

Colorado Smoke Management Program Manual



Colorado Department
of Public Health
and Environment

Air Pollution Control Division

Colorado Department of Public Health and Environment

Table of Contents

Click on an entry in the Table of Contents to jump to that section, or use a word processor's 'find' tool. To see all the topics and no answers, in MS Word view the document in outline and show through level 5.

Topics are organized generally in order of the form to which they pertain. If a reference to Form A does not specify piles or broadcast, it applies to both.

Topic Grouping		<u>page</u>
I.	I) Application, Forms A and B	3
II.	II) Application Form A, Portion for Piles Only	21
III.	III) Application Form A, Portion for Broadcast Only	24
IV.	IV) Project-Specific Conditions, Form A	31
V.	V) General Conditions, Form A	50
VI.	VI) Application attachments - maps, narratives, etc.	55
VII.	VII) Daily Notification, Form D	57
VIII.	VIII) Daily Accomplishment Reporting, Form E	58
IX.	IX) Annual Accomplishment Reporting, Form F	62
X.	X) Not Related to a Specific Form	62
XI.	XI) There is a topic or question that I'd like added to this manual.	70
XII.	XII) Appendix: Related Documents	71
XIII.	XIII) Appendix: Descriptions of Topic Headers	73

I) Application, [Forms A and B](#)

A) Form A: What basic requirements apply to all application paperwork?

1. *Requirements:* The most basic requirement of permit paperwork is that the information submitted be as accurate as reasonably possible. Information on the application becomes part of the permit and is legally binding. Here are three examples. 1) Fuel loads should be a best estimate, and conservative when in doubt. 2) Listed PLSS section numbers must include all in which burning may occur. 3) Total annual acres or number of piles is a firm upper limit. Also binding are firm volunteered statements in the application, such as planned public outreach or mop up. Failure to comply with any of these permit conditions may result in enforcement action by the Air Division.

No permit condition may be ignored or 'adjusted' in the field. At no time does a permittee have the option to unilaterally change the permit conditions because something else seems better at the time. Only APCD has the authority to change permit conditions.

2. *Intent:* The intent of this section is to make clear the Air Division's basic expectations of the permittee, basic legal responsibilities of the permittee, and overall permit authority held by the Air Division.
3. *Implementation Guidance:* We consider your signature to be an affirmation that in your judgment and based on what experience you have, you believe the requested conditions to be responsible. We take that seriously.

For the several kinds of information requested on the application, we recognize that the difficulty of accuracy and precision varies. If one fuel load category is a little off, it isn't necessarily a huge deal. We are looking for good faith, application of professional-level skill, and attention to detail that probably includes the person completing the application being personally familiar with the burn site.

If you want to change a permit condition or something on your application after the permit is issued, [contact us](#). For example, you may find more piles to burn than the total number listed for the year. We do often review and approve requests for permit amendments like this. Of course it's easier on everyone if all likely eventualities are considered and addressed when the application is submitted, but we know that isn't always reasonable or possible.

There is a lot more implementation guidance in the [instructions for completing applications](#).

4. *Authority:* Colorado Air Quality Control Commission [Regulation 9](#): III.A, IV.A.1 & 2, IV.B.1, IV.C.1 – 12, V.A,B,& C, V.D.1 – 10, V.E.1 – 3.
5. *Approved by and date of signature:* Dan Ely, 11/11/10

B) Form A, Burn Name: For permitting purposes, what is a “project”?

1. *Implementation Guidance:* This question comes up most often with respect to scattered piles. Our criterion for lumping piles together into one project is that the project should affect the same receptors from a similar distance and to a similar extent. Also, the activity included on a single permit should be planned for generally the same treatment. Usually if burn units are on the same NEPA and burn plan, they should have the same smoke permit.

For example, if for some reason the piles on one fuel break come in two fairly similar sizes, include them on the same permit with an explanation. But if the piles are next to different communities, each should have its own permit. As a third example, to acknowledge there are decisions at the margin, if some of the piles are built by hand and some are moderate-size machine piles, it depends... so, please [contact us](#).

2. *Written by and date of signature:* Coleen Campbell and Sarah Gallup, 7/18/11

C) Form A, County: How and why are smoke permits for some piles in Grand County handled differently?

1. *Requirement:* Grand County requested and received additional delegation of authority from the state to help cope with challenges created by the mountain pine beetle epidemic. The county has an existing and long-standing delegation from the state to locally issue permits for general open burning. The additional delegation involves authority to permit larger piles than could be allowed under their existing delegation, for only entities that are not significant users only, and reporting to the state on actual activity for the state’s emission inventory.

Grand County issues nearly all permits on private land and to small agencies who burn infrequently. Permits for significant users of prescribed fire, whether public or private, are issued by APCD.

2. *Background:* As discussed above, with the mountain pine beetle (MPB) outbreak concentrated in some of the north-central counties of Colorado, there are huge numbers of small logging piles on private land. Since those piles generally cannot be out cold by sunset, the piles are larger than counties with delegated general open burn authority may permit.

APCD and County staffs work together to figure out what procedures are best, mostly for the County’s benefit. APCD’s primary interest is to ensure that conditions and their effect on air quality remain reasonably consistent across all permits regardless of who issues them, or that there be good reasons for any differences while also being responsive to the county’s needs. Some counties’ staffs have considered a more extensive delegation and decided not to request one, mostly because it is more work for them with little or no associated revenue.

3. *Intent:* County staff may be interested to provide a lower-cost and somewhat simpler permit system for residents who expect to burn a few medium-size piles and who lack formalized training or experience with managing smoke. In essence, County staff have volunteered to do some of the work for both us as state regulators and private landowners as burners. They issue the permits for some smaller projects, inspect piles, and track weather in order to give a daily go/no go smoke authorization. They may also assist with public outreach. APCD’s

intent is to support local counties as much as legally possible, especially those faced with the MPB outbreak.

The local public land managers we asked preferred that their permits remain with the state rather than the county. The main reason was to avoid the confusion of different processes and slightly different procedures for managers whose work, and sometimes whose projects, are in multiple counties. This is the preference of the counties as well.

4. *Implementation Guidance:* It may not be important to know which agency should issue the permit for a particular project. If you need a County permit instead of APCD's or vice versa, we'll both let you know. Contact either [APCD](#) or your [county](#).
5. *Authority:* A formal delegation from APCD to Grand County has been signed by APCD's director and an authorized county official. The delegation document is available by [contacting APCD](#). Reg. 9 allows for the Division or an approved local agency to issue permits: [Reg 9.V.A.](#)
6. *Approved by and date of signature:* Dan Ely, 1/21/2011

D) Form A, Location: Which is better, lat/long or a legal location (TRS)?

1. *Requirements:* Send either. If you send lat/long, aim generally for the middle of the project. If you send the Public Land Survey System township, range and section(s) (TRS), list all sections in which the project falls.
2. *Implementation Guidance:* We find TRS easier to place on a paper map. Once we get on-line mapping of permit applications, some year all this may change.
3. *Authority:* [Reg. 9](#) IV B 1 a: "The division shall consider... the location and proximity of the proposed burning to any building or other structure..." ; V.D.3: The division shall consider...The location of the proposed burn and smoke-sensitive areas and class I areas that might be impacted by the smoke and emissions from the burn;"
4. *Approved by and date of signature:* Dan Ely, 1/21/2011

E) Form A, Burn Year: Can a permit for a planned ignition cross two years?

1. *Requirements:* A permit may not cover ignition in more than one calendar year. There must be a separate application and permit for each year.
2. *Background:* The question about multi-year permits arises most often for piles. It may not be known in the fall whether there is going to be enough early snow to burn some piles before New Year's, or it may be likely the project will take days in both years to complete.
3. *Implementation Guidance:* If you don't already have a permit and want your planned ignition to be permitted over a 2-year period:
 - 1) Fill-out the first year application ([Form A](#)).

- 2) Make an (electronic) copy. Change the burn year to the second year and, if needed, proposed burn dates.
- 3) Submit them together with a single set of any needed attachments.

If instead you do already have a permit for the current year, if the permit was submitted electronically, and if the project is unchanged, then you need only send us email requesting a permit for the new calendar year. Otherwise, resurrect your application/permit. Change the burn year and fill in the old permit number in the block for 'renewal?' Review the rest of the application, and change whatever else is also needed. You can make it easier on APCD if you point out other updates, such as by using 'track changes.' Then send in the application. Older permit applications may need a separate Form C, which we may have on file to bring forward. We will pull the permit's old maps or other attachments and use them.

4. *Authority:* [Reg. 9](#) IV C 10: "The permit is valid only for the date or period specified in the permit."
5. *Approved by and date of signature:* Dan Ely, 6/24/11

F) Form A, Administrative Unit: If a burn involves more than one landowner and/or agency, which should be listed on the permit?

1. *Requirements:* List all agencies or landowners on the application. Ultimately each landowner or line officer is responsible for what happens on their land, including adherence to permit conditions.

[Thresholds for significant users](#) of prescribed fire could become relevant on multi-owner projects. If the landowner has not completed significant user review, APCD will apply toward their PM-10 ceiling a proportion of the project's expected emissions equal to their share of the acres burned. In that case APCD needs to know each owner's share of acres, but we will ask you if necessary. Adjustment to the acre basis for allocation may be made if fuel loads differ greatly by ownership.

2. *Background:* The boundaries of some burns cross jurisdictional lines, or a burn done by one agency can be on a second agency's land, sometimes for the benefit of a third.
3. *Implementation Guidance:* Beyond the formalities or who is ultimately responsible for adherence to a permit, we expect that whoever signs the permit will ensure that the burn boss has the information needed to adhere to the permit, will oversee that reporting is completed, and will direct the prescribed fire fee invoice to the appropriate person(s) or agency(s) for payment.

Applicants for multi-owner permit may prefer to split the costs. In that case, complete the part of the form that asks what percent of the costs should be levied to each permittee.

As soon as we see that significant user procedures might be on the horizon, we will talk to you about it.

4. *Authority:* [Reg. 9](#) V A: “Significant users of prescribed fire shall apply for and may obtain a... permit if they also satisfy the requirements of section VII of this regulation.” [Reg. 9](#) V B: “Any person seeking authority to conduct a prescribed fire [with]... potential to exceed the de minimis threshold... shall apply for... a planned ignition fire permit.”
5. *Approved by and date of signature:* Dan Ely, 6/24/11

G) Form A, Landowner: Do permitted land users on federal land need smoke permits?

1. *Requirements:* A public land permittee, such as a ski resort operator, needs a permit just as if the land manager were doing the burning themselves. However, if the project is small enough or is not for forest or grassland management and otherwise meets the requirements for general [open burning](#) then it is eligible for those simpler permits.¹

The permittee land user files the application for a smoke permit, not the federal agency that manages the land. Permittee land users are subject to the same smoke requirements and procedures as any other burner.

2. *Background:* Many ski resorts are on federal land that has a special use permit. Ski areas may burn piles after clearing runs on USFS lands, for example. The user of the land (ie, the ski area) is the permittee and responsible party.
3. *Authority:* [Reg. 9](#) V B: “Any person seeking authority to conduct a prescribed fire [with]... potential to exceed the de minimis threshold... shall apply for... a planned ignition fire permit.”
4. *Approved by and date of signature:* Dan Ely, 6/24/11

H) Form A, Local Fire Department:

1. *Background and History:* Two fire departments requested notification when APCD issues a prescribed fire permit for burning within their jurisdiction. Because federal land management agencies are the fire control authority on land they oversee, the request applies only to land owned by individuals, businesses, or local governments.
2. *Intent:* The purpose of asking about fire control permitting authority is to strengthen APCD’s support of local agencies. Consequences are slightly increase in a private-land applicant’s preparatory work, and expected increased compliance with requirements to obtain fire control permits. The latter benefits good smoke management by strengthening APCD’s

¹ There are exceptions in Eagle County due to additional local regulations. If you need more information about Eagle County, contact us for more detail.

collaboration with agencies that are well-placed to advise potential burners about smoke permit requirements and to assist burners with managing smoke responsibly on the ground.

3. *Implementation Guidance:* As a courtesy to aid in local coordination and challenges with managing the considerable increase in burning piles on private lands APCD forwards the completed smoke permit to the person listed on the application as the fire department contact.
4. *Written by and date of signature:* Coleen Campbell and Sarah Gallup, 7/27/11

I) Form A, miles to nearest home: Standard conditions refer to occupied residences. What determines whether a home is occupied?

1. *Requirements:* In determining whether a house is occupied, we require (only) reasonable attempts. What is workable will vary by project. There is no requirement to contact the owner or occupant of every apparently-unoccupied structure if other methods are effective. (If the home is in fact occupied and you are trying to mitigate distance, personal contact IS required. Please see that separate topic, below.)

Whether a residence is occupied can change from day to day. For example, use of some second homes is reliably seasonal. For permit purposes, “occupied” refers to day(s) when ignition occurs. If whether a home is in fact occupied is likely to vary depending on the time of year, say so in the narrative.

Only for piles < 300 ft³ each, a residence can be considered unoccupied if every resident of the home is at work or otherwise gone during the day.

In your project file keep basic documentation of determinations whether residences are occupied. Show the documentation to APCD on request, but do not submit it routinely.

2. *Intent:* Small piles have different occupancy requirements because, provided required chunking is completed, we are concerned about nighttime drainage smoke into nearby homes mostly from larger piles.

In addition, [Reg 9](#) is concerned with protecting public health and welfare, not buildings. The point is to protect public health and welfare, and this is moot if the home is unoccupied.. This is important in some situations; for example if there is one close-in home to the burn but the next closest home(s) are several miles away. If the only home within a couple miles of the home may be unoccupied either seasonally or permanently, knowing and telling APCD that on an application matters and will impact the amount of burning permitted.

3. *Implementation Guidance:* In figuring out whether anyone is occupying a home, following are options to consider.
 - For piles, watch where there are tracks in the snow or where the plow quit.
 - Consider not burning on weekends if most nearby homes are vacation residences.
 - Ask the agency law enforcement officer.
 - Talk to local residents.

- Distribute flyers to homes or cabins, post notices in common areas, and ask.
4. *Authority:* [Reg. 9](#) IV B 1 a: “The division shall consider... the location and proximity of the proposed burn to any building...” and [Reg. 9](#) IV C 2: “Each permittee shall use the best smoke management techniques appropriate to the proposed burn.” [Reg. 9](#).V.C: “The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public.”
 5. *Approved by and date of signature:* Dan Ely, 6/24/11

J) Form A, miles to nearest home: Can I ‘mitigate’ an occupied residence?’

1. *Requirements:* To count an occupied home as unoccupied for purposes of permit distance categories, contact a person in each household by phone or in person to establish that no member of the household has unmitigated health concerns related to smoke.

Indicate on the application both the actual distance to the nearest occupied home and also the ‘mitigated’ distance. Space for each appears on the same line on the first page of Form A.

While mitigating a residence is likely to result in a project having less restrictive permit conditions, it does not imply permission to exceed the NAAQS even at mitigated homes. We expect the permit conditions we issue will prevent this. However, the mitigated homes and smoke impacts there still should be part of the burn’s routine smoke monitoring and adjustments should be made as needed in order to keep impacts below national health impact thresholds.

For requirements related to how one determines whether a house is occupied in the first place, see that topic above.

2. *Intent:* We want to provide some flexibility for the isolated home or ranch whose occupants have no health issues related to smoke and whose tolerance for seeing, smelling and breathing limited smoke is established.

Mitigating distance means working with permit conditions that effectively presume that a household doesn’t exist, or similarly that their welfare beyond NAAQS is of no concern. That is a strong action. For it we require a strong test. We intend to give people in each mitigated residence a very easy opportunity to make their concerns known. That is why affirmative personal contact is required. It isn’t appropriate to be this dismissive of someone just because they didn’t respond to a message, email, or letter.

3. *Implementation Guidance:* Contacting individual homes is labor-intensive. It isn’t practical for whole subdivisions or neighborhoods, and isn’t meant to be. Those areas should be labeled and treated for what they are: occupied.

Other than in working with health-sensitive individuals, for no project does APCD require house-to-house contact. It is optional, and usually done only to put the project in a less restrictive distance category.

- With respect to establishing distance to nearest occupied home, you have the option to assume that every home is occupied or of using other reasonable methods to determine that the house is vacant.
 - Mitigating distance is optional. If it is not done, permit conditions will reflect the actual distance to the nearest home. Using personal contacts in order to 'earn' less restrictive permit conditions is an option we offer and that you may - and may not - decide helps you do your work.
 - Simple public notification as opposed to distance mitigation may always be done via impersonal media, whether it is a news release, signs posted in appropriate places, HOA newsletters or other means. Again, working with people who have known health sensitivity to smoke is an exception.
4. *Authority:* [Reg. 9](#) IV B 1 a: "The division shall consider... the location and proximity of the proposed burn to any building..."; [Reg. 9](#) IV C 2: "Each permittee shall use the best smoke management techniques appropriate to the proposed burn." [Reg. 9](#).V.C: "The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public."
5. *Approved by and date of signature:* Dan Ely, 6/24/11

K) Form A, Receptors: Should I list every single isolated home around the proposed burn as a receptor on Form A?

1. *Requirement:* Listing isolated homes as receptors is never required.
2. *Intent:* The list of receptors we use to help us picture a burn. It does not influence what category of conditions applies. The main use we make of the list of receptors is for understanding and reviewing requested wind directions, a review that also includes us consulting a map. On the other hand, distance to nearest occupied home does determine conditions category.

The home of a smoke-sensitive individual, such as a person with respiratory illness, is a critical concern when managing a project's smoke. It is not necessary to list the sensitive individual's home as a receptor, however, since each known sensitive person must be addressed individually. If there are key considerations specific to this burn about known or possible smoke-sensitive individuals, describe them in the narrative or call if you'd rather not put it in writing.

Occasionally a burn is so remote that a permit applicant decides that listing the nearest home(s) as receptors will help APCD picture and better understand the project. That's fine.

3. *Authority:* [Reg. 9](#) IV B 1 a: “The division shall consider... the location and proximity of the proposed burn to any building...” Reg. 9 II R, definition of smoke-sensitive receptors: “... urban and rural population centers... and other locations that may be sensitive...” [Reg. 9.V.C](#): “The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public.”
4. *Approved by and date of signature:* Dan Ely, 6/24/11

L) Form A, Receptors: I am applying for a permit to burn within a Class I area. Is the Class I area considered a receptor?

1. *Requirements:* When a burn is inside a Class I area the Class I area itself does not need to be listed as a receptor.
2. *Intent:* APCD recognizes that management of National Parks and other [Class I areas](#) involves tradeoffs among natural resources. Managers charged with holistic oversight of Class I areas must consider all the resources in the area for which they are responsible, including air. APCD recognizes that land managers are best placed to judge whether a prescribed burn is appropriate in the Class I area they manage. An outer limit on burning is that, like APCD, land managers lack legal authority to ignore NAAQS limits including in Class I areas.

In the application narrative, do describe the mitigations that will be used. The usual range of options is relevant, especially visitor interpretation.

3. *Authority:* [Reg. 9](#) V D 3: “The division shall consider... the location of the proposed burn... and Class I areas that might be impacted.”
4. *Approved by and date of signature:* Dan Ely, 6/24/11

M) Form A, Management Purposes / Type of Project: Are training burns exempt from getting smoke permits?

1. *Requirement:* Training projects are exempt from smoke permits only if they otherwise [qualify as general open burning](#), which for broadcast is less than 10 acres of grass or 5 acres of other fuels. If a training burn needs a regular prescribed fire permit rather than a general open burn permit, it is not exempt.
2. *Intent:* It’s a rare prescribed fire that doesn’t provide training benefits. Our logic is that a project too big for a general open burn permit has more benefits than training alone so is not strictly a training burn. The size threshold is also a surrogate for the burning having enough potential to affect air quality to be regulated. Second, one of the subjects firefighters learn about during training is managing smoke professionally. That includes working with smoke permits.
3. *Implementation Guidance:* The general [open burning staff](#) appreciate if you notify them when you are implementing an exempt training burn.

4. *Authority:* [Reg. 9](#) III B 3: “The following activities are exempt.... Fires used for instructional or training purposed, except instructional or training wildland pile or broadcast fires larger than the de minimis thresholds of a low smoke impact burn pursuant to Appendix A of Regulation Number 9;”
5. *Approved by and date of signature:* Dan Ely, 6/24/11

N) Form A, contingency: What is meant by smoke contingency?

1. *Intent:* Every permit includes a smoke contingency plan for a couple reasons. First, we want to be sure that the burn’s planners have thought through what ought to happen if smoke impacts are unexpectedly bad so they will be better prepared to respond if needed. Like escaped fire or medical or sometimes other contingency plans made for nearly every prescribed fire, we don’t expect situations to arise often when a smoke contingency would have to be implemented. They do occasionally exist, however.

Second, understanding a burn’s smoke contingency plan helps us understand and evaluate how risky for smoke a particular permit application is. The more a contingency plan is likely to be sufficient to stop a bad smoke situation quickly, is realistic, and has been thought out ahead of time with care, the shorter the duration and perhaps even lower severity a bad smoke situation is likely to be. Understanding smoke risk is a key part of evaluating and conditioning a smoke permit application. For example, a paved road that cuts through a large ponderosa burn unit that is likely to have fire on only one side of the road at a time, a well-oiled homeowner association communication network, a loader and operator on site when machine piles are burned, or even an over-sized burn organization all can significantly reduce the likelihood that residents will breathe heavy smoke for a long time. Knowing those kinds of details helps us figure out how loosely or tightly to set the burn’s conditions, including whether standard conditions are appropriate.

2. *Implementation Guidance:* The contingency plan that is part of each permit application describes a planned response to excessive smoke. The smoke contingency plan ideally includes commitments of what will occur if its implementation is triggered, rather than exclusively listing options that the burn boss may consider. Example contingency provisions:
 - Two added information officers will attempt to contact each household within 1.0 miles down valley within 2 hours.
 - All assigned operational resources will mop up until sunset.
3. *Authority:* [Reg. 9.V.D.8](#), “...applicant will conduct the burn in accordance with a smoke management plan or narrative that requires: d. That smoke management contingency measures will be taken if smoke impacts occur at smoke-sensitive receptors;”
4. *Approved by and date of signature:* Dan Ely, 6/28/11

O) Form A, contingency: When things go really wrong with smoke what does the burn boss need to do?

1. Requirements: A general permit condition addresses excessive impacts:

“If unhealthful or excessive smoke impacts develop, implement smoke mitigation plan and [contact APCD](#) within 2 hours. If the smoke mitigation plan is not sufficient to mitigate smoke impacts by sunset of the next day, additional smoke mitigation measures will be developed in collaboration with APCD. If agreement on a collaborative plan cannot be reached or implemented, APCD may rescind this permit immediately.”

This note provides more detail.

Implement the smoke contingency plan in the permit. The plan includes notifying APCD within 2 hours. Once the burn boss has finished dealing with urgent matters related to the fire, phone us with more details.

If implementing the smoke contingency plan is insufficient and excessive smoke impacts are likely to continue longer than overnight, we’ll ask to discuss options with you. If 24 hours from the end of ignition we cannot come to agreement about what your ‘extended attack’ on the smoke will involve, it is possible that we may invalidate and suspend the project’s permit. Possible consequences then include enforcement action for burning without a permit and/or needing formally to convert the burn to a wildfire.

2. Implementation Guidance: It is our expectation and hope that we may never need to use the last resort of rescinding a permit. It is present only in case in APCD’s judgment a burn boss who is managing a serious problem smoke is not responsive to the need to mitigate as best as can reasonably be done. We realize that a day or more into serious smoke trouble, options may be limited. We do expect the burn boss and their organization to make a strong effort to do what is feasible and effective.

If APCD staff request, or if the burn boss thinks documentation is wise regardless, prepare a smoke incident report. We have some example forms.

If there were problems with smoke but not a full-blown incident, call us anyway. From a punitive perspective, timely self-reporting may go a long way toward softening enforcement. From a professional perspective, sharing the learning helps everyone.

3. Authority: [Reg. 9.V.D.8.d](#): “The division shall consider... whether... smoke contingency measures will be taken if unacceptable smoke impacts occur” and [Reg. 9.IV.C.12](#): “If at any time the division... determines that the permittee has not complied with any terms... the permit is subject to partial or complete suspension.”

4. Approved by and date of signature: Dan Ely, 6/28/11

P) Form A, Requested Wind Directions: How tightly must I constrain wind directions? How close to the burn can the receptor be and still be OK?

1. *Requirement:* If wind direction needs to be constrained including to avoid a smoke-sensitive receptor, eliminate direction(s) defined to the closest of the 8 basic compass directions.
2. *Implementation Guidance:* If the receptor to be protected falls near a line dividing two of the eight directions, both may need to be eliminated. For example, a receptor to the N may be a reason to eliminate S wind. SW and SE would still be acceptable. If the receptor were NNE, then both S and SW may need to be eliminated.

How far from a burn receptor must be mitigated individually can be a fairly project-specific decision and include an element of judgment. In general, consider the closest town or large subdivision in each of the four cardinal directions and within 25 miles of the burn. Not all the receptors you consider this way will require wind constraints, but how much they are likely to be impacted and its acceptability need to be thought through. Listing them helps document that the evaluation was made. Call us if this answer is too vague for your specific project.

3. *Authority:* [Reg. 9.IV.C.6](#): “The authority granting the permit may impose conditions on wind direction...”; [Reg. 9.V.C](#) “...application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes... the impacts of the smoke on visibility and on the health and welfare of the public.”; [Reg. 9.V.D.3, 6 & 8.a](#): “The Division...shall consider...in determining whether, and under what conditions, to issue a... permit: 3. The location of the proposed burn and smoke-sensitive areas and class I areas that might be impacted by the smoke and emissions from the burn; 6. The smoke mitigation techniques proposed; 8.a That best smoke management methods will be used to minimize or eliminate smoke impacts at smoke-sensitive receptors;”
4. *Approved by and date of signature:* Dan Ely, 6/28/11

Q) Form A, Requested Wind Directions: I expect to loft smoke completely over a nearby receptor. Is that adequate mitigation?

1. *Background:* There are two general methods of changing the smoke a burn does produce so that impacts are minimized: dilution and removal/avoidance. Dilution ‘thins out’ smoke, so that even if it stays on the ground and passes through receptor areas, it is less dense. Removal/avoidance occurs when the receptor is avoided through wind direction or by lofting a column up over close receptors, with the expectation that when it eventually resurfaces downwind, it will be well diluted.

From a weather perspective, different conditions are required to promote dilution versus lofting. Good dilution occurs when winds are strong and the mixing layer is deep. Smoke disperses through a large volume of ambient air. Good lofting occurs when the air is unstable and winds are relatively light. Instability, which is related to a deep mixing layer, promotes both loft and dilution. Unlike instability, wind has opposite influences on loft and dilution. Relatively light winds can help a column develop, while strong winds are needed for dilution.

There is little certainty that lofting from an ordinary sort of prescribed fire will protect nearby receptors. In contrast, it is common for major wildfires to loft smoke well. There are two reasons for the difference.

- First, most wildfires occur in summer when instability peaks.
- Second, the wildfire's vertical lift is usually generated by draw within a convection column. An intense fire's column has enough energy to reach a height in the atmosphere where the water vapor in the smoke condenses. When the vapor condenses, the water's phase change from gas to liquid releases huge amounts of heat. The second pulse of heat boosts the smoke's vertical velocity. A senior researcher at Missoula told us once that the released latent heat of condensation far exceeds the sensible energy in a fire's flames. That is, for lofting it matters a lot more whether the column becomes fully formed than whether the flames are impressive. The kind of energy in a condensed column can do all kinds of things with air flow and smoke, including loft it well. But does the burn plan for this project really imply this prescribed fire will have a fully-developed, condensed column?

2. *Implementation Guidance:* To decide which if any method of dispersing smoke is feasible and appropriate requires detailed familiarity with a site and its planned fire. Reliable mitigation by lofting depends on generating a fully developed column. Under some circumstances a more intense fire with good loft is harder to control. On the other hand, the higher winds required for dilution can also portend control challenges. While at APCD we do decide that a proposal is or is not sufficiently protective of air quality, we cannot appropriately decide whether the implications for control are acceptable. You must.

If you plan to use lofting as mitigation, describe the logic well in your narrative as a starting point. Address the atmospheric dynamics and fire behavior you expect. Consider adding the mitigation of a maximum eye-level windspeed, one at which you believe the plume won't lay over enough to adversely impact nearby receptors. And expect we will want to attend and document this burn and/or require that you share documentation of the smoke.

3. *Written by and date of signature:* Coleen Campbell and Sarah Gallup, 7/18/11

R) Form A, Request Standard Conditions: Why does APCD have both standard and non-standard conditions?

1. *Background and History:* For as long as Colorado has had a smoke management program, burn projects have been reviewed and conditioned individually. In 2007 we recognized an opportunity to provide both greater consistency across similar projects and more predictability for burners by describing what typical projects would have as permit conditions. We created "standard conditions" worksheets first for piles then for broadcast burns. Both were based not on averages but on near-upper limits of what had successfully been burned in the past in Colorado without known undue smoke impacts.

One consequence of using the high end of prior experience is that not all burn projects are close enough to typical of their fuel, distance and location category for standard conditions to be appropriate. The worksheets would be considerably more conservative if they had

instead been designed to be protective for every possible project that fit within each category's criteria. So some projects' permit conditions are *more* restrictive than standard.

A 2009 example is handpiles immediately adjacent to homes in the bottom of Vail Valley. The valley is high (read 'cold'), narrow, steep, and backs up to the even-higher Continental Divide, all characteristics that discourage smoke dispersion. People likely to be in Vail when the piles were burned included drivers in winter weather on the immediately adjacent interstate, people entirely unfamiliar with wildland smoke, patients of a large hospital, fresh out-of-state visitors whose blood has not yet adjusted to high elevation, and many retirees. Finally, all of the agencies involved in the burn project were very eager to maintain the high level of project acceptance they had worked hard to earn. APCD staff and the permittee both felt tighter conditions than standard were warranted.

2. *Intent*: In the sense that the worksheets reflect the real world of what has been done rather than a theoretical upper limit of what could be done responsibly, it's been known from the start that the worksheets may be excessively conservative. They also may not. Absent a credible smoke impacts model, only experience can reveal discrepancies. So a second reason for non-standard conditions, opposite of burns whose characteristics invited unusual restraint, is to experiment with relaxing standard conditions. Projects for experimental permits are chosen carefully, represent incremental change, and are monitored closely in order to milk them fully of lessons.

A third reason for non-standard conditions is the most common. Project particulars may lead implementers to prefer tighter restrictions on one variable in exchange for a similarly consequential loosening on another. The typical trade-offs are in both directions between daily acres and end ignition times.

Including all three groups of reasons, in 2008 eight percent of pile projects and 39% of broadcast projects had permits that varied in some respect from standard conditions. Variances ranged from almost trivial to the state's most experimental smoke management.

Generally, while the standard/non-standard framework of our permitting program creates some additional complexity to the program, we believe it is worth it. Some degree of uniformity among permits for typical burns through "standard conditions" has many advantages. But so does the ability to be flexible, respond to unique site characteristics and situations, and push the envelope via "non-standard" conditions. We have attempted to package and separate the standard and non-standard parts of our program in ways that are clear both on the web site and in our forms and instructions. We are always interested in suggestions about how to do better!

3. *Implementation Guidance*: The following several topics in this manual address making requests for non-standard conditions. Also we are available (even eager) to [discuss](#) smoke plans for any burn project.

Additional references include [example narratives](#) and a list of [best management practices](#).

4. Approved by and date of signature: Dan Ely, 6/29/11

S) Form A, Request Standard Conditions: Should I propose my own permit constraints or is that APCD's job?

1. *Implementation Guidance:* 'Yes' to both. You should propose your own permit constraints and it is APCD's job to ensure constraints are consistent with [Regulation 9](#). If you think non-standard conditions are appropriate for this project it's better to recommend your own than to rely on us alone to generate the conditions. The main reason is that you are more likely to end up with effective constraints that work well for your project because they take into account the particulars of your situation. You know and we do not, for example, whether you are better off reducing acres or constraining wind direction. Second, APCD can more quickly review whether proposed conditions are acceptable than generate them.

The standard conditions described on the [pile](#) and [broadcast](#) worksheets are a starting point. Proposals for less stringent conditions need especially strong justification, which can be included in the narrative.

We do not as a matter of course deny permits. The main reason is that all but a handful of applications come from experienced, responsible fire professionals and it shows. Instead of turning down an application, when needed we typically talk with applicants to revise proposals and/or devise different conditions than originally proposed.

If it's relevant, help us better understand the smoke program's effects by telling us what you think even more appropriate conditions would be than the ones you propose. A common example is for an applicant to limit the number of acres per day too tightly, or constrain wind direction to avoid receptors that you truly believe will not be affected even if wind blows toward them. In that case, please note in the narrative what you have artificially tightened. Explain why you think less restrictive conditions are still responsible. Additional mitigation of a sort other than the permit condition you are loosening is probably in order also; describe that. When we review the application, we will look for opportunities to consider your information. Also, it will help us track the need for ongoing program adjustments.

A group of APCD staff rather than a single reviewer considers, conditions, and approves any permit with less restrictive permit conditions. Committee review is intended to ensure reasonable parity and thoughtful review from a variety of perspectives on the most challenging projects. The committee is specifically required as part of its review to consider appropriate monitoring requirements, and means and opportunities to share information subsequently collected. Committee review increases turnaround times somewhat on high-risk projects, but does not change the 30-day deadline APCD uses for determination of approval or denial of a completed permit application.

2. *Written by and date of signature:* Coleen Campbell and Sarah Gallup, 8/9/11

T) Form A, Request Standard Conditions: How likely is it that a burn will have exactly the conditions listed as standard?

1. *Implementation Guidance:* For the most part, it's up to you how likely it is that a burn will have standard conditions. If you have a responsible proposal that's different than standard, propose and justify it. Otherwise, most projects will have standard conditions. Exceptions

are a project too small even to need them, or with unusual smoke risks. From APCD's perspective, the latter includes burn organizations with whom we have never yet worked.

2. *Written by and date of signature:* Coleen Campbell and Sarah Gallup, 8/9/11

U) Form A, Request Standard Conditions: How can I get the widest permit conditions that are consistent with responsible smoke management?

1. *Background:* This is a question that on occasion we get, and not unreasonably. An experienced burn boss may believe they can responsibly burn with less smoke restriction than standard conditions provide.
2. *Implementation Guidance:* First, we expect every applicant to ask themselves rigorously 'what is responsible?' If an aspect of a proposal doesn't meet this test, go no further.

If your proposal passes your gut test, submit it. Include a solid description and justification in the narrative. Note what additional offsetting mitigations you may be proposing.

It may be quicker if you call us first to discuss the project before submitting a highly non-standard application. Please see also the next topic.

To a very limited degree, in setting conditions we may consider local history. How professionally have burn bosses on previous projects within the administrative unit managed both permit conditions and smoke? Also, what is the history of burns in that airshed? Has there been a burn of the proposed size or reasonably close to it? What happened?

So over time the best ways to get wide permit conditions are (1) to work responsibly with existing permits; (2) to continue to improve skills to picture smoke possibilities for future projects accurately and in detail, and to figure out how best to manage the smoke; and (3) work with us to figure out how to responsibly and incrementally increase the size and/or smoke risk in a given area.

3. *Written by and date of signature:* Coleen Campbell and Sarah Gallup, 8/9/11

V) Form A, Request Standard Conditions: We have a proposal that is responsible but doesn't look good on paper. What should we consider in preparing our permit application?

1. *Implementation Guidance:* There are some legitimate ways to justify a challenging proposal on an application. Also, call us. We'll want to talk to you about a project like this anyway, including to really ground our understanding of why your proposed conditions might be a good idea.

Think individually and creatively about receptor mitigations. For example, impacts on a Class I airshed or a view are more important during periods of high visitor use, typically summer and weekends. See the discussion of narrative content.

Think individually and creatively about permit conditions. Examples: If you want to do aerial ignition of hundreds of acres a day, how early do you expect to finish? How early can you

commit to finish? Or if dilution is a key mitigation, should you restrict the project to fair days or limit fair days to a low acre cap to allow for some blacklining? If drainage smoke is a critical concern and therefore so is NWS' ability to accurately predict inversion timing, could you put a weather station within the project area a month or two before ignition?

Here is another example. The option to burn small piles in waves is a standard permit condition. If you will be burning small grass units or other very light fuels in blocks that can be partitioned into different ignition periods, consider waves also for broadcast. Request a daily acre cap that includes two or three waves per day. Either you or APCD staff will also note on [Form A](#) that the permit has a constraint on the number of acres on fire at once. Waves are not appropriate in fuels like timber where hours of smoldering may follow flaming.

Think carefully about the tonnage of fuel you expect will be consumed.

For smoke impacts, two-way outreach can go a long way. For example, WUI (wildland-urban interface) fuels projects often create piles right in backyards. If you can provide simple indicators that everyone or almost everyone who lives nearby has a good opportunity to know what burning is proposed, to comment and discuss their concerns, to hear notification shortly before ignition, and especially to bring to burners' attention people with health sensitivities, then APCD is more likely to consider that smoke impacts are mitigated.

If you end up constraining daily acres or number of piles for the sake of managing air quality responsibly rather than for other reasons, APCD staff want to know. Knowing is a reality check for us on the sometimes inevitable tradeoffs between fuels reduction or other burn objectives and air quality.

2. *Written by and date of signature:* Coleen Campbell and Sarah Gallup, 8/9/11

W) Form A, 'Submit to': May I submit my application electronically?

1. *Requirements:* You may send forms, maps, photos, and any optional attachments via email. Addresses are right below your signature block on the application. New permittees may also have to fax or mail a signature page, but we will tell you if that is necessary.
2. *Implementation Guidance:* Please do submit applications electronically, for both our benefit and yours. Sometimes submitting applications electronically will mean a permit can be processed sooner because program staff can more easily exchange documents. Also, renewals can be requested via a simple email if - and only if - we have the previous year's permit in electronic format and can therefore make the renewal updates ourselves on an electronic copy.
3. *Authority:* Electronic signatures are widely accepted. As an example, the Colorado Air Commission's Procedural Rules allow in section 1.3.8(2)(a) "Service by electronic mail shall be complete when the Office of the Air Quality Control Commission receives an electronic mail containing an attached, signed version of the document to be filed, and a message is transmitted back to the sender from the Office of the Air Quality Control Commission, confirming the filing was received. When a party files by electronic mail, it shall be considered an agreement to be served by electronic mail." [Reg 9.V.C](#), "Persons seeking a

planned ignition fire permit shall submit to the Division or authorized local agency an application on a form approved by the Division for each separate burn.”

4. *Approved by and date of signature:* Dan Ely, 7/14/11

X) Form A, signature date: How long does it take to review and process an application?

1. *Implementation Guidance:* Short answer: Most permits are on their way back within a week or two.

Long answer: We grant ourselves 30 days after receiving a complete application to make a decision on a permit. The 30 days does not include a public comment period if one is required (rare). We recommend that you plan for permit approval to take 30 days. By doing so, we will be sure to have the permit processed by the time you need it.

Even when application packets include all the pieces and are prepared carefully, we usually end up asking questions, especially about projects that are not renewals. Phone or email tag may delay processing. It is not until we have all the information we will need that we date an application as ‘complete.’ Typical inquiries: two statements in an application appear to be inconsistent; we want to know your expectations about how this project’s smoke potential differs from a particular previous project; we can’t adequately understand this fuel complex from the labels; we aren’t familiar enough with a particular receptor to picture it without your help; we’d like to know the operational feasibility of the some alternative mitigations; etc. It would waste everyone’s time if we asked all our possible questions as part of every application. Instead, please expect and plan for some discussion.

The more complicated and risky a project is for smoke, the more rounds of discussions with you and each other APCD staff are likely to have. The reverse is also true. Small, simple projects generally take less time to work through.

Long formal time limits are one thing. In fact, we take pride in turning most applications around in less than ten days. Exceptions:

We tend to have small backlogs in December and January, since every permit expires on New Year’s Eve.

We juggle priorities more freely and may take more time if we know a project won’t be burned for many weeks or months.

If a project is a rush for some good reason, say so. We may be able to push one application ahead of everyone else’s - but not if it would hold up burning for people who submitted earlier. In responding to rush requests we also consider our other priority tasks.

Processing the few projects subject to public comment tends to take the full 60 days allowed by regulation.

Occasionally we get waylaid for emergencies. Unpredictable, high priority issues that consume lots of time may limit our ability to move quickly on permits for a few days. We

live in a less multi-faceted work world than most agency fire personnel, so this exception isn't as routine as it might sound. And we still expect to meet the 30 day deadline pretty much no matter what else is happening.

2. *Authority:* For those few applications that receive formal public comment, [Reg. 9 VI E 2](#) requires that the Division “within 30 days of the close of the comment period... shall either grant or deny the permit.” We elect to require of ourselves that no completed application be in processing status for more than the same 30 days, even if it does not require a comment period.
3. *Approved by and date of signature:* Dan Ely, 7/14/11

II) Application Form A, Portion for Piles Only

A) Form A Broadcast, Annual Acres OR Form A Piles, Annual Number of Piles: Is this burn too small to need a prescribed fire smoke permit?

1. *Requirement:* Submit candid and honest applications so we can all do our best to stay within the law and give you advice/guidance based on the facts of the situation.
2. *Implementation Guidance:* We'll help you figure out from there whether a project is eligible for a general open burn permit. Or see our website's discussion about [open burn permits](#).
3. *Authority:* [Reg. 9 V B](#): “Any person seeking authority to conduct a prescribed fire [with]... potential to exceed the de minimis threshold... shall apply for... a planed ignition fire permit.”
4. *Approved by and date of signature:* Dan Ely, 7/14/11

B) Form A Piles, Annual Number of Piles: Is there a limit on how large a pile may be burned in Colorado?

1. *Requirements:* Within half a mile of homes, no single pile may be larger than 200,000 ft³. It also must be no larger than 50' in one of its footprint directions. If the pile is at least 0.6 miles from the nearest home, there is no permitting limit on a pile's size.
2. *Background:* Several years ago when we received an application for one pile whose footprint exceeded an acre - a wooden Superdome - we realized we had to address maximum pile size.
3. *Intent:* Limiting pile footprints in one direction means that piles either must be relatively small, or that they be shaped as windrows. Windrows are a way to balance two objectives: (1) to give loggers and others who build piles the greatest flexibility we reasonably can, and (2) to keep piles narrow enough that (a) they can be ignited reasonably quickly, and (b) if bad smoke impacts develop, the pile can be worked within a day or so. Limited width addresses

the latter two intents. If one long edge of a long windrow is ignited, the fire does not need hours to reach the opposite side. And if bad smoke impacts require it, a long narrow pile is more accessible to water and heavy equipment than a very large round pile.

4. *Implementation Guidance:* The simple guide to maximum pile size for purposes of Colorado's smoke permits is to keep windrows within half a mile of homes no wider than 50', and to keep the windrow lengths unremarkable.

We recognize that not all landing configurations and other pile spaces allow long windrows to be built. If you have a responsible alternative to propose, please do. But do it before the pile is built.

5. *Authority:* [Reg. 9](#) IV B 1 f: "The division shall consider... the potential contribution of the proposed burning to air pollution in the area; [and] whether burning will be conducted using best smoke management techniques so as to minimize emissions and the impacts from the smoke on the health and welfare of the public."
6. *Approved by and date of signature:* Dan Ely, 7/14/11; amended 7/27/11

C) Form A Piles, Annual Number of Piles: May I use the 'corrected' volume given in the PNW's biomass calculator?

1. *Requirements:* APCD uses the biomass calculator's "geometric volume," not the "corrected" volume.
2. *Background and History:* USFS' Pacific Northwest Research Station has computerized calculation of some geometric shapes in an on-line [biomass calculator](#). The calculator's "geometric volume" uses standard math geometry and gives the same results as the [pile volume calculator](#) on APCD's website. Our spreadsheet in turn draws on an [even older PNW publication](#). Geometric volumes assume that pile shapes conform to standard geometric shapes like half spheres, standing cylinders, etc.

In addition to geometric volume, the biomass calculator gives a "corrected volume." The researchers used 3-dimensional locations of multiple points at the outer edges of their sampled piles. They modeled the points in a [TIN format](#) to calculate a volume closer to observed volume. From that they derived by regression a relationship between geometric volume and TIN-measured volume. The regression applied to dimensions entered into the biomass calculator yields the corrected volume.

3. *Intent:* We share with many people an interest in trying to figure out the best way to calculate pile volumes. Following are the reasons we think geometric volume is the best one to use for Colorado's smoke program.
 - a) Every project's volume should be estimated using the same algorithm. At least as important as precision is parity among projects. If one project is calculated in one way, all should be. Is it valuable to introduce more complexity for everyone by using corrected volumes in the interest of what may be more accurate? That depends on the consequences.
 - b) The recalculation wouldn't make much difference in the real world, so it's not clear that adding complexity would be worthwhile. While the research seems sound and well done, the

correlations aren't so high as to inspire great confidence that the "adjustment" is a reliable improvement.

Using the biomass calculator's "correction" wouldn't change either bills or permit conditions. Except to the slight extent that the adjustment is not linear, it wouldn't change bills. Smoke permit bills are based on relative shares of burn activity rather than absolute sizes of projects.

One might wonder if a lower calculated volume would let people burn piles with fewer restrictions by putting projects in lower-numbered categories. It wouldn't. Standard conditions describe not theory but observations of what has worked. "Less than 300 ft³" characterizes piles that have been measured via geometric shapes in the past. If we used "corrected" volumes, we'd have to adjust the size cut points on standard conditions as well.

c) The biomass calculator's correction fine-tunes a calculation that has much bigger known sources of error, so it would seem to focus attention in the wrong place. If nonetheless there were compelling reason to use a slightly more complicated system in order to work with more accurate volumes, we should ask ourselves where the biggest source of error is now, and work on improving that.

There is a lot of inaccuracy in using shapes. They are rough estimates. As the [biomass calculator's research paper](#) notes, "Piles rarely conform perfectly to a geometric shape." Choosing a less-than-perfect shape code overwhelms the "correction" in the research paper, and the calculator too relies first on a shape choice to describe each pile. The error band on choosing the best shape is considerably larger than the calculator's "adjustment."

Questions about what of the proffered geometric shapes is most representative arise most often for larger logging piles - perhaps 20' on a side or bigger. It's often unclear whether the closest representation of the pile's shape is an upright cylinder or an ellipsoid. Unless the pile leans far toward the cylinder shape, we pretty consistently use the equation for ellipsoids, and nearly every applicant makes the same choice. The difference is significant, an exact ratio of 2/3. If we are going to work toward greater accuracy, rather than worry about fine-tuned adjustments, we could pay more attention to shapes. We generally don't quibble among similar shapes, and err on the side of assuming the piles are small.

Using a different way of calculating volume might change our emissions inventory a little. It has almost no immediate consequence for permits, but in the long run may influence the extent to which fire is understood to be an important source of particulates relative to other sources. The inventory, however, has an even larger source of inaccuracy that probably overwhelms even imprecision about shapes: packing ratios. [FOFEM](#) offers 10% or 20% or 30%. It's the user's choice - a potential for error of 300%. The biomass calculator's correction, in contrast, addresses differences on the order of 5-10%. We have asked Roger Ottmar, lead author of both [FOFEM](#) and [CONSUME](#), which ratio to use when. Although sympathetic, he doesn't have any guidance about which of the 3 choices is best when, and suggests operator judgment.

The biomass calculator paper reinforces our uncomfortable awareness of uncertainty about packing ratios. "Of the 121 hand piles the researchers measured, the packing ratio of 58 piles was less than 0.10, the packing ratio of 53 piles was between 0.10 and 0.25, and the packing ratio of 10 piles was greater than 0.25." Until we can all make headway on

understanding what packing ratio to use when, using adjusted shapes would fine-tune a small source of inaccuracy while ignoring one that easily overwhelms the change.

In sum, given the very limited consequences, we don't see sufficient value in using an additional calculation in the interest of questionably greater accuracy. At the risk of lying on laurels, we're already well ahead of where we were a few years ago, when many people simply multiplied height times width times length to derive pile volume. Other people calculated geometric volumes, and we weren't even sure how a few projects' volumes were derived.

We will continue to keep our ears open for improvements to pile volume calculations that fit well in Colorado's program.

4. *Implementation Guidance:* Do your reasonable best with pile volume calculations, but don't worry overly about it.

We suggest that you do use one or the other of the on-line [biomass calculator](#)'s geometric volume or the [pile volume](#) spreadsheet. They yield the same numbers.

During application review, APCD staff verify volume calculations using the pile dimensions also included in the application. If the volume we calculate differs from the volume shown on the application we may call you to ask. If instead, as happens more often, the difference is in your favor in the sense of the calculated volume being smaller than reported and the calculated volume also doesn't change the project's conditions category, we may simply make and mark the change.

5. *Authority:* [Reg. 9](#) IV B 1 f: "The division shall consider... the potential contribution of the proposed burning to air pollution in the area..." and [Reg. 9](#) V D 5: "The division shall consider... the smoke risk rating for the proposed burn;"
6. *Approved by and date of signature:* Coleen Campbell and Sarah Gallup, 8/9/11

III) Application Form A, Portion for Broadcast Only

A) Form A Broadcast, smoke-sensitive areas: What's behind APCD's smoke-sensitive areas map?

1. *Background:* The smoke-sensitive areas map includes land in Colorado that meets any of three criteria:
 - within 5 miles of a Census 2000 tract with population density ≥ 500 people per km²
 - within 3 miles of a residential health care facility.
 - within a formal or informal PM-10 maintenance areas. As an example of an informal area, in the 1990s Telluride's monitors indicated exceedances of the NAAQS sufficient to cause a non-attainment designation. The community avoided a formal

designation by created a mandatory action plan that closely resembled the State Implementation Plan (SIP) that is required of any non-attainment area. As of 2010, there have been no PM 2.5 non-attainment areas in the state.

2. *Intent.* The Air Commission has directed APCD in [Reg. 9](#) to be especially protective of smoke-sensitive areas. The Commission's definition of a smoke-sensitive area is included in [Regulation 9](#):

“Class I areas and other locations of scenic and/or important vistas, especially during periods of significant public use, urban and rural population centers, schools, hospitals, nursing homes, transportation facilities such as roads and airports, recreational areas, and other locations that may be sensitive to smoke impacts for health, safety, and/or aesthetic reasons.”

The Commission's direction for smoke-sensitive areas is in [Reg. 9.V.D.3 & 8](#): “[The Division or authorized local agency shall consider the following factors in determining whether, and upon what conditions, to issue a planned ignition fire permit:] 3. The location of the proposed burn and smoke-sensitive areas and class I areas that might be impacted by the smoke and emissions from the burn;... 8. Whether the applicant will conduct the burn in accordance with a smoke management plan or narrative that requires:

- a. That best smoke management methods will be used to minimize or eliminate smoke impacts at smoke-sensitive receptors;
- b. That the burn will be scheduled outside times of significant visitor use in smoke-sensitive receptor areas that may be impacted by smoke and emissions from the fire;
- c. A monitoring plan to allow appropriate evaluation of smoke impacts at smoke-sensitive receptors;
- d. That smoke management contingency measures will be taken if unacceptable smoke impacts occur at smoke-sensitive receptors; and
- e. That measures will be taken to notify the public in smoke-sensitive areas at least twenty-four hours, and not more than 120 hours, in advance of the planned ignition of the fire regarding the location, expected duration and projected smoke impacts from the fire.”

The health and welfare of each person matters. Smoke-sensitive areas indicate where we believe above-average conservatism in smoke management is warranted.

People in hospitals and retirement homes already have compromised health. Their bodies may react poorly to smoke at lower concentrations than would affect a healthy person. In the language of burn plan complexity rating, burning near residential health care facilities increases risk to some extent and definitely elevates potential consequences.

Particulate maintenance areas also have high potential consequences. A day of unintended heavy smoke is likely to exacerbate air quality levels whose effects already may be marginally acceptable. It could even cause an exceedance of a health standard. Risk of a burn's smoke being unacceptable also is elevated a bit, because despite clean-up work maintenance areas tend to have the dirtiest background air in the state often because they are in river valleys where air gets trapped and inversions are more common.

Finally, for urban area burns public perception of unacceptable welfare impacts tends to occur at lower concentrations of smoke. Risk of adverse impacts is therefore increased. So are consequences, because a smoke problem will affect so many people. Finally, technical difficulty also may be increased, for two reasons. (1) In a city it is hard to implement an effective smoke contingency plan or even pre-burn notification. Essentially, it is no longer practical to make door-to-door contact with people who will be affected, including by unexpected but developing heavy smoke. Mass media is the only venue likely to work, and it will not be as effective at reaching everyone. (2) A second reason for elevated technical difficulty of urban burns is that cities and burns close to them tend to be in valleys.

The protection of visibility in Class I areas and scenic/important views is another purpose behind extra care being taken in considering burn conditions impacting smoke sensitive areas..

Where smoke complexity is higher, more protection from adverse consequences is warranted. This is reflected in broadcast standard conditions.

3. *Authority:* [Reg. 9](#). II.R: "Smoke Sensitive Areas or Receptors - Class I areas and other locations of scenic and/or important vistas, especially during periods of significant public use, urban and rural population centers, schools, hospitals, nursing homes, transportation facilities such as roads and airports, recreational areas, and other locations that may be sensitive to smoke impacts for health, safety, and/or aesthetic reasons." [Reg. 9](#).V.D.3 and 8 (a-e), quoted above.
4. *Approved by and date of signature:* Dan Ely, 7/14/11; amended 7/27/11

B) Form A Broadcast, annual acres: How should I count acres for which I need a permit?

1. *Requirements:* For counting both annual total acres and daily limits, use the project (or fully separable units you intend to burn in the permit year). Include all acres potentially within any black perimeter. If land is interior to continuous blacklining, it must be covered under the current day's permit. An exception would be an interior block all of whose edges will be actively suppressed on the current day. For a discussion of 'separate unit,' see the question under Burn Operations below about stopping fire.
2. *Background:* We base permits and reporting on perimeter acres because it is readily verifiable. If instead we reduced perimeter acres for percent unburned, it would be much more difficult to verify acres. Unburned area within a burn perimeter is accounted for in other ways than through daily or annual acres.
 - Standard conditions were created with recognition that some degree of mosaic is typical of most burns, and that it is uncommon for 100% of a unit's interior to be blackened.
 - The fuel description block asks expected consumption by fuel size category.

- The emission reduction techniques block has space to note what percent of acres within the fire perimeter you expect will end up black.
 - Daily and annual reports of what percent of the area within the black perimeter is of which fuel type include a category for 'unburned.'
3. *Authority:* [Reg. 9](#) IV B e: "The division shall consider... the potential contribution of the proposed burning to air pollution..."
 4. *Approved by and date of signature:* Pat McLaughlin 8/10/11

C) Form A Broadcast, smoke fuel category: What should I do if a burn's individual units fall in different categories?

1. *Requirements:* If units within a project have different smoke categories, either submit the most restrictive category or split them in the application. If you split conditions by unit, then

Create a name for each set of conditions or otherwise find a way to make it clear on the unit map or the narrative which units are subject to which proposed conditions.

Include a unit map, with units labeled.

Describe the fuel loads or piles separately for each category.

When you submit burn notification Form D and accomplishment report Form E, indicate which unit(s) are planned to be or were burned.

2. *Implementation Guidance:* Processing of your application tends to be more efficient if you call us about the project before you send us a new application for split conditions.
In order to describe two fuel beds and show clearly 2 sets of conditions, either get creative with the application's formatting, put unit-specific information in the narrative, or let us help you with templates we already have.
3. *Authority:* [Reg. 9](#) V D 5: "The division shall consider... the smoke risk rating for the proposed burn;" [Reg. 9](#).V.C, "The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public."
4. *Approved by and date of signature:* Dan Ely, 7/14/11

D) Form A Broadcast, smoke fuel category: How are the fuel categories defined for purposes of a smoke permit, and why?

1. *Background:* Please see the [broadcast smoke worksheet](#) for definitions of the smoke fuel categories we use for permitting.

2. *Intent:* The logic behind the categories is to segregate and condition burns according to what their smoke has the potential to do. Each category's conditions must be reasonably protective of the high end of risk within the category. (In order to keep this consideration reasonable, we apply restrictive and non-standard conditions to a few unusually risky burns within a category. But standard conditions still are intended to cover most burns in any category.) If many varied burns are lumped into one category, burns on the low-risk end of the group will have excessive constraints. In the interest of not unnecessarily restricting burns, there is a benefit to having a large number of categories, each at a different level of smoke risk.

On the other hand, a large number of categories makes the program complex, at some point too much so. Another problem with very fine distinctions among burns is accuracy. The extreme would be to eliminate categories and in effect give every burn its own category based on the site's actual specifics. But making reasonably accurate fuel load estimates is very difficult. Put bluntly, fuel load estimates are too inaccurate to use for permitting categories.

Our compromise solution is to use a small handful of categories - four. In defining the categories we want focus on smoke, not fuels or fire. Fuels are the cause, and smoke is the result. But we think that the basic four fire behavior fuel types correspond to different smoke issues. So we renamed the fuel groups according to their smoke issues.

- Light smoke, or grass - Grass smoke is both light and brief. The main concern is not to send the smoke directly into the closest receptors.
- Brief smoke, or shrubs - in Colorado most frequently pure stands of oak, sage and/or mountain mahogany - can put up thick black smoke. But the smoke doesn't last long. We need to be more careful than with grass about where the smoke from flaming combustion goes and to take into account receptors a little farther from the burn. But shrubs burn out very quickly. A few minutes after ignition ends, accumulated litter may still be smoldering and producing new smoke but it isn't extensive or heavy. Typically, management of fires in brush doesn't need to make allowance for drainage smoke.
- Drainage potential smoke, or timber understory - An understory burn has potential to generate some smoke hours after the flaming front passes. The delay means smoke may be generated at night when drainage air flows prevail. On the other hand typical targets for prescribed fire - mostly ponderosa, light mixed conifer, don't smolder heavily for days.
- Highest smoke risk - The last group is the only one that is different between fire behavior fuel types and Colorado's smoke categories. For fire behavior the fourth group is slash. For Colorado smoke permits the fourth group is heavy standing timber. A fire in spruce/fir is an example. In this category heavy drainage smoke is a realistic possibility. Few Colorado prescribed burns fall in the highest smoke risk category. There were five each in 2009 and 2010, or about three percent of all broadcast applications. Even so, they included widely-varying fuels as well as other smoke risk factors. Every permit application is evaluated individually, but burns in the highest smoke risk category almost automatically receive tailored permit conditions.

There are a few more situations where the four class fire behavior fuel types and smoke concerns diverge, like pinyon/juniper. Even though it is a tree fuel, P/J has so little litter that it is in the brief category along with shrubs.

3. *Authors and date of signature:* Coleen Campbell and Sarah Gallup, 8/9/11

E) Form A Broadcast, Ignition Method: Why does APCD ask how a broadcast burn will be lit?

1. *Intent:* Sometimes - and hardly always - aerial ignition burns are hotter and get better lift.

Sometimes - not always - aerial ignition burns are lit over a shorter time period. If so, their smoke disperses more toward midday than if ignition took most of the day. The short-duration smoke may also be heavier.

Sometimes - not always - aerial ignition burns present few options to break up units if further smoke mitigation is needed. One reason is that an aerial ignition is sometimes a mitigation for super-rugged terrain, so putting firefighters in on the edges of smaller units isn't possible, effective, and/or safe. The other reason is economic. If any of the day's ignition will be by air, there is a large sunk cost that makes sense only spread over many acres.

All of these reasons affect either smoke and/or smoke mitigation, and we want to be able to consider them.

2. *Authors and date of signature:* Coleen Campbell and Sarah Gallup, 8/9/11

F) Form A Broadcast, Site Fuel Load: In collecting fuel load data, what is expected?

1. *Requirements:*

Fuel Component	Minimum Accuracy
Duff depth	$\pm \frac{1}{2}$ "
Litter depth	$\pm \frac{1}{4}$ "
Grass & forbs	± 1 ton/acre
Woody shrub	± 1 t/a
1-hr wood (< 1/4" diam.)	± 1 t/a
10-hr wood (1/4 - 1")	± 1 t/a
100-hr wood (1-3")	± 1 t/a
1000(+) hr wood (>3")	± 2 t/a
% Rotten for 1000(+) hr wood	± 25 %
Canopy	± 20 %

2. *Background:* Estimating fuel load is a challenge. In order for randomly-located line intercept transects to be statistically reliable, they must be numerous. A sufficient number are seldom laid. One solution is to choose subjectively the transect locations that you judge are representative. But in that case the sample is not longer statistically random and you are half way through using a photo series anyway.

For a more rigorous discussion, see

http://www.fs.fed.us/rm/pubs_other/rmrs_2008_sikkink_p001.pdf. One of the study's conclusions is that "For the planar-intersect method... most fuel classes would be adequately sampled using 750 to 1000m of transects." (p. 173) For 100-foot intercepts, that's 25-33 transects per site!

3. *Implementation Guidance:* While you certainly may use transects, we recommend fuel photos series instead. They take a lot less time than transects.

Duff can be difficult. We have personally found over time that our best top-of-the-head off-site guesses even in familiar places aren't very accurate. On most sites it's best to check at least a few places with a ruler. Duff also tends to be very unevenly distributed. On a forested site one solution is to combine two estimates:

1. Estimate duff depth under tree driplines, then separately outside of driplines. Measure enough places that you feel you have a solid estimate of what is typical for each.
2. Area under driplines is essentially the same thing as canopy closure. Estimate canopy closure visually or look it up in GIS. The latter is less subjective.
3. Calculate the weighted average: (depth under driplines) x (percent cover) + (depth outside driplines) x (1-percent cover)

If you use this method or some other way to estimate variable cover, please make a note in the narrative that you did.

There is a logic for putting masticated fuel in litter, or in 1-hour fuel, or in 10-hour fuel. So APCD staff know what we are looking at, please either put it in 10-hour fuel or tell us in the narrative where you included the load.

4. *Authority:* [Reg. 9](#) IV B 1 e: "The division shall consider... the potential contribution of the proposed burning to air pollution in the area." [Reg. 9](#).IV.C.11, "The Division or local agency may include in the permit other conditions necessary to protect public health and welfare from emissions and smoke impacts." [Reg. 9](#).V.C, "The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public."
5. *Approved by and date of signature:* Dan Ely, 7/14/11

G) Form A Broadcast, Site Fuel Load: Are fuel load estimates in a permit application binding?

1. *Requirements:* Fuel load estimates in a permit are binding as an upper limit averaged for the site. If load estimates are too low, the burn is not permitted for as much smoke as it may generate. The permit is not valid and must be revised before ignition.

On the other hand if the estimates are too high, the burn is permitted for extra smoke that won't be created, and the revised estimates can be noted on the daily activity report without notifying APCD ahead of time.

2. *Implementation Guidance:* As marked on Form A, for broadcast burns APCD requests a consumption estimate. Consumption is not binding and is simply a way to help us visualize the fire's most likely smoke impacts.
3. *Authority:* [Reg. 9](#) IV B 1 e: "The division shall consider... the potential contribution of the proposed burning to air pollution in the area." [Reg. 9](#).IV.C.11, "The Division or local agency may include in the permit other conditions necessary to protect public health and welfare from emissions and smoke impacts." [Reg. 9](#).V.C, "The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public."
4. *Approved by and date of signature:* Dan Ely, 7/14/11

IV) Project-Specific Conditions, Form A

A) Form A, conditions, project-specific conditions, pollution alerts: What are the additional constraints on *winter* burning on the Front Range?

1. *Requirements:* Please see http://www.colorado.gov/airquality/smoke_docs.aspx?action=open&file=ParticulateAlertsAndPrescribedBurns.pdf. The limitations affect Boulder, Denver, Jefferson, Douglas, Arapahoe, Adams, and El Paso counties from November 1 through March 31.
2. *Background and History:* Since winter 2009-2010 APCD has been carefully experimenting with allowing some metro-area burns to occur at low elevation on days with no particulate alert. Promoting a high portion of combustion during hours when inversions break is a focus of the experiments.
3. *Implementation Guidance:* A separate topic below addresses ozone alerts, which can be a constraint on summer burning. If you have a project you would like to propose for inclusion in experiments with winter burning at low elevation in the metro area, [contact us](#).

4. *Authority:* [Reg. 9](#) IV C 1: "... permits are not valid during periods of publicly announced air pollution emergencies or alerts in the area of the proposed burn."
5. *Approved by and date of signature (policy):* Margie Perkins, 2/10/05, revised by Dan Ely, 12/1/09 and 2/24/10; Approval of *this topic* in the program manual: Dan Ely, 7/14/11; amended 7/27/11

B) Form A, project-specific conditions, pollution alerts: What are the additional constraints on *summer* burning on the Front Range?

1. *Requirements:* No prescribed burn permit may be implemented if an ozone alert is in effect for the area of the burn. The restriction applies if the day's burning is entirely or partly within the alert area. As of summer, 2010, permittees are required to take the initiative for ozone alerts between May 1 and September 15 for any burn in the proposed ozone non-attainment area and for any burn in Teller or El Paso County. Elsewhere in the state, APCD staff will contact relevant permittees if an ozone alert is issued.

For more information about ozone alerts, please see APCD's [Ozone Prescribed Fire Policy](#)

2. *Authority:* [Reg. 9](#) IV C 1: "... permits are not valid during periods of publicly announced air pollution emergencies or alerts in the area of the proposed burn."
3. *Approved by and date of signature:* Dan Ely, 7/14/11

C) Form A, conditions, weather column: A smoke permit lists only one dispersion adjective for a day. A forecast may give different adjectives for different parts of the day. What governs?

1. *Requirements:* The most favorable dispersion adjective that is forecasted to occur at any time during the day of ignition determines compliance with permit conditions.
2. *Implementation Guidance:* It is prudent to light only if you expect enough hours of sufficient dispersion to complete ignition before the minimum required adjective's time period ends, and to be able to start late enough not to cause unreasonable smoke impacts. Burners may choose and sometimes are well advised to accept the risk of lighting after sunrise but sooner in the day than an adequate adjective is forecasted to start ('jump the gun'). However, in that case the burn boss ought to be able and prepared to shut down the burn if smoke impacts early in the day are unreasonable, including if acceptable forecasted dispersion does not materialize.
3. *Authority:* [Reg. 9](#) IV B 1 b: "The division shall consider... meteorological conditions on the day or days of such [sic] the proposed burning;"
4. *Approved by and date of signature:* Dan Ely, 7/14/11

D) Form A, conditions, weather column: How do I find out the day's dispersion adjectives?

1. *Requirements:* APCD does not require that a spot forecast be obtained for every burn. Any National Weather Service (NWS) forecast for the time and place of burning will suffice if it includes the relevant forecast element(s). Forecasts from sources other than NWS may not be used to establish permit compliance.
2. *Intent:* NWS is an independent third-party source of forecasts. They have a Congressionally mandated role to be the one authorized source of weather forecasts for some federal activities. This legislation does not pertain to state permits directly, but we think it is a principle worth abiding. NWS has access to the same models, and often more, than are used by any other forecasters of which we are aware. On a nice-to note, NWS provides forecasts free to all users, is staffed 24/7, and offers a comprehensive website.

Some state smoke programs have one or more dedicated weather forecasters on staff year-round. So far that option is an expense and complication for which we have not had a need in Colorado. APCD does employ several meteorologists who specialize in air quality. They are available to advise smoke staff and occasionally burners, but work primarily on programs other than smoke.

3. *Implementation Guidance:* Anyone may obtain an NWS dispersion adjective forecast from the internet without requesting a spot forecast. Our [instructions document](#) for getting an NWS forecast anywhere in Colorado and that includes smoke parameters, was written for private landowners who do not have the option to request a spot forecast. Some land management agencies do have policies that require a spot forecast for every burn. However, from APCD's perspective any permittee may use the NWS interactive forecast described in the document.

To review the spots issued for the day, see each NWS office's spot forecast website: [Boulder](#) (Denver), [Grand Junction](#), and [Pueblo](#). On spot forecasts, ventilation index translated into a dispersion adjective is labeled 'smoke dispersal.'

4. *Authority:* [Reg. 9](#) IV B 1 b: "The division shall consider... meteorological conditions on the day or days of such [sic] the proposed burning;"
5. *Approved by and date of signature:* Dan Ely, 7/14/11

E) Form A, conditions, daily acres column: Smoke permit conditions keep us from burning big blocks. What can I do?

1. *Background and History:* Larger units may use tax dollars efficiently, reduce the amount of time people breathe smoke, and make bigger dents in fuels problems. We therefore often discuss with permittees the subject of permits for large daily acres.
2. *Intent:* We understand that there are many benefits of larger units. However, big burns do pose higher smoke risks and potentially generate higher particulate concentrations. Health responses are roughly linear with concentration; heavier smoke means more people get sicker. Smoke duration and density are almost direct tradeoffs. Extremes of either are not acceptable. Finding the balance sometimes involves difficult judgments.

In evaluating your proposal to burn many acres on one day, we have to judge whether taking this extra risk of smoke risks also safeguards air quality. Good pre-burn smoke preparation and contingency planning help.

3. *Implementation Guidance:* Send us the best responsible proposal you can make. If the daily limits are still smaller than you think you can burn with responsible smoke impacts, we want to continue the discussion after that.

Here are specific suggestions if you are requesting non-standard conditions:

(1) First, please think hard about the need to burn only big blocks. You may set up big units, but if that doesn't include the possibility of burning small blocks, the burn may be limited to impractically tight constraints. (That's often the case for more than smoke, but the rest of the problem is yours to evaluate.) The temptation later to make smoke the scapegoat for the burn not being completed serves no one in the long run.

(2) Standard conditions invite you to make an array - big units if the dispersion is excellent, smaller if it's only good, etc. The variation may represent different physical locations - some big units, some smaller ones - or may be optional subdivisions within major blocks.

(3) If you really could shut the burn down mid-day if smoke were unexpectedly bad, we all have a better basis to think that it is possible to safeguard air quality and still set out to burn large daily areas in one day. Think out, map, and tell us about subunits. Be sure it's realistic to cut the fire off at subunit boundaries. Describe briefly what you will use to subdivide the unit - preconstructed handline, discontinuous fuels, wet line, snow, etc. Unfortunately we've learned the hard way that on this topic we need to ask a lot of specifics, operational though they are. If we all are relying on snow as a critical smoke management tool, for example, is the presence of a certain amount of snow a binding limitation included in the permit conditions? And if you offer subunits as a potential mitigation, be prepared on burn day to use them if needed. The contingency isn't just a point of discussion nor is it exclusively for complete smoke fiascos.

(4) Include smoke in a big way in all of the project's outreach. The better the outreach, the greater confidence we can all have that should smoke be worse than expected, it is unlikely to cause a health crisis. Ask smoke sensitive individuals to identify themselves to you (requesting that anyone with special concerns phone or see you at the end of a public meeting is often good). These may include people with bad asthma, on oxygen, or with other respiratory compromise. With this step we're trying to protect health even when some smoke is in the air. Give residents clear expectations - well, clear not as in 'pure air' but as in 'honest and specific.' Good two-way outreach may also reduce public concerns that can develop during a smoke incident separate from health effects but that surface as objections to smoke.

(5) Take the time to generate representative, accurate, and relatively precise fuel loads. Duff, litter, and heavies are particularly important for understanding smoke. Second entry burns usually generate less smoke. This will be reflected in your site's fuel loads.

(6) Non-standard conditions can be more, differently, or less restrictive than standard. Especially if you are requesting less restrictive conditions, you are proposing a burn from which it is important that we all learn as much about smoke as reasonable. What monitoring

and other documentation can you commit to staff so that one of the benefits of a higher risk permit is shared learning about smoke?

4. *Approved by and date of signature:* Dan Ely, 7/14/11

F) Form A, conditions, end ignition times: Why must nearly every burn's ignition end by sunset?

1. *Intent:* It's a rare night that an inversion doesn't set up around sunset even in mid-summer. An inversion traps newly-generated smoke near the ground. In consequence smoke dilution is minimized. Also in consequence, smoke starts to flow in a drainage pattern. Human settlements tend to be in the bottoms of drainages. Concentrated smoke under an inversion moving even a mile an hour or so down a drainage may travel many miles during the night time hours and affect people at a considerable distance from the burn site.
2. *Implementation Guidance:* Please see the next topic.
3. *Written by and date of signature:* Dan Ely, 7/14/11

G) Form A, conditions, end ignition times: May I burn with poor ventilation or at night?

1. *Requirements:* Unless your permit has special conditions, you may not burn at night. All permits have an end ignition time that is around sunset or earlier. To light at night, you must (1) have an option to burn at night as a special condition on the project's permit and either (2a) light on nights when the dispersion adjective is forecast to remain above poor or (2b) also have permit conditions that allow you to burn with unrestricted ventilation. A day's ignition may begin no earlier than sunrise.

If daytime dispersion is poor all day you also may not burn without special permit conditions. The exceptions are for piles and apply only during a major snowstorm, when it is more lightly snowing, and/or with minimal wind. Please see [Form A](#) for definitions of terms.

2. *Background and History:* Night burning has several operational advantages, including sometimes improving control of the fire.

In the last five years we've agreed to some experiments with night burning. The roughly half a dozen that actually were pulled off mostly haven't gone well. They have ended up being situations we've regretted, and worse than we and the burn bosses expected.

3. *Intent:* 'Poor' ventilation is well named. Generally those are times when putting smoke in the air everyone breathes isn't a good idea. They correspond well to particulate alert pollution days in cold months, which our meteorologist coworkers determine for the Front Range after significantly more elaborate consideration than calculating a ventilation index.

With really, really small exceptions, igniting prescribed fires at night is not allowed in Colorado. The exceptions are so tight they aren't likely to be useful, which is by design. The reason is the great consistency with which night air becomes stagnant and smoke disperses minimally. As for burning at night with better than poor ventilation, the most likely underlying scenario involves a strong cold front - with its potential control consequences that the burn boss must evaluate.

Snow falling during the day is one circumstance when burning under a 'poor' forecast is not only approved but encouraged. During conditions like an upslope storm on the Front Range, the mixing layer may be very shallow and winds light. It is therefore possible to get a ventilation index of 'poor' during a snowstorm. Nevertheless, three reasons combine to make snowstorms an ideal time for smoke.

First, snow falling through air keeps it turbulent. Snowstorm turbulence occurs at a very fine scale within the air profile. Snowflakes swirling below a street light make the movement visible. Ventilation index incorporates mixing height, an indicator only of large-scale turbulence potential. At whatever scale, turbulence disperses smoke. Rain is denser. Because rain falls with less swirling, it doesn't generate as much air turbulence as snow does.

Second, snowflakes scavenge, or 'scrub', some of the smoke particles from air close to the fire. Rain is not nearly as effective as snow for scrubbing because rain has less surface area.

Finally, from the perspective of maintaining Colorado's famous views, sight distances are already closed down in a snowstorm.

4. *Implementation Guidance:* In making requests to burn at night or with poor dispersion, please consider the following:

- Describe the unusual and good reason for the situation. The most frequent reasons we are given is 'otherwise I can't burn this unit safely,' 'otherwise I can't control it,' or 'otherwise I can't get the project done.' Are we inappropriately asking air quality to pay a price that belongs elsewhere? That is, is the project design so unworkable that the only apparent escape from its excessive constraints is to give up on good smoke management? A real example was a request to burn an archipelago of tiny decadent timber islands but none of the surrounding sea of tall sage. Another was (each for a good reason) to burn every year, only between Thanksgiving and President's Day, when the ground is bare of snow, not on weekends, at least three units per day, and avoiding very windy days. If unreasonable project constraints are the driving problem, we respectfully suggest that you return to the NEPA team or other designers instead.
- We at APCD are obliged to ask 'even though you need what you are requesting, are we all being adequately protective of air quality?' In other words, the reason you want to burn with poor ventilation probably isn't the same as the reason we can agree to it. Explain in the application why your proposal is responsible *from a smoke perspective*.
- Address receptors farther from the project than usual. In half a dozen hours or more of poor ventilation, condensed smoke riding a 2 mph drift will go a dozen miles. At

poor ventilation, along that path neither wind nor vertical rise will dilute it as much as usual.

- Time of night is key. It is far more like to be protective of air quality to start lighting at 4 or 5 a.m. than to start at midnight. Expect 'no' if you are asking to start lighting at supertime. The later ignition starts, the fewer hours the smoke is likely to remain stagnant, and the shorter a distance it can go while it hugs the ground.
5. *Authority:* [Reg. 9](#) IV B 1 b: "The division shall consider... meteorological conditions on the day or days of such [sic] the proposed burning;" [Reg. 9.V.E.2](#), "Planned ignition fire permits shall include, but not be limited to, the following conditions, as appropriate:...2. All permit conditions necessary to ensure that the burn will be conducted so as to minimize the impacts of the fire on visibility and on public health and welfare."
 6. *Approved by and date of signature:* Dan Ely, 7/14/11

H) Form A, conditions, end ignition times: Why is sunset used to establish end ignition times rather than using forecasted transition to poor dispersion?

1. *Intent:* Using forecasted transition to poor dispersion to correlate to an end ignition time could get very complicated. Not all burns even get spot forecasts, and not all spots specify the timing of changes in dispersion adjective. (In Colorado it's routine only for the Boulder office). What information governed in a full range of scenarios required almost a decision tree. That level of potential for confusion doesn't contribute to good smoke management.

The confusion would be tolerable if the results were important enough. We think they seldom are. Only occasionally do the two times differ by more than an hour or two. That extent of uncertainty about when inversions will establish is built in to the standard end ignition times. If the forecasted switch is earlier than sunset, it may be because a front is moving in, information a burn boss is already taking into account for considerably more reasons than smoke alone. If the forecasted switch is later, we don't think it's necessarily more indicative of smoke potential. Typical nocturnal inversions build from the surface up as the earth starts to cool. A shrinking sandwich filling of unstable air can remain, the base of which is still too close to the ground to show up for a while in forecasting models. So, stability of the air closest to the fire may change before the upper-level mixing height falls. The lowest air is usually what matters most for smoke. Sunset is the best indicator we have found for when air at the ground typically starts to stabilize.

2. *Implementation Guidance:* If you would prefer to use forecasted transition time and are prepared to make a special request of the National Weather Service if needed to get the relevant forecast information, we're happy to consider your request. Using transition time may be appropriate particularly on a large project whose air flow you have been observing closely over time, and also if the nearest downdrainage homes are at least a mile or two away.

Choose between sunset and forecasted transition before the permit is issued. Changes to the permit conditions to another method will not be allowed on the day of the burn. End time calculations would be adjusted accordingly.

3. *Written by and date of signature:* Coleen Campbell and Sarah Gallup, 8/9/11

I) Form A, conditions, daily acres: If total project acres exceed the daily acres allowed on the permit, must each day's units be separated and fire stopped in between?

1. *Requirements:* It is not required that burns always be controlled at the end of a day of ignition. What is required is that it be possible. The reason is that the number of acres burned each day must not exceed what is permitted. If a following day will still meet the smoke permit conditions including forecasted ventilation, the burn boss may let the fire continue to spread on its own into the next unit. If conditions are not met on the next day, spread must be stopped. In many situations this would not be possible if a fire had continued to spread on its own overnight. In those cases, do not let the fire continue to spread after the day's ignition in the first place.
2. *Background and History:* The question comes up usually in relation to one of two scenarios. First, ignition may be planned for multiple days and the burn boss does not consider it necessary either for prudent smoke management or otherwise to burn each day's area as a separate unit and stop fire in-between. The second scenario is when creeping spread is apt to occur is on burns designed to mimic historic fire, including spreading essentially unchecked during multiple days.

It is OK if boundaries between adjacent planning units are not secure firebreaks that will stop fire unstaffed as long as available resources could stop fire at the end of a day if needed and under the conditions you propose for the burn. If at the end of Ignition Day 1 the forecast for Day 2 does not meet permit conditions, put the fire out at the unit edges. On the other hand, if at the end of the day the forecast for Day 2 does meet requirements, end active ignition by the time limit on the permit. You may allow the fire to spread on its own until the next morning.

The version that has happened and is not acceptable is to do the same project by lighting one of the "units," a perimeter, say, and then, despite crummy dispersion or other smoke problems on the following day, say 'we can't put it out now.' That is a permit violation.

3. *Implementation Guidance:* If interior burnout of more acres than your permit allows per day would be your only choice once part of the fire is lit, either get a permit to burn the entire project as one unit or rethink alternative implementation options. Otherwise among of the possible consequence of enforcement is to lose your permit and for that reason alone have to formally declare a wildfire- not a plus on a burn boss' record.

Please also see the discussion below of secondary acres. The ten percent allowance may apply to area internal to a blackline as well as external to one.

4. *Authority:* [Reg. 9.IV.B.1.e](#), "The Division or authorized local agency shall consider the following factors in determining whether, and upon what conditions, to issue a general open burning permit; e. The potential contribution of the proposed burning to air pollution in the area; whether the burning will be conducted using best smoke management techniques so as to minimize emissions and the impacts from the smoke on the health and welfare of the public;" [Reg. 9.IV.C.11](#), "The Division or local agency may include in the permit other

conditions necessary to protect public health and welfare from emissions and smoke impacts.” [Reg. 9](#) IV D 5 “The Division... shall consider...[t]he smoke risk rating for the proposed burn; IV B 1 b “The Division... shall consider...Meteorological conditions on the day or days of such the proposed burning; “[Reg. 9](#).V.D.7 Whether the applicant has demonstrated, through an emissions and smoke generation projection based on a model approved by the Division, the conditions under which the proposed prescribed fire will be conducted and that the applicant will protect scenic and/or important vistas and visibility in class I areas, will minimize the impacts of emissions and smoke and will not cause a violation of any ambient air quality standards;”IV C 12: “If at any time the Division or the local agency granting the permit determines that the permittee has not complied with any term or condition of the permit, the permit is subject to partial or complete suspension or revocation or imposition of additional conditions. All burning activity subject to the permit shall be terminated immediately upon notice of suspension or revocation. In addition to suspension or revocation of the permit, the Division or local agency may take any other enforcement action authorized under state or local law.”

5. *Approved by and date of signature:* Dan Ely, 7/14/11

J) Form A, conditions, daily acres: How does a smoke permit apply to secondary burn area?

1. *Requirements:* If fire gets into a secondary target area and burns no more than 10% above the burn’s daily permitted acres, we consider it to be within permit conditions. Include the additional acres on Form E, daily accomplishment. Add an explanatory note if the total is over the daily permit limit.

If fire burns more than 10% over the daily acres and no special provisions have been included in the permit for secondary spread, we consider the fire to be outside of permitted conditions. We will evaluate the need for enforcement action. If instead secondary area and/or minimal or no prepared fireline are both planned and noted in the permit application, our investigation will look for and likely make reasonable allowance for this acknowledged uncertainty.

Escaped fires are unlikely to result in significant enforcement, especially if they are formally converted.

2. *Background and History:* Some burn plans include area that may or will not be ignited directly, but neither is it undesirable for the area to burn. The name of the outer area and its formal definition and requirements seems to be a popular subject of enduring debate. Here we call it ‘secondary area.’

Secondary area is a way to manage legitimate uncertainty. It usually forms a buffer around all or part of an intended burn unit. “Secondary area may be ignited intentionally to meet either project objectives or fire control needs. However, secondary area is not critical to project completion and is not expected to be the focus of ignition efforts.” (USFS) In the last decade there has been increased attention to secondary area receiving adequate planning review, including smoke permits.

3. *Intent:* We do not mean for the allowance that daily burning may be as much as 110% of daily acres to create leeway to deliberately exceed daily acres within planned and intended units, and APCD may need to curtail flexibility if that seems to be a frequent effect.
4. *Implementation Guidance:* For most burns we recommend that you secure your smoke permit for your intended primary target unit/acres only. On the other hand, if you want fire in secondary target areas in excess of 10% to be acceptable for smoke permitting, apply for daily acre limits that include the additional area. Allowance in the smoke permit for large secondary acres may be appropriate when, for example:
 - The permit covers very few acres per day, so that a small fire in a secondary target area still exceeds 10% of daily acres. We are not making a standard exception since smaller burns are less likely than big ones to have secondary area.
 - Secondary area is very large relative to primary.
 - The burn's edge is deliberately vague, including so that ecosystem conditions rather than constructed line will have a strong role in determining fire effects ('guerilla burning'). In this instance be sure that your permit designates all of the PLSS sections included in the designated secondary area, or that you otherwise make clear in your application where you intend to allow the fire to go.

Whatever the situation, if it is reasonably likely that more than 10% of daily acres of secondary target area will burn make advance arrangements in the smoke permit. You may request a permit for more daily acres. Or you may request a higher allowable secondary target percent for this burn. In either case, note the reason in the narrative.

One last note: If fire control becomes difficult to the point of impending escaped fire, the burn's footprint may coincidentally overlap some the same area designated as secondary. In that case we are unlikely to take enforcement action. You're probably already getting too much negative reinforcement as it is!

5. *Authority:* [Reg. 9](#) IV B 1 e: "The division shall consider... the potential contribution of the proposed burning to air pollution in the area."
6. *Approved by and date of signature:* Dan Ely, 7/21/11

K) Form A, conditions, wind direction: How does one translate wind direction and speed constraints into conditions on the ground?

1. *Requirements:* Permit constraints apply to transport winds.
2. *Implementation Guidance:* Transport wind direction and speed is the average through the mixed layer. Assuming that at some relevant short distance downwind the top of a plume reaches the mixing height, transport wind shows where smoke will go. Before a morning inversion breaks, transport wind may even be 'downslope/downvalley.'

The complicated situation is when surface winds are strong enough to lay over a plume for a long distance. Then, all wind heights for which a burner can get information may be relevant to smoke: eye-level or midflame, 20', and transport winds. Making adjustments as needed

for good smoke management are not a permit requirement, but in the long run a continuing pattern of conservative good judgment being applied anyway underlies much of what permissiveness and flexibility smoke permits do have.

3. *Authority:* [Reg. 9](#) IV C 6: “The authority granting the permit may impose conditions on wind direction...”[Reg. 9](#).V.D.4, “The meteorological conditions under which the applicant proposes to conduct the burn and the measures that the applicant will take to ensure that the burn will be conducted only during those identified meteorological conditions, including coordination with appropriate sources of meteorological information on the day preceding ignition;”
4. *Approved by and date of signature:* Dan Ely, 7/14/11

L) Form A, conditions, chunking: Why and how much do I have to chunk?

1. *Requirements:* As also described in the pile worksheet,

[a] pile may be considered to have been *chunked* in either of two ways. First, the work of chunking has been done at least once. Partly-burned wood may be thrown outward where it will self-extinguish in snow and/or bonepiled inward for renewed flaming. Second, and whether or not anyone has touched the pile since ignition, there is a 1' wide band of ash that has no unburned fuel and lies between the remaining hot material and the adjacent snow perimeter along which no hot fuel remains.

Each pile permit specifies if and when chunking must be done. Chunking is required for piles within half a mile of homes. For the two smallest pile size categories, chunking must be done the day the pile is lit and only then. For larger piles, chunking must start once the pile's heat allows, which often is the day after it is lit. It must continue at least daily until smoke production ends.

2. *Background and History:* Chunking is arduous, slow, and therefore expensive. Depending on one's mindset it can also be boring and unpleasant.

We used to not require chunking but instead that by certain times no smoke production be visible from 100' away. Two problems led to change. First, over time we found out there was widespread non-compliance. Second, when people did comply it usually limited burning of hand piles to one wave per day, or a third of what permits nominally provide. One wave per day was not the most smoke that could be managed responsibly.

The second of the two ways a pile may be considered to be chunked is the result of very long conversations plus experimenting with piles that are “built too well to need chunking.” The proof is in the results of a clean ring around the burned pile.

The distance at which chunking is required used to be one mile from homes and been relaxed based on experience.

3. *Intent:* Chunking has been the subject of more time on the phone, in the field, and in APCD offices than any other smoke permit condition. There have been more experiments with alternatives to chunking than with any other condition than daily acres.

In the right circumstances chunking is basic to good smoke management. It reduces both the amount of pollution that a pile generates, and how likely the pollution is to affect people.

- Amount: Chunking reduces pollution by favoring flaming over smoldering combustion, which is a difference of about two-fold in total pollutant production.
- Impacts: Chunking reduces impacts by minimizing the portion of smoke that is trapped under evening inversions. Under inversions the smoke dilutes poorly and also tends, like people, to concentrate in valleys. Chunking reduces smoke impacts both indirectly and directly.

[Regulation 9](#) requires that permit conditions minimize emissions. Chunking and its less common broadcast equivalent emission reduction technique of bonepiling are the *only* permit conditions that minimize the amount of particulates generated per ton of fuel consumed. It is hard to picture how else to implement the emission minimization requirement than through chunking. The minimizing of emissions is not just an end in itself. The chunking requirement is for piles very near to residences, human beings and lungs. This requirement, focused on situations close to homes and therefore public health, is appropriate and consistent with regulatory and statutory direction to the Air Division to ensure permits are conditioned to be protective of public health.

In the standard conditions the numbers of piles per wave in each category reflect expected impacts from those piles. Standard conditions near homes presume that little smoldering occurs and therefore require chunking.

4. *Implementation Guidance:* There are options for burning piles near homes without chunking. An example instance is when protection of soils requires that ample coarse woody debris remain after burning.

- APCD has issued a few permits near homes that do not require chunking. Because chunking's significant smoke mitigation does not happen, limits on piles per daily and wave are about a third of standard conditions.
- Chunk outward. During rehab, put the leftover wood back where the pile was.
- Leave more wood out of the piles in the first place.
- Permits for small piles (categories 1c and 2c) require only one thorough chunking. Usually a little wood remains if a second round is omitted. Refrain from over-accomplishment.
- Far enough from homes that chunking is not required, the options are wide open.

5. *Authority:* [Reg. 9](#).IV.C.2, "In order to minimize emissions and smoke impacts, each permittee shall use the best smoke management techniques appropriate to the proposed burn.", ;" [Reg. 9](#) IV D 8 a: "the division shall consider... whether the applicant will conduct the burn in accordance with a smoke management plan that requires that the best smoke

management methods will be used to minimize or eliminate smoke impacts at smoke-sensitive receptors.” [Reg. 9.V.C.](#), The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public.” [Reg. 9.V.D.3, 6 & 8a](#), “The Division or authorized local agency shall consider the following factors in determining whether, and upon what conditions, to issue a planned ignition fire permit: 3. The location of the proposed burn and smoke-sensitive areas and class I areas that might be impacted by the smoke and emissions from the burn; 6. The smoke mitigation techniques proposed; 8.a. Whether the applicant will conduct the burn in accordance with a smoke management plan or narrative that requires: a. That best smoke management methods will be used to minimize or eliminate smoke impacts at smoke-sensitive receptors;” [Reg. 9.V.E.2](#), “Planned ignition fire permits shall include, but not be limited to, the following conditions, as appropriate: 2. All permit conditions necessary to ensure that the burn will be conducted so as to minimize the impacts of the fire on visibility and on public health and welfare.”

6. *Approved by and date of signature:* Dan Ely, 7/14/11

M) Form A, conditions, 2 in 7: What does a ‘2 in 7’ permit condition mean?

1. *Requirements:* Meet the conditions of the permit. This topic is included in the manual in order to address uncertainty about what the words mean.
2. *Background and History:* It is both our experience in Colorado and a remarkably consistent belief based on experience among our peers in other states that people who live near a burn will tolerate a level of unpleasantness from smoke considerably higher for two nights than for three or more nights running. The policy addresses nuisance, public welfare, public health, NAAQS issues, sustainability of programs, continued opportunities to use prescribed fire, respect of the communities we serve, and so on.
3. *Intent:* The intent is to address APCD’s responsibilities for public welfare and public health, as required by [Regulation 9](#). The people of immediate concern are those who live down-drainage.
4. *Implementation Guidance:* If a project has a 2 in 7 condition, you may still burn small areas as often as every single day anyway.

Here is an example from a 3c rural broadcast permit:

Burn \geq 250 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.

That means any days on which 249 acres or fewer are burned don't count as one of the two days in a seven day period. The threshold for counting, in this instance 250 acres, varies by the burn's condition category.

The easiest way to figure out whether 250 acres or more can be burned today is to check whether in the past week (today and the 6 days prior) there were at most one other day of 250 acres.

Here's an extra-complicated example for a 2 in 7 provision that applies when ≥ 250 acres per day are burned:

Week before example starts: No burning occurred

Day 1: 30 acres of blacklining. Does not count because less than 250 acres was burned.

Day 2: 300 acres. This day does count because more than 250 acres was burned. As a result, only one day remains out of the next 6 on which 250 acres or more may be burned.

Day 3: 200 acres. Doesn't count. Considering Day 2, for the next 5 days more than 250 acres may be burned on only one day.

Day 4: no burning

Day 5: 300 acres. Through Day 8 (7 days starting on and including day 1), the most that can be burned is 249 acres per day.

Days 6, 7, 8: about 100 acres a day, none of which count toward 2 in 7.

Day 9: In the last 7 days (days 3 through 9), one of those (day 5) counts toward 2 in 7. On Day 9, 300 acres again is burned. Now the next day on which 250 acres or more may be burned is Day 12. Day 12 is just after the 7 day stretch that starts on Day 5 (day 1 in 7), includes day 9 (day 2 in 7), and ends on Day 11.

5. *Authority:* [Reg. 9](#).IV.A.2, "The application must demonstrate that the open burn can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on the health and welfare of the public." Reg. 9.IV.B.e, "The potential contribution of the proposed burning to air pollution in the area; whether the burning will be conducted using best smoke management techniques so as to minimize emissions and the impacts from the smoke on the health and welfare of the public;" Reg. 9.IV.C.2, "In order to minimize emissions and smoke impacts, each permittee shall use the best smoke management techniques appropriate to the proposed burn." Reg. 9.IV.C.11, "The Division or local agency may include in the permit other conditions necessary to protect public health and welfare from emissions and smoke impacts." Reg. 9.V.C., "The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public." Reg. 9 V D 8 a: "the division shall consider... whether the applicant will conduct the burn in accordance with a smoke management plan that requires that the best smoke management methods will be used to minimize or eliminate smoke impacts at smoke-sensitive receptors." Reg. 9.V.E.2, "Planned ignition fire permits shall include, but not be limited to, the following conditions, as appropriate: 2. All permit conditions necessary to ensure that the burn will be conducted so as to minimize the impacts of the fire on visibility and on public health and welfare."
6. *Approved by and date of signature:* Dan Ely, 7/14/11

N) Form A, conditions, share smoke observations: Why is it a permit condition that smoke observations be sent to APCD?

1. *Intent:* APCD has repeatedly heard from land managers, especially the USDA Forest Service, that it should endeavor to do what it can to drive change toward the potential of increased responsible use of prescribed fire. APCD has also consistently noted that change will need to be based on information, experience, and weight of evidence. The burns that provide the most potential to produce meaningful information about smoke impacts are (1) burns with standard or non-standard conditions at which at least 50% of standard acres are burned on one day and (2) non-standard condition burns with significantly less restrictive conditions.

The more information collected, the more opportunity there is for shared learning about permit conditions and outcomes. APCD staff resources in the Smoke Management Program are insufficient to be present at all or even most relevant burns and to collect information where data for evaluating conditions is the most needed to drive potential change at a faster pace. That is why all projects with substantially less restrictive conditions must be documented photographically, and may have requirements for instrumented particulate concentration monitoring.

We recognize that the monitoring requirements are a burden on permittees. On the other hand the requirements apply to burns with less restrictive conditions than standard, which constitute APCD's experimental prescribed fire permits. The hoped for and expected consequence is mutually beneficial and faster shared learning about permit conditions as requested by land managers without unreasonable burden to individual permittees.

2. *Implementation Guidance:* APCD provides guidance about both photographic and instrumented monitoring. See the back page of the example [monitoring form](#) on the smoke website. We may occasionally assist. See also the topic below about brands of smoke monitors and loaned equipment. However, the permittee is responsible to do required monitoring.
3. *Approved by and date of signature:* Dan Ely, 7/27/11

O) Form A, conditions, consult: How does prior consultation with forecasters work?

1. *Requirements:* If a permit requires that a burn have an advance consult, then send maps and the burn plan to the relevant NWS office's fire weather lead prior to the consultation phone call. The fire weather lead will decide which forecaster(s) may be NWS' representative for the consultation phone call. During call with the forecaster(s), decide at least:

What advance weather indicators will be especially important to managing this burn's smoke?

How will on-site weather observations be collected in the days before ignition?
Key point not to overlook: APCD requires that at least three pre-burn days of hourly data be collected within the permitted burn area and provided to NWS.

What feedback to the Weather Service will be provided, how, and when?

How will the forecaster develop and provide advance information about smoke for days subsequent to initial ignition?

The smoke permit will be finalized only after the advance portion of the weather consultation is complete. You may start formal consultation prior to applying for a smoke permit.

2. *Background and History:* As is detailed in the broadcast worksheet, some burns must have a weather consultation with either the National Weather Service or APCD's meteorologist. This requirement was developed after experiences with some high smoke risk burns in smoke-sensitive areas.
3. *Intent:* Only burns with high risk for smoke impacts must have consults. Within standard conditions, consults are required only within mapped smoke-sensitive areas. Regardless of burn location, consults are one of the possible mitigations for non-standard high daily acre limits.

The purpose of both the consult conversations and on-site observations are to support meteorologists in tailoring their spot forecast as accurately as possible to the burn location. The process was created in an open meeting for permittees and forecasters that occurred after and in response to an unusually bad prescribed fire smoke situation. The group felt that precise and accurate forecasting was invaluable. For smoke, expected times of inversion formation and break up are a focus. Site specifics matter for inversion timing. Being able to see patterns of timing on previous days and potentially to compare those to coarser weather prognostic models is the best way the group could think up to improve forecast accuracy.

4. *Implementation Guidance:* A consult requirement almost always involves placing a weather measuring and transmitting instrument within the project area. If you need and cannot find one, [call us](#). We may be able to refer you to agency partners who own equipment and would be willing to loan it to you. The weather station does not have to be a full-blown portable RAWS or cost that much, although ordering one from the NIFC cache is among your options.

To facilitate an effective consult discussion, call the fire weather lead well ahead of burning. The consultation requirement is specific to smoke, but we expect and encourage it to involve other weather concerns also.

We recommend that burners consult with the National Weather Service rather than APCD meteorologists as a first choice, unless specific questions or problems arise. NWS forecasters know they may open a peer discussion with APCD's forecasters any time. APCD forecasters have experience in understanding the movement of polluted air. Their input can help clarify expected smoke risks, highlight which detailed forecasting information may be most important, and perhaps help an NWS forecaster to key in on certain factors. NWS has the staffing, currency with a broad range of weather information, and familiarity with their local area to issue forecasts. In truth both groups of forecasters know parts of each other's specialties fairly well.

5. *Authority:* [Reg. 9.V.D.3, 4 & 5](#): "The Division or authorized local agency shall consider the following factors in determining whether, and upon what conditions, to issue a planned ignition fire permit: 3. The location of the proposed burn and smoke-sensitive areas and class

l areas that might be impacted by the smoke and emissions from the burn; 4. the measures that the applicant will take to ensure that the burn will be conducted only during those identified meteorological conditions; 5. The smoke risk rating for the proposed burn;”

6. *Approved by and date of signature:* Dan Ely, 7/14/11

P) Form A, conditions, consult: Collecting weather data for a burn that requires a weather consult isn’t reasonable in a particular case. What alternatives are there?

1. *Implementation Guidance:* Probably not much, but if you have a proposal, talk to us about it. Only burns with a significant smoke risk in the first place must have a consult.

A RAWs station even a few miles away isn’t necessarily representative, given differences in aspect, wind funneling, etc. After a few years of experience with consults, we realized NWS forecasters sometimes receive more ‘encouragement’ to use an existing RAWs than would provide the best forecast. To protect everyone involved, the discretion to approve satisfying smoke permit requirements with an off-site RAWs is now reserved to APCD’s forecasters. NWS may not approve the substitution.

2. *Written by and date of signature:* Coleen Campbell and Sarah Gallup, 8/9/11

Q) Form A, conditions, order IMET: How does the permit condition to order an IMET work?

1. *Requirements:* If the project’s permit conditions include ordering an IMET, the permittee or burn boss must place a resource order for an incident meteorologist at least three days before the date of ignition, and host and pay them if one is available. The NWS will determine where the IMET will work, but the assigned meteorologist must be dedicated to this burn for the whole day and not also have other duties.

2. *Background and History:* Conditions for a rare few burns that have especially high risk for smoke impacts require that a dedicated Incident Meteorologist (IMET) be ordered.

3. *Implementation Guidance:* We recommend a site visit first with the likely IMET. NWS fire weather forecasters say that good communication before, during and after a burn can sometimes minimize or eliminate the need for an IMET to be on site on burn day(s), and we are open to consider that advice.

The condition is worded so that if no IMET is available through the national ordering system the burn does not have to be cancelled as a result. Short of that, the IMET must be assigned.

4. *Authority:* : [Reg. 9.V.D.3](#), 4 & 5: “The Division or authorized local agency shall consider the following factors in determining whether, and upon what conditions, to issue a planned ignition fire permit: 3. The location of the proposed burn and smoke-sensitive areas and class l areas that might be impacted by the smoke and emissions from the burn; 4. the measures

that the applicant will take to ensure that the burn will be conducted only during those identified meteorological conditions; 5. The smoke risk rating for the proposed burn;”

5. *Approved by and date of signature:* Dan Ely, 7/14/11

R) Form A, conditions, heavy equipment: Why does APCD have a permit condition as operational as requiring that staffed heavy equipment be on site?

1. *Background and History:* Heavy equipment can be used for routine chunking of large piles, and for smoke contingency. The business ends of heavy equipment can get within working range of some piles that still are too hot for human exposure. If needed, heavy equipment can help extinguish a pile by moving snow, by stirring in snow or water, by chunking, and/or by spreading out a pile. In those ways heavy equipment can minimize emissions and smoke impacts.

In 2008 there was a total of one permit in the 5b pile category for which heavy equipment is required, and no 5c permits.

2. *Intent:* By providing a realistic if still difficult smoke contingency option, heavy equipment on-site provides a way to burn piles responsibly that have been built way too large for straightforward good smoke management.

The requirement to have heavy equipment on site is standard for only those piles so large that the category's conditions start, "Piles this large and wider than the windrow widths shown below may not be burned in Colorado." Those piles deserve extra mitigation, and to the extent that they are an unreasonable smoke risk, the necessary mitigation also may look otherwise unreasonable.

It would be best if oversize piles were never built. But we have tried to be helpful to people who are handed piles for which, without a realistic contingency option, otherwise we would not give a permit at all. An alternative to requiring considerable mitigation in the form of equipment on site would be to issue no permits near homes for piles wider than 30-50' and larger than 50,000 ft³ per pile. Then the only option for burning super-size piles near homes would be to rebuild them into smaller piles. Rebuilding substantially increases the likelihood and amount of included dirt. Rebuilding too requires using heavy equipment, and typically is more expensive than having a dozer on standby during burning at the same site. Currently the choice is left to the permittee.

Usable heavy equipment on site is a common permit condition for burning logging slash in some other states. We have been told that smoke inspectors in some states not infrequently respond to impacts by requiring on the spot that large piles be extinguished. A large and full tender on site also has also often been required in at least one other state.

We have been asked to require only that 'a means to work the pile' be provided so that APCD doesn't get so involved in operations. We think the risk from these excessively large piles is too high to leave the specifics unknown except to the person doing the burning. We don't mean thereby to limit a person's options unreasonably, and an applicant is welcome to request a specific and similarly effective alternative to heavy equipment on site. So far, though, we don't know of any.

The heavy equipment condition is applied also to some non-standard permits. One of its uses in that context is to give credit and ensure follow-through when an applicant says that heavy equipment probably will be on site anyway, as, for example, for some logging piles.

Again trying to minimize APCD's involvement in operational details, the condition used to say simply that heavy equipment had to be nearby. Then we inspected a set of piles that was smoldering days longer than seemed logical. As required on the permit, there was indeed a bulldozer as well as multiple potential operators less than a hundred yards from the piles. But the machine was stuck on the far side of and inextricably cabled to a different two-week project underway at the same time. That was the origin of the permit condition including the further direction that the equipment "could be in use within one hour."

3. *Authority:* [Reg. 9](#).IV.A.2, "The application must demonstrate that the open burn can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on the health and welfare of the public." Reg. 9.IV.B.e, "The potential contribution of the proposed burning to air pollution in the area; whether the burning will be conducted using best smoke management techniques so as to minimize emissions and the impacts from the smoke on the health and welfare of the public;" Reg. 9.IV.C.2, "In order to minimize emissions and smoke impacts, each permittee shall use the best smoke management techniques appropriate to the proposed burn." Reg. 9.IV.C.11, "The Division or local agency may include in the permit other conditions necessary to protect public health and welfare from emissions and smoke impacts." Reg. 9.V.C., "The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public." [Reg. 9](#) V D 8 a: "the division shall consider... whether the applicant will conduct the burn in accordance with a smoke management plan that requires that the best smoke management methods will be used to minimize or eliminate smoke impacts at smoke-sensitive receptors." Reg. 9.V.E.2, "Planned ignition fire permits shall include, but not be limited to, the following conditions, as appropriate: 2. All permit conditions necessary to ensure that the burn will be conducted so as to minimize the impacts of the fire on visibility and on public health and welfare."
4. *Approved by and date of signature:* Dan Ely, 7/14/11

S) Form A, conditions: I can't reasonably work within my permit conditions. May I have them reconsidered?

1. *Requirements:* If you believe you can't reasonably work within a project's permit conditions, call, email or write to APCD smoke program staff. Present your different but responsible proposal or provide additional relevant information not yet submitted. APCD must document via email or otherwise in writing the basis for any consequent significant changes to permit conditions.

If after presenting your alternative proposal to smoke program staff you still believe the conditions in the permit including any revisions are not reasonable, you may make a formal appeal. Contact Gordon Pierce, APCD, Technical Services Program Manager, who is the Smoke Management Program's appeals officer: 303 692-3238 or gordon.pierce@state.co.us.

2. *Background and History:* An agency's Regional Office representative requested that we designate a less formal appeals process short of a formal appeal to the Air Quality Control Commission to challenge a denial of a permit or of permit terms and conditions as allowed under the AQCC Procedural Rules (5 CCR 1001-1, section 1.6.0 Procedures for Adjudications)..
3. *Implementation Guidance:* Typically a phone conversation takes care of unworkable permit conditions. If the reasons and facts are simple, usually but not always the person you talk to at APCD will let you know that we will draft the documenting email. If it's more complicated we may ask you to draft the documentation which we will then formally approve.

Please make revision requests well ahead. First, we may not be available if you must get approval in a short window. Second, last-minute requests related to foreseeable needs smack of poor planning more generally.

We don't have more guidance to share about a formal appeal because so far we've never had to use one.

4. *Authority:* [Reg. 9](#) V E 2: "Planned ignition fire permits shall include but not be limited to... all permit conditions necessary to ensure that the burn will be conducted so as to minimize the impacts of the fire on visibility and on public health and welfare."
5. *Approved by and date of signature:* Dan Ely, 7/14/11

V) General Conditions, Form A

A) Form A, general conditions: How far apart do projects with separate permits have to be in order to burn on both permits in the same day?

1. *Requirements:* There are no implicit requirements for separation among projects, only what is explicitly included in project-specific conditions. Most permits do not address separation.
2. *Background and History:* So far in Colorado we have not yet encountered the problem situation that would make standardized separation requirements necessary. The situation that could arise and would change the need is multiple burns in an area causing unacceptable smoke impacts within the same airshed, while each contributing burn did not individually cause undue problems.
3. *Intent:* So far all our experience with problem burns has been about one project at a time. That's why we condition one project at a time.

The place where we think there is the most potential for the problem is the mountainous part of Boulder County, where lots of agencies all burn in a small geographic area. So far those burn bosses have made it a habit to talk among each other about forthcoming projects, and to consider the potential for cumulative smoke impacts. Until problems seem likely, and

currently we don't think they are, we think voluntary efforts in which APCD does not routinely participate are best.

If we should start to see problems that involve overlap of otherwise acceptable prescribed fire smoke plumes, then we would consider changing program parameters. Options include required separation distances for which we'd somehow have to provide information, and/or APCD's involvement in daily go/no go decisions. The latter could easily double program costs and therefore permit fees.

Allocation of total PM production or acres per day by airshed is an especially large-scale solution if the new problem existed primarily at the scale of whole airsheds. We keep an eye on this subject also.

4. *Implementation Guidance:* Please continue to apply good judgment. When you think you ought to coordinate with other burners in your agency or airshed because overlapping smoke could be a problem, it's wise to do so. It could prevent the kind of problem that would tie every burners' hands more tightly for the foreseeable future.

As a general guide to apply if you are in doubt, most problems can be prevented if simultaneous pile projects stay at least 5 miles apart, and broadcast burns stay at least 10 miles apart. But there also are times burns this close together can work fine from a smoke perspective. Factors you may want to consider include wind and therefore plume transport direction, time of ignition, size of burn, location of key receptors, and others.

We watch during permit review for likely overlap of already permitted projects with new applications. We take into account our awareness of burn organizations. Some areas have enough firefighters to staff several nearby burns on one day and some don't. Some areas have established and tight coordination among agencies or within their own large organizations on nearly every burn day and some don't. Occasionally it looks like there is reasonable potential for a problem to develop if specific projects' smoke overlaps. If so, we add to both projects special conditions that address separation. After that, rather than APCD getting involved in the details we think everyone is better off if the burn bosses work out among themselves who has priority in the unlikely event they do end up wanting to burn the projects on the same day.

5. *Authority:* [Reg. 9](#) IV B e: "The division shall consider... the potential contribution of the proposed burning to air pollution in the area."
6. *Approved by and date of signature:* Dan Ely, 7/14/11

B) Form A, general conditions, monitoring: What brands of smoke monitors will APCD accept for tracking real time smoke concentrations?

1. *Background and History:* The price for a single outdoor particulate monitoring instrument starts at about \$5,000. Typical packages including communication and data logging can cost about twice that.
2. *Implementation Guidance:* Like most government agencies, APCD avoids certifying or recommending brand names. APCD staff are not aware of any equipment that would not be acceptable, although it is possible to imagine really poor quality monitors we haven't yet

encountered. The Missoula fire lab reviewed half a dozen of the more common commercial brands of real-time particulate monitors. Any of the models that Missoula reviewed, and probably others as well, would be accepted as potentially providing useful data. . Please [contact us](#) for more information about the equipment the Division (and others) have purchased. APCD's smoke website has field [users' guides](#) for some models of monitors.

There are about a dozen monitors around the State, a small national research cache of monitors that may sometimes be used, and other monitors based with land management agency units in Utah and elsewhere. On any one day, most monitors in the state are not in use. Owners have often been cooperative about loaning them to other burners. APCD also purchased two monitors for special projects. They are available to loan to permittees, especially state and local agencies or private landowners who may have less access to shared federal resources.

Field monitors are quite different from the monitors that establish whether a city or other area is in compliance with NAAQS. Federal reference method monitors (FRMs) are used to determine attainment. FRMs are permanently located, are larger and heavier and more difficult to move, run essentially year-'round, cost many times as much as even the rather pricey field monitors, often use volumetric filters rather than optical technology, are managed formally including with chain of custody data tracking, and are more precise than field monitors - a lot more, in some cases. As for accuracy as distinguished from precision, Missoula's lab testers, we at APCD and others all sometimes run field monitors collocated with FRM instruments for comparison. We all also make the founded assumption that when they differ it is the field-quality instrument that is off base.

All the differences from FRMs aside, field-quality particulate monitoring equipment has an important if limited function. It can tell roughly what the smoke concentration was at a single point in space and time(s). In that respect, it may tell where smoke didn't go. *The monitor doesn't tell where it did go. Therefore there is no prima facie reason to think monitor data indicates peak concentrations overall.* Even for apparently simple and obvious drainage flow, we've been truly impressed how infrequently we locate instruments that end up being where the thickest-looking smoke in fact goes. Knowing only how dense smoke was in one place may not indicate much at all about the burn's smoke elsewhere. To know what smoke did do as opposed to what it didn't, we recommend instead or definitely in addition that photographs of the smoke plume be taken at a regular time interval.

3. *Approved by and date of signature:* Dan Ely, 7/21/11

C) Form A, general conditions, notify the public: From APCD's perspective, what constitutes adequate pre-burn notification?

1. *Requirements:* [Regulation 9](#) requires "that measures will be taken to notify the public in smoke-sensitive areas at least twenty-four hours, and not more than 120 hours, in advance of the planned ignition of the fire regarding the location, expected duration and projected smoke impacts from the fire."
2. *Implementation Guidance:* A press release to local papers or electronic media, a homeowner's newsletter, a phone tree, a note on your agency's website, a community meeting, or a poster at the only post office or gas pump for miles - there are circumstances

under which any or all of those notifications would suffice. What works well in Colorado Springs isn't what works well in Maybell.

Required last-minute one-way notification of the public differs from advance two-way outreach. We encourage permittees to judge outreach by the Sensitive Person Test. Does a person with health sensitivity to smoke have a reasonable opportunity to make themselves known in time to be individually notified about what day(s) burning will occur? For the test we assume that someone with, for example, severe asthma pays basic attention to readily-available information about their environs. If the outreach works for them, it is good enough for the rest of us. Last minute notification as required by [Regulation 9](#) generally does not meet this more meaningful test.

The best outreach we see involves some form of two-way human-to-human conversation. Telling someone what will happen to the air they breathe - one-way communication - amounts to advance notification. Discussing - two-way communication - real options to modify even minor aspects of an operation builds public support.

Two-way outreach and more thorough one-way notification often increase public acceptance of reasonable smoke levels, both for a single project and more widely over the longer term. Further, our experience suggests that if excessive smoke is generated, public response is more measured when prior outreach was interactive. From a more legalistic perspective, APCD's responsibilities include safeguarding acceptable visibility. Scientists say in the end that visibility judgments always have a subjective component. Good outreach may contribute toward people believing that visibility was not compromised inappropriately. In short, outreach can help mitigate some smoke impacts.

For projects with little smoke potential, like many remote pile burns, required notification and minimal outreach such as a seasonal press release may be all that is worthwhile. At the other extreme, for a large broadcast unit near a subdivision, more outreach pays off.

In summary, we are looking for a person with concerns to have a reasonable opportunity to know what burning is planned and when it will occur. That is required. More, including giving them an opportunity to respond, is not required but will help nearly everyone involved.

3. *Authority:* [Reg. 9](#) IV D 8 e. Text quoted above.
4. *Approved by and date of signature:* Dan Ely, 7/21/11

D) Form A, general conditions, unmilled waste: Why can't I burn unpainted lumber?

1. *Requirement:* Comply with the general permit condition that says 'This permit is for burning only the unmilled forest fuel shown in the description of fuel above. No milled or treated lumber may be burned.' Even if it appears untreated, do not burn any dimension lumber, unwanted fencing, or parts of old buildings on a prescribed fire permit.
2. *Background and History:* Pressure-treated wood used to be pretty easy to spot. It was a sickly green and there were staple-like marks parallel to the grain where the preservatives were injected. Neither is still necessarily true. Now a sales attribute of some wood is the

invisibility of its pressure treatment. As one indicator of the nature of the problem, there are research projects to develop easy, low-cost field tests for pressure treatment of lumber to help landfill operators separate arriving loads. And wood stains can fade to invisibility.

3. *Intent:* Paints, preservatives, coatings, and other chemicals that sometimes are applied to wood may release toxins and other pollutants when they are burned. The smoke can harm both the firefighters doing the work and the public APCD is charged to protect. Prescribed fire permit conditions are not designed to address these complex pollutants.

Permit conditions have to be objective and verifiable. We have no reasonable way to ensure that lumber that looks untreated really is. Neither do some permittees, as when, for example, they are asked to burn a pile of waste that has accumulated at an agency administrative site.

4. *Implementation Guidance:* Keeping agency ad site piles clean of material that may not be burned on a prescribed fire permit takes considerable effort and attention.

If you want to burn lumber that appears to be or that you are sure is untreated, apply for or call to discuss a [general open burn permit](#) instead. Cabins, including trespass cabins on public land, also may be burned only on a general open burn permit and never on a prescribed fire permit. Every structure that is burned on a general open burn permit must first have certified asbestos clearance. Because the considerations, alternatives to burning, and potential pollutants all are different between general open burning and prescribed fires, a significant portion of requests for general open burn permits are denied even though this rarely occurs with prescribed fire permits.

Sometimes there are a few wood fence posts in a broadcast burn unit. Where it is reasonably feasible to keep them from burning, please do so. (You probably are anyway including for reasons unrelated to smoke.) However, burning them is not what we are trying to prevent by this condition and their minimal presence does not invalidate the whole permit. It is prudent and responsible to document the presence of standing wood fences on the broadcast permit application, either in the description of fuel or the narrative.

5. *Authority:* [Reg. 9](#) II N (definitions): A “planned ignition fire [is]... intended for the purpose of grassland or forest management” and [Reg. 9](#) V C 7: “Precautions shall be taken to ensure that the burn is restricted to items... identified in the permit.” Re internal fences, [Reg. 9](#) IV B 1 d: “The division shall consider... whether there is any practical alternative” [Reg 9.V.E.2](#), “All permit conditions necessary to ensure that the burn will be conducted so as to minimize the impacts of the fire on visibility and on public health and welfare.”
6. *Approved by and date of signature:* Dan Ely, 7/21/11

E) Form A, general conditions, transportation safety: What is APCD’s responsibility for traffic safety?

1. *Requirements:* APCD’s smoke management program has no responsibility for transportation safety and we don’t review permits for it.
2. *Implementation Guidance:* Concern for transportation safety affects burn operations. It may influence receptors considered during planning, acceptable wind directions, pre-burn

notifications, and smoke contingency, all of which are addressed in our application as they pertain to health, welfare and visibility. We are interested in whatever transportation safety decisions you make that affect permit conditions, but only so we can picture the project and understand your request.

To use a typical example, you might submit an application with a wind direction constraint request that protects a nearby interstate or airport and has nothing to do with homes. Knowing the interstate is nearby helps us understand the request. The simplest way you can help us to know is to list the highway as a receptor on Form A. Also, often there are homes along the relevant stretch of road, in which case the road is simply a convenient label for the homes we do care about. In that case we do review how it will be protected from undue impacts, and definitely want it listed as a receptor.

On the other hand, a notification or smoke contingency plan that addresses only traffic safety and/or interagency coordination is not sufficient. We need to know how health, welfare and visibility will be protected also.

3. *Authority:* This is an area where [Reg. 9](#), as originally drafted in 2001, is apparently at odds with what was intended at the time the overall Regulation was adopted. The issue was not discovered until some years later. APCD will address this with the Commission in the future. For the time being, SMP staff has received guidance that they do not have authority to condition permits for fire escape concerns or transportation safety. Staff have been advised that they have discretion in how consideration of smoke sensitive areas occurs during permitting. Within this discretion, staff are instructed to ignore traffic safety. The problem is Reg. 9.II.R, the definition of Smoke Sensitive Areas or Receptors (see below).

[Reg. 9](#) II R (definitions): "Smoke Sensitive Areas or Receptors - Class I areas and other locations of scenic and/or important vistas, especially during periods of significant public use, urban and rural population centers, schools, hospitals, nursing homes, transportation facilities such as roads and airports, recreational areas, and other locations that may be sensitive to smoke impacts for health, safety, and/or aesthetic reasons.

4. *Approved by and date of signature:* Dan Ely, 7/21/11

VI) Application attachments - maps, narratives, etc.

A) Application attachments, narrative: What should be included in a narrative or cover note?

1. *Implementation Guidance:* Only some applications need a narrative. But if you have information that doesn't logically fit elsewhere and that APCD staff should take into account in reviewing an application, write it in a cover note or in the narrative block on the application. Situations when a narrative or cover email might be appropriate are not limited to and include:

You need your application processed very quickly. Say so. We'll try.

You may, but do not this it is necessary to commit to, undertake additional mitigations. Be clear which are firm commitments and which are options for the burn boss to consider. When you are making firm commitments, you may put them in the 'notes' box on [Form A](#). Any actions that you say will occur in the application sections about mitigation and implemented contingency are firm commitments.

If you are attaching a photo, put a caption or description in the narrative if needed.

If outreach has turned up anything consistent or surprising it usually works best if we all know it.

If you think this burn will be a great opportunity for shared learning about smoke but you can't afford to staff extra documentation, say so. We can't always help or find loaner resources but we'll try.

If you think it will help all of us visualize and/or discuss your project, describe how the fuels or other characteristics of this project relevant to smoke are similar to or different from other burns we've already reviewed including in prior years.

You are requesting a visit in advance, or already have even a reasonable guess specifically when you may burn.

2. *Written by and date of signature:* Coleen Campbell and Sarah Gallup, 8/9/11

B) Application attachments, smoke map: What area should a smoke map cover?

1. *Requirements:* On a smoke planning map show potentially affected receptors up to 15-25 miles out from the burn. Center the map on the burn, or show a little more of the direction where smoke is most likely to go.

Draw drainage flow from the burn, indicating by the length of the arrow(s) how far you think the smoke will be noticeable the first night after ignition. Draw the most likely (range of) paths for lofted smoke. As needed for clarity, highlight receptor communities.

For requests to burn with unrestricted ventilation, see the [broadcast worksheet](#) for more detailed requirements of what to map.

2. *Implementation Guidance:* A good scale is ½-inch = 1 mile, which matches most full-Forest and some BLM maps. Feel free to send a .pdf, .jpg, a GIS export or photo of a paper map, Google Earth .kmz, or other electronic format. We also can accept hard copy maps.

Unit maps do not replace smoke planning maps. Even though we seldom require unit and/or general vicinity maps we welcome them, and find them especially helpful for large multi-unit burns. If you are requesting split conditions in which different units have different permit constraints, a unit map is (additionally) required.

3. *Authority:* [Reg. 9](#) V D 3: "The division shall consider... the location of the burn and smoke-sensitive areas and Class I areas that might be impacted by smoke..."

4. *Approved by and date of signature:* Dan Ely, 7/21/11

VII) Daily Notification, Form [D](#)

A) Form D, local agency contact: Who is the local agency representative I must notify and how may I advise APCD?

1. *Requirements:* To identify the local agency representative you must notify before ignition, see the [list of county air quality contacts](#). Notification to them may be via email, fax, phone mail, or a human conversation.

Notification to APCD of intent to ignite must be in writing, whether it is fax or email. It must be on APCD's [Form D](#) and submitted 2-48 hours before ignition starts.

2. *Implementation Guidance:* One option is to email Form D to both APCD and the local air contact.

We recommend that burners find time at some point to meet their [county air quality representative](#) face-to-face. If there is a significant smoke incident you are likely to be working together. Also, minor issues could arise later that can be handled quickly and informally without unnecessary escalation if there is a familiarity and level of comfort between the burner and local county rep. Local air quality contacts may also know of sensitive individuals and are a great source of information about local public health concerns and mitigations that may be appropriate.

We appreciate and occasionally request informal notification that a burn day is approaching. Even if you have a phone conversation or general email exchange with APCD staff about a particular ignition, Form D still must also be sent in.

3. *Authority:* [Reg. 9.IV.C.9](#), "The permit shall state that the permit is for compliance with state air pollution control requirements only and is not a permit to violate any existing local laws, rules, regulations, or ordinances regarding fire, zoning, or building. The permittee will notify the appropriate local agencies as required by local regulations and/or ordinances. Permittees also shall ensure that their actions comply with all procedural and substantive requirements contained in state and local air pollution control regulations." [Reg. 9.V.D.8.e](#), "That measures will be taken to notify the public in smoke-sensitive areas at least twenty-four hours, and not more than 120 hours, in advance of the planned ignition of the fire regarding the location, expected duration and projected smoke impacts from the fire."
4. *Approved by and date of signature:* Dan Ely, 7/21/11

VIII) Daily Accomplishment Reporting, Form [E](#)

A) Form E, 'burn cancelled?': I sent in a daily notification but we ended up not burning. Do I owe APCD more paperwork?

1. *Requirement:* If you submit a notification of ignition (Form D) for a day, then whether or not you burn you must also complete and submit a daily accomplishment report (Form E).
2. *Intent:* Reported cancellations are how we know that a report of actual burning (Form E) is not late or lost instead. Also, when burns are cancelled last minute it is a demonstration that in general burners must pay thoughtful attention to weather, smoke dispersion, safety etc even last minute. This collated information is helpful when APCD staff talk to people concerned about smoke.
3. *Authority:* [Reg. 9](#) V D 10: "The division shall consider... whether the actual burn activity that occurs will be reported to the division on forms approved by the division."
4. *Approved by and date of signature:* Dan Ely, 7/21/11

B) Form E, spread only: If people do not actively ignite a larger perimeter on a particular day, but a prescribed fire or fire use spreads on its own, is a daily activity report required?

1. *Requirements:* Yes. If the black perimeter expands at least five acres in a day, report it.
2. *Intent:* Please see the topic under annual report that describes what APCD does with accomplishment report data.

Information about both active and self-sustained second day ignition is collected daily rather than only annually because an additional use is to provide the basis for responding to inquires from government officials or other residents about smoke at a particular time and place. While not frequent, those calls can be and often are important. Everyone benefits if those conversations begin with our awareness of what ignition is or recently was underway, and quickly incorporate input from a burn boss who knows better than anyone else what is happening on site. We find that quick, informed, professional, and detailed responses to concerns brought to us about smoke go a long way toward defusing conflict - a pattern we suspect would go away fast if our response started with not knowing or being able quickly to find out even who was probably burning what and where.

3. *Implementation Guidance:* It is not necessary to undertake extra-frequent perimeter mapping purely for purposes of reporting to APCD about creep. On the other hand, any time acres are updated we would like to know. If you have them, please do submit estimates each day. If not, talk to us about options. See also the discussion of daily acres and uncontrolled fire edge under project-specific conditions.

4. *Authority:* [Reg. 9](#) V D 10: “The division shall consider... whether the actual burn activity that occurs will be reported to the division on forms approved by the division.”
5. *Approved by and date of signature:* Dan Ely, 7/21/11

C) Form E, spread only: Separate from perimeter expansion, what does APCD need to know when the same acres continue to burn out on multiple days?

1. *Requirements:* We do not need to know about interior burn-out unless the smoke situation is unusual.

Each acre should be reported only once on an accomplishment form, on the first day it burns. One exception is if the same piece of ground is burned long enough apart that it was out cold in between. For example, a burner may blackline in spring, and want to reburn the edges the next fall after forbs and grasses have cured. In that case, on the daily form report the acres twice with an explanatory note. On the annual summary report the acres once, with consumption percentages that represent the combined effect of both ignitions. We can help draft the annual report that way if you request.

2. *Implementation Guidance:* A note telling roughly how many acres or piles are currently smoldering on a day with no new ignition by humans, and the likely amount and direction of smoke during the next day or two, would be welcome if the smoke is unusually heavy or is likely to receive atypical public attention.
3. *Authority:* [Reg. 9](#) V D 10: “The division shall consider... whether the actual burn activity that occurs will be reported to the division on forms approved by the division.”
4. *Approved by and date of signature:* Dan Ely, 7/21/11

D) Form E, acres burned: In a mosaic burn, at what scale should burned acres be assessed?

1. *Requirements:* Daily acres should include everything inside the black perimeter. Report the total acres that either were ignited, or are internal to an area that a fire front has passed. If the burn resulted in a mosaic, in the fuels section of the daily and annual accomplishment forms use the assigned block to report percent of interior area that is unburned.
2. *Intent:* We realize none of the numbers on Form E may match what is reported as treated for agency activity and budget targets.
3. *Implementation Guidance:* Example: Should a 10-acre green island be included in the total acres burned? Yes.

If the burn was very spotty and only half of every acre burned, is the total area burned the perimeter, or half of the perimeter? The total area is the perimeter. In the fuel break-out section, report 50% unburned.

Ragged edges will involve some judgment; call APCD to discuss as needed.

4. *Authority:* [Reg. 9](#) V D 10: "The division shall consider... whether the actual burn activity that occurs will be reported to the division on forms approved by the division."
5. *Approved by and date of signature:* Dan Ely, 7/21/11

E) Form A, end ignition times: ... but not all evening ignitions on prescribed fires are planned.

1. *Requirements:* Late ignition and the reason(s) for it must be reported on Form D. Please see also enforcement of end times, below, and secondary burn area, above.
2. *Background and History:* Very rarely, unplanned night ignition is going to occur despite permit conditions. An example could be that the day's anticipated schedule was shot because the burn crew is struggling to hang on to the fire and continued ignition is part of the adapted control strategy.
3. *Intent:* In terms of your report on the reason ignition ended late, we are interested to know not that ignition had to continue because the consequences of suddenly ending it don't make sense, but instead why the initial anticipation that ignition could be finished in time didn't hold up.
4. *Authority:* [Reg. 9](#) V D 10: "The division shall consider... whether the actual burn activity that occurs will be reported to the division on forms approved by the division."
5. *Approved by and date of signature:* Dan Ely, 7/21/11

F) Form E, end time: How will APCD enforce end ignition time?

1. *Requirements:* We have built in limited leeway for rare times someone needs to ignite past the permitted end time. The first enforcement action against a district or burn boss will be limited to no more than a warning letter if all of the following criteria are met:

The overage ('upset' in permitting language) is self-reported, including on Form D.

No other permit conditions were violated at the same burn day.

Ignition ends no later than three hours past the permitted time.

2. *Intent:* Our intent in specifying end ignition time is to promote good planning. It is a partial alternative to tighter daily acre limits. If more can be burned and the smoke diluted while ventilation is favorable, that can be incorporated into standard conditions and permits as long as the smoke production falls off before an evening inversion sets up.

For meeting an end ignition time, good planning means biting off no more acres than one can reasonably ignite before pumpkin time. It means also building in a time margin for the unexpected. Still, we recognize that the best planning may not yield the desired outcome. As one burner gave us for an example, maybe I provided for the possibility a power torch won't work by having two on site but then they both break and there's no logical closer place to cut the burn off.

We don't intend to enforce for Murphy's Law. Occasional late ignition may be unavoidable, but should be infrequent. We do intend to require responsible planning. And we want burn bosses to accept and light with only permit conditions they can commit to meet under normal levels of uncertainty, not just hope to.

Finally, we recognize that it is harder for us to 'police' end ignition times than most other permit conditions. Relying on end times is in that respect an experiment that will be restricted or will end if it doesn't work reasonably well.

3. *Implementation Guidance:* Our typical approach to enforcement is to start with permit compliance, not even warning letter. Discuss the situation with us if a burn goes over its end ignition time.

We look most of all for patterns of upsets. If one organization or burn boss seems to be exceeding end ignition time more than rarely, that suggests we should investigate for bad planning and intervene as needed.

4. *Authority:* [Reg. 9.IV.A.2](#), "The application must demonstrate that the open burn can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on the health and welfare of the public." [Reg. 9.IV.B.1.e](#), "whether the burning will be conducted using best smoke management techniques so as to minimize emissions and the impacts from the smoke on the health and welfare of the public" [Reg. 9.IV.C.3](#), "To the degree practical, all burning shall be conducted during periods conducive to smoke dispersal." [Reg. 9.IV.C.7](#), "Precautions shall be taken to ensure that the burning is restricted to the items and location identified in the permit..." [Reg. 9.IV.C.11](#), "The Division or local agency may include in the permit other conditions necessary to protect public health and welfare from emissions and smoke impacts." [Reg. 9.V.C](#), "The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public." AQCC Procedural Rules 1.1.0: "In adjudicatory proceedings the Commission intends to enforce its rules as uniformly and equitably as possible while ensuring that the goals of the air quality program it has adopted are not compromised."
5. *Approved by and date of signature:* Dan Ely, 7/21/11

IX) Annual Accomplishment Reporting, Form **F**

A) Form F, header: What does APCD do with annual activity data?

1. *Background and History:* We use the acreage and fuel type from annual activity reports, together with emission factors EPA has published, to calculate the amount of particulates and other pollutants that each fire generated.

The totals are collated into an annual emission inventory [report](#). The emission data and locations are often used during the construction of complex air quality modeling in support of plans required by EPA. Also every three years staff compile data from the past three years to determine the allocation basis for permit [fees](#). Finally, the data also has been useful for ad hoc inquiries. For example, the Fire Emissions Joint Forum of the Western Regional Air Partnership compiled emissions data from all western states as part of their efforts to project prescribed fire's contribution to regional haze. The Division also is frequently asked questions like, "How many piles have you permitted?" "How many broadcast acres were burned in each year for the last 10 years in a particular part of the state? Each piece of information, notification and report you provide is the base upon which these many uses are built.

2. *Written by and date of signature:* Dan Ely, 7/21/11

X) Not Related to a Specific Form

A) What constitutes grounds for enforcement?

1. *Requirements:* Permittees are accountable to abide strictly by all permit conditions. Provided all permit conditions are met, smoke impacts alone do not form the basis for enforcement. One of the general permit conditions addresses what is required if impacts are excessive, which starts with implementing the smoke contingency plan included in the permit application.
2. *Intent:* Colorado's smoke program is a hybrid, with decision-based conditions whose origin and evolution are outcome-based.
 - Conditions enforce prudent burn day decisions, basically regulating inputs rather than outcomes.
 - Permit design is informed by outcomes - by history. Program evolution strongly reflects evolving knowledge about smoke outcomes.

One of the reasons for the focus on permit conditions is that they are objective and verifiable, while smoke impacts often are neither.

Permits are designed to prevent excessive smoke impacts. But permits are not perfect. One of several reasons is that smoke is a part of the natural world that humans can imperfectly predict. Uncertainty is inherent to weather predictions and a burn boss faces a host of other uncertainties. If the terms of a permit are followed but there are unacceptable smoke impacts, this is a situation for learning, not punishment! Smoke impacts we document, learn from, will talk about with the involved burners, and are a critical way we evaluate potential program changes including standard conditions. We hope for, appreciate, build trust with, and all benefit from decisions that promote good smoke outcomes. But a permittee is bound only to meet the terms of the smoke permit.

Permits are intended to enforce good professional judgment. They are not intended to require perfect luck also.

3. *Implementation Guidance:* By far most permittees are conscientious and careful with smoke. Most are fire professionals with substantial experience and with career-long stakes in public support of burn programs. Burners are subject to sometimes-intense peer pressure from within the fire community to serve the public well. As a result the need for formal enforcement related to smoke permits in Colorado, while it has happened, has been downright rare. Virtually everyone involved works hard to keep it that way.

For a description of how we typically handle any apparent non-compliance we may notice at a burn and that usually reflects misunderstandings or points of confusion, please see [Regarding APCD Site Inspections](#).

4. *Authority:* [Reg. 9.IV.A.2](#), “The application must demonstrate that the open burn can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on the health and welfare of the public.” [Reg. 9.IV.B.1.e](#), “whether the burning will be conducted using best smoke management techniques so as to minimize emissions and the impacts from the smoke on the health and welfare of the public” [Reg. 9.IV.C.3](#), “To the degree practical, all burning shall be conducted during periods conducive to smoke dispersal.” [Reg. 9.IV.C.7](#), “Precautions shall be taken to ensure that the burning is restricted to the items and location identified in the permit...” [Reg. 9.IV.C.11](#), “The Division or local agency may include in the permit other conditions necessary to protect public health and welfare from emissions and smoke impacts.” [Reg. 9.V.C](#), “The application must demonstrate that the planned ignition fire can and will be conducted in a manner that minimizes the emissions from the burn and the impacts of the smoke on visibility and on the health and welfare of the public.” Procedural Rules 1.1.0: “In adjudicatory proceedings the Commission intends to enforce its rules as uniformly and equitably as possible while ensuring that the goals of the air quality program it has adopted are not compromised.” CRS 25-7-123 Open Burning – Penalties. CRS 18-13-109 – Firing Woods or Prairie.
5. *Approved by and date of signature:* Dan Ely, 7/21/11

B) May I discuss a burn or permit application or program topic with a real person at APCD?

1. *Implementation Guidance:* We believe informal face-to-face meetings are a great tool when there are questions about our SMP that are bothering you. We would much rather get into specifics about the issues and find out about how our permit conditions affect people working

on the ground than hear later only through the grapevine that somebody has an unaddressed issue. It's hard for us to act on perceived problems we don't know about. It also provides an opportunity to explain the pressures and expectations we are each under and build mutual understanding – seldom a bad thing.

However, an office discussion in person about a project is never required and seldom necessary. It is always an option. If you want to meet with us, say so and we'll make it happen. Generally we will schedule a time convenient for you that we come to your office and/or the project area. If you actually prefer to come to a Denver office building, please call first to be sure one of us will be around.

A meeting in person is useful sometimes, but it isn't the only way to discuss a project or a concern with us. We do not hesitate to call you when we have questions, and hope you do the same. We keep our ears to the ground listening for more general information relevant to our work via phone calls with permittees, by email, and at the many meetings we all attend. If you want to talk in person, we'd like to hear from you.

Possible reasons to meet with APCD staff:

- You are an agency fire management officer (FMO) at any level, Assistant FMO, fuels specialist, and/or RXB1/2 new to Colorado. That's reason enough! If you don't call us, we'll be asking to meet you soon.
- You want us to know the big picture about your large or growing program, rather than us only reviewing applications one at a time. You think the best way to explain is on the ground and/or with maps everyone can see together.
- You are planning a burn that from a smoke perspective is especially complicated or risky. Maybe its permit will be significantly different from standard conditions. You think a face-to-face discussion will help understanding of the project situation, what you are proposing, and why we should agree with you that your proposal is responsible with respect to air quality. Maybe you'd like more ideas or another set of eyes at this stage, too. We may know something relevant that has worked for other burn bosses and in any case welcome the opportunity to be proactive.
- You feel that the permit conditions you have been receiving are unnecessarily constraining your ability to manage the land effectively. Maybe it isn't clear why the applications you send in come back with the conditions they do. And/or you would like to be sure you are aware of all the ways to write a responsible but less constraining permit request.
- You have smoke management ideas or observations or complaints that other burners could benefit from. You want APCD to be able to apply and help share this productive input.

For any of these reasons and more we're happy to respond to your request that we come to your office. Better yet, invite us to have the same conversation walking around a project area.

On the subject of face-to-face meetings, if you haven't already we encourage you to contact your [local air quality representative](#) and offer to meet with them concerning the projects you are planning. We have had very positive feedback from local officials when this occurs.

2. *Written by and date of signature:* Coleen Campbell and Sarah Gallup, 8/9/11

C) What may I expect from an APCD site inspection?

1. *Requirements:* For details please see [Regarding APCD Site Inspections](#). In an attempt to include in this manual nearly all requirements of permittees, requirements relevant to all field reviews including burn site inspections are repeated here. The detailed document but not this manual addresses requirements of APCD staff rather than of permittees. For burn bosses it also includes options for confidentiality, escorts, and cross-over between operations and smoke permits, each of which is relevant to only some site inspections.

A consequence of obtaining a prescribed fire permit is that "burning operations shall be subject to inspection by the Division." Any aspect of a permit's conditions or consequences or the veracity of the information submitted on an application may be checked. While we show up unannounced at a burn site infrequently, it is within the Division's legal right to do so and to be present.

On an active burn site, an APCD representative is always be accountable to the burn boss. Also we will make the burn boss aware of our presence at an active burn as soon as possible. We make an important and usually fine distinction between reporting and being accountable. We may not 'report' to the burn boss, be under their authority, nor be present only with their approval. The burn boss may not unilaterally assign us roles or tasks. We do not serve as the day's smoke monitor. Having said, nearly all the time we also try hard to cooperate and help and to fit in easily as best we can.

2. *Intent and Implementation Guidance:* Please see [Regarding APCD Site Inspections](#).
3. *Authority:* [Reg. 9](#) IV C 8: "All open burning operations shall be subject to inspection by the division."
4. *Approved by and date of signature:* Dan Ely, 7/21/11

D) How does the modeling happen?

1. *Background:* APCD staff have spent hundreds of hours over the last decade examining and testing different numeric and computerized models for smoke from wildland fires. Every year we spend at least some time to learn about computerized smoke model changes and updates. We have yet to find a numeric calculation model that we believe is better than the Division's spreadsheet model captured in the standard conditions worksheet. Put more bluntly, we believe all the numeric models currently available give significantly erroneous

rankings of smoke risk among burns, to the extent that using one to inform permitting decisions would constitute a worsening of decision-making.

Most dictionary definitions of a model are some variant of ‘a simplified representation of a complex object or process that is used to analyze and solve problems or make predictions.’ The smoke model we use at APCD is professional judgment, formed largely in response to actual burns that have occurred in Colorado. The smoke worksheets are condensed and somewhat simplified versions of our experience-based smoke model.

2. *Intent:* We’d all like the convenience and simplicity of using a good computerized smoke model. But we don’t want to succumb to delusions about the numbers they produce.
 - Precision can wrongly imply accuracy.
 - Computation can wrongly imply objectivity.

There are good reasons it is difficult to create good numeric models of smoke impacts. Here are some.

- Precision of baseline fuel loads is very low for all but research-scale measurements. Among others, see Roger Ottmar’s research for particulars.
- Converting particulate production into the concentrations that determine impacts means distributing a weight measurement across all 3 dimensions of space plus time.
 - Mixing height is a pretty good estimate of a y-axis measurement far enough downwind of a burn. Critically, it won’t capture impacts at the most vulnerable receptors within a couple miles of the burn. Close to the source, height is instead mostly determined by initial plume rise, in turn a function of heat. So many variables affect heat from a prescribed fire at a moment in time that modeling accurate enough to make permit decisions with real consequences is nearly impossible. Some of the variables that affect initial rise like fuel moisture can be known with reasonable certainty only near or at the start of a burn day. Others can’t even then: ignition patterns, fine-scale variations in wind and in fire front geometry, etc. Although incorporating more stochasticity is a promising research direction for smoke models, a risk is results too generalized to inform good decisions.
 - x-axis: Windspeed is the usual estimate. It varies from forecasts and throughout a day, though there are computational ways to accommodate probabilities.
 - z-axis: To evaluate horizontal spread one must estimate plume expansion. Smokestack models suffice here. How many imaginary smokestacks should be used for a line of fire, however, is a decision critical to model outputs and that lacks obvious answers.
 - Variation in timing of combustion during a burn day is also highly variable across burns, and also reflects real-time management decisions. Rate of combustion affects real lift and also model outputs through calculated initial

“height” of the imaginary smokestack; Accurately predicting or characterizing time variance within a day is difficult.

- Complex topography matters a lot. All but a few research weather forecasting models resolve at a scale of a kilometer or more. That is far too coarse to capture the variations that matter most for smoke impacts in Colorado’s jagged and complex landscapes.
- Drainage smoke is at least as important a source of real smoke impacts as lofted smoke. Except one box model inappropriate in Colorado, no numeric smoke model we’ve seen addresses night impacts.

We look forward to testing and using a good computerized predictive model of smoke impacts. Until then, the best model we have is experience-based professional judgment. That’s one of the reasons we focus so much on learning from fires and from experienced burners, and listening closely to permittees’ input.

We also look forward to continuing to experiment with modeling real fires. Modeling combined with monitoring lets all of us to learn more about model performance, pros/cons, size of fires v. accuracy of prediction, and so on. APCD’s intent is to continue to learn more about smoke impacts and continue to evolve its smoke program based on learning. On-going involvement with modeling has a role in that endeavor.

3. *Approved by and date of signature:* Dan Ely, 7/21/11

E) What is involved in the public comment process?

1. *Requirements:* Broadcast burns that rate out as highest risk for smoke impacts receive formal invitation for public comment on their smoke permit conditions.

The Division considers any comments received in determining whether to issue a permit and what different or additional conditions, if any, to impose. A commenter may request a public comment hearing before the Air Quality Control Commission in addition. Within 30 days after the close of the public comment period or after the public comment hearing, the Division will either grant or deny the permit.

Public comment on high smoke risk burns’ permit conditions has a different lifespan than the permit itself. Public comment is taken once every five years for the project. If the proposal changes significantly, the Division will reopen public comment sooner. The project itself still requires a renewed permit every year.

To know which projects are subject to public comment, see the [broadcast worksheet](#).

2. *Background and History:* Applicants have pointed out that most projects that need a smoke permit have already been through a formal public comment period as part of NEPA (National Environmental Protection Act) review. The APCD comment period is not redundant, however. We solicit and consider comments not about the appropriateness of the project in general, but only about the proposed conditions of its smoke permit.

This element of [Regulation 9](#) is part of law and is not discretionary on the part of APCD staff. The intent is to capture only the highest smoke risk burns for public comment. One severely problematic prescribed fire led to this aspect of regulatory law. Essentially, the Commission has directed the Air Division to provide public comment opportunity when, for example, a relatively large-scale burn in heavy fuel is proposed near a smoke sensitive area.

3. *Implementation Guidance:* The extent to which we publicize the public comment process varies with our evaluation of the project's smoke risks and who it may affect. Typically we [post](#) comment opportunities on the web. We also usually send specific invitation for comment via email to the Board(s) of County Commissioners in whose jurisdiction the land falls. Occasionally other special targeted outreach makes sense:
4. *Authority:* [Reg. 9](#) V F 2: "If the division determines that a fire poses a high smoke risk, the division will... issue a draft permit for public comment."
5. *Approved by and date of signature:* Dan Ely, 7/21/11

F) How does EPA's Exceptional Events Rule Affect Prescribed Fire in Colorado?

1. *Background and History:* In March 2007, EPA published the Exceptional Events Rule (72 FR 13560) that addresses how EPA will review and potentially discount certain ambient air quality data. As defined in the Rule, an "exceptional event" is an emission-producing event that is not expected to occur routinely at a given location, is not reasonably controllable or preventable, but causes or significantly contributes to an exceedance or violation of the National Ambient Air Quality Standards (NAAQS)." Examples of exceptional events are stratospheric ozone intrusions, chemical spills, and clean ups after major disasters. Also included in the Rule are "natural events" that produce emissions due to non-anthropogenic sources and which either cause or significantly contribute to an exceedance or violation of the NAAQS. Examples of natural events are wildfires, high wind events, and volcanic and seismic activities.

EPA's March 2007 action brought together into a single rule three separate EPA policies: the 1986 Exceptional Events Policy, the 1996 Natural Events Policy and the 1998 Ozone Mexican Fire Policy. In its 2007 decision EPA also committed to amending their 1998 Interim Air Quality Policy on Wildland and Prescribed Fire to bring it in line with the Exceptional Events Rule. The focus of the Rule is to identify what ambient air quality data will be used in determining compliance with the NAAQS and thus whether or not an area will be designated as in attainment of public health standards or not. The rule change applies only to NAAQS attainment and does not affect compliance with state permitting requirements, regional haze programs or other state/local public safety or welfare regulations concerning open burning.

Past policies and the Exceptional Events Rule have defined wildfires as natural events. In spring of 2007 EPA added prescribed fire and wildland fire use to the list of exceptional events. Relative to wildland fire, the 2007 Rule changed the definition of an 'exceptional event' to include additional types of wildland fire that would qualify as a potentially excused NAAQS exceedance of the PM2.5 standard.

2. *Intent in Colorado.* APCD wrote a policy, Implementation of EPA's Exceptional Events Rule, 5/8/2008. In March, 2011 at an Air Quality Control Commission meeting, the Air Division

stated that its interpretation of EPA's Rule was too conservative and the policy of 5/8/2008 was being withdrawn.

Simply stated, APCD's intent is to follow the law and EPA's guidance, FAQs and advice on its interpretation and implementation. At the time this is being written, more information from EPA is on the way.

Less simply stated, APCD has heard many interpretations and declarations about the effects of this Rule and its intent from a few excited burners and their representatives who possibly hoped the Rule would remove the constraints of Colorado's SMP. Some of these beliefs are of concern and do need to be addressed:

- EPA's Exceptional Events Rule does not change any permitting requirements, applicable rules or regulations adopted by the Colorado Air Quality Control Commission nor operational smoke management procedures in Colorado. Regardless of the existence of EPA's Rule, burners in Colorado must comply with Colorado regulations on wildland fire burns and with their Division-issued permits.
- Burners still need to get permits in order to burn lawfully. The Rule does not eliminate permitting directly or indirectly.
- The Rule does not allow the Division to write permits that it believes will exceed the NAAQS.
- While the Rule applies only to situations where exceedances of a standard have occurred due to an exceptional event as monitored at a fixed, federal reference method, official monitoring site, it does not imply that the NAAQS do not apply where there are no such monitors. APCD has been told by EPA Region 8 that we are to write permits "as if" an official monitor were at the nearest occupied residence relative to the proposed burn site.

Along with many burners, the Division believes the Rule also provides an opportunity. The Division has asked for evaluation projects that incrementally push the envelope of what has been done in the past in exchange for additional monitoring, is engaged in a geographically focused pilot project intended to closely evaluate smoke impacts from a series of increasingly larger burns, and is always eager to learn more about smoke impacts in collaboration with burners. All of these activities provide many of the inputs that drive and inform change in Colorado's SMP and may, over time, allow us to adjust our program so the level of prescribed fire may increase. In order to evaluate impacts, it will likely be necessary to burn more than we typically have experience with and to measure what happens. It is conceivable that a NAAQS exceedance could occur as a result. EPA's Rule provides a process for excluding data from such "exceptional events" that were not intended.

One final note: It is unlikely the Rule will ever be used in Colorado. In order for us to apply to EPA to exclude an exceedance the following circumstances/scenarios would need to occur:

1. The burn would have to take place in an airshed with an official particulate monitor. Relative to all the places in Colorado where burns happen, there are very few such monitors.

2. The burn's particulate smoke would have to impact the monitor on a "run" day. The monitors do not operate every day. A typical schedule is one-out-of-three.
3. An exceedance would have to be monitored.
4. The burn would have to be the primary reason the exceedance occurred.

EPA says that the Division would have to demonstrate that "but for" the exceptional event, the exceedance would not have occurred². All of these elements are unlikely to occur at the same time. Nevertheless, if this low probability situation did happen, the Division would evaluate the opportunities afforded by the Rule on a case-by-case basis.

3. *Approved by and date of signature:* Dan Ely, 7/21/11

XI) There is a topic or question that I'd like added to this manual.

Please [contact us](#).

² There is a large amount of technical data that must be assembled for EPA to consider whether to flag/excuse an event. For examples see <http://www.colorado.gov/airquality/tech.aspx> . Should such an event occur due to prescribed/wildland fire use fire, it is likely that the Division will request considerable assistance from the burner and/or their management agency in compiling and assembling the required information.

XII) Appendix: Related Documents

Pile Burn	Broadcast Burn
pile application	broadcast application
pile worksheet	broadcast worksheet

Basic instructions are embedded in the forms as hover hints and should suffice for most burns. The [hints are available also as a .pdf](#).

[Detailed Instructions for Smoke Application Forms](#) are available but not needed for most basic permit applications.

[Guidance for Non-Standard Permits](#) is for experienced burn bosses working with especially complex projects.

The smoke program [manual](#) (this document). Addresses in detail formal requirements, program concepts, and background about individual permit conditions. The manual might be useful if you have a specific question or want more in-depth information about Colorado's smoke program.

Related Documents

Pile Burn	Broadcast Burn
pile worksheet	broadcast worksheet
pile application	broadcast application
pile non-standard supplement	broadcast non-standard supplement

Basic instructions are embedded in the forms as hover hints and should suffice for most burns. The [hints are available also as a .pdf](#).

[Detailed Instructions for Smoke Application Forms](#). Not needed for most basic permit applications

[Glossary](#). Consolidated list of terms specific to Colorado's smoke program. Each term's definition also appears in some other place where the term is used.

[Guidance for Non-Standard Permits](#). For experienced burn bosses working with especially complex projects

Smoke program [manual](#) (this document). Addresses in detail formal requirements, program concepts, and background about individual permit conditions. The manual might be useful if you have a specific question or are terribly interested in Colorado's smoke program.

XIII) Appendix: Descriptions of Topic Headers

Requirements: This section tells what is mandatory. Like burn plans, permits are legally binding. Changes may not be made in the field even if doing something different than what is required seems to make more sense at the time. (Escaped fire is an exception.) Deviations require signed authorization. The manual is written as if we [APCD staff] were speaking to a permittee. ‘You’ is the burn boss and/or landowner.

Background and History: are included only if we think an explanation is important to implementation, now. Many permit requirements reflect one or more burn(s) whose smoke went badly. An intermediate step in establishing intent often was ‘make this bad thing less likely to recur.’ Generally we don’t see much value in implying blame by rehashing. If you want to know the history of a particular requirement, ask us.

Intent: This section tells why a requirement or process exists. It tells what effect we [APCD smoke program staff] believe the requirement generally will have. People ask. And the more clearly burners understand intent, the more likely implementation will meet not just minimum requirements but also excellent smoke management.

Implementation Guidance: Any advice given in this section is optional. We hope it is helpful. It is intended to make everyone’s work simpler and/or more effective.

Authority: If a topic has a section for requirements, then authority is included also. Ultimately the smoke management program’s authority is based on the federal Clean Air Act’s requirements of states and tribes. The requirements are implemented through state law and regulation. The authority cited in the manual is the lowest level of implementation rules on which we base our requirements. [‘Reg. 9’](#) refers to the Colorado Air Quality Control Commission’s “Regulation Number 9: Open Burning, Prescribed Fire and Permitting.

Authority references are given only for the convenience of permittees who are interested. References are partial sources of authority, are heavily excerpted from context, and do not represent an attorney’s opinion.

Approving Official and/or Authors: This section is intended to display the level of review provided and to provide for tracking of changes over time. Topics that include no ‘requirements’ section are written by smoke management program implementation staff and do not have a recorded formal approval.