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NSF-wide

Innovations at the Nexus of Food, Energy and Water Systems (INFEWS) N

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All questions regarding proposal submissions should be directed to INFEWSquestions@NSF.GOV

PROGRAM GUIDELINES

Solicitation 18-545

Important Information for Proposers

ATTENTION: *Proposers using the Collaborators and Other Affiliations template for more than 10 senior project personnel will encounter proposal print preview issues. Please see the Collaborators and Other Affiliations Information website for updated guidance.*

A revised version of the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 18-1), is effective for proposals submitted, or due, on or after January 29, 2018. Please be advised that, depending on the specified due date, the guidelines contained in NSF 18-1 may apply to proposals submitted in response to this funding opportunity.

INFEWS Solicitation

The overarching goal of the INFEWS program is to catalyze well-integrated, convergent research to transform understanding of the FEW Nexus as integrated social, engineering, physical, and natural systems in order to improve system function and management, address system stress, increase resilience, and ensure sustainability. The NSF INFEWS activity is designed specifically to attain the following goals:

- Significantly advance our understanding of the food-energy-water system of systems through quantitative, predictive and computational modeling, including support for relevant cyberinfrastructure;
- Develop real-time, cyber-enabled interfaces that improve understanding of the behavior of FEW systems and increase decision support capability;
- Enable research that will lead to innovative and integrated social, engineering, physical, and natural systems solutions to critical FEW systems problems;
- Grow the scientific workforce capable of studying and managing the FEW system of systems, through education and other professional development opportunities.

INFEWS Tracks

- **Track 1: Social-Physical Modelling of FEW Systems** Track 1 aims to significantly advance understanding of FEW systems with advanced modeling that investigates the functioning of coupled social, physical, biotic, abiotic, and engineered systems. The goal is to define and understand the couplings/linkages, feedback mechanisms and processes among the FEW systems components and to elucidate the factors that influence resilience, thresholds and criticalities. Track 1 projects should articulate clear hypotheses and/or describe what anticipated theoretical advancements will likely emerge from the systems modeling efforts. Development of advanced computational methods and effective means for incorporation of large quantities of disparate data, as implemented in new and novel software and tools, is also appropriate.
- **Track 2: Research to Enable Innovative System Solutions** Track 2 projects will develop and examine innovative solutions that address specific FEW system challenges and aim to enhance FEW systems' resilience and sustainability. Research on innovative institutional, behavioral, and technological solutions – and the coupled-combinations of solutions – is needed. Track 2 research might explore sustainable management solutions, examine the drivers of resource consumption, and study the means of extending resources via methods such as reducing, recycling, recovery, and reuse, among other topics
- **Track 3: INFEWS Research Coordination Networks (INFEWS-RCN)**This track supports the establishment of new networks of interdisciplinary researchers from multiple organizations who will collectively and significantly advance INFEWS concepts, knowledge and new directions through active exchange of ideas, development of new directions in fundamental research and education, and other approaches.

Proposals must

- Clearly define especially in the project description and the context statement) the FEW systems intended for study. Each of the three FEW components must be important and significant in the research proposed from an integrated systems perspective.

- Integrate and engage the disciplinary science from three or more intellectually distinct disciplines that represent scientific areas typically supported (one each) by the three participating NSF directorates (ENG, GEO, SBE) or two (or more) participating directorates and USDA/NIFA. Proposals that conduct integrated research on two of the three disciplines, while inadequately integrating the third discipline and/or proposing research that integrates the third discipline only tangentially, will be returned without review.

FEW Context Statement

The FEW Context Statement is an important component of the submission and review process. It is not a project summary or a synopsis; it is a critical document specifically addressing the points noted below.

- An explanation and definition of the food and energy and water systems the project is addressing, and why that overall FEW systems to be studied is of importance.
- For Tracks 1 and 2: The persuasive reasons why the research is to be undertaken, and how the work will significantly enhance knowledge of FEW systems
- For Track 3, why the research coordination network is needed around that specific FEW topic, and how the network will significantly enhance the FEW community
- The specifically named and defined (at least) three disciplines that will be engaged and integrated in the project. The three or more intellectually distinct disciplines must represent at least 3 scientific areas typically supported (one each) by the three participating NSF Directorates (ENG, GEO, SBE), or two (or more) participating NSF Directorates and USDA/NIFA. (USDA/NIFA may be invoked as a "discipline" if the research focus represents a topical area that is uniquely distinct from disciplines typically supported by participating NSF Directorates ENG, GEO, and SBE. The FEW Context Statement should carefully elaborate the specific disciplines as well as the relevant differences between NSF and a USDA/NIFA "discipline").

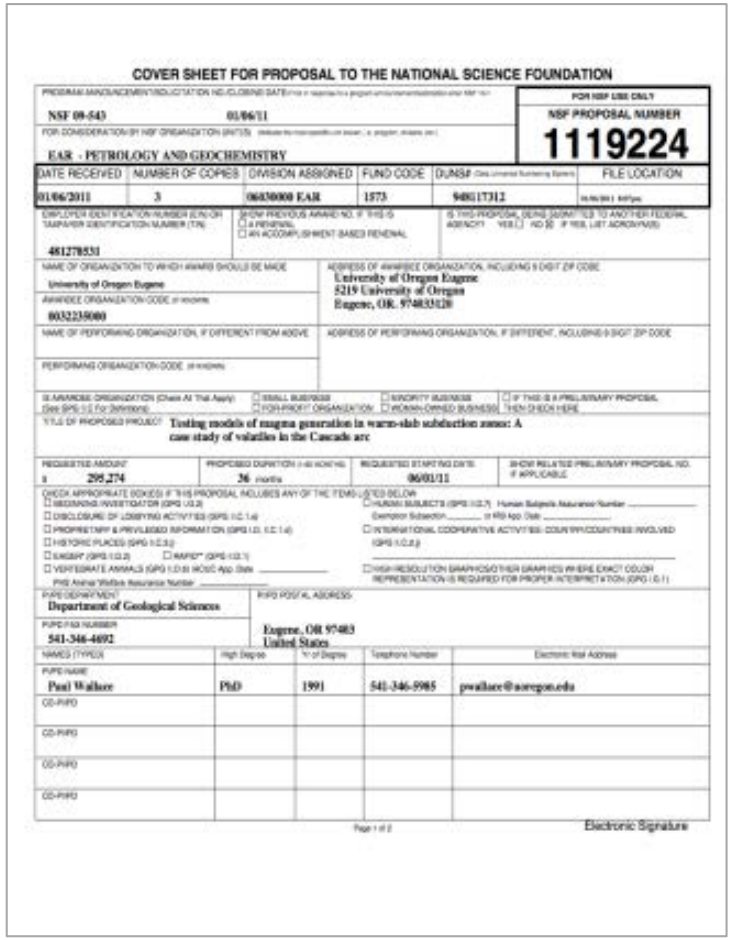
INFEWS Merit Review Process

Deadline/Target Date

Review panel

PO makes recommendation

Committee deliberates & recommendation



COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

NSF 09-543 — 01/06/11

FOR NSF USE ONLY — NSF PROPOSAL NUMBER 1119224

EAR - PETROLOGY AND GEOCHEMISTRY

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS#	FILE LOCATION
01/06/2011	3	0630000 EAR	1573	948117312	

EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN): 48127853I

SHOW PREVIOUS AWARD NO. IF THIS IS: ☐ A RENEWAL ☐ AN ACCOMPLISHMENT-BASED RENEWAL

IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES ☐ NO ☒ IF YES, LIST ACRONYM(S)

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE: University of Oregon Eugene

AWARDEE ORGANIZATION CODE: 0032239000

ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE: University of Oregon Eugene, 5219 University of Oregon, Eugene, OR. 974035220

NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE:

PERFORMING ORGANIZATION CODE:

ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE:

IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions): ☐ SMALL BUSINESS ☐ FOR-PROFIT ORGANIZATION ☐ MINORITY BUSINESS ☐ WOMAN-OWNED BUSINESS

IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE: ☐

TITLE OF PROPOSED PROJECT: Testing models of magma generation in warm-slab subduction zones: A case study of volatiles in the Cascade arc

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
$ 295,274	36 months	06/01/11	

CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW:

☐ BEGINNING INVESTIGATOR (GPG II.D.2)
☐ DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C.1.e)
☐ PROPRIETARY & PRIVILEGED INFORMATION (GPG II.D, II.C.1.d)
☐ HISTORIC PLACES (GPG II.C.2.j)
☐ EAGER* (GPG II.D.2) ☐ RAPID* (GPG II.D.1)
☐ VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date
PHS Animal Welfare Assurance Number
☐ HUMAN SUBJECTS (GPG II.D.7) Human Subjects Assurance Number
Exemption Subsection or IRB App. Date
☐ INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)
☐ HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.G.1)

PI/PD DEPARTMENT: Department of Geological Sciences
PI/PD FAX NUMBER: 541-346-4692
PI/PD POSTAL ADDRESS: Eugene, OR 97403 United States

NAME(S) (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address
PI/PD NAME: Paul Wallace	PhD	1991	541-346-5985	pwallace@uoregon.edu
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				

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Electronic Signature

Merit Review Criteria

- Intellectual Merit:

The Intellectual Merit criterion encompasses the potential to advance knowledge

- Broader Impacts:

The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes

Five Review Elements (apply to both IM and BI)

1. Will the work advance knowledge, and benefit society?
2. Is the work creative? even potentially transformative?
3. Does the work plan make sense? Will they know if they’re successful?
4. Is the team qualified to do what they propose?
5. Do they have the right lab, or know the right people?

What makes a good proposal?

- An intriguing idea
- That will advance science in each stated discipline
- Framed in specific well-integrated hypothesis or science questions
- With a clear experimental plan
- That will collect (or use) specific types of data
- And with explicit methods to analyze the data to answer the questions or test the hypotheses
- So that what you learn can be extrapolated beyond the place you conducted the experiment

But the trick is that it can't be so well defined that it looks like a lists of tasks with risk-free outcomes that are known a priori!

Common Pitfalls

- Work is too close to what has been done before - i.e., incremental advance
- Project has too large a scope *or* is too narrowly focused to be exciting
- Proposed research plan will not clearly answer/test the stated questions/hypotheses
- Techniques + methodology are not cutting edge
- One of 3 disciplines is seen as an “add-on” and not well integrated

Broader Impacts

Advance discovery and understanding while promoting teaching, training, and learning

curriculum; students; REU; teachers; K-12; RET; mentoring; postdoc

Broaden participation of underrepresented groups

community college; HBCU; minority; Native Americans

Build or enhance partnerships

with industry, internationally, with other federal agencies, etc.

It is better to do one or two of these solidly and well, than to try and cover a number of them superficially.

Enhance infrastructure for research and education

international collaboration in developing countries; equipment; laboratories

Broad dissemination to enhance scientific and technological understanding

blogs; citizen-science; local media; museums

Benefits to society

hazards; policy; environmental impacts; local + state agencies

The INFEWS program seeks to support research that conceptualizes FEW systems broadly and inclusively, incorporating social and behavioral processes (such as decision making and governance), physical processes (such as built infrastructure and new technologies for more efficient resource utilization), natural processes (such as biogeochemical and hydrologic cycles), biological processes (such as agroecosystem structure and productivity), and cyber-components (such as sensing, networking, computation and visualization for decision-making and assessment). Investigations of these complex systems may produce discoveries that cannot emerge from research on food or energy or water systems alone. It is the synergy among these components in the context of sustainability that will open innovative science and engineering pathways to produce new knowledge, novel technologies, and innovative predictive capabilities.

The overarching goal of the INFEWS program is to catalyze well-integrated, convergent research to transform understanding of the FEW Nexus as integrated social, engineering, physical, and natural systems in order to improve system function and management, address system stress, increase resilience, and ensure sustainability. The NSF INFEWS activity is designed specifically to attain the following goals:

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3. Enable research that will lead to innovative and integrated social, engineering, physical, and natural systems solutions to critical FEW systems problems;

4. Grow the scientific workforce capable of studying and managing the FEW system of systems, through education and other professional development opportunities.

This initiative enables interagency cooperation on one of the most pressing problems of the millennium - understanding interactions across the FEW nexus - how dynamics of the FEW Nexus are likely to affect our world, and how we can proactively plan for consequences. This solicitation allows the partner agencies - National Science Foundation (NSF) and the United States Department of Agriculture National Institute of Food and Agriculture (USDA/NIFA) - to combine resources to identify and fund the most meritorious and highest-impact projects that support their respective missions, while eliminating duplication of effort and fostering collaboration between agencies and the investigators they support.

In addition, NSF and USDA/NIFA promote international cooperation that links scientists and engineers from a range of disciplines and organizations to solve the significant global challenges at the nexus of FEW systems. Proposals including international collaboration are encouraged when those efforts enhance the merit of the proposed work by incorporating unique resources, expertise, facilities or sites of international partners. The U.S. team's international counterparts generally should have support or obtain funding through non-NSF sources. To facilitate coordinating research activities between US and international partners, specific collaborative funding opportunities have been developed involving some international partners: list of international opportunities.

All questions regarding proposal submissions should be directed to INFEWSquestions@NSF.GOV or the program officers listed below.

What Has Been Funded (Recent Awards Made Through This Program, with Abstracts)

Map of Recent Awards Made Through This Program

News

Track 1 Funded Projects

- INFEWS/T1 Towards Resilient Food-Energy-Water Systems in Response to Drought Impacts and Socioeconomic Shocks Award Number:1739835; Principal Investigator:Hatim Geli; Organization:New Mexico State University;NSF Organization:BCS Start Date:09/01/2017; Award Amount:$842,465.00;
- INFEWS/T1: Scarcity Amid Abundance: Understanding Trade-offs in the Food-Energy-Water Nexus in the Willamette River BasinAward Number:1740082; Principal Investigator:Chad Higgins; Organization:Oregon State University;NSF Organization:EAR Start Date:09/01/2017; Award Amount:$1,828,428.00;
- INFEWS/T1: A Modeling Framework to Understand the coupling of Food, Energy, and Water in the Teleconnected Corn and Cotton BeltsAward Number:1639327; Principal Investigator:Xin-Zhong Liang; Organization:University of Maryland College Park;NSF Organization:EAR Start Date:09/01/2016; Award Amount:$3,000,000.00;
- INFEWS/T1: Advancing FEW System Resilience in the Corn Belt by Integrated Technology-Environment-Economics Modeling of Nutrient CyclingAward Number:1739788; Principal Investigator:Ximing CaiOrganization:University of Illinois at Urbana-Champaign;NSF Organization:EAR Start Date:09/01/2017; Award Amount:$997,093.00;
- INFEWS/T1: Impacts of Deglobalization on the Sustainability of Regional Food, Energy, Water SystemsAward Number:1739909; Principal Investigator:Elena Irwin; Organization:Ohio State University;NSF Organization:SES Start Date:09/01/2017; Award Amount:$1,769,794.00;
- INFEWS/T1: Increasing regional to global-scale resilience in Food-Energy-Water systems through coordinated management,technology and institutions. Award Number:1639458; Principal Investigator:Jennifer Adam; Organization:Washington State University;NSF Organization:EAR Start Date:09/15/2016; Award Amount:$2,788,042.00;

Track 1 Funded Projects

- INFEWS/T1: Intensification in the world's largest agricultural frontier: Integrating food production, water use, energy demand, and environmental integrity in a changing climate Award Number:1739724; Principal Investigator:Michael CoeOrganization:Woods Hole Research Center;NSF Organization:EAR Start Date:08/15/2017; Award Amount:$828,428.00;
- NFEWS/T1: Linking Current and Future Hydrologic Change to Hydropower, Human Nutrition, and Livelihoods in the Lower Mekong Basin
  Award Number:1740042; Principal Investigator:John SaboOrganization:Arizona State University;NSF Organization:EAR Start Date:08/15/2017; Award Amount:$1,331,133.00;
- INFEWS/T1: Mesoscale Data Fusion to Map and Model the U.S. Food, Energy, and Water (FEW) System
  Award Number:1639529; Principal Investigator:Benjamin Ruddell; Organization:Northern Arizona University;NSF Organization:OAC Start Date:09/01/2016; Award Amount:$3,463,681.00;
- INFEWS/T1: Monitoring and managing food, energy, and water systems under stress: California
  Award Number:1639318; Principal Investigator:Steve Davis; Organization:University of California-Irvine;NSF Organization:EAR Start Date:09/01/2016; Award Amount:$1,890,219.00;
- INFEWS/T1: Reducing the Environmental Impacts of FEW Systems In and Around Cities
  Award Number:1739676; Principal Investigator:Arpad Horvath; Organization:University of California-Berkeley;NSF Organization:EAR Start Date:08/15/2017; Award Amount:$828,428.00;
- INFEWS/T1: Understanding multi-scale resilience options for vulnerable regions
  Award Number:1639214; Principal Investigator:Benjamin Zaitchik; Organization:Johns Hopkins University;NSF Organization:BCS Start Date:09/15/2016; Award Amount:$2,999,021.00;

Track 3 Funded Projects (now Track 2)

- INFEWS/T3: Innovations for Sustainable Food, Energy, And Water Supplies In Intensively Cultivated Regions: Integrating Technologies, Data, And Human Behavior. Award Number:1739191; Principal Investigator:Jeffrey Peterson; Organization:University of Minnesota-Twin Cities;NSF Organization:CBET Start Date:10/01/2017; Award Amount:$930,904.00
- INFEWS/T3: Advancing Technologies and Improving Communication of Urine-Derived Fertilizers for Food Production within a Risk-Based Framework. Award Number:1639244; Principal Investigator:Nancy Love; Organization:University of Michigan Ann Arbor;NSF Organization:CBET Start Date:09/01/2016; Award Amount:$2,999,968.00
- INFEWS/T3: Closing the Loop: An Integrated, Tunable, and Sustainable Management System for Improved Energy, Nutrient, and Water Recovery from Biowastes. Award Number:1739884; Principal Investigator:Yuanzhi Tang; Organization:Georgia Tech Research Corporation;NSF Organization:CBET Start Date:09/15/2017; Award Amount:$1,730,953.00;
- INFEWS/T3: Coupling infrastructure improvements to food-energy-water system dynamics in small cold region communities: MicroFEWs
  Award Number:1740075; Principal Investigator:William Schnabel; Organization:University of Alaska Fairbanks Campus;NSF Organization:CBET Start Date:10/01/2017; Award Amount:$2,419,338.00;
- INFEWS/T3: Critical Nutrient Recovery and Reuse: Nitrogen and Phosphorus Recycling from Wastewaters as Struvite Fertilizer
  Award Number:1739473; Principal Investigator:Lauren Greenlee; Organization:University of Arkansas;NSF Organization:CHE Start Date:09/15/2017; Award Amount:$1,930,597.00;
- INFEWS/T3: Decision Support for Water Stressed FEW Nevus Decisions (DS-WSND) Award Number:1739977; Principal Investigator:Bruce McCarlOrganization:Texas A&M AgriLife Research;NSF Organization:SES Start Date:10/01/2017; Award Amount:$1,162,358.00;

Track 3 Funded Projects (now Track 2)

- INFEWS/T3: Managing Energy, Water, and Information Flows for Sustainability across the Advanced Food Ecosystem Award Number:1639391; Principal Investigator:Callie Babbitt; Organization:Rochester Institute of Tech;NSF Organization:CBET Start Date:09/01/2016; Award Amount:$991,925.00;
- INFEWS/T3: Reducing Household Food, Energy and Water Consumption: A Quantitative Analysis of Interventions and Impacts of Conservation Award Number:1639342; Principal Investigator:David Watkins; Organization:Michigan Technological University;NSF Organization:CBET Start Date:10/01/2016; Award Amount:$2,983,358.00;
- INFEWS/T3: Rethinking Dams: Innovative hydropower solutions to achieve sustainable food and energy production, and sustainable communitiesAward Number:1639115; Principal Investigator:Emilio Moran; Organization:Michigan State University;NSF Organization:CBET Start Date:01/01/2017; Award Amount:$2,618,489.00;
- INFEWS/T3: Social-ecological-technological solutions to waste reuse in food, energy, and water systems (ReFEWS) Award Number:1639524; Principal Investigator:Lilian Alessa; Organization:University of Idaho;NSF Organization:SES Start Date:09/01/2016; Award Amount:$2,698,207.00;
- INFEWS/T3: Solar-Powered Integrated Greenhouse (SPRING) Systems Using Wavelength Selective Photovoltaics for Complete Solar Utilization. Award Number:1639429; Principal Investigator:Brendan O'Connor; Organization:North Carolina State University;NSF Organization:CBET Start Date:01/01/2017; Award Amount:$2,996,668.00;
- INFEWS/T3: Strategic FEW and Workforce Investments to Enhance Viability of Controlled Environment Agriculture in Metropolitan Areas
  Award Number:1739163; Principal Investigator:Neil Mattson; Organization:Cornell University;NSF Organization:CBET Start Date:01/01/2018; Award Amount:$1,923,476.00;