

## CONSERVATION PRACTICE SPECIFICATION

### Firebreak – 394

Firebreaks shall be installed in accordance with the NRCS Standard detailed in the Field Office Technical Guide (FOTG) – Section IV – Conservation Practices. This document provides conservation planners with the parameters, procedures, and additional requirements for developing site-specific plans for this practice.

#### FIREBREAK BASICS

The need for a firebreak is dependent upon the value of the resource to be protected. The cost of installation and maintenance should be weighed against the loss of the resource should a wildfire occur. Firebreaks are usually installed to protect structures, developed areas, and areas of high value. As the value of the property at risk to wildfire increases, fire prevention efforts become more intense.

Firebreak effectiveness is dependent upon an adequate width of bare soil and/or fire retarding vegetation and locating the firebreak to take advantage of favorable existing landscape features such as ridges, streams, roads, lakes, and other areas of reduced fuels.

Firebreaks may be installed by plowing, burning, chemical burn back, grazing, mowing or clipping, or through the establishment of vegetation which produces low volumes of herbage or which remains succulent throughout most of the growing season.

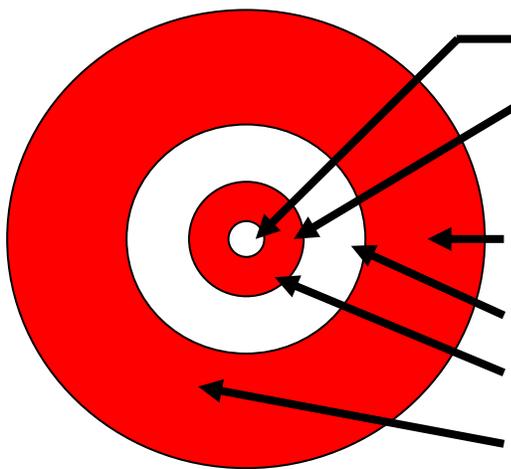
#### FIREBREAKS AS PART OF A SYSTEM

Firebreaks are an integral part of a complete system to minimize the potential impact of catastrophic wild fires. Firebreaks alone will not stop wildfires during extreme conditions.

Wildfire prevention is no better than the weakest link in the fire control system employed. Following are a few of the critical points of a fire control system.

#### Targeted Fire Control Efforts

Most benefits accrue from efforts at the center.



- Buildings are covered with non-combustible or fire resistant material. (House, barns, etc.)
- Defensible space exists around and within areas to be protected. Minimum of 35 feet around high value property (non combustible ground cover such as soil, gravel, irrigated lawn, etc.)
- Firebreaks are properly sited, contiguous, and well maintained. See Figure 2.
- Combustible debris (leaves, papers, limbs, etc) is not allowed to accumulate.
- Combustible materials (LP tanks, fire wood, etc.) are located away and downwind from structures.
- Easy access exists for fire fighters.
- Management plans exist to address extreme fire conditions.

Figure 1: Targeted Fire Control Efforts

## FIREBREAK BENEFITS

Firebreaks are usually installed on the land in a position between a known or suspected fire hazard and an area needing protection from wildfire. Firebreaks reduce risks of wildfire by

- Providing a zone of non combustible material through which a flame cannot be sustained
- Providing a change in fuel type that is less volatile and burns with less heat
- Providing a point of access for fire suppression equipment
- Providing a stable point at which fire fighters can initiate fire control measures.

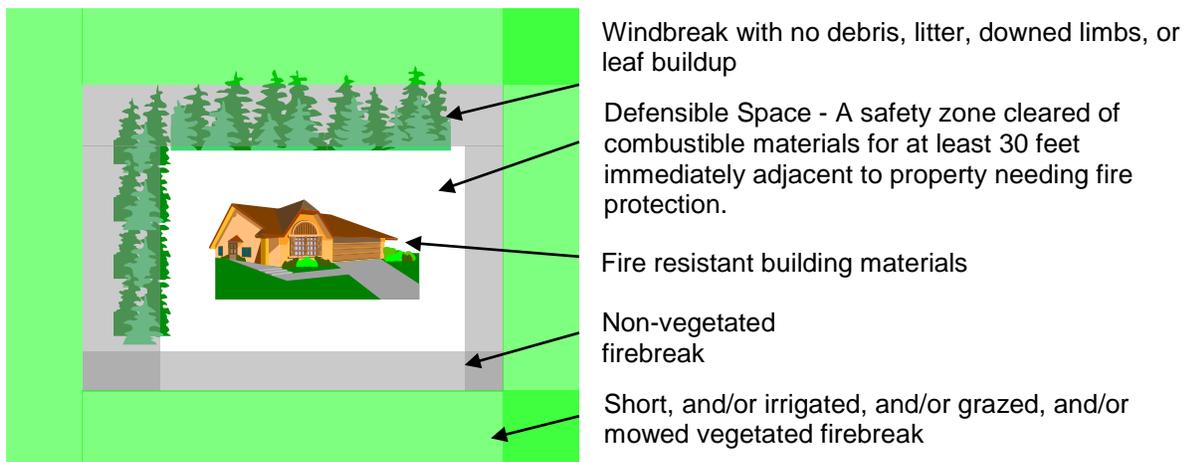
When properly constructed and maintained, combination firebreaks may successfully intercept and control a wildfire when conditions are mild (i.e. humidity above 30%, temperatures below 75°, winds below 10 mph, fuel loads below 3000 #/acre.) During high fire danger times firebreaks should not be relied upon to stop wildfires without trained fire fighting personnel nearby. Monitoring conditions during times of high fire danger in order to initiate a rapid response is imperative to reduce damage from wildfires. Daily Rangeland Fire Index Ratings can be found at <http://www.crh.noaa.gov/data/BIS/RFDDBIS>. For a description of each fire index rating, and permitted fire activities for each rating, refer to the North Dakota Fire Danger Guide.

## FIREBREAK TYPES

There are three main types of firebreaks - vegetated, non-vegetated and burned. For "permanent" protection, a combination of vegetated and non-vegetated firebreaks shall be installed to protect high value property (homes, structures, feed supplies, facilities, etc).

Each type of firebreak has its advantages and disadvantages. The fire risk, value of the area being protected, the landowner's ability to manage a specific type of firebreak, and the particular site characteristics should determine the type selected.

Most permanent firebreak types will need regular maintenance to maintain effectiveness. A few firebreak types such as water bodies or those with road surfacing materials may not require as much maintenance but may be more expensive to install initially.



**Figure 2:** Combination firebreak around a building site showing key components

### Non-vegetated Firebreaks

These firebreaks consist of a strip of land, with no vegetation or other combustible material, around the perimeter of areas needing protection. The surface material of non-vegetated firebreaks may be bare soil, gravel, road-surfacing material, water bodies, or other non-combustible material. When properly installed, fire will not burn across non-vegetated firebreaks, though it may jump these firebreaks during extreme conditions or if the firebreak is not wide enough for the adjacent fire risk.

Maintenance throughout the season is required. Non-vegetated firebreaks shall be managed to maintain a surface free of combustible material throughout the entire fire season.

### Vegetated Firebreaks

Vegetated firebreaks are most effective when vegetation is green and succulent. Used alone, they are not very effective during drought conditions when vegetation is dry and fire danger is high. Even when vegetation has dried, well-managed vegetated firebreaks effectively reduce flame length and intensity.

For most situations in rural North Dakota a combination of vegetated and non-vegetated firebreaks will be required for permanent firebreaks except as noted for irrigated firebreaks.

In many locations, yards are irrigated and kept green all growing season long. These yards, without a non-vegetated component, are effective firebreaks in areas where they are wide enough.

### Temporary Firebreaks

Temporary, tilled firebreaks can provide effective protection with minimal risk and costs in situations where fire risk is only for a limited time of the year, such as disked strips around fields or between fields and structures

### Burned Firebreaks

A successful burned firebreak consumes all fine fuels to mineral soil resulting in bare soil and rapid greenup. Usually burned firebreaks are utilized only during prescribed burning operations. There may be situations where a wildfire risk can be reduced by burning the hazard area at times within the prescription of a prescribed burn plan. This will produce lower fuel loads and green vegetation in the hazard area while reducing the fire risk to the area needing protection. However, after initial greenup, burned firebreak vegetation can mature, dry out and become a fire risk later in the season.

Burned firebreaks may be used only when they have been planned and applied according to the Prescribed Burning Standard and Specification – 338. All conservation practices are located in FOTG – Section IV – Conservation Practices.

Additionally, establishing burned firebreaks falls under the North Dakota Century Code. "The area to be burned must not exceed 100 feet wide, and have two plowed strips not less than five feet wide on either side. At least four people must be present, with appropriate water and tools to maintain control of the fire. If a fire which is lawfully set to establish a firebreak accidentally and without any negligence on the part of the person setting the fire gets beyond the person's control, the person is liable only in a civil action to the person damaged for the amount of the

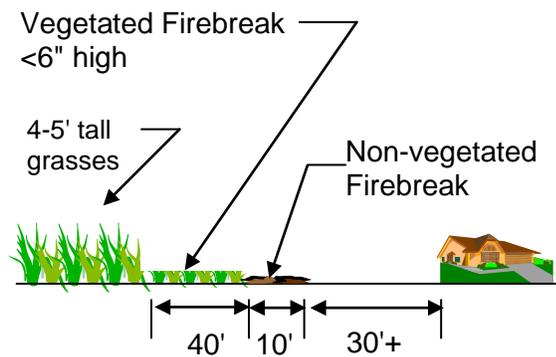
damage. However, a person who conducts a burn and leaves it without thoroughly extinguishing it is guilty of a class B misdemeanor."

Besides the fire risk and potential liability during the installation of a burned firebreak there may also be a false sense of security. When conditions are mild enough to safely conduct a prescribed burn, fuel moistures may prohibit complete burning. If the fire does not consume all vegetation on the soil surface the effectiveness of the burned firebreak is greatly compromised.

## Design

### General Design Considerations

Use existing barriers such as streams, lakes, ponds, shale outcroppings, roads, drainage ditches, railroads, and cultivated land as natural firebreaks.



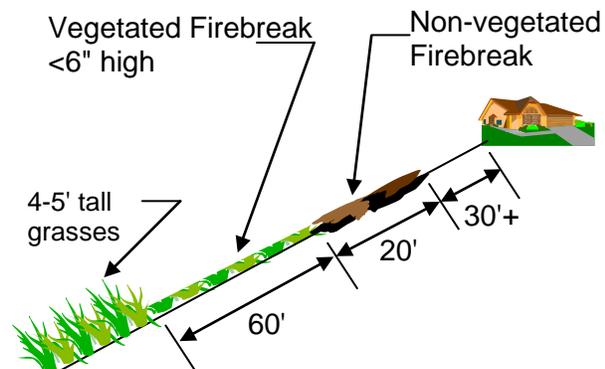
Generally within North Dakota, firebreaks should completely encircle areas needing protection, since damaging wildfires can originate from all points of the compass. Depending upon site-specific conditions, a firebreak may be installed to protect from only several directions.

Adequate firebreak width is strongly dependent on the height of adjacent vegetation. Taller more flammable fuels require wider firebreaks. See Table A for firebreak widths based on fuel types.

**Figure 3: Combination Firebreak on Level Ground**

Topography can be used to improve firebreak effectiveness. In general, locate firebreaks on ridge crests or valley bottoms. If prevailing wind direction is predictable, firebreaks should be located on the leeward side of ridge crests. See Table A to determine how slope conditions affect firebreak widths.

Only combination (vegetated and non-vegetated) firebreaks are appropriate for permanent firebreak protection, except where irrigation can maintain a green succulent vegetated firebreak through the entire fire season.



**Figure 4: Combination Firebreak on 25% Slope**

For all situations the vegetated or burned firebreak, (V) from Table A, is on the fire hazard side of the non-vegetated firebreak, (V/B) from Table A. See Figure 3. As the hazard class of the fuels and/or the slope increases it is imperative that vegetated firebreaks be wider to reduce radiant heat energy and flame lengths so that the non-vegetated firebreaks are effective. See figure 4. Use Table A to determine firebreak component widths depending upon fuel types and slope conditions.

Firebreak design widths can be reduced if the fire hazard fuels can be managed in a way to reduce their fire intensity. For this situation hazardous fuels must be managed for a distance upwind of the firebreak for at least 5 times the height of the existing fuels. For instance a combination fire break on level ground protecting from a fire risk of canary grass and prairie cord grass (>4' high) would need to be 50 feet wide. If the tall grasses could be mowed and baled, leaving stubble of less than 18", the firebreak would only need a total width of 25'.

Table A - Firebreak Widths	Firebreak Widths (feet) Modified by Slope							
	Downwind on level		Downwind 1-20% slope		Downwind 20-40% slope		Downwind >40% slope	
	NV	V/B	NV	V/B	NV	V/B	NV	V/B
Herbaceous Vegetation < 18" high	5	20	6	30	8	40	10	50
Herbaceous Vegetation 18" - 48" high	8	30	10	40	12	50	15	60
Herbaceous Vegetation > 48" high	10	40	15	50	20	60	25	70
Shrubs and Brush < 10' high	10	50	15	75	20	100	25	125
Deciduous Trees > 10', Conifers < 10'	10	50	15	75	20	125	25	150
Conifers > 10' high	10	100	15	125	20	150	30	200

NV = Non-vegetated

V/B = Vegetated or Burned Firebreak

Downwind = Slope away from the fire hazard towards the area needing protected.

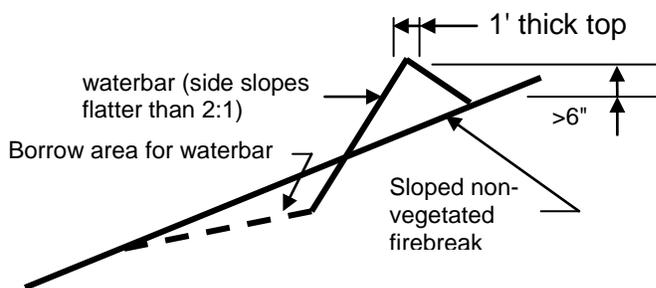
These widths are appropriate for most conditions found in North Dakota. In areas of dense forest, covering many contiguous acres, consider increasing each firebreak component width by 50-100%.

Non-vegetated Firebreaks

Use Table A to determine the appropriate width for a non-vegetated firebreak based on slope of the firebreak, and surrounding area, and the wildfire potential of the upwind fuels.

Non-vegetated firebreaks shall be maintained in a vegetation-free condition during the entire time needed to protect property from wildfires. If herbicides are used, they must be handled and applied in accordance with the label and North Dakota State University Extension Service recommendations.

If additional erosion control is necessary, water bars or diversions shall be installed within the bare soil area to divert water from the non-vegetated firebreak to the vegetation along the edges. Ensure waterbars extend into the vegetated portion for several feet to outlet water on the vegetated portion not on the edge of the grass where it can cause a gully in the bare soil.

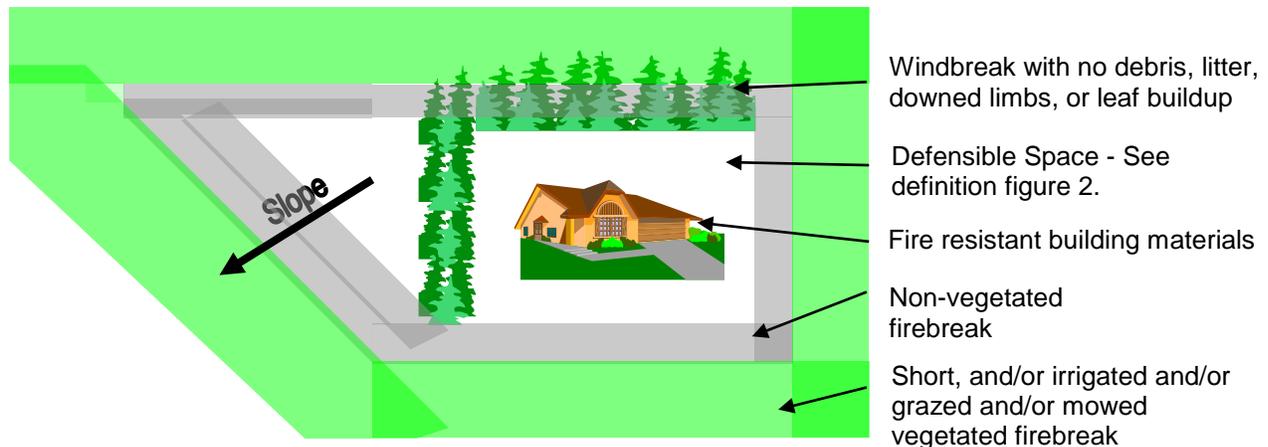


As a rough guide, water bars or diversions should be installed at 100-foot spacings on slopes less than 5% steepness. For every percent of increasing slope steepness the waterbars or diversions should be installed 2' closer together. For example; A 4% slope would have waterbars every 100' but a 20% slope would have waterbars spaced every

**Figure 5: Waterbar Dimensions**

70'. Once slopes exceed 30% water bars do not need to be any closer than 50'. Waterbars shall be at least 6" high, measured from the upstream toe to where the top of the waterbar is 1' wide. See Figure 5. They should be pushed up from the downhill side rather than from the uphill side. They shall be reformed as needed to maintain effectiveness.

Where site conditions allow, bare soil firebreaks should be placed on the contour to minimize erosion. See figure 6. The area between the non-vegetated firebreak and the windbreak (protected area) can be managed for any use that does not increase fire risk on the protected side of the firebreak.



**Figure 6: Firebreak on contour to reduce erosion**

For smaller areas, such as parks or where needed to protect exceptionally high value property, non-vegetated firebreaks may be covered with gravel, rock, asphalt, or concrete. Such firebreaks can be used as a walking or biking path. Surface thickness shall be thick enough to withstand the weight of maintenance and fire fighting equipment. Consider placing weed control fabric under gravel or rock surfaces to reduce vegetation emergence.

Firebreaks, temporary and permanent, may also be appropriate to break up larger blocks of hazardous fuels such as large areas of range or wildlife land. For this purpose the non-vegetated firebreak shall be at least 50' wide and perpendicular to the direction of the most likely fire risks. Along each side of this non-vegetated firebreak, vegetation shall be mowed as short as possible for a width of 100'.

When non-vegetated firebreaks are no longer needed they should be reseeded or planted to crop to control erosion. When reseeding follow the recommendations of Pasture and Hayland Planting – 512.

#### Vegetated Firebreaks

Use Table A to determine minimum widths for vegetated firebreaks based on the site's slope, surrounding area, and upwind fuels hazard class.

Vegetated firebreaks shall consist of short vegetation or vegetation that can be kept short with frequent mowing or grazing. Firebreaks shall be planted to a species of grass or legume that is succulent at times different from the predominant species of the adjacent fire hazard. I.e.: When a fire hazard of dense nesting cover is dried and quite flammable in late July or August, a

firebreak of mowed and managed alfalfa will either be green and succulent or short with plenty of bare soil between stubble.

Widths of irrigated firebreaks shall equal or exceed the total width of vegetated and non-vegetated firebreaks as found in Table A for the fuel hazard of the site. Vegetated firebreaks used alone shall remain succulent through the entire fire season. If irrigated firebreaks could become dormant (dry) and subject to burning, then a combination firebreak shall be used

Vegetated firebreaks shall be planted to one or more of the perennial plant species listed in Table B. Planting guidelines and techniques are found in Pasture and Hayland Planting 512 Specification.

<b>Table B: Acceptable Firebreak Species</b>	<b>Full Seeding Rate lbs. PLS per Acre</b>	<b>Plant Type</b>
Hard Fescue	4	grass
Intermediate/Pubescent Wheatgrass	10	grass
Purple Prairie Clover < 10% of mix	3.8	legume
Prairie Cone Flower < 10% of mix	1.5	forb
Crested Wheatgrass	7	grass
Slender Wheatgrass	6.5	grass
Alfalfa	5.5	legume
White Clover <50% of mix	1.5	legume

lbs. PLS = pounds Pure Live Seed

#### Temporary Firebreaks

Use Table A to determine the appropriate width required based on hazard fuel types and slope. To be effective a temporary firebreak will be non-vegetated and the design widths from Table A will be found in the non-vegetated column for the appropriate fuel and slope conditions. The surface of a temporary firebreak shall not carry ground fire or support combustion. When no longer needed, temporary firebreaks shall be reseeded following the recommendations of the Pasture and Hayland Planting - 550.

#### Burned Firebreaks

Burned firebreaks are usually temporary and only effective when all organic material has been consumed or during the time that vegetation regrowth is green and succulent. If burned firebreaks are part of a prescribed burning operation, their design shall be that described in the prescribed burning plan and should adhere to the Prescribed Burning Standard - 338

Burned firebreaks, as part of a combination firebreak shall be the width shown in Table A for a Vegetated/Burned firebreak.

If burned firebreaks are to be used alone to reduce fuels or to promote early green up the width shall be the sum of the vegetated/burned and the non-vegetated firebreak types found in Table A for the appropriate fuel and slope conditions.

#### **MANAGEMENT/ MAINTENANCE**

Evaluate the condition and effectiveness of all fire control systems at the beginning of each fire season and when performing regular maintenance of firebreaks. Be particularly aware of firebreak continuity, fuel buildup within vegetated firebreaks, debris that may have collected in windbreaks or adjacent to structures, or any other factor that affects firebreak effectiveness.

### Non-vegetated Firebreaks

The firebreak will be bladed, cultivated, or chemically fallowed as necessary to denude the entire width of vegetation and expose mineral soil. This condition must be maintained throughout the entire fire season.

Ensure that combustible material has not accumulated within the non-vegetated firebreaks.

Water bars, if required for erosion control, will need to be rebuilt to compensate for the leveling effects of erosion. Herbicide vegetation control instead of tillage will reduce the need to rebuild water bars.

If firebreaks have been surfaced, maintain or replace as necessary to maintain the integrity of the firebreak, its function as a path, trail or road and as an access for fire fighting.

### Vegetated Firebreaks

Vegetation shall be managed to maintain vigor and control erosion. Noxious weeds shall be controlled.

Keep Kentucky blue grass, reed canary grass, and switch grass out of vegetated firebreaks. These species burn hot, produce lots of fuel, and are difficult to extinguish.

Where appropriate, remove accumulated biomass (bag, bale or graze). If biomass cannot be removed, mow in such a way the forage is finely chopped and lays close to the soil surface. Minimize biomass accumulations by frequent mowing when vegetation is actively growing to reduce fire risks during the dry part of the season. Frequent mowing and removal will promote a green and succulent firebreak that reduces flame length and intensity. The effectiveness of vegetated firebreaks can be enhanced by late fall mowing and aggressive raking to remove plant litter in preparation for the spring fire season.

Grazing is an effective way to harvest forage on a vegetated firebreak. Grazing systems on a firebreak should strive to leave vegetation shorter than 3 inches and/or discontinuous fuel types. This grazing management will probably be applied to the whole pasture containing the firebreak. To minimize effects of overgrazing, reduce the size of the pasture with the firebreak to as small as possible.

Animal dung is highly flammable during conditions of high fire risk. During, and immediately after wildfires, burning cow chips can blow or roll across fire breaks, igniting fuels downwind. If concentrations of dung exist, they should be raked and removed from the firebreak.

### Temporary Firebreaks

Temporary firebreaks shall be managed similar to non-vegetated firebreaks. When no longer needed, temporary firebreaks shall be reseeded following the recommendations of FOTG - Section IV – Conservation Practices - Pasture and Hayland Planting 512.

### Burned Firebreaks

Immediately before, during, and immediately after the prescribed burn, these firebreaks shall be managed as specified in the prescribed burning plan developed within the guidelines of the Prescribed Burning 338 Standard, located in FOTG – Section IV – Conservation Practices. At other times of the year a burned firebreak shall be managed as a vegetated firebreak. I.e.: maintain health and vigor of the vegetation and control erosion. Spring burned firebreaks will

usually need mowing, grazing or harvesting later in the season. Firebreaks burned in mid to late summer may not need mowing, grazing or harvesting though these would be compatible uses and increase the effectiveness of the firebreak.

State and local ordinances concerning open burning must be adhered to. Landowners shall be made aware of the liability and risks associated with prescribed burning.

### **CONSIDERATIONS**

Where water supplies are adequate, irrigate portions of the defensible space to keep low growing vegetation green and succulent and in a condition to resist burning. Irrigation will increase forage production and resulting in more frequent mowing and removal of biomass.

A portion of the vegetated firebreak, especially adjacent to the non-vegetated firebreak could be irrigated to increase the firebreak effectiveness when unattended.

Be alert to seasonal site conditions that may affect timely firebreak management. I.e.: Will the firebreaks be too wet in the spring to effectively mow or till when needed?

Expand firebreak widths beyond the minimum where utilization of woody fuels or forage is possible and where high value property could benefit from additional protection.

Establish a water supply readily available to fire fighters during times of high fire risk.

When Rangeland Fire Index is at, or exceeds very high, activate a monitoring program that will enable rapid response to wildfires until the fire department can arrive. At the very least this means keeping an eye to conditions within the area so that resources can respond to new fires while they are small.

When the Daily Rangeland Fire Danger Index is at, or exceeds, a very high rating, have fire-fighting equipment positioned and ready-to-go. For example: A heavy disk is hooked to the tractor, with keys in the ignition, and located near the hazard area but not where fire would take it out of the equation.

Work with local fire departments to evaluate fire hazard risks, determine site-specific prevention treatments, and if appropriate, learn some wildland fire-fighting techniques that could be used during the first few minutes of a wildland fire situation before the fire department arrives.

Work with neighbors to develop a community-wide fire-prevention program.

This design and installation guide addresses the design, installation and management of firebreaks only. For more complete coverage of wildfire control systems, refer to the North Dakota Forest Service and your local fire department.

The following pamphlets, available from the North Dakota Forest Service, provide information on protecting property from wildfire.

- "Wildfire Home or Farm Hazard Rating"
- "Protecting Your Property from Wildfire"
- "10 Steps to Being Firewise in North Dakota"

They can be obtained at local North Dakota Forest Service Offices or by contacting the Fire Planning and Prevention Specialist in Bismarck, ND at 701-328-9990, or at [colleen.reinke@ndsu.nodak.edu](mailto:colleen.reinke@ndsu.nodak.edu).