ENVIRONMENTAL MONITORING

EPA Streamlines Troubled National Ecological Survey

The Environmental Protection Agency (EPA) had big plans for its Ecological Monitoring and Assessment Program (EMAP) when it was launched in 1989. Each year, at thousands of sites throughout the United States, EPA scientists would collect baseline data on everything from the number of amphibians to the health of trees. These data would then be analyzed to see if they reflect broad environmental trends, and the results would feed into EPA's environmental policy-making.

So far, EPA has spent $150 million on EMAP, making it the biggest research project in the agency's history. But big turned out not to be beautiful. This spring, after a series of harsh outside reviews, EPA announced plans to retool the program. The new EMAP, which will be presented to the agency's Science Advisory Board (SAB) this month, will be smaller, with monitoring confined initially to three regional sites instead of spanning the entire country. It will enlist academic researchers to fine-tune existing, and develop new, indicators of environmental change, freeing EPA scientists to monitor those changes. And it will tap into ongoing efforts by other federal agencies to collect similar baseline ecological data. The idea is to salvage a troubled program that everyone agrees is worth saving.

S. MARTIN/LTER

A changing world. The accretion of this salt marsh into a loblolly pine forest along the Virginia coast is part of EPA's revised ecological survey.

"We didn't want to kill this thing, because it is such a good idea," says Richard Fisher, director of Texas A&M's Institute for Renewable Natural Resources and chair of a panel from the National Research Council (NRC) that spent 4 years reviewing the program. "But we didn't want it to fail so miserably that the idea got a bad rap."

The idea behind EMAP is to provide regulators with the necessary information to home in on environmental dangers. For instance, if frogs were dying off nationwide, some global factor—such as ultraviolet radiation—might be to blame. But if frogs were dying off only in one area, the killer might be a local pollutant. "EPA had no way to look at ecological resources on a scale that was consistent among sites or states or regions," says EPA botanist Rick Linthurst, who along with EPA ecologist Jay Messer drew up the original plans for EMAP. The project also appealed to EPA officials as a way to justify regulatory programs by allowing them to quantify their effects on the environment.

But last fall, shortly after taking over as head of EPA's Office of Research and Development, marine ecologist Robert Huggett called a time out. "Bob made no secret of his genuine dislike for EMAP," says an EPA official who requested anonymity. "He had said EMAP was toast when he came in."

A litany of flaws. Huggett wasn't the first scientist to criticize EMAP, which was started in response to a suggestion by the agency's SAB. In November 1990, a panel of outside scientists reporting to the SAB questioned whether EPA had a comprehensive and accurate list of environmental indicators. It also concluded that EMAP officials had "unrealistic expectations" about the data's value in determining the cause of observed trends.

In July 1991, a second SAB panel, on which Huggett served, concluded that EMAP was playing down the uncertainties in assessing environmental conditions around the country and had failed to show how the results would be used by EPA policy-makers. Moreover, it criticized EMAP's methodology and pointed to perceived scientific inaccuracies, arguing, for example, that EMAP's in-house research plan had overstated the value of population levels of a certain kind of shellfish as a measure of a habitat's ability to support all shellfish. Still, the panel concluded that EMAP had the potential to "significantly contribute" to EPA's ecological risk assessment efforts.

The NRC panel, in a string of four reports beginning in 1992, was even more critical. In its report on EMAP's forests and estuaries component, for example, the panel took issue with a key EMAP design standard—the ability to detect a 20% change by the end of a decade. Some changes occur at a much slower rate, the panel noted, adding that "it seems that in some cases EPA personnel have not researched the published literature." In the panel's final report, it concluded that EMAP's sampling program may be operating on too coarse a scale—both geographically and over time—to detect meaningful changes, and that it needed to develop "reliable, scientifically defensible" indicators of change.

The panel also faulted EPA for failing to seek the help of other federal agencies. "This is the toughest thing anybody could think of doing in ecological research," says panel member John Hobbie, director of the ecosystems center at the Woods Hole Marine Biological Laboratory in Massachusetts. "I don't think EPA had the reputation or the structure to do it alone," he says.

Smaller and sharper. The new EMAP will bear little resemblance to the old. Perhaps the biggest change is that much of EMAP's monitoring work will take place in three regions rather than nationwide—the Pacific Northwest, the Everglades, and the mid-Atlantic coastal watershed. Part of the reason is financial: With an expected annual budget for EMAP of $30 million for the foreseeable future, EPA simply can't afford to conduct monitoring nationwide, says Tom Murphy, head of EPA's research laboratory in Corvallis, Oregon, whom Huggett brought in to become acting director of EMAP. The narrower coverage should also make it easier for EPA to spot any problems with the value of its monitoring techniques and choice of indicators.

EPA officials acknowledge that collecting data at three sites won't meet the project's original mission of providing a snapshot of the entire nation's environmental status. "It will take a number of years to build up a phased picture of the ecological health of the whole nation," says ecologist Sidney Draggan, an EMAP administrator, explaining that EMAP will eventually extend to other regions to provide a more complete picture of the nation's ecological status. In the meantime, says Murphy, it's necessary to provide a firm scientific footing for EMAP.

One way for the program to broaden its horizons is by tapping into a network of intensive ecological research sites advocated by the White House's Committee on Environment and Natural Resources (*Science*, 24 February, p. 1083). The backbone of this network will be elements already in place at other agencies, including the National Science Foundation's Long-Term Ecological Research sites, the U.S. Geological Survey's national water quality assessment program, the Forest Service's forest health monitoring program, and the Department of Energy's national energy research program sites.

The third prong of EMAP's new approach will be to shift funding to academic scientists. The main focus of the extramural re-

search, says Draggan, will be to develop better indicators of ecological change or improve current indicators such as crown dieback in forests, species abundance in lakes, or songbird diversity. That's good news, says Fisher: "Some of these things we have thought of as good indicators, such as the nutrient value of tree foliage, have proven to be poor indicators of long-term trends."

Huggett and other EPA officials are still working out the details of the revised program, which they hope SAB will approve for implementation in the fall. In the meantime, other environmental officials think Huggett is the right man for the job. "Bob is very open to the sorts of changes [needed] to make EMAP a much more valuable program," says Robert Watson, associate director for the environment in the White House Office of Science and Technology Policy. And even EMAP's sharpest critics are pulling for it to succeed. "EMAP is a program that in the future we'll be really glad we have," says Fisher.

–Richard Stone

SCIENCE IN CHINA

Leaders Pledge More for Shrinking Pool

BEIJING—China's largest national science conference in 17 years ended here last week with senior officials vowing to triple within 5 years the slice of the economic pie spent on research but, in the meantime, support fewer scientists. The apparent contradiction reflects tensions between policies that emphasize the importance of science and technology to a growing economy and those aimed at weaning scientists from a guaranteed source of public funds.

Virtually all of China's top-ranking leaders, including President Jiang Zemin and Prime Minister Li Peng, attended the 5-day National Science and Technology Conference, which ended on 30 May. The conference, which received extensive coverage in government-run media outlets, was organized jointly by the government and the Communist Party, and many of the speeches were devoted to ideological theorizing.

Buried in the oft-repeated rhetoric about science as "the primary productive force of a socialist economy," however, were several concrete proposals. The most welcome was a pledge to triple overall R&D funding to 1.5% of the gross domestic product (GDP) by the year 2000. Science's share of GDP has remained flat for the past decade.

China's top science official, State Science and Technology Commission Chair Song Jian, promised to put more money into new research centers, upgrade scientific equipment, and improve working conditions for researchers. The government spent $275 million last year on research, a 13% increase over 1993, after an increase of less than 1% in real terms in the previous year.

One detail that has raised eyebrows is Song's promise that the government will maintain "a first-class contingent of 100,000 scientists and researchers." Song said this figure represents about 10% of the country's R&D work force, and that "it is quite proper for China to maintain a research contingent [of that size] during the next decade for major fields of basic and high-tech research." However, as recently as last year, Chinese policymakers said they planned to continue funding one in three scientists now on the government payroll, in particular those doing long-term, fundamental research. The remaining two thirds are expected to pursue applied research with funding from outside sources.

A Beijing biologist who attended the conference said Song's remarks appear to mark a retreat from the earlier goal. At the same time, the scientist noted that the number of basic researchers at government-run institutes has been declining steadily as a result of budget cuts. Others have estimated that less than 10% of the staff at some research institutes is engaged in productive science.

Chinese researchers have nevertheless welcomed the kind words offered at the conference, saying that such high-level expression of concern for science is useful in its own right. But they remain skeptical that the lofty commitments will be met, especially as the rhetoric was not accompanied by any specific spending proposals.

–Ted Plafker

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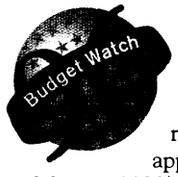
U.S. CONGRESS

Gingrich Urges Panels to Spare Science



On 23 May, shortly after the House passed a budget resolution that would reduce government support for basic research and slash spending on applied science (*Science*, 26 May, p. 1120), House Speaker Newt Gingrich (R–GA) privately delivered a surprising message to a handful of key legislators: Don't pull the purse strings too tight on federal research programs. Gingrich, along with House Science Committee Chair Robert Walker (R–PA), met with the heads of the five House Appropriations subcommittees that oversee most civilian science programs to urge them not to sacrifice science to pay for other programs.

The appropriations subcommittees will be the prime focus of the budget battles over the next several weeks as they set funding for each agency within a shrinking federal budget. Gingrich's unusual intervention is being interpreted as an effort to ensure that basic research gets a high priority in the committees' deliberations; some participants in the meeting are even interpreting it as a signal that appropriators should treat research more favorably than it was treated in the budget resolution, which is not binding on appropriators.

"Gingrich was concerned there was the mistaken impression that science was not a priority, and that it was okay to go ahead and cut it," says an aide to Walker, who was instrumental in formulating the science portion of the budget resolution and helped to arrange the meeting. Other staffers said Gingrich was upset with press reports that the cuts proposed in the House budget resolution would hit science hard, and he did not want the Republican party to be accused of devaluing research.

But some appropriators say Gingrich had more than spin control in mind. "The speaker did not criticize the budgeteers per se, but he did clearly imply that his relative priorities are different from those of the Budget Committee," says Representative Jerry Lewis (R–CA), who chairs the panel that oversees space and environmental programs and the National Science Foundation. Gingrich did not go into program specifics, Lewis told *Science*, but "he wants us to do what we can to see they stay healthy."

The speaker also made his case to John Myers (R–IN), who oversees energy efforts; John Porter (R–IL), an advocate of the biomedical programs under his purview; Ralph Regula (R–OH), who oversees the Interior Department; and Harold Rogers (R–KY), whose panel includes the Commerce Department. Regula is particularly angry about proposed cuts to clean-coal technology research.

Although the legislators made no promises, Lewis says Gingrich's point was clear. "The speaker's concerns about science funding are very well taken," he said, adding that the budget resolution is "a very helpful document, not a list of things I have to do." Adds one Republican aide: "We're trying to make it clear that science is important to us, and now [the committee chairs] understand the speaker is involved."

–Andrew Lawler