

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

1. 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.

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 ³ 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

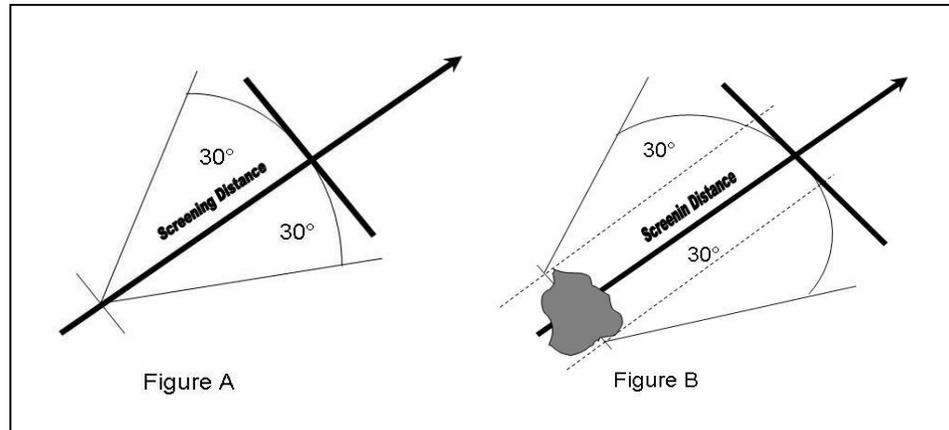
2. Determine Screening Distance

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.

3. 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.



4. 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.

5. 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.