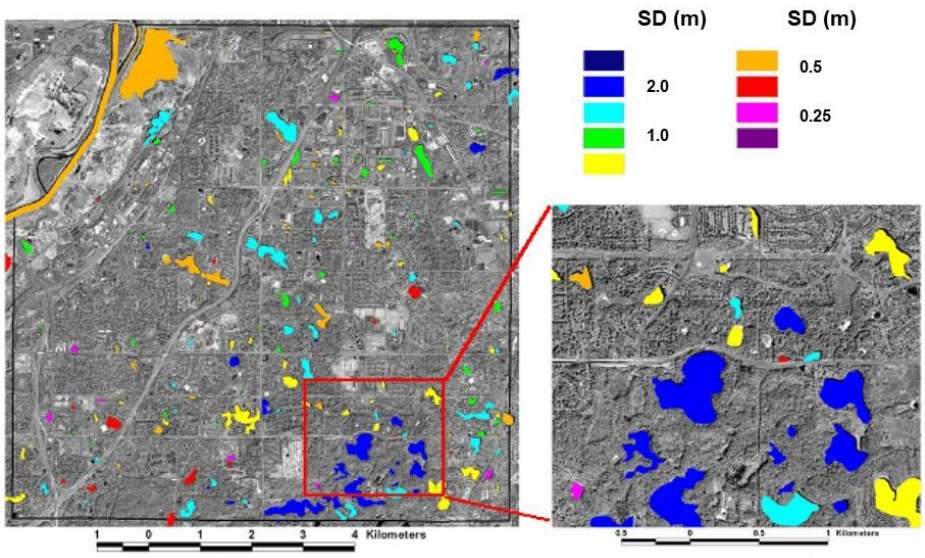
Water Clarity of Lakes at the City Level:

City Level, Eagan, Minnesota

High-resolution satellites such as IKONOS, which has four multispectral bands similar to Landsat TM bands 1-4, are ideal for studying small lakes. To explore the capabilities of IKONOS for lake water quality assessments and monitoring, we acquired an IKONOS image for August 23, 2000 of the City of Eagan, Minnesota. Eagan has 375 small lakes and ponds larger than one acre, with 44-acre Thomas Lake being the largest.

To map water clarity for Eagan, we acquired Secchi depth data from 19 lakes in Eagan that had been measured within three days of the image. Lake signatures were extracted from the image to model lake water clarity for the lakes and ponds. A regression equation (model) was developed using the band 1:3 ratio and band 1 as independent variables and the natural log of Secchi depth (SD) as the dependent variable. The relationship between the IKONOS data and SD had an $R^2 = 0.89$, which is similar to results using Landsat data at the metro and state scale. Finally, we created a pixel-level map of water clarity in the lakes and ponds of Eagan.



Lake water clarity classification of Ikonos multispectral data overlaid on panchromatic land image. (Imagery © Space Imaging L.P.)

The use of IKONOS data (and similar data from the QuickBird satellite) to assess water clarity in small lakes and ponds at a city scale thus is feasible. The spatial resolution of IKONOS data enables assessment of much smaller water bodies than Landsat's 30-meter resolution allows. Only 14 of Eagan's 375 ponds and lakes were included in our statewide assessment, while IKONOS data allows for the assessment of all of Eagan's small lakes and ponds.

IKONOS also could be useful for detailed city land use/cover and wetland mapping, and such maps could be used to assess how land use/cover affects water clarity. The cost of the IKONOS data would be too expensive for assessments of large regions, but should be affordable for many cities. Other newer data are now available at less cost. One source is National Agricultural Image Program (NAIP) imagery that is available at no cost.