



USGS NSF GRIP Opportunity

USGS Center:	Northern Rocky Mountain Science Center
Project Title:	Multi-Century Reconstructions of Streamflow for the Upper Missouri River Basin
Project Hypothesis or Objectives:	<p>The Missouri River Basin (MRB) is the only major river headwaters in the western U.S. for which hydrologic reconstructions from tree rings have not been generated in any systematic way. This knowledge gap is critical given that the region is facing an array of water resource issues that are challenged by hydrologic variability – experiencing both severe floods and droughts in the recent past. Providing a longer context for understanding past variability of flow and the climatic controls on it, particularly at decadal and longer time scales, is critical for anticipating and managing future water supplies. Historical discharge records are too short for such assessments; hence, the value of tree-ring based hydrologic reconstructions that span the past several centuries or more. The main objectives of this project are to: 1) develop efficient algorithms to use a new network of tree-ring data for reconstructions of upper Missouri River basin streamflow; 2) evaluate the use of modeled hydrology for the calibration of streamflow reconstructions where natural or estimated natural streamflow series are not available, and; 3) identify and quantify characteristics of major drought and wet periods for the headwaters region of the MRB.</p>
Duration:	9-12 months
Internship Location:	Bozeman, Montana
Area of Discipline:	Earth Science, Hydrology, Paleohydrology, Climate Change
Expected Outcome:	<p>Results of this project will advance our understanding of historic variability and trends in streamflow for the MRB headwaters, and have implications for a number of BOR and USGS climate and hydrology programs, particularly the BOR climate change impacts assessment process. The project will publish at least one paper in the peer-reviewed literature and present results at a national or international scientific conference. The intern will receive mentorship, opportunities to broaden their professional network,</p>

and exposure to BOR and USGS culture, mission and research efforts.

- **Special skills/training Required:** Completion of a bachelors or masters degree in the earth sciences, hydrology, ecology, ecohydrology, biology, applied mathematics, or related fields. Previous experience in dendrochronology and tree physiology preferred. Applicant must be proficient in applied statistics and programming in the R programming language.
- **Duties/Responsibilities:**
 1. Collection and standardization of raw, naturalized, and modeled hydrologic flow series for MRB headwaters gages.
 2. Develop algorithms using the R programming language for the statistical screening of tree-ring chronologies against hydroclimatic variables, and the reconstruction of streamflow records using well-established dendrohydrologic methods.
 3. Characterize the spatial and temporal variability of drought in the MRB headwaters.
 4. Collaborate with U.S. Geological Survey and Bureau of Reclamation scientists and managers on establishing relevant stream gages and flow metrics for reconstruction.
 5. Present results at a national or international meeting, and publish the research in the peer-reviewed literature.
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