Dust Emission Inventory Summary Project

CONCLUSION STATEMENT

The current WRAP PM dust emission inventory is derived from a variety of sources and estimation methodologies. These sources include regional emission models (e.g., Windblown Dust model), region-wide assessments (e.g., paved and unpaved road dust), and state/local data submissions. The project identified he need for a consistent approach in reporting of dust emissions was identified in order to facilitate the quality assurance of emission inventory development efforts by separately processing dust emission from other emission source categories. In addition to aiding in the QA process, modeling dust emissions separately allows the application of fugitive dust transport fractions. Transport fractions are used to model the affects of near-source removal of dust emissions through gravitational settling and/or deposition to surfaces or captured in the surround canopy or on physical structures, thus reducing the amount of dust emitted to the atmosphere for regional air quality modeling. Additionally, the result of this project highlighted a number of inconsistencies, both regionally and across source categories, related to the fraction of fine particulate matter in the dust emission estimates.

BACKGROUND

In the western US, dust is a significant component in visibility degradation. The current WRAP PM dust emission inventory is derived from a variety of sources and estimation methodologies. These sources include regional emission models (e.g., Windblown Dust model), region-wide assessments (e.g., paved and unpaved road dust), and state/local data submissions. The DEJF initiated this project to summarize the entire WRAP $PM_{2.5}$ and PM_{10} fugitive dust emissions inventories for 2002 and 2018, and provide recommendations regarding emission estimation methodologies and modeling approaches, particularly with respect to consistency across source categories and regions.

PM INVENTORY DEVELOPERS AND MODELERS

- Results of this project provides a template for QA of dust inventory development
- Summarizes general emissions modeling procedures (i.e., process source categories separately from the rest of inventory, application of Transport Fractions, application of PM10/PM2.5 ratios, etc…)
- Provides comprehensive emissions summaries by source category and region to facilitate QA/QC
- Project results highlight need for detailed SCCs for all sources for accurate emissions modeling

SIP DEVELOPERS

- Consistent presentation format of dust emission inventory
- Results highlight need for detailed SCCs for all sources for accurate emissions modeling
- Importance of accurate representation of PM2.5/PM10 ratios in emissions development efforts

WHAT THE DUST EMISSION JOINT FORUM (DEJF) DID:

The DEJF devised and oversaw several projects to support RHR SIP development in the western US. These include:

- Dust Emission Inventory Summary Project (this project)
- Windblown Dust Emissions from Vacant Lands
- Dust Tools and Resources (several projects)
- Dust Definition Implementation
- New Mexico Pilot SIP Project

There are related “Lessons Learned” papers for all of these projects. The WRAP Dust Emission Inventory Summary Project was initiated to evaluate the overall fugitive dust emission inventory for consistency, both across source categories as well as geographic regions, completeness, and applicability for air quality modeling efforts. Emission summaries were prepared for the 2002 Base Case, 2000-04 Plan and the 2018 Base Case emission scenarios. County-level inventories and gridded model-ready inventory data were reviewed and summarized. The results of the project were used to augment existing QA/QC procedures, revise fine fractions for PM dust, based on the results of other WRAP projects, and to improve upon emission modeling procedures for fugitive dust sources. The project provided various recommendations for improvements to regional fugitive dust emission inventory development efforts

Methods & Results

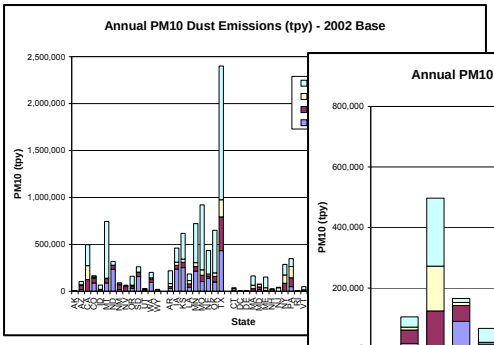
GOALS & OBJECTIVES

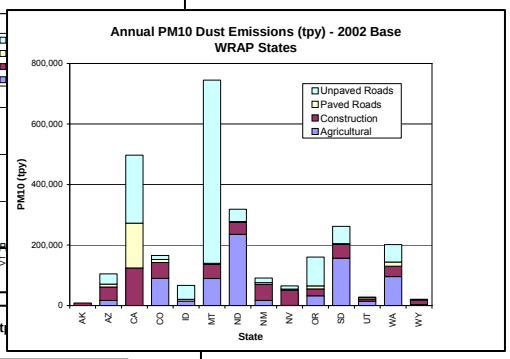
- Summarize all fugitive dust emission sources
- Evaluate dust emissions for reasonableness and consistency
- Review estimation methodologies (AP-42, State/local studies, regional models, etc.)
- Review fine fraction of PM fugitive dust (PM2.5/PM10)
- Develop SCC-level summaries:
  - County-level
  - Model-ready, gridded
  - Develop summaries by geographic region
- Consider 2002 and 2018 EIs
- Provide recommendations for future inventory development, reporting and modeling efforts

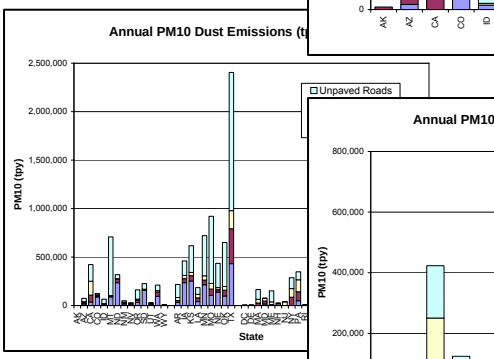
EMISSION INVENTORY SUMMARIES

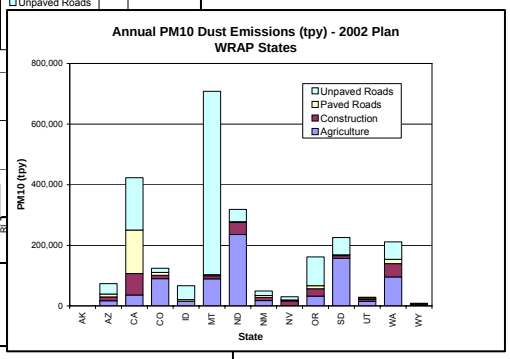
Emission inventory summaries were developed for all fugitive dust emission sources at the SCC, county, and regional level for base year, planning and future year emission inventories. Fugitive dust emission source categories included:

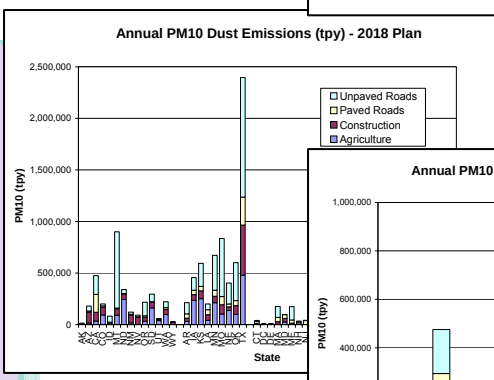
- Agricultural Dust
  - Harvesting
  - Tilling
  - Transport
  - Feedlots
- Road Dust
  - Paved
  - Unpaved
- Construction Dust
  - Mining/Quarrying
  - Road Construction
  - Residential
  - Industrial/Commercial/ Institutional
- Windblown Dust

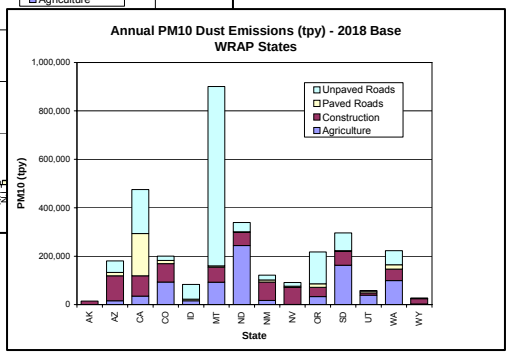


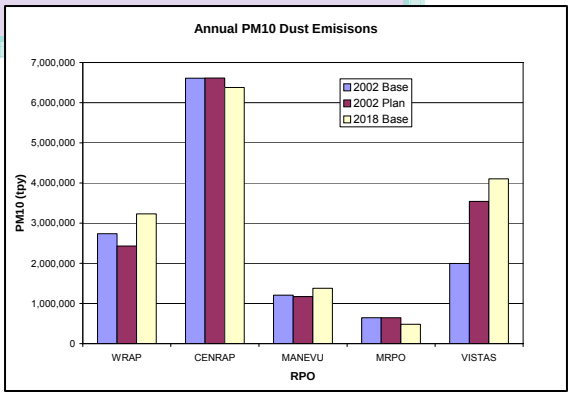


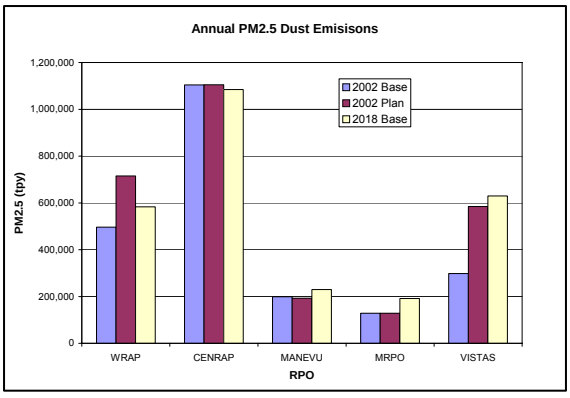






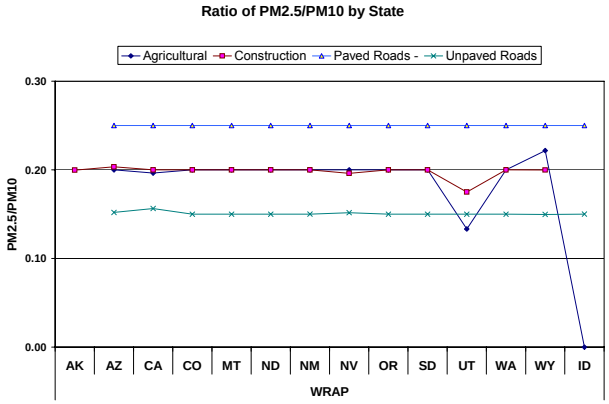






Methods & Results

PM2.5/PM10 RATIOS IN FUGITIVE DUST EMISSIONS



Source Category	AP-42 Section	PM2.5/PM10 Ratio	
		Current	Proposed
Paved Roads	13.2.1	0.25	0.15
Unpaved Roads	13.2.2	0.15	0.10
Construction & Demolition	--	0.208	0.10
Aggregate Handling/Storage Piles	13.2.4	0.314	0.10 (traffic) 0.15 (transfer)
Industrial Wind Erosion	13.2.5	0.40	0.15
Agricultural Tilling	--	0.222	0.20

FUGITIVE DUST TRANSPORT FRACTIONS

Transport fractions used to model affects of near-source removal of dust emissions through gravitational settling and/or deposition to surfaces or captured in the surround canopy or on physical structures

Reduces the amount of dust emitted to the atmosphere for regional air quality modeling.

Applied to gridded modeling inventory

Not applicable to SIP inventories or NEI submissions

Transport fractions updated (see below) in all fugitive dust emission inventories

Fugitive Dust Transport Fractions		
LULC Category	**Original**	**Revised**
Urban	0.30	0.00
Agriculture	0.85	0.75
Grassland	0.70	0.75
Shrubland	0.60	0.75
Forest	0.30	0.00
Barren/Water	0.97	1.00

CONCEPTUAL MODEL OF TRANSPORT FRACTIONS

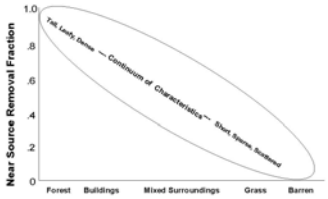


Figure 1. Conceptual Model – Potential for Near Source Particle Emissions Removal vs Type of Surroundings

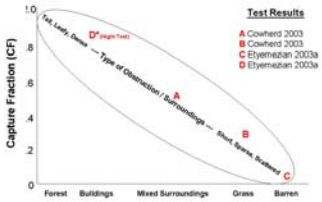
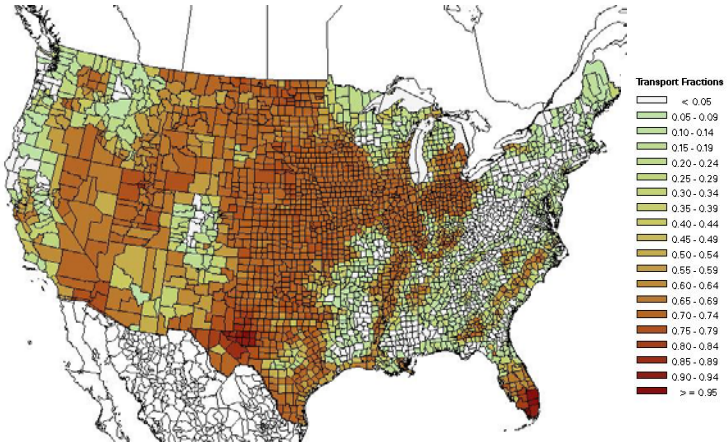
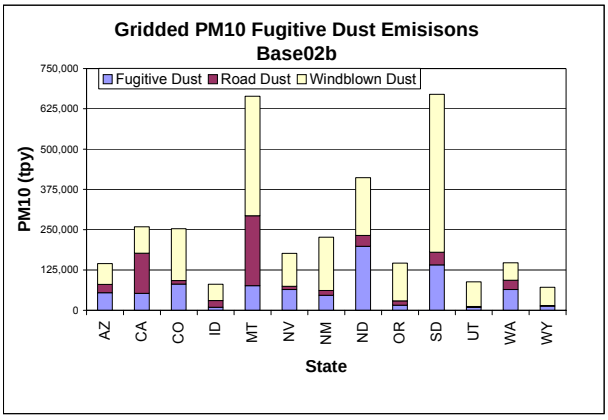
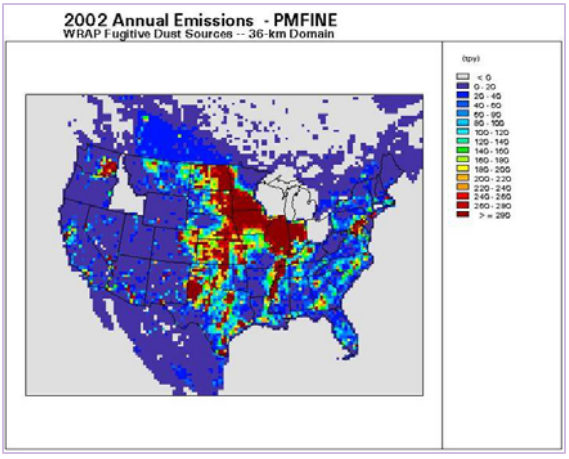


Figure 2. Comparison of Test data with CF Conceptual Model



GRIDDED FUGITIVE DUST EMISSION INVENTORY SUMMARIES





Other Relevant Points & Issues

Provides comprehensive emissions summaries by source category and region to facilitate QA/QC

Provides recommended emissions reporting and development procedures for consistency in SIPs and air quality modeling

Illustrates various issues associated with the use of comprehensive and accurate SCCs for all sources for accurate emissions modeling

Highlights various issues associated with PM2.5/PM10 ratios in emissions development efforts

Recommendations & Future Work

Fugitive dust EIs should be developed using up-to-date consistent methodologies & emission factors and reported using full detailed SCCs

All dust subsequent EIs should be reviewed & summarized following the approach used in this project

Fugitive dust inventories should reflect recently revised fine/coarse PM ratios

Dust emission for modeliomng should apply the latest transport fractions

Related Studies

Analysis of the Fine Fraction of Particulate Matter in Fugitive Dust

New Mexico Pilot Dust Regional Haze State Implementation Plan for the Salt Creek Wilderness Area

WRAP Dust Definition and Feasibility Assessment

Phase II Windblown Dust Project

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