Office of Energy Research

Notice 97-02
Joint Program on Terrestrial Ecology and Global Change

Department of Energy
Office of Energy Research

Joint Program on Terrestrial Ecology and Global Change Notice 97-02

AGENCY:

Department of Energy (DOE)
National Science Foundation (NSF)
National Aeronautics and Space Administration (NASA)
U.S. Department of Agriculture (USDA)
Environmental Protection Agency (EPA)

ACTION: Notice inviting grant applications

SUMMARY: In concert with the U.S. Global Change Research Program (USGCRP) and with the intent of enhancing interagency collaboration, the Department of Energy (DOE), the National Science Foundation (NSF), the National Aeronautics and Space Administration (NASA), the United States Department of Agriculture (USDA), and the Environmental Protection Agency (EPA) announce their interest in receiving applications for support of grants that seek to augment research on terrestrial ecology as it relates to global environmental changes. This request for applications encourages multi-disciplinary applications involving companion experimental/ manipulative and modeling efforts to provide critically needed data and information for improved predictions of global change phenomena in three equally important areas: (1) the consequences of global-scale environmental changes on terrestrial ecosystems, (2) the role of terrestrial ecosystems as a source or sink of carbon dioxide and other trace gases, and (3) the interactions and feedback between terrestrial ecosystems and the atmosphere and between linked ecosystems at watershed and landscape scales.

This request for applications extends the research begun as a result of the first two Terrestrial Ecology and Global Change (TECO) competitions in FY 1995 and FY 1996. It also extends current USGCRP activities supported by the five participating agencies that are relevant to this notice. These activities include the NSF Ecological Rates of Change (EROC), Water, Energy, Atmosphere, Vegetation and Earth (WEAVE), Land Margin Ecosystem Research (LMER), and Ecological Diversity (ED), the DOE Program on Ecosystem Research (PER), Terrestrial Carbon Processes (TCP), and the National Institute for Global Environmental Change (NIGEC), the NASA programs on Terrestrial Ecology and Land Cover and Land Use Change, the USDA programs on Forest/Range/Crop/Aquatic Ecosystems, Soils and Soil Biology, and Plant

Responses to the Environment (PRE), and the EPA program on Regional Ecological Vulnerabilities to Climate Change.

Applications submitted in response to this interagency announcement are to be submitted to DOE. Each agency supporting an award, however, will act as the sole administrative unit for that award. All successful awards will be identified with the joint effort. The participating agencies will jointly manage the TECO program throughout the entire phase from the receipt and review of applications until the close-out of awards.

It is expected that 15-18 awards up to 3 years in duration and not exceeding $500,000 per year will be issued subject to the availability of FY 1997 funds. Applications submitted under this notice will be managed, prior to award selection decisions, in accordance with the DOE Office of Energy Research's (ER's) Financial Assistance Program Regulation 10 CFR Part 605 as published in the Federal Register September 3, 1992 (57 FR 40582).

DATES: Submission of an original and 18 copies of each application must be received no later than 4:30 p.m. E.S.T., February 28, 1997, in order to be accepted under this notice and to permit timely consideration for award by the participating agencies during FY 1997.

ADDRESSES: Formal applications referencing Program Notice 97-02 on the cover page must be sent to: U.S. Department of Energy, Office of Energy Research, Grants and Contracts Division, ER-64, 19901 Germantown Road, Germantown, MD 20874-1290, Attn: Program Notice 97-02. The above address for formal applications must also be used when submitting formal applications by U.S. Postal Service Express Mail, any commercial mail delivery service, or when hand carried by the applicant.

FOR FURTHER INFORMATION CONTACT: Dr. Jerry Elwood, Office of Energy Research, U.S. Department of Energy, Office of Health and Environmental Research, ER-74, 19901 Germantown Road, Germantown, MD 20874-1290, telephone: (301) 903-4583, E-mail: jerry.elwood@oer.doe.gov; Dr. Roger Dahlman, Office of Energy Research, Office of Health and Environmental Research, ER-74, 19901 Germantown Rd., Germantown, MD 20874-1290, telephone: (301) 903-4951, E-mail: roger.dahlman@oer.doe.gov; Dr. Scott Collins, Division of Environmental Biology, Room 635 National Science Foundation, 4201 Wilson Blvd., Arlington, VA 22230, telephone: (703) 306-1479, E-mail: scollins@nsf.gov; Dr. Andy Phillips, Division of Integrative Biology and Neuroscience, Room 685, National Science Foundation, 4201 Wilson Blvd. Arlington, VA 22230, telephone: (703) 306-1421, E-mail: jphillip@nsf.gov; Dr. Diane E. Wickland, Terrestrial Ecology Program, Office of Mission to Planet Earth, National Aeronautics and Space Administration, Washington, D.C. 20546, telephone: (202) 358-0245, E-mail: Diane.Wickland@hq.nasa.gov; Dr. Anthony C. Janetos, Land Cover and Land Use Change Program, Office of Mission to Planet Earth, National Aeronautics and Space Administration, Washington, D.C. 20546, telephone: (202) 358-0276, E-mail: Anthony.Janetos@hq.nasa.gov; Dr. Timothy C. Strickland, National Research Initiative Competitive Grants Program, U.S. Department of Agriculture, Ag Box 2241, Washington, D.C. 20250-2241, telephone: (202) 401-4082, E-mail: tstrickland@reeusda.gov; Ms. Barbara M. Levinson, Office of Research and Development, Environmental Protection Agency, 401 M Street, N.W., Mail Code 8723, Washington, D.C. 20460, telephone: (202) 260-5983, E-mail:

Levinson.barbara@epamail.epa.gov; Dr. Robert Menzer, Office of Research and Development, Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460, telephone: (202) 260-5779, E-mail: menzer.robert@epamail.epa.gov

SUPPLEMENTARY INFORMATION: In concert with the U.S. Global Change Research Program (USGCRP) and with the intent of enhancing interagency collaboration, the National Science Foundation (NSF), the Department of Energy (DOE) , the National Aeronautics and Space Administration (NASA), the United States Department of Agriculture (USDA), and the Environmental Protection Agency (EPA) seek to augment terrestrial ecological research with this special competition. This competition will allow more comprehensive research on the combined response of terrestrial ecosystems to global-scale environmental changes that are occurring or are expected to occur and the influence of terrestrial ecosystems on environmental phenomena.

In recent decades, extensive efforts have been made to characterize and monitor the distribution and state of terrestrial ecosystems. Various global-scale environmental changes that are known or have the potential to affect terrestrial ecosystems have already been documented (e.g., increasing atmospheric CO2 and other trace gases, global average increase in temperature, decreasing stratospheric ozone and increases in tropospheric ozone, and land transformations, including changes in land cover and land use). Some of these changes are expected to continue, if not increase due to continuing human activities. Other potential global-scale environmental changes could occur in the future due directly or indirectly to human activities (e.g., altered precipitation patterns, increased severity and frequency of extreme events related to climate change). Presently, what is lacking is an understanding of the potential combined effects of global-scale environmental changes on essential ecosystem components, functions, and processes, particularly the effects of multiple and interacting environmental changes such as changes in climate and atmospheric composition and land transformations that are outside the range normally experienced by terrestrial ecosystems. There are also significant uncertainties regarding the role of terrestrial ecosystems in affecting global-scale changes and how natural and human-induced changes in terrestrial ecosystems may influence global phenomena. It is unclear from existing information how the essential functions of species or ecosystems are being or will be affected by global environmental changes in the future, on scales from individual organisms to populations, communities, ecosystems, landscapes and subcontinental regions. Without the ability to make such projections, implications for the sustainability of ecosystems as a support system for humans remain uncertain.

The goal for this research is to improve the scientific understanding of how species, ecological characteristics and processes, and ecosystems effect and are affected by global change over a range of time scales. To enhance capabilities to assess the probable consequences of multiple influences (e.g., concurrent changes in climate, atmospheric composition, land transformations/ land use) and their feedback effects. The research also will increase the capability for extending experimentally-derived information obtained at smaller geographical scales (e.g., plot-size, stand-level, patch-size) and shorter time frames (e.g., growing seasons) to landscape and larger scales (e.g., regions, river basins) at longer temporal intervals (e.g., decades, centuries).

To achieve this scientific understanding, innovative field experiments and observational studies are needed to address interactions of ecological processes and combinations of effects related to

global change; to relate observed effects to causative factors; and to test predictive response models. Also, to improve predictability, new modeling efforts will be needed for extrapolating information to other systems and across multiple scales that will contribute to the development of regional and subcontinental models and ecological models that are fully interactive with other Earth system models (e.g., Dynamic Global Vegetation Models). Agencies involved in this interagency announcement encourage multi-disciplinary applications involving companion experimental, manipulative and modeling efforts to provide critically needed data and understanding for improved predictions of global change phenomena in the following, equally important areas:

(1) Consequences of Global Change on Ecosystems.

The goal of research in this area is to provide a stronger scientific basis for understanding, predicting, and assessing the effects of human-induced and natural influences on terrestrial ecosystems, including aquatic ecosystems imbedded within terrestrial ecosystems (e.g., streams, lakes, wetlands). It is hypothesized that ecosystems are changing or will change in response to climate and land use changes of the past century and predicted future changes due to the enhanced greenhouse effect and increasing demands on land for food, fiber, and other human uses. Understanding the consequences of these and other global-scale changes on terrestrial ecosystems, organisms, and resources presents unprecedented challenges because many other types of change are occurring simultaneously. There is a need to understand how existing terrestrial ecosystems are likely to respond to ongoing or predicted environmental changes, and to relate observed changes to likely causes using experimental approaches that examine phenomena at multiple scales. There is also a need to consider the adaptive potential of terrestrial ecosystems to environmental changes and to incorporate the influence of ongoing adaptive changes through time. Also, the research needs to provide the quantitative information for models that generalize from selected study sites to broader areas at local, regional and global levels at multiple temporal scales.

The focus of research on consequences should be on improving the scientific understanding of how the structure and function of terrestrial ecosystems will respond to global change, including changes in land use and land cover, climate, and atmospheric composition. The research should improve the scientific basis for assessing the vulnerability of different ecosystems to global changes, including the potential beneficial and adverse effects of such changes on ecosystem components and processes of utilitarian and/or intrinsic value to humans. This capability should also include projecting potential ecological effects of future environments that many ecological communities may not yet have experienced, and the potential role of natural selection in driving these changes. Experimental and modeling research is encouraged:

- To understand and predict how ecosystem processes (e.g., net primary production, respiration, net ecosystem productivity) are affected by combinations of altered atmospheric CO2 and other trace gas concentrations (e.g., ozone), different climate conditions, changing resource constraints (e.g., nutrients, water and light), and changing land-use patterns (e.g., urban/suburban sprawl, conversion of forest to other uses);
- To identify and quantify the mechanism(s) or process(es) controlling observed responses to altered climatic and atmospheric conditions and altered land cover or land use, and to

understand both the potential for these mechanisms and processes to undergo adaptation to the changes through physiological adaptations and natural selection, and the consequences of adaptive responses and evolutionary changes on ecosystem function;
- To investigate trends, patterns, and relationships among vegetation, climate, and land use to document and understand the interaction between natural and human-dominated systems;
- To determine how biological and ecological responses to global-scale environmental changes are manifested at higher levels of ecosystem hierarchy (populations, communities, ecosystem, landscape) of terrestrial environments;
- To identify changes in structural components (e.g., landscape pattern, community structure, architectural properties of vegetation), caused by different atmospheric, climatic, and land-use activities that will predict the future structure and distribution of ecosystems;
- To understand and predict the effects of combinations of altered CO2, climate conditions, changing resource constraints and land-use change on biodiversity (e.g., genetic diversity, species diversity, habitat diversity).

(2) Carbon, CO2, and Other Trace Gases Related to Global Change.

The goal of research in this area is to improve the scientific basis for understanding, predicting and assessing the quantitative role of the terrestrial biosphere as a source or sink of radiatively active trace gases such as carbon dioxide, methane, and nitrous oxide. The combined results of process, observation, and global modeling studies strongly suggest that terrestrial ecosystems must be taking up and storing significant amounts of carbon each year, yet we do not know where it is going, how long this might continue, and whether this storage will be permanent or only temporary. Improved databases, experiments and process models are needed:

- To understand complex interactions that control exchange of CO2 and other trace gases between the biosphere and the atmosphere for representative terrestrial ecosystems;
- To develop databases for the use, intercomparison, and testing of process-based models of net ecosystem productivity, including data to quantify carbon content of terrestrial ecosystems and estimate how sources and sinks of carbon are changing;
- To measure continental atmospheric CO2, carbon isotopes, and oxygen to better quantify processes of terrestrial carbon cycles.

(3) Ecosystem Feedbacks to Global Change.

The goal of research in this area is to improve the scientific understanding of the full range of interactions and feedbacks between terrestrial ecosystems and the atmosphere (e.g., water and energy exchange, aerosol exchange, nutrient fluxes), and between linked ecosystems at a landscape scale by, for example, biotic propagule dispersal, land-water interactions, biogeochemical linkages. Research is encouraged on how species composition, ecological properties and processes, changes in land use or land management practices influence the ability of ecosystems, for example:

- To control or modify physical factors such as albedo, regional precipitation, wind speed, and particulate movement in water and air;
- To control the movement of biological propagules between ecosystems and affect the spread of indigenous and non-indigenous species, including pest species across the landscape.
- To control biogeochemical cycling and nutrient deposition, retention and transport that affect soil fertility, and water quality;
- To regulate the exchange of energy, water, trace gases, aerosols, and biotic materials between the atmosphere and terrestrial environment under variable and/or changing climatic conditions.

Research is also encouraged on the development and testing of coupled land-atmosphere models that include interactive surface-atmosphere processes in integrative global models.

Research proposed for this competition is encouraged to take advantage of existing programs, research sites and facilities, or data sets of other agencies with multi-disciplinary efforts. Examples of such existing efforts are: NASA field campaigns (FIFE, BOREAS), DOE's National Environmental Research Parks (NERPS), Free-Air CO2 Enrichment (FACE) field sites, the Atmospheric Radiation Measurement (ARM) Southern Great Plains site, and Program on Ecosystem Research (PER) sites, NSF's Long Term Ecological Research (LTER) sites and Land Margin Ecosystem Research (LMER) sites, and USDA's Management Systems Evaluation Areas (MSEA). Applications involving the establishment of new long-term research facilities or study sites must clearly demonstrate the need for such facilities, including the unique research opportunities they would provide.

In addition to interest in applications in these three areas, one-year scoping applications will also be considered that involve developing and demonstrating the feasibility of new experimental approaches and/or facilities for field studies to investigate the responses and/or feedback effects of terrestrial ecosystems to global environmental changes. The agencies involved in the TECO program recognize the need for new, innovative field experimental approaches and facilities to study interactive effects of environmental changes on terrestrial ecosystems. Accordingly, this announcement also seeks one-year scoping applications to design and test the feasibility of new approaches and/or field experimental systems for studying the effects of environmental changes on ecosystems. Such scoping applications should be clearly identified as such in the title of the application.

ADMINISTRATIVE INFORMATION: To provide a consistent format for the submission and review of grant applications submitted under this notice, the preparation and submission of grant applications must follow the guidelines given in the Application Guide for the Office of Energy Research Financial Assistance Program 10 CFR Part 605.

Information about the development and submission of applications, eligibility, limitations, evaluation, the selection process, and other policies and procedures may be found in 10 CFR Part 605, and in the Application Guide for the Office of Energy Research Financial Assistance Program. The Application Guide is available from the U.S. Department of Energy, Office of Energy Research, ER-74, 19901 Germantown Road, Germantown, MD 20874-1290. Telephone

requests may be made by calling (301) 903-3338. Electronic access to ER's Financial Assistance Application Guide and forms is possible via the World Wide Web at: http://www.er.doe.gov/production/grants/grants.html.

Interested scientists at Federal agencies and Federally owned or operated laboratories, including Federal-Funded Research and Development Centers (FFRDC) must contact the web site http://www.er.doe.gov/production/grants/lab97_02.html for information on this program, or seek information from a relevant agency contact listed above under the section entitled FOR FURTHER INFORMATION CONTACT.

All U.S. institutions eligible to receive grant support from DOE, NSF, NASA, USDA, and EPA may submit applications in response to this notice. NSF will not fund applications from FFRDCs.

Applications will be subjected to formal merit review (peer review) and will be evaluated against the following evaluation criteria which are listed in descending order of importance codified at 10 CFR 605.10(d):

1. Scientific and/or Technical Merit of the Project.

2. Appropriateness of the Proposed Methods or Approach.

3. Competency of Applicant's Personnel and Adequacy of Proposed Resources.

4. Reasonableness and Appropriateness of the Proposed Budget.

As part of the evaluation, program policy factors such as the relevance of the proposed research to the terms of the announcement and an agency's programmatic needs, are also criteria used in the selection process. Note that external peer reviewers are selected with regard to both their scientific expertise and the absence of conflicts-of-interest. Both Federal and Non-federal reviewers may be used, and submission of an application constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

Applications must not exceed 15 pages for the project description section; visual materials and tables count toward the 15 page limit. No letters of endorsement or other appendices are allowed. Applications may request funding for projects with a duration not to exceed three years and a total budget not to exceed $500,000 per year. Final selection of awards by participating agencies will be determined by the review panel's recommendations and programmatic considerations. Each award will be supported by a single agency. Overall the estimated amount of funding for this program is $7M in FY 1997, depending on the availability of funds from each agency. Principal investigators may be requested to modify their budgets and work plans to comply with special requirements of the particular agency supporting their award. The principal investigator of an award will be requested to travel to Washington, DC for an annual meeting of all principal investigators to discuss additional collaboration, sharing of information and interaction of efforts among successful projects funded through TECO and other global change programs mentioned above. Budget requests should include travel costs to attend such a meeting.

DOE awards made as a result of this notice will be administered in accordance with the DOE Office of Energy Research Financial Assistance Program (10 CFR Part 605).

NSF awards made as a result of this notice will be administered in accordance with the terms of conditions of SF GC-1, Grant General Condition or FDP-II, Federal Demonstration Project. Copies of these documents are available at no cost from the NSF Form and Publication Unit, telephone: (703) 306-1130, or via E-mail: (internet: pubs@nsf.gov). More comprehensive information is contained in the NSF grant Policy Manual (NSF 95-26, July 1995), for sale through the Superintendent of Documents, Government Printing Office, Washington, DC 20402. The telephone number at GPO is (202) 783-3238 for subscription information.

NASA grant or cooperative agreement awards made as a result of this notice will be administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NHB 5800.1).

USDA award authority for this program is contained in section 2(b) of the Act of August 4, 1965, as amended (7 U.S.C. 450i(b)). Under this program, subject to the availability of funds, the Secretary may award competitive research grants for periods not to exceed five years for the support of research projects to further the programs of the Department of Agriculture (USDA). Applications may be submitted by any state agricultural experiment station, college, private organization, corporation, or individual. Applications from scientists at non-United States organizations will not be considered for support. Pursuant to Section 712 of Public Law 103-330 (the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 1995) funds available in fiscal year 1995 to pay indirect costs on research grants award competitively by CSREES may not exceed 14 per centum of the total Federal funds provided under each award. In addition, pursuant to Sec. 719(b) of public Law 103-330, in the case of any equipment or product that may be authorized to be purchased with the funds provided under this Program, entities are encouraged to purchase only American-made equipment or products.

The Catalog of Federal Domestic Assistance Number for this program is 81.049, and the solicitation control number is ERFAP 10 CFR Part 605.

John Rodney Clark
Associate Director
for Resource Management
Office of Energy Research

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