The Issue:

The State of Florida, most notably the Florida Department of Health or Florida Department of Environmental Protection, does not have a codified policy for effectively warning the public of health risks associated with cyanobacteria in public waters.

The Problem:

Cyanobacteria (also referred to as blue-green algae) are ubiquitous in aquatic environments and some species produce potent toxins that can sicken or kill people, domestic animals, and wildlife. Cyanotoxins identified as harmful to public health include anatoxin-a, anatoxin-a(s), cylindrospermopsins, microcystins, nodularins, and saxitoxins. Certain species are very competitive ecologically and can “fix” nitrogen and regulate their position in the water column to increase light availability for photosynthesis.

Background:

Federal Legislation, Guidelines and Health Risks: Currently, cyanobacteria toxins are classified by USEPA as unregulated contaminants. However, EPA requires monitoring of certain contaminants with respect to drinking water safety (Fourth Unregulated Contaminant Monitoring Rule, FUCMR). Under the auspices of FUCMR and its enabling act (1996 Safe Drinking Water Act) all Public Water Systems (PWS) having surface water as their source water or having groundwater under the direct influence of surface water, serving 10,000 or more customers will be required to start monitoring for ten cyanotoxins for a period of five years starting in March 2018. A random selection of 800 Community Water Systems (CWS) in the U.S. will be also be required to monitor for cyanotoxins starting in 2018. USEPA will fund the costs for monitoring by CWS.

Under the FUCMR PWS are required to notify their customers of the monitoring results for cyanotoxins and to post the results on the National Contaminants Occurrence Database.

An additional source of information on cyanotoxins, The Harmful Algal Bloom-Related Illness Surveillance System (HABISS) was created in response to the need to support public health decision-making about health risks associated with exposure to HABs and associated toxins but was closed for data collection in 2012.

USEPA describes drinking water health advisories, in the context of a 10 day exposure period to cyanotoxins, as guidelines (10 day Drinking Water Health Advisory) under the authority of the Harmful Algal Bloom and Hypoxia Research and Control Amendments Act of 2014 (also known as HABHRCA).
The HABHRCA “requires the National Oceanic and Atmospheric Administration (NOAA) and USEPA to advance the scientific understanding and ability to detect, monitor, assess, and predict HAB and hypoxia events in marine and freshwater in the U.S. These act also requires to maintain and enhance a national program to control and mitigate harmful algal bloom and hypoxia events, delineates the role of the Task Force (Interagency Working Group or IWG), and to develop reports and plans to reduce the likelihood of HABs formation and to mitigate their damage.”

Utilization of these guidelines by relevant state regulatory agencies appears to be optional. Florida has not codified WHO/NOAA/USEPA’s advisory guidelines as regulatory rules or statutes or as an official response to the presence of cyanotoxins in public waters.

USEPA has also published comprehensive standards or guidelines and certified analysis methodology for cyanobacteria/cyanotoxin in recreational waters derived from World Health Organization (WHO) research (Recommendations for Cyanobacteria and Cyanotoxin Monitoring in Recreational Waters (PDF)).

“For recreational waters, WHO concludes that a single guideline value for cyanobacteria or cyanotoxins is not appropriate. Due to the variety of possible exposures through recreational activities (contact, ingestion and inhalation) it is necessary to differentiate between the chiefly irritative symptoms caused by unknown cyanobacterial substances and the more severe health effects due to exposure to high concentrations of known cyanotoxins, particularly microcystins. The WHO guidance values for the relative probability of acute health effects during recreational exposure to cyanobacteria and the probability of microcystins concentrations are:”

<table>
<thead>
<tr>
<th>Relative Probability of Acute Health Effects</th>
<th>Cyanobacteria (cells/mL)</th>
<th>Microcystin-LR (µg/L)</th>
<th>Chlorophyll-a (µg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>&lt; 20,000</td>
<td>&lt;10</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Moderate</td>
<td>20,000-100,000</td>
<td>10-20</td>
<td>10-50</td>
</tr>
<tr>
<td>High</td>
<td>100,000-10,000,000</td>
<td>20-2,000</td>
<td>50-5,000</td>
</tr>
<tr>
<td>Very High</td>
<td>&gt; 10,000,000</td>
<td>&gt;2,000</td>
<td>&gt;5,000</td>
</tr>
</tbody>
</table>

For the public to accurately interpret the relative probability of health risks from recreational exposure, it would be necessary to know what cyanobacteria species were present, their cell density or related chlorophyll-a concentration. At this point in time, Florida does not have a codified policy for what information is necessary to obtain related to cyanobacteria blooms. The Florida Department of
Environmental Protection (FDEP) will variably respond to reports of cyanobacteria blooms and under arbitrary circumstances will collect samples and variably determine what dominant algal or cyanobacterial species or associated toxins are present. When this information is determined it may be listed on their internet site (**cyano sampling**). A recent view of where and when samples are taken reveals relatively few waterbodies are sampled and how infrequently sampling occurs, likely a result of largely depending on the public to report blooms. At this time, there appears to be no codified State of Florida policy, guidance or standards for an action by FDEP or local health departments for posting an advisory or warning at the location of a bloom with signage or by other effective public notification methods. In response to the 2017 cyanobloom in Lake Okeechobee, FDEP issued a news release stating that “Florida is a national leader in responding to and managing algal blooms” (**FDEP news release in response to 2017 Lake Okeechobee algae bloom**).

Under these circumstances, the Florida public is at risk if unable to determine whether or not a cyanobacteria bloom or cyanotoxin is present. The presence of cyanotoxins cannot be determined visually or by smell nor does the public have the expertise (species identification) to determine whether a bloom is harmful to public health. It’s likely that recreational water users will be exposed to a cyanobloom before the State responds with confirmation or follow up guidance, assuming it is reported. For the Florida public to have some reasonable level of protection, a relevant public agency would have to conduct periodic or comprehensive surveys similar to the approach by FDOH for enteric bacteria or sampling design for other pollutant parameters similar to those outlined in F.A.C. Chapter 62-302 and 303, to determine the criteria and necessity for issuing a health advisory or warning to recreational water users rather than waiting for someone to report a bloom.

I have observed recreational water users involved with swimming, skiing, tubing or angling in southwest Florida public waters during the occurrence of a cyanobloom. Personally, I have never seen a sign at a beach or boat ramp in Florida that warns of the presence or potential presence of cyanotoxins. Florida Department of Health does monitor for enteric bacteria and will post warnings at contaminated recreational sites where sampling occurs but apparently not for cyanotoxins likely as a result of their unregulated contaminant status. At least one Waterkeeper organization in Florida monitors for cyanotoxins and others disseminate information on occurrence and location of blooms. The Calusa Waterkeeper is planning to start a sampling program and analysis by a commercial laboratory in the near future. Experience by Waterkeeper organizations conducting cyanobacteria identification and toxin analysis should be shared with other Waterkeepers or similar advocacy organizations in Florida where the problem has become widespread.

Other states have been more proactive in developing actionable standards or thresholds for informing the public of health risks associated with cyanobacteria. Four states have developed criteria for drinking water and 22 states have “action level guidance” for recreational waters (**State Guidelines per EPA/WHO Criteria**).

**Additional Cyanobacteria Derived Contaminants in Florida:** In addition to the toxins produced by cyanobacteria described above, another unregulated substance produced by cyanobacteria is BMAA. The non-protein amino acid BMAA (beta-amino-L-alanine - produced by some species of cyanobacteria) is suspected as a causal link to a number of human neurodegenerative diseases including Alzheimer’s Disease, ALS (amyotrophic lateral sclerosis; also known as motor neuronal disease or MND), and Parkinson’s Disease (**Fact Sheet Update on BMAA 2015**). More recently the American Association for the
Advancement of Science issued a public release in January 2016 confirming that for the first time, scientists have observed brain tangles in an animal model through exposure to an environmental toxin BMAA (January 2016 AAAS Public Release). Brand et al. 2010, documented the occurrence of the neurotoxin BMAA in various species of fish and shellfish in south Florida food webs concluding: “It is predicted that human exposure to cyanobacteria and BMAA will increase, leading to a possible increased incidence of neurodegenerative diseases such as Alzheimer’s disease, Parkinson’s disease, and Amyotrophic Lateral Sclerosis (ALS).”

**Health Risks to Animals:** Domestic animals and wildlife are also subject to poisoning by cyanotoxins. Dogs are particularly vulnerable to cyanotoxin poisoning due to their habit of swimming in or drinking contaminated water. A study by Backer et al. 2013, of dogs reported to have cyanotoxin poisoning indicated that 58% of the occurrences were fatal. Backer et al. 2013 further estimates that “the impacts of these cyanotoxins on domestic and wild animals are significantly under-recognized because many cases are misdiagnosed, few cases are biochemically confirmed, and even fewer are reported in the scientific literature or to animal health surveillance systems.”

**The Florida Situation:**

Cyanoblooms in south Florida and apparently elsewhere in the State have become a relatively common occurrence observed primarily in still or slow-moving fresh or brackish waters.

The degree of nutrient enrichment and pollutant impairment of Florida waters has increased steadily over the past decade and no resident of the state now lives more than about 20 miles from a verified impaired waterbody (Cassani Op Ed 2017). In 2008, Florida had 1,000 miles of its rivers, 350,000 acres of lakes and 900 square miles of it’s vital estuaries impaired by nutrient pollution (2008 Integrated Water Quality Assessment for Florida).

In southwest Florida cyanoblooms have become essentially an annual occurrence in the Caloosahatchee River and estuary system. The Olga PWS in Lee County that uses water from the Caloosahatchee River has been taken offline many times in the past due to the presence of cyanoblooms. Most recently the Olga PWS went offline May 30, 2017 for about three weeks due to cyanobacteria concerns. In 2005, a microcystin concentration of over 1000 ug/l was documented in the Caloosahatchee River in Lee County near the intake of the Olga Water Treatment Plant but the information on toxin level was apparently not made public. Subsequent sampling to determine cyanotoxins in the Olga PWS “finished” water indicates that the treatment process has been effective in reducing cyanotoxins below detectable levels of about 0.15 ug/l per Greenlabs ELISA methodology. However, sampling of the raw and finished water for cyanotoxins at the Olga facility has been sporadic since about 2005 and reflects the lack of a consistent or official policy on monitoring and notification.

A preponderance of artificial ponds and urban reservoirs excavated for various purposes in the region also experience cyanobacteria blooms. These artificial waterbodies are in high population areas where riparian property owners and domestic animals are potentially exposed to cyanotoxins. Artificial waterbodies in the region, some constructed by permit for stormwater treatment, discharge to public waters and can diminish the receiving water quality and the health of wildlife when cyanobacteria are present.
For many, the 2016 South Florida multi-county algal bloom was the culmination of the problem in Florida. Governor Scott subsequently declared a State of Emergency in Lee and Martin Counties as a result of the bloom. The severity and duration of the 2016 cyanobloom in Martin County and associated coastal systems during the “tourist” season gained national attention. Many considered Florida’s response to notifying and warning the residents of the bloom’s health risks was not as accurate or timely as many suggested is should have been. As a result, the American Civil Liberties Union of Florida, published a report titled “Tainted Waters - Threats to Public Health and the People’s Right to Know,” June 2017.

The report states the following: “In the wake of the 2016 outbreak of toxic algae in the St. Lucie River and Estuary and along Florida’s Treasure Coast, the ACLU of Florida was asked by members in the region and several environmental organizations to investigate the state’s record of transparency with regard to the dissemination of information about the potential grave danger to the public health posed by the algae flow. Specific concern was expressed about the state’s performance in delivering needed information evenly to all citizens in affected areas, and whether the state understated scientific evidence of dangers to public health. The following report was researched with the help of local residents, scientists, media sources, and those state employees who cooperated with an ACLU of Florida investigator."

As emphasized in the Tainted Waters report, Florida convened, through legislation, an interagency Harmful Algal Bloom Task Force in 1999 that reviewed HAB issues in the state. The fact that the HAB Task Force started in 1999 some 19 years ago, is testament to how long HAB’s have been a serious issue in Florida. Ironically, funding for the HAB Task Force ceased just two years after starting 2001. Consequently, the lack of an active technical HAB Task Force may be why Florida has not been more progressive toward protecting the public from the health risks of cyanobacteria.

Potential issue resolution:

The following are a few suggestions for Waterkeepers in Florida to consider as a “position” for resolving this issue.

1. Seek at least conceptual approval from Waterkeepers in Florida that there is a need to provide adequate public notice of health risks associated with recreational exposure to cyanobacteria in public waters.
2. If Waterkeeper Alliance and Florida Waterkeepers are in agreement to adopt a unified position, then proceed with a statewide education campaign to educate legislators, local government policy makers and the media on the health risks and lack of adequate public notice for recreational exposure to cyanotoxin.
3. Seek allied partners in promoting the education campaign. Sierra Club and Earth Justice have been active in Florida on HABs in the past and may be powerful partners in promoting resolution of the problem.
4. Seek support from legislators by Waterkeepers in Florida Waterkeeper jurisdictions.
5. Seek a Florida House and Senate “ambassador” that will sponsor a bill that funds a Florida HAB Task Force. Optimally the bill would vest the Task Force with developing criteria similar to other states for adequately informing the public of health risks from cyanobacteria.
Images from the May 2016 bloom in the Caloosahatchee River