2017/18 Review of Freshwater HAB Programs

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2017/2018 Review – To Date

- Updated the summary table for all 50 states through:
  - A lot of internet searches
  - Some direct communication to fill in the gaps
- Provided updated state program websites to North American Lake Management Society (NALMS) and USEPA
- Provided brief presentation at January CCHAB Network meeting
  - Grouped freshwater HAB programs into 3 relative categories (less, more, and most developed)
  - Identified some common issues or next steps across states
  - Provided initial thoughts about further outreach

2017/2018 Review – This Talk

- More detailed summary of:
  - Regulations and funding
  - Planning documents
  - Reporting
  - Recreational water
  - Drinking water
  - Outreach and mapping

- Please Note:
  - Specific states are provided (with hyperlinks) as examples of different characteristics. These lists may not be comprehensive.
  - Websites are subject to change, so please check original sources for current resources.

REGULATIONS & FUNDING

HAB-related Statutes and Regulations

- OK: Title 74, Section 2301 (2012)
  - Identify agency lead for public information for recreational waters in OK
  - State Department of Health to provide information on public health impacts
  - Require waterbody managers to post advisories with exceedance of established action levels (100,000 cells/mL and 20 ug/L microcystin)
- WA: Aquatic algae control account (RCW 43.21A.667, 2011)
  - $1 from derelict vessel and invasive species removal fee ($5 total)
  - Develop freshwater and saltwater aquatic algae control program
  - Fund grant program for managing freshwater and saltwater nuisance algae
  - Provide technical assistance
- OR: Title 36, Oregon Revised Statute (ORS), Chapter 431.035 to 431.530 (2013)
  - OPHD has authority to issue and lift advisories for HABs
- FL: Title XXVIII, Chapter 379, Sections 2271 and 2272 (2017)
  - Establish HAB task force and HAB program for red tides and other HABs in Florida waters (estuarine and marine) under Fish and Wildlife Research Institute

HAB Program Funding

- Federal funding
  - Initial funding from CDC
    - OR (ended 2013)
- Vessel registration fee
  - WA
    - Annual grant program ($100-200K per year; maximum grant $50K)
    - Project types include monitoring plans, pilot projects, research, and sampling equipment (and others)
- State agency funds
  - Limited funds for initial response, follow up by local agencies (CA, RI)

PLANNING DOCUMENTS

Planning Documents

- Terminology
  - Response plans, strategies, toolkit, guidance
- Content
  - Background on cyanobacteria, identification, health impacts
  - Roles and responsibilities, contacts
  - Reporting process
  - Response flow chart, timelines, and action levels
  - Monitoring methods
  - Drinking water intake locations
  - Templates of signage, press releases, and other outreach materials
- Audience
  - Local health departments, local municipalities/communities, state agencies, public
- Scope
  - State
    - CA, OR, MI*, NJ, NY, OH, OR, VA, WI, WV, WY*
  - Multi-state waterbody
    - Upper Mississippi River, Lake Erie

* received upon request

Planning Documents – State Examples

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

HARMFUL ALGAL BLOOMS (HABS) PROGRAM GUIDE

State Agency Partners
- NYSDOH & OPRHP monitor public swimming areas
- NYSDOH communicates bloom reports & health risks
- County/regional agency staff report blooms and conduct sampling

Public Partners & Programs
- Monitor select waterbodies
- Report blooms, submit digital photos and/or collect samples
- Provide outreach to local communities

DEC HABs Program
- Conduct surveillance and/or sampling
- Evaluate bloom reports & analytical results
- Determine bloom status
- Communicate HABs occurrence on website and via email
- Provide outreach and educational resources

Receipt of bloom report and/or digital photographs

Is the observer a professional or trained citizen?
- No (lay person)
- Yes

Report of a closure of a regulated swimming area

Does DEC HABs staff determine descriptions/imagery are credible—likely to be cyanobacteria?
- No
- Yes

SUSPICIOUS BLOOM

BG Chl.a < 25 µg/L or non-cyanobacteria majority → **NO BLOOM**

Collect a sample for analysis (if possible)

Confirmed Bloom & Microcystin ≥ 10 µg/L (open water) / 20 µg/L (shoreline) or high risk of other cyanotoxin exposure → **CONFIRMED WITH HIGH TOXINS BLOOM**

BG Chl.a ≥ 25 µg/L and/or cyanobacteria majority; microcystin ≤ high toxin thresholds; or a regulated swimming area has been closed → **CONFIRMED BLOOM**

Figure 3.1 Decision tree that indicates the process by which DEC HABs Program staff determine the status of a potential bloom

Oregon Harmful Algae Bloom Surveillance (HABS) Program

Public Health Advisory Guidelines
Harmful Algae Blooms in Freshwater Bodies

Oregon Health Authority

Public Health Division
Center for Health Protection
Environmental Public Health Section

Figure 2. OPHD process for issuing public health advisories for a cyanoHAB

Option #1: Visible scum with documentation and testing*
Have photos (close-up and overview) been sent to OPHD and will water be sampled for cell count or toxicity within 1 business day?
- YES → Issue advisory
- NO

Option #2: Toxigenic species – combined cell count
Is combined cell count of all toxigenic species ≥100,000 cells/mL?
- YES → Issue advisory
- NO

Option #3: Toxigenic species - individual species cell count
Is the cell count of *Microcystis* or *Planktothrix* ≥ 40,000 cells/mL?
- YES → Issue advisory
- NO

Option #4: Toxin testing
Are relevant toxins above their guideline value (see Table 2)?
- YES → Issue advisory
- NO

Stop: Do not issue advisory

Cyanobacteria
(Blue-green Algae)

Guidance for Vermont Communities

VERMONT

Appendix C: BGA Health Alert Template

Blue-green algae blooms have recently been observed in areas near _____ (If toxin testing performed then: Samples from toxin tests indicated levels of toxin which/did not exceeded Vermont beach health guidelines. Based on conditions in these areas the following recommendations to residents and lake users have been advised:

- Avoid contact with algae contaminated water (swimming, bathing etc.). Pay close attention to children as they are at higher risk.
- Monitor drinking water intakes for private residences, if algae are present near intake, switch to alternate known safe source of water. Do not use algae contaminated water to prepare meals or brush teeth. Note that boiling water will not remove toxins.
- Do not allow pets in algae contaminated water.

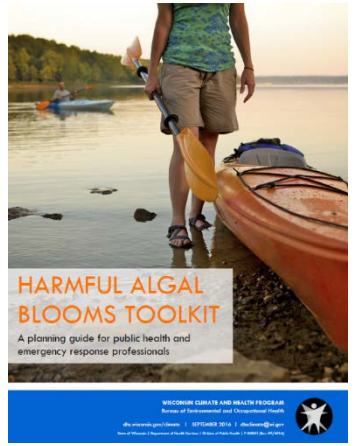
Public water suppliers in the area are monitoring water supplies closely. (if appropriate)

Skin contact with algae contaminated water can cause irritation or rashes. If people or pets come into contact with water, promptly shower or rinse off in uncontaminated water. Swallowing algae contaminated water can result in diarrhea, vomiting, or nausea. Seek medical attention if you feel you have been exposed to blue green algae and are having adverse health effects.

The Vermont Department of Health Laboratory can test for blue green algae toxins. Call 1-800-660-9997 to purchase a kit. (Kit BGA-2A and Kit ANA Drinking Water Supplies or BGA-3 and Kit ANA for Private Swimming Waters)

For photos, information visit the Vermont Department of Health's website at: http://healthvermont.gov/enviro/bg_algae/bgalgae.aspx.

Also contact the_____for more information.



The following is a message map that could be used when addressing the general public regarding harmful algal blooms.

Key Messages *Three key messages*	Supporting Information *Three pieces of supporting information for each key message*
Message 1 Blue-green algae, also known as cyanobacteria, can cause adverse health effects.	Supporting Info 1 Cyanobacteria, otherwise known as blue-green algae, are photosynthetic (light-using) organisms that are responsible for harmful algal blooms. Supporting Info 2 Not all cyanobacteria can produce harmful toxins, but those that do can cause rashes, diarrheal disease, and respiratory problems. Supporting Info 3 In Wisconsin, harmful algal blooms are most common during the warm-weather months between mid-June and mid-September, but they can occur all year.
Message 2 When in doubt, stay out!	Supporting Info 1 Humans can be exposed to harmful algal blooms through accidental ingestion while swimming, by inhaling aerosols (spray) during water recreation, or just by being in the water where a bloom is occurring. Supporting Info 2 If you are unsure about the water, don't go in! Be sure to check for beach postings and water quality notices before swimming. Supporting Info 3 Rinse yourself off immediately after being in contact with algal-affected waters, and get medical treatment right away if you think you have been poisoned by harmful algal blooms.
Message 3 Animals and livestock can become very ill after exposure to harmful algal blooms.	Supporting Info 1 Do not let your pets or livestock drink, graze, or play near water where there could be harmful algal blooms. Supporting Info 2 If your animal gets into water with a bloom, immediately wash him with clean water, and do not let him lick algae off its fur. Supporting Info 3 If your pet displays symptoms such as seizures, vomiting, or diarrhea after contact with surface water, contact your veterinarian right away.

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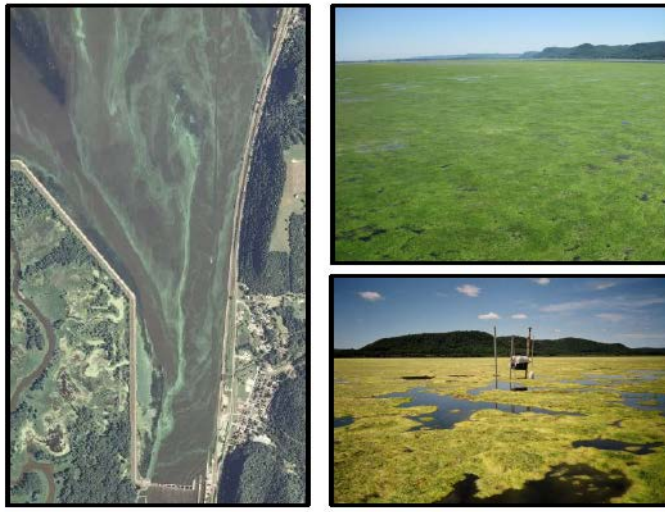
Planning Documents – Multi-state Waterbody Example

Upper Mississippi River (UMR) Harmful Algal Bloom (HAB) Work Group

Upper Mississippi River Harmful Algal Bloom

Response Resource Manual



August 2017

Upper Mississippi River Basin Association

UMR HAB Tools and Resources (August 2017) *Page*

3 - Spatial Scope, UMR-Specific Presence, and Staffing/Field Presence

States
Federal Agencies

4 – Parameters, Sampling Frequency, Sampling and Analytical Methods, Laboratories Used

States	Illinois EPA	Iowa DNR	Minnesota PCA	Missouri DNR	Wisconsin DNR
	Parameter Focus: Currently, microcystin and piloting cylndrospermopsin. May expand to include phytoplankton identification. **Sampling Frequency:** Routine lake and in response to reports. Routine lake sampling 4x during June through October. **Sampling Methods:** ELISA field test kits, with dilution as necessary. **Analytical Methods:** ELISA **Laboratories Used:** IL EPA laboratory	**Parameter Focus:** *Beaches* – total microcystins and limited cylindrospermopsin; *Lakes* – phytoplankton identification and nutrients; *Streams* – nutrients, chlorophyll a, sediment, and - this year - microcystin in source waters. **Sampling Frequency:** Weekly beach samples during swimming season (one week before Memorial Day to Labor Day); Lakes – 3x during summer; Streams – 3x **Sampling Methods:** Beaches – composite of nine samples and scums in beach area. Sample Monday/Tuesday using Abraxis ELISA kits; plus Abraxis strip tests for select beaches. **Analytical Methods:** ELISA **Laboratories Used:** Iowa DNR water quality lab	**Parameter Focus:** Microcystin. Also did some paired saxitoxin monitoring in July 2007. Study in 2016 includes microcystin and anatoxin. **Sampling Frequency:** In response to reports – limited to animal deaths or human illness. For 2016 study, weekly in 2 metro lakes, monthly in 9 outstate lakes. **Sampling Methods:** Laboratory analysis. Also, experimenting with test strips. **Analytical Methods:** ELISA-for laboratory for both microcystin and anatoxin. Abraxis test strips for microcystin; intend to add test strips for anatoxin when they are available on the market. **Laboratories Used:** MDH laboratory, may add private lab in the future.	**Parameter Focus:** Microcystin, cylindrospermopsin, saxitoxin, anatoxin-a. **Sampling Frequency:** Response only, no continuous monitoring. If toxins are found, monitoring will be determined on a case-by-case basis based upon waterbody use. **Sampling Methods:** Microcystin dipstick test kits and cylindrospermopsin test kits provided to field offices most likely to encounter problems. If screening indicates presence of toxins samples collected and sent to state lab for ELISA testing according to Abraxis collection recommendations. **Analytical Methods:** ELISA – have in-house capacity. Developing cyanobacteria ID and enumeration abilities. **Laboratories Used:** Missouri DNR laboratory. Would utilize contract lab if ID or counts are desired.	**Parameter Focus:** Microcystins, anatoxins, cylindrospermopsins, saxitoxin, phytoplankton enumeration, water chemistry. **Sampling Frequency:** In response to reports, with priority for human and animal illnesses confirmed by Wisconsin Department of Health Services as consistent with cyanobacterial exposure symptoms (no routine ongoing monitoring). Bloom confirmation and/or identification by WI DNR staff via photographs or occasional submitted sample. **Sampling Methods:** Response monitoring sampling kits staged for sample collection by DNR staff and laboratory analysis by Wisconsin State Laboratory of Hygiene. For selected State Parks, enhanced surveillance pilot program using microcystin test strips (funded by Wisconsin Department of Health Services). **Analytical Methods:** Microcystin, cylindrospermopsin, and saxitoxin by ELISA. Anatoxin-a by receptor-binding assay. By HPLC-MS/MS: microcystins (LA, LR, RR, YR), anatoxin-a, homoanatoxin-a, cylindrospermopsin, deoxycylindrospermopsin. Also, cyanobacterial identification and enumeration. **Laboratories Used:** Wisconsin State Laboratory of Hygiene

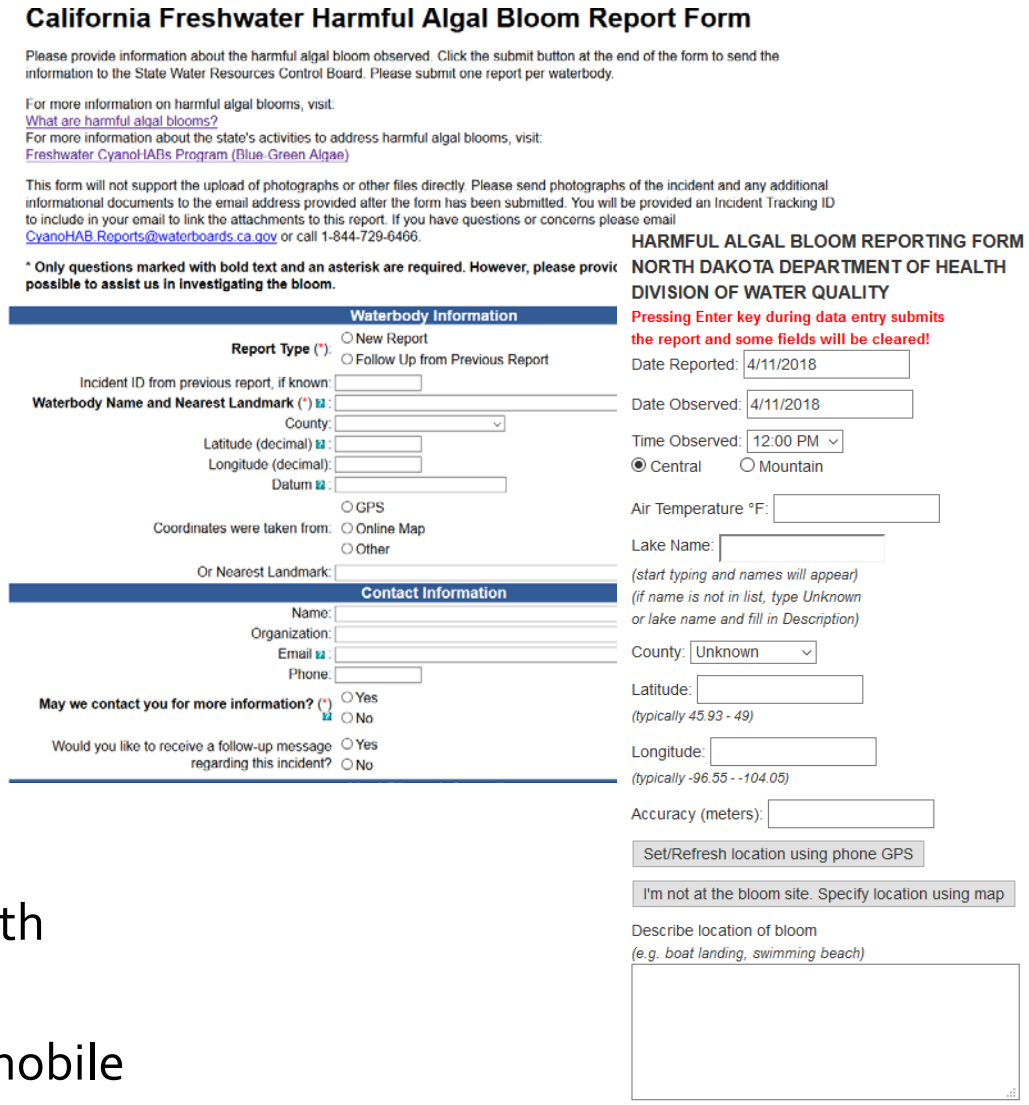
REPORTING

Reporting Algal Blooms

- Bloom reporting
  - HAB-specific – most states
  - Generic environmental incidents/spills - AZ, NJ, NM, TN, TX, UT, WY
- Phone/email
  - 24-hour hotline (particularly if fish kills or human illness) - MD, MT, TX, UT, VA
  - Single HAB phone # or email
  - Individual staff contact
  - Multiple contacts (health and environmental agencies)

Reporting Algal Blooms - Forms

- Submittal – online, email, or fax
- Typical content
  - Notifying party contact and/or anonymous option
  - Bloom description – extent, color, timing, location
  - Photos
- Additional content
  - Waterbody use (recreational/drinking water)
  - Waterbody management
  - Sampling
  - Weather conditions
  - Animal and/or human illness
  - Advisory signage posted
- Pros: more detailed info, can auto-populate database with online submittal
- Cons: may be more difficult to submit in the field or on mobile device



California Freshwater Harmful Algal Bloom Report Form

Please provide information about the harmful algal bloom observed. Click the submit button at the end of the form to send the information to the State Water Resources Control Board. Please submit one report per waterbody.

For more information on harmful algal blooms, visit.
What are harmful algal blooms?
For more information about the state's activities to address harmful algal blooms, visit:
Freshwater CyanoHABs Program (Blue-Green Algae)

This form will not support the upload of photographs or other files directly. Please send photographs of the incident and any additional informational documents to the email address provided after the form has been submitted. You will be provided an Incident Tracking ID to include in your email to link the attachments to this report. If you have questions or concerns please email CyanoHAB.Reports@waterboards.ca.gov or call 1-844-729-6466.

* **Only questions marked with bold text and an asterisk are required. However, please provic possible to assist us in investigating the bloom.**

Waterbody Information

Report Type (*): ○ New Report ○ Follow Up from Previous Report
Incident ID from previous report, if known:
Waterbody Name and Nearest Landmark (*):
County:
Latitude (decimal):
Longitude (decimal):
Datum:
Coordinates were taken from: ○ GPS ○ Online Map ○ Other
Or Nearest Landmark:

Contact Information

Name:
Organization:
Email:
Phone:
May we contact you for more information? (*) ○ Yes ○ No
Would you like to receive a follow-up message regarding this incident? ○ Yes ○ No

HARMFUL ALGAL BLOOM REPORTING FORM
NORTH DAKOTA DEPARTMENT OF HEALTH
DIVISION OF WATER QUALITY

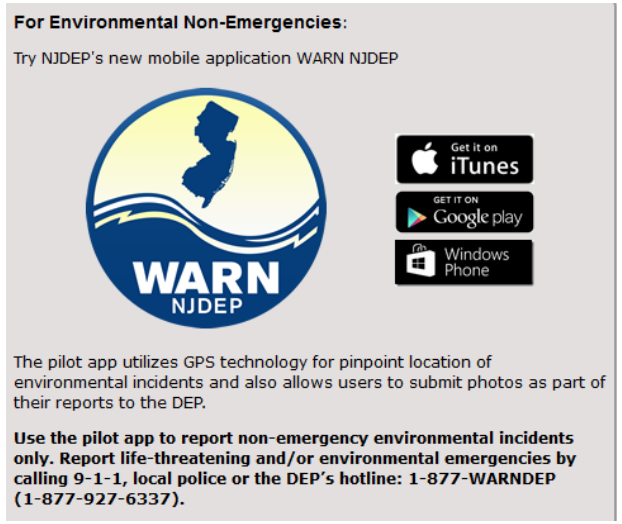
Pressing Enter key during data entry submits the report and some fields will be cleared!

Date Reported: 4/11/2018
Date Observed: 4/11/2018
Time Observed: 12:00 PM
◉ Central ○ Mountain
Air Temperature °F:
Lake Name:
(start typing and names will appear)
(if name is not in list, type Unknown or lake name and fill in Description)
County: Unknown
Latitude:
(typically 45.93 - 49)
Longitude:
(typically -96.55 - -104.05)
Accuracy (meters):
Set/Refresh location using phone GPS
I'm not at the bloom site. Specify location using map
Describe location of bloom
(e.g. boat landing, swimming beach)

Reporting Algal Blooms – Smart Phone Apps

- State-specific app for reporting incidents
  - AR, NJ
- General app for reporting HABs
  - BloomWatch
  - UGA CyanoTRACKER
- Pros: ease of photos, locations, use in the field
- Cons: may be more difficult to follow up with reporting party, generally less detailed

ARIZONA WATER WATCH



Reporting Human Incidents

- 1st step - seek medical attention, contact your physician
- Contact for more information:
  - Local health department – most states
  - Poison control center (1-800-222-1222) - CO, FL, NE, UT, WI, WY
- Reporting form
  - Specific for human illness - IL
  - Part of bloom reporting form - CA
- Reporting illness
  - Report to state health agency
    - Report as general "waterborne illness" – ID
    - Report as "unusual condition or emerging infectious disease" – WV
    - Report as HAB-specific illness – IA, MD, WI
    - Encourage voluntary reporting – most states
  - Report to CDC OHHABs
    - Specific link to OHHABS identified - ID, IA , OR, VA

Reporting Domestic Animal Incidents

- 1st step – contact your veterinarian
- Contact for more information:
  - Poison control center (1-800-222-1222)
  - Pet poison hotline (855-764-7661) – ID
  - State health agency staff - OR
- Reporting form
  - Specific for animal illness
    - Separate small and large animal forms - MN
  - Part of bloom reporting form – CA
- Report to
  - State public health veterinarian or state agency – IN, OR, WI, WY
- Report to CDC OHHABs

Reporting Fish or Wildlife Incidents

- Reporting form
  - Part of bloom reporting form
- Report to
  - State wildlife agency - CA
  - State public health veterinarian – WY
  - Hotline for fish and/or wildlife impacts – FL, MD
  - USGS Wildlife Health Center
- CDC OHHABs reporting

RECREATIONAL WATER

Monitoring – Timing

- "Reactive monitoring" in response to bloom/illness reports – most states
- Incorporate into ongoing monitoring
  - Ambient water quality monitoring
  - Routine beach/lake fecal bacteria monitoring – IA, NE
- One-time, special study
  - USGS
  - Academic research
  - University extension

Monitoring – Participants

- Agency staff
  - Initial response (CA, RI)
  - Routine
- Native American tribes – CA (Clear Lake and Klamath Basin)
- Waterbody/land managers - OR
- Local municipalities
- Drinking water suppliers
- Researchers
- Citizen volunteer programs - MO, NY

Monitoring – Analyses

- Relates to what data are used as action levels for response/advisory
- Visual observations – bloom, Secchi depth, stick and jar test
- Cell identification and counts
- Chlorophyll-a
- Phycocyanin
- Cyanotoxins
  - Lab
  - Field tests
  - Deployed instruments (Environmental sample processor)

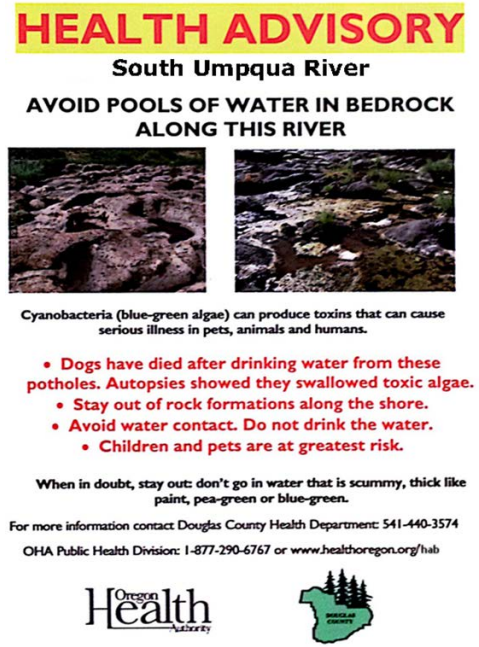
Recreational Water Advisories and Signage

- Long-term, general awareness signage - OH, VA, WV, PA (Lake Erie)
- Under investigation signage – CO, WY*
- Specific advisory/signage
  - Single (non-tiered) advisory
    - 1 level based on presence/duration of bloom - DE, FL, NM
    - 1 level based on action levels - CO, IA, ID*, IL, MA, MD, MI*, MO*, NC, NE, NH, OK, OR, RI, WI
  - Tiered advisories based on action levels
    - 2 levels – CT, IN, KY*, MN, MT, ND, OH, PA, VA, VT, WV, WY*
    - 3 levels – CA, KS, NJ, NY, UT, WA, USACE Tulsa

*Received upon request

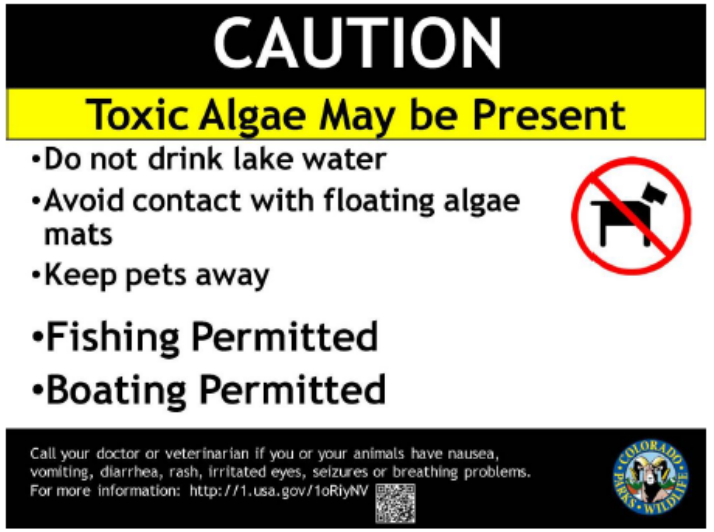
Recreational Water – Awareness / Long-term Signage

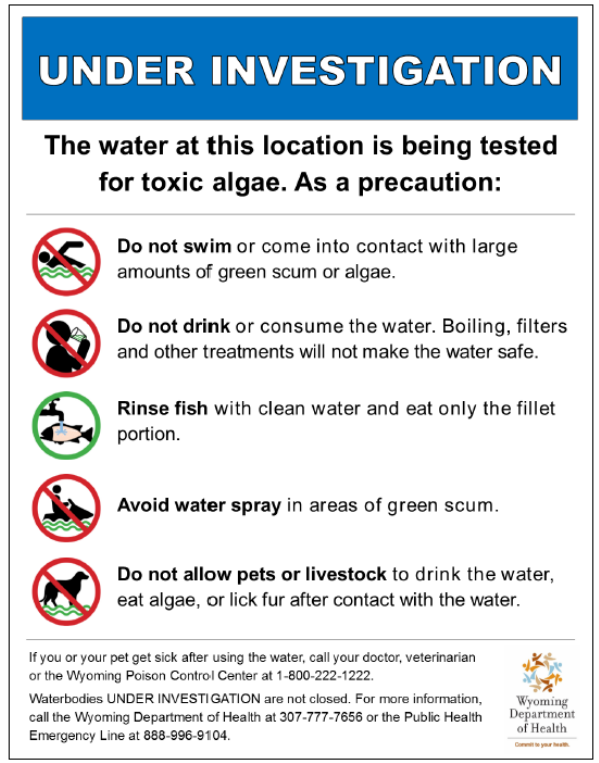
- General awareness
  - Pictures and descriptions of HABs
  - General precautions
  - Contact info
  - OH, VA, WV, PA (Lake Erie)
- Permanent
  - OR (S. Umpqua R.)



Recreational Water – Under Investigation

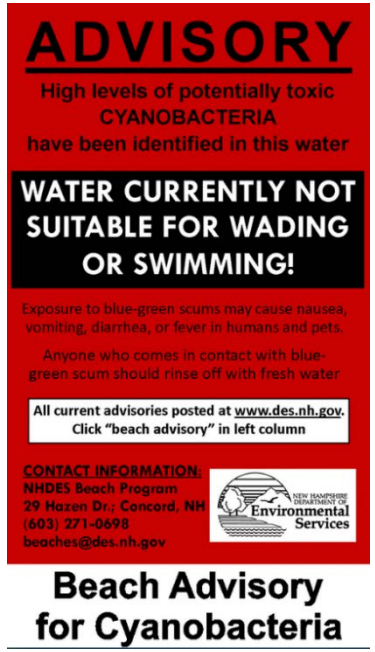
- Avoid contact with bloom, do not drink water
- CO (“caution”), WY

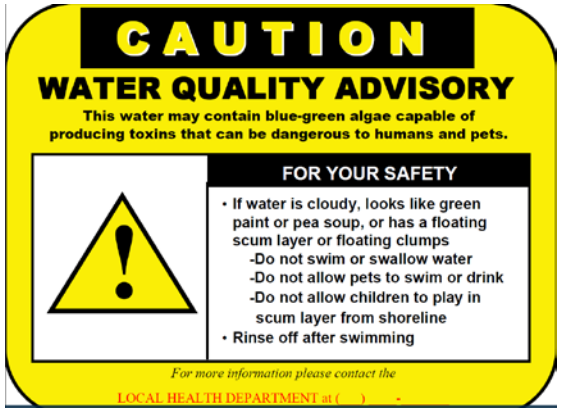




Recreational Water – Single (Non-tiered) Advisory Sign

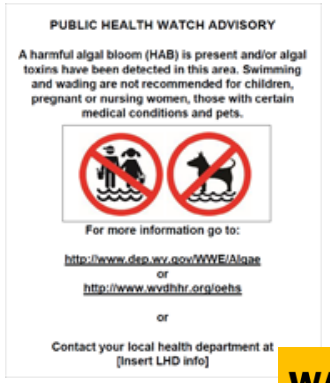
- Typically avoid water contact, particularly pets and children
- Based on presence/ duration of bloom
  - DE, FL
- Based on action levels
  - CO, IA, ID, MA, MD, MI, MO, NC, NE, NH, RI, OK, OR, WI

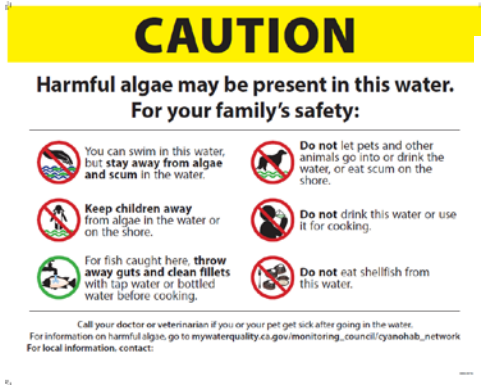


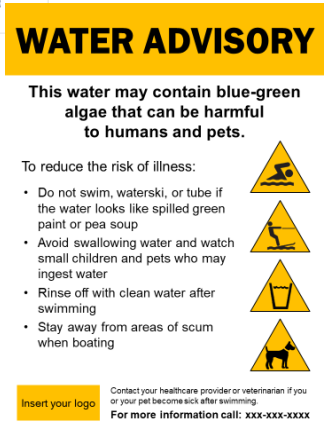


Recreational Water - Tier I

- Typically avoid water contact, particularly pets and children
- Advisory: MN, ND, PA, VA, WY
- yellow/low alert: VT,
- Watch: KS, KY, WV,
- Caution: CA, WA
- Recreational use advisory: PA, OH
- Cautionary/Visual Category 2: CT
- Suspicious: NY

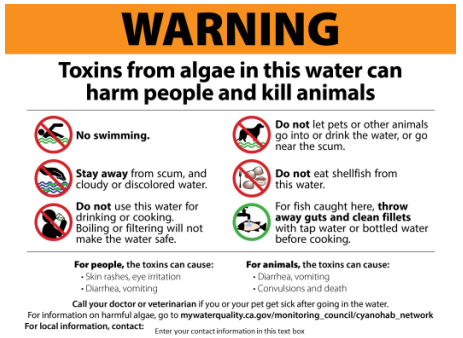






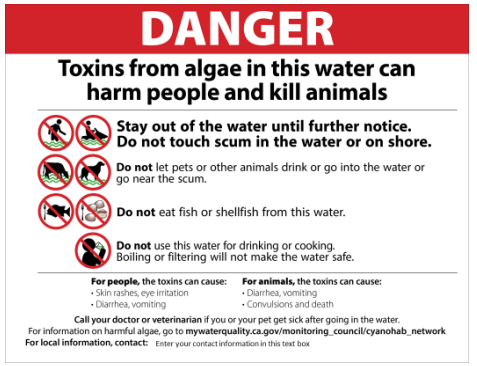
Recreational Water – Tier II

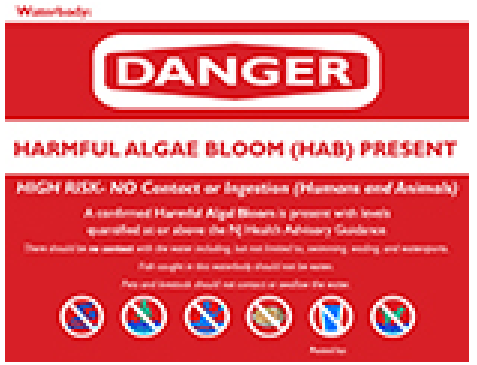
- Typically no water contact
- Warning: CA, KS, KY, MN, ND, NJ, UT, VA, WA, WV
- red/high alert: VT
- Avoid contact: PA
- Condition 2: USACE Tulsa
- Elevated Recreational use advisory: OH
- Beach closure/ Visual Category 3: CT, VT
- Confirmed: NY
- Closed: WY

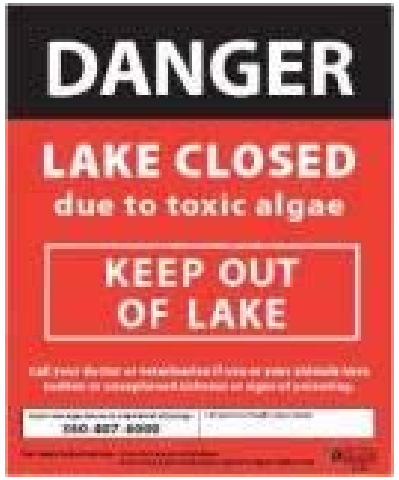


Recreational Water - Tier III

- Typically closure
- Danger: CA, NJ, UT, WA
- Closure: KS
- Condition 3: USACE Tulsa
- Confirmed with High Toxin: NY







Action Levels for Recreational Waters – Cyanobacterial Cell Counts

CyanHAB (cells/mL)*	Source	General signage	Single advisory	Tier I advisory	Tier II advisory	Tier III advisory
4,000	CCHAB, 2016			CA		
10,000	NC, 2017		NC (+BGA sp. dominant)			
<20,000 **	WHO, 2003 (low)			UT, WY		
20,000	WHO, 2003 (low)		ID (MC sp.)	CT, VA	UT	
40,000	ID, 2017; MO, 2016; OR, 2018		ID (total sp.), MD, MO, OR (MC sp.)			
70,000	MA, 2016		MA, NH, RI			
80,000	KS, 2015			KS		
100,000	WHO, 2003 (moderate)		MO, OK, OR (total sp.), WI	IN	CT, VA	
250,000	KS, 2015				KS	
10 million	KS, 2015					KS, UT

* Sorted in increasing numerical order
** with presence of bloom

Action Levels for Recreational Waters – Microcystins

MC (ug/L)*	Source	General signage	Single advisory	Tier I advisory	Tier II advisory	Tier III advisory
0.8	CCHAB, 2016			CA		
<3 **	NJ, 2017				NJ	
3	NJ, 2017					NJ
<4 **	USEPA, 2016			UT		
4	USEPA, 2016; KS, 2015; OR, 2018		CO, ID, OR	CT, IN, KS, MI, NY	UT	
<6 **	OH, 2016	OH, WV				
6	OH, 2016; CCHAB, 2016			KY, OH, PA, WV	CA, VA, VT, WA	
<10 **	WHO, 1999	WI		ND	NY	
10	WHO, 1999		MD, MO, WI	MO, WY	ND	NY (water)
14	MA, 2016		MA, RI			
20	WHO, 1999; OH, 2016; CCHAB 2016; KS, 2015		IA, IL, MI, NE, WI		IN, KS, KY, MI, OH, OK, PA, TX, WV	CA, NY (shore)
2000	WHO, 1999; KS, 2015					KS, UT

* Sorted in increasing numerical order
** with presence of bloom

Action Levels for Recreational Waters – Cylindrospermopsin

CYL (ug/L) *	Source	General signage	Single advisory	Tier I advisory	Tier II advisory	Tier III advisory
1	CCHAB, 2016			CA		
4	CCHAB, 2016				CA	
4.5	WA, 2011				WA	
<5 **	OH, 2016	OH, WV				
5	OH, 2016			KY, OH, PA, WV		
<8 **	NJ, 2017				NJ	
8	USEPA, 2016; NJ 2017; OR, 2018		CO, ID, OR	IN		NJ
10	VT, 2015				VT	
17	CCHAB, 2016					CA
20	OH, 2016		MO		KY, OH, PA, WV	

* Sorted in increasing numerical order
** with presence of bloom

Action Levels for Recreational Waters – Anatoxin-a

ANA (ug/L)*	Source	General signage	Single advisory	Tier I advisory	Tier II advisory	Tier III advisory
detect	CCHAB, 2016			CA		
1	WA, 2008				WA	
8	OR, 2018		CO, OR			
10					VT	
20	CCHAB, 2016		MO		CA	
<27 **	NJ, 2017				NJ	
27	NJ, 2017					NJ
<80	OH, 2016	OH, WV				
80	OH, 2016			IN, OH, PA, WV		
	USEPA, 2016					
90	CCHAB, 2016					CA
300	OH, 2016				OH, PA, WV	

* Sorted in increasing numerical order
** with presence of bloom

Action Levels for Recreational Waters – Saxitoxin

SAX (ug/L) *	Source	General signage	Single advisory	Tier I advisory	Tier II advisory	Tier III advisory
<0.8 **	OH, 2016	OH, WV				
0.8	OH, 2016			OH, PA, WV		
3	OH, 2016				OH, PA, WV	
4	OR, 2018		CO, OR			
10	MO, 2017		MO			
75	WA, 2011				WA	

* Sorted in increasing numerical order
** with presence of bloom

Human Fish/Shellfish Consumption Advisories

- General precautions
  - Fish:
    - If you fish, remove guts and rinse in clean water;
    - Do not fish until bloom disappears;
    - OR
    - Wait a couple weeks after the bloom disappears to be "extra safe"
  - Shellfish: do not consume
  - Most states include as part of general signage

- Cyanotoxin tissue levels
  - CA

Table 4: Cyanotoxin Action Levels for Sport Fish and Shellfish

Chemical	RfD[1]	Action Level[2]
Units	mg/kg-d	ng/g tissue ww[4]
Microcystins[3]	6.4×10^{-6}	10
Cylindrospermopsin	3.3×10^{-5}	70
Anatoxin-a	2.5×10^{-3}	5000

[1] RfDs calculations described in section III above
[2] Based on typical consumption rate of self-caught fish in California (one meal per week) and body weight of 70 kg. See Appendix II for calculations. Children are assumed to eat smaller meals (2 - 4 ounces uncooked).
[3] Apply action levels to the sum of all detected microcystins until subchronic toxicities of the other variants are clarified.
[4] Wet weight. Action level units assume fresh (or wet) weight of the fish tissue.

  - FDA
    - SAX, 800 ng/g (0.8 mg/kg) ww in shellfish

Dog/Livestock Advisories

- General precautions
  - Avoid contact with water, scum, and mats
  - Provide separate source of drinking water
  - Do not allow them to groom after contact and rinse with clean water
  - Wait to graze pastures if contaminated irrigation water used
- General signage includes dogs
- Specific action levels for domestic animals
  - OR (also used in PA)
  - CA (also used in IN)
  - Drinking water ingestion rate does not account for preferential drinking and eating mat/scum
- Specific signage for domestic animals
  - Lake Erie (PA)

Dog/Livestock Action Levels

Animal	Type	MC	ANA	CYL	SAX	Source
Water intake (ug/L)						
Dog	Caution level*	0.8	Any detect	1	N/A	CCHAB, 2016
	Use advisory	0.2	0.4	0.4	0.02	OR, 2018
	Swimming	0.8	Any detect	1.0	N/A	IN (adapted from CCHAB, 2016)
	Guidance value	0.2	0.6	0.2	3	PA Lake Erie (adapted from OR)
Cattle (dairy**)	Subchronic	0.9	40	5		OEHHA, 2012
	Acute	50	40	60		OEHHA, 2012
Crust and mat intake (mg/kg dw)						
Dog	subchronic	0.01	0.3	0.04		OEHHA, 2012
	acute	0.5	0.3	0.5		OEHHA, 2012
Cattle (dairy**)	subchronic	0.1	3	0.4		OEHHA, 2012
	acute	5	3	5		OEHHA, 2012

* Recommended for use in CA to account for preferential ingestion by dogs (vs acute and sub-chronic values based on water ingestion rate only)
** Action levels for beef cattle were also developed but were higher values than for dairy cattle

DRINKING WATER

Drinking Water Monitoring – Federal Resources

- Federal requirement under Unregulated Contaminant Monitoring Rule (UCMR 4; 2016)
  - Monitoring of cyanotoxins in drinking water for 2018-2020
  - Monitoring varies depending on size of drinking water system
  - Surface water or ground water "under the direct influence of surface water" sources only
- Many other tools and resources available
  - https://www.epa.gov/ground-water-and-drinking-water/cyanotoxins-drinking-water

Cyanotoxin Tools For Public Water Systems	Additional Information about Cyanotoxins in Drinking Water
• Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water	• Cyanotoxin Drinking Water Health Advisories
• Cyanotoxin Management Plan Template and Example Plans	• Detection and Methods
• Water Treatment Optimization for Cyanotoxins	• Control and Treatment
• Drinking Water Cyanotoxin Risk Communication Toolbox (English and Spanish versions)	• Cyanotoxins and the Safe Drinking Water Act: Drinking Water Protection Act, Contaminant Candidate List and the Unregulated Contaminant Monitoring Rule
• Cyanobacteria and Cyanotoxins: Information for Drinking Water Systems Factsheet	• Algal Toxin Risk Assessment and Management Strategic Plan for Drinking Water
• Harmful Algal Blooms and Drinking Water Factsheet	• U.S. EPA's CyanoHABs Webpage
• Fact Sheet: Possible Funding Sources for Managing Cyanobacterial Harmful Algal Blooms and Cyanotoxins in Drinking Water	

Drinking Water Monitoring – State Resources

- State programs often provide support, resources, technical expertise to drinking water systems. Examples include:
  - CA – collaborate with water systems on management plan, response, and messaging
  - IA – 2016-2017 study of microcystins in weekly raw water samples, flow charts for monitoring and public notice templates for MC and CYL
  - VT - no cost MC and CYL analysis at state lab for 22 systems using Lake Champlain water in summer 2017; weekly results posted online

Cyanotoxin Levels for Drinking Water - International

- WHO
  - MC - provisional guideline value of 1 ug/L total MC-LR
- 2015 updated summary of international drinking water guidelines (Soltani, Hess et al. 2017)
  - Most incorporate WHO value for MC
  - Australia (1.3 ug/L), Canada (1.5 ug/L) slightly higher for MC
  - Brazil and New Zealand include guideline values for other cyanotoxins

Cyanotoxin Levels for Drinking Water – United States

- USEPA
  - 2015 Drinking water Health Advisory for MC and CYL
  - ANA
    - No drinking water HA determined
    - 2015 Health Effects Support Document
- States
  - Most reference USEPA and/or WHO
    - Some recommend use of USEPA values for vulnerable populations only (e.g., UT, VA)
  - OH, OR, MN, VT have state-specific values
  - Some reference other state's values (e.g., MI, UT, WV)

Drinking Water Guidelines – United States

Group	Source*	MC (ug/L)	ANA (ug/L)	CYL (ug/L)	SAX (ug/L)	Type
Vulnerable population (infants and kids under 6 years old)	MN	0.1 (HBV)	0.1 (RAA)	-	-	HBV, health based value; RAA, risk assessment advice
	OH	0.3	20	0.7	0.2	
	OR	0.3	0.7	0.7	0.3	
	USEPA	0.3	-	0.7	-	Heath advisory levels
Non-vulnerable (adults and kids at least 6 years old)	OH	1.6	20	3	0.2	
	OR	1.6	3	3	1.6	
	VT	0.16	0.5	0.5	-	Heath advisory levels
	USEPA	1.6	-	3	-	Heath advisory levels
	WHO	1.0	-	-	-	Provisional guideline value
Do not Use	OH	20	300	20	3	Elevated recreational public health advisory thresholds
	OR	10	20	20	10	

* In alphabetical order by group

USEPA Drinking Water Advisories

- Vulnerable: exceed Health Advisory for infant and <6 year old
  - Vulnerable populations should not drink the tap water and should use alternative sources of water
  - Do not boil the tap water
  - Prevent accidental ingestion of water during bathing for infants and young children
  - Individuals not in vulnerable category may drink water
  - Everyone can use tap water for washing hands, bodies, dishes, toilet, cleaning, and laundry
- Everyone: exceed Health Advisory for adult and 6+ year old
  - Do not drink or boil the tap water
  - Use alternative sources of water for drinking, infant formula, ice, preparing food and beverages
  - Provide alternative source of water for animals
  - Prevent accidental ingestion of water during bathing for infants and young children
  - Everyone can use tap water for washing hands, bodies, dishes, toilet, cleaning, and laundry

USEPA's Risk communication toolbox

(also in Spanish)

Toolbox Contents

Templates

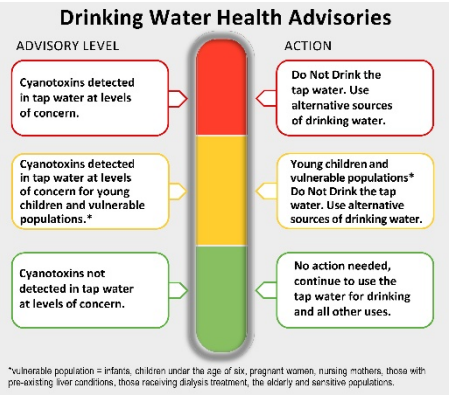
- Drinking Water Advisory - Everyone
- Drinking Water Advisory - Vulnerable Populations
- Drinking Water Advisory - Lifted
- Press Release - Everyone
- Press Release - Vulnerable Populations
- Press Release - Advisory Lifted
- Social Media - Everyone
- Social Media - Vulnerable Populations
- Social Media - Lifted
- Public Messaging

General Information

- Fact Sheets
- FAQs

Graphics

- Icon-Based Style
- Thermometer and Stoplight Style
- Speedometer Style



OUTREACH AND MAPPING

Outreach Materials – Human Health

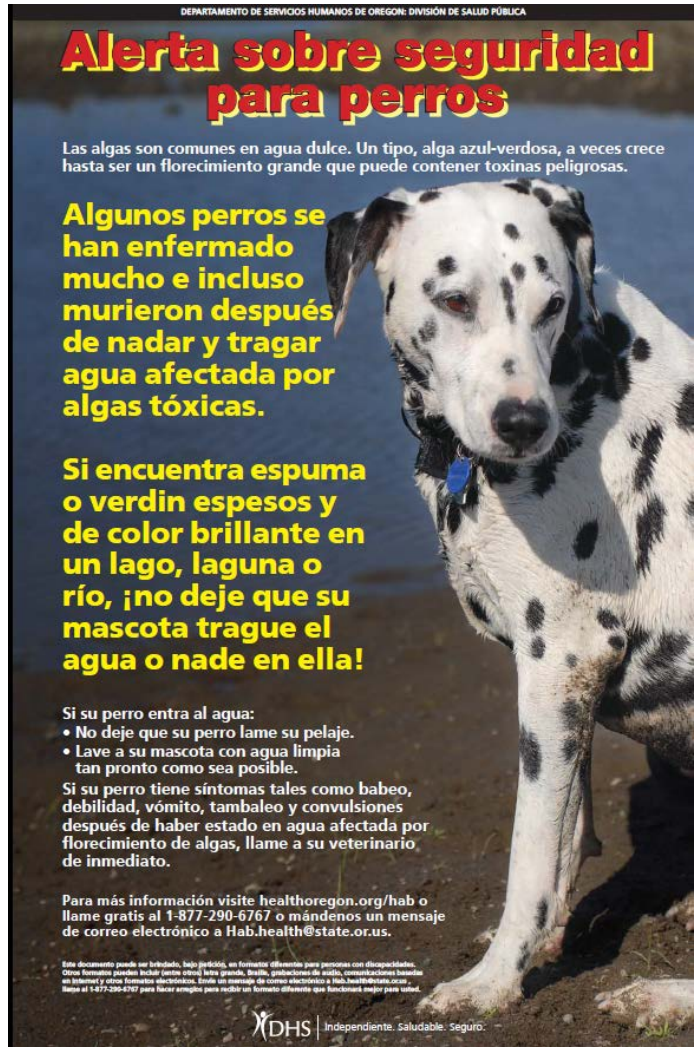
- FAQs
  - Available from most states
  - Generally include overview, general precautions, next steps in case of exposure
- Physician reference
  - CDC– possible signs and symptoms
  - KS – also includes overview on monitoring, advisories, and reporting info

Outreach Materials – Domestic Animals

- Pet safety
  - CDC
  - ID, KS, MA, MN, NY
- Vet fact sheet
  - Generally include signs and symptoms, differential diagnosis, laboratory findings
  - CDC
  - CA – also includes potential sample analytical process and support
  - MN
  - VT – also includes link to current conditions map and overall occurrence in VT
  - WI – part of overall toolkit
- Cyanobacteria poisoning and livestock
  - Western Australia
  - ND

Multilingual Materials

- Spanish
  - Signage: CA, UT, VA, WY
  - FAQ: VA, MA
  - Safe recreational water use: VA, MA
  - Pet safety: MA, OR
- Multiple
  - HABs in freshwater (MA; 7 other languages)

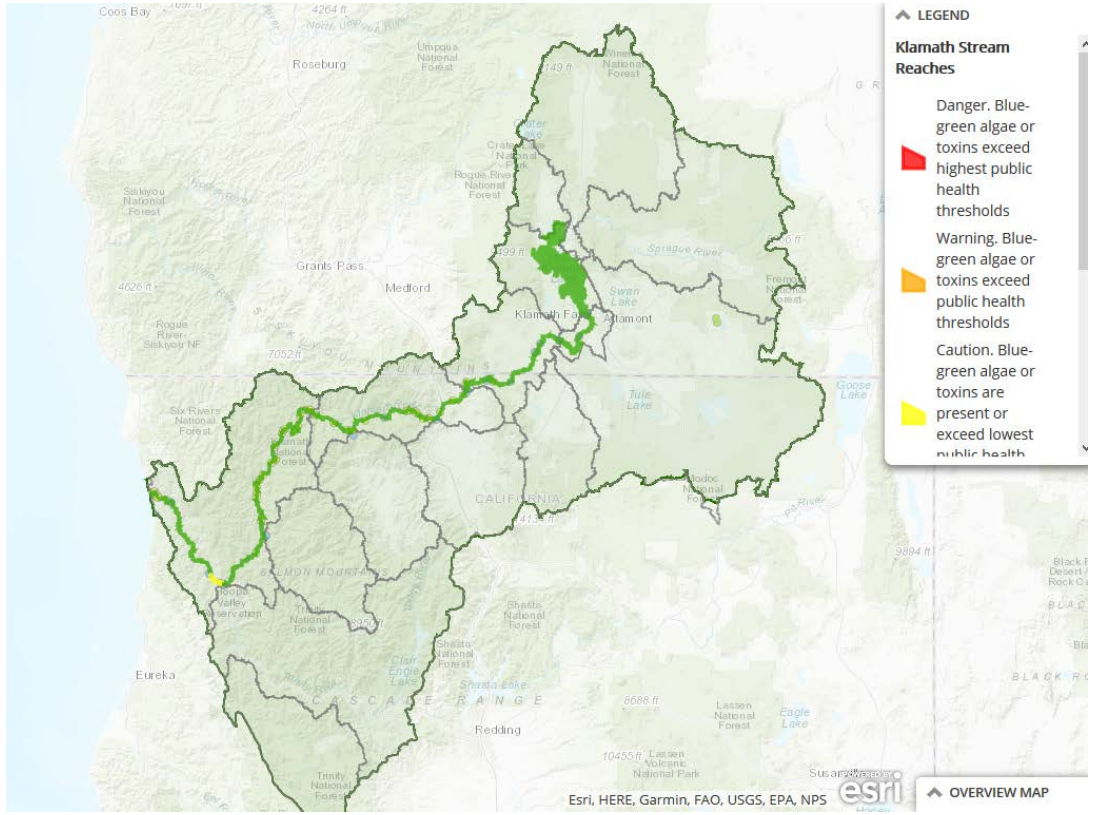


Mapping

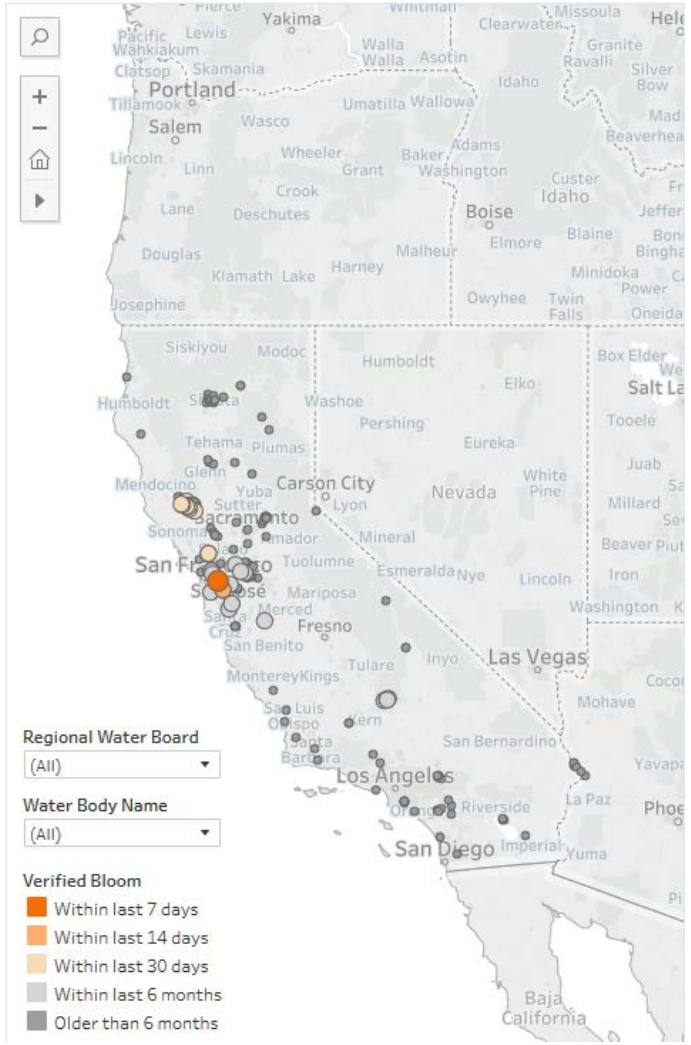
- Incorporated with existing monitoring
  - Beach fecal bacteria monitoring (often seasonal)
  - Ambient water quality monitoring (rivers and/or lakes)
- Posted advisories
  - Recreational water
  - Drinking water
- Toxin data
- Bloom presence/absence

Mapping Examples - California

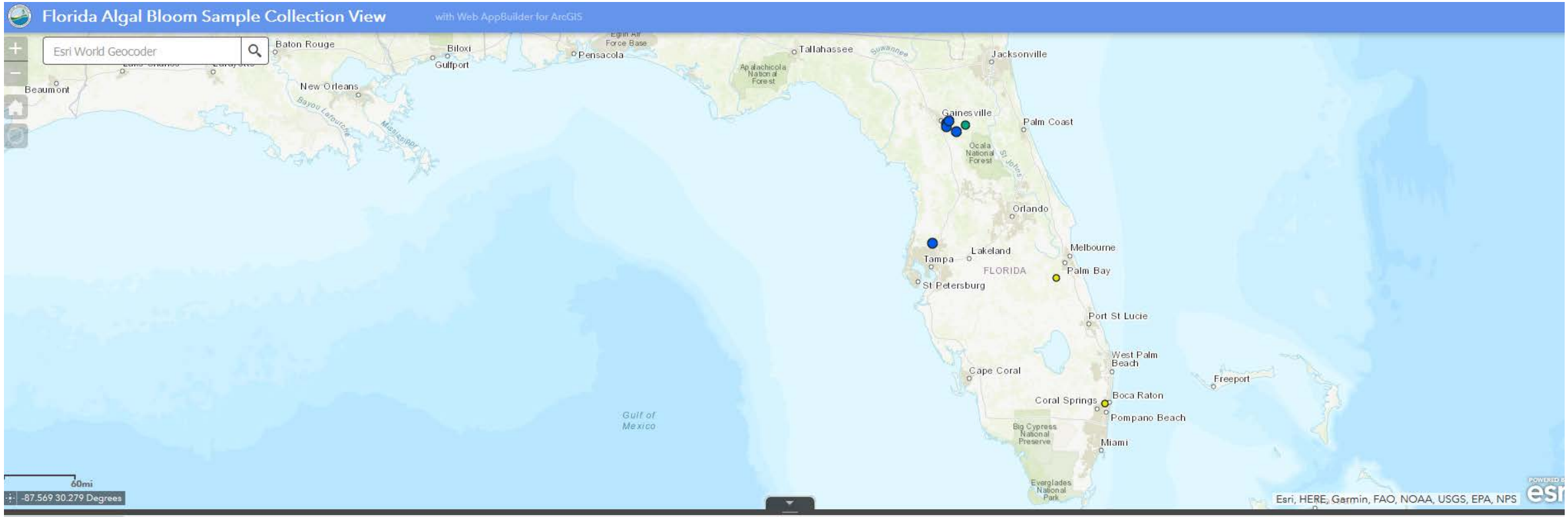
Klamath Basin



Statewide



Mapping Examples - Florida

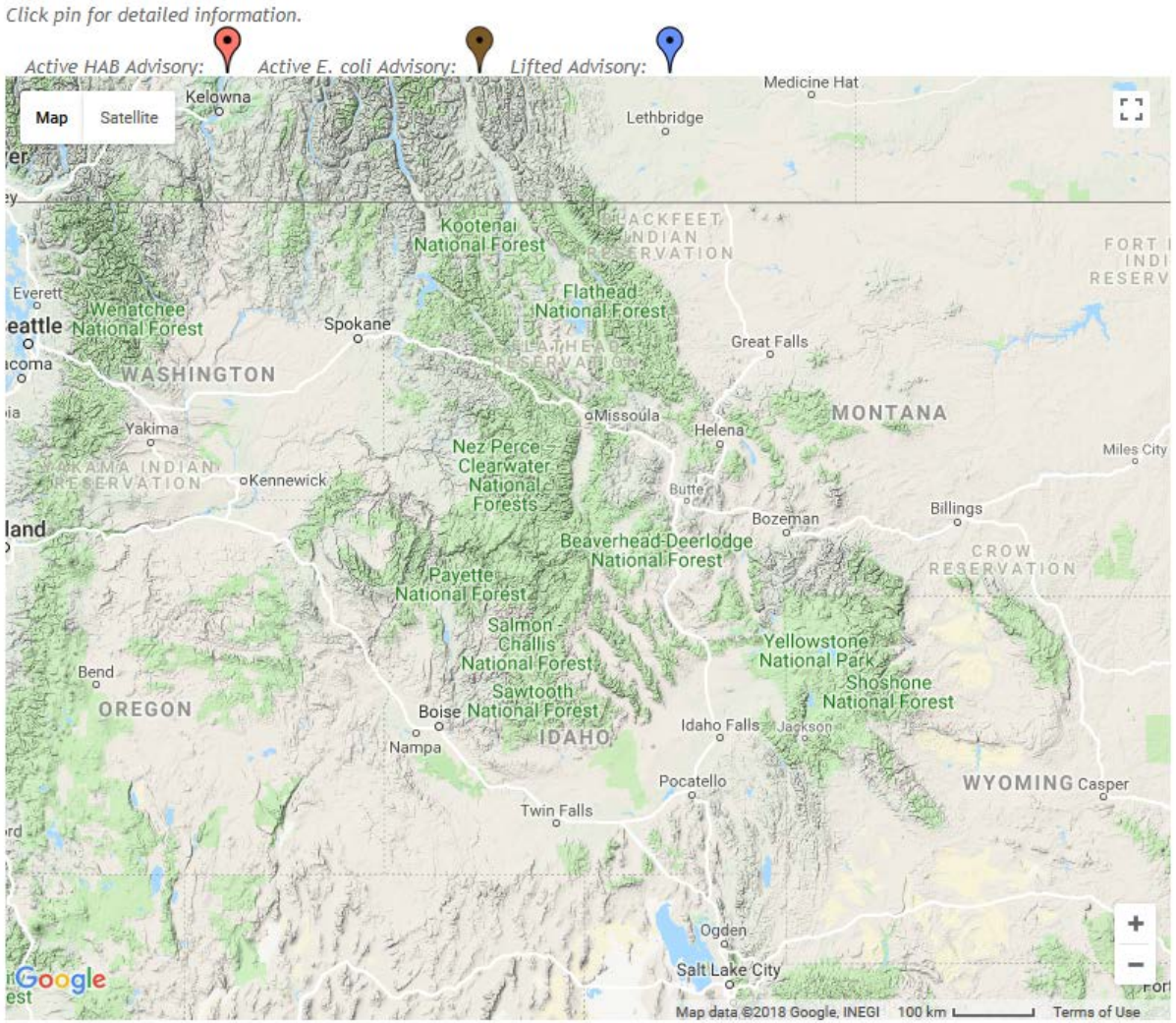


Site Visits - within 30 days | Site Visits - past 31-60 days | Site Visits - past 61-90 days | Site Visits - older than 90 days

Options | Filter by map extent | Zoom to | Clear selection | Refresh

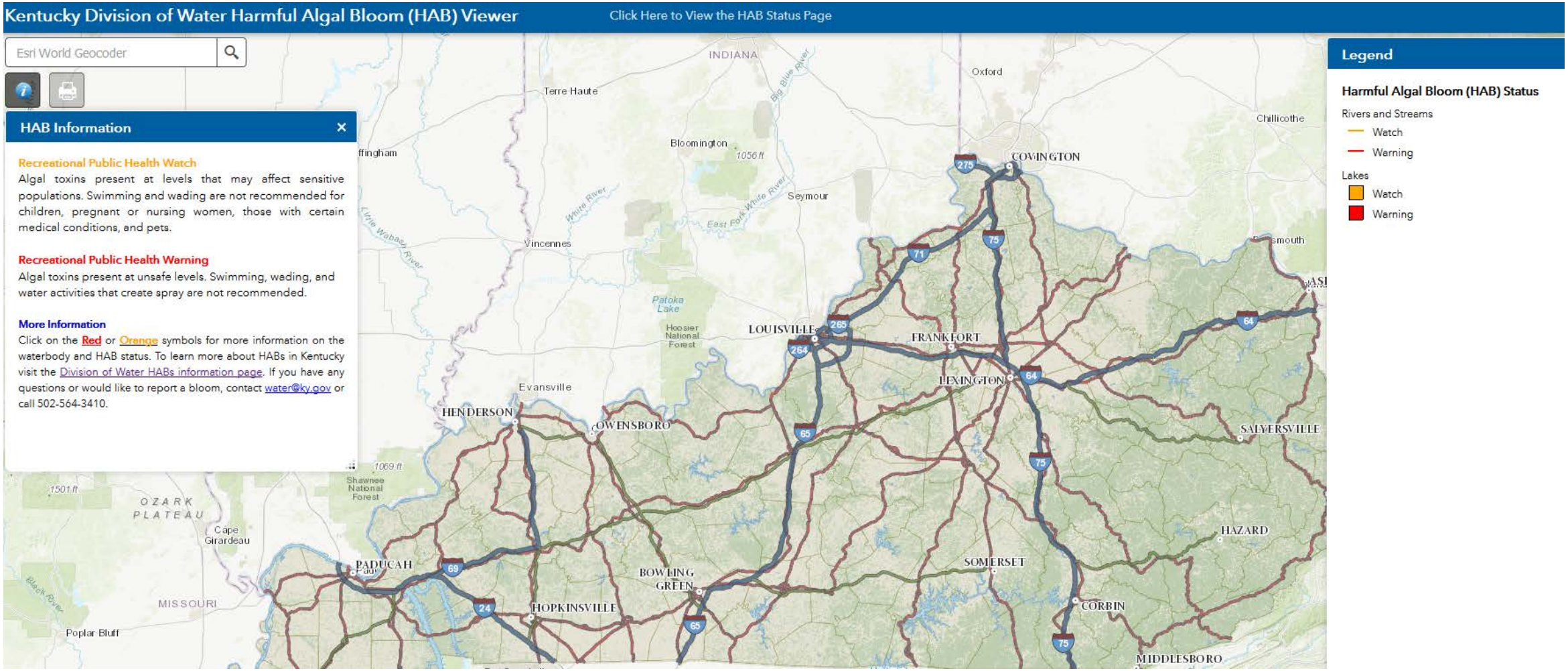
Site Visit Date and Time	Sample Location	County	Site Visited By	Sample Taken?	Sample Depth Description	Sample Depth (meters)	Analyzed By	Other Lab name	Comments	Latitude	Longitude	Algal ID	Total Microcystin Toxin (micrograms/L)	Other Toxin (micrograms/L)
3/15/2018, 7:20 AM	Prairie Creek at SR20	Alachua	SJRWMD	Yes	Surface grab	0.30	DEP	Greenwater Labs	Algae identified by DEP; toxin analysis performed by Greenwater	29.6111	-82.2483	Dominant taxon: Aphanizomenon flos-aquae	0.34	Anatoxin-a: not detected; Cylindrospermopsin: not detected; Saxitoxin/Paralytic Shellfish Toxins: not detected

Mapping Examples - Idaho

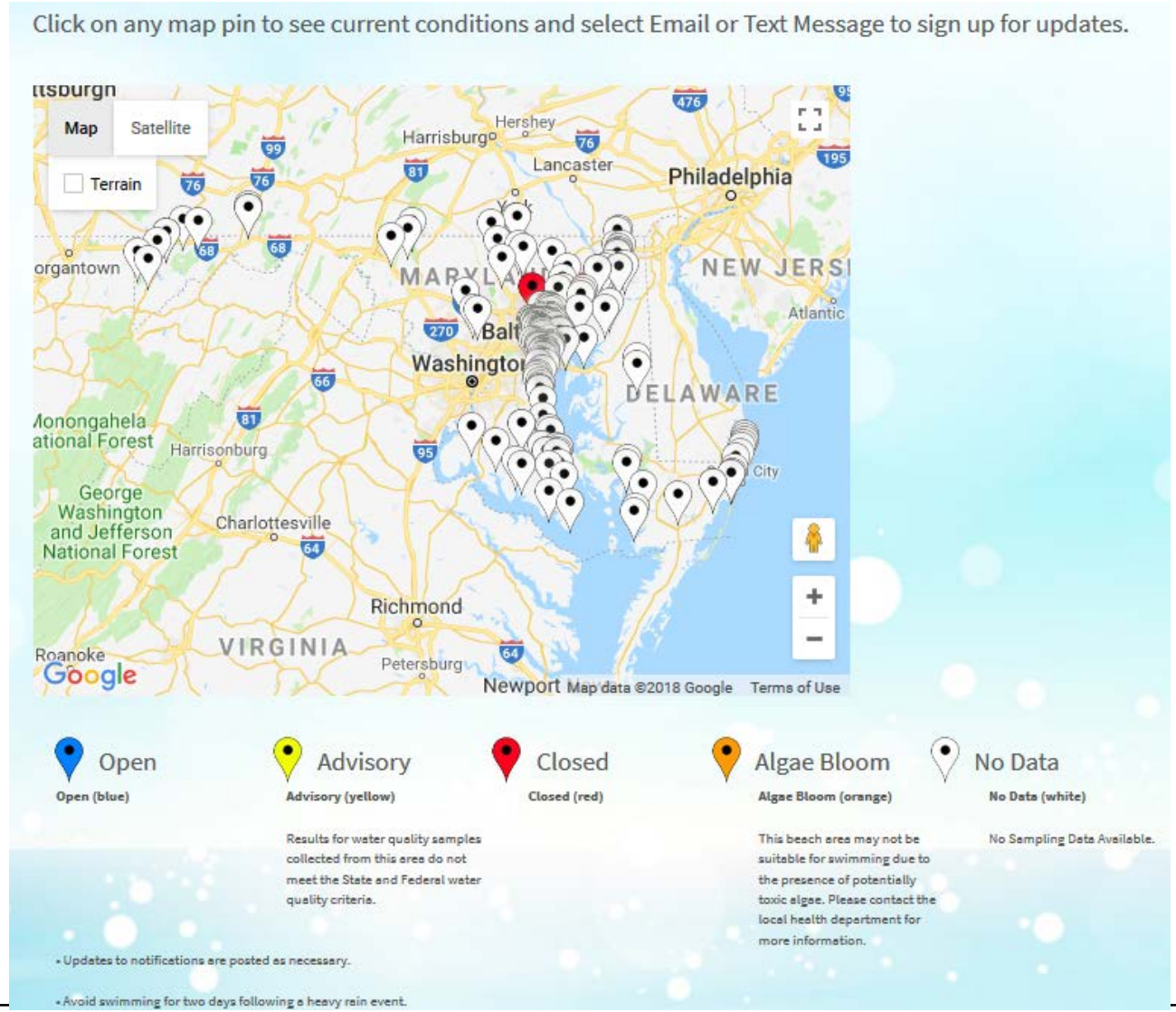


There are no current Harmful Algal Bloom advisories at this time.

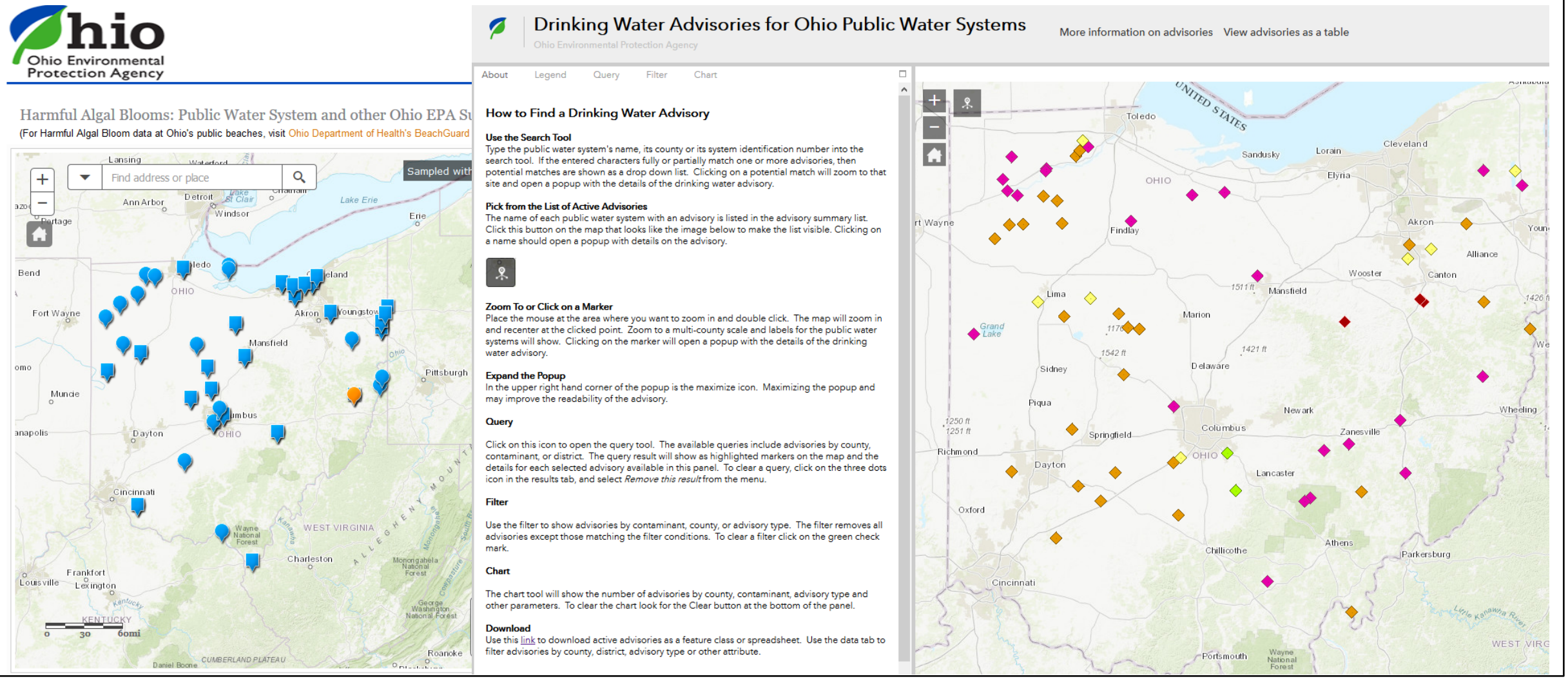
Mapping Examples - Kentucky



Mapping Example – Maryland (Beaches)



Mapping Examples
– Ohio (monitoring and drinking water advisories)



Summary (1)

- Underlying regulations and funding support well-developed programs
- Response plans help coordinate efforts and provide clear and consistent process
- Reporting processes vary considerably
- Monitoring
  - Many states have reactive monitoring in response to blooms
  - Routine monitoring often tied to existing ambient water quality monitoring or fecal bacterial monitoring for recreation, and may utilize volunteers
  - Current cyanotoxin monitoring of drinking water sources under EPA UCMR4

Summary (2)

- Recreational water advisories and action levels vary considerably
  - Different action levels or same action levels applied differently
  - Different terminology and signage, but generally similar recommendations/precautions
- Outreach materials
  - Many states provide general overview of HABs and health risks, links to CDC materials
  - Some states have materials available in Spanish, few states provide resources in multiple languages
- Mapping resources convey monitoring data and/or advisories for specific locations

Questions or Suggestions on Further Outreach?

- Future plans
  - Relay information through CCHAB subcommittees
  - Specific information upon request
    - 916-322-2088
    - Rebecca.Stanton@oehha.ca.gov
- Other opportunities?