Utah Water Watch Monitoring Guidelines

SAFETY

Utah Water Watch stresses volunteer safety. Please use common sense and never put yourself or other volunteers in a position where conditions may be unsafe.

- Always let someone know when and where you are going to monitor
- Work with a partner to decrease the risk of accidents
- **NEVER** enter a water body that has dangerous conditions, including: high water or flooding, fast flowing water or rapids, abnormally colored water or unnaturally foul odors
- Do not drink the water in lakes or streams
- Listen to weather reports and do not sample during dangerous weather conditions
- Take precaution when using boats and always wear a personal flotation device
- Take precaution when entering lakes or streams
- Wear protective clothing including proper footwear
- Always wash your hands after monitoring

Trespassing

NEVER walk on or monitor at sites that are on private property, unless you have written permission from the landowner. Trespassing is a crime and a violation of Utah Water Watch volunteer ethics.

IN CASE OF AN EMERGENCY

DIAL 911

In case of a severe environmental problem call:

Hazardous Waste Spills	Division of Solid and Hazardous Waste	801-536-0200
Water Quality Threats	Division of Water Quality	801-536-4300

For all other serious problems contact:

Utah Department of Environmental Quality

195 North 1950 West, Salt Lake City, UT 84114

Office: (801) 536-4400 ~ Hotline: (800) 458-0145

Lake Monitoring Instructions

Field Observations

For each observation record the number that best describes the dominate conditions of the lake at the time of monitoring.

- **Water Condition** – Record the movement of the lake surface
- **Water Surface** – Is there material on the surface of the lake?
  - Clear – No
  - Scummy – A visible dirty film on the surface
  - Foamy – Bubbles or foam
  - Natural debris – Lots of leaves, sticks, or other natural objects
  - Trash – Lots of plastic, garbage, or other forms of trash
  - Sheen / Oily – Surface has a multi-colored sheen or dark oil
- **Water Clarity** – Look into the water and record the best description
  - Clear – Colorless, transparent
  - Cloudy/Milky – Water appears hazy, chalky, cloudy white or grey
  - Turbid - Murky (brownish, reddish, or greenish) due to suspended sediment
- **Water Color** – Chose the number that best describes the color and check normal if this is the typical color or abnormal if this color is unusual for the lake
- **Water Odor** – Does the water have a smell?
- **Dead Fish** – Look around your immediate sampling location (10 m in all directions) and count the number of dead fish floating or below the surface. Take photo of large kills.
- **24H Weather** – Record the dominate weather pattern for the past 24 hours

Sampling

1. **Measure the Temperature**
   1.1. Turn on the thermometer, make sure it is reading degrees Celsius. Measure the air temperature first by holding the thermometer in a shady location and let the thermometer adjust to the ambient conditions for at least 1 minute before recording.
   1.2. Measure the water temperature by submerging the metal tip of the thermometer two-thirds of the way into the water. Let the thermometer adjust to the water temperature for at least 1 minute before recording the temperature.

2. **Measure the pH**
   2.1. Remove one test strip from the jar and then reseal the jar.
   2.2. Place colored end of test strip in the water for 30 seconds.
   2.3. Remove test strip from the water and shake off excess water. Then wait 2 minutes.
   2.4. Compare test strip to the color guide and select the closest color match. Record the pH.

3. **Measure the turbidity using a Secchi Disk (turbidity tube when inaccessible)**
   3.1. Move to the shady side of the boat or dock. If wearing sunglasses remove before measuring.

3.2. Lower the Secchi Disk into the water column until you can barely see the disk.
3.3. Lower the disk slightly until you cannot see it.
3.4. Raise the disk slowly until it just reappears.
3.5. Record the depth to the nearest hundredth of a meter (X.XX m).
3.6. If the Secchi Disk went all the way to the bottom of the lake and you can still see it, circle the greater than symbol (>) on the data sheet. If not, circle the equals sign (=).

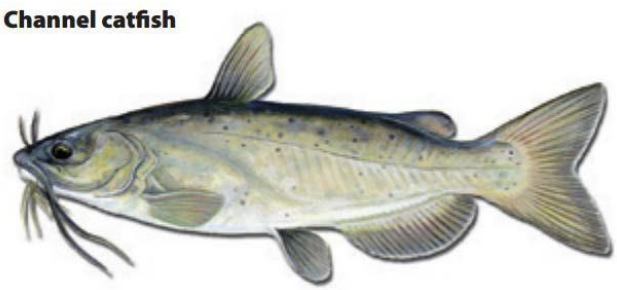
4. **Record sample location information**
   4.1. Measure the total depth of the monitoring location by lowering the Secchi Disk all the way till it touches the bottom of the lake.
   4.2. Record your sample depth (usually 0.15 m, for sampling in the upper surface area).
   4.3. Check the line to indicate where your sample location is (Inshore, Dock/Pier, or Boat)

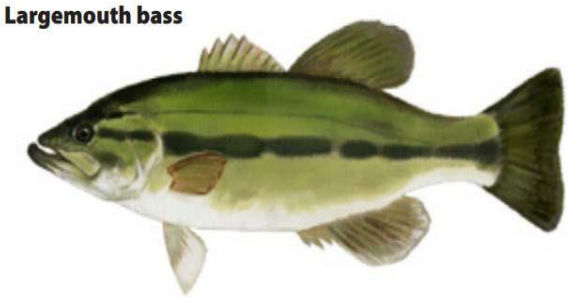
5. **Remember to decontaminate your equipment** and record the time spent sampling (to nearest half hour), miles traveled and number of participants at the bottom of the datasheet.

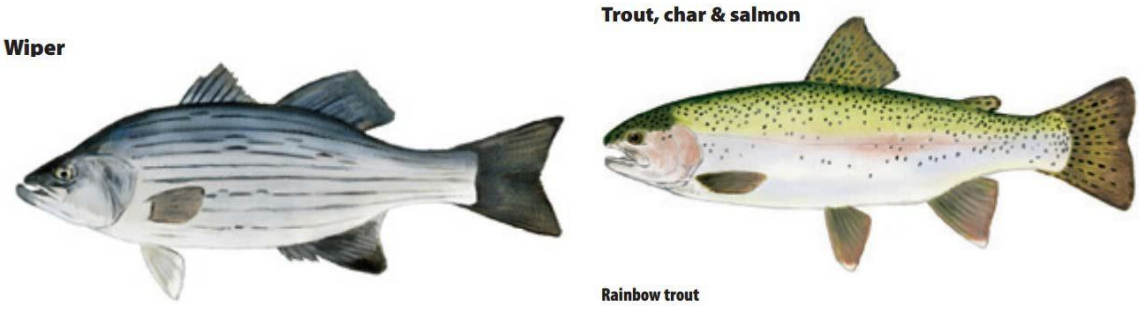
Community Fishing

Fishing data can be personal, or obtained by surveying fisherpeople present at the site. Please combine fish catch and time spent data if multiple people are surveyed. Look around for cormorants (pictured right) and pelicans, known fish predators. Please record fish species different than those on the datasheet (and their quantities) in the "other" section.


Cormorant





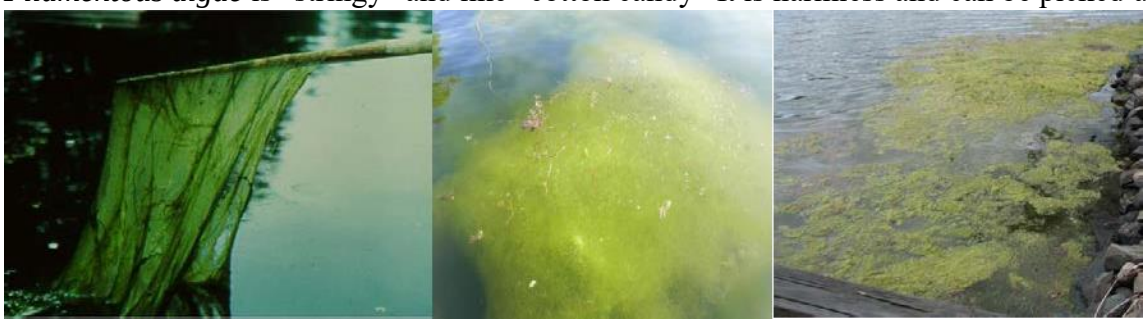


Harmful Algal Bloom Monitoring

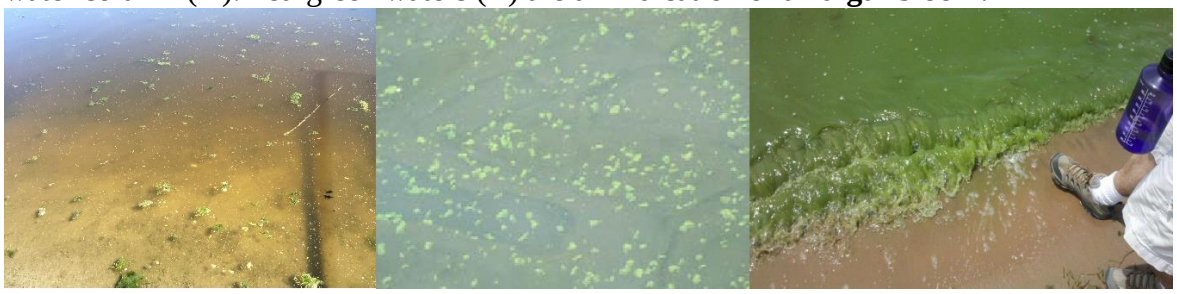
Algae observed in the lake?
Did you notice any algae at the lake site? Algae, when present in moderate amounts, is a healthy part of the lake community. Please survey popular recreation sites at the water body.

Types [of algae] observed?

Filamentous algae is "stringy" and like "cotton candy" It is harmless and can be picked up with a stick.



Algae in the *water column*: Tiny microscopic algae are often present in the water column, giving the water a green (or brown) tint. Look for greenish colored water (L) or tiny clumps of algae floating in the water column (m). Pea-green waters (R) are an indication of an **algal bloom.**



Floating scum (different than filamentous green algae) are almost always **Harmful Algal Blooms.** Follow "in-case of a bloom instructions".

Harmful algal bloom suspected?
If your water is abnormally greenish colored, you observe many floating algal colonies or if there are any spilled-paint like scums present, you should suspect a harmful algal bloom. Follow the "*Steps to Take if You Suspect a Harmful Algal Bloom*" document to collect a 1L sample, photograph the bloom, contact the authorities and transport the sample to a local scope for analysis.

UWW or bloomWatch Contacted?
Utah Water Watch should be contacted (waterquality@usu.edu, (435) 797-2580) if you suspect a bloom. Alternatively, you can submit data and photos through the bloomWatch app.

E. coli Sampling Instructions

In the field Sample Collection

1. Pull of the top of the Whirl-Pak using the perforated line.
2. Use the white tabs to open the pouch making sure not to touch the top or inside of the bag.
3. Collect your sample from a depth below 15 cm (6 in.) if possible. Be careful not to sample disturbed substrate or surface scum.
4. With bag open, in one quick motion, immerse the bag under water and fill making sure to leave some head space. Remove from water, hold yellow tabs and flip over twice. Seal by twisting the yellow ties closed.
5. If you are monitoring more than one location record sample ID on bag.
6. Water samples kept longer than 1 hour before plating need to be stored on wet ice or refrigerated.

Inside plating

1. Make sure Coliscan Easygel medium in the bottles have thawed (2 per site)
2. Shake Whirl-Pak to thoroughly mix the sample. Carefully open bag using white tabs so not to touch the lip or inside. Use a transfer pipe, and deposit 1 to 5 mL in a Coliscan Easygel bottle, cap and gently swirl. Repeat in for second duplicate sample.
3. Using a permanent marker record on the bottom of the petri dish the site id or name, date, time sample was plated, volume of sample, and sample # 1 or 2.
4. Remove the lid, but be careful not to touch the inside of the petri dish or lid.
5. Pour Coliscan Easygel medium with sample water from the bottle slowly into the bottom of the petri dish. Replace lid and gently swirly to coat entire bottom. Place the top on the petri dish and leave it on a level surface out of direct sunlight for 45 minutes to solidify. Once solid move to incubation location. Wash hands.

Incubation Period

1. Store petri dishes in a warm draft free location out of direct sunlight. Use the thermometer to measure the temperature. At room temperature, 20 - 24 °C (68 – 75 °F), colored colonies will take at least 48 hours to develop.
2. Check every 10-12 hours to observe if colored colonies have started to form. Upon sighting the formation of colored colonies, note the time and allow for another 24-30 hours for the maturation of these colonies. This is usually 48-60 hours after you poured the medium into the petri dish. Counts should not be made after 72 hours.
3. When you believe the colonies have matured record the total number of hours on the data sheet in the Incubation time along with the normal temperature during incubation

Record Results

1. In a bright area, count ONLY colonies that have a dark blue or purple color. Dark blue and purple colonies indicate *E. coli*. Do not count pink, red, or teal, colonies as these indicate other Coliforms and different types of bacteria. Also ignore tiny, pin sized colonies. If you are unsure, look at examples provided. If still uncertain check with another UWW volunteer or take a photo and send to UWW staff.
2. Record the number of dark blue or purple colonies counted on the data sheet for each sample. Enter the sample size (1 to 5) for each sample. Now you can calculate the E. coli per 100 mL (cfu). First divide 100 by the sample size. Then multiply this dilution factor by the colonies counted
3. EX: 100ml / 3 mL Sample size = 33. 33 X 9 colonies counted = 297 cfu / 100mL
4. Do this for both samples. Then average the two sample to the nearest whole number and record on the data sheet Average E. coli cfu / 100 mL

Disposal

1. Place a teaspoon of bleach onto the surface of the medium. Close the lid and let it sit for five minutes.
2. Place both petri dishes in a water-proof (Ziploc bag) and throw in the trash.
3. **WASH YOUR HANDS** after handling samples, plates, and water.

Stream Monitoring Instructions

Field Observations

For each observation record the number that best describes the dominate conditions of the stream at the time of monitoring.

- **Flow** – Record the current stream flow
  - No flow – water not moving; either no water or only water in isolated pools
  - Low – some flow but lower than normal baseflow; many exposed rocks
  - Normal / Baseflow – Natural flow of the stream due to infiltration
  - High/Runoff – At or near bank full due to recent precipitation or runoff
  - Flood – Stream is out of the banks
- **Water Surface** – Is there material on the surface of the stream?
  - Clear – No
  - Scummy – A visible dirty film on the surface
  - Foamy – Bubbles or foam
  - Natural debris – Lots of leaves, sticks, or other natural objects
  - Trash – Lots of plastic, garbage, or other forms of trash
  - Sheen / Oily – Surface has a multi-colored sheen or dark oil
- **Water Clarity** – Look into the water and record the best description
  - Clear – Colorless, transparent
  - Cloudy/Milky – Water appears hazy, chalky, cloudy white or grey
  - Turbid- Murky (brownish, reddish, or greenish) from suspended sediment or algae
- **Water Color** – Chose the number that best describes the color and check normal if this is the typical color or abnormal if this color is unusual for the stream
- **Water Odor** – Does the water have a strong smell?
- **Algae Cover** – Look upstream and downstream (10 m) of the sampling location and record what category best describes the dominate condition of algae in the stream
  - Little/Rare – No visible signs of abundant algae
  - Substrate layer – Algae that is attached to the stream bed and woody debris; often a green-brown slimy coating
  - Filamentous – Strands of long green string like or hair like algae
- **Dead Fish** – Look around your immediate sampling location (10 m in all directions) and count the number of dead fish floating or below the surface. Take photo of large kills.
- **Present Weather** – Record the current weather conditions while monitoring
- **Inches of rainfall** – Total rainfall in past 24 hours. Locate a weather station nearby and record the total precipitation. - (www.wunderground.com)
- **Photo point monitoring** – Did you take photos this trip – Upload any photos to your Google folder (supplied by UWW coordinator)

Sampling

1. **Measure the Temperature**

   1.1. Turn on the thermometer and make sure it is set in Celcius (°C). Measure the air temperature first by holding the thermometer in a shady location and let the thermometer adjust to the ambient conditions for at least 1 minute beforerecording.
   1.2. Measure the water temperature by submerging the thermometer two-thirds below the surface of the water. It is best to record the temperature of the stream in a central flowing location. Let the thermometer adjust to the water temperature for at least 1 minute before removing the thermometer from the water and quickly recording the temperature.

2. **Measure the pH**
   2.1. Remove one test strip from the jar and then reseal the jar.
   2.2. Place colored end of test strip in the water for 10 seconds.
   2.3. Remove test strip from the water and shake off excess water. Then wait 2 minutes.
   2.4. Compare test strip to the color guide and select the closest color match. Record the pH.

3. **Measure the turbidity using a Turbidity Tube**
   3.1. Dip tube into the water at your sampling site and fill to the top. Be careful to sample flowing water and not the stream bottom. Do not stand upstream from the area you are sampling.
   3.2. Take the reading in an evenly lighted area.
   3.3. Cover your hand over the top and shake the tube to re-suspend any sediment.
   3.4. Look through the tube toward the target disk on bottom:
      - If the disk is visible, record the water level in centimeters
      - If the disk is not visible, slowly release water from the valve until the disk becomes visible and then stop the valve. Record the water level in cm.

4. **Measure Dissolved Oxygen**
   4.1. Rinse the collection cup with stream water three times and then fill to 25 mL with water below the surface of the stream.
   4.2. Place glass ampoule in cup and break tip under the water. Let ampoule fill with water.
   4.3. Mix the ampoule by turning it up and down several times. *DO NOT PLACE FINGERS ON OR NEAR BROKEN GLASS TIP* Wait 2 minutes.
   4.4. With light shining on the comparator place the test ampoule near the color standards. Place on both sides to determine the best color match. Record the concentration.

5. **Record sample location information**
   5.1. Check the line to indicate where your sample location is (Side or Center) and the habitat type (Riffle, Run, or Pool)
   5.2. Measure and record in centimeters the total depth of sampling location

6. **Remember to decontaminate your equipment** and record the time spent sampling (to the nearest half hour), miles traveled and number of participants on your datasheet.

E. coli Sampling Instructions

In the field Sample Collection

1. Pull of the top of the Whirl-Pak using the perforated line.
2. Use the white tabs to open the pouch; do not touch the top or inside of the bag.
3. Face upstream and collect your sample from a depth below 15 cm (6 in.) if possible. Be careful not to sample disturbed substrate or surface scum.
4. With bag open, in one quick motion, immerse the bag under water and fill making sure to leave some head space. Remove from water, hold yellow tabs and flip over twice. Seal by twisting the yellow ties closed.
5. If you are monitoring more than one location record sample ID on bag.
6. Water samples kept longer than 1 hour before plating need to be stored on wet ice or refrigerated. Samples can be stored for up to 8 hours.

Inside plating

1. Make sure Coliscan Easygel medium in the bottle has thawed.
2. Strongly shake Whirl-Pak to thoroughly mix the sample. Carefully open bag using white tabs so not to touch the lip or inside. Use a transfer pipe, and deposit 1 to 5 mL in the Coliscan Easygel bottle, cap and gently swirl. Repeat for second duplicatesample.
3. Using a permanent marker record on the bottom of the petri dish the site id or name, date, time sample was plated, volume of sample, and sample # 1 or 2.
4. Remove the lid, but be careful not to touch the inside of the petri dish or lid.
5. Pour Coliscan Easygel medium with sample water from the bottle slowly into the bottom of the petri dish. Replace lid and gently swirly to coat entire bottom. Place the top on the petri dish and leave it on a level surface out of direct sunlight for 45 minutes to solidify. Once solid move to incubation location. Wash hands.

Incubation Period

1. Store petri dishes in a **warm, draft free location** out of direct sunlight. Use the thermometer to measure the temperature. At room temperature, 20 - 24 °C (68 – 75 °F), colored colonies will take at least 48 hours to develop.
2. Check every 10-12 hours to observe if colored colonies have started to form. Upon sighting the formation of colored colonies, note the time and allow for another 24-30 hours for the maturation of these colonies. This is usually 48-60 hours after you poured the medium into the petri dish. Counts should not be made after 72 hours.
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Record Results

1. In a bright area, count ONLY colonies that have a dark blue or purple color. Dark blue and purple colonies indicate *E. coli*. Do not count pink, red, or teal, colonies as these indicate other Coliforms and different types of bacteria. Also, ignore tiny, pin sized colonies. If you are unsure, look at examples provided. If still uncertain check with another UWW volunteer or take a photo and send to UWW staff.
2. Record the number of dark blue or purple colonies counted on the data sheet for each sample. Enter the sample size (1 to 5) for each sample. Now you can calculate the E. coli per 100 mL (cfu). First divide 100 by the sample size. Then multiply this dilution factor by the colonies counted
3. EX: 100ml / 3 mL Sample size = 33. 33 X 9 colonies counted = 297 cfu / 100mL
4. Do this for both samples. Then average the two sample to the nearest whole number and record on the data sheet Average E. coli cfu / 100 mL

Disposal

1. Place a teaspoon of bleach onto the surface of the medium. Close the lid and let it sit for five minutes.
2. Place both petri dishes in a sealed container (Ziploc bag) and throw in the trash.
3. **WASH YOUR HANDS** after handling samples, plates, and water.

Photo point monitoring instructions

UWW will assist in setting up your photo point locations. Photos should be taken on a quarterly basis – spring, summer and fall - and uploaded to a shared Google Drive.

The field of view for each photo should remain the same over time. To ensure this, keep original copies of photos in your monitoring binder.

Take the photo:

1. Choose the camera settings that give the greatest depth of field. For digital cameras a "landscape" setting generally fulfills this requirement.
2. Hold the camera at eye level. Try to include about 1/3 sky in the photo for scale and for consistent replication.
3. Take the photos in early morning, late afternoon or slightly overcast days to eliminate harsh glares or dark shadows. Take the photos with the sun at your back and avoid days when visibility is poor due to fog or heavy rain.

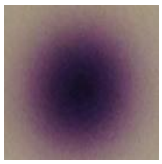
Decontamination Procedures

After collecting field samples or recreating in bodies of water known or suspected to have invasive species, all equipment and clothing that encounters the water should be cleaned thoroughly. When practical, the least infected or least likely to be infected sites should be sampled prior to infected sites. This will reduce accidentally infecting a new area while sampling.

1. Before you leave the site, remove any visual debris (e.g. mud, plants or debris). Use a bristled brush to help remove debris.
2. Clean equipment with warm soapy water or a disinfecting solution (e.g. Ethanol, Lysol, Bleach, Formula 409).
3. Pay particular attention to crevices, such as in the tread of boots orwaders.
4. Rinse by immersing and agitating the gear in the bucket of clean rinse water (tap water). Do not use stream water to rinse gear as this may reintroduce organisms.
5. Completely dry out equipment using these drying times.
    - Summer - 7 days in the summer
    - Spring/fall - 18 days
    - Winter - 30 days
    - Freeze - 3 days

If available, SOPs recommend placing your waders, sandals and equipment in Sparquat 256 solution for a minimum of 10-15 minutes in the field.

E. coli


Purple, with purple halo


Purple, no halo


Purple with pink halo


Blue with purple or pink halo

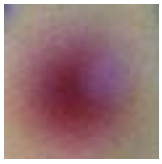

Blue or dark blue, no halo

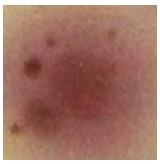

Dark blue with teal halo

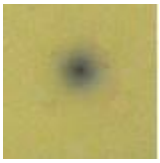

Dark blue with blue halo

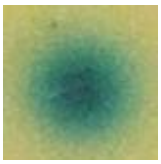
Not*E. coli*

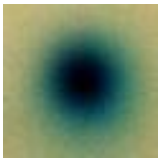

White

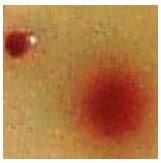

Pink, no halo


Pink with pink halo


Pinpoints*
(If after incubation period)


Teal green, no halo


Teal with teal halo


Red

*Do not count pinpoints if the plate is dominated by larger colonies. Pinpoints may be counted if they make up >50% of colonies. If possible, incubate a few additional hours to see if colonies will grow larger.

Photographs and definitions compiled by James Beckley, QA Coordinator of the Dept. of Environmental Quality, Richmond, VA

R 317-2-14 Numeric Criteria for Domestic Recreation, Aquatic Wildlife and Agricultural Uses

https://rules.utah.gov/publicat/code/r317/r317-002.htm

Parameters	Units	Domestic Source	Recreation and Aesthetics		Aquatic Wildlife				Agriculture
		1C	2A	2B	3A	3B	3C	3D	4
pH	Range	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0
Max. Temperature	^{o}C				20	27	27		
Max. E. coli	(No.)/100mL	668	409	668					
Turbidity Increase	NTU		10	10	10	10	15	15	
Minimum Dissolved Oxygen	(mg/L)	First number in column is for when early life stages are present, second number is for when all other life stages present.			8.0 / 4.0	5.0 / 3.0	3.0	3.0	
Minimum Dissolved Oxygen	(mg/L) 30 Day-Average				6.5	5.5	5.0	5.0	
Minimum Dissolved Oxygen	(mg/L) 7 Day-Average	First number in column is for when early life stages are present, second number is for when all other life stages present.			9.5/5.0	6.0 / 4.0			

Use Designations:

Class 1C - Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water
Class 2A - Protected for frequent primary contact recreation where there a high likelihood of ingestion of water or a high degree of bodily contact with the water. Examples include, but are not limited to, swimming, rafting, kayaking, diving, and water skiing.
Class 2B - Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.
Class 3A - Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.
Class 3B – Protected for warm water species of game fish and other warm aquatic life, including the necessary aquatic organisms in their food chain.
Class 3C – Protected for nongame fish and other aquatic life, including the necessary aquatic organisms in their food chain.
Class 3D – Protected for waterfowl, shore birds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.
Class 4 – Protected for agricultural uses including irrigation of crops and stock watering.
Class 5 – The Great Salt Lake

Visit our Water Quality Interpretation Tool to further investigate water quality standards: http://extension.usu.edu/waterquality/htm/wqtool

Utah Water Watch Useful Websites

Utah Water Watch

- Homepage: http://extension.usu.edu/utahwaterwatch
- UWW Database: https://uww.usu.edu
- Water Quality Extension: http://extension.usu.edu/waterquality
- Facebook: http://www.facebook.com/UtahWaterWatch
- Twitter: https://twitter.com/UtahWaterWatch
- Instagram: https://www.instagram.com/utahwaterwatch/
- Stream Side Science curriculum: http://streamsidescience.usu.edu

Utah Water Quality Monitoring Agencies and resources

- Utah Division of Water Quality: http://www.waterquality.utah.gov/
    - Utah Standard Operating Procedures (SOPs) and other QAQC Procedures: http://www.deq.utah.gov/Compliance/monitoring/water/qaqc.htm
    - Approved Total Maximum Daily Loads (TMDLs): http://www.deq.utah.gov/ProgramsServices/programs/water/watersheds/approved tmdls.htm
- Utah Clean Water Partnership: utahcleanwater.org

Utah Water Quality Laws

- Utah Administrative Code R 317 - Environmental Quality, Water Quality: https://rules.utah.gov/publicat/code/r317/r317.htm
- Utah Administrative Code R 317.2 - Standards of Quality for Waters of the State: https://rules.utah.gov/publicat/code/r317/r317-002.htm

National Water Quality agencies and resources

- Environmental Protection Agency, Water: http://www.epa.gov/gateway/learn/water.html
- My Waters Mapper: http://watersgeo.epa.gov/mwm/
- National Water Quality Monitoring Council: http://acwi.gov/monitoring/
- USGS Water Watch: http://waterwatch.usgs.gov/
- NOAA Phytoplankton Monitoring Network: https://products.coastalscience.noaa.gov/pmn
- National Aquatic Center Monitoring Center – BugLab – www.usu.edu/buglab

Weather

- Weather Underground: http://www.wunderground.com
- Community Collaborative Rain, Hail & Snow Network: http://www.cocorahs.org/state.aspx?state=ut

Preventing the Spread of Invasive Species

- UT DWR Decontamination Methods: http://wildlife.utah.gov/dwr/decontaminate.html

Key to Macroinvertebrate Life in Ponds and Rivers in Utah

Shells

Single Shell

Snails
(Gastropoda)

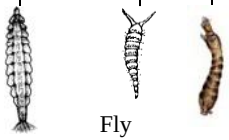
Double Shell

Clams, Mussels
(Bivalvia)

No Shells

Legs

With tentacles, brushes or



Fly
larve

No legs

Worm like

Fly larve
(Diptera)

Flat worm
(Turbellaria)

Segmented worm
(Oligochaeta)

Leech
(Hirudinea)

10 + legs

Crayfish
(Decapoda)

Scud
(Amphipod)

Sowbug
(Isopod)

4 pair of legs

Water mite
(Trombidiformes)

3 pairs of legs

No Wings

No tails

Dragonfly
(Odonata)

Caddisfly
(Trichoptera)

Aquatic Moth
(Lepidoptera)

Beetle Larva
(Coleoptera)

Alderlfy
(Megaloptera)

1 or 2 tails

Stonefly
(Plecoptera)

Caddisfly
(Trichoptera)

Mayfly
(Ephemeroptera)

Alderfly
(Megaloptera)

Beetle
Larva

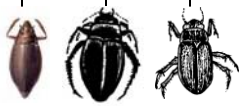
3 tails

Mayfly
(Ephemeroptera)

Damselfly
(Odonata)

Wings

Beetle-like,
hard wings



Water Beetles
(Coleoptera)

Leathery wings

Water Bugs
(Hemiptera)

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http://www.extension.usu.edu/waterquality

Images courtesy of USU Water Quality Extension and University of Wisconsin– Extension Environmental Resources Center.

IMAGES NOT TO SCALE

Steps to Take if You Suspect a Harmful Algal Bloom

USU Water Quality Extension – Utah Division of Water Quality

(Available online at: http://extension.usu.edu/utahwaterwatch/monitoring/Lakes/Hab)

Introduction

What are harmful algal blooms?

Harmful algal blooms (HABs) are large growths of cyanobacteria that change the water color or form surface scums, and occur in lakes, reservoirs and ponds. Cyanobacteria blooms are occurring more frequently in Utah, likely in response to increased nutrients and a warmer climate. These tiny plant-like bacteria can produce deadly toxins that are harmful to humans, livestock and pets.

For up-to-date info on algal blooms, including toxin levels check ***habs.utah.gov***

Program overview:

USU Water Quality Extension and Utah Division of Water Quality are collaborating to supply microscopes and cyanotoxin test strips used to verify potential blooms and evaluate their toxicity.

Part of this program involves training people who commonly visit water bodies – state park employees, conservation districts, extension agents, boaters, outdoor recreationalists, etc. – on what these blooms look like and how to collect samples of the bloom. Volunteers then bring these samples to local scopes for further analysis.

Document outline:

These instructions will guide you through (1) examining the suspected bloom (2) documenting the extent of the bloom, (3) collecting, storing and transporting the sample for further analysis, and (4) Completion of the online Google form.

Field Supplies needed to make a preliminary field ID and to collect a sample.

Contact waterquality@usu.edu for replacement materials. Documents are available on at http://extension.usu.edu/utahwaterwatch/monitoring/Lakes/Hab

- This notebook
- 1 liter screw-cap bottle (prevents spillage), provided. In a pinch, clean 32oz sports drink bottles work as well.
- Digital camera + GPS (smartphone)
- Waterproof gloves (shoulder length when possible), eyewear (in case of a splash), and waders.
- Fresh water and soap to wash hands and remove any cyanobacteria or toxins

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Safety First

As discussed above, blooms can be dangerous to human and animal health. Cyanobacteria produce toxins that, when ingested, impact the brain and kidneys. A review of the occupational hazards related to cyanobacterial exposure (Stewart et al 2009), found moderate risks. Animals and swimmers, which often ingest surface waters, are at particular risk. According to the review, most people who ingest small amounts of the toxin report flu-like symptoms. People in contact with cyanobacteria scums have reported skin irritation (documented scientific risk) and nausea from breathing fumes (negligible risk).

Volunteers should take care to avoid falling into waters, when accidental swallowing of cyanobacteria may occur. Be sure to avoid steep banks and, and when possible, use basic tools (e.g. buckets) to collect the surface scum or whole-water samples.

Avoid exposure to cyanotoxins by following these simple safety guidelines:

- Wear elbow/shoulder length rubber or nitrile gloves, eye protection (such as lab glasses), and waders/boots during sampling.
    - If you don't have shoulder length gloves, a simple garbage bag will suffice.
    - Waders/boots should be rinsed of algal material using tap or other uncontaminated water and disinfectant (i.e. Formula 409) before storage to remove toxins and reduce risk of transportation of aquatic invasive species.
- Do not ingest water or allow water to come into contact with exposed skin.
- Avoid inhaling spray caused by boats, wind or other water surface disturbances.
- Wash hands thoroughly with soap after sampling before eating or drinking.

Citation

Stewart I., Webb P. M., Schluter P. J., Shaw G. R. (2006a). Recreational and occupational field exposure to freshwater cyanobacteria - A review of anecdotal and case reports, epidemiological studies and the challenges for epidemiologic assessment. *Environ. Health* 24:6 10.1186/1476-069X-5-6

Steps to Take

1. Rule out look-a-likes and examine the bloom

Before proceeding, make sure the suspected bloom is not filamentous green algae or duckweed, two common, and harmless, aquatic plants. Then, take a closer look: cyanobacteria form blooms of many different colors and forms.

Refer to the "Field Guide to Scums" for more info on common types of algae and cyanobacteria.

Verify the suspect bloom is not filamentous green algae or duckweed

Filamentous green algae
Types of green algae can look a lot like cyanobacteria and grow in similar nutrient-enriched waterbodies. Unlike cyanobacteria, green algae may form long filamentous strands that make up silky "clouds" below the surface or viscous mats on the surface.

- **The stick test**

Find a sturdy stick or pole and pull it through the algae. If the stick pulls out strands that look like green hair or threads, the mat on the pond is likely filamentous green algae (non-toxic). If not, you may have a harmful algal bloom. (Source: Kansas Dept. of Health and the Environment)

Filamentous green algae
Sources: Clemson U. (L), NYS Department of Environmental Conservation (M, R)

Duckweed
Duckweed are tiny aquatic plants with a grainy texture that can cover the entire surface of calm, nutrient-enriched ponds. If you collect them you will notice their tiny leaves and root structures.

Examples of the aquatic plant duckweed.
Source: Ohio Environmental Protection Agency.

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Waterquality@usu.edu
435-797-2580

Examples of cyanobacteria

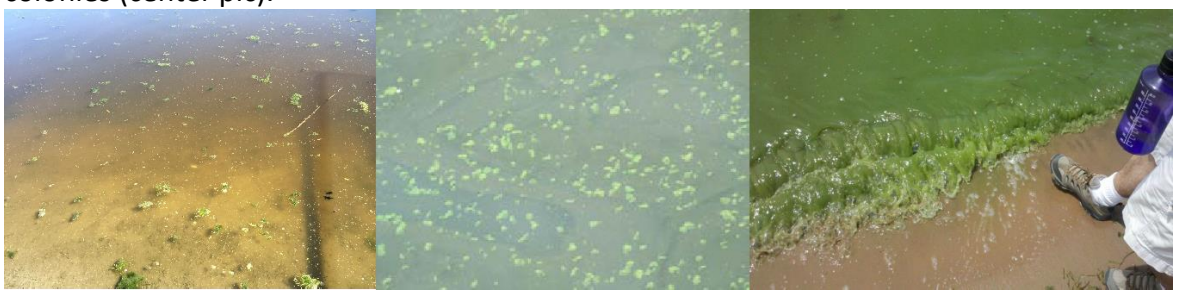
Cyanobacteria blooms tend to take two forms; they can be suspended throughout the water column (planktonic) or form a thick glop on the surface. **Collect a sample if you see either of these forms of cyanobacteria.**

Surface scums (likely cyanobacteria)

Often, HABs are described as looking like "spilled paint", green, white or blue. A blooms' color may change over time: the photos below were all taken at Utah Lake. Surface scums develop when the cyanobacteria begin to die and cannot control their buoyancy. **Be careful, these scums can be especially toxic!**

Pytoplankton (possibly cyanobacteria)

Besides cyanobacteria, many types of phytoplankton (euglena, diatoms) can form planktonic blooms. The water has been described as looking like "pea soup". You may see clumps, which are cyanobacterial colonies (center pic).



Sources: Raymond Li and the Utah County Health Department

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2. Photograph the bloom

Photos of the bloom will help managers assess the severity of the bloom

Survey the bloom

If possible, walk the perimeter of the water body. Blooms can be small and localized or cover most of a waterbody. If you visit a waterbody often, print out a map of the lake and trace the extent of the bloom on that map. Take notes of anything you see. These notes should include location, if the bloom is near a public beach, and GPS coordinates.

Photograph the bloom

Photograph the bloom, showing the breadth of the bloom as well as close ups (see pictures below). Be sure to take note of your GPS location. Many phones will do this for you. These steps are all spedified when using th bloomWatch app.

3. Collect and transport phytoplankton samples

Collect the sample

Wearing gloves and being sure to keep any liquid away from your face, collect a 1L sample. Keep sample in cooler of ice and refrigerate as soon as possible. Collect the sample from the top 1-2” of the surface in an area of thick scum, pushing the sample into the bottle if necessary.

If the phytoplankton are distributed throughout the water column, fill the 1L bottle with water from an elbow-depth.

Label the 1L sample bottle using the permanent marker, included in your kit.

- Site name, your initials, date (Mmddyy). Also include the water temperature.
  - Willard_EWR_053116

Transport and store the sample

Once you have collected a sample, make sure the bottle is well-sealed and kept cool. A sample may be stored up to 48 hours when refrigerated. If a sample cannot be analyzed for toxins within 24 hours, freeze the sample.

Name your photos:

Field Pictures (if not already submitted with bloomWatch):

The name of the file should contain site name, volunteer initials, and the date (MMDDYY).
eg: "**Mantua_BNM_081417**"

You can easily edit the photo's file name via your computers file manager.

Scope Pictures:

The name of the file should contain site name, volunteer initials, the date (MMDDYY), and magnification. eg: "Mantua_BNM_081417_x200"

4. Fill Out the Bloom Report

Fill out the Google form at https://goo.gl/forms/r0VfHjjzDL5g5dlr2

Note: This form is also where you will submit your pictures at the site and from your microscope location. If you already used bloomWatch, simply fill in the microscope information.