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THERMAL STRATIFICATION AND DISSOLVED OXYGEN IN
DALE HOLLOW RESERVOIR, TENNESSEE AND KENTUCKY

ERNEST L. RAGDORAL AND FRANK J. BULLO

Tennessee Technological University
 Cookeville, Tennessee 38501

ABSTRACT

This paper describes the seasonal cycle of tempera-

ture and dissolved oxygen in Dale Hollow Reservoir.
The 30,000 acre "two story" impoundment was studied
stratification first appeared in March and persisted
through November. The seasonal distribution of tem-

terature was indicative of a monomictic lake. The

appearance of hypolimnetic water was accompanied by
uniformly high values suggestive of oligotrophic
conditions.

INTRODUCTION

During the summer months, the deeper waters of Dale Hollow Reservoir stratify into a warm upper layer and a cold lower layer. The cold layer retains high concentrations of dissolved oxygen and the reser-

voir supports year-round populations of cold-water fish
such as rainbows and brown trout. However, the shallower

depths can support a good population of warm-water fish.

There was no significant lake-wide distribution of dissolved oxygen in either layer, but the lower layer often contained levels in excess of 10-15 mg/l. A similar pattern was also observed in the upper layer, but the levels were generally lower. The dissolved oxygen concentrations were highest in the upper layer during the summer months and lowest in the lower layer during the winter months. This pattern was consistent in both years of the study, and was also observed in other lakes in the region.

The purpose of this study was to determine the effects of thermal stratification on the distribution of dissolved oxygen in Dale Hollow Reservoir. The study was conducted from February, 1971 through January, 1972, and included 36 transects in the reservoir. These transects were distributed throughout the reservoir, and were selected to cover the entire depth range of the reservoir. The transects were also designed to include areas of different water depths and directions.

The dissolved oxygen concentrations were measured using a Winkler titration method. This method involves the addition of a standard solution of potassium permanganate to a sample of water, followed by the addition of a standard solution of sodium thiosulfate. The difference between the two titrations is used to calculate the dissolved oxygen concentration.

The results of this study indicate that thermal stratification has a significant impact on the distribution of dissolved oxygen in Dale Hollow Reservoir. The higher concentrations of dissolved oxygen in the upper layer during the summer months are due to the stratification of the reservoir. This stratification prevents mixing of the two layers, allowing the upper layer to maintain higher oxygen levels. In contrast, the lower layer remainsoxic throughout the year, due to the lack of mixing.

These results have important implications for the management of Dale Hollow Reservoir. The stratification of the reservoir can lead to hypoxic conditions in the lower layer, which can be harmful to fish populations. Additionally, the stratification can also lead to reduced productivity in the upper layer, which can have negative impacts on the ecosystem.

These results highlight the importance of understanding the effects of thermal stratification on dissolved oxygen concentrations in reservoirs. Further research is needed to fully understand the mechanisms underlying these effects, as well as to develop effective management strategies to mitigate their impacts.
FIG. 2: Dissolved Oxygen and Temperature Recorded at Transect 3; Heavy Line at Left Corresponds to Dissolved Oxygen Concentrations within 2 ppm of 100% Saturation.

FIG. 3: Dissolved Oxygen and Temperature Recorded at Transect 6; Heavy Line at Left Corresponds to Dissolved Oxygen Concentrations within 2 ppm of 100% Saturation.
FIG. 4: Dissolved Oxygen and Temperature Recorded at Transect 9; Heavy Line at Left Corresponds to Dissolved Oxygen Concentrations within 2 ppm of 100% Saturation.

FIG. 5: Monthly Thermal Distribution for February, April, July, and October, Dale Hollow Reservoir. Numerals Indicate Transects and Horizontal Lines Indicate 2°C Temperature Changes.