Making a Difference

Junior Joseph Hoover has studied water contamination in New Mexico and bromine atmospheric chemistry in Alaska in his efforts to understand and improve the natural world.

Water brings life to the sweeping desert and red rock canyons of America’s Southwest. But water there can also kill. That’s what junior Joseph Hoover found when he researched water contamination on the Navajo Reservation in June 2004.

From the 1940s through the 1960s the federal government mined uranium ore on the Navajo Reservation. From 1994 through 2000 the U.S. Environmental Protection Agency conducted the Abandoned Uranium Mines Project, sampling more than 200 artesian wells, springs and mine sites, testing for more than 25 stable and radioactive elements. In June 2003 assistant professor of chemistry Franz Geiger worked with several Navajo Red Valley Chapter officials to make the information from the EPA study accessible on Geiger’s water-quality web site. (This information was first published only on CD in a complicated scientific format.) As a continuation of the project, Hoover and Geiger traveled to Red Valley, Ariz., to collect water samples for testing.

Concerned residents approached Hoover as he took samples from artesian wells. “People wanted to know what was in the water.”

Poison, he later found out. Hoover found uranium as he had predicted, but he also discovered arsenic levels that were two times greater than the maximum contaminant level deemed legal for drinking water by the EPA.

Hoover also discovered that straining the samples through household water filters removed the uranium. The next step is to develop or find an existing filter that will remove arsenic, Hoover says, and to encourage people on the reservation to use the available water filters in the meantime. “There are people who have never left the reservation,” Hoover says. “They looked at these filters and were like, ‘What’s this?’”

Hoover says he took away a life lesson from that experience. “The more I learn, the more I realize how difficult it is to cause a change in environmental consciousness.”

It was just one of the important observations Hoover has made in three years of cross-continental research projects. Last summer he studied in Alaska on a National Science Foundation summer Research Experiences for Undergraduates program at the Geophysical Institute at the University of Alaska-Fairbanks. He studied the use of a chemical dye to identify a reactive bromine compound in the atmosphere, a component of a larger project investigating mercury deposition in the high Arctic and mercury bioaccumulation in the Arctic food chain, “a problem, especially for people who hunt and eat animals,” Hoover says.

The bromine compound is part of a series of chemical reactions that deposits airborne mercury in snow. The mercury in the air can come from anywhere in the Northern Hemisphere when winds deposit air pollution from lower latitudes in the Arctic. His work will help scientists to identify the reactive bromine compound in the atmosphere.

The environmental sciences major from Boulder, Colo., dove into research the day he arrived at Northwestern. He tested Chicago’s soil for lead in chemistry chair Hillary Goddard’s Undergraduate Success in Science Program during the summer before his freshman year.

After his research on the Navajo Reservation in 2004 he presented his findings at the Chicago Area Undergraduate Research Symposium, where his oral presentation won top honors.

Hoover is preparing for a career in environmental science and policy, a field that seeks to “strike a balance between what’s best for the environment and what’s best for society,” Hoover says. (In his free time he also plays the euphonium in the Northwestern University Wildcat Marching Band and is an officer of the music fraternity Phi Mu Alpha.)

Hoover is currently involved in three projects: following up on his Navajo project by updating the water quality web site, researching the impact of the new arsenic water standard on U.S. public drinking water supplies; and serving as a research assistant on a project investigating wetland denitrification under the supervision of civil and environmental engineering professor Kimberly Gray (W9CAS78) (see “Good Chemistry for the Good Earth,” fall 2005) and research associate Shai Arnon.

Hoover is shaping into a passionate and rational environmentalist, his professors say. “You often will find a young person who’s passionate about something but they’re not really directed in finding a realistic solution,” Geiger says. “But Joe’s really grounded in realizing how he can make a difference, and he’s doing something about it.”

Heidi Zhou (J08)