

# Oyster Propagation Results

## Town of Wellfleet



Provincetown  
Center for Coastal Studies



**Cape Cod Cooperative Extension**



Massachusetts Oyster Project  
[www.massoster.com](http://www.massoster.com)

Oysterfest Shell Return 2011



Site visit on July 17, 2011:  
After cultching;



Dr. Frankic's students:  
Anny Cataldo, Aly Pitts,  
and Judith Druker



Deniz Bertuna

6-11 -2012; A. Frankic



8-20-12

<http://www.flickr.com/photos/greenbostonharbor/sets/72157631223836048/show/>



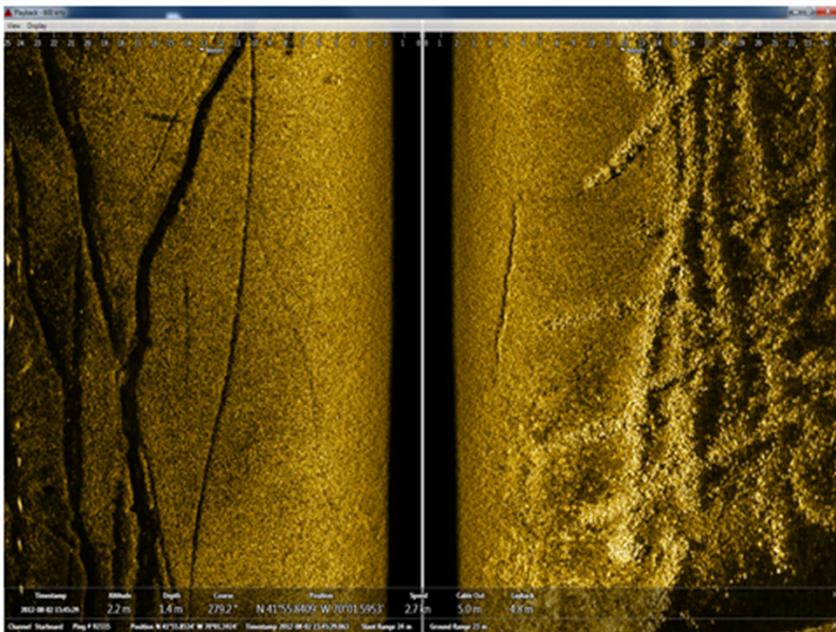
# Groundtruthing

414858.423	4642618.410	-0.763	wlhbr-01
414858.608	4642619.471	-0.750	wlhbr-02
414857.518	4642619.609	-0.757	wlhbr-03
414857.382	4642618.620	-0.748	wlhbr-04





Mark Borrelli,  
Jennifer Wilson (CCS)



# Denitrification by Habitat Type

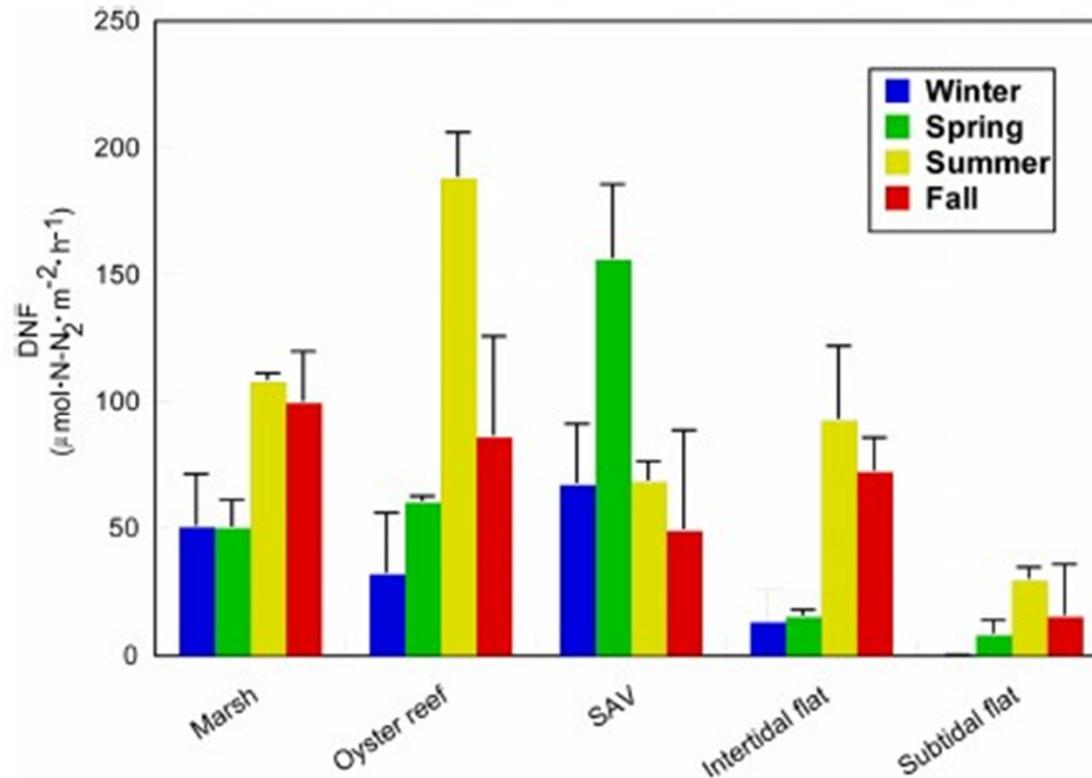


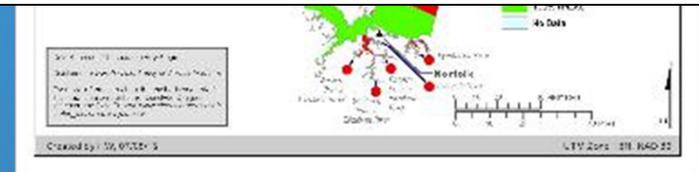
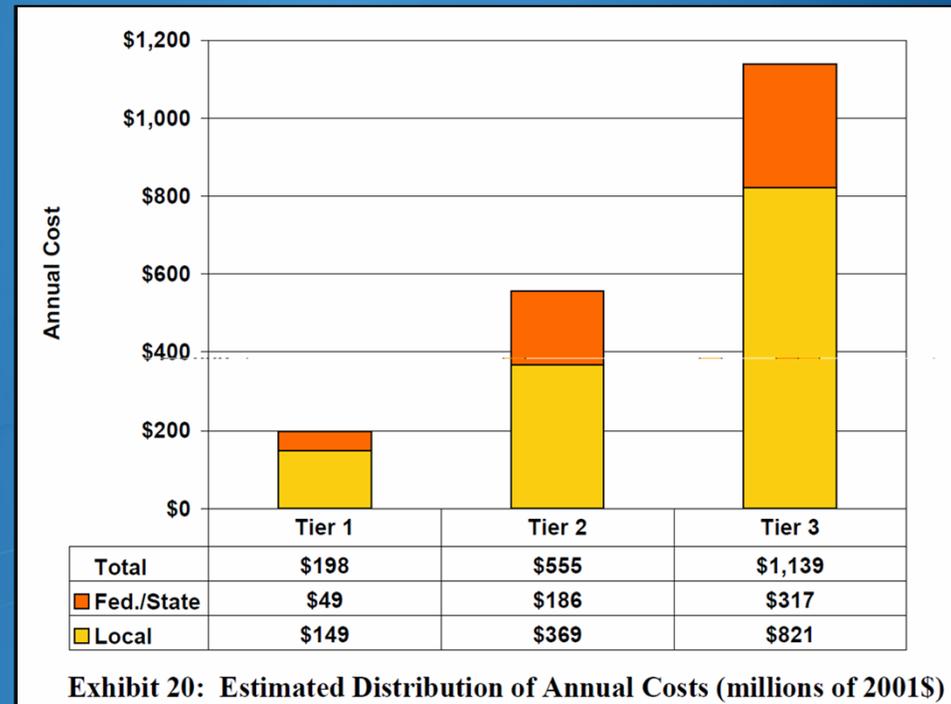
Fig. 1. Mean rates of denitrification by habitat for each season. Error bars are one standard error.

- Structure seems to help promote the denitrification process (Piehler and Smyth 2011)

# Increasing Interest in Oysters and WQ

## Why?

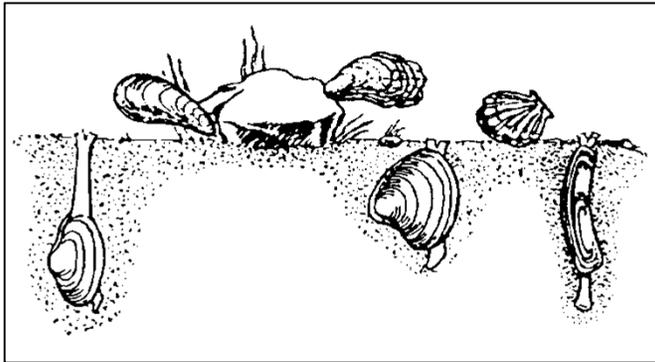
- Population decline
  - < 1% historic levels
- Failure to meet WQ goals
- EPA-mandated WQ improvements (TMDLs) increasingly expensive
  - MD and VA
  - Local governments will pay bulk of costs
- Enhancing oyster populations may cost less than other options
  - Additional benefits



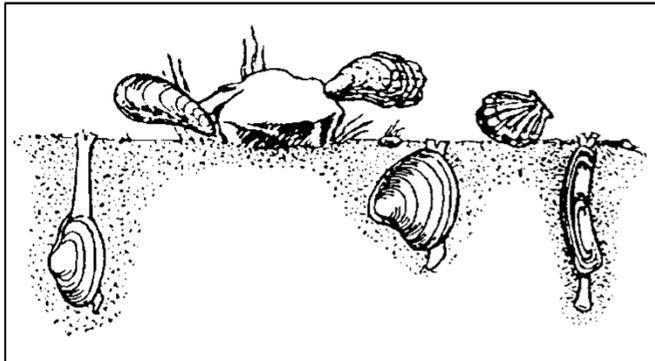
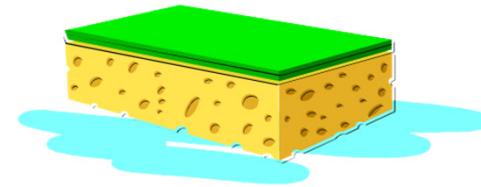
Source: US EPA 2003. Economic analysis of nutrient and sediment reduction actions to restore Chesapeake Bay. Annapolis, MD



# Shellfish and Nutrients



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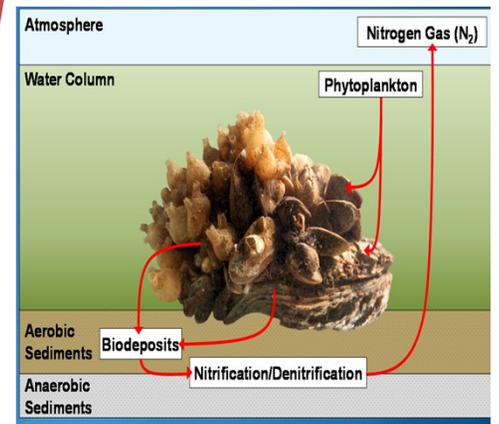
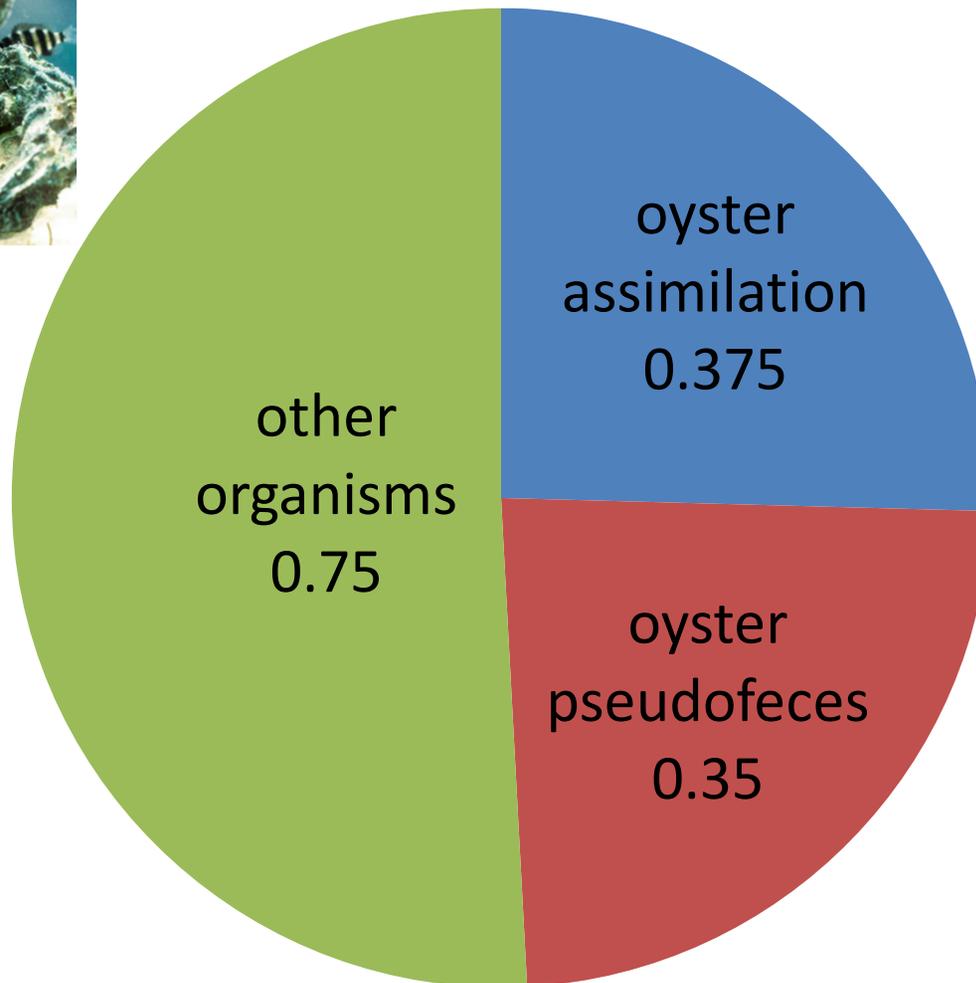
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# Best Available Science



Oyster Nitrogen Removal  
(gms/oyster/year)



# Measuring Oysters' Improvements on Water Quality



Real Time Water Quality



[www.capecodextension.org/Marine-Programs/YSI-Water-Quality-Monitoring.html](http://www.capecodextension.org/Marine-Programs/YSI-Water-Quality-Monitoring.html)



Overall project area with new culch

- > already 2-3 million additional oysters
- > goal: 8,800 pounds of nitrogen removed per year
- > likely increase in commercial shellfish value of \$1 million/year
- > increased water filtration approximately 100 million gallons/day
- > erosion control
- > sediment reduction
- > increased turtle, eel, juvenile fish habitat



New spat on seaclam culch (small black patches)

Monitoring Wells

Oyster Spawning Study Area (2.04 acres)

Recycled OysterFest Shells



YSI Meter



- Uniqueness of Wellfleet Harbor
- Importance of Habitats Connectivity
- Challenges to restore & sustain keystone coastal habitats together and not separate

**Facts:**

- In Spring 1877, a Wellfleet schooner in 5 trips in one day landed 16,254 bushels of oysters (Ernest Ingersoll, 1881); 1 bushel ~ 100 oysters ~ 1.5 mill oysters
- Today: ~ 3 mill oysters/year

## Duck Creek Site



May 14 2011



Photos: A. Frankic

2 acre project site change in only 2 years!



**Green** - compact sediment with cultch from the oyster festival; **red** – sand and mud sediment with little cultch along the fringing salt marsh; **purple** - variable sediment texture with high cultch and young oysters and spats; **blue** - established oyster reef with adult oysters ~ 3y/o.



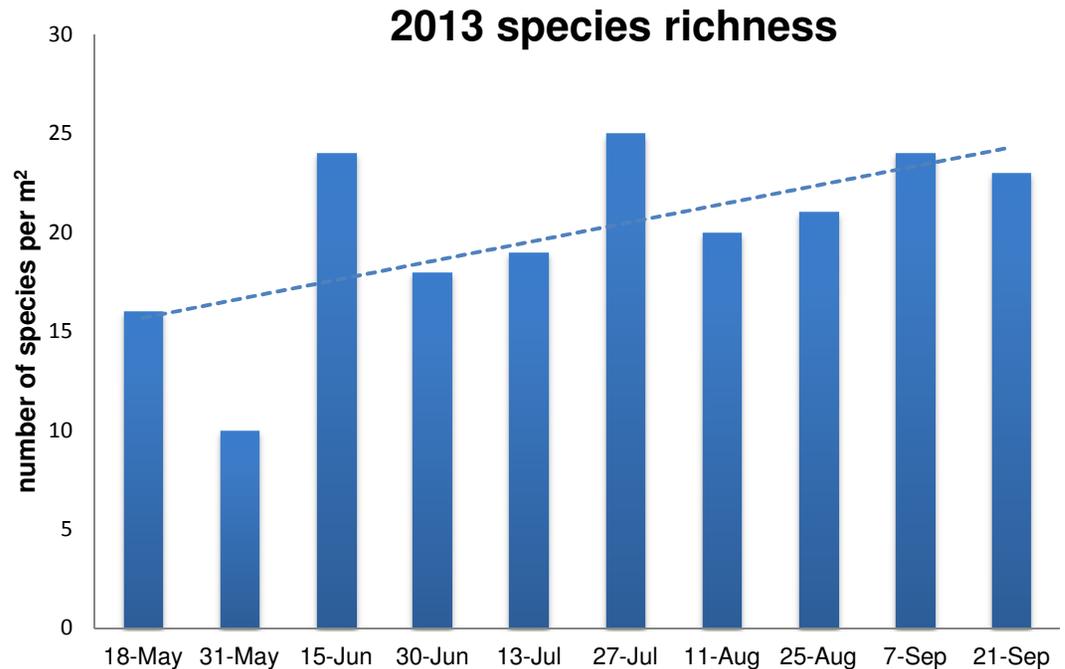
# Species biodiversity at the project site

## 2013 species identified within quadrats:

- ribbed mussel (*Geukensia demissa*)
- mud crab (*Neopanopeus sayi*)
- amphipods (*Gammarus*)
- hard clams (*Marcenaria m.*)
- mud snails (*Ilyanassa obsoleta*)
- oyster drills (*Urosalpinx cinerea*)  
~58 individuals counted in September,  
7.25 individual oyster drills per m<sup>2</sup>
- mud warms (*Polycheate*)
- anemones (*Ascidia*)
- asian shore crab (*Hemigrapsus sanguineus*)
- barnacle
- mite
- whelk

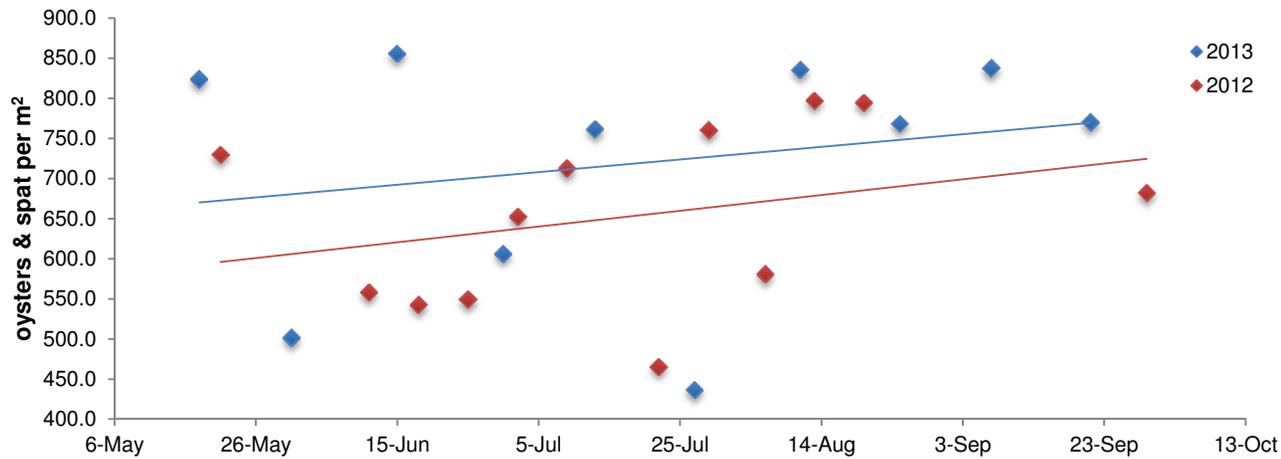
Increased abundance and appearance of other species was observed throughout the project site:

- Terrapins (~40 at the site)
- Grey heron
- gulls
- juvenile fish
- Shrimps
- Oyster catcher



# Oyster population data 2012-13

2012 and 2013 oyster (including spat) comparisons per m<sup>2</sup>.

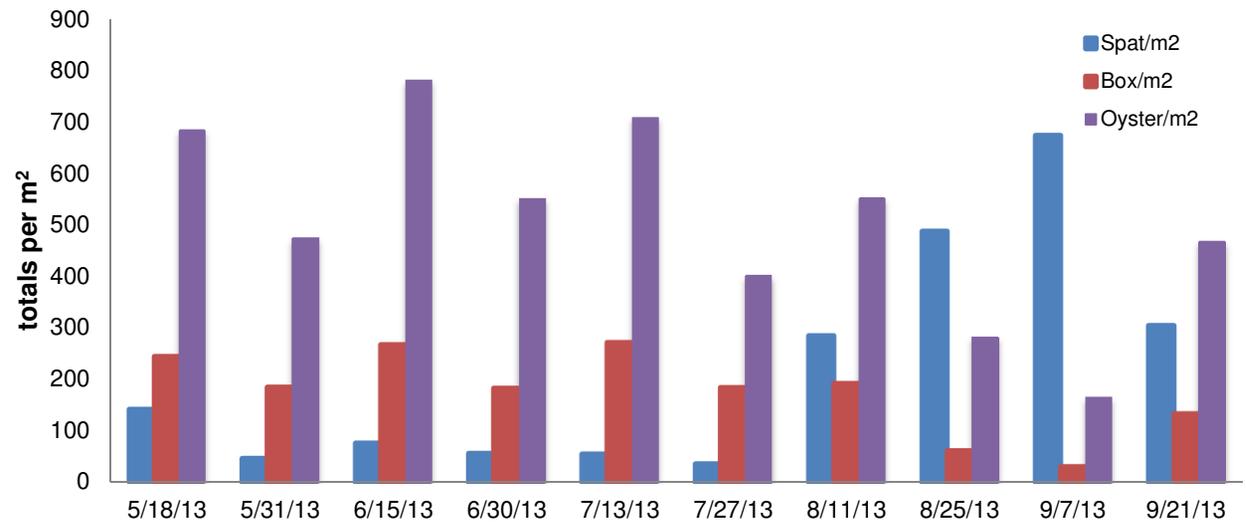


2012 spat & oyster estimate:  
~3.9 million

2013 spat & oyster estimate:  
~4.4 million

Population assessment of adult oysters and spats per m<sup>2</sup>

To note – the spat from May 18<sup>th</sup> to May 31<sup>st</sup> were from the end of the 2012 season

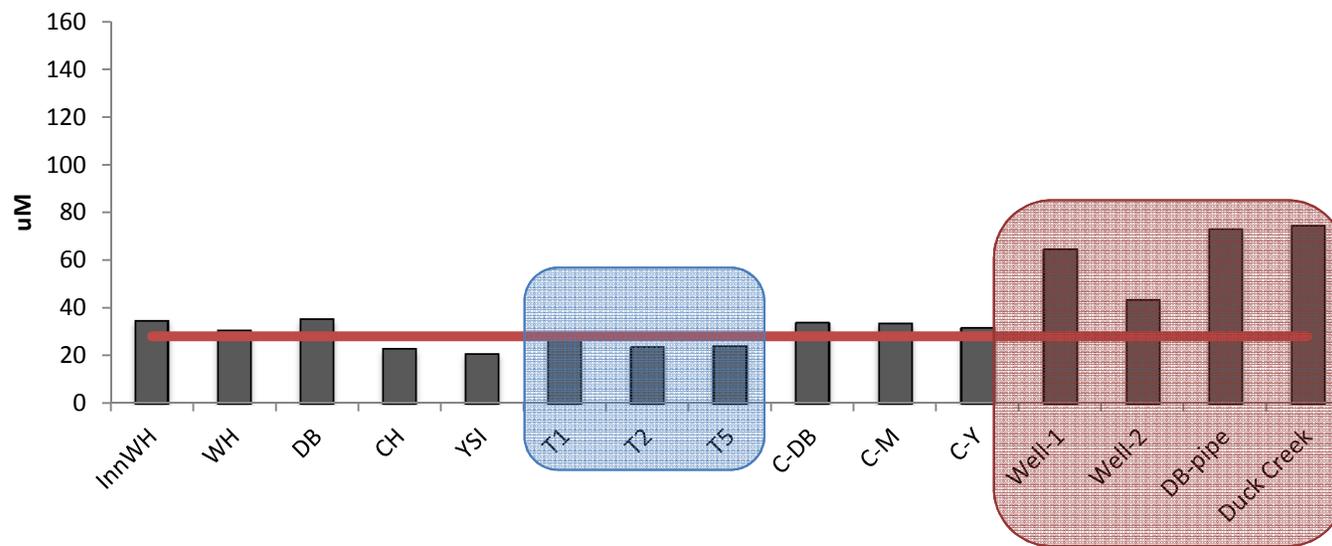




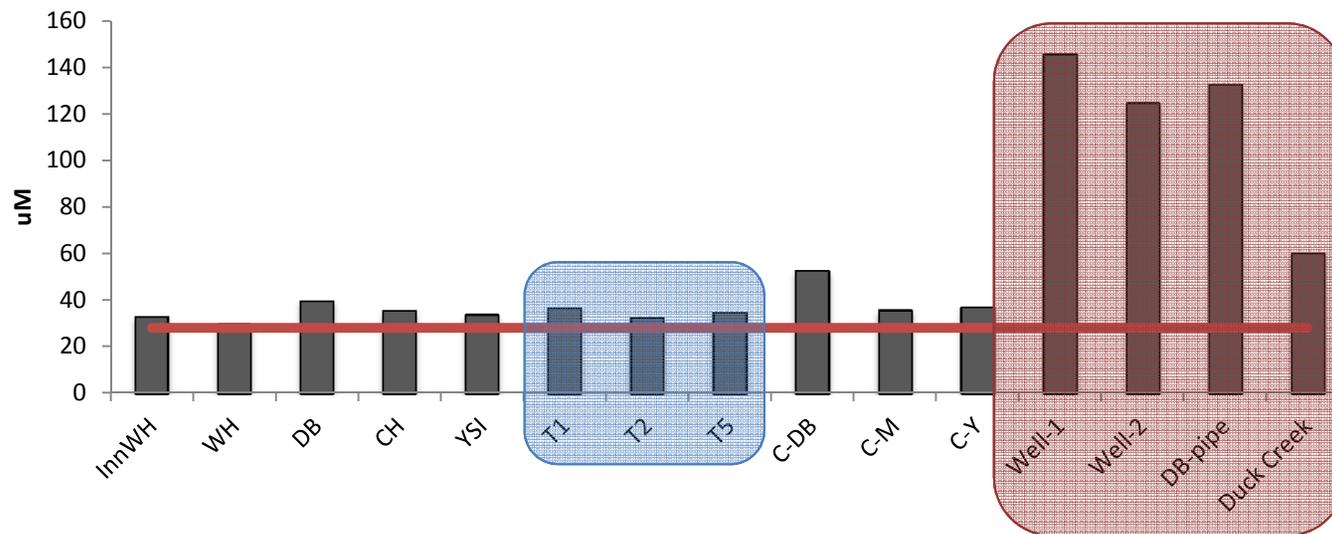
Fall 2013



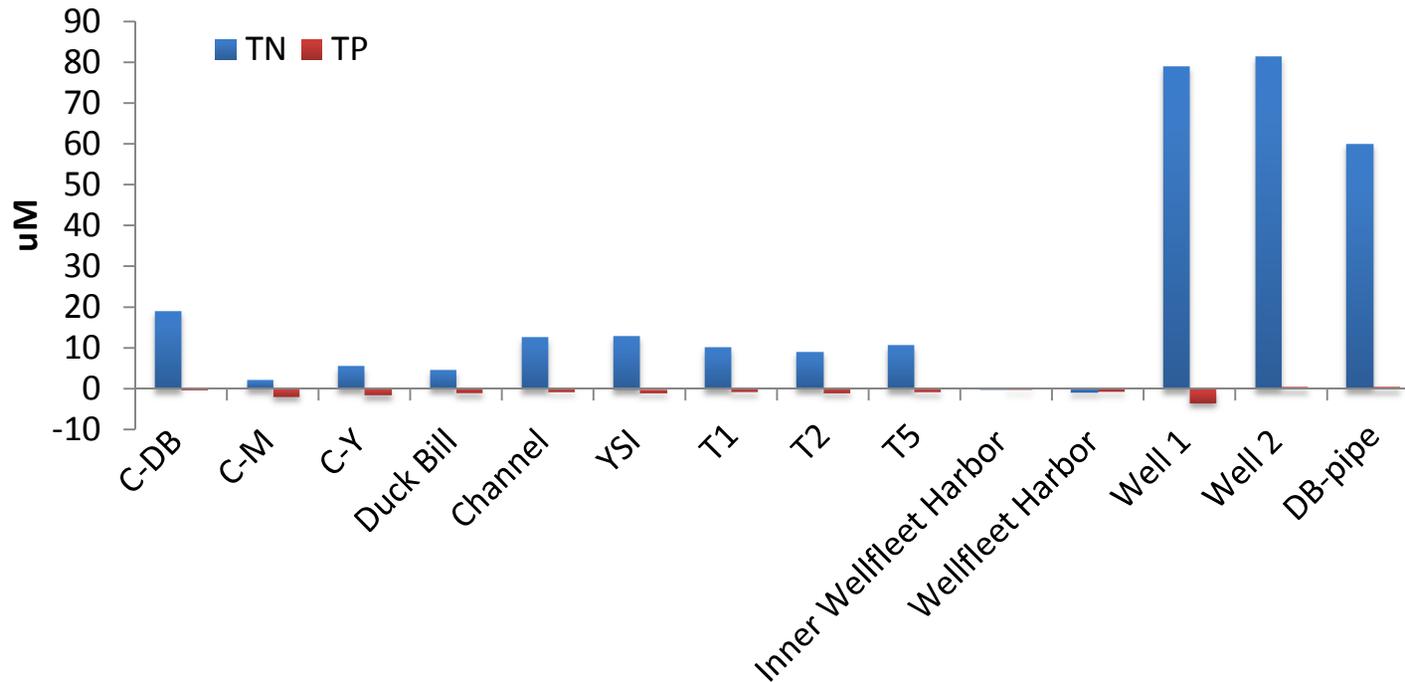
## Total Nitrogen 2012



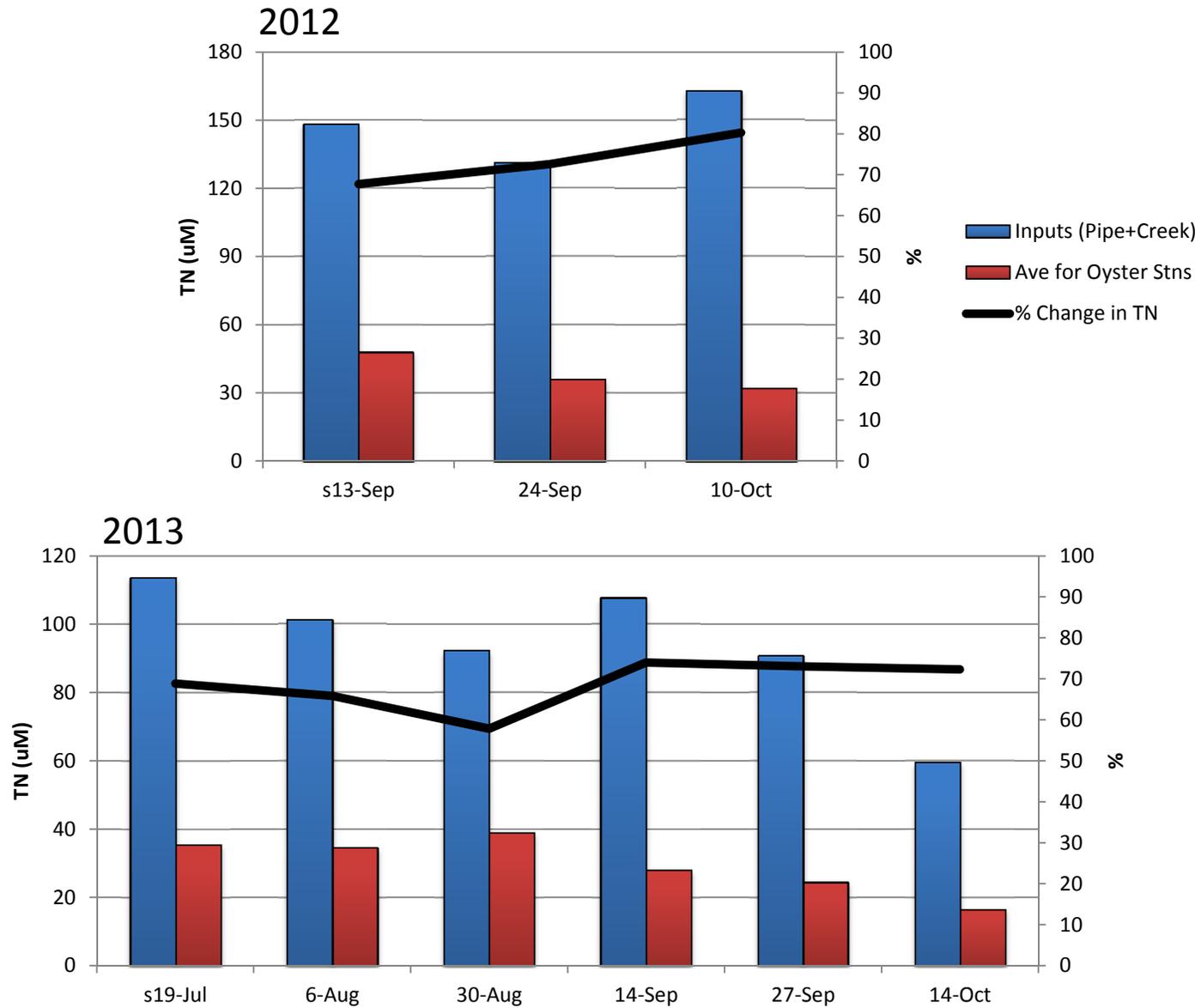
## Total Nitrogen 2013



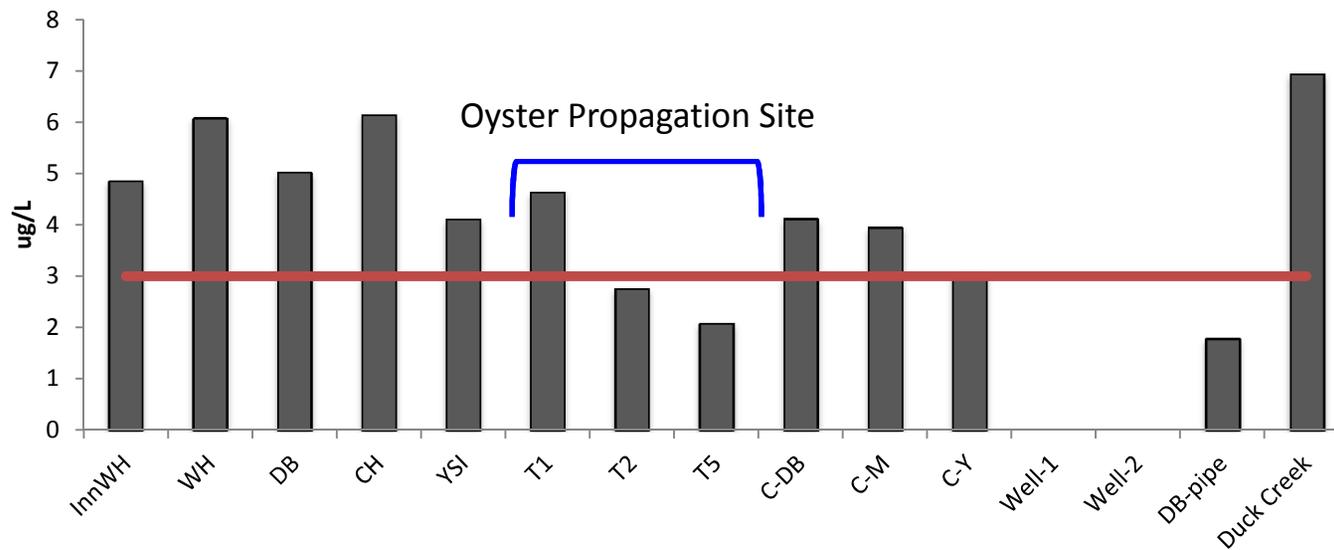
# Difference Between Years 2013 - 2012



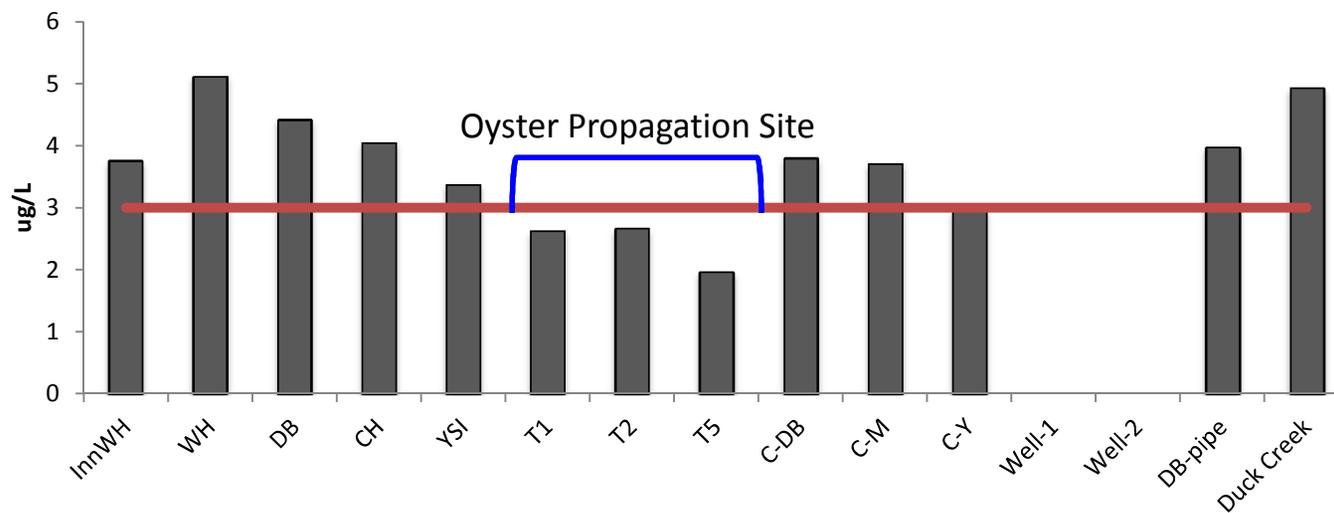
# Total Nitrogen



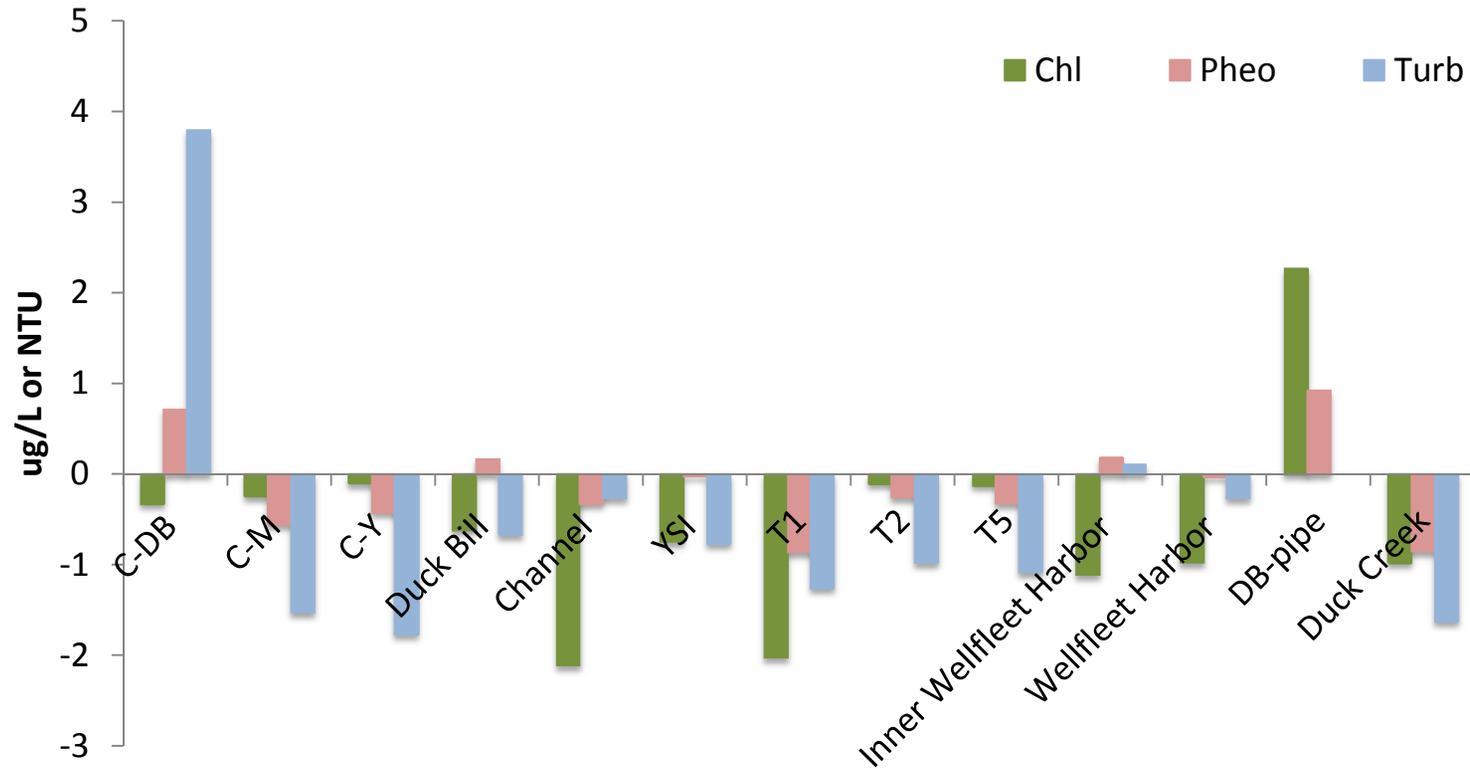
## Chlorophyll 2012

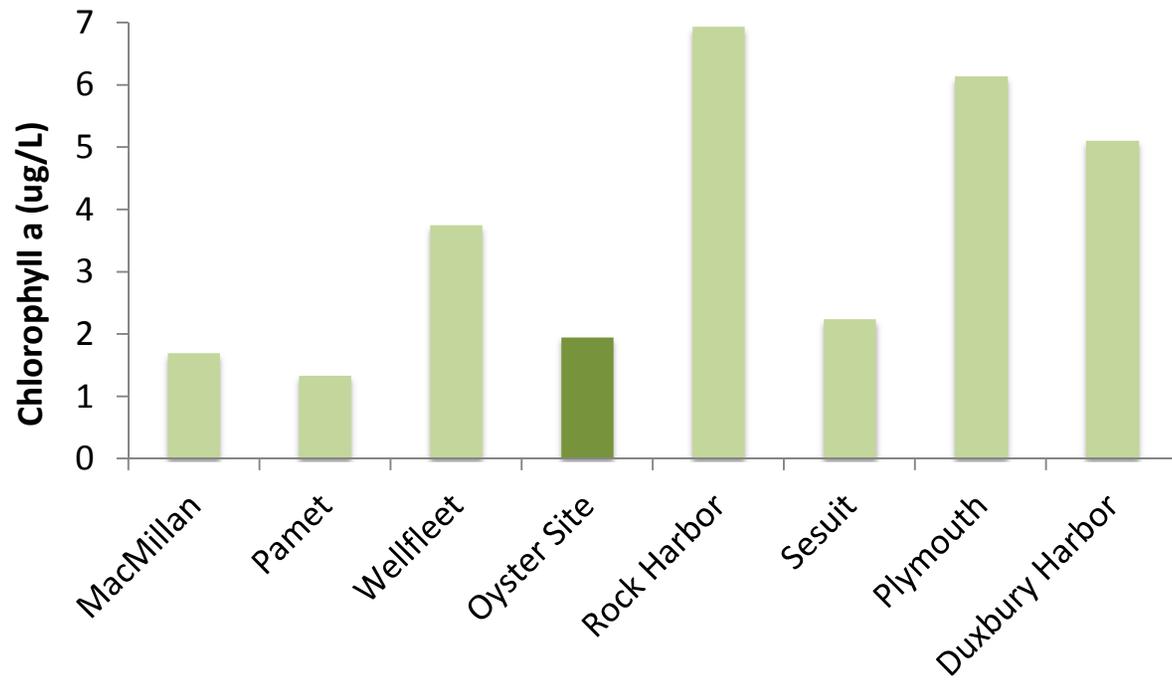


## Chlorophyll 2013

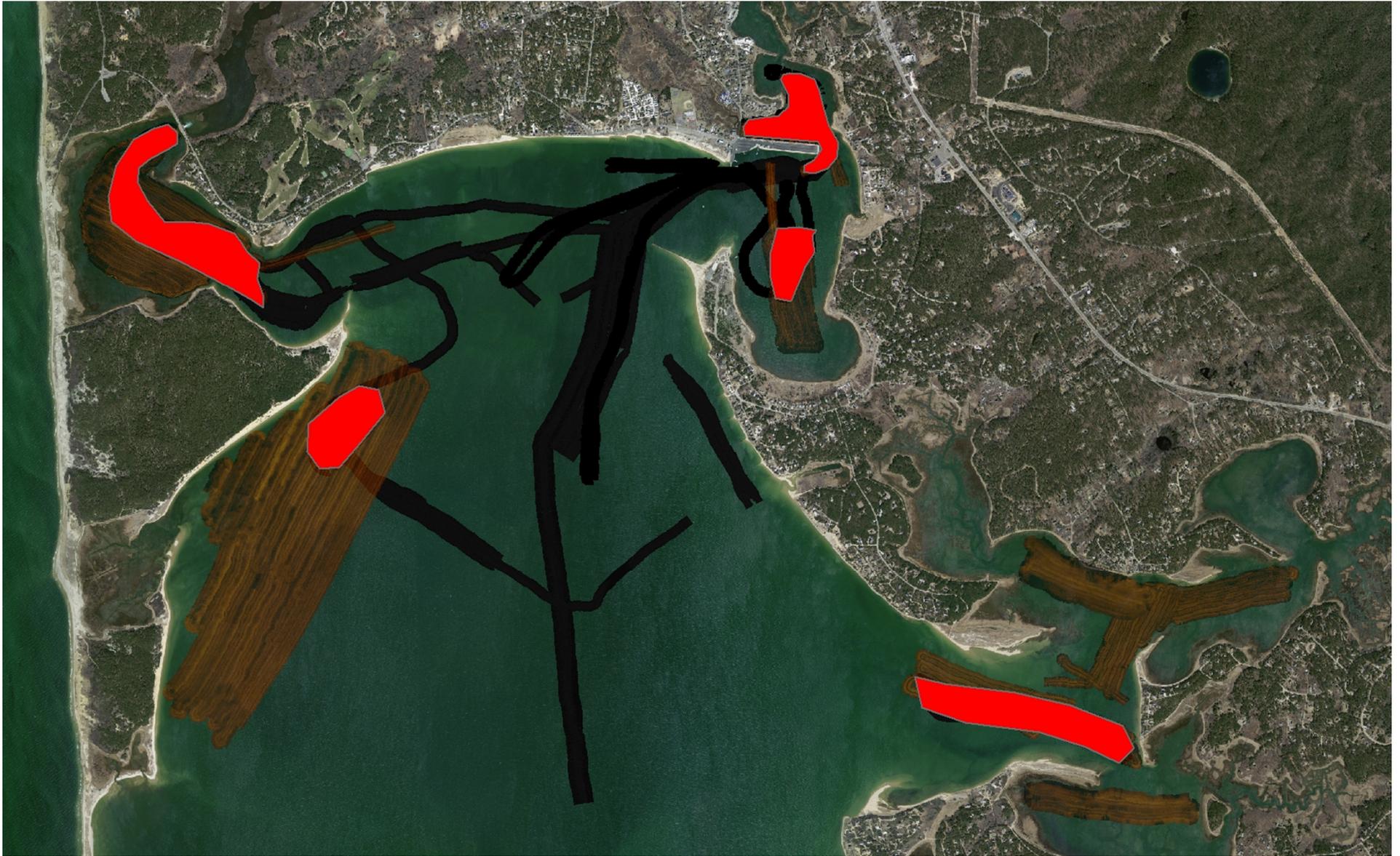


# Difference Between Years 2013 - 2012









Areas of Overlap  
Average 2012

