Multi-Agency Coordination and Response of Harmful Algal Blooms in Utah

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For assistance in accessing this document please send an email to EPACyanoHABs@epa.gov
2016 cHABs in Utah Waters

- Blackridge Reservoir
- Mantua Reservoir
- Payson Lakes (n=4)
- Scofield Reservoir
- Utah Lake
- Farmington Bay
- Upper Box Cr. Reservoir
3 Pillars of UDWQ HAB Program

- GUIDANCE
- MONITORING
- COMMUNICATION
HAB Program Pillars

1. Guidance
## 2016 UDEQ/UDOH Guidelines for HABs

<table>
<thead>
<tr>
<th>Toxin Producing Blue-green algae Cell Density (cells/mL)</th>
<th>Health Risks</th>
<th>Action Recommended</th>
<th>Microcystin Concentrations (µg/L)</th>
<th>Relative Probability of Acute Health Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20,000</td>
<td>Negligible</td>
<td>None</td>
<td>&lt;4</td>
<td>Low</td>
</tr>
<tr>
<td>20,000-100,000</td>
<td>Short-term effects e.g. skin irritation, gastrointestinal illness</td>
<td>Issue caution advisory; Post CAUTION sign; Weekly sampling recommended</td>
<td>4-20</td>
<td>Low to Moderate</td>
</tr>
<tr>
<td>100,000 – 10,000,00 or reports of animal illnesses or death</td>
<td>As above for low risk, and potential for long-term illness</td>
<td>Issue warning advisory; Post WARNING sign; Weekly sampling recommended</td>
<td>20-2,000</td>
<td>Moderate to High</td>
</tr>
<tr>
<td>&gt;10,000,000 or large scum mat layer or reports of human illness;</td>
<td>As above for moderate risk, and potential for acute poisoning</td>
<td>Issue Danger Advisory; Post DANGER sign; Weekly sampling recommended</td>
<td>&gt;2,000</td>
<td>High</td>
</tr>
</tbody>
</table>
# Draft 2017 UDEQ/UDOH HAB Guidance

<table>
<thead>
<tr>
<th></th>
<th>Tier 1: None</th>
<th>Tier 2: Warning</th>
<th>Tier 3: Danger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Probability of Acute Health Risk $^1$</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>Cyanobacterial Cell Density (cells/mL) $^1$</td>
<td>&lt; 20,000</td>
<td>20,000 - 10,000,000</td>
<td>&gt;10,000,000</td>
</tr>
<tr>
<td>Microcystins (µg/L) $^{1,2}$</td>
<td>&lt; 4</td>
<td>4 - 2,000</td>
<td>&gt; 2,000</td>
</tr>
<tr>
<td>Cylindrospermopsin (µg/L) $^2$</td>
<td>&lt; 8</td>
<td>&gt; 8 *</td>
<td>&gt; 8 *</td>
</tr>
<tr>
<td>Anatoxin-a (µg/L) $^3$</td>
<td>Non-detect</td>
<td>Detection - 90</td>
<td>&gt; 90</td>
</tr>
<tr>
<td>Additional Factors</td>
<td>None</td>
<td>Reports of animal illness or death</td>
<td>Reports of human illness</td>
</tr>
<tr>
<td>Health Risks $^1$</td>
<td>Negligible</td>
<td>Potential for long-term illness</td>
<td>Potential for acute poisoning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Short-term effects (e.g., skin and eye irritation, nausea, vomiting, diarrhea)</td>
<td>Short-term effects (e.g., skin and eye irritation, nausea, vomiting, diarrhea)</td>
</tr>
<tr>
<td>Recommended Actions</td>
<td>None</td>
<td>Issue WARNING advisory</td>
<td>Issue DANGER advisory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post WARNING signs</td>
<td>Post DANGER signs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sampling recommended at least weekly</td>
<td>Consider CLOSURE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sampling recommended at least weekly</td>
</tr>
</tbody>
</table>

$^1$ Relative probability of acute health risk: Low, Moderate, High

$^2$ Microcystins and Cylindrospermopsin: < 4, 4 - 2,000, > 2,000 µg/L

$^3$ Anatoxin-a: Non-detect, Detection - 90, > 90 µg/L
HAB Decision-making algorithm

**Note 1**
Field tests are initial screening tools that do not require formal lab analysis. The most common are strip test kits for cyanotoxins, but other methods exist. The main guidance document has further information.

Optional

**Start**
Visible or suspected bloom

- **Cyanobacteria or cyanotoxins detected via field tests?**
  - **YES**
  - Collect Samples for Lab Analysis
    - Lab Analyses
      - Cyanobacterial cell density
      - Cyanotoxin concentrations

    - **Tier 1**
      - < 20,000 cells/mL; and
      - Microcystins < 4 µg/L; and
      - CYN < 8 µg/L; and
      - Anatoxin-a Non-detect

    - **Tier 2**
      - 20,000 – 10,000,000 cells/mL; or
      - Microcystins 4 – 2,000 µg/L; or
      - CYN > 8 µg/L; or
      - Anatoxin-a Detection - 90 µg/L

    - **Tier 3**
      - > 10,000,000 cells/mL; or
      - Microcystins > 2,000 µg/L; or
      - CYN > 8 µg/L; or
      - Anatoxin-a > 90 µg/L

  - **NO**

  - **HAB-related animal illness or death?**
    - WARNING Advisory and signs
    - DANGER Advisory and signs

  - **HAB-related human illness?**
    - WARNING Advisory and signs
    - DANGER Advisory and signs

- **NO**
  - No advisory
  - Monitor for changes

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CYN = Cylindrospermopsin

* Data are sparse on where cylindrospermopsin advisory break points should be. Consult with UDEQ and UDOH as needed on this issue.

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Return to Lab Analyses
Continue sampling at an appropriate frequency.
To rescind an advisory, at least 2 weeks of sampling data indicating that the hazard has passed are recommended.
Additional HAB Guidance Resources

Utah Division of Drinking Water
Draft Guidance that educates drinking water facilities how to prepare, respond, and act when source and treated waters become impacted

Utah Department of Agriculture and Food
Developing a HAB program that provides guidance for livestock and agricultural producers
Price City drinking water intake 2016

Photo by Utah DEQ
Jordan River irrigation & secondary water use
HAB Program Pillars

2. Monitoring
Monitoring: Prioritize Utah’s Vulnerable Waters

Increase monitoring of most vulnerable waters

• Develop HAB collection SOP that targets a ‘reasonable maximum’ of cyanobacteria exposure to the public

• Coordination with Division of Drinking Water, State Parks, Drinking Water Providers, District Engineers, Dept. Agriculture, and Local Health Departments.

• DWQ and USU: Utah Water Watch (citizen monitoring) have scopes, test strips and trained staff to provide initial screen at select locations (via NOAA program).
Types of Analysis

- **Cyanobacteria taxonomy and cell count** – Rushforth Phycology
  - 24 to 48 hour turn around time

- **Cyanotoxin test strip screen** – Abraxis
  - Day of sampling
  - Limited to cylindrospermopsins, microcystins and anatoxin-a (not saxitoxins)
  - Limited to various screening levels – recreation values set at >10 ug/L

- **Cyanotoxin qPCR screen (pilot)** - Phytoxigene

- **Cyanotoxin analysis** – GreenWater Lab, EPA R8, (and Utah State Labs?)
  - 48 to 96 hour turn around time at best; 1 week is more likely
  - ELISA and LC/MS/MS results and costs vary
  - Differences in capacity, result ranges, and sample submission
  - This level of laboratory quality is needed for conducting water quality assessments
Utah Lake Buoy Network

- 3 high frequency sondes
- Telemetered every 60 min.
- Parameters:
  - Temperature
  - Conductance
  - pH
  - Dissolved oxygen
  - DO saturation
  - Chlorophyll
  - Turbidity
  - Blue-green algae
- iUTAH partnership

https://wqdatalive.com/public/669
HAB Program Pillars

3. Communication
Communication: Incoming/Outgoing

DEQ 24-hour Spill Line: 801.536.4123

Utah Poison Control Center: 1.800.222.1222

DEQ website:

HABS.UTAH.GOV

UT Department of Health:

http://health.utah.gov/enviroepi/appletree/HAB
Response Coordination

Partners:
UDEQ: DWQ/DDW, UDNR, Local Health Departments, Poison Control, UDAF, UDEM, Drinking water providers, municipalities, US EPA and NOAA, USFWS, labs, universities, volunteers and more to come…

Steer monthly communication team*

Develop inter-agency response coordination process
- Local Health Departments are the lead (Utah)
- All relevant agencies should be notified
- Public notification process (SOCOs, press releases)
Develop SOCOs

Single Overriding Communication Objective (SOCO) Worksheet (US CDC)

**Key Message: Provides Meaning and Context:** state the key point or objective you want to communicate.

**Key Facts:** What are the three (3) most important facts you need an individual to understand about the Drinking Water Advisory?

**Target Audience:** Who is the main audience or population segment you would like this message to reach? Who is the secondary audience?

What is the one message or action someone needs to understand?

**Primary Contact:** Who in your office/organization is the primary point of contact?
Potential Health Risks Force Closure of Utah Lake from Harmful Algal Bloom
Lab tests confirm a high probability of health risks

SALT LAKE CITY - Public health officials have decided to close Utah Lake, effective immediately, due to a large, harmful algal bloom that may pose a serious health risk to the public and animals. The Utah Department of Health (UDOH) and Utah County Health Department (UCHD) say lab results for samples collected by the Utah Department of Environmental Quality (DEQ) show the concentration of algal cells in the water are three times the threshold for closing a body of water.
Utah Poison Control Center Reports

**676 Reported Cases (As of November 1)**

<table>
<thead>
<tr>
<th>Exposure Type</th>
<th>Percentage</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Exposure (533)</td>
<td>79%</td>
<td>Recreated in or exposed to Utah Lake Water</td>
</tr>
<tr>
<td>Animal Exposure (34)</td>
<td>5%</td>
<td>14 dogs (8 UT Co., 5 SL Co., 1 WY)</td>
</tr>
<tr>
<td>Information only (109)</td>
<td>16%</td>
<td></td>
</tr>
</tbody>
</table>

32% of cases are symptomatic

Symptoms reported:
- GI: diarrhea, nausea, vomiting, and abdominal pain
- Skin: rash and irritation
- Neuro: headache, dizziness, drowsiness
- Ocular: irritation

Currently largest HAB exposure incident in the US CDC database- One Health HABS
Develop Economic Studies

Utah’s Public Interest in Nutrient Reduction (2013)

- 97% of Utah households - important to maintain water quality for future generations
- Utahns are willing to spend $8 to $32/month to protect and improve waters that are threatened by increasing levels of nutrients
- Utahns spend about $1.4 to $2.4 billion a year on water-based recreation activities

Economic Impacts to Utah from HABs (2017)

- Assess costs associated with 2016 HABs to recreation, agriculture, utilities
Utah’s 2014 Technology-Based Phosphorus Effluent Limit

• Developed with extensive stakeholder input
  • Proposed by the POTW community and vetted with plant operators

• What does the rule allow?
  • Effluent limit of 1 mg/L total phosphorus by 2020
  • Variances
Utah Lake Water Quality Study

The Division is conducting a water quality study on Utah Lake to:

- Evaluate the role of excess nutrients on beneficial use impairments
- Identify appropriate in-lake nutrient endpoints

Driving Factors

- Continuation of previous studies
- Additional nutrient related 303(d) impairments
- Recent HAB events
- Regulatory certainty
Downstream Waters: Jordan River – Great Salt Lake

~80 tons/year total phosphorus exported to Jordan River from Utah Lake
QUESTIONS

Contact: bholcomb@utah.gov