects, including parasitoid wasps and mites, advantages that persist in the potato phase of the rotation.

During this period, results from the Mount Vernon LTARE were presented at the annual meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America (2 presentations), the Entomological Society of America meeting, the Pacific Northwest Insect Management Conference, a WSU CAHNRS Regenerative Agriculture Showcase, the Western Washington Potato Workshop, and the 2024 Virtual SoilCon. We also held a regional SoilCon event in December 2024 in conjunction with the Lynden Ag Show, with separate sessions focused on soil health in both red raspberry and potato systems. This included a well-attended panel discussion with growers and researchers on the connections between soil health and soilborne pathogen management. In January 2025, our LTARE site was featured in an episode of Washington Grown focused on potato production.

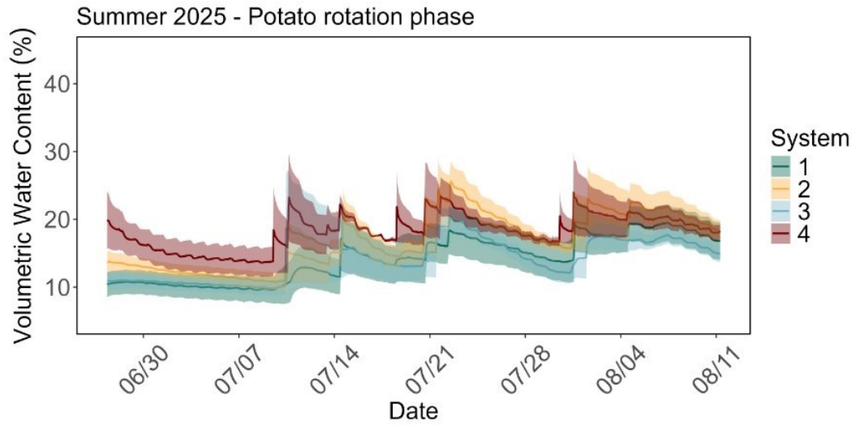


Figure 2. Soil moisture (volumetric water content) across management systems in plots planted to potatoes during the 2025 growing season. System 4, which includes compost and a perennial grass-clover cover crop, has higher soil moisture than all other treatments during parts of the year.

IRRIGATED COLUMBIA BASIN POTATO SYSTEMS LTARE SITE

Tim Waters, Washington State University

The Long-Term Agroecological Research and Extension (LTARE) site in Othello, WA was reset in Spring 2025 after extensive planning. This site represents a major step forward in understanding soil health and sustainability in irrigated potato-based cropping systems in the Columbia Basin. The overarching goal of the site is to evaluate the long-term impacts of key management practices on soil health, disease dynamics, and crop performance.

Why this site matters

Growers in the Columbia Basin face unique challenges—soil-borne diseases, declining soil health, and the need for sustainable nutrient management under irrigation.

Management Practices

The Othello LTARE trial focuses on three conservation practices identified by stakeholders as practical and impactful:

• Fumigation (+/-) using metam sodium, a common disease management tool with potential soil health trade-offs.

• Compost application (+/-) to build organic matter, improve cation exchange capacity, and stimulate microbial activity.

• Cover cropping (+/-) with diverse species mixes, including biofumigant crops like mustard, to enhance carbon inputs and soil resilience.

These practices are tested in all possible combinations, plus a true control, across an eight-treatment split-plot design with four replications at the WSU Honey Bee Farm in Othello. The rotation includes potatoes, field corn, and spring wheat, ensuring each crop is present every year.

Experimental Layout

The site features three crop ranges and four replications aligned with irrigation spans. There are eight plots per replication, each measuring 30 ft (E–W) by 20 ft (N–S) with buffers between east-west plots. Plots are arranged in split-plot format, where main plots contain fumigation treatments and subplots contain compost and cover crop combinations. This design ensures robust statistical analysis while reflecting real-world management constraints.

LTARE Site Team:

Tim Waters, Ashley Spradling, Maddie Spets, Levi Allen, Gary Middleton, Andy McGuire, Mark Pavek, Ken Frost, and Rui Lui

Potatoes were harvested and graded in September 2025.

Corn was planted in late May and set to be harvested in late October.

Infrastructure challenges resulted in irrigation delays and dry soils.

Progress in 2025

Trial Reset and System Improvements

Following a 2024 test run, the trial was redesigned to accommodate a new linear irrigation system. Early challenges included low pump pressure and drought stress for potatoes and corn, prompting a major system renovation in Fall 2024. Permanent plot markers were installed, and Timothy grass was planted around the plot area to stabilize borders.

The first full season highlighted the complexity of integrating conservation practices under irrigation. In 2025, irrigation reliability improved, though hose failures in July caused temporary setbacks. Repairs required specialized equipment, delaying operations for 11 days. By late summer, a new hose system was installed to prevent future disruptions.

- Initial soil samples taken in February 2025
- Crops fertilized in March 2025
- Compost applied in March 2025
- Crops planted May through August 2025
- Potatoes harvested and graded in September 2025
- Spring wheat harvesed
- Mustard disked
- Corn harvest is scheduled for late fall

Looking Ahead

The next steps for Othello LTARE include:

• Fumigation is lined up for late October to prepare for the next rotation cycle.

• Cover crops will be planted after cash crops, with species mixes evolving based on establishment success and stakeholder feedback.

•Comprehensive soil sampling to monitor changes in org anic matter, microbial activity, and nutrient dynamics.

• Yield and quality assessments for all crops to evaluate economic trade-offs.

•Stakeholder engagement through winter meetings to review progress and refine trial components.

	All Rotation Phases Planted Each Year						
Trt	Phase 1	Phase 2	Phase 3	Fumigated	Compost	Cover Crop	Summary
1	Potato	Field Corn	Wheat	Yes	No	No	+Fum
2	Potato	Field Corn	Wheat	No	Yes	No	+Compost
3	Potato	Field Corn	Wheat	No	No	Yes	+CC
4	Potato	Field Corn	Wheat	Yes	Yes	No	+Fum+Compost
5	Potato	Field Corn	Wheat	Yes	No	Yes	+Fum+CC
6	Potato	Field Corn	Wheat	No	Yes	Yes	+Compost+CC
7	Potato	Field Corn	Wheat	Yes	Yes	Yes	+Fum+Compost+CC

The Othello site grows a rotation of potatoes, field corn, and spring wheat. Each crop is present every year.

EASTERN WASHINGTON WINE GRAPE SYSTEMS LTARE SITE

Devin Rippner, USDA-Agriculture Research Service and Liz Gillispie, WSU

The Washington Soil Health Initiative (WaSHI) Vineyard LTARE at Prosser continues to advance its mission of improving soil health and sustainability in irrigated wine grape systems. This site was established to answer critical questions about how soil health-building practices influence vineyard resilience, grape quality, and long-term sustainability under the unique conditions of the Columbia Basin.

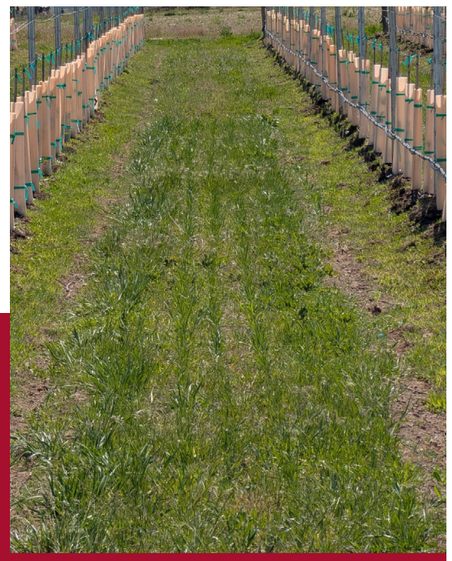
In fall 2024, the team conducted deep soil sampling across all treatment replicates to establish post-treatment baselines. Samples were collected from both under-vine and alleyway positions in Cabernet Sauvignon and Chardonnay blocks at five depth intervals (0–15 cm to 60–90 cm).

Analyses included:

- Carbon fractions (total, organic, and inorganic carbon).
- Biological indicators such as phospholipid fatty acids (PLFA) for microbial biomass.
- Chemical properties including pH, electrical conductivity (EC), cation exchange capacity (CEC), and available phosphorus.
- Functional indicators like permanganate-oxidizable carbon (POXC), ACE protein, and mineralizable carbon.

Vineyard Management and Growth

The 2024–2025 growing season



Cover crops have been established undervine (left) and in tractor rows (right).

LTARE Site Team:

Devin Rippner, Michelle Moyer, Markus Keller, Troy Peters & Elizabeth Gillispie

This experiment includes 2 wine grape varieties grown with 5 combinations of vineyard management activities.

marked the second year of vine establishment under five contrasting management systems. Key management activities included:

- Pruning and training vines to four buds in spring 2025
- Cover crop reseeding in under-vine and alley zones
- Targeted irrigation and fertilization, with synthetic fertilizer applied through drip irrigation in May and June 2025.

Outreach and Engagement

The Prosser LTARE team actively shared findings through several outlets. These efforts have strengthened industry awareness of soil health practices and fostered dialogue on sustainable viticulture.

Presentations at the Washington State Grape Society Annual Meeting, WAVEx webinars, and national conferences.

Field tours for growers, researchers, and policymakers, including visits from U.S. Congressional representatives and international scientists.

Popular press coverage, including features in Good Fruit Grower, Washington Grown Magazine, and the Sustainable Winegrowing Podcast.

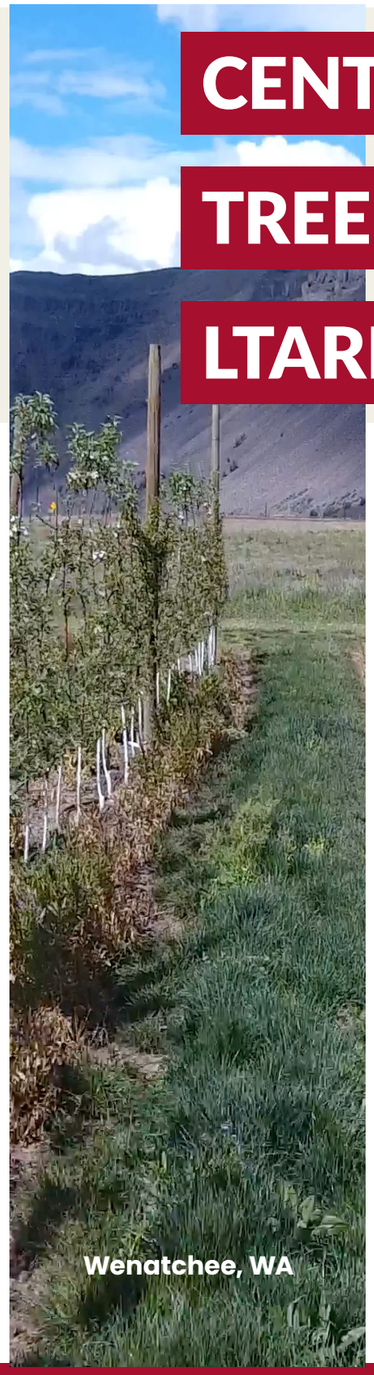
Challenges and Adaptations

The team faced several barriers, including labor shortages for critical vineyard tasks, rodent damage to young vines and moisture sensors, and equipment limitations, requiring upgrades to irrigation filtration systems and under-vine mowing strategies.

Solutions included partnerships with industry for donated vines, enhanced rodent control, and contracting skilled vineyard crews. These adaptations have improved vineyard uniformity and management efficiency.

LTARE treatments are helping wine grape producers optimize their vineyard for both soil health and weed management.

CENTRAL WASHINGTON TREE FRUIT SYSTEMS LTARE SITE



Tianna DuPont, Washington State University

The Washington Soil Health for Tree Fruit Long-Term Agroecological Research and Extension (LTARE) had an exciting year. Researchers planted two new trials between June 2024 and July 2025 year and collected the second full year of data on trial 1 established in 2023.

Research Objectives

The Washington Soil Health for Tree Fruit LTARE aims to develop and evaluate management systems that optimize fruit yield and quality through sustainable soil health management practices. Project goals include: identifying soil health best management practices that will 1) reduce fruit disorders related to nutrient uptake and water/plant stress; 2) conserve water and buffer environmental stress, and 3) identify long-term sustainable management for soil borne disease and nematodes.

Experiments

• Trial 1 and 3 (LTARE1, LTARE3) investigate practices to build soil carbon, reduce variability, conserve water, and buffer environmental stress with organic matter applications.

• Trial 2 (LTARE2) investigates soil amendment-based strategies designed to mitigate apple replant disease.

Experimental Progress

• Annual soil and rhizosphere sampling was conducted in the fall of 2024 for LTARE1 including measurements of biological, physical and chemical properties. Measurements included soil carbon, microbial communities and nematode soil food web indicators.

• Tree diameter was measured in the fall 2024 in LTARE1 to track tree growth.

• Treatments for experiment 2 (LTARE2) were implemented in August 2025 to experimental plots in a 2.5 acre orchard (Figure 1 to 3). Treatments include anaerobic soil disinfestation (ASD), Brassica seed meal (BSM) soil amendment, fumigation (FUM) and a no treatment control (CON).

• Treatments for experiment 3 (LTARE3) were applied in fall 2024 and spring 2025 to experimental plots in a 2.5 acre orchard. A high carbon treatment (Carbon) and organic treatment (Organic) was initiated with 10 tons per acre of compost applied in the fall. The mulch treatment was initiated in the spring with a 2 to 3 inch deep layer of apple wood chips

Figure 1. Researchers applying chopped orchard grass hay to experimental plots in August 2024. The hay serves as a carbon source for microbes who produce volatile compounds toxic to soilborne pathogens under flooded conditions.

LTARE Site Team:

Tianna, DuPont, Tracey Somera, Lee Kalcsits, Chad Kruger, Cameron Burt, Devin Rippner & Jessica Waite

Figure 2. Brassica seed meal application in experiment 2 August of 2024. Brassica seed meal releases volatile compounds toxic to soil borne pathogens and nematodes when incorporated into the soil.

Figure 3. Researchers tarping soil after treatments were applied to soil in August 2024. Tarps are impermeable to the volatile compounds produced brassicas in the brassica seed meal treatment and by microbes under anaerobic conditions in the anaerobic treatment.

• LTARE2 was planted to apple cultivar gala on G.41 and M9.337 rootstock in April 2025 (Figure 4). Activities to establish the planting included removing rocks, preparing the soil, constructing trellis, planting trees and training young trees.

• LTARE3 was planted with cherry cultivator Skeena on Gisela 12 rootstock in April 2025 (Figure 5). Activities to establish the planting included installing the irrigation system, preparing the soil, constructing trellis, planting trees and training young trees.

• Baseline soil sampling was conducted in the spring of 2025 for LTARE2 and LTARE3 including measurements of biological, physical and chemical properties. Measurements included plant parasitic nematodes, soil borne pathogens linked to apple replant disease.

• Tree diameter was measured in new experiments LTARE2 and LTARE3 in the spring to establish their initial size.

• Soil moisture was tracked throughout the growing season in each treatment for LTARE1.

• Tree stress measurements were conducted every other week in June and July in LTARE1.

Outreach

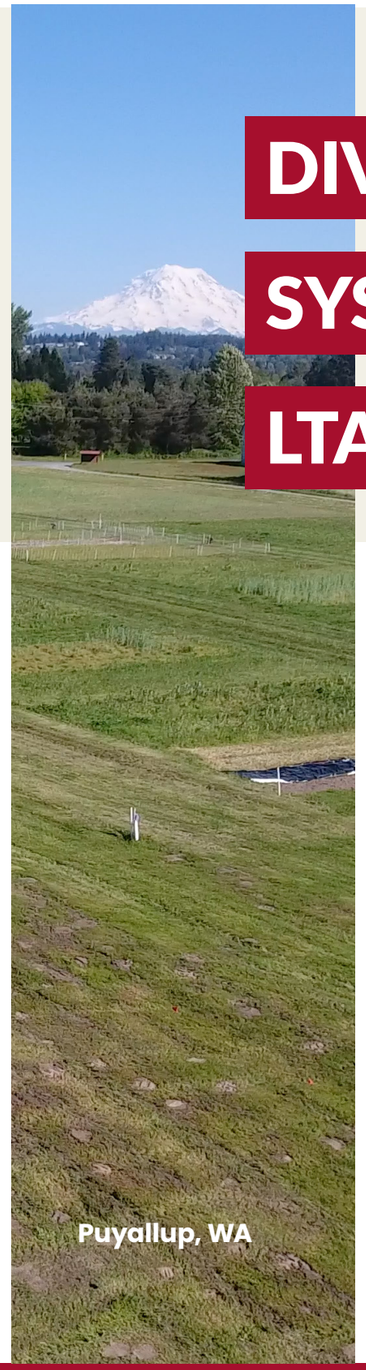
• We presented our progress at the 2024 Sunrise Research Farm Summer Field Day, attended by 100 participants, and at the 2024 Tree Fruit Soil Health Workshop, attended by 119 participants.

• Our LTARE site was toured by two groups, one from Australia and one from Texas.

• Cumulatively, over 250 people were reached through trainings and tours.

Figure 4. Gala apple trees newly April 2025 planted in soil treated with anaerobic soil disinfestation, LTARE2. Pictured June 2025.

Figure 5. Skeena cherries newly planted in April 2025 into experiment 3 (LTARE3). Soil in high carbon and organic treatments had 10 tons per acre of compost applied and will receive additional carbon from grass mown and blown from the drive row into the tree row.



DIVERSIFIED ORGANIC SYSTEMS WITH LIVESTOCK

LTARE SITE

Transplanting squash into strip-tilled zones in the reduced tillage treatment.

Applying compost to pasture in the animal-integrated treatment before tilling for fall-planted broccoli.

Doug Collins, Washington State University

The Puyallup Long-Term Agricultural Research and Extension (LTARE) site is located on certified organic land at the WSU Puyallup Research and Extension Center. The specific site was the location of a different long-term organic farming systems experiment that ran from 2003-2015. The land was maintained as pasture for the intervening years and transitioned to the new experiment during the summer of 2022. As part of the transition, plots were located, tilled, and planted to a summer cover crop of sudangrass in late June 2022. In summer 2023 vegetables were planted and harvested for the first time.

The experiment focuses on maritime northwest organic fresh vegetable systems. The design of the Puyallup LTARE was strongly influenced by the previous organic farming experiment as well as a different multi-year organic reduced tillage experiment. The design is a split-split plot, randomized complete block with 4 replications. Main plots include an intensive tillage, reduced tillage, and animal integrated system. To manage residue and prepare beds for planting, the intensive tillage treatment utilizes a rotary spader which tills to approximately 30 cm. The reduced tillage treatment utilizes a no-till transplanter, no-till drill, strip tillage, and a power harrow operated at 5 cm. The animal-integrated treatment also uses the power harrow and strip tillage and additionally reduces tillage over the 3-year rotation by establishing a pasture for 22 months. The experiment utilizes a 3-year crop rotation and subplots are the year of the rotation. Sub-sub plots include compost application where compost is applied at a relatively high rate (target is 28 dry tons per acre) once every 3 years.

The Puyallup LTARE research team, (L to R: Doug Collins (PI), Nicole Capizzi (graduate student), Amy Wagner (technician), Samantha Shortledge (Scientific Assistant)

LTARE Site Team:

Doug Collins, Stephen Bramwell, Todd Murray, Sierra Smith, Chris Benedict & Maren Friesen

In 2024 we harvested squash, broccoli, and winter wheat from the experiment. Soil health assessments were done during the squash and broccoli phases of the experiment. Results indicated that intensive tillage benefited all crop yields, especially compared to the reduced tillage treatment. Compost was applied before broccoli and had a positive effect on broccoli yield across tillage treatments. Squash and broccoli harvest are donated to local food banks.

An exciting development in 2024 was the introduction of sheep to the animal-integrated treatment. The sheep grazed on pasture (red clover, annual ryegrass, and perennial ryegrass) in summer 2024 and 2025. Pasture was rotated to broccoli in mid-August, so effects of pasture and grazing on nitrogen availability and broccoli yield can be assessed.

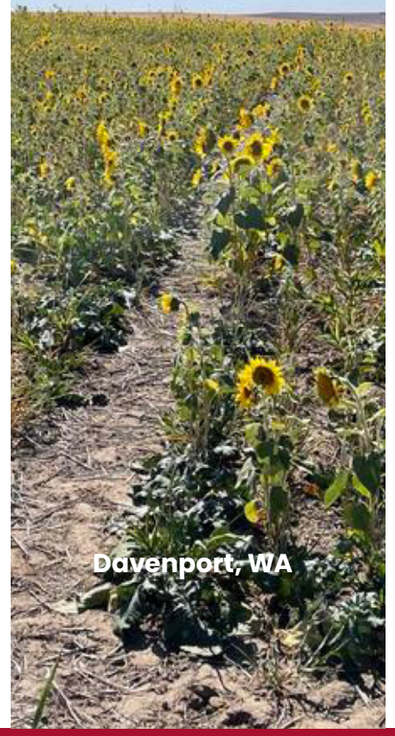
In 2025 we utilized soil moisture monitoring equipment to regulate irrigation in squash. We are still finessing this strategy and hope to share our soil moisture monitoring approach as a webpage in 2026.

A bonus of the LTARE is our ability to explore related research questions that could not fit into the long-term experiment. In a field adjacent to the LTARE, we completed an additional pasture experiment in 2024-2025 that yielded interesting results. Based on soil test data, we applied three different soil minerals before planting pasture: 1) micronutrients + dolomitic lime, 2) calcitic lime, and 3) no treatment. The results were exciting and showed clear promise for the micronutrients + dolomitic lime to increase legume (red clover) production. This pasture also serves as extra grazing land for the sheep.

Volunteers from Harvest Pierce County help harvest 'Delicata' squash from LTARE plots. 6,750 pounds of squash were donated to local food banks in 2025.

Sheep from cooperating farm, Local Color Farm and Fiber, arrive to tall pasture for their first day in the Puyallup LTARE.

DRYLAND SYSTEMS WITH LIVESTOCK LTARE SITE



Shikha Singh & Haly Neely, Washington State University

The Long-Term Agroecological Research and Extension (LTARE) site in Davenport, WA continues to advance its mission of improving soil health and sustainability in dryland cropping systems. Since its inception, the LTARE has focused on addressing key challenges faced by growers in the region—loss of soil organic matter, soil acidification, herbicide-resistant weeds, and moisture management. The site incorporates management activities that aim to:

- Increase soil organic matter in annual crop and crop-fallow transition systems.
- Shorten fallow periods to improve moisture capture and storage.
- Integrate livestock and cover crops into conventional rotations to diversify income streams and improve soil function.

The 2024 cover crop trial helped the team identify a mix that balances productivity, soil health, and feed quality.

LTARE Site Team:

Haly Neely, Shikha Singh, Aaron Esser & Don Llewellyn

Collaboration with growers, researchers, planners, and industry partners is key to the success of the WaSHI LTARE Network.

As Kruger Cattle steers grazed, their least favorite snack became clear. They left fields of untouched sunflowers in their wake.

Cover Crop Trial

In 2024, the LTARE site launched a new cover crop experiment. The trial compared five distinct cover crop mixes under a randomized complete block design. Species combinations range from traditional mixes (millet, peas, barley) to innovative blends featuring sorghum, sunn hemp, crimson clover, and radishes. The mixes included: Mix 1. tillage radish, turnips, white mustard, faba bean and sunflower; Mix 2: proso millet, spring forage peas, beardless barley, blackoil sunflower, and purple top turnips; Mix 3: Rye, oats, crimson clover, hairy vetch, daikon radish, and rapeseed; Mix 4: Sorghum and sunnhemp; and Mix 5: Spring triticale. These treatments aimed to identify optimal strategies for balancing biomass production, nutrient cycling, and feed quality. Results from the trials informed cover crop plantings in 2025.

Progress in 2025

This year marked significant milestones for the LTARE site at Wilke Farm.

Cover Crop Integration - In June 2025, the team seeded a diverse cover crop mixture designed to provide forage, improve soil structure, and enhance nutrient cycling. The mix included species such as proso millet, spring forage peas, beardless barley, blackoil sunflowers, and purple top turnips, building on previous trials while incorporating lessons learned from 2024.

Grazing - Six yearling steers grazed the cover crop in mid-September, continuing the site's integrated livestock approach.

Soil and Forage Monitoring - Biomass samples were collected and sent to a lab for feed quality analysis to ensure that forage meets nutritional standards while supporting soil health objectives. Prior to winter wheat seeding in September, soil moisture samples were collected across multiple depths (0–100 cm). These measurements help us understand how grazing and cover cropping influence water availability for subsequent crops.

Engagement and Outreach

The Dryland LTARE site's commitment to stakeholder engagement remains strong. In 2025, the team hosted the second SoilCon in January, coinciding with the WSU Lincoln County Wheat Producer Meeting. These sessions provide opportunities for growers, researchers, and industry partners to exchange insights and guide future LTARE activities. Looking ahead, a full advisory meeting is scheduled for February 2026, where researchers will share comprehensive results and next steps.

Looking Forward

The coming year will focus on:

- Completing soil and forage analyses from 2025 trials
- Continuing long-term rotation sampling to assess cumulative impacts on soil health
- Finalizing infrastructure for advanced soil stability testing at Lind
- Preparing manuscripts for publication

Thank you to the LTARE collaborators, advisory panel, and stakeholders for your continued support. The goal of our research remains unchanged: to deliver actionable, science-based solutions that help dryland growers maintain productive, resilient systems.

WASHI BLOG

READ THE WASHI BLOG AT WASOILHEALTH.ORG

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Soil Health Ambassador: Brier Patch Farm—Making Compost Leslie Michel	47
New precision agriculture technologies explained through Sustainable Farms and Fields Program Lauren Kirkpatrick	46
Guiding soil health advancement Molly McIlquham	28
Beyond the biochar hype—how to decide if it's right for you Dani Gelardi	117
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Thank you to the members of our advisory team for ensuring that we stay grounded in with what is important to our stakeholders by providing feedback on our projects.

Justin Allegro
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