25 YEARS OF WATER QUALITY CHANGE IN RHODE ISLAND LAKES AND PONDS

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of Natural Resources Science

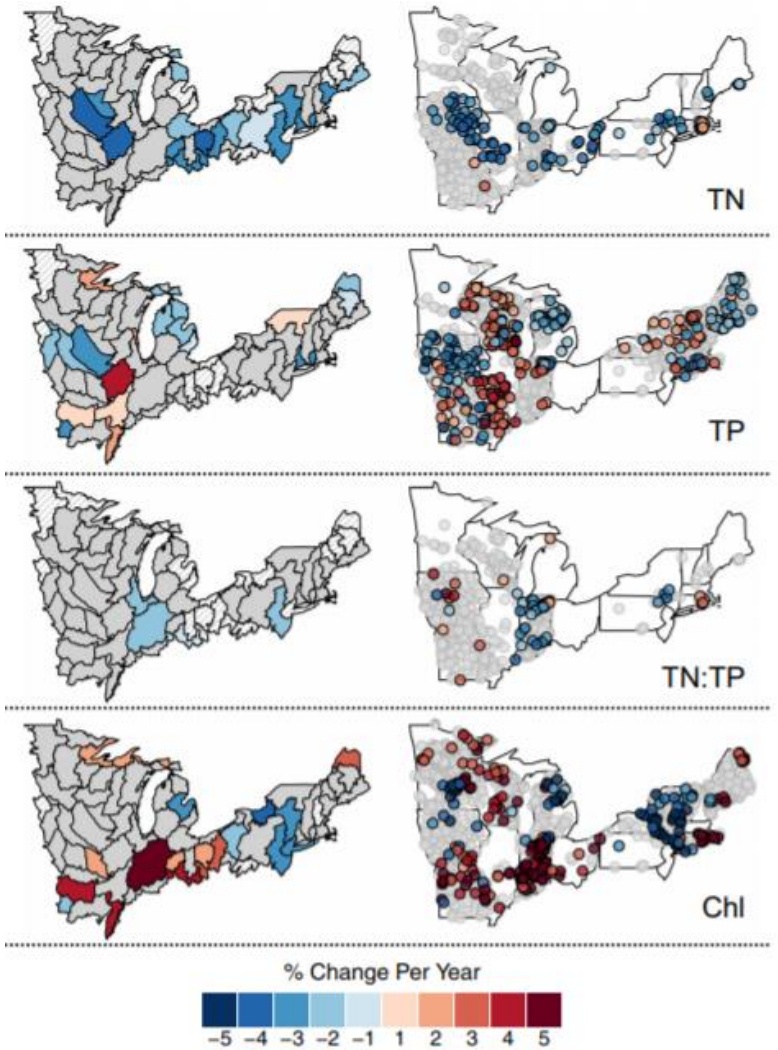
Trends in decadal water quality changes… stasis?

PRIMARY RESEARCH ARTICLE

WILEY Global Change Biology

Unexpected stasis in a changing world: Lake nutrient and chlorophyll trends since 1990

Samantha K. Oliver[1] | Sarah M. Collins[1,2] | Patricia A. Soranno[2] | Tyler Wagner[3] | Emily H. Stanley[1] | John R. Jones[4] | Craig A. Stow[5] | Noah R. Lottig[1]



Oliver et. al. 2017. Global Change Biology 23:5455-5467

Trends in decadal water quality changes… declining?

Is Vermont Losing
Its Oligotrophic Lakes?

Leslie Matthews, Kellie Merrell, and Perry Thomas

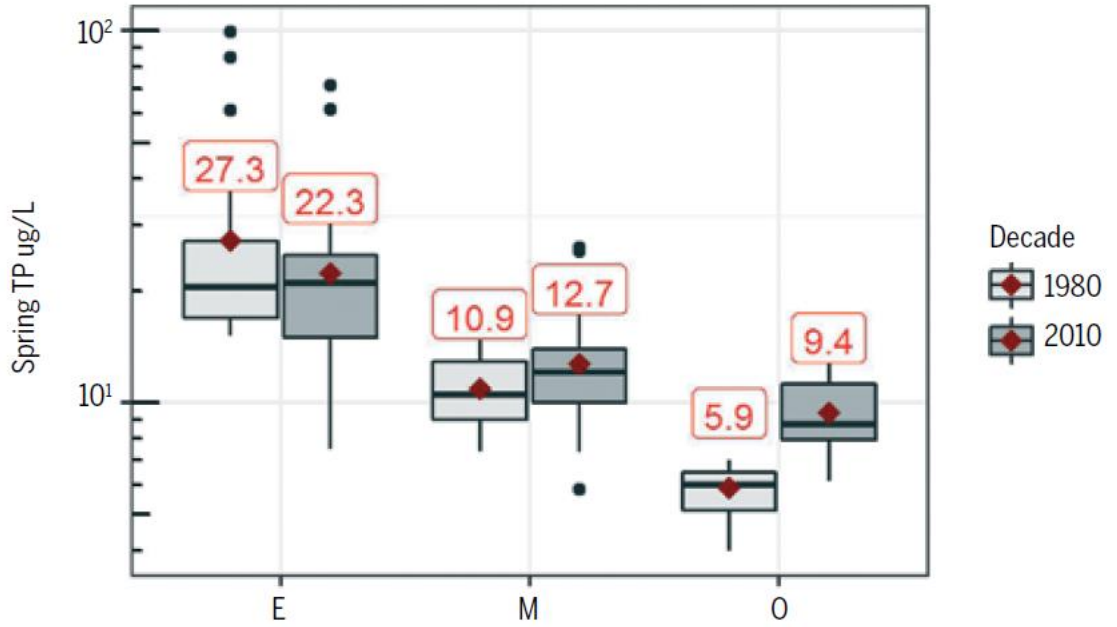


Figure 1. Boxplots (log scale) showing median, first and third quartiles, outliers, and mean (red diamonds and red text) spring TP (µg/L) for eutrophic (E), mesotrophic (M) and oligotrophic (O) lakes during the 1980s (lighter shading) and the current decade (darker shading).

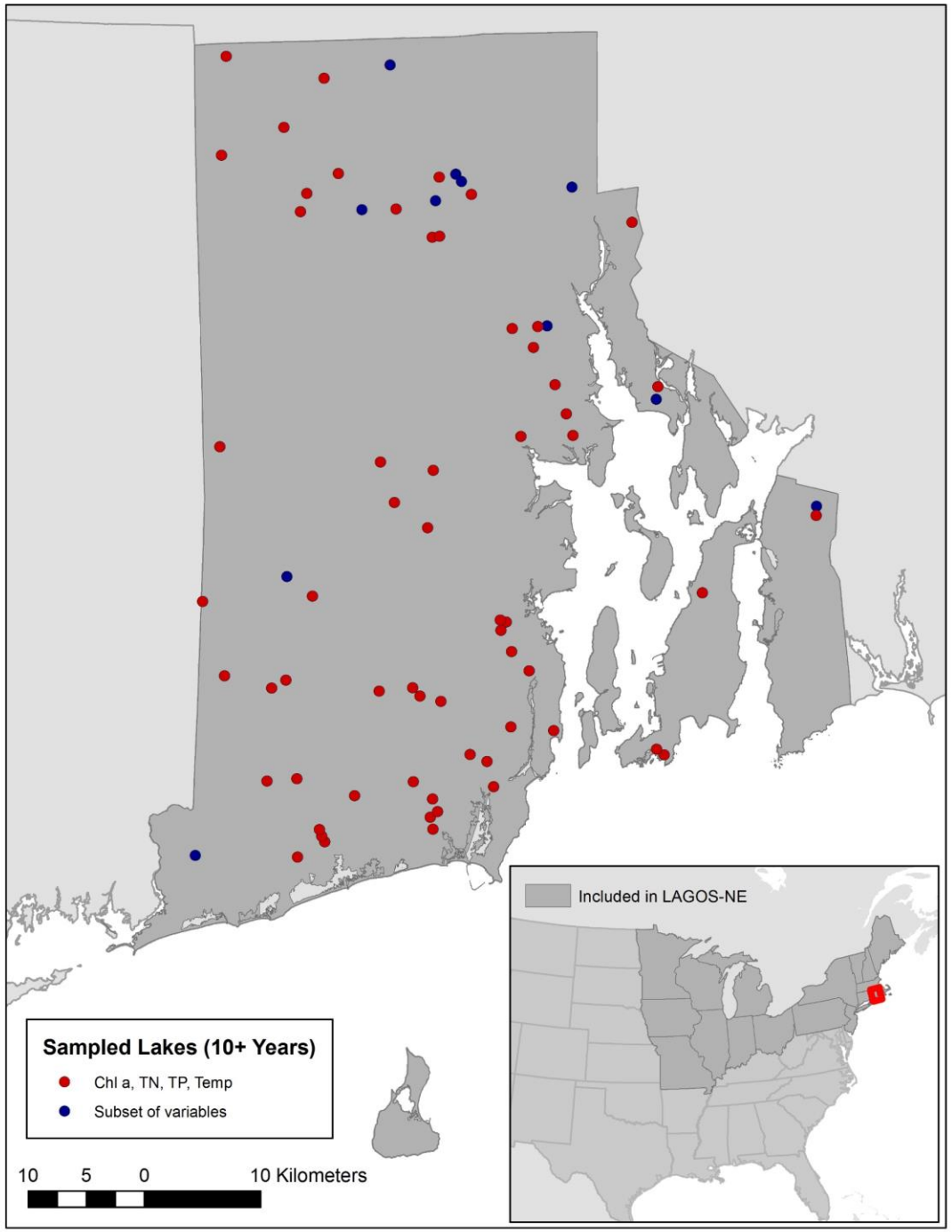
Matthews et. al. 2018. LakeLine: Summer 2018.

URI Watershed Watch overview

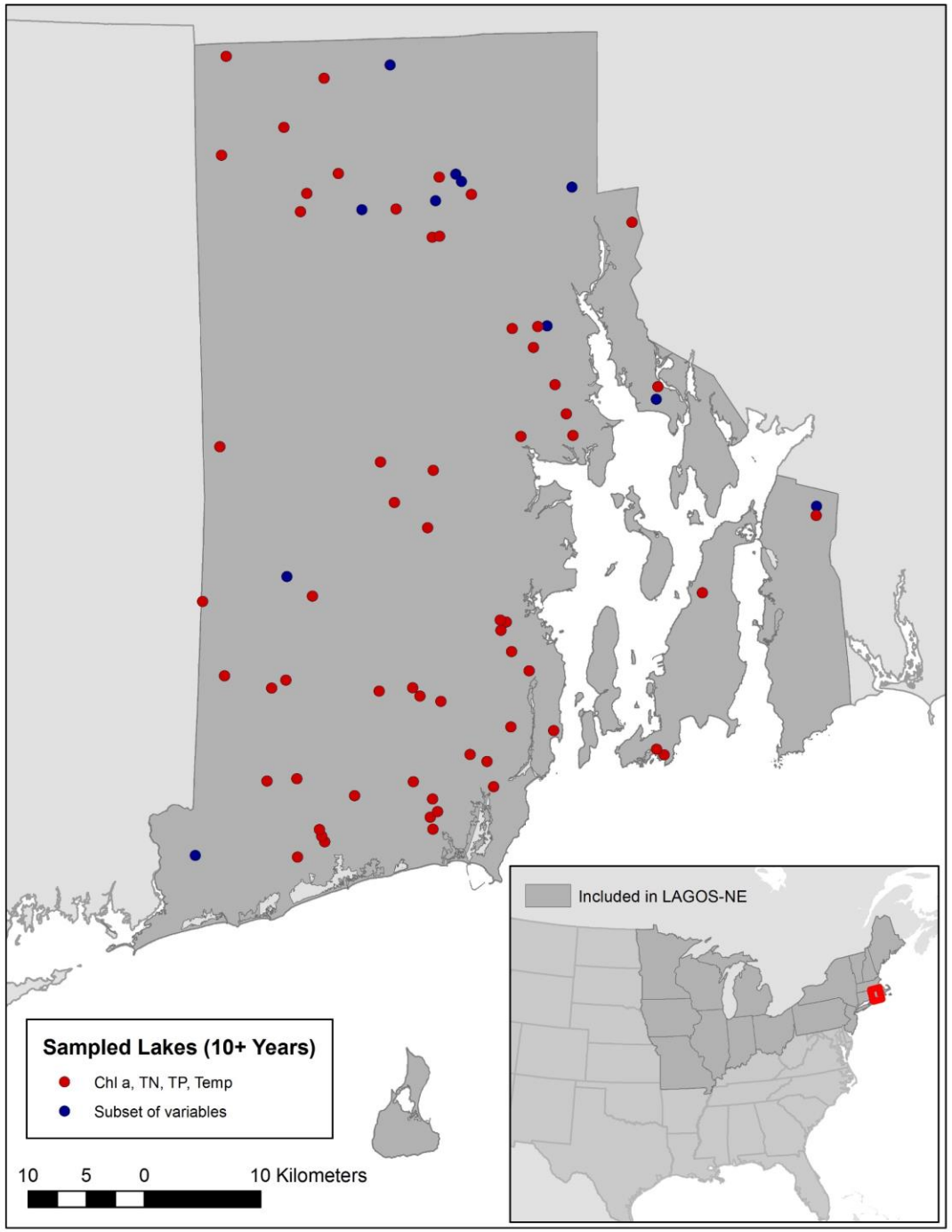
- URI Cooperative Extension Water Quality Group
  web.uri.edu/watershedwatch/
- Volunteer monitoring (~400 volunteers)
- Rigorous QA/QC, EPA-certified lab
- Data are used by RI DEM and EPA to assess water quality
- Over 30 years
  - Begun in 1988 with 14 lakes
  - Now monitors +250 sites on +120 water bodies

URI WW Lakes

- **Weekly: Water clarity (Secchi depth), Temperature**
- **2X per Month: Chl-*a*, DO**
- **3X per Season: Nutrients, Alkalinity, pH, Bacteria**



- Lakes, ponds, reservoirs
- 1990 to 2016
- May to October
- Temperature, Chl-*a*, TN, TP
- ~ 1 m depth
- Minimum of 10 years of data



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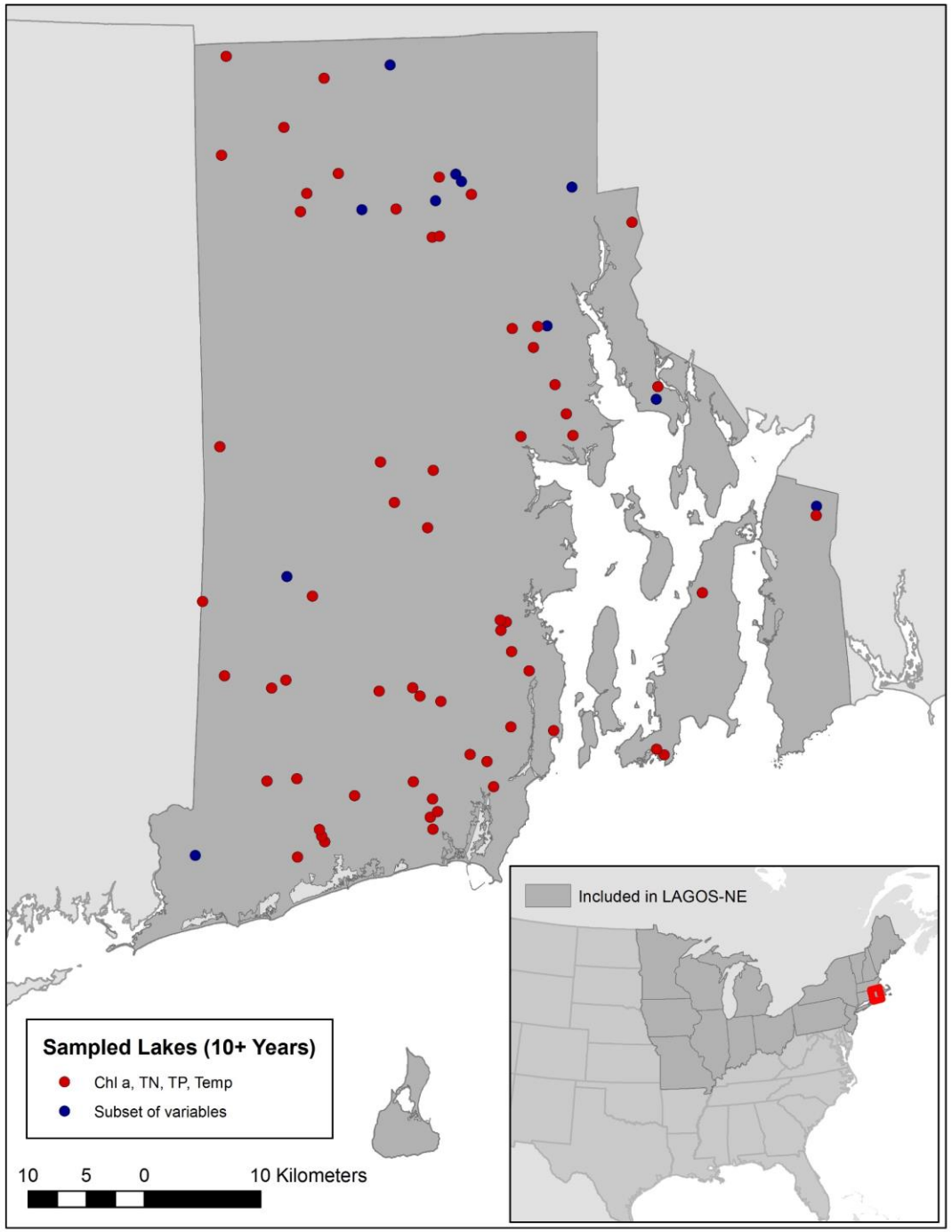
85% of sites have at least 10 years of all 4 parameters



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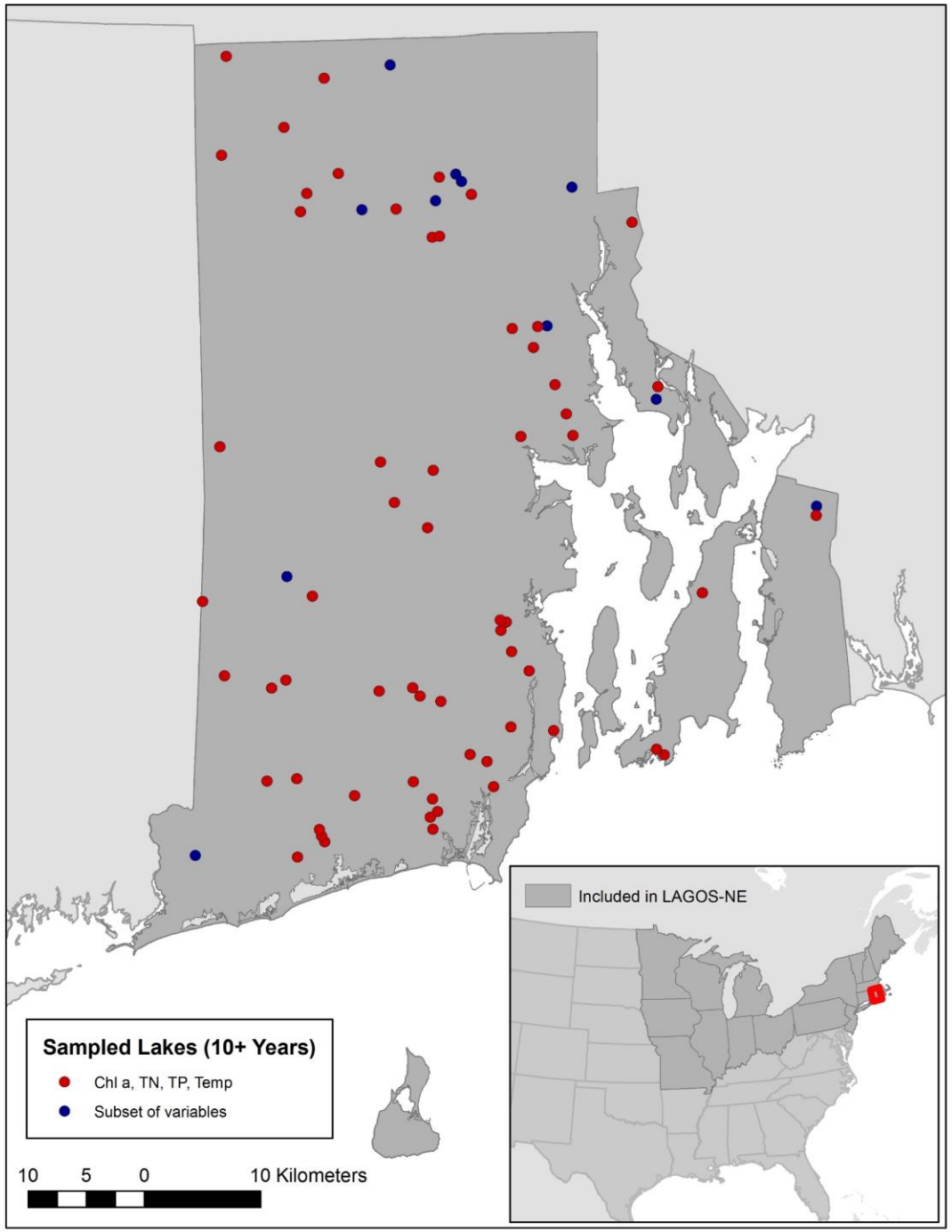
Anomaly analysis

- Compare with larger regional dataset (LAGOS-NE)



R package:
https://cran.rproject.org/web/packages/LAGOSNE/index.html
LAGOS website:
https://lagoslakes.org

For each Parameter:

- By Site:

$$\text{z-score} = (\textit{measurement} - \textit{long-term mean})/\text{st. dev}$$

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  mean of z-scores

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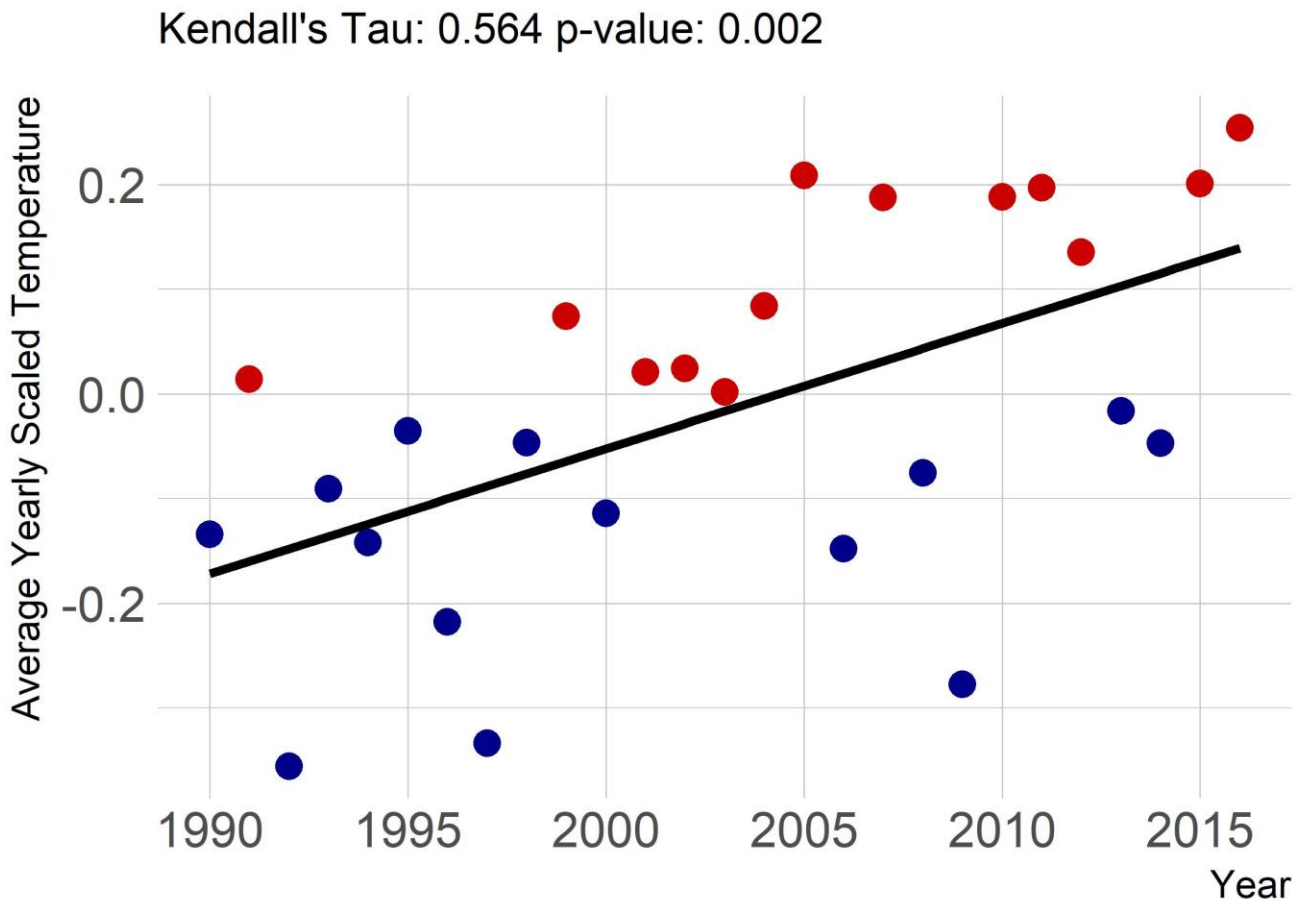
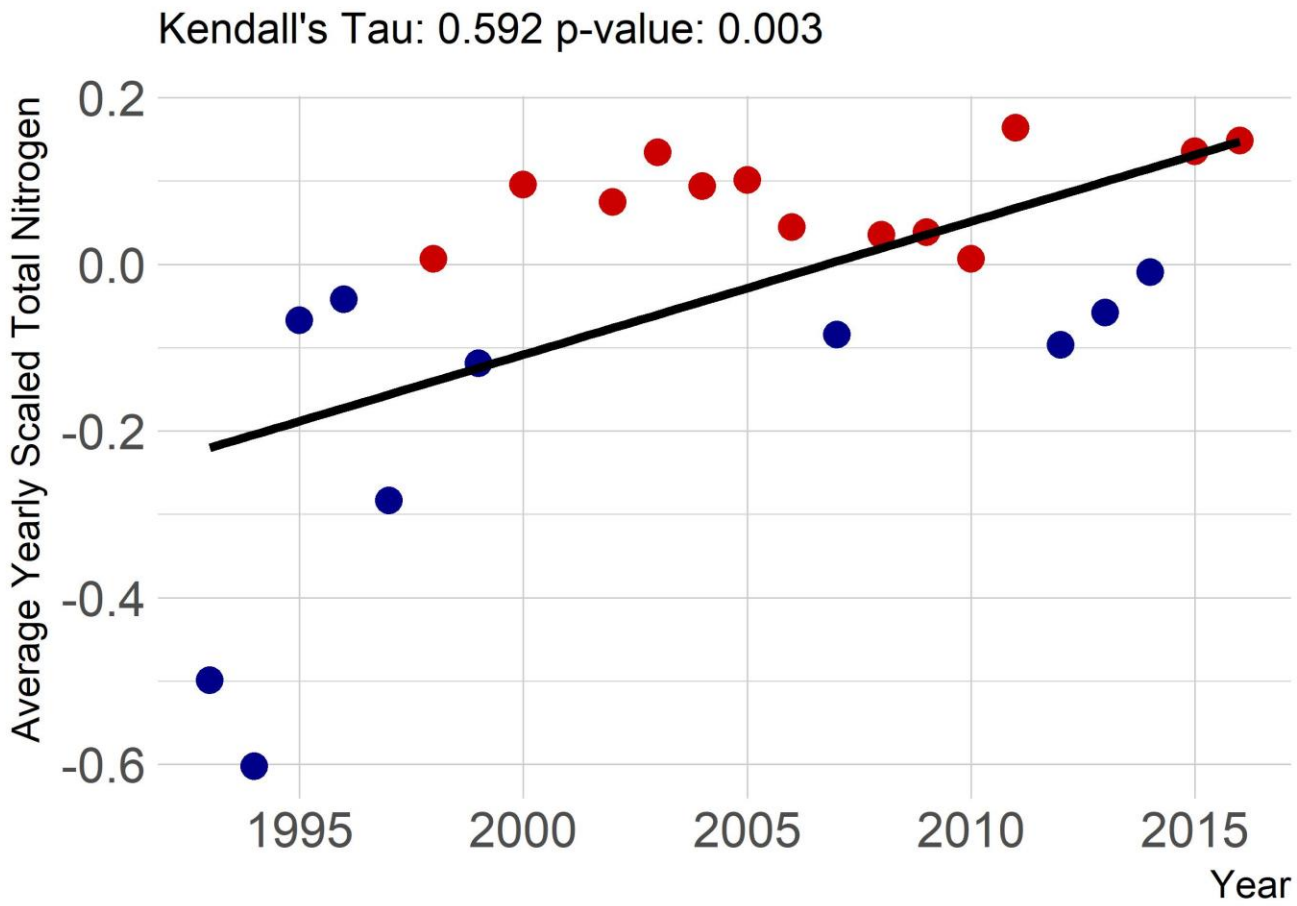
- Annual Anomaly = mean of all site anomalies

Water Temperature Anomalies



Total Nitrogen Anomalies



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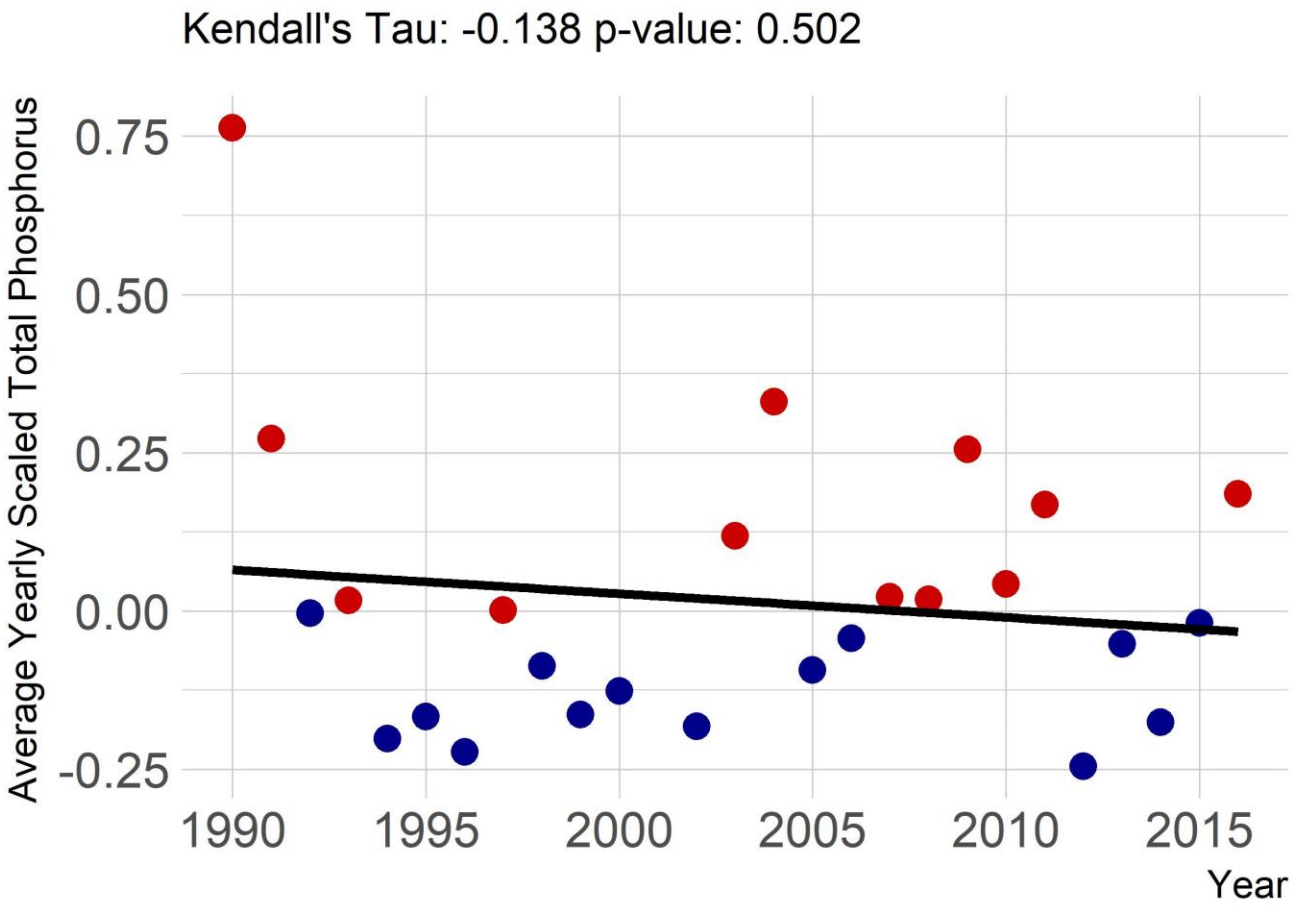
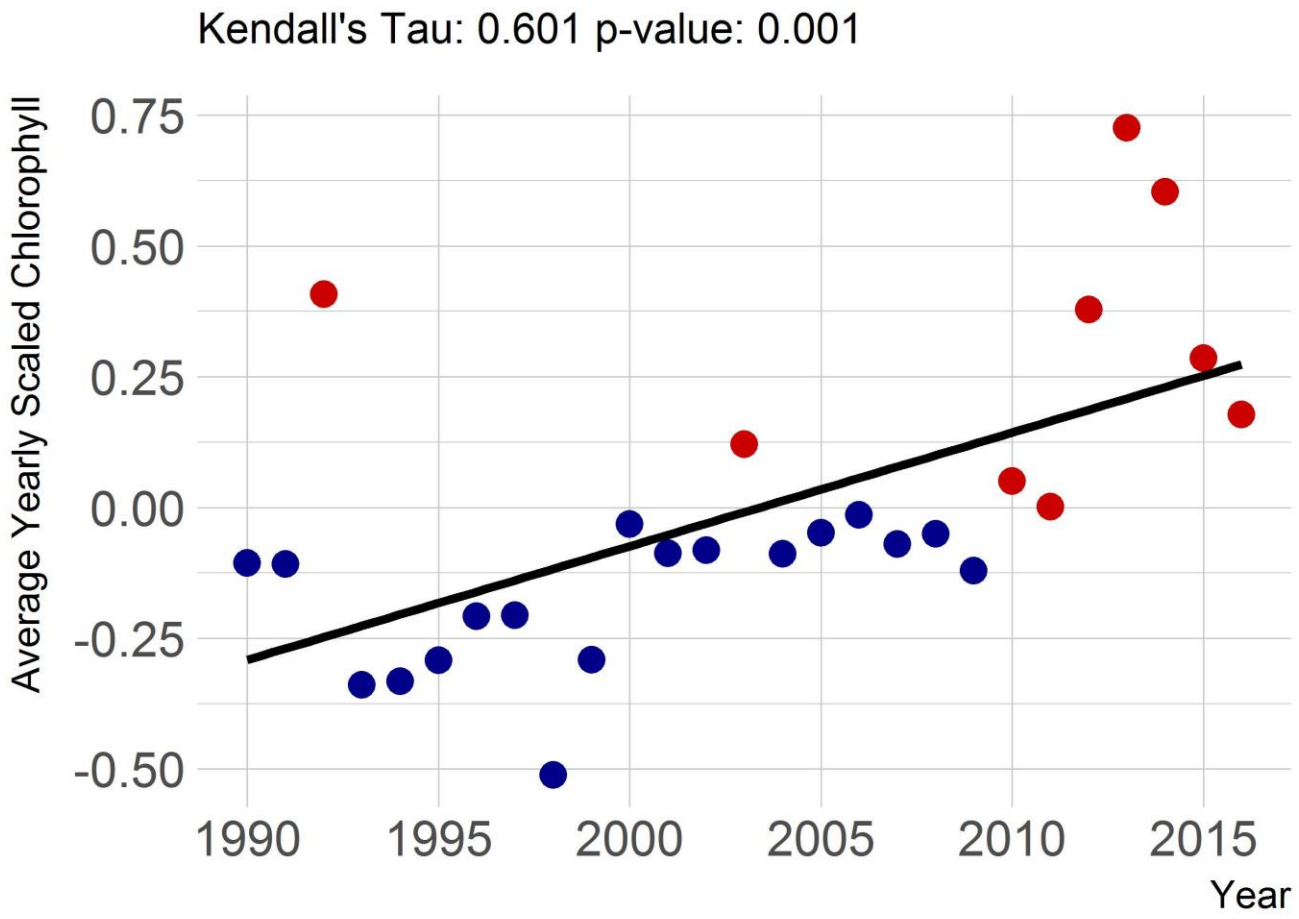


Chlorophyll-*a* Anomalies



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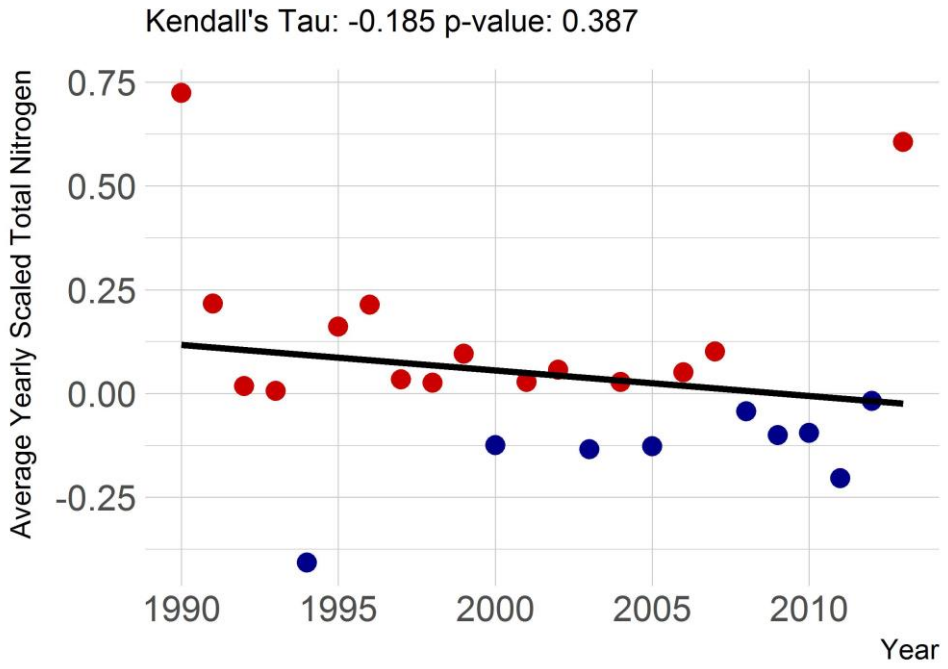
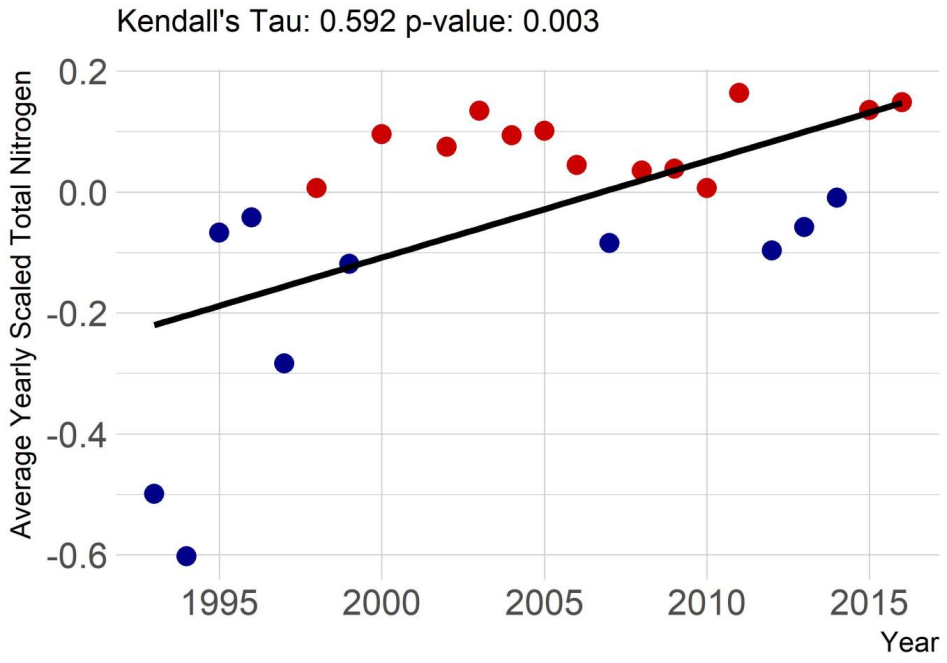
LAGOS-NE



Rhode Island



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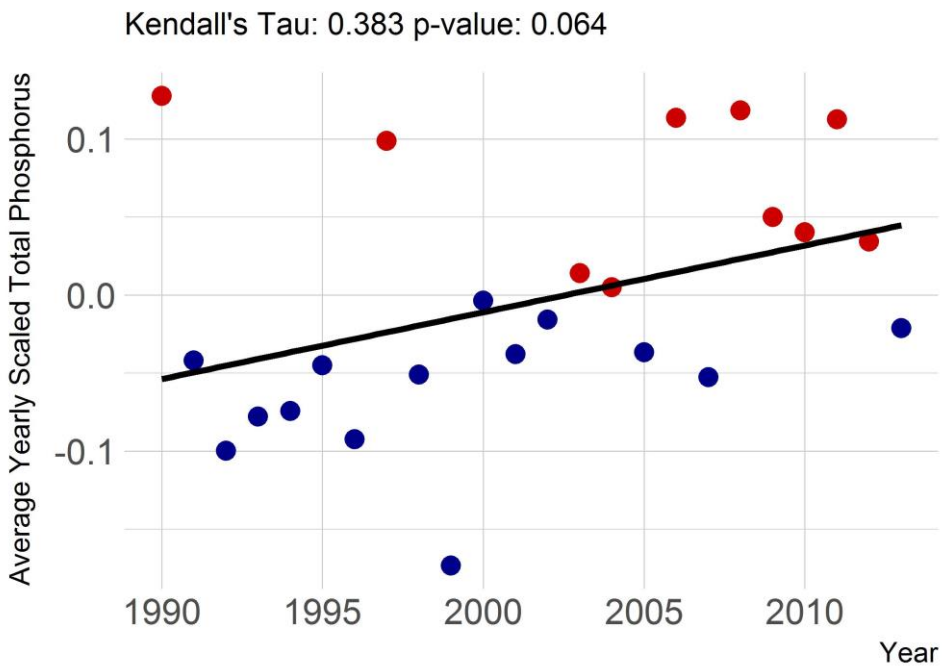

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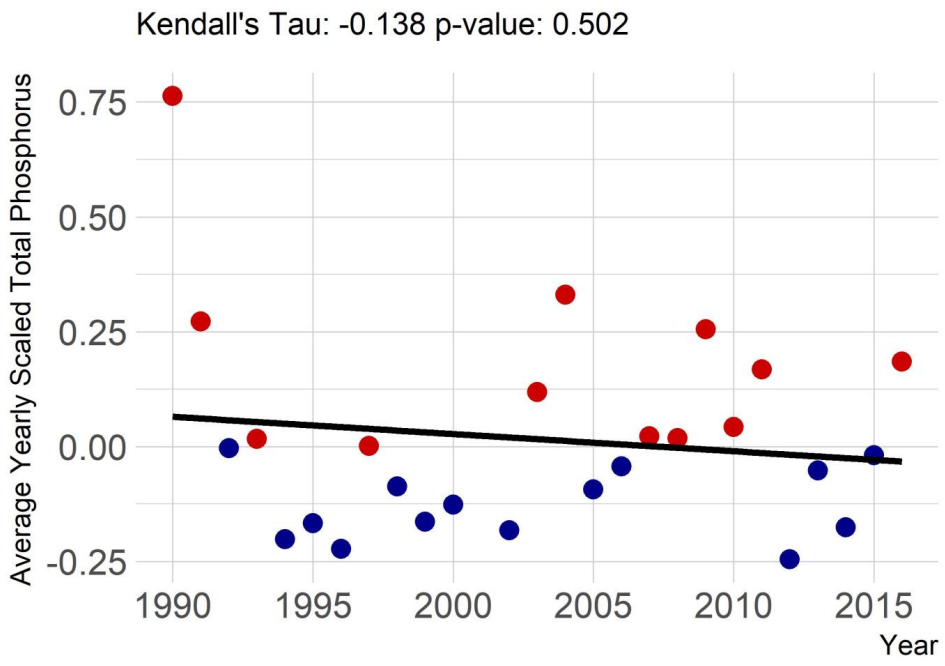

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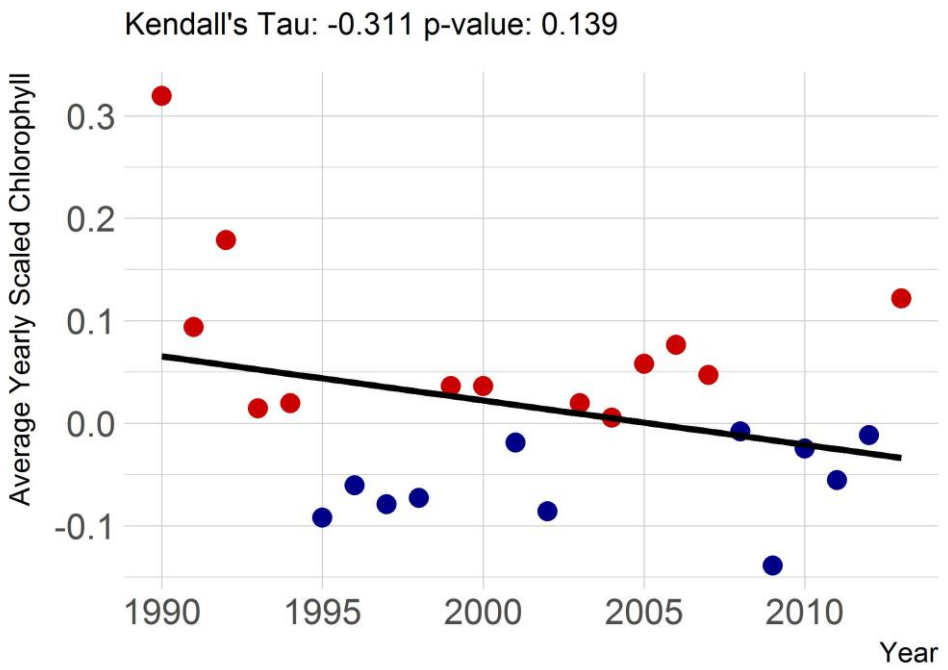

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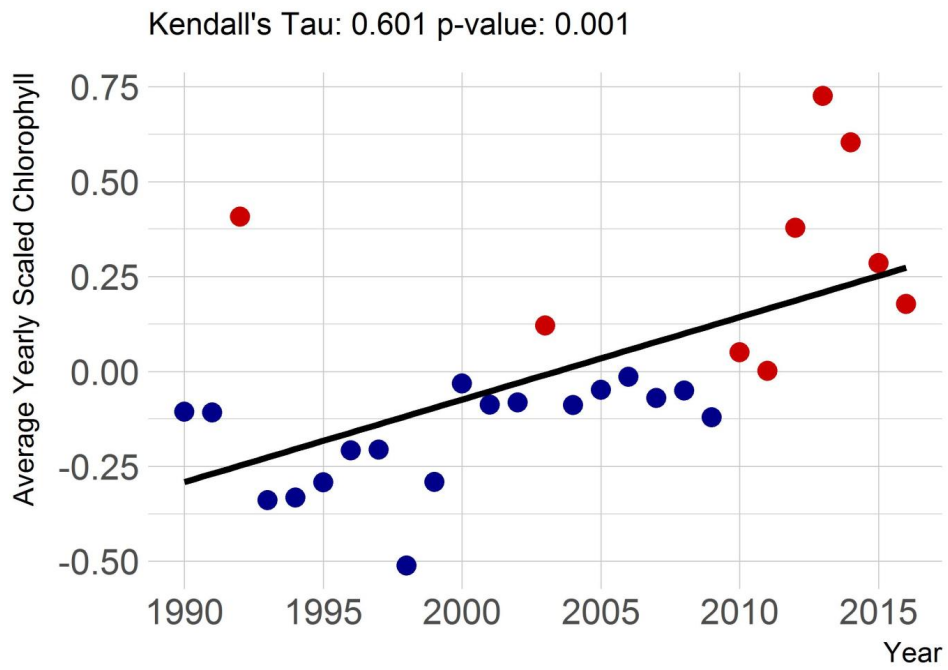

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- **Temperature increasing**
- **TN increasing**
- **TP stable**
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Compared to larger region (LAGOS-NE):

- **Our analysis shows similar results to Oliver et al. (2017)**
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...SCALE MATTERS

- **High variability within large regions - difficult to detect trends**
- **Local management critical**

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Thank you!

Questions?

More at:
https://github.com/USEPA/ri_wq_trends