Abstracts

Wednesday, April 30

Session F6: Integrating Remote Sensing into Assessment Programs

8:00 – 9:30 am | Room 232

Remote Sensing of Wintertime Groundcover on Agricultural Fields within the Chesapeake Bay Watershed: Performance of Winter Cover Crops for Water Quality Protection

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Abstract
Winter cover crops are used to reduce soil erosion and nutrient leaching from agricultural fields, particularly during the winter months. However, cover crop performance is highly variable, depending on species choice, planting date, and other agronomic management factors. This project has developed a geospatial toolkit that uses well-calibrated multiband satellite imagery to map wintertime groundcover on agricultural fields, and then uses the NASS National Cropland Data Layer to segment the fields by crop type. The resulting reports can be used by conservation managers to promote adaptive management of winter cover crops to maximize soil protection in critical areas of the landscape. This presentation will detail the methods used to map wintertime groundcover, and will present selected results from a four-year analysis of Showcase Watersheds in the Chesapeake Bay region.

Satellite Remote Sensing and Crowd Sourcing to Monitor and Predict Cyanobacteria Blooms

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Abstract
Cyanobacterial blooms occur worldwide and are associated with human respiratory irritation, undesirable taste and odor of potable water, increased drinking water treatment costs, loss of revenue from recreational use, and human illness as a result of ingestion or skin exposure during recreational activities. Satellite technology allows for the development of harmful algal bloom indicators at the local scale with national coverage. Cyanobacteria can successfully be monitored using remote sensing technologies based on algorithms to retrieve chlorophyll *a* and phycocyanin. In this project, cyanobacteria cell count data from Ohio, Florida, New Hampshire, Vermont, Rhode Island, Connecticut, and Massachusetts were derived with data from the Medium Resolution Imaging Spectrometer (MERIS). MERIS data on the European Space Agency's Envisat-1 satellite were used in a case study with 300 m data available in the region from 2009 to 2012. The goal of this project was to develop a stakeholder tool with the capability to monitor cyanobacteria blooms near real-time, and potentially provide predictive capability. Crowd sourcing was a unique opportunity to pool the problem solving skills of >500,000 people worldwide to develop these capabilities. The predictive algorithm was targeted to forecast the status of cyanobacteria bloom events in 7, 14, and 28 day intervals. First, the model identified lakes likely to attain cyanobacteria cell counts greater than 10,000 cells/mL during the forecast period. Next, the model focused on freshwater systems identified by satellite observations to have low cell counts (10,000 – 109,999 cells/mL) and predicted the potential for future development to either Medium (109,000 – 299,999), High (300,000 – 1,000,000), or Very High (> 1,000,000) cell count ranges. The combined use of satellite technology with crowd sourcing provided a sophisticated stakeholder tool that may allow for more holistic management to reduce exposure risk to the public.

Multispectral Monitoring of New England Freshwater Resources to Assess Turbidity, Algal Blooms and Water Quality for Enhanced Natural Resource Management

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Abstract
Centered between New York, Vermont, and Quebec, Lake Champlain is a critical water resource for the surrounding area. Approximately 145,000 people rely on the lake for drinking water and it is a major stopping point and breeding ground for migrating birds. Development in the Lake Champlain watershed has led to an increase in nutrients in the lake. Algae in the water thrive on the nutrient flux and reproduce exponentially, causing hazards to both human and environmental health. Interested organizations, including the Lake Champlain Basin Program (LCBP), the Lake Champlain Committee (LCC), and the Vermont Department of Environmental Conservation (VTDEC), mobilize citizen volunteers to collect water samples in various parts of the lake in order to monitor water quality. However, this process requires a large number of volunteers, can be inconsistent, does not account for the quality of the entire lake, and requires the cost of laboratories to test the water samples. Using data from the Moderate Resolution Imaging Spectroradiometer (MODIS) sensor aboard the Aqua satellite, Landsat 7's Enhanced Thematic Mapper Plus (ETM+) and Landsat 8's Operational Land Imager (OLI) sensors, this project generated a sustainable methodology for partner-use to monitor changes in chlorophyll *a*, cyanobacteria, phycocyanin, and total suspended sediment (TSS) over time in Lake Champlain. These results and methods were then transferred to project partners for continued use of remote sensing to monitor water quality and the creation of visual tools to support public policy decision making.

Predicting Algal Concentrations from Landsat Satellite Imagery in Kentucky Lakes

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Abstract

Several public agencies are currently employing remote sensing to monitor environmental conditions. Faced with both staffing limitations and financial constraints, we have developed a method by which we can satisfy the reporting of warm water habitat quality as well as locating specific areas of lakes to be sampled for primary contact recreation. Satellite imagery has been employed in many studies to predict the trophic state, chlorophyll *a* concentration (Chl-*a*), phycocyanin concentration as well as total phosphorous. By utilizing Landsat 8 imagery and georeferenced *in situ* measurements we were able to derive a model which allows us to predict Chl-*a* concentrations in Kentucky lakes. We are then able to calculate trophic state for reporting purposes and to predict locations within lakes that may contain harmful algal blooms. Kentucky has adopted a policy in which a water body will receive a health advisory if any area has an elevated risk to human health. With over 600 reservoirs and seasonal limitations, our method is an effective way to identify high risk locations where trained staff can make quality observations.