

### Dissolved Oxygen Dynamics, Nutrients and Aquatic Life Uses in Texas Small Streams



### Dissolved Oxygen Dynamics and Aquatic Life Uses in Texas Small Streams

- A number of streams in East Texas have been observed to have water quality problems associated with dissolved oxygen
  - Extreme diurnal dissolved oxygen (DO) concentrations
  - Depressed DO concentrations
  - DO standards violations



### DO/Nutrients Study Objectives

- Support Texas 303(d) listing decisions
- Acquire data for developing nutrient criteria of low-gradient streams through linking nutrients to algal growth and respiration, dissolved oxygen, and impairment of aquatic life
- Relate diurnal dissolved oxygen to aquatic life conditions in reference sites to modify DO criteria



### DO/Nutrients Study Approach

- 48-hr. deployments of continuous monitors at 25 East Texas Sites 10 times (2003-4)
- 48-hr. deployments of continuous monitors at 15 Central Texas Sites (2005)
- Measurements of nutrient concentrations, algal biomass and algal production
- Conduct biological/habitat/hydrological surveys



### TCEQ -USGS Project Plans 2003-2005

- Assess 25 streams five times each year in 2003 and 2004 during the critical period; add 10 more in 2005
  - Study includes reference and impaired sites
  - All data collected during the index period; three samples during the critical period
  - Include estimates of DO, nutrient chemistry, algal biomass, primary productivity, benthic biotic integrity (2), and fish biotic integrity (2)
  - Perform analysis of associations between biotic integrity and physical and chemical data



### Status

- Completed 2003 and 2004 assessments. Conducting seven re-sampling events in July 2005
- Submitted workplan and QA documentation for additional central Texas sites; sampling will occur in August of 2005
- Data delivery to TCEQ July 29, 2005
- Summary data analysis August 31, 2005
- Final Report December 31, 2005

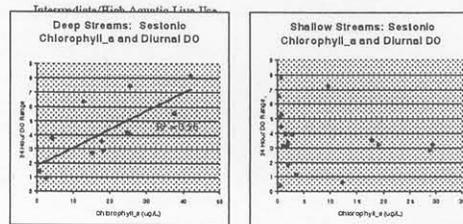


## Overview of Analysis

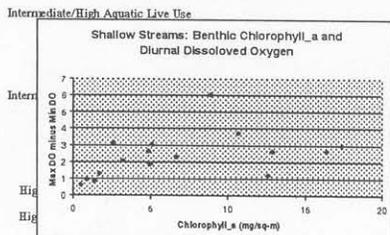
- Questions of interest:
  - Are there relationships between observed DO values and other water quality parameters?
    - physical parameters - discharge
    - chemical parameters - nutrients
    - biological uses - algae (chlorophyll a), benthic invertebrates, fish?
  - Are these relationships affected by elevated algal biomass accumulation?



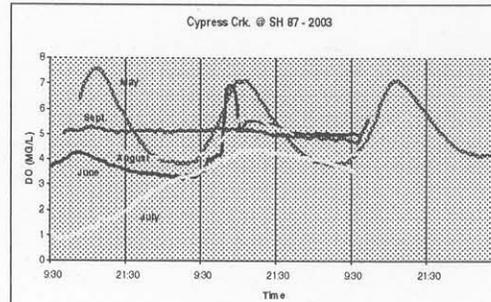
## Water-Column Algae and Dissolved Oxygen in Deep and Shallow East Texas Streams



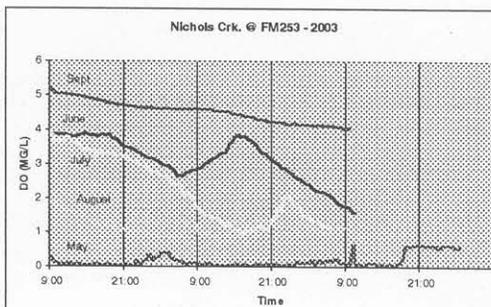
## Benthic Algae and Dissolved Oxygen in Shallow East Texas Streams



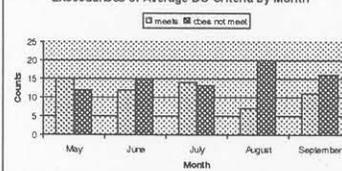
Cypress Crk. @ SH 87 - 2003



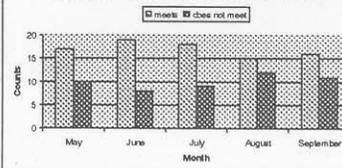
Nichols Crk. @ FM253 - 2003

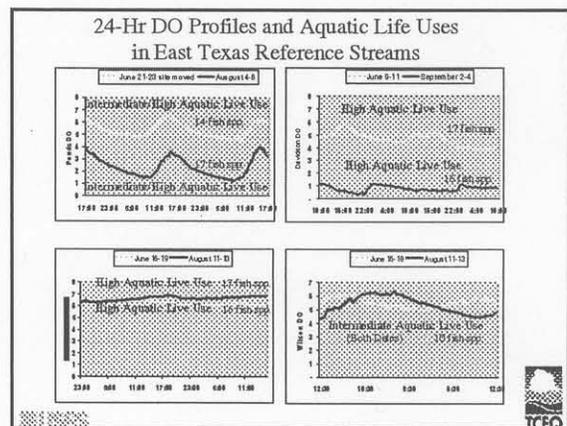
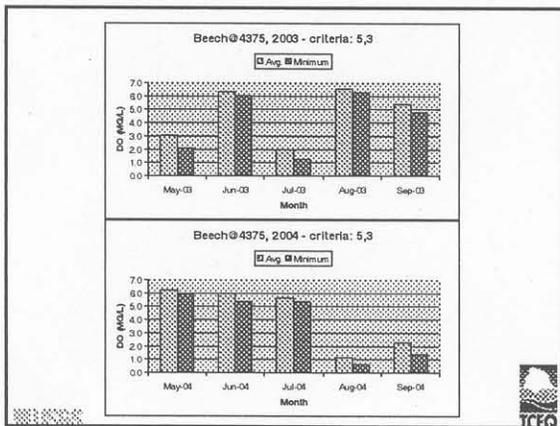
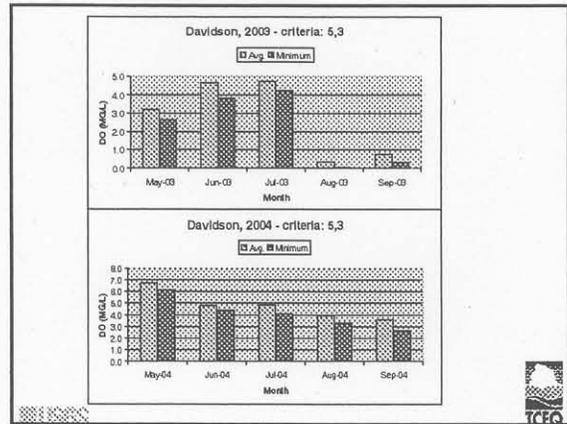
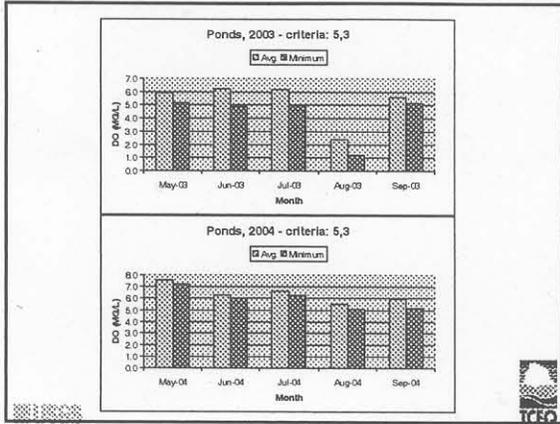


Exceedances of Average DO Criteria by Month



Exceedances of Minimum DO Criteria by Month





## Contact Information

Dr. Richard Kiesling  
 US Geological Survey  
 8027 Exchange Drive  
 Austin, TX 78754

[kiesling@usgs.gov](mailto:kiesling@usgs.gov)  
 (512) 927-3505