

National Aeronautics and Space Administration



CHESAPEAKE BAY WATER RESOURCES

Using Earth Observations to Assess Spatial and Social Disparities in Water Quality Trends Shaping Fishing and Swimming Access in the Chesapeake Bay

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Meet the Team

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Image Credits: Alicia Pimental

Background



- Chesapeake Bay is the largest marine estuary in the United States
- The bay is a source of **recreation and food** for local communities
- Major land use changes through urbanization and farming have led to increased anthropogenic stressors
- Accelerated nutrient loads lead to an increase in turbidity and harmful algal blooms

Background

With more than 18 million people residing in the bay watershed, there is **limited direct physical access** to recreational activities at the bay open waterways.

Many people cannot access their local water bodies due to **private land** restrictions, **unsafe** conditions, or lack of **awareness** about open waterways.



Partners

Ocean Conservancy

A science and policy advocacy group that works to protect the ocean from today's greatest global challenges, creating evidence-based solutions for a healthy ocean and the wildlife and communities that depend on it.

Blacks of the Chesapeake Foundation

A community advocacy non-profit that works to ensure **equitable access** to green and blue spaces around the Chesapeake Bay.



DEVELOP Team and Partners Credit: Isabel Lubitz

Community Concerns

Turbid Water

Harmful Algal Blooms

Image Credits: NASA Goddard, F. Lamiot

Objectives







Map areas with persistent chlorophyll-a exceeding harmful thresholding levels



Identify communities with high social vulnerability and low access to recreational fishing and swimming locations

Study Area and Period



Earth Observations

Aqua MODIS



Sentinel-3 OLCI



Image Credits: NASA, SkywalkerPL

Water Quality Over Time



Landsat 5 Mosaic Image of Chesapeake Bay Image Credit: NASA

Time Series Methods





Time Series



May 2020 – 2024 Chlorophyll-a (µg/L) May 2020 – 2024 Kd490

Chlorophyll-a Time Series



Chlorophyll-a Persistence



Fish kill in Choptank River likely caused by algal bloom Image Credit: Adrian Jones

Chlorophyll-a Persistence Methods

Chlorophyll-a Threshold: Above 50 ug/l indicates a significant harmful algal bloom

Data: Bi-weekly Composites Sentinel-3 OLCI Chlorophyll-a Product





Basemap Credit: VGIN, Esri, TomTom, Garamin, SafeGraph, METI/NASA, USGS, EPA, NPA, USDA, USFWS, County of Anne Arundel

Results – Chlorophyll-a Persistence



Basemap Credit: VGIN, Esri, TomTom, Garamin, SafeGraph, METI/NASA, USGS, EPA, NPA, USDA, USFWS, County of Anne Arundel and Dorchester



Social Vulnerability & Public Fishing and Swimming

Fishing Poles on the Chesapeake Bay Image Credit: Simone Schneider

Social Vulnerability Index



Public Swimming & Fishing Access

Anne Arundel County



Data: Chesapeake Progress

Geometry: Block group level

Public Swimming

Public Fishing

Dorchester County







Basemap Credit: VGIN, Esri, TomTom, Garamin, SafeGraph, METI/NASA, USGS, EPA, NPA, USDA, USFWS, County of Anne Arundel

SVI & Recreational Access Bivariate



Uncertainties

Coarseness of Spatial Resolution

15 Day Mean Composites Lack of Co-location of Monitoring and Recreation Sites



Credit: NASA Earth Observatory





Conclusions



trend in chlorophyll-a over the past 5 years

Lack of turbidity monitoring data Sustained algal blooms occurred at numerous sites in both counties

No significant relationship between SVI and access sites

Feasibility Assessment



Evaluate chlorophyll-a and turbidity, comparing results to in situ data



Map areas with persistent chlorophyll-a levels exceeding harmful thresholding levels



Identify communities with high social vulnerability and low access to recreational fishing and swimming locations



Fishing Boat on the Chesapeake Bay Image Credit: Blacks of the Chesapeake Foundation

Partner Implementation



Work with Stakeholders

Empower Youth



Vince Leggett, Founder of Blacks of the Chesapeake Foundation Image Credit: Simone Schneider

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