

IN-RICHES

Creating systems level change that scales regenerative soil health systems in the Rocky Mountain region and beyond



What is IN-RICHES?

- Integrated Rocky Mountain-region Innovation Center for Healthy Soils
- Colorado Agricultural Experiment Station & CSU Spur
- “Integrated”:
 - Stakeholders
 - Ecosystem services provided by soils
 - Landscapes and ecosystems
 - The Rocky Mountain region
- Integration & innovation go hand-in-hand

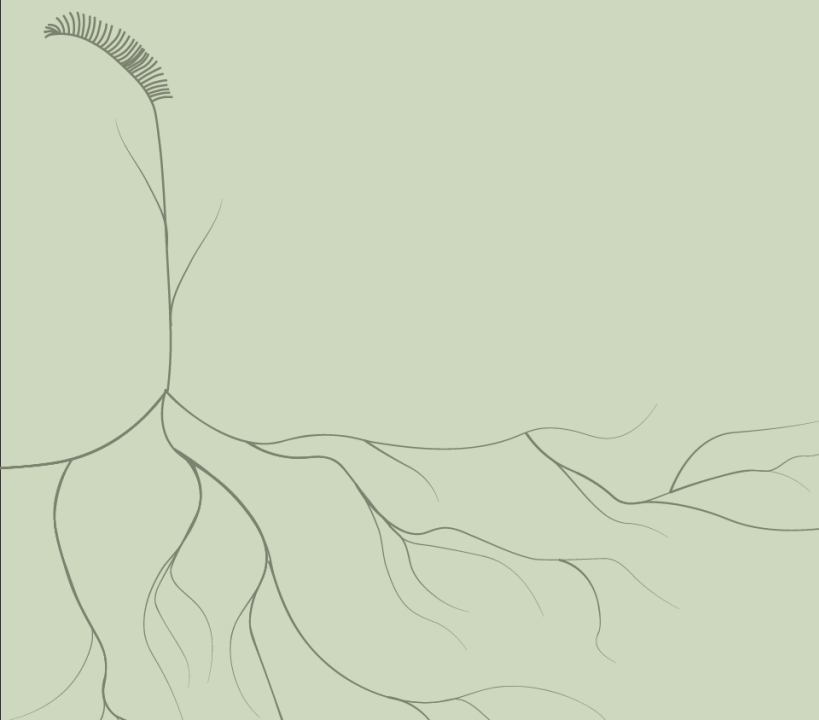


The Opportunity

- From forests to farms, healthy soils are critical for human, economic, and environmental health in the Rocky Mountain region.
- With climate change, soil's strategic importance is growing, including to meet the West's water supply challenges.
- The Rocky Mountain Region faces unique challenges, including critical information gaps, requiring a regional approach.
- The challenge is surmountable, but collaborative engagement of all key stakeholders is necessary.
- *IN-RICHES is driving region-wide impact because success is imperative.*



Our Approach: *Addressing Root Causes Through Collective Buy-in*



**Transdisciplinary
Engagement**



5 Focal Areas of Work

- *Collaboration.* Multi-stakeholder, science driven dialogue and co-learning opportunities.
- *Investigation.* Community engaged research that advances a holistic understanding of soil health and regenerative transitions.
- *Education.* Scientifically grounded support for land managers.
- *Exploration.* Helping all audiences understand the wonders of soil and advancing awareness of their critical role in human and planetary health.
- *Non-partisan expertise.* Objective information and input for policymakers.



**Collective Buy-in &
Systems Level
Change**



Leading Expertise for the Rocky Mountain Region

- Soil Ecology & Biogeochemistry
- Socio-cultural, community, and governance of food system sustainability efforts
- Stakeholder Engagement
- Policy and Program Development
- Education
- Building partnerships and collaborative processes with producers, government, and others



Priority Initiatives

- **Regional Soil Health Inventory**
 - Provide scientifically supported education and technical assistance
- **Web-based Soil Health Discovery Platform**
 - Support site-specific, regenerative decision-making
- **Colorado Open Soil Moisture Monitoring Infrastructure and Network**
 - Enable policymakers, land managers, and other to increase resilience to climate risks
- **Advancing the science of regenerative soil transitions & creating communities of practice**
 - Enable policymakers, supply chain partners, and others to create programs with lasting impact
 - Opening communication pathways between researchers, producers, extension and others



Rocky Mountain Region Soil Health Inventory

Objectives:

- 1. Standardized Soil Health Reporting:** Establish a standardized methodology for soil health data collection and reporting to create transparency and collaboration across state boundaries.
- 2. Support for Research Initiatives:** Facilitate and accelerate research by giving researcher access to long-term, landscape level data.
- 3. Development of Regionally- Specific Soil Health Benchmarks:** Process and analyze data to develop regionally specific soil health benchmarks to provide context for land managers, allowing them to tailor their practices to the unique environmental conditions of the region.
- 4. Creation of a Soil Health Discovery Platform:** The inventory is the backbone of a real-time monitoring platform, which allows users to track changes in soil health and resilience in soil ecosystems.

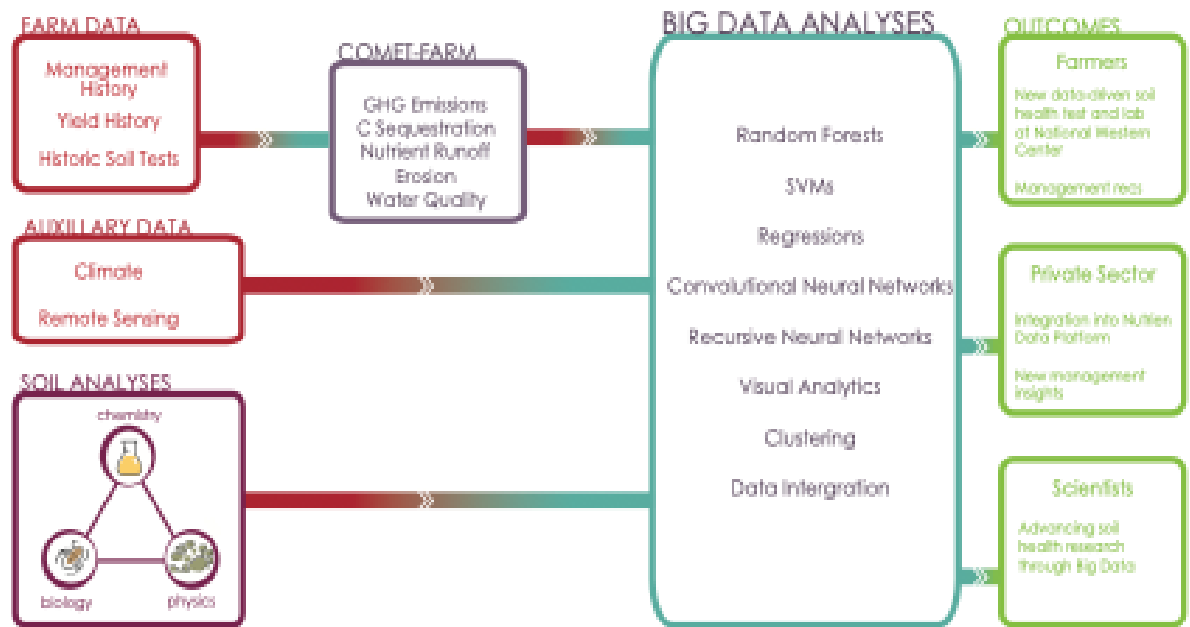


Rocky Mountain Region Soil Health Inventory (2)



Project Phases:

- 1. **Personnel Recruitment (in-progress):** Build an expert team including data scientists, soil scientists, project managers.
- 2. **Standardization of Data Collection (in-progress):** Develop and implement standardized protocols for data collection to ensure data consistency and quality.
- 3. **Privacy Protections (in-progress):** Privacy parameters and data security measures will be put in place to protect sensitive information.
- 4. **Data Workflow and Systematization (in-progress):** Data management protocols will be designed to ensure data is organized, accessible, and stored securely.
- 5. **Collaboration (in-progress):** 35 research fields that IN-RICHERS is spearheading in partnership with STAR+, CDA, and research institutions in WY, MT, UT, NM, ID to lay the soil health inventory foundation.
- 6. **Data Analysis:** Determine soil health benchmarks and the identify trends using advanced statistical modeling and machine learning techniques.
- 7. **Creating an Outward Facing Data Repository:** An outward-facing *Soil Health Discovery Platform* will be developed to make data accessible to a wide range of stakeholders. The repository will provide user-friendly interfaces for data retrieval, visualization, and comparison to peers.



Soil Health Discovery Platform

Objectives:

- 1. Educational Hub:** Establish a comprehensive educational resource for broad audiences that will promote understanding and awareness of soil health.
- 2. Data-Driven Decision-Making:** Provide access to soil health data that compares soils across the region and links changes in soil health to changes in management.
- 3. Context-Specific Interpretation:** Showcase regional (e.g. cropping system, soil type, climate) soil health benchmarks to ensure relevance to local context and needs.
- 4. Collaboration and Empowerment:** Unite farmers, researchers, and policy makers in the co-creation of the platform, creating visualizations and conceptualization of soil health knowledge that is meaningful and impactful for soil health education.
- 5. Sustainability and Accessibility:** Create a sustainable web-based platform that remains accessible and user-friendly, promoting long-term engagement and support for soil health initiatives.



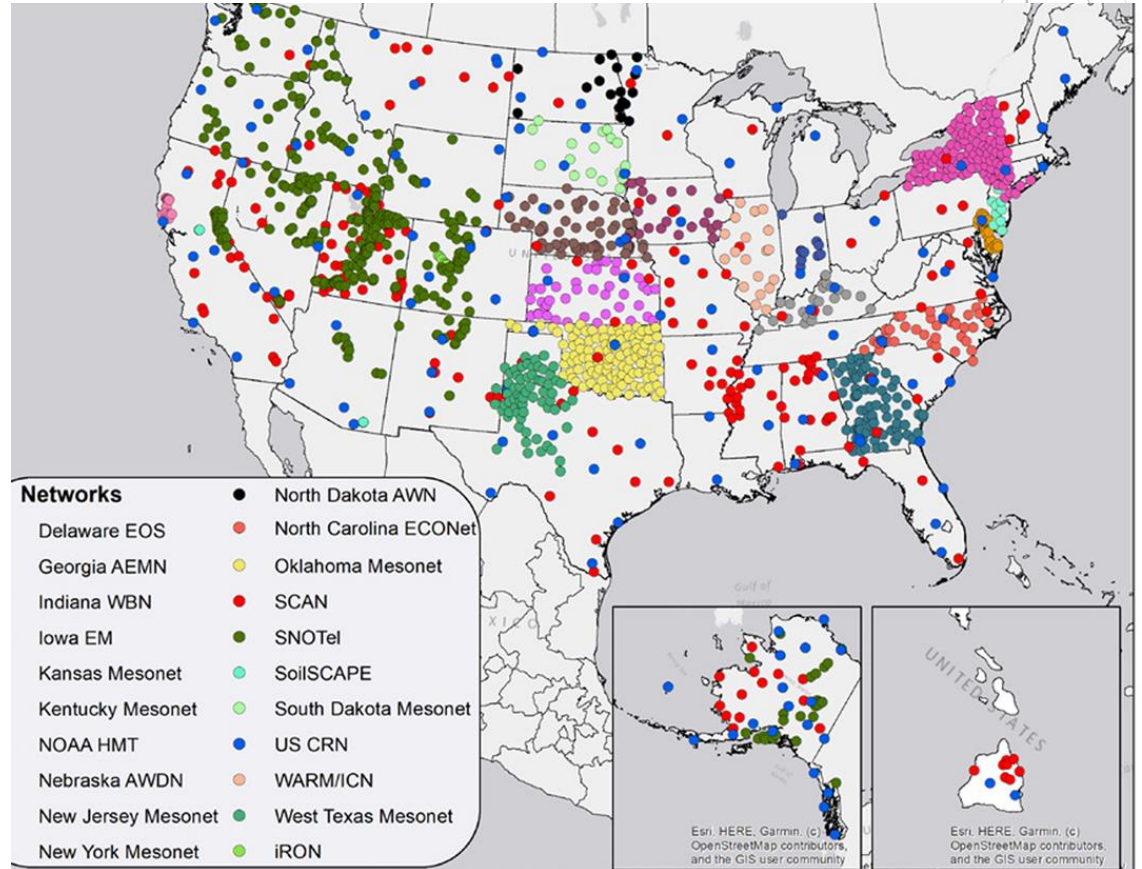
Project Phases:

- 1. Establish Soil Health Inventory Framework (in-progress):** Foster collaborative partnerships, on-going data collection, and conduct advanced statistical analysis to inform the platform's data framework.
- 2. Stakeholder Engagement and Conceptualization:** Collaborate with key stakeholders to gather input on platform needs.
- 3. Platform Development and Testing:** Work with computer scientists to design the platform's user interface and conduct iterative testing to ensure functionality.
- 4. Continuous Data Updates and Sustainability:** Continue data collection and update the platform with the latest soil health information.
- 5. Community Engagement and Education:** Promote platform usage within the community and encourage stakeholder participation and data contributions.

Ideal Funding Scenario: \$280,000 per year for Regional Inventory and Discovery Platform

Open Soil Moisture Infrastructure and Information for Colorado

- Objectives
 - Increase climate risk preparedness by filling critical information gaps
 - Create an inventory of existing networks and on-ramp new networks for data sharing
 - Create an open-knowledge platform
 - Drive information on land-atmosphere feedback loops
- Project Design
 - Collaborative project with continuous stakeholder engagement
 - Initial investment in long-term infrastructure
 - 2-year project



Open Soil Moisture Infrastructure and Information (2)

- Project phases:
 - Establishment of Inventory
 - Needs Assessment
 - Gap Analysis
 - Rapid Infrastructure Deployment
 - Creation of knowledge platform
 - Long-term maintenance of infrastructure and platform
- Current partners and collaborators
 - Colorado River District, Colorado Climate Center, Yampa Valley Sustainability Council, Aspen Global Change Institute and others
- Initial Funding needed ~\$1.05M for 2 years



Emerging Amendments Research

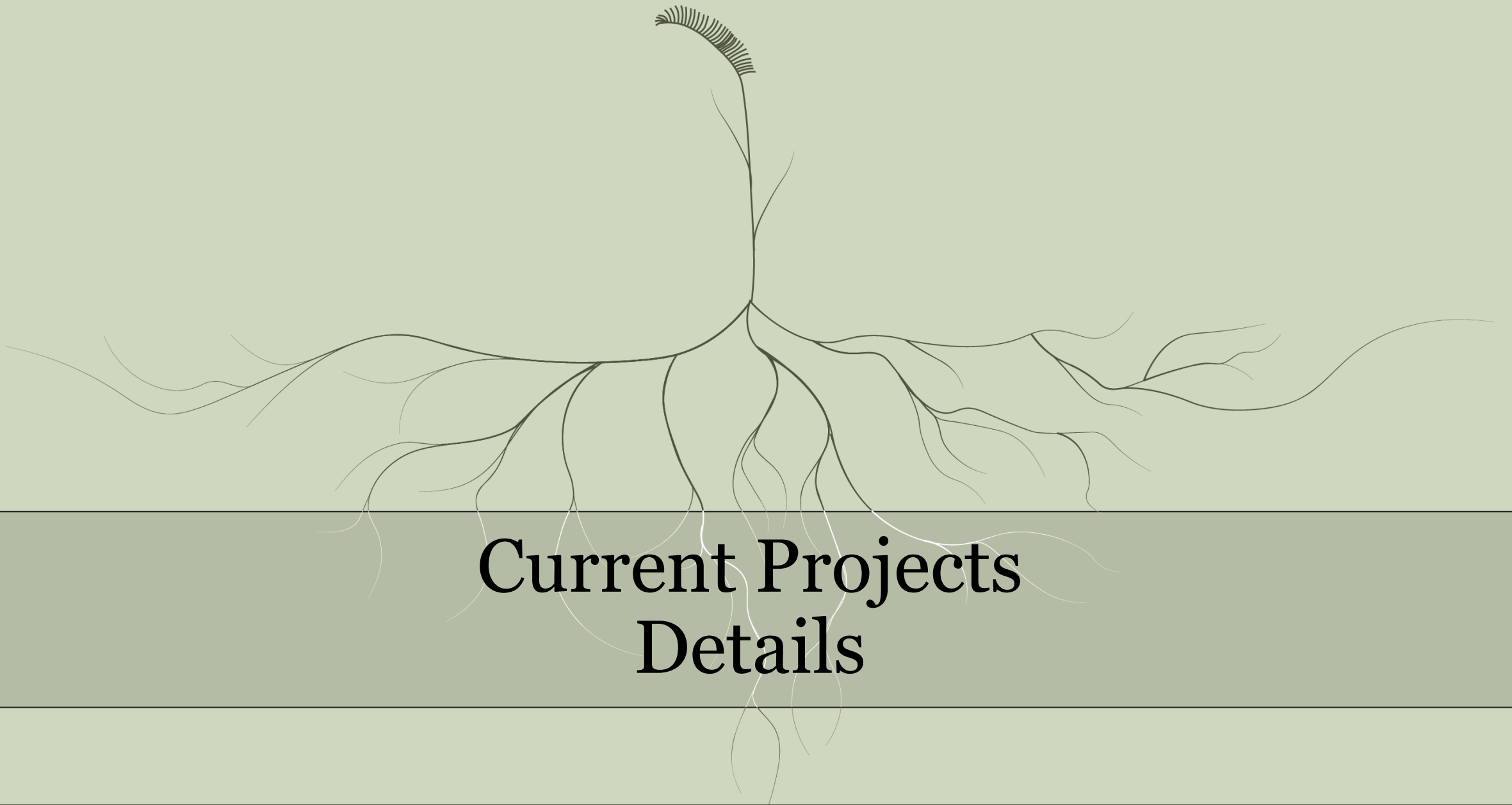
- Examples include compost, compost tea, humic substances, and inoculants
- Objectives:
 - Advance producer innovation and co-learning opportunities for nutrient stewardship on a regional basis
 - Systematize research to provide trustworthy information
 - Inform land use transitions (e.g., to dryland or perennial grassland)
 - Broad dissemination of findings
- Research design:
 - 2.5 year study with detailed soil and vegetative sampling and soil moisture monitoring
 - On-farm/ranch plots
 - 5 producers
 - Co-learning with producer(s) for diagnostic and amendment selection
 - Broad dissemination of learnings
- Funding needed: ~\$242,000 for one 2.5 year pilot



Opportunities for Partnership and Impact

- *Philanthropic giving to support our center and our priority initiatives and 5 focal areas of work.*
- *Partner with us to expand existing projects.*
- *Co-create new opportunities with us.*





Current Projects Details

Current Projects

- **Investigation**
 - Creating a framework for and building a Colorado and regional soil health inventory
 - Establishing a regional soil health research network
 - Validating the COMET-Farm and COMET-Planner for the arid West
 - Investigating the efficacy of emerging amendments in buy-and-dry lands and rangelands in Southeast Colorado
 - Open Soil Moisture Infrastructure and Information for Colorado
- **Collaboration**
 - Rocky Mountain Soil Health Roundtable and ongoing regional dialogue
 - Scientific and technical support for the STAR Plus Program in Colorado
- **Education**
 - Designing in-field decision support tools for soil health
 - Developing educational deliverables for the Colorado STAR+ Program
- **Exploration**
 - Designing an educational soil health exhibit for K-Gray audiences
 - Hosting open houses and educational workshops for urban audiences



Success in Systems Level Change

- Colorado Collaborative for Healthy Soils
- CO HB21-1181 Establishing a Voluntary Soil Health Program
 - ~450 producers enrolled
 - ~29 administering conservation districts and nonprofits
- CO SB23-092 “Voluntary Emissions reductions in Agriculture”
- Wyoming Collaborative for Healthy Soils
- Expansion of the Saving Tomorrow’s Agricultural Resource Program (STAR) to Western States



Climate Smart Commodities: Expanding the STAR Program Across the West

- **Activity 1: Expanding the STAR Plus program in Colorado**
 - 319 new STAR Plus participants (450 total)
 - Capacity support for up to 25 new CDs and eligible entities to work with producers
 - Peer-to-peer learning, pay-for-performance pilot, sociology research
- **Activity 2: Regional soil health research**
 - Subawards to land grant universities across 6 states (CO, ID, MT, NM, UT, WY))
 - 5 research sites in each state (10 in CO)
 - Soil health, water, and carbon analysis
 - Economic analysis across case study fields
- **Activity 3: Regional and National STAR Program Development**
 - Revise Colorado field forms and scoring sheets
 - Convene STAR Science Committees to develop field forms and scoring sheets for WA and Rocky Mountain region
 - Progressive web app development
 - National STAR development



Climate Smart Commodities Partners



Open Soil Moisture Infrastructure and Information for Colorado

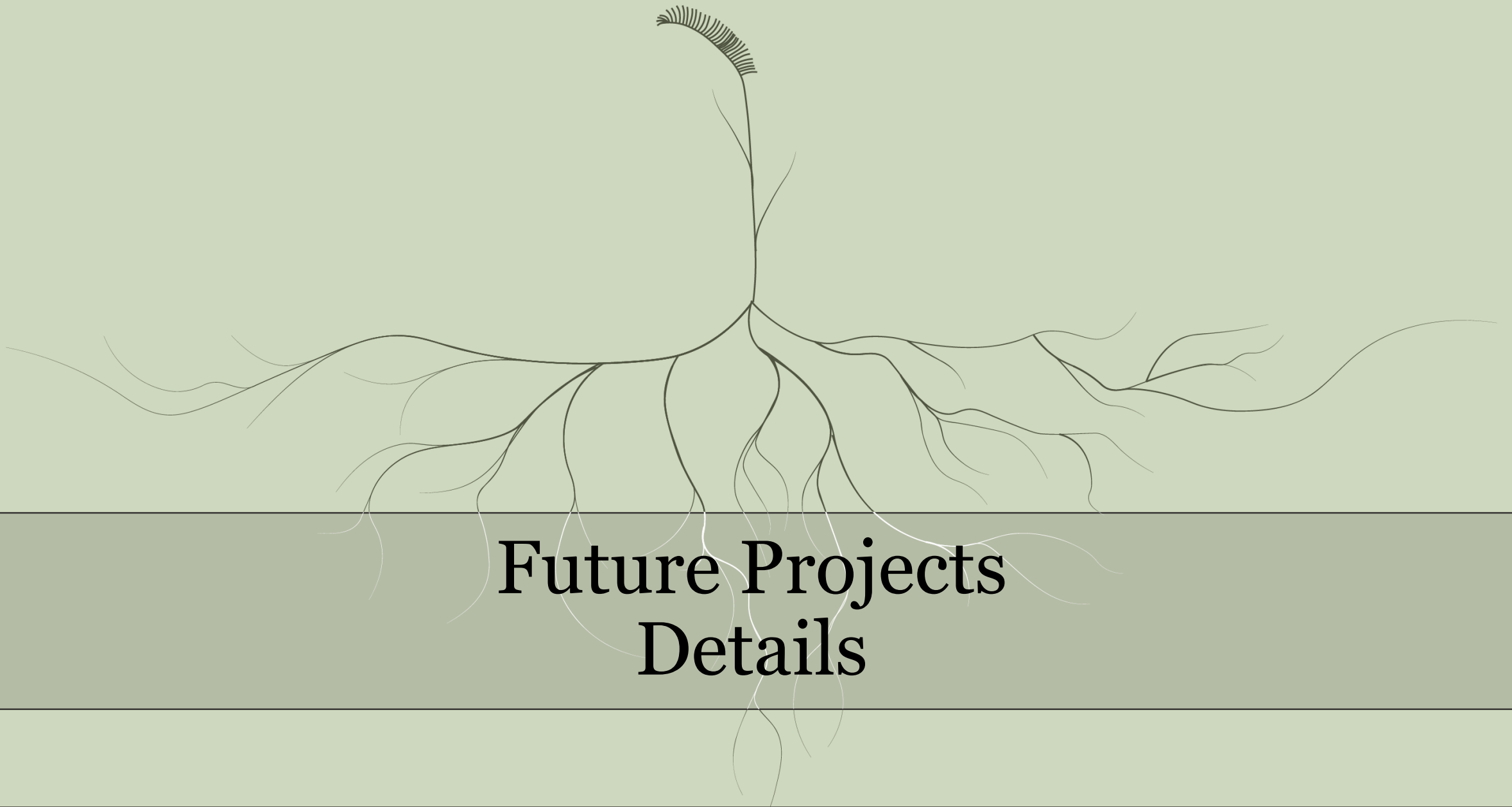
- Application for Earmark (Funds FY 24)
 - Rapid deployment of new infrastructure to fill existing gaps
 - Delivery of producer- and policy-relevant information through an open knowledge platform
 - Supported by Senators Hickenlooper & Bennet
 - Decision in Fall 2023
- Current Collaboration with:
 - Colorado River District, CWCB, Aspen Global Change Institute, Scripps Institute of Oceanography (CW3E), and others



Emerging amendments to restore grazing and buy-and-dry lands

- 1.5-year pilot project in SE Colorado involving IN-RICHES, CSU AES, Extension, and Denver Water
- Eight sites with award winning ranchers to study the impacts of emerging amendments
- Innovative Structure
 - Educational and diagnostic approach with ranchers
 - Soil testing coordinated with Colorado Soil Health Program and Climate Smart Commodities work
 - Creating a scalable approach to provide systematized research
- Status: Baseline soil and vegetative testing conducted; currently applying amendments





Future Projects Details



Thank you

Megan Machmuller, Co-director
megan.machmuller@colostate.edu

Helen D. Silver, Co-director
Helene.d.silver@gmail.com

Inrichsoil.com