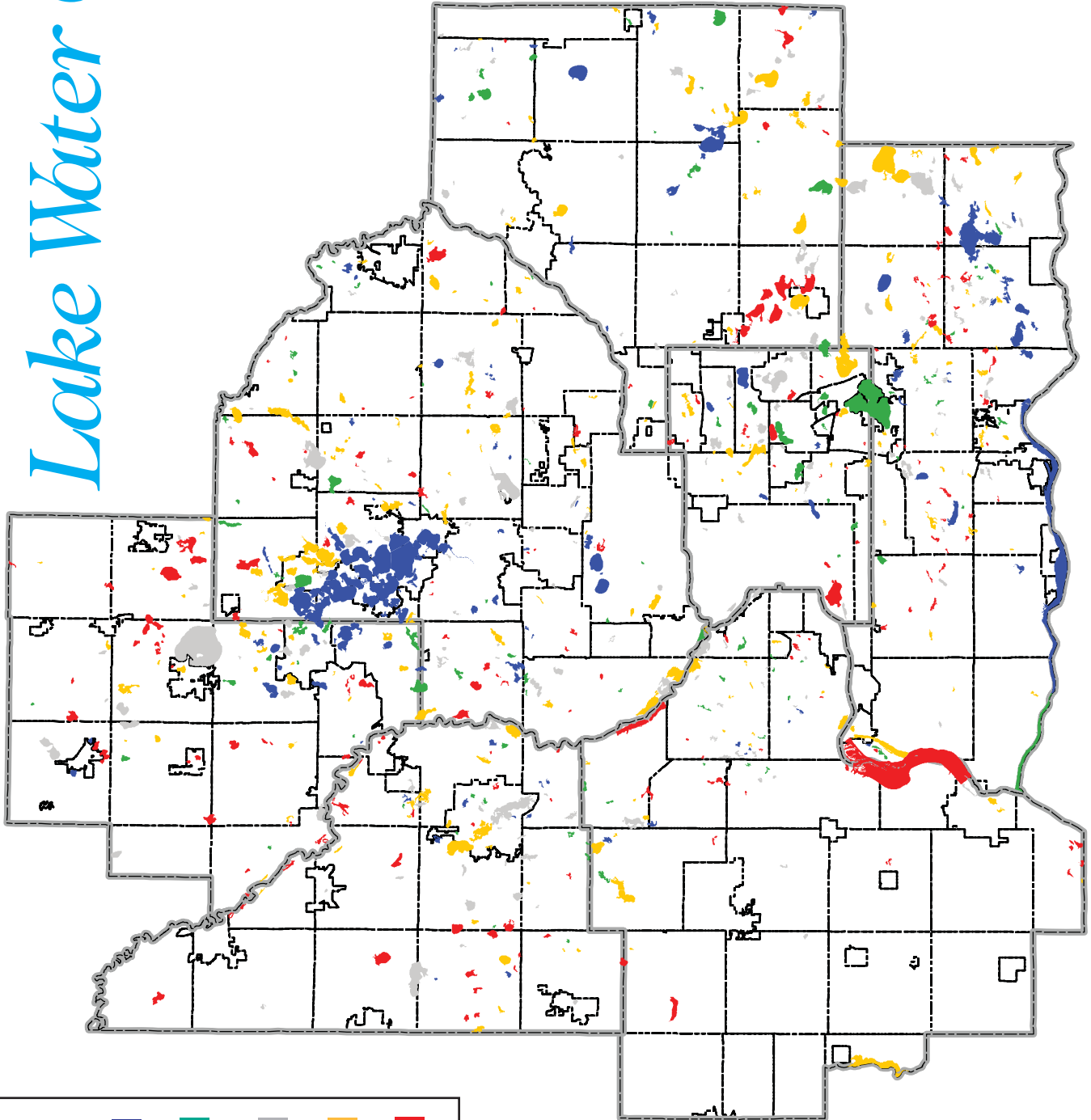





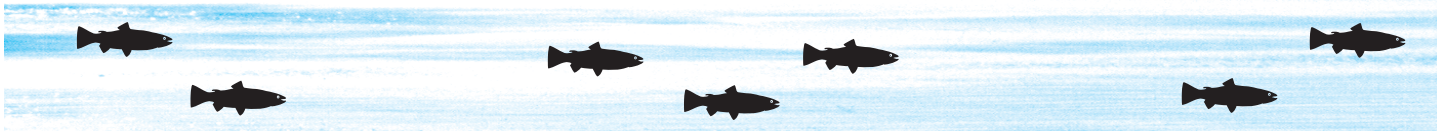


# 2007 Census of Twin Cities Lake Water Clarity

The Metropolitan Council uses state-of-the-art satellite technology to assess water clarity of lakes within the Twin Cities Metropolitan Area. This technique helps the Council and other organizations involved in water management make better management decisions by complementing existing water monitoring programs with a spatially complete snapshot of water clarity for the region's lakes.



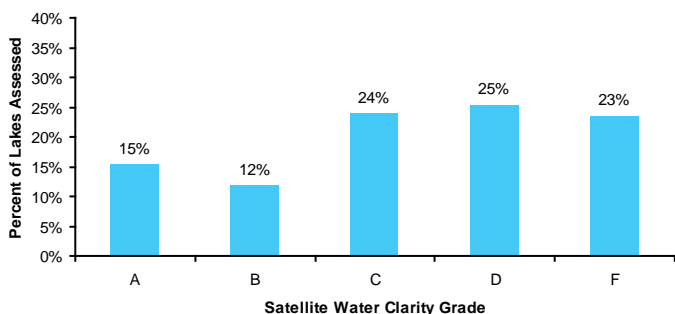
					
Grade	A	B	C	D	F
(m)	>3.0	3.0-2.2	2.2-1.2	1.2-0.7	<0.7
Secchi Depth					
(ft)	>9.8	9.8-7.2	7.2-3.9	3.9-2.3	<2.3



## How Does It Work?

Traditional monitoring programs are usually limited to monitoring only a fraction of the lakes in the Twin Cities each year due to logistics and cost. Satellite technology can complement on-the-ground monitoring programs by providing a spatially complete snapshot of water quality for all lakes in the Twin Cities region at comparatively little cost. Satellite remote sensing uses visible and infrared sensors to form digital images of the earth's surface by detecting solar radiation reflected from the ground. Assessment of water clarity by satellite imagery requires the development of a mathematical relationship between satellite observations of brightness in the red and blue regions of the spectrum and simultaneously collected ground measurements of water clarity for 25 to 50 lakes. This relationship can then be used to extrapolate water clarity for nearly all the region's lakes.

## How Clear are the Region's Lakes?



## Lake Water Clarity in 2007

In 2007, the Council, with the use of volunteer help, conducted monitoring on 176 lakes; however, nearly five times the lakes were assessed using satellite data. Of the 176 ground-monitored lakes, 166 lakes had sufficient water clarity data to determine water clarity grades for comparison to the satellite grades. Twenty-four percent of the ground-monitored lakes received a water clarity grade of "A" or "B" compared with 27% for the satellite assessment. The percent of lakes receiving a grade of "C" was 36% for the ground-based monitoring program and 24% for satellite assessment. Lakes receiving a poor water clarity grade of "D" or "F" accounted for 40% of the ground-monitored lakes, but 49% of the satellite assessed lakes. One likely explanation for the differences in the lake grades is that the lakes enrolled in the ground-monitoring program tend to be the larger and deeper lakes, which are generally characterized by better water clarity. A comparison between the 2007 satellite analysis of area lake water clarity to the last satellite assessment in 2005 indicates that the region experienced worse water clarity in 2007 in contrast to that of 2005.

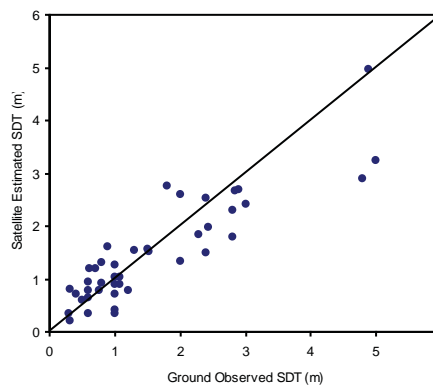
## Why Worry About Water Clarity?

Water clarity is an important attribute of lakes because it is strongly related to human perception of lake quality, particularly its suitability for swimming and boating. Water clarity is traditionally measured using a white metal disk, called a Secchi disk, which is lowered into a lake to the point where it is no longer visible. The depth at which the disk disappears serves as a good index of lake water quality. It is one of three measures used to characterize the trophic status (or degree of eutrophication) of a lake (the others are chlorophyll-a and total phosphorus concentrations).

## How Accurate Are Satellite Water Quality Estimates?

In general, the relationship between satellite data and water clarity, as measured by Secchi disk transparency (SDT), is strong. For this year's assessment, more than half (54%) of the satellite estimated summer mean SDT values were within  $\pm 0.5$  meters of the ground-observed summer mean SDT and 83% of the satellite estimates were within  $\pm 1.0$  meter. In terms of lake water clarity grade, the satellite-estimated grade was within  $\pm 1$  letter grade of the ground-observed grade 93% of the time.

## Comparing Satellite Estimates to Ground Observations of Water Clarity



## More information

Information about the Council's lake monitoring program can be found at <http://www.metrocouncil.org/environment>

Satellite water clarity assessment data for specific lakes can be found at [http://resac.gis.umn.edu/water/regional\\_water\\_clarity/content/lakebrowsers.htm](http://resac.gis.umn.edu/water/regional_water_clarity/content/lakebrowsers.htm)

For more information about the Council's satellite lake assessment program contact **Steve Kloiber at (651) 602-1056 or [steve.kloiber@metc.state.mn.us](mailto:steve.kloiber@metc.state.mn.us)**

For more information about the Council's lake monitoring programs contact **Brian Johnson at (651) 602-8743 or [brian.johnson@metc.state.mn.us](mailto:brian.johnson@metc.state.mn.us)**