environment

Precise soil nutrient monitoring

Fertilizer runoff from cropland into waterways is a source of considerable water pollution and consequent eutrophication. In addition, if there is an excess of one particular nutrient ion in soil, when it is leached out, it can take other nutrients along with it. Current tests for gauging fertilizer needs are often gross, and crop needs are estimated from rough extractions.

Dr. Dale E. Baker, soil chemist at Pennsylvania State University, says he is now perfecting a system using a solution which contains precise minimum amounts of nutrients, in the proper balance, for all soils (with further calibration for crop variety, climate, etc.).

Elements being analyzed with the system include nitrogen, phosphorus, potassium, calcium, magnesium, manganese, copper, zinc and sulfur. But eventually, says Dr. Baker, it will be applicable to about 15 nutrients.

The theory behind the tests is that soils contain physiochemical "matrices," which have a capacity for holding certain numbers, kinds and proportions of the nutrient ions (SN: 5/1/71, p. 302). If a soil does not have these ions in these amounts or balances, it will tend to reject or accept more until it reaches them.

In Dr. Baker's test, the soil is exposed to the solution—which contains the ideal amounts and balances. Then removal of ions from the solution, or additions of ions to it, will show the balances that exist in the soil being tested. Then fertilizer applications can be increased or decreased, precisely according to the need. Once the system is perfected, it will not only prevent unwanted fertilizer runoff but also result in lower fertilizer costs, says Dr. Baker.

That sinking feeling

When studies showed that withdrawal of fluids from oil and gas wells may in some cases relieve stresses that lead to earthquakes (SN: 4/17/71, p. 263), it looked as if exploitation of resources might have some ecological benefits for a change. It now appears, however, that such an earthquake cure may create problems of its own.

Joseph F. Poland, a U.S. Geological Survey hydrologist, believes that land subsidence as a result of subsurface mining and withdrawals of water, oil and gas from underground wells may become an increasingly serious problem. Oil and gas withdrawals, and the consequent decline in underground fluid pressure, he explains, has created areas of major subsidence in Texas, California, Venezuela, Italy and Japan. In California's Santa Clara Valley, decline in artesian pressure has resulted in over 13 feet of subsidence since 1915. Along coastal areas in California and Japan, says Poland, subsidence has resulted in intrusions of the sea onto the land.

Wild bee mortality explained

The alfalfa leafcutter bee, a wild bee, is a highly effective pollinator in Idaho, where after introduction it will often double alfalfa seed yield. But efforts to introduce the bee in California have been less than successful because the bee has difficulty in reproducing there.

Dr. Robin Thorp of the University of California at Davis says the bee in California appears to be the victim of a toxin, a steroid material called saponin, that occurs naturally in California alfalfa varieties.

Dr. Thorp's theory—based on exposing the bees to plants other than alfalfa and discovering that the reproduction problems did not exist for these other plants—is that the bee, in preparing nests, bites out small circles of alfalfa leaf. Nectar in the nest dissolves the saponin and the larvae feed on the poisoned food and die.

Dr. Thorp corroborated his theory by testing bees with strains of alfalfa having high and low levels of saponin. Toxicity was in direct proportion. If the bee is to be introduced successfully in California, it probably will be necessary to select nontoxic varieties of alfalfa, says the researchers.

Mercury—the compound is the question

Sometimes near panic has prevailed with regard to discovery of mercury in fish and wildlife. What has been feared is the toxicity of certain compounds—such as methyl mercury in fish of the kind which apparently killed and disabled large numbers of people in Japan a few years ago.

Dr. Henry A. Schroeder, director of the Trace Elements Laboratory at the Dartmouth Medical School and a major researcher in the toxicity of trace elements (SN: 6/6/70, p. 560), warns that the panic is unjustified until Federal agencies can distinguish between toxic and nontoxic mercury compounds in food.

"Methyl mercury and ethyl mercury are highly toxic," says Dr. Schroeder. "Inorganic and most other organic forms of mercury are not highly toxic."

Dr. Schroeder says that measuring methyl mercury is very difficult and that a rapid and easy test is badly needed. Once this is developed, he says, bans on sale of fish can be based specifically on toxic levels of methyl mercury rather than on gross mercury as is the practice now.

Mosquito-eaters

Mosquitoes, a perennial plague of mankind, have had reason to feel pretty sassy lately. The malaria-carrying insects are becoming increasingly resistant to standard insecticides. And insecticides in general, because of their insidious ecological consequences, have fallen from favor.

Drs. Eldon Reeves and S. V. Amonkar of the University of California at Riverside have found another weapon—two species of algae that kill mosquito larvae. The two researchers discovered the larvicidal algae in Orange County, Calif. They found that concentrated extracts from the algae killed mosquito larvae within hours. The algae, *Cladophora glomerata* and *Chara elegans*, release toxic substances that attack the lining of the larva's alimentary canal, they explain. They are especially effective against *Aedes aegypti*, a disease-carrier, as well as four other species of mosquito.

In addition, says Dr. Reeves, there would be relatively little risk of the insects developing a resistance to a botanical larvicide. Further, he continues, there should be no adverse effects on fish or aquatic insect predators. "The insects and fish that live in mosquito habitats are very healthy in the presence of these active compounds at levels that suppress mosquito development."