JOINT FIRE SCIENCE PROGRAM

A smoke column near the Alaska pipeline on the Grapefruit Complex from the afternoon of June 30.
Credit: Alaska Fire Service - Upper Yukon Zone

FACT SHEET

Reducing Damages and Losses to Valued Resources from Wildfires

Practical Science-Based Guidance for Wildfire Practitioners

Wildfires threaten water sources, ecosystems, infrastructure, and other valued resources. The Joint Fire Science Program has funded research to deliver practical tools and strategies that help practitioners forecast risk and target treatments where they matter most.

The Power of Fuel Treatments

Prescribed fire remains one of the most effective tools for reducing wildfire severity and protecting critical assets such as wildlife habitat, tree plantations, agricultural land, and communities in the wildland–urban interface.

- **Choose burn frequency based on regional context:** In the Southeast, where productivity is high and fuels rebound quickly, frequent burning (1-2 years) is essential. In other systems, treatment effectiveness can last longer (3+ years).
- **Weather considerations:** Hot, dry conditions increase wildfire severity, but prescribed fire helps offset this risk.

Recent research provides strong empirical evidence to support integrating prescribed fire into long-term wildfire risk reduction strategies.

A U.S. Fish and Wildlife Service firefighter talks on the radio while working on a prescribed fire at Shaw Air Force Base in South Carolina.
Credit: Zach Brown

Beyond Forests: Sagebrush & Pinyon–Juniper Systems

Fuel treatments can also address wildfire risk in sagebrush and pinyon–juniper ecosystems, where rising fire frequency and severity threaten habitat and rangeland.

- **Treatment tradeoffs:** Fuel reduction can preserve sagebrush and reduce suppression costs but may also increase annual grass invasion risk.
- **Strategic placement:** Modeling shows costs and benefits vary by vegetation type and successional stage.
- **Decision-support tools**: New data have been incorporated into treatment prioritization tools to guide placement across these landscapes.

These advances enable outcome-based risk assessments that balance ecological tradeoffs, protect high-value resources, and optimize limited budgets.

Fuel Treatments Protect Water Resources and Habitats After Fire

Wildfire impacts often extend beyond the flames. Post-fire floods and debris flows can threaten municipal water supplies, aquatic ecosystems, infrastructure, and neighborhoods. In some cases, these cascading effects cause more damage than the fire itself.

Fuel treatments help managers prepare by reducing fire severity and watershed risks—though effectiveness depends on vegetation and watershed characteristics.

- **Prioritize spatially:** Target treatments where wildfire risk overlaps with debris-flow pathways and key water assets.
- **Plan holistically:** Integrate post-fire debris-flow and flood risk assessments into pre-fire planning.

Emerging research is linking fuels, fire behavior, and watershed impacts to give managers clearer, science-based guidance on where and how to apply treatments for maximum protection.

Wildland firefighters use prescribed fire to manage 1,100 acres of ponderosa pine, sagebrush, and pinyon-juniper woodland communities on the Arizona Strip.
Credit: Jenna Moore

High-severity fire impacted the flows of this perennial stream. These sorts of effects can be avoided with strategically-placed fuel treatments.
Credit: Dixie National Forest

Conclusion

By integrating predictive models, fuel data, and treatment strategies, wildfire practitioners can better safeguard water supplies, ecosystems, and communities. Continued application of these tools will strengthen resilience and support proactive, effective wildfire management across diverse landscapes.

Dig deeper into the science behind this summary on FireScience.gov.

1. *Evaluating fuel treatment efficacy in reducing risk of high-severity fire and downstream impacts. Principal Investigators: Larissa Yocom, Patrick Belmont, Brendan Murphy. Project ID: 19-2-02-6.*
2. *Integrating post-wildfire debris-flow and flood risk assessments and value change metrics with QWRA. Principal Investigators: Ann M. Youberg, Luke A. McGuire, Joseph Loverich, Ryan A. Fitch. Project ID: 19-2-02-9.*
3. *Using Next Generation Fuels Data and Outcome-Based Metrics in Fire Risk Assessments for High Value Resources in the Sagebrush Biome. Principal Investigators: Jeanne C. Chambers, Karen C. Short. Project ID: 19-2-02-11.*
4. *Quantifying Prescribed Fire's Capacity to Mitigate Wildfire-Induced Damage and Loss of Valued Resources. Principal Investigators: Christopher W. Ross, Eva L. Loudermilk, Grant J. Snitker, Joseph J. O'Brien, Steve A. Flanagan. Project ID: 21-2-02-18.*

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Research Supporting Sound Decisions

The **Joint Fire Science Program (JFSP)** provides research funding, exchange, and communication for science associated with wildland fire, fuels, and fire-impacted ecosystems to dynamically respond to the emerging needs of fire managers, practitioners, and policymakers.