

*Harmful algal bloom
monitoring and response
for drinking water in
Colorado*

April 29, 2016

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COLORADO

Department of Public
Health & Environment

June 2015 - EPA publishes cyanotoxin health advisories

- Studies find liver, kidney, and reproductive toxicity
- Health Advisories are non-regulatory informal technical guidance

Chemical	10-day advisory	
	Bottle-fed infants and pre-school children	School age children and adults
microcystins	0.3 µg/L	1.6 µg/L
cylindrospermopsin	0.7 µg/L	3 µg/L



Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water

June 2015



The challenges

- Need to educate and raise awareness among surface water systems that could be impacted
 - New acute health advisories with devastating “do not drink” public notice
 - 10,000 people with a week long advisory could mean around \$1M per day using FEMA’s valuation of lost water of \$103 per person per day
 - “What is a health advisory?” “Why are there 2 tiers and 10-days?”
- No database of toxin data in Colorado but we know many systems with blue-green algae and taste and odor issues
- No Colorado lab capacity
 - High analytical costs, 3-4 day turnaround time
 - Debate among analytical methods

Solution - Colorado Harmful Algal Bloom Workgroup

- Collaboration between Colorado's Drinking Water Program, Colorado drinking water providers, and others
- Workgroup goal - provide guidance and tools for systems large and small
 - Guidance, trainings, troubleshooting, lab support, data sharing, TTX
- Meetings to share information, Google Group to communicate quickly, and online library to share information



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CoWARN Colorado's Water/Wastewater
Agency Response Network

Colorado's drinking water guidance

April 2016

Harmful Algal Bloom Monitoring Guidance

For Colorado drinking water providers with surface water sources
From the Colorado Harmful Algal Bloom Workgroup

Step 1: Observe and prepare	<p>Visually inspect source waters for algae blooms at least weekly during bloom season (typically late summer through early fall). Taste and odor events, shorter filter runs, and changes in source water quality may indicate the presence of a bloom. Before bloom season starts, be prepared and order cyanotoxin (microcystins and cylindrospermopsin) field tests, evaluate source and treatment options, and develop a monitoring, response, and communication plan.</p> <p><i>*If bloom observed continue to step 2</i></p>
Step 2: Field screen for blue-green algae	<p>Immediately after observing bloom use microscopic examination or phycocyanin analyzers if available or use jar and stick tests¹ and field identification guide² for presence of blue-green algae which could produce cyanotoxins. Continue examinations at least weekly during presence of bloom.</p> <p><i>*If blue-green algae are present continue to step 3</i></p>
Step 3: Field screen for toxin presence in raw water	<p>Monitor raw water intake for presence of cyanotoxins using a field test for source drinking water (e.g., Abraxis Strip Test) immediately after identifying blue-green algae and then at least weekly during presence of blue-green algae. You can use a field test for finished drinking water if you freeze then thaw sample 3 times to release toxins within cells prior to analysis. Evaluate source and treatment options. Identify and contact lab³ in advance about sampling procedures and sample turnaround time in case toxins are detected in finished water.</p> <p><i>*If microcystins and/or cylindrospermopsin are present in raw water continue to step 4</i></p>
Step 4: Field screen for toxin presence in finished water	<p>Monitor finished water at entry point for presence of the cyanotoxin(s) detected in raw water using a field test for finished drinking water (e.g., Abraxis Strip Test) immediately after detecting cyanotoxin presence in raw water and then at least weekly during cyanotoxin presence in raw water. Evaluate source and treatment options. Notify utility management about a response and communication plan in case cyanotoxins are present in the finished water above EPA's health advisory values.</p> <p><i>*If microcystins and/or cylindrospermopsin are present in finished water continue to step 5</i></p>
Step 5: Quantitative lab analysis for toxin in finished water	<p>Send finished water sample (after quenching chlorine residual) to lab for quantification of the cyanotoxin(s) detected in finished water immediately after detecting cyanotoxin presence in finished water and then at least weekly during cyanotoxin presence in finished water. Evaluate source and treatment options.</p> <p><i>*If microcystin values are above 0.3 µg/L and/or cylindrospermopsin values are above 0.7 µg/L (EPA's health advisory values), consult CDPHE (1-877-518-5608) so they can assist. Take a confirmation sample of the finished water within 24 hours and send to lab. If confirmation sample results are above health advisory values, follow utility response and communication plan and notify consumers. Consider monitoring for toxins at various points throughout distribution to look for toxin degradation and extent of impacted area using a field test for finished drinking water. Notify consumers that water has returned to acceptable levels after at least 2 consecutive finished water samples are below EPA's health advisory levels.</i></p>

¹ Jar and stick test procedures developed by Kansas Department of Health and Environment to identify blue-green algae: www.kdheks.gov/algae-illness/download/Jar_Test.pdf

² Field and Laboratory Guide to Freshwater Cyanobacteria developed by USGS: <https://pubs.er.usgs.gov/publication/ofr20151164>

³ List of laboratories for toxin analysis developed by Oregon Health Authority: <http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/Operations/Treatment/Pages/algaelabs.aspx>



Colorado's drinking water guidance

Step 1: Observe and prepare

Visually inspect source waters for algae blooms at least weekly during bloom season (typically late summer through early fall). Taste and odor events, shorter filter runs, and changes in source water quality may indicate the presence of a bloom. Before bloom season starts, be prepared and order cyanotoxin (microcystins and cylindrospermopsin) field tests, evaluate source and treatment options, and develop a monitoring, response, and communication plan.

**If bloom observed continue to step 2*

Colorado's drinking water guidance

Step 2: Field screen for blue-green algae

Immediately after observing bloom use microscopic examination or phycocyanin analyzers if available or use *jar and stick tests*¹ and field identification guide² for presence of blue-green algae which could produce cyanotoxins. Continue examinations at least weekly during presence of bloom.

**If blue-green algae are present continue to step 3*

Field screen for blue-green algae

- Jar Test - Cyanobacteria float to the surface or remain suspended in the water column



Field screen for blue-green algae

- Stick Test - Long strands are probably NOT cyanobacteria



Field screen for blue-green algae

Field and Laboratory Guide to Freshwater Cyanobacteria Harmful Algal Blooms for Native American and Alaska Native Communities



Colorado's drinking water guidance

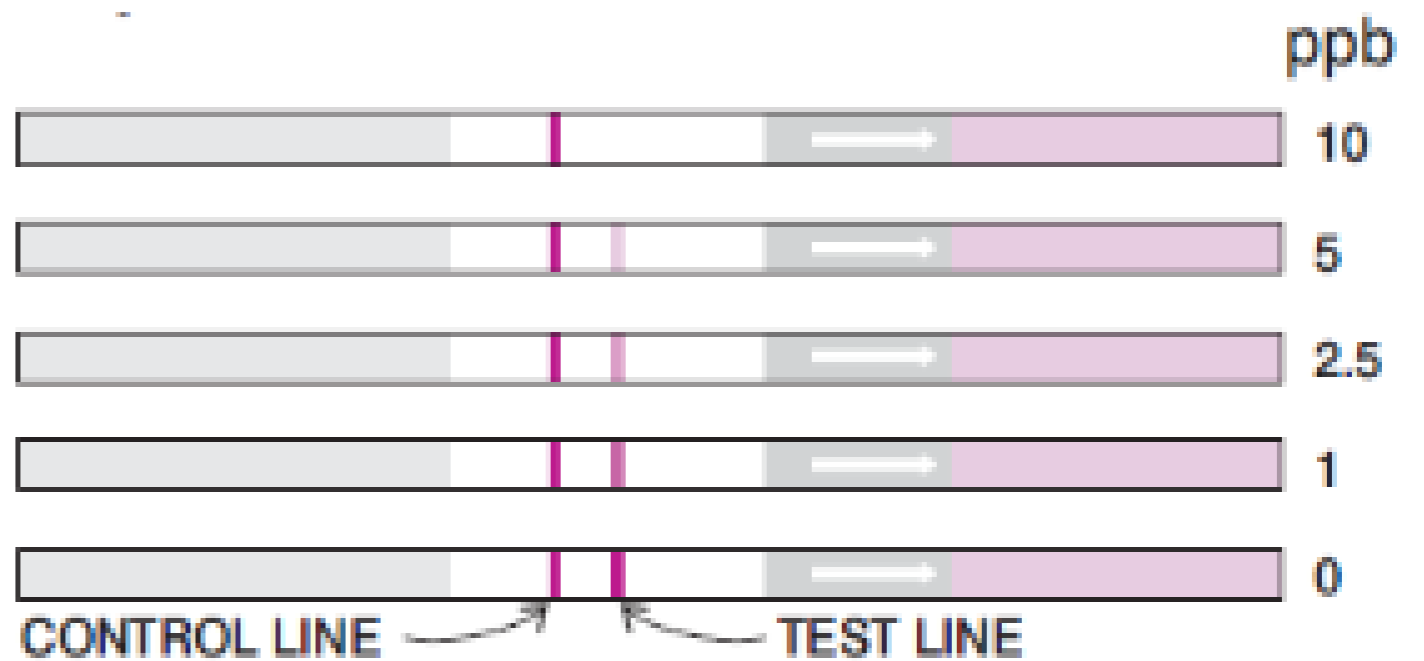
Step 3: Field screen for toxin presence in raw water

Monitor raw water intake for presence of cyanotoxins using a field test for source drinking water (e.g., Abraxis Strip Test) immediately after identifying blue-green algae and then at least weekly during presence of blue-green algae. You can use a field test for finished drinking water if you freeze then thaw sample 3 times to release toxins within cells prior to analysis. Evaluate source and treatment options. Identify and contact lab³ in advance about sampling procedures and sample turnaround time in case toxins are detected in finished water.

**If microcystins and/or cylindrospermopsin are present in raw water continue to step 4*

Field screen for toxin presence

- Abraxis test strips
- Easy to use
- \$30 per test
- Microcystin only, but additional strips coming this spring



INTERPRET TEST

CONTROL LINE	TEST LINE	INTERPRETATION
NO CONTROL LINE PRESENT	NO TEST LINE PRESENT	INVALID RESULT
CONTROL LINE PRESENT	NO TEST LINE PRESENT	> 10 ppb
CONTROL LINE PRESENT	MODERATE INTENSITY TEST LINE PRESENT	BETWEEN 0 AND 10 ppb

Identify and contact lab

The screenshot shows a web browser window with the URL <http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/Operations/Treatr>. The page is titled "Blue-Green Algae Labs & Expert Contacts". The header includes the Oregon.gov logo, text size options, a language selector, and a search bar. The main navigation bar features "Public Health" and various categories like "Topics A to Z", "Data & Statistics", "Forms & Publications", "News & Advisories", "Licensing & Certification", "Rules & Regulations", and "Public Health Directory". The left sidebar lists "Drinking Water" sub-topics, with "Water System Operations" highlighted. The main content area shows a breadcrumb trail: "Public Health > Healthy Environments > Drinking Water > Water System Operations > Surface Water Treatment > Blue-Green Algae Labs & Expert Contacts". The page title is "Blue-Green Algae Labs & Expert Contacts". Under "On this page:", there are links for "Labs that can perform algae testing" and "Local expert contacts". A list of five labs is provided, each with contact information and services offered. A "More Resources" sidebar includes links for "Drinking Water Data Online", "Site Map", and "For Consumers". A "Contact Us" sidebar links to "Drinking Water Services" and "Center for Health Protection". A "Ready to Quit Tobacco?" banner is visible at the bottom left.

Public Health > Healthy Environments > Drinking Water > Water System Operations > Surface Water Treatment > Blue-Green Algae Labs & Expert Contacts

Blue-Green Algae Labs & Expert Contacts

On this page:

- [Labs that can perform algae testing](#)
- [Local expert contacts](#)

Labs that can perform algae testing

- Aquatic Services**, 42184 Tweedle Lane, Seaside, OR 97138. Phone 503-755-0711. Contact: Wayne W. Carmichael, PhD, wayne.carmichael@wright.edu. (Consulting and lab services, algal identification/enumeration.)
- Environmental Analysis Laboratory**, Lake Superior State University, 650 W Easterday Ave, Sault Ste. Marie, MI 49783. Phone 906-635-2076. Contact: Ben Southwell, bsouthwell@lssu.edu. (Consulting and lab services, algal identification/enumeration.)
- UC Davis CAHFS Toxicology Laboratory**, School of Veterinary Medicine, University of California West Health Sciences Drive, Davis, CA 95616. Phone 530-752-6322. Contact: Birgit Puschner, bpuschner@ucdavis.edu. (Toxin testing.)
- Greenwater Labs/Cyano Lab**, 205 Zeagler Dr, Suite 302, Palatka, FL 32177. Phone 386-328-0882, fax 386-328-9646. Contact: Mark Aubel, markaubel@greenwaterlab.com. (Toxin testing, as well as identification and enumeration.)
- Aquatic Analysts**, 126 Ocean View Dr, Friday Harbor, WA 98250. Phone 503-869-5032. Contact: Jim Sweet, jwsweet@aol.com. (Identification and enumeration only, cheapest.)

More Resources

- [Drinking Water Data Online](#)
- [Site Map](#)
- [For Consumers](#)

Contact Us

- [Drinking Water Services](#)
- [Center for Health Protection](#)

Ready to Quit Tobacco? Learn more >

Colorado's drinking water guidance

Step 4: Field screen for toxin presence in finished water

Monitor finished water at entry point for presence of the cyanotoxin(s) detected in raw water using a field test for finished drinking water (e.g., Abraxis Strip Test) immediately after detecting cyanotoxin presence in raw water and then at least weekly during cyanotoxin presence in raw water. Evaluate source and treatment options. Notify utility management about a response and communication plan in case cyanotoxins are present in the finished water above EPA's health advisory values.

**If microcystins and/or cylindrospermopsin are present in finished water continue to step 5*

Colorado's drinking water guidance

Step 5: Quantitative lab analysis for toxin in finished water

Send finished water sample (after quenching chlorine residual) to lab for quantification of the cyanotoxin(s) detected in finished water immediately after detecting cyanotoxin presence in finished water and then at least weekly during cyanotoxin presence in finished water. Evaluate source and treatment options.

**If microcystin values are above 0.3 µg/L and/or cylindrospermopsin values are above 0.7 µg/L (EPA's health advisory values), consult CDPHE (1-877-518-5608) so they can assist. Take a confirmation sample of the finished water within 24 hours and send to lab. If confirmation sample results are above health advisory values, follow utility response and communication plan and notify consumers. Consider monitoring for toxins at various points throughout distribution to look for toxin degradation and extent of impacted area using a field test for finished drinking water. Notify consumers that water has returned to acceptable levels after at least 2 consecutive finished water samples are below EPA's health advisory levels.*

Colorado's drinking water guidance

Resources:

- Colorado Harmful Algal Bloom Workgroup (303-692-3605) can assist with toxin sampling and evaluating source and treatment options.
- Colorado Lake and Reservoir Management Association (www.clrma.org) can assist with bloom and algae identification.
- Colorado's Water and Wastewater Agency Response Network (www.cowarn.org) can assist with resources to respond to a cyanotoxin health advisory exceedance.
- Colorado Water Quality Control Division's Local Assistance Unit (303-692-3665) can assist with harmful algal bloom training, toxin sampling and evaluating source and treatment options.

Colorado HAB workgroup next steps

- Denver Water volunteered to add color and graphics to guidance - NO state logo
- Post guidance and tools on local AWWA webpage
- Our water quality control division will recommend systems follow the guidance
- Work on public notice templates
- HAB Communication Tool with scenarios and responses from TTX

Benefits of utility/state HAB workgroup

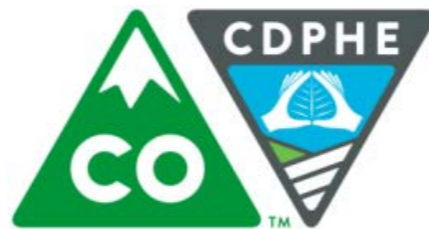
- Quickly educate utilities and others of new HAB information
- Colorado now a resource rich state - workgroup members are willing to share their resources to help each other and other drinking water providers
- Workgroup can quickly update guidance and tools as new information becomes available
- Systems are more willing to follow guidance since they helped create it - not top-down
- Product is better with more experts
- State water quality control division is viewed as a partner and resource

Questions?

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303-692-3605



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