WY-ACT: Anticipating the Climate-Water Transition and Cascading Challenges to Socio-Environmental Systems in America's Headwaters

National Science Foundation
Office of Integrative Activities – EPSCoR Research Infrastructure
RII Track-1 award
$20 million
5 years, start date June 1, 2022
Process 2019-2021; Crossing Divides to State Committee to Institutional Support

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Sarah Konrad (Associate Project Director)
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At UWyo:
Agricultural Economics, Atmospheric Sciences, Botany, Communication and Journalism, Economics, Ecosystem Science and Management, Geology and Geophysics, Haub School of Environment & Natural Resources. Philosophy and Religious Studies, SMTC, WyGISC, Zoology and Physiology

In the State:
Central Wyoming College/Wind River Indian Reservation
Western EcoSystems Technology, Inc. (WEST, Inc.)
AMK Ranch
Established Program to Stimulate Competitive Research (EPSCoR)-
goal is to provide access to research resources for jurisdictions that receive the least amount of research dollars and reduce geographic concentration of national resources.

Note: As of FY16 Iowa, Tennessee, and Utah were no longer EPSCoR-eligible.
NSF EPSCoR’s outcomes at UW and around Wyoming

Aligns with State Science and Technology Plan (water, energy, computation)

Leveraged EPSCoR investments for:
- Wind River Indian Reservation
- Community Colleges
- Department of Chemistry
- Energy Resources
- Wyoming Geographic Information Science Center
- Program in Ecology
- Stable Isotope Facility
- Hydrology and Geophysics
- Science Initiative
- Genome Tech., Biogeochemistry, Data Science

St. Clair et al Science 2015
NSF EPSCoR Funding Tracks

Track 1-$20 million for five years, must be transformational, nationally competitive science that fits jurisdiction/state

Track 2-up to $6 million for four years, must be transformational, nationally competitive science in a theme that changes every two years, must collaborate with institution from other EPSCoR jurisdiction

Track 4-up to $300 thousand for two years, helps researchers improve career through collaboration with individuals of national prominence
Declining snowpack across the Western US over the last 60 years – loss of 15-30%  

Mote et al., 2018

In the Greater Yellowstone Area  

Mean annual temperature  

Temperature (°F)  

Year  

Mean annual snowfall  

Snowfall (inches)  

Year  

Hostetler et al., 2021
The future of Yellowstone area SNOW (RCP 4.5)

2021-2040

2041-2060

2061-2080

Changing the “Water Towers of the West”

Modified from Hostetler et al., 2021
How do we enable communities to anticipate and prepare for significant and lasting changes in water availability?

Powell, WY
Global climate model drivers CMIP6 (and PMIP)

Dynamically downscaled regional climate model (WRF) with land surface model and dynamic vegetation (CTSM)

Statistical downscaling and watershed-scale WRF-Hydro simulations

Co-produced scenarios

Socio-economic modelling

Lake ecosystem simulations (GLM), stochastic ecosystem models
Wind River Indian Reservation

Partnership and Collaboration
- Water Issues Climate change
- Building Capacity
  - THPO, TWE, FWS
  - Mule Deer Migration

Current
- AISES
- STEM Pathways
- Bison Restoration
- TEK: Medicinal Plant Revitalization
Enduring and sustainable elements:

Laboratory for Regional Earth System Modeling
5 faculty positions

Center for Climate, Water and People

AMK Ranch
Enduring and sustainable elements:

Enhanced computing infrastructure, data tools, models, informatics approaches

Workforce development, entrepreneurship, economic development, pipeline for PhD graduate education and training, collaborations with Wyo Innovation Partnership

Increased trust in climate science and enhanced resilience of Wyoming’s communities
Laboratory for Regional Earth System Modeling (LRESM)

**Integrated Earth System Modeler** (Associate or Full Professor)
- Project changes in complex human-environment systems
- Haub School, June 1, 2022 (start Fall 2023)

**Hydroclimate Modeler** (Assistant Professor)
- Track water from atmosphere to surface
- Atmospheric Sciences, Fall 2022 (start Fall 2023)

**Computational Economist** (Assistant Professor)
- Predict economic consequences of declining water availability
- Economics, Fall 2022 (start Fall 2023)

**Forest Ecosystem Modeler** (Assistant Professor)
- Predict forest disturbances and changes and effects on streamflow
- Ecosystem Science and Management, Fall 2022 (start Fall 2023)

**Social-Watershed Modeler** (Assistant Professor)
- Anticipate social repercussions of declining water availability
- Ecosystem Science and Management or WyGISC, Fall 2022 (start Fall 2023)

**Partnership with School of Computing**
Opportunity to join the School of Computing with 25% faculty appointment or as an Adjunct/Affiliate faculty member