The Inter-RPO 2002 Wildfire Emissions Inventory for 2002 –

Building a Consistent National Wildfire Inventory for Use in Regional Haze Modeling

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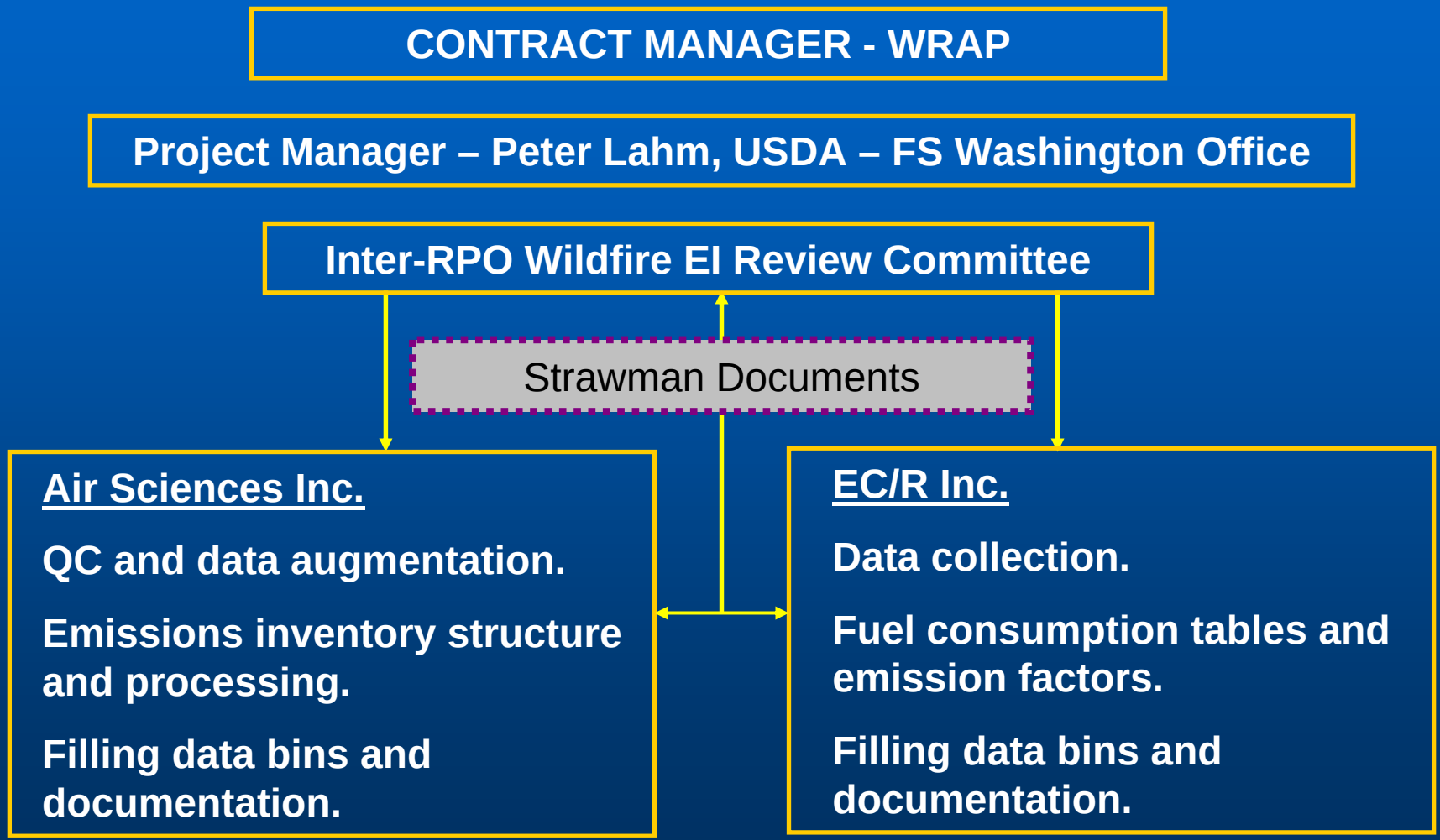
LINK TO INTER-RPO WORKPLAN – to be posted at http://www.wrapair.org/RPO/index.html

Project Overview

- Project Team
  - Air Sciences Inc., Golden, CO/Portland, OR.
  - EC/R Inc., Chapel Hill, NC.
- Workplan reviewed & approved by Review Committee:
  - RPO's;
  - state air quality divisions;
  - federal land managers.
- Currently in project execution.
- Project specs:
  - Temporal - 2002
  - Spatial - Nationwide
  - Source - Wildfire

Project Organization



Project Objectives

- **To support atmospheric modeling of fine particulate mass and visibility for the year 2002.**
  - Some RPO's will use EI for the upcoming round of performance and visibility impact allocation modeling.
- **To supplement state inventory submittals for 2002 under EPA's Consolidated Emissions Reporting Requirements or to update EPA's National Emissions Inventory for 2002.**

Project Objectives

- Value-added analysis
  - Several topics have been discussed to improve the utility of the Inter-RPO National Wildfire Emission Inventory:
    - QC tool for other activity/emissions estimation method.
    - Comparative assessment of Inter-RPO methods & results to existing RPO methods & results.
    - Guidance/suggestions to RPO's on how best to process the Inter-RPO WF EI and use the EI in their modeling systems.

Project Specifications

- **Fire activity data should be maintained at the finest temporal and spatial scale available.**
- **Emissions should be calculated for individual fires and compiled to define monthly and annual inventories.**

Project Specifications

- **Data supplied in easily assessable formats.**
  - **(e.g. Excel) for general review purposes.**
  - **Individual fires reported as point sources using EPA National Inventory Format Version 3.0 (NIF3.0).**
    - **Consistent with EPA formatting requirements and the Inter-RPO Data Exchange Protocol.**
  - **Formats required by the individual RPOs.**
    - **Air quality dispersion model-ready files (SMOKE input).**
  - **Fires composited as monthly inventories by county in NIF3.0 area source format.**

Wildfire Activity Data Gathering Hierarchy

1. QA/QC'd inventory from RPO.
2. Available on-line electronic databases for federal, state, and private lands.
3. Contact individual state and local agencies, especially in areas where data appears to be lacking.
4. Attempt to use general wildfire data from the National Interagency Fire Center web site:
   - National Situation Reports
   - 2002 Wildfire Statistics
   - Bureau of Land Management fire occurrence data

Wildfire Activity Data

- Activity data gathering:
  - Accept all available wildfire activity data (i.e., no deminimis fire size).
    - Data collection efforts prioritized for fires > 100 acres in size and/or located < 50 miles from Class I area.
  - Primary centralized data sources:
    - RPO QC'd EI for wildfire (VISTAS, WRAP, & WMRPO)
    - Federal data sources:
      - USDA – FS Nat'l Interagency Fire Mgt Integrated DBase (NIFMID);
      - USDOI – 1202 Form/Shared Application Computer System (SACS);
      - USDA – FS/USDOI ICS209 report forms;
      - Others.

Inventory Structure

- DATABASE - Raw data imported & formatted.
- GIS - Data processing, augmentation, QA/QC tasks, and formatting for output.
- SPREADSHEET – Storage of essential information for each event, look-up functions, emission calculations, data summaries/documentation.
- TEXT & DBF – Output files.

Data Quality & Augmentation

- Minimum Data Requirements:
  1. Location (lat/lon, UTM, valid legal [TRS]);
  2. Start date (month and day);
  3. Area burned (acres).
  - Always use most refined data available.
    - Dedicate effort to gather “missing” refined data for larger fires closer to Class I areas.
  - Augment with less refined data when necessary.
    - Always try to keep the record in the database!

Data QC and Augmentation

- Quality control (QC) methods:
  - GIS routines (location, timing, event names);
  - Complex fire checks.
- Data Augmentation:
  - Assign latitude / longitude when less resolved location information is provided;
  - Assign other event-specific info
    - (e.g., state & county FIPS, RPO identifier, Source Classification Code (SCC), time zone).

Data QC and Augmentation

- Data Augmentation
  - Fire perimeter x 0.66 = Blackened Acres.
  - Multi-day events distributed to daily events using “spreading oval” routines (from FEPS).
  - Other data improvements to increase number of valid data records (primarily date & location).

Emission Calculations

- Document RPO-specific methods (in Workplan).
- Implement fuel loading data hierarchy
- Implement *new* fuel consumption and emission factor method.
  - Propose Strawman approach to review and refine.
- Estimate emissions for wildfire.
  - More consistent across RPO's.

Fuel Loading

- Implement fuel loading data hierarchy.

Fuel Loading Hierarchy			
Hierarchy No.	Type of Fuel Loading Data	Units	Source of Data
1	Fuel Consumed (observed)	tons	Raw data
2	Fuel Available (observed)	tons	Raw data
3	Fuel Loading (observed)	tons/acre	Raw data
4	NFDRS Fuel Model (observed)	n/a	Raw data
5	Fuel type description (observed)	n/a	Raw data
6	GIS-assigned NFDRS Fuel Model	n/a	GIS-routine
7	Regional Composite Fuel Loading	tons/acre	Default (RPO or state specific

Fuel Consumption, Emission Factors, and Smoldering

- Apply *new* fuel consumption and emission factor method.
  - Multiple runs of Fire Emission Production Simulator (FEPS) across each NFDRS fuel model (20) and up to 6 moisture classes to build lookup table:
    - Fuel Loading/Fuel Consumption
    - Emission factor
    - Smoldering fraction
  - Moisture class (day and location specific) assigned to each event from Wildland Fire Assessment System (WFAS) data.

Strawman Review

Goal – Emission calculation method should be as comparable as possible between each RPO.

Challenge – Standardize fuel loading & fuel consumption estimates as much as possible *AND* maintain unique fuel and burning characteristics of each RPO.

- ***Strawman Review***
  - Summarize fuel loading and consumption differences in existing RPO inventories.
  - Assess/Quantify differences between existing RPO methods and Inter-RPO method.
    - Fuel consumption
    - Emission factors
    - Smoldering fraction

Other Event Characteristics

- Hourly emissions profile:
  - RPO specific.
  - Consider emissions profile algorithms generated by FEPS.
- Plume characteristics:
  - Hard-wired (ala WRAP and others).
  - Consideration of DAYSMOKE and BLUE SKY for plume characterization.
    - Info critical for these dynamic plume models will be placed in the event record and included in NIF3.0 output.

Value-added Analyses

- Provide dataset to satellite imagery / fire detection experts (as QC test of either *system*).
- Comparison to WRAP's Phase 2 Wildfire EI.
  - To assess the effect on emission estimates due to changes in the technical methods.
- Report on how previous modeling analyses have incorporated fire AND suggest ways for RPO's to integrate this set of fire data.

Value-added Analyses

- Compare Fuel Loading/Fuel Consumption:
  - *new* method – using Fire Emissions Production Simulator (FEPS) and temporally/spatially specific fuel moisture to estimate fuel consumption.
  - *old* method(s) – varied:
    - Explicit values (when available);
    - National Fire Danger Rating System (NFDRS) or modified;
    - Forest Service photo series + First Order Effects Model (FOFEM).

Value-added Analyses

- Compare Emission Factors/Speciation:
  - *new* method:
    - FEPS for CO, CH4, PM2.5;
    - FOFEM EF's for TSP, PM10, NOx, SO2;
    - Numerical relationships in the literature for VOC & NH3 (based on CO) and EC & OC (based on PM2.5).
  - *old* method(s) – varied:
    - AP-42 and other EPA documentation (EC/R 2003);
    - Computed from FOFEM.

Value-added Analyses

- Suggestions/Recommendations to RPO's.
  - Preferred technical methods for quantifying emissions from wildfires.
  - Suggestions for processing / integrating Inter-RPO WF EI into modeling system.
    - Integrating models (e.g., DAYSMOKE or BLUE SKY) to dynamically estimate plume characteristics.
    - Sensitivity runs (compare results against previously completed modeling runs).
    - As input to establish boundary conditions for the modeling domain.

Deliverables

- Output Formats
  - National Emission Inventory NIF3.0
    - Modified from MWRPO and WRAP NIF3.0 format previously submitted to NEI.
  - Air quality dispersion model-ready input files (typically formatted for SMOKE emissions processor).
- Project documentation.

Schedule/Status

- Workplan – *complete*.
- Data Collection – *complete*.
- Series of Strawman documents to evaluate and refine technical methods and preliminary results – *ongoing*.
- Implementation of technical methods - *ongoing*.
- Draft inventory and documentation – *June 1, 2005*.
- Fill data bins and documentation – *July 15, 2005*