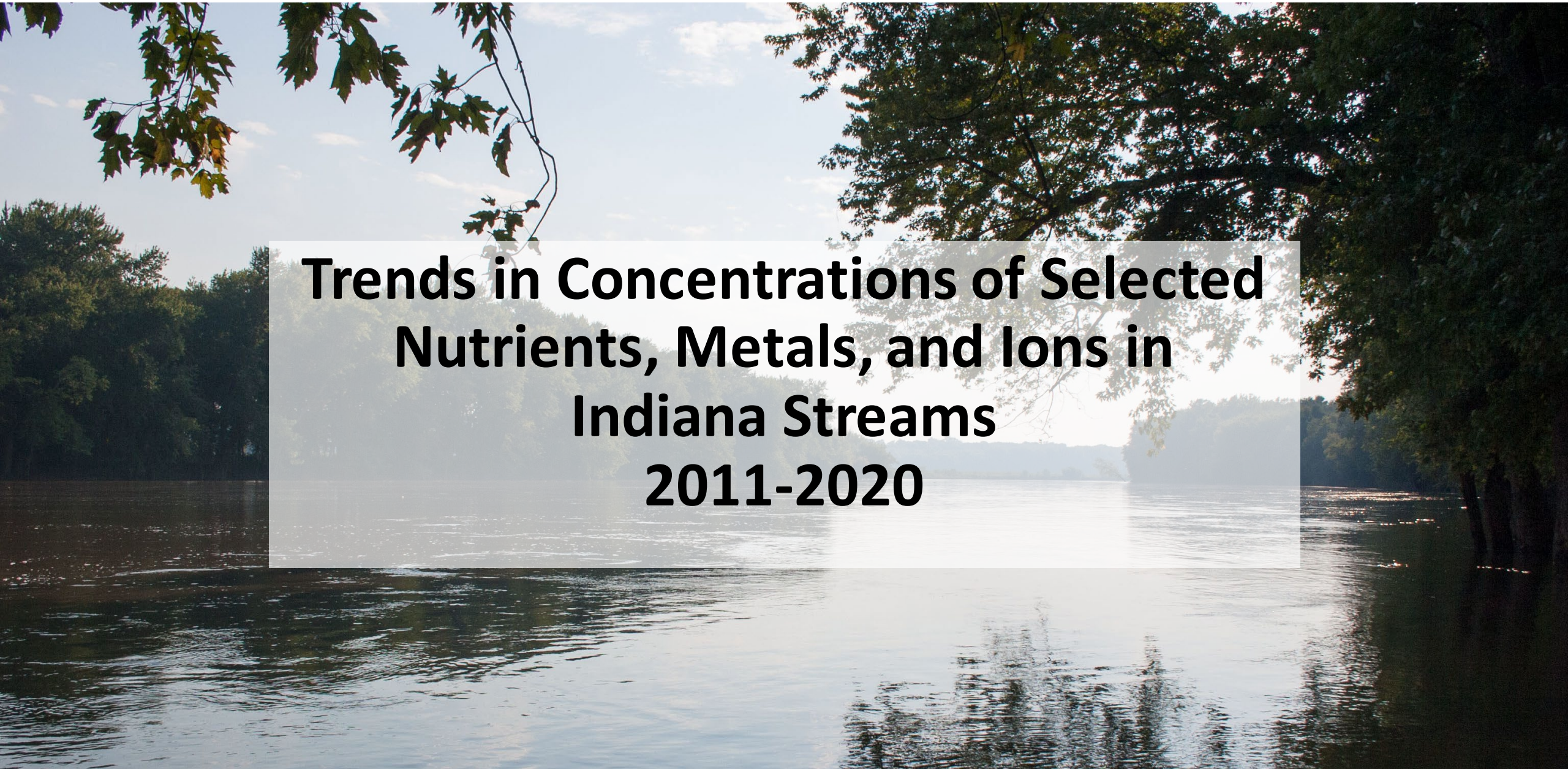


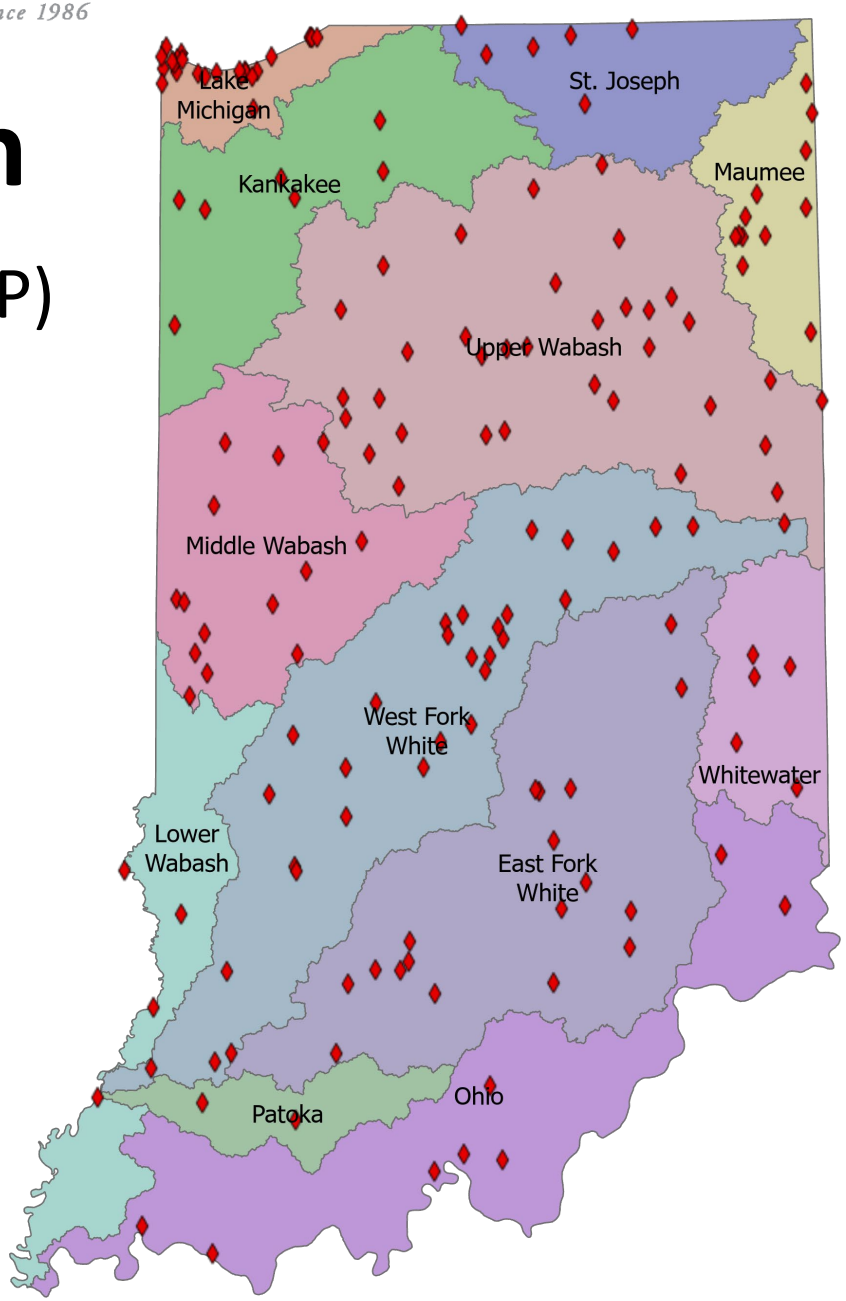
Trends in Concentrations of Selected Nutrients, Metals, and Ions in Indiana Streams 2011-2020

Introduction

Fixed Station Monitoring Program (FSMP)

- Began in 1957
- Water samples collected monthly
- 165 sites

Bridge sampling device



Introduction – FSMP data use

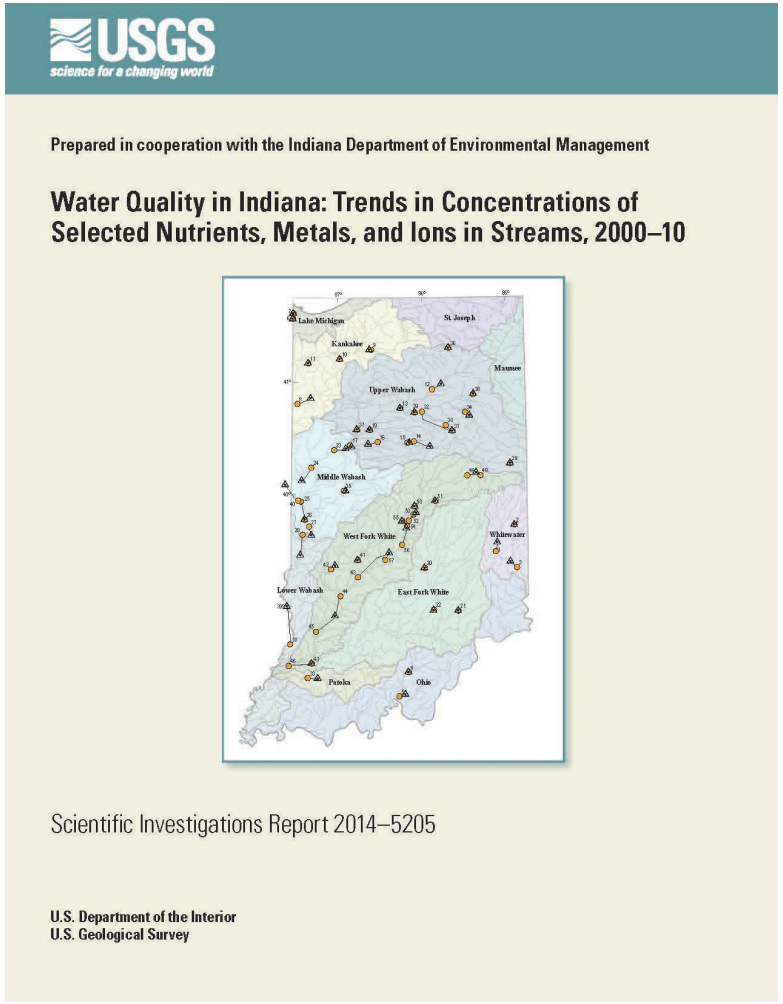
Waste load allocation models

Designated use assessments

- Define water quality goals for waterbodies

Water quality trends

- USGS study 2000-2010


USGS
science for a changing world

Prepared in cooperation with the Indiana Department of Environmental Management

Water Quality in Indiana: Trends in Concentrations of Selected Nutrients, Metals, and Ions in Streams, 2000–10

Scientific Investigations Report 2014–5205

U.S. Department of the Interior
U.S. Geological Survey

Methods

R-QWTREND package (Vecchia & Nustad, 2020):

- Variability in streamflow impacts measured concentration
- Co-located with a USGS streamgage

Limitations:

- Time period (10 years)
- Completeness of samples
- Sensitivity of lab analyses (non-detects)

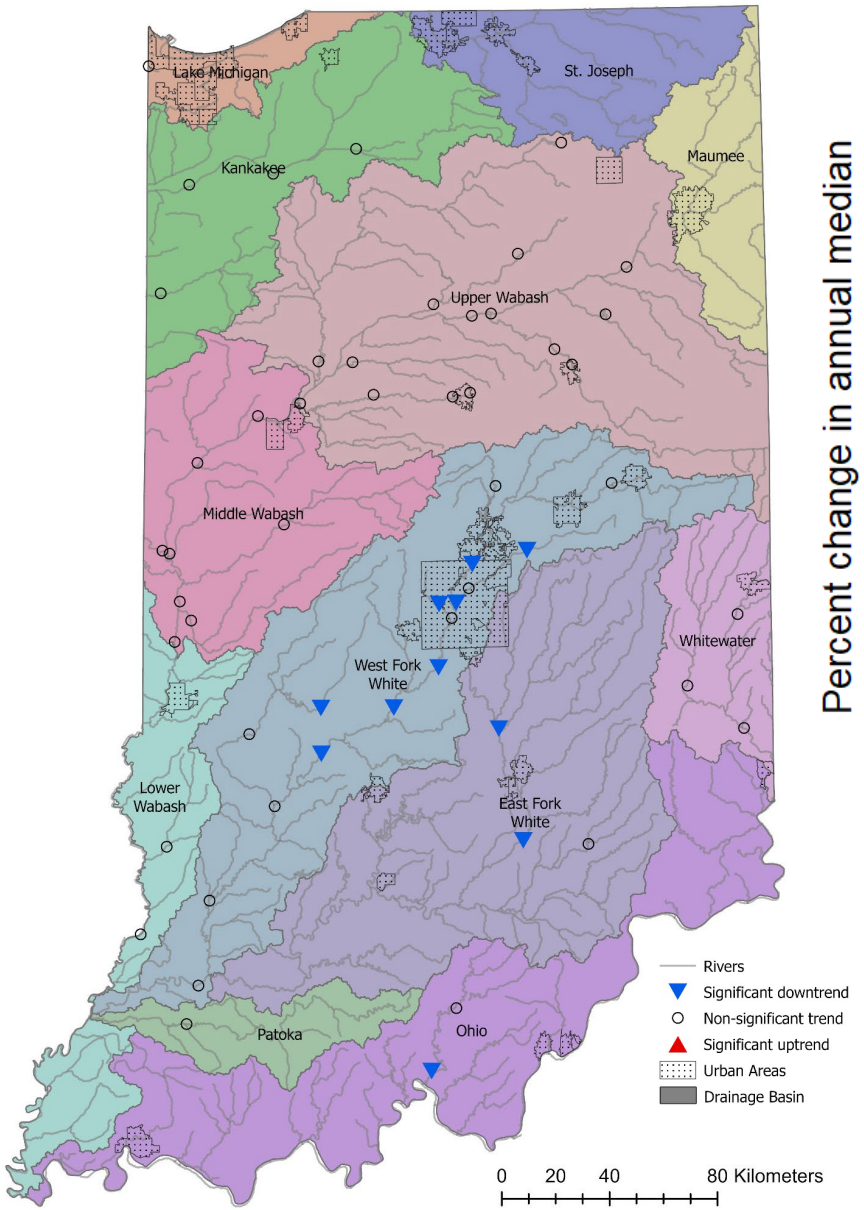
USGS Streamgage

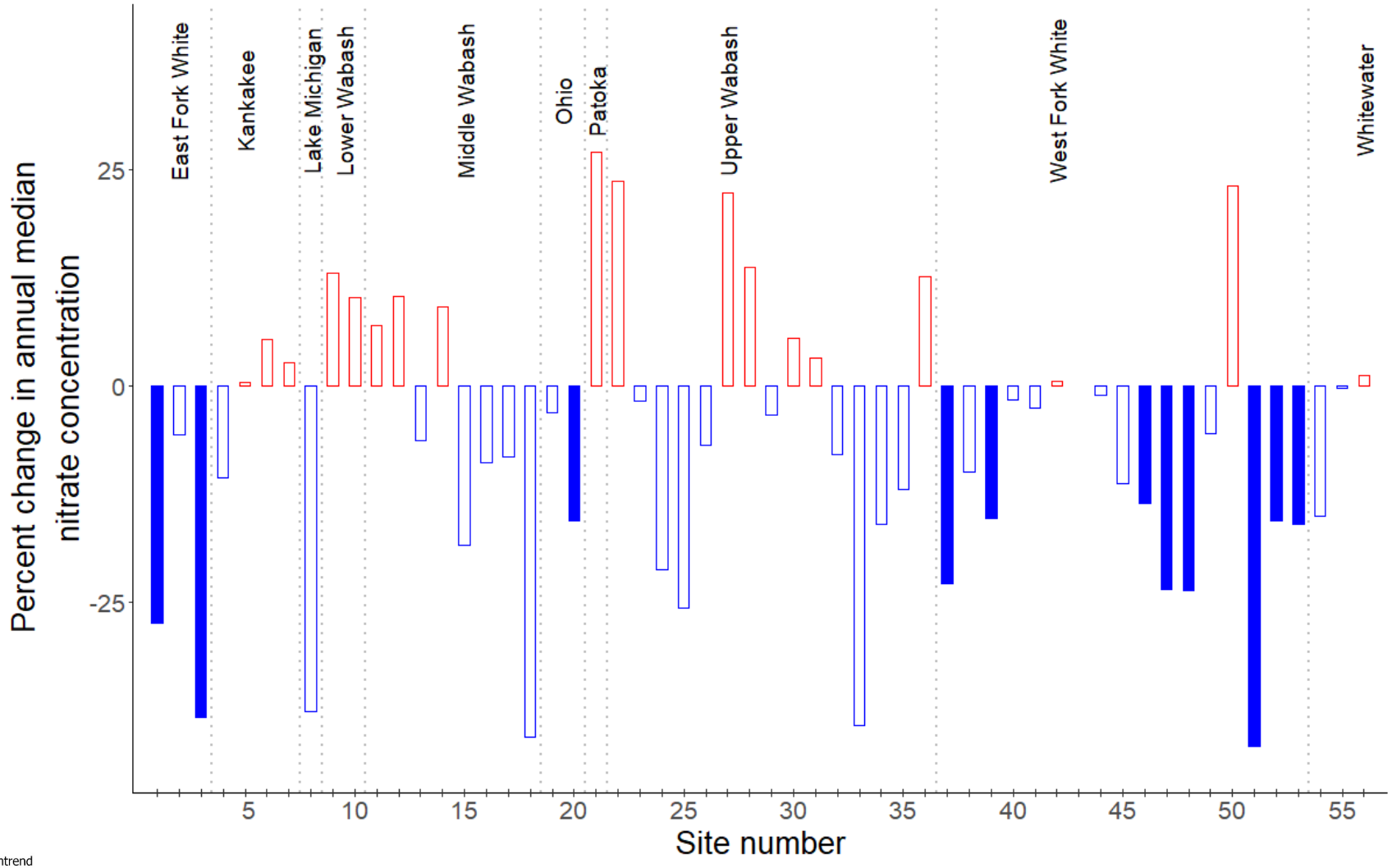
Methods

- 56 sites
- 12 contaminants
  - **Nutrients:** Nitrate, organic nitrogen, phosphorus, and total suspended solids
  - **Ions:** Chloride, sulfate, hardness, and total dissolved solids
  - **Metals:** Lead, iron, copper, and zinc
- 8,530 stream samples
- 672 trend analyses

IDEM staff Joel Armstrong manages water samples at a fixed station site.

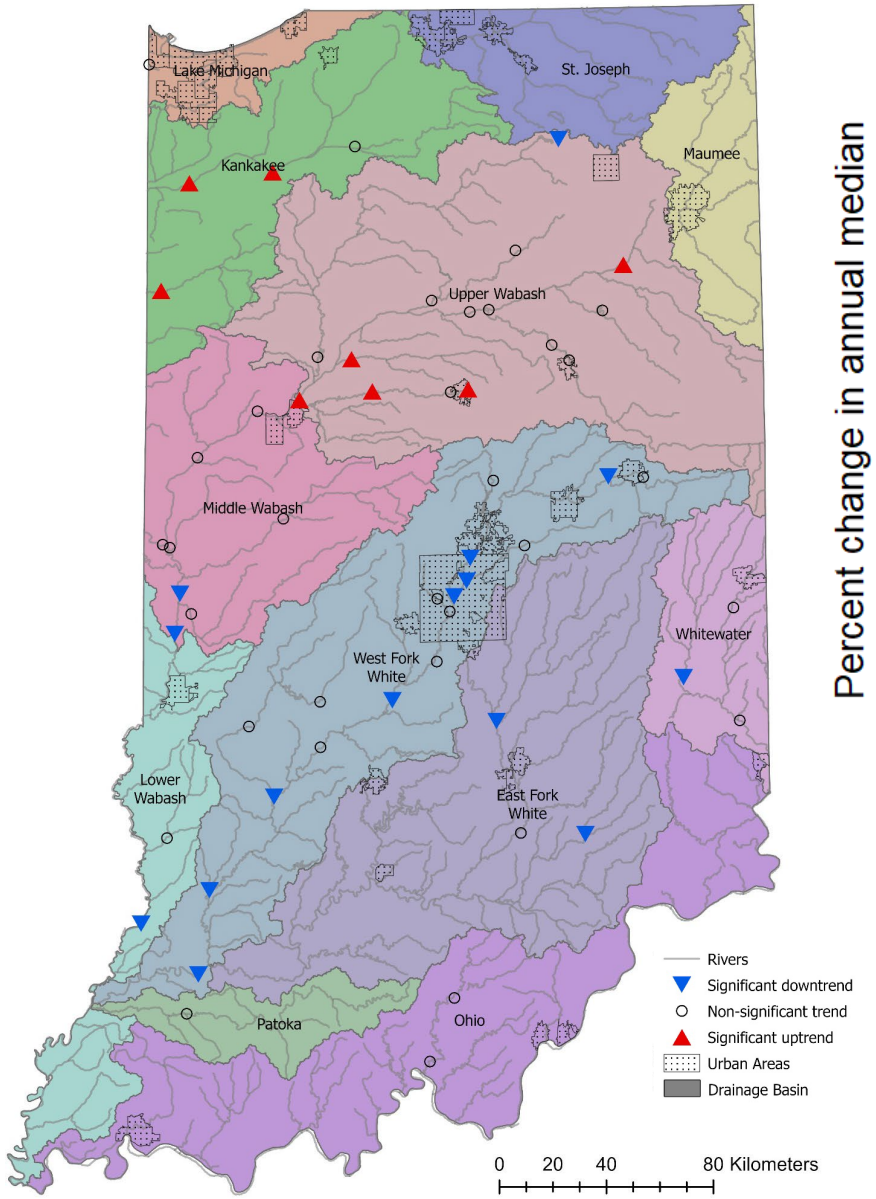
Nitrate

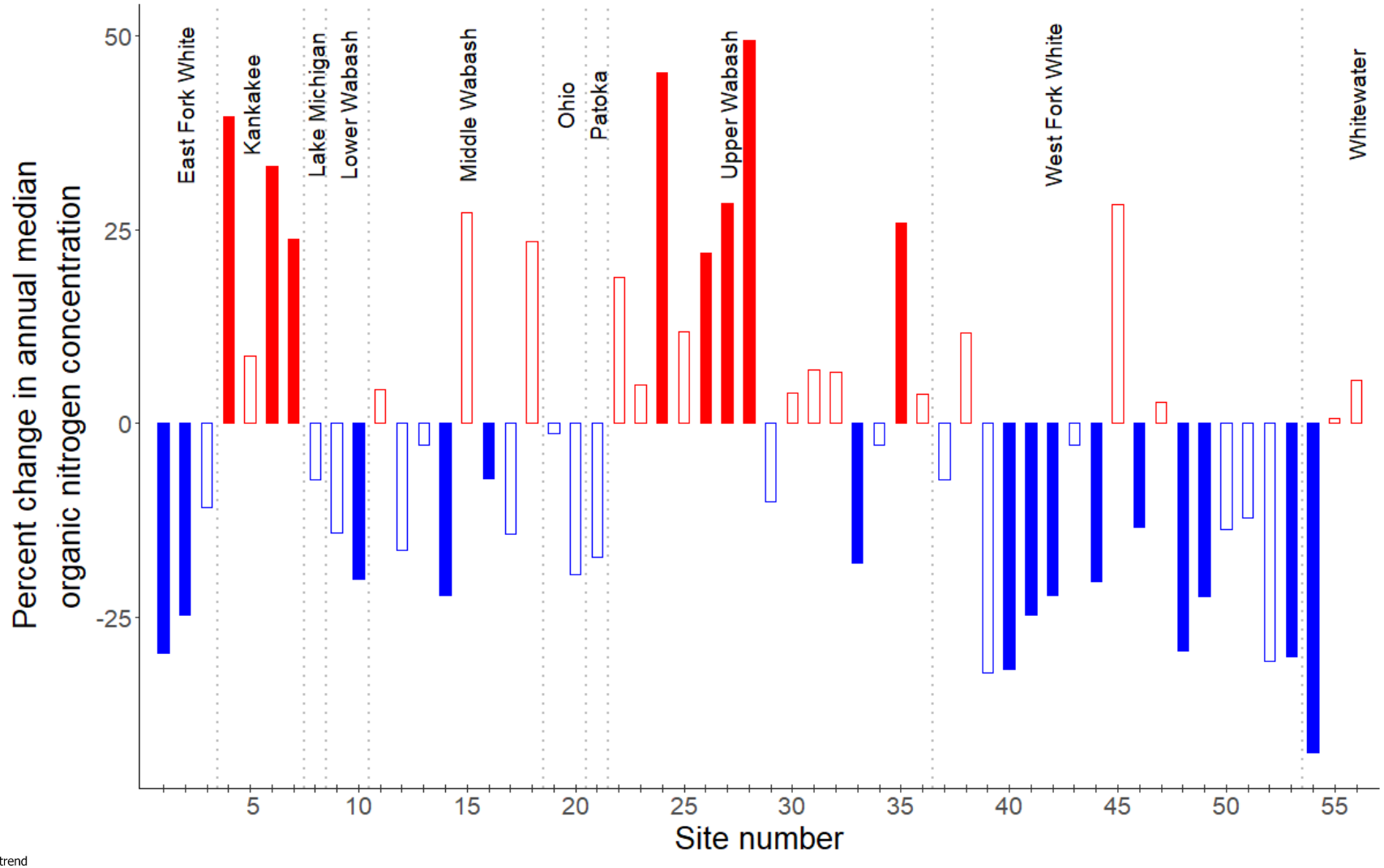




- Nitrate (nitrate + nitrite) has significantly declined; many sites in the West Fork White River Basin

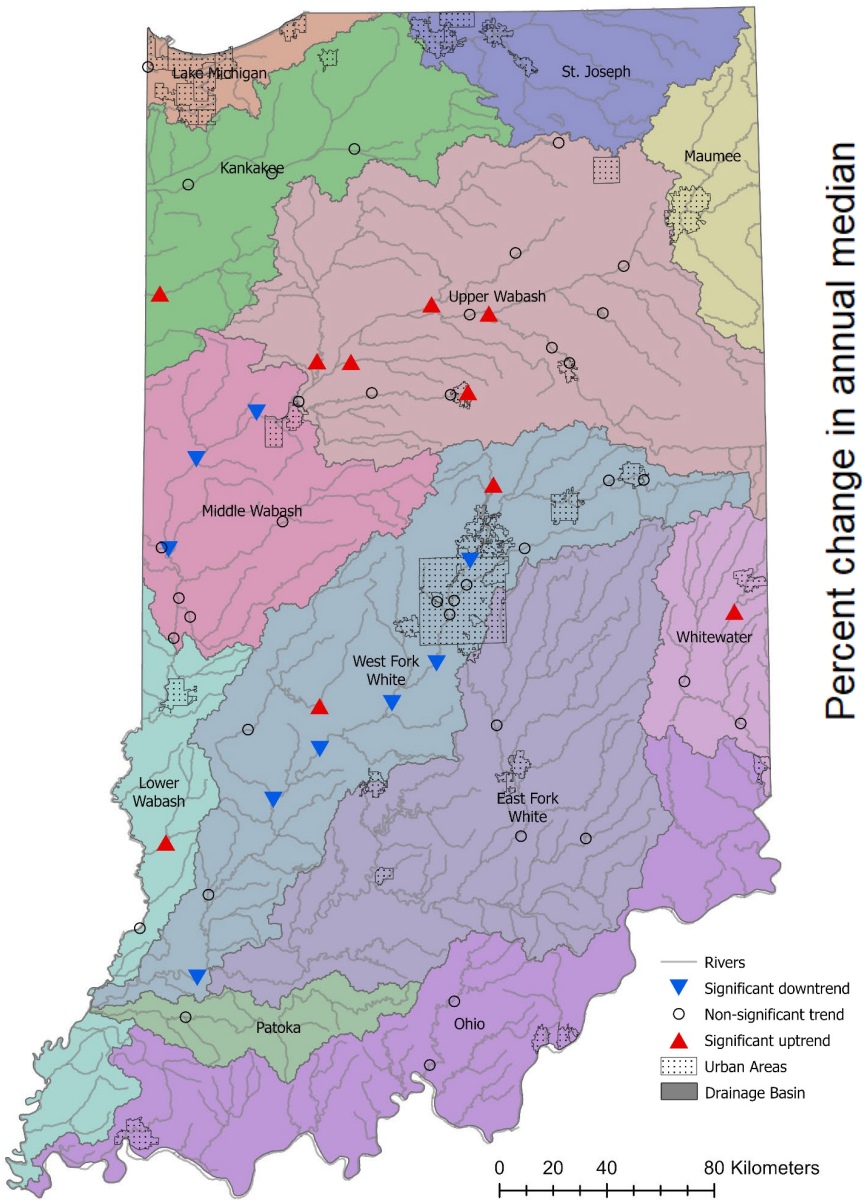
Organic nitrogen

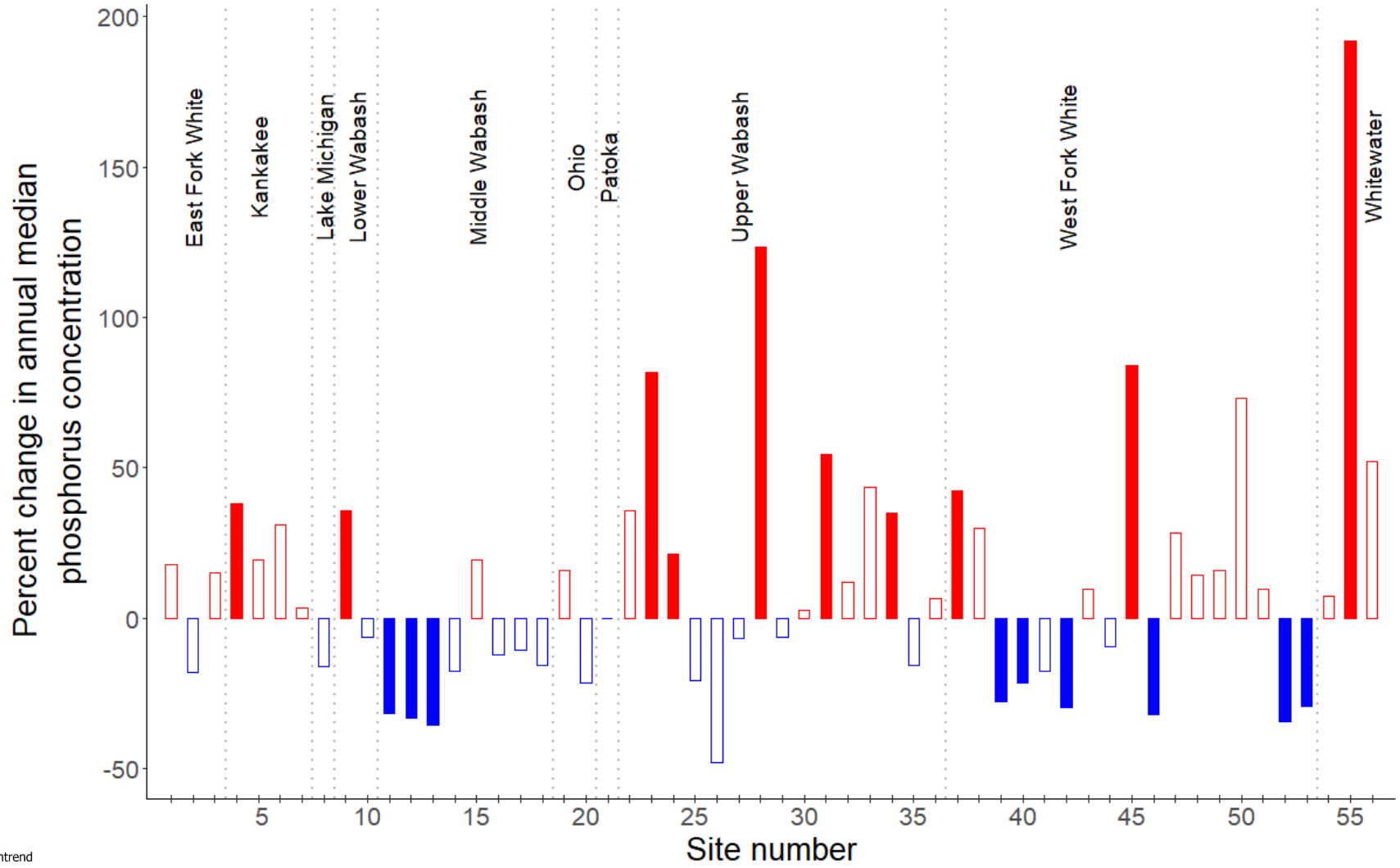




- Organic nitrogen declined at 15 sites – Southern
- Increases at 8 sites – Northern

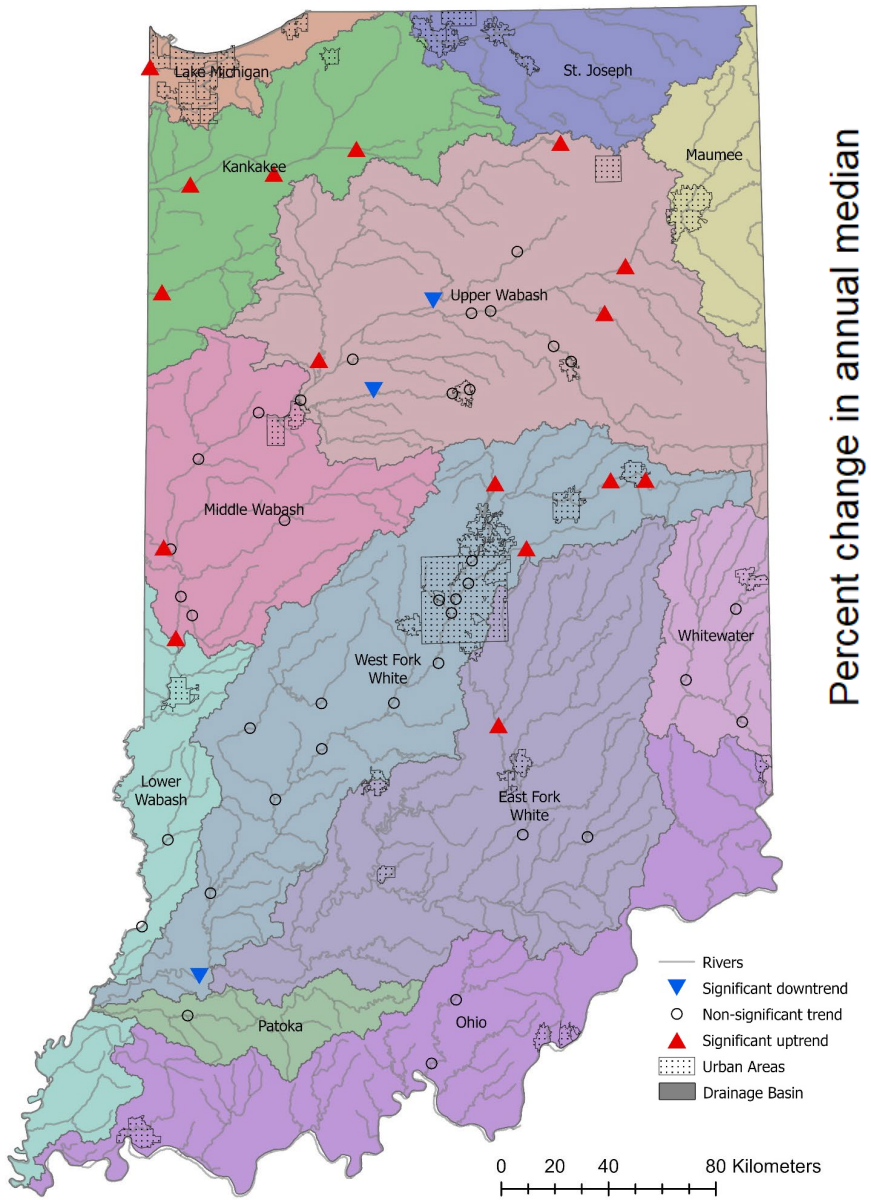
Phosphorus

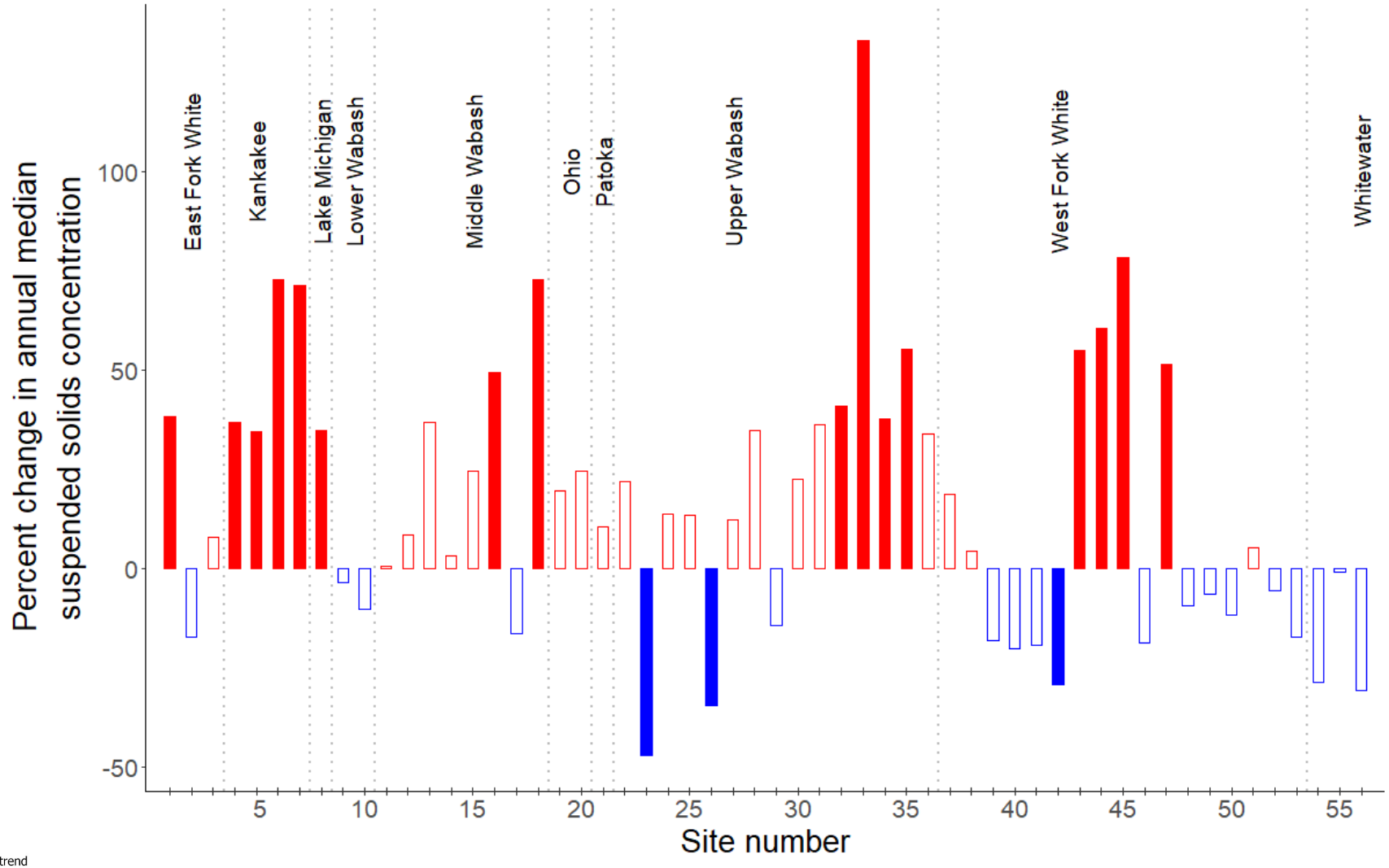




- Phosphorus declined at 9 sites across the state
- Increases seen at 10 sites

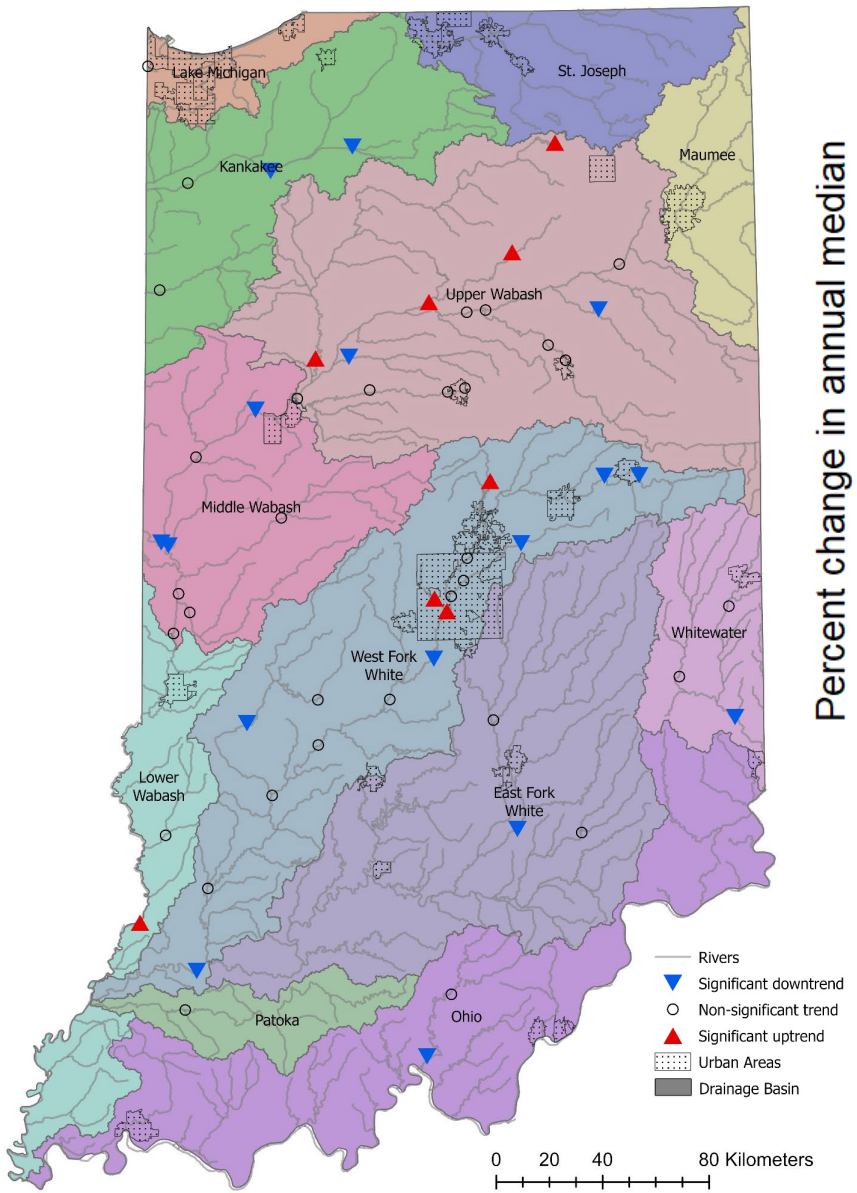
Suspended solids

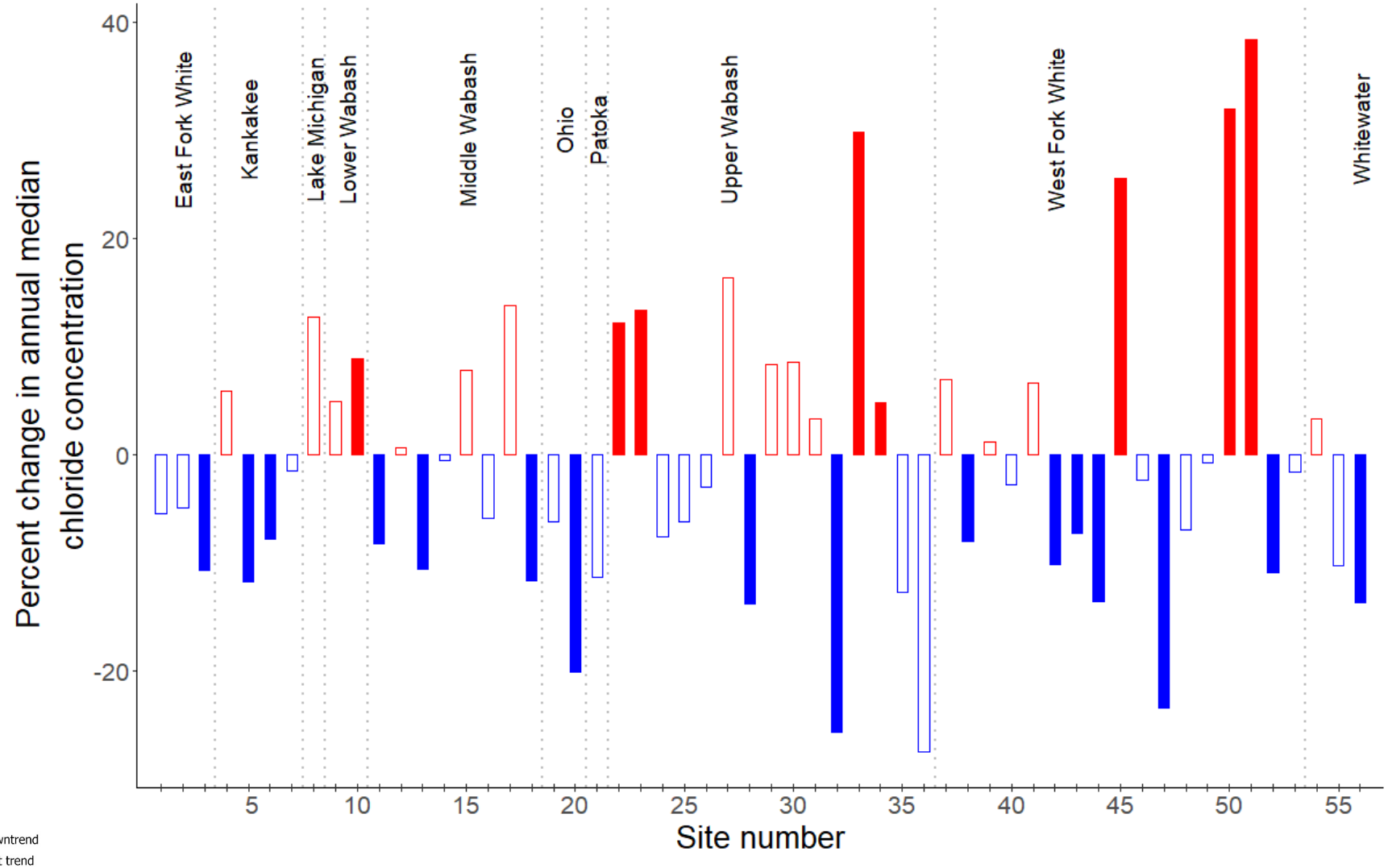




- Suspended solids declined in 3 sites
- Significant increases seen at 16 sites

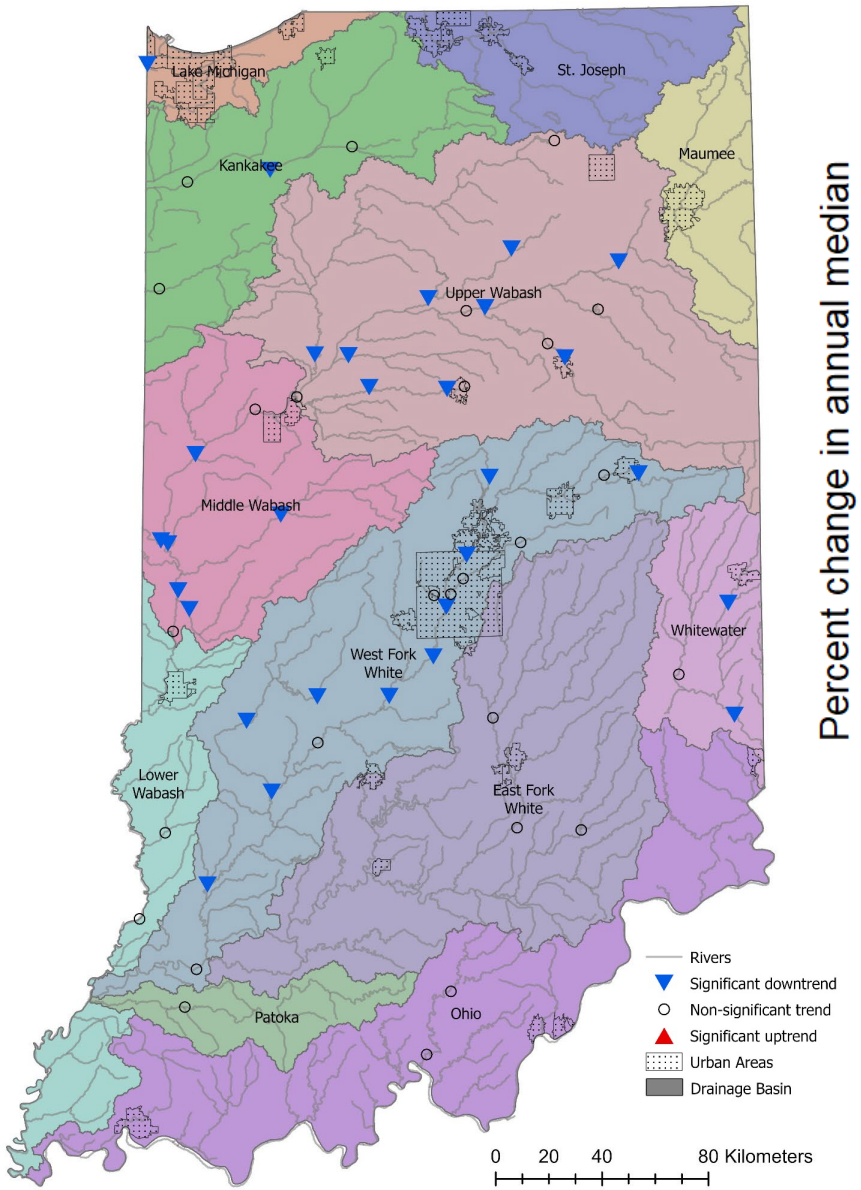
Chloride

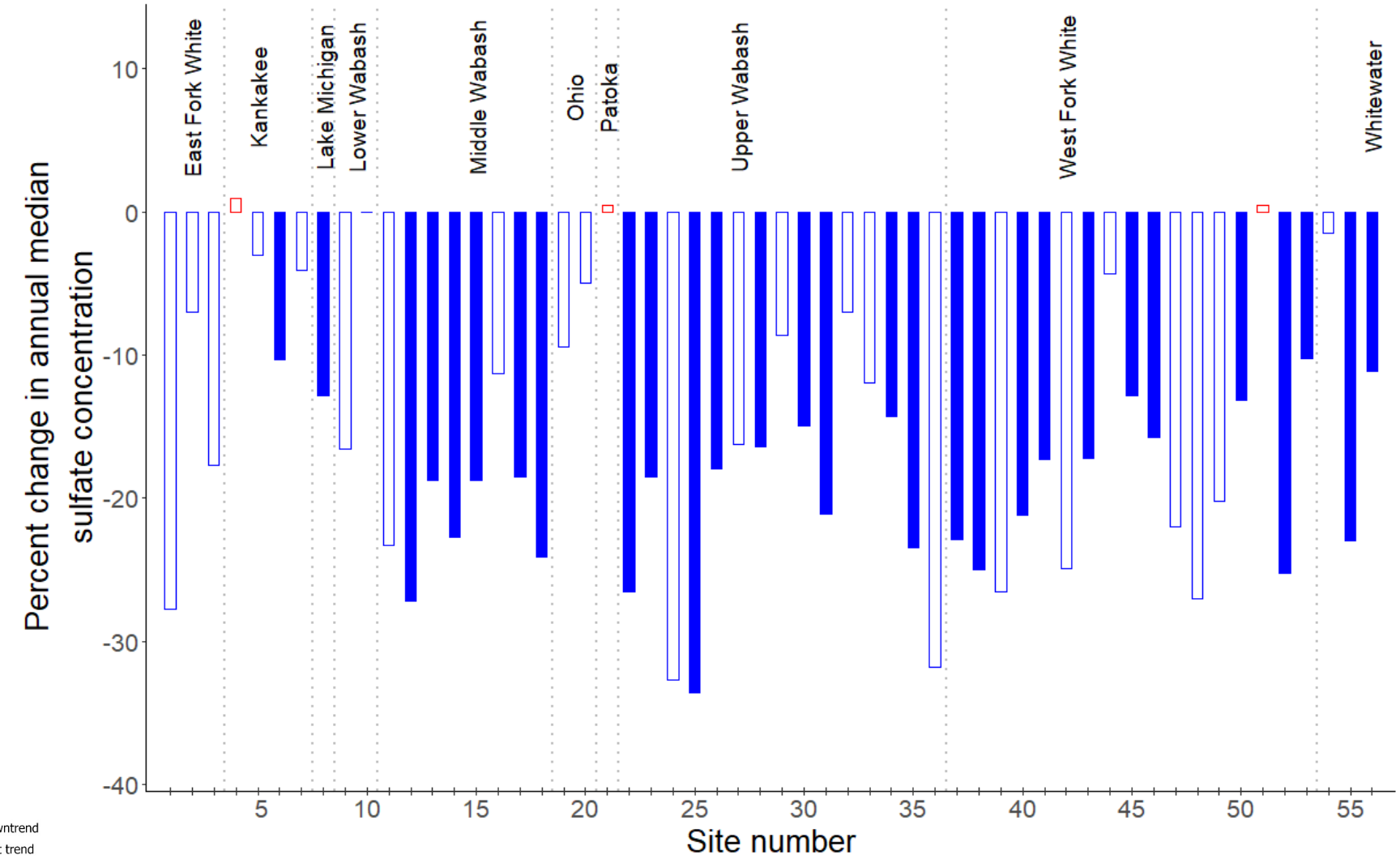




- 8 sites with significant increase in chloride; 4 in the Upper Wabash
- 16 sites with significant declines in chloride across the state

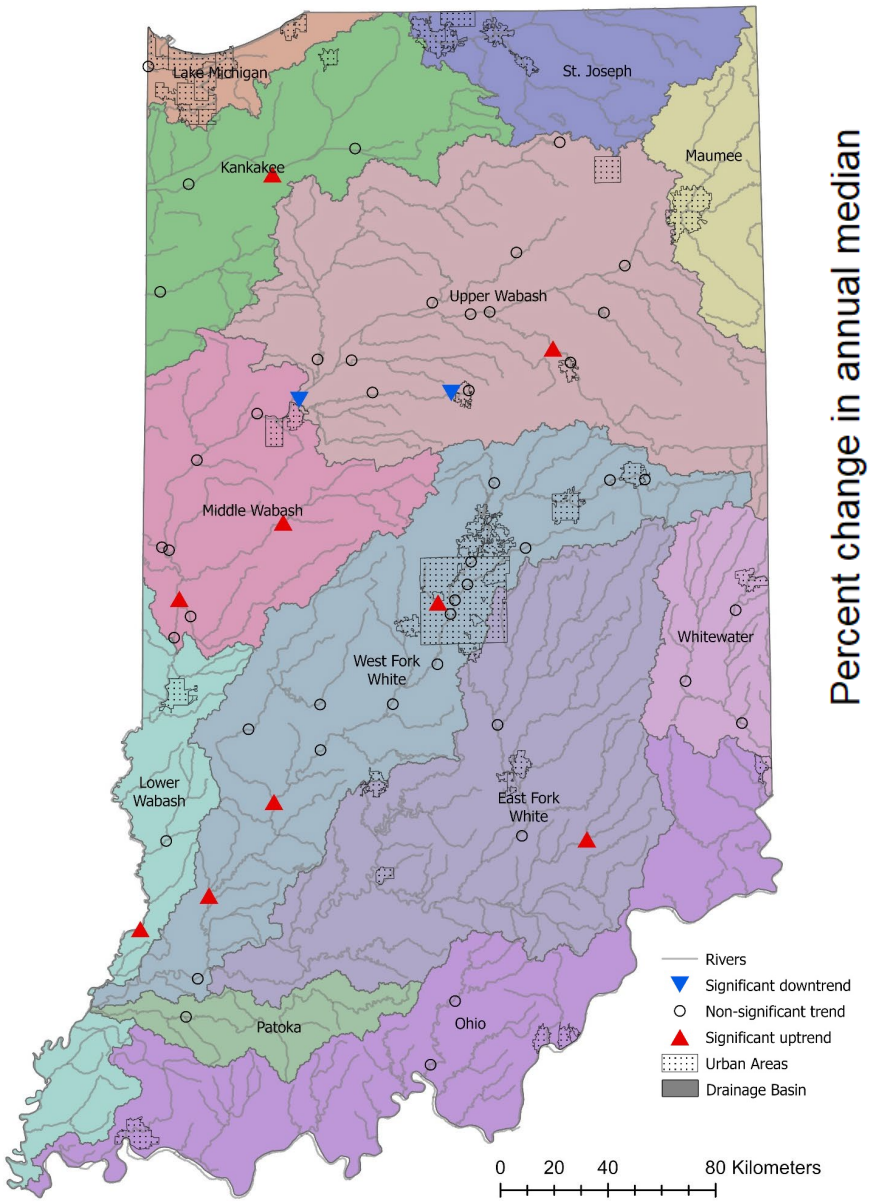
Sulfate

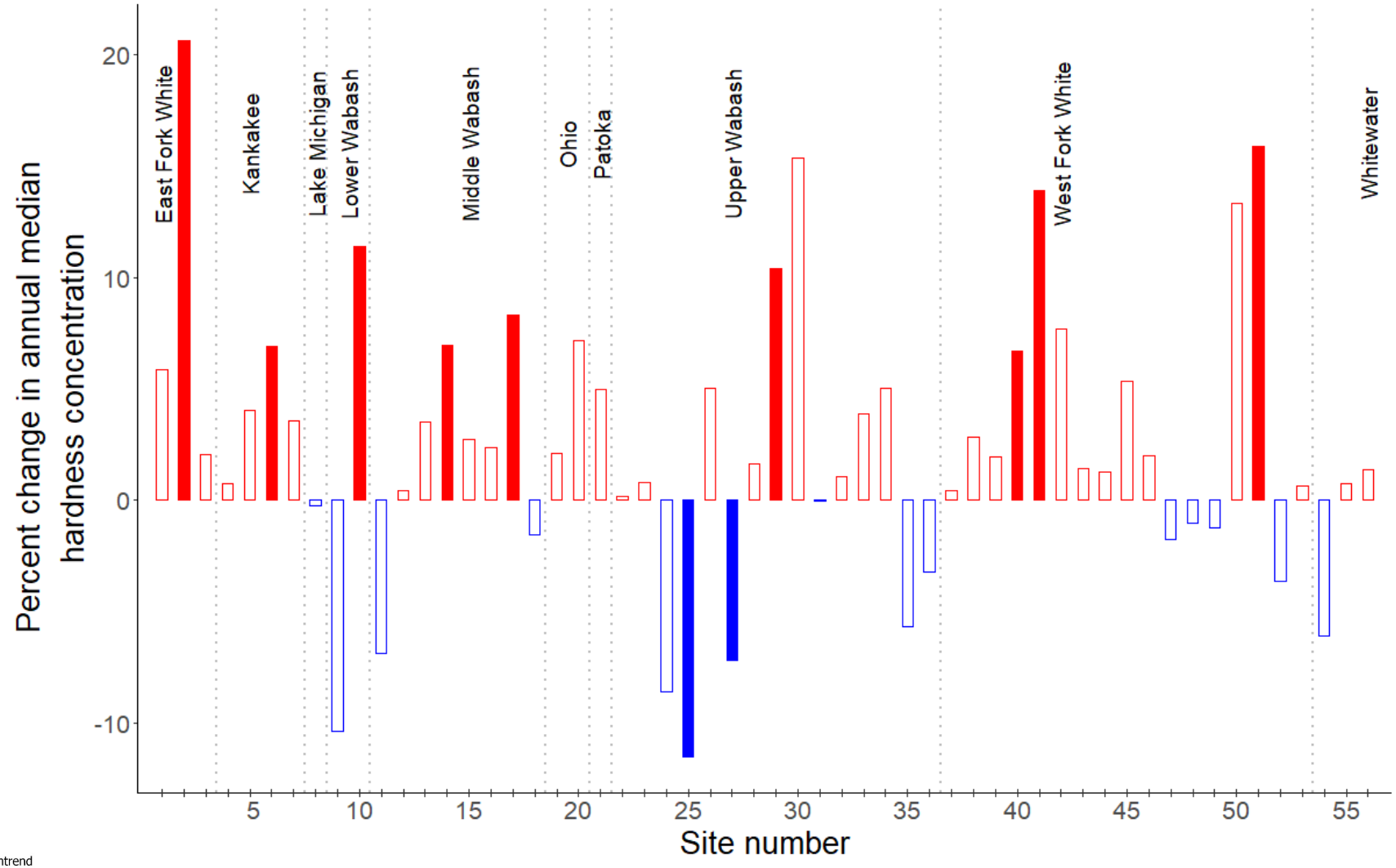




- Sites across the state with significant declines in sulfate concentration

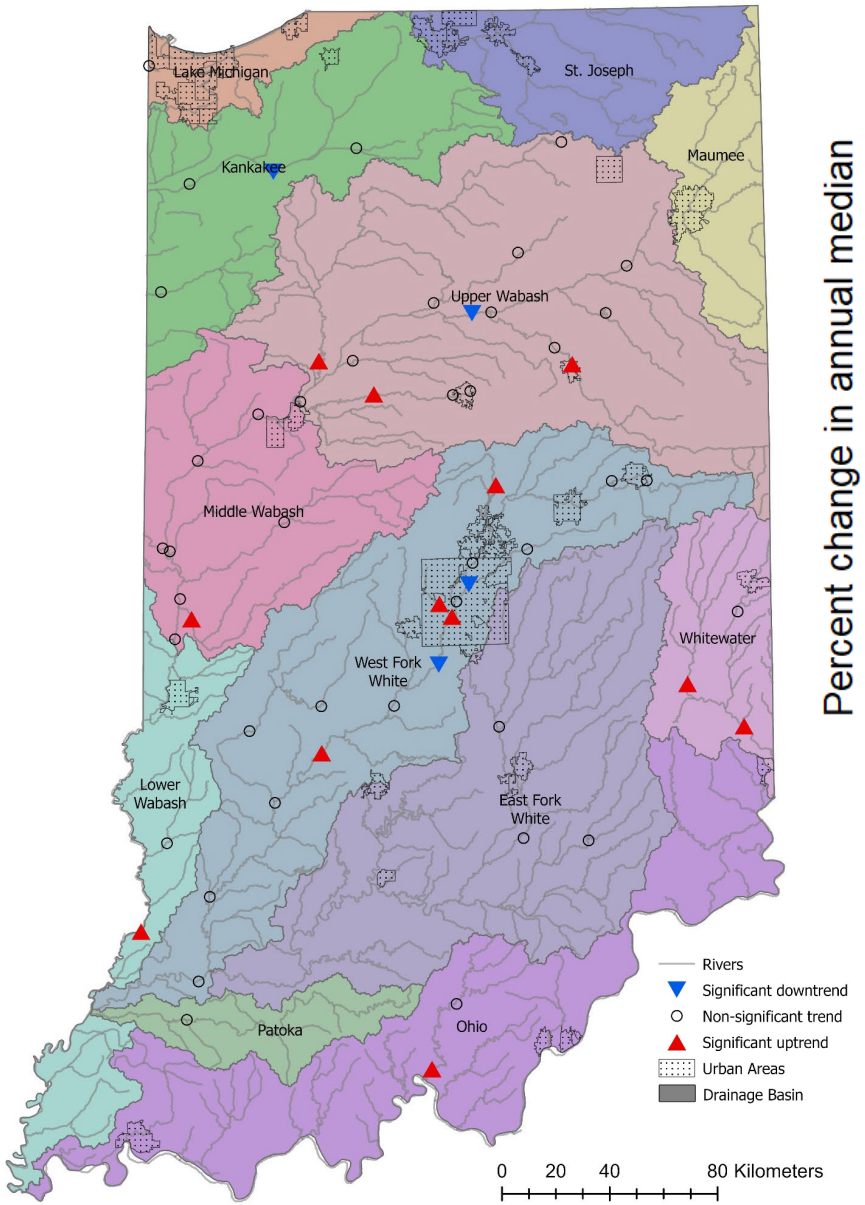
Hardness

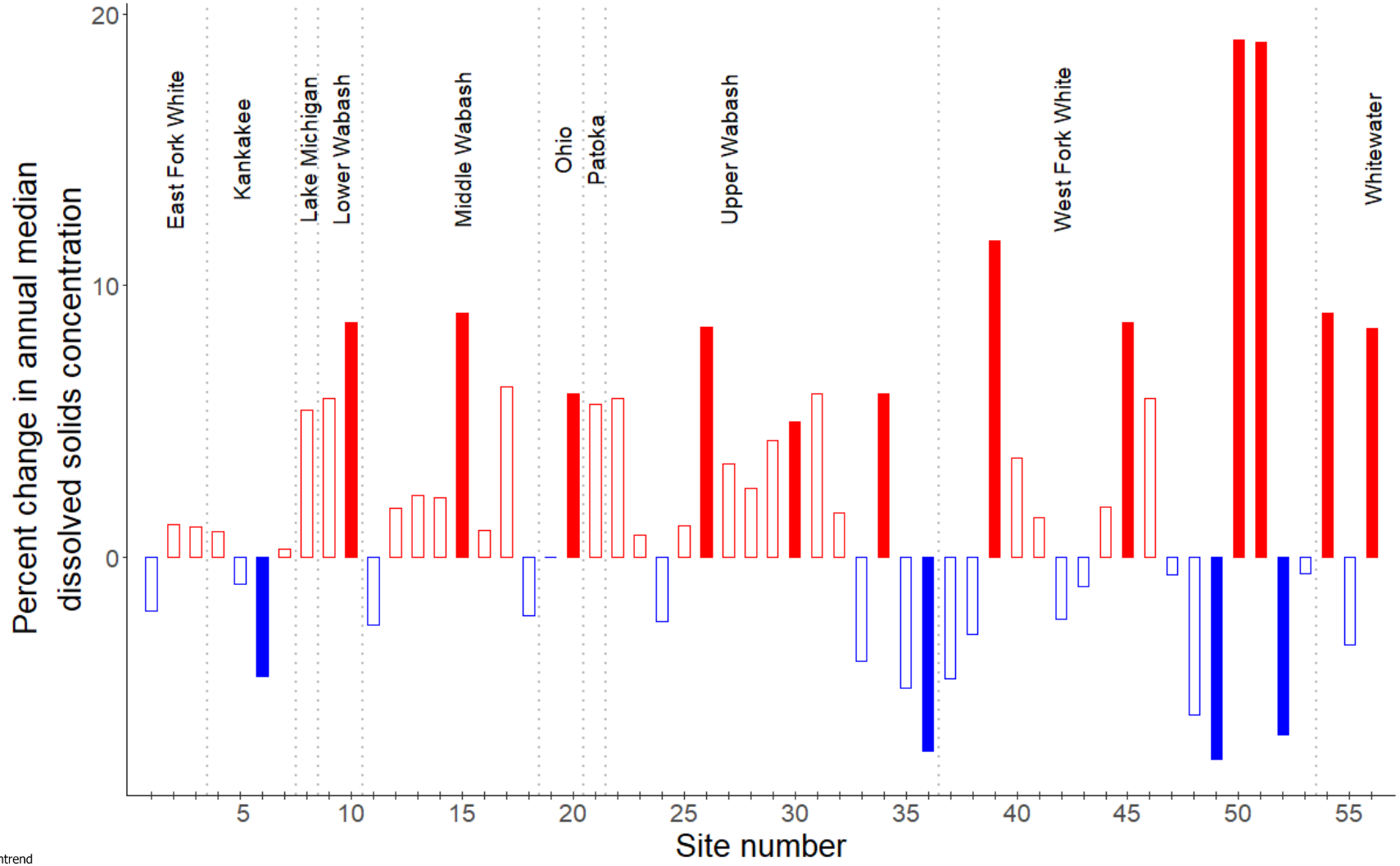




- 9 sites with significant increase in hardness across the state
- 2 sites with significant declines in the Upper Wabash

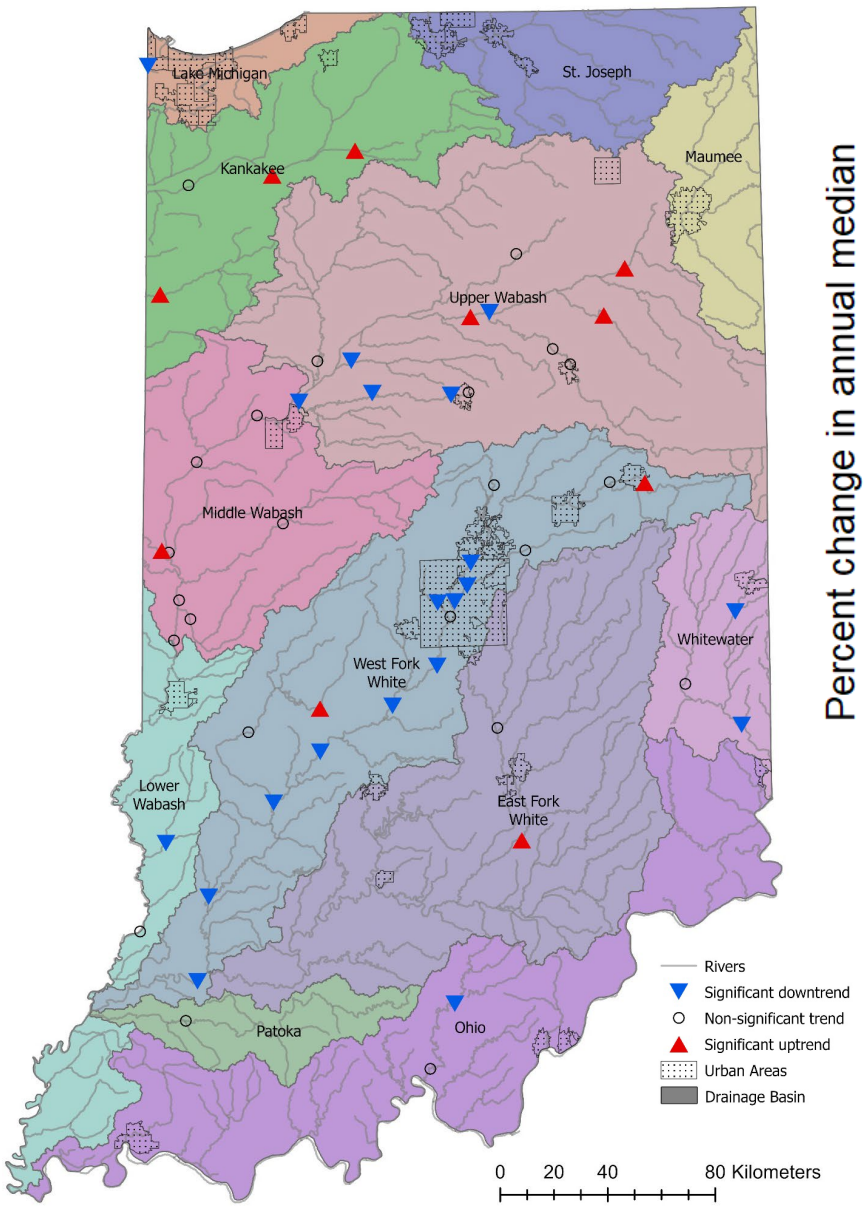
Dissolved solids

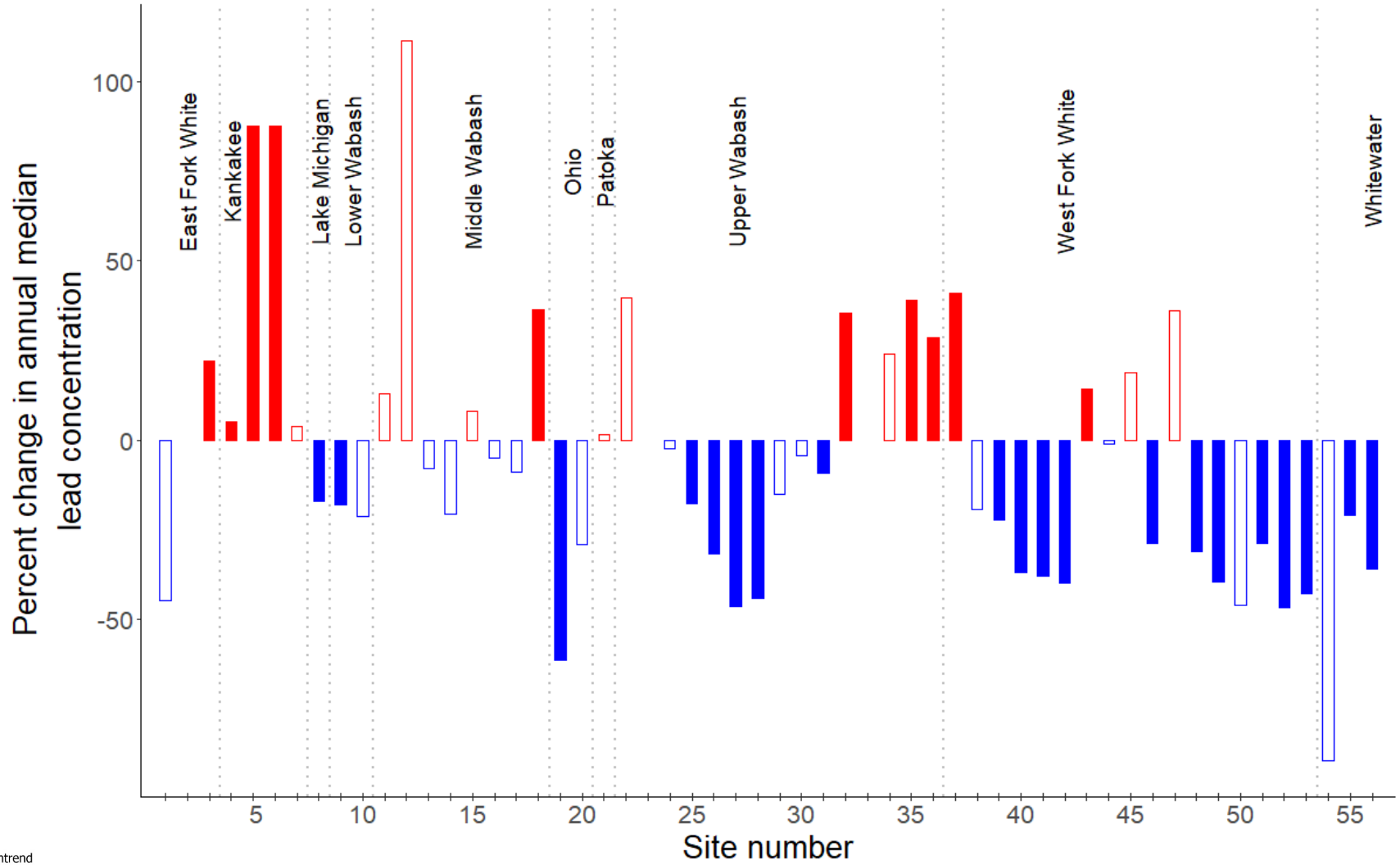




- Dissolved solids increased significantly in 12 sites across the state.
- Significant declines observed in 4 sites across the state

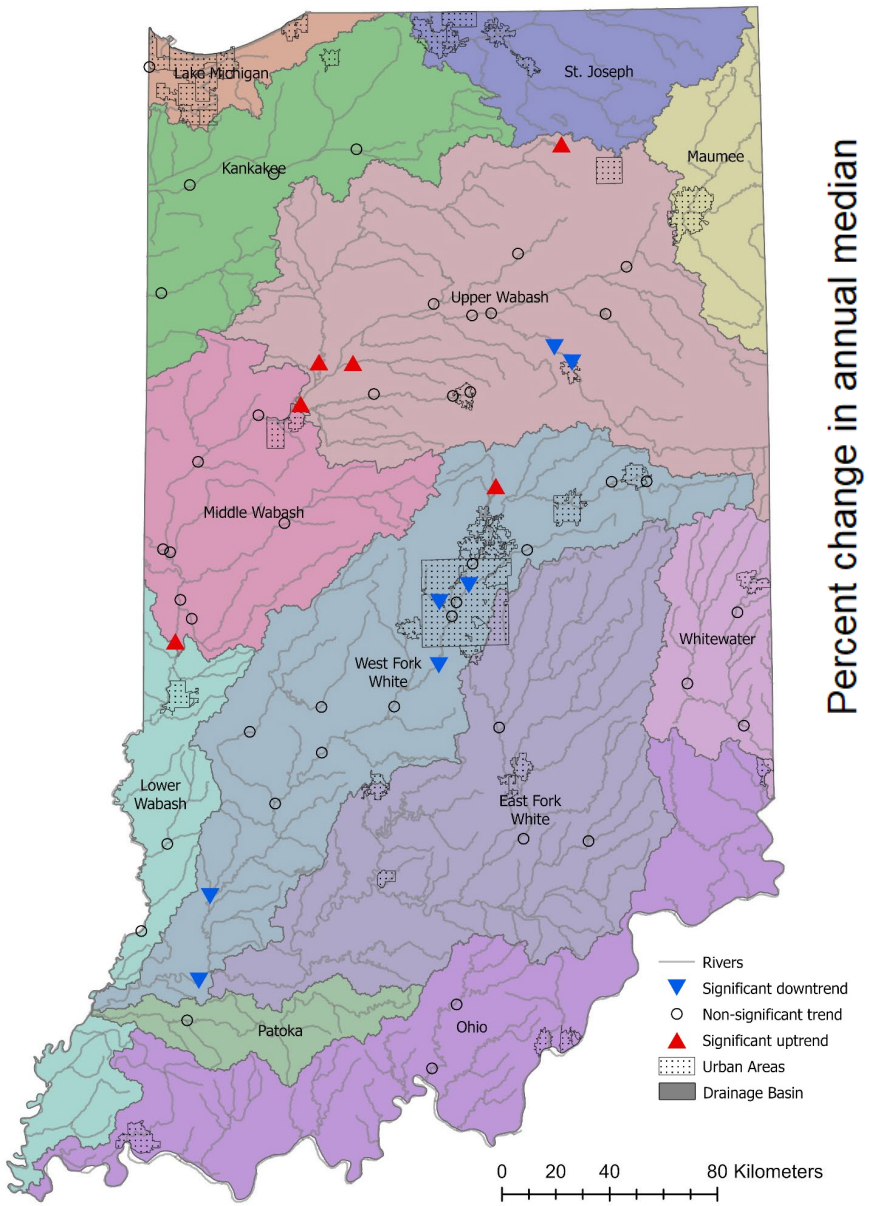
Lead

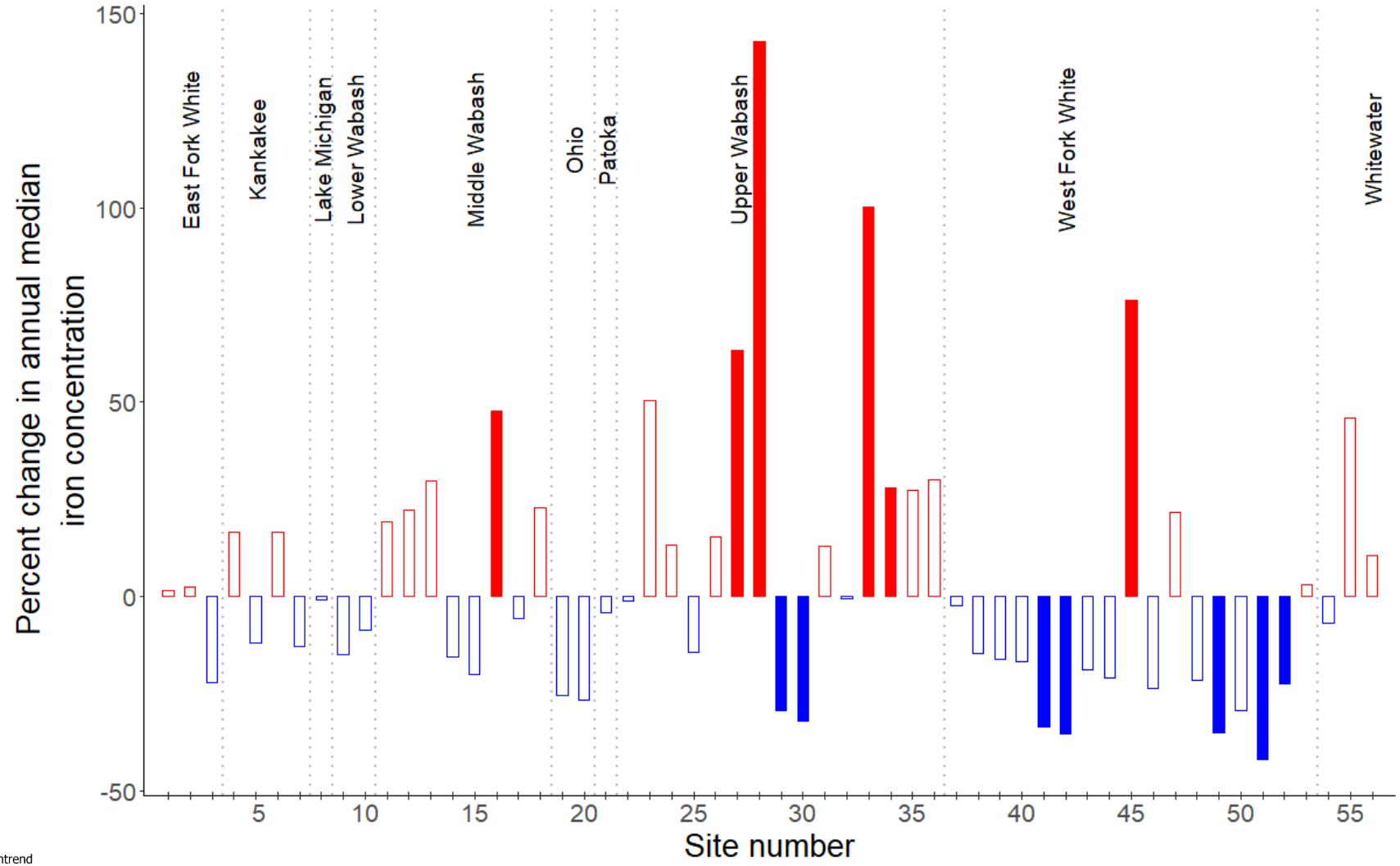




- 20 sites with significant declines in total lead
- 10 sites with significant increase in total lead across the state; all sites in the Kankakee River Basin

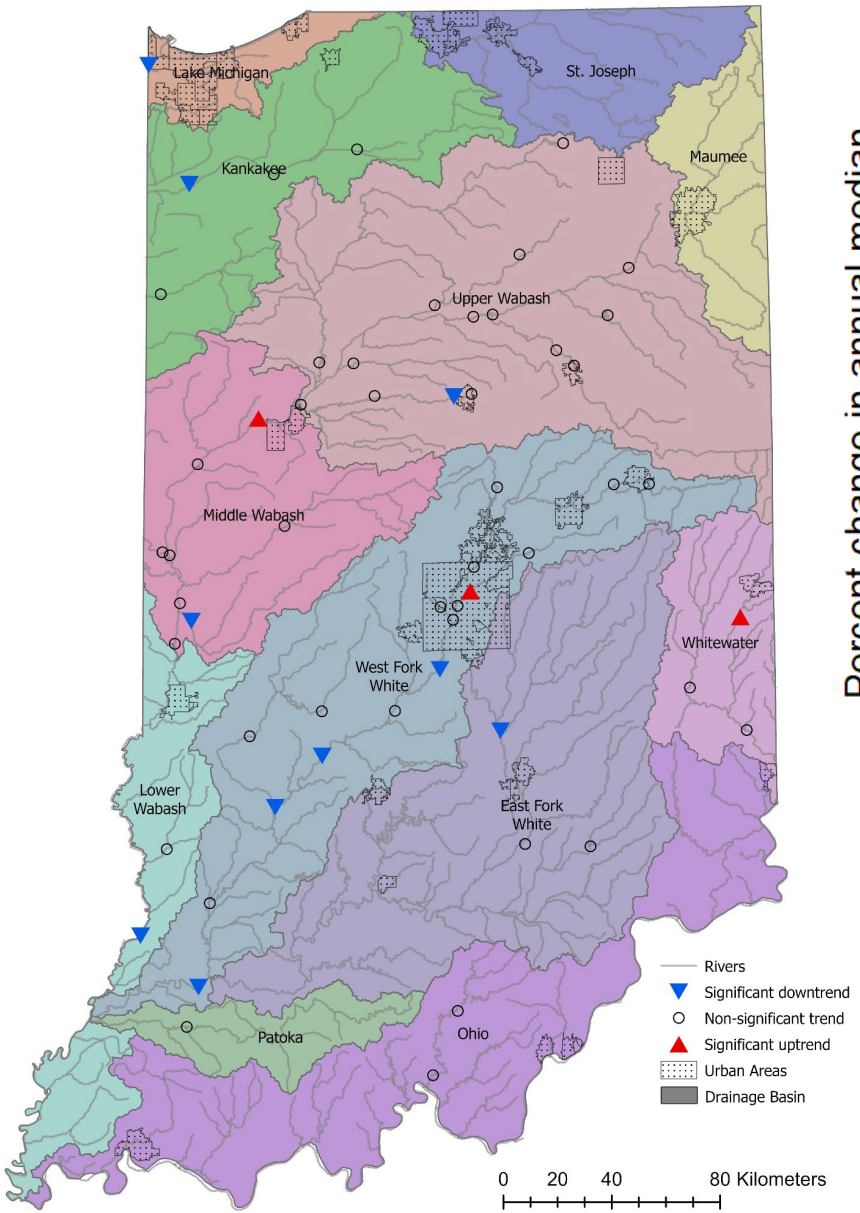
Iron

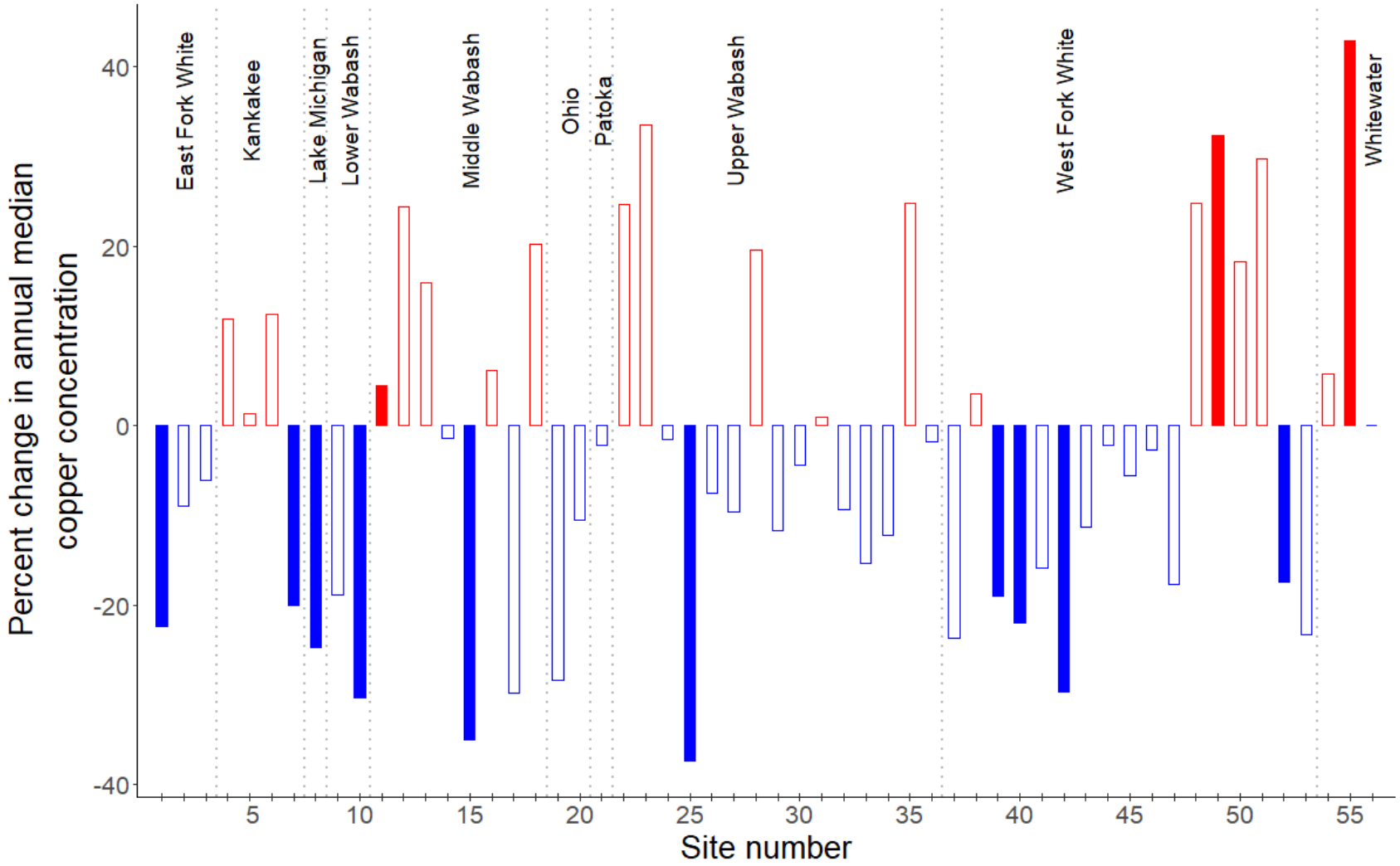




- 6 sites with significant increase in iron concentration (Northern)
- 7 sites with significant decline in iron concentration; 5 sites in the West Fork White River Basin

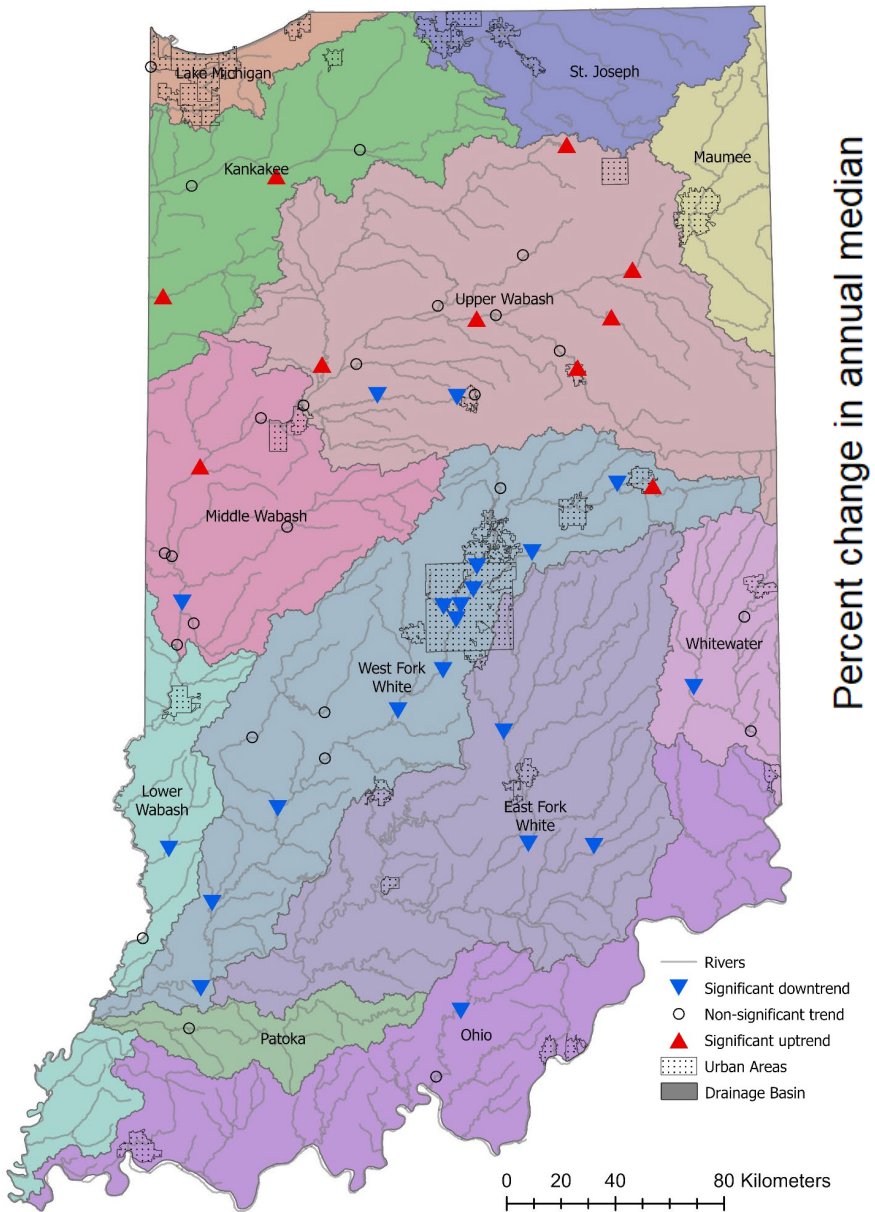
Copper

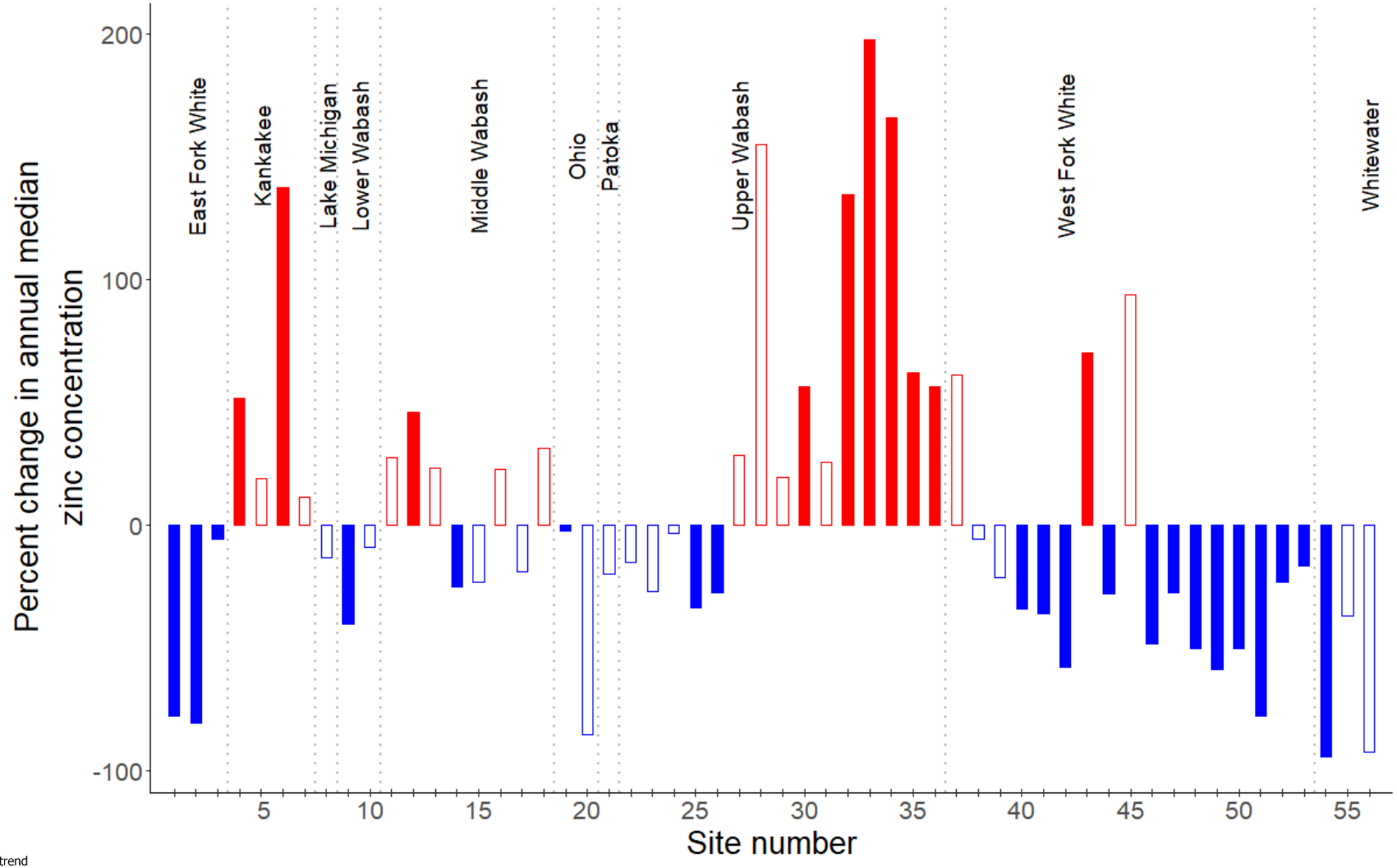




- 3 sites downstream of urban areas with significant increase in copper concentration
- 10 sites with significant declines across the state

Zinc

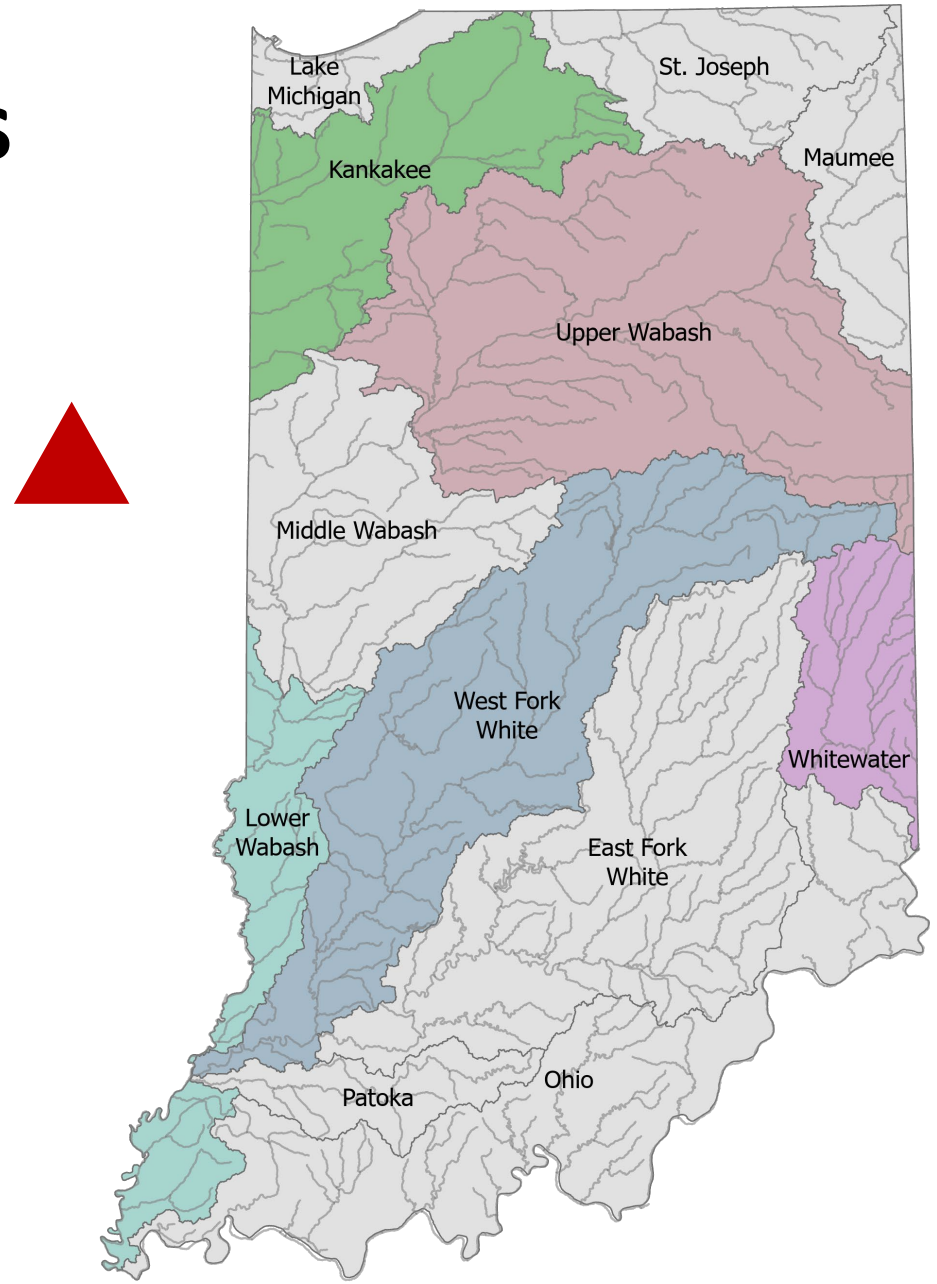




- 21 sites with significant declines in zinc concentration - Southern
- 10 sites with significant increase in zinc concentration - Northern

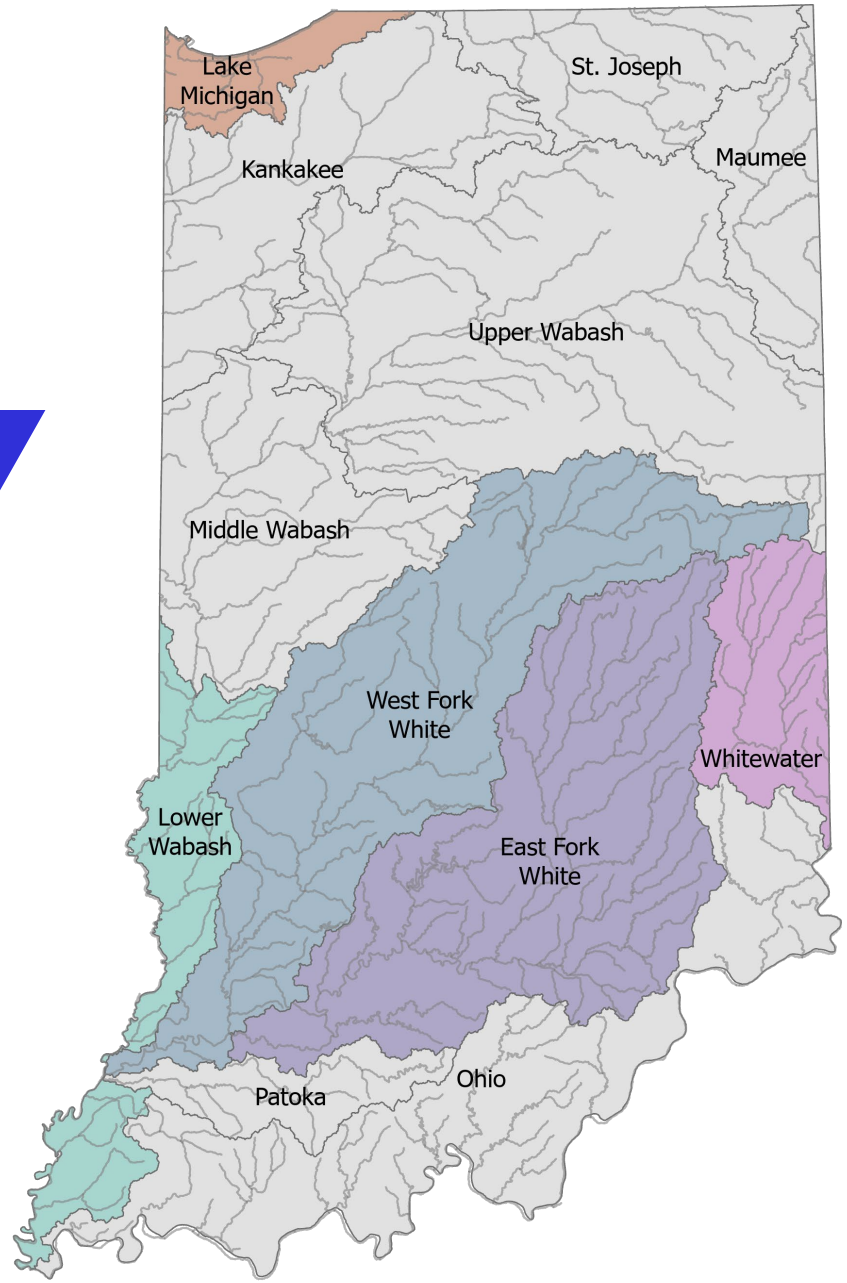
Summary – Regional results

River Basin	Uptrends
Kankakee	29%
Upper Wabash	20%
Lower Wabash	17%
Whitewater	11%
West Fork White	10%



Summary – Regional results

River Basin	Downtrends
West Fork White	35%
East Fork White	26%
Lake Michigan	25%
Whitewater	19%
Lower Wabash	17%



Summary – Surface Water Criteria

Substance	Criteria	% samples exceeding
Nitrate*	10 mg/L	0.4%
Chloride	516 - 881 mg/L	0%
Sulfate*	500- 2,689 mg/L	0%
Lead	37 – 280 µg/L	0%
Copper	10 - 63 µg/L	0.05%
Zinc	76 – 379 µg/L	0%

* Criteria for the protection of human health

Summary – Great Lakes Water Criteria

One site on the Little Calumet River in Lake Michigan Drainage Basin

Substance	Criteria	% samples exceeding
Nitrate*	10 mg/L	1.74%
Chloride	250 mg/L	6%
Sulfate	250 mg/L	0%
Dissolved Solids	750 µg/L	23%

* Criteria for the protection of human health

Questions?

Take a closer look on our **ArcGIS Story Map** and **Interactive Maps**

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