JOINT FIRE SCIENCE PROGRAM

BLM conducted a fuels project to create a fuel break along Wickahoney Road in Idaho. Credit: BLM Idaho

FACT SHEET

Fuel Breaks and Fuel Break Systems

Applying JFSP-funded research to improve placement, design, and management

The Joint Fire Science Program (JFSP) has funded multiple projects exploring how fuel breaks and fuel break systems can influence wildfire behavior, firefighter safety, and long-term community protection. This fact sheet summarizes results from those studies and other work by the fire science community, providing guidance for managers and planners on how, where, and when to use fuel breaks effectively.

Key Points

1. **Fuel breaks rarely stop large, fast-moving fires on their own.**
2. **They are most effective when actively used during suppression (e.g., firing operations, line holding).**
3. **Their greatest contributions may be indirect: slowing lateral spread, improving access, providing time for evacuations, and enabling suppression strategies.**

What Fuel Breaks Do – and Don't Do

Fuel breaks are intentionally modified strips of vegetation designed to reduce fuel continuity and volume, making them safer locations for fire suppression actions. Unlike treatments that broadly alter fuel conditions across large landscapes, fuel breaks are linear features intended to facilitate firefighting access, improve suppression efficiency, and provide anchor points for operations.

A line of retardant provides a fuel break between the Buffalo Mountain Fire and the homes near by.
Credit: National Interagency Fire Center

Effectiveness: When Fuel Breaks Work

Research across California, Alaska, the Great Basin, and the Pacific Islands has shown that effectiveness depends on both environmental conditions and management use.

- **Moderate Weather**: Wider fuel breaks combined with adjacent treated areas show the highest success rates under moderate wind and fuel conditions.
- **Extreme Fire Behavior**: Wind-driven crown fires and ember spotting can breach even wide, well-maintained breaks.
- **Suppression Support**: Fuel breaks improve outcomes when integrated with fireline construction, aerial drops, and firing operations.
- **Manager Perspectives**: Fire managers often rate fuel breaks as successful even if they don't fully stop a fire—because they buy time for evacuations and help protect high-value resources.

Where to Place Fuel Breaks

Strategic placement is critical for maximizing effectiveness:

Ridges and Watershed Divides
Primary breaks on ridgelines can slow large runs and divide fuel into more manageable blocks.

Base of Slopes and Canyons
Breaks here can provide suppression anchor points and safe egress.

Road Networks
Integrating breaks with roads improves firefighter access and speeds up suppression response.

WUI Priorities
Fuel breaks bordering communities are valuable, but managers must set realistic expectations—these breaks alone will not guarantee structure protection.

System Design
Interconnected systems outperform isolated breaks, fragmenting fuels into compartments that slow fire spread.

How Often Do Fuel Breaks Need Renewal?

The frequency of re-treatment depends on vegetation type and growth rates:

- **Grasslands/Savannas:** 2-4 treatments per year (mowing, grazing, herbicide)
- **Chaparral/Brush Fuels**: Every 3–7 years, depending on regrowth.
- **Forested Breaks**: Thinning or prescribed fire is typically required on 10–20 year cycles, though invasive grasses and woody debris can shorten this timeline.

Design and Maintenance Considerations

- **Width**: In grasslands and savannas, 40–100 ft is typical. In shrubland and hardwood environments, 100-200 ft. is recommended.
- **Condition**: Breaks tied to existing low-fuel features (roads, rivers, rock outcrops) are easier to maintain and more reliable.
- **Vegetation Type**: Breaks where vegetation is thinned or replaced with less flammable species can be long-term strategies, but still require management.

Photo: This photo from the Waianae Mountains Watershed Partnership illustrates a green break where fire-prone nonnative grasses and shrubs have been replaced with drought tolerant native plant species. Credit: Clay Trauernicht

Conclusion

Fuel breaks and fuel break systems are valuable tools when planned strategically, placed with suppression and access in mind, and maintained regularly. JFSP-funded research highlights that while fuel breaks alone cannot prevent large fires, they are critical components of broader fire management systems that help protect communities, ecosystems, and firefighter safety.

Dig deeper into the science behind this summary on FireScience.gov and in the resources below.

1. JFSP Project ID 19-2-01-1: Manager Perspectives on Fuel Break Effectiveness and Configurations
2. JFSP Project ID: JFSP 20-2-01-12: Assessing fuel breaks using an empirical spatial fire planning model in the context of suppression operations
3. JFSP Project ID: 20-2-01-16: Developing and evaluating fuel break performance metrics across spatiotemporal scales and for multiple risk factors in sagebrush landscapes of the Great Basin
4. Pacific Fire Exchange: Pacific Island Fuel Breaks & Management Strategies, https://pacificfireexchange.org/resource/pacific-island-fuel-breaks-management-strategies

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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.