

**Welcome to the USGS Cooperative Water Program Webinar series on regional and national water issues and innovation in monitoring, assessments, and research.**

**Understanding the Effects of Groundwater Pumping on Streamflow Depletion through USGS Capture Maps**

**Topic:** USGS scientists and Cooperators with the Lower Loup Natural Resources District in Nebraska will describe recent advances in the development of a USGS mapping tool—referred to as capture maps—and provide an example of the use of capture maps to better understand effects of groundwater pumping and resulting streamflow depletion in the Elkhorn and Loup River Basins of central Nebraska, now and decades into the future. (Refer to abstract and related links, pages 2 and 3)

**When:** Wednesday, November 20<sup>th</sup>, 2013, 1:00-2:30 PM Eastern Time (you can join 5-10 minutes before seminar begins at 1:00 pm)

**Speakers:**

- Paul Barlow, Hydrologist, USGS, Office of Groundwater, Northborough, MA (508) 490-5070
- Stanley Leake, Research Hydrologist, USGS, Arizona Water Science Center, Tucson, AZ (520) 670-6671 x259
- Steven Peterson, Lead Hydrologist, USGS Nebraska Water Science Center, Lincoln, NE (402) 328-4151
- Jennifer Stanton, Hydrologist, USGS Nebraska Water Science Center, Lincoln, NE (402) 261-0458
- Tylr Naprstek, Water Modeling Coordinator, Lower Loup Natural Resources District, Ord, Nebraska (308) 728-3221

**Webinar logistics:**

**Topic:** Streamflow Depletion by Wells

**Session password:** wells1

**To join, go to:**

<https://fedgov.webex.com/fedgov/k2/j.php?ED=217649557&UID=0&HMAC=eec99f4de0e64a73b12afd3829bc7178f02f25a5&RT=MiM2>

- Enter your name and email address.
- Enter the session password: **wells1**
- Click "Join Now".
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**Audio conference logistics: (NOTE: You need to connect by phone in addition to connecting to the Webinar)**

From the National Center in Reston, dial internally x4848

From all other USGS/DOI locations, dial 703-648-4848

From non-DOI locations, dial toll free 855-547-8255\*

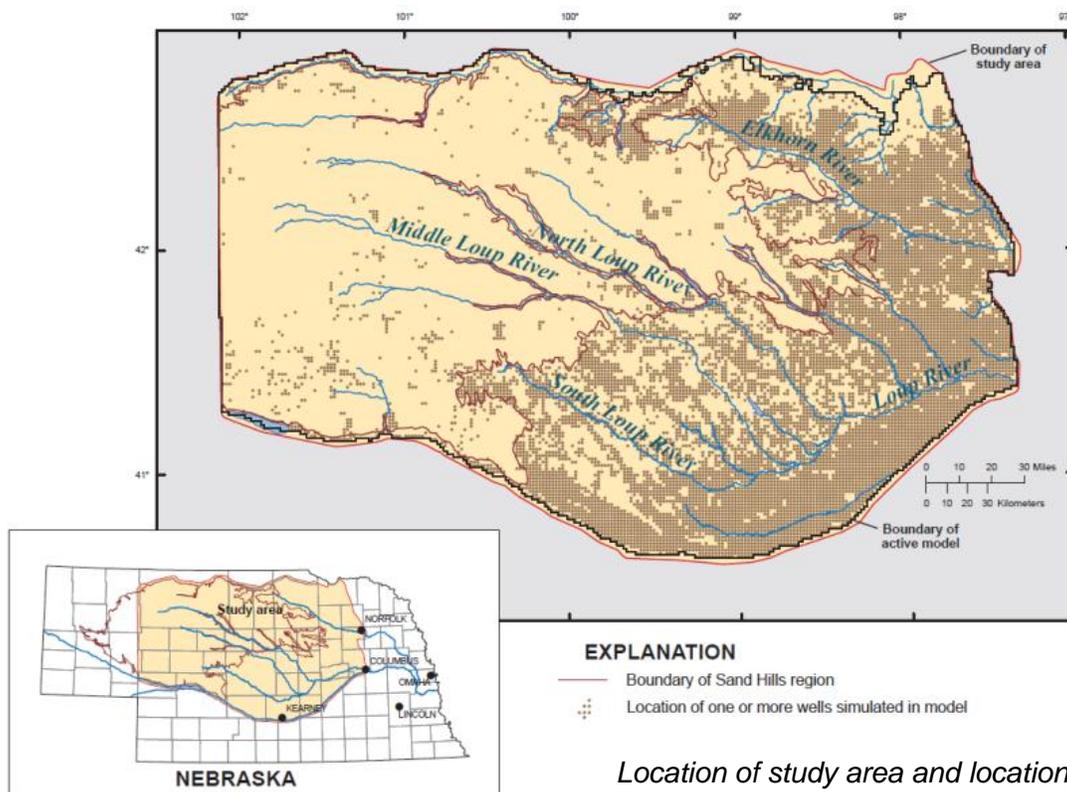
Access code: **58494#**

\*If you are unable to connect with the toll free number for any reason, please use 703-648-4848.

**Abstract:** Streamflow depletions caused by groundwater pumping have become an important water-resource management issue because of the negative impacts that reduced flows can have on aquatic ecosystems; on the availability of surface water for drinking and other water needs; and on the quality and aesthetic value of streams and rivers.

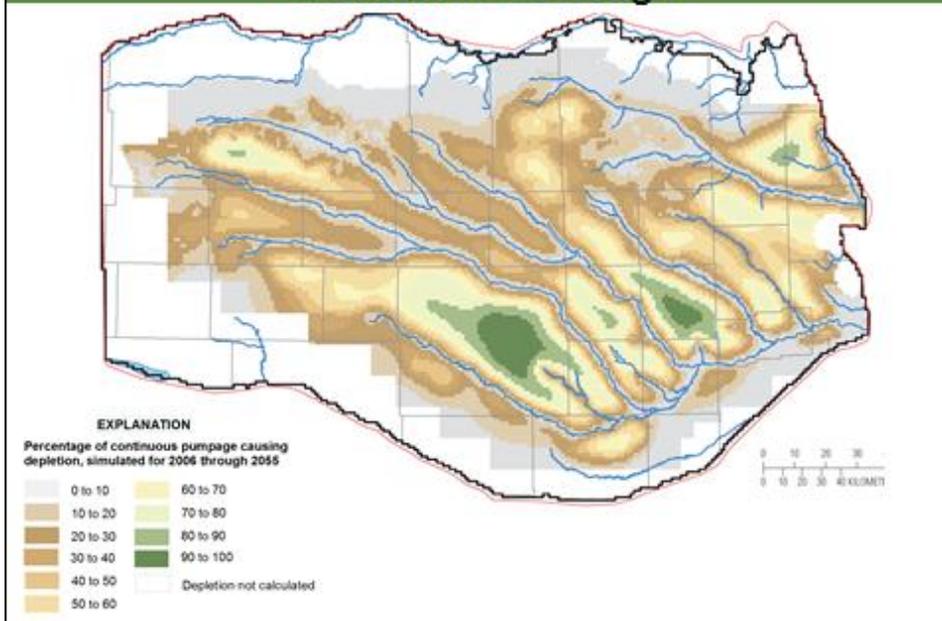
USGS has developed new mapping capabilities—referred to as capture maps—that help characterize effects of pumping on the timing and rates of streamflow depletion. The USGS capture maps are created through repeated simulations from a numerical groundwater-flow model, each simulation helping to illustrate specific effects from pumping at varying locations and at varying rates over time. The capture maps help provide water-resource managers with a visual tool to characterize effects of pumping and determine optimal siting for additional wells and (or) recharge facilities.

This USGS seminar will provide an example of the use of capture maps to improve the understanding of how groundwater pumping results in depleted stream flow in the Elkhorn and Loup River Basins of central Nebraska (see accompanying map).

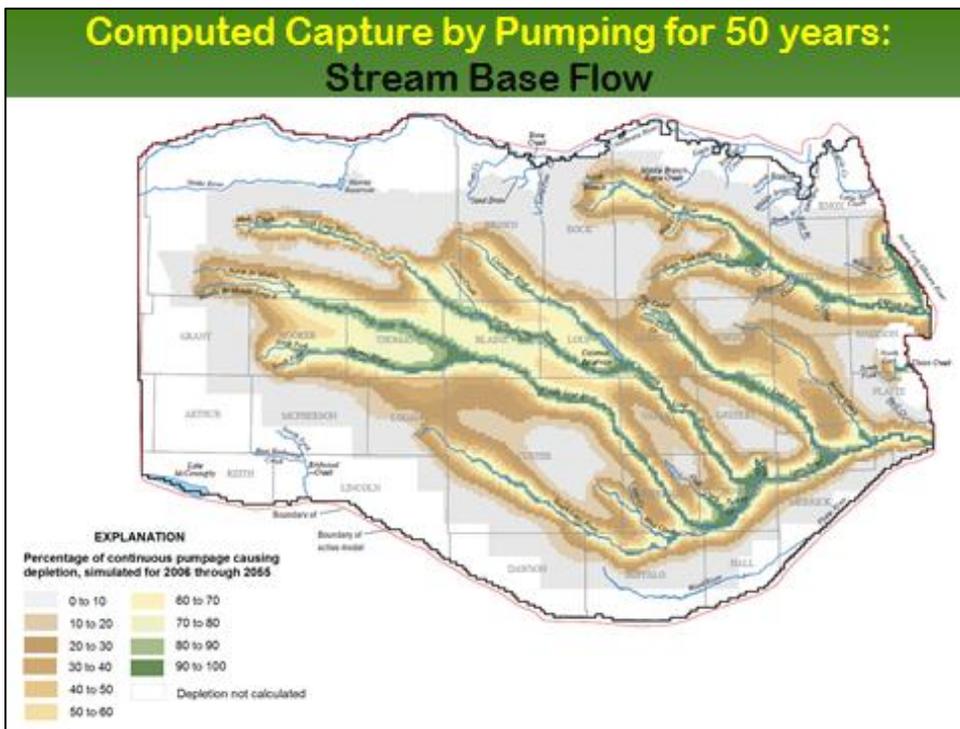


Groundwater withdrawals from thousands of wells in the Elkhorn and Loup River Basins are used to irrigate more than two million acres of cropland. Capture maps help to illustrate the effects of pumping at more than 22,000 locations for 50 years on streamflow depletion. The capture maps illustrate the percentage of water from groundwater storage, streams, and evapotranspiration. As shown in the two maps below, nearly 100 percent of pumped water is from groundwater storage in areas furthest away from streams, while nearly 100 percent of pumper water is from stream depletion in areas in close proximity to streams.

## Computed Capture by Pumping for 50 years: Groundwater Storage



## Computed Capture by Pumping for 50 years: Stream Base Flow



The study was done by the USGS in cooperation with several Natural Resources Districts (Lewis and Clark, Lower Elkhorn, Lower Loup, Lower Platte North, Lower Niobrara, Middle Niobrara, Upper Elkhorn, and Upper Loup), the Nebraska Department of Natural Resources, and the University of Nebraska-Lincoln Conservation and Survey Division.

USGS capture maps are actively used at the regional scale by the State of Nebraska Natural Resources Districts for water-resource management. The maps also are used for regulatory purposes by the State of Nebraska to define “hydrologically connected” areas where groundwater withdrawals reduce streamflows by more than 10 percent in a 50-year period.

### **USGS Resources:**

“Simulation of Groundwater Flow and Effects of Groundwater Irrigation on Stream Base Flow in the Elkhorn and Loup River Basins, Nebraska, 1895–2055–Phase Two”

(<http://pubs.usgs.gov/sir/2010/5149/> )

“Streamflow Depletion by Wells–Understanding and Managing the Effects of Groundwater Pumping on Streamflow” (<http://pubs.usgs.gov/circ/1376/> )