

A LAKE ON THE EDGE

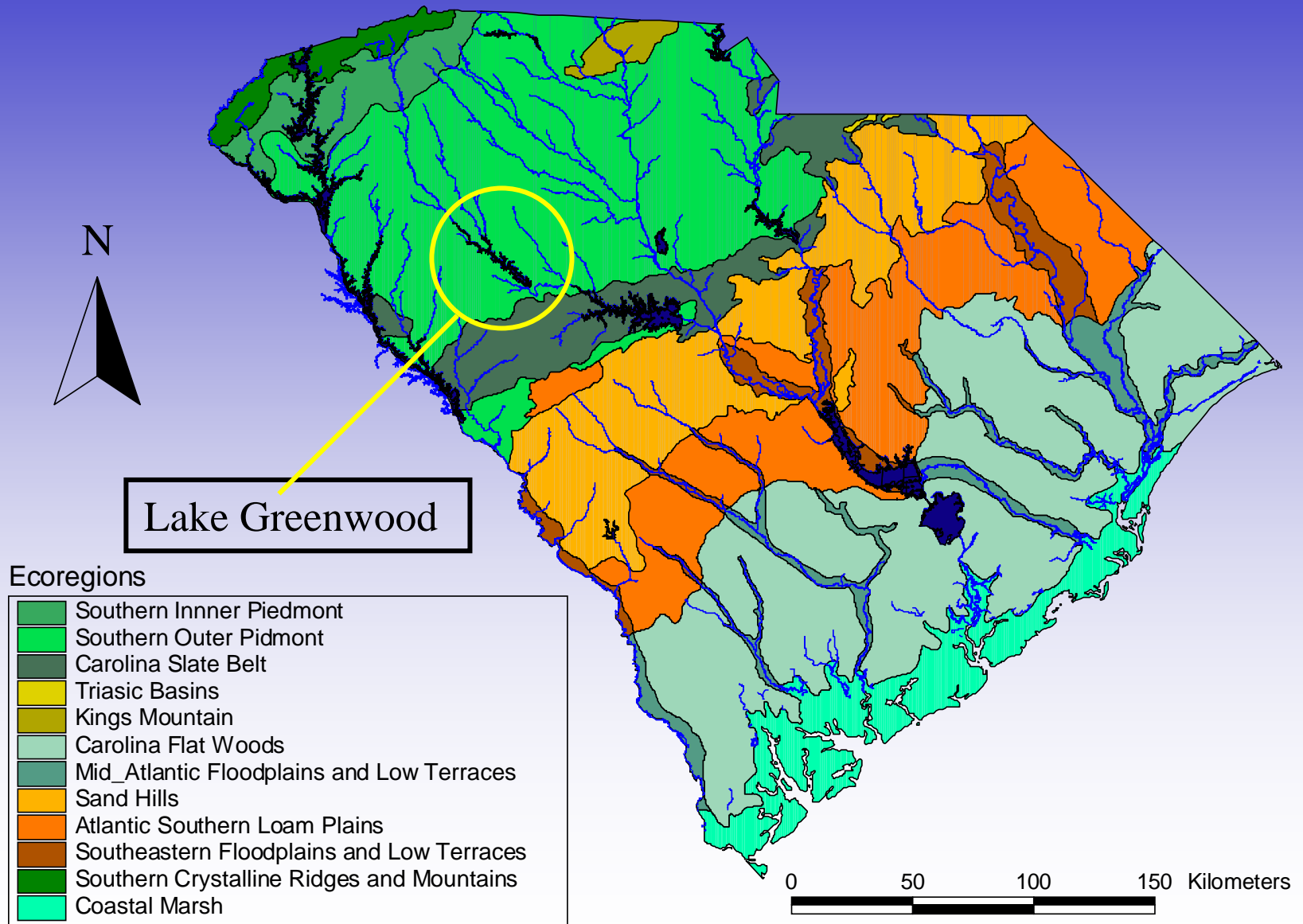
Modeling Water Quality Change in Lake Greenwood

PHOSPHORUS DISTRIBUTIONS, ALGAL PRODUCTION, AND OXYGEN DEPLETION IN LAKE GREENWOOD, SC

Hank McKellar and Jim Bulak
Freshwater Fisheries Research
SC Department of Natural Resources



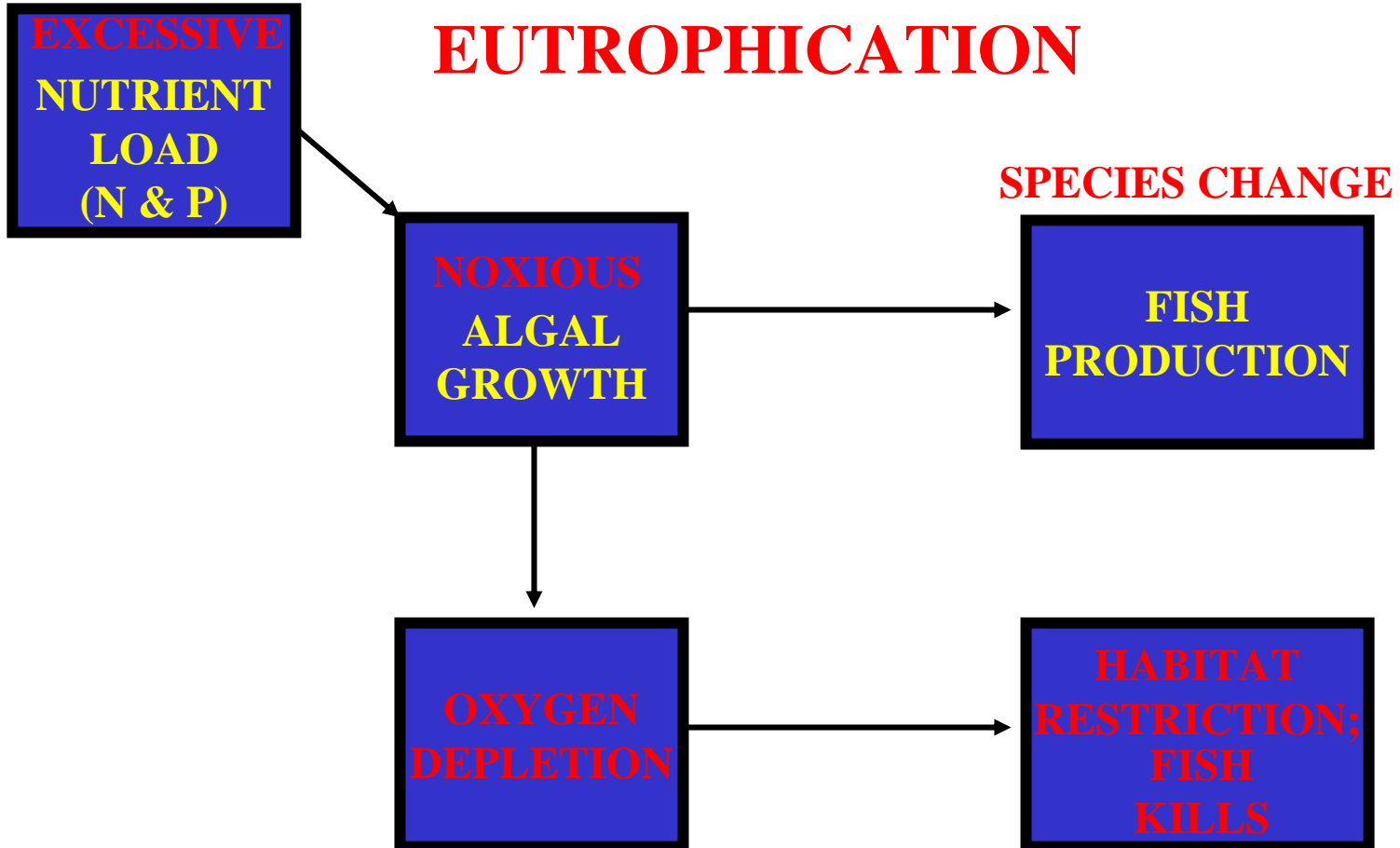
ECOREGIONS OF SOUTH CAROLINA



Prepared by Jason Bettinger, SCDNR

NUTRIENT LOADS AND LAKE ECOLOGY

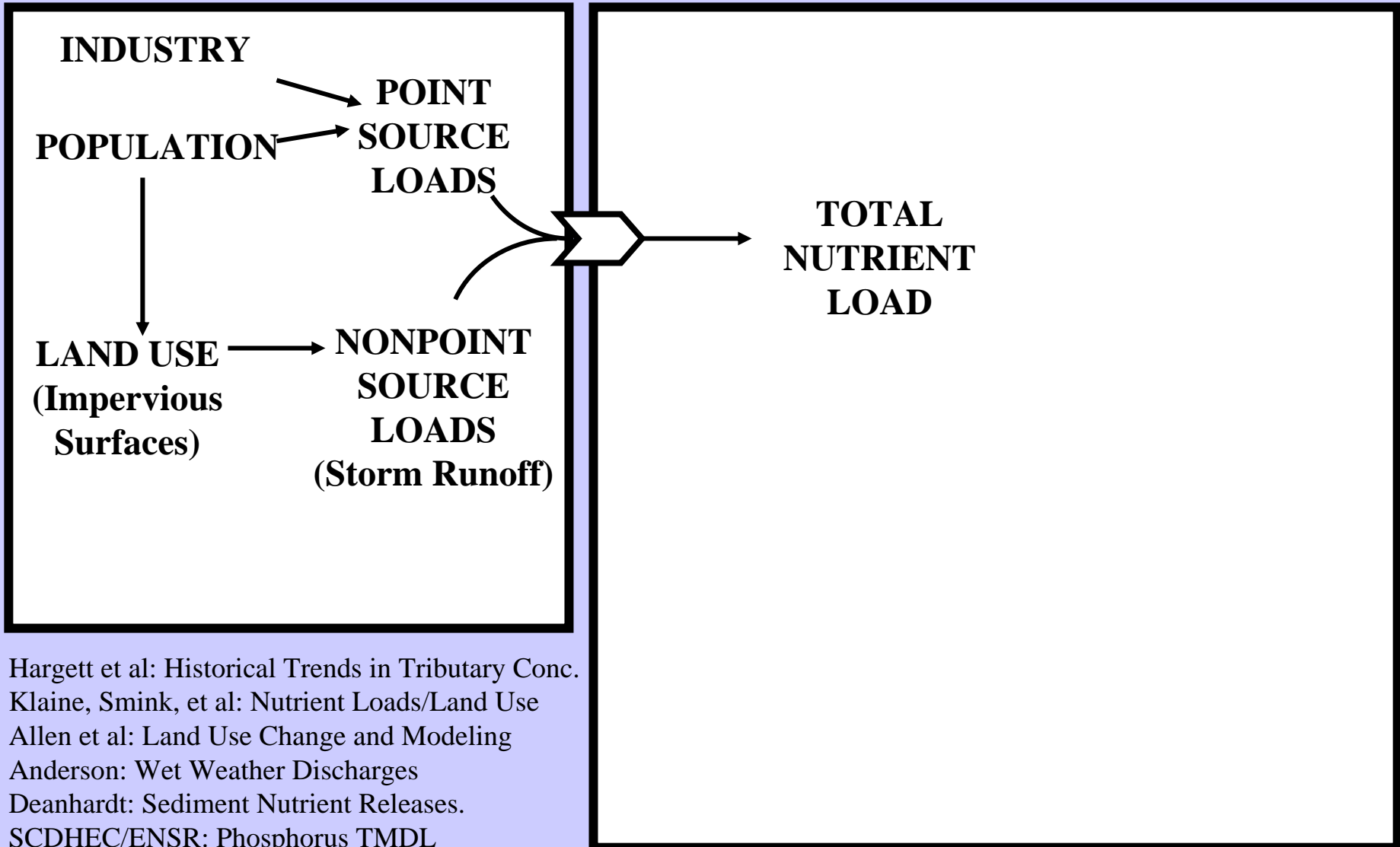
EUTROPHICATION



MODELING NUTRIENT LOADS AND LAKE EUTROPHICATION

WATERSHED

LAKE

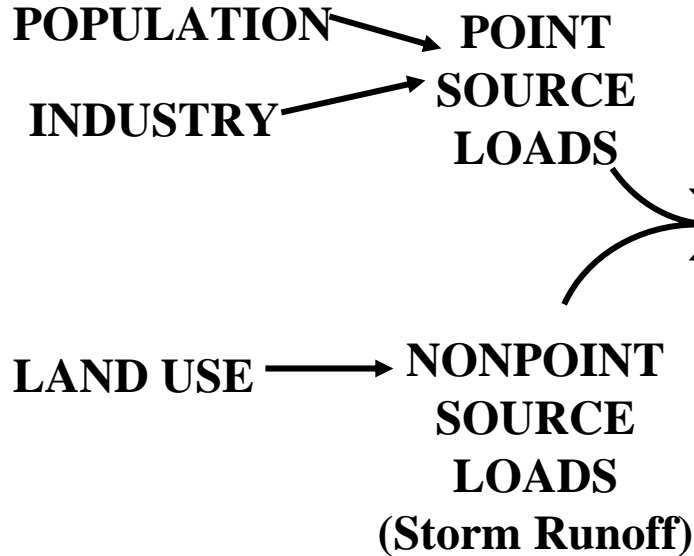


Hargett et al: Historical Trends in Tributary Conc.
Klaine, Smink, et al: Nutrient Loads/Land Use
Allen et al: Land Use Change and Modeling
Anderson: Wet Weather Discharges
Deanhardt: Sediment Nutrient Releases.
SCDHEC/ENSR: Phosphorus TMDL

MODELING NUTRIENT LOADS AND LAKE EUTROPHICATION

WATERSHED

LAKE



Lake Hydrology Residence Time

NUTRIENT CONC.

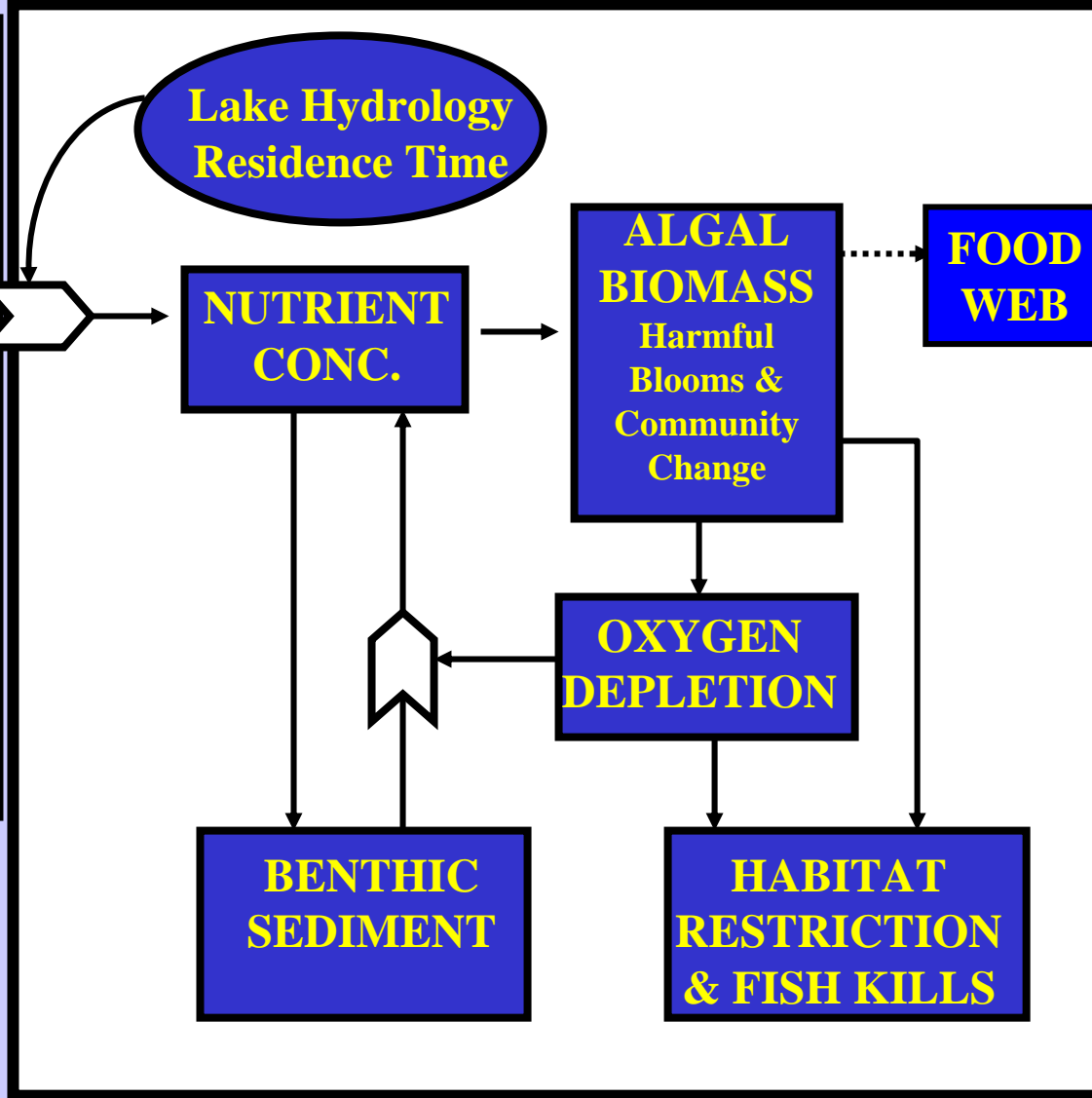
ALGAL BIOMASS
Harmful Blooms & Community Change

FOOD WEB

OXYGEN DEPLETION

BENTHIC SEDIMENT

HABITAT RESTRICTION & FISH KILLS



**SALUDA
RIVER**

**REEDY
RIVER**

**RABON
CREEK**

LAKE GREENWOOD

Drainage Area : 1,170 mi²

Surface Area : 11,394 Acres

Mean Depth : 7.0 m

Volume : 320.7 x 10⁶ m³

Avg. Res. Time: 3.45 Months

**Sampling Stations
(2004-05)
SCDNR/SCDHEC**

Upper
Saluda
Arm

Upper
Reedy Arm
S-308

Middle
Reedy

Lower
Reedy

Cothran's
Bridge (HW72/221)

S-024
Saluda
Bridge

Mid Cane Creek
Embayment

Irwin Point

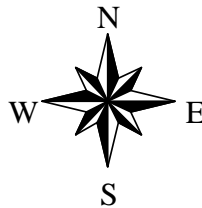
Grand Harbor

Random Lake
Site (RL-04387)

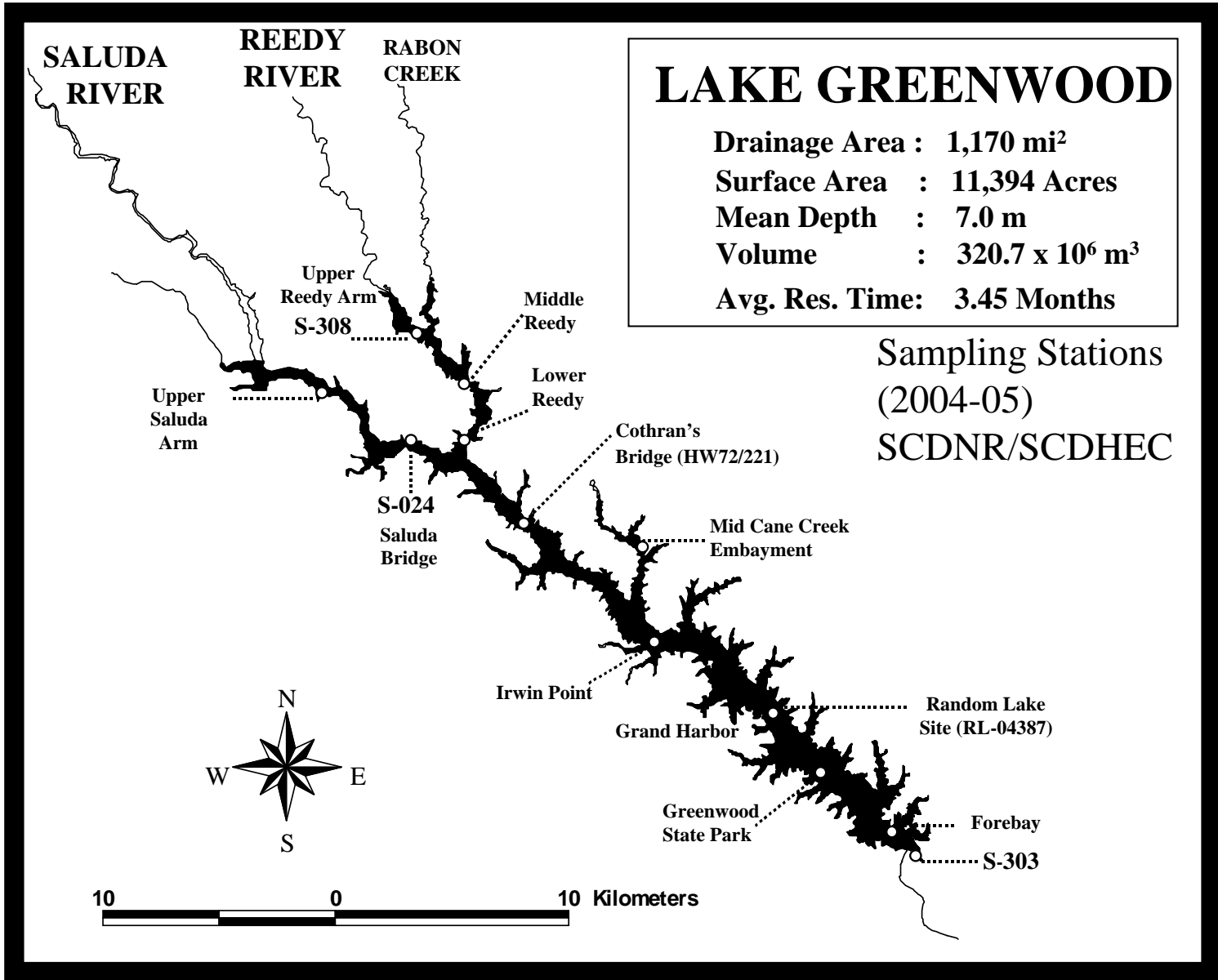
Greenwood
State Park

Forebay

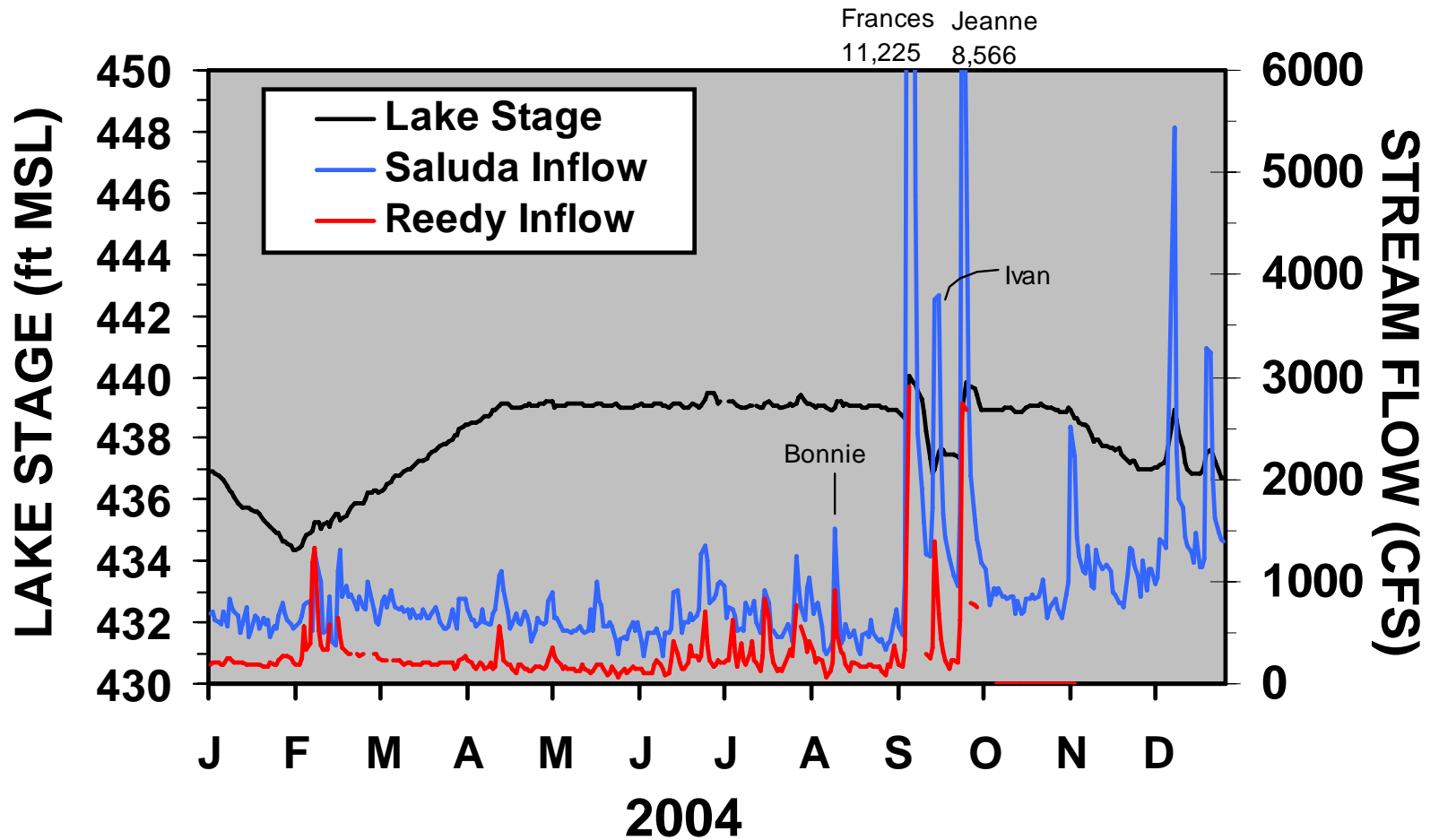
S-303



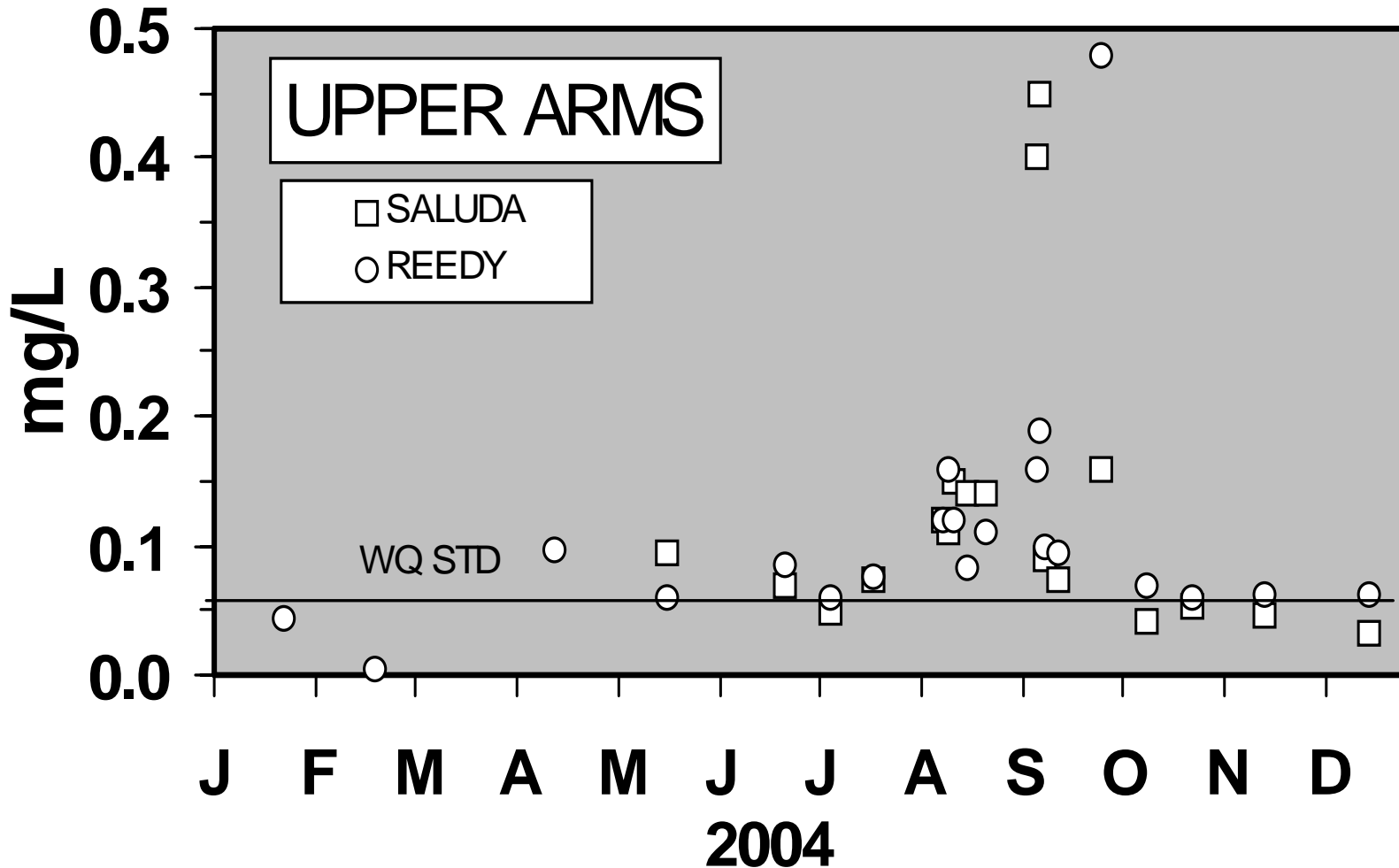
10 0 10 Kilometers



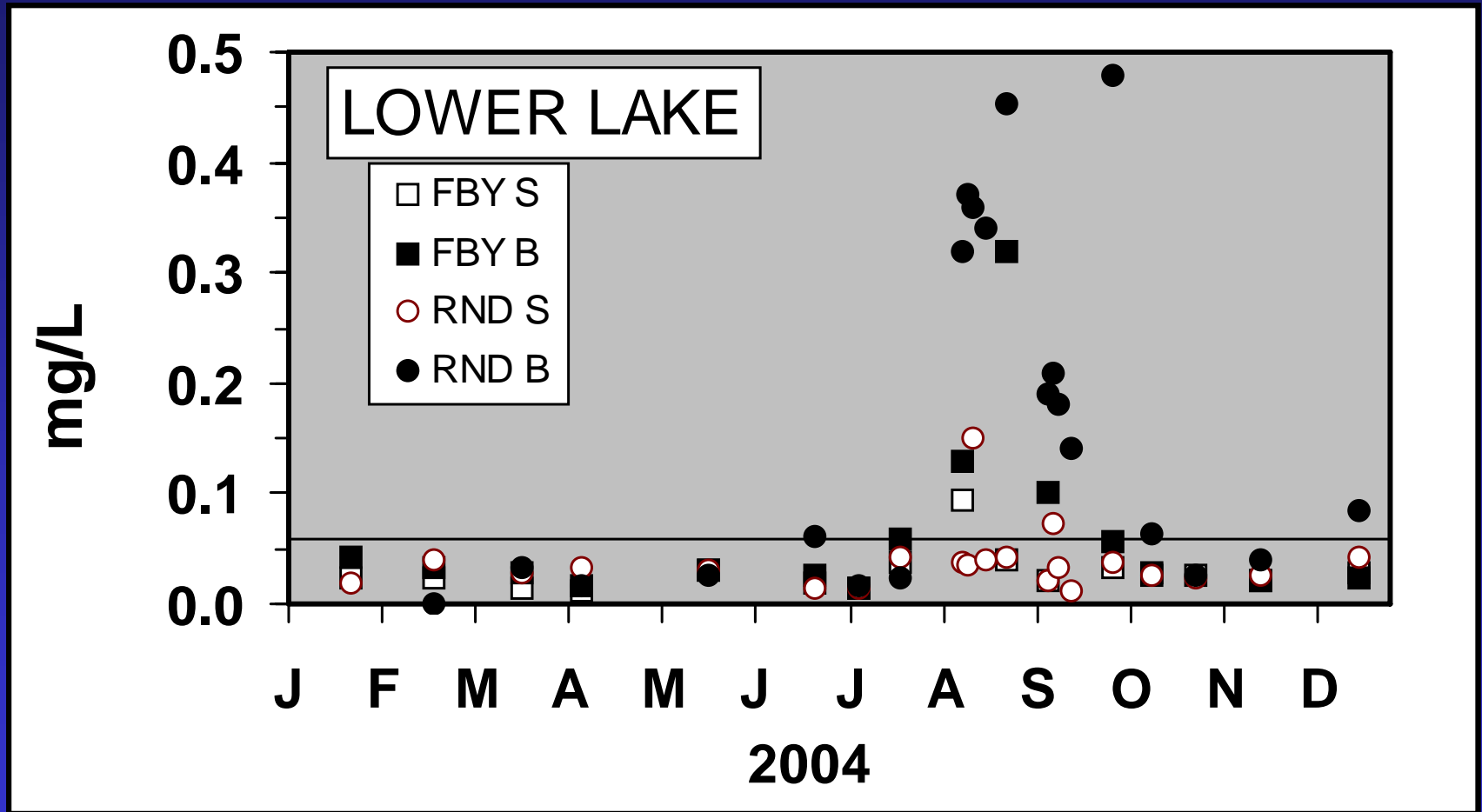
BASIC HYDROLOGY



TOTAL PHOSPHORUS



TOTAL PHOSPHORUS

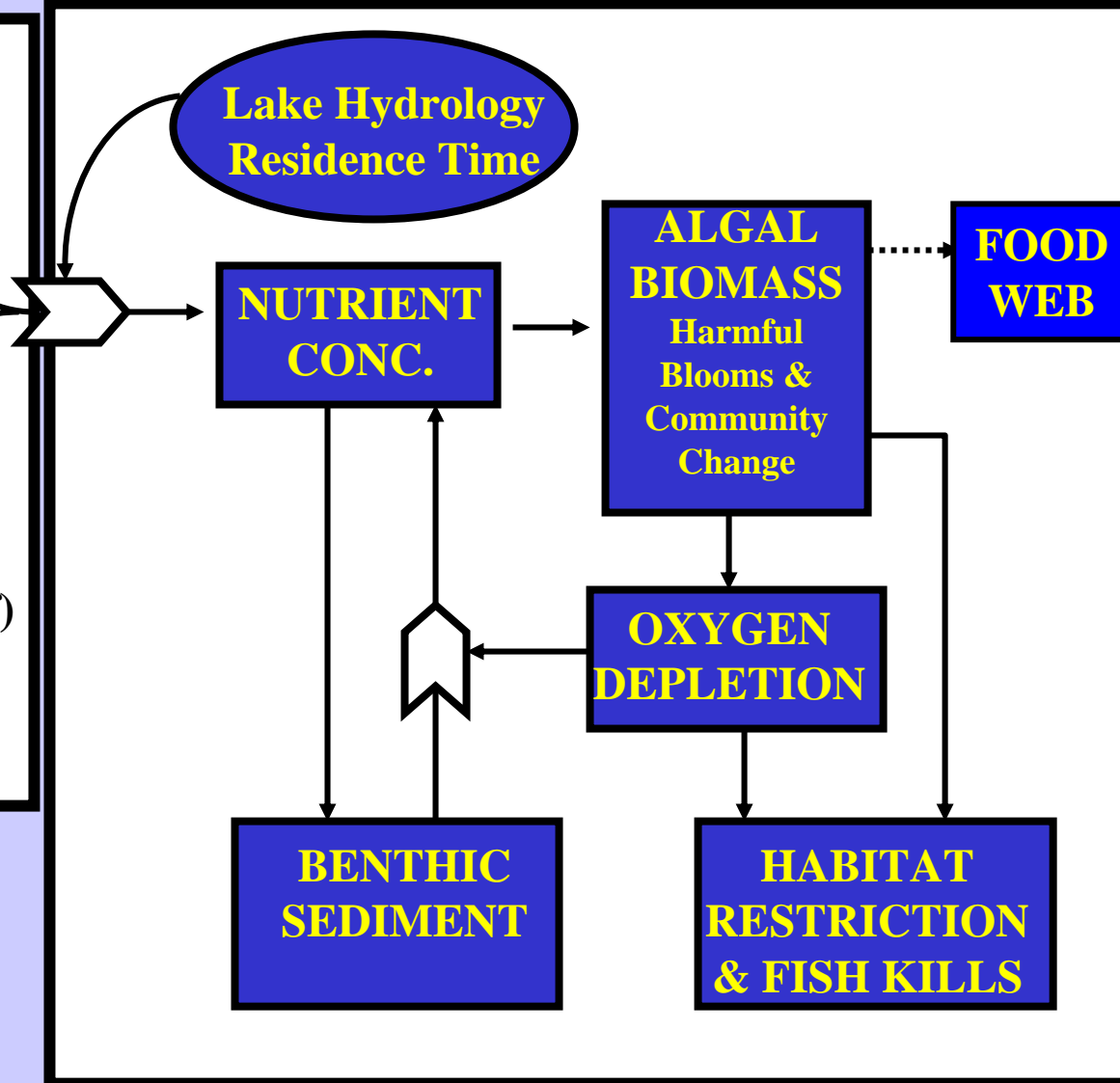


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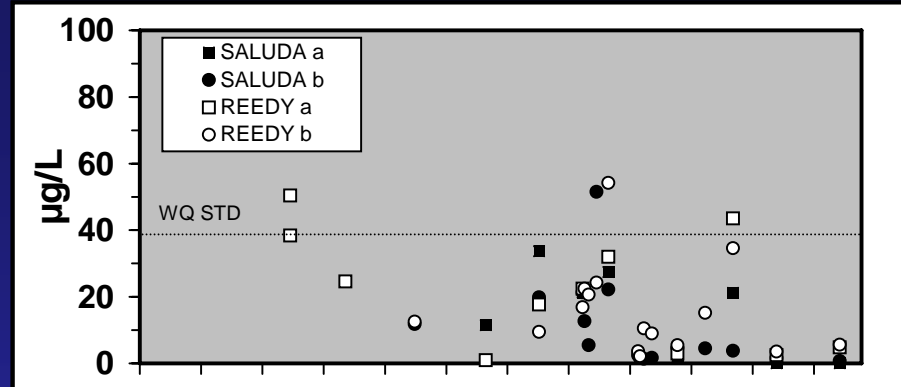
LAKE

POPULATION → POINT SOURCE LOADS
INDUSTRY → POINT SOURCE LOADS
LAND USE → NONPOINT SOURCE LOADS (Storm Runoff)

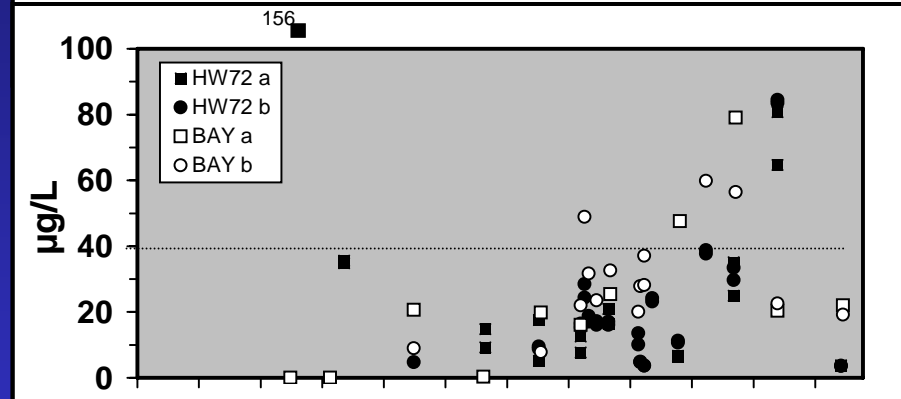


CHLOROPHYLL a

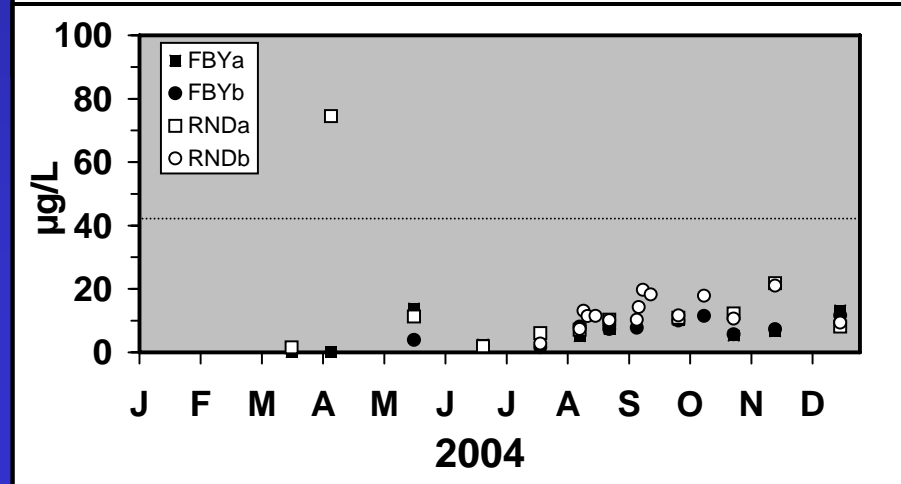
UPPER ARMS



MID LAKE



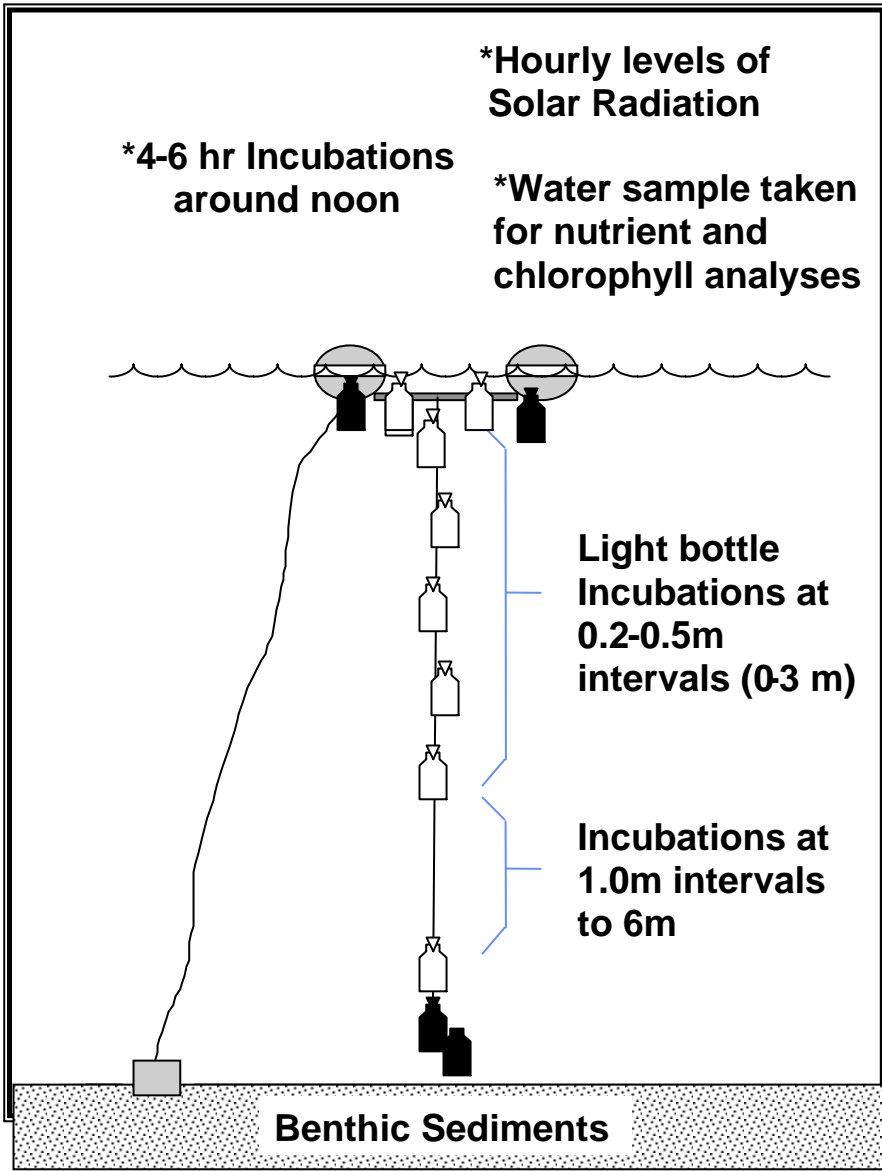
LOWER LAKE



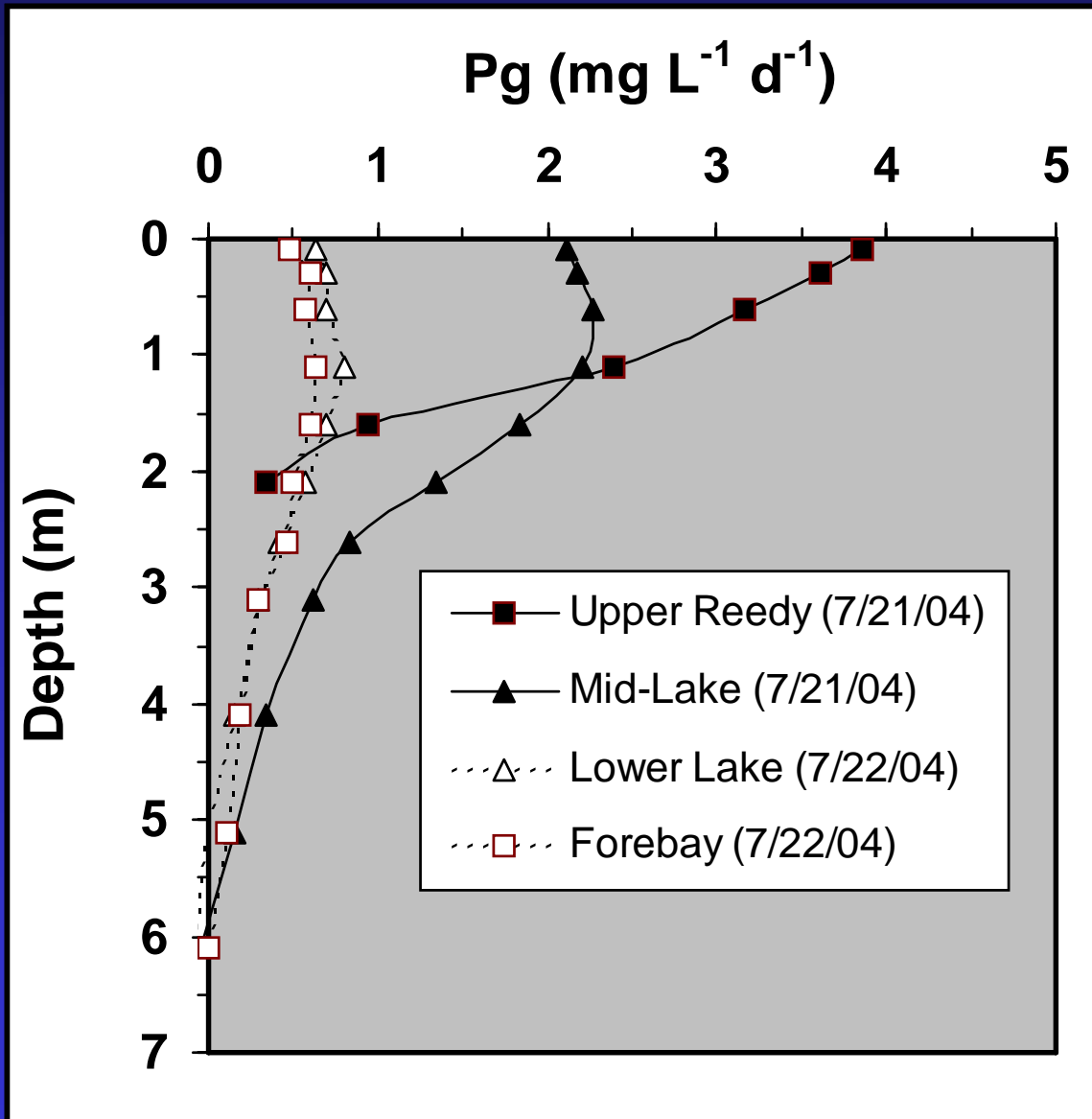
**MONTHLY
PLANKTON PRODUCTIVITY
AND WATER COLUMN
RESPIRATION**

**LIGHT AND DARK BOTTLE
INCUBATIONS
(IN SITU)**

**4 STATIONS
REEDY ARM TO DAM**



VERTICAL PATTERNS OF ALGAL PRODUCTION



ALGAL COMMUNITY COMPOSITION

HPLC
ANALYSIS

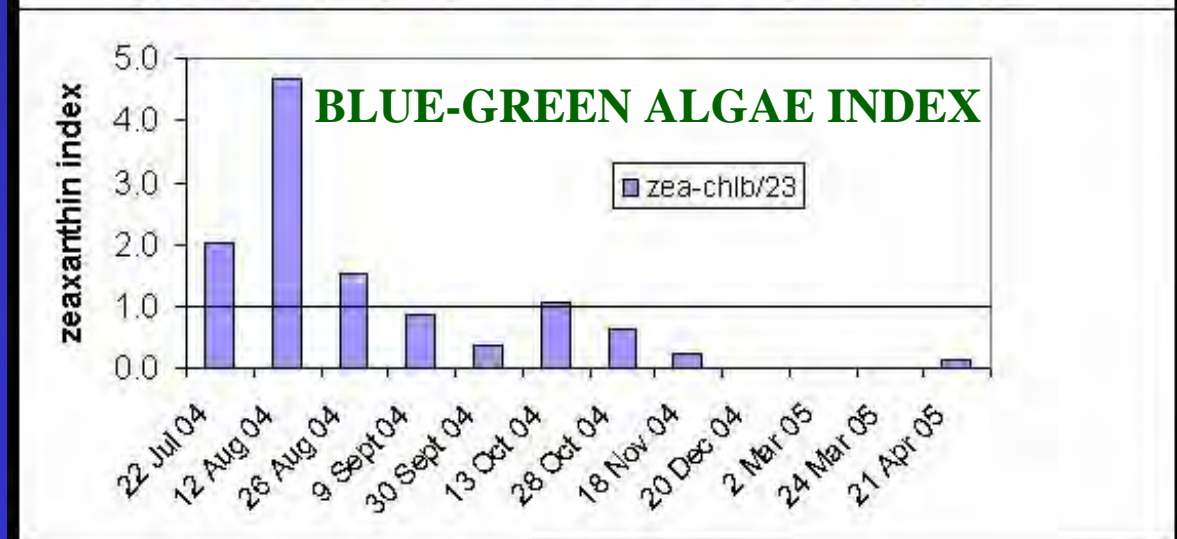
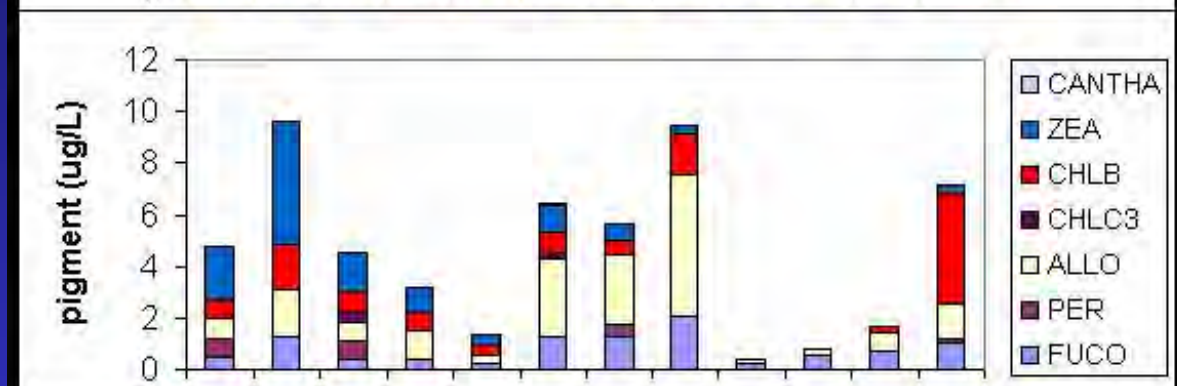
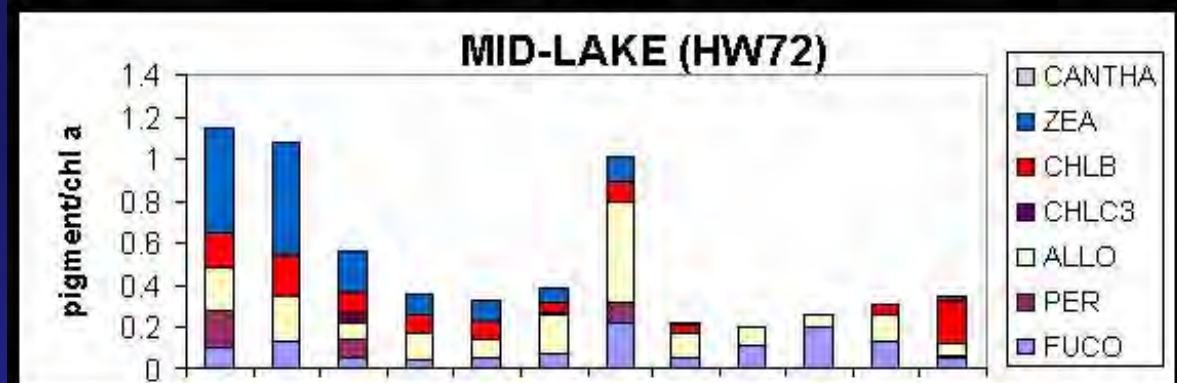


PIGMENT
MARKERS



ALGAL
COMMUNITY
COMPOSITION

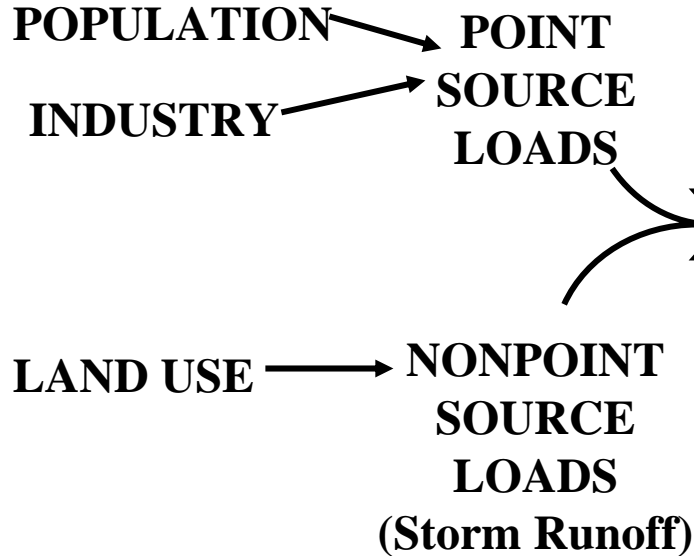
Lewitus et al.
Hollings Marine Lab



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WATERSHED

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Lake Hydrology Residence Time

NUTRIENT CONC.

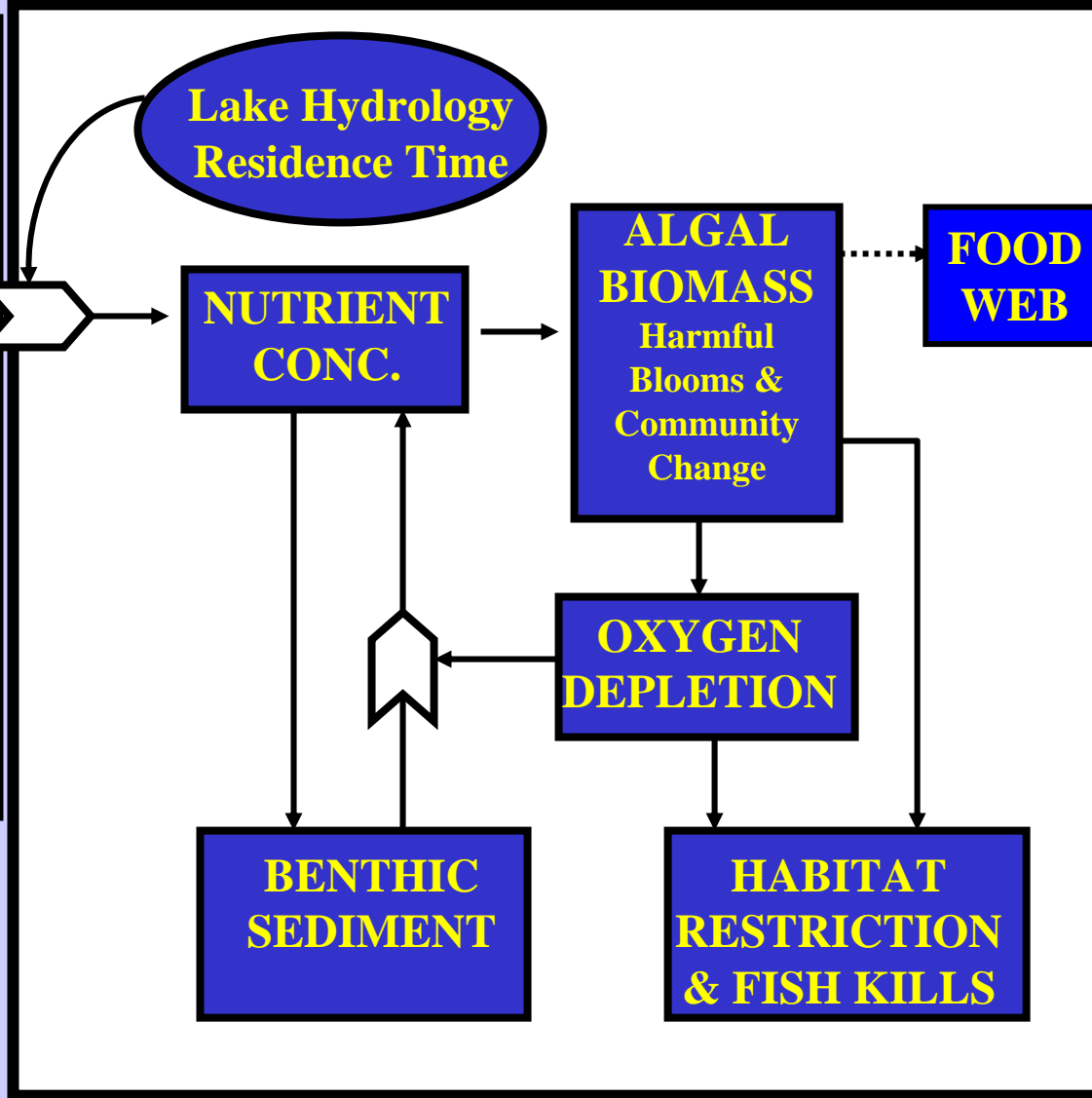
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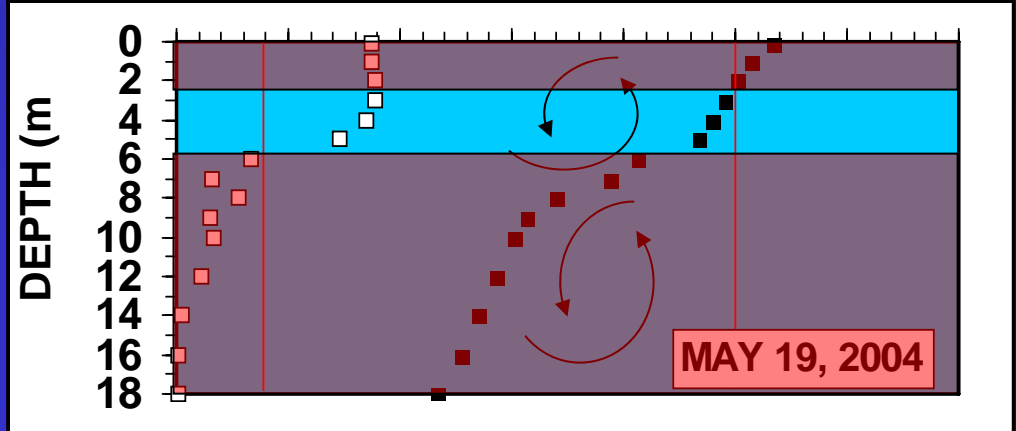
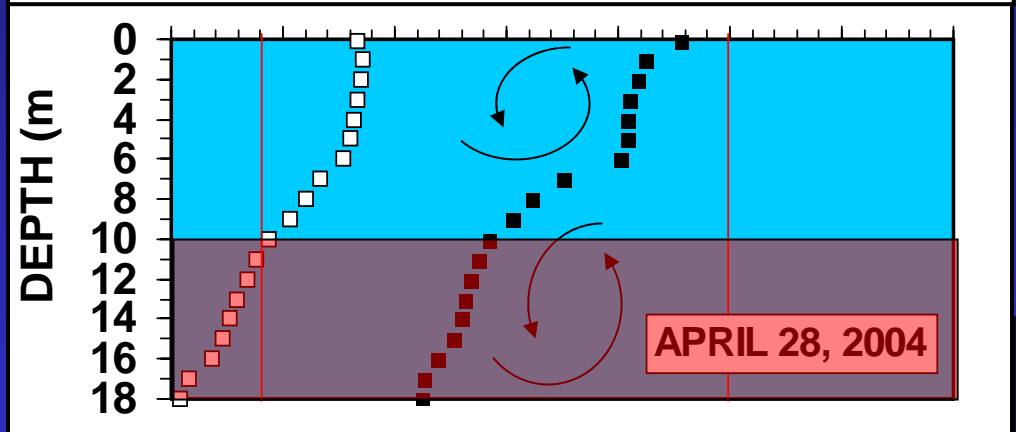
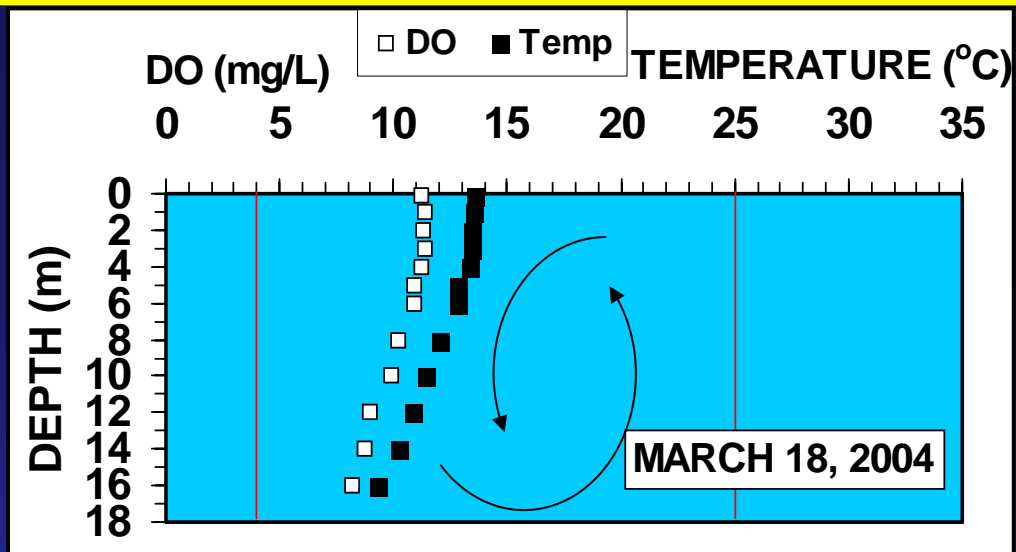
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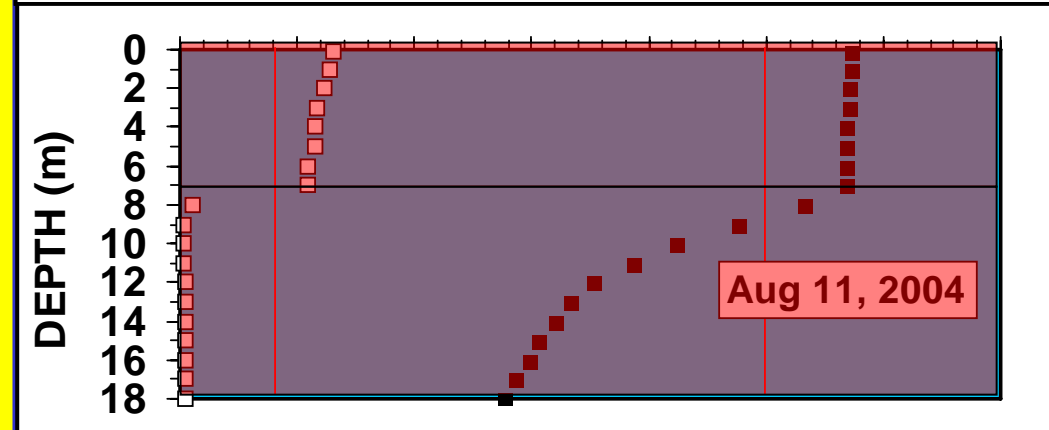
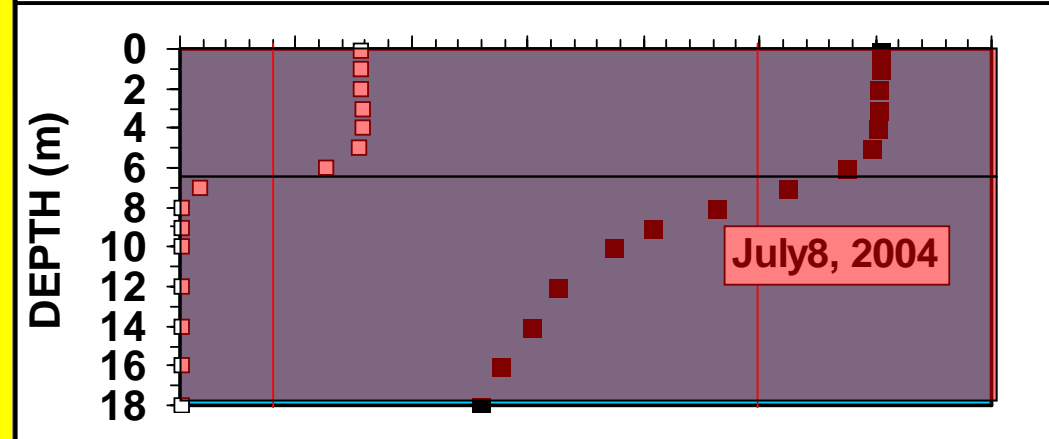
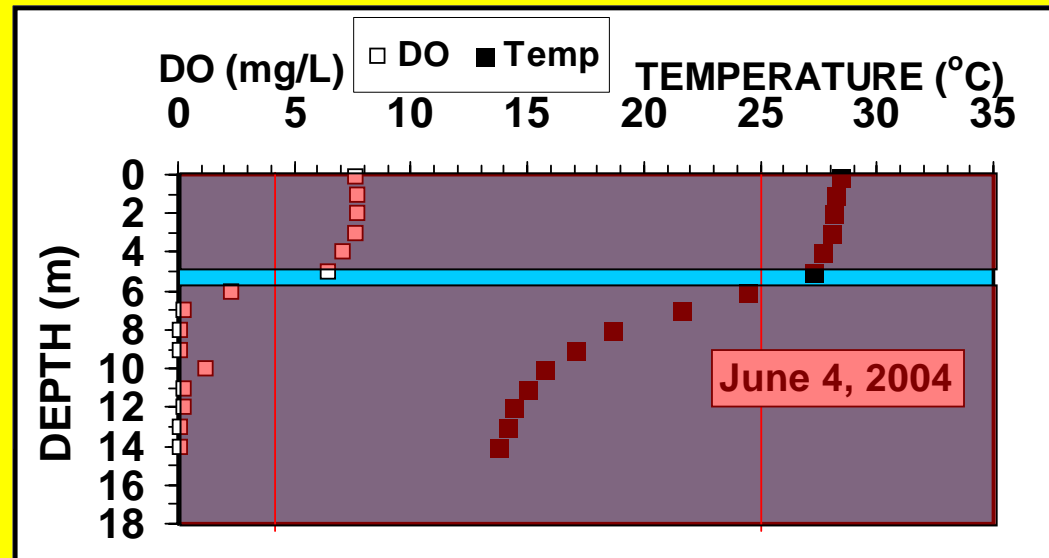


TEMPERATURE OXYGEN PROFILES FOREBAY 2004



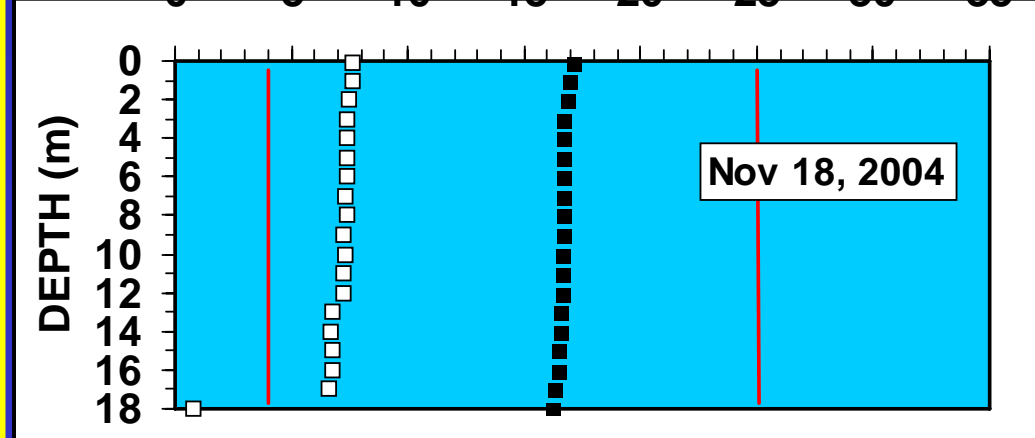
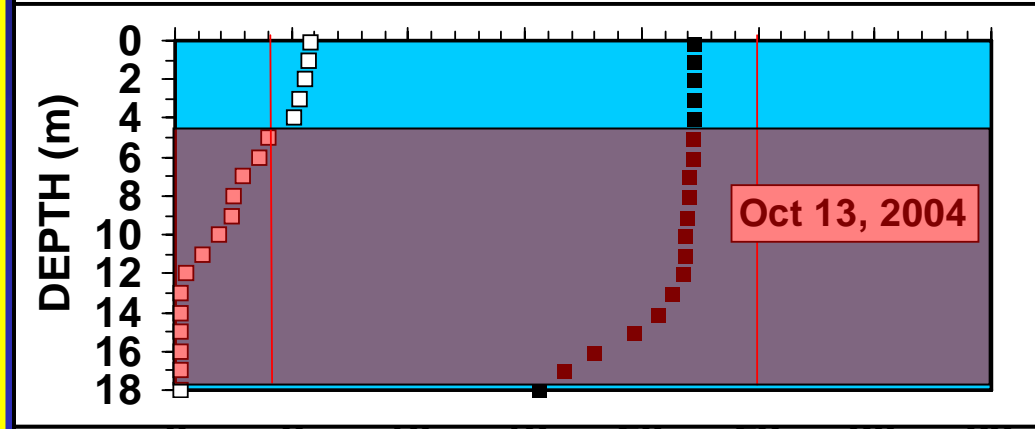
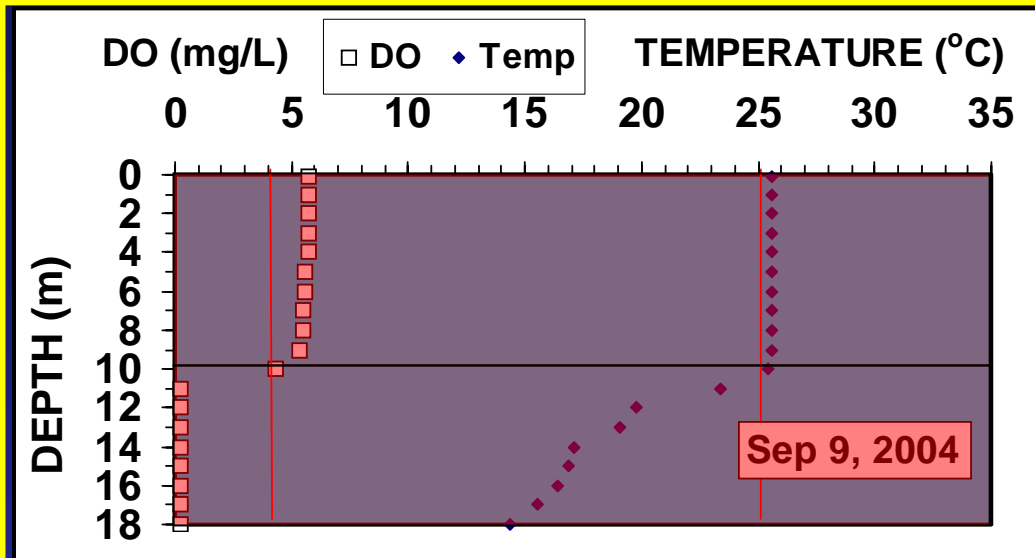
TEMPERATURE OXYGEN PROFILES

FOREBAY
2004

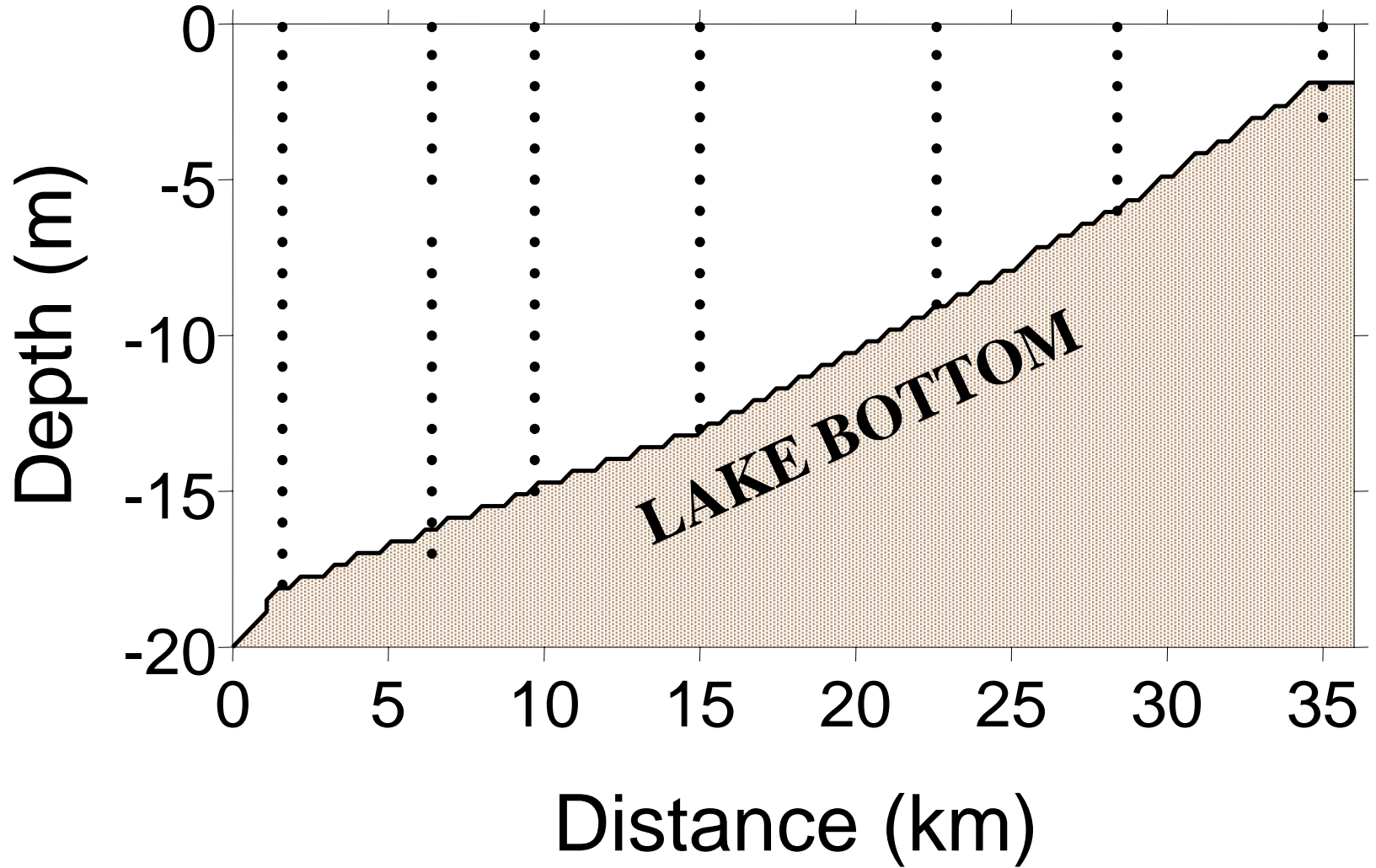


TEMPERATURE OXYGEN PROFILES

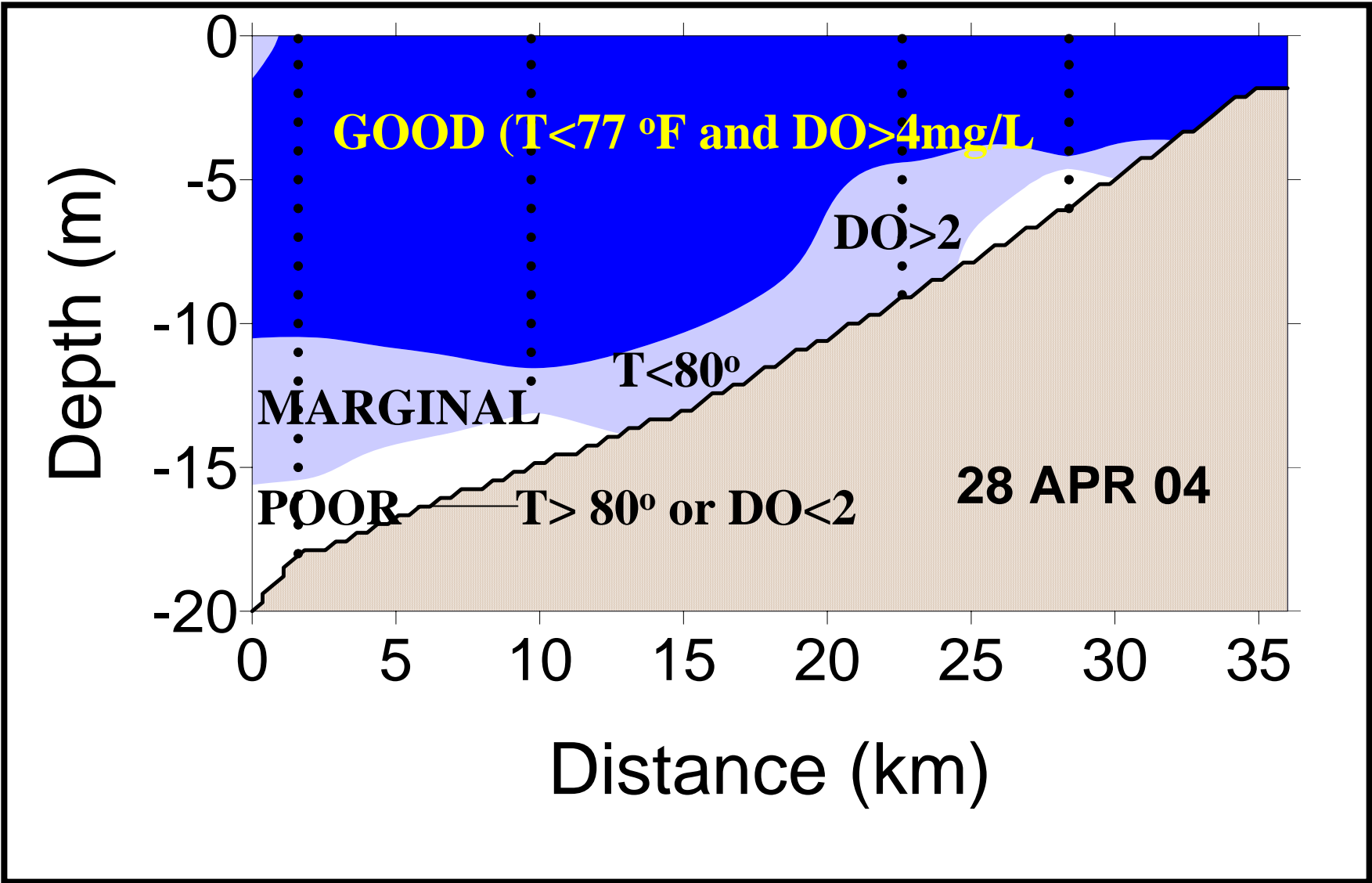
FOREBAY
2004



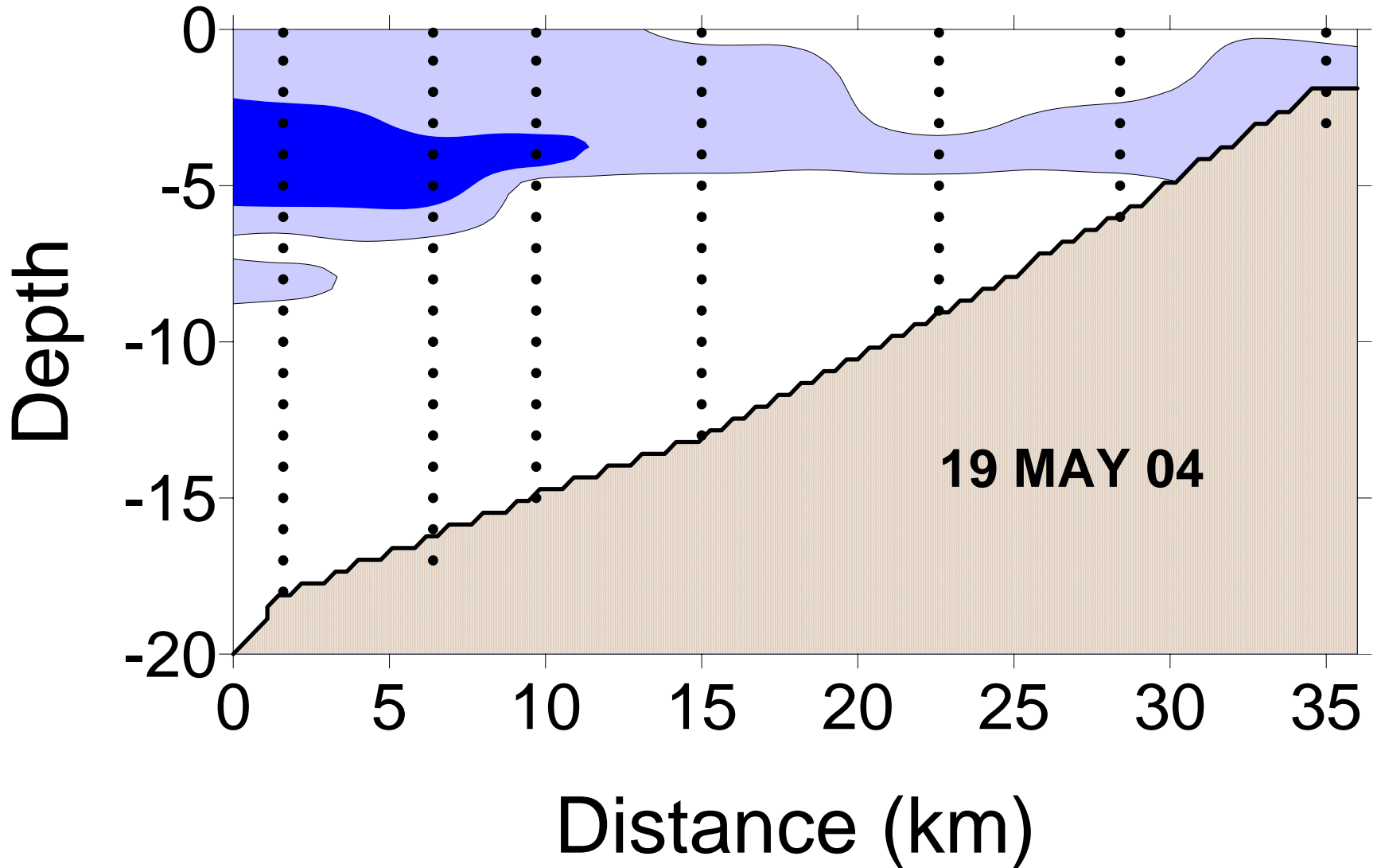
HABITAT QUALITY



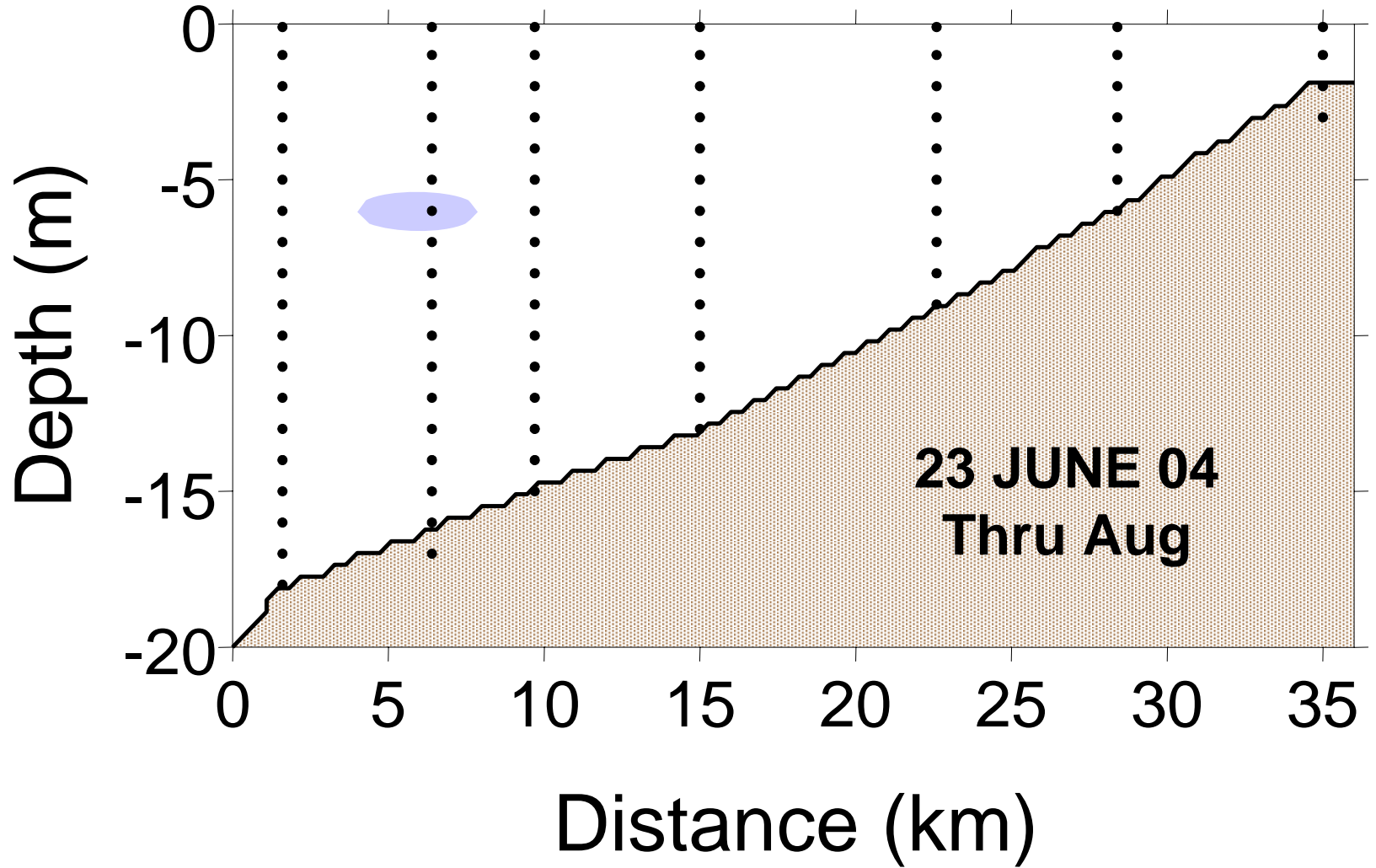
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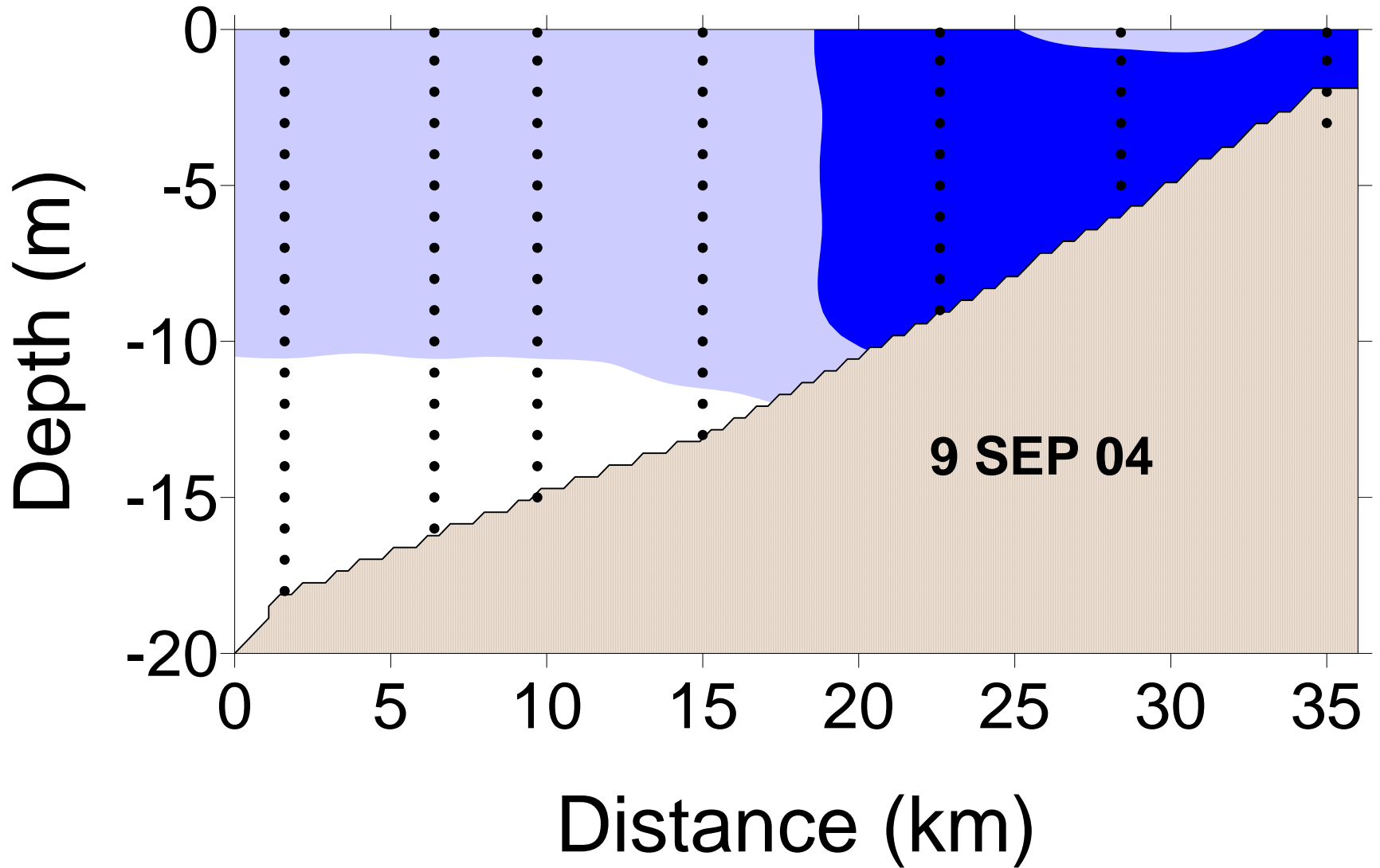
HABITAT QUALITY



HABITAT QUALITY



HABITAT QUALITY



LAKE GREENWOOD MODELING STUDY

To develop a computer model of water quality in Lake Greenwood (Spatial and Temporal)

- * nutrient loading and distributions
- * plankton biomass and production
- * oxygen balance and depletion

To help formulate long-term plans for water quality and aquatic habitat protection

Specific Objectives

Model Development : CE-QUAL-W2

Support Data: Nutrient/Oxygen Distributions,

Algal Biomass and Production Dynamics