

FEJF LESSONS LEARNED #5: FIRE ACTIVITY AND EMISSIONS – TRACKING FIRE ACTIVITY IS THE KEY

The Regional Haze Rule requires a statewide emissions tracking system (spatial and temporal) of emissions from fire (51.309.d.6.ii). In addition, the WRAP’s *Enhanced Smoke Management Program Policy*¹ identifies several program elements for addressing visibility impacts due to fire. For all states and Tribes in the WRAP to effectively meet the requirements of the Rule and goals of the ESMP policy, it’s crucial to have a reliable, near real-time method to track fire activity and emissions.

The Fire Emissions Tracking System (FETS) is a step in the evolution of WRAP’s efforts to develop effective decision support tools. The FETS provides for routine fire data acquisition (planned and unplanned fire events), stable data storage, and real-time regional coordination among smoke management programs (SMP). The FETS will aid Regional Haze SIP planners with emission inventory and modeling input development, establishing annual emission goals (AEG), and tracking the application of emission reduction techniques (ERT).

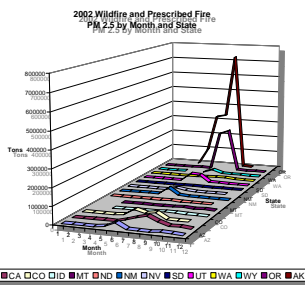
Audience	Key Takeaway Points
SMP Personnel	Track near real-time activity of all fire types
	Mapping and other resources to facilitate Regional Coordination
	Decision support for Burn/No-Burn decisions
Burning Community	What burn information is tracked
	How your ability to burn is affected
	Importance of activity reports

FEJF STARTING POINT

Prior to the promulgation of the Regional Haze Rule (RHR), the Grand Canyon Visibility Transport Commission was charged with assessing visibility conditions in Class I areas and identifying strategies to remedy impairment. Specifically pertaining to fire. The GCVTC identified the need for updated emission inventories for fire and a consistent, region-wide tracking system for fire. This recommendation became part of the RHR². The WRAP’s policy³ for Fire Tracking Systems (FTS) emphasizes the need for a collaborative system and identifies the essential components of an effective FTS.

ACCOMPLISHMENTS OF THE FEJF

The FEJF has developed comprehensive, QC’d emissions inventories (EI) made available for use by the WRAP, states, and Tribes. The technical procedures used to build the EI’s form the bases for a region-wide FTS.



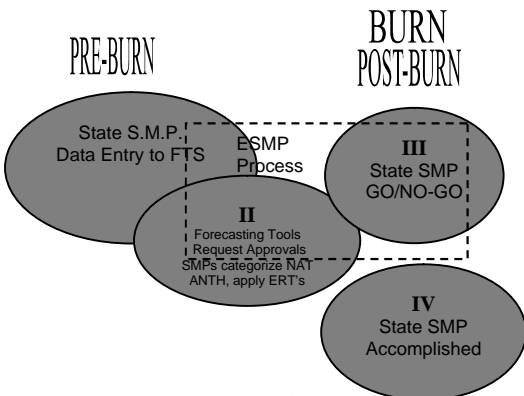
The FEJF’s review of existing tracking systems revealed several functioning systems with unique capabilities. Yet no system could fully meet the technical requirements needed by the WRAP for an FTS. The WRAP moved forward by developing a stable and relatively simple Fire Emissions Tracking System (FETS) that will be fully integrated in the

WRAP’s Technical Support System (TSS). Operable in September 2007, the FETS features automated data acquisition and near-real-time data access. The FETS’s technical procedures reflect the fire and emissions science gathered over 10 years of FEJF EI development.

REGIONAL HAZE RULE REQUIREMENTS

§51.308(d)(4)(v): *A statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I area...for a baseline year,...the most recent year for which data are available, and and estimates of future projected emissions.*

§51.309(d)(6)(ii): *[A] statewide inventory and emissions tracking system (spatial and temporal) of VOC, NO_x, elemental and organic carbon, and fine particle emissions from fire*



WHERE DID THE FETS COME FROM? IMPLEMENTING POLICIES AND TECHNICAL TOOLS

FIRE CATEGORIZATION POLICY

Wildfire = “NATural”
 Ag burning = ANTHropogenic
 Prescribed fire (Rx) and Wildland Fire (WFU) get either NAT or ANTH depending on specific criteria (primarily based upon intention of burn to *restore* (ANTH) or *maintain* (NAT) ecosystem health).
 NAT and ANTH are assigned to each fire in the FETS (typically by consultation between SMP and burner).

EMISSION REDUCTION TECHNIQUES (ERT) TECHNICAL TOOL

FEJF guidance is that Smoke Management Program’s should consider requiring ERTs for every planned fire event (NAT or ANTH). FEJF conducted literature searches to develop a list of available ERTs and estimates of the effectiveness of ERTs to reduce emissions. To assist SMPs with selecting ERTs for a planned event and to quantify emissions averted, ERT suites were built for the

ANNUAL EMISSION GOAL (AEG) POLICY

The WRAP defines the annual emission goal² as a quantifiable value that is used to measure progress each year toward achieving the minimum emissions increase from fire. The primary means of accomplishing an AEG for a state or Tribe will be through requiring ERTs for planned fire events.

?? What happens in the FETS ??

← Emissions data for NAT events may be used to attribute monitored concentrations of emissions to “natural background.” ANTH events may be more subject to requirements to consider alternatives to burning or to apply ERTs.

↓ ERT suites are stored in the FETS. A percent reduction may be applied automatically (based on location, vegetation type, and date of the event). Users will be able to apply a custom percent reduction to a burn. Emissions from the event and an estimate of emissions averted are both stored in the FETS.

→ By querying the FETS data, states and Tribes will be able to document the number of planned events for which ERTs were applied and estimates of the emissions averted.

EVOLUTION OF FIRE EMISSION INVENTORIES IN THE WRAP

Development of annual, quality-controlled emission inventories of fire was critical for implementing a successful tracking system. The process of developing several EIs with increasing resolution and application of fire science has helped the WRAP to identify the key data elements needed to effectively track fire and generate estimates of emissions. The WRAP has also investigated the uncertainty and potential sources of errors in the emission inventories. Where feasible, the FETS incorporates quality assurance/quality control (QA/QC routines) designed to increase confidence in data quality. **Highlighted features are in the FETS.**

1996 Annual EI (WF & Rx)

- 1st annual fire inventory for WRAP region.
- **Estimated daily emissions based on reported fire growth.**
- **GIS techniques to assign fuel loading and perform spatial QC.**
- fuel loading-based smoldering estimates.
- Hourly plume rise estimates
- SMOKE-ready files.

2002 Annual EI (Phase II)

- Technical methods and QC procedures similar to 1996 inventory.
- Refined methods of calculating fire growth, plume rise.
- **ERTs quantified.**
- Agricultural burning and Non-Federal Rangeland burning added to EI.
- **QC Review** packets sent to FLMs, states and Tribes.
- **SMOKE and NIF files.**

Baseline & 2018 Projections (Phase III/IV)

- Stakeholder input used to define representative year of baseline (2000-2004) and projected (2018) fire activity and emissions.
- Less, Likely, & More fire scenarios prepared for each fire type to capture possible fire activity levels in 2018.
- SMOKE-ready files.

2002 All-RPO Wildfire

- Worked with other RPO’s for nation-wide consistent emissions estimation method.
- **Developed refined fuel consumption routines using fuel moisture data** and USFS’s Fire Emissions Production Simulator (FEPS).
- NIF files.

FETS KEY FEATURES

Mapping Functions

- Real-time activity
- Coordination across regions
- Acreage and emissions estimates

Data Acquisition

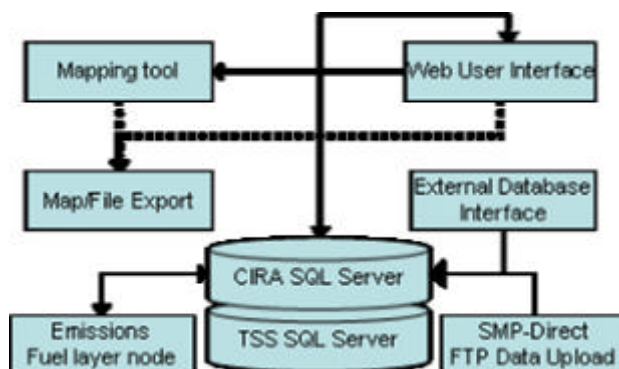
- Daily ICS-209 reports (wildfire)
- Manual entry by SMP's at wrapfets.org
- Automated state and Tribe batch entry via FTP

Quality Control Tools

- Pre-process data for format, range, and spatial reference
- Identification tracking to vet duplicates
- Data missing a spatial reference are rejected

Fuel Loading Assignments

- Manually entered with burn info at wrapfets.org
- GIS tools to assign fuel loading based on 1-km Fuels Characterization Classification System (FCCS) vegetation layer:
 - Point location based on burn latitude/longitude
 - 5-km buffer around location if fuel loading is null



Emissions Calculations

- Defer to user-provided emissions
- WRAP-modified (à la 2002 EI – Phase II) emissions estimates for regional coordination
- CONSUME 3.0 for post-burn, QC'd data. Utilizes fuel moisture content and other fire specific information to derive more refined fuel consumption and emission estimates.

Query and Reporting Services

- Generate annual emissions summaries
- Customize reports by state, agency, dates, or pollutant
- Download model-ready (SMOKE) or database formats

FULFILLING NEEDS BY TRACKING FIRE

The functions the FETS to allow state and tribal smoke management programs to meet the requirements of the Regional Haze Rule and objectives of WRAP Policies and guidance pertaining to fire.

Regional Coordination

- ✓ Mapping functions
- ✓ Contact list
- ✓ Smoke Management Program Resources

Emission Inventories

- ✓ Build historical EI for each year
- ✓ Permanent data storage for future needs
- ✓ Storage of projection EI

Data Reporting

- ✓ Export to NIF and SMOKE-ready files.
- ✓ Spreadsheet-ready for custom quality control and manipulation

Integration with the TSS

- ✓ Unite fire data with emissions summaries
- ✓ Relate to IMPROVE monitoring data
- ✓ Access to analytical planning tools

Annual Emission Goals

- ✓ Estimate emissions averted
- ✓ Track application of ERTs

Regional Haze SIPS/TIPS

- ✓ Demonstrate implementation of ESMP elements.
- ✓ Reasonable progress toward meeting AEG.
- ✓ Include fire in emissions inventories and modeling analysis.

IMPORTANT ADDITIONAL INFORMATION

USER PERMISSIONS IN THE FETS

The FETS will support a ‘Three-Tiered’ system, including Data Providers, TSS registered users, and the public.

- TSS and FETS users exist in a single registration database.
- Data Providers will need manual approval to access some FETS features.
- The public will have access to the Mapping Tool, Methods and Resources pages.

ENHANCED EMISSIONS CALCULATIONS

- Daily ten- and thousand-hour fuel moisture maps are interpolated from the Weather Information Management System.
- Estimates and defaults as input to CONSUME have been established to accommodate variation in burn reporting details.

NEXT STEPS AND FUTURE WORK

Integrate FETS and TSS databases (late 2007 – early 2008).

Improve estimates of daily wildfire acres burned

- SMARTFire
- Daily fire growth algorithm (post-burn, for emission inventories)

Fuel Classification

- Possibility of using LANDFIRE if a fuel map becomes available.
- Incorporate fire perimeter data into GIS fuel classification scheme.

Projections

- Can use FETS as “filing cabinet” and reporting tool for 2018 Projections.

QUALITY CONTROL AND ASSURANCE

- Built-in FETS routines and Data Providers’ review are used.
- Time entry of accomplishment reports is required for data to be included in QC’s emission inventory.
- Appropriate range/date/location checks on incoming data.
- An annual “close-out” date will be implemented to lock emission inventories each year.

FETS DEVELOPMENT TIMELINE

June 19-20, 2007: TSS workshop presenting beta version of FETS.

Summer 2007: Coordinate planned burn data acquisition, incorporate user feedback

September 1, 2007: FETS ready to accept planned and unplanned fire data.

September 26-27, 2007: In-depth training on FETS features and functions.

REFERENCES

¹ *Enhanced Smoke Management Program Policy*

http://wrapair.org/forums/fejf/documents/esmptt/policy/030115_E_SMP_Policy.pdf

² *Regional Haze Rule*

http://www.epa.gov/ttn/oarpg/t1/fr_notices/rhfedreg.pdf

³ *WRAP Policy: Fire Tracking System*

<http://wrapair.org/forums/fejf/documents/fts/WRAPFTSPolicy.pdf>

⁴ *FEJF Natural vs. Anthropogenic Guidance policy*

<http://www.wrapair.org/forums/fejf/documents/nbtt/WRAPFEJFNAGuidance.pdf>

<http://wrapair.org/forums/fejf/documents/nbtt/FirePolicy.pdf>

⁵ *WRAP Policy: Annual Emission Goals for Fire*

<http://wrapair.org/forums/fejf/documents/aeg/WRAPAEGPoly1.pdf>

⁶ *FTS White Paper*

http://www.wrapair.org/forums/fejf/documents/fts/20060731_FTS_White_Paper.pdf

⁷ *FETS Draft Work Plan*

http://www.wrapair.org/forums/fejf/documents/fts/Workplan_DR_AFT_%20FETS_20070323.pdf

CONTACT INFORMATION

- Dave Randall, Air Sciences Inc. drandall@arisci.com
303.988.2960 x221
- Tom Moore, WRAP mooret@cira.colostate.edu
- FETS website – <http://www.wrapfets.org>