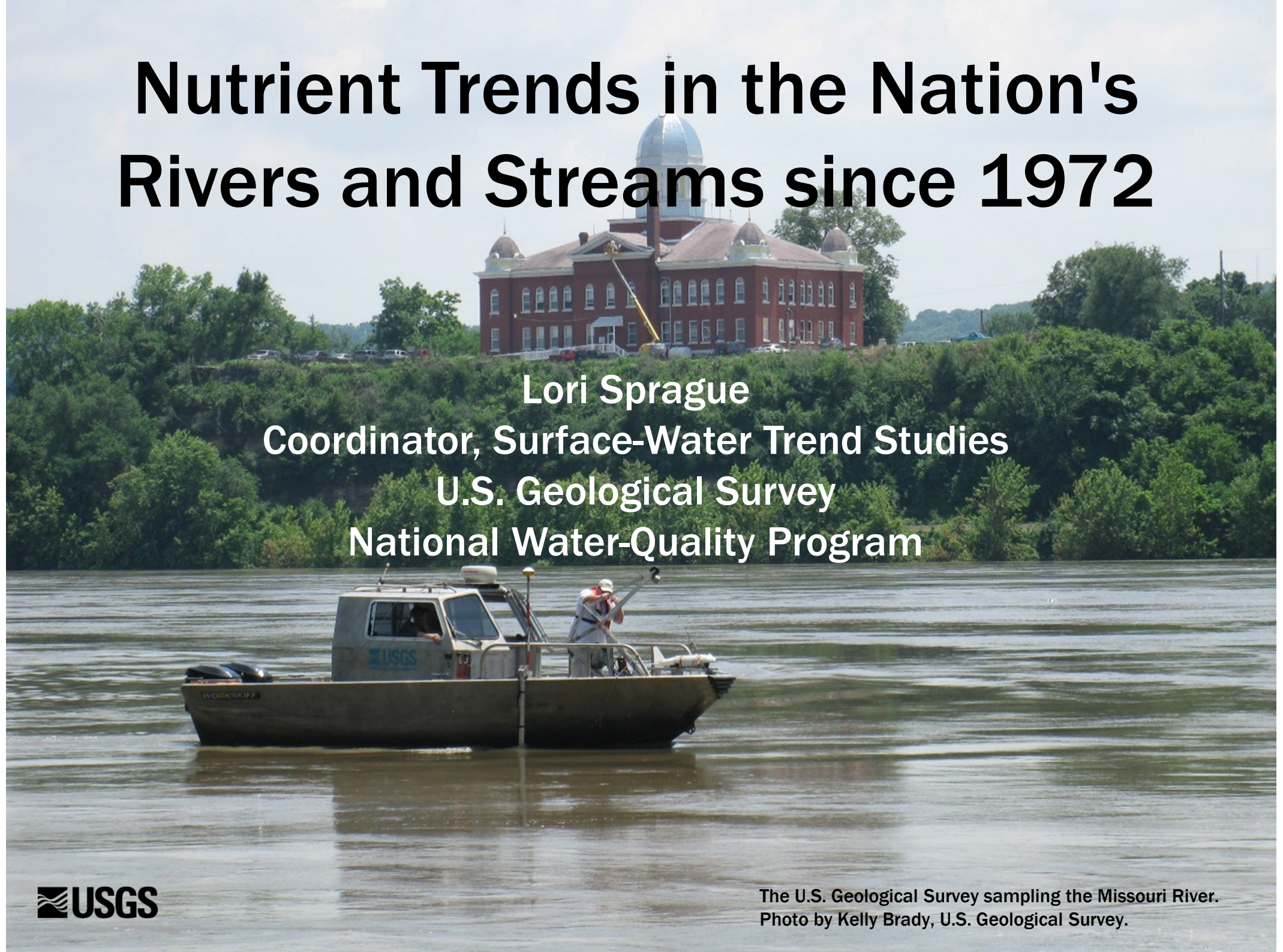
Nutrient Trends in the Nation's Rivers and Streams since 1972

Lori Sprague
Coordinator, Surface-Water Trend Studies
U.S. Geological Survey
National Water-Quality Program



The U.S. Geological Survey sampling the Missouri River.
Photo by Kelly Brady, U.S. Geological Survey.

NAWQA TREND ANALYSIS

- Data sources
  - NWIS, STORET, and other Federal, State, and local databases
  - 25 million nutrient records from 322,000 sites and over 500 organizations
- Scope
  - Nutrients, pesticides, sediment, carbon, salinity, and aquatic ecology
    - Nutrient focus: total nitrogen, total phosphorus, nitrate, ammonia, orthophosphate
  - Four trend periods: (1) 1972-2012, (2) 1982-2012, (3) 1992-2012, and (4) 2002-2012

USGS

METHODS

- **Data screening**
  - Complete metadata
  - Start and end of data within one year of start and end of specified trend period
  - At least quarterly sampling
  - No more than a 30% gap in data coverage
  - Paired with gage
  - Coverage over a range of streamflow
- **Trend test**
  - Weighted regressions on time, discharge, and season (WRTDS)

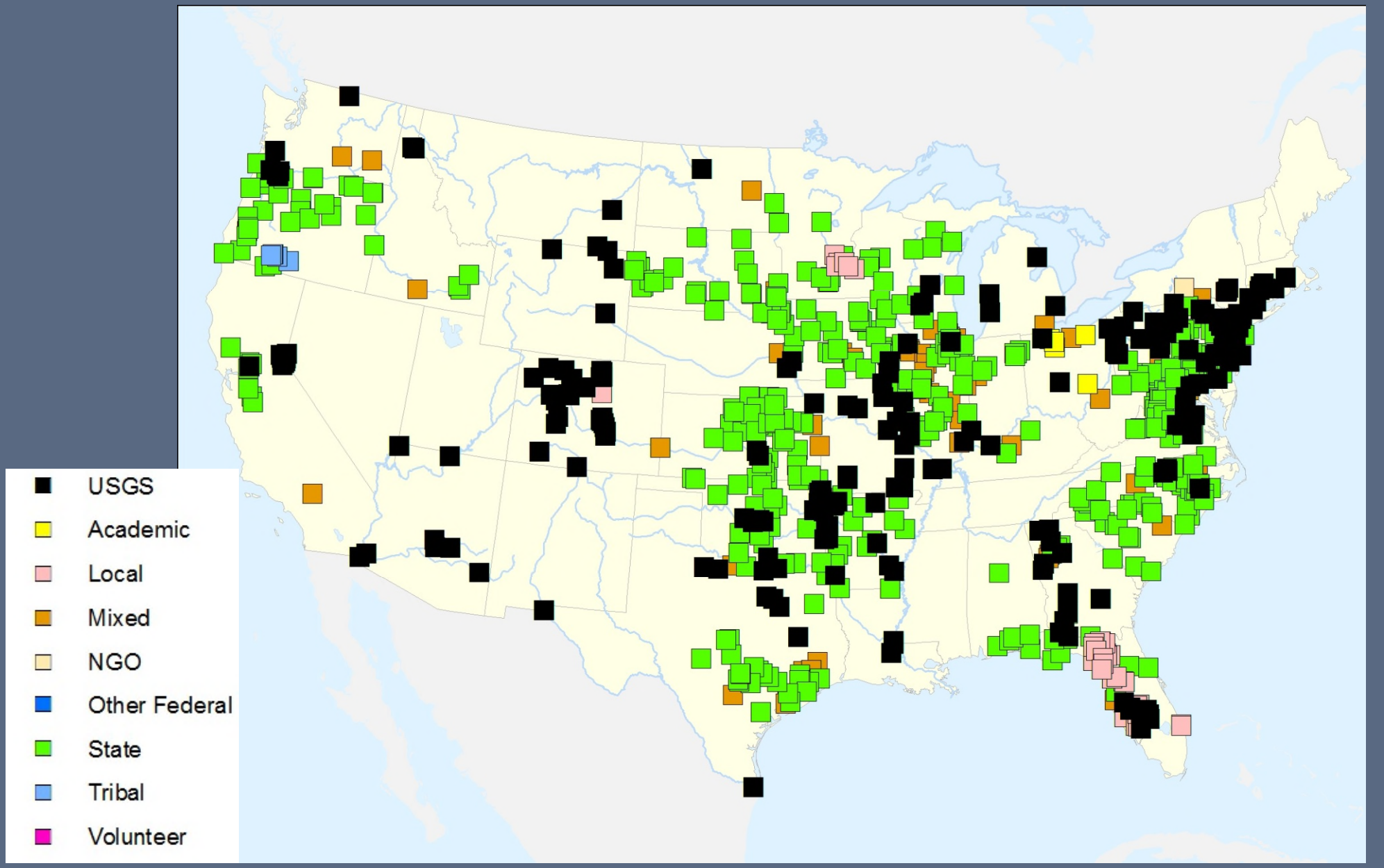
USGS

The U.S. Geological Survey sampling the Colorado River.

USGS

Final trend sites

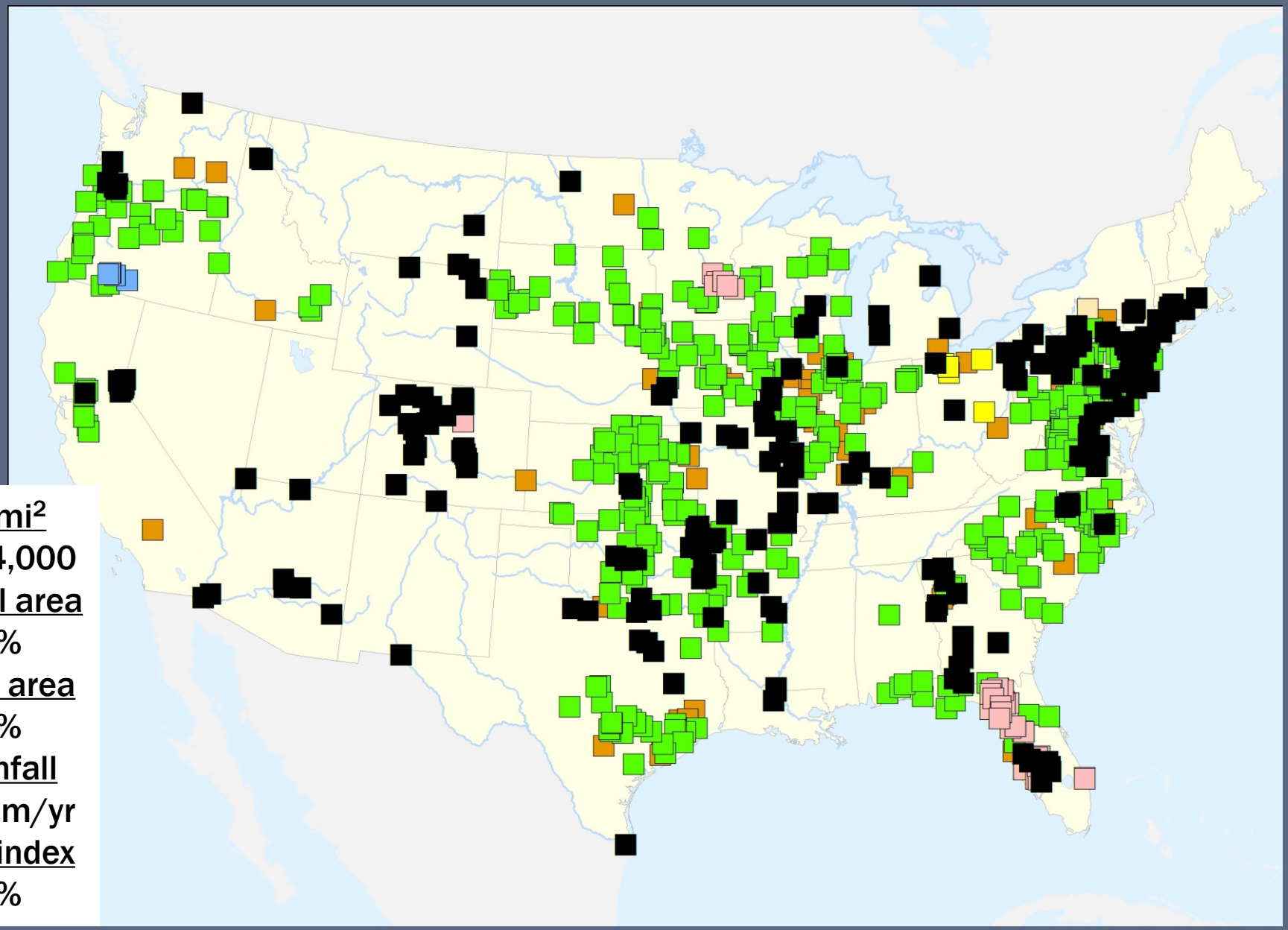
Nutrient sites in all trend periods (856 sites)



USGS

PROVISIONAL DATA – SUBJECT TO REVISION

Nutrient sites in all trend periods (856 sites)

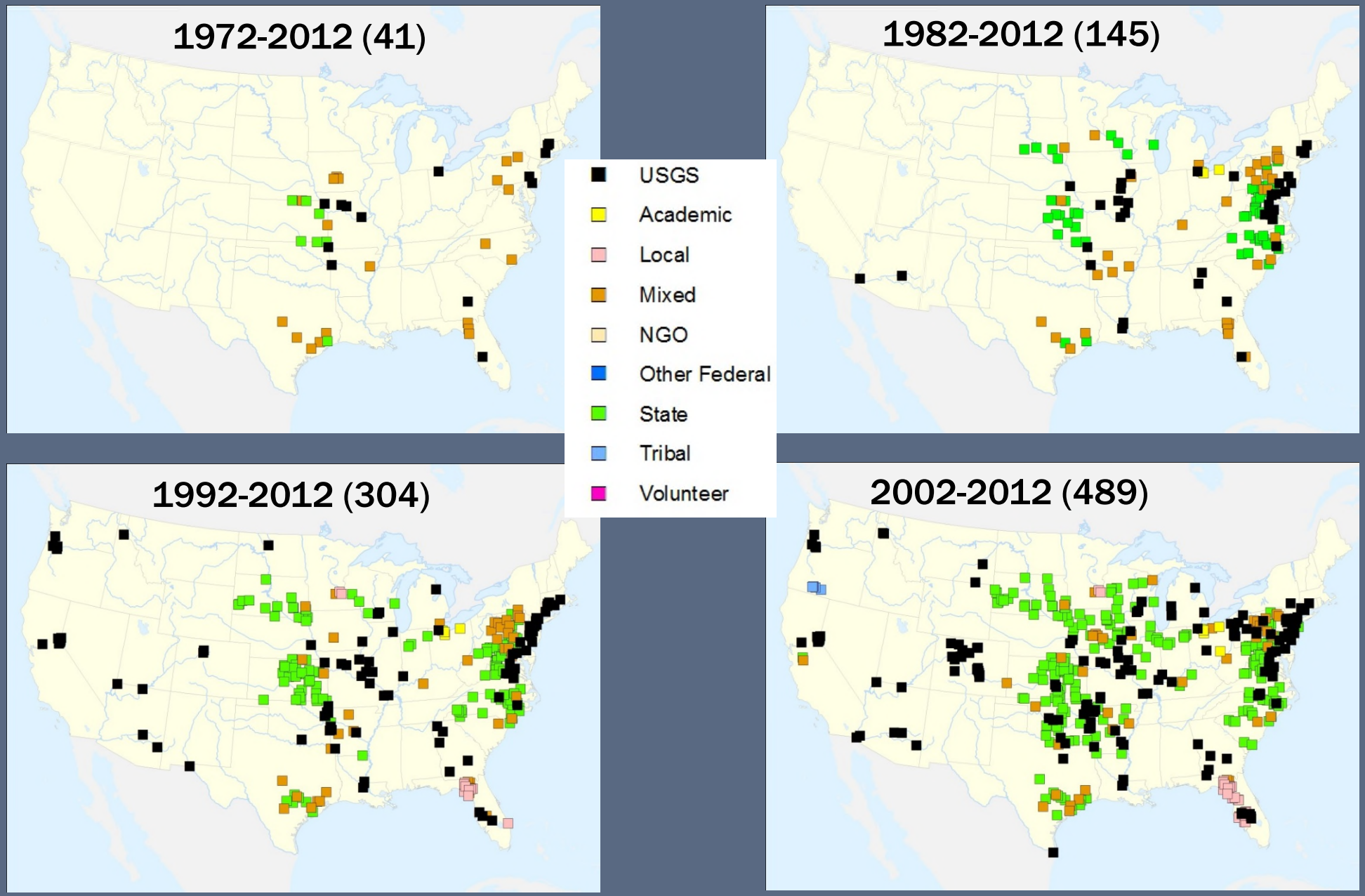


Area, in mi^2
2.2 - 1,204,000
Agricultural area
0 – 93%
Developed area
0 – 95%
Mean rainfall
3 – 329 mm/yr
Base flow index
1 – 85%

USGS

PROVISIONAL DATA – SUBJECT TO REVISION

Total phosphorus sites by trend period



USGS

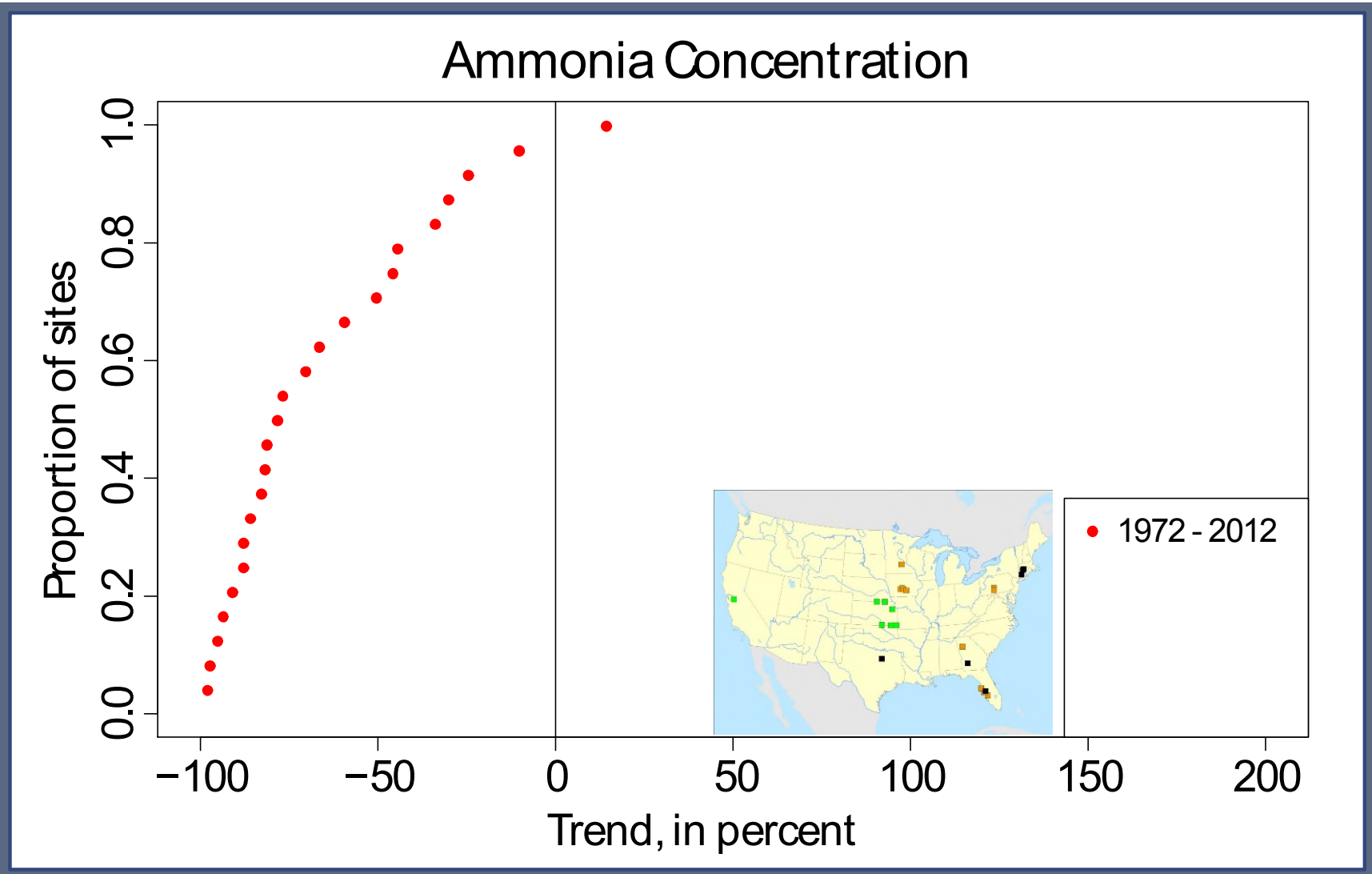
PROVISIONAL DATA – SUBJECT TO REVISION

Results

Photograph from Franklin D. Roosevelt Presidential Library Museum

USGS

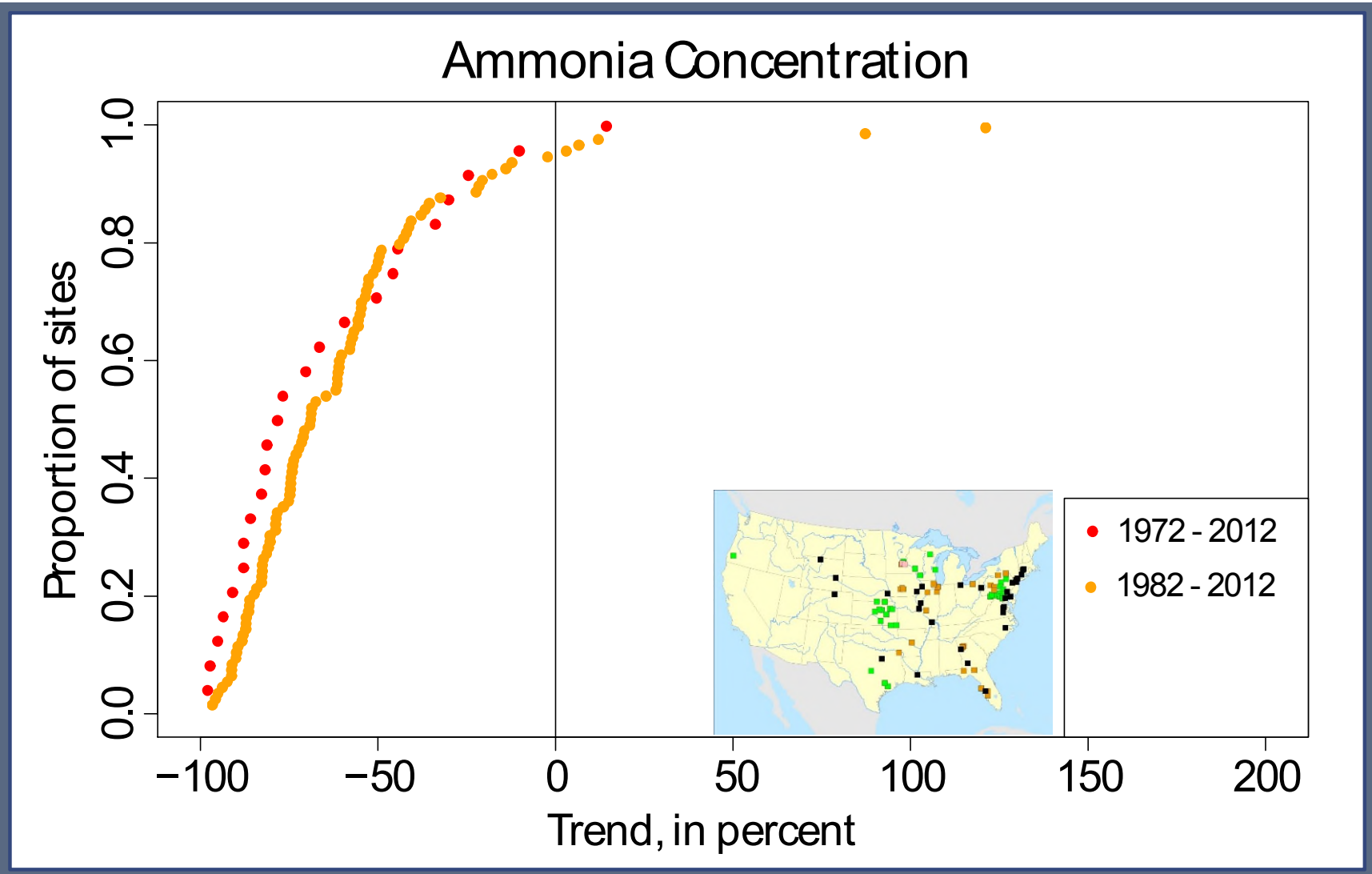
RELATIVELY FEWER DOWNWARD TRENDS IN AMMONIA IN RECENT DECADES



USGS

PROVISIONAL DATA – SUBJECT TO REVISION

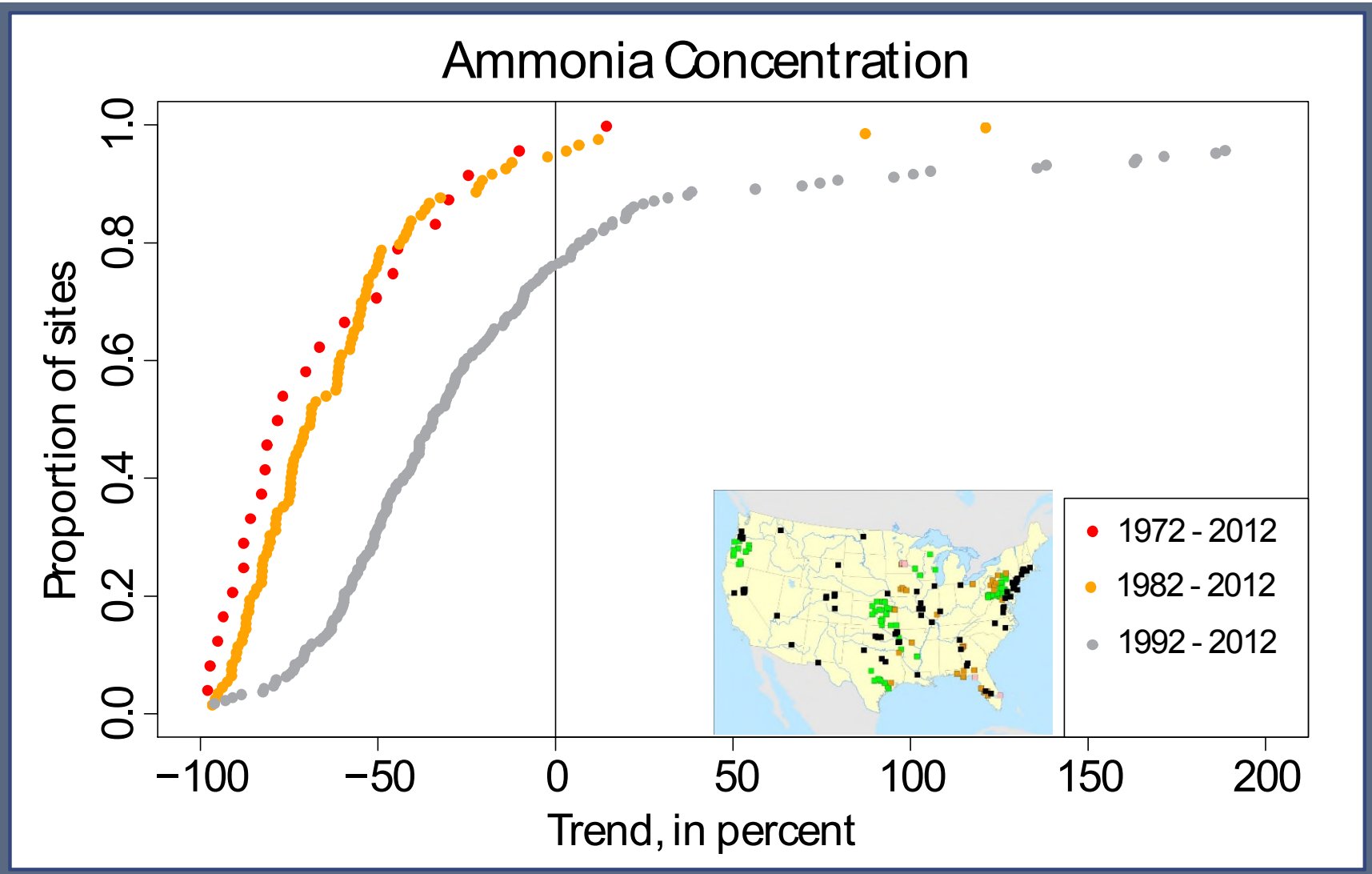
RELATIVELY FEWER DOWNWARD TRENDS IN AMMONIA IN RECENT DECADES



USGS

PROVISIONAL DATA – SUBJECT TO REVISION

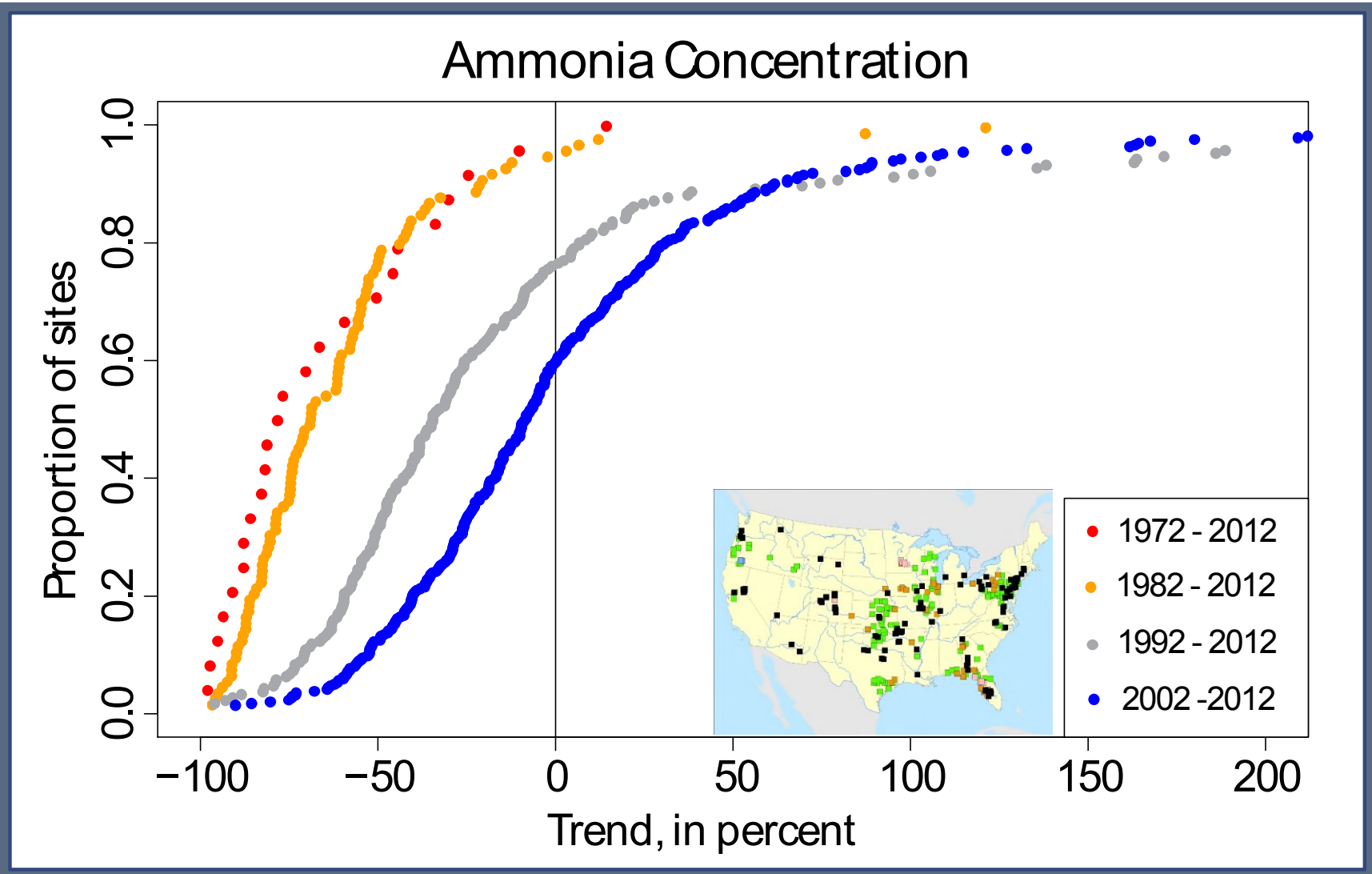
RELATIVELY FEWER DOWNWARD TRENDS IN AMMONIA IN RECENT DECADES



USGS

PROVISIONAL DATA – SUBJECT TO REVISION

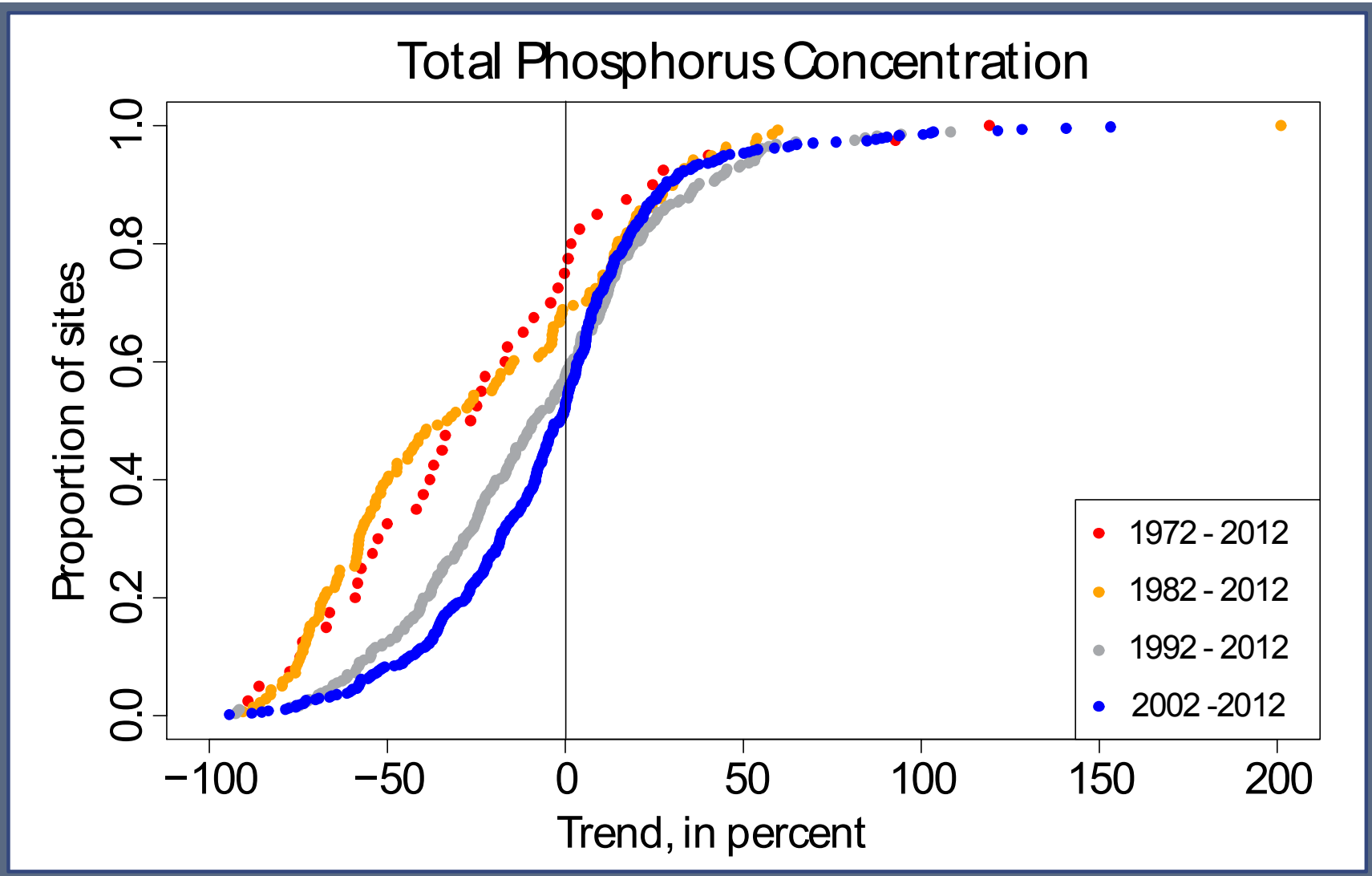
RELATIVELY FEWER DOWNWARD TRENDS IN AMMONIA IN RECENT DECADES



USGS

PROVISIONAL DATA – SUBJECT TO REVISION

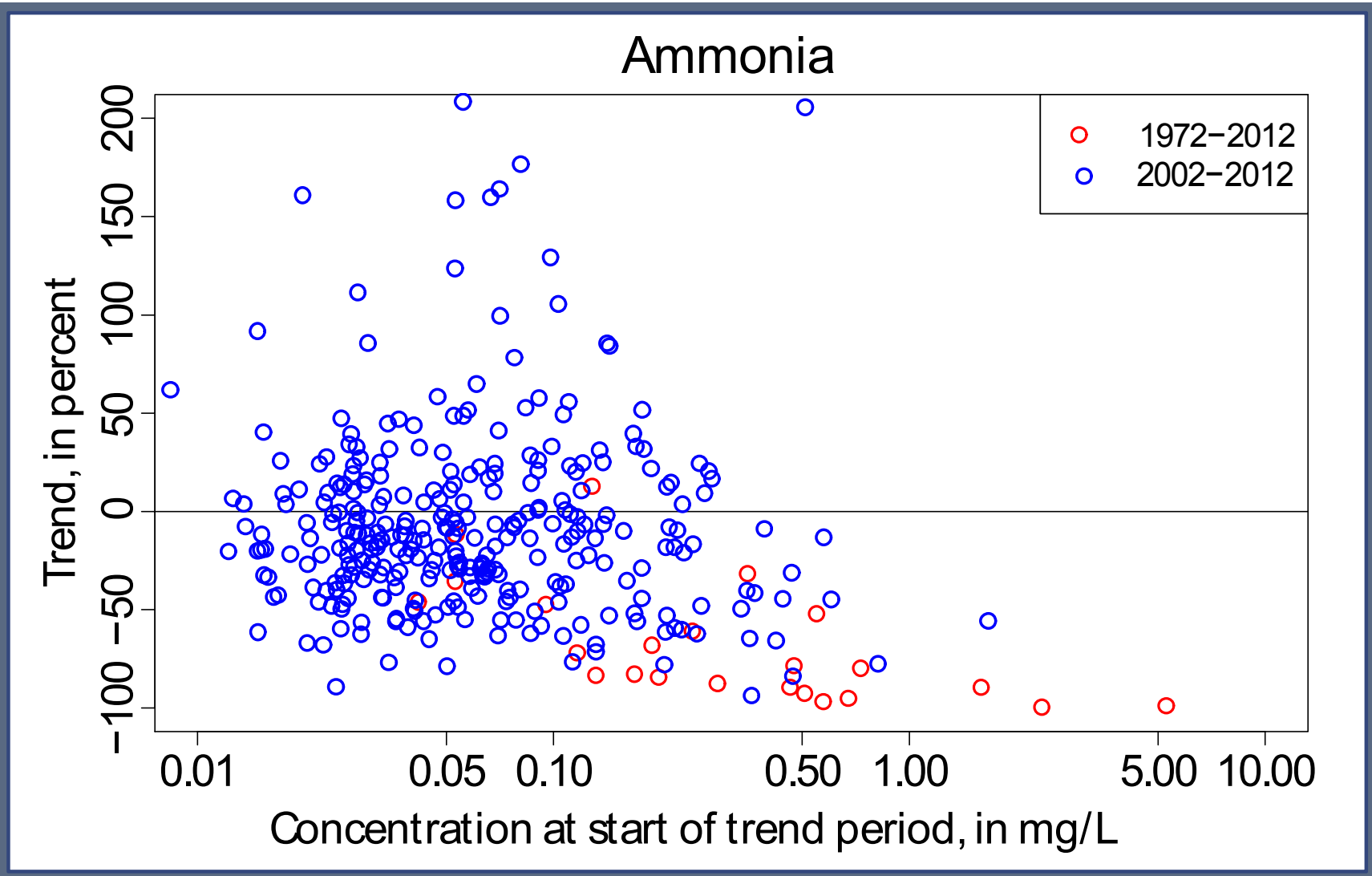
SMALLER DIFFERENCES IN TOTAL PHOSPHORUS TRENDS AMONG DECADES



USGS

PROVISIONAL DATA – SUBJECT TO REVISION

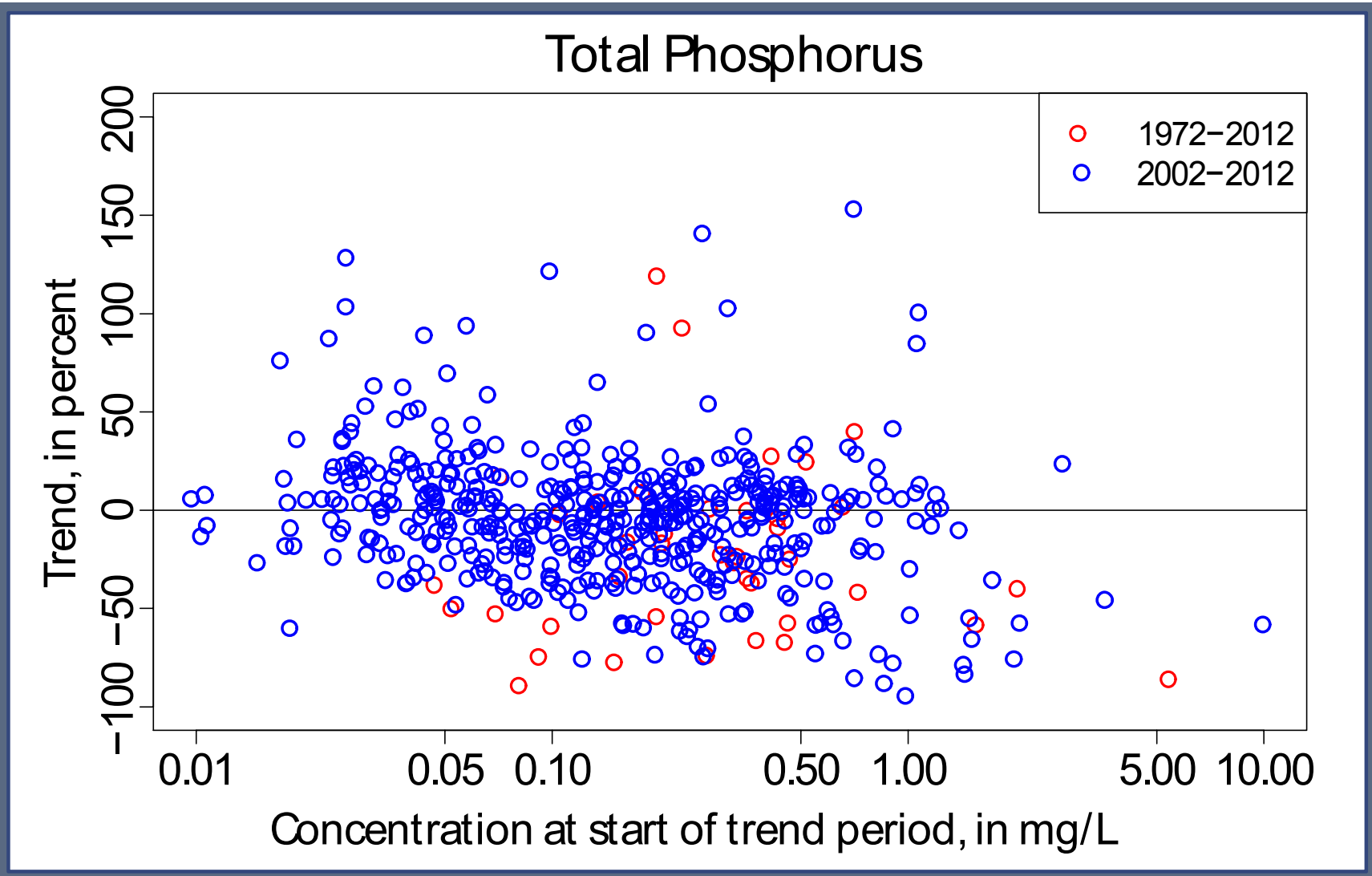
AMMONIA DECREASED AT SITES WITH THE HIGHEST CONCENTRATIONS



USGS

PROVISIONAL DATA – SUBJECT TO REVISION

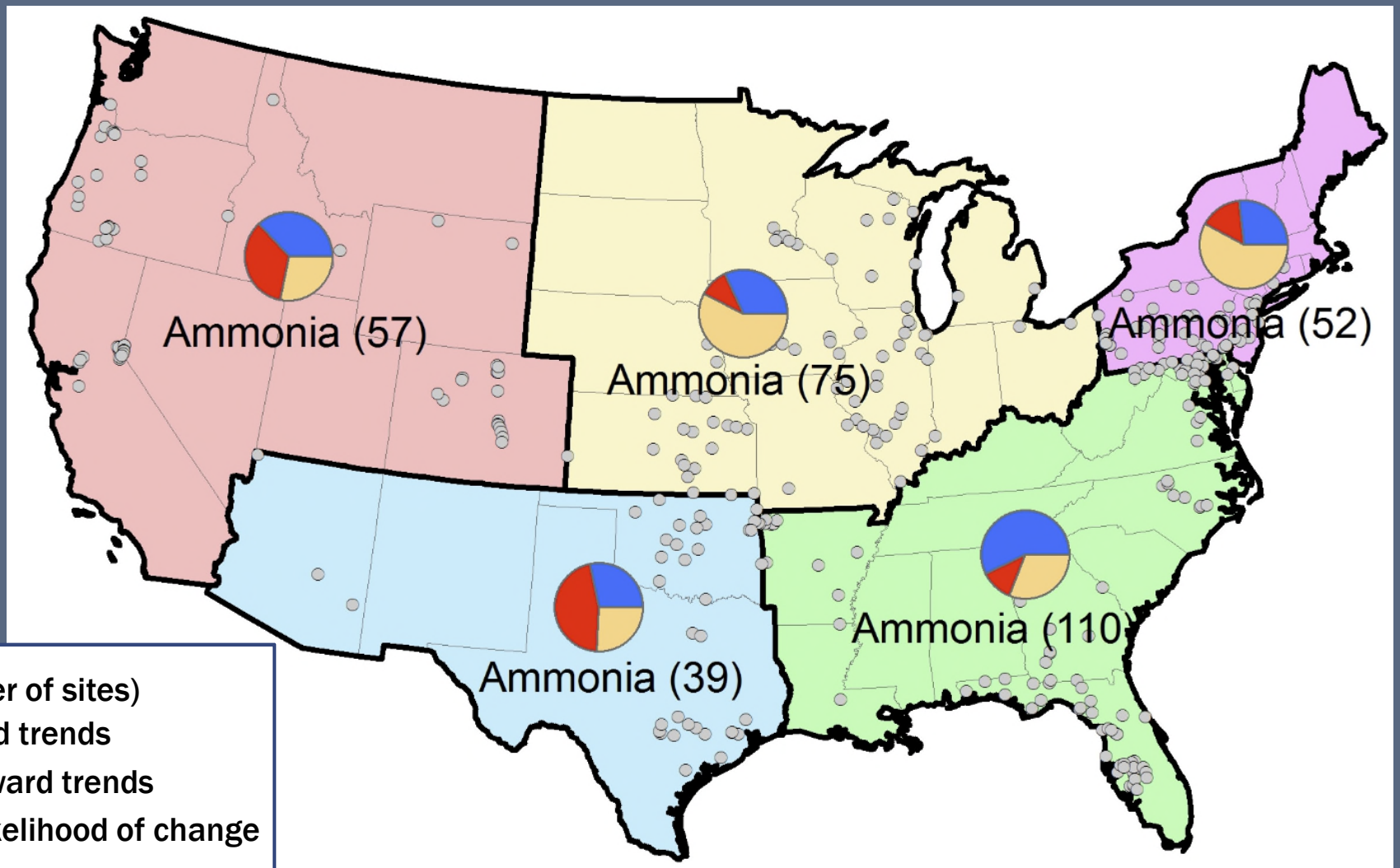
TOTAL PHOSPHORUS TRENDS LESS CONSISTENT OVERALL



USGS

PROVISIONAL DATA – SUBJECT TO REVISION

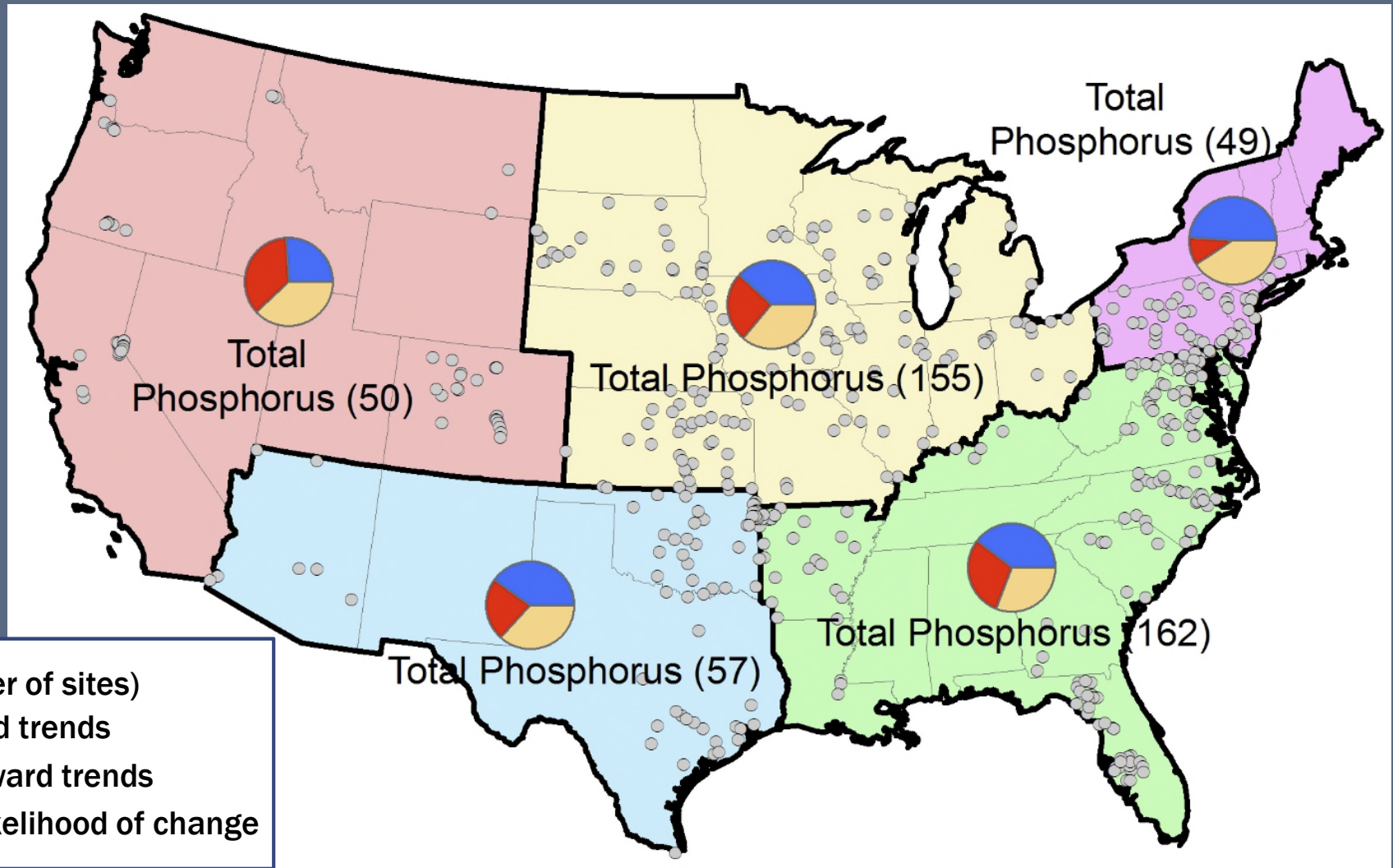
REGIONAL PATTERNS IN AMMONIA CONCENTRATION TRENDS 2002-2012



PROVISIONAL DATA – SUBJECT TO REVISION

USGS

REGIONAL PATTERNS IN PHOSPHORUS CONCENTRATION TRENDS 2002-2012



PROVISIONAL DATA – SUBJECT TO REVISION

USGS

FUTURE WORK

- Trend results in this study
  - 7,000+ for nutrients
  - 22,000+ for all constituents
- Topics for further study
  - Geographic distribution
  - Environmental significance
  - Major causes of change
  - Comparison across constituents

Photograph by Lynn Betts, U.S. Department of Agriculture, Natural Resources Conservation Service

USGS

QUESTIONS?

Acknowledgments

- James Falcone, Hank Johnson, Jenny Murphy, Gretchen Oelsner, Karen Ryberg, Ted Stets, Skip Vecchia, Bob Zuellig, Melissa Riskin, Laura DeCicco, Bob Hirsch, Denise Argue, Jeff Deacon, Christine Wieben, Amy Ludtke, Jeff Martin, and Candice Hopkins
- All of the organizations in the United States that have monitored stream quality over the years

USGS