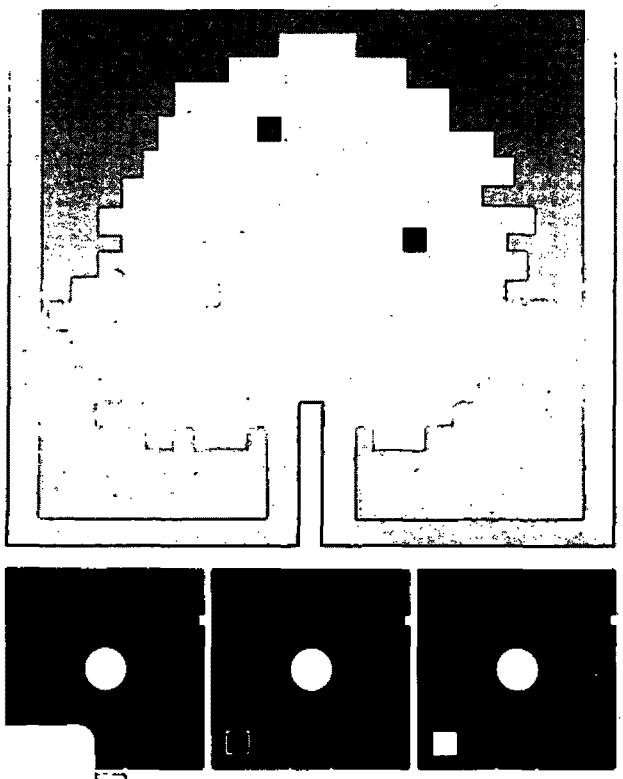
NATIONAL ENVIRONMENTAL INFORMATION CONFERENCE

BUILDING ENVIRONMENTAL PARTNERSHIPS THROUGH INFORMATION SHARING



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Preface and Acknowledgements

We have witnessed two significant trends in the twenty years since the first Earth Day: increasing awareness of the importance of protecting, restoring, and preventing damage to our environmental resources; and an explosion of data about environmental conditions and our efforts to control pollution. These two trends converged recently at the 1989 National Environmental Information Conference in Kansas City. Participants from throughout the environmental community came to share their insights and perspectives on how to use information more effectively in meeting the environmental management challenges of the 1990s and beyond. These proceedings and the accompanying videotape provide an overview of the many diverse topics and ideas discussed during the three days, and highlight the conference's major themes and messages.

We want to express our appreciation to everyone who contributed to the success of this landmark forum for multi-agency interaction on these very important issues. In particular, we want to recognize the energetic efforts of the following people:

Conference Director: Gene A. Ramsey, *Chief, Program Integration Branch, EPA Region VII*

Conference Program Committee: Ernie Arnold, Katie Biggs, Paul Brands, Mark Hague, Diane Hershberger, Chris Hess, Marian Hess, Dominique Lueckenhoff, Mary Melton, Rowena Michaels, Alvin Pesachowitz, Delores Platt, William Rice, Cindy Sayers, Carol Smith, and Dan Vallero.

Conference Support Team (EPA Region VII): Margaret Allee, Cecil Bailey, Regina Bates, Shannon Campbell, Janet Carlet, Mary Carter, Richard DeVoe, Walt Foster, Gary Goodnow, Vickie Hale, Ray Hurley, Debbie Kring, Lynn Kring, Kathy Montalte, Dale Parke, Elaine Pries, Michael Thomas, Les Vahsholtz, Jeff Wandtke, and Aaron Zimmerman.

We also commend the four States of Region VII for their ongoing cooperation in information management and many other environmental initiatives. We especially note the conference-related efforts of Darrell McAllister from Iowa; Jim Green and Lorne Phillips from Kansas; Mark Day, Stan Nessing, Jim Williams, and John Young from Missouri; and Dennis Burling from Nebraska.

Susan C. Gordon
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Opening Remarks

Countdown ... Ignition ... Lift-Off!

Susan C. Gordon

Assistant Regional Administrator for Policy and Management, U.S. Environmental Protection Agency, Region VII

"For the past several years, EPA and many States have taken initial steps to solidify a State/EPA information sharing partnership....This conference reflects the Agency's continuing commitment to the State/EPA partnership and recognizes the need to expand that partnership throughout the environmental community."

Edward J. Hanley

Deputy Assistant Administrator for Administration and Resources Management, U.S. Environmental Protection Agency

"This conference will help to broaden our perspective on using information to make decisions, to view information in terms of how we might prevent environmental disasters and pollution—in short, how we assess our progress, communicate it to the public, and manage for the greatest environmental benefit."

Morris Kay

Regional Administrator
U.S. Environmental Protection Agency, Region VII

"We've become very good at developing the technology for cleaning up our environment. You, and thousands of others just like you who are not in attendance, have made great strides toward improving the environment..... After the next few days at this conference, we will be able to form the partnerships for information management that will enable us to concentrate not just on cleaning up the environment but also on using information to prevent pollution."

Charles L. Grizzle

Assistant Administrator for Administration and Resources Management, U.S. Environmental Protection Agency

"We are poised to take advantage of opportunities to work together, forging newer and better and stronger partnerships with States, communities, our sister Federal agencies, and the private sector. This conference can be a booster rocket for us, putting the thrust behind this initiative that we now need to take advantage of the opportunities before us."

Photo: Courtesy of NASA.

Major Themes and

William Reilly, Administrator, EPA: "Nothing is more important to our integrity in environmental protection than a reputation for dealing in facts, for respecting sound science and sound information."

Hank Habicht, Deputy Administrator, EPA: "If we really want to make environmental protection a national enterprise, an international enterprise . . . . we have to build a foundation of information, and the time is now."

Dennis Kelso, Commissioner, Alaska Department of Environmental Conservation: "[After the Exxon spill] each shoreline segment was mapped. The data were exchanged with other agencies as well, including NOAA and the Coast Guard. Even though different systems were being used, we made those data move around."

Dallas Peck, Director, USGS: "This conference provides a good opportunity to expand existing inter-agency relationships to create the information acquisition and data sharing systems that will be needed to meet the environmental challenges of the 21st Century and beyond."

The 1989 National Environmental Information Conference was an unprecedented gathering of over 750 environmental and data management professionals to exchange ideas and experiences on the general topic: "Building Environmental Partnerships Through Information Sharing." EPA's primary objective in sponsoring the conference was to demonstrate and strengthen the Agency's commitment to the State/EPA partnership in managing the environment and to recognize formally the need to expand this partnership throughout the environmental community.

The attendees formed a broad cross-section of that community (see the Appendix). All EPA Regional Offices and Headquarters program offices were represented, as were each of the 50 States, the District of Columbia, Puerto Rico, Guam, American Samoa, and ten Native American tribes. Representatives also came from numerous other Federal agencies, eight foreign countries, and several private interest groups, foundations, and institutes. The conference participants talked, listened, and learned during three days of speeches, panel presentations, EPA/State meetings, system demonstrations, and informal discussions.

As this diverse group arrived in Kansas City for the opening of the conference, the eyes of the world were trained on an historic event taking place halfway around the globe—the dismantling of the Berlin Wall. The monumental developments in East Germany and throughout Eastern Europe in recent months illustrate the power of two concepts that have come to embody the world's hopes for a reduction in Cold War tensions: perestroika, or restructuring, and glasnost, or openness. In a small way, these complementary themes are apt metaphors for the underlying spirit and message of the conference.

The perestroika theme was reflected in the sense of excitement and urgency felt throughout the conference, fueled by the addresses of EPA's Administrator and Deputy Administrator, that we are entering a new era in environmental management—an era characterized by greater concern with global problems and increasing emphasis on prevention and protection in addition to regulatory restrictions and enforcement. This broader strategic vision will require some restructuring in the manner in which EPA and State agencies go about their business. The restructuring will extend to the ways that government agencies collect, manage, and use information to support the risk-based, results-oriented decisions of the future. In the words of EPA Deputy Administrator Hank Habicht, "Data is in essence the glue that will hold us together and allow us to move into a forward-looking and strategic phase of environmental protection."

The second theme—glasnost—could be heard in some fashion in virtually every speech, presentation, and breakout session. Using information and electronic technology effectively to support environmental decisionmaking requires openness within and between the disparate organizations involved. Barriers to the free exchange of data and experience among program offices and among agencies must be removed or circumvented. Insularity, suspicion, and rigid bureaucracy will defeat rather than protect the best interests of environmental managers and the public they serve. With its emphasis on partnership, the State/EPA Data Management Program is one of many efforts that will be needed to promote the openness and cooperation necessary for effective trans-agency responses to environmental challenges.

Messages of the Conference

Within the two overarching themes of restructuring and openness, several other points emerged as basic messages of the conference. These subthemes define broad areas where specific initiatives and individual actions are now needed to capitalize on the spirit and energy of the 1989 National Environmental Information Conference.

• **The data available to decisionmakers must be as timely, accurate, and complete as possible.** Al Pesachowitz, new Director of EPA's Office of Information Resources Management (OIRM), told conference attendees that while considerable gains have been made in the last two years, the State/EPA program will continue to press for improvement in this fundamental area.

• **There is a great need for information about the data and the systems available to decisionmakers.** Variants of this point were heard repeatedly throughout the conference. Managers at all levels of government cannot use external information in their decisions unless they know where they can find the kind of data they need and how their technical staff can obtain it for them.

• **To promote use of its data by States and others, EPA should make its systems easier to access and to use.** In the Region/State breakout meetings, for example, several States called for EPA to reduce the number of different data transfer protocols used with its systems. State staff also require additional training to make them more effective users of EPA systems.

• **EPA and the States must work together to develop practical information tools that bridge the separate environmental programs, supporting cross-media analysis and decisionmaking.** Accurate and standardized facility location data is a vital requirement for this interlinkage. Geographic Information Systems (GIS) are proving very effective at facilitating cross-media analysis and communicating the facts and conclusions to top decisionmakers and the public. EPA, other Federal agencies, and many States all are making notable progress in using GIS technology for decision support, although questions of expense, data quality, and organizational barriers still abound.

• **Government agencies should consider themselves stewards of publicly owned data and, whenever practical, should provide direct public access to the data.** Former EPA OIRM Director, Ed Hanley, set the tone for this stewardship theme in his address, and it was elaborated by a panel session devoted to the idea of "recycling" environmental information by making it available to other potential users, including the public.

This unique assemblage of environmental and information professionals left Kansas City with a disposition toward action. All ten of EPA's Regional Offices soon will have permanent State/EPA IRM workgroups—providing regular forums for continued communication and cooperation on data management issues. Each Region/State breakout session at the conference enumerated specific action items (summarized beginning on page 16). In his closing remarks, Charles Grizzle, EPA's Assistant Administrator responsible for IRM activities, pledged the Agency's continued commitment to the State/EPA partnership and to other cooperative efforts needed to strengthen the vital role of information in restoring and protecting the environment.

Al Pesachowitz, Director, OIRM, EPA: "The [Phase I] foundation of data timeliness, quality, and completeness must be strong as we move ahead with data integration."

Mark Coleman, Deputy Commissioner, Oklahoma Health Department: "I want to be able to push a very small number of buttons to get the information that I need in order to manage."

Jack Dangermond, President, ESRI: "You, as professionals, will lay the footprints for how the [GIS] methodologies will be established and effectively employed in the next decade, the next century. In other words, we're about to go into an adventure, you and I, to discover how we can use information effectively in policy-making."

Ed Hanley, Deputy Assistant Administrator, OARM, EPA: "We are just the stewards of the data. It's really public data, owned by the people, paid for with tax dollars."

The Role of Data in Reducing Environmental Risk

The Honorable William K. Reilly

Administrator
U.S. Environmental Protection Agency

"Nothing is more important to our integrity in environmental protection than a reputation for dealing in facts, for respecting sound science and sound information."

At a plenary luncheon, the EPA Administrator told the audience that he has "enormous respect for the discussions taking place" at the conference and that he "fully intends to use the products" of their work. "All we really have is information," he said in emphasizing the importance to EPA of basing its policy decisions on good data. "Above all, we must know what we're doing. Nothing is more important to our integrity in environmental protection than a reputation for dealing in facts, for respecting sound science and sound information."

"We need to rationalize the collection, storage, and retrieval of data and make the data more useful to decisionmakers."

Reilly recently returned from The Netherlands, where he headed the U. S. delegation to the Ministerial Conference on Global Climate. He used this experience to illustrate the challenges the international community faces in obtaining the information needed to support difficult policy decisions. He contrasted the global climate conference with an earlier international meeting on stratospheric ozone held in London. At the ozone conference, scientists from all over the world presented their conclusions on the role of chlorofluorocarbons (CFCs) in depleting the planet's ozone layer—conclusions based on careful analysis of CFCs, their behavior, and their effects. Reilly noted that this scientific consensus, backed by reliable data, made it easier for wary countries to be receptive to the need for action to phase out use of CFCs and products containing them.

"To build the worldwide consensus that's needed to take effective action, we will need sound information, data carefully derived, and cooperation with others whose function it is to collect information."

The recent conference on global climate change was a very different matter, the Administrator said. For example, the relative lack of scientific information on carbon dioxide buildup and its climatic consequences (e.g., regional variations) makes it very difficult for policymakers all over the world to understand how to act. Though many countries at The Netherlands meeting were prepared to accept a proposed goal of stabilizing carbon dioxide emissions by the year 2000, some of them had very little idea of the consequences of their decision for their national economies or the specific steps they will take to achieve the goal. All parties recognize the need to develop much more information on this and other factors in global climate change, Reilly said.

To highlight the growing international recognition of environmental problems, the Administrator reported a statement made to him recently by West German Chancellor Helmut Kohl. "One does not have to be a 'Green' to understand and know it is time to act," Kohl said. "Environmental protection is increasingly a matter of morality." In order to build the worldwide consensus needed to take effective action, Administrator Reilly said, "we will need sound information, data carefully derived, and cooperation with others whose function it is to collect information."

Featured Speaker

Using Information for Global Scale Emergencies

Dennis Kelso

Commissioner
Alaska Department of Environmental Conservation

Alaska's top environmental protection official emphasized the vital role that computers have played in the cleanup of the *Exxon Valdez* spill. He described four microcomputer data base systems that Alaska developed to aid in its response efforts: 1) an inventory of oil spill surveys which characterized oil geographic coverage, thickness and composition, and impact on wildlife; 2) a system to monitor, map, and communicate to field teams and logistic managers the progress of shoreline cleanups; 3) a scientific data base to manage information on oil samples and facilitate the use of this data in modeling fate and transport; and 4) a system containing litigation data, such as chain-of-custody information, on data collected as potential evidence in future enforcement actions.

Drawing on Alaska's recent experience, Kelso suggested other ways to make future spill responses more effective:

- ***Prevention is essential.*** A major spill has a catastrophic impact, regardless of plans and preparation. We must do everything in our power to ensure that equipment and procedures are in place to minimize the chances of a major spill occurring in the first place.

- ***Spillers should not be in charge of spill response.*** Kelso argued strongly for Federal and State control of cleanup efforts. The government organizations, and not private industry, should decide what will be done, where, and for how long. While Federal assistance is important, a strong role for State and local agencies also is vital, given their knowledge of the affected area and their inherent interest in ensuring a thorough cleanup.

- ***Avoid limits on industry liability for oil spills.*** Without limitations on liability, industry is continually motivated to reduce the probability of a spill and to ensure that plans are in place to minimize the environmental impact should a spill occur.

- ***Create a shared data base of cleanup resources.*** An international data base of information about the types, numbers, condition, location, and availability of cleanup technology is needed that industry, States, and local governments can access for immediate retrieval. Kelso related Alaska's frustrations at witnessing Exxon's inability to locate cleanup equipment in a timely manner and the resulting deleterious effect on cleanup efforts.

- ***Establish an R&D cleanup program.*** An on-the-job research program is not adequate. Improved techniques offer major returns, but a continuing, focused research program is required.

"[Using a geographic information system] we mapped the spill during the early going almost every hour, and that meant that not only could we predict the next phase and tailor our actions accordingly, but we could make this information available on a real-time basis so that our field staff could actually use it."

"Each shoreline segment was mapped. The data were exchanged with other agencies as well, including NOAA and the Coast Guard. Even though different systems were being used [by these agencies], we made those data move around."

"Industry didn't know where the response equipment was. We need to change that. We need to have a shared core of information that is available to the Federal Government, to the State Government, and of course to industry as well."

Innovative Uses of Information

Donnelly: "[Scientific visualization systems] convey complex concepts in a form that can be understood by those with little training in the earth sciences....They've proven to be effective tools for presenting information to decisionmakers."

"Geographic Information Systems and Scientific Visualization Systems: Instruments for Decisionmaking"

Jay Donnelly, *Chief, Technology Transfer Section, Office of Geographic and Cartographic Research, U. S. Geological Survey, Reston, Virginia*

USGS has successfully applied geographic information systems to support environmental decisionmaking. Two examples: an assessment with the U. S. Forest Service of the environmental impact of a proposed open pit mine in Arizona; and an earthquake risk assessment in the Wasatch Region of Utah to support local land use decisions and formulation of structural design policies. The complementary technology of "scientific visualization systems" is potentially applicable in many less dramatic ways than its one notable use by USGS to date: analysis of data on Soviet underground nuclear testing.

"The 'People Role' in Building Land Information Systems"

Brian Bernard, *Deputy Service Center Director for Resources Management, Bureau of Land Management Service Center, Denver, Colorado*

The Bureau of Land Management (BLM) is developing a complex Land Information System (LIS) using GIS technology. BLM has already used the system to integrate data for decisionmaking and planning, for example in helping the U. S. Forest Service perform "what-if" analyses for forest management. BLM intends LIS to provide a standard base of digitized spatial data for use throughout the Federal Government and by State and local agencies, industry, and the general public. They have found that at least 80% of the effort required to succeed has to do with identifying and meeting the needs of the people who will use the system and not with the technical capabilities of the GIS hardware and software itself.

Bernard: "The most important thing [in GIS development] is having the people understand the relationship of their data to their business. That's the step that's most often skipped."

Mace: "By 1991, this technology will be available 24 hours a day, and I think it will be a tremendous benefit to those of us who have to make our way around in the natural environment and know exactly where we are."

"Global Positioning System"

Dr. Thomas H. Mace, *Chief, Remote and Air Monitoring Branch, EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada*

The global positioning system (GPS) is a rapidly-emerging technology that can be used to obtain highly accurate, three-dimensional location coordinates for environmental management purposes, such as generating exact positions for facilities or resource boundaries. Using a constellation of satellites, the GPS can calculate the precise location of a vehicle-based or hand-held signal receiver. Costs for a hand-held signal receiver average $20,000. EPA's EMSL-Las Vegas laboratory has used GPS in a joint project with USGS to produce control data for investigations using digitized photographs from the Old Southington (CT) Landfill Superfund site.

in Environmental Management

"Chesapeake Bay GIS Project"

Alvin R. Morris, *Director, Water Management Division, EPA Region III*

The Chesapeake Bay Program is a coordinated State/Federal program to restore and protect the living resources of Chesapeake Bay, the country's largest estuarine system. Under a sampling program started in 1985, water quality is monitored regularly at 50 stations on the "mainstream" of the bay and at about 100 tributary locations. This monitoring data has been interpolated to provide estimates of conditions at more than 60,000 points in the system.

The Chesapeake Bay Program has developed a geographic information system to produce visual representations of this data, making it easier to determine which pollution problems are most severe in which areas and during which months. Land use data is being added to the system to support decisions on priorities for action and on future economic development in the region.

"My experience indicates that the information gained from our monitoring programs is too costly not to use well," Al Morris said. "There is more analytical power available today than at any time in history. It is relatively cheap, fast to use, and it can be very informative. The use of GIS technology has the capability of aggregating vast amounts of information and transforming it into pictorial information which you can wrap your mind around. You can see what's going on in ways you can't see in any other fashion, and I think it's more easily understood visually than in large tables of data."

As a final thought, Morris urged everyone involved in ambient monitoring to attach locational information to every piece of field data collected. "Even if you're not using GIS now," he pointed out, "you're laying the base for future users."

Morris: "In times of scarce resources, GIS is fast becoming the best tool we have for isolating environmental problems, for wisely choosing program priorities, and for seeing the results of management efforts which we've undertaken—seeing if in fact we're getting what we think we're paying for."

Mullane: "This project can serve as an example of how to gather information, help you format that information, and provide some direction in making the decisions we have to make in terms of environmental quality."

"Oregon Water Priority-Setting Project"

Neil Mullane, *Manager, Planning and Monitoring Section, Water Quality Division, Oregon Department of Environmental Quality*

The Oregon Department of Environmental Quality has created a Geographic Information System to aid in prioritizing water bodies in the preparation of a State Clean Water Strategy. Water bodies were first ranked according to a complex set of criteria by means of a model that used existing data to assign a score to each one. The GIS was then used to display visually the results of this prioritization. The State was able to identify water bodies with agricultural land use and has gone on to establish cooperative agreements with Federal and State agricultural agencies for action on the highest-priority streams and lakes. DEQ expects to expand the GIS to include much additional information, including data on wetlands, groundwater, and natural resources.

Innovative Uses of Information

"Beyond Compliance Data: Information for Environmental Enforcement Decisionmaking"

Gary Young, *Director, Laboratory Services Division, EPA National Enforcement Investigations Center, Denver, Colorado*

NEIC has developed automated tools for integrated compliance analysis. One system extracts data from CDS, PCS, HWDMS, FINDS, and a Dun & Bradstreet data base to prepare a multi-media noncompliance profile of a specified facility. Another tool produces a multi-regional listing of facilities out of compliance in any environmental medium. The SARA, Title III Targeting System (SATTS) identifies potential nonreporters. Corporate compliance profiles are aided by automated extractions from several EPA systems, though the information must be integrated manually at this time.

Young: "In the last couple of years, ever since some of these State/EPA efforts began..., we've noticed a considerable improvement in the quality of the data we've had to access in the national systems."

Setser: "It takes a long time. To create a better data management system does not happen in six months, or a year, or two years. It's a long-term project that requires relentless commitment and a lot of character and fortitude. And you'll go through disappointments and you'll go through successes. But you've got to hang in there."

"A Cross-Media Facility, Permit, and Compliance Tracking System"

Jim Setser, *Chief, Program Coordination Branch, Environmental Protection Division, Georgia Department of Natural Resources*

Georgia's Integrated Information Management System (IIMS) is an early and successful example of how data gathered by separate programs for widely disparate uses can be integrated electronically to support cross-media analysis and decisionmaking. Georgia's approach, begun in 1985 as the national pilot project for the State/EPA Data Management Program, has been to avoid creating a single large integrated data base and instead develop tools for extracting and manipulating small amounts of data from existing systems. To date, the State has developed three such software tools linked to EPA's national data systems:

- A central facility file, which cross-references the identification numbers of all facilities under regulatory obligation in the State, and which makes the other two tools possible;
- A multi-media permit tracking and reporting system; and
- An integrated compliance/enforcement management reporting system.

Georgia uses its data integration tools to extract data from and send updates to PCS, AIRS, HWDMS, and FINDS. Reports from IIMS are used routinely by program managers and by the State agency's top management.

Noting that "resistance is a reality," Jim Setser focused much of his presentation on the procedural and organizational issues associated with a project of this kind. He cited commitment of the agency's top manager as the most important thing for a State data staff to have before trying to "sell" a systems integration project within its organization.

in Environmental Management (Continued)

"Computer-Aided Management of Emergency Operations—CAMEO II"

Robert C. Horn, *Battalion Chief, Kansas City, Kansas Fire Department*

CAMEO II is a Macintosh-based decision support system for firefighters and other first responders to a chemical accident. The system, developed by NOAA and the Seattle Fire Department, contains information on more than 3,500 chemicals and has many other features useful in an emergency response setting, including MSDS data and floorplans for handlers of hazardous materials in the responder's jurisdiction. CAMEO is designed to be carried to the site in a response vehicle for immediate access as the incident unfolds. The Kansas City, Kansas Fire Department selected CAMEO after an intensive search for a portable, easy-to-use information system.

Horn: "We went to the industrial community and said, 'Help us help you.' Within three months, we had all the money and equipment we needed to put this system into being."

"EVA—Environmental Assessment: Assessing Impacts on Training Grounds"

Danita Hardy, *Environmental Protection Specialist, U. S. Army Garrison, Fort Huachuca, Arizona*

The U. S. Army is developing a PC-based expert system called Environmental Assessment (EVA) to aid in gauging the environmental impacts and trade-offs of planned training activities at Fort Huachuca, Arizona. Officers organizing large-scale training exercises can use the system to identify the potential environmental issues associated with a proposed area on the military reservation. Natural resource information for EVA was provided by Federal and State biologists, foresters, soil scientists, and archaeologists. The system now contains 120 decision rules, and additional rules dealing with hazardous materials are being added.

Hardy: "It has really increased the communication between our [training planners] and environmental personnel."

"Artificial Intelligence/Expert Systems Advances in Hazardous Waste Management"

Daniel Greathouse, *Operations Research Analyst, EPA Risk Reduction Engineering Laboratory, Cincinnati, Ohio*

EPA's Risk Reduction Engineering Laboratory has developed operational versions of five RCRA-oriented expert systems initially created to evaluate the potential of this technology for decision support. The PC-based systems now nearing completion are the Flexible Membrane Liner Review System, the Waste Analysis Plan Review System, and three closure evaluation systems. RREL will now begin a five-year initiative to develop expert system tools for the Superfund program, including a contract modification request evaluation system and a remedial technology screening system.

Greathouse: "To be successful, we have to have input from the people for whom these systems are targeted."

Featured Speaker

Information Sharing and Environmental Protection

Edward J. Hanley

Deputy Assistant Administrator for Administration and Resources Management U.S. Environmental Protection Agency

"Information is going to be the key to leveraging the scarce resources we have."

"We are just the stewards of the data. It's really public data, owned by the people, paid for with tax dollars."

"Personally, I find the notion of stewardship a lot more exciting and energizing than ownership."

The former EPA IRM Director and initiator of the State/EPA Data Management Program began by remarking on how far EPA has come in the last few years in this arena. He recalled the first conference of this kind just three years ago, at which no State agencies were present because none were invited. "We didn't know where our data came from," he said wryly. He then announced that all 50 States were represented at this year's gathering.

Hanley then turned to the concept of data stewardship and it relationship to data ownership. When EPA first began looking at data sharing issues, he remembered, "we talked a lot about ownership. If people could be made to accept ownership of a system and its data, then they would also accept responsibility for making the data good and making the system work right." Today, though, changes in EPA's fundamental approach to environmental protection require a new attitude toward data. "We have to mobilize the public, the Government, and industry to find new ways of doing business," Hanley said. "We need to find ways to get things done that we no longer can do through direct intervention, through regulation. Information is going to be the key to leveraging the scarce resources we have."

He suggested that this challenge for EPA and the States requires a shift in information management philosophy from data ownership to data stewardship. To leverage resources most effectively, he said, environmental agencies have to provide accurate data to the public and to industry on the nature of environmental problems and threats and the effects of efforts to meet them. Federal, State, and local government agencies must recognize that the data they gather does not belong only to them, he noted.

"We are just the stewards of the data. It's really public data, owned by the people, paid for with tax dollars," Hanley stressed. "The information we collect describes matters of vital concern to our whole society. The public has a right to expect us to use that data wisely—to share it, reuse it when possible, and to provide public access to it. It may turn out that our experience with sharing data within the environmental community in the last few years may be just practice for the job of sharing data with the public."

Hanley urged the audience to keep the idea of data stewardship in mind as they move ahead with the State/EPA Data Management Program and other information management initiatives. "Personally," he said, "I find the notion of stewardship a lot more exciting and energizing than ownership."

Featured Speaker

State/EPA Data Management Initiative—Future Directions

Alvin M. Pesachowitz

Director, Office of Information Resources Management
U.S. Environmental Protection Agency

The new Director of the Office of Information Resources Management noted how far the State/EPA Data Management Program has progressed from its early days as a pilot project involving just one State and one Regional Office. By the end of fiscal 1990, he said, all but one State will be connected to EPA's telecommunications network and will have high-speed access to the Agency's mainframe computers.

Pesachowitz outlined several other Phase I achievements of the Program at both the State and Regional levels, but he announced that a priority for his office will be to revisit Phase I "to see how well we have achieved its overall goal of timeliness, completeness, and accuracy of the shared data." He stated that "we need to find out what barriers still exist and what incentives we can provide to truly achieve this goal. The foundation must be strong as we move ahead with data integration."

Pesachowitz then reviewed progress in Phase II—Data Integration. He highlighted the fact that by the end of fiscal 1990 all EPA Regional Offices will have a geographic information system capability. Several Regions have already completed important analyses using this technology. In addition, two Centers of Excellence have been established—one in Las Vegas and one in Atlanta—to provide technical assistance with GIS and to promote technology transfer. He emphasized, though, that the data integration efforts of the Program will focus not only on GIS but also on a variety of non-graphical data integration approaches such as systems for cross-media reporting on permitting, compliance, and enforcement at a single facility.

Two additional steps will help push the State/EPA Data Management Program forward in 1990, Pesachowitz said. The first will be the dissemination of three policies and standards that are crucial in facilitating data integration: a Location Data Policy, a Data Sharing Policy, and a Facilities Identification Data Standard. He stressed that these policies, all to be published in final form in 1990, will help establish and maintain the infrastructure necessary to move the Program ahead. A second major goal for the near future will be to enhance the Regional Office infrastructure that is now in place to support the national Program.

The new IRM Director closed with a nod to his predecessor, acknowledging that Ed Hanley "provided the vision and leadership that introduced and developed this successful program. I look forward to providing continued leadership," he said, "with the help and support of the conference attendees."

"The Agency and I are committed to a long-term partnership with the States, the local communities, with the other Federal agencies, and with the world community to keep this important data sharing program going."

"The [Phase I] foundation of data timeliness, quality, and completeness must be strong as we move ahead with data integration."

"We at EPA and in my office hope to help expand and facilitate the GIS effort by developing standards and guidelines and policies that lend support to this area."

Looking Forward— Environmental Information Management

LaJuana S. Wilcher, *Assistant Administrator for Water, U.S. Environmental Protection Agency*
Fred Hansen, *Director, Oregon Department of Environmental Quality*
Mark Coleman, *Deputy Commissioner for Environmental Health Services, Oklahoma Department of Health*
Jim J. Scherer, *Regional Administrator, U.S. Environmental Protection Agency Region VIII*

Hansen: "What we are talking about here, I think, is a process of enrollment—enrollment of all the people here and our counterparts in other parts of the nation, to say "these are important concepts, these are important strategic directions."

Coleman: "We must find ways to share not just concepts but software and hardware and to do things more economically."

Scherer: "The negativism that the general public has today, I think, is well-founded in the fact that we [regulators] can't agree on anything. We must get some agreement among ourselves, and we're not going to get that agreement unless we're sharing our data together."

Moderator LaJuana Wilcher noted that since her recent appointment as Assistant Administrator for Water she has already seen evidence of many advances in managing water-related information, including GIS pilot projects in four Regional Offices and several cross-program cooperative efforts within the Office of Water. These are hopeful signs, she said, and form a portion of the backdrop for this panel's discussion of future directions in environmental information from the senior manager's perspective.

Fred Hansen called for a "new strategic vision" in the environmental field—a recognition by all environmental regulators that their job is not just to manage pollution but also to protect environmental quality. "We must see ourselves as environmentalists," he said. And in this role, environmental agencies at all levels of government have the responsibility to define a clear vision of where they are going and what information they need to get there. In Hansen's view, everyone's version of this vision should recognize the need for several things: more information on the ambient quality of the environment; more resources devoted to prevention rather than compliance; greater public participation in environmental decisions; a cross-media and multi-state approach to enforcement; better integration of data on air, water, and waste conditions and trends; and relative risk assessments for use in decisionmaking and public education.

To fulfill a strategic vision like this, Hansen said, we must do three things: 1) develop a consistent management methodology for all environmental programs, so everyone—Federal and State—is reading from the same script; 2) develop information tools which direct efforts toward environmental care and protection in addition to regulation, enforcement, and cleanup; and 3) establish and maintain cooperative programs among all levels of government.

Mark Coleman pointed out that, despite recent progress, most organizations are still better at gathering data than they are at using it. He offered some ingredients for better use of data to support environmental management activities at both the Federal and the State level: 1) complete the basics—the single-medium data sets have to be complete and accurate before you can integrate across media; 2) keep it simple—managers often need only high-level summary information on a facility's status and history; 3) create "a mechanism for information sharing about information sharing"—a central source of information on environmental data systems and applications around the country; and 4) share software and hardware in addition to data and concepts when resource constraints make this desirable.

Jim Scherer pointed out three important requirements for strengthening the State/EPA partnership and improving the use of environmental information in decision-making: 1) EPA should make concerted efforts to inform managers in State agencies about the importance of sharing timely and complete data with EPA; 2) EPA must be willing to share information with States, as Region VIII has done to great mutual advantage with Colorado regarding the Rocky Flats site; and 3) decisionmakers at all levels of government must be trained in what information resources are available to them and how to ask their staffs for the specific information they need.

Multi-Federal Agency Panel

Broadening Our Approach to Environmental Management Beyond Agency/Department Boundaries

Charles L. Grizzle, *Assistant Administrator for Administration and Resources Management, U. S. Environmental Protection Agency*
Dallas Peck, *Director, U. S. Geological Survey*
James Brennan, *Deputy General Counsel, National Oceanic and Atmospheric Administration*
Nancy B. Firestone, *Deputy Director, Environmental Enforcement Division, U. S. Department of Justice (on detail as Special Counsel to the Deputy Administrator, U.S. Environmental Protection Agency)*
Ralph Morgenweck, *Assistant Director, Fish & Wildlife Enhancement, U. S. Fish & Wildlife Service*

Dallas Peck, Director, USGS, cited the need for cooperation among many agencies in dealing with national and global problems such as climate change and pesticide contamination of surface and ground waters. Fiscal pressures make it imperative, he said, to share existing data and to create national and global geographic information systems. He pointed to two existing bodies as possible models for the kind of multi-agency teams that must be formed: the Interagency Working Group on Data Management for Global Change, and the Federal Interagency Coordinating Committee for Digital Cartography.

James Brennan, Deputy General Counsel, NOAA, discussed the importance of information sharing in investigating such issues as the impact of 200-mile limits on fishery resources on the high seas. He stressed the general need to document rigorously how data is collected so that people in the future will be able to use it for other purposes. A massive, centralized data system is not the answer, he said. Instead, we need to be more systematic with interagency meetings, telephone directories, and personal networking.

Environmental enforcement specialist Nancy Firestone discussed two issues of importance to enforcement attorneys—major users of environmental data generated by others. First, we need to find ways to use information more effectively to target enforcement activities where they have the greatest chance of improving the environment. Second, she said, we have to do a better job of using data to explain to judges and juries in enforcement cases the nature and extent of a source's pollution, how it compares to that from other sources, and how Government-imposed remedies will bring about the desired changes.

Ralph Morgenweck described experiences of the U. S. Fish & Wildlife Service which suggest that successful interagency data sharing projects must be planned and executed carefully. Participating agencies should each have a strong, capable project manager on the team; the project should be defined extensively at the outset, including objectives, products, data needed, and schedule; and the project should be monitored closely by the project officers and higher management.

Following several questions from the audience, Moderator Charles Grizzle of EPA closed the session with the suggestion that "maybe it's time to look into the possibility of establishing an umbrella organization, something we might call the Federal Environmental Data Council, bringing together all the Federal agencies who collect and use environmental data to establish some protocols and build some bridges so we can ensure that the work that needs to go on will be executed in a much more efficient manner."

Peck: "This conference provides a good opportunity to expand existing inter-agency relationships to create the information acquisition and data sharing systems that will be needed to meet the environmental challenges of the 21st Century and beyond."

Brennan: "The answer is not to try to anticipate the needs of future scientists and policymakers but to document rigorously how we collected the data so that future technologies can use it."

Firestone: "We have a major task ahead of us—for those of you who [collect and manage information] day to day to educate those of us who have to use it day to day so we can become your partners in actually getting those environmental results out in the field."

Morgenweck: "We have to have decisionmakers and managers who know how to use data, and we have to have technical people who know how to put that data into a format that lends itself to the decisionmaking process."

Managing Information

"Data is in essence the glue that will hold us together and allow us to move into a forward-looking and strategic phase of environmental protection."

"If we really want to make environmental protection a national enterprise, an international enterprise, ...we have to build a foundation of information, and the time is now."

"Without information, strategic planning is a game, it's a college seminar."

The Honorable F. Henry Habicht II

Deputy Administrator
U.S. Environmental Protection Agency

"Managing information is the foundation, the centerpiece for moving EPA into a new generation of environmental protection." With this emphatic endorsement as his central theme, Hank Habicht, EPA's Deputy Administrator, addressed the entire conference as attendees began their first full day of the program. He expressed the personal commitment of EPA's top management to information-related initiatives, including the State/EPA Data Management Program, and he forcefully stated his personal conviction that sound and innovative information management is "critical to the future of environmental protection."

Most of Habicht's address focused on the challenge of acquiring and using high-quality information on environmental conditions, trends, and progress. He proposed that EPA view its information management mission in terms of a four-point framework for "moving forward through this massive area."

• Basic Information. EPA and the States need to obtain the highest quality information in each environmental program area to use as a basis for day-to-day decisionmaking. "It is fundamental for continued credibility with the public," he emphasized. He pointed to the State/EPA Data Management Program as an important contributor to this objective.

Habicht also stressed the need for common protocols for data collection, storage, and access so that environmental data is comparable across program areas. This is essential groundwork, he said, to build an ability to pull information together to demonstrate progress in environmental cleanup and protection. He mentioned two examples of important information management approaches to aid in this task: graphical integration of data via Geographic Information Systems, and EPA's Integrated Risk Information System (IRIS), a cross-media data bank on environmental risk.

• Information Management Infrastructure. Habicht identified four important elements in the effort to provide the "infrastructure" necessary to support day-to-day program implementation and new environmental initiatives. EPA must provide the technical infrastructure—the hardware, software, communications networks, and expertise—necessary to make it possible for the Agency to acquire and use basic information and to support new strategic thrusts. A methodological infrastructure also is needed, encompassing consistent methods and protocols for gathering, storing, and retrieving data across programs and across agencies. Training and

for Environmental Results

human resources development programs are required, he said, to build and sustain the appropriate human infrastructure for these activities. And finally, the top levels of the Agency must establish the necessary management infrastructure, providing strong and consistent direction regarding the vital role of information management.

• Support for New Strategic Initiatives. Habicht outlined three areas in which information management can play a major role in strategic planning activities designed to move EPA into a new generation of environmental protection.

—Maximizing the impact of available resources, by supporting efforts to develop risk reduction strategies, reliable environmental indicators, and pollution prevention programs that are oriented toward categories of sources and receptors rather than solely along institutional media lines.

—Institutionalizing the effective use of environmental data in a stable organization. One such idea now being considered by EPA is a "Center for Environmental Statistics," envisioned as a central repository for information and a source of objective analysis and reporting to the public on environmental matters.

—Targeting enforcement activities on environmental results, as the Agency moves out of a period of preoccupation with "enforcement numbers" and toward more effective integration of enforcement efforts into day-to-day work.

• Long-Term Research. The Deputy Administrator stated firmly that EPA cannot accomplish the other three steps in the framework without the fourth—the solid scientific research that's needed to help set the agenda for the years ahead. "True pollution prevention depends on moving forward in this area," he said, not only at EPA but through other public and private research bodies and the academic community. He noted that EPA's Office of Research and Development is "doing an outstanding job of pulling together research results" and bringing this information to bear on the Agency's challenges. ORD's Environmental Monitoring and Assessment Program (EMAP) provides a potentially great foundation, he pointed out, for efforts to work with other organizations to determine the complex relationships among pollution and other factors.

Habicht closed with a strong statement of encouragement to environmental managers. "All managers in and out of EPA need to begin to think in terms of the longer term," he said. "When laying the groundwork for the next century, we're not as likely to get immediate gratification" as from the shorter-term, more reactive approach to environmental protection. "We have to be in this for the long pull," he stressed, "and this may require taking some resources away from other important activities." He acknowledged that these longer-term initiatives are vital, and he urged each environmental manager to "know in your heart that you will be making history, even if you're not making headlines."

"Fundamentally, all the managers in the Agency and outside the Agency need to think in terms of building these long-term infrastructures and not looking necessarily for immediate returns."

"We need to be sure we have information that allows us to make strategic, informed decisions about our enforcement direction."

"Information management is critical to our credibility and effectiveness in the years ahead, and I think the people of the world really depend on us."

Next Steps for the States and EPA

CROSS-CUTTING THEMES

State/Region IRM work groups

EPA-led data integration projects

ID and locational data standards

Education of potential data users

Systems easier to access and use

Additional training

Alerting States to procurement plans

More flexible use of grants

The conference provided a structured opportunity for each EPA Regional Office to strengthen its IRM partnership with its States through focused discussion of data management issues and needs. The ten concurrent Region/State breakout meetings held on the second day of the conference sought to identify EPA and State action items, assign responsibilities, and agree on forums for future interaction and planning. Most of the sessions were led by the Region's Assistant Regional Administrator for Policy and Management, who oversees the IRM function.

The discussion in these breakout meetings was wide-ranging and lively, as State agency heads, program managers, and data specialists took full advantage of this chance to communicate directly with their counterparts at EPA. The next few pages provide highlights of each session, itemizing the main issues, concerns, and action items that arose. Despite the inevitable breadth of topics covered, a cross-cutting look at the summaries reveals that several State needs and suggestions were expressed repeatedly in the respective meetings:

- Regular interaction between State and EPA regional IRM staffs should be institutionalized in work groups or other permanent bodies to ensure continual coordination and exchange of pertinent information.

- Regions should exert a leadership role in organizing and supporting cooperative data integration projects with their States, using GIS and non-GIS approaches.

- To make cross-organizational data integration possible, EPA and States should work together to establish common facility identifiers and locational data standards and add this information to all relevant data bases.

- Most State decisionmakers have little or no knowledge of the information resources available at EPA, how they might be useful for State operations, and how to obtain access to them. Educating potential data users should be a high priority for EPA.

- EPA should make its systems easier to use. Specific suggestions included reducing the number of different file transfer protocols used and developing a single, user-friendly interface or "gateway" for accessing all major EPA systems.

- Additional training of State staff is a continual and pressing need. States require regular in-depth training for the national EPA systems and also for more specialized tools such as GIS.

- EPA should give States "early warning" of its software and hardware policy decisions and procurement plans so that the States have sufficient lead-time to plan their own ADP acquisitions in this light.

- Regional management divisions should help States obtain more grant funding for IRM-related needs, especially when the need is for computer equipment that can benefit more than one program.

Region/State Breakout Sessions

Region I

- State decisionmakers must be made more aware of the EPA (and other Federal) data bases available to them, how the information in each system might be useful to them, and how to gain access to each system. EPA should produce a directory of EPA and other relevant data bases, with a digestible synopsis of what each system can do and how to access it. This directory should provide considerably more information about each system than is contained in the recently-published EPA Information Resources Directory.

- To increase the usefulness of some systems in supporting management decisions, EPA should integrate its existing data systems with analysis and presentation tools such as SAS.

- Standards are needed for a variety of data types (e.g., groundwater) and for QA procedures to ensure that all data sets are of comparable accuracy and completeness.

- While national data standards are desirable, Regional differences in program implementation and data needs make Regional initiatives necessary. Region I and its States should work together to develop a process for arriving at needed standards.

- EPA should reduce the number of file transfer protocols used with its systems, so that States have to know only two or three sets of procedures for data transmission. EPA should give State technical staffs complete information about the existing file transfer tools and how to use them.

- EPA and the States should look for interstate GIS project opportunities. It's time to break out of the pilot project phase and put in place the infrastructure to use this technology in cooperative problem solving.

- All ten Regions should be represented on EPA's IRM Steering Committee. The Regional representative could be a senior State manager.

Improve States' awareness of EPA data bases and their value to decisionmakers

Develop a Region/State process for arriving at needed regional data standards

Reduce the number of file transfer protocols States must know to interact with EPA systems

Break out of the pilot phase of GIS and begin interstate problem-solving using this technology

Region II

- There was a consensus that the Region's IRM function has been too "technology-driven" and not "needs-driven" enough. A much stronger linkage is needed between programmatic requirements and investments in information systems. EPA program Division Directors should be more directly involved in discussions about data management. There is too much "preaching to the choir" and not enough outreach to senior program management to determine needs and future directions for information systems development.

- The Region II information systems staff will continue to seek ways to "market" their services to the programs more effectively. They are particularly concerned about serving the needs of increasingly distributed activities and technologies.

- The Region and its States and territories should develop strategic systems plans that establish management goals as a basis for setting information system development priorities. There should be an explicit linkage between the strategic planning process and the budget process.

- Cross-media environmental management problems should be a focus for the State/EPA data management partnership. Pilot projects are needed to demonstrate how information technology such as GIS can assist the Region in addressing complex issues. Areas suggested as fruitful for pilots included compliance monitoring, enforcement, and pollution prevention. Region II agreed to hold a meeting of its States and territories during 1990 to discuss GIS technology and pilot projects.

Take a more needs-driven approach to systems planning and development

Market IRM services to the program offices more effectively

Develop State/EPA strategic systems plans, tied to the budget process

Undertake State/EPA GIS pilot projects, focusing on cross-media problems

Region/State Breakout Sessions

Region III

- The Region will involve State IRM and administration units in decisions regarding how States will report EPA-required data to national data bases.

- EPA should keep States informed of future Agency software developments and procurements so the States can consider compatibility with EPA in their system decisions.

- The Region will keep States up to date on GIS technology and geographic data collection standards developed by EPA.

- The Region should help the States to access specialized EPA software (e.g., e-mail, file transfer, graphics), providing training where needed.

- The Region will inquire into options for back-up capabilities for the present telecommunications links to NCC.

- Data the States submit for EPA national reports may be interpreted differently by EPA. The Region should work with the States to develop procedures for coordinating the release of their data to the public and to Congress.

- The States would like to exchange information on in-house data management capabilities with each other. A Region/State clearinghouse could be developed to facilitate these exchanges.

- A Region/State data management conference will be held in the spring, probably in Philadelphia.

Keep States informed of EPA software developments and procurements

Help States access specialized EPA software, providing training where necessary

Coordinate with the State when releasing State-reported data to Congress and the Public

Facilitate interstate exchange of information on in-house data management

Region IV

- A collegial State/EPA group should meet periodically to exchange information on IRM activities and needs and to share ideas on how to work together to meet data management challenges. The Region planned to host a workgroup meeting in Atlanta in January at which the mechanics of this on-going interaction was to be discussed further. A potential future product of this group is a five-year plan describing how the States and the Region will share capabilities and work together to improve IRM support for environmental decisionmaking.

- EPA should make it easier for States to use Federal funds to acquire data management equipment, software, and services intended for cross-cutting uses rather than "ownership" by a single program. States are very interested in finding ways to pool funds from more than one program grant to meet these common needs. The Region will survey each State's cross-cutting needs and will then look for the best way to arrange financial support for them.

- The Region should arrange and provide funding support for common training sessions to ensure that States know how to take advantage of EPA's tools and technologies. The Region will explore further the possibility that joint ARC/INFO training may be desirable.

- The Region should try to anticipate changes in State reporting requirements and inform the States as soon as possible so they have more time to make the necessary changes in their own data systems.

- Some States need more information on how to make use of GIS technology and how to extract data from multiple EPA data bases for a single integrated analysis.

Establish a State/EPA IRM workgroup

Facilitate grant funding for IRM needs that cut across program lines

Arrange and provide funding support for common training sessions

Inform States of expected changes in reporting requirements

Region/State Breakout Sessions

Region V

- The Region declared that all Phase I objectives of the State/EPA Data Management Program have been achieved in Region V, and all resources will be dedicated to Phase II in FY 1990. Region V staff will work with each system's staff to verify the continuing timeliness, accuracy, and completeness of all States' data.

- The Region and the States will continue the work begun in FY 1989 to establish a common facility identifier and to enter State facility data into the FINDS system. The Region V/State IRM Steering Committee will meet in January to determine how the FY 1990 funds will be allocated.

- The States requested that EPA's Office of Information Resources Management be available to participate in the quarterly meetings of the Region V/State IRM Steering Committee. Region V will contact OIRM when specific agenda items require their participation.

- The Region's Management Division will work with the Water Management Division to arrange increased EPA support for data management in the Great Lakes Program. Effective use of data systems will be vital in helping the States and the Region develop multi-media Remedial Action Plans for the 42 "areas of concern" in the Great Lakes.

- In response to State concerns, the Region will seek participation by the States in designing a strategic planning process for the Region, in accordance with the Deputy Administrator's initiative.

- The States urged the Region to commit to longer-term investments in meeting State needs, shifting the emphasis from meeting EPA's "bean-counting" requirements to solving the problems of greatest significance to each State.

Continue work to establish a common facility identifier and enter State data into FINDS

Increase EPA support for data management in the Great Lakes Program

Seek State participation in EPA's strategic planning process

Shift EPA focus from bean-counting to longer-term investments to meet critical State needs

Region VI

The participants in the Region VI breakout session were all top-level managers. The discussion focused on areas for improvement in State/EPA data management and on a mechanism for continuing the involvement of top State managers in Region-wide data management planning and review.

- A State/EPA Data Management Council was established, composed of the State agency heads and the Assistant Regional Administrator for Policy and Management. The first meeting was tentatively scheduled for early December in Dallas, at which each State agency was to describe its present data management capabilities and needs. Work groups including other State and EPA staff will be formed as necessary to work on projects designated by the Council.

- States need EPA's assistance in making better use of existing sources of data. The Region should ensure that States are aware of useful systems and tools and receive the training required to make effective use of EPA's systems for their own purposes.

- Some States would like EPA to take a leadership role in integrating facility-related data across programs and in providing a single point of user-friendly access to all major EPA data bases.

- The Region should inform the States about its long-term ADP plans, so that States can make informed decisions on software and hardware procurement.

- The Region plans to increase the dialog between the IRM staff in Dallas and their counterparts in the State agencies.

Establish a State/EPA Data Management Council

Ensure that States are more aware of useful EPA systems and tools and receive the training needed to use them

EPA coordinate States to create integrated access to EPA data bases

Inform the States of long-term ADP plans so States can make informed procurement decisions

Region/State Breakout Sessions

Region VII

- The States acknowledged that data quality is a continuing problem for some EPA data systems, due to the lack of resources in the States to perform adequate quality assurance. The Region should recognize this on-going need and earmark more program grant funds for data quality activities.

- EPA should continue its efforts to make it easier for State nontechnical staff to retrieve data from and transmit data to EPA's systems. Access to and interpretation of data is not transparent enough for nontechnical users. A representative from Nebraska described the "Gateway" prototype that has been developed there, with EPA's support, to provide a single point of access to several EPA systems.

- All States agreed that EPA should continue its present support of GIS activities. The need for non-GIS data integration sparked the most discussion, however, with some States feeling that Region VII should underwrite development of a model multi-media integration system that could eventually benefit all four States.

- Common facility identifiers and locational data standards were identified as two areas where immediate Region/State action is needed to permit EPA-State and State-State data integration. The Region should coordinate work on these fronts.

- The Region will convene a meeting of State and Regional IRM and program staff early in 1990 to continue the discussion on how best to promote data integration in the Region.

- With respect to GIS and other IRM initiatives, EPA should decide early who will buy what equipment—EPA or the States—and inform the States so they can plan for critical hardware and software expenditures in advance.

Provide increased support to States for data quality assurance

Continue efforts to make it easier to interact with EPA systems

Coordinate multistate efforts to establish common IDs and locational data standards

Inform States of EPA plans for procuring hardware and software

Region VIII

- On-going training for data managers, program managers, and ADP staff is a continuing need in the States.

- Some States feel that EPA collects more data from the States than is necessary. The Region, with cooperation of the States, should review existing data bases and data elements to determine how and why data is used. The Region will observe a similar effort underway in Region X before embarking on its own program to remove unused data.

- All States have received or are planning to receive technical assistance from the Region through the State/EPA Data Management Program, and they wish to continue this assistance through Phase II of the Program. Each State should begin to identify data integration projects, such as GIS applications, expert systems, or integrated facility management systems, so that the Region can determine how to allocate its resources under Phase II.

- To improve coordination with EPA and to help develop and implement an ADP plan, each State should create an IRM Steering Committee. Such committees have been very successful within EPA.

- The Regional Office and EPA Headquarters must improve communications and coordination with the States to inform them of developing data, software, and hardware standards; fiscal trends; and impending program regulations. Without this information, the States cannot set and adhere to long-term ADP strategies.

- The Region will arrange a Region/State data management conference for the Spring of 1990.

Provide more training for State IRM and program staffs

States should identify potential data integration projects for Phase II

States should create IRM Steering Committees

Inform States better about EPA IRM standards, fiscal trends, and impending regulations

Region/State Breakout Sessions

Region IX

- Topics discussed in the session include: status of State telecommunications links to NCC; EPA and State GIS implementation plans; and improving data integration between EPA and State agencies.

- The Region will prepare a draft Memorandum of Understanding on State/EPA data management improvement activities for each State by Spring of 1990. The Region hopes to have all MOUs in place by the end of 1990.

- The Region will develop an action plan for in-depth training of State staff in use of EPA's major data systems.

- Efforts are needed to improve communications between EPA and State senior management regarding the State/EPA Data Management Program and its objectives.

- The Region will assist each State in developing a State locational data policy similar to EPA's.

- The Region will assist States, to the extent possible, in procuring needed data management equipment. The Region's IRM Branch will become more involved in the grant negotiation process when data collection and ADP equipment are addressed.

- The Region will develop a GIS center, expected to be operational by the end of FY 1990.

- The Region will explore the possibility of an annual Region/State conference on data management.

Have State/EPA MOUs in place by the end of 1990

Develop an action plan for in-depth training of State staff on major EPA systems

Assist in developing State locational data policies

Help States obtain more grant support for ADP needs

Region X

- The discussion centered on the general need in Region X and nationally to find ways to make better use of environmental data to support decisionmaking. Representatives from Washington and Oregon described their activities in this realm and the needs that these experiences have highlighted.

- In its "Washington Environment 2010" project, Washington found that its data needs for risk-based priority-setting were not well served by the State's current data systems and sources. The State now is seeking to upgrade and integrate some of these systems. Oregon found, in attempting to make environmental risk assessments, that State epidemiologists in the Department of Health did not concur with the environmental scientists' estimates of certain cancer risks. Coordination is needed to determine the data requirements for valid risk assessments.

- The States agreed that one important way to move ahead in using environmental data is to share experiences with each other and to develop joint projects where appropriate to pool their knowledge and resources. To facilitate this, the States and the Region will form a work group on data management issues, to be composed of senior IRM officials from each agency, with program participation as appropriate.

- Region X will host the first meeting of the work group, which they hoped to convene before the end of the year. A long-range objective of the group will be to cultivate a better understanding between program managers and data managers about how to improve information support for risk-based, results-oriented decisionmaking. A shorter-range objective will be to identify a first project that will benefit all four States and EPA.

Draw on Washington and Oregon experiences to find ways to make better use of environmental data to support decisionmaking

Establish a Region/State workgroup on data management issues

Identify an initial cooperative project that will benefit all four States and EPA

Dinner Address

Harnessing Market Forces to Meet Today's Environmental Protection Challenges

"The environmental problems we face demand new attitudes and new tools."

"I do believe that a healthy environment and a healthy economy go hand in hand, and that our regulations should set up incentives for companies to develop solutions, to do the right thing in the first place instead of require costly clean-ups as an afterthought."

"We need to harness the power of the marketplace to work for the environment instead of against it."

Fred Krupp

Executive Director
Environmental Defense Fund

Echoing one of the major themes of the conference, Fred Krupp called for a partnership for protection of the environment, but he urged that industry be included in the partnership along with the Federal and State regulatory agencies.

Environmental problems are gaining the spotlight because it is factually imperative that they do rise to the top of the public agenda, he said. The present regulatory approach is not sufficient to meet the national and global challenges we face. New approaches are needed which give companies economic incentives to do the right thing in the first place instead of paying for costly controls and cleanups. Krupp stated his conviction that a healthy environment and a healthy economy go hand in hand and that environmentally responsible growth is economically strong and sustainable growth.

Krupp devoted most of his address to the main principles of "third wave environmentalism," a view of environmental protection that he first introduced three years ago. The first wave of environmentalism in the U. S. was President Theodore Roosevelt's focus on conservation of Western wilderness lands. The second wave, sparked in large measure by Rachel Carson's *Silent Spring*, expanded protection nationwide to halt gross abuses of the Environment through regulations on pollutant discharges and toxic chemicals. We now need to embark on a third wave, Krupp said, in which we do more than place restrictions on industry—an approach that by itself cannot solve large-scale problems such as ozone depletion, global warming, and acid rain. This third wave requires changing attitudes, emphasizing solutions instead of restrictions, and deploying new tools to encourage environmentally responsible behavior by industry.

Krupp described six economic tools that he believes can enable us to set more ambitious environmental goals while at the same time giving businesses more flexibility and incentives:

- Deposit schemes, like those for cans and bottles, for automotive batteries and other items containing environmentally destructive substances.
- Removal of market barriers that now prevent industries from making environmentally responsible decisions that would be in their best economic interest if those barriers were not present.
- Halting government subsidies for environmentally destructive activities, such as certain dam projects.
- Labeling schemes, in which companies take advantage of the public's preference for environmentally responsible products by labeling them as such.
- Pollution charges and rebates to raise the cost of noncompliance and provide additional public funds for research and regulation.
- Tradeable reduction permits, such as those called for in the Bush Administration's acid rain proposals.

Keynote Address

Tools That Enhance Environmental Analysis

Jack Dangermond

President
Environmental Systems Research Institute

Noting with pleasure that the conference was being held during the national Geography Awareness Week, Jack Dangermond presented his thought-provoking views on the role of geographic information systems in environmental management. Dangermond, one of the "fathers" of GIS and perhaps the technology's leading visionary, encouraged the audience to consider GIS the road to using data more effectively in supporting environmental decisionmaking.

He set the stage for his forward-looking comments with a nontechnical description of the GIS technology today—sets of data describing "objects" (e.g., points or areas on a map), plus about 1,000 different software tools for manipulating this data. Environmental decisionmakers can use this highly visual approach, he said, to get new insights from "nearness" analyses of existing but hitherto tabular data.

He briefly described several areas in which GIS technology will evolve in the next few years:

- We will move from the ability to bring a couple of data sets together to easily bringing many together.
- New software tools will allow indexing of many different data representation modes—maps, photos, drawings, tabular data, etc.—in a GIS data base, making it easier to incorporate two or more data modes in a single analysis.
- Icon-based, point-and-click interfaces will be used increasingly to make it easier to access the tools and the data sets.
- "Data switchyards" will be employed to reorganize GIS data base structures "on the fly" so they can be used with different kinds of software tools.
- Most GIS processing will be performed on networks of small, very powerful workstations rather than large, central computers.

Dangermond concluded with his vision of GIS as a mechanism for bridging many of the organizational and communications problems that inhibit comprehensive, integrated approaches to environmental problem solving. The traditional sectorial approaches are not going to work for us in the future, he said, and sharing of data through GIS-based joint analyses can be instrumental in bringing about a cross-organizational mindset. Our public and private organizations should be restructured around the use of maps to promote integrated analyses and to "roll information up" for easier decisionmaking by management.

"GIS, to me, is a means of bringing people together to work on these complex problems," he said, "to address crime not just with police, to address air pollution not just with EPA but in a more comprehensive way. The questions is: Who's going to do it? It's very risky to step out. I believe that it's time we begin to take a stand for integrating information, and I believe that will provide us the basis for more integrated thinking in our sciences and among our policy people."

"This is what I call information integration—disparate data types, often collected by different sciences and different disciplines, being brought together to give us visualization and guidance about where to do certain things, from a strategic standpoint."

"Geography can be the common key that allows us to interrelate, or have inter-operability among, the existing investments [in environmental data sets] today and also in the future."

"You, as professionals, will lay the footprints for how the methodologies will be established and effectively employed in the next decade, the next century. In other words, we're about to go into an adventure, you and I, to discover how we can use information effectively in policy-making."

Improving Information Use

Rice: "We'd like these panels to be as interactive as possible to give you a chance to contribute....I think this can be a stimulus for all of our thinking about where we should go with information management."

Kay: "We're going to be pouring information into [an environmental indicators system], and then when we get information out of the system everyone is going to assume it is accurate—because it came from the system. I think we have to be very careful about the quality of the information we put in."

Kay: "We recognize that in many instances the States have priorities that are different, perhaps, than what our national program offices may think is necessary. At the Regional level, we attempt to achieve a working relationship and some balance in that. I think there is a good sense of awareness at EPA of trying to achieve that good working relationship with our States."

William W. Rice

Deputy Regional Administrator
U.S. Environmental Protection Agency, Region VII
(General Moderator)

Panel Members

ENVIRONMENTAL INDICATORS AND STRATEGIC PLANNING

Moderator: Morris Kay, *Regional Administrator, EPA Region VII*
J. Clarence Davies III, *Asst. Administrator, EPA Office of Policy, Planning and Evaluation*
Stanley L. Laskowski, *Deputy Regional Administrator, EPA Region III*
Erich W. Bretthauer, *Asst. Administrator, EPA Office of Research and Development*

AIR

Moderator: Jack McGraw, *Deputy Regional Administrator, EPA Region VIII*
Gerald Emison, *Director, EPA Office of Air Quality Planning and Standards*
Roger Westman, *Bureau of Air Pollution Control, Allegheny (PA) County Health Department*
Don Theiler, *Director, Bureau of Air Management, Wisconsin Department of Natural Resources*
William A. Spratlin, *Director, Air and Toxics Division, EPA Region VII*

WATER

Moderator: Frank Covington, *Deputy Regional Administrator, EPA Region V*
Douglas "Dusty" Hall, *Environmental Protection Manager, City of Dayton, Ohio*
Jim Williams, *Director, Missouri Division of Geology and Land Survey*
Stephen R. Wassersug, *Director, Hazardous Waste Division, EPA Region III*
Michael Evans, *Carroll County (MD) Health Department*
Bill Wiley, *Arizona Department of Environment*
Karol Erickson, *Washington Department of Ecology*
David Fierra, *Director, Water Management Division, EPA Region I*

HAZARDOUS WASTE

Moderator: James Marshall, *Director, Office of External Programs, EPA Region II*
Jeffrey Denit, *Deputy Director, EPA Office of Solid Waste*
James Miller, *Waste Management Division, EPA Region IV*
Valerie Sikes, *Financial Assurance Analyst, Georgia Environmental Protection Division*
Robert Morby, *Chief, Superfund Branch, EPA Region VII*

TOXICS INFORMATION INTEGRATION

Moderator: William W. Rice, *Deputy Regional Administrator, EPA Region VII*
Charles Elkins, *Director, EPA Office of Toxic Substances*
William Farland, *Director, EPA Office of Health and Environmental Assessment*
Brent Bradford, *Deputy Director, Utah Division of Environmental Health*
Irwin L. Dickstein, *Director, Air and Toxics Division, EPA Region VIII*

in Environmental Programs

Environmental Indicators and Strategic Planning

Terry Davies, EPA's Assistant Administrator for Policy, Planning, and Evaluation, pointed to two important EPA initiatives that emphasize the Agency's commitment to using environmental indicators: the new strategic planning process, which requires use of indicators; and the task force to develop a Center for Environmental Statistics, which would assist in improving data and its use in deriving indicators.

Stan Laskowski, Region III's Deputy Regional Administrator, cited three major challenges EPA faces in developing and using environmental indicators: to develop Agencywide policies for the development, management, and implementation of monitoring; to provide standard reference materials, technical manuals, and guidance, and to accredit laboratories; and to adopt standard methods and common "core" indicators that can be monitored consistently by agencies at all levels of government nationwide. These challenges will be addressed by EPA's newly established Environmental Monitoring Management Council, which will foster consistency and simplicity in monitoring methods and analysis across all environmental media.

Erich Bretthauer, Assistant Administrator for Research and Development, announced that EPA plans to commit $40 million to indicators research over the next three years—$30 million for an Ecological Institute to develop new indicators, and $10 million for evaluating and standardizing existing indicators. To build on the available expertise, ORD will work actively with EPA's Regional Offices, State agencies, and other Federal agencies in developing and implementing indicators, Bretthauer promised.

In summarizing the key points of the presentations, Moderator Morris Kay highlighted the importance of quality assurance in developing and using environmental indicators. Without stringent quality control measures, he said, we will not truly know whether our decisions are sound and our actions effective, even when the quantity of the data appears adequate.

Davies: "For policy purposes, the reading you get as to whether you're doing any good, whether you're having any effect in the real world, is encompassed in environmental indicators."

Laskowski: "We need public support for what we do, and we have to be able to explain to the public what our measurements mean and that they are consistent from one part of the country to another."

Bretthauer: "We've been working rather aggressively over the last year and a half to put in place the agreements that are necessary with the other Federal agencies and State agencies that need to be involved in this program."

Air

Gerald Emison, Director, OAQPS, presented "AIRS 101," a thorough overview of EPA's new Aerometric Information Retrieval System. He noted that, while AIRS is a major step forward for EPA and the States in terms of air data systems, the system can only be as good as the quality of its data. County air planner Roger Westman called for additional EPA emphasis on comprehensive emissions inventories, which can be important sources of information for local and state air quality managers. Don Theiler urged continued attention to data quality and timeliness and looked ahead to systems that are updated in "real time," always giving decisionmakers the latest monitoring results. He also stressed that EPA must use State data responsibly, citing instances where news media have misinterpreted Wisconsin data supplied by EPA.

Westman: "We must get out of doing special-purpose emissions inventories and into doing regular, comprehensive, accurate inventories."

Theiler: "EPA really must bring to the States and Locals the advantages of working with them in setting up these systems. ... This has to be more than just saving money. EPA must also begin to use this data responsibly."

Improving Information Use in Environmental Programs (Continued)

Wiley: "Don't make major data management decisions without us. Keep us informed."

Evans: "We at the local level are in a much better position to tell EPA what good data is than EPA is in to tell us what good data is."

Water

Presentations by the first three panelists provided local, State, and Federal perspectives on using Geographic Information Systems to support groundwater programs: Dusty Hall on the City of Dayton's Wellhead Protection Program; Jim Williams on the Missouri geological survey's enforcement of regulations on drilling private water wells; and Steve Wassersug on EPA Region III's region-wide assessment of groundwater risks and pollution trends. The second group of panelists—Michael Evans, Bill Wiley, Karol Erickson, and Dave Fierra—addressed data sharing goals, roles, and obstacles. Panelists and audience members discussed the need for more information about available data; standards for minimum data sets to support decisions; greater consistency and linkage among existing data systems; and breaking down the institutional barriers between media programs.

Sikes: "Through the monumental cooperative efforts of EPA Headquarters, the National Governors Association, the Regions, and the States, RCRIS is an improvement over its predecessor, and this partnership must continually strive to understand and protect each participant's needs and goals."

Hazardous Waste

EPA's Jeff Denit reviewed the rationale, history, and current status of RCRIS, the new data system that soon will replace HWDMS. Jim Miller from EPA's Region IV office provided a more detailed description of RCRIS and its capabilities and described the four-state pilot implementation conducted in Region IV in May and June. Valerie Sikes from Georgia hailed the State/EPA partnership in developing RCRIS, and she urged strict adherence to the configuration management process. Memoranda of Understanding must be executed, she said, to ensure that States have a say in determining what data they will provide to EPA. Bob Morby gave a status update on CERCLIS, EPA's national Superfund data management system.

Bradford: "The area of risk management has become the driving force, in our State, in environmental management. That then forces us into the business of information integration, particularly with respect to toxics. Without it, I don't think we can do our jobs properly."

Toxics Information Integration

Chuck Elkins, Director, OTS, described the status and plans for the Toxics Release Inventory System (TRIS), EPA's general-access data base of information reported by industry in accordance with SARA, Title III requirements. Bill Farland discussed the Integrated Risk Information System (IRIS) and ORD's plans for expanding access outside the Agency. Brent Bradford identified several areas in which the State of Utah has a critical need for access to information on toxic chemicals, including risk-based permitting and siting of new facilities. Irv Dickstein cited three uses of toxics information in EPA Regional Offices: compliance reviews and inspection targeting; geographical studies; and risk screening. Wide-ranging audience contributions included descriptions of toxics information activities in California, Georgia, and Nebraska.

Panel: The Conservation Foundation

Great Lakes, Great Legacy?

Lessons From a Bi-National State-of-the-Environment Report

Dr. Jeff Leonard, *Vice-President, Conservation Foundation*
Richard A. Liroff, *Senior Associate, Conservation Foundation*
Dr. Ian Jackson, *Consultant to the Institute for Research on Public Policy, Ottawa, Canada*

The panel reviewed the process, findings, and implications of a two-year joint U. S.-Canadian study of the condition of the environment in the Great Lakes region. The study report, *Great Lakes, Great Legacy?*, released in October 1989, was co-written by the Conservation Foundation and the Institute for Research on Public Policy of Canada. This report called for urgent, unprecedented action by Federal, State, Provincial, and local governments in both countries to reverse the degradation the study found to be threatening the long-term environmental health of the Great Lakes.

Moderator Jeff Leonard introduced the presentations by noting that the Conservation Foundation views the Great Lakes as a microcosm for problems that are facing the world and that he hopes the messages of the study will be heeded globally. The problems are the same as those now faced in many other places, he said. While there is little raw sewage going into the lakes any more and few factories with unpermitted discharges, other problems are looming—such as the effects of agricultural and urban run-off, and the concentration of past pollution into small areas such as lake-bottom sediments and derelict toxic waste dumps.

Rich Liroff provided an historical and geographic overview of the Great Lakes Region and then reviewed the study's major findings. General trends discovered—mainly through analysis of existing data—include the increasingly significant effects of air pollution (including acid precipitation) and the biomagnification of toxics in the food web. The study also indicates, he said, that exposure to pollution in the waters of the Great Lakes causes developmental problems for many species as well as having the more familiar carcinogenic effects. According to the report's authors, the policy implications of these and the other findings include: the need to improve public health warnings concerning fish taken from the lakes; the need for enhanced research on the threats to public health; the need for more explicit consideration of environmental impacts in planning for economic development; and the need to move beyond end-of-the-pipe control of pollution in the region. Liroff stressed the need to to take an integrated, multi-media approach to restoring and protecting the environmental quality of the Great Lakes.

Ian Jackson, representing the Canadian point of view, addressed the implications of the study for environmental information management. The experience gained in the study indicates the importance of taking an ecosystem approach as a framework for environmental decisionmaking. Present information systems are not well-equipped to support this effort, though. Many data sets are available, but they are organized by environmental medium and there are no tools and little experience to integrate them. Much of the solution, he suggested, will lie in taking a more integrated approach to collecting new data in the future. "I think many scientists are going to have to ask themselves what the value of their monitoring resources, as now focused, would be in alternative uses," Jackson said.

Leonard: "We hope that this experience serves as a positive model in the United States for bilateral and multilateral cooperation. It helps lead the way for us to realize increasingly that protecting our Environment, and particularly the world environment, is a global task and must be met with U. S. leadership and active cooperation at the international level."

Liroff: "All of these data were out there—there were the other data, the mink data, the fish data, the bird data—a little bit here, a little bit there. It took this project...to bring all that information together to help identify some of the common findings among these disparate bodies of data."

Jackson: "Not merely are different jurisdictions measuring different things in different ways at different times for different purposes—quite often they don't really know what they're measuring."

Panel

Public Access to Environmental Information

Elkins: "It is not good public policy to deprive all the legitimate and intelligent second-time users of our information of its benefits just to guard against an occasional misguided user."

Poje: "The Federal environmental protection agencies and their namesakes at the State and Local level have a much more important role than collecting information. They have to present that information in such a way that it lives in our communities."

Bass: "We have gone beyond the Us versus Them. We are now at a stage of a great deal of opportunities for cooperation. This is a whole new arena, something unlike anything we've come through in terms of working together. We have a common mission, and that is: how to effectively get information out to the public."

Garie: "It would be nice if environmental agencies became known as the 'Show Me' agencies, that we were able to actually show people how we made our decisions. We truly believe that those decisions are made using good data—now it's time for us to show others. And hopefully that will help us to establish, or reestablish, some of the trust and credibility that we need as we're serving the public."

Edward J. Hanley, Moderator, *Deputy Assistant Administrator for Administration and Resources Management, U.S. Environmental Protection Agency*
Charles Elkins, *Director, Office of Toxic Substances, U.S. Environmental Protection Agency*
Gerald Poje, *Environmental Toxicologist, National Wildlife Federation*
Gary Bass, *Executive Director, OMB Watch*
Hank Garie, *Assistant Director, Division of Science and Research, New Jersey Department of Environmental Protection*

"The public doesn't want simply our press releases and our meetings," moderator Ed Hanley declared in opening the session. "They want direct access to the data we process describing their environment and their natural resources." While acknowledging the "real and enormous practical problems" with public access to EPA's data, Hanley said that the time has come to consider the subject seriously and determine whether the obstacles can be overcome.

Chuck Elkins forcefully advocated "recycling" of environmental data, just as we increasingly recycle solid wastes. In too many cases, he said, our information efforts have followed the same trends as "no deposit, no return" soda bottles—only the "owner" gets to use it. If we are truly stewards of environmental information as opposed to owners, as was suggested elsewhere in the conference, then we have an obligation to recycle it so others can also benefit. He suggested that EPA may be acting like an overly protective parent in its fear that sharing data with the public will lead to frequent misunderstandings and misuses.

Gerald Poje urged the audience to change hats from their roles as environmental managers and look at the issue from their viewpoint as citizens in their communities. There are many legitimate reasons for public concern about their local environment, he said, citing drinking water quality, food contamination, and acid rain effects among other examples. "Owners" of the environmental data at EPA and elsewhere have to think like average citizens, Poje stressed, if we are to get beyond the barrier of fear that people are going to do something with the data that government officials would not like to see.

Gary Bass pointed out that upcoming changes to the Paperwork Reduction Act will mandate a change in the way Federal organizations must act as information providers, making agencies responsible for disseminating information regardless of its format. He noted five things that will be needed to get agencies like EPA into the public access arena: resources; improved agency commitments and internal communications; increased public participation in planning of access routes to the information; clearer common definitions of terms such as "access" and "user-friendly;" and exploration of different channels for distributing information.

Hank Garie outlined three needs for improved information sharing with the public. Agencies must: use the data they collect in making sound decisions, employing tools like GIS to increase integrated decision-making where possible; commit to a philosophy of openness to the public, characterized by transparent decision processes based on dialog with affected communities; and develop mechanisms for sharing relevant data in understandable ways. Garie described New Jersey's efforts to use GIS as a public communication tool in assessing human exposure to chromium contamination around Jersey City.

EPA Pledges Continued Action

Charles L. Grizzle

Assistant Administrator for Administration and Resources Management
U.S. Environmental Protection Agency

Charley Grizzle formally closed the conference by pledging five actions that EPA will take to sustain the momentum established during the 1989 National Environmental Information Conference:

1. **Conduct more extensive long-range IRM planning, the indispensable foundation for wise investments by EPA and the States.**

2. **Continue the capacity-building efforts of the State/EPA Data Management Program, including:**

   - Providing training to States in the use of individual EPA systems and also in broader IRM activities; and

   - Providing technical assistance to ensure that EPA's data sharing partners are realizing all the benefits of existing systems.

3. **Encourage additional participation by EPA's national program offices in the State/EPA data sharing initiative, to ensure a consistent, unified, multi-media effort.**

4. **Continue three initiatives of importance to EPA and the States:**

   - Through EPA's recently established Systems Development Center, provide the technical and fiscal means for developing and enhancing systems of value to the wider environmental community;

   - Establish appropriate standards and policies to guide and facilitate data integration;

   - As the focus of the State/EPA Data Management Program shifts to data integration, retain the commitment to the Phase I goals of timely, accurate, and complete data in all of EPA's national systems.

5. **Form a Federal/State team to determine what specific actions are needed now to consolidate the gains made so far and capitalize on the energy and and interest generated during this conference.**

"Data sharing partnerships must become a program office priority, not just a data management priority."

"We have the technology and the expertise. Now we must also have a change in our mindset in order to achieve real progress."

"I challenge you all to leave here with a renewed resolve to ensure that the information pillar of our environmental mission is sound. Our success depends on it."

Appendix

Organizations Represented

State Agencies

Alabama Department of Environmental Management
Alaska Department of Environmental Conservation
Arizona Department of Environmental Quality
Arkansas Department of Pollution Control and Ecology
California Department of Health Services
California Environmental Affairs Agency
California Water Resources Control Board
Colorado Department of Health
Connecticut Department of Environmental Protection
Delaware Department of Natural Resources and Environmental Control
District of Columbia Department of Consumer and Regulatory Affairs
Florida Department of Environmental Regulation
Georgia Environmental Protection Division
Guam Environmental Protection Agency
Hawaii State Department of Health
Idaho Department of Health and Welfare
Illinois Environmental Protection Agency
Indiana Department of Environmental Management
Iowa Department of Natural Resources
Iowa Department of Public Health
Kansas Department of Health and Environment
Kansas Department of Wildlife & Parks
Kansas Geological Survey
Kentucky Department for Environmental Protection
Louisiana Department of Environmental Quality
Maine Department of Environmental Protection
Maryland Department of Environment
Massachusetts Department of Environmental Protection
Massachusetts Executive Office of Environmental Affairs
Michigan Department of Natural Resources
Minnesota Pollution Control Agency
Mississippi Department of Environmental Quality
Missouri Department of Natural Resources
Missouri Soil Conservation Service
Montana Department of Health and Environment
Nebraska Department of Environmental Control
Nevada Division of Environmental Protection
New Hampshire Department of Environmental Services
New Jersey Department of Environmental Protection
New Mexico Environmental Improvement Division
New York Department of Environmental Conservation
North Carolina Department of Environment, Health & Natural Resources
North Dakota State Department of Health
Ohio Environmental Protection Agency
Oklahoma Department of Pollution Control
Oklahoma State Department of Health
Oregon Department of Agriculture
Oregon Department of Environmental Quality
Pennsylvania Department of Environmental Resources
Puerto Rico Environmental Quality Board
Rhode Island Department of Environmental Management
South Carolina Department of Health and Environment
South Dakota Department of Water and Natural Resources
Tennessee Department of Health and Environment
Texas Air Control Board
Texas Water Commission
Texas Water Development Board
Utah Division of Environmental Health
Vermont Agency of Environmental Conservation
Virginia Office of Natural Resources
Washington Department of Ecology
Washington State Department of Health
West Virginia Air Pollution Control Commission
West Virginia Division of Waste Management
West Virginia Division of Water Resources
Wisconsin Department of Natural Resources
Wyoming Department of Environmental Quality

National Governors' Association

U. S. Environmental Protection Agency

Regions I - X

Office of the Administrator
Office of Administration and Resources Management
Office of Air and Radiation
Office of Enforcement and Compliance Monitoring
Office of External Affairs
Office of General Counsel
Office of Inspector General
Office of Pesticides and Toxic Substances
Office of Policy, Planning, and Evaluation
Office of Regional Operations
Office of Research and Development
Office of Solid Waste and Emergency Response
Office of Water

at the Conference

U.S. Environmental Protection Agency (Continued)

Great Lakes National Program Office
National Data Processing Division/National Computer Center
National Enforcement Information Center

Other Federal

Agency for Toxic Substances and Disease Registry
Bureau of Land Management
National Oceanic and Atmospheric Administration
National Park Service
Office of Management and Budget
U. S. Army, Corps of Engineers
U. S. Army, Fort Huachuca, Arizona
U. S. Department of Agriculture
U. S. Department of Defense
U. S. Department of Housing and Urban Development
U. S. Fish & Wildlife Service
U. S. Geological Survey

Local and Regional

Allegheny County (Pennsylvania) Health Department
Carroll County (Maryland) Department of Health
City of Dayton, Ohio
Kansas City, Kansas Fire Department
Lower Platte North (Nebraska) Natural Resources District
South Coast (California) Air Quality Management District
Wyandotte County (Kansas)

Native American

Americans for Indian Opportunity
Council of Energy Resource Tribes
Great Lakes Indian Fish & Game Commission
National Congress of American Indians
Northwest Indian Fish Commission

International

Canadian Department of Environment
Centrum Voor Milieukunde, Leiden University (The Netherlands)
National Institute for Physical Planning and Construction Resources (Ireland)
INFOTERRA Programme Activity Center (Kenya)
International Register of Potentially Toxic Chemicals (Switzerland)
Institute for Research on Public Policy (Canada)
Ministry of Local Government and Lands (Botswana)
Ministry of Housing and Regional Planning (Uganda)
United Nations Environment Programme

Public Interest

The Conservation Foundation
Environmental Defense Fund
National Wildlife Federation
OMB Watch

Academic and Research

Environmental Systems Research Institute
Harvard University
Kansas State University
Midwest Research Institute
State University of New York—Syracuse
Trailridge Middle School
University of Cincinnati
University of Kansas
Washington University

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