

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE GENERAL SPECIFICATION**

PRESCRIBED BURNING

(Ac.)

CODE 338

GENERAL SPECIFICATIONS

Procedures, technical details, and other information listed below provide additional guidance for carrying out selected components of the named practice. This material is referenced from the conservation practice standard for the named practice and supplements the requirements and considerations listed therein.

Planning will be in accordance with the National Planning Procedures Handbook, prescribed Burning (Code 338) practice standard criteria, Section IV, Arkansas Field Office Technical Guide, GM 190—Part 413 Subpart B, and the Arkansas amendment to national policy.

Prescribed fire is a complex tool and should only be used only by properly trained individuals. Detailed planning is required for conducting prescribed burns. The incomplete assessment of any factor can cause personnel safety issues, cost in natural resource damage, or pose serious liability questions should the fire escape or its smoke cause damage.

If a prescribed fire does not accomplish its intended objectives it may be necessary to re-burn as soon as sufficient fuel accumulates. Some resource management objectives can be met with a single fire and some can only be accomplished by burning periodically.

The Arkansas Forestry Commission (1-800-830-8015), County Sheriff's Office, and local fire department must be notified prior to the ignition of the burn. **Notifying the Arkansas Forestry Commission is a requirement of Arkansas State Law.**

As a matter of courtesy and to limit liability, neighbors and any one potentially affected by the smoke should be notified prior to the execution of a planned prescribed burn. Usually, this is adjacent landowners and anyone down wind for at least a quarter of a mile. The distance influenced by smoke depends on the fuel load and the weather conditions at the time of the burn. See "Arkansas Voluntary Smoke Management Guidelines," for proper planning of smoke impact. Keep in mind, liability for damages caused from prescribed burning covers smoke as well as the fire. Pay particular attention to smoke sensitive areas such as highways, airports, towns, hospitals and chicken houses.

NRCS clients must acknowledge acceptance of full liability resulting from implementation of recommendations made by NRCS. The client (landowner or his/her designee) must be on-site throughout the prescribed burn period and is responsible for any damages caused as a direct result of the prescribed burn including the smoke generated from the burn. NRCS personnel will NOT serve as the client's designee.

Fuel, weather and topography combine to influence a fire's rate of spread and overall behavior. The following should be taken into consideration when developing the burn plan:

- Ignition patterns affect fire growth and intensity.
- Head fires burn with the wind or upslope, and are of relatively high intensity. They move through fuels at a relatively high rate of speed.
- Backing fires burn against the wind or burn down slope and burn with lower flame heights and lower intensity. They move

- through the stand at slower speed than head fires.
- Most lower-slope positions and north-and east-facing slopes have higher fuel moisture and higher relative humidity, burning with less intensity than upper-slope positions.
- South- to west-facing slopes have open canopies with dry fuels and low relative humidity, these slopes burn with greater intensity.
- **The highest intensity fire occurs under conditions of high wind speed and low moisture content.**
- Fine fuels such as grass or leaf litter burn at a much higher intensity and rate of spread than those with heavier fuels.
- Fires with heavier fuels will produce more smoke for a longer period of time than those with lighter fuels.
- Smoke management is important for all fires and with extra consideration given to those fires with heavier fuels which produce more smoke for longer periods of time.
- At night smoke hangs close to the ground and follows the lowest terrain and can decrease visibility along roads.

PRESCRIBED BURN PLAN

A written detailed prescribed burn plan **MUST** be developed **PRIOR** to the implementation of the burn according to standards specified in GM 190 – Part 413 Subpart B and the Arkansas amendment to national policy.

See Job Sheet JS-338 for the prescribed burn plan worksheets.

A copy of the burn plan **MUST** be kept in the client's conservation plan folder along with the management prescription.

The Management/burn plan **MUST**:

- Be written so that the planned wind direction takes smoke away from roads, residences, or other sensitive areas according to the Arkansas Smoke Management Guidelines.

- Define desired results for a successful burn required by the management objectives to enable a proper post burn evaluation.
- Inform clients of their potential liability if the fire escapes control or smoke damage occurs.
- Require all persons present on the fire to wear natural fiber clothing or “Nomex” clothing, and leather boots.
- Require all persons to be physically capable of performing the activities associated with prescribed burning.

PRE-BURN VEGETATION COVER:

Pre-burn vegetation cover must be considered when planning a burn as it is one of the main components effecting fire behavior.

Most common cover types and typical fire behavior are:

- **Short Grass:** Grass is fine structured, generally below knee level and primarily dead or near dead. Annual and perennial grasses are included. The fire will move rapidly (rate of spread with a 5 mph mid-flame wind speed can be 85 feet per minute with 4 foot flame lengths).
- **Tall Grass:** Grass is coarse structured, above knee level and is difficult to walk through. The fire will be the most intense of any burn and have high rates of spread under the influence of wind (rate of spread with a 5 mph mid-flame wind speed can be 114 feet per minute with 12 foot flame lengths).
- **Grass under open Timber:** Fire spread is primarily through the fine herbaceous fuels at a rapid rate of speed, but slower than fires in open grass land. The herbaceous material, litter and dead-down stem wood from the open over story contribute to the fire intensity and the rate of spread (rate of spread with a 5 mph mid-flame wind speed can be 38 feet per minute with 6 foot flame lengths).
- **Dead, tightly compacted foliage litter beneath a closed canopy timber stand:** Fuel is mostly tightly compacted needles,

- leaves, and some twigs with little undergrowth. Slow burning fires with low flame heights are the usual case (rate of spread with a 5 mph mid flame wind speed is 2 feet per minute with 1 foot flame lengths).
- **Dead, loosely compacted foliage litter beneath a timber stand:** Fuel is mostly loosely compacted needles, leaves, and some twigs under closed canopy stand with little undergrowth. Pine plantations and hardwood stands, especially the oak-hickory type are typical. High winds will cause higher rates of spread than predicted because of spotting caused by blowing leaves (rate of spread a 5 mph mid-flame wind speed will be 8 feet per minute with 3 foot flame lengths).
- **Large fuels beneath a timber stand:** Dead-down fuels include large quantities of 3-inch or larger limb wood resulting from over-maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees can be frequent and lead to potential fire control difficulties (rate of spread with 5mph mid-flame wind speed can be 9 feet per minute with 5 foot flame lengths).
- **Light Logging Slash:** Slash is 2 foot thick or less. Fires are active in the slash and herbaceous material intermixed with the slash. Thinning operations in both hardwood and pine stands are included. The rate of spread with a 5 mph mid-flame wind speed can be 14 feet per minute with 4-8 foot flame lengths.
- **Heavy Logging Slash:** Slash is greater than 2 foot thick. Fire is rapidly spreading with high intensity capable of generating firebrands which contribute to spotting problems as weather conditions become more severe. Fire is sustained until a fuel break is encountered. Heavily thinned pine stands and clear cuts are typical. The rate of spread with a 5 mph mid-flame wind speed can be 15 feet per minute 10-11 foot flame lengths.

RESOURCE MANAGEMENT OBJECTIVE

Resource management objectives determine the timing and intensity of the fire. Depending on the objective a “hotter” or “cooler” fire may be needed. Prescribed fire should be planned for the proper season, type (head or backing), frequency, temperature, wind speed, and relative humidity to give the desired results.

In upland hardwood stands, where quality saw timber is a objective, prescribed burns should be very cool backfires to avoid damage to the residual stands (hot fires will cause cambium damage and but rot). Steeper slopes should be carefully stripped (as percent slope drastically effects fire behavior) to reduce fire intensity and avoid over story damage or mortality.

Landowners will always be warned of the potential for this damage when burns are planned in upland hardwoods. Burns will be avoided in hardwood forests where timber values may be degraded.

Bottomland hardwood forests and riparian forest buffers are not normally burned due to damage to the macroinvertebrate food chain. This is especially important when waterfowl management is one of the client’s objectives.

Burning should be avoided during the nesting period of April 1 through July 15.

Some common objectives are:

- **Fuel Reduction:** Forest fuels accumulate and can build up to pose a serious threat from wildfire to all the forest resources. Prescribed fire will reduce dangerous accumulations of combustible fuels.

A cool burn is needed to meet this object so as to limit damage to the existing forest. The burn should be a backing, point source or strip head fire conducted in the coolest season between November and March.

Depending on the productivity of the site, burning every two to four years may be

needed to maintain the desired forest condition.

The air temperature at the time of the burn should be between 32 and 70 degrees.

- **Improve Access:** Burning underbrush prior to the sale of forest products improves the efficiency of cruising, timber marking and harvesting. Hikers and hunters also benefit from easier travel and increased visibility.

A cool burn is needed to meet this object so as to limit damage to the existing forest. The burn should be a backing fire conducted in the cool season (fall or winter) between September and March.

The air temperature at the time of the burn should be between 32 and 80 degrees.

- **Site Preparation for Natural Regeneration:** Prescribed burning is useful when regenerating species dependent on disturbance (species intolerant of shade) to maintain their place in the forest. Pine and oak are two keystone species that fall into this category.

Knowledge of the anticipated seed crop and date of the earliest seed fall is essential. Burning should be done prior to seed fall on years when an adequate seed crop is present. Complete mineral soil exposure is not necessary or desirable; a thin layer of litter should remain to protect the soil.

A cooler burn is needed to meet this object so as to limit damage to the existing forest. The burn should be a backing or strip head fire conducted in the fall usually between September and October.

- **Improve Wildlife Habitat:** Prescribed burning is highly recommended for wildlife habitat management. Periodic fire tends to favor understory species that require a more open habitat.

In forests periodic fire tends to remove the

litter layer, control woody growth and favors native plants like grass, forbs, sedges and legumes (herbaceous) that require a more open habitat with sunlight at the forest floor. These plants not only create volumes of food resources at ground level but also increase cover for nesting, escape, foraging and young rearing of many wildlife species.

In open lands (fields, openings, etc.) periodic fires help maintain succession, controlling woody growth and promotes native herbaceous plant species. Fire is also effective in helping to control or reduce fescue and other non-native invasive grasses.

A mosaic of burned and unburned areas tends to maximize the “edge effect” which promotes a larger and more varied wildlife population. This can be achieved by burning during times of medium to moderately high fuel moisture.

Size, frequency and timing should all be taken into consideration for these burns. For example, better habitat will result from burning 1/3 of the acreage every year in a rotation rather than burning the entire area at once every 3 years.

Optimal forage abundance can be achieved by using prescribed fire in conjunction with Forest Stand Improvement (Code 666) for thinning activities. Growing season burns in combination with herbicide injection may be required to control undesirable understory and mid-story brush species to release the herbaceous ground layer.

Biological requirements of the preferred wildlife species (such as nesting times) must be considered.

Usually a cooler burn is needed to meet this objective. The burn should be a backing fire and is usually conducted in the cool season between November and April.

The air temperature at the time of the burn should be between 32 and 70 degrees.

- **Manage Competing Vegetation:** The judicious use of prescribed fire can manage the understory to limit competition with desired species. This can be done to favor pine over undesirable hardwoods. It can also be done to favor oak over other hardwoods.

Burning is most effective in controlling thin barked hardwoods that are less than 3 inches in diameter at the ground line. Burning at 3-5 year intervals are needed to maintain this condition and not allow the target species to grow past 3 inches at the ground line.

Usually, a hot burn is needed for these “killing” fires to be effective. The burn can be done anytime of the year, but is most effective on larger stems in the spring to the summer. A backing, strip or head fire can be used to meet the objectives.

Air temperature at the time of the burn above 80 degrees is most effective in killing the target species, but may damage or kill desirable residual trees. These burns can be done anytime the air temperature allows proper burning (above 32 degrees).

- **Forage Production Burns:** Native pasture, rangeland, pastureland, and/or hayland can be burned to improve forage quality and to control undesirable woody vegetation and annual broadleaf weeds.

The area to be burned should be of high vigor and should have adequate fuel to carry the fire with continuity. The upper surface of the soil in grasslands should be sufficiently moist to allow rapid forage regrowth, but fine fuels should be dry enough to carry the fire.

Native warm season grasses can be burned

prior to April 1 to stimulate earlier growth, control cool season grass invasion, and control weeds. Burning should be considered every three years for optimum productivity.

There are times that cool season grasses can be burned to remove residual dry matter that is not going to be grazed during the winter season. This will be done in January or late February before the cool season grasses begin to green up.

These burns can be done anytime the air temperature allows proper burning (above 32 degrees).

PREFERRED WEATHER CONDITIONS

Before starting the prescribed burn, obtain the latest weather forecast for the day of the burn and the following night. Knowledge of weather is the key to successful prescribed burning, and is mandatory for proper smoke management.

The preferred wind speed is 1 to 3 mph at eye level. The wind speed should be less than 10 miles per hour and steady. **THE LENGTH OF TIME THE WIND BLOWS FROM ONE DIRECTION IS OF GREATEST IMPORTANCE.** Persistent, steady winds are much more desirable and predictable than gusty and variable winds.

Burns planned adjacent to areas of concern or near smoke sensitive areas must be burned when wind direction is steady and persistent in a favorable direction.

The preferred relative humidity is between 30% and 50%. When relative humidity falls below 30%, prescribed burning becomes dangerous. Fires are more intense and spotting is much more likely. When relative humidity is greater than 50% burns tend leave unburned areas or may not burn hot enough to accomplish the desired result.

The air temperature should be above 32 degrees.

Burns conducted when the air is below freezing may result in slow moving fires with large unburned areas. The preferred winter temperature is below 60 degrees.

The air mass stability should be slightly unstable or neutral to allow adequate smoke dispersion.

NO BURNING SHOULD BE DONE WHEN THE RELATIVE HUMIDITY IS BELOW 25% OR THE WIND SPEED IS OVER 10 mph.

Weather parameters and other data that affect fire behavior should be monitored during the burn

PREBURN PREPARATION

Good preparation is the key to successful burning. Good preparation makes the area ready for burning and has all the tools and equipment in good operating order and ready.

Adequate control lines (fire breaks) must be established to best accomplish the objectives of the burn and contain the burn to the designated area. The fire breaks may be natural or constructed. See the practice standard for Firebreak (Code 394).

Clients participating in the Prescribed Burn Practice should also be encouraged to participate in the Firebreak Practice (Code 394). Having fire lanes in place prior to the burn will facilitate finding a prescribed burn vendor. Fire lanes that divide the land into logical one day burning jobs will make the burn easier and safer for the client.

The following must be taken into consideration when planning the location and size of the control lines:

- Weather elements
- Fire behavior
- Smoke management
- Amount and type of fuel in the area to be burned

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- Location of natural and manmade fire barriers
- Degree of risk and hazard present
- Intensity of fire to be used
- Identify any improvements endangered by the fire or smoke
- Identify any areas included in the burn unit that may need to be excluded (snags, sawdust piles, stream side management zones, desirable hardwood, pipelines, power lines, cultural resources, T&E species, etc.),

Locate all control lines on a map. Also note on the map any danger spots along control lines having potential for fire escape.

Before starting the fire:

- Remove any material that could carry fire across the control line
- Fall snags near the control line

EQUIPMENT CHECKLIST/PERSONNEL ASSIGNMENTS AND NEEDS/SAFETY REQUIREMENTS

Usually, five persons will be needed to carry out the prescribed burn. At least one person needed to ignite the burn. At times more than one igniter is needed to get the ignition sequence and timing done properly and in a timely manner. Usually, four people are needed to patrol the perimeter of the burn area.

The key is to have enough people patrolling the perimeter to locate any spot fires outside the control lines and control them before they have time to get out of control.

The people patrolling the perimeter should have the necessary hand equipment to extinguish a small spot fire.

All crew members should know their assignments and have a map of the tract.

All persons on the burn should have radio communication with each other.

Recommended equipment during the prescribed burn is:

- a dozer is best if it is at all possible,
- if the terrain and vegetation permit a farm tractor with disk
- ATVs
- hand held radios
- rakes
- back pack pumps or pumps to spray water
- first aid kit
- method to ignite the fire. (back fire torch)
- map of burn area

Members of the crew must have the proper clothing:

- Long-sleeve “Nomex” or cotton shirts
- “Nomex” or cotton pants without cuffs
- Leather boots
- Safety glasses
- Hardhat
- Gloves

Members of the crew must be physically capable of performing the assign duties.

Plenty of drinking water must be available on the burn site for the crew.

Make sure all equipment is in working order and safe to use

Prior to the burn, give clear instructions to crew on procedures to be used during the burn, proper operation of equipment, and contingency plan if the burn escapes control. In case the burn escapes control, safe areas for the crew must be identified before the fire is started.

FIRING SEQUENCE

Various firing techniques can be used to accomplish a burn objective. The technique chosen must be correlated closely with burning

objectives, fuels, topography, and weather factors to prevent damage to forest resources. The proper technique to use can change as these factors change. Atmospheric conditions should be favorable for smoke to rise into the upper air and away from smoke-sensitive areas.

The firing sequence must be consistent with resource management objective and the burning method needed to obtain the objective.

Detailed description of ignition techniques can be found in: U.S. Department of Agriculture, Forest Service, Southern Region, Technical Publication R8-TP 11, “A Guide For Prescribed Fire In Southern Forests,” February 1989, 56 pages. This guide provides basic information needed to help become technically proficient in the proper use of prescribed fire.

SMOKE MANAGEMENT

When prescribed burning has been determined to be the appropriate management practice, the planner will specify measures needed to keep the smoke’s impact on the environment within acceptable limits.

Proper smoke management procedures are outlined in the “Arkansas Voluntary Smoke Management Guidelines.” The publication can be obtained from the Arkansas Forestry Commission (www.forestry.state.ar.us or 501-296-1940).

Planners must know the direction and distance to any areas susceptible to damage from smoke.

The greater the amount of fuel (size of burn and fuel type determine this), the farther the burn must be from sensitive areas. Also, the less favorable the weather conditions for dispersing smoke, the farther the burn must be from sensitive areas.

A preferred wind direction should be specified if the smoke from the burn has a possibility of impacting a sensitive area.

NO BURN CAN BE MADE IF AN AREA SENSITIVE TO SMOKE IS WITHIN 1,000 FEET OF THE BURN!

An alternative to burning (herbicide application) should be used if an area is identified as being potentially critically impacted by smoke from the burn.

Predicting visibility and smoke drift is more difficult at night. When winds lessen or die out completely, smoke will stay near the ground. Frequently traveled roads within one mile of the prescribed fire cause greater concern, especially if these roads are down hill from the burn. Residual smoke flows and settles in low areas during the night and can contribute to heavy fog, which creates hazardous road conditions.

Consider the following recommendations for night time burns:

- Burn in light fuels.
- Use backing fire.
- Burn when humidity is less than 80%.
- Burn with surface wind speed is greater or equal to 4 miles per hour.
- Monitor down hill and low areas for smoke.

SAFETY

Safety is the **FIRST** consideration in prescribed burning. If unfavorable atmospheric, fuel, logistical or other conditions exist, NRCS employees present at the burn location must advise the client and designated fire boss to postpone the burn. NRCS employees are required to inform the client and designated fire boss of any unsafe situation or act as soon as it is apparent. If an emergency situation develops, NRCS employees are to follow the direction of the designated fire boss and act responsibly to resolve the situation.

The client (landowner or his/her designee) must be on-site throughout the prescribed burn

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period. NRCS personnel will **NOT** serve as the client's designee.

All persons present on a fire will wear natural fiber clothing or "Nomex" clothing and leather boots.

Employees and all other persons must also be physically capable of performing the activities associated with prescribed burning.

The location of utilities such as electric power lines and natural gas pipelines shall be documented to prevent damage to the utility and avoid personal injury.

NRCS employees will work through a three step notification process in an effort to resolve or address concerns related to a prescribed burn plan being implemented inappropriately:

1. **First Notification:** In cases where NRCS employees are participating in a prescribed burn and the designated fire boss or client appear to be inappropriately implementing a prescribed burning plan, NRCS employees are required to immediately inform the designated fire boss or client of the concerns and request they take corrective action.
2. **Second Notification:** Should the designated fire boss or client not take corrective action and continues to implement the burn under conditions outside the parameters of an appropriately developed prescribed burning plan NRCS employees are required to inform the designated fire boss and client:
 - of the unsafe conditions
 - NRCS participation is prohibited
 - certification of the completed practice is in jeopardy
 - if the designated fire boss or client continue to proceed with the burn the local fire department or the Arkansas Forestry Commission will have to be notified.
3. **Final Notification:** If the designated fire boss or client continues to proceed with the burn:

4.
 - NRCS will discontinue providing on-the-ground assistance
 - document the designated fire boss's or client's decision and the actions taken
 - notify the local fire department or the Arkansas Forestry Commission
 - LEAVE THE AREA IMMEDIATELY

Monitor the burned site and adjacent areas until ash, debris and other consumed material is at pre-burn temperatures.

POST BURN EVALUATION CRITERIA

The results of the burn must meet the resource management objective on at least 50% of the burn area.

If the objective is to manage competing vegetation and have a "killing fire", the intensity

of the fire must have been hot enough to kill at least 1 inch trees. The best indicator of tree damage for pine is percent foliage discoloration. A good indicator of hardwood control is a series of bark cracks extending into the cambium near ground level.

For other resource management objectives that do not require a "killing fire", then the intensity of the fire should have been such so as not to kill 1 inch trees.

Site preparation burns for planting should be intense enough to provide planter access. Burns should create enough access so tree planters are able to plant the proper number of seedlings properly.