Spikes in Pollutants during Wet Periods: Challenges and Strategies for Monitoring, Assessment, and Plans

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2024 NATIONAL TRAINING WORKSHOP ON WATER QUALITY ASSESSMENT AND PLANS

MAXIMIZING CWA PROGRAMS TO ACHIEVE WATER QUALITY GOALS

National Conservation Training Center
Shepherdstown, West Virginia
June 4-6, 2024

Quick Summary

- Chemical and biological parameters are likely to be affected by extreme weather conditions; however, all data should be used unless it has been flagged due to lab error etc.

- The impact of a “spike in pollutants“ during wet periods varies depending on the type of waterbody. For some pollutants, a single criterion or threshold may not be applicable across all different waterbody types.

- Assessment protocols should address what to do during wet weather events/years. An exceedance frequency should also be utilized.

- Statistical methods such as using the median or flow normalized concentrations can help mitigate bias or evaluate trends.

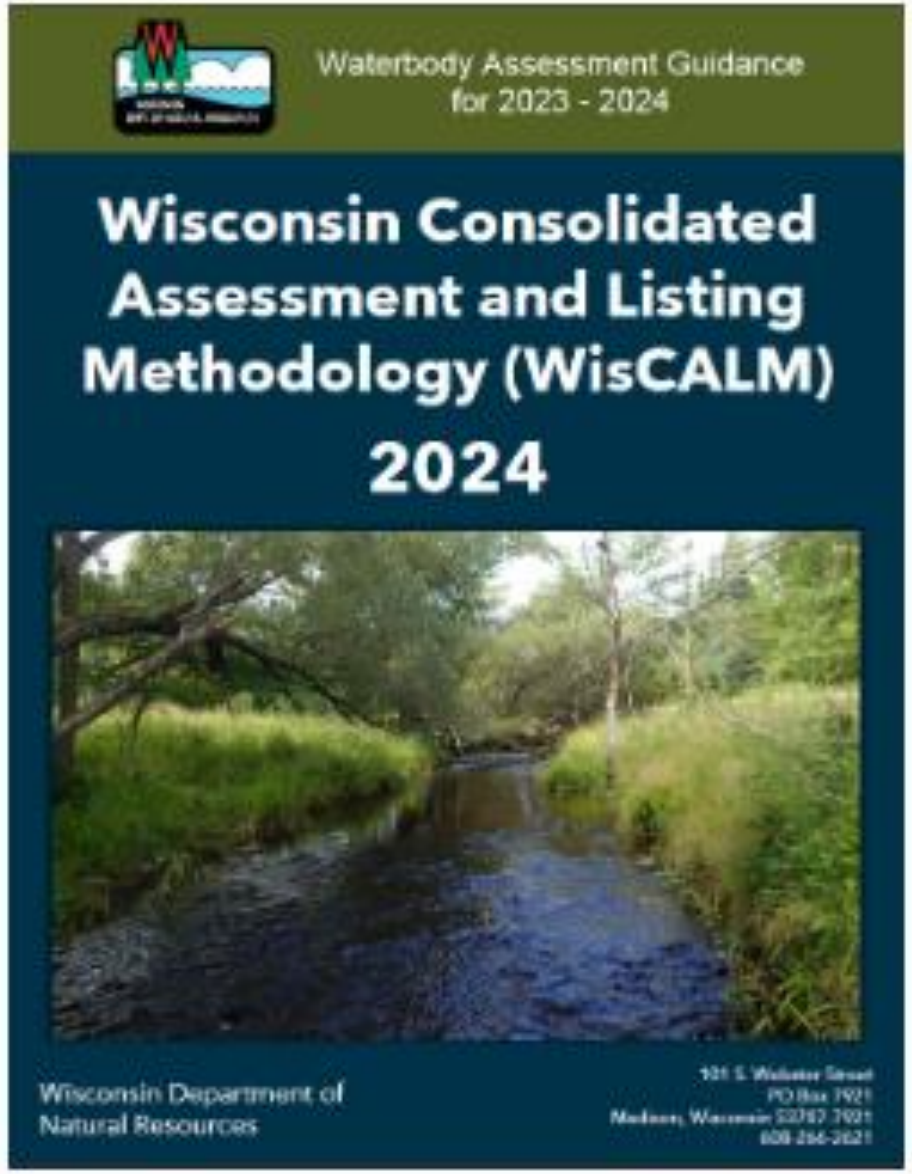
- For plan development (modeling), spikes in pollutants during wet periods are critical to properly characterizing source areas. Need to have samples collected over the full range of flows to understand the true distribution.

Monitoring and Assessment

Wisconsin's Consolidated Assessment and Listing Methodology (WISCALM)

- Lays out monitoring requirements
- Lays out assessment methodologies
- Updated every two years
- Public Participation and Comment Process
- Approved by US EPA

https://dnr.wisconsin.gov/topic/SurfaceWater/WisCALM.html



General Methods

- Assessment process utilizes random sampling protocols that are pollutant specific.
    - For total phosphorus: utilize median of monthly samples for rivers and streams. Mean of monthly samples for lake and reservoirs.
        - 2012 was an extremely wet year with sampling falling twice within 100+year recurrence interval precipitation events. Additional samples were collected.
    - For bacteria utilize the geomean which helps account for wet weather events.

Define Extreme Weather Years

- If a prescribed sampling schedule falls during an extreme weather year, exhibiting unusual average air temperature, precipitation, stream flow or water levels, a determination is made as to whether that year was an extreme weather year that resulted in unrepresentative conditions.

- As a guideline, an extreme weather year may be defined as a year where precipitation, flow, stage/elevation, and/or temperature are above the 90th or below the 10th percentile of the annual averages within the period of record.

- The following sources to document their determination of whether data were collected from a particular waterbody during an extreme weather year: Climate data from nearest regional weather station(s); Regional stream stage/flow gage(s); Indices of drought severity (e.g., Palmer Drought Severity Index, U.S. Drought Monitor).

What to do?

- If it is determined that a year was an extreme weather year resulting in unrepresentative conditions, that year's data points are not excluded, but rather are supplemented with data from an additional year(s) of monitoring.

- In this case, combined data from a minimum of two years should be used for assessments to account for variability between years.

- Gaps in assessment datasets left when samples are determined to be unrepresentative should be filled by either collecting additional data or considering data from outside the standard period of record.

PhosMER: Stream Phosphorus and Sediment Dynamics

Stream Phosphorus and Sediment dynamics | Interactive map & site selection | Site-level daily model results

PhosMER Model:

Distribution

Observed vs. Predicted

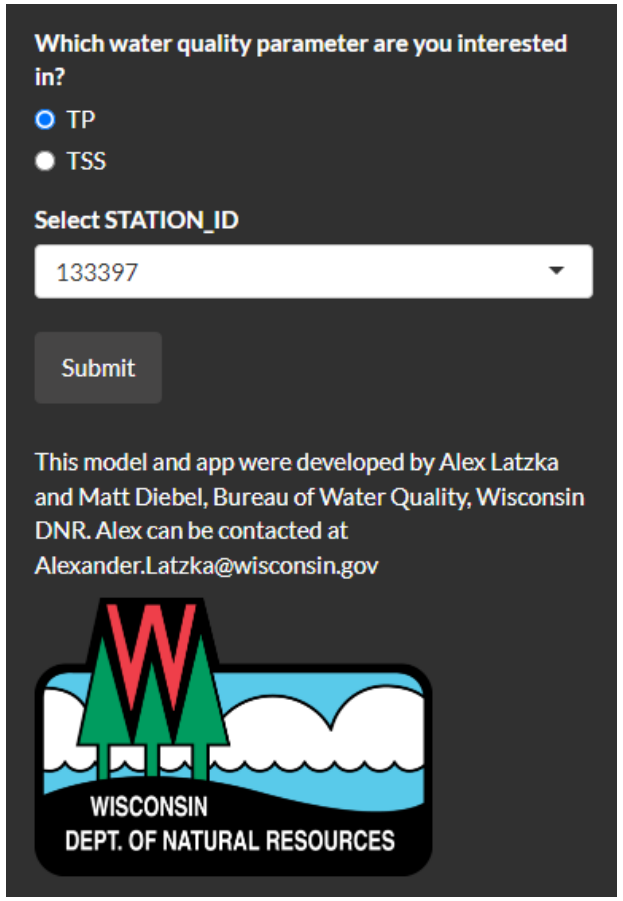
Time Series

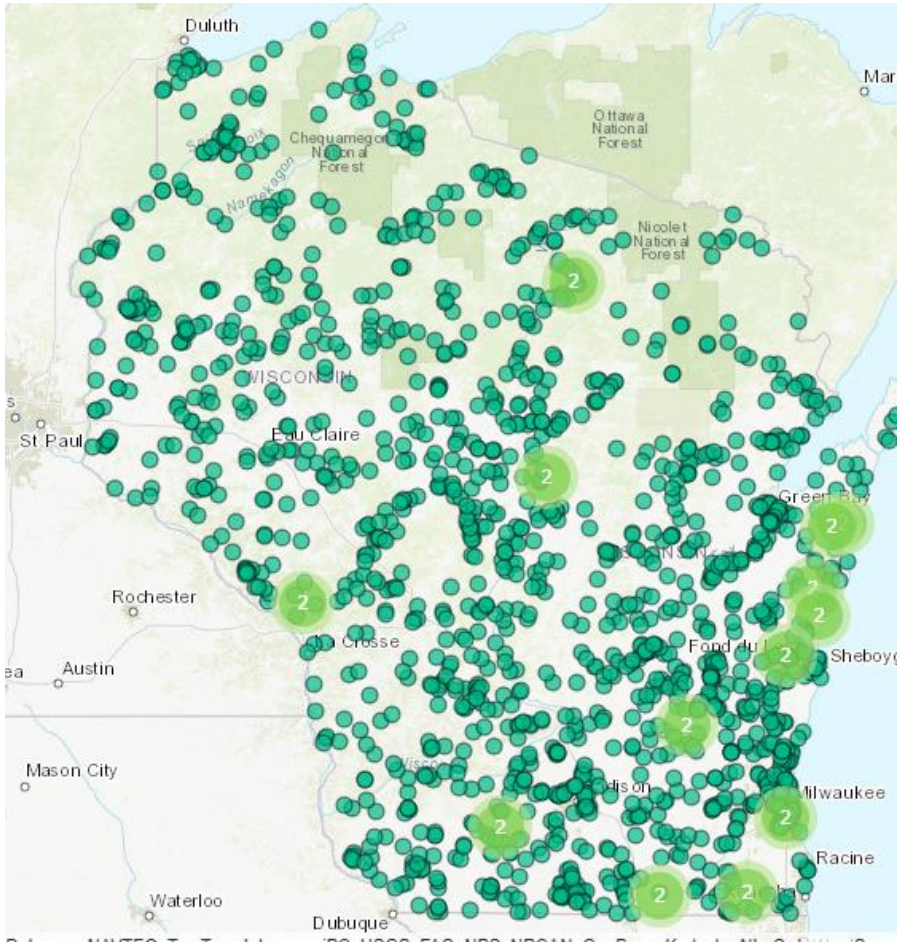
Water Quality Drivers

Test for Change

Statistically Significant Reductions

Monitoring Needs

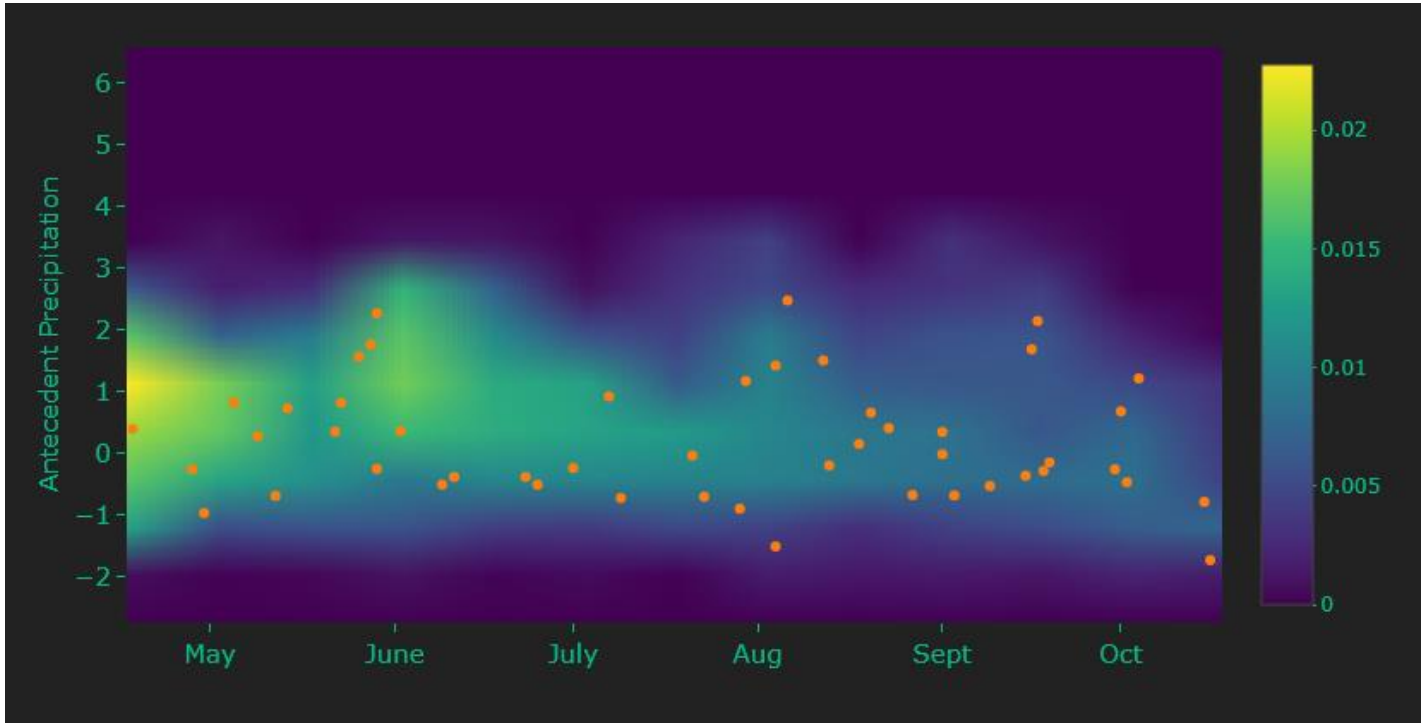




PhosMER: Monitoring Needs Rush River, Lake Pepin TMDL

- Decisions about future sampling at a site can be informed by the conditions in which previous samples have and have not been taken, and by how well we understand and can predict water quality during those conditions.

- Because antecedent precipitation and day of year are the most important variables affecting water quality dynamics, we show the value of this index across each variable in the heatmap.



Questions