# Harmful Algal Blooms

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Idaho Department of Environmental Quality

# Harmful Algal Blooms

- Definition, appearance, and cause
- Regulations and criteria
- Idaho DEQ monitoring and response

Harmful Algal Blooms = HABs

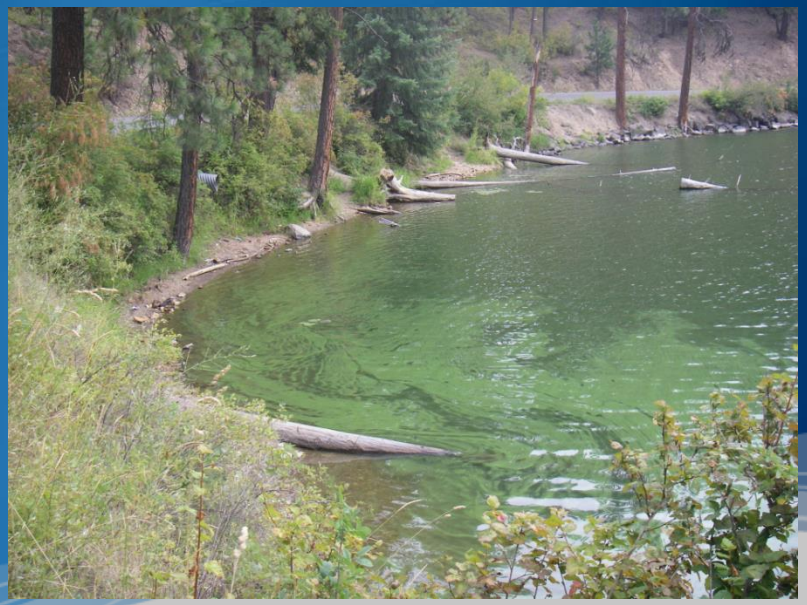
# What Are Harmful Algal Blooms?

- Cyanobacteria, commonly referred to as blue-green algae, occur naturally in marine and freshwater systems
- Photosynthetic bacteria
- Single cells or colonies
- Rapid, excessive cyanobacteria growth is commonly referred to as a “bloom”

Photo credit: Darren Brandt

# Where are HABs Found?

- In freshwater systems, blooms most commonly form in still or slow-moving water
- Usually located near the shorelines of lakes and reservoirs
- Typically occur during summer and fall



# What Do HABs Look Like?

- HABs can be unsightly and vary in appearance
  - Foam
  - Scum
  - Paint
  - Mats on the surface of water
- Colors range from blue, bright green, to brown and red
- Some blooms associated with foul odor

# Variable Bloom Appearance

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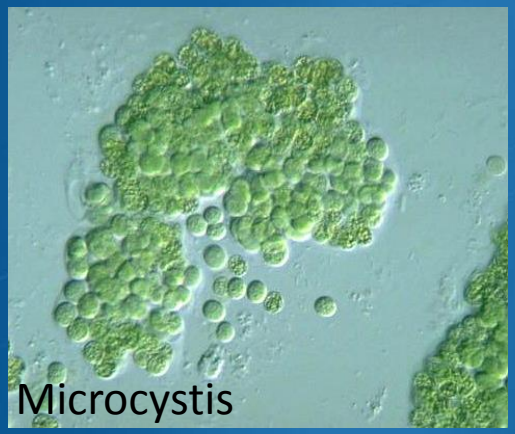
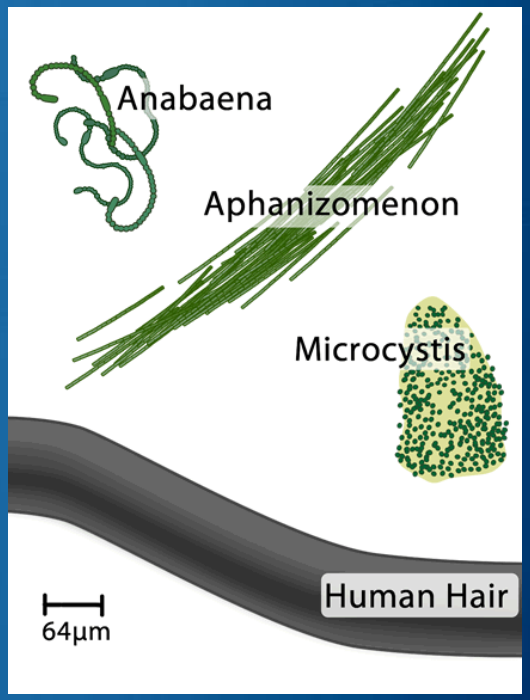
# Causes of HABs

- Nutrients (nitrogen: phosphorus ratio)
- Water temperature (warmer, sunlight)
- Low water flow

# Why the Concern?

- Some species form blooms that can produce toxins = HABs




- Not all blooms produce toxins

# Toxin Production

- Microcystins are the most common group of cyanotoxins
  - 80+ types of microcystins including microcystin L-R
  - Microcystin LR is generally considered among the most toxic, and is frequently present in HABs world-wide

- Other toxin groups include Anatoxin-a, Cylindrospermopsin, Saxitoxin, Lyngbyatoxin-a, and Lipopolysaccharides

# Potential Health Risks

- **People and animals can be exposed to cyanotoxins**
  - Oral ingestion of drinking water and during recreation
  - Dermal contact during recreation
  - Inhalation (incidental) during recreation
  - Ingesting contaminated fish, or shellfish
- **Effects can vary depending on toxin and concentration**
  - Gastroinstestinal (GI), skin irritation, respiratory
  - Liver or kidney damage
  - Nervous system

Regulatory Standards

# Regulatory Standards

- No current federal water quality criteria or regulations for cyanobacteria or cyanotoxins
  - Drinking water under the Safe Drinking Water Act
  - Ambient waters under the Clean Water Act (CWA)
- EPA may publish Health Advisories (HA) for contaminants not subject to drinking water regulation
  - Provide informal technical guidance
  - Not legally enforceable

http://www.epa.gov/nutrient-policy-data/guidelines-and-recommendations

# EPA Health Advisories – Drinking Water

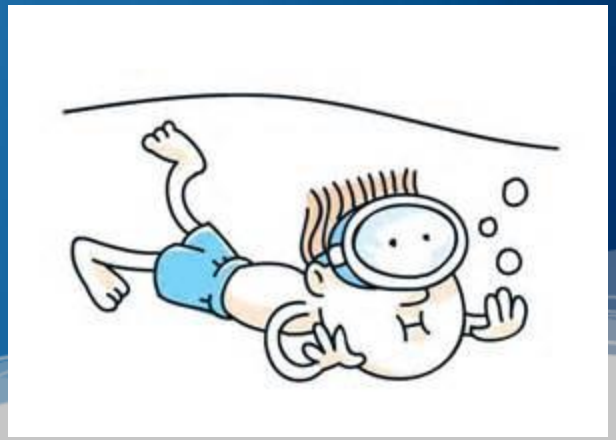
- In June 2015, EPA published Drinking Water Health Advisories for two cyanotoxins
- Advisories based on consumption of finished drinking water containing these cyanotoxins
- EPA recommended levels for two age groups

| Toxin | Health Advisory Values | |
|---|---|---|
| | ≤ 6 yrs | > 6 yrs |
| Microcystins | 0.3 µg/L | 1.6 µg/L |
| Cylindrospermopsin | 0.7 µg/L | 3.0 µg/L |

Source: http://www.epa.gov/nutrient-policy-data/guidelines-and-recommendations

# EPA Criteria – Recreation

- No current standards or guidelines
- People can be exposed to cyanotoxins during recreational activities
- EPA currently developing ambient water quality criteria protective of human health
  - For primary contact recreation
  - For children
  - Developing for the toxins microcystins and cylindrospermopsin



# Management in Idaho

- No numeric criteria for HABs
- Applicable ID water quality standards narrative criteria in the context of beneficial uses
  - Excess nutrients (IDAPA 58.01.02.200.06)
  - Floating, suspended, or submerged matter (58.01.02.200.05)
  - Toxic substances (IDAPA 58.01.02.200.02)
- Some TMDL objectives are to control nuisance aquatic growth
  - Indirectly address HABs through control of nutrients (phosphorous)

# Decision-making Scheme for Blue-green Algae Health Risks

| Risk Measurement | Decision | Action: Posting | Action: News Release |
|---|---|---|---|
| **1. Is surface scum visible and associated with toxigenic* species?** | Yes | Recommend posting by public health district (PHD) in conjunction with water body management agency | DEQ and PHD make determination |
| | No | Proceed to 2 | |
| **2. Is the sum of all potentially toxigenic* taxa ≥100,000 cells/mL?** | Yes | Recommend posting by PHD in conjunction with water body operator | DEQ and PHD make determination |
| | No | Proceed to 3 | |
| **3. Is the density of Microcystis or Planktothrix ≥40,000 cells/mL?** | Yes | Recommend posting by PHD in conjunction with water body operator | DEQ and PHD make determination |
| | No | Do not recommend posting | |

* Toxigenic taxa include *Anabaena, Microcystis, Planktothrix, Nostoc, Coelosphaerium, Anabaenopsis, Aphanizomenom, Gloeotrichia, Woronichinia, Oscillatoria,* and *Lyngbya*. Additional taxa are known to be potentially toxic and may be added to the list in the future.

***Adapted from ODHS 2015***

# HABs in Idaho

# Are HABs a Concern in Idaho?

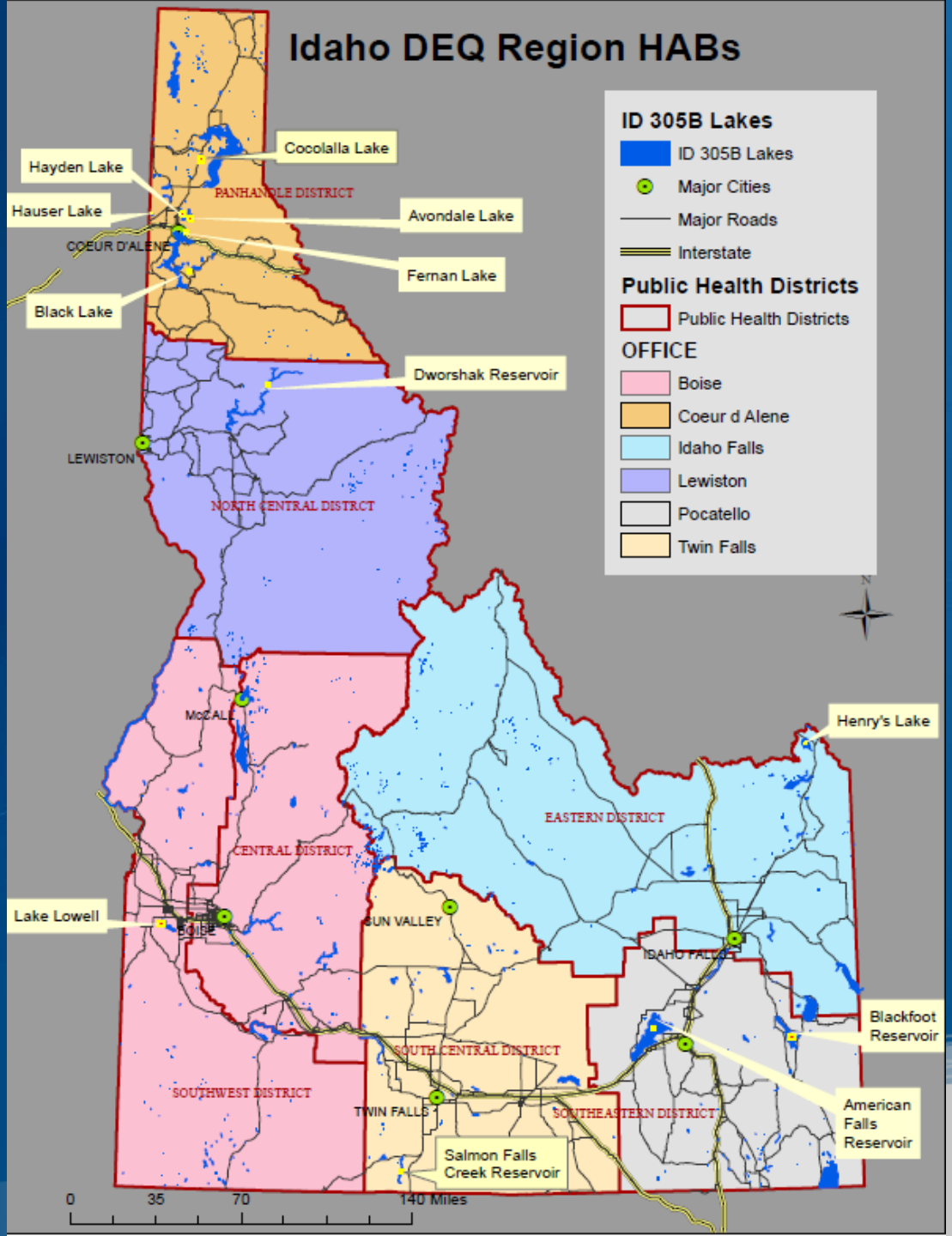
- Several complaints each year
- Public concerned about aesthetics and possible impacts to children and pets

# History of Blooms in Idaho

- Historical Reports of Cyanotoxin Issues:
  - Black Lake (1985 and 1986) – death of dogs, cattle, and deer
  - Cascade Reservoir (1993 to 1996) – 23 cattle died
- Reports Increasing in Recent Years
- HABs Detected in all 6 Idaho DEQ Regions

# Idaho Waterbodies with HABs

- **Boise Region**
  - Lake Lowell
- **Coeur d'Alene Region**
  - Avondale Lake
  - Black Lake
  - Cocolalla Lake
  - Fernan Lake
  - Hayden Lake
  - Hauser  Lake
- **Idaho Falls Region**
  - Henry's Lake
- **Lewiston Region**
  - Dworshawk Res.
- **Pocatello Region**
  - American Falls Res.
  - Blackfoot Res.
- **Twin Falls Region**
  - Salmon Falls Creek Res.


Idaho DEQ Region HABs
ID 305B Lakes
ID 305B Lakes
Major Cities
Major Roads
Interstate
Public Health Districts
Public Health Districts
OFFICE
Boise
Coeur d Alene
Idaho Falls
Lewiston
Pocatello
Twin Falls
Cocolalla Lake
Hayden Lake
Hauser Lake
Avondale Lake
Fernan Lake
Black Lake
Dworshak Reservoir
Henry's Lake
Lake Lowell
Blackfoot Reservoir
American Falls Reservoir
Salmon Falls Creek Reservoir
PANHANDLE DISTRICT
COEUR D'ALENE
LEWISTON
NORTH CENTRAL DISTRICT
McCALL
CENTRAL DISTRICT
BOISE
SUN VALLEY
EASTERN DISTRICT
IDAHO FALLS
SOUTH CENTRAL DISTRICT
SOUTHWEST DISTRICT
TWIN FALLS
SOUTHEASTERN DISTRICT
N
0
35
70
140 Miles

# Idaho HAB Timeline – 2015

| DEQ Region | June | July | August | Sept. | Oct. | Nov. |
|---|---|---|---|---|---|---|
| Coeur d'Alene | Fernan | Fernan<br>Avondale<br>Hayden | Fernan<br>Avondale<br>Hayden | Fernan<br>Avondale<br>Hayden | Fernan<br>Avondale<br>Hayden<br>Black | Fernan<br>Black |
| Idaho Falls | | | Henry's | | | |
| Pocatello | | | | Blackfoot R. | | |
| Lewiston | | | | Dworshawk | Dworshawk | |
| Boise | | | | | Lake Lowell | |

- Health advisories posted for all noted waterbodies except for Blackfoot Reservoir
- Advisories also posted for Hayden and Fernan lakes in 2014

# 2015 Taxa List – Idaho HABs

- *Anabaena* (5 waterbodies)
- *Aphanizomenom* (5 waterbodies)
- *Microcystis* (5 waterbodies)
- *Woronichinia* (5 waterbodies)
- *Gloeotrichia* (4 waterbodies)
- *Lyngbya* (2 waterbodies)

# Guidance and Response Strategies

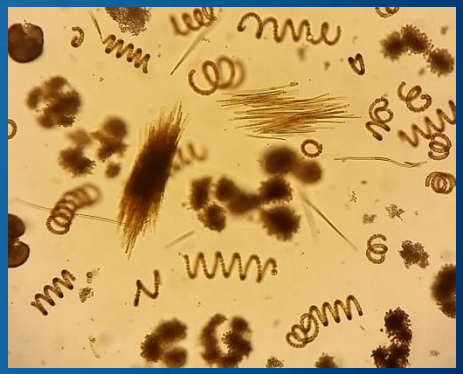
- The increase in HABs, complaints, and associated investigations highlighted the need for a statewide blue-green algae response plan

# Response Plan

- Idaho DEQ and  DHW finalized a state-wide blue-green algae bloom response plan Oct. 2015
  - Response associated with recreational waters

# Response Plan

- Response kit
- Sample collection
- Sample preservation, transport and handling
- Decontamination procedures
- Laboratory analyses
- Response to event
- Communications



# Response Plan

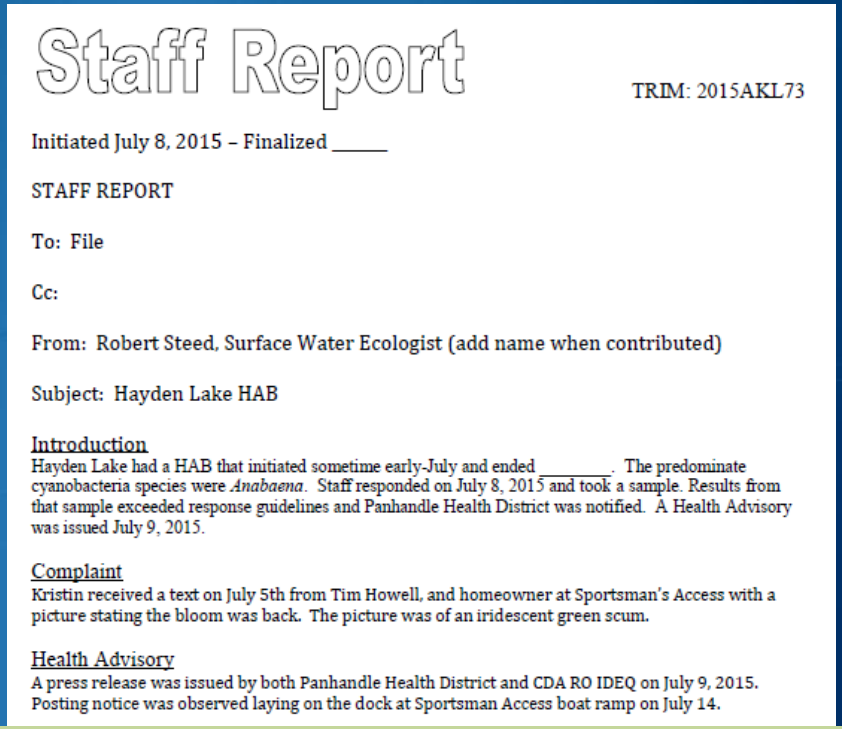
- Respond to public complaint
- Identify if a problem exists
  - Bloom presence
  - Collect and preserve grab samples
- Quantify problem
  - Send for lab analysis (identify and enumerate species; measure toxicity)
- Determine need for public health warning

# Monitoring

- Most monitoring is reactive
  - Based on public reports of blooms
- Some field offices planning to monitor proactively
  - Concurrent with other field efforts (e.g., invasive species monitoring)
- State-wide HAB tracking table developed

# Reporting

- State-wide HAB tracker
- Staff reports



Staff Report

TRIM: 2015AKL73

Initiated July 8, 2015 – Finalized _____

STAFF REPORT

To: File

Cc:

From: Robert Steed, Surface Water Ecologist (add name when contributed)

Subject: Hayden Lake HAB

Introduction

Hayden Lake had a HAB that initiated sometime early-July and ended _____. The predominate cyanobacteria species were *Anabaena*. Staff responded on July 8, 2015 and took a sample. Results from that sample exceeded response guidelines and Panhandle Health District was notified. A Health Advisory was issued July 9, 2015.

Complaint

Kristin received a text on July 5th from Tim Howell, and homeowner at Sportsman's Access with a picture stating the bloom was back. The picture was of an iridescent green scum.

Health Advisory

A press release was issued by both Panhandle Health District and CDA RO IDEQ on July 9, 2015. Posting notice was observed laying on the dock at Sportsman Access boat ramp on July 14.

| Regional Office | Primary Investigator | Investigation Type | Date | Waterbody | Id and Enum Samples Taken | Toxin Samples Taken | Do conc. exceed criteria | Health Advisory Issued | Health District Coord | Notice Posted |
|---|---|---|---|---|---|---|---|---|---|---|
| Boise RO | Jenkins, Stephanie | Preliminary | 9/29/2015 | Lake Lowell | Yes | Yes | Yes | Yes | Yes | Yes |
| Boise RO | Jenkins, Stephanie | Preliminary | 7/9/2015 | Payette Lake | Yes | Yes | No | No | No | No |
| Coeur d'Alene RO | Steed, Robert | Preliminary | 6/29/2015 | Avondale Lake | Yes | No | Yes | Yes | Yes | |
| Coeur d'Alene RO | Larson, Kristin | Follow-up | 7/7/2015 | Avondale Lake | Yes | Yes | Yes | Yes | Yes | No |
| Coeur d'Alene RO | Larson, Kristin | Follow-up | 7/16/2015 | Avondale Lake | Yes | No | Yes | Yes | Yes | No |

# Coordination and Public Outreach

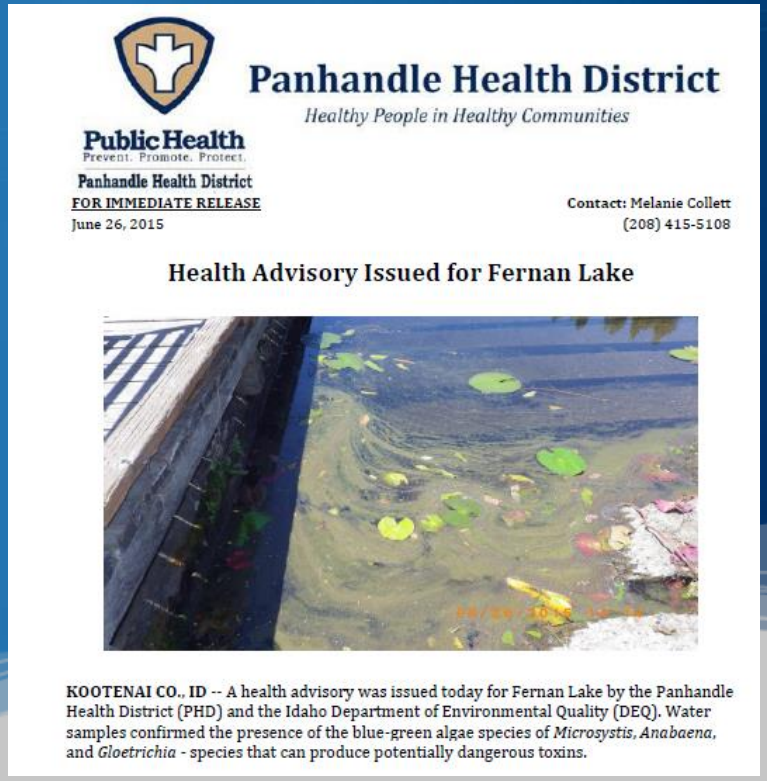
- ID Public Health Districts (primary contact)
- U.S. Fish and Wildlife Service (Refuges)
- ID Dept. of Fish & Game
- Army Corps of Engineers
- Bureau of Reclamation
- Dept. of Agriculture
- City of Boise

# Role of IDEQ

- **Identify if problem exists**
  - Determine presence/absence of blue-green algae bloom
  - Identify species present
  - Enumerate number of cells or colonies
- **Coordinate with public health districts**
  - When public health advisories/postings warranted
  - When public communication necessary

# Role of Public Health Districts

- Responsible for issuing health advisories
- Responsible for postings/removal of postings
- DEQ coordinates closely during this process
- Work closely with Department of Health and Welfare



Panhandle Health District

*Healthy People in Healthy Communities*

Public Health
Prevent. Promote. Protect.

Panhandle Health District

FOR IMMEDIATE RELEASE

June 26, 2015

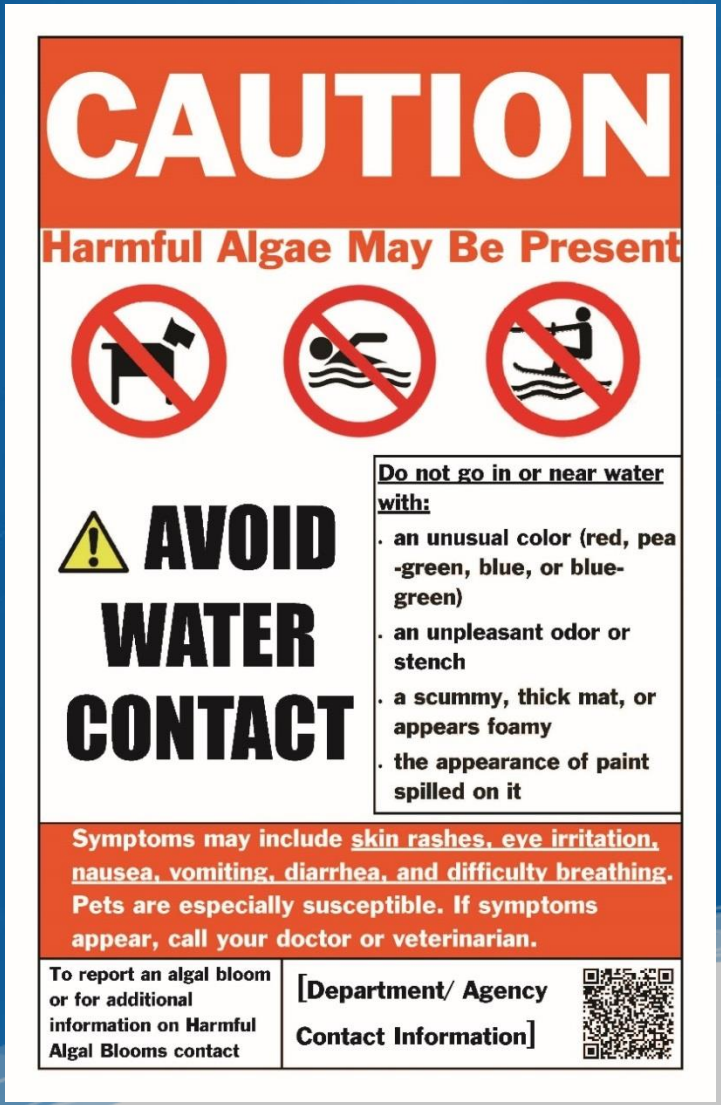
Contact: Melanie Collett
(208) 415-5108

**Health Advisory Issued for Fernan Lake**

**KOOTENAI CO., ID** -- A health advisory was issued today for Fernan Lake by the Panhandle Health District (PHD) and the Idaho Department of Environmental Quality (DEQ). Water samples confirmed the presence of the blue-green algae species of *Microsystis*, *Anabaena*, and *Gloetrichia* - species that can produce potentially dangerous toxins.

# Coordination and Public Outreach

- Postings
- Website
  - FAQ
  - Advisories



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# Blue-Green Algae and Harmful Algal Blooms

Blue-green algae are not algae at all but are photosynthetic bacteria, also known as cyanobacteria. There are several species of blue-green algae, which thrive under their own unique conditions and produce a variety of toxins. Blue-green algae are naturally occurring and usually present in a water body, but they typically exist in numbers too small to cause problems. Blue-green algae growth is influenced by a variety of environmental conditions including temperature, flow, nutrient levels, light, weather, vertical mixing in the water column, and pH levels.

Given the right conditions, high concentrations of blue-green algae can occur and form a bloom. Blooms can vary in appearance, sometimes looking like mats, foam, or surface scum. Blooms can range in color from blue and bright green to brown and red. Some blooms produce a foul odor. Not all blooms are toxic, but when toxic harmful algal blooms do occur they present a health risk to humans, pets, and livestock. Exposure may occur from ingestion, skin contact, or inhalation. Exposure can result in a range of health effects from skin irritation and stomach upset to neurotoxic effects and at very high levels, death. Symptoms in humans are rare; anyone with symptoms should seek medical attention.

If you observe a blue-green algae bloom, contact your DEQ regional office.

## Blue-Green Algae Health Advisories

Health advisories are typically issued by the public health districts, who work closely with DEQ staff.

There are no current health advisories.

Take the following precautions when an advisory is in effect:

- Avoid exposure to water experiencing a harmful algal bloom. Take extra precautions to ensure children, pets, and livestock are not exposed to the water.
- Do not consume water with a blue-green algae bloom. Neither boiling nor disinfecting removes blue-green algae toxins from water.
- If fish are known to have been exposed to a blue-green algae bloom, only consume the fillet portion (remove the fat, organs, and skin). Wash hands after handling. The risk associated with consuming fish caught in waters with a blue-green algae bloom is unknown. Toxins produced by blue-green algae can accumulate in the viscera of fish (e.g., liver and kidneys).

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## DEQ Resources

Blue-Green Algae Response Plan (2015)

## More Information

Harmful Algal Blooms (EPA webpage)

Harmful Algal Blooms Brochure (IDHW brochure)

## Related Pages

Drinking Water

# Additional Information

- Idaho DEQ's Blue-green Algae Webpage
  http://www.deq.idaho.gov/water-quality/surface-water/
- Idaho Department of Health and Welfare
  http://www.healthandwelfare.idaho.gov/Health/EnvironmentalHealth/HarmfulAlgalBlooms/
- EPA's CyanoHAB web portal
  http://www.epa.gov/cyanohabs
- World Health Organization
  http://www.who.int/water_sanitation_health/diseases/cyanobacteria/en/

# Idaho HAB Point of Contacts

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# Questions?