Health Advisories and Treatment Considerations for Cyanotoxins in Drinking Water

North Coast RWQCB – CyanoHAB Public Workshop

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Clear Lake, CA
Konocti County Water District
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Drinking Water Health Advisories

- Per US EPA: Heath advisories are non-regulatory concentrations at which adverse health effects are not anticipated to occur over specific exposure durations (e.g., one day, ten days, and lifetime).
- In June 2015, US EPA issued 10-day Drinking Water Health Advisories (HAs) for two cyanobacterial toxins: total microcystins and cylindrospermopsin.
- HAs are not legally enforceable, and are subject to change based on new information.
- Analytical capability may present a major challenge in responding to drinking water events.

Drinking Water Health Advisories

- 10-day Health Advisory recommended concentrations for total microcystins are:
  - 0.3 µg/L for children younger than school age
  - 1.6 µg/L for all other age groups

- 10-day Health Advisory recommended concentrations for cylindrospermopsin are:
  - 0.7 µg/L for children younger than school age
  - 3.0 µg/L for all other age groups

HAs and Division of Drinking Water

- DDW regulates Public Water Systems in CA (PWSs have 15 or more **service connections** or regularly serve at least 25 individuals daily at least 60 days out of the year).
- DDW does not have the authority to require any specific action from PWSs in response to the HAs.
- DDW Recommends that water systems refer to USEPA's Health Advisories and its *Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water.*
- DDW offers to collaborate with water systems in developing Cyanotoxin Management Plans, monitoring plans, and public messaging (if needed).

Treatment Considerations

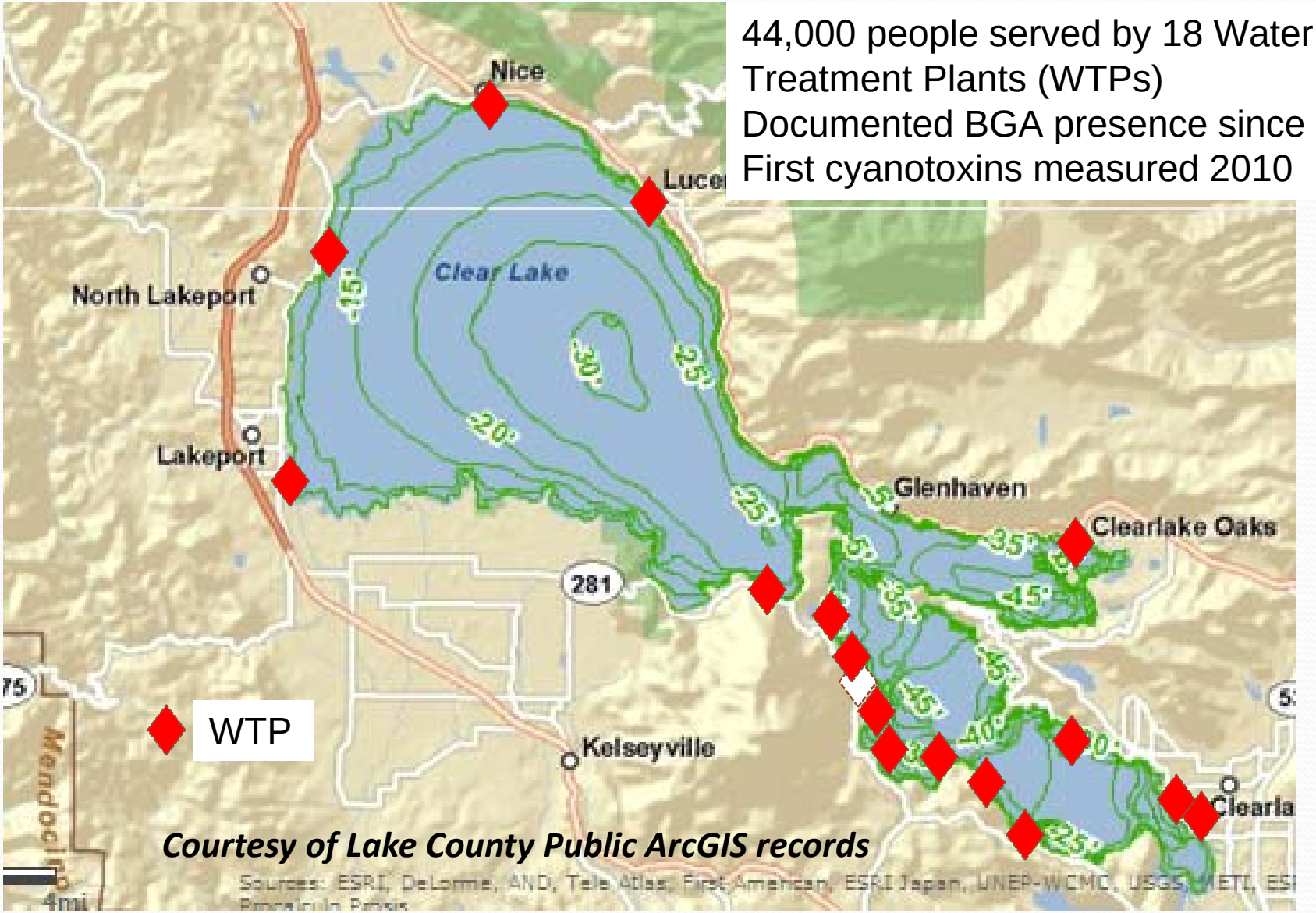
- USEPA and AWWA/WRF offer general treatment recommendations.
- Conventional treatment (coagulation, sedimentation, filtration) is effective in removing in-tact cells, but not extracellular toxins.
- Pre-oxidation can lyse cells, releasing toxins that will pass through conventional filters.
- Activated carbon can remove extracellular toxins.
- Some oxidants, such as ozone and free chlorine, can destroy extracellular toxins. CAREFUL: if in-tact cells are present, additional toxins may be released by cell lysis.

Treatment Considerations

- From what we've observed: there are no "one size fits all" solutions. Treatment systems must be fine-tuned based on source water, treatment train, technical ability, analytical ability.
- That said, general advice to PWSs may be feasible (e.g., optimizing pre- and post-oxidation to destroy dissolved toxins while avoiding cell lysis before filters).
- None of this advice applies to recreational or household treatment systems. Use of camping filters, over-the-counter systems is <u>not advised.</u> **Boiling water is not effective!**

Clear Lake Experience

44,000 people served by 18 Water Treatment Plants (WTPs)
Documented BGA presence since 1969
First cyanotoxins measured 2010

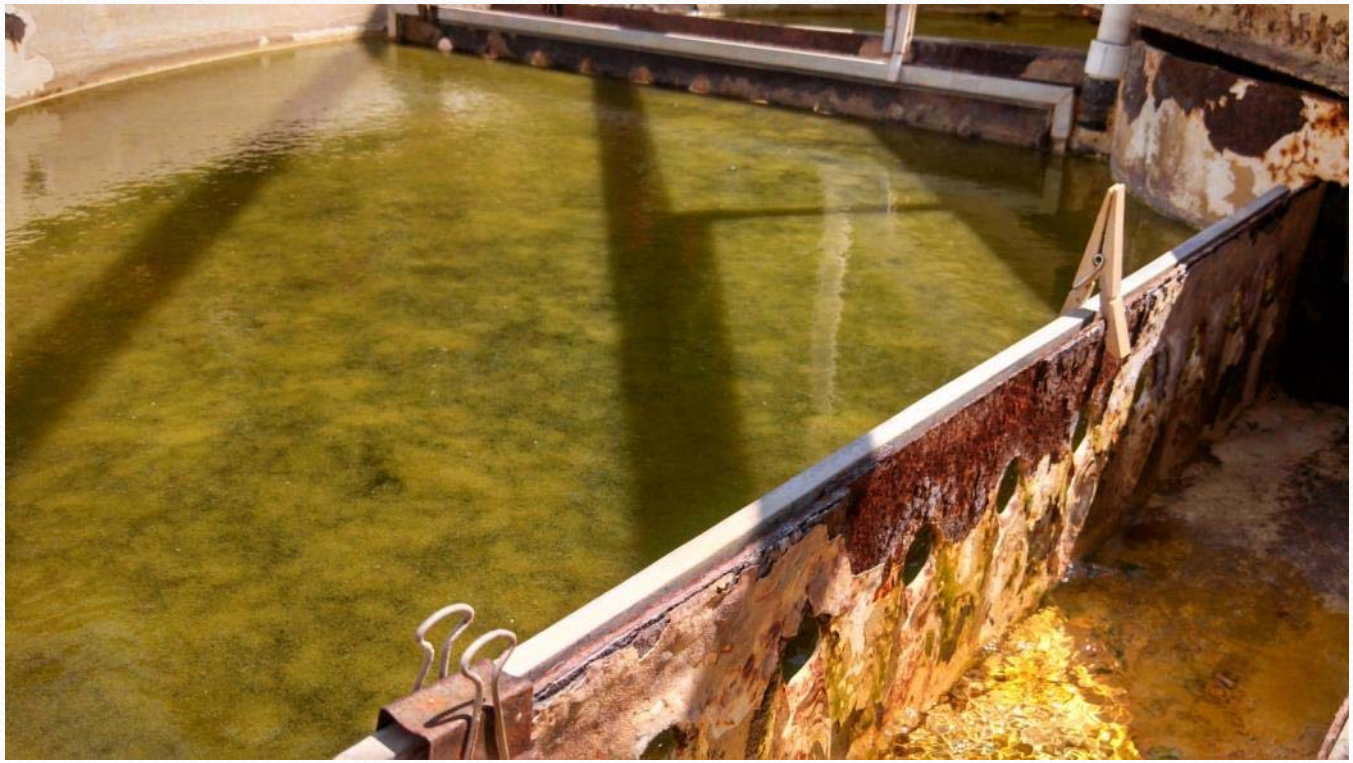


Courtesy of Lake County Public ArcGIS records

Clear Lake Experience

Ingenuity a must in 2014 season!

Typical Treatment in Clear Lake, CA



Hypothetical Cyanotoxin Treatment Assessment @ City of Lakeport

Highest cyanotoxin concentration detected at intake

INTAKE
2.76
ACID
Pre-Ozone
ACH
-%94
Alt Tech
2.5 log G
Post-Ozone
0.15
GAC
NaOCl
Contact Tank
0.5 log G
<RL
To Dist

Tip #1: Use tools to answer questions
Fluorometer? SCM?

Raw:
Monitoring pH? Change in intake depths available? Possible to adapt to behave like a DAF? Recycled water introduced?

Acid addition: in operation? Target pH at what point

Pre-Ozone: Restrict dosage? Or crank it? Effective?

US Filter: evaluate time between flushes; consider using filter aids; consider adding intermediate sample point

Monitor number of backwashes; look for breakthrough

Nature of the charge going on to the filter bed

Post-Ozone: In operation? Effective?

GAC: Know that it is possible for cyanotoxin breakthrough to happen before traditional indicators for spent media are used

Know CT: 99.9% Giardia lamblia cyst reduction is required

Tip #2: Know what stage the bloom is in

● **Cyanotoxin Sample Location**

Clear Lake – Cyanotoxin Results

Range of Microcystin concentrations, µg/L

	SOURCE WATER @ INTAKE	PROCESS WATER	FINISHED WATER RESULTS
Sept 8, 2011	<RL – 7.97	<RL – 0.53	NO DETECTIONS IN FINISHED WATER* INCLUDING AT DIALYSIS CENTERS
Aug 20-21, 2013	<RL – 2.36	<RL – 0.24	
July 24-28, 2014	<RL – 23.8	<RL – 7.4	

RL – reporting limit
* Detection at Lucerne but sampling & labelling was highly questionable

DDW District Offices

If you are aware of a Harmful Algal Bloom that might affect drinking water, contact the local DDW office!

Follow-up Information

- A wealth of information is available on our website:

http://www.swrcb.ca.gov/drinking_water/programs/index.shtml

http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/publicwatersystems.shtml

- Contact your local DDW field office

http://www.swrcb.ca.gov/drinking_water/programs/documents/ddwem/DDWdistrictofficesmap.pdf

- DDW Cyanotoxin Web Page:

http://www.waterboards.ca.gov/drinking_water/programs/habs/

- USEPA Cyanotoxin Web Page:

http://www.epa.gov/nutrient-policy-data/cyanobacteriacyanotoxins

- AWWA/WRF Guidance for Water Utilities:

http://www.waterrf.org/PublicReportLibrary/4548a.pdf

Contact Information

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