

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

Brent Ewers (Project Director/Principal Investigator)

Sarah Konrad (Associate Project Director)

Corrie Knapp, Bart Geerts, Bryan Shuman, Dave Williams (co-PIs)

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:

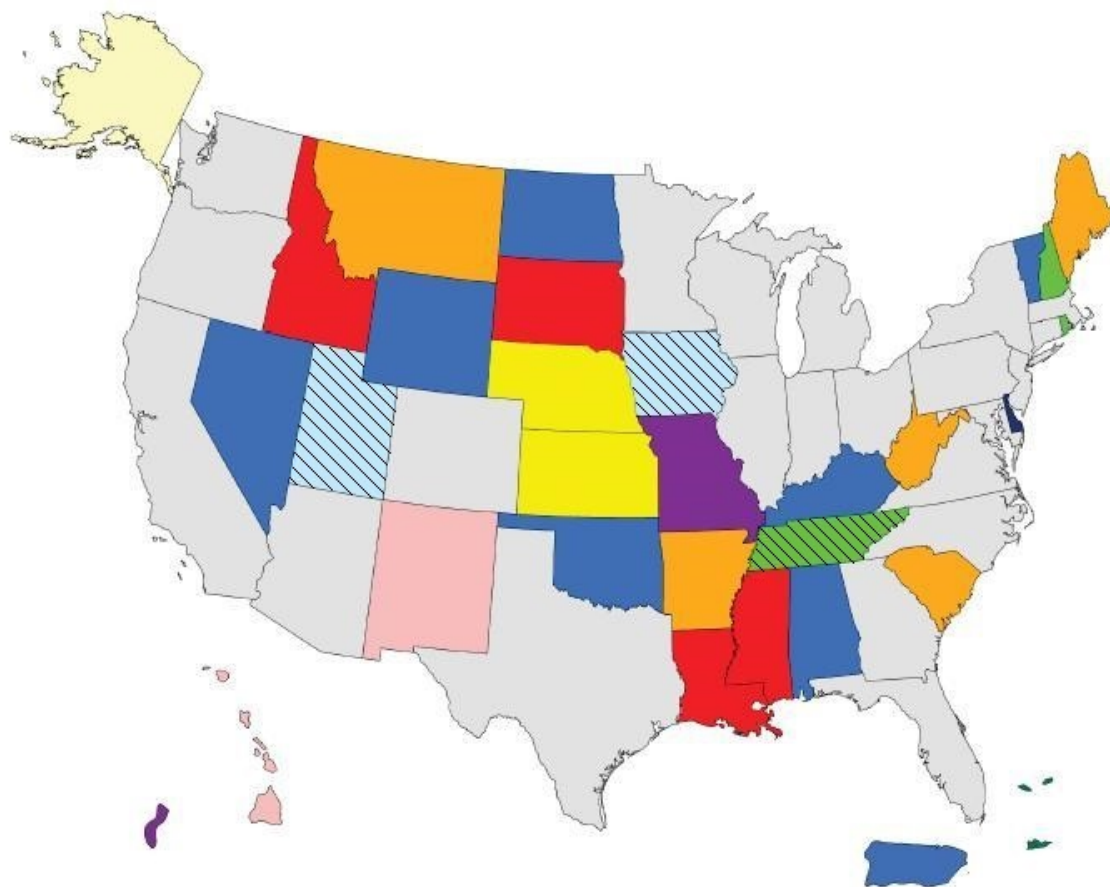
Central Wyoming College/Wind River Indian Reservation

Western EcoSystems Technology, Inc. (WEST, Inc.)

AMK Ranch



EPSCoR JURISDICTIONS



1980	1985	1987	2000	2003	2009
Arkansas Maine Montana South Carolina West Virginia	Alabama Kentucky Nevada North Dakota Oklahoma Puerto Rico Vermont Wyoming	Idaho Louisiana Mississippi South Dakota	Alaska	Delaware	Iowa Utah
		1992	2001	2004	2012
		Kansas Nebraska	Hawaii New Mexico	New Hampshire Rhode Island Tennessee	Guam Missouri
			2002		
			U.S. Virgin Islands		

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

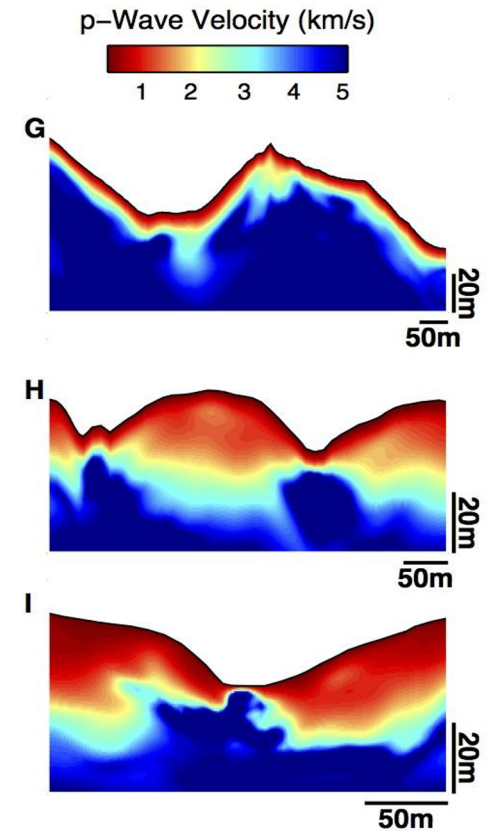
Note: As of FY16 Iowa, Tennessee, and Utah were no longer EPSCoR-eligible

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



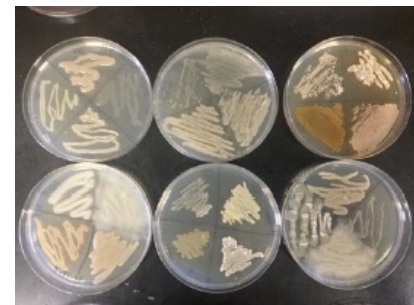
St. Clair et al Science 2015

NSF EPSCoR Funding Tracks

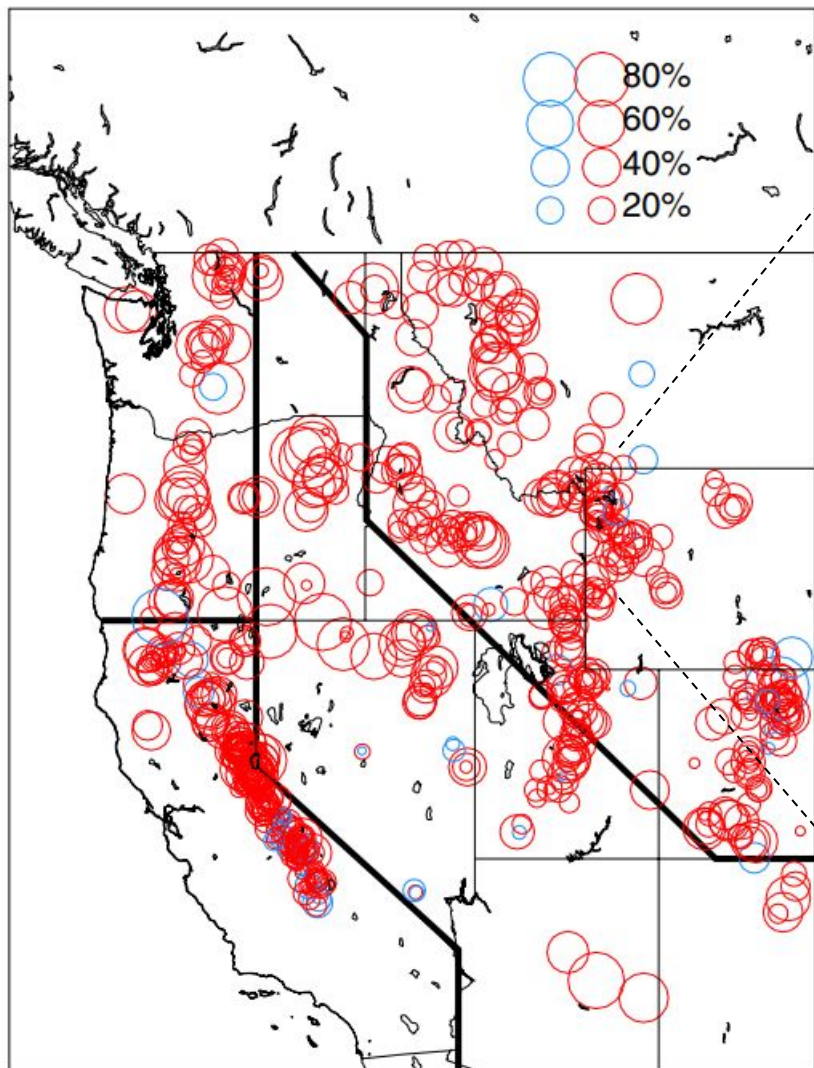
Track 1-\$20 million for five years, must be transformational, nationally competitive science that fits jurisdiction/state

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

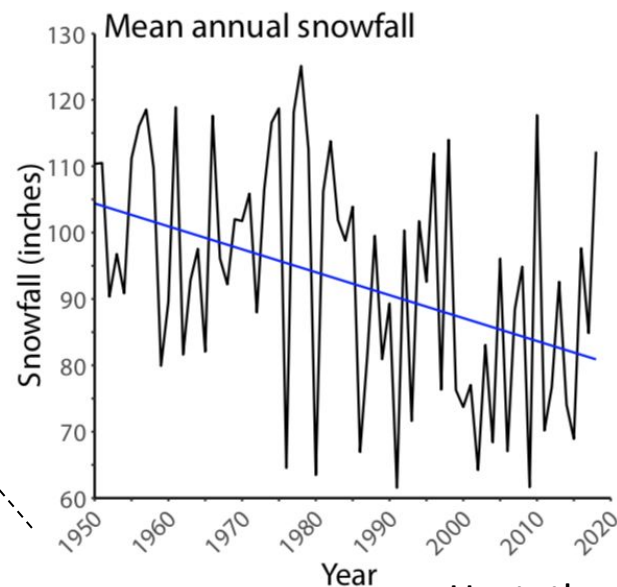
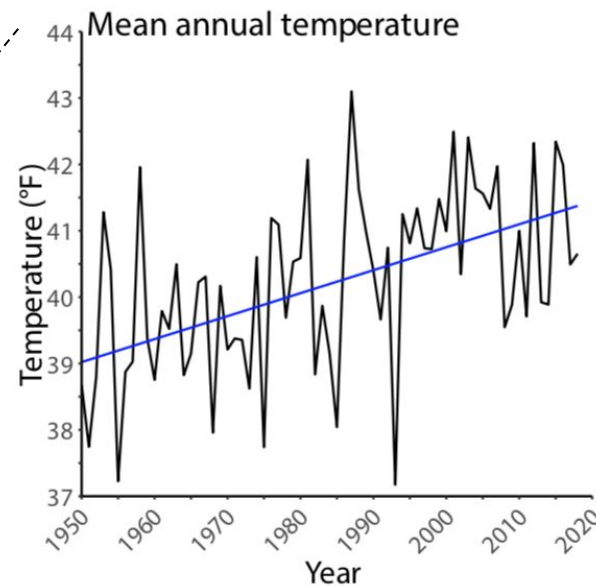


Declining snowpack across the Western US over the last 60 years – loss of 15-30%



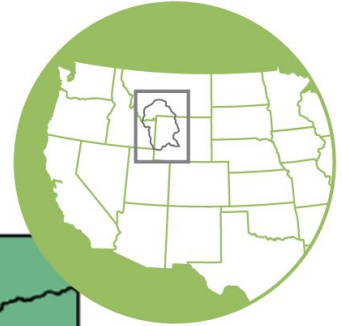
Mote et al., 2018

In the Greater Yellowstone Area

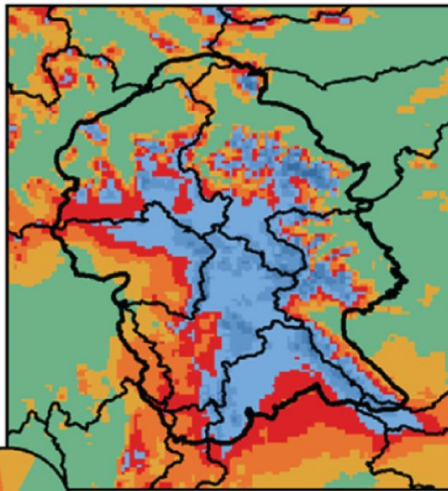


Hostetler et al., 2021

The future of Yellowstone area **SNOW** (RCP 4.5)

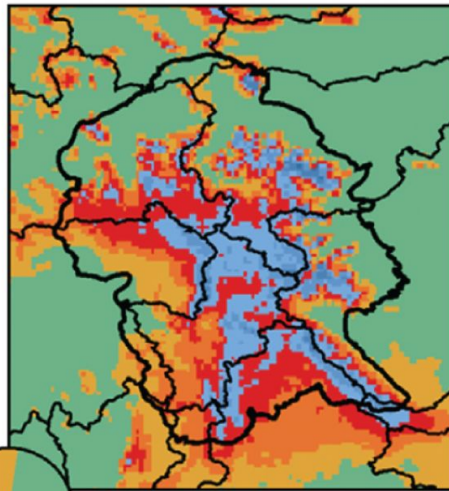


2021-2040

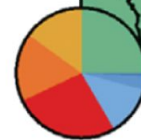
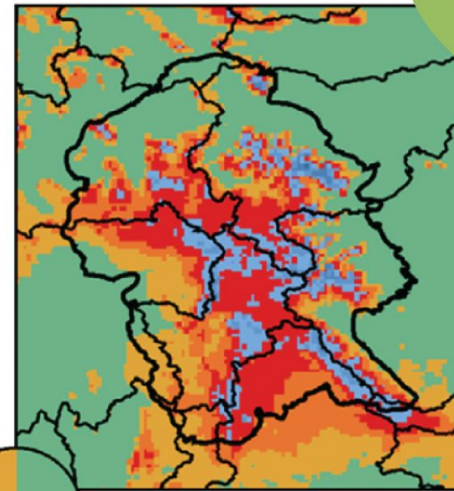


Percent area: snow, mix, rain

2041-2060



2061-2080



Statistical downscaling using
MACAv2-METDATA

Changing the “Water Towers of the West”





Powell, WY

How do we enable communities to anticipate and prepare for significant and lasting changes in water availability?



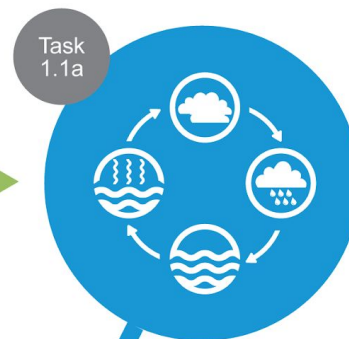
Global climate
model drivers
CMIP6 (and PMIP)



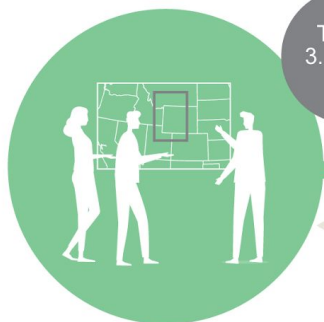
Dynamically downscaled regional climate
model (WRF) with land surface model and
dynamic vegetation (CTSM)



Statistical downscaling
and watershed-scale
WRF-Hydro simulations



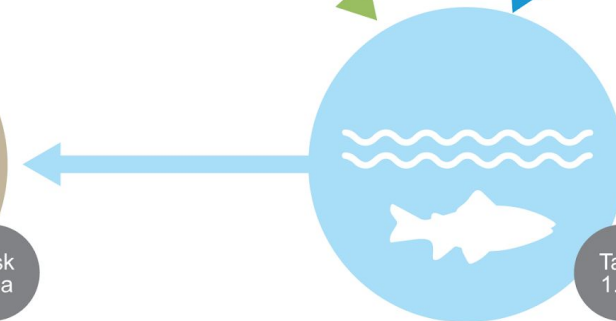
Tasks:
3.1a and
4.2



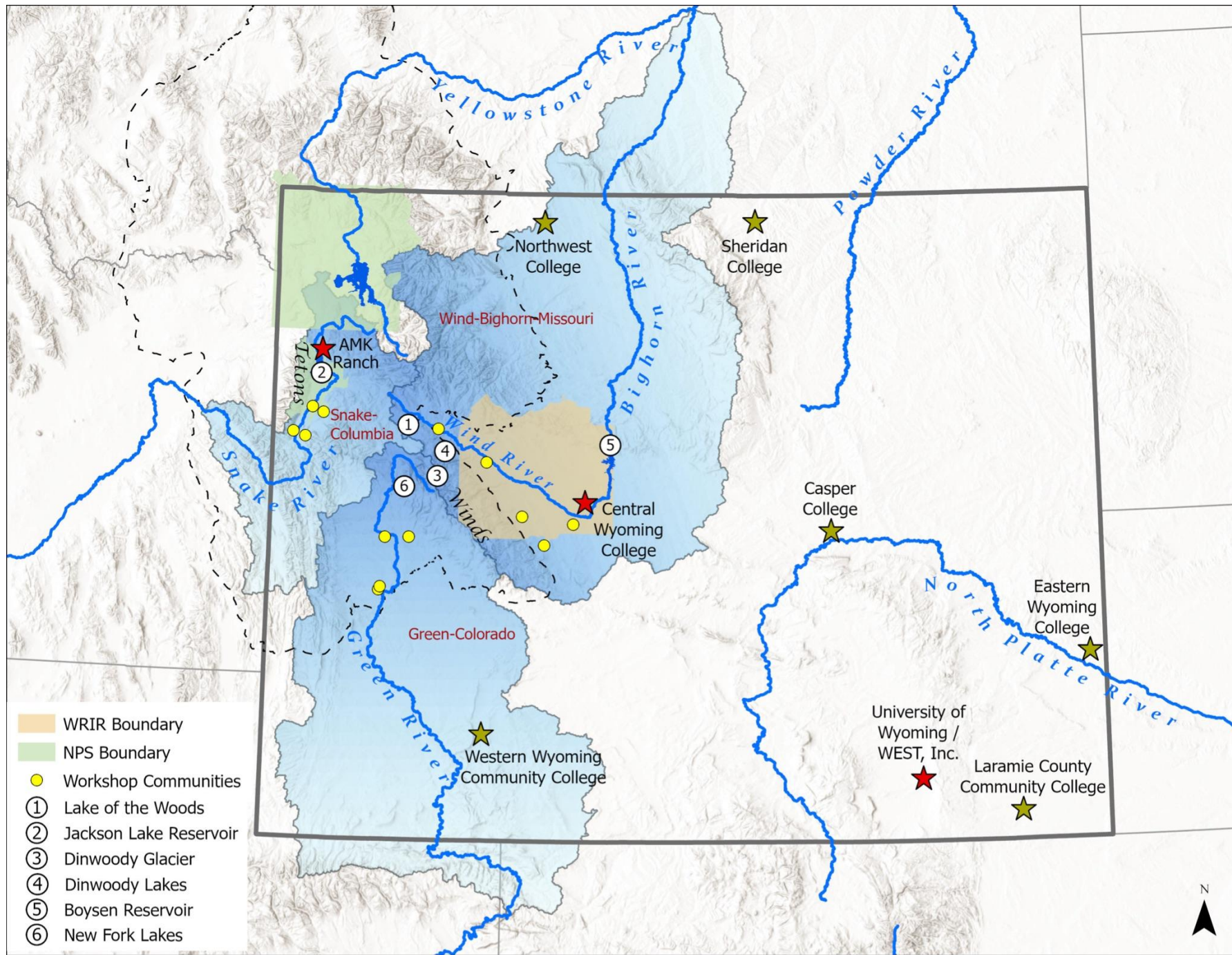
Co-produced
scenarios



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



AMERICAN INDIAN SCIENCE
AND ENGINEERING SOCIETY

- STEM Pathways
- Bison Restoration
- TEK: Medicinal Plant Revitalization



Enduring and sustainable elements:

Laboratory for Regional Earth System Modeling
5 faculty positions

NCAR-Wyoming Supercomputing Facility



Center for Climate, Water and People

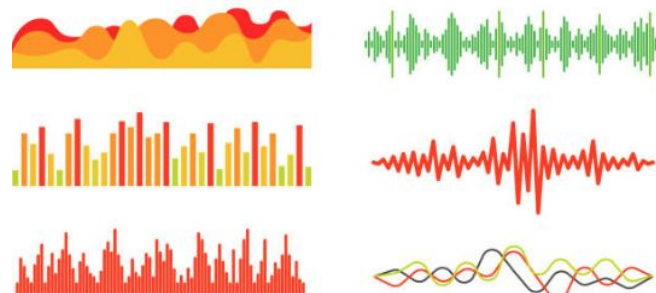


AMK Ranch



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 WyGIS, 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

