

EPA-600/M-90-011

Monitoring

Our Nation's

Resources

U.S. Environmental Protection Agency
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WHY MONITORING IS NECESSARY

INTRODUCTION

This brochure describes interagency monitoring efforts to address the condition of our Nation's ecological resources. Several Federal agencies currently operate traditional chemical monitoring programs, however, the purpose of this brochure is to foster interagency cooperation and enhance integrated ecological monitoring activities. Such an ecological monitoring effort is unprecedented in scope because of the breadth of coverage that is provided by the participation of many Federal agencies having expertise in ecological and chemical monitoring. An interagency monitoring strategy is being developed to focus the effort on critical ecosystems in this country upon which our continued quality of life depends, with current representation from the following agencies:

- *National Oceanic and Atmospheric Administration - National Status and Trends Program*
- *U.S. Department of Agriculture, Forest Service - Forest Health Monitoring Program*
- *U.S. Department of Agriculture, Agricultural Research Service*
- *U.S. Fish and Wildlife Service - National Wetlands Inventory*
- *U.S. Environmental Protection Agency - Environmental Monitoring and Assessment Program*

These agencies, their programs, and other agencies that will be participating as this effort expands, will contribute capabilities to the overall success. The expertise from these organizations is integrated to address ecological problems from a multimedia perspective, providing information to enhance our Nation's ability to protect our most critical ecological resources.

There is increasing concern over potential and actual hazards to the environment from the use of over 60,000 chemicals and other man-induced stresses. While adverse effects on a local environment may be readily recognized, the build-up of pollutants both regionally and globally may not be identified until they are at a critical stage. This is especially true if pollutants pass through various segments of the environment causing delays in the response.

The Nation's land and natural resources have continually nourished our civilization. Because our original heritage was so abundant, often these resources are taken for granted. The abundance of our land and natural resources, however, has limits and the demands upon them are steadily increasing. Resources such as farmlands, fisheries, and forests can be depleted through overuse, misuse, and pollution. Reports increasingly appear on the symptoms of current or potential ecosystem problems: declining waterfowl populations as well as declining fish and shellfish harvests and blooms of toxic algae in near-coastal waters, dying high elevation forests, diseased and cancerous fish in lakes and rivers, and loss of biodiversity. Some examples of the magnitude of the pollutant and man-induced stresses on our ecological resources are:

- It is estimated that by the year 2000, over 90% of the U.S. population will live within 50 miles of a major body of water.
- Annual wetlands losses in the 1970s were estimated to be 300,000 - 500,000 acres.
- Forests throughout southern and central California, and high elevation eastern spruce forests, are weakened by high levels of air pollution. Other forests which are showing possible signs of man-induced stress include northeastern sugar maple and southeastern yellow pine.

- From 1980 to 1985, eleven coastal states suffered losses of 1,000 to 200,000 acres of productive shellfish beds.

Existing chemical monitoring efforts of various Federal agencies have collected data assessing the presence and distribution of chemicals in the environment. However, we presently lack an integrated national approach for monitoring biological indicators of ecological condition and pollutant exposure in these ecosystems. Therefore, we can not determine with confidence the scope and rate of ecological degradation or improvement in response to management and protection programs. Natural resources within ecosystems such as wetlands, forests, estuaries, croplands, fish, grasslands,



deserts, wildlife, and coastal areas must be monitored to ensure their protection from pollutants and other abuse. Monitoring should not be

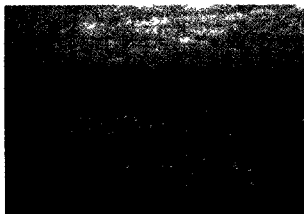
conducted for some brief period of time; rather monitoring for the preservation of the nation's ecosystems should be an ongoing process. Such an ambitious effort requires a partnership among various levels of government, as well as public and private actions.

A NEW PERSPECTIVE

As we enter the 1990's our Nation has rededicated itself to protecting the integrity and sustainability of our ecosystems. Accompanying this rededication is a new perspective of the value of ecological resources and a commitment to enhance the quality of the environment. Although significant progress has been made since Earth Day, 1970, we cannot assume that our ecosystems will have complete protection against degradation or adverse effects from man-induced stress. Some of the threats to ecosystems, such as global climate change, acidic deposition, point and nonpoint source impacts on estuaries, ozone, and loss of habitat, pose an imposing hurdle to scientists charged with addressing these problems. There is an immense need for progress on these and many other environmental issues. As the needs and goals of the nation have changed, new environmental problems and issues have been created and will require rapid, effective response.

Several Federal agencies have responsibilities for the Nation's ecological resources.

The information needed to assess fully the value and effectiveness of



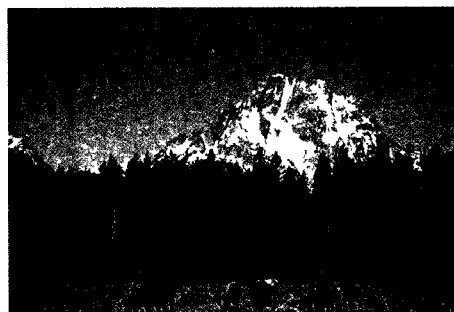
environmental protection programs and to validate the science upon which they are based, however, is limited. Federal agencies must be able to assess with certainty to what extent changes in environmental quality are occurring and the overall progress toward accomplishment of legally mandated goals for protection of ecological resources. Decision-makers must have reliable and unbiased estimates of the extent of damage to ecosystems on a regional basis. This information can be used to target most effectively available resources to identify and correct these problems.

ADDRESSING THE PROBLEMS

Addressing the environmental problems of the 21st Century requires carefully planned and executed scientific research programs that focus on the reduction of risks associated with pollution. Our ability to address and effectively manage future problems,



however, is contingent on accurate scientific information. Solutions to pollution problems require a better understanding of the scientific issues involved; better



systems for collecting, managing, and assuring the quality of the scientific data used for making decisions; improved interaction and information exchange at all levels of government, especially among Federal agencies; education of the public about environmental risk and the role of the individual citizen in environmental protection; and improved enforcement of existing environmental laws and regulations.

In the past two decades, pollution control efforts have been successful in improving the air quality in many cities, protecting thousands of miles of rivers and streams, and restoring and protecting thousands of acres of lakes. The chemical-by-chemical and site-by-site approaches of regulating environmental pollution that have historically been used appear to have been successful at reducing the impacts of pollution. These approaches based most frequently on acute toxicity studies on individual organisms, however, have not addressed the serious ecological impacts associated with long-term exposure or the subtle changes in our environment. While the risk assessment process based on pollutant characterization and mathematical models remains critical to site-specific and single pollutant effects, many threats such as cumulative pollution impacts and global climate change require the



integration of traditional data bases with enhanced ecological approaches. Presently, a limited information framework exists from which to assess the cumulative effects of pollution on ecosystems as a whole. Moreover, the need to document baseline conditions against which future changes can be assessed has become more acute as environmental issues have grown in complexity.

AN INTERAGENCY PERSPECTIVE

The public is increasingly concerned about the lack of critical scientific information on the condition of our ecological resources. Several organizations have highlighted the need for more relevant and accessible data on ecosystem conditions, which will form the basis for strategies to mitigate the problems. In response to these needs, development of a long-term research and monitoring effort has been initiated to address environmental problems resulting from cumulative pollution and other man-induced stress. The approach being implemented to address the environmental problems in the next decade includes (1) establishment of an interagency monitoring program to assess ecological status and trends and (2) development of methods to detect pollution problems before they become severe. The coordinated efforts of the agencies will attempt to accomplish the following:

- Quantify exposure of ecosystems to pollutants;
- Define the responses and consequences of ecosystem exposure to pollution;
- Determine the status and trends and rate of change of conditions in the Nation's ecosystems;
- Identify emerging pollution problems before they reach crisis proportions;
- Assess the effects of pollutants on surface water quality, ground-water resources, soils, plants, animals, and ecosystems; and
- Evaluate the effectiveness of the regulatory programs aimed at reducing exposure.

Data from integrated ecological monitoring efforts will serve a wide spectrum of users including decision-makers, research and monitoring program managers, scientists, and analysts. Such activities will serve as mechanisms to examine the current status and geographic distribution of resources such as estuaries, lakes, streams, wetlands, croplands, forests, grasslands, and deserts.

PURPOSE

Ecological monitoring will provide the scientific information needed to identify and determine the extent, magnitude, and location of deteriorating or improving environmental resources. The data derived from these activities will indicate whether serious changes are occurring in these systems, at what rate, and what are the likely causes for those changes. Accurate assessments of change require that comparative data be collected on large geographic scales over extended time periods. Monitoring changes in trends through a national, long-term approach, along with statistically based design, distinguishes this collective effort from most current ecosystem monitoring efforts. Such a comprehensive approach offers the advantages of earlier detection of problems, an improved ability to solve them, and development of more cost-effective regulations or remedial actions. The sampling design will be adaptable to a range of environmental problems and ecological resources and will facilitate the integration of data from multiple environmental resources and networks.

Ecosystems and specific areas of concern to be monitored include, but are not limited to:



- near coastal areas
- wetlands
- estuaries
- inland surface waters
- croplands
- forests
- grasslands
- deserts
- acid precipitation
- air quality

THE FUTURE

This interagency monitoring effort is designed with the commitment to evaluate the current status of our Nation's critical ecological resources. Through a comprehensive national approach, monitoring data will be collected to meet the growing need to identify trends in degrading environmental conditions. In addition, the coordinated interagency monitoring activities will complement the available data and expertise from existing programs of several organizations. As such, interagency coordination will avoid duplication of effort, facilitate the exchange of data, and increase available expertise, while maximizing the available resources. Ultimately, these essential activities will serve to protect the ecosystems upon which our Nation's quality of life depends.



ARS Agricultural Research Service



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