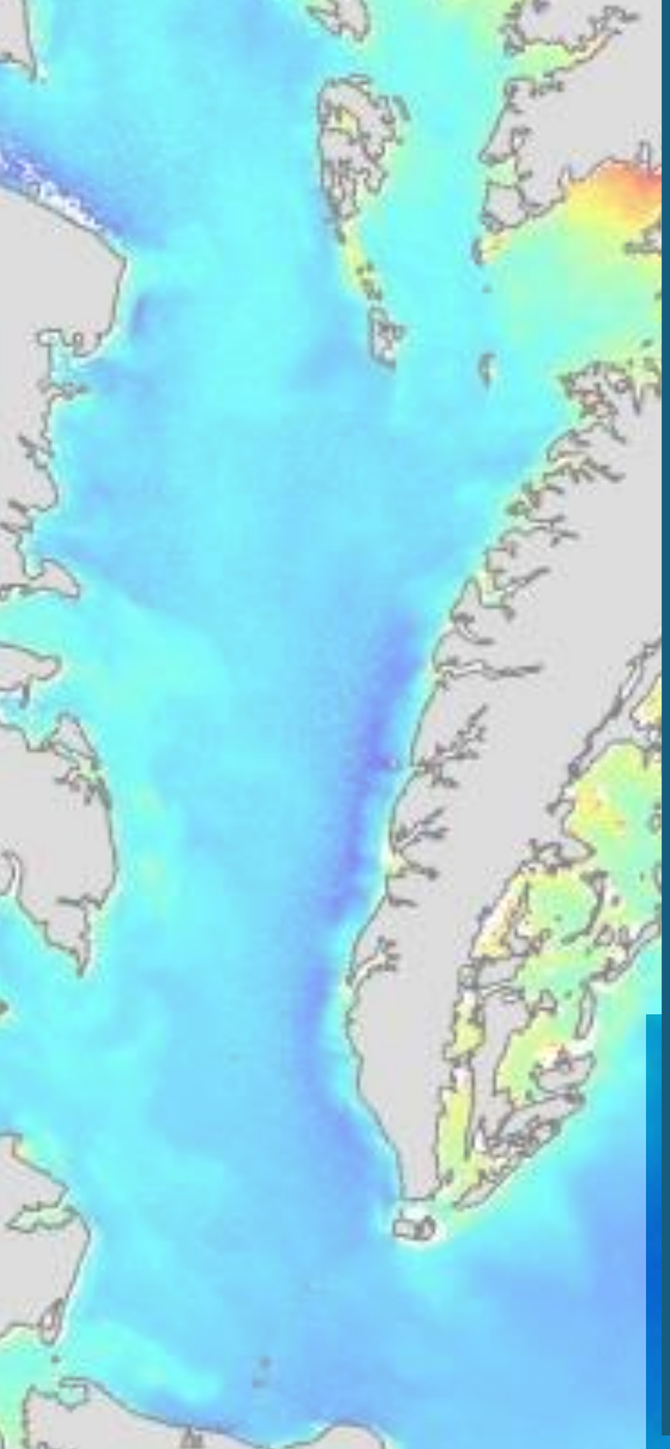

CHESAPEAKE WATER WATCH

Smithsonian Environmental Research Center

NASA Partner

Eyes in the Skies and Feet on the Ground

Ray Terracina

CWW Project Manager

Arundel Rivers FEDERATION

Advocates for Herring Bay

CHESAPEAKE WATER WATCH

SHORERIVERS

ANNE ARUNDEL COMMUNITY COLLEGE
Environmental Center

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Severn River ~ASSOCIATION~

ELIZABETH RIVER PROJECT
DO SOMETHING BEAUTIFUL

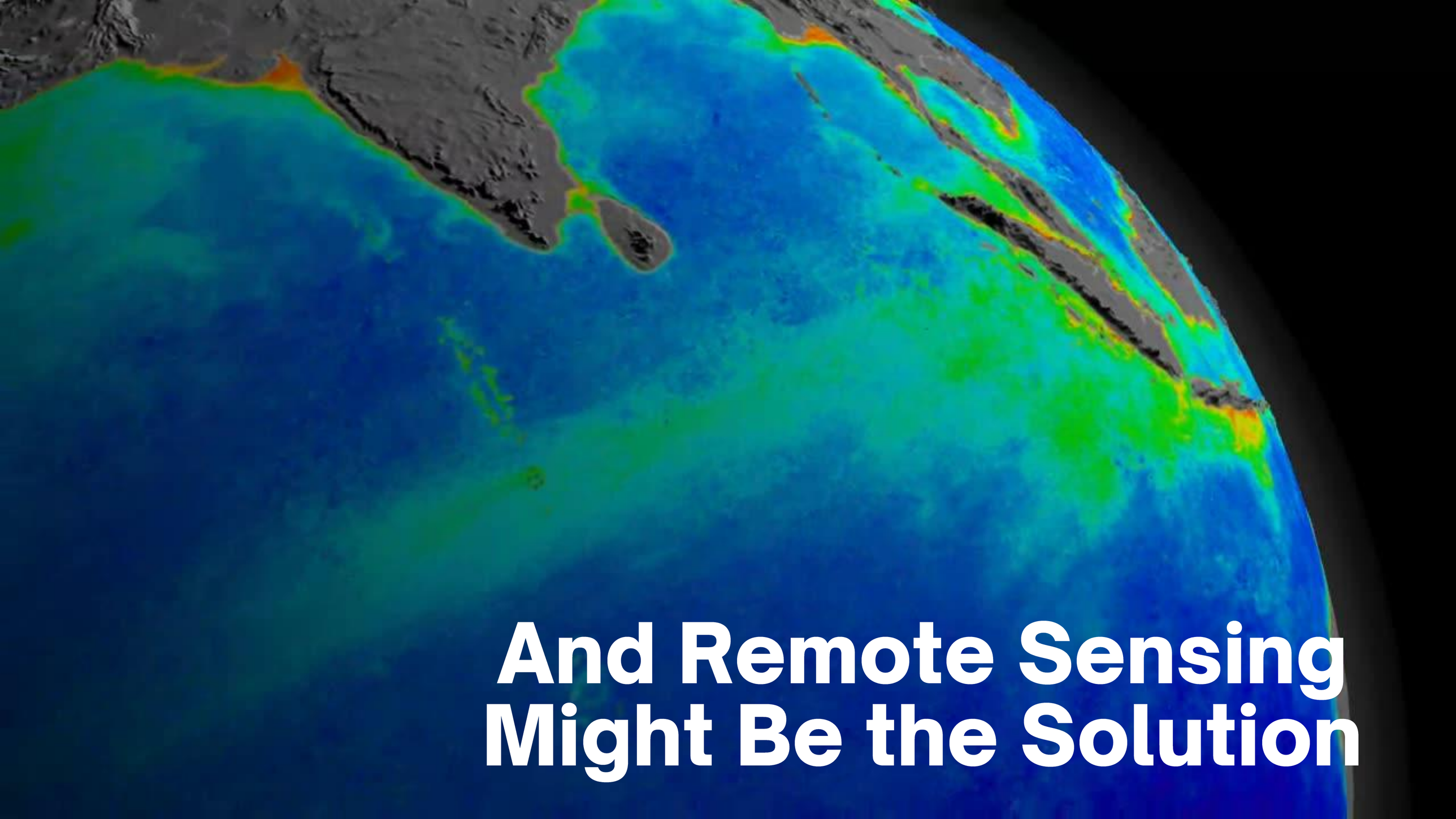
MRA

Funded through NASA's Citizen Science for Earth Systems Program

We have a problem...

The Chesapeake Bay is our nation's largest estuary, at approximately 200 mi in length, making it tricky for one person to monitor. The Chesapeake Bay is widely accessed and studied but still deals with major ecological issues like algal blooms, high sedimentation influxes, and pollution.

Photo credit: *Wolfgang K. Vogelbein/Virginia Institute of Marine Science*



And Remote Sensing Might Be the Solution

Chesapeake Water Watch

In a nutshell

Project Goals

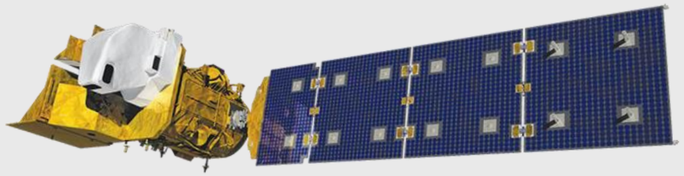
- Develop new ways for volunteers to monitor waterways
- “Train” satellites to accurately monitor the Bay

This is known as: “Ground Truthing”

Results will lead to better tools to monitor **costal waters around the world!**

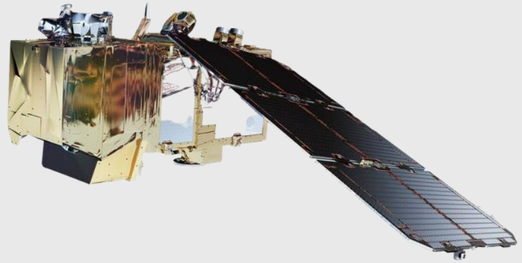
Chesapeake Water Watch

In a nutshell cont.



Landsat-9

NASA/USGS

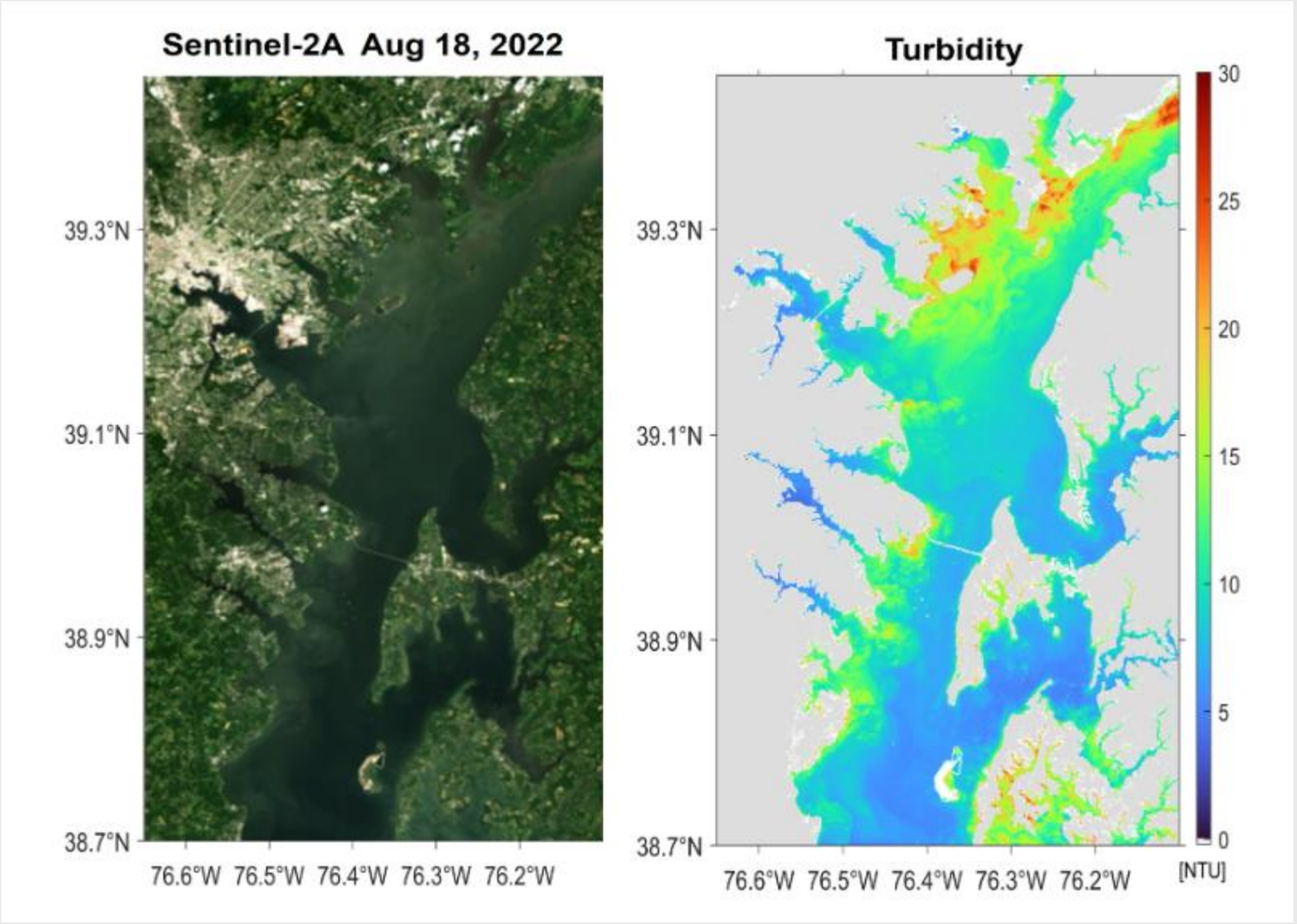


Sentinel-2

ESA

+ OLCI

ESA



What We Test For

and What the Acronyms Mean!

IVCH → In vivo Chlorophyll-a

Translation:

The chlorophyll, or chemical plants and algae use for photosynthesis, detected from the outside.

CDOM → Colored Dissolved Organic Matter

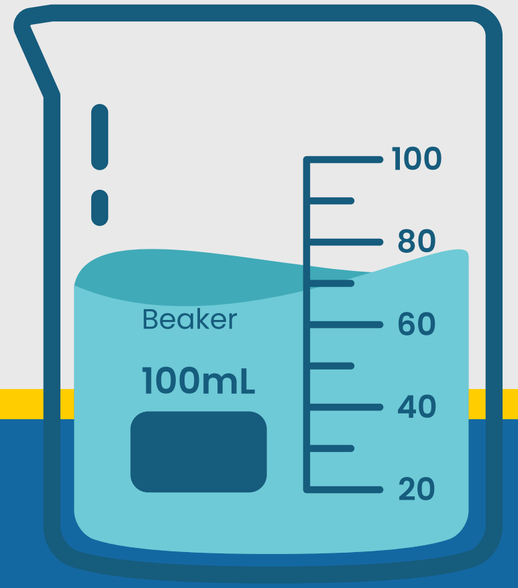
Translation:

Colored molecules from living, or once living, things that can make water look like tea.

Turbidity

Translation:

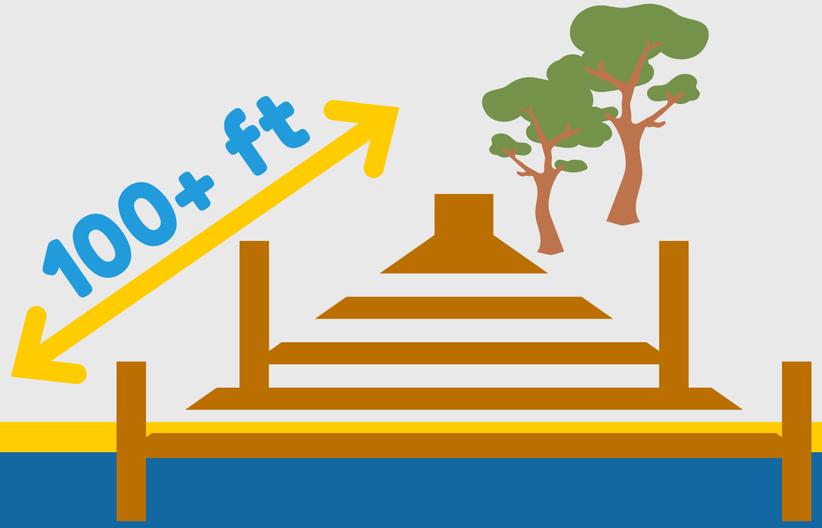
How cloudy or hazy a fluid appears



Collecting Data

When and Where

- We ask for samples throughout the bay system, including tributaries
- Data is collected year-round
- We encourage more sampling during ‘overpass’ days, often holding events around them

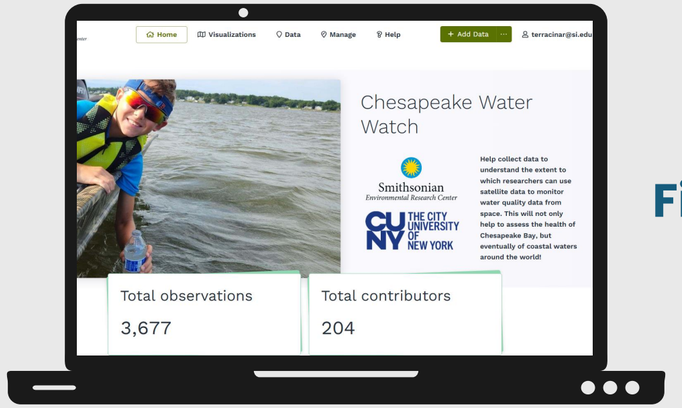


The Tools

Turbidimeter

Aquafluor

HydroColor



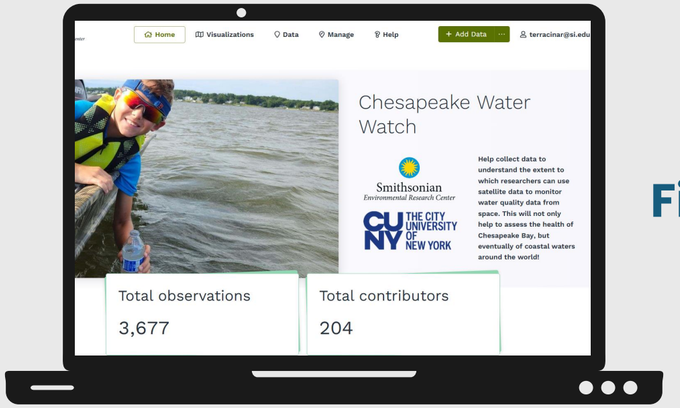
Fieldscope

The Tools

Turbidimeter

Aquafluor

HydroColor



Fieldscope

HydroColor:

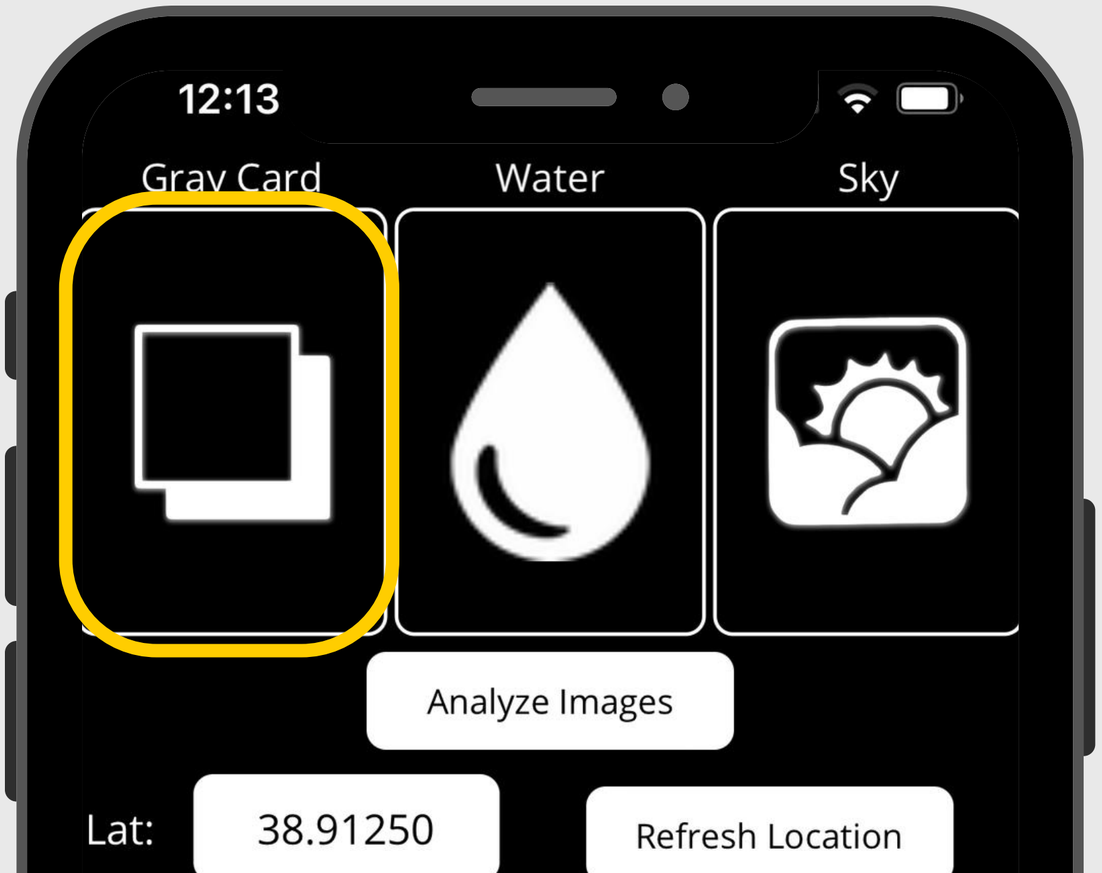
A Water Quality App

- Free app that uses a smartphone’s digital camera to estimate turbidity

- What’s needed:
  - Phone
  - App
  - Gray card

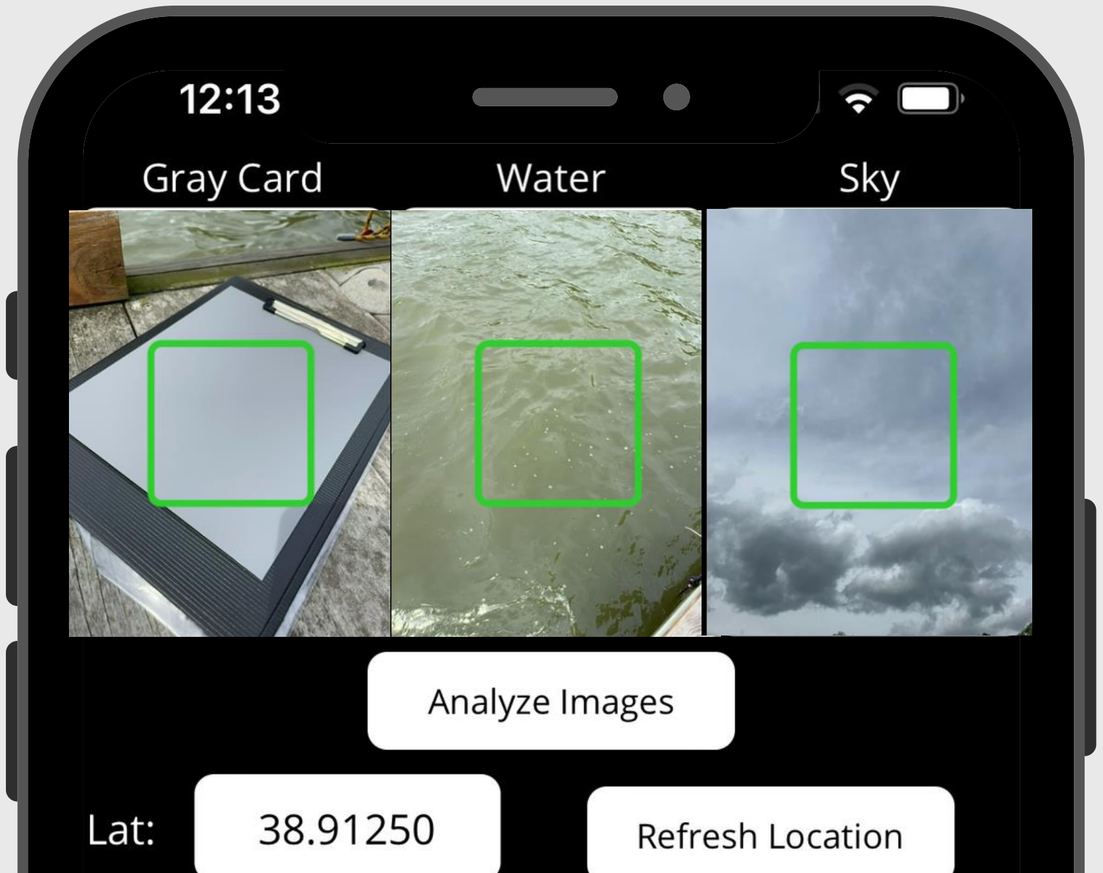
HydroColor:

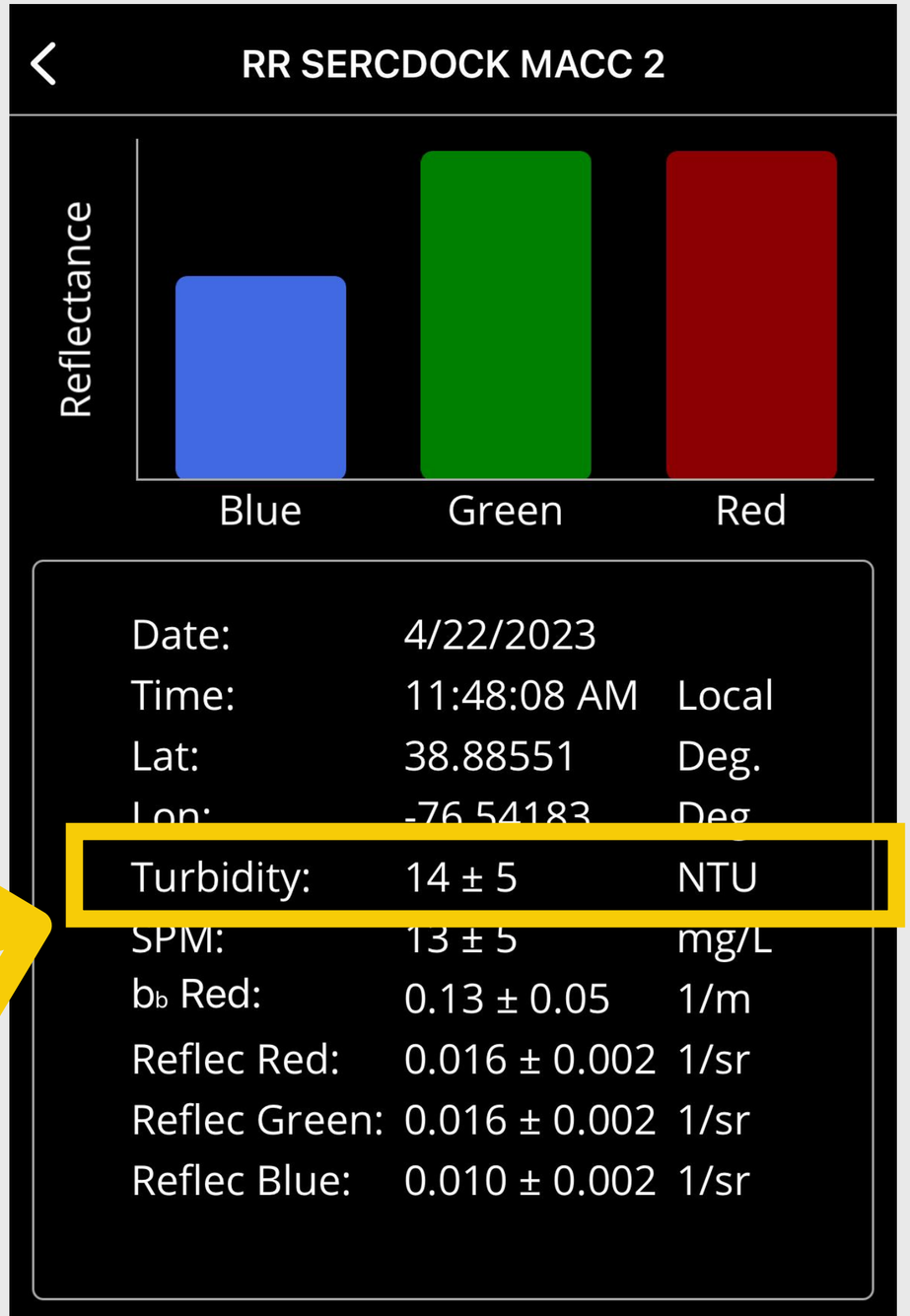
A Water Quality App



HydroColor:

A Water Quality App



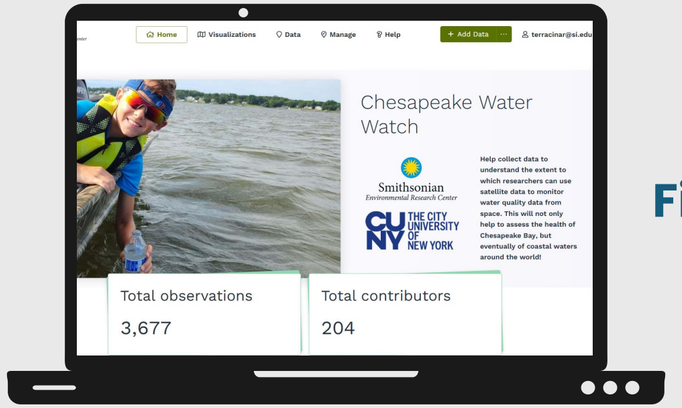


The Tools

Turbidimeter

Aquafluor

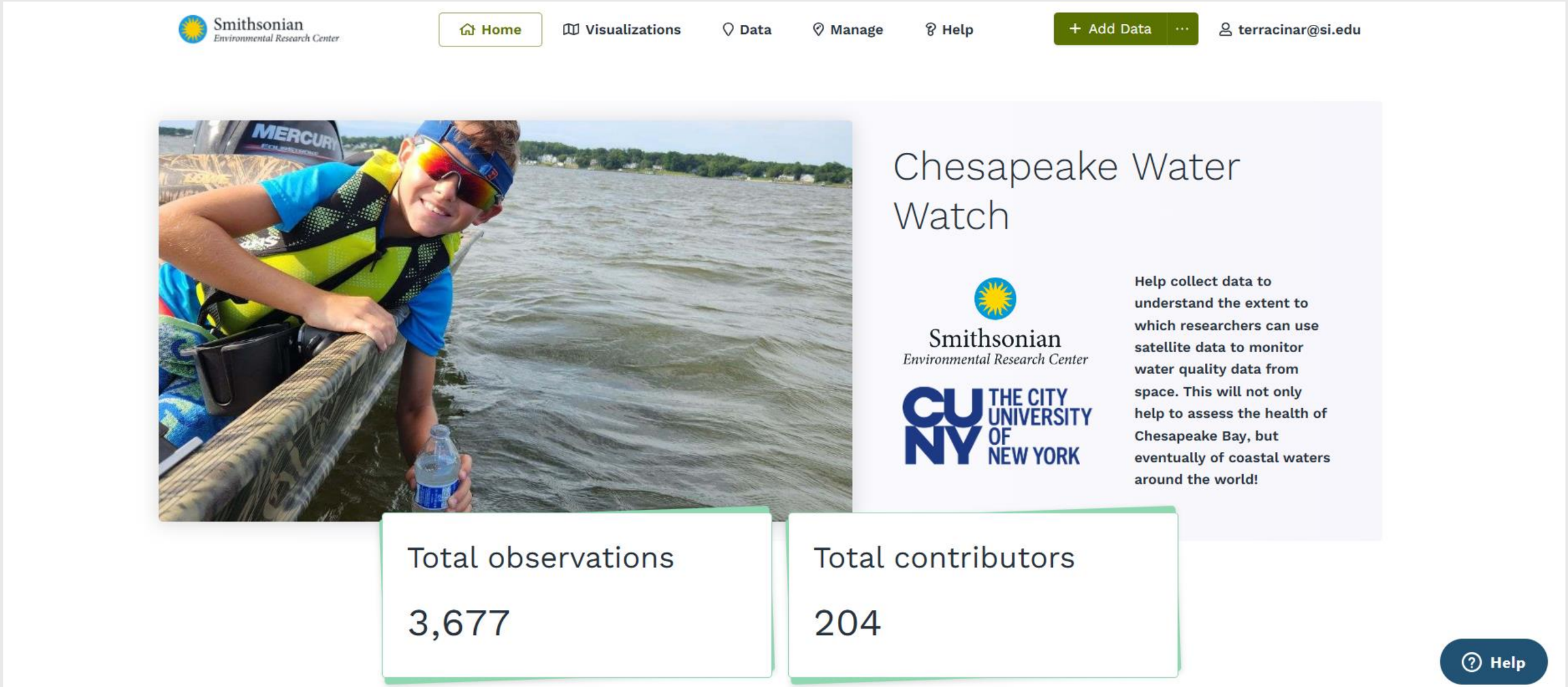
HydroColor



Fieldscope

Fieldscope

Open-access online database



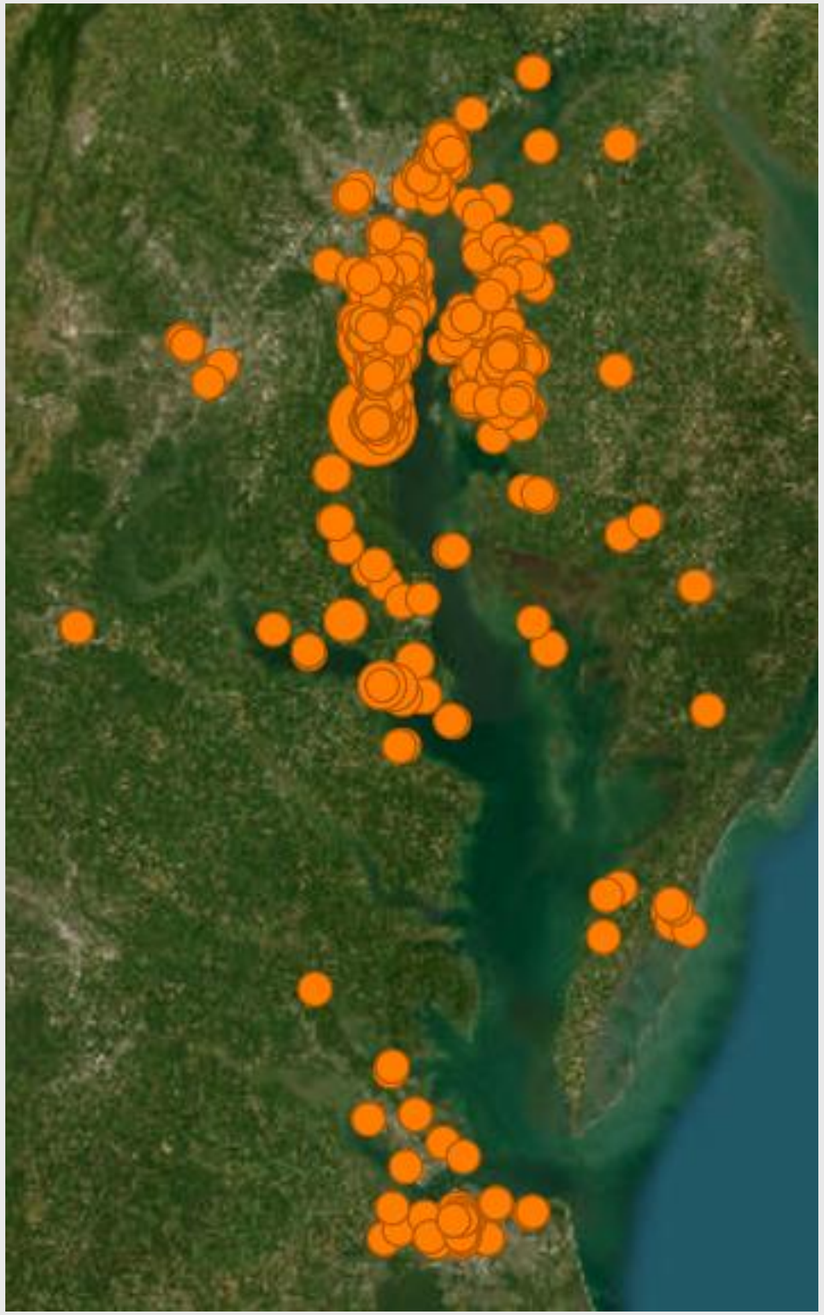
Fieldscope

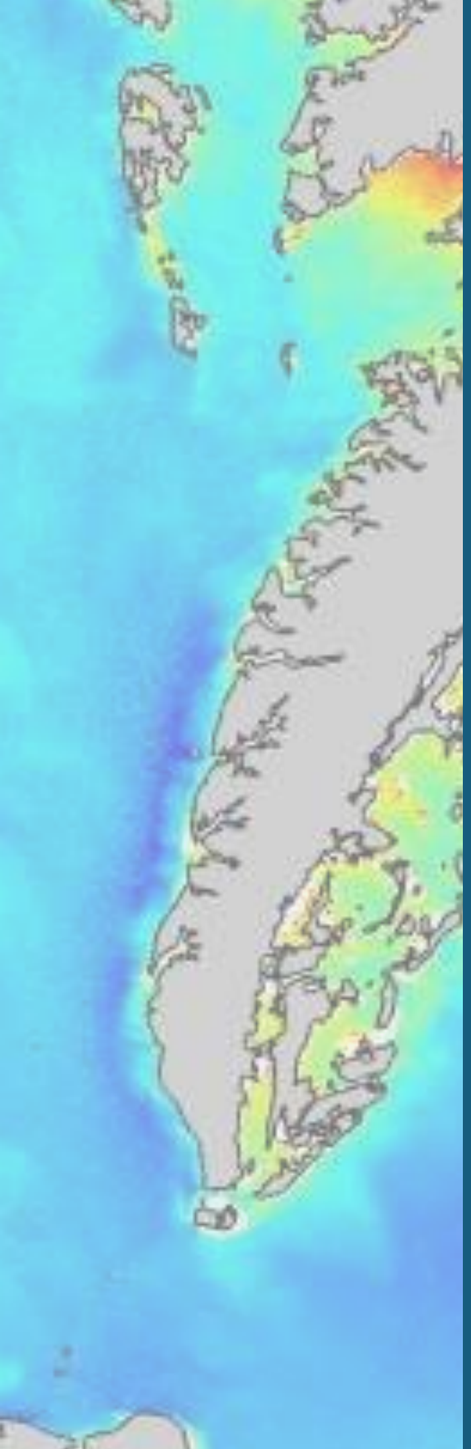
Open-access online database

My Observations | Recent Observations | All Observations

Download data | Table | Map | 2718 observations

Status	Station Name	Observation Date	Latitude (d...	Longitude (d...	Has Media	Study time (HH:MM)
	LFR_NYCC_CF	2024-07-08	36.90664	-76.30613	No	01:56 pm
	LFR_DOCK_CF	2024-07-08	36.89688	-76.29553	No	03:11 pm
	ER_NBC_CF	2024-07-08	36.85202	-76.29688	No	02:35 pm
	MR_LMAG_SM	2024-07-08	39.04262	-76.43208	No	11:34 am
	WR_SailingClubDock_SH	2024-07-08	38.84568	-76.53915	No	02:48 pm
	SR_GraaeDock_CG	2024-07-08	38.92361	-76.51562	No	01:00 pm
	MR_WE_AACC	2024-07-08	39.05221	-76.45498	No	09:15 am
	MI_TurkeyPoint_JMC	2024-07-08	39.29933	-76.40521	No	10:39 am
	MR_FA_AACC	2024-07-08	39.08701	-76.52948	No	08:30 am





Validating the Methods

and Publishing the Results

- Chlorophyll-a: EPA Method 445.0 (extracted then measured fluorescence)
- CDOM: Absorbance measurements on a spectrophotometer.
- Turbidity: turbidimeters and TSS

To view full publication, visit
https://doi.org/10.1371/journal.pone.0305505
or scan the QR code

Validation

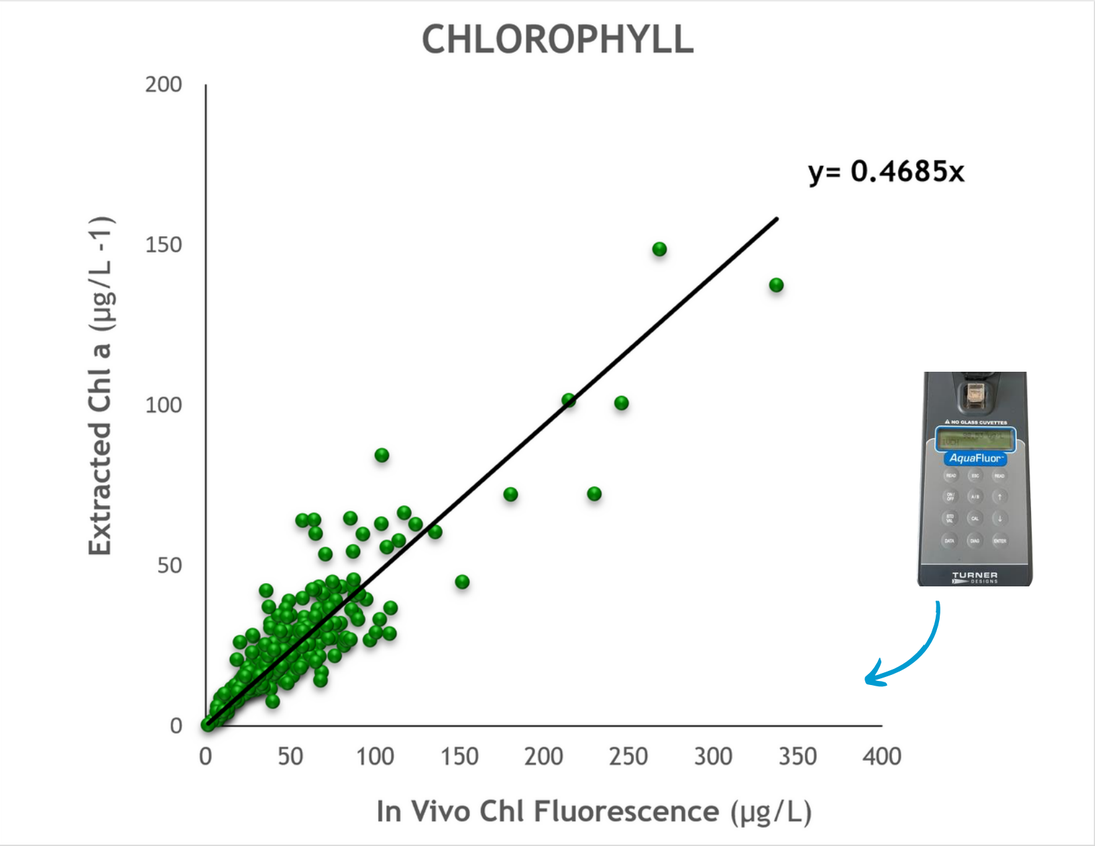


Figure 2: The 281 samples analyzed over the 2023-2024 seasons revealed that Aquafluor measurements of In Vivo Chl fluorescence can be used to estimate extracted chlorophyll with relative error of about 17%. A Root Mean Squared Error (RMSE) of 9.0 µg L^{-1} indicated good agreement between predicted and actual chlorophyll values.

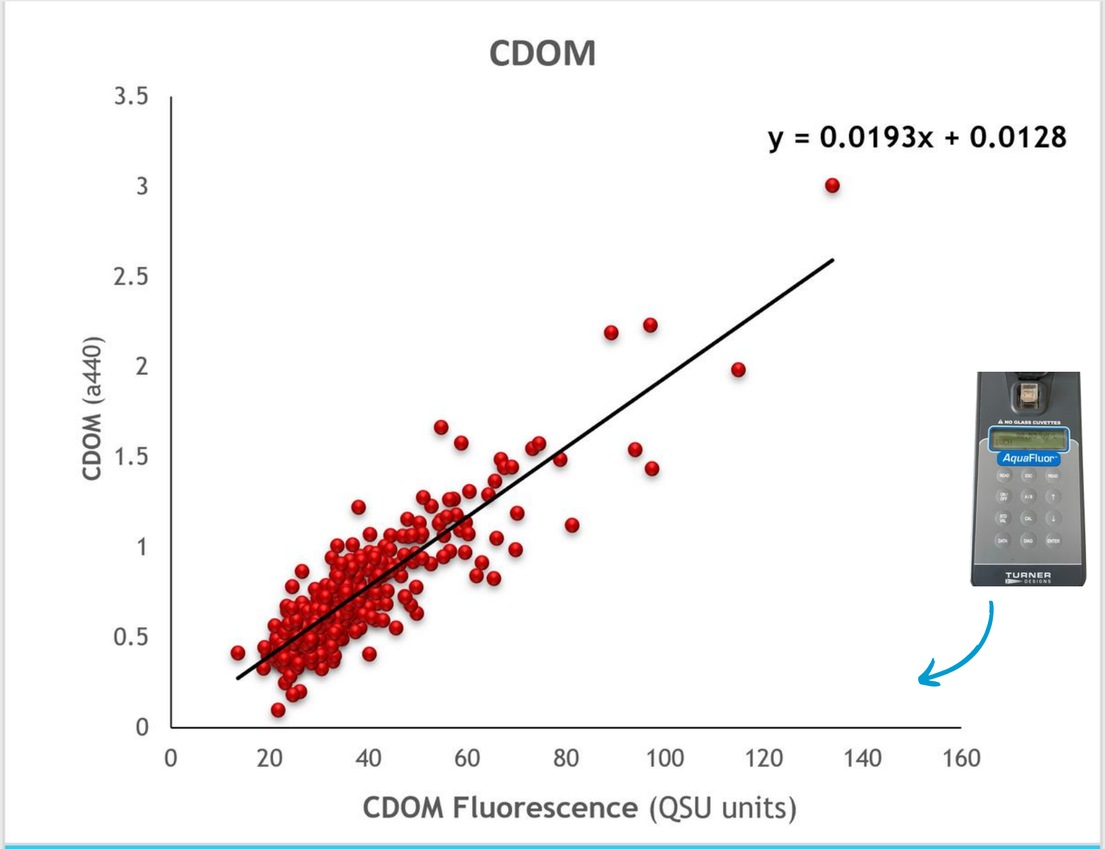


Figure 3: The 270 samples analyzed over the 2023-2024 seasons revealed that Aquafluor instrument measurements of CDOM fluorescence can be used to estimate CDOM absorbance at 440nm with a relative error of around 12%. A Root Mean Squared Error (RMSE) of 0.15 m^{-1} indicated good agreement between predicted and actual CDOM values.

New Trends?

2023

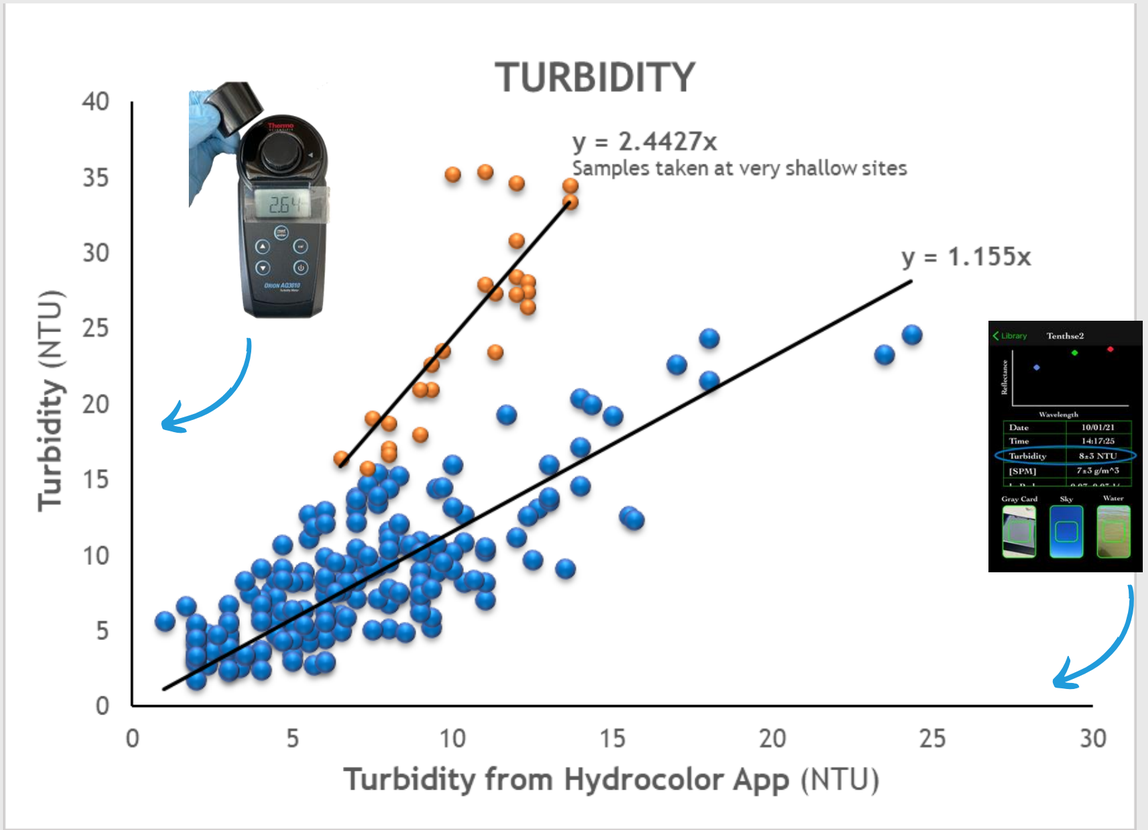


Figure 1: Analysis of 185 samples during the 2023 season revealed that smartphone Hydrocolor app measurements of turbidity differed by around 27% compared to Aquafast turbidity benchtop measurements. A Root Mean Squared Error (RMSE) of 2.9 NTU indicates a good agreement between predicted and actual turbidity values.

2024

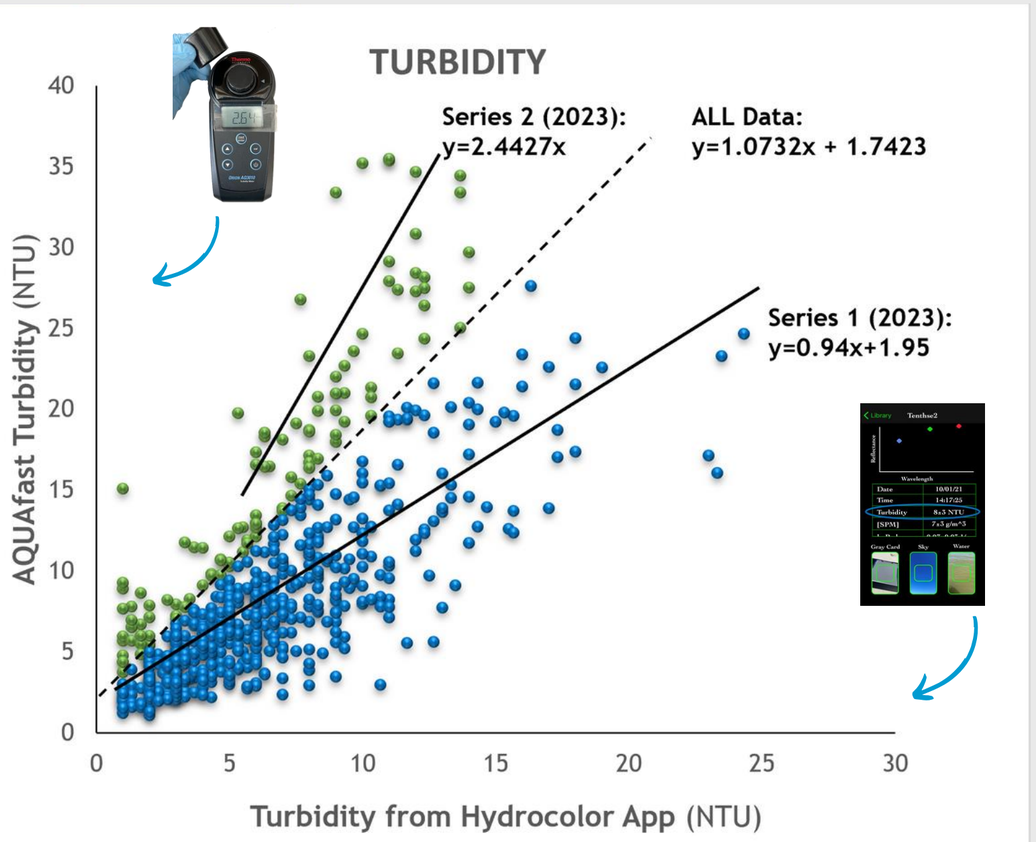


Figure 1: Analysis of 598 samples during the 2023-2024 seasons revealed that smartphone Hydrocolor app measurements of turbidity differed by around 29% compared to AQUAfast turbidity benchtop measurements. A Root Mean Squared Error (RMSE) of 3.9 NTU indicates a good agreement between predicted and actual turbidity values.

Closing Remarks

- Please note: Our project was designed for the development of water monitoring methods
- We continue to explore new relationships
  - i.e. surface turbidity/ light attenuation, CDOM/bacteria levels
- We encourage any who needs it, to download and utilize the data we have collected.

Any Questions?

Thank you!

Scan for
project website