

# Critical-Zone Collaborative Network

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## PROGRAM SOLICITATION

NSF 19-586

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## REPLACES DOCUMENT(S):

NSF 12-575

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National Science Foundation

Directorate for Geosciences  
Division of Earth Sciences

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

December 02, 2019

## IMPORTANT INFORMATION AND REVISION NOTES

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This program is the successor to the Critical Zone Observatories (CZO) program.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 19-1), which is effective for proposals submitted, or due, on or after February 25, 2019.

## SUMMARY OF PROGRAM REQUIREMENTS

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### General Information

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**Program Title:**

Critical-Zone Collaborative Network

**Synopsis of Program:**

NSF seeks proposals to establish an adaptive and responsive research network that supports investigations of the Earth's Critical Zone. This network will consist of two components that will work together to advance knowledge, education, and outreach in this convergent science: 1) Thematic Clusters of fixed or temporary locations will conduct basic research on significant, overarching scientific questions concerning the structure, function, and processes of the Critical Zone. These U.S.-based Clusters could include existing observatories engaged in collecting environmental data, other monitoring locations that have been in operation for extended periods of time, and new sites that will support the scientific goals of the Cluster; 2) A Coordinating Hub that will oversee the compatibility and archiving of the data resulting from the Thematic Clusters, coordinate outreach and community-building activities, support the use of network facilities by outside researchers, and plan for infrastructure needs of the network.

This solicitation invites proposals for either of the two components: 1) Thematic Cluster or 2) Coordinating Hub. The Thematic Clusters will carry out interdisciplinary research on scientific questions and manage part of the network infrastructure; the Coordinating Hub will serve as the national center for the network. The infrastructure of the network will be accessible to other research teams pursuing research in the Critical Zone.

**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.*

- Richard F. Yuretich, Lead, telephone: (703) 292-4744, email: [cznet@nsf.gov](mailto:cznet@nsf.gov)
- Enriqueta C. Barrera, telephone: (703) 292-4731, email: [cznet@nsf.gov](mailto:cznet@nsf.gov)
- Justin Lawrence, telephone: (703) 292-2425, email: [cznet@nsf.gov](mailto:cznet@nsf.gov)
- Ingrid Padilla, telephone: (703) 292-2268, email: [cznet@nsf.gov](mailto:cznet@nsf.gov)
- Philip C. Bennett, telephone: (703) 292-2915, email: [cznet@nsf.gov](mailto:cznet@nsf.gov)

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

- 47.050 --- Geosciences

## Award Information

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**Anticipated Type of Award:** Continuing Grant or Cooperative Agreement

**Estimated Number of Awards:** 8 to 11

**Thematic Clusters:** The number of awards will depend upon the scope and budgetary requirements of the projects; approximately 8 -10 awards as continuing grants or cooperative agreements are anticipated.

**Coordinating Hub:** 1 award to be made as a Cooperative Agreement.

**Anticipated Funding Amount:** \$8,500,000 Anticipated funding is yearly.

**Thematic Clusters:** Award amounts will depend upon the scope and budgetary requirements of the successful proposals. Each project may comprise multiple collaborative proposals. Awards will be 5 years in duration.

**Coordinating Hub:** There will be 1 award of up to \$1 million annually for 5 years.

Estimated program budget, number of awards average award size and duration are subject to the availability of funds. Award budgets will be reviewed annually.

## Eligibility Information

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**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: 4**

**Thematic Clusters:** 3 proposals per organization

**Coordinating Hub:** 1 proposal per organization

An organization may submit a total of 4 proposals to this competition, 1 for the Coordinating Hub and 3 for the Thematic Clusters.

**Limit on Number of Proposals per PI or Co-PI: 4**

**Thematic Clusters:** An individual may serve as PI or co-PI on as many as 3 proposals.

**Coordinating Hub:** An individual may serve as PI or co-PI on only 1 proposal.

An individual may serve as PI or co-PI on a total of 4 proposals; 3 Thematic Clusters and 1 Coordinating Hub.

## Proposal Preparation and Submission Instruction

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**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=papppg](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=papppg).
  - 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](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)** (due by 5 p.m. submitter's local time):

December 02, 2019

## **Proposal Review Information Criteria**

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**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**

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**Award Conditions:**

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

**Reporting Requirements:**

Standard NSF reporting requirements apply.

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## I. INTRODUCTION

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The Critical Zone (CZ), which extends from the top of the vegetation canopy to the base of weathered bedrock is where fresh water flows, soils are formed, and most terrestrial life flourishes on Earth. The CZ is under unprecedented pressure because of contemporary human demands for food, water, land, and other resources that drive global economies. In the heterogeneous and complex CZ, multiple components of the Earth's life-support system interact through connected processes that operate at different temporal and spatial scales. These coupled processes directly influence and are affected by lithology, climate, tectonics, anthropogenic activity, ecology, and cycles of water, nutrients, and other constituents. The Critical-Zone Collaborative Network will build upon the outcomes of the Critical Zone Observatories (CZO) to address significant interdisciplinary scientific questions at the regional and national scale, and develop predictive models of complex CZ phenomena. In order to achieve these goals, stimulate collaborations among new and existing CZ community members, and expand the CZO infrastructure to more diverse participation, the Critical-Zone Collaborative Network to be established will consist of several science-driven **Thematic Clusters** linked to a **Coordinating Hub**.

The **Thematic Clusters** (Clusters) will operate an array of CZ locations chosen on the basis of a unifying scientific theme. Each Cluster would ideally have several locations encompassing multiple watersheds that could facilitate investigations of environmental gradients relevant to the proposed research theme. The Network is expected to include Clusters with a variety of physical and environmental characteristics, such as lithology, climate, erosional and depositional settings, land use, and biota, that foster investigations showcasing convergent science and multidisciplinary teams. These Clusters could include existing CZOs or similar locations that have been actively gathering data for extended periods of time, other locations that leverage relevant data sets that have been collected previously, as well as new locations that will support the science theme.

The **Coordinating Hub** (Hub) will manage the standardization, archiving, and accessibility of the data generated by the Clusters, convene regular meetings of the Thematic Clusters, and plan for future research infrastructure needs of the network. The Hub will also help support national outreach activities and organize workshops that engage the larger CZ community. These activities are expected to enhance scientific progress within the domains of CZ research and to encourage the participation of a broad range of scientists from various disciplines, at different career stages, and from groups that are traditionally underrepresented in the sciences.

Additional documents that are useful descriptors of community planning related to this solicitation may be accessed through [https://www.nsf.gov/geo/ear/programs/czo\\_moreinfo.jsp](https://www.nsf.gov/geo/ear/programs/czo_moreinfo.jsp)

## II. PROGRAM DESCRIPTION

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This solicitation invites proposals for either component of the Critical-Zone Collaborative Network: Thematic Clusters or the Coordinating Hub. Together, these components will serve as the basic infrastructure to facilitate interdisciplinary research into processes that govern Critical-Zone dynamics and they are expected to contribute to the following overall program goals:

1. Conduct network-scale investigations of CZ phenomena, processes, and gradients to push CZ science beyond single-watershed studies;
2. Establish and maintain a physical infrastructure to collect comprehensive data covering the key environmental variables that govern CZ processes;
3. Institute a logical and effective management structure that will coordinate the operation and research agenda of the network, and support the use of the facilities by other research teams;
4. Implement a coordinated education and outreach plan to enhance the growth of Critical-Zone science that will fully include groups that are historically underrepresented in the sciences;
5. Implement a plan for the management, dissemination, and maintenance of the data that results from the network operation and scientific investigations.

Proponents are encouraged, where appropriate, to leverage infrastructure and data sets from existing or previous projects, observational networks, experimental watersheds, long-term ecological research sites, long-term agricultural research centers, or testing and evaluation facilities, whether supported by NSF or other agencies such as USEPA, USGS, USDA, DOE, NOAA, etc. They are similarly encouraged to connect with the NSF INCLUDES network coordination hub or alliances, and professional societies in science, mathematics, and engineering for underrepresented minorities and people with disabilities. Coordinating Hub proposals may be strengthened by including senior personnel with advanced research cyberinfrastructure expertise. The project description should make clear how the proposed work differs from and augments activities already supported. Letters of collaboration in the appropriate format must be included as specified below.

### Critical-Zone Collaborative Network Components

1. **Thematic Clusters** will carry out research into CZ processes, structure, and function at the network scale. Clusters will be united by science themes rather than be defined by a particular geographic location. Successful proposals will be organized around a conceptual model, not by data gathering or site characterization alone. Clusters will investigate CZ science questions using an array of existing or new observation sites with various physical and environmental characteristics. Investigations should be guided by an integrated field and modeling approach, with advances in each providing the impetus for improvements in the other. Clusters will carry out the proposed scientific research program, operate and maintain the instrumentation at the various locations within the Cluster, insure the compatibility of data collection and management with Network-wide protocols, coordinate activities with the research agenda of the Network, implement a vibrant education and outreach plan that has a strong emphasis on diversity and inclusion, and facilitate the use of the Cluster infrastructure by other research teams. Each Cluster proposal will include an engagement plan as part of the project description, budgeted appropriately, that details how it will serve as a resource to others interested in the Cluster research and education program. It is expected that Cluster proposals will be collaborations among investigators at various institutions that oversee the different monitoring locations within the Cluster; early-career scientists are encouraged to be on the leadership team. Communication among Cluster members will occur through regular teleconferences and face-to-face meetings as specified in the proposal management plan. All clusters are expected to collaborate with the Hub, by sharing data, protocols, and education and outreach activities.
2. The **Coordinating Hub** will: ensure the compatibility of the measurements across the various Clusters; lead the data management of the Network by establishing procedures for data collection, standardization, central archiving, and access by the research community; facilitate access to appropriate cyberinfrastructure resources, tools and services essential to the advancement of CZ science; manage the web presence for the entire Network; promote dissemination of information and resources both within the network and to additional stakeholder communities outside of academia; identify opportunities to leverage resources or develop synergistic activities; support the use of the Network facilities by other research teams with a dedicated plan and budget to ensure that broadening participation goals are met; and plan and facilitate meetings of the entire Network. These will occur as monthly teleconferences and semi-annual face-to-face meetings, one in the Fall and the other in conjunction with an Annual Meeting in the Spring. Funds to support the meetings should be included in the budget request. The Coordinating Hub will establish a Network Advisory Committee to provide

oversight of the operation of the network, progress on the research agenda, and community participation in the Network. Half of the membership of this committee shall consist of individuals not affiliated with any of the participating Thematic Clusters. The composition of the committee will reflect diversity with respect to gender, geography and nature of the home institutions of its' members.

### III. AWARD INFORMATION

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**Anticipated Type of Award:** Continuing Grant or Cooperative Agreement

**Estimated Number of Awards:** 8 to 11

**Thematic Clusters:** The number of awards will depend upon the scope and budgetary requirements of the projects; approximately 8 -10 awards as continuing grants or cooperative agreements are anticipated.

**Coordinating Hub:** 1 award to be made as a Cooperative Agreement.

**Anticipated Funding Amount:** \$8,500,000 per year

**Thematic Clusters:** Award amounts will depend upon the scope and budgetary requirements of the successful proposals. Each project may comprise multiple collaborative proposals. Awards will be 5 years in duration.

**Coordinating Hub:** There will be 1 award of up to \$1 million annually for 5 years.

Estimated program budget, number of awards average award size and duration are subject to the availability of funds. Award budgets will be reviewed annually.

### IV. ELIGIBILITY INFORMATION

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#### 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: 4

**Thematic Clusters:** 3 proposals per organization

**Coordinating Hub:** 1 proposal per organization

An organization may submit a total of 4 proposals to this competition, 1 for the Coordinating Hub and 3 for the Thematic Clusters.

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**Coordinating Hub:** An individual may serve as PI or co-PI on only 1 proposal.

An individual may serve as PI or co-PI on a total of 4 proposals; 3 Thematic Clusters and 1 Coordinating Hub.

### V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

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#### A. Proposal Preparation Instructions

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**Full Proposal Preparation Instructions:** Proposers may opt to submit proposals in response to this Program Solicitation via FastLane 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](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) 292-7827 or by e-mail from [nsfpubs@nsf.gov](mailto: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: ([https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=grantsgovguide](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) 292-7827 or by e-mail from [nsfpubs@nsf.gov](mailto: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 the NSF FastLane system. 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.

### Proposal Sections with Special Instructions for Proposals Submitted in Response to this Solicitation

The following sections of the proposal are mandatory and must be prepared in accordance to the following supplementary instructions as well as guidance in the PAPPG or the NSF Grants.gov Application Guide

#### Proposal Title

The title of the proposal should begin with one of the following prefixes to designate the specific kind of proposal being submitted:

- Network Cluster: This prefix is used for a Thematic Cluster proposal
- Network Hub: This prefix is used for a Coordinating Hub proposal

For collaborative proposals arranged as separate submissions from multiple organizations, the project title must begin with the words "Collaborative Research:" followed by the applicable solicitation specific prefix noted above.

The rest of the title should provide a brief description of the proposed network component.

#### Project Description

Due to the complex nature of the Network, PIs will be allowed to use 20 pages to describe their projects; the management plan is not included in this total and will be a supplementary document (see below). The proposal must clearly describe the vision, goals and anticipated outcomes of the proposed Thematic Cluster or Coordinating Hub. The vision and goals should be informed by current knowledge of CZ science within which the proposed Network component will operate. For Thematic Clusters, the prevailing scientific theme or themes should be articulated clearly. All proposals must indicate how they plan to function as part of an integrated network with the other Clusters and Hub.

The project description should enumerate the activities that will take place at the Cluster or Hub (e.g., instrument deployment, data gathering, archiving, synthesis, outreach and education) and how these will be coordinated with the Hub or other Clusters. The plan should specify how the activities align with the overall goals.

**The project description must include a detailed plan on how the Cluster or Hub would engage other scientists and fulfill the expectation of being a community resource.** This section of the project description should be labeled with the heading "**Engagement Plan**" and provide information on the activities that will take place to attract and involve scientists not historically affiliated with the CZO network. Funds to support this plan are expected to be included in the budget request.

#### Special information and Supplementary Documentation

**Management Plan (governance structure, up to 4 pages):** The management plan must describe the management and administrative structure with sufficient detail to demonstrate the capability for operating the Cluster or Hub and interacting with the rest of the Network, identify the members of the leadership team and the level of effort of the main participants. Proposals for the Coordinating Hub should detail plans for arranging the communications and meetings of the Thematic Clusters, establishing the national Network education and outreach effort, and specifying the role and membership of the Network Advisory Committee.

**Postdoctoral Researcher Mentoring Plan:** Proposals that request funding to support postdoctoral researchers must include a description of the disciplinary and cross-disciplinary mentoring activities that will be provided for such individuals. See Chapter II.C.2.j of the PAPPG for further information about the implementation of this requirement.

**Data Management Plan:** The DMP for the Coordinating Hub must describe how it will establish a centralized effort for data aggregation, archiving, and dissemination, and how it will connect with extant data from the legacy CZO sites. The DMP for the Thematic Clusters will emphasize the types of data to be collected and the means by which these data will be aligned with the rest of the other Clusters and the Hub. See Chapter II.C.2.j of the PAPPG for further information about the implementation of this requirement.

**Letters of Collaboration:** This supplementary documentation shall include any letters of collaboration from individuals or organizations that are integral parts of the proposed project such as the involvement of collaborator organizations that are not supported by sub awards, or documentation of permission to access sites, materials, or data for research or other associated project activities. 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 of the proposal for the duration of the project. Letters must use the template that is specified in the PAPPG; See Chapter II.C.2.j for further information about the implementation of this requirement. Individuals and organizations providing letters of collaboration must be included in the declaration about Collaborators and Other Affiliations.

#### Single Copy Documents

**Collaborators and Other Affiliations (COA) Information:** Proposers must follow the guidance specified in Chapter II.C.1.e of the NSF PAPPG. Grants.gov users: The COA must be provided through use of the COA template and uploaded as a PDF attachment.

## B. Budgetary Information

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#### Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

#### Other Budgetary Limitations:

Funds to support travel to the two required meetings (Cluster and Hub proposals) and to defray the expenses of the Network Advisory Committee (Hub proposals) should be included in the budget request. Please see the full text of this solicitation for further information.

## C. Due Dates

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

December 02, 2019

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

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#### 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](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](mailto:fastlane@nsf.gov) or [rgov@nsf.gov](mailto: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](mailto: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

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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/](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

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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**

In addition to addressing the standard NSF review criteria of Intellectual Merit and Broader Impacts identified in the PAPPG, proposals submitted in response to this solicitation will be evaluated against the following criteria:

1. The likelihood that the project will advance network-scale syntheses of CZ phenomena, processes, and gradients to push CZ science beyond single-watershed studies;
2. For the Thematic Clusters, how well the proposal describes plans to establish and maintain a physical infrastructure to collect comprehensive data covering the key environmental variables that govern CZ processes;
3. Do the proposed activities represent a logical and effective management structure that will coordinate the operations and research agenda of the network, and support the use of the facilities by other research teams;
4. Will the proposed activities lead to coordinated education and outreach activities that enhance the growth of Critical-Zone science that will fully include demographic groups that are historically underrepresented in the sciences;
5. Will the proposed plans and activities lead to efficient and effective management, dissemination, and maintenance of the data that results from the network operation and scientific investigations.

## **B. Review and Selection Process**

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

Proposals will be sent out for ad hoc review. Proposals and received reviews will then be evaluated by a panel of experts, who will make a recommendation to the program. The team of program officers will examine the recommendations and may invite the top proposals to NSF for a reverse site visit that will include additional panel evaluation.

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**

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### **A. Notification of the Award**

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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**

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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](https://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](mailto: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](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg).

#### **Special Award Conditions:**

**EAR Data Policy:** Principal Investigators are required to adhere to the [EAR Data Policy](#) available on the NSF website. Final reports for all awards should include a statement describing how the data policy requirements have been met.

**Post-Award Meeting:** All awardees will attend an initial meeting at NSF to begin the collaboration among the Thematic Clusters and the Coordinating Hub.

**Annual Budget Review and Negotiation:** All Awards, whether Cooperative Agreements or Continuing Grants, are subject to annual budget negotiations after review of annual reports.

**Mid-Term Review:** Awards will be reviewed via site visits (actual, virtual, or reverse) during the mid-point of the expected award period as a condition of continued support.

## **C. Reporting Requirements**

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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](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg).

## **VIII. AGENCY CONTACTS**

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*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:

- Richard F. Yuretich, Lead, telephone: (703) 292-4744, email: [cznet@nsf.gov](mailto:cznet@nsf.gov)
- Enriqueta C. Barrera, telephone: (703) 292-4731, email: [cznet@nsf.gov](mailto:cznet@nsf.gov)
- Justin Lawrence, telephone: (703) 292-2425, email: [cznet@nsf.gov](mailto:cznet@nsf.gov)
- Ingrid Padilla, telephone: (703) 292-2268, email: [cznet@nsf.gov](mailto:cznet@nsf.gov)
- Philip C. Bennett, telephone: (703) 292-2915, email: [cznet@nsf.gov](mailto:cznet@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](mailto:fastlane@nsf.gov)  
Research.gov Help Desk e-mail: [rgov@nsf.gov](mailto: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](mailto:support@grants.gov).

## IX. OTHER INFORMATION

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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

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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](mailto:nsfpubs@nsf.gov)
  - or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

## PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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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  
Alexandria, VA 22314

## X. APPENDIX

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### Frequently-Asked Questions

#### Is this program an extension of the Critical Zone Observatories?

No. The Critical Zone Collaborative Network will build upon the science discoveries of the CZOs but aims to cast a wider net in exploring Critical-Zone processes in a coordinated manner. Communication among the Thematic Clusters and Coordinating Hub from the outset will align the research and management programs in a functioning network from the beginning of the projects.

#### How are Thematic Clusters different from current CZO sites?

CZO sites are based upon intensive monitoring of a single watershed. Thematic Clusters will be collaborative proposals that explore specific Critical-Zone research themes across a variety of locations that may involve multiple watersheds with various environmental characteristics.

#### It seems as if current CZOs have a distinct advantage in submitting a Thematic Cluster proposal; is this not the case?

Not necessarily. There are numerous other locations where relevant environmental data is being collected that could become part of a Thematic Cluster.

#### I have a monitoring location that has been collecting environmental data for several years. Could this become part of a Thematic Cluster?

It could be included as part of a Cluster collaborative proposal as long as it is aligned with the investigation of a relevant science theme that is being pursued by the research team.

#### Should a Thematic Cluster be a collaborative effort?

Yes. Thematic Clusters are research collaborations pursuing science investigations that will make use of a network of monitoring stations at various physical locations. It seems logical that this will require a team approach to effectively manage the operation and research of the Cluster.

#### Who should be on the team of a Thematic Cluster?

The composition of the team leading a Thematic Cluster is entirely up to the investigators and will depend upon the size, extent, and goals of the proposed research. The team can reasonably be expected to comprise a mix of investigators, students, post-doctoral associates and support staff as needed to maintain the instruments and gather required data.

#### What is the budget for the Thematic Clusters?

Budgets should be appropriate to the size of the collaboration. We anticipate approximately \$7.5 million annually available for all the Clusters and expect that will support 8 to 10 Clusters of varying sizes.

#### How will Thematic Clusters align their science programs? Won't they all be different?

Successful proposals will address a variety of CZ science themes and have a management plan that provides for frequent exchanges of information with the other Thematic Clusters and with the Coordinating Hub.

#### Is the Coordinating Hub similar to the CZO National Office?

The Coordinating Hub will have responsibilities that go beyond the current CZO National Office. The Hub will represent the public face of CZ research through various media. The Hub will facilitate CZ science by coordinating among the Clusters to optimize site usage by other researchers and assist with establishing

new locations through various mechanisms, such as seed grants. The Hub will also have the prime responsibility for managing the data streams from each Cluster and insuring the compatibility and accessibility of the data archive. The Hub will collaborate with the Clusters on local education and outreach while being responsible for regional and national broader-impacts activities.

**Can you provide some examples of how the Critical Zone Collaborative Network can “fulfill the expectations of being a community resource” as mentioned in the solicitation?**


There are different ways that this can be accomplished. The facilities can be made available to researchers not part of the Network who wish to undertake investigations of Critical-Zone processes, seed grants can be given to encourage other investigators to join the Cluster teams or to stimulate cross-site comparisons of various data streams, or new investigators can participate in Network workshops or meetings.

**How will the Thematic Clusters and Coordinating Hub form a network?**

Although Thematic Clusters will be focused on different science themes, monitoring stations can be part of more than one Cluster. All data from the Clusters will be centralized in the Hub, which will develop common protocols for data collection, management, and access. The Network teams will convene regularly to share project results and adjust research plans to complement the themes at the various Clusters.

**Can a Thematic Cluster include an international location?**

Yes. However, the NSF will only support the U.S. side of the collaboration. International partners should seek support from their own agencies.

<a href="#">Policies and Important Links</a>	<a href="#">Privacy</a>	<a href="#">FOIA</a>	<a href="#">Help</a>	<a href="#">Contact NSF</a>	<a href="#">Contact Web Master</a>	<a href="#">SiteMap</a>
	National Science Foundation, 2415 Eisenhower Avenue, Alexandria, Virginia 22314, USA Tel: (703) 292-5111, FIRS: (800) 877-8339   TDD: (703) 292-5090 or (800) 281-8749					<a href="#">Text Only</a>