Long-Term Ecological Research (LTER)
Renewal

PROGRAM SOLICITATION
NSF 15-596

REPLACES DOCUMENT(S):
NSF 13-588

National Science Foundation

Directorate for Biological Sciences
  Division of Environmental Biology

Directorate for Geosciences
  Division of Polar Programs
  Division of Ocean Sciences

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

  March 04, 2016

IMPORTANT INFORMATION AND REVISION NOTES

This solicitation includes revised review criteria and proposal guidelines for LTER renewal proposals. Please read the appropriate sections below.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 17-1), which is effective for proposals submitted, or due, on or after January 30, 2017.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

  Long-Term Ecological Research (LTER)

Synopsis of Program:

  NSF currently supports 25 LTER sites, and the solicitation is open to renewal proposals only.

  To address ecological questions that cannot be resolved with short-term observations or experiments, NSF established the Long Term Ecological Research Program (LTER) in 1980. Two components differentiate LTER research from projects supported by other NSF programs: 1) the research is located at specific sites chosen to represent major ecosystem types or natural biomes, and 2) it emphasizes the study of ecological phenomena over long periods of time based on data collected in five core areas. Long-term studies are essential to achieve an integrated understanding of how populations, communities, and other components of ecosystems interact as well as to test ecological theory. Ongoing research at LTER sites must test ecological theories and significantly advance understanding of the long-term dynamics of populations, communities and ecosystems. It often integrates multiple disciplines and, through cross-site interactions, examines patterns or processes over broad spatial scales. Recognizing that the value of long-term data extends beyond use at any individual site, NSF requires that data collected by all LTER sites be made broadly accessible.

Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

- William Ambrose, telephone: (703) 292-8029, email: wambrose@nsf.gov

- David L. Garrison, Division of Ocean Sciences, telephone: (703) 292-7588, email: dgarriso@nsf.gov

- Louis A. Kaplan, telephone: (703) 292-7187, email: lkaplan@nsf.gov

- Douglas Levey, telephone: (703) 292-5196, email: dlevey@nsf.gov

- Peter H. McCartney, telephone: (703) 292-8470, email: pmccartn@nsf.gov

- John Schade, telephone: (703) 292-7139, email: jschade@nsf.gov

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

- 47.050 --- Geosciences
- 47.074 --- Biological Sciences

Award Information

Anticipated Type of Award:

Continuing Grant

Estimated Number of Awards:

11

Eleven sites are scheduled for renewal in FY 2016.

Anticipated Funding Amount:

$12,320,000

Projects currently funded at $980,000 per year may increase their annual request by up to 15%, to an annual request not to exceed $1,127,000. This amount includes $16,000 to support two research experiences for undergraduates and $24,000 for Schoolyard activities. Budgets must be thoroughly justified.

All awards will be pending availability of funds.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- The LTER program is currently accepting only renewal proposals. Only the organization or institution that holds the current award is eligible to apply for a renewal. Collaborative proposals must be submitted using the "single proposal" method as described in Chapter II, Section D.5.a. of the GPG. Separately submitted collaborative proposals will be returned without review.

Who May Serve as PI:

The lead PI on a renewal proposal must be the lead PI on the current award or one of the co-PIs listed on the current award.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI:

An individual is not allowed to be lead PI on more than a single renewal proposal.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required

- **Preliminary Proposal Submission:** Not required

- **Full Proposals:**

    - Full Proposals submitted via FastLane: *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) guidelines apply. The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=papp.
    - 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:**

    Inclusion of voluntary committed cost sharing is prohibited.

- **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. submitter's local time):

    March 04, 2016

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

All ecological populations, communities, and ecosystems face long-term change. Identifying the nature of these changes and the mechanisms driving them requires the collection, analysis, and interpretation of data over long periods of time. To address questions that cannot be resolved with short-term observations or experiments, NSF established the Long Term Ecological Research Program (LTER). Two components characterize LTER research: 1) it is located at specific sites chosen to represent major biomes or ecosystem types, and 2) it emphasizes the study of phenomena over long periods of time based on data collected in five core areas. Ongoing research at LTER sites provides a unique opportunity for researchers to obtain an integrated, holistic understanding of populations, communities, and ecosystems that is not possible through individual, short-term awards.

Over thirty years of LTER research have produced unique and valuable knowledge about ecological change in response to natural and human influences. LTER research has advanced the field of ecology and helped to provide the empirical data needed to forecast change. It has also advanced understanding of continental-scale processes, through cross-site analyses of ecological change. Urban LTER sites explicitly engage social sciences to investigate the interactions and feedbacks among social, economic, and ecological drivers in urban environments. Social scientists have been engaged at several sites to examine questions of socio-ecological connections among organisms, biological processes, and the abiotic environment.

The LTER Program faces new demands for long-term research. Long-term data are necessary to advance our understanding of complex biological systems, important ecological processes that are context-dependent and non-linear, ecological and evolutionary processes that interact continually through feedbacks, and the effects of ongoing climate change. These are a few of the frontiers particularly appropriate to LTER research.

II. PROGRAM DESCRIPTION

The proposed research should be organized around a suite of integrated questions that arise from the analysis of long-term data. These questions must be based on a conceptual framework that examines and predicts how the components of natural ecosystems, including populations and communities, interact to produce a comprehensive understanding of ecosystem structure and function. The research should have the goals of achieving a mechanistic understanding of biological responses to past and present environmental change at multiple scales and of using this understanding to predict ecological, evolutionary, and - if appropriate - social responses to future environmental change. Renewal projects must clearly define questions that demand study on decadal time scales.

NSF has invested in coordination across the 25 active sites through cross-site or network-level activities, recognizing the value of addressing questions across broader spatial scales within the LTER network and of collaborations with broader research communities. Renewal proposals may include comparative research with other LTER or non-LTER projects. These broader-scale activities should extend the conceptual framework proposed for innovative site-based research and contribute to a broader understanding of the mechanisms underlying ecological responses. Research must thoroughly justify the need for long-term support to understand ecological systems and processes.

Core data collection at LTER sites will continue to center on the five areas of 1) primary production, 2) population dynamics and trophic structure, 3) organic matter accumulation, 4) inorganic inputs and movements of nutrients through the ecosystem, and 5) patterns and frequency of disturbances. Analyses of these data provide the foundation for testing major theories and for identifying new questions that demand long-term study. These five areas focus and integrate LTER research within and among sites. In addition, the two urban LTER sites relate the human impact on land use and land-cover change in urban environments to ecosystem dynamics, examine the effects of human-environmental interactions in urban ecosystems and develop integrated approaches to linking human and natural dynamics.

The scientific goals of the proposed research will be evaluated based on the following principles:

1. formulation of a conceptual framework that integrates across populations, communities, and ecosystems.
2. use of this framework to develop predictions that link processes and observations across levels of organization or across temporal or spatial scales. Where appropriate, projects among sites or with collaborators outside of the LTER network may be included.
3. identification of important, general ecological questions that a) derive from theory, b) are motivated by the analysis of long-term data, and c) require additional, long-term data collection to be answered.
4. development, refinement, and testing of predictive models that include sources of uncertainty.
5. for the two urban sites, the likelihood that proposed activities will contribute to an integrated understanding of social, economic, and ecological interactions in urban environments.

Please read carefully the program-specific review criteria described below.

Renewal proposals also must articulate milestones and deliverables for data management that include timelines for data release, publication of discovery-level metadata, and online access for all core data through the LTER Network Information System.

NSF recognizes that human decisions, behavior, and actions may contribute to LTER research. LTER renewal projects may elect to include social science research if it helps to advance or to understand key, conceptually motivated ecological questions.

III. AWARD INFORMATION

At the end of each 6 year award, active LTER sites in good standing are eligible for renewal. Projects currently funded at $980,000 per year may increase their annual request by up to 15% but not to exceed $1,127,000 per year. This amount includes $16,000 to support two research experiences for undergraduates and $24,000 for Schoolyard activities. Budgets must be thoroughly justified.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- The LTER program is currently accepting only renewal proposals. Only the organization or institution that holds the current award is eligible to apply for a renewal. Collaborative proposals must be submitted using the "single proposal" method as described in Chapter II, Section D.5.a. of the GPG. Separately submitted collaborative proposals will be returned without review.

Who May Serve as PI:

The lead PI on a renewal proposal must be the lead PI on the current award or one of the co-PIs listed on the current award.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI:

An individual is not allowed to be lead PI on more than a single renewal proposal.

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 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.

The following instructions supplement the GPG and NSF Grants.gov Application Guide guidelines:

Proposal Format

The page limits contained in this solicitation take precedence over those given in the NSF *Grant Proposal Guide (GPG)*. Each project must be managed by a single organization with other organizations involved via sub-awards. Proposals will be subjected to initial screening for the requirements in the *GPG* and this solicitation. Those that do not meet specific requirements will be returned without review.

Proposals must include the following key components:

- An integrated, six-year research plan that addresses a set of mechanistic, ecological questions. This plan must result from a conceptual framework that clearly integrates across populations, communities, and other ecosystem components and that provides clear predictions. Questions should arise from analyses of long-term data and advance understanding of ecological concepts. Justification must be provided for at least 6 more years of data collection to answer these questions. Proposed cross-site or non-LTER collaborative research must fit within this cohesive research plan.
- Information Management and Technology, including milestones and deliverable products from data management that result in availability of all data via the LTER Network Information System.
- Project Management, including personnel, fiscal, administrative, institutional, and logistical issues. Involvement of new or early-career researchers in project activities is encouraged. If the Lead PI for the renewal changes, this change should be explained.
- Outreach and Education including training of students, K-12 Schoolyard activities, application of results to management or policy decisions, outreach to the public, and others as relevant.

Each of these components will be evaluated for quality, productivity, and impact.

Cover Sheet: The title must start with the acronym, "LTER:" followed by the substantive title.

Project Description: A maximum of 25 pages of text, with an additional 7 pages allowed for figures. No substitution of text for figures, or figures for text, will be accepted. Please include the following sections:

Results from Prior Support: Describe results of prior LTER support, including the 10 most significant publications resulting from the last 6 years of funding. Include broader impacts and results of supplemental support in these results. To provide a context for the current renewal, it may be useful to summarize briefly the major foci of previous LTER proposals.

Include in this section a short description of how the proposal addresses substantive issues identified during the recent mid-term review. The proposed research should convincingly incorporate major recommendations or suggestions.

Proposed Research: Essential to this section is a clear articulation of the conceptual framework and individual questions that constitute an integrated research plan. New research questions should arise from analyses of long-term data. Authors should describe in appropriate detail the experiments and observations that will be carried out, and explain how they fit into the proposed conceptual framework. Methods and data analyses must be described in enough detail that reviewers can critically evaluate the quality of these efforts. Likewise, proposed models or model development must be presented in sufficient detail to allow evaluation, including the model structure, and should explain how the models account for different sources of uncertainty. New activities should be conceptually integrated with ongoing, longer-term studies. If cross-site or other collaborative efforts are proposed, they should fit intellectually within the overarching research plan, and authors should describe how these will advance understanding of site-specific dynamics or relate site-specific results to communities or ecosystems at different spatial scales. This section of the proposal should conclude with a synthesis that ties together the proposed research activities and shows how they will significantly advance understanding of ecological dynamics at different spatial and temporal scales.

Methodological detail is important for new activities. Less detail is needed for ongoing projects, particularly when methods have been published in peer-reviewed journals. **Reference to established methods through links to websites is no longer allowed.**

Related Research Projects: Many LTER projects leverage NSF and other funds to obtain additional research support. Some of these complement the long-term research supported through the LTER program, but are not essential to it. Please use this section to report other research efforts that are **essential** to address the questions posed in this renewal, and describe how they contribute to answering these questions.

Education and Outreach Activities: Broader impacts that complement new research activities should be presented, including new educational activities planned through Schoolyard LTER programs, public outreach, media interactions, and applications of your research to policy and management. If well justified, support will be provided for 2 REU students. Plans for their involvement in research and for their mentoring must be included. Funds requested for REU activities must be requested as Participant Support and described separately in the budget justification, as explained in more detail below. Support will also be provided for LTER Schoolyard activities, as described above.

References Cited: pages as required, following GPG format

Budget and Budget Justification: Projects currently receiving $980,000 per year may request up to a 15% increase not to exceed $1,127,000 per year. Please contact the Program Director managing your current award for clarification or with questions about your budget.

All awards are subject to the availability of funds. Thorough justification of items requested in the budget is required. Explain why you need the funds requested to carry out specific aspects of the proposed research. Justification for general purpose equipment such as boats and other field vehicles must describe its primary or exclusive use for the proposed research.

Describe other sources of funding, how LTER funds are leveraged at your site, and what other in-kind services are provided, and by whom. **The description of other in-kind services should be included in the *Facilities, Equipment and Other Resources* section of the proposal, should be narrative in nature, and should not include any quantifiable financial information.** For further information please see the Grant Proposal Guide (GPG), Chapter II.C.2i

Funds for REU supplements must appear as Participant Support Costs. They should be justified and accompanied by a table that includes requests for stipends, travel, supplies, and other expenses.

Budgets should include all costs charged to the project for necessary platforms and facilities supporting the research except for those facilities separately supported by NSF (e.g., UNOLS research vessels, research aircraft, or field equipment). For research involving UNOLS vessels, a UNOLS ship request should be appended to proposals as a Supplementary Document. Likewise, research involving polar regions should follow established guidelines for requesting logistical assets, as discussed in the relevant proposal solicitations (for Antarctic Sciences, see NSF 15-529; for Arctic Sciences, see NSF 14-584). Principal Investigators are responsible for filing the appropriate requests for major research platforms, if applicable; a copy of the request must be attached as a Supplementary Document. More information is provided below.

Biographical Sketches: Provide a one-page biographical sketch for each PI and senior scientist listed in the proposal. List up to ten publications or products per investigator on each Bio Sketch but do not list conflicts of interest and collaborators on the Bio Sketch. As indicated below, conflicts are to be listed separately and submitted as a Single Copy Document.

Current and Pending Support: as specified in the GPG. This proposal is considered a pending support activity.

BIO Proposal Classification Form: Applicants must complete the Proposal Classification Form. The Proposal Classification Form is required for all submissions to BIO; FastLane will not allow processing of the proposal without it.

Supplementary Documents must include the following (order is not important):

1. A table that lists all data sets from the site currently deposited into the LTER Network Information System.

2. Data Management Plan (maximum of 5 pages): Core data sets generated at a site must be available electronically and accompanied by metadata that meet LTER standards for the Network Information System. This section must provide a description of the data and information management system and metadata standards to be used at the site. It is expected that data derived from LTER funding will be made freely and publicly available as soon as possible, and not to exceed 2 years after collection, via the Network Information System. This section should include milestones and deliverable products from data management. NSF places high priority on the availability of site-based data to a broad research community. This section should include descriptions of how data management will be implemented in the design of research projects; how the data manager will be involved in designing research projects; and the mechanisms employed to ensure that researchers contribute their data to the LTER databases. Proposers should describe the resources dedicated to harvesting, documenting, archiving, managing, and making data accessible; and should detail any anticipated major changes and why these are necessary.

3. Project Management Plan (maximum of 3 pages): Describe how the proposed research, which could involve a number of individuals and diverse projects, will be managed. This must include a cohesive management plan that is adequate for a project of the size and complexity proposed. The plan should describe how funding and research decisions will be made and implemented, and efforts to integrate non-LTER scientists into research activities. Describe efforts to increase diversity among site participants. The Project Management Plan also must address continuity of leadership, succession planning, and the recruitment of new scientists to the project. Explain any major changes anticipated or proposed, including a change in the project's lead PI since the most recent award.

4. Postdoctoral Mentoring Plan (maximum 1 page): A single postdoctoral mentoring plan must be included if salaries are listed for post-doctoral researchers on the appropriate line in the budgets requested.

5. Ship time - Proposals may require the scheduling of ship time. These proposals must include a completed NSF-UNOLS Request Form (NSF Form 831). The UNOLS form may be obtained from the NSF Division of Ocean Sciences Ship Operations Program by calling (703) 292-8581, or directly from the UNOLS World Wide Web site at http://www.unols.org/.

6. Logistical Support for Antarctic and Arctic LTER sites: Three current LTER sites rely on research support and logistics provided through the Division of Polar Programs. The Arctic Research Support and Logistics (RSL) Program supports the field component of research projects, usually through third party contractors. Third party logistics providers include CH2MHILL Polar Services, which manages support at many Arctic sites and includes a subcontract to Umiaq-UIC (Ukpeagvik Iñupiat Corporation), which supports work on Alaska's North Slope; and the Toolik Field Station, which is operated by the Institute of Arctic Biology at the University of Alaska Fairbanks. The Antarctic Infrastructure and Logistics Section provides logistical support for US Antarctic Program (USAP) research projects in Antarctica via support contractors or agreements with Department of Defense organizations. The scope of polar fieldwork at both poles must be outlined in the proposal so NSF and logistics providers can evaluate the feasibility of requested support and institute appropriate planning. Additional information about planning field support for polar projects can be found in NSF 15-529, Antarctic Research (http://www.nsf.gov/pubs/2015/nsf15529/nsf15529.pdf), and NSF 14-584, Arctic Research Opportunities (http://www.nsf.gov/pubs/2014/nsf14584/nsf14584.pdf).

Single Copy Documents

1. An alphabetical, combined Conflict of Interest document. This should be presented as an alphabetized table identifying conflicts of interest for the PI, all co-PIs, and all Senior Personnel. The table should be organized, by columns, as: A. Last and first name of the individual in conflict, B. institutional affiliation of the conflict, C. type of conflict, and D. name of the PI, co-PI, or Senior Personnel holding the conflict. Conflicts to be identified are (1) Ph.D. advisors or advisees, (2) collaborators or co-authors within the past 48 months, (3) postdoctoral researchers and Masters students within the past 48 months, (4) any other individuals with whom, or institutions with which, the research personnel (PIs, co-PIs, other named personnel) have financial or other professional ties, including advisory committees (specify type), and (5) friends, family members, or other individuals from whom an objective evaluation would be unlikely. Do not list conflicts separately on each biographical sketch.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

Federal agency scientists and scientists based in other countries may participate contingent on funding from other federal agency or foreign agency partners, but not via NSF funding.

Up to $24,000 for LTER Schoolyard activities and $16,000 for REU expenses may be requested if well justified.

C. Due Dates

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

    March 04, 2016

D. FastLane/Grants.gov Requirements

For Proposals Submitted Via FastLane:

To prepare and submit a proposal via FastLane, see detailed technical instructions 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.

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. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: http://www.grants.gov/web/grants/applicants.html. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical 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.

Proposers that submitted via FastLane are strongly encouraged to use FastLane to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements, for review. 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 either as *ad hoc* reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with 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. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in PAPPG Exhibit III-1.

A comprehensive description of the Foundation's merit review process is available on the NSF website at:

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Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Investing in Science, Engineering, and Education for the Nation's Future: NSF Strategic Plan for 2014-2018*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the strategic objectives in support of NSF's mission is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions must recruit, train, and prepare a diverse STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

NSF's mission calls for the broadening of opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which 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.

A. Merit Review Principles and Criteria

The National Science Foundation strives to invest in a robust and diverse portfolio of projects that creates new knowledge and enables breakthroughs in understanding across all areas of science and engineering research and education. To identify which projects to support, NSF relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects.

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (PAPPG Chapter II.C.2.d(i). contains additional information for use by proposers in development of the Project Description section of the proposal). Reviewers are strongly encouraged to review the criteria, including PAPPG Chapter II.C.2.d(i), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to
   a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
   b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management Plan and the Postdoctoral Researcher Mentoring Plan, as appropriate.

Additional Solicitation Specific Review Criteria

The following additional merit review criteria will be used to evaluate the scientific goals of the proposed research. The research must:

- address an integrated conceptual framework that describes or predicts how populations, communities, and other ecosystem components interact.
- propose a cohesive research plan that focuses on major ecological questions.
- rely on analyses of existing long-term data to generate new research questions.
- require additional, long-term (6 years or more) data to answer the questions posed.
- advance understanding of key concepts, questions, or theories in ecology.
- develop, refine, and test predictive models.
- for the two urban sites, advance understanding of feedbacks among social, economic, and ecological factors in urban environments.

Proposals involving fieldwork in the polar regions will also be evaluated for operational feasibility, which includes resource availability, environmental protection and waste management provisions, safety and health measures, and safeguards of radioactive materials.

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 evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will generally be completed and submitted by each reviewer and/or panel. 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 strives to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

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. After an administrative review has occurred, Grants and Agreements Officers perform 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.

Once an award or declination decision has been made, Principal Investigators are provided feedback about their proposals. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers or any reviewer-identifying information, 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.

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 notice, 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 notice; (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 notice. 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 *Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=papp.

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 no later than 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). No later than 120 days following 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 all identified PIs and co-PIs on a given award. 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 Research.gov, for preparation and submission of annual and final project reports. Such reports provide information on accomplishments, project participants (individual and organizational), publications, and other specific products and impacts of the project. Submission of the report via Research.gov constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report also 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.

More comprehensive information on NSF Reporting Requirements and other important information on the administration of NSF awards is contained in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=papp.

VIII. AGENCY CONTACTS

Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.

General inquiries regarding this program should be made to:

- William Ambrose, telephone: (703) 292-8029, email: wambrose@nsf.gov

- David L. Garrison, Division of Ocean Sciences, telephone: (703) 292-7588, email: dgarriso@nsf.gov

- Louis A. Kaplan, telephone: (703) 292-7187, email: lkaplan@nsf.gov

- Douglas Levey, telephone: (703) 292-5196, email: dlevey@nsf.gov

- Peter H. McCartney, telephone: (703) 292-8470, email: pmccartn@nsf.gov

- John Schade, telephone: (703) 292-7139, email: jschade@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, "NSF Update" 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 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. "NSF Update" also is available on NSF's website.

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this 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 55,000 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 Arctic 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 (FASED) provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See the *NSF Proposal & Award Policies & Procedures Guide* Chapter II.E.6 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**   (703) 292-5111
>   (NSF Information Center)**:**
>
> - **TDD (for the hearing-impaired):**   (703) 292-5090
>
> - **To Order Publications or Forms:**
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>   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
Office of the General Counsel
National Science Foundation
Arlington, VA 22230

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