Prescribed Burning in Louisiana Pinelands

LSU AgCenter
Research & Extension

Prescribed Burning in Louisiana Pinelands

Purpose and Scope

Prescribed burning is the deliberate use of fire, under specified and controlled conditions, to accomplish one or more objectives of forest land management. Each objective could probably be attained in some other way, but often at much greater cost. Prescribed burning, therefore, gives the forest manager an effective, economical means of performing many necessary management tasks.

All fires in a natural environment do some damage, and prescribed burns are no exception. It is a matter of accepting a risk of loss to obtain a desired gain. Properly planned and executed, prescribed burning can accomplish many objectives at reasonable cost and minimum risk. This publication explains how this can be done.

The guidelines given here are meant to apply to these circumstances:

1. It is assumed that the forest landowner is committed to growing even-aged crops of pine timber for wood and other products, with consideration in some cases for wildlife habitat improvement as well.
2. The applicable region is the pine-growing area of Louisiana.
3. Topography within the region ranges from poorly drained flatwoods to gently rolling uplands to somewhat hilly country with moderately steep slopes.
4. Timber types treated are (a) longleaf and slash pine in the lower flatwoods, (b) slash and loblolly pine plantations in flatwoods and uplands and (c) loblolly-shortleaf-hardwoods found throughout the state. True hardwood types are excluded because prescribed burning can be used there only in certain limited situations not related to pineland forestry.

Uses for Prescribed Burning

1. Fuel Reduction

Fuels — grass, weeds, pine needles, hardwood leaves and debris accumulate in pine stands of all ages. In place, fuels present the threat of destruction by wildfire to young stands and hinder regeneration in older stands. Periodic removal of fuels by prescribed burning is swift, effective and inexpensive.

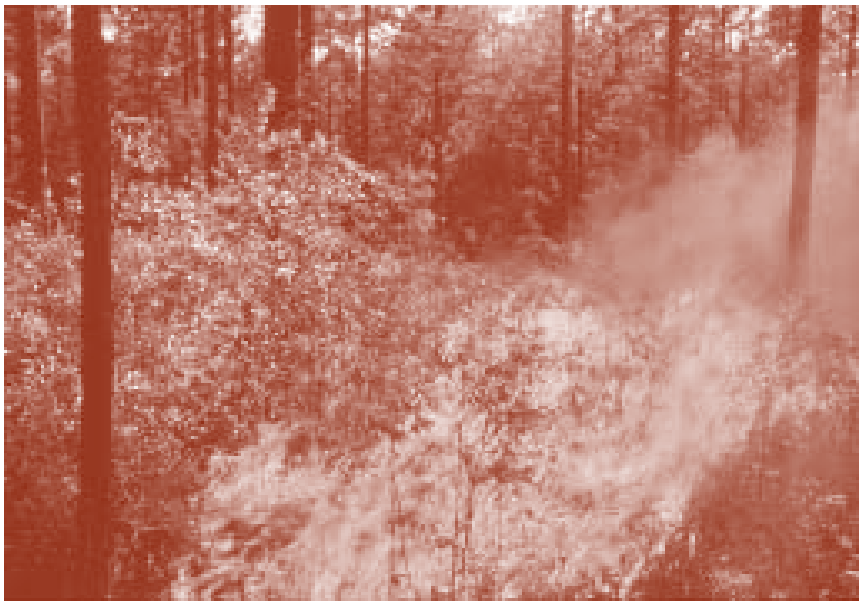
2. Hardwood Control

Hardwoods creep into pine stands early and, if not treated, grow increasingly bothersome. They persist because they can grow under shade. They take moisture and nutrients from pines, impede visibility and access through the stand, and interfere with pine regeneration. A vigorous, persistent burning program is the most economical way to deal with this problem.

3. Site Preparation

Pines cannot regenerate under shade or on littered seedbeds. In both natural and artificial regeneration, full overhead light, bare mineral soil and freedom from hardwood competition are necessary for establishment and growth. For natural seeding, burning to reduce hardwoods and expose mineral soil just before harvest is essential. To prepare sites for direct seeding or planting of seedlings, more vigorous measures are needed. Hardwoods have to be removed and the soil turned. Timely and severe burning plays a part in this process.

Heavy brush understory hurts pine growth and creates hazardous fuel conditions.



Prescribed burning in summer gives excellent brush control and eliminates dangerous fuel accumulation.

4. Wildlife Habitat Improvement

Land managers who wish to stress habitat improvement should work with wildlife specialists. Many of the burns prescribed for other purposes will benefit wildlife as well. For example, hardwood control burns in immature stands induce fresh, low sprout growth which is within the reach of browsing deer. Quail and turkey benefit from fuel reduction burns that remove heavy rough and encourage growth of annual plants. But, if game is the chief object of management, more intensive measures will be required than are described here.

5. Disease Control

Brownspot needle blight infects the foliage of longleaf pine seedlings in the grass stage. Unchecked, it delays growth and kills seedlings. When more than one-third of the needles are dead because of disease, prescribed burning in winter will scorch the needles and kill the fungus without harming the seedlings. Subsequent new needle formation increases seedling vigor and helps initiate early height growth.

6. Harvest Cutting Area Improvement

Reduction of understory before harvesting increases visibility and makes timber marking and cutting much easier. This also lowers administrative and logging costs, often substantially. Prescribed burning is an ideal tool for this purpose.

Representative Stand Conditions and Prescribed Burning Objectives

1. **Mature Pine,** well to moderately stocked (more than 50 square feet of pine basal area per acre), hardwood understory present. Objectives: Reduce hardwoods, get area ready for harvesting, prepare seedbed for regeneration.
2. **Mixed, Irregular, Sawlog-size, Pine-Hardwood** (pine basal area less than 50 square feet per acre) ready for conversion to pure pine. Objectives: Reduce hardwoods, prepare area for planting or direct seeding.
3. **Immature Pine** (age 15 to 40 years), planted or natural, well stocked (more than 70 square feet per acre), hardwood understory light to heavy. Objectives: Reduce hazardous fuel accumulation and control hardwoods.
4. **Young Pine Plantations** (less than 15 years old), densely stocked (600-plus stems per acre), with heavy grass and/or pine needle ground fuel. Objective: Reduce hazardous fuel accumulation.
5. **Grass-stage, Longleaf Pine Seedlings** (2-10 years), afflicted with brownspot needle blight. Objective: Scorch needles and kill fungus.
6. **Pine Plantations, Pulpwood-size** (age 10 to 25 years), growing on oldfield sandy soils with deep needle litter. Objective: Reduce risk of annosus root-rot infection after thinning.

Conditions for Conducting Prescribed Burns

For the stand and fuel conditions described above, here is an outline of the desired conditions for prescribed burning to accomplish the objectives sought.

1. Season of Year

There are two seasons for prescribed burning (summer and winter), and sometimes summer burning **weather** occurs in winter. Generally, summer burning conditions prevail from June through October and winter ones from November through March. Ordinarily, no burning should be done in April or May because of possible harm to the young of many wildlife species.

Fuel reduction burns are mostly done in winter. For hardwood control in immature pine stands, winter burns are preferred. In older stands and just before harvesting, summer burning may be done. Site preparation burns are best done in hot, dry weather, preferably late summer. Brownspot control burns are made in winter.

2. Fuel Conditions

Hardwood leaves carry fire poorly, so pine needle fuel is required to successfully carry fire over the area. This means an overstory of pine greater than 30 square feet of basal area per acre. The only way to successfully burn over the mixed pine-hardwood stand properly is to use hotter fire conditions: dry fuel and high wind velocity. An exception would be an open stand with scattered waxmyrtle and considerable grass on the ground. Fire will move readily through this fuel.

For most purposes, the surface fuels should be relatively dry (10% to 30% moisture content) and the lower layer on top of the soil moist to dry. The soil should be damp.

3. Weather

a. Days since last rain - It takes at least 1/2 inch of rain to halt prescribed burning and, even then, after passage of a cold front, a burn may sometimes be made the next day. Generally, burning may be done from one to 10 days after a rain. A wet-site fuel may take three weeks to dry out. Ordinarily, after about 10 days without rain most fuels are too dry to burn without excessive damage to the standing pines.

b. Relative humidity - The safe and effective range is from 30% to 60%. Occasionally, when a hot burn is mandatory, a reading of 20% may be all right. Conversely, a safe burn may not be possible in a very young plantation unless the humidity exceeds 80%.

c. Air temperature - With certain notable exceptions, this factor is not as important as it once was. Fuel moisture and wind velocity are the governing factors for most burns, so a wide range of temperatures (from 40 degrees to 80 degrees F) may be suitable. Exceptions are the careful winter burn in young stands and the hot site-preparation burn in summer.

d. Wind direction and velocity - The ideal condition is a strong, steady wind from the north-northwest. Often, however, conditions are less than ideal. After the north-northwest winds, the south-southwest ones are the most dependable. Avoid the variable winds from some easterly quarter. Wind velocities ranging from 3 to 10 miles per hour, at eye height in the stand, serve most

burning purposes. Determine wind speed with a portable anemometer. Finally, **never** try to burn when there is no wind at all. The fire will not move properly, and excessive butt and crown scorch will result.

4. Time of Day

Most prescribed burning is done in the daytime (from 10 a.m. to 6 p.m.) when weather and working conditions are favorable. Night burning may be required in (a) very young stands, (b) stands where draped fuel is a real problem or (c) where there is slash on the ground as from thinning. This is because night air tends to be cooler, humidity is higher and fuels are moister.

5. Type of Fire

a. Backfire - Fire is set on the windward side of a control line and allowed to back into the wind. Since rate of backing seldom exceeds 100 feet an hour, interior firelines must be prepared and fires set along them rapidly to get the area burned over in the available burning period. Backfiring is not flexible; it requires stable weather. It is relatively easy and safe to do and causes minimum scorch. Backfires are used mainly for fuel reduction and hardwood control.

b. Strip headfire - A downwind control line or burned area is established first, then short strips of headfire are allowed to run with the wind. How far apart the strips are spaced depends on wind, fuel and desired results. Strip headfire can be used in cool weather when humidity and fuel moisture are relatively high and wind velocity is low. It requires fewer plowed lines and is faster and cheaper. It is flexible and allows some change in direction of firing to meet changes in wind direction. It is used in winter for brownspot control and fuel reduction and in winter or summer for hardwood control. Caution: Inexperienced burners should always use backfire until they gain the knowledge and skill to use strip headfire or flank fire.

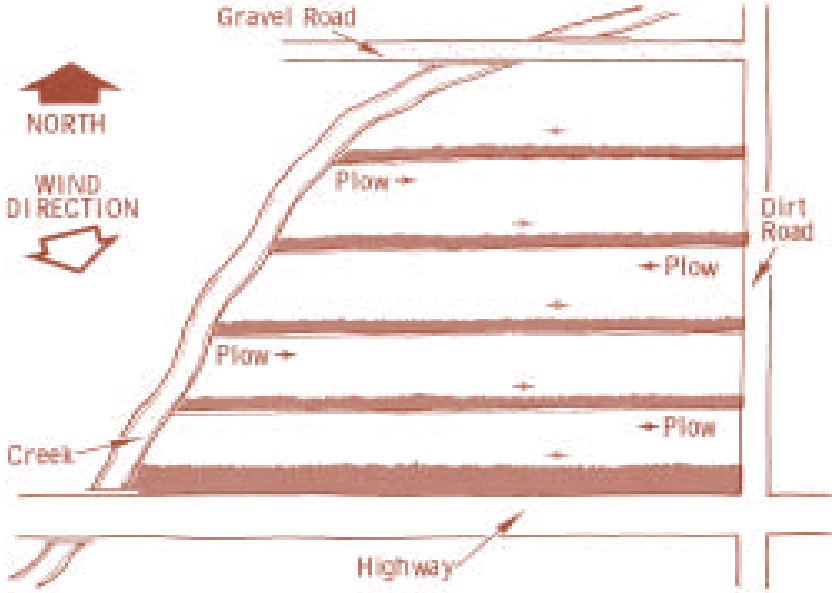
c. Flank fire - In this method, fire is set directly into the wind and burns slowly at right angles to the wind. It may also be used on the flanks of any fire to secure them as the fire progresses. Flank fire burns hotter than backfire and cooler than headfire. It requires a constant wind direction. No interior fire lines are needed. It requires experienced personnel and good crew coordination. It is used in medium fuels or in larger timber, usually in winter, to speed the job or to supplement some other burning method.

d. Spot fires - After a downwind control line has been established, a series of spot fires 30 to 100 feet apart are set in rows, fired and spaced as in strip headfiring. The result is a checkerboard of fires that burn in all directions and eventually draw together to cover the whole area. A large area can be burned in a short time, but this method of firing takes care and skill to execute. It can be used only in uniform fuel and relatively large timber. Few plowed lines are needed. Considerable variation in wind direction can be tolerated. Use in cool weather.

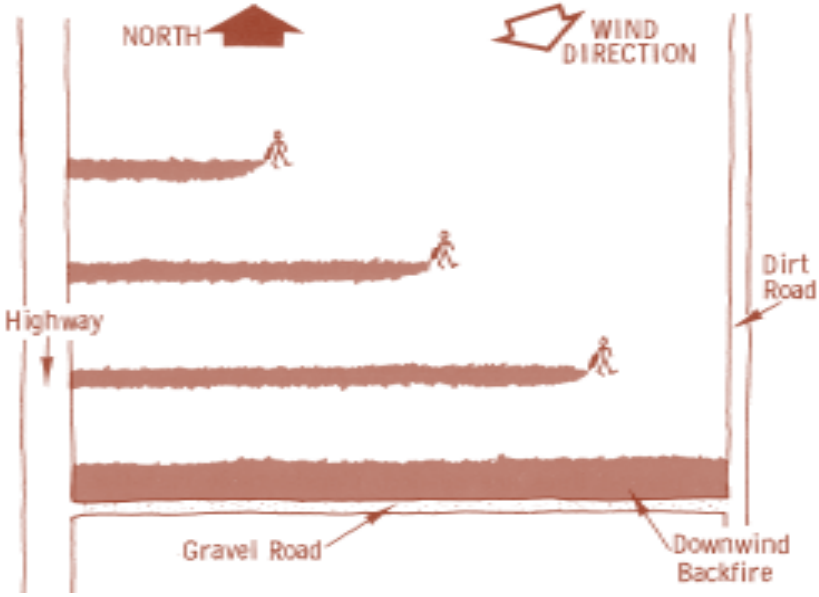
6. Fire Intensity and Flame Height

Depending on purpose of the burn and type of fire used, a wide range in severity may be tolerated.

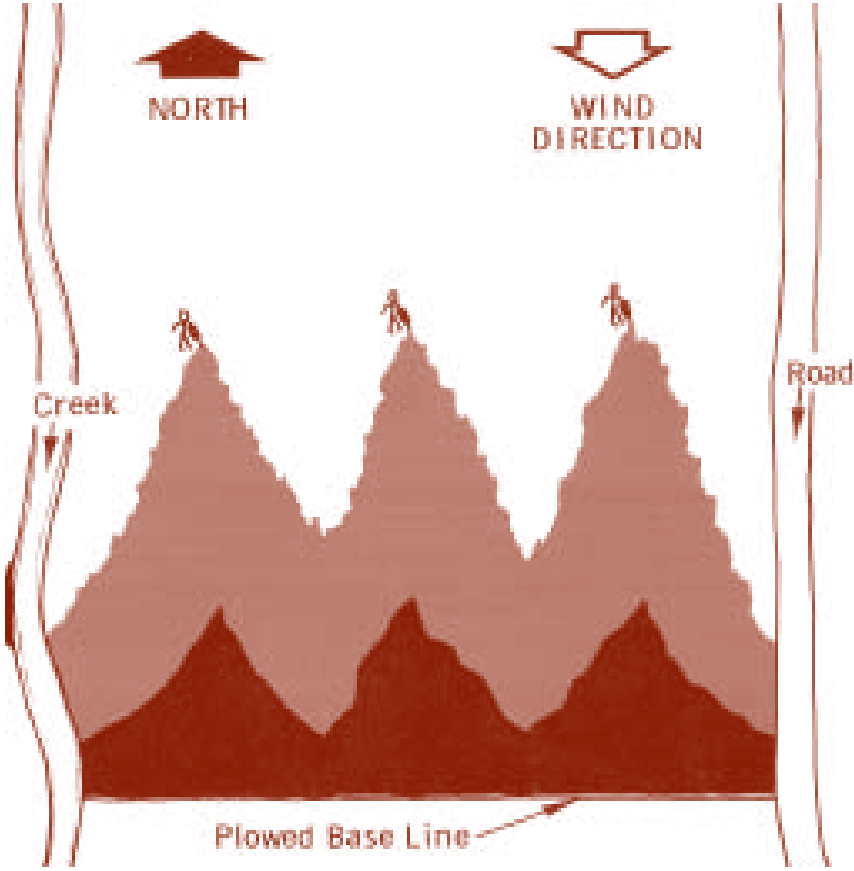
Winter burns to reduce fuel in young stands should be low intensity with flame height less than 3 feet. Wildlife burns to remove litter in older stands work best under similar conditions.



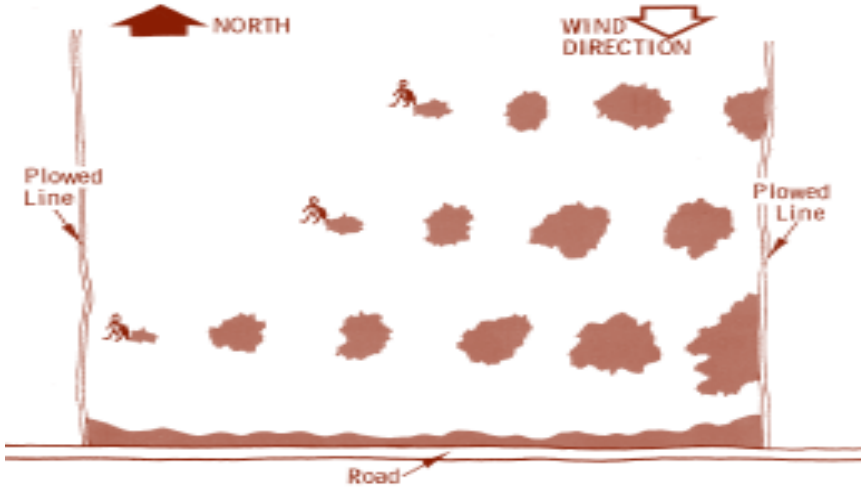
Backfire *is set on the windward side of a prepared baseline and burns against the wind.*



Strip headfire *is a series of short headfires which run with the wind toward safe areas.*



Flank fire *is set straight into the wind and burns at right angles to it.*



Spot fires *make a checkerboard of small fires which burn in all directions and eventually join.*

For control (but not kill) of small hardwoods in young stands, winter strip headfire of moderate intensity of flame heights up to 10 feet is good. Later in stand age, hot summer burns with flame heights up to 5 feet should give good hardwood control. The idea in both cases is to scorch the understory without browning more than the lower one-third of the pine overstory foliage. Brownspot burns should be fast-moving headfires of moderate intensity and low flame height. For site preparation the hottest fires that can be controlled are desired.

7. Burning Interval

The first fuel reduction burn in a young pine stand, although often needed earlier, should not be made until the trees are at least 12 feet tall and 3 inches in diameter at groundline. Thereafter, burn in winter as needed (every two to five years) to keep fuel accumulation low. Wildlife burns fit this cycle also.

For hardwood control, some pine needle fuel is essential. Winter burns at three-year intervals will control, but not kill, hardwoods under 2 inches in diameter. Later in stand age, a short series of biennial summer burns will kill hardwoods less than 4 inches in diameter and get the site ready for regeneration.

The first brownspot control burn in longleaf pine is usually made the second or third winter after germination (age 14 months or 26 months). In areas of heavy infection, a second burn may be needed two years after the first burn. After height growth initiates, longleaf stands should not be burned until heights average 2 - 3 feet.

Planning And Executing the Burn

1. Planning

The best qualified person, usually a professional forester, should do the planning. The planner decides on the unit to be treated, the objective of the burn, and type and intensity of fire required. By field reconnaissance, the planner establishes, preferably on a map or aerial photograph, these basic factors:

a. Exterior boundaries and available existing firebreaks
b. Interior areas to be excluded from the burn
c. Lines to be plowed - to be burned - their location and length
d. Fuels - overstory, understory, surface
e. Month to burn
f. Needed weather, including (1) days since last rain of more than ½ inch (2) fuel moisture (from relative humidity), (3) wind direction and velocity, (4) air temperature range
g. Type of fire to use
h. Time of day
i. Firing method and sequence
j. Equipment and manpower needed
k. Smoke management requirements

2. Preparation

a. Line location is important and has much to do with the success of the burn. An experienced person should do it, one who knows fuel types and fire behavior and who can read maps or aerial photos. The crew leader must adapt the plan to actual fuel and terrain conditions. The leader should make use of existing features, keep plowed lines mostly straight and avoid obstacles that would create burning and mop-up

problems. Time of plowing is just far enough ahead of the burn to leave clean lines, perhaps even on the day of the burn. Avoid streamside management zones (SMZs) and steep terrain.

Plowed firebreak on level ground

b. Equipment needed will include several drip torches in good working order and a generous supply of drip-torch fuel (usually a mixture of 3 parts diesel oil or kerosene and 1 part gasoline). If possible, have a tractor-plow unit available on the day of the burn. In any case, the crew should have with it a few basic hand fire-fighting tools (fire rake, flap, maybe a backpack pump), a power saw and the necessary first aid equipment.

c. Manpower usually consists of a crew leader and from two to five helpers to fire and patrol the lines. The leader should be an experienced prescribed burner, preferably the same person who located and plowed the lines. All personnel should be thoroughly trained and briefed beforehand. Experience on other prescribed burns and on wildfire suppression is the best training.

d. Weather is of prime importance once the month for the planned burn has arrived. Daily forecasts are watched closely, for successful prescribed burning depends absolutely on occurrence of weather matching the prescription for it. All means of gathering weather data are used. With a simple hand-held anemometer, a small sling psychrometer and the appropriate tables of information, a supervisor can tell if a given day is suitable for the burn.

e. Notification to authorities of intention to burn on a given day is a matter of courtesy and expediency. The landowner or manager will probably want to inform neighbors or adjacent landowners. By law, and to avoid the chance of having the prescribed burn mistaken for a wildfire, the burn manager certainly should notify the state forestry commission of intentions to burn. The prudent burner may also want additional help or reinforcements to be on call in case a serious breakover occurs.

3. Executing the Burn

When a good day arrives, the crew leader drops all other tasks and sets in motion the prescribed burning plan. The leader begins the morning by obtaining the best available weather information, making sure the predicted weather conditions fit smoke management guidelines. After notifying the proper authority before burning, the leader takes the crew to the area, where it performs an orderly series of actions designed to result in a safe and effective burn:

Firing the line with a drip torch

a. Make an on-the-spot check of weather and fuel conditions.
b. Review the day's plan with crew, making sure each person knows exactly what to do.
c. Set a test fire in the stand away from edges and openings and watch it carefully to see if it behaves as called for in the prescription. If it doesn't, put the fire out and leave the area.
d. A downwind safety strip must be established when using strip headfire, flank fire or spot fire. This is done by backfiring. The crew should patrol it vigilantly to prevent breakovers.
e. With all going well, the crew leader gives the word to activate the main burning plan. It may call for backing fire, strip headfire or something else, but the crew now rapidly proceeds to the task, following the order and sequence prescribed.
f. While this is going on, one or more crew members carrying hand tools patrol the base and flanks to prevent breakovers and check progress of the burn.
g. During the burn, the crew leader watches for changes in weather, especially wind direction and velocity. If dangerous or unsuitable conditions arise, the leader should stop firing and prepare to control or put out the going fire.
h. A well-planned and carefully executed burn should require little patrol and mop-up. When firing has ended, the crew should do what is needed to secure boundary lines and safeguard the burn.

4. Checking the Results

After the burn, check for results in relation to objectives sought. Things to look for are (1) amount of fuel consumed, (2) prospective hardwood control as indicated by bark cracking at ground line and (3) probable damage to pines as shown by the height tree boles are blackened or percentage of crown length discolored. Bole scorch over about eye height or crown scorch more than one-third shows the fire was probably too hot and the burning technique was faulty. Under large pines and where hardwood control is the chief aim, more severe conditions may be tolerated.

Later, from three months to a year after the burn, final evaluation of results is made. By that time hardwood kill (or dieback to ground) and extent of damage to standing pines are revealed. Only then can the prescription burner know fully what has been accomplished or what was not done correctly. The leader plans subsequent burns with this experience in mind.

Summary of Recommendations

1. Fuel Reduction Burns

Do not make the first burn in a young stand until average height is at least 12 feet and groundline diameter is 3 inches. Use backing fire in winter just after a cold front passage when air temperature is below 40 degrees F, wind is steady northerly and more than 3 miles per hour at eye height, relative humidity is 50% to 60% and moisture of the fresh litter layer is 25% to 30%. Flame height should be 3 feet or less. With a backing rate of 60 to 100 feet per hour, interior plowed lines about 400 to 700 feet apart will be needed.

In a dense young stand with heavy grass or draped fuel, the first burn may have to be made at night. With surface fuels dry enough to burn, the most important requisite is a steady and persistent wind, one strong enough to move the backing fire through the stand and to dissipate the heat obliquely up through the tree crowns. Again, favorable conditions

are most apt to exist within several days after passage of a cold front.

After the first burn, keep fuels down with winter headfires every two to five years as needed. Where fuel accumulation is heavy and risk of wildfire is great, several annual burns may have to be made. Once fuels are reduced to a moderate level, a wider range of weather conditions can be used for burning: air temperatures below 70 degrees F, winds up to 15 mph and steady from south-southwest as well as northerly, relative humidities from 30% to 60% and fuel moistures from 10% to 30%. Fuel reduction burns are repeated as needed in young stands. Later, burns made for hardwood control should also keep down fuels.

Young longleaf stand burned in winter for fuel reduction. Scorch line is very low on the bole, indicating no damage to the standing pines.

2. Hardwood Control Burns

A first principle in control of hardwoods is never let them get as large as 2 inches in diameter at the ground line. Once they reach 3 inches, they rarely can be killed by fire alone. Thus, a program of early and repeated burning for fuel reduction would, if vigorously carried out, accomplish hardwood control as well.

If hardwoods under pines are less than 2 inches in diameter, control with winter backfire (first burn) or strip headfire every three to five years. Burn two or more days after rain with temperature 40 degrees to 60 degrees F, relative humidity 40% to 70%, fuel moisture 20% and wind steady from north or south at 3 to 8 miles per hour. Width of strip headfire is judged by flame height, which should not be high enough to scorch more than the lower one-third of the overstory foliage. Use backfire in young stands or when humidity and fuel moisture are low and wind velocity is high. Sometimes flank fire may be used when strip headfire burns too hot. Remember, a steady wind is a necessity here for a safe burn.

The burning program just described will control small hardwoods by killing the tops back, but will not eliminate them because they resprout. In older stands, when more than just control is desired (as before regeneration), two to four summer burns will practically eradicate the hardwood understory. Burn from June to September, using short stretches of strip headfire to keep flame height less than 5 feet to avoid excessive scorch of overstory crowns. Desired conditions are: dry litter fuels and damp soil, a temperature over 80 degrees F and a steady wind 3 to 8 miles per hour from the north, west or south. Repeat the burns at about two-year intervals or when litter fuel builds up to the point where fire will move across the area readily.

3. Site Preparation Burns

a. For natural reseeding - If the dual program outlined above has been followed in loblolly-shortleaf-hardwood stands, the site should be in good condition for pine regeneration when that time comes. With hardwoods nearly gone and fuel accumulation light, about all that might be needed is a final burn to expose mineral soil. It should

Burned area with seed trees.

be a strip headfire, or even a headfire running across the whole area if the timber is large. Burn 30 to 60 days before seedfall, which means a burn in August or September for loblolly pine. Any combination of weather factors that will ensure a successful but safe burn may be used. This same burn would, of course, leave excellent conditions for timber marking and logging that follows. Good silviculture calls for the harvest cut to be made that same fall or winter, to make best use of seeding and seedbed conditions.

Burning windrows for planting.

In stands where no burning at all has been done, unless herbicides have been used, hardwoods will be a real problem. A series of hot summer burns as described earlier should be made before harvest to weaken the hardwoods and uncover the soil for a seedbed. Later, after pine regeneration appears, further hardwood control measures will probably be needed.

Longleaf pine requires a bare seedbed for proper germination. This means the usual heavy grass cover must be reduced before seedfall. Burn annually in winter (strip or running headfire) until a good pine seed crop appears, then keep fire out for at least two years while seedlings are becoming established.

b. For planting or direct seeding - The idea is to use fire most effectively as one of several operations designed to rid the site of competing vegetation and expose mineral soil. Depending on original stand conditions and on logging and utilization practices, varying amounts of standing and down material will remain. Some owners then push and windrow; others shear or crush this material. Fire is used at this stage. Allow debris to dry for 14 to 21 days, then burn April to October, 5 or more days after rain when temperature is over 60 degrees F and humidity is 30% to 60%. If

Mature pine stand ready for harvest. Burning is needed for seeding.

danger of breakovers from spot fires is great, burn when the humidity is even higher. With a steady wind up to 3 miles per hour from any direction, use headfire or strip headfire to obtain the hottest fire that can be contained. A further site treatment might be chopping or disking, but this would follow, not precede, the burn.

4. Disease Control Burns

a. For brownspot needle blight - Burn in winter (December to March) one or two days after a rain when temperature is below 60 degrees F, relative humidity is 30% to 60%, and winds are northerly at 3 to 10 miles an hour. Use a strip headfire or running headfire if boundaries can be held. The object is to get a fast-moving fire that will scorch infected needles without injuring terminal buds of seedlings. Burn large areas, preferably 80 acres or more, to discourage rapid disease reinfection from the outside. Repeat the burn two years later, if most of the seedlings still have not started height growth and one-third of the needles again have brownspot. Once longleaf seedling height has started on most trees, keep fire out until they are several feet tall.

Longleaf seedling burned over to eliminate brownspot disease. They will leaf out again and start height growth next year.

b. For annosus root rot - The purpose here is to remove the surface litter under a young slash or loblolly pine plantation just before thinning to discourage root-rot infection of remaining stems. Burn in winter, within six months of cutting, when the air temperature is below 50 degrees F, humidity is 30% to 50%, and the litter is dry right down to mineral soil. Wind should be steady northerly at 5 to 10 miles an hour. Use a backfire to keep flame height low and to avoid damage to crowns of the pine overstory. The cutting should be done in summer (May through August) when mean daily temperature is over 75 degrees F, because at this time the rate of stump infection from the fungus is low.

5. Steep Slope Burns

The preceding recommendations apply mainly to burns on flat to gently sloping ground. Burning on steep slopes should be approached with caution and only after much experience has been gained in easier situations. Consider these factors: Vegetation (litter) is different on north and south slopes, and fuels on slopes are apt to be deeper. The litter is spongy, well aerated, dries quickly after a rain and burns with greater intensity than on flat ground. To prevent damage to standing pines and protect the soil from erosion, flame heights must be low and a residual unburned layer of humus must be left. Firebreaks should not be steep or straight up or down hills. They should be water barred and planted with grass after the burn.

Steep slopes should be carefully burned.

With these limitations in mind, plan north and south slope burns separately. North slopes will be burned later after a rain because they do not dry as quickly. In either case burn from the top of the slope downhill and against the wind. On north slopes let the backfire move downhill or set successive bands of strip headfire as you progress down the slope. Burn downhill against a south wind on south slopes.

Because of greater fire intensity on steep slopes, fewer burns are needed to control hardwoods. One burn might be enough on a south slope to kill back hardwoods under 4 inches in diameter. It will usually take two burns on a north slope.

Smoke Management

Forest landowners and managers must be aware that smoke from forestry burning can affect the quality of the air. The amount of noxious gases emitted from prescribed fire is small and not considered dangerous. Smoke, however, contains tiny suspended particles called particulates which can cause problems downwind from the burn. It is the responsibility of the forest manager to make sure that smoke from prescribed fire does not cause respiratory irritation or impair visibility in the vicinity of populated areas, airports and well-traveled roads. Federal and state air pollution control regulations require that prescribed burning not cause a nuisance or create a traffic hazard, and compliance is expected.

Dense smoke from moist fuels.

Smoke is certain to be created by prescribed fire, and possible adverse environmental effects must be minimized by careful planning, execution of the burn and mop-up. When prescribed burning is used, the prescribed burner must take measures to keep the environmental impact of smoke within acceptable limits. The recommended procedure to accomplish this follows a five-step screening system recommended by the Louisiana Office of Forestry (LOF):

1. Determine category day
2. Determine screening distance
3. Determine trajectory of smoke plume
4. Identify smoke-sensitive and other impacted areas
5. Evaluate the results

Numerous variables affect fire behavior and smoke resulting from burning forestlands. This system does not attempt to consider all the variables. It offers basic guidance used by professional prescribed burners to assist in smoke management planning.

1. Determine category day

The prescribed burner obtains the daily fire weather forecast, category day and surface inversion lifting temperature (SILT) from the nearest Louisiana Office of Forestry District Office. This information is available by 9 a.m. each day. The LOF will determine the category day by its ventilation rate.[1]

Ventilation Rate	Category Day Guidelines
Less than 2,000 ft.	No burning
2,000 ft. - 4,000 ft.	No burning until after 11 a.m. and not before surface inversion has lifted. Fire should be substantially burned out by 4 p.m.
4,000 ft. - 8,000 ft.	Daytime burning only, but not before surface inversion has lifted.
8,000 ft. - 16,000 ft.	Burning anytime. For night burns, use backing fires with surface wind speed greater than 4 mph.
Greater than 16,000 ft.	"Unstable" and windy. Excellent smoke dispersal. Burn with caution.

[1]Ventilation rate is calculated by multiplying the afternoon mixing height in meters by the transport wind speed in meters per second. The minimum recommended mixing height of 1600 feet (500 meters) and the minimum recommended transport wind speed 9 mph (four meters per second) provide the minimum recommended ventilation rate (500 x 4 = 2,000).

2. Determine screening distance

Place your planned burn into one of these four categories:

a. Backing fire less than 1,000 acres
b. Head fire less than 1,000
c. More than 1,000 acres
d. Piles/Windrows

The type of burn coupled with the category of burning day obtained from the LOF will determine the number of miles downwind from the burn for the screening process to apply.

Using the following table, find the block that represents the type of burn and category of day. The number in that block is the minimum number of miles downwind from the burn to screen for smoke sensitive areas.

Screening distance is the area to examine for possible smoke-sensitive areas such as airports, highways, communities, recreation areas, schools, hospitals, factories and nursing homes.

Type of Burn	Category Day				
	1	2	3	4	5
	No burning	Miles Downwind			
Backing fire less than 1,000 acres		10	5	2.5	0.75
Head fires less than 1,000 acres		20	10	5	0.75
More than 1,000 acres in size		20	10	5	0.75
Piles/Windrows		30	15	8	0.75

3. Determine Trajectory of Smoke Plume

Locate the area to be burned on a map, and draw a line representing the centerline of the path of the smoke plume for distance obtained from the table. If burn will last three hours, draw another line showing predicted wind direction at completion of burn.

To allow for horizontal dispersion of the smoke, as well as shifts in wind direction, draw two other lines from the fire location at an angle of 30 degrees from the centerline (s). If the fire is represented as a spot on the map, draw as in figure A. If larger, draw as in figure B.

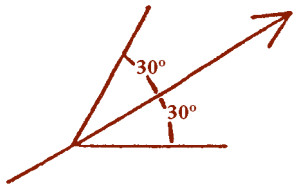


Figure A

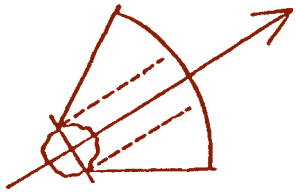


Figure B

4. Identify smoke-sensitive and other impacted areas

Smoke-sensitive areas can be adversely affected by smoke. Examples are: airports, highways, communities, recreation areas, schools, hospitals, nursing homes and factories. These areas are potential problems for smoke from your burn.

Using the Screen Distance from Step 2:

a. Determine smoke sensitive areas.
b. Recognize potential smoke sensitive areas that already have an air pollution or visibility problem.
c. Identify any potential area where emission of sulfur dioxide (SO^2) may merge with the smoke plume. (Research indicates that SO^2 in the presence of particulate matter might be a health hazard.) Likely sources are smelters, electric power plants and factories where coal is burned.
d. If other known sources of smoke overlap your trajectory toward a sensitive area, consider increasing the recommended screening distance. LOF should remain sensitive and advise prescribed burners of such known conditions when called for burning notification.

5. Evaluate the results

If you identify any areas in step D that could be adversely affected by smoke production from your burn, either take necessary precautions or consider burning under more favorable conditions. Here are some precautions that should further help to ensure a safe, nonpolluting prescribed burn:

a. Notify the state forestry office and surrounding landowners and residents of your intention to burn.
b. Use backfire more often and headfire less. Although slower and more costly, backfires are safer, consume fuel more completely and produce less smoke.
c. Avoid nighttime burning where possible. It is unpredictable, risky and often leads to smoke problems.
d. Never burn when an air pollution alert is in effect or in the forecast.

e. Be prepared to stop burning and put the fire out if weather, especially wind direction, changes.

Finally, prescribed burning affects the environment and all living things that inhabit it. Use of fire for forest management purposes has been permitted by state officials, provided reasonable care is exercised to comply with acceptable burning practices as established by the state office of forestry. If this privilege is abused, and if serious interference with human affairs results from unwise prescribed burning, then the air control regulations now in place could be rigidly enforced. The result could be curtailment or even loss of one of the best, most inexpensive aids to forest and wildlife management ever devised.

Prescribed Burning BMPs

Studies have shown that properly planned and conducted prescribed burning has no significant impact on air or water quality. Most problems associated with prescribed burning are a result of poor planning and changing weather conditions. Where a prescribed fire becomes too hot, the entire humus layer can be consumed, exposing the underlying mineral soil to erosion.

Prescribed burning requires an understanding of weather conditions, fuel conditions, wildfire danger, smoke management and a host of other factors. Only experienced personnel should attempt it.

Louisiana law requires that the Louisiana Office of Forestry be notified prior to burning. Precautions must be taken to prevent the fire's escape and smoke problems. Ensure that the burn site is enclosed by adequate fuel breaks; have sufficient manpower, tools and equipment available to control the fire; and stay with the fire until it is safe. It is recommended that all prescribed burning be conducted under the supervision of a certified prescribed burn manager. A written burning plan is highly recommended.

To prevent soil erosion, grades, ditches and water bars should be planned and installed when the fireline is being constructed. The distance between water bars should be the same as those needed on logging roads. Simple diversion ditches should be constructed to direct surface water out of the fireline and into undisturbed forest cover for dispersion of water and soil particles. Avoid installing diversion ditches at the head of a drain. If a fireline causes an erosion problem, it should be returned to normal contour by pushing soil back into the line and revegetating. Hay bales or debris may be needed to temporarily slow runoff before revegetating.

Prescribed burning, including fireline construction, should be kept out of streamside management zones.

Leave a streamside management zone (SMZ) between the fireline and stream. Firelines should not run directly into an SMZ. When anchoring a fireline to an SMZ, turn the line at the edge of the SMZ so that the plowed line parallels the zone. This will keep surface water runoff from flowing directly into the drainage.

Corrective measures for improperly built firelines or fire-related soil problems are similar to those needed to correct and stabilize improperly built roads and skid trails. Lines plowed downhill or at right angles to contours should be constructed around slopes at a grade less than 10%. Erodible areas should be promptly seeded with grasses or ground cover and fertilized.

BMP Summary

- Comply with smoke management guidelines. Monitor smoke after the burn until it is no longer a hazard.
- Have fire-fighting equipment readily available.
- Time prescribed fires so that the moisture level of the forest floor prevents the entire humus layer from being burned.
- Locate firebreaks on the contour as much as possible.
- On grades over 5% and over 200 feet long, construct water bars in firebreak lines at frequent intervals to slow surface runoff.
- Use hand tools when it is necessary to tie firebreak lines into stream channel.

Louisiana Prescribed Burner Certification Program

A voluntary program of Prescribed Burner Certification was established by Act 589 of the 1993 Louisiana Legislature. Louisiana Revised Statute 3:17 and associated administrative rules published by the Louisiana Department of Agriculture and Forestry contains the details on this program and its administration.

This legislation provides for the authorization and promotion of the continued use of prescribed burning for silvicultural and other purposes. The law further defines procedures for certification and for the proper application of prescribed burning. It also addresses the liability for Certified Prescribed Burners who operate within the guidelines of the law and associated administrative rules.

Glossary

Air Stagnation Advisory (ASA): A statement issued by a National Weather Service Forecast Office when atmospheric conditions are stable enough that the **potential** exists for air pollutants to accumulate in a given area. The statement is initially issued when conditions are expected to last for at least 36 hours.

Backing Fire: The fire spreading against the wind or downhill. Flames tilt away from direction of spread.

Cooperators: Those forest land owners or managers who have agreed to carry out prescribed burning in such a manner to adhere to the Voluntary Smoke Management Guidelines.

Heading Fire: A fire spreading with the wind or uphill Flames tilt in the direction of the spread.

Inversion: An increase of temperature with height in the atmosphere. Vertical motion in the atmosphere is inhibited, allowing for pollution buildup. A "normal" atmosphere has temperature decreasing with height.

LOF: Louisiana Office of Forestry

Meter (m): Basic unit of length in the metric system: there are 39.37 inches/meter, 3.28 feet/meter, 1.1 yards/meter. Minimum mixing height of 500 meters = 1,640 feet.

Meters Per Second (mps): Expression of distance traveled each second. One meter/second is equal to 2.2 miles/hour. Minimum transport wind speed of 4 mps = 8.8 mph.

Mixing Height: Measured from the sea level upward, the height to which relatively vigorous mixing occurs because of convection. Same as mixing depth. Use of this term normally implies presence of an inversion and base of the inversion is the top of the mixed layer and defines the mixing height.

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