United States
Environmental Protection
Agency

EPA/600/9-90/007
February 1990

EPA

Request for Applications BIO-01-90

Identification and Evaluation of Endpoints and Indicators of Ecosystem Health

Background

The Ecosystems and their component organisms are continually exposed to stresses, both natural and anthropogenic. One task of EPA is to determine whether systems are sufficiently stressed by anthropogenic agents to cause damage. Problems to be addressed by scientists are the difficulty in detecting stress and to identify the causative stressors. These problems are particularly acute because of the interactive nature of stress, in which multiple anthropogenic factors act in an integrated manner with multiple natural stressors.

The following is presented as a conceptual basis for a research program to address these problems. Organisms exposed to stress undergo a predictable sequence of changes in response to stress. At low to moderate levels of stress, behavioral responses (avoidance), acclimation (physiological response) and compensation occur. Acclimation and compensation allow organisms to continue functioning while exposed to a stressor, but growth and allocation costs are incurred. At some level of stress, adaptation (genetic response) occurs. When the stress exceeds the ability of organisms to acclimate, or exceeds the ability of populations to adapt, damage occurs. Each of these processes produces measurable changes in ecosystems, populations, and organism states and processes. Detection of acclimation or compensation could serve as an early warning, which would trigger more intensive monitoring of a system. These changes may or may not result in degradation, but they may provide information about causal factors.

The development of new tools and criteria for detecting stress and determining the cause(s) would enhance the ability of EPA to assess the impacts of anthropogenic stress, and would play a particularly important role in early detection of ecosystem change due to stress.

Scope

The purpose of this Request for Application (RFA) is to promote research on identifying and evaluating biological endpoints and indicators of ecosystem health and stress response. An endpoint is defined as that component or characteristic of an ecological system that humans care about. It may be at a species level (e.g., endangered species, economically important species, nuisance species), a community level (e.g., species diversity or richness), at an ecosystem level (e.g., nutrient cycling, production). Changes in the state or trends of one or more ecological endpoints would constitute a change in the ecological system (which separately is evaluated with respect to the social importance or acceptability of the change).

An indicator, on the other hand, is a specific organism or measures (proteins, macromolecule) that characterizes that endpoint, either directly (e.g , the population level of an endpoint species) or indirectly (e.g., coliform count as an indicator of water contamination). Ecological research is needed to identify the types of endpoints that are appropriate for different ecosystems and the particular types of indicators most appropriate for characterizing endpoints. Of particular importance are those biological indicators and endpoints which can distinguish between anthropogenic and natural disturbances.

For the purposes of this RFA, the focus should be limited to biological indicators applicable to freshwater and estaurine ecosystems including water column and sediment organisms at all trophic levels including surface microlayers. Topics of interest include, but are not restricted to, identifying bioindicators of anthropogenic stresses, determining specificity and sensitivity of endpoint bioindicators, and developing approaches for using multiple bioindicators. Of interest also are macromolecule and microbial plasmids that may be used to characterize the state of an ecosystem.

Mechanism of Support

Assistance under this RFA will be provided by a research grant, administered through EPA's investigator-initiated research grants program. The applicant will be responsible for the planning, direction and execution of the proposed research. Support under this program is limited to non-profit organizations and educational institutions.

Approximately 1.0 million dollars will be available from fiscal 1990 funds and it is estimated that 4 to 6 projects will be

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supported for a period of two years each. This RFA is for a single competition with a deadline of **April 17, 1990.**

The Application

Each application will consist of **Application for Federal Assistance** forms (standard forms 424 and 424A), separate sheets providing the budget breakdown for each year of the project, curriculum vitae for the principal investigator, abstract of the proposed project, and a project narrative. All certification (drug free work-place, etc.) forms must be signed and included with the application. Attachments, appendices or other materials included in addition to those identified above will not be forwarded to the reviewers. Application forms, instructions, and other pertinent information are contained in the Federal grant application kit obtainable from:

Research Grants Staff (RD-675)
U.S. Environmental Protection Agency
401 M Street S.W.
Washington, DC 20460

or by calling (202) 382-7445.

Special Instructions

1. Project narrative or proposal must not exceed 30 single sided 8-1/2 by 11 inch pages. Typeface must be standard 10-12 characters per inch.
2. CVs or resumes must not exceed 2 pages for each principal investigator and should focus on education, positions held and most recent or related publications.
3 Project period should not exceed two years.
4. Aplication in response to this RFA must be identified by printing "RFA BIO-01-90 in the upper right hand corner of the EPA assistance applications form." The absence of this identifier from an application absolves EPA of any responsibility if it is not reviewed along with the other applications responding to this RFA.

Application Review

All applications in response to this solicitation will be reviewed at a single meeting of a scientific peer panel which will evaluate and rank each proposal according to its scientific merit as a basis for recommending agency approval or disapproval. The panel will consider:

- quality of research plan (including theoretical and/or experimental design, originality, and creativity), qualifications of the research team,
- availability and adequacy of facilities and equipment, and
- appropriateness of the proposed budget.

Application Submission

The original and eight copies of the application must be received no later than the close of business, **April 17, 1990**, to be considered. The applications must be sent to:

Grants Operations Branch (PM-216F)
Grants Administration Division
U.S. Environmental Protection Agency
401 M Street S.W.
Washington, DC 20460

Staff Contact

Questions relating to this solicitation may be directed to Clyde Bishop by telephone on (202) 382-7445.

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