

Considerations for Prescribed Burning: TOOLS & SAFETY GEAR

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What You Will Need - Equipment

Prescribed fire is one of a suite of tools used to manage landscapes to achieve specific management goals. Safety in using prescribed fire is of utmost importance. To conduct a safe and effective prescribed fire requires not only a burn plan and clear lines of communication, but also the right equipment and a crew who know how to safely use that equipment and employ the correct firing techniques.

Equipment for Safety

Equipment falls into several categories: personal safety gear, fire ignition, fireline construction, and suppression gear.



1 Personal Safety

Personal protective equipment (PPE), protects workers from thermal and other hazards while burning. PPE includes eye protection, leather boots and gloves, a fire resistant hard hat, respiratory protection, and natural underlayers. The use of PPEs is of great importance; radiant heat and smoke can cause death or severe injury.

Thought fire resistant clothes (e.g. Nomex) are preferred, at a minimum, anyone on the fireline should wear clothing of natural fibers (e.g. denim, cotton, etc.). No synthetic materials should be worn near a fire!

Hardhat\$25 – \$50

Protects against embers, radiant heat, and falling debris, and tools. Made of lightweight fire resistant material.

Goggles\$25 – \$100

Protect against smoke, embers, ash.

All Natural Underlayers\$25 – \$100

Absorb and insulate. T-shirts made of plain 100 percent cotton without screen-printing. Also flannel, wool, or denim layers.

Radio\$50 – \$100

Provides two-way communication. (Most problems during a burn can be contributed to a breakdown in communications.)

Flame Resistant Shirt and Pants\$70 – \$300

Absorb heat and resist burning and melting; Nomex or Indura Cotton.

Leather Gloves\$15

Withstand the rigors of prescribed burning. Leather is a good, tough insulator.

Leather Boots without steel toes\$100 – \$500

Withstands wear, insulates. Steel toes increase danger of burning skin as the steel toes can heat up fast and while hold heat against the toes longer, causing severe burns to occur.



Fire
Ignition
2

Drip Torch..... \$120 - \$250

Drip torches are specially designed and manufactured hand-held fuel reserves used to ignite the fire. They consist of a fuel reservoir, a valve to control fuel flow, and a specially manufactured pipe that delivers fuel to the igniter without allowing fire to flash back into the reservoir. When the drip torch is tilted, fuel will run out across a burning wick and drip onto the ground to ignite the material to burn. Drip torches come in a variety of shapes and sizes but generally use a diesel-gas mixture. The mixture should be a 4:1 ratio diesel to gas. The diesel provides a longer burning material that “sticks” to the material intended to be burned while the gas provides the rapid combustion to help the diesel fuel burn.

Rake \$20 - \$100

All personnel should carry a hand tool on the fire. A heavy rake is an effective ignition device, as it can be used to pull / spread burning materials.

Fusee..... \$150 for 72 flares

Fusees are lightweight flares (similar in nature to road safety flares) that are used to light fuels between the fire and fireline. When using a Fusee, the flame must be held in contact with the fuel until the fuel sustains the fire. Fusees come in four different burn times (5, 10, 15, and 30 minutes) and are most effective when burning dry fuels in a small area. Wet fuels generally cannot maintain a flame and should be lit by other means.

Several different types of ignition sources are available.

CAUTION

Lighting a Fusee can be dangerous when lit improperly. Always ignite the Fusee by pulling it across the rough surface of the starter in a motion that is away from the handler’s face. Once the Fusee is working, never look directly into the bright light or inhale the smoke. Also, Fusees can spontaneously ignite when temperatures are above 375°F, and, as a result they should be stored in a cool, dry, locked location.



Council Rake.....\$35

Flapper.....\$50

McLeod.....\$60

Garden Rake.....\$35

3 Firebreak Construction

In order to interrupt the movement of a fire and control the extent of the burned area, firebreaks ("firelines") are commonly constructed by hand. Firebreaks are breaks in the fuel source made by cutting, scraping, or digging to expose mineral soil. In forested settings, backpack air blowers can be used to expose a two to three foot swath of mineral soil. Firebreaks also can be created with heavy machines (bulldozers, plows, etc.), but difficult terrain can limit places where this machinery can operate. Most situations in the Midwest do not warrant using such heavy pieces of equipment. Common farm machinery (disks, chisel plows, etc.) can create perfect mineral soil firebreaks and can be used if farm fields border the burn area.

Common Hand Tools

A wide variety of tools can be used to create a fireline. The most typical tools include axes, hoes, leaf blowers, lawn mowers, rakes, and shovels. Axes are used to cut through limbs, clear logs, and clear debris. Hoes cut through sod and small roots. Leaf blowers blow away loose debris and can put out a backing fire. Lawn mowers cut excess grass to expose low growing green grass. Rakes are used for leaf, brush, and debris removal, and shovels are used to dig out roots, logs, and smoldering fires. Flapper/swatters are used to smother burning embers by cutting the oxygen source.

Axe.....\$40 - \$50

Cuts through debris and roots.

Hoe.....\$25 - \$35

Creates firebreaks by scraping away grass to expose soil.

Pulaski.....\$10 - \$70

(Combination grub hoe and axe) Removes debris and constructs firebreaks.

Shovel.....\$25 - \$55

Removes dirt and other debris for firebreak construction.



Mechanical Tools

Mechanized firebreak construction tools come in four basic forms: bulldozer, tractor-disc, dozer-plow, and mechanical chipper. Bulldozers have a front blade to remove logs and debris, clearing away all burnable vegetation that exposes an 8 to 12 foot swath of mineral soil. Tractor-plows are mounted either directly to the back of a large dozer or wheeled tractor-skidder and are pulled through the soil. These plows create a furrow of mineral soils and are often used in timbered areas because they do less damage, and a three-foot furrow can effectively stop most fires in timber understories. Tanker-plows have a dual purpose of spraying water as they scrape or plow a firebreak. New skidloader-mounted chippers can be used to clear and construct firebreaks. These chippers are carbide-tipped drums that chip and shred a path through the timber, exposing a four to eight foot swath of mineral soil.



Forestry mower to create firebreak in existing woodlands



Prepared firebreak in grass using 6' disk



Dozer mounted V fire plow

Prepared by: Jesse Randall, ISU Extension forester, and Ryan Harr, Assistant Scientist II, Natural Resources Ecology and Management. Related publications can be found on the ISU Extension Forestry web page at www.forestry.iastate.edu or at the ISU Extension Store at www.extension.iastate.edu/store. Search for publications PMR 2088A, Developing a Prescribed Fire Burn Plan, PMR 2088C, Why, When, and When Not to Burn, PMR 2088D, Smoke Management for Prescribed Burning, and PMR 2088E, Ignition Techniques. Materials listed are suggested safety items; many good substitutes are available. Original material adapted from Randall and Haley Frater. Printed in cooperation with Iowa Dept. of Natural Resources Forestry Bureau and US Forest Service.

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4 Suppression Equipment

Weather conditions that change or other unforeseen events can require that a fire be put out. Several tactics can be used, but the objective remains the same—to eliminate one of the three elements needed for a fire to burn (oxygen, heat, fuel source). Many of the hand tools used for fireline construction can be used to put fires out, but some equipment is specifically designed for fire suppression activities.

Indian Pumps and Bladder Bags.....\$100 – \$175

Indian Pumps and Bladder bags are portable backpacks that hold 4-5 gallons of water. They have a hand pump that can deliver a straight stream of water or a wide angled mist to control small fires in areas that are inaccessible to larger equipment. These small units are well worth the price and are one of the most used pieces of equipment during controlled burns. Replacement parts can be ordered for these pumps as the hand pump seals will wear out in time. Remember to aim the stream of water at the base of the flame to knock it out.



Water Tanks for Trucks and ATVs.....\$1,000 – \$5,000

Adequate water supply is always crucial when controlling a fire. Water tanks can be mounted to the back of pickup trucks, ATVs, and tractors. To facilitate movement in and out of vehicles, select tanks made from lightweight materials such as fiberglass or plastic. To avoid damage to the vehicle, stay within the recommended cargo weight when filling water tanks. The example at the right is an ATV mounted tank, pump, and hose reel for off-road fire suppression.

Commercially available units can fit in the back of a pick-up truck. Such units consist of a high-pressure pump, hose reel, tank, and external hose ports. These units have the capacity to draft pump out of a water source to provide continuous water. The minimum pump capacity should be 60 gpm at 125 psi. Pumps range in price from \$4,000 for basic units to \$25,000 or more for professional rigs.



ATV mounted tank, pump, and hose reel for off-road fire suppression.

Hoses.....\$40 – \$500

Dependable hoses also play a role in fire control. Characteristics to consider include diameter, length, and material. Given the working pressures associated with modern pumps, hose diameter should be no less than three-fourths inch. Hose lengths can be a minimum of 50 feet, with longer lengths necessary for larger burn areas and steeper slopes. The most reliable hose materials include rubber reinforced with synthetic fibers and metal mesh.

- 50 ft Hose
- 3/4" diameter..... \$40 – \$50
- 1" diameter..... \$60 – \$225
- 1 1/2" diameter..... \$90
- 2" diameter..... \$150 – \$200
- 100 ft Draft Hose
- 2" diameter..... \$300 – \$500



Nozzles.....\$50 - \$500

Nozzles control the amount and direction of water. The most effective nozzles will adjust for volume and output pattern: straight, stream, spray, and fog. A typical agricultural nozzle is appropriate for small fires and for constructing wetlines or firebreaks. However, for large area burns with the possibility of large flames, select a high volume nozzle that can deliver a minimum of 6 gpm at a pressure of 125 psi. This combination enables personnel to stand a safe distance away and place water on the fire to reduce the intensity and spread.

