Briefing:

High Selenium Levels Confirmed in Six States

The *Sacramento Bee* set off an alarm at the Interior Department several months ago with a series of articles on widespread selenium contamination in the West. The series was prompted by the problems of the Kesterson Wildlife Refuge in the San Joaquin Valley, which has been poisoned by irrigation runoff water (*Science*, 12 July, p. 144).

The newspaper collected mud and algae samples from 23 locations in 9 western states and had them analyzed by a private lab. It publicized the results on 8 September. "Selenium," the *Bee* announced, "the lethal poison that has killed and deformed birds, fish, and other wildlife in the San Joaquin Valley, is poisoning wildlife, livestock, and even some rural families over thousands of square miles. . . ." Wildlife refuges and farm drains in seven states had high concentrations of selenium (above 600 parts per billion, the *Bee*'s definition), enough to "trigger death and deformity in migratory waterfowl, shore birds, fish, frogs, insects, and other marsh-related wildlife." The report placed the blame on irrigation projects built by the Bureau of Reclamation, part of the Interior Department.

Selenium threatens birds in wildlife refuges.

Representative George Miller (D–CA), chairman of the House subcommittee on water and power and a critic of irrigation programs, asked for an investigation. The Deparment of Interior (DOI) complied, and its hastily assembled response came out on 11 December.

The DOI undertook no fieldwork but based its report on existing water, fish, and soil data. It confirmed that high levels of selenium can be found in the areas visited by the *Bee*, but DOI officials do not agree that wildlife or farm animals are being poisoned. Using a more demanding test of significance than the *Bee* (defining a "high" concentration in soil as 1500 ppb), DOI identified nine areas in six states where selenium is of concern. DOI will now investigate further to see whether any damage is being done to wildlife and, if so, whether irrigation runoff is to blame.

The nine high-risk sites identified in the report are:

- Yuma Valley and Imperial National Wildlife Refuge, Arizona
- Salton Sea National Wildlife Refuge, California
- Imperial Valley, California
- Benton Lake National Wildlife Refuge, Montana
- Bowdoin National Wildlife Refuge, Montana
- Fallon and Stillwater National Wildlife Refuge, Nevada
- Poison Canyon, New Mexico
- Angostura, South Dakota, and
- Belle Fourche, South Dakota.

In every case but one, DOI concludes there is no evidence that birds or fish are being killed or losing reproductive capacity because of poisoning by selenium. However, in several places, birds are being killed by what DOI identifies as botulism. The one exception is Carson Lake, south of Fallon, Nevada, which receives agricultral drainage from the Newlands Project. There birds have died from "unknown causes," according to DOI. Selenium may be a factor, since high concentrations of it have been found in bird eggs. High levels of arsenic were found too.

Robert Broadbent, assistant secretary of interior for science and water, released a new management plan to deal with selenium and said that DOI will soon name a program director to take charge of research and cleanup efforts in California. By February, the Department hopes to have an "overall plan" for dealing with selenium in the West. ■ ELIOT MARSHALL

NRC Finds Crisis in Remote Sensing

The U.S. program of civilian remote sensing is in striking disarray, says a new report* from the National Research Council's Space Applications Board. It is marked by a wasteful duplication of spacecraft devoted to land, sea, and atmospheric observations, a splintering of responsibilities among federal agencies, and an arbitrary division of responsibility between the public and private sectors.

The new report, produced at the request of the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA), is one of the few such studies to look at the remote sensing program as a whole, as opposed to just the Landsats or just the weather satellites. It notes that the problems have become especially apparent during the past few years. During that time the civilian weather satellite system, operated by NOAA, has repeatedly been the target of funding cutbacks; the transfer of the Landsat system to a private operator has suffered from long delays and anemic federal support; and the development of civil ocean-sensing satellites has lapsed entirely, after extensive work in the 1970's. (*Science*, 14 December 1984, p. 1289.)

"The situation seems to be one of not-so-benign neglect," say the Research Council panelists. "In the absence of a strong and positive policy in favor of exploiting the values of earth remote sensing, comparatively low-level decisions have eaten away at the national program in response to budget pressures and short-term agency priorities."

In short, concludes the board, "a federal plan [for civilian remote sensing] is urgently needed."

The board found that the key problem was the fragmentation of the remote sensing program, which is split along at least three different axes. (Four axes if one counts the separation between civilian and military remote sensing, which the research council did not address.) First there is the tension between public sector and private sector. A long and acrimonious debate, culminating in the Land Remote Sensing Commercialization Act of 1984, has moved the United States toward two separate operational systems: the Landsats, which observe the solid ground, and which have recently been transferred to a private operator; and the weather satellites, which observe the atmosphere,

**Remote Sensing of the Earth from Space: A Program in Crisis* (National Academy Press, Washington, DC, 1985).