

Research team probes climate's impact on groundwater quality

September 8 2014, by Gillian Klucas



An interdisciplinary University of Nebraska-Lincoln team is studying how climate and agricultural changes influence groundwater quality. From left: Yusong Li, civil engineering; Zhenghong Tang, community and regional planning; Shannon Bartelt-Hunt, civil engineering; Xu Li, civil engineering; Dan Snow, Nebraska Water Center; and Eric Thompson, economics. Not pictured is David Rosenbaum, economics. Credit: Craig Chandler

Climate change and increasing food production demands both influence groundwater quality. To better understand the links between climate,

agriculture and groundwater, University of Nebraska-Lincoln researchers will investigate climate's impact on groundwater contamination from chemicals used in crop and animal production.

The UNL team received a nearly \$600,000 Water Sustainability and Climate Program grant from a joint National Science Foundation-U.S. Department of Agriculture program that takes an interdisciplinary approach to understand and predict [climate](#) change-water system interactions. UNL's team includes faculty with expertise in engineering, economics, water science, and community and regional planning.

"We were surprised at how little information there is about how climate will impact [groundwater](#) quality," said project leader Shannon Bartelt-Hunt, UNL associate professor of civil engineering based at the Peter Kiewit Institute in Omaha. "Groundwater is used as a drinking water source and for irrigation so it's an important resource."

The team will study climate's direct and indirect effects on atrazine, a widely used crop herbicide, as well as the antibiotic sulfamethazine and artificial hormone estrone, both used in [animal production](#). Atrazine is applied directly to fields, while the other two are applied through manures used as a fertilizer.

All three organic compounds can contaminate groundwater by mixing with rainwater as it percolates through the soil. The team will investigate how different climatic conditions affect the compounds' behavior and the characteristics of the infiltration process.

To study climate's indirect effects, they'll develop economic models to understand how predicted climate changes will affect land uses.

"We expect that [climate change](#), in addition to directly affecting the environment, will also directly affect human behavior, in particular

human decisions about land use," said UNL economist Eric Thompson. "Those changes in human behavior will then also change water quality."

Researchers expect that decreasing water availability in the southern Plains will concentrate crop and animal production farther north, including in Nebraska, intensifying the use of these compounds. This ultimately could hurt groundwater quality.

"We hypothesize that those land use changes will have a greater impact than any direct effects of climate," Bartelt-Hunt said. "Hopefully, at the end, we'll have information specific to Nebraska, but we'll also have a model linking economic and hydrological components that can be used to evaluate climate and land use changes on subsurface hydrology in other geographic areas."

They'll also look at the economic ramifications of increased amounts of these compounds in the environment, particularly if the compounds become regulated in the future due to health concerns. The additional costs of regulation may also alter land use.

Having input from a wide variety of disciplines is a key feature of the project, Bartelt-Hunt said.

"Getting all of those viewpoints focused on a single topic is really beneficial because it allows us to look at the question from a lot of different angles than one group could do themselves," she said. "But it's also a challenge because you have to learn how to speak a different research language."

The team also plans to work with the Groundwater Foundation, a national organization committed to groundwater conservation, to provide public educational material about climate change effects on groundwater.

Provided by University of Nebraska-Lincoln

Citation: Research team probes climate's impact on groundwater quality (2014, September 8) retrieved 11 May 2024 from <https://phys.org/news/2014-09-team-probes-climate-impact-groundwater.html>

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