

## Technical Support Document

### Derivation of Dissolved Oxygen Criteria to Protect Aquatic Life in Florida's

#### Fresh and Marine Waters

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Technical Support Document Derivation of DO Criteria for Florida's Fresh and Marine Waters*

#### 1.3. Everglades SSAC

In the Everglades open-water slough communities, where light penetration is high, photosynthetic activity by periphyton and submerged aquatic vegetation (P/SAV) result in increasing oxygen concentrations during daylight hours. At night, respiration and sediment oxygen demand (SOD) draw oxygen concentrations down. The combination of high DO production during the day and the respiration and oxygen demand from the organic rich sediment results in strong natural diel DO fluctuations.

Recognizing that a single value criterion does not adequately account for the wide natural daily (diel) and seasonal fluctuations in DO concentrations observed in the marsh, FDEP developed an algorithm to account for the major factors (*e.g.*, time of day and temperature) influencing natural background DO variation in the Everglades. The algorithm uses sample collection time and water temperature to model the observed natural sinusoidal diel cycle and seasonal variability. This model provides a lower DO limit (DOL) for an individual monitoring station and is described by the equation:

$$DOL_i = [-3.70 - [1.50 \sin(2\pi/1440 t_i) - (0.30 \sin(4\pi/1440 t_i))] + 1/(0.0683 + 0.00198 C_i + 5.24 \cdot 10^{-6} \cdot C_i^2)] - 1.1$$

Where:

$DOL_i$  is the lower limit for the  $i^{\text{th}}$  annual DO measurement in mg/L

$t_i$  is the sample collection time of the  $i^{\text{th}}$  annual DO measurement, minutes, adjusted to Eastern Standard Time

$C_i$  is the water temperature associated with the  $i^{\text{th}}$  annual DO measurement in °C

To fully account for seasonal and annual variability in marsh DO concentrations, the SSAC is assessed based on a comparison between the annual average of multiple (*e.g.*, monthly) DO measurements made throughout the year and the average of the corresponding DO limits specified by the above equation for that year. In other words, annual average observed DO at a monitoring station is to be compared to the annual average of all  $DOL_i$  determinations for that year.