Can We Bury Global Warming?

Beneath the Columbia River Basin, a real-life trial of the uncertain science of carbon sequestration

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Posted: 10/04/2007

Photo courtesy Rajah Bose/High Country News

Scientists are studying Columbia River basalt to see whether it holds promise for storing CO2. Researchers Charlotte Sullivan, Pete McGrail and Frank Spane at a basalt outcrop outside Benton City, Washington.

An environmental engineer who favors the techie national uniform—Dockers and a light yellow Oxford shirt—Pete McGrail works out of a utilitarian office and lab, two among dozens of similar small rooms in the rabbit warren of cloyingly beige hallways at the Battelle campus in Richland, Wash. A global science and technology nonprofit, Battelle manages the Pacific Northwest National Laboratory at the Hanford Nuclear Reservation for the U.S. Department of Energy. McGrail's work is part of the Big Sky Carbon Sequestration Partnership, a consortium led by Montana State University and drawing on researchers from all three of Idaho's universities, the U.S. Department of Energy's Idaho National Laboratory near Idaho Falls, and Battelle. The DOE and several private companies have given $17.9 million to the Big Sky partnership, which covers the eastern halves of Washington and Oregon, Idaho, Montana, Wyoming and South Dakota and is one of six regional programs covering the whole country.

McGrail is a clear-eyed man who speaks in the precisely worded sentences typical of scientists; he's careful to obey the strictures imposed on employees at defense installations. At least one public information officer accompanies him to press interviews. No photos can show his security badge. And whether from natural reticence, scientific rigor, or administrative pressure, McGrail firmly repulses journalistic queries into taboo subjects such as the date and location of his upcoming field test of the transformative powers of...lava.

Actually, except for the details of his field test, McGrail is anything but close-mouthed when it comes to his research specialty, a type of volcanic rock known as flood basalt. In fact, he sings basalt's virtues at every opportunity—and the government has begun listening to his tune.

As the reality of global warming sinks in, more and more people are hoping against hope for a miracle cure, a way to avert global catastrophe by reducing or stabilizing the amount of carbon dioxide in the atmosphere. So far there's been little movement toward reducing fossil-fuel use. But the government is encouraging efforts to develop technologies that can capture and contain CO_2 emissions before they reach the atmosphere.

Carbon sequestration, as it has come to be known, has one primary attraction: It could enable the United States to keep using its most abundant (but until now dirtiest) fossil fuel—coal. Growing or preserving forests and other plant-heavy ecosystems that take up carbon dioxide by respiration may accomplish some sequestration. But a big part of the sequestration scenario involves stripping CO_2 from power plant exhaust and injecting it into natural underground reservoirs and rock formations.

Among the types of rock being investigated for carbon sequestration is McGrail's focus: flood basalt. Most sequestration experts think basalt sequestration a rather quirky, even quixotic idea. After all, most of the country lacks the layered volcanic flows that spread to form the Columbia and Snake river plains.

But basalt has one virtue that other geologic formations lack. In the laboratory, it can transform CO_2 into calcium carbonate—the equivalent of seashells or limestone—in a matter of weeks or months, effectively immobilizing carbon in a solid. And because most of the Pacific Northwest is awash in basalt, carbon sequestration of this type could be an excellent regional method of reducing carbon dioxide emissions—if what happens in the lab can be made to happen 3,000 feet below the Columbia River Basin.

Basalt is a majestic rock, a deep black when young that gradually weathers into softer colors, especially the telltale reds that show where iron in the stone has reacted with oxygen. Depending on how it cools, basalt sometimes forms huge or tiny vertical columns — Wyoming's Devils Tower and the Giant's Causeway in Northern Ireland are prominent examples of the big versions. In the Northwest, one of the best places to see large-scale columnar joining is in the Columbia River Gorge 200 miles west of Richland, where massive columns rear above Interstate 84 as it snakes alongside the river.

The center of McGrail's interest lies in this area and in the Columbia River Basalt Group, which consists of about 300 lava flows that ran fast and frequently in the Miocene epoch between 6 million and 17 million years ago. It covers about 65,000 square miles, in places to a depth of three miles; some of the crustal rifts disgorging the basalt were as much as 100 miles long. Because the lava gushed out and spread horizontally, on a relief map the flood basalt region looks like it has been ironed out compared to the mountainous topography surrounding it.

The Columbia basalt's surface landscape is classic Western sagebrush desert, which, unmodified by paved roads, irrigation or air conditioning, appears to be a trackless, inhospitable and worthless wasteland, good for nothing but possibly grazing sheep. The federal government viewed it as a handy spot to conduct dangerous experiments and dispose of nasty wastes, building the Hanford Nuclear Reservation just northwest of Richland to manufacture plutonium during World War II.

At one point, the Department of Energy considered injecting its millions of gallons of liquid nuclear waste deep into the Columbia basalt. During the search for an appropriate injection site, hundreds of core samples were drilled and archived. Those core samples have come in very handy for Pete McGrail as he conducts studies that may lead to another industrial use for an already hard-used land.