ASSESSING THE BENEFITS OF CHESAPEAKE OYSTER RESTORATION: Ecosystem Services

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NOAA Fisheries
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Chesapeake Bay Oyster Restoration Ecosystem Services Projects
NOAA Project Awards - 2013 and on-going

- Virginia Institute of Marine Science (VIMS), “Ecosystem Services of Restored Oyster reefs in the Lower Chesapeake Bay”
  Principal Investigators: R. Lipcius, R. Seitz

- University of Maryland/VIMS, “Macrofaunal and Productivity Utilization, Secondary Production, and Nutrient Sequestration”
  Principal Investigators: K. Paynter, L. Kellogg, P. Ross

- VIMS, “Fish and Crustacean Utilization, Secondary Production, and Trophic Linkages”
  Principal Investigators: L. Kellogg, M. Luckenbach, P. Ross

- University of Maryland Center for Environmental Science (UMCES)/VIMS, “Integrated Assessment of Oyster Reef Ecosystem Services: Quantifying Denitrification Rates and Nutrient Fluxes”
  Principal Investigators: J. Cornwell, M. Owens, L. Kellogg
NOAA Project Awards - 2014 and on-going

- **UMCES**, “Natural Engineers in Ecosystem Restoration: Modeling Oyster Reef Impacts on Particle Removal and Nutrient Cycling”  
  Principal Investigators: L. Harris, J. Testa, E. North, L. Sanford

- **Virginia Commonwealth University (VCU)**, “Pathways to Production: An assessment of fishery responses to oyster reef restoration and the trophic pathways that link the resource to the reef”  
  Principal Investigator: S. McIninch

- **Smithsonian Environmental Research Center (SERC)**, “Application of Dual-frequency Imaging Sonar to the Study of Oyster Reef Ecosystem Services”  
  Principal Investigators: A. Hines, M. Ogburn
National Fish and Wildlife Foundation Award - 2016

- Morgan State University, “Choptank River Complex Habitat Focus Area: Quantifying Ecosystem Services”

  Principal Investigators: S. Knoche, H. Townsend, J. Holzer, D. Lipton
• Rates of nitrogen (NH4, NOX, N2) flux greater on restoration sites than on reference sites

• Denitrification rates related to oyster abundance

• Site depth, light penetration, and benthic algal photosynthesis affects net nutrient exchange with the bottom

• Denitrification rates at Harris Creek sites less than more mature restoration sites elsewhere in the Choptank River system
Macrofaunal and Productivity Utilization, Secondary Production, and Nutrient Sequestration

Principal Investigators: K. Paynter, L. Kellogg, P. Ross

Hooked Mussel, Mud Crab, Naked Goby

![Graphs showing relationships between oyster tissue biomass and mussel, mud crab, and goby biomass.]

- Mussel Biomass (g DW m⁻²): \( y = 0.0049x^{1.5913} \), \( R^2 = 0.887 \)
- Mud Crab Biomass (g DW m⁻²): \( y = 0.053x + 1.4845 \), \( R^2 = 0.9191 \)
- Goby Biomass (g DW m⁻²): \( y = 0.9073x^{0.365} \), \( R^2 = 0.5056 \)
• NOAA Chesapeake Bay Office (NCBO), "Fish Utilization of Oyster Restoration Sites in the Little Choptank River and Tred Avon River (MD) Oyster Sanctuaries"

Principal Investigator: D. Bruce

- 2014: pre-restoration
- 2015: substrate reef construction only (no seeding)
- 2016: seeding of reef and seed-only sites
Summary

• All projects in varying stages of maturity

• Lag time: ecosystem services not fully realized until have functioning oyster reef ecosystem supported by high densities of mature oysters

• Challenge to assess utilization linkages between restoration sites and larger mobile species
ORES Research Updates on NCBO WebSite