

Water Resources in a Changing Climate:

Integration of Hydrology and Ecological Change in the Salmon Basin

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A Vacant “Research Niche”

- Most watershed research (e.g., LTER) & monitoring (e.g., NEON) focused on small systems – need for large basin perspective
- Long-term contemporary records that include ecological data are rare
- Links between contemporary change & paleo records rare
- Need for wilderness “window” on change

Salmon Basin: Idaho's "window" into water resources & climate change



Salmon River Basin

unique record of past studies

- seminal stream ecosystem (Minshall et al.) and hydro-geomorphic (Leopold et al.) studies and long-term monitoring



Salmon River Basin

site of on-going paleo studies

Impacts of Climatic Change and Fishing on Pacific Salmon Abundance Over the Past 300 Years

Bruce P. Finney,^{1*} Irene Gregory-Eaves,² Jon Sweetman,¹ Marianne S. V. Douglas,³ John P. Smol²

Finney et al. Science 2000



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Fire-induced erosion and millennial-scale climate change in northern ponderosa pine forests

Jennifer L. Pierce¹, Grant A. Meyer¹ & A. J. Timothy Jull²

Pierce et al. Nature 2004

Goal

- *Build on legacy datasets to establish Salmon basin as internationally recognized natural laboratory to study coupled physical-ecological responses to climate change and associated regime shifts (e.g., hydrology, wildfire, insect outbreaks)*

Research Questions

- What are the historical relationships among climate, hydrology, geomorphic conditions, fire, and ecology in the Salmon?
- How do current ecological conditions in the Salmon compare with the past?
- Can observed changes in hydrology, geomorphology, disturbances (fire, insects), and ecological health be attributed to changes in climate? If so, can accurate predictions of future changes in ecological conditions be made for the next century?

Hydro-Ecology Objectives

- Organize & analyze legacy datasets to study coupled physical-ecological responses to climate change and associated regime shifts (e.g., hydrology, wildfire, insect outbreaks)
- Integrate paleo perspectives on past climate change & responses (e.g., fire history) and make comparisons with contemporary dynamics (i.e., separate anthropogenic patterns)
- Establish and instrument new study sites & labs (e.g., flumes) to test mechanisms of change

Hydro-Ecology Objectives

- Improve basin scale hydrologic forecasting - verification and operation under climate change scenarios for Salmon River Basin
- Link future hydrologic change scenarios to mechanisms of ecological change
- Develop new round of long term environmental monitoring

Sustainability

- Hires to fill critical gaps (e.g., hydrologic modeling, ecosystem ecology)
- Focus on top-tier publications to establish reputation
- Proposals to long-term NSF funding programs (e.g., LTREB, Center)...and to diverse funding agencies to ensure long-range, consistent support
- Partnerships (e.g., MOU's, long-range investment in monitoring) with state (e.g., IDFG, DEQ), Tribes, and federal agencies (USFS, NOAA), & neighbor states

Sustainability

- Improve communication of science to our communities and engage in policy processes
- Grow more of our own scientists!
- Increase opportunities for underrepresented groups—not just “the right thing to do,” but an untapped source of creativity and inspiration for our sciences (e.g., native students and ecology)