EXTRACTIONS

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IS ALBERTA DRYING UP?

Alberta Agriculture figures show that the 2001 growing season received less precipitation than any other season in the 74 years that records have been kept. This drought was widespread and occurred throughout most of the irrigation area of southern Alberta. The years 2000 and 2001 were the driest two consecutive years for the same 74-year period, and overall winter precipitation totals for 2003 were below normal levels for most of the province.

Dr. David Schindler, a professor of ecology at the University of Alberta and winner of the 2001 Gerhard Herzberg Gold Medal for Science and Engineering, says paleo-glacial indicators dating as far back as 2,000 years ago show that we experience an average four droughts per century and, on average, one of these four droughts lasts between 10 and 20 years. "There is one exception to that," says Dr. Schindler, "and that's the 20th century. So what we have come to think of as 'normal' has actually been the wettest century that has been studied so far."

Global warming is not helping either. According to Dr. Schindler, Alberta water resources are not going to do well if CO_2 concentrations continue to increase. Research on the Oldman River run-off predicts a drop in water volume from 632 million m^3 in 1973 to 391 million m^3 in 2050. This decrease in water volume will make parts of southern Alberta unsuitable for farming.

In addition, about one quarter of all fresh groundwater allocations in the province are for enhanced oil recovery, says Mary Griffiths, Environmental Policy Analyst with the Pembina Institute. In this process, water is pumped deeper into the ground and stays there; it is removed from the water cycle.

To address this serious water issue, The Hon. Lorne Taylor, Alberta's Minister of the Environment, has appointed an *Advisory Committee on Water Use Practice and Policy* to prepare recommendations on practices that remove water from the hydrologic cycle, including oilfield injection activities. It plans to complete its report before the end of March 2004.

[from *Business in Calgary*, May 2003, p. 10-13 and http://www.waterforlife.gov.ab.ca/html/removed.html]

WIND POWER CLEANUP

Dr. Curt Elmore, assistant professor of geological engineering at University of Missouri-Rolla and 11 geological engineering students will use wind power to clean up groundwater contaminated with wastes such as TNT (trinitrotoluene) at a former munitions production site in Nebraska.

Elmore's research group will use a wind turbine to power a groundwater circulation well that removes contamination from the aquifer by extracting water from one interval, treating it, and putting it back in the same aquifer at a different depth, so nothing is wasted. "The only thing that comes out is the contamination," says Elmore. "Because we use a renewable resource, we are hoping to achieve total resource conservation," he says. "It's kind of a holistic approach, that you can remediate the groundwater without doing anything to it except removing the contamination."

The $300,000 project should be completed in September 2004, one year after its start.

HOMEOPATHIC SOLUTION FOR ARSENIC POISONING

Arsenic contamination is a major health problem, especially for people in India and Bangledesh. Chemical methods can remove arsenic contamination from pumped water, but they have not been widely implemented due to cost.

Researchers at the University of Kalyani, West Bengal, have shown the effectiveness of an inexpensive homeopathic remedy in mice. The basic ideas of homeopathy are that 'like cures like' and that the lower the concentration of a drug, the higher the effectiveness. In this case, the researchers prepared dilute solutions of arsenic oxide to treat mice affected with arsenic poisoning. The treatment reduced the arsenic damage to the livers of the mice, measured indirectly by liver enzyme activity, for up to 30 days. If the experiment had been done on humans first, any positive results might have been attributed to a placebo effect.

[from http://www.enn.com/news/2003-09-12/s_8370.asp]

SHOCK WAVES PUSH THE SALT OUT

Cleaning salt-contaminated water as it is withdrawn from underground water sources is expensive. Scientists in Israel have developed a new, possibly less expensive, in situ process.

Starting with theoretical calculations, then using a column of sand saturated with salty water, Shaul Sorek of Ben-Gurion University of the Negev and his colleagues confirmed that pressure waves caused by a bursting membrane can push dissolved contaminants along but leave the water where it is. A preliminary field test showed similar results.

Contamination of aquifers with salt is common in coastal regions such as along Israel's Mediterranean coast. When too much freshwater is withdrawn from water-saturated underground rocks, seawater flows in.

However, the shock-wave system is far from being practical on a large scale, warns Sorek. The flushing process is currently rather inefficient — contaminant concentrations change by only a few per cent, and it is not yet clear whether salt or other pollutants can be transported over the long distances required to clean the aquifers. "To what extent such a remediation procedure is feasible is still an unresolved issue."

[from http://www.nature.com/nsu/nsu_pf/031006/031006-1.html and *Environmental Science and Technology 2003*, 37,4481-4486]

TRICLOSAN CONVERTS TO DIOXIN

Earlier studies have shown limited effectiveness of the currently popular anti-bacterial soaps. Now there's another reason to avoid using the product.

Researchers at the University of Minnesota found that when a solution of Triclosan, a common anti-bacterial ingredient, was exposed to sunlight, it was chemically converted into a dioxin. While this reaction had been known in the laboratory, this study shows that it can happen naturally on the surface of river water, converting up to 12% of the Triclosan. Although this form of dioxin is not the most toxic, the scientists suggest that exposure to chlorine in water treatment plants might produce a chlorinated Triclosan that would be converted to the more toxic form.

Even very low levels of dioxin cause concern because dioxins are stable in the environment and accumulate in organisms, becoming more concentrated the higher up the food chain.

[from http://www.sciencedaily.com/releases/2003/04/030415083625.htm]

HOW DID MERCURY GET IN OUR TUNA?

Since the level of atmospheric mercury is two to three times higher today than it was 150 years ago, scientists have previously assumed that the high mercury levels in fish came from this pollution, but a new study suggests it may come from natural sources instead.

Geochemistry Professor Francois Morel, of Princeton University, explored the origins of mercury in ocean tuna by comparing methylmercury levels in yellowfin tuna caught off the coast of Hawaii in 1971 and 1998. To his surprise, he found no change.

This suggests that high levels of methylmercury are coming from a natural source such as hydrothermal vents or deep ocean sediments — the oxygen-free habitats favoured by methylating bacteria. His theory applies only to ocean-going predators, though, as scientists have already established a strong link between pollution and mercury levels in coastal and lake fish.

Meanwhile, there is hope that the form of mercury found in some fish may be less harmful than at first thought. Researchers used X-ray technology to probe the structure of mercury in the muscle tissues of swordfish, orange roughy, and sole purchased from a California fishmonger.

"There may be reason for cautious optimism," said Graham George, who did the work at the Stanford University Synchrotron Radiation Laboratory in Menlo Park, Calif. George and his colleagues found the mercury in fish is bound to an atom of carbon and an atom of sulphur. The researchers say this form of mercury is less toxic than methylmercury chloride, which is often used to model the toxicity of mercury in fish.

The researchers' next step is to look at the form of mercury that accumulates in mammals eating mercury-laden fish.

[from http://geoweb.princeton.edu/research/biogeochem/mercury.html]

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