

Key Concepts Regarding Prescribed Fire

by Steven Smith, Wildlife and Fisheries Consultant

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Fire is an important process in the ecology of most native plant and animal communities, especially in uplands. Most plant and animal communities in the Great Plains and eastern forests evolved with fire. In many situations, land managers can use prescribed fire to manage native plant communities, wildlife habitat, woody encroachment, forage quality and wildfire risks. This fact sheet highlights items that a land manager new to prescribed fire should consider when learning to use and implement prescribed fire. This fact sheet is intended to serve as a starting point for prescribed fire education and training. Beginning burners should attend prescribed fire educational and training events and assist an experienced burn boss multiple times prior to conducting his/her first prescribed burn.

Information needed on a prescribed burn plan:

- **Contact information** – Landowner and burn boss (person in charge of the prescribed burn) contact information is needed in case local authorities have questions about the burn.
- **Burn unit** – Physical and legal description, driving directions and map for the burn unit (area to be burned) are needed to assist local authorities in finding the property in case their assistance is needed. This helps the burn boss plan the burn and helps the burn crew become familiar with the burn unit. The description also should include brief information about the plant community, fine fuel loads and topography.



Prescribed fire is used to maintain or improve native rangeland.

- **Objective(s)** – Common objectives include brush management, fine fuel and thatch reduction, forage quality improvements, and wildlife habitat improvements.
- **Equipment and labor** – Equipment needed includes sprayers, drip torches, drip torch fuel, chainsaw(s), protective clothing, communication devices, etc. Adequate labor should be present to safely and effectively conduct the burn.
- **Ignition plan** – Ignition plan(s) describe the ignition sequence for the burn and define the role and responsibility of the burn crew(s).
- **Dates and times** – Burn dates and times give local authorities and burn crew a timeframe for when the burn will be conducted and how long ignition of the burn is expected to take.
- **Weather** – Weather prescription is used to define the acceptable range of wind speeds, wind gusts, wind directions, air temperatures, relative humidities and atmospheric conditions. Include a range of each parameter to create a prescription for a safe and effective burn.
- **Firebreaks** – Firebreaks define the boundary of the burn unit, define ignition point(s) and help to contain fire within the burn unit. Firebreaks and their preparation are described.
- **Smoke management plan** – Smoke management plan defines any smoke-sensitive areas near the burn and the acceptable range of wind direction(s) and atmospheric conditions for smoke management purposes.
- **Authority and neighbor contact information** – Local authorities' ►

and neighbors' contact information is used to notify them before the burn is conducted and if emergency assistance is needed.

- **Escaped fire and contingency plans** – Escaped fire and other contingency plans inform the burn crew of an action plan if the fire escapes, injuries occur or equipment fails.
- **Mop-up procedure** – Inform the burn crew of how and where to address burning and smoking material after ignition is complete.

Weather requirements during a burn:

- **Wind** – Winds from a consistent direction, ranging from 5 to 20 mph, including gusts, are needed to safely direct the fire in a dependable direction at a manageable speed.
- **Relative humidity** – Relative humidity (RH) is the measurement of the amount of moisture in the air. During a burn, RH should remain above 30 percent for many prescriptions. As RH drops, the risk of spot fire increases.
- **Air temperature** – Air temperature above 33 degrees Fahrenheit is necessary to keep water in sprayers from freezing, which reduces the ability to use sprayers.
- **Atmospheric mixing conditions** – Good atmospheric mixing conditions are necessary to disperse and dilute smoke as it travels away from the burn unit.
- **Weather forecast source** – Reliable forecast (National Weather Service, OK-Fire, Weather Underground, etc.) is necessary to determine whether or not the burn should be conducted, plan the direction that fire will travel and predict how fire will behave during the burn.
- **On-site weather** – On-site weather can be monitored with hand-held weather kits such as the Kestrel Weather Meter.
- **Post-burn weather** – Post-burn



A Kestrel Weather Meter is used to monitor on-site weather during a prescribed burn.



Strip fires are used to widen the blackline.

weather should be monitored. Many times, weather conditions exceed the acceptable range for the weather prescription the day after a burn was conducted. If this is forecasted to occur, extra attention during the mop-up process should be given to the side where an escape fire could originate.

Fire types:

- **Backfire** – A fire that backs into unburned fuel against the wind. This is generally the slowest, coolest and easiest to control of the types of fires. The technique is often used to establish adequate firebreaks around a target area.
- **Flank fire** – A fire that is burning



Crew and equipment begin the backfire of a prescribed burn.



A bare soil firebreak is constructed adjacent to a mowed strip, which reduces fire intensity next to the firebreak.

the backfire or flank fire.

Firebreak information and guidelines:

- **Purpose** – Firebreaks serve as the boundary of the burn unit and facilitate ignition. Firebreaks decrease the likelihood of a fire escaping the burn unit.
- **Coarse and volatile fuels** – Coarse and volatile fuels (described in next section) should be moved away from firebreaks, where possible.
- **Types** – Firebreaks can be bare soil (tilled, dozed or bladed), roads, water features (ponds, rivers, etc.), blacklines (area pre-burned), topographic features (gravel pits, cliffs, etc.), lush green vegetation, raked/blown/mowed leaf litter in timber, or mowed/grazed short grasses combined with wet lines.

Fuel information and guidelines:

- **Fine fuel** – Fine fuels primarily include grasses and tree leaves. They are the primary fuels that carry a fire across the burn unit.
- **Coarse fuel** – Coarse fuels are fuels that burn for more than a few minutes such as logs, brush piles and snags (standing dead trees).
- **Snags** – Snags near a firebreak are often the source of embers or fire brands that can ignite a spot fire. Snags near a firebreak should be cut down or not allowed to ignite during the burn. Hollow burning snags and hollow burning live trees that catch fire are often called Roman candles.
- **Volatile fuels** – Volatile fuels contain compounds such as oils and waxes that cause them to burn with greater intensity (e.g., Eastern red-cedar, greenbrier, blackberry and weeping love grass). Large amounts of coarse or volatile fuel may require a highly skilled burn crew, wider firebreaks and/or extra fire suppression equipment. ▶

perpendicular to the wind into unburned fuel. The relative intensity of this type of fire is between that of a head fire and a backfire. Flank fires are also used to establish adequate firebreaks around a target area.

- **Head fire** – A fire being pushed by the wind into unburned fuel. This is

the fastest, hottest and most difficult to control of the types of fires.

- **Strip fire** – A fire used to increase the width of blackened areas around a target area by igniting small head fires upwind of the backfire. Strip fires can range from several feet to several hundred feet upwind from

- **Fuel load** – Fuel load is the amount of plant material in a burn unit, commonly expressed as pounds per acre. Sufficient fuel loads allow burns to occur under more diverse weather conditions and provide greater impact such as woody plant reduction.

Burn frequency and timing:

- **Frequency** – Burn frequency varies depending on goals, objectives and rainfall. As average rainfall increases, so can burn frequency.
- **Amount to burn** – Percentage of a property burned annually can range from 25 to 50 percent for common objectives. This too varies depending on goals and objectives.
- **Timing** – Prescribed burns can be conducted any time of year. Objectives of the burn commonly dictate when a burn is conducted. For example, if the burn unit is mostly deciduous woods, the burn typically should be conducted soon after the majority of leaves fall from the trees.

Topography information:

- **Topography** – Topography includes features of the land such as hills, gullies, creeks, bottomland, etc.
- **Influence on plants** – Topography can influence the type of plant communities growing in an area. Fire intensity, speed and behavior can be influenced by plant community type.
- **Influence on fire behavior** – Topography such as deep gullies or an opening in dense trees can influence wind direction and speed, which could cause fire to behave erratically. Fire intensity and rate of spread increases when burning uphill; when igniting in steep terrain, ignition usually should occur while travelling downhill.

Equipment and labor requirements:

- **First-time burner** – Beginning



A 100-gallon skid unit used during a prescribed burn.



Crew member using a walkie-talkie to communicate with the rest of the burn crew.

burners should attend prescribed fire educational and training events and assist an experienced burn boss with several burns prior to conducting his/her first prescribed burn.

- **Burn boss** – An experienced burn boss (person in charge of the prescribed burn) is necessary to safely and effectively coordinate a

burn. This person is in charge of all aspects of the burn.

- **Labor** – Sufficient labor should be present on-site to safely conduct the burn; a minimum burn crew is two or more people.
- **Sprayers** – A minimum of two power sprayers with adequate water storage (always have one more



A drip torch is used to ignite a prescribed burn.



Smoke from a prescribed burn lifting up and away from the burn unit.

than you plan to use) is needed. Power sprayers usually are powered by combustion engines or tractors' power take-off shafts (PTO). Examples of power sprayers include fire trucks, skid units in trucks or on trailers, pesticide sprayers and PTO-driven sprayers with hand wands. ATV sprayers are useful but typically

lack the water pressure and volume to suppress fires in areas with high fine fuel loads.

- **Ignition devices** – Matches or a lighter and drip torches are needed to ignite and spread the fire during a burn. A drip torch usually is a 1.25-gallon canister with a handle and wick used to ignite fire along

the firebreaks. Drip torch fuel is usually a diesel and gasoline mixture with typically 50 to 75 percent diesel.

- **Hand tools** – Hand tools (chain saws, blowers, rakes, etc.) can be used to remove fuel in an area before a burn is conducted. Hand tools are also used to move smoking or burning fuel away from firebreaks during and after ignition.
- **Clothing** – Fire-resistant clothing (e.g., Nomex), 100 percent cotton or mostly natural fiber clothes, hat, boots, and leather gloves are necessary to protect the crew from extreme heat and burns.
- **Crew hydration** – Drinking water and possibly sport drinks are necessary to keep crew members hydrated while conducting a burn.
- **Communication** – Cellphones and often walkie-talkies are used to communicate with a crew and local authorities. Communication among the crew is critical. Sharing information such as crew locations, fire behavior and general updates assist a burn boss with managing a burn.

Smoke management guidelines:

- **Sensitive areas** – Keep smoke away from sensitive areas (public roads, homes, schools, towns, etc.). Smoke can cause health concerns and motor vehicle accidents, and it can damage sensitive equipment.
- **Weather forecast source** – Use reliable fire weather forecasting entities (National Weather Service, OK-Fire, etc.) to determine mixing height, atmospheric dispersion and Category Day.
- **Atmospheric mixing heights** – Mixing height is defined as the altitude (feet above the ground) at which smoke stops rising and levels off. Burn when mixing heights are at least 1,500 feet or higher. This allows smoke to rise above the surrounding area, to be carried away ►

and dispersed by the wind.

- **Atmospheric dispersion** – OK-FIRE defines atmospheric dispersion as “the ability of the atmosphere to dilute and disperse a compound such as smoke as it travels down-wind.” The Oklahoma Dispersion Model breaks down atmospheric dispersion into six categories: 1 (very poor), 2 (poor), 3 (moderately poor), 4 (moderately good), 5 (good) and 6 (excellent). Burn when atmospheric dispersion condition is moderately good to excellent.
- **Category Day** – The Category Day system is also used to predict smoke behavior. It is determined by the ventilation rate, which takes into account mixing height and transport wind speed. The Category Day system has five categories. They are 1 (poor), 2 (fair), 3 (good), 4 (very good) and 5 (excellent). Burn when the Category Day is good or better.
- **Smoke production** – Wooded areas produce more smoke for a longer time than grassy areas. Head fires produce more smoke than back or flank fires.

Laws, regulations and liability information:

Oklahoma guidelines

- **Strict liability state** – Oklahoma is a “strict liability” state, which means the one(s) causing a fire are civilly liable for actual damages. A burn boss and a landowner with a prescribed fire are responsible for damage caused by fire or smoke.
- **Adjacent landowners** – Adjacent landowners should be notified within 60 days of a burn.
- **Prescribed Burning Notification Plan** – Prescribed Burning Notification Plan should be provided to local authorities prior to a burn.
- **Local authorities** – The local authorities receiving the plan should be notified within 48 hours



Regrowth of a native rangeland site 64 days after a prescribed burn in southern Oklahoma.

prior to a burn.

- **Property right** – Burning agricultural land for management purposes is a property right in Oklahoma.
- **More information** – See “Notification Requirements and Considerations for Safe and Lawful Prescribed Burning in Oklahoma: Guidelines, State Law and the Burning Notification Plan,” available through the Oklahoma Department of Agriculture Forestry Services for more information.

Texas guidelines

- **Negligence state** – Texas is a “negligence” state, which means the one(s) causing a fire are presumed innocent until proven guilty.
- **Adjacent landowners** – As a courtesy, notify the adjacent landowners and the regional Texas Commission on Environmental Quality office.
- **Local authorities** – Notify local authorities (sheriff, fire department, etc.) before conducting a burn.
- **More information** – See “Outdoor Burning in Texas,” available through the Texas Commission on Environ-

mental Quality for more information.

Land Management Association benefits:

- **Goals** – Work together toward common goals such as using prescribed fire or improving wildlife habitat and populations.
- **Equipment and labor** – Can provide opportunities to share and pool equipment and labor to help each other.
- **Education and experience** – Can provide educational and experience opportunities for members.

Impacts of prescribed burning:

- **Plant community health** – Maintains health of fire-dependent native plant communities.
- **Brush management** – Reduces brush encroachment by top killing trees and brush (kills live plant tissue above the ground). Kills most Eastern red-cedar and Ashe juniper smaller than 4 feet tall when adequate fuel load is present.
- **Wildlife habitat** – Can improve wildlife habitat by promoting forage



Prescribed fire being used to maintain native rangeland in southern Oklahoma, in the top and bottom photos.

availability and palatability, desirable plants, reducing thatch (past years' plant growth), increasing plant species diversity and invertebrates, etc.

- **Forage production** – Improves forage quality by eliminating old plant growth and promoting new plant

growth higher in nutritive value.

- **Wildfire reduction** – Temporarily reduces wildfire risks by removing accumulated fine fuels.

For additional educational material:

- The Samuel Roberts Noble Foundation Inc.
- Prescribed Fire Community of

Practice

- Oklahoma Prescribed Burn Association
- Prescribed Burn Alliance of Texas
- Oklahoma Cooperative Extension Service
- Southern Fire Exchange
- Texas A&M AgriLife Extension
- Texas A&M Forest Service
- Oklahoma Forestry Service
- Oak Woodlands and Forests Fire Consortium
- Great Plains Fire Science Exchange

Where can I find further assistance?

- The Samuel Roberts Noble Foundation Inc.
- Natural Resources Conservation Service
- Oklahoma Department of Wildlife Conservation
- Oklahoma Forestry Service
- Texas Parks and Wildlife Department
- Oklahoma Prescribed Burn Association
- Prescribed Burn Alliance of Texas
- Oaks and Prairies Joint Venture ■

THE SAMUEL ROBERTS
NOBLE
FOUNDATION

The Samuel Roberts Noble Foundation
2510 Sam Noble Parkway
Ardmore, OK 73401
Phone: (580) 223-5810
www.noble.org