National Science Foundation's Established Program to Stimulate Competitive Research (NSF EPSCoR) Research Infrastructure Improvement (RII) Award OIA-2148788

"Harnessing the Data Revolution for Fire Science"

HDRFS Seed Grants
Request for Proposals

Announcement for faculty at:

College of Southern Nevada; Desert Research Institute; Great Basin College; Nevada State College; Truckee Meadows Community College; University of Nevada, Las Vegas; University of Nevada, Reno; and Western Nevada College

Submission Deadline: March 1, 2023
Application materials and faculty recommendations must be submitted no later than 5:00 pm PDT on March 1, 2023

Period of Performance: June 1, 2023 – May 31, 2024

Nevada System of Higher Education Sponsored Programs

Introduction

The goal of NSF's Established Program to Stimulate Competitive Research (EPSCoR) is to develop academic research enterprises that are long-term, self-sustaining, and nationally competitive for non-EPSCoR dollars. The program seeks to:

- Catalyze the development of research capabilities and the creation of new knowledge that expands jurisdictions' contributions to scientific discovery, innovation, learning, and knowledge-based prosperity.

- Establish sustainable STEM education, training, and professional development pathways that advance jurisdiction-identified research areas and workforce development.

- Broaden direct participation of diverse individuals, institutions, and organizations in the project's science and engineering research and education initiatives.

- Effect sustainable engagement of project participants and partners, the jurisdiction, the national research community, and the general public through data-sharing, communication, outreach, and dissemination, and

- Impact research, education, and economic development beyond the project at academic, government, and private sector levels.

Who is Eligible?

Full-time faculty members from all NSHE campuses are eligible to apply. Faculty from state and community colleges are encouraged to partner with UNLV, UNR, or DRI faculty in their application. Post-doctoral researchers are not eligible to apply. Faculty members who are currently involved in the HDRFS project are not eligible. The goal of the mini-grants is to attract faculty members with expertise in HDRFS-related areas who were not involved in the original proposal submittal. Junior faculty members and faculty members who are underrepresented minorities (as defined by NSF - https://ncses.nsf.gov/pubs/nsf21321/report/introduction) are strongly encouraged to apply.

HDRFS

The overarching goal of the project RII Track-1: Harnessing the Data Revolution for Fire Science (HDRFS) is to increase the capacity of Nevada for wildland fire research, education, and workforce development and to demonstrate this increased capacity through fire research in the regionally important sagebrush ecosystem. HDRFS will balance capacity development with advancement of knowledge and discovery in the wildland fire continuum over a wide range of fire sizes investigating scaling and fire impacts through common experiments of four fire science areas: 1) Ecology, 2)

Hydrology between fire events, 3) Fire Processes and 4) Fire Emissions and their Atmospheric Aging during fire events. This will be achieved through strategic investments in expertise, facilities, Cyberinfrastructure Innovations, and Education and Workforce Development creating end-to-end pipelines for research and STEM advancements. We will innovate in data acquisition and science, including the use of intelligent unmanned aerial system (UAS) sensor platforms, computer vision (CV), data fusion, and machine learning (ML) that will ignite fire science capability amongst environmental and engineering researchers. Read more at: https://epscorspo.nevada.edu/wp-content/uploads/2023/01/Project-Description.pdf

Research Areas

HDRFS will engage faculty in areas related to, but not recognized in, the current research to provide new opportunities and pursue high-risk, high-impact research. HDRFS seed funding is not intended to provide a substitute for NSF individual investigator funding. Seed grant funding will provide strategic mechanisms for additional research, education, and workforce development (E-WFD), and sustainability in relevant areas and will provide proof of principle results needed to secure external funding. Research areas should align with the 2020 NSHE Science and Technology Plan (S&T). Research areas may include, but aren't limited to:

Ecology (Eco) – Research activities in this component of the HDRFS project seek to investigate:
- How the stage of sagebrush plant community succession present on the landscape before wildfire influences:
  - CO_2 sequestration from, and evapotranspiration (ET) to, the atmosphere
  - The severity of experimentally imposed field contained/controlled burns
- How the above factors (i.e., successional status and fire severity) feedback to modulate post-fire plant community recovery and recovery of sagebrush ecosystem function (e.g., measured as net ecosystem CO_2 uptake and ET).

This will be achieved through field and laboratory analyses that inform statistical and mechanistic models, which will in turn, scale observations from plots to watersheds to regions. Research in the ECO component is closely linked to research planned in the HYDRO component.

Hydrology (Hydro) – The Hydrology component of the HRDFS project studies the impacts of fire on the hydrology of a sagebrush ecosystem. This includes how fire affects infiltration, runoff, and evapotranspiration by changing soil properties and land cover (litter, vegetation), scaled from individual plots to whole watersheds.

Fire Processes (FP) – This component of the HRDFS project is focused on building a multi-scale center for fire process modeling that integrates full physics and hybrid computational fluid dynamics fire behavior models with artificial intelligence and measured data to improve the understanding of fire energy release and fire effects. The further integration of model outputs tied to remotely sensed data and virtual reality

inspired 3D environments is expected to enhance fire decision making and fire effects interpretation that will improve the understanding of fires' role in sagebrush ecosystems.

<u>Fire Emissions and their Atmospheric Aging (FEAA)</u> – This component of the HRDFS project studies the physical and chemical evolution of smoke plumes at different spatial and temporal scales using laboratory and field experiments. Specifically, the aim is to investigate the interaction of plume dynamics (dilution and cooling) with photochemical aging processes and how it affects aerosol optical, chemical, and toxicological properties.

<u>Cyberinfrastructure Innovations (CII</u>) – This component of the HRDFS project integrates science workflows and performs engineering research in the areas of: field site networks and edge computing; regional networks, regional computing, and science data exchange; UAS automation and novel sensor deployment; multi-source data aggregation, alignment, and fusion; deep learning applications in feature recognition and classification; and interdisciplinary tools for training dataset development in deep learning applications.

<u>Education and Workforce Development (E-WFD)</u> – The focus of E-WFD infrastructure-building is to create pathways between higher education and STEM careers. Strategic workforce areas of focus are future classroom educators in STEM, data analytics professions, fire science research and application, and cyberinfrastructure training in support of interdisciplinary Earth science applications. Key activities include immersive internship and training programs, undergraduate research, and educational content creation. Potential areas of focus for seed grant proposals that are synergistic with current activities include:
- Mechanisms that support future STEM educators (e.g., experiences for pre-service teachers, pathways into STEM education training, etc.).
- Projects that support quantitative skills (e.g., numeracy, mathematics, data analytics) or fundamental computer science skills needed for data analytics (e.g., analytics software, programming, data visualization, etc.) across the higher education training pipeline in Nevada (Associates or Bachelors-level)
- Work-based learning or career-focused experiences in the research areas of the grant described above (Associates, Bachelors, or graduate level)

<u>Broadening Participation (BP)</u> – The overarching goal of our BP Plan is to enhance inclusivity, interdisciplinary team building, career development, and retention through best practices in mentorship, team science, and an effective culture of support. Activities that would support these goals include:
- Quality mentorship-focused programs for future STEM professionals
- Training or experiences that promote inclusion and belonging at the lab- or department-level
- Activities that support students or postdocs who are underrepresented in the STEM fields to advance to the next career stage
- Projects that support effective interdisciplinary collaboration in ways that specifically broaden participation in STEM

For more information about the NSF EPSCoR HDRFS program, visit
https://epscorspo.nevada.edu/wp-content/uploads/2023/01/Project-Description.pdf

Award: Funding Information

Five (5) seed grants of $30,000 each are expected to be awarded. A faculty member (PI/Co-PI) may submit a maximum of one award. Depending on your institution's policies, we encourage grad students and post-docs to be included as Co-PIs.

Award Obligations

Award recipients are required to prepare a progress and final report describing progress, publications, presentations, and student participation following NSF EPSCoR guidelines. Detailed reporting requirements will be provided with award notification. Note: You will be required to prepare and submit a short progress report on January 2, 2024, and a final report at the end of the project (June 30, 2024), provide demographic data about participants, and prepare a project highlight for inclusion in an annual NSF EPSCoR Congressional report.

Award recipients are also expected to attend and present at the annual Nevada NSF EPSCoR statewide meeting that alternates between Reno and Las Vegas. Travel for this meeting should be included in your budget. The annual meeting will be held in Las Vegas in 2024.

Faculty receiving seed funding will provide evidence of external funding applications and any awards within one year of completing a seed funding award.

You must agree to comply with all budget documentation requests and reporting requirements.

Submission Guidelines

Proposals will be accepted until 5:00 pm on Friday, March 1, 2023. Proposals must be submitted by the institution's Sponsored Programs Office or appropriate Authorized Official. Incomplete or late applications will NOT be reviewed. Submit the entire application as one PDF at https://epscorspo.nevada.edu/2023-2024-hdrfs-seed-grants

Proposal Guidelines

Proposals must be typed, single-spaced, and use a Times New Roman 12 pt. or similar font with numbered pages and 1-inch margins. The proposals should be written so that faculty from any STEM discipline can understand the proposal goals, importance of the research, and how the anticipated outcomes will benefit NSF, Nevada, and NSHE. Review panel members will not have specific expertise within the topic area of each

proposal submitted.

<u>Application Content</u>

1. Cover page

2. Project description (limited to five (5) pages) - Provide a clear, concise description of the proposed research or research-building activities, including the following:

   a. Title

   b. Project summary (300-word maximum)

   c. Project goals, objectives, and methods (tasks)

   d. Anticipated project products, i.e., publications, proposals, hardware, software, websites, etc. List anticipated future proposal(s) resulting from the project

   e. List of collaborators and expertise they will contribute. If applicable, letters of support/collaboration should be included. Letters must be recent and dated within 45 days of the due date

   f. Description of how the effort will contribute to the 2020 NSHE Science and Technology Plan, https://epscorspo.nevada.edu/wp-content/uploads/2020/06/NSHE-S-T-Plan-Final-6-12-20.pdf

   g. Description of how the effort will align with the HDRFS project Budget and Budget Justification - Use the attached budget template. Include a maximum one-page budget justification providing details of each expected expense

3. Budget
   A total amount not to exceed $30,000 is available per proposal. These seed grants will be awarded from state funds; F&A (indirect) is not allowable. The involvement of either graduate or undergraduate students is mandatory for this grant. Funds for travel to related technical conferences up to $1,500 is allowed. At least 80% of the funds should be used for graduate/undergraduate student support and supplies needed to perform the research.

   All reasonable costs are allowable with the following exceptions:

   a. No foreign travel may be charged under this award without prior approval.

   b. Purchase of any telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate

of such entities) is unallowable.

    c. Purchase of video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of those entities) is unallowable.

    d. Funds may not be used for the construction or remodeling of facilities.

4. NSF Funding history (limited to one page)
    a. Provide a detailed list of previous and current NSF-funded projects for the lead PI. Include the title of the project, the project period, the funded amount, and project outcomes.

5. References/Citations (No page limit).

6. Biographical Sketch in NSF format (PAPPG (NSF 22-1) dated October 4, 2021)
    a. Limited to three pages per person, including the PI and Co-PI(s) who have a major role in the project.

Projects Involving Human Subjects or Vertebrate Animals

Prior approval by the Institutional Review Board (IRB) for human subjects and/or the Institutional Animal Care and Use Committee (IACUC) for animal subjects is not required for proposal submission. However, faculty chosen to receive funding under this program who anticipate the use of human or animal subjects in their research must receive approval of their research protocols by the appropriate review board prior to the beginning of research and release of funds.

1. Human Subjects: If this proposed project involves the collection of information from human beings through interaction or observation, include an attachment (not included in the five-page limit) that provides sufficient information to enable reviewers to evaluate potential risks to subjects. Include information concerning the subject population, type(s) of information to be gathered, and measures to be taken to protect privacy and reduce risks.

2. Vertebrate Subjects: If this proposed project involves living vertebrate animals in any way, include an attachment (not included in the five-page limit) that provides sufficient information to enable reviewers to evaluate the choice of species, number of animals to be used, and any exposure of animals to discomfort, pain, or injury.

Review Criteria

The proposals will be evaluated by a team of six faculty members, two from each NSHE

research institution. All awards will be reviewed for merit as outlined below, and funding will be based on the restrictions outlined in Item #3 above. Decisions will be made by April 1, 2023.

Proposals will be evaluated according to their intellectual merit and broader impacts (as defined by NSF) as well as the following criteria:

1. How closely does the proposal meet the objectives of the HDRFS proposal?

2. Does the proposed activity have the potential to advance knowledge and understanding within the HDRFS fields of Eco, Hydro, FP, FEAA, CI, and E-WFD?

3. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?

4. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale?

5. Does the plan incorporate a mechanism to assess success?

6. How well qualified is the individual or team to conduct the proposed activities?

7. Are adequate resources available to the PI (either at the home institution or through collaborations) to carry out the proposed activities?

8. Will the research involve underrepresented and minority students?

9. Is the budget adequate? Does it include funding for graduate or undergraduate students?

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