

Long Term Research in Environmental Biology (LTREB)

PROGRAM SOLICITATION

NSF 18-597

REPLACES DOCUMENT(S):

NSF 17-513



National Science Foundation

Directorate for Biological Sciences
Division of Environmental Biology

Full Proposal Deadline(s):

Proposals Accepted Anytime

IMPORTANT INFORMATION AND REVISION NOTES

A no-deadline submission process for DEB is initiated in this solicitation.

Preliminary proposal submissions have ended; all submissions must be full proposals.

Details of how data from previously funded projects were made publicly accessible must be included in the "Results from Prior NSF Support" section.

There will be **no limits** on the number of proposals an investigator can submit as PI or co-PI.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 20-1), which is effective for proposals submitted, or due, on or after June 1, 2020.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Long Term Research in Environmental Biology (LTREB)

Synopsis of Program:

The Long Term Research in Environmental Biology (LTREB) Program supports the generation of extended time series of data to address important questions in evolutionary biology, ecology, and ecosystem science. Research areas include, but are not limited to, the effects of natural selection or other evolutionary processes on populations, communities, or ecosystems; the effects of interspecific interactions that vary over time and space; population or community dynamics for organisms that have extended life spans and long turnover times; feedbacks between ecological and evolutionary processes; pools of materials such as nutrients in soils that turn over at intermediate to longer time scales; and external forcing functions such as climatic cycles that operate over long return intervals.

All proposals submitted through the LTREB solicitation are processed by 1 of the 3 clusters in the Division of Environmental Biology: Ecosystem Science, Population and Community Ecology, and Evolutionary Processes. Proposals must address topics supported by these clusters. Researchers who are uncertain about the suitability of their project for the LTREB Program are encouraged to contact the cognizant Program Officer.

Ecological research on marine populations, communities and ecosystems is not supported by LTREB and should be directed to the Biological Oceanography Program: (https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=11696&org=OCE). However, research that examines the evolutionary dynamics of marine populations or communities will be accepted. Investigators who are uncertain about the suitability of their research for LTREB are strongly encouraged to contact the managing Program Officers listed in this solicitation.

Examples of current LTREB awards can be viewed at <https://www.nsf.gov/awardsearch/> by including 'LTREB' in a title search.

The Program intends to support decadal projects. Funding for an initial, 5-year period requires submission of a proposal that includes a 15-page project description containing two essential components: a decadal research plan and a description of core data. Proposals for the second five years of support (renewal proposals) are limited to a ten-page project description.

Continuation of an LTREB project beyond an initial ten-year award will require submission of a new proposal that presents a new decadal research plan.

Specific review criteria for LTREB proposals and renewals are explained within this solicitation. Prospective proposers are advised to read this solicitation carefully.

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.

- Kendra McLauchlan, telephone: (703) 292-2217, email: Kmclaunch@nsf.gov
- Matthew S. Olson, telephone: (703) 292-2655, email: matolson@nsf.gov
- Mary Beth (Betsy) Von Holle, telephone: (703) 292-4974, email: mvonholl@nsf.gov

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

- 47.074 --- Biological Sciences

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 10

per year (Inclusive of New and Renewal awards)

Anticipated Funding Amount: \$6,000,000

per year, pending availability of funds

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

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

There are no restrictions or limits.

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=pappg.
 - Full Proposals submitted via Research.gov: *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=pappg.

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: https://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):**

Proposals Accepted Anytime

Proposal Review Information Criteria

Merit Review Criteria:

National Science Board approved criteria. Additional merit review criteria 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

Many important questions in ecology, ecosystem science, and evolutionary biology require data collected for ten or more years to be answered. Research areas include, but are not limited to, the effects of natural selection or other evolutionary processes on populations; the effects of interspecific interactions that vary over time and space; population and community dynamics for organisms that have extended life spans and long turnover times; feedbacks

between ecological and evolutionary processes; pools of materials such as nutrients in soils that turn over at intermediate to longer time scales; and external forcing functions such as climatic factors that operate over long time periods. Investigators often are constrained in addressing questions in these areas by the relatively short support periods associated with typical research awards. In recognition of this problem, the Division of Environmental Biology (DEB) established the **Long Term Research in Environmental Biology (LTREB) program**. LTREB awards are designed to provide the funding to maintain an ongoing, long-term research project for a period of a decade or perhaps longer.

The usefulness of long-term data sets extends beyond typical scientific publications. Therefore, a means of sharing data with other investigators in order to stimulate data reuse, synthesis, and the generation of novel ideas is an important requirement of all proposals. Results should be of interest to and available to the general public. To take advantage of the data collected by these long-term projects, LTREB investigators are required to implement mechanisms of data sharing in the broadest manner possible.

II. PROGRAM DESCRIPTION

The Long Term Research in Environmental Biology Program intends to support decadal projects. Funding for an initial, 5-year period requires submission of a proposal following the guidelines described in Section V and the additional review criteria in Section VI, below.

Proposals must address timely and important concepts in environmental biology. The research must demonstrate an ability to advance general understanding in evolutionary biology, ecology, or ecosystem science. Clearly defined hypotheses must guide the research. These hypotheses must be motivated by at least six years of recently-collected data on the study system and must be grounded in appropriate concepts or theory.

All proposals submitted through the LTREB solicitation are processed by 1 of the 3 clusters in the Division of Environmental Biology: Ecosystem Science, Population and Community Ecology, and Evolutionary Processes. Proposals must address topics supported by these clusters. Researchers who are uncertain about the suitability of their project for the LTREB Program are encouraged to contact the cognizant Program Officer.

Ecological research on marine populations, communities and ecosystems is not supported by LTREB and should be directed to the Biological Oceanography Program: (https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=11696&org=OCE). However, research that examines the evolutionary dynamics of marine populations or communities will be accepted. Investigators who are uncertain about the suitability of their research for LTREB are strongly encouraged to contact the managing Program Officers listed in this solicitation.

Essential components of an LTREB proposal must include:

Decadal Research Plan: Proposals must pose questions that require long-term data collection of variables directly relevant to the proposed hypotheses. Investigators must present a research plan that spans ten years. This plan should clearly articulate important questions that cannot be addressed with data that have already been collected but could be answered if ten additional years of data were collected. It is not a research timeline or management plan. It is a concise justification for ten additional years of support in order to advance understanding of key concepts, questions, or theories in environmental biology. The decadal plan is a critical component of an initial 5-year proposal, and questions or hypotheses outlined in this framework must guide any subsequent renewal.

Core Data: LTREB proposals require preliminary data on a particular phenomenon or process for at least six years up to the present (within 1-2 years of the present) and for long enough to generate a contemporary time series that contains at least six consecutive data points for each response variable and sampling site included in the proposal. The data must be collected by the research team. Consecutive measures must be collected on a regular frequency (e.g. on a yearly basis, collected once every two years or collected once every five years) appropriate to the phenomenon or process being studied. These data constitute Core Data on which the proposed project is based. Analysis of these data should generate new questions on the same phenomena or processes; these questions provide the basis for LTREB support. Gaps or breaks in data collection compromise analyses of time series data. Time series that include significant or repeated gaps in data collection do not meet LTREB criteria. Proposals that do not meet these requirements will be returned without review.

New research activities such as the addition of new sites or the initiation of a new manipulation can be proposed with the following conditions: these activities cannot compromise continued collection of the core data that form the basis for the research and must clearly improve the ability to answer questions that arise from analyses of the Core Data. An example is the initiation of a new, short-term experiment to reveal mechanisms responsible for observed, longer-term trends.

Questions concerning the appropriateness of an existing data set as the basis for an LTREB proposal or of new research activities should be discussed with the cognizant NSF Program Officer prior to proposal development. The LTREB Program does not provide support solely for monitoring, for the analysis of long-term historical data, or for the continuation of an ongoing study that is not question- or hypothesis-driven.

LTREB Renewals

To implement the decadal time frame for LTREB projects, and following an initial 5-year LTREB award, renewal proposals for a second, 5-year period will be accepted. The additional criteria for a renewal proposal, described in Section V, must be included in the project description. Instructions for writing a renewal proposal are provided in Section V, below. Renewal proposals will be evaluated using review criteria described in Section VI of this solicitation. **Renewal proposals should be submitted early in the fifth year of the existing award.**

Special Categories

Research in Undergraduate Institutions (RUI): LTREB RUI proposals should comply with the instructions in the LTREB solicitation, include the required RUI documentation and **be submitted to the current RUI solicitation**. If the proposal is collaborative involving multiple institutions, only the undergraduate institution(s) should submit to the RUI solicitation. Other institutions should submit to this LTREB solicitation. Additional information on the scope of RUI projects and the additional, specific content and format requirements of those proposals can be found at https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5518&org=NSF&sel_org=NSFW&from=fund. Please note: Proposals from RUI-eligible institutions are not required to submit through the RUI solicitation.

Review Process

LTREB proposals will receive ad hoc review and/or panel review at the discretion of the program as described in Section VI of this Solicitation.

III. AWARD INFORMATION

LTREB awards are not to exceed \$600,000 (direct and indirect costs) over a 5-year (60 month) effort. The number of awards made through the LTREB program is subject to the availability of funds.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

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

There are no restrictions or limits.

Additional Eligibility Info:

Note that institution types, other than those listed in the "Who May Submit Proposals" section, are allowed to receive subawards through an eligible institution, but there are limitations on what can be supported by those subawards. The PI should discuss with a program officer any plans to incorporate a subaward to an institution not eligible to submit directly to this solicitation.

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 FastLane, Research.gov, or Grants.gov.

- 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 Proposal & Award Policies & Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg. Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 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 Research.gov: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal and Award Policies and Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg. Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov. The Prepare New Proposal setup will prompt you for the program solicitation number.
- 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: https://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) 292-8134 or by e-mail from nsfpubs@nsf.gov.

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 FastLane or Research.gov. PAPPG Chapter II.D.3 provides additional information on collaborative proposals.

See PAPPG Chapter II.C.2 for guidance on the required sections of a full research proposal submitted to NSF. Please note that the proposal preparation instructions provided in this program solicitation may deviate from the PAPPG instructions.

Cover Sheet: Select the program solicitation number from the pull-down list. The DEB Programs will automatically appear. Select the lead DEB Program. Entries on the Cover Sheet are limited to the Principal Investigator and a maximum of four co-Principal Investigators. Beginning Investigators (individuals who have not been a Principal Investigator [PI] or co-Principal Investigator [co-PI] on a Federally-funded award with the exception of doctoral dissertation, postdoctoral fellowship or research planning grants) listed as Lead PI must check the box for "Beginning Investigator" on the proposal Cover Sheet. For more FastLane instructions, see section V.D. below.

Title of Proposed Project: The project title must begin with 'LTREB:', followed by the substantive title. If submitted as an RUI proposal, through the RUI solicitation, the title must begin with 'LTREB: RUI:'

Project Summary: The one-page Project Summary should include the three sections required by the PAPPG (II.C.2.b): Overview, Intellectual Merit, and Broader Impacts. The summary should be informative to those working in the same or related field(s) and understandable to a scientifically or technically literate reader. **Note: Project Summaries entered in FastLane are displayed with standardized formatting.**

Project Description: The Project Description must include the two labeled sections required by the PAPPG (II.C.2.d): Intellectual Merit, and Broader Impacts. The Project Description is limited to 15 pages. It should also include a section titled **Results of Prior NSF Support** and must follow the format described in the PAPPG (II.C.2.d.iii) for this section. Specifically, results of prior NSF support must be reported in the Project Description for each PI or co-PI identified on the proposal who has received any NSF funding with an end date in the past five years, regardless of whether the support was directly related to this proposal. Funding includes not just salary support, but any funding awarded by NSF. In addition, details of how data from previously funded projects were made publicly accessible must be included in the **Results from Prior NSF Support** section, including the relevant Digital Object Identifiers (doi) or Digital Package Identifier. This information is required to be provided for all publications listed as products of prior NSF support.

LTREB proposals must include the following two components in the Project Description:

- **Decadal Research Plan:** The Project Description must include a specific section, entitled 'Decadal Research Plan', that identifies questions or hypotheses that require an additional ten years of investigation to be answered. These questions or hypotheses should form the crux of the proposal. Investigators must demonstrate that the questions posed cannot be answered with data already on hand, or with data collected from typical three-to-five-year awards made by core programs. Clear justification must be provided for needing an additional ten years of data to answer these questions. The decadal research plan should provide the overarching motivation for the initial 5-year investigation as well as for a 5-year renewal.
- **Core Data:** Central to all successful LTREB projects is a set of core data that are already being collected continually in the laboratory or at an existing field site or sites. As described above, the proposal should describe the study of a particular process or phenomenon for at least six years, up to the present (within 1 – 2 years), and for long enough to generate a time series that includes at least six annual (or longer, regular frequency) data points. Analysis of these data should serve as the basis for new questions that motivate the current proposal, and these questions should focus on the same phenomena or processes that constitute the core data. Proposals should clearly state the data that have been collected, the sites at which they have been collected, how long they have been collected, if they will continue to be collected, and how these data generate the new questions posed. These data can be documented in a table or as a narrative description. They must be presented as part of the Project Description.

Budget: LTREB budgets should be prepared following PAPPG guidance, with two exceptions: i) total costs (direct plus indirect) cannot exceed \$600,000 for a 5-year duration; ii) senior personnel may request up to one month of salary per year, if they do not exceed a request for more than two months of salary support per year across all NSF awards. These requests must be justified carefully, and proposers are encouraged to contact the cognizant Program Officer prior to proposal development. Involvement of undergraduate and graduate students is encouraged in LTREB projects. Because data management is a key aspect of these research projects, the proposed budget can include the establishment or periodic upgrading of information technology to provide for data sharing with other researchers and the public. Under unusual circumstances, the purchase of major equipment (over \$5,000) will be entertained if these expenses are well justified. Support from the LTREB Program does not preclude support from other NSF programs.

If the proposal includes plans for REU activities, then funds to support REU students should be included in the budget. If the intent is to engage students as technicians, then an REU is not the appropriate support mechanism; instead, salary support should be entered on the Undergraduate Students line of the proposal budget. All REU person related costs, including stipends and/or travel should be placed in Participant Support Costs on the budget. Materials and supplies costs should be included under section G1 of the budget. A detailed breakdown of the budget must be included in the budget justification. Budgets for REUs are generally \$6,000-8,000 per student. Funds requested for REU educational supplements can be in addition to the \$600,000 funding limit for LTREB projects. A limited number of post-award supplements may be available if REU activities were unforeseen at the time of submission and the request broadens participation in STEM fields. Eligibility for post-award educational supplements for REU, RET, RAHSS, and ROA projects is described on the DEB supplement request website: <https://www.nsf.gov/bio/deb/suppopp.jsp>

Biographical Sketches and Current and Pending Support: Biographical sketches and Current and Pending Support Statements should be submitted for all senior personnel in the full proposal. **Biographical sketches should follow the format described in the PAPPG.** All senior personnel biographical sketches should be placed in that section of the proposal. Biographical sketches for post-doctoral fellows can optionally be included, but if included, must be added as Non PI/Co-PI Senior Personnel. No biographical sketches should be included in supplementary documents. Biographical sketches should not be included for anyone providing a "Letter of Collaboration". Please note: Do not bundle Biographical Sketches or Current and Pending Support documents for multiple individuals into a single file. Use the "Add/Delete Non-Co-PI Senior Personnel" button on the FastLane proposal preparation screen to enable submission of separate files for individuals not listed on the Cover Sheet.

Supplementary Documents: The following documents are uploaded as Supplementary Documents:

- **Data Management Plan.** The PAPPG (II.C.2.j) requires the inclusion of a Data Management Plan with all full proposal submissions. The Data Management Plan can be no longer than two pages and must be inclusive of the entire project. The Directorate for Biological Sciences provides additional context and guidance to PIs on the preparation of Data Management Plans here: <http://www.nsf.gov/bio/biodmp.jsp>. All projects must ensure that data and biological materials are collected, archived, digitized, and made available using methods that allow current and future investigators to access data and material. Funded projects must disseminate project data broadly, using widely accepted electronic data

- standards. Investigators are strongly encouraged to make use of appropriate community infrastructure for data management.
- o **Postdoctoral Researcher Mentoring Plan** (if applicable). This one-page document should describe the mentoring of all postdoctoral researchers on the projects, including those at collaborating institutions.
 - o **Research Experiences for Undergraduates (REU)** (if applicable). The descriptions of proposed REU activities should be included in the Supplementary Documents. For REUs, follow the guidelines for "REU supplement requests as part of a proposal" in the [REU solicitation](#). REU projects must involve students in meaningful ways in ongoing research programs or in research projects specifically designed for the REU student. The description of these activities is limited to 3 pages. If multiple institutions on a collaborative proposal are requesting funds for REU students, all REU activities should be included in one 3-page supplementary document.
 - o **Letters of Collaboration**. Supplementary Documents may include letters of collaboration from individuals or organizations that are integral to the proposed project but are neither senior personnel nor supported by subawards. This may include subsidiary involvement in some aspect of the project, cooperation on outreach efforts, or documentation of permission to access materials or data. Letters of collaboration must focus solely on affirming that the individual or organization is willing to collaborate on the project as specified in the Project Description or Facilities, Equipment and Other Resources section of the proposal. No additional description of research activities or endorsements of the potential value or significance of the project may be included. Each letter of collaboration must be signed by the designated collaborator. Requests to collaborators for letters of collaboration should be made by the PI well in advance of the planned proposal submission date because they must be included at the time of the proposal submission. The recommended template for letters of collaboration is provided below:

To: NSF _____(Program Title)_____ Program

From: _____

(Printed name of the individual collaborator or name of the organization and name and position of the official submitting this memo)

By signing below (or substitute: transmitting electronically), I acknowledge that I am listed as a collaborator (or substitute: contributor) on this proposal, entitled "_____(proposal title)_____" with _____(PI name)_____ as the Principal Investigator. I agree to _____(description up to 140 characters)_____, as described in the Project Description or Facilities, Equipment and Other Resources section of the proposal.

Signed: _____

Organization: _____

Date: _____

Single Copy Documents:

- o **Collaborators & Other Affiliations (COA) Information**. As detailed in the PAPPG (II.C.1.e), information regarding collaborators and other affiliations must be provided for each individual who has a biographical sketch in this proposal. If you have correctly added biographical sketches for all persons, there should be a separate space within Single Copy Documents to upload each individual's file. The COA information must be provided through use of the [COA template](#).
- o **Suggested Reviewers**. PIs are encouraged to provide a list of suggested reviewers, including the individuals' names, institutions, and areas of expertise, email addresses, and URLs if available. Please ensure no one on this list has a conflict with the proposal.

Personnel List Spreadsheet: Submission of a standard spreadsheet listing project personnel is required. The spreadsheet template can be found at <https://www.nsf.gov/bio/deb/debpersonnelist.xlsx>. Please read the instructions carefully. Using the template, compile an Excel file that provides information for all persons identified in the proposal as: "PI or co-PI" (i.e., those listed on the Cover Sheet); "Other Senior Personnel/Subawardee"; or "Other Personnel" who have a biographical sketch included in the proposal. Only one spreadsheet should be submitted per project. All participants in a multi-institutional collaborative proposal should be included on the lead proposal's Personnel List Spreadsheet. The file **must include the FastLane proposal ID assigned after submission of your proposal (i.e., not the Temporary ID # or Grants.gov ID #)**. Once completed, the file should be submitted by email to debtemplate@nsf.gov within one business day of proposal submission.

PROPOSAL PREPARATION INSTRUCTIONS FOR LTREB RENEWAL PROPOSALS

To implement the decadal time frame intended for LTREB projects, and following an initial 5-year LTREB award, renewal proposals for a second, 5-year period will be accepted. Renewal proposals should be submitted in the fifth year of the initial award. The project description of a renewal proposal is limited to **ten pages**; all other sections described above for a proposal must be included. Renewal proposals will be evaluated using the standard NSF Merit Review Criteria and four additional criteria described in Section VI below.

Titles for renewal proposals must begin with "LTREB Renewal:" followed by the substantive title.

Project descriptions should provide a brief description of the study system, core data, and decadal research plan such that a reviewer can appreciate the basis for the original award. The renewal proposal project description should also include information on the following topics:

1. Progress made toward the decadal research plan outlined in the initial proposal, including a description of Intellectual Merit and Broader Impact accomplishments from the most recent five years of funding.
2. A description of planned research activities to complete this decadal plan.
3. Evidence that previously-collected data are available to the broader research community. Acceptable evidence of data accessibility include a URL (web address) link to the data, or a detailed description of how to access these data within a public database.
4. A description of how results at the end of the ten years of funding will be integrated to resolve the original questions posed.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

Proposals will be limited to a total of \$600,000 over five years.

C. Due Dates

- **Full Proposal Deadline(s):**

Proposals Accepted Anytime

D. FastLane/Research.gov/Grants.gov Requirements

For Proposals Submitted Via FastLane or Research.gov:

To prepare and submit a proposal via FastLane, see detailed technical instructions available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. To prepare and submit a proposal via Research.gov, see detailed technical instructions available at: https://www.research.gov/research-portal/appmanager/base/desktop?_nfpb=true&_pageLabel=research_node_display&_nodePath=/researchGov/Service/Desktop/ProposalPreparationandSubmission.html. For FastLane or Research.gov user support, call the FastLane and Research.gov Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov or rgov@nsf.gov. The FastLane and Research.gov Help Desk answers general technical questions related to the use of the FastLane and Research.gov systems. 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: <https://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 or Research.gov may use Research.gov 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: https://www.nsf.gov/bfa/dias/policy/merit_review/.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Building the Future: Investing in Discovery and Innovation - NSF Strategic Plan for Fiscal Years (FY) 2018 – 2022*. 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

Proposals

In addition to the two standard review criteria established by the National Science Board, reviewers will evaluate new LTREB proposals for:

1. A compelling, conceptually- or theoretically-motivated decadal research plan; and
2. Core Data - at least six years of contemporary data collected up to the present should be in hand at the time of submission, and should motivate or provide the foundation for the research questions proposed.

LTREB Renewal Proposals

Proposals submitted for a second, 5-year award to complete a decadal research plan will be evaluated using the standard NSF Merit Review Criteria and the following additional criteria:

1. Progress made toward the decadal research plan outlined in the initial proposal, including a description of Intellectual Merit and Broader Impact accomplishments from the most recent five years of funding;
2. A description of planned research activities to complete this decadal plan;
3. Evidence that previously-collected data are available to the broader research community; and
4. A description of how results at the end of the ten years of funding will be integrated to resolve the original questions posed.

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 https://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 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=pappg.

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=pappg.

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:

- Kendra McLaughlan, telephone: (703) 292-2217, email: Kmclauch@nsf.gov
- Matthew S. Olson, telephone: (703) 292-2655, email: matolson@nsf.gov
- Mary Beth (Betsy) Von Holle, telephone: (703) 292-4974, email: mvonholl@nsf.gov

For questions related to the use of FastLane or Research.gov, contact:

- FastLane and Research.gov Help Desk: 1-800-673-6188
FastLane Help Desk e-mail: fastlane@nsf.gov.
Research.gov Help Desk e-mail: rgov@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 <https://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 (FASSED) 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 <https://www.nsf.gov>

- **Location:** 2415 Eisenhower Avenue, Alexandria, VA 22314
- **For General Information** (NSF Information Center): (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**
 - Send an e-mail to: nsfpubs@nsf.gov
 - or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See [System of Record Notices](#), NSF-50, "Principal Investigator/Proposal File and Associated Records," and NSF-51, "Reviewer/Proposal File and Associated Records." 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
Alexandria, VA 22314

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