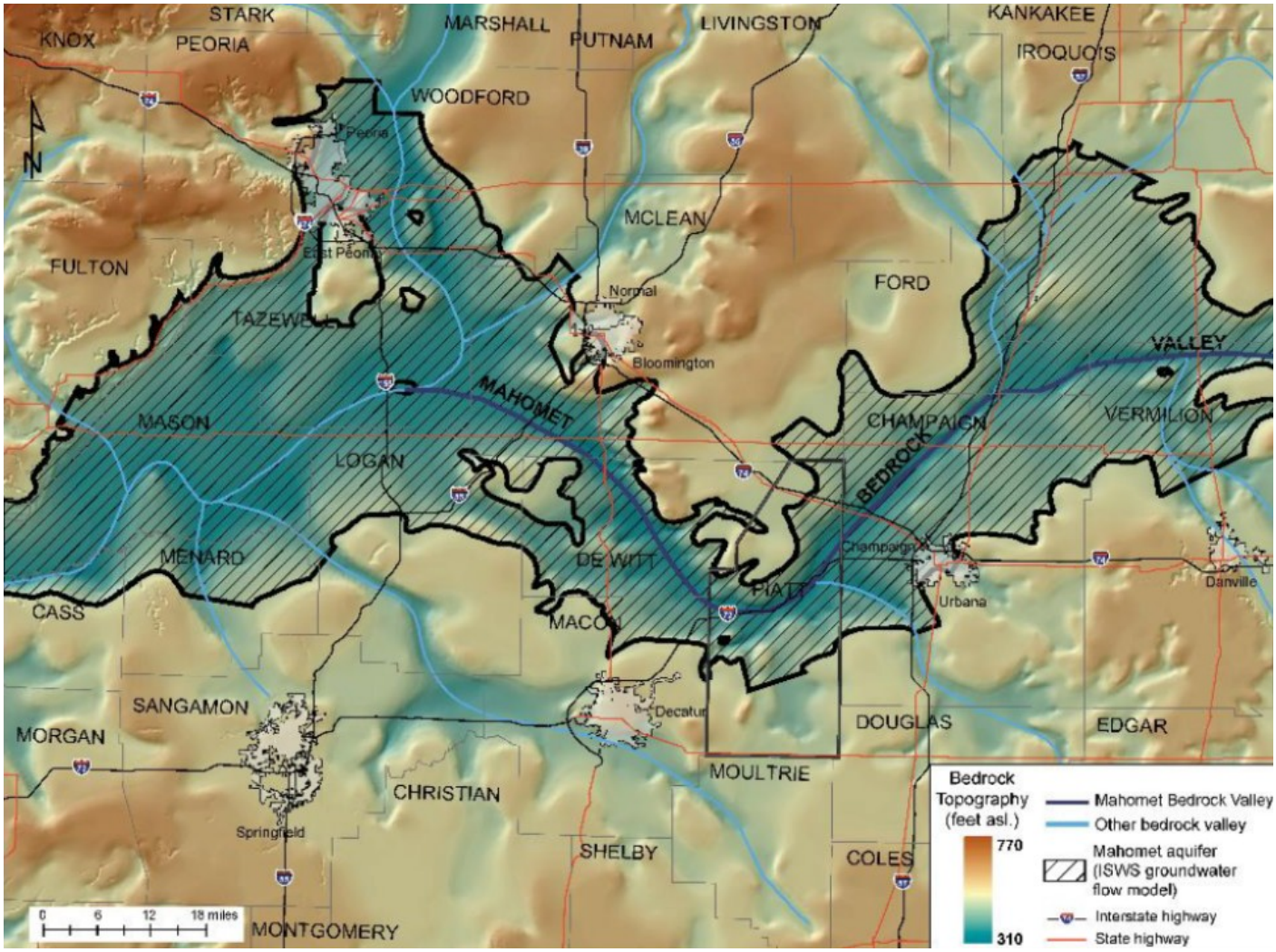
Carbon sequestration and the Mahomet Aquifer: scientists break down what you need to know

By Sam Rink | July 11, 2025



A map of east-central Illinois shows the boundary of the Mahomet Bedrock Valley.

Photo: Graphic courtesy of Prairie Research Institute

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Earlier this year, a bill that would ban carbon sequestration under sole-source aquifers in Illinois passed the General Assembly with overwhelming bipartisan support.

Gov. JB Pritzker has yet to act on the bill, but some scientists say the approach is a necessary tool for tackling climate change, particularly because carbon dioxide makes up nearly 80 percent of all greenhouse gas emissions in the United States.

Carbon sequestration is the process where CO_2 is captured, compressed and injected into absorbent rock layers deep underground.

In Illinois, a prime location for this lies beneath the Mahomet Aquifer — the primary source of water for over 800,000 people stretching from Iroquois County to Cass County.

Policymakers are worried that the carbon capture and storage could affect water sources like the Mahomet Aquifer.

“It’s about our community being able to turn the water faucet on and drink water from that tap that is not contaminated with any toxins whatsoever,” said State Rep. Carol Ammons (D-Urbana).

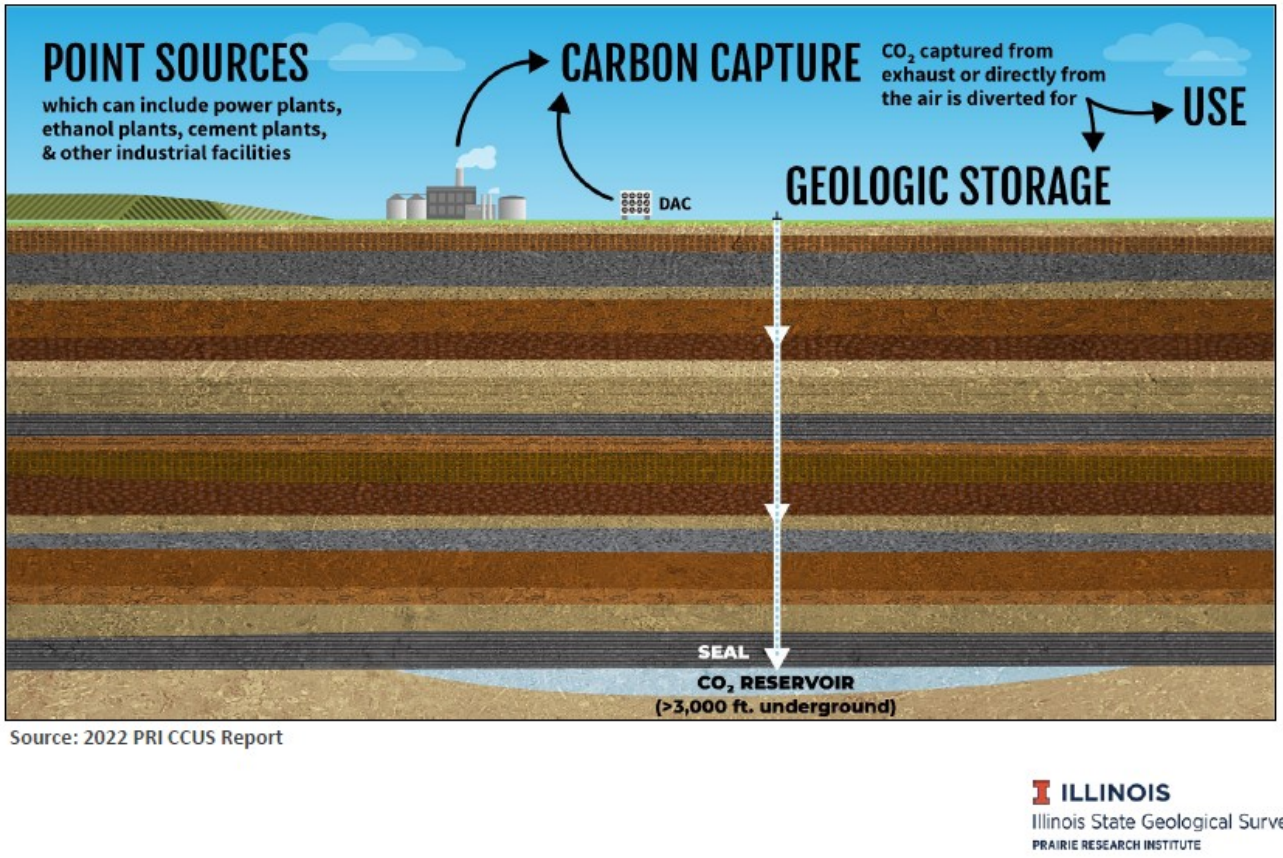
‘A distinct separation’ between carbon storage sites and aquifers

But many experts who’ve spoken to lawmakers insist the practice is safe.

Randy Locke is the chief scientist for research and development at the Illinois State Geological Survey. ISGS provides information about Illinois’ geology and natural resources to both the public and legislators.

Locke said carbon dioxide is often a byproduct of industrial processes like ethanol production — and sequestration allows manufacturers to direct the substance into the ground rather than the air.

"CO_2 is captured from some source, typically an industrial source, and [in] the case of some places that might be at an ethanol facility, or it might be off of the gas coming from generating energy, and then it is concentrated or compressed and then transported and either taken to a use, or it's then put into the subsurface."



A graphic depicts the basic steps of carbon capture and storage.

Graphic courtesy of Prairie Research Institute

Illinois is home to formations of highly permeable rock layers deep underground, making certain areas of the state prime sites for injecting CO_2. Most notably, the Mount Simon

Sandstone formation spans much of the Midwest and provides ample spaces for natural gas to be stored.

The Mahomet Aquifer lies thousands of feet above these rock formations where CO_2 would be injected, with layers of rock separating the reservoirs. According to Locke, these layers include a thick layer of cap rock sometimes referred to as a "seal" that would prevent gas from reaching shallow aquifers.

"Storage is occurring over a mile underground, and the local water sources are less than 200 to 500 feet from the land surface," he said. "There's a distinct separation between where potable water occurs and where the storage is occurring."

And where wells are bored through an aquifer, they are surrounded by multiple layers of steel and concrete to prevent contamination.

The risk of contamination

Others say carbon sequestration is a flawed solution that poses serious risks.

That includes Andrew Rehn, director of climate policy at the Illinois-based Prairie Rivers Network, an environmental advocacy nonprofit that has led a campaign to protect the Mahomet Aquifer.

"Changing water chemistry changes what is in your aquifer," he said. "You could have chemical constituents that are stable in the pH ranges that you're seeing now, and that, if CO2 were to leak, those could start leaching pollutants."

Rehn said there are growing questions about the safety of carbon sequestration after two

leaks occurred at an Archer Daniels Midland facility in Decatur last year. According to the Environmental Protection Agency, equipment malfunctions there caused carbon dioxide and brine to leak, violating the company's injection permit.

But the leaks occurred so far below ground they did not impact drinkable water. The Decatur site is several miles outside the boundaries of the Mahomet Aquifer.

Rehn said community members could be forced to deal with the consequences of a problematic well, especially considering the aquifer's sole-source designation.

"That could result in cost to us," Rehn said. "It could result in wells having to be shut down and be relocated."

How likely is it that the aquifer could be contaminated by a CO_2 leak?

Not very likely, according to Susan Hovorka, a senior research scientist at the Bureau of Economic Geology at the University of Texas at Austin.

"I was very worried about water back when I started," she said. "And I have, through experience, convinced myself that the risk to water is negligible, truly negligible, and that and that the management techniques are truly successful."

Hovorka said her research has shown that while a leak could cause toxic metals to be released, the impacts are often minimal. She said each well requires site-specific testing and risk assessment as part of the permitting process to construct wells and inject CO_2.

"The more I see, the more I understand that we need this tech," Hovorka said.

A 2017 study had similar results, showing that although CO_2 leakage could lead to the release of contaminants like arsenic that are naturally present in many reservoirs, the

effects would depend heavily on the specific geology and chemistry at the site of the leak.

Is carbon sequestration worth the risk?

Despite the limited risks, Rehn still said the potential for leaks is cause for concern.

“The reality is that when you’re doing something so big, failure points that you didn’t expect are going to show up,” he said.

But Hovorka warned against writing off the technology entirely. She noted that changes to the aquifer from climate change may affect an aquifer more than tools like carbon sequestration.

“Impact to the aquifer from uncontrolled climate change is much more severe because it’s a near surface valley filled aquifer, so if there’s episodes of drying or flooding, any kind of changes in climate are serious risks to the aquifer,” she said.

The use of carbon sequestration is currently expanding on a large, commercial scale. Several projects have already been proposed in Central Illinois — including some under the Mahomet Aquifer.

For Randy Locke, the ongoing research and development of carbon sequestration technology is a good thing. He compared the risks of using it to the risks of driving a car.

“There are things in our daily lives that we accept as things that are commonplace, but they do actually carry risk,” he said. “The things that have happened with evolution of well design, changing of the wells, all of those things help make future projects safer and able to perform their function while maintaining the carbon storage aspect as much as it can.”

24 well applications are currently under review by the EPA in Illinois.

While it's unclear what Governor JB Pritzker plans to do with the bill banning carbon sequestration, some lawmakers say they have the numbers to override a potential veto.

TAGS: CARBON SEQUESTRATION, CLIMATE CHANGE, Illinois, mahomet aquifer

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