

Forest Habitats

11. Green Firebreaks

DEFINITION

There are two main types of firebreaks in use in the United States. *Standard firebreaks* are areas where all organic material has been removed down to the mineral soil (Bennet 2017). *Green firebreaks* are strips of fire-resistant vegetation planted strategically to slow or stop the spread of wildfires, especially near infrastructure (Curran et al. 2018; Texas A&M Forest Service n.d.). Green firebreaks are also called *fuelbreaks*, *greenstrips*, and *greenbelts* (Ascoli et al. 2018; Davison and Smith, 1997; Greenbelt Alliance 2021).

TECHNICAL APPROACH

Green firebreaks are used as a method to stop or slow the spread of wildfire or prescribed fire, particularly in human-inhabited areas. Agencies can use existing and constructed firebreaks to achieve the same goal (Weir et al. 2017). Managers can also decide on whether or not to use firebreaks without vegetation or green firebreaks that include fire-resistant native vegetation (Bennet 2017, Curran et al. 2018).

- 1. Preparation:** To construct a firebreak, a land manager needs to establish where it should go, determine the type of firebreak, and prepare the site before construction (Davison and Smith 1997).
- 2. Constructing:** When constructing green firebreaks, width, naturally occurring breaks, and topography must be considered. It is also important to space out vegetation to reduce the spread of a potential wildfire (Davison and Smith 1997). In terms of vegetation, it is important to use native plants that will prevent fire spread and growth. Establishing a firebreak along a contour is best to mitigate erosion (USDA 2022). Green firebreaks can be single- or multilayered, meaning one or multiple species. Studies have shown that multilayered firebreaks are more effective. Green firebreak width depends on topography, slope, wind, typical temperature, and vegetation flammability (Cui et al. 2019).

OPERATIONS AND MAINTENANCE

After the firebreak has been constructed, it is crucial to continue monitoring and maintaining it to ensure unwanted vegetation and organic material do not build up. Firebreaks should be inspected at least annually to ensure proper functioning. Maintenance includes removing dead limbs and trees, unwanted flammable vegetation, and excessive litter. It is also essential to repair any erosion control measures (NRCS 2022). Green firebreaks can be mowed or grazed to reduce fuel buildup, particularly if grasses are included in the firebreak (Davison and Smith 1997; NRCS 2011).

FACTORS INFLUENCING SITE SUITABILITY

- ✓ **Wildland-urban interface:** In human-inhabited areas, green firebreaks are useful for the protection of life and property (Davison and Smith 1997).
- ✓ **Topography/contour:** It is best to build a green firebreak along a contour to mitigate erosion and upon ridges due to wind patterns (NRCS 2022; Cui et al. 2019).
- ✓ **Soil composition:** Soil composition is an essential consideration because more fragile soil is more susceptible to erosion (DFES n.d.).
- ✓ **Typical wind direction:** Green firebreaks should be perpendicular to prevailing winds in the region during the fire season (Cui et al. 2019).
- ✓ **Adjacent to roads and railways:** Green firebreaks can be useful next to roads or railways because of the risk of wildfire ignition from littered cigarettes and sparks from trains or vehicles (Davison and Smith 1997).
- ✓ **Continuous flammable vegetation:** Green firebreaks can be helpful in areas with continuous flammable vegetation as a method to break up the continuity (Davison and Smith 1997).
- ✓ **Low-flammability native species:** It is important to use native species to promote biodiversity. Therefore, areas with low-flammability native species are necessary for effective green firebreaks (Curran et al. 2017).

TOOLS, TRAINING, AND RESOURCES FOR PLANNING AND IMPLEMENTATION

Name and Link	Resource Type	Year	Authors/ Authoring Organization	Geography	Description	Resource Includes			
						Design/Construction Guidance?	Site Selection?	Monitoring Guidance?	Example Projects?
A Guide to Constructing and Maintaining Firebreaks	Guidebook	n.d.	Government of Western Australia Department of Fire & Emergency Services Rural Fire Division	Although this is an Australian resource, it could be useful for land managers to see what other countries are doing	This guide provides a detailed outline of how to construct and maintain firebreaks in accordance with Australian policy.	✓	✓	✓	—
Conservation Practice: Standard Firebreak	Document	2022	US Department of Agriculture (USDA) Natural Resources Conservation Service.	National	This document provides information on how to implement and maintain standard firebreaks. It also explains essential considerations to keep in mind when constructing these interventions.	✓	✓	✓	—
Texas Prescribed Burn Handbook: Firebreaks	Webpage	2021	Texas AgriLife Extension	Written for Texas but most of the information is more broadly applicable	This resource provides specifications for firebreak widths dependent on fuel type.	✓	—	✓	—
Firebreaks for Prescribed Burning	Webpage	2017	Oklahoma State University Extension	National	This resource explains the differences between constructed and existing firebreaks and how to use them for prescribed burns.	✓	✓	—	—
Green Firebreaks as a Management Tool for Wildfires: Lessons from China	Journal Article	2019	Cui et al.	National	This resource shares knowledge from China's use of green firebreaks. China is the world leader in using this mitigation strategy to reduce wildfires, so the authors of this article synthesized some of the lessons learned into helpful information for implementing green firebreaks in the United States.	✓	—	✓	✓

LIKELY BENEFITS AND OUTCOMES

Primary objectives for each strategy are **highlighted**.

Climate Threat Reduction

- **Reduced wildfire risk:** Plants with low flammability have the ability to reduce or stop the spread of catastrophic wildfires when placed strategically along the landscape within green firebreaks (Cui et al. 2019).
- **Improved air quality:** Firebreaks slow or stop wildfires and thus limit the emissions of particulate matter, greenhouse gases, and ozone (NRCS 2022).

Social and Economic

- **Property and infrastructure protection:** Green firebreaks are often used as a means of defensible space surrounding homes and farmland (Greenbelt Alliance 2021, NRCS 2011).
- **Reduced or avoided costs:** Green firebreaks require less maintenance and costs when compared to human-made firebreaks such as roads (Dosch 2020, Cui et al. 2019).
- **Firefighter safety:** All forms of firebreaks provide wildland firefighters with a defensible area to effectively fight fire and prevent the destruction of life and property (NRCS 2011).

Ecological

- **Enhanced biodiversity:** Green firebreaks can promote biodiversity by conserving native vegetation within the firebreak and reducing the potential for severe wildfires that can be detrimental to native vegetation and animals. Firebreaks allow for strategically protecting areas with high biodiversity (Greenbelt Alliance 2021). To achieve the increase in and conservation of biodiversity, it is crucial to use native plants (Dosch 2020)
- **Reduced erosion:** With the proper vegetation, green firebreaks can promote erosion control when built along a contour (Texas A&M Agrilife Extension n.d., NRCS 2022).

BARRIERS AND SOLUTIONS FOR PRACTITIONERS

Common Barriers

Several barriers are common across many of the nature-based solutions strategies; these are described in more detail in [Section 1 of the Roadmap](#). Additional notes about the barriers specific to green firebreaks are included here.

- **Expense:** Although long-term maintenance can be less costly, some studies have shown that vegetated firebreaks cost more per unit area than unvegetated firebreaks (Dosch 2020; Cui et al. 2019; USDA 2014).
- **Capacity**

- **Public opinion**
- **Conflict with other land uses**
- **Regulation**
- **Lack of effectiveness data**

Economic

- **Need for other management:** Green firebreaks alone are not a highly effective strategy and often not enough to address the issue of severe wildfires (Dosch 2020).
- **Maintenance requirements:** To ensure low flammability, it is important to consistently maintain green firebreaks. Comparatively to standard firebreaks, they require less maintenance (Davison and Smith, 1997; Dosch 2020; Cui et al. 2019).

Ecological

- **Threat of invasive species:** Invasive species are a threat to green firebreaks since they often increase overall flammability (Dosch 2020).
- **Potential for catastrophic fires:** Unlike common firebreaks, green firebreaks can still burn, so it is essential to have other measures of protection from wildfires (NRCS 2011).

EXAMPLE PROJECTS

Name and Link	Location	Leading Organizations	Techniques Used	Size	Cost, \$	Duration	Project Description	Climate Threats Targeted	Lessons Learned or Adaptive Management
Paradise Nature-Based Fire Resilience Project	Paradise, CA	Conservation Biology Institute, The Nature Conservancy, and Paradise Recreation & Park District	Used mapping methods to determine ignition risks based on dominant wind direction and high-risk locations to determine the sites. Some techniques used include converting from conifer to hardwood, highlighting conservation cobenefits, and reducing fuels.	34,553 acres	Not provided	Ongoing (began 2020)	This project was designed in response to the Camp Fire that devastated Paradise, California, in 2018. The project is part of the ongoing rebuilding efforts and will test the use of wildfire risk reduction buffers, also referred to as greenbelts.	Reducing catastrophic wildfires	Not provided
Missouri – Vegetated Fire Break	Missouri	USDA	Fertilizer application, seeding operation, chemical application	3,000 ft	534.52	Not provided	This project aimed at reducing the risk of wildfires and allowing for safe prescribed burns.	Reducing wildfires, enhancing wildlife habitat	Not provided
Bureau of Land Management (BLM) Firebreak Across the Great Basin	Western United States	BLM	Brown strips, mowed and targeted grazing fuel breaks, green strips (Bathouth, 2020)	11,000 mi	Not provided	Not provided	This project will combine different firebreak methods to protect a 223 million ac area from catastrophic wildfires.	Reducing catastrophic wildfires	Not provided

Bolding indicates DOI affiliates.

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