

## Lake Okeechobee Performance Measure Macroinvertebrates

**Last Date Revised: March 7, 2007**

**Acceptance Status: Accepted**

### 1.0 Desired Restoration Condition

Increased diversity and distribution of pollutant-sensitive taxa of invertebrates.

#### 1.1 Predictive Metric and Target

#### 1.2 Assessment Parameter and Target

For macroinvertebrates, the pelagic zone target is to reduce the relative abundance of pollution-tolerant oligochaetes to below 25% and increasing the relative abundance of taxa other than oligochaetes and chironomids to at least 50% (Warren et al. 1995). Setting a quantitative target for littoral zone macro-invertebrates requires additional analysis of the available historic data, or additional research.

### 2.0 Justification

Macroinvertebrates occupy an intermediate trophic level in an ecosystem. They play important roles in nutrient cycling, primary productivity, and decomposition. Macroinvertebrates are a critical food resource for fish, and effective fisheries management must account for the fish-invertebrate linkages (Wallace 1996). Larger Fish, birds and other wildlife directly or indirectly depend on a well-balanced macroinvertebrate community for food. The current macroinvertebrate community in Lake Okeechobee is dominated by pollution tolerant species, e.g., oligochaetes and chironomids, most likely a result of excessive organic and nutrient loading (Warren et al. 1995). The elevated organic loading rate of particulate organic matter (POM) to the Lake's sediment is due to several factors, among which are the elevated phosphorus concentration, algal bloom severity and frequency, influx from external sources of organic matter of terrigenous origin, and unnatural water level regimes. These stressors have negatively impacted the macroinvertebrate community by reducing taxonomic richness and diversity.

### 3.0 Scientific Basis

#### 3.1 Relationship to Conceptual Ecological Models

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

##### Regional Models

Lake Okeechobee

##### Ecological Model for Hypothesis Clusters

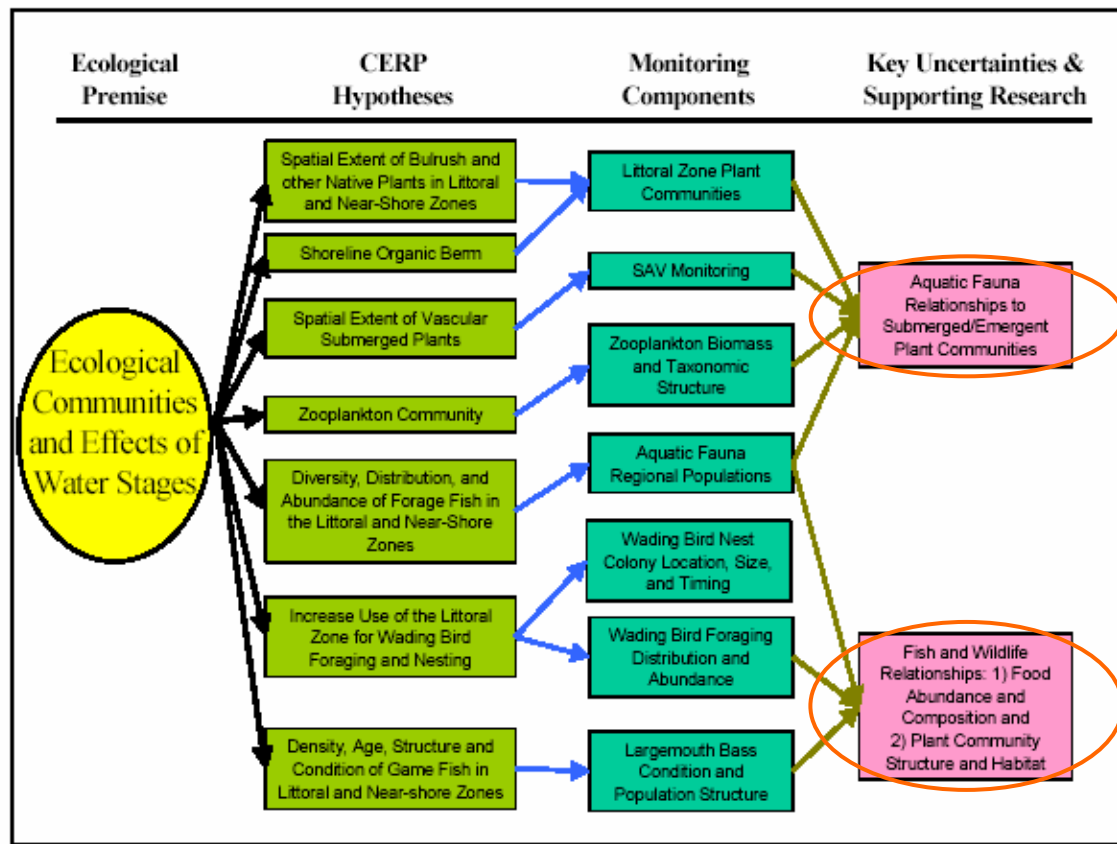
Ecological Communities and Effects of Water Stages Conceptual Ecological Model

### 3.2 Relationship to Adaptive Assessment Hypothesis Clusters

**Ecological Premise:** Sustained lake levels and a reduction of spring recession conditions have resulted in the degradation of pre-drainage macroinvertebrate communities in Lake Okeechobee.

**CERP Hypotheses:** Providing a reduction in the frequency of extreme high water levels (stage >17 feet and stage >15 feet for more than 12 consecutive months) and low water levels (stage <11 feet and stage <12 feet for more than 12 consecutive months) and an increase in the frequency of spring recessions (yearly stage decline from near 15.5 feet in January to near 12.5 feet in June, with no reversal >0.5 feet) will result in the following changes (see Havens 2002 for details):

- Increase in spatial extent of bulrush along the western lakeshore; increased spatial extent of spikerush and beakrush, which will provide more habitat for macroinvertebrates.
- Increase in spatial extent of vascular submerged plants, in particular eelgrass, peppergrass, and southern naiad, which will provide more habitat for macroinvertebrates.
- Shift in taxonomic structure of macroinvertebrates to one less dominated by pollution-tolerant oligochaetes and chironomids, which may provide a better food source for fish
- Increase in diversity, distribution, and abundance of macroinvertebrates in the littoral, pelagic and near-shore zones



## **4.0 Evaluation Application**

### **4.1 Evaluation Protocol**

### **4.2 Normalized Performance Output**

### **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 3.4.3.5 (RECOVER 2004a). Pre-CERP implementation monitoring commenced during August, 2005 in the pelagic region, and summer and winter sampling is being conducted at 18 sites. This monitoring is expected to continue through 2008, and collection techniques for the on-going pelagic monitoring replicate those used in previous pelagic studies (Warren et al. 1995). Bi-annual macroinvertebrate sampling also is currently being conducted at replicate *Scirpus* and *Typha* (emergent) and *Hydrilla*, *Potamogeton* and *Valisneria* (submergent) sites as part of the Pre-CERP implementation assessment. Specific monitoring methods for the littoral region have not yet been determined, but standard sampling techniques such as the use of various types of traps and nets for littoral macroinvertebrates will be employed. Collection techniques in the littoral monitoring program should replicate, as closely as possible the methods used in historical sample collections (e.g. Rudolph and Strom, 1990, Warren and Vogel, 1991). Sampling frequency in the littoral region should be of sufficient frequency to capture both seasonal and inter-annual effects related to hydroperiod and extrinsic climatic factors.

### **5.2 Assessment Approach**

## **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-13, Lake Okeechobee Fish Population Density, Age Structure, and Condition (Last Date Revised: November 8, 2004), and LO-14, Lake Okeechobee Fish and Aquatic Fauna : Fish and Invertebrates (Last Date Revised: November 8, 2004).

## **8.0 Working Group Members**

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## **9.0 References**

- Rudolph, H. D., and D. G. Strom. 1990. Macroinvertebrates Associated with Macrophytes in Lake Okeechobee, Florida. Florida Department of Environmental Regulation, Port St. Lucie, Florida, 301 pp.
- Warren, G.L. and Vogel, M.J. 1991. Aquatic Invertebrate Communities of Lake Okeechobee: in Lake Okeechobee-Kissimmee River-Everglades Resource Evaluation Completion Report to US Dept of Interior. Wallop-Breaux Project No. F-52. Florida Game and Freshwater Fish Commission, Tallahassee, FL : 107-177.
- Walace, J. B. 1996. The role of macroinvertebrates in stream ecosystem function. Annual Review Entomol. 41:115-39.
- Warren, G.L., M.J. Vogel, and D.D. Fox. 1995. Trophic and distribution dynamics of Lake Okeechobee sublittoral benthic invertebrate communities. Arch Hydrobiol. 45. 317-332.