



California-Nevada Tahoe Basin Fire Commission
Wildland Fuels Committee

10/11/07

Subject: Solutions regarding Air Quality Issues and Fire Protection Efforts

Dear Members of the Wildland Fuels Committee and other air quality subject experts:

I would like to express my appreciation for the opportunity to discuss with you and other subject matter experts air quality issues as they relate to efforts to protect ourselves from the impacts of catastrophic wildfires. I have assembled this list to reflect action items that I believe can be taken to improve our ability to perform prescribed burns (to reduce excess fuels and restore forest health) while protecting humans and our environment from negative air pollution impacts. Existing health-based air quality standards are based on extensive research regarding air pollution impacts on human health. We also know that air pollution impacts lake clarity, although we are just beginning to understand the strength of that relationship. We all recognize that prescribed burns reduce overall, long-term air pollution by preventing large, catastrophic wildfires which emit far more pollution. Regardless, solutions for implementing increased prescribed fire (hereafter "Rx burns") will not be based on finding ways around or relaxing air quality standards; rather, effective solutions will come from better management of our Rx burn activities. Further, we must find more alternatives to removing excess biomass via pile burning so that we can meet our fuels reduction goals, use our burn days to implement more restorative understory burning and continue to protect the health of the Basin's populations and our environment.

Proposed solutions are summarized below and discussed in greater detail in the attachment:

1. Streamlining permitting processes for prescribed burning & small scale biomass facilities.
2. Considering source emission 'tradeoffs' to determine where we can reduce emissions from one source (non-fire) in order to allow an increase in emissions associated with prescribed burning, while still meeting AQ standards.
3. Improving our ability to forecast and track local/in-Basin weather conditions and smoke impacts and use these tools to better manage basin-wide Rx burns so burn days are used most effectively.
4. Improve our ability to monitor smoke impacts around the Basin.
5. Consider how seasonal conditions affect implementation of Rx burns and what options may be available to improve overall effectiveness.

I look forward to further discussing these and other ideas to help improve our ability to utilize prescribed fire more effectively. Thank you for your consideration.

Sincerely,

Jennifer Quashnick

Attachment: Detailed Discussion of Proposed Solutions

The following section discusses items in greater detail. Note that number 1 has been left off because this is best left to discussion by permitting agencies (APCDs, AQMDs, etc.).

2. Considering source emission ‘tradeoffs’ to determine where we can reduce emissions from one source in order to allow an increase in prescribed burning, while still meeting AQ standards.

Although this is also an issue for the local air districts for several sources, this idea was originally discussed by the Pathway 2007 Air Quality Technical Working Group (AQ TWG) in earlier years of that process. The AQ TWG included representatives from each of the 5 local air districts with a portion of the Basin in their jurisdiction and state representatives. Members from the research community, environmental groups and other agencies (e.g. USFS) were also represented on that group. This option would require further review and investigation, but it may present a positive regulatory change that will support increased Rx burns.

- a. The AQ TWG discussed possible options for TRPA’s new Thresholds and Regional Plan that would allow these types of tradeoffs. Note that because of acute smoke impacts, this may be more applicable in terms of the annual loading to Lake Tahoe related to clarity than human health. However, until there is an operating Tahoe-specific Emissions Inventory (and associated fully-developed Tahoe specific air quality model) that allows us to better understand sources, timing, etc., we do not know how applicable this may be in terms of allowing tradeoffs to still achieve the health-based standards, which include 24-hour exposures.
- b. In considering annual or longer time periods, an example would be modifications to and/or better enforcement of TRPA’s wood heater retrofit program so that associated emissions during the cooler months would be far less than existing levels. The “emissions savings” from making these changes could then allow an equivalent level of annual emissions increase from Rx burns.

3. Improving our ability to forecast and track local/in-Basin weather conditions and smoke impacts and use these tools to manage basin-wide Rx burns and help reduce the smoke generated by Rx burns.

- a. Hire a local, in-Basin meteorologist and purchase the associated equipment needed to run forecasts and make burn day determinations locally.
- b. Evaluate the model inputs for CA vs. NV forecasting models. We have heard that CARB models use a more conservative approach than Nevada models. Has that proven to correlate well with actual conditions, or can we use less conservative data and still successfully predict conditions and perform Rx burns? How has the NV modeling approach worked? Can we unify our models and approaches?
- c. Utilize the smoke management models that have been developed by multiple agencies and research institutions to better forecast potential smoke impacts and

help guide overall Rx burn activity. Better smoke management will likely mean more Rx burns can be performed without exceeding health-based standards.

There are several models and databases already being developed to help achieve these goals. However, some still require additional resources in order to be fully developed, while others are almost done and merely require additional staff time and/or political will to prioritize them to get them completed and in operation. While the focus here is mostly related to California state information, we suggest that discussions include how we can utilize these tools with Nevada smoke management regulations as well.

PFIRS:

CARB has spent years developing the “Prescribed Fire Information Reporting System” (PFIRS) database. This database is close to completion and could possibly use a “political push” to move things along (e.g. prioritizing this in staff work programs). The Tahoe Fire Commission is in a position to help prioritize completion. The PFIRS database was developed to take in all information from Title 17 Smoke Management Plans (e.g. fire size, estimated material, location, estimated emissions, etc.). Currently, such information is submitted to Air Districts via hard copy. It is difficult to determine the impacts of a burn from the information provided in this form. Therefore, air districts will generally err on the side of caution and perhaps deny Rx burns to assure that air standards are not violated when conditions are questionable or uncertain. With PFIRS, not only can burn agency personnel enter this information online, but the information can feed into another model to allow an actual evaluation of impacts. There is a model in development which can use PFIRS data to do just that: the California And Nevada Smoke and Air Consortium, or CANSAC, has been developing a “Blue Skies” modeling program.

Blue Skies Model:

CANSAC has developed this model to use data from two systems - the MM5 meteorological model and the PFIRS program – to estimate the expected smoke impacts from all planned fires in the Basin on a given day and therefore presents an important tool for planning Rx burn activities. Impacts include the expected location of the plume, where the smoke may end up and what the concentrations in those areas may be. The information provided by the Blue Skies model will help revolutionize how we manage smoke and Rx burns in the Basin. If we can estimate the expected smoke impacts, we can plan Rx burns better. Chances are, this program will allow more Rx burns on burn days. For example, as mentioned, air districts currently must decide which burns to authorize on a given day based on smoke management plan data – which does not include a forecast of the eventual smoke impacts. Trying to determine this for multiple burns is even more difficult. As would be expected, decisions may tend to be conservative so as to not jeopardize human health. Therefore, perhaps the existing process would result in the approval of 3 burns on a given day. By using the PFIRS data with the Blue Skies Model, air districts will have better information to make decisions and may be able to authorize 5 or 10 burns on that day because the modeling data

indicate the smoke will loft and disperse such that concentrations remain well below standards.

Unfortunately, CANSAC needs additional resources in order to complete the Blue Skies Model.

- i. The Tahoe Fire Commission's recommendation to seek funding to complete this model would go a long way in helping to obtain those resources.
 - ii. Further, perhaps through this air quality panel discussion we can assign a committee that will be responsible for overseeing the completion and implementation of these various smoke management tools.
 - iii. This committee could also evaluate how multi-state programs, such as the Fire Emissions Tracking System (FETS), may assist in smoke management in the Basin as well.
- d. The federal Regional Haze Rule (RHR) designates special protections for visibility in Class I Areas. In the Basin, Desolation Wilderness is designated as a Class I Area, therefore the associated protections will apply to activities where emissions can affect Desolation Wilderness (in other words, protections will extend beyond Desolation Wilderness since air pollution crosses boundaries). Currently, states are required to prepare Visibility State Implementation Plans (VSIPs) to address how they will meet RHR protections in these areas. These VSIPs are currently under development and draft VSIPs for public review and comment are expected this winter or early spring. Through these VSIPs, methods for reducing smoke from Rx burns will be identified. Additionally, these SIPs can require Emission Reduction Techniques (ERTs) and Enhanced Smoke Management Programs (ESMPs), which basically prescribe methods for reducing the smoke generated by Rx burns. The California VSIP will provide opportunities to reduce smoke generated by Rx burns in the Basin.
- e. Individual fuels reduction projects should include funding to support air quality forecasting/emissions modeling activities. Individual projects generally include funding to address other resource considerations such as water quality and habitat protection, yet air quality management (e.g. the forecasting and emissions modeling discussed above, which is clearly a significant tool for planning fuels reduction projects), is not funded through these projects. Because these air quality planning tools can help facilitate more effective prescribed burning, it makes sense that funding to support them should be included in forest thinning and restoration projects. As mentioned, resources are currently needed to complete the systems however once operable, funding will be needed for ongoing operation. Perhaps this budget pool may also be used to support local meteorological staff and resources if that is proven to be a beneficial option.

On a final note, a historical comparison of actual weather conditions versus burn day determinations (including how many "no-burn" days may have been acceptable for burning in the Basin although models indicated risk) will help determine the usefulness of these ideas and help shape solutions. Can CARB and the local air

districts perform this review and report back to the Committee in the next month or two?

Further, it is important to note that these smoke management activities will also provide benefits in terms of addressing climate change. Smoke emissions include greenhouse gases. When we can prevent large wildfires through smaller Rx burns, we will also help prevent the release of more greenhouse gases.

4. Improve our ability to monitor smoke impacts around the Basin (which helps feed into number 3).

Prescribed burning is regulated in order to make sure health-based air quality standards are not violated. Impacts to air quality are determined by monitoring. Therefore, monitoring is a necessary component of planning for prescribed burning and especially for maximizing opportunities to do Rx burn projects while not violating AQ standards. Further, monitoring provides ongoing calibration of models so that model performance can be checked and refined when necessary.

Unfortunately, the Basin's overall air quality network has been reduced over the past few years for a variety of reasons. CARB experienced budget cuts and had to focus resources where air quality was far less healthy. TRPA closed down their new South Lake Tahoe site not long after it was installed, and staff resources have apparently been shifted to focusing on the P7 Update. Luckily, members of the research community have been able to secure limited grant funding to add some additional AQ stations to the Basin. Overall, however, far more monitoring sites and equipment are needed (as is the funding to support them).

- a. There is a need for portable and real-time monitoring equipment which can monitor the impacts of Rx burns. The monitoring data are useful in two ways: 1) to determine whether the expected/estimated emission impacts are actually occurring [which helps calibrate the models as well] and 2) evaluate air quality conditions in communities. Portable monitors should not be set up right next to the burn; rather, they should be set up in communities downwind of the burns because that is where the impacts count. There are a variety of portable samplers available for this purpose. Two examples are discussed below:
 - i. Currently, "mini-vol" samplers are being used in the Basin. These samplers were used by CARB as part of the Lake Tahoe Atmospheric Deposition Study (LTADS – 2002-early 2004). After this study was completed, CARB donated 10 mini-vols to the Tahoe Environmental Research Center (TERC) facility (Dr. Tom Cahill, Pers. Comm.). These mini-vols were used to obtain air quality samples during the Angora Fire. As expected, the samples indicated smoke levels exceeded healthy levels by orders of magnitude, further supporting the air quality benefits of prescribed fire when compared to catastrophic fire.¹ Data are not real-time, however mass can be determined

¹ Data are available from Dr. Tom Cahill with UC Davis.

within a day or two (at TERC's laboratory) and chemical analyses can be performed if desired.

- ii. Portable *real-time* samplers that can provide benefits as well include "EBAMs" – these instruments are a portable version of Beta Attenuation Monitors (BAMs), which provide real-time particulate mass data in PM_{2.5} and PM₁₀ size classes. The EBAMs can utilize satellite transmissions/modems to provide immediate data.
- b. There is also a need for a Basin-wide ongoing monitoring network to capture overall air pollution levels and help examine sources. This also supports the option of considering source 'tradeoffs.'
- i. Re-instate operation of TRPA's SLT air quality monitoring site. In 2005, new IMPROVE equipment was purchased for this site by TRPA (IMPROVE data include PM_{2.5} and PM₁₀ mass plus PM_{2.5} chemical data). Additionally, the USFS purchased an ozone sampler to operate on this site and TRPA agreed to support ongoing operation. The site location was determined by air quality experts to best reflect ambient SLT air quality (i.e. the site is not impacted by highway 50 traffic emissions); the P7 Air Quality Technical Working Group (AQ TWG) supported location of this site. There were also discussions about adding other equipment, including DRUM samplers, CARB PM mass samplers, etc. The site was shut down in 2006 but the shelter remains in location and equipment is in storage. What the site lacks appears to be funding and political will. Perhaps the Tahoe Fire Commission can help by indicating support for obtaining these resources to reinstate the continuous operations of this air monitoring station.
 - ii. Address the need for other monitoring locations around the Basin. There is already a great deal of research and information regarding the need for additional sites and locations, including the 2000 Lake Tahoe Atmospheric Research Scoping Document (copies can be obtained from TRPA), the LTADS Study and other documents.
 - ii. Address the need for continuous sampling of particulate mass by size, with ex post facto composition as needed (to separate fine soil from smoke). Currently, the best technology available to meet this need is UC Davis' DRUM Sampler. This equipment is a well-tested instrument which has been used in the Basin for several years and is presently being used in the Basin by the EPA (Region 9). The DRUMs can provide the chemical make-up of PM in 8 size classes, including ultra-fines. The chemical data help determine sources; for example, they can separate wood smoke from diesel particles – these two sources have two distinct and separate peaks between 0-1 micron, but with normal PM_{2.5} monitoring, these two peaks are not separated so it's not possible to determine how much of the PM_{2.5} mass is from wood smoke versus diesel particles. This information can help in examining source tradeoffs – e.g. what would be the benefit of a change in the wood heater

regulations and once implemented, is that benefit being realized in ambient air quality? Further, if for example, only ½ of the PM_{2.5} mass in winter is from wood smoke, then any reduction from regulatory changes would affect only ½ the PM_{2.5} mass.

5. Consider how seasonal limits affect our overall ability to implement Rx burns and what options may be available to improve overall effectiveness.

Determining what time of the year to burn is not easy. There are pros and cons associated with each season. In the winter, the Basin experiences dominating inversions that trap pollution; this limits the ability to burn. In the summer, conditions are driest so the risk from burning is higher; also, this is when tourism is highest and tourists expect to see clear skies when they visit. Therefore, burning often falls to the shoulder seasons, when conditions are not as dry and inversions not yet as strong as in winter months.

The 2000 Watershed Assessment (Chapter 3: Air Quality) explains that during the summer months, weather conditions are generally best in terms of getting smoke up and out of the Basin. During the fall, conditions are more troublesome:

“The results of this evaluation indicate that, for prescribed fires, a fall burn is particularly troublesome from the standpoint of air quality. The atmospheric inversions that tend to be present during the fall inhibit ventilation of the Lake Tahoe Basin and hence allow concentrations of PM_{2.5} to build up.”

However, we have heard that because of risk from drier conditions and tourism, Rx burns are not generally scheduled for the summer months. (There are likely far more factors affecting this decision which representatives from burn agencies can share during today’s discussion). A review of historical information indicates that natural fire regimes actually included several small fires during the summer months. Therefore, perhaps we need to reconsider Rx burns in the summer. This could increase risk due to drier fuels, but perhaps we could counter that increase through hiring more trained personnel to control and monitor Rx fires to reduce the risk of them getting out of control? We can certainly work to educate visitors on why Rx burns are necessary for the Basin, and remind them what the alternative looks like (e.g. pictures of when uncontrolled fires have smoked out the Basin). In fact, we may have no choice if we are to prevent future fires like the Angora Fire. That was obviously bad for our economy in itself.

The Watershed Assessment also explains that historically, when natural fires burned between May and October, there was often smoke in the Basin most mornings but due to summer weather patterns, this smoke usually blew out of the Basin by mid-day. Assuming we meet the standards, perhaps we consider this option again?

- a. Develop a template to allow additional small Rx fires in summertime’s low humidity conditions.
 - i. What can we do to make this happen without significant increases in the risk of Rx burns going out of control? What are the associated costs?

- ii. How can we represent these actions in a template format that can be used for all summer Rx burns?
 - iii. How many additional burn days would we have if we didn't exclude summer months?
 - iv. How many additional piles/acres burned would that translate into per year?
- b. Investigate whether tradeoffs in non-fire 'seasonal sources of wood smoke' would allow more Rx burns. For example, can we reduce residential wood heater emissions and allow an equivalent increase in smoke through wintertime Rx burns? Would this be worth the effort and cost?