

NATURAL HAZE LEVELS SENSITIVITY ASSESSMENT

1. Project Overview

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Regional Haze Data Analysis Workshop

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Project Sponsorship

- WRAP is lead, acting on behalf of the 5 RPOs
- Contract is with Western Governors' Assoc.
- Marc Pitchford is WRAP technical lead for project

Purpose of Study

- States have the option of developing refined estimates of natural conditions that incorporate advances in scientific knowledge and consider local conditions
- The study assists in this process by evaluating the sensitivity of natural haze estimates at each Class I area to potential refinements
- Study results will help States evaluate where refinements could materially affect estimates of natural conditions and reasonable progress glide paths

Topics of Today's Presentations

- 1. Overview of study (this presentation)
- 2. Discussion of currently-prescribed approach to estimating average and 20% best/worst natural conditions and analysis of uncertainties

Today's Topics (cont'd)

- 3. Descriptive analysis of default natural concentrations and their relationships to current concentrations
- 4. Discussions of potential refinements to natural conditions estimates and examples of their implications

Caveat -- These are initial results of a work in progress and could change

Three Types of Potential Refinements to Natural Conditions Estimates

- 1. Refinements to the IMPROVE extinction formula
 - May consider refinements to formula after this workshop
 - Up to now this study has only considered effects of including sea salt in the extinction formula and of adjusting the OC to POM mass multiplier

Potential Refinements (2)

- 2. Refinements to EPA's (Trijonis') default estimates of annual average natural background concentrations
 - Consider new information on background concentrations since Trijonis' work
 - Consider geographic variability throughout US
 - Consider seasonal or episodic variability

Potential Refinements (3)

- 3. Refinements to EPA's (Ames' & Malm's) approach for estimating haze indices for the 20% clearest/haziest natural haze days
 - Improved estimates of mean natural values
 - Improved estimates of standard deviations under natural conditions
 - Improved choices of percentile values to represent averages of worst and best 20%

Natural Background vs. Controllable Background -- How Does That Fit In?

SOURCE LOCATION	SOURCE OF BACKGROUND AEROSOL	
	NATURAL	ANTHROPOGENIC
U.S. (LOCAL)	LNP	LAP
Non-U.S. (TRANSPORTED)	TNP	TAP

Key: LNP = Local Natural Pollution, etc.



Natural Background under Regional Haze Rule (LNP + TNP)



Pollution that is controllable by U.S. (LAP)



Pollution that is not controllable by U.S. (LNP + TNP + TAP)

Potential Refinements to Default Natural Concentrations

- Add sea salt and its hygroscopic growth to natural and current conditions (Fine and possibly coarse)
- Consider organics from vegetation (seasonal) and from the ocean
- Consider seasonal and episodic impacts from intercontinental transport of desert dust
- Consider episodic POM and LAC impacts of natural fires
- Consider episodic impacts from volcanic emissions

Issues with Refinements to Concentrations

- Robustness of scientific information for setting a refined concentration value at a specific location?
- To what degree do default concentration values already reflect refinements?

But, Note!

- For the objectives of this study
 - Exact numerical values are not needed to illustrate whether refinements could potentially result in material changes to natural conditions or glide paths nor for qualitatively evaluating the importance of refining one component relative to another
 - States/RPOs can determine more exact values if they actually decide to undertake refinements

Ground Rules for Study

- Studied all 156 mandatory Class I Areas, except for Bering Sea Wilderness
- Used 5 yrs of IMPROVE data (1999-2003) or as much of that period as was available to represent each Class I area. (No complete years of data for Breton Wilderness during that period.)

Ground Rules (cont'd)

- Followed EPA protocols for data handling and calculations (using data from IMPROVE and VIEWS web sites)
 - Substitution for missing data
 - Data completeness
 - Calculated annual and multi-year haze averages by averaging deciviews (not b_{ext})

Summary of Study Process

- Describe current conditions at each Class I area
 - Determine slopes of default glide paths for 20% haziest days
 - Evaluate sensitivity of results to changing 90th %-ile to 92nd %-ile and to choice of OC-POM multiplier

Process (2)

- Estimate uncertainties in default estimates of natural extinction at each Class I area
 - Propagate Trijonis' uncertainties
 - Look at geographic distribution of uncertainties.
 - Varies with East vs. West and local $f(\text{RH})$ distribution over year

Process (3)

- Review scientific basis for refining default concentration values
 - Propose alternative values (or range of values), if appropriate, and estimate uncertainties
 - Re-evaluate Trijonis' error limits, by subregion if possible

Process (4)

- Determine which PM components are most important contributors to glide path slopes at every Class I area
 - Include sea salt
 - Look for geographic and seasonal patterns

Process (5)

- Consider potential *annual average* and *seasonal/episodic* concentration refinements and evaluate their impacts on the glide path slopes at every Class I area
 - Relative impacts -- Helps States/RPOs decide where to concentrate their efforts at developing refinements
 - Absolute impacts -- Helps for optimizing regional control strategy over several Class I areas

Process (6)

- Synthesize results
 - Assess relative importances of various potential refinements at each Class I area
 - Group Class I areas with similar responses to refinements, to provide subregional assessments

Process (7)

- A study deliverable -- Methodology for assessing relative importance of natural conditions refinements at any Class I area

Schedule

- Draft report in mid-July
- Final report by September 1