Cultivating Community Preparedness: Grassroots Water Risk Assessment Survey in the Headwaters of the Green, Snake, and Wind Rivers

A proposal to the Grand Challenges Initiative Planning Grant by the Cultivating Community Preparedness team, Submitted February 1, 2021

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Nature of the problem

Title: Cultivating Community Preparedness: Grassroots Water Risk Assessment Survey in the Headwaters of the Green, Snake, and Wind Rivers.

Grand Challenges theme: Biodiversity and Earth System Change, Rural Health Issues, and Public Trust in Research and Information. Our work aligns with the **President's priority** that UW grows its interdisciplinary capacities.

Research problem to pursue: Design and deliver a survey (via WYSAC) by June 2021 to ground our understanding of risk *perception* of hydro-social issues in Wyoming communities.

Narrative description of problem: "*Water is the life blood of the West*," said a Baggs resident who identifies as a water rights holder, ranching/ag community member, and conservationist who attended one of three November 2019 community meetings about the future of water management in Wyoming, co-hosted by several CCP team members. This quote motivates our CCP team's goals for this project. Our team conducted a pilot transdisciplinary survey of attendees at these community meetings, providing research guidance for our proposed survey. The CCP team has worked during the past four years to address **emergent and urgent challenges facing rural communities concerning climate variability**, developing **transdisciplinary research** from the social sciences, humanities, and environmental and natural resource sciences.

Wyoming's unique geographic setting includes snow-dominated mountainous headwaters for three major river basins in the United States - the Green/Colorado, Snake/Columbia, and Platte/Missouri/Mississippi Rivers. Recent climate change in Wyoming (Shuman, 2012) includes impacts on water resources that range from drought (e.g., Udall & Overpeck, 2017; Xiao et al., 2018), which also plays a role in increased forest fires (Carter et al., 2017, 2018); to changes in precipitation and snowpack (Nicholson et al., 2018; Pederson et al., 2013); to earlier than average spring snowmelt and runoff (Shinker et al., 2010; Stewart et al., 2005). Such changes in mountainous precipitation and increasing drought conditions are projected to continue (Udall & Overpeck, 2017) and will increasingly put Wyoming's communities at risk to address obstacles and prepare for consequences.

The **challenge for Wyoming communities will be to build resilience into their livelihoods** as they aim for a healthy and prosperous future amidst the pressures of neighboring states and water law. However, **communities will not plan for resilience if they do not perceive risk.** Physical vulnerability of climate change does not matter as much as *risk perception* (e.g., Safi et al., 2012). Given COVID challenges to in-person community meetings, **a survey will provide a baseline** understanding of how Wyoming communities perceive the magnitude and susceptibility of threats to water resources, which will then **guide our development of scenarios** that reflect community concerns of potential watershed futures.

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Encouraging communities to engage and work through future-oriented scenarios can increase the perceived risk of climate change (e.g., Lee et al., 2018; Murphy et al., 2016). Our CCP transdisciplinary process connects local experience and knowledge with UW expertise, toward the **ultimate goal of co-creating preparedness plans**. With more accurate risk assessments and collaborative community building processes, the community planning processes will deliver better results for adaptation, including **which entrepreneurial horizons to explore** and **how to develop resilient community health**.

This survey is the first step in addressing Wyoming's **urgent hydro-social, economic needs** relative to climate variability. It will help us understand how to most **effectively communicate** (e.g., listen, frame, storytell) with Wyoming communities about these issues given community risk perception, which is often influenced by psychological biases such as *endpoint bias* (i.e., misinterpreting environmental time series data to place more weight on the last point in the trend), affect heuristic (i.e., using feelings to guide us), personal experience (i.e., overemphasizing anecdotes more than data), and selective perception (i.e., differential evaluation of information depending on prior beliefs) (Hardy & Jamieson, 2017; Peters, 2017; Stroud, 2017).

The survey allows us to **build new areas of distinction** and also to **develop further capacities for current projects** so we can **apply for external funding**. Reflective of our **transdisciplinary strength**, survey aims are to (a) Understand how Wyoming residents may be adapting to water and climate variability in their local communities; (b) Understand how geographic location within a desired area may impact Wyoming community preparedness; (c) Understand the use of media *compared to other information sources* when it comes to staying informed about climate and water issues; (d) Understand whether media use habits are associated with Wyoming residents' *attitudes and risk perceptions* about climate variability on hydro-social systems; (e) Understand how *connected, informed, and confident* Wyoming residents feel about community preparedness issues; (f) Understand how religious identities within the desired area may impact Wyoming community preparedness (see Jenkins et al., 2018); (g) Estimate citizen values of alternative water management plans under varying probabilities of climate and water extremes using contingent valuation methodology (see Munro & Hanley, 1999); and (h) Obtain Wyoming residents' perceptions of water and environmental-related national hazard risk perceptions and measures of loss-aversion (Tversky & Kahneman, 1981).

Work plan: For the transdisciplinary design phase in February and March, we plan four meetings: (1) Discussion of *Essentials of Transdisciplinary Research* and its ramifications for our team (lead: Keller); (2) Overview of risk perception research and communication of science research regarding resistance to climate science (leads: Cooper and Landreville); (3) Overview of hydrology and climate science as relates to uncertain water futures (leads: Paige and Shinker); (4) Overview of economic approaches to risk perceptions and valuation (leads: Ehmke and Hansen). Following these workshops, we will develop our survey instrument, building from our previous pilot survey. WYSAC will administer the new survey in April and May. Our findings will inform our first fall 2021 community meetings.

Partnerships: Stakeholders on the Wyoming headwaters of the Colorado River Basin including the Green River and Little Snake River basins, with whom we completed our pilot transdisciplinary survey; Greater Yellowstone Ecosystem (GYE), with which we are in planning to engage GYE communities in a scenario process based on data from the soon-to-be-released Greater Yellowstone Climate Assessment, results from *this* proposed survey, and results from two other surveys (of water managers and water users more specifically on drought-risk perceptions) for which we have applied for funding from the Provost Strategic Initiative; AMK Crossing Divides Initiative.

Budget: Transdisciplinary research design workshops, 4 x 2 hr lunch meetings, February and March 2021. No cost due to Covid.

WYSAC survey (to be implemented April and May 2021), mixed mode survey (mail and web), 400-500 residents of Greater Yellowstone communities plus Green River/Rock Springs communities. Survey estimate acquired from Bistra Anatchkova, Senior Research Scientist and Survey Research Manager at WYSAC, on January 21, 2021. **Total Budget Request: $19,780**

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