

BEYOND THE BONFIRE:  
A PRIMER ON PRESCRIBED FIRE  
FOR VIRGINIA'S PRIVATE LANDOWNERS



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## INTRODUCTION

Many of the ecosystems found across Virginia's diverse landscape were shaped by the frequent presence of fire over thousands of years. Lightning was the primary source of ignition prior to the arrival of Native Americans, after which they themselves began to alter the Virginia landscape through the earliest form of what we now call "prescribed burning." The Native Americans used fire to clear dense vegetation for agriculture, establish villages, attract game, and promote specific plants they would use for food, basket-making, and other products. By the late 19<sup>th</sup> century, the logging industry was established throughout the South. Excessive logging, followed by wildfires fueled from logging debris, led to a lack of forest regeneration in many areas. Because of this, we began extinguishing all wildfires and halted the use of prescribed fire.

***Fire-adapted plants** are those that have adaptations that can withstand occasional fires without harming the plant. The large taproot of oak seedlings is an adaptation allowing them to easily re-sprout following a fire.*

***Fire-dependent plants** are those that require fire to complete part of its life cycle. Longleaf pine is a fire-dependent tree—fire helps the plant grow beyond the "grass stage" and limits competition for sunlight and nutrients.*

After nearly a century of suppressing fires on the landscape, natural resource professionals realized the negative impacts of "fire exclusion." Virginia's forests and grasslands are well-adapted to fire, with plant species that have survival or regeneration strategies that not only tolerate fire, but some may require it (fire-dependent). Some wildlife species depend upon these plants as well. As fire disappeared from the landscape, these fire-adapted plants and animals also declined. In an effort to reverse these trends, agencies have reintroduced fire to portions of public lands. While this is certainly a step in the right direction, much greater potential for habitat restoration exists on private land, as approximately 90% of Virginia is privately owned.

Efforts to educate the public on the benefits of prescribed fire and to encourage the use of prescribed fire on private lands are proving successful, as currently, many private landowners recognize the benefits of fire; however, many don't know where to begin when they consider implementing this important management tool on their properties.

The goal of this booklet is to make you aware of things you must consider before attempting a prescribed burn on your property. What are the laws regarding prescribed burning? How is a burn conducted? What tools are necessary to safely

conduct a burn? These topics and more are covered in the following chapters. After reading this, you may discover that prescribed burning may not be possible on your land or you may discover that prescribed fire may very well suit your situation. If, after reading this booklet, you want to learn more about prescribed burning on your own land, we highly encourage you to enroll in the Virginia Prescribed Burn Manager Certification Course, administered annually by the Virginia Department of Forestry. Additional state agencies and land management partners have also been offering “Learn and Burn” courses recently, which have been well-attended and well-received. More information on these courses can be found later in the booklet.

*Please note: this publication is not intended to be a substitute for training and experience!*

If you have additional questions after reading this booklet, please do not hesitate to contact any of the resources listed in a later chapter. We are here to help!



*Photo by C. Folks.*

## DEFINITION OF PRESCRIBED BURNING

First, let's make sure we define "prescribed burning." Prescribed burning is defined as fire that is applied in a skillful manner in a defined place, under appropriate weather conditions, to achieve specific results. Prescribed burning is much more than saying, "I think this could use a burn and today looks like a good day to do it," and then lighting a match. Let's break down the definition of prescribed burning further:

"Fire that is applied in a skillful manner..." This means you need to have training and experience. Attend lecture-based training sessions, but understand that all of the classes, online videos, blogs, and publications in the world can't substitute for getting out with someone who knows what they're doing and experiencing it firsthand. Aim to get some experience before lighting your own fire.

"...in a defined place..." Determine the exact area you intend to burn and the exact area you DO NOT want to burn. A good burn plan makes this clear, and make sure everyone involved in a prescribed burn clearly understands it.

"...under appropriate weather conditions..." Walking outside and thinking, "This looks like a good day to burn," doesn't cut it. Temperature, humidity, wind speed, atmospheric stability, and wind direction are all critical aspects to consider when conducting a prescribed burn, and all of these factors influence burn results. Plan ahead and define the weather parameters within which you want to burn.

"...to achieve specific results." You must determine your objectives for a burn beforehand. Reading an article that said "burning is good for quail" isn't a sufficient reason to burn. Burning is not the goal—it is a tool used to achieve a goal. A good burn plan should have specific objectives that are explicitly stated. Some example objectives could be, "to remove 90% of thatch, top-kill 50% of emerging hardwoods, and increase legume composition by 5%." The only way to get a good evaluation of how well a burn performed is to have specific objectives laid out at the start. If a burn didn't meet one or more of your objectives, you can then learn from it and adapt your plan for your next burn.



Now let's cover some of the laws and regulations regarding prescribed burning in Virginia. Commonly, the first questions we receive from private landowners when discussing prescribed burning involve legality and liability. Also, one or more of these laws or regulations may prohibit you from burning on your property at all.

The Virginia Department of Forestry (VDOF) is the legal authority for prescribed fire and wildfire in Virginia. Specific laws regarding fire under authority of VDOF can be found in **Title 10.1 of the Code of Virginia**. Additional information on penalties for negligence, fires set with malicious intent, and more can be found in **Title 18.2**.

### IS IT LEGAL FOR ME TO BURN ON MY OWN PROPERTY?

It sure is. The regulations laid out by the Virginia Department of Environmental Quality's State Air Pollution Control Board permit open burning. Per Virginia Administrative Code:

#### **9VAC5-130-40. Permissible open burning.**

**9. Open burning is permitted for forest management, agricultural practices and highway construction and maintenance programs approved by the board (see 9VAC5-130-50), provided the following conditions are met:**

- a. The burning shall be at least 1000 feet from any occupied building unless the occupants have given prior permission, other than a building located on the property on which the burning is conducted; and**
- b. The burning shall be attended at all times.**

### LEGAL DEFINITIONS REGARDING PRESCRIBED BURNING IN THE CODE OF VIRGINIA

Per §10.1-1150.1:

As used in this article unless the context requires a different meaning:

**"Certified prescribed burn manager" means any person who has successfully completed a certification process established by the State Forester under §10.1-1150.2.**

**"Prescribed burning" means the controlled application of fire or wildland fuels in either the natural or modified state, under specified environmental conditions, which allows a fire to be confined to a predetermined area and produces the fire behavior and fire characteristics necessary to attain planned fire treatment and ecological, silvicultural, and wildlife management objectives.**

**"Prescription" means a written statement defining the objectives to be attained by a prescribed burn and the conditions of temperature, humidity, wind direction and speed, fuel moisture, and soil moisture under which a fire will be allowed to burn. A prescription is generally expressed as an acceptable range of the prescription elements.**

### **PREScribed BURN ELEMENTS**

#### **§ 10.1-1150.4. Prescribed burn elements.**

**Prescribed burning shall be performed in the following manner:**

**1. A prescription for the prescribed burn shall be prepared by a certified prescribed burn manager prior to the burn. The prescription shall include: (i) the landowner's name, address, and telephone number, and the telephone number of the certified prescribed burn manager who prepared the plan; (ii) a description of the area to be burned, a map of the area to be burned, the objectives of the prescribed burn, and the desired weather conditions or parameters; (iii) a summary of the methods to be used to start, control, and extinguish the prescribed burn; and (iv) a smoke management plan. The smoke management plan shall be based on guidelines presented in the Virginia Department of Forestry publication, "Voluntary Smoke Management Guidelines for Virginia," and the U.S. Forest Service's technical publication, "A Guide to Prescribed Fire in Southern Forests." A copy of the prescription shall be retained at the site throughout the period of the burning;**

**2. Prescribed burning shall be conducted under the direct supervision of a certified prescribed burn manager, who**

**shall ensure that the prescribed burning is in accordance with the prescription; and**

**3. The nearest regional office of the Virginia Department of Forestry shall be notified prior to the burn.**

### **DO I NEED TO BE A CERTIFIED PRESCRIBED BURN MANAGER IN ORDER TO BURN ON MY OWN PROPERTY?**

The short answer is “no;” however, you are afforded some “protections” if you are a Certified Prescribed Burn Manager (discussed later). Certification is not mandatory to conduct burning in Virginia but highly recommended due to liability issues. §10.1-1150.2 authorizes the State Forester to establish a certification process for becoming a Certified Prescribed Burn Manager.

**The State Forester shall develop and administer a certification process and training course for any individual who desires to become a certified prescribed burn manager. The training program shall include the following subjects: the legal aspects of prescribed burning, fire behavior, prescribed burning tactics, smoke management, environmental effects, plan preparation, and safety. A final examination on these subjects shall be given to all attendees. The State Forester may charge a reasonable fee to cover the costs of the course and the examination.**

If you are a Certified Prescribed Burn Manager, be sure to always have a burn plan, notify the appropriate people prior to a burn, and burn within your prescription. Failure to do so can result in the revocation of your certification.

### **WHAT HAPPENS IF MY FIRE GETS AWAY?**

Per §18.2-88:

**If any person carelessly, negligently or intentionally set any woods or marshes on fire, or set fire to any stubble, brush, straw, or any other substance capable of spreading fire on lands, whereby the property of another is damaged or jeopardized, he shall be guilty of a Class 4 misdemeanor, and shall be liable for the full amount of all expenses incurred in fighting the fire.**



The keywords here are “carelessly, negligently or intentionally.” If you become a Certified Prescribed Burn Manager, prepare a complete and proper burn plan, conduct the burn within the parameters of the prescription, and it still gets away, it may not be considered “careless, negligent, or intentional.” Determination of carelessness, negligence, or intent will be made by the courts. Regardless, you will remain responsible for any associated costs of suppression.

§10.1-1150.5 discusses liability of a prescribed burn, and reinforces the legal benefit of becoming a Certified Prescribed Burn Manager:

#### **§ 10.1-1150.5. Liability.**

**A. Any prescribed burning conducted in compliance with the requirements of this article, state air pollution control laws, and any rules adopted by the Virginia Department of Forestry shall be in the public interest and shall not constitute a nuisance.**

**B. Any landowner or his agent who conducts a prescribed burn in compliance with the requirements of this article, state air pollution control laws, and any rules adopted by the Virginia Department of Forestry shall not be liable for any damage or injury caused by or resulting from smoke.**

**C. Subsections A and B of this section shall not apply whenever a nuisance or damage results from the negligent or improper conduct of the prescribed burn or when the prescribed burn elements described in §10.1-1150.4 have not been complied with.**

Regardless of whether you are a Certified Prescribed Burn Manager or not, the costs of any damages to another property resulting from an escaped fire may be claimed in a civil suit. For example, say you’re certified and have a fire escape which burns up a neighbor’s barn—you still may be liable for the damages to the barn and everything in it.

#### **LOCAL ORDINANCES AND OTHER CONSIDERATIONS**

Some local ordinances may supersede state laws and regulations, so be sure to check with your local government(s)

to ensure you are in compliance. Some counties may require a burn permit (which is different from a burn plan or Prescribed Burn Manager certification) prior to conducting a prescribed burn. Also be aware of local weather conditions and “red flag” days. Absolutely no burning shall occur on red flag days—when the danger of wildfire activity is extremely high!

## **PRESCRIBED FIRE INSURANCE**

“Prescribed fire insurance” is a real option for burners. The details of prescribed fire insurance are beyond the scope of this publication. More information on prescribed fire insurance can be found here:

<https://research.cnr.ncsu.edu/blogs/southeast-fire-update/insurance/>. Interested individuals should consult directly with the insurance company, organization, or a licensed professional attorney.

## **THE “4 PM BURN LAW”**

Per §10.1-1142(B):

**During the period February 15 through April 30 it shall be unlawful to burn before 4:00 p.m. or after midnight within 300 feet of woodland, brushland or field containing dry grass.**

**Doing so results in a Class 3 Misdemeanor, and you will be liable for all costs incurred by the Commonwealth in suppressing the fire. If your burn unit is a grass field  $\leq 10$  acres or a forest understory  $\leq 5$  acres, you do not need to apply for an exemption as these types of burns are small enough that they can be conducted after 4 PM.**

**You may apply for an exemption to burn during the 4 PM Burn Law period, but only if you are a Certified Prescribed Burn Manager and have a valid reason for burning within the 4 PM Burn Law period. Exemption applications must be submitted to the VDOF by February 1. Exemption applications must include VDOF Form 180 (the “exemption form”), a Burn Plan, Smoke Management Plan, Location Map, Tract Map, and a statement completely explaining why the burn needs to be accomplished during the exemption period. The reason**

**for exemption must complement the purpose AND fit within the guidelines set forth in the law, which are:**

- i. Control of exotic and invasive plant species that cannot be accomplished at other times of year;**
- ii. Wildlife habitat establishment and maintenance that cannot be accomplished at other times of year; or**
- iii. Management necessary for natural heritage resources.**

### **SUMMARY**

It is legal to conduct a prescribed burn on your own property in Virginia; however, if your burn area is within 1000 ft of an occupied building that is not on your property, you need permission from those occupants prior to burning.

You do not have to be a Certified Prescribed Burn Manager to conduct a prescribed burn; however, it is highly recommended that you become certified. Becoming certified not only provides you with a wealth of information and training through the certification course, it also provides you with some protections in case a fire gets away. If you are a Certified Prescribed Burn Manager, are conducting a burn within prescription, are attending/monitoring the fire at all times, and the fire gets away due to circumstances not within your control, you may not be charged for a Class 4 Misdemeanor, nor possibly be held liable for the costs of extinguishing the fire.

If a fire gets away and burns up another person's or entity's property, you may be liable for the costs of damages incurred regardless of whether you are a Certified Prescribed Burn Manager or not. It is recommended that you check your insurance policy regarding escaped fires prior to burning or consider purchasing prescribed fire insurance.

You may not conduct a prescribed burn before 4 PM from February 15 through April 30<sup>th</sup> unless you are a Certified Prescribed Burn manager AND have applied and been approved for an exemption. Only Certified Prescribed Burn Managers may apply for an exemption to burn during the 4



PM Burn Law period, and you need to have a valid reason why the burn can only be conducted during this period.



*Photos by E. Kallen.*

### SAFETY

Safety should be your number one priority when conducting a prescribed burn. If any part of your burn plan is even a tad unsafe, re-think your plan. Make sure “your people” are safe, and don’t forget about the safety of those who could be impacted by smoke. As with all types of burning, take safety precautions to prevent a wildfire. Burning without a plan or proper assessment could lead to loss of property. The best burn plan is the safest burn plan!



*Photo by J. Folks.*

### SMOKE

The first thing most folks worry about regarding prescribed fire is the fire itself and the possibility of it escaping onto a neighbor’s property. While this is certainly justifiable, one of the most important (and often overlooked) considerations of prescribed burning is the smoke that is produced by the fire. Smoke can cause visibility issues on roadways and around airports. It can also lead to health problems for those with respiratory issues, especially young children and the elderly.

*Smoke-sensitive targets (SSTs) are places where visibility and/or respiratory issues caused by smoke are of significant concern.*

Before considering a burn, identify potential “smoke-sensitive targets” (SSTs) in the area. Examples of SSTs include, but are not limited to: schools, airports, major roadways, hospitals, and retirement communities. If SSTs are present within 20 miles of your burn unit, they could potentially be impacted by smoke—burn on days when winds are not forecast to blow in the direction of those SSTs. If SSTs are within 10 miles of your burn unit, special caution is necessary in order to conduct the burn. An entire course can be taught on smoke management, but for the sake of this publication, just know that there are certain weather conditions and firing techniques that affect smoke production and dispersion.



*Signs help notify people that the fire is intentional and is being attended.*  
*Photo by J. Folks.*

Firebreaks don’t control smoke. Few people are likely to see the flames of your fire, but the smoke will be much more visible. You’ll always want to notify the local emergency dispatch before starting the fire so they are aware of what’s going on before getting a bunch of calls. Additionally, if the fire will be near a well-traveled roadway, it’s a good idea to put up some signs to notify passersby that the fire is intentional and attended. If the fire is near a highly-populated area, you may want to reach out to a local news outlet to let

them know of a potential burn so they may relay that information to the public.

## FUELS

In prescribed fire jargon, “fuel” refers to the plant material that will burn within a burn unit. Examples of fuels include grass, pine needles, hardwood leaves, limbs, and large woody debris. Each type of fuel will burn differently, with different points of ignition, rates of consumption (by the flames), smoke production, and heat production. Knowing the fuels in your burn unit and how they burn is important for developing your burn plan.



*Grasses are considered **fine fuels**. They dry quickly, burn rapidly, and generally produce less smoke. A mat of dead fescue (left, photo by J. Folks) will have low flame lengths and burn very slowly. Standing grasses like switchgrass and big bluestem (right, photo by E. Kallen) have much greater availability of oxygen, causing them to burn rapidly with longer flame lengths and a LOT of heat.*



*In hardwood stands with little understory vegetation, hardwood leaf litter burns relatively slowly and produces more smoke than grasses (left). When a forest understory contains shrub-like vegetation, like young pines, cedars, and mountain laurel (right), fire conditions can change dramatically. Scouting the fuels in your burn unit and understanding their potential fire behavior impacts is critical when planning and executing a burn. Photos by J. Folks.*

## TOPOGRAPHY

Simply put, flat areas are much easier to burn than steep areas. If your burn unit has complex topography (i.e., steep ridges facing different directions), prepare to have a complex burn plan.

## SEASON OF BURN

One of the main questions many landowners and fire managers often ask about prescribed burning is, “When is the best time of year to burn?” This will vary depending upon specific land management goals. Timing will also depend upon when the burn can be accomplished safely and under favorable weather conditions.

Burning in different seasons produces different results. Fall or winter burns, also known as dormant season burns, tend to be more controllable. Dormant season burns reduce understory debris, lessen wildfire hazard, and replenish necessary soil nutrients. Burning during the dormant season puts less stress on pine trees; however, it is not as effective in controlling hardwoods.

Spring and summer burning, also known as growing season burning, can have greater impacts on encroaching hardwoods. These fires tend to burn hotter due to drier understory fuels and higher ambient temperatures, which normally results in improved control of young hardwoods (especially with late summer burns). Unlike pine trees, many hardwoods have thinner bark, which makes them less resistant to scorching and more susceptible to being killed by fire (especially smaller diameter trees). A higher intensity growing season burn is more likely to kill larger diameter hardwood trees and other woody underbrush.

Some folks are often concerned that growing season burns may negatively impact ground-nesting birds. While these burns can destroy nests, research suggests the benefits of prescribed burning outweigh potential nest loss. Furthermore, recent studies have shown that when small blocks are burned, ground-nesting birds quickly return and use the burned areas. Late summer burns (August/September) are most effective at controlling hardwoods and boosting forb (wildflower) abundance, and most, if not all, nesting has been completed by

this time; however, good burn windows are hard to find this time of year due to moisture and humidity levels.

*A growing season burn conducted in September 2019 on the George Washington and Jefferson National Forest. Although a slow-moving burn (this 327-acre unit burned over several weeks!), this burn should be much more effective at meeting the management objectives, which are to “restore and maintain semi-open, fire-adapted yellow pine and oak heath communities, with a focus on shortleaf/pitch pine restoration.” Photos by J. Moncure.*





## HOW ARE PRESCRIBED BURNS CONDUCTED?

A prescribed burn begins months (sometimes years) before a match is lit. The general process of a prescribed burn is as follows: evaluate existing conditions, develop a burn plan, and construct firebreaks (as necessary). You'll also need to prepare and check your equipment prior to the burn. Once a plan is developed, firebreaks are in place, and equipment is acquired, weather forecasts must be monitored to determine when desired conditions will be achieved. When the weather looks favorable for a good burn day, final equipment preparations are made, fuel conditions are evaluated (i.e., are the fuels dry enough to burn, or are they too dry?), and the burn crew is notified. On the day of the burn, appropriate authorities are notified (local Emergency Operations Command, VDOF Regional office, etc.) and the burn crew goes over the fire plan in detail. A test fire is lit first to observe fire and smoke behavior and, if all is well, the crew proceeds to carry out the burn plan. On every burn, there is one person in charge—the “burn boss.”

### FIREBREAKS

The purpose of a firebreak (also referred to as a fireline or control line) is to prevent the spread of a fire and contain it within the area you want to burn. Firebreaks must be devoid of flammable material, and wide enough to prevent fire from easily jumping across. Firebreaks are often plowed or disced so that a strip of bare soil surrounds the burn unit. Firebreaks should be at least 8 feet wide, but wider is better. Firebreaks may also consist of other natural or man-made barriers, such as streams, rock slides, or roads. In a hardwood forest setting, leaf blowers may be used to create a strip of bare ground around the burn unit.





*An example of a plowed firebreak along the edge of a hardwood burn unit. Photo by J. Folks*

Vegetated firebreaks are those that have been planted. One such firebreak is called a “green firebreak,” where the strip is planted in a mixture of clover (usually) which stays green and lush in the spring when many burns are conducted. Green firebreaks are mowed frequently to keep them low and lush, and the best ones are sprayed occasionally to keep grasses from establishing—grass thatch may promote fire creeping across the line. For extra insurance, green firebreaks are often sprayed with water just prior to ignition, often referred to as a “wet line.”



*This “green firebreak” bisects a hardwood burn unit. It is mowed periodically to prevent fuel from accumulating. Photo by J. Folks*

Another type of vegetated firebreak is one that is planted into an annual crop of some sort and serves as a “linear food plot.” The firebreak is planted into a desirable mixture, allowed to go to seed, then remains fallow until the next burn. When it’s time to burn again, the firebreak is plowed to mineral soil, the burn occurs, and then the plowed area is seeded again.

*After tilling, this firebreak was planted with partridge pea, a native, annual legume, to provide food and cover for bobwhite quail. When this firebreak is disced again prior to the next burn, the discing will help the partridge pea re-seed itself. Photo by J. Folks.*



If prescribed fire is part of the long-term management plan for an area, consider establishing permanent firebreaks around the burn unit prior to the first burn. While it may cost more time and money initially, these permanent firebreaks are easier to maintain, provide easier property access, and greatly reduce the cost and effort of subsequent burns.

## **BURN EQUIPMENT**

There are all sorts of gadgets, gizmos, vehicles, and tools you *could* use for prescribed burning, but you don’t need them all. Necessary equipment for successful prescribed burning falls into the following categories: ignition, suppression, communications, weather monitoring, and health/safety. For this booklet, we’ll cover the basics for each category.

## Ignition

### Drip torch

A drip torch is the most commonly used prescribed fire ignition tool. A drip torch is a double-walled metal canister that holds a mixture of diesel fuel and gasoline. A metal fuel line leads to a synthetic wick, which, when covered in the diesel/gas mix, remains lit for some time. When the drip torch is pointed downward, fuel mix comes out of the nozzle and is ignited by the wick. The ignited fuel mix burns slowly and remains burning when it hits the ground, aiding the ignition of plant material. The gasoline in the mix helps it ignite, while the diesel fuel helps it burn longer. Fuel mixtures are typically in the range of 3:1 (75% diesel, 25% gasoline) for warm weather burns, to 2:1 (67% diesel, 33% gasoline) for cold weather burns. It's recommended to mix torch fuel by adding diesel to a fuel can first in case you add too much—it's better to err on the side of too much diesel than to add too much gasoline.



*Drip torches  
awaiting  
employment. Photo  
by E. Kallen.*

### Fusees

Fusees are essentially road flares. Fusees, when ignited, burn at very high temperatures for about 10 minutes or so, allowing you to ignite plant material by hand during that time. While they can be effective at lighting plant material on prescribed burns, they are often only used as a back-up to drip torches because of their one-time use and increased risk of burning one's self.

## Suppression

### Fire rakes and other hand tools

*A spot fire, is a small spot of fire outside of the burn unit.*

Fire rakes are different from your typical yard or garden rake. Fire rakes have larger “teeth” that are often sharpened to help cut through roots. The larger teeth also help prevent the rake from being clogged with debris. Fire rakes are meant for scratching out a firebreak by hand (also called a “hand line”) around small spot fires or in places that are inaccessible to equipment.

A fire swatter or “flapper” is another hand tool used to extinguish small fires. The flap of rubber-treated belting is attached to the end of a wooden handle and is used to smother small flames. These are particularly useful when fire is trying to creep slowly across a vegetated firebreak or when there is a small spot fire in an area of short vegetation (like a lawn). These are NOT useful against larger flames!

There are many other hand tools that are used for prescribed burning or wildland firefighting to dig, cut, and/or scrape. These include the Pulaski, McLeod and the Rogue hoe.

### Water acquisition and delivery

Water is an absolute necessity for prescribed burning, so you’d better have a way to acquire it and use it. For water delivery on foot, you could use backpack garden sprayers (make sure there are no traces of other chemicals in them from previous use!) or bladder bags. Bladder bags are flexible water containers you wear as a backpack that have a hand pump at the end of a hose line.



*Backpack sprayers like bladder bags (left, photo by M. Puckett) or those with hard plastic tanks (right, photo by J. Folks) are both useful for extinguishing small spot fires.*





Vehicle-mounted water tanks with pumps and hoses are extremely handy on prescribed burns. The vehicles allow you to respond to problems quickly (as long as you can access them), and they allow you to carry much more water than you could on your back. While ATVs and UTVs can reach areas that trucks cannot, exercise extreme caution when operating ATVs and UTVs when loaded with water—the added weight makes them much more dangerous as they are more likely to flip or roll over.



*This UTV rig is equipped with a water tank, pump, and hose reel, making it a highly mobile suppression vehicle. UTVs can also haul personnel, fire tools, and drip torch fuel.*

If you don't have a well nearby, you'll either need a way to store back-up water or a way to acquire additional water. A large holding tank full of water on-site allows you to refill smaller tanks and bladder bags as needed. If there is a stream, pond, or other water body nearby, a gasoline-powered pump can be used to refill tanks as needed or a hose can be attached to help fight fire directly from the pump.

Be sure to have PLENTY of water available for a burn and always have it ready to use. Have tanks filled and pumps primed before you start the fire to ensure that no time is lost if and when a problem occurs. Water is also critical for "mop-up" operations, which will be discussed later.

## Leaf blowers

Leaf blowers can be used to create an impromptu firebreak around small spot fires in forested settings. If you have fire trying to creep across a vegetated firebreak or have a spot fire in short vegetation like a lawn, the high velocity of wind produced by a leaf blower can actually blow the fire out like a candle; use caution when attempting this, because the leaf blower may also blow embers further away, causing additional spot fires. Try to blow it back towards the main fire or towards areas that have already burned (“the black”).



*Leaf blowers can be extremely handy on prescribed fires – from backpack style blowers to the pull-behind style in the photo above (photo by M. Kline) – for quickly creating a bare soil firebreak in leaf litter.*

## Chainsaw

*A **snag** is a standing dead tree. Old snags tend to be hollow and can easily ignite. Snags can act as chimneys and throw embers great distances. Felling snags prior to a burn reduces the risk of an escaped fire.*

A chainsaw isn't useful for extinguishing fires directly, but it is a critical piece of equipment to have when burning in a forest. It can help clear a path for a vehicle to access an escaped fire, and you can use it to cut down burning snags. Prior to a burn, you'll want to cut down any snags adjacent to a firebreak to prevent them from catching fire, falling across the firebreak, and causing an escape. A chainsaw is perhaps the most dangerous piece of equipment you may use on a prescribed burn. Consider taking a chainsaw certification course; although you may have operated a chainsaw your



entire life, you'll most likely learn something from taking the course that could save your life.

## Heavy equipment

If you have access to a bulldozer, have it on standby. A bulldozer can be used to create a firebreak around an escaped fire, push over burning snags, and more. In addition to bulldozers, a tractor with a plow and/or disc can be used to create impromptu firebreaks in open fields.



*This bulldozer is equipped with a fire plow at the rear. Bulldozers are obviously useful for creating firebreaks before a burn, but are handy to have on-site during a burn in case a fire escapes and new lines are needed. Bulldozers can also be useful during mop-up activities, and can be used to push over burning snags.*

## Communications

Clear communication amongst crew members on a prescribed burn is critical to make sure everyone stays safe and does what they're supposed to do. On a very small burn of 1-2 acres, yelling to one another may be sufficient. On larger burns, you'll need quicker and more effective means of communication.

### Hand-held radios

Even though everyone has a cell phone, don't rely on them for communication on a burn! Some people may not have service, and some may not hear their phone ring. It takes time for the person calling to dial a number and additional time for the recipient to answer—precious seconds that may make or

break a successful and safe burn. Hand-held radios are the way to go for direct communication amongst crew members. Make sure everyone has a radio and that they all function on the same frequency so everyone can be a part of the conversation. Test the radios a few days before the anticipated burn to ensure they work—if not, it gives you time to buy new batteries, charge batteries, or buy new radios.

## Weather Monitoring

In addition to watching the local weather forecasts, you'll want to monitor the on-site weather conditions before and during a burn. Forecasts apply to larger areas than your burn unit, so your on-site weather could be a bit different than the forecast. Being able to monitor the weather at your burn site allows you to make the call to shut down a burn if conditions become unsafe or out of prescription. Weather information acquired during the burn can also help you evaluate and learn from the burn later. On every burn, one person should be designated to monitor weather conditions and provide hourly updates to the rest of the crew.

### Belt weather kits

A bit old-fashioned now, belt weather kits (called such because you can wear the case on your belt) are effective weather monitoring tools. A belt weather kit includes a thermometer, wind meter, compass (for determining wind direction), a sling psychrometer (for measuring relative humidity), and a notebook for recording weather conditions.



*Digital weather meters are convenient and easy to use. Photo credit: Kestrel Instruments*

### Hand-held, digital weather meters

Hand-held, digital weather meters have replaced most belt weather kits due to their size, convenience, and ease of use. There are many types and models of these units—be sure to get one that, at a minimum, reads temperature, wind speed, and relative humidity.

## Health/Safety

The safety and well-being of burn crew members should be the top priority. Be sure to have plenty of water and snacks available for the crew. Dehydration is a major concern when burning—drink adequate amounts of water before, during, and

after a burn is completed. Make sure crew members have water and snacks with them at all times; it never fails that if you leave your food in the truck, you will be on the fireline on the opposite side of a burn when you get hungry.

Ensure there is at least one first aid kit on-site the day of the burn to treat any minor injuries and know how to address any major injuries that may occur. Common injuries/conditions experienced during prescribed burns include skin burns, dehydration, insect bites, cuts (from minor to major), sprained ankles, broken bones, and vehicle roll-overs. Know how to respond to any one of these issues.

Have phone numbers and addresses of local hospitals for serious but non-emergency injuries/conditions.

### **Personal Protective Equipment (PPE)**

Nomex is a fire-resistant material from which shirts, pants, jackets, and packs for wildland firefighting are made. It is standard issue for wildland firefighters and agency personnel who conduct prescribed burns. It's not cheap, but if you can afford a Nomex outfit, get one. At a minimum, ALL clothing (shirts, pants, jackets, even socks and underwear) should be made from natural fibers (wool or cotton). While natural fibers are flammable, they can at least burn off of your body. Synthetic fibers like polyester have a much higher ignition point than cotton and will melt to your skin before they ignite, causing more serious burns and injuries to your body.

At an absolute minimum, all burn crew members should have the following personal protective equipment (PPE) when conducting a prescribed burn:

- All clothing made of natural fibers
- Leather gloves
- All-leather boots (Preferably 8" tall or more to protect the ankle. No steel toes!)
- Safety glasses, sunglasses, or goggles

If burning in a forest stand, it is highly recommended that each person wears a hard hat to prevent potential injuries from falling limbs and trees.



*A member of a firing crew with preferred PPE: hard hat, eye protection, Nomex clothes, leather gloves, and leather boots. Agency personnel are also required to carry a fire shelter with them at all times. Photo by H. Ritchie.*

Everyone should know how to contact local emergency responders on the day of the burn. If there is no way to contact emergency responders from the burn site, make sure everyone knows a hospital location and the quickest route to get there.

Have vehicles on-site to help transport crew members to and from the burn area and to different points along the fireline to help prevent exhaustion. These same vehicles should carry first aid kits, water, and food so that crew members can “refuel” when needed. Keep cars and trucks at a staging area away from the burn site so they are safe from the burn but can be easily accessed in case of an emergency.

## **FIRING TECHNIQUES**

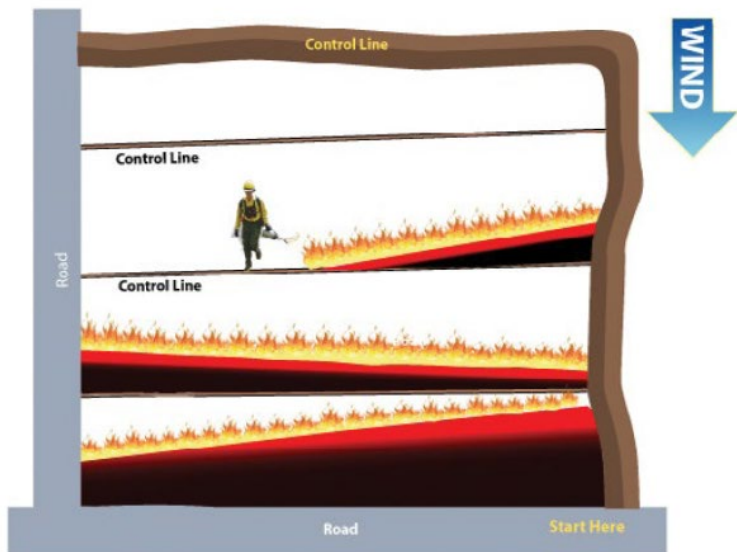
There are several different methods of igniting and completing a prescribed burn, often referred to as “firing techniques” — each has their own utility, fire effects, and list of pros and cons. The most-commonly-used firing techniques are as follows:

### **Backing fire**

*Residence time refers to the amount of time the hot part of a flame burns in one place.*

A backing fire is a fire that moves against the wind or downslope. Fire wants to burn with the wind and upslope, so a backing fire moves relatively slow. Because of its longer residence time, the fuel burns more completely, thereby

producing less smoke. A prescribed burn is typically initiated with a backing fire from a firebreak on the downwind side of the burn unit in order to create “black” and increase the effective width of that firebreak.



*Backing fire. Image from USFS Publication SRS-054*



*The wind in this photo is blowing from left to right, as indicated by the flames and smoke, while the fire is burning from right to left (against the wind). This is a backing fire. Photo by M. Kline.*

## Head fire

The opposite of a backing fire, a head fire moves with the wind or upslope. A head fire can move very rapidly and get quite intense, producing a lot of heat. In forests, head fires may cause crown scorching and kill overstory trees. Due to its speed, a head fire doesn't burn as completely as a backing fire and produces much more smoke. In prescribed burning, head fires are typically reserved for the very end of a burn to "wrap things up" once most of the burn unit is black.

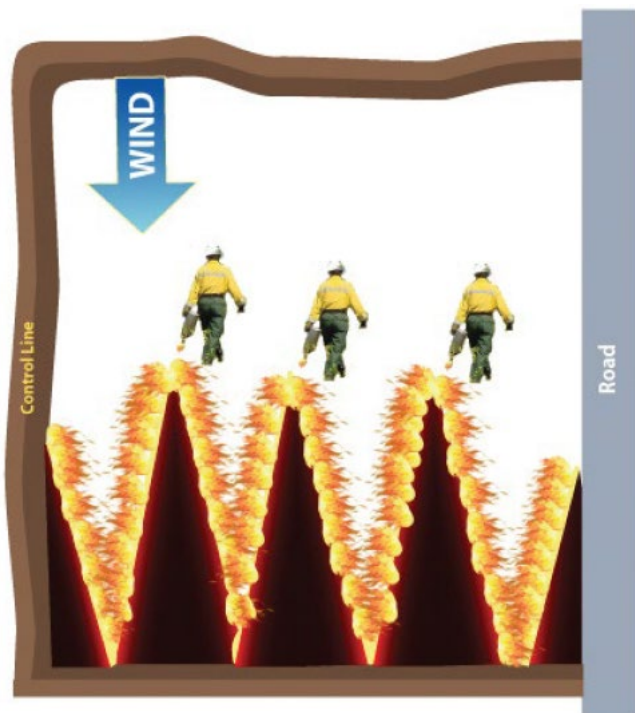


*A head fire burns with the wind. This produces greater flame lengths and moves more rapidly across a burn unit. Head fires typically burn less completely and produce more smoke, even in fine fuels like this grassy field. Photo by L. Koontz.*

## Flanking fire

A flanking fire is ignited parallel to the wind direction. Often, a flanking fire is ignited along the "flanks" of a burn unit to continue creating "black" after a backing fire has commenced. In some cases, flanking fire may be used to ignite an entire burn unit after the initial backing fire. A flanking fire moves more quickly than a backing fire but is slower than a head fire.



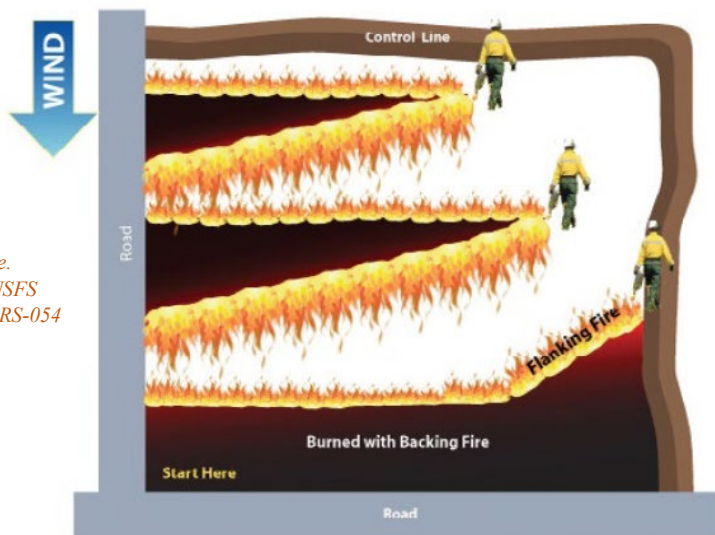


*Flanking fire.  
Image from USFS  
Publication SRS-054*

### Strip head fire

A strip head fire is ignited in strips perpendicular to the wind direction. The strip sequence begins on the downwind side of the burn unit and progresses upwind. Each subsequent strip burns into the one created before it, thereby putting itself out. Strip head fires help speed up the progress of a burn, and the intensity of the fire is managed by the distance between strips (the further apart the strips, the more intense the fire gets).

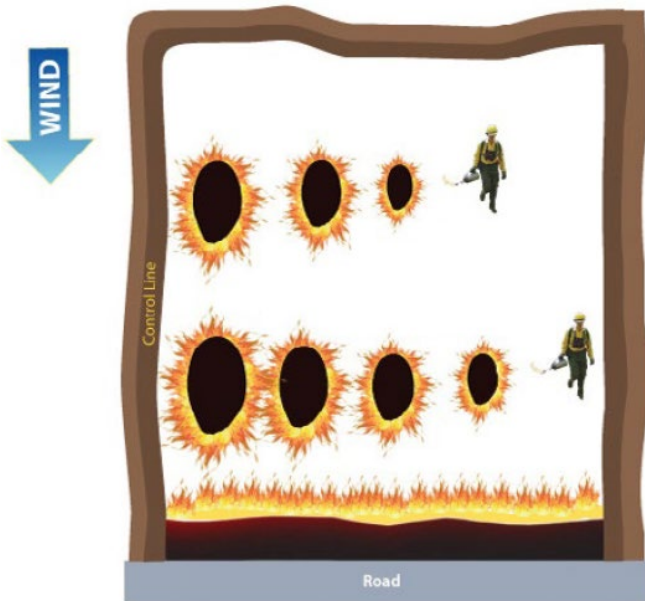
*Strip head fire.  
Image from USFS  
Publication SRS-054*



*Strip head fires being used to burn off dead grass. A backing fire was lit first on the downwind side of the burn unit (right side of this photo), then strip head fires were lit within the burn unit in sequence so the downwind igniter is not in danger of the head fire behind them. Photo by C. Stover.*

## Dot/Grid ignition

Dot ignitions simply involve creating spots of fire within a burn unit. Dot ignitions are typically performed in a grid pattern (why they're sometimes called grid ignitions), and can help speed up the progress of a burn. With dot ignitions, you get a mosaic of backing fire, flanking fire, and head fire throughout the burn unit, and dots burn out when they run into another dot. Dot ignitions save a great deal of drip torch fuel, and fire intensity is managed by the distance between dots (the further apart the dots, the more intense the fire gets).



*Dot  
ignition.  
Image from  
USFS  
Publication  
SRS-054*

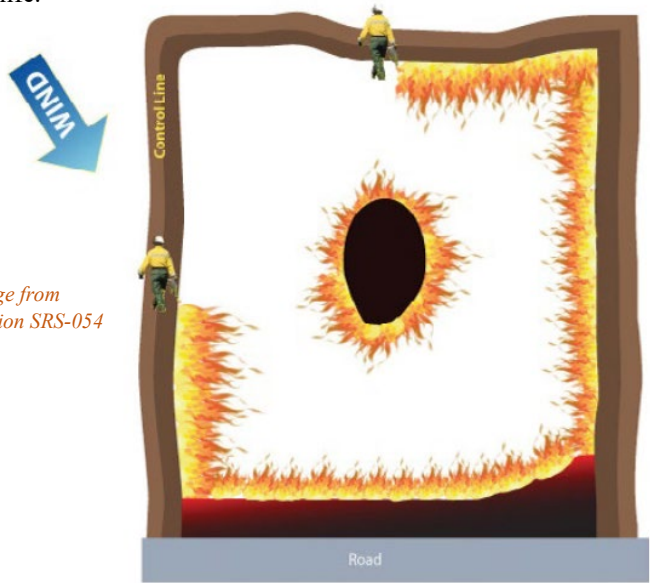


*Dot ignitions burning into one  
another in a pine understory.  
Photo by M. Kline.*

## Ring fire

As the name suggests, a ring fire is created by lighting from each firebreak along the perimeter of the burn unit and allowing the ring of fire to burn inward. Sometimes, a spot is ignited in the very center of the unit before the outer ring is ignited. Ring fires can get very intense as the flame fronts approach the center of the burn unit due to the convective action the fire itself creates. Ring fires are also the most detrimental to wildlife, because it entraps those that are within the burn unit. Although it makes for a short burn, ring fires are rarely used in prescribed burning when managing for wildlife.

*Ring fire. Image from  
USFS Publication SRS-054*



*Left: A ring fire is lit in a small patch of native grasses. As the flames converge in the center of the ring (right), the convective energy of the fire causes a dramatic increase in fire intensity. Photos by J. Folks.*

## **Chevron**

Although a fancy term, chevron ignitions are quite simple. This technique has the most utility in the mountains where you have more complex topography, like steep ridges and hollows. Because fire likes to “run” uphill, it’s safest to ignite off of the ridge top and let it back downslope. As the igniter progresses along the ridge top lighting a strip or dots, the fire pattern behind him/her forms a chevron, hence the name. Chevron ignitions help speed up the progress of burns in complex terrain. Care must be taken to ensure that igniters do not get ahead of one another and cause head fires that could entrap someone else.

## **MOP-UP ACTIVITIES**

Just because you’re finished igniting doesn’t mean the job is done. As soon as your burning objectives are completed (note: patchy burns are good for wildlife!), “mop-up” begins. Simply put, “mop-up” means patrolling the firelines at least one more time, ensuring nothing has escaped, and extinguishing everything that is burning or smoldering within 50 feet of the firebreak. Do everything it takes until there is no smoke left in that 50 ft area—cut, scrape, spray, bury—because if it’s still smoking, it can still ignite. If you find burning snags within your burn unit, it’s a good idea to go ahead and fell them with your chainsaw or push them over with a bulldozer. A hollow snag can act like a chimney and throw embers far into the air. You want to leave the burn unit assured that if the wind picked up overnight, fire wouldn’t carry into places you don’t want it.

## **PLANNING THE BURN**

As mentioned previously, a prescribed burn really begins months, if not years, before ignition. A well-thought-out plan is critical to the success and safety of a prescribed burn. The planning process typically begins by creating a map of the area, evaluating the current site conditions, and developing a list of management objectives. Keep in mind: prescribed burning is only one potential tool that may be used to achieve management objectives—other tools may be better options. If you’ve never burned before, reach out to someone with training and experience to help you. There’s no substitute for experience when it comes to writing burn plans.

## Writing a Burn Plan

If prescribed fire is determined to be the best management tool for the job, start looking for Smoke-Sensitive Targets (SSTs) within 20 miles of the site. Recall that **if there is an occupied building within 1000 ft of the burn unit, you'll need permission from those occupants to burn.** If there are SSTs in the area, determine which wind direction you'll need to keep smoke away from the SSTs. Lay out where your firelines must be constructed (if none are present) and begin developing the plan of ignition. Each firing technique will have a different impact on smoke production, the accomplishment of your objectives, and the number of crew members required to complete the burn.

*Safety zones are places where there is zero risk of being injured by flames, such as a bare logging deck, bare crop field, or parking lot.*

*Escape routes are the routes laid out to reach the safety zones from a given point.*

Identify nearby water sources—if none are present, plan how you will acquire and store water at the burn site. Identify or create “safety zones,” and the “escape routes” which will lead crew members to them. The number of people required to execute the burn will depend on a number of factors, including the plan of ignition, length of fireline, complexity of the burn, size of the burn, and the number of vehicles available. There really is no “rule of thumb” for how many people you need—this is a case where experience plays a huge role; typically, the more vehicles you have, the less people you need because vehicles can more quickly cover increased acreage. Keep in mind, though, that vehicles may break down or get flat tires.

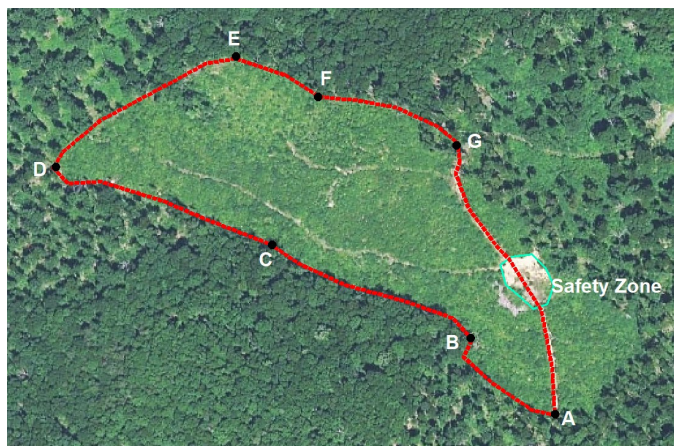
For a prescribed burn, you'll need to determine which individual will serve as burn boss. A burn boss is THE person in charge and should do nothing except monitor the burn and provide instruction on how to conduct the burn safely and successfully (i.e., “the conductor doesn't play an instrument at the concert”). A good burn boss should have plenty of experience in that role—if this is your first burn, get help from an experienced burner and/or VDOF personnel. You'll also need to designate one person to monitor the weather for the duration of the burn. Hourly updates are usually sufficient, and the “weather person” can help patrol areas in between weather updates.

Determine what types of equipment you'll need and how much of that equipment will be used based on the number of people required to complete the burn. For example, if the ignition plan calls for 4 igniters and 8 people patrolling the



fireline, make sure you have at least 4 drip torches, plenty of fuel mix, at least 1 hand tool (such as a fire rake) for each patroller, and at least 14 hand-held radios (4 igniters, 8 patrollers, 1 fire boss, and 1 weather person). Have extra batteries for radios, extra torches, extra hand tools - extra everything. If things go south on a burn, there's no time to run to the store.

Create a map of the burn area and identify and label critical points on the map (e.g. water sources, safety zones, ignition patterns, and other points of significance like where igniters start or stop). The map should be easy to read and understand by anyone participating on the burn.



*Take the time to prepare a good map of the burn unit to distribute to the crew. Clearly label safety zones and other points of interest to help keep communication clear and concise. For example, "Begin ignition at Point A, and bring fire to point B." Be sure to label nearby water sources, if available.*

Determine the weather conditions under which you'll want to burn in order to meet your objectives. When writing a burn plan, weather prescription parameters are typically listed as a range of values. After these weather parameters are written in the plan, these are now your prescribed weather conditions you'll be looking for in the weather forecasts. If you burn outside of your prescription, you risk having your certification revoked.

The official burn plan is written on [VDOF Form 4.9](#), the "Virginia Department of Forestry Prescribed Burn Management Plan." Fill out all information completely and don't forget to include a map of the burn area, as well as a map showing SSTs in the vicinity. If you are applying for an

exemption to the 4PM Burn Law, an official burn plan, burn map, and an SST map are required.

## **THE DAY OF THE BURN**

The stars have aligned and it's "showtime." Hopefully, all of your crew members arrived on time, you made equipment checks and fueled vehicles the day before, and everything is operational. Your first step on the "big day" should be to contact your regional VDOF office and notify them of the burn. Next, contact your local Emergency Operations Command (A.K.A., County/Town Dispatch) and inform them of the burn. Display signs along roadways to notify passersby that the fire is prescribed, intentional, and there's no need to report it to authorities.

Once everyone has been notified, it's time to discuss the burn plan with the burn crew. EVERYONE involved with the burn needs to be present, go over the burn plan, and clearly understand it. Each member of the burn crew should have a map and a copy of the burn plan on them at all times. If there are any questions about the plan, clear them up before the fire is lit.

Once everyone is clear on the plan, perform radio checks, test water pumps, fill drip torches, and prepare extra drip torch fuel. When everything and everyone is ready to go, ignite a "test fire" to evaluate how well the fuels are burning, how the smoke is dispersing, and how the winds are behaving. A test fire is lit at the same point you will begin the main burn. If the test burn is satisfactory, proceed in carrying out the burn plan.

During the burn, the burn boss should keep a written record of time, events, and conditions. This documentation may be important should you run into problems and your actions are scrutinized. This information may also be useful in evaluating fire effects and planning future burns.

An example “burn log”:

*BURN LOG - John Smith Rx Burn, 02/10/2020*

*1000 - weather - temp 76, RH 40, wind SW 7  
(gusting 9), clear sky*

*1010 - notify DOF*

*1015 - notify county dispatch*

*1030 - test fire @ northeast corner (point X)*

*1100 - weather - temp 80, RH 35, wind SW 8  
(gusting 10), 20% cloud cover*

*1130 - downwind ignition complete on north side  
of unit*

*1140 - spot fire @ NW corner (3ft x 5ft),  
extinguished*

*1200 - interior ignition - strip headfires, 100 ft  
spacing*

*1300 - ignition complete*

*1500 - mop-up complete*

*A fire crew goes  
over the burn plan  
for the day. Photo  
by J. Folks.*



Entire courses are taught on “fire weather,” but for the sake of this booklet, we’ll introduce you to the weather factors you need to monitor when planning and conducting a prescribed burn.

### **SURFACE WINDS**

As the name suggests, surface winds are the winds present at the Earth’s surface. Surface winds are officially measured at 20 ft above the average height of surrounding obstructions. If you are burning in a forest stand or a brushy field, wind speeds at ground level (called “in-stand winds”) will be less than the official surface winds due to the obstructions. While wind can make a fire burn faster and hotter, having no wind at all can cause problems. Light winds tend to shift frequently, making fire management difficult. Light winds also do not disperse smoke as needed and heat does not dissipate (which may cause crown scorch in trees). You want to have sustained winds of a consistent direction for a prescribed burn. In-stand winds of 1 to 3 miles per hour (measured at eye level) are preferred for most fuel and topographic situations. For a fairly dense canopy, this would require 20-foot wind speeds of at least 10 miles per hour (for more open conditions, a minimum 20-foot wind speed of 6 miles per hour would be sufficient).

### **TRANSPORT WINDS**

Transport winds are often reported as part of a smoke management section within a forecast and represent the average wind speed and direction from the ground up to the mixing height (discussed below). Transport winds are well above Earth’s surface and can carry smoke long distances.

### **INVERSIONS AND MIXING HEIGHT**

The region of the atmosphere adjacent to the ground typically has thermally-driven eddies that mix atmospheric conditions. This is referred to as the mixed layer. This mixed layer is often capped by an inversion (a stable layer in the atmosphere that limits vertical motion). The mixing height is defined as the distance from the ground to the base of this inversion. Inversions act as barriers and limit the vertical mixing of smoke within the atmosphere. In short, the greater the mixing height, the better conditions you’ll have for dispersing smoke.





*Above: A low mixing height “caps” the smoke from this fire and inhibits its dispersion.*

*Below: The smoke from this fire disperses well into the atmosphere and is indicative of an increased mixing height and a less-stable air mass. Unstable air works better for dispersing smoke, but fire behavior intensifies. Stable air keeps fire behavior relatively calm, but is less desirable for smoke dispersal. Photos by M. Kline.*



Night-time inversions require special consideration. As the ground surface cools at night, it also cools the adjacent

atmosphere and gradually builds an inversion at the surface. This can enable lingering smoke to remain at ground level, creating a dense fog that can create respiratory and visibility issues.

## RELATIVE HUMIDITY

Relative humidity (RH) is not an exact measure of the amount of moisture in the atmosphere, but is a relative expression of the moisture content compared to the saturation value for a given temperature and pressure. The lower the relative humidity, the more rapidly fuels will dry and ignite.

Generally, for every 20°F increase in temperature, the RH is decreased by half. For every 20°F decrease in temperature, the RH is doubled. The preferred range in RH for most prescribed burns is between 30 and 55%. On the lower end of this range, prescribed burning can become dangerous as fire intensities increase and fine fuels quickly dry to a point where they may be ignited by embers landing outside of the burn unit. Realize that 30% RH first thing in the morning could become 15% in the afternoon.

## TEMPERATURE

Air temperature is an often-overlooked factor of prescribed fire, but it may impact burns greatly. Higher temperatures may lead to crown scorch in desirable tree/shrub species within the burn unit and can dry fuels more quickly. For first-entry burns, it's generally a good idea to burn when temperatures are cooler as fuel loads are typically high. Recommended air temperatures for first-entry burns and winter understory burns are those below 60°F. If your objective is to kill more woody species with a burn, higher air temperatures may be desirable so that you'll more likely achieve lethal foliage temperatures (about 140°F).

*First-entry burns refer to those being conducted for the first time in a given area (or at least there is no recent history of burning on the site). Because these areas haven't seen fire for a long time, accumulated fuels can cause intense burns.*

## CUMULATIVE SEVERITY INDEX

The Cumulative Severity Index (CSI) or Keetch-Byram Drought Index (KBDI) is a continuous reference scale for estimating the dryness soil and duff (the upper organic portion of the soil primarily composed of decaying and decomposing leaves and debris) layers. This system is based primarily on recent rainfall patterns.

The KBDI, specifically developed to equate the effects of drought with potential fire activities, is the most widely used system by fire managers in the southeastern United States. This mathematical system for relating current and recent weather conditions to potential or expected fire behavior results in a drought index number ranging from 0 to 800. This number accurately describes the amount of moisture that is missing: a rating of 0 defines a point of no moisture deficiency and 800 defines the maximum drought possible.

Prolonged droughts (high KBDI) influence fire intensity because more fuel is available for combustion (i.e. fuels have a lower moisture content). In addition, dry organic material in the soil can lead to increased difficulty in fire suppression. High KBDI values are an indication that conditions are favorable for wildfire occurrence and spread, but drought is not by itself a wildfire prerequisite. Other weather factors, such as wind, temperature, relative humidity and atmospheric stability, play a major role in determining actual fire danger.

These KBDI numbers correlate with potential fire behavior:

**0 - 200** Soil and fuel have a high moisture content. Most fuels will not readily ignite or burn. However, with sufficient sunlight and wind, cured grasses and some light surface fuels will burn in spots and patches.

**200 - 400** Fuels more readily burn and fire can move across an area without “gaps.” Heavier fuels do not readily ignite and burn. Smoldering and the resulting smoke might be expected to carry into and possibly through the night.

**400 - 600** Fire intensity significantly increases. Fire readily burns in all directions exposing mineral soils in some locations. Larger diameter fuels may burn or smolder for several days creating possible smoke and fireline management concerns.

**600 - 800** Fire burns to mineral soil. Stumps will burn to the end of underground roots and spot fires will be a major problem. Fires will burn through the night and heavier fuels will actively burn and contribute to fire severity.

For most prescribed burns, KBDI values should be between 300 and 400. This may vary based on your objectives.

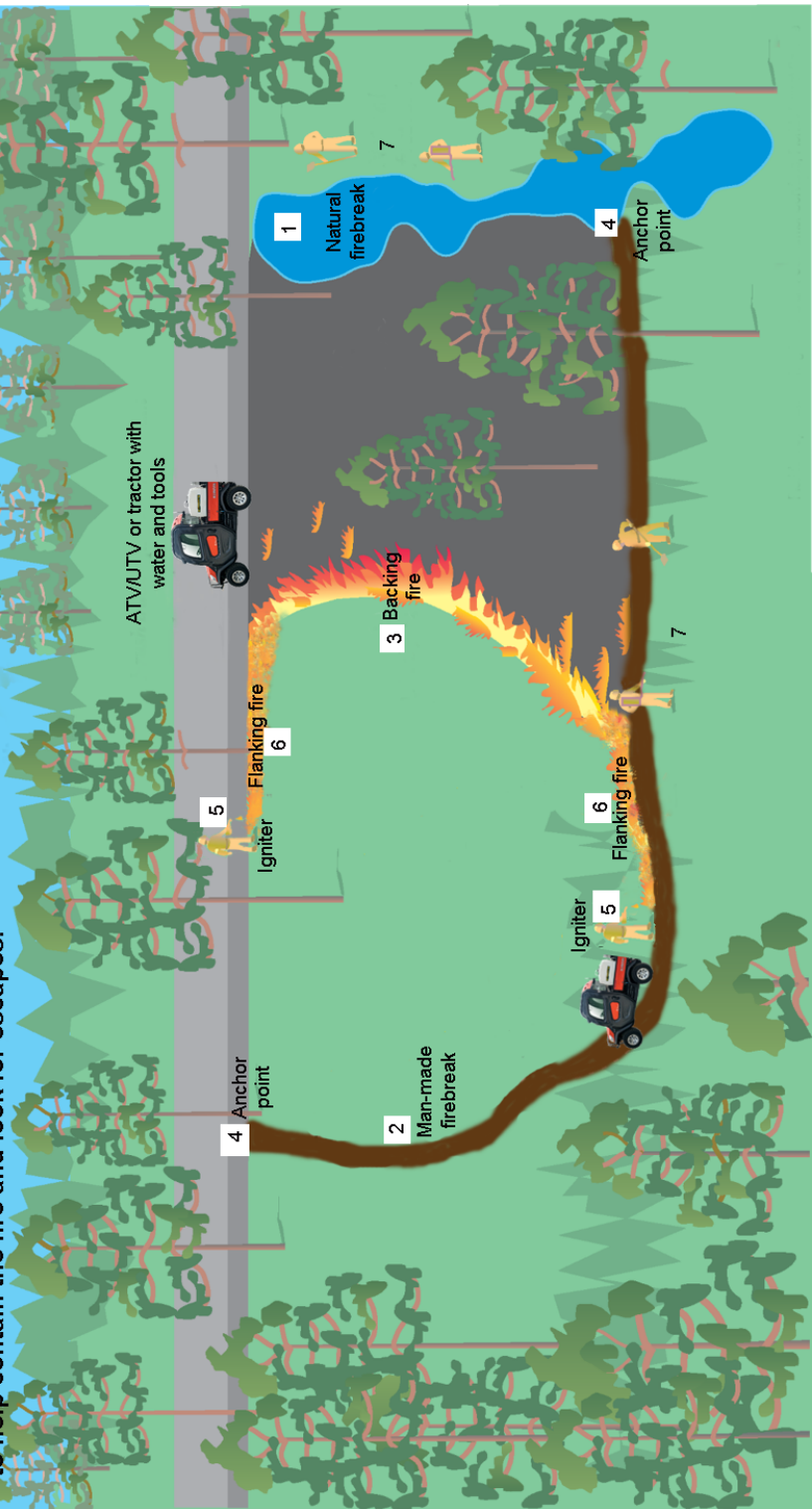
### **SHORT AND LONG-TERM FORECASTS**

In addition to the weather conditions on the day of the burn, it's important to consider recent weather history and extended forecasts. Precipitation, humidity, and temperatures within the last few days to weeks prior to a burn will have a big impact on fuel moisture content within the burn unit. If you are unable to measure fuel moisture content, recent weather conditions can help you decide whether fuels are too wet or too dry to burn. Three-day or extended weather forecasts are also important to consider to help reduce the risk of fire re-igniting and escaping the day(s) following the planned burn. Burning the day before the passage of a dry front can be dangerous because increased winds with no precipitation could cause large, smoldering fuels to ignite and throw embers across firebreaks. Pay close attention to weather conditions the night following the burn and be mindful of conditions that may cause inversions or other visibility issues if smoke is still present (for example, high dew points or fog forecasted).

## Anatomy of a Prescribed Burn

WIND DIRECTION

Prescribed burn managers use firebreaks, both natural (1) and man-made (2), from which they can ignite a backing fire (3) and keep it contained. All firebreaks must be anchored (4) or tied into an area that won't burn. Igniters (5) may employ other firing techniques, like flanking fires (6), to manage the burn. Other crew members patrol the fireline (7) to help contain the fire and look for escapes.





## RESOURCES

### TECHNICAL ASSISTANCE

Because they are the authority on prescribed fire in the Commonwealth, we encourage anyone who has questions about prescribed burning on their land to first contact the Virginia Department of Forestry (VDOF). Additional information, expertise, and input can be obtained from the Virginia Department of Game and Inland Fisheries (VDGIF), the USDA-Natural Resources Conservation Service (NRCS), and VDGIF-NRCS partner Private Lands Biologists (PLBs).

VDOF

[www.dof.virginia.gov](http://www.dof.virginia.gov)

VDGIF

[www.dgif.virginia.gov](http://www.dgif.virginia.gov)

NRCS

[www.nrcs.usda.gov/wps/portal/nrcs/site/va/home](http://www.nrcs.usda.gov/wps/portal/nrcs/site/va/home)

PLB Coverage Areas and Contact Info

[www.dgif.virginia.gov/quail/get-involved/private-land-biologist/](http://www.dgif.virginia.gov/quail/get-involved/private-land-biologist/)

You may also consider becoming a member of the Virginia Prescribed Fire Council (VPFC). The VPFC consists of prescribed fire experts and practitioners from all across the state and gathers annually to share knowledge and network. It is an excellent resource. For more information on the VPFC, visit <https://www.vafirecouncil.com>.

### FINANCIAL ASSISTANCE

Financial assistance for prescribed burns may be available from a variety of programs administered by various agencies. Each program and agency has different eligibility requirements, rules, and payments—if interested in financial assistance, we encourage you to reach out to VDOF, NRCS, or your local PLB to find out what program(s) you may qualify for.

## WEATHER FORECAST INFORMATION FOR PRESCRIBED BURNING

Detailed weather forecast information (including fire weather) can be obtained from the National Weather Service at [www.weather.gov](http://www.weather.gov). At the NWS home page, enter the zip code for your burn area and click “Go.”

The screenshot shows the National Weather Service (NWS) homepage. At the top, the NWS logo and the text "NATIONAL WEATHER SERVICE" are visible. Below this is a navigation bar with links: HOME, FORECAST, PAST WEATHER, SAFETY, INFORMATION, EDUCATION, NEWS, SEARCH, and ABOUT. A red circle highlights the "Locally Forecasted by" section, which includes a text input field for "City, ST or ZIP code", a "Go" button, and a link for "Location Help". Below the navigation bar, there is a headline "Locally Heavy Rainfall with Mountain Snows Out West" followed by a paragraph of text and a "Read More" link. On the left side, there is a "Customize Your Weather.gov" section with a "City, ST" input field, a "Remember Me" checkbox, and a "Get Weather" button. On the right side, there is a map of the United States with various colored regions. Below the map, there are links for "Active Alerts", "Forecast Maps", "Radar", "Rivers, Lakes, Rainfall", "Air Quality", "Satellite", and "Past Weather". At the bottom of the map, there are links for "American Samoa", "Guam", and "Puerto Rico/Virgin Islands".

Forecast information is given for your location on the next page. To get more detailed, hourly weather information (which is what you want), scroll down and click “Hourly Weather Forecast.”

### Detailed Forecast

Today	Sunny, with a high near 39. West wind around 9 mph.
Tonight	Mostly clear, with a low around 20. West wind 3 to 7 mph.
Thursday	Sunny, with a high near 38. Calm wind becoming southeast around 6 mph in the afternoon.
Thursday Night	A slight chance of freezing rain after 4am. Increasing cloudy, with a low around 24. Southeast wind around 5 mph becoming calm in the evening. Chance of precipitation is 20%.
Friday	Freezing rain before 10am, then rain. High near 39. Calm wind. Chance of precipitation is 80%.
Friday Night	Rain. Low around 35. Chance of precipitation is 90%.
Saturday	Showers likely. Mostly cloudy, with a high near 48. Chance of precipitation is 60%.
Saturday Night	A chance of rain and snow showers. Mostly cloudy, with a low around 35. Chance of precipitation is 30%.
Sunday	Mostly sunny, with a high near 44.
Sunday Night	Partly cloudy, with a low around 28.
Monday	A chance of rain. Mostly cloudy, with a high near 49. Chance of precipitation is 50%.
Monday Night	Snow showers likely. Cloudy, with a low around 32. Chance of precipitation is 70%.
Tuesday	Showers likely. Mostly cloudy, with a high near 47. Chance of precipitation is 60%.

### Additional Forecasts and Information

[2000-AREA FORECAST FOR AUGUST 10](#)  
[Forecast Discussion](#)  
[Printable Forecast](#)  
[Text Only Forecast](#)

[Hourly Weather Forecast](#)  
[Tabular Forecast](#)  
[Incardon Weather Briefing Page](#)

[Air Quality Forecasts](#)  
[International System of Units](#)  
[Past Weather Information](#)  
[Interactive Forecast Map](#)

[Home](#)

**Forecast Area**

**Point Forecast:** Staunton VA  
38.15°N 79.08°W (Elev: 1404 ft)

**Last Update:** 9:32 am EST Dec 11, 2019

**Forecast Valid:** 11am EST Dec 11, 2019-4pm EST Dec 17, 2019

[Forecast Discussion](#)

[RAW](#) [XML](#)

### Additional Resources

**Radar & Satellite Image**

**Hourly Weather Forecast**

On the hourly forecast page, you can select various weather parameters to be displayed on the hourly graphs. If you click any of the check boxes, be sure to click “Submit” afterward to update the graphs.

Point Forecast: Staunton VA  
38.15°N 79.08°W (Elev: 1404 ft)

Last Update: 9:32 am EST Dec 11, 2019

### Hourly Weather Forecast Graph

[\[dash&dot\]](#) [\[B/W\]](#) [\[hide menu\]](#)

**Weather Elements**

- ☒ Temperature (°F)
- ☒ Dewpoint (°F)
- ☒ Wind Chill (°F)
- ☒ Surface Wind (mph)
- ☒ Sky Cover (%)
- ☒ Precipitation Potential (%)
- ☒ Relative Humidity (%)

**Weather/Precipitation**

- ☒ Rain
- ☒ Thunder
- ☒ Snow
- ☒ Freezing Rain
- ☒ Sleet
- ☐ Fog

**Fire Weather**

- ☐ Mixing Height (x100ft)
- ☐ Haines Index
- ☐ Lightning Activity Level
- ☐ Trans. Wind (mph)
- ☐ Vent Rate (x1000 mph-ft)

48-Hour Period Starting: 11am Wed, Dec 11 2019

[Submit](#) [Back 2 Days](#) [Forward 2 Days](#)

Regional KBDI values can be found at <http://dof.virginia.gov/fire/sit-rep.htm>.

## **PRESCRIBED BURNING EQUIPMENT SUPPLIES**

We do not endorse or promote any particular supplier of prescribed burning equipment. The suppliers listed below are provided as examples.

Forestry Suppliers, Inc.  
[www.forestry-suppliers.com](http://www.forestry-suppliers.com)

The Supply Cache  
[www.supplycache.com/wildland-fire-gear/departments/370/](http://www.supplycache.com/wildland-fire-gear/departments/370/)

National Fire Fighter Corp.  
[www.nationalfirefighter.com](http://www.nationalfirefighter.com)

## **FURTHER READING**

2018. [NWCG Smoke Management Guide for Prescribed Fire](#). PMS 420-2.

2012. [Introduction to Prescribed Fire in Southern Ecosystems](#). USDA Forest Service Southern Research Station publication SRS-054.

Virginia Prescribed Fire Council website:  
<https://www.vafirecouncil.com>

VDOF Prescribed fire and smoke management page:  
[www.dof.virginia.gov/fire/prescribed/index.htm](http://www.dof.virginia.gov/fire/prescribed/index.htm)

## **PRESCRIBED FIRE CONTRACTORS**

<https://www.vafirecouncil.com/find-fire-contractors>

<https://www.dgif.virginia.gov/quail/additional-links/prescribed-burn-contractors/>

## **THE VDOF PRESCRIBED BURN MANAGER CERTIFICATION COURSE**

As mentioned throughout this booklet, there are several benefits to becoming a certified prescribed burn manager. The Prescribed Burn Manager Certification Course is hosted annually by the Virginia Department of Forestry at their State Office in Charlottesville. For more information on the course and to sign up for the next available one, contact Fred Turck at [Fred.Turck@dof.virginia.gov](mailto:Fred.Turck@dof.virginia.gov).

## **LEARN AND BURN COURSES**

“Learn & Burn” workshops provide an opportunity to gain hands-on experience with prescribed fire and learn from some of the best fire managers in Virginia and surrounding states.

These workshops can come in many forms, from combination classroom/field day events, to a full day (or even multiple days) in the field. Participants will learn more about fire safety, smoke management, firing techniques, and more... with a drip torch in-hand! These workshops serve as a great follow-up to the Certified Prescribed Burn Manager course, allowing participants to apply their classroom training in the field and become more comfortable with the process of prescribed burning.



## APPENDIX – GOAL-SPECIFIC BURN INFORMATION

Purpose	Time of Burn	Size of Burn	Type of Fire	Frequency	Remarks
Reduce fuels	Winter	Large enough to break fuel continuity	Not critical (Do not ring fire)	2-4 years	Use line-backing fire, or spot fires under moist conditions for initial burn. Grid-firing technique excellent for maintenance burns
Improve Wildlife Habitat					General- Protect transitional or fringe areas. Do not burn stream bottoms.
Deer Habitat	Winter preferred	Small or leave unburned areas in a mosaic	Backing or dot fires	2-4 years	Want to promote sprouting and keep browse within reach. Repeat summer fires may kill some rootstocks.
Turkey Habitat	Winter preferred; summer burns in July-August	Small or leave unburned areas in a mosaic	Backing fire or dot fires	2-4 years	Avoid April-June nesting season, if possible; however, hens will readily re-nest.
Quail Habitat	Usually late winter; growing season burns to manage against woody species	25-200 acres	Not critical (do not ring fire)	1-2 years	Avoid April-June nesting season, if possible; however, hens will readily re-nest. Leave unburned patches and thickets.
Dove Habitat	Winter	Not critical	Not critical (do not ring fire)	Not critical	Leave unburned patches and thickets.
Waterfowl Habitat	Late fall or winter	Not critical	Heading fire	2+ years	Marshland only. Do not burn in hardwood swamps.

<b>Purpose</b>	<b>Time of Burn</b>	<b>Size of Burn</b>	<b>Type of Fire</b>	<b>Frequency</b>	<b>Remarks</b>
Improve Forage for Grazing	Winter through late spring for most situations	Not critical but will be damaged by overuse if too small for herd	Not critical (do not ring fire)	3 years	Split range and burn one-third each year. Individual forbs and grasses respond differently to fire and season of burn. Consult expert.
Improve Accessibility	Will vary with understory and desired use	Varies with individual situation	Depends on amount of fuel present	As needed	Coordinate with other resource objectives. They will dictate size, timing, and frequency
Control Disease	Brownspot, winter	Depends on size of infected area. Include a buffer strip	Strip-heading or heading fire	2-3 years	Burn when humidity is above 50%. Avoid leaving unburned pockets of infected seedlings within or adjacent to burn.
Perpetuate Fire-dependent Species	Varies with species	Will vary but usually fairly small	Varies with fuel conditions and species	Varies with species	Fire intensity, timing, and frequency all dictated by species requirements
Young Pine Stands (other than longleaf pine)	Winter	Varies with stand size	Backing Fire	2-4 years	Pine diameter 3 inches or more at ground. Pine height above 10 ft. Burn only after a strong cold front with rain.
Control competing vegetation	Heavy roughs in winter; otherwise, not critical	Not critical	Not critical (do not ring fire)	2-8 years	Summer burns result in higher rootstock kill and affect larger stems.

<b>Purpose</b>	<b>Time of Burn</b>	<b>Size of Burn</b>	<b>Type of Fire</b>	<b>Frequency</b>	<b>Remarks</b>
Dispose of Logging Debris	Not critical	Small areas mean fewer nighttime smoke problems	Strip head fire preferred		Smoke management is a must! Take care not to damage soil or water resources with these hot fires. If a broadcast burn will not meet objectives, pile debris- do not windrow
Prepare Sites for Pine Seeding	Natural Seeding, summer to early fall prior to seed fall	Large enough to prevent concentrations of birds & rodents (usually 10+ acres)	Not critical (do not ring fire)		Be careful not to kill seed trees. If logging debris present, manage your smoke.
	Direct seeding, fall to late winter for spring sowing. Previous winter for fall sowing of longleaf pine	Large enough to prevent concentrations of birds & rodents (usually 10+ acres)	Not critical (do not ring fire)		If logging debris present, smoke management is a must! Take care not to damage soil or water resources with these hot fires.
Prepare Sites for Planting Pines	Growing season for hardwood control	Large enough to prevent concentrations of rodents (usually 10+ acres)	Not critical		If logging debris present, smoke management is a must! Take care not to damage soil or water resources with these hot fires.