Quality Assurance of Emission Inventories Using Visual and Geographical Techniques

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Purpose:

- Demonstrate visual techniques for QA of emission inventories, including:
  - Initial assessment of data
  - Evaluating inconsistencies
  - Comparing with related data sets
  - Comparing with data for previous years
  - Eliminating outliers
  - Evaluating locational information

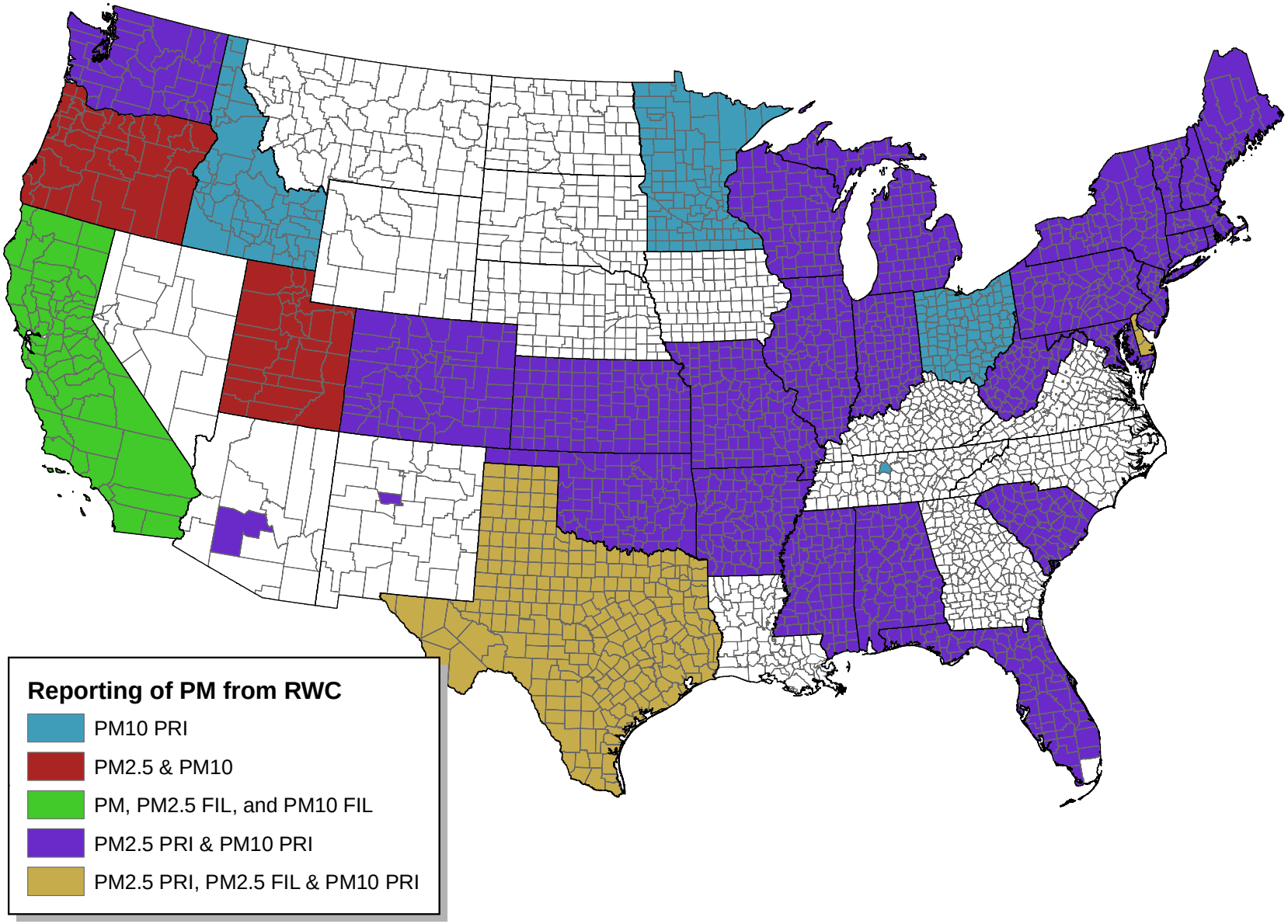
Important Points

- Visual QA techniques can help quickly identify potential errors in EI's
- Prior to QA, You should assume there are errors in the EI when you begin your review
- You can use off-the-shelf software to aid in this type of review
- Look at the data different ways (e.g., mapping quintiles & natural breaks, bar charts comparing time series) to highlight anomolies

General Assessment of Data

- Can use visual techniques to get an initial sense of the starting data for an inventory, including:
  - Format of reported pollutants
  - Categorization of data
  - Data completeness
- See example in Figure 1

Figure 1. Reporting of PM from Residential Wood Combustion



Data Inconsistencies & Trends

- Visual techniques can help identify patterns that are inconsistent with expectations, including:
  - Location of emissions
  - Expected trends in emission levels
  - Relationship to related data sets
  - Comparison to data for previous years
- See examples in Figures 2-11.

Figure 2. Offshore Emissions

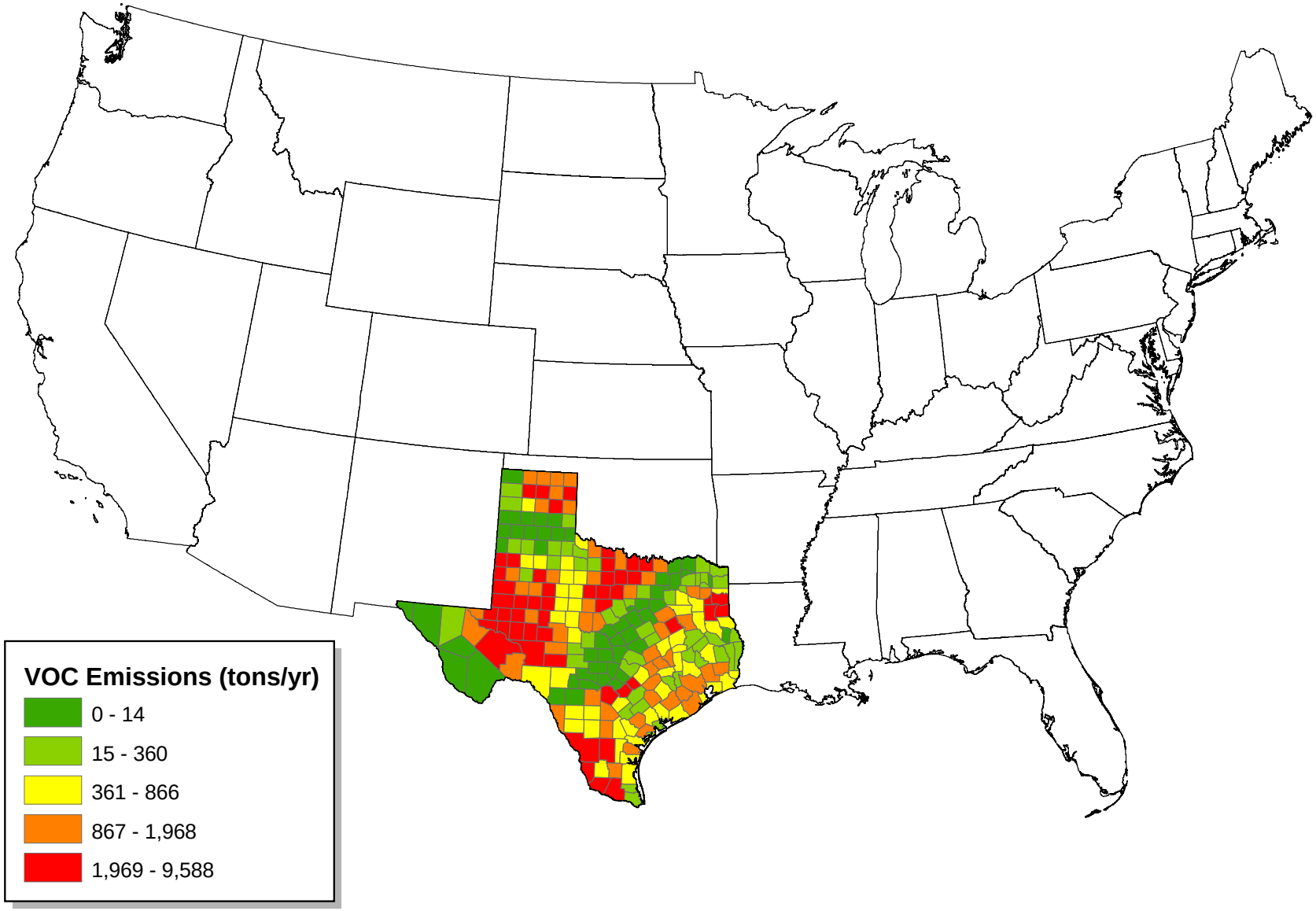


Figure 3. PM2.5 from Wildfires

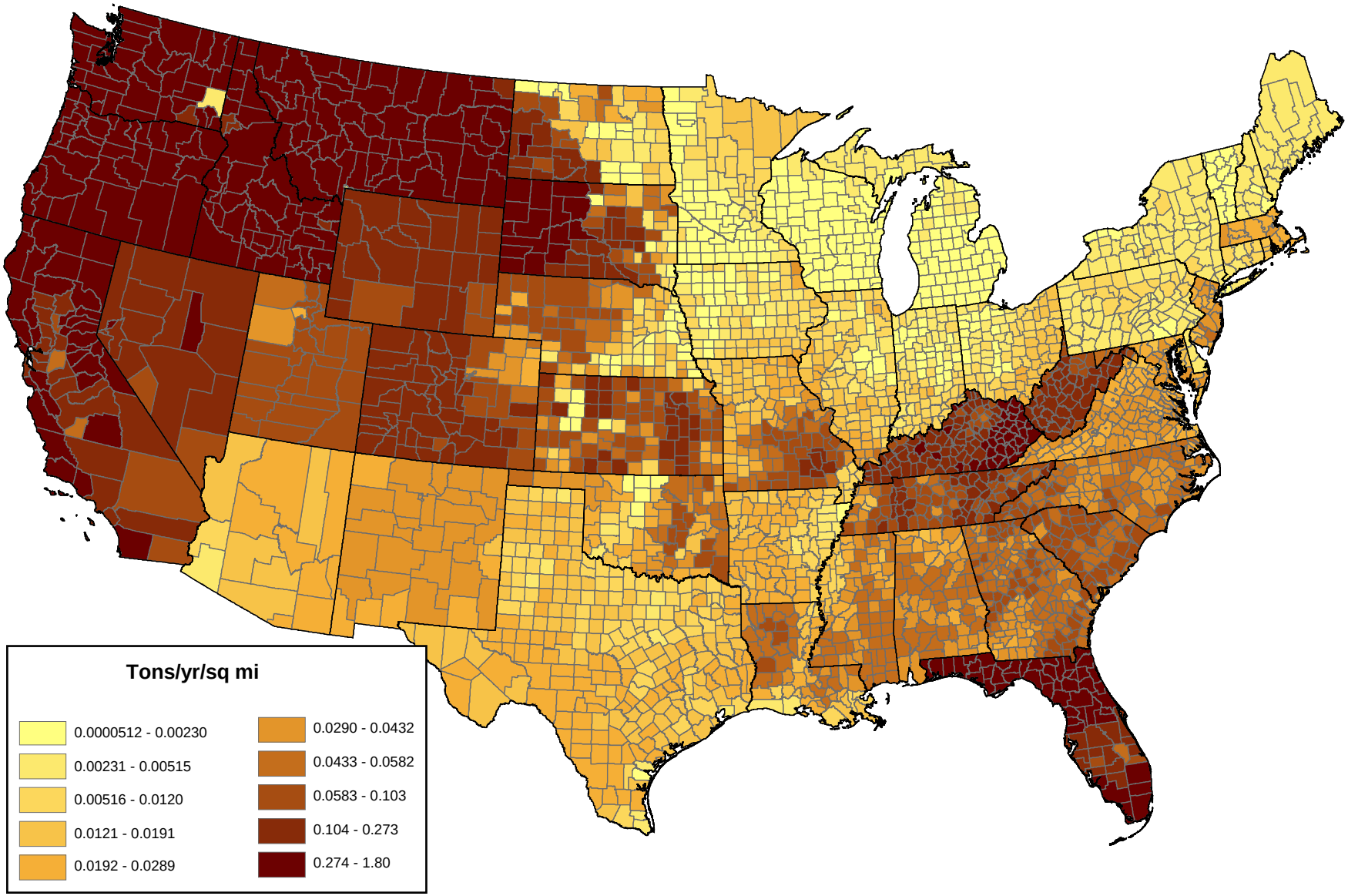


Figure 4. Fraction Forested for Each County

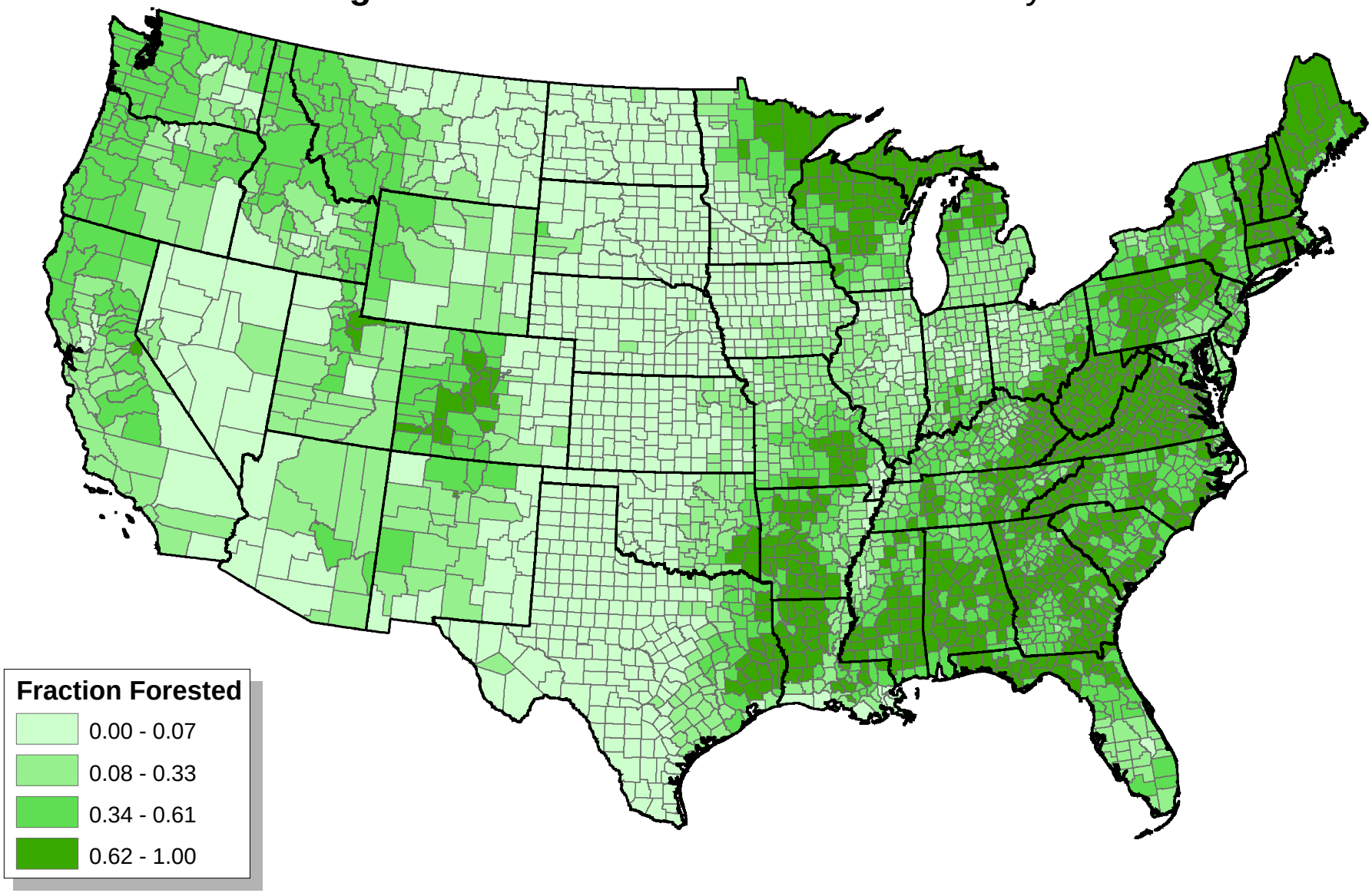


Figure 5. VOC Emissions Differences between 2002 & 1999 NEI

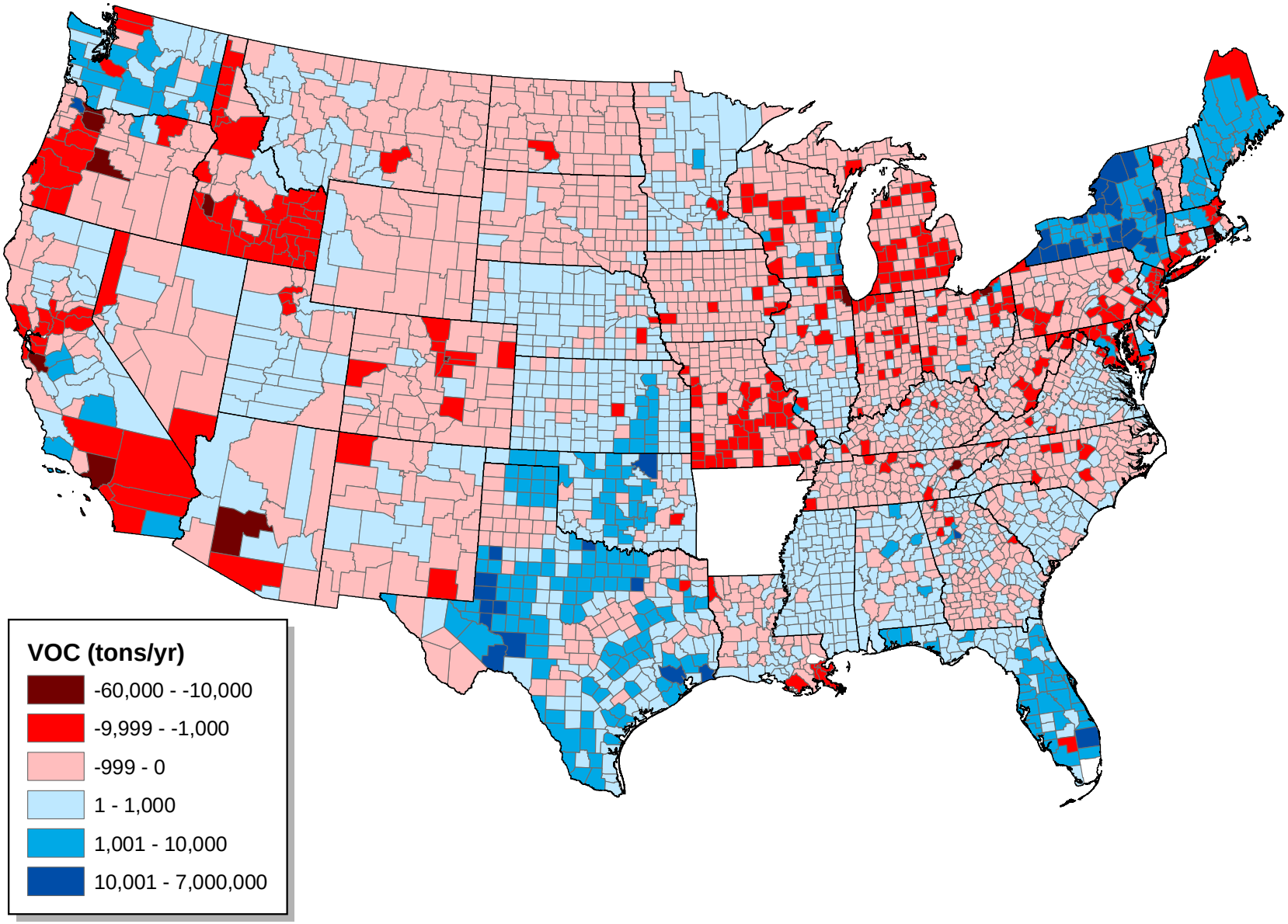


Figure 6. PM2.5 Primary Emissions from Paved Roads

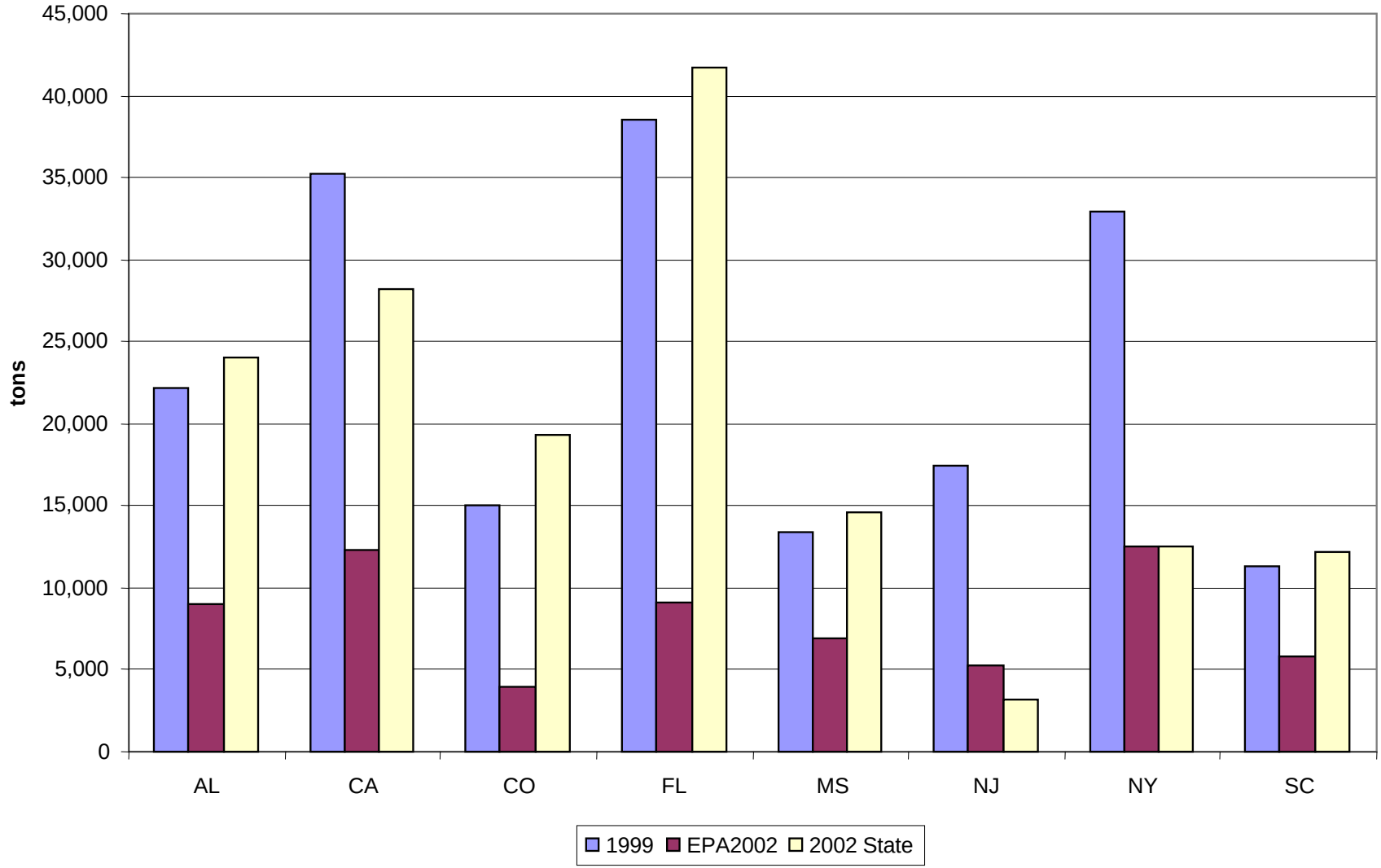


Figure 7. VOC Emissions from Asphalt Paving

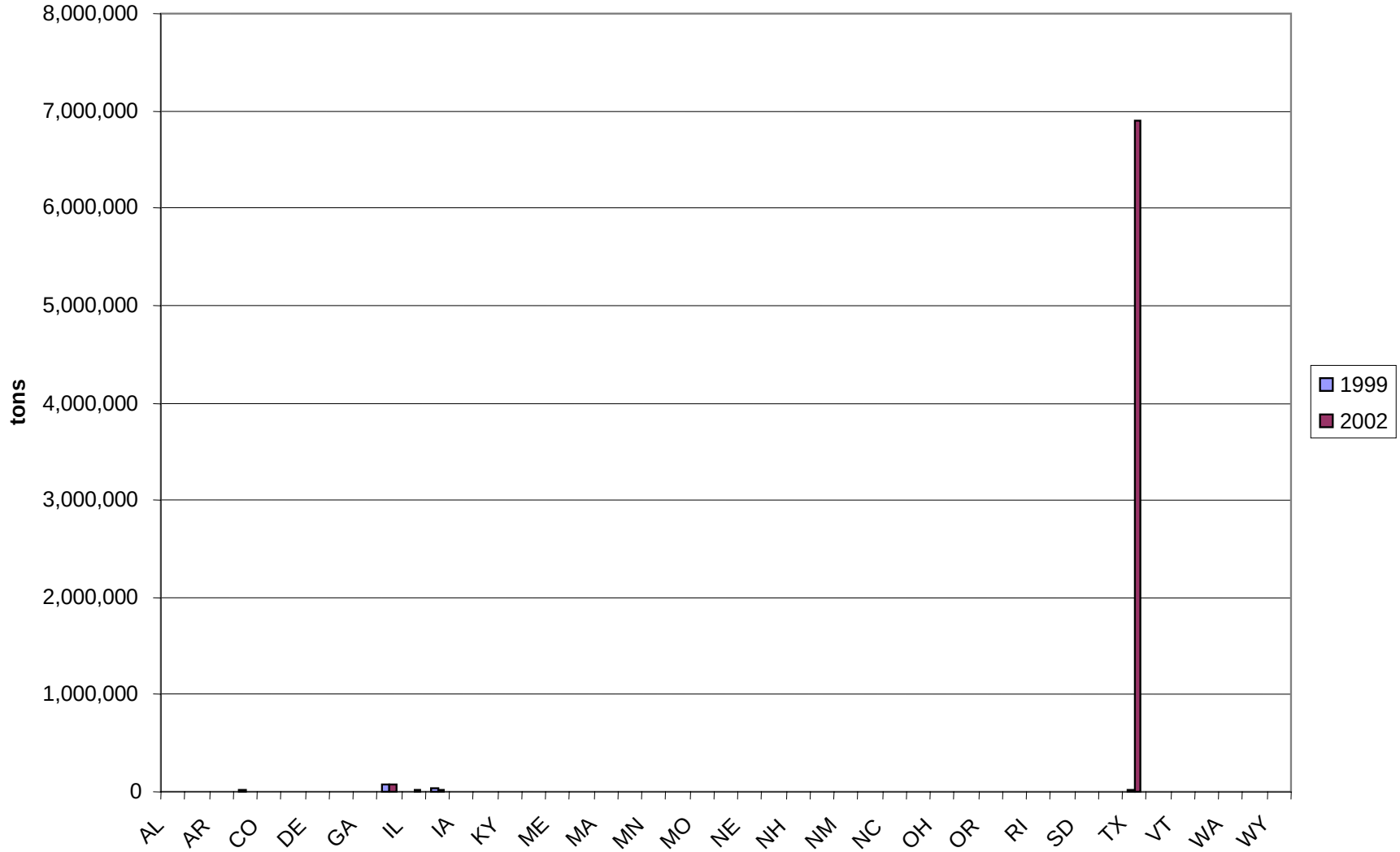


Figure 8. VOC Emissions from Asphalt Paving, minus Texas

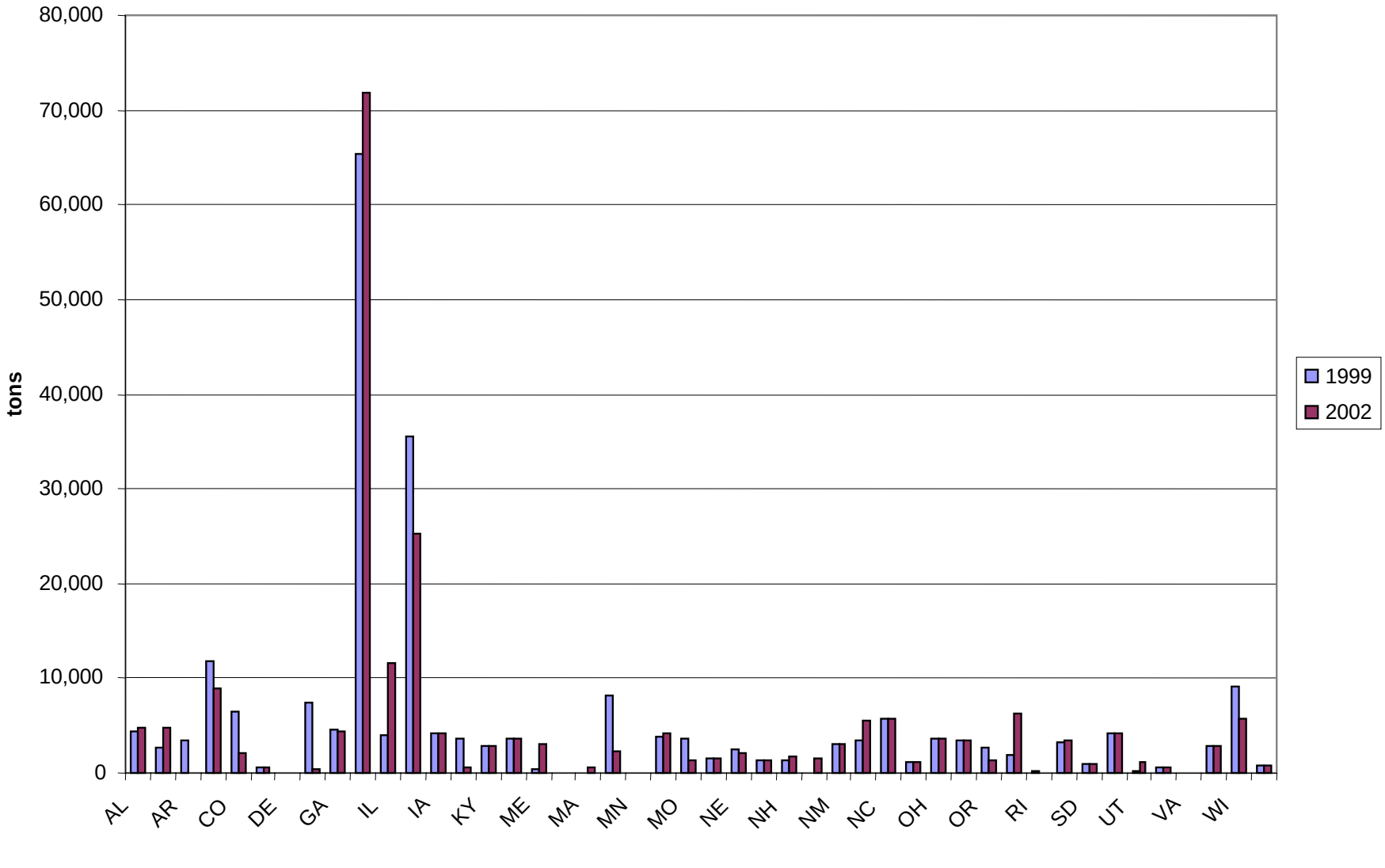


Figure 9. VOC Emissions from Asphalt Paving, minus Texas, Idaho & Indiana

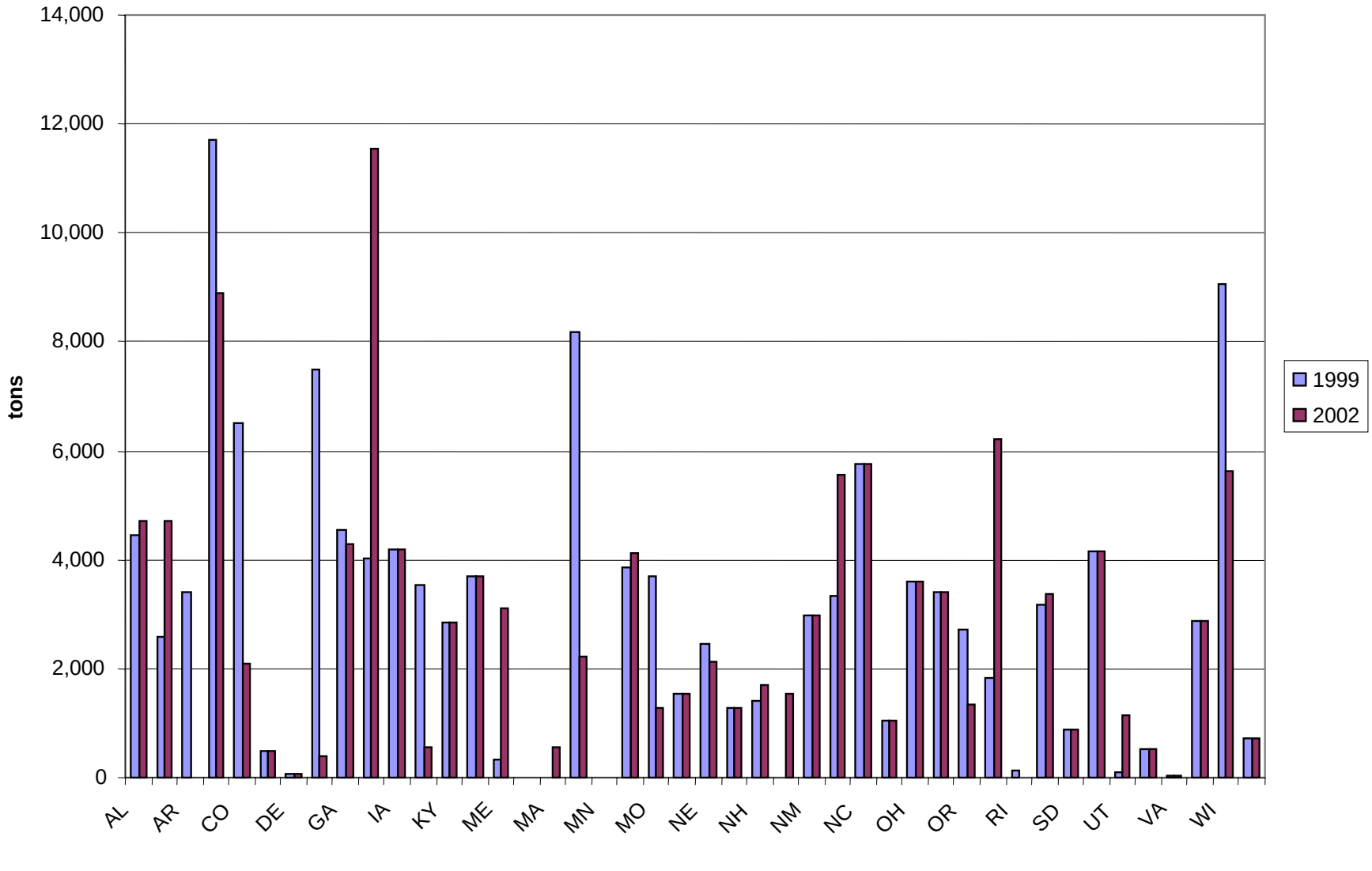


Figure 10. PM2.5 Emissions from Residential Wood Combustion

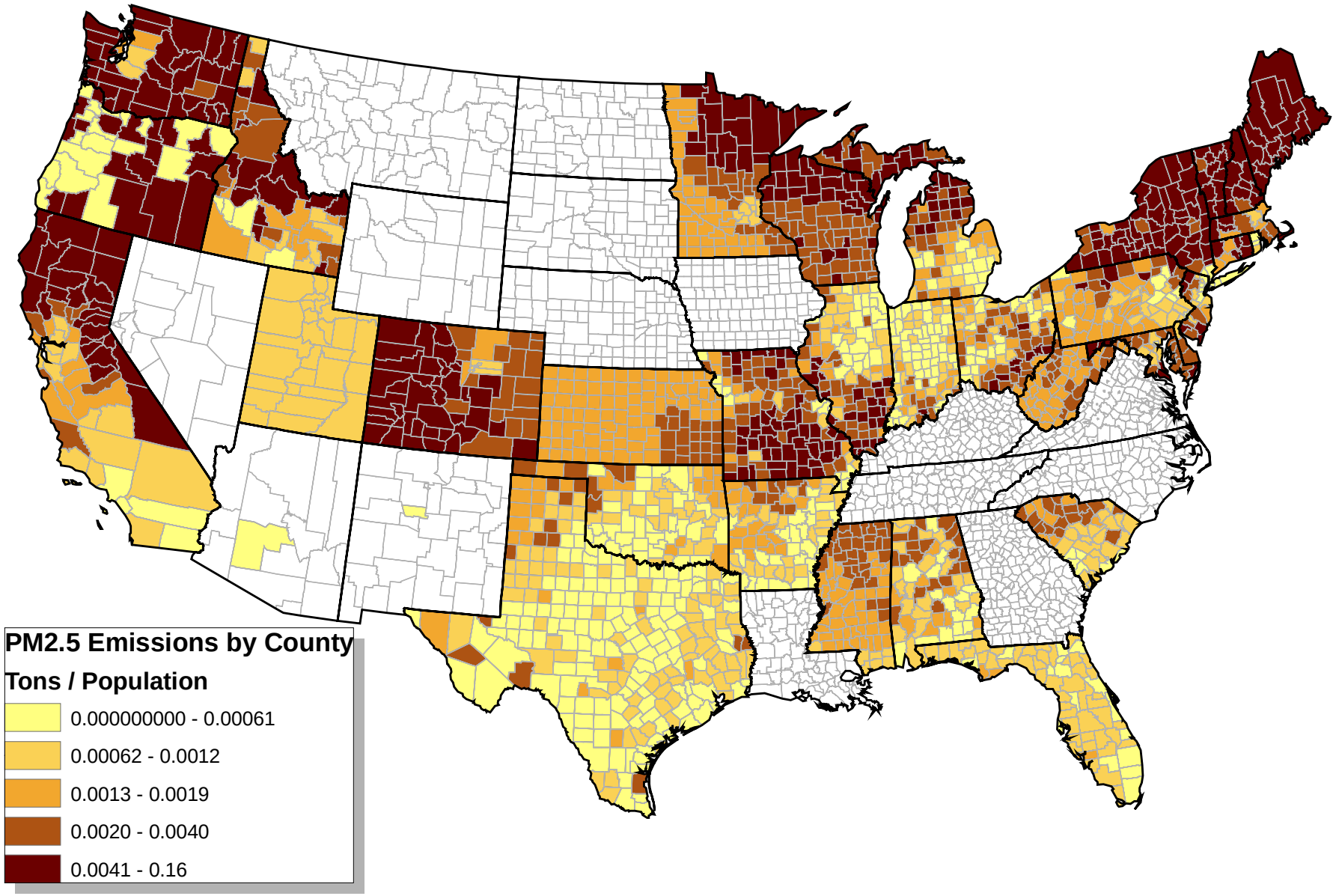
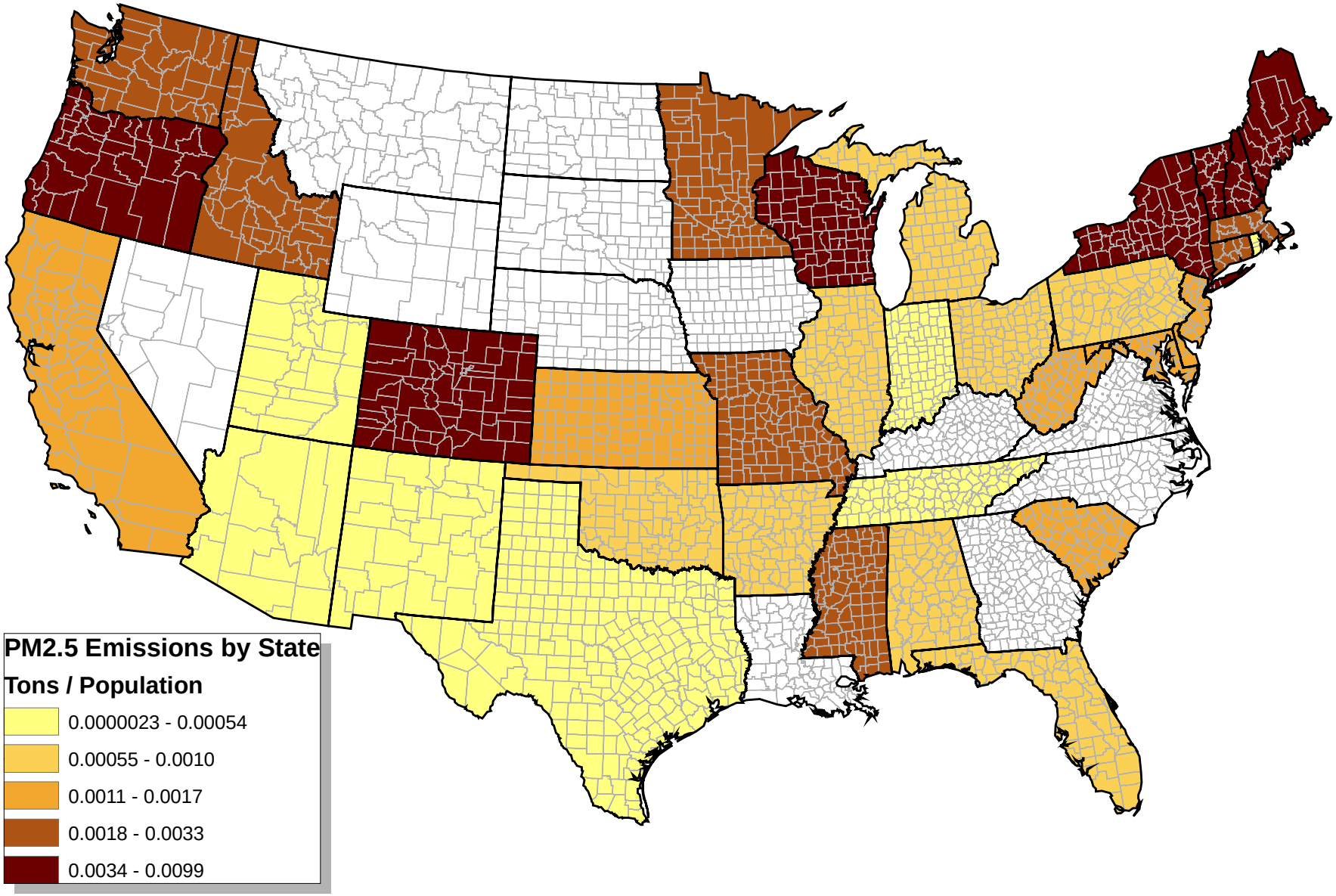


Figure 11. PM2.5 Emissions from Residential Wood Combustion



Locational Errors

- Mapping is an obvious tool for quickly evaluating errors in locational information
- This technique can be used to identify anomalies on a regional or local level
- Like other visual techniques, it is best to use this approach in conjunction with automated QA procedures

Figure 12. 2002 NEI Draft – EGU Locations

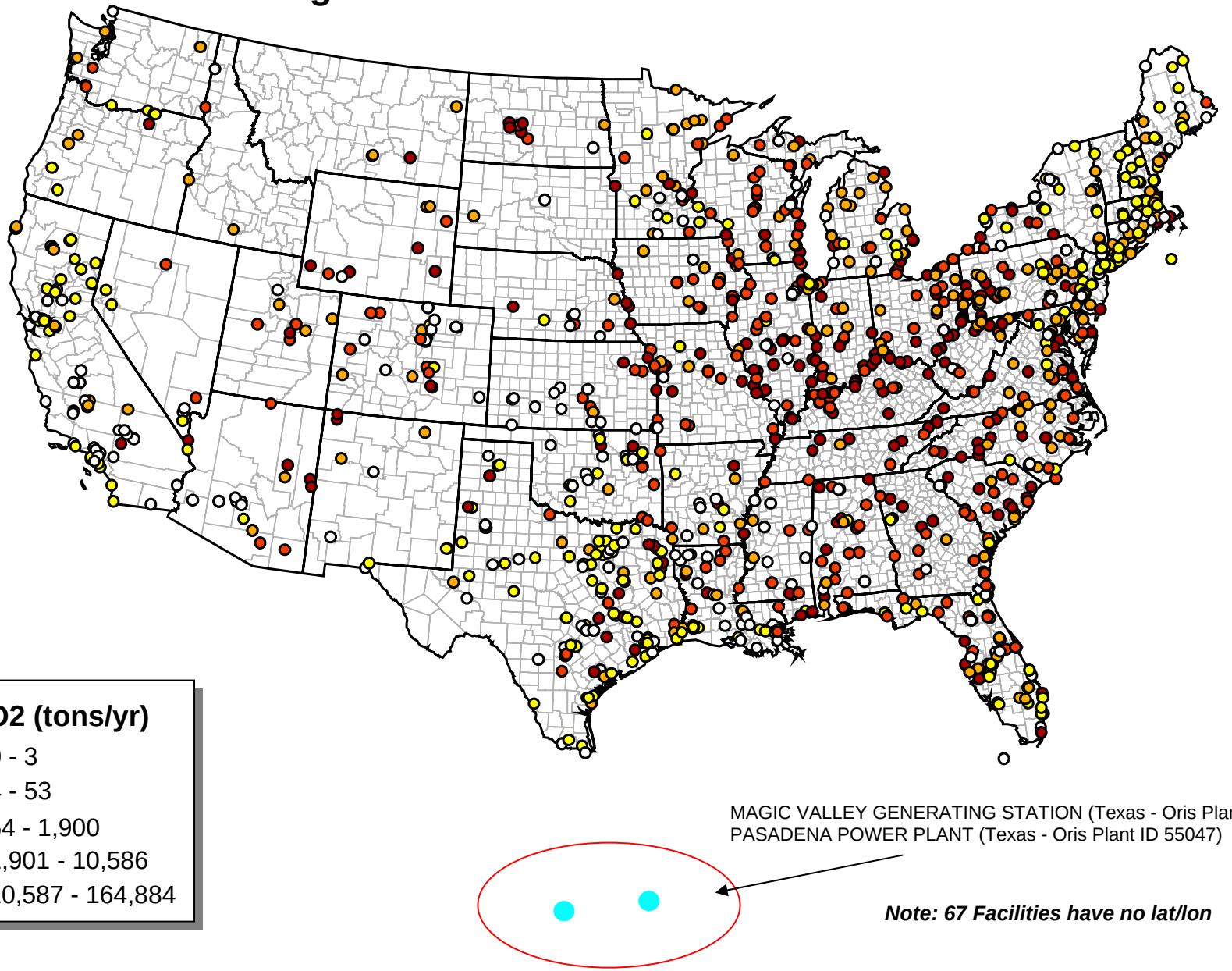


Figure 13. 2002 NEI Draft – EGU Locations, corrected

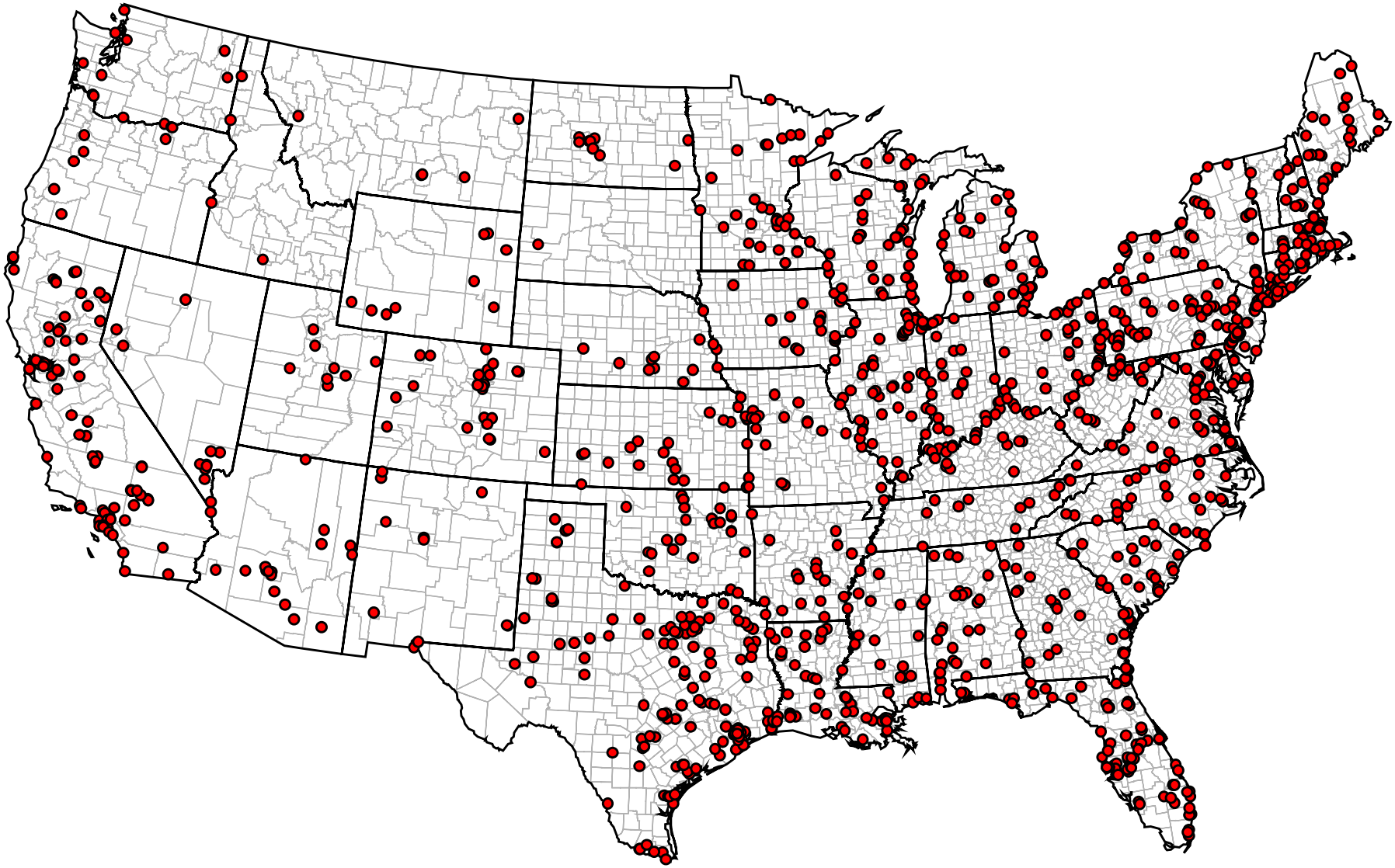
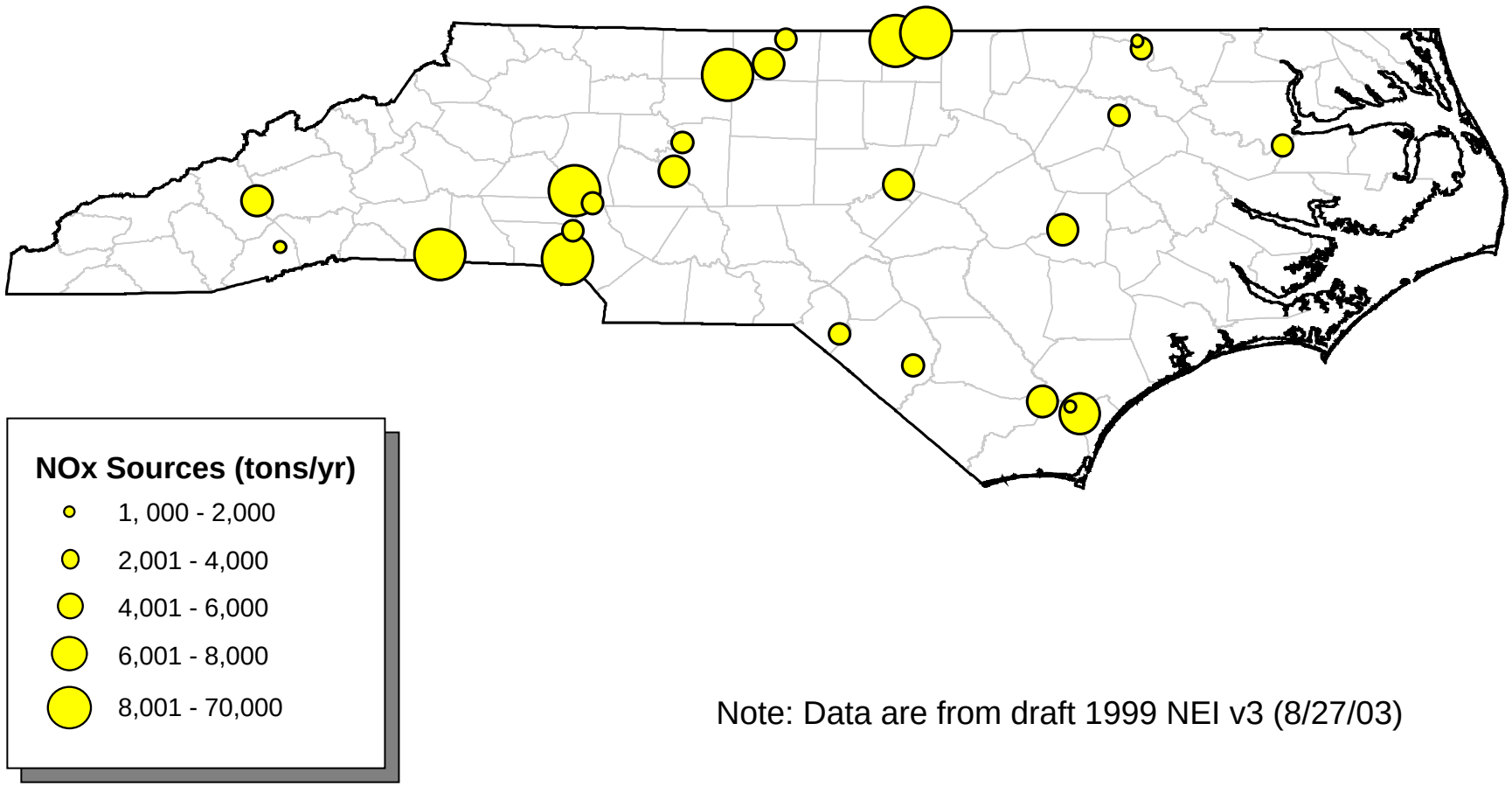


Figure 14. NOx Point Sources in North Carolina



Note: Data are from draft 1999 NEI v3 (8/27/03)

Conclusion

- Visual QA techniques offer a powerful tool, in conjunction with automated QA procedures, for identifying and correcting emission inventory data errors