Great Bay Nitrogen Issue

Presented by the Great Bay Municipal Coalition

Dover, Exeter, Newmarket,
Portsmouth, and Rochester

Dean Peschel
603-781-5931
dean_peschel@yahoo.com

Great Bay Municipal Coalition Objectives

Protect Estuary resources

- Understand the science
- Invest in solutions that address cause of resource degradation to the extent necessary


PISCATAQUA REGION
Estuaries
Partnership
Piscataqua Region Estuaries Partnership
Focus Area
Includes:
Hampton-Seabrook Estuary watershed (49.79 mi²)
Great Bay Estuary watershed (1,023.42 mi²)
52 communities in New Hampshire (42) and Maine (10)
NEW HAMPSHIRE
MAINE
MASSACHUSETTS
Atlantic Ocean
(Gulf of Maine)
Wakefield
Brookfield
Middleton
Acton
New
Durham
Milton
Sanford
Lebanon
Farmington
North Berwick
Wells
Rochester
Berwick
Strafford
Somersworth
South Berwick
York
Rollinsford
Barrington
Dover
Northwood
Madbury
Eliot
Deerfield
Nottingham
Lee
Durham
Newington
Kittery
Newmarket
Portsmouth
New
Castle
Candia
Epping
Newfields
Greenland
Raymond
Stratham
Rye
Exeter
Fremont
Brentwood
North
Hampton
Chester
Danville
Kingston
East
Kingston
Kensington
Hampton
Sandown
Hampton
Falls
Seabrook
0 1 2 4 6 8
Miles

History of Nitrogen Issue

- NH Estuary Program TAC 2005-2008
  - Concluded N not cause eelgrass loss
- 2009 NHDES Numeric Nutrient Criteria
  - Concluded N was the cause of eelgrass loss
  - Established a .3 mg/l TN water column transparency based WQ standard to protect eelgrass
- 2009 NHDES declared Great Bay Impaired
- 2011 EPA issues draft NPDES permits
  - limits of technology (3 mg/l)

Conceptual Model

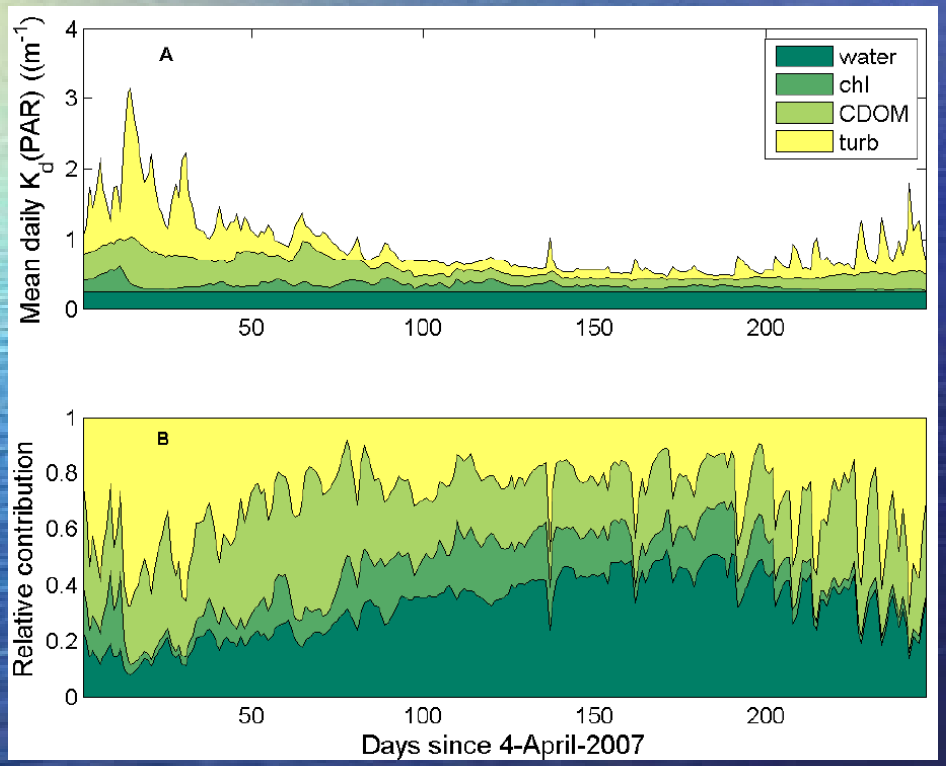
Excess Nitrogen stimulates phytoplankton growth (chl-a)

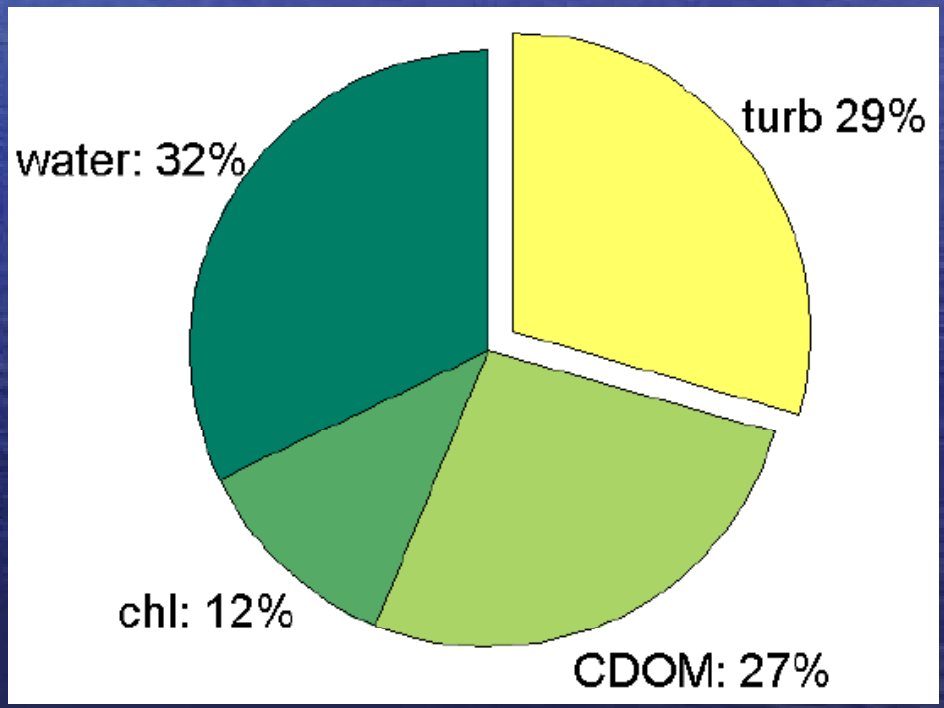
Excess phytoplankton in the water reduces light transparency

Reduced light transparency impacts eelgrass

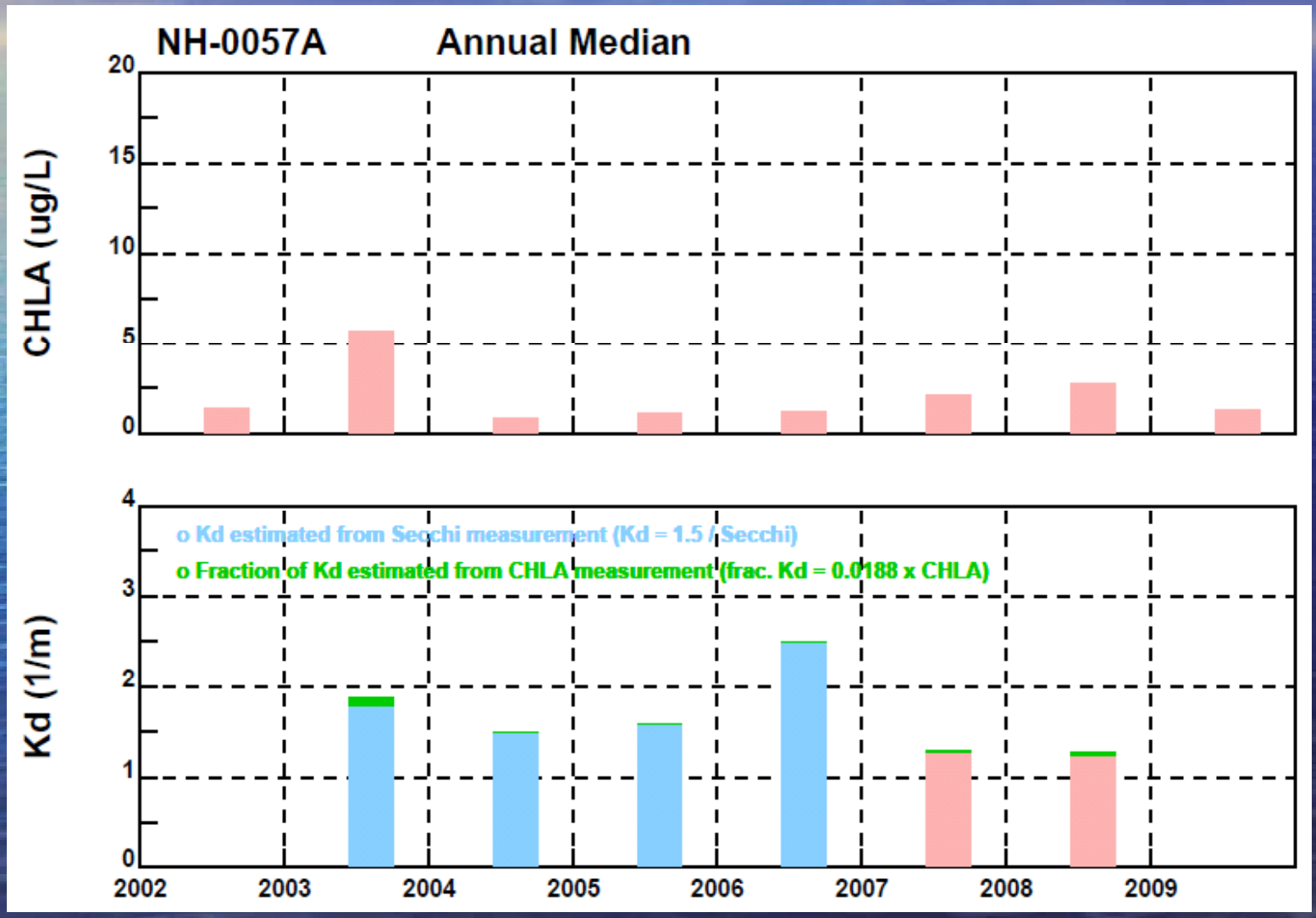
Contributions to Kd (PAR) measured at the Great Bay Buoy

(From Morrison et al, 2008)





Upper Piscataqua River
Measured Chla and Kd (2003-2008)



Conclusions

- ✓ Reducing nitrogen levels in the estuary will not materially improve water column transparency
- ✓ Proposed .3 mg/l TN transparency based WQ standard is unjustified

Macroalgae

Great Bay Macroalgae studies

- 2, 1980's UNH Studies show macroalgae not a problem
- 2008 UNH Study shows increase in macroalgae at the five study sites

Nutrient Criteria

- Sets .34- .38 mg/l WQ standard to prevent macroalgae proliferation (10-20% below 2008 TN level of .42mg/l)

Hydroqual analysis

- NPDES TN permit limit of 8 mg/l at WWTP's will lower DIN system loading in GB to well below 1990's levels

Macroalgae mats *(Ulva* and *Gracilaria)* in Great Bay near Lubberland Creek. Photo credit: Jeremy Neddleton (2008).

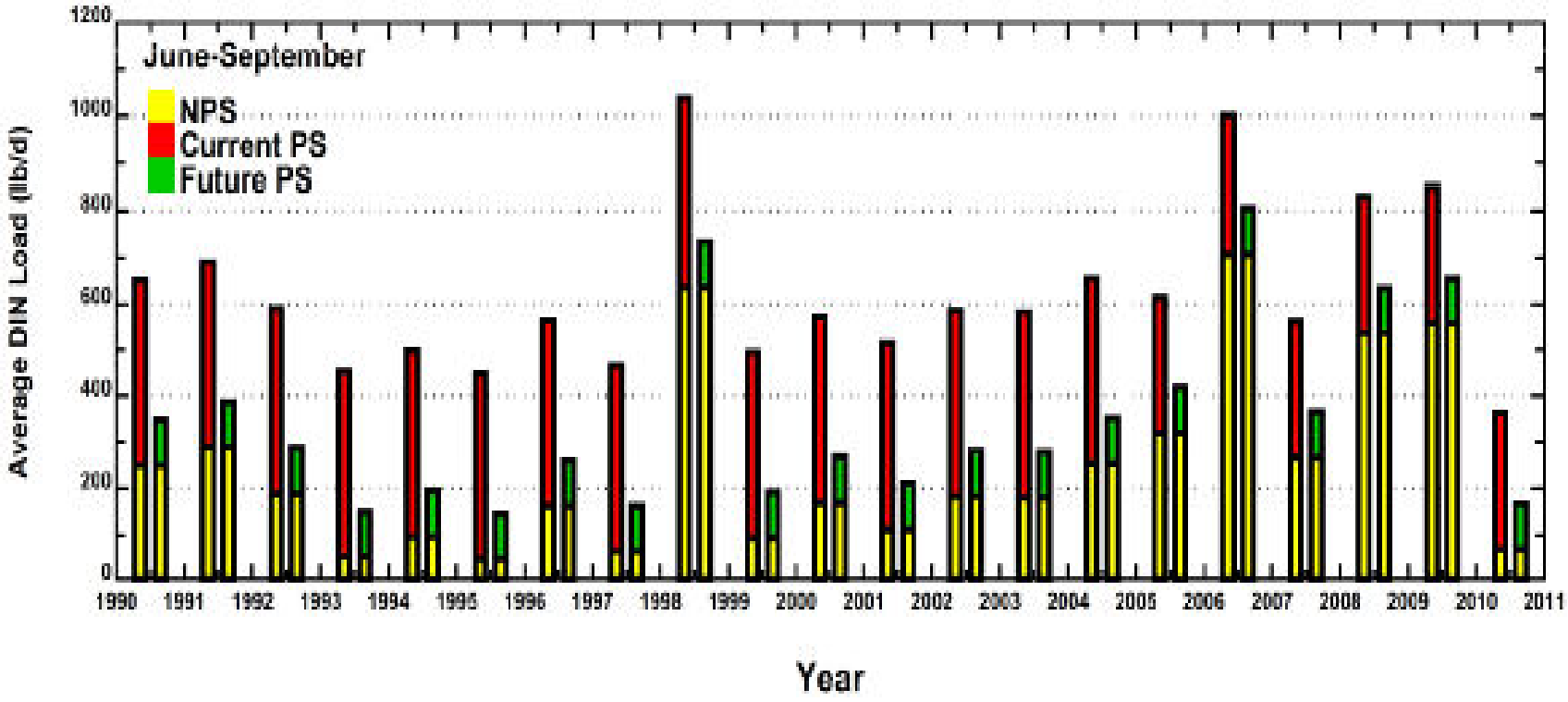
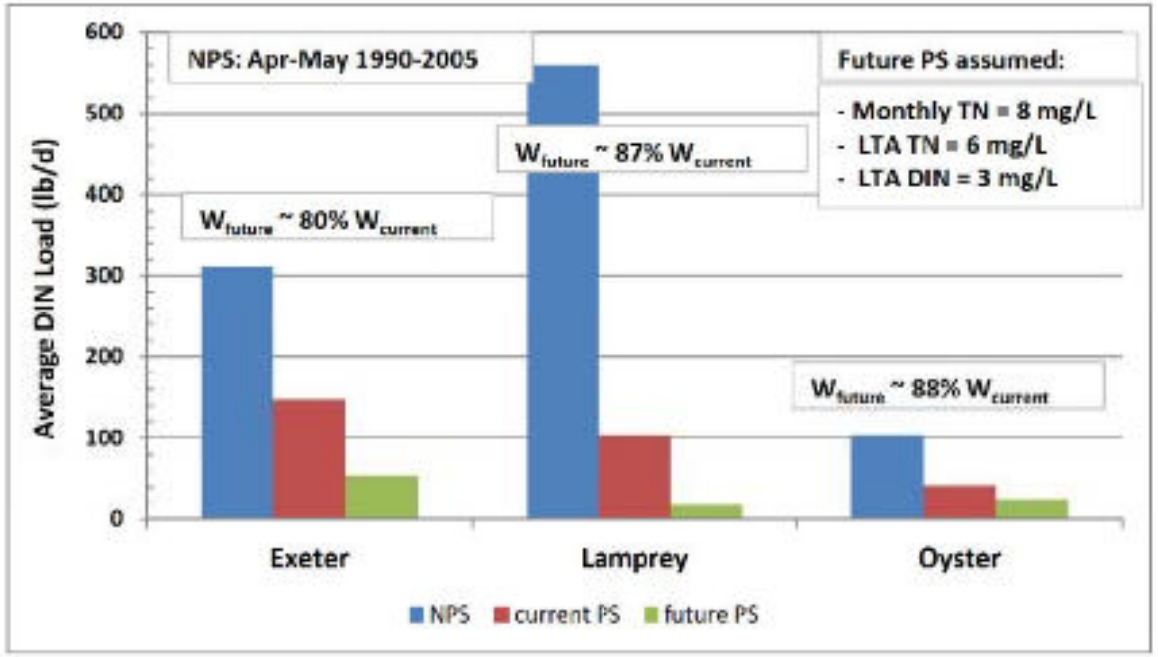


Figure 13. Exeter, Lamprey and Oyster River DIN Loads (1990-2010)



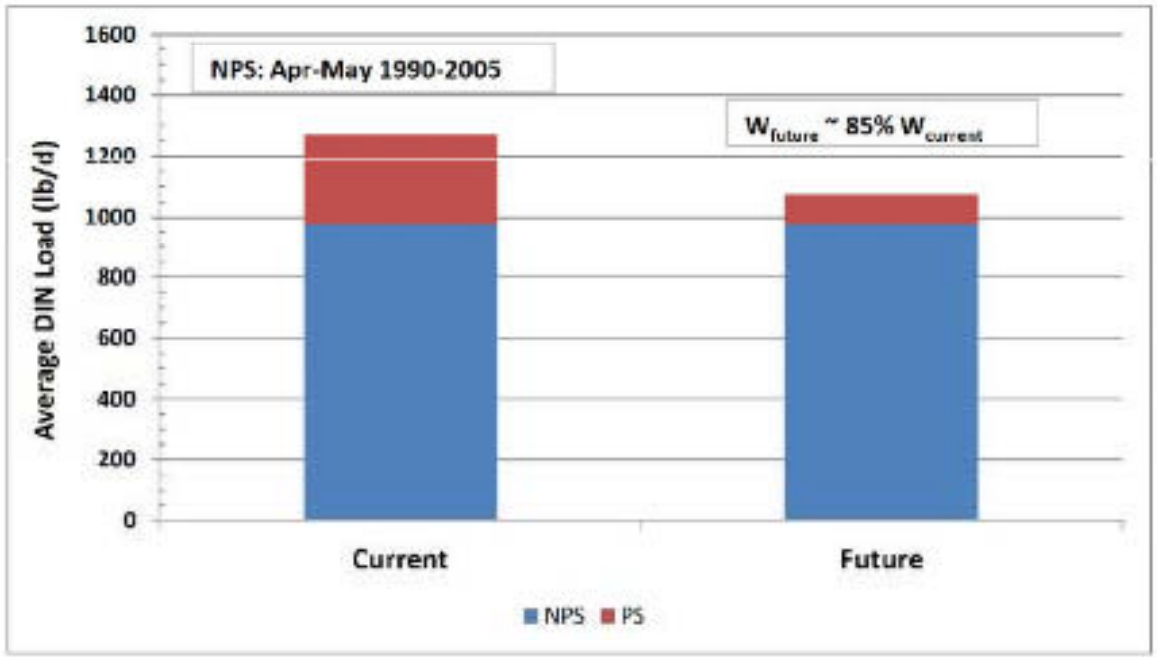
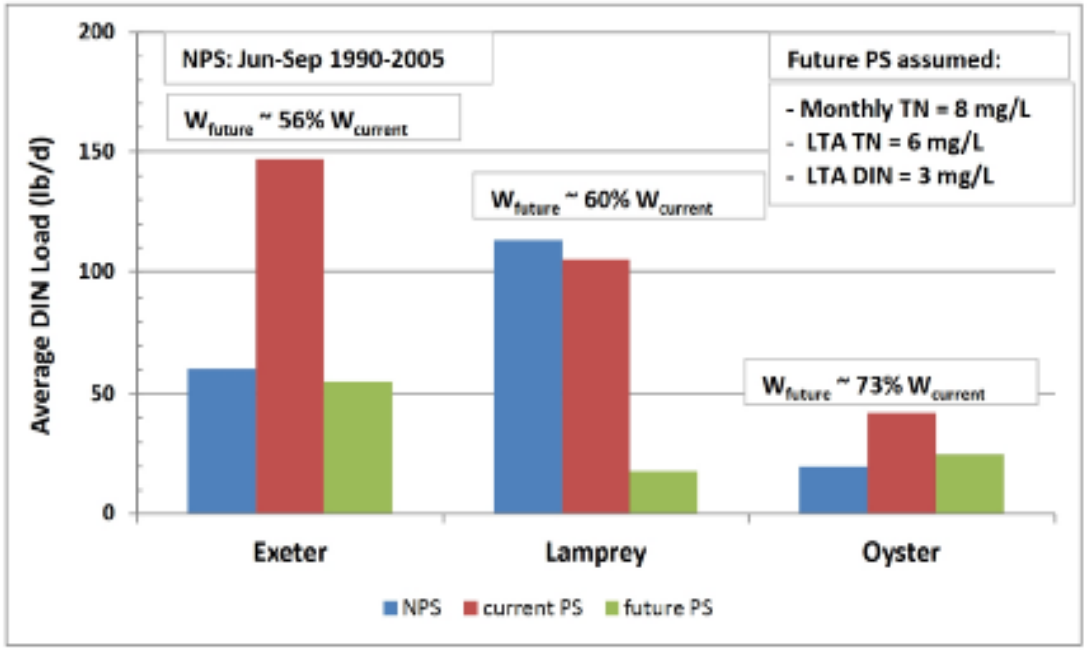


Figure 12. Estimated Current and Future NPS and PS DIN Loads (April-May 1990-2005).



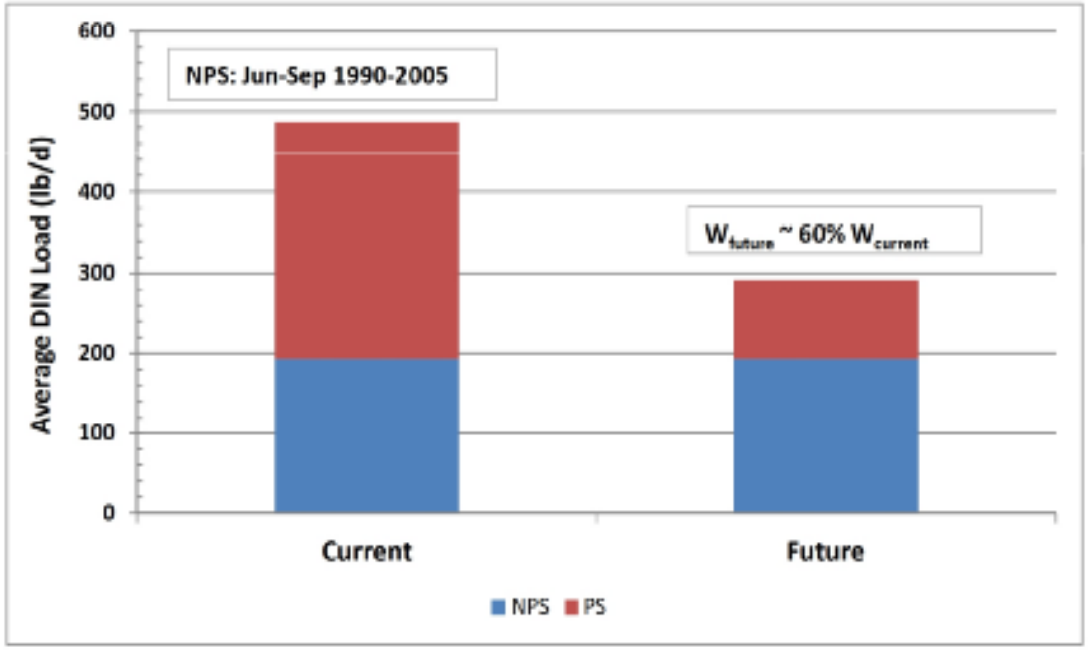
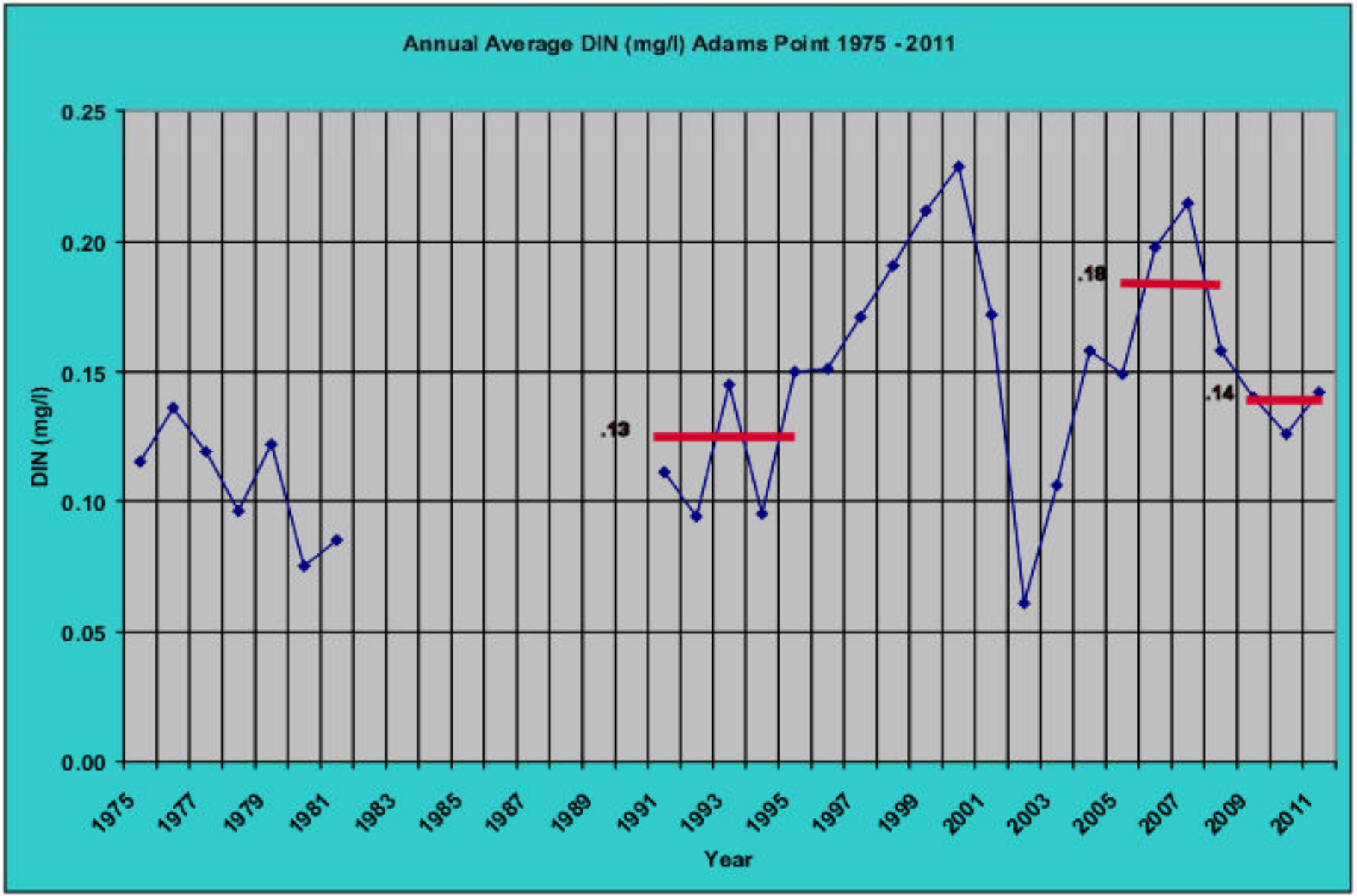
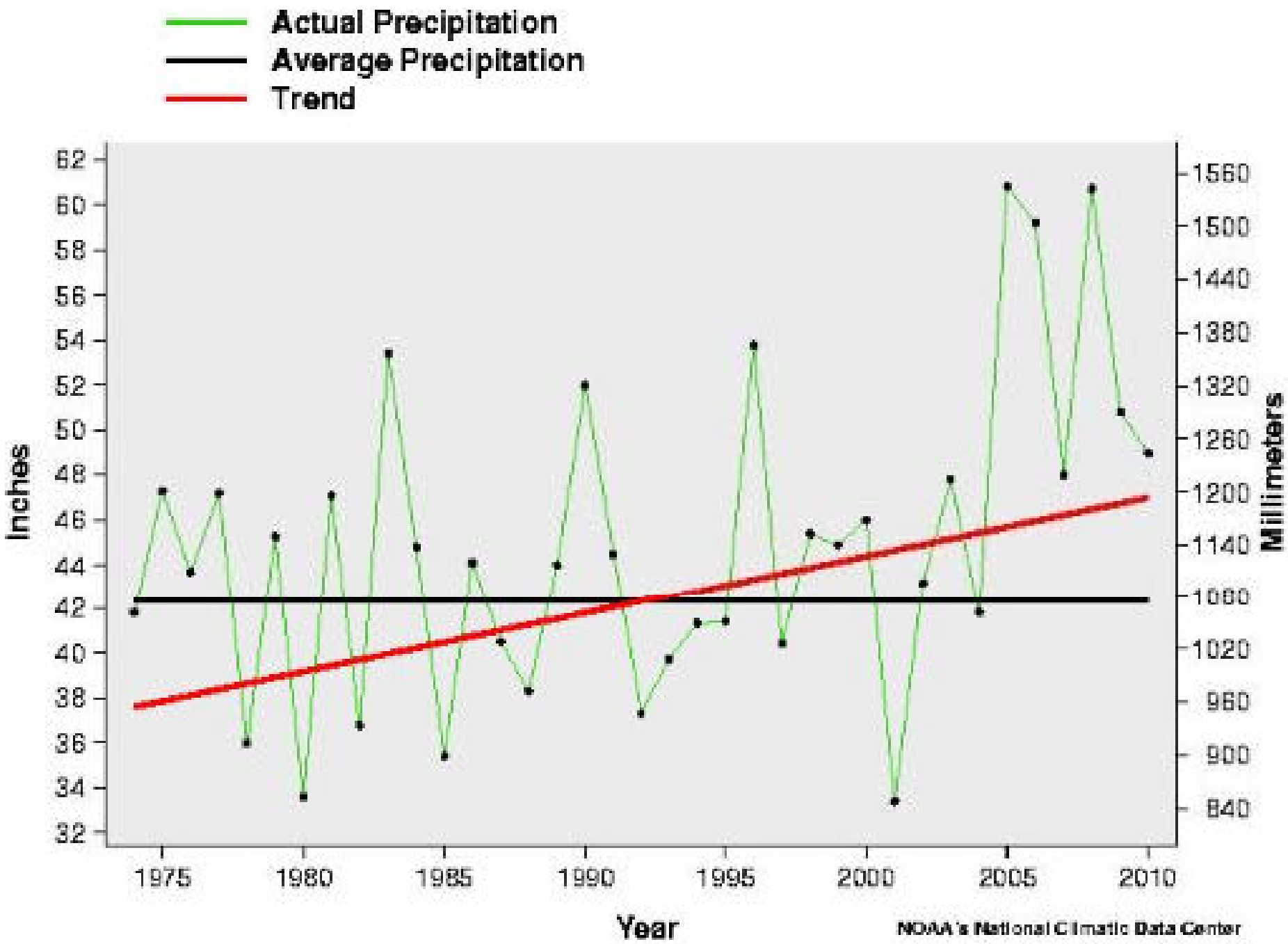


Figure 11. Estimated Current and Future NPS and PS DIN Loads (June-September 1990-2005).


Annual Average DIN (mg/l) Adams Point 1975 - 2011
DIN (mg/l)
0.25
0.20
0.15
0.10
0.05
0.00
.13
.18
.14
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
Year


Actual Precipitation
Average Precipitation
Trend
Inches
62
60
58
56
54
52
50
48
46
44
42
40
38
36
34
32
Millimeters
1560
1500
1440
1380
1320
1260
1200
1140
1080
1020
960
900
840
1975
1980
1985
1990
1995
2000
2005
2010
Year
NOAA's National Climatic Data Center

Why All The Fuss?

Times have changed

Funding of WWTP upgrades 100% local users

Stakes are high

* Coalition Wastewater plant upgrade costs

3 mg/l	$588,000,000 over 20 years
8 mg/l	$364,000,000 over 20 years
Delta	$224,000,000 over 20 years

* Applied Economic Resources Report 2011

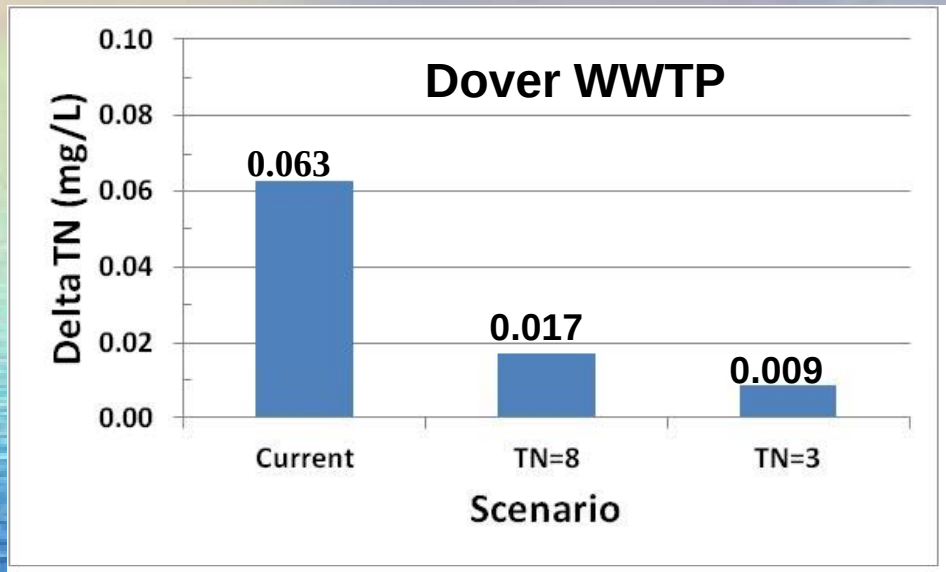
WWTP estimated costs to reduce N

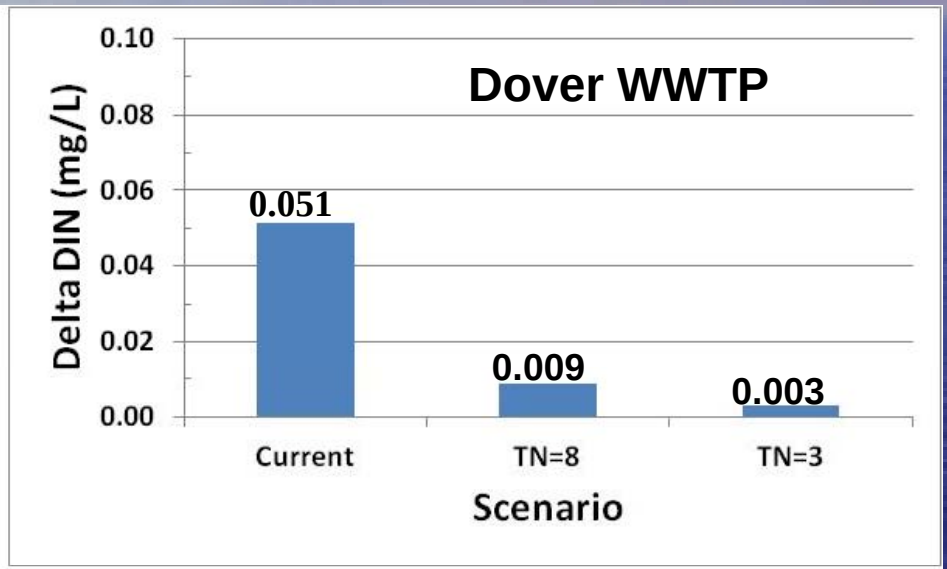
Dover 2.8 mgd 96 tons N/yr

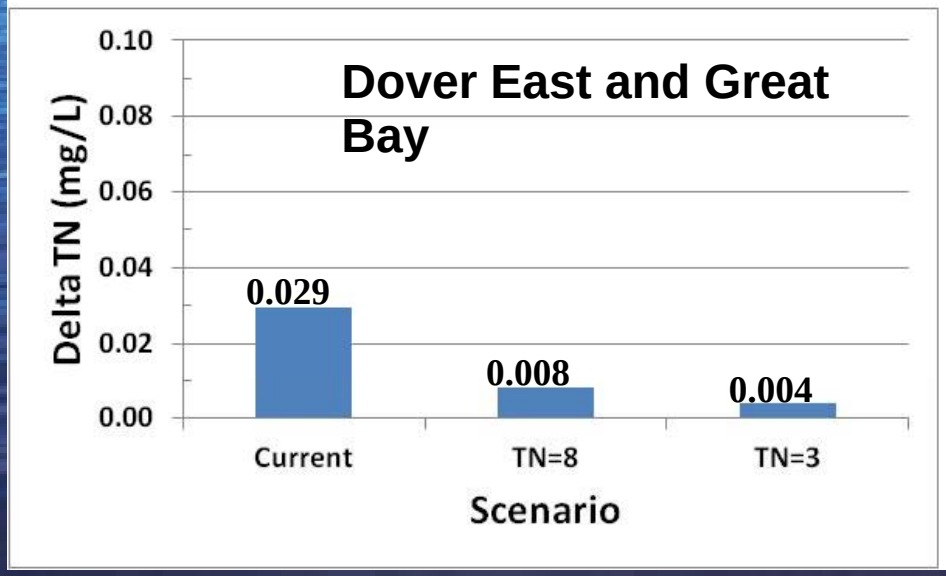
Limit (mg/l)	% red.	Tons red.	20yr Cost	Cost/ton
8 (6)	73%	70	$36.4 mil	$26K
3	86%	83	$94.9 mil	
	13%	13	$58.5 mil	$225K

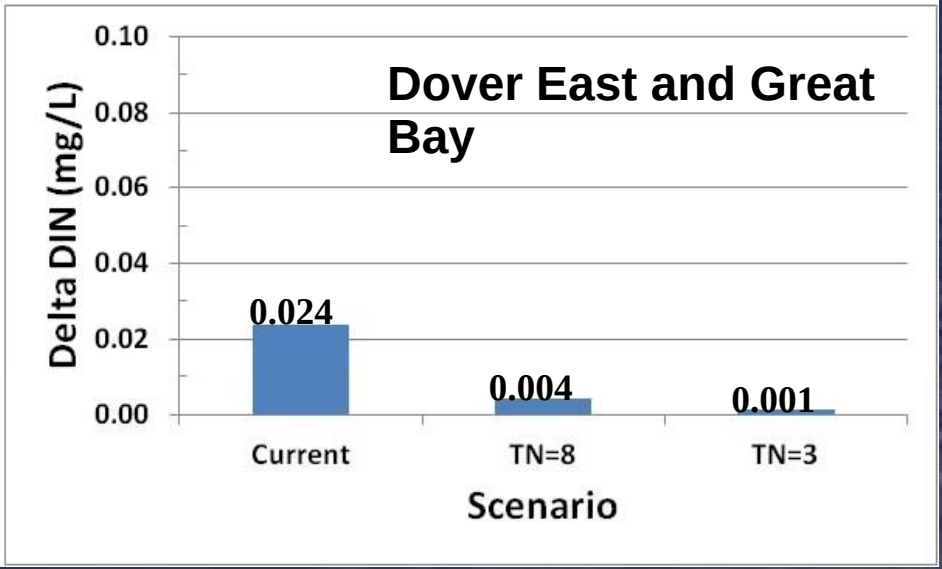
Preliminary Hydrodynamic Model Grid

Computed Increase in Great Bay Estuary TN and DIN Levels due to Dover WWTP Discharge









Plan that makes sense

- Best use of available resources
- Addresses point and non point sources
- Monitors progress and adapts
- Coalition Adaptive Management proposal (Oct.-11)
  - Utilizes recommendations from the Piscataqua River Estuary Partnership's CCMP

Adaptive Management Proposal

- Coalition WWTP's discharging to the estuary
  - 8 mg/l N permit limits; Operational within 5 yrs
- Invest in WQ and Habitat monitoring & research
- Invest in habitat restoration projects
- Stormwater improvements
- Septic system contribution reduction strategy
- Fertilizer use controls
- Stream and wetland buffers
- Support land conservation

Adaptive Management Proposal

- WWTP's contributing to Great Bay
  - 8 mg/l N seasonal permit limits for 10 yrs
  - Operational within 5 yrs or sooner
  - Assess system improvements during permit
- Invest in WQ and Habitat monitoring and research
- Invest in habitat restoration projects
  - Oyster restoration and aquaculture
  - Eelgrass restoration

Adaptive Management Proposal

- Stormwater improvements
  - Adopt consistent stormwater regulations
  - Adopt watershed wide use of BMP's
  - Partner with UNH to develop effective BMP's
- Septic system contribution
  - Develop and implement a strategy- NHDES
- Fertilizer use controls

Adaptive Management Proposal

- Stream and wetland buffers
  - Protection
  - Encourage re-establishment
- Support land conservation initiatives

Benefits of Adaptive Management Proposal

- Provides significant nitrogen reduction
- Addresses point and non point sources
- Funds needed monitoring, research, and restoration
- Avoids legal appeals
  - Wastes financial resources
  - Delays implementation of reductions

Additional Efforts

- Southeast Watershed Alliance
  - Implementation of regional water related projects
  - 42 NH Communities
- Town of Durham
  - Integrated watershed permit – combined wastewater and stormwater permiting

Capital Investment in Wastewater

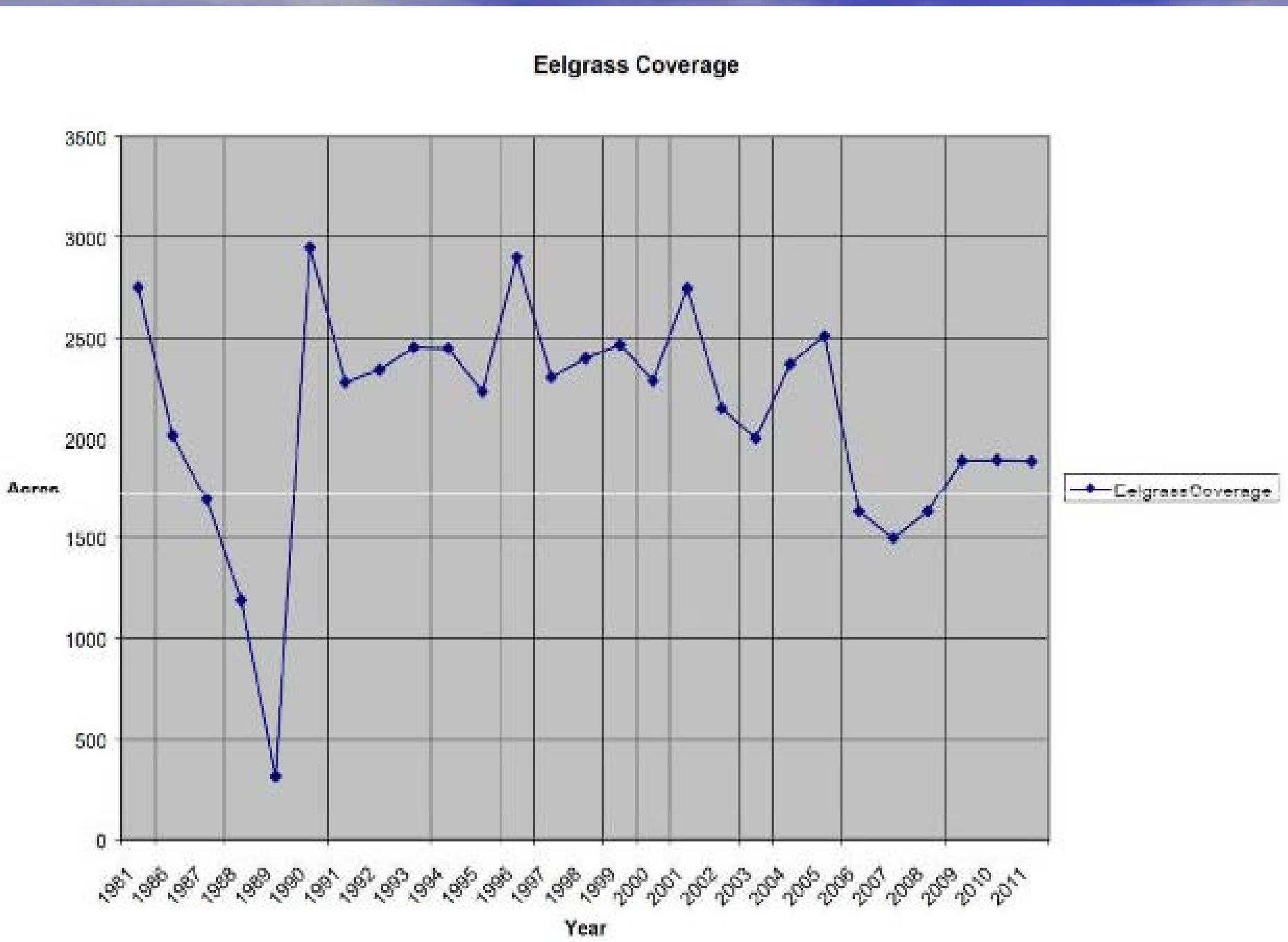
Portsmouth	$41 million
Dover	$20 million
Exeter	$10 million

Conclusions

- Nitrogen is not the cause of reduced water column transparency in the estuary
- Therefore .3 mg/l TN transparency based WQ standard is unjustified
- Lack of available Macroalgae research in GB estuary
- Hydroqual analysis shows 8 mg/l TN permit limit @ WWTP's reduce system DIN load well below 1990's levels
- Coalition Adaptive Management proposal reduces point and non point sources, invests in monitoring and research, & supports restoration efforts

Conclusions

- Coalition communities committed to protecting the estuary
- Coalition is ready to implement the proposed Adaptive Management proposal
- Coalition insists we invest wisely to avoid wasting resources
- Success will require a cooperative partnership with all the stakeholders


Eelgrass Coverage
3500
3000
2500
2000
1500
1000
500
0
Acres
1981
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Year
EelgrassCoverage