



2024 Ogallala Aquifer Summit Summary Report:

Building Trust, Mobilizing Collaboration



IRRIGATION INNOVATION
CONSORTIUM



Ogallala Aquifer Summit Summary Report

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We greatly appreciate the Ogallala Aquifer Summit planning committee members, listed in Appendix A, who contributed their time and effort to help put together this event. Drafting, coordination review, and publication of this report was led by planning team members from NOAA's National Integrated Drought Information System (NIDIS) and the Irrigation Innovation Consortium (IIC). In addition to the many participants who provided feedback on this report, we would like to thank those listed as report contributors who provided input, review, and edits to the report.

The report resulting from the Ogallala Aquifer Summit reflects the dialogue and discussion of attendees, and does not represent official Administration policy or position, or an official policy or position of the individual organizations/agencies represented at the Summit.

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Executive Summary

Regional groundwater measurements in the Ogallala Aquifer show ongoing declines in aquifer water quality and quantity that are being exacerbated by warming trends and highly variable precipitation. The importance of this system, which is used for agriculture and is a main driver impacting socioeconomic activity and ecosystems in the region, cannot be overstated.

A large percentage of the nation's crop and livestock production takes place in this region. Irrigation of cropping systems significantly boosts productivity and reduces agricultural risk from drought conditions that are a common feature of this semi-arid area. Agricultural sales from the Ogallala Aquifer region contribute billions of dollars to local economies and national Gross Domestic Product (GDP) every year (USDA NASS, 2022; Steiner et al., 2021). For example, Texas County, Oklahoma, where irrigated agriculture relies wholly on the Ogallala Aquifer, is the largest agricultural producing county in Oklahoma, representing \$1.16 billion in total annual agricultural sales (USDA NASS, 2022). In Kansas, the boost in crop yields made possible by irrigating from the Ogallala Aquifer supports an additional 2.4 million head of cattle per year, increasing animal sales in Kansas by \$2.4 billion annually (Steiner et al., 2021). The region hosts many ethanol plants, dairies, and cheese-processing facilities in the region tied to the availability of locally-produced irrigated feed and forage (Owens, 2018).

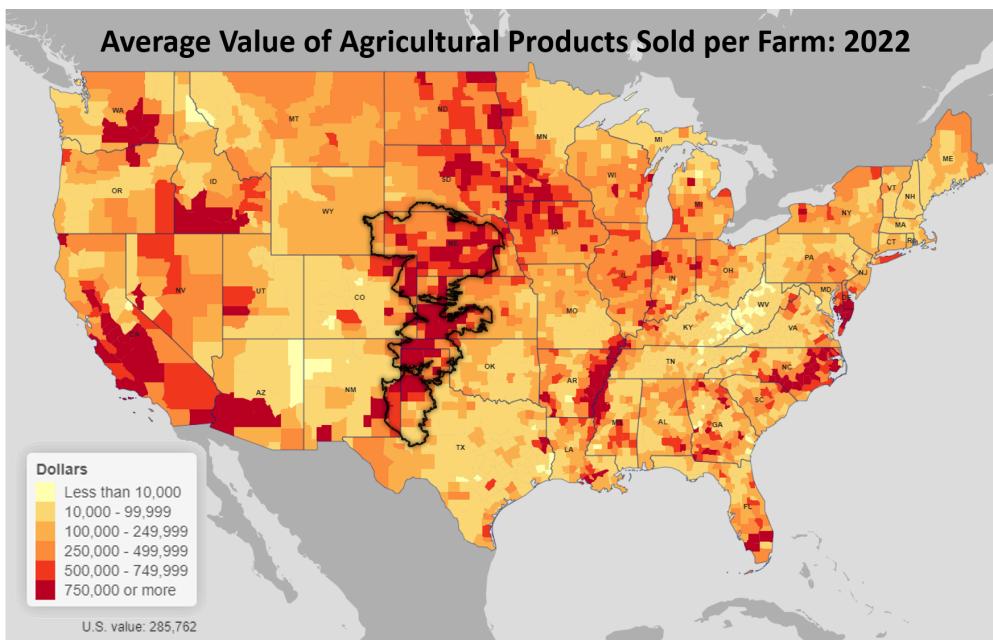


Figure 1:
Average value of agricultural products sold per farm with approximate boundaries of the Ogallala Aquifer shown in black.
Source: [USDA National Agricultural Statistical Service 2022 Census of Agriculture](#).

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The Ogallala Aquifer is in trouble. Available water storage in the region has declined by approximately 410 km³ since 1935 (Haacker et al. 2016). Based on current trends, the anticipated usable lifespan of some of the most productive portions of the aquifer measures on the order of decades (Haacker et al. 2016). A warming climate, which typically intensifies pumping for crop irrigation, may shorten this timeframe (Nozari et al. 2022). Addressing regional aquifer depletion and other water-related challenges, including drought, is vital and necessary work. This work requires social connections as well as management actions from the farm and personal scale to regional and global scales. The Ogallala Aquifer Summit, held in 2018, 2021, and in 2024, is an important convening event that brings together diverse water managers and practitioners working to address water management challenges within and/or across the region. The third Ogallala Aquifer Summit took place on March 18-19, 2024, in Liberal Kansas. It attracted around 230 participants and partners from across the eight-state Ogallala Aquifer region and beyond (South Dakota, Nebraska, Wyoming, Colorado, Kansas, Oklahoma, New Mexico, and Texas). Building on the model of two previous Summits, the 2024 Ogallala Summit explored new examples and ideas that can benefit the aquifer along with the communities, economies, and ecosystems that depend on it. The theme of the 2024 Summit was “Building Trust, Mobilizing Collaboration.”

When trust is high, partnerships are easy. Summit organizers aimed to bring together people and ideas to establish and build trust through focused discussion on existing effective programs, actions, and other activities. The 2024 Summit was designed to carry the conversation forward from previous summits, exploring how to align perspectives and activities of agricultural, municipal, industrial, environmental, research, corporate, and community domains. To adapt and scale efforts for the most positive regional outcomes requires increased awareness, collaboration, and trust to support the communities of today as well as of tomorrow.

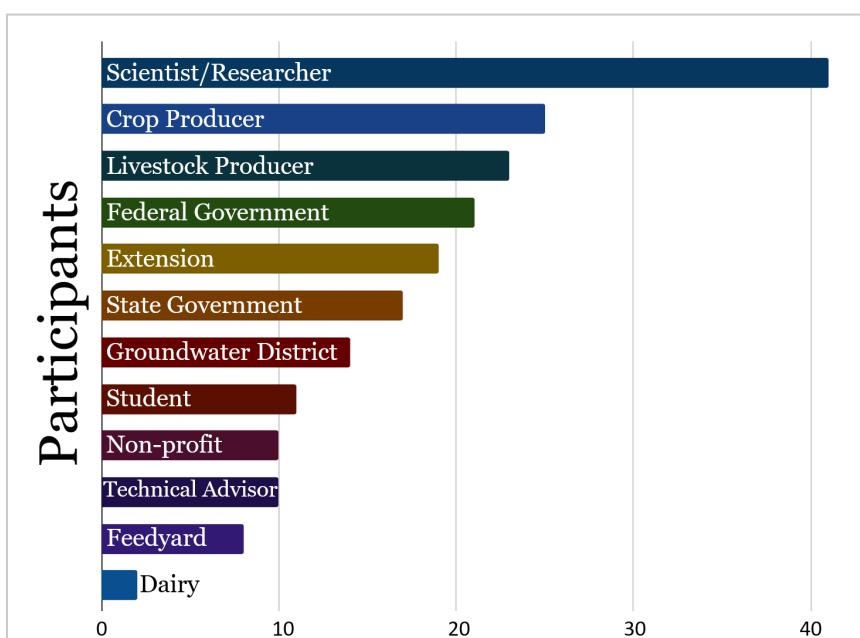


Figure 2: A count of participants at the 2024 Ogallala Aquifer Summit organized by participant type based on the description provided in the post-Summit survey. Note that not all participants returned a survey.

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The Summit was organized into four interactive sessions.

1. Applying Science and Data for Regional Agricultural Sustainability
2. Harnessing the Power of Peer Networks
3. Mobilizing Supply Chain Partners
4. Building the Future We Want: Thinking and Acting Intergenerationally

Each session involved a highly interactive, call-and-response approach of featured keynotes and panels alternating with facilitated, in-depth table discussions. Organizers designed these sessions to identify advances and successful shifts related to, or applications of, water management practices, science and data, policy, and effective partnerships.

The Summit culminated in a capstone session designed to identify actionable priorities relevant at individual, local, state, regional, and broader scales. Participants at each table were asked to identify things “they hope will be true by 2027” based on the information provided over the course of the Summit. Participants explored and shared information related to effective short-, medium-, and long-term natural resources management, investment practices, stabilizing supply chains, planning for rural vitality and workforce development, and systems approaches to building resilience in the face of climate change. Key takeaways from the capstone discussion that people hoped to see include the following:

- **Changes in Focus:**
 - Focus on sustainability and conservation
 - Focus beyond the here-and-now
 - Focus on mental health and personal resilience
- **Changes in Collaborations:**
 - This could also be characterized as *improvements* to collaborations beyond the traditional partnership with the farming industry to further include crop consultancy groups, lenders, investors, bankers, and food processors, etc.
 - Improvements to collaborations means taking a more holistic, regional approach to local water issues, including across state lines, beyond the Ogallala boundary and engaging Tribal Nations
- **Changes in Education:**
 - Improvements in public education about national water issues
 - Consistent messaging and better coordination across different groups working to bring the Ogallala Aquifer to a sustainable balance of supply and demand
 - Formal educational opportunities at all levels, including job shadowing and internships, to link students to careers in agricultural water management or supporting regional sustainability

- **Changes in Systems and Practices:**

- Increased water metering to track and report water use
- A uniform and accepted metric for water goals and conservation commitments
- Replication of the Kansas Local Enhanced Management Areas¹ (LEMA), or water conservation area models within other groundwater districts around the region
- More flexible crop insurance options for those that want to conserve water
- Increased water recycling and playa restoration

Overall, participants identified the need to foster broader understanding of the capabilities and limitations of Ogallala/High Plains region agriculture. This region is different from other key grain and livestock producing regions of the U.S., notably the Corn Belt. The region is semi-arid and drought-prone, and it relies on sustainable groundwater management to support agriculture and communities. Therefore, future policies, research efforts, and programs intended to strengthen agriculture and rural vitality will understandably be different for the High Plains region than from those applied to other regions.

The planning and execution of the Summit represented a collaboration between the Southern Plains Drought Early Warning System (DEWS) within National Oceanic and Atmospheric Administration (NOAA)'s National Integrated Drought Information System (NIDIS) and the Irrigation Innovation Consortium (IIC) at Colorado State University. One of the strategic priorities of Southern Plains DEWS is to build resilience and mitigate economic, human health, ecological, and other costs of drought in the region. Within the semi-arid High Plains region, drought resilience is achieved primarily through groundwater use and irrigation. The IIC is dedicated to testing, improving, and studying the use of advanced and precision irrigation management tools and strategies. The IIC also supports collaborations that involve diverse partners to advance precision irrigation management for conservation-oriented and productive land use outcomes. IIC leadership was involved in organizing the first two Ogallala Aquifer Summits through Ogallalawater.org, an interdisciplinary research and outreach project that predates the IIC's founding that was supported by the U.S. Department of Agriculture's National Institute of Food and Agriculture (USDA-NIFA) (2016-2021), working with the Kansas Water Office, Texas A&M University and other regional partners.

The suggestions and outcomes from the Ogallala Aquifer Summit are intended to provide guidance for future work in the region and can be taken up by any regional or national partners. For example, some of this guidance will apply best to private-sector partners within the crop or livestock industries, while other points may be directed toward researchers. The IIC, NIDIS Southern Plains DEWS, and key groups can work together to support improved drought resilience and profitable, water-smart outcomes for farmers, water districts, and communities across the region. Together with regional partners, we can achieve improved drought resilience and encourage more sustainable water management practices.

¹<https://www.agriculture.ks.gov/divisions-programs/division-of-water-resources/managing-kansas-water-resources/local-enhanced-management-areas>

Introduction

About a quarter of U.S. crops and livestock are produced in the Ogallala Aquifer region, making it an essential contributor to national and global food, feed, and fiber value chains. However, due to the semi-arid climate and the propensity for frequent droughts, agriculture in the region relies on irrigated cropping systems to significantly boost productivity and reduce agricultural risk. Across much of the High Plains, the Ogallala Aquifer represents the primary or sole water resource for agricultural, municipal, and industrial uses (Whittemore et al., 2018, Zambreski et al 2018).

Groundwater quantity and quality declines within the Ogallala Aquifer region have been extensively studied and discussed for many years (Scanlon et al. 2012). Available water storage in the region declined by approximately 410 km³ since 1935 (Haacker et al., 2016). Based on current trends, the anticipated usable lifespan of some of the most productive portions of the aquifer measures on the order of decades (Steward et al., 2013; Haacker et al., 2016). A warming climate, which typically intensifies pumping for crop irrigation, may shorten this timeframe, particularly with “business as usual” crop production, rotations, and irrigation management patterns (Nozari et al., 2022). Meanwhile, researchers identified distinct geographic patterns in groundwater contamination and associated salinization in the Ogallala Aquifer region (Chaudhuri and Ale, 2014), along with other water quality issues (nitrates, PFAS, etc.) that demand careful attention.

Preventing or slowing further decline of Ogallala/High Plains aquifer, a critical water resource, is paramount. Managing the limited groundwater resources of this region more sustainably is key to mitigating domestic and international food supply and supply chain risk, maintaining land value, and supporting social and economic vitality. From a land management perspective, available groundwater supplies mitigate drought impacts and reduce potential for large-scale soil erosion and land abandonment. And yet, collaborative exchange to address aquifer decline-related challenges is fairly new. Only recently have individuals, groups, businesses, and public actors in different states come together to learn about and support efforts to scale and implement adaptive solutions to address aquifer decline.

In parts of the Ogallala Aquifer region, adaptive management is showing potential to slow or even stall aquifer decline in certain areas. It also highlights the need for careful advance planning where transitions to dryland production (versus pasture) will be needed when irrigation is no longer viable (Schipanski et al., 2023). The region’s agricultural sustainability will rely on collective commitments that value and prioritize conservation of groundwater, soil, and energy. Such commitment requires strong local leadership, diverse expertise, well-conceived policy mechanisms, technical support capacity, and economic incentives or investment. In other words, cohesive and intentional adaptive management is required for practical, inter-institutional, and science-informed governance at a local, state, and regional scale.

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This context underscores the value and importance of the Ogallala Aquifer Summit. This eight-state interactive meeting is designed to build trusted social connections that link the work of diverse regional stakeholders and agents of change. First held in 2018 in Garden City, Kansas, and again virtually in 2021, the goal of the Summit is to catalyze collective action to ensure the function and vitality of communities and regional ecosystems today and for generations to come.

On March 18–19, 2024, more than 230 water management leaders from all eight Ogallala states gathered in Liberal, Kansas for the third Ogallala Aquifer Summit. This Summit event was designed and coordinated by a multi-state planning team led by the IIC based at Colorado State University and NOAA’s NIDIS with key assistance from Kansas-based colleagues along with a 24-person planning committee (see Appendix A). The Summit received financial support from a USDA-NIFA conference grant, and several other public and private sponsors.

The 2024 Ogallala Aquifer Summit theme was “Building Trust, Mobilizing Collaboration.” Summit participants included producers, commodity leaders, representatives from water management districts, technology companies, state and federal agency staff, nonprofit representatives, researchers, students, policy makers, and elected officials. The meeting’s format of keynotes, panels, and workshops fed into a final capstone discussion in which participants identified important activities with potential to benefit the region over the long term. This report provides an overview of the panels and input shared by participants during the Summit’s workshops and a description of immediate and anticipated impacts of this event, including some “next steps” to sustain regional momentum and dialogue.

Prior to the Summit, water management leaders contributed white papers summarizing key issues and efforts to manage critical water-related challenges in each Ogallala state. This included updates on information shared in white papers produced for previous Summits. Two additional white papers, one on crop insurance and another on “addressing common misconceptions” related to the aquifer and water resource management, were also produced for the Summit as core background reading material. Papers in this collection can be viewed or downloaded at: <https://www.irrigationinnovation.org/2024-summit-white-papers>.

Summit Sponsors



USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

USDA National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE



Summit Facilitation Led By:



Summit Format

The 2024 Ogallala Summit used an interactive call-and-response approach of keynote talks and panels alternating with facilitated, in-depth discussion at participant tables. Attendees were assigned to tables to facilitate connections and cross-pollination of ideas and knowledge spanning multiple states and stakeholder types. In guided exercises, participants shared their reflections on the success, opportunities and potential trade-offs associated with regionally-appropriate, short-, medium-, and long-term adaptive management practices (i.e., programs, strategies, policies, and partnerships) already underway. Participants also imagined a future built on and extending from the foundation of these practices that might benefit the region, considering questions like:

- What types of data and tools do, or could, most influence producers' decision-making to help ensure the region's agriculture will be viable in the short- and long-term?
- What specific types of collaborative structures or programs are helping people work toward common agricultural sustainability goals?
- What entities/actors along the value chain would you like to see supporting agricultural water sustainability, downstream of producers?
- Where is it particularly important that we do a good job at baton-passing with leadership and workforce development, to ensure a future of thriving agriculture in the region?

The flow of keynotes, panel sessions, and table discussions culminated in a facilitated capstone session, during which participants were tasked to identify actionable priorities and personal commitments with potential to benefit the shared aquifer resource, regional communities, and associated economic activity. The 2024 Summit also included an evening social and a livestock sector-specific "pre-meeting". The pre-meeting explored the critical role of maintaining water availability through careful management to sustain feed and forage supplies. The pre-meeting highlighted the fundamentally critical interlinkage of cropping and livestock systems. Dairy and beef sector representatives explored their role as critical "agents of influence" who can inform and help shape regional water management sustainability goals and outcomes. The evening social was hosted at a local movie theater² featuring short films and presentations offering time and space for discussion and socializing. Films included two short documentaries about the role of playa lakes in regional aquifer recharge produced and introduced by the [I-20 Wildlife Preserve](https://www.i2owp.org/preserve/)³ (Midland, Texas) and by the [Playa Lakes Joint Venture](https://pljv.org/).⁴ A separate, interactive session focused on exploring common misconceptions about aquifer hydrology and impacts of water management on groundwater decline.

² Thanks to Mitchell Theaters for opening up their venue for this event (<https://www.southgate6.com/>).

³ <https://www.i2owp.org/preserve/>

⁴ <https://pljv.org/>

Summit Overview

Summit opening remarks were delivered by Kansas Governor Laura Kelly and U.S. Senator for Kansas Jerry Moran, followed by a keynote speech by Meagan Schipanski, associate professor of agroecology in the Department of Soil and Crop Sciences at Colorado State University and director of the USDA-NIFA funded Ogallala Water Coordinated Agricultural Project (2016-2021) which co-coordinated the two previous Ogallala Summits in 2018 (Garden City, Kansas) and 2021 (virtual).

Following these introductory remarks, the main body of the Summit program was organized into interactive sessions and discussions, each devoted to some aspect of the Summit theme, "Building Trust, Mobilizing Collaboration:"

1. Applying Science and Data for Regional Agricultural Sustainability
2. Harnessing the Power of Peer Networks
3. Mobilizing Supply Chain Partners
4. Building the Future We Want: Thinking and Acting Intergenerationally

A final capstone further reflected on the content of these earlier sessions, when participants identified important activities with potential to benefit the region over the long term. The full Summit agenda is included in Appendix B.

Goals for the 2024 Ogallala Aquifer Summit

- Increase networking, alignment & collaboration within, as well as across, state lines involving diverse actors and groups and encouraging the alignment of shared goals, efforts, and responsibility for sustainable water resource management.
- Encourage new and continued activities critical to sustaining economic activity, aquifer health, and ecosystem and community resilience to climate change.
- Identify common vision, practices, and opportunities with potential to benefit the region if scaled or replicated, identifying key partnerships, connections, commitments to be supported post-Summit.

Introductory Remarks

Kansas Governor Laura Kelly

The Governor set the tone for the Summit, presenting an optimistic view of the future of water management and water use sustainability in western Kansas, which depends on the Ogallala Aquifer. “It is not going to be easy,” she said, “but the good news is that we are in a better position than we have ever been to get this done.” Governor Kelly outlined four aspects her optimism is based on: “First, we have the momentum. Last year, for the first time ever, the Kansas Water Authority voted to reject the planned depletion of the Ogallala Aquifer. This alone will put us on a new path towards water conservation.” Second, she noted new funding in Kansas “to jumpstart” conservation efforts thanks to new investment in the [Kansas Water Plan](#) of \$35 million annually for the next five years. “Third,” she said, “we have the science,” pointing to the new Kansas Water Institute at Kansas State University along with Kansas’s demonstrated excellence in having “some of the best [ground]water data in the world.” Finally, Governor Kelly noted, “we know what works,” highlighting initiatives like the Local Enhanced Management Area (LEMA) in Sheridan County, Kansas, and understanding the conservation impact of advanced technologies that support dynamic, real-time water monitoring and management.

“Strong, regional plans... will ensure the stability of the Ogallala Aquifer for years to come.”

- Kansas Governor Laura Kelly

United States Senator for Kansas Jerry Moran

Senator Moran also elevated the presence of “momentum” underway in western Kansas to address challenges that limited and declining groundwater resources pose to grow local economies, retain rising generations in the region, and to improve quality of life. Given that “...ongoing drought in Kansas is again putting additional strains on our groundwater supply,” Senator Moran described recent legislation he co-sponsored that would create a new groundwater conservation easement program at USDA to encourage voluntary, compensated reductions in groundwater consumption on agricultural land to support local, regional, or state groundwater conservation and management goals.

“Without water there is no agriculture, and without agriculture there are no rural communities in the High Plains.”

- Kansas Senator Jerry Moran

Setting the stage by underscoring the importance of what agricultural activity means for the region, Senator Moran noted farmers provide more than food and fiber; their activity supports “whole communities in which they live, work and buy, and where their kids go to school.” The Governor and Senator Moran highlighted the importance of this Summit in bringing so many people dedicated to building water management leadership capacity together to learn from one another.

Meagan Schipanski, Associate Professor of agroecology in the Department of Soil and Crop Sciences at Colorado State University

Dr. Schipanski provided background context from previous Summits, highlighting the 2018 Summit centered on recognizing the importance of learning from and with colleagues across state lines about water management and conservation efforts that made a positive difference for farms, communities, and regional management groups. Key takeaways from the 2021 Summit included the need to inform and align cross-state and cross-sector efforts and invest in workforce development.

Previous Summits clarified there is “no one-size fits all” solution, given how multiple groundwater trajectories exist across the region, which can be categorized as follows:

- (1) *Sustainable Use: Areas within the aquifer region endowed more generously with deeper reserves of groundwater*, which require improvements in irrigation management, particularly to address water quality concerns with little land-use change;
- (2) *Extended Use: Areas within the aquifer region with thinner or rapidly declining aquifer saturated thickness*, which require implementation of advanced irrigation technologies and water management strategies including shifts to lower water use crop rotations and/or selective irrigation well retirement; and
- (3) *Managed Depletion and Transition: Areas requiring major land-use transitions and large-scale irrigation retirement to preserve and use groundwater to restore broken ground back into pasture where it is unsuited for dryland cropping, and to support domestic, municipal, and industrial uses, which are less water-use intensive than agriculture* (Schipanski et al. 2023).

Each of these trajectories exist in all areas of the aquifer region, extending from the Northern to Southern High Plains. Such variability in groundwater levels underscores the need for coordinated planning and incentives to limit inequitable impacts on water users and local

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communities and to address local, state, and/or national level policy structures that inadvertently may impede or complicate conservation efforts.

Session 1. Applying Science and Data for Regional Agricultural Sustainability

Panel Discussion

Moderator

Elizabeth Ossowski (NOAA/NIDIS)

Speakers

Jonathan Aguilar (Kansas State University)

Rachel O'Connor (Environmental Defense Fund)

Dave DeWitt (NOAA/National Weather Service's Climate Prediction Center), and

Brownie Wilson (Kansas Geological Survey)

This session highlighted the work of scientists who gather data, and apply data-based insights related to the water balance of the region. These include hydrology, climatology, remote sensing, and decision support tools for productive, profitable, and conservation-oriented agronomic and water management decision making.

The panelists focused on how data, including big data, is increasingly applied in new tools to support local and regional hydrologic and climatological shifts. Panelists highlighted understanding sub-seasonal and seasonal climate variability and having [reliable seasonal climate predictions](#) provides critical insight in managing production and community risks. The [Q-Stable](#) tool, available through the Kansas Geological Survey, shows landowners and managers the impact over time of year-to-year groundwater use on aquifer levels in a localized area of a set diameter, such as 10 or 20 square miles. The Crop Water Allocator tool from Kansas State University's [Mobile Irrigation Lab](#), the [Nebraska Water Optimizer](#) from the University of Nebraska-Lincoln, and other similar tools were released and updated to support producers in targeting water applications for conservation-oriented, productive outcomes. Satellite-derived and modeled evapotranspiration data can now support or integrate with these existing tools at a field/farm scale, through tools like [OpenET](#), for enhanced decision support.

Interactive Table Discussion

Following the panel discussion, facilitators asked attendees to reflect on what it means for increasing amounts of data to be gathered, how (or if) these data are being used, and for whose benefit. Facilitators asked participants for their perspective on what would make such data and science actionable to best benefit the region and help to sustain agricultural viability in the short- and long-term. Participants mentioned several tools, such as Open ET, soil moisture sensors, and software platforms to support real-time water and energy monitoring, etc.

Notably the integration and use of big data to support decision making remains fairly modest among water users in both cropping and livestock production systems. During this discussion, some attendees shared they weren't immediately familiar with some or all of the tools showcased during the panel discussion, highlighting the opportunity in meetings such as the Summit to raise awareness of available tools.

Attendees also shared their ideas to accelerate or improve broader awareness, trust, usability, and uptake of these types of data or tools. A few noteworthy ideas and themes shared by participants included:

- **Education:** More effort and investment needs to be made to educate producers, crop consultants and others across the supply chain about data and tools. In addition to data and tools, there's a critical workforce opportunity to train people who can translate data and other information, including data trends, into practical guidance producers and water managers can use day to day. Sometimes this might mean holding large workshops, small-group trainings, or even one-on-one interactions with people, or simply simplifying tool interfaces ("green means irrigate, red means don't irrigate").
- **Peer Examples:** When producers see early adopters or neighbors in their community achieve successes by applying a new technology or management strategy that conserves water, this can generate confidence for others to follow suit. Sometimes it takes real-life learning experiences to make a mindset change, keeping in mind bad experiences sour farmers on trying new technologies. In a modern approach, social media trend-setters and social-influencers can help things catch on.
- **Economics & Financial Incentives:** Farmers need more information about the business or financial repercussions or ramifications of adopting a new tool. They need to understand the return on investments or the value in dollars and other benefits. This might include lowering the cost of new data, tools, or technologies, improving access to training and troubleshooting, to lower the hurdles to adoption. A few specific ideas participants shared include: more cost-sharing of soil moisture probes and other weather sensors, innovation grants for those willing to try new things, and involving the supply chain in helping to fund tools and data platforms. Data is increasingly available to support financial incentives connected to water-use-to-profit ratio rather than a yield-to-profit ratio.
- **Security and Accessibility:** Not everyone can use web-based tools. Lack of remote internet access, consistent or affordable digital connectivity, and technological literacy can be barriers to using web-based tools. If the tool is intended for use on a mobile device, consider privacy and app security concerns and cellular coverage on-farm. Some water users may be sensitive about sharing their water information due to concerns it

"Don't underestimate the intelligence and innovation of farmers!"

- Workshop attendee

may jeopardize their water use. It would be helpful to consolidate data into a few accessible points/portals.

- **Accuracy and Timeliness:** Correct, verifiable, and real-time data is a game changer for all kinds of management, supporting water savings, labor savings, and better decision making. Inaccurate data (e.g. misread water meters) erodes trust. Data quality control remains a challenge. Summit attendees expressed interest in seeing data and tool investment in open source tools that are reliable (or as reliable as possible) and adaptable to technology advancement.
- **Trusted Partnerships:** The way data and tools are pitched or demonstrated through partnerships can drive conversations and awareness. The Testing Ag Performance Solutions (TAPS) (a program with several chapters across the High Plains) and the Water Innovation Systems and Education (WISE) program (led by the Kansas Water Office) are two examples of trusted partnerships. In these partnerships, producers work closely with academics, agricultural technology industry groups, state agencies, commodity groups, and others. However, many farmers' ideas and decisions to buy into an idea happens "at the fenceline," based on engaging with or observing their neighbors and peers. To accelerate that diffusion, programs like Master Irrigator, a program with several chapters in the High Plains and elsewhere in the U.S.) help producers share ideas and insights about implementing new or different water conservation management practices in a setting where they are not competing against each other. Other ways to facilitate this kind of conversation could include a user network focused on weather data (a modern coffee shop conversation).
- **Usability:** Management tools and user interfaces need to be specific to climate, region, and soil type. They should also be reliable, unbiased, engaging, understandable, simple, effective, and maintained after development. Constant changeover in the private sector, the boom-busts of agriculture tech startup funding cycles, and emphasis on digital solutions led to tools being abandoned and a lack of continuity in tools and trusted personnel who understand how to apply these tools within local and regional management contexts.

Session 2. Harnessing the Power of Peer Networks

Panel Discussion

Moderator

Daran Rudnick (Kansas State University)

Panelists

Brian Lengel (farmer/rancher and Colorado Master Irrigator Program),
Jack Russell (Middle Republican Natural Resources District), and
Chris Grotegut (veterinarian, farmer/rancher)

This session focused on harnessing the power of "peer networks" to help bring people together to affect shifts in water management thinking and practice.

Brian Lengel presented on the growth and adaptation of the Colorado Master Irrigator program across the state since 2020. This 32-hour professional development course is offered to producers and crop consultants. It focuses on economic ramifications of integrating advanced water conservation, agronomic, and irrigation management practices. This course is organized and designed by a farmer-led project advisory committee. It seeks to equip participants with knowledge and connections they can use, including access to incentives to help pay for water management shifts on their farms to save water and maintain or enhance farm profitability. The program is formatted specifically to provide ample time for producers to engage with one another regarding their experiences working to test or implement different tools and strategies. It also leverages the expertise of a wide range of presenters—including producers, ag industry specialists, researchers, and many others to deliver a wide ranging curriculum.

In the Middle Republican Natural Resources District (MRNRD), all wells have been metered for more than two decades because of a settlement related to the Republican River Compact, which requires Nebraska to deliver water to Kansas. Jack Russell, manager of MRNRD, provided an overview of the full-scale modernization effort. This effort seeks to replace inaccurate meters and improve the time- and labor-consuming process of manual meter readings across the MRNRD. By improving meter accuracy, upgrading meters with telemetry to provide daily water use information, and helping finance additional decision support solutions (remote sensing or soil moisture probes), the district anticipates upwards of 10% in water use savings each year. The district will be able to effectively monitor and maintain these systems with one technician instead of three. Critically, the anticipated 10% savings equals 35,000 acre-feet/year, ensuring the district will be more than capable of satisfying its interstate responsibility to deliver 4000 acre-feet/year to Kansas. This achievement was made possible through shared effort and

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common vision involving producers, MRNRD's board and staff, technology companies, and state and federal support.

In addition to structured courses, peer-to-peer networks allow farmers to share successes and lessons learned. Dr. Chris Grotegut, a veterinarian and farmer at Grotegut Farms in Deaf Smith County in the Texas Panhandle, presented the challenges and opportunities of integrating regenerative practices on his operations, which stabilized, then improved groundwater levels at his farm. These aren't insurable practices through Federal Crop Insurance programs, even though they reduce farming risk. These opportunities can be facilitated at a state level, as occurred in the Master Irrigator program, or at a more local level, such as through Nebraska's Natural Resource Districts.

Interactive Table Discussion

Summit participants were asked to reflect on the following questions: "What specific types of collaborative structures or programs are helping people work toward common sustainability goals?" and "What makes these structures or programs effective?"



Summit participants identified existing collaborative structures shown in Figure 3. The "Other" category includes structures mentioned only once. These include: Climate Smart Commodities, Banking Conferences, the 4H Water Ambassador Program, and local faith groups, among other things.

Figure 3 at left: Examples of existing collaborative structures mentioned by Summit participants that are mobilizing collective engagement aimed at increasing conservation-oriented management. The "Other" category represents a collection of the structures that were only mentioned once.

Participants identified the following attributes that make these programs effective:

The “Who” Matters

In other words, who is connecting with whom, and how? When it comes to collaborating on Ogallala Aquifer water issues, it is important that knowledge sharing programs include involvement from multiple states or others within the geography of interest (aquifer-scale, regional collaboration). Several producers said they would like opportunities to work with scientists, economists, innovators, advisory boards, technical experts, coaches, or others with shared goals.

Community Control

In addition to opportunities to reach beyond the normal circles of influence, many comments expressed the value of peer-to-peer or “farmers teaching farmers” networks. Learning from peers who have success stories (“If you can do it, I can do it”), or even lessons learned, help establish respect and trust for new management approaches. Producer driven, locally controlled, and “bottom-up” approaches have a lot of traction. Participants acknowledged that sometimes a third party is needed to bring people/peers together, but this convening role should not smother grassroots initiatives, grounded interests, local input, and local control.

Incentives

What’s in it for the participants? Changing irrigation systems and making shifts in agricultural production to lower water use can involve costly system updates and upgrades. Knowledge-sharing programs need to provide some incentives, so participation is worthwhile and changes create value. These can include college credit, data-sharing opportunities, access to new knowledge or specialized training, and preferential operating loan rates. Sometimes the incentives aren’t financial. Other structures can be valuable, like the Testing Ag Performance Solutions (TAPS) program, which supports producers in testing new technologies and management strategies without risk using an interactive growing season-length contest.

Economic Practicality

Effective knowledge-sharing initiatives need to be cost effective. They also should highlight realistic potential return on investment and factors like the cost (time, labor and dollars) to learn or troubleshoot a new practice or technology. Many farms operate on a tight budget, so no-cost or low-cost education programs will be the only option for many potential participants. To be successful, some programs will need a steady source of outside money (e.g., grants) to establish a foundation for a program to scale up from. For example, the Natural Resources Conservation Service (NRCS) in five High Plains states recently invested significant funding to strengthen and scale the Master Irrigator and TAPS programs. This funding is complemented with additional non-federal sources of funding and sponsorship.

Cultural Will

Local champions who devote their time and talents to help support these programs are imperative to their development and sustainability. Where there is a willingness to lead an

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effort, there is the potential for additional leadership development to support programming and model more conservation efforts to drive collective momentum.

Discussion: Understanding Ogallala Region Cross-Cutting Risk

Moderator

Vincent Gauthier (Climate-Smart Agriculture, Environmental Defense Fund)

Panelists

Renata Rimšaitė (University of Nebraska-Lincoln),
Nathan Hendricks (Kansas State University)

The second day of the Ogallala Summit opened with a discussion focused on understanding the kinds of regional risk for the region's economies related to climate change, such as projected extreme heat and anticipated increases in water scarcity based on current water use trends. Panelist Nathan Hendricks from Kansas State University cited research showing how land values, spillover value to other parts of the agriculture sector, and community and business activities are all being negatively impacted today as a result of Ogallala Aquifer declines. This session highlighted that many different stakeholders are exposed to this risk with varying degrees of awareness, extending beyond irrigators and communities to a widely diverse supply and value chain. For example, moderator Vincent Gauthier shared analysis conducted by the Environmental Defense Fund showing agricultural lenders, which make loans and hold mortgages on properties across the region, believe climate and water risk are important, but only 8% have taken steps to formalize how they will finance loans to help mitigate that risk with landowners using their products and services.

While investment in irrigation technology is important to improve water management and conservation efforts, panelist Renata Rimšaitė from the University of Nebraska-Lincoln highlighted that investment in technology in areas where strong governance is lacking, or where there's a lack of incentives for water stewardship, will add an additional layer of risk. If lenders operate using assumptions that groundwater supply is constant into the future, investments in updating irrigation or other infrastructure might result in stranded assets, such as a center pivot that cannot deliver water due to declining groundwater levels. This can lead to increased risk for both the lender and producer, with ripple effects through the agricultural sector..

Lots of collaboration is needed to understand local and regional linchpins needed to support Ogallala region communities and productive agriculture into the future. For example, this might look like prioritizing more forage production over grain, since grain can be railed in to feed high-value cattle, while this would be cost-prohibitive to do for the forage part of feed rations. In another example, some major packaged food corporations are choosing to invest in advanced water management in areas where there is serious risk of water scarcity—encouraging

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management and adaptation shifts to address water risk. If those changes do not sufficiently address risk, that corporate investment may end.

Overall the risk to the region, and the world, is large, based on how the Ogallala Aquifer is managed now and going forward. Water risk is economic risk and will affect everyone within that economic system. The value of the water is immense to producers, their communities, and others all along the value chain. This session highlighted the need for ways to enhance the economic value of the water, whether through creative localized water market structures or incentives that reward producers for smart stewardship or other approaches. Bottom-up (producer and community led) and top-down efforts (civil governance and regulatory structures) that bring diverse stakeholders together for common investment, aligned goals, and efforts to prevent destabilizing risk for communities and food supplies are critical.

Session 3: Mobilizing Supply Chain Partners

Moderator

Ben Weinheimer (Texas Cattle Feeders Association)

Panelists

Nick Osman (Regrow Ag),
Joel Jarnagin (Cobalt Cattle), and
Andy Lyon (Trust in Beef)

All major agricultural sector industries face cross-cutting risk related to intersecting water and climate change related challenges. The Summit's second day opened with a panel session focused on the impact of Ogallala region agricultural activity on the local, national, and global economy and, as one panelist pointed out at this regional scale, ensuring "food security is national security."

This session focused on exploring how to achieve greater mobilization of supply chain partners "downstream" of cropping systems—beef and dairy sectors, agricultural lenders and investors, food processors, and others—in helping to address water challenges to support regional agricultural sustainability. Sustainable water management in the Ogallala not only impacts local farmers, but major corporations across the country and the world who rely on Ogallala water, or products produced with Ogallala water. Customers at grocery stores across the country buy bread or beef produced using Ogallala water. Northern Texas alone produces 20% of U.S. cotton supported by irrigation from the Ogallala Aquifer, which is exported from the region to global cotton markets. Corporations depend heavily on this region to source raw and processed products. This session highlighted the major need and opportunity for companies to mitigate increasing risks by investing in efforts to slow the decline of the region's water resources.

Panelists described implementing technology and innovations to support more sustainable water management in the region. In introductory remarks, Weinheimer explained the number of irrigated acres in the Texas Panhandle and High Plains regions declined by 40% since the early 1980's, while the population of these regions has grown by 25%. With this transition, agriculture remained the region's primary economic driver. According to Weinheimer, regional water planning models projecting to 2080 forecast the potential of implementing current known water management tools and practices. These projections suggest the region could lower overall water use by 55% from current levels while accommodating a 34% increase in regional population.

Local governance structures can be instrumental in affecting such change. In Kansas, for example, LEMA's allow groundwater management districts (in consultation with local water users) to set water conservation goals and control measures expressly intended to slow aquifer decline. Producers were able to remain productive and profitable while using less water, with the aquifer table stabilizing over time taking the variation of wet and dry years into account. Much

of this progress came through working with local feed and forage buyers, implementing cropping shifts (crop type and rotation, planting density), integrating soil moisture probes, and other measures.

A majority of the region's water use is applied as irrigation to grow feed and forage for cattle. Livestock value chain groups and industries can increasingly partner with growers through public-private programming to facilitate changes in aquifer conditions and influence smart and holistic approaches to water use. Developing a common understanding of how much water is needed to produce a ton of quality silage (or other feed), is an important step toward collaboration among government programs, crop insurance providers, farmers, nutritionists and feedyard owners.

New programs are emerging to reward and incentivize water conservation, but more are needed. Technological innovation supports more real-time data gathering on crop water use and water application amounts, but farmers face significant learning curves to use these tools effectively and apply them to determine return on investment related to water management choices. At the same time, at a regional scale, such programs and technologies aid communication to value chain partners interested in supporting water conservation and other environmental goals (agricultural emissions reductions, restoration of playa lakes for bird habitat, etc.).

A common understanding of water-use, including language, metrics, and data types, is crucial to unite value chain partners within the Ogallala. In recent years major agricultural corporations have invested in environmental sustainability, notably in the area of reducing carbon dioxide and methane emissions to address climate change. Nationally and globally, groundwater conservation and the role of agriculture in generating nitrous oxide emissions, a powerful greenhouse gas, has not received nearly as much attention to date. Part of the difficulty is that groundwater management policies differ by state. This creates a barrier for national and multinational companies to implement broad groundwater conservation measures that span localized regulatory contexts.

Summit discussions highlighted consumer interest in knowing where their food comes from and how it is produced as an important data-driven throughline and a related, growing need to connect consumers' and corporations' awareness to water issues. Consumers need to understand the compelling need to protect Ogallala aquifer water resources as part of protecting food production and preventing costly supply chain shortages during drought.

Following this panel, facilitators asked Summit attendees:

- "What entities/actors would you like to see supporting agricultural water sustainability, downstream of producers? And what would they do?";
- "What's needed to enable the various types of action/engagement discussed?"; and
- "Which actions did your group think would make the greatest difference and why?"

Identified entities and actors spanned the full value chain, including: producers/farmers, feedlots, meat packers, food manufacturers, large corporate conglomerates (food and fiber),

retailers/supermarkets, and customers. Other key players identified included the finance and banking sector, insurance companies, policy makers, industry/commodity groups, professional societies, local and national media (including influencers and other storytellers), marketing companies, non-government organizations, crop consultants and USDA's Agricultural Research Service, Agricultural Extension Services, water districts, economists, academics, local governments, at least one Tribal Nation, state and federal agencies, and realtors.

Ideas for possible actions shared included: (1) Government programs that provide an economic incentive to conserve water and educational initiatives for consumers about the water requirements associated with the products they buy; and, (2) insurance products that consider long-term water sustainability when calculating seasonal crop risk.

In addition to these two ideas, a vast majority of the actions proposed were also aligned with the answers to the question, "what's needed to enable various types of action/engagement discussed?" These can be summarized as: helping foster broader understanding of the capabilities and limitations of Ogallala/High Plains region agriculture as differentiated from other key grain producing regions of the US, notably the Corn Belt, and implications of these differences related to current and future policies, research efforts, and programs intended to sustain agriculture and support rural vitality.

Session 4: Building the Future We Want: Thinking and Acting Intergenerationally

Moderator

James Rattling Leaf, Sr.

Panelists

Katie Durham (Kansas Groundwater Management District 1),
Rosy Brummette (staff for Colorado Senator Michael Bennet),
Chuck Pfeifer (Garden City Community College) and
Clint Evans (USDA-Natural Resources Conservation Service-Colorado)

The final session focused on the future generation and building intergenerational collaboration to ensure the future we want for the region. This session focused on making sure there was water for the future generation and a skilled future workforce for water. Panelists were asked:

- What is needed to build a workforce at scale to adjust to the regions' water challenges?
- What kind of planning, including succession and transitions, are necessary to protect local and regional future water features?
- And, what is needed to build new leadership and engage younger producers?

Panelists identified a few key components to build a workforce at scale to adjust to the regions' water challenges. These components include education, including a specificity in education geared toward new technologies and emerging farm practices that can bolster productivity while conserving water. This should include opportunities to continue a formal education beyond a university, such as additional industry-recognized certifications and credentials. Beyond tertiary education, building a workforce includes on-the-job workforce training. In essence, the Ogallala region needs to adopt a culture of lifelong learners, where employers invest in employees to gain new skills and bring those skills back to the farm or local business.

An additional component of building a workforce that can adjust to regional water challenges involves community outreach and having important, difficult conversations with those who are yet to adopt water saving practices. Panelists encouraged attendees to "have a 'change' mindset," or to be open to new ideas and willing to implement them. Large community meetings, such as the Ogallala Aquifer Summit, can help build momentum. Community organizations are invited to partner with educational institutions as avenues for community engagement, including using college facilities to host meetings.

Planning, including succession and transitions, is necessary to protect local and regional future water features. The workforce is changing. It can be difficult to recruit employees to rural communities, which can feel remote and isolating. When water and soil experts are stationed in

remote communities, these communities are encouraged to reach out to them, celebrate and utilize their diversity, and help them be part of the community. Consider mentorship opportunities to pass soil and water knowledge to the future workforce. New leadership can engage younger producers and ensure a water-smart workforce for the next generation.

There is a need for flexible and voluntary tools at the federal level. There is also a need to assign a value to water stewardship and conservation. This is the motive behind programs like newly proposed *Voluntary Groundwater Conservation Act* and the not-yet-enacted Conservation Reserve Enhancement Program (CREP) Improvement Act, which are designed to compensate farmers and ranchers for retiring their water rights or limiting their water use while allowing dryland farming on some of those acres where appropriate.

Meanwhile, the recent roll-out of the Climate Smart Agriculture and Forestry (CSAF) program invested billions to provide producers with technical and financial assistance. This funding is intended to support implementation of best management practices and markets for commodities produced with a smaller greenhouse gas emissions (GHG) footprint. CSAF is also supporting efforts to test and implement innovative, cost-effective methods to quantify, monitor, report and verify GHG emissions reductions.

Facilitators then asked attendees, “Where is it particularly important that we do a good job at “baton-passing,” to ensure a future of thriving ag in the region?” They were invited to expand on their answers to also point to where “baton-passing” is already happening well and what is most helpful or effective. A few ideas include:

On-Farm Planning

Transition and succession plans can set up the next generation to take over operations. Sometimes these can be difficult conversations, but having the succession planning conversation in farming families can take uncertainty out of the transition. On this topic, some attendees shared the following suggestions:

1. Make water conservation part of that conversation.
2. Start succession planning early—don't wait until the older generation passes/retire before passing the baton to the next generation.
3. Gradually integrate future generations into the operation, teach them along the way, and add ownership responsibilities along the way. If the family is not interested in taking over the farm, connect with a beginning farmer that is eager to work on the operation.
4. Transition planning also means learning about the regulations that may interfere/disrupt the generational transition (i.e. water rights transferring with the land).

Community Involvement/Change

Baton-passing can extend beyond the family farm to be part of a community conversation. There needs to be a change in the mindset within the agricultural community of what a “good” farm looks like—from profitability to sustainability. Community involvement can include outreach to young farmers and urban communities about what agriculture means for the community. Exposure to farming can build interest and connect youth to a potential career in agriculture. Social media and virtual reality can introduce the future workforce to opportunities in agriculture or water management. Youth that leave the community for college need more encouragement and opportunities that will bring them back to the community.

Adjustments to Formal Education

Many people think you need to own land, or have grown up on a farm, to be able to have a career in agriculture. Within this session of the Summit, there was a call to adjust agricultural and water sustainability education to include advocacy. General agriculture education at the high school level (as opposed to specific agricultural classes) can reach and involve students who may not be familiar with agriculture. Also, consider opportunities to give students exposure to agriculture, such as farm shows, field trips, agricultural career fairs, on-farm experience through internships, or certifications.

Capstone Discussion: Key Takeaways

The Capstone conversation helped articulate potential next steps to arrive at real progress in the region. The conference was rounded out with a capstone session that asked Summit participants:

- What do you hope to be true in three years?
- What needs to happen to reach the 2027 goals, including what actors/partnerships need to be in place and the actions that need to be taken?
- What changes do you plan to make? What do you hope to be true by the 2027 Ogallala Aquifer Summit?

Changes in Focus

So often people focus on, and therefore incentivize, yield and/or profit. The first change is a focus on sustainability and conservation. Two examples include increased national emphasis on water or a new economy that will use less water or incentivize water saving. This change in focus could come about with a return-on-investment focus (where water is considered part of the investment) rather than a yield focus.

"I better see the big picture, and how I connect with it."

- Summit Attendee

The second change in focus is to look beyond the here-and-now. Ogallala Aquifer depletion is a global problem, not just a local problem. Food security is a national and intergenerational issue. Dairies, feedyards, and new farms are not 5-year projects, and agricultural industries as a whole need to consider water use over longer term periods (30+ year) of activity and planning. Looking beyond the here-and-now can include a stronger focus on mental health and personal resiliency; this can include sharing more good stories of sustainability.

Changes in Collaborations

This could also be characterized as *improvements* to collaborations. By 2027, key players in the region beyond farming, should share a unified plan and vision for aquifer sustainability. New collaborative opportunities need to look beyond the farm; considering water use changes from just the farming perspective will not be enough. Ongoing water conservation needs to involve private sector partners, crop consultancy groups, lenders, investors, bankers, food processors, etc.

Improvements to collaborations means taking a more holistic regional approach to local water issues, including multi-state, trans-Ogallala boundary and Tribal engagement. Some very specific suggestions to improve collaboration include:

"Conflict will be inevitable, but collaboration will be essential."

- Summit Attendee

- Improved youth engagement by reengaging the Kansas Youth Water Advocate program;
- Facilitate water use meetings with support sufficient to navigate difficult discussions;
- Establish partnerships through peer-to-peer networks to share success stories and other knowledge that will help others improve.

Changes in Education

By 2027, many people would like to see improvements in public education about national water issues. This includes consistent messaging and branding across all different groups who are working to save the Ogallala Aquifer. For example, previous efforts like “Eat Beef” or “Got Milk” successfully improved public knowledge. Creating a “Let’s Save the Aquifer” campaign (or similar campaign) could recruit more champions to the cause. More consistent communication is needed to reach the people and resources to make a difference.

Improving education by 2027 can also mean better formal educational opportunities. One attendee would like to see *aquifer management* in school curriculum in agricultural programs (high schools and colleges). Others suggested more programs like Master Irrigator or development of a youth-based water and agricultural ambassador programs.

Changes in Systems and Practices

New value is created when behaviors change. Some of this change that attendees hoped would be seen by 2027 included:

1. More water users (including, but not limited to, irrigators) use water meters to track and report water use. Increased measurements can be used to create a uniform, agreed-upon metric, so corporations can actually set water goals and commitments. Some ideas of uniform metrics estimated useable life of the aquifer, water use reduction targets, and the development of a *Water Intensity Score*
2. Attendees saw value in the Kansas LEMA and Water Conservation Area (WCA) models and would like to see similar models used by other groundwater districts in the region.
3. Committed efforts to having “hard conversations” about water policy (local, state and interstate).
4. Crop insurance providers (e.g. USDA-RMA) have more flexible options for those that want to conserve water.
5. Water recycling and playa restoration have become the norm.

Many behavior changes will only create value when they are implemented at scale. Within the capstone discussion, participants discussed a cultural tipping point: after about 24% of people adopt a new idea, others follow. Participants hoped by 2027, cross-sector engagement from aligned ag sector partners will support water users in reaching that 24% “tipping point.”

2024 Summit Impact

The Summit was attended by 234 people who represented local communities, farmers, elected officials, scientists, and government agencies (local, state, and federal; refer to Figure 2). A breakdown of the types of attendees, or entities represented, is presented in Appendix C. This Summit aimed to connect attendees in a manner that might build trust and mobilize collaboration more broadly after the event.

Beyond the overall theme/vision of this Summit, the overarching goals for the 2024 Ogallala Aquifer Summit were to:

1. Increase networking, alignment & collaboration within and across state lines, involving diverse actors and groups, and encouraging alignment of shared goals, efforts, and responsibility for sustainable water resource management.
2. Encourage new and continued activities critical to sustaining economic activity, aquifer health, and ecosystem and community resilience to climate change.
3. Identify common vision, practices, and opportunities with potential to benefit the region if scaled or replicated, identifying key partnerships, connections, commitments to support post-Summit.

Specific objectives or desired outcomes connected to these goals are listed below (in **bold**) with some of the actual outcomes listed below each one:

- **Build trust and strengthen collaboration involving scientists, producers, and a wide range of other private and public partners working within and beyond the eight Ogallala region states.**
 - In the post-Summit evaluation forms, 68 people identified themselves as representing the agriculture industry in some way (including primary producers), and 60 attendees identified as being a scientist/researcher/extension specialist.
 - Meetings and presentations at the Summit involving beef and dairy sectors helped deepen relationships and built momentum for these groups to work more actively and directly with water districts, programs, farmers, and others toward water use sustainability efforts.
 - Corporate partners expressed interest in investing in a future Summit, supporting the expansion of Master Irrigator and TAPS programs, and finding ways to fund and support research to implement advanced and precision water and farm management practices.
- **Increase interdisciplinary integration of science applied to support broad stakeholder awareness and inform aquifer management and related planning efforts.**

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- Following the first session about *Applying Science and Data for Regional Agricultural Sustainability*, one attendee wrote they were not previously familiar with tools presented (including Q-Stable, Open ET, and some seasonal climate outlooks) and will be more inclined to use these tools in the future.
- **Feature and help strengthen or catalyze the formation of successful and new projects and activities.**
 - The following are actions listed in the post-Summit evaluation that attendees said they would do:
 - “Host a local event to share information;”
 - “Producer meetings, hopefully have a common site where partners can link to and share information;”
 - “I want to host a drought management seminar or series of seminars all over this region.”
- **Encourage motivation and foster connections beneficial to the diverse areas and types of work of Summit participants.**
 - The following are actions listed in the post-Summit evaluation that attendees said they would do: “
 - Collaboration building with stakeholders;”
 - “Intentionally collaborate with contacts made at this Summit.”
- **Foster broader interdisciplinary and cross-sector (crop and livestock, urban and rural, etc.) functional awareness, engagement, and intersections relevant to local, interstate, and regional scales.**
 - One Summit attendee remarked, “I better see the big picture, and how I connect with it.”
 - There were and will continue to be a series of presentations about the Summit at upcoming meetings and conferences about water management.

To continue dialogue and facilitate collaborations, please consider joining the [Ogallala Aquifer Networking LinkedIn group](https://www.linkedin.com/groups/14425300/).: <https://www.linkedin.com/groups/14425300/>

Next Steps

Before departing, facilitators asked Summit attendees to answer the following question as part of a Summit event evaluation questionnaire: "If you are likely to make changes in the next 3 years due to attending the Summit, what are one or two changes you are likely to make?" This section provides a summary of notable ideas or themes emerging from these responses. In addition to a clear desire stated by attendees that another Ogallala Summit should take place in 2027, here are some of the planned actions shared⁵:

Communication

1. Take back information to GWD (Groundwater District).
2. Provide opportunities for producer-to-producer dialogue.
3. Host a local event to share information. Host producer meetings.
4. Further connect and collaborate with producers that use the Ogallala water to create the best plan moving forward to address the depletion.
5. Connect with commodity groups to procure funding for pilot local programs.

Data & Technology

1. Improve pivot and water sensing technology.
2. We will work to develop our own "water index" for properties to evaluate water risk.
3. Monitor how much overflow we are having from tanks.
4. Make a prediction model (irrigation-yield) to give farmers the tool to make informed decisions during crop failure regarding whether or not to stop irrigation.
5. Use Open ET and Q-Stable and other tools in irrigation system design.

Education

1. Learn how to adequately share data available not as a scare factor but more of an incentive for action.
2. Find or develop curriculum to take to school-aged youth.
3. Educate fellow staff and customers. Create more case studies.
4. More education, talk to more youth, and give examples of conservation methods.
5. Learn more about peer-learning examples discussed and find a metric to assess their impact.

Engagement

1. Recruitment into our field and all of the available opportunities to get involved.
2. Join some kind of group who I can share ideas with and learn from regarding water.

⁵ Not a complete list.

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3. Engage lenders in water risk and management solutions they can support.
4. Host a drought management seminar or series of seminars all over this region; explore the formation of an Ogallala-region Drought Learning Network.
5. Organize a water or ag and natural resources tour for critical decision makers in OK. Engage Ag. economists in research/extension efforts on Ogallala in OK.

Policy

1. Reevaluate EQIP program ranking points and cost estimates, explore CSP options. Both to determine if better ways to facilitate adoption.
2. Connecting with lawmakers from other states around policy. Also connecting with federal lawmakers to address disconnects and unintentional disincentives for water conservation related to state and federal policies and programs, including crop insurance.
3. Connections with local Kansas district managers. Action to change insurance - investors.
4. For Kansas... encourage GMD board member to adopt LEMAs.
5. Start the work to set up LEMA's in Texas; Promote LEMAs in CO.

Production Practices

1. Playa lake restoration.
2. Install regenerative livestock grazing, and expand no till.
3. Help develop water intensity score/index with industry.
4. Reduce flood irrigation strategy. Verifying well production or yield.
5. Working with my own company to play a bigger role in sustainability.

Research

1. More producer-informed research efforts.
2. Integrating across projects- linking my research group's activities to related work by others. Met some people that are possible new collaborators.
3. Water and soil quality research, transdisciplinary collaboration.
4. A masters project related to soil health and its resulting water conservation.
5. Research focusing on forage production/rangeland conservation

Youth

1. Looping more students into conversations.
2. Help develop a statewide water leaders program in KS, get more young people involved.
3. Working harder to be more inclusive of the youth in the planning process.
4. Water use at home-limit. Educate the younger generation about usage.
5. Working with high schools to promote careers and practices/tools.

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Appendix A:

Ogallala Summit Planning Committee

Thank you to all who helped bring this event together in any way.

Name	Affiliation	State
Angela Anderson	Kansas Water Office	KS
Brent Auvermann	Texas A&M University	TX
Sam Capps	Nebraska Department of Natural Resources	NE
Andres Cibilis	USDA Southern Plains Climate Hub	Regional
Gwen Coyle	USDA-Agricultural Research Service	TX
Steve Evett	USDA-Agricultural Research Service	TX
Rajan Ghimire	New Mexico State University	NM
Erin Haacker	University of Nebraska - Lincoln	NE
Amy Harsch	Grower Information Services Coop	NE
Syed Huq	Rosebud Sioux Tribe	SD
Robert Hagevoort	New Mexico State University	NM
Amy Kremen	Colorado State University/Irrigation Innovation Consortium	CO
Joel Lisonbee	Southern Plains Drought Early Warning System	Regional
Gary Marek	USDA-Agricultural Research Service	TX
Tyler Martin	Nebraska Department of Natural Resources	NE
Susan Metzger	Kansas State University/KCARE	KS
Elizabeth Ossowski	NOAA/National Integrated Drought Information System	Regional
Dannele Peck	USDA Northern Plains Climate Hub	Regional
Crystal Powers	University of Nebraska - Lincoln	NE
Karen Schlatter	Colorado Water Center/Colorado State University	CO
Kjagadish (Krishna) Sv	Texas Tech University	TX
John Tracy	Colorado Water Center/Colorado State University	CO
Kevin Wagner	Oklahoma State University	OK
Kaila Willis	Wyoming State Engineer's Office	WY

Appendix B: Agenda

2024 Ogallala Aquifer Summit Agenda

March 18-19, 2024 (Liberal, KS)

Monday, March 18th

1:00 pm	Welcome from conference organizers and state hosts: <i>Kansas Senator Jerry Moran, Kansas Governor Laura Kelly</i>
1:35 pm	Introduction & level setting: progress and change since the 2021 Ogallala Summit, current challenges and opportunities - <i>Meagan Schipanski, CO State University</i>
1:55 pm	Interactive session #1 - Table Icebreaker
2:10 pm	Session 1 Applying Science and Data for Regional Agricultural Sustainability <i>Moderator: Elizabeth Ossowski/National Integrated Drought Information System</i> <i>Panelists: Brownie Wilson/Kansas Geological Survey, Dave DeWitt/Climate Prediction Center, Jonathan Aguilar/Kansas State University, Rachel O'Connor/Environmental Defense Fund</i>
	This panel will highlight the evolving process, purpose and/or goals underlying how data about the region is being gathered and interrelated, and how such data and related scientific insights are becoming more accessible through visualization, decision support tools, and stakeholder engagement.
2:55 pm	Interactive session 2- Facilitated table discussion & full group debrief; brain break
4:00 pm	Harnessing the Power of Peer Networks for Ag Sustainability <i>Moderator: Daran Rudnick/Kansas State University</i> <i>Panelists: Brian Lengel/Colorado Master Irrigator, Jack Russell Middle Republican Natural Resources District, Chris Grotegut/Soil for Water</i>
	This panel will highlight new approaches to scaling awareness and shifts in water management, along with investing in professional development involving irrigators, water management districts, and others.
4:45 pm	Facilitated table discussion & full group debrief
5:20-5:30 pm	Wrap up, preview of Day 2, directions to evening social
6:30-8:30 pm	Evening social at Mitchell Theatres Southgate 6

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Food, drinks, films and discussion

Tuesday, March 18th

8:00 am Welcome back and interactive check in

8:10 am Intro Framing Session: Understanding Ogallala Region Cross-Cutting Risk: Water, Climate, and the Economy

Moderator: Vincent Gauthier/Manager, Climate-Smart Agriculture, Environmental Defense Fund

Panelists: Renata Rimšaitė/University of Nebraska-Lincoln, Nathan Hendricks/Kansas State University

This conversation will consider questions such as "How big of a factor is water risk to the local, regional, and national economy? Who and what are most at risk? How and where can collaboration diffuse or mitigate these risks?

8:45 am **Mobilizing Supply Chain Partners to Support Ag Sustainability**

Moderator: Ben Weinheimer, Texas Cattle Feeders Association

Panelists: Nick Osman/Regrow, Joel Jarnagin/Cobalt Cattle, Andy Lyon/Trust in Beef

This panel will tackle the critical topic of the role and potential influence of "downstream" supply and value chain partners can have in supporting High Plains water users continuing to be able to supply high quality feed, fuel, and fiber.

9:30 am Facilitated table discussion & full group debrief; brain break

11:00 am **Building the Future We Want: Thinking and Acting Intergenerationally**

Moderator: James Rattling Leaf/North Central Climate Adaptation Science Center

Panelists: Katie Durham/Kansas Groundwater Management District 1, Rosy Brummette/Staff for CO Senator Bennet, Chuck Pfeifer/Garden City Community College, Clint Evans/USDA-Natural Resources Conservation Service-Colorado

This panel will cover evolving approaches to training, workforce development and formal education, implementing conservation programs, and engaging diverse collaborators, all designed to support action on water management and conservation in the short and long-term.

11:30 am Facilitated table discussion & full group debrief

12:30 pm Lunch

1:15 pm **CAPSTONE WORKSHOP:** Facilitated, interactive room-wide exercise to identify and

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prioritize collaborative action (personal, local, state, regional) that could benefit the aquifer and communities in the next 12, 24, and 36 months.

[Framing thought-leadership from Kristen Dickey/Aimpoint Research and Elizabeth Söderström/Water Foundation](#)

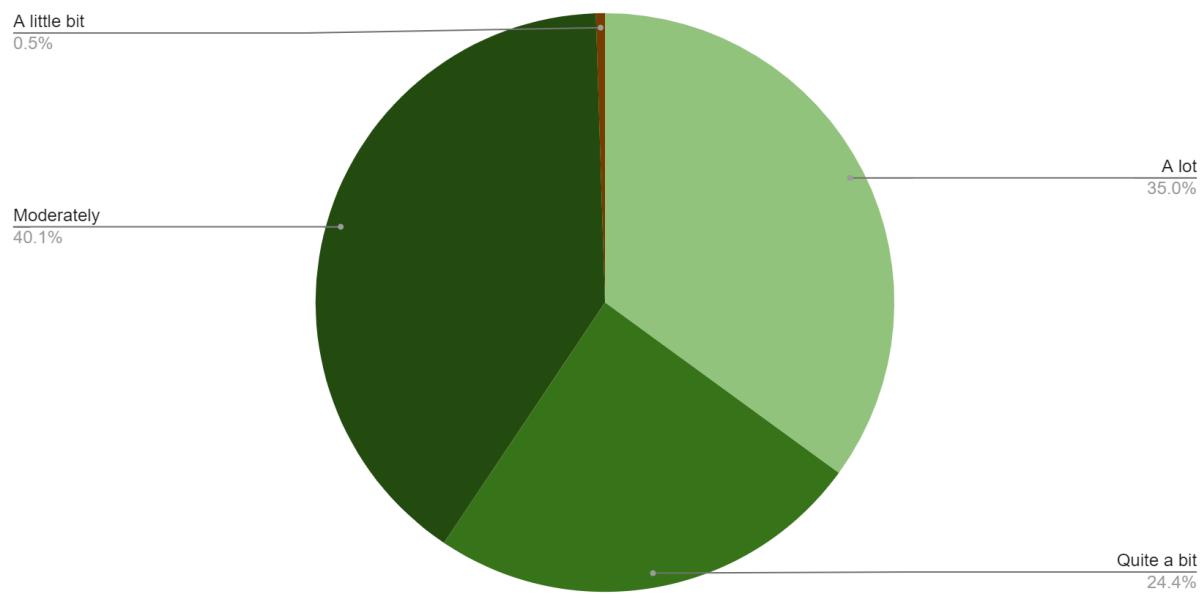
3:00 pm	Room-wide debrief/report-outs, next steps
3:30 pm	Closing remarks - USDA Secretary of Agriculture Tom Vilsack (invited)
4:00 pm	Summit officially adjourns
4:00-5:00 pm	Social hour for networking, overlapping with kickoff for USDA-ARS Ogallala Aquifer Program annual research planning meeting

Appendix C: Summit Evaluation

Attendees represented the following entities based on post-Summit feedback form

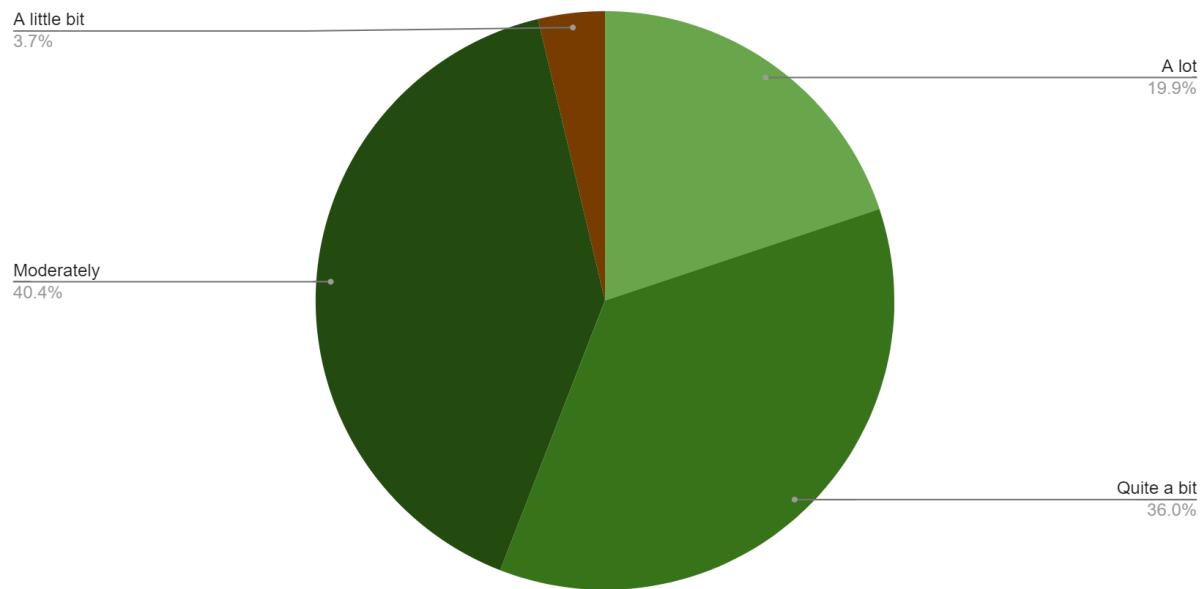
Entities Represented at the Summit					
Scientist/ Researcher	41	Extension	19	Non-profit	10
Crop producer	25	State Government	17	Technical Advisor	10
Livestock producer	23	Groundwater District	14	Feedyard	8
Federal Government	21	Student	11	Dairy	2

Was the Ogallala Summit a constructive use of your time?

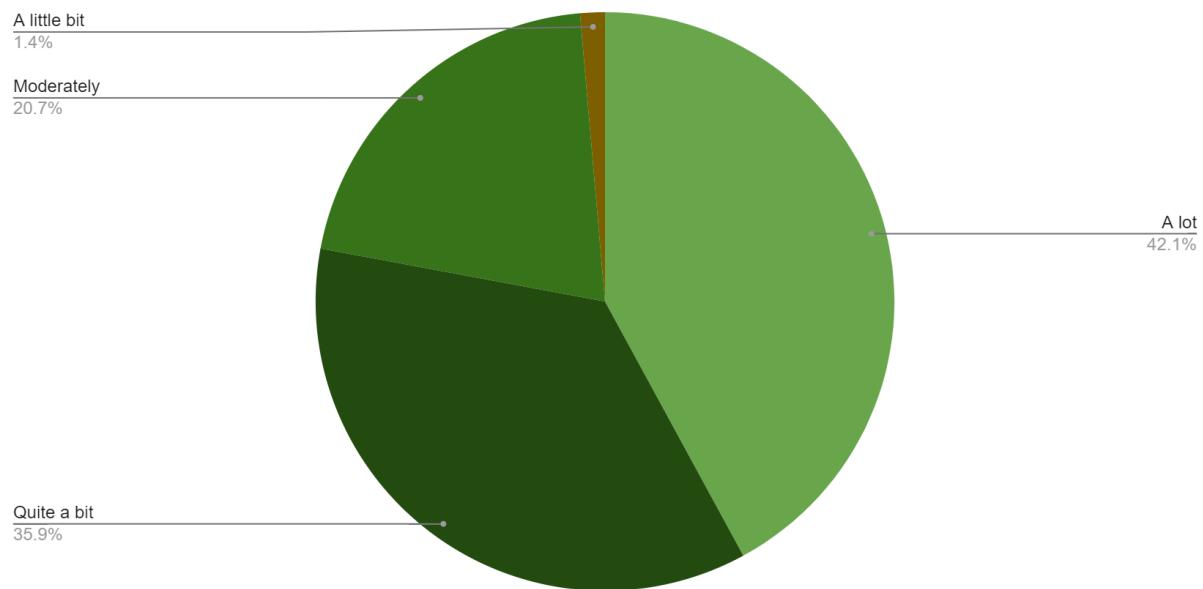


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Did the Ogallala Summit produce useful ideas for shifting groundwater management?

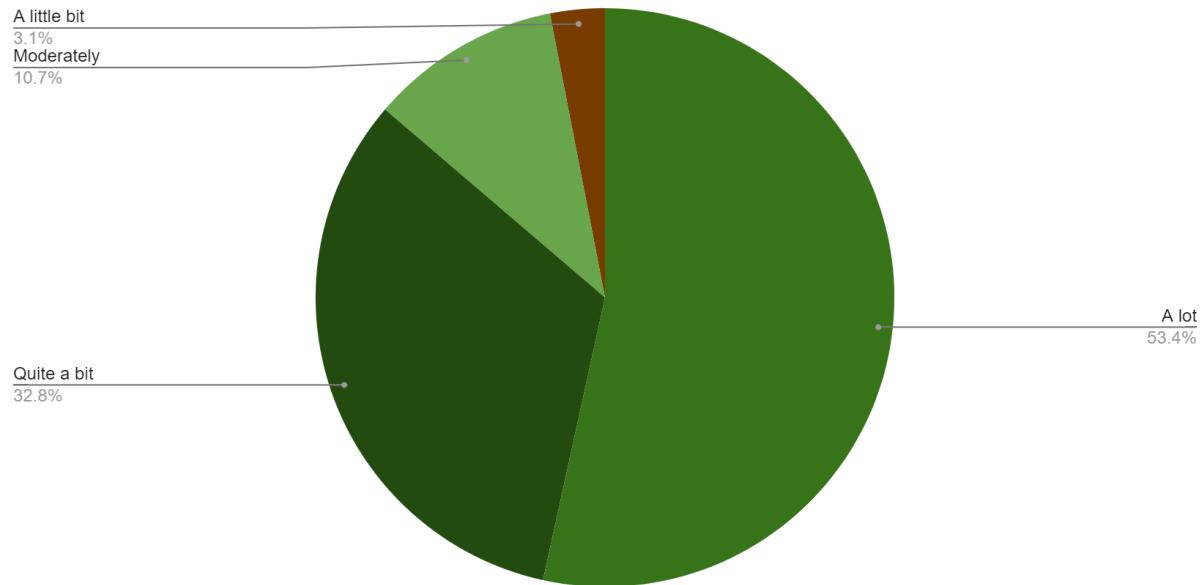


Did the Ogallala Summit meet your overall expectations?



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Did you make new connections that will be useful to you after the Summit?



As a result of this Summit, how likely are you to make a change in your work related to groundwater and or agricultural management within the next 3 years?

