



# Smithsonian Environmental Research Center



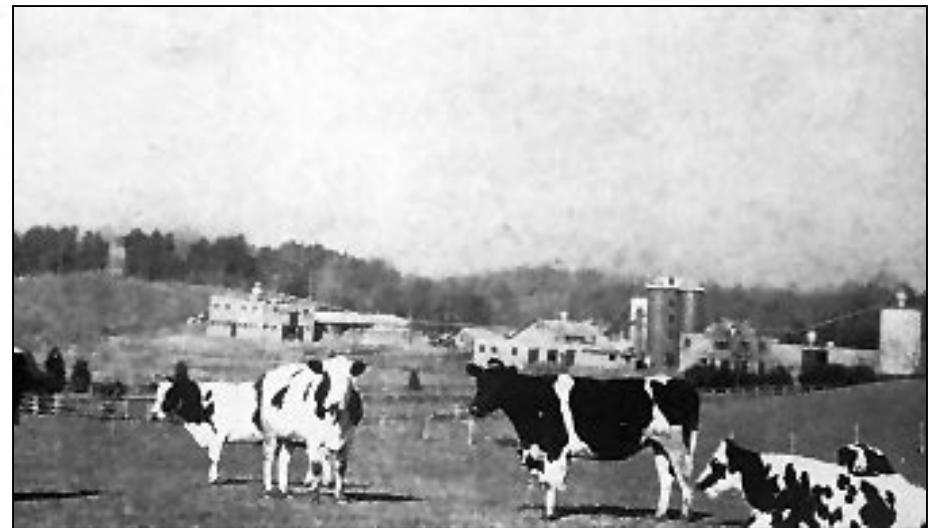
## Place and Land: SERC Origins



**Robert Lee Forrest 1878 - 1962**

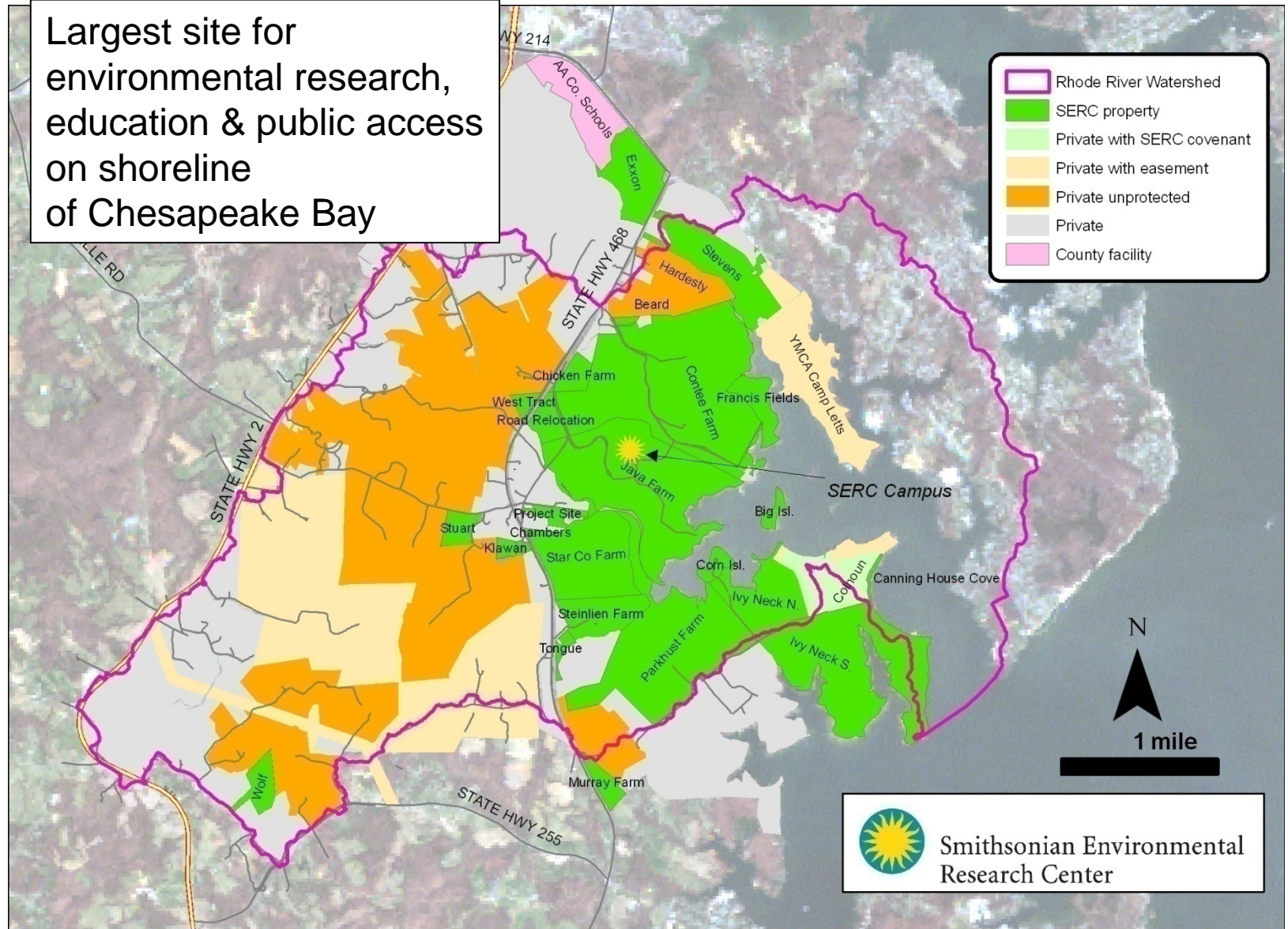
**Bequeathed 368-acre Java Farm +  
\$1.7M; estate settled 1965**

**Java Farm 1930s**



# ***SERC Land : 2,650 acres, 16 miles of shoreline***

Largest site for environmental research, education & public access on shoreline of Chesapeake Bay



# ***Mathias Laboratory***

**The Smithsonian's first LEED platinum building  
2015 Presidential Award for Building the Future**





## *Major Ecosystem Impacts*

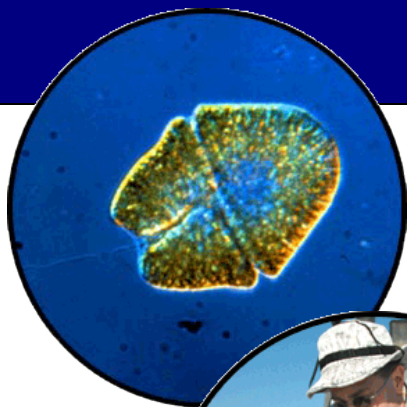
**Global change.**

**Pollution by toxic chemicals and nutrients.**

**Land-use effects of agriculture, forestry and urbanization.**

**Fisheries and food webs.**

**Invasive species and loss of biodiversity.**



## ***Marine Global Earth Observatories: MarineGEO***



### **SERC is World Headquarters**

Long-term research program to focus on understanding coastal marine life and its role in maintaining resilient ecosystems.

**N = 11 sites globally currently**

**Growing in next decade to 30 sites pole-to-pole along both coasts of the Americas.**



# *Forest Global Earth Observatories: ForestGEO*



**SERC = Temperate Plot Coordinator**

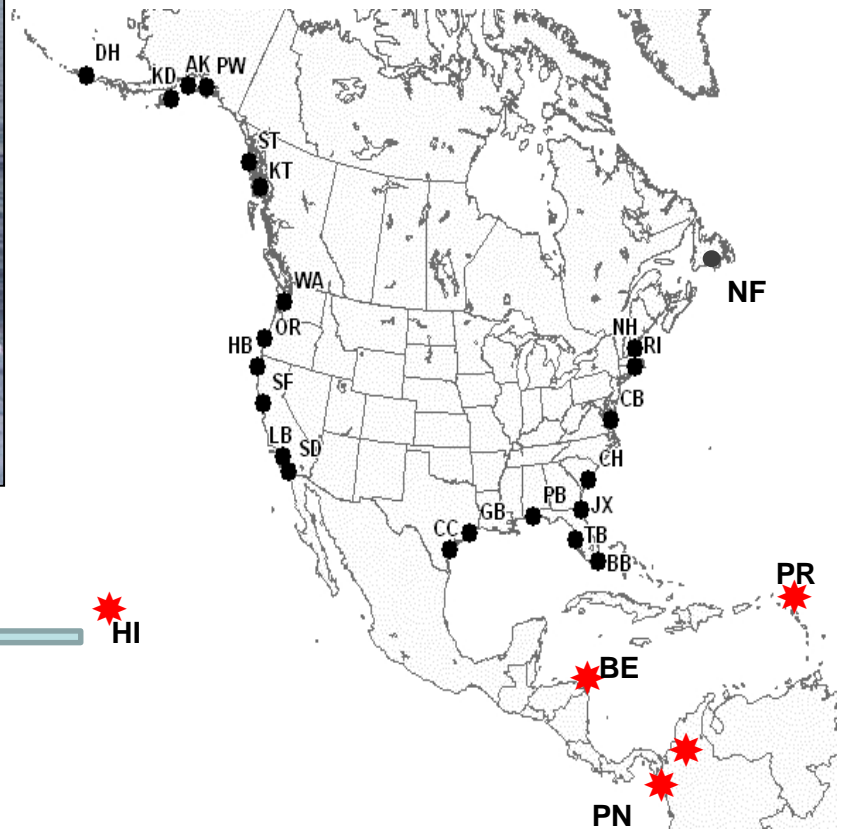
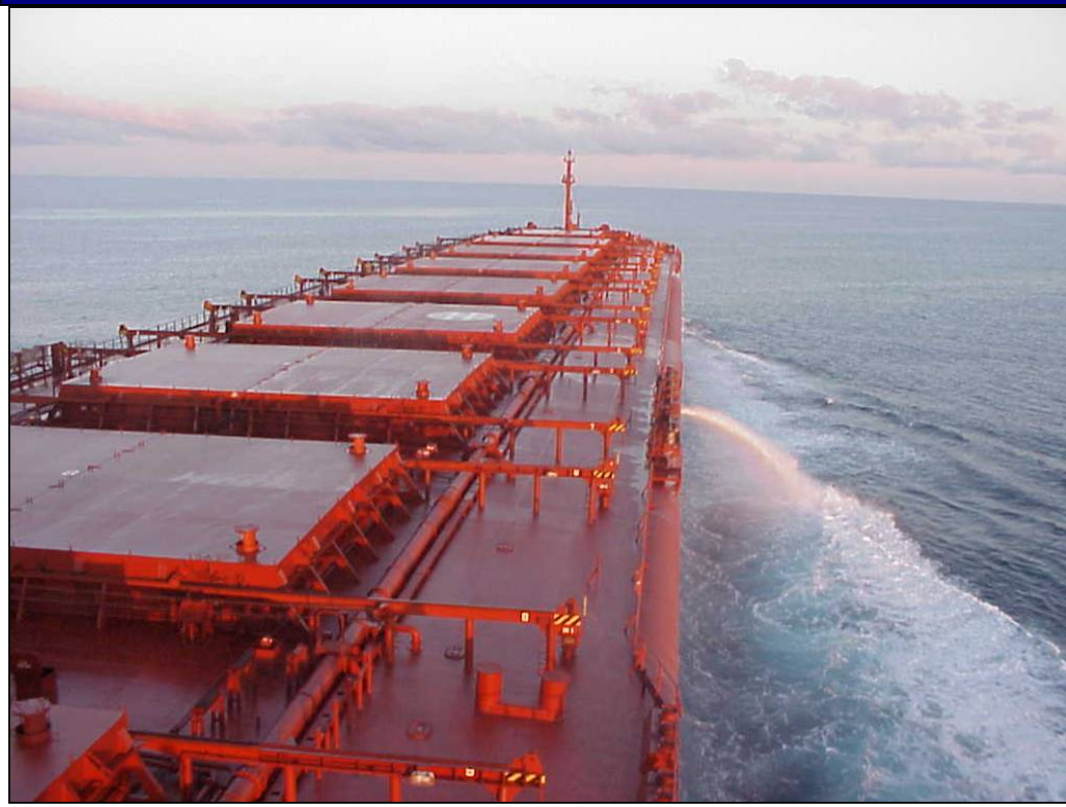
**63 plots**

**25 countries**

**4.5 million trees**

**8,500 species**

# Marine Invasive Species: Ports and ballast water



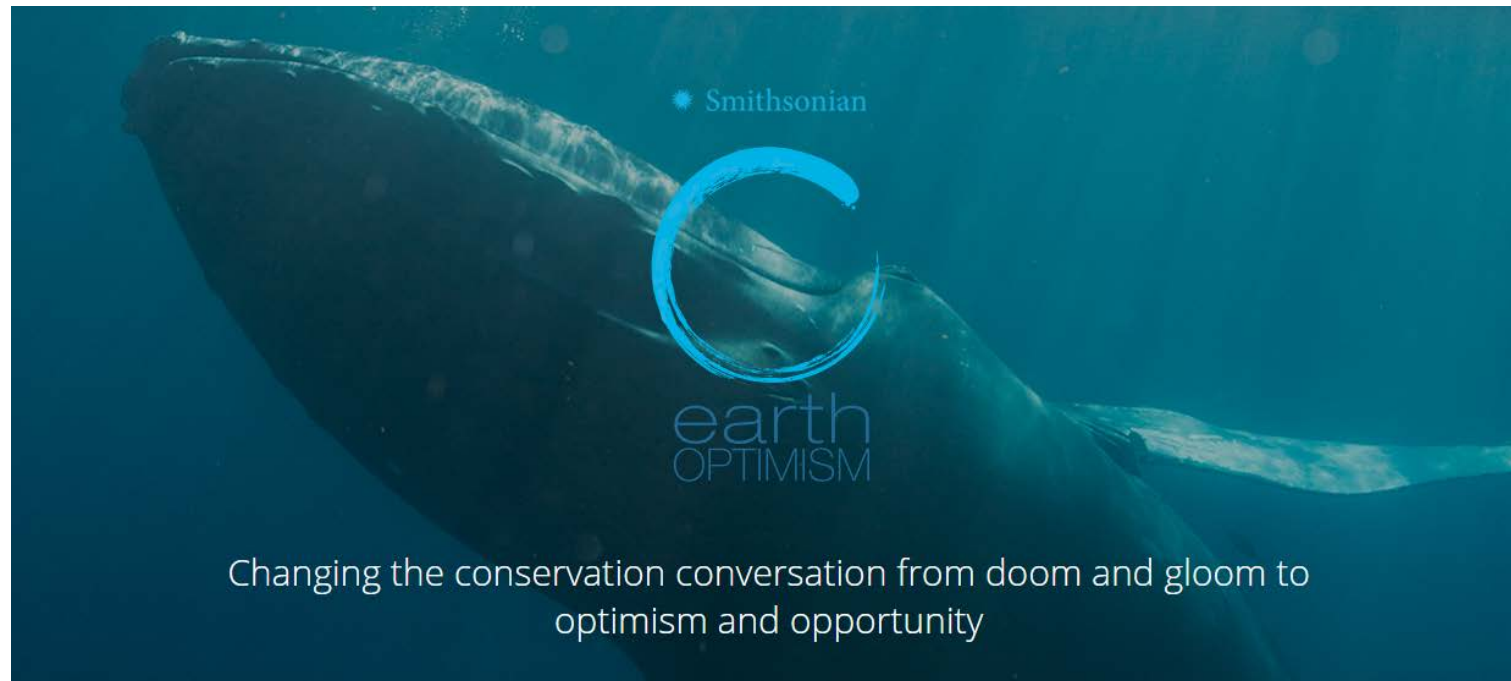
← \* Guam

← \* HI



# Smithsonian Conservation Commons

- Working Land and Seascapes
- Movement of Life
- Sustainable Food Systems
- #EarthOptimism





*MovementofLife.si.edu*

Twitter: @fishinvertlab @SmithsonianMoL





Land-Sea Interactions

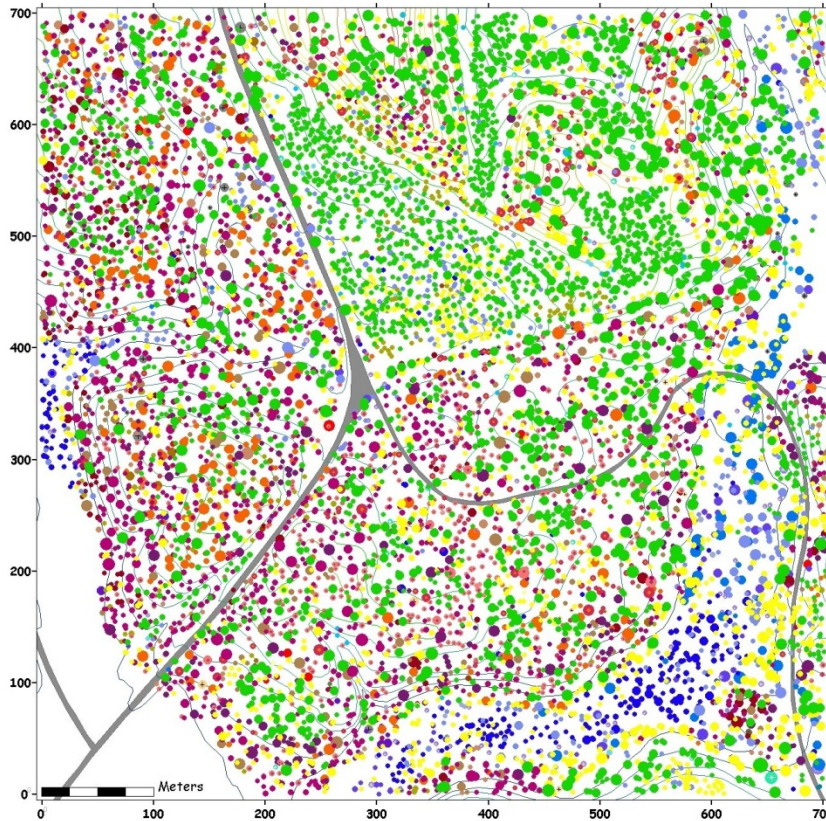
***Rhode River  
Model Research Platform  
Sentinel Site***

# Global Change: Ecosystem Responses

The Big Tree Plot  
 Forest of Java Farm/Contee's Plantation  
 Smithsonian Environmental Research Center

Tree Diameter  
 (DBH in cm)

- 20.0 - 39.9
- 40.0 - 59.9
- 60.0 - 79.9
- 80.0 - 99.9
- 100.0 - 149.9
- 150.0 +



**Tree Species**

- Tulip Poplar (*Liriodendron tulipifera*)
- Sweetgum (*Liquidambar styraciflua*)
- Beech (*Fagus grandifolia*)
- Red Maple (*Acer rubrum*)
- Mockernut Hickory (*Carya tomentosa*)
- Pignut Hickory (*Carya glabra*)
- White Oak (*Quercus alba*)
- Southern Red Oak (*Quercus falcata*)
- Ash spp. (*Fraxinus* spp.)
- Virginia Pine (*Pinus virginiana*)
- Black Oak (*Quercus velutina*)

## Forest Ecology & Management



# BiodiversiTREE

...a 100yr forest diversity experiment

## CORE QUESTIONS

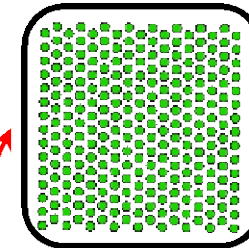
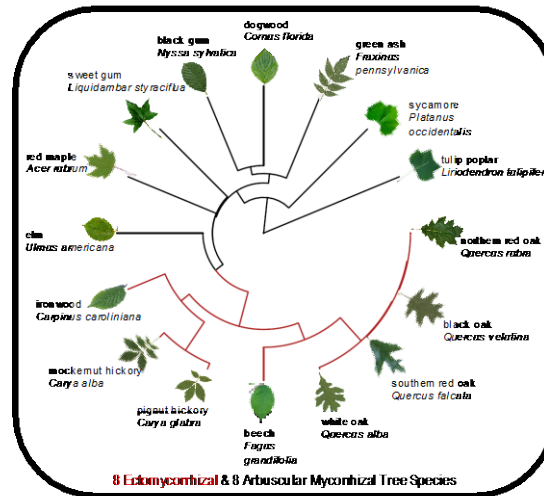
### DO TREE SPECIES & FUNCTIONAL DIVERSITY INFLUENCE:

- resistance to climate change, drought, & pests?
- above & belowground carbon sequestration?
- water quality & soil nutrient retention?
- habitat for insects, birds, and mammals?

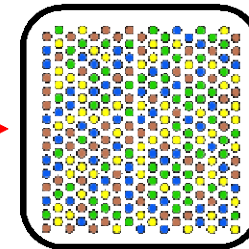
## Experimental Design

- 16 native tree species
- ~20,000 trees
- 20 hectares

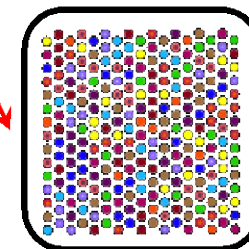
### 16 native tree species



**1-species  
monoculture**  
32 plots (2/species)



**4-species  
polyculture**  
19 plots (AM/EM mixtures)



**12-species  
polyculture**  
19 plots

## ***Nutrient Pollution: Stream Discharges***

*BASE FLOW*



*STORM EVENT*



***Rhode River Long-term Data: Stream weirs monitor nutrient and sediment discharges – 40 years.***



**Sea-Land Interactions**  
**Shoreline hardening**

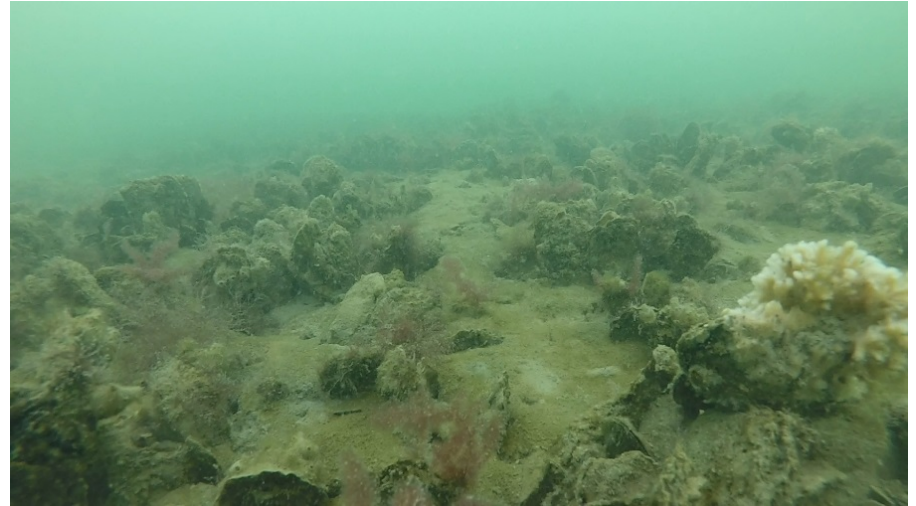
# ***Global Change: Ecosystem Responses***

**Marsh Elevated CO<sub>2</sub> Study  
(World's longest - 30 years)**





# *Fish habitat, food webs, and fisheries*





***Professional training  
for future generations of  
researchers, educators  
& resource managers.***





## ***SERC In Your Community:***

- **Land conservation, open space, shoreline protection, increased property values**
- **Unique research for improved environmental stewardship & management**
- **Professional training of the next generation of scientists & managers**
- **Innovative education, public programs, public access**
- **Model for sustainable landscapes & facilities: \$80M  
Over past 9 yrs, \$225M over 20 yrs**
- **Employs 185 people plus contractors in high quality jobs in service to the public - \$15M annually**