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**The**  
**BENEFITS**  
**of Prescribed**  
**BURNING**  
**on Private Land**

Minnesota Department  
of Natural Resources  
Section of Wildlife  
500 Lafayette Road  
St. Paul, MN 55155-4007



# BURNING IMPROVEMENTS INTO YOUR LAND



Fire is bad, right?

Not always. Though fires are commonly viewed as life-threatening disasters, prescribed burning can actually help landowners improve their property and its value. By *purposely* setting *regulated* fires, called **prescribed burns**, you can:

- Improve wildlife habitat
- Boost pasture productivity
- Enhance native plant communities

When properly managed, fire can rejuvenate open areas to create lush and healthy grasslands. Contrary to popular myth, fire actually *helps* many open-land wildlife species, including:

- Bluebirds
- Prairie chickens
- Waterfowl
- Sandhill cranes
- Bobolinks
- Sharp-tailed grouse

Burning stimulates new grass growth that these and other animals use for nesting and hiding. It also retards the growth of brush and trees, which can overtake open areas and crowd out some animal and plant species.

## HISTORICAL BURNING

During the past 10,000 years, fires have been rejuvenating grasslands and brushlands throughout this region. Tallgrass prairies and open brushlands were kept free of trees by occasional wildfires that swept across the landscape. Fire set back or killed encroaching woody plants but did no harm to prairie grasses, whose roots extend deep beneath the ground surface.

*This brochure is a basic introduction to prescribed burning and outlines only the simplest prescribed burns. It's not intended to be an instruction manual. For specifics on how to conduct a prescribed burn on your land, call your local DNR Wildlife office for free assistance.*

**Note:** Words in **bold italics** are defined in the glossary at the back of the brochure.

American Indians intentionally set fires to stimulate plant growth on grasslands and keep forest areas open to produce food such as blueberries. Early European settlers used fires for hundreds of years to keep pastures open and healthy. Prescribed burning is still used by some farmers and by other land managers such as the Department of Natural Resources and U.S. Forest Service as a safe, cost-effective way to revitalize pastures, prairies, and brushlands.

Though the value of fire to open areas has remained unchanged, prescribed burning has become less common over the past 40 years. As a result, populations of grassland and brushland wildlife species that once thrived in Minnesota are dramatically declining. And landowners are missing opportunities to use this cost-effective management tool.

**This brochure is for landowners who want to know more about how to use prescribed burning to improve their land. It promotes the safe and proper use of fire in certain vegetation types, but does not endorse the use of fire for any other purpose.**

## PREScribed FIRE BENEFITS:

### IMPROVE

- Wildlife habitat
- Pasture growth
- Native plant communities

### REDUCE

- Vegetation-control costs







Henry Kantarik

*Why do a prescribed burn? To help wildlife such as sharp-tailed grouse, a native bird that needs brushlands kept open by periodic fires.*



Richard Hamilton Smith

*Another benefit of fire: flowers, grasses, forbs, and other plants that create a healthy native prairie plant community.*

## WHY DO A PRESCRIBED BURN?

**T**he bottom line is that prescribed burns can improve your land, whether it is pasture, prairie, or brushland.

Burning is often a cheaper way to manage vegetation than bulldozing, cutting, or using chemicals.

Prescribed burning is also an ecologically sound way to improve wildlife habitat. Fire used as part of a **land management plan** can help game species and plants or animals that are endangered, threatened, or of special concern. You can also use fire to rejuvenate lands enrolled in state or federal set-aside programs such as Reinvest in Minnesota (RIM) or the federal Conservation Reserve Program (CRP)\*.

Prescribed burns maintain moist prairies to provide nesting areas for waterfowl, pheasants, and nongame birds such as prairie chickens, upland plovers, and marbled godwits. Brushland species such as sharp-tailed grouse also benefit from fires, which maintain or restore the open areas these birds prefer. In some oak forests, prescribed burning can encourage oak regeneration and boost acorn production, benefitting deer, squirrels, and wild turkeys.

Burning pasture hastens green-up in the spring and improves forage range quality and palatability for livestock. Similarly, burning forest openings helps the regrowth of woodland plants eaten by deer and ruffed grouse. Foresters use fire to burn slash and prepare logged-over sites for re-establishing black spruce and jack pine.

\*With Natural Resource Conservation Service—formerly SCS/ASCS —approval beforehand.





## **FIRE: WILD VERSUS PRESCRIBED**

*Prescribed burns differ greatly from wildfires. Wildfires are accidental and uncontrolled. They threaten lives and property and can do great harm.*

*Prescribed burns, on the other hand, are set intentionally after considering the safety of people and property. Prescribed burns are planned to achieve a specific objective in a specific area under appropriate weather conditions and at the right time of year. Fire-control equipment and fire crews are used to keep the fire under control.*



*A wildfire rages out of control (above), threatening property and lives. A prescribed burn (left), on the other hand, is carefully contained to ensure the safety of people and property.*

Lawrence Duke

Lawrence Duke



## HABITATS THAT BENEFIT FROM FIRE

Prescribed burning works best on plant communities such as prairies and pastures that have an ecological history of periodic fires. The wildlife helped most by prescribed burns are those that require open areas, such as bluebirds, bobolinks, and sharp-tailed grouse. The photographs shown here illustrate habitats most suitable for fire management.

**Prairies can't survive without** periodic fires. The flames kill or set back encroaching woody vegetation and rejuvenate native grasses.



Lawrence Duke

**Upland nesting cover for** pheasants, waterfowl, and grassland songbirds stays lush and productive when periodically burned.



Lawrence Duke

**Brushlands are rejuvenated** and maintained with fire to benefit species such as bluebirds in smaller openings, and sharp-tailed grouse in larger ones.



Bill Berg

**Burning cattail and sedge** cover creates healthy springtime cover for waterfowl and several shorebird species.



Minnesota DNR

**Burning old fields helps** control woody plants and prepare the sites for planting grasses eaten by livestock and used by wildlife for nesting.



Minnesota DNR

**Bluff prairies (goat prairies)** common along southeastern Minnesota rivers can be maintained using prescribed fire to control woody plants.



Minnesota DNR

**Forest openings can be** maintained with prescribed burns to benefit more than 150 wildlife species. Openings burned in early spring green up sooner than other areas.



R. Nelson

**Oak percentage and number** in some hardwood stands can be increased with managed fires, which kill off less fire-tolerant trees such as maple and basswood.



Minnesota DNR



## HOW FIRE HELPS

*So how is it that fire—such a seemingly destructive force—can be so beneficial to grasslands and brushlands and the wildlife that live there?*

*Fire acts as nature's "gardener" by "trimming" back trees and overmature shrubs that shade out sun-dependent plants such as grasses and prairie flowers. After a burn, the blackened soil quickly absorbs sunlight. The warmed earth encourages seed germination. Charred plant remains turn into a rich fertilizer, encouraging new grass growth to sprout from the network of root systems deep below ground.*

*In pastures and meadows, the new growth can be top-notch cattle forage. In ungrazed areas, the dense grasses provide hiding and nesting places for birds and other wildlife. Deer often use lush meadows and grasslands as loafing areas.*

*Forests openings burned in the spring, when the woods are full of snow, are the first areas to green up, providing lush food for hungry deer.*

Richard Hamilton Smith





A. Rothstein

## WILL SPRING FIRES HURT BIRD NESTS?

*Sometimes. But the long-term benefits to birds from burning far outweighs any short-term losses. Burning reinvigorates nesting habitat, providing more and better nesting grasses for birds in subsequent years. Most private-land burning is done before nesting season. Though fires during nesting season burn nests, many birds nest again.*

## PLANNING A PRESCRIBED BURN

**F**ind out if prescribed burning will help your land by writing a general land management plan. Your local DNR wildlife manager, working with the area DNR forester, can help. The plan can be nothing more than a few notes about what you want to achieve with your land and ways to get it done. Or it can be more extensive, even to the point of including adjacent properties. In many cases, landowners find that prescribed burning can help them meet certain management goals, and sometimes neighbors can work together as prescribed burning teams to manage larger areas.

If burning looks like an option, you need a **burn plan**. In a nutshell, the plan is a brief outline of what you are trying to accomplish with the burn, how you plan to go about it, and how you'll evaluate the results. Local DNR staff can help. In your burn plan,

identify factors affecting the proposed burn, such as cost, available help, time of year, nearby buildings, and liability. Some of the main components of the plan:

### 1. *The Site*

Define the area to be burned, using an aerial photo or map. Mark the location of fences, gates, power poles and lines, property lines, streams, wetlands, roads, trails, nearby buildings, and other important features. Include features that could slow or hasten fire movement or direction, such as windbreaks, woods, wind-swept valleys, slopes, and cattle trails. Also note dense fuels such as matted grass, dead trees, and dry conifers that could intensify the blaze.

Walk your property before the burn day to identify areas or habitats that should not be burned, such as:

- Grasses in young conifer plantings
- Farm dumps (junked vehicles, chemicals, plastics, etc.)
- Discarded tires, railroad ties, or utility poles
- Peat (though burning over peat usually poses little or no danger from early- to mid-spring)
- Wooden fence posts
- Phone cable boxes
- Large slash piles

- Fuel tanks or containers
- Poison ivy patches

## 2. Seasons to Burn

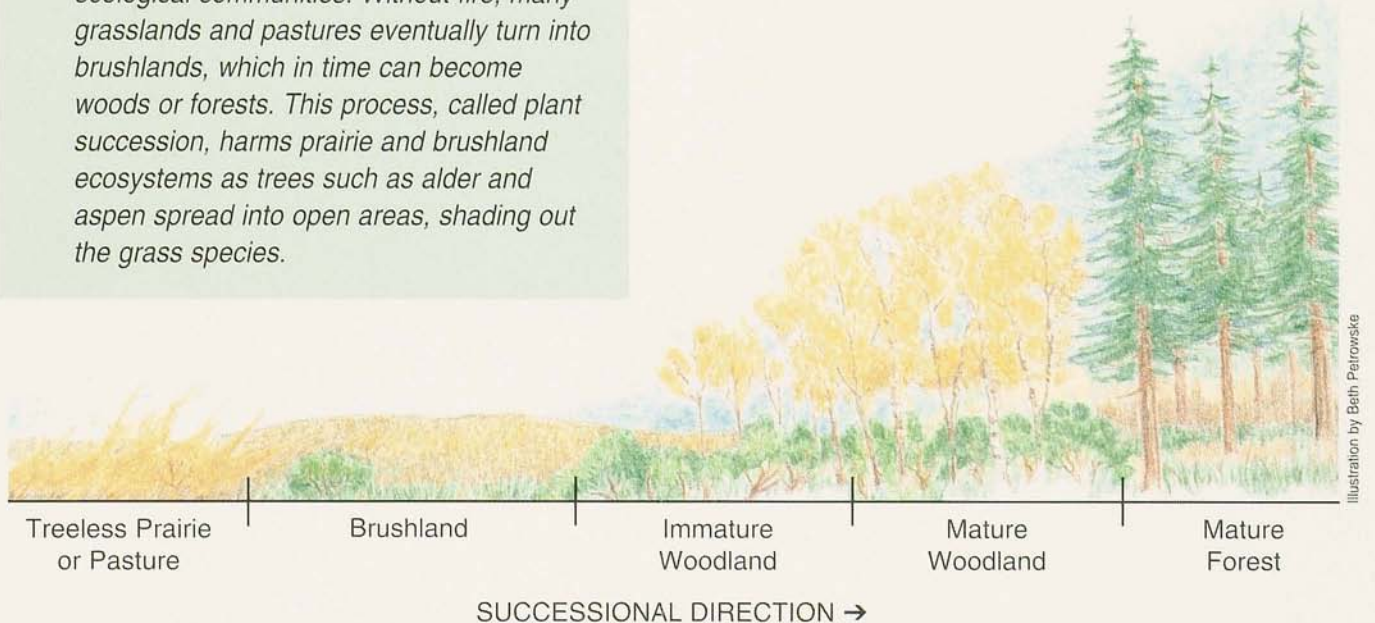
The safety and effectiveness of prescribed burns vary according to the season.

The best time of year to burn is in spring before green-up, when the fire feeds off the dead plants without harming desirable vegetation. Early spring, when frost is still in the ground, is considered the safest time to burn, but these burns do little to control brush. Late-spring burns take out more brush but are harder to control.

Summer burns work well but may create excessive smoke. Fall burns vary in effectiveness depending on the amount of available dead fuels, such as fallen leaves. Local DNR staff can help you choose the best time of year for burns in your area.

## PLANT SUCCESSION

*Years ago, before modern fire suppression techniques were invented, periodic wildfires swept across Minnesota's prairies, brushlands, and forests. These natural disturbances prevented trees and tall brush from creeping in and taking over open ecological communities. Without fire, many grasslands and pastures eventually turn into brushlands, which in time can become woods or forests. This process, called plant succession, harms prairie and brushland ecosystems as trees such as alder and aspen spread into open areas, shading out the grass species.*





### 3. Developing Firebreaks

**Firebreaks** should contain fire within the burn area. Ponds, plowed fields, and roads can act as firebreaks for part of the burn area. But in most cases you'll also need to develop additional firebreaks wide enough to stop the fire.

Depending on the terrain and vegetation, firebreaks can be created by mowing, plowing, bulldozing, disking, establishing a **wetline**, or **backfiring** (see ① and ② on diagram, page 12). Most firebreaks are prepared in advance, but others, such as wetlines, are created the same day as the burn.



Lawrence Duke

A landowner plows a firebreak, avoiding native prairie, to keep flames from moving outside the burn area.

### 4. Crews and Equipment

The number of people needed for the fire crew varies with the size and complexity of the burn. Generally, three or four people are necessary for each fireline: one for ignition, one or two to control the line, and one to **mop up**. Others can help mop up or act as spotters. Often, it's crucial to have a road patrol if smoke might blow across a roadway and obscure the vision of drivers. Neighbors can work together on burns so that everyone has as much help and equipment as possible. A larger and better-equipped crew can burn faster and safer.

Crews should have a sprayer capable of 125 pounds-per-square-inch pressure and at least an output of 6 gallons of water per minute. Low-pressure, low-volume cattle or field crop sprayers with handgun nozzles can work for small burn areas that have extremely safe boundaries. If you use high-pressure pumps, ration water to keep from running out partway through the burn. Always make sure there is enough water nearby to replenish pumps and sprayers.

**Drip torches** are the most efficient way of igniting an even fireline, though highway flares or even matches will work. To control the fire and mop up afterwards, use **backpack sprayers**, **wet sacks**, **bow rakes**, **broom rakes**, and **swatters**. Other necessary equipment includes drinking water and a first aid kit. Use citizen's band radios or cellular phones to communicate with other crew members, especially for larger burns. Simple hand signals work for small burns. Use farm tractors, four-wheel ATVs, four-wheel-drive vehicles, or even garden tractors to transport equipment and water.

Crew members should wear clothing made of



natural materials such as cotton or wool, leather boots (or rubber boots for wet sites), and leather gloves. Outer clothing should be made of a durable, close-knit material such as cotton duck. Do not wear frayed or torn clothing. Avoid synthetic materials such as polyester, plastic, or rubber, which melts and sticks to the skin if it catches fire. It also pays to wear eye goggles and face masks (like those sold in most hardware and paint stores for sanding sheetrock or installing insulation). Hard hats are recommended when working around trees, brush, or powerlines.

*Cellular phones (right) or CB radios make it easy to keep in touch with other members of your fire crew. ATVs and backpack sprayers (below) are handy equipment for conducting larger burns. A drip torch (below right) keeps a steady flow of fire along the fireline.*



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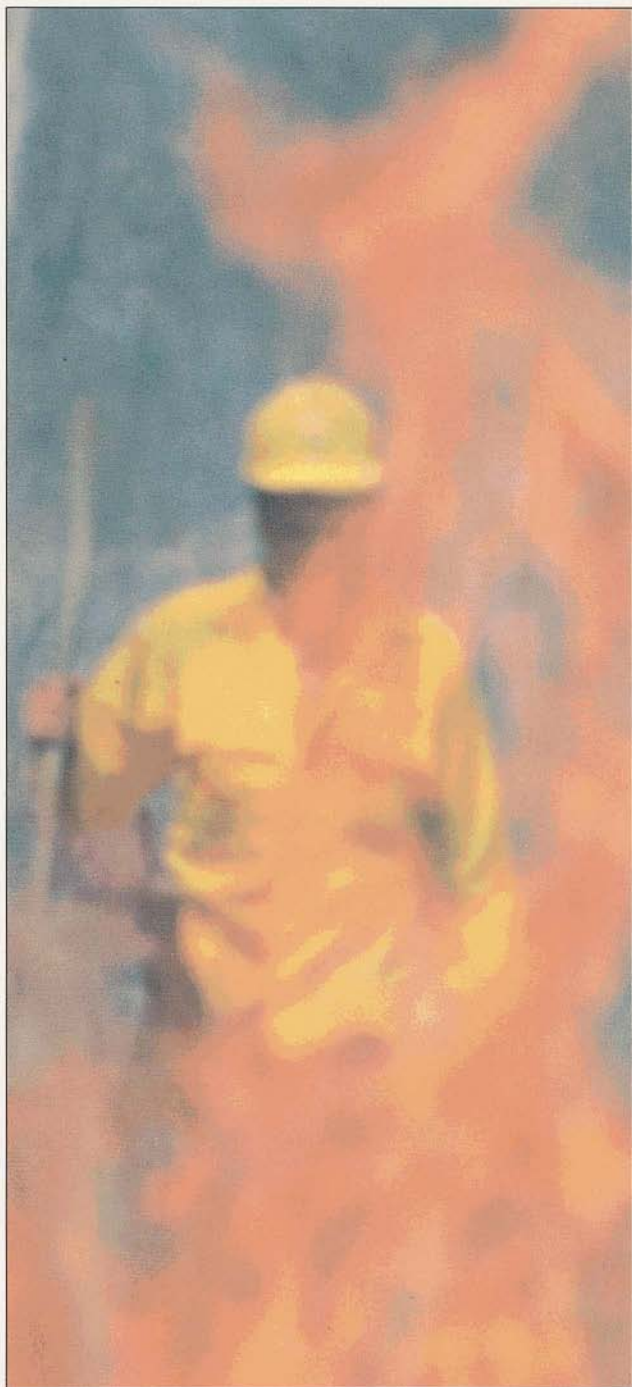


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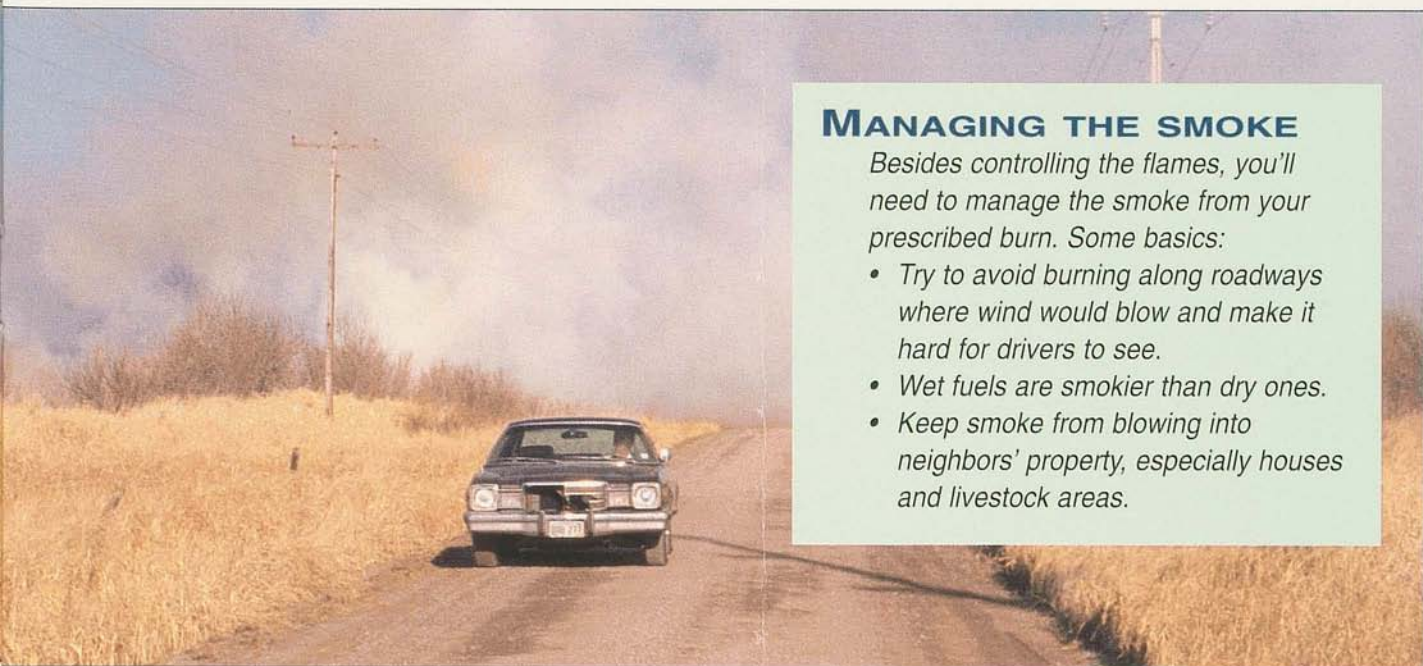
Lawrence Duke

## ***5. Permits and Notification***

You must obtain a state burning permit from the local DNR Forestry office or the township fire warden or fire chief before conducting a burn. For burns within city limits, a local permit may be necessary, too. Plan to get permits well in advance of the burn date.

Make a list of people you'll need to call before the burn. Because prescribed burns can resemble wildfires, notify neighbors, the local fire department, law enforcement officials, and the DNR Forestry office in advance and on the day of the burn.

Have a contingency plan in case the wind shifts, the fire gets out of control, someone is injured, equipment breaks down, or smoke creates severe problems. Be sure to have some way to quickly call for help in an emergency.



Lawrence Duke

## MANAGING THE SMOKE

*Besides controlling the flames, you'll need to manage the smoke from your prescribed burn. Some basics:*

- *Try to avoid burning along roadways where wind would blow and make it hard for drivers to see.*
- *Wet fuels are smokier than dry ones.*
- *Keep smoke from blowing into neighbors' property, especially houses and livestock areas.*

## 6. Weather Conditions

Weather can make or break a prescribed burn. Call the local DNR Forestry or Wildlife office for specific advice about weather conditions appropriate for your prescribed burn.

To conduct a safe and effective burn, the weather on burn day should fall within specific parameters for wind speed and direction, relative humidity, air temperature, and forecasted conditions. Consult local radio stations or airports for current and predicted weather reports and pay particular attention to forecasts predicting changes in wind direction. Generally, burns should *not* be done when winds exceed 12 to 15 miles per hour, humidity is lower than 25 percent, and the temperature is above 80 degrees.

## 7. Conducting the Burn

As burn day nears, pay close attention to weather forecasts. If unstable weather, low relative humidity, or strong winds are predicted, be prepared to reschedule the burn. *Don't take chances.* Rescheduling the burn for another day is better than doing a burn that doesn't accomplish what you want or having the fire get out of control.

On the day of the burn, assemble the crew and go over the burn plan. Check the equipment to make sure everything works.

Next, ignite a small test fire in the downwind corner of the burn site to observe fire behavior and the crew's performance. This is your chance to correct problems before beginning the main burn.



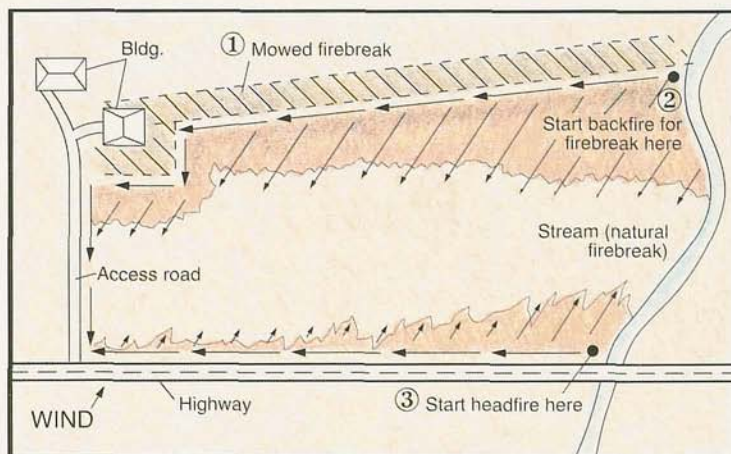
## 8. Ignition

**A)** After the test fire, start the actual burn by igniting a backfire in the downwind corner of the burn site (see ②). In most cases, begin a backfire in late afternoon or early evening. This permits a slow ignition of backfire lines when humidity is at its lowest point and winds are quietest. A backfire moves against the wind, burns slowly, and is effective at scorching and killing woody brush. It also gives you a preview of the fire's behavior before beginning the headfire.

**B)** Lengthen the backfire by igniting short segments of **fireline** along the boundary of the burn site that is downwind. Never ignite more fire than the crew can easily control. The crew member igniting the fire must be alert to fire behavior, wind speed and direction, and the location and abilities of other crew members. At least one crew member should periodically check back along the fireline to make sure fire has not re-ignited or crept across the firebreak.

**C)** Continue working along the perimeter of the burn area, igniting the flanks. A **flankfire** moves at right angles to the wind and burns more quickly than a backfire. Be careful, because a wind shift can turn a flankfire into a fast-burning **headfire**. Also, remember that fires move more quickly uphill because flames leap up and ignite fuel above on higher ground.

**D)** The backfires and flankfires should create a firebreak of burned ground around most of the burn area's perimeter. Now you can ignite a headfire, which moves with the wind and burns fast (see ③). Whether you ignite the headfire in parts or for the entire length



This diagram shows a typical prescribed burn area, including a mowed firebreak ①, where the backfire would be started based on wind direction ②, and where the headfire would be started ③.

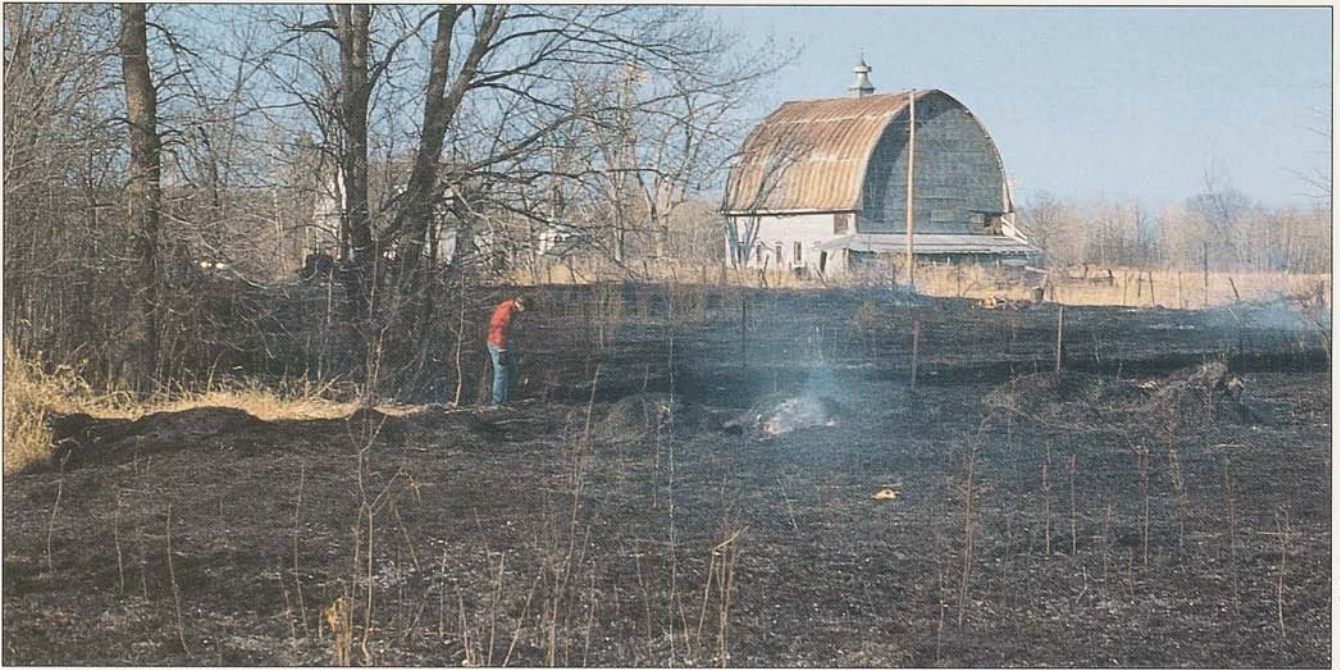
of the burn depends on the size of the area, wind conditions, and where the crew is. For example, a half-mile-long headfire is too long to be safe. Far better to break it up into a half-dozen strips.

Headfires spread quickly, have long flame lengths, and create the most heat. This is where most fire **escapes** occur. Generally, you need a firebreak two times wider than the average flame height before lighting the headfire.

## 9. Mop-up

After completing the burn, you are responsible for ensuring that the fire is completely out. One smoldering ember could start a wildfire. Check the burn area perimeter at least twice, making sure the fire hasn't escaped its boundaries. Cut down and extinguish any trees burning near the break. Drench all smoldering debris and hot coals with water. Water mixed with detergent will work even better to penetrate smoldering debris. Do not bury smoldering





Lawrence Duke

material, because it can burn for a long time underground. Make a final check one or two days later to make sure no fire has reignited.

When mop-up is complete, notify your neighbors and the agencies listed in your burn plan.

## 10. Evaluating Results

When the burn is over, you'll want to evaluate your work. Make a walking inspection of the burn area, and ask yourself: Did the burn meet its objectives? Was the operation safe and efficient? Were the firebreaks effective?

Make a record of the equipment, crew, weather conditions, burn operations, and seasonal timing of the burn to evaluate its effectiveness. A photo record of the area before and after the burn, as well as a year later, will improve your evaluation and make planning the next burn easier and more effective.

*A landowner evaluates the site of his successful prescribed burn. Next spring, this field will sprout lush new plant growth.*

## WORD OF WARNING

*Prescribed burning, like operating farm equipment or using chemicals to control vegetation, can be dangerous if improperly or carelessly done. You are liable for any damages or suppression costs that occur as a result of your prescribed burn, including fire damage and problems created by smoke. With these words of warning, bear in mind that if you take appropriate measures and precautions before, during, and after the burn, you can reduce the risks to a reasonable level.*



## Glossary

**Backfire:** A fire that burns into or against the wind. Often used to create a firebreak for a headfire.

**Backpack sprayer:** Small 5-gallon tank with a slide-action pump. Shoots a stream of water up to 20 feet.

**Bow and broom rakes:** Rakes used to sweep away combustible materials and extinguish small fires.

**Burn plan:** An outline of what landowners want to accomplish with prescribed burning, components of the burn, and how to measure the results of the fire. Often done with help from DNR staff.

**Disturbance:** Fire, wind, logging, tillage, insects, or other natural or human-caused factors that alter vegetation types such as brushlands or forests.

**Drip torch:** A hand-held device, used to light fires, that drips flaming fuel.

**Escape:** Fire outside the firebreak. Must be suppressed immediately.

**Firebreak:** A pond, road, plowed field, burned area, or anything else that stops a fire and contains it within the burn area.

**Fireline:** The advancing fire ignited along the firebreak moving across the burn area in a line or front.

**Flank fire:** A fire that moves at a 90-degree angle to the wind direction.

**Headfire:** A fast-moving fire that burns with the wind.

**Land management plan:** An outline of what landowners want to achieve with their land, how to achieve it, and how to measure the results of land-management activities. Often done with help from DNR staff or other land-management professionals.

**Mop-up:** The process of extinguishing all smoldering debris, such as logs and stumps.

**Plant succession:** In the absence of fire or other

disturbance, the gradual maturation of vegetation types such as grasslands maturing into brush, or brushlands maturing into forest.

**Prescribed burn:** Fire applied to a specific area of land under selected weather conditions to accomplish predetermined, well-defined management objectives.

**Swatter:** A piece of non-combustible material, such as a truck mud flap, attached to a handle. Used to smother small grass fires.

**Wet sack:** Soaked burlap sack attached to a handle. Used to extinguish small fires.

**Wetline:** A firebreak made by dousing an area or line with water.

**Wildfire:** An uncontrolled fire that can threaten lives and property.



White-tailed deer use the lush grassy areas created by regular prescribed burns for hiding and resting.

Bill Marchel

## FOR MORE INFORMATION

Want to know more about how prescribed burning can improve your land? DNR Wildlife and Forestry staff can help you develop a safe prescribed burning plan for your property. They also can help you develop an overall land management plan. Some DNR offices have firefighting equipment you can borrow. For more information, contact the nearest DNR regional office.

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*This information is available in an alternative format upon request.*

**Cover photos:** Richard Hamilton Smith (flowers, cows)  
Bill Marchel (bluebird, sharp-tailed grouse)