Lake Okeechobee Performance Measure Diatom/Cyanobacteria Ratio

Last Date Revised: March 7, 2007

Acceptance Status: Accepted

1.0 Desired Restoration Condition

The target is to substantially reduce the dominance of cyanobacteria relative to diatoms. This can be expressed as a numeric target of having a long-term pelagic ratio of biovolume (diatoms: cyanobacteria) greater than 1.5:1.

1.1 Predictive Metric and Target

N/A.

1.2 Assessment Parameter and Target

Biovolume ratio (diatoms: cyanobacteria) greater than 1.5:1.

2.0 Justification

Studies of phytoplankton taxonomic structure of Lake Okeechobee in the 1970s indicated that the community was dominated by diatoms; today the community is dominated by pollution-tolerant bloom-forming cyanobacteria (Havens et al. 1996). The five-year mean diatom to cyanobacteria ratio for 2000-2005 was 0.63 (SFER, 2006). If phosphorus loads are substantially reduced the percentage of the community comprised of cyanobacteria should decline (LATHROP et al., 1998).

3.0 Scientific Basis

3.1 Relationship to Conceptual Ecological Models

The indicator for this performance measure is an ecological attribute (diatoms:cyanobacteria ratio) in the following conceptual ecological models:

Regional Models

Lake Okeechobee

Ecological Model for Hypothesis Clusters

Lake Okeechobee Water Quality Conceptual Ecological Model

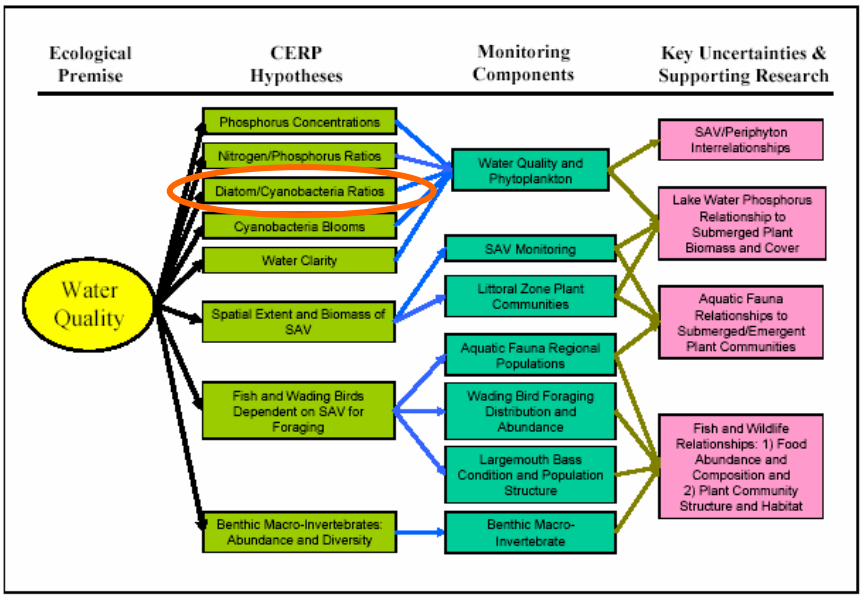
3.2 Relationship to Adaptive Assessment Hypothesis Clusters

Ecological Premise: The predrainage Lake Okeechobee was characterized by hydrologic inputs primarily from rainfall and inflow from tributaries draining wetlands, forest, and range lands. This resulted in relatively moderate phosphorus inputs to the lake and moderately eutrophic conditions in

the ecosystem. This contrasts sharply with the present condition of high phosphorus inputs from agricultural lands and highly eutrophic lake conditions.

CERP Hypothesis: A decrease in phosphorus inputs to the lake will result in the following changes:

- Reduction in pelagic (open-water) total phosphorus concentrations to 40 ppb
- Increase in pelagic total nitrogen:total phosphorus mass ratios to >22:1
- Increase in the ratio of diatoms:cyanobacteria biovolume to >1.5:1, resulting in a more effective food web to support the lake's fishery
- Decrease noxious cyanobacteria bloom frequency (chlorophyll a <40 ppb and total algal biovolume <50% cyanobacteria composition during blooms)
- Increase in water clarity



4.0 Evaluation Application

4.1 Evaluation Protocol

Due to the large uncertainty in the predictions of diatoms and cyanobacteria, the evaluation application using the LOWQM has been withdrawn.

4.2 Normalized Performance Output

Scores have not been developed at this time.

4.3 Model Output

4.4 Uncertainty

5.0 Monitoring and Assessment Approach

5.1 MAP Module and Section

See *CERP Monitoring and Assessment Plan: Part 1 Monitoring and Supporting Research* - Lake Okeechobee Module section 3.4.3.1 (RECOVER 2004a). Phytoplankton is sampled by the SFWMD on a quarterly basis at four pelagic sites (representing four documented ecological zones). Integrated water column samples are collected and analyzed microscopically by a contract laboratory to determine relative biomass of major algal groups. The sample collection, sample processing, and data entry features of this project follow a detailed QA/QC Plan developed by the SFWMD and the external contractor.

5.2 Assessment Approach

Performance is assessed on the basis of yearly-averaged ratios of diatoms: cyanobacteria in the samples.

6.0 Future Tool Development Needed to Support Performance Measure

6.1 Evaluation Tools Needed

6.2 Assessment Tools Needed

7.0 Notes

This Performance Measure supersedes and addresses LO-7, Lake Okeechobee Diatom: Cyanobacteria Ratio (Last Date Revised: November 29, 2004).

8.0 Working Group Members

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9.0 References

Havens, K.E., N.G. Aumen, R.T. James and V.H. Smith. 1996. Rapid ecological changes in a large subtropical lake undergoing cultural eutrophication. Ambio 25:150-155.

Lathrop, R.C., S.R. Carpenter, C.A. Stow, P.A. Soranno, and J.C. Panuska. 1998. Phosphorus loading reductions needed to control Blue-green algal blooms in Lake Mendota. Canadian Journal of Fisheries and Aquatic Sciences 55:1169-1178.

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