FOCUS ON RESEARCH

Steward of water

"When the well is dry, we learn the worth of water."

— Benjamin Franklin

The Consortium for Global Research on Water-Based Economies—GRoWE—at Kansas State University, understands the worth of water.

Led by facilitator, David Steward, associate professor of civil engineering, this collaborative organization is dedicated to helping people understand and manage the relationships between water resources and human consumption for agricultural production and livelihood.

Steward came to Kansas State in 1998 with a background in mathematical and computer modeling tools to understand groundwater flow and transport, application of geographic information science (GIScience) to water resources, and integrated modeling approaches to understand natural/social systems' response to human/climate-induced changes in groundwater use and availability.

"The GRoWE group came together in 2001," Steward said, "when then-department head Stu Swartz gave me the keys to the departmental van and I spent two months driving the state trying to understand what I could do to help in the area of groundwater resources management."

The common thread in response to his travel-related inquiries was concern over depletion of the High Plains-Ogallala Aquifer region, which led him to recognize the need, as a society, to understand and manage use of water resources.

"I went across campus looking for help to build a 'K-State community' to develop the scientific information necessary to support decision making and policy management in the area of water resource systems," Steward said.

From this process came the executive committee of GRoWE—a group from five different departments in four colleges at K-State that meets weekly and brings together people related to water: Jeff Peterson, agricultural economics; Eric Bernard, landscape architecture; Steve Welch, agronomy; Laszlo Kulcsar, sociology; and Steward.

"This team unites people related to water," Steward said, "—people who can understand water resources from a new perspective and view it as an ecosystem that is part of the fabric of our world."

The committee's early focus was learning to accept the different approaches necessary for developing the research, education, and outreach to support a program on water-based economies.

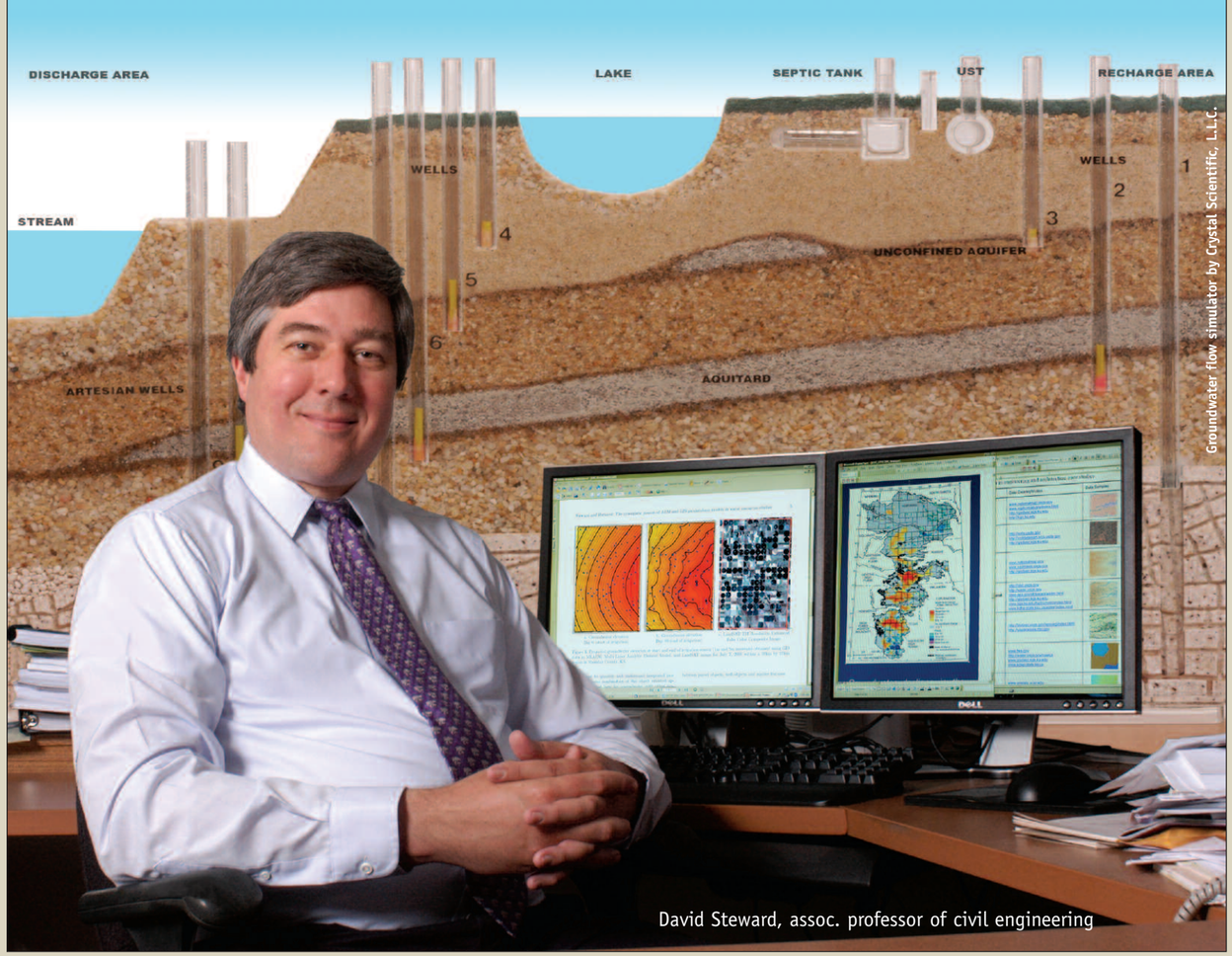
"GRoWE is a three-legged stool of research, education, and community engagement. If you're weak in one of these areas," Steward said, "your program will not succeed to its full potential."

And the GRoWE group realized you can't plan for future water needs without understanding the entirety of the water resource system.

They began to address some of the following questions:

- Does water availability drive the farm economy, or do national and global markets drive water use on farms?
- How does global climate impact the longevity of the finite aquifer resource?
- How could the farm bill and energy policy improve long-term economic vitality in the High Plains Aquifer region and maintain water security?
- Who is the workforce in a region, and how do they impact community decision making?
- What are the migration patterns and age distribution of a community, and how does that impact policy and decision making?

This system-wide approach is also how national funding agencies now address their allocations, Steward said, listing the following investors as financial sources for GRoWE's collaborative research linking water resources and human systems:



David Steward, assoc. professor of civil engineering

Institute for Inland Water Management and Wastewater Treatment in the Netherlands, National Science Foundation, United States Department of Agriculture, United States Geological Survey, Kansas Water Resources Institute, and Kansas State University Provost's Targeted Excellence Program.

"GIScience is the technological underpinning for the research," Steward said. "Water resource systems are spatial in nature, which allows storage, analysis, and modeling of the natural and social systems comprising a water resource system in a geographic information system (GIS), as well as thematic mapping, remote sensing, and telemetry data and methods."

An example of this is the team's development of a computerized mapping system of all authorized water-use sites in Kansas (gis.ksu.edu/ogallala). The identified wells are drawing water from either river basins in eastern Kansas or the Ogallala Aquifer in the west, and the system shows how much water is being pumped from the wells. Other data sources include real-time data for stream levels, agricultural data, population data, and ecological regions.

"This data provides a public record for other groups to use in their decision-making processes—groups like local groundwater management districts and water boards," Steward said.

"We've leveled the playing field. Every Kansan now has access to the same data that Topeka had before. We're building the tools necessary for leaving water-use decisions up to people in their local districts."

"... groundwater declines threaten both short-and long-term viability of the water resource, the economy, and the regional population ...."

The GRoWE team is working with a linked-models approach—models that were previously separated, in order to make predictions.

"We want people to understand how precipitation models affect water table models, and water table models affect plant models, and plant models affect production models, which, in turn, impact economics and people," Steward said.

"Scarcity of water resources poses risks to the economic, social, and environmental well being of communities, regions, nations, and ultimately the world. In the western Kansas region, the High Plains Aquifer provides the primary source of water for agriculture and municipalities.

"However, groundwater declines threaten both short- and long-term viability of the water resource, the economy, and the regional population," he said. "It is of national and international interest to identify and evaluate economically viable, socially acceptable, and environmentally conscious water management strategies to sustain this important region, as well as other world water and agricultural resources."

GRoWE creates and disseminates knowledge related to the adaptation of limited water resources. Team members are currently collaborating on four interrelated tasks: collaborating with stakeholders and agencies to identify potential water management strategies; developing a common data model that assembles hydrologic, environmental, economic, and socio-demographic data collected at multiple geographic scales; analyzing current and projected trends in groundwater use and possible impacts of different groundwater management strategies on environmental, economic, and social systems; and creating education materials that utilize the newest information technologies.

A "first of its kind" at K-State has come from this program, when in fall 2006 professors from four colleges combined to develop and teach a new course, Water and Society. Students from the Colleges of Engineering, Agriculture, Arts and Sciences, and Architecture—both graduate and undergraduate level—enrolled in the class and were successfully able to achieve interdisciplinary collaboration and understand water resources as a system. The course will be offered again in fall 2007.

A future goal also, Steward said, is to synergistically leverage the combined efforts of nearly 120 faculty members on the K-State campus who are interested in the potential use of ecoforecasting—looking into the effects of climate change on ecology using the models strategy already developed by GRoWE.

In spreading this interdisciplinary approach beyond Kansas and the U.S., Steward plans a sabbatical at Delft Technical University in the Netherlands for the spring 2008 semester where he will participate in cross-research activities with faculty there who are working on similar modeling and water resource management issues for the European Union's Water Framework Directive.

–by Mary Rankin