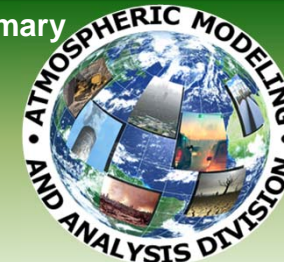




# Crop Residue Burning Emissions in the National Emission Inventory: A Review and Summary



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## Background

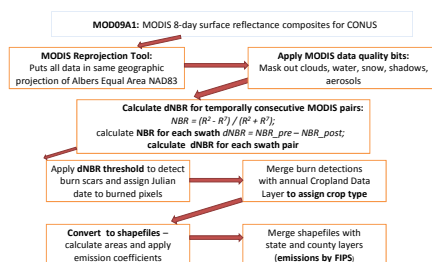
- Biomass burning: an important contributor to the degradation of air quality because of its impact on ozone, particulate matter and Hazardous Air Pollutants (HAPS).
- Using EPA methods, crop residue burning is poorly characterized in the 2011 National Emission Inventory (NEI) for some parts of the country (feedback from the states)
- A more robust method is needed for future NEIs.

### Previous NEI Methods

- 2002 NEI: 23 states reported emissions for this sector; no satellite information was used.
- 2005 NEI: This sector was not estimated, 2002 estimates used.
- 2008 NEI: SMARTFIRE/HMS fire detections used one fixed field size, emission factors all mapped to one SCC.
- 2011 NEI modeling platform: J. McCarty satellite-based procedure used; it was based on changes in the land surface over a 8 day period plus updates from the states, McCarty (2011).

Year	Source	PM2.5 (tons/yr)	Notes
2002	NEI	224,684	23 states reported only
2003	McCarty	24,134	8 day totals
2004	McCarty	23,473	8 day totals
2005	McCarty	23,583	8 day totals
2006	McCarty	20,718	8 day totals
2007	McCarty	23,583	8 day totals
2008	NEI	49,653	HMS data, SmartFire Based
2011	Platform	141,184	Based on McCarty & State data
2011	Crop only	38,209	HMS data, new method
2011	Grass/pasture	69,941	HMS data, new method

### Current 2011 NEIv1 EPA Method



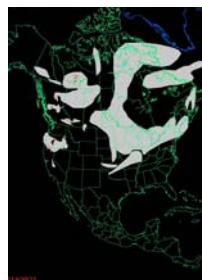
### Shortcomings with 2011 NEI v1 Method

- Uncertainty in mapping burned cropland
  - Irrigated lands can be assigned as burned
  - Plowed fields (dark soils) can lead to false detection
- Inconsistent state-level data
- Sensitivity to Collection of MODIS data
- 8 day satellite retrievals (need daily)

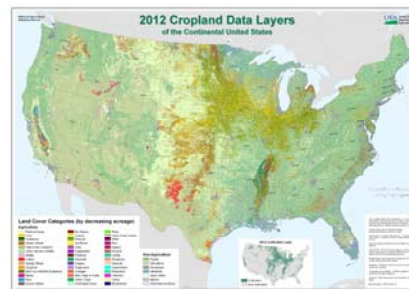
## New Method

- NOAA's Hazard Mapping System (HMS) daily operational satellite product with QA provides "hot spots".
- Year-specific** National Agricultural Statistics Service (NASS) cropland data layer product distinguishes burned agricultural lands from rangeland.
- Each burn location assumed to have state-average field size.
- Method used to generate **day-specific, county-resolved crop residue burning emissions for 2011 by crop type**.

Example of NOAA's daily HMS product

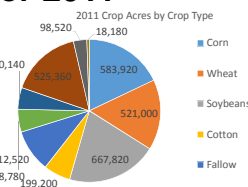


Example of year-specific cropland data layer product

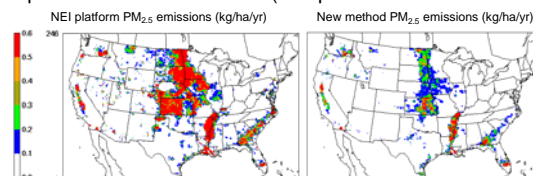


## Results for 2011

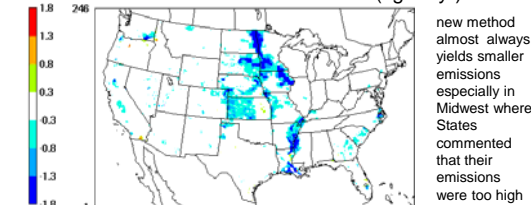
Crop residue burning acres by crop type for 2011 for the CONUS



Comparison of 2011 emissions (NEI platform vs new method)

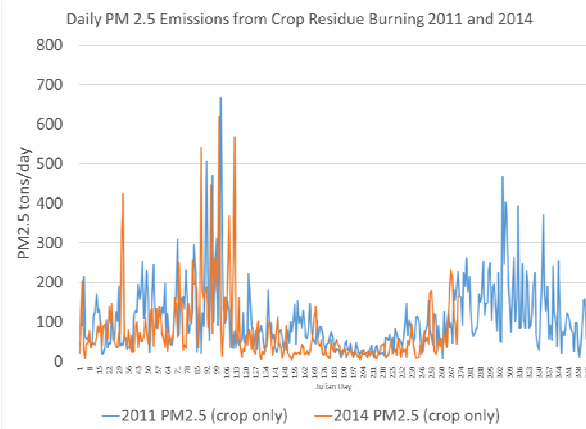


Decreased emissions with new method (kg/ha/yr)



(New method - 2011 platform)

## Method Applied to 2014 in Near Real Time



New Method being tested for 2014 with near real time CMAQ simulations in preparation for 2014 NEI; comparisons show year to year differences in this sector

## Summary and Future Directions

- Method provides an efficient way to estimate crop residue burning emissions.
- Method allows for easy updates and improvements.
- Estimates for 2014 will be available in January 2015.
- States will have access to review the information for their 2014 NEI submissions.

## References

McCarty, J.L., Loboda, T., Trigg, S., 2008. A hybrid approach to quantifying crop residue burning in the US based on burned area and active fire data. *Appl. Eng. Agric.* 24: 515-527.  
 McCarty, J.L., Korontzi, S., Justice, C.O., and Loboda, T., 2009. The spatial and temporal distribution of crop residue burning in the contiguous United States. *Science of the Total Environment.* 407 (21): 5701-5712.  
 McCarty, J.L., 2011. Remote sensing-based estimates of annual and seasonal emissions from crop residue burning in the contiguous United States. *J. Air Waste Manag. Assoc.* 61:22-34.

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