

## GEOCHEMISTRY

## Unsuspected Underground Nitrates Pose a Puzzle for Desert Ecology

Desert plants face a hardscrabble life. Their soil is parched, and it's poor in bioavailable nitrogen, an essential nutrient. A few meters down, though, lies a potential bonanza. On page 1021, a team reports that desert subsoils in the southwestern United States contain much more nitrogen than previously estimated, a finding that raises questions about how desert ecosystems work. "This paper clearly will cause people to think about arid lands and where they fit into the global nitrogen cycle," says ecologist Ross Virginia of Dartmouth College in Hanover, New Hampshire.

The nitrate was discovered by accident. Hydrologist Michelle Walvoord, then a Ph.D. student at New Mexico Institute of Mining and Technology in Socorro, and hydrologist Peter Hartsough of the University of Nevada, Reno, were drilling cores at the Nevada Test Site to study chloride in the subsoil. They found a peak of chloride several meters below the surface, which indicates that the climate became drier some 16,000 years ago. Oddly, nitrate concentrations also peaked at that depth. "We thought that was weird," recalls Walvoord, now a postdoc at the U.S. Geological Survey in Lakewood, Colorado, because nitrate in soil is usually concentrated in the uppermost meter.

The matching peaks suggested that nitrate, like chloride, was leaching from the

soil without being taken up by plants or microbes. To check out the pattern, Walvoord, Hartsough, and colleagues studied four more desert sites in the Southwest. Although only two other cores showed a tight match between chloride and nitrate, the researchers found subsoil nitrate in almost all the cores, in amounts ranging from 2000 to 10,000 kilograms per hectare. (Farmers typically apply 25 to 250 kg/ha each year.) That's up to 10 times more than is found in the topsoil.

Because deserts make up one-third of the dry land on Earth, their subsoil reserves could add up to a lot of nitrogen, Walvoord and her colleagues say. They estimate that it could mean 16% more nitrogen in Earth's soil than previously thought and as much as 71% more in deserts. In the future, Walvoord and colleagues say, that huge nitrate reservoir could percolate into aquifers and contaminate groundwater if Southwestern deserts are irrigated or the

climate becomes wetter.

How widespread that problem could be isn't clear. "The variation they saw across cores makes regional and global extrapolations a lot more questionable," cautions ecologist Robert Jackson of Duke University in Durham, North Carolina. But that same variability provokes some interesting questions about desert ecosystems, he adds. Why isn't the nitrate tapped by desert plants, which



**Buried riches.** In deserts such as Nevada's Amargosa, nitrate leaching from the soil has accumulated meters below the surface.

can use nutrients from as deep as 4 meters? Jackson wonders if the pool of nitrate could help explain why deep-rooted woody plants have invaded the Southwest over the past century or so: "The paper is helpful because it makes us rethink the way deserts work."

—ERIK STOKSTAD

## TOXICOLOGY

## Europe Whittles Down Plans for Massive Chemical Testing Program

**MADRID**—The European Commission (EC) has scaled back a major piece of legislation on safety testing of commercial chemicals. Yet even in its revised form, the proposed law would represent one of the most ambitious toxicological programs ever undertaken.

An earlier version of the legislation, which has been in the works for more than 2 years, would have required chemical makers to perform extensive toxicological and environmental tests on the 30,000 chemicals most commonly used in commerce (*Science*, 18 April, p. 405). Under the latest draft, released by the EC last week, the testing requirements would apply only to chemicals produced in amounts greater than 10 tons, covering about one-third of the number originally envisioned. Some 1500 chemicals that European regulators deem particularly hazardous to human health—including bromi-

nated flame retardants, phthalates used as plastic softeners, and perfluorinated compounds—are likely to be severely restricted or banned, the EC says.

The testing program, to be called REACH (Registration, Evaluation, and Authorization of Chemicals), would require some safety tests of chemicals produced in amounts of between 1 and 10 tons. But such substances would be exempt from tests of reproductive effects and environmental persistence. The changes mean that "we will have no idea how far the chemicals get into the environment," contends Stefan Scheuer of the European Environmental Bureau, a coalition of 140 non-governmental organizations.

The revisions to the legislation, according to lobbyists and U.S. officials, came after a blitz by the European and American chemical industries, which had estimated

that the tests would cost as much as \$12 billion. In reworking the legislation, the EC stated that it wants a program that would not unduly crimp European competitiveness. Industry and environmental groups concur that the legislation, although watered down, still amounts to a radical change. "At the end of the day, this will still be the biggest such program in the world," says Véronique Scailteur, director of external relations at Procter & Gamble's headquarters in Brussels. The testing is now expected to cost about \$2.3 billion.

Scheuer says, however, that he and other activists are planning a lobbying counter-attack to try to persuade the European Parliament and the Council of Ministers to restore some cuts when the two bodies take up the legislation early next year.

—SAMUEL LOEWENBERG

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