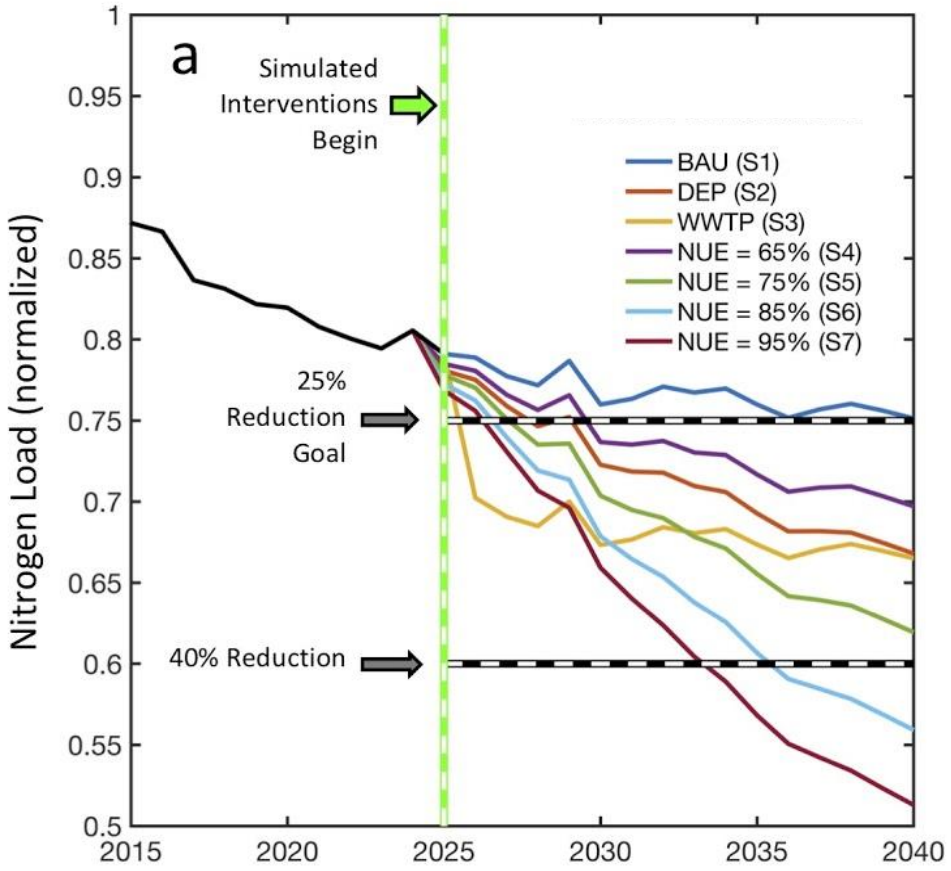
Advancing Water Quality Predictions using IWAND
A CONUS nutrient benchmark

Shuyu Chang, Doaa Aboelyazeed, Kamlesh Sawadekar, Digant Chavada, Chaopeng Shen, Kim Van Meter

Chesapeake has made remarkable progress in nutrient management



(Chang, Zhang, Van Meter et al 2021)

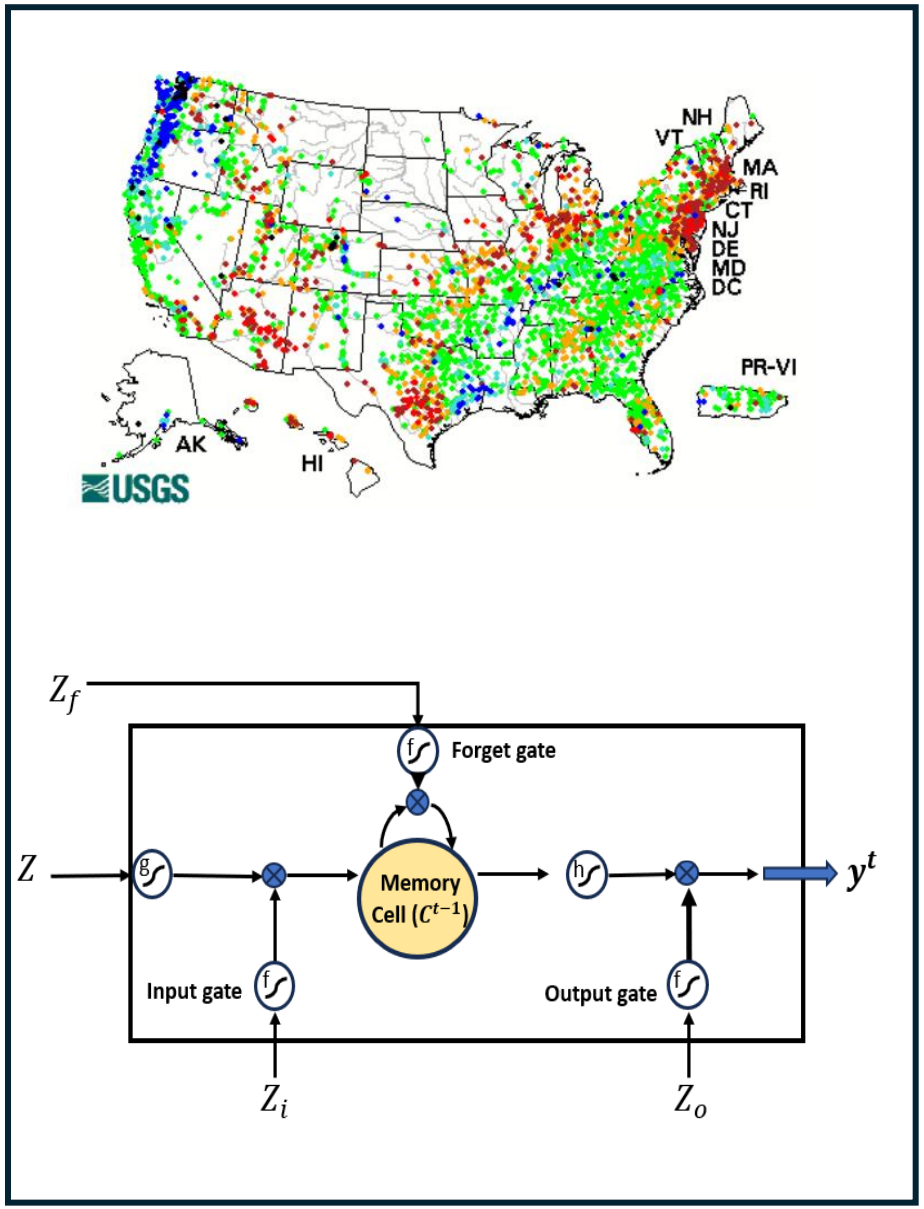
A CRITICAL PATH FORWARD FOR THE CHESAPEAKE BAY PROGRAM PARTNERSHIP BEYOND 2025

July 2024

This draft has been prepared by the Beyond 2025 Steering Committee for public feedback. It may be revised before being provided to the Principals' Staff Committee for their consideration.

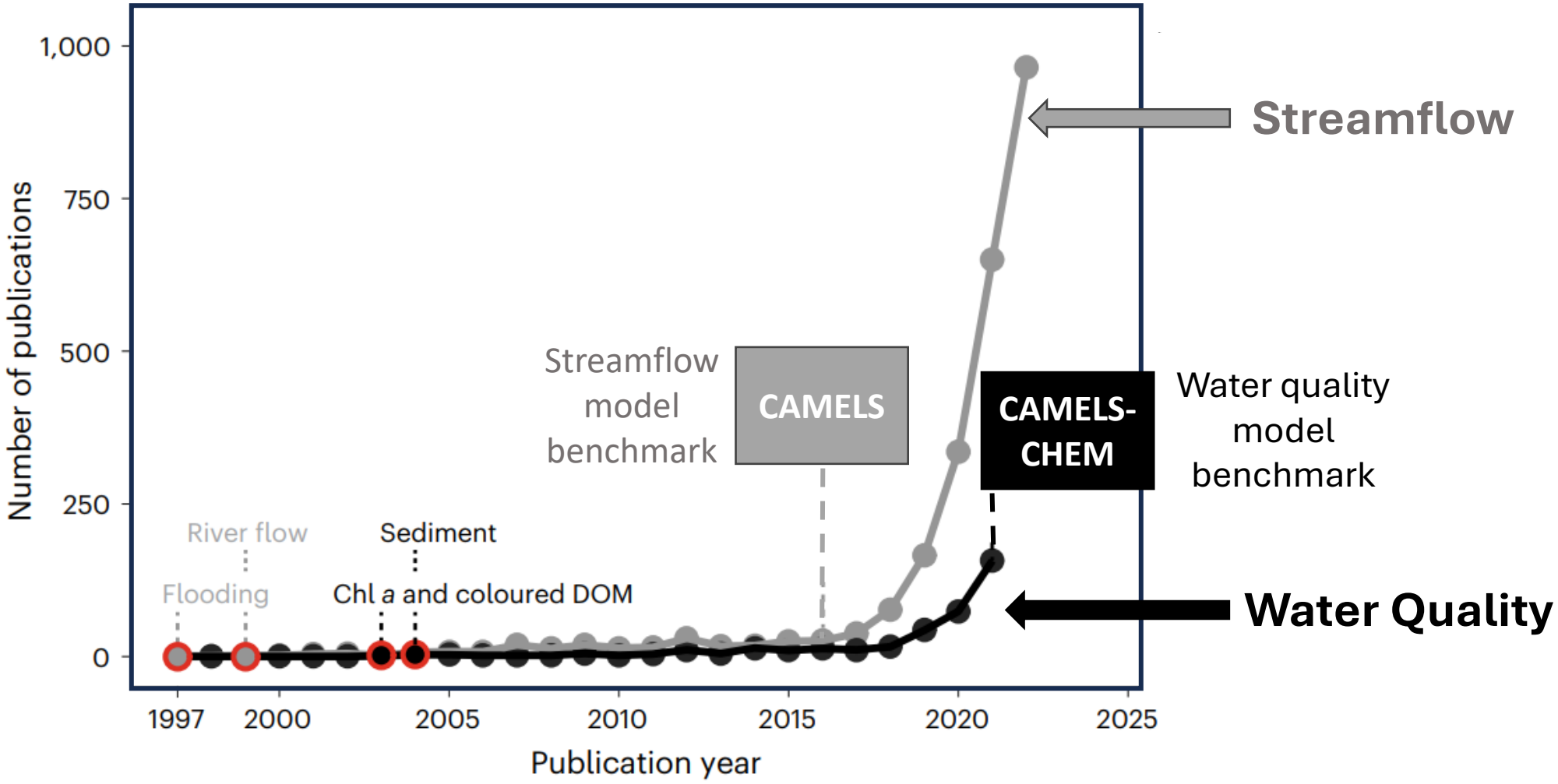
Chesapeake Bay Program
Science. Restoration. Partnership.

Large-sample Hydrology (LSH)



Biogeochemical processes vary,
yet insights from one can inform another.

Deep Learning for Water Quality Lagged



Deep learning for water quality *(Zhi et al., 2024)*

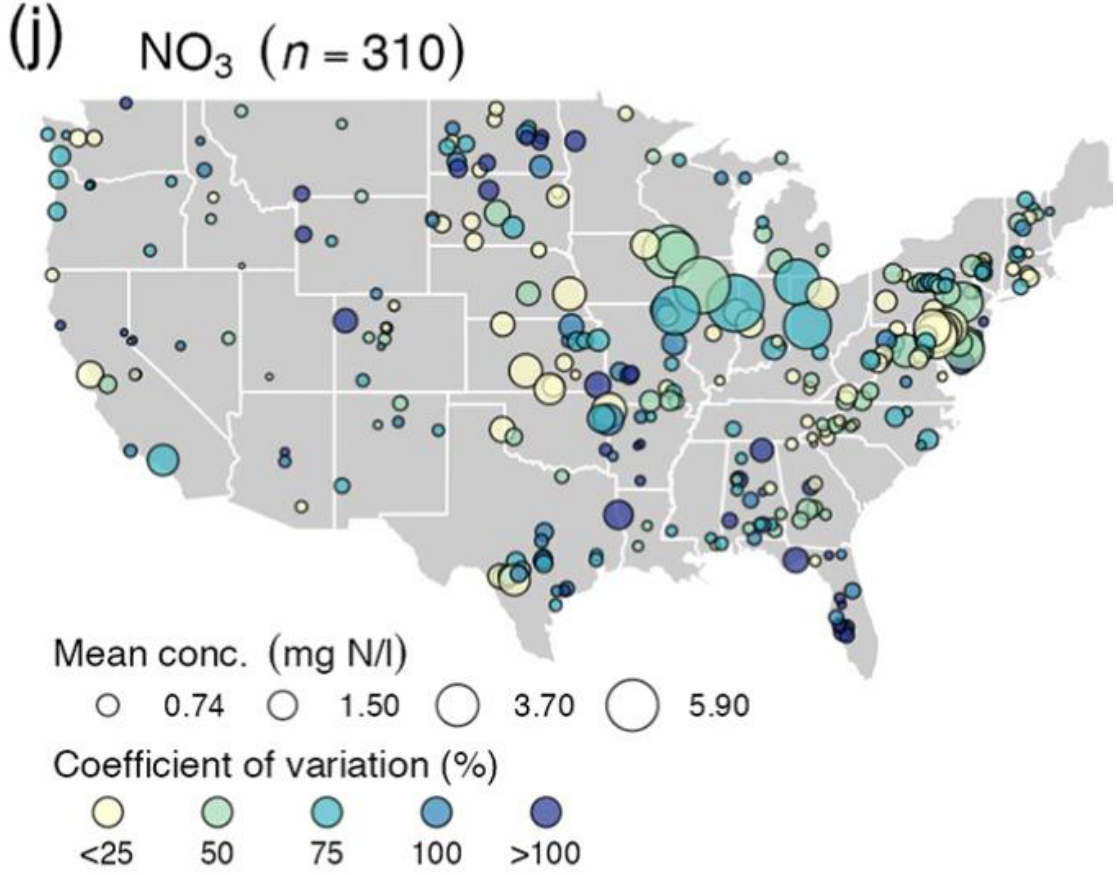
Advance Further from CAMELS-CHEM

(a) Minimal human impacts

(b) Lacks nutrient inputs

(c) Sparse sampling locations

CAMELS-CHEM



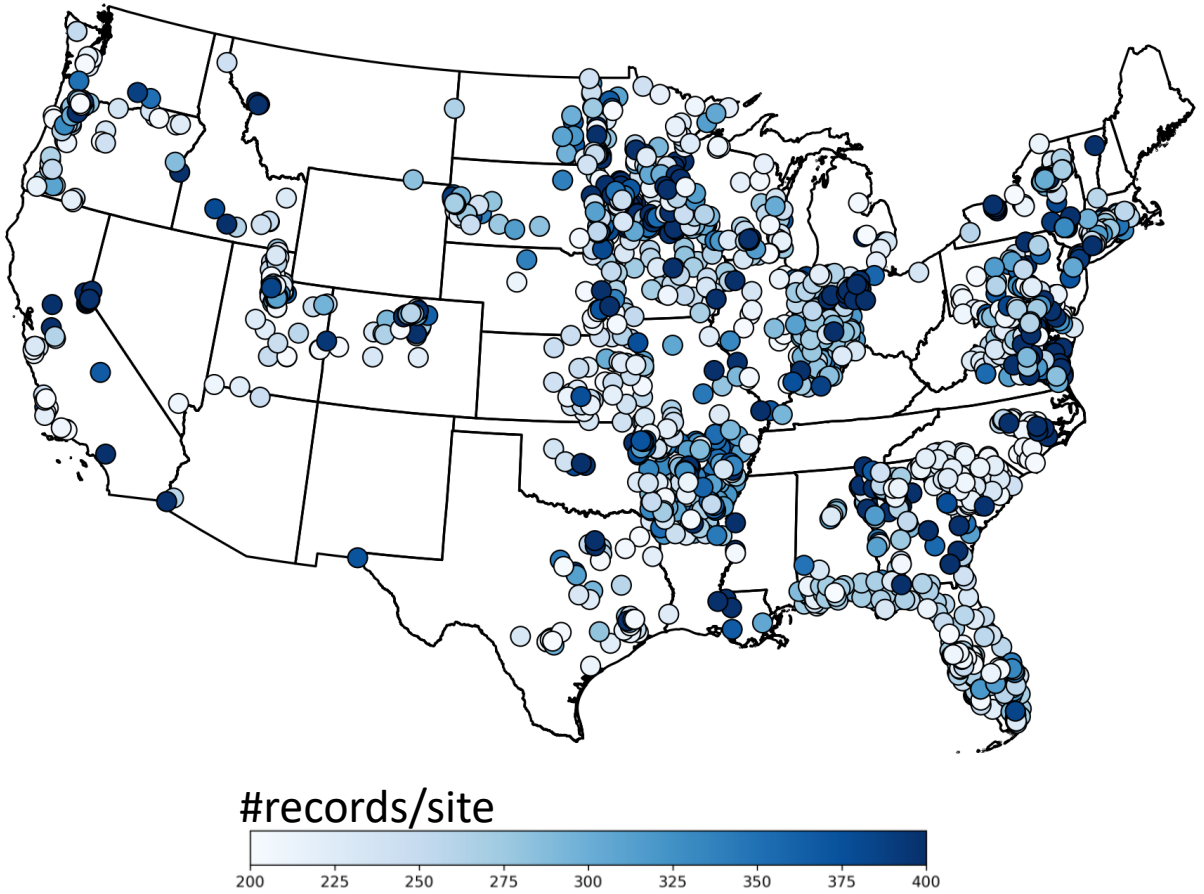
(Sterle et al., 2024)

IWAND Dataset

Integrated Watershed Attributes, and Nutrient Data

A large benchmark for nutrient modelling

NO3	IWNAD	CAMELS-CHEM
#Rivers	2022	310
#records	625,928	13,615



(Chang and Aboelyazeed, Shen, Van Meter et al, in prep)

IWAND Dataset

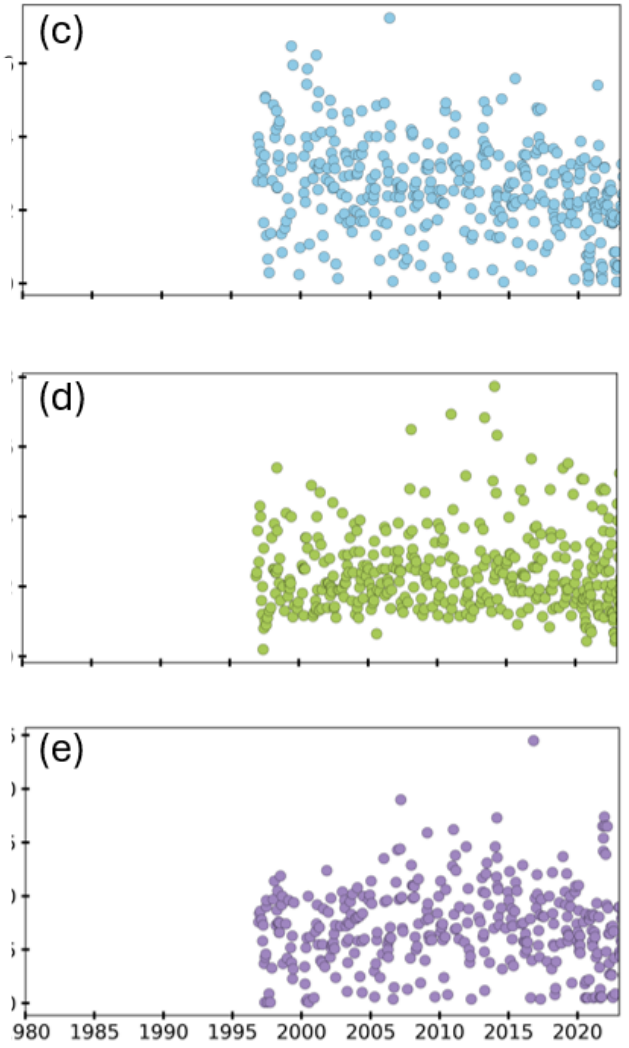
Gauge location and basin boundary

Catchment Attributes

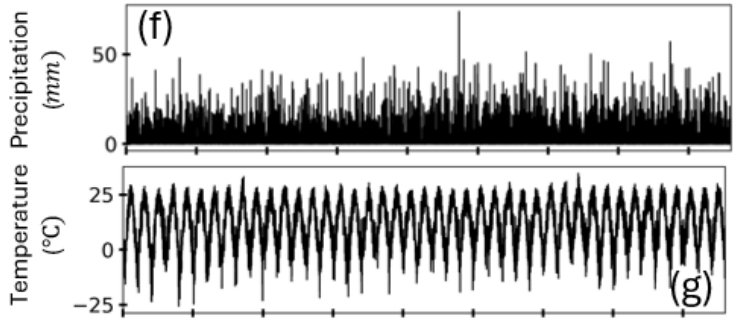
Attributes	Value	Unit
Elevation	218.8	m
Sand	21.6	%
#Dam	927	-
⋮		

(b)

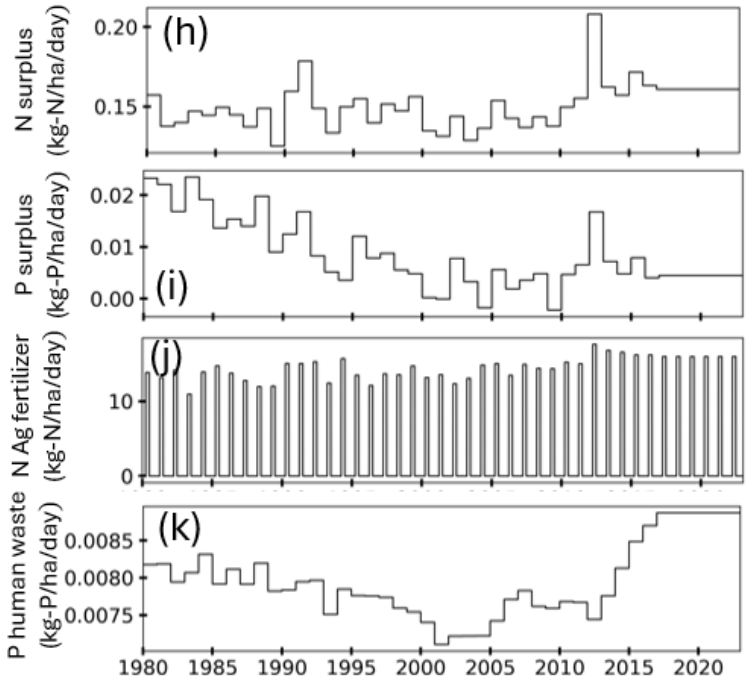
In-situ records



Climate forcings



Nutrient forcings



(Chang and Aboelyazeed et al, in prep)

gTREND-N Dataset (250m)

gTREND-Nitrogen - Long-term nitrogen mass balance data for the contiguous United States (1930-2017)

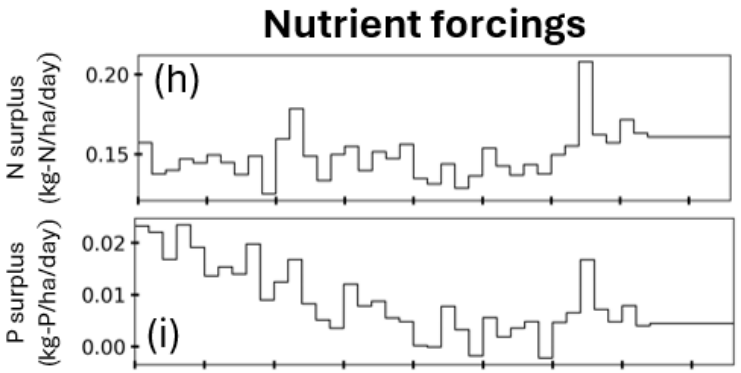
This collection is shared privately

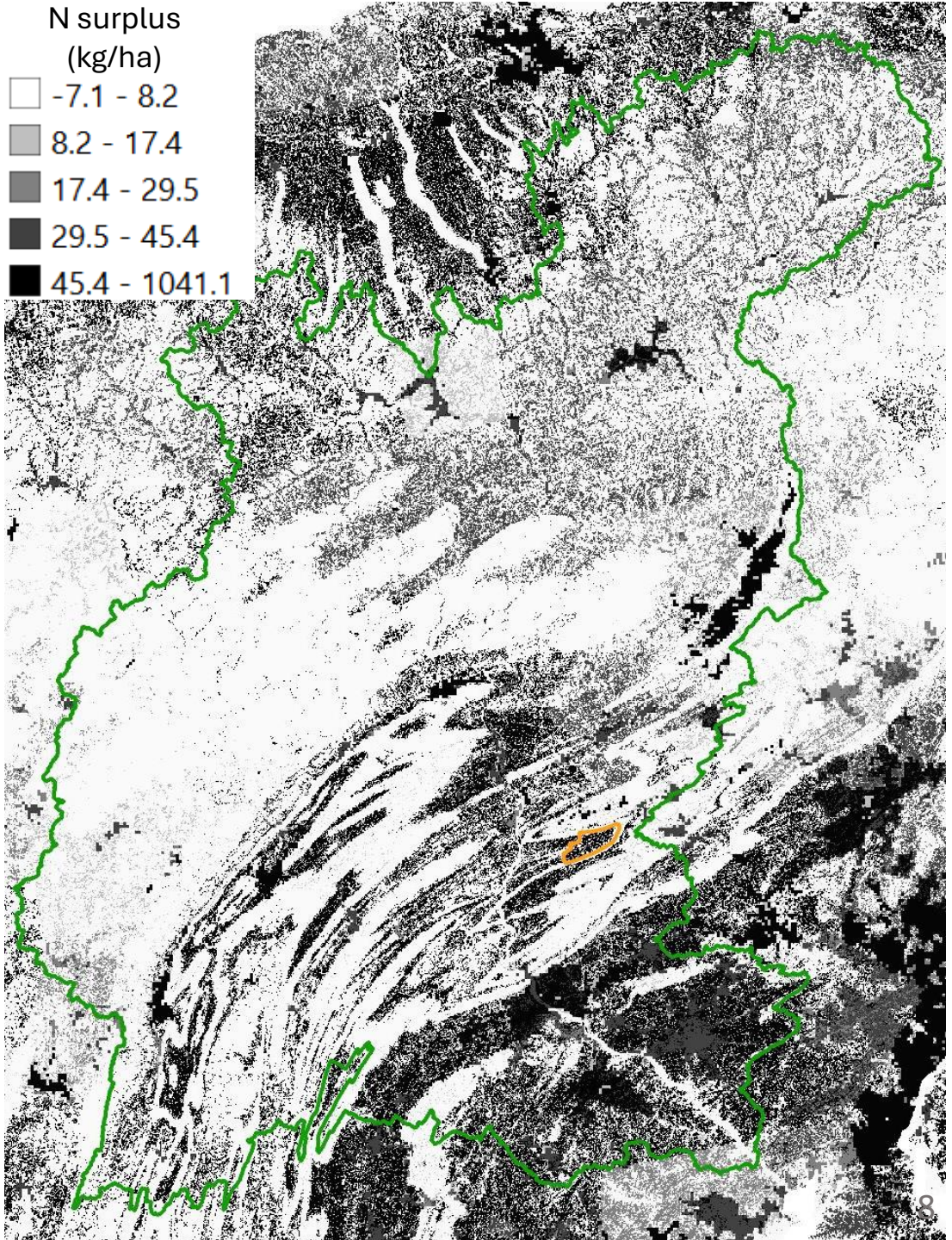
CATEGORIES

- Environmental Management
- Environmental Science
- Agricultural Hydrology (Drainage, Flooding, Irrigation, Quality, etc.)

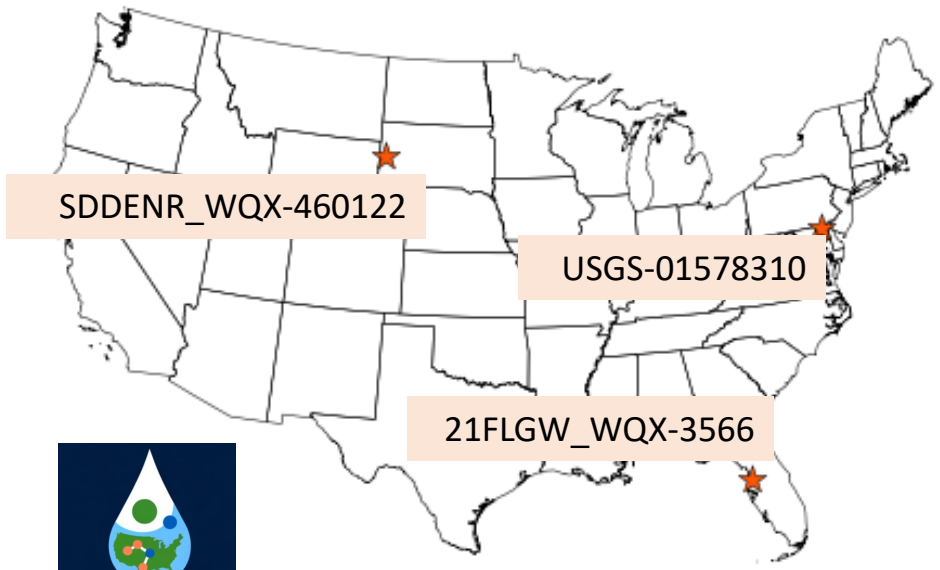
Excess nitrogen (N) within the landscape can lead to environmental issues such as water pollution and downstream eutrophication. Quantification of landscape nitrogen (N) fluxes can help identify areas of excess N and can improve our understanding of

Chang and Byrnes, Van Meter et al, in revision, Sci. Data

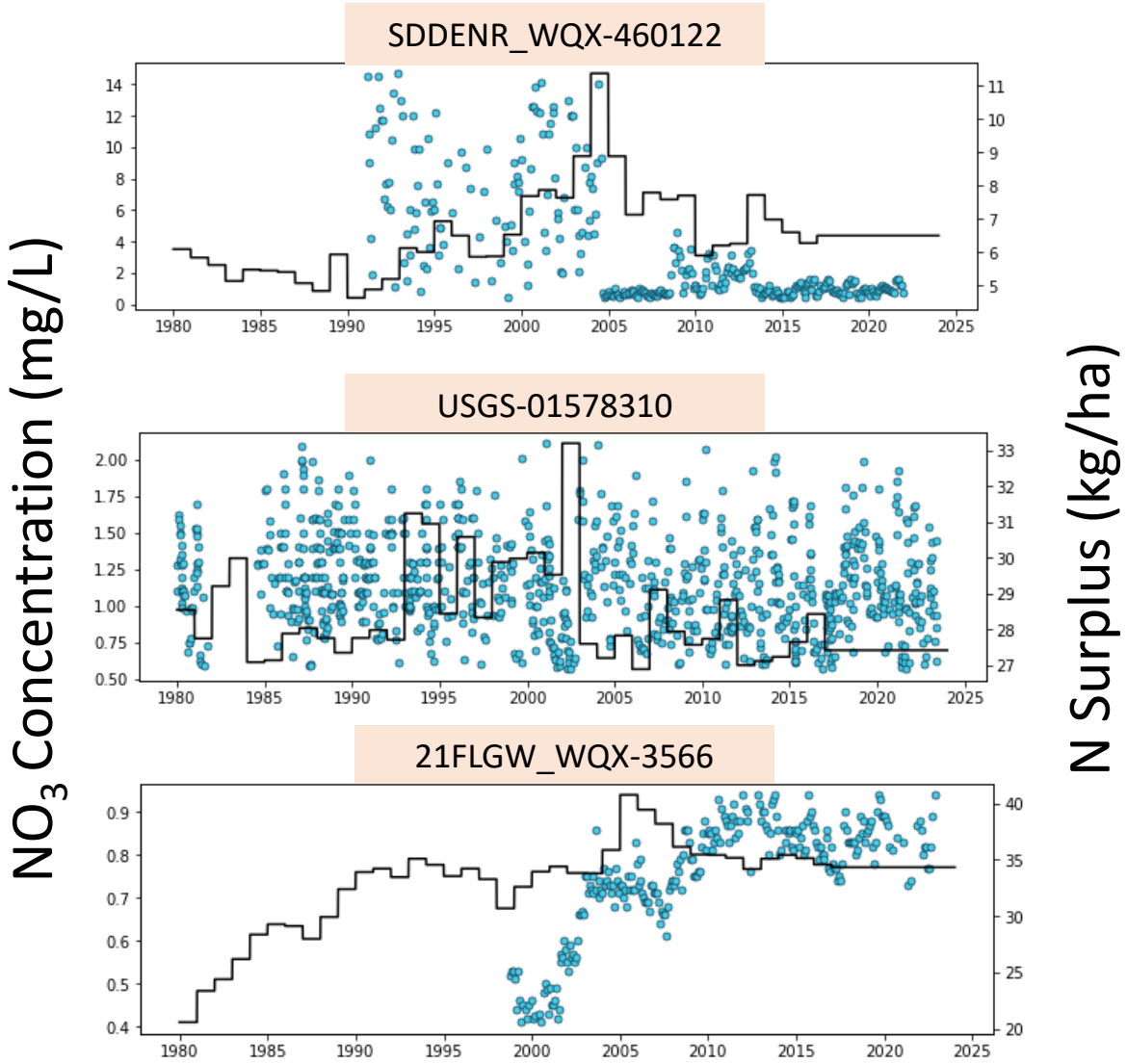




N application Vs River N



(Chang and Aboelyazeed, Shen, Van Meter et al, in prep)



Questions?

Contact:
Shuyu Chang
Penn State
shuyu.chang@psu.edu

Funding:

NASA FINESST

"When we work together for the bay, we protect not just water, but the communities and life it sustains"