# *Applying novel techniques to assess and forecast HABs in Chesapeake Bay to protect fisheries, aquaculture and human health…*

*Stakeholder Engagement in Chesapeake Bay*

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

# CHESAPEAKE BAY

*Photo by Will Parson/Chesapeake Bay Program with aerial support by Southwings*

# GENESIS OF FOCUSING ON THE CHESAPEAKE BAY

- Small community looking at & using imagery
- What's the demand?
- More capabilities
- How do we make sure products are useful?

# ***Goal:*** Assess HAB forecasting opportunities & limitations at scales needed for resource management & industry business practices.

- To understand how HABs affect the operations of aquaculture, recreational fishing & other water dependent users.
- To understand the HAB spatial information & forecasting needs of resource managers (and areas of synergy w/ researchers).
- To learn about potential forecast data products & how output could be used (capabilities & limitations).
- To compile information on potential uses of (satellite imagery & forecasting) tools and products.
- To assess current monitoring and observing efforts that could lead to the development of a forecast and identify gaps.

# NEEDS ASSESSMENTS

- Obtain input from target audience
- Two assessments
- IRB Approved
- Qualtrics
- Emailed – July to September 2022

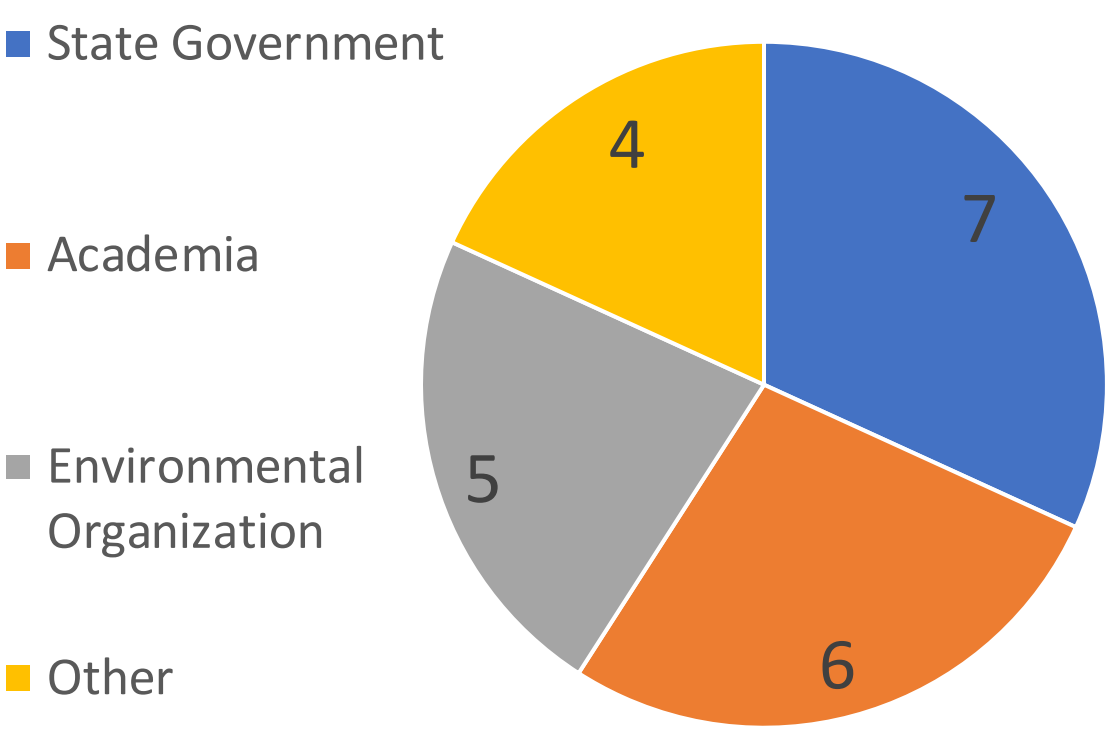
*1 - To understand how HABs affect the operations of aquaculture, recreational fishing & other water dependent users.*

*2 - To understand the HAB spatial information & forecasting needs of resource managers (and areas of synergy w/ researchers).*

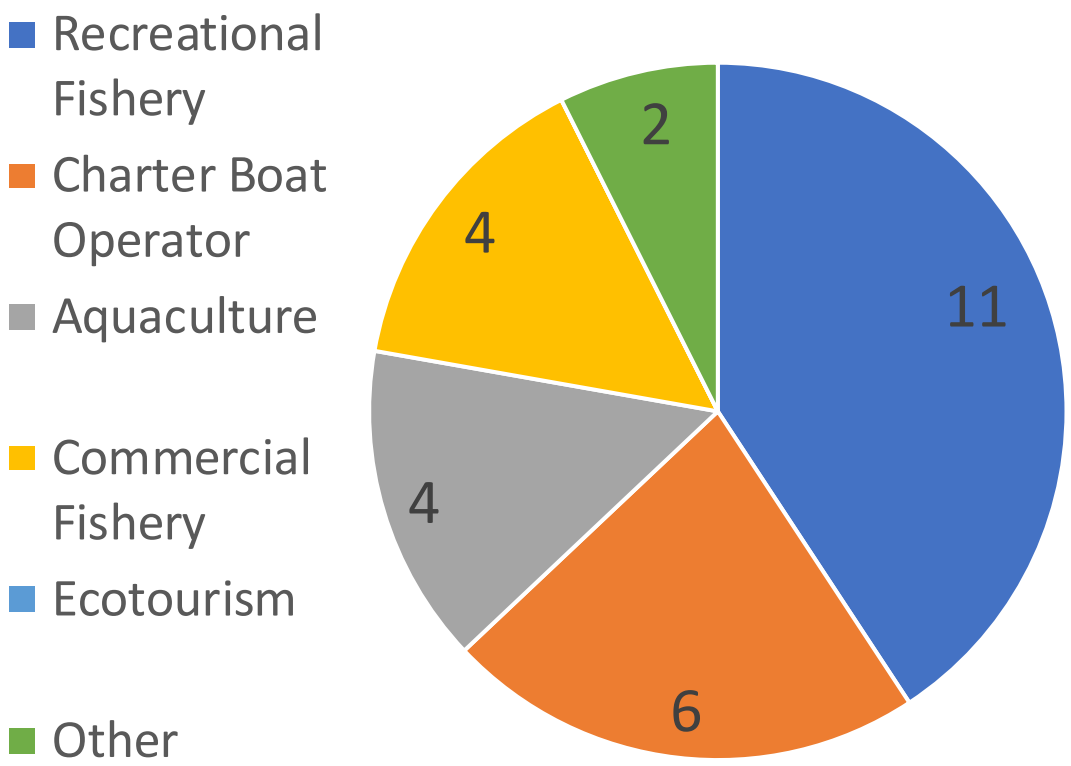
# NEEDS ASSESSMENTS

## *Demographics…*

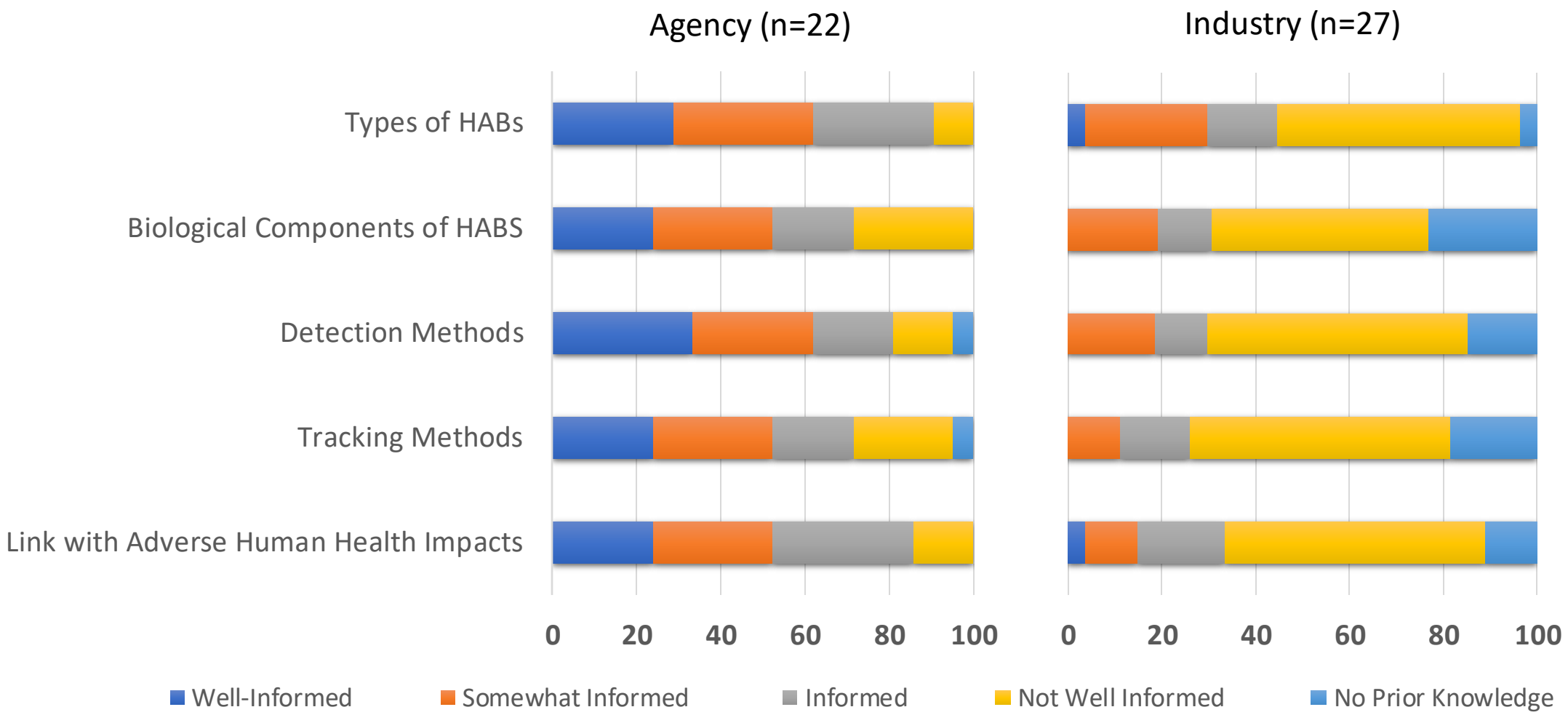
### Agency (n=22)




### Industry (n=27)



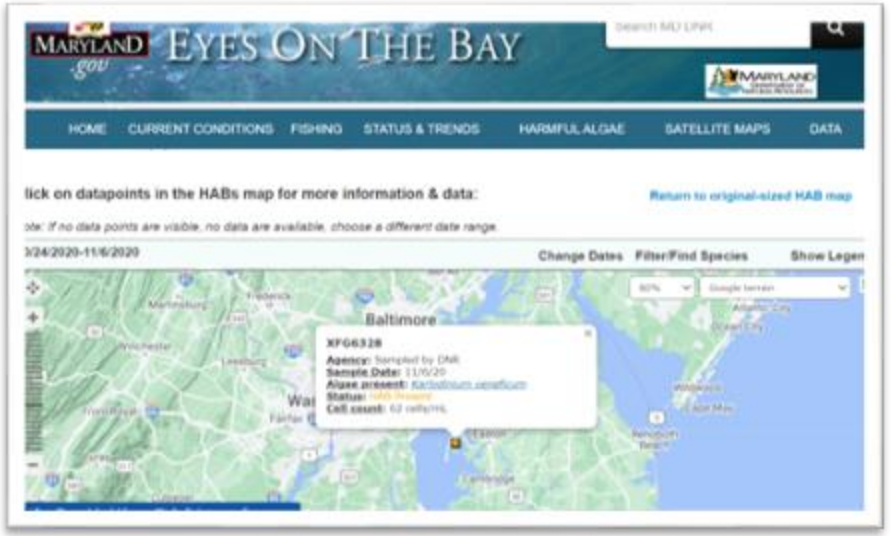
# HOW INFORMED ARE YOU ABOUT THE FOLLOWING HAB ASPECTS?



# METHODS USED TO DETECT HABS

## Agency

- In Situ HAB Monitoring Programs
- Email/Mailing Lists
- Integrated Data Portals
- Remote Sensing, Public Reporting Systems, Websites




## Industry

Aquaculture

- Public Reporting Systems, Email, Websites

Recreational Fishery/Charter Boats

- Social Media, Traditional News, Word of Mouth

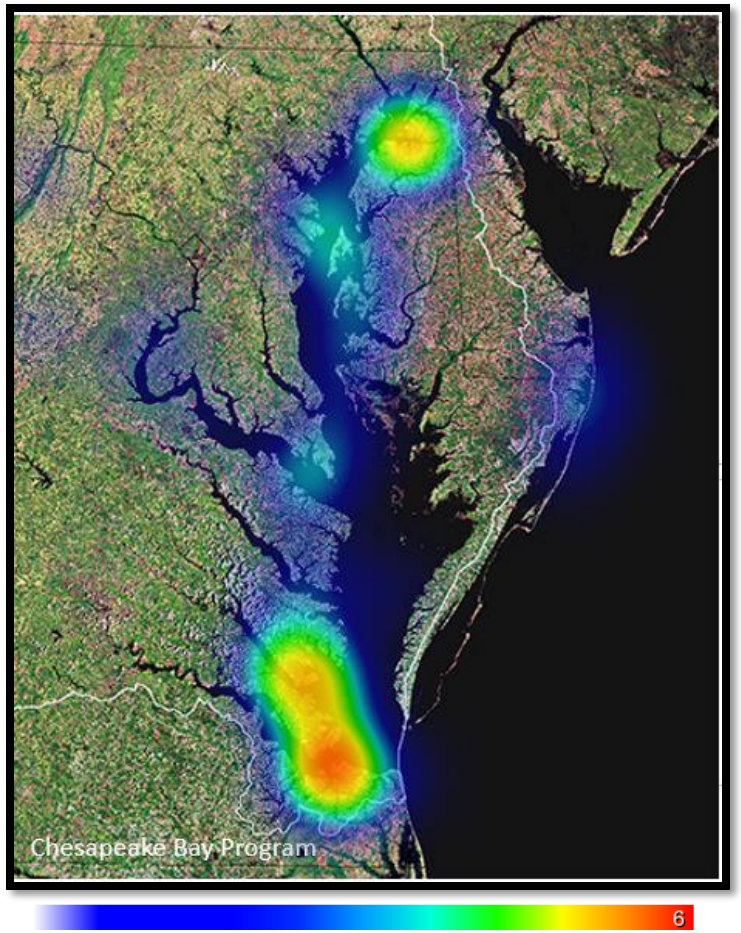
Commercial Fishery

- Traditional news
- Word of Mouth

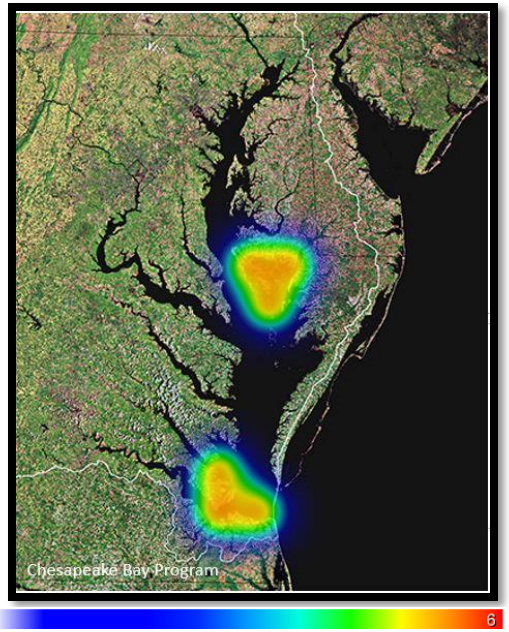
# WHERE ARE HABS THE GREATEST PROBLEM FOR YOUR ROLE/BUSINESS?

Please use your mouse (or finger) to select up to three (3) spots.

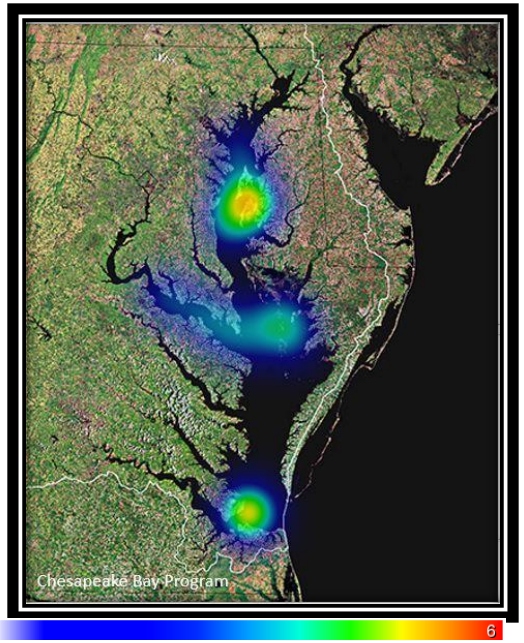
Agency



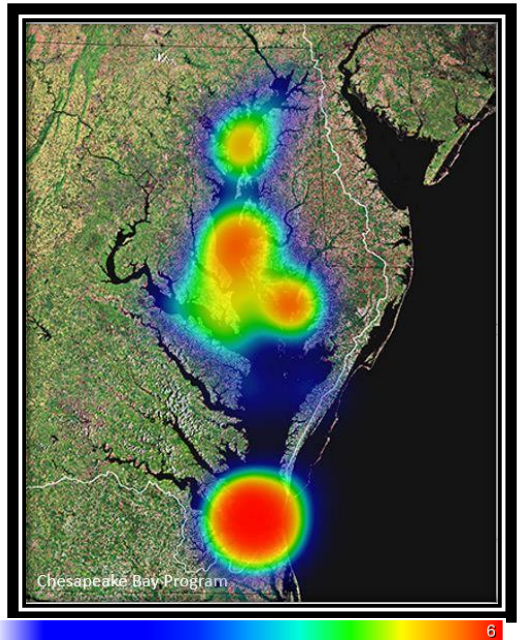

Aquaculture




Commercial Fishery




Recreational Fishery and Charter Boat Operators



# WHAT TOOLS ARE MISSING?

## Monitoring

- Dockside Tests, Rapid Collection and Testing for Toxicity, Drones, Staff

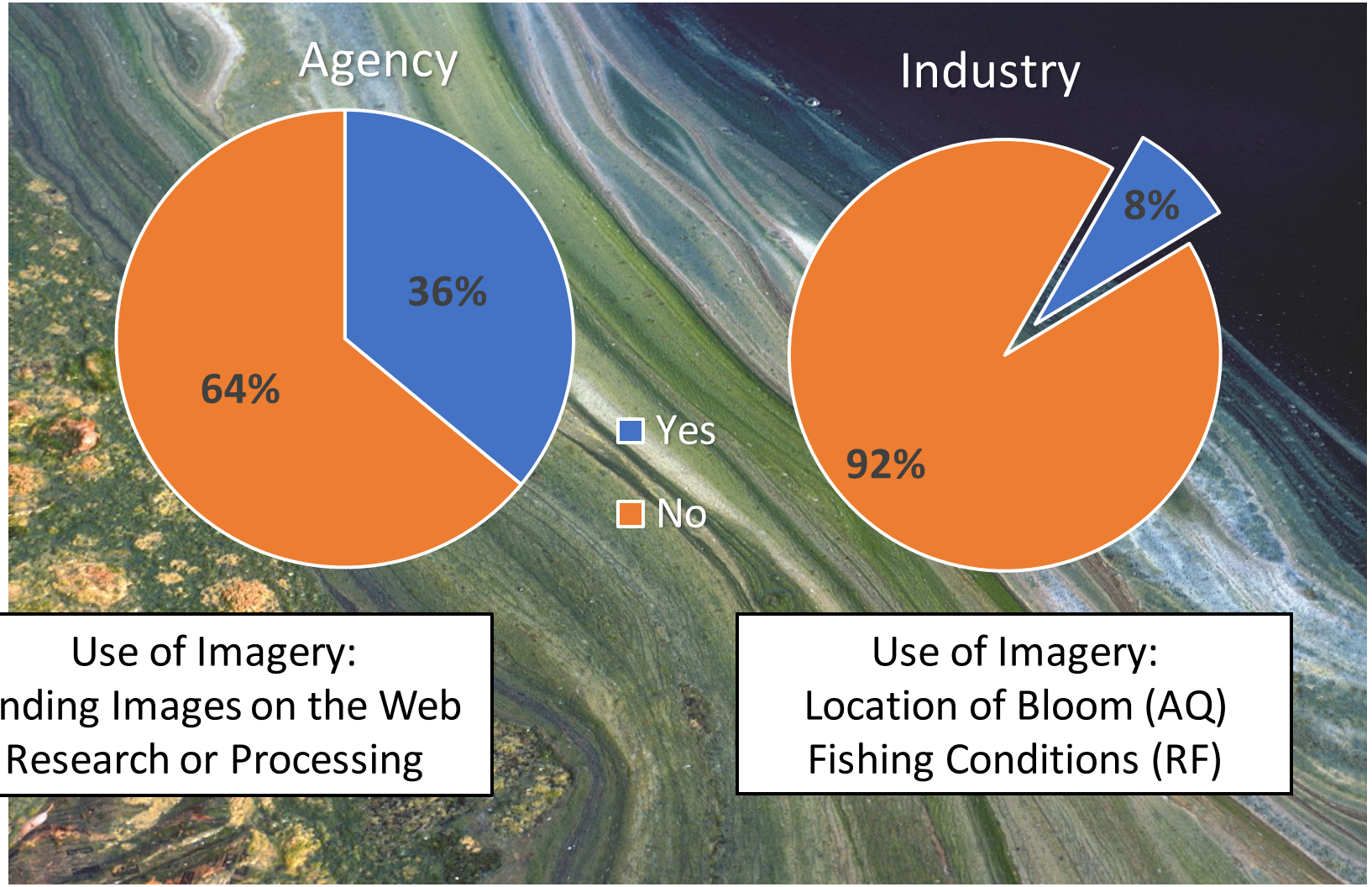
## Mapping

- Real-time map of blooms for shellfish growers to determine threat levels
- Remote sensing
- Spatial/temporal scales are limited
- Suborbital/UAV/aircraft to reduce cloud cover in satellite images

## Resources

- ISSC approved lab methods, VA HAB Lab
- HAB Taxonomists
- A network for sampling/reporting

# HAVE YOU USED SATELLITE IMAGERY TO DETECT OR RESPOND TO HABS?




Use of Imagery:
Finding Images on the Web
Research or Processing

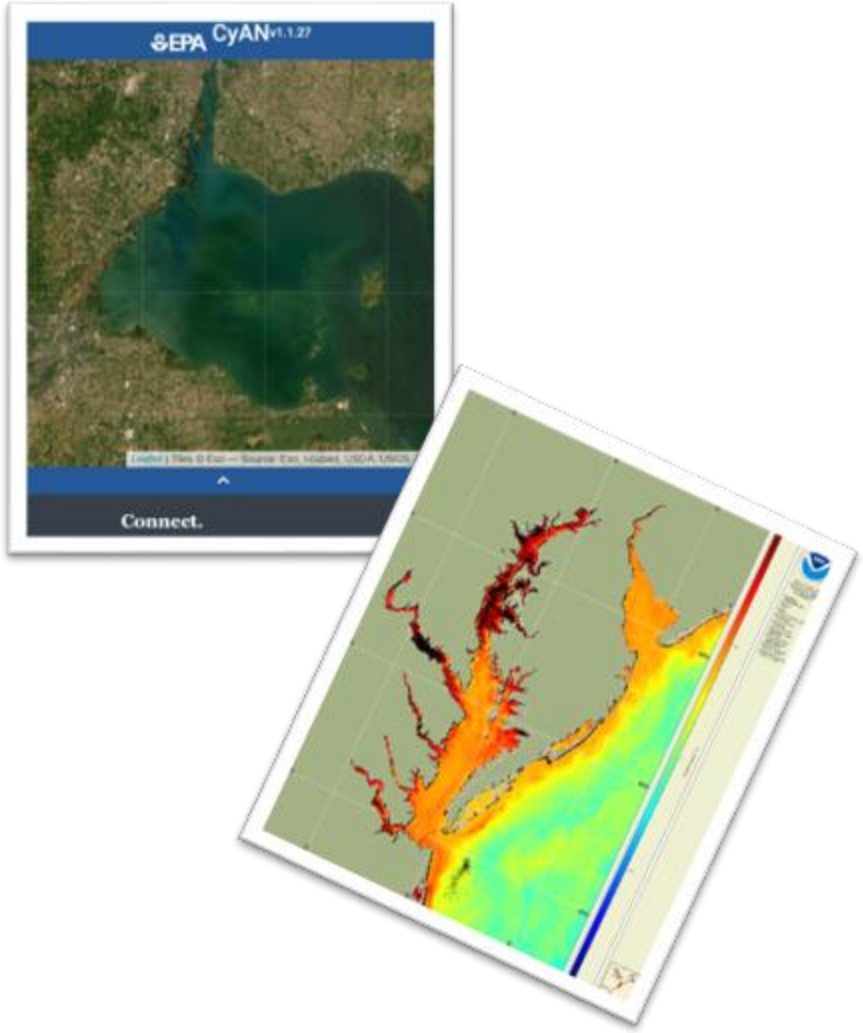
Use of Imagery:
Location of Bloom (AQ)
Fishing Conditions (RF)

Main Limitations:

1) Where to find the imagery?
2) What to do, how to process?
3) Spatial Constraints

# SOURCES OF SATELLITE DATA CURRENTLY BEING USED

- ESA Sentinel 2 and 3
- Landsat
- EPA HAB Products
  - https://qed.epa.gov/cyanweb
- NOAA HAB Products
  - https://coastwatch.noaa.gov/cw_html/NCCOS.html
  - https://eastcoast.coastwatch.noaa.gov/data/olci/chlora/daily/cy/



# PREFERRED TOOLS FOR HABS COMMUNICATION?

## Agency

- Website
- Collaborative Platform
- Email Bulletin
- Phone App

## Industry

- Phone App
- Email Bulletin
- Website
- Social Media (RF)

# WORKSHOP – JANUARY 18 & 19, 2023

- 2- half days at VIMS
- 41 participants
- Agency, Academia, Extension, Industry, NGO
- Format
  - Presentations
  - Panel discussions
  - Breakout groups

# PRESENTATIONS

- Tools & Products
  - Satellite Background
  - Example uses of satellite in Chesapeake Bay for mgmt. decisions
  - Forecasting HABs – around country
  - Observations – NHABON

*3 - To learn about potential forecast data products & how output could be used (capabilities & limitations).*

# PANEL DISCUSSIONS

## Agency Panel


## Industry Panel


*1 - To understand how HABs affect the operations of aquaculture, recreational fishing & other water dependent users.*

*2 - To understand the HAB spatial information & forecasting needs of resource managers (and areas of synergy w/ researchers).*

*4 - To compile information on potential uses of (satellite imagery & forecasting) tools and products.*

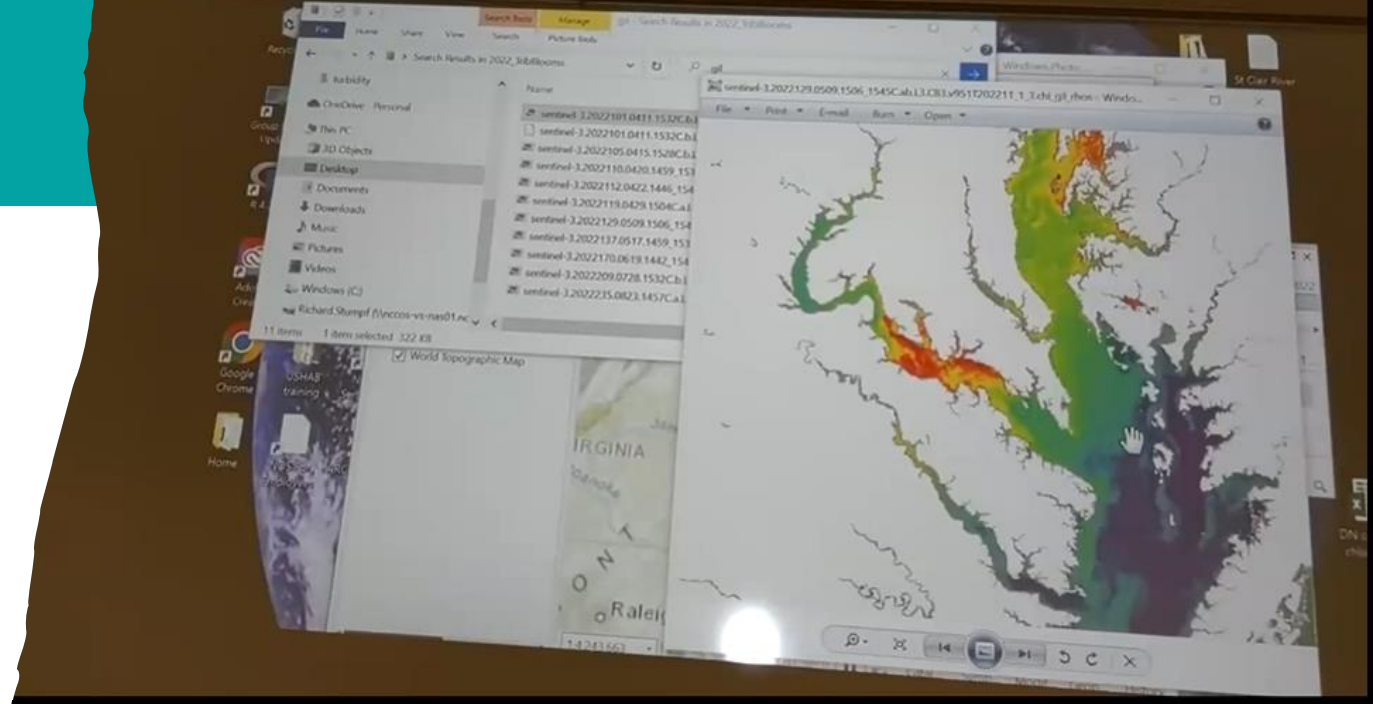
*5 - To assess current monitoring and observing efforts that could lead to the development of a forecast and identify gaps.*

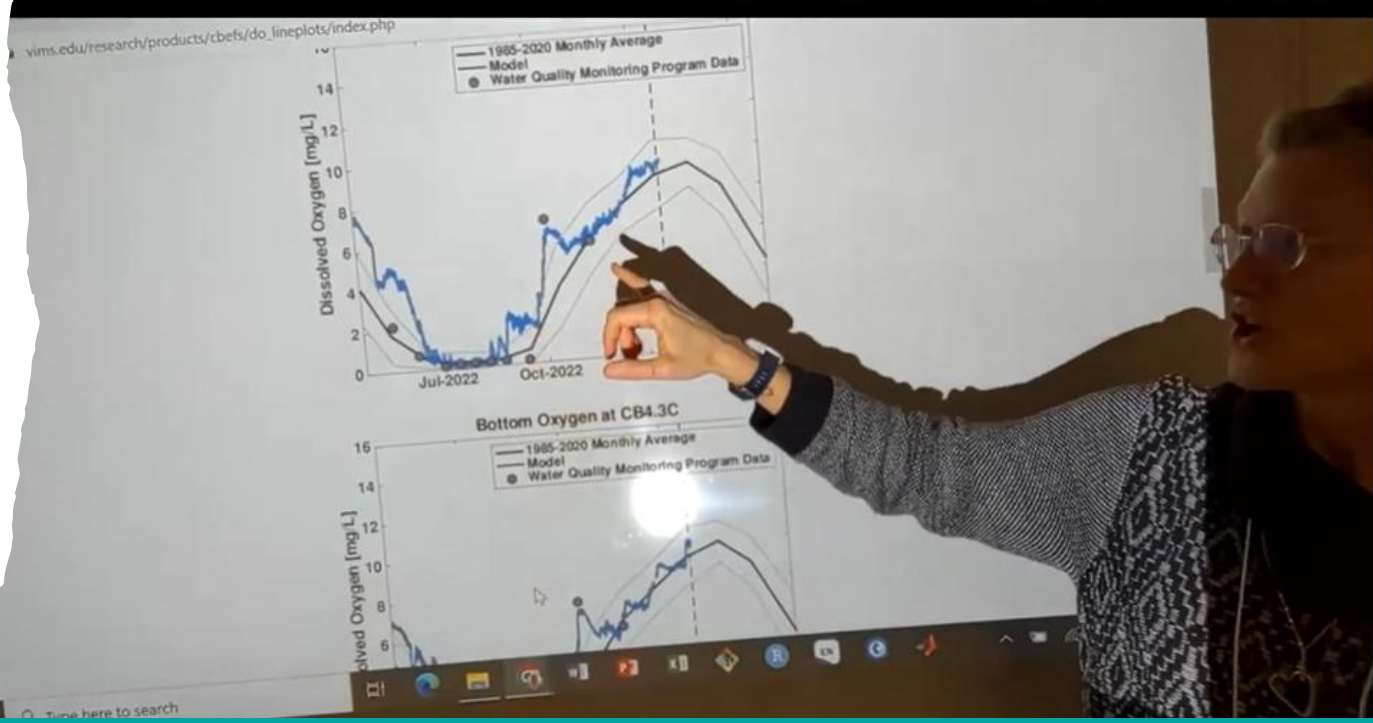
# BREAKOUTS

- Modified WeTable
- 3-Rotations
  - Satellite Products & CBEFS

*3 - To learn about potential forecast data products & how output could be used (capabilities & limitations).*

*4 - To compile information on potential uses of (satellite imagery & forecasting) tools and products.*





# POTENTIAL USES - AGENCY?

- Resource managers would like a monitoring system that can track the emergence and growth of harmful algal blooms.
- Virginia - understanding where blooms might be and using satellite to assess if current monitoring stations are capturing blooms and whether additional sampling is needed.
- Maryland - increasing their temporal and spatial ability to track blooms.
- Using satellite data to inform shellfish closures and reopening.
- Determining how blooms have changed over time – Are we seeing more blooms in the bay?

- There was considerable interest in Sentinel-2 MSI data.
- Using a standard anomaly application to identify how to determine blooms, i.e., on hotter days – e.g., >10µg/L.
- Have animated images showing bloom progression in the Bay.
- How to merge satellite data and the suitability model outputs to have a classified map of identified bloom types in the Bay.
- In addition, many agreed there is a need for a model/tool to separate bloom types (*P. minimum, M. polykrikoides*, etc.).

*4 - To compile information on potential uses of (satellite imagery & forecasting) tools and products.*

# POTENTIAL USES - INDUSTRY

- Recreational anglers would be interested in an app for where HABs are at certain tides and times.
- Forecast pace of movement with direction and magnitude.
- Image interpretation using local knowledge and familiarity, such as a deep channel in Tangier Sound, right of Smith Island, potentially upwelling, bringing up nutrients, and starting blooms.
- Having an early warning for hatcheries. If they knew there was a HAB in area, they could potentially modify practices to avoid water coming into Hatchery.
- Quick, timely information for harvesters to understand if it's safe to harvest that product. Just because it's a bloom doesn't mean it's harmful.
- Turbidity and water clarity for siting aquaculture.
- Learning how to read the images.

*4 - To compile information on potential uses of (satellite imagery & forecasting) tools and products.*

https://www.flseagrant.org/wp-content/uploads/2023/05/CB_HABWorkshopReport_Final050423.pdf

# LINKAGES

- CoastWatch – Aquaculture Working Group
  - Sea Grant Aquaculture - NE
- CoastWatch Training

Image: Virginia Marine Resources Commission

# QUESTIONS?

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