Sediment Nutrient Flux and Oxygen Demand Study for Canyon Lake with Nutrient Monitoring and Assessment of In-Lake Alternatives: January – March, 2007

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Introduction

This report summarizes the results from water column and sediment sampling conducted during the winter quarter 2007 to assess water quality and evaluate potential in-lake treatments to improve water quality in Canyon Lake.

Approach

Nutrient Monitoring

Water column sampling during this reporting period was conducted monthly. As previously reported, field measurements included Hydrolab casts and water column sampling for a large number of constituents at 5 sites (M1, M2, M3, E1, and E2) on Canyon Lake (Fig. 1).

Fig. 1. Canyon Lake sampling sites.

Sediment Nutrient Flux and In-Lake Treatment Evaluation

Separate studies were also conducted to quantify the forms of phosphorus in the sediments, as well as the rate of internal recycling of nutrients. Sediments from the five

sites were extracted following Lewandowski et al. (2003) to quantify the concentrations of phosphorus in labile-, iron-, calcium-, aluminum- and organic-bound forms. The labile+Fe-P forms are generally considered potentially available for release, and are thus used to guide alum dose requirements. Sediment cores were also collected at the very end of the quarter to quantify winter nutrient flux rates as well as assess effects of aeration and oxygenation on rates of nutrient release. The nutrient analyses associated with these measurements were not available at the time of this report, and so will be discussed in the draft final report for this phase of the project to be completed later this month.

Results

Temperature and Dissolved Oxygen

The water column properties of the main body of Canyon Lake reversed the trends found in the previous reporting period. Cool, isothermal conditions continued into January, with water temperatures dropping to about 9 °C during an unusually cold interval in mid-January (Fig. 2a). The water column warmed in February with stratification present on the March 22nd sampling date following a period of very warm weather (Fig. 2a).

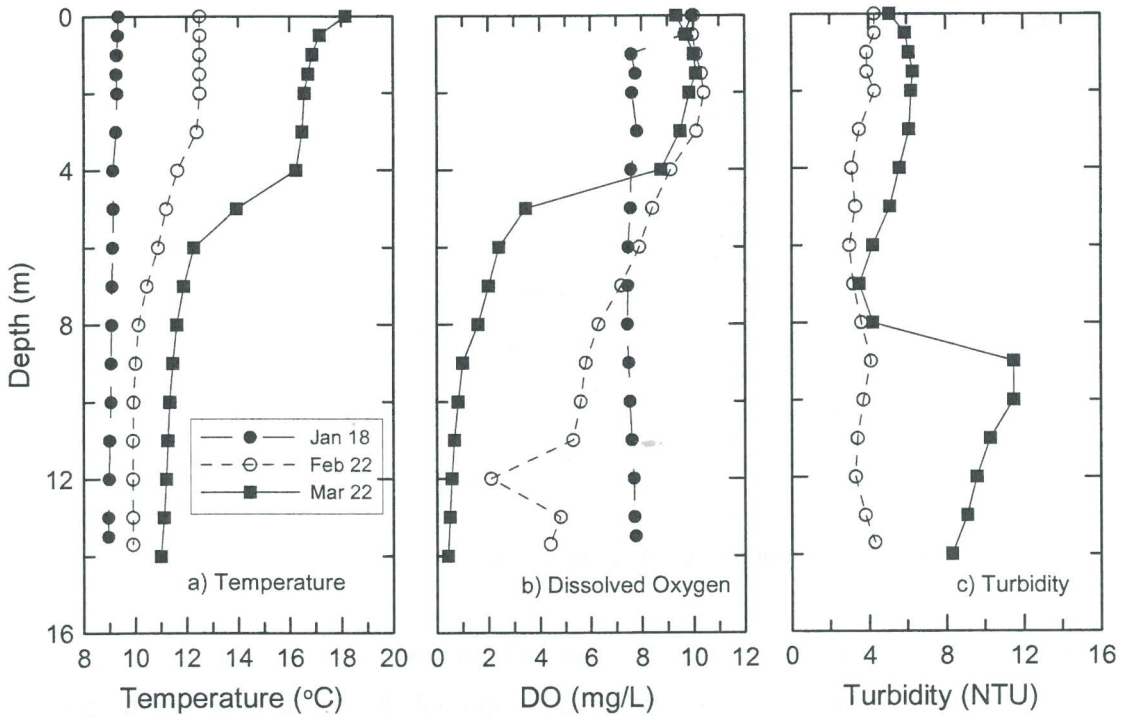

Fig. 2. Selected profiles from site M1: a) temperature, b) DO and c) turbidity.

The water column was well-mixed with respect to DO concentration on January 18th, with uniform concentrations of about 8 mg/L at all depths except the very surface where slightly higher concentrations were found (Fig. 2b). As the lake warmed however, (Fig. 2a), DO concentrations increased near the surface and declined lower in the water column, with anoxic conditions (DO <1.0 mg/L) already in place on the March 22nd sampling (Fig. 2b). The turbidity sensor on the Hydrolab was no functioning properly in the field on the January sampling date, so no data is available for that date. Turbidity averaged about 4 NTU throughout the water column in February, although turbidity levels increased from 4 NTU to 11 NTU below 8 m on the March 22nd sampling (Fig. 2c).

Conditions in East Bay mirrored those in the uppermost 3-4 m of the water column in the main body of the lake. Temperature, DO and turbidity were fairly uniform with depth (Fig. 3), with temperatures increasing from 9 °C to 18°C during this period. Dissolved oxygen concentrations varied from about 6-12 mg/L (Fig. 3b), reflecting higher daytime photosynthetic O_2 production later in the quarter. Turbidity levels increased from about 8 NTU found on February 22nd to about 15 NTU in March (Fig. 3c).

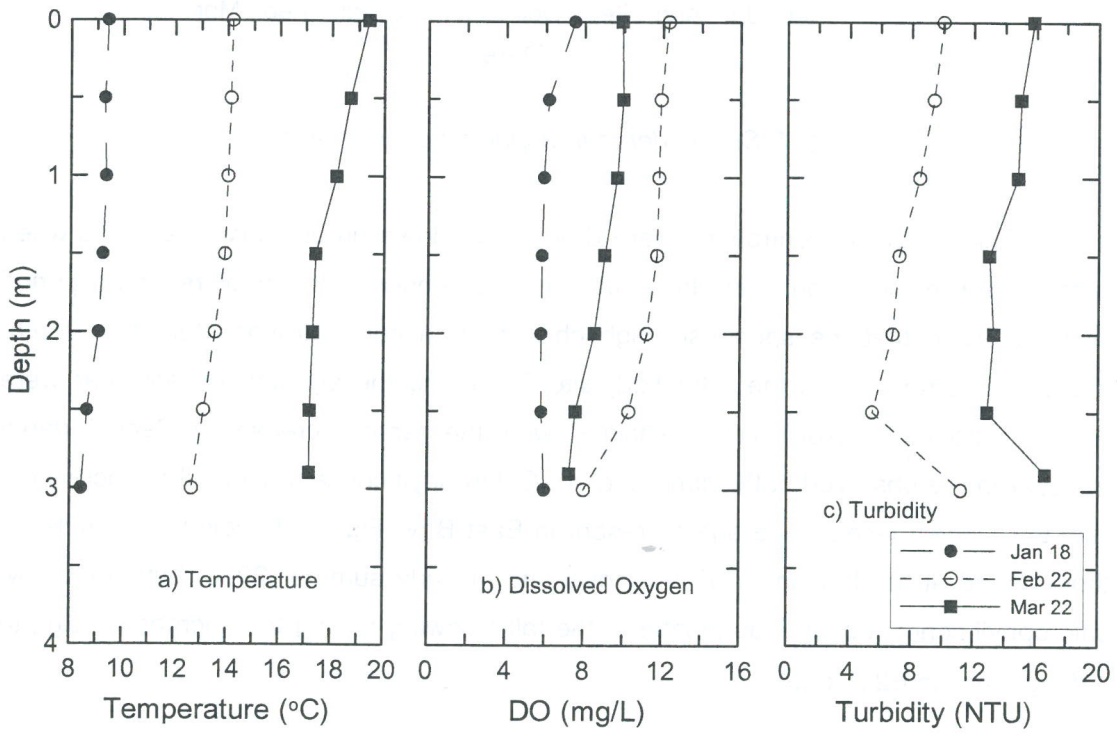

Fig. 3. Selected profiles from site E2: a) temperature, b) DO and c) turbidity.