Introduction

The New York-New England region is the most densely forested region in the U.S. It is also one of the most densely populated, and experiences air pollution levels among the highest in the country. Over 30 million people in the region seek potable water, forest products, recreation and aesthetic renewal from a complex patchwork of forested lands with a rich and diverse history of human use and current ownership. The health of these forest lands and the waterways they feed are a critical component of the economic well-being and quality of life in the region.

Forest health and stream water quality both depend on the integrity of biogeochemical cycles within forest ecosystems. It has been clearly established that both atmospheric deposition and forest management can alter the biogeochemistry of forest ecosystems, inducing significant changes in forest production, species composition and stream water quality. Nutrient-cation imbalances have been associated with soil and stream acidification, nutrient imbalances in forest vegetation, and in some cases with decreased forest production.

Monitoring the biogeochemical status of forest and stream ecosystems is a key component of assessing environmental quality in the northeastern U.S. Any monitoring system requiring spatially-continuous capabilities will need to utilize some form of remote sensing technology. Forest canopies are only the portion of the system accessible to optical remote sensing instruments and so offer the most likely target surface for monitoring forest health in this spatial mode. The usefulness of remote sensing of canopy chemistry depends on tight relationships between canopy chemistry and the critical processes of forest production and element losses in drainage water.

Regional Forest Health and Stream and Soil Chemistry Using a Multi-Scale Approach and New Methods of Remote Sensing Interpretation, Catskill Mountains, NY

A key tool for integrating biogeochemistry with forest health is remote sensing (RS) of canopy chemistry. RS offers the most likely target surface for monitoring forest health in this spatial mode. The most recent work has focused on the potential of hyper-spectral remote sensing to monitor the biogeochemical status of forest and stream ecosystems. Application of this technique can be divided into three primary steps: (1) Spectral characterization of ecosystem processes, (2) Development of remote sensing algorithms, and (3) Integration of RS data into landscape models to interpret and predict biogeochemical processes.

Remote sensing of canopy chemistry has been shown to provide a means of monitoring forest health, detecting disturbances, and predicting biogeochemical turnover in response to nutrient deposition.