COHYST PROJECT

SARAH McCAMMON

Despite the name, the COHYST (CO-heist) project has nothing to do with elaborate break-ins or safecracking. Instead, the detailed model of groundwater and surface water along the Platte River is designed to help regulators manage Nebraska's water resources.

While the public soon will be able to view the data online, the model is meant for use by scientists.

"It's not something that just anybody's going to be able to pick up and use," said Nebraska Department of Natural Resources Acting Director Ann Bleed. "It's going to take someone with a fair amount of groundwater-modeling expertise to actually use it."

But for state and local officials with that expertise, COHYST will be an important tool for making controversial water-management decisions. Regulators will use the data to help implement LB962, the state law passed in 2004 with the goal of jointly managing surface and groundwater.

Bleed said involving a variety of organizations and agencies in COHYST was key.

"Having widespread support means there's more buy-in to the final model because everybody's had a hand in it," she says.

Nebraska Game and Parks Commission Water Resource Program Manager Larry Hutchinson said his agency helped fund COHYST out of concern about habitat for endangered species along the Platte.

"Without the model, we have a very crude estimate of what effect groundwater use might have on flows in the river," he said.

The data also will be used by other agencies and natural resources districts in the area, said Central Platte NRD Hydrologist Duane Woodward. Woodward said data from the study can be broken down into smaller pieces to help design local water-management plans.

"Those aren't simple to do, really, but they're simpler now because we've got the regional model and all the information that goes with that," he said.

Outside scientists reviewing the model last year drafted a list of dozens of suggested revisions and questions for the project's sponsors. While most were relatively to address, Woodward said work on the model will continue over the next few years.

"So COHYST doesn't end," Woodward said. "It just kind of continues on as we actually use the tools we've developed.

GROUNDWATER GROUNDWORK

The new Platte River Cooperative Hydrology Study takes a larger look at managing Nebraska's resources.

KRISTINE NEMEC & JOYITA MALLIK

Groundwater is the lifeblood of Dick Mercer's central Nebraska farm.

Although he pumps most of the water for his corn and soybeans from wells, since 2003 he has been prohibited from drilling new ones.

His farm lies within the Central Platte Natural Resources District. The district has suspended new well drilling until the results of a study on the relationship between groundwater pumping and river and stream flows are released.

Mercer, however, doesn't mind a moratorium on well drilling.

"There are already a tremendous number of wells in Nebraska," Mercer said. "We need to look at sustainability. I want the groundwater to be around for my sons and grandsons."

Mercer supports the new study, called the Platte River Cooperative Hydrology Study, or COHYST.

"It's a very important tool that will help back up decisions on groundwater management," said Mercer, who served on the Central Platte district board for 33 years before resigning in January 2005.

Carroll Sheldon, who uses groundwater irrigation to grow corn and soybeans near Kearney and also is on the Central Platte district board, agrees COHYST is important, but he isn't sold on the study.

"We've never dealt with a study this complex before, and we don't know what it is going to say yet," he said. "We need to make sure it's accurate."

Groundwater wells are not responsible for lower water levels in streams and rivers, Sheldon said.

"It's a weather problem, not a well problem," he said. "We haven't been getting enough rainfall and Rocky Mountain snowmelt for the streams and rivers. There were no irrigation wells in the Platte River valley during the Dust Bowl, when we had the worst conditions ever."

The study area covers 29,300 square miles in the basin upstream of Columbus to the Colorado and Wyoming state lines. Funded by the Nebraska Environmental Trust, state agencies and power and irrigation districts, the $7 million study was initiated by state and local government agencies to better understand the relationship between groundwater and surface-water flows and to improve groundwater management.

River and stream flows are easy to observe and measure, but groundwater flow is hidden and difficult to measure, said Roger Patterson, former director of the Nebraska Department of Natural Resources.

In an October 2004 DNR publication, Patterson and acting director Ann Bleed used the analogy of a sandbox filled with sand to explain how groundwater and surface water interact:

Water poured into a sandbox will fill the empty spaces between the grains of sand, just as groundwater fills the empty spaces between soil particles in an aquifer. If there is a hole in the side of the sandbox, water flows to the hole until there is no more water in the sand. The drain acts like a river.

If there is a hole in the sand in the middle of the box, there might be water in it. If the water is ladled out of the hole, more water will move into the hole from the surrounding sand. The hole is like a well. Taking water from the hole in the sand reduces the amount available to drain from the hole in the side of the sandbox.

When the water table is high, groundwater can flow into rivers; when the water table is low, surface water may replenish groundwater. In some cases, pumping wells may remove so much groundwater that water moves from the stream to the well, and the stream may even go dry. Streams and rivers also lose large amounts of water to surface-water irrigation and evapotranspiration — the use of water by plants, especially trees and shrubs. Streams and rivers gain water from rainfall and snowmelt and from discharge by groundwater aquifers.

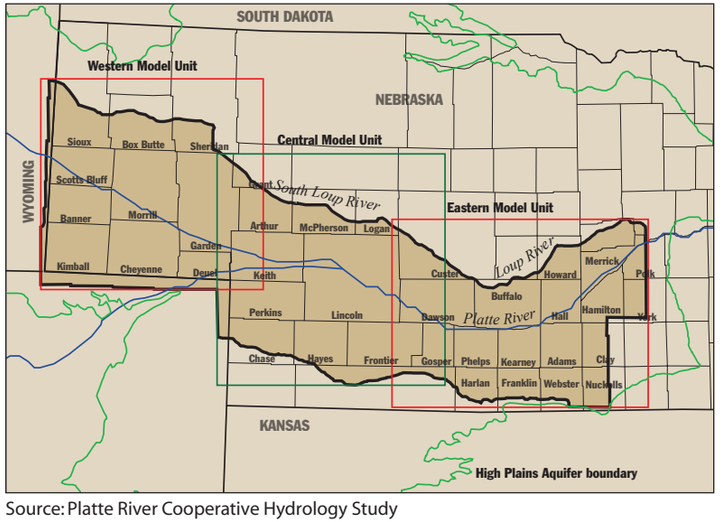
Groundwater levels may be increased by rainfall, by water leaking from dirt-lined irrigation canals and by well pumping and evapotranspiration.

Hydrologists routinely measure these and other factors that affect groundwater and surface water levels. They then enter the data into a computer model that estimates the relative effect each process has on groundwater and surface water flows.

Several groundwater models have been developed for the Platte River since the 1970s, but COHYST is different.

"COHYST covers a larger area and uses more de-

Computer model



Source: Platte River Cooperative Hydrology Study

The groundwater flow models developed by COHYST (Cooperative Hydrology Study) are one of the key tools in making decisions about restrictions on water usage. These models can be used to better understand the available resources and to help predict changes in water levels with time and changes in stream flows due to groundwater discharge to or recharge from streams. This knowledge, in turn, will be helpful in developing new regulations for managing groundwater.

HEATHER SIGLE

A thunderstorm blows over Gothenburg. Summer rains — rare in recent years — provide crops with needed moisture and relieve the pressure on irrigation.

BRIAN LEHMANN

tailed information than earlier models," said Duane Woodward, a Central Platte Natural Resources District hydrologist who worked on the study.

For example, geologists used descriptions of sand, silt, clay and gravel material from 6,500 test well and irrigation well records to divide the aquifer into 10 hydrostratigraphic units, or layers of geologic materials that move and store groundwater in similar ways.

A variety of factors affect how fast water moves through a unit. Those include topography and the types of soils in the unit. Water moves more slowly around fine-grained soil particles like clay than around large-grained soil particles like sand. That is why water will not puddle up on a beach but will in a muddy area.

Wells where groundwater flows quickly — as much as 50 feet per day — have a greater effect on local streams than wells where groundwater flows more slowly. Previous models did not account for this effect.

Other improvements include the use of recent satellite imagery to update land-use data for the COHYST area.

In addition to geology and land-use data, the modelers assembled climatic and water-use data from 1950-97 to develop western, central and eastern regional groundwater-flow models within the COHYST area.

The historical information is used to compare each model's predictions for groundwater and surface-water flows with water levels measured during the same time period. Because different regions of the Platte basin have different problems, the model was divided into three units.

To build the computerized groundwater-flow model, the COHYST area was divided into a grid of about 150,000 cells measuring a half-mile on each side. Computer simulations put one well in each cell to measure the effect a well pumping in that place would have on groundwater.

The model will help officials identify regions where demand for water exceed supply. Based on these results, different regions would have different regulations on pumping water.

The COHYST project involved extensive study of all factors that affect groundwater flow. In the process, the need for even more detailed data was recognized. As a result, the Nebraska Department of Natural Resources has started the Nebraska Rainfall Assessment and Information Network to get more information on rainfall in different parts of Nebraska. This data could lead to more accurate calculation of groundwater recharge. This new information could be easily integrated with the existing COHYST model to obtain better predictions.

While irrigators in much of the Platte River basin are still restricted from drilling new wells, they are not limited on how much water they can pump from existing wells. In fact, until the recent moratorium on well drilling, Nebraska was the only state in the region that placed no restrictions on groundwater pumping.

Central Platte hydrologist Woodward said the moratorium could be lifted after the resource districts plan how to manage groundwater and surface water as one resource, rather than separately as they are now. Under the state's new water law, LB962, these plans should be completed within three years from when the state determines the water in an area is fully appropriated.

The plans reflect COHYST's greatest impact on water management in the Platte River Basin west of Columbus — they treat groundwater and surface water as one interconnected resource.

WHAT WILL IT DO?

If the $7 million Platte River Cooperative Hydrology Study — or COHYST — passes review, it will be used to:

- Help Nebraska manage flows in the Platte River to benefit wildlife, as proposed under the 1997 cooperative agreement by the governors of Nebraska, Wyoming and Colorado and the U.S. Department of the Interior.
- Help the state Department of Natural Resources determine whether natural resource districts in the COHYST area are fully appropriated (the amount of available water equals the demands on that water) or over-appropriated.
- Help the Platte River natural resources districts manage groundwater and surface water so they do not become over-appropriated.
- Help Nebraskans analyze proposed activities of the cooperative agreement and other programs in Nebraska.