



Temporal Patterns of Dissolved Oxygen Depletion In Reservoirs

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DISSOLVED OXYGEN

Very reactive, tends to oxidize reduced materials.
(redox, respiration, metabolism, decomposition, etc.)

Essential for aerobic organisms and therefore is one of the two most important habitat determinants (along with temperature).



DISSOLVED OXYGEN

Hutchinson's Master Variables

pH and pE

Of these, pE cannot be directly measured. Greatly affected by presence of oxygen, in aerobic environments oxygen can be used as a surrogate for pE.

Therefore, presence (or absence) of oxygen is critical for the biogeochemical state of the aquatic ecosystem.

Oxygen dynamics are therefore important for setting the limits of the environment for chemical reactions such as those involved with sulfides.



Great Lies

Mark Twain – Statistics

Championship Wrestling – is real (sorry Steve)

Dams – don't inherently add anything to streams



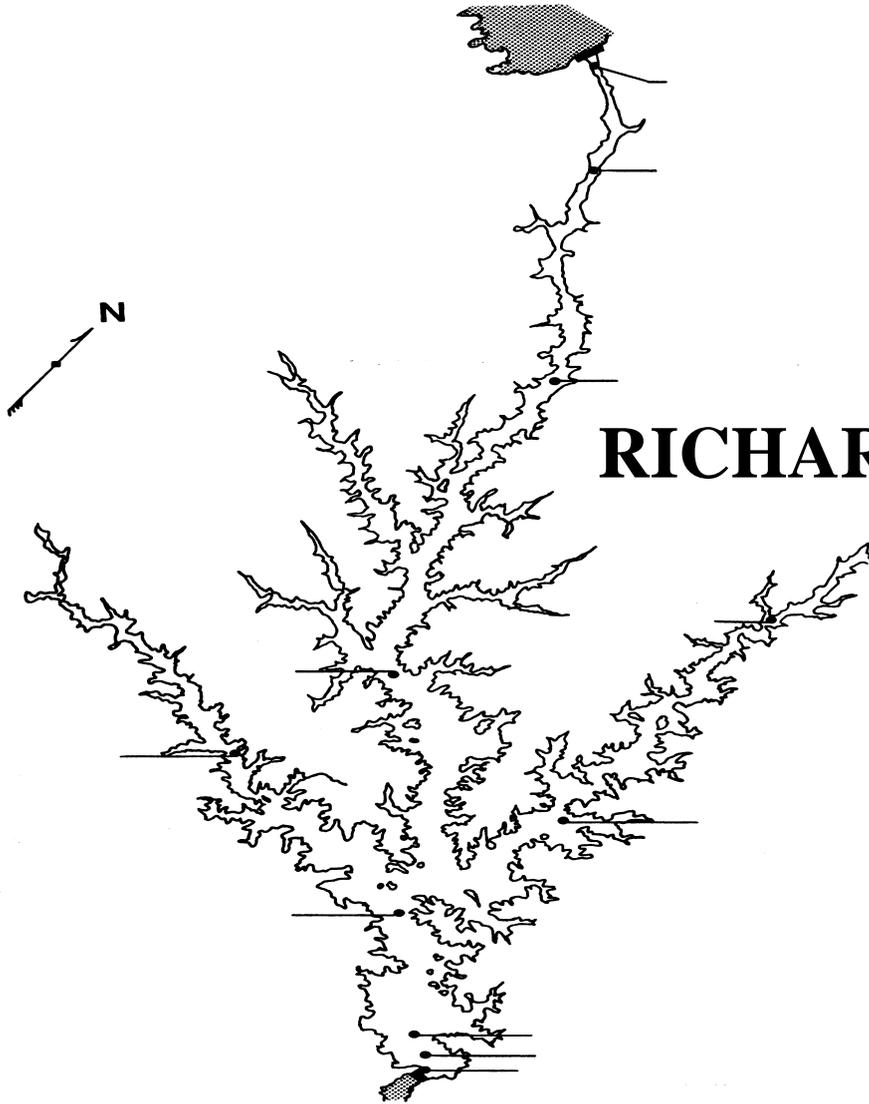
DAMS DO ADD (REMOVE) FROM THE STREAM

Or, properly, they change the energetic status of the water during the conversion of lotic to lentic systems.

Kinetic energy is altered and converted to potential energy which is sometimes converted to electricity.



In a stream, this loss of kinetic energy results in a loss of aeration during stream flow (among other effects).



RICHARD B. RUSSELL LAKE



J. STROM THURMOND LAKE
(formerly Clarks Hill Lake)

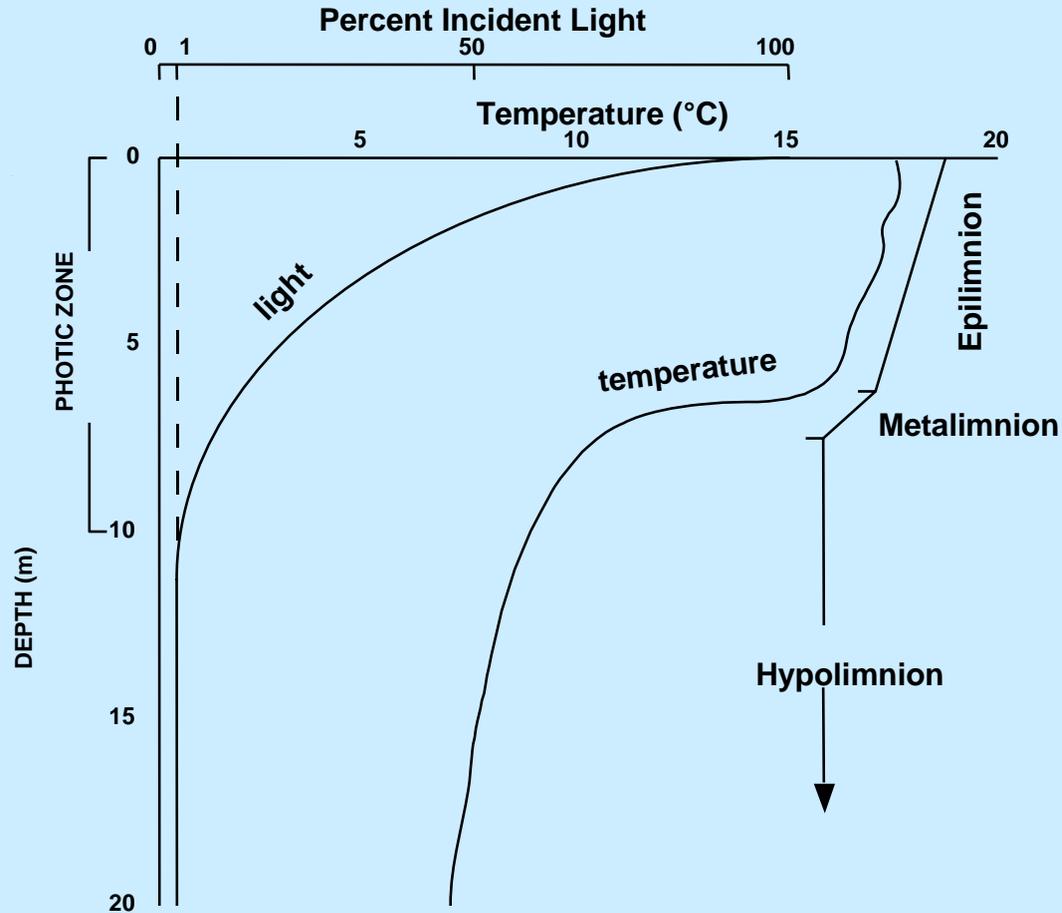


Diagram illustrating thermal patterns typical of a stratified monomictic lake.

What's a monomictic lake?



Lake Classification

Based on Mixing Processes

Monomictic = one period or season of mixing per year.

Common in south-temperate lakes. Example: Lake Lanier

Dimictic = two periods or seasons of mixing per year.

This is common in north-temperate lakes, especially those that have winter ice cover. Example: Lake Michigan

Meromictic = never mix completely, but always have an unmixed deep density layer (the monimolimnion). Example: Carter's Lake.

Other types include polymixis, atelomixis, etc.







Dissolved Oxygen Distributions in Lakes

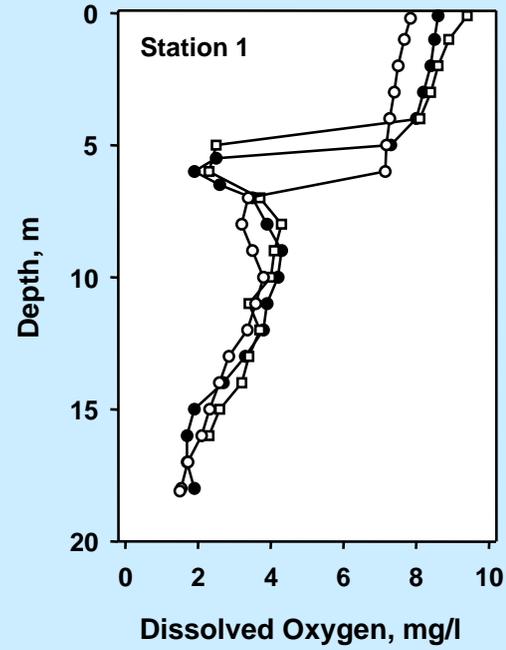
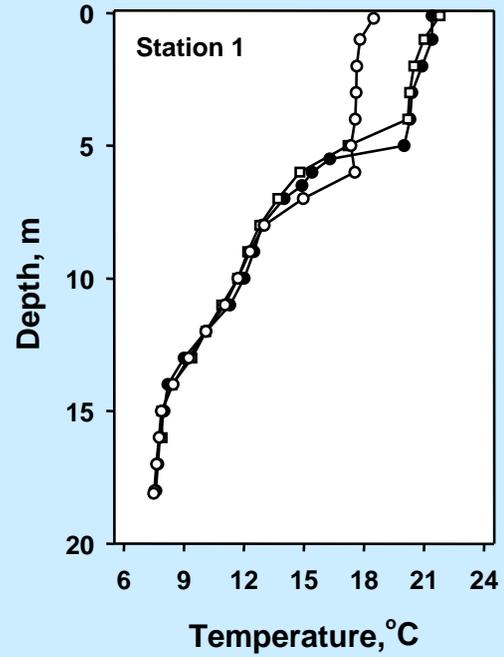
Orthograde – little, if any, gradient

Clinograde – gradient of declining concentration

Heterograde – gradient with discontinuity

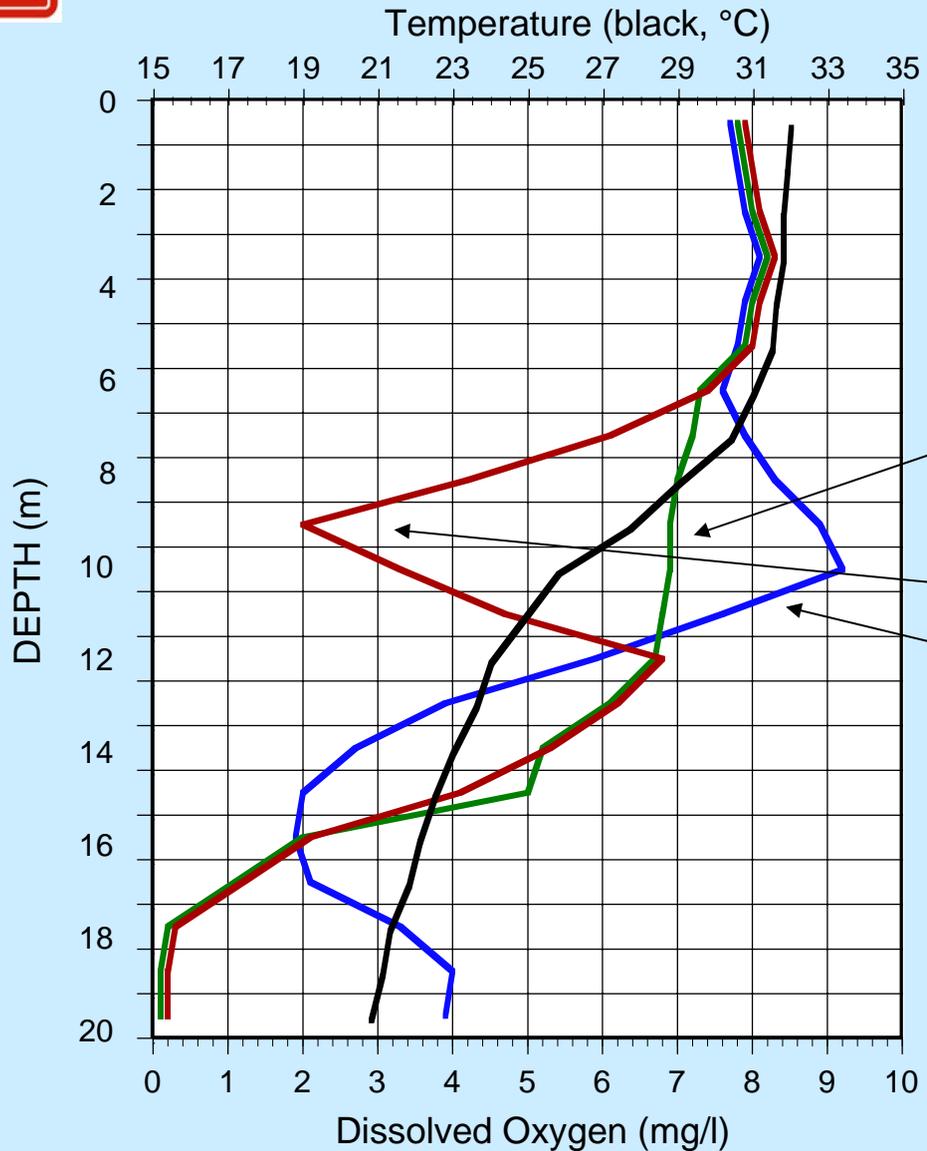
Negative – discontinuity is negative

Positive – discontinuity is positive



Symbol Legend

- 8/5/99
- 8/6/99
- 8/11/99



Dissolved Oxygen Distributions in Lakes

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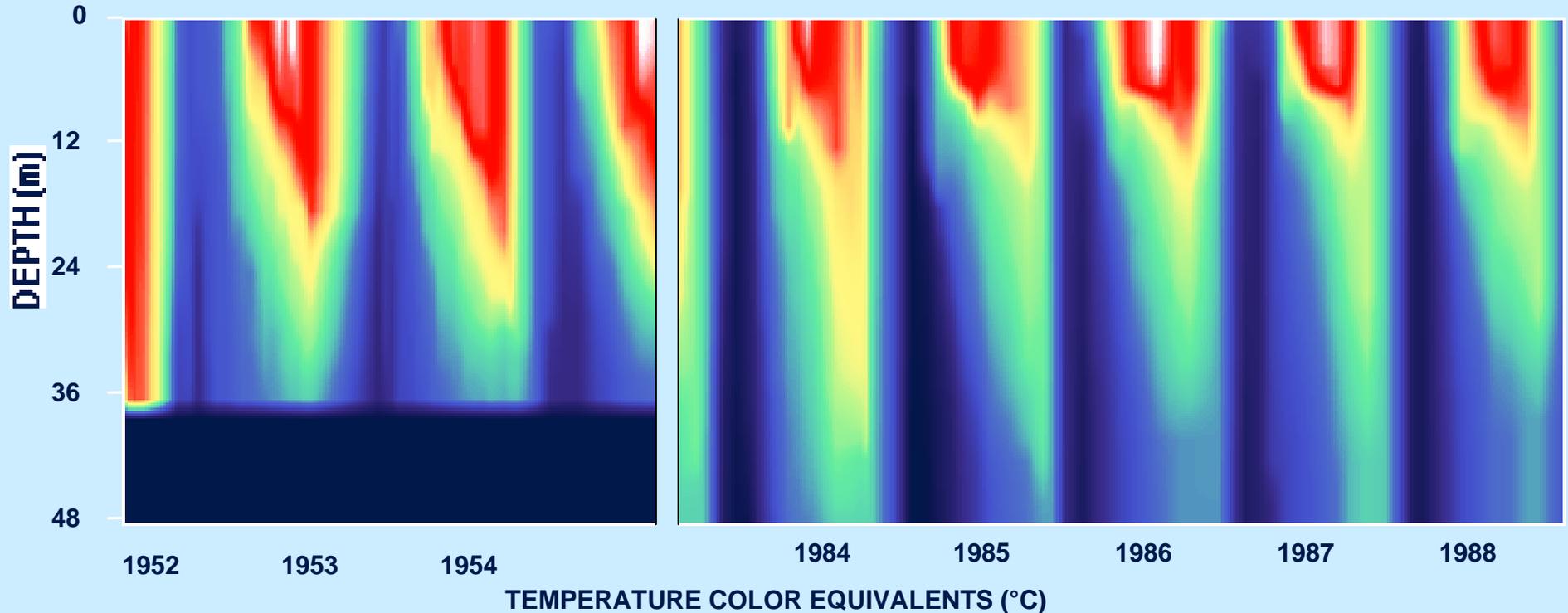
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Thermal Trends in J. Strom Thurmond Lake

Station 20 (JST Forebay) 1952-1988



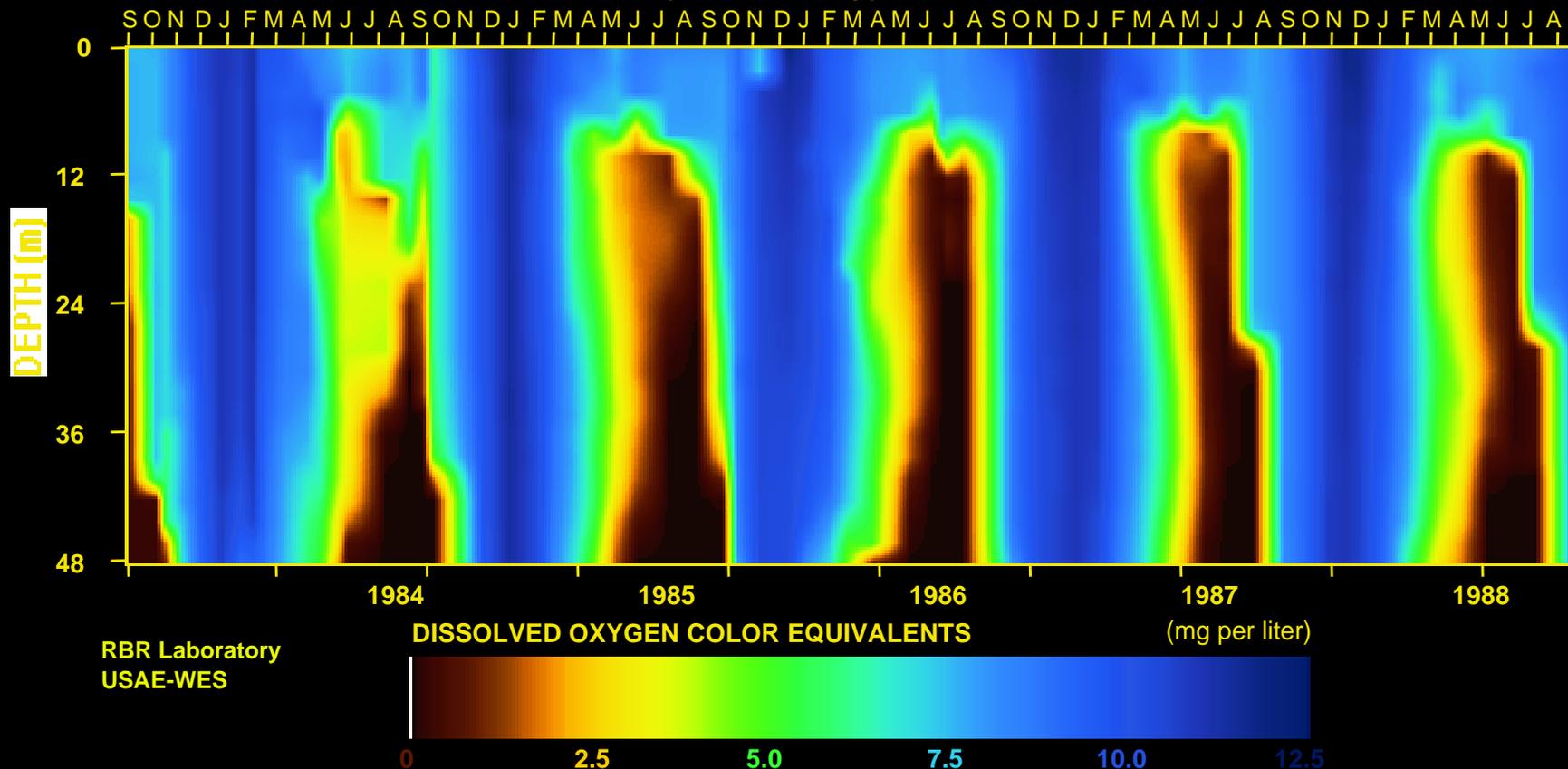
RBR Laboratory
USAE-WES





Dissolved Oxygen Trends in J. Strom Thurmond Lake

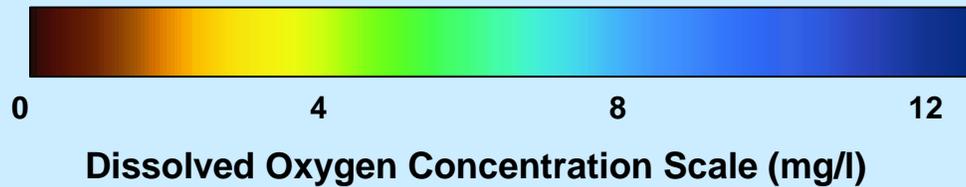
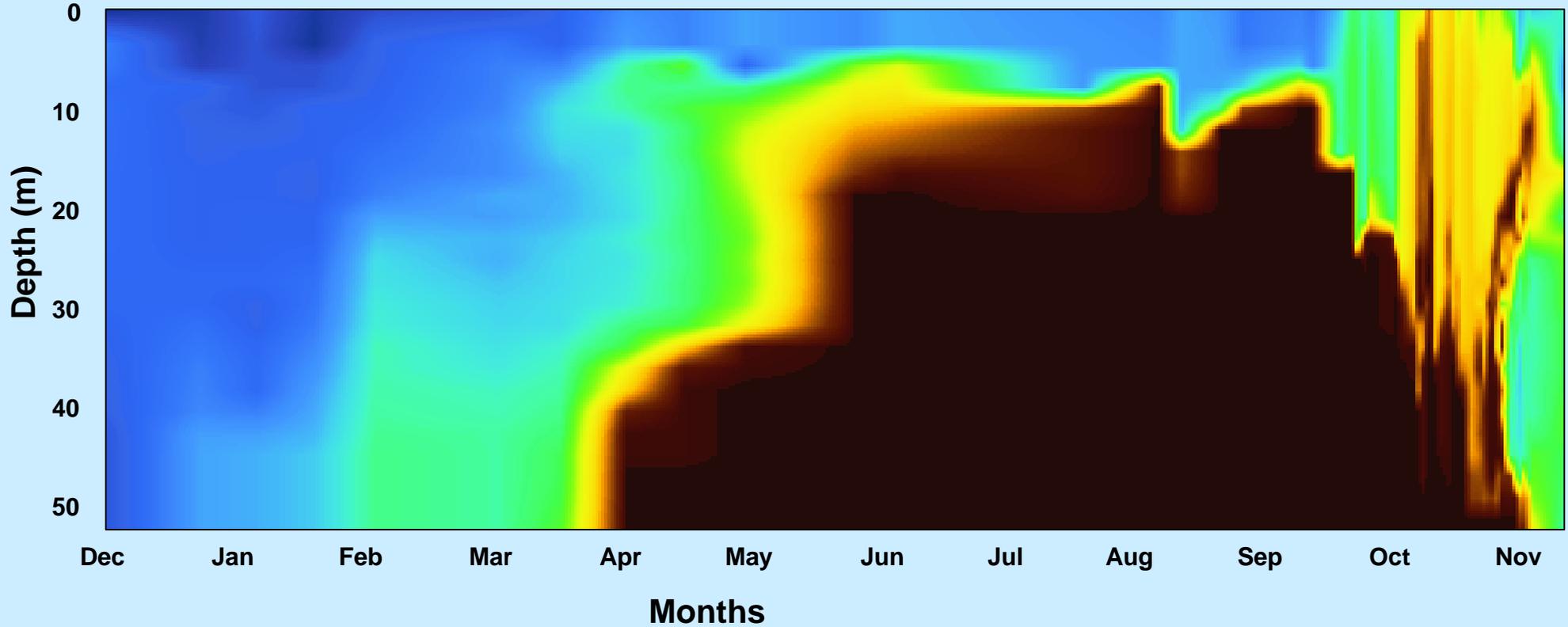
Station 20 (JST Forebay) 1983-1988





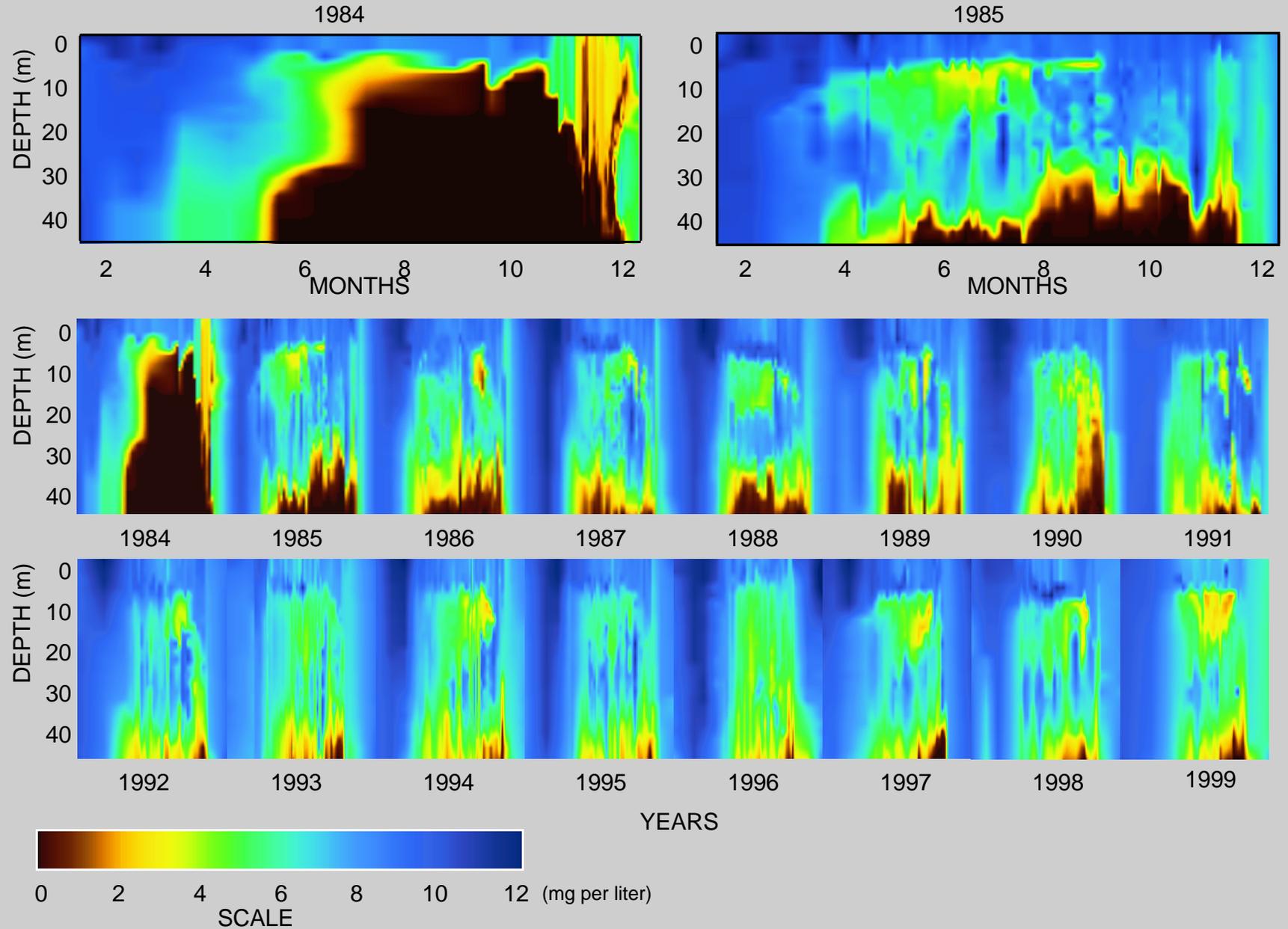
Richard B. Russell Lake, SC/GA

First Full Year, 1984



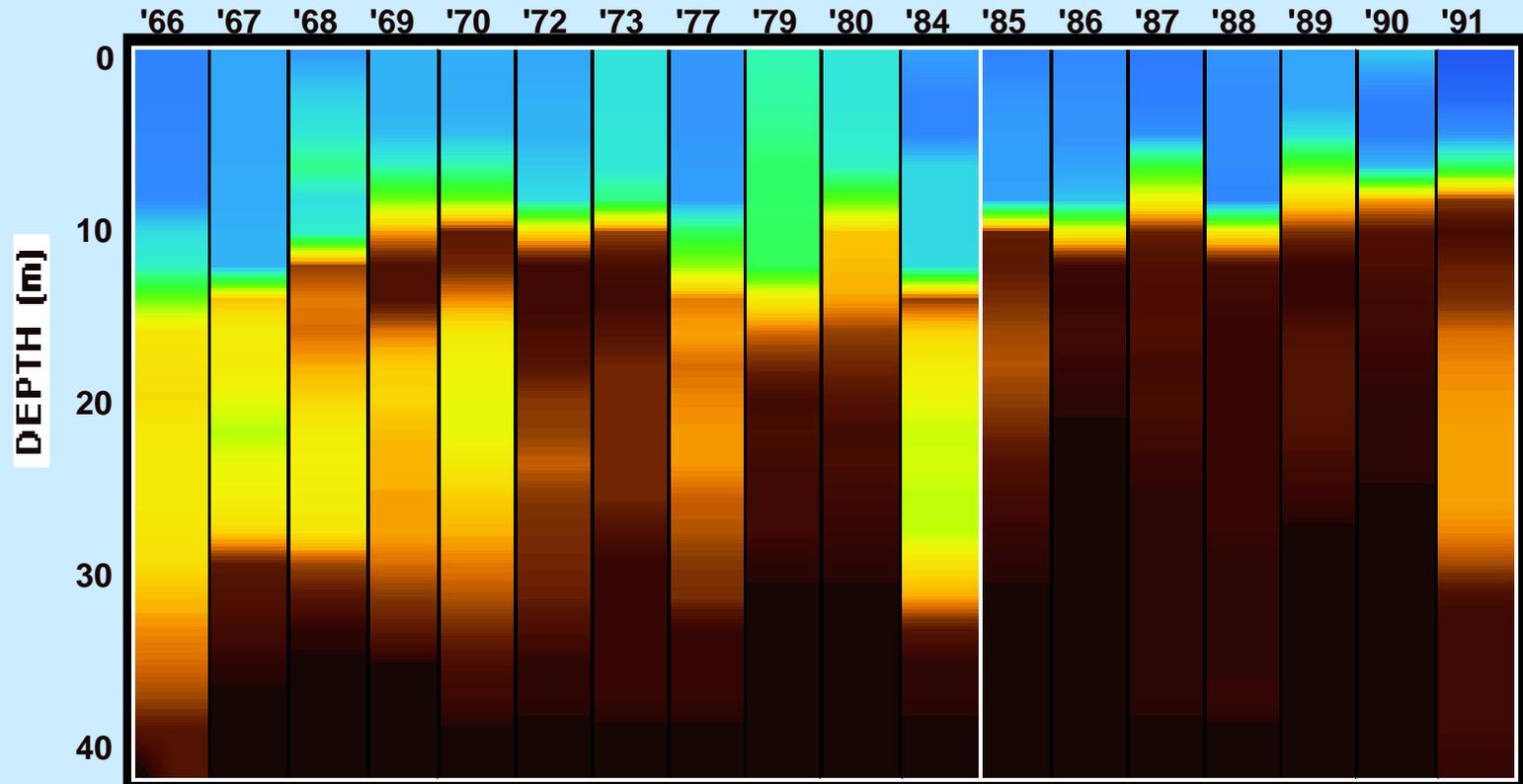


Dissolved Oxygen in the RBR Forebay, 1984-1999

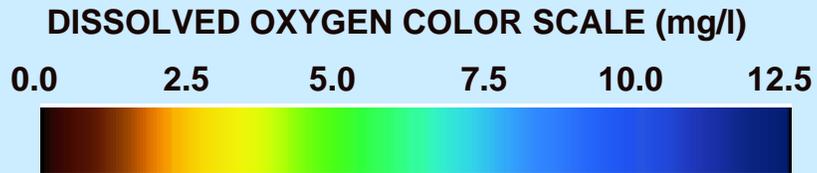




HISTORICAL SEPTEMBER DISSOLVED OXYGEN CONCENTRATIONS J.STROM THURMOND FOREBAY

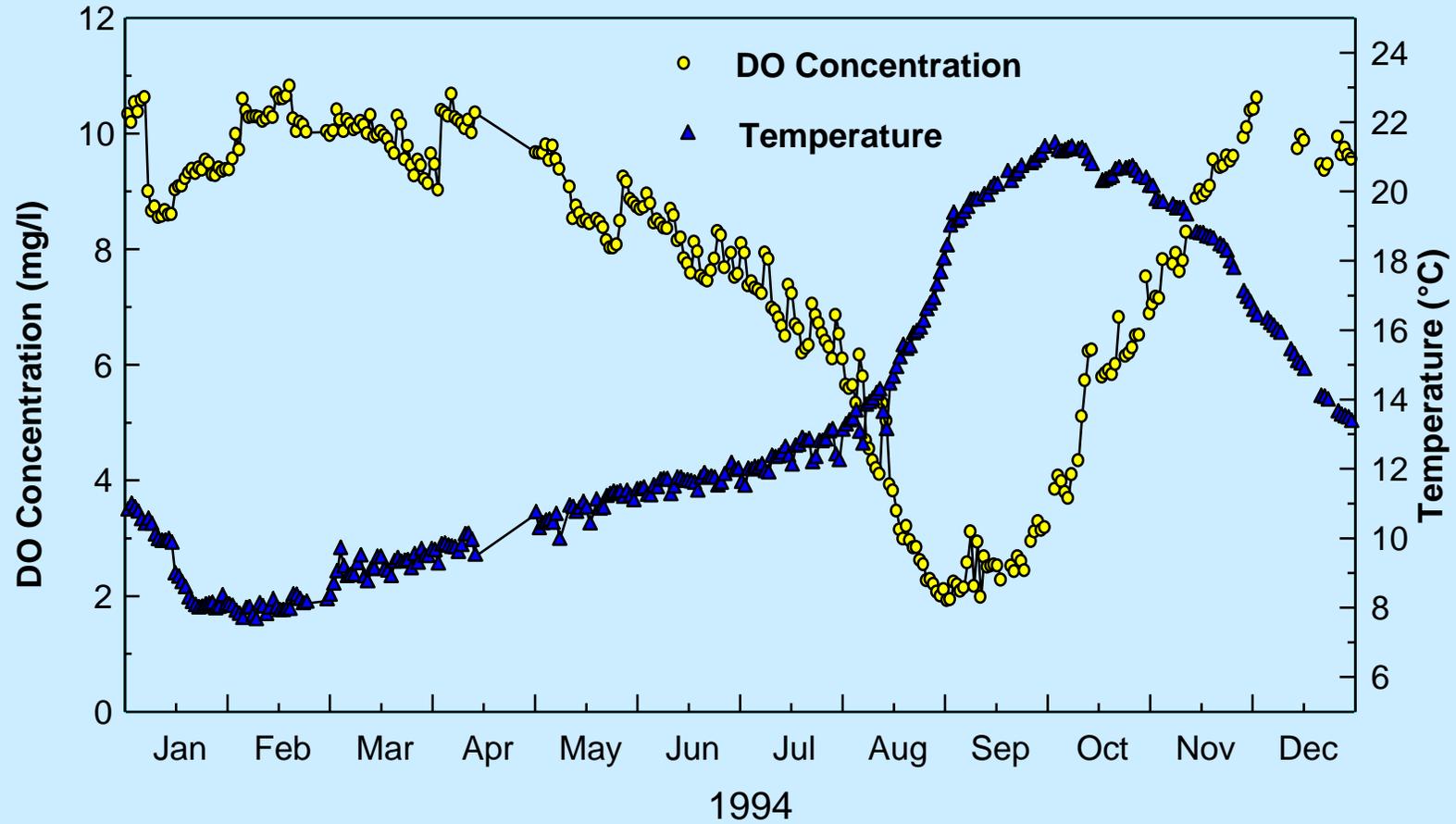


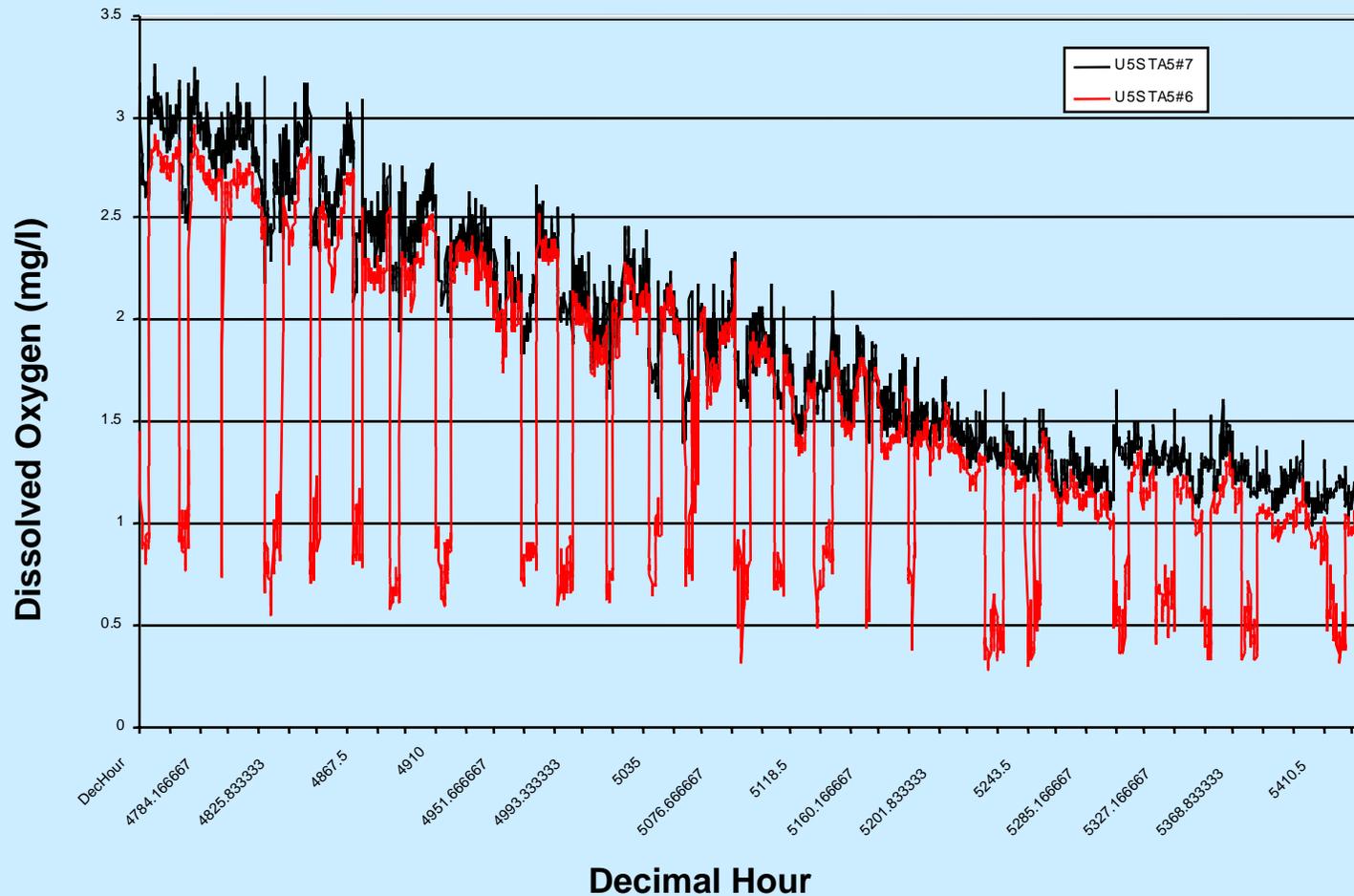
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1994 Hartwell Dam Releases





Comparison of water quality from taps 6 and 7, penstock piezometer taps. Data collected during declining water quality conditions. Note periodic departures of tap #7 from #6 due to generation cycles.



Summary and Questions