



United States Department of Agriculture

Fire and Fuels Research

Physical Fire Science

The Forest Service researches physical fire science to help protect public safety, ecosystem integrity and sustainability, and environmental quality.

Background

Physical fire science advances our fundamental understanding of fire-fuel-atmosphere interactions, fire behavior, danger, and emissions from different fuels and fuel complexes. This is critical for:

- Developing timely, accurate, and complete predictions of fire behavior and effects,
- Improving assessments of fire hazards and risks,
- Designing and comparing fuel treatments and outcomes, and
- Prioritizing fuel treatment and response options.



The Elk Complex Fire in the Boise National Park in Idaho in August 2013. *Credit: USDA Forest Service*

Highlights - Research and Activities

In the lab and in the field, using data collected by satellites, airborne sensors, and crews on the ground, Forest Service scientists investigate:

- Fundamental, multi-scale, **physical processes** that govern fire behavior, such as heat and energy transfer, combustion, and fuel-fire-transitions from “well behaved” to extreme;
- **Atmospheric interactions and dynamics** in complex fuelbeds and environments;
- Influences of **large spatial and temporal scale processes** - regional climate patterns and variability, terrain variability, landscape-level management strategies, and regional fuel variability on fire behavior, fire severity, fire size, and burn patterns across landscapes; and
- Methods for new and improved **fire danger assessments**, including using information on atmospheric conditions, fuel moisture interactions, physical and structural variability in fuels, fuel flammability and ignition probabilities, and critical atmospheric boundary layer and mesoscale processes associated with fire-weather.



Forest Service
Research & Development

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