

Environmental Synthesis Center (ESC)

PROGRAM SOLICITATION NSF 10-521



National Science Foundation
Directorate for Biological Sciences

Preliminary Proposal Due Date(s) (required) (due by 5 p.m. proposer's local time):

March 23, 2010

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):

July 14, 2010

IMPORTANT INFORMATION AND REVISION NOTES

Please be advised that the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) includes revised guidelines to implement the mentoring provisions of the America COMPETES Act (ACA) (Pub. L. No. 110-69, Aug. 9, 2007.) As specified in the ACA, each proposal that requests funding to support postdoctoral researchers must include a description of the mentoring activities that will be provided for such individuals. Proposals that do not comply with this requirement will be returned without review (see the PAPP Guide Part I: *Grant Proposal Guide* Chapter II for further information about the implementation of this new requirement).

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Environmental Synthesis Center (ESC)

Synopsis of Program:

This solicitation will establish a new environmental synthesis center to stimulate research, education and outreach at the interface of the biological, geological, and social sciences. The center will foster synthetic, collaborative, cross-disciplinary efforts to understand and predict the complex interactions among ecological populations, communities and ecosystems, the geophysical environment, and human actions and decisions that underlie global environmental change. It will play a pivotal role in forecasting adaptive responses to environmental change and understanding sudden shifts in dynamic systems. The center will also directly involve policy makers, managers, and conservation efforts, and educate an informed citizenry. The center will be international in its scope, addressing the most pressing challenges posed by global environmental change. The center represents a new effort, based on NSF's substantial investments in ongoing synthesis activities, and is not intended to extend or duplicate these activities. The Biological Sciences Directorate expects this center to lead the next generation of synthesis activities.

Cognizant Program Officer(s):

- Saran Twombly, telephone: (703) 292-8133, email: stwombly@nsf.gov
- Kathleen C. Weathers, telephone: (703) 292-8227, email: kweather@nsf.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.074 --- Biological Sciences

Award Information

Anticipated Type of Award: Cooperative Agreement

Estimated Number of Awards: 1 One award with a budget up to \$6,000,000 per year for up to five years is anticipated, contingent on the quality of proposals received and pending the availability of funds

Anticipated Funding Amount: \$30,000,000 Up to \$30,000,000 over a five-year period. The initial term of the award is expected to be five years, with the potential for one terminal renewal for an additional five years, subject to performance and availability of funds. Note that the maximum period NSF will support the center is 10 years. We strongly encourage creative thinking about the potential range of activities that might occur at this center and their budgetary needs.

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.
- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.

PI Limit:

Only a single investigator may appear on the cover sheet of a preliminary or full proposal. This individual should be the intended center director or provisional director. No co-PIs are allowed.

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposals:** Submission of Preliminary Proposals is required. Please see the full text of this solicitation for further information.
- **Full Proposals:**
 - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg .
 - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required under this solicitation.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

- **Preliminary Proposal Due Date(s) (required)** (due by 5 p.m. proposer's local time):
March 23, 2010
- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):
July 14, 2010

Proposal Review Information Criteria

Merit Review Criteria: National Science Board approved criteria. Additional merit review considerations apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions: Additional award conditions apply. Please see the full text of this solicitation for further information.

Reporting Requirements: Additional reporting requirements apply. Please see the full text of this solicitation for further information.

TABLE OF CONTENTS

Summary of Program Requirements

- I. Introduction
- II. Program Description
- III. Award Information
- IV. Eligibility Information
- V. Proposal Preparation and Submission Instructions
 - A. Proposal Preparation Instructions
 - B. Budgetary Information
 - C. Due Dates
 - D. FastLane/Grants.gov Requirements
- VI. NSF Proposal Processing and Review Procedures
 - A. NSF Merit Review Criteria
 - B. Review and Selection Process
- VII. Award Administration Information
 - A. Notification of the Award
 - B. Award Conditions
 - C. Reporting Requirements
- VIII. Agency Contacts
- IX. Other Information

I. INTRODUCTION

Synthesis is the process of putting together disparate data, concepts or theories to generate new knowledge or understanding (e.g., Carpenter et al. 2009). Over the past 20 years, it has become essential for progress in the ecological and environmental sciences. Solutions to the central challenges in ecology increasingly encompass the physical and social sciences, and synthesis of existing data across a broad spectrum of disciplines is needed to address environmental questions and problems. Synthesis facilitates scientific efficiency in the face of growing empirical data at the same time that it accelerates scientific discovery and novel insights. The recent success of several, diverse synthesis efforts raises new challenges, among them identifying the most successful modes and models of synthesis and integrating the allied fields critical for solving pressing environmental problems.

The promises of novel approaches to synthesis are exciting and wide reaching. Education and training in ecology and environmental sciences are intrinsically synthetic, and innovation is essential to the cultural shifts required to train a more capable workforce and citizenry. Beyond its necessity for innovation in basic science, synthesis is increasingly needed for finding novel and effective solutions for pressing environmental problems. It is essential to assess complex causes that have social, physical and biological origins. The activity of synthesis by definition requires obtaining, managing, using and storing large amounts of information obtained through multiples modes of inquiry; next generation synthesis activities will demand increasingly interactive, integrative and collaborative work. New cyberinfrastructure developments will facilitate the cross-disciplinary collaboration necessary by making resources more accessible. Synthesis itself is synergistic and proactive, and will lead to the emergence of new ideas or fields of inquiry that were unexpected before the synthesis took place. It can contribute uniquely to the identification of future research needs and methods, such as those associated with new observational networks, and will provide opportunities to address new research frontiers in a more organized way than has been previously possible.

Few challenges require synthesis as urgently as global environmental change, which is proceeding at an unprecedented scope, scale and speed. The resulting challenges surpass, in their scale and complexity, any that scientists have grappled with to date. Biological adaptation lies at the heart of global environmental change, as the ways in which life on Earth responds to, and subsequently drives, geophysical events dictate the trajectories and the dynamics of global change. At the same time, human decisions and behavior increasingly complicate and accelerate the rate of environmental change. The shift from viewing people as an external impact to integral components of ecosystems requires inclusion of social as well as ecological processes in feedback loops. Because of its complexity, environmental problem solving requires synthesis across the biological sciences, computational sciences, geosciences, social sciences, engineering, and educational research to transform our understanding of ecological systems - both terrestrial and oceanic - and the practice of ecological research and ecological education. Synthesis has great potential to produce novel insights at a faster pace, resulting in broader perspectives and solutions, than more traditional approaches to ecological problems.

The new center for environmental synthesis will be international in scope, funded at a level that allows researchers from around the world to participate in synthesis using diverse, leading edge methods that will address issues and problems at a global scale. NSF expects this center to interact with other synthesis centers and activities, environmental observatory networks (e.g., National Ecological Observatory Network (NEON), Ocean Observatories Initiative (OOI); PAGES (Past Global Changes); GLOBEC (Global Ocean Ecosystem Dynamics)), and the Long Term Ecological Research (LTER) network, particularly in the areas of developing shared cyberinfrastructure and bioinformatics tools. The successful center will also collaborate with centers and organizations that use effective, innovative methods of GK-16 and informal science education.

Reference

Carpenter, S.R., E.V. Armbrust, P.W. Arzberger, F.S. Chapin III, J.J. Elser, E.J. Hackett, A.R. Ives, P.M. Kareiva, M.A. Leibold, P. Lundberg, M. Mangel, N. Merchant, W.W. Murdoch, M.A. Palmer, D.P.C. Peters, S.T.A. Pickett, K.K. Smith, D.H. Wall, A.S. Zimmerman. 2009. Accelerate Synthesis in Ecology and Environmental Sciences. *BioScience* 59: 699-701.

II. PROGRAM DESCRIPTION

General Characteristics

A new synthesis effort at the interface of biological, geological, and social sciences is expected to play a vital role in addressing fundamental ecological questions that require tools, approaches, and input from diverse, related disciplines. The decision to solicit proposals for such a center is based on NSF's substantial investments in synthesis; it is incumbent on the proposers to build on, and not to duplicate, NSF's current investments to develop the next generation of synthesis. The center is expected to catalyze progress in ecological responses to global change through synthesis of complex data, and to advance environmental science through creative and innovative synthesis activities. It will lead efforts to educate the next generation of scientists, enable discovery through access to existing information and lead efforts in outreach to the general public.

Goals of this new activity include, but are not limited to:

- Understanding the feedback loops and tipping points that are essential characteristics of global oceanic and terrestrial environmental change
- Reducing the time required to address pressing environmental questions and problems
- Focusing on cross-disciplinary solutions
- Integrating diverse disciplines to achieve the goals of forecasting and prediction
- Understanding recent environmental change since humans populated the earth
- Integrating research, cyberinfrastructure, education and outreach to achieve environmental synthesis
- Engaging policymakers, managers and the general public in activities that lead to a better understanding of the interconnectedness of environmental systems and of the uncertainties inherent in predictions and forecasts.

The center is expected to integrate the expertise required to address leading environmental challenges at a global scale. The Biological Sciences Directorate expects it to become a world leader in understanding and predicting global environmental change. The center will be interdisciplinary, with a focus on innovative approaches to environmental science fueled at least in part by community input. Center activities should include diverse and innovative approaches to, or mechanisms of, synthesis that extend beyond models and modes employed at existing synthesis centers.

The center should be motivated by a clear and compelling vision for the next generation of environmental synthesis. It should provide support for core synthesis activities, including meta-analysis, conceptual and theoretical integration, and information management. Education, training and outreach should be thoroughly integrated into scientific goals; we do not envision a center with distinct branches or components, but rather an intimate association among science, education and outreach in all activities. Education should embrace both the basic motivation for synthesis and its associated analytical tools. Supported activities will focus on ecologically relevant issues and their interface with other appropriate disciplines; these activities will be supported by new communications and computing technology.

These core expectations may be accomplished through a variety of mechanisms, and NSF expects that this new center will implement a broad range of synthesis modes and activities. Current modes of synthesis range from community-generated working groups and catalysis meetings to center-driven targeted activities to initiatives focusing on agency-defined national needs. This solicitation is intended to generate innovative approaches to next generation synthesis activities that expand the horizons of ecological synthesis across the biological sciences, computational sciences, engineering, geosciences and social sciences, to transform our understanding of complex ecological systems, the practice of ecological research and ecological education. We urge broad and creative thinking about the form, structure, and activities of this new center, within the mandates that it be international in scope and disseminate results and a culture of co-operative synthesis to the broadest possible community.

Convincing strategic and management plans are essential, as described in more detail below. These should be accompanied by clear metrics and milestones required to evaluate the center's performance.

Center Director

NSF views the director as essential to successful operation of the new environmental synthesis center. Therefore, the leadership and management qualifications of the director are critical to a successful proposal. The director will be responsible for management and staffing; appropriate center oversight; effective communication with broad research community, agencies and the general public; procurement, use and maintenance of equipment, supplies and facilities; and management of the funds provided. The principal investigator of a proposal is expected to be the center's director or interim director; if the latter, the proposal must clearly describe the process that will be used to select a full-time director. Co-Principal Investigators are not allowed.

Proposal Content

Proposals should include

- a cohesive, compelling vision for next generation synthesis activities, including a rationale for the center and the unique opportunities that will be developed
- plans describing how different disciplines or disciplinary interests (e.g., geosciences, social sciences) will be fully integrated in center activities, strategic plans, and governance
- a description of intended research activities and the range and modes of synthesis in sufficient detail to assess their merit
- a cyberinfrastructure plan to foster interdisciplinary connections and synthesis needed to confront complex environmental challenges
- a data management plan that includes integration, sharing and visualization of data from multiple sources of input; data attribution, curation, and authentication; and plans for data archiving. This plan should include management of intellectual property rights
- the process by which synthesis activities will result in innovative and effective education and outreach, and how success in these areas will be evaluated
- plans for linking with appropriate communities and institutions beyond those participating in order to enhance involvement in environmental synthesis and knowledge transfer
- a description of the organizational structure of the center, including an outline of the mechanisms for identifying and selecting projects, allocating funds and equipment, and managing participating groups
- plans for external oversight by an advisory committee, including the number of members, their range of expertise, and how they will be chosen
- a roadmap for developing and implementing a strategic plan within the first six months of the center's operation
- metrics and milestones to assess the center's performance and progress toward its central mission(s)

strategies, mechanisms and a structure that demonstrates the center's international scope and how international participation will be implemented

- description of how the current capabilities and resources of the host institution will facilitate the proposed activities. This description should include organizational leadership, technical expertise, general support, and maintenance as well as space, infrastructure and technologies that will support the center, and appropriate logistical details (ease of travel, accommodations, if relevant)

The center may be multi-institutional. If such a plan is intended, the proposal must come from one leading institution; others should be included as sub-awardees. The advantages and strengths of a multi-institutional approach should be highlighted, if this structure is proposed.

The proposal must clearly and concisely justify center support; important considerations include the center's breadth of vision, education and outreach; leadership and management skills of its director(s); its international dimensions; communication and knowledge transfer; and how this center will cooperate with other, ongoing synthesis activities, as described above. This is not a research plan; it is a plan for how research activities will be fostered.

Supporting Information

The Biological Sciences Directorate currently supports four synthesis centers: the National Center for Ecological Analysis and Synthesis (see <http://www.nceas.org/>), the National Evolutionary Synthesis Center (see <http://www.nescent.org/>), the National Institute for Mathematical and Biological Synthesis (see <http://www.nimbios.org/>), and the Plant Science Cyberinfrastructure Collaborative (see <http://iplantcollaborative.org/>). Proposers should take advantage of lessons learned from these organizations, while keeping in mind that this solicitation is for a next generation synthesis center that neither duplicates nor continues activities at the existing centers.

International Participants: NSF envisions this center as a world leader in environmental synthesis. NSF funds may be used to support US investigators and students to work in international settings and, with some restrictions, foreign investigators and students to travel to the center and participate in collaborative activities. Foreign collaborators should seek support for their activities from their home institutions, from their own national sources, or from funding sources other than NSF, except when they are from a developing country or from a country whose currency is not convertible. Additional details should be discussed with the cognizant program officers listed above.

III. AWARD INFORMATION

NSF plans to make one award as a cooperative agreement. The award budget is anticipated to be up to \$6,000,000 per year for up to five years, contingent on the quality of proposals received and pending the availability of funds. The anticipated award date is August 31, 2011. The initial term of the award is expected to be five years, with the potential for a single, terminal renewal for an additional five years, subject to performance and availability of funds. This will be determined after a full site visit review planned for early in the fourth year of the initial award. Note that the maximum period NSF will support the center is ten years. A plan for the transition of the center and, if appropriate, disposition of its resources including databases when NSF funding ends will be required. This requirement will be implemented through the cooperative agreement governing the award.

IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.
- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.

PI Limit:

Only a single investigator may appear on the cover sheet of a preliminary or full proposal. This individual should be the intended center director or provisional director. No co-PIs are allowed.

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

Additional Eligibility Info:

When a consortium of organizations submits a proposal, it must be submitted as a single proposal with one organization serving as the lead and all other organizations participating as subawardees. Organizations ineligible to submit to this program solicitation cannot receive subawards.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Preliminary Proposals (required): Preliminary proposals are required and must be submitted via the NSF FastLane system, even if full proposals will be submitted via Grants.gov.

Submission of a preliminary proposal is required for eligibility to submit a full proposal. The preliminary proposal must include the following:

- Title: The title must begin with 'Environmental Synthesis Center Preliminary Proposal:' followed by substantive title
- Project Summary (1 page): must consist of two parts 1) a succinct summary of the intellectual scope of the activity including the vision and rationale for center capabilities and mechanisms for achieving this vision, and 2) a clear description of the broader impacts of the proposed activities, including the approaches proposed to advance leadership in education and outreach
- Project description limited to 7 pages, including 1) vision for a next generation synthesis center (up to 1 page); 2) description of range and modes of activities that will be supported (up to 2 pages); 3) organizational structure of center (up to 2 pages); 4) list of primary individuals and major institutions involved (up to 1 page); 5) capabilities of institution to host and manage center (up to 1 page).
- Results of prior support are not required
- Cited references are limited to 5 pages
- Biographical sketch should be included for the PI only; this document should emphasize the PI's training and skills in leadership
- Current and pending support statements not required
- No budget is required.

Following peer review of preliminary proposals, proposers with competitive programs will be invited to submit a full proposal. Comments on the preliminary proposal will be considered during review of full proposals.

Full Proposal Preparation Instructions

The following exceptions and additions to the GPG or the NSF Grants.gov Application Guide apply to full proposals submitted to this Program:

Full proposals will be accepted only from individuals who have submitted preliminary proposals and who are subsequently invited to submit a full proposal after peer review of preliminary proposals. Eligible proposals must be based on the preliminary proposal submitted. All proposals not meeting these specifications will be returned without review. Full proposals whose preliminary proposals received a recommendation of 'not invited' will also be returned without review.

- Cover Page
 - FastLane Users - Select this program solicitation number from the pull down list. Entries on the FastLane cover sheet are limited to the principal investigator / project director. All other senior project participants should be entered into FastLane as Senior Personnel (this provision allows their biographical sketches to be included in the FastLane proposal)
 - Grants.gov Users - The program solicitation number will be pre-populated by Grants.gov on the NSF Grant Application Cover Page. NSF allows one principal investigator / project director. Instructions for entering additional senior project participants are included in Section V.5. of the NSF Grants.gov Application Gui
- Title - the title of the proposal must begin with 'Environmental Synthesis Center Full Proposal:' followed by the substantive title.
- Project Summary (1 page) - this section must consist of two parts 1) a succinct summary of the intellectual scope of the activity including the vision and rationale for center capabilities and mechanisms for achieving this vision, and 2) a clear description of the broader impacts of the proposed activities, including the approaches proposed to advance leadership in education and outreach
- Project Description - the project description is limited to 25 pages and must contain the following information
 1. A vision for the center that includes the unique opportunities it will afford
 2. Proposed activities - describe the range and modes of research activities that the center will support in sufficient detail to allow evaluation of their merits. Explain selection criteria and mechanisms for visiting and fixed-term personnel, individuals and groups. Educational and outreach activities should be thoroughly integrated in all center activities. Outline plans for involving students at different educational levels, from different participating disciplines, and for increasing participation of underrepresented groups. Activities should be international in scope
 3. Communication, knowledge transfer and informatics - describe plans for linking appropriate communities and institutions, beyond those directly involved in center, to enhance knowledge transfer and participation. Include plans to integrate or collaborate with other existing synthesis centers and activities.
 4. Management Plan - provide a description of the organizational structure of the center. Outline mechanisms for selecting projects, allocating funds and equipment, and managing participating groups. Describe plans for external oversight and accountability, provide the number of members intended for advisory purposes and describe the range of expertise needed for an efficient and effective committee. If there is an Interim Director, provide details of the process used to select a full-time director.
 5. Intellectual Property Rights - describe how the center plans to share information, data, tools, and resources that result from the center's activities, regardless of source (NSF or other) of support.
 6. Institutional Capabilities - provide a description of how the current capabilities and resources of the host institution will facilitate the proposed activities. Include information on organizational leadership, technical expertise, general support and maintenance, and space, infrastructure and technologies that will support the center's activities. Describe how the center's location will influence its success, including any unique characteristics of the institution or its location (ease of travel, accommodations, etc.)
- Results of prior support not required
- References cited should not exceed 5 pages
- Biographical Sketches - PI and all key personnel; the PI's biographical sketch may be expanded to three pages and should include details on leadership training and skills. All other biographical sketches are limited to the 2-page, standard NSF format
- Current and Pending Support statements are not required
- Single Copy Documents - Conflicts of Interest: A single, integrated document (table or spreadsheet form only) should be uploaded into the Single Copy Document section in FastLane at the time of full proposal submission. Printed or e-mail copies of this document will not be accepted. The document should consist of a list in the form of a single, alphabetized table with the full names (last name, first name, middle initial) and institutional affiliations of all individuals who

have a conflict of interest with any senior personnel and any named personnel whose salary is requested in the project's budget. Conflicts to be identified are 1) PhD advisors or advisees; 2) collaborator or co-author over the past 48 months, including post-doctoral advisors and advisees; 3) any other individuals or institutions with which the investigators have financial ties (please specify). Members of current advisory boards or committees who receive reimbursement for travel or honoraria should be included in this last category (#3).

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.
- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

B. Budgetary Information

Cost Sharing: Cost sharing is not required under this solicitation.

C. Due Dates

- **Preliminary Proposal Due Date(s) (required)** (due by 5 p.m. proposer's local time):
March 23, 2010
- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):
July 14, 2010

D. FastLane/Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

Detailed technical instructions regarding the technical aspects of preparation and submission via FastLane are available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the Grant Proposal Guide for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane Website at: <https://www.fastlane.nsf.gov/fastlane.jsp>.

- **For Proposals Submitted Via Grants.gov:**

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. The Grants.gov's Grant Community User Guide is a comprehensive reference document that provides technical information about Grants.gov. Proposers can download the User Guide as a Microsoft Word document or as a PDF document. The Grants.gov User Guide is available at: <http://www.grants.gov/CustomerSupport>. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program where they will be reviewed if they meet NSF proposal preparation requirements. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with the oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal.

A. NSF Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board (NSB)-approved merit review criteria: intellectual merit and the broader impacts of the proposed effort. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two NSB-approved merit review criteria are listed below. The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which the reviewer is qualified to make judgements.

What is the intellectual merit of the proposed activity?

How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

Examples illustrating activities likely to demonstrate broader impacts are available electronically on the NSF website at: <http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf>.

Mentoring activities provided to postdoctoral researchers supported on the project, as described in a one-page supplementary document, will be evaluated under the Broader Impacts criterion.

NSF staff also will give careful consideration to the following in making funding decisions:

Integration of Research and Education

One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities

Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

Additional Review Criteria:

Reviewers will be instructed to evaluate the proposals using the following additional criteria:

- Potential of, and plans for, the proposed center to integrate across participating disciplines, education and outreach to bring about environmental synthesis. Does the plan described in the proposal ensure that the center will be interdisciplinary, innovative, diverse and fully integrated?
- Management plan: does the management plan provide for strong and capable leadership, clear lines of authority and responsibility, accountability, effective communication, responsiveness to the scientific community, and the ability to adapt to new opportunities and technologies?
- Ability of the proposing institution to host the center.
- Computational capability: Does the proposal describe plans for computational and cyberinfrastructure capabilities that will enable the center to meet its full set of responsibilities and v
- Extent to which center's activities build on existing synthesis efforts in creative and novel ways

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review, or Site Visit Review.

Proposals submitted in response to this solicitation will be reviewed in three stages.

The first stage is submission of a preliminary proposal that provides the information described in section V of the Program Solicitation. Following review of preliminary proposals, selected proposers will be invited to proceed to the next stage of review by submitting a full proposal. Investigators who did not submit preliminary proposals are ineligible to submit a full proposal during the current review cycle. Eligible full proposals will be evaluated by external mail reviews and panel review. The outcomes of this evaluation will be used to select proposals for the third stage of the review process, which consists of a site visit by a panel of experts.

After scientific, technical and programmatic review and consideration of other appropriate factors, the Environmental Synthesis Center Working Group will recommend to the cognizant Division Director whether a proposal should be declined or recommended for award. Following all necessary approvals, the proposal recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial and policy implications and the processing and issuance of a cooperative agreement.

Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (GC-1); * or Research Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the *NSF Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

Special Award Conditions:

NSF has responsibility for providing general oversight and monitoring of the center to assure effective performance and administration. Because the award resulting from this solicitation will require substantial NSF oversight, it will be made in the form of a Cooperative Agreement. The Cooperative Agreement will contain two types of terms and conditions, the Programmatic Terms and Conditions (PTC) that relate to the research and educational projects carried out, and the Financial and Administrative Terms and Conditions (FATC) that relate to management of funds that support the project.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period. (Some programs or awards require more frequent project reports). Within 90 days after expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report will delay NSF review and processing of any future funding increments as well as any pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and organizational) publications; and, other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

The PI of this center will submit annual or other special reports of progress and plans; the contents of the reports will be determined by the terms of the cooperative agreement. External review in the form of a site or reverse site visit will be conducted by NSF approximately 12 months after the start of the award and as often as necessary thereafter. The results of such review(s), the contents of annual reports, and the response of the center to reports it receives from its advisory and oversight committees will be among the factors used to determine the continuation of support.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Saran Twombly, telephone: (703) 292-8133, email: stwombly@nsf.gov
- Kathleen C. Weathers, telephone: (703) 292-8227, email: kweather@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, National Science Foundation Update is a free e-mail subscription service designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Regional Grants Conferences. Subscribers are informed through e-mail when new publications are issued that match their identified interests. Users can subscribe to this service by clicking the "Get NSF Updates by Email" link on the [NSF web site](#).

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this new mechanism. Further information on Grants.gov may be obtained at <http://www.grants.gov>.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent Federal agency created by the National Science Foundation Act of 1950, as amended (42 USC 1861-75). The Act states the purpose of the NSF is "to promote the progress of science; [and] to advance the national health, prosperity, and welfare by supporting research and education in all fields of science and engineering."

NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 40,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at <http://www.nsf.gov>

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information** (NSF Information Center): (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**
 - Send an e-mail to: nsfpubs@nsf.gov
 - or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and NSF-51, "Reviewer/Proposal File and Associated Records, " 69 Federal Register 26410 (May 12, 2004). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

Suzanne H. Plimpton
Reports Clearance Officer
Division of Administrative Services
National Science Foundation
Arlington, VA 22230

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