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Mapping Concentration and Spatial Distribution of Cyanobacteria in Mesotrophic to Eutrophic Reservoirs Using Airborne Hyperspectral Remote Sensing Imagery

Sengpiel, R.^[1], Li, L.^[1], Tedesco, L.P.^[1], Wilson, J.^[2], Pascual, D.^[1], and Moran, D.^[3]

[1] IUPUI Department of Earth Science and Center for Earth and Environmental Science

[2] IUPUI Department of Geography

[3] Veolia Water Indianapolis, LLC.

Historically, cyanobacterial blooms of *Anabaena*, *Aphanizomenon*, and *Pseudanabaena* in Central Indiana drinking water reservoirs (Geist, Morse, and Eagle Creek Reservoir) have contributed to drinking water use impairment by causing aesthetic degradation (taste and odor). However, recent EPA work on developing Cyanobacterial toxin guidelines has created a need to better understand the spatial distribution of these algae. The primary objective of this research is to develop an efficient mapping tool to meet this need. Using the optical properties of Cyanobacterial pigments (Chlorophyll *a* and Phycocyanin), reflectance spectra from the Airborne Imaging Spectrometer for Applications (AISA) sensor were used to develop maps of Cyanobacteria concentration and distribution. On September 6, 2005, concurrent with the AISA imagery acquisition, approximately 30 water quality samples were collected from each reservoir, and later analyzed for Chlorophyll *a*, Phycocyanin, and other water quality constituents. Spectral data from a subset of locations matched to GPS coordinates of ground truth samples were extracted from calibrated AISA imagery to create a calibration data set and develop models. Two algorithms were applied: one to link the AISA spectra in the calibration set to Chlorophyll *a* concentration; and the other to link the same set to Phycocyanin concentration. The models were then applied to the AISA image to generate high spatial resolution (1 m²) maps of Chlorophyll *a* and Phycocyanin distribution for each reservoir.

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