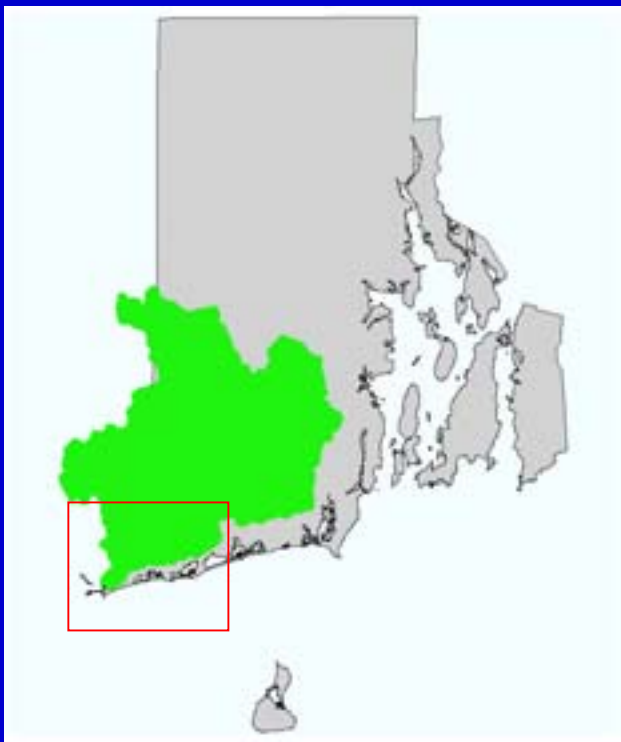


Quantifying Nutrient Export from the Pawcatuck Watershed to Little Narragansett Bay



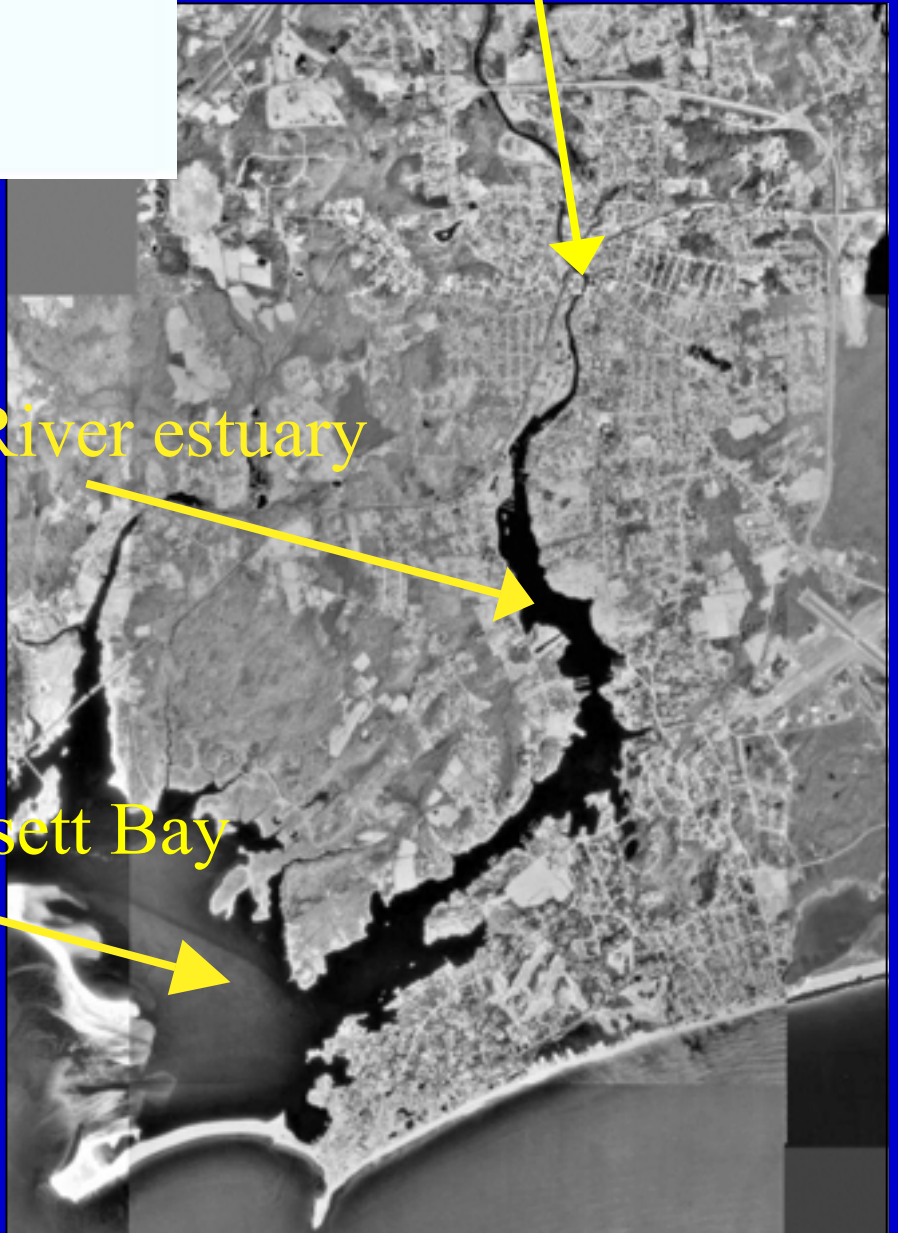
Robinson Fulweiler
Scott Nixon
Betty Buckley
Stephen Granger
December 9, 2002



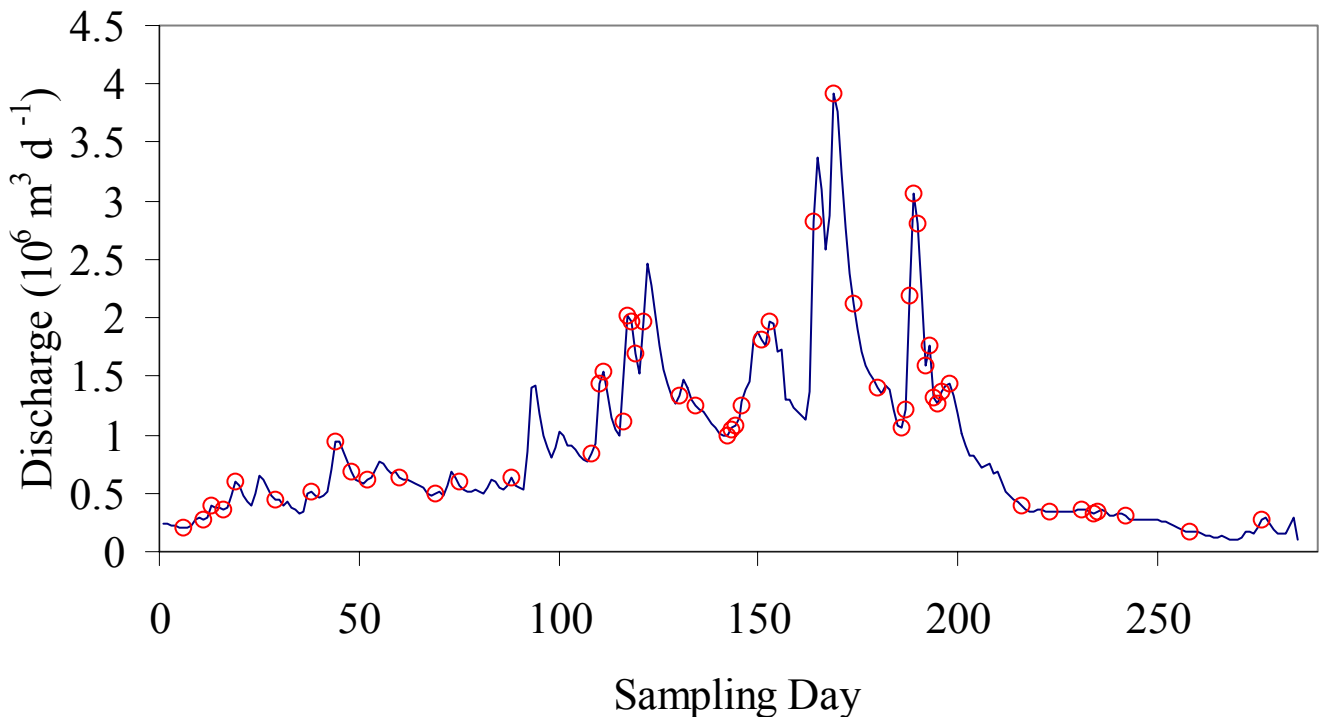
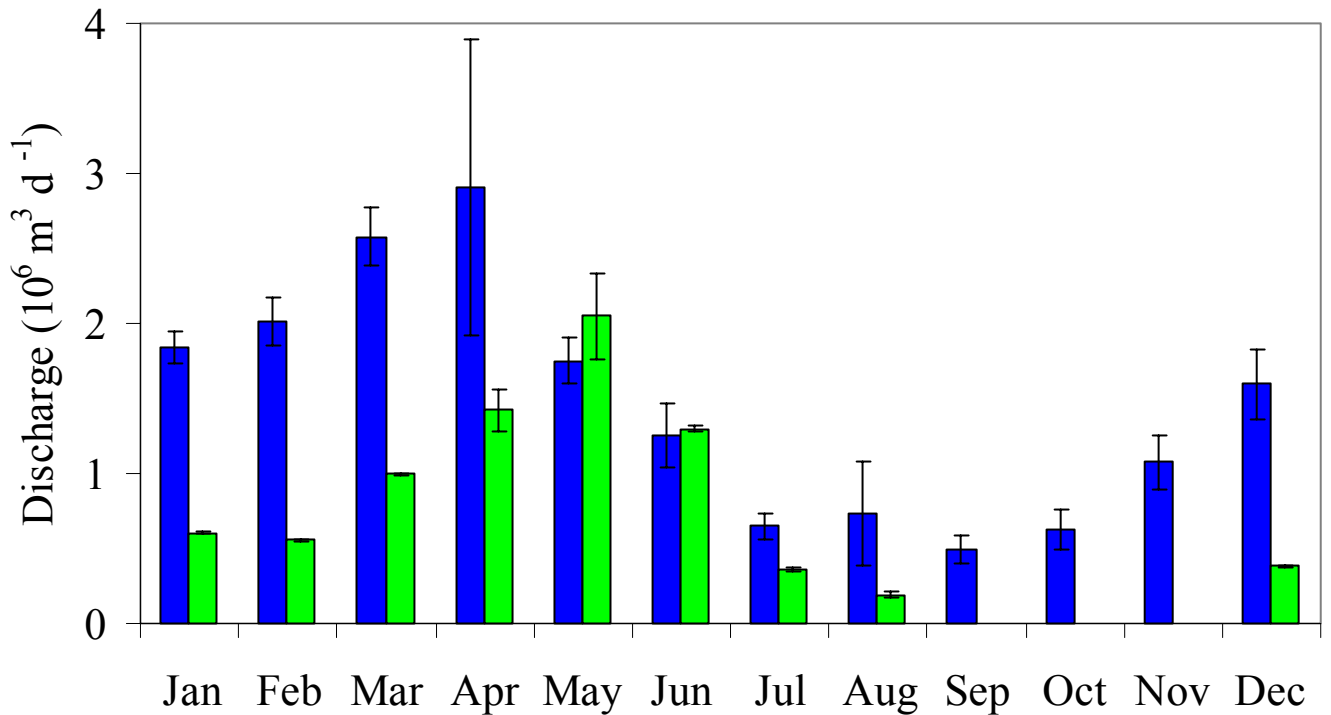
USGS Flow Gage
and Sampling Site

Pawcatuck River estuary

Little Narragansett Bay



Pawcatuck River Discharge at Westerly, R.I. December 6, 2001 – September 3, 2002



Pawcatuck Watershed Characteristics*

Drainage basin area (km²)	797
Agriculture (%)	8
Urban (%)	18
Forest (%)	61
Wetland (%)	13

Pawcatuck River**

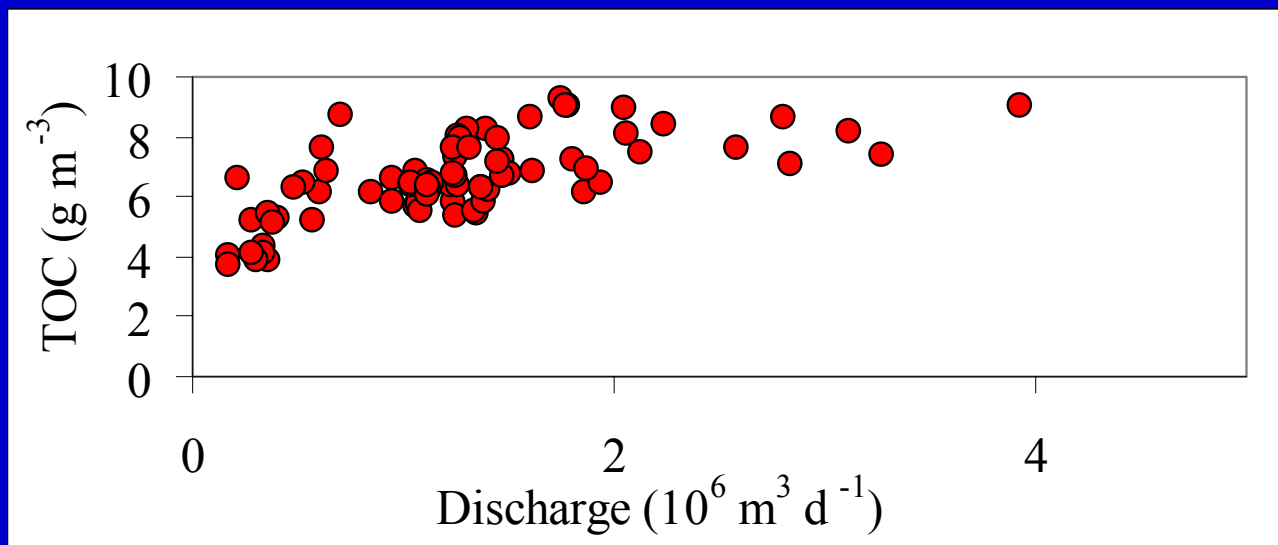
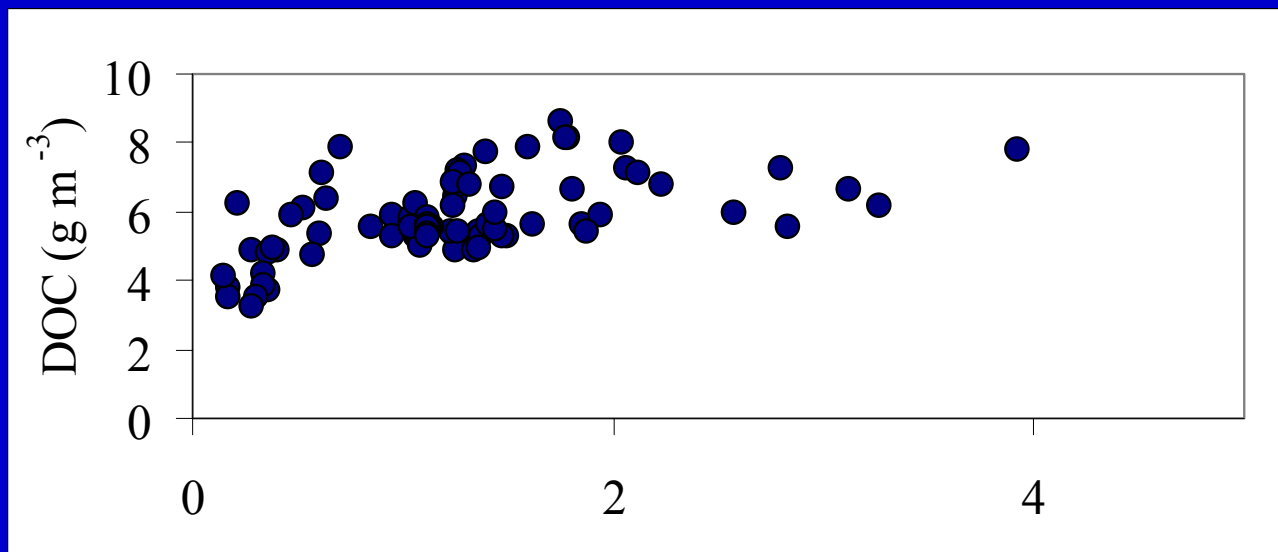
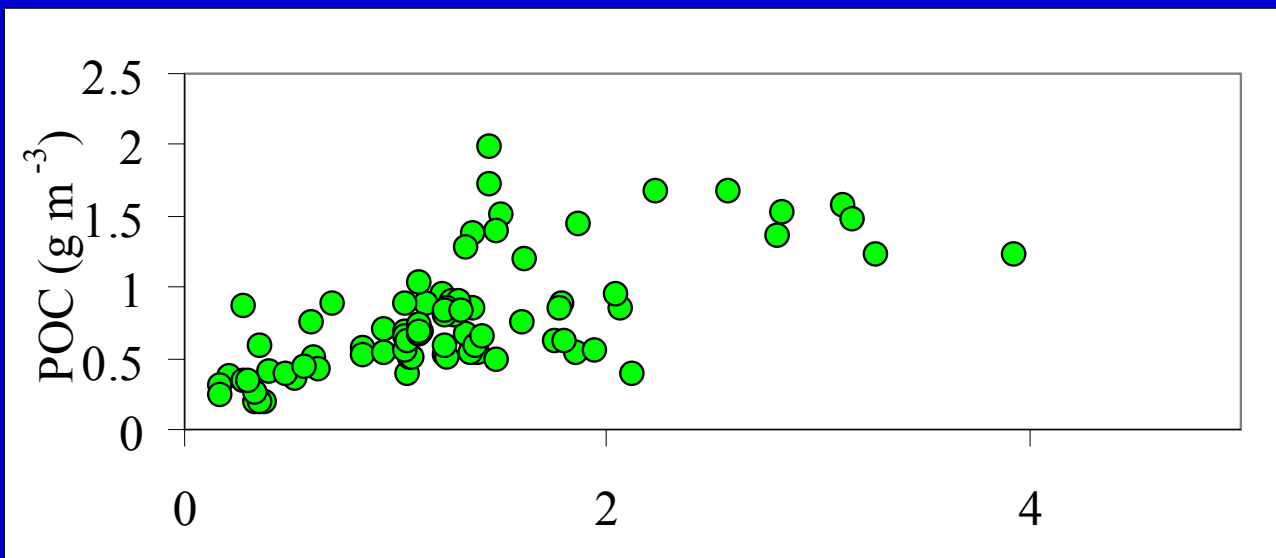
Length (km)	47
Mean annual discharge (1941-2000)	$1.4 \times 10^6 \text{ m}^3 \text{ d}^{-1}$

* Desbonnet, A. 1999

** USGS discharge data obtained from <http://waterdata.usgs.gov/nwis/annual>

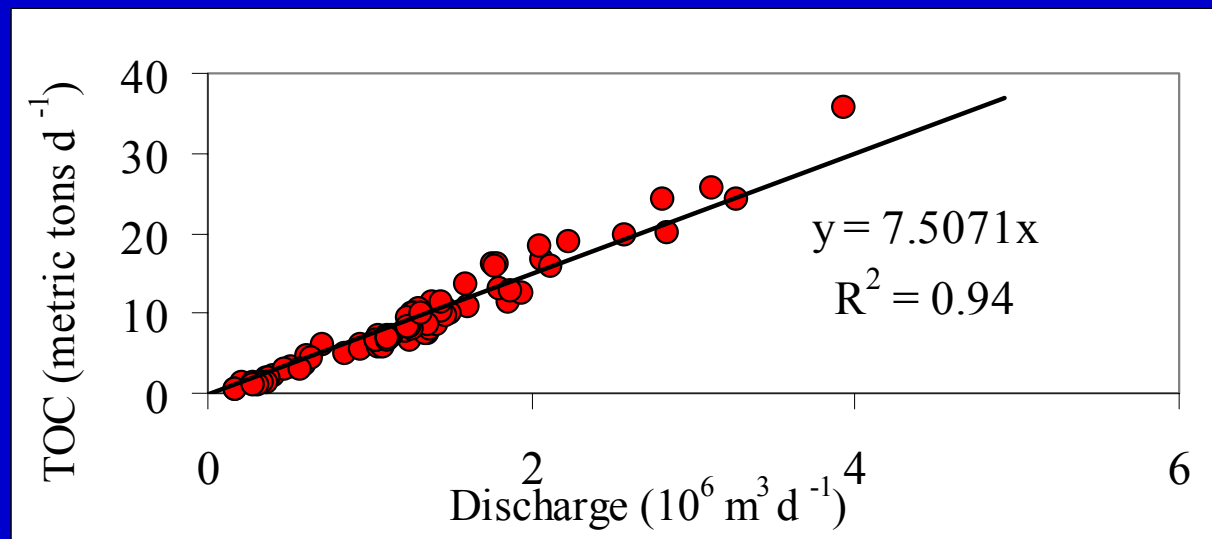
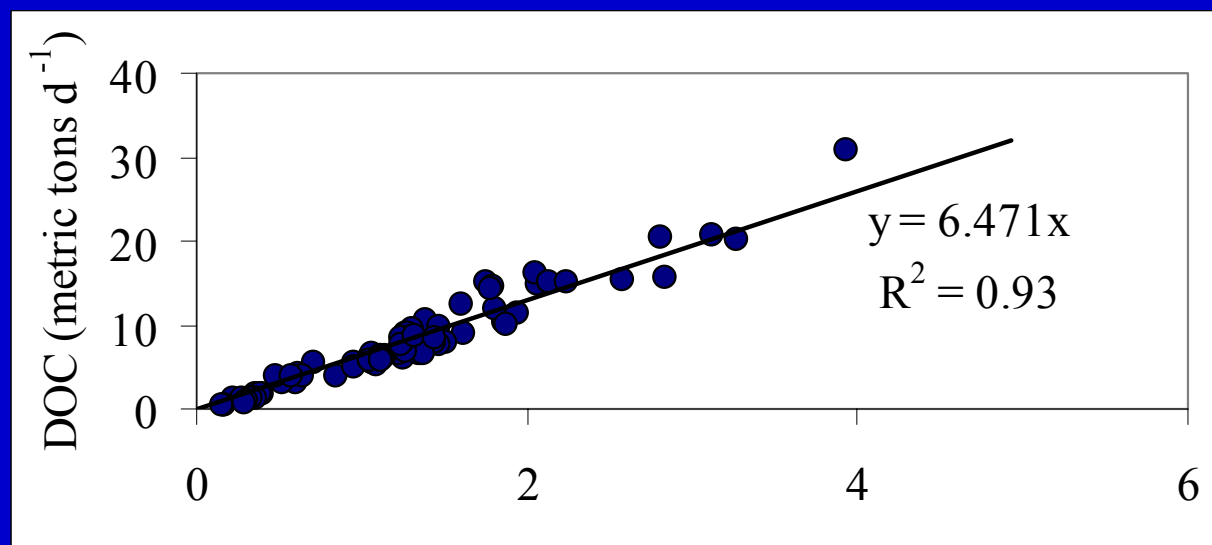
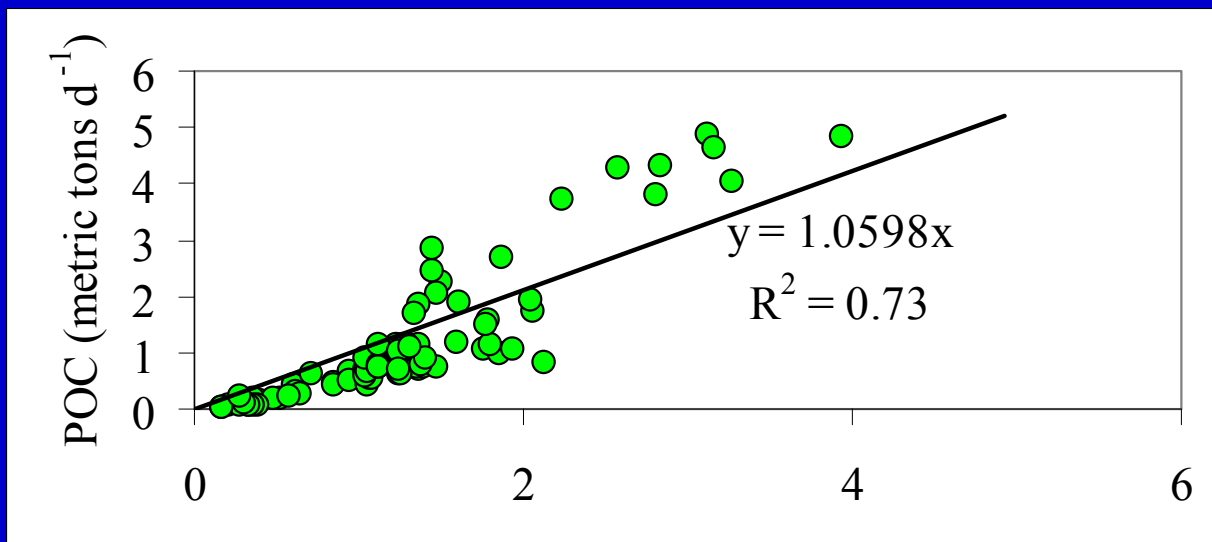


Organic Carbon Concentrations at Westerly, R.I. 12/6/01 – 9/3/02

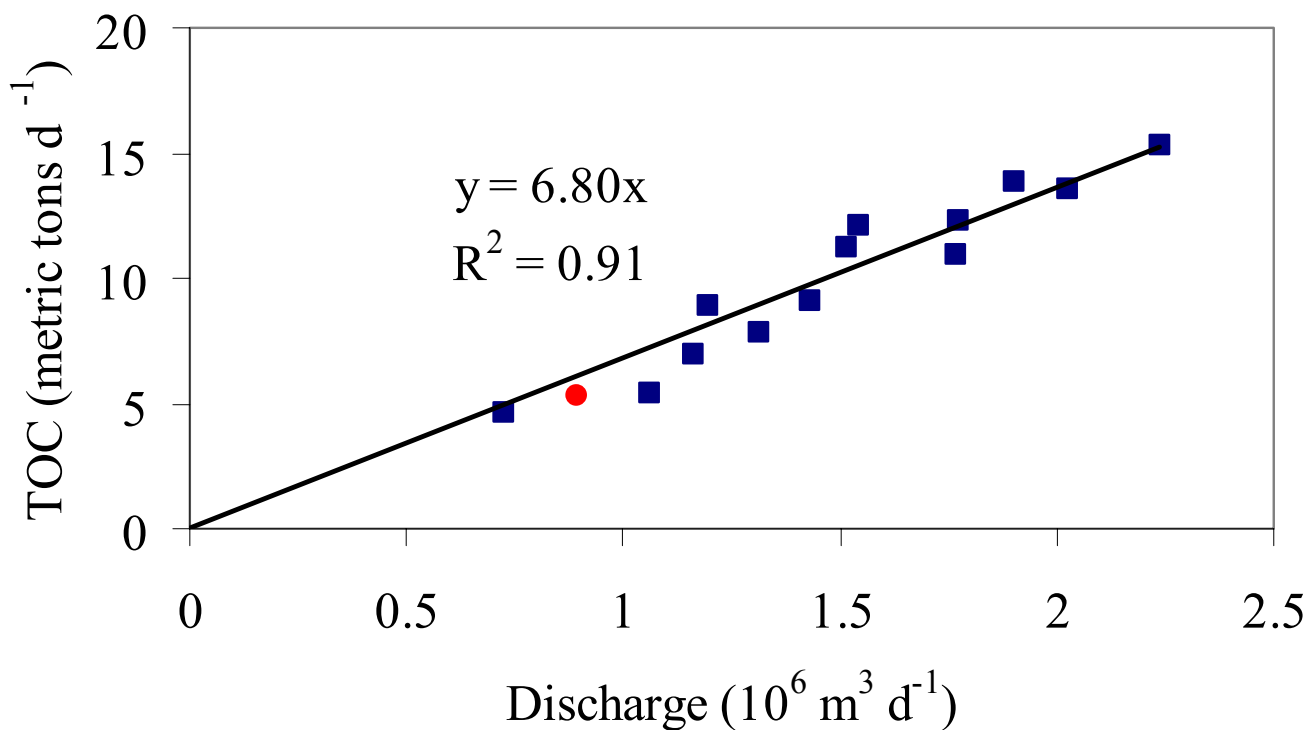
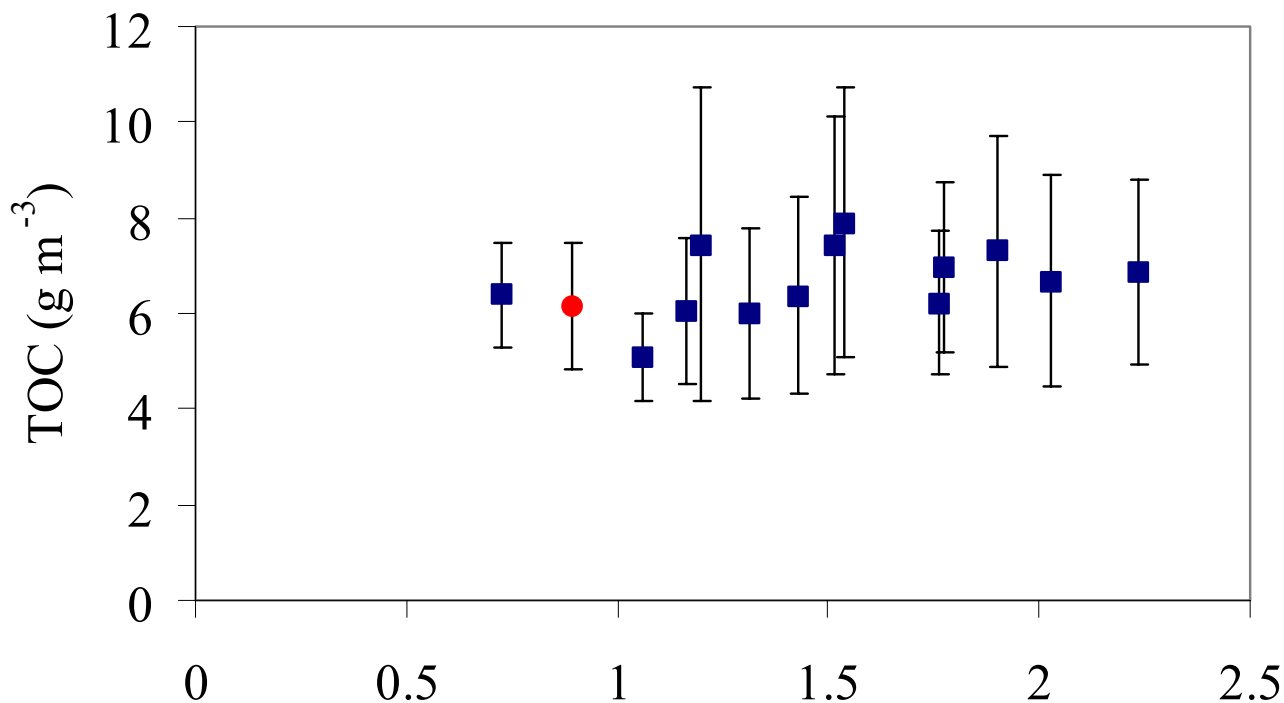


Organic Carbon Flux at Westerly, R.I.

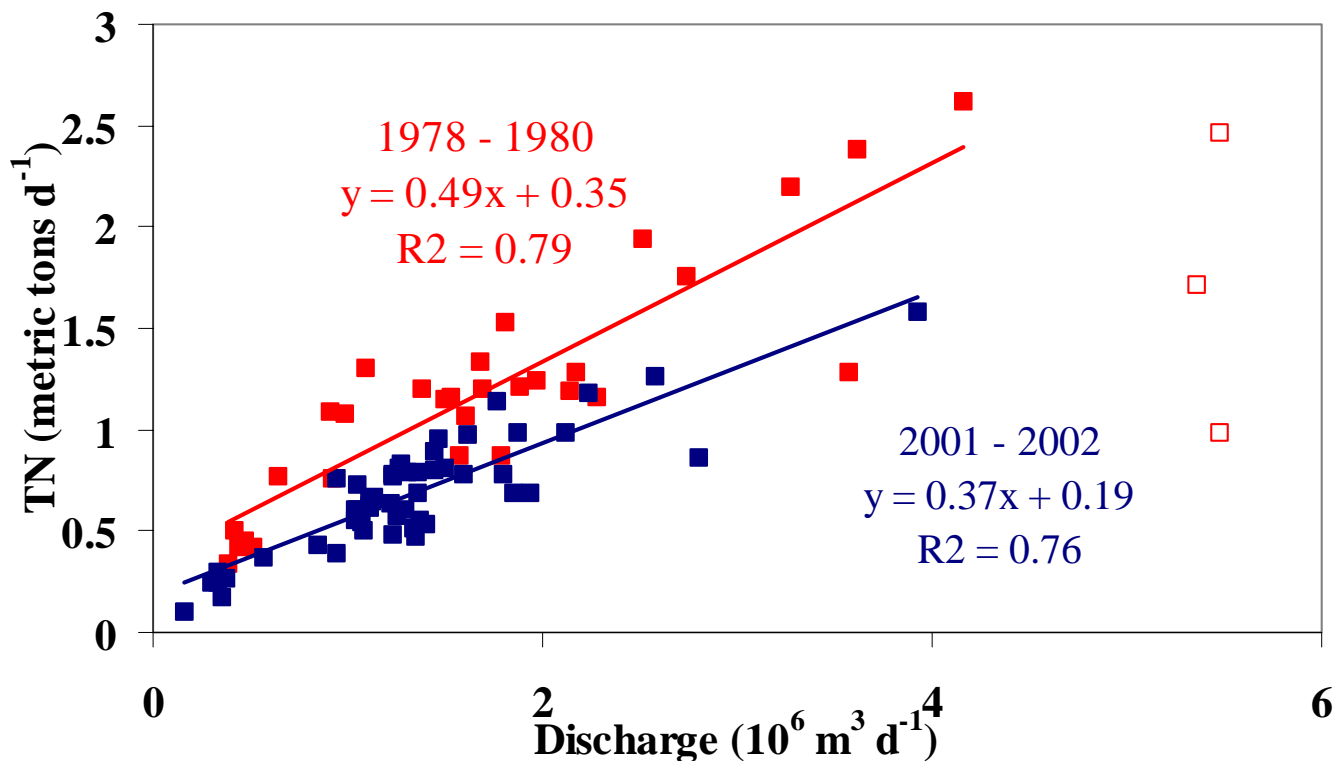
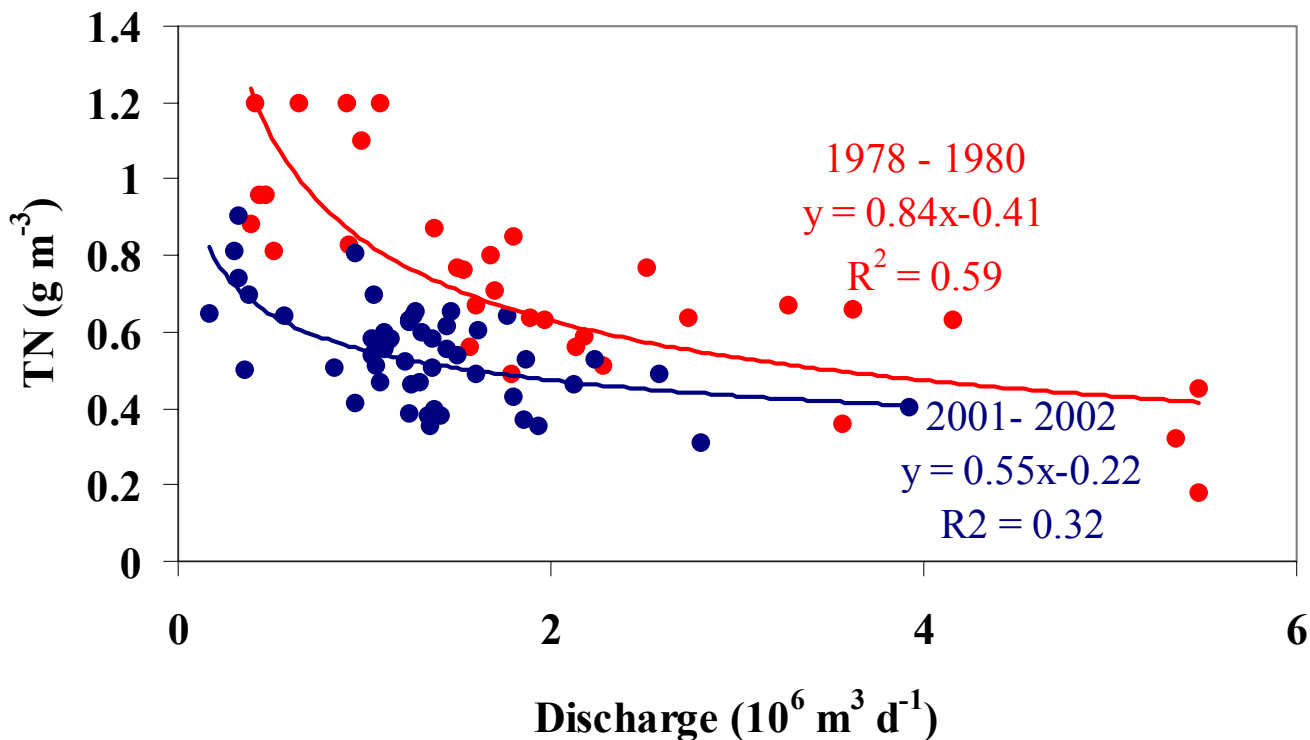
12/6/01 – 9/3/02

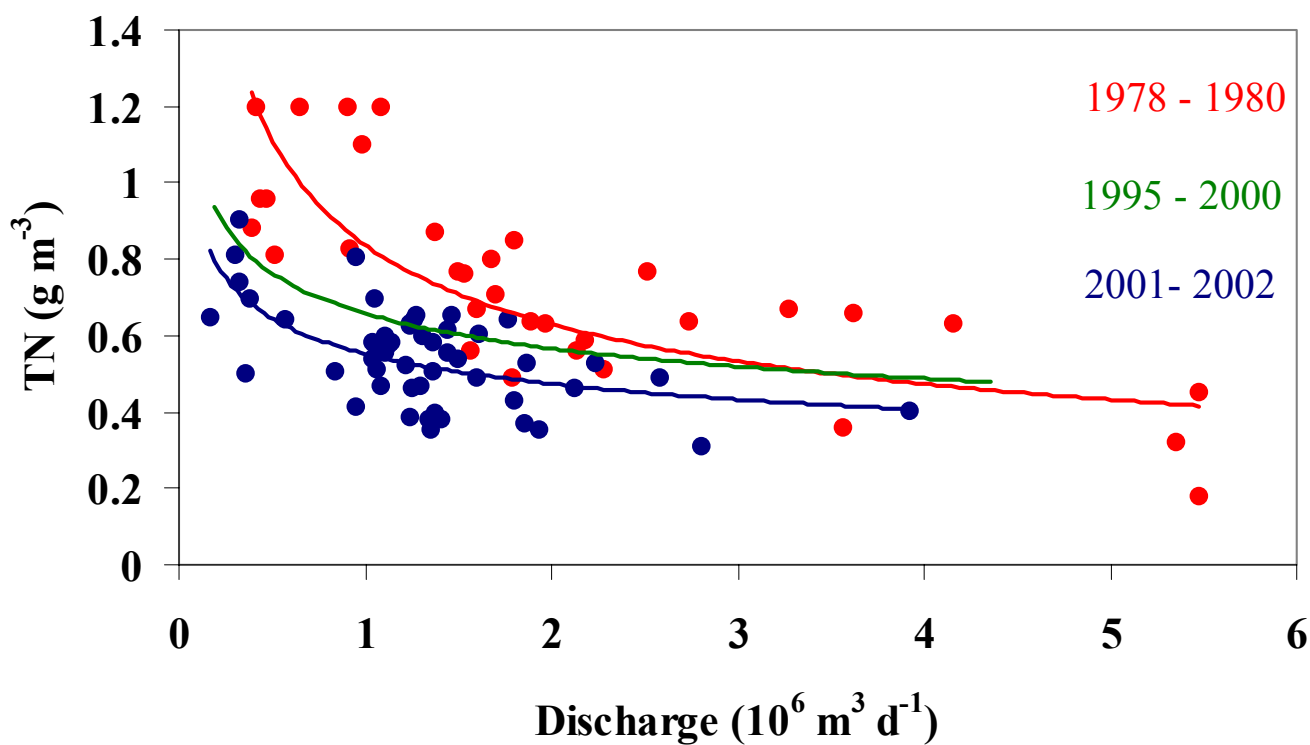


USGS Annual Carbon trends at Westerly, R.I. 1977 - 1990



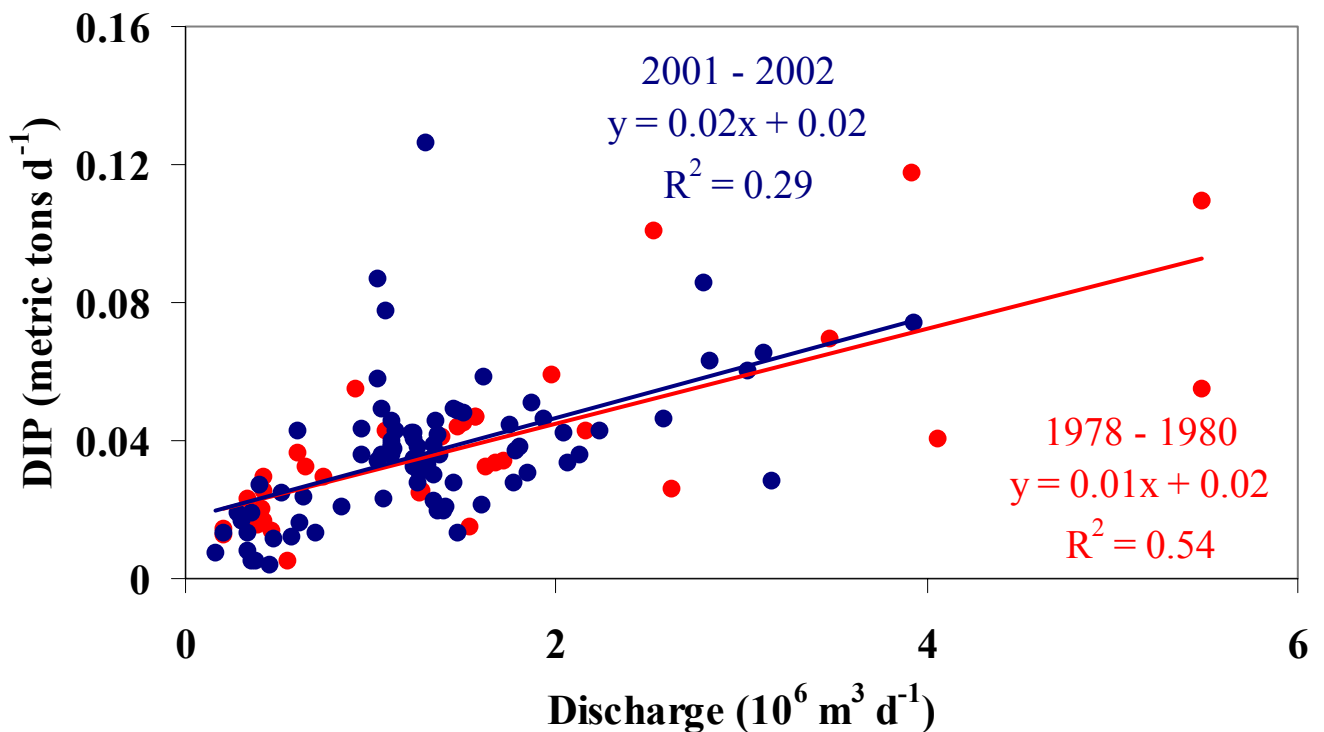
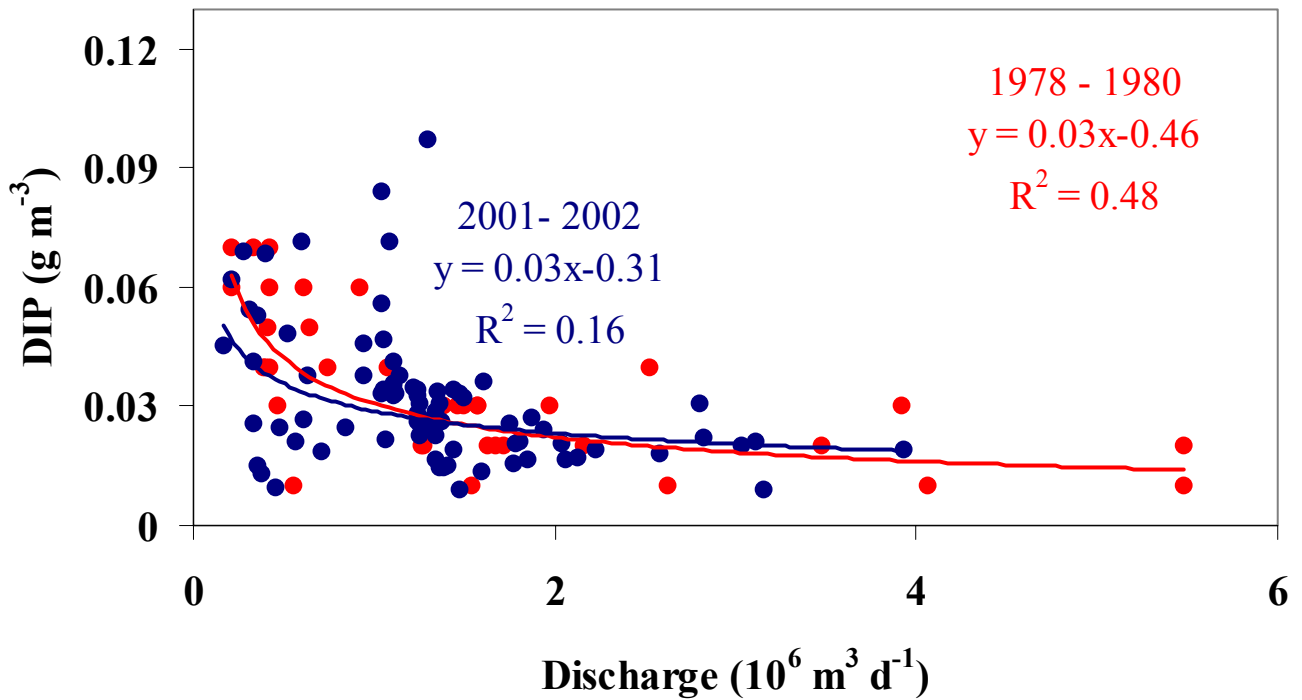
Total Nitrogen trends at Westerly, R.I.

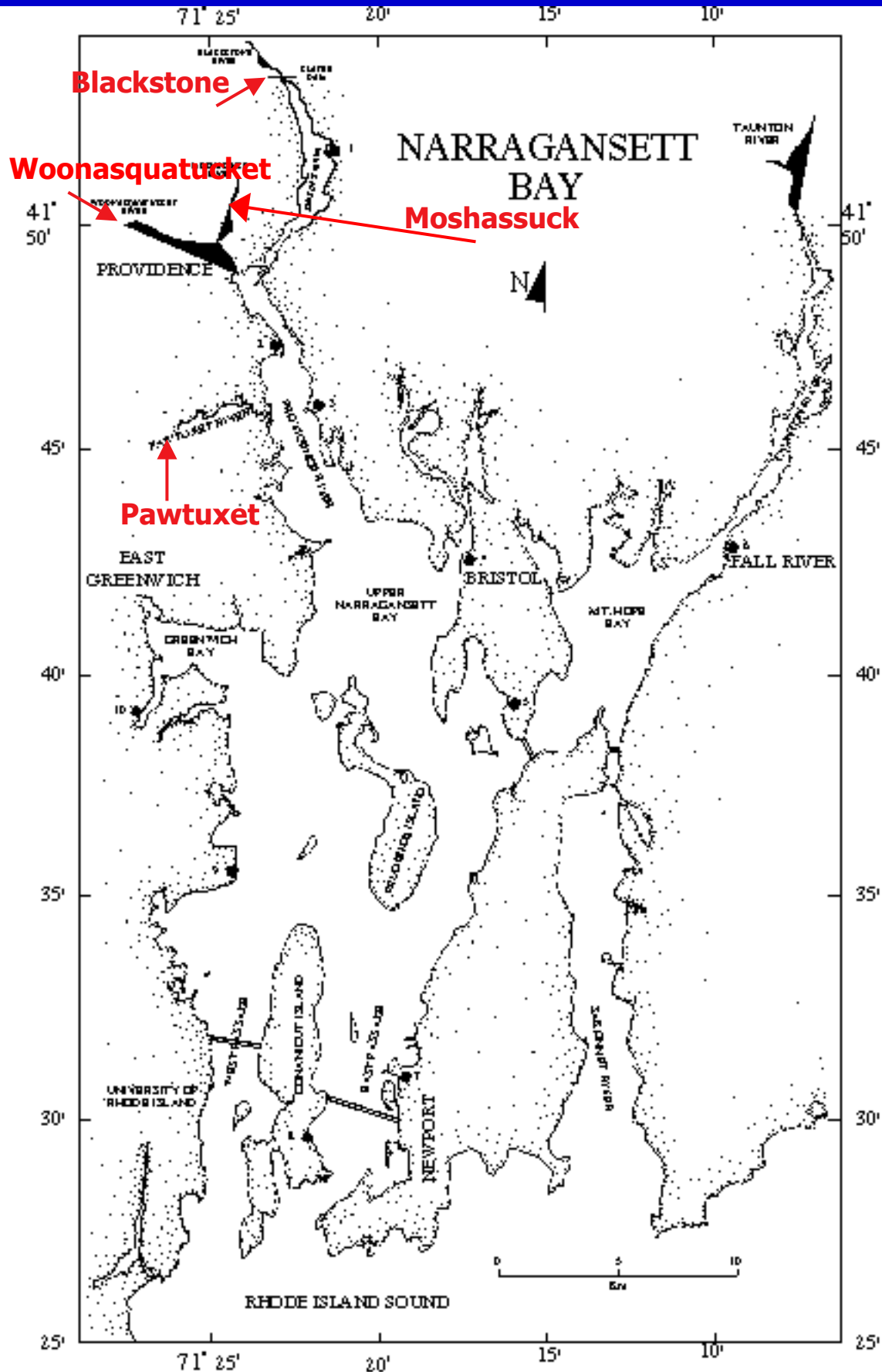




Atmospheric Deposition	1980	1995
Hubbard Brook ($\text{NH}_3 + \text{NO}_3 \text{ mg/L}$)	2.15	2.08
	1980	2001
Watershed Population	61,409	84,934
R.I. Fertilizer Usage (tons per year)	9,960	17,659
	1980	1998
Est. Forest Coverage (cubic feet per acre)	1148	1574

Dissolved Inorganic Phosphorus trends at Westerly, R.I.





R.I. Watershed Characteristics:

River	Blackstone*	Pawcatuck	Pawtuxet
Length (km)	77	47	26
Drainage basin (km ²)	1416	797	601
Agriculture	-	8	4
Urban	12	18	26
Forest	50	61	51
Wetland	2	13	11

* Dash (-) indicates that the data were unavailable

River	Woonasquatucket	Moshassuck
Length (km)	30	16
Drainage basin (km ²)	141	60
Agriculture	5	3
Urban	38	50
Forest	34	25
Wetland	10	10

Comparative Loss of Organic Carbon from R.I. Watersheds

RI River	Watershed (km²)	C loss (g m⁻² y⁻¹)
Blackstone	1222	4.58
Pawtuxet	601	5.10
Woonasquatucket	134	4.66
Moshassuck	61	3.94
Pawcatuck	797	4.66

Comparison of DIN and DIP Export from R.I. Watersheds:

	DIN $\text{mg m}^{-2} \text{y}^{-1}$	DIP $\text{mg m}^{-2} \text{y}^{-1}$
Blackstone	1100	70
Pawtuxet	1070	230
Woonasquatucket	695	40
Moshassuck	780	30
Pawcatuck	130	5

Comparison of Measured Nitrogen Exports from the Pawcatuck Watershed to Inputs estimated by the MANAGE Model:

Input to Watershed:

	Kmoles N d⁻¹
Surface water	52.6
Groundwater	118.5
Total	170.6

Export from Watershed:

Pawcatuck River*	
Average	30.6
Study year Linear Regression	11.6
Beale's unbiased estimator	20.4

*Based on DIN only

Nitrogen Export from the Pawcatuck Watershed

Linear Regression:

Kmoles N d⁻¹

Based on sixty year mean discharge

18.9

Based on highest discharge

29.9

Acknowledgements:

R.I. Sea Grant

Coastal Resources Center

Andrew Staroscik

David Smith

Alan Desbonnet

Linda Comeau, USGS, Hydrologic Technician

