


# Examining drinking water vulnerability from increased frequency and intensity of wildland fires



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# A vulnerability assessment of wildland fire impacts to public drinking water in the western and southeastern United States

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But first....A story of scale  
comparing wildfire vs. mining  
impacts on water quality –  
Animas River, Colorado

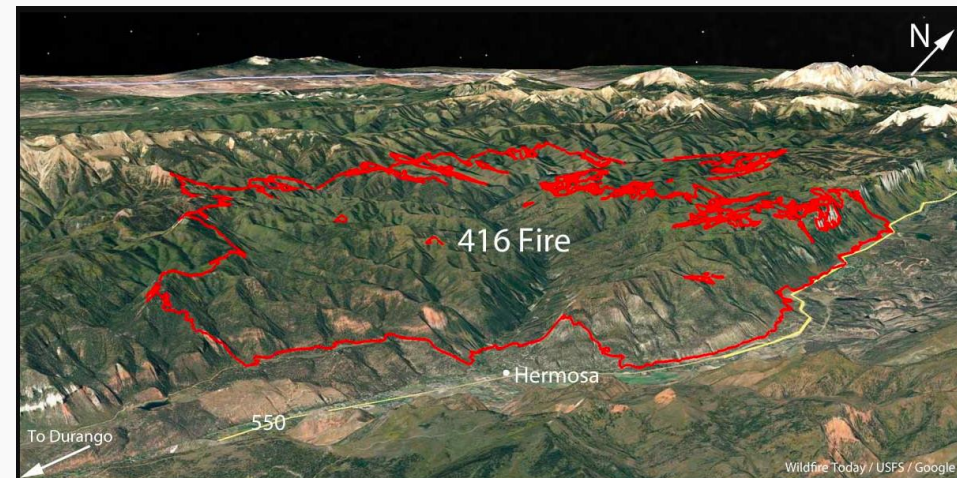


- **2015 Gold King Mine Spill**
- EPA Contractors Culpable
- Animas River (Tributary to San Juan River)
- 3 million gallons of toxic waste released in one hour





- **2018 416 Fire, Hermosa, CO**
- Animas River (Tributary to San Juan River)
- 54,000 Acres burned





- **Al<sup>+</sup> - 50X higher (416 Fire)**
- **Fe – 6X higher (416 Fire)**
- **Mn – 20X higher (416 Fire)**
- **Hg – 3X higher (416 Fire)**

## Which was worse for water quality: Gold King Mine spill or 416 Fire floods?



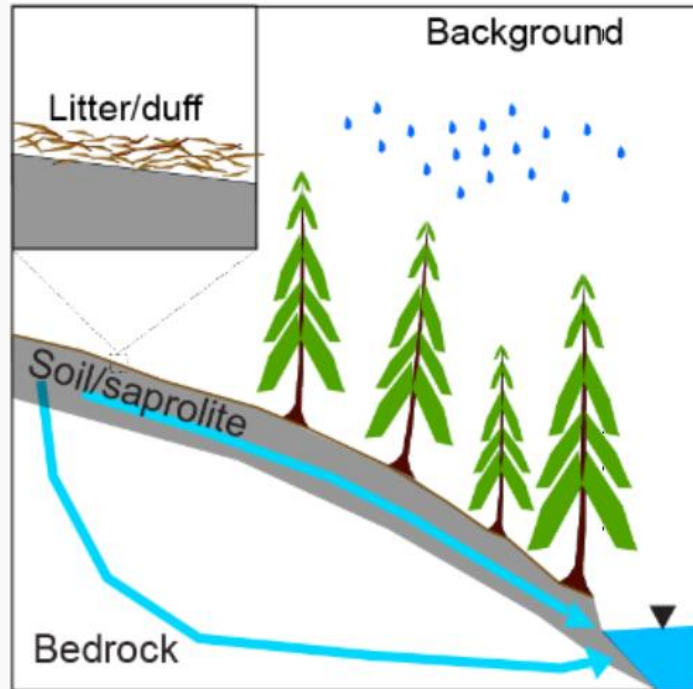
Study compared metal loading in both events; results surprised researchers

By Jonathan Romeo Staff reporter

Saturday, Nov 3, 2018 5:03

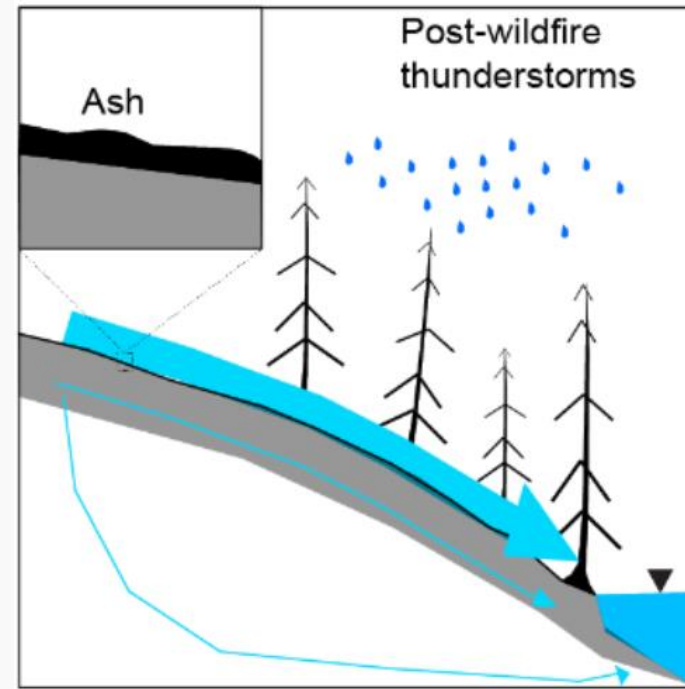


# Wildfire impact to receiving water bodies



## Background forested condition:

- Subsurface flow dominant
- Overland flow very rare
- Forest acts as filter and sponge



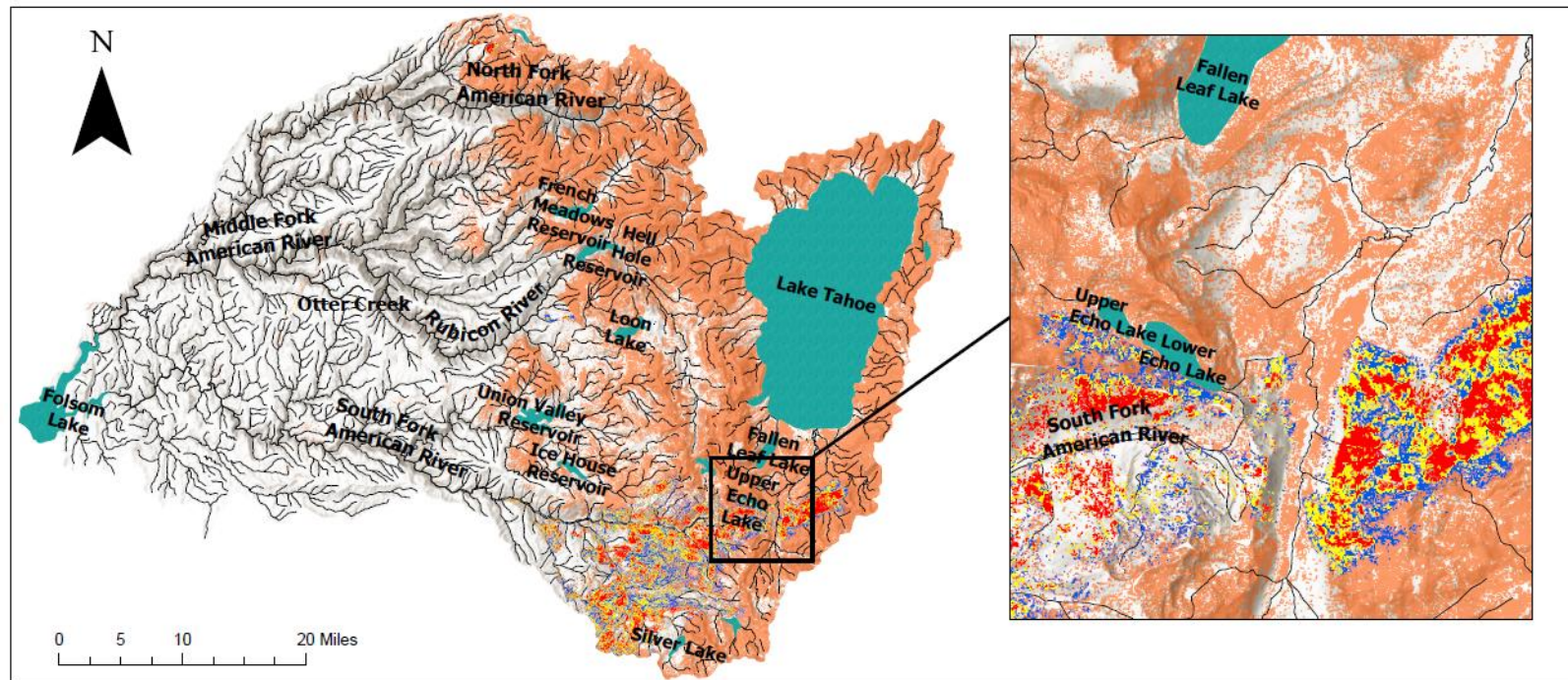
## Post-wildfire:

- Decreased interception, infiltration, and storage
- Overland flow
- Water (and entrained sediment, ash, etc) moves quickly to streams

Murphy et al., 2018,  
*JGR-Biogeosciences*

This slide courtesy of  
Sheila Murphy,  
USGS

## Soil hydrophobicity following moderate to high burn intensity to the forest floor



MTBS Fire Severity Burns (2018-2022) On Soils Modeled at-risk for Fire Induced Hydrophobicity in the Sierra Nevada Mountains, California. (*Steven Miller, ORISE Fellow, US EPA*)



# Wildfire impact on formally vegetated and stable legacy mining sites

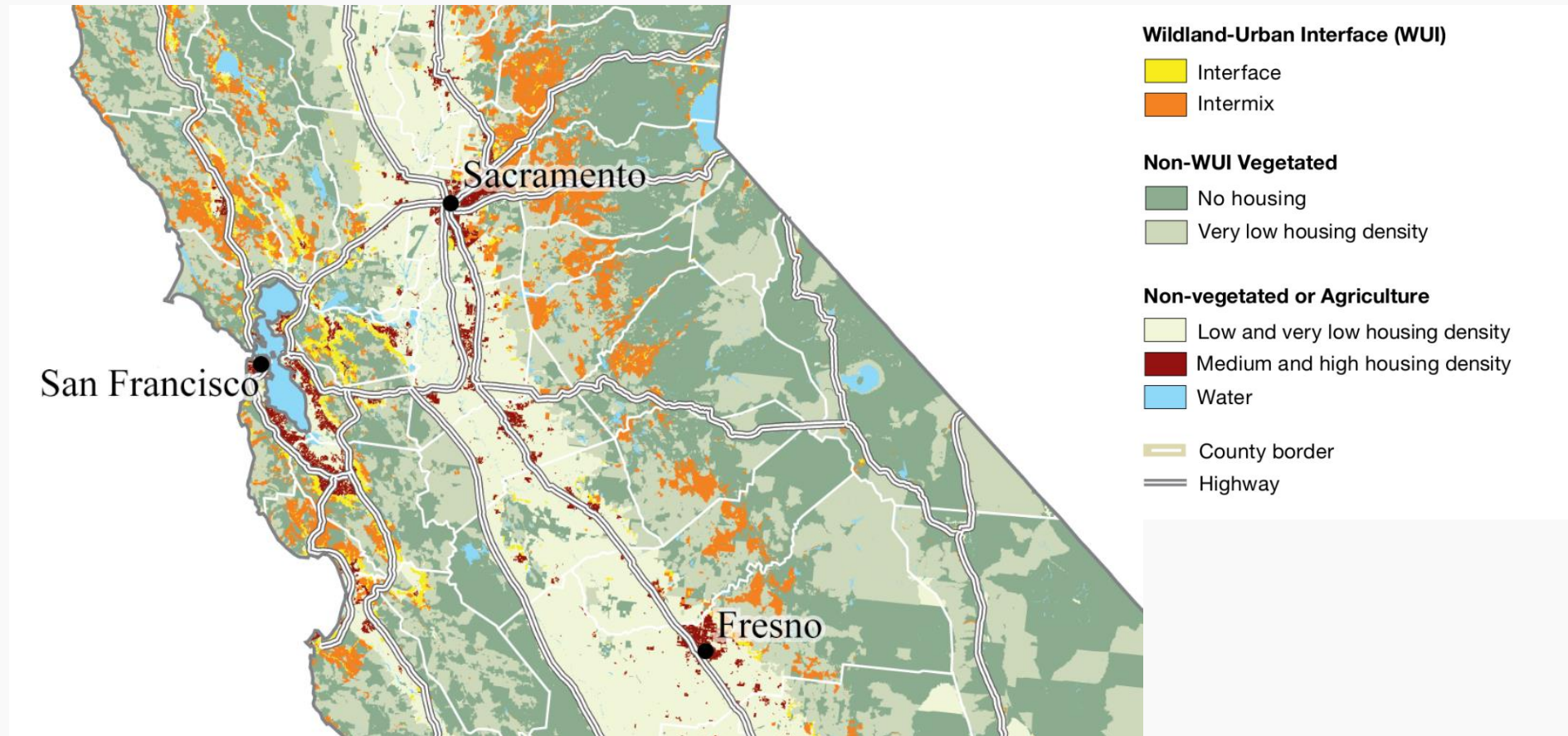


Mining legacy in  
the Fourmile  
Creek watershed  
(1860s-1940s)

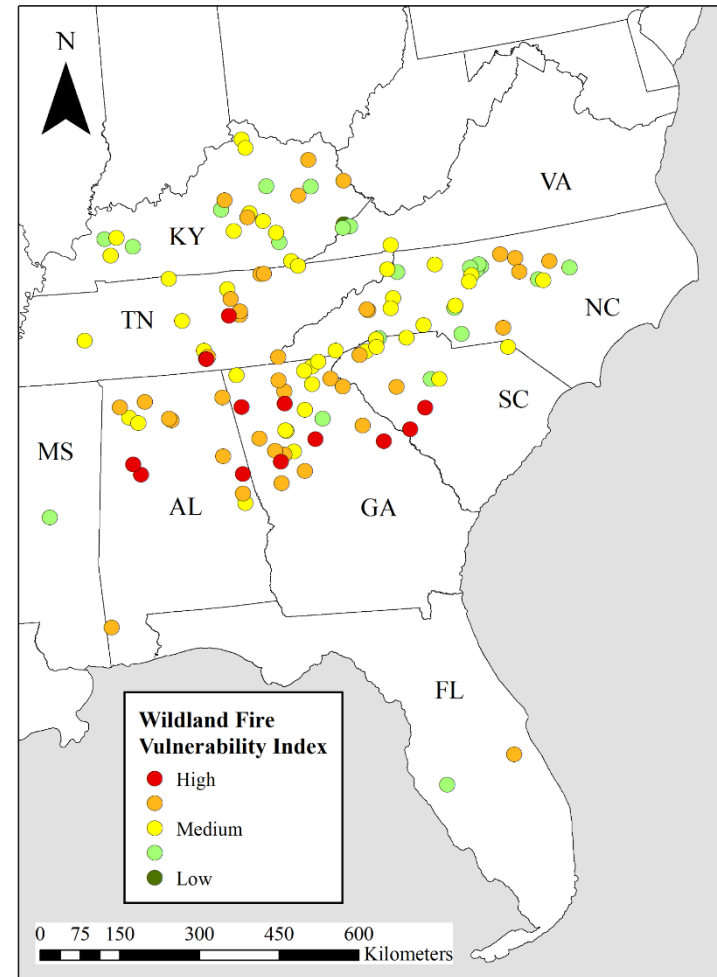
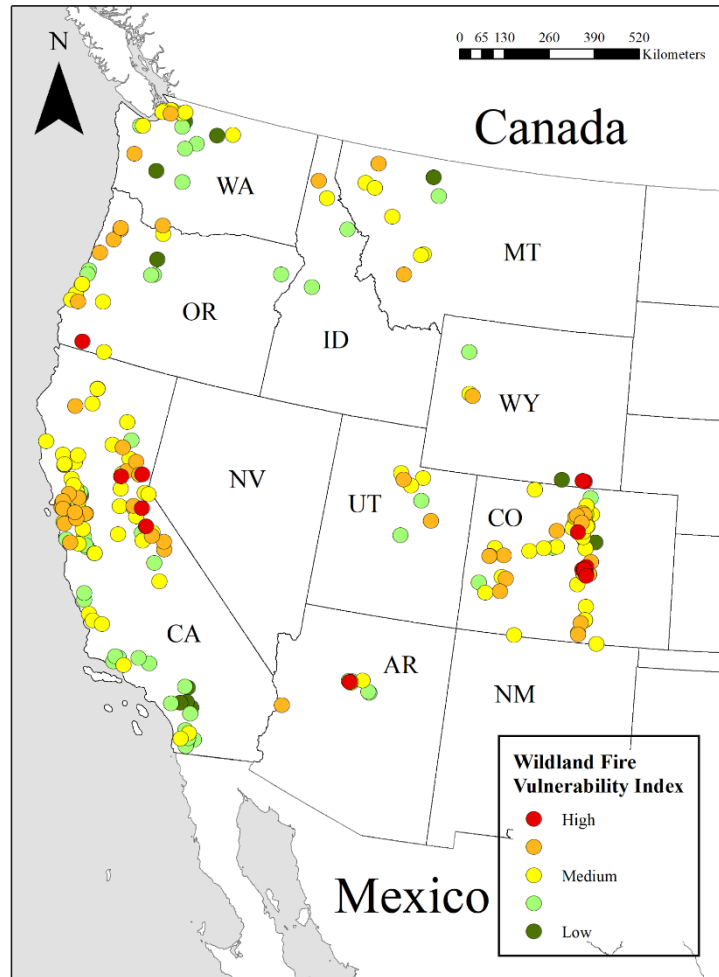
*Murphy et al., 2020*

This slide courtesy of  
Sheila Murphy, USGS

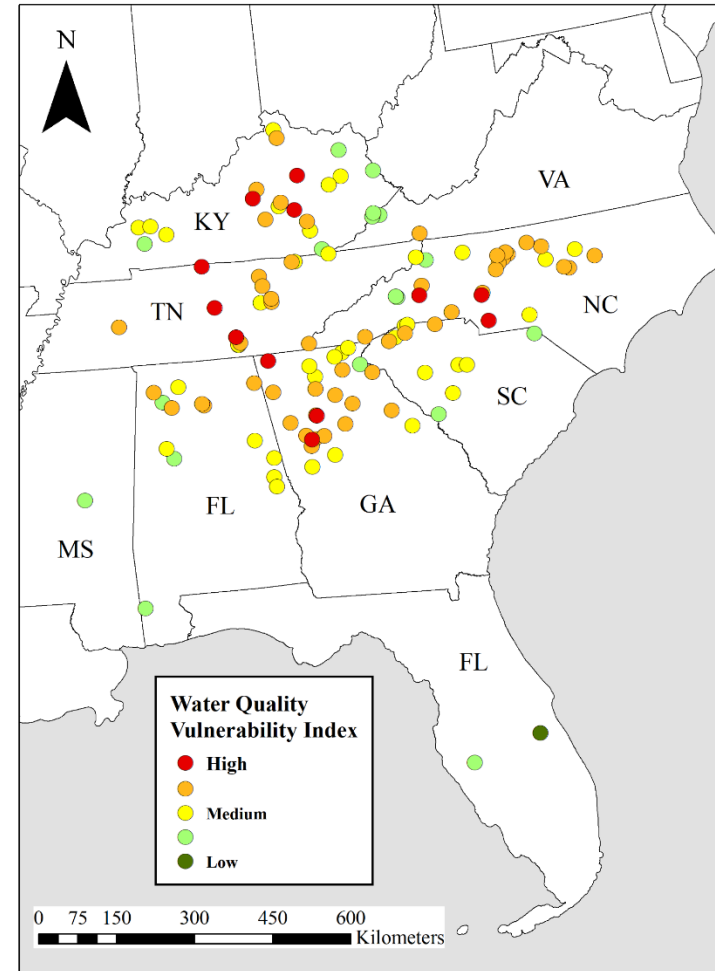
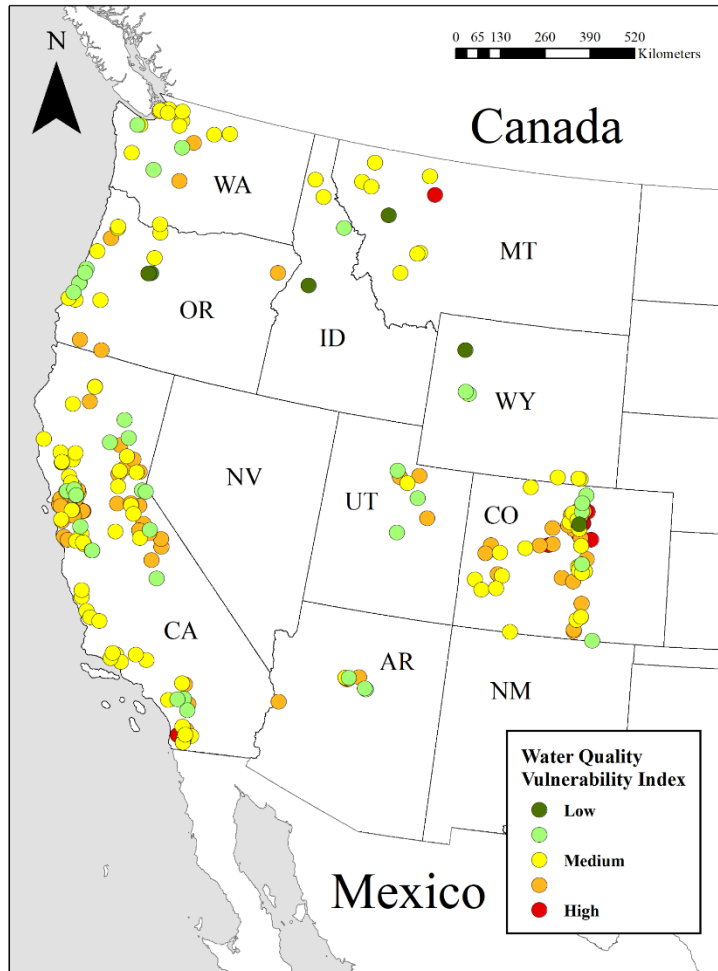
# Wildfire-Urban Interface areas are increasing...



[https://www.fs.fed.us/nrs/pubs/rmap/rmap8/rmap\\_nrs8-hi.pdf](https://www.fs.fed.us/nrs/pubs/rmap/rmap8/rmap_nrs8-hi.pdf)  
Martinuzzi et al., 2015



Wildland Fire Vulnerability Index



Water Quality Vulnerability Index

# Forecasting freshwater cyanobacterial harmful algal blooms for Sentinel-3 satellite resolved U.S. lakes.

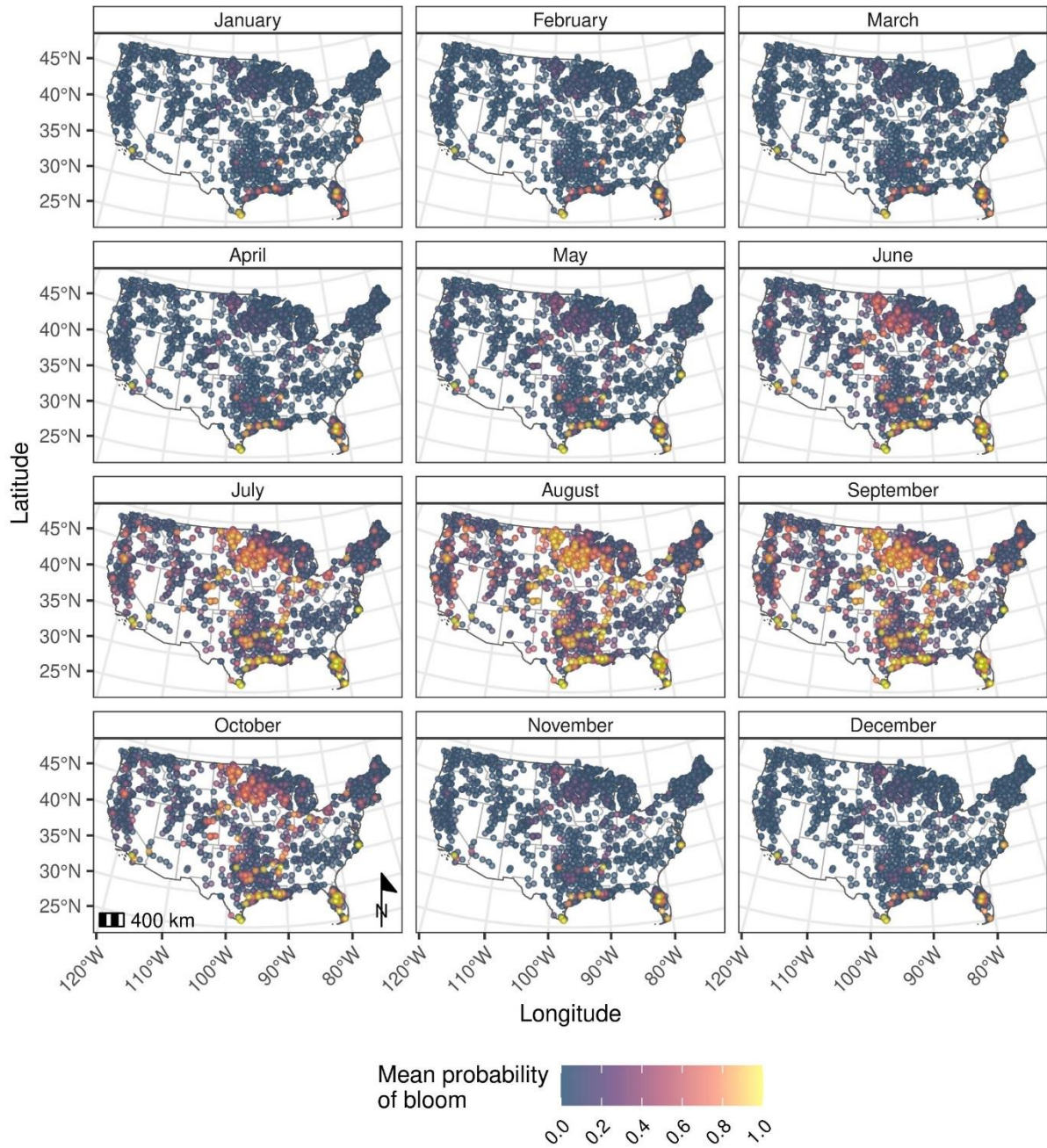
Blake Schaeffer



# Motivation

- World Health Organization Alert Level 1
  - $> 12 \mu\text{g L}^{-1}$  chlorophyll-a
- $\text{CI}_{\text{cyano}}$  algorithm
- Bayesian spatiotemporal model
  - One-week in advance
  - Surface water temperature, precipitation, lake geomorphology

# Forecasting





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