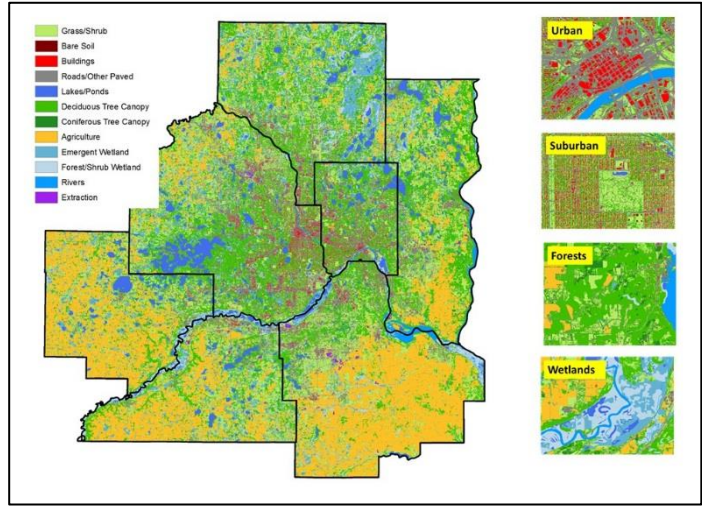# MINNESOTAVIEW
REMOTE SENSING ACTIVITIES
2015 - 2016

HIGH-RESOLUTION LAND COVER MAPPING

Classification of 7-county Twin Cities Metropolitan Area by Object-based image analysis of 1-meter NAIP and lidar data. The overall classification accuracy was 88 percent.
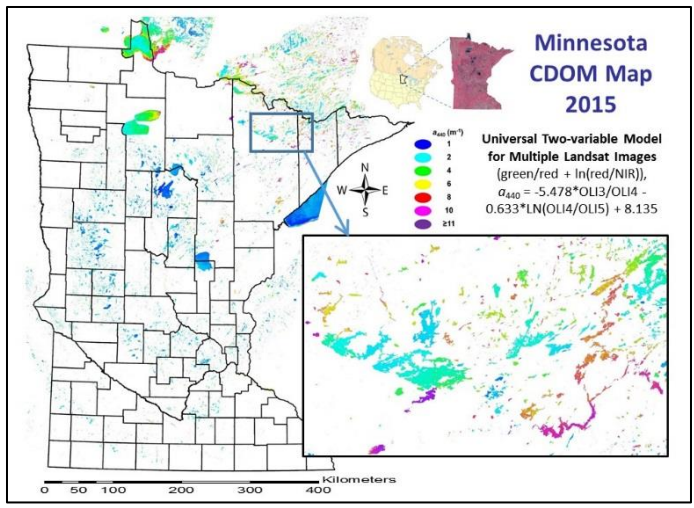
MinnesotaView produced high-resolution (1-meter) land cover classifications for Duluth, Rochester, and the seven-county Twin Cities Metropolitan Area (TCMA) using multispectral NAIP imagery, LiDAR data and derived products, and other thematic ancillary data. These data sets were integrated using an Object-Based Image Analysis (OBIA) approach to classify 12 land cover classes. By using objects instead of pixels we were able to utilize spatial and contextual information of objects such as shape, size, texture, and LiDAR-derived metrics, particularly height, as well as multispectral responses to distinguish different land cover types.

The classifications of the TCMA, Duluth and Rochester are being used by agencies for urban tree and stormwater management and other applications are available at http://portal.gis.umn.edu/, along with other Minnesota land cover classifications.

LAKE WATER QUALITY MONITORING

Colored dissolved organic matter (CDOM) is the major component of the dissolved natural organic matter in many natural waters, especially in forested watersheds with wetlands. It has major effects on physical, chemical, and biological processes, as well as on the suitability of surface waters for human use. Understanding its distribution and dynamics is important to monitoring, assessment and management of surface waters by state and local agencies.

We classified colored dissolved organic matter (CDOM) of Minnesota lakes using Landsat 8 OLI data. The analysis started with image normalization to surface reflectance using radiometric rectification of a series of overlapping Landsat 8 images. Data extracted from the normalized images were then used to develop a common CDOM model that was used to create the first Minnesota statewide CDOM map. The agreement (R^2) between actual and predicted CDOM is 0.86. Development of the radiometric rectification approach was supported by an AmericaView water resources mini-grant.

CDOM classification of Minnesota lakes with Landsat 8 OLI data.

BENEFITS TO MINNESOTA

MinnesotaView supports the development, distribution and application of geospatial information derived from remote sensing data for mapping, monitoring and analysis of land and water resources in Minnesota. Classifications of land cover, impervious surface area and lake water clarity are being used for management and planning by Minnesota agencies at state and local levels.

One example is the Metropolitan Council. The manager of its Water Resources Assessment Section writes in a user testimonial, "The Metropolitan Council has worked with the University of Minnesota's Remote Sensing and Geospatial Analysis Laboratory for a number of years to use remote sensing to track changes in land cover and evaluate changes in water quality. Based on these experiences, the Metropolitan Council sees a great value in remote sensing to answer water resources questions. There is an ever present demand in the state for more water resources data: to assess the quality of our lakes and rivers, to understand how they are changing, and to understand what might be driving that change. Remote sensing makes that possible at a scale not otherwise feasible. Even with the large amount of funding from the Clean Water Land and Legacy Amendment, there is never funding or staff to collect enough information "on the ground." The University of Minnesota's efforts using remote sensing to understand lake clarity have created a state-wide database of clarity in all lakes above a certain size threshold, not just those that are reachable by scientists or volunteers. This allows widespread investigation of changing water quality over time. Sequential years of remotely sensed land cover data then allow us to investigate land cover change as a driver of this changing water quality. We strongly support the work of the University of Minnesota and MinnesotaView to continue providing quality remote sensing products to assist us in evaluating water quality."
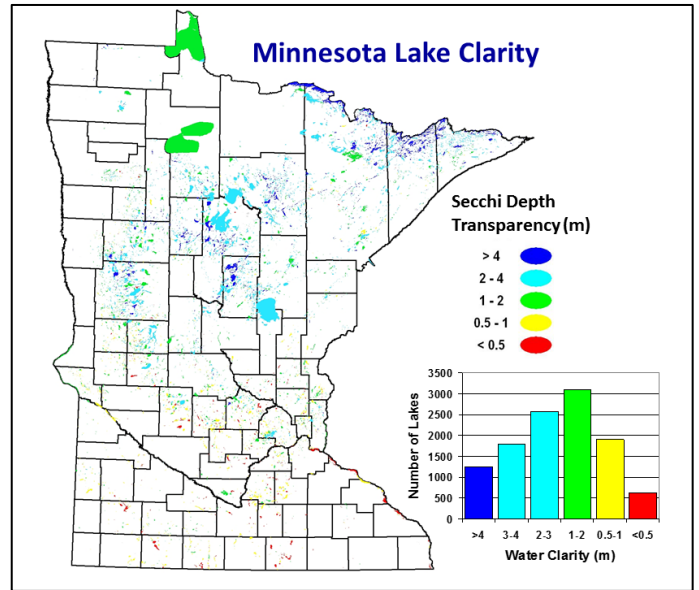
Classification of lake clarity, a key indicator of water quality, using Landsat satellite imagery has proven to be an accurate and economical method to monitor the condition of lakes in Minnesota. More than 10,000 Minnesota lakes have been classified at seven different times for the past 40 years. The classifications provide an unprecedented assessment of lakes in terms of number of lakes and geographic and temporal extent for analysis of temporal and geographic patterns and trends and relationships to land use and other factors that cause changes in lake water quality. Data for all lakes and years are available in the LakeBrowser, a web-based mapping tool that enables searches and display of results for individual lakes at: water.umn.edu.

MINNESOTAVIEW CONSORTIUM MEMBERSHIP

MinnesotaView was established in 2008 and is working with state agencies and universities in Minnesota to advance remote sensing research and application, education and outreach. The Consortium is led by the University of Minnesota's Remote Sensing and Geospatial Analysis Laboratory, and includes the Minnesota Geospatial Information Office, Minnesota Department of Natural Resources, and Metropolitan Council.

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