



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
NATIONAL EXPOSURE RESEARCH LABORATORY  
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OFFICE OF  
RESEARCH AND DEVELOPMENT

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**MEMORANDUM**

**SUBJECT:** Request for U.S. Environmental Protection Agency Science Advisory Board Review of Draft Ecological Research Program Multi-Year Plan

**FROM:** Rick A. Linderholm, National Program Director for Ecology  
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**TO:** Thomas Armitage, Designated Federal Official  
EPA Science Advisory Board Staff Office

This memorandum is to request a review by the U.S. Environmental Protection Agency Science Advisory Board of the Ecological Research Program's (ERP) draft multi-year plan (MYP). This document is intended to strategically guide the research to be conducted by the Ecological Research Program (ERP) over the next five years. It was prepared by Office of Research and Development (ORD) staff in consultation with experts and partners across the Agency. The document has been made available for public comment at <http://www.epa.gov/ord/npd/pdfs/ERP-MYP-complete-draft-v5.pdf>.

The ERP MYP will serve as the foundation for the subsequent development of implementation plans for executing the research outlined in the plan. The last MYP was completed in 2003. This new MYP represents an evolution of the research since then. Because many of the intended products from the earlier plan have been successfully delivered, the new MYP represents an expanded focus on one of the previous research areas, ecosystem services. The goal of the MYP is to improve decision making by making clear the ways in which our policy and management choices affect the type, quality and magnitude of the goods and services we receive from ecosystems.

Attached are the charge questions to the Science Advisory Board that provide background information as well as the questions that are requested as the focus of the SAB review committee's advisory on this plan.

## **Charge to the SAB Ecological Processes and Effects Committee for the advisory on EPA's Ecological Research Program Multi-Year Plan**

### **Background**

*1. The focus of the EPA Office of Research and Development (ORD) Ecological Research Program for the past 10 years has been on:*

- Developing monitoring tools and indicators to determine the status and trends of ecological resources and the effectiveness of national programs and policies.
- Developing diagnostic tools and methods to determine the causes of ecological degradation.
- Developing tools and methods to forecast the ecological impacts of actions taken by states, tribes, and EPA Offices.
- Developing environmental restoration tools and methods to improve the ability of states, tribes, and EPA Offices to protect and restore ecological condition.

*2. How is the direction of EPA/ORD ecological research is changing?*

The EPA/ORD ecological program is taking a new strategic direction that is intended to fill the need for better understanding the implications of human impacts on ecosystems and the services they provide. This new program direction recognizes that even though the nation's health, security, economic potential, and much of its culture are directly and intimately tied to ecosystem characteristics and quality, environmental policy decisions have failed to take these relationships into account. The redirected Ecological Research Program intends to build on past research efforts and existing expertise in ecosystem monitoring, restoration, and functioning to develop operational methods for routinely incorporating quantitative information on the type, quality and magnitude of changes in ecosystem services and their value into decision making. Programs developed by ORD to monitor ecosystem conditions (e.g., Environmental Monitoring and Assessment Program – EMAP, one of the largest components of the past program) will be passed to the EPA Program and Regional Offices for implementation.

*3. Why is ORD focusing on ecosystem services?*

The Ecological Research Program Multi-Year Plan describes the creation of an integrated, systems-based approach to identify, inventory, monitor, map, and model ecosystem services and to quantify these services, their value, and how they contribute to human health and well-being. This new approach takes the focus of EPA's Ecological Research Program beyond traditional ecological endpoints, e.g., biological, chemical, and physical condition. This new approach will be useful for many reasons, for example:

- It better serves EPA Programs. Using ecosystem services as a lens to evaluate and respond to environmental issues will enable EPA to expand its influence on

environmental stewardship at all levels of governance, in both the public and private sectors. Because ecosystem services are more easily valued than are traditional endpoints in the context of environmental decisions, system level trade-offs will be more apparent and thus become more a part of decision making beyond media specific regulations. Further, understanding the linkages between ecosystem services and human well-being offers the potential for framing the management of risk in new and productive ways that cut across environmental media and scientific disciplines.

- It responds to recommendations of the EPA Science Advisory Board Committee on Valuing the Protection of Ecosystem Services (CVPESS). The CVPESS has advised EPA that understanding human well-being and valuation of environmental benefits are critical to the success of the Agency's Ecological Research. The Ecological Research Program will therefore bring social scientists and natural scientists together at the outset of the Program. Doing so creates significant challenges for the Program initially, but should spur innovations in research and efficiencies in implementation as the program continues.
- It responds to recommendations of EPA's Board of Scientific Counselors (BOSC). All programs in EPA's Office of Research and Development undergo a program review every 4 to 5 years by representatives of its BOSC, a review panel similar to the SAB, focused solely on ORD research issues. In 2005, the BOSC reviewed the Ecological Research Program and noted that:

*The research, tools, and analytical technologies developed under the Ecological Research Program represent the most comprehensive federal government research program examining the provision of ecosystem services and the communication of these to decision makers.*

*...The goal and sub-questions form a body of work that should proceed as a whole. Because the ongoing work focuses on the delivery of tools to understand societal benefits of ecosystem services, new research on the provision of these ecosystem services is essential.*

- It addresses findings of the United Nations' Millennium Ecosystem Assessment (MEA). In 2005, the United Nations released the MEA which documented declines in 15 of 24 ecosystem services worldwide. These include the provision of fresh water, maintenance of wild fisheries, and natural processes that cleanse air, control regional climate, constrain outbreaks of pests and disease, and mitigate natural hazards. Publication of the MEA has drawn attention to these alarming trends of ecosystem service losses. However, one underlying barrier to the reversal of these trends, of particular interest to EPA as a science and regulatory agency, was reflected in the MEA statement:

*Even today's technology and knowledge can reduce considerably the human impact on ecosystems. They are unlikely to be deployed fully, however, until ecosystem*

*services cease to be perceived as free and limitless, and their full value is taken into account.*

4. *What are the ORD Ecological Research Program long and near-term goals?*

ORD's Multi-Year Plan describes long-term and annual goals of the Ecological Research Program, the scientific questions to be answered, and the general research approach chosen to answer the questions. The vision for the Program is that a comprehensive theory and practice for characterizing, quantifying, and valuing ecosystem services, and their relationship to human well-being is incorporated into environmental decision making at all levels of governance. In the near term, the Program will improve the science for mapping, modeling and monitoring ecosystem services. Beyond this traditional role, the Ecological Research Program will also advance awareness and acceptance of the value of ecosystem services and their influence on human well-being. The two scientific questions driving the plan are: 1) What are the effects of multiple stressors on ecosystem services at multiple scales over time? 2) What are the impacts of changes in these services on their societal value and human well-being?

Using internal resources, and a suite of unique partnerships with outside organizations (academia, nongovernmental organizations, other governmental agencies, etc.), the Ecological Research Program will conduct research designed to answer multiple questions about ecosystem services and develop multiple measures of services, including biophysical and monetary measures, to estimate incremental changes to ecosystem services. The focus will be on individual services as well as suites of bundled services associated with land, air, and water systems over explicitly defined spatial and temporal scales. This research will inform a wide range of issues related to questions of social choice, with a special focus on informing evaluation of trade-offs involving ecosystem services provided under alternative management and policy decisions. The Ecological Research Program, through its own work and that of partners, will create products in three categories: 1) measurements and dynamic maps of ecosystem services; 2) predictive models relating to the response of stressors; and 3) tools for analysis of management options.

**Overarching Charge to the SAB**

The overall goal of the Ecological Research Program is to change the way decision makers understand and respond to environmental issues by making clear the ways in which our policy and management choices affect the type, quality, and magnitude of the goods and services we receive from ecosystems. In 2005, research on conserving ecosystem services was a small part of EPA's Ecological Research Program. The Agency began planning additional research on ecosystem services immediately following the 2005 BOSC review of the program. The 2008 Ecological Research Program Multi-Year Plan is the result of that planning. ORD requests that the Science Advisory Board provide advice on the program focus, research questions, and implementation approach articulated in the Agency's proposed Ecological Research Program Multi-Year Plan. Specifically, ORD asks the SAB to respond to the following charge questions.

## **Specific Charge Questions**

### *Focus of the Program*

1. The strategic direction of the Ecological Research Program is to: a) characterize and quantify the type, quality, and magnitude of services that ecosystems provide, b) develop new methods to quantify and forecast how services respond to stressors, and c) combining these and existing tools for assessing the benefits of alternative management decisions. Please comment on the appropriateness and utility of this strategic direction in: 1) offering meaningful contributions to the ecological sciences and 2) providing research that will be useful to decision makers at EPA and other levels of governance.

### *Research Goals and Questions*

2. The Ecological Research Program includes five long-term goals, associated objectives, and research questions. Please comment on the adequacy of the goals, objectives, and questions in contributing significantly to meeting the overall purpose of the program. In reviewing each research goal please consider the following:
  - Are the research questions appropriate? If changes are needed in the research questions, please indicate how they should be changed.
  - Are the descriptions of planned research adequate to characterize the intended results, and is the planned research appropriate for accomplishing the goals?
  - Please comment on needed improvements in and clarification of the goals and objectives as well as additions or eliminations to be considered in future program development.

### *Implementation Strategy*

3. The Ecological Research Multi-Year Plan lays out the process by which ORD intends to accomplish research. Please comment on the logic model approach and provide any recommendations that should be considered in developing implementation plans.
4. Please comment on anticipated challenges to achieving the overall goal of the Ecological Research Program Multi-Year Plan based on the Program as presented. What recommendations does the Committee have to overcome the most significant of these challenges?
5. What suggestions does the committee have for measuring annually over the next five years the progress, productivity, efficiency, and effectiveness of the Ecological Research Program?
6. Does the Committee have any recommendations on how EPA can better enhance its ability to leverage available resources within and outside the Agency?