Citizen Monitoring Program

A description of the nature of our nutrient data (metadata),

and a preliminary look at some trends from 1996-2005.

CIB STAC 6/16/06

Frequency of sample collection (scheduled sample pick-up days)

Twice a month from mid-April to mid-October
Once a month from mid-October to mid-April

Sample Collection Protocols

Samples collected by volunteers, kept in fridge or in cooler with ice pack
Samples collected by Volunteer Coordinator on sample pick-up route
Supporting data (Full CMP Data, or at least, Temp and Salinity)

Samples filtered and filtrate frozen on same day (mostly)

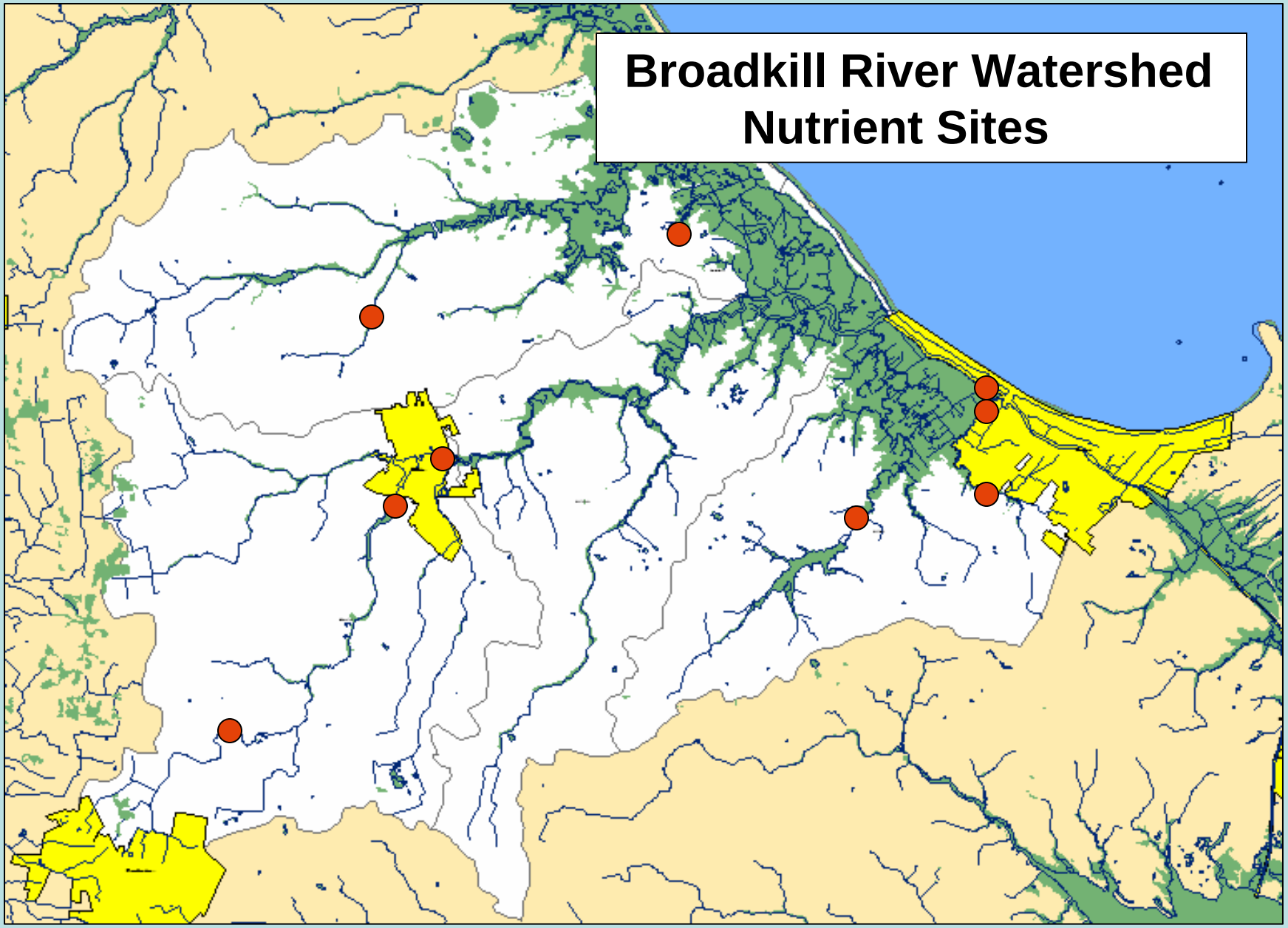
Samples run on CMS Autoanalyzer for:

1) Nitrate + Nitrite
2) Ammonium Sum 1 and 2=Dissolved Inorganic Nitrogen (**DIN**)
3) Orthophosphate or Dissolved Inorganic Phosphorus (**DIP**)

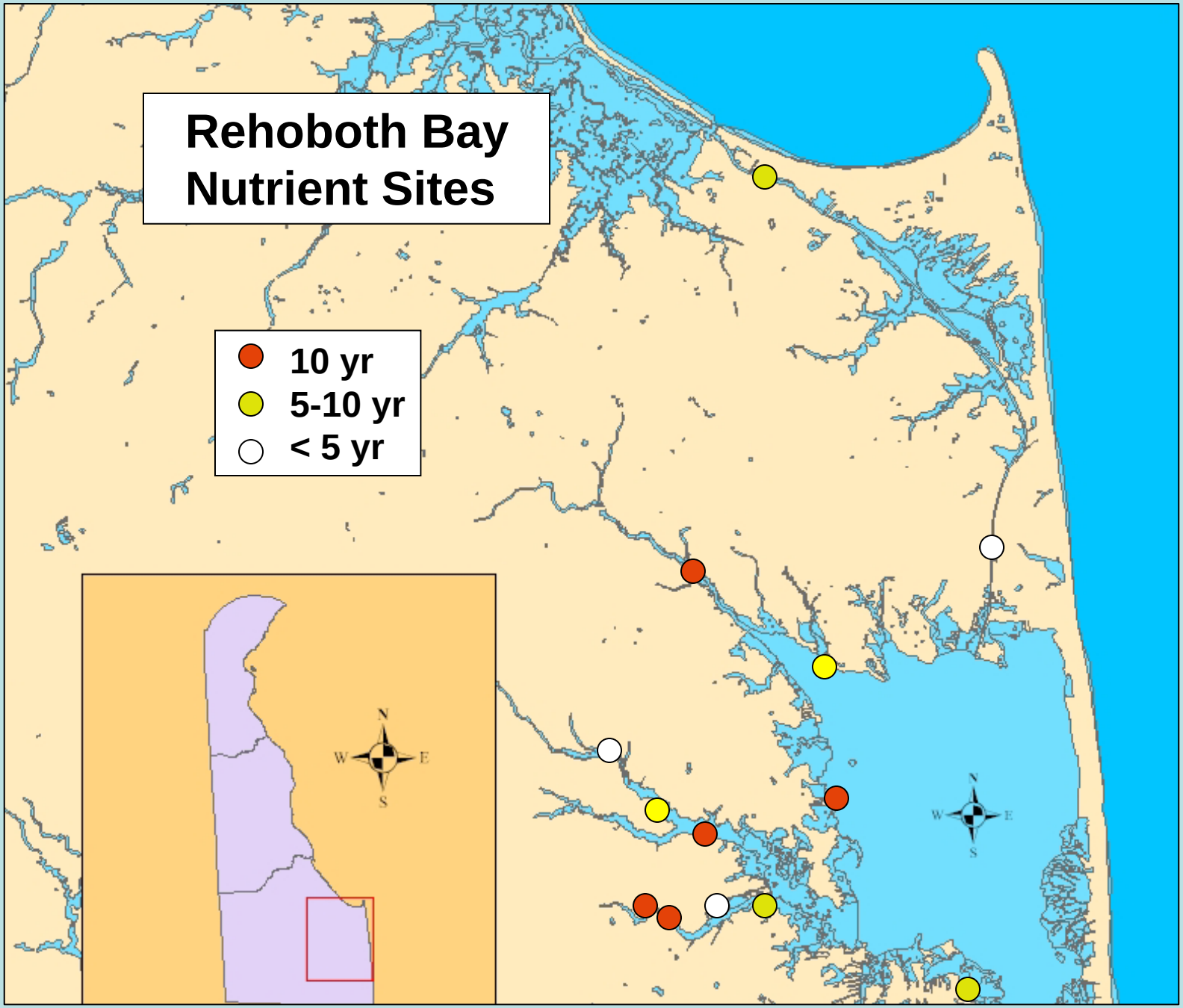
Each sample run twice-dilutions tacked on end of second run.
Same method, but different AA operators.
Bad Ammonium runs
Samples stored (frozen) for 1 +/- 0.5 yr.

Other parameters analyzed: Total Suspended Solids and Chlorophyll a

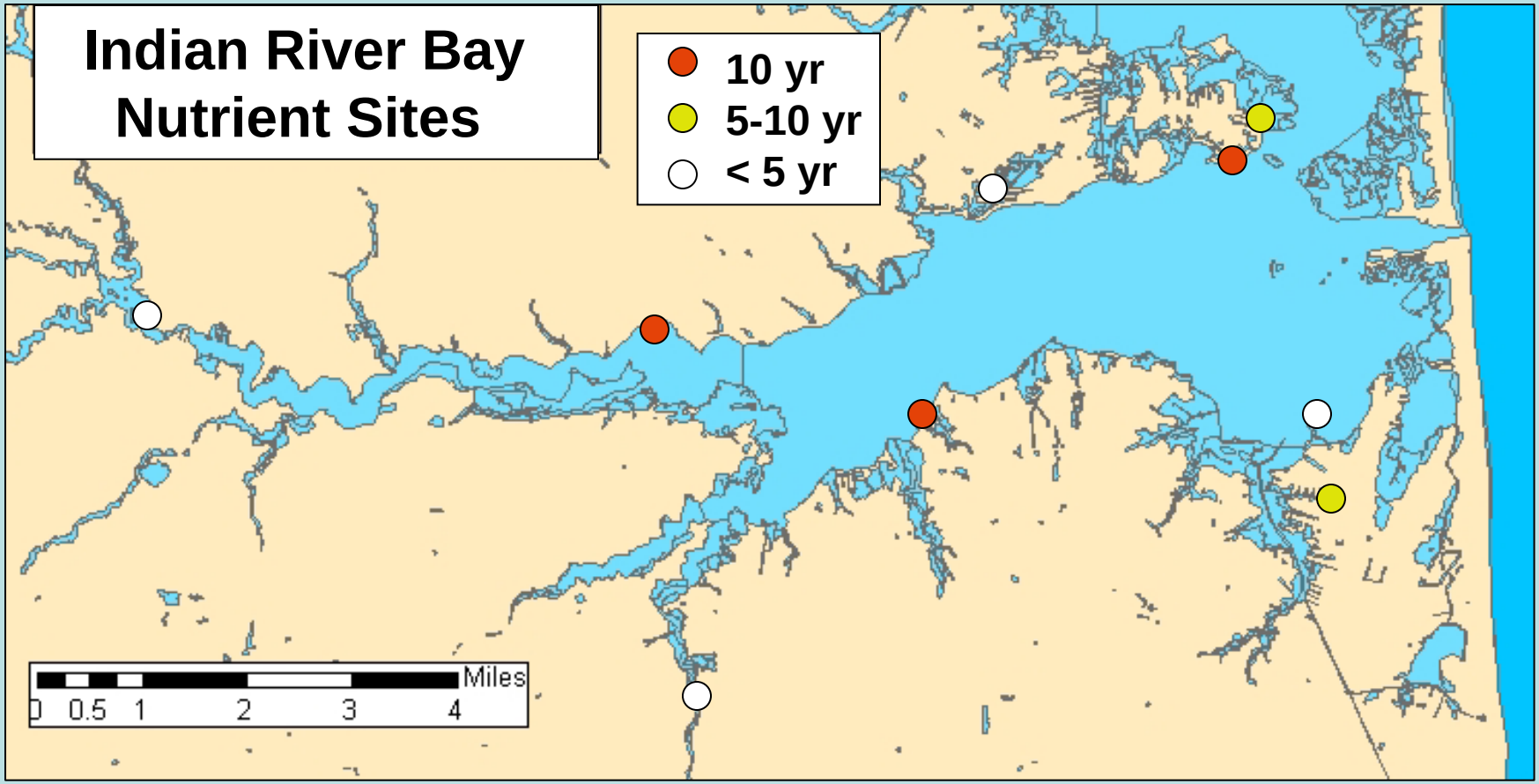
Date Span	# years	Site ID	Broadkill River Watershed Nutrient Sites
'05-'06	1.5	BR01	Broadkill River @ PEL dock.
'05-'06	1.0	BR03	Primehook Creek Boat Ramp at Refuge Headqtrs.
'05-'06	1.0	BR06	Ingram Ditch, Rds 212 and 231 (to Waples Pond)
'05-'06	1.0	BR10	Ingram Branch at Rt 319 (to Diamond Pond)
'05-'06	0.8	BR19	Canary Creek at New Road
'05-'06	1.0	BR20	Broadkill River at Milton, just below dam
'05-'06	1.0	BR21	Old Mill Creek downstream from Red Mill Pond
'05-'06	1.0	BR40	Canary Creek at Pilottown Rd
'05-'06	1.0	BR48	Diamond Pond Outfall


Broadkill River Watershed
Nutrient Sites

Date Span	# years	Site ID	Rehoboth Bay Nutrient Sites
'98-'99	1	BP	Burtons Pond Spillway
'96-'03	7	RB01	Mouth of Arnell Creek/Mouth of Love Creek
'96-'05 B	4…1	RB02	Lewes - Rehoboth Canal at Lewes
'96-'05	10	RB04	Herring Creek, Mid-Section
'97-'05	9	RB05	Mouth of Guinea Creek (Pot Nets Creekside)
'96-'05	10	RB06	Guinea Creek (Winding Creek Village)
'96-'05	10	RB06A	Guinea Creek @ Rd 298 Bridge
'96-'05	10	RB07	West Bay Park
'96-'97	2	RB31	Guinea Creek 2-Deadend Lagoon
'96-'05	10	RB34	Love Creek at Rt 24 Bridge
'96-'04	8	RB40	Burton Prong
'99-'03	4	RB45	Lewes-Rehoboth Canal - Rehoboth
'98-'05	8	ML	Massey's Landing

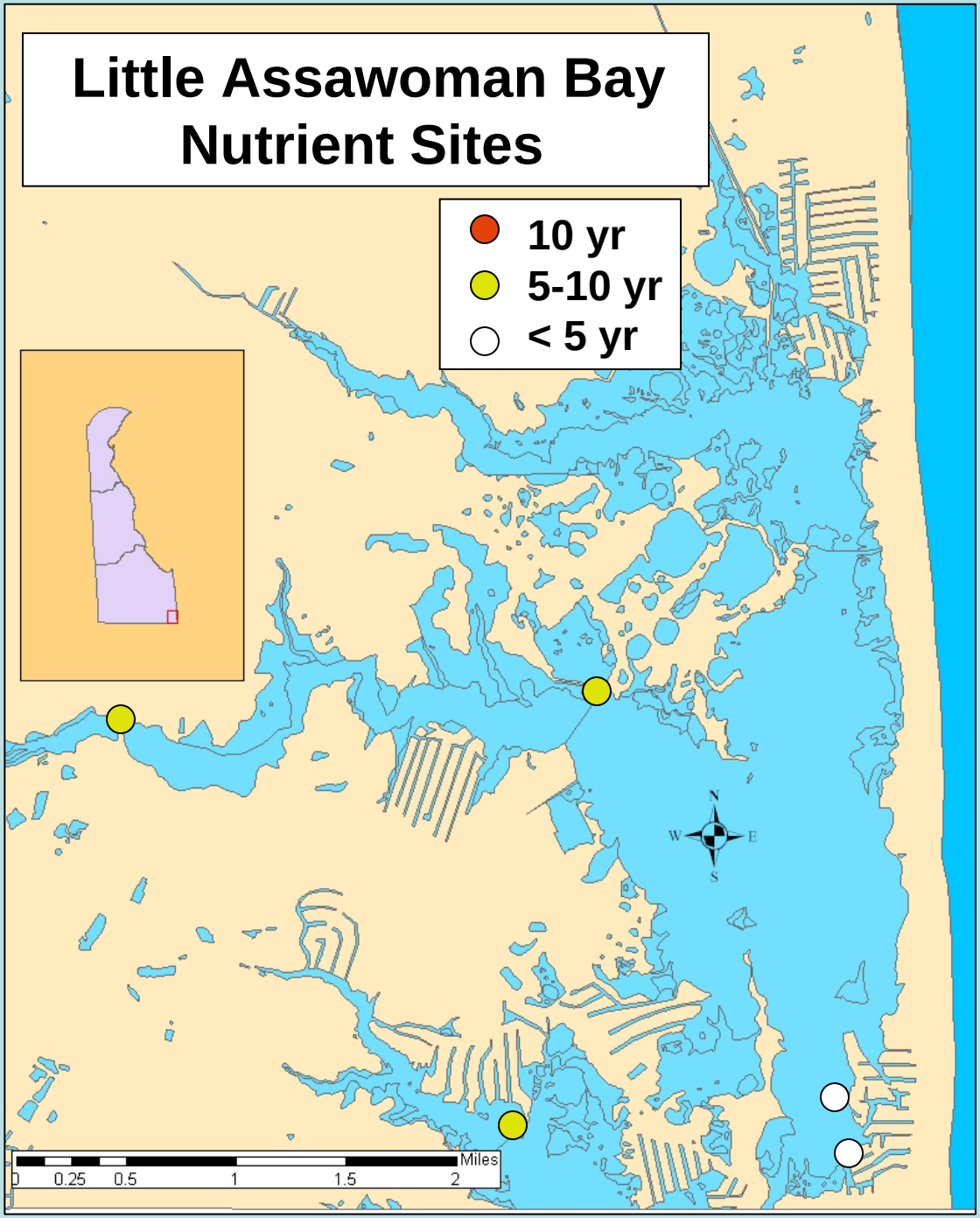

Rehoboth Bay
Nutrient Sites
10 yr
5-10 yr
< 5 yr
N
W
E
S

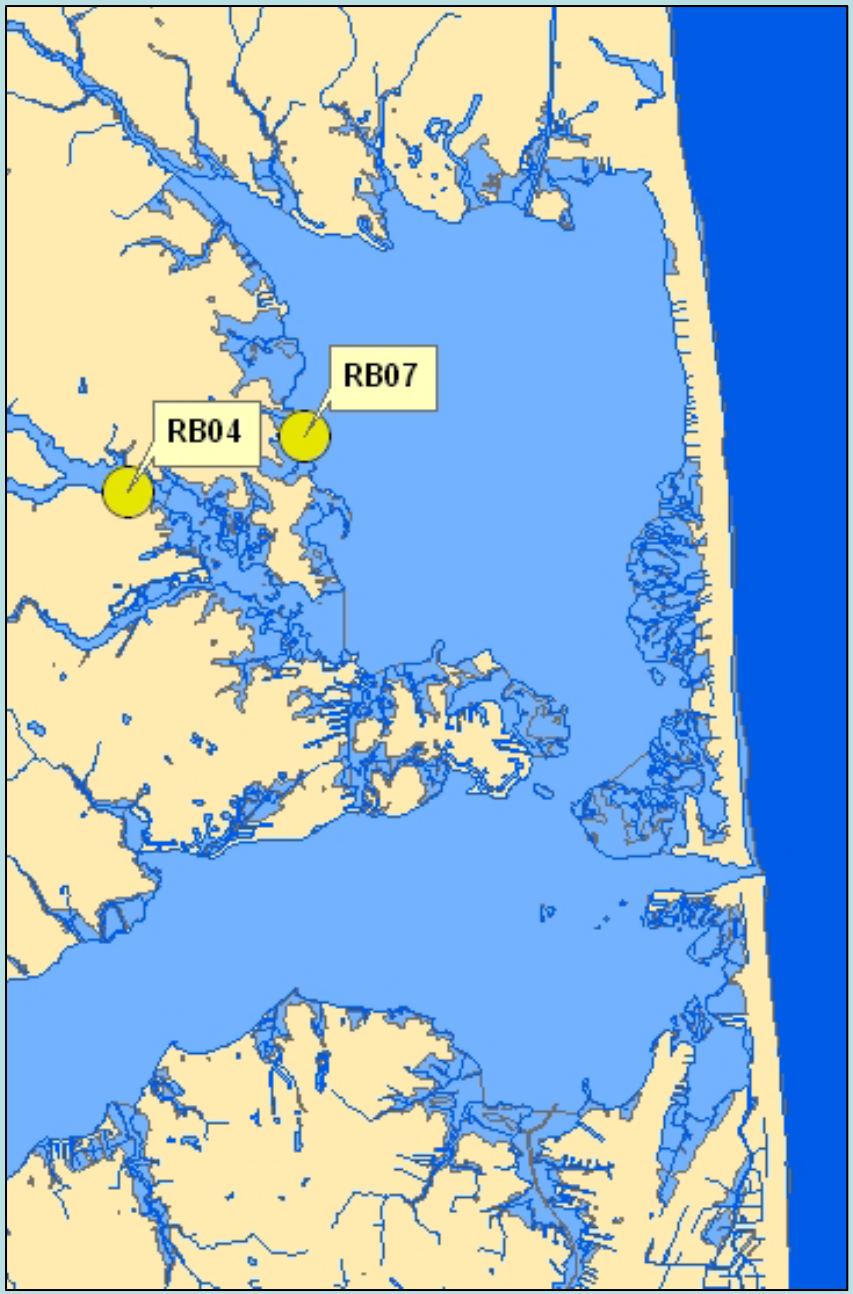
Date Span	# years	Site ID	Indian River Bay Nutrient Sites
'98-'99	1	MP	Millsboro Pond-Rt 30 Boat Launch
'96-'02 *	7	IR02	Gull Point
'02-'05 *	4	IR04	Warwick Cove
'96-'00 **	5	IR10	Steele Cove, Pot Nets Indian Landing
'96	1	IR10A	Steele Cove, inside lagoon
'00-'05 **	6	IR11	Big Ditch Point, Pot Nets Indian Landing
'96-'95	10	IR20	Bay Colony
'96	1	IR30	Pot Nets East-Lagoon
'01-'05	5	IR32	Holly Terrace Acres Canal
'03-'05	3	IR36B	James Farm, Pasture Point
'01-'02	1	IR37	Vine Creek at Rt 26
'98-'05	8	ML	Massey's Landing


Indian River Bay
Nutrient Sites
10 yr
5-10 yr
< 5 yr
Miles
0 0.5 1 2 3 4

Date Span	# years	Site ID	Little (and Big) Assawoman Watershed
'98-'01	3	AG1	Ag. Ditch (Roxana)
'00-'05	6	BA01	Keenwick on Bay, Roy Creek
'97-'05	9	LA03	Mulberry Landing
'96-'99	3	LA08	Lighthouse Cove, Fenwick
'99-'05	7	LA09	Dirickson Creek at Road 381 bridge.
'05	1	LA45	Fenwick Island Bayside

AG1


Little Assawoman Bay
Nutrient Sites
10 yr
5-10 yr
< 5 yr
N
W
E
S
Miles
0
0.25
0.5
1
1.5
2



Compare trends in nutrients between a Creek and Bay site in close proximity, each with 10 year record.

DIN=Dissolved Inorganic Nitrogen (nitrate + nitrite + ammonium)

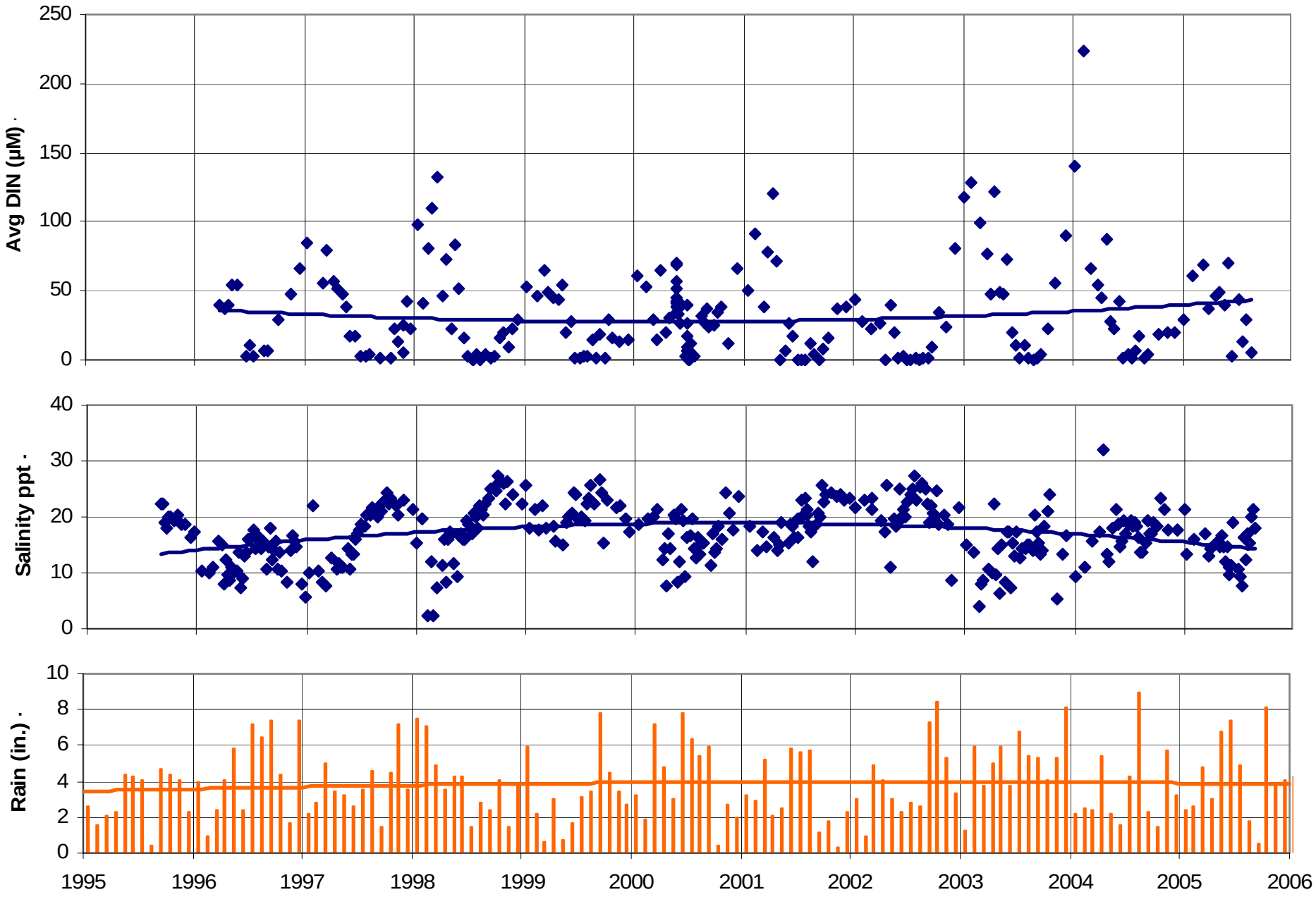
--Mobile in soils and groundwater.

DIP=Dissolved Inorganic Phosphorus (orthophosphate)

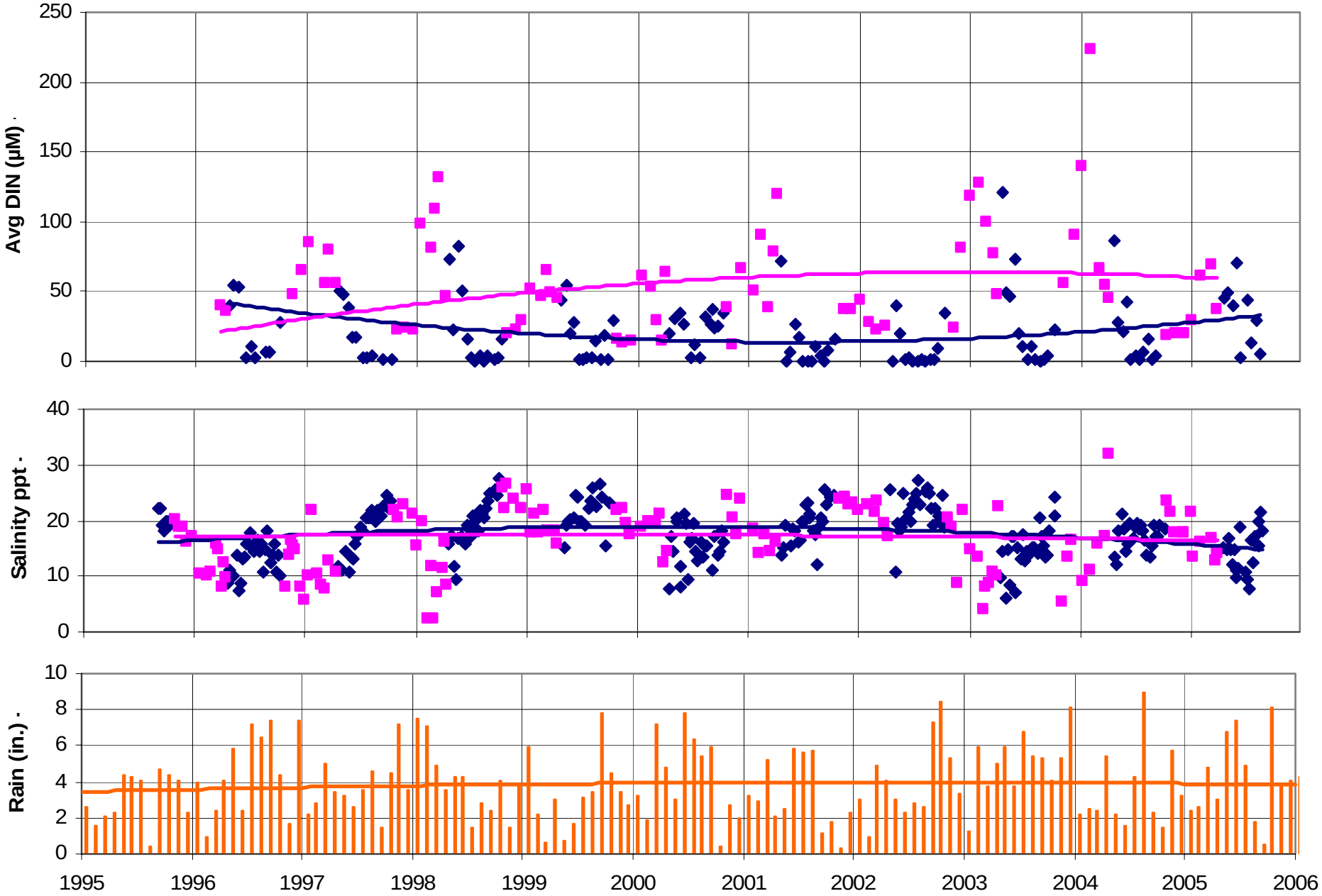
--Less mobile in soil to groundwater, but pulses of particulate forms.

--Stored in estuary sediments and released under anoxic conditions.

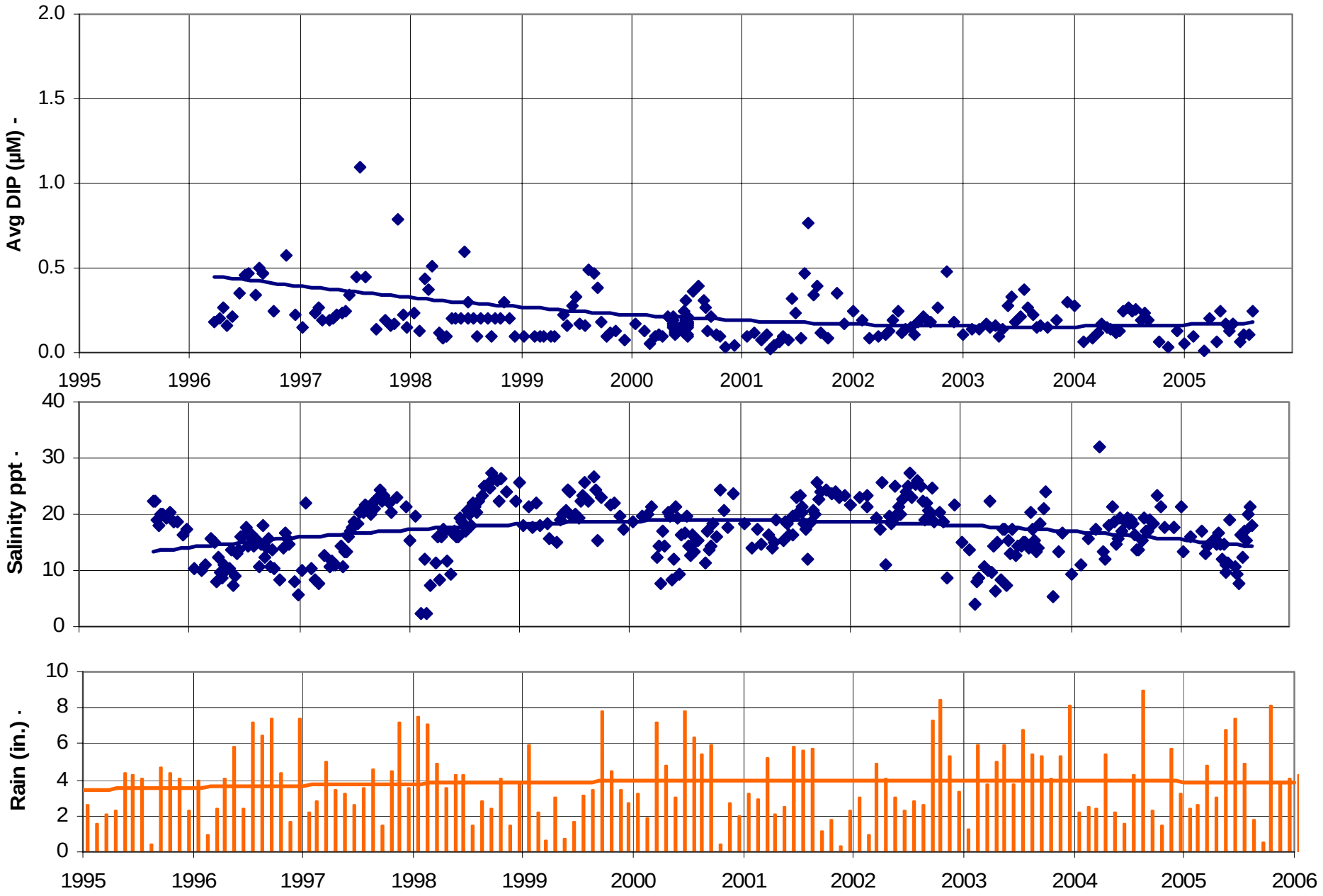
Both are:
“Food on the table” for algae.



RB04 – All Data



RB04 – (Apr 15 thru Oct 15) – (Oct 15 thru Apr 15)



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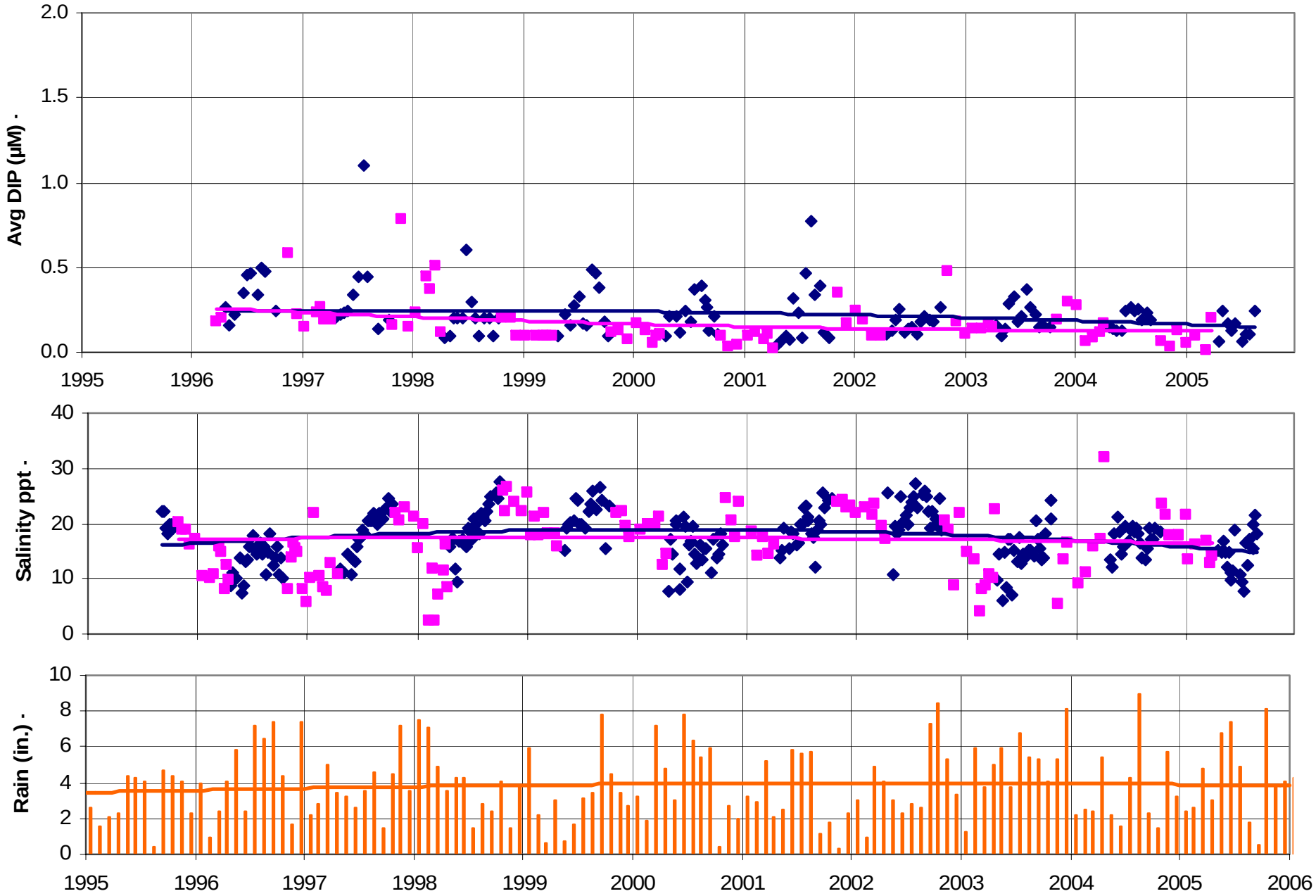
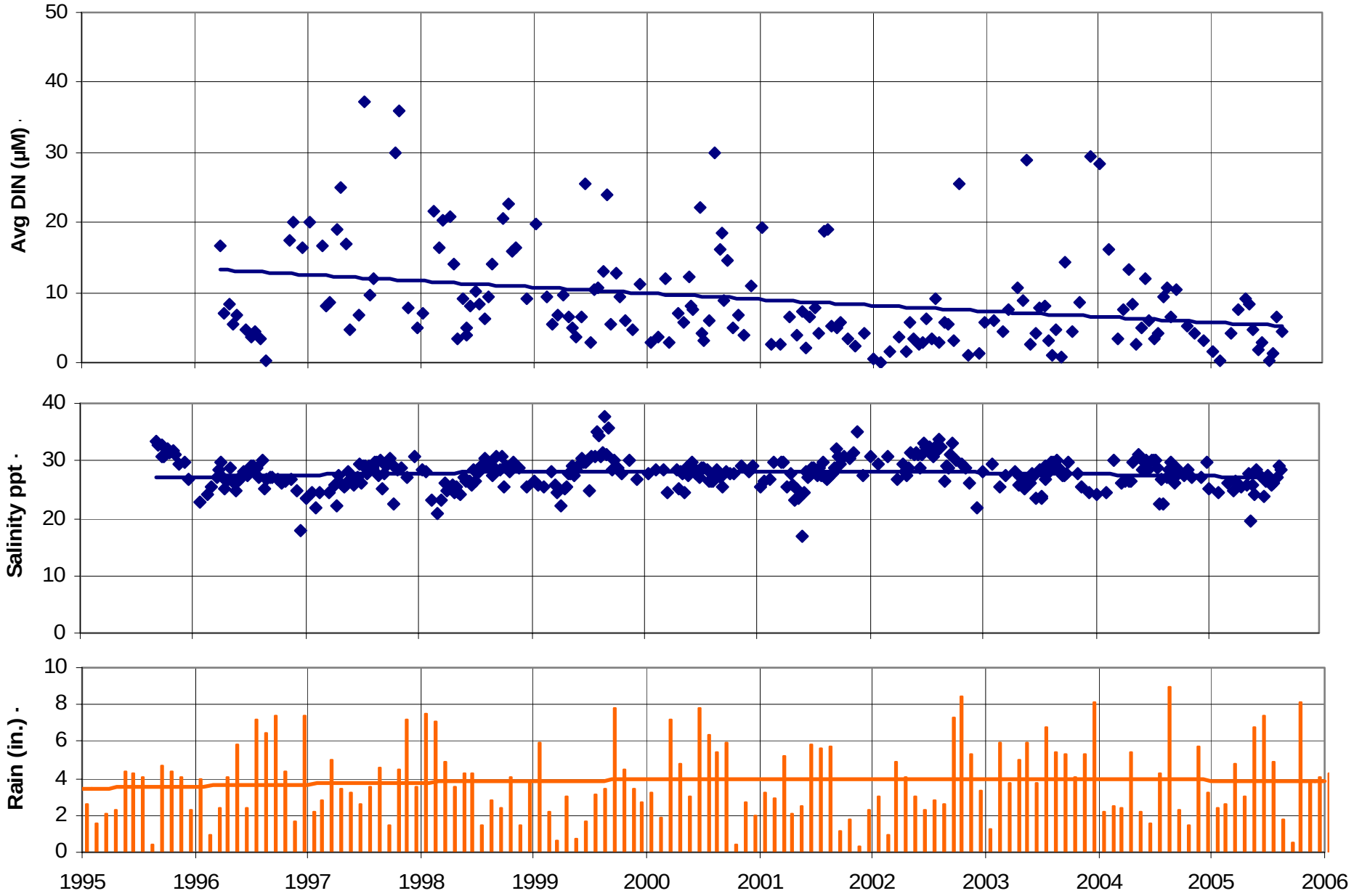
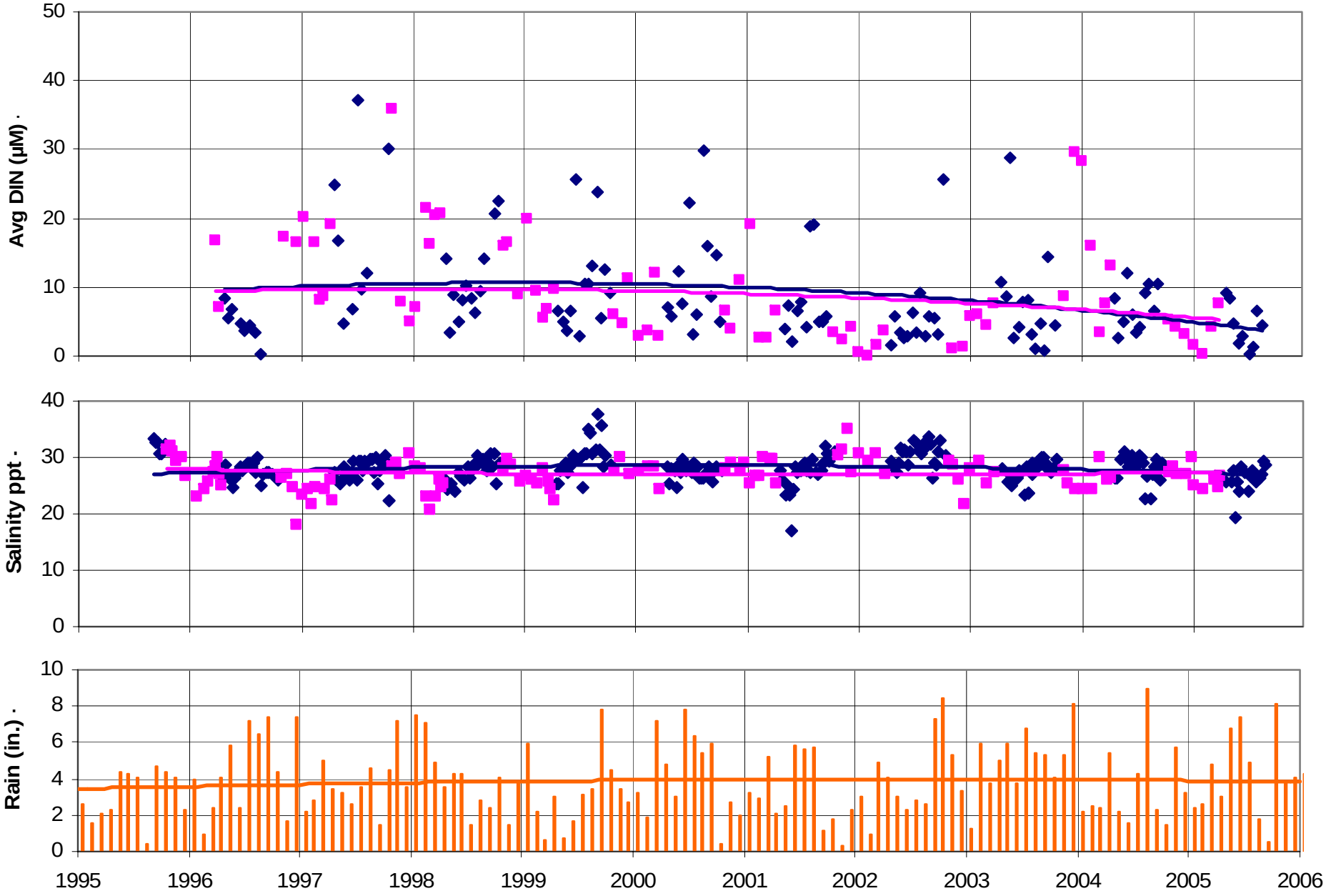


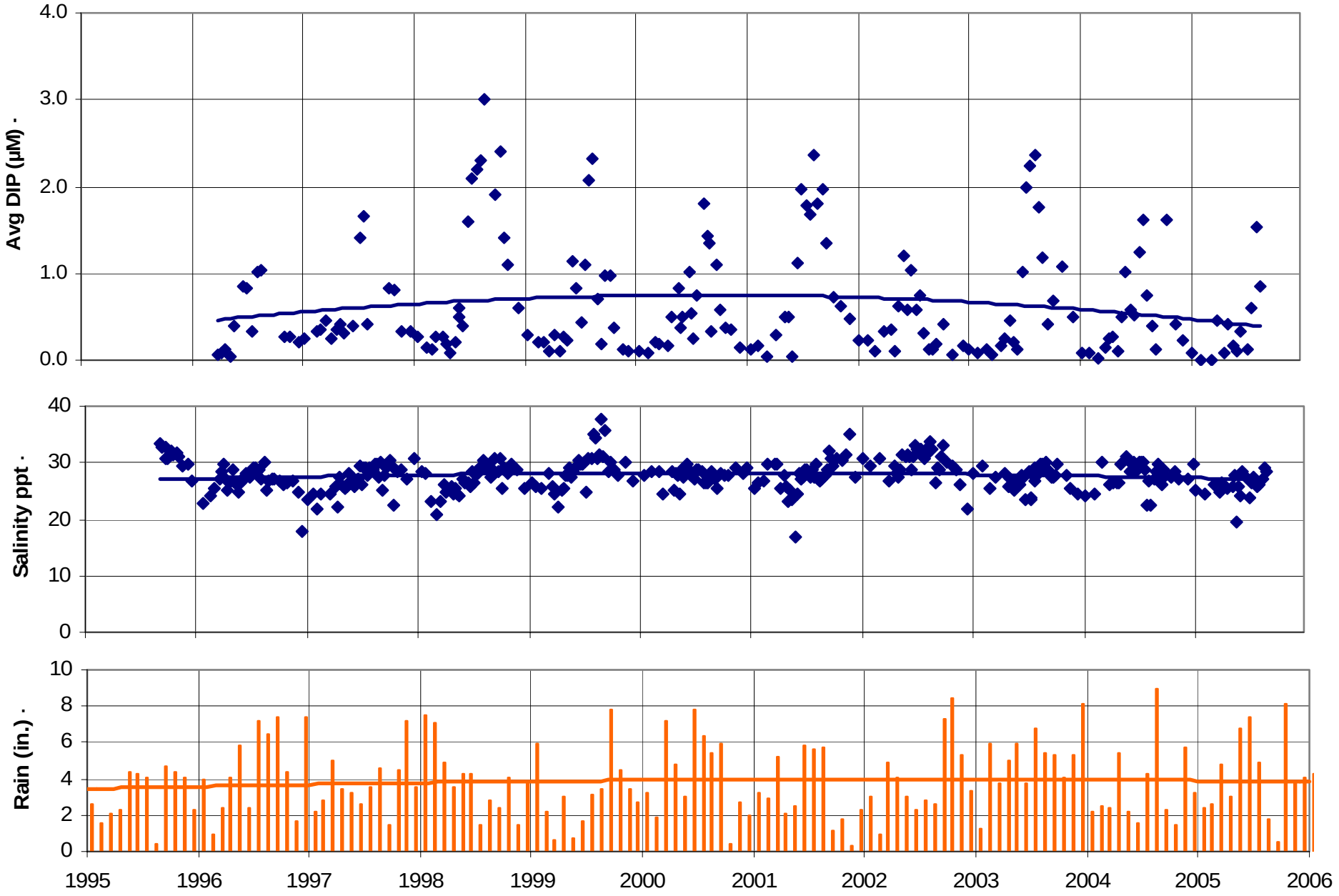
RB04 – (Apr 15 thru Oct 15) – (Oct 15 thru Apr 15)



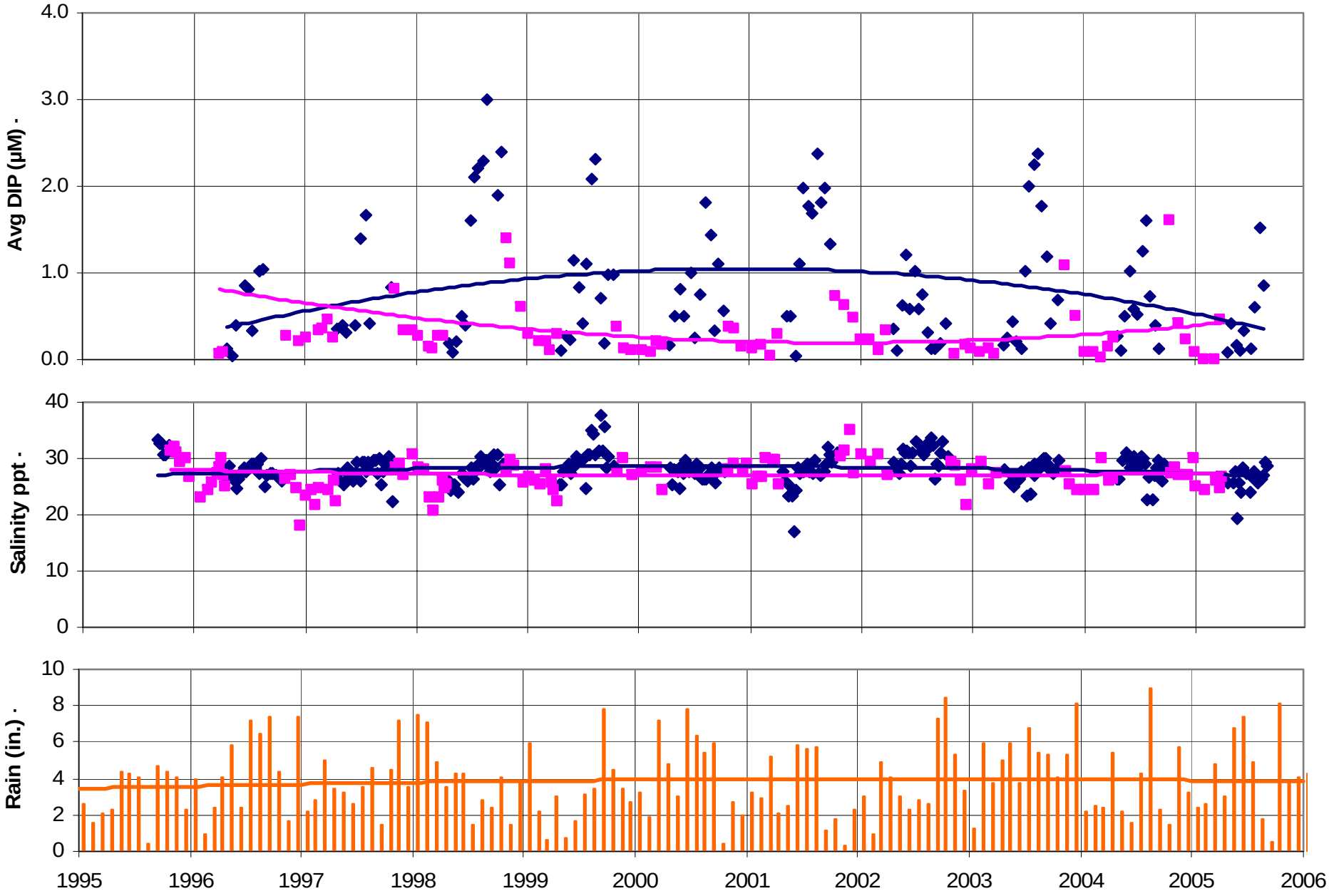
RB07 – All Data



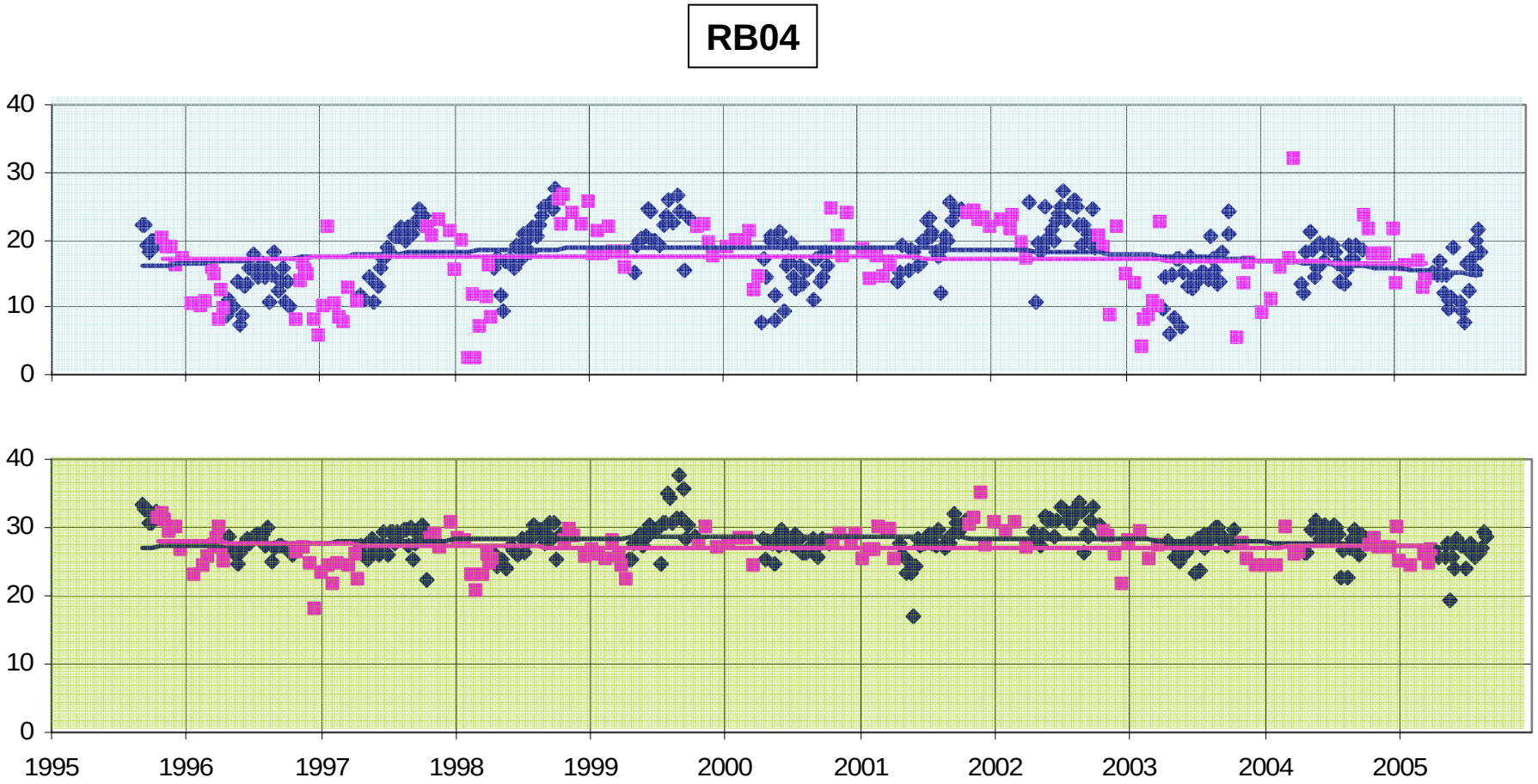
RB07 – (Apr 15 thru Oct 15) – (Oct 15 thru Apr 15)

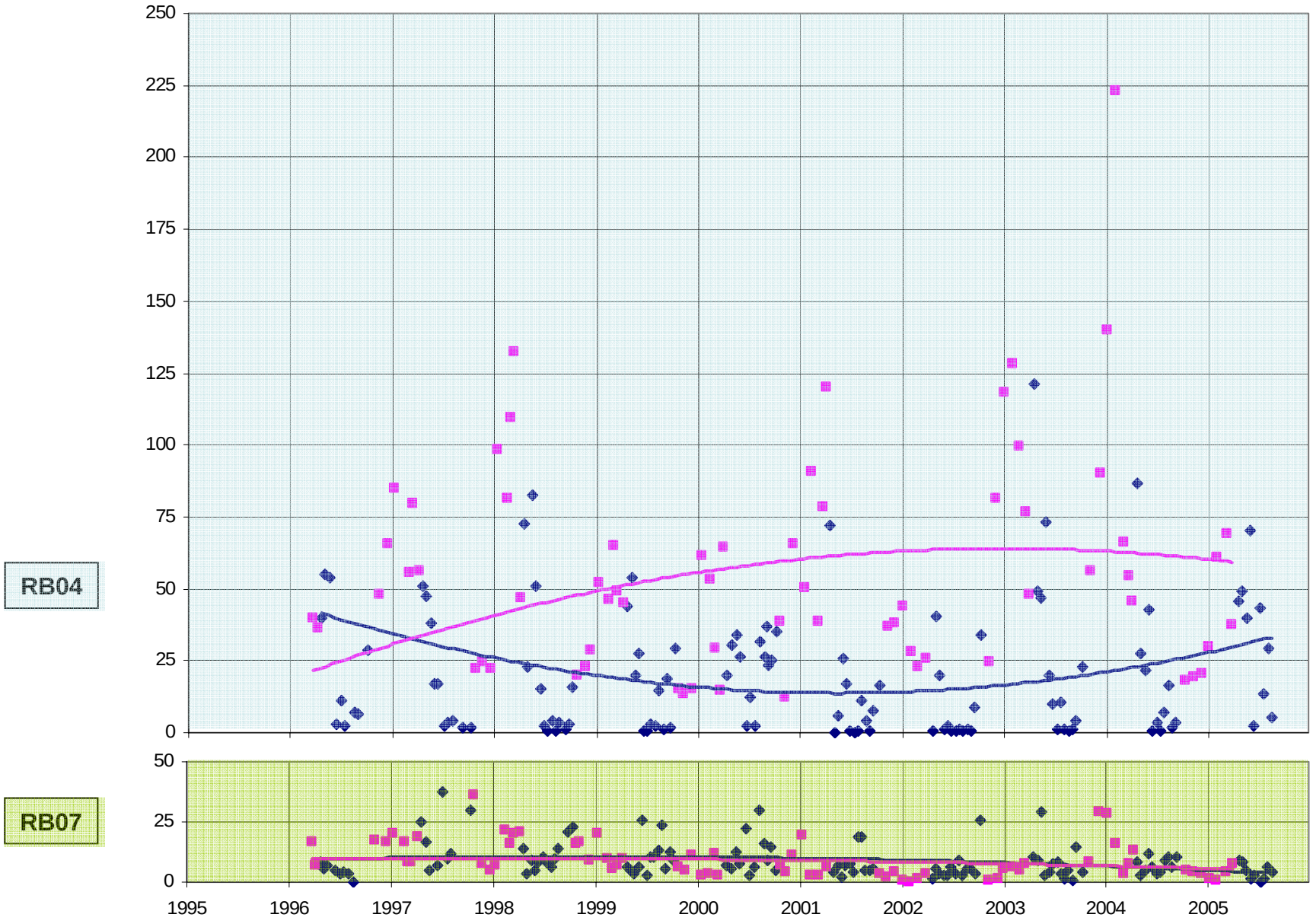


RB07 – All Data



RB07 – (Apr 15 thru Oct 15) – (Oct 15 thru Apr 15)

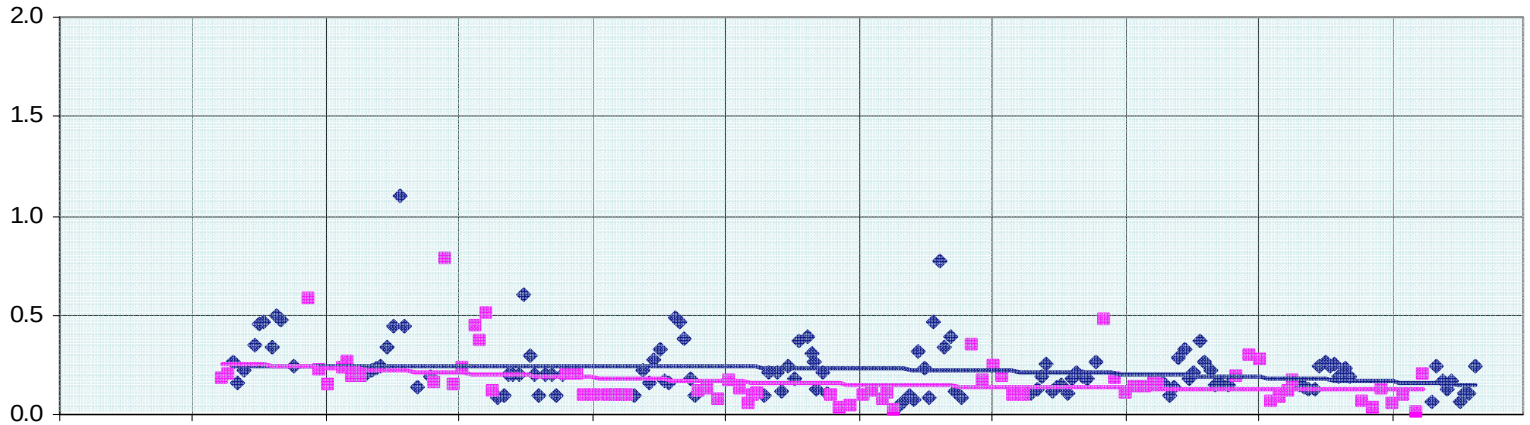

RB04
40
30
20
10
0
40
30
20
10
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
RB07
Salinity (ppt)
Apr 15 thru Oct 15
Oct 15 thru Apr 15



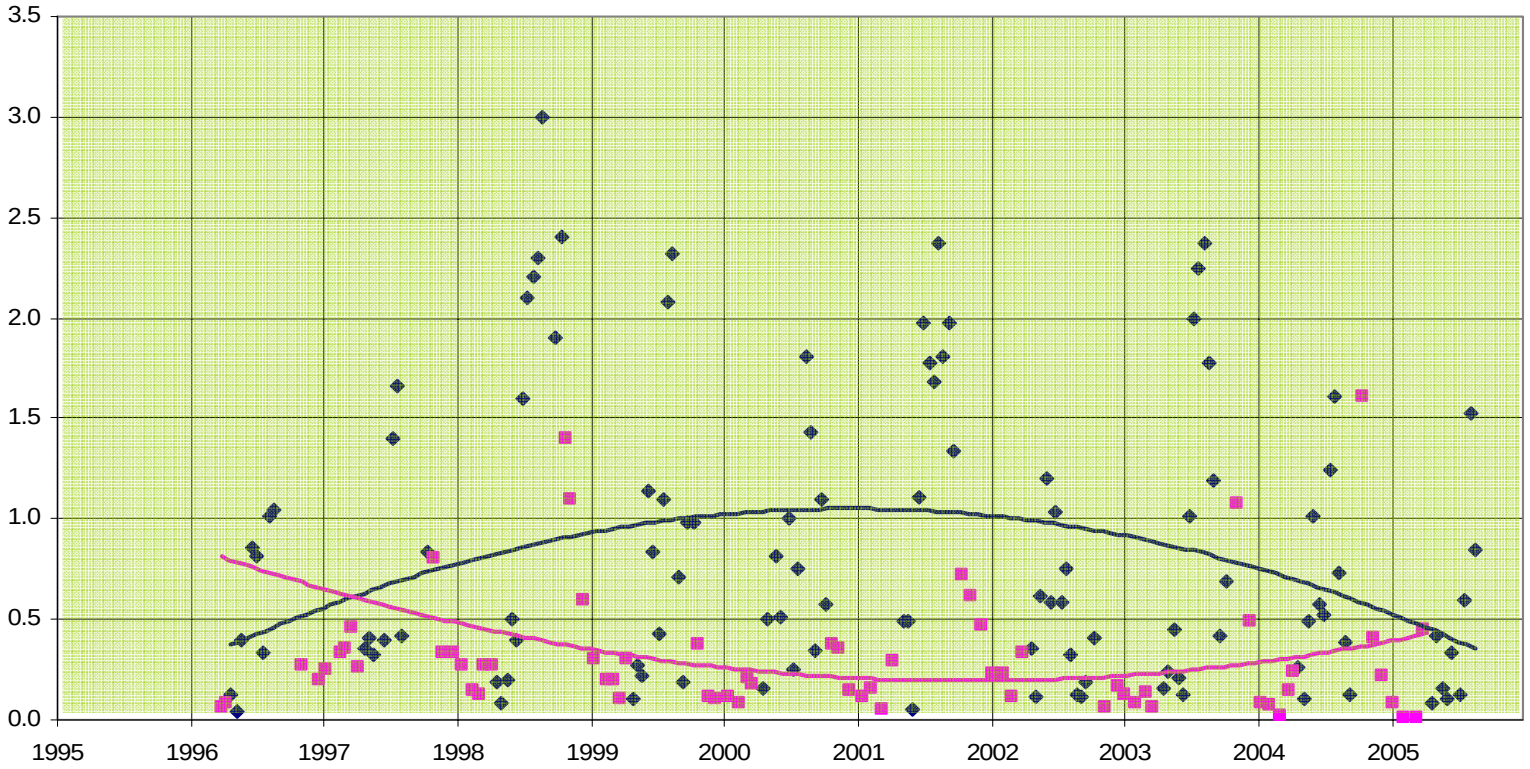
DIN (µM)

Apr 15 thru Oct 15 **Oct 15 thru Apr 15**

RB04

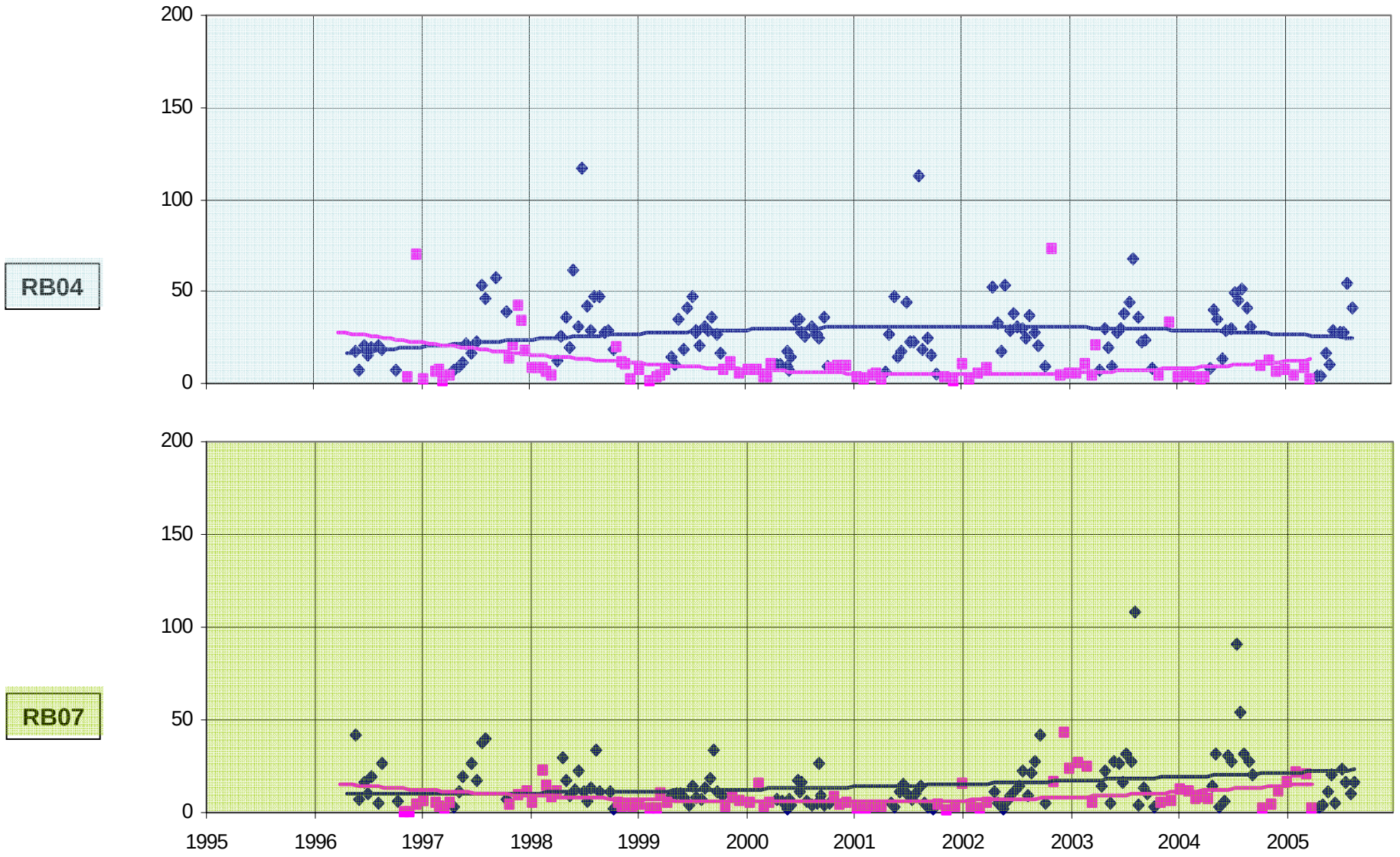


RB07



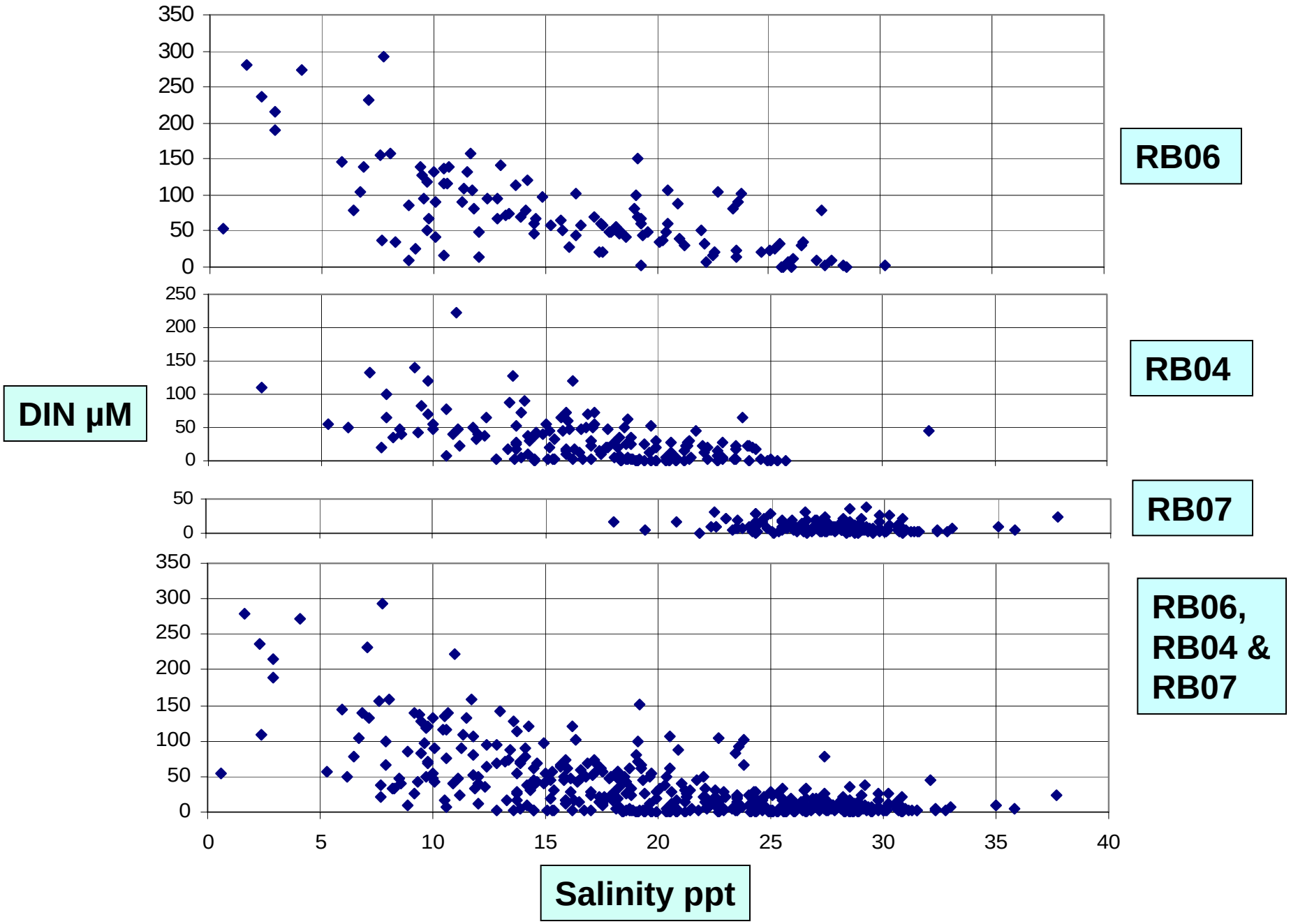
DIP (µM)

Apr 15 thru Oct 15 Oct 15 thru Apr 15



Chlorophyll a

Apr 15 thru Oct 15 Oct 15 thru Apr 15


DIN µM
350
300
250
200
150
100
50
0
RB06
250
200
150
100
50
0
RB04
50
0
RB07
350
300
250
200
150
100
50
0
RB06, RB04 & RB07
0
5
10
15
20
25
30
35
40
Salinity ppt

Preliminary Conclusions on Nutrient trends at 2 sites ’96-’05

RB04-Herring Creek

DIN All Data - shallow “bowl”

Oct 15 to April 15 - increases and levels off 

Apr 15 to Oct 15 - deeper “bowl”

DIP All Data –drops and levels off

Oct 15 to Apr 15 - drops, but less dramatic, more linear 

Apr 15 to Oct 15 - drops, but less dramatic, more linear

Salinity All data – “hump” (Do “humps” mirror “bowls”?)

Oct 15 to Apr 15 - less “hump”

Apr 15 to Oct 15 - less “hump”

RB07-West Bay Park

DIN All Data - drop, pretty linear

Oct 15 to April 15 - steady, then drop at end 

Apr 15 to Oct 15 - steady, then drop at end

DIP All Data – slight “hump”

Oct 15 to Apr 15 - “bowl”

Apr 15 to Oct 15 - bigger “hump”

Salinity All data – slight “hump”

Oct 15 to Apr 15 - flat

Apr 15 to Oct 15 - slight “hump”