



# Air, Water and Aquatic Environments Science Program

Rocky Mountain Research Station



## Climate Change, Water, and Aquatic Ecosystems

Research

Technology Transfer

Science Application

### Challenge

Environmental trends associated with a warming climate are occurring rapidly in the Rocky Mountains. These trends will affect the spatial and temporal distribution of water resources, habitats, and disturbance in aquatic ecosystems. Threats from reduced runoff, increased flow variability, increased temperature, increased wildfires, lost snowpack storage, and reduced vegetation cover affect water users and aquatic biota alike. The complex challenges posed by climate warming will require proactive, informed management if significant alteration of aquatic systems is to be avoided.

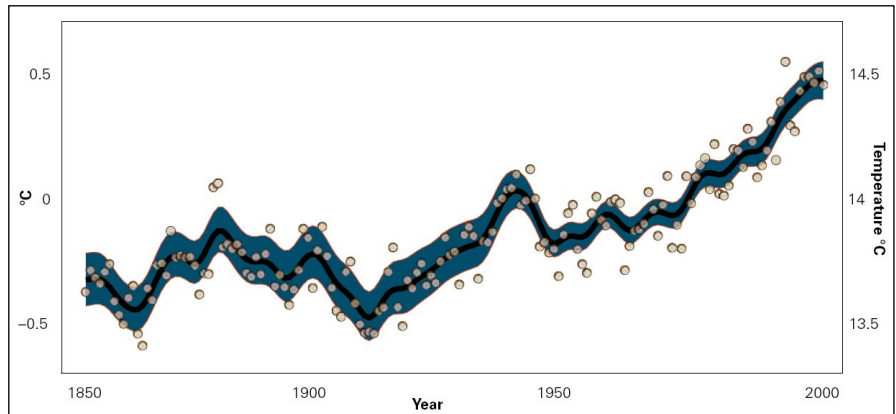


Figure 1. Global average temperature; IPCC 2007

### Strategic Questions

- How will warming climate environmental trends in air temperatures, precipitation, snowmelt, and fires affect local water supplies and aquatic organisms?
- Can changes in key hydrologic and ecosystem attributes be predicted with sufficient accuracy to facilitate proactive management?
- How can the resistance, resilience, and adaptability of aquatic ecosystems be increased to minimize climate impacts and conserve native biodiversity and ecosystem services?

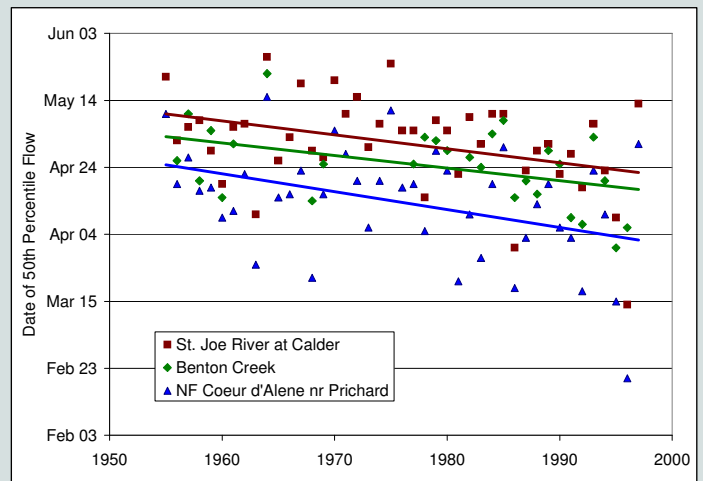


Figure 2. Earlier streamflow timing



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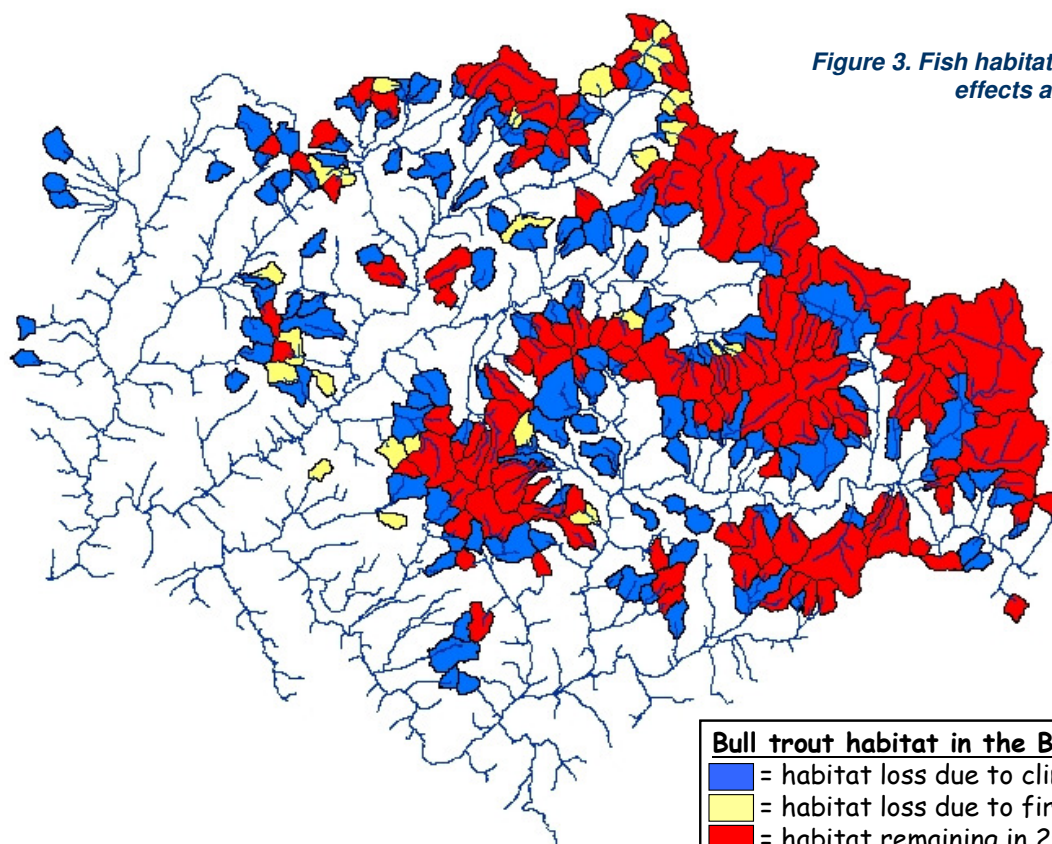


Figure 3. Fish habitat loss due to climate effects and fire.

## AWAE Research Activities

- Studying hydroclimatic and biological data to understand how a warmer climate will affect snowmelt, streamflow, stream temperature, forests, and aquatic ecosystems.
- Developing improved snowmelt, hydrology, and stream temperature models for habitat risk assessment and short-term forecasting of environmental conditions.
- Facilitating information exchange with Forest Service personnel and aquatic and water resource agencies in the form of workshops, presentations, and peer-reviewed manuscripts.
- Developing decision support models and web-based tools to enhance the effectiveness of communications and collaboration.
- Developing monitoring technology to rapidly detect trends and surprises resulting from climatic change and to provide data to downstream users.
- Understanding how climate change alters disturbance regimes from insects and fires.