LINCOLN—It fuels both bombs and power plants, but uranium probably doesn't come to mind to many people when they think about Nebraska.

Still, it's here and a University of Nebraska-Lincoln researcher is mapping the aquifers and rock formations that may contain it.

Most of the world's uranium is mined in Canada, Australia, Kazakhstan, Russia and elsewhere, yet Nebraska has one of the few working commercial mines in the U.S. where uranium to fuel power plants is mined.

The Crow Butte mine, near Crawford in the Panhandle, has produced about 16 million pounds of uranium extracted from local water bearing geologic formations since 1991.

The uranium it mines is present as a solid mineral, which then is dissolved with oxygen and pumped out.

South of that mine, University of Nebraska-Lincoln Conservation and Survey Division hydrogeologist Steven Sibray is mapping the shallow High Plains (or Ogallala) Aquifer. The data he and his research partners have collected "indicates we are also seeing the deeper water bearing formation at the base of White River Group in the southern Panhandle.

"Our research suggests that commercial uranium mining companies could use this technology to locate uranium-bearing sandstones within the deeper formation," Sibray said. He added that finding the uranium-bearing sandstones is just the first of several high-risk and costly steps needed to find mineable quantities of the mineral.

"Recent advances in the application of airborne electromagnetic surveys to our ongoing groundwater management programs can also be utilized to map water-bearing formations that host uranium deposits," said Sibray, of UNL's School of Natural Resources.

This AEM data, collected by the U.S. Geological Survey and UNL's Conservation and Survey Division, is part of a project to define the hydrogeologic framework of the High Plains Aquifer, Sibray explained.

"With additional interpretation of these data sets, the deeper confined aquifer of the White River Group can be identified that may contain mineable quantities of uranium," he said.

Evidence of the potential for uranium mineralization as far south as Cheyenne County, about 90 miles from the Crow Butte mine, is found in radioactive anomalies shown on borehole geophysical logs from oil and gas tests drilled in the area. This information has been a factor in recent decisions by several mining companies to lease land in the southern Panhandle to explore for uranium.

The airborne AEM technology, which relies on identifying water-bearing formations by their electrical resistance compared to surrounding materials, has helped confirm the presence of potential uranium-bearing formations in several areas that were previously mapped from more traditional oil and gas borehole tests.

"The airborne geophysics may be sexy, but you need the borehole data first," Sibray said. "That gives us the 'dots' for subsurface mapping while the airborne AEM allows us to connect those dots."

"We use the boreholes to measure the same rock properties as AEM—how rocks conduct electricity. It's relatively old technology that was developed for the oil and gas industries, but it works.

"During World War II, engineers developed an electromagnetic tool for locating landmines, which ultimately led to airborne electromagnetic tools after the war that were used by the mining industry to locate metallic mineral deposits," Sibray explained.

“It took a little longer, but the oil industry was able to use electromagnetic tools in boreholes in the late 1940s early 1950s. It measures the same rock properties as my tools but uses a different method.

“Recently, the airborne methods have been refined and we can now map aquifers using them,” he said.

The newer AEM methods can also “see” and measure deeper into aquifers than was previously possible and are able to map with good results to as much as 500 meters below the earth’s surface.

“Deeper mapping AEM systems would allow mapping of the larger channel deposits of sands and gravels within the White River Group that were formed by rivers approximately 35 to 37 million years ago,” Sibray said, noting that the formation exists over most of the Nebraska Panhandle.

Sibray is conducting this research in cooperation with Bruce Smith, Jared Abraham and James Cannia, of the U.S. Geological Survey. He is a geoscientist and hydrogeologist at UNL’s Panhandle Research and Extension Center in Scottsbluff, where for nearly 25 years he has specialized in developing and using reliable, efficient groundwater monitoring systems that help conservationists, land users and researchers.