NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE GENERAL SPECIFICATIONS

PRESCRIBED BURNING
(Acre)
CODE
338

General Use

This practice will be planned and applied in accordance with Texas Commission on Environmental Quality regulations and Texas Prescribed Burn Policy (Texas Supplement GM190 413 Subpart B).

Prescribed burning planning authority, including in the forested areas of the state (MLRA's 133B and 152), will remain within the NRCS. However technical application assistance in burning for forest management purposes will require prior notification of the Texas Forest Service.

Measures will be taken to control the extent of the fire. Written burn plans will be developed on all planned burns. The Texas NRCS Prescribed Burning Management Plan (TX-ECS-1) will be used.

The expected weather conditions, human and vehicular traffic that may be impeded by heat or smoke, and liability (e.g., utility lines), safety, and health precautions shall be integrated into the timing, location and expected intensity of the burn.

Precautionary measures will be planned to protect any sensitive wildlife habitat, cultural resources, headquarters, oil and gas sites, power-lines, or other areas that could be unsafe to burn or suffer potential damage.

Burning should be managed with consideration for wildlife needs such as nesting, feeding, cover and pollinator habitat.

When existing brush encroachment, soil/vegetation site potentials, and/or low plant succession levels persist, one or more years of deferment may be needed to accumulate an adequate fuel load.

Minimize carbon release by the timing and burn intensity.

When a portion of a pasture is burned, grazing management should be based on the burned area within the context of the long-range management plan. Burning will alter grazing patterns.

Warm season prescribed burns may be used on sites with considerably less soil moisture. It is important to understand that recovery of these sites will not occur until adequate precipitation is received. In general, warm season burning should be considered when target woody species densities are high enough to prevent fine fuel accumulation for a cool season burn.

All employees who conduct or participate in prescribed burning must have the proper certification and training. For new employees, this will include the initial 16-hour burning course conducted by NRCS or its equivalent offered by selected universities. Each employee, who plans, approves or assist with prescribed burns must receive the NRCS refresher course at least once every three years.

1. PLANS AND SPECIFICATIONS

- **Certified individuals** will prepare a written burn plan. Individuals with appropriate approval authority for the planned prescribed burn will sign the completed burn plan.
- Specifications will be prepared by individuals with Prescribed Burn Planning Authority and prepared for each site and recorded using approved specification sheets (TX-ECS 1), job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation. All necessary permits must be obtained and a burning plan developed before implementation of the practice. As a minimum these plans will include:
    - Burn objectives
    - Location and description of the burn area, including a map.
    - Location of smoke sensitive and other affected areas, including a forecast trajectory of smoke plume for the appropriate downwind distance.
    - Pre-burn vegetation cover.
    - Required weather conditions for prescribed burn.
    - Pre-burn preparation.
    - Firing sequence and ignition method(s). Equipment checklist/personnel assignments and needs/safety requirements.
    - Notification check list.
    - Post burn evaluation criteria.
    - Approval signatures
- Do not burn until all precautions have been taken and all personnel on site are briefed on the burn plan and their responsibilities during the burn. Have on hand sufficient equipment and manpower needed to control the fire at all times. Ensure that all personnel are able to operate their assigned equipment.
- The fire boss is the sole leader and coordinator of all prescribed burning activities.
- Timing of burning will be commensurate with soil and site conditions to maintain site productivity and minimize effects on soil erosion and soil properties (structure, soil moisture).

PRESCRIBED BURNING PRESCRIPTIONS

- See **Table 1** - General Prescribed Burning Prescriptions
- A burning prescription will be developed as part of all burn plans and will include acceptable ranges for the following parameters:

    The desired effects
    Timing
    Fire weather
    Fuel load or quantity

VARIANCES

Any requests for variances are to be submitted to the State Rangeland Management Specialist.

FIREBREAKS AND BLACKLINES

- All land uses where prescribed burning is applied will have a natural firebreak, an appropriate constructed firebreak, or combination installed.
- Dimensions and types of firebreaks will be designed for each burn and recorded in the Prescribed Burn Management Plan. The minimum effective firebreak width will be 10 feet. Refer to Firebreak Standard and Specification (394).

- When backfiring off a firebreak the blackline area shall be a minimum of:
  - 100 feet wide for low-volatile fuels when temperatures are forecasted to be less than 80°F.
  - 200 feet wide for low-volatile fuels when temperatures are forecasted to exceed 80°F.
  - 500 feet wide for all highly volatile fuels

See **Table 1** section titled "***Installation of black-lines",*** for blackline burning prescription.

- All land uses where prescribed burning is applied will have a natural firebreak, an appropriate installed firebreak, or combination. Refer to the *Firebreak Standard and Specifications (394).*

- The use of existing inflammable barriers such as lakes, streams, wetlands, roads, and constructed firebreaks may reduce the cost of application and are important to the design and layout of this practice

2. Fire Weather

- A current fire weather forecast is required prior to doing a prescribed burn. This weather forecast will be obtained from the NOAA's National Weather Service or a similar forecasting agency.
- Weather parameters and other data that affect fire behavior will be collected for the day of the burn, monitored and recorded frequently during the burn.
- Do not burn within 12 hours of a predicted wind shift or if winds are light and variable (<6 mph).
- Do not burn log-littered areas if the weather forecast is for strong winds within 3 days following a burn.

3. Fuel

- **Volatile Fuels in Texas include:**
  - Juniper spp.
  - Salt Cedar

- When burning juniper species, the green juniper leaf moisture must be less than 80% for a desirable suppression or kill. Crown fires can occur when green juniper leaf moisture falls below 60%.
- When the 10-hour time-lag fuel moisture is less than 6%, slash juniper areas will be highly volatile and will not be burned - as spot fires are almost certain to occur. Ten-hour time-lag fuel moisture will be measured with appropriate moisture monitoring devices.
- Pre-burn or protect with firebreaks any brush piles that are near downwind firebreak boundary.

4. Smoke Management

- For recommendations on reducing smoke effects see Technical Note TX-RANGE/FORESTRY-1. Information on winds, mixing, and predicting smoke impacts can be found in the Texas Fire Weather Operating Plan at: http://www.nws.noaa.gov/.

- Prescribed burning will be conducted only when smoke and other pollutants will not cause adverse effects to sensitive receptors. Smoke impacts will be monitored during the burn.

5. Safety

- Prescribed burning is physically strenuous. All crewmembers must be in good physical condition to enable them to perform all necessary assigned tasks.
- All burn crewmembers will wear flame resistant clothing (Nomex, cotton or wool), leather gloves, and leather boots. Polyester clothing will not be worn. Adequate fluids (drinking water, etc.) will be available during the prescribed burn to avoid dehydration.
- Avoid burning practices that encourage fire-whirl production. If potential exists for fire-whirls, provide necessary safeguards such as spotters in vulnerable locations and sufficient blacklines. Fire-whirls can be caused by burning under low-wind conditions, burning head-fires into back- fires, and in canyons or hilly terrain.
- "Mop-up" the burn before leaving. Maintain close observation of the burned area until the fire is extinguished. Be aware that stumps and manure may smolder for several days after the burn. Be especially careful with burning material near the perimeter of the burned area and move burning or smoldering logs 50-100 feet inside the fireguard.
- The procedure, equipment, and the number of trained and qualified personnel shall be adequate to accomplish the intended purposes.
- All fire suppression equipment should be tested prior to starting a fire.

Operation and Maintenance

- The kinds and expected variability of site factors (e.g., fuel condition and moisture content, weather conditions, human and vehicular traffic that may be impeded by heat or smoke, liability, and safety and health precautions) shall be monitored during the operation of this practice. Sufficient fire suppression equipment and personnel shall be available commensurate with the expected behavior of these factors during the time of burning to prevent a wildfire or other safety, health or liability incident.
- Maintenance shall include monitoring of the burned site and adjacent areas until ash, debris and other consumed material are at pre-burn temperatures.
- The decision to burn should be compatible with the long-term objectives of the resource and the client. In many cases, a long-term regime of prescribed burning will be needed to achieve the objectives.
- Prescribed fire may serve as a component practice in a brush management system designed to reduce brush to an acceptable tolerance level. Fire then, is only one tool in an overall management plan that may involve the use of multiple brush management techniques.
- The burned area should be incorporated into a system of grazing management, as stipulated in the Prescribed Grazing Specification (528), allowing for response of the desired plant community. When all of a pasture is not burned, grazing management will be based on the needs and objectives of the burned area.

TABLE 1 - GENERAL PRESCRIBED BURNING PRESCRIPTIONS

These prescriptions are general and cover a wide geographic area. Any prescribed burn plan shall be developed on site-specific conditions and goals and objectives. Consult NRCS employees that have required job approval authority for on-site assistance.

Vegetative Type and Specific Purpose	Season	Wind Velocity (MPH)	Relative Humidity (%)	Air Temp (°F)	Lbs. Fuel	Frequency of Burning
Installation of Blacklines						
All purposes and vegetative types	Anytime	6 - 10	≥ 40	30 - 100		
Improve: Forage Quality/Quantity for Wildlife, Livestock Grazing Distribution, and Stimulate Seed Production						
Warm Season Grasses	Late winter to green-up or summer dormancy	6 - 20[7]	20 – 65	30 -100	2000+	As needed
Improve Browse or Cover Structure	Appropriate for species needs and site/fuel characteristics	6 - 20[7]	20 – 65	30 -100	2000+	As needed
Increase Cool Season Production 3/	Fall to early winter	6 - 20[7]	20 – 65	30 -100	2000+	As needed
Spartina spp.	August 15 to March 1	6 - 15	20 – 65	40 - 100	2000+	As needed
Kleingrass, Bermudagrass, Introduced bluestems, and Lovegrasses	January 1 to April 1	6 - 15	20 – 65	30-100	2000+	As needed
Reduction of Grass Rough or Fine Fuel – Range, Pasture	Fall/Spring	6 - 20[7]	20 – 65	30 -100	2500+	
Disease and Competition Control – Longleaf Pine						
Reduction of herbaceous weeds and control of Brown Spot	Winter to green-up	6 - 20	>20	<70	Longleaf is very susceptible to damage between leaving grass stage and reaching 6'	
Control (>50% Efficacy) of Undesirable Vegetation						
Eastern Red Cedar[6] - less than 6 ft. of height	Winter to green-up or summer dormancy	6 - 20[7]	20 - 65	30 -100	2000+	Every 3-5 years
Eastern Red Cedar[6] greater than 6 ft. of height	Winter to green-up or summer dormancy	6 - 20[7]	20 - 65	30 -100	3000+	Every 3-5 years
Ashe Juniper[6]	Winter to green-up or summer dormancy	6 - 20[7]	20 - 65	30 -100	2000+	Before growth reaches 4 ft.
Prickly Pear Cactus	Summer dormancy	6 - 20[7]	20 - 65	30 -100	1000+	As needed
Suppression (<50% Efficacy) of Undesirable Vegetation						
Redberry Juniper (<70% green juniper leaf moisture)[6]	Winter to green-up summer dormancy	6 - 20[7]	20 - 65	30 - 100	2000+	Before growth reaches 6 ft. or seedlings reach 7 yrs. of age[4]
Post Oak, Blackjack, and associated hardwoods 5/	Anytime	6 - 20	20 - 65	30 - 100	300 - 500	As needed
Macartney Rose	Anytime	6 - 15	20 - 65	60 -100	1500+	As needed
Mixed Brush Communities	Anytime	6 - 15	20 - 65	60 -100	750 +	As needed
Prickly Pear Cactus	Winter to green-up	6 - 20[7]	20 - 65	30 -100	1000+	As needed
Pine Forest Maintenance Burns[8]	Winter	In stand: 2 – 10 20' Open: 6 - 20	30 - 55	<70		Every 3 – 5 years

FOOTNOTES FOR TABLE 1

1/ Fuel loads listed are the minimum level required to achieve satisfactory results.

2/ Frequency of burning will depend on objectives to be accomplished and what was accomplished with prior burns. If forage quality improvement is the primary objective, grazing management should be such that additional burns will not be needed frequently.

3/ Prior to green-up of desired species.

4/ Research indicates that following mechanical control, redberry seedlings can be effectively controlled with fire until they reach approximately 7 years of age or 3 feet tall, when the bud zone becomes covered by soil. This may happen more quickly on deeper soil sites and less quickly on shallow, rocky sites. Burning redberry juniper when they are greater than 6 feet tall or greater than 7 years old can be effective in reducing canopy but bud zone kill should not be expected.

5/ Dry, low relative humidity, weather conditions should exist 7-14 days prior to burn so that leaf litter has an opportunity to dry out adequately. Two foot wide fireguards are adequate when burning in the woods where leaf litter is the fine fuel load, provided that backfires are set on the downwind side prior to head-fire ignition. If dead trees are adjacent to the fireguard, they must be cut down or properly protected prior to the fire. Cut, dead trees with leaves on them can be a major flaring and firebrand problem. If the objective of the burn includes the maintenance of the oak timber, select the lower air temperatures.

6/ A crown canopy fire may develop when juniper canopy exceeds 30%. Other brush management alternatives must be planned when juniper canopies greater than 30 percent exist.

7/ When burning at air temperatures above 80˚F the maximum wind speed will be 15 mph and 10 hour time lag fuel moisture shall be 6% or higher.

8/ Fine fuel moisture: 7% to 20%, Soil moisture: Damp. Consideration of fuel type, burning techniques that may be required, presence of ladders fuels must be taken during planning. Best burning conditions usually exist about 24 to 48 hours after the passage of a cold front that produces ½ to 1" rain.

Technical Note: TX-RANGE/FORESTRY-1 Smoke Management Guidelines

These guidelines are designed for NRCS to assist clients in managing smoke from prescribed burning activities. All outdoor burning in Texas is regulated by the Texas Commission on Environmental Quality (TCEQ). Nothing in this guidance should be construed as allowing any person or company to violate regulations, laws, ordinances or orders of the State of Texas or any governmental entity having jurisdiction, or to relived any person from the consequences of damages or injuries which may result from their burning activities.

There are numerous variables that affect fire behavior and the resulting smoke. This process is designed to offer basic guidance.

The potential negative impact of smoke from prescribed burning can be mitigated by following a five step procedure.

1. **Determine the Category Day/Ventilation Rate**
2. **Determine the screening distance**
3. **Determine the trajectory of smoke plume**
4. **Identify smoke sensitive and other impacted areas (receptors)**
5. **Evaluate results**

Determine Category Day/Ventilation Index

The Category Day/Ventilation Rate (Table 1) is the product of the transport wind speeds and the mixing height. It is a measure of the volume rate of horizontal transport of air within the mixing layer per unit distance normal to the winds. Units will depend on the information provided by the weather reporting station.

As a guide, the following categories describe the Category Day/Ventilation Rate.

Table 1 – Determining Category Day

Category Day	VENTILATION RATE (TRANSPORT WIND SPEED x MIXING HEIGHT)			
	MPH – FT	M^2/S	Knot - Ft	Guideline
1 – Poor	<14,500	<2,000	<12,600	No Burning
2 – Fair	14,500 – 29,000	2,000 – 4,000	12,600 – 25,500	No Burning till inversion lifts
3 – Good	29,000 – 58,000	4,000 – 8,000	25,500 – 51,000	Daytime after inversion lifts
4 – Very Good	58,000 – 117,000	8,000 – 16,000	51,000 – 102,250	Burning anytime
5 – Excellent	>117,000	>16,000	>102,250	Excellent dispersal, but windy, Use caution

Exercise caution with high transport wind speeds and low mixing height, or low transport wind and high mixing height. These conditions can cause poor smoke dispersion and burn behavior problems.

Transport Winds

Transport winds are a measure of the average rate of horizontal transport of air within the mixing layer. Units are expressed in miles per hour, meters per second, or knots in forecasts. For the calculation use the wind speed coinciding with peak of the burn. If winds are light and variable, then it may be best to consider local drainage effects when in sensitive situations.

Mixing Height Or Mixing Depth

The mixing height is feet above ground level (AGL) through which relatively vigorous mixing occurs due to convection. The mixing height is usually found at the base of a temperature inversion. It is important to note the difference in elevation between the burn site and the referenced upper-air site, and modify the provided mixing depths accordingly. Units are expressed in meters or feet.

Fire Weather Information

Transport winds, mixing heights as well as other weather information can be obtained at the National Fire Weather Page at http://fire.boi.noaa.gov/.

TXZ014-019-022215-
GRAY-DONLEY-
312 AM CST FRI MONTH DAY, YEAR

	TODAY	TONIGHT	SAT
CLOUD COVER	PCLDY	MCLDY	PCLDY
PRECIP TYPE	NONE	SNOW SHOWERS	NONE
CHANCE PRECIP (%)	0	10	0
MAX/MIN TEMPERATURE	55	26	48
RELATIVE HUMIDITY %	14	44	19
20FT WND - AM (MPH)	NW 10		N 20 G29
20FT WND - PM (MPH)	NW 10 G18	N 8 G18	N 21 G29
PRECIP AMOUNT	0.00	0.01	0.00
LAL	1	1	1
HAINES INDEX	5	4	4
MIXING HGT (M-AGL)	3597		1831
MIXING HGT (FT-AGL)	11801		6007
TRANSPORT WND (M/S)	NW 3		N 12
TRANSPORT WND (MPH)	NW 7		N 28
VENT RATE (M*M/S)	21068		22851
VENT RATE (KT-FT)	134094		145441
CATEGORY DAY	5		5

Example 1. - Example of fire weather forecast from NOAA giving mixing heights and transport winds (in 2 units). Units can vary with reporting stations

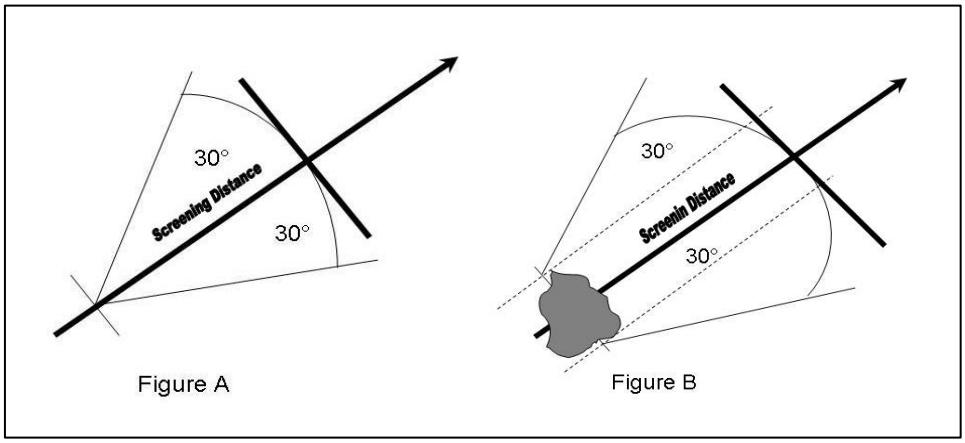
Determine Screening Distance

Screening distance is the downwind distance to examine for possible smoke sensitive or receptor sites such as airports, highways, communities, recreation areas, schools, hospitals, nursing homes, and residences etc. A minimum of one mile is recommended for an Excellent Category Day while at least five miles is recommended for Fair Category Day and above. Burning is not recommended on Poor Category Days.

Determine Trajectory of Smoke Plume

Locate the area to be burned on a map and draw a line representing the centerline of the smoke plume. The length of the line should be greater than the screening distance. Draw an additional line to represent the predicted wind direction at the end of the burn if the burn will take a long period of time.

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



Identify Smoke Sensitive and Other Impacted Areas

Many areas are adversely affected by smoke and can be problematic – yet very important - for the burn.

1. Determine the smoke sensitive areas within the smoke trajectory,
2. Recognize the smoke sensitive areas that may already have an air pollution or visibility problem,
3. Identify any potential areas where an Air Quality Index (AQI) is Moderate or above,
4. Determine if other known sources of smoke overlap the trajectory toward a sensitive area and consider increasing the screening distance on the trajectory map to account for the effects of the combination.

Evaluate Results

If receptors are identified that could be adversely affected by smoke production from the burn, recommend postponing the burn. This will include waiting for a better Category Day or a more acceptable smoke trajectory.

APPROVAL AND CERTIFICATION

Prescribed Burning

(Ac.) CODE 338

PRACTICE SPECIFICATIONS APPROVED:

/s/ Jeff Goodwin	**10/1/2014**
State Rangeland Management Specialist	**Date**
/s/ Alfonso Leal	**10/1/2014**
State Resource Conservationist (Acting)	**Date**

Reviewed By:
Zone Rangeland Management Specialists
State Office Specialists