

DISSOLVED OXYGEN DYNAMICS OF A COASTAL RHODE ISLAND SALT POND

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Conclusions

- Physical characteristics of some coastal lagoons restrict exchange with ocean waters
- Exchange with well-oxygenated ocean waters can be a key control on dissolved oxygen concentrations
- This study demonstrates that oxygenated ocean water does not reach shallower areas of the coastal pond during several tidal cycles

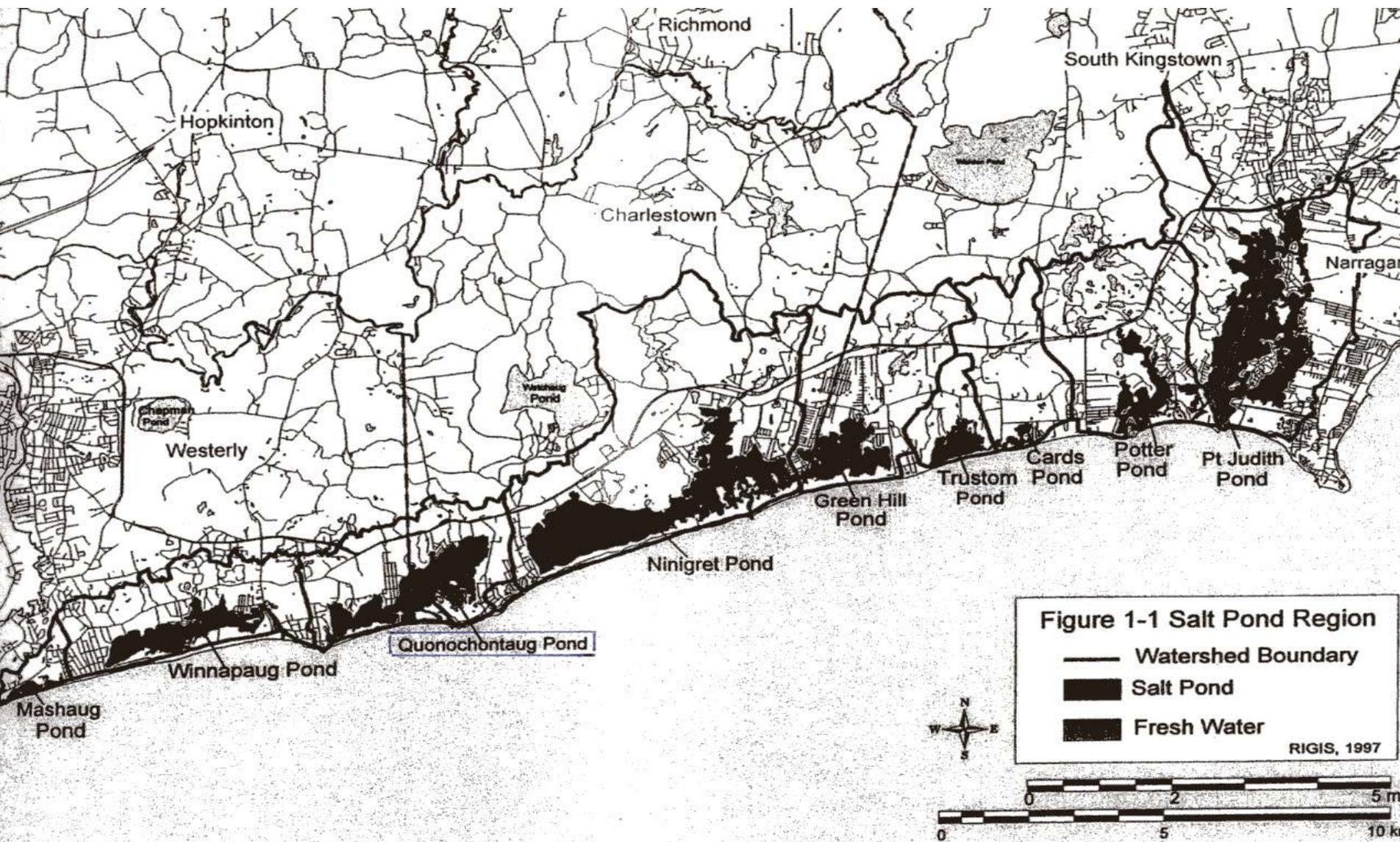
Background

- Quonochontaug Pond—South East RI salt pond
- Significant Dissolved Oxygen depletion in bottom waters of western basin
- Purpose of study to assess Dissolved Oxygen status of water column and understand controls

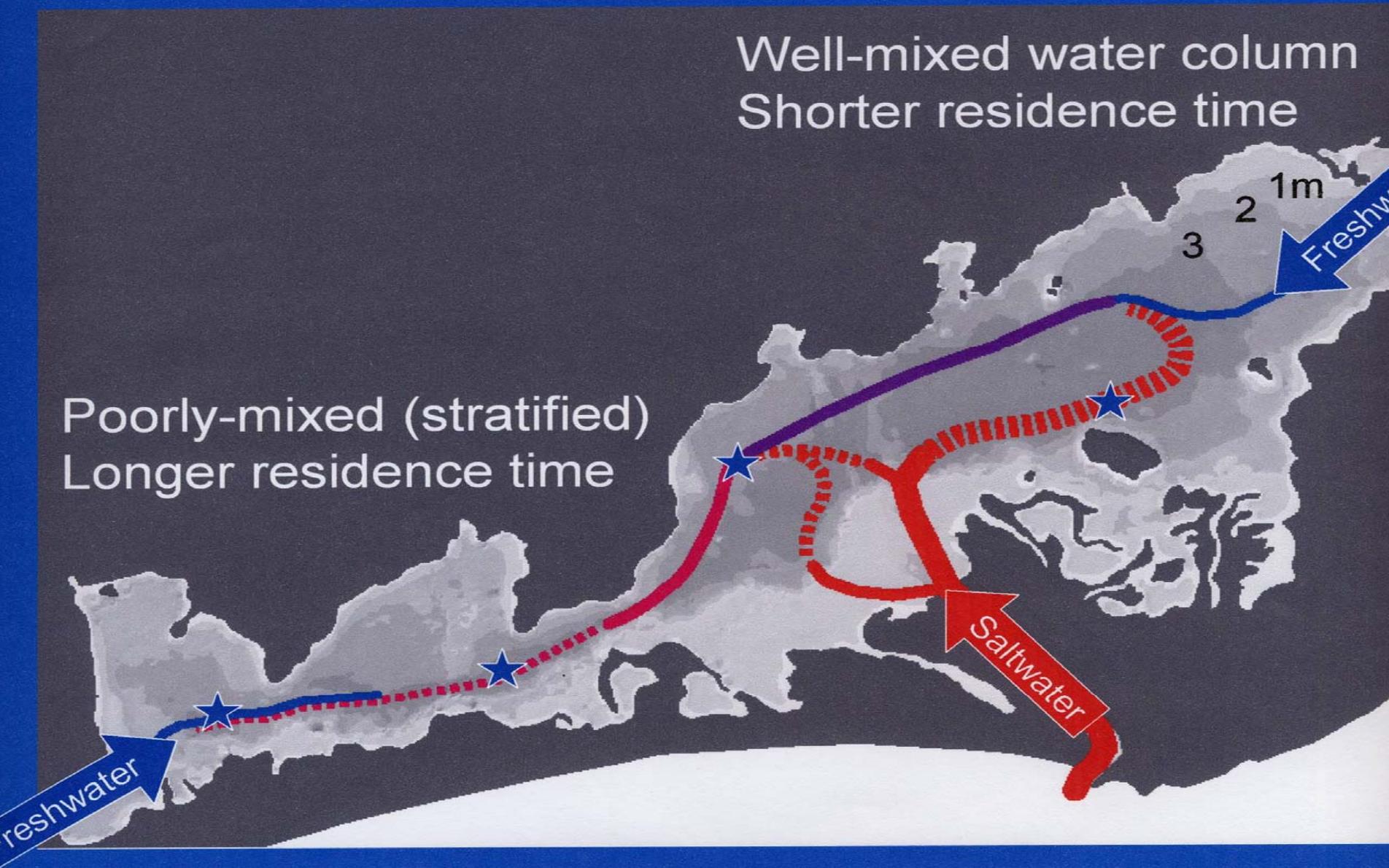
Study Design

- Weekly measurements: Profiles of dissolved oxygen, temperature, salinity; and Secchi disk readings
- Bi-weekly chlorophyll-a measurements
- Monthly nutrient samples
- Physical oceanography and current flow studies conducted by colleagues at the University of Rhode Island

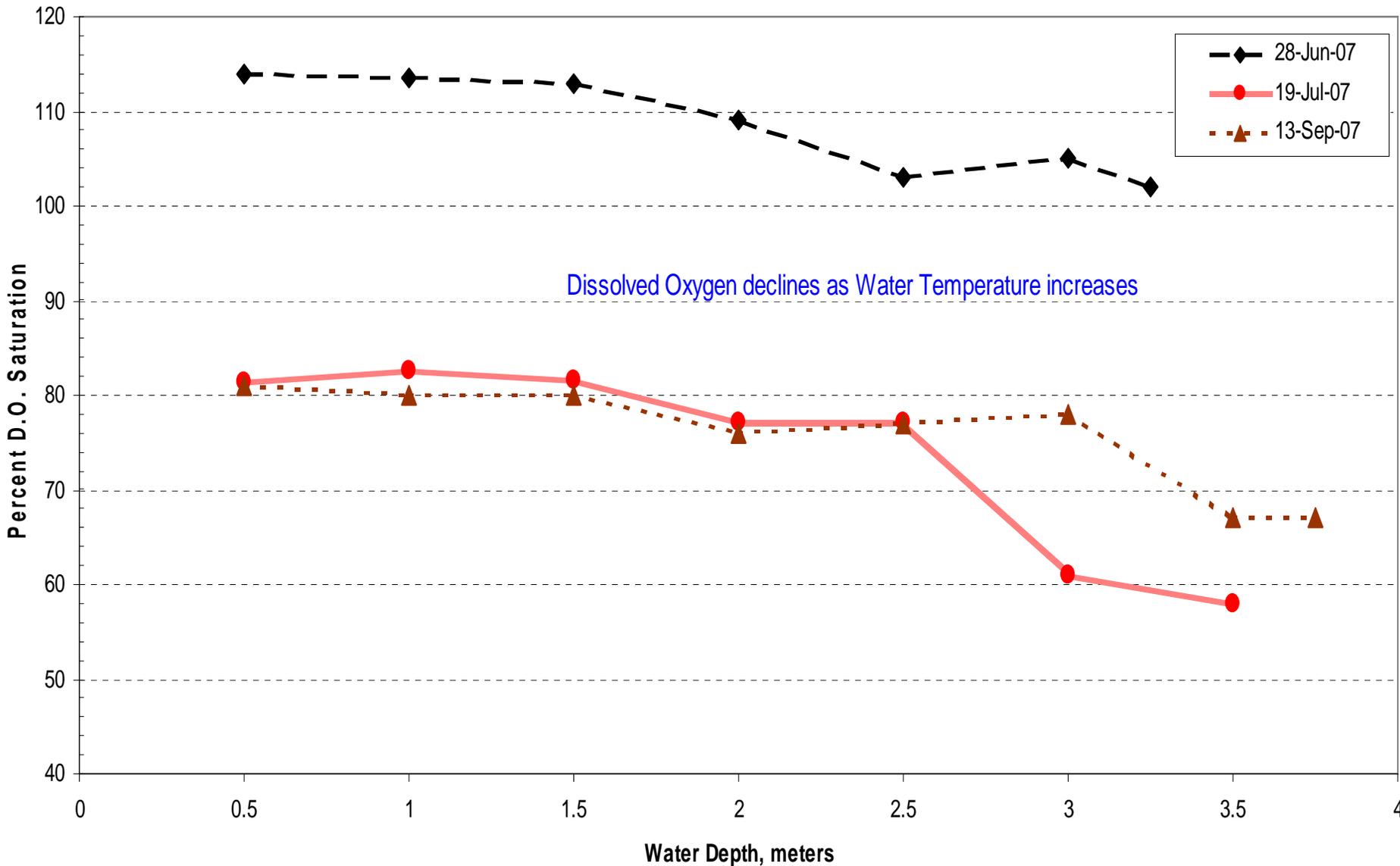
MAP OF SOUTHEAST RHODE ISLAND SALT POND REGION



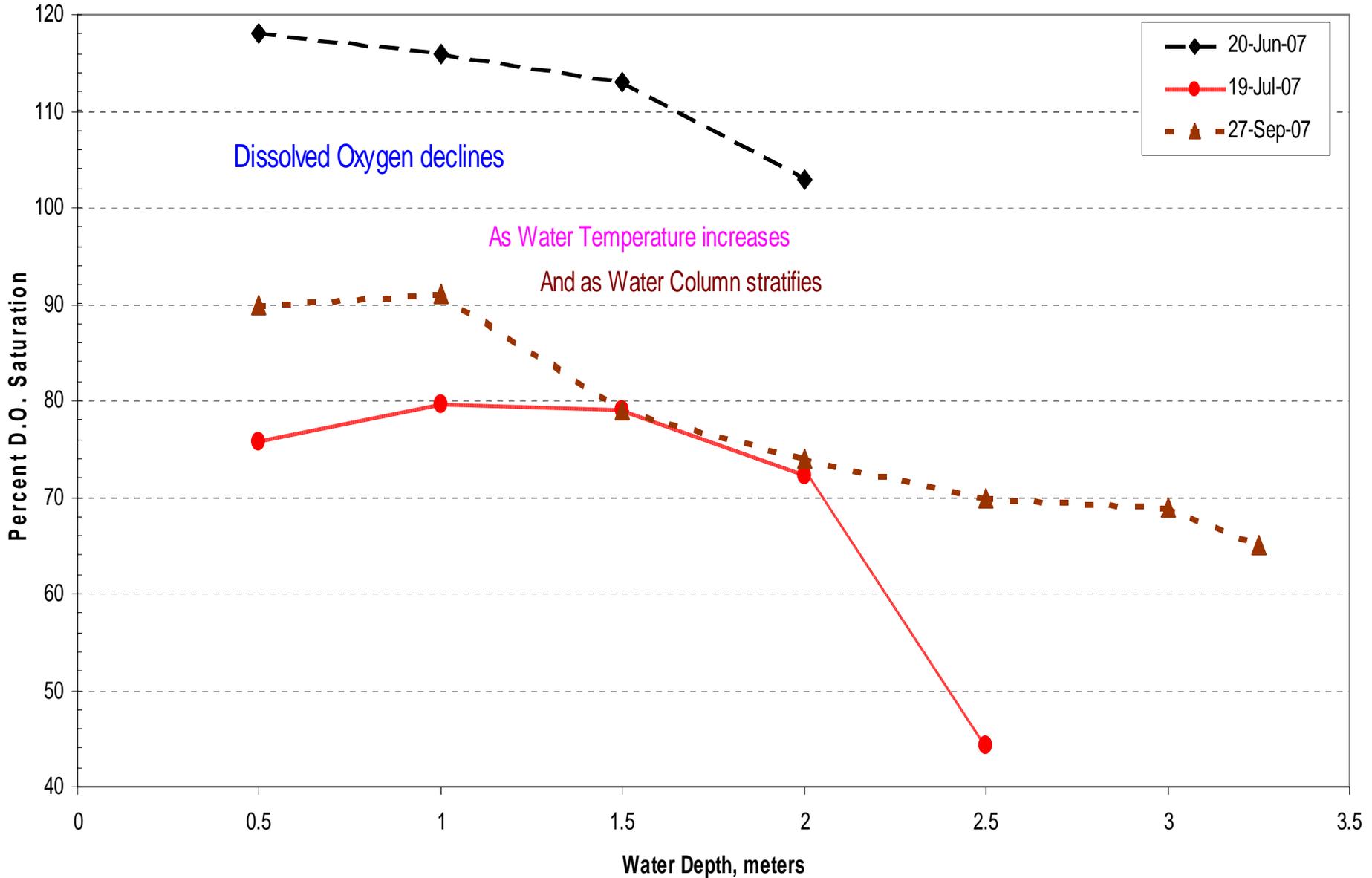
General Circulation



Representative Dissolved Oxygen Saturation Profiles for Well-Mixed Quonochontaug Pond Eastern Basin Waters, June-September, 2007



Representative Dissolved Oxygen Saturation Profiles for Poorly-Mixed Quonochontaug Pond Western Basin Waters, June-September, 2007

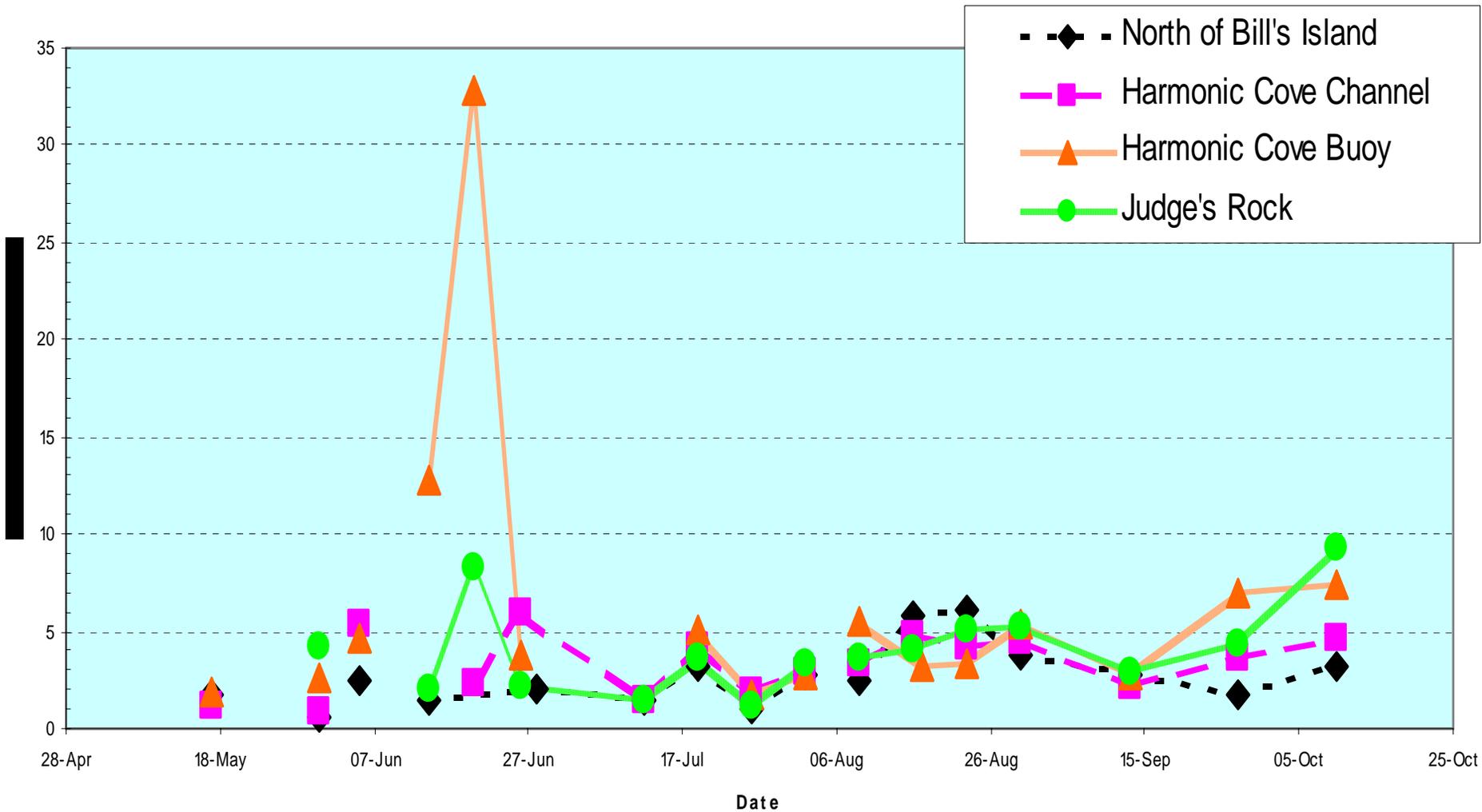


POSSIBLE CAUSES OF DISSOLVED OXYGEN DEPLETION

- General Circulation- Decreasing volume of well-oxygenated seawater progressing from East to West
- Phytoplankton Production- Algal “blooms” that after die-off, organic matter sinks to bottom and consumes dissolved oxygen
- Hydrological Forcing Events- Rain and Wind

PHYTOPLANKTON PRODUCTION

Chlorophyll-a Concentrations at Four Quonochontaug Pond Stations, May-October 2007



HYDROLOGIC FORCING EVENTS

- Significant rainfall causes freshwater to “layer” over salt water and reduce reaeration
- Within a few days of significant rainfall, on 6 different occasions, poorly-mixed stations showed bottom water dissolved oxygen depletion
- 45 to 65 % Dissolved Oxygen Saturation

SUMMARY

- Quonochontaug Pond is a coastal Rhode Island Salt Pond with restricted input of salt water
- Dissolved Oxygen profiles in the well-mixed portion of the pond do not change significantly as the water temperature increases through the summer season
- Dissolved Oxygen profiles in the poorly-mixed portion of the pond do show some relationship to water temperature and occasional freshwater dilution

SUMMARY (continued)

- Algal blooms were not a major control on Dissolved Oxygen concentrations during the study period
- Hydrologic forcing events (rain and wind) were significant factors in causing stratification and Dissolved Oxygen depletion in bottom waters on several occasions during the study period
- General circulation and mixing with well-oxygenated sea water is a major factor affecting Dissolved Oxygen dynamics in this salt pond system