



Project: Assessing water quality with remote sensing; Lake Water Quality Decision Support System (LDSS)

Funding Sponsor: Center for Water Sciences, Michigan State University; Zhejiang University

Overarching Goal: The overarching goal of this project is to monitor water quality parameters using remotely sensed and GIScience technologies

Objectives:

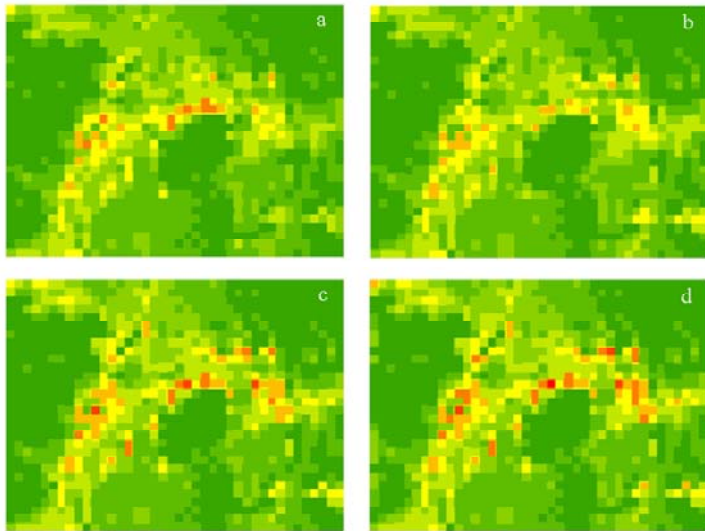
- A. Utilize moderate remotely sensed imagery to map chlorophyll-a and water quality attributes
- B. Create protocol for systematic processing of Landsat imagery for water quality monitoring

Summary: Eutrophication is a persistent problem that affects the ecological health of many shallow lakes in China. An indicator used to monitor trophic status is chlorophyll-a; however, collection and analysis can be spatially limiting and time consuming. In this study we utilized Landsat 7 ETM+ (Path/Row 119/39) imagery for West Lake, Hangzhou, to map chlorophyll-a concentrations. An optimal linear regression model with the band ratio $ETM+3/ETM+1$ (dependant) and concurrent field-collected water quality measurements (independent) was developed. The resulting model, $\ln Chl. = 5.009 (ETM+3/ETM+1) - 1.855$, showed a strong ($R^2=0.815$) ability to accurately map the distribution of chlorophyll-a. The straightforward approach carried out to assess this fresh-water lake in a rapidly developing region increased the level of information required to combat aquatic ecosystem degradation.

Direct results

- Provide cost-effective monitoring tools for management and compliance on the order of cents per lake/pond; comprehensive assessment (spatial & temporal) and monitoring system to improve decision making process
- Assess water bodies rarely sampled due to traditional time and cost restraints
- Forecast system to assist health managers make decisions
- Generate high quality, spatially explicit, scientifically valid information and substantially reduce required field collection, assessment, and regulatory compliance
- Non-invasive monitoring & assessment of landscape conditions
- Ability to generate near-real time assessment and apply continued analyses regularly in the future with newly obtained imagery
- Secured, web-based delivery system reaches wide audience digitally

This project was part of a series of water quality projects that form our **Lake Water Quality Decision Support System (LDSS)** The DSS that generates and disseminates a suite water quality information products derived from remotely sensed data in a dynamic web-based geospatial data visualization and distribution system. Information products include chlorophyll-a and cyanobacteria indicators, TSM, CDOM, and trophic status index among others. The eventual full scale system will be capable of systematic monitoring as well as historical analysis, “hot spot” investigations, model parameterization, and harmful algae bloom (HAB) forecasting. Example graphic visualizes Microcystis blooms in Lake Erie.



Lake Water Quality Decision Support System

USER INTERFACE: The User interface system allows users to select and modify all input parameters for the models and define output products from the decision support system. The DSS is designed as a web-based system allowing for easy access to online databases, system updates, and near real time information.

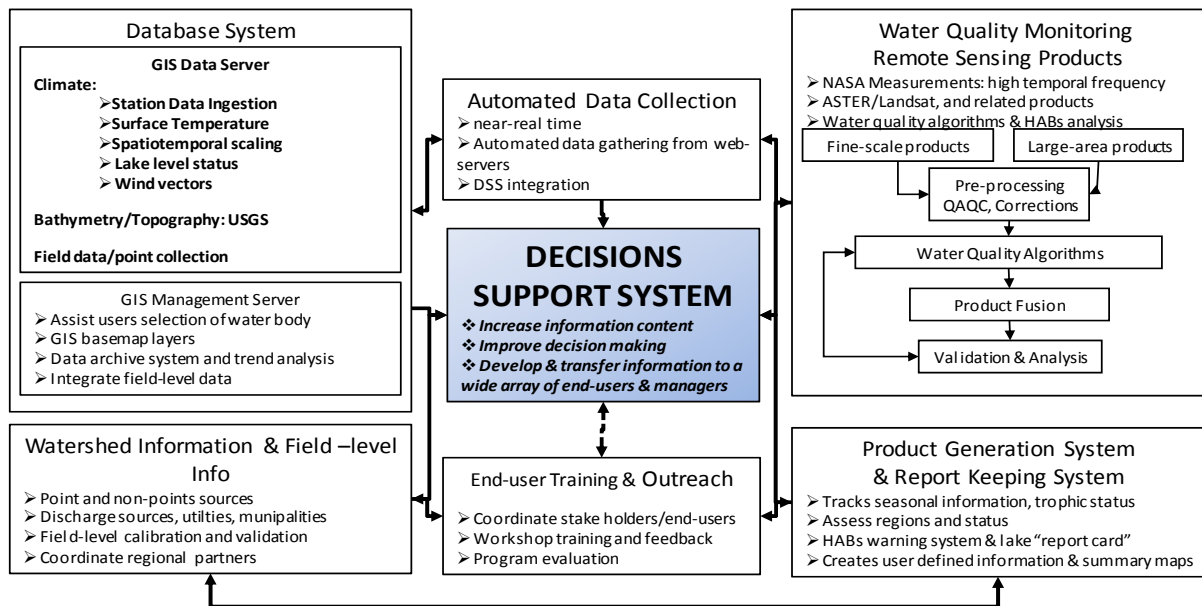


Figure: Conceptual framework for full-scale Fresh Water Quality Decision Support System.

