

## Sustaining Agriculture through Adaptive Management to Preserve the Ogallala Aquifer under a Changing Climate

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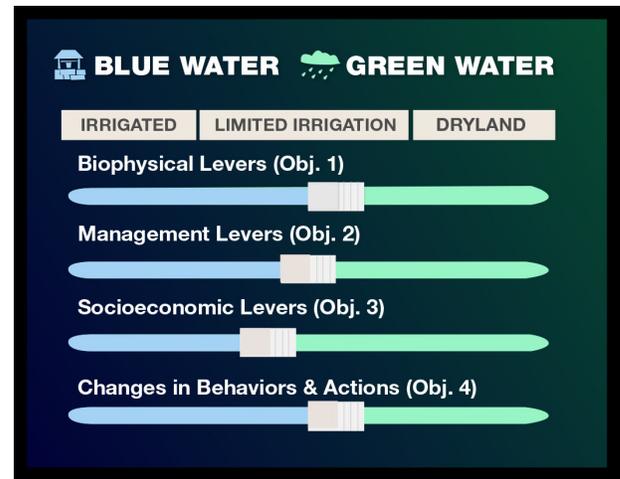
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The Ogallala Aquifer, one of the largest freshwater aquifers in the world, supports 30% of U.S. crop and animal production, increases agricultural production by more than \$12 billion annually, and impacts global food supplies. However, much of the Ogallala is rapidly declining and climate change will only compound this challenge. *Our long-term goal is to optimize use of groundwater in the Ogallala Aquifer Region (OAR) to sustain food production systems, rural communities and ecosystem services.* Achieving this goal requires integrated management to improve use of the right water (blue and green) at the right time in the right place across the OAR.

Our specific objectives are to:

1. Integrate hydrologic, crop, soil, and climate models and databases to provide baseline data for evaluating management and policy scenarios.
2. Develop and identify the best irrigation technologies, cropping system management practices, and decision support tools to improve water use efficiency.
3. Analyze current social, policy, and economic frameworks in the OAR and identify incentives and policies to increase the adoption of adaptive strategies.
4. Enable the adoption of tools and recommended strategies for improved water use through integrated and effective communication among the project team and transfer with stakeholders.



**Figure 1.** We will develop new knowledge and management strategies across the multiple levers that regulate water use (biophysical (e.g., recharge rates, climate change), management practices (e.g., irrigation, crop selection), and socioeconomic (e.g., policies, social beliefs)) to cause changes in behaviors and actions that improve use of the right water (blue or green) at the right time in the right place across the OAR.

Our systems-based approach will foster water conservation through the development of cost-effective, adoptable and sustainable practices and technologies for agricultural producers and processors. We will work in close collaboration with local groundwater management districts and utilize a network of research and extension sites to ensure an integrated, aquifer-wide approach and build long-range capacity for adaptive management.

## Approach

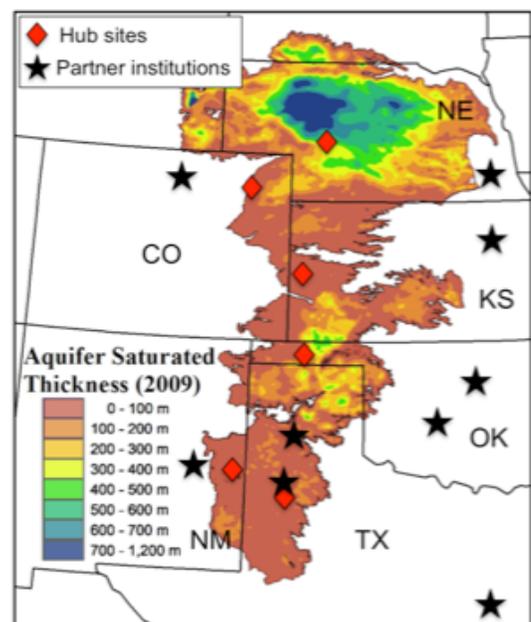
Our approach will utilize a network of six sites that span the climatic, hydrogeologic, and management gradients across the OAR (Fig. 2). Site locations include agricultural research and extension centers in: 1) North Platte, NE; 2) Akron, CO; 3) Tribune and Garden City, KS; 4) Goodwell, OK; 5) Clovis, NM; and 6) Lubbock, TX. These sites already serve as knowledge ‘hubs’ in their region and have established producer and stakeholder networks. Each of our specific research and extension activities will include a minimum of 3 hub sites to ensure an integrated, aquifer-wide approach.

**Research approach:** Research activities will include development and validation of models to simulate management systems and groundwater hydrology, data synthesis to identify best management practices, and research on cutting edge technologies. Research findings will inform the development of decision support tools, extension activities, and extension products.

**Extension approach:** Integrated research/extension teams can rapidly transfer innovations from public research and the private sector to crop producers and advisors. We will employ high impact methods such as hands-on workshops and on-farm demonstrations to educate users on new decision support tools and irrigation methods. Producers’ experiences will be tapped to strengthen tools and the credibility of extension information.

**Major Research Outcomes:** 1) Improved understanding of climate change impacts on water resources and the identification of emerging technologies and management practices that could extend the life of the aquifer; 2) Science-based road map for policy makers and stakeholders to evaluate groundwater policy for balancing water use and the sustainability of rural communities; and 3) Synthesized research databases made accessible to research and extension communities.

**Major Extension and Outreach Outcomes:** 1) Extended life of the aquifer through the adoption of water-efficient irrigation strategies and crop management technologies; 2) Development of policies that reduce water use and sustain agricultural economies across a diverse set of groundwater districts; 3) Formation of new communication networks for integrated management across groundwater districts through coordinated outreach across the OAR; 4) Integration of private and public sectors in delivering objective, research-based recommendations and commercial products; and 5) Informed non-farm consumers about the role of water in food production.



**Figure 2.** Network of hub sites and partner institutions across the OAR.