

Dynamics of Coupled Natural and Human Systems (CNH)

PROGRAM SOLICITATION

07-598

REPLACES DOCUMENT(S):

NSF 06-587



National Science Foundation

Directorate for Social, Behavioral & Economic Sciences

Directorate for Biological Sciences

Directorate for Geosciences



USDA Forest Service

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

January 08, 2008

November 18, 2008

Third Tuesday in November, Annually Thereafter

Third Tuesday in November

REVISION NOTES

Dynamics of Coupled Natural and Human Systems (CNH) has been established as a multi-directorate program through coordination action by the Directorate for Biological Sciences, the Directorate for Geosciences, and the Directorate for Social, Behavioral, and Economic Sciences.

Starting with this solicitation, the Forest Service of the U.S. Department of Agriculture (USDA) will participate as a partner in the conduct of annual CNH competitions.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Dynamics of Coupled Natural and Human Systems (CNH)

Synopsis of Program:

The Dynamics of Coupled Natural and Human Systems competition promotes quantitative, interdisciplinary analyses of relevant human and natural system processes and complex interactions among human and natural systems at diverse scales.

Cognizant Program Officer(s):

- Sarah Ruth, Lead Program Director, telephone: (703) 292-7594, email: sruth@nsf.gov
- Thomas Baerwald, Program Director, telephone: (703) 292-7301, email: tbaerwal@nsf.gov
- Laura Gough, Program Director, Division Environmental Biology, telephone: (703)292-7137, email: lgough@nsf.gov
- Alan Tessier, Program Director, telephone: (703) 292-8481, email: atessier@nsf.gov

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

- 10.652 --- Forestry Research
- 47.041 --- Engineering

- 47.049 --- Mathematical and Physical Sciences
- 47.050 --- Geosciences
- 47.070 --- Computer and Information Science and Engineering
- 47.074 --- Biological Sciences
- 47.075 --- Social Behavioral and Economic Sciences
- 47.076 --- Education and Human Resources
- 47.078 --- Office of Polar Programs
- 47.079 --- Office of International Science and Engineering
- 47.080 --- Office of Cyberinfrastructure

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 7 to 12

Anticipated Funding Amount: \$9,000,000 This total is for awards to be made annually, pending availability of funds.

Eligibility Information

Organization Limit:

None Specified

PI Limit:

None Specified

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 Proposal Submission:** Not Applicable
- **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/pubs/policydocs/grantsgovguide607.pdf>)

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required under this solicitation.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):
 - January 08, 2008
 - November 18, 2008
 - Third Tuesday in November, Annually Thereafter
 - Third Tuesday in November

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: Standard NSF award conditions apply.

Reporting Requirements: Standard NSF reporting requirements apply.

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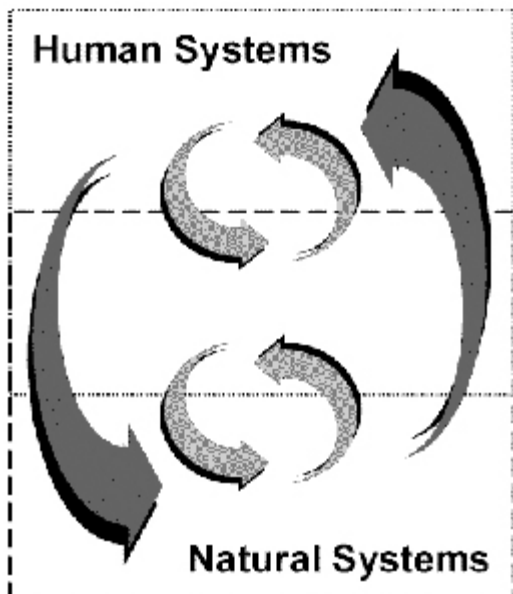
I. INTRODUCTION

The Dynamics of Coupled Natural and Human Systems (CNH) is a multidirectorate program jointly operated by three NSF directorates (Biological Sciences; Geosciences; and Social, Behavioral, and Economic Sciences). In addition to those three directorates, other NSF units (including the Directorate for Engineering, the Directorate for Education and Human Resources, the Office of International Science and Engineering, and the Office of Polar Programs) participate in evaluation of proposals. Starting in FY 2008, the Forest Service of the U.S. Department of Agriculture (USDA) will participate as a partner in the conduct of annual CNH competitions. CNH is a direct successor of a special competition that was part of the Biocomplexity in the Environment emphasis area.

The CNH Program aims to support basic research and related activities that enhance fundamental understanding of the complex interactions within and among natural and human systems. Through its annual competition, CNH intends to make awards across a range of sizes from roughly \$500,000 to no more than \$1,500,000. Budgets should be developed at scales appropriate for the project to be conducted.

II. PROGRAM DESCRIPTION

The Dynamics of Coupled Natural and Human Systems (CNH) Program supports basic research and related activities that enhance fundamental understanding of the complex interactions within and among natural and human systems. CNH focuses on the complex interactions among human and natural systems at diverse spatial, temporal, and organizational scales. CNH seeks to advance basic knowledge about the system **dynamics** -- the processes through which systems function and interact with other systems. CNH-supported projects must examine relevant **natural AND human systems**. Proposals cannot focus solely or largely on either human systems or on natural systems. Projects also must examine the full range of **coupled** interactions and feedbacks among relevant systems. The arrows in the accompanying figure symbolize these relationships.



In order to be most competitive, CNH proposals must demonstrate how the proposed research is well grounded in relevant theory from a range of appropriate fields. They generally will focus on one or a limited number of specific questions that emanate from the theoretical discussion and review of relevant literature. They must outline and specify a scientifically sound research plan, typically cast in terms of testable hypotheses, and they must show considerable promise that the research results will contribute to enhancement of theory within and across relevant fields. To the extent possible, projects should try to improve capabilities for predicting the responses of systems to endogenous and exogenous changes, including appropriate estimates of uncertainty in model predictions.

To attain project goals, the investigative teams conducting CNH research should have expertise that matches the range of systems to be examined and activities to be undertaken. The team should include expertise from the natural sciences (biological sciences, geosciences, and/or physical sciences) and human sciences (social sciences, behavioral sciences, and/or engineering). Involvement of individuals with expertise in quantitative approaches and in education is also expected.

The CNH Program fully supports the overall goals of the Biocomplexity in the Environment priority area from which it evolved. Biocomplexity refers to the dynamic web of often-surprising interrelationships that arise when biological, physical, and human components of the global ecosystem interact. Special characteristics of biocomplexity research studies in an environmental context include a high degree of interdisciplinarity and a focus on systems that likely exhibit highly non-linear behavior.

In addition to basic new knowledge and enhanced theory regarding the complex ways that people and natural systems interact, CNH seeks to develop the capabilities of people and tools needed to advance these areas of research in the future. CNH seeks to foster and develop interdisciplinarity by bringing researchers from different disciplines into teams, by developing new methods and expertise, and by reaching beyond the borders of the United States for partners in inquiry. In the process, the next generation of researchers will learn to work in diverse teams, cross disciplinary boundaries, and use advanced sensing and monitoring, communication, and information technologies to work across many scales of time and space.

CNH projects include three integrative elements:

- An integrated, quantitative, systems-level method of inquiry is essential. Because of the complex nature of systems under investigation, treatment of non-linearities, feedback processes, and integration across temporal or spatial scales is necessary. Qualitative and other approaches may complement quantitative approaches, but projects must use appropriate quantitative methods, and teams should include one or more individuals with demonstrated expertise in the quantitative methods to be used during the conduct of the project. Quantitative methods may include conceptual, mathematical, or computational models; numerical simulation; artificial intelligence techniques; statistics; visualization; or database development. Mathematical models should include appropriate estimates of uncertainty, and experiments should assess power and precision.
- Education must be addressed and integrated effectively. Competitive projects must integrate research and education. Those benefiting from educational experiences can include participants (such as undergraduates, graduate students, teachers, and postdoctoral associates) and individuals beyond those directly involved in the project. Investigators are encouraged to include students as active participants on interdisciplinary teams. Informal education channels, such as science centers, aquariums, and similar facilities may be used to help enhance the public's ability to deal with complex environmental information and make informed decisions about the environment. Educational efforts at the K-12 level should promote the acquisition of scientific inquiry skills and take advantage of technology and use it appropriately. Investigators may target their education plans at any groups for which they believe their educational activities can be especially effective, but they must identify clearly what those groups are, what educational activities will be undertaken, who on the project team has the expertise to conduct the educational activities successfully, and how the performance of the educational activities will be evaluated. Investigators are encouraged to disseminate information about their educational activities (including assessment of the effectiveness of those activities) through publications and other appropriate media.
- A global perspective is encouraged. When appropriate and practical, specific international collaborations and networks for research and education are encouraged. CNH research projects may offer excellent opportunities for students at U.S. and foreign institutions to gain experience in the conduct of research in other countries. NSF awards normally are limited to the support of the U.S. portion of the collaboration. In the case of some developing countries, limited funds may be available to support the involvement of the foreign collaborator.

CNH-supported projects may be totally independent activities, or they may be conducted in association with existing projects or activities, including Long-Term Ecological Research sites, NSF Science and Technology Centers or NSF Engineering Research Centers, or similar group efforts. If the proposed activity is associated with other activities currently supported by NSF or other funders, the project description should make clear how the proposed work is different from but complimentary to activities for which support has already been acquired. A letter from the director of the ongoing activity or center agreeing to the proposed project should be included as Supplementary Documentation.

As part of the CNH competition, the U. S. Forest Service encourages proposals focused on forest or grassland ecosystems at multiple spatial scales and across a continuum of human systems and densities ranging from urban to rural. Of particular interest are studies at the landscape to regional scale, where changes in both natural and human systems are occurring actively and interactively. Proposals are desired that focus on the dynamics of coupled human-forest/grassland systems and on multiple, interacting perturbations and stressors (local to global in scale) that are central to the ecological and human sustainability challenges faced by forest and/or grassland communities. Questions for Forest Service personnel regarding proposals may be directed to Ed Dickerhoof (edickerhoof@fs.fed.us) or Anne Hoover (ahoover@fs.fed.us).

A full list of awards supported in past CNH competitions can be accessed at http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13681&from=fund.

III. AWARD INFORMATION

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds.

NSF and USDA Forest Service expect to have at least \$9,000,000 available to support awards resulting from this competition. Support provided through this competition for awards across a range of sizes from roughly \$500,000 to no more than \$1,500,000. Budgets should be developed at scales appropriate for the project to be conducted.

Projects should be conducted for the length of time necessary to effectively conduct the project. No award may be more than five years in duration. Depending on the quality of proposals for projects of different size and the availability of funds, NSF anticipates making 7 to 12 awards.

IV. ELIGIBILITY INFORMATION

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the [Grant Proposal Guide](#), Chapter I, Section E.

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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 pubs@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/pubs/policydocs/grantsgovguide607.pdf>). 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-

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via the NSF FastLane system. Chapter II, Section D.3 of the Grant Proposal Guide provides additional information on collaborative proposals.

The following information deviates from the Grant Proposal Guide (GPG) and the NSF Grants.gov Application Guide:

Proposal Format

Proposals not in conformance with the proposal-preparation requirements of the GPG or NSF Grants.gov Application Guide will be returned without review. Please note, however, that the page limits contained in this solicitation take precedence over those given in the GPG and NSF Grants.gov Application Guide.

Proposals submitted for this competition should clearly specify all relevant parts of the proposed project. With respect to the proposed research, the proposal should outline the theoretical foundations of the project as based in relevant literature. It should specify the questions on which the research will focus, the research methods that will be used, the expertise that different researchers will bring to different facets of the project, and how and where results will be disseminated. With respect to education, the proposal should specify educational goals, what methods will be used to attain those goals, and the expertise of individuals who will participate in educational efforts. The proposal should also identify the proposed educational products, how those products will be disseminated, and how the effectiveness of educational activities will be evaluated.

This program solicitation requests material about the personnel involved in the project. Please use the following definitions to provide the corresponding information.

- **Principal Investigators** -- Individuals who would assume responsibility for an award resulting from this competition, would manage the award, and are listed on the cover sheet of the proposal.
- **Senior Personnel** -- All Principal Investigators, as well as any named other senior personnel who will receive salary support, as well as non-salaried senior investigators who will play lead roles in the conduct of the project. This group may include active participants in the research team from outside the U.S.
- **Project Participants** -- Every person involved with the research project, including students.

Proposal Cover Sheet

Work on the Cover Sheet first. Check that the Awardee and Performing Organizations are correct. Highlight the Program Solicitation Number and click on the "Select" button. Your proposal will automatically be assigned to the correct directorate and division on the Cover Sheet. Prepare the remainder of the Cover Sheet.

Project Description

All project descriptions are limited to 20 pages in length. With the exceptions noted below, proposers may organize the different components of the project description as they wish.

The following sections **MUST** be included under separate headings in the project description:

- **Results from Prior NSF Support.** This section is required only for principal investigators and co-investigators who have received NSF funding in the last five years. (This section may be up to five pages in length.)
- **Education Plan.** The research plan should include integrated educational activities as a part of the narrative. Highlight these integrated activities in this section by specifying the project's educational goals, the methods that will be used to attain those goals, how the educational activities will be evaluated, and the role of project personnel in educational efforts. If educational products are expected to result, describe those products and indicate how they will be disseminated. (This section is usually between 1 and 2 pages in length).
- **Management Plan.** The following information should be provided: (1) a description of the management structure that will enable the team to work effectively; and (2) specification of the qualifications of each of the senior personnel as well as the contribution they are expected to make to the project. This section increases in importance as the number of senior personnel or institutions involved in the project increases. (This section is usually between 1 and 2 pages in length).
- **Expected Project Significance.** This section should clearly specify what proposers expect will be the results and contributions of the project. The section should describe both the anticipated intellectual merit of the proposed work as well as its anticipated broader impacts. Intellectual merit and broader impacts are NSF's two primary merit review criteria, and major items to be considered in each one are specified in Section VI.A. of this solicitation. Examples illustrating activities likely to demonstrate broader impacts also are available electronically at <http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf>. Education and international activities are among the examples. (This section is usually about 1 page in length.)

Biographical Sketches

A biographical sketch with a 2-page limit must be provided for each investigator and each person identified as senior personnel.

Current and Pending Support

Each person identified as a principal investigator or as senior personnel must submit a current and pending support form. This proposal is considered a pending support activity.

Supplementary Documentation

Items 1 and 2 below are required to be included in this section for all proposals. Items 3 and 4 should be included here if needed.

1. Provide a list in a single, alphabetized table with the full names and institutional affiliations of all people in conflict of interest with any of the senior personnel (PI, Co-PIs, and any named personnel whose salary is requested in the project budgets). Conflicts to be identified are (a) primary Ph.D. thesis advisors and advisees, (b) collaborators or co-authors, including postdocs, for the past 48 months, and (c) any other individuals or organizations with which the investigator has financial ties (please specify type).

2. Provide a description of the project's data management and access plan, as a maximum 2-page supplementary document. This information should be clearly identified by the subheading "Data Management and Access." NSF realizes that individual cases may differ widely and recognizes that any absolute timeline or rigid set of rules is not possible. However, plans should address some or all of the following issues:

- The types of data and samples to be produced in the project;
- The standards for data format and metadata content that will be used (where existing standards are absent or inadequate, this should be pointed out for the benefit of the program and the reviewing community);
- Policies for access including provisions for appropriate protection of privacy, confidentiality or intellectual property rights;
- Policies for re-use, distribution, or the production of derivatives; and
- Plans for archiving data and samples and preservation of access.

The data management and access plan will be considered an integral part of the project and therefore subject to reviewer, panel, and program evaluation. Successful applicants will be expected to address this issue in annual and final project reports and within the Results of Prior Research section when they submit subsequent proposals to NSF.

3. Include in this section letters of commitment from any entity that is an integral part of the proposed project, such as the involvement of an international collaborator or permission to access sites, materials, or data for research or other associated project activities. Generic letters of endorsement are not allowed, however.

4. If you wish to do so, you may include in this section IRB certifications associated with the use of human subjects or IACUC certifications associated with the use of animals subjects.

Unless authorized here or in the *Grant Proposal Guide*, no other materials should be included in this section. Survey or interview protocols are not permitted in this section, nor are reprints of articles previously published by the investigators. Proposals that include materials in this section that belong in the project description may be returned without review.

Appendices

No appendices are permitted.

Proposals Involving Multiple Institutions

Proposals involving multiple organizations may be submitted in one of two ways: (1) as a single proposal with one organization serving as the lead organization and with support to other organizations provided through subawards, or (2) as separate submissions from eligible organizations. See Chapter II, D.3 of the *GPG* for instructions regarding the preparation of collaborative proposals and carefully follow on-line instructions regarding their preparation.

Proposals Involving Collaborators at Foreign Organizations

Proposers are reminded they must provide biographical sketches of all senior project personnel, including those at foreign institutions. In addition, as supplementary documentation, proposals involving foreign collaborators must provide letters of commitment from the foreign counterpart institutions. Please note that although eligibility for this competition is restricted to U.S. organizations, as described in the *GPG*, collaborations with foreign institutions may be considered. Any funding for non-U.S. organizations must be made through subawards. Those subawards to non-U.S. organizations may not include any indirect costs.

Human Subjects

If the project involves human subjects, the Institutional Review Board (IRB) of the submitting organization must certify that the proposed project is in compliance with the Federal Government's "Common Rule" for the protection of human subjects. If IRB approval has been obtained and the date of approval is listed on the cover sheet, no other certification is required. If IRB approval is still pending, submit certification of IRB approval in electronic form as soon as approval is obtained to the cognizant program officer. (The name of this program officer will be listed in the Proposal Status module of FastLane.) Delays in obtaining IRB certification may result in NSF being unable to make an award. For more information regarding the protection of human subjects, consult <http://www.nsf.gov/bfa/dias/policy/human.jsp>.

Pre-Submission Checklist

CNH proposals must be in compliance with the *GPG* or NSF Grants.gov Application Guide and special requirements in the solicitation in order to be considered for review. Proposals not in compliance with these requirements will be returned without review. Please refer to the following checklist to address some of the items required in all proposals:

- Font and margin requirements
- Page numbers on pages
- Project summary that includes a description of broader impacts
- Project description that is 20 pages or less and includes separate sections for Results from Prior Support, Education Plan, Management Plan, and Project Significance
- Biographical Sketches (including collaborators and advisors/advisees) for all senior personnel
- Conflict of Interest spreadsheet submitted in the Supplementary Documentation section
- Data Management and Access Plan submitted in the Supplementary Documentation section

B. Budgetary Information

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

Other Budgetary Limitations:

Almost all CNH funding is expected to be available for awards to be made based on evaluation of proposals submitted for this competition. NSF intends to make awards across a range of sizes from roughly \$500,000 to no more than \$1,500,000. Support for any award in this category will not exceed a cumulative total of \$1,500,000 for the duration of the award. Budgets should be developed at scales appropriate for the project to be conducted. No award may be more than five years in duration.

Budget Preparation Instructions:

Budgets should include travel funds for Principal Investigators to attend a workshop or meeting of those supported in this program every 1 to 2 years.

Research Platform Support:

Specific amounts for research cruises, polar logistics, arctic logistics, or use of aircraft or other atmospheric sciences field facilities should not be included in the budget request. However, the PI should submit the UNOLS request, OPP logistics form, or ATM facilities form with the proposal.

C. Due Dates

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

January 08, 2008

November 18, 2008

Third Tuesday in November, Annually Thereafter

Third Tuesday in November

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>.

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:

Successful CNH proposals must be highly interdisciplinary, address the inherent complexity and highly coupled nature of natural and human systems, be well grounded in theory, and show great promise for enhancing basic theoretical understandings. Quantitative approaches, education, and global perspectives also are important. Research projects must include quantitative approaches or advanced conceptual models to study the systems chosen for investigation. Projects must also include specific plans for education. If appropriate, projects will be given consideration if they promote the development of long-term international partnerships.

In the evaluation of proposals submitted by teams of investigators, considerations in addition to standard NSF review criteria are:

- o Strength of the collaborations planned and degree of interdisciplinarity
- o Effectiveness of the group organization and management plan
- o Quality and expected significance of the educational activities
- o Strength of the dissemination plans
- o Extent, effectiveness, and long-term potential of collaborations with industries, national laboratories, and researchers outside the U.S., when appropriate.

Descriptions of educational activities should specify goals, methods to attain those goals, and the expertise of individuals to accomplish them. Thus, they will be evaluated based on:

- o Potential interest to and appropriateness for the audience targeted
- o Quality of planning and appropriateness of personnel
- o Feasibility and potential for resulting in a disseminable product
- o Integration and complementarity to the research efforts
- o Focus on integrated learning and discovery and the preparation of U.S. students for a broad set of careers in environmental fields.

B. Review and Selection Process

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

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

In all cases, after programmatic approval has been obtained, the proposals 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 grant or other 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 pubs@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.

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.

Failure to provide the required annual or final project reports 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.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Sarah Ruth, Lead Program Director, telephone: (703) 292-7594, email: sruth@nsf.gov
- Thomas Baerwald, Program Director, telephone: (703) 292-7301, email: tbaerwal@nsf.gov
- Laura Gough, Program Director, Division Environmental Biology, telephone: (703)292-7137, email: lgough@nsf.gov
- Alan Tessier, Program Director, telephone: (703) 292-8481, email: atessier@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, MyNSF (formerly the Custom News Service) is an information-delivery system 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 or the user's Web browser each time new

publications are issued that match their identified interests. MyNSF also is available on NSF's Website at <http://www.nsf.gov/mynsf/>.

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: pubs@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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