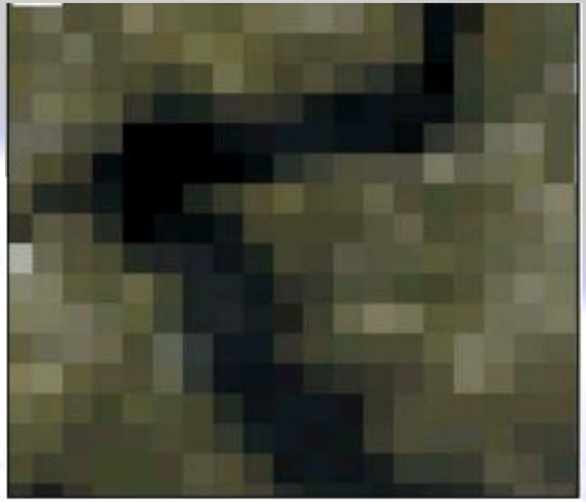
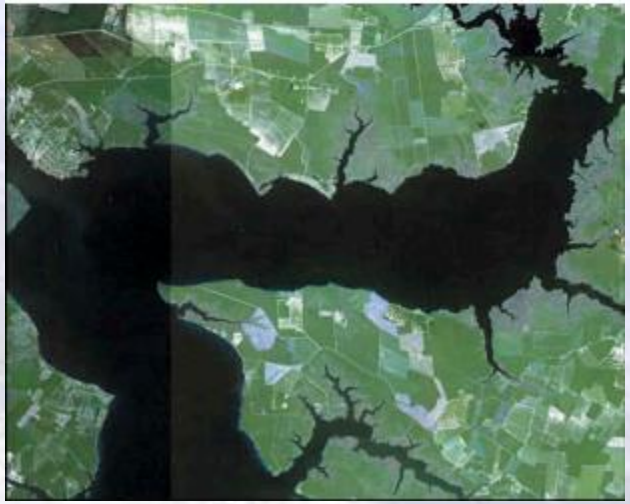
Remote Sensing for Water Resources and Water Quality Modeling Applications







Vamsi Krishna Sridharan

May 18, 2025

Anchorage, AK

TETRA TECH

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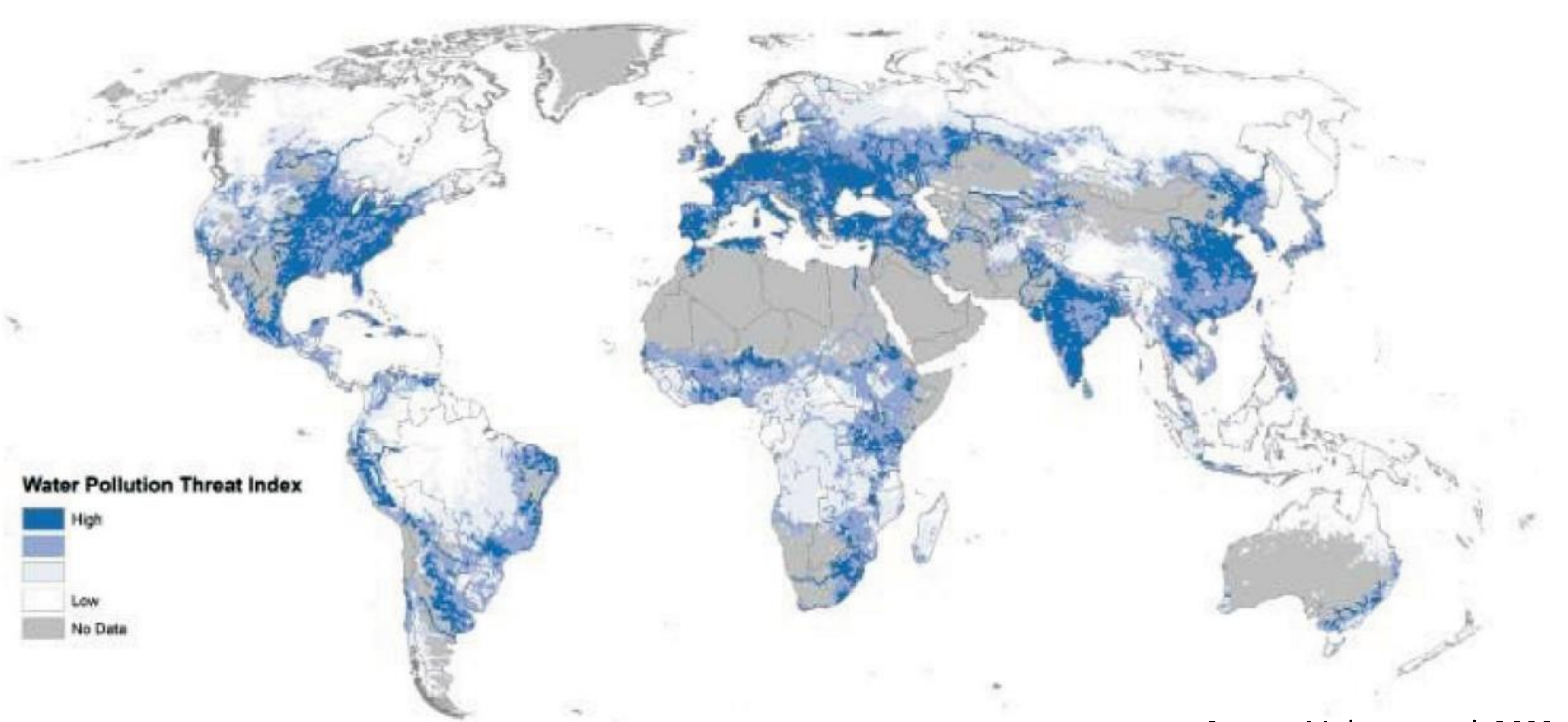
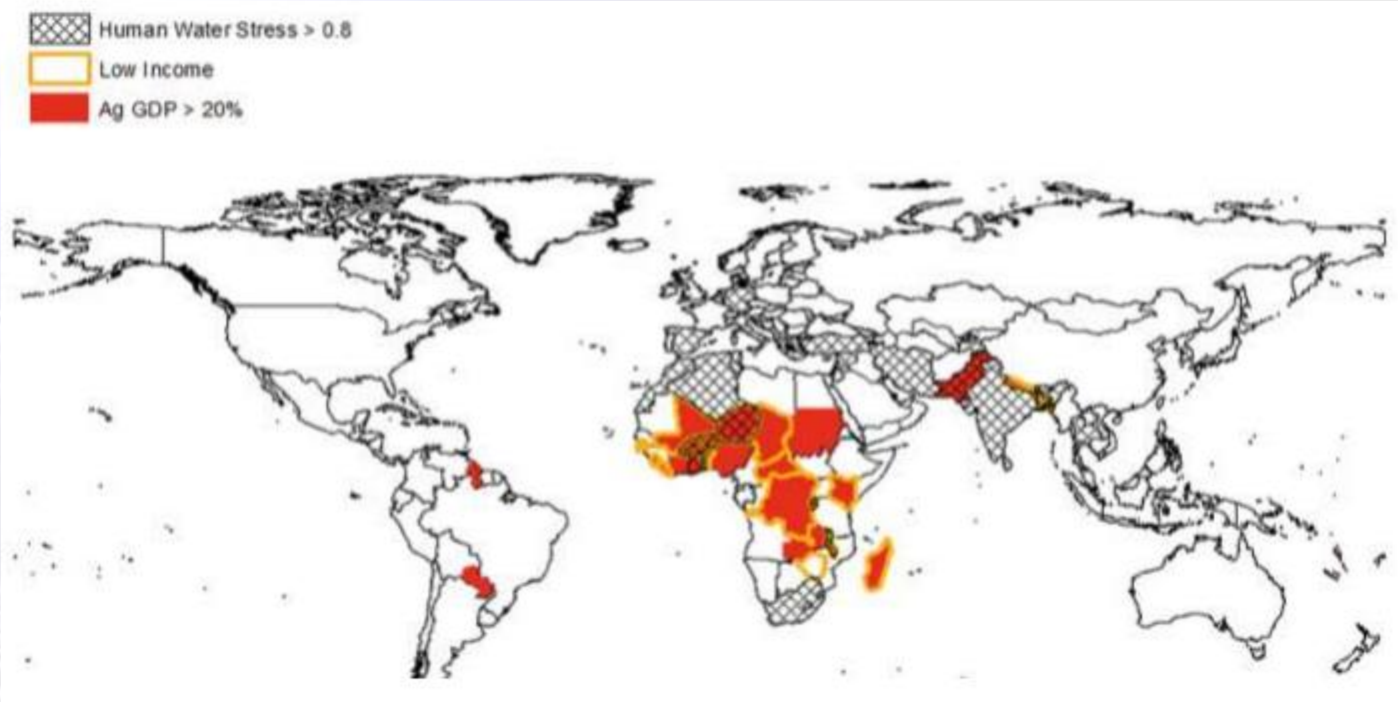
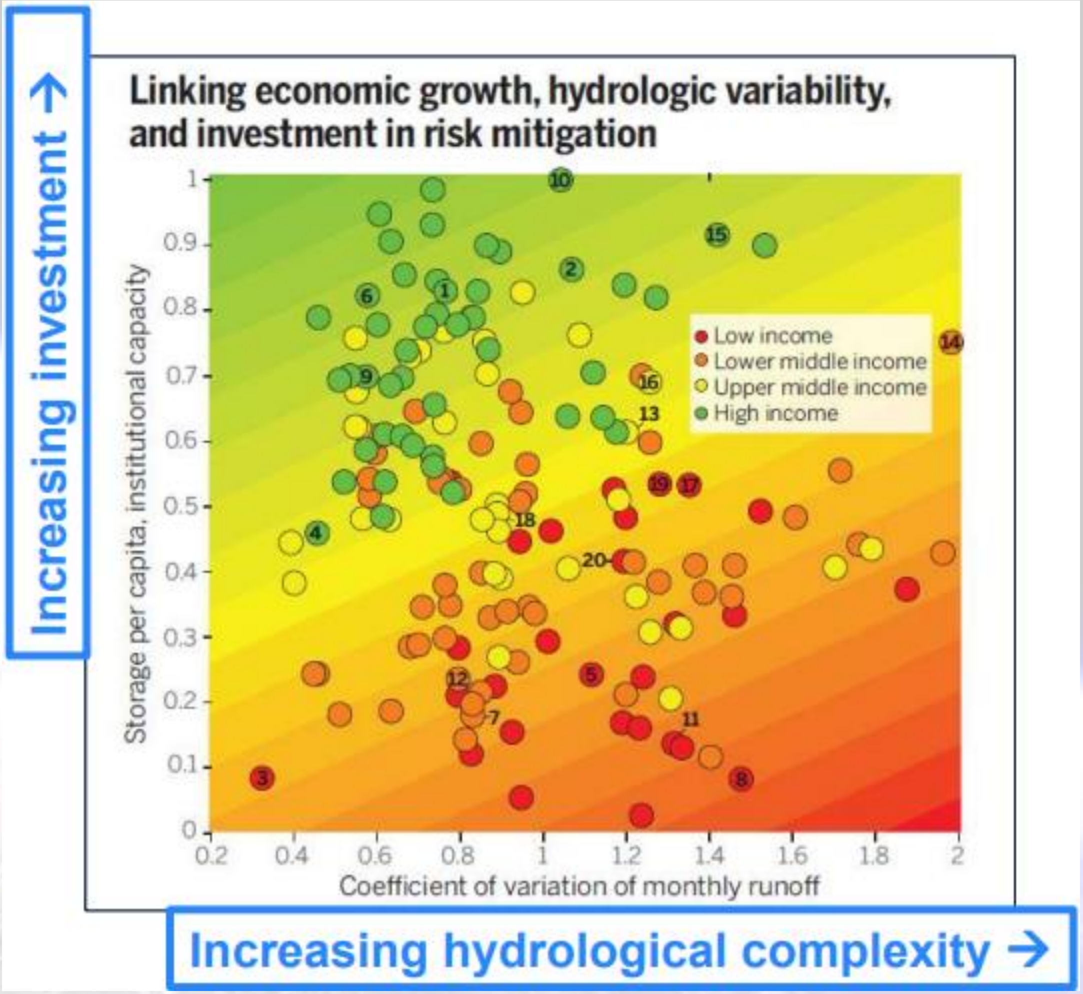
The challenge



Source: Mohanty et al. 2023

The challenge





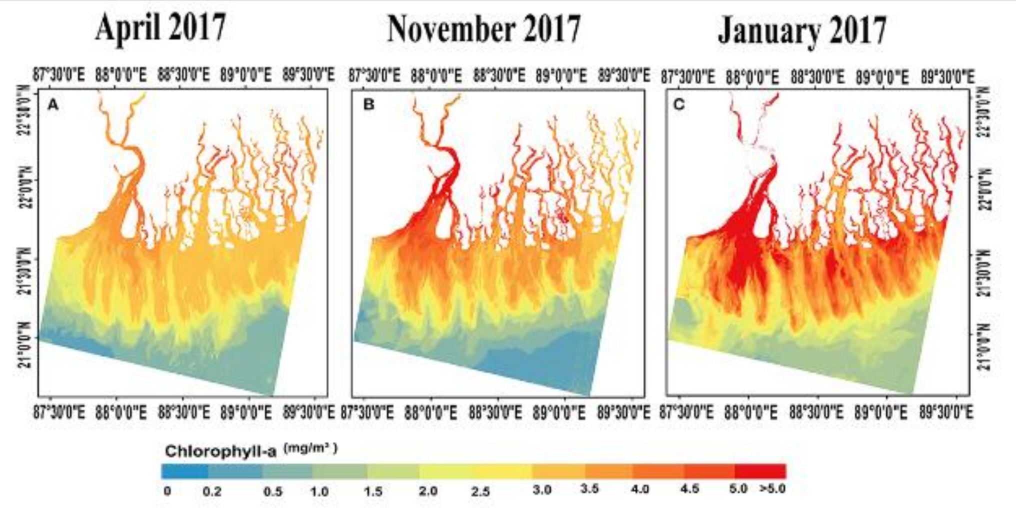
Source: Sadoff 2015

The challenge

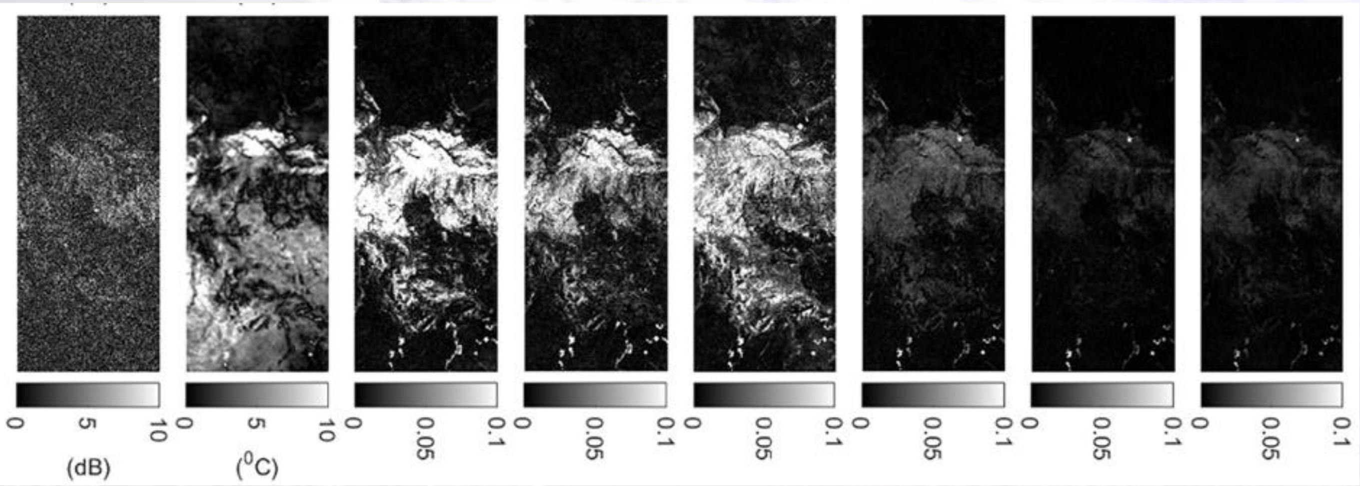
Source: https://sdgs.un.org/goals

Role of remote sensing in identifying impairment

- In water-column impairments

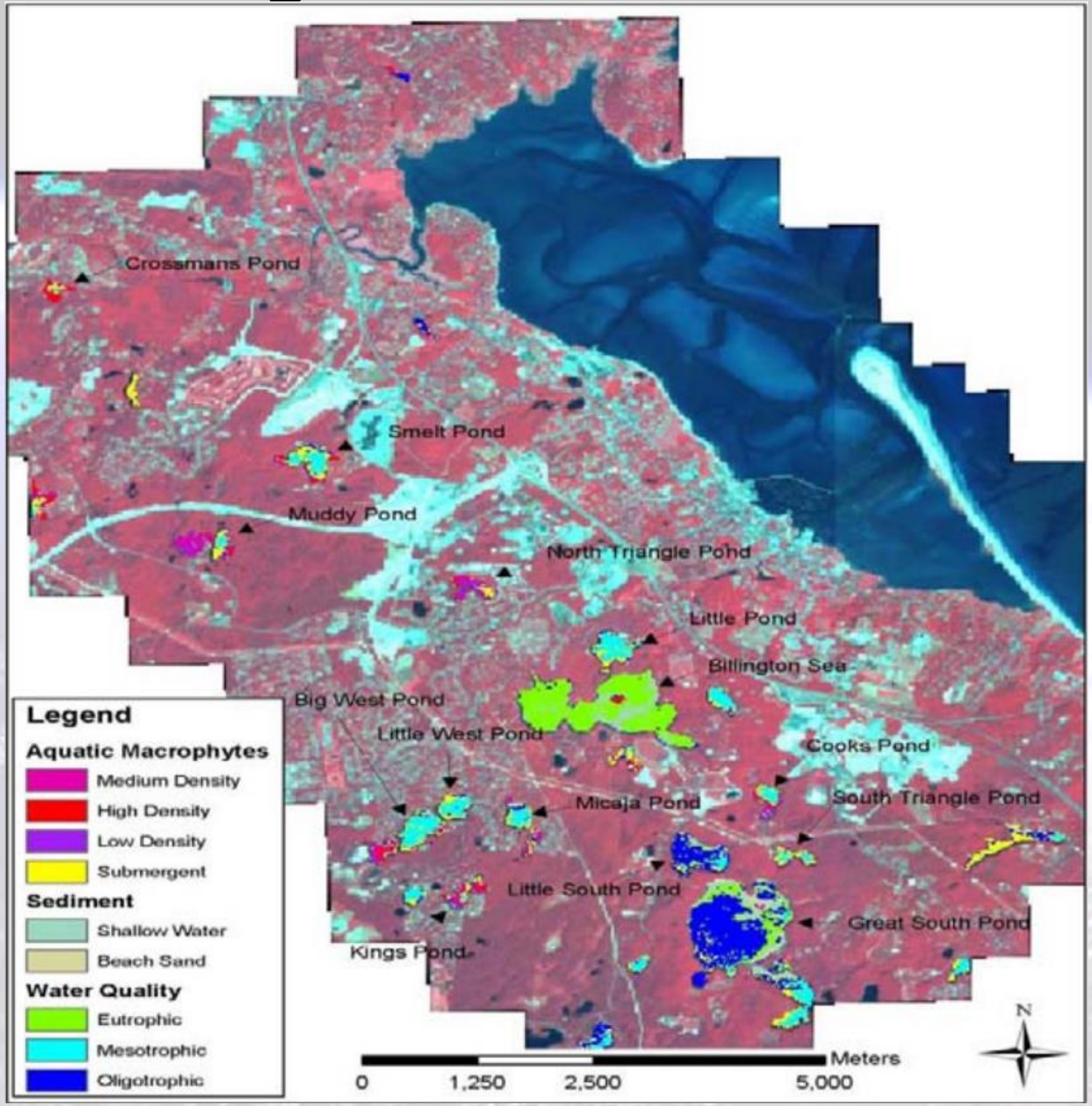


- Predicting impairments from land use land cover change



Source: Zhu et al. 2022

Remote sensing for initial assessment of eutrophication



Source: Rogers and Thompson 2002

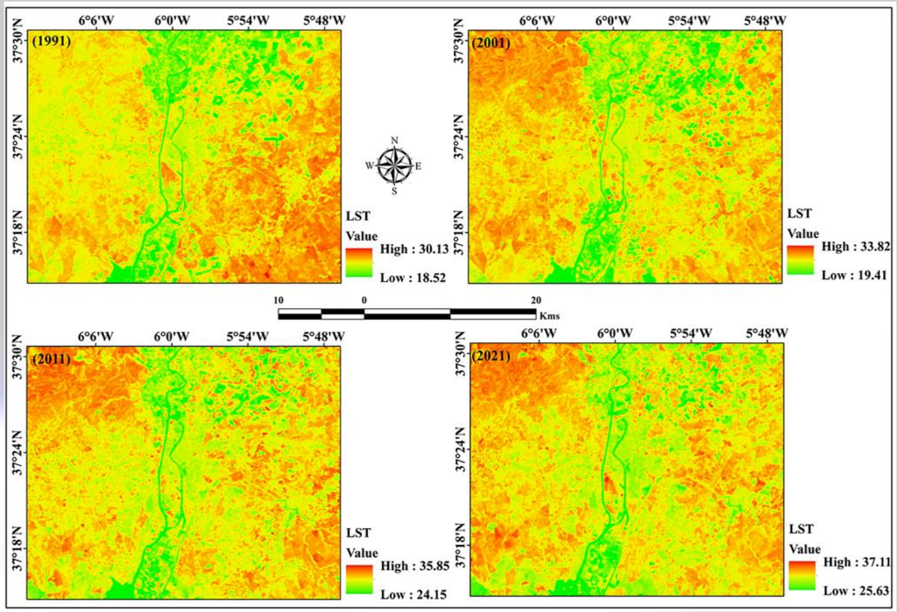
Remote sensing for HABs, acid mine drainage, and sediment plumes

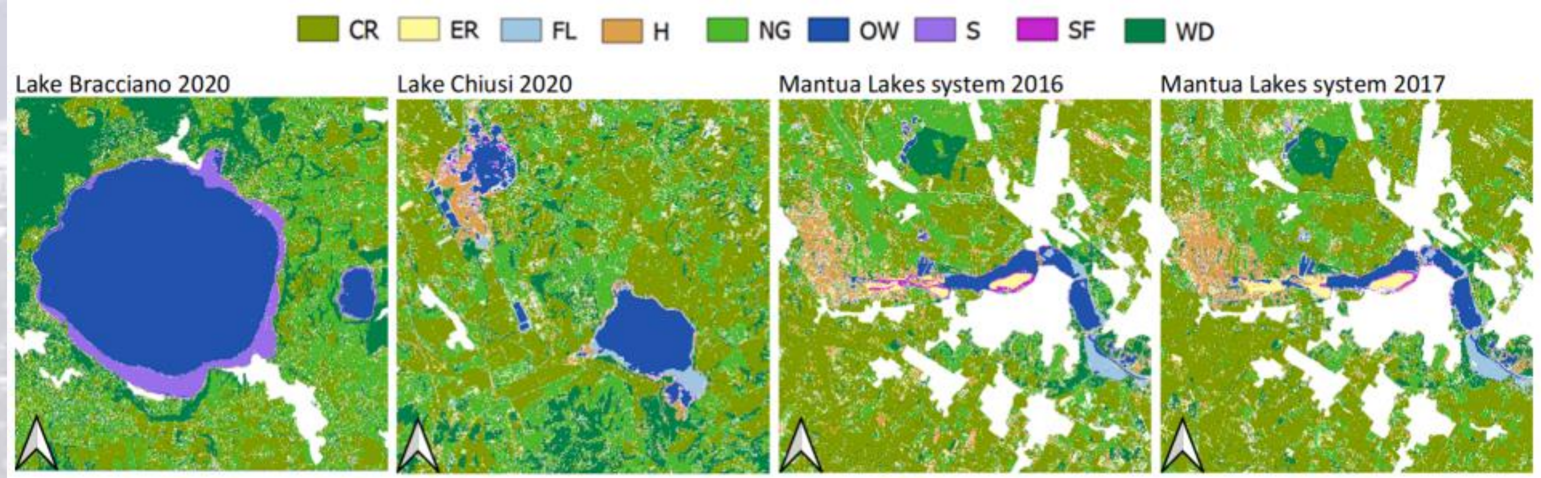
- Quantities that affect the water column color
- Quantities that have a large spatial footprint
- Quantities that persist, or cycle over time

Source: Murray et al. et al. 2022

Remote sensing for watersheds

- Linking sources to impairments
  - Urban heat islands and water temperature
  - Submerged aquatic vegetation and water quality





Sources: Halder et al. 2022; Piaser and Villa 2023

Remote sensing preconditions and limitations

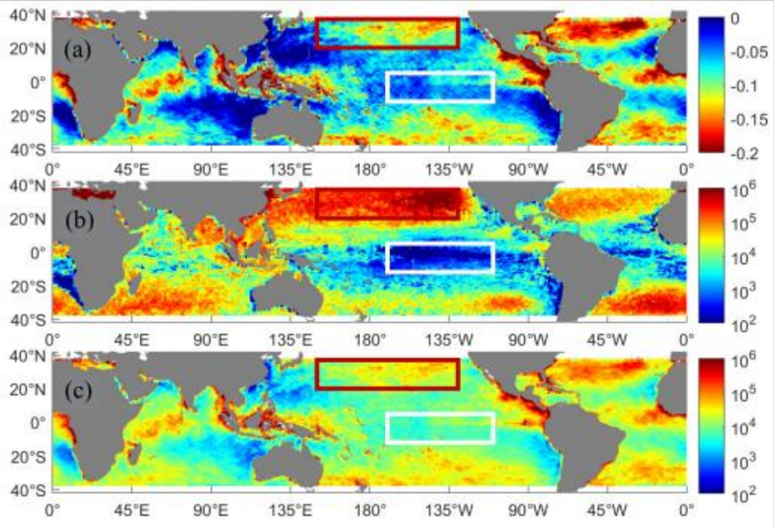
- Impairment indicator being remotely sensed must be
  - Consistent with water quality standards
  - Quantifiable
  - Sensitive to local conditions
  - Reproducible
  - Discriminable at the scale of management
  - Comparable to in-situ measurements
  - Able to be referenced to a baseline
  - Able to indicate a trend
  - Able to be linked to sources and water conditions
  - Affordable to acquire

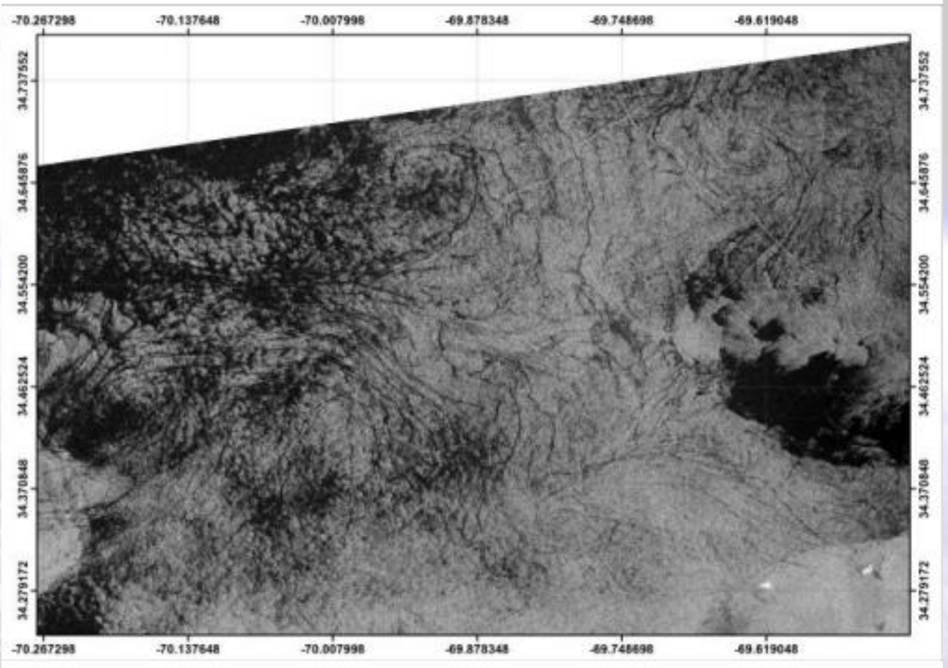
Adapted from: Rogers and Thompson 2002

Remote sensing for non-traditional impairments

- Microplastics using RADAR wind field and ocean roughness deficit
- Microplastics using SAR coupled with striated ocean smoothness, no corresponding shipping, and bacterial activity

- Heavy metals using hyperspectral reflectance correlated with environmental factors

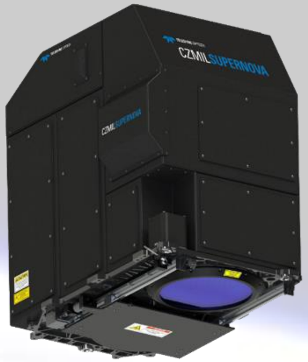


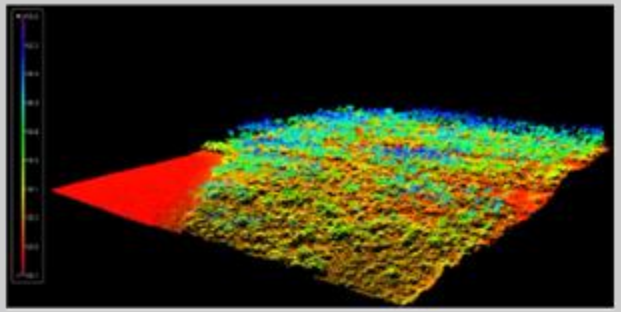


Sources: Davaasuren et al. 2018;
Evans and Ruf 2022

Remote sensing for coupled topobathymetry, and terrestrial ecosystem and benthic substrate mapping

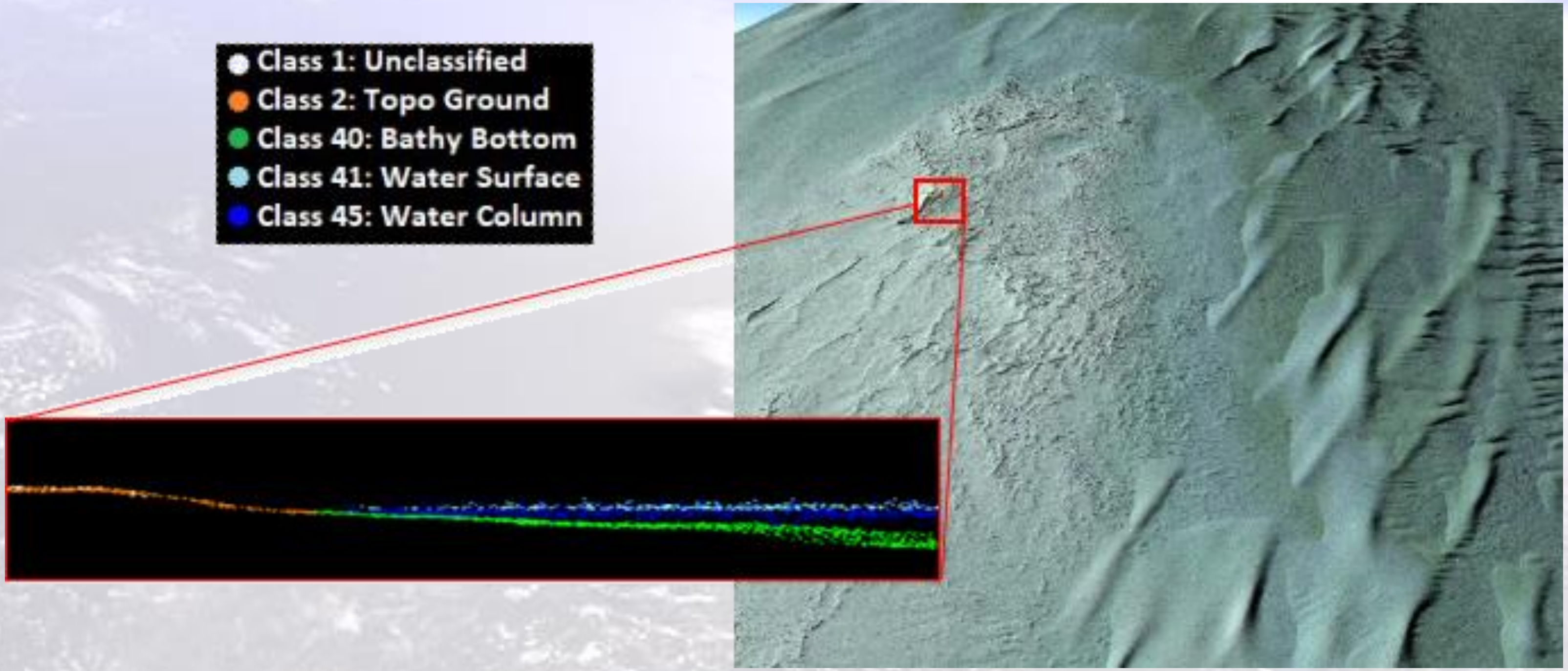
Coastal
Zone
Mapping
Imaging
Lidar
SuperNova

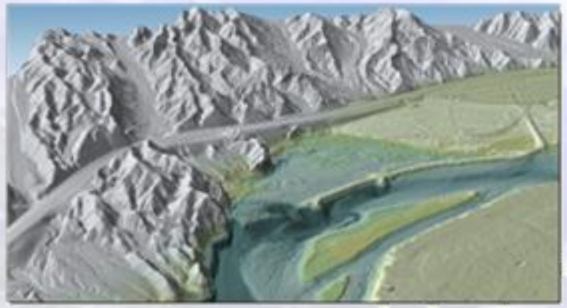




Kiribati

Blue River, CO





Colorado River, NV

Remote Sensing Applications for TMDL Modeling Task Committee

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Qing Qang, Ph.D.

Purpose:

The mission of this Task Committee is to review and disseminate technical information derived from scientific and other published literature regarding the application of remotely sensed data from aerial and satellite platforms in water quality modeling and Total Maximum Daily Loads (TMDL) development. The committee compiles and summarizes the findings from these reviews, providing clear recommendations for practitioners on effectively utilizing remotely sensed data products in their water quality modeling efforts. It also seeks to act as a bridge between remote sensing and water system experts and practitioners within and outside EWRI.

https://www.asce.org/communities/institutes-and-technical-groups/environmental-and-water-resources-institute/committees/environmental-and-water-resources-institute/ewri-governing-board/technical-coordination-executive-committee/watershed-council/watershed-management-technical-committee/remote-sensing-applications-for-tmdl-modeling

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