Lessons and Approaches from Regional Monitoring Network Sites

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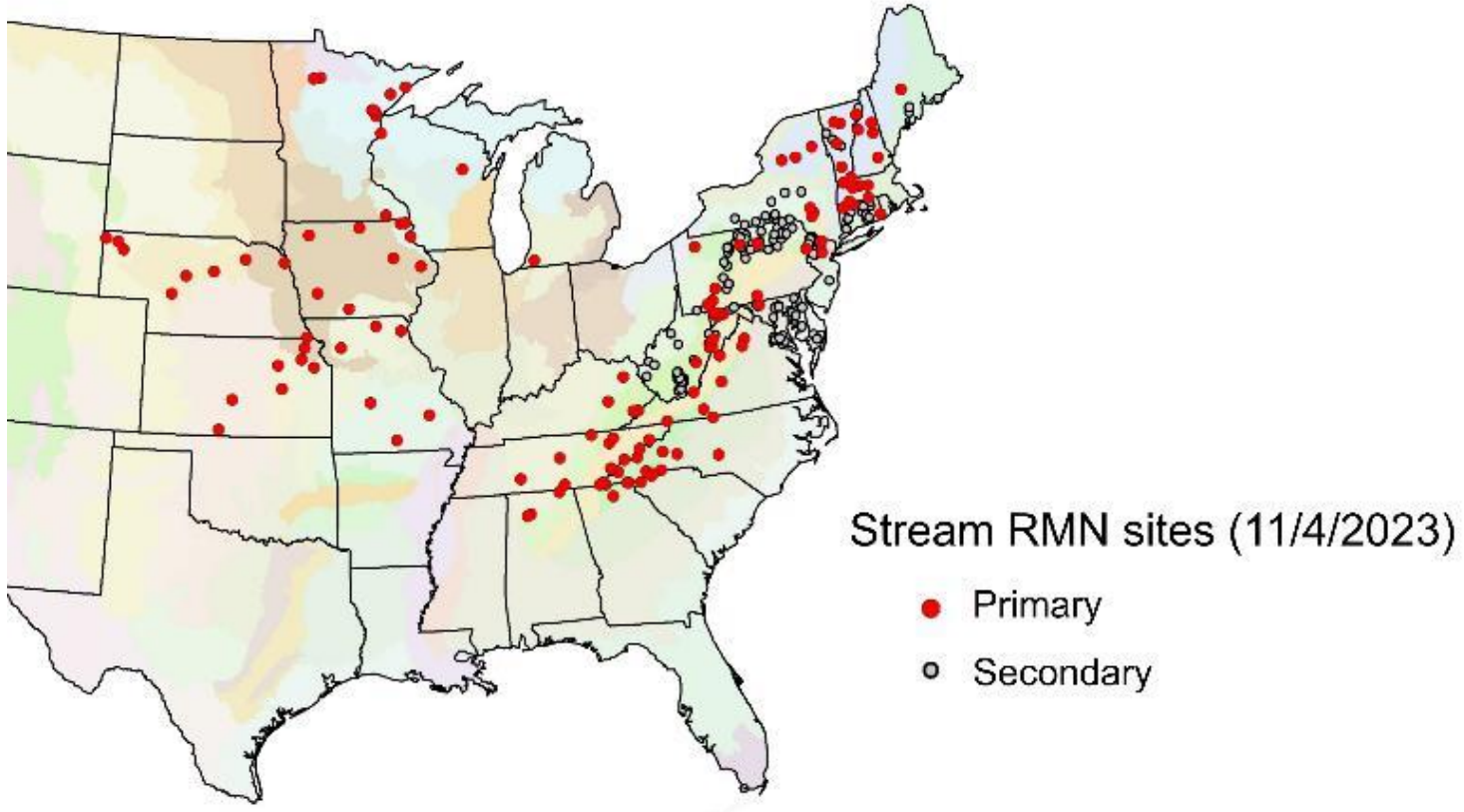
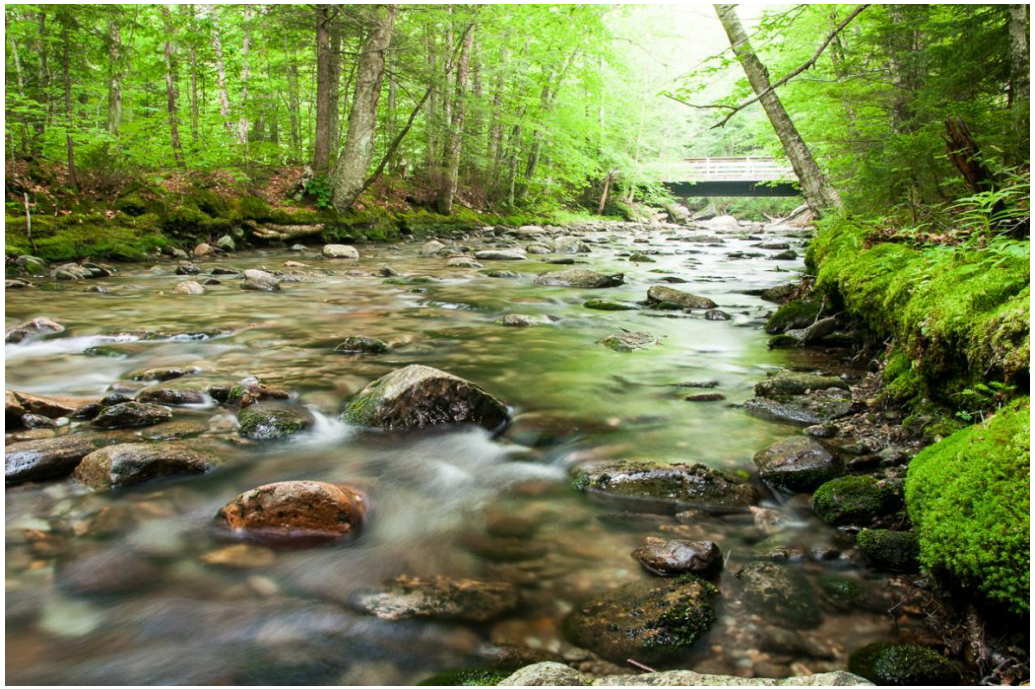
Stream RMN Sites

- Collaborative, volunteer effort to collect comparable long-term monitoring data at targeted sites to detect changes over time



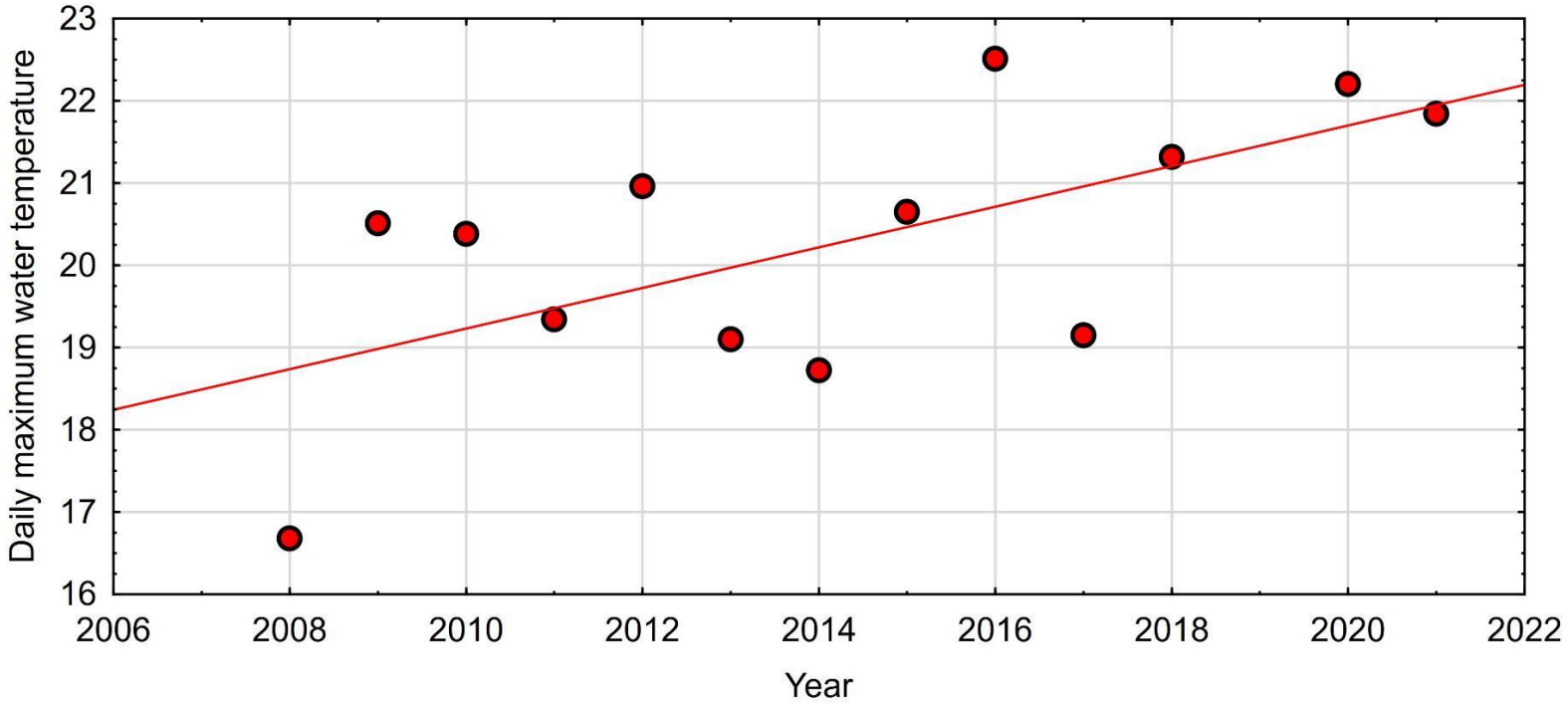
Initial focus on ‘reference’ sites

- Provide baseline
- Measure current conditions
- Describe year-to-year variability
- Understand relationship between biology, temperature and hydrology
- Analyze any trends over time



Stream RMN site over time

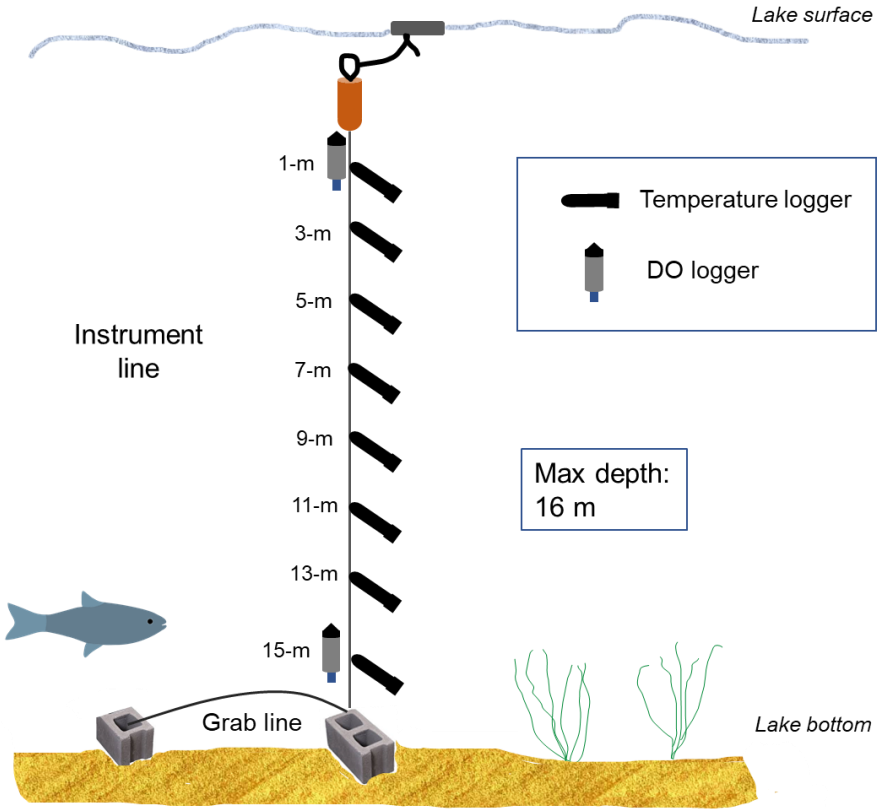
- Not enough years of data to detect clear regional trends, but some sites are showing monthly warming signals



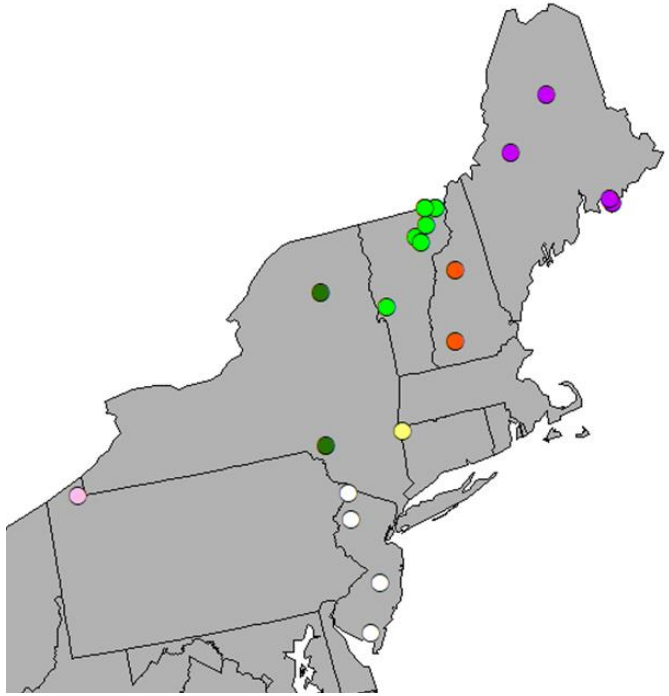
Bingo, VT RMN site showing August daily maximum temperatures. Significant warming trend ($p<0.05$) in both June & August maximum temperatures.

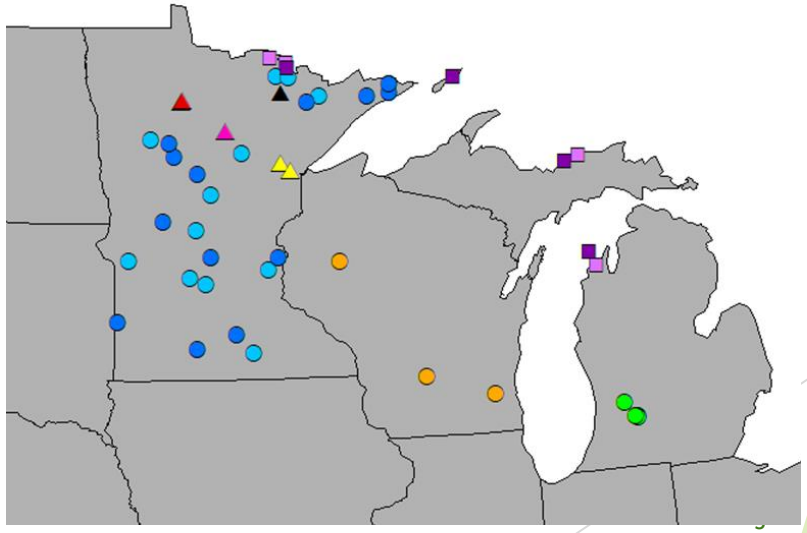
Lake RMN sites

- Sensor array schematic



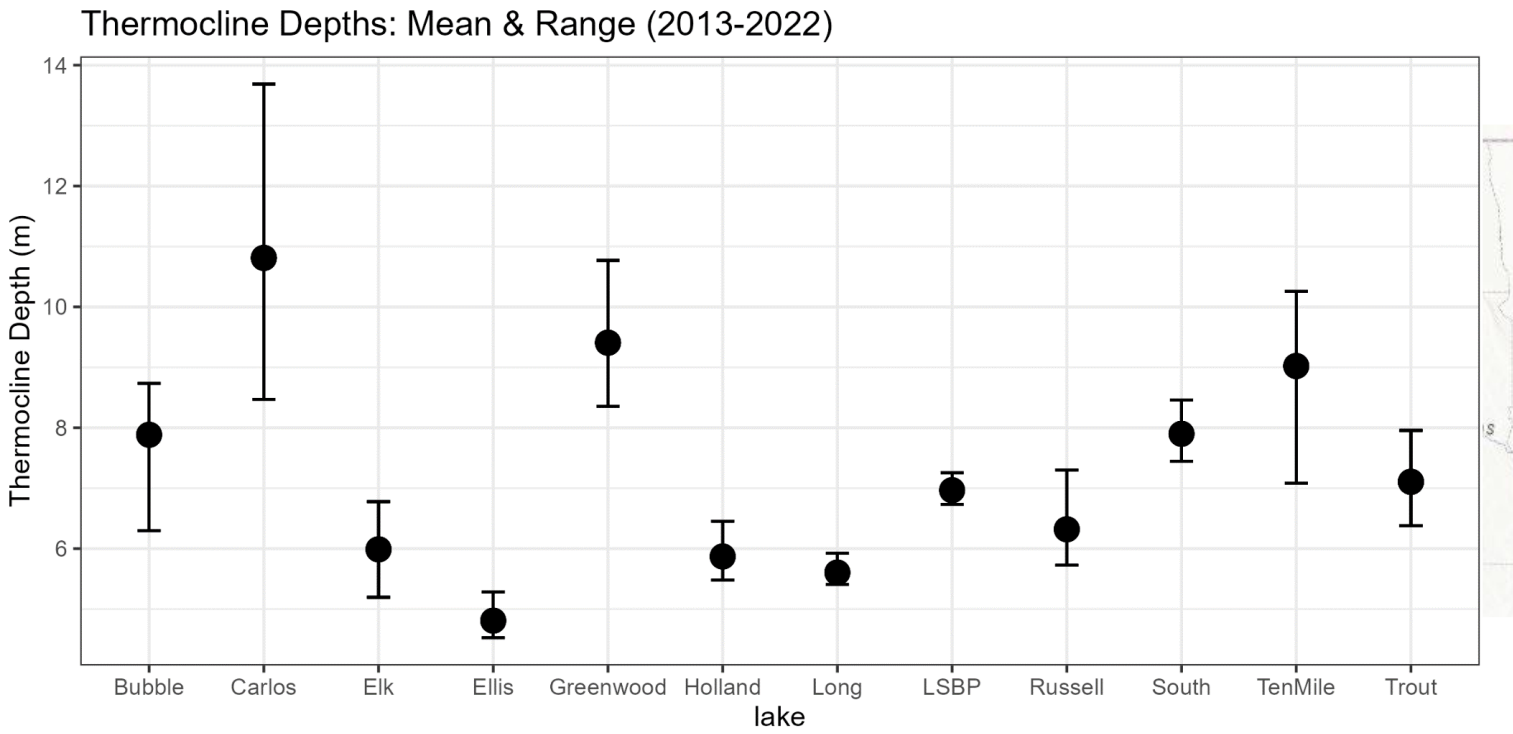
Modified version of Shane Bowe's latest schematic





Different colors used for different monitoring organizations

Annual variations in lake thermocline depth across northern sites



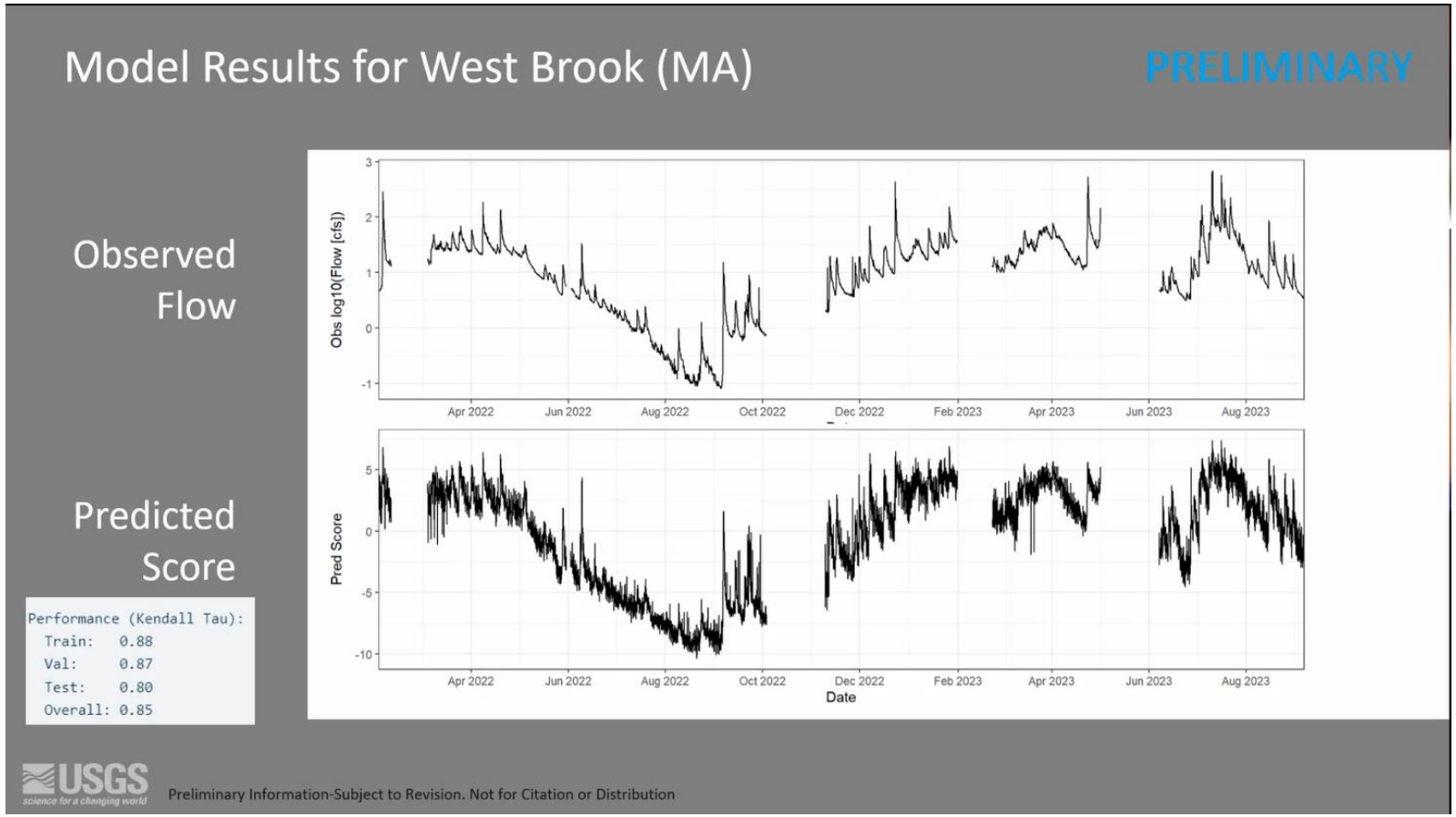
Analysis from Jeremy Deeds, Maine DEP

Waterbody monitoring with machine learning modeling

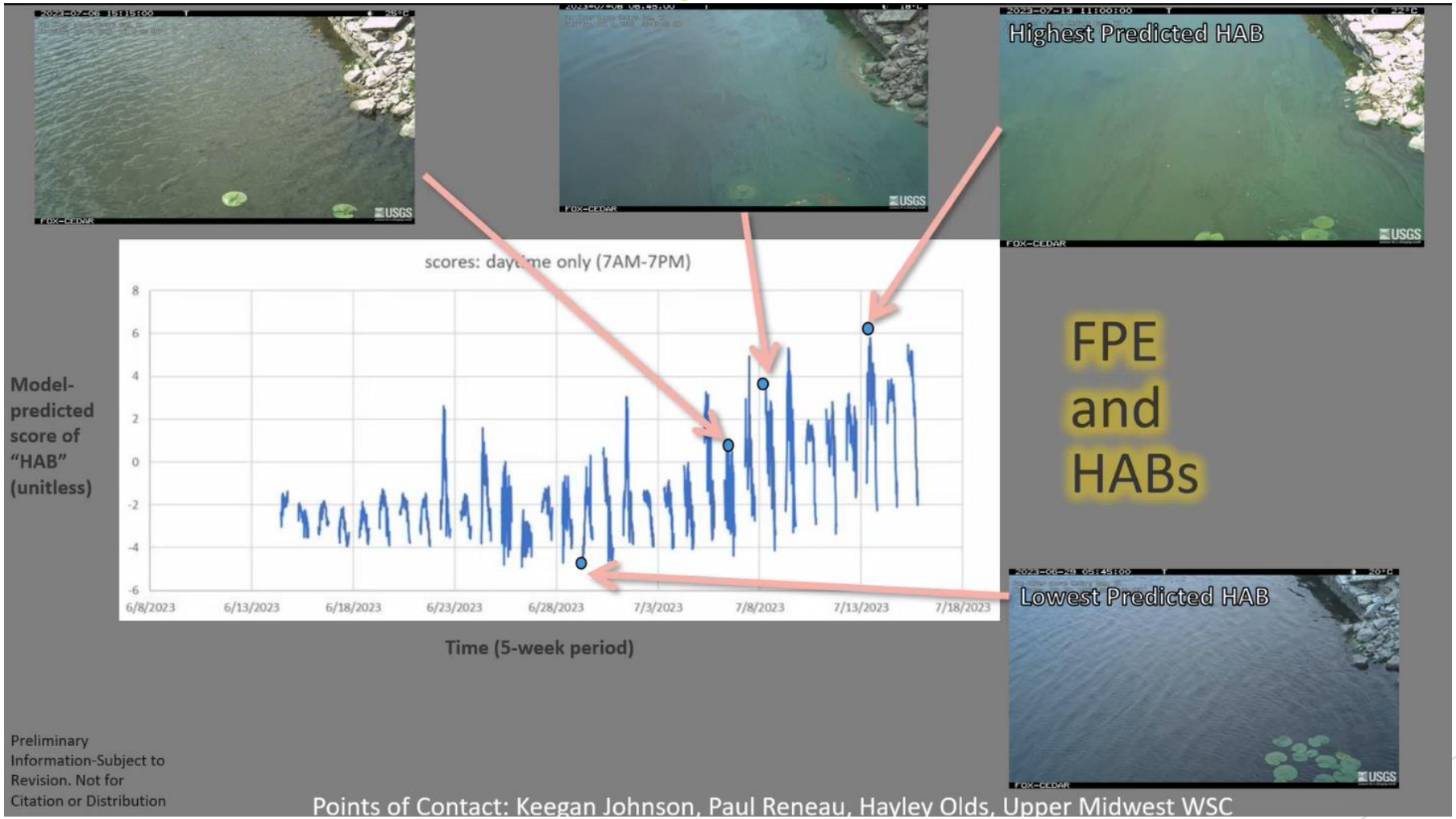
- Waterbodies are vulnerable to climate change, including increases in the frequency, duration and intensity of droughts and floods
- Need a cost-effective approach to monitoring to understand the impacts of changing hydrologic conditions
- Evaluating use of imagery and machine learning to monitor hydrologic changes in streams, lakes, and wetlands
- Using neural network model to rank images, e.g., more or less water, higher or lower flow

Trail Camera with timelapse mode

Comparison of observed flow vs. predicted from neural network model



Game camera images to detect HABs

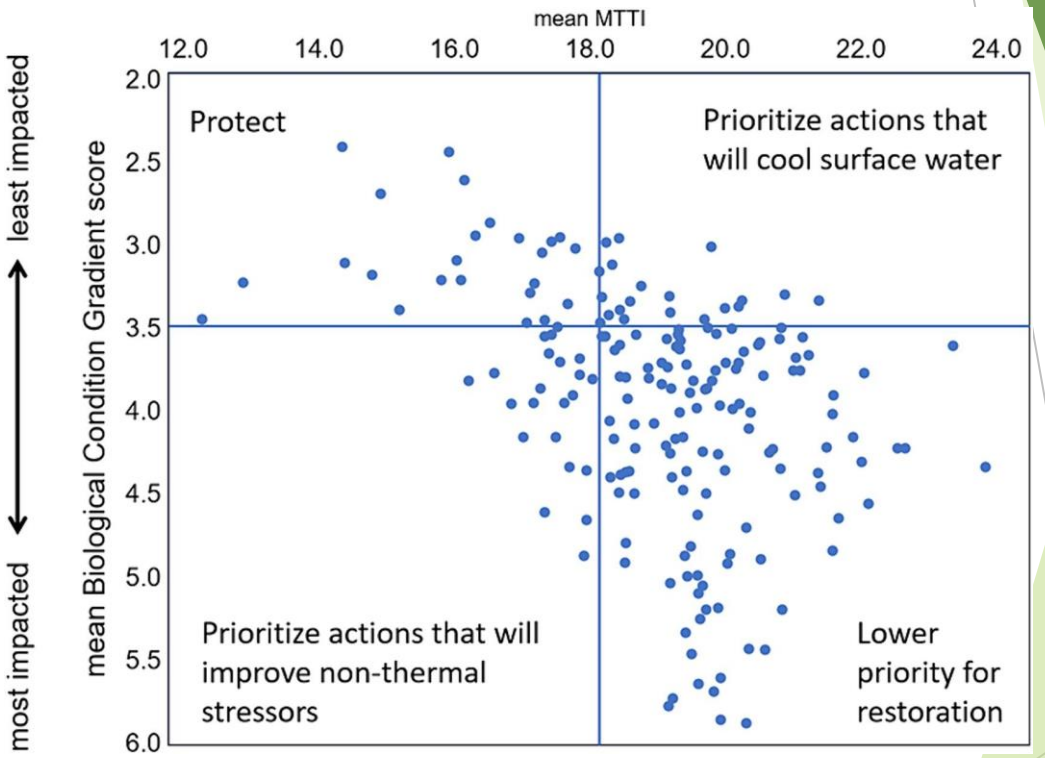


What does this all mean?

- States, tribes, and Regions are trying to collect baseline information of continuous temperature, flow, and dissolved oxygen
- Using sensors and trail cameras to collect information and innovative machine learning algorithms to analyze data (as well as R scripts to visualize data – come to the Continuous Monitoring breakout!)
- Collecting biological data and developing thermal preference metrics to understand impacts and changes (*currently in progress*)

Salmon restoration in King County, WA

- Protect streams that support macroinvertebrate communities with colder thermal conditions (MTTI < 18˚C), and overall good biological condition (<3.5)
- Streams with good overall biological condition supporting warmer macroinvertebrate communities (MTTI > 18˚C) may be candidates for thermal restoration
  - E.g., riparian planting to increase shading, or stormwater management to increase infiltration and limit retention in ponds



Goal

Ultimately use data and information collected to better protect and restore waterbodies to maintain thermal and hydrologic conditions that maintain biodiversity, especially cold and cool water taxa