



Air, Water and Aquatic Environments Science Program

Rocky Mountain Research Station



Fire, Fuel Management, and Aquatic Ecosystems

Research

Technology Transfer

Science Application

Challenge

Wildfires dramatically change watersheds, yielding floods and debris flows that endanger water supplies, human lives, and valuable fish habitats. Fuel management is intended to mitigate the effects of wildfire but poses risks to water quality and aquatic habitat. Solutions are needed for simultaneous restoration of forests and aquatic ecosystems. Although the problem is typically cast as a tradeoff between management actions like fuel reduction, fire suppression, and emergency stabilization versus wildfire, new ideas about appropriate management response to wildfire require understanding how to build resilient ecosystems. There is a need for strategic restoration that addresses terrestrial as well as aquatic needs.



Following fires, debris flows can impact municipal water supplies, homes, roads, and fish habitat.



Fire on the Middle Fork Boise River, Boise National Forest

Strategic Questions

- How are water supplies, fish, and riparian ecosystems affected by wildfire?
- How do the impacts of wildfire differ from those of fuel management on water yield, water quality, flood risks, and fish?
- How persistent are wildfire impacts and how much stream network do they affect at once. What is the spatio-temporal scaling of fire effects?
- Can we effectively mitigate after wildfires?
- How do we design restoration approaches to make landscapes and river networks resilient to major wildfires and make them compatible with wildfire use?



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AWAE Research Activities

- Studying tradeoffs and differences between impacts of land and fuel management and those of wildfire.
- Understanding the role of wildfire in the dynamics of terrestrial and aquatic ecosystems.
- Developing strategic management for fuels and watershed restoration to promote ecosystem resilience.
- Studying how changing snowmelt and water balances affect fire size and severity.
- Studying recovery of forests, soils, and streams after wildfire.
- Describing the scaling of post-fire flooding and debris flow impacts.
- Estimating risks of post-fire flooding and debris flows on downstream infrastructure, homes, populations and water supplies.
- Measuring and modeling performance of post-fire stabilization treatments.
- Describing movement of fine sediment through steep gravel bedded streams to contrast persistent (e.g. roads) and acute (e.g. fire) sources of fine sediment.
- Contrasting fire and climate change effects on stream temperature and runoff patterns.



Fire affects aquatic habitat



Even minor debris flows and landslides can have consequences in the wildland-urban interface.