Oil and Gas Production Emission Estimates in the NEI

Oil & Gas Emissions Summit

November 4, 2014

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Today

- NEI – brief description
- Oil & Gas Estimation Tool
  - Beginnings
  - Features
  - Results for 2011 NEI
- Opportunities for improvements

National Emissions Inventory (NEI)

- The full NEI is on a 3-yr cycle (e.g. 2008, 2011, 2014)
  - Point sources (facility-process for ~100,000 facilities)
  - Nonpoint and mobile sources (county-process)
  - Fires (daily/point)
  - Biogenic soil and vegetation (county)
- States, locals, and tribes are required to submit CO, SO_X, NO_X, VOC, PM_{10}, $PM_{2.5}$, NH_3, and Lead.
  - Basis is sections 110 and 172 of the Clean Air Act
  - Use CAA-based emissions thresholds for "point." States can go lower.
- States can voluntarily submit Hazardous Air Pollutants (HAPs) and GHGs to the NEI
  - EPA augments the data to make HAPs more complete
  - GHGs are not published in the public release of the NEI
  - Toxics Release Inventory helps

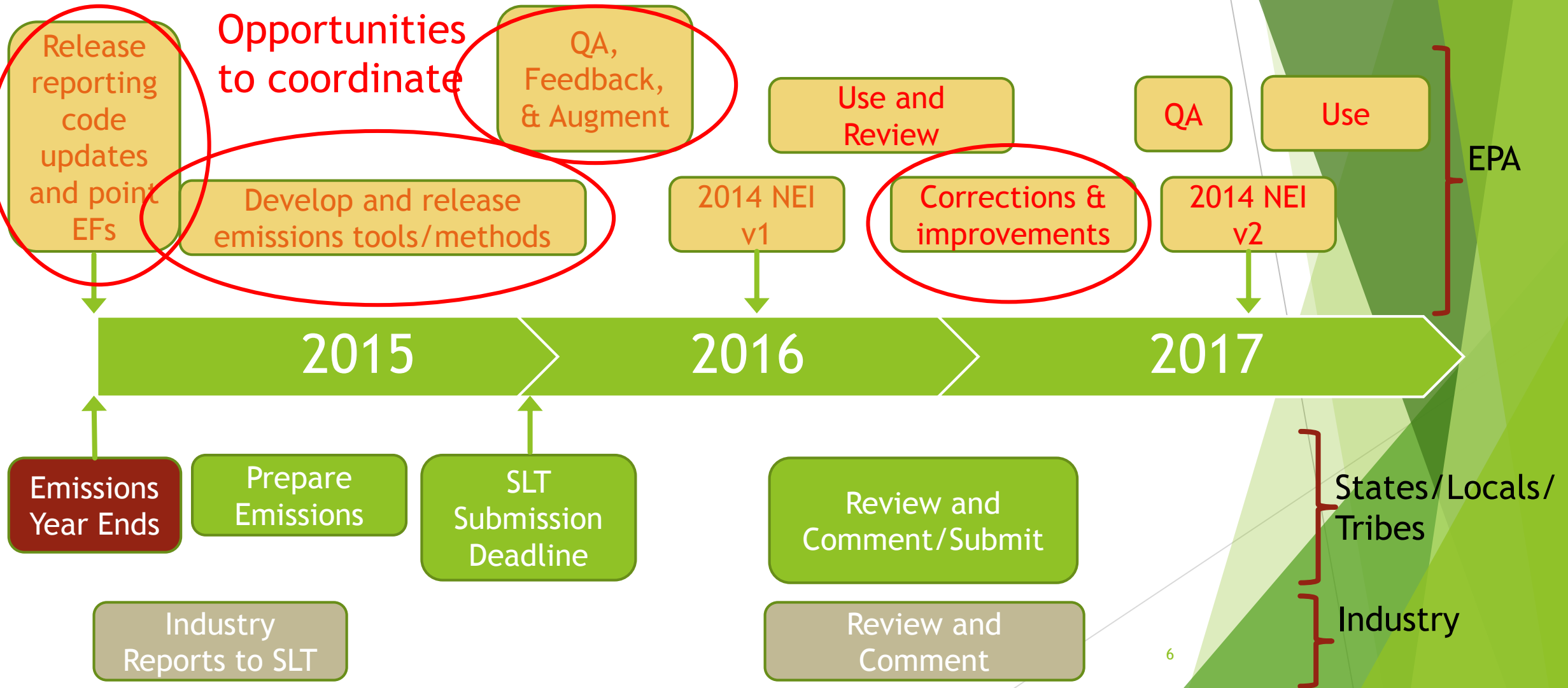
NEI Categories

- All emissions to the atmosphere included, whether regulated or unregulated, all counties
  - Electric power plants and industrial sources
  - Universities, hospitals, landfills, other commercial sources
  - Residential heating, gasoline fueling stations, dry cleaners, household solvent use
  - Farm animal waste, fertilizer, and agricultural burning
  - On-road vehicles – exhaust, evaporative, brake and tire wear, paved and unpaved road dust
  - Non-road engines – e.g., farm equipment, mining equipment
  - Aircraft, Ships, Railroads
  - Wildfires and prescribed burning (forest management)
  - Biogenics – soil and vegetation
- Some not included, notably:
  - Volcanoes and other natural geothermal (SO2, PM)
  - Lightning NOx

Four Key NEI Goals

- Complete
- Represents the year of the inventory
- Uses best available information
- Transparent - includes the emissions origin (who provided, factor, activity, method)

NEI Timeline – example 2014 NEI



Oil and Gas Tool: History and Status

ERTAC's National Oil & Gas Committee

- ERTAC (Eastern Regional Technical Advisory Committee) recognized need for development of national EPA emissions of criteria and HAP estimates
  - First established for 2008 NEI
  - Purpose: Develop NEI methodologies for estimates
- Established National Oil and Gas Committee, late 2011
  - Members, OAQPS/EIAG (Roy Huntley & Jennifer Snyder) RPOs and MJOs (Westar/WRAP (Tom Moore), MARAMA (Julie McDill), CenSARA (Theresa Pella), Mark Janssen (LADCO)), and many state/county emission inventory experts
  - Prepared white paper regarding need for national estimates
  - EPA funding/resources became available to develop tool in early 2012

Tool Development

Based on estimation methodologies developed by CenSARA

- CenSARA states are TX, OK, KS, NE, LA, AR, IA, MO
- We wanted to leverage the progress CenSARA had already made on estimation methodologies
- Technical approaches were sound and based on new data
  - Includes data and methodologies from operator surveys, permit reviews, literature reviews, the Climate Registry, and previous studies, such as one for the Haynesville Shale in NE Texas and the WRAP phase III study for the Rocky Mountain Region – Basin Factors
- Expanded coverage to all states (not just CenSARA states)

Overview of Tool

- MS Access-based
  - Creates county- and process-level detail for criteria and HAPs
  - Needs to handle large amounts of data, inputs and outputs
  - Ability to create front-end, user-friendly steps
  - Portability/availability
  - Transparent
  - Combination of tables, queries, macros
  - Logical grouping of tables and queries, use of message/instruction boxes
  - Users can vary parameters by county or basin, as necessary
- Emission process selection
  - Can run the tool on one or more of the processes
    - Processes coded with 34 Source Classification Codes (SCC)

Oil & Gas Processes Covered by Tool

- Artificial lift engines
- Associated gas venting
- Condensate tanks
- Crude oil tanks
- Dehydrators
- Drilling rigs
- Flaring
- Fugitive leaks
- Gas-actuated pumps
- Heaters
- Hydraulic fracturing pumps
- Lateral compressors
- Liquids loading
- Liquids unloading
- Mud degassing
- Pneumatic devices
- Produced water tanks
- Well completions
- Wellhead compressors

Tool Data Sources

- Basin-specific Inputs (or county level)
  - Equipment profiles - e.g., number of dehydrators or lateral compressors per well
  - Control profiles - e.g., fraction of well completion flared and control efficiency
  - Whole gas composition profiles (percent VOC, benzene, toluene, etc.)
  - Engine size, load, hours of operation
  - Used state-provided factors where available, then EPA emission factors as defaults where available, then "CenSARA averages" when no better info available
- Activity Data: from state oil and gas commissions, state inventory offices, Drillinginfo/HPDI, trade associations, all at county level
  - Well counts by type (oil, gas, CBM (coal bed methane))
  - Oil and natural gas production
  - Produced water from oil, gas, and CBM wells
  - Well completion counts by type
  - Fraction of gas wells that need compression
  - Fraction of oil wells that need lift
  - Spud information (aka drilling starts) - directional (horizontal, vertical) and feet drilled

Tool Data Sources (continued)

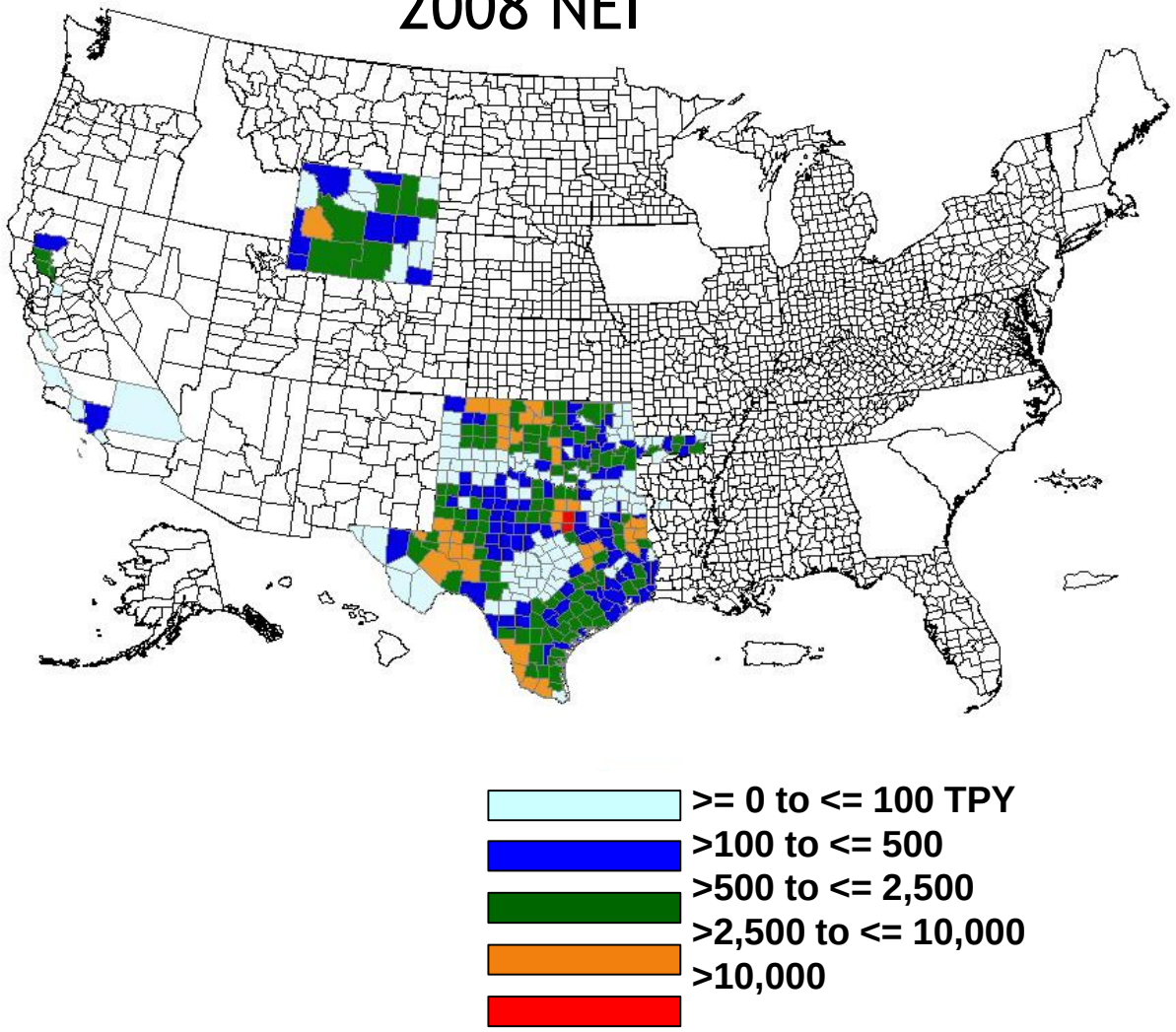
- Emission factor data (i.e., drilling & compressor engines, well completions)
  - EPA (EPA's GHG Reporting Program, AP-42, FIRE, SPECIATE, Equipment Leaks Protocol)
  - API (American Petroleum Institute)
  - ANGA (America's Natural Gas Alliance)
  - NONROAD model
  - Other sources (e.g., CenRAP (Central Region Air Planning Association), TCEQ (Texas Commission on Environmental Quality), Climate Registry)

Tool Outputs & Documentation

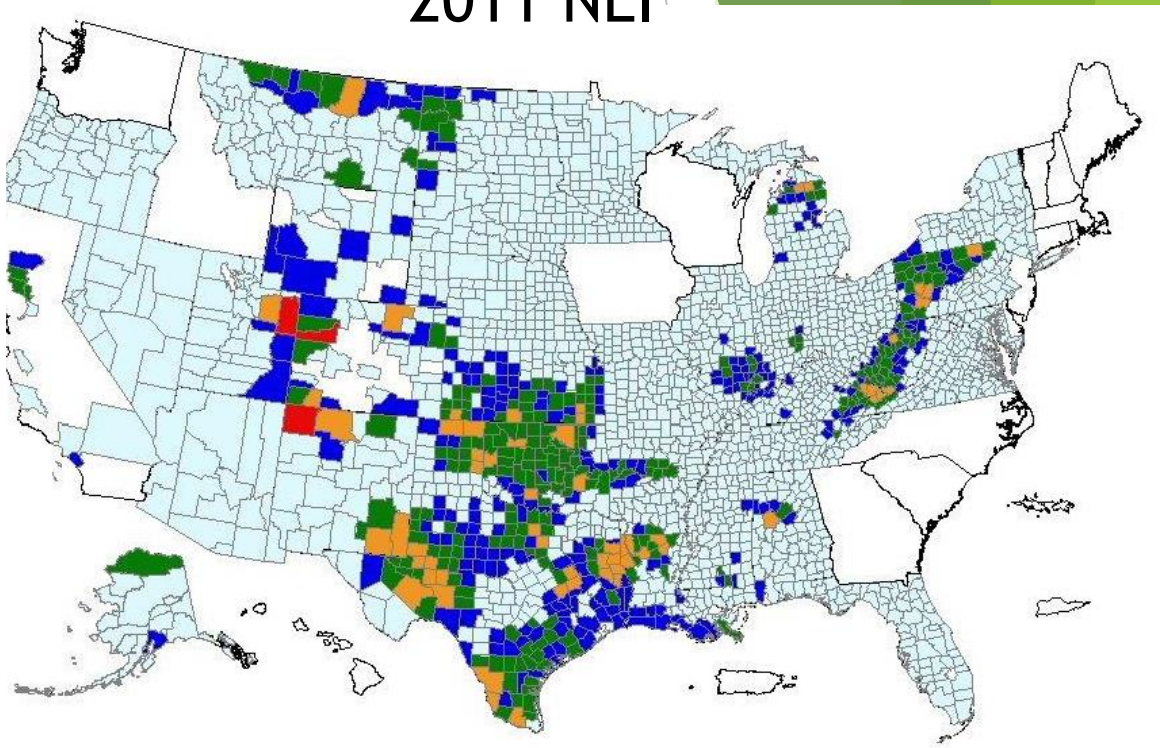
- Data exported in EIS (Emission Inventory System) format
  - County-process-pollutant
  - Converting emission data to EIS format traditionally has been a hurdle for state inventory submitters
- Point source subtraction
  - User can subtract out point source contributions to prevent double counting
- Summary queries
- Basin factor and inputs activity glossaries
- Master references table in tool identifies sources of all input data
- Documentation of methodologies
- Directions on how to use tool

Oil and Gas NOx: 2008 versus 2011

2008 NEI



2011 NEI



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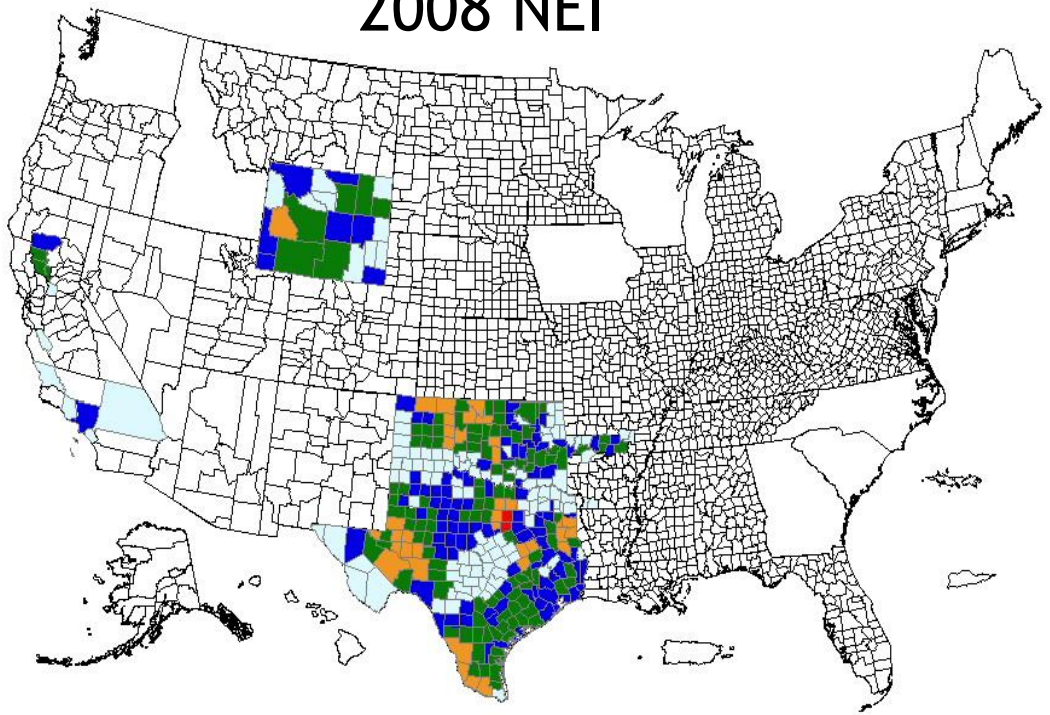
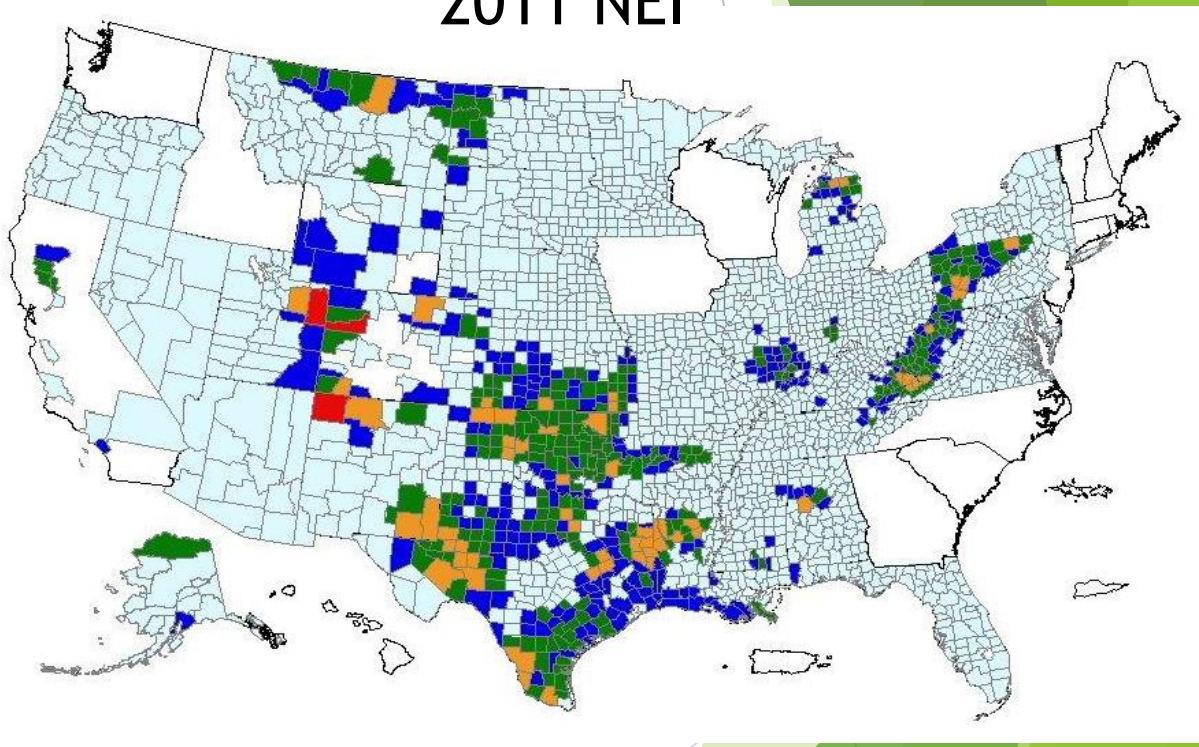


2011 NEI



>= 0 to <= 100 TPY
>100 to <= 500
>500 to <= 2,500
>2,500 to <= 10,000
>10,000

2011 NEI Oil and Gas Data Source