Deep-water cyanobacteria (blue-green algae) blooms in Cross Reservoir, Kansas

KU KANSAS BIOLOGICAL SURVEY
The University of Kansas

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Introduction

Cross Reservoir and its 50-hectare watershed have minimal human impact due to their location at the University of Kansas Field Station. Because Cross is substantially deeper than other reservoirs of similar size, it functions more like a naturally derived lake. Cyanobacteria (also known as blue-green algae) have bloomed in more than 100 Kansas waterbodies in the last decade. Most blooms are constrained to the water surface due to lack of light in deeper waters, and form dense surface scums that disrupt ecosystem services. Physical and limnological characteristics unique to Cross create conditions that prompt deep-water blooms of algae; Cross is the only known waterbody in Kansas to have these deep-water algal blooms.

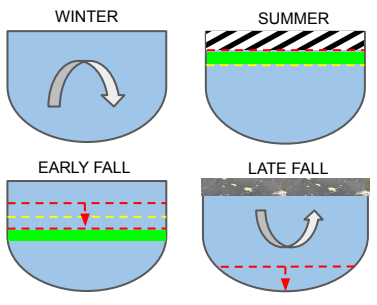


Fig. 1 - Seasonal lake dynamics affect algal bloom peak position. During Summer, light depth (yellow dotted line) reaches just below the thermocline (red dotted line) creating a goldilocks zone for blue-green algae to accumulate. As surface air temps drop, so does the thermocline, which in turn pushes the deep water peak deeper throughout Fall. Although starved for light, the blue-green algae stay below the thermocline until late Fall turnover. Turnover causes the entire lake to mix, and the deep-water algae are forced to the surface where they quickly die off due to low temps and turbulent mixing.

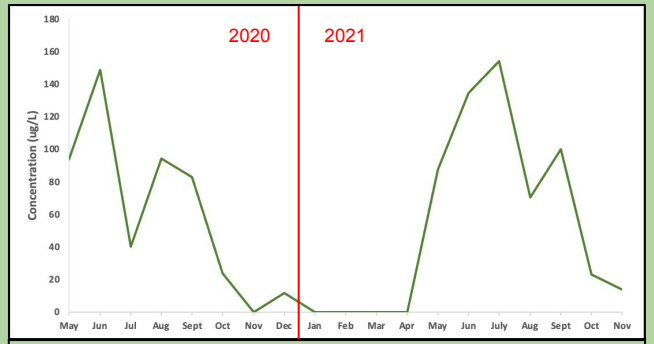


Fig. 2 - Algal concentrations shown over time for 2020 and 2021.

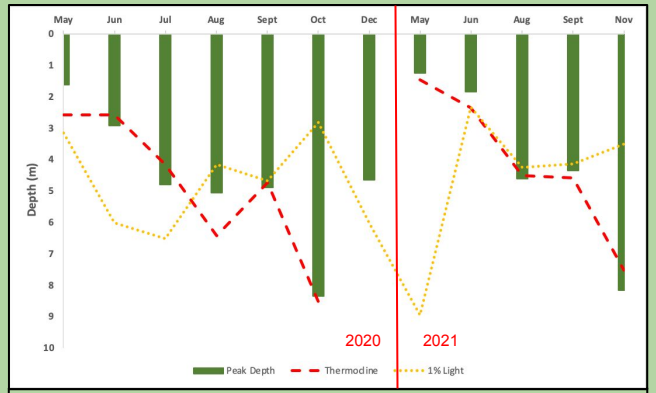
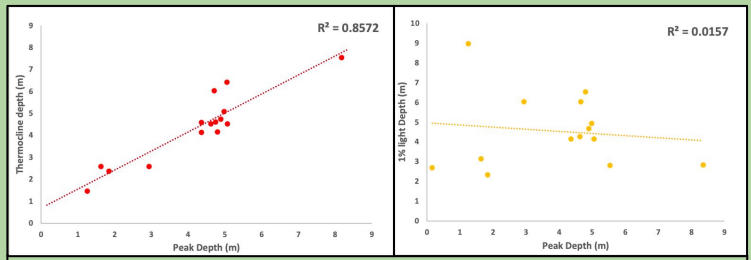


Fig. 3 - Seasonal changes to peak depths in relation to the thermocline and light depths.



Figs. 4 & 5 - Comparison between thermocline and 1% light versus peak depths.


Monitoring algal blooms

Conclusions

Blue-green algae blooms on Cross Reservoir form in Mid-Summer when light extends deeper than the thermocline. During this time, the algae take up and store extra nutrients.

Throughout Fall, the thermocline deepens, which in turns causes the deep blue-green algal layer to be pushed below where light exists for continued positive population growth. Blue-green algae use their reserve of nutrients and carbon during this period to stay beneath the thermocline.

Blooms dissipate in Late Fall because they get starved for light as the thermocline deepens in the water column.

Deep blooms are not a health risk because they are deep enough to avoid primary recreational contact.