A Rare *Uroglena* Bloom in Beaver Lake, Arkansas, Spring 2015

Reed Green, Ph.D., CLP, NALMS Past-President (2015)
USGS, Little Rock
Brad Hufhines, NALMS Region 6 Director
Beaver Water District, Lowell

Beaver Water District

North American Lake Management Society

Benefits

- Lake and Reservoir Management Journal
- LakeLine Magazine
- NALMS Notes
- CLM / CLP Certification
- Student Travel Grants and Awards

Symposium

- Presentations covering a wide array of Limnology
- Networking
- Fun

Programs

- Lakes Appreciation Month

https://www.nalms.org/lakes-appreciation-month/

- Secchi Dip-In

http://www.secchidipin.org/

Agenda

- Beaver Lake
- *Uroglena* Ecology
- Spring 2015 Bloom
- Intermediate Disturbance Hypothesis
- Summary

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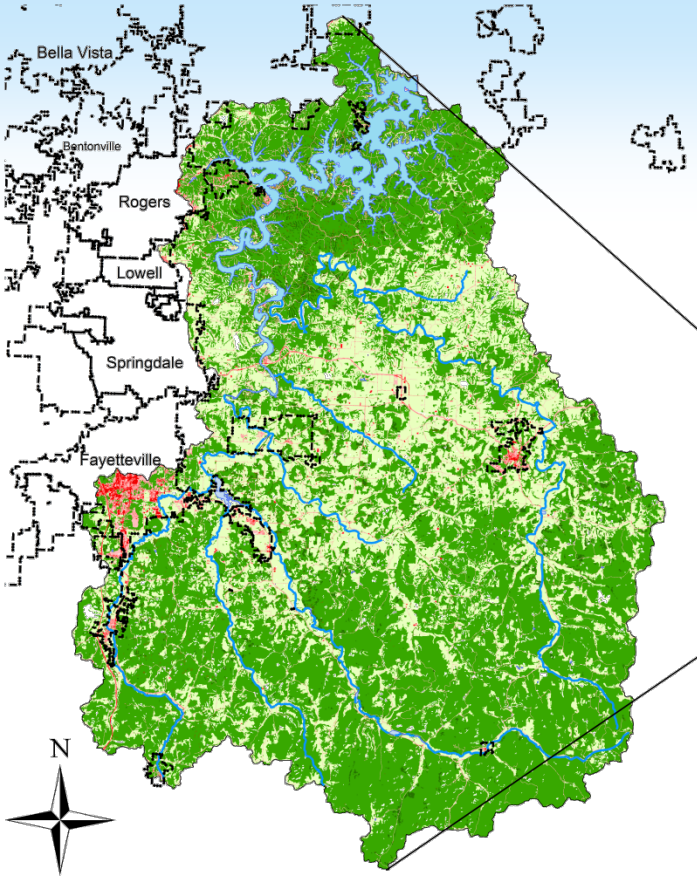
Beaver Lake

- **NWA source of drinking water**
- **USACE multi-purpose reservoir**

- Surface Area 12,828 ha (31,700 ac)
- Mean Depth 18 m (60 ft)
- Max Depth 73 m (240 ft)
- Hydraulic retention time averages about 1-1.5 years

Beaver Lake



Legend

- City Limits
- Rivers
- Beaver Lake
- Lakes within the Watershed

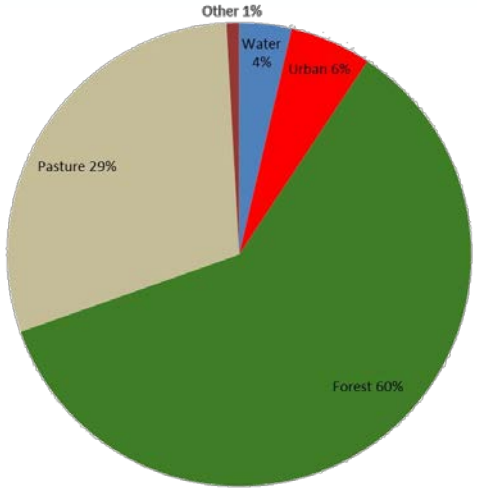
2011 NLCD Land Cover

- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Pasture/Hay

Location Map

- Beaver Lake Watershed
- Arkansas

Beaver Lake Watershed Land Cover
2011 NLCD Data



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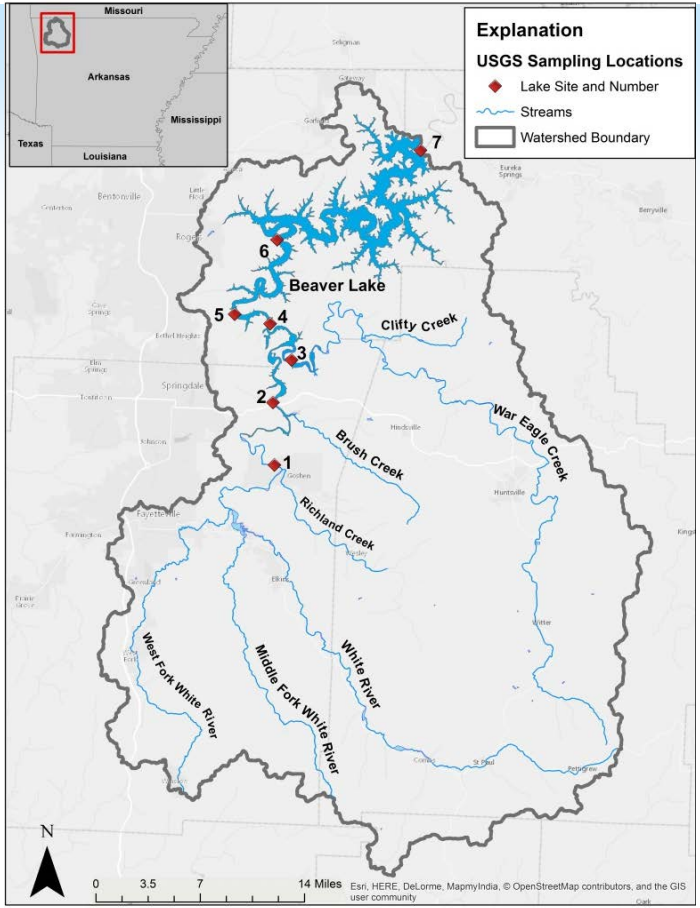
Beaver Lake



Cooperative Sampling (USGS and BWD)

- 6 lake sampling trips per year
  - 4 during thermal stratification
  - 2 during mixis

- Inflows are sampled 6 times per year
  - 4 storm event samples

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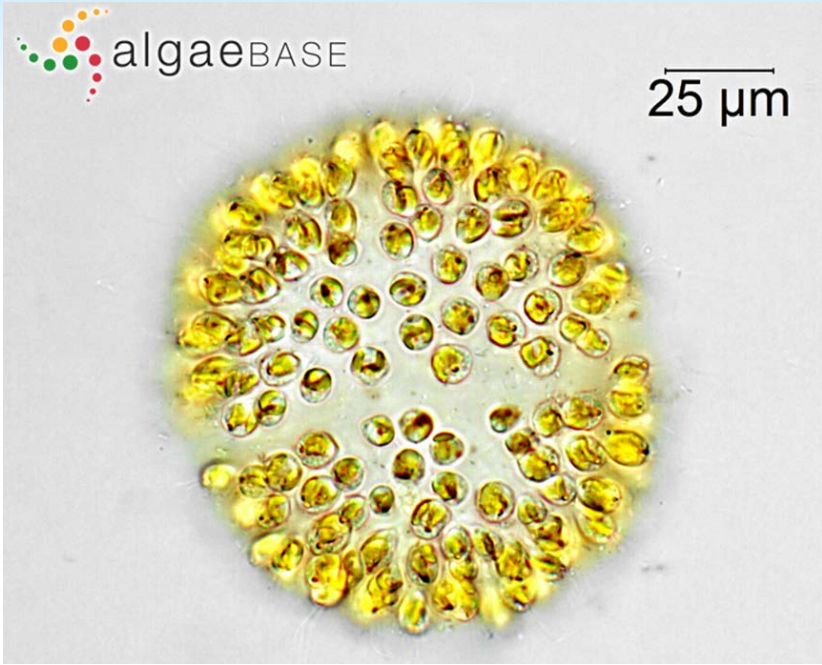
Uroglena

- Motile, colonial chrysophyte (Golden Alga)
- Grow well in extended periods of low nutrient availability
- Mixotrophic – able to incorporate organic molecules through osmosis and ingest bacteria for nutritional purposes
- Typically found in oligotrophic systems



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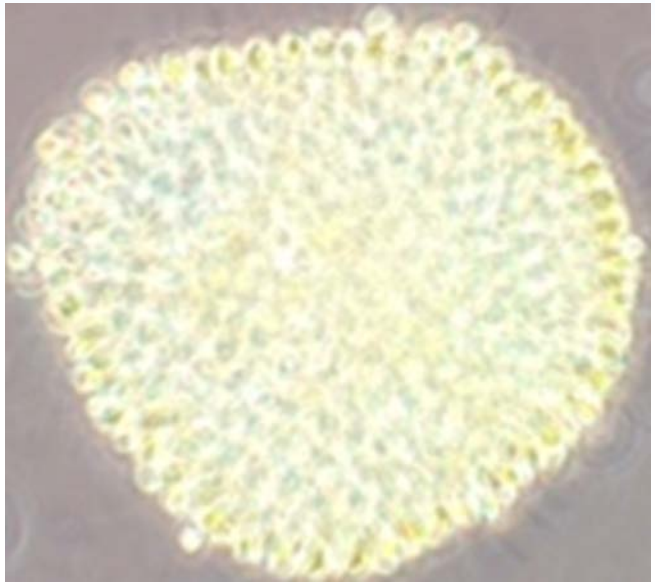
Uroglena

- Energy is stored as an oil instead of a starch (fishy smelling)

- *Uroglena* blooms are unpredictable because of the interaction of different confounding factors (i.e. temperature, salinity, flushing rate, turbulence, light, predation, and competition)



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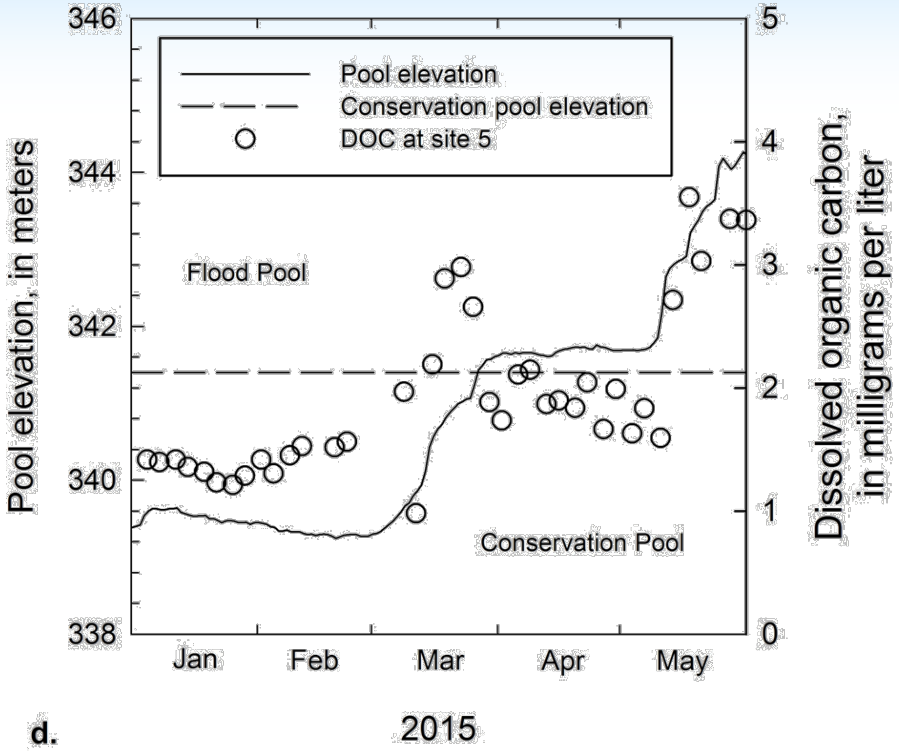
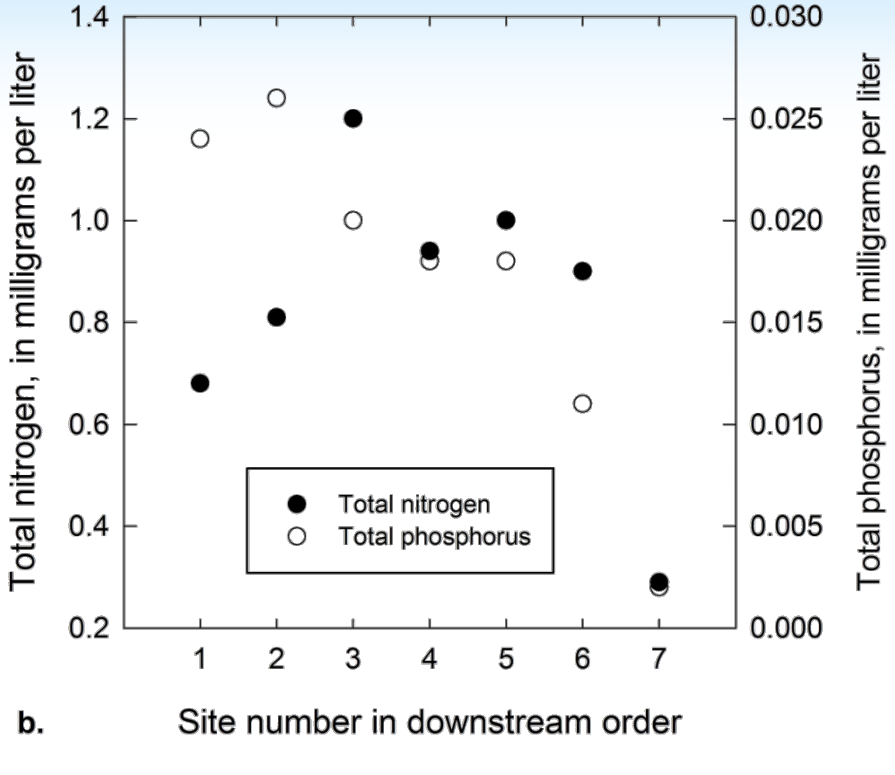
Spring 2015 *Uroglena* Bloom

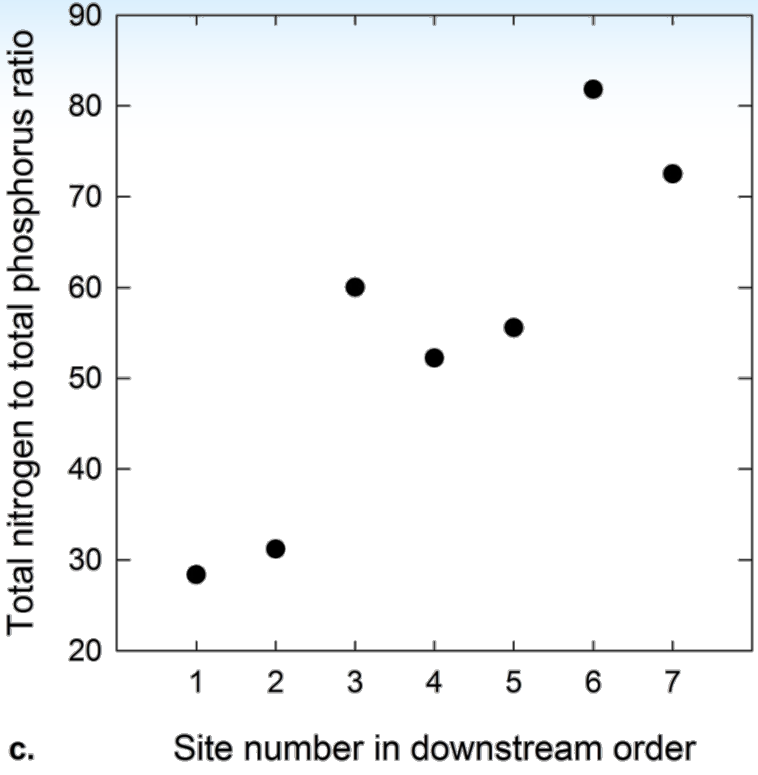
Combination of factors contributed to the bloom

- Increased rainfall and runoff containing DOC
- An extended, stable pool
- Expansion of reservoir surface area (10%) and littoral zone



Spring 2015 *Uroglena* Bloom





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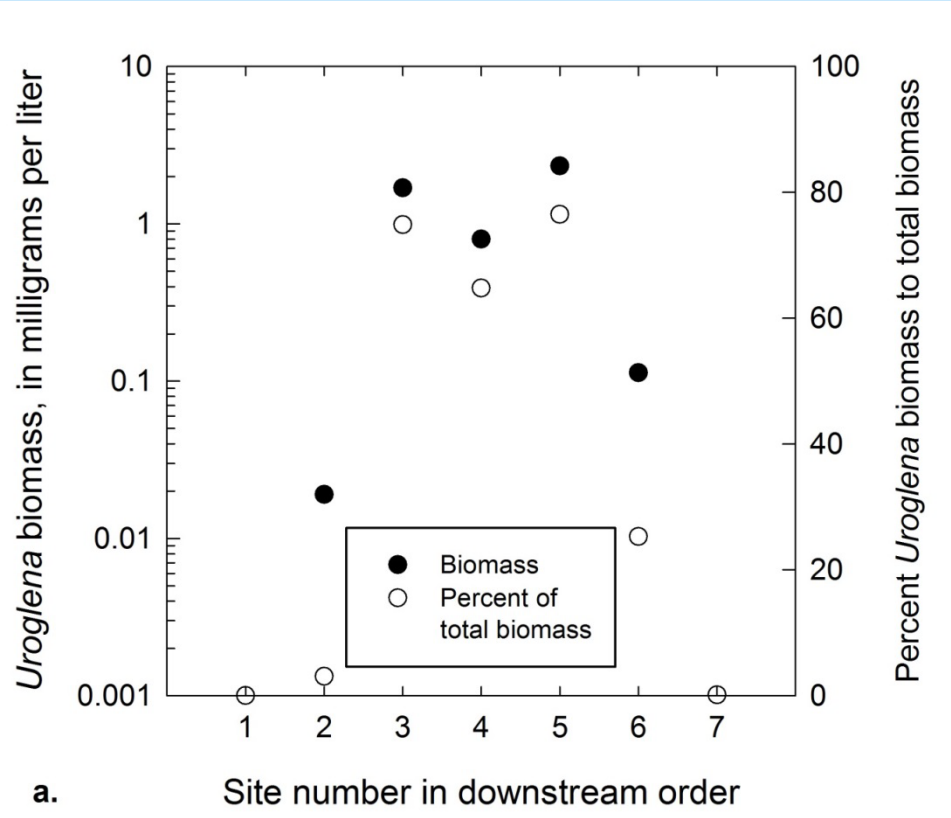

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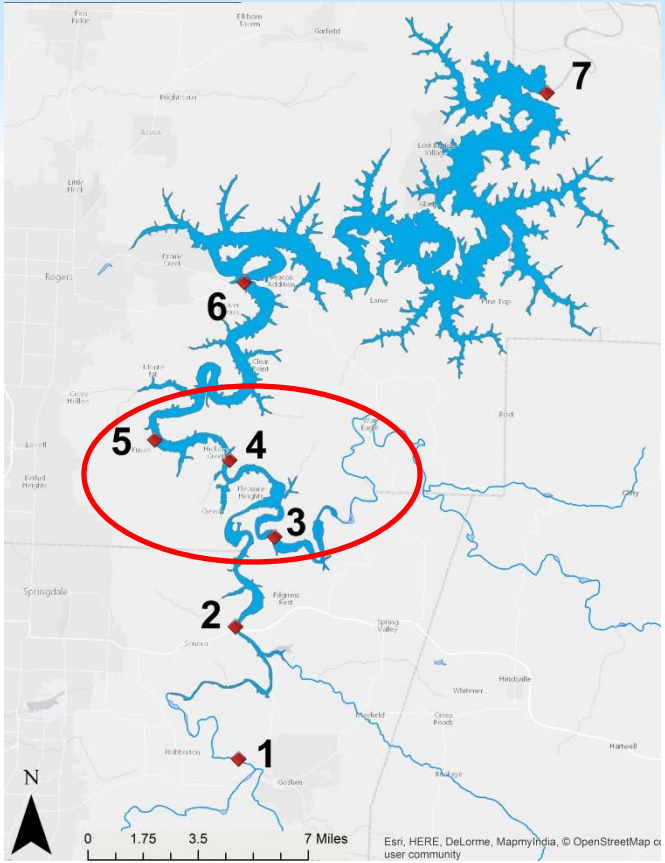

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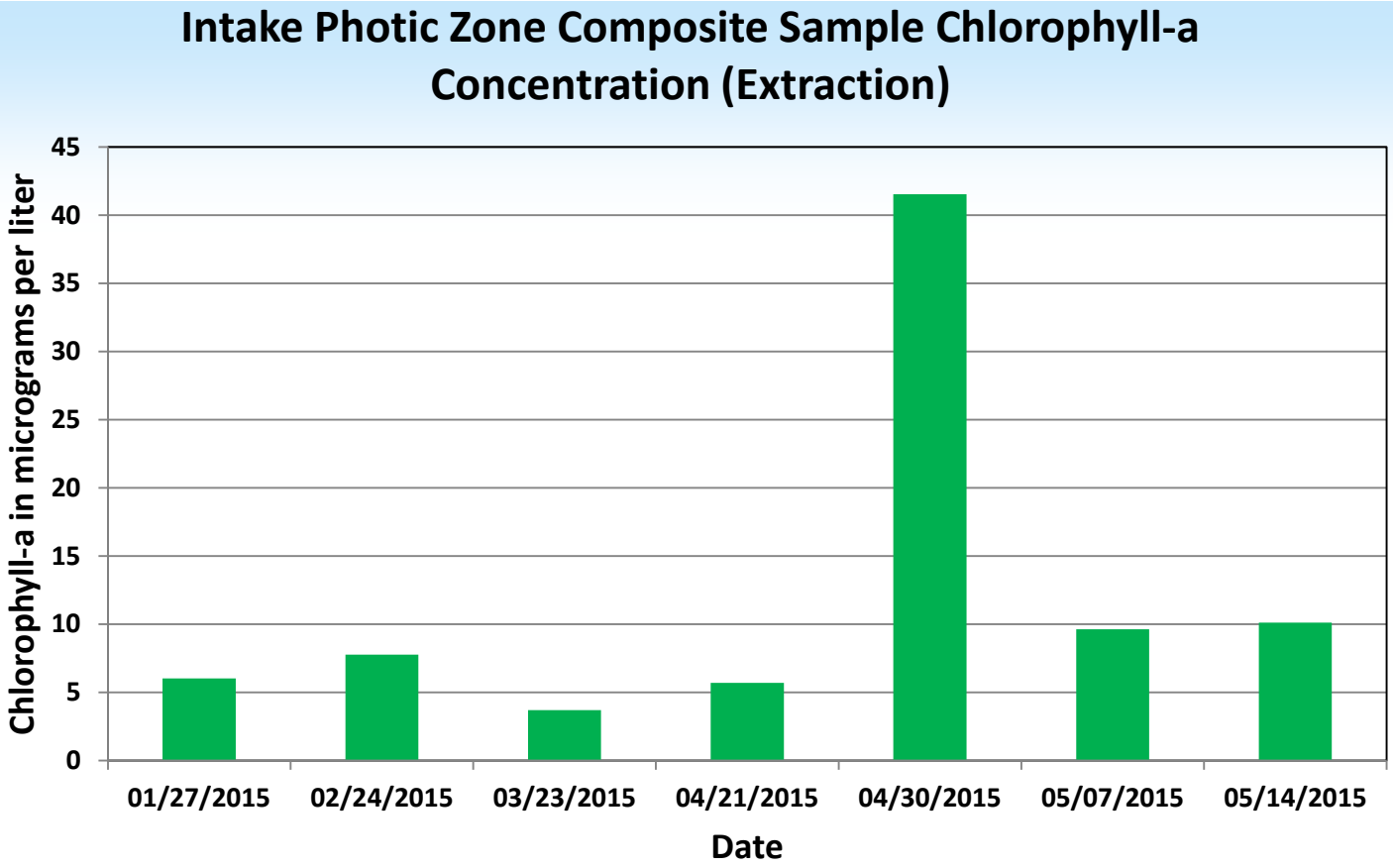
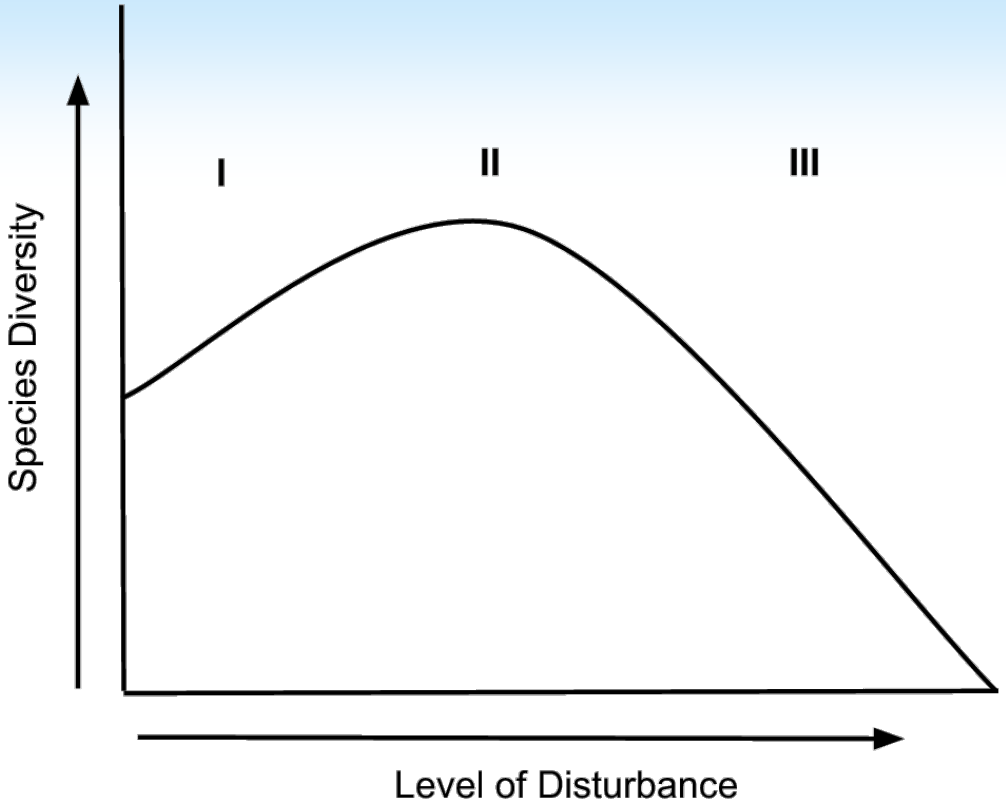


Intermediate Disturbance Hypothesis

Local species diversity is maximized when ecological disturbance is neither too rare nor to frequent



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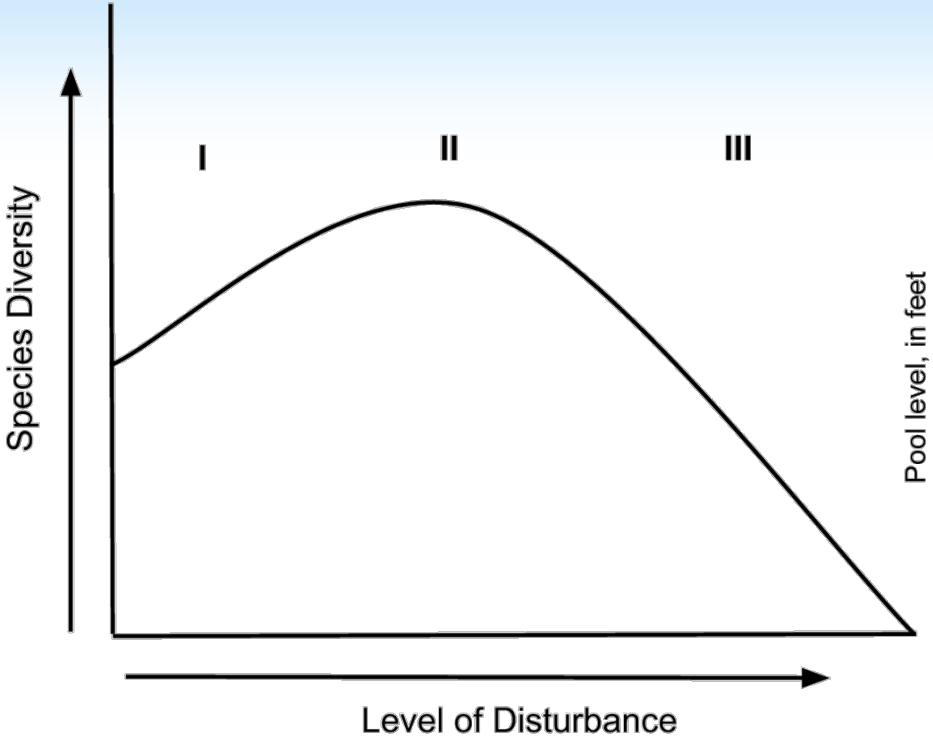

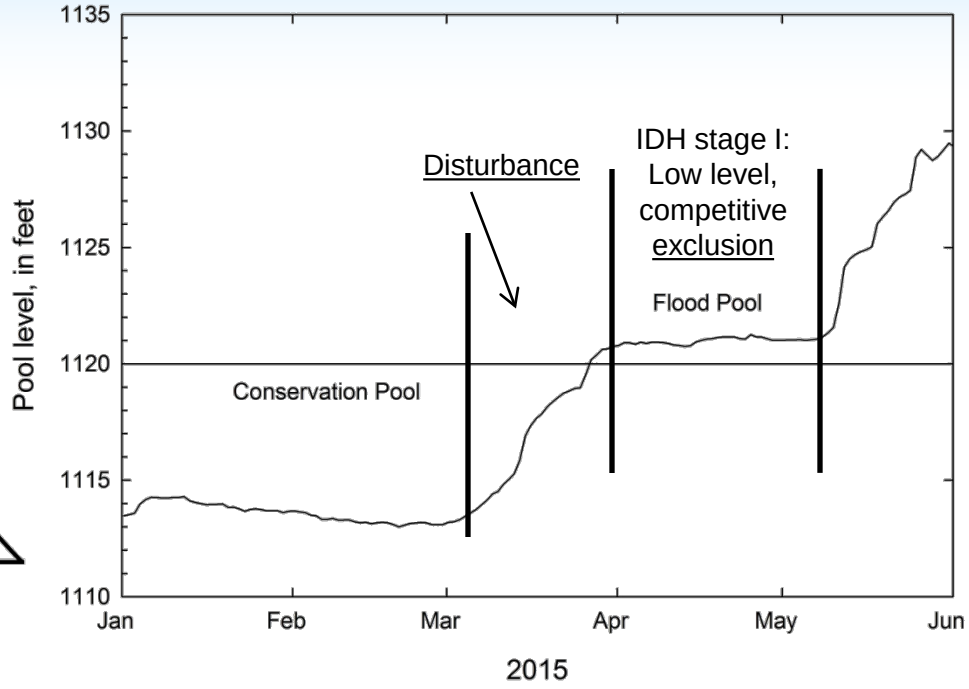

Summary

- Beaver Lake experienced a short lived bloom during Spring 2015 that led to taste and odor in the drinking water.
- Lake expansion followed by a stable pool with relatively low nutrients and high DOC
- Chlorophyll a exceeded 40 µg/L in the photic zone at our water intake
- Intermediate Disturbance Hypothesis (IDH) explains why competitive exclusion allowed for *Uroglena* to exploit a niche during the stable period following a disturbance

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