



Forecasting Algal Blooms

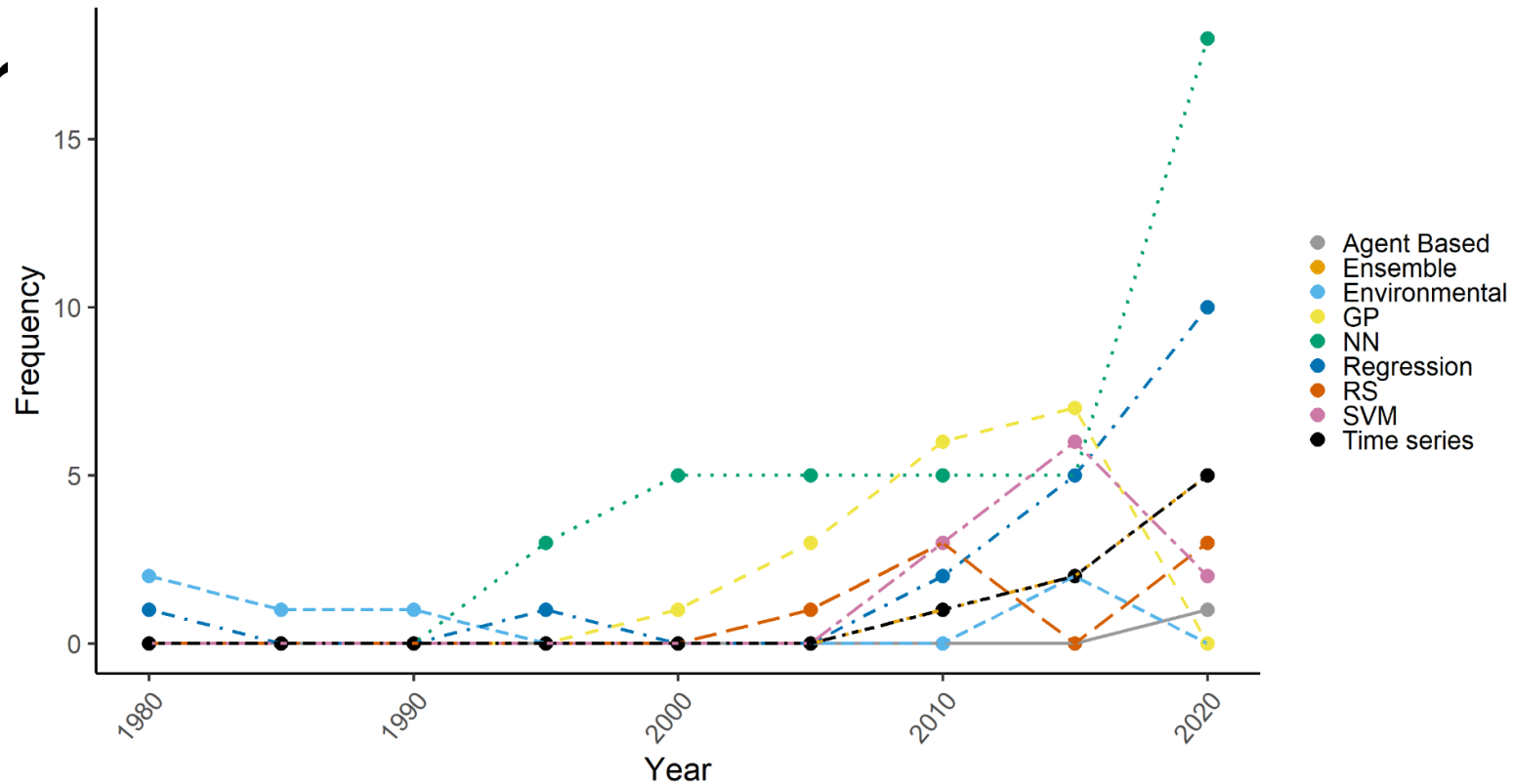
Katie Campbell | University of Alberta

ALMS Annual Conference

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Why Algal Blooms Matter

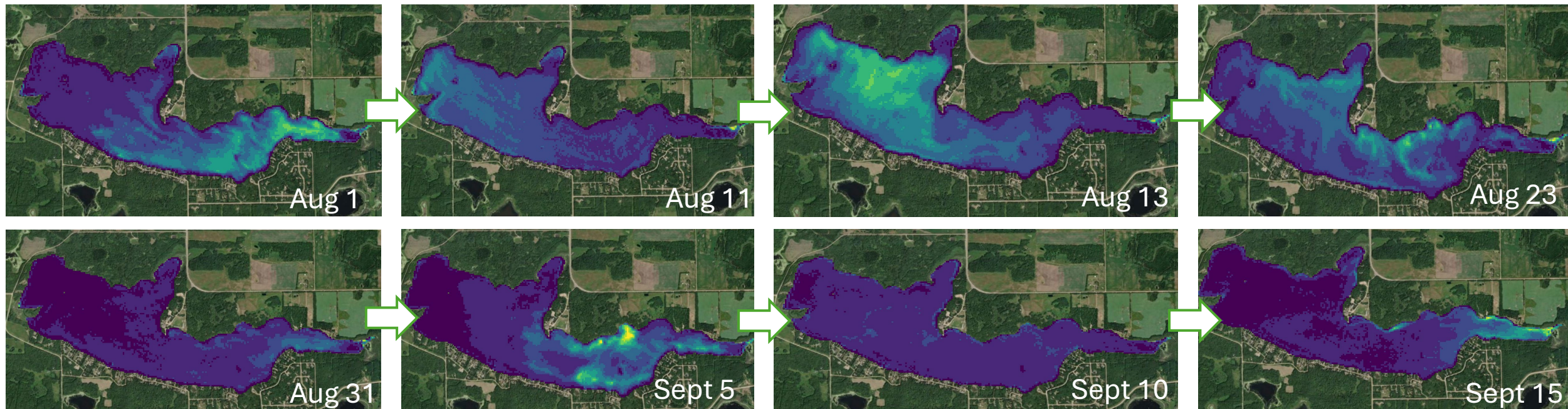
- Blooms impact water quality
- Affect recreation, fisheries, and drinking water
- Increased variability with climate change



Algal modelling types used from 1980 to current applications

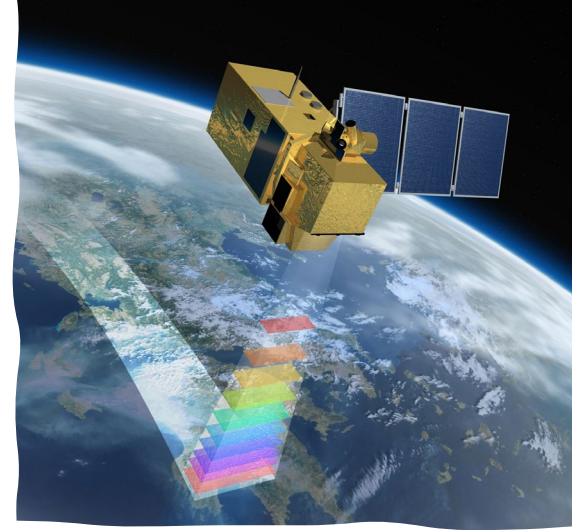
The Challenge

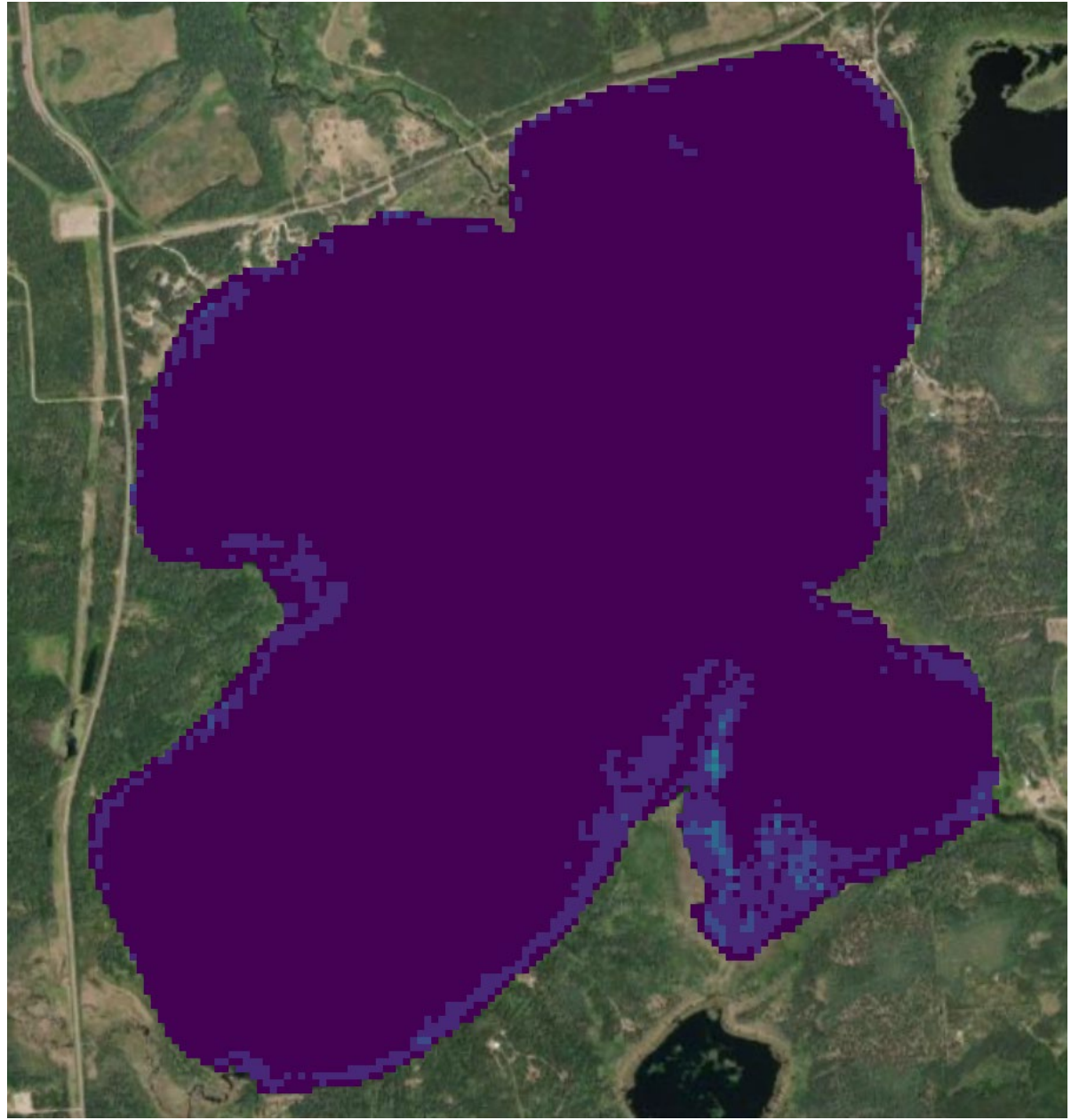
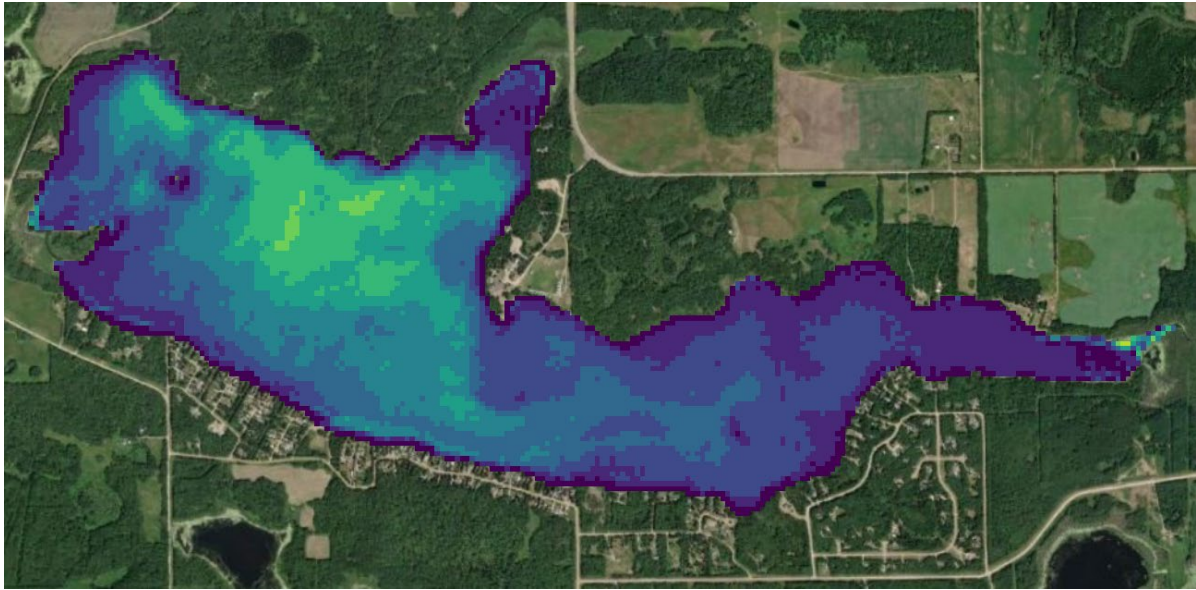
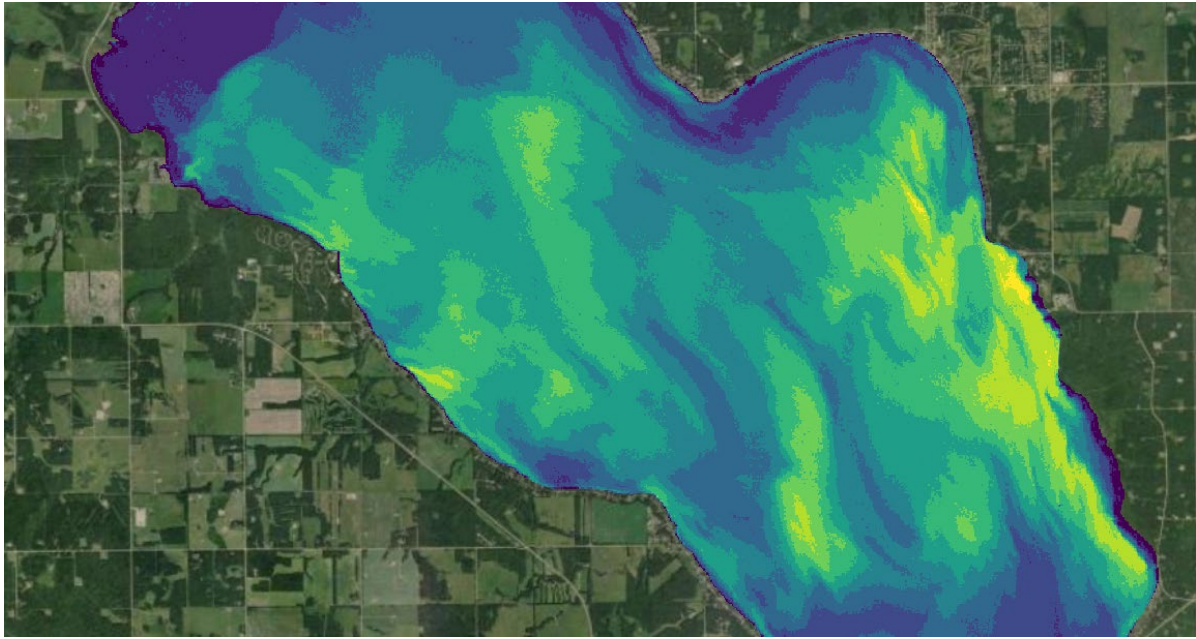
- Blooms are complex and dynamic
- Influenced by multiple factors (weather, nutrients, water chemistry)
- Traditional monitoring – biweekly with large gaps



Data Sources

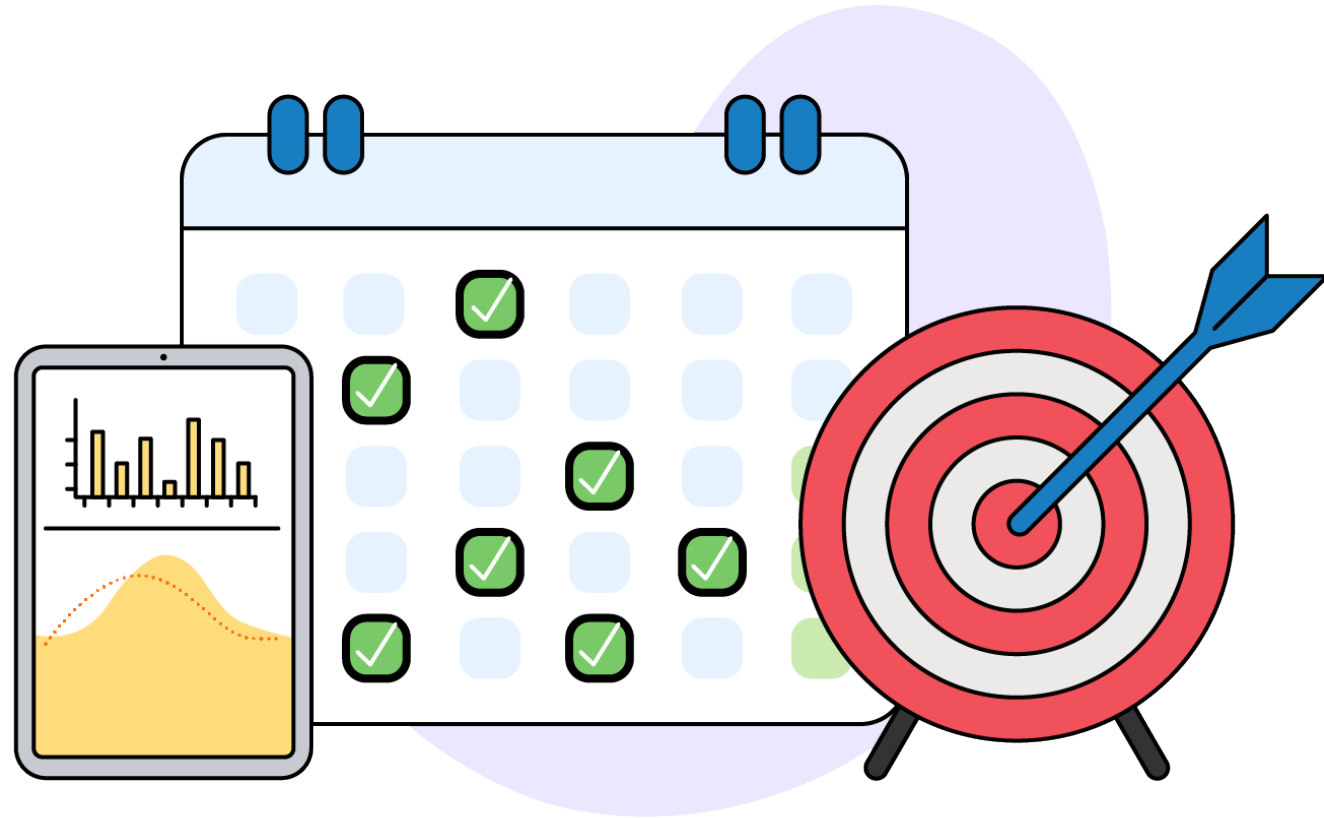
- Satellite images (Sentinel-2)
- Environmental sensors (water quality, weather)
- 2017-2024
 - Pigeon Lake
 - Nakamun Lake
 - Ethel Lake





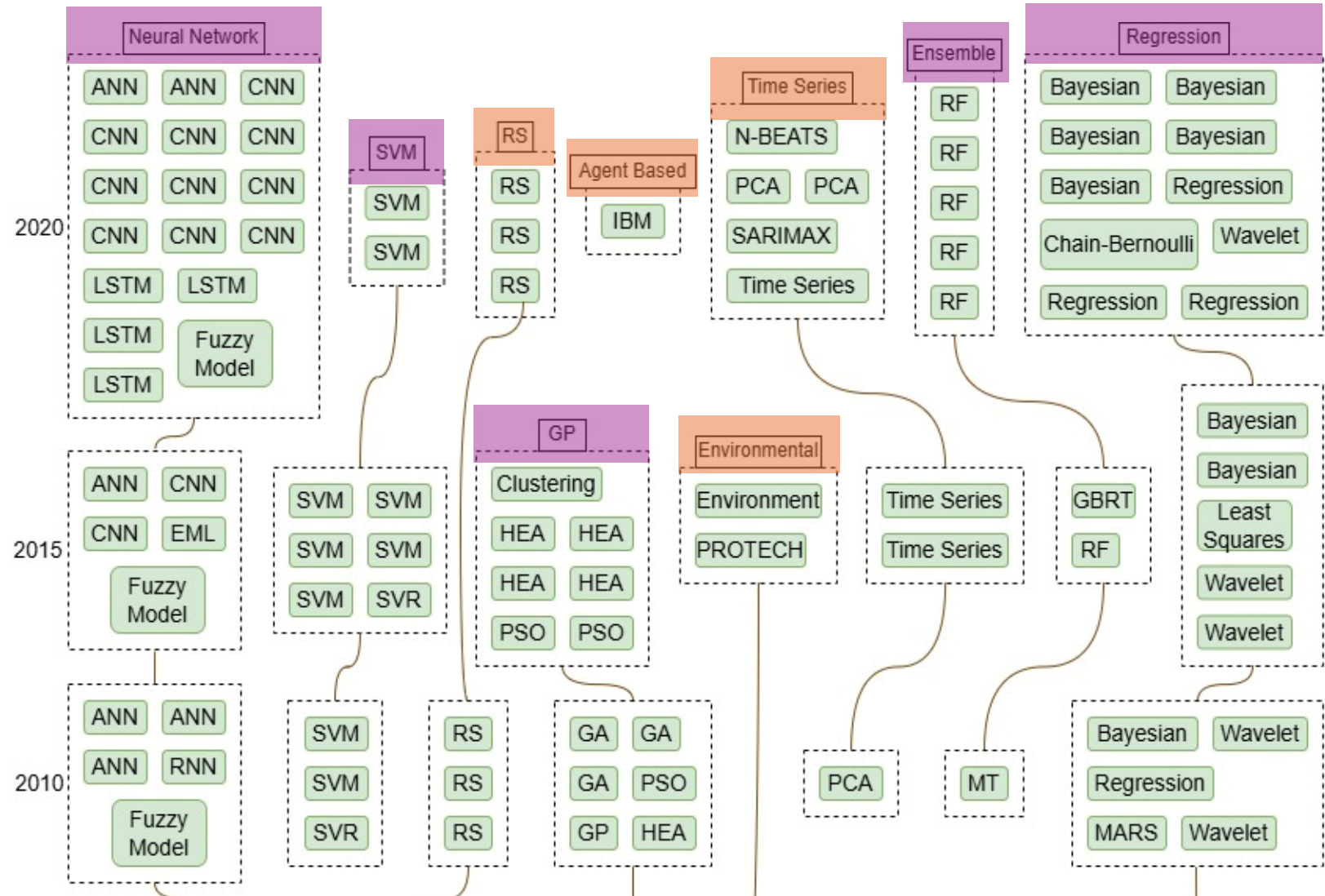
Prediction Goal

- Examine past patterns in algal blooms to forecast 7 days ahead
- Focus: chlorophyll *a* concentration (algal proxy)



Algal Bloom Models

- Simulation approaches
- Predictive Machine Learning

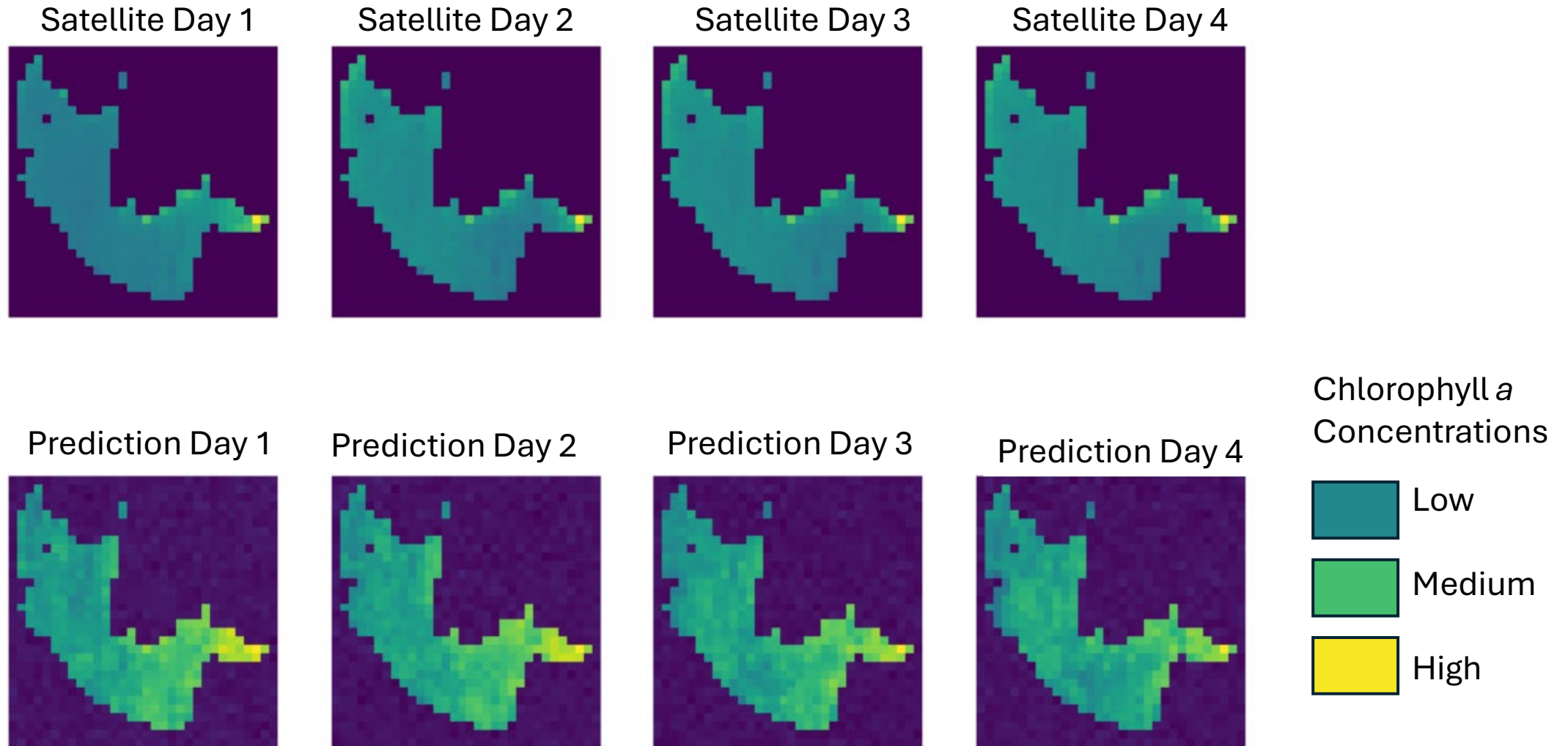


Time series visual of the main models used in algal bloom forecasting from 2010 to current.

Why a Machine Learning Approach?

- Captures complex relationships
- Handles large, multi-source datasets
- Learns patterns in space and time

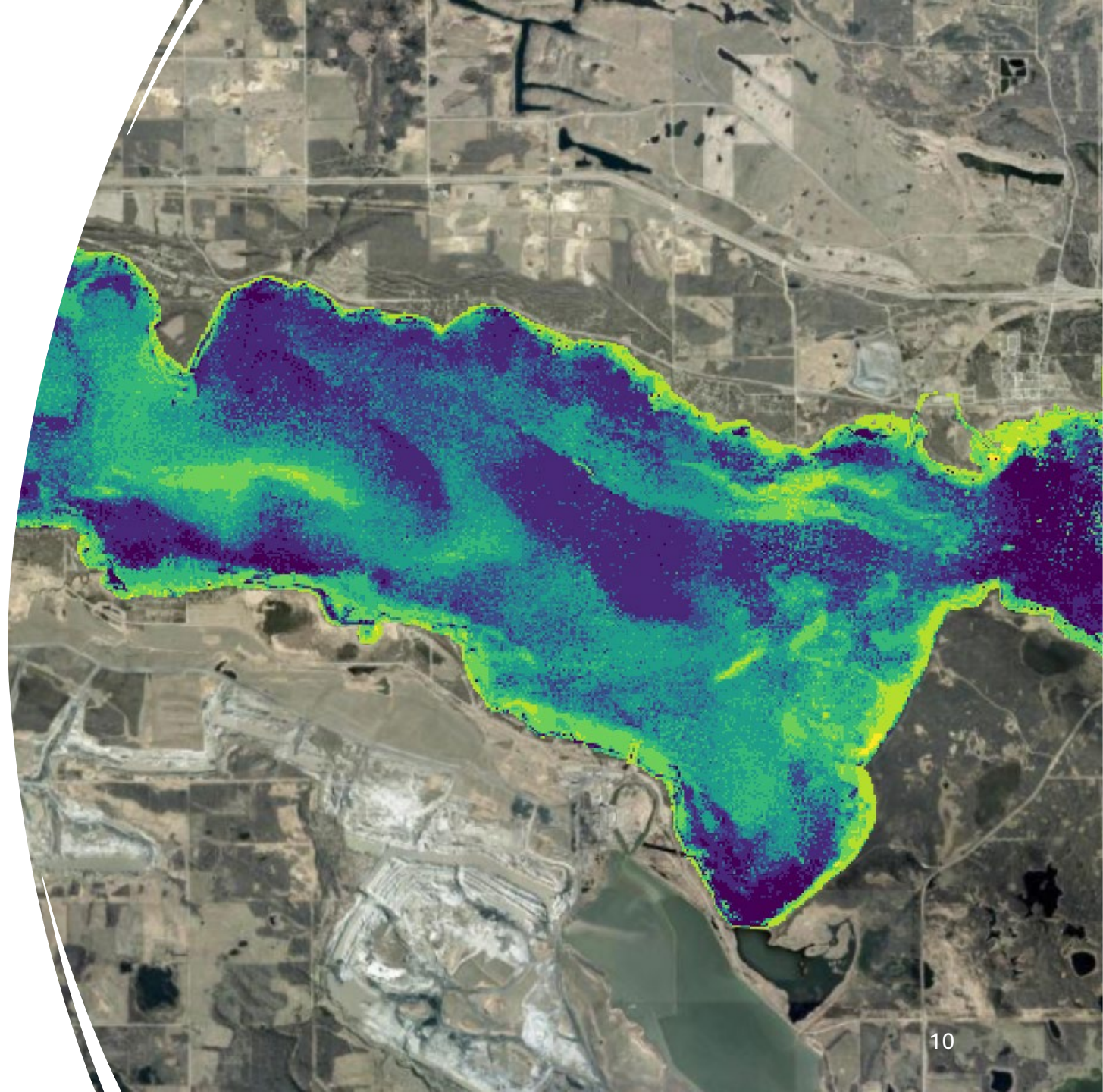




Preliminary results of a machine learning produced forecast for Nakamun Lake, showing overprediction of chlorophyll *a* concentrations.

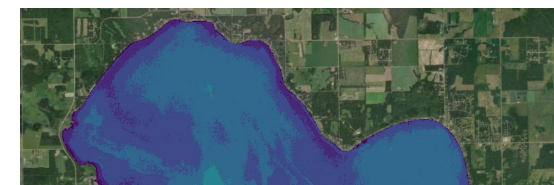
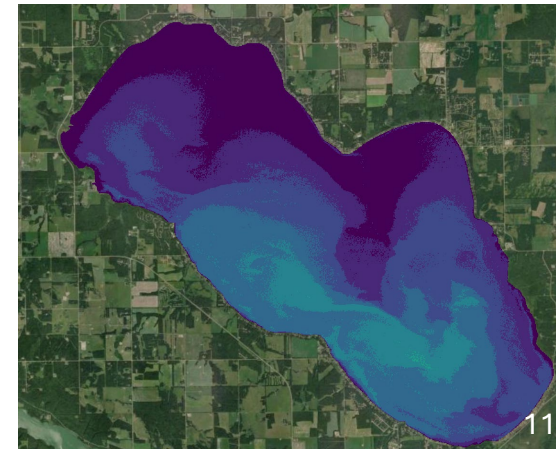
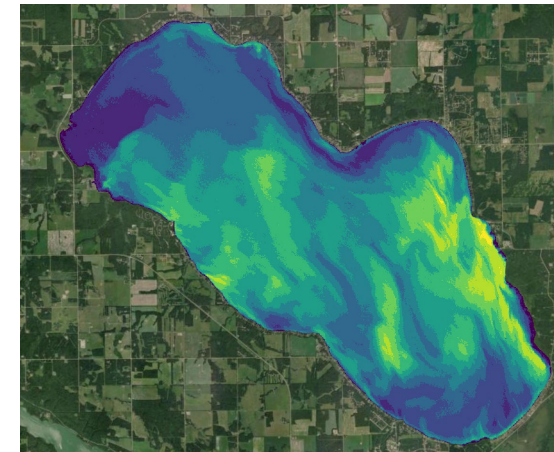
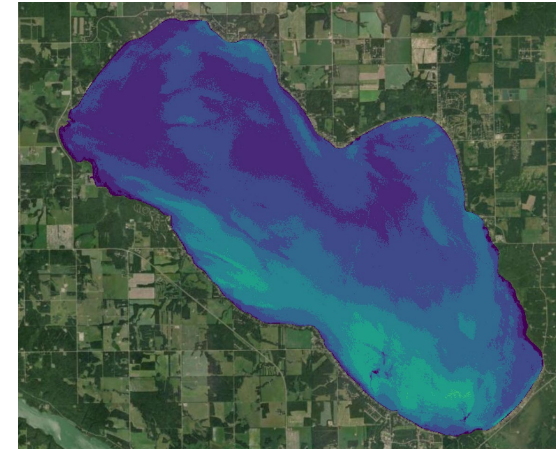
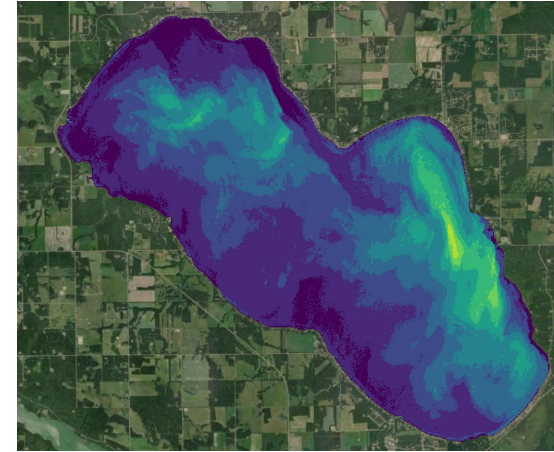
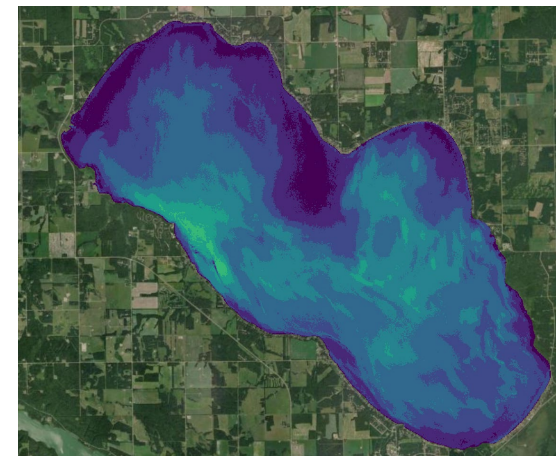
Key Insights

- Satellite imagery is crucial
- Models learn bloom 'fingerprints'
- Early warning system for management



Why it Matters?

- Protects health and recreation
- Informs water management decisions
- Builds climate resilience





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Climate Change Canada

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Acknowledgements



An aerial photograph of a rural landscape with a grid of fields. A large, irregularly shaped area is highlighted with a heatmap overlay. The heatmap uses a color scale from purple (low) to yellow (high), with a peak of yellow in the center. The word "Questions?" is written in white, sans-serif font across the middle of the heatmap.

Questions?