



# Firebreaks for Prescribed Burning

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Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education

for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.

- It utilizes research from university, government, and other sources to help people make their own decisions.
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- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

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Firebreaks, also known as fireguards, are one of the most important elements of a properly conducted prescribed fire. Firebreaks should be constructed by removing vegetation and exposing bare ground or mineral soil. This is done to keep the fire from creeping across the firebreak and escaping from the burn unit. Bare ground firebreaks are the safest to work with, but not the only type that can be used. Firebreaks serve several purposes, but the most crucial is to contain the fire within the boundary of the burn unit. Well-constructed firebreaks make burning safer and can reduce the amount of labor required on a prescribed burn.

Firebreaks are also used to define the boundary of the burn unit and help the crew know the area to be burned. Firebreaks allow access to the perimeter of the burn unit for personnel and equipment. Ease of crew movement is essential for watching for spotfires, monitoring potential problem areas, and mop-up after ignition. It is also safer and less strenuous on crew members to access the burn unit with vehicles rather than on foot.

Firebreaks can also be used to reduce fuel along the edge of a burn unit to make ignition safer. In situations when there are large quantities of fine fuel along the edge of the burn unit, flames can reach across a narrow firebreak causing the fire to escape. It can also create a tremendous amount of heat, which can put crew members at risk and damage equipment. Many prescribed fires are conducted inside a fence line. When the heat gets extreme, there is nowhere for the crew or vehicles to go because they are pinned against the fence. In these instances it may be necessary to mow a desired width inside the burn unit along the firebreak to reduce fireline intensity next to the firebreak. This will make ignition safer for personnel and equipment.

Firebreaks may not be difficult to build, but firebreak preparation is usually one of the greatest expenses when conducting a prescribed fire. Once the firebreaks are established, they should be maintained annually to keep future construction costs down. Using firebreaks as a road or disking them annually can maintain a firebreak indefinitely. Firebreaks that

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are also available on our website at:  
<http://osufacts.okstate.edu>

had to be dozed to remove trees or brush may need mowing or herbicide treatments annually to control regrowth.

### Types of Firebreaks

The basic types of firebreaks are natural, existing, constructed, and mowed line/wet line. The type(s) and size of firebreak needed will be determined by fuel load, fuel type, topography, and weather conditions for each burn unit.

### Natural Firebreaks

Most natural barriers such as bluffs, creeks, streams, rivers, and lakes make good firebreaks. Make sure the barrier being used as a firebreak is wide enough so the fire cannot burn across. One contingency is to have a plan in case the fire escapes across the firebreak. Can personnel and equipment be moved down, over, or across the barrier quickly enough to suppress the escaped fire before it gets too large? It may be necessary to place personnel on the other side of the barrier for added protection. When using streams beds, make sure they do not contain vegetation that will carry a fire. There are usually debris dams on streams which will allow fires to



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burn across if they are not removed or monitored. Often dry streams can have large amounts of vegetation grown up in the bed. Also in the late spring creeks and streams make good firebreaks, due to the fact that the areas along the banks green-up early making them less likely to burn.

Another type of natural firebreak is wet or damp vegetation. This entails burning fine fuels, such as grasses that are surrounded by timbered areas where the leaf litter is too damp or wet to burn. Typically, grass fuels will be dry enough to burn in a short period of time after a rain. The fire in the grass will burn into the wet leaf litter and go out. Prior to doing this, make sure that the leaf litter is too wet to burn by conducting a test fire. Once the fine fuels are burned and the leaf litter dries, the leaf litter can be burned into the blackened prairie openings. One thing to watch out for is large amounts of grass litter on the ground that did not burn. This fuel may now be dry enough to carry a fire.

## Existing Firebreaks

### Cultivated Fields

Cultivated fields or crop fields with non-flammable vegetation make prescribed burning very simple and safe. Make sure there are no crops planted in the field that will burn. If crops are present, do not allow a headfire to run into the field boundary. Heat from the fire can damage the crops for a considerable distance. If crops are present, it is best to backfire away from the field border.

### Roads

Most roads make excellent firebreaks because they are bare ground and already in place. There are several types of roads that can be used as firebreaks. Two-track roads, or pasture roads, can be used as effective firebreaks. They work especially well when on the upwind side of the burn unit where the headfire will be set. They can also work for



**Two-track roads, or pasture roads, can be used as effective firebreaks. They work especially well when on the upwind side of the burn unit where the headfire will be set (as in this example). They can also work for the downwind side of the burn unit where the backfire will be set. If a two-track road is used as a firebreak, make sure the road is down to mineral soil in the tracks. Mowing is normally used in conjunction with this type of firebreak.**



**Gravel roads, county maintained roads and lease roads make good firebreaks because they allow for movement of fire equipment and personnel and are void of vegetation. Traffic on these roads should be considered as well, not only for the safety of those travelling on the road, but also for the personnel conducting the fire.**

the downwind side of the burn unit where the backfire will be set. If a two-track road is used as a firebreak, make sure the road is down to mineral soil in the tracks. Mowing is normally used in conjunction with this type of firebreak. Often the center part of the road has tall grass in growing in it, so the road should be mowed before being used as a firebreak. It is also advisable to mow alongside the road on the side closest to the burn unit to reduce the height of the fuel, thus reducing fire intensity.

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**Paved roads can be used as firebreaks as well, but there are two major limitations. First, paved roads normally have more traffic, increasing the risk of an accident because of smoke or onlookers. Also, the fire crew is at increased risk working next to traffic on the road. Second, firebrands can easily slide across paved roads and cause spotfires.**

nel conducting the fire. Most traffic on these roads occurs at specific times of day, usually in the morning or evening, so plan the burn appropriately. It may be necessary to plan for extra personnel to help with traffic control, or check to see if the local authorities can assist with these activities.

Paved roads can be used as firebreaks as well, but they have two major limitations. First, paved roads normally have a higher traffic load, increasing the risk of an accident because of smoke or on-lookers. Also, this puts the fire crew at risk working next to the road and traffic. Second, firebrands can easily slide across paved roads and cause spotfires. As with other types of roads, be sure to plan the burn according to traffic patterns and if possible request assistance with traffic flow from local authorities.

## Constructed Firebreaks

### Dozed or Scraped

Some of the best firebreaks are those that have been scraped to bare ground by a dozer or road grader/maintainer. Ideally, only the fine fuel is removed with little soil movement. Done properly, these firebreaks can be made economically and cause little erosion. Dozed or scraped firebreaks also provide a corridor for equipment and personnel to travel on safely and quickly. The main consideration for dozed or scraped lines is to find an equipment operator who is reliable and understands what you are trying to accomplish. Often equipment operators are not accustomed to scraping only the surface without moving a lot of soil. This type of operation can cause serious erosion problems and drastically raise the cost of the burn by increasing the time spent preparing the firebreak. It is also best to have the scraped soil placed away from the burn unit to reduce fuel build up that if ignited can smolder for days causing potential problems.



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### Disked

Disking makes an excellent firebreak if done properly. It is usually best to mow first and then disk the firebreak until the ground is void of fuel. In some soil types, it may be necessary to disk the area two or more times. If this has to be done, it is best to disk in opposite directions. The main concern with disking is to incorporate the herbaceous material into the soil and not have continuous fuel across the firebreak. Even light amounts of contiguous fuels can cause a fire to escape across a disked firebreak; therefore it is very important that no contiguous fuel remains within the disked area.



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### Hand Lines

In areas that are forested, too steep for equipment, or where erosion will be a problem, hand lines may need to be used. Hand lines should be kept to the shortest distance possible because they require extensive labor to prepare. If leaf litter is the main surface fuel, leaf blowers and rakes can be used to remove the litter to bare ground. The best technique for preparing firebreaks in leaf litter is to have one or two crew members use leaf blowers to remove the leaf litter followed by personnel with rakes pulling limbs and logs out of the way. The person leading the crew should follow areas with lighter fuels and use natural firebreaks such as drainages and exposed rocks to make the operation easier. If the area is covered in grass, hand line preparation becomes harder and is less effective. Care should be used when burning off these lines and adequate water should be on hand for fire suppression.

### Mowed Line/Wet Lines

Mowed firebreaks are usually used in conjunction with wet lines. A wet line consists of water sprayed on a portion of the mowed line, with the fire immediately ignited just inside the wet line. The wet line serves as the firebreak and the mowed line reduces the amount of fuel and fireline intensity. Extreme care should be exercised when using these types of firebreaks because the fire can still burn across them.



In areas that are forested, too steep for equipment, or where erosion will be a problem, hand lines may need to be used. These firebreaks should be kept to the shortest distance possible because they require a lot of labor to prepare.

To conduct a burn with a mowed line/wet line firebreak, the perimeter of the burn unit should be mowed as short as possible prior to the burn. Then just before ignition, spray water using a cone or fan type nozzle to a width of about 1 foot to 3 feet in the mowed area. Just spray to wet the ground; do not waste water by completely soaking the area unless there is an endless supply of water. Next, ignite the fire directly behind the person spraying the wet line and right next to the wet line in the dry area of the burn unit. Do not let the ignition person get too far behind the person spraying the wet line, because the wet line may evaporate and become ineffective. Be sure to light the fire as close to the wet line as possible and allow the fire to back away from the wet line. Remember, the only firebreak you have is a line of water. Be sure to have people come behind you to mop-up along the wet line.

One method that works very well when using mowed line/wet line firebreaks is to operate two waterlines from one pumper truck. The person on the first line sprays water right in front of the pumper truck. It is best to spray the wet line immediately in front of one of the tires on the truck, which allows the truck to press the water into the vegetation, making the wet line more effective. The ignition person follows behind the truck setting the fire. The person on the second waterline follows 50 to 150 feet behind the pumper truck extinguishing burning or smoldering vegetation next to the wet line and possible spotfires. The distance this crew member follows will depend upon the fuel load, flame height, and amount of heat being produced by the backfire. Crew members running the waterlines must be conservative with the amount of water they use, because this water will be needed for suppression if the fire escapes. Several crew members should follow the wet line and ignition crew with hand tools. A leaf blower can be used to completely mop-up along the edge by blowing smoldering mulch piles, cow chips, or small limbs back into the black of the burn unit. Lastly, have at least one other vehicle patrol and monitor for spotfires or fire creeping across the firebreak.

Remember – there is nothing to stop the fire from creeping across the mowed line/wet line firebreak. If not thoroughly



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monitored, fire can burn through the wet line and across the mowed line while the crew is not in the immediate vicinity. This results in an escaped fire and may cause a significant problem if not detected quickly. Remember, it takes more water, more equipment, and more personnel to conduct a burn when using mowed line/wet line firebreaks instead of bare ground firebreaks.

Be aware that mulch left over from mowing can cause problems as well. If the wet line is placed over the mulch piles, the underside of the piles combust, while the wet mulch on the top smolders. Later, when the wet mulch has dried the pile can re-ignite, causing an escape when the area is not being monitored. When using mowed lines, it is best to mow them right after a frost in the fall if the burns are to be conducted



There are several problems that can occur when using mowed line/wet line firebreaks. The main problem is that there is nothing to stop the fire from creeping across the mowed firebreak. Remember, it takes more water and more personnel to conduct a burn when using mowed line/wet line firebreaks instead of bare ground firebreaks.

in the late winter or spring. This allows for no re-growth of the mowed line and gives the mulch time to blow away and or decompose before being burned in the spring. Mowing firebreaks early and often can promote the growth of cool season plants that help make a green, less flammable barrier. Allowing livestock to graze the mowed lines will reduce fine fuel accumulation as well.

### Width of Firebreaks

Firebreak width varies with each burn unit and depends on fuel load and type, topography, weather conditions, equipment, personnel, agency policy, and other factors. The Oklahoma Natural Resource Conservation Service (NRCS) recommends a minimum width of 10 feet or 10 times the height of the flammable vegetation in the area to be burned, on bare ground and mowed firebreaks. There are several fact sheets, books, NRCS technical guides, and other information on firebreaks that can be found throughout the United States. These documents should be used to gain additional information needed for constructing firebreaks and conducting prescribed burns in your area. For more information from the Oklahoma NRCS visit the following links:

#### Firebreak Standard 394

<http://efotg.sc.egov.usda.gov/references/public/OK/394std.pdf>

#### Firebreak Job Sheet

[http://efotg.sc.egov.usda.gov/references/public/OK/394js\\_02.pdf](http://efotg.sc.egov.usda.gov/references/public/OK/394js_02.pdf)

#### Prescribed Burning Standard 338

[http://efotg.sc.egov.usda.gov/references/public/OK/338std\\_407.pdf](http://efotg.sc.egov.usda.gov/references/public/OK/338std_407.pdf)

### Special Considerations

Sometimes it may be necessary to mow inside the burn unit along the downwind sides of the firebreak to assist with the backfiring operation. Some fuels like sand sagebrush (*Artemisia filifolia*), annual broomweed (*Xanthocephalum dracunculoides*), and sand shinnery oak (*Quercus harvardii*) may not burn completely during backfiring or there may not be enough fine fuel for a backfire to carry. This makes backfiring unsafe because unburned fuels can carry a headfire into the backfire area and across the firebreak. Changing the structure and density of these fuel types helps to ensure that they will be completely burned next to the firebreak.

### Brush Piles

A major problem that occurs when building firebreaks in areas with woody plants is what to do with the piles after clearing. Most equipment operators want to pile the brush next to the firebreak. This is a big mistake and will result in fires escaping from the burn unit and create unnecessary work. An alternative is to push the brush outside the burn unit or push and scatter the brush a safe distance inside the burn



Grinders can be used to reduce brush piles along the firebreak. Grinders can reduce large trees into smaller piles of chips, which are much safer than large piles of whole trees.

unit. The distance will vary with fuel type, fuel moisture, and fuel load, but 100 feet to 500 feet is usually recommended.

Another option to reduce problems from brush piles is to pile the brush right next to the firebreak and place a bare ground firebreak around the pile to exclude it from the burn unit. This way, the unit can be burned without igniting the piles. After the unit has burned and conditions are favorable, burn the piles. Another option is to grind up the brush. There are grinders that can reduce large trees into smaller piles of chips, which are much safer than large piles of whole trees.

### Preventing Erosion

When developing a firebreak, try to minimize potential erosions problems. On steep slopes, it may not be advisable to take the firebreak down to mineral soil. Instead, a mowed line/wet line firebreak may be the best option. Mowed line/wet line firebreaks and some hand line firebreaks can cause problems because they contain flammable material that may allow the fire cross if not closely monitored. For this reason, they should be limited to as short a distance as possible. There are several options that can minimize soil erosion on bare ground firebreaks. One option is to make water bars (i.e. terraces, cut-outs) to reduce channeling of the water. A second option is to use J-checking on plowed, disked, or dozed firebreaks, where the water is diverted every so often in the shape of a "J". This prevents the water from following a long, continuous path and diverting it into or out of the burn unit onto the side slope. Still another option to reduce erosion is to plant a cover crop on the firebreak. When doing this, make sure the crop you plant is fire resistant and that it is green and actively growing when the unit is burned. Wind erosion on sandy soils is not a problem even with firebreaks that have been maintained for several years.