Early Detection Tools for Cyanobacterial Harmful Algal Blooms in Georgia's Inland Waters

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Abstract. The effects of anthropogenic eutrophication are intensified in inland watersheds across southeastern United States (SEUS) due to increasing temperatures associated with frequent droughts and agricultural induced nutrient enrichment. These factors may ultimately lead to the formation of toxic Cyanobacterial Harmful Algal Blooms (CyanoHABs) in inland waters. Therefore, accurate, cost-effective, and targeted monitoring of these events is indispensable to sustainable management of the environment. The abundance of phycocyanin (PC), a phycobiliprotein, may be used as a proxy to assess the amount of cyanobacteria biomass that is present in a water body. This study presents two innovative approaches for monitoring CyanoHABs in these environments; community and satellite-based remote sensing. CyanoTRACKER is a project supported by NSF that encourages the community to provide their observations regarding the quality of their lakes by sending trustworthy, actionable information via online social media platforms such as Facebook and twitter. This community-as-sensors paradigm will act as the initial trigger for the traditional sensing infrastructure comprised of high-resolution cameras and multiple Raspberry PI integrated with OceanOptics "STS-VIS" hyperspectral spectroradiometers deployed at the study sites. Data collected by these sensors will be run through models that produce an estimation of cyanobacteria concentration within the water bodies. Meanwhile, an upscaling procedure demonstrated the feasibility of using Landsat-8 satellite imagery to detect cyanobacteria reflectance patterns. This model aimed to identify and delineate spatial and temporal distribution of CyanoHABs in order to rapidly monitor and respond to these systems thereby improving water quality management decision-making for inland Georgia reservoirs. The combination of these tools will enable early detection and timely implementation of preemptive measures to reduce the frequency and severity of future CyanoHABs.