TEMPORAL RELATIONSHIP BETWEEN DROUGHT–PRECIPITATION PATTERNS AND THE CYANOBACTERIAL HARMFUL ALGAL BLOOMS IN LAKE ALLATOONA, GA

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AFFILIATION: UGA Dept. of Geology
REFERENCE: *Proceedings of the 2017 Georgia Water Resources Conference*, held April 19-20, 2007, at the University of Georgia

Harmful algal blooms (HABs) increasingly threaten the freshwater supply through contamination and fish kill. These blooms occur annually in the eutrophic Lake Allatoona, and are affected by a number of interconnected biological, chemical, and hydrogeological mechanisms. This study investigated the effect of precipitation and drought dynamics on HAB onset, durations, and severity through the integration of remote sensing and in situ datasets and statistical analysis. Precipitation and streamflow data were obtained from USGS stations at Lake Allatoona for the years 2008–2014. Chlorophyll–a fluorescence data measured by the Georgia Environmental Planning Division in Allatoona were collected for the same time span to calculate algal biomass. Phycocyanin concentrations were modelled using geometrically, radiometrically, and atmospherically corrected data from the Landsat ETM+ and OLI/TIRS satellite sensors. Statistical analyses including a Standardized Precipitation Index and Flow Duration Curves were conducted to determine the relationship between precipitation intensity, duration, and frequency and HAB growth. Landsat scenes were corrected and processed using a phycocyanin concentration detection algorithm to verify the presence of HABs associated with Chlorophyll–a data. These data suggest that the relationship between HAB growth and precipitation dynamics during the wet season may be a function of bloom location within the lake. Blooms near the river inflow are disrupted by destratifying discharge events throughout the year and therefore can show reduced growth due to the increased wet season inflow. HABs in stable waters will be more likely to have increased growth correlating to wet season precipitation intensity. Improved understanding of the relationship between precipitation and HAB growth will allow for greater prediction and remediation of freshwater resources.

Program reference: 1.4.20