

Long-term Water Quality Trends in the Delaware Estuary from the DRBC Boat Run Database

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DRBC Boat Run

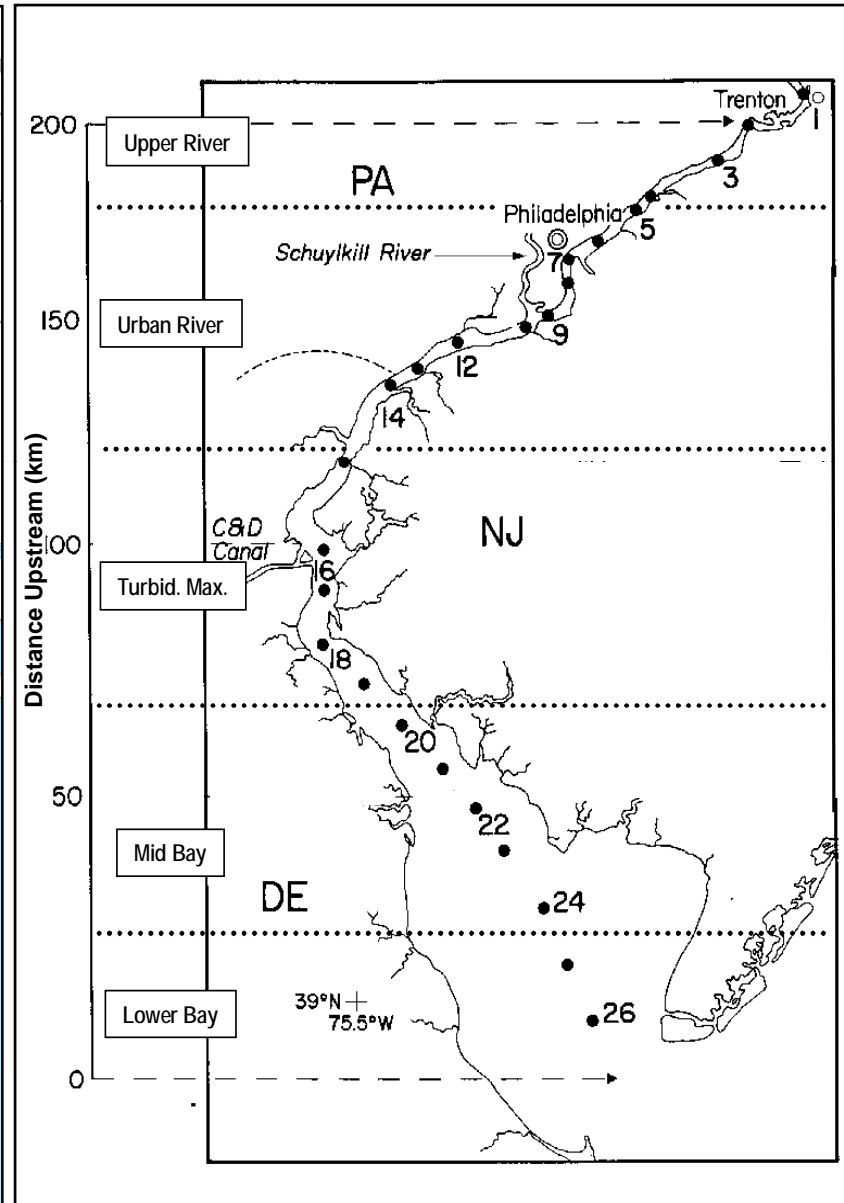
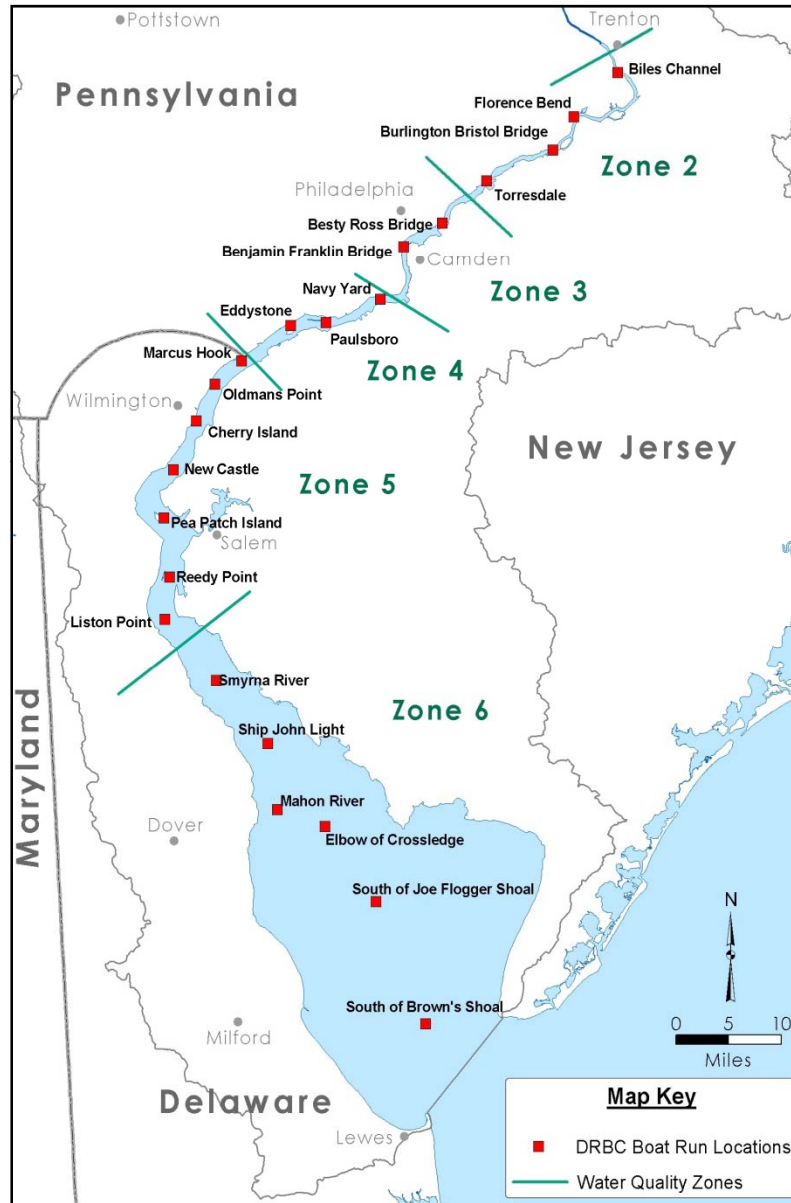
- 1967 - present
- Sampling:
 - March - November
 - at slack water (1 day)
 - 1-3 times a month
- Extensive array of water quality parameters

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- 1978 - present
- Sampling:
 - irregular
 - multiple day cruises
 - 1-13 cruises per year
- Additional parameters, sampling is guided by research aim

Combined, these databases form a long-term continuous reliable record of the Delaware Estuary water biogeochemistry and can be extremely valuable for researchers.

DRBC Boat Run Sampling Stations



DRBC Boat Run at EPA STORET Database

- Legacy STORET (1967-1998)
 - Data available via Delaware State archives in “None Assigned” folder
- Modern STORET (1999-2008)
 - Data available by email; requires knowledge of Organization ID, station name/number, specific routine parameter
- WQX (2008-present)
 - Newest data reporting system
- Future improvements:
 - One website for the entire database
 - Editing to convert it to a more user-friendly format

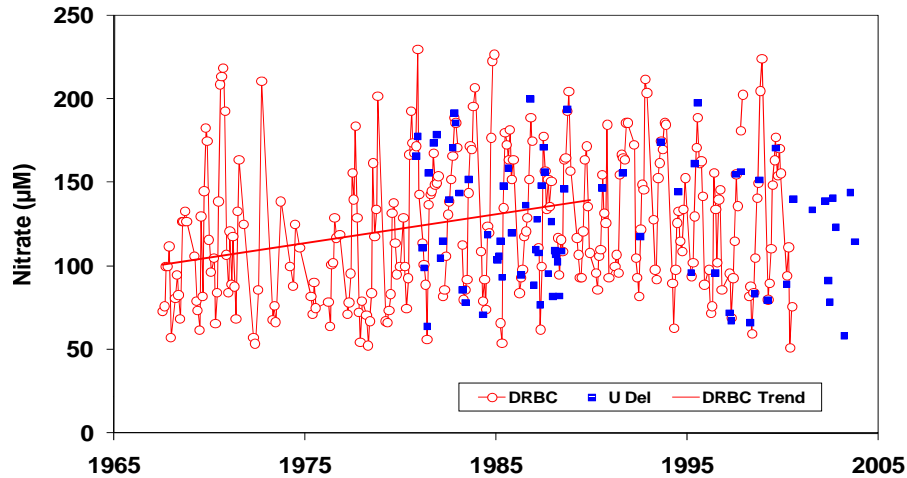
Changes in Regular Sampling Stations

Station ID	Station Name	River Mile	Primary Type	Latitude	Longitude
332068	Biles Channel (RM 131.04)	131.04	River/Stream	40.18	-74.75
332061	Fieldsboro (RM 127.5)	127.5	River/Stream	40.14	-74.87
332064 332058	Florence Bend (RM 122.4)	122.4	River/Stream	40.12	-74.83
892080	Burlington Bristol Bridge (RM 117.8)	117.8	River/Stream	40.08	-74.87
892077	Torresdale (RM 110.7)	110.7	River/Stream	40.04	-74.99
892070	Betsy Ross Bridge (RM 104.75)	104.75	River/Stream	39.98	-75.07
892071	Benjamin Franklin Bridge (RM 100.2)	100.2	River/Stream	39.95	-75.14
892065	Navy Yard (RM 93.2)	93.2	River/Stream	39.88	-75.18
332052	Paulsboro (RM 87.9)	87.9	River/Stream	39.85	-75.26
892062	Eddystone (RM 84.0)	84	River/Stream	39.85	-75.34
332049	Marcus Hook (RM 78.1)	78.1	River/Stream	39.80	-75.43
332046	Oldmans Point (RM 74.9)	74.9	River/Stream	39.77	-75.47
91011	Cherry Island (RM 71.0)	71	River/Stream	39.72	-75.51
91008	New Castle (RM 66.0)	66	River/Stream	39.65	-75.55
91005	Pea Patch Island (RM 60.6)	60.6	River/Stream	39.59	-75.56
91002	Reedy Island (RM 54.9)	54.9	River/Stream	39.51	-75.55
91015	Liston Point (RM 48.2)	48.2	Estuary	39.46	-75.56
91017	Smyrna River (RM 44.0)	44	Estuary	39.38	-75.47
91020	Ship John Light (RM 36.6)	36.6	Estuary	39.30	-75.38
91023	Mahon River (RM 31.0)	31	Estuary	39.21	-75.36
91026	Elbow of Crossledge Shoal (RM 22.75)	22.75	Estuary	39.17	-75.28
91028	South Joe Flogger Shoal (RM 16.5)	16.5	Estuary	39.08	-75.19
91030	South Brown Shoal (RM 6.5)	6.5	Estuary	38.93	-75.10

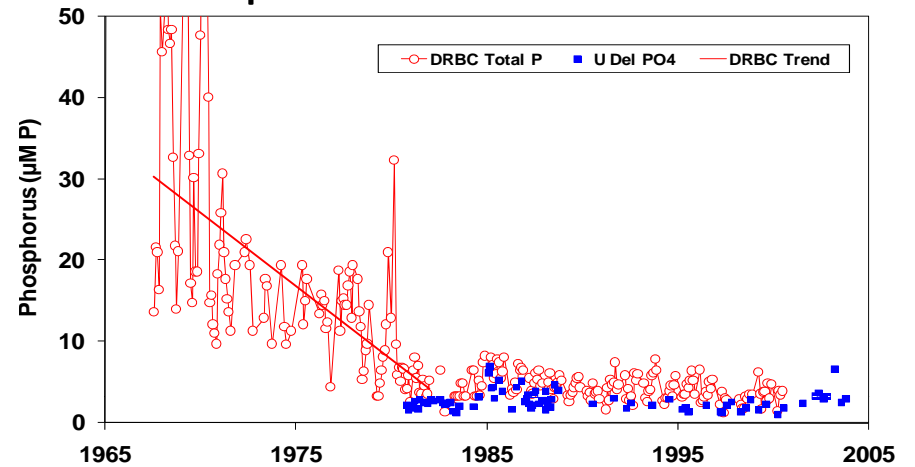
- Stations 332055, 892074 and 892068 and 91014 abandoned.

UD and DRBC Database Comparison: Nutrients

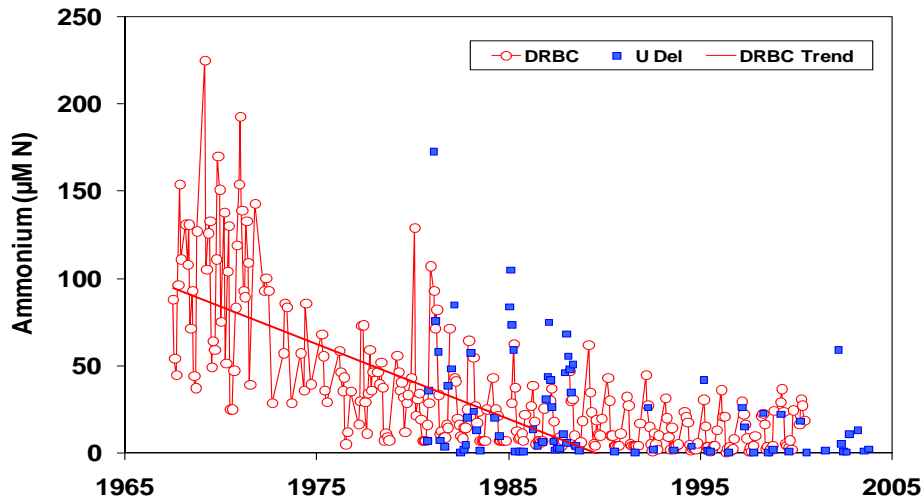
Nitrate



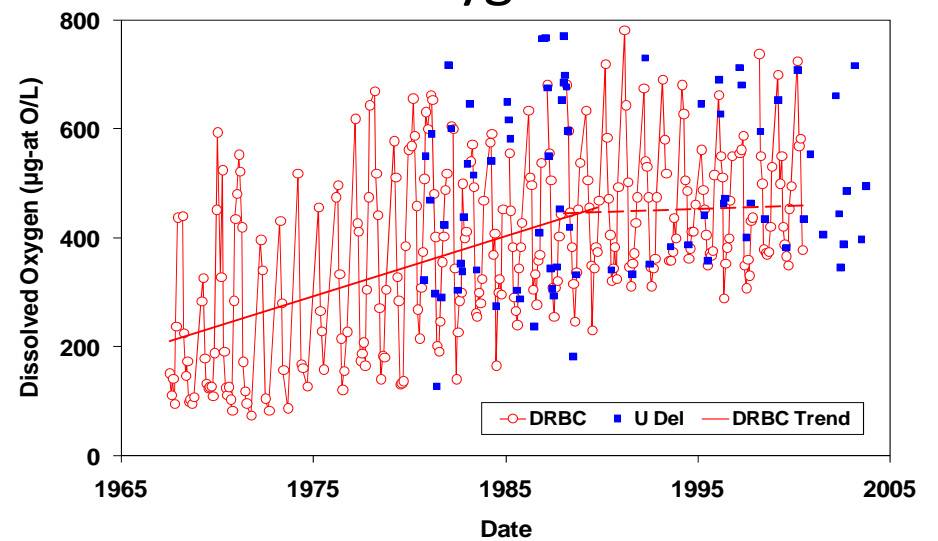
Phosphorus



Ammonium

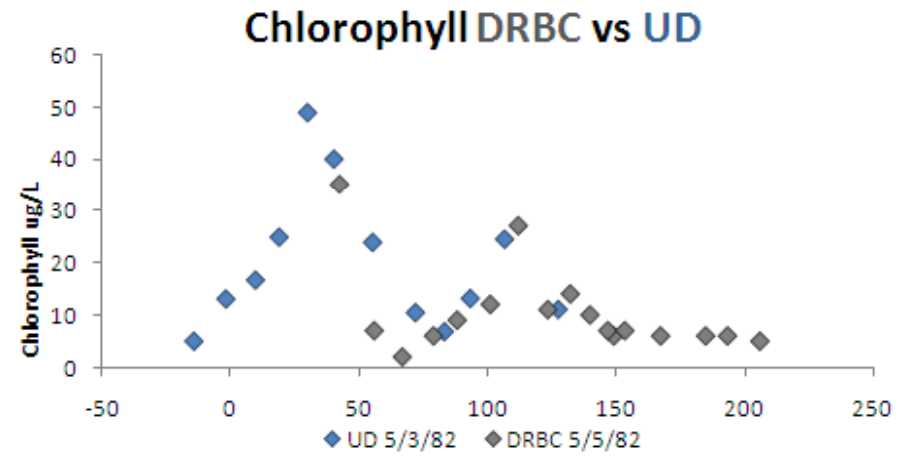


Dissolved Oxygen

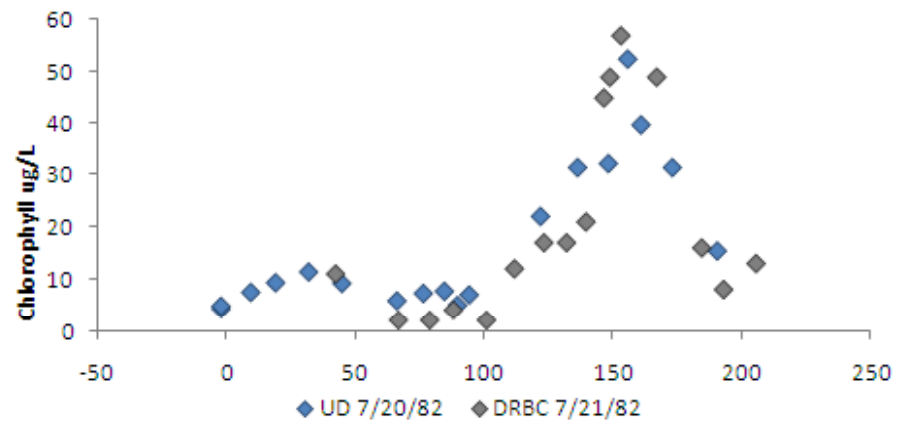


Database Comparison: Chlorophyll

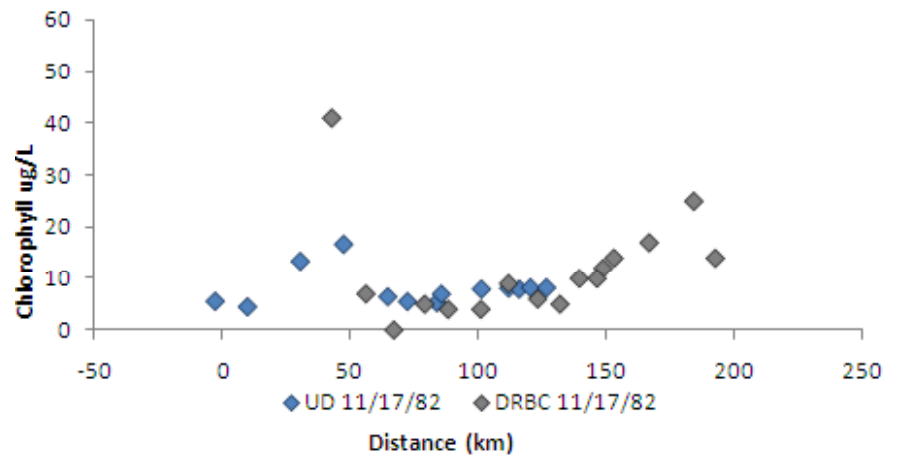
Spring



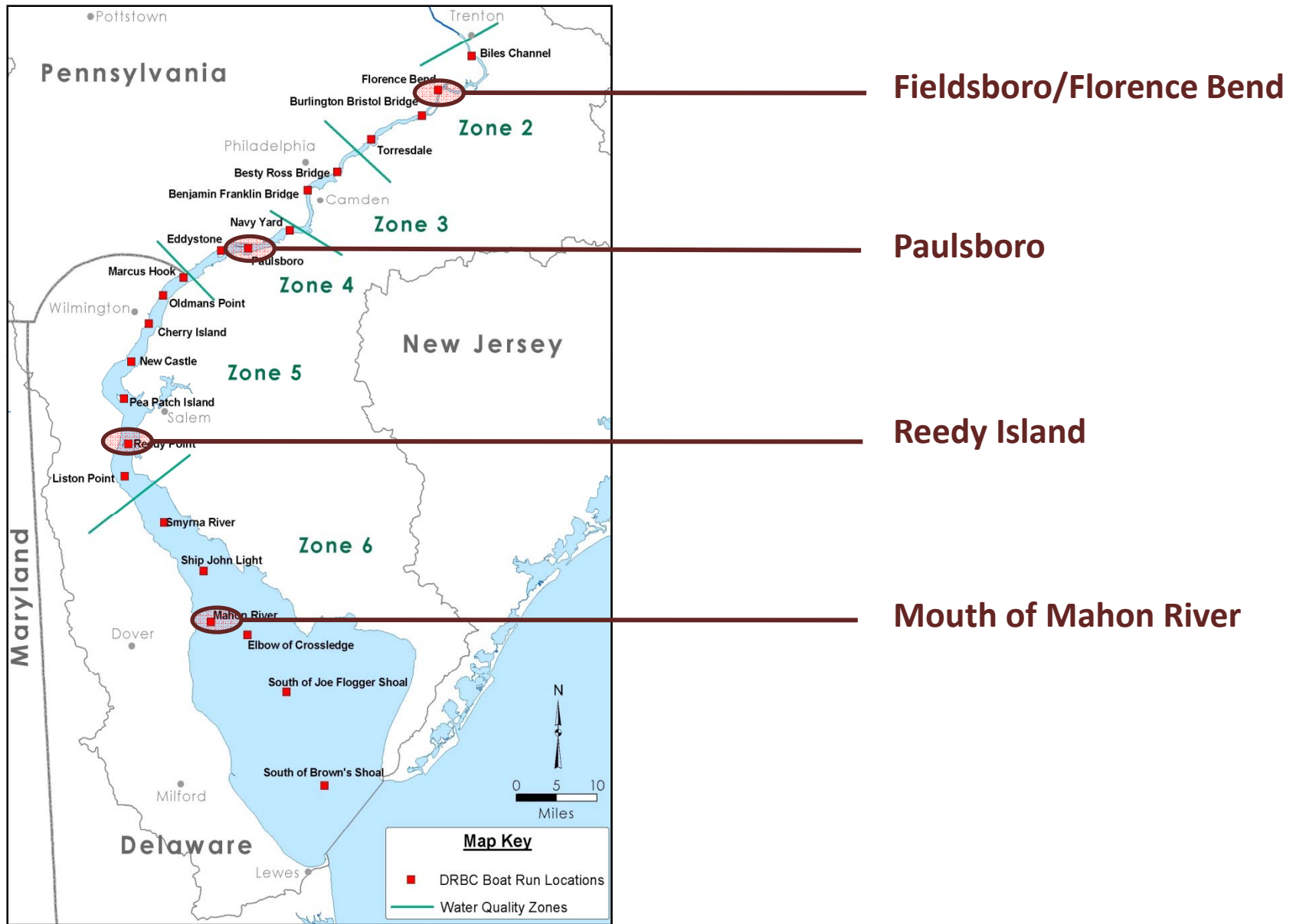
Summer



Fall

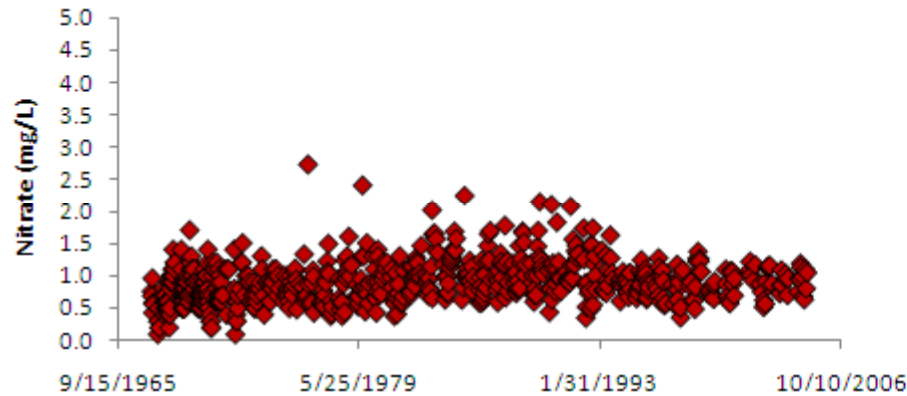


Average Parameter Plots: Focus on 4 Regular Sampling Stations

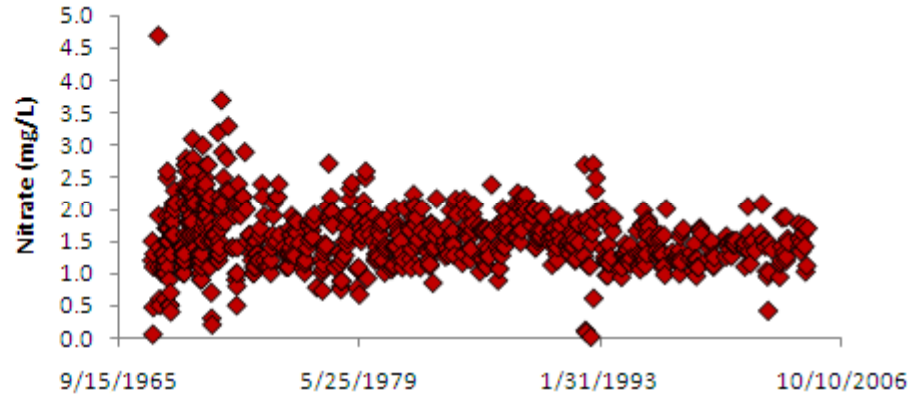


Average Parameter Plots - Nitrate

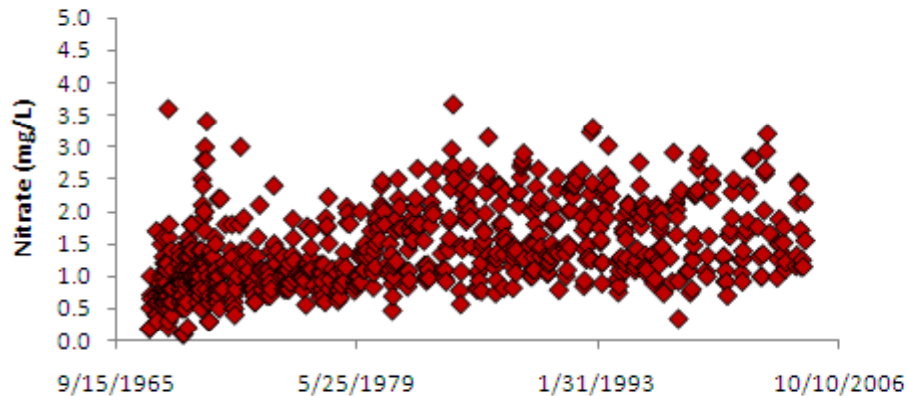
Fieldsboro



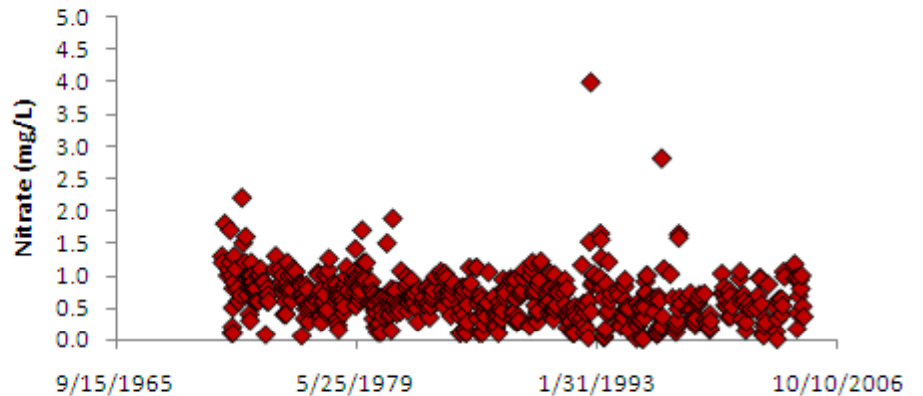
Reedy Island



Paulsboro



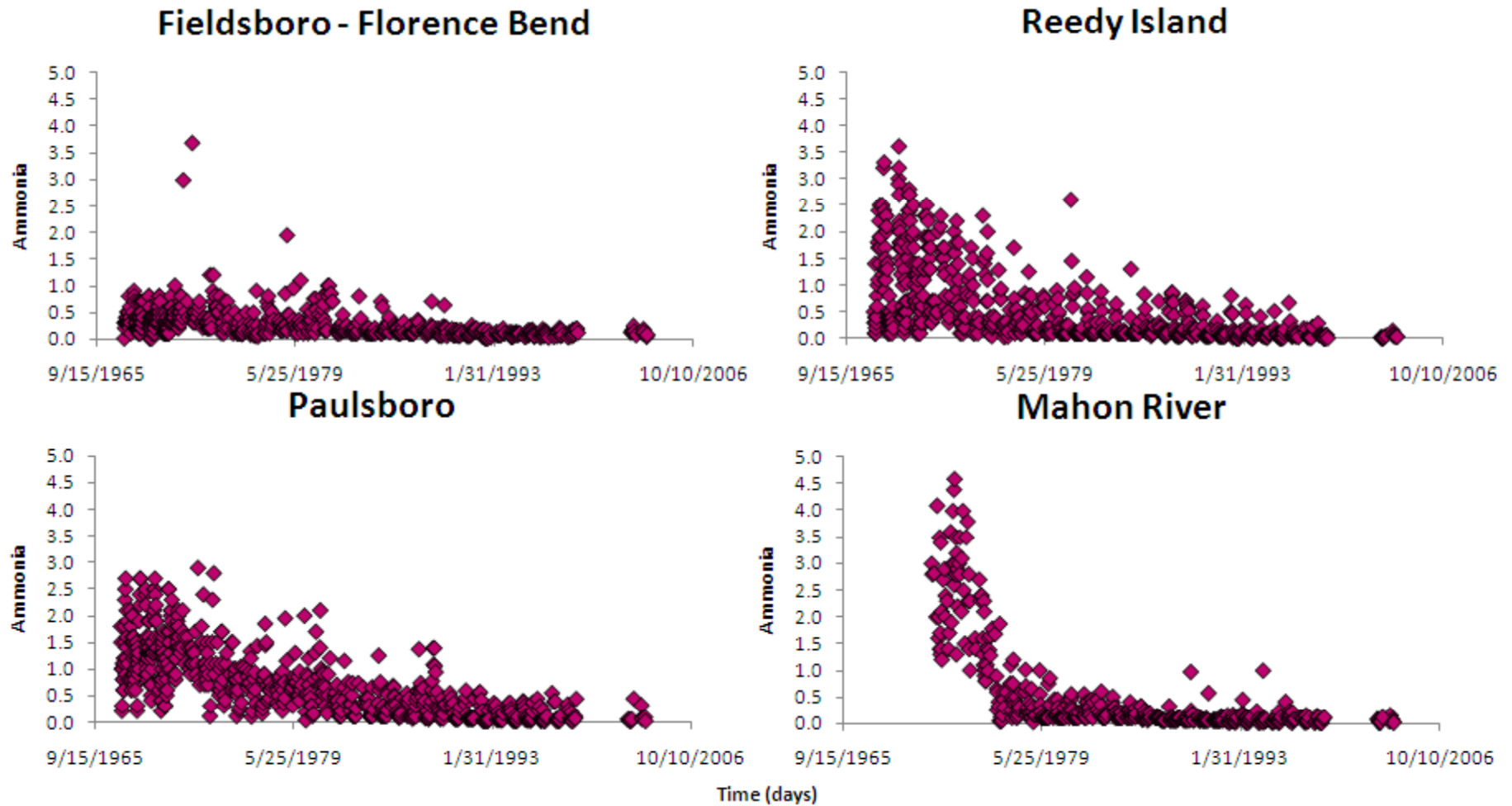
Mahon River



Time (days)

Nitrate is lower in the upper river region (Fieldsboro), increases in the urban region (Paulsboro) and is still high near Reedy Island (at the beginning of the salinity gradient), but is diluted in the mid and lower estuary regions (Mahon River).

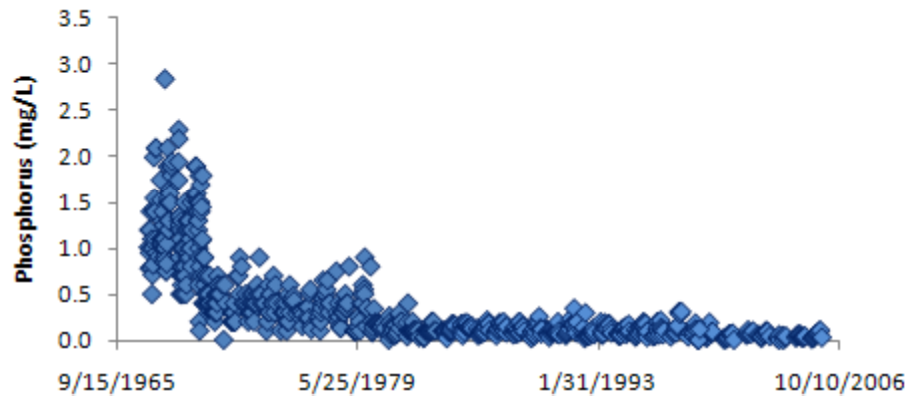
Average Parameter Plots - Ammonia



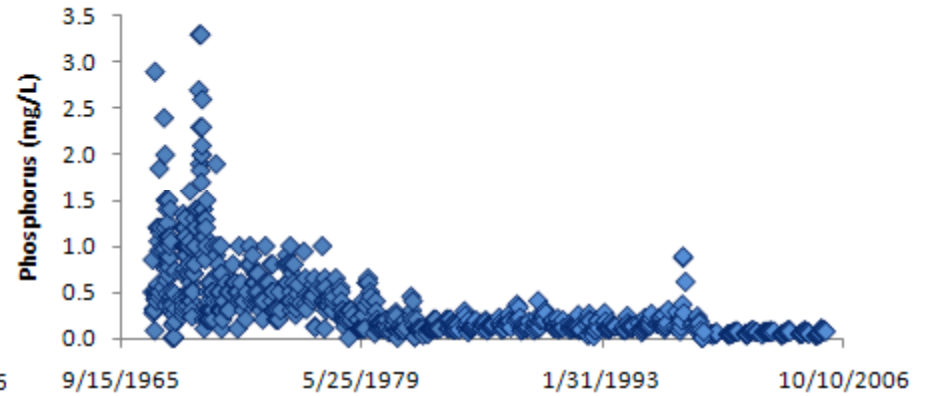
Generally, ammonia was higher in all stations before 1980. The high concentration in Mahon River in the 70s is an anomaly.

Average Parameter Plots - Phosphate

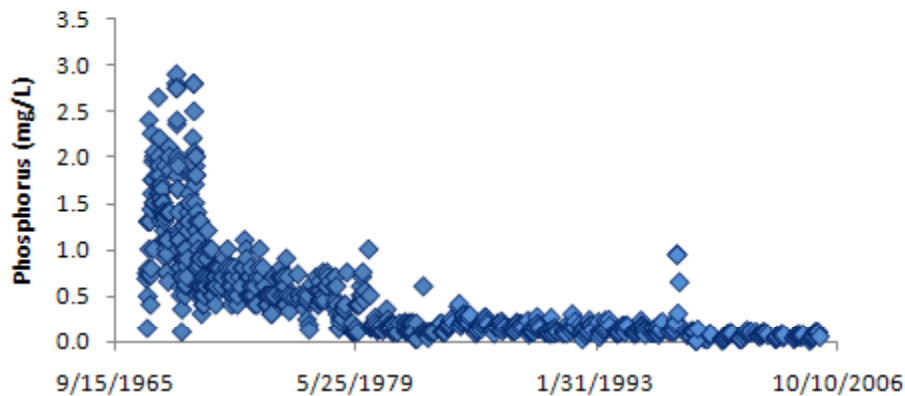
Fieldsboro



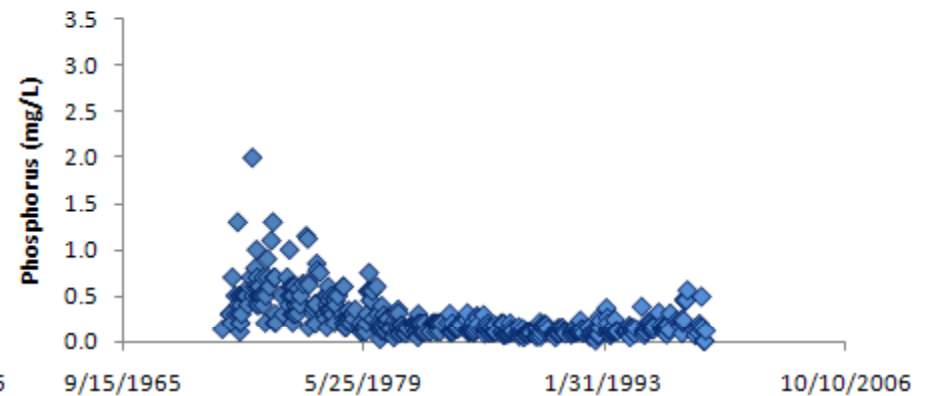
Reedy Island



Paulsboro



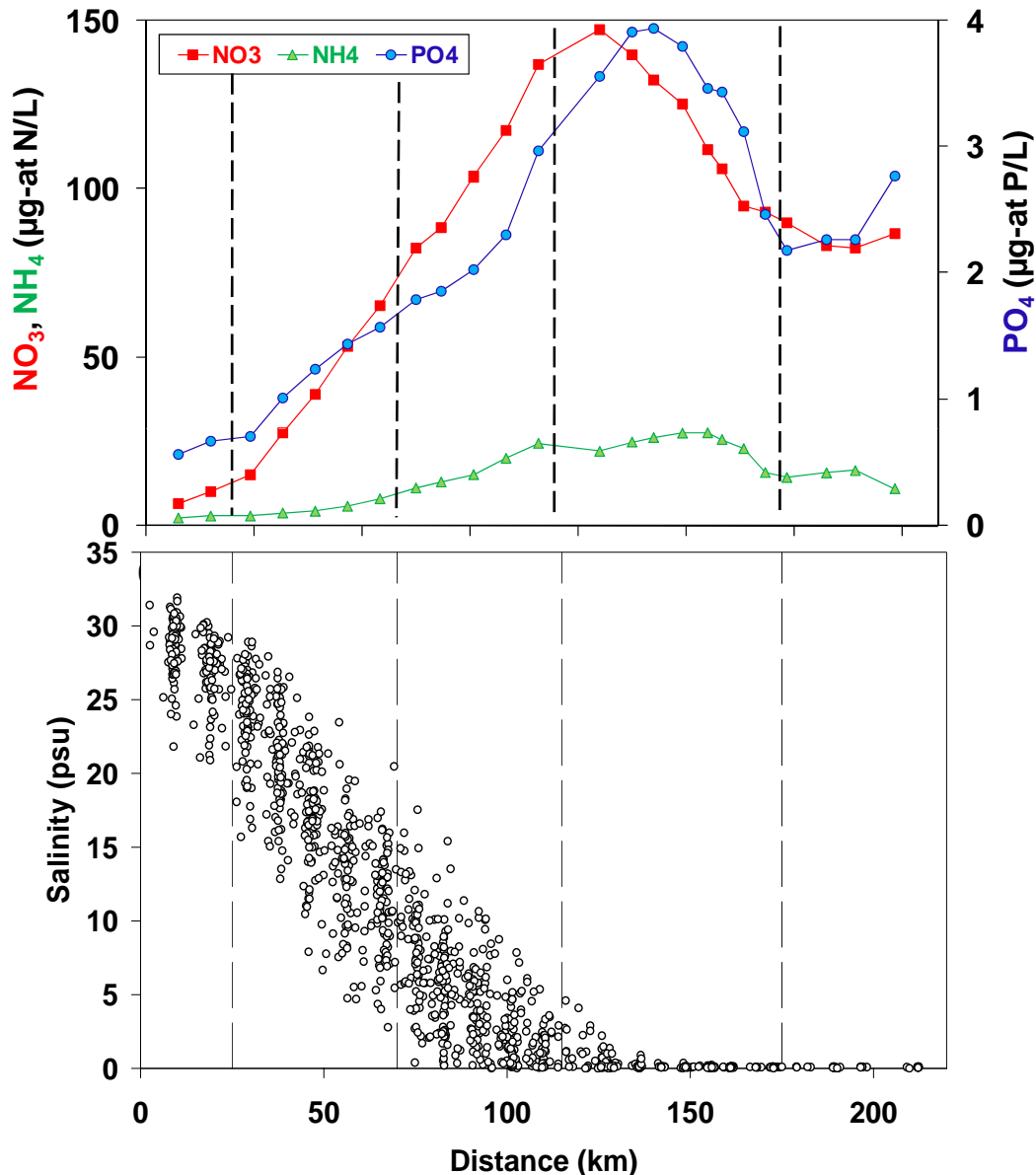
Mahon River



Time (days)

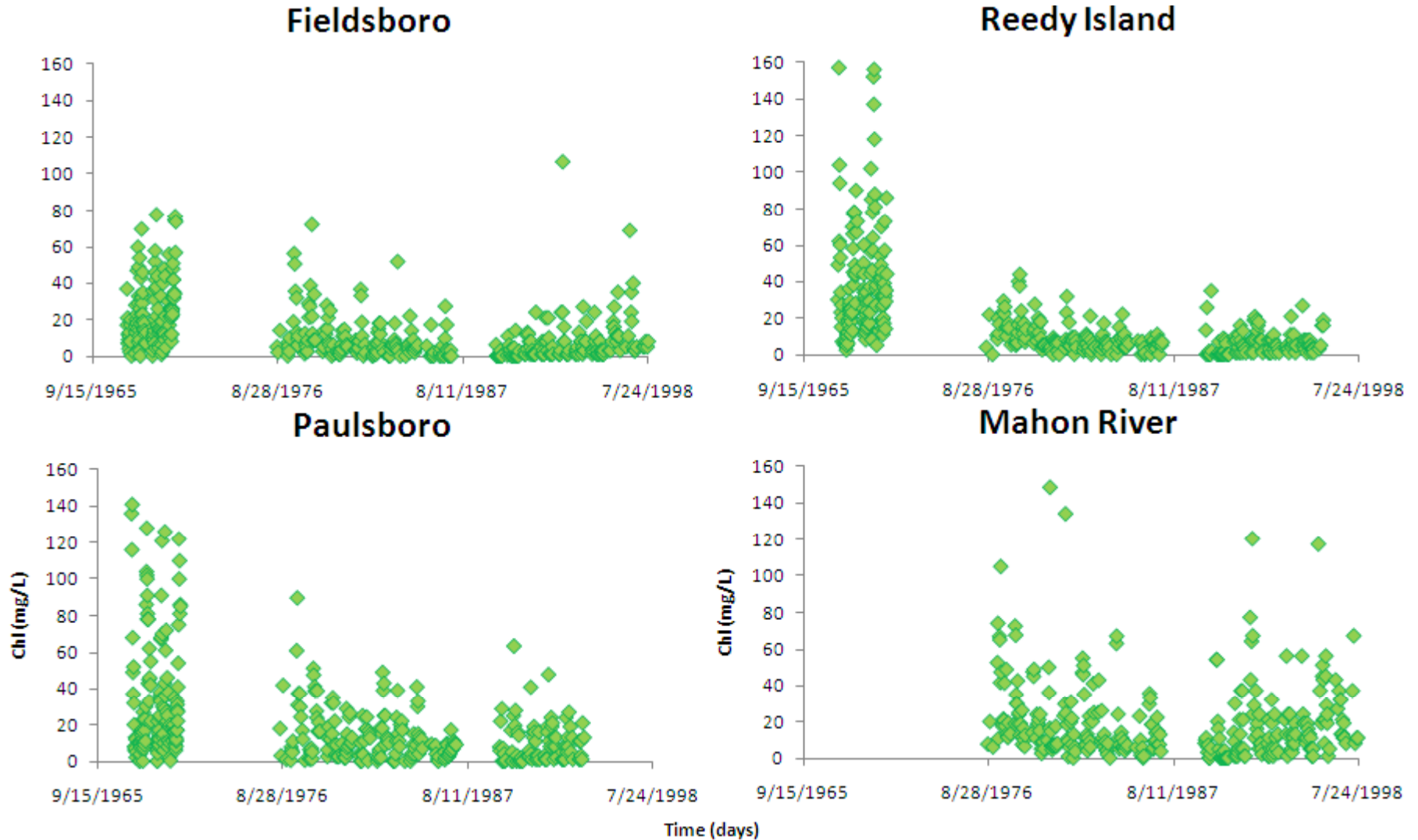
The large decrease in phosphate concentrations after the 70s reflects the ban of phosphate detergents.

Nutrient Distributions in Recent Years – UD Data



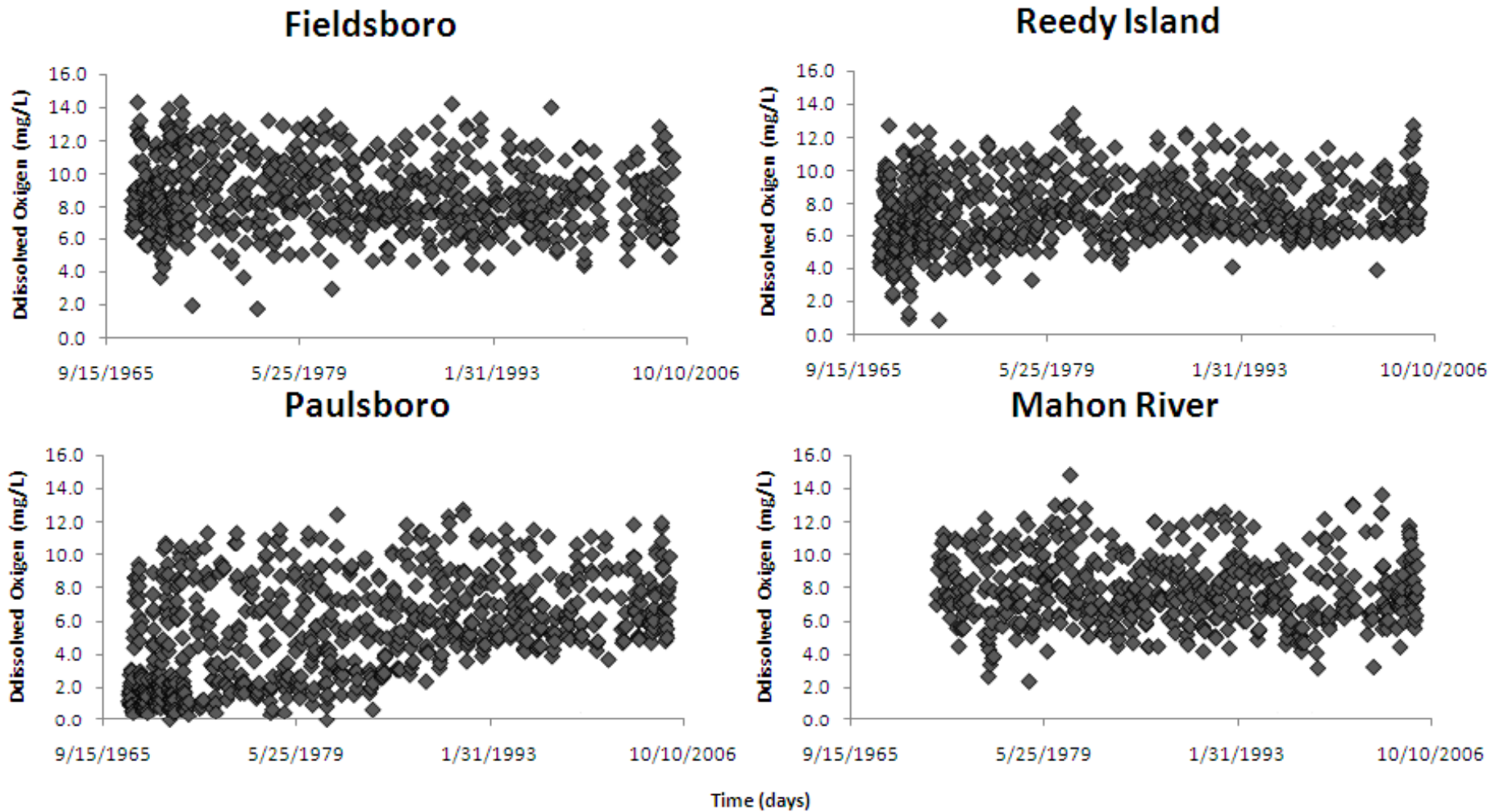
- Nutrient concentrations:
 - Increase in the urban region
 - Are subsequently diluted down the salinity gradient (turbidity maximum, mid and lower bay regions)
- Salinity:
 - Is small to zero in the tidal river regions, with occasional salt intrusions in the urban region
 - Increases linearly in the turbidity maximum, mid and lower bay regions

Average Parameter Plots – Chlorophyll *a*



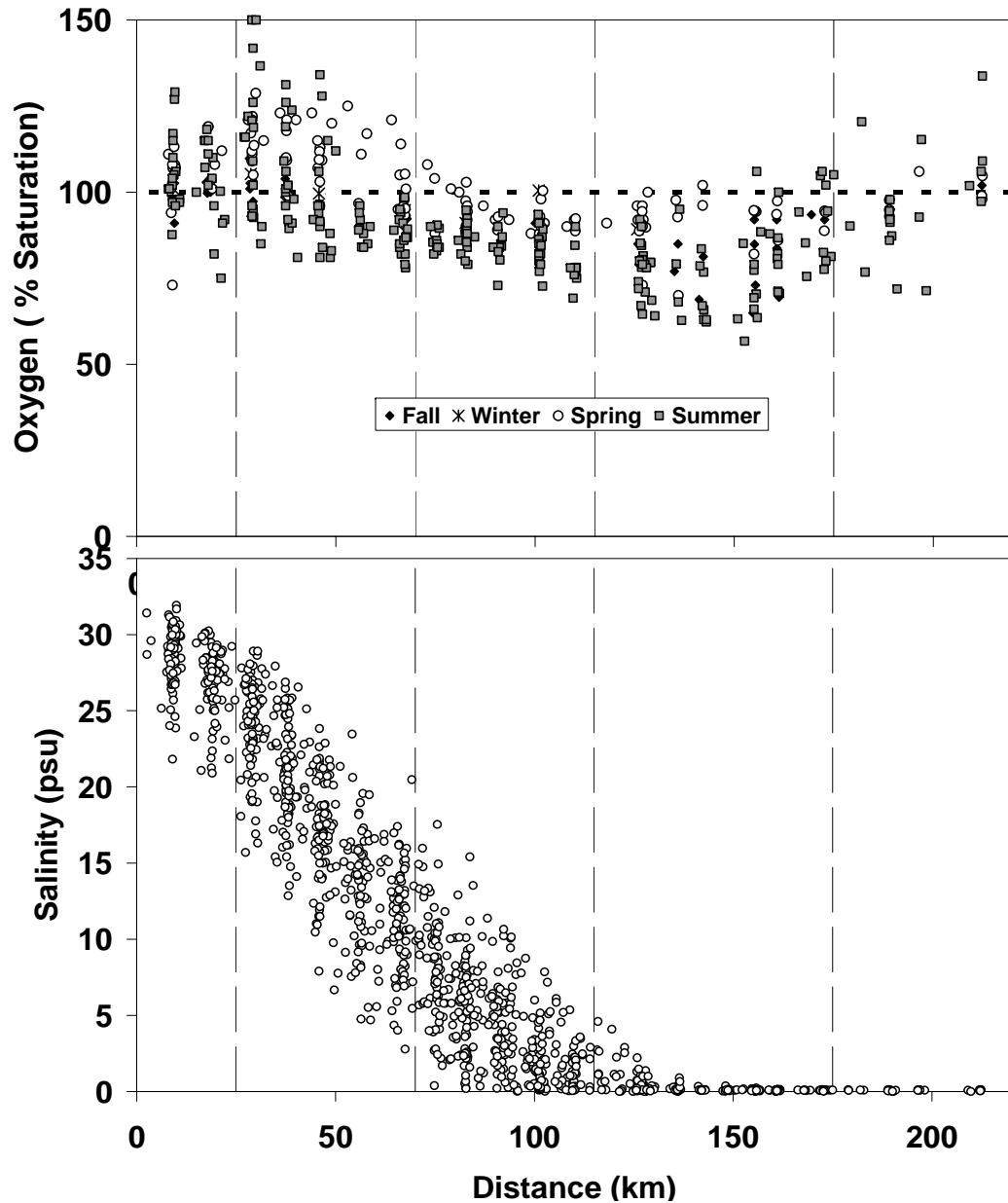
The chlorophyll record is not complete and does not show a clear trend.

Average Parameter Plots – Dissolved Oxygen



Dissolved oxygen has large seasonal variability and was especially low in the 60s and 70s in Paulsboro and Reedy Island stations. In recent years, minimum oxygen levels have been higher than 4 mg/L.

Oxygen Distributions in Recent Years – UD Data



- Dissolved oxygen saturation:
 - Large seasonal variability
 - Generally undersaturated in the urban region and the turbidity maximum
 - Often supersaturated in the mid and lower bays due to increased primary productivity (spring and summer)

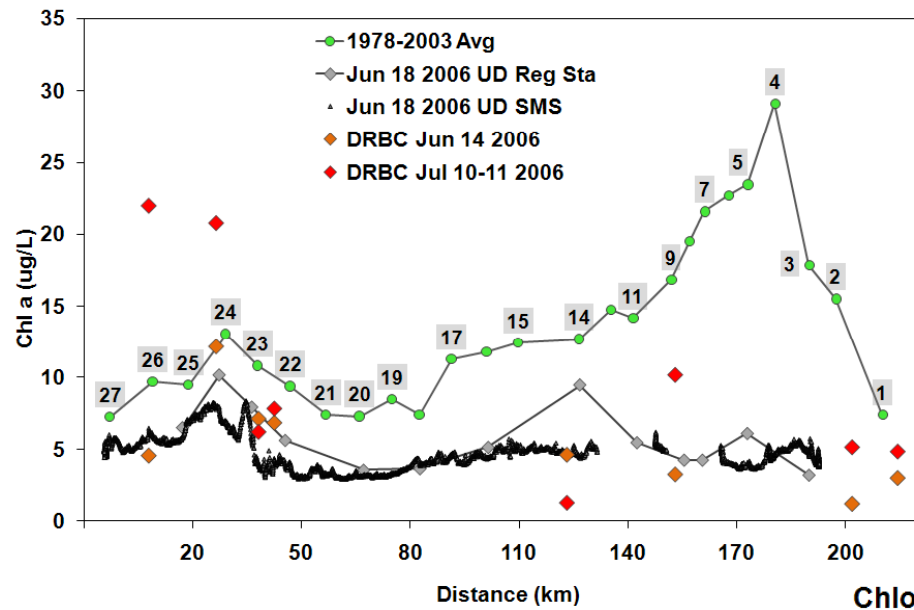
Conclusions

- The DRBC Boat Run Database is a valuable data resource for the Delaware Estuary:
 - Essential for characterizing the Delaware Estuary ecosystem along the main shipping channel
 - Solid record of important water quality parameters
 - Long-term water quality trends
 - Short-term variability
- Database not easily available to users:
 - EPA STORET website
 - WQX
 - No uniform and user friendly website for the entire database
- The DRBC Boat Run record should be continuously maintained and can serve as a platform for additional and improved future monitoring in the estuary

Acknowledgements

- Institute of Soil and Environmental Quality (ISEQ), University of Delaware
- Assistance from our lab group
- Data assistance from Edward Santoro, DRBC

Average and June - July 2006 Chlorophyll a



Chlorophyll a in Summer 2006 - SMS and Cruise Records

