Colorado Smoke Management Program

Broadcast Smoke Worksheet

To use this table:

A. Choose a section header that matches the burn's smoke fuel category. Appendix I shows the project area characteristics that determine a burn's smoke fuel category. Each category has a different color background in the table that follows.

B. Within a smoke fuel category, use the first column on the left, 'distance to homes,' to match the burn's distance to the nearest occupied home.

C. You have now selected a row that is split 3 ways by ventilation adjective. The 3-way row's right set of columns show standard permit conditions. End ignition times and maximum daily acres vary by ventilation adjective. *Information in italics in this document applies only in mapped smoke-sensitive areas.*

APCD evaluates all burns individually, and assigns conditions as appropriate. The worksheet shows most likely conditions. Some burns that have especially high smoke risk for their category will have conditions tighter than standard.

The numbered footnotes are grouped at the end of the document, or hold the cursor over a footnote number to read it in place. Please **do read the fine print.**

For projects that do not fit well with standard permit conditions, you may propose tailored conditions. For more information see the detailed instructions for smoke permit applications and guidance for non-standard applications.

Standard Permit Conditions[1]

Category, Distance to homes[2]	Ventilation[3]	End time[4]	Daily acre limit		Wind direction limited[5]	Holiday weekend acres[6]	2 in 7[7]
			Rural[8]	*Sensitive*			
Light Smoke							
1a. >5.0 mi.	v gd/exc	by	10,000	*3,500*		2,000	n/a
	good	by	4,500	*1,500*			
	fair	by	3,000	*1,000*			
1b. 2.0 - 5.0 mi.	v gd/exc	by	5,000	*1,750*	if > 300 ac/d	2,000	n/a
	good	by	2,200	*750*			
	fair	1	1,500	*500*			
1c. 0 - 1.9 mi.	v gd/exc	by	3,500	*1,200*	x	2,000	n/a
	good	by	1,500	*500*			
	fair	1	1,000	*350*			
Brief Smoke							
2a. >5.0 mi.	v gd/exc	by	3,500	*1,200*		1,000	n/a
	good	by	1,500	*500*			
	fair	1	1,000	*350*			
2b. 2.0 - 5.0 mi.	v gd/exc	by	2,000	*600*	if > 200 ac/d	1,000	n/a
	good	1	1,000	*250*			
	fair	1	640	*175*			
2c. 0 - 1.9 mi.	v gd/exc	1	1,500	*400*	x	1,000	n/a
	good	1	1,000	*175*			
	fair	(3)	(325)[9]	*(120)*			
Drainage Potential							
3a. >5.0 mi.	v gd/exc	by	1,250	*350*	if > 250 ac/d	500	n/a
	good	1	700	*150*			
	fair	1	300	*100*			
3b. 2.0 - 5.0 mi.	v gd/exc	1	700	*175*	x	500	Rural: 350 ac. *Sensitive: 100 ac.*
	good	1	350	*75*			
	fair	2	150	*50*			
3c. 0 - 1.9 mi.	v gd/exc	1	500	*125*	x	n/a	Rural: 250 ac. *Sensitive: 50 ac.*
	good	2	300	*50*			
	fair	(4)	(100)[9]	*(35)*			

Appendix I - Smoke Risk (Fuel) Categories

- **Light** **Go to the white section of the standard conditions table, above**.

  Site characteristics - all must be met:
  (a) Total site fuel load excluding standing trees is ≤ 3 tons/acre
  (b) Shrub load is < 0.5 tons/acre
  (c) Canopy cover ≤ 20% of the unit's area.
  (d) Average depth of litter plus duff is ≤ 2.5".
  (e) The site will have no mechanical treatment[10] before burning.

  Smoke Concern: Short-term wispy smoke
  Example vegetation: most dryland grass. Similar to grass fire behavior group.

- **Brief** **Go to the yellow or light grey section.**

  Site characteristics - all must be met:
  (a) Site 1000-hour fuel load ≤ 2 tons/acre[11]
  (b) Average depth of conifer litter plus duff ≤ 2.5"
  (c) Canopy cover (surface tree litter extent, percent of the forest floor shaded at noon on a clear day) is ≤ 20%.
  (d) At most 20% of the site surface area is covered by mechanical residue.

  Smoke Concerns: Pulses of heavy smoke may occur but are brief. Drainage concerns are limited. Lofting is key.
  Example vegetation: most sage, oak without an overstory, marshes, nearly pure P/J. Similar to shrub fire behavior group.

- **Drainage Potential** **Go to the pink or medium grey section.**

  Site characteristics - both must be met:
  (a) Litter plus duff ≤ 2.5" deep.
  (b) Tree litter (canopy) covers ≥20% of surface OR site 1000-hour fuel load 2.5 - 9.5 tons/acre.

  Smoke Concerns: The potential for impacts from both lofted and drainage smoke must be managed.
  Pinon/Juniper: Include P/J in % canopy cover but also note on the application what percent is P/J. Due to their minimal duff and litter, P/J is not counted toward the 20% canopy cover threshold for drainage potential.
  Example vegetation: most ponderosa, dry mixed conifer, and mechanical residue. Similar to timber litter fire behavior group.

- **Highest Smoke Hazard** **All permits for this fuel category are non-standard.** See guidance for non-standard permits.

  Site characteristics - either is met:
  (a) Average depth of combined duff and litter ≥ 3" or
  (b) 1000-hour fuel load ≥ 10 tons/acre.

  Smoke Concerns: Principally, there is potential for heavy drainage smoke. Secondarily, extensive torching may be possible, creating more particulate pollution than surface load would suggest.
  Example vegetation: most closed-canopy wet mixed conifer or spruce/fir; years-dead bug kill

[1] All burns are **evaluated individually**, and conditions tailored as appropriate. This document shows *most likely* conditions. Some burns that have especially high smoke risk for their category will have conditions tighter than standard.

For burn categories 2c, 3 and 4, a **smoke planning map** must be included with the application. The map should show burn units and expected path of both lofted smoke (daytime, showing pie-shape of acceptable wind directions + 30^{o}) and night (drainage) smoke out at least 25 miles. If you are requesting ≤50% of the standard daily acres and the project is at least two miles from homes, maps may be omitted.

[2] If a person in every home within the relevant distance is contacted individually before burning, either in person or by a 2-way phone conversation, and none of the people in a contacted household has unmitigated health concerns related to smoke, then note the mitigated distance in the block provided on the application and categorize the burn according to the **distance to the closest home** that was not contacted and cleared.

[3] Day's best forecasted **ventilation adjective**

[4] **End ignition times** are number of hours before sunset.

[5] The x's indicate what burns are more likely to have permit conditions that include wind direction limits. **Wind constraints** are especially situation-specific, and may be required for burns in other categories also. Wind limits will typically protect receptors rather than individual homes. For the burns with x's for wind constraints, outreach will also be evaluated closely. If no reasonable wind direction(s) will keep smoke out of communities, non-standard alternatives such as burning on only the most favorable dispersion days must be considered.

[6] '**Holiday weekends'** means no more than the listed number of acres may be ignited on any day of Friday through Monday on a federal holiday weekend. Its purpose is to minimize regional haze when visibility is most important.

[7] Burn more than the specified number of acres per day on at most **2 days in any 7**-day period. Days when fewer acres are burned do not count as one of the two days.

[8] '**Smoke-sensitive areas**' refers to a map on APCD's website. On the map, smoke-sensitive areas includes all formal and informal PM-10 maintenance areas, a 5-mile buffer around those census 2000 tracts with population density ≥500 people per km^2, plus a 3-mile buffer around each residential health care facility. 'Rural' is any area not mapped as a 'smoke-sensitive area.' Applicants may indicate whether or not a burn is in a sensitive area, or APCD will make the map comparison.

[9] End time for most burns **within 2 miles of homes on fair** days is several hours before sunset. Burning close to homes at fair dispersion in heavier fuel types despite an early end time is an opportunity during marginal conditions for a limited amount of burning such as blacklining. These conditions were developed rather than allow no burning close to homes on days with fair dispersal. The time is not expected to be sufficient for production burning. In one year's sample of spot forecasts, the day's best forecasted ventilation adjective was fair for about 5% of days in the four peak months for broadcast burning.

[10] '**Mechanical treatment**' means that chips or other products of mechanical work remain on site and that the work was done on at least 20% of a unit's acres. Mechanical treatment does not include work accomplished only with saws and/or shears, such as pile burning with or without harvest.

[11] As an illustration of site **load of heavy fuel**, 2 tons/acre of 1000-hour (3+" diameter) logs is about nine 4" logs or four 6" logs per 100 yards of transect, or of walking. Ten-ton equivalents are 45-4" logs or 20-6" logs. Use of fuel photo series to estimate loads is recommended.