

INDICATORS OF ECOLOGICAL EFFECTS OF AIR QUALITY PROJECT

THE
HEINZ
CENTER

An initiative of
The Environmental Reporting Program

~ Linking Ambient Conditions with Ecosystem Changes ~

The Need for Indicator Development

To scientifically assess the strength of its air pollution control strategies, U.S. EPA needs improved understanding and monitoring of the effects of air pollutants on ecosystems. Indicators have been developed for some ecosystem effects, such as altered stream chemistry, however, indicator development and integration is needed for other ecosystem characteristics that might be affected by air quality (e.g., coastal eutrophication, agricultural productivity).



A Heinz Center Project

Through a cooperative agreement with EPA's Clean Air Markets Division, the Heinz Center is developing a suite of indicators to inform environmental data collection and integrated assessment of ecosystem response to changes in air quality. This project expands on the *State of the Nation's Ecosystems* project (www.heinzctr.org/ecosystems) by investigating ecosystem responses specific to changes in air quality.

Project Implementation

Through a multi-stakeholder, technically-based approach, this project will identify indicators that demonstrate the links between ecosystem exposure and response where they are strongly established. The project Steering Committee will oversee three technical subcommittees charged with providing guidance for metric selection and modeling experiments:

- *What are the most important ecological effects metrics?* The Ecological Change subcommittee has identified well-documented and widespread ecological responses to air pollutants (i.e., ecological conditions that are sensitive to changes in air quality over time).
- *What are the most important air pollutant exposure metrics?* The Air Quality subcommittee has recommended the most relevant aspects of ecosystem exposure to air pollutants (e.g., atmospheric composition, deposition) for examining ecological responses to air quality.
- *How are they linked ecologically?* The Analysis subcommittee is designing specialized analyses of the relationships between exposure and response variables to evaluate the role of air quality in changing ecosystem condition and identify the most useful metrics.



For more information contact Christine Negra
Negra@heinzctr.org or (202) 737-6307

Project Elements

This project will produce a major publication that recommends national level indicators and describes data systems to support them. Major building blocks for this report include:

Literature review. A preliminary review of scientific work on ecosystems and air pollution, including more than 150 peer-reviewed journal articles and government-sponsored reports, is being used to catalogue common measures of ecosystem properties that respond to air pollutant exposure as well as to develop a conceptual model of the multiple impacts air pollution can have on the chemical and biological condition of ecosystems.

Candidate indicators. Indicators of ecological condition have been selected from high-profile environmental reporting projects (e.g., *The State of the Nation's Ecosystem's*, *EPA's Draft Report on the Environment*, reports from the forest and rangeland sustainable roundtables and the NRC's *Ecological Indicators for the Nation*), as well as other environmental indicator projects identified in the 2004 GAO *Environmental Indicators* report (e.g. *The State of the Great Lakes*). These and other candidate indicators will be reviewed for their ecological linkages to air pollutants.



Modeling studies. Modeling experiments will be commissioned to quantify the strength of associations between exposure and response metrics. Two general approaches will be considered: (1) statistical tests of proposed exposure and response indicators to assess if they adequately represent exposure-response linkages; (2) experiments with ecosystem models that simulate ecosystem condition and functioning with and without the influence of air pollutants at different concentrations/depositions.

Assessment of data systems. An evaluation of available data systems will include programs that monitor ambient concentrations, deposition and ecological conditions as well as remote sensing.



About the Environmental Reporting Program...

For nearly a decade, the Heinz Center has pioneered the effort to provide decision-makers and the public with useful, science-based and neutral information on the state of the nation's lands, waters and living resources.

“Our vision is the establishment of an integrated, coherent national system for gathering & delivering environmental information to support the stewardship of the resources we depend on.”

About the Heinz Center...

Established in 1995 in memory of the late Senator John Heinz, the Heinz Center is a nonpartisan, nonprofit organization that brings business, government, academia and environmental groups together to foster consensus on environmental policy solutions.

THE H. JOHN HEINZ III CENTER FOR SCIENCE, ECONOMICS AND THE ENVIRONMENT
900 17th Street, NW Suite 700 Washington, D.C. 20006
Tel: (202) 737-6307 Fax: (202) 737-6410 www.heinzctr.org