

## EMISSION REDUCTION TECHNIQUE LOOK-UP TABLE - EXPERT PANEL REVIEW

**PREPARED FOR:** Roger Ottmar: Research Forester, USDA – FS Region 6 & Pacific NW Research Station; [rottmar@fs.fed.us](mailto:rottmar@fs.fed.us)

Colin Hardy: Research Forestry, USDA – FS Rocky Mountain Research Station; [chardy01@fs.fed.us](mailto:chardy01@fs.fed.us)

Janice Peterson: Air Quality Specialist for NF’s in WA, USDA – FS Region 6 & Pacific NW Research Station; [jlpeterson@fs.fed.us](mailto:jlpeterson@fs.fed.us)

Sam Sandberg: Supervisor Physical Scientist, USDA – FS Region 6 & Pacific NW Research Station, Fire and Environmental Research Applications Team; [dsandberg@fs.fed.us](mailto:dsandberg@fs.fed.us)

Bryan Jenkins: UC Davis; [bmjenkins@ucdavis.edu](mailto:bmjenkins@ucdavis.edu)

**PREPARED BY:** *Co-Chairs of the Emission Reduction Technique Task Team*

Dave Randall: Air Sciences Inc.; [drandall@airsci.com](mailto:drandall@airsci.com)

Mark Fitch: Air Quality Management, USDA – FS Region 3 Tonto National Forest; [mjfitch@fs.fed.us](mailto:mjfitch@fs.fed.us)

**PROJECT:** Western Governors’ Association, Western Regional Air Partnership, Fire Emissions Joint Forum, Emissions Reduction Technique Task Team

**COPIES:** *Members of the Emission Reduction Technique Task Team*

**DATE:** June 30, 2005

The Emissions Reduction Techniques Task Team (ERT TT) of the Fire Emissions Joint Forum (FEJF) of the Western Regional Air Partnership (WRAP) is charged with proposing technical tools for state and tribal smoke management programs to employ to track the use of emission reduction techniques (ERT) and to quantify the emission reductions associated with the application of ERTs to prescribed fire events (wildland, non-federal rangeland burning, and agricultural burning). This memo presents a Strawman ERT table of emission reduction factors for ERTs and solicits input from a small group of recognized experts in the

area of ERT's to assist with gathering data necessary to complete the ERT table. In addition, recommendations on the completeness and format of the ERT table are welcome.

**A conference call to discuss your comments on the Strawman ERT table has been scheduled for July 27, 2005 at 10 a.m. MDT. Please RSVP for the call by July 20, 2005.** Of course, any input you'd like to provide by email in the meantime is welcome. Please send any comments by email to Dave Randall ([drrandall@airsci.com](mailto:drrandall@airsci.com)) and Mark Fitch ([mjfitch@fs.fed.us](mailto:mjfitch@fs.fed.us)). If you have any questions regarding the Strawman ERT table or any aspect of this review, please call Dave Randall (303.988.2960 x221) or Mark Fitch (602.771.2374).

### **Strawman ERT Table.**

The ERT TT has prepared a table (Table 1) that lists ERTs and the emission reduction factor (expressed in percent of PM<sub>2.5</sub> emission reduced) associated with each ERT. Table 1 is supposed to be a *simple* tool that smoke managers throughout the WRAP can use to track the application of ERTs and to consistently quantify the emissions reduction associated with the application of ERTs. Of course, smoke managers will have the discretion to track and quantify the effect of ERTs using any technical tools and methods they choose.

The list of ERTs in Table 1 was developed through review of existing documentation on ERTs, most notably the report National Assessment of Smoke Management Techniques and Practices prepared for the National Wildfire Coordination Group, Fire Use Working Team (Core, 2000). Emission reduction factors for four primary fuel types (grass, brush, timber, and crop) were gathered from the literature (specific references for the source of each emission reduction factor are included in Table 1).

Also included in Table 1 is a column that attempts to characterize the type of emission reduction benefit associated with each ERT. ERT benefit categories include:

- Reduction in available fuel;
- Combustion efficiency improvement (i.e., lower PM<sub>2.5</sub> emission factor);
- Reduction in fuel consumed;
- Combination of lower PM<sub>2.5</sub> emission factor and reduced fuel consumption; and
- Reduction in fuel consumption with potential increase in PM<sub>2.5</sub> emission factor.

The ERT TT has shaded out cells in the emission reduction factor portion of the table for instances where the ERT is not applicable to vegetation type.

### **KEY QUESTIONS FOR REVIEWERS:**

1. Can you provide (or direct the ERT TT) emission reduction factors to fill-in the blank cells in Table 1?
2. Are there ERTs that are missing from the list?
3. Are there ERTs that should be deleted from the list?
4. Do the Emission Reduction Benefit categories make sense?
5. Have we assigned Emission Reduction Benefit categories appropriately?

**Table 1 - ERT Emission Reduction Factors**

Emissions Reduction Method	Emission Reduction Benefits	Percent PM2.5 Emission Reduction							
		Primary Fuel Type							
		Grass	Ref	Brush	Ref	Timber	Ref	Crop (ag)	Ref
Pre-Burn Fuel Removal									
Firewood Sales									
Mechanical Processing									
Biomass Utilization (except for Elect Gen)									
Biomass for Electrical Generation									
Ungulates		67%	1						
Burn More Frequently				83%	1				
Underburn Before Litter Fall									
Burn Before Green Up							46%	4	
Backing Fire (grass, pine needle litter)		67%	2			45%	2	50%	3
Maintain fire line intensity (grass, PNL, other)		50%	2						
Isolating Fuels									
Concentration Burning									
Chemical Treatment									
High Moisture in Large Fuels						43%	1		
Moist Litter and Duff						26%	1		
Burn Before Large Activity Fuels Cure						44%	1		
Aerial Ignition/Mass Ignition						10%	1		
Rapid Mop-Up						10%	2		
Windrow Burning						13%	1		
Pile Burning						70%	2		
Air Curtain Incinerators								85%	3
Mosaic Burning						50%	1		

Equal to percent (by mass) of fuel removed  
 Emission Reduction Method not applicable to veg type

**Key for ERT benefit categories**

	fuel reduction
	combustion efficiency improvements (lower EF)
	reduce fuel consumed
	lower EF and reduce fuel consumed
	reduce fuel consumed / maybe some increase in EF

References:

- 1 Smoke Management Guide for Rx and Wildland Fire, 2001 USFS PNW
- 2 FEJF ERT % Reductions - wildland fire (MACTEC)
- 3 FEJF ERT % Reductions - agricultural burning (MACTEC)
- 4 Air Sciences Inc., Wheat Grass Emission Burning Study, July 2003

Notes:

1. When range is given in references for PM2.5 emission reduction, median is used