

The dynamics of dissolved oxygen and metabolic rates in a shallow subtropical urban lake, Louisiana, USA

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Abstract Ecosystem metabolism is an important indicator of biological activities in the context of enhanced nutrient fluxes to freshwater. In this study, we assessed both the gross and net primary production, and respiration of a shallow subtropical lake that is influenced by a highly developed urban environment. A real-time water quality monitoring platform with multi-parameter probes was deployed in the centre of the lake to record changes in dissolved oxygen (DO) concentration and other water quality parameters at 15-minute intervals from July 2008 to July 2009. The measurements were used to quantify lake productivity with a single station diel oxygen change method. The data suggested a mean annual gross primary productivity of $4.41 \text{ g O}_2 \text{ m}^{-2} \text{ d}^{-1}$, a mean annual net primary production of $2.13 \text{ g O}_2 \text{ m}^{-2} \text{ d}^{-1}$, and a mean annual respiration of $5.90 \text{ g O}_2 \text{ m}^{-2} \text{ d}^{-1}$. Annually, a total of $1610 \text{ g O}_2 \text{ m}^{-2}$ were produced compared with a respiratory consumption of $2150 \text{ g O}_2 \text{ m}^{-2}$. Monthly respiration rates were equal to, or greater than, monthly productivity rates during the monitored year, suggesting that this shallow subtropical urban lake was heterotrophic in net terms throughout most of the year.

Keywords lake eutrophication; dissolved oxygen; metabolic rates; net productivity; community respiration; subtropical urban lake