City of Stuart

ENVIRONMENTAL UPDATE



State of Florida

New Initiatives from Governor DeSantis

- Appointment of Dr. Thomas K. Frazer (Biologist) as Chief Science Officer as of April 1, 2019
- New Blue-Green Algae Task Force established with 5 doctors from across the state
- Focus on funding and restoration initiatives and to make recommendations to expedite nutrient reductions in Lake O. and surrounding estuaries.



2019 Legislative Appropriations

Grants, Programs, and Projects

- ✓ Blue-Green Algae Task Force - **$10,800,000**
- ✓ HAB Mitigations / Emergencies - **$10,000,000**
- ✓ Implementation of EAA Reservoir - **$43,824,918**
- ✓ Total funds towards CERP - **$145,500,000**
- ✓ Northern Everglades Protection / Restoration - **$32,876,213**
- ✓ Alternative Water Supply Projects (Grant) - **$39,000,000**
- ✓ Water Quality Improvement Projects (Grant) - **$50,000,000**
- ✓ *City of Stuart AWS Project (Grant) - **$250,000**

System Update for May 21, 2019

Author: Victoria Coraci and Ed Cambeiro
Office of Ecosystem Projects

Area	Lake Okeechobee	WCA-1	WCA-2	WCA-3A	WCA-3B	Holey Land	Rotenberger
Current Level (ft. NGVD)	11.21	16.09	11.74	9.28	7.59	11.55	12.07
Above (+) / Below (-) Regulation Schedule (ft. NGVD)	-1.93	0.34	0.74	-0.29	-0.91	0.55	-0.11
Above (+) / Below (-) High Water Closure Criteria (ft.	N/A	N/A	N/A	-0.85	-0.91	-0.95	-1.43
Total Structure Inflow (cfs)	753	288	1,502	1,586	440	0	0
Precipitation (cfs)	1,373	196	1,373	3,139	3,139	589	5,101
Total Structure Outflow (cfs)	1,338	1,102	660	1,601	0	0	0
Estimated Evapotranspiration (cfs)	4,120	1,411	1,327	4,788	962	346	242
Volume Gain (+) / Loss (-)	-3,332	-2,029	888	-1,664	2,617	243	4,859
Precipitation (in.)	0.07	0.01	0.07	0.16	0.16	0.03	0.26
Water Level Trend from a Week Ago (ft. NGVD)	-0.10	-0.07	0.00	-0.10	-0.05	0.11	-0.11

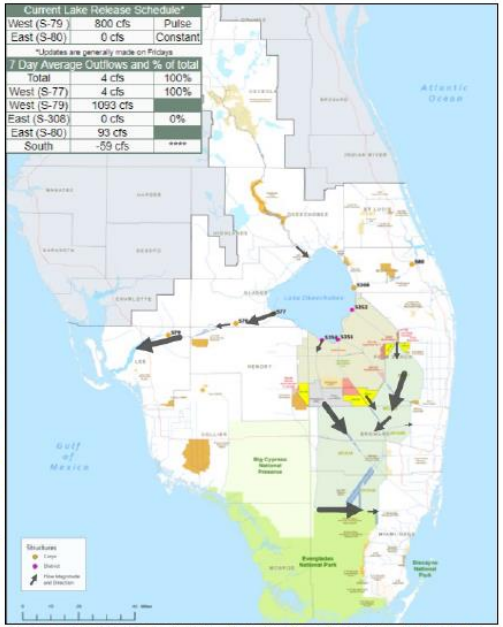
Salinity Conditions for Adult Oysters:

Caloosahatchee
Sanibel: Not Reporting
Shell Point: Good
Cape Coral: Good

Saint Lucie
U.S. 1 Bridge: Good
A1A: Good

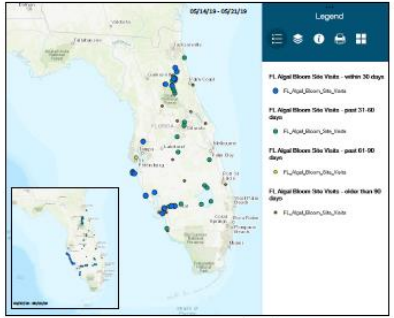
District Rainfall 3-Day Average (in.): 0.178

District Rainfall Forecast: A mid- to upper-level trough over the southwestern Atlantic should gradually shift eastward today as weak surface high pressure remains in place offshore the northeast coast of Florida. Upper-level convergence on the backside of the trough is resulting in large-scale sinking, warming, and drying of the atmosphere aloft across the Florida peninsula, all of which are strong negative factors favoring suppressed rain activity. Furthermore, the warming of the mid-levels of the atmosphere is contributing to greater static stability, another element that would weigh against rain production. Drier air over the Bahamas reaching the east coast early today should also inhibit rains along or near the east coast, with considerably less today compared to yesterday. Nevertheless, some shower and thunderstorm activity is expected to form from the south-central interior to the lower Kissimmee Valley in association with the east coast sea breeze that should already be well inland by mid-afternoon, with more over the south relative to the north. With the steering flow easterly to northeasterly today and over a deep layer, afternoon rains could progress inland more rapidly than yesterday and reach a maximum over the western interior to the west coast later in the day. Overall, total District rainfall is forecast to be lower than yesterday's total (0.07") and well under the daily climatological average for the fourth week of May (0.16"). A mid-level ridge of high pressure is expected to form over the southeastern United States today and tomorrow and strengthen considerably by late week as it anchors itself over north Florida and the Gulf during the weekend. The sprawling high pressure area and its associated warming and drying aloft should greatly suppress shower and thunderstorm activity across the District from the middle part of this week through at least early the following week, with little to no rainfall likely over that period of time. Near-record or record heat is also likely to build over the interior of Florida through the west coast perhaps as soon as Friday and more likely over the weekend into early next week. Additionally, the extreme heat, lack of cloud cover, low relative humidity around peak heating, light wind, and high sun angle should contribute to greater-than-average evapotranspiration rates for an extended period of time. For the week ending next Tuesday morning, the deterministic total QPF is a paltry 0.04" or less than 5% of normal (weekly average is 1.16"), with the probabilistic model output not optimistic about anything greater than a tenth of an inch. Indications are that the exceptionally dry conditions from this week would extend into at least mid-week next week, with some hints that late next week/weekend there would be the potential for at least some rain, even if it is less than the climatological average. The prolonged period of dryness also means a late start to the wet season, which stands a good chance of beginning by the first few days of June.



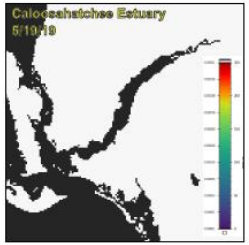
Blue-Green Algae Update

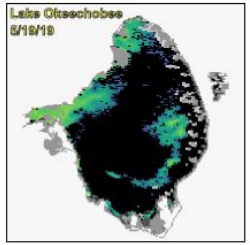
The most recent satellite imagery shows a slight decrease in bloom concentration and coverage over Lake Okeechobee. Approximately 33% of the lake appears to have bloom potential. The estuaries seem to remain free of bloom potential. Bloom conditions are subject to change rapidly due to changing environmental conditions (wind, rain, temperature, etc.). DEP toxin sampling continues with no recent samples returning toxin concentrations greater than 1 µg/L. DEP is coordinating with FFWCC to identify the filamentous blue-green algae that has been observed along the Sarasota coast. Salinity conditions in the estuaries are in the good range for adult oysters. Corps discharges from the Lake yesterday were 0 cfs to the east, 655 cfs to the west, and 683 cfs to the south.



Toxin Sampling, Last 7 Days

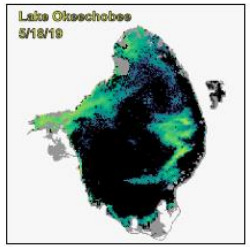
	Number of Samples Taken	Sample Results Pending	Samples > Health Limit of 1 µg/L
St. Johns Region	5	0	0
Caloosahatchee/ West Coast Region	14	1	0
Lake Okeechobee	0	0	0
St. Lucie/East Coast Region	0	0	0

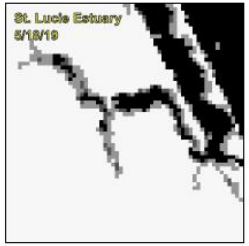










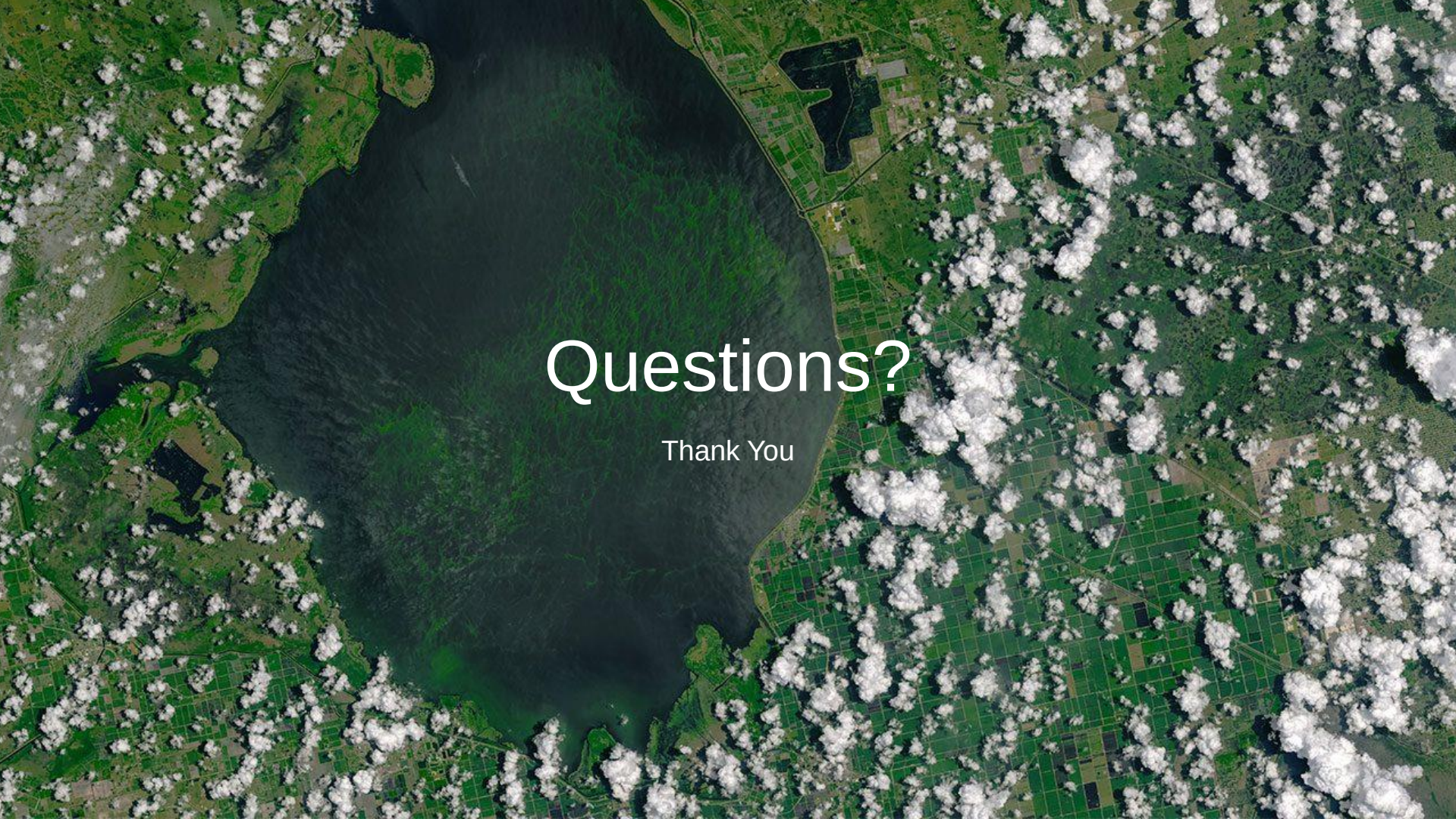


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May 21, 2019

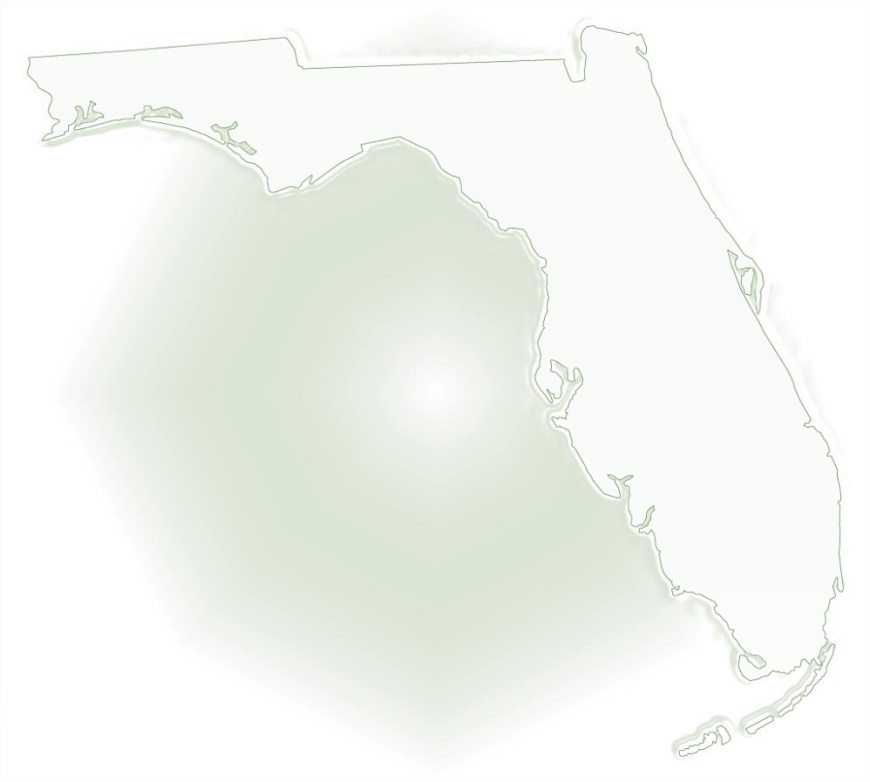


- Created and updated by Todd Thurlow as a contribution to the community
- Includes both satellite imagery of Lake O. blooms and other useful data, graphs, and tools


Questions?
Thank You

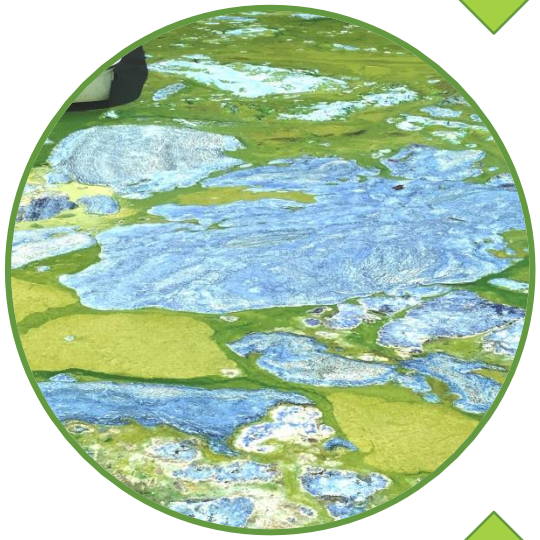
Reference Section

Following slides are retained for informational purposes



Environmental Legislation and Policy

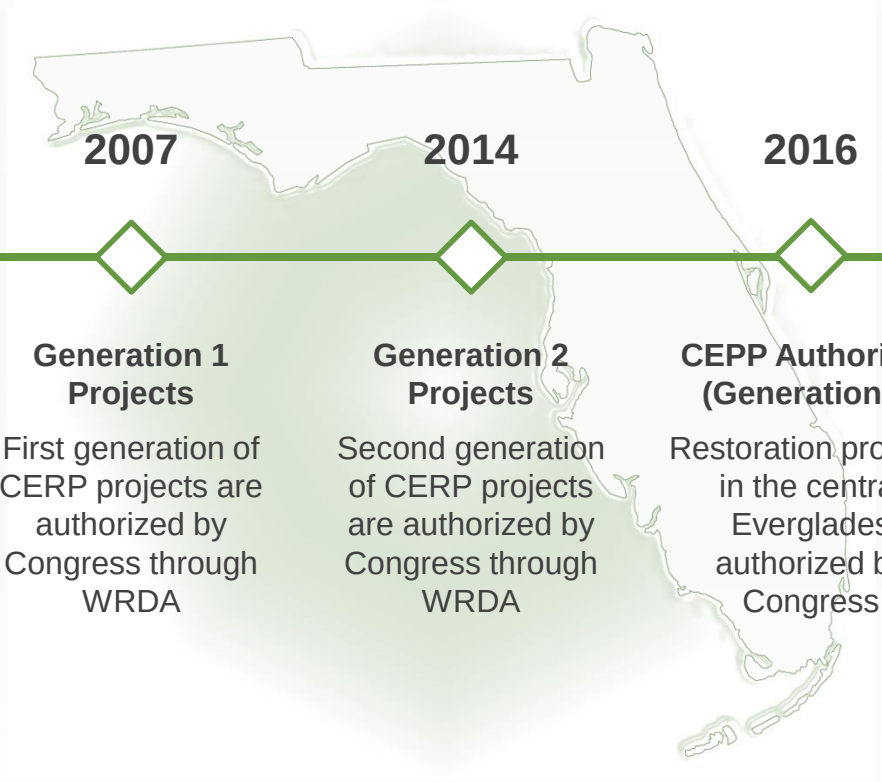
Overview of critical laws and congressional authorizations



1. **Clean Water Act** — 1972 – established basic regulatory standards for discharges of pollutants into WOTUS and for surface waters via (NPDES permits)
2. **HAB Law** — 1998 - Harmful Algal Bloom and Hypoxia Research and Control Act first authorized by Congress and included appropriations
3. **WRDA** — 2000 – Water Resources Development Act authorized CERP and Army Corps projects including Everglades and Lake Okeechobee
4. **Water Transfer** — 2008 - The “Water Transfer Rule” codified a longstanding EPA policy that all WOTUS are unitary and are exempt from CWA permits
5. **Do No Harm Act** — 2018 – The “Federal Do No Harm Act” is authorized and WRDA is reauthorized with appropriations and new provisions

CERP Timeline

Comprehensive Everglades Restoration Plan congressional authorization history



2000

CERP Authorized

CERP is authorized and is the largest environmental restoration program in history

2007

Generation 1 Projects

First generation of CERP projects are authorized by Congress through WRDA

2014

Generation 2 Projects

Second generation of CERP projects are authorized by Congress through WRDA

2016

CEPP Authorized (Generation 3)

Restoration projects in the central Everglades authorized by Congress

2018

EAA Reservoir Authorized

Everglades Ag. Area storage reservoir authorized via America's Water Infrastructure Act

Marine Algae

(Seaweed, kelp, and other non-plant cellular organisms)



Green Algae – "*Chlorophyta*" consist of more than 4,000 species (new classification), typically found in shallow bodies of water.



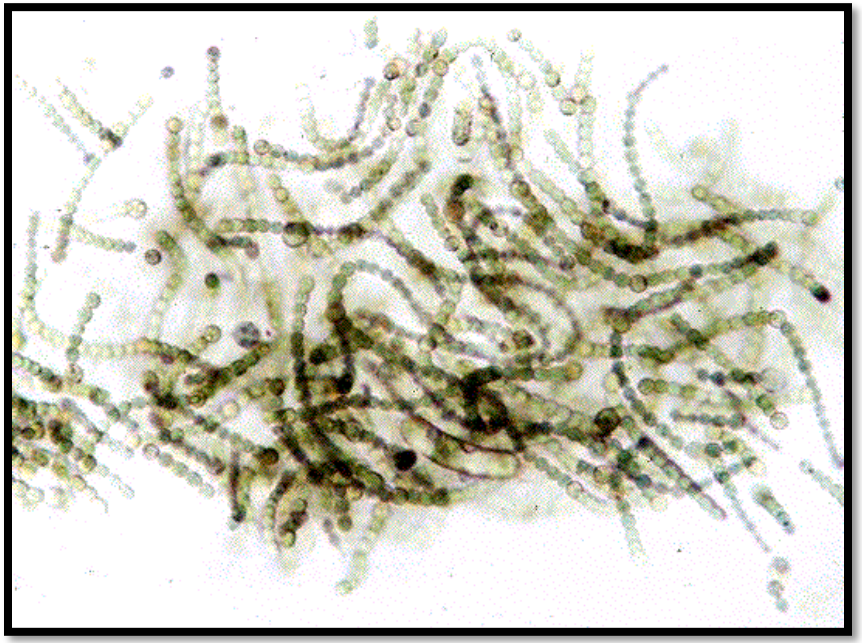
Red Algae – "*Rhodophyta*" consist of more than 6,500 species of which 200 are freshwater based. (Red Tide specifically linked to *Karenia brevis* – an algae that produces brevetoxin*).*



Brown Algae – "*Phaeophyta*" consist of more than 1,500 species and the most complex of algae variations.

Blue Green Algae (BGA)

"Cyanobacteria" aka *Cyanophyta*



- Simplest form of algae (many unicellular) with tens of thousands of known species
- Not all BGA produce toxins
- Toxins released when cell wall is ruptured or cellular decay occurs
- Microcystin (hepatotoxin) primary known toxin can be absorbed through skin contact, ingestion, and/or inhalation

Known Algae Toxins

Toxin Types	Examples	Effects
Neurotoxins	Anatoxin-a, Anatoxin-a(s), Saxitoxin, Neosaxitoxin	Affects central nervous system, causes seizures, paralysis, respiratory failure, and death
Hepatotoxins	Microcystins, Nodularins, Cylindrospermopsin	Affects liver, causes hemorrhaging, tissue damage, tumors, liver cancer, and death
Dermatotoxins and Gastrointestinal toxins	Aplysiatoxins, Lyngbyatoxin-a, lipopolysaccharide endotoxins	Affects skin and mucous membranes, causes rashes, respiratory illness, headache, and stomach upset
Cytotoxins	Cylindrospermopsin	Affects liver and other organs, causes chromosome loss, DNA strand breakage, and organ damage

*BMAA (beta-Methylamino-L-alanine) - a cyanobacterial metabolite believed to be the causative or a contributory factor in the development of non-familial neurodegenerative diseases (like ALS, Parkinson's, and Alzheimer's)

Exposure and Diet

Is consumption of local fish / shellfish dangerous?

- Current science extremely limited.
- Bivalves (oysters, mussels, clams, scallops, etc.) – particularly dangerous to consume during or after an algal bloom.
- “Red Tide” can take months to flush out of bivalves after exposure.
- Link between BMAA at high levels in brains of dead dolphins – shows the toxin can cause plaques and tangles in brain.
- Benthic-oriented (bottom feeding) fish / organisms of special concern.

“The consumption of algal cells was the main factor to influence the accumulation of MCs by fish. Smaller fish accumulated more MCs in their kidneys and hearts. The ADI (acceptable daily intake) values based on the consumption of these four fish all exceeded the provisional tolerable daily intake (TDI) proposed by the WHO” (World Health Organization).
(*Junmei Jia, Wei Luo, Yonglong Lu, John P. Giesy, 2014*)