Synthesis of the Areal Extent of Hypoxia in Narragansett Bay Dissolved Oxygen Surveys 1999 - 2010

Warren Prell, David Murray, Chris Deacutis

Brown University
Marine Ecosystem Research Laboratory, GSO
Narragansett Bay Estuary Program
Save The Bay

Narragansett Bay Commission Symposium
A Day on the Upper Bay: Current Monitoring, Research, Source Reduction Progress & Future Challenges
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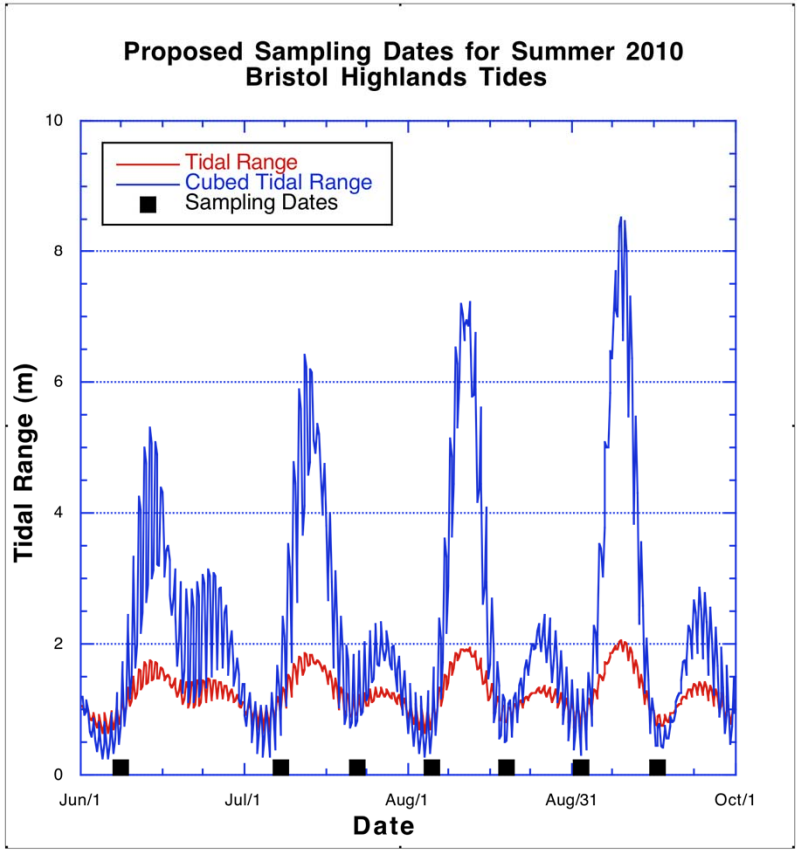
Prell, W., Murray, D., Deacutis, C., 2010. Summer-Season survey of dissolved oxygen in upper Narragansett Bay. Data available at: http://www.geo.brown.edu/georesearch/insomniacs

Revised sampling dates for the summer DO survey

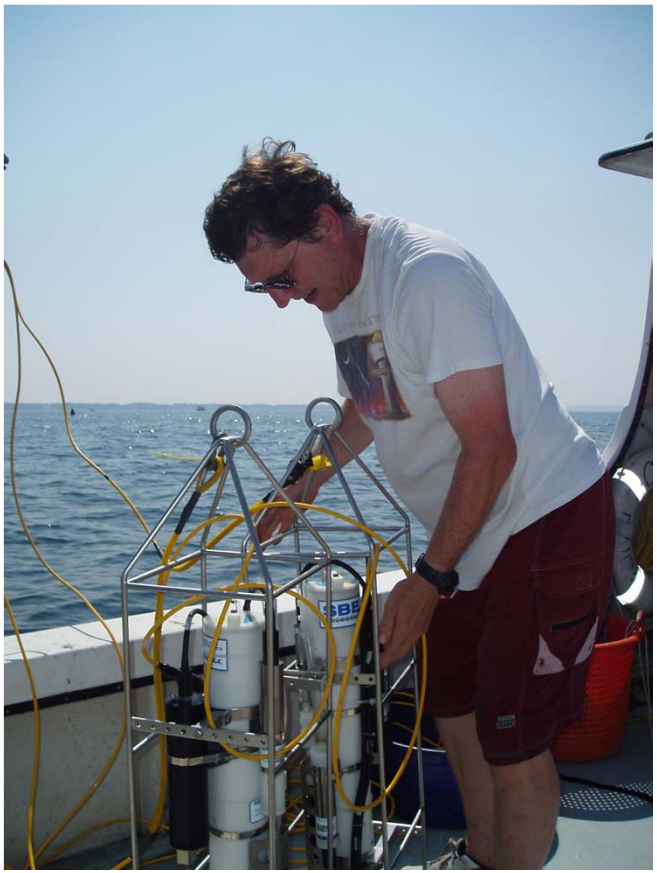
Selected Tuesdays for initial survey so that backups could be on Wednesday or Thursday rather than going to next week

DATE	DAY	TIDE STATUS
6/08/10	TU	Low range semi equal tides, end of neap
7/08/10	TH	Low range semi equal tides, end of neap
7/22/10	TH	Low-moderate range-mixed-high diurnal range
8/05/10	TH	Low range semi equal tides
8/19/10	TH	Low-moderate range-mixed-high diurnal range
9/02/10	TH	Low-moderate range-mixed-high diurnal range
9/16/10	TH	Low range semi equal tides end of neap



Strategy

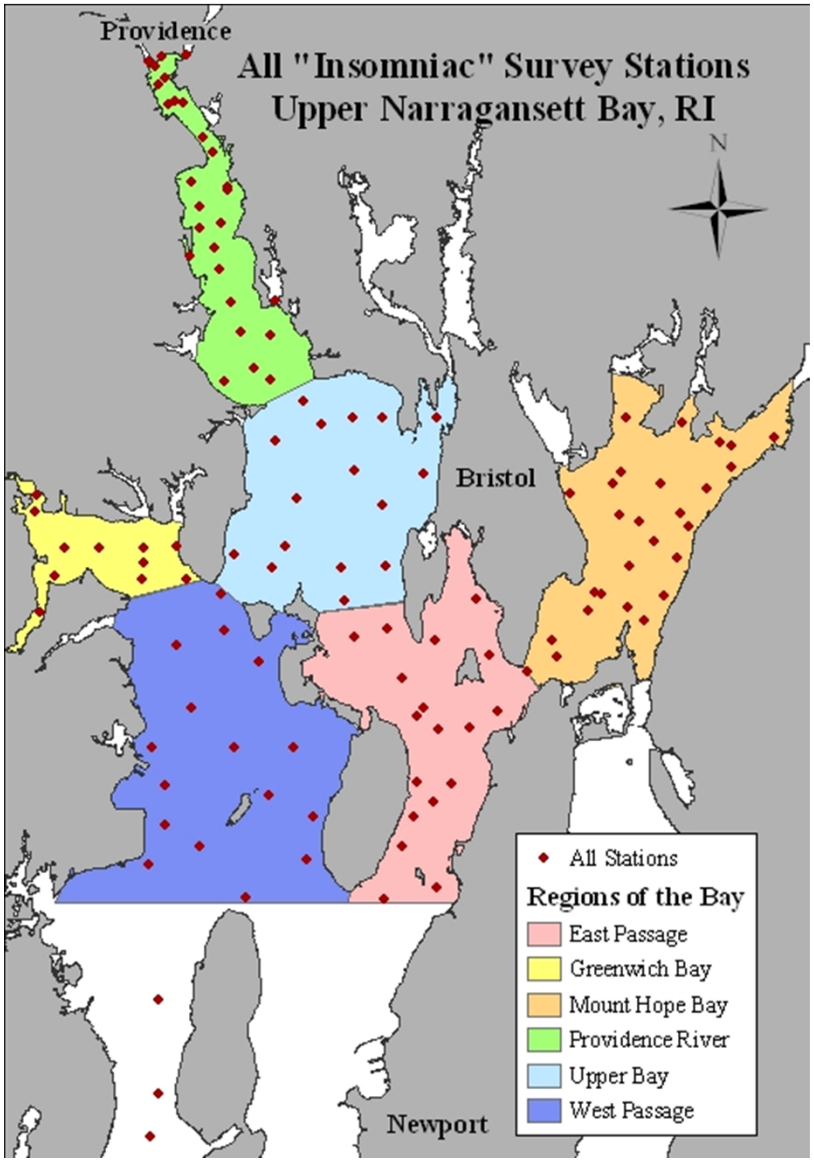
Continuous profiles of DO and physical properties at many stations, including shoal locations

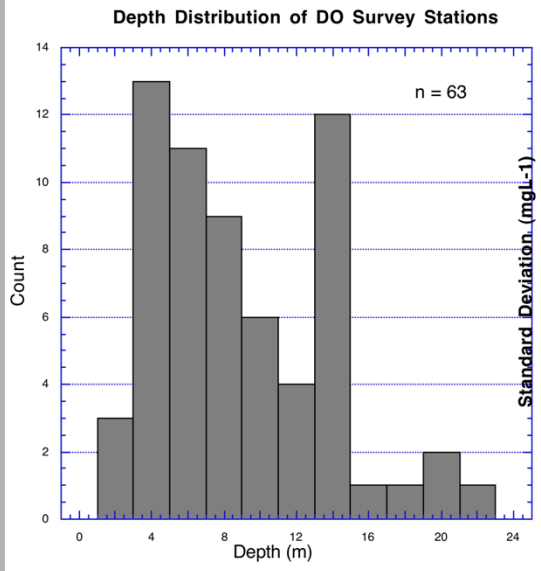


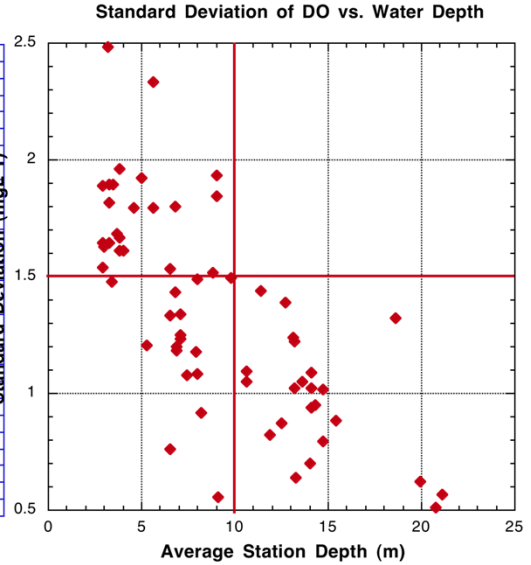
All Stations

~75 stations
63 stations are >3m
15 to 27 July-August profiles

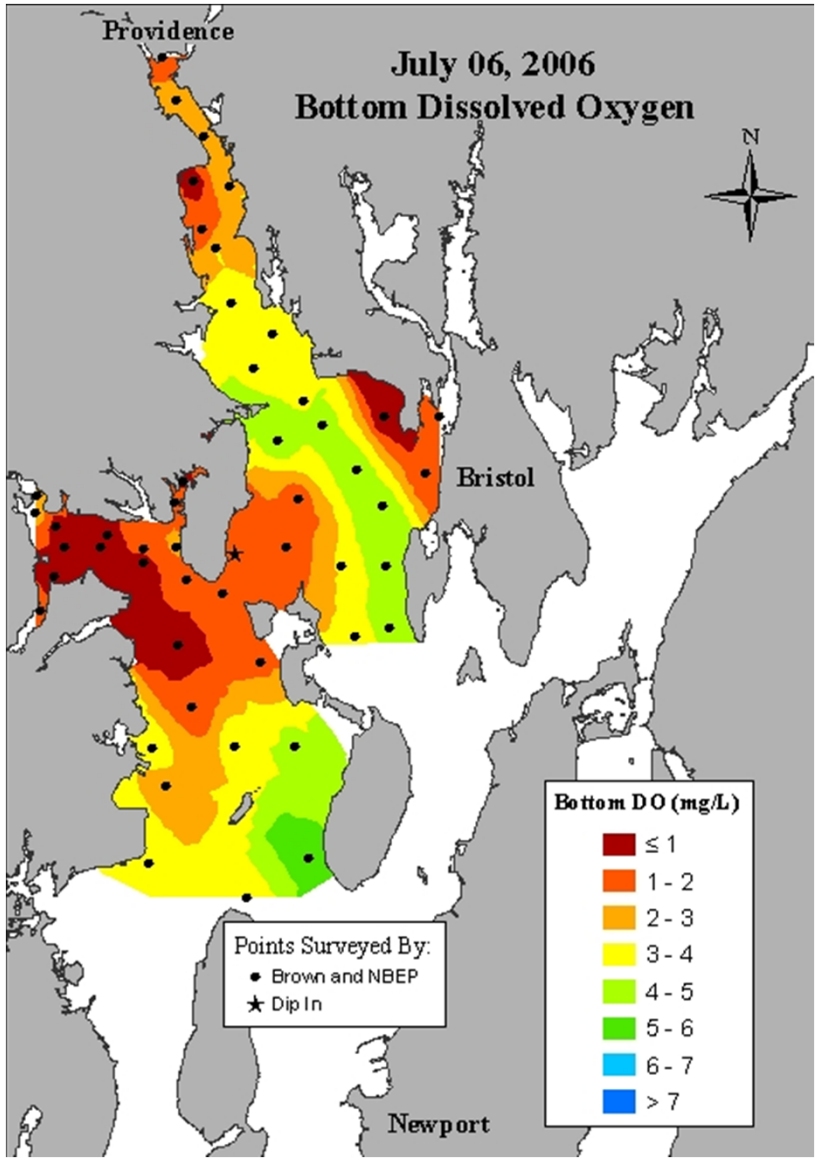
Depth distribution
Variance of DO with depth

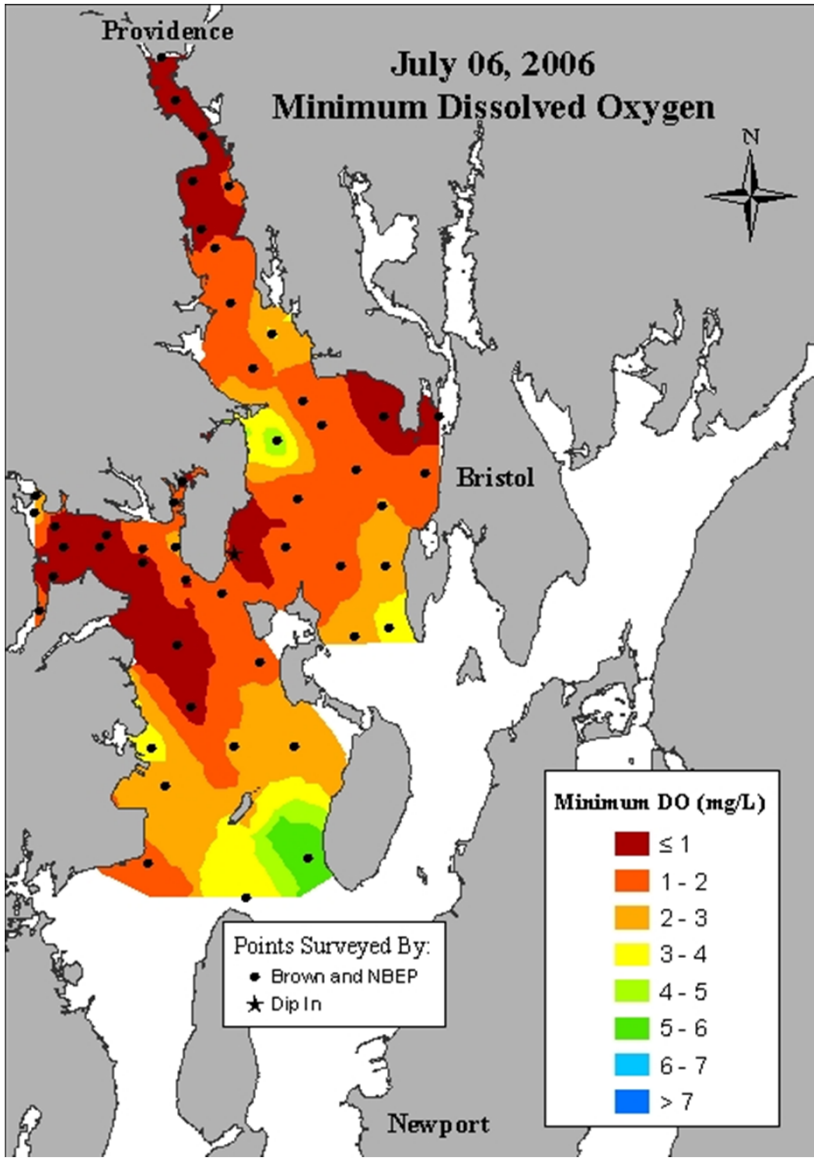


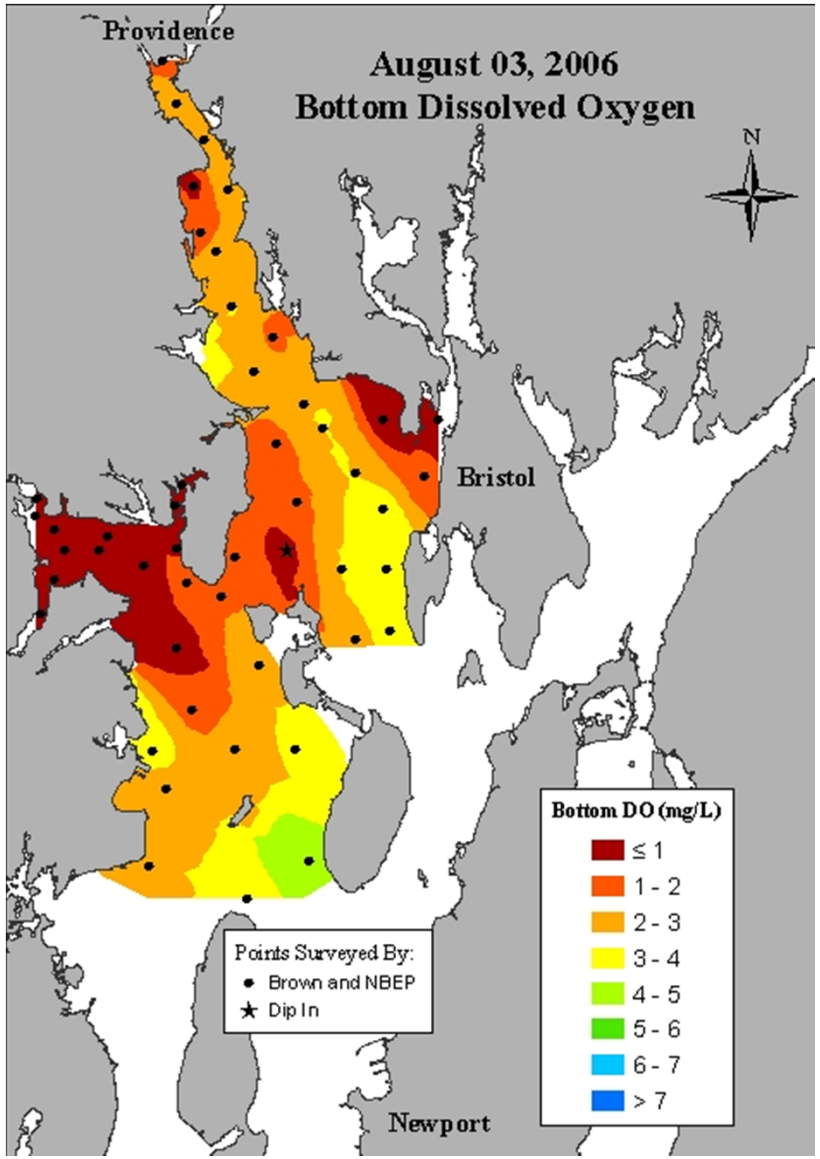


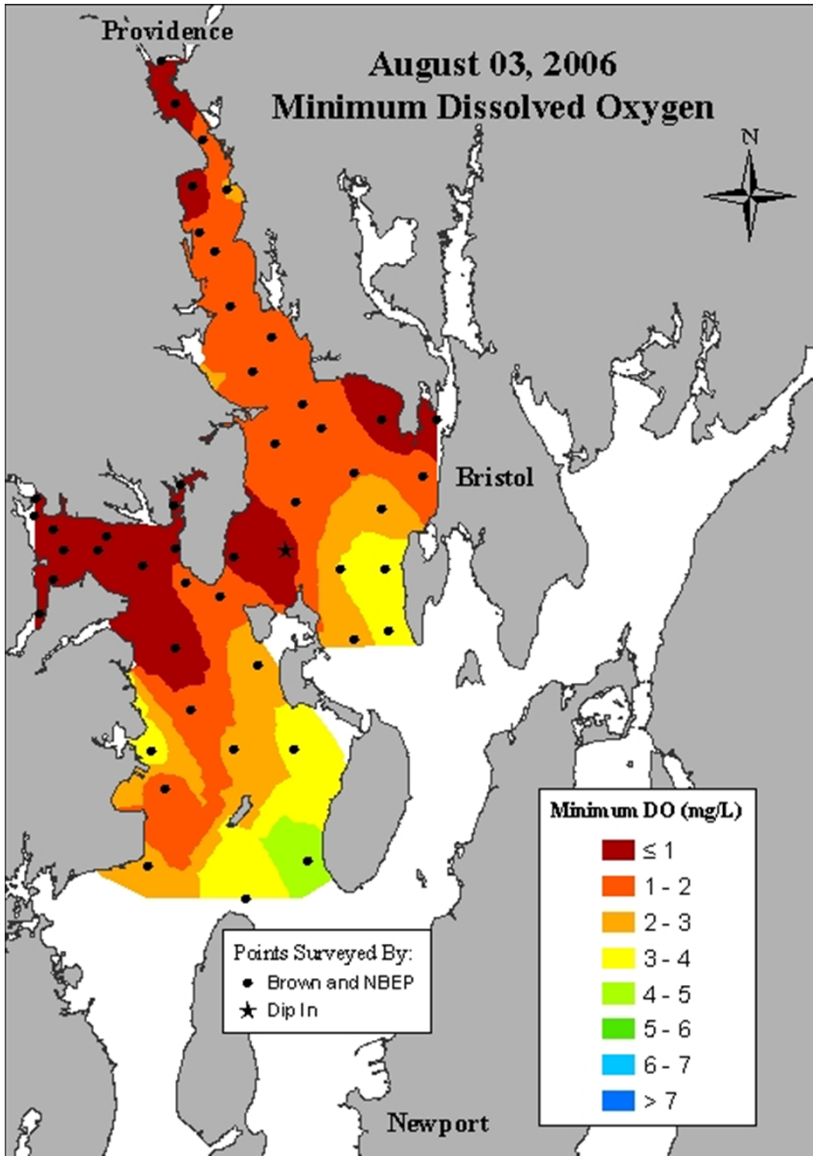


Bottom versus minimum DO

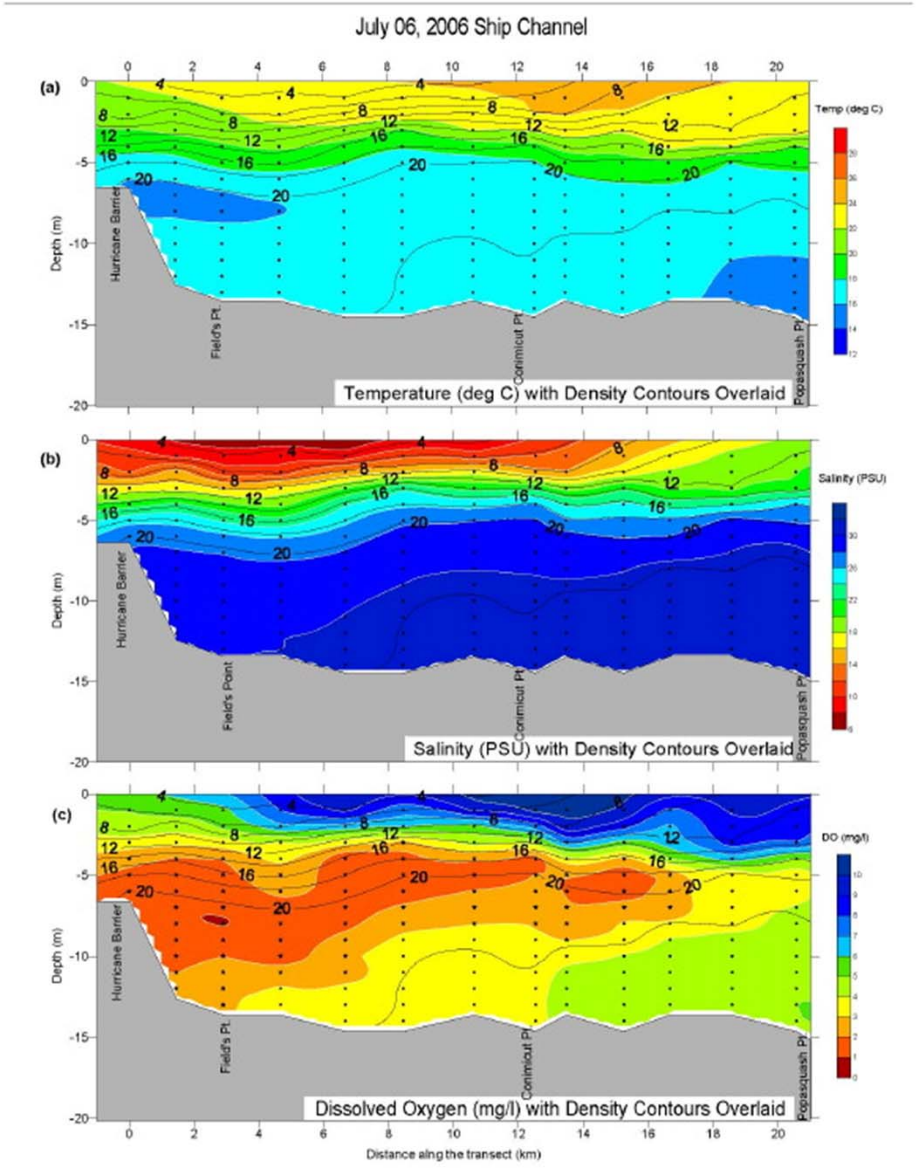


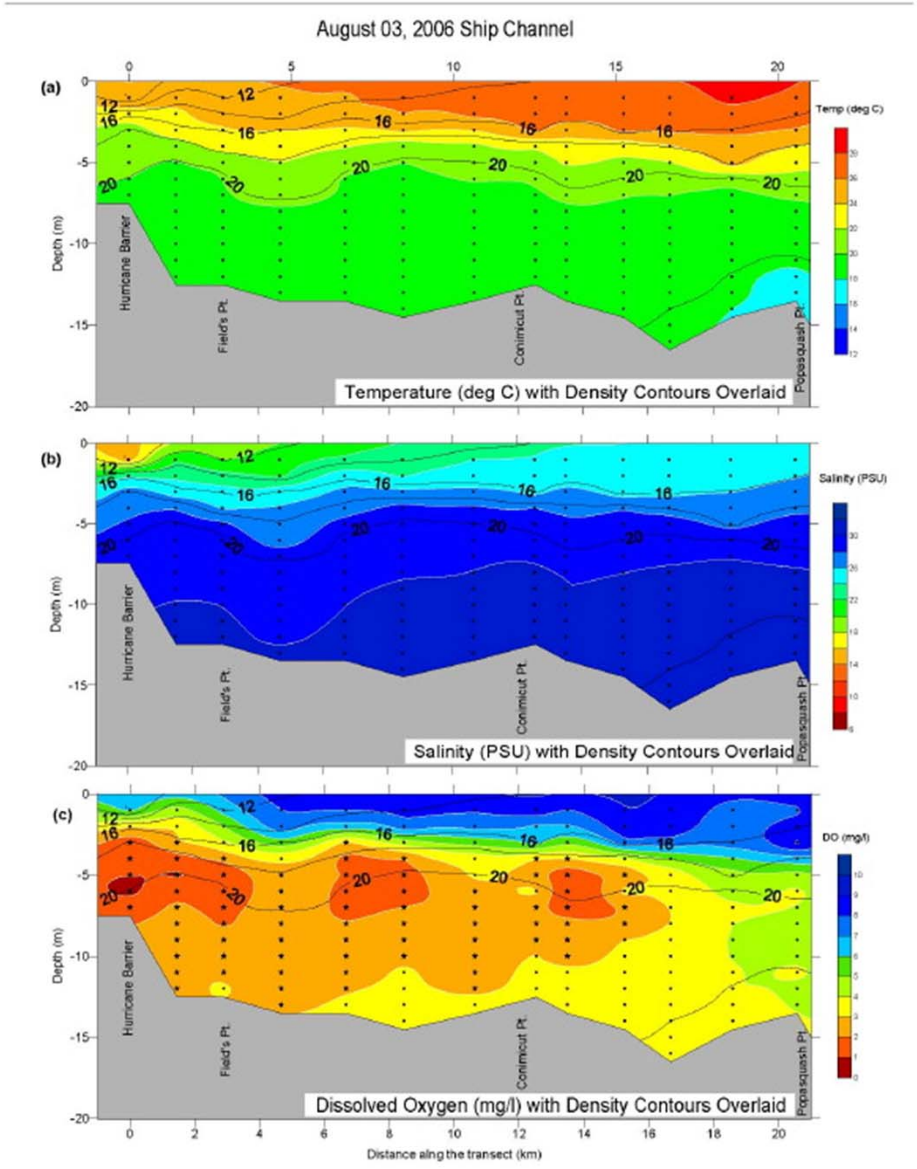



Providence
August 03, 2006
Bottom Dissolved Oxygen
N
Bristol
Bottom DO (mg/L)
≤ 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
> 7
Points Surveyed By:
Brown and NBEP
Dip In
Newport

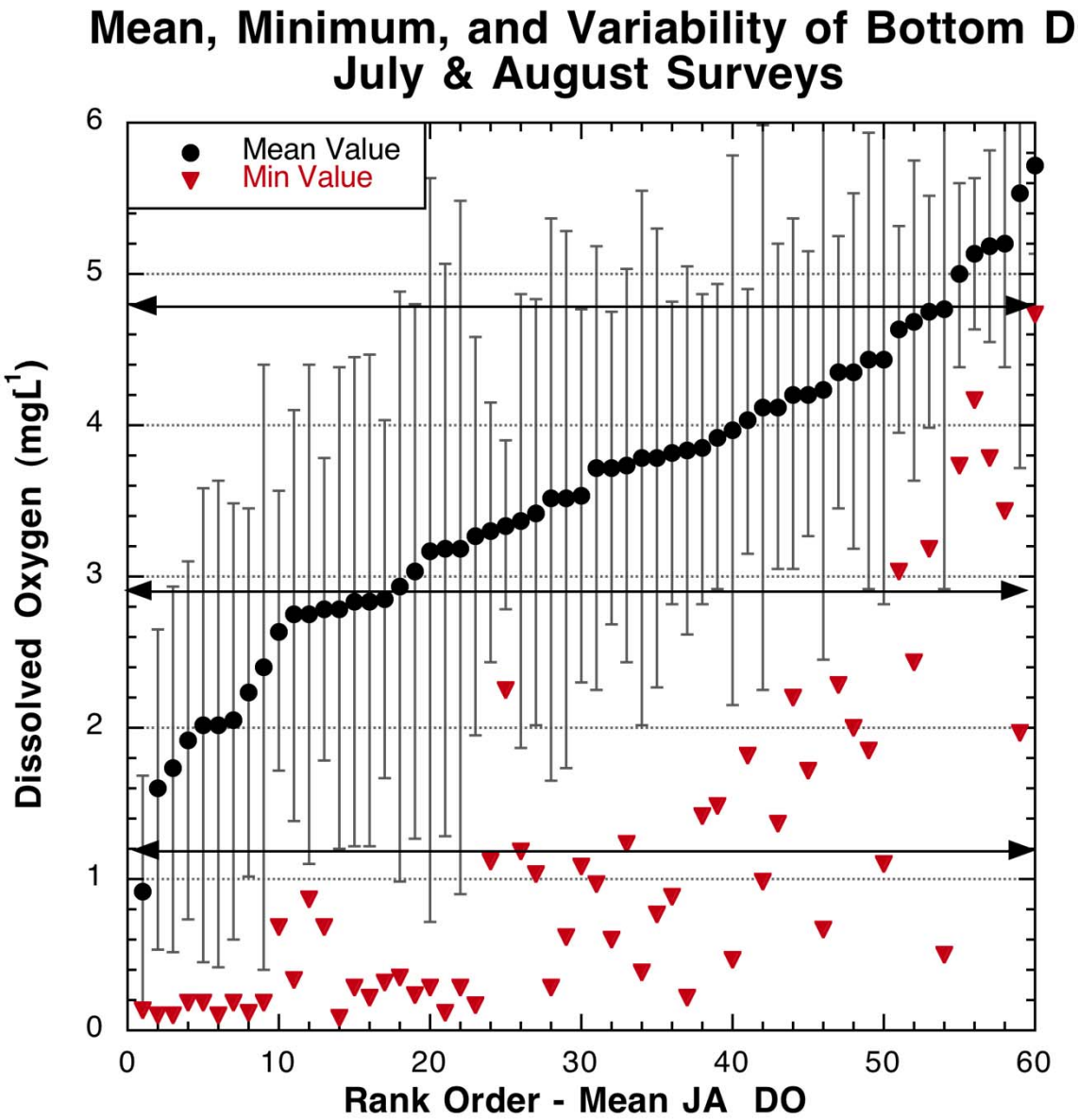

Providence
August 03, 2006
Minimum Dissolved Oxygen
N
Bristol
Minimum DO (mg/L)
≤ 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
> 7
Points Surveyed By:
Brown and NBEP
Dip In
Newport

Shipping Channel Transects
Different modes





1999 – 2010



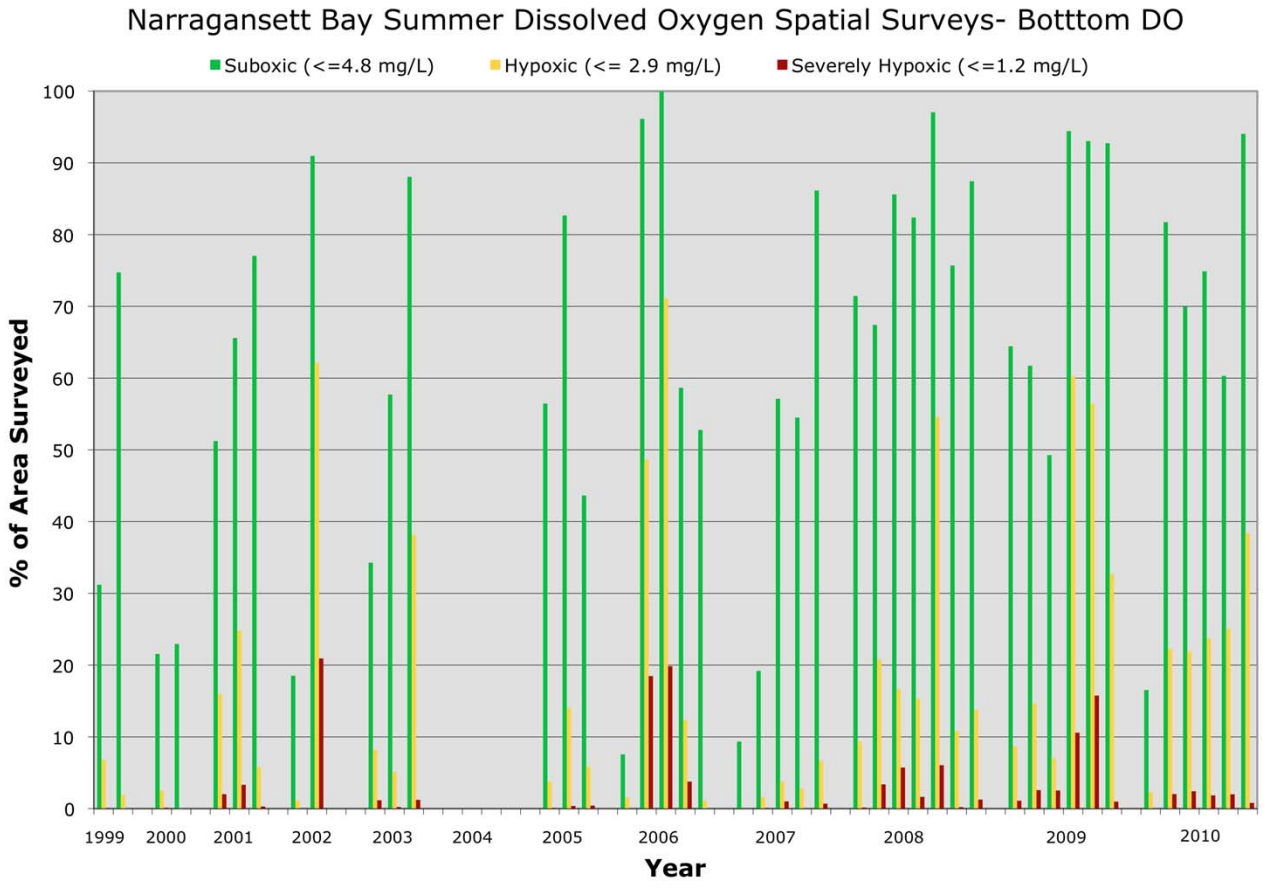
July – August
60 Stations
15-30 Surveys

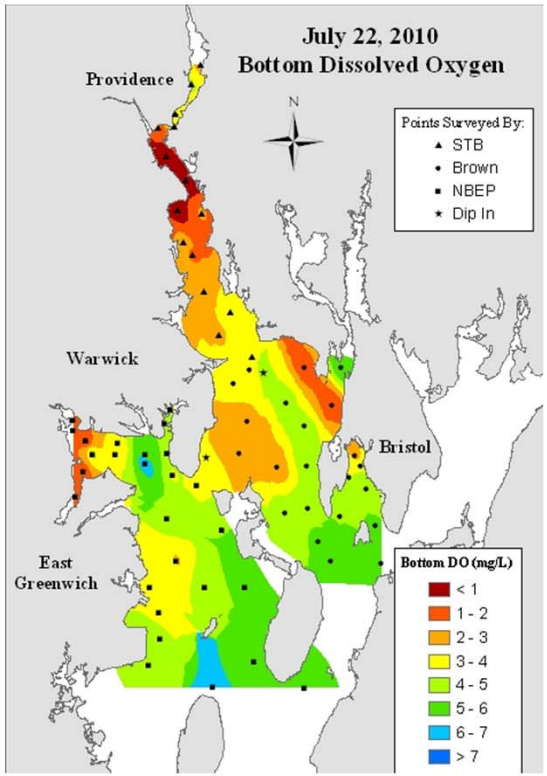
Mean DO
Standard Deviation
Minimum DO

Ordered by average DO

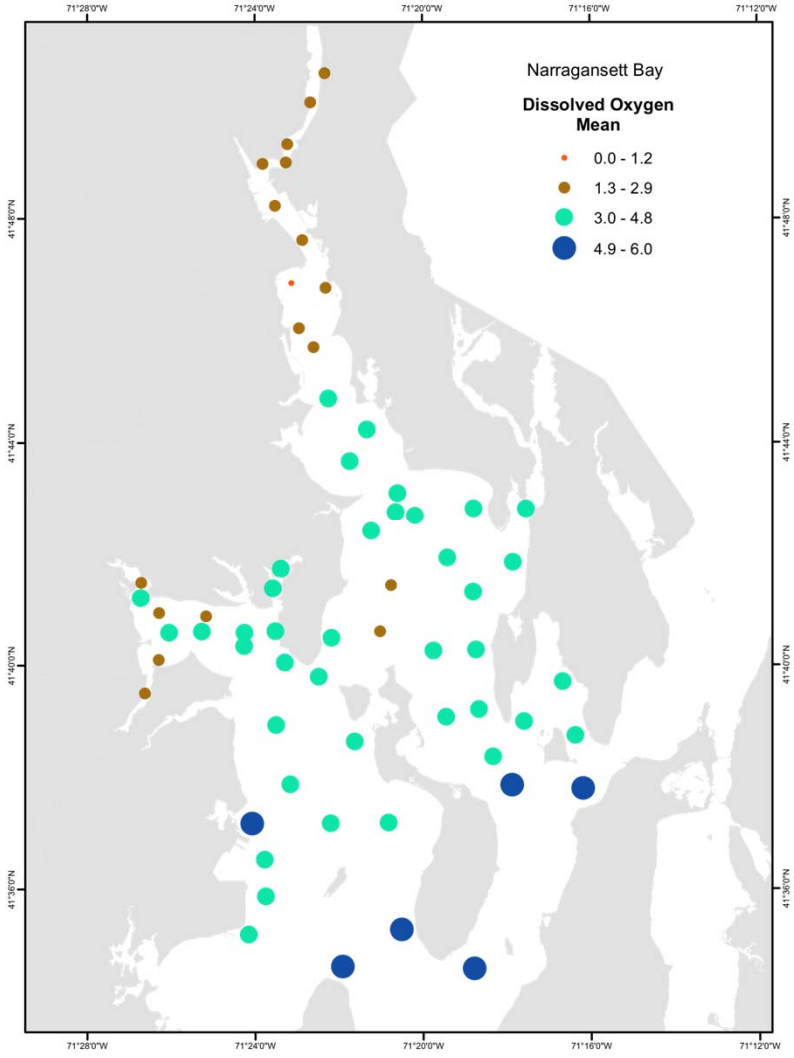
	%Mean	%Min
<1.2	2	67
<2.9	27	87
<4.8	88	97

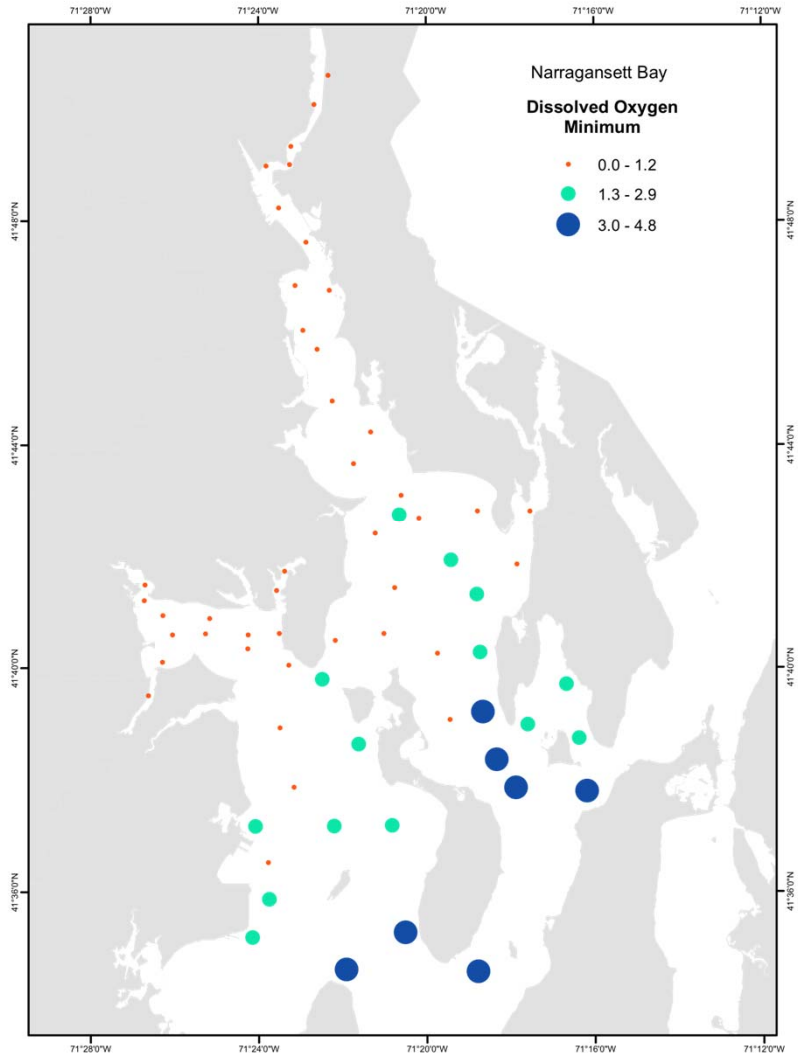
1999 – 2010
% of Area Surveyed that is Suboxic, Hypoxic or Severely Hypoxic
Area Surveyed ~140 -150 km^2



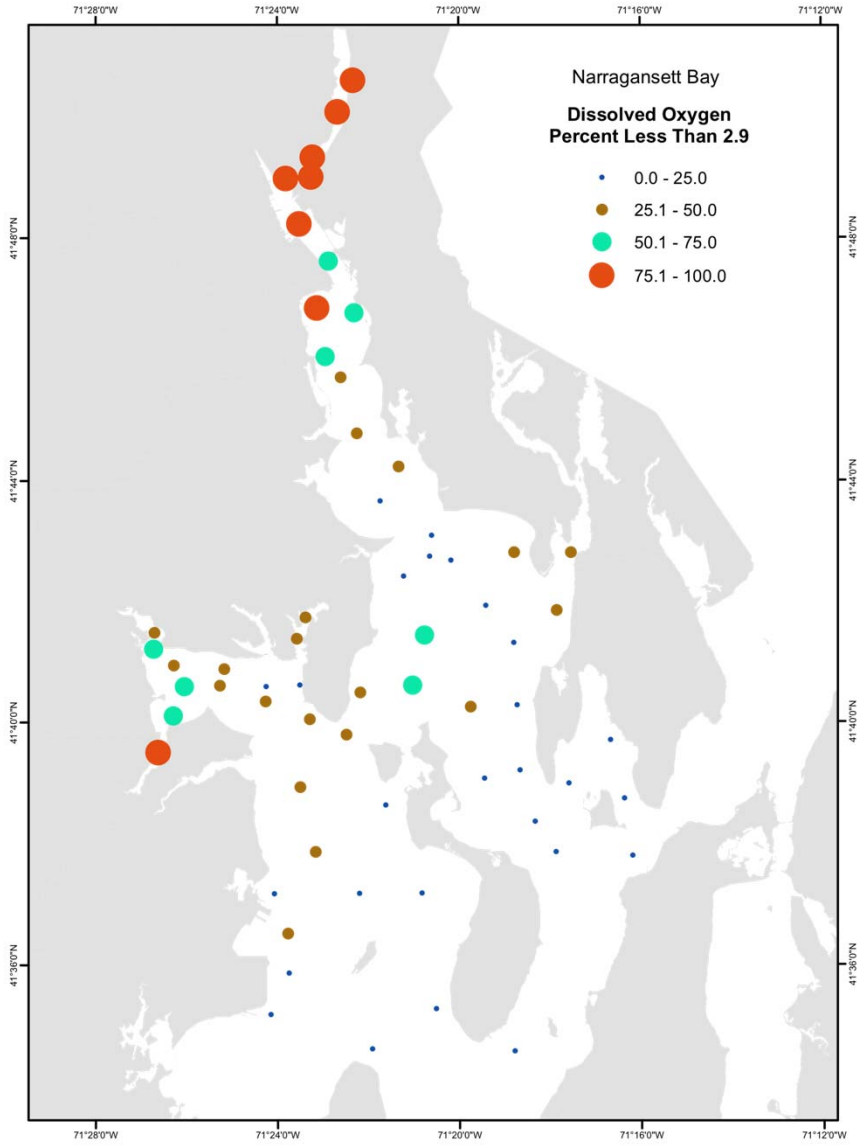


Mean and Minimum July-August DO





Percent of July-August surveys with mean DO <2.9 mg/L



Upper Providence River and western Greenwich Bay average <2.9 mg/L more than half of the July-August surveys

Much of the upper Bay (other than the deep shipping channel) and Greenwich Bay averages <2.9 mg/L at least 25% of the July-August surveys

Summary of the spatial extent of summer DO in Narragansett Bay

- Low DO events occur predominately in July and August with June and September transitional.
- Low DO events are episodic, with large inter-annual variation.
- The spatial pattern of low DO is systematic and covers much of the Providence River, the upper Bay, Greenwich Bay, and extends into the West Passage.

Next steps:

- Relate temporal buoy data to spatial patterns
- Develop a more robust statistical definition of the spatial footprint of hypoxia
- Better relate the distribution of hypoxia with physical and biological forcing