

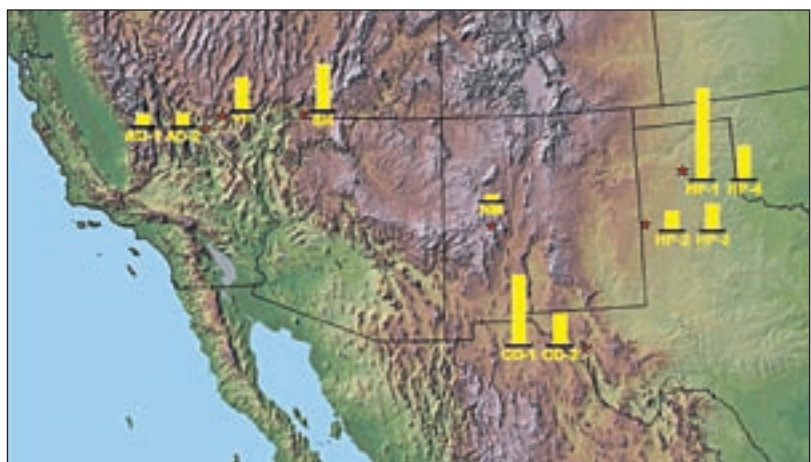
Perchlorate is widespread in U.S. Southwest

Natural atmospheric perchlorate deposits occur in deep, dry soils across the southwestern U.S., at levels that could rival the amount known to come from military sources and natural fertilizer, according to new research published in this issue of *ES&T* (pp 4522–4528). The finding has implications for human exposures.

Perchlorate, a potent oxidizer

spherically derived perchlorate in the Southwest's dry unsaturated or vadose zones. They collected 10–20 grams of soil to get enough perchlorate from 11 sites across seven ecosystems. Isotopic analyses would have required tons of soil.

Previous research led by coauthor Michelle Walvoord of the U.S. Geological Survey (USGS) examined many of the same sites for



KAREN BOLM, USGS

This map of the southwestern U.S. shows 11 deep soil sampling sites in seven different ecosystems where researchers found perchlorate. The site with the highest concentrations, HP-1 in the High Plains aquifer in northern Texas, contains 1050 grams of perchlorate per hectare (ha). The lowest, NM in New Mexico, has 93 g/ha.

that disrupts thyroid function by inhibiting the uptake of iodide, is best known for its use in rocket fuel but also occurs naturally in the environment. Since the beginning of the last century, Chilean nitrate fertilizers that contained naturally produced perchlorate were applied to U.S. agricultural fields. Today, perchlorate hot spots occur, some of which seem to extend farther than what is predicted from known contamination sources. Researchers have recently turned to isotopic analysis to help pinpoint the origins of perchlorate, because manufactured and atmospherically deposited perchlorate have very different isotope signatures.

Andrew Jackson of Texas Tech University and colleagues took a different tack to examine atmo-

desert salts in the vadose zone. Using that data, the team correlated perchlorate concentrations in their soil columns with chloride deposits (and in some cases with nitrate, which has a more variable occurrence because of microbial and other activity). The results suggest that the perchlorate arrived in tandem with the chloride and was deposited atmospherically and ubiquitously in the vadose zone across different desert environments—but at very low concentrations.

One studied site sat above the High Plains aquifer in Texas, a highly cultivated region where farmers and water utilities have mined the aquifer. The new *ES&T* research suggests why the groundwater there now contains relatively high concentrations of perchlo-

News Briefs

A call for mitigation

The time has arrived: everyone from individuals to businesses should factor climate change into choices, according to *Mitigation of Climate Change*, from the Intergovernmental Panel on Climate Change (IPCC). The report provides an in-depth analysis of the costs and benefits of programs already under way as well as of policies and incentives for governments and industries to reduce greenhouse gases. It considers financial impacts in the short term (between now and 2030) and in the longer term. Governments can start the ball rolling for investors by establishing a price for carbon through a tax on carbon emissions or a government-sponsored trading system, the report notes. To view the full report, go to www.ipcc.ch. For key passages and links to websites detailing measures to reduce greenhouse-gas emissions, go to www.ipccinfo.com.

Jolt for U.S. energy plan

The U.S. should hasten efforts to curb greenhouse-gas emissions and secure energy supplies, according to recommendations from a leading energy think tank. The National Commission on Energy Policy (NCEP), a bipartisan group of energy experts, is calling for stronger controls than it first proposed in 2004. In its new report, *Energy Policy Recommendations to the President and the 110th Congress*, NCEP calls for tougher auto fuel-economy standards, a national renewable-energy standard, and developing technologies to capture and sequester carbon. The cuts would reduce U.S. carbon emissions to 15% below current levels by 2030. The proposed system to cap and trade emissions would include a higher “safety valve” to protect businesses from high clean-up costs. To view the report, go to www.energycommission.org.



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rate: pulling out the groundwater and then reapplying it, so it could trickle down through the unsaturated zone, could have “flushed a long-term reservoir into the drinking water,” Jackson says.

This process could also deliver perchlorate to food grown in such dry areas through groundwater used for irrigation. At one Mojave Desert study site, the perchlorate salts migrated 6 meters in less than a decade.

The team estimates that the deserts in the southwestern U.S. hold ~4–103 million kilograms (kg) spread out over 1 million square kilometers. Estimates of Chilean nitrate fertilizer imported into the U.S. amount to ~81 million kg in the past century, and total U.S.

production of perchlorate in the past half century has reportedly hit 5 billion kg. The amounts the team found are “significant,” says Sandy Dasgupta of the University of Texas, Arlington. “[The] potential for contaminating groundwater to levels that can easily exceed the currently recommended safe-dosage level is therefore of considerable concern, if this water were to be used as drinking water. . . . Now it would appear people living in arid and semi-arid lands [which is a large part of the U.S.] need to be particularly aware of their iodine nutrition.”

The potential for migration with changes in water-usage patterns also complicates remediation efforts for perchlorate-contami-

nated military and manufacturing sites. Shannon Cunniff, director of DOD’s Emerging Contaminants Office, says the new work is “increasing the body of evidence that perchlorate levels that are relevant to public health can exist naturally. Especially in these arid and semiarid regions, one can no longer assume that DOD activities are the source of perchlorate.”

Researchers agree that issues related to the origins of perchlorate are far from settled. The new research “clearly is an important contribution, and the collection of data from these sites presents a very convincing story,” says JK Böhlke of USGS, but “the search for other sources of perchlorate is still on.”

—NAOMI LUBICK

E-waste campaign begins in the U.K.

Starting this summer, British consumers won’t toss their old electronic equipment out with their everyday trash. Instead, they will carry their computers, radios, and the like to designated collection points or hand the equipment over to certain large retailers when they purchase new items. The program is part of an EU-wide directive aimed at stemming the ever-growing pile of computers, iPods, and other electronic waste going to European landfills.

The EU Waste Electrical and Electronic Equipment (WEEE) Directive, approved in 2003, requires producers to finance the take-back programs and treatment of the trash and sets targets for recovery and recycling for different categories of waste. According to the European Commission, e-waste is the fastest-growing portion of Europe’s garbage stream and is increasing three times quicker than municipal solid waste. By 2010, e-waste will account for more than 8% of the European municipal waste stream.

The directive should have been adopted by all EU countries by

August 2005, but many countries are behind schedule. “Austria, Belgium, The Netherlands, and Sweden already had take-back legislation and systems in place, which only needed to be aligned with the directive,” explains Denise Perchard of Perchards, a consulting firm specializing in government issues. Most countries, including Ireland, Portugal, Germany, and the U.K., only recently approved WEEE legislation, but by this summer, almost all EU states will have at least commenced take-back in some form, she says.

The directive also requires EU states to encourage producers to implement equipment design changes to make it easier to dismantle, recycle, and reuse electronics waste.

But changes to the directive made by individual countries have angered a group of companies and nongovernment organizations, including computer systems producer Dell and the Basel Action Network. In March, the group issued a statement expressing its concerns about changes made to the directive by 11 member states.

These states, including Denmark, France, and the U.K., have amended the individual producer responsibility element of the directive when writing their national laws and made producers collectively responsible for the recycling of future products. Spreading the cost of the recycling programs across the entire industry won’t stimulate product redesigns, the group argues.

Still, the push to redesign products has been encouraged by another EU directive on the restriction of hazardous substances (RoHS) in electrical and electronic equipment. RoHS banned, with some exceptions, products containing lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyl ethers.

RoHS has had an effect on countries outside of Europe, says Kevin Brigden of the Greenpeace Laboratories at Exeter University (U.K.). He notes that lead-free solders are now widely available. “Although RoHS doesn’t go far enough—for example, it does not cover phthalates—it is the way forward and has had a huge impact,” Brigden says.

—MARIA BURKE