NATURAL RESOURCES CONSERVATION SERVICE

FIREBREAK DESIGN PROCEDURES

(394DP)

INTRODUCTION

Firebreaks shall be designed and installed in accordance with the current Firebreak Standard (394) and Firebreak Statement of Work. Designs shall recommend the type of firebreak that is best suited to the site and meets the objective of the land manager.

The topics covered include:

- **CONTAINING PRESCRIBED BURNS**
- **LOCATING FIREBREAKS**
- **SELECTING FIREBREAK TYPE(S) FOR CONTAINING PRESCRIBED BURNS AND REDUCING THE RISK OF A WILDFIRE SPREADING**
- **REDUCING THE RISK OF A WILDFIRE SPREADING**

CONTAINING PRESCRIBED BURNS

Excess volatile fuels (live and dead), will be removed from the firebreak prior to ignition. Width and length must equal or exceed local fire district requirements. The firebreak will be included as part of a prescribed burn plan (NE-ECS-72) and meet all requirements of the Prescribed Burning Standard (338).

The type of fuel, its relative location to a proposed firebreak, and the minimum firebreak width required for prescribed burns are presented in Table 1. Definitions of the various terms appear below under Firebreak Location in Relation to Wind Direction and Types of Fuel within the Area to be burned.

Table 1 illustrates how the recommended minimum width of firebreaks may be applied. Three examples describing how to calculate minimum firebreak width and location are shown below.

Table 1. Minimum Firebreak Width for Prescribed Burns on Non-forested Land

[1/] Type of Fuel	Minimum Firebreak Width (feet)		
	Upwind Side	[2/] Downwind Side	Downwind Flank
Non-volatile Herbaceous	20	20	20
Volatile Herbaceous	20	40	30
Non-volatile Woody	20	60	50
Volatile Woody	40	300	100

[1/] Major consideration should be given to type of fuel directly adjacent to the firebreak and the most hazardous fuel in the burn area, i.e., Volatile Woody is significantly more hazardous than the other three fuel types; therefore it requires greater firebreak widths on all sides. Spotters should be posted downwind, especially when any volatile woody fuels exist that can send firebrands downwind.

[2/] On the Downwind Side a factor of 10 times the height of the tallest vegetation will be used as the minimum width if greater than widths listed in this table.

At least 20' of all firebreaks must consist of any combination of the following:

a) Mowed line - vegetation mowed to less than 4", excess debris removed or raked out of the firebreak and out of the unit. Used in conjunction with the wetline technique.
b) Nonburnable surface, i.e. mineral soil, pavement, open water/shoreline, green crop field etc. (note, Eco-fallow/no till crops are not good stand alone firebreaks). Patrolling will be used to maintain the integrity of the lines where necessary.
c) Sparse or intermittent fuel, an area devoid of continuous, heavy fuels over 10" tall, i.e. grama/buffalograss veg type on a ridge top, a heavily grazed area etc. used in conjunction with the wetline techniques, primarily with engines as support units. If ATV's alone are used as support units, a careful evaluation of the fuel load, topography and wind direction will be conducted before initiating the burn. In grazed areas, special care must be given to extinguish all smoldering cow chips near any portion of the line. Avoid placing lines through areas with excessive cow chips. A harrow section pulled behind an ATV may be used to break up/disperse concentrations of chips.

LOCATING FIREBREAKS

Firebreak Location in Relation to Wind Direction

***Upwind Side*:** Firebreak is located upwind of area to be burned

***Downwind Side*:** Firebreak is located downwind of area to be burned

***Downwind Flank*:** Firebreak flanks (sides) are located downwind of area to be burned

The planned location of a firebreak may need to be adjusted during the implementation phase in order to compensate for adjacent fuel load location and changing wind direction. Flexibility and attention to environmental details at the time of the proposed burn are critical factors relevant to ensuring success or failure.

Firebreak Location in Relation to Topography

Firebreaks should not be located on slopes if possible, and particularly not on slopes greater than 10%. The exception to this will be established existing natural and/or manmade barriers such as county roads, crop fields etc. If the mowed line/wetline technique is used, the mowed line may need to be wider if the fireline is on the uphill side of the unit, and the wetline should be placed farther from the outside edge of the mowed line to allow for greater flame lengths and pre-drying of fuels due to the slope. Firebreaks located on steeper slopes below the unit run the risk of having flaming material roll across the break and out of the unit.

Firebreak Location in Relation to Fuel Load

Heavier fuel loads generate more heat, even on the upwind side of the unit. When burning units with fuel loads exceeding 5,000 lbs/ acre wider mowed lines may be needed, and wetline placement within the mowed line may need to be evaluated and adjusted accordingly

Firebreak in relation to volatile woody species

All volatile woody species and woody debris should be removed from a 100' perimeter on the downwind flanks and the downwind side of the unit, and a 50' perimeter on the upwind side of the burn unit. For an additional 50', all woody volatile species over 10' should be removed or topped to 10' on the downwind flanks, and the downwind side of the unit

Rationale: Any torching tree within 100' of the fireguard can throw burning material across the line. Torching trees over 10' are likely to send flaming embers farther than 100' (personal experience) and across the line into any receptive fuels on the downwind flanks and side.

Burnplanners may make adjustments to these distances to account for local factors but must document in the burn plan the rationale for the exceptions.

Firebreak in relation to red slash and brush piles

All red slash brush piles are to be either 200' outside of the unit, or at least 300' inside the unit in all directions from the center of the fire break. All red slash branches and single trees must be at least 100' from the perimeter of the unit, inside or out. All cutting and stuffing should be done at least 300' from the perimeter of the unit in all directions.

Rationale: Red slash and brush piles outside the unit provide receptors for airborne burning embers (personal experience), can ignite from radiated infrared, and can cause a minor spot or slopover to turn into a major escape.

Red slash and brush piles within the unit burn very hot, can burn for long periods of time and can throw flaming embers for great distances (personal experience). Red slash brush piles need to be 300' from the perimeter of the unit on the upwind side because the wind may change unexpectedly during the burn (personal experience), or within hours or days of the burn.

If you experience an unpredicted wind shift during the burn, red slash and brush piles near the perimeter can cause a major escape, and present a dangerous situation to burn crew members. Brush piles often smolder for several days after the burn is completed, and the wind is very likely to shift during that period, potentially blowing embers across the line if the pile is closer than 300' to the burn perimeter (local experience).

Burn planners may make adjustments to these distances to account for local factors but must document in the burn plan the rationale for the exceptions.

Types of Fuel within the Area to be Burned

Non-volatile herbaceous:

Herbaceous fuels such as grasses that have low amounts of ether extractives. Big bluestem, Kentucky bluegrass and Smooth bromegrass are herbaceous fuels that have very low amounts of ether extractives. Fresh green growth is less volatile than dead plant residue and is not considered volatile if little or no dead plant material exists.

Volatile herbaceous:

Herbaceous fuels contain higher amounts of ether extractives, such as waxes, terpenes, oils, or resins. Switchgrass and lovegrass are examples of volatile herbaceous fuels. Dead plant residue is also considered volatile.

***Non-volatile woody*:**

Deciduous (hardwood) trees with low volatility, such as elms, Russian olive, and honey locust. This group may also include invasive shrubs, such as sumac, snowberry, etc.

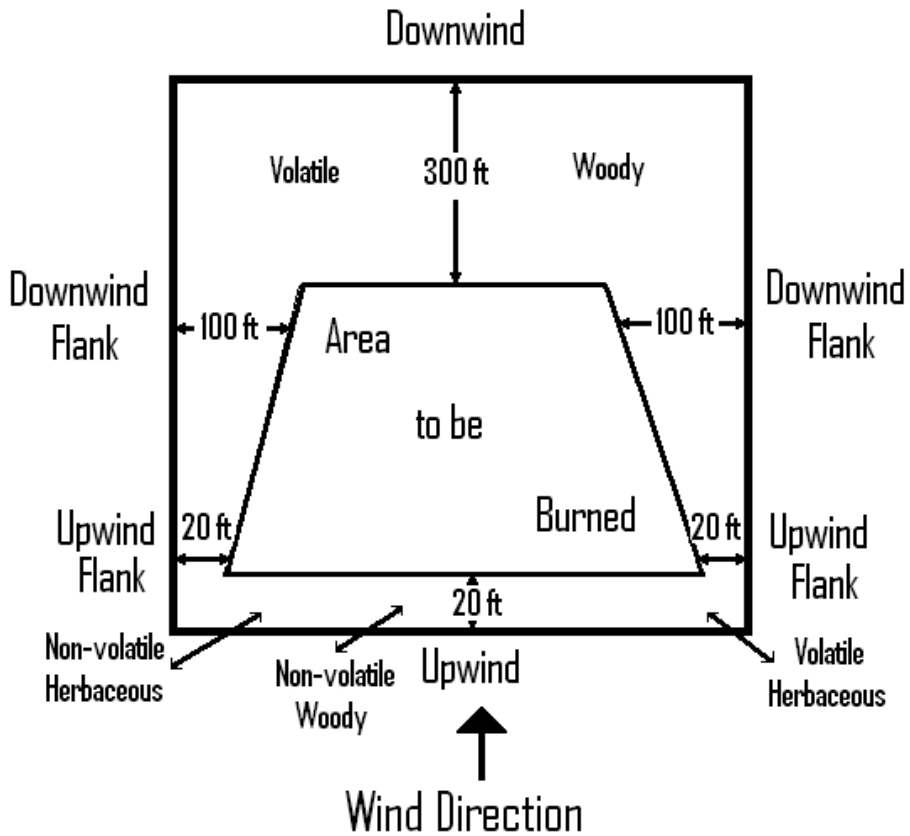
Volatile woody:

Coniferous (softwood) trees, such as eastern redcedar and ponderosa pine, are examples of volatile woody species.

***Fine fuel*:**

Non-woody herbaceous materials, generally less than 0.25 inches in diameter, such as grasses. Fine fuel with fresh green growth and little dead plant residue or areas with a low amount of fine fuel will be more difficult to carry a prescribed burn.

Figure 1. Schematic of Firebreak Locations and Widths for an Area to be Burned that Contains Volatile Woody Fuel on the Downwind Side



Note: Diagram not drawn to scale; for illustration purposes only.

Example 1: Client wishes to perform a prescribed burn on native rangeland that has been encroached by 15 ft high eastern redcedar. Redcedar is located on the **downwind** edge.

Firebreak Width Calculation:
Upwind Side: (non-volatile herbaceous fuel adjacent to firebreak) 20 ft (from Table 1) = 20 ft wide firebreak.

Downwind Side: (volatile woody fuel adjacent to firebreak) 300 ft minimum width (from Table 1) Using the 10 X vegetation height rule alone would result in a (15 ft high fuels X 10) = 150 ft firebreak which would not meet the minimum width required for volatile woody fuels. The client could use a combination of firebreaks to achieve the minimum 300 ft firebreak width, including roads or trails, and the backburn of the prescribed fire itself.

Downwind Flank: (volatile woody fuel adjacent to firebreak) 100 ft (from Table 1) = 100 ft wide firebreak (redcedars will need to be cleared from the firebreak and piled upwind at least 300' from the fireline or offsite).

Example 2: Client wishes to perform a prescribed burn on native rangeland that has been encroached by 3-4 ft high eastern redcedar. Redcedar is located on the **upwind** edge.

Firebreak Width Calculation:
Upwind Side: (volatile woody fuel adjacent to firebreak) 0 ft (from Table 1) = 0 ft wide firebreak (redcedars will need to be cleared from the firebreak and piled downwind at least 300' from the fireline).

Downwind Side: (volatile herbaceous fuels 2 feet in height adjacent to firebreak) = 40 ft (from Table 1) = 40 ft wide firebreak.

Downwind Flank: (volatile herbaceous fuel adjacent to firebreak) 30 ft (from Table 1) = 30 ft wide firebreak.

Example 3: Client wishes to burn a CRP planting which has a mix of volatile and non-volatile native herbaceous fuels. Average fuel height is 5 ft switchgrass and big bluestem. A 30 ft wide gravel road is adjacent to the downwind side of the proposed prescribed burn:

Firebreak Width Calculation:
Upwind Side: (volatile herbaceous vegetation) (from Table 1) = 20 ft wide minimum firebreak

Downwind Side: (volatile herbaceous vegetation) (from Table 1) = 40 ft wide minimum firebreak. Using 10 X fuel height rule, the firebreak is designed to (5 ft X 10 = 50 feet). Using the 30 ft gravel road as part of the firebreak, the client mows a 20 ft swath adjacent to the road and rakes the mowed vegetation outside of the area to be burned.

Downwind Flank: (volatile herbaceous fuel adjacent to firebreak) 30 ft (from Table 1) = 30 ft wide firebreak.

SELECTING FIREBREAK TYPE(S) FOR CONTAINING PRESCRIBED BURNS AND REDUCING THE RISK OF A WILDFIRE SPREADING

It is important to account for the location and type of fuel in the area to be burned and to select the appropriate firebreak type(s) (Table 2). Nine types of firebreaks and their uses for prescribed burns and/or reducing the risk of wildfire spreading are presented. More details about each type of firebreak appear below Table 2.

It is also important to keep in mind that a combination of firebreak types may be used at the same time. Backfires used for prescribed burns may be used in conjunction with other firebreak types when calculating the minimum firebreak width required.

Two types of firebreaks are used for prescribed burns only:

- burned (blackline) and
- mowed wetlines.

The other seven types of firebreaks may be used for both prescribed burns and reducing the risk of wildfire spreading:

- natural
- constructed
- perennial vegetation
- annual vegetation
- tilled
- mowed and
- access roads/skid trails.

Table 2. Selecting Type(s) of Firebreak for a Prescribed Burn or for Reducing the Risk of Wildfire Spreading

Type of Firebreak	Prescribed Burns	Reducing Risk of Wildfire Spreading
Natural Firebreaks	Used in conjunction with black- lines and mowed wetlines to take advantage of natural features.	May be used in conjunction with various other firebreaks to take advantage of natural features.
Constructed Firebreaks	Used to remove flammable woody material prior to a prescribed burn.	Can be constructed for the prevention of a wildfire; may need maintenance to keep woody growth away from them; water bars may be needed if areas are too steep and erosion is likely.
Burned Firebreaks (blackline)	Mowing/raking or haying may be needed first if excess fine fuel load exists.	Used with prescribed burns only.
Perennial Vegetation Firebreaks	Need to be mowed or hayed if excess fine fuel load exists.	An excellent choice when used on areas that build up fine fuel loads, such as CRP or wildlife areas. Annual maintenance such as mowing or haying is needed in most cases.
Annual Vegetation Firebreaks	Need to be mowed or hayed if residue is too heavy.	Need to be mowed or hayed if residue is too heavy.
Tilled Firebreaks	Level of tillage will vary depending on residue type and quantity. May be used in conjunction with annual and perennial vegetation firebreaks.	Level of tillage will vary depending on residue type and quantity. May be used in conjunction with annual and perennial vegetation firebreaks.
Mowed Wetlines	Wetlining is used just prior to prescribed burn in conjunction with mowed firebreaks.	Used with prescribed burns only.
Mowed Firebreaks	Vegetation may need to be raked inward or removed if done in conjunction with a blackline or if residue is too heavy.	Needs to be done prior to risk of wildfire. Needs to be repeated annually prior to wildfire season. Will need to remove vegetation if residue is too heavy.
Access Roads/ Skid Trails	Roads that are void of vegetation can serve as firebreaks. Extra width may be needed through the use of other types of firebreaks, such as mowing or haying areas directly adjacent to them.	Access roads along with mowing/haying areas directly adjacent to them can serve as an excellent firebreak for reducing the spread of a wildfire. Annual maintenance is needed.

Natural Firebreaks

Existing terrain features can serve as a firebreak. Existing roads and trails can be used for installing low-intensity backfires in non-volatile fuels. Any terrain feature, such as cropland, rivers, roads, rock outcrops or other areas devoid of fuels can serve as a firebreak. These features should be augmented to accommodate the minimum width recommendations for the type of fuels being burned.

Constructed Firebreaks

A constructed firebreak must be built so that it can be traversed by fire suppression vehicles. All flammable material will be removed or covered with soil by machinery on a strip of land adequate to contain the fire. Disks, graders, plows, and bulldozers can be used to construct the firebreaks. Heavy equipment, such as a bulldozer, will be required to remove thick brush or large trees in rocky areas, creek crossings, and on steep slopes. This debris will either be stacked outside the burned area, or burned prior to the prescribed burn when the surrounding fuel source is either too green to burn, covered with snow, or is too wet to burn.

A constructed firebreak can be permanent or semi-permanent. All flammable vegetation needs to be removed from permanent firebreaks at least once annually before the wildfire danger season and prior to implementing a prescribed burn. Wildfires in Nebraska can occur at any time of the year, but are especially prevalent from late March through late September. The firebreak should be reworked as needed to maintain fire protection during extended summer drought conditions. Slopes 10 percent and greater will have water bars constructed (Refer to Access Roads/Skid Trails for guidance on water bars).

Burned Firebreaks (blacklining)

Burned firebreaks are semi-permanent or temporary firebreaks installed in combination with other types of firebreaks, such as constructed firebreaks, where mowing, disking, or dozing is used to meet the minimum widths required. Burned firebreak construction is also called black-lining and the construction specifications will be described in a prescribed burn management plan. Blacklines are not fire proof, and should not be used as stand-alone burn lines without patrolling. The burned firebreak is installed by constructing two 10 feet wide parallel strips with bare soil or mowed vegetation sandwiching the area to be burned. The burned firebreak should meet the minimum width recommendations listed in Table 1. Remove large flammable material, such as logs, limbs, standing cedar, or discarded fence posts from the area between the strips. Burn the area between the strips to complete the firebreak following the guidelines outlined in the prescribed burn management plan. Burned firebreaks or black-lines can be constructed well before the planned date of a prescribed burn or the wildfire season. Early green-up of vegetation in the burned strip retards the spread of fire and can be an effective anchor for prescribed burn ignition.

Perennial Vegetation Firebreaks

Perennial vegetation firebreaks are planted and managed to ensure that non-volatile vegetation is present during the risk of wildfire. If volatile vegetation is present it must be removed prior to wildfire risk. These firebreaks are planted with low growing vegetation or cool season plants to reduce future maintenance costs, prevent soil erosion, and provide wildlife food or pollinator habitat. Suitable species are identified in Table 3 below. Refer to Pasture and Hayland Planting (512) or Range Planting (550) for species adaptation. The Herbaceous Vegetation Design Procedures (550DP) provides necessary information on seedbed preparation, seeding dates, equipment and other factors related to establishment of perennial vegetation. Firebreaks planted with alternating strips of cool-season grasses or legumes and low-growing, warm-season grasses can provide extended protection. Grazing of perennial vegetation firebreaks will be deferred until the vegetation is established.

Table 3. Suitable Species for Use with Perennial Vegetation Firebreaks.[1/]

Low-Growing Warm Season Grasses	Cool Season Grasses	Introduced Legumes	Native Wildflowers (only in mixtures)
Blue grama	Kentucky bluegrass	Alfalfa	Black-eyed Susan
Buffalograss	Orchardgrass	Birdsfoot trefoil	Blanketflower
Hairy grama	Tall fescue	Cicer milkvetch	Purple prairieclover
Sideoats grama	Prairie Junegrass (native)	Red clover	Upright coneflower
Sand lovegrass	Western wheatgrass (native)	White clover (Ladino)	Western yarrow

[1/] Additional species may be acceptable. Refer to Pasture and Hayland Planting (512) or Range Planting (550) for information on other species that may be included.

Annual Vegetation Firebreaks

Annual crops, such as corn, soybeans, forage crops, small grains, or other annually tilled crops can be used as firebreaks. High residue crops such as small grains and corn stalks will need to be tilled or have vegetation removed during the dormant season if the intended purpose is to address wildfire concerns. Low residue crops, such as soybeans or sunflowers harvested for grain, may not need to be tilled or have residue removed if fine fuel load is low enough to reduce the risk of escape from a wildfire or a prescribed burn. These firebreaks may provide an added benefit as a winter food source for wildlife in some years if the only intent is to use them when applying a prescribed burn. Refer to Upland Wildlife Habitat Management (645) and Nebraska Conservation Planning Sheet 21 for additional information.

Before planting, the seedbed should be tilled or residue removed if vegetation provides excessive fuel load. Use the width recommendations in Table 1. Seed and fertilize the prepared area at rates consistent with the Pasture and Hayland Planting (512) standard and/or the Cover Crop Standard (340).

Tilled Firebreaks

Tilled firebreaks are tilled strips that can be used for controlling a prescribed burn or reducing the risk of wildfire spreading. The level of tillage will depend on the amount of residue and the type of fuel load present. Typical tillage implements can include disks or other non-inversion tillage tools. When aggressive measures are required due of heavy residue, inversion tillage tools, such as plows, can be used when it is necessary to bury all residues. Erosion control measures may be needed if adequate residue cover is not maintained. Tilled firebreaks are not always a complete barrier to fire, and fire can creep across a tilled line. Patrolling the tilled line with ATV's with sprayers may be required, particularly on the downwind side of the burn.

Mowed Wet-lines

The mowed wet-line is a temporary firebreak used in herbaceous fuels immediately before a prescribed fire. Mowed firebreaks using wet-lines can be used as long as adequate personnel, equipment, and water supplies are available to safely conduct the procedure.

Mowed wet-lines shall meet requirements in Table1. The mowed height should be no more than 4 inches. Cuttings should be raked outside of the area to be burned or removed if vegetation is excessive.

Water is sprayed on the mowed vegetation to create a wet-line immediately in advance of ignition of the fire. This procedure entails using a lead engine laying down a wetline followed by the igniter, who is lighting the unit side of the wetline not more than 20 feet behind the lead engine. The igniter is followed by a trail engine or trail ATV with a tank sprayer, who ensures that the flames do not cross the original wetline. In the event that engines are not available, a tandem team of all terrain vehicles with mounted 25 gallon sprayers has been effective where the fuel load allows and water re-supply sources are available. This method requires strict observation as fire can dry the wetted vegetation and attempt to creep across the fireguard. Follow-up personnel with hand tools or patrolling ATV's with sprayers should be available to immediately extinguish fire that attempts to creep through the firebreak.

Mowed Firebreaks

These are the same as mowed wet-lines except wet-lines are not used. These firebreaks are typically used for reducing the risk of wildfire spread. Haying or removal of excess vegetation may be needed, depending on the purpose of the firebreak and the amount of fine fuel load. A mowed firebreak alone will not serve as an adequate firebreak in most cases. The exception may be a previously established mowline that has adequate standing green material to prevent fire from crossing.

Access Road/Skid Trails

New road construction should be located to provide adequate access to the area for long-term fire protection. Water control devices will be installed on slopes that could cause damage to the road from soil erosion. Ridge tops are excellent locations for access roads and make good firebreaks. Refer to the NRCS standard, National Forest Harvest Trails and Landings Standard (655) and Access Road Standard (560) for construction details. Flammable materials and debris that would prohibit access on the roads should be removed annually or just prior to the fire danger season. They can be augmented by mowing areas directly adjacent to them.

Water bars can be used along with constructed firebreaks on steep slopes and access road/skid trails to divert water from side ditches and road or trail surfaces in highly erosive areas. Water bars are excavated channels with a berm constructed across an access road or skid trail. They are best suited for roads that receive little use for extended periods of time because they are difficult to drive over and easily eroded when subjected to heavy traffic.

Install water bars at the top of any sloping road or trail. Space additional water bars as needed (Table 4). Note: for roads or trails with less than 10 percent grades or slopes construction of water bars is optional.

“The uphill end of a water bar should extend beyond the side ditch of the road or trail. The downhill end should extend far enough beyond the road to disperse the water onto undisturbed ground” (SD Forestry BMPs, 2003).

“The water bar should have a 30-to-35 degree angle downslope from a line perpendicular to the direction of the road or trail. The water bar should have a 2-4 percent outslope along this angle” (SD Forestry BMPs, 2003).

Table 4. Spacing for Water Bars

(From: SD Forestry BMPs, 2003; see References)

Road or Trail Grade (%)	Spacing between Water Bars (Ft)
2	250
5	135
10	80
15	60
20	45

REDUCE THE RISK OF WILDFIRE SPREADING

General

The firebreak dimensions, location, vegetative cover type, operation and maintenance, and other details will be included on a site map and a seeding jobsheet, NE-CPA-8.

Firebreak Dimensions for Reducing the Risk of Wildfire Spreading

Firebreaks will be of sufficient width and length to contain the fire.

- The width for any firebreak shall never be less than 20 feet wide.
- Width and length must always equal or exceed local fire district requirements.
- Longer stretches of continuous fuels will require wider firebreaks to reduce the risk of wildfires spreading because of the extra energy released.

For stretches of continuous fine fuel (herbaceous) **less than 1,000 feet adjacent to low risk areas** (tilled cropland, growing crops, or low fuel load areas):

- The minimum width of a firebreak will be 20 feet unless 10 times the height of the fine fuel load is greater.

For stretches of continuous fine fuel **greater than 1,000 feet adjacent to low risk areas** (tilled cropland, growing crops, or low fuel load areas):

- The minimum width of a firebreak will be 20 feet unless 20 times the height of the fine fuel load is greater.

For stretches of continuous fine fuel **less than 1,000 feet adjacent to high risk areas** (personal property such as dwellings, outbuildings, windbreaks, etc., and areas with a high fuel load):

- The minimum width of a firebreak will be 40 feet unless 30 times the height of the fine fuel load is greater.

For stretches of continuous fine fuel **greater than 1,000 feet adjacent to high risk areas** (personal property such as dwellings, outbuildings, windbreaks, etc., and areas with a high fuel load):

- The minimum width will be 100 feet, unless 40 times the height of fine fuel load is greater.

Location

Firebreaks shall be located next to the area being protected on the outside perimeter of the fire hazard area.

Establishing and Managing Annual or Perennial Vegetative Cover

Firebreaks applicable to this section are: perennial vegetation, annual vegetation, tilled and mowed firebreaks (Table 2).

All vegetation must be managed to eliminate burnable material during the highest risk of wildfire spread. This can be accomplished through haying, tillage, burning, or other removal methods, or by selecting appropriate cover types to reduce the risk of wildfire spread.

When planting perennial grasses: low growing grasses, such as bluegrass, buffalograss, sideoats grama, etc., are favored. Cool season grasses or legumes that are hayed and have green growth during the season with the highest risk of wildfire may also be appropriate. Other perennial vegetation is also acceptable if hayed or otherwise removed prior to the risk of wildfire.

All perennial vegetation firebreaks must be managed and established as follows:

- Manage to eliminate burnable material prior to the risk of wildfire.
- The timing and height of haying/shredding operations must be compatible with vegetation in order to maintain the health and vigor of the stand (refer to Forage Harvest Management 511 for guidance).
- Refer to Pasture and Hayland Planting standard 512 and/or Herbaceous Vegetation Design Procedures 550DP for selecting and establishing perennial vegetation.
- A grass seeding job sheet NE-CPA-8 will be completed according to requirements in 550DP.

When planting annual crops: low residue crops that are harvested are preferred (i.e., soybeans, edible beans, sunflowers, etc.). High residue crops that are tilled, or residue removed after harvest, are also acceptable (i.e., corn, milo, small grains, annual forage crops, etc.).

Support References

Forestry Best Management Practices for South Dakota. 2003. South Dakota State University, Brookings, 26 pp. http://www.state.sd.us/doa/forestry/publications/bmp.pdf

Fuelbreaks and Other Fuel Modifications for Wildland Fire Control. 1977. Agricultural Handbook No. 499, USDA-Forest Service.

Masters, Robert, et al. 1990. Conducting a Prescribed Burn and Prescribed Burning Checklist, Nebraska Cooperative Extension EC 90-121, Lincoln, NE.

NRCS Forest Harvest Trails and Landings (655) ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/655.pdf

NRCS Nebraska Access Road Standard (560)
http://efotg.sc.egov.usda.gov/references/public/NE/NE560.pdf

NRCS Nebraska Cover Crop Standard (340)
http://efotg.sc.egov.usda.gov/references/public/NE/NE512.pdf

NRCS Nebraska Firebreak Standard (394)
http://efotg.sc.egov.usda.gov/references/public/NE/NE394.pdf

NRCS Nebraska Firebreak Statement of Work (394SOW)
http://efotg.sc.egov.usda.gov/references/public/NE/NE394_SOW_Firebreak.pdf

NRCS Nebraska Forage and Biomass Planting (512) formerly Pasture and Hayland Planting
http://efotg.sc.egov.usda.gov/references/public/NE/NE512.pdf

NRCS Nebraska Forage Harvest Management (511)
http://efotg.sc.egov.usda.gov/references/public/NE/NE511.pdf

NRCS Nebraska Herbaceous Vegetation Design Procedures (550DP)
http://efotg.sc.egov.usda.gov/references/public/NE/NE550DP.pdf

NRCS Nebraska NE-CPA-52 Environmental Evaluation Worksheet
http://efotg.sc.egov.usda.gov/references/public/NE/NE-CPA-52(Environmental_Evaluation_for_Conservation_Planning).xlsx

NRCS Nebraska NE-CPA-8 Job Sheet for Grass Seeding
http://efotg.nrcs.usda.gov/references/public/NE/NE-CPA-8(grass_seeding_jobsheet).pdf

NRCS Nebraska NE-ECS-72 Prescribed Burn Management Plan
http://efotg.sc.egov.usda.gov/references/public/NE/NE-ECS-72_Prescribed_Burn_Management_Plan.pdf

NRCS Nebraska NE-ECS-72 Prescribed Burn Management Plan
http://efotg.sc.egov.usda.gov/references/public/NE/NE-ECS-72_Prescribed_Burn_Management_Plan.pdf

NRCS Nebraska Prescribed Burning (338)
http://efotg.sc.egov.usda.gov//references/public/NE/NE338.pdf

Wright, H. A. and A. W. Bailey. 1982. Fire Ecology: United States and Southern Canada. John Wiley, New York, NY.