

# Wildland Fire Emission Factors: Research and Implementation

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# Wildland Fire Emission Factor Research and Implementation

- Field Measurements (since 2005)

- NASA (ARCTAS, SEAC4RS)
- Missoula Fire Lab (FLAME I, II, III)
- JFSP (RxCADRE, others)
- SERDP (several)
- DOE (BBOP)

- Data publication



# Wildland Fire Emission Factor Research and Implementation

- Newer studies show some significant differences with older, commonly used emissions factors

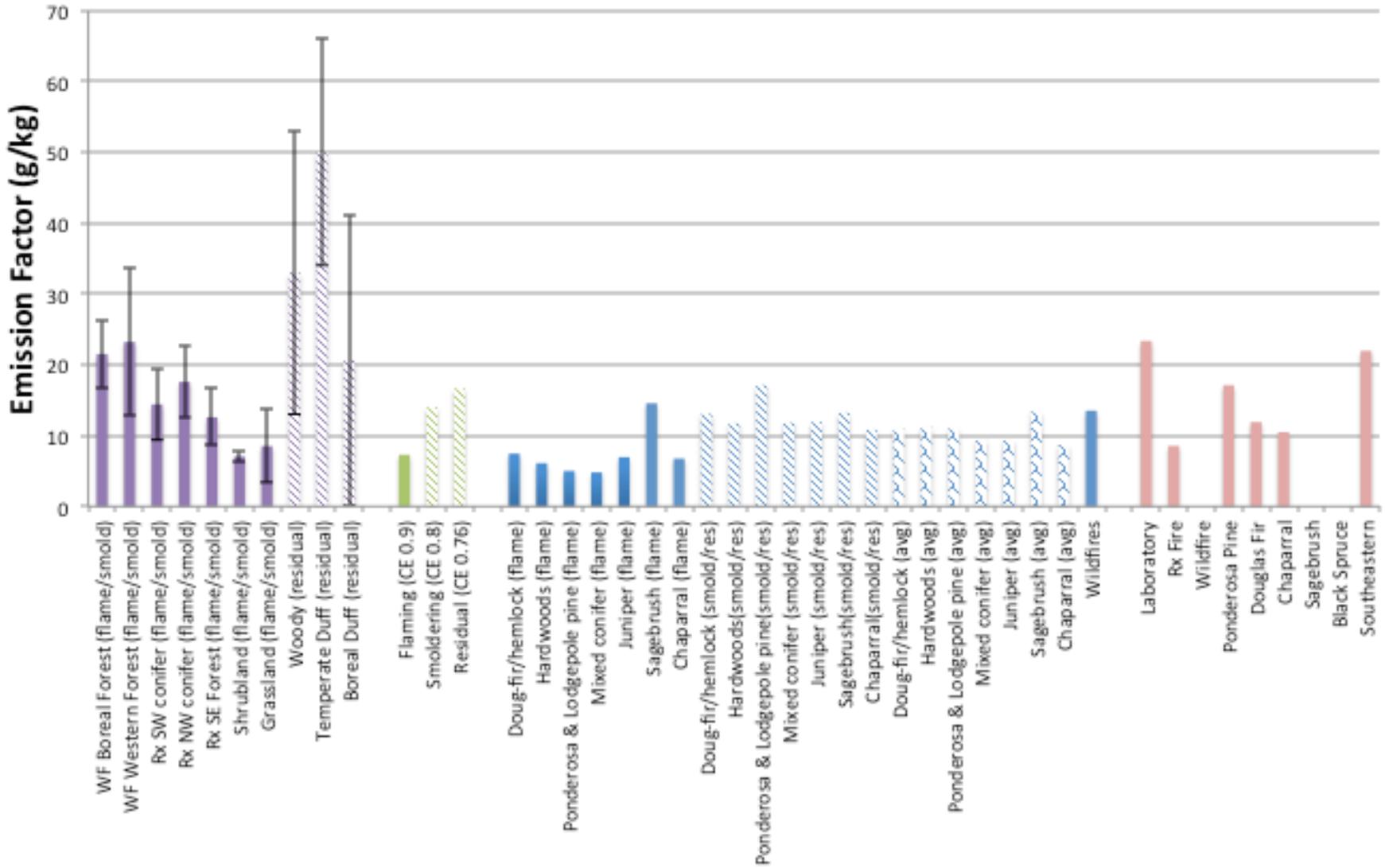
# Wildland Fire Emission Factor Research and Implementation

- Synthesis Project: SERDP Wildland Fire Emission Factor Database (WFEFD)
  - Synthesis of over 230 wildland fire emission papers (through 2012)
  - Excel spreadsheet:  
<http://www.fs.usda.gov/rds/archive/Product/RDS-2014-0012>
- Synthesis Papers
  - Andreae & Merlet (2001)
  - Battye & Battye (2002)
  - Akagi et al. (2011)
  - Yokelson et al. (2013)
  - Urbanski (2009, 2014)

NEWER

PM2.5

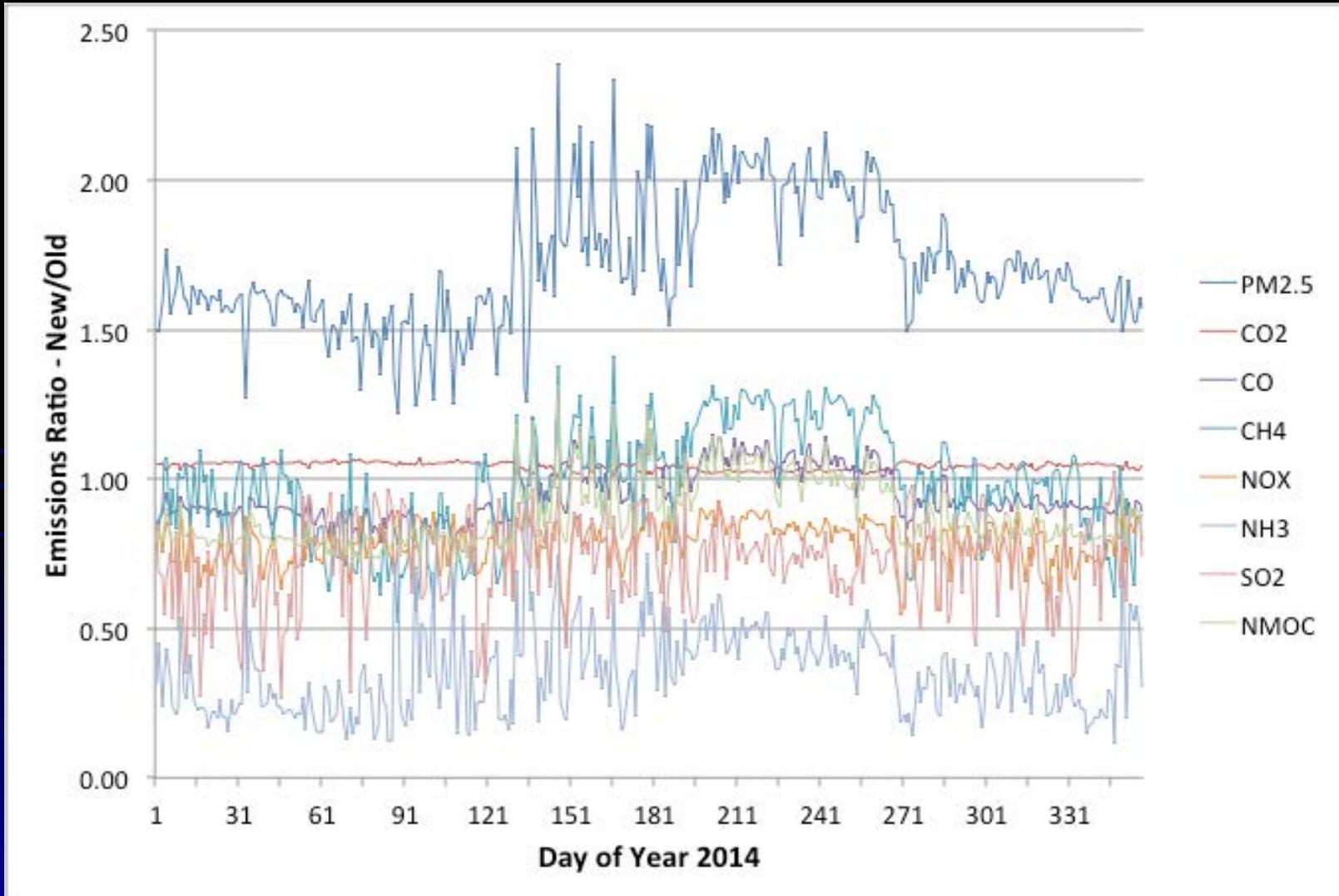
OLDER



Urbanski 2014 = purple, FEPS = green, CONSUME = blue, Strand et al. = peach

# BlueSky 2014

## Daily Emission Ratios: new/old



# Wildland Fire Emission Factor Research and Implementation

- Field Measurements
- Data analysis and publication
- Synthesis Papers/Projects
- Scientific review and recommendation
  - Working group under the NWCG Smoke Committee
- Adoption of accepted values/data

# Wildland Fire Emission Factor Research and Implementation

## *Where we are today*

- Scientific review and recommendation
  - NWCG Smoke Committee Working Group
  - Audiences/needs
    - Emission Inventories
    - Land Managers (e.g. Emission Reduction Techniques)
    - Models (e.g. Fuels/Consumption Models, Air Quality Models, Smoke Forecasting Models)
    - Policy (e.g. Implications of a source that contributes 36% to total PM<sub>2.5</sub> in the NEI, goes to 50%)
- Future: Adoption of accepted values/data



More information:

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# 2014 NEI for Wildland Fires Processing



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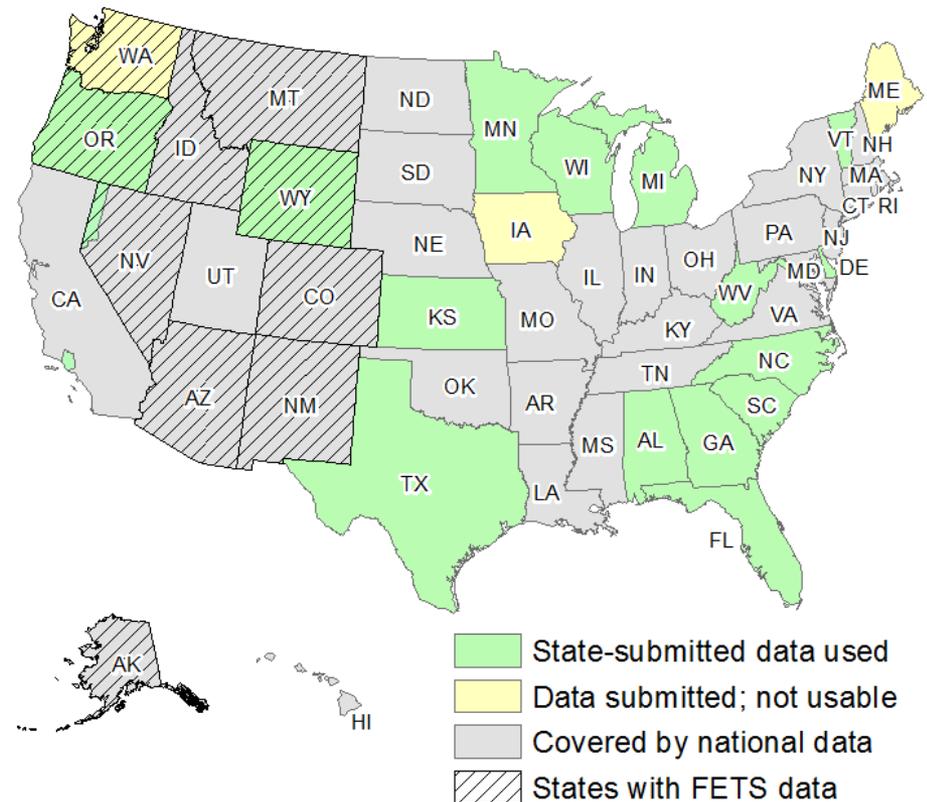
Presented to EPA's 2015  
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San Diego, California  
April 15, 2015

# Goals: 2014

1. Continue effort to gather as much state / local data as possible
2. Fix several known issues in methodology
3. Create transparent report and easier state review

# 2011 Effort

- Concerted effort to gather state / local data
- State-provided data covered 23 states
- Thank You!
- Final emissions reconciled state & national datasets

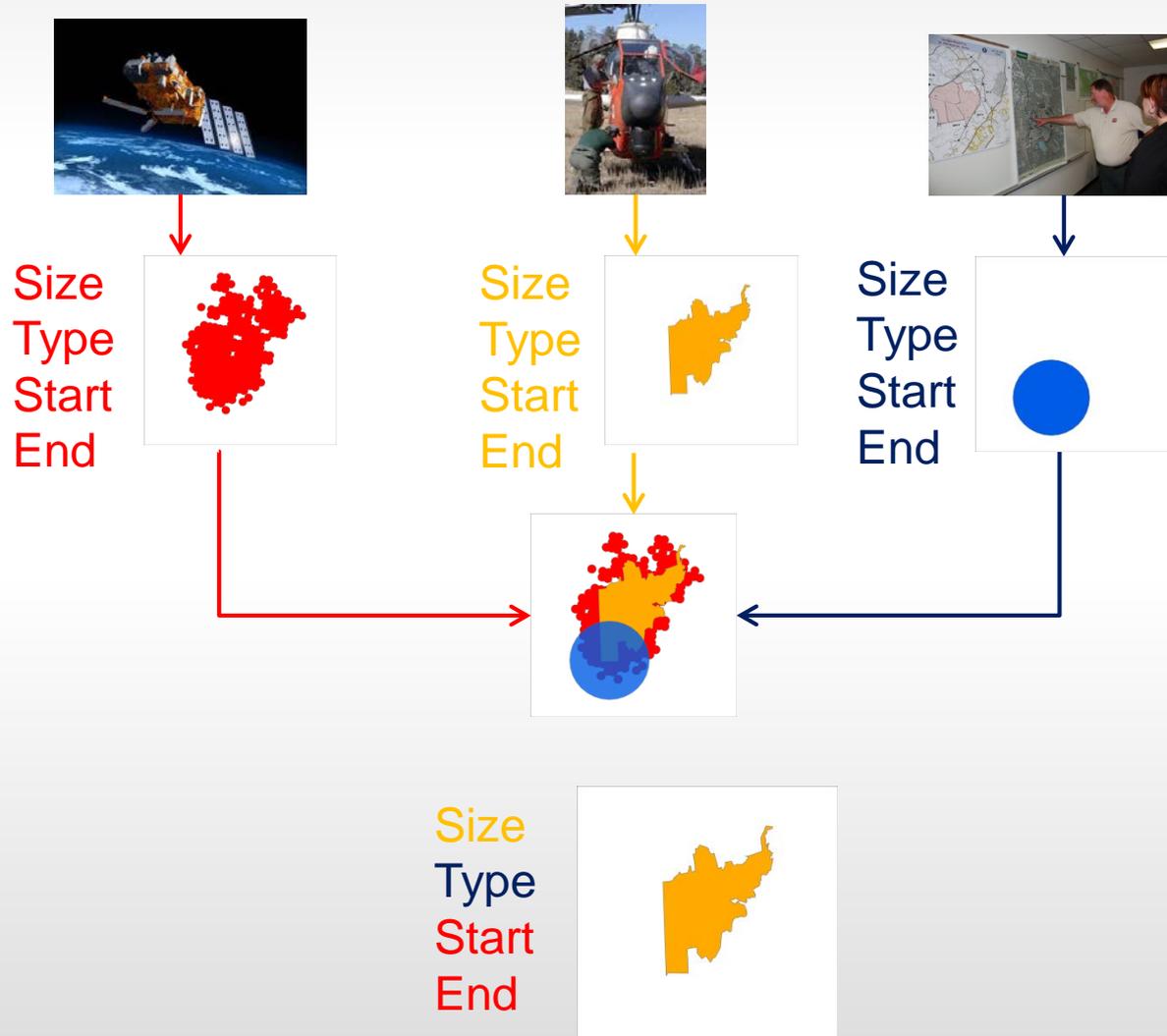


# National Data

- Incident Command Reports – many WFs
- GeoMac Perimeters – large WFs
- US Fish & Wildlife – Rx burns on FWS land
- US Forest Service – Rx burns and some WFs on USFS land
- National Association of State Foresters – database of WFs and some Rx burns on state jurisdiction
- NOAA Hazard Mapping System – Detection from seven satellites plus human analysts

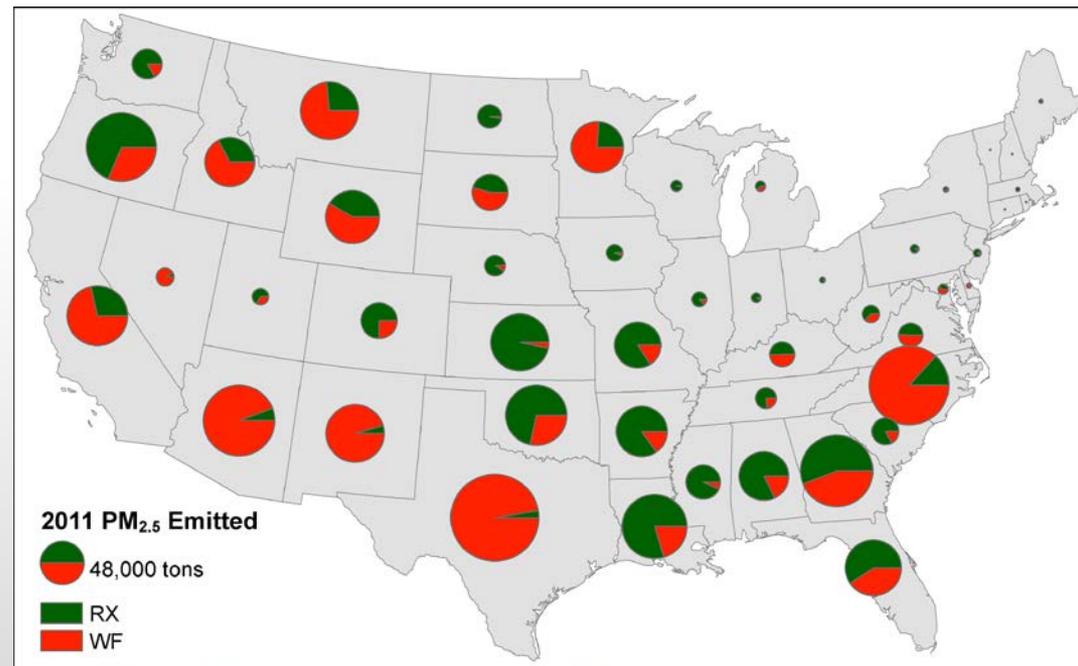
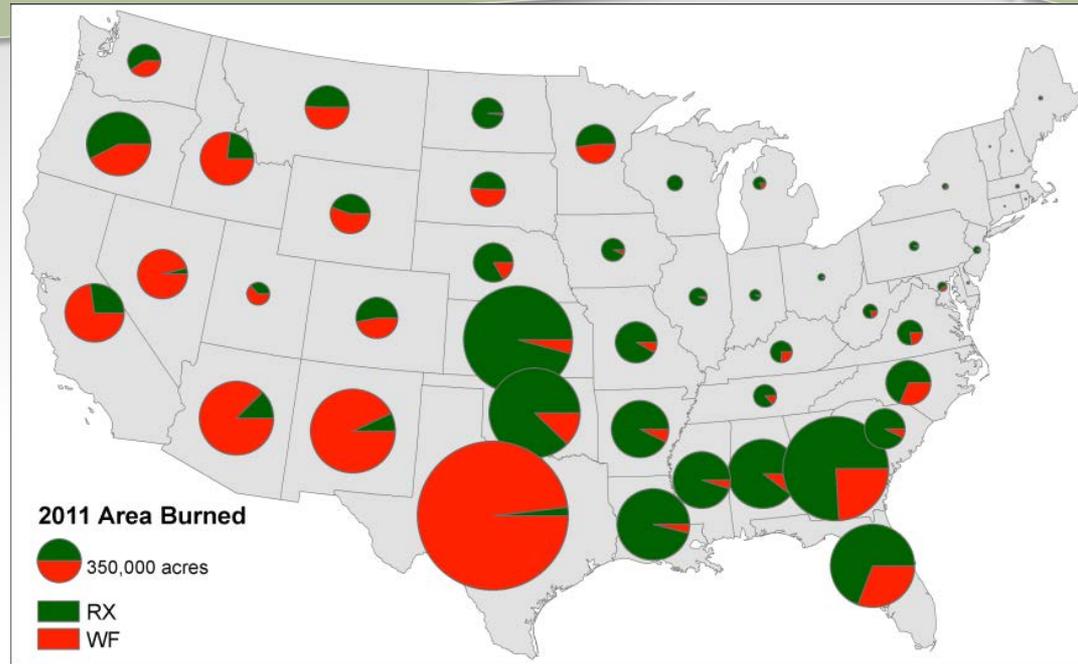
# Reconciliation – Overview

- Spatio-temporal overlaps associate data across datasets
- We ranked each data source for reliability of each element
- A final composite fire was created using the highest ranking data



# 2011 Results

- Large WF area in southwest, especially Texas
- Rx burns dominate area burned in southeast and central plains
- High PM<sub>2.5</sub> from peat fires (NC, MN)



# Issues to Improve for 2014

- State-provided complete data sets
- Agricultural burn classification
- Emission factors
- Pile burning
- More transparent output and better review process

# Do you have complete data?

- With information on fire types and land ownerships covered, we can use state-provided fire activity data exclusively, without the need to reconcile with satellites.
- Providing this metadata will allow us to improve the inventory.

2014 NEI Wildland Fire Inventory Database Questionnaire					
For each row, please indicate whether that fire type, land type, or land ownership is included in the database ALWAYS, SOMETIMES, or NEVER. For SOMETIMES, please explain in the comments.					
Please indicate the expected coverage - the % of all fires that should be in the database that actually are.					
<b>FIRE TYPES AND SIZES OF FIRES INCLUDED</b>		<b>Should be included:</b>	<b>Expected coverage:</b>	<b>Min size (acres or piles) for inclusion if any:</b>	<b>Comments if any:</b>
Type:					
F1	WILDFIRES				
F2	PRESCRIBED BURNS (BROADCAST BURNS)				
F3	PRESCRIBED BURNS (PILE BURNS)				
F4	RANGELAND BURNING				
F5	AGRICULTURAL BURNING				
<b>PRIMARY AGENCIES OR ACTORS INCLUDED:</b>		<b>Should be included:</b>	<b>Expected coverage:</b>	<b>Comments if any:</b>	
Type:					
A1	State Forestry Agencies				
A2	State Department of Transportation				
A3	State Wildland Firefighting				
A4	State Agencies (all other)				
A5	County / Local Governments				
A6	Tribal Governments				
A7	Military				
A8	Federal (non-Military)				
A9	Private Landowners (Forestry Companies)				
A10	Private Landowners (All Others)				
A11	Other. Specify in comments as needed.				
<b>LAND OWNERSHIPS INCLUDED</b>		<b>Should be included:</b>	<b>Expected coverage:</b>	<b>Comments if any:</b>	
Ownership:					
L1	State Lands				
L2	County / Local Lands				
L3	Tribal Lands				
L4	Military Bases				
L5	Federal Lands (non-military)				
L6	Private Lands (Forestry Companies)				
L7	Private Lands (All Others)				

# Pile Burns

- At present, pile burns are treated as other prescribed burns
- To model pile burns properly, we need more data
  - At a minimum, number of piles and their approximate size



Source: USFS

# Transparency & Easy Review

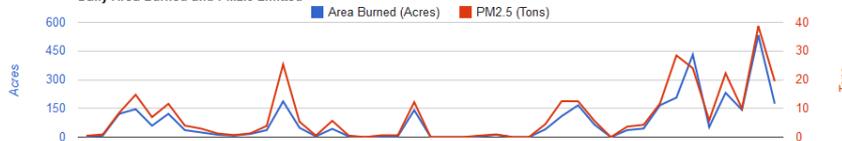
Draft NEI Data												State Data				
Event ID	Start Date	End Date	Event Name	Acres	Type	Latitude	Longitude	State	County	Sources	TotalAcres	Latitude	Longitude	DiscoveryDate	FireID	FireName
SF11E1514	5/30/2011	6/2/2011	Gone Fishing	397.4347	WF	32.848	-87.258	Alabama	Bibb	State_AL_WF;HMS	400	32.8478	-87.2578	5/30/2011	4105	GONE FISHING
SF11E1597	3/19/2011	3/24/2011	Goldville Cut Off, Al	126.9551	WF	33.068	-85.775	Alabama	Tallapoosa	State_AL_WF;NASF	126	33.068	-85.775	3/19/2011	2143	GOLDVILLE CUT
SF11E1514	5/30/2011	6/2/2011	Tiny Swamp	25	WF	32.848	-87.258	Alabama	Bibb	State_AL_WF;HMS	25	32.8478	-87.2578	5/30/2011	1266	TINY SWAMP
SF11E1597	3/19/2011	3/24/2011	Sudden	22.2	WF	33.068	-85.775	Alabama	Tallapoosa	State_AL_WF;NASF	22	33.068	-85.775	3/19/2011	3212	SUDDEN
SF11E1514	5/30/2011	6/2/2011	Smokehouse	18.4432	WF	32.848	-87.258	Alabama	Bibb	NASF						
SF11E1597	3/19/2011	3/24/2011	Bass	6.321	WF	33.068	-85.775	Alabama	Tallapoosa	NASF						
											1.5	34.0825	-87.3728	10/27/2009	4136	PINETUCKY

## Hardaway 2011 Fire

[View Fire](#)

Area Burned	2,275 acres
Start Date	Feb. 11, 2011
End Date	March 25, 2011
Location	Macon County, Alabama 10 miles N of Union Springs, AL
Type	Wildfire
Average Fuel Loading	27 tons/acre
Total PM <sub>2.5</sub>	313 tons
Total GHGs	63,514 tons

Daily Area Burned and PM2.5 Emitted



## Report an issue

### Hardaway 2011 Fire (2011 (USA) - Version\_1)

Please tell us about any specific issue with this fire.

#### Area Burned

Currently: 2,275 acres

Change to  acres

#### Start Date

Currently: Feb. 11, 2011

Change to

#### End Date

Currently: March 25, 2011

Change to

#### Type

Currently: Wildfire

Change to

#### Total PM<sub>2.5</sub>

Currently: 313 tons

Change to  tons

#### Notes

#### Your Name

#### Organization

#### Email