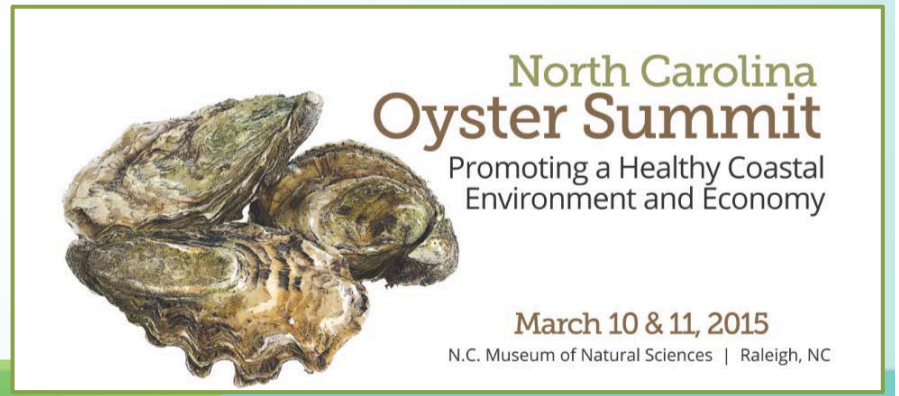
The Importance of Oysters in Providing for Healthy Coastal Ecosystems

Panelists: Dr. Martin Posey, University of North Carolina Wilmington

Dr. Michael Piehler, University of North Carolina at Chapel Hill , I.M.S. and C.S.I



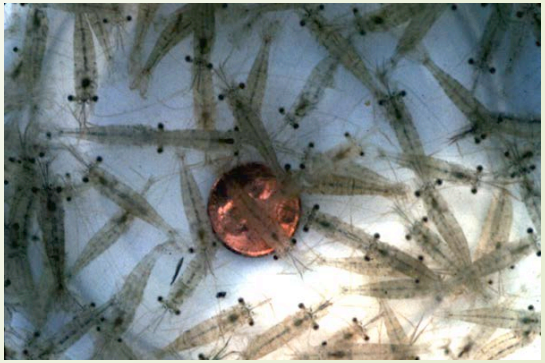
Ecosystem Impacts of Oyster reefs: Not Just Food on the Half Shell

Martin Posey

University of North Carolina Wilmington

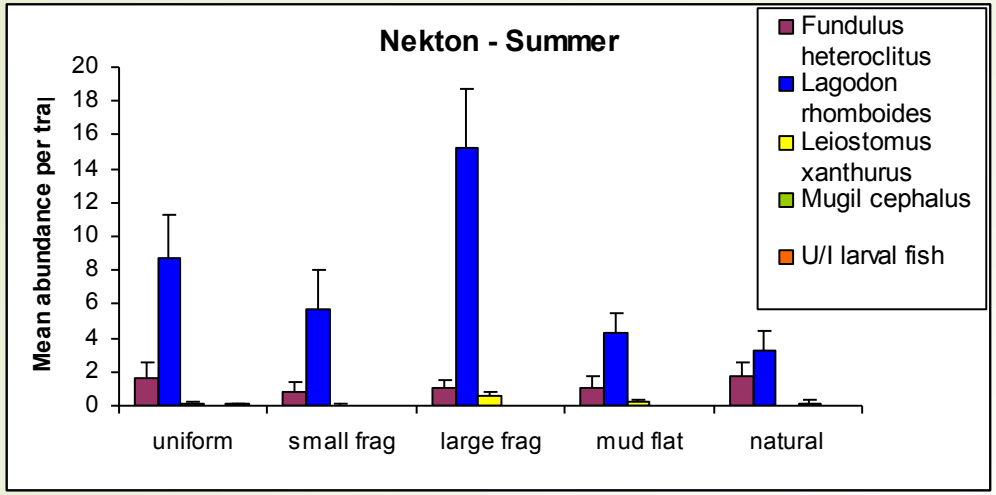
- With decline of oysters have lost ecological and fishery functions
  - Roger Mann has estimated ecosystem economic impacts >> fishery impacts
- Ecosystem Functions and Human Interest
  - Filtration and Water Quality
  - Nutrient Processing
  - Habitat
    - Fish, crabs, shrimp
    - Forage animals
  - Shoreline Stabilization
  - Oyster Fishery

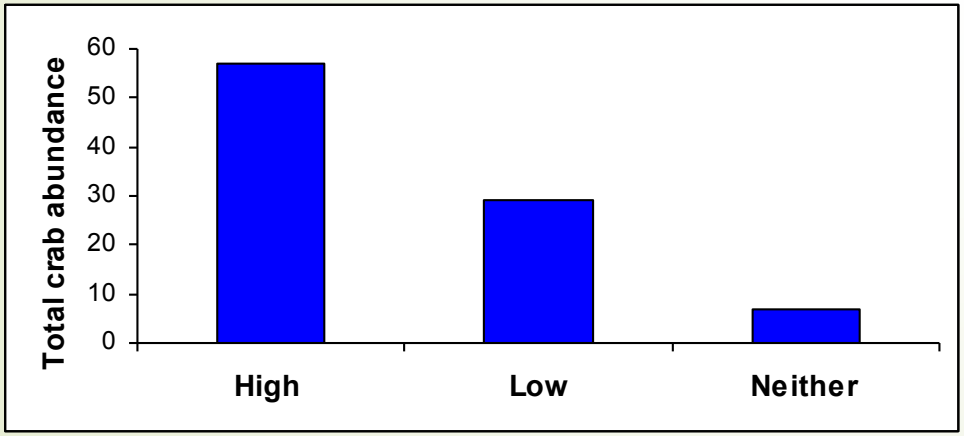
- Habitat
  - Habitat for organisms living in reef as well as many other fish, crabs and shrimp.
  - Nursery habitat for juveniles of fisheries species, forage location for fishery species, habitat for forage species.
  - How critical are reefs as a habitat?

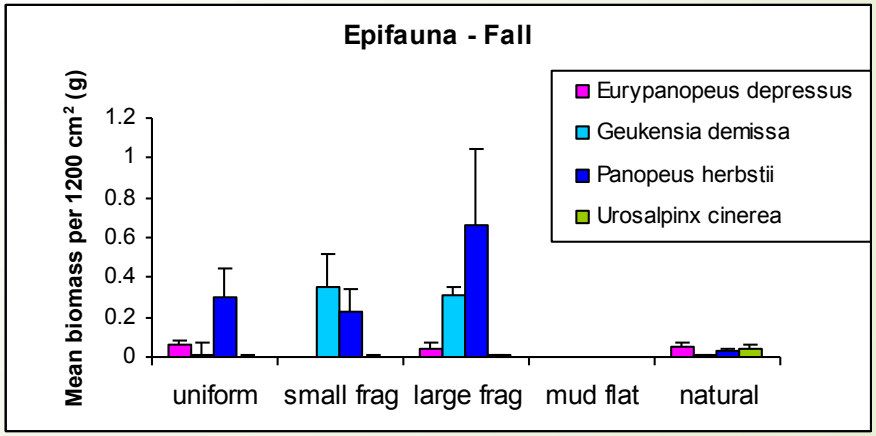


Variety of factors may impact habitat function of restored reefs

- Oyster density and size distribution
- Reef size
- Reef height
- Reef complexity
- Landscape factors
  - Spacing, position, proximity
- Trophic interactions within the reef system


Nekton - Summer
Mean abundance per tra
20
18
16
14
12
10
8
6
4
2
0
uniform
small frag
large frag
mud flat
natural
Fundulus heteroclitus
Lagodon rhomboides
Leiostomus xanthurus
Mugil cephalus
U/I larval fish


Total crab abundance
60
50
40
30
20
10
0
High
Low
Neither


Epifauna - Fall
Mean biomass per 1200 cm² (g)
1.2
1
0.8
0.6
0.4
0.2
0
uniform
small frag
large frag
mud flat
natural
Eurypanopeus depressus
Geukensia demissa
Panopeus herbstii
Urosalpinx cinerea

- Shoreline stabilization/baffling
  - may be important in stabilizing marsh edge areas and certain shoreline areas
  - Receiving increased attention for both ecosystem and management implications

Using oysters for shoreline stabilization

- Approaches
  - Shell placement along shoreline
  - Usually in staked bags
- Numerous recent efforts
  - In U.S.: NC, SC, Fl, Va, Md
- Questions:
  - Under what circumstances can oysters be used in shoreline stabilization?
  - What are best placement approaches?

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Sea Grant North Carolina

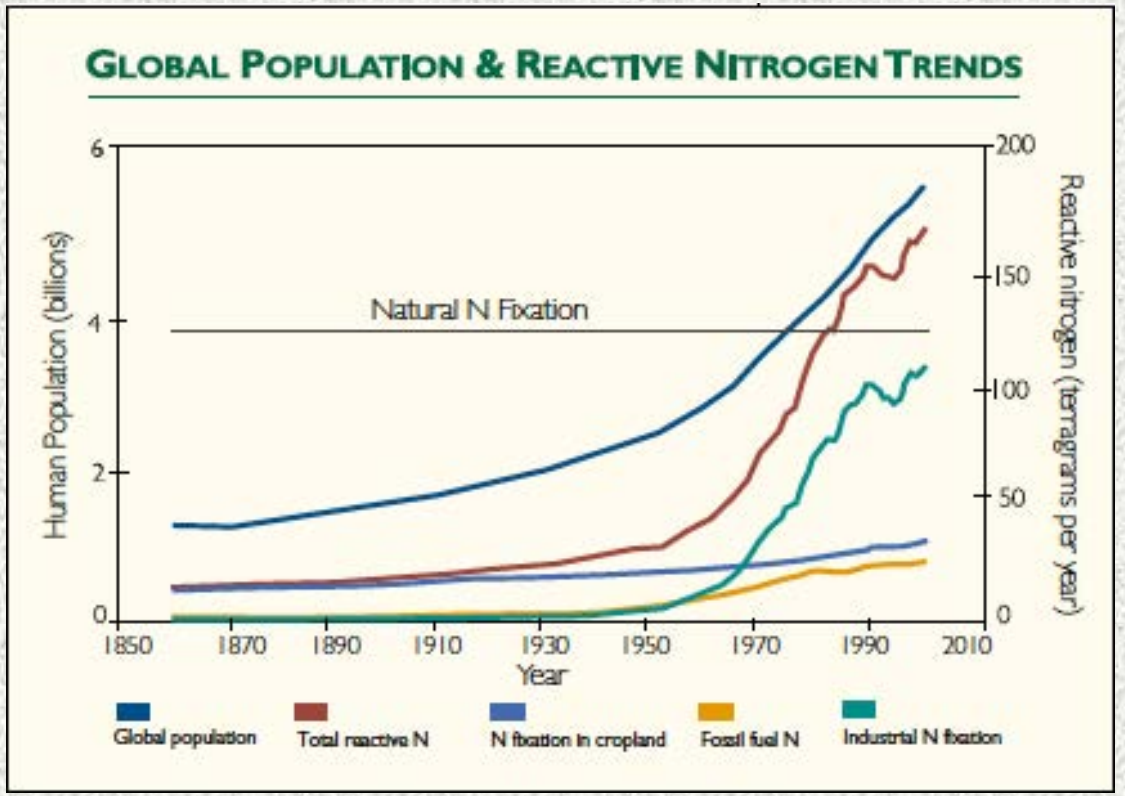
Ecological and economic benefits of oyster filtration

Michael F Piehler (piehler@unc.edu)

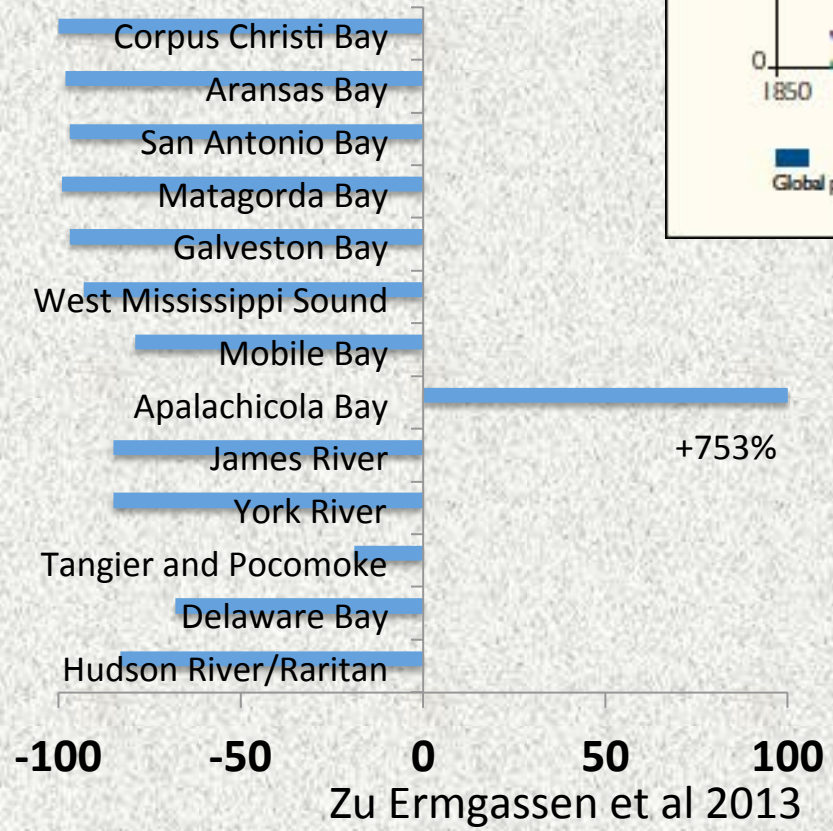
UNIVERSITY of NORTH CAROLINA INSTITUTE of MARINE SCIENCES

Coastal Studies Institute
UNIVERSITY OF NORTH CAROLINA

More nitrogen, less oyster filtration



Percent historical filtration capacity



Zu Ermgassen et al 2013

Oyster reefs may help resist eutrophication

Marine Pollution Bulletin 64 (2012) 1997–1999

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Marine Pollution Bulletin

journal homepage: www.elsevier.com/locate/marpolbul

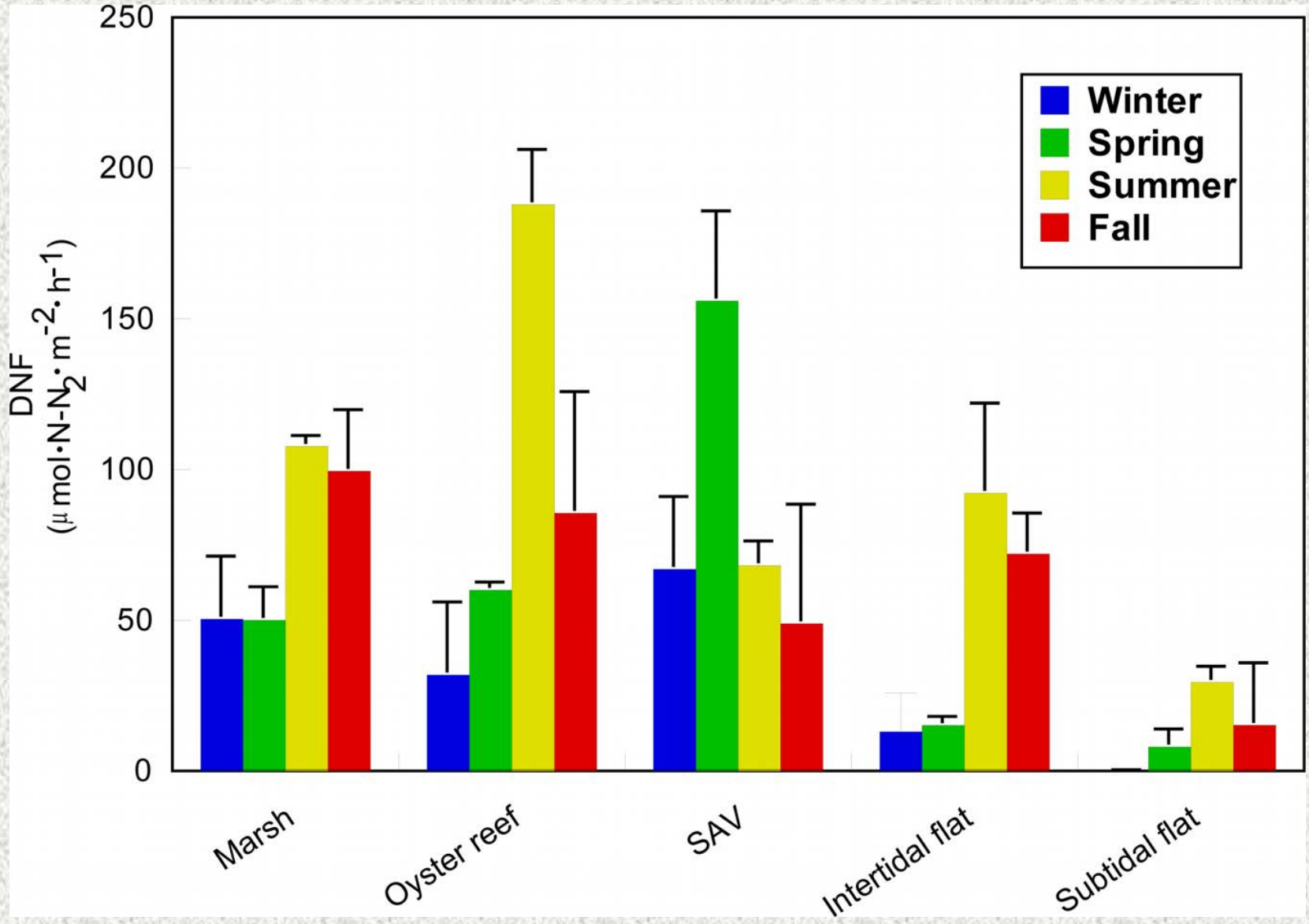
Viewpoint

The eutrophication commandments

R.W. Fulweiler [a,*], N.N. Rabalais [b], A.S. Heiskanen [c]

2. Eutrophication commandments

1. **Thou shall protect coastal ecosystems to deliver biodiversity and ecological services.**
   Coastal ecosystems are diverse and productive. They rank among the most productive in the world comparable to rainforests (Cebrian and Duarte, 1996). In addition, coastal systems provide a series of harder to quantify ecosystem services including nursery habitat for commercially valuable species, nutrient filtering (Piehler and Smyth, 2011), and carbon sequestration. Marine ecosystem services alone are estimated to be worth \$20.9 trillion y^{-1} with the majority coming from coastal systems (10.6 trillion y^{-1}) and an additional 4.9 trillion y^{-1} coming from wetlands (Costanza et al., 1997). Thus of the \$33 trillion total ecosystem services supply annually, 75% of these dollars are dependent on coastal systems.



Piehler and Smyth 2011, Ecosphere

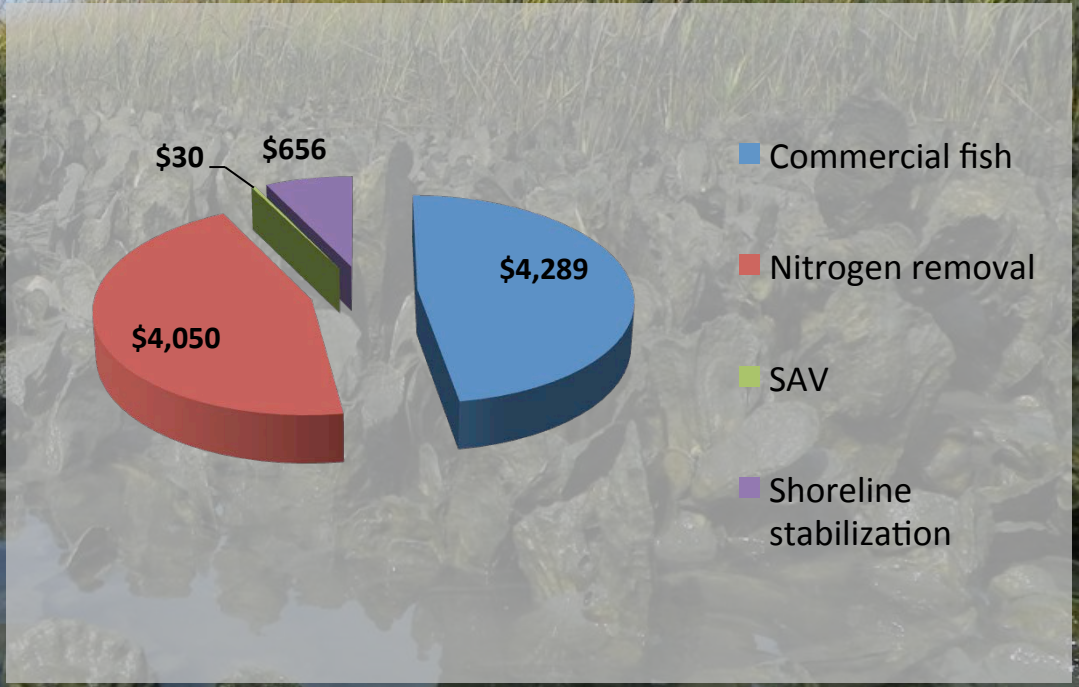
Evaluating estuarine N processing

- Rigorous measurements of processes
- Net contributions to N processing
- Transferable data

Oyster Ecosystem Services

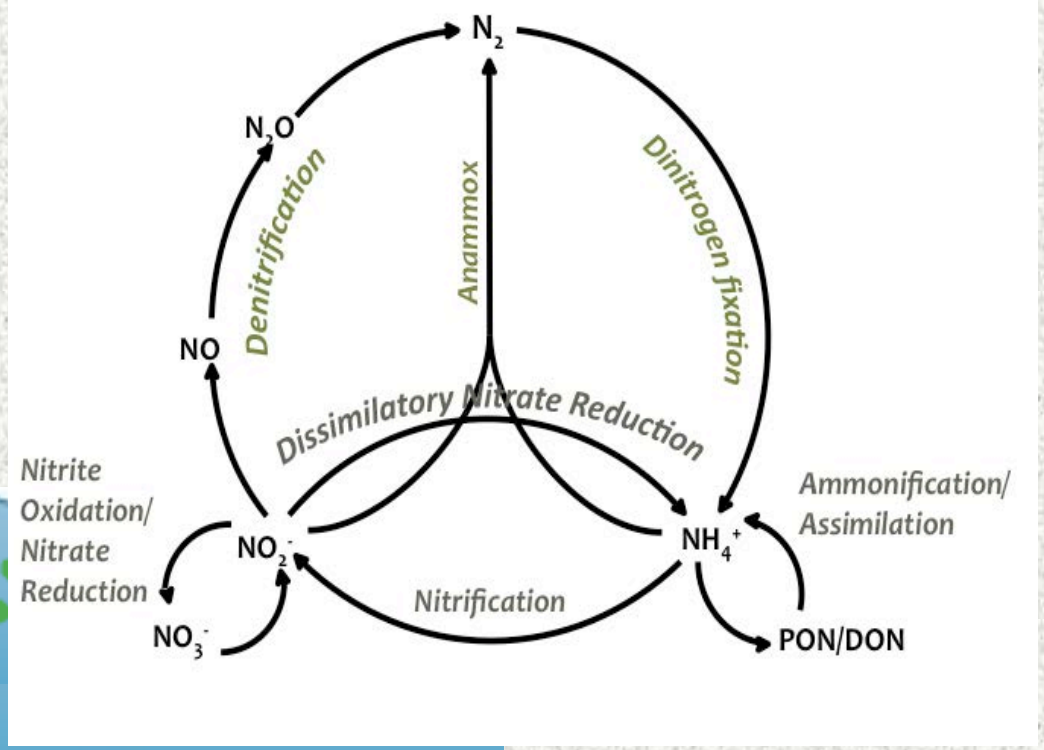
Value of oyster services= $10,122 per hectare

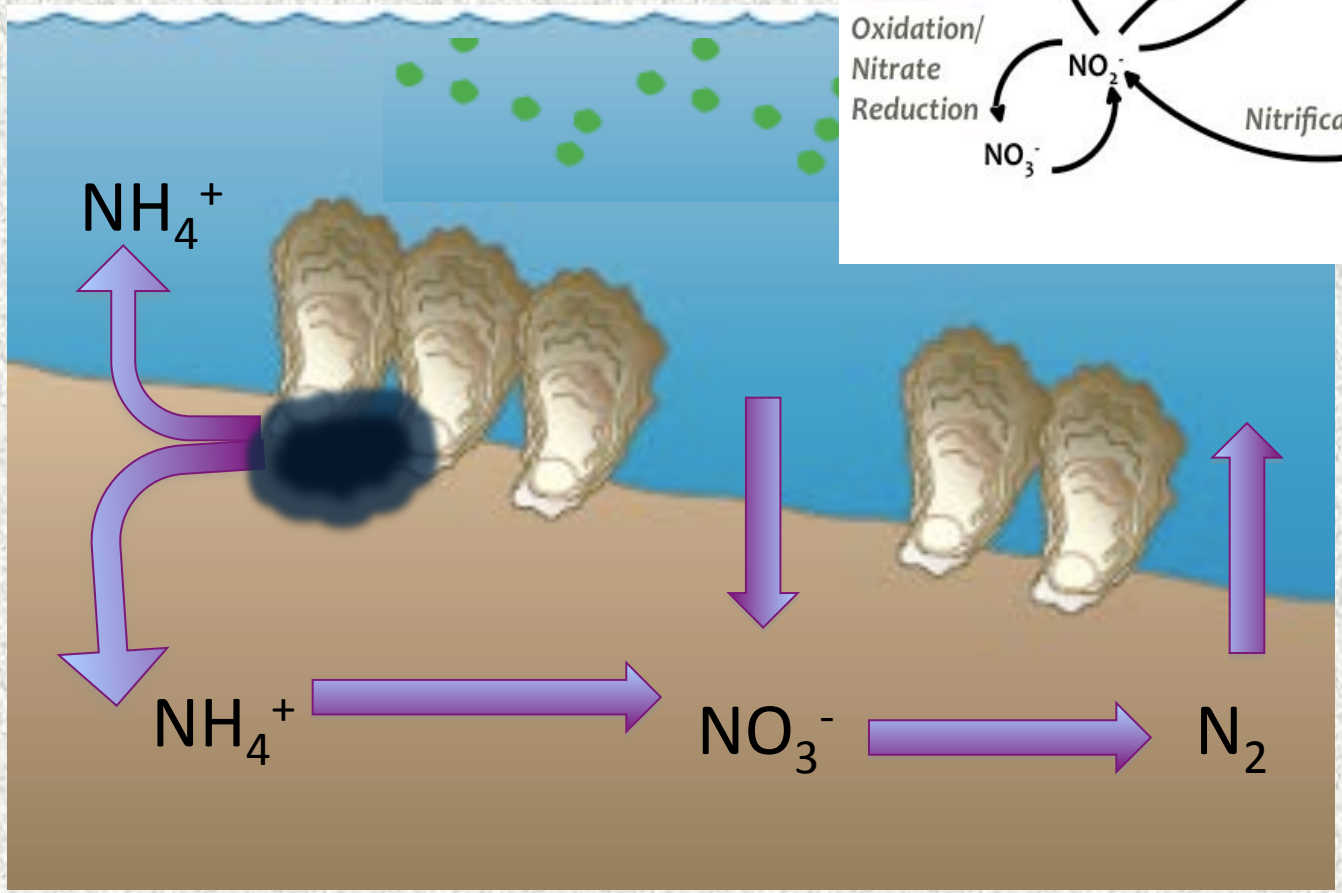
- Oyster fishery
- Fish production
  - Provide habitat
- Shoreline stabilization
- Water quality
  - Algae removal
  - Increase water clarity
  - Nitrogen removal



Grabowski et al. 2012

Oysters and nitrogen removal





Many thanks

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