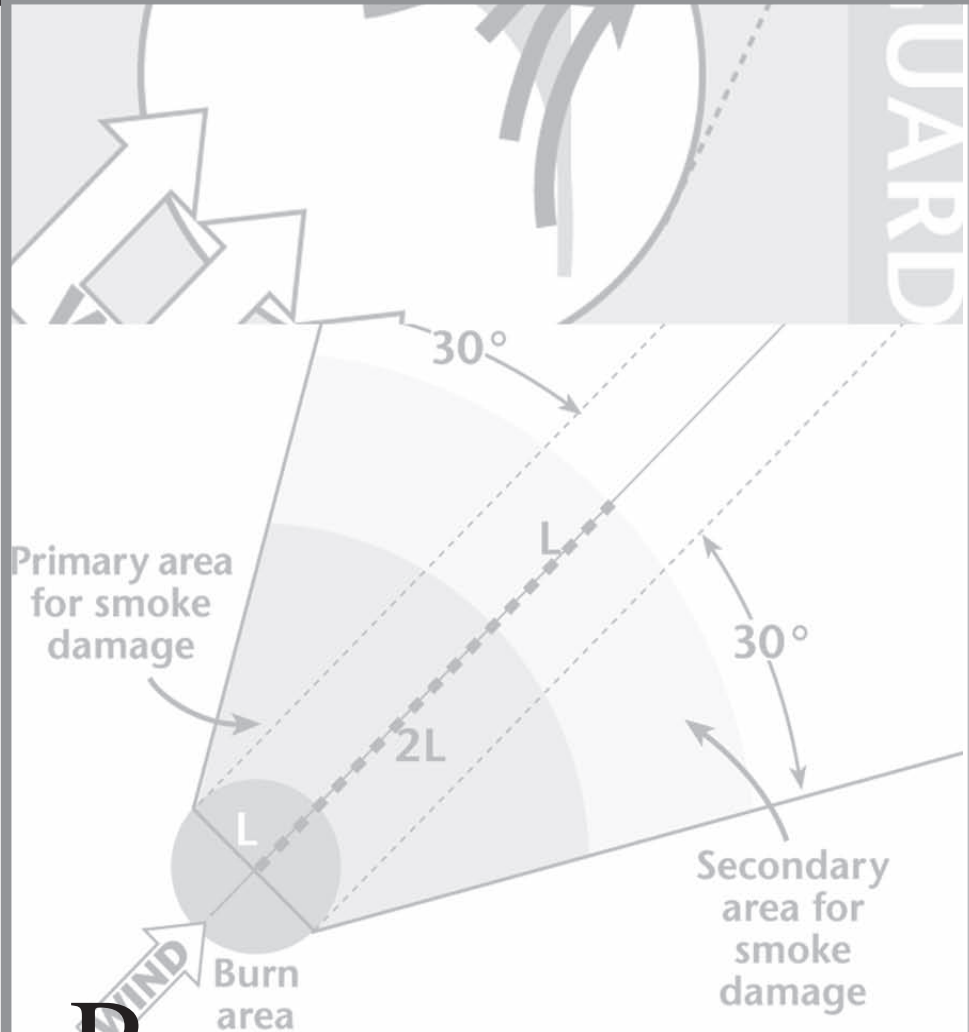




# Prescribed Burning Safety



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**P**rescribed burning has become a major, though potentially dangerous, management tool throughout Kansas. Poorly managed burns or ignorance of safety measures can lead to property damage and even injury or death. Even in well-managed burns, accidents can occur. Before, during and after every burn, safety should be the major consideration. Follow basic burning procedures, wear proper clothing, and be prepared for the unexpected.

## Personal Safety

Prescribed burning, like any management practice, must be accomplished with careful planning, understanding, and care. In addition to planning the burn and providing for adequate fire guards, it is important that everyone on the burn meet specific requirements. This is for the safety and protection of everyone.

**Health Considerations** People with known health problems, such as high blood pressure, heart conditions, certain allergies, and respiratory diseases, must not participate. Prescribed burning is a strenuous, stressful, and demanding job that requires good physical conditioning. Should a medical emergency occur, some people will have to be pulled away from fire control to provide emergency assistance. The result could be an uncontrolled burn (wildfire).

**Clothing** Clothing must be of natural fiber (cotton, wool, etc.) that covers the body, arms and legs (Figure 1). A cap or hat of natural material is needed to cover the hair. Gloves (preferably leather) and hightop boots are mandatory (steel-toed safety boots are prone to accumulating heat). Wear pant legs outside the boots, not inside. In areas where burning includes timber, brush or trees, a hard hat should be used.

Clothing made of most synthetic fibers, such as polyester and nylon, is a hazard to personal safety near fires. Some synthetic fibers can melt at temperatures common in prescribed burning, causing severe burns. While such incidents are rare, the risk of wearing synthetic materials should be avoided.

The one exception to the use of synthetic fibers is NOMEX™ (a registered trademark of Du Pont) or any other material designed for fire fighting. These are special fire retardant fibers and are used by fire fighters, military pilots, and race car drivers. Shirts, pants, and coveralls made of NOMEX™ are the best available alternative to natural fibers.

## Public Safety

From the public's viewpoint, fire is dangerous and should be avoided. Always maintain good public relations and avoid situations that endanger the public. Dangerous situations can create legal liability.

**Notification** For both safety and legal reasons, certain groups should be notified before a burn to prevent unnecessary concern and danger. Check with local authorities.

Neighbors, the fire department, and law enforcement officials should be notified. This can prevent misunderstandings, unnecessary fire calls, and poor public relations. A procedure has been developed that is based on state regulations, experience, and common sense.

**Neighbors** Notifying neighbors can help in determining their attitudes toward burning and possibly help in finding assistance. Notifying neighbors of a burn can lead to cooperation in conducting the burn. With good relations, neighbors may be willing to share labor and equipment.

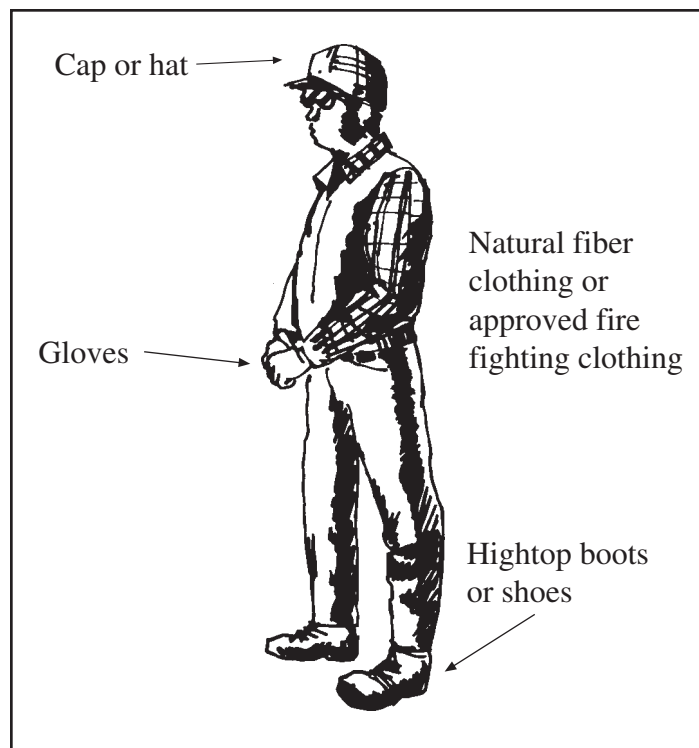
**Fire Department** State regulations, adopted in 1996, require anyone conducting a prescribed burn to notify the local fire department of the intended burn. The only exception is in counties that have chosen not to require notification. Working with the fire department is crucial. Contact the fire chief to determine state and local regulations and to develop specific plans for requesting emergency help. Problems may be avoided ahead of time by asking which neighbors, if any, report all fires.

**Law Enforcement** If a potential traffic hazard exists, notify local law enforcement personnel. Discuss the location of the burn with law enforcement officials to determine what needs to be done.

An example notification process has been developed. It is in the publication *Prescribed Burning: Planning and Conducting* (L 664).

## Smoke Management

From a public safety standpoint, smoke presents the greatest safety hazard. Airports and public roads are the major concerns. The following situations merit special consideration:



**Figure 1.** Natural fiber clothing, or approved fire fighting clothing that covers the arms, legs, and body must be worn while working on a prescribed burn.

**Public Roads** Smoke moving over public roads creates a visibility problem (Figure 2) and should be avoided. Three alternatives are available when burning next to public roads. The most desirable is to burn with the wind blowing away from the road. The second option is to use burning procedures that limit the amount of smoke and/or causes the smoke to lift over the road. The last alternative would be to arrange for traffic control during the burning time. Such arrangements are often difficult to make due to the length of time involved and the need for law enforcement personnel.

**Airports** Burning near an airport is a major concern. Smoke over airports can cause poor visibility created by smoke. Turbulence and updrafts within the smoke column can create control problems for light aircraft. When planning burns near airports, select a time when wind directions will carry the smoke away from the airport. Also, notify airport authorities and discuss your plans with them.

## Weather

Weather conditions must remain within acceptable limits to safely manage a prescribed burn. The main factors that need to be monitored are wind speed, wind direction, cloud cover, relative humidity, and temperature. These factors affect fire behavior and control. Acceptable ranges and limits for prescribed burns are summarized in Table 1. Burning when conditions are outside these ranges

should rarely be done and only by experienced personnel.

**Wind** speed and direction are crucial to fire behavior. Wind speeds of 5 to 15 mph, steady from a desirable direction, are preferred. Listen to weather forecasts closely. Changes in wind direction, variable wind speed, or gusty winds, are unacceptable conditions. Wind speed is modified by relative humidity, temperature, and frontal movements. As relative humidity decreases and temperature increases, the effect of the wind is increased. Frontal movements can cause changes in wind direction and speed. Burning should not be performed if frontal movements are forecast within 24 hours.

**Cloud cover** plays a significant role in prescribed burning. As a rule, as cloud cover increases, it becomes more difficult to ignite and maintain a burn. Cloud covers of more than 0.7 (more than 70 percent of the sky is covered) and ceilings below 2,000 feet are conditions to avoid. When cloud ceilings are below 2,000 feet, smoke will stay near the ground and can cause visibility problems.

**Relative humidity** controls the rate at which fuel dries. Most grassy fuels change moisture content quickly as the relative humidity changes. During late morning and early afternoon hours, relative humidity can drop quickly, causing fire size and intensity to increase rapidly.

**Temperature** and relative humidity are related. As a rule, as temperature increases, relative humidity decreases. When temperatures exceed 80°F, people perform at lower efficiency, tire quickly, and require higher levels of fluids

to maintain stamina. At low temperatures (below 55°F), people have problems working effectively and, if wet, can chill.

**Weather Forecasts** The two best sources of weather information are NOAA Weather Radio and the Rangeland Fire Danger Index. NOAA Weather Radio is a recorded broadcast of current weather conditions and forecasts. These broadcasts are received on special radios at three different frequencies. Weather radios are available from many sources.

The Rangeland Fire Danger Index is a part of all weather forecasts issued in Kansas during periods of dry weather. The Rangeland Fire Danger Index is announced only when the levels are **Very High** or



Figure 2. Smoke over a public road presents a hazardous situation to drivers and can create a legal liability for the land owner

**Extreme.** When a Very High or Extreme Fire Danger Index is issued, atmospheric conditions are such that fires will start easily, move extremely fast, and become large and hot. Such fires will be extremely difficult, if not impossible, to control by normal fire fighting tactics. Burning under these conditions should be avoided. If possible, it is best to burn under **Moderate** or **High** Fire Danger Index levels.

## Safety During the Burn

**Communications** Two types of communication during a burn are desirable: contact with a location that can relay a request for emergency assistance; and between crews working on the burn. Communications can be by CB, business band or similar radios, or cellular phones. Where service is available, cellular phones are the best alternative for requesting emergency assistance in most areas. It can be vital to have fast response by emergency help in case the fire gets out of control or an injury occurs.

**Emergency situations** Several dangerous situations can occur during a prescribed burn. Potential dangers can be minimized with good advance planning. Have escape routes planned, wear proper clothing, use well-maintained equipment, plan for good communications, and have a good overall plan for conducting the burn.

Probably the most frightening situation is to be in front of a head fire. This can occur as a result of unexpected wind shifts or from becoming disoriented. Unless the fire front is low and it's possible to determine that the depth of the fire is small, never attempt to run or drive through the fire. High temperatures, smoke, and lack of oxygen make it virtually impossible for a person on foot to walk or run through larger fire fronts. If matches or a lighter are

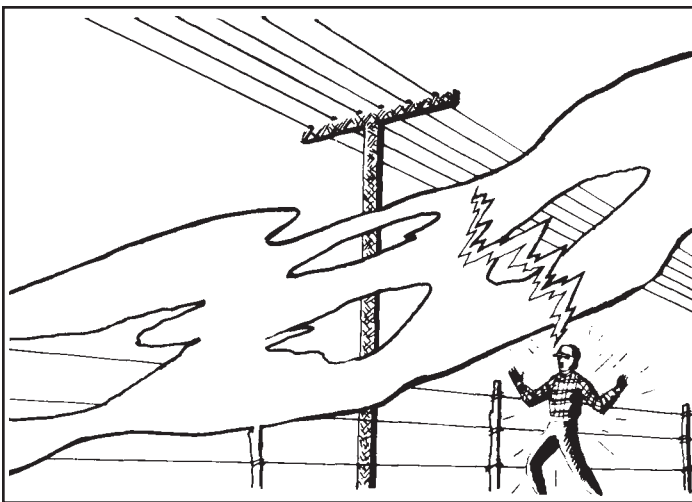
available, a small fire can be started. Stay behind it until the main fire passes. If a person is in a vehicle in running condition, a similar approach can be used. If the vehicle is inoperable, the best option is to set a fire. If water is available, wet down an area around the vehicle and remain inside it. Try not to get in front of a head fire.

**Crew Preparation** Every person working on a burn should be briefed on the burning plan. This briefing should include designating who is in charge, the responsibility of each person during the burn, and the responsibility of each person in case the fire escapes. In addition, each person should be briefed on communication procedures for notifying emergency personnel if needed. This item is extremely important.

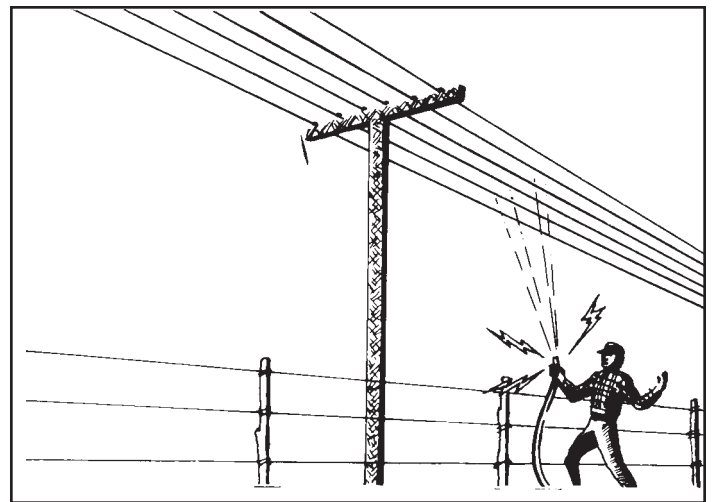
Each person working on the burn must be familiar with basic prescribed burning and fire fighting techniques. Persons who are not familiar with these basics pose a hazard to the entire operation and to themselves. Every effort must be made to train or familiarize each person on the techniques needed during the prescribed burn and what to do in case the fire escapes.

**Equipment Operation** Safe operation of all equipment should be first and foremost. Tractors and other vehicles should be operated by trained and experienced persons. Equipment operators should remain in communication with other personnel. Power-take-off shafts, belts, and other dangerous parts should be shielded and marked.

**Night Burning** Burning at night should be avoided. Darkness prevents the drivers of vehicles or personnel on foot from being able to find their way, see obstacles and landmarks, judge distances, and assess the overall fire situation. Night fires also appear more severe than they are and result in more false alarms.



**Figure 3.** Smoke buildup under electric power lines can create the potential for a discharge similar to lightning.



**Figure 4.** Powerlines downed on fences can produce the potential for electrical shock for long distances.

## Special Concerns

Electrical power lines and oil and gas production and transmission equipment can pose special hazards for prescribed burns. Special consideration during the planning and conducting of a prescribed burn can eliminate or greatly reduce injury and damage from these factors.

**Power Lines** When burning under or near electrical power lines or high voltage transmission lines, exercise extreme care. The following situations can lead to injury or death:

**Smoke Buildup** Smoke consists of carbon particles, which can conduct electricity. If the concentration of carbon is high enough, an electrical discharge from the line to the ground, similar to lightning, can occur (Figure 3). The discharge hazard increases as line voltage increases, distance to the ground decreases, and the amount of smoke increases. Such discharges have killed fire fighters.

To reduce the potential for discharges, the fire front should not be allowed to cross under the lines in large areas. By properly coordinating the location of the burn with the wind direction or by lighting the fire parallel to the line, no major smoke buildup can occur.

**Water and Power Lines** When working below power lines with water hoses, extreme care must be taken to keep water streams out of overhead lines. Water will conduct electricity and the water stream will act as a conductor (Figure 4).

Weather Factor	Minimum	Maximum
	<i>Preferred range</i>	<i>Limit</i>
Wind speed	5-15mph	20 mph
Wind direction	steady, from one direction	
Relative humidity	40-70%	>30%
Temperature	55°-80°F	50°-85°F
Cloud cover	clear - 0.7 (70%)	
Ceiling	2,000-unlimited	

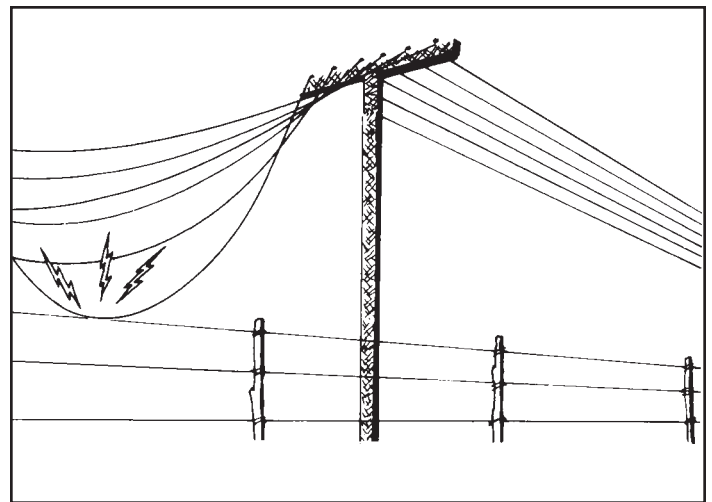
**Table 1.** A summary of the preferred weather conditions for a prescribed burn.

**Downed Power Lines** Power lines can be downed during a prescribed burn by vehicles colliding with poles or poles being burned. If power lines are downed, there are two hazards: the lines themselves and the combination of lines on wire fences (Figure 5).

When lines are downed they become hard to see and people or vehicles can run into them. Electrocutation or serious shock injury can occur. Also, wildfires can be started by the downed lines arcing.

If lines fall on fences, a new hazard is created. Electricity will be conducted by the fence wires for long distances. The distance will be determined by the type of posts (steel posts may reduce the hazard) and the contact between wires at corner and pull posts. As long as the wires contact each other, there is the potential for shock.

**Oil and Gas Production** Burning near oil or natural gas production sites or around pipelines, pump stations, and storage facilities can be potentially hazardous. Explosions and/or fire at these sites can result. In all cases, during the planning of the prescribed burn, contact the company representative to determine what is needed to prevent damage. Leaks, open vents, and plastic lines and parts are potential hazards.



**Figure 5** Downed powerlines on fences can produce the potential for electrical shock for long distances.

***O***ther Useful Publications:  
*Prescribed Burning A Management tool L-815*  
*Planning and Conducting a Prescribed Burn L-644*  
*Prescribed Burning Equipment L-876*

Brand names appearing in this publication are for product identification purposes only. No endorsement is intended, nor is criticism implied of similar products not mentioned.

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