Issues Paper - FEJF De Minimis Task Team

Summary

Develop a source/impact analysis on visibility and criteria pollutants to assist states and tribes with assessing de minimis levels for fire tracking purposes.

Background

The Regional Haze Rule requires states to periodically monitor progress towards meeting the national visibility goal by tracking pollutant emissions and monitoring visibility. States must show visibility improvement on the worst days and no degradation on the best days. De minimis levels are those levels below which impacts are considered insignificant. While it is not possible to track every fire, it is also a waste of resources to track fires that are insignificant. A science-based de minimis level can provide a cutoff point below which fires do not need to be tracked.

The WRAP FEJF Fire Tracking Systems policy states:

> "… the WRAP recognizes that the unique air quality circumstances of states/tribes may call for excluding some fires from tracking by the establishment of a de minimis level, based on number of acres, tons of fuel, or tons of emissions. The spatial and temporal variability of fire and the significance of visibility impacts is highly dependent upon a number of factors such as size, fuel consumption, meteorology, climate and proximity to a Class I area. The WRAP FTS Policy *does not* prescribe a de minimis level to exclude fires from tracking. States or tribes may wish to establish de minimis levels, which should be defined in the SIP/TIP and be based on a source-impact relationship. The FEJF will be assessing potential de minimis levels based on source/impact relationships to assist states and tribes in this endeavor." (2002)

The main advantage of establishing de minimis levels is to reduce unnecessary workload and costs. For example, historic wildfire data indicate that 80 percent of the particulate emissions are caused by fires greater than 100 acres, while the number of fires less than 100 acres greatly exceed those greater than 100 acres.

There are many potential uses for de minimis levels:
- Reducing model run time
- Streamlining smoke management programs and regulations
- Interpreting source apportionment results
- Integrating with de minimis levels for other sources (road dust, BART, Alaska haze sources)
- Developing regulations
- Enforcing becomes more effective

Several states already use "de minimis" levels although they are not always identified as such (see table below). The parameters used are acres, tons of emissions, or tons of fuel per year, burn, or day. The southern forests focus on the existence of smoke sensitive areas downwind or down drainage. The levels can be set using a variety of methods. For example, Arizona bases its level on data availability. California bases its level on a similar requirement for stationary sources. There is often a progression of additional requirements once the de minimis level has been exceeded such as permits, burn plans, fees, burn authorization, etc. The requirements are generally minimal, if any, for de minimis fires. It is likely that specific conditions would accompany the de minimis levels. For example, low threshold zones near smoke sensitive areas.

State "De Minimis" Levels (need to add fuel types)

State	De Minimis Level	Comments
AK	40 acres/year	
AZ	100 acres for WFU 100 acres (timber), 300 acres (grass/brush) for wildfire	Wildfire acres based on ICS 209 reporting requirements
CA	10 acre burn for WFU	
CA-NSAQMD	5 acre burn	
CO	10 acre grass burn 50 small piles (out before sunset) <5 acre other type burn	draft
MT	500 tons CO or 50 tons of any other pollutant/year	"minor burners"
NV	1 ton PM_{10}/burn	
NM	1 ton PM_{10}/day	draft
NM-Bernalillo Co.	¼ acre burn	
Southern Forests	No SSA within 5-60 miles and no critical SSA within ½ - 3 miles of burn	
UT	20 acre burn or 0.5 tons PM/day	
WA	100 tons fuel/burn 10 acre field burn	

From: "Wildland Smoke Management Program Survey," EC/R 2001 (question #5) and "A guide for Prescribed Fire in Southern Forests," NWCG 1989.

Methods

Modeling Protocol

A diagnostic dispersion model is most appropriate to conduct an air quality source/impact analysis (including ozone to the extent applicable). Two scales of modeling would be used - meso and regional. The meso-scale modeling features complex terrain capacity with smaller geographic and temporal scales to assess localized impacts. The regional-scale modeling features chemistry capacity with regional and longer temporal scales to assess regionalized impacts. Together, these two approaches will provide a more comprehensive analysis of potential de minimis levels.

Meso-Scale: A meso-scale approach would include geographic areas representing major climates of the WRAP region using a plume-based model such as Calpuff. For this study, two geographic areas will be used: Pacific Northwest and Four Corners.

28-32 model runs including the following criteria:

- 2 model domains
  - Pacific Northwest (Idaho, Oregon, and Washington)

- Four Corners (Arizona, Colorado, New Mexico, Utah)
- 4 fire-size scenarios (ie, 10, 50, 100, 250 acres)
- Up to 4 five-day dispersion periods (good and poor)

The fire scenarios and receptor locations for analysis of model results will be developed by the FEJF working with Gail Tonnesen and staff at the UC Riverside RMC. The focus for scenario building will be on terrain and dispersion. Fire activity data will be characterized in terms of fire size, fire density, fire duration, and fire (or fuel) type. Fire scenarios and receptor locations will be developed for each state within each of the two domains.

The FEJF has tentatively identified three peak burn periods for the Four Corners (Jan/Mar/Oct) and four peak burn periods for the Pacific Northwest (May/Aug/Oct/Nov). The FEJF will select the two time periods in each domain to optimize the representation of all fire types, range of fire sizes (acres will reflect the potential range of emissions), and terrain. Once the 2002 interim emission inventory is available, dispersion conditions will be evaluated against the burn activity to select the specific five-day periods for modeling.

Regional Scale: A regional-scale approach would include the entire WRAP geographic area using CMAQ. This project will be conducted after the model sensitivity runs are complete. This project will take advantage of improved understanding of the model fire characterization such as physical plume characteristics, optimal number of vertical layers, and protocols for analysis and interpretation of results.

12 CMAQ model runs including the following criteria:
- WRAP model domain
- 2002 interim fire emission inventory data
- 2002 12km meteorological field for three 2-week periods
- 2002 interim base CMAQ model runs
- Four fire scenarios

Similar to meso-scale, the FEJF will develop the fire scenarios working with Gail Tonnesen and staff at the UC Riverside RMC. The focus for scenario building will be on location and season. As with scenarios for the meso-scale modeling, fire activity data will be characterized in terms of fire size, density, duration, and type. Fire scenarios will be developed for each state within the WRAP domain.

The FEJF will select the three 2-week time periods to optimize the representation of fire characteristics (seasonality, type, size, and density) and terrain. These time periods will be coordinated with those selected for the meso-scale modeling runs. Fires will be spread out over the landscape at various locations within the domain. The analysis of the model results will be concentrated on impacts near the fires and in neighboring grid cells. This provides flexibility in selecting different fire locations that represent varying fuel models and terrain complexity.

The four fire scenarios would include one scenario with more fires than the 2002 base run. The other three scenarios would include fires at various levels under the 2002 base. The fire scenarios will be built selecting individual fires. The RMC can handle scenarios using fire emissions or individual fires. Building scenarios based on fire emissions would present data interpretation difficulties. A "cross-walk" table between fire emissions and what those emissions actually represented in terms of fire size for different fuel types would need to be generated. Due to the innumerable potential solutions, the type of product may be very difficult, if not impossible, to interpret for real on-the-ground application. Once the 2002 interim emission inventory is available, dispersion conditions will be evaluated against the burn activity to select the specific two-week periods for modeling. The selection of fire scenarios may also be influenced by the forth-coming model sensitivity results.

Analysis

1. Written reports

The following is what the FEJF has initially scoped for inclusion in the analysis and interpretation of results. There may be a need for adjustment as the results of the model sensitivity runs become available.

Model Protocol. The contractor would provide detailed documentation of the model protocol.

- Fire scenarios
- Maps of fire locations by day
- Meteorological conditions
- Emissions data
- Fire characteristics (size, density, type)
- Model uncertainties
- Recommendations for improving protocol

Analysis. The model results would be provided in a form that allows a quick and easy method to determine which fires need to be tracked for emission inventory purposes. Each scenario will be compared to the base case.

- Emissions
- Surface air quality impact (dv and visibility impairing pollutants-PM10, PM2.5, CO, O3)
    - Summation tables
    - Spatial animations
    - Scatter plots or histograms at receptor locations (meso-scale) and neighboring grid cells (regional-scale)
    - Time-series plots at receptor locations (meso-scale) and neighboring grid cells (regional-scale)
- Data uncertainties

2. Report Format

The summary data (spreadsheet/database formate) and report (pdf) will be provided on CD(s) to the FEJF.