

# Integrated assessment of oyster reef ecosystem services



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**Chesapeake Bay Program**  
*A Watershed Partnership*

# Integrated assessment of oyster reef ecosystem services



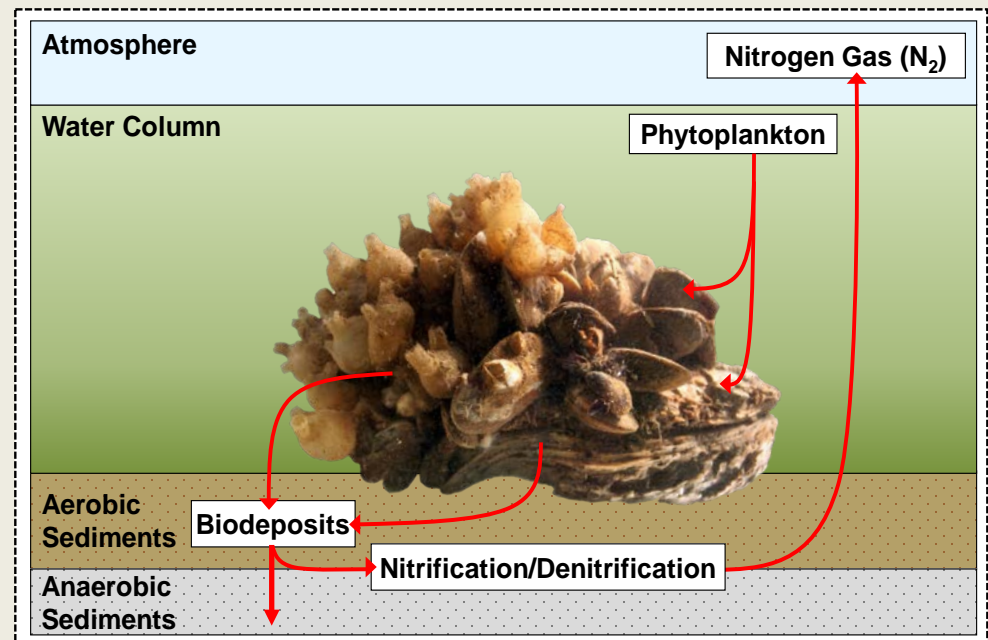
## Three integrated projects in Harris Creek, MD

- 1) Quantifying denitrification rates and nutrient fluxes  
*Cornwell (UMCES) and Kellogg (VIMS)*
- 2) Macrofaunal utilization, secondary production and nutrient assimilation  
*Paynter (UMD); Kellogg and Ross (VIMS)*
- 3) Fish and crustacean utilization, secondary production and trophic linkages  
*Luckenbach, Kellogg and Ross (VIMS)*



# Quantifying denitrification rates and nutrient fluxes

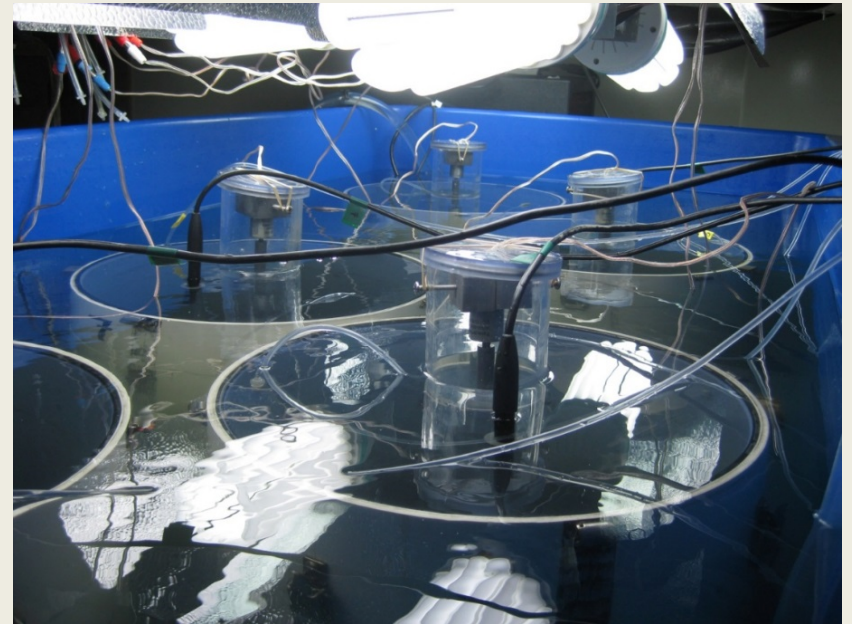
- *Rationale:* Oyster reefs alter local nutrient cycling and can enhance denitrification rates. However, rates can vary by orders of magnitude both between and within sites.
- *Objective:* Determine whether restoration sites in Harris Creek have enhanced denitrification rates



# Quantifying denitrification rates and nutrient fluxes



- *Approach:*
  - Direct measurement of nitrogen fluxes from 0.1 m<sup>2</sup> sections of reef during five sampling periods distributed throughout the year.
  - Calculate annual enhancement (= restored site – control site)



- *Results from a prior study (Kellogg et al. 2013):*
  - A mature, densely populated restored reef in the Choptank River enhanced nitrogen removal by ~500 lbs. N acre<sup>-1</sup> y<sup>-1</sup>



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# Macrofaunal utilization, secondary production and nutrient assimilation



- *Rationale:* Oyster reefs provide habitat for high densities of other macrofaunal species. These organisms are a food source for other species and assimilate nutrients in their tissues and shells
- *Objective:* Determine whether restoration sites in Harris Creek have enhanced macrofaunal species abundance, diversity, biomass, secondary production and/or nutrient assimilation.





# Macrofaunal utilization, secondary production and nutrient assimilation

- *Approach:*
  - Sample macrofaunal communities five times throughout the year
  - Use resulting data to estimate secondary production and nutrient assimilation rates



- *Results from a prior study (Kellogg et al. 2013):*
  - A mature restored reef in the Choptank River provided habitat for  $>20,000$  organisms  $m^{-2}$

# Fish and crustacean utilization, secondary production and trophic linkages



- *Rationale:* By providing habitat and food resources, oyster reefs can enhance the secondary production of both resident and transient finfish and crustaceans.
- *Objectives:*
  - 1) Determine whether finfish and crustacean utilization is enhanced at restoration sites in Harris Creek.
  - 2) Assess trophic linkages between transient finfish species and restoration sites.
  - 3) Estimate secondary production and nutrient assimilation by appropriate resident finfish and crustacean species



# Fish and crustacean utilization, secondary production and trophic linkages



- *Approach:*
  - Sample finfish and mobile crustacean communities five times throughout the year at restoration and control sites
  - Assess finfish diet during each sampling period
- *Estimates from a study in NC (Peterson et al. 2003):*
  - For every 10 m<sup>2</sup> of restored oyster reef, production of fish and large mobile crustaceans is enhanced by ~2.6 kg m<sup>-2</sup> y<sup>-1</sup>

