Preparation of a Base-Year Inventory for Application to Regional Haze in the West

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Presentation Outline

• Introduction
• Inventory Preparation Methodology
  - Information Collection
  - Information Processing
• Results
  - Point Sources
  - Area Sources
• Summary/Recommendations
INTRODUCTION

• EF of WRAP has responsibility to compile base and future year inventories for regional haze analyses in West
• Compile “Best Possible” Base-year Emissions Inventory
  - Focus on Point and Area Sources
  - Based On 1996 NEI (Western States)
    • Point sources thought to be more accurate than area sources
  - Canadian NPRI and Northwestern Mexico inventory data also included (not discussed here)
INTRODUCTION (cont’d)

• NEI Serves as Starting Point for the Effort (1996)
• Features
  – National in Scope (all States, all Counties in West)
  – Includes all Haze Pollutants
  – Developed with Consistent Methodologies
• Still Has Weaknesses for Regional Haze Studies
  – Point source data is more precise and current than area source but still has weaknesses
  • sometimes missing activity rates, seasonal operating rates, stack parameters, and location data
  – Area source data has substantial uncertainty due to:
    • point/area source size cutoffs, allocation of activity data to county level, variable control requirements in different jurisdictions
INVENTORY PREPARATION METHODOLOGY

• Information Collection
  – Some Western States had already submitted data for 1996 NEI as part of 1996 PEI process
    • WA, CA, OK, TX, MO, LA (point and area) and MT, ND, SD, NE, KS, and CO (point only)
  – Version 3.12 of 1996 NEI obtained and State level files provided in dbf and NIF formats
  – EPA replaces EGU emissions, so 17 Western States given the opportunity to revise EGU emissions and to modify any sources that had changed since PEI submittal
  – QA checks were run on submitted data and data augmentation and gap filling were performed for missing pollutants and important modeling information
**DATA SUBMITTALS**

<table>
<thead>
<tr>
<th>STATE</th>
<th>SUBMISSION</th>
<th>ACTION TAKEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington</td>
<td>Minor updates to the earlier submission for 1996 NEI</td>
<td>Incorporated minor corrections</td>
</tr>
<tr>
<td>Oregon</td>
<td>Area Source data submitted for some categories</td>
<td>Merged data provided and augmented with selected categories that were not provided from NEI inventory</td>
</tr>
<tr>
<td>Idaho</td>
<td>Plant level data for point sources were extracted from AIRS</td>
<td>Plant and point identifiers could not be matched and the data could not be incorporated</td>
</tr>
<tr>
<td>Wyoming</td>
<td>Point Source data submitted</td>
<td>Data were incorporated</td>
</tr>
<tr>
<td>Utah</td>
<td>Point Source and Area Source data submitted</td>
<td>Incorporated data with minor augmentation</td>
</tr>
<tr>
<td>Colorado</td>
<td>Point Source data for utilities, and Area Source data for all sources submitted</td>
<td>Merged data provided to replace the NEI data.</td>
</tr>
<tr>
<td>Arizona</td>
<td>Point Source data submitted</td>
<td>Substituted data provided by the State and Maricopa county, and retained NEI data for Pinal, and Pima counties, and major sources on Tribal lands.</td>
</tr>
<tr>
<td>New Mexico</td>
<td>Point Source data submitted</td>
<td>Replaced data in NEI file with some minor augmentations</td>
</tr>
</tbody>
</table>
DATA SUBMITTALS
INFORMATION PROCESSING

- Information submitted varied by agency
- Data were reviewed and summaries developed
  - by pollutant at both State and county level
  - compared to similar totals from NEI
  - all significant discrepancies investigated
- Other checks included
  - emission summaries from subsets of sources in major categories
  - check of activity rates for fuel use categories
  - ID of missing/erroneous stack parameters or locations
INFORMATION PROCESSING

• Problems encountered:
  - missing major point sources from submittals by State agencies for selected sources that are operated on tribal lands,
  - inclusion of movable sources (e.g., asphalt and concrete batch plants) in point source files without a recognizable county code,
  - missing or inaccurate fuel use or other activity totals, and
  - different totals for some area source categories that arose from differences in point/area source size cutoff assumptions.
INFORMATION PROCESSING

• Problems encountered:
  - PM-2.5 and NH3 missing from virtually all S/L/T submittals
    • PM-2.5 added based on NEI PM-2.5/PM10 ratio x PM10 emissions submitted by S/L/T
    • NH3 added directly from NEI even if S/L/T submitted NH3 estimates
      - treated this way to avoid large differences among States
  - Missing/inaccurate stack parameters filled using default stack parameters
  - Incorrect location information corrected by placing in county centroid
    • flags used to keep track of parameters that were changed
  - Final inventory database delivered to WRAP on 10/26/01.
RESULTS

- Local Point Source Data for 17 of 22 States
- Area Source Data for 9 of 22 States
- Overall Small Changes in Emissions Magnitude
- Large Changes in Some State/Category Combinations
# POINT SOURCE SUMMARY

<table>
<thead>
<tr>
<th>State</th>
<th>SO₂</th>
<th>%</th>
<th>NOₓ</th>
<th>%</th>
<th>PM-10</th>
<th>%</th>
<th>PM-2.5</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington</td>
<td>-1,848</td>
<td>-1.5</td>
<td>-2,958</td>
<td>-5.0</td>
<td>+193</td>
<td>+1.5</td>
<td>+221</td>
<td>+2.5</td>
</tr>
<tr>
<td>Colorado</td>
<td>-750</td>
<td>-0.7</td>
<td>-1,356</td>
<td>-1.0</td>
<td>-1,054</td>
<td>-5.0</td>
<td>-690</td>
<td>-5.5</td>
</tr>
<tr>
<td>Wyoming</td>
<td>-26,688</td>
<td>-17.2</td>
<td>-23,109</td>
<td>-14.9</td>
<td>-935</td>
<td>-2.8</td>
<td>-137</td>
<td>-0.7</td>
</tr>
<tr>
<td>Utah</td>
<td>-16,713</td>
<td>-28.6</td>
<td>-12,795</td>
<td>-12.9</td>
<td>-10,426</td>
<td>-43.3</td>
<td>-12,063</td>
<td>-65.8</td>
</tr>
<tr>
<td>Arizona</td>
<td>-20,716</td>
<td>-9.6</td>
<td>-43,549</td>
<td>-28.6</td>
<td>-12,755</td>
<td>-36.5</td>
<td>-6,837</td>
<td>-36.9</td>
</tr>
<tr>
<td>New Mexico</td>
<td>-19,567</td>
<td>-10.9</td>
<td>-3,413</td>
<td>-2.2</td>
<td>-6,621</td>
<td>-39.2</td>
<td>-7,073</td>
<td>-69.4</td>
</tr>
<tr>
<td>Entire Study Area</td>
<td>-86,282</td>
<td>-2.3</td>
<td>-87,180</td>
<td>-2.5</td>
<td>-31,598</td>
<td>-5.8</td>
<td>-26,579</td>
<td>-8.4</td>
</tr>
</tbody>
</table>

Numbers represent WRAP-NEI so negative values indicate reductions in estimates emissions.
POINT SOURCES

• Total regional change is less than 10% for all pollutants
  – differences are significantly larger for some pollutants in some States
  – significant differences for SO2 and NOx result from plant closures and some fuel switching not reflected in NEI
• Changes for Washington and Colorado the smallest
  – both submitted data as part of the 1996 PEI effort
• County-level changes could be significant
  – primarily due to location changes due to incorrect location information
POINT SOURCES

Point Source SO₂ differences in tons/yr (NEI minus WRAP)
Colorado Utilities

COLORADO UTILITY EMISSIONS

COLORADO ACTIVITY DATA
(Fuel Use for Utilities)
Effect of Tribal Sources

NEW MEXICO UTILITY EMISSIONS (STATE DATA DOES NOT INCLUDE EMISSIONS FROM ESCALADE OR FOUR CORNERS FACILITIES)

NEW MEXICO UTILITY EMISSIONS (STATE DATA INCLUDES EMISSIONS FROM ESCALADE AND FOUR CORNERS FACILITIES)
AREA SOURCES

• Absolute magnitude of emissions changes is small (except for NOx in CO)
• Patterns of changes for PM are also interesting
  - OR showed an increase in emissions with significant decreases for CO and UT
    • OR increase due to RWC - have detailed studies showing activity data significantly different than NEI
    • much of CO reduction due to cutoff of 2 tons/yr for point sources which moves many sources from area into point component of inventory
• Harder to draw conclusions about area source differences compared to the NEI since only 3 States submitted updated information
### AREA SOURCE SUMMARY

<table>
<thead>
<tr>
<th>State</th>
<th>SO₂</th>
<th>%</th>
<th>NOₓ</th>
<th>%</th>
<th>PM-10</th>
<th>%</th>
<th>PM-2.5</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oregon</td>
<td>- 15,735</td>
<td>- 87.5</td>
<td>+ 5,982</td>
<td>+ 65.6</td>
<td>+ 35,648</td>
<td>+ 23.3</td>
<td>+ 34,363</td>
<td>+ 71.2</td>
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<tr>
<td>Colorado</td>
<td>- 2,593</td>
<td>- 57.5</td>
<td>- 41,579</td>
<td>- 79.1</td>
<td>- 44,466</td>
<td>- 17.1</td>
<td>- 15,796</td>
<td>- 26.1</td>
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<tr>
<td>Utah</td>
<td>- 2,968</td>
<td>- 26.7</td>
<td>- 13,412</td>
<td>- 72.6</td>
<td>- 23,892</td>
<td>- 36.5</td>
<td>- 5,393</td>
<td>- 30.1</td>
</tr>
<tr>
<td>Entire Study Area</td>
<td>- 21,296</td>
<td>- 6.0</td>
<td>- 49,009</td>
<td>- 6.6</td>
<td>- 32,710</td>
<td>- 0.6</td>
<td>+ 13,174</td>
<td>+ 1.0</td>
</tr>
</tbody>
</table>

Numbers represent WRAP-NEI so negative values indicate reductions in estimates emissions.
# Changes to Specific Area Source Categories

<table>
<thead>
<tr>
<th>Source Category</th>
<th>Pollutant Species</th>
<th>Utah</th>
<th>Colorado</th>
<th>Oregon</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>NEI Data</td>
<td>State Data</td>
<td>NEI Data</td>
</tr>
<tr>
<td>Residential Wood Combustion</td>
<td>PM-2.5</td>
<td>1,747</td>
<td>3,860</td>
<td>4,724</td>
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<td></td>
<td>NO\textsubscript{2}</td>
<td>179</td>
<td>356</td>
<td>485</td>
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<tr>
<td></td>
<td>VOC</td>
<td>2,803</td>
<td>10,140</td>
<td>7,581</td>
</tr>
<tr>
<td></td>
<td>SO\textsubscript{2}</td>
<td>26</td>
<td>54</td>
<td>69</td>
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<tr>
<td>Open Burning</td>
<td>PM-2.5</td>
<td>787</td>
<td>0</td>
<td>1,757</td>
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<td></td>
<td>NO\textsubscript{2}</td>
<td>224</td>
<td>0</td>
<td>499</td>
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<tr>
<td></td>
<td>VOC</td>
<td>1,179</td>
<td>0</td>
<td>2,635</td>
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<tr>
<td></td>
<td>SO\textsubscript{2}</td>
<td>32</td>
<td>0</td>
<td>71</td>
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<tr>
<td>Area Source Fuel Use</td>
<td>PM-2.5</td>
<td>443</td>
<td>1,893</td>
<td>541</td>
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<tr>
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<td>NO\textsubscript{2}</td>
<td>17,968</td>
<td>4,707</td>
<td>51,445</td>
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<tr>
<td></td>
<td>VOC</td>
<td>304</td>
<td>4,796</td>
<td>646</td>
</tr>
<tr>
<td></td>
<td>SO\textsubscript{2}</td>
<td>10,991</td>
<td>8,094</td>
<td>4,291</td>
</tr>
</tbody>
</table>
Oregon Area Sources

OREGON AREA SOURCE ANALYSIS - MANAGED BURNING

- STATE MISC. AREA - MANAGED BURN
- NEI MISC. AREA - MANAGED BURN

OREGON AREA SOURCE ANALYSIS - WILDFIRES

- STATE MISC. AREA - WILDFIRES
- NEI MISC. AREA - WILDFIRES
Oregon Area Sources

OREGON AREA SOURCE ANALYSIS - RESIDENTIAL WOOD BURNING

OREGON AREA SOURCE ANALYSIS - OTHER BURNING
Utah Area Sources

UTAH AREA SOURCE ANALYSIS - WILDFIRES

UTAH AREA SOURCE ANALYSIS - RESIDENTIAL WOOD BURNING

UTAH AREA SOURCE ANALYSIS - OTHER BURNING
FUTURE NEEDS

- Point Sources
  - Attention to Physical Information
  - Consistent Size Cutoffs
  - Verify Retired and New Facilities
  - Updates for Facilities on Tribal Land, and for Areas Under Local Jurisdiction
FUTURE NEEDS

• Area Sources
  - More State, Tribal, Local Data Needed
  - Consistency in Assumptions, Methods
  - Allocation and Spatial Resolution
  - Treatment of Dust and Fire Sources