

# What happens when Nutrients are Reduced?

Candace Oviatt

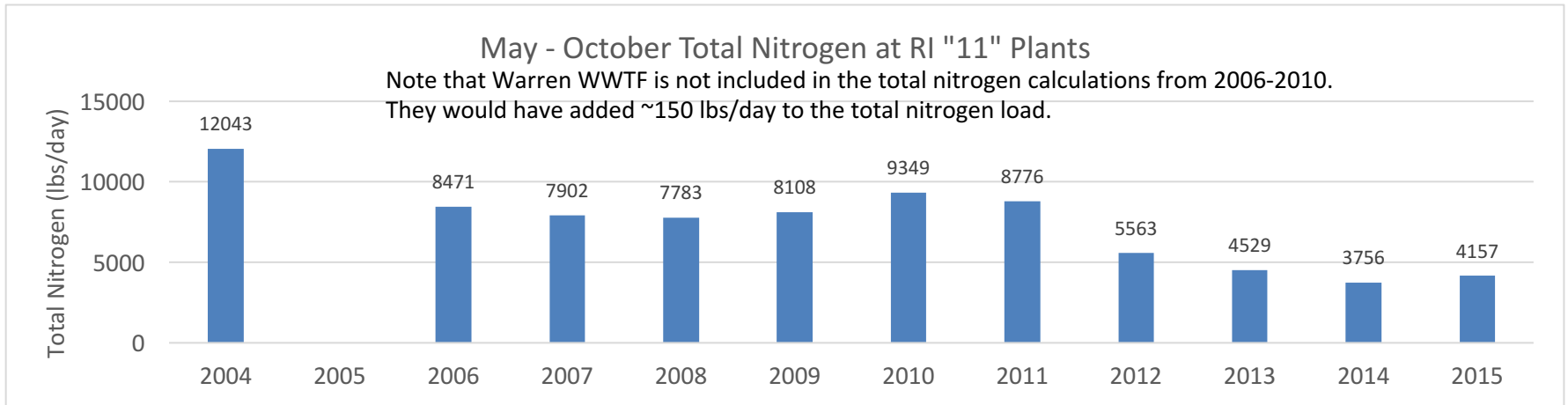
Ronald C. Baird Sea Grant Science Symposium

December 6, 2017

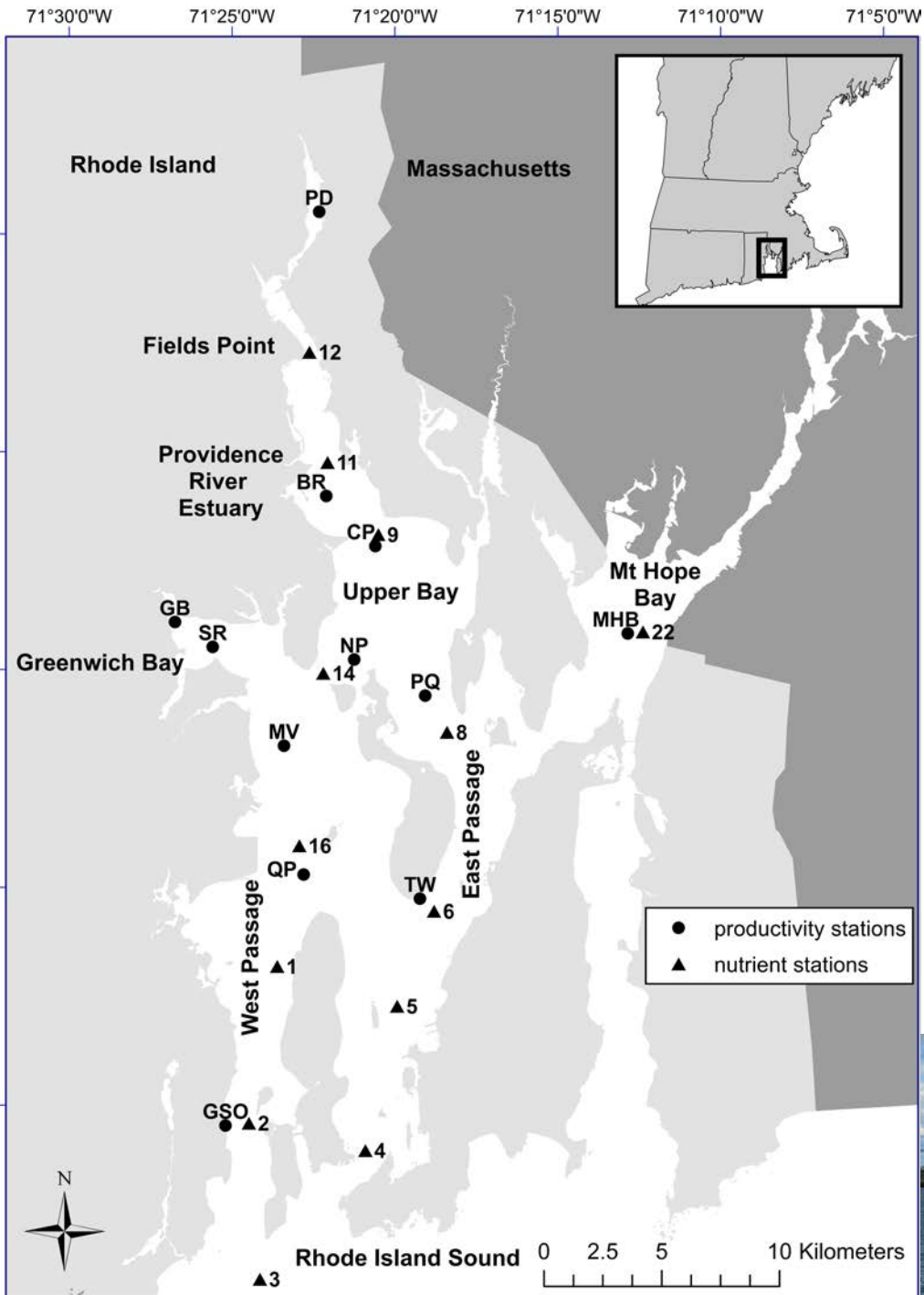
Coastal Institute Auditorium



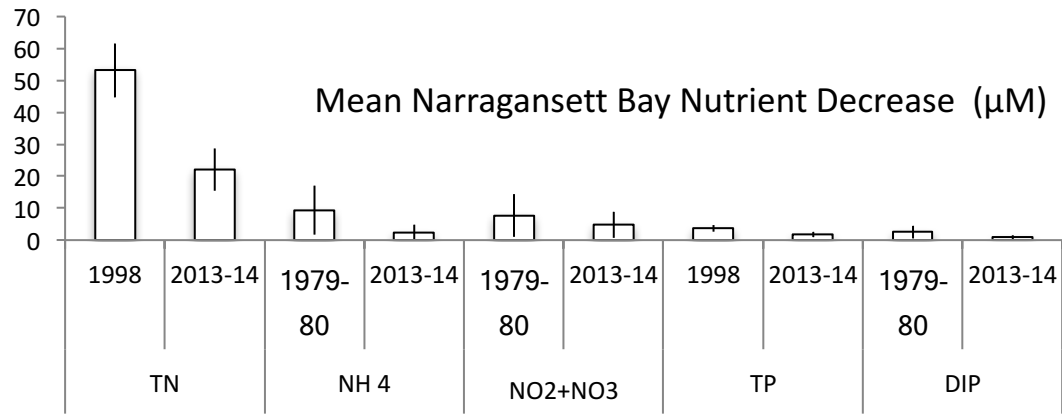
# RI Department of Environmental Management Summer Total Nitrogen Inputs



Slide courtesy of Warren Prell and the RI DEM Office of Water Resources



# Nutrients have decreased by over 50%



# Decrease in Primary Production Along the North-South Axis of Narragansett Bay with Nitrogen Reduction

Station	Prod %	Prod %	Prod %
	Difference	Difference	Difference
	2004 to	2006-2011	2004 to
	2006-2011	to 2013-	2013-2015
		2015	
BR	-13	-21	-31
CP		-15	
MHB		-15	
NP	-29	-22	-44
GB	4	-16	-12
SR		-22	
MV	-28	-24	-45
PQ	-29	-3	-31
QP		-18	
T-W		-29	
GSO		2	
Average	-21	-17	-33
Statistical Significance:	**	N.S.	**

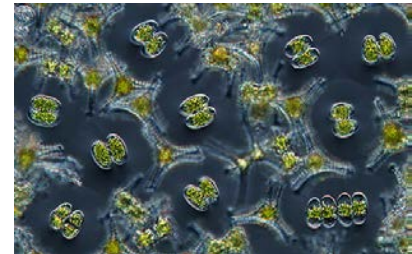
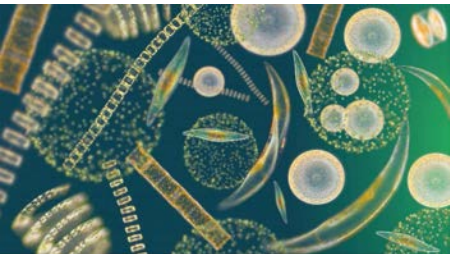
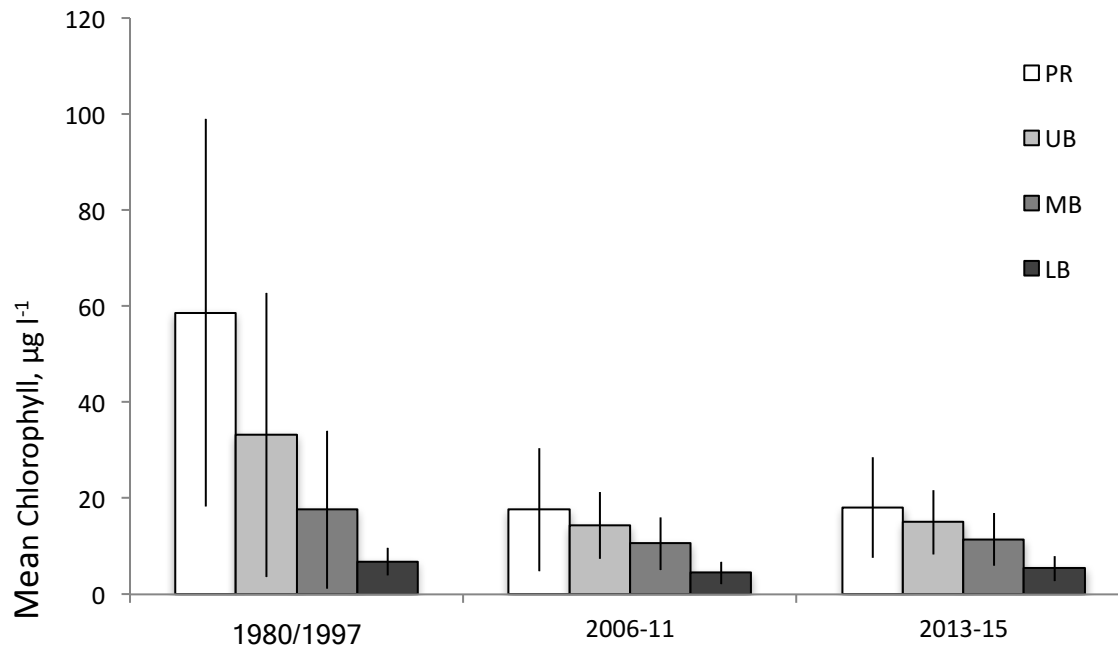
\*\* = 0.01 level of significance

N.S. - not significant at the 0.05 level of significance

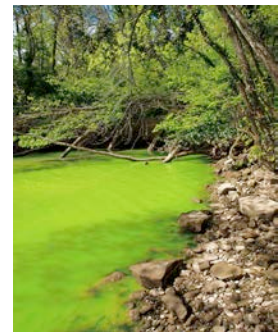
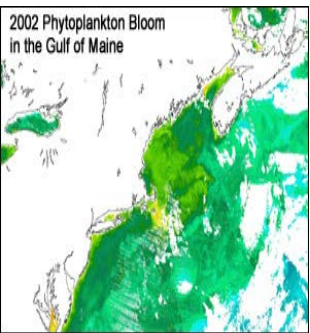
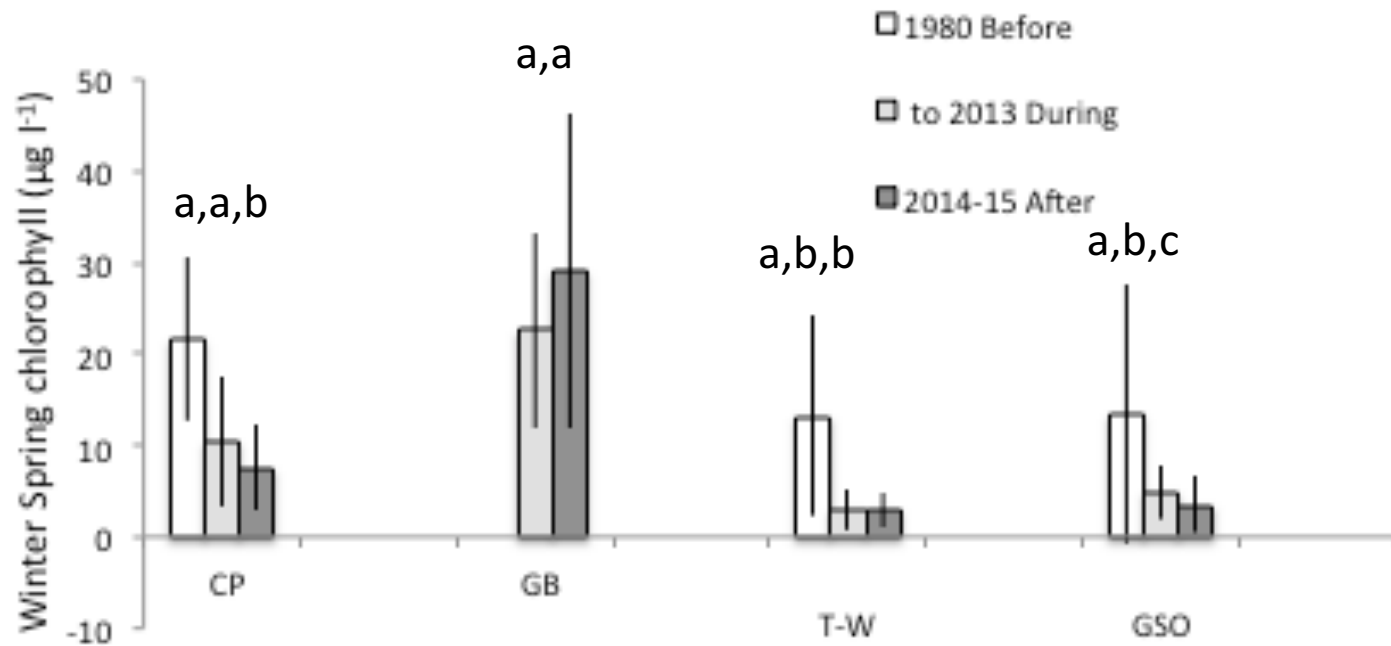




# Decrease in Summer Chlorophyll



# Decrease in Winter-Spring Bloom, JFM



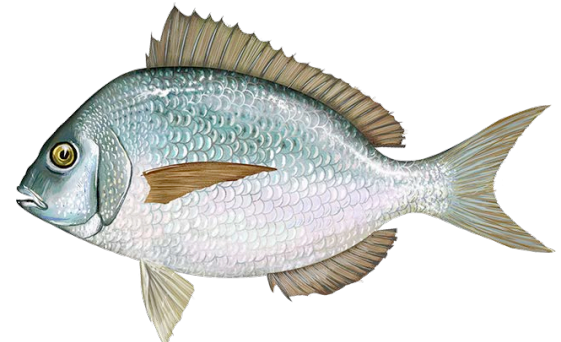
## Summary of the Narragansett Bay Ecosystem with and without the Winter-Spring Bloom

### **With the bloom during cold winters and high nutrients:**

- 1- Prolonged bay-wide, several week diatom bloom with high chlorophyll concentrations during winter-spring period which sinks to the benthos.
- 2- High biomass benthic infauna, epifauna and demersal fish community.

### **Without the bloom during warm winters and high or low nutrients:**

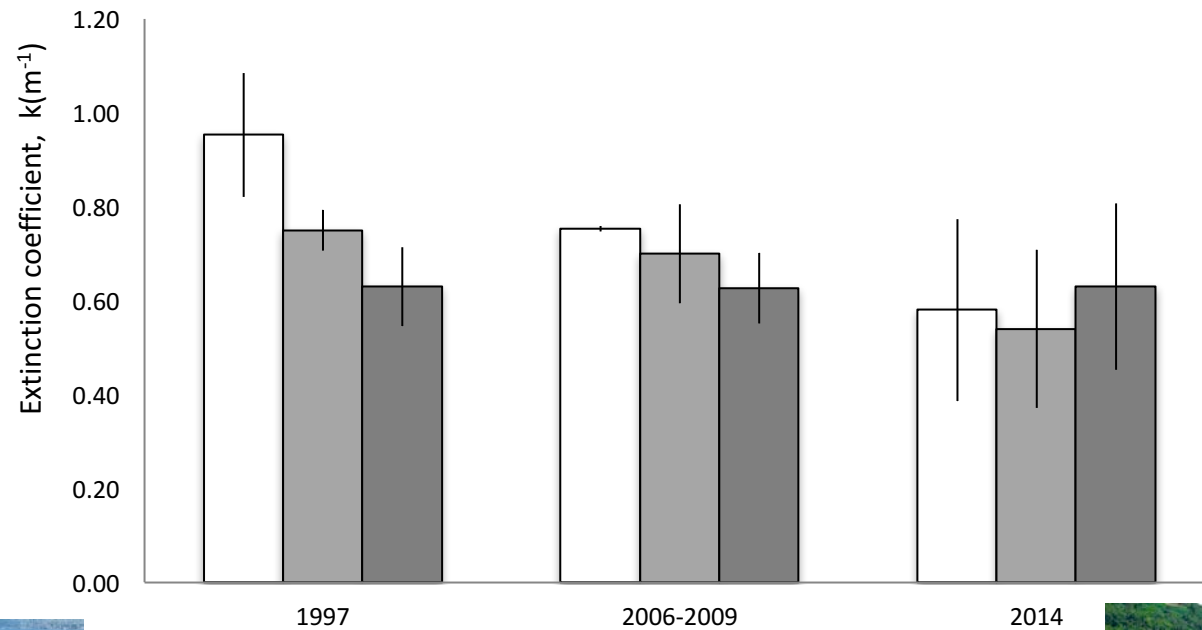
- 1- Small, non-extensive, short or no diatom bloom with low input of organic matter to the benthos but numerous zooplankton community in the water column.
- 2- Lower biomass benthos with pelagic fish dominating in the water column.





# Increased water clarity in the Providence River and Upper Bay.

Summer Mean Extinction Coefficients  
PR, UB, MB



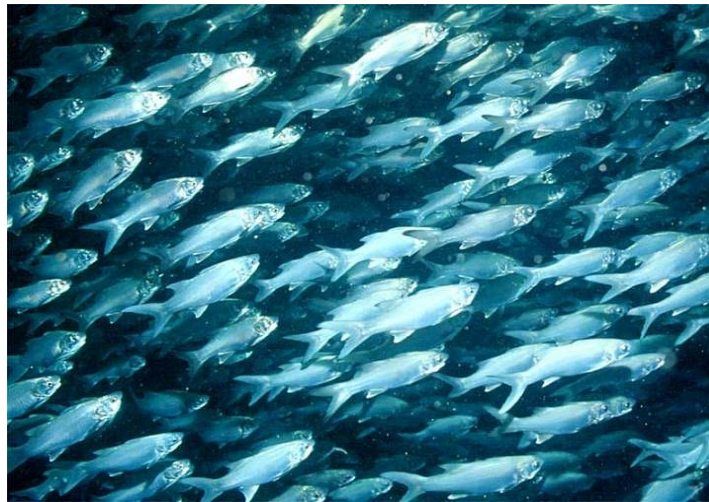
# Summary

Nutrients in the Bay have been decreased by over 50%.

Primary Production has decreased by about 30%.

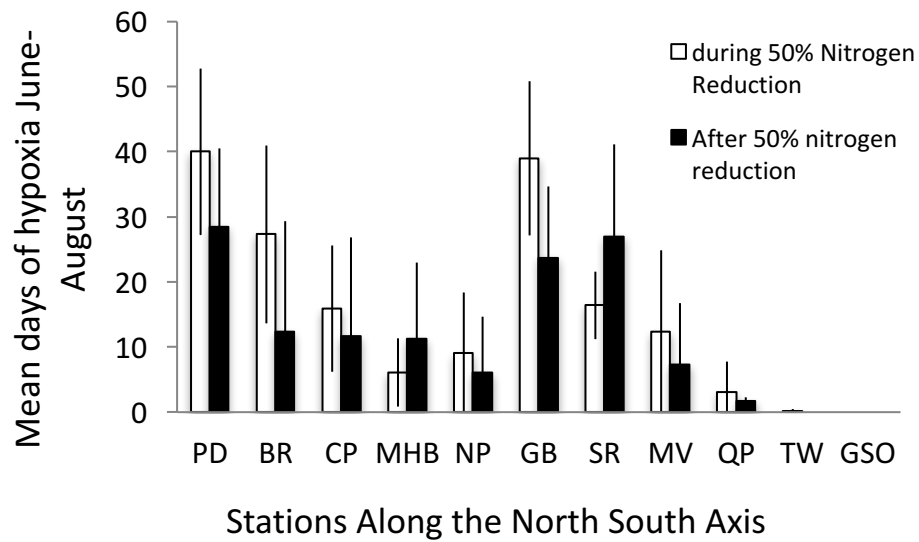
The Winter Spring Diatom Bloom has decreased due to warmer winters and reduced nutrients.

As a result we have greater water clarity in the upper Bay.



Questions?

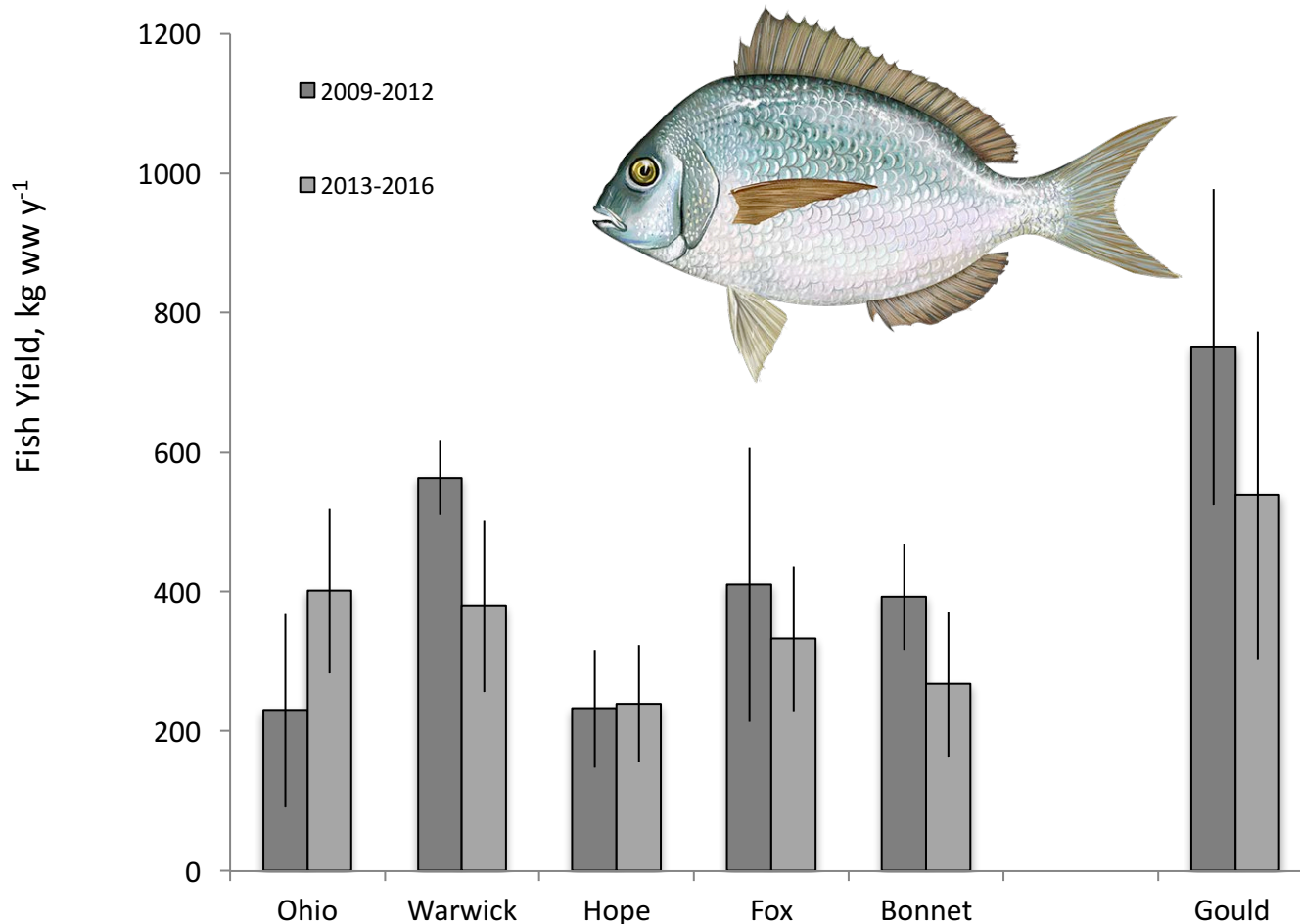
# Continued periods of low oxygen in the Bay.



# What about Fish?

Narragansett Bay Five Station Transect During to After Nutrient Reduction  
(After Decapod Decline)

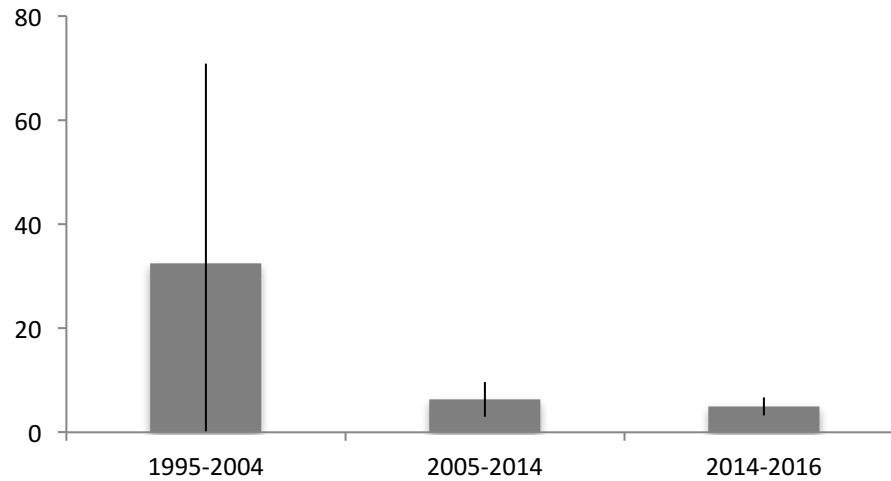
Significant decreases for all except Ohio and Hope between during and after nutrient reduction.



# Decrease in Crabs and Lobsters due to Predation/Temperature?

GSO Fox Island Demersal Invertebrate Mass

Mean Tow ww, kg y-1





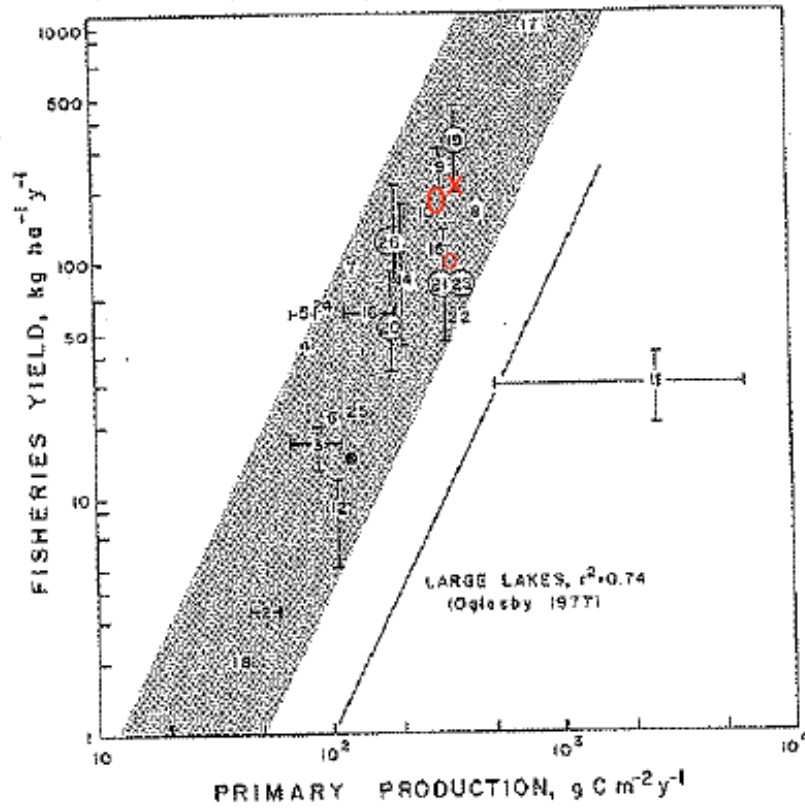


Figure 20

The relationship between fisheries yield (first reference) and the primary production (second reference) of a variety of marine systems (points in shaded area) compared with the regression line developed by Oglesby (1977) for similar data from large fresh water systems.

pp	gC m <sup>-2</sup> y <sup>-1</sup>	kgww/hect/y-1		Mean
	327	243	X	during
	276	214	0	after
	311	94	o	before
	311	336		before decapod corr

## Fish (Nixon 1982)

