

Cyanobacteria, Blooms and Nutrients

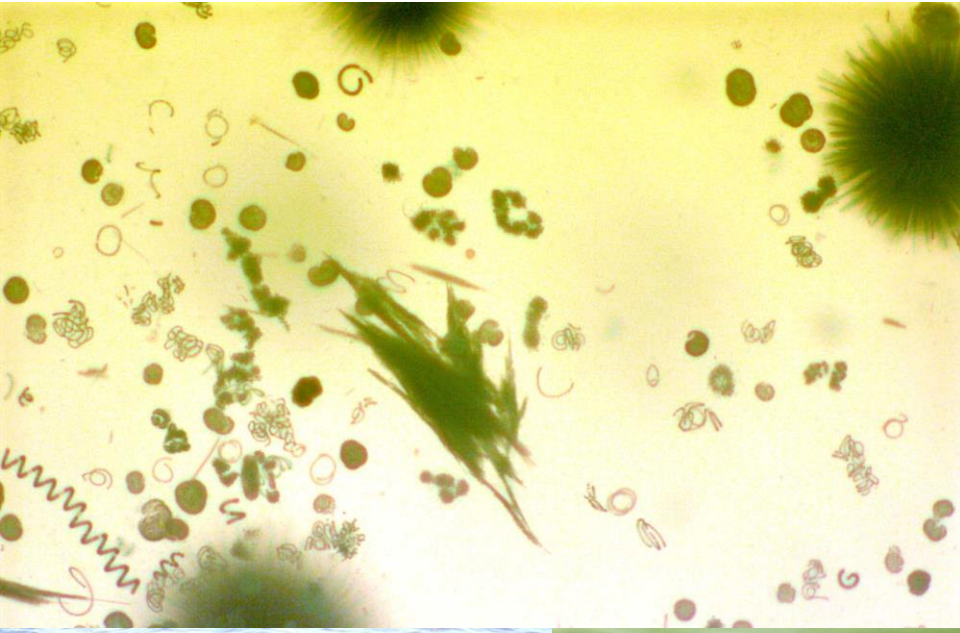
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https://coastwatch.glerl.noaa.gov/modis/region_map.html

Q1. What are cyanobacteria?



Approximately 8000 species of cyanobacteria

- 3 billion years of evolution
- Humans: 6 million years

Blue-green Algae (BGA) are a very diverse plant-like group very well adapted to life

Some float,

Some fix nitrogen,

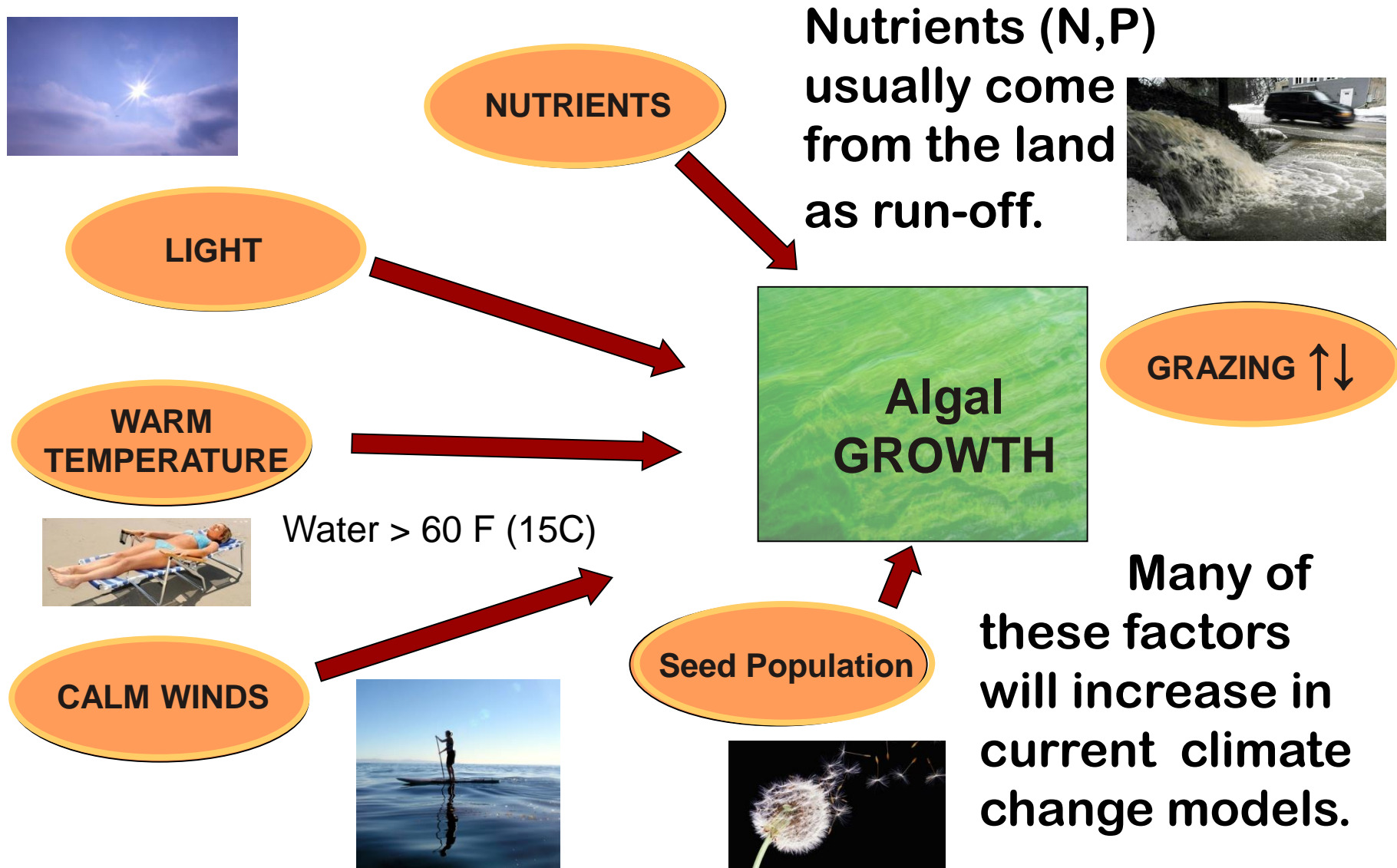
Some forms blooms,

Some are toxic; some not

Grow slow: peak in August



Q2. Why do blooms form?



How do we prevent blooms?

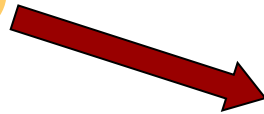
- We know the seed population is there
- Zebra mussels may promote blooms or “harvest blooms”, best bet is to keep them out of the system.



How do we prevent blooms?



LIGHT

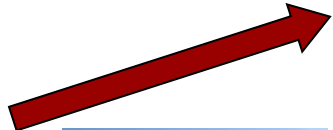


**WARM
TEMPERATURE**



Water > 60 F

CALM WINDS



Not much we can do about
light, temperature and winds

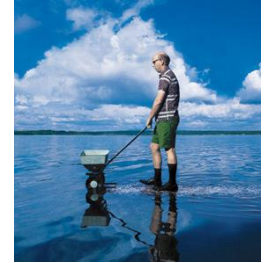


If anything – climate changes
predicts we will have more calm
days and warm falls (aka a
longer growing season)

How do we prevent blooms?

NUTRIENTS

Nutrients (N,P)
usually come
from the land
as run-off.



That brings us to
nutrients.....

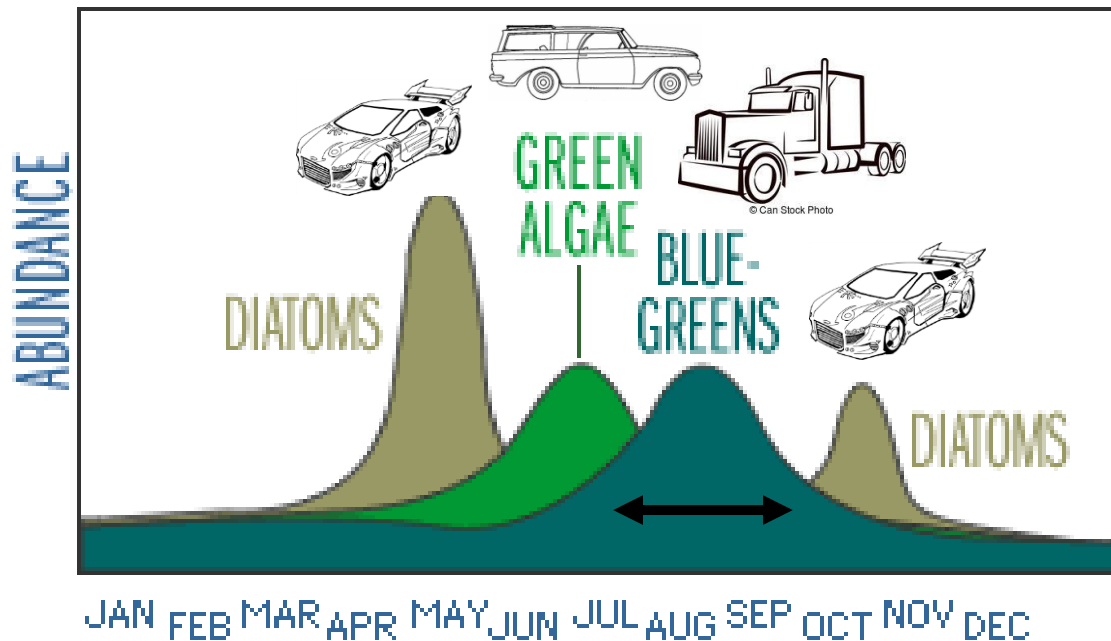
It is not the only thing
important, it is the only
thing we can control.

Algal
GROWTH



Blue-green algae don't care what is the source of nutrients.
control both episodic and continual inputs

How does climate change fit in?

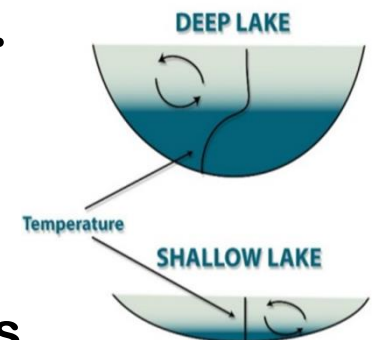


Q3. Why are they called Harmful?

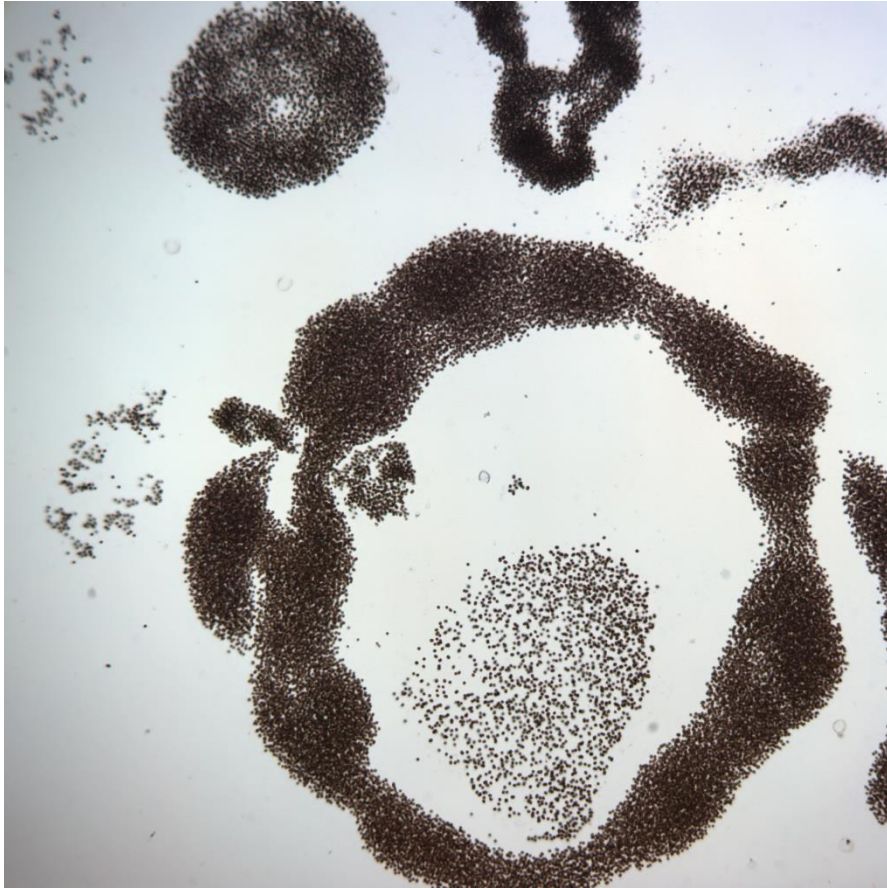


- Cyanobacteria are a common member of the aquatic flora!
- Some (not all) produce:
 - liver toxins (hepatotoxin).
 - Neurotoxins
 - Other nasty compounds
 - Swimmers itch
 - Alzheimer's-like agents.
- When they die – it uses up oxygen.

Especially important in stratified lakes



What is the difference between *Microcystis* and microcystins?



- *Microcystis aeruginosa*
 - non-N fixer.
 - Likes organic N
 - forms surface blooms
 - Mix of toxic and non-toxic species.
- Very common genera
 - Found in every water body
- Can exist in toxic, non-toxic and potentially toxic forms.
 - Liver toxin: microcystins
 - Cell wall may be allergenic to some.

A wee bit of history on HABS in the Finger Lakes

% of samples with detectable Microcystins (n); maximum value in ug/L												
2004	2006	2007	2010	2011	2012	2013	2014	2015	2016	2017	2018	
0% (3)		10% (10) 0.1					0% (2)			4% (52) 0.56	5% (42) 2.1	Otisco Lake
15% (7) 0.2										57% (82) 214	21% (47) 205	Skaneateles Lake
33% (6) 0.2		0% (26)		100% (3) 2500		100% (2) 40	33% (9) 75	73% (26) 800	80% (40) 2000	32% (59) 1803	20% (45) 1355	Owasco Lake
0% (5)		0% (18)			0% (1)		0% (5)	0% (4)	85% (7) 150	9% (43) 730	25% (96) 1060	Cayuga Lake
0% (3)			0% (2)				0% (9)	11% (9) 70	20% (10) 33	72% (70) 390	(108) 620	Seneca Lake
20% (5) 0.1										19% (21) 623	(108) 620	Keuka Lake
40% (5) 0.4	0% (2)		100% (1) 40			0% (2)		93% (15) 50	0% (8)	30% (27) 632	2% (47) 246	Canandaigua Lake
42% (9) 1			100% (2) ????			95% (25) ????	7% (57) 3	4% (71) 80	12% (80) 5	10% (104) 5	7% (9) 0.4	Honeoye Lake
0% (4)										10% (19) 0.2	0% (14)	Canadice Lake
0% (4)										0% (54)	0% (96)	Hemlock Lake
33% (6) 0.1									0% (1)	5% (36) 1	0% (44)	Conesus Lake

We really did not see a lot of toxic HABs in the finger lakes 15 years ago