USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2002VT5B

Title: Detection of cyanobacterial blooms using remote sensing

Project Type: Research

Focus Categories: Water Quality, Methods, Toxic Substances

Keywords: algal blooms, blue green algae, cyanobacteria, toxic algae, monitoring, nuisance species, remote sensing

Start Date: 03/01/2003

End Date: 02/28/2005

Federal Funds Requested: $30000.00

Matching Funds: $60518.00

Congressional District: First

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Abstract: Cyanobacterial blooms are an all too common nuisance in freshwater lakes throughout the northeastern U.S. where they create a suite of water quality issues including surface scums, malodors, shading of submerged plant communities, and oxygen depletion (during decomposition of dead biomass). Moreover, various cyanobacterial species are known to produce hepatotoxins or neurotoxins that, if consumed, can pose a serious risk to human and animal health. In Vermont, various field sampling programs have been created by state, citizen and research groups to identify the presence of blooms and their toxicity. Based on widely-spaced sampling points, however, these efforts can provide only limited information about the extent, timing and movement of blooms or may miss blooms altogether. We propose in this effort to develop an algorithm to detect and characterize the spatial and temporal distribution, density and movement of cyanobacterial blooms throughout Lake Champlain and in selected smaller lakes across Vermont using currently operational satellite sensors. Field and laboratory observations will be combined with satellite image analyses to define relationships between light reflected from lakes at the wavelengths associated with chlorophyll a and phycocyanin (a pigment unique to cyanobacteria), and in situ pigment concentrations and biomass. These relationships will be examined

with regard to algal species composition and to differences in concentrations of suspended particles and dissolved organic material and in lake surface roughness. Analyses will initially focus on evaluation of ENVISAT MERIS and LANDSAT ETM+ imagery. The validated algorithms and resultant map products will be distributed to the public via the World Wide Web site that will be created for this purpose. Use of resultant algorithms and map products by state and other interested users could widen and enhance current field monitoring and alerting efforts, and contribute substantially to the development of models of bloom formation and movement, particularly in relation to land use practices contributing to the nutrient loading of afflicted waters. Sampling, analytical, and image procurement costs for this project will be shared with at least two other research teams interested in water quality in Lake Champlain.

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