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

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

Final trend sites
Nutrient sites in all trend periods (856 sites)

**Area, in mi²**
- 2.2 - 1,204,000

**Agricultural area**
- 0 – 93%

**Developed area**
- 0 – 95%

**Mean rainfall**
- 3 – 329 mm/yr

**Base flow index**
- 1 – 85%

PROVISIONAL DATA – SUBJECT TO REVISION
Total phosphorus sites by trend period

1972-2012 (41)  
1982-2012 (145)  
1992-2012 (304)  
2002-2012 (489)  

PROVISIONAL DATA – SUBJECT TO REVISION
RELATIVELY FEWER DOWNWARD TRENDS IN AMMONIA IN RECENT DECADES

Ammonia Concentration

Trend, in percent

Proportion of sites

1972 - 2012

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Ammonia Concentration

PROVISIONAL DATA – SUBJECT TO REVISION
SMALLER DIFFERENCES IN TOTAL PHOSPHORUS TRENDS AMONG DECADES

The graph shows the proportion of sites against the trend in total phosphorus concentration. The trends are represented for different decades:

- 1972 - 2012 (red dots)
- 1982 - 2012 (orange dots)
- 1992 - 2012 (gray dots)
- 2002 - 2012 (blue dots)

The x-axis represents the trend in percent, while the y-axis shows the proportion of sites.
AMMONIA DECREASED AT SITES WITH THE HIGHEST CONCENTRATIONS

PROVISIONAL DATA – SUBJECT TO REVISION
TOTAL PHOSPHORUS TRENDS
LESS CONSISTENT OVERALL

Total Phosphorus

Concentration at start of trend period, in mg/L

Trend, in percent

-100 -50 0 50 100 150 200

0.01 0.05 0.10 0.50 1.00 5.00 10.00

1972–2012
2002–2012
REGIONAL PATTERNS IN AMMONIA CONCENTRATION TRENDS
2002-2012

PROVISIONAL DATA – SUBJECT TO REVISION
REGIONAL PATTERNS IN PHOSPHORUS CONCENTRATION TRENDS 2002-2012

PROVISIONAL DATA – SUBJECT TO REVISION
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
QUESTIONS?

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• All of the organizations in the United States that have monitored stream quality over the years