

USACE Water Quality and HAB Mission

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USACE WQ Mission

- Federal Water Pollution Control Act
- ER 1110-2-8154
 - ▶ *“provides one of the greatest opportunities for the USACE to demonstrate its commitment to environmental leadership, conservation, restoration, and stewardship.”*



USACE WQ Program Objectives

- Ensure compliance with applicable state and federal water quality regulations as mandated by federal law and EO 12088



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- Provide support to water management, project operations and navigation



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- Provide support to water management, project operations and navigation
- Monitor water quality conditions, establish baseline conditions, assess current water quality status and identify any significant water quality trends



USACE WQ Program Objectives

- Ensure compliance with applicable state and federal water quality regulations as mandated by federal law and EO 12088
- Provide support to water management, project operations and navigation
- Monitor water quality conditions, establish baseline conditions, assess current water quality status and identify any significant water quality trends
- Evaluate the effectiveness of the Water Control Plan



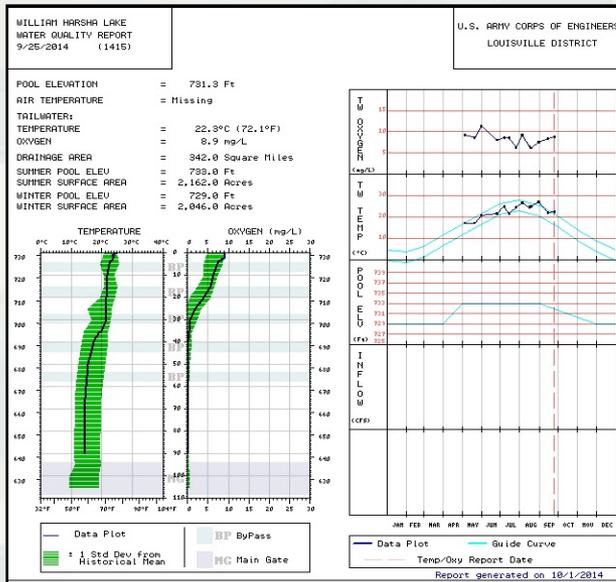
WQ Surveys and Studies



- Project profiles
- Ambient surveys
- Intensive surveys
- Special studies



WQ Surveys and Studies



- Project profiles
 - ▶ Monitor stratification
 - ▶ Water management
- Ambient Surveys
 - ▶ Yearly monitoring



WQ Surveys and Studies



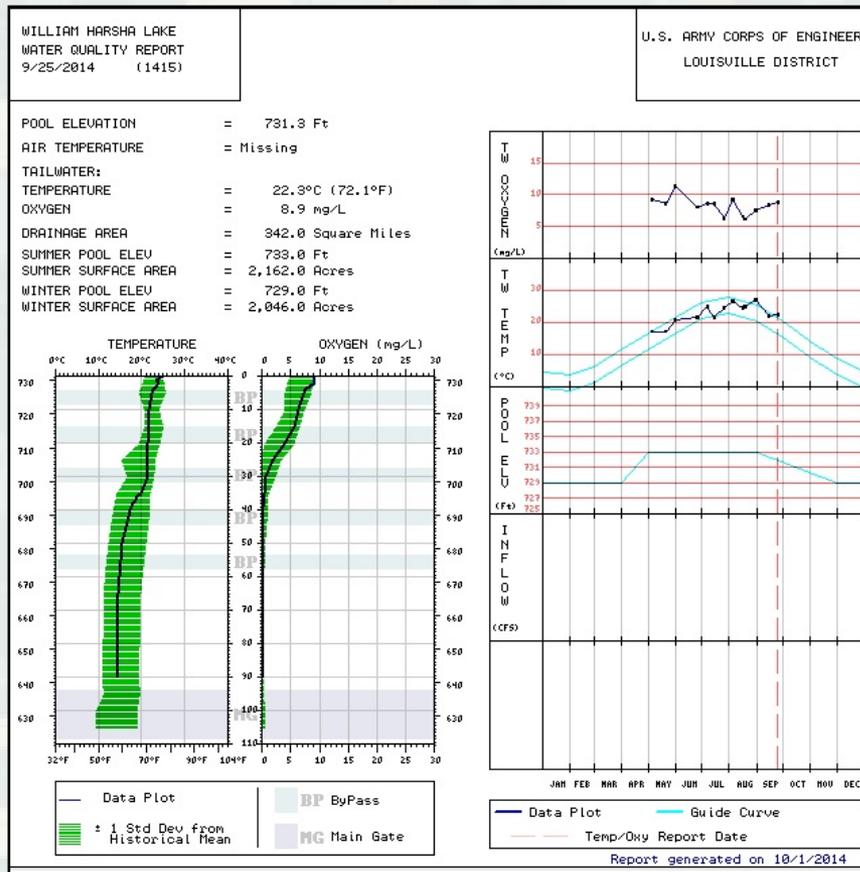
- Intensive Surveys
 - ▶ full assessment
 - ▶ ~ 10 year rotation
 - ▶ Repetitive visits
 - ▶ Includes biological surveys (2015)
- Special Studies



Project Profiles

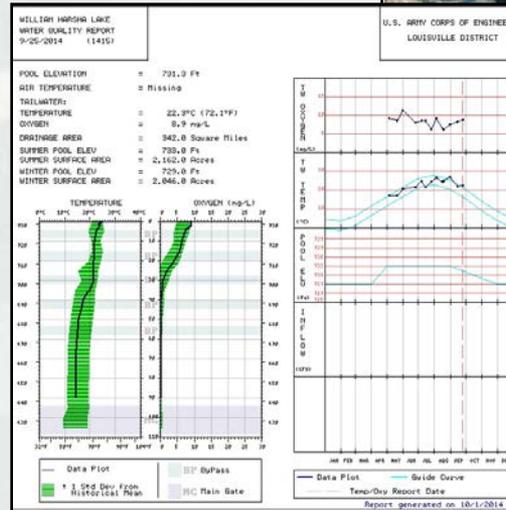
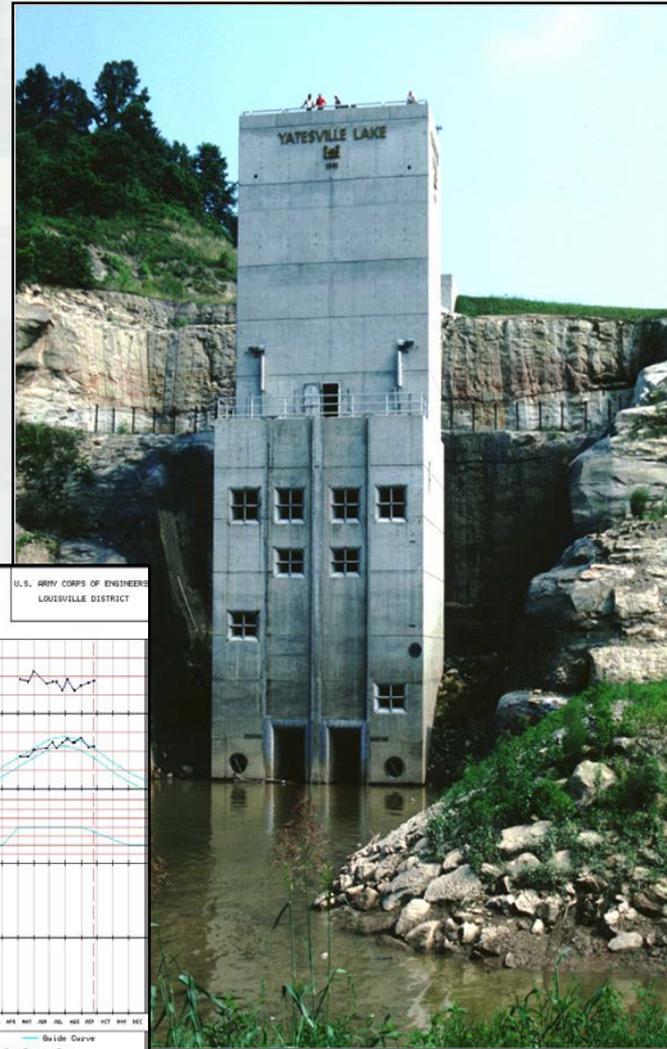


Collected at XXX20001 (damsite) during thermal stratification approximately every two weeks



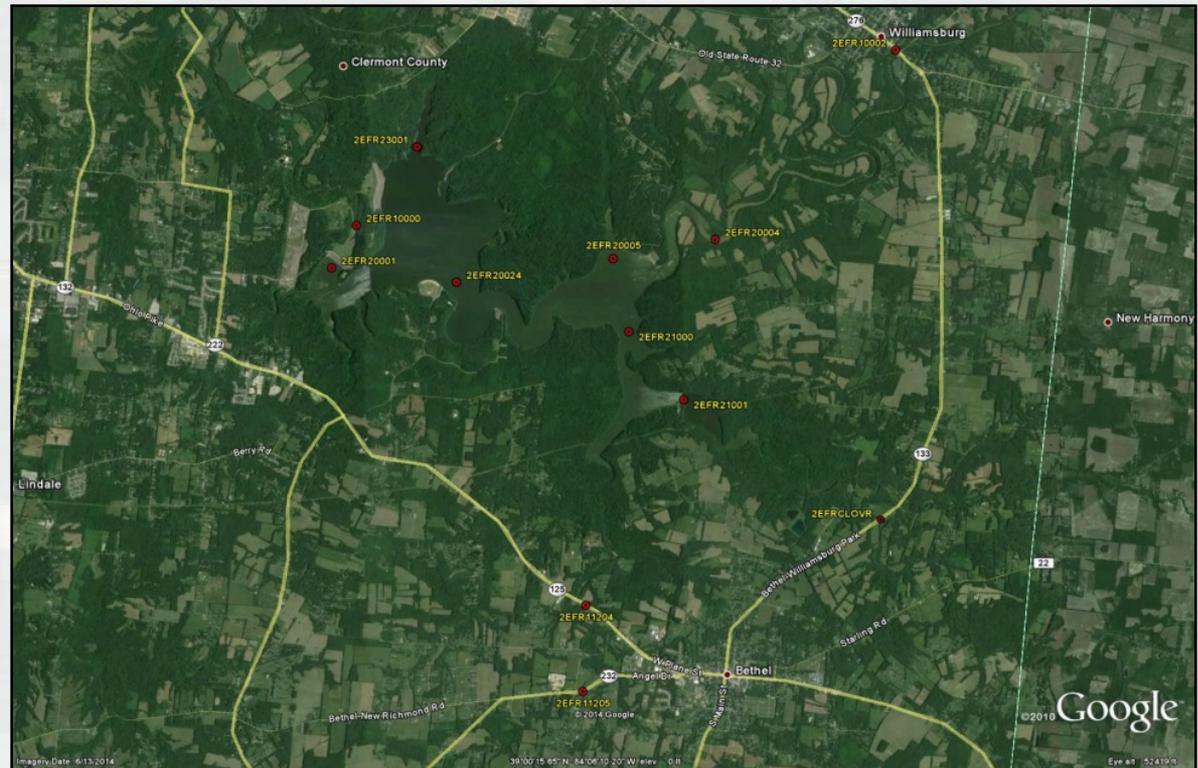
Selective Withdrawal

- Water quality gates
 - ▶ Limited release capacity
 - ▶ Flood events must pass through mains



2014 Ambient Monitoring

- ~10 sites
 - ▶ During thermal stratification
- Field data
 - ▶ Secchi
 - ▶ Temperature
 - ▶ DO
 - ▶ Conductivity
 - ▶ pH
 - ▶ Turbidity



2014 Ambient Monitoring



- Chemical
 - ▶ Epilimnion
 - ▶ Metalimnion
 - ▶ Hypolimnion
 - ▶ QA

- Biological
 - ▶ 0, 5, 10, 20



Water Chemistry

- Alkalinity
- Aluminum
- Ammonia
- Calcium
- Chloride
- Dissolved Organic Carbon
- Hardness (as CaCO_3)
- Iron
- Magnesium
- Nitrate + Nitrite
- Orthophosphate
- Phosphorus
- Potassium
- Sodium
- Sulfate
- Total Dissolved Solids
- Kjeldahl N
- Total Organic Carbon
- Total Solids
- Total Suspended Solids
- Atrazine (8081A)
- Decachlorobiphenyl



Water Chemistry

- Antimony
 - Arsenic
 - Barium
 - Beryllium
 - Cadmium
 - Chromium
 - Copper
 - Lead
 - Manganese
 - Mercury
 - Nickel
 - Selenium
 - Silver
 - Zinc
- 2XXX10000 (tailwater)
 - 2XXX20001 (damsite all depths)
 - Hypolimnion (all lake sites)



Biological

- Chlorophyll a
 - ▶ 0, 5, 10, 20
- Phytoplankton
 - ▶ 0, 5, 10, 20
 - ▶ Full counts/Identification
 - ▶ Density/Abundance/Biovolume



Intensive Monitoring 2014



- West Fork
- Carr Fork

- Full assessment
 - ▶ Field, chemical, phytoplankton
 - ▶ Sampled three times



Intensive Monitoring 2015



- Barren and Nolin

- Full assessment
 - ▶ Sampled three times
 - ▶ Field, chemical, phytoplankton, macroinvertebrates
 - Native state's criteria
 - KDOW protocols



Special Studies

- Harsha EFW Coop
- Remote Sensing
- Sediment
- Macroinvertebrates
- Bathymetry
- Ohio River
- *Escherichia coli*
- USGS Gage
- IPA/CESU
- Environmental Flows
- HABs

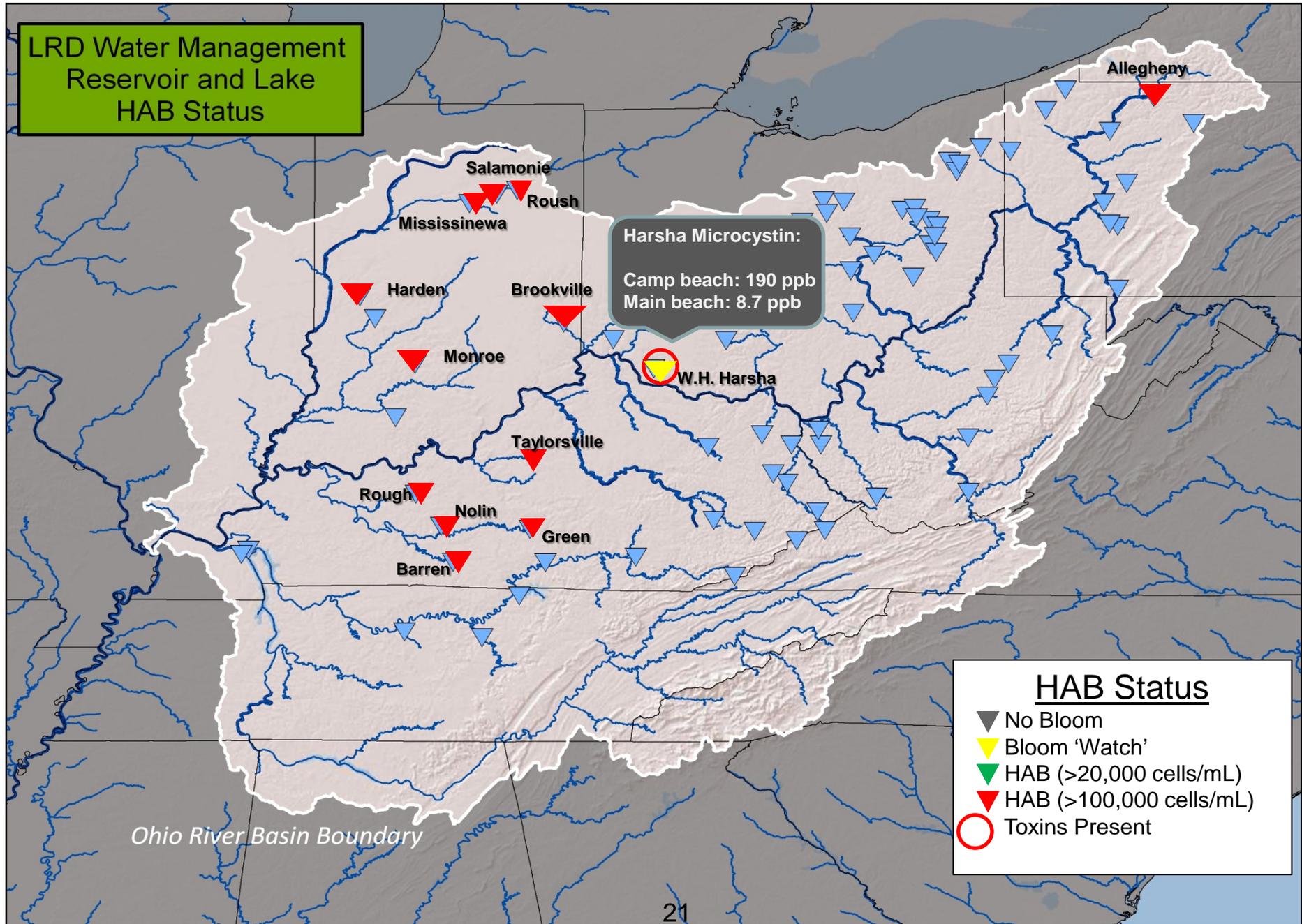


Special Studies

- Harsha EFW Coop
- Remote Sensing
- Sediment
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- *Escherichia coli*
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- Environmental Flows
- HABs ←



LRD Water Management Reservoir and Lake HAB Status



USACE LRD HAB Plan Overview



- WHO Guidelines
 - ▶ Cell counts
- Advisories
 - ▶ > 20,000 cells/mL
- Cautions
 - ▶ >100,000 cells/mL
- Entire Reservoir



LRD HAB Plan Overview

■ WHO Guidelines

- ▶ @ 20,000 cells/mL
 - *ADVISE* the public of increased risk
 - Post ADVISORY signs at appropriate locations – TBD by district HAB plan.
 - Begin sampling on a weekly basis.
 - 2 consecutive weeks of sampling results below the threshold level needed to remove signs.

Blue-green Algae Awareness Level	
ADVISORY	
Elevated Risk of Adverse Health Effects	
BLUE-GREEN ALGAE BLOOMS ARE PRESENT	
<small>For Your Safety, The U.S. Army Corps of Engineers, _____ District Recommends the Following:</small>	
<ul style="list-style-type: none">• DO NOT drink untreated lake water.• Use caution when swimming, water skiing and coming into contact with water.• Children and animals are more likely to get sick with exposure to or consumption of blue-green algae.• Avoid areas with visible algae accumulation.	
Symptoms from exposure may include nausea, vomiting, diarrhea, skin rash, eye irritation, respiratory problems or other unexplained illness.	
<small>For more information go to:</small>	
	
<small>Report algae blooms to:</small>	<small>For additional information contact your local health department:</small>



LRD HAB Plan Overview

- WHO Guidelines
 - ▶ @ 100,000 cells/mL
 - *DISCOURAGE* contact
 - Post CAUTION signs at appropriate locations – TBD by district HAB plan.
 - Continue sampling on a weekly basis.
 - 2 consecutive weeks of sampling results below the threshold level needed to remove signs.

<p>Blue-green Algae Awareness Level</p> <h1 style="margin: 0;">CAUTION</h1> <p>Elevated Risk of Adverse Health Effects</p>	
<p>BLUE-GREEN ALGAE BLOOMS ARE PRESENT</p> <p>For Your Safety, The U.S. Army Corps of Engineers, _____ District Recommends the Following:</p>	
<ul style="list-style-type: none">• DO NOT drink untreated lake water.• Children and pets are more likely to get sick because of blue-green algae.• Contact with the water is <i>discouraged</i> (e.g., swimming, wading, water skiing).• Keep pets/livestock off of the beach and out of the water.• Avoid areas with visible algae accumulation.	
<p>Symptoms from exposure may include nausea, vomiting, diarrhea, skin rash, eye irritation, respiratory problems or other unexplained illness.</p>	
<p>For more information go to:</p> 	
Report algae blooms to:	For additional information contact your local health department:



USACE Louisville District Website

- <http://www.lrl.usace.army.mil/>

LOUISVILLE DISTRICT

US Army Corps of Engineers

Search Louisville District

ABOUT BUSINESS WITH US MISSIONS LOCATIONS CAREERS MEDIA LIBRARY CONTACT

Photo of the week: Autumn colors

Little Clifty Creek at Rough River Lake, Falls of Rough, Ky. (U.S. Army Corps of Engineers photo by Jeffrey Tucker)

Recreation

Water Information

Regulatory/Permitting

Latest News Releases

Army Corps of Engineers waives day use fees for vets, service members at lakes

LOUISVILLE, KENTUCKY – The U.S. Army Corps of Engineers (USACE) announced today that it will waive

Published: 10/27/2014

The U.S. Army Corps of Engineers shares water safety tips for Labor Day holiday

It's almost time to say goodbye to summer. If you'll be spending the weekend on or around the water

Published: 8/28/2014

New leader Col. Christopher Beck takes charge of U.S. Army Corps of Engineers Louisville District

Published: 10/27/2014

Latest Stories

District LDP promotes volunteerism among workforce

Life's most persistent and urgent question is, 'What are you doing for others?' The immortal words of

Published: 10/23/2014

Contaminated soil removed at Hanna City Air Force Station

The U.S. Army Corps of Engineers (USACE) Louisville District has completed a remedial response at

Published: 10/23/2014

Sampling begins at Raco Army Airfield and Missile Site

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Louisville District, U.S. Army Corps of Engineers

Like 2,198

Louisville District, U.S. Army Corps of Engineers



USACE Louisville District Website

The screenshot shows the USACE Louisville District website. At the top, there is a header with the US Army Corps of Engineers logo and the text "LOUISVILLE DISTRICT". Below the header is a navigation menu with links: HOME, ABOUT, BUSINESS WITH US, MISSIONS, LOCATIONS, CAREERS, MEDIA, LIBRARY, CONTACT. The main content area is titled "Water Information" and contains a paragraph about the Water Management section. Below this is a "Quick Links" section with links to "3-day NWS River Forecast", "Daily Lake Report", "Daily River Report", and "Quantitative Precipitation Forecasts". There are two main columns of links: "Water Control" and "Water Quality". The "Water Quality" column has a red arrow pointing to the link "Harmful Algal Blooms (HABs)".

LOUISVILLE DISTRICT

US Army Corps of Engineers

Search Louisville District

HOME ABOUT BUSINESS WITH US MISSIONS LOCATIONS CAREERS MEDIA LIBRARY CONTACT

HOME > MISSIONS > CIVIL WORKS > WATER INFORMATION

Water Information

The Water Management section is responsible for the daily operation of twenty multi-purpose reservoir projects within the Louisville District and the collection and dissemination of data associated with those projects in regards to reservoir control and water quality. Water Management is composed of the Water Control Team and the Water Quality Team.

Quick Links

- 3-day NWS River Forecast
- Daily Lake Report
- Daily River Report
- Quantitative Precipitation Forecasts

Water Control	Water Quality
Current Stage Data	Water Quality Home
DCPs by Basin	Harmful Algal Blooms (HABs)
External Links	Other Concerns
Lake Information	Updated Lake Temperatures and Dissolved Oxygen Levels
Navigation Conditions	Biological Assessments
Other USACE Information	



USACE Louisville District Website

LOUISVILLE DISTRICT

 US Army Corps of Engineers

HOME ABOUT BUSINESS WITH US MISSIONS LOCATIONS CAREERS MEDIA LIBRARY CONTACT

HOME > MISSIONS > CIVIL WORKS > WATER INFORMATION > HABs

Lake Conditions (last updated 9/25/2014)

Monroe:
HAB present as of 9/1 (cell count exceeds 100,000 cells/mL); IDEM, IDNR, and other state and county stakeholders have been notified. In accordance with the LRL Agreement with the IDNR, HAB sampling at this location is now suspended until May 2015

Harden:
HAB present as of 9/4 (cell counts exceed 100,000 cells/mL threshold); cell counts exceed 1,000,000 cells/mL at 2 sites; IDEM, IDNR, and other state and county stakeholders have been notified. In accordance with the LRL Agreement with the IDNR, HAB sampling at this location is now suspended until May 2015

J. Edward Roush:
HAB present as of 9/2 (cell counts exceed 100,000 cells/mL threshold); IDEM, IDNR, and other state and county stakeholders have been notified. In accordance with the LRL Agreement with the IDNR, HAB sampling at this location is now suspended until May 2015

Salamonie:
HAB present as of 9/2 (cell counts exceeds 100,000 cells/mL); IDEM, IDNR, and other state and county stakeholders have been notified. In accordance with the LRL Agreement with the IDNR, HAB sampling at this location is now suspended until May 2015

Water Quality

- Water Quality Home
- Harmful Algal Blooms (HABs)
- Other Concerns
- Updated Lake Temperatures and Dissolved Oxygen Levels
- Biological Assessments
- Water Quality Data
- Useful Links
- Contact Water Quality

HAB Photos



USACE Louisville District Website

J. Edward Roush:

HAB present as of 9/2 (cell counts exceed 100,000 cells/mL threshold); IDEM, IDNR, and other state and county stakeholders have been notified. In accordance with the LRL Agreement with the IDNR, HAB sampling at this location is now suspended until May 2015

Salamonie:

HAB present as of 9/2 (cell counts exceeds 100,000 cells/mL); IDEM, IDNR, and other state and county stakeholders have been notified. In accordance with the LRL Agreement with the IDNR, HAB sampling at this location is now suspended until May 2015

Brookville:

HAB present as of 8/26 (cell counts exceed 100,000 cells/mL threshold); IDEM, IDNR, and other state and county stakeholders have been notified. In accordance with the LRL Agreement with the IDNR, HAB sampling at this location is now suspended until May 2015

Mississinewa:

HAB present as of 9/3 (cell counts exceed 100,000 cells/mL threshold); cell counts exceed 1,000,000 cells/mL at 1 site; IDEM, IDNR, and other state and county stakeholders have been notified. In accordance with the LRL Agreement with the IDNR, HAB sampling at this location is now suspended until May 2015

Taylorsville:

HAB present as of 9/18 (cell counts exceed 100,000 cells/mL threshold); cell counts have decrease below 1 million cells/mL at all sites; KDOW, KY Dept of Parks, KY Dept of Fish & Wildlife, and other stakeholders have been notified

Rough River:

HAB present as of 8/27 (cell counts exceed 100,000 cells/mL threshold); KDOW, KY Dept of Parks, KY Dept of Fish & Wildlife, and other stakeholders have been notified.

Useful Links

Contact Water Quality

HAB Photos



Caption



◀PREV NEXT▶

HABs Links

- US EPA CyanoHABs
- US EPA Harmful Algal Blooms
- WHO Guidelines
- Ohio algae info
- Indiana Blue-Green Algae
- CDC HABs

HAB Video Links

US EPA's "Protect your pooch from HABs"



State Strategies

- The state agencies have the primary responsibility for setting water quality standards/criteria.
- This may lead us back to doing things differently in each state, but that's **OK**.
- The state agencies become the voice to the public, the Corps works in support.



Ohio/ Corps Cooperative Agreement

Have fun on the water, but know that blue-green algae are in many Ohio lakes. Their toxins may be, too.

Be Alert! Avoid water that:

- looks like spilled paint
- has surface scums, mats or
- is discolored or has colored
- has green globs floating be



Avoid swallowing lake water.

For more information, visit ohioalgaefinfo.com or call 1-866-644-6224.



- State continues to sample beaches
- USACE reports HABs through OEPA's HAB mailbox
- USACE may or may not collect samples (TBD) as needed



Ohio Thresholds

Threshold (ppb)	Microcystin*	Anatoxin-a	Cylindrospermopsin	Saxitoxin*
Recreational Health Advisory	6	80	5	0.8
Recreational No Contact Advisory	20**	300**	20**	3**

*Microcystin and saxitoxin thresholds are intended to be applied to total concentrations of all reported congeners of those toxins.

**In combination with a confirmed human illness or pet death.

- All advisory thresholds set by the state
 - ▶ Corps recognizes state as water quality authority
 - ▶ Corps works as a cooperating partner in reporting and collecting samples if requested



Advisory Diamonds

■ Recreational Health Advisory

▶ **ORANGE**

▶ “WARNING”

- ▶ “High levels of algal toxins have been detected.

Swimming and wading are not recommended for the very old, the very young or those with compromised immune systems.”

■ Recreational No Contact Advisory

▶ **RED**

▶ “DANGER”

- ▶ “Algal toxins at UNSAFE levels have been detected. Avoid all contact with the water.”



OH “General Awareness”

Have fun on the water, but know that blue-green algae are in many Ohio lakes. Their toxins may be, too.

Be Alert! Avoid water that:

- looks like spilled paint
- has surface scums, mats or films
- is discolored or has colored streaks
- has green globs floating below the surface



Avoid swallowing lake water.

*For more information, visit
ohioalgaefinfo.com
or call 1-866-644-6224.*



- Description of HABs
 - ▶ Verbal description
 - ▶ Photographs

- Direction for more information



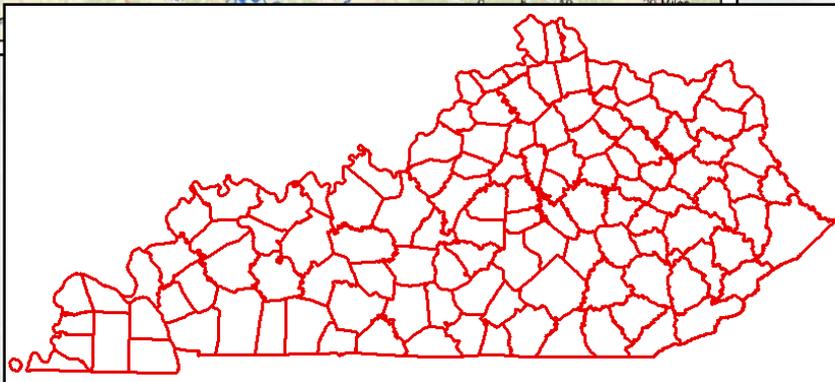
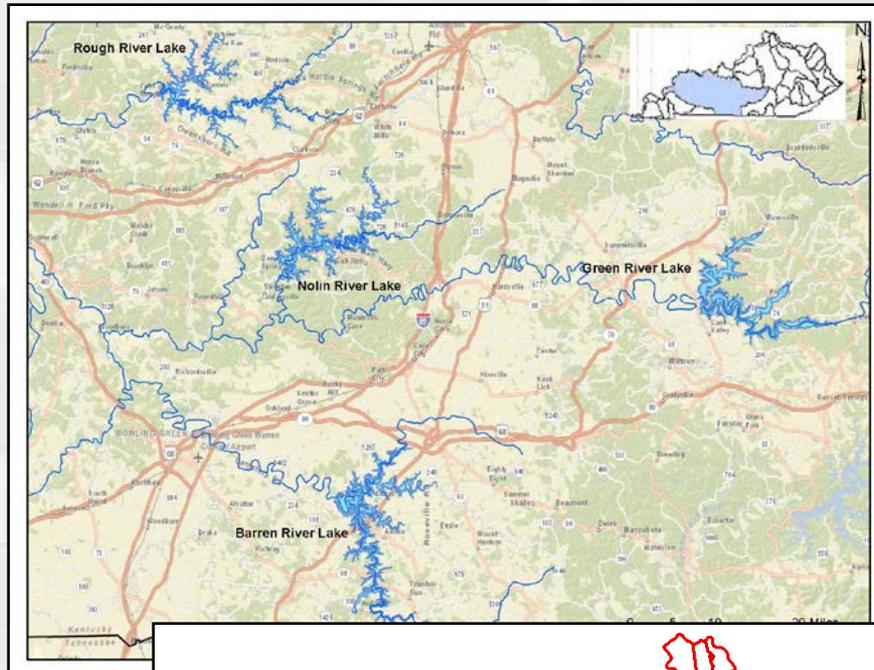
Ohio/ Corps Cooperative Agreement



- Each lake has unique sign posting and communication plan
 - ▶ Establishes WHO is responsible for posting
 - ▶ WHAT message,
 - ▶ WHERE on the property
- Builds on locally established Corps/State park relationships



Kentucky 2014



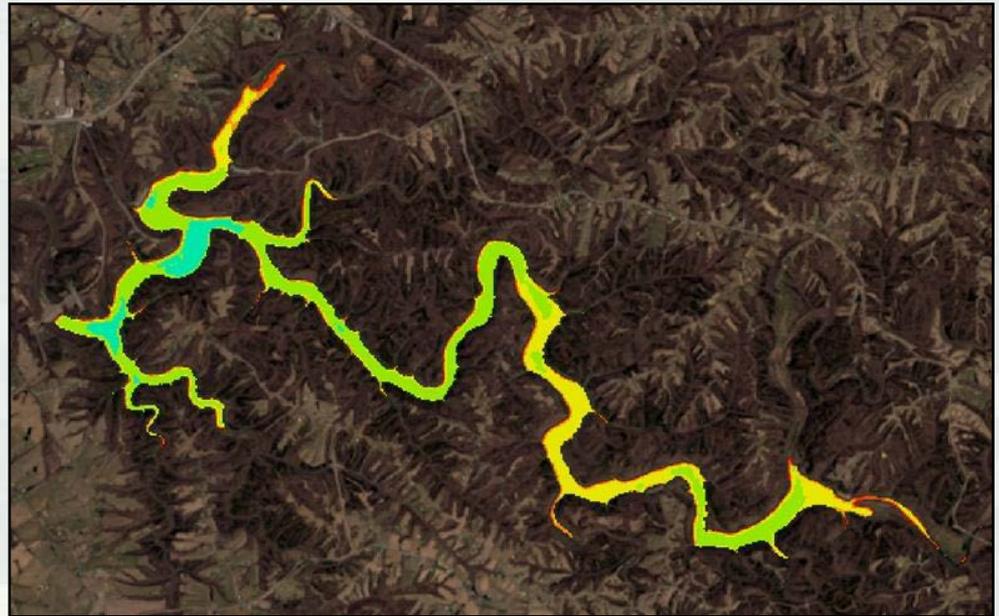
■ Objectives

- ▶ Identify locations with highest HAB probability
- ▶ Produce graphics to communicate water quality conditions
- ▶ Use remote sensing and Landsat 8 data to model conditions



Kentucky / Corps 2014

- Monthly ground truthing
- Collecting data on flyover dates
 - ▶ Secchi disk
 - ▶ Cyanobacteria
 - Cell counts
 - Identification
- Remote sensing study

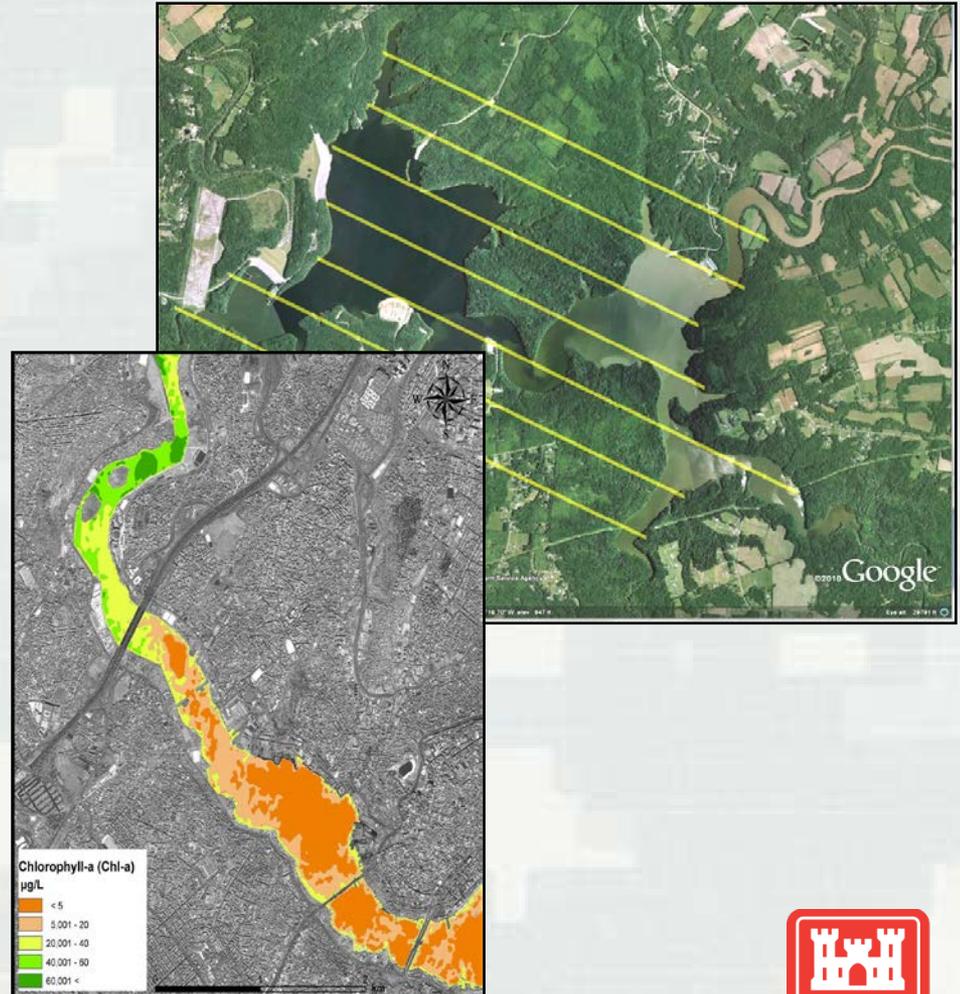


Courtesy of Mark Martin/Garrett Stillings presentation



2014 Remote Sensing Pilot Project

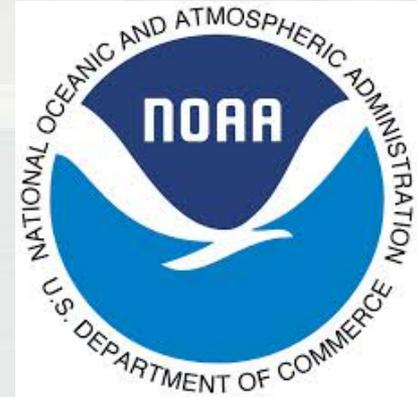
- Comparing
 - ▶ Satellite derived multi- and hyperspectral data
 - ▶ Airborne derived hyperspectral data
 - ▶ Field measured reflectance
 - ▶ Field WQ parameters
 - ▶ Grab samples



Remote Sensing Pilot Collaborators

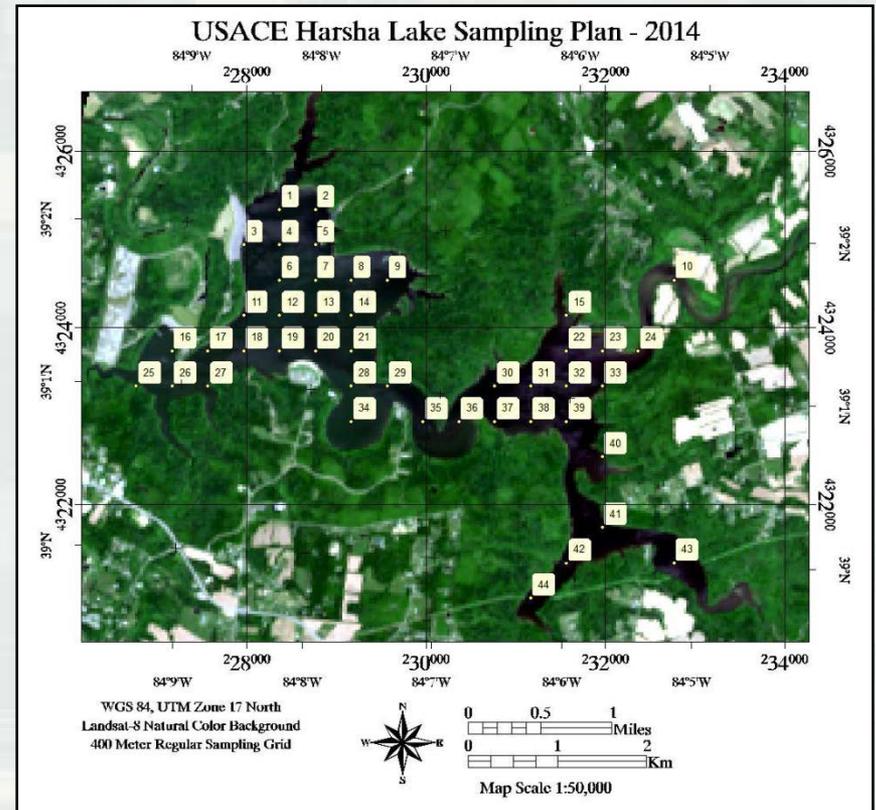
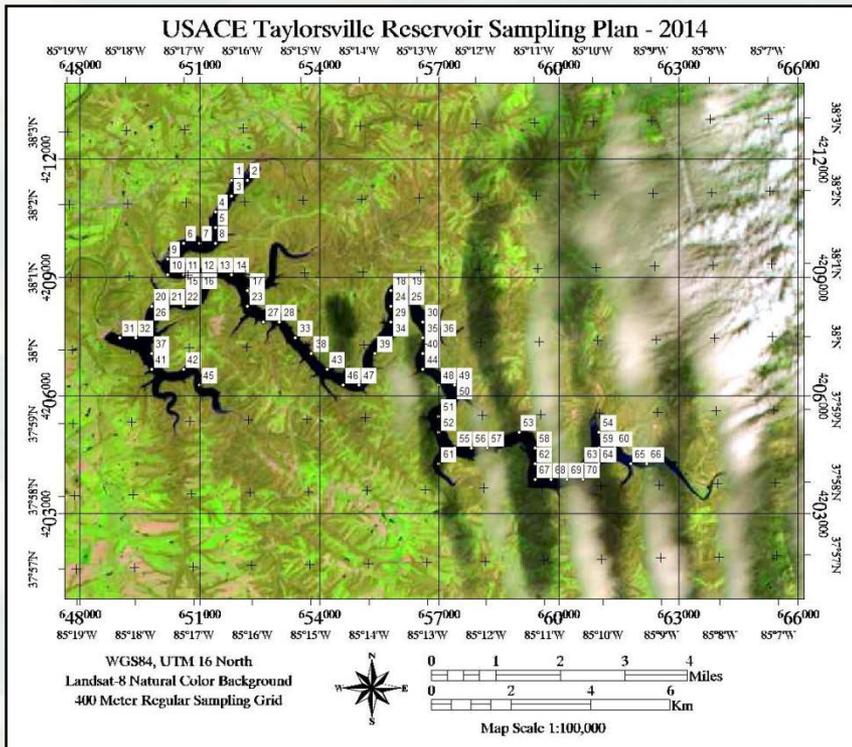


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2014 Remote Sensing Pilot Project

Taylorville Sampled June 18, 2014



Harsha Sampled June 27, 2014



Kentucky / Corps 2014

(for the time being...)

- Working together to develop model
- Advisories based on Corps cell count data at Corps lakes
- Corps lakes posted with previously agreed upon signage

Blue-green Algae Awareness Level
ADVISORY
 Elevated Risk of Adverse Health Effects

Blue-green Algae Awareness Level
CAUTION
 Elevated Risk of Adverse Health Effects

BLUE-GREEN ALGAE BLOOMS ARE PRESENT
 For Your Safety, The U.S. Army Corps of Engineers, Louisville District, in coordination with Kentucky Division of Water, Kentucky Department for Fish and Wildlife Resources, Kentucky Department for Public Health, and the Kentucky Department of Parks, Recommend the Following:

- DO NOT drink, or allow pets/horses to drink, untreated lake water.
- Children and pets are more likely to get sick because of blue-green algae.
- Keep pets/horses out of the water.
- Avoid areas with visible algae accumulation.
- Remove fish skin and organs before cooking, do not consume or allow pets/animals to consume the organs or skin.

Symptoms from exposure may include nausea, vomiting, diarrhea, skin rash, eye irritation, respiratory problems or other unexplained illness.

For more information go to:
www.lrl.usace.army.mil

Report algae blooms to:
 USACE lake project office or the Louisville District Water Quality (502) 315-7439

For additional information contact your local health department or the Kentucky Department for Public Health.

MS ARE PRESENT
 ers, Louisville District, in co-
 Kentucky Department for Fish
 t for Public Health, and the
 mend the Following:

drink, untreated lake

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 artement.



Kentucky / Corps 2014

- Working together on new sign
- Consistent representation to the public is important



Indiana/USACE Cooperative Plan

- IDEM samples beaches
- USACE samples rest of the lake
- Memorial through Labor Days
- IDNR responsible for posting signs

Does the Beach Have Blue-green Algae?
Blue-green algae can be found in many of Indiana's lakes and reservoirs. Swimmers, boaters and pet owners can enjoy water based recreation, but should be on the lookout for evidence of harmful algal blooms (HABs).

Blue-Green Algae
Algae of many species occur naturally in Indiana's lakes and reservoirs. Blue-green algae is common and not a problem unless levels are high. When levels are high, toxins may be produced as algae cells grow and die.

How Can Exposure to High Levels of Blue-Green Algae Affect People, Pets and Fish?

<p>Swimmers and boaters Avoid contact with algae. Avoid swallowing water while swimming. Take a bath or shower with warm, soapy water after coming in contact with lake water. Do not use lake water for cooking or boiling.</p>	<p>Pet Owners Toxins can be produced by the toxins produced by some algae. Precautions: Do not allow your pet to swim in or drink water where algae is present. Rinse your pet with soap and water if they swim in the lake water. Do not let your pet lick algae off their fur. Bat in moderation.</p>	<p>Fishing Toxin levels may accumulate in the tissues of fish. Precautions: Do not eat fish caught when fishing your fish. Rinse the fillets with clean water before freezing or cooking. Avoid consuming the guts, where toxins accumulate, if present. Eat in moderation.</p>
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What Does Blue-Green Algae Look Like?
Blue-green algae can appear as a thick, slimy mat on the water surface or as a green, yellow, or blue-green color in the water. It may also appear as a green, yellow, or blue-green color in the water. It may also appear as a green, yellow, or blue-green color in the water.

Blue-green algae and toxin levels are tested in this body of water. Alert levels vary with testing results:

- LOW RISK**
Don't drink the water
Shower after you swim
- ADVISORY**
Swimming and boating permitted.
Avoid contact with algae.
Avoid swallowing water while swimming.
Take a bath or shower with warm soapy water after coming in contact with lake water.
Do not use lake water for cooking or boiling.
Do not allow your pet to swim in or drink water where algae are present.
- CAUTION**
All Recreation Advisory precautions, plus - Children and those with compromised immune systems should not swim.
- BEACH CLOSED**
Algae and toxin levels make this beach currently unsafe for swimming.

Today's Alert Level

ADVISORY
Don't drink the water. Shower after you swim. Keep pets out of the water.

Indiana's lakes and reservoirs provide great recreational opportunities. Learn to recognize blue-green algae, be alert, take precautions and have fun on the water!

Water Quality Notice

Watch for Blue-Green Algae!
Water conditions, combined with weather and high nutrient levels may result in harmful algal blooms (HABs).

at property offices, entrances
ating possible HABs.

ntreated lake water.

ze blue-green algae and
visible algae accumulation.

ren or pets to swim where

wading or skiing, shower with
er and wash hands thoroughly.

te precautions for people
have fun on the water!

n available:

v
my.mil

DNR Indiana Department of Natural Resources

US Army Corps of Engineers

