Stakeholder Assessment for a HABs Early Warning System

A study conducted by:

THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,
AND ENVIRONMENTAL SCIENCES

For the:

**great lakes
observing system**

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Tellez, C. and R.S. Wilson. 2020. *Stakeholder assessment for a HABs early warning system.* Columbus, OH: The Ohio State University, School of Environment and Natural Resources.

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Overview

The goal of this report is to identify stakeholder information needs for optimal design of the Lake Erie harmful algal bloom (HAB) early warning system. Specifically, we investigate how to tailor the use of sensor technology to ensure that the right information is delivered at the right frequency to each group given their desired source and channel. Data was gathered through a mixed-mode survey gauging how different groups currently receive information about HABs, how they are impacted by the blooms, what type of information each group would like to receive about HABs, and the willingness to pay for HAB warning systems.

Survey Instrument and Methodology

Three survey instruments and varying methodologies were produced to represent the needs of specific Lake Erie stakeholder groups: professionals, residents and visitors. Lake Erie professional stakeholders (charter captains, decision makers, lakeside business owners, marinas, media reps) were identified in collaboration with Ohio Sea Grant which provided email addresses thus, electronic surveys were sent via email (using the online survey platform Qualtrics). This survey version included questions concerning communication preferences (sources and channels for information), HAB concerns, the frequency and type of information needed, stakeholder-specific demographic information, and general demographic information. There was also a choice experiment that differed by the level of specificity in HAB information so professionals could choose which option best suited their field. Emails with an electronic link to the survey were sent to 225 charter captains, 66 marinas, 402 lakeside business, 1169 decision makers (i.e., local, county, state leaders and policy makers), and 651 media representatives. Four waves of emailed correspondence followed. An initial email was sent with a link to the survey. This was followed by a reminder two days later, a second reminder one week after that, and a third reminder a week after that. A final email was sent one week after the last reminder to inform participants that access to the online survey would close the following week. As soon as a potential respondent completed the survey or has indicated that he/she is not interested in participating in the survey, no further correspondence was issued. Final responses included 84 charter captains (36% response rate), 25 marina owners (38% response rate), 84 lakeside business owners (21% response rate), 210 government decision makers (18% response rate), and 85 members of the media (13% response rate).

A panel of Lake Erie residents were administered a similar online survey by a third-party data analytics company (i.e., Qualtrics). The sample of 410 residents was stratified to represent different demographic groups appropriately, while the potential participants were individuals living within 30 miles from the lakeshore, determined by zip code, across 8 counties: Lucas, Ottawa, Sandusky, Erie, Lorain, Cuyahoga, Lake, and Ashtabula.

Lake Erie visitors were recruited to participate in a shortened visitor intercept survey. Research staff traveled to the Aquatic Visitors' Centre (Lake Erie South Bass Island) and Maumee Bay State Park multiple times throughout the summer of 2019. During each visit, staff approached every third visitor they saw and asked them to take part in a survey about water quality information. Surveys were completed electronically on iPads. Visitor intercept surveys obtained a final response of 182 visitors out of approximately 400 approached (45% response rate). This version of the survey was condensed to be completed in 5 minutes (e.g., less options for each question) and the choice experiment was excluded.

Takeaways and Recommendations

Key findings for each section are detailed at the beginning of the sections throughout the report, followed by tables and figures summarizing the descriptive results for each question in the survey. Here we summarize the key takeaways from all of the sections and pose recommendations for designing an early warning system to meet multiple stakeholder needs.

Recommendations for Warning System Design

- Lake Erie residents and visitors are significantly less engaged with Lake Erie information and significantly less concerned. For residents, this may be do the fact that only half of residents report using Lake Erie for activities related to leisure or recreation. Additionally, less than 5% of residents have experienced a decrease in property value due to HABs.
  - Residents and visitors are less interested in receiving news and information than other stakeholder groups.
  - Residents are the only group that prefers information via the television, and they prefer it on a weekly basis. This suggests that residents may be less likely to seek out information but may expect it to be brought to them directly.
  - On average, residents felt that issues that may cause stakeholders to seek out information were "sometimes a concern" but did report the most concern for the economy of the region, public health and safety, health of plants and animals, and trust-

related concerns (trusting available information, trusting resource management agencies and water treatment managers to manage risks)

- o Visitors would like to receive alerts on the changing conditions of Lake Erie less than other stakeholder groups and prefer alerts only when conditions escalate.
- o Residents are less likely to desire detailed information regarding HAB conditions. However, around two-thirds of residents are interested in receiving information about the severity of the bloom and health impacts. Approximately half of residents and visitors are interested in forecasting information but prefer short-term forecasting options.

- Due to distinct differences between residents and professional stakeholders, and similarities across professional stakeholder groups, designers should consider a separate tool specific to the needs of different stakeholders.
    - o Visitor centers/kiosks are the least sought after for information regarding HABs. Additionally, only about one third of stakeholder groups will stop by a visitor center frequently when recreating around Lake Erie.
    - o Weekly updates via email or an online source are the most preferred channel for HAB conditions for all stakeholder groups besides residents (who prefer television).
    - o Stakeholders seek information about HABs mostly due to their concerns for the economy of the region, recreational opportunities, and knowing what actions they can take to mitigate the impacts of HABs.
    - o Stakeholders would prefer to receive alerts about HAB conditions on a daily basis as conditions escalate to recreation and drinking water watch/alert modes.
    - o While all stakeholders are interested in receiving information regarding the severity of blooms and health-related impacts, the percentage of stakeholders interested in physical and biological parameters varies. Charter captains and marina owners are the most interested in specific physical and biological parameters.
      The majority of professional stakeholders are interested in short-term, long-term, and seasonal forecasts with a slight emphasis on short-term forecasts.
    - o Overall, most stakeholders prefer an early warning system that focuses on drinking water conditions (except for charter captains who prefer info on fishing conditions). Most stakeholders also want current and one-week forecasts, while decision makers want mixing and transport forecasts. Decision makers and the media prefer to pay $50 per

year, while other professional stakeholders would pay up to $100 per year while residents prefer that this information be free.

Potential areas for engagement

- o The majority of residents and visitors believe the state/local government is responsible for protecting the health of Lake Erie, while visitors also believe the federal government is responsible. Professional stakeholders place responsibility on the state/local government and the agriculture/manufacturing industry.

- o 20-30% of charter captains and lakeside business owners do not believe their work is impacted by water quality of Lake Erie. This may be because only one third of charter captains and lakeside business owners experienced a decrease in revenue from HABs, compared to two-thirds of marina owners. 90% of marina owners believe their work is impacted by water quality. From focus group data with water treatment personnel, there is evidence that some water treatment plant professionals have low concern for HABs due to belief in their treatment systems and technology.

- o About 50% of government decision makers agree or strongly agree that the public they serve trusts them for information on HABs, and that the public is willing to consider news and information that does not affect them directly. This may explain why residents are the least engaged with Lake Erie issues as decision makers may not prioritize topics surrounding HAB conditions or mitigation until they are urgent. About 70% of media representatives believe that the public they serve trusts them for information about HABs and are willing to consider news and information that does not affect them directly. Since residents prefer information via the television, media representatives may be an important source for engaging residents in Lake Erie issues.

Section I: Stakeholder Group Comparisons of Early Warning System Data

Key Findings

- **Interest in receiving news and information on harmful algal blooms**
  - Lake Erie residents and visitors were significantly less interested in receiving news and information than almost every other stakeholder group.[1] For example, ~50% of residents and visitors were interested or extremely interested compared to the ~80% of respondents in all other stakeholder groups.

- **Current sources of HAB information**
  - The National Weather Service and NOAA were the most popular source of information for stakeholder groups (i.e., around 40-50% of all stakeholder groups often or very often seek HAB information from the NWS). The only exception to this is for residents where 40% often or very often receive HAB information from NWS but only 10% receive information from NOAA.
  - Businesses, media and decision makers were also likely to seek information from environmental agencies, while public health agencies were not a popular source for most (somewhat more popular for the public).
  - Overall, visitor centers/kiosks are the least sought after for information regarding HABs.

- **Preferred information channel and frequency**
  - 85% or more of all stakeholder groups prefer information on HAB conditions direct to their email. Greater than 85% of most stakeholder groups also prefer information via online source with 70% of lakeside business owners preferring online source. Marina owners and residents prefer email information on a monthly basis while all other groups prefer it on a weekly basis.
  - Approximately 80% or more of charter captains, decision makers, marina owners, and media representatives prefer information via online source. Lakeside business owners and residents prefer information via online source slightly less frequently at 69% and 64%, respectively. All stakeholder groups would choose to receive information from an online source at a weekly basis.
  - Around 80% of decision makers and media representatives prefer HAB information via lakeshore signage compared to approx. 60% of other stakeholder groups. Most stakeholder groups would prefer lakeshore signage information weekly with charter captains preferring monthly, and marina owners equally preferring monthly and weekly information.
  - 60-80% of stakeholders prefer information via the television. Television is the channel most preferred by residents.
  - Around one third of visitors prefer HAB condition information direct to their email and via the television. Less than one third of visitors check marked other sources as their preferred channel.

- **Issues or concerns that cause stakeholders to seek information about HABs**

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[1] Significant differences based on ANOVA testing

- o All stakeholders are generally most likely to seek information due to concerns about the economy of the region and recreational opportunities, followed by concerns about understanding personal HAB mitigation actions, and health and safety.
- o Decision makers and residents repeatedly show slightly less concern than all other stakeholder groups. This makes sense as decision makers have an array of agenda items that draw their concern, and residents may not be as engaged with Lake Erie recreation or business as other stakeholder groups, despite their proximity.
- o While Lake Erie residents are equally driven to seek information due to concerns of the economy, recreational opportunities, health of plants and animals, and trust-related concerns.

- **Preferred frequency of HAB and lake condition alerts**
  - o Consistently, visitors only prefer HAB alert frequencies only when the mode of alert escalates.

  - o The majority of stakeholders prefer normal/routine mode and recreation watch mode on a weekly basis with lakeside business owners and media representative wanting recreation watch mode on a daily basis.

  - o Stakeholder groups want drinking water watch mode, recreation alert mode, and drinking water alert mode on a daily basis with residents wanting recreation alert mode on an hourly basis.

- **Types of information included in an early warning system**
  - o Lake Erie residents do not want to receive as much early warning system information, regardless of category, compared to all other stakeholder groups.
  - o 78%-98% of stakeholders (excluding residents and visitors) want to receive information regarding severity of the bloom (ex. Bloom size, cyanotoxin concentration) and health-related information (ex. Cases of human exposure, advisories).
  - o Marina owners, charter captains and to a lesser extent, lakeside business owners, want information on the physical parameters as well (e.g., XYZ).
  - o Charter captains and media representatives want biological parameters (ex. Nutrients, fish, birds) more than any other group.
  - o Charter captains, decision makers, and media representatives prefer short term (i.e., 3 to 5-day predictions) forecasts. Lakeside business owners show no clear preference and marina owners prefer long-term (i.e., 10-day predictions) forecasts. Residents and visitors prefer all forecasting options less than all other stakeholder groups but prefer short-term forecasts.

- **Perceived responsibility for Lake Erie health**
  - • Stakeholders indicated that responsibility for the health of Lake Erie should be shared among many parties (e.g., government, industry, individuals). However, responsibility was primarily attributed to local/state and federal government, followed by agriculture.

Interest in receiving news and information on harmful algal blooms

Respondents were asked if they were interested in receiving news and other information related to HABs affecting Lake Erie on a scale where 1 = not at all interested, 2 = a little interested, 3 = somewhat interested, 4 = interested, and 5 = extremely interested. Table 1 displays the average response for each stakeholder group in order from most to least interested. Residents and visitors are the least interested in receiving HAB news and information (on average, they are only "somewhat interested", while the rest of the groups are "interested").

Table 1. Average interest in receiving HAB news and information

	Charter Captain	Decision Maker	Lakeside Business Owner	Marina Owner	Media Rep	Resident	Visitors
	N = 83	N = 203	N = 80	N = 21	N = 81	N = 410	N = 182
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Avg interest	4.20 (.89)	4.09 (.95)	4.04 (.95)	4.00 (1.18)	4.15 (1.07)	3.22 (1.34)	3.58 (1.21)

Current sources of HAB information

Stakeholders were asked how often they receive or seek out information from a number of sources. The Ohio Department of Health and Centers for Disease Control were combined into "health related agencies". The question included a scale of 0 = never, 1 = rarely, 2= sometimes, 3 = often, and 4 = very often. Table 2 shows the percentage of stakeholders who "often" or "very often" receive or seek information from the following sources.

Table 2. Percentage of stakeholders who often or very often receive HAB information from sources

	Charter Captain	Decision Maker	Lakeside Business Owner	Marina Owner	Media Rep	Resident	Visitors
	N = 84	N = 210	N = 84	N = 25	N = 85	N = 413	N = 182
GLOS	30.9%	21.4%	18.0%	23.5%	21.1%	11.4%	N/A[1]
National Weather Service	52.1%	44.4%	44.1%	52.9%	42.5%	40.4%	45.4%
NOAA	59.2%	48.9%	30.8%	41.2%	47.9%	9.6%	N/A
EPA	11.8%	31.4%	9.8%	25.0%	21.9%	17.0%	N/A
Health Agencies (ODH, CDC)	6.1%%	12.6%	18.0%	17.6%	19.2%	24.8%	16.0%
Visitor Center/Kiosk	3.0%	1.2%	6.7%	12.5%	5.7%	8.2%	10.5%
Other	10.7%	9.0%	1.2%	12.0%	11.8%	12.7%	7.7%

[1] This option was not provided in the shortened visitor survey.

Preferred information channel and frequency

Respondents indicated how they would prefer to receive information on HAB conditions in the future using a scale comprised of 0 = never, 1 = daily, 2 = biweekly, 3 = weekly, 4 = monthly, and 5 = seasonally. To illustrate channel preference and difference between stakeholder preferences the scale was combined to 0 = never and 1= want to receive information to any extent. Table 2 displays the percentage of stakeholders who want to receive information from each channel, regardless of frequency.

Table 3. Percentage of stakeholders who want to receive information from channels

Channel	Charter Captain N = 84	Decision Maker N = 210	Lakeside Business Owner N = 84	Marina Owner N = 25	Media Rep N = 85	Resident N = 413
Direct to my email	89.7%	91.4%	84.8%	94.4%	95.6%	66.9%
Online source	79.4%	85.9%	69.1%	93.8%	93.0%	64.3%
Lakeshore Signage	66.7%	82.5%	60.4%	66.7%	80.6%	63.9%
Via the television	70.6%	77.4%	72.9%	64.7%	77.0%	80.0%
Social media	46.3%	59.4%	58.6%	73.3%	82.0%	51.5%
On the radio	71.0%	66.9%	63.0%	29.4%	64.8%	69.1%
From print media	63.8%	61.1%	51.9%	64.7%	63.5%	63.5%
Smart phone app	60.6%	60.4%	58.2%	60.0%	59.6%	49.9%
Via text message	47.8%	35.9%	40.4%	40.0%	27.6%	43.0%
Via the phone	22.1%	13.7%	9.1%	25.0%	7.1%	28.3%

Table 4. Percentage of visitors with HAB information channel preferences

As in Table 3, respondents indicated their preferred information channel for HAB condition information. For the shortened visitor intercept survey, source options were presented as a "check all that apply" question without the option of frequency preference. Table 4 displays the channel preferences from highest to lowest percentage of respondent.

Channel	**Visitors** N = 182
Direct to my email	34.1%
Via the television	30.2%
Social media	24.7%
On the radio	23.6%
Via text message	23.6%
Online source	19.2%
Lakeshore Signage	13.7%
Smart phone app	12.6%
From print media	7.1%
Via the phone	1.6%

Table 5 displays the median frequency preference for the channels listed in Table 3. Differing preferences across stakeholder groups are bolded.

Table 5. Median preference of HAB information frequency

	Charter Captain	Decision Maker	Lakeside Business Owner	Marina Owner	Media Rep	Resident
	N = 84	N = 210	N = 84	N = 25	N = 85	N = 413
Direct to my email	Weekly	Weekly	Weekly	Monthly	Weekly	Monthly
Online source	Weekly	Weekly	Weekly	Weekly	Weekly	Weekly
Lakeshore Signage	Monthly	Weekly	Weekly	Monthly/ Weekly	Weekly	Weekly
Via the television	Weekly	Weekly	Weekly	Weekly	Weekly	Weekly
Social media	Weekly	Weekly	Biweekly	Daily	Biweekly	Weekly
On the radio	Weekly	Monthly	Weekly	Weekly	Weekly	Weekly
From print media	Monthly	Seasonally	Monthly	Monthly	Weekly	Monthly
Smart phone app	Weekly	Biweekly	Weekly	Weekly	Weekly	Weekly
Via text message	Weekly	Weekly	Weekly	Monthly/ Weekly	Weekly	Weekly
Via the phone	Weekly	Monthly	Monthly	Weekly	Monthly	Weekly

Issues or concerns that cause stakeholders to seek information about HABs

Respondents were presented a bank of concerns that might cause them to seek information about HABs. For this report, items were condensed into broader topics. Health and safety concerns includes the items, "my personal safety and well-being, the safety and well-being of my family and pets", "the safety and well-being of my community", and "my ability to feed myself or my family with local fisheries." Trust-related concerns include, "how much I can trust the information that is readily available", "resource management agencies not properly managing the risks", water treatment manager not properly managing the risks". Items were scaled using 1 = never a concern, 2 = rarely a concern, 3 = sometimes a concern, 4 = very often a concern, and 5 = always a concern. Table 6 shows the average response to whether or not they seek information due to concerns.

Table 6. Average agreement with issues that may cause stakeholders to seek out information on HABs

	Charter Captain	Decision Maker	Lakeside Business Owner	Marina Owner	Media Rep	Resident
	N = 84	N = 210	N = 84	N = 25	N = 85	N = 413
The economy of the region	4.52	3.86	4.38	4.53	3.97	3.45
	(.74)	(1.01)	(.89)	(.62)	(.95)	(1.28)
Recreational opportunities	4.33	3.74	4.33	4.44	3.92	3.24
	(.90)	(.98)	(.80)	(.62)	(.81)	(1.31)
Knowing what actions I can take to mitigate the impacts of HABS	4.23	3.61	4.15	4.12	3.83	3.08
	(.90)	(1.14)	(1.00)	(.99)	(.95)	(1.32)
Health and safety concerns	4.09	3.76	4.15	4.04	3.87	3.42
	(1.04)	(1.08)	(.95)	(.79)	(1.03)	(1.22)
Health of plants and animals	4.05	3.61	4.02	3.38	4.06	3.47
	(1.01)	(1.11)	(1.10)	(1.15)	(.86)	(1.26)
Possible damage to my community's pride and reputation	3.78	3.27	4.00	3.81	2.98	3.01
	(1.23)	(1.19)	(1.15)	(1.11)	1.22)	(1.33)
My home's property value	3.47	2.47	3.95	3.53	2.27	2.89
	(1.47)	(1.40)	(1.18)	(1.23)	(1.26)	(1.43)
Trust-related concerns	3.80	3.34	3.91	3.63	3.66	3.43
	(.91)	(.98)	(.97)	(1.00)	(.92)	(1.13)

Preferred frequency of HAB and lake condition alerts

Respondents were prompted to the following question by the statement, "The conditions in Lake Erie are constantly changing and therefore require a dynamic monitoring and warning system. Monitoring systems can be categorized into modes depending on the severity of HAB conditions." Stakeholders responded to how often they would like to receive alerts during the following mode categories using a scale of 0 = never, 1 = hourly, 2 = daily, 3 = weekly, 4 = biweekly, and 5 = only when the mode escalates. Table 7 displays the median occurring response for each stakeholder group.

Table 7. Percentage of stakeholders with HAB alert frequency preferences

	Charter Captain	Decision Maker	Lakeside Business Owner	Marina Owner	Media Rep	Resident	Visitors
	N = 84	N = 210	N = 84	N = 25	N = 85	N = 413	N = 182
Preferred frequency info for normal/routine mode	Weekly	Weekly	Weekly	Hourly[2]	Weekly	Weekly	Only when mode escalates
Preferred frequency info for **recreation watch mode**	Weekly	Weekly	Daily	Weekly	Daily	Weekly	Only when mode escalates
Preferred frequency info for **drinking water watch mode**	Daily	Daily	Daily	Daily	Daily	Daily	Only when mode escalates
Preferred frequency info for **recreation alert mode**	Daily	Daily	Daily	Daily	Daily	Hourly	Only when mode escalates
Preferred frequency info for **drinking water alert mode**	Daily	Daily	Daily	Daily	Daily	Daily	Only when mode escalates

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[2] Response may differ compared to other stakeholder groups due to comparably low sample size

Types of information included in an early warning system

Stakeholders were presented a bank of specific information that might be included in an early warning system. Items were separated into categories including severity information, physical parameters, biological parameters, and health-related information. Respondents could check either yes, no, or unsure whether or not they wanted each type of information in an early warning system. Table 6 displays the percentage of stakeholders who indicated that they wanted to receive information. Although we collapsed specific items into categories, interest within categories for each stakeholder group was similar.

Table 8. Percentage of stakeholders who want to receive types of information in an early warning system

	Charter Captain	Decision Maker	Lakeside Business Owner	Marina Owner	Media Rep	Resident	Visitors
	N = 84	N = 210	N = 84	N = 25	N = 85	N = 413	N = 182
Severity of the bloom (ex. bloom size, cyanotoxin concentration)	87%	78%	81%	98%	91%	62%	N/A[1]
Health-related information (ex. Cases of human exposure, advisories)	81%	80%	86%	85%	92%	66%	77%
Physical parameters (ex. Water temps, turbidity)	84%	57%	74%	83%	66%	48%	N/A[1]
Biological parameters (ex. Nutrients, fish, birds)	78%	52%	63%	47%	74%	46%	N/A[1]

[1] This option was not provided in the shortened visitor survey.

Similar to table 8, respondents had the option to indicate yes, not, or unsure to whether they wanted specific HAB forecasts. Table 9 presents the percentage of stakeholders who indicated they that they want to receive forecast information.

Table 9. Percentage of stakeholders who want to receive HAB forecast information

	Charter Captain	Decision Maker	Lakeside Business Owner	Marina Owner	Media Rep	Resident	Visitors
	N = 84	N = 210	N = 84	N = 25	N = 85	N = 413	N = 182
Short-term forecasts (i.e., 3- to 5- day predictions)	86.3%	81.5%	85.0%	88.2%	90.6%	66.6%	57.7%
Long-term forecasts (i.e., 10-day predictions	79.2%	75.4%	83.1%	94.2%	83.1%	58.0%	48.3%
Long-term seasonal forecasts (i.e., prediction of blooms for the entire season)	71.2%	73.2%	83.6%	82.4%	81.5%	55.1%	45.8%

Perceptions of who is responsible for protecting the health of Lake Erie

Stakeholders were asked who in their opinion is responsible for protecting the health of Lake Erie. Respondents were given the option to check all relevant options. Table 10 displays the percentage of stakeholders that indicated whether they believed a group was responsible. State and local govt, fishing and tourism industry, and agriculture and manufacturing industry options were collapsed due to common scope and similar stakeholder perceptions.

Table 10. Percentage of stakeholders indicating that each group was responsible for health of Lake Erie

Responsible for protecting health of Lake Erie (check all)	Charter Captain N = 84	Decision Maker N = 210	Lakeside Business Owner N = 84	Marina Owner N = 25	Media Rep N = 85	Resident N = 410	Visitors N = 182
Federal govt.	76.2%	61.9%	57.1%	56.0%	69.4%	50.5%	74.7%
State / local govt.	83.3%	68.6%	65.5%	60.0%	70.6%	72.2%	89.0%
Fishing / tourism industry	52.4%	42.4%	38.1%	28.0%	51.8%	33.7%	56.0%
Agriculture / manufacturing industry	70.2%[3]	61.4%	54.8%	52.0%	65.9%	42.7%	63.7%
Individual	51.2%	47.6%	41.7%	36.0%	56.5%	37.6%	51.2%
Unsure	1.2%	0.5%	1.2%	4.0%	-	13.4%	1.2%

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[3] Perceptions of responsibility between agriculture (70.2%) and manufacturing (52.4%) were not as comparable for charter captains.

Section II: Stakeholder Preferences for Early Warning Systems

Key Findings

The following tables summarize stakeholder preferences for early warning systems. The first table (Table 11), summarizes the results for respondents who opted in to the more general of the two choice experiments (focused on drinking water, fishing and beach conditions). Generally, stakeholders were more likely to select a warning system that contained information for drinking water conditions over beach conditions. There was also a general preference for systems that contained information on both current conditions and one-week predictions. Finally, there was a preference for systems that would only cost $50 per year. There were some stakeholder differences of interest (see Tables 14 to 19 for detailed results), namely that charter captains preferred information on fishing conditions over drinking water (7x more likely to pick a system with fishing conditions). They were no more or less likely to select a system based on the other factors. Marina owners had a clear preference for receiving information via a website, while the media preferred email. The sensitivity to cost seems to be largely driven by decision makers and the media, while other stakeholders did not seem to select systems based on the variation in cost.

Table 11. Aspects of the early warning system that drove system preferences (where an X indicates a significant effect or a primary preference in an early warning system)

	Info on Conditions			Conditions		Means of Receiving Info		Cost	
	Drinking water	*Fishing*	*Beach*	*Current*	*One week*	*Email*	*Website*	*$50 annually*	*$100 annually*
All (Combined)	X			X	X			X	
Charter Captains		X							
Decision Makers	X			X	X			X	
Business Owners	X				X				
Marina Owners							X		
Media	X					X		X	

Residents had a slightly different set of attributes in their choice experiment, but here we see that there was a preference for information on drinking water conditions (over fishing and beach conditions), as well as a preference for this to be free (over costing either $5 or 10) (see Table 12 for general results or Table 20 for more detailed results). Choices for early warning systems were *not* driven by whether the information provided was for current or future (one week) conditions, or by how the information was provided.

Table 12. Aspects of the early warning system that drove system preferences (where an X indicates a significant effect or a primary preference in an early warning system)

	Info on Conditions			Conditions		Means of Receiving Info			Cost		
	Drinking water	*Fishing*	*Beach*	*Current*	*One week*	*Text*	*TV/ Radio*	*Website*	*Free*	*$5*	*$10*
Residents	X								X		

For stakeholders who chose to consider the warning systems with more detailed information, there was a strong preference for systems that contained: current conditions, mixing forecast, transport forecast and satellite imagery (this mix of information was particularly important for decision makers) (see Table 13). However, some stakeholders just wanted information on current conditions (i.e., business owners and the media) (see Tables 21 to 25 for more details results). Preferences for different early warning systems did not vary based on the cost or mode of providing the information, indicating that either are acceptable.

Table 13. Aspects of the early warning system that drove system preferences (where an X indicates a significant effect or a primary preference in an early warning system)

	Current conditions	**Mixing forecast**	**Transport forecast**	**Satellite image**	**Means of receiving info**	**Cost**
All	X	X	X	X		
Charter Captains	X			X		
Decision Makers	X	X	X	X		
Business Owners	X					
Marina Owners	*Couldn't estimate, sample too small*					
Media	X					

Detailed Results on the Simple Choice Experiment with Basic Info on Conditions

Table 14. Odds ratios for factors driving selection of an early warning system (all respondents combined)

Variable	Odds ratio	p-value
Conditions		
Drinking water conditions	Reference category	
Fishing conditions	0.594	0.005
Beach conditions	1.038	0.832
Current conditions (0,1)	2.256	0.000
One-week prediction (0,1)	2.078	0.000
Means of receiving information (0=email, 1=website)	0.923	0.595
Cost (0 = $50/yr, 1 = $100/yr)	0.989	0.000

Table 15. Odds ratios for factors driving selection of an early warning system (charter captains only)

Variable	Odds ratio	p-value
Conditions		
Drinking water conditions	Reference category	
Fishing conditions	7.736	0.000
Beach conditions	2.373	0.156
Current conditions (0,1)	2.263	0.110
One-week prediction (0,1)	1.888	0.192
Means of receiving information (0=email, 1=website)	0.997	0.994
Cost (0 = $50/yr, 1 = $100/yr)	0.996	0.611

Table 16. Odds ratios for factors driving selection of an early warning system (decision makers only)

Variable	Odds ratio	p-value
Conditions		
Drinking water conditions	Reference category	
Fishing conditions	0.315	0.000
Beach conditions	0.618	0.114
Current conditions (0,1)	3.120	0.000
One-week prediction (0,1)	3.029	0.001
Means of receiving information (0=email, 1=website)	1.363	0.239
Cost (0 = $50/yr, 1 = $100/yr)	0.987	0.013

Table 17. Odds ratios for factors driving selection of an early warning system (business owners only)

Variable	Odds ratio	p-value
Conditions		
Drinking water conditions	Reference category	
Fishing conditions	0.367	0.025
Beach conditions	1.658	0.171
Current conditions (0,1)	1.230	0.591
One-week prediction (0,1)	2.459	0.033
Means of receiving information (0=email, 1=website)	0.679	0.231
Cost (0 = $50/yr, 1 = $100/yr)	0.988	0.059

Table 18. Odds ratios for factors driving selection of an early warning system (marina owners only)

Variable	Odds ratio	p-value
Conditions		
Drinking water conditions	Reference category	
Fishing conditions	0.683	0.607
Beach conditions	2.140	0.279
Current conditions (0,1)	3.972	0.069
One-week prediction (0,1)	2.984	0.116
Means of receiving information (0=email, 1=website)	5.871	0. 006
Cost (0 = $50/yr, 1 = $100/yr)	0.026	0.018

Table 19. Odds ratios for factors driving selection of an early warning system (media only)

Variable	Odds ratio	p-value
Conditions		
Drinking water conditions	Reference category	
Fishing conditions	0.221	0.006
Beach conditions	0.716	0.476
Current conditions (0,1)	2.534	0.092
One-week prediction (0,1)	0.826	0.692
Means of receiving information (0=email, 1=website)	0.206	0.001
Cost (0 = $50/yr, 1 = $100/yr)	0.979	0.010

Table 20. Odds ratios for factors driving selection of an early warning system (residents only)

Variable	Odds ratio	p-value
Conditions		
Drinking water conditions	Reference category	
Fishing conditions	0.271	0.000
Beach conditions	0.381	0.000
Current conditions (0,1)	1.214	0.061
One-week prediction (0,1)	0.996	0.966
Means of receiving information		
Text	Reference category	
TV/radio	1.291	0.055
Website	1.034	0.714
Cost		
Free	Reference category	
$5	0.367	0.000
$10	0.264	0.000

Detailed Results on the Choice Experiment with more Detailed Info on Conditions

Table 21. Odds ratios for factors driving selection of an early warning system (all respondents combined)

Variable	Odds ratio	p-value
Current conditions (0,1)	6.234	0.000
Mixing forecast (0,1)	1.535	0.006
Transport forecast (0,1)	2.215	0.000
Satellite image (0,1)	2.597	0.000
Means of receiving information (0=email, 1=website)	0.792	0.135
Cost (0 = $50/yr, 1 = $100/yr)	0.997	0.331

Table 22. Odds ratios for factors driving selection of an early warning system (charter captains only)

Variable	Odds ratio	p-value
Current conditions (0,1)	2.788	0.002
Mixing forecast (0,1)	0.982	0.955
Transport forecast (0,1)	1.749	0.091
Satellite image (0,1)	3.334	0.000
Means of receiving information (0=email, 1=website)	0.817	0.525
Cost (0 = $50/yr, 1 = $100/yr)	1.000	0.943

Table 23. Odds ratios for factors driving selection of an early warning system (decision makers only)

Variable	Odds ratio	p-value
Current conditions (0,1)	7.860	0.000
Mixing forecast (0,1)	1.918	0.005
Transport forecast (0,1)	3.135	0.000
Satellite image (0,1)	3.078	0.000
Means of receiving information (0=email, 1=website)	0.764	0.240
Cost (0 = $50/yr, 1 = $100/yr)	.999	0.782

Table 24. Odds ratios for factors driving selection of an early warning system (business owners only)

Variable	Odds ratio	p-value
Current conditions (0,1)	8.902	0.002
Mixing forecast (0,1)	0.997	0.996
Transport forecast (0,1)	1.574	0.409
Satellite image (0,1)	2.665	0.086
Means of receiving information (0=email, 1=website)	0.453	0.163
Cost (0 = $50/yr, 1 = $100/yr)	0.041	0.915

Table 25. Odds ratios for factors driving selection of an early warning system (media only)

Variable	Odds ratio	p-value
Current conditions (0,1)	22.414	0.000
Mixing forecast (0,1)	2.450	0.056
Transport forecast (0,1)	1.359	0.468
Satellite image (0,1)	1.326	0.504
Means of receiving information (0=email, 1=website)	1.022	0.958
Cost (0 = $50/yr, 1 = $100/yr)	0.983	0.063

Section III: Individual Stakeholder Group Demographic Comparisons

Key Findings

- **Age, gender and education**
  - The average age of the survey respondents was between 50-60 years of age. The business, media and decision-making groups were male dominated, while residents and visitors displayed an almost equal male-to-female ratio.
  - On average, decision makers and media representatives had higher education levels than other stakeholder groups.
- **Recreation frequency, location, and type**
  - Only half of residents and resident households reported using Lake Erie for activities related to leisure or recreation. Of the respondents that recreate in Lake Erie, charter captains, lakeside business owners and marina owners recreate more frequently than other stakeholder groups.
  - The average stakeholder who recreates around Lake Erie has done so for about 30-40 years.
  - At most, about a third of stakeholder groups will stop by a visitor center half-to-every time they recreate around Lake Erie.
  - Visitors recreate more often than any other stakeholder groups in the Maumee Bay or Maumee River. Charter captains (57%) and visitors (34%) recreate the most in the Western Basin compared to other stakeholder groups. About 20-40% of all stakeholder groups recreate in the Sandusky Bay. Residents recreate the least in Catawba Islands and Lake Erie Islands compared to other groups. Less than 30% of all stakeholder groups recreate in Sandusky Sub-Basin and Central Basin.
  - When asked if stakeholders bring pets to Lake Erie when recreating 51% of charter captains and 61% of lakeside business owners said yes. Around 30% of residents and decision maker responded yes while less than 30% of media reps and visitors said yes.
- **Lake Erie impacted industry, combined family income, and political affiliations**
  - 90% of marina owners and about 70-80% of charter captains and lakeside business owners believe they work in an industry directly impacted by the quality of Lake Erie. Meaning, 10-30% of stakeholders who work most directly with Lake Erie do not believe their work is impacted by the water quality.
  - About half of charter captains, decision makers, and lakeside business owners fall into the combined family income bracket of $100,000 or greater. Marina owners, media representatives, residents, and visitors are much more variant across income brackets.
  - Charter captains and visitors are the most conservative-leaning, while media representatives are the most liberal-leaning stakeholders. Charter captains are majority republican while all other stakeholder groups are mixed in political affiliation.

Age, Gender, and Education

Table 26. Average age across stakeholder groups

	Charter Captain	Decision Maker	Lakeside Business Owner	Marina Owner	Media Rep	Resident	Visitors
	N = 69	N = 144	N = 56	N = 14	N = 60	N = 408	N = 177
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Age	59 (11.12)	55 (11.78)	56 (11.08)	54 (13.07)	52 (13.14)	49 (17.68)	50 (17.13)

Table 27. Percentage of male respondents in each stakeholder group

	Charter Captain	Decision Maker	Lakeside Business Owner	Marina Owner	Media Rep	Resident	Visitors
	N = 73	N = 149	N = 59	N = 17	N = 62	N = 410	N = 179
Male	98.6%	71.8%	57.6%	70.6%	64.5%	51.0%	46.4%

Table 28. Average education level where 1 = some high school, 2= high school no diploma, 3= some college, 4= associates or bachelors, 5 = graduate or professional degree

	Charter Captain	Decision Maker	Lakeside Business Owner	Marina Owner	Media Rep	Resident	Visitors
	N = 73	N = 149	N = 59	N = 17	N = 62	N = 409	N = 177
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Avg. education level	3.36 (0.99)	4.19 (1.00)	3.93 (0.91)	3.53 (.080)	4.19 (0.67)	3.23 (1.11)	3.75 (4.00)

Recreation frequency, location, and type

Table 29. Percentage of stakeholders whose household uses Lake Erie for recreation activities

Recreate in Lake Erie	Charter Captain N = 72	Decision Maker N = 151	Lakeside Business Owner N = 61	Marina Owner N = 18	Media Rep N = 62	Resident N = 408
Yes	100%	74.8%	95.1%	94.4%	69.4%	52.5%

Table 30. Percentage of stakeholders with Lake Erie recreation / leisure visitation frequency

Visit Frequency	Charter Captain N = 73	Decision Maker N = 113	Lakeside Business Owner N = 58	Marina Owner N = 17	Media Rep N = 43	Resident N = 215	Visitors N = 180
Multiple times a week	50.7%	16.8%	75.9%	76.5%	18.6%	11.6%	20.0%
Once a week	31.5%	24.8%	15.5%	5.9%	27.9%	26.0%	12.8%
Once a month	17.8%	35.4%	8.6%	11.8%	14.0%	36.7%	26.1%
Once a year	-	22.1%	-	5.9%	30.2%	23.3%	27.8%
Less than once a year	-	0.9%	-	-	9.3%	2.3%	13.3%

Table 31. Percentage of stakeholders with visitor center visitation frequency

Visitor center frequency	Charter Captain N = 72	Decision Maker N = 113	Lakeside Business Owner N = 56	Marina Owner N = 17	Media Rep N = 43	Resident N = 215	Visitors N = 171
Never	43.1%	37.2%	37.5%	58.8%	37.2%	28.4%	40.4%
When visiting location for the first time	43.1%	41.6%	30.4%	35.3%	27.9%	38.6%	31.0%
About half to every time	13.9%	21.2%	32.1%	5.9%	34.9%	33.0%	28.7%

Table 32. Average years of Lake Erie recreation / leisure visitation

	Charter Captain	Decision Maker	Lakeside Business Owner	Marina Owner	Media Rep	Resident	Visitors
	N = 59	N = 101	N = 54	N = 17	N = 41	N = 213	N = 166
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Avg. years visited	41.49 (13.72)	34.37 (18.27)	40.61 (17.36)	43.65 (17.70)	32.30 (18.80)	28.06 (19.02)	30.50 (19.96)

Table 33. Percentage of stakeholders who recreate in various areas

Rec area (check all)	Charter Captain N = 84	Decision Maker N = 210	Lakeside Business Owner N = 84	Marina Owner N = 25	Media Rep N = 85	Resident N = 410	Visitors N = 182
Maumee Bay	9.5%	11.4%	4.8%	-	12.9%	9.5%	44.5%
Maumee River	7.1%	9.0%	1.2%	-	12.9%	5.0%	39.6%
Western Basin	57.1%	22.9%	19.0%	20.0%	18.8%	5.4%	33.5%
Sandusky Bay	27.4%	25.7%	35.7%	16.0%	22.4%	20.0%	42.3%
Catawba Islands	54.8%	29.5%	40.5%	28.0%	30.6%	14.6%	46.2%
Lake Erie Islands	64.3%	36.2%	58.3%	44.0%	31.8%	25.6%	53.8%
Sandusky Sub-Basin	20.2%	19.5%	22.6%	28.0%	18.8%	8.3%	20.3%
Central Basin	23.8%	21.9%	19.0%	28.0%	20.0%	20.2%	17.0%

Table 34. Percentage of stakeholders who participate in various recreational activities

Lake Erie rec type (check all)	Charter Captain N = 84	Decision Maker N = 210	Lakeside Business Owner N = 84	Marina Owner N = 25	Media Rep N = 85	Resident N = 410	Visitors N = 182
Swimming	50.0%	29.5%	47.6%	52.0%	30.6%	33.4%	51.6%
Boating	82.1%	36.2%	59.5%	68.0%	28.2%	21.5%	48.9%
Canoeing/kayaking	17.9%	20.0%	33.3%	16.0%	20.0%	10.7%	22.5%
Fishing	85.7%	33.3%	42.9%	44.0%	21.2%	25.6%	34.1%
Hiking	11.9%	21.4%	15.5%	12.0%	29.4%	17.6%	35.7%
Bird watching	15.5%	15.7%	14.3%	16.0%	23.5%	10.2%	18.7%
Sunbathing	29.8%	29.8%	29.8%	29.8%	29.8%	29.8%	29.8%
Other	3.6%	6.7%	8.3%	8.0%	5.9%	2.7%	15.4%

Table 35. Percentage of stakeholder groups that bring pets to Lake Erie when they recreate

Bring pets to lake	Charter Captain N = 73	Decision Maker N = 112	Lakeside Business Owner N = 57	Marina Owner N = 17	Media Rep N = 43	Resident N = 215	Visitors N = 178
Yes	50.7%	29.5%	61.4%	35.3%	25.6%	34.4%	21.9%

Lake Erie impacted industry, combined family income, and political affiliations

Table 36. Work in industry / profession directly impacted by quality of Lake Erie

Work in impacted industry	Charter Captain N = 73	Decision Maker N = 152	Lakeside Business Owner N = 61	Marina Owner N = 18	Media Rep N = 61	Resident N = 409	Visitors N = 167
Yes	78.1%	64.5%	72.1%	88.9%	32.8%	6.8%	15.6%

Table 37. Combined family income

Combined family income	Charter Captain N = 69	Decision Maker N = 139	Lakeside Business Owner N = 53	Marina Owner N = 15	Media Rep N = 58	Resident N = 409	Visitors N = 115
$25,000 or less	1.4%	.7%	7.5%	6.7%	17.2%	20.3%	3.5%
$25,000-$50,000	10.1%	2.2%	11.3%	40.0%	24.1%	30.6%	11.3%
$50,000-$75,000	21.7%	12.2%	9.4%	6.7%	32.8%	21.8%	25.2%
$75,000-$100,000	17.4%	26.6%	24.5%	46.7%	25.9%	13.7%	22.6%
$100,000 or greater	49.3%	58.3%	47.2%	6.7%	17.2%	13.7%	37.4%

Table 38. Political leaning

	Charter Captain	Decision Maker	Lakeside Business Owner	Marina Owner	Media Rep	Resident	Visitors
Political associations	N = 69	N = 144	N = 54	N = 16	N = 58	N = 407	N = 150
Consistently conservative	33.3%	11.8%	13.0%	12.5%	5.2%	12.8%	32.0%
Mostly conservative	36.2%	21.5%	33.3%	31.3%	10.3%	23.8%	14.0%
Mixed	23.2%	29.9%	25.9%	37.5%	34.5%	41.3%	26.7%
Mostly liberal	7.2%	20.1%	20.4%	12.5%	12.1%	12.0%	14.7%
Consistently liberal		16.7%	7.4%	6.3%	37.9%	10.1%	12.7%

Table 39. Political party affiliation

	Charter Captain	Decision Maker	Lakeside Business Owner	Marina Owner	Media Rep	Resident	Visitors
Political associations	N = 70	N = 140	N = 54	N = 17	N = 57	N = 407	N = 142
Republican	62.9%	27.9%	37.0%	47.1%	14.0%	26.0%	45.1%
Independent	24.3%	32.1%	24.1%	35.3%	40.4%	37.1%	22.5%
Democrat	11.4%	38.6%	33.3%	17.6%	42.1%	33.9%	28.9%
Other	1.4%	1.4%	5.6%	-	3.5%	2.9%	3.5%

Section IV: Individual Stakeholder Group Feedback

Key Findings

Unique stakeholder findings

- **Charter captains**
    - The average charter captain has worked on charter boats for 18 years with an average number of about 60 trips per year.
    - Average travel time is about 2 hours each way with 6 anglers on crew. The majority of charter captains (82%) do not move to another marina later in the season.
    - The majority of captains charter a 30-foot vessel.
    - About one-third of captains have experienced a decrease in expected revenue since 2014 (Toledo Water Crisis), with most charter captains indicating 20% or less decrease in trips in their worst year.
    - Most charter captains target walleye and perch with various fishing methods. Most (50-75%) of clients are repeat clients.
- **Decision makers**
    - Decision makers represented various levels of work in the public sector with about two-thirds representing the municipal and state-level.
    - Half of the respondents were public sector workers with an average of 20 years in the public sector and 9 years in their current position.
    - Decision makers hear from constituents regarding HABs at a variety of frequencies, with only 8% hearing from such constituents at a daily frequency, and most hearing weekly or monthly.
    - 56% of decision makers agree or strongly agree that the public they serve trusts them for info on HABs. Only about 20% agree or strongly agree the public is not capable of grasping complex, scientific issues with about one-third neither disagreeing nor agreeing and about 40% disagreeing.
    - About 50% of decision makers agree or strongly agree the public is willing to consider news and information that does not affect them directly. Greater than 70% of respondents believe topics surrounding HABs are important for them to cover and trust the source and content of information about HABs that they share with the public.
- **Lakeside business owners**
    - About half of lakeside business owner respondents represent the lodging or recreation and entertainment industry. The majority (70%) of respondents have less than 20 employees.
    - About half of business owners believe their annual revenue could be better.
    - About one-third of respondents experienced a decrease in expected revenue due to HABs in the years since 2014 (Toledo Water Crisis). 13-14% of respondents indicated 2017-2019 as the years they experienced decreased revenue, with two-thirds indicating a 10-20% decrease in the number of total sales in the worst year since 2014.
    - The average respondent has owned their business for 24 years and half are seasonal vs. year-round businesses.

- **Marina owners**
  - The average respondent has owned a marina for about 30 years with an average 191 boat slips.
  - Two-thirds of marina owners interact with their marina users on a daily basis.
  - 71% of marina owners believe their annual revenue could be better. Less than one-third experienced a decrease in expected revenue due to HABs in the years since 2014 (Toledo Water Crisis). Half of marina owners indicate a less than 10% decrease of total sales in the worst year since 2014, while half indicate 10-20% decrease.
  - 72% of marinas are seasonal.
- **Media representatives**
  - About one-third of respondents represent newspapers while one-quarter represent broad journalism.
  - Frequency of HAB coverage in reporting varies with only 5% of respondents indicating daily coverage.
  - About 70% of media representatives agree or strongly agree that the public they serve trusts them for information on HABs. About 20% agree or strongly agree that the public is not capable of grasping complex, scientific issues while about 50% disagree.
  - About 70% of respondents agree or strongly agree that the public is willing to consider news and information that does not affect them directly. About 80% of respondents agree or strongly agree that topics surrounding HABs are important for them to cover.
  - More than 90% of respondents trust the source and content of information about HABs that they share with the public.
- **Residents**
  - The majority (85%) of Lake Erie residents are white and have lived near the lake for about 35 years.
  - Residence distance varies with 30% living between 1-5 miles and 40% living 5-20 miles from the nearest shore.
  - About 80% of respondents do not lease their property. Most of those who do lease their property, lease it year-round.
  - Only 4.8% of residents have experienced a decrease in property value since purchase, due to HABs. 42.1% of respondents have delayed renovations or home improvements based on decreased property values from HABs although this reflects a very small sample of respondents with 19 out of the 410 responding. Similarly, only 20 residents responded to the question indicating percentage of property value decrease since 2014. Only 4.2% of residents have sold a boat for HAB reasons and about 75% have never owned a boat.
  - Half of residents believe their home's tap water comes from Lake Erie while one-third are unsure. About half of respondents live in a suburban community.

Comparisons across stakeholder groups

- **Impacts of HABs on marine trips, property value, and total sales**
    - About one-third of charter captains and lakeside business owners experienced a decrease in expected revenue due to HABs in the years since 2014. Less than one-third (22.2%) of marina owners experienced this decrease and only 4.8% of residents have experienced a decrease in property value since purchase, due to HABs.
    - About 15% of charter captain respondents indicated the years 2014-2016 as years in which revenue decreased due to HABs while 13-14% of lakeside business owners indicated the years 2017-2019.
    - For charter captains 24% experienced less than a 20% decrease in the number of marine trips in their worst year since 2014, while 27% experienced greater than a 40% decrease. Two-thirds of lakeside business owners experienced less than a 20% decrease in the number of total sales in their worst year since 2014. Half of marina owners indicated a less than 10% decrease in total sales in their worst year since 2014, while half indicated 10-20% decrease.

- **Differences in beliefs regarding the relationship between the public and decision makers/ media representatives**
    - Slightly more media representatives (about 70%) agree or strongly agree that the public they serve trusts them for info on HABs compared to decision makers (56%)
    - Decision makers and media representatives are similar in their agreement that the public is capable of grasping complex, scientific issues, with about 40-50% agreeing or strongly agreeing, and 20% disagreeing.
    - Slightly more media representatives (about 70%) compared to decision makers (about 50%) agree or strongly agree that the public is willing to consider news and information that does not affect them directly.
    - About 70% of decision makers and 80% of media representatives agree or strongly agree that topics surrounding HABs are important for them to cover.
    - Media representatives trust the source and content of information about HABs that they share with the public slightly more (89%) than decision makers (75%).

Charter Captains

Table 40. Average years worked, number of clients, average travel time, and number of anglers

	N	Mean	Std. dev
Years CC have worked on charter boats	68	17.68	11.88
# of client boat trips per year	70	58.57	42.70
Avg. travel time each way (hours)	60	2.31	2.65
# anglers on crew	68	5.93	5.32

Table 41. Percentage of charter captains with movement to another marina later in the season

Move to another marina later in the season?	N = 71
No	81.7%

Table 42. Percentage of charter captains with approximate sizes of fishing vessel

Size of vessel	N = 71
Less than 20 ft.	1.4%
20 ft.	15.5%
30 ft.	76.1%
40 ft.	5.6%
Greater than 50 ft.	1.4%

Table 43. Percentage of charter captains with decrease in expected revenue due to HABs in the years since the 2014 (Toledo Water Crisis)

Experience decrease in expected revenue due to HABs	N = 71
Yes	32.4%

Table 44. Percentage of charter captains with years in which revenue decreased due to HABs

Year experienced decrease revenue	N = 84
2014	15.5%
2015	14.3%
2016	14.3%
2017	10.7%
2018	7.1%
2019	9.5%
Unsure	7.1%

Table 45. Percentage of charter captains with number of marine trips decreased in worst year since 2014

# marine trips decreased	N = 23
Less than 10% decrease	8.3%
10-20% decrease	15.5%
21-30% decrease	2.4%
31-40% decrease	1.2%
Greater than 40% decrease	27.4%

Table 46. Percentage of charter captains targeting typical fish

Fish targets (check all)	N = 84
Walleye	83.3%
Perch	67.9%
Smallmouth bass	17.9%
Other	8.3%

Table 47. Percentage of charter captains using method of fishing

Fishing method (check all)	N = 84
Jigging	44.0%
Casting	66.7%
Trolling	59.5%
Other	2.4%

Table 48. Percentage of charter captains with proportion of repeat clients to total clients

Proportion repeat clients	N = 84
A few (0-25%)	4.3
Some (25-50%)	27.5
Most (50-75%)	53.6
All (75-100%)	14.5

Decision Makers

Table 49. Percentage of decision makers in level of work in public sector

Level of work	N = 143
Municipality	34.3%
County	14.0%
State	28.0%
Region	7.7%
Other	16.1%

Table 50. Percentage of decision makers in position description

Position description	N = 154
Elected official	23.4%
Aide to elected official	5.2%
Public sector worker	51.3%
Other	20.1%

Table 51. Average years in public sector and current position

	N	Mean	Std. dev
Years in public sector	146	20.79	11.03
Years in current position	151	9.53	8.05

Table 52. Percentage of decision makers with frequency of hearing HAB issues from constituents

Constituent frequency	N = 156
Daily	7.7%
Weekly	34.0%
Monthly	21.8%
Once per summer/fall season	16.7%
Never	19.9%

Table 53. Percentage of decision makers with beliefs regarding relationship with public and role in disseminating information about HABs

	N	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree
The public I serve trust me for info on HABs	149	6.0%	3.4%	34.2%	40.9%	15.4%
The public is not capable of grasping complex, scientific issues	151	7.3%	39.7%	31.1%	18.5%	3.3%
The public is willing to consider news and information that does not affect them directly	150	2.7%	13.3%	34.0%	48.7%	1.3%
Topics surrounding HABs are important for me to cover	150	2.0%	4.7%	20.0%	54.0%	19.3%
I trust the source and content of information about HABs that I share with the public	150	-	0.7%	24.7%	50.7%	24.0%

Lakeside Business Owners

Table 54. Percentage of lakeside business owners in business industry / sector

Industry / sector (check all)	N = 84
Lodging	27.4%
Recreation and entertainment	25.0%
Food and beverage	10.7%
Other	10.7%
Fishing	9.5%
Retail trade	9.5%
Manufacturing	3.6%
Government	3.6%
Transportation	3.6%
Agriculture	2.4%
Construction and utilities	1.2%

Table 55. Percentage of lakeside business owners with size of business in employees

# employees	N = 60
Under 20 employees	70.0%
20-49 employees	16.7%
50-99 employees	8.3%
100-200 employees	3.3%
Greater than 200 employees	1.7%

Table 56. Percentage of lakeside business owners with rating of annual revenue

Annual revenue rating	N = 56
My annual revenue is not nearly enough	19.6%
My annual revenue could be better	53.6%
My annual revenue is fine	26.8%

Table 57. Percentage of lakeside business owners with decrease in expected revenue due to HABs in the years since the 2014 (Toledo Water Crisis)

Experience decreased in expected revenue due to HABs	N = 60
Yes	30.0%

Table 58. Percentage of lakeside business owners with years in which revenue decreased due to HABs

Year experienced decrease in revenue	N = 84
2014	4.8%
2015	9.5%
2016	8.3%
2017	13.1%
2018	13.1%
2019	14.3%
Unsure	7.1%

Table 59. Percentage of lakeside business owners with total sales decrease in worst year since 2014

Total sales decrease	N = 84
Less than 10% decrease	33.3%
10-20% decrease	61.1%
21-30% decrease	5.6%
31-40% decrease	-

Table 60. Average number of years business owned

	N	Mean	Std. dev
Years business owned	54	23.93	25.36

Table 61. Percentage of lakeside business owners with business open seasonally or year round

Time open	N = 60
Seasonal	58.3%
Year round	41.7%

Marina Owners

Table 62. Average number of years marina owned and number of boat slips

	N	Mean	Std. dev
Years marina owned	18	29.33	21.70
# boat slips	17	190.88	192.58

Table 63. Percentage of marina owners with frequency of interaction with marina users

Interaction frequency	N = 18
Never	0%
Rarely	16.7%
Frequently	22.2%
Daily	61.1%

Table 64. Percentage of marina owners with rating of annual revenue

Annual revenue rating	N = 17
My annual revenue is not nearly enough	5.9%
My annual revenue could be better	70.6%
My annual revenue is fine	23.5%

Table 65. Percentage of marina owners with decrease in expected revenue due to HABs in the years since the 2014 (Toledo Water Crisis)

Experience decreased in expected revenue due to HABs	N = 18
Yes	22.2%

Table 66. Percentage of marina owners and years in which revenue decreased due to HABs

Year experienced decrease revenue	N = 25
2014	0%
2015	4.0%
2016	4.0%
2017	8.0%
2018	4.0%
2019	4.0%
Unsure	8.0%

Table 67. Percentage of marina owners with total sales decrease in worst year since 2014

Total sales decrease	N = 84
Less than 10% decrease	50.0%
10-20% decrease	50.0%
21-30% decrease	0%
31-40% decrease	0%

Table 68. Percentage of marina owners with marina open seasonally or year round

Time open	N = 60
Seasonal	72.2%
Year round	27.8%

Media Representatives

Table 69. Percentage of media representatives and type of media channel

Media type	N = 85
Television	7.1%
Radio	5.9%
Newspaper	31.8%
Journalism	25.9%
Other	16.5%

Table 70. Percentage of media representatives with frequency of HAB coverage in reporting

HAB coverage	N = 85
Daily	4.8%
Weekly	22.6%
Monthly	27.4%
Once per Summer/Fall season	27.4%
Never	17.7%

Table 71. Percentage of media representatives with beliefs regarding relationship with public and role in disseminating information about HABs

	N	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree
The public trusts me for info on HABs	149	3.3%	1.6%	26.2%	41.0%	27.9%
The public is not capable of grasping complex, scientific issues	151	0%	49.2%	13.1%	16.4%	4.9%
The public is willing to consider news and information that does not affect them directly	150	0%	8.1%	22.6%	66.1%	3.2%
Topics surrounding HABs are important for me to cover	150	0%	1.6%	18.0%	41.0%	39.3%
I trust the source and content of information about HABs that I share with the public	150	0%	0%	11.5%	50.8%	37.7%

Residents

Table 72. Race breakdown of respondents

Race	N = 410
White	84.6%
Hispanic/Latino	6.3%
Black/ African American	11.0%
American Indian/ Alaska native	0.2%
Asian	1.0%
Native Hawaiian/ Pacific Islander	-
Other	0.5%

Table 73. Percentage of residents with residence at distances from nearest shore

Distance from nearest shore	N = 408
Less than 1 mile	13.7%
1-5 miles	30.1%
5-20 miles	39.7%
20-25 miles	16.4%

Table 74. Average number of years lived near Lake Erie

	N	Mean	Std. dev
Years lived near lake	405	34.21	22.39

Table 75. Percentage of residents who lease property

Lease property	N = 409
No	81.4%

Table 76. Percentage of residents who experienced decrease in property value since purchase, due to HABs

Participant property decreased	N = 310
Yes	4.8%

Table 77. Percentage of residents with delayed renovations or home improvements based on decreased property values from HABs

Delay renovations or home improvements	N = 19
Yes	42.1%

Table 78. Percentage of residents reporting property value decreases in worst year since 2014

Total sales decrease	N = 20
Less than 10% decrease	35.0%
10-20% decrease	30.0
21-30% decrease	35.0%
31-40% decrease	0%

Table 79. Percentage of residents with property leased seasonally and year round

Lease property	N = 90
Seasonal	25.6%
Year round	74.4%

Table 80. Percentage of residents who sold boat for HAB reasons

Sold boat	N = 409
No, have never owned a boat	74.6%
No, have never sold boat for HAB reasons	21.3%
Yes	4.2%

Table 81. Percentage of residents who believe home's tap water comes from source

Drinking water source	N = 409
Lake Erie	51.1%
Local river	3.2%
Local reservoir (fed from river)	6.6%
Inland lake	.5%
Groundwater	8.1%
Unsure	30.6%

Table 82. Percentage of residents within each community description

Community description	N = 409
Urban	22.2%
Suburban	56.7%
Small town/village	11.0%
Rural	10.0%

Section V: Stakeholder locations along and from Lake Erie

Lakeside business owners, charter captains, and marina owners were presented with a question during the online survey where they could indicate the location of their business, docked vessel, or marina using a pin-drop on the map of Lake Erie. The following maps represent and aggregate of these pin drops. Residents and visitors were asked how far they lived from Lake Erie in terms of miles from the shore. Figures 4 and 5 display the distribution of responses.
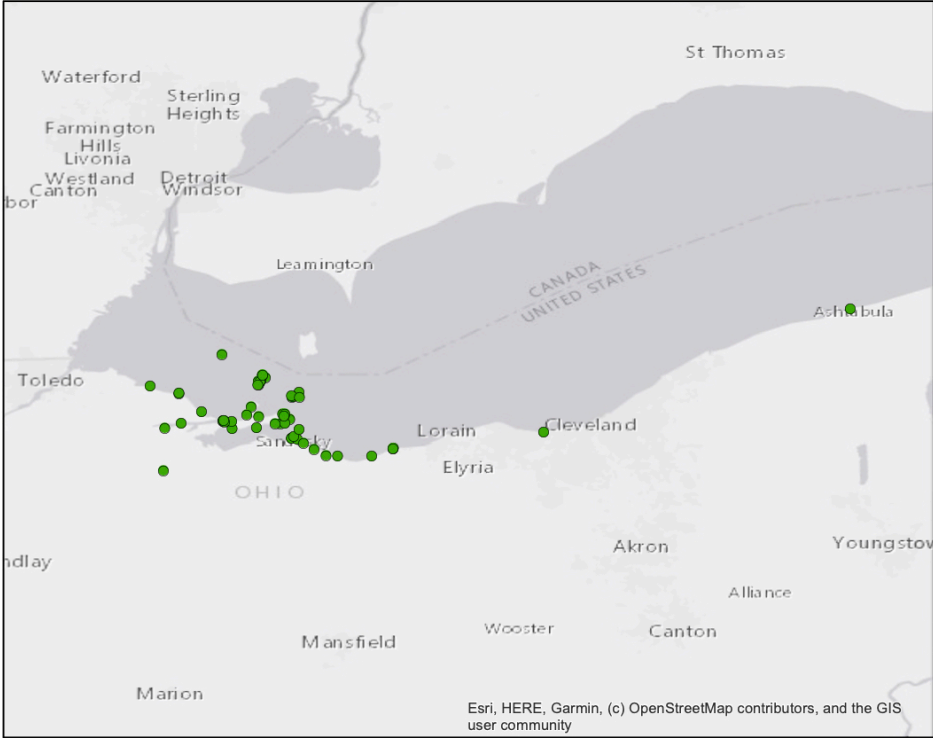
Figure 1. Location of lakeside businesses along Lake Erie n = 58
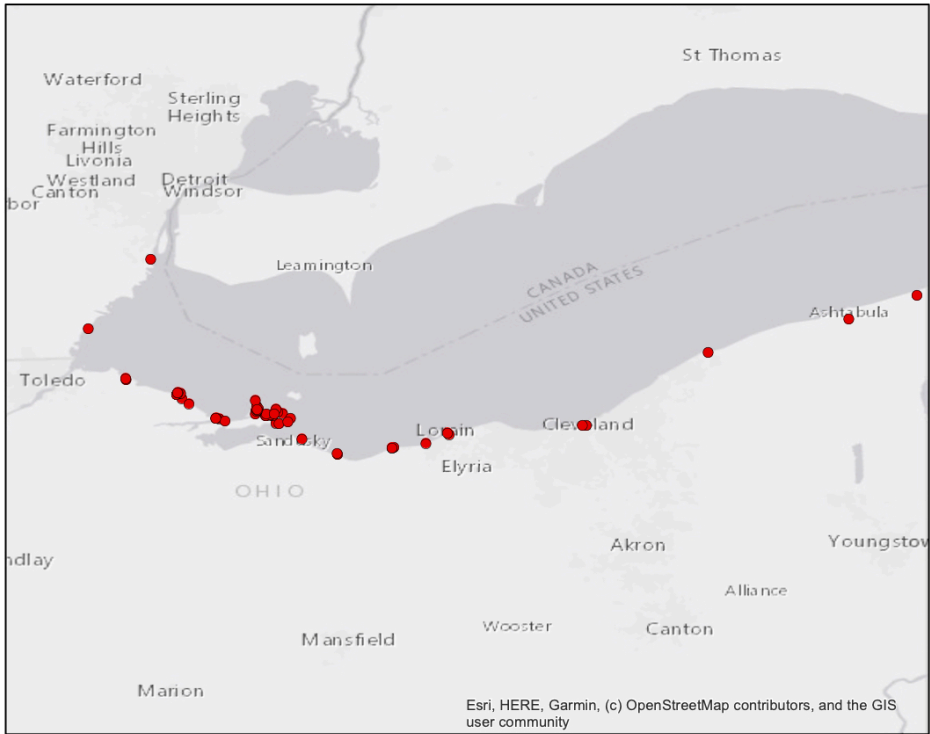
Figure 3. Location of charter captain docked vessels along Lake Erie n = 64
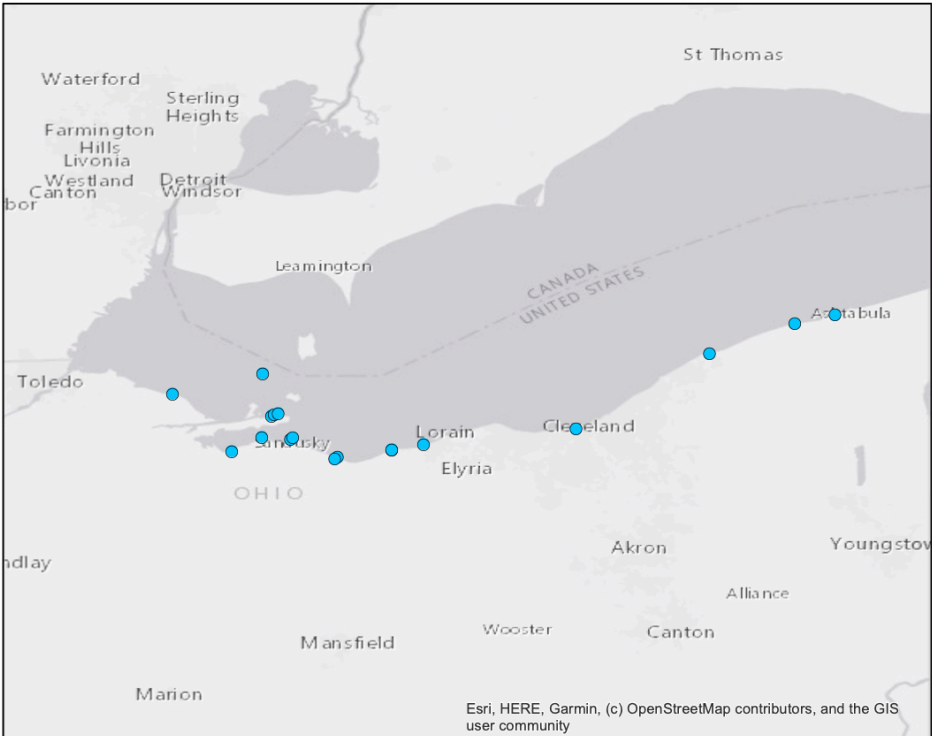
Figure 2. Location of marinas along Lake Erie n = 18
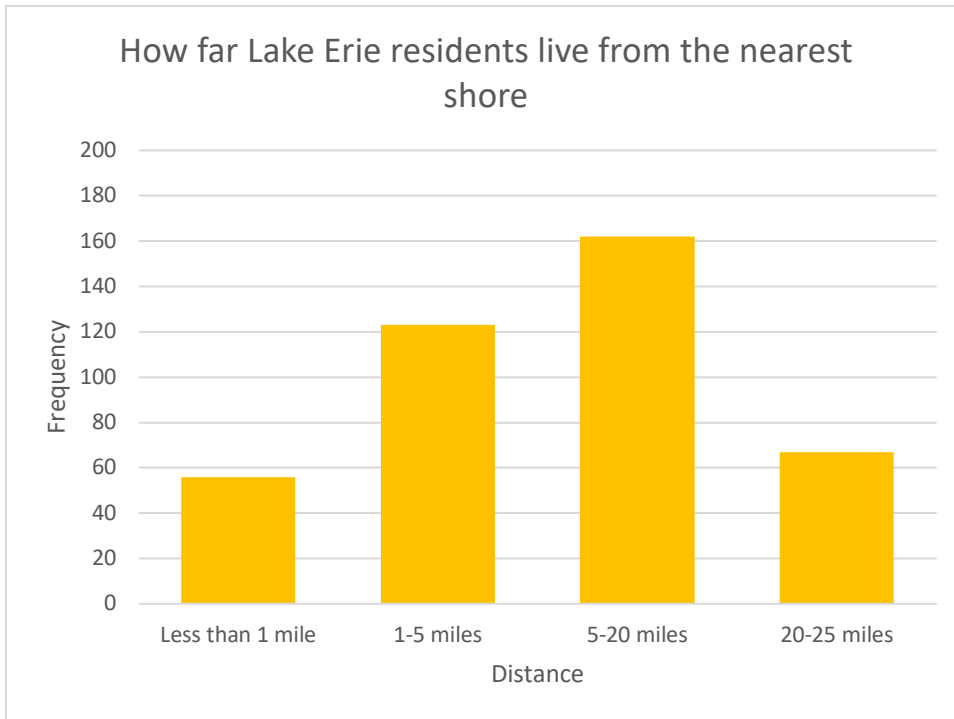
Figure 4. Location of residents as distance from shore of Lake Erie n = 408
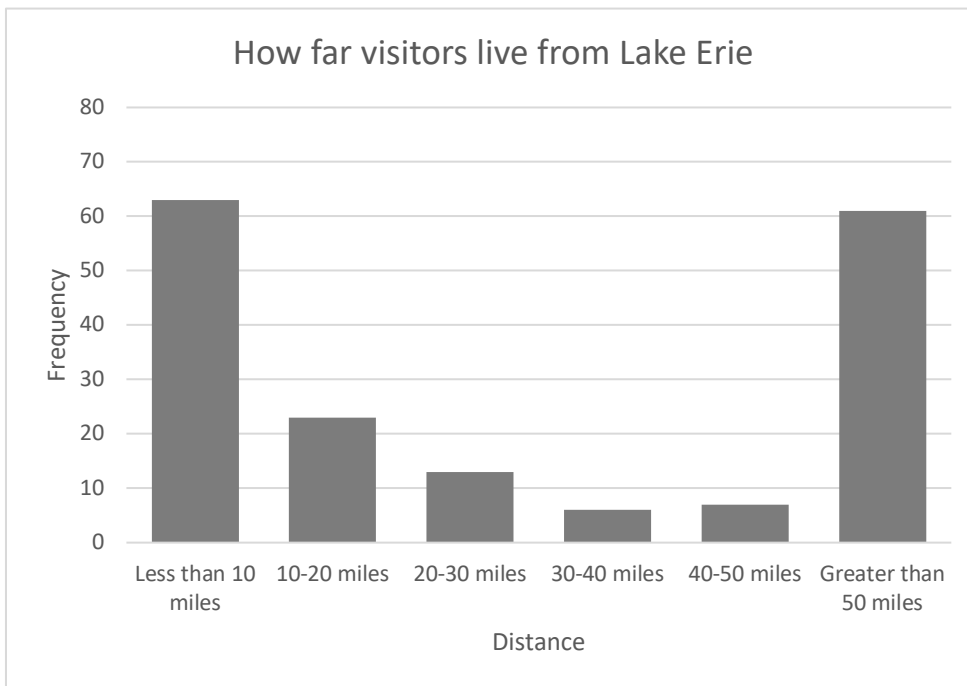
Figure 5. Location of visitors as distance from Lake Erie N = 173

Section VI: Relevant Water Treatment Plant Interview Group Data

In early 2018, LimnoTech conducted interviews at ten water treatment plants along Lake Erie. According to the report, the plants interviewed have been affected by HABs with potential drinking water quality impacts. Tables 68 and 69 display specific information drawn from these interviews that loosely relate to the scope of information included in the business, resident, and visitor data.

This data has identified areas of need such as a channel for treatment plants to "send alerts to neighbors". Given the preference of other Lake Erie stakeholders, an email or online website channel may serve treatment plant staff well. One treatment plant in particular requested an inclusive website with forecasts and information in one place. Perhaps this website could include a channel for water treatment plant communications. There is an additional need for sonde replacement/ repairment suggesting water treatment plants seek better data located close to intakes. One plant does not believe HABs are important and another states that 90% of cyanobacteria is removed in coag/flocc which may suggest a lack of concern for HABs among some treatment plants.

Table 83. Water treatment plant HAB monitoring frequency, HAB plan, and HAB tools

`	HAB monitoring frequency	HAB plan?	HAB tools used
Avon Lake	Bi-weekly	No	GLOS, other plants
Elyria	Weekly	No	Website
Lorain	Weekly	No	Neighbors
Huron	Weekly	Yes	Forecasts, other plants
Sandusky	Weekly "if hit"	In process	Plant sondes, bulletin
Marblehead	Weekly	No	Bulletin, other plants
Port Clinton	Weekly	Yes	Bulletin, other plants
Oregon	Weekly	Yes	Other plants
Toledo	Daily	Yes	Bulletin, sondes
Monroe	Weekly	No	Bulletin

Table 84. Relevant additional comments from water treatment plant focus groups

Plant	Information	Sensors/ buoys	Other
Avon Lake	"a way to send alerts to neighbors would be helpful"	"buoy would help them know which intake is the problem" "it would be good to have a sonde closer to the intake"	source water protection plan to be updated
Elyria	-	"sonde comes in on SCADA"	"does not think HABs is important"
Sandusky	-	"sonde stopped working in 2017" "they would like a phycocyanin sensor"	"they get high algae levels due to rain and dumping out of Sandusky Bay"
Port Clinton	"they would like to be able to click on screen to get all data - not go back and forth" "have one web page with all the data"	"sonde data going to SCADA" "sensors are going to need to be replaced" "could they have wifi out at the sonde? Better than a modum?"	-
Toledo	-	"data not in SCADA"	"90% of cyanobacteria is removed in coag/flocc"
Monroe	"he relies on forecast and bulletin"	"$8,000-$10,000 maintenance on sonde" "closest buoy is 7 miles away"	-

Appendix A: Visitor Intercept Survey

Survey location (to be filled out by researcher just for in-person data collection):

▼ Aquatic Visitors Center (51) ... OT14 Sandusky Bay Bridge Access- North (50)

Section 1: Harmful Algal Bloom Information Sources and Channels

Q1 Thank you for your willingness to participate in this project. We greatly appreciate you taking the time to provide us with your thoughts and opinions.
To begin, how interested are you in receiving news and other information related to harmful algal blooms (HABs) affecting Lake Erie?

- ○   Not at all interested (1)
- ○   A little interested (2)
- ○   Somewhat interested (3)
- ○   Interested (4)
- ○   Extremely interested (5)

Q2

You may already get information about HAB conditions from a variety of sources. For the sources listed below, please indicate how frequently you receive or seek out information from each in a typical year by selecting the most appropriate response.

Then, check the last box if you would prefer to receive information from that particular source in the future. You may check as many preferred sources as you desire.

	How often do you receive or seek out information?					I would prefer to receive information from this source
	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Very Often (5)	Preferred Source (1)
National Weather Service (1)	○	○	○	○	○	☐
Environmental-related agencies (e.g., National Oceanic and Atmospheric Admin, Environmental Protection Agency) (2)	○	○	○	○	○	☐
Health-related agencies (e.g., Ohio Dept. of Health, Center for Disease Control) (3)	○	○	○	○	○	☐
Visitor Center/Kiosk (7)	○	○	○	○	○	☐
Other (type in specific source below) (9)	○	○	○	○	○	☐

Q3 Information on HAB conditions can come via a variety of channels or means of receiving information. In the future, how would you prefer to receive updated information on current or forecasted HAB conditions, advisories, and warnings? Please check all that apply.

☐ Direct to my email (1)

☐ On the radio (2)

☐ From an online source (designated website, blog) (3)

☐ Via text message (4)

☐ Via the phone (automated voicemail) (5)

☐ From lakeshore signage (6)

☐ From print media in the mail (pamphlets, brochures, newspaper) (7)

☐ Via the television (e.g., nightly news, weather channel, alert banners) (8)

☐ Smart phone app (10)

☐ Social media (e.g., Twitter, Facebook, Instagram) (11)

☐ Other (fill in) (12) _____

Q6 Section 2: Early Warning System Advisory Content

Q7 The conditions in Lake Erie are constantly changing and therefore require a dynamic monitoring and warning system. Monitoring systems can be categorized into modes depending on the severity of HAB conditions. At which mode(s) and how often would you like to receive alerts or updates on the HAB and lake conditions? Please select the option that best describes how often (if at all) you would want alerts during each of the following modes.

	Never (1)	Hourly (2)	Daily (3)	Weekly (4)	Biweekly (5)	Only when the mode escalates (6)
Normal/routine mode: No algal blooms are present in Lake Erie and water is safe (1)	○	○	○	○	○	○
Recreation watch mode: Algal blooms are present in Lake Erie, but toxicity is not a threat to recreation or pets (2)	○	○	○	○	○	○
Drinking water watch mode: Lake Erie drinking water plant treatment for algal bloom toxins is required, but use of drinking water is not a threat (3)	○	○	○	○	○	○
Recreation alert mode: Toxic algal blooms observed, public advised not to swim in Lake Erie and pet restrictions issued at one or more Lake Erie beaches- check local conditions (4)	○	○	○	○	○	○
Drinking water alert mode: Algal bloom toxins have been detected in treated drinking water in one or more Lake Erie communities and drinking water there has been restricted- check local conditions (5)	○	○	○	○	○	○

Q8 Here we want to know what specific information you might want about HABs when it comes to a variety of categories ranging from HAB severity to environmental impacts to health and safety information.   For each statement, please check the box that best indicates whether or not you would want this information included in an early warning system. If you are unsure what the parameter is, or if it would be useful, please check the box in the last column.

	Yes, I want this information (1)	No, I do not want this information (2)	Unsure (3)
Cases of human exposure and symptoms (18)	○	○	○
Cases of animal exposure and symptoms (19)	○	○	○
Fishing advisories (22)	○	○	○
Drinking water advisories (23)	○	○	○
Recreational and beach advisories (24)	○	○	○
What is being done to manage HABs or risky conditions (33)	○	○	○
Real-time, 24/7 environmental conditions monitoring (26)	○	○	○
Short-term forecasts (i.e. 3- to 5-day predictions) (27)	○	○	○
Long-term forecasts (i.e. 10-day predictions) (28)	○	○	○
Long-term seasonal forecasts (i.e. prediction of blooms for the entire season) (29)	○	○	○

End of Block: Section 2 Early Warning System Advisory Content

Start of Block: Section 3 Demographics and Personal Views

Q12 Are you:

- ○ Male (1)

- ○ Female (2)

Q13 What is your age in years?

_____

Q14 How much formal education have you completed?

- ○ Some high school, no diploma (1)

- ○ High school degree or equivalent (2)

- ○ Some college, no degree (3)

- ○ Associate's or Bachelor's degree (4)

- ○ Graduate or professional degree (5)

Q15 Who in your opinion is responsible for protecting the health of Lake Erie? Check all that apply

☐ Federal government (1)

☐ State government (2)

☐ Local government (3)

☐ Fishing industry (4)

☐ Tourism industry (5)

☐ Agricultural industry (6)

☐ Manufacturing industry (7)

☐ Individuals (8)

☐ ⊗Unsure (9)

Q17 How often do you or your household use or visit Lake Erie for personal reasons (i.e. leisure, recreation) in a typical year?

○ Multiple times a week (1)

○ Once a week (2)

○ Once a month (3)

○ Once a year (4)

○ Less than once a year (5)

Q80 How long have you visited Lake Erie for recreation? *Please enter the number of years.*

_____

Q81 Do you bring pets with you when you come to Lake Erie for recreation?

○ No (1)

○ Yes (2)

Q78 What areas do you or a household member visit for recreational or leisure purposes? (check any that apply)

- ☐ Maumee Bay (1)

- ☐ Maumee River (2)

- ☐ Western Basin (3)

- ☐ Sandusky Bay (4)

- ☐ Catawba Islands (5)

- ☐ Lake Erie Islands (6)

- ☐ Sandusky Sub-Basin (7)

- ☐ Central Basin (8)

Q82 What type of recreational activities do you participate in when visiting Lake Erie? (check all that apply)

- ☐ Swimming (1)

- ☐ Boating (2)

- ☐ Canoeing/kayaking (3)

- ☐ Fishing (4)

- ☐ Hiking (5)

- ☐ Bird Watching (6)

- ☐ Sun Bathing (7)

- ☐ Other (fill in): (8) _____

Q83 How often do you frequent visitor's centers when recreating in and around Lake Erie?

- ○ Never (1)
- ○ When visiting a location for the first time (2)
- ○ About half the time (3)
- ○ Most of the time (4)
- ○ Always (5)

Q84 Do you work in an industry/profession that is directly impacted by the quality of Lake Erie?

- ○ No (1)
- ○ Yes (2)

Q20 What is your combined family income?

- ○ $25,000 or less (1)
- ○ $25,000-$50,000 (2)
- ○ $50,000-$75,000 (3)
- ○ $75,000-$100,000 (4)
- ○ $100,000 or greater (5)

Q21 Do you consider yourself to be politically conservative, liberal or moderate?

- ○ Consistently conservative (1)
- ○ Mostly conservative (2)
- ○ Mixed (3)
- ○ Mostly liberal (4)
- ○ Consistently liberal (5)

Q22 When it comes to political parties in the United States, how would you best describe yourself?

- ○ Republican (1)

- ○ Independent (not leaning toward any party) (2)

- ○ Democrat (3)

- ○ Other (please describe) (4) _____

Q24 How far do you live from Lake Erie?

- ○ Less than 10 miles (1)

- ○ 10-20 miles (2)

- ○ 20- 30 miles (3)

- ○ 30-40 miles (4)

- ○ 40-50 miles (5)

- ○ Greater than 50 miles (6)

Q25 Would you be willing to be contacted to answer a few more questions on Harmful Algal Bloom Early Warning System preference? If you are interested in this possibility, please provide your info below.

- ○ Name (1) _____

- ○ Email (2) _____

End of Block: Section 3 Demographics and Personal Views

Appendix B: Professional Stakeholder Survey

Intro This survey seeks to understand the impact of harmful algal blooms (HABs) on residents, visitors, and businesses in the Western Lake Erie Basin. The information you share with will be used to identify how best to design a HAB early warning system.

This survey should take about 20 minutes of your time. We will not link your name to anything you say, either in the results from this survey or in any publications or reports that may result. Your de-identified information will not be used or shared with other researchers.

   Participation is voluntary. If you decide not to participate, there will be no penalty or loss of benefits to which you are otherwise entitled. You can, of course, decline to answer any particular questions, as well as to stop participating at any time.

   We will work to make sure that no one sees your online responses without approval. But, because we are using the Internet, there is a chance that someone could access your online responses without permission. In some cases, this information could be used to identify you.

  By clicking on the button below, you agree to participate in this survey. If you do not wish to participate, please close your browser window.

Q1 Thank you for your willingness to participate in this project. We greatly appreciate you taking the time to provide us with your thoughts and opinions.

To begin, how interested are you in receiving news and other information related to harmful algal blooms (HABs) affecting Lake Erie?

- ○ Not at all interested (1)
- ○ A little interested (2)
- ○ Somewhat interested (3)
- ○ Interested (4)
- ○ Extremely interested (5)

Q2

You may already get information about HAB conditions from a variety of sources. For the sources listed below, please indicate how frequently you receive or seek out information from each in a typical year by selecting the most appropriate response.

Check the last box if you would prefer to receive information from that particular source in the future. You may check as many preferred sources as you desire.

	How often do you receive or seek out information?					I would prefer to receive information from this source
	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Very Often (5)	Preferred Source (1)
National Weather Service (1)	○	○	○	○	○	☐
National Oceanic and Atmospheric Admin. (NOAA) (2)	○	○	○	○	○	☐
Great Lakes Observing System (3)	○	○	○	○	○	☐
Ohio Environmental Protection Agency (Ohio EPA) (4)	○	○	○	○	○	☐
Ohio Department of Health (5)	○	○	○	○	○	☐
Center for Disease Control (CDC) (6)	○	○	○	○	○	☐
Visitor Center/Kiosk (7)	○	○	○	○	○	☐
Other (type in specific source below) (8)	○	○	○	○	○	☐
Other (type in specific source below) (9)	○	○	○	○	○	☐

Q3 Information about HAB conditions can come from a variety channels or means of receiving information. In the future, how would you prefer to receive updated information on current or forecasted HAB conditions, advisories, and warnings?

	Never (1)	Seasonally (6)	Monthly (5)	Weekly (4)	Biweekly (3)	Daily (2)
Direct to my email (1)	○	○	○	○	○	○
On the radio (2)	○	○	○	○	○	○
From an online source (designated website, blog) (3)	○	○	○	○	○	○
Via text message (4)	○	○	○	○	○	○
Via the phone (automated voicemail) (5)	○	○	○	○	○	○
From lakeshore signage (6)	○	○	○	○	○	○
From print media in the mail (pamphlets, brochures, newspaper) (7)	○	○	○	○	○	○
Via the television (e.g., nightly news, weather channel, alert banners) (8)	○	○	○	○	○	○
Smart phone app (10)	○	○	○	○	○	○
Social media (e.g., Twitter, Facebook, Instagram) (11)	○	○	○	○	○	○
Other (fill in) (12)	○	○	○	○	○	○
Other (fill in) (13)	○	○	○	○	○	○

Q4 People typically seek out information due to concerns they may have about HABs.

Please indicate to what extent each of the following issues is a concern that would drive you to want to know more about future harmful algal blooms and their impacts.

	Never a concern (1)	Rarely a concern (2)	Sometimes a concern (3)	Very often a concern (4)	Always a concern (5)
My personal safety and well-being (1)	○	○	○	○	○
The safety and well-being of my family and pets (2)	○	○	○	○	○
The safety and well-being of my community (3)	○	○	○	○	○
The health of plants and animals (4)	○	○	○	○	○
How much I can trust the information that is readily available (5)	○	○	○	○	○
Resource (lake, fisheries, beach) management agencies not properly managing the risks (6)	○	○	○	○	○
Water treatment managers not properly managing the risks (7)	○	○	○	○	○
Possible damage to my community's pride and reputation (8)	○	○	○	○	○
Recreational opportunities (9)	○	○	○	○	○
My ability to feed myself or my family with local fisheries (10)	○	○	○	○	○
Survey version = business, charter captain, marina owner The safety and well-being of my customers and clients (11)	○	○	○	○	○
Survey version = business, charter captain, marina owner My ability to make a living as a lake/lakeside business (12)	○	○	○	○	○
The economy of the region (13)	○	○	○	○	○
Knowing what actions I can take to mitigate the impacts of HABs (14)	○	○	○	○	○
My home's property value (15)	○	○	○	○	○

Q7 The conditions in Lake Erie are constantly changing and therefore require a dynamic monitoring and warning system. Monitoring systems can be categorized into modes depending on the severity of HAB conditions. At which mode(s) and how often would you like to receive alerts or updates on the HAB and lake conditions?

Please select the option that best describes how often you would want alerts.

	Never (1)	Biweekly (5)	Weekly (4)	Hourly (2)	Daily (3)	Only when the mode escalates (6)
Normal/routine mode (No algal blooms are present in Lake Erie and water is safe) (1)	○	○	○	○	○	○
Recreation watch mode (Algal blooms are present in Lake Erie, but toxicity is not a threat to recreation or pets) (2)	○	○	○	○	○	○
Drinking water watch mode (Lake Erie drinking water plant treatment for algal bloom toxins is required, but use of drinking water is not a threat) (3)	○	○	○	○	○	○
Recreation alert mode (Toxic algal blooms observed, public advised not to swim in Lake Erie and pet restrictions issued at one or more Lake Erie beaches- check local conditions) (4)	○	○	○	○	○	○
Drinking water alert mode (Algal bloom toxins have been detected in treated drinking water in one or more Lake Erie communities and drinking water there has been restricted- check local conditions) (5)	○	○	○	○	○	○

Q111 We would like to know what specific information you might want about HABs. For each statement, please check the box that indicates whether or not you would want this information included in an early warning system. If you are unsure what the parameter is, or if it would be useful, please check the box in the last column.

	Yes, I want this information (1)	No, I do not want this information (2)	Unsure (3)
Bloom size (square miles/kilometers) (18)	○	○	○
Bloom intensity (cyanobacteria cell count) (19)	○	○	○
Greenness of lake (chlorophyll) (22)	○	○	○
Scum or surface accumulation (23)	○	○	○
Cyanotoxin concentration (24)	○	○	○

Q169 Please check the box that indicates whether or not you would want this information included in an early warning system. If you are unsure what the parameter is, or if it would be useful, please check the box in the last column.

	Yes, I want this information (1)	No, I do not want this information (2)	Unsure (3)
Water temperatures (18)	○	○	○
Water levels (19)	○	○	○
Wave height (22)	○	○	○
Ambient air temperature (23)	○	○	○
Wind speed and direction (24)	○	○	○
Turbidity/water clarity (36)	○	○	○

Q112 Please check the box that best indicates whether or not you would want this information included in an early warning system. If you are unsure what the parameter is, or if it would be useful, please check the box in the last column.

	Yes, I want this information (1)	No, I do not want this information (2)	Unsure (3)
Oxygen content (18)	○	○	○
Nutrient (nitrogen, phosphorus, etc) (19)	○	○	○
Fish (28)	○	○	○
Birds (29)	○	○	○
Phytoplankton (algae) (26)	○	○	○
Zooplankton (tiny aquatic animals) (27)	○	○	○
Benthos (plants and animals at the bottom of the lake) (35)	○	○	○

Q8 Please check the box that best indicates whether or not you would want this information included in an early warning system. If you are unsure what the parameter is, or if it would be useful, please check the box in the last column.

	Yes, I want this information (1)	No, I do not want this information (2)	Unsure (3)
Cases of human exposure and symptoms (18)	○	○	○
Cases of animal exposure and symptoms (35)	○	○	○
Update on toxicity of fish consumed from lake (22)	○	○	○
What is being done to manage HABs or risky conditions (33)	○	○	○
Recreational and beach advisories (36)	○	○	○
Drinking water advisories (37)	○	○	○
Potential economic impacts to tourism/ local business (38)	○	○	○

Q116 Please check the box that best indicates whether or not you would want this information included in an early warning system. If you are unsure what the parameter is, or if it would be useful, please check the box in the last column.

	Yes, I want this information (1)	No, I do not want this information (2)	Unsure (3)
Short-term forecasts (i.e. 3- to 5-day predictions) (27)	○	○	○
Long-term forecasts (i.e. 10-day predictions) (28)	○	○	○
Cases of animal exposure and symptoms (19)	○	○	○
Drinking water advisories (23)	○	○	○
Recreational and beach advisories (24)	○	○	○
Potential economic impacts to tourism/ local business (34)	○	○	○
Long-term seasonal forecasts (i.e. prediction of blooms for the entire season) (29)	○	○	○

End of Block: Early warning system content

Start of Block: Section 3 (CE branching question)

Q9
This next set of questions aim to understand how much value you place on an early warning system with different types of HAB information. For each question, you will be presented with three options for an early warning system, with different types of information and costs. For each set of options, please select the one option or early warning system that you would be most likely to access and use.

Before we start, how would you classify the level of information about HABs that would be most useful to you and your organization or business?

- ○ General HABs information (e.g., recreation and drinking water advisories) (4)

- ○ Detailed HABs information (e.g., bloom-specific information such as mixing forecasts, bloom density, etc.) (5)

CE1B   Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Information included	Drinking water conditions	Fishing conditions	Drinking water conditions
Current conditions	Included	Included	Included
One-week prediction	Not included	Included	Included
Means by which the update will be sent	Website	Email	Website
Cost	$50 annually	$50 annually	$10 annually

- ○ A (1)

- ○ B (2)

- ○ C (3)

- ○ I would not use any of these early warning systems (4)

CE2B Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Information included	Drinking water conditions	Drinking water conditions	Beach/recreation conditions
Current conditions	Included	Not included	Included
One-week prediction	Included	Included	Included
Means by which the update will be sent	Email	Email	Website
Cost	$50 annually	$50 annually	$50 annually

○   A (1)

○   B (2)

○   C (3)

○   I would not use any of these early warning systems (4)

End of Block: CE2

Start of Block: CE3

CE3B Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Information included	Fishing conditions	Drinking water conditions	Beach/recreation conditions
Current conditions	Included	Included	Included
One-week prediction	Included	Included	Included
Means by which the update will be sent	Email	Email	Email
Cost	$100 annually	$50 annually	$100 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE3

Start of Block: CE4

CE4B Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Information included	Beach/recreation conditions	Beach/recreation conditions	Fishing conditions
Current conditions	Not included	Included	Not included
One-week prediction	Included	Not included	Included
Means by which the update will be sent	Website	Email	Website
Cost	$50 annually	$100 annually	$100 annually

○ A (1)

○ B (2)

○ C (3)

○ I would not use any of these early warning systems (4)

CE5B Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Information included	Drinking water conditions	Drinking water conditions	Fishing conditions
Current conditions	Included	Included	Included
One-week prediction	Not included	Not included	Not included
Means by which the update will be sent	Website	Email	Email
Cost	$100 annually	$100 annually	$100 annually

○ A (1)

○ B (2)

○ C (3)

○ I would not use any of these early warning systems (4)

CE6B Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Information included	Drinking water conditions	Fishing conditions	Drinking water conditions
Current conditions	Not included	Not included	Not included
One-week prediction	Included	Included	Included
Means by which the update will be sent	Website	Website	Email
Cost	$100 annually	$50 annually	$100 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE6

Start of Block: CE7

CE7B Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Information included	Beach/recreation conditions	Drinking water conditions	Beach/recreation conditions
Current conditions	Included	Included	Not included
One-week prediction	Not included	Included	Included
Means by which the update will be sent	Website	Website	Email
Cost	$100 annually	$50 annually	$100 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE7

Start of Block: CE8

CE8B
Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	**B**	**C**
Information included	Drinking water conditions	Beach/recreation conditions	Beach/recreation conditions
Current conditions	Included	Included	Not included
One-week prediction	Included	Not included	Included
Means by which the update will be sent	Email	Website	Email
Cost	$100 annually	$50 annually	$50 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

CE9B Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Information included	Fishing conditions	Beach/recreation conditions	Fishing conditions
Current conditions	Not included	Included	Included
One-week prediction	included	Included	Included
Means by which the update will be sent	Email	Email	Website
Cost	$50 annually	$50 annually	$100 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

CE10B Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Information included	Fishing conditions	Fishing conditions	Beach/recreation conditions
Current conditions	Included	Included	Not included
One-week prediction	Not included	Not included	Included
Means by which the update will be sent	Website	Email	Website
Cost	$100 annually	$50 annually	$100 annually

- ○ A (1)

- ○ B (2)

- ○ C (3)

- ○ I would not use any of these early warning systems (4)

End of Block: CE10

Start of Block: CE11

CE11B Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Information included	Fishing conditions	Drinking water conditions	Fishing conditions
Current conditions	Included	Not included	Not included
One-week prediction	Included	Included	Included
Means by which the update will be sent	Website	Website	Email
Cost	$50 annually	$50 annually	$100 annually

- ○ A (1)

- ○ B (2)

- ○ C (3)

- ○ I would not use any of these early warning systems (4)

End of Block: CE11

Start of Block: CE12

CE12B Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Information included	Beach/recreation conditions	Beach/recreation conditions	Fishing conditions
Current conditions	Included	Included	Included
One-week prediction	Not included	Included	Not included
Means by which the update will be sent	Email	Website	Website
Cost	$50 annually	$100 annually	$50 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE12

Start of Block: CE1D

CE1D
Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Included	Included	Included
Mixing forecast	Included	Not included	Included
Transport forecast	Included	Included	Not included
Satellite image	Included	Included	Included
Means by which the update will be sent	Website	Email	Email
Cost	$100 annually	$100 annually	$50 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE1D

Start of Block: CE2D

CE2D

Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Not included	Not included	Included
Mixing forecast	Not included	Not included	Not included
Transport forecast	Included	Included	Included
Satellite image	Included	Included	Not included
Means by which the update will be sent	Website	Email	Website
Cost	$50 annually	$50 annually	$100 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE2D

Start of Block: CE3D

CE3D
Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	**B**	**C**
Current conditions	Included	Not included	Not included
Mixing forecast	Not included	Included	Not included
Transport forecast	Included	Not included	Not included
Satellite image	Not included	Included	Included
Means by which the update will be sent	Email	Email	Email
Cost	$100 annually	$100 annually	$50 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

CE4D
Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Not included	Included	Not included
Mixing forecast	Not included	Not included	Included
Transport forecast	Included	Not included	Not included
Satellite image	Not included	Included	Included
Means by which the update will be sent	Email	Email	Website
Cost	$100 annually	$100 annually	$50 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE4D

Start of Block: CE5D

CE5D
Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Included	Included	Not included
Mixing forecast	Included	Included	Not included
Transport forecast	Not included	Included	Not included
Satellite image	Included	Not included	Included
Means by which the update will be sent	Email	Website	Website
Cost	$100 annually	$50 annually	$50 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

CE6D
Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Not included	Not included	Included
Mixing forecast	Not included	Included	Not included
Transport forecast	Not included	Included	Included
Satellite image	Included	Not included	Not included
Means by which the update will be sent	Website	Email	Website
Cost	$100 annually	$100 annually	$50 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

CE7D
Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Not included	Included	Included
Mixing forecast	Included	Not included	Included
Transport forecast	Not included	Not included	Not included
Satellite image	Not included	Included	Not included
Means by which the update will be sent	Website	Email	Email
Cost	$50 annually	$50 annually	$50 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE7D

Start of Block: CE8D

CE8D
Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	**B**	**C**
Current conditions	Included	Not included	Not included
Mixing forecast	Included	Included	Included
Transport forecast	Not included	Not included	Included
Satellite image	Not included	Not included	Included
Means by which the update will be sent	Email	Website	Email
Cost	$100 annually	$100 annually	$50 annually

○ A (1)

○ B (2)

○ C (3)

○ I would not use any of these early warning systems (4)

End of Block: CE8D

Start of Block: CE9D

CE9D
Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	**B**	**C**
Current conditions	Not included	Included	Included
Mixing forecast	Included	Not included	Included
Transport forecast	Included	Not included	Included
Satellite image	Included	Included	Not included
Means by which the update will be sent	Website	Website	Website
Cost	$100 annually	$50 annually	$100 annually

○ A (1)

○ B (2)

○ C (3)

○ I would not use any of these early warning systems (4)

End of Block: CE9D

Start of Block: CE10D

CE10D Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Not included	Included	Included
Mixing forecast	Included	Not included	Included
Transport forecast	Included	Not included	Included
Satellite image	Included	Included	Included
Means by which the update will be sent	Website	Website	Email
Cost	$50 annually	$100 annually	$50 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE10D

Start of Block: CE11D

CE11D
Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Included	Not included	Included
Mixing forecast	Included	Not included	Included
Transport forecast	Not included	Included	Not included
Satellite image	Not included	Not included	Included
Means by which the update will be sent	Email	Email	Website
Cost	$50 annually	$50 annually	$100 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE11D

Start of Block: CE12D

CE12D Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Not included	Included	Included
Mixing forecast	Included	Not included	Not included
Transport forecast	Not included	Included	Not included
Satellite image	Included	Included	Not included
Means by which the update will be sent	Email	Email	Website
Cost	$50 annually	$50 annually	$100 annually

○   A (1)

○   B (2)

○   C (3)

○   I would not use any of these early warning systems (4)

CE13D Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Included	Not included	Included
Mixing forecast	Not included	Not included	Not included
Transport forecast	Not included	Included	Included
Satellite image	Not included	Not included	Included
Means by which the update will be sent	Email	Website	Website
Cost	$100 annually	$50 annually	$100 annually

○ A (1)

○ B (2)

○ C (3)

○ I would not use any of these early warning systems (4)

CE14D Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Not included	Included	Included
Mixing forecast	Not included	Included	Included
Transport forecast	Not included	Included	Included
Satellite image	Included	Included	Not included
Means by which the update will be sent	Email	Website	Email
Cost	$100 annually	$50 annually	$50 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

CE15D Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Not included	Not included	Included
Mixing forecast	Not included	Included	Included
Transport forecast	Included	Not included	Included
Satellite image	Not included	Included	Included
Means by which the update will be sent	Website	Website	Email
Cost	$100 annually	$100 annually	$100 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE15D

Start of Block: CE16D

CE16D Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Not included	Included	Not included
Mixing forecast	Included	Not included	Included
Transport forecast	Included	Not included	Included
Satellite image	Included	Not included	Not included
Means by which the update will be sent	Email	Website	Website
Cost	$100 annually	$50 annually	$100 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE16D

Start of Block: CE17D

CE17D Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Included	Included	Not included
Mixing forecast	Included	Included	Included
Transport forecast	Not included	Included	Not included
Satellite image	Not included	Not included	Not included
Means by which the update will be sent	Website	Email	Email
Cost	$100 annually	$100 annually	$50 annually

○ A (1)

○ B (2)

○ C (3)

○ I would not use any of these early warning systems (4)

End of Block: CE17D

Start of Block: CE18D

CE18D Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Included	Not included	Not included
Mixing forecast	Not included	Not included	Included
Transport forecast	Included	Included	Included
Satellite image	Included	Included	Not included
Means by which the update will be sent	Website	Email	Email
Cost	$100 annually	$100 annually	$50 annually

○ A (1)

○ B (2)

○ C (3)

○ I would not use any of these early warning systems (4)

CE19D Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Not included	Included	Not included
Mixing forecast	Not included	Not included	Included
Transport forecast	Included	Not included	Included
Satellite image	Included	Not included	Not included
Means by which the update will be sent	Website	Email	Website
Cost	$100 annually	$15 annually	$50 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

Q168 Suppose your organization or business has three different options for a HABs early warning system to which it can subscribe. Please choose the option (A, B, or C) that you would be *most* likely to subscribe to for your organization or business.

	A	B	C
Current conditions	Included	Not included	Included
Mixing forecast	Included	Included	Not included
Transport forecast	Not included	Not included	Included
Satellite image	Included	Not included	Not included
Means by which the update will be sent	Website	Email	Email
Cost	$50 annually	$100 annually	$50 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

Q54 At what level do you work? Check and fill in the option that best represents your constituency.

- ○ Municipality: (1) _____
- ○ County: (2) _____
- ○ State: (3) _____
- ○ Region: (4) _____
- ○ Other (fill in): (5) _____

Q55 Please select the option that best describes your position

- ○ Elected official (1)
- ○ Aide to elected official (2)
- ○ Public sector worker (3)
- ○ Other (fill in) (4) _____

Q56 How many years have you worked in the public sector?

_____

---

*

Q58 How many years have you worked in your current position?

_____

Q57 How often do you hear from constituents on Lake Erie HAB issues?

- ○ Daily (1)
- ○ Weekly (2)
- ○ Monthly (3)
- ○ Once per summer/fall season (4)
- ○ Never (5)

Q59
This question has to do with your relationship with the public and the role that you play in disseminating information about HABs.

Please select the extent to which you disagree or agree with each of the following statements.

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
The public I serve trust me for info on HABs (1)	○	○	○	○	○
The public is not capable of grasping complex, scientific issues (2)	○	○	○	○	○
The public is willing to consider news and information that does not affect them directly (3)	○	○	○	○	○
Topics surrounding HABs are important for me to cover (4)	○	○	○	○	○
I trust the source and content of information about HABs that I share with the public (5)	○	○	○	○	○

End of Block: Section 4f: Decision Makers

Start of Block: Section 4a Boat Captains

Q26 How many years have you worked on fishing charter boats?

_____

Q85 How many trips do you take with clients (out and back) per year?

_____

Q28 Where do you dock your vessel? Drag the pin on the map below to indicate your approximate location. You may also enter a location to quickly reposition the map before dragging the pin.

_____

Q86 Do you move to another marina later in the season?

○ No (1)

○ Yes (2)

Q87 How long is your average travel time (each way) per trip, in hours?

_____

Q29 What is the approximate size of your vessel?

○ Less than 20 ft (1)

○ 20 ft (2)

○ 30 ft (3)

○ 40 ft (4)

○ 50 ft (5)

○ Greater than 50 ft (6)

Q88 How many anglers are on your crew?

_____

Q119 In the years since 2014 (the Toledo Water Crisis), have you experienced any decrease in expected revenue due to HABs?

○ No (1)

○ Yes (2)

Display This Question:

If In the years since 2014 (the Toledo Water Crisis), have you experienced any decrease in expected... = Yes

Q30
Please select all of the years in which you experienced a decrease in revenue due to HABs.

☐ 2014 (1)

☐ 2015 (2)

☐ 2016 (3)

☐ 2017 (4)

☐ 2018 (5)

☐ 2019 (6)

☐ Unsure (7)

Q31 In the worst year since 2014, my number of marine trips decreased by...

○ Less than 10% decrease (1)

○ 10-20% decrease (3)

○ 21-30% decrease (4)

○ 31-40% decrease (5)

○ Greater than 40% decrease (6)

Q89 What fish do you typically target? (check all that apply)

☐ Walleye (1)

☐ Perch (2)

☐ Smallmouth bass (3)

☐ Other (fill in): (4) _____

Q91 What is your method of fishing? (check all that apply)

☐ Jigging (1)

☐ Casting (2)

☐ Trolling (3)

☐ Other (fill in): (4) _____

Q90 Roughly what proportion of your clients are repeat clients?

○ A few (0-25%) (1)

○ Some (25-50%) (2)

○ Most (50-75%) (3)

○ All (75-100%) (4)

End of Block: Section 4a Boat Captains

Start of Block: Section 4b Marina owners

JS

Q32 Where is your marina located? Drag the pin on the map below to indicate your approximate location. You may also enter a location to quickly reposition the map before dragging the pin.

_____

Q33 How many boat slips do you have?

_____

Q96 How many years have you been a marina owner?

_____

Q34 How often do you personally interact with marina users?

- ○ Never (1)
- ○ Rarely (2)
- ○ Freqeuntly (3)
- ○ Daily (4)

Q113 How would you rate the annual revenue of your business?

- ○ My annual revenue is not nearly enough (1)
- ○ My annual revenue could be better (2)
- ○ My annual revenue is fine (3)

Q120 In the years since 2014 (the Toledo Water Crisis), have you experienced any decrease in expected revenue due to HABs?

- ○ No (1)
- ○ Yes (2)

Q92 Please select all of the years below in which you experienced a decrease in revenue due to HABs.

☐ 2014 (1)

☐ 2015 (2)

☐ 2016 (3)

☐ 2017 (4)

☐ 2018 (5)

☐ 2019 (6)

☐ Unsure (7)

Q94 In the worst year since 2014, my number of occupied boat slips decreased by...

o Less than 10% decrease (1)

o 10-20% decrease (3)

o 21-30% decrease (4)

o 31-40% decrease (5)

o Greater than 40% decrease (6)

Q97 Is your business seasonal or year round?

o Seasonal (1)

o Year round (2)

End of Block: Section 4b Marina owners

Start of Block: Section 4c: Lakeside Business

Q38 Where is your business located? Drag the pin on the map below to indicate your approximate location. You may also enter a location to quickly reposition the map before dragging the pin.

_____

Q40 What is your industry/sector? (Please select all that apply)

☐ Agriculture (1)

☐ Fishing (2)

☐ Construction and utilities (3)

☐ Manufacturing (4)

☐ Transportation (5)

☐ Retail trade (6)

☐ Recreation and entertainment (7)

☐ Lodging (8)

☐ Food and Beverage (9)

☐ Government (10)

☐ Other (fill in) (11) _____

Q41 What is the size of your business?

○ Under 20 employees (1)

○ 20-49 employees (2)

○ 50-99 employees (3)

○ 100-200 employees (4)

○ Greater than 200 employees (5)

Q42 How would you rate the annual revenue of your business?

○ My annual revenue is not nearly enough (1)

○ My annual revenue could be better (2)

○ My annual revenue is fine (3)

Q121 In the years since 2014 (the Toledo Water Crisis), have you experienced any decrease in expected revenue due to HABs?

○ No (1)

○ Yes (2)

Q98 Please select all of the years below in which you experienced a decrease in expected revenue.

☐ 2014 (1)

☐ 2015 (2)

☐ 2016 (3)

☐ 2017 (4)

☐ 2018 (5)

☐ 2019 (6)

☐ Unsure (8)

Q100 In the worst year, my total sales decreased by...

○ Less than 10% decrease (1)

○ 10-20% decrease (3)

○ 21-30% decrease (4)

○ 31-40% decrease (5)

○ Greater than 40% decrease (6)

Page Break ────────────────────────────────

Q102 How many years have you owned your business?

_____

Q103 Is your business seasonal or year round?

○ Seasonal (1)

○ Year round (2)

Q51 What type of media channel do you work for?

☐ Television (1)

☐ Radio (2)

☐ Newspaper (3)

☐ Online journalism (4)

☐ Other (fill in) (5) _____

Q114 What specific outlet do you work for? Please type in the name below.

_____

Q52 How often do you cover HABs in your reporting?

○ Daily (1)

○ Weekly (2)

○ Monthly (3)

○ Once per summer/fall season (4)

○ Never (5)

Q53
This question has to do with your relationship with the public and the role that you play in disseminating information about HABs.

Please select the extent to which you disagree or agree with each of the following statements by selecting the most appropriate response.

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
The public trusts me for info on HABs (1)	○	○	○	○	○
The public is not capable of grasping complex, scientific issues (2)	○	○	○	○	○
The public is willing to consider news and information that does not affect them directly (3)	○	○	○	○	○
Topics surrounding HABs are important for me to cover (4)	○	○	○	○	○
I trust the source and content of information about HABs that I share with the public (5)	○	○	○	○	○

Q10 Please tell us a little about yourself!

Q12 Are you:

- ○ Male (1)
- ○ Female (2)

Q13 What is your age in years?

_____

Q148 What is your race and ethnicity? Please check all that apply.

- ☐ White (1)
- ☐ Hispanic or Latino (7)
- ☐ Black or African American (2)
- ☐ American Indian or Alaska Native (3)
- ☐ Asian (4)
- ☐ Native Hawaiian or Pacific Islander (5)
- ☐ Other (6)

Q14 How much formal education have you completed?

- ○ Some high school, no diploma (1)
- ○ High school degree or equivalent (2)
- ○ Some college, no degree (3)
- ○ Associate's or Bachelor's degree (4)
- ○ Graduate or professional degree (5)

Q15 Who in your opinion is responsible for protecting the health of Lake Erie? Check all that apply

- ☐ Federal government (1)
- ☐ State government (2)
- ☐ Local government (3)
- ☐ Fishing industry (4)
- ☐ Tourism industry (5)
- ☐ Agricultural industry (6)
- ☐ Manufacturing industry (7)
- ☐ Individuals (8)
- ☐ ⊗Unsure (9)

Q16 Do you or any member of your household use Lake Erie for activities related to leisure or recreation?

- ○ No (1)
- ○ Yes (2)

Skip To: Q84 If Do you or any member of your household use Lake Erie for activities related to leisure or recreat... = No

Q17 How often do you or your household use or visit Lake Erie for leisure and/or recreation in a typical year?

- ○ Multiple times a week (1)
- ○ Once a week (2)
- ○ Once a month (3)
- ○ Once a year (4)
- ○ Less than once a year (5)

Q80 For how many years have you visited Lake Erie for recreation?

_____

Q81 Do you bring pets with you when you visit Lake Erie?

- ○ No (1)
- ○ Yes (2)

Q78 What areas do you or your household members visit for recreational or leisure purposes? (check all that apply)

- ☐ Maumee Bay (1)
- ☐ Maumee River (2)
- ☐ Western Basin (3)
- ☐ Sandusky Bay (4)
- ☐ Catawba Islands (5)
- ☐ Lake Erie Islands (6)
- ☐ Sandusky Sub-Basin (7)
- ☐ Central Basin (8)

Q82 What type of recreational activities do you participate in when visiting Lake Erie? (check all that apply)

- ☐ Swimming (1)
- ☐ Boating (2)
- ☐ Canoeing/kayaking (3)
- ☐ Fishing (4)
- ☐ Hiking (5)
- ☐ Bird Watching (6)
- ☐ Sun Bathing (7)
- ☐ Other (fill in): (8) _____

Q83 How often do you frequent visitor centers when you visit Lake Erie or surrounding areas?

- ○ Never (1)
- ○ When visiting a location for the first time (2)
- ○ About half the time (3)
- ○ Most of the time (4)
- ○ Always (5)

Q84 Do you work in an industry/profession that is directly impacted by the quality of Lake Erie?

- ○ No (1)
- ○ Yes (2)

Q20 What is your combined family income?

- ○ $25,000 or less (1)
- ○ $25,000-$50,000 (2)
- ○ $50,000-$75,000 (3)
- ○ $75,000-$100,000 (4)
- ○ $100,000 or greater (5)

Q21 Do you consider yourself to be politically conservative, liberal or moderate?

- ○ Consistently conservative (1)
- ○ Mostly conservative (2)
- ○ Mixed (3)
- ○ Mostly liberal (4)
- ○ Consistently liberal (5)

Q22 When it comes to political parties in the United States, how would you best describe yourself?

- ○ Republican (1)
- ○ Independent (not leaning toward any party) (2)
- ○ Democrat (3)
- ○ Other (please describe) (4) _____

Q23 What is the source of your home's tap water?

- ○ Lake Erie (1)
- ○ Local river (2)
- ○ Local reservoir (fed from river) (3)
- ○ Inland lake (6)
- ○ Groundwater (well) (5)
- ○ Unsure (7)

Q24 How would you describe the community in which you live?

- ○ Urban (1)
- ○ Suburban (2)
- ○ Small town/village (3)
- ○ Rural (4)

Q25 Would you be willing to take part in a one-time focus group to help inform the creation of an HAB early warning system? If you are interested in this possibility, please provide your contact information.

- ○ Name (1) _____
- ○ Email (2) _____

End of Block: Section 4

Appendix C: Residents Survey

Intro This survey seeks to understand the impact of harmful algal blooms (HABs) on residents, visitors, and businesses in the Western Lake Erie Basin. The information you share with will be used to identify how best to design a HAB early warning system.

This survey should take about 20 minutes of your time. We will not link your name to anything you say, either in the results from this survey or in any publications or reports that may result. Your de-identified information will not be used or shared with other researchers.

   Participation is voluntary. If you decide not to participate, there will be no penalty or loss of benefits to which you are otherwise entitled. You can, of course, decline to answer any particular questions, as well as to stop participating at any time.

   We will work to make sure that no one sees your online responses without approval. But, because we are using the Internet, there is a chance that someone could access your online responses without permission. In some cases, this information could be used to identify you.

   By clicking on the button below, you are agreeing to participate in this survey. If you do not wish to participate, please close out your browser window.

Q10 Before we start, please tell us a few things about yourself.

Q12 Are you:
- ○ Male (1)
- ○ Female (2)

Q148 What is your race and ethnicity? Please check all that apply
- ☐ White (1)
- ☐ Hispanic or Latino (7)
- ☐ Black or African American (2)
- ☐ American Indian or Alaska Native (3)
- ☐ Asian (4)
- ☐ Native Hawaiian or Pacific Islander (5)
- ☐ Other (6)

Q151 What is your zip code?

_____

Q1 Thank you for your willingness to participate in this project. We greatly appreciate you taking the time to provide us with your thoughts and opinions.
To begin, how interested are you in receiving news and other information related to harmful algal blooms (HABs) affecting Lake Erie?

○ Not at all interested (1)

○ A little interested (2)

○ Somewhat interested (3)

○ Interested (4)

○ Extremely interested (5)

Q2
You may already get information about HAB conditions from a variety of sources. For the sources listed below, please indicate how frequently you receive or seek out information from each in a typical year by selecting the most appropriate response.
 Check the last box if you would prefer to receive information from that particular source in the future. You may check as many preferred sources as you desire.

	How often do you receive or seek out information?					I would prefer to receive information from this source
	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Very Often (5)	Preferred Source (1)
National Weather Service (1)	○	○	○	○	○	☐
National Oceanic and Atmospheric Admin. (NOAA) (2)	○	○	○	○	○	☐
Great Lakes Observing System (3)	○	○	○	○	○	☐
Ohio Environmental Protection Agency (Ohio EPA) (4)	○	○	○	○	○	☐
Ohio Department of Health (5)	○	○	○	○	○	☐
Center for Disease Control (CDC) (6)	○	○	○	○	○	☐
Visitor Center/Kiosk (7)	○	○	○	○	○	☐
Other (type in specific source below) (8)	○	○	○	○	○	☐
Other (type in specific source below) (9)	○	○	○	○	○	☐

Q3 Information about HAB conditions can come from a variety channels or means of receiving information. In the future, how would you prefer to receive updated information on current or forecasted HAB conditions, advisories, and warnings?

	Never (1)	Seasonally (6)	Monthly (5)	Weekly (4)	Biweekly (3)	Daily (2)
Direct to my email (1)	○	○	○	○	○	○
On the radio (2)	○	○	○	○	○	○
From an online source (designated website, blog) (3)	○	○	○	○	○	○
Via text message (4)	○	○	○	○	○	○
Via the phone (automated voicemail) (5)	○	○	○	○	○	○
From lakeshore signage (6)	○	○	○	○	○	○
From print media in the mail (pamphlets, brochures, newspaper) (7)	○	○	○	○	○	○
Via the television (e.g., nightly news, weather channel, alert banners) (8)	○	○	○	○	○	○
Smart phone app (10)	○	○	○	○	○	○
Social media (e.g., Twitter, Facebook, Instagram) (11)	○	○	○	○	○	○
Other (fill in) (12)	○	○	○	○	○	○
Other (fill in) (13)	○	○	○	○	○	○

Q4 People typically seek out information due to concerns they may have about HABs.

Please indicate to what extent each of the following issues is a concern that would drive you to want to know more about future harmful algal blooms and their impacts.

	Never a concern (1)	Rarely a concern (2)	Sometimes a concern (3)	Very often a concern (4)	Always a concern (5)
My personal safety and well-being (1)	○	○	○	○	○
The safety and well-being of my family and pets (2)	○	○	○	○	○
The safety and well-being of my community (3)	○	○	○	○	○
The health of plants and animals (4)	○	○	○	○	○
How much I can trust the information that is readily available (5)	○	○	○	○	○
Resource (lake, fisheries, beach) management agencies not properly managing the risks (6)	○	○	○	○	○
Water treatment managers not properly managing the risks (7)	○	○	○	○	○
Possible damage to my community's pride and reputation (8)	○	○	○	○	○
Recreational opportunities (9)	○	○	○	○	○
My ability to feed myself or my family with local fisheries (10)	○	○	○	○	○
The economy of the region (13)	○	○	○	○	○
Knowing what actions I can take to mitigate the impacts of HABs (14)	○	○	○	○	○
My home's property value (15)	○	○	○	○	○

End of Block: HAB information sources and channels

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Q7

The conditions in Lake Erie are constantly changing and therefore require a dynamic monitoring and warning system. Monitoring systems can be categorized into modes depending on the severity of HAB conditions. At which mode(s) and how often would you like to receive alerts or updates on the HAB and lake conditions?

Please select the option that best describes how often you would want alerts.

	Never (1)	Biweekly (5)	Weekly (4)	Hourly (2)	Daily (3)	Only when the mode escalates (6)
Normal/routine mode (No algal blooms are present in Lake Erie and water is safe) (1)	○	○	○	○	○	○
Recreation watch mode (Algal blooms are present in Lake Erie, but toxicity is not a threat to recreation or pets) (2)	○	○	○	○	○	○
Drinking water watch mode (Lake Erie drinking water plant treatment for algal bloom toxins is required, but use of drinking water is not a threat) (3)	○	○	○	○	○	○
Recreation alert mode (Toxic algal blooms observed, public advised not to swim in Lake Erie and pet restrictions issued at one or more Lake Erie beaches- check local conditions) (4)	○	○	○	○	○	○
Drinking water alert mode (Algal bloom toxins have been detected in treated drinking water in one or more Lake Erie communities and drinking water there has been restricted- check local conditions) (5)	○	○	○	○	○	○

Q111 We would like to know what specific information you might want about HABs. For each statement, please check the box that indicates whether or not you would want this information included in an early warning system. If you are unsure what the parameter is, or if it would be useful, please check the box in the last column.

	Yes, I want this information (1)	No, I do not want this information (2)	Unsure (3)
Bloom size (square miles/kilometers) (18)	○	○	○
Bloom intensity (cyanobacteria cell count) (19)	○	○	○
Greenness of lake (chlorophyll) (22)	○	○	○
Scum or surface accumulation (23)	○	○	○
Cyanotoxin concentration (24)	○	○	○
37 (37)	○	○	○

Q150 Please check the box that best indicates whether or not you would want this information included in an early warning system. If you are unsure what the parameter is, or if it would be useful, please check the box in the last column.

	Yes, I want this informaiton (1)	No, I do not want this information (2)	Unsure (3)
Water temperature (1)	○	○	○
Water levels (2)	○	○	○
Wave height (3)	○	○	○
Ambient air temperature (4)	○	○	○
Turbidity/water clarity (6)	○	○	○
Wind speed and direction (5)	○	○	○

Q112 Please check the box that best indicates whether or not you would want this information included in an early warning system. If you are unsure what the parameter is, or if it would be useful, please check the box in the last column.

	Yes, I want this information (1)	No, I do not want this information (2)	Unsure (3)
Oxygen content (18)	○	○	○
Nutrient (nitrogen, phosphorus, etc) (19)	○	○	○
Fish (28)	○	○	○
Birds (29)	○	○	○
Phytoplankton (algae) (26)	○	○	○
Zooplankton (tiny aquatic animals) (27)	○	○	○
Benthos (plants and animals at the bottom of the lake) (35)	○	○	○

Q8 Please check the box that best indicates whether or not you would want this information included in an early warning system. If you are unsure what the parameter is, or if it would be useful, please check the box in the last column.

	Yes, I want this information (1)	No, I do not want this information (2)	Unsure (3)
Cases of human exposure and symptoms (18)	○	○	○
Cases of animal exposure and symptoms (35)	○	○	○
Update on toxicity of fish consumed from lake (22)	○	○	○
What is being done to manage HABs or risky conditions (33)	○	○	○
Recreational and beach advisories (36)	○	○	○
Drinking water advisories (37)	○	○	○
Potential economic impacts to tourism/ local business (38)	○	○	○

Page Break

Q116 Please check the box that best indicates whether or not you would want this information included in an early warning system. If you are unsure what the parameter is, or if it would be useful, please check the box in the last column.

	Yes, I want this information (1)	No, I do not want this information (2)	Unsure (3)
Short-term forecasts (i.e. 3- to 5-day predictions) (27)	○	○	○
Long-term forecasts (i.e. 10-day predictions) (28)	○	○	○
Cases of animal exposure and symptoms (19)	○	○	○
Drinking water advisories (23)	○	○	○
Recreational and beach advisories (24)	○	○	○
Potential economic impacts to tourism/ local business (34)	○	○	○
Long-term seasonal forecasts (i.e. prediction of blooms for the entire season) (29)	○	○	○

End of Block: Early warning system content

Start of Block: CE introduction

Q125
This next set of questions aim to understand how much value you place on an early warning system with different types of HAB information. For each question, you will be presented with three options for an early warning system, with different types of information and costs.

For each set of options, please select the one option or early warning system that you would be most likely to access and use.

CE1 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Drinking water conditions	Fishing conditions	Fishing conditions
Current conditions	Included	Included	Included
One-week prediction	Not included	Included	Not Included
Means by which the update will be sent	Website	TV/radio alerts	Website
Cost	$5 annually	Free	Free

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

CE2 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Beach/recreation conditions	Fishing conditions	Beach/recreation conditions
Current conditions	Not Included	Included	Included
One-week prediction	Included	Included	Included
Means by which the update will be sent	Text Alert	Text alert	Website
Cost	Free	$10 annually	Free

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE2

Start of Block: CE3

CE3 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Drinking water conditions	Fishing conditions	Drinking water conditions
Current conditions	Included	Included	Included
One-week prediction	Not included	Included	Included
Means by which the update will be sent	TV/radio alerts	Text alert	Text alert
Cost	Free	Free	$10 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

CE4 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	**B**	**C**
Information included	Drinking water conditions	Fishing conditions	Beach/recreation conditions
Current conditions	Included	Not included	Included
One-week prediction	Not included	Included	Included
Means by which the update will be sent	Text Alert	Website	Website
Cost	Free	$5 annually	$5 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE4

Start of Block: CE5

CE5 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	**B**	**C**
Information included	Fishing conditions	Drinking water conditions	Fishing conditions
Current conditions	Included	Not included	Not included
One-week prediction	Included	Included	Included
Means by which the update will be sent	Website	Text alert	Text alert
Cost	$5 annually	Free	$5 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE5

Start of Block: CE6

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CE6 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	**B**	**C**
Information included	Drinking water conditions	Beach/recreation conditions	Fishing conditions
Current conditions	Included	Included	Included
One-week prediction	Included	Included	Included
Means by which the update will be sent	TV/radio alerts	Website	Website
Cost	Free	$10 annually	Free

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE6

Start of Block: CE7

CE7 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Drinking water conditions	Fishing conditions	Beach/recreation conditions
Current conditions	Included	Not included	Not included
One-week prediction	Included	Included	Included
Means by which the update will be sent	Text alert	Website	TV/radio alerts
Cost	$5 annually	$10 annually	Free

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE7

Start of Block: CE8

CE8 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Drinking water conditions	Beach/recreation conditions	Fishing conditions
Current conditions	Included	Included	Included
One-week prediction	Not included	Included	Included
Means by which the update will be sent	Text Alert	Text alert	TV/radio alert
Cost	$5 annually	Free	Free

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE8

Start of Block: CE9

CE9 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Beach/recreation conditions	Fishing conditions	Drinking water conditions
Current conditions	Included	Included	Included
One-week prediction	Not included	Not included	Included
Means by which the update will be sent	Text Alert	Website	Website
Cost	$10 annually	Free	$10 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE9

Start of Block: CE10

CE10 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Fishing conditions	Beach/recreation conditions	Drinking water conditions
Current conditions	Not included	Not included	Included
One-week prediction	Included	Included	Not included
Means by which the update will be sent	Text Alert	Website	Text Alert
Cost	$10 annually	Free	$10 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

CE11 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Drinking water conditions	Beach/recreation conditions	Fishing conditions
Current conditions	Not included	Included	Included
One-week prediction	Not included	Not included	Included
Means by which the update will be sent	Text alert	Text alert	Website
Cost	$5 annually	$5 annually	$10 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE11

Start of Block: CE12

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CE12 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Fishing conditions	Beach/recreation conditions	Beach/recreation conditions
Current conditions	Included	Included	Included
One-week prediction	Not included	Not included	Included
Means by which the update will be sent	Text Alert	Website	Website
Cost	Free	$5 annually	Free

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE12

Start of Block: CE13

CE13 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Beach/recreation conditions	Drinking water conditions	Fishing conditions
Current conditions	Not Included	Not included	Included
One-week prediction	Included	Included	Not included
Means by which the update will be sent	Text Alert	Website	Website
Cost	$5 annually	$10 annually	$5 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

CE14 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Drinking water conditions	Fishing conditions	Drinking water conditions
Current conditions	Included	Not included	Included
One-week prediction	Not included	Included	Included
Means by which the update will be sent	Website	Text alert	Website
Cost	Free	Free	Free

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE14

Start of Block: CE15

CE15 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Fishing conditions	Drinking water conditions	Drinking water conditions
Current conditions	Included	Not included	Not included
One-week prediction	Included	Included	Included
Means by which the update will be sent	Text alert	Website	TV/radio alerts
Cost	$5 annually	Free	Free

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE15

Start of Block: CE16

CE16 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Fishing conditions	Fishing conditions	Beach/recreation conditions
Current conditions	Not included	Included	Included
One-week prediction	Included	Not included	Not included
Means by which the update will be sent	TV/radio alerts	Text alert	Website
Cost	Free	$10 annually	$10 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE16

Start of Block: CE17

CE17 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Beach/recreation conditions	Drinking water conditions	Beach/recreation conditions
Current conditions	Included	Included	Included
One-week prediction	Not included	Included	Not included
Means by which the update will be sent	TV/radio alerts	Website	Website
Cost	Free	Free	$5 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

CE18 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	**B**	**C**
Information included	Beach/recreation conditions	Beach/recreation conditions	Drinking water conditions
Current conditions	Not included	Not included	Included
One-week prediction	Included	Included	Included
Means by which the update will be sent	Text alert	Text alert	Text alert
$10 annually	$5 annually	$10 annually	Free

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE18

Start of Block: CE19

CE19 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Beach/recreation conditions	Drinking water conditions	Beach/recreation conditions
Current conditions	Included	Included	Included
One-week prediction	Included	Not included	Not included
Means by which the update will be sent	Text Alert	Website	Text Alert
Cost	$10 annually	$10 annually	Free

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

End of Block: CE19

Start of Block: CE20

CE20 Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Drinking water conditions	Fishing conditions	Beach/recreation conditions
Current conditions	Included	Included	Included
One-week prediction	Included	Not included	Included
Means by which the update will be sent	Website	Text alert	Text alert
Cost	$5 annually	$5 annually	$5 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

CE21   Suppose you have three different options for an HABs early warning system from which you can get information about bloom conditions. Please choose the option (A, B, or C) that you would be *most* likely to use as your primary source for HAB information.

	A	B	C
Information included	Fishing conditions	Drinking water conditions	Drinking water conditions
Current conditions	Included	Included	Not included
One-week prediction	Not included	Not included	Included
Means by which the update will be sent	Website	Website	Text alert
Cost	$10 annually	$5 annually	$10 annually

- ○ A (1)
- ○ B (2)
- ○ C (3)
- ○ I would not use any of these early warning systems (4)

Q44 How far do you live from the nearest shore?
- ○ Less than 1 mile (1)
- ○ 1-5 miles (2)
- ○ 5-20 miles (3)
- ○ 20-50 miles (4)

✳

Q104 How many years have you lived near Lake Erie?

_____

Q107 Do you lease your property?

- ○ Yes (1)
- ○ No (2)

✱

Q123 How many years have you owned your property?

_____

Q118 Since you purchased your property, has it deceased in value due to HABs in Lake Erie?

- ○ Yes (1)
- ○ No (2)

Q105 Because of HABs, since I purchased my property its value has decreased by...

- ○ Less than 10% decrease (1)
- ○ 10-20% decrease (3)
- ○ 21-30% decrease (4)
- ○ 31-40% decrease (5)
- ○ Greater than 40% decrease (6)

Q117 Have you ever delayed renovations or home improvements to your property based on decreasing property values that you attribute to HABs?

○   Yes (1)

○   No (2)

Q108 I lease my property...

○   Seasonally (1)

○   Year round (2)

Q110 Have you or your family ever sold your boat due to HABs?

○   Yes (3)

○   No, have never sold boat for HAB reasons (2)

○   No, have never owned a boat (1)

End of Block: Section 4d: Lakeside residents

Start of Block: Section 4

Q149 Please tell us a little more about yourself.

✱

Q13 What is your age in years?

_____

Q14 How much formal education have you completed?

- ○ Some high school, no diploma (1)
- ○ High school degree or equivalent (2)
- ○ Some college, no degree (3)
- ○ Associate's or Bachelor's degree (4)
- ○ Graduate or professional degree (5)

Q15 Who in your opinion is responsible for protecting the health of Lake Erie? Check all that apply

- ☐ Federal government (1)
- ☐ State government (2)
- ☐ Local government (3)
- ☐ Fishing industry (4)
- ☐ Tourism industry (5)
- ☐ Agricultural industry (6)
- ☐ Manufacturing industry (7)
- ☐ Individuals (8)
- ☐ ⊗ Unsure (9)

Q16 Do you or any member of your household use Lake Erie for activities related to leisure or recreation?

- ○ Yes (2)
- ○ No (1)

Skip To: Q84 If Do you or any member of your household use Lake Erie for activities related to leisure or recreat... = No

Q17 How often do you or your household use or visit Lake Erie for leisure and/or recreation in a typical year?

- ○ Multiple times a week (1)
- ○ Once a week (2)
- ○ Once a month (3)
- ○ Once a year (4)
- ○ Less than once a year (5)

*

Q80 For how many years have you visited Lake Erie for recreation?

_____

Q81 Do you bring pets with you when you visit Lake Erie?

- ○ Yes (2)
- ○ No (1)

Q78 What areas do you or your household members visit for recreational or leisure purposes? (check all that apply)

- ☐ Maumee Bay (1)
- ☐ Maumee River (2)
- ☐ Western Basin (3)
- ☐ Sandusky Bay (4)
- ☐ Catawba Islands (5)
- ☐ Lake Erie Islands (6)
- ☐ Sandusky Sub-Basin (7)
- ☐ Central Basin (8)

Q82 What type of recreational activities do you participate in when visiting Lake Erie? (check all that apply)

- ☐ Swimming (1)
- ☐ Boating (2)
- ☐ Canoeing/kayaking (3)
- ☐ Fishing (4)
- ☐ Hiking (5)
- ☐ Bird Watching (6)
- ☐ Sun Bathing (7)
- ☐ Other (fill in): (8) _____

Q83 How often do you frequent visitor centers when you visit Lake Erie or surrounding areas?

- ○ Never (1)
- ○ When visiting a location for the first time (2)
- ○ About half the time (3)
- ○ Most of the time (4)
- ○ Always (5)

Q84 Do you work in an industry/profession that is directly impacted by the quality of Lake Erie?

- ○ Yes (2)
- ○ No (1)

Q20 What is your combined family income?

- ○ $25,000 or less (1)
- ○ $25,000-$50,000 (2)
- ○ $50,000-$75,000 (3)
- ○ $75,000-$100,000 (4)
- ○ $100,000 or greater (5)

Q21 Do you consider yourself to be politically conservative, liberal or moderate?

- ○ Consistently conservative (1)
- ○ Mostly conservative (2)
- ○ Mixed (3)
- ○ Mostly liberal (4)
- ○ Consistently liberal (5)

Q22 When it comes to political parties in the United States, how would you best describe yourself?

- ○ Republican (1)
- ○ Independent (not leaning toward any party) (2)
- ○ Democrat (3)
- ○ Other (please describe) (4) _____

Q23 What is the source of your home's tap water?

- ○ Lake Erie (1)
- ○ Local river (2)
- ○ Local reservoir (fed from river) (3)
- ○ Inland lake (6)
- ○ Groundwater (well) (5)
- ○ Unsure (7)

Q24 How would you describe the community in which you live?

- ○ Urban (1)
- ○ Suburban (2)
- ○ Small town/village (3)
- ○ Rural (4)

Display This Question:

If psid Is Empty

Q25 Would you be willing to take part in a one-time focus group to help inform the creation of an HAB early warning system? If you are interested in this possibility, please provide your contact information.

- ○ Name (1) _____
- ○ Email (2) _____

End of Block: Section 4