Library Reference 2.2.2

Progress toward water quality improvement: Chlorophyll-a. AMP 2011 Annual Report. (Narrative Standard, Assessment Measure)

AMENDED CONSENT JUDGMENT GOAL

Reduction in average and peak algal biomass, and frequency and duration of bloom conditions as a result of reduced phosphorus loading from Metro, to achieve desired uses of the lake for water contact recreation, aesthetics and aquatic life protection.

Hypotheses to be tested:	**Status:**
Metro improvements and watershed phosphorus load reductions result in lower chlorophyll-a concentrations in the lake.	• 2005 – HRFS phosphorus treatment came on-line; reduced Metro's average contribution of phosphorus to lake from 43% to 20%. • Chlorophyll-a concentrations remain consistently below the nuisance bloom threshold (30 µg/l) during the summers since 2005.

Current Conditions with Historical Comparison

Major Sources: Internal algal production based on nutrients (phosphorus consistently limiting as of late 1990s), light, and temperature.

Upper Waters and Photic Zone Concentrations
(Summer= June 1 – September 30, Annual = January 1 – December 31; includes samples designated as "South", "Photic", "Epi", "UML", or "Tube", at depths ranging from 0 to 8 meters)

Time Period	Summer Average (µg/l) with Standard Deviation	Annual Maximum (µg/l) with Date Observed
1990-1997:	23.4 (14.6)	716.4 (07/11/1990)
1998-2004:	24.3 (4.66)	129.2 (04/30/2001)
2005-2009:	10.1 (4.87)	35.8 (03/28/2006)
2010:	7.27 (2.3)	13.4 (05/18/2010)
2011:	6.52 (2.5)	17.6 (05/09/2011)

Compliance with NYS AWQS and Guidance Value
(No NY State standard or guidance value for chlorophyll-a. Narrative P standard references algal abundance at nuisance levels. Federal guidance based on ecoregion and reference lakes)

Time Period	Percent exceeding 15 µg/l (Perceived impairment)	Percent exceeding 30 µg/l (Nuisance bloom)
1990-1997:	49%	26%
1998-2004:	65%	31%
2005-2008:	21%	0%
2009:	0%	0%
2010:	0%	0%
2011:	0%	0%

Factors Affecting Compliance: Nutrients, light, temperature, grazing pressure, species composition

Planned Load Reductions (1998 – 2012)

Metro SPDES Permit Requirement
- No SPDES requirement for chlorophyll-a
- Staged reduction in total phosphorus load from Metro
- Staged implementation of CSO and watershed projects to reduce phosphorus loading from nonpoint sources

Monitoring and Assessment Program

Lake Monitoring
(Annual County monitoring program)
- Weekly measurements at South Deep Station, May–September
  Collected as depth-integrated tube samples through the UML of the water column and, through 2008, as photic zone (2x Secchi depth,) composites. The photic zone composites were discontinued in 2008. The UML depth is determined by the temperature profile; when no distinct thermocline is present, 0, 3, 6 meters in depth is the UML default.

Related Biological Monitoring
- Phytoplankton community measurements biweekly April-November
- Zooplankton community measurements biweekly April-November
- Alewife monitoring

Tools for Decision Making

Model
- Onondaga Lake Water Quality Model (Anchor QEA,LLC)
- Mass balance TP framework and empirical eutrophication model (William Walker)

TMDL Allocations: Phosphorus - NYSDEC Phase I TMDL 8/27/97; TMDL for Phosphorus was updated in 2012 and approved by the USEPA on June 29, 2012.