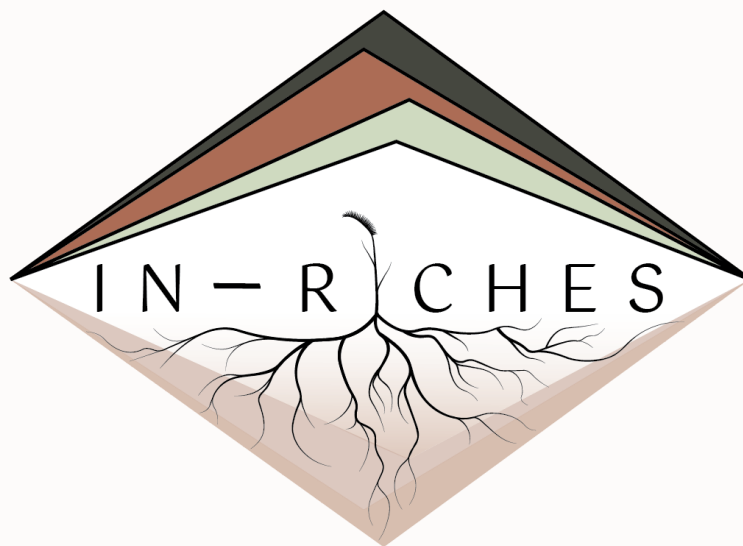
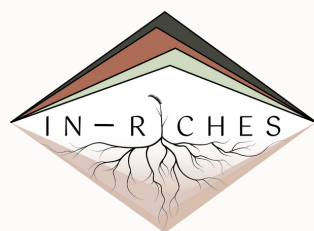


Rocky Mountain Soil Health Roadmap

Conference Report
of the
Rocky Mountain
Soil Health Roundtable





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ABOUT IN-RICHES

This Roadmap is the conference report of the **Rocky Mountain Soil Health Roundtable**. It is the result of stakeholder engagement conducted at the in-person event in Denver on Sept 19-20, 2023, and virtually over the last year. This document summarizes the results of that process, identifies barriers and opportunities, and suggests next steps for implementation.

Engagement in the Roundtable shows that there is substantial interest in soil health among Rocky Mountain producers, agricultural professionals, policymakers and other stakeholders. Despite this interest, many barriers prevent ranchers and farmers from adopting soil health practices. This report identifies **cost of soil improving practices, risk and uncertainty, tradition and cultural inertia, lack of credible locally-specific information, and lack of technical assistance** as some of the most commonly cited barriers among the stakeholders we engaged with.

At the same time, there are numerous opportunities to expand soil health activities in the region. This Roadmap identifies seven opportunity areas for advancing voluntary soil health practices in the Rocky Mountains. These include **demonstration projects, technical assistance, additional funding, market incentives, education, information sharing and peer-to-peer learning**.

While not a comprehensive list, there was broad agreement among the stakeholders that took part in this process that these are the things we should focus on. Appendix A contains the results of this stakeholder process and can be found at www.inrichsoil.com/resources

The **Rocky Mountain Soil Health Roundtable** has been a collaborative process focused on encouraging the widespread adoption of soil health practices across the arid West. This process included an in-person 2-day event in Denver, a virtual event, additional stakeholder outreach, and is culminating with this report.

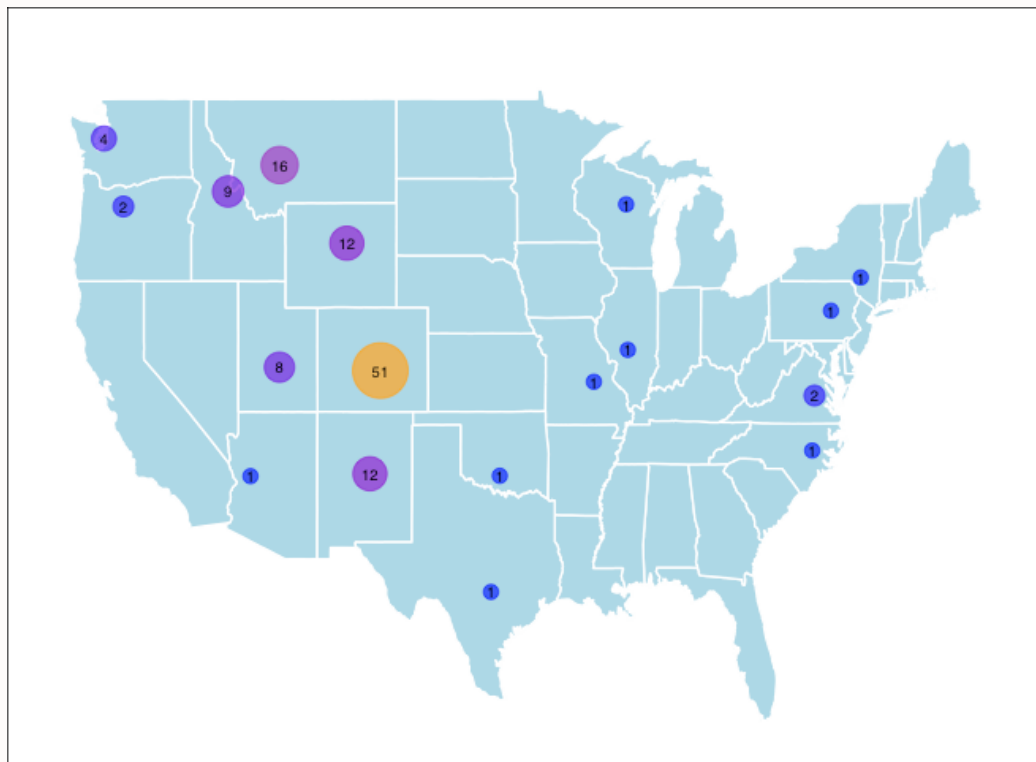
Prior to the event, we circulated a survey to more than 450 invitees and received 52 responses. Results from the survey were shared in aggregate format at the the in-person event to initiate group discussion, collaborative learning, and innovative problem solving.

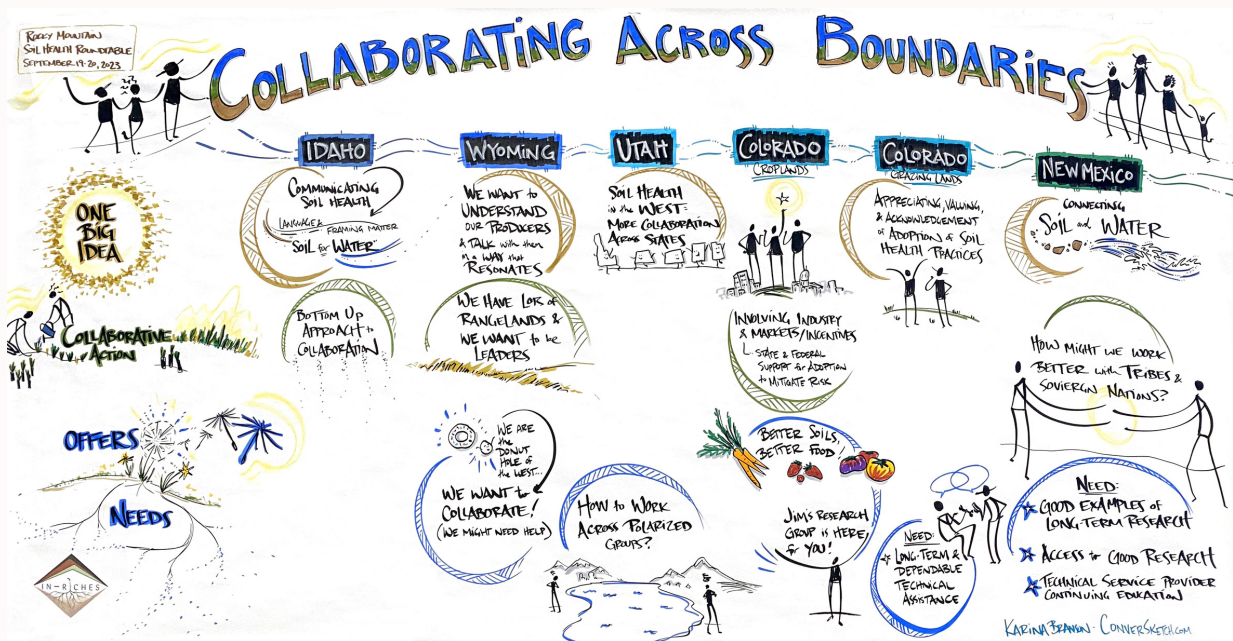
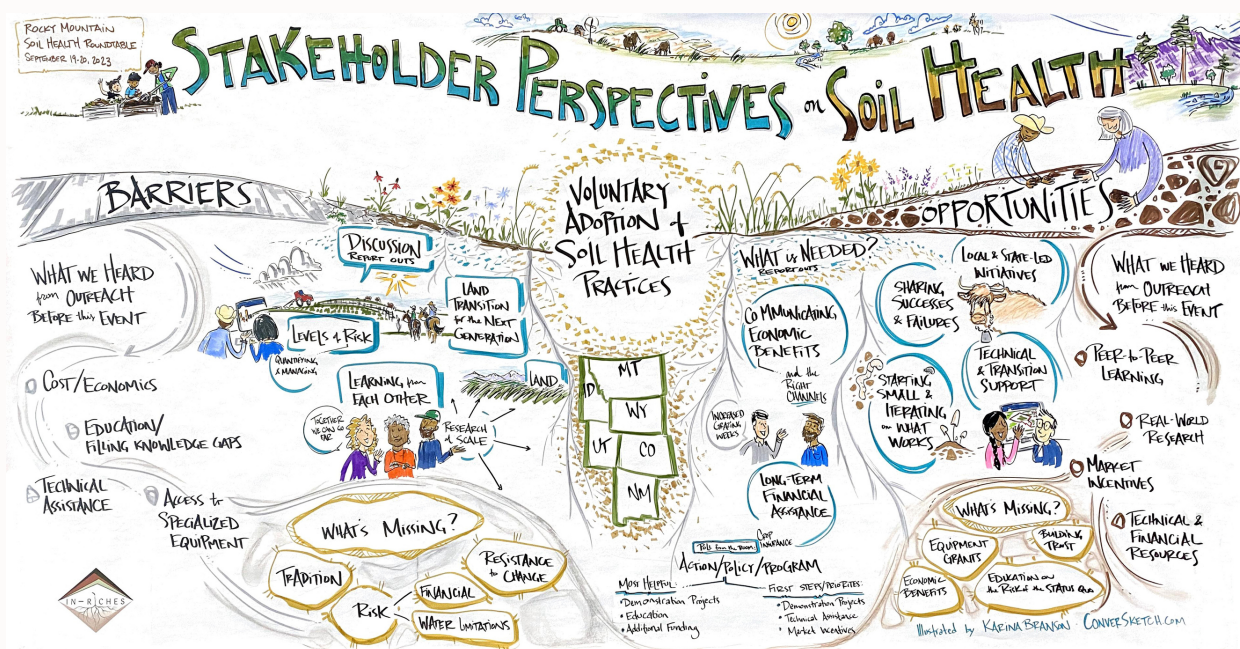
With 120 people in attendance, barriers and opportunities were discussed through plenary sessions that included panels with representatives from state soil health programs, policymakers, and producers. Participants were invited to further discuss successes and challenges in small groups, state specific breakout sessions and through interactive survey sessions using Poll Everywhere.

We examined and discussed the barriers that exist to the voluntary adoption of soil health practices. We also examined and discussed the opportunities that we have as an agricultural community to support farmers and ranchers in making their soils healthier. The goal of creating opportunities for producers in the region to improve their soils is ambitious, but it's also imperative if we are to sustain life in the West.

Through surveys, virtual events, and the in-person roundtable, we heard from a wide variety of stakeholders across the agricultural value chain in the Rocky Mountain West. These included producers; scientists, extension, and others affiliated with universities; supply chain partners; producer groups; nonprofits; and representatives from state, federal, and local governments. While the majority of stakeholders were from Colorado, we had representation from all six Rocky Mountain States.

Geographic Location of Participants in Poll Everywhere





Graphic recording was conducted by Karina Branson of ConverSketch. Learn more at www.ConverSketch.com.

BARRIERS

While there are several barriers to the adoption of soil health practices, the most commonly cited include 1) the cost of soil improving practices; 2) lack of technical assistance; 3) lack of credible, locally-specific information; 4) tradition and cultural inertia; and 5) and risk and uncertainty.

Commonly Cited Barriers



See [Appendix A](#) for the full Stakeholder Engagement results

BARRIERS

Cost of soil improving practices (including labor)

The cost (and perceived cost) of soil improving practices consistently ranks among the most significant barriers. Cost-savings are sometimes hard to see, particularly when there is a focus on yields over profitability. Additionally, economic case studies, particularly for the arid West and for ranching operations, are lacking. This makes it even more challenging to overcome trepidation about the cost of soil health practices.

“Economics is critical to producer buy-in and long-term investment is needed.”

Lack of technical assistance

Technical assistance from expert and experienced conservation professionals is a perennial need. Technical assistance providers sometimes lack training around key topics such as the economics of soil health practices. Additional training needs to be provided to certified crop advisors, extension agents, and other conservation professionals. Finally, better pay for conservation professionals is required in order to achieve sustained, high quality technical assistance.

“There is a lack of connection between universities and producers. We need experts with applied knowledge; producers often know more than conservation professionals.”

Lack of credible, locally-specific information

Participants at the Roundtable reported challenges around finding and trusting information and discerning credible information from misinformation. There is a perception that what works in some areas will not work locally.

“There are mixed messages from all sorts of different organizations and angles. This is challenging for farmers to sift through – better coordination is needed”

BARRIERS

Tradition and cultural inertia

Changing generational experiences and cultural mindsets is a formidable challenge. Many participants pointed to tradition and cultural inertia as the most significant barriers to the voluntary adoption of new practices. Shifting the culture around soil health is crucial for sustained adoption of soil health practices.

“An important aspect of changing approaches to soil health is culture change. Changing the understanding of the timeline of ecological changes is important so producers can stick with it and make needed adjustments.”

Risk and uncertainty

There is inherent risk and uncertainty in trying new practices. Each farm and ranch is unique, and so what works in one area might not be directly transferable to another. There's also the risk in the first few years of the transition period that yields suffer. With some notable exceptions, there is a lack of safe-to-fail opportunities and funding to eliminate the risk and uncertainty of experimentation.

“When trying new practices, producers are required to overcome both the fear of change and confront the risk that the practices won't be successful. Early adopters and others should be supported so that they don't burn out or give up.”

OPPORTUNITIES

Demonstration projects, technical assistance, market incentives, and education are rated as those opportunities that would be most impactful for producers. In terms of what opportunities should be tackled first, stakeholders rated demonstration projects the most highly, education second, followed by additional funding, technical assistance and market incentives. Conversely, carbon and other ecosystem goods and services markets consistently ranked among the least impactful opportunities among the stakeholders we engaged with.

Commonly Cited Opportunity Areas

Demonstration projects

Technical Assistance

Additional Funding

Market Incentives

Education

Information Sharing

Peer-to-Peer Learning

See [Appendix A](#) for the full Stakeholder Engagement results

DEMONSTRATION PROJECTS

Producers consistently report that they need to see that a given practice works in their area - that is, that there is a deficiency of “real world,” context specific data. Demonstration projects outranked all opportunities in terms of both impact and immediacy because of the potential to overcome a variety of barriers including 1) lack of credible and locally relevant information; 2) overcoming potential traditional and cultural inertia; and 3) reducing risk and uncertainty by showing how something works in the local context.

“Demonstrating usefulness is more important than proving financial benefits.”

“We need more grower informed and guided research. The results at a research center are often different than on the farm.”

“Demonstration projects need to show successes and failures.”

Demonstration projects are an excellent opportunity to advance a holistic and long-term understanding of the impacts of soil health practices in the context of an actual operation. To be effective, demonstration projects should be structured to show: 1) the challenges in practices; 2) their actual usefulness to producers; and 3) the economic outcomes.

Ideally, demonstration projects have characteristics that advance our understanding of soil health practices in a practical, locally-driven, and robust way. Therefore, we recommend that demonstration projects:

- Be both on-farm/ranch and have replication at scientific research centers;
- Involve producers at each critical stage, starting with project design through results analysis.
- Report on a wide variety of metrics, including soil health, drought resilience, and other locally relevant factors, as well as why certain practices were successes and others were not;
- Offer continuous community engagement and co-learning opportunities through for instance, field days, informal field walks, and newsletter updates.
- be long-term as conservation practices often involve a transition period and outcomes may vary year-to-year depending on climate; and
- include economic analyses.

Robust demonstration projects will help overcome several commonly reported barriers, such as: 1) lack of location-specific research; 2) cultural inertia; 3) mistrust that research data does not apply to the “real world”; and 4) perceived risk.

TECHNICAL ASSISTANCE

Even with ample educational resources, implementation of practices will vary from farm to farm depending upon the context, including soil and climate type, the production system, and existing management practices such as irrigation. A significant barrier is that many professionals on whom producers rely, including Extension, NRCS, conservation districts, and crop advisors, lack basic training in soil health. Providing this training to professionals who are already trusted by producers and who can work with producers at low or no-cost is critical.

Well-supported technical assistance programs through trusted professionals may help overcome barriers such as lack of credible, locally-specific information and reduce risk and uncertainty in the adoption of soil health practices.

“Having well-funded and well-informed technicians who can provide ongoing support as producers are adopting new practices would make a huge difference through their transitions.”

The delivery of technical assistance depends upon local factors, however there are several common approaches that can increase its efficacy. We recommend:

- Increasing the knowledge base of technical assistance providers regarding soil health;
- Creating a common framework for approaching and improving conservation that is specific to the production type; and
- Providing additional resources for conservation professionals, such as Extension, NRCS, and conservation districts, to perform in-depth site visits, including funding and staffing.

Unfortunately, the professionals trusted most by producers , such as conservation districts, Extension, and NRCS, often lack sufficient understanding of soil health and supporting practices to meet producers' needs. Therefore we recommend that states and NRCS support at least basic training of all conservation professionals in soil health and provide additional resources in areas, according to producer interest.

Beyond a shared educational foundation, it is important to provide conservation professionals with a locally-relevant, scientifically robust framework for analyzing the relevance of conservation practices for any given production type and encouraging improvement. Such a consistent framework will likely minimize risks for producers and support better outcomes.

Finally, each operation is unique, and the importance of having ample time to understand the individual needs of the land manager and production type is critical. Providing additional funding and staffing resources would increase the availability of this one-on-one support. This is particularly important for ranching operations, which because of their large size and heterogeneity, often require multiple day visits.

MARKET INCENTIVES

Market incentives are one of the most impactful ways to increase the adoption of conservation practices, but the stakeholder engagement results also suggest that they are one of the most difficult mechanisms to develop. Producers are not as receptive to ecosystem services markets (including carbon markets). Ecosystem services markets may also present greater risks to producers as outcomes are dependent upon factors outside their control, such as weather. Producers, however, take pride in their products and farm operations and want the people who buy and consume their products to do so as well.

Developing robust market incentives would overcome the most significant barrier cited by producers by reducing the financial risk and offsetting capital costs of soil health practices. Market incentives have the added benefit of not being inherently temporary by definition, unlike state, local, and federal programs and philanthropic funding.

“Cost share and incentives are temporary. If soil health practices don’t pencil out after the incentives are done, farmers and ranchers will stop.”

Incentives can be structured in several ways, including: 1) a premium per product unit; 2) payment by acreage; and 3) certification of farms/ranches for consumer-facing labels. Many factors will influence what type of structure is feasible and attractive to all parties. Above all, however, since producers are ultimately the ones adopting actions that benefit the environment and society at large, these must be structured to fit their needs. To ensure this, we recommend:

- **Structuring programs with producer input.** This input will lower the risk for supply chain partners, by helping to ensure demand for the program and participation, and producers creating clarity around participation requirements and rewards.
- **Paying for practices and monitoring outcomes.** In the arid Western United States, environmental outcomes are uncertain and depend on factors outside the producers' control. To increase producer participation and reward producers equitably, we recommend that payment be based on the practices adopted per acre with outcomes serving only for corporate reporting.
- **Simplifying producer engagement.** Producers commonly report that incentives programs require too much time, especially for paperwork. Supply chain partners should ensure that enrollment, verification (see below), and other aspects of the program are not onerous.
- **Providing equitable payment for producers.** A common criticism of market incentives programs is that producers are unfairly burdened with risk. This is because if payment amounts are insufficient, the pay-back-period may be several years, particularly if practices require a capital investment or result in a transitional yield loss. Factors that should be considered in setting rates include: 1) additional labor; 2) capital costs and other expenditures (i.e., seed); and 3) potential yield reductions.
- **Avoiding expensive outcomes monitoring.** Expensive monitoring protocols do not necessarily offer a high degree of certainty, and resources could instead be directed at supporting conservation. Therefore we recommend relying to the extent practicable on established models (e.g., COMET-Planner) and include in outcomes reporting conservation practices rewarded.
- **Including robust verification procedures that inspire and provide technical resources.** Verification protocols can vary from phone/video interviews, submission of documentation, on-site visits or a combination of the foregoing. Further, successful structures may include verifying all or just a portion of producers. Regardless of the exact process, supply chain partners and/or third parties should take the opportunity to direct producers to technical assistance, conservation planning, and other resources.
- **Allowing participation in other incentive programs.** Since one program is unlikely to fully compensate producers for capital expenditures and adopted practices, supply chain partners should allow participation in other programs when integrity of corporate reporting can be maintained.

ADDITIONAL FUNDING

While several federal programs provide funding for soil health practices, there are significant barriers and limitations to participating. For instance, NRCS programs are already oversubscribed, require significant paperwork, and involve competitive rankings. Further, NRCS programs may omit certain, innovative practices. Additional funding would help overcome the barriers of the cost of soil improving practices and help mitigate risk and uncertainty. In certain cases, additional funding can also help overcome the barrier of tradition and cultural inertia.

“We must build structures that are flexible, nimble, and allow for support to alleviate risk, show economic value, and increase opportunities for trying new practices.”

“Costs that you don’t have to pay are as good as incentives - things like loan payments and financing; lower insurance.”

We recommend the development of additional funding sources for producers from a variety of sources, including state and local governments and philanthropic sources. There are several promising grant types that should be considered by these entities:

- **Safe-to-Learn Grants.** Relatively small amounts of funding can allow farmers and ranchers to take on new risks by experimenting with soil health practices. Often these trials take part on small acreage and are meant to help producers gain familiarity and confidence with new practices. These grants do not permanently subsidize the cost of new practices; soil health practices still must be economically viable on their own. Instead, safe-to-fail grants allow producer-driven experimentation and innovation. In this way, they can be also be a powerful tool to change mindsets and overcome cultural inertia.
- **Equipment Grants.** Larger grants for capital expenditures can also be a powerful way to enable new practices. Grants to conservation districts, water districts, co-ops, other organizations, and individual farmers and ranchers can allow for both experimentation and conservation at scale. This funding is particularly powerful when used to purchase shared equipment. It is key to structure rules and guidance for equipment grants in a way that balances flexibility with oversight. Equipment grants should require matching funding from producers to ensure buy-in. Given the cost of farm and ranch equipment, they should be in amounts of at least \$20,000.
- **Transitional payments per acre for practices.** While it is likely infeasible for funding to cover practices the cost of conservation practices in perpetuity, additional funding could be provided to farmers based on the cost of adopting practices per acre for a certain number of years. This would assist in the transition to new practices by buying down the producers' risk. Custom rates from Extension could be used as the basis for reimbursement.
- **Lump sum payments.** These payments would involve a fixed amount per producer (by acre or otherwise) to adopt soil health practices. Reimbursement would be limited to actual costs incurred by producers.

EDUCATION

Education can take several forms, including: 1) a library of references; 2) audio or video classes; 3) decision support tools; 4) peer to peer learning opportunities for producers, researchers, and other agricultural professionals; 5) field based trainings - or any combination of these.

Topics of importance include 1) the soil/water/drought resilience connection; 2) the economics (short and long-term) of soil health practices; and 3) the time frames in which ecological change occurs. Providing trustworthy educational resources to producers in an accessible and streamlined format is critical. While there are several educational resources available, producers often do not trust them as they are or may not be: 1) scientifically rigorous; 2) locally relevant; 3) reflective of the realities of actual farm or ranch operations; and 4) in an easy-to-access fashion.

“Education; agriculture and environmental education are two separate tracks in school and they often blame/oppose one another, which is unnecessary since they can benefit one another quite significantly.”

- **Soil Health Curriculum for K-12 and Undergraduate Audiences.** We need curriculum to inspire and educate the next generation of producers, ag professionals, policymakers. Educational materials can also empower the public to make well informed choices at the grocery store and in other parts of life. These materials should be made accessible in digital and audio formats for maximum impact.
- **In-Field Assessment Toolboxes and Trainings for Conservation Professionals.** In-Field Assessments are known to be one of the most powerful experiences for understanding soil for producers considering new practices. Effective in-field assessments require training and simple equipment. IN-RICHES has developed a concept paper that would assemble toolboxes for conservation professionals to use in the field. Toolboxes would contain equipment such as penetrometers, infiltrometer, bulk density rings, and refractometers. These would be provided to professionals (such as those engaged with the Colorado Soil Health Program) along with training and other resources.
- **Scholarships for Soil Health Conferences.** Many producers begin (or accelerate) their soil health journey by attending soil health conferences. Conferences and speakers series such as Ranching for Profit, Soil Health Academy, and many regional events across the region have been pivotal inflection points for farmers and ranchers.
- **Open-Access Curriculum Tailored for the West.** Educational content in digital, audio and video formats should be created specifically for Western producers and conservation professionals. It should focus on drought preparation and other topics identified by this report as most salient to Western farmers and ranchers. It should be distributed through conservation districts, state government, NRCS, and made available to the public.
- **Co-Learning Discussion Series with Lenders.** The soil health community needs to engage with lenders about how to remove barriers to investment in soil health. To get started in this direction, a discussion series focused on bi-directional learning is recommended. Such an event series could be a good way for soil health practitioners to better understand the barriers that lenders face in providing loans for soil health practices; and would help educate lenders on the (economic and other) benefits of soil health practices. A regional NGO is likely best positioned to take on this project.

INFORMATION SHARING

Breaking down silos and building networks amongst different stakeholders is critical and will inform efforts on education, technical assistance, demonstration plots, and additional incentive structure. Specifically, information sharing should be increased amongst and between the following at a regional level: 1) land grant universities and other academic institutions; 2) between researchers, Extension, agricultural professionals, and producers; 3) amongst all of those groups and NGOs and decision makers. Often, the one-way information flow from researchers and technical assistance providers to producers is emphasized. This, however, ignores the importance of producers sharing their innovations and on the ground knowledge, which can serve as the basis for further research and education. Therefore, emphasizing this bi-directional informational flow and co-learning is critical. Information sharing would address the lack of credible, locally specific information; and helps mitigate risk and uncertainty.

“There is an information gap between actual operations and research.”

- **Regular Meetings between State Decision Makers.** Biannual meetings between program managers of state soil health programs, state conservationists, university leadership, and other decision makers across the region could go a long way to sharing information. An optional biannual call with program managers of existing state soil health programs is recommended as a good starting place. These calls could be facilitated and organized by a third party, or on a rotating basis by state departments of agriculture.
- **Standardized Research Protocols.** Effective and impactful regional research requires coordinated efforts and standardized protocols. The Colorado Collaborative for Healthy Soils, IN-RICHES and Colorado Department of Agriculture have established standardized protocols now in use with 400+ participants in Colorado and 35 research sites in the region. It is recommended that these “program” and “research” protocols be extended to other regional research efforts so that researchers can compare apples to apples.
- **Regional Inventory and Soil Health Discovery Platform.** A Soil Health Discovery Platform would allow producers to compare their outcomes to their peers by county and production system. With adequate confidentiality in place, this could be a way to inspire friendly competition, celebrate success, and spread innovation. IN-RICHES has submitted a proposal to National Science Foundation that would develop this as an informal learning experience through a process of community-based participatory research.
- **Clearinghouse for Economic Research.** Economic research is critical to overcoming a number of the barriers identified in this Roadmap. To ensure it is accessible to producers, ag professionals, policymakers, and researchers, a clearinghouse of regionally-relevant soil health research is needed. Such a clearing house (perhaps using Airtable or a similar platform) could be used to do this. In addition to creating such a resource, it is also important to keep it updated over time. A Western academic institution should take this on for the region.

PEER-TO-PEER LEARNING

Related to both education and information sharing, peer-to-peer learning is an educational approach in which individuals learn from and with each other. It is a co-learning process that emphasizes collaboration, knowledge exchange, and social interaction between stakeholders. Peer-to-peer learning can occur in a variety of settings, including in-field events and online platforms, and take many forms, such as informal and facilitated discussions and mentorship programs. While peer-to-peer learning opportunities between producers are critical, it has been repeatedly emphasized that co-learning opportunities should involve researchers, technical assistance providers, and, when appropriate, others, such as federal, state, and local decision makers and supply chain partners.

Peer-to-peer learning addresses the following barriers: Lack of technical assistance, lack of credible, locally-specific information, tradition and cultural inertia.

“Peer to peer learning is not just for producers, but universities, state agencies, federal partners, and others.”

- **Grow Existing Peer-to-Peer Learning Programming.** There are promising current initiatives that could expand significantly with increased funding. Funding this work should be a priority for philanthropic funders and federal agencies. Peer-to Peer for ag professionals should also be considered.
- **Virtual Shop Talks.** Virtual meetings have increased for everyone over the last few years and have become a powerful way to connect, particularly for those across large distances. Harnessing these tools to connect producers to learn from each other could increase peer-to-peer learning in a cost efficient way but powerful way. IN-RICHES hopes to develop virtual shop talks as an informal STEM learning experience as part of a recent NSF proposal. Whether funded or not, Western producers need ways to connect in virtual space about soil health.
- **Consulting Fees for Producers to Mentor Others.** Often a small amount of payment goes a long way to enabling farmers and ranchers to mentor others. Additionally, this financial support fosters a sense of community and collaboration and leads to the sharing of invaluable expertise.
- **Social Science Research to Evaluate Peer-to-Peer Learning (and other strategies).** We need social scientists to evaluate whether incentives, education, market opportunities, peer-to-peer, and other strategies work in convincing producers to try out and adopt new practices. Without rigorous social research, policymakers, NGOS, and ag professionals are flying blind. Such research needs to avoid an information-deficit framing, but look squarely at which types of policy interventions are most effective and empowering. Such work is already underway in conjunction with the Colorado Soil Health Program - it needs to be expanded in both scope and reach.

The following implementation steps are included to energize this dialogue into strategic action. These key steps will help to ensure that the momentum of the Roundtable continues and that insights gained through this stakeholder process make it off of the page.

- Institutional capacity support for critical supporting organizations.** Organizations such as conservation districts, nonprofits, and other NGO’s that work with and for producers and agricultural professionals, are central in both developing and implementing new programming. Investing in these organizations is a powerful way to encourage more programming in the opportunity areas identified in this Roadmap.
- Collaborative grant writing for state and regional programming.** This Roadmap could be used as a framework for collaborative grants writing that incorporates the ideas within. Grants could be pursued on a state or regional basis. Some grant opportunities that could be a good fit include Federal CIG and RCPP. As with the development of the Colorado Soil Health Program, a relatively small amount of philanthropic funding could be used as match to leverage other opportunities.
- Continue networking and other events to enhance regional connectivity.** Ongoing dialogue is needed between key stakeholders at the state and regional level. To keep up this progress of the Roundtable, investment in new and existing networking events is needed. Whether virtual or in-person, these events are critical to collaborating across boundaries.

SEITH RICHES IN THE BOARD

The mission of Integrated Rocky Mountain-region Innovation Center for Healthy Soils (IN-RICHES) is to create systems level change that scales regenerative soil health systems in the Rocky Mountain region and beyond.

IN-RICHES takes a holistic approach to soil health, integrating cutting-edge science, practical knowledge, policy, and community engagement to make climate-smart decisions.

We collaborate with researchers, land managers, policymakers, and other stakeholders to develop and implement innovative solutions.

We believe that healthy soils are the foundation of a resilient and sustainable food system, a thriving environment, and a prosperous society.

Colorado Department of Agriculture

The mission of the Colorado Department of Agriculture (CDA) is to strengthen and advance Colorado agriculture; promote a safe and high-quality food supply; protect consumers; and foster responsible stewardship of the environment and natural resources. The CDA vision is that Colorado agriculture be strong and vibrant, a key driver of the state's economy, and recognized worldwide for its safe and abundant supply of high-quality food and agriculture products. A key priority for CDA is promoting water-resilient agriculture and understanding how soil health is our greatest ally in keeping agriculture in the West a strong, viable, thriving industry.

Ground Up Consulting LLC

GUC helps clients develop community-driven policies and programs around soil health, working lands, and natural climate solutions in the Rocky Mountain West. Since 2019, GUC has led the Colorado Collaborative for Healthy Soils, the Wyoming Collaborative for Healthy Soils, and helped bring in more than \$30M in grant funding to launch STAR in Colorado and stand up the Colorado Soil Health Program.

Saving Tomorrow's Agriculture Resources

STAR is a national, non-profit organization leading work with state level Affiliate and conservation partners to empower farmers and ranchers to choose conservation as the standard on all agricultural lands to ensure a legacy of economic sustainability and clean, abundant water and healthy soils for future generations. The STAR framework inspires, guides, and standardizes conservation practice adoption and implementation across a variety of agricultural production systems at scale through state level STAR Affiliates. We provide STAR Affiliates with a comprehensive toolkit and tailored guidance to create a state specific STAR framework for enabling producer success through connections to technical, economic, and financial resources and programs.



AI Image generated by Dr. Lexi Firth

