Understanding the Harmful Algal Bloom Forecasting Needs of Lake Erie Anglers

5.16.17

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Introduction: Outline

Introduction

- Why this study matters
- Lake Erie HAB Tracker

Methodology

Results & Discussion

- Forecasting Needs
- HAB Tracker Feedback
- Recommendations

Conclusion

Introduction: The Need for Social Science

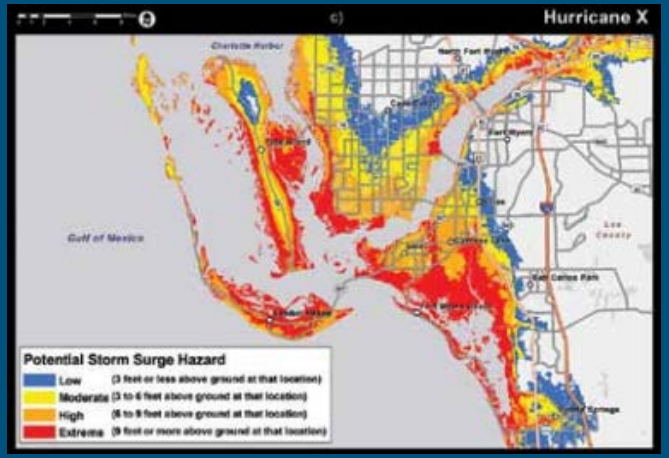
Why do we need social science research for forecast tool assessment ?

- Ensure research products are used
- Meet stakeholder needs

  i.e. storm surge warning system

- Successful HAB management requires human dimensions research

  Ecosystems = humans + environment



Morrow et al. (2015) *American Meteorological Society*

Bauer et al. (2010) *Frontiers in Ecology and the Environment.*

Introduction: Harmful Algal Bloom Monitoring

Experimental Lake Erie Harmful Algal Bloom Bulletin

29 August, 2016, Bulletin 15

The cyanobacterial (*Microcystis*) bloom is present at low to moderate concentrations on the Michigan coast, extending out to the north and west of West Sister Island. High concentrations and sporadic scums continue in Maumee Bay. The bloom is patchy at low concentrations along the Ohio coast, and is also present in patches east and north of Pelee Island and Pelee Point closer to the Ontario coast. Toxin concentrations are above recreational risk thresholds in Maumee Bay, but low outside of the Bay.

Some mixing today with light mixing Tuesday, and mixing again Wednesday and Thursday. We expect some eastward transport through Tuesday and southerly transport later in the week. Toxin concentrations remain a risk for recreational exposure around Maumee Bay, especially in scums.

The persistent cyanobacteria bloom continues in Sandusky Bay. No other blooms have been detected in the central basin or the eastern basin.

Keep yourself and your pets out of scums. Please check Ohio EPA's site on harmful algal blooms for safety information. http://epa.ohio.gov/habalgae.aspx Thunderstorms remain a greater risk. --Stumpf, Dupuy

The images below are "GeoPDF". To see the longitude and latitude under your cursor, select "Tools > Analyze > Geospatial Location

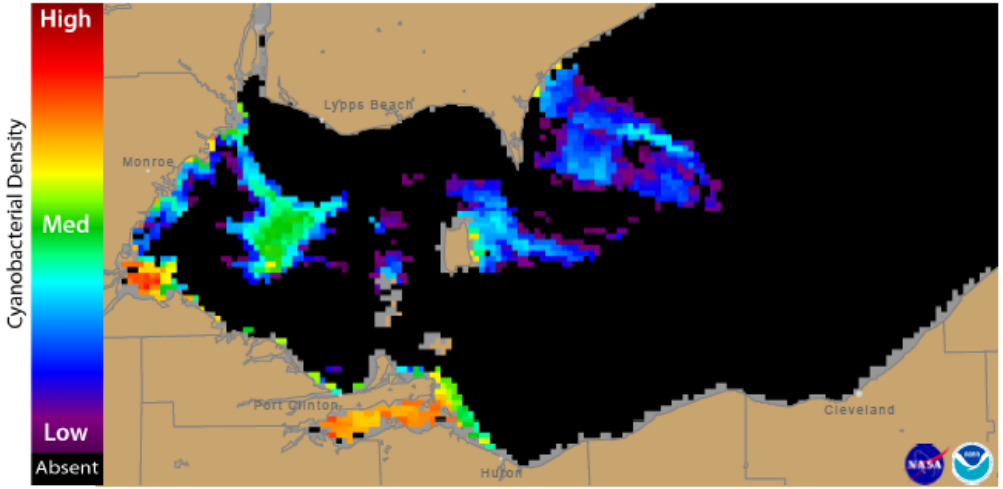
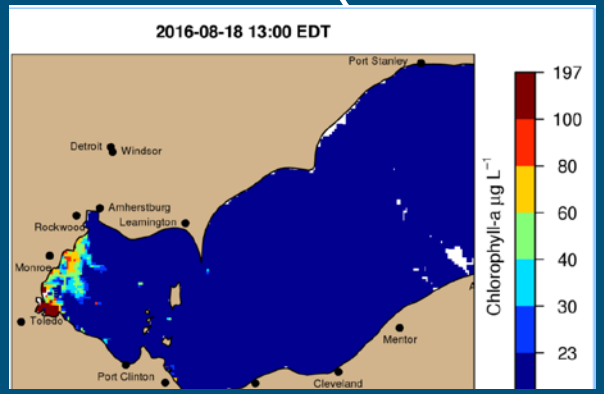


Figure 1. Cyanobacterial Index from NASA's MODIS-Terra data collected 26 August, 2016 at 11:18 EST. Grey indicates clouds or missing data. The estimated threshold for cyanobacteria detection is 20,000 cells/mL.

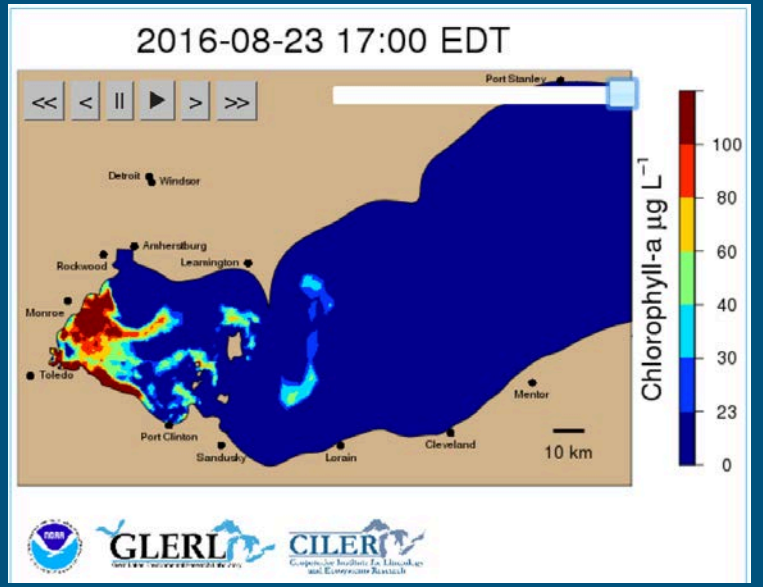
Introduction: Lake Erie HAB Tracker

MODIS Satellite Image

Satelite Derived Cyanobacterial Chlorophyll Concentration (NOAA NCCOS)



HAB Tracker Model



Introduction: HAB Tracker

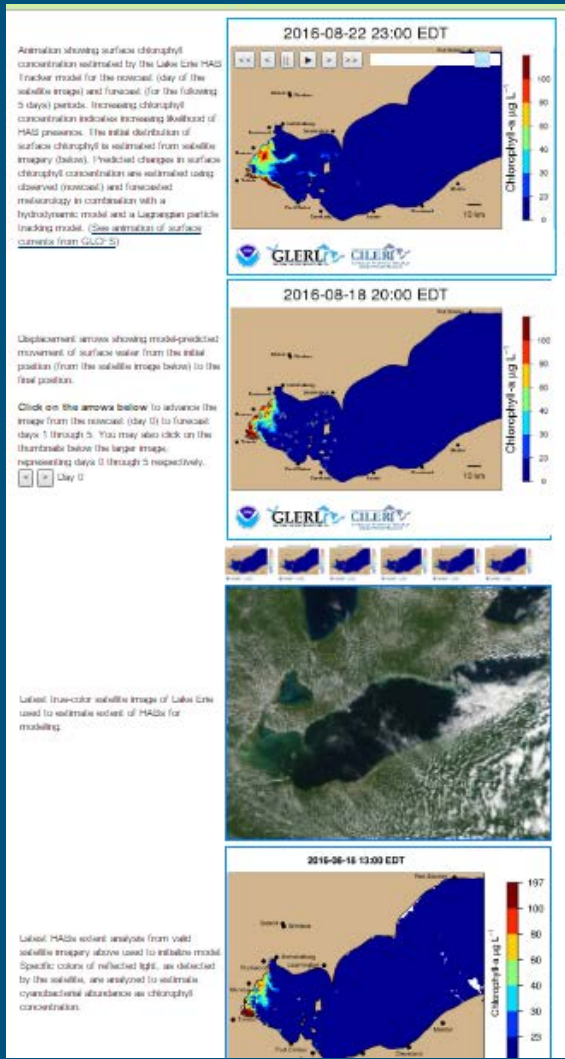
Purpose:

- Nowcast and 5-day forecast of HABs in Western Lake Erie

✓ Where are blooms?

✓ How big are they?

✓ Where are they likely headed?



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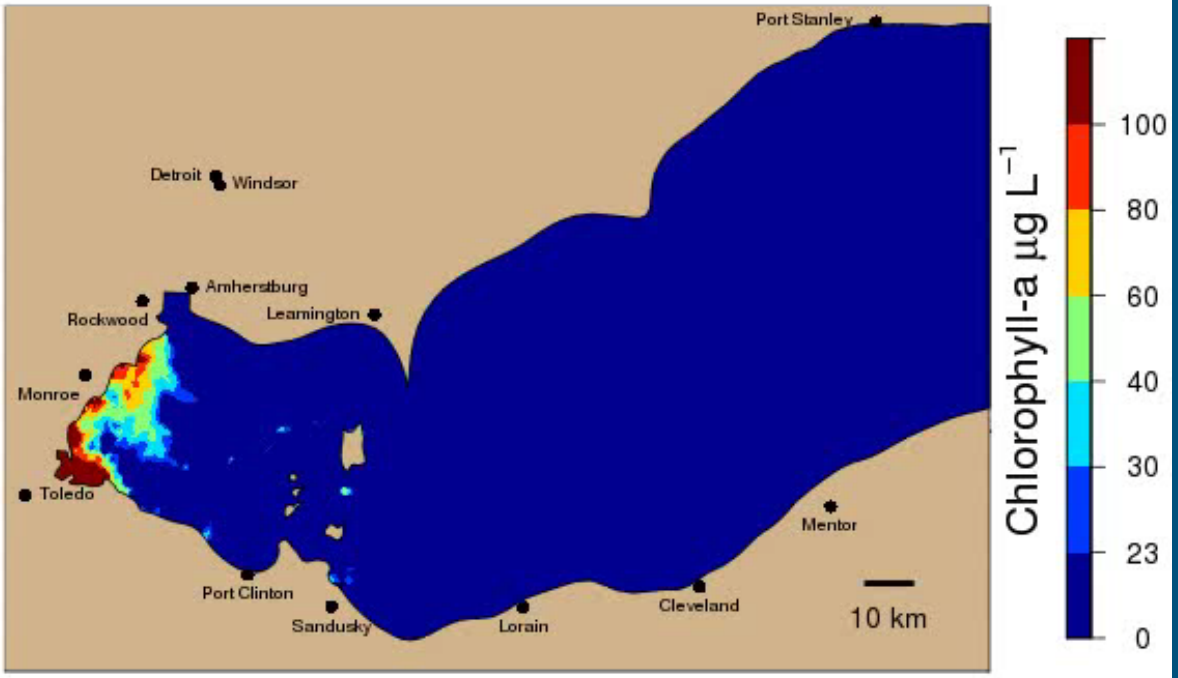

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Introduction: Targeted Stakeholders

Lake Erie Anglers are a key stakeholder

- Anglers spent approximately $2 billion in Ohio in 2014 to fish Lake Erie

(Great Lakes Commission, 2014)

Carpenter, Sandra (Photographer). (2012). www.sandracarpenter.net

Methods

Would Lake Erie anglers find the HAB Tracker to be useful?

Which variables contribute to whether or not Lake Erie anglers find the HAB Tracker to be useful?

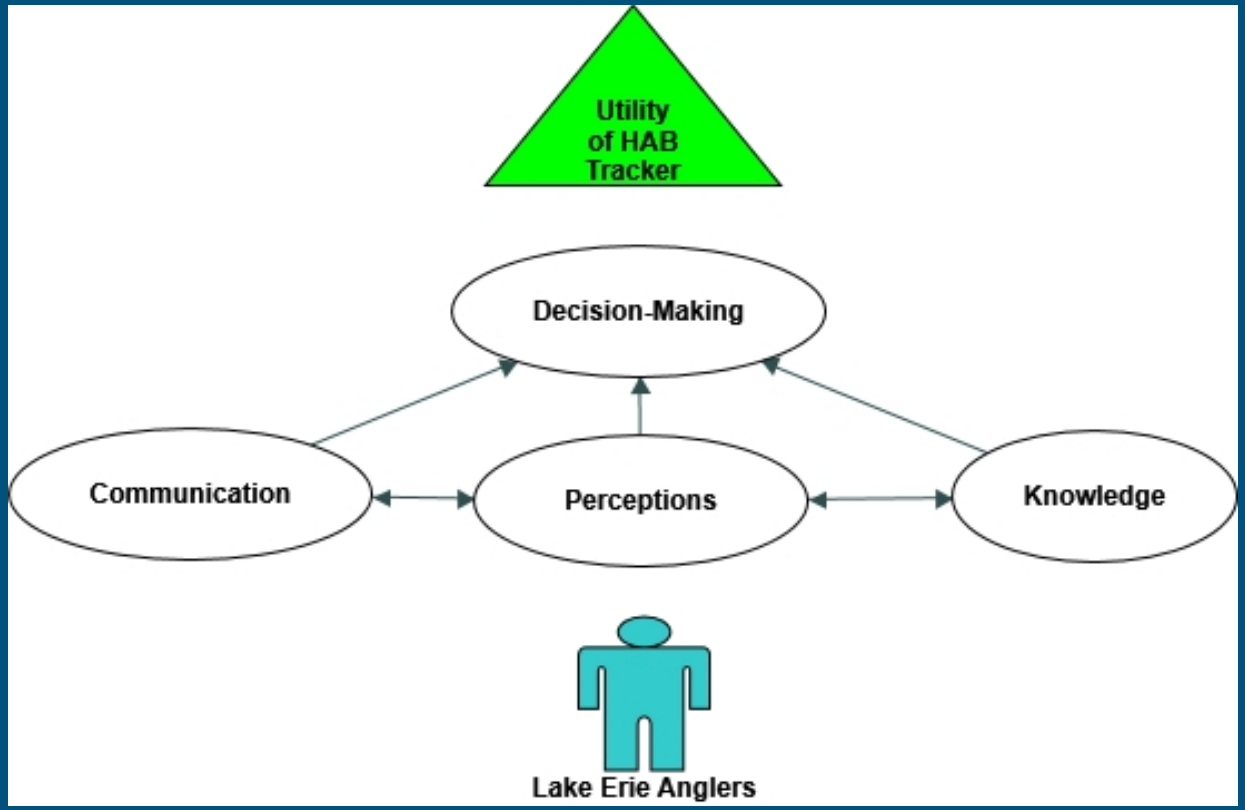
Egan, D'Arcy (Photographer). (October 2011). www.cleveland.com

Methods: Focus Groups

Focus Group Participants	
Offshore Recreational Anglers	Charter Boat Captains
Wyandotte: 7	La Salle: 5
Sandusky: 6	Oregon: 5
Oregon: 6	Oregon: 10
*Cleveland: 2	

Kruger, R. A., Casey, M. A., (2009). *Focus Groups*: 1-15.

Methods: Interview Guide Design



Methods: Steps for Data Analysis

1. Focus groups
2. Transcribe
3. Code
4. Compare
5. Develop themes
6. Generate a recommendation

172 **TJ:** Algae is mostly in that real top layer of the water.

173 **JH:** I was with someone that works with the natural resources conservation office, that farm type
174 agriculture agency, and he would make a point of going beyond the blooms. So several times two years
175 ago, we went out beyond West Sister Island where it had thinned out specifically to avoid the algae. And
176 so he was superstitious that he couldn't catch perch in the algae bloom, and so just for a variety of
177 reasons avoiding it was at the top of his list. And then like the other guys have said, you can look at the
178 maps, the MODIS satellite images and go east far enough to avoid it.

179 **MJ:** Yeah, that's a good one....

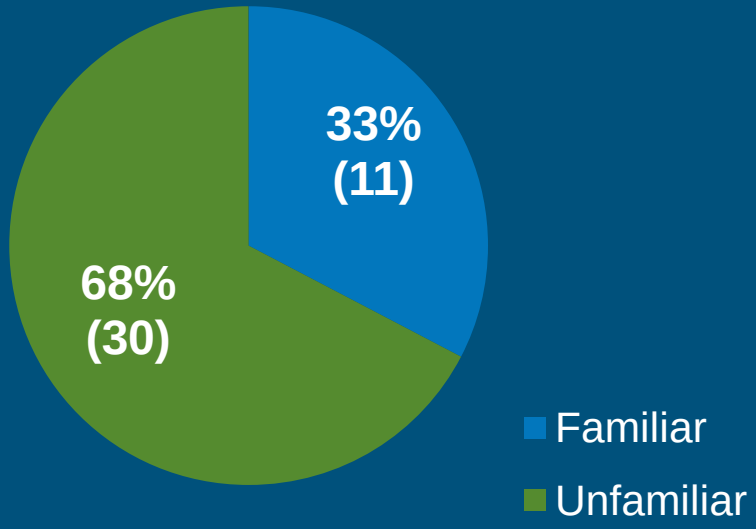
180 **FS:** Exactly.

Communication/Web/MODIS

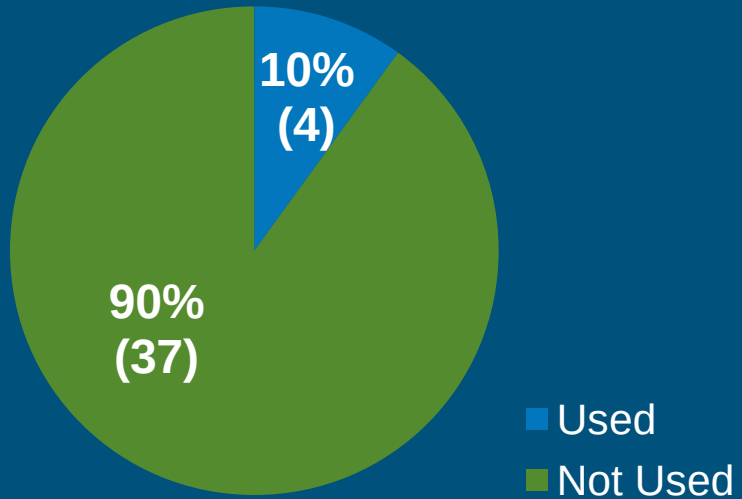
Walker, D., Myrick, F., (2006). Qualitative Health Research, 16(4): 547-559.

Results: Polling Data

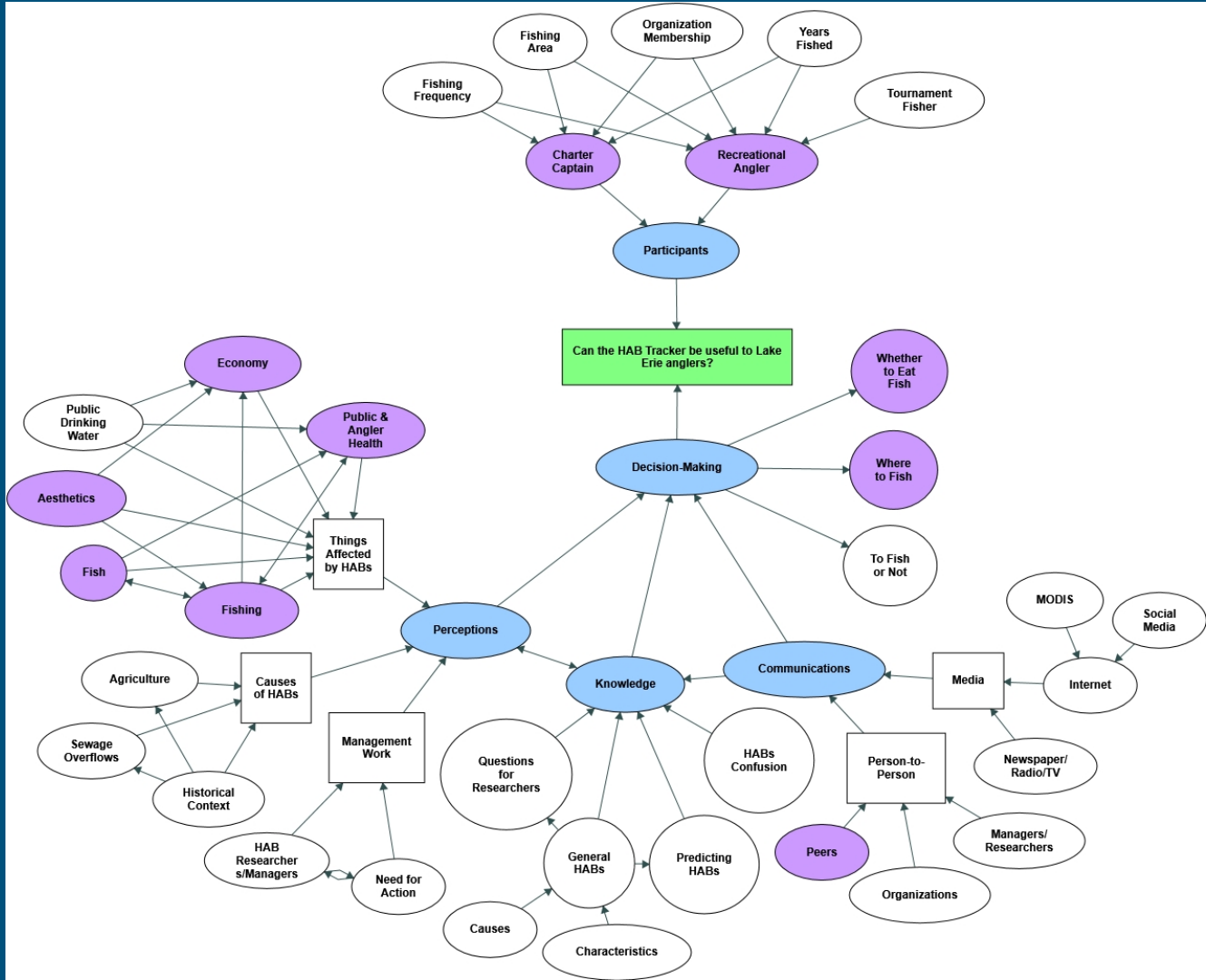
Participants Familiar with the HAB Tracker (n = 41)



Participants Who Used the HAB Tracker (n = 41)



Results: Coding Map



Results: Decision-making while fishing in HABs

- **Whether to fish**
- **Where to fish**
- Whether to eat the fish

“We’ll end up running farther and farther….The closer that we can go means our profits are maximized. The farther we have to run and the more fuel we have to spend means the less profit there is.”

Results: Key variables that influence decision-making

- Fishing aesthetics
- Angler perceptions of health risks
- Angler perceptions of ability to catch fish
- Charter captain customer perceptions of fishing in HABs
- Communication with peers

Results: Fishing Aesthetics

Majority prefer to avoid HABs, but efforts varied

- Smell, appearance
- Coats boat, slows speed

Angler 1: *You're looking at one of the Great Lakes, and then you've got this green slime floating and stuck on everything. It's not appealing.*

Angler 2: *I know that I've driven up to 6, 7 miles further just to get to water that didn't have that to make people comfortable. There was great fishing close, but it was under that algae.*

Results: Angler Perceptions of Health Risks

1) HAB exposure deleterious to health

- Cough/asthma

2) Unsure of impacts, but better safe than sorry

3) Risks are minimal and acceptable

"..Even though I don't know exactly why it's toxic, the fact that it's toxic algae… I'm not going to be swimming in it, but the fish are coming up through that and then I'm handling them and eventually eating them…so I would not fish in one."

Results: Angler Perceptions of Ability to Catch Fish

1) Poor fishing

- HABs extent must impact ecosystem -> fish
- Change migration patterns; leave western basin; emerald shiners

2) Successful fishing

- Fish use blooms for cover; swim below bloom

"If it's a light bloom, then it doesn't matter…Walleye don't like a lot of light. But if it becomes toxic, it's not alright and it's a flip of a coin.…Those fish know if that algae bloom goes from more than a light bloom to a heavy bloom, and I guarantee then that there are no fish in it."

Results: Communication with Peers

Referenced conversations with peers when explaining decision-making

- Information distribution
- Strong charter captain network

“We’ve got a pretty big network of Captains that all talk every day and work together. So, we find out about a lot of stuff that way.”

Results: Charter Captain Customer Perceptions

All charter captains concerned about customer perceptions

- Business losses

"..Just looking at last year [2015], *typically everyone lost 25% of their business. Now, think about the fact that we only run from April until November. You've got to earn your living during that short time. We lost 6 weeks, because of the bloom last year… we lost 10 grand within that six week timeframe…It doesn't sound like a lot of money, but for that guy, that 10 grand has to carry him until next year."*

Results: Feedback on HAB Tracker

Useful for trip-planning

“A lot of times we didn’t know..we’d take off for one spot, and then go look after another spot. Now, we just know where to go instead of wasting gas running around.”

Improve accessibility and add information

- Name recognition
- Wave height, wind velocity, dissolved oxygen

Results: Barriers to Angler use of HAB Tracker

- **Distrust of researchers & government agencies**

"How many years of research do you have to do before you stop saying you need to throw money at it? You're throwing a lot of money at research, and that's all good stuff, but unless it goes toward actually doing something, you might as well use it in the @#$%^."

- **Distrust of media**

"Our biggest issue is the media. It's usually news media blowing something out of proportion and spooking the general public."

Results: Recommendations for Improvement

- **Increase frequency of researcher/angler communication**
  Training sessions, Fishing org. meetings, User surveys
- **Incorporate angler input into research & products**
  Update HAB Tracker, Development of hypoxia forecast
- **Leverage charter captain communication network & self-motivation**
  Strategy for stakeholder partnership development

Dedual et al. (2013) *Fisheries Management and Ecology* 20(2-3): 234-246
Holmes and Lock (2010) *Marine Policy* 34(1): 29-35
McNie (2007) *Environmental Science and Policy* 10(1): 17-38

Conclusion

If Lake Erie anglers use the HAB Tracker, we predict that they will find it useful, because the HAB Tracker has the potential to improve angler decision-making efficiency related to whether to fish and where to fish during a bloom.

* *Recommend improvements for accessibility and content to reflect angler concerns & interests*

Acknowledgements

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