PLANNING AND CONDUCTING

PREScribed Burns

IN MINNESOTA

Adapted from Planning and Conducting Prescribed Burns in Missouri © Copyright 1994 by the Conservation Commission of the State of Missouri.
Fire has always been an important factor in determining which plants grow in the prairies, plains and forests. The western edge of the hardwood forest, and the eastern edge of the prairie may have shifted hundreds of miles over the centuries as the combined effects of drought and fire pushed the grasslands eastward, only to be reclaimed by trees during cooler and wetter years. This leaflet has been prepared as an education aid for farmers, ranchers and landowners to promote the proper and safe use of fire in grassland management. This does not endorse the use of fire for any other purpose. Research and experience have shown that fire can be used to manage native grasslands and planted cool- and warm-season grasses. Fire can control many woody plants and herbaceous weeds, stimulate desirable plants, improve poor grazing distribution, reduce wildfire hazards, improve wildlife habitat and increase livestock gains. To realize these benefits, fire must be used under specified conditions and with proper timing. This is termed prescribed burning. Not following appropriate precautions can lead to tragic results.

**TIMING AND FREQUENCY OF BURNING**

**Native warm-season grasses**, such as big bluestem, Indiangrass, and switchgrass, respond with increased vigor, growth and competitiveness when they are burned just as they begin to grow. They should have 1 to 1 1/2 inches of new growth when burned. This will normally be in mid to late spring. The average date of greenup (and thus prescribed burn date) for native warm-season grasses in different parts of MN. The time may vary 10 days from year to year depending on the kind of spring, i.e. cool and wet or warm and dry.

Little bluestem and side oats grama responds less favorably to burning than other native warm-season grasses. They form dense bunches in which the crowns may be damaged if burned when they are too dry. Nevertheless, spring burning helps maintain their vigor and competitiveness.

**Cool-season grasses** also respond to burning just after they break dormancy, usually in late spring. An early spring burn can improve plant density, increase tillering, improve forage quality, and encourage legumes, broadleaf forbs, and annual warm-season grasses.

Late spring burning of prairies or native warm-season grasses is the most effective way to reduce competition from smooth bromegrass, Kentucky bluegrass, and other cool-season grasses. These grasses use nutrients, moisture and sunlight that would be available for native warm-season grasses. Cool-season grasses grow slowly during the hot summer months, but use large quantities of soil moisture that would be used by the more productive and moisture conserving warm-season grasses. By late spring, cool-season grasses are actively growing but have not had time to replenish the carbohydrate root reserves they used to begin growth in early spring. Burned at this time, they have little reserves left to renew growth and are quickly outgrown by the warm-season grasses.

Similarly, deciduous trees and shrubs, and perennial forbs pull substantial amounts of carbohydrates from root reserves to begin growth. Burned after they leaf-out and top killed, they will make further root reserve withdrawals to resprout. Two or three consecutive year burns will control species, such as buckthorn, boxelder and aspen by depleting root reserves. Non-sprouters, like red cedar, may be controlled by one burn if they are less than five feet tall. Larger cedars will need to be cut, and large deciduous trees cut and stumps treated with herbicides to prevent resprouting.

Smooth sumac is similar to warm-season grasses in its food storage. Root reserves do not reach a low point until a month later than other deciduous plants. Therefore, late spring burning will reduce its height but not control it.

**FORAGE PRODUCTION**

Warm-season grass forage yield is affected by timing of burns. Unburned plots and late spring burned plots showed little difference in total forage yield in Kansas burning studies. Late winter, early spring and mid-spring burned plots all produced less than unburned or late spring burned plots. The earlier the burn, the lower the yield.

Reduced yields in early burned plots are attributed to greater soil moisture losses because the exposed soil has higher evaporation rates, lower rainfall infiltration rates, and higher runoff and soil erosion rates. Plant growth quickly covers the soil in late spring burns because the uninsulated (by old growth) soil warms up more quickly from the sun, accelerating plant growth.
**LIVESTOCK MANAGEMENT**

Burning can improve grazing distribution and reduce spot grazing. Grazers are attracted to the vigorously growing forage on burned areas. Overgrazed areas will usually not carry a fire and will be grazed less, allowing plants to recover from heavy grazing.

Research on bluestem range in Kansas has shown that growth animals (steers and heifers) gain 10 to 12 percent more following late-spring burns than on either unburned or early spring burned pastures. This response is apparently due to increased availability of higher quality forage in early summer. The benefits are gained only during the year of burning. Similar burning and grazing trials have not been conducted on warm-season grass plantings or native prairies in MN but similar results and benefits are expected.

Cow and calf gains on burned warm-season grasses have not shown any significant differences from unburned. Burning is primarily done to control weeds, cool-season grasses and woody plants, reduce litter accumulation and redistribute grazing pressure. A burning frequency of two or three consecutive years out of five or six is usually sufficient to maintain a highly productive grassland.

**HAY PRAIRIES**

Hay prairies should be burned two or three years in a row every five or six years to control cool-season grass, woody sprouts, and mulch buildup, and stimulate tillering of native warm-season grasses. Timing is usually in the spring, later to benefit warm-season grasses; earlier to benefit prairie forbs and wildlife. Hay or grazed prairies should always be burned prior to applying fertilizers to control weeds that would use the fertilizer before the native grasses could. Neither burning nor fertilizing is a substitute for good haying or grazing management. A prairie in poor (weak) condition must be managed back to a healthier condition before it will respond to a burn or fertilizer.

**WILDLIFE**

Most wildlife species in the historic prairie regions evolved with fire. Some wildlife species are tolerant of the effects of fire; others benefit from them. Burning prairies, native warm-season grass and cool-season grasses increases native forbs including legumes which provide cover, seeds and sources of insects for ground nesting and foraging wildlife. Litter removal exposes seeds and allows birds to move more freely through the new vegetation to find insects, seek protection from the weather and predators, and dry off on damp mornings.

Prescribed burns help control woody vegetation which would adversely affect bobwhite quail and prairie wildlife habitat. Prairie-chicken populations decline when woody vegetation becomes too thick. Prescribed burning is once in three years can reduce nest predation on grassland birds and increase browse for deer. One and two year old burns provide more food plants than older burns. Only one-fourth to one-third of the available nesting habitat should be burned any one year to ensure adequate nesting cover.

**REDUCING WILDFIRE DANGER**

Prescribed burning can reduce the danger and severity of wildfire. Wildfires often occur at times when conditions are driest, at times of the year when they can be most damaging to soil and plants, and when fuel loads are high. Removing all the vegetation in the fall or winter by grazing or mowing to reduce wildfire potential can damage the plants and soil. Plant crowns are exposed to freezing temperatures and the soil to erosion. Critical wildlife cover is also eliminated.

**HAZARDS**

When improperly or carelessly used, fire can destroy property and lives, damage valuable timber, and impair health, just as can happen with the careless use of pesticides, motor vehicles or firearms. Many of the negative opinions about fire have resulted from careless or improper use.

**SMOKE MANAGEMENT**

Smoke from grass fires is composed mostly of water vapor, carbon, carbon monoxide, carbon dioxide, and minute amounts of nitrogen oxides, and hydrocarbons. The components that are considered air pollutants are in such low levels that there is little long-term detrimental affect on air quality. The engine exhaust from a tractor mowing the same acreage being burned contains more air pollutants.

Nevertheless, smoke from prescribed burns can temporarily cause serious health and visibility problems. Winds during the burn should be 5 to 18 mph to help disperse the smoke quickly.
Cloud cover should be less than 70% and ceiling not less than 2000 ft. to allow the smoke to rise well above the ground and disperse in the atmosphere. Heat produced during the burn will help lift the smoke. Slow, cool burns usually produce more smoke than fast, hot burns. Tall, heavy warm-season grass will generally produce less smoke than shorter cool season grass.

Burning within one mile of an airport should be avoided and may be unlawful. In addition to poor visibility from smoke, turbulence and updrafts within the smoke column can create control problems for light aircraft. Beyond one mile, burning should be done only with winds from a direction that will carry smoke away from an airport.

Smoke on public roads creates visibility problems for motorists. Those responsible for the burn may be liable for vehicle accidents resulting from driving through the smoke. Putting smoke over public roads should be avoided. Burn only with winds blowing away from roads or atmospheric conditions that will quickly lift smoke above the ground. Burning near roads means that enough personnel must be available for some to act as traffic patrol if wind shifts put smoke on roads. This may not, however, absolve one of liability if a motorist drives through smoke and has an accident. Putting smoke on residences, businesses or poultry houses could result in liability i.e. threat to health, loss of business or damage to property.

Heavy concentrations of smoke can conduct electricity from overhead electrical power or high voltage transmission lines. Because smoke is mainly carbon particles and water vapor, an electrical discharge from the line to the ground, similar to lightning, can occur. The discharge hazard increases as distance to the ground decreases, line voltage increases, and the amount of smoke increases. Such discharges have killed firefighters working on wildfires. To avoid the danger of electrical discharges from power lines, light the fires parallel to the lines. Let the fire back under the wires in smaller, narrower fronts and do not stand in smoke that is passing through or under lines.

LEGAL RESPONSIBILITIES

You are legally responsible for damages that occur as a result of your prescribed burn. This includes smoke damage or fire damage. Burning should be done according to burn plans prepared by technically qualified and adequately insured individuals. Landowners and/or contractors are responsible for obtaining all necessary permits prior to burning and for complying with all applicable laws in carrying out the burning. Costs associated with obtaining required permits and other necessary approvals, notification of neighbors and governmental units are entirely the landowner's responsibility.

Landowners and/or contractors are responsible for all liability related to this practice. By entering into USDA cost share programs, landowners release the Government and its agents and employees from any responsibility or legal liability arising from injury or harm to person or property that occurs as a result of this practice. Landowners acknowledge that they knowingly assume all risk of injury while participating in any USDA agreement.

If the location of the warm-season grass planting or prairie is such that there is the potential for damage, you should obtain legal counsel before burning to determine what precautions will be necessary.

PLANNING A PRESCRIBED FIRE

The Plan

A prescribed burn should be planned long before it is time to do the burn. The plan should include what is to be burned, why, how, when and what precautions must be taken to ensure the greatest effect and safety. Once planned, the burn can be completed more quickly and safely when conditions are right. A valid DNR Burning Permit is required before proceeding with a burn.

Area To Be Burned

Using an aerial photo, map or hand drawing of the area to be burned (Fig. 2), draw in important features such as fences, gates, powerlines, water resources, streams, wet spots, roads, trails, and surrounding houses and buildings. Show access routes, neighboring property boundaries and other important features. Include features that might affect fire behavior such as windbreaks, woods, wind-swept valleys and cattle trails. Next, mark areas where firebreaks need to be developed, areas or buildings to be protected, direction of preferred smoke dispersal areas which should be headfired and backfired and irregularities in perimeter and topography that will require special handling.
Firebreaks help contain the fire within the burn area. Whenever possible, use natural barriers such as streams, cropfields, closely grazed cool-season grass pastures, field trails, little-used roads and hedgerows as firebreaks from which to backfire.

Constructed firebreaks are usually burned or cleared. They should be installed wherever natural or existing barriers are not present or not wide enough from which to back the fire. Firebreaks may be prepared in advance or at the time of burning, they must be wide enough to prevent burning embers from drifting to unburned fields. Generally firebreaks need to be at least twice as wide as the adjacent vegetation is tall.

Clearing Firebreaks are generally of two types: those maintained as bare soil and those seeded to cool-season grasses, called greenlines.

- **Bare Soil Lines** are created by plowing or discing the boundary. They should be used only where erosion is not a concern or when an extra insurance of fire control is needed. Wet areas, where access by equipment will be limited during the burn, should be plowed or disced when the ground is dry. The strips should be a minimum of 15 feet wide.

- **Greenlines** are maintained by mowing or grazing to keep fuel from accumulating and to maintain a short, thick stand of cool-season grasses. Fertilizer may be applied to these boundary strips to encourage selective grazing by cattle. Cool-season grass firebreaks are less helpful for burning cool-season grasses in late winter or early spring. Close mowing will aid control during backfiring but wetlines or bare soil will be necessary for safe burning.

**Burned Firebreaks** are established along the perimeter of the burn area, taking advantage of natural barriers and mowed or wetlines. Burned Firebreaks are prepared by lighting short lengths of vegetation along the downwind side of the burn area boundary. The fire is allowed to back away from the line a distance of 15 to 20 feet before it is extinguished. A new length is then ignited and the procedure repeated along the entire downwind boundary.

Burned firebreaks may be made in the evenings when the fire is more easily controlled. Preburned firebreaks must be relit before the headfire is started to ensure that there is no unburned fuel still present on them. Preburned firebreaks are time consuming to install and have limited application, but may be useful in situations where equipment access is limited.

**Wetlines** are used in conjunction with either bare soil, burned or cleared firebreaks. Using wetlines is the most common method of conducting prescribed burns if high-pressure sprayers are available and vehicle access is not a problem. Simply, it involves the use of water to form a narrow strip of dampened vegetation from which to light the backfire. After the fire backs away from the wet strip several inches, it is dampened again to extinguish any residual burning or smoldering debris.
Fire Intensity Reduction Mowing is advisable in tall fuels such as ungrazed or unhayed native warm-season grass to reduce heat intensity during the backfire. This is done by mowing the grass adjacent to the firebreak to a height of 10 to 15 inches for a width of 8 to 15 feet. (Fig.3). It is important not to create a windrow of mowed vegetation on either side of the firebreak. Left on the side to be burned, windrowed material will slow down progress by smoldering if damp or cause flaring up and drifting of burning material across the line if too dry. Left on the unburn side it tends to catch drifting embers and is difficult to extinguish once it catches fire.

Personnel and Equipment

Once the plans for firebreak placement and lighting sequence have been made, you need to estimate the personnel and equipment needed for the burn. Neighbors often work together so that everyone has as much help and equipment as possible. By pooling labor and equipment, a larger and better-equipped crew can bum faster and safer. The experience of the group can also be shared.

Generally, three or four people will be necessary on each fireline: one to light, one or two to control the line and one to mop-up. If two lines are planned at right angles to each other, at least six crewmembers will be necessary. Additional members may be used for mop-up or as spotters and road patrol.

The minimum equipment would include a sprayer capable of 125 psi pressure and an output of six gallons of water per minute (gpm). The best examples of this type of pump are FMC and Hypro. High-pressure pumps are acceptable, but gallonage output should be conservative. Small prairies and plantings with extremely safe boundaries may be burned with low-pressure, low-volume cattle or field crop sprayers equipped with handgun nozzles.

Backpack blowers have become extremely useful tools for firebreak preparation and for putting out fires. They produce a 180 mph blast of air that will blow away loose fuel down to bare ground. They may be used weeks or days ahead of the planned burn date to cleanup firebreaks as well as during the burn. They are effective at blowing out backing and flanking fires at relative humidities above 30% but tend to spread fire when relative humidity is lower.

Important hand tools include bow rakes, broom rakes, fire swatters, backpack sprayers or garden sprayers and wet sacks. A drip torch, although not essential equipment allows the crew to string even lines of fire. This may be important to obtain the desired effects under prescribed conditions. Other essential equipment includes pliers, bolt cutters, (for cutting fences or locked gates in the event of an escape), gloves, drinking water, eye goggles and hearing protectors. Hard hats are valuable around brush or trees.

After determining what is needed, you should list what's available, and where it is. Make arrangements to get the items that are missing. Check all equipment to see that it is clean and in good repair and replace those items in poor condition. You won't have time to deal with breakdowns on the firelines.

Notification

Prescribed burns are highly visible and resemble wildfires from a distance. From both a safety and legal standpoint, certain people should be notified before a burn to prevent unnecessary concern. Make a list of those to notify, including their telephone numbers and the notification date.

Neighbors should be notified because it's good relations, prevents unnecessary alarm, and allows you to share equipment and labor if they plan to burn too. Notify neighbors several days before the burn, at the time of the burn and after the burn is completed.

Name: ______________________________________
Number: ____________________________________

Fire departments should be notified to prevent unnecessary emergency runs which endanger firemen and are costly, to establish a means by which they can be notified in the event of an emergency, and to ensure adequate fire protection for the community. Fire departments may want to participate in the prescribed burn as a training or practice exercise. They also should be told when the burn has been completed.

Name: ______________________________________
Number: ____________________________________

Local law enforcement officials (County Sheriffs etc) should be notified to avoid unnecessary reports and concern and to provide for public safety in the event smoke crosses a public road and endangers
traffic. However, do not expect them to routinely flag traffic during your prescribed burn.

Sheriff’s Number: ____________________________

Forestry personnel are responsible for wildfire suppression in many counties. Contacting your DNR Forester will prevent unnecessary fire runs, allow you to obtain updated weather information and ensure a more rapid response in the event of an escape. U.S. Forest Service personnel should be notified if your land lies within their district.

Name: ______________________________________
Number: ________________________________

WEATHER

Weather will be the most important factor determining the success of the burn. Wind direction and speed, frontal passage, precipitation, relative humidity and temperature affect how the burn will be conducted, how the fire will behave, how difficult it will be to control, and how well smoke will disperse.

Wind direction and speed are two of the most critical considerations. Most burns should be done with a wind speed of 5 to 15 mph. This will allow the headfire to move fast enough to remove most of the fuel but not damage the plant crowns. Wind direction shifts frequently at wind speeds less than 5 mph. Also, smoke will not rise or disperse well which could cause roads, homes, or towns to be engulfed in heavy smoke.

Wind speed usually increases toward mid-day as the temperature increases. Both decrease near sunset. Burns that cannot be completed before noon should be delayed until mid-afternoon when wind speed begins to lower, thus easing control of the burn.

The best wind direction is determined by the physical features of the burn area. In general, choose a direction in which the fewest hazards, such as heavy fuel loads in adjacent fields, will be affected downwind and which will carry smoke away from nearby hazards such as buildings, roads, highways, powerlines, and towns. Prevailing wind directions in late spring, in decreasing order of frequency, are from the southwest, northwest and southeast.

Relative Humidity affects the rate at which fuels dry. Grass fuels change moisture content quickly as the relative humidity changes. Fires are difficult to control when relatively humidity is low because fire size and intensity increases rapidly. The preferred relative humidity for prescribed burning is 35 to 50%. Relative humidity declines as temperature increases. Low relative humidity in early morning usually means that afternoon burning could become hazardous.

Air Temperature should be between 70 and 80 degrees F. Above 75° F degrees, fire become more difficult to control because relative humidity usually declines as air temperature increases. Crew members tire more quickly at higher temperatures, work less efficiently, and require more fluids to drink. Fires don’t burn well below 45° F and crew members work less effectively and chill easily.

Cloud Cover affects fire behavior. As cloud cover increases grassy fuels take on humidity and become difficult to ignite and keep burning. Low cloud ceilings keep smoke from rising and dispersing. Avoid burning on days when cloud cover is over 0.7 (more than 70% of the sky is covered) and ceilings below 2000 feet.

Weather Forecasts are issued for 24 to 48 hours by the Weather Bureau. They include temperature, wind direction and speed, anticipated wind changes, precipitation chances and relative humidity. Weather information can be obtained from local radio stations, TV news reports, or the National Oceanographic and Atmospheric Administration (NOAA) weather radio.

Local radio stations and TV news should be used for obtaining 3 to 5 day outlooks to establish the approximate burn date. Their reliability for accurate 24 hour forecasts varies greatly. Some local weather conditions may be obtained by contacting a local forestry office.

Notice the coming and passing of weather fronts. Weather before or just after a cold front is unstable and hazardous for burning. After a front passes, weather will be stable for one to three days. This will be the best time to conduct the burn if wind, relative humidity and air temperatures are within the limits of your plan.

| Table 1 Summary of preferred weather conditions for prescribed burns - MN. |
|-----------------------------|------------------|---------------------|---------------------|
| Wind Speed                 | 5-15 mph         |
| Relative Humidity          | 35-50 %          |
| Temperature                | 40-80° F         |
| Moisture                   | 5-11 %           |
| Time                       | 10 am - 4 pm     |
Fuel and Terrain

Fuel - Fire spreads more rapidly in grass than leaves, bark or branches because fine grass blades and stems hold less moisture and lose moisture more quickly than woody fuels.

Terrain - Fire moves more quickly uphill because heat and convection pre-dries fuels uphill allowing them to burn more quickly. Conversely, fires burn more slowly downhill. Hills, draws, and treelines along fences, roads and drainways may cause wind eddies and speed changes. Firebreak width and type may need to be adjusted to take these factors into account.

Burn plans should also note these factors so that crews may plan to adjust for them.

CONDUCTING THE BURN

As the proposed time of the burn nears, you should follow weather forecasts to determine the approximate date when planned conditions are most likely to occur. Determine again who will be able to help with the burn and what equipment will be available.

On the day prior to the burn, pay particular attention to radio and television weather forecasts. Check with your district forester or NOAA weather station for a spot weather forecast for the next day.

Contact the district forester and listen to the local radio station the morning of the burn for an updated forecast. Remember, pay particular attention to relative humidity, wind direction, wind speed and predicted changes in all three. Do not hesitate to call everything off if conditions are not satisfactory. Make the planned notifications. Next, assemble the crew and go over the burn plan. Be sure that each is familiar with basic safety requirements, communication methods, equipment operation, gate and water-refill locations and other information. Walk the boundary to make sure that winds haven't blown fuels across the firebreaks. Check equipment to ensure everything works.

Begin the burn in the downwind corner as planned (Fig.4.1). Start with a small test fire to check fire behavior, crew performance and reaction to potential hazards. If something does not seem quite right, shutdown until the problem is solved. If everything is functioning properly, continue lighting the backfire in short segments only as much as the crew can easily watch and control (Fig. 4.2).

The fire should be started at the downwind edge of the firebreak and allowed to back into the wind a few feet. A second line of ignition may then be made a few feet into the fuel and parallel to the first to widen and secure a black (burned out) line before the taller fuel is ignited (Fig. 5).

Figure 4: Ignition Sequence
Care must be taken not to widen the line too fast to prevent the fire from the second line from jumping the blackline of the first fireline. The crewmember in charge of lighting must be alert to fire behavior, wind gusts, drifting fuels, or crew members in trouble. Never string out more fire along the fireline than can be easily reached by the length of hose on the sprayer. Watch for spotovers and react quickly.

Figure 5: Developing Black Line Firelines
Monitor any weather changes and make adjustments as needed to maintain fire control. Moderate windshifts are common but major changes (180°) should only occur during frontal passage, which are predictable. Relative humidity will decline as temperature increases. Maintain communications with other crews and crewmembers to be sure that they are not having problems. Complete the burn by ringing the burn area (Fig. 4.3 & 4.4). The striphead fire (Fig. 6) and the flankfire (Fig. 7) are modifications of the ring headfire. (Fig. 4).

Mop-Up

Check the burn-area perimeter to ensure that nothing has blown or crept across to start a fire on the other side. Watch for cow chips, tree limbs, snags or fence posts smoldering near the boundary which could blow sparks into an unburned area. Water doesn't always extinguish smoldering debris, although detergent mixed with water will help penetrate it. Move smoldering debris away from the edge of the burn, into the burned area. Dead trees should be cut down and moved into the burned area. Check the perimeter at least twice. Do not bury smoldering debris as it can hold fire a long time, and dry the soil on top. Winds may blow away the soil, and rekindle the smoldering material.

Notify neighbors and agencies listed on your plan that burning has ceased. This will ensure that if wildfire or accidental escape (poor mop-up) occurs, help may be summoned and will respond.

Clean, repair and store equipment so that it will be ready when needed again.

Post-Burn Evaluation

When you have completed all of the burn operations, take the time to list the things that you would do next time to achieve a safer, more efficient burn. Make a record of equipment operation and usefulness, personnel availability and value, weather conditions and changes, firebreak effectiveness and timing of the burn.

Throughout the summer, observe the burned field. Note how the desired plants are responding and how well undesirable plants were controlled. This will help you determine when you will need to burn again.

PRESCRIBED FIRE SAFETY

Personnel Safety

People who have health problems such as high blood pressure, heart conditions, respiratory diseases and other such conditions must not be allowed to participate. Prescribed burning is strenuous and the stress could be disastrous to these people. Loss of the stricken crewmember, as well as those needed to care for him, could result in an inability to maintain control of the burn.
Clothing worn on prescribed burns must be of natural fibers (cotton, wool, etc) and should cover the body, arms, and legs. A natural material hat or cap to cover the hair, gloves (preferably leather) and high top boots are mandatory. Synthetic fibers melt at temperatures which are common in prescribed burning and can result in severe burns. A hard hat and goggles should be worn when burning near trees and brush. Goggles and hearing protectors are essential if operating a backpack blower.

Public Safety

An uninformed public views all fires as dangerous and generally unnecessary. Good public and neighbor relations, in addition to avoiding dangerous situations, are important. Notifying neighbors of your plans will help ease their fears. Contacting responsible fire and forest districts and establishing the circumstances by which they will respond prevents unwarranted fire runs. Local sheriff's offices often dispatch for fire departments and should be notified of your plans to burn and when burning has ceased.

Safety During A Burn

All people on the burn should be briefed on the burn plan. This should include designating who's in charge, the responsibility of each person in the event of an escape, including spotovers. Quick and organized action on spotovers will prevent many escapes. Procedures for notifying emergency personnel should also be understood.

Chemically treated electrical poles burn intensively and are difficult to extinguish once they ignite. Spraying water on poles or high-voltage lines can be dangerous.

Burning at night should be avoided. Darkness prevents the drivers of vehicles and people on foot from seeing obstacles or hazards. Smoke particles at night absorb all light, making the dark even darker. The natural cooling of the night air creates problems with smoke movement and may result in the smoke staying near ground level across roads.

Finally, each person working on the burn must be familiar with basic prescribed burning and fire fighting techniques. Those who are not familiar with basics pose a hazard to the entire operation and to themselves. Every effort should be made to familiarize them with the techniques they will need in the prescribed burn and in case of escape.

SUMMARY

Prescribed fire is a cost-effective tool for managing grasslands. Properly used, the productivity of perennial grasses and forbs may be maintained and increased, undesirable plants controlled, wildfire hazards reduced and wildlife and domestic livestock benefited. Improperly used it can destroy property and lives. As with all farming operations, it requires a certain amount of equipment and experience to be used effectively.

After establishing the need for burning your grassland, determine the timing of the burn to achieve the most desired effects. Then develop a burn plan which includes a map of the burn area, preferred weather conditions, legal responsibilities, personnel and equipment needs, firebreak construction needs, and people to notify prior to the burn.

Changes in weather conditions during the burn can have a dramatic effect on fire behavior. Wind direction and speed are critical to fire behavior. Steady winds of 5 to 15 mph are recommended. Wind speed effects are modified by relative humidity and temperature. As relative humidity decreases and temperature increases, fires become more difficult to control. Relative humidity below 35 percent is extremely dangerous for burning.

The most important aspect of a prescribed burn is safety. Plan for safety, be sure that workers are healthy, equipment works properly and everyone on the crew understands how the burn is to be conducted and what to do in case of an escape.

It is highly recommended that landowners intending to complete a grassland burn themselves view the video “Prescribed Burning in Grassland”, available from DNR - Forestry.
### Before Day of Burn
- Review burn plan
- Check weather patterns
- Construct firebreaks
- Plan for needed equipment
- Plan for needed personnel
- Make notifications
- Burn permit obtained and in your possession

### Day of Burn
- Weather conditions fit burn plan
- Burn equipment checked and ready
- Check firebreaks
- Brief burn crew
- Review emergency plan
- Check area for changes
- Test burn

### After Burn
- Mop-up (check twice)
- Make Notifications
- Evaluate Burn (immediately and later in summer)
- Clean Equipment

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**Figure 8: Prescribed Burning Checklist**

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**DEFINITIONS**

**Backfire** - A fire that burns into the wind, characteristically, very slow rate of speed, short flame lengths, low smoke density but hotter at ground surface than head or flankfire. Results in maximum litter consumption.

**Bow Rake** - A ridged, steel-toothed garden rake.

**Broom Rake** - A rake with long flexible teeth similar to a broom. Similar to a leaf rake.

**Drip Torch** - A container of fuel with a long metal tube, usually with coil for an air lock, with a wick on the end that dispenses the fuel in a dripping or slow trickle manner over the burning wick and to the ground.

**Fire Swatter** - A thick, flexible rubber pad on a long handle for swatting out flames. Functions similar to a wet burlap sack but easier to use and carry.

**Firebreak** - A natural or constructed barrier used to stop or check the spread of the fire or to provide a control line from which to work. It may be a stream, a road or a disked or burned strip. Sometimes called a firelane.

**Fireline** - A line of fire, usually ignited along a firebreak.

**Flankfire** - A fire that burns at right or oblique angles to the wind direction. A modification of backing fires in that lines are set into the wind but at angles to the wind direction. Used to secure the flanks of the burn area after backfiring and before headfiring.

**Headfire** - A fire that burns with the wind, characteristically, very fast rate of spread, long flame lengths, greater smoke volumes and columns, but burns cooler at the ground surface than backfires or flankfires.

**Litter** - The uppermost layer of loose debris composed of freshly fallen or slightly decomposed organic materials such as dead grass, leaves and sticks.