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.

Interior-Sport Fisheries & Wildlife

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,

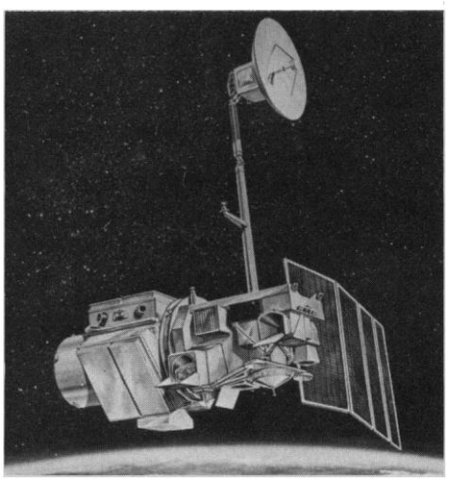
**Remote Sensing of the Earth from Space: A Program in Crisis* (National Academy Press, Washington, DC, 1985).

and which are operated by the federal government.

The panel supports this division in principle—assuming that land remote sensing will indeed be commercially viable—but it strongly recommends that the federal weather satellites be supplemented with a system for sensing the oceans. The law is silent as to who should run such an ocean-sensing system. However, given the close physical coupling between the ocean and weather a unified system seems highly desirable.

Second, the federal agencies themselves are split between research on such things as new sensors, which is supposedly the responsibility of NASA, and satellite operations, which is the responsibility of NOAA. A long and fruitful cooperation between these two agencies was abruptly terminated in 1981, when the Reagan Administration's first budget-cutting effort forced NASA to protect higher priority programs. NOAA, meanwhile, was under budget pressures of its own, and was unable to take up the slack. The research council recommends that the NOAA/NASA relationship be restored.

More fundamentally, however, NOAA has been hampered by its position within the Department of Commerce, where scant attention is paid to satellite services. Indeed, it has often been suggested that NOAA be made an independent agency, or perhaps incorporated into a new department of science or natural resources. Whatever the outcome of that debate, the research council report recommends that the issue be resolved quickly, and that wherever NOAA finally resides, it be given greater budgetary and management flexibility.



Artist's rendition of Landsat.

Finally, remote sensing has been split by an artificial division between land, atmosphere, and ocean programs. The sensors are often similar, and their required orbits are similar; from a purely technical point of view, in fact, the whole thing should be a single program. In particular, substantial cost savings would result if NASA, NOAA, and the private Landsat operator would consolidate sensors on multipurpose spacecraft wherever possible. "Observational and orbital requirements, not institutional or programmatic labels, should determine on what satellite a given sensor is flown," says the panel. NASA's polar orbiting platform, for example, which will be built as part of the agency's space station project, might fly a battery of NOAA's operational atmospheric and ocean sensors along with NASA's own experimental instruments. At the same time, NASA might lease space on the platform to privately owned land sensors. ■ **M. Mitchell Waldrop**

Reye's Data to Be Turned Over to Company

Plough, Inc., the manufacturer of St. Joseph's Aspirin for Children, has obtained through a subpoena a protective order that will allow its scientists to examine the raw data from a government-sponsored study of Reye's syndrome. The company has been sued by the family of a young boy who developed Reye's syndrome and alleged that aspirin caused his illness. To defend itself, Plough says it needs to see data that the government has withheld because it may reveal the identity of individuals who participated in the study (*Science*, 18 October, p. 297).

Most of these data are in the hands of Westat, a consulting company located in Rockville, Maryland, which conducted the study under contract for the Centers for Disease Control, and the rest are held by the CDC. The protective order, issued by the circuit court of Maryland in Montgomery County, attempts to reconcile the government's interest in maintaining the privacy of patients and their families with Plough's interest in scrutinizing the data.

To do this, the court requires that names and any other direct identifiers of study participants be removed from the study documents but stipulates that scientists be allowed to verify, by checking a sample of the records, that only direct identifiers are erased. Yet even if direct identifiers are removed, it still may be possible to determine who participated in the study by means of indirect identifiers, such as the location of the towns where the children with Reye's syndrome lived. The court therefore requires that no one who examines the raw data contact or reveal the identities of any study participants.

Plough and its attorneys are satisfied with the protective order and the company intends to begin its analysis of the CDC study. The protective order "sets a useful precedent for public health studies," says Plough attorney Bryan Jay Yolles of the Washington firm Clifford and Warnke. ■ **Gina Kolata**

Creationism Downed Again in Louisiana

Proponents of a law giving creationism equal time with the teaching of evolution in Louisiana schools received yet another setback in December. In an 8–7 decision, the fifth U.S. Circuit Court of Appeals declined to reexamine a ruling it made against the creationism law in July.

Louisiana Attorney General William Guste plans to take the case to the Supreme Court, because, he says, the arguments for the Louisiana balanced treatment law have not been fully aired in court, unlike a similar law in Arkansas, which was declared unconstitutional in January 1982. The seven-vote dissent represents major support for the law, he says.

Louisiana's law, which was enacted by the legislature in July 1981, has been the subject of numerous legal maneuvers, both by proponents and opponents. At one point, in November 1982, Federal Judge Adrian Duplantier declared that the law violated the state constitution, on the grounds that the Board of Elementary and Secondary Education, not the legislature, was empowered to determine school curricula. Creationists persisted in their support of the law, and even survived an attempt to kill it in the legislature itself in summer 1984: the state senate gave a 21 to 16 thumbs down, but the House rescued the law with a surprising 61 to 26 vote in its favor.

Next was another ruling by Judge Duplantier, this time on the issues. This followed the line of argument that had felled the Arkansas law—that the law essentially promoted selected religious beliefs. Duplantier's decision, of 10 January 1985, was appealed by Guste to the 5th Circuit Court of Appeals and was upheld there by a majority ruling in July. Faced with a failed appeal, Guste tried to persuade the court that the law had not had a fair hearing, a move which elicited the recent 8–7 rebuttal.

The influence of the January 1982 decision by Arkansas's Judge William Overton has been apparent through the long odyssey of the Louisiana law, both for its powerful argument and for the $1.5 million bill for legal expenses with which the legislature found itself stuck. ■ **Roger Lewin**