MANAGEMENT NOTES

RANGE AND WILDLIFE MANAGEMENT

College of Agricultural Sciences
Texas Tech University

GETTING STARTED IN PRESCRIBED BURNING

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GETTING STARTED IN PRESCRIBED BURNING[1]

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Prescribed burning for range improvement has increased dramatically during the past few years. This has been especially evident in Texas. Prescribed fire can accomplish many range improvement objectives with a single treatment. For example, one burn can control noxious brush, increase herbage yield, increase utilization, increase forage availability, improve wildlife habitat, and control various diseases.

Management after the burn is essential if desired results are to be obtained. Grazing animals frequently concentrate on a burn because forage is more palatable, nutritious, and available. Therefore, alternate forage will have to be available until the pasture is ready for grazing.

Equipment

Equipment required before beginning a prescribed burning program includes:

1) pumper
2) belt weather kit
3) drip torches
4) hand tools (shovels, swatters, backpack pumps)
5) radio communication (depending on size of unit)
6) heavy equipment (for line preparation and suppression activities).

These items need to be gathered in advance to ensure they are operative and available for use.

A pumper is essential because water is the quickest method to cool an escaped fire, allowing it to be put out. The type of pumper may vary from a cattle sprayer to a fire truck, but it should meet the following specifications:

1) minimum capacity of 100 gallons
2) minimum of 50 feet of hose
3) hand held nozzle with adjustable spray.

In addition, the terrain and vegetation of rangelands require the pumper to be maneuverable. Texas Tech University has used a 100 gallon slip-on pumper for the past 19 years with no problems. This pumper is placed in the bed of a 3/4 ton 4 x 4 pickup to gain maneuverability.

Weather forecasts cannot accurately predict changes in temperature, relative humidity, and wind speed through the course of a day, so these variables must be measured on site. A belt weather kit needs to contain the following:

1) psychrometer (temperature and relative humidity)
2) bottle of water
3) anemometer (wind speed)
4) note pad and pencil
5) compass.

Grassland fire behavior is closely related to local weather variables. Air temperature, relative humidity, and wind have the greatest impact on fire behavior. Prescriptions developed to meet specific objectives for different fuel types depend on these weather variables. Weather changes throughout the day, causing changes in fire behavior. Wind speed affects fire behavior immediately, whereas changes in relative humidity do not affect fine fuel moisture content for approximately 1/2 hour. Because of this time lag, weather variables are measured every 1/2 hr and recorded for reference throughout the burn. If the person responsible for taking the weather is not

Suppression can be facilitated with proper equipment. A slip-on pumper unit is desirable. Appropriate hand tools include (from left to right) backpack pumps, axes, fires swatters, and shovels.

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familiar with the area, a compass is recommended for wind direction.

Ignition sources used in prescribed burning are divided into two categories, ground and aerial techniques. The most common ground technique utilizes drip torches. The drip torch consists of a reservoir tank, spout, and wick. There are several types available commercially. The mixture of fuel used in rangeland prescribed fires is 70% diesel and 30% gasoline.

Aerial ignition techniques include the helitorch and aerial ignition device system. These techniques require specialized training and will not be discussed here. However, burns larger than 3,000 acres with rough topography are candidates for aerial ignition.

Hand tools are needed to remove any fuel bridges (areas where fine fuel extends across the fire break) and suppress spot fires. The most common tools are shovels, rakes, and axes. Use of specialized tools such as the fire swatter and backpack water pumps for suppression are very effective. Fence cutters are also recommended to allow quick access, with limited damage, to an adjacent pasture if a spot fire is beyond reach of the pumper.

Communication is essential during a prescribed fire. When the unit is too large for effective voice communication, radios are recommended. Two-way radios are especially useful because of their greater range and the advantage of assigned channels. Citizen band radios will work, but the fire boss must be aware of their limitations.

Establishment of mineral soil, dozed lines is the safest practice for securing the perimeter of a unit to be burned. Equipment needed to make mineral soil lines will vary with topography and vegetation. A farm tractor with a blade or disk will suffice on level areas with few rocks and small brush, but heavy equipment (bulldozer or maintainer) may be required on rough, rocky terrain or areas with large brush. Regardless of the equipment used, the break must be clear of fuel bridges. Heavy equipment may also be used for suppression activities when the unit is being burned.

Organization

The success of a prescribed fire is largely dependent upon the level of planning. Dozed lines should be constructed and arrangements made for equipment several weeks in advance. Finally, everyone should know their task on the day of the burn. Teamwork and communication are essential for conducting a safe, efficient prescribed fire.

Several aspects of prescribed burning should be addressed early in the planning process. Specific objectives for burning individual pastures should be identified. Preburn treatments, including mechanical and herbicidal treatments, should be considered. The pasture to be burned must be deferred from grazing for one growing season before burning to ensure adequate fine fuel. General insurance for the ranch should provide liability protection.

Final preparations for burning can be made after equipment is secured and dozed lines are constructed. Several days before burning, facilities (feeders, pens, fences, electric transmission poles, oil and gas structures, buildings) and dozed lines should be inspected. Dozed lines should expose mineral soil, and be 6 to 8 feet wide. Finally, an extended weather forecast is necessary to determine the feasibility of burning within the next several days.

Number of people required on a particular prescribed burn will depend on fuel characteristics, size of the unit, and personnel experience. Pesonnel should be divided into the fire boss, pumper crew, and ignition crew.

The fire boss serves several functions in facilitating a smooth burn. This person is responsible for determining the type of ignition pattern needed to accomplish the objectives, when ignition should occur, and where suppression crews should be placed. Knowledge of prescribed fire behavior and its interactions with fuel and weather variables allow the fire boss to determine if desired objectives can be met. If objectives

A belt weather kit is used to monitor temperature, relative humididty, and wind speed. A sling psychrometer is demonstrated in the foreground and a windspeed indicator in the background.

The fire boss should give a pre-burn briefing to explain ignition sequence and crew assignments.

cannot be met or conditions create a safety risk, the fire is not ignited, or put out if already in progress.

An objective view of the fire allows the fire boss to alter ignition pattern to account for changing fuel and weather conditions. For example, slight changes in wind direction may dictate a change in ignition pattern. The fire boss is also the key communication link between the entire burning crew.

The fire boss places the pumper crew in the area which has the greatest danger of fire escape. Examples of this would be when a bluff, ridge, or areas with heavy or volatile fuels are next to the dozed line. These conditions alter wind patterns and fire behavior creating increased risks of spot fires.

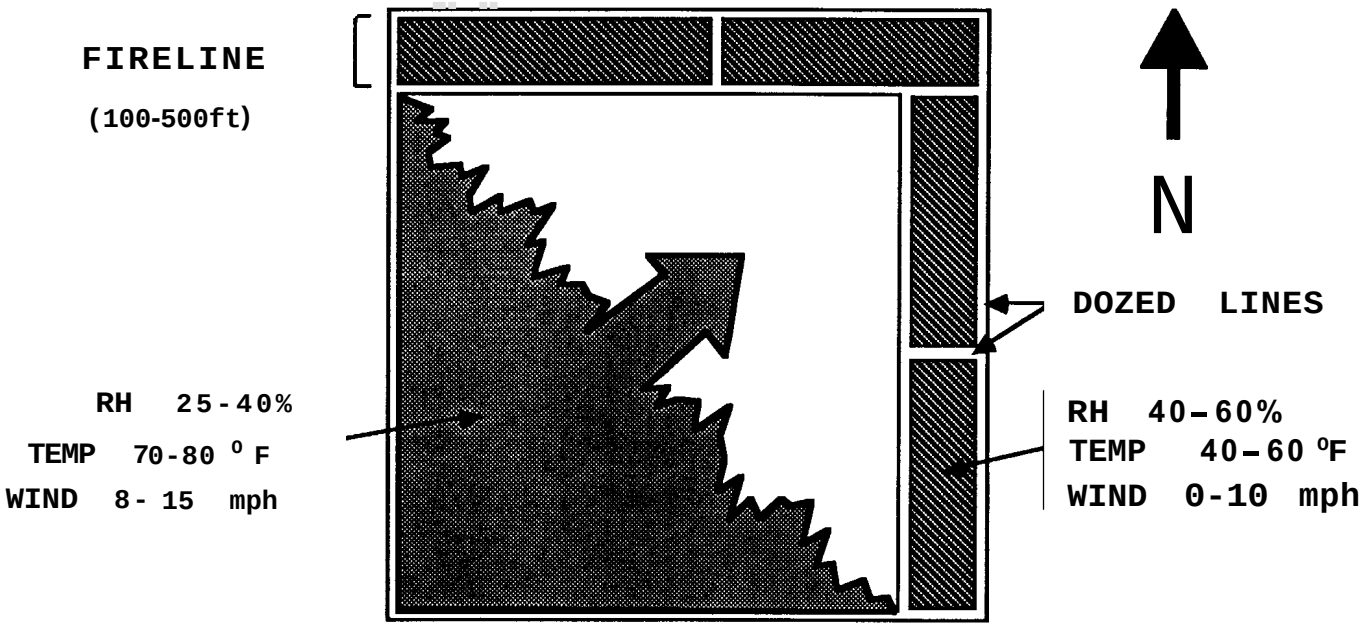
Suppression crew (pumper crew) of 1 to 4 people is normally sufficient on burns of 1000 acres or less. This crew is responsible for patrolling down wind of the fire to check for spot fires and put them out. The fire boss should tell them where the greatest danger may be, but they must be aware that spot fires can occur ***anywhere.*** If the pumper crew finds a spot fire outside the unit, all ignition is stopped until the spot fire is controlled. Ignition crew should help the suppression crew contain the spot fire if required. Further ignition does not take place until the fire boss determines it is safe.

The primary responsibility of the ignition crew is to ignite the unit under the fire boss's direction. They also serve as a second suppression crew. Many techniques have been developed to ignite prescribed fires. The safest, under most conditions, is to divide the unit into two parts, firelines and headfires. Firelines are burned under cool, moist conditions, while the headfire is burned under hotter, dryer conditions needed to achieve the desired objectives.

Rules

Prescribed fires can be safe and efficient if a few rules are followed.

1) Check the unit several days beforehand. All dozed lines and structures within the unit (power lines, oil tanks, hunting stands, etc.) must be checked.



Generalized fire plan for conducting prescribed burns. Fireline width depends on fuel type and amount.

The strip headfire ignition pattern is commonly used to burn firelines. Personnel with torches proceed in a staggered pattern.

2) Obtain a weather forecast. Information needed is:

   a) predicted wind speed and direction
   b) temperature
   c) relative humidity
   d) time of next major wind shift
   e) stability of atmosphere.

   A spot fire weather forecast from the National Weather Service can be obtained for specific areas.
3) Call all neighboring land owners, fire and sheriff departments before igniting a fire.
4) Equipment must be available and operational. It is recommended that a check list be developed and used.
5) Make sure all personnel know their duties and how the burn will be conducted.
6) Stay within fire prescriptions that are developed to meet objectives.
7) Never burn when there are one or more of the following "RED FLAG CONDITIONS":

   a) wind gusts greater than 20 mph
   b) relative humidity below 20%
   c) air temperature above 80°F
   d) cold front to pass within 12 hr.

Firelines

Firelines (areas between dozed lines) are generally burned on the north and east sides of the pasture. This assumes that the head fire will be burned with a southwest wind. Fireline width varies from 100 feet for low volatile fuels (such as mesquite-tobosagrass) to 500 feet for high volatile fuels (such as juniper-mixed grass). The prescription for burning firelines is:

1) temperature 40-60°F
2) relative humidity 40-60%
3) wind speed 0-10 mph.

This prescription minimizes the chance of spot fires.

The most common ignition pattern for burning firelines is the strip headfire technique. This technique involves igniting a series of lines of fire upwind of a dozed line in such a way that no individual line of fire will develop to a high level of intensity before it reaches the dozed line or another line of fire. The first strip is ignited within a few feet of the dozed line. The second strip is ignited 5 to 20 feet upwind of the first. Strip widths should be narrow in heavy fine fuel and wider in light fuel. The third and subsequent strips should be wider, since there is a decreasing chance of spot fires as the width of the burned out area increases. Personnel with torches should be in a staggered pattern. It is important for torch carriers to maintain visual or verbal contact with the people on both sides to prevent overrunning a slow-moving torch carrier with fire.

The number of personnel required will depend on fuel type and width of firelines. Firelines in low-volatile fuel types can be burned safely with as few as 5 people. A fire boss, a 2-man pumper crew, and a 5-man ignition crew can burn 3 miles of 100-foot wide fireline in 4 hours. More people and time are required for firelines wider than 100 feet.

For the headfire, fine fuel should be ignited downwind from the dozed lines and from major fuel breaks in large pastures.

Good communication is imperative for safe, effective fireline burning. This is especially true in the evening, when prescription conditions are often present. Radios for the fire boss, the pumper crew, and every second torch carrier are desirable. Radios can be used to: 1) inform the pumper crew that a torchman needs fuel; 2) announce a spot fire; 3) tell torchmen about approaching topographic features or turns in the fireline; 4) control the pace of ignition; and 5) improve efficiency of all phases of the operation.

Headfires

The pasture can be burned with a headfire after fireline burning is completed. The prescription for burning headfires in west Texas is:

1) temperature 70-80°F
2) relative humidity 25-40%
3) wind speed 8-15 mph.

Since firelines are usually established on the north and east sides of the pasture, wind direction should be west, southwest, or south for the headfire.

Pasture size, shape, and topography influence the number of people required for headfire ignition. Fine fuel should be ignited on the north and east side of each fuel break (roads, drainages, rocky ridges). The number of fuel breaks will determine time and manpower requirements for ignition. A flat 200 acre pasture with continuous fine fuel may require ignition only on the south and west dozed lines. On the other hand, a 3,000-acre pasture dissected by several roads, rivers, and steep ridges will require several miles of ignition.

A fire boss should be designated on headfires. This is especially important on large fires, where people and equipment can become spread over a large area. The fire boss coordinates the ignition sequence, monitors weather conditions, and makes decisions regarding conduct of the burn.

Equipment requirements on headfires include a pumper truck, a belt weather kit, several drip torches, and radios. The pumper truck can be used to patrol the downwind fireline. A post-burn patrol should be made around the entire pasture to check for any burning material near the firelines. Burning material should be moved 50 feet inside the fireline.

Getting Experience

Experience is the best teacher of fire behavior. Before burning a large pasture, the inexperienced prescribed burner can learn quickly by observing prescribed fires lit by other people. Important points to observe are:

1) organization and efficiency
2) communication between torchmen

Junipers are high-volatile fuels capable of lofting firebrands several hundred feet. Caution should be exercised with using fire in juniper habitats.

3) ignition pattern
4) number of people and their assignments
5) placement of pumper.

After watching a few burns, the next step is ignition, of several small fires. Considerable knowledge can be learned about fire behavior by burning small (less than 1 acre) units under a wide range of weather condition. Lighting several fires is the only way to learn what environmental and fuel conditons are required to produce desired fire behavior. Be sure to start gaining experience in low-volatile fuels first. After several years of experience, high-volatile fuels can be attempted.

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COVER PHOTO: Prescribed burning of mesquite tobosagrass range in west Texas.