An overview of the RI EQIP Oyster Restoration Initiative

December 3, 2019

RI Marine Fisheries Institute
Fall 2019 Meeting
URI Graduate School of Oceanography

Eric Schneider

-RI DEM, Div. of Marine Fisheries

-PhD Student, Northeastern Univ

- Background
- Goals
- Site Selection
- Reef Construction, Monitoring, Research
- Challenges & Next Steps
- Questions

Many Partners and Contributors

RI NRCS
Melissa Hayden
Ghyllian Conley
Jim Turenne
Jameson Long
Morgan McKee
Gary Casabona
Bruni Velez
Joe Bachand

RI DEM
Eric Schneider (DMF)
Pat Barrett (DMF)
Dennis Erkan (DMF)
Div. of Law Enforcement
Office of Water Resources

Northeaster University
Dr. Randall Hughes
Dr. Torrie Hanley
Dr. Jon Grabowski
Sarit Truskey
Dan Von Staats
Sophia Hui Samaha

Other Contributors
RI Aquaculturists

Rob Hudson (RWU)
Matt Griffin (RWU)
Bryan DeAngelis (TNC)
Dave Beutel (CRMC)

RI Aquaculturists Participating in EQIP Oyster Restoration

BACKGROUND

Why conduct oyster restoration?

Wild oyster populations are at historic lows

- Regional populations are estimated at 15% of historic levels (Beck et al. 2011)
- RI oyster population are estimated at 1% of historic levels (zu Ermgassen et al. 2012) and 10% of mid 1900's (Griffin 2016)

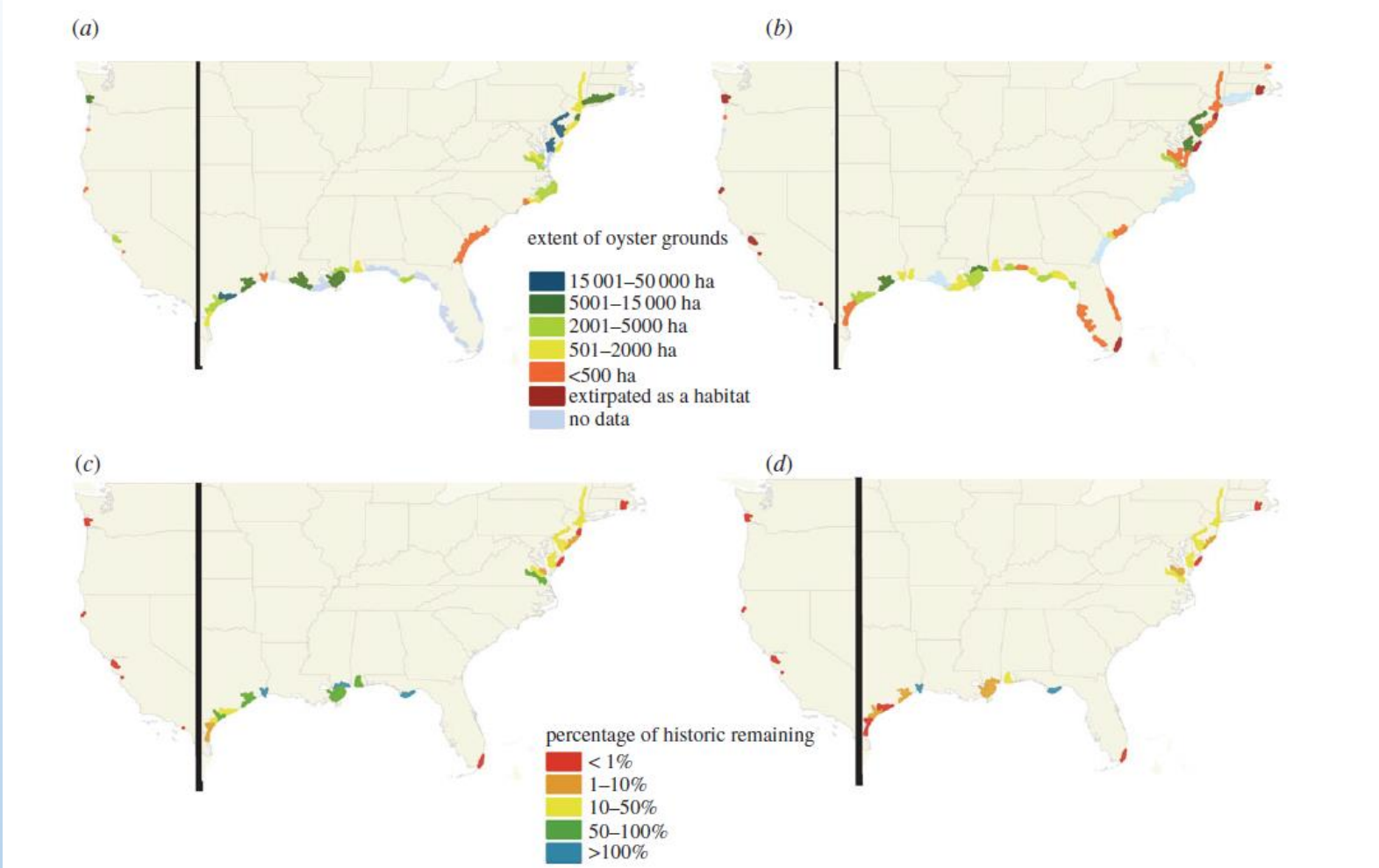


Figure 1. Maps illustrating: oyster ground areal extent (*a*) historically and (*b*) presently in estuaries in the US and the percentage change in (*c*) oyster ground extent and (*d*) oyster biomass in estuaries for which comparable historic and modern data were available.

What has been lost?

Services provided by oysters has been dramatically reduced or eliminated, including:

- water filtration capacity and improved water quality,
- habitat for fish and other marine species,
- shoreline stabilization,
- resiliency of remnant wild oyster populations,
- as well as a source of food, income, and assc. social and community benefits.

(Photo: NC Coastal Federation)

(Photo courtesy of TNC)

GOAL

RI NRCS EQIP Oyster Reef Restoration Initiative

Goal

- Create sustainable oyster habitats and oyster reefs in sanctuary areas in Rhode Island waters

Overview

- Voluntary conservation program that provides financial assistance to agriculture producers (e.g. aquaculturists) to help implement conservation practices that create oyster reefs to improve water quality and associated ecosystem services

Photo taken in 2015 of oyster reef constructed in Potter Pond in 2008

DEM RHODE ISLAND

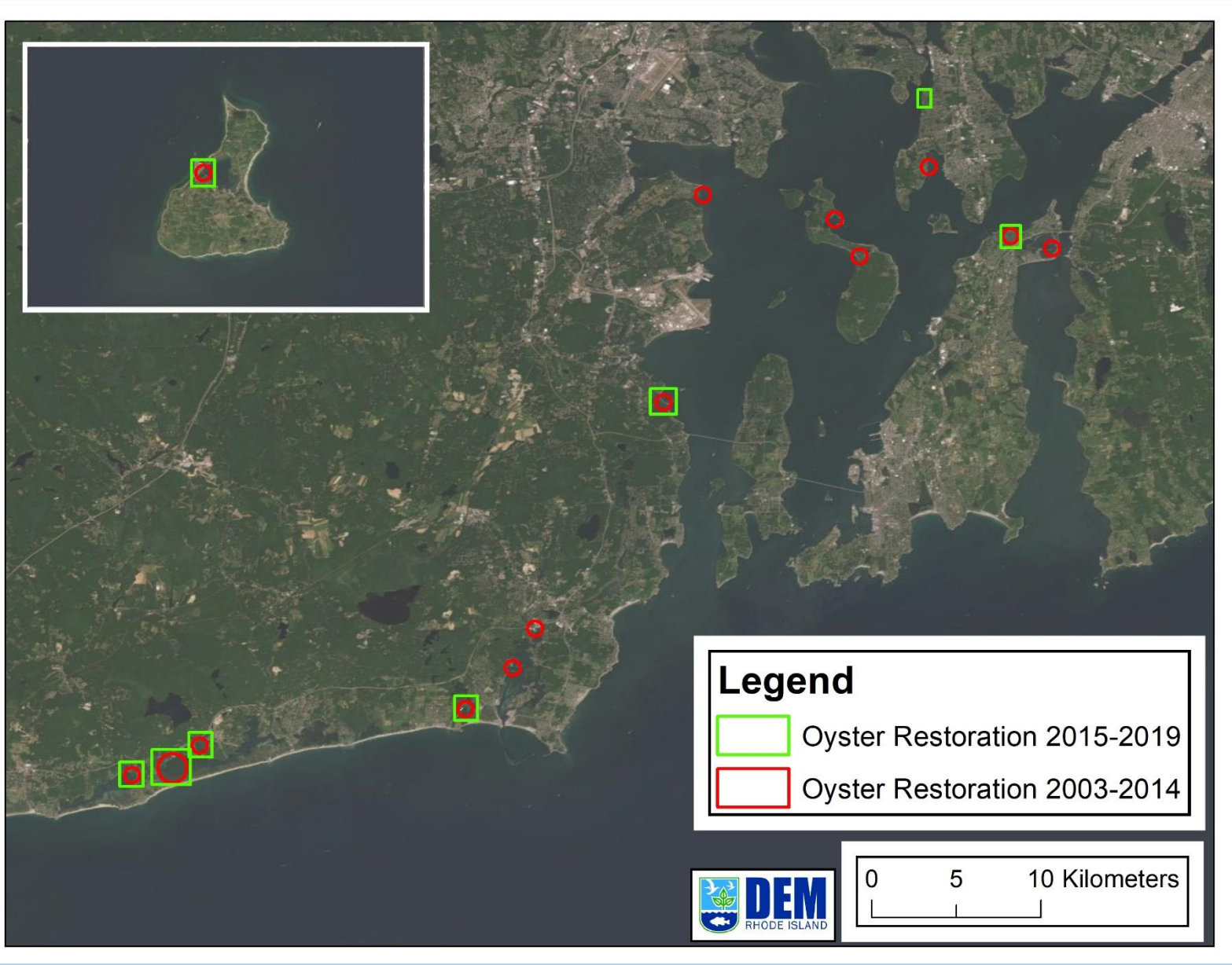
USDA NRCS

Results from Previous Work

Consider results from previous oyster restoration work from 2003 - 2014 by

- multiple partners (DEM, NOAA, RWU, NRCS, URI, EPA, Northeastern, and TNC)
- Collaborating on several projects (Oyster Gardening, North Cape Restoration, EQIP, and others).

Results summarized in Griffin 2016, Helt and Schneider 2016, and other literature.

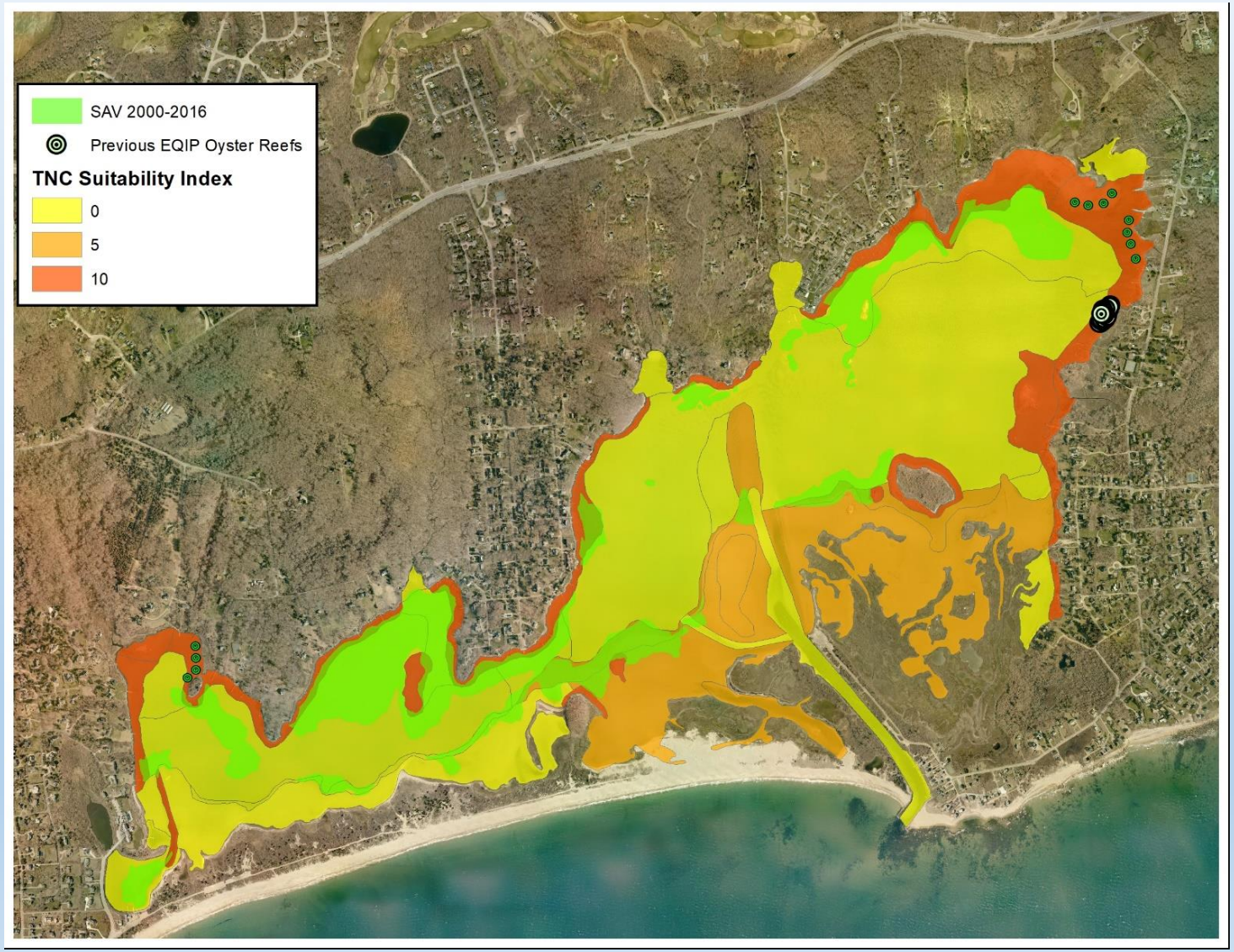


Example of Selected Ecological Aspects

Site Selection:

Ecological Aspects

- Subaqueous soils
- Salinity
- Depth, exposure
- Existing Habitat and Structure (SAV, Kelp, cobble)
- Other shellfish spp.
- Is the area habitat and/or larval limited



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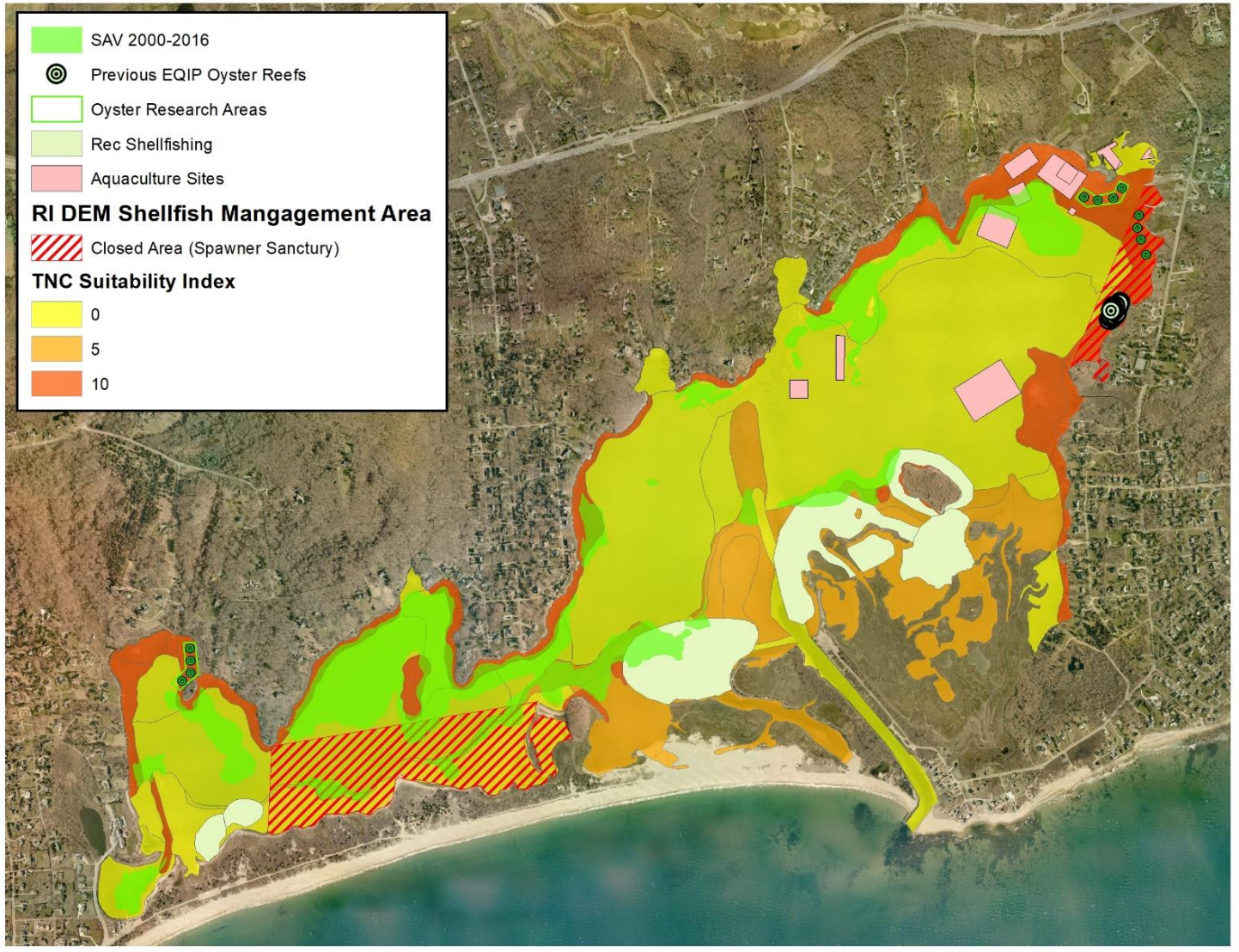
Management Considerations

- Management closures
- Enforceability
- Conflicts with other uses
- Disease and biosecurity zones

Example of Selected Ecological and Management Aspects



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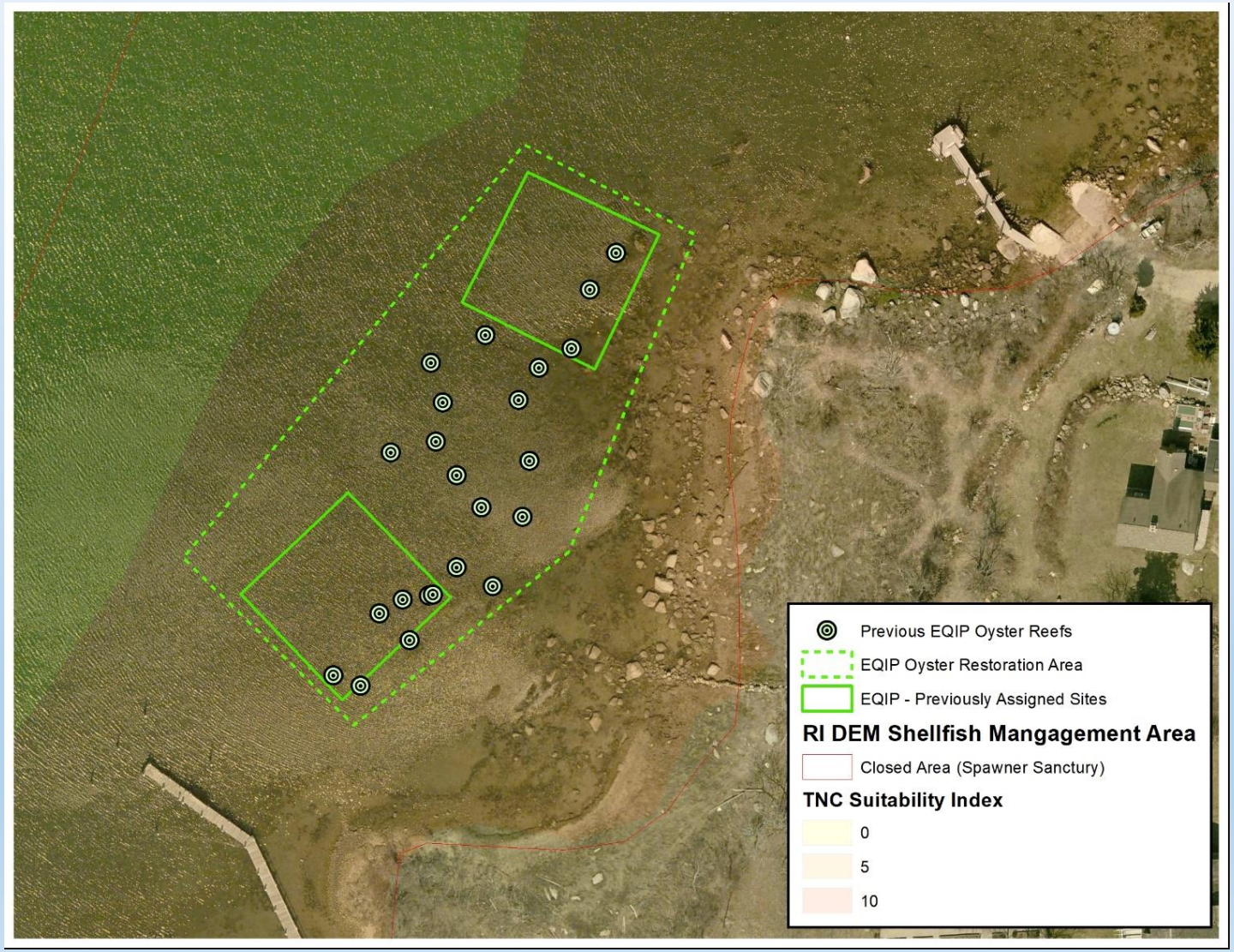
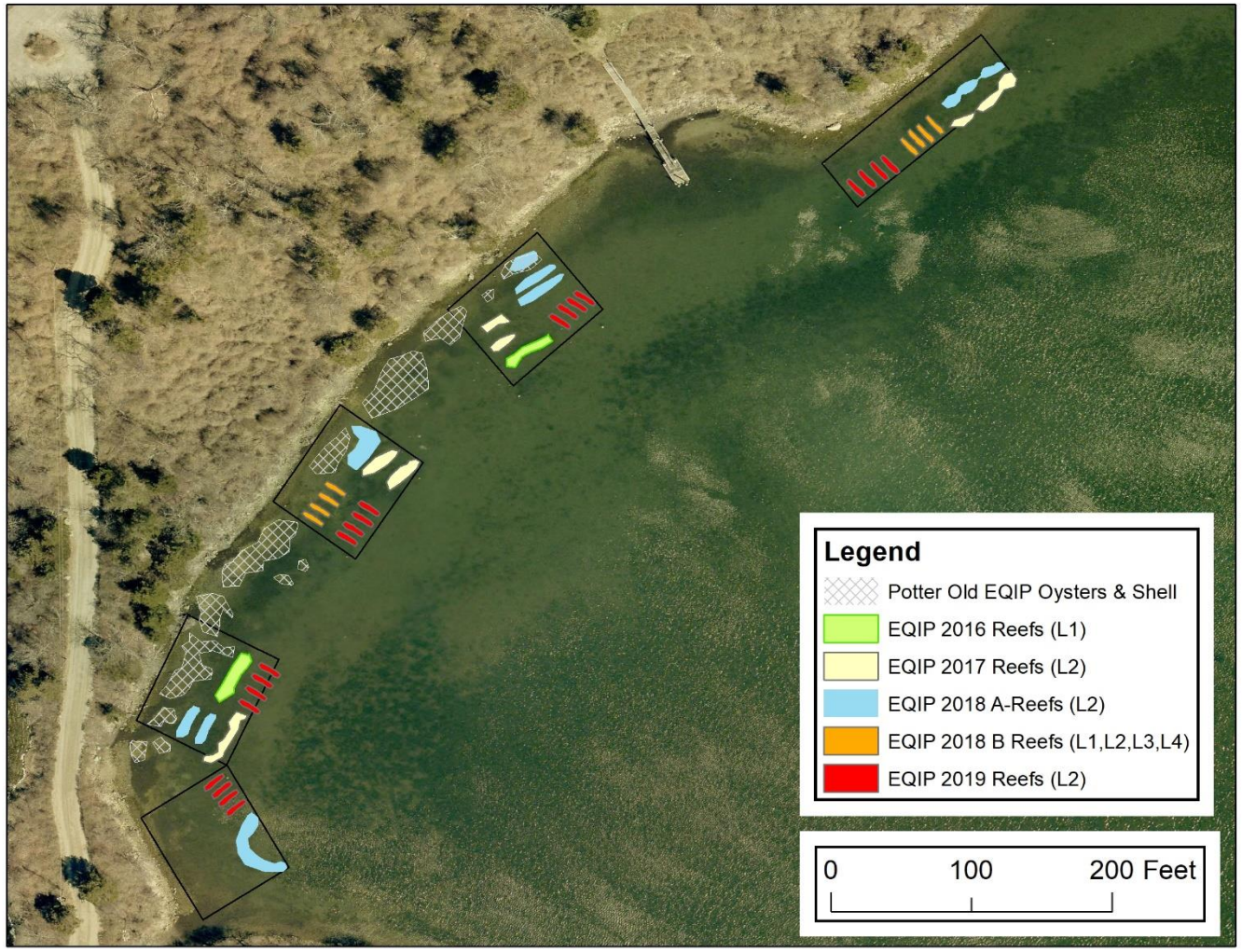


Site Selection:

Small-scale considerations

- Plot and reef orientation, spacing, desired height
- Avoid cobble, boulders, SAV
- other considerations
  - ice scour, subsidence, navigation and sequencing

Example of Small-scale considerations



Finalizing Sites and participants

- DMF finalizes potential oyster sites locations
- Aquaculturists submit EQIP applications to NRCS, applications ranked, and contracts initiated
- DMF prepares & submits permit application to place cultch in tidal waters

Why is DEM always a partner on oyster restoration?

- DEM has the responsibility to conserve, manage, enhance, and restore the Rhode Island's (RI) shellfish resources, thus all shellfish restoration and enhancement is conducted in partnership with DEM to ensure work is aligned with DEM's goals and management objectives, and complements other management activities and research.

Two Practices

- Cultch only
- Seeded Reefs (Seed on Shell)

Overview – Cultch Only

- Used in areas where habitat it limited

- Shell is used to create a reefs
- Juvenile oysters recruit onto the reefs

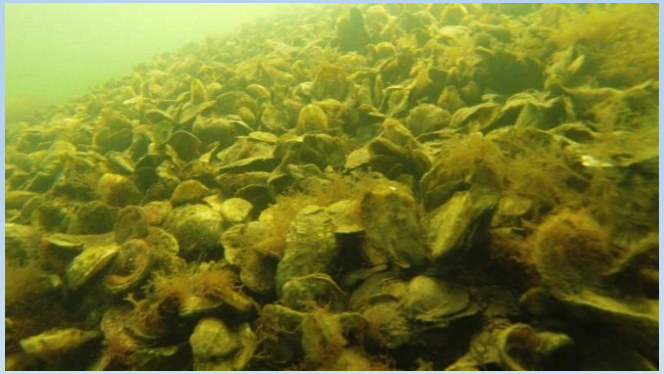
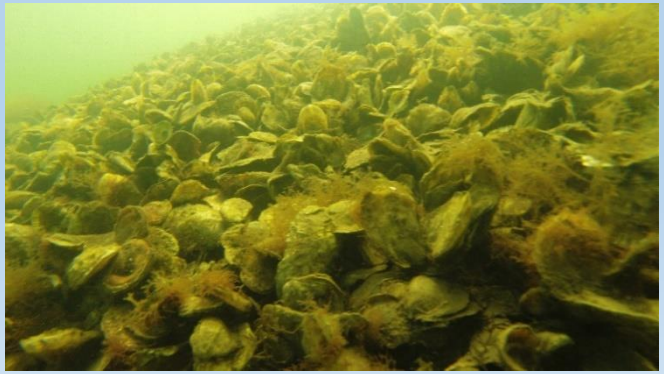


Photo: Mike Congrove, VIMS

Overview – Seeded Reefs (Seed on Shell)

- spat is set on shells and grown out on an aquaculture farm
- Shell is used to create a base for reefs
- Juvenile oysters are seeded onto the reef
- Reefs are monitored

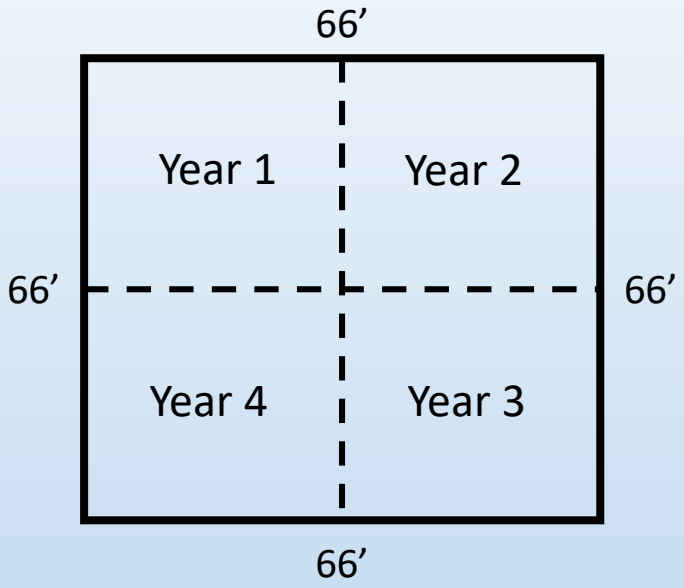


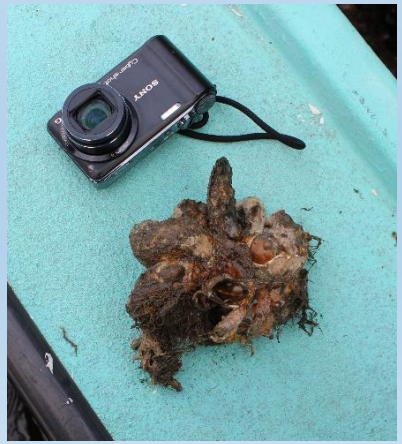
Aquaculturists contracted to restore 0.1 acre plots

- Work occurs over 5-years
  - 4 years of construction and monitoring
  - Each year ¼ of the plot is restored
- Practice
  - $5y^3$ of shell & $5y^3$ of seed on shell per year
  - Pre-deployment assessment (size and density shell, projected number of oysters to be deployed)
- Monitoring
  - Conducted by a qualified contractor
  - Reefs are monitored annually

  until 1-year after the last reef has been created

***Example* 0.1 Acre Plot:**





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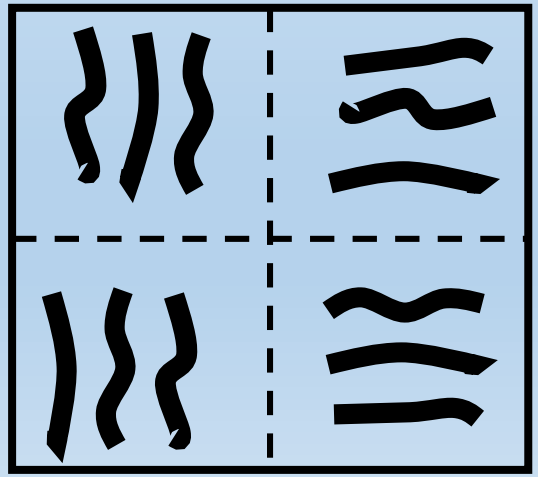

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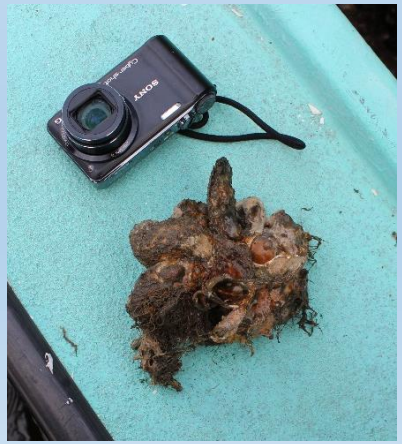

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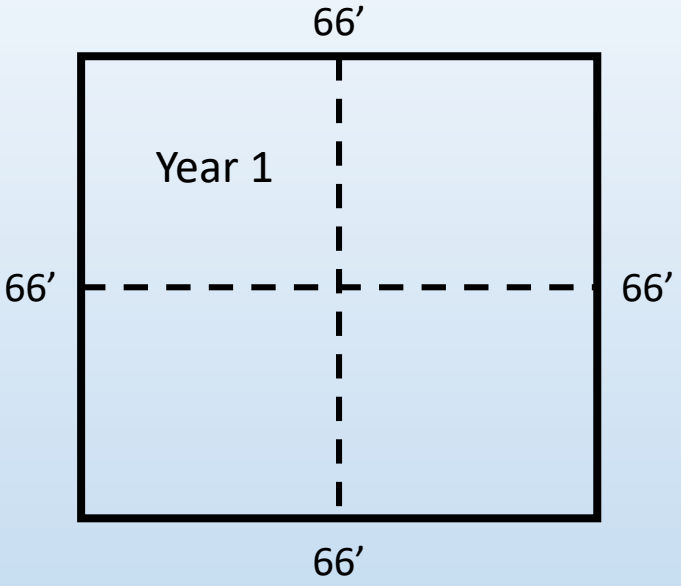

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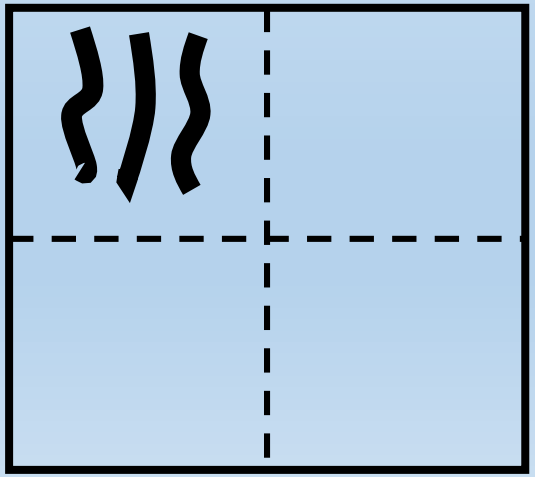

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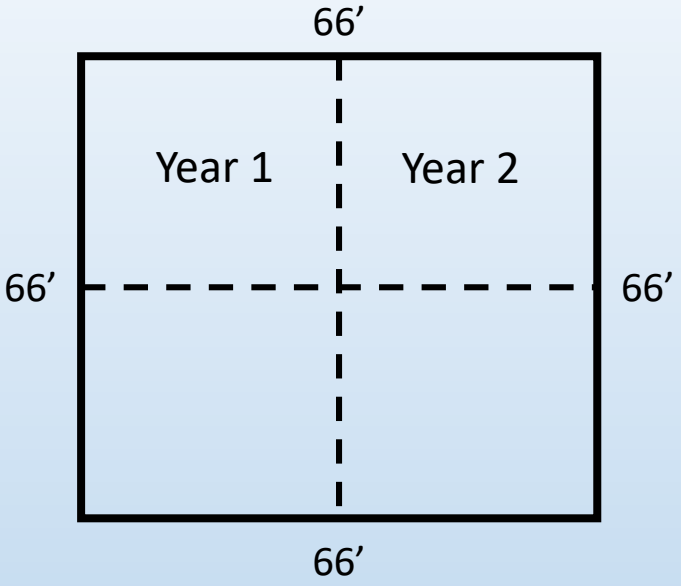

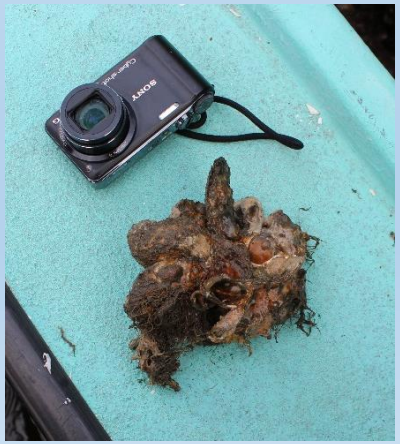

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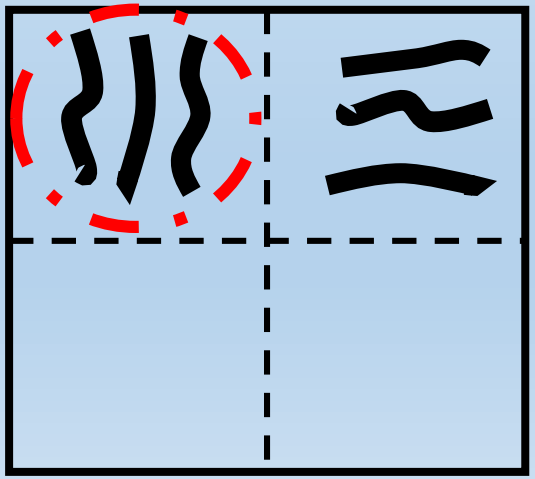

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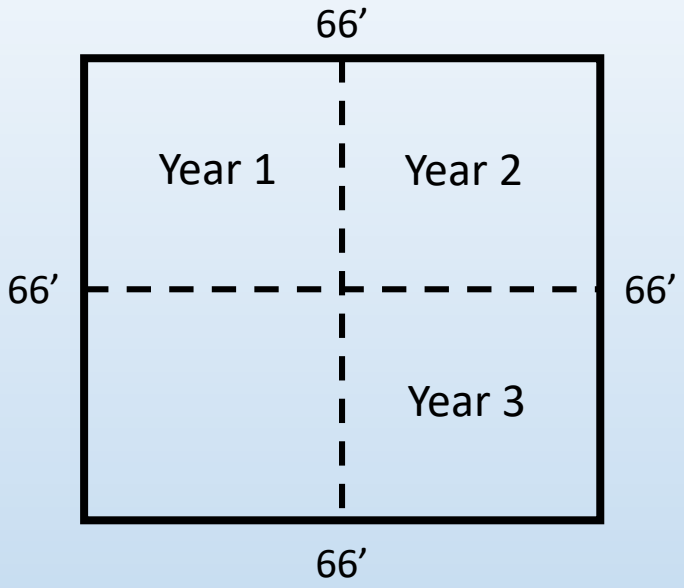

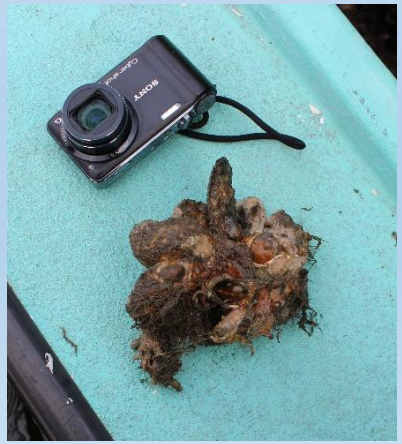

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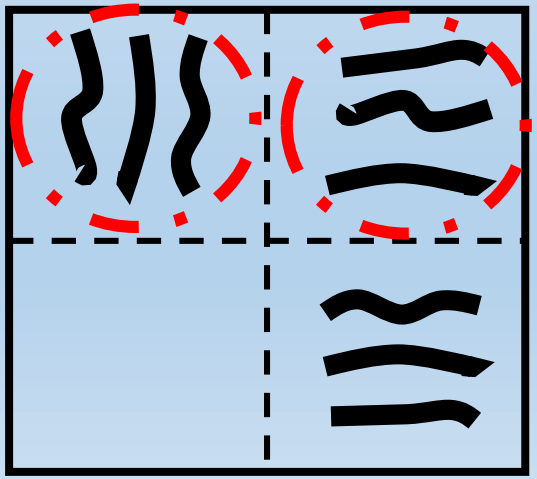

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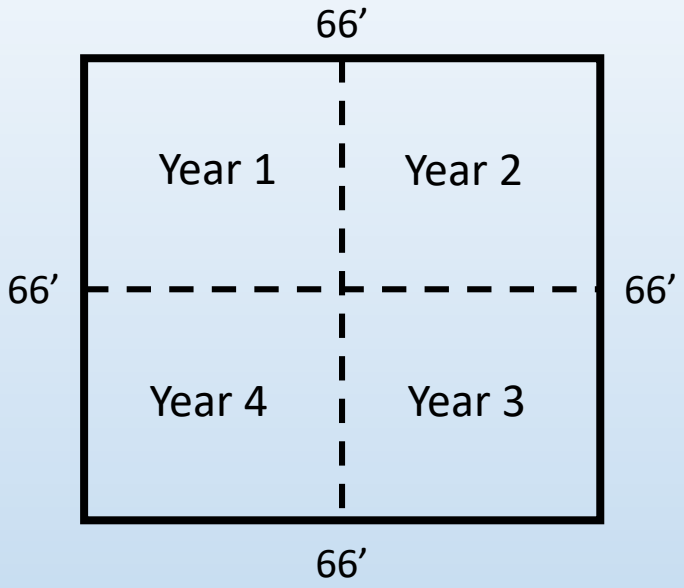

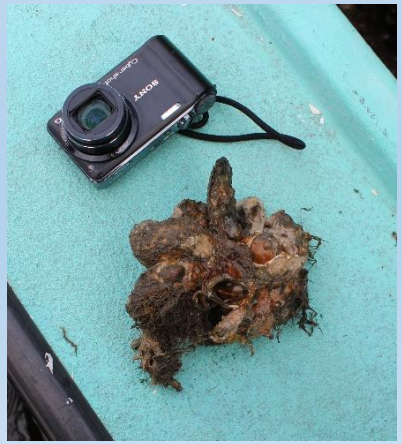

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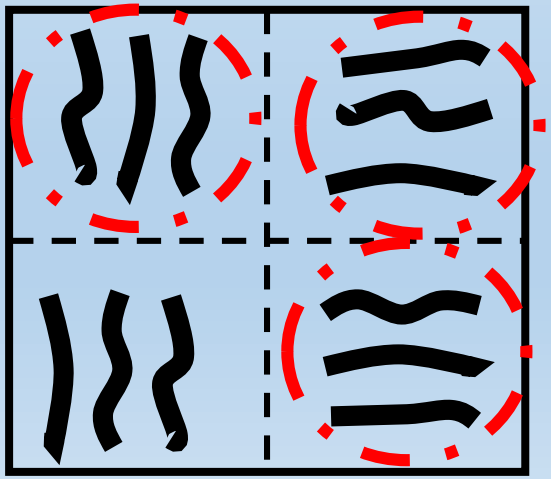

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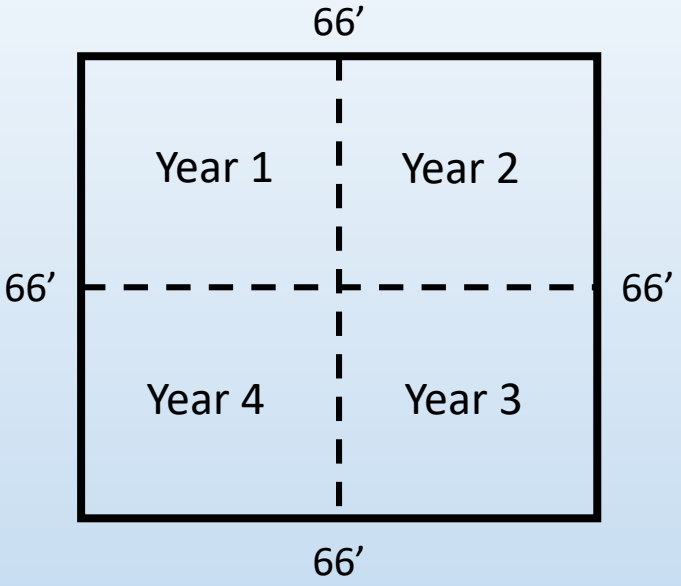

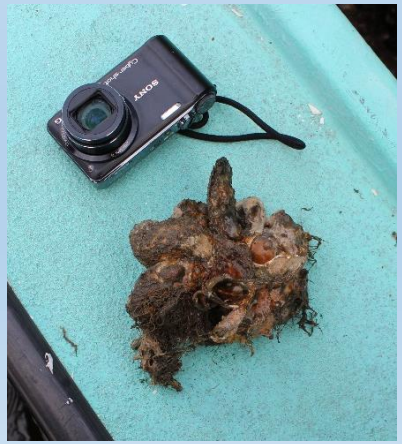

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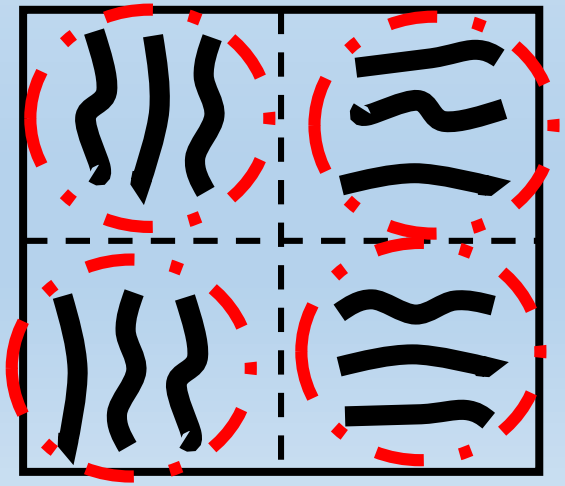

Oyster Monitoring - CRITICAL

- Conducted between Sept and Nov, annually
- Uses Methods described in the RI Oyster Restoration Minimum Monitoring Metrics and Assessment Protocols (Griffin et al. 2012)

- Quantify Reef size
- Oyster density, number alive/dead at height, algal cover, substrate type, reef height
- Pathology: test for Dermo, MSX, and SSO

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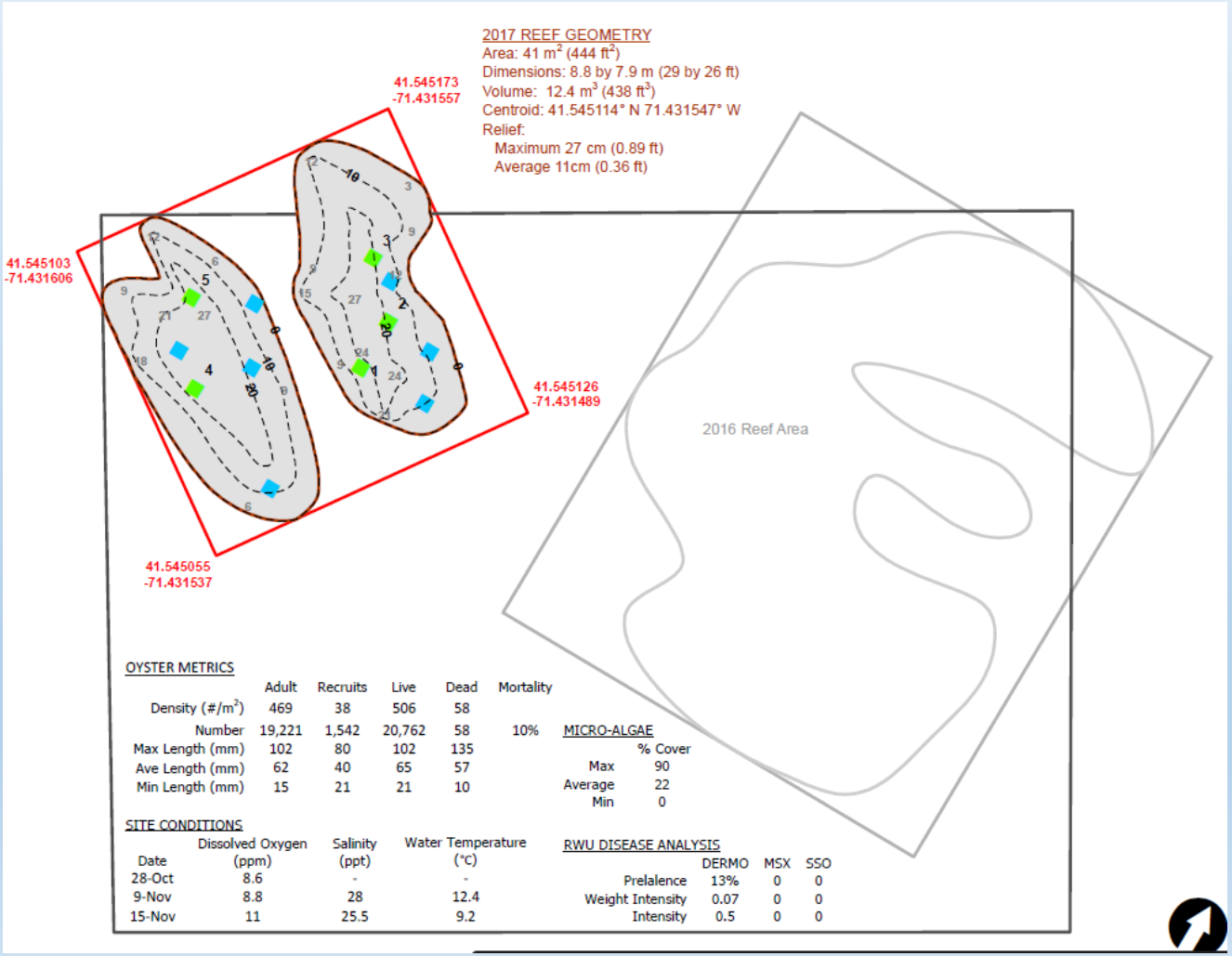
Oyster Monitoring – Glimpse of Results



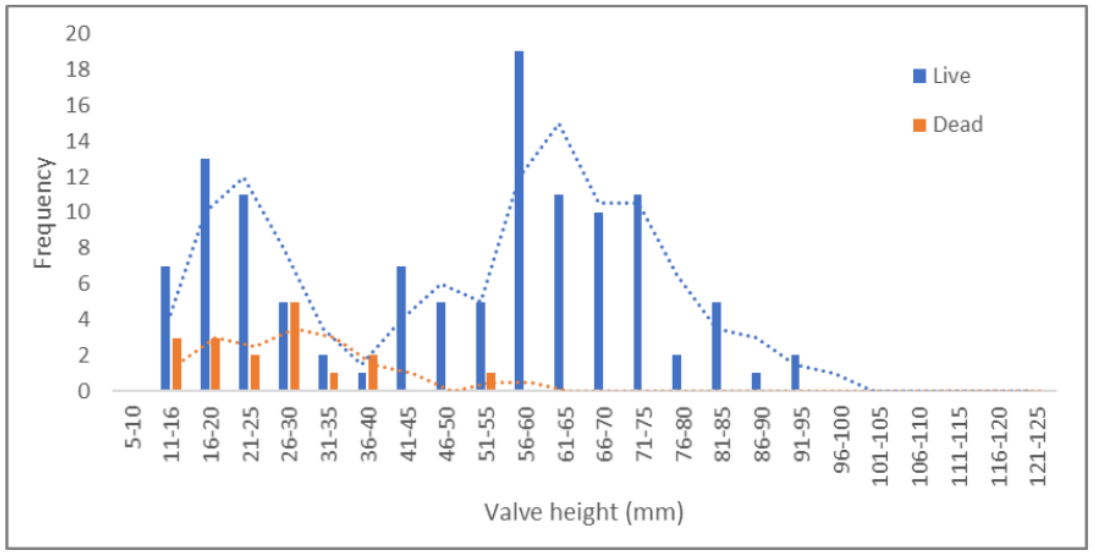


Figure 1. Length frequency of oyster from Great Salt Pond W-2017.

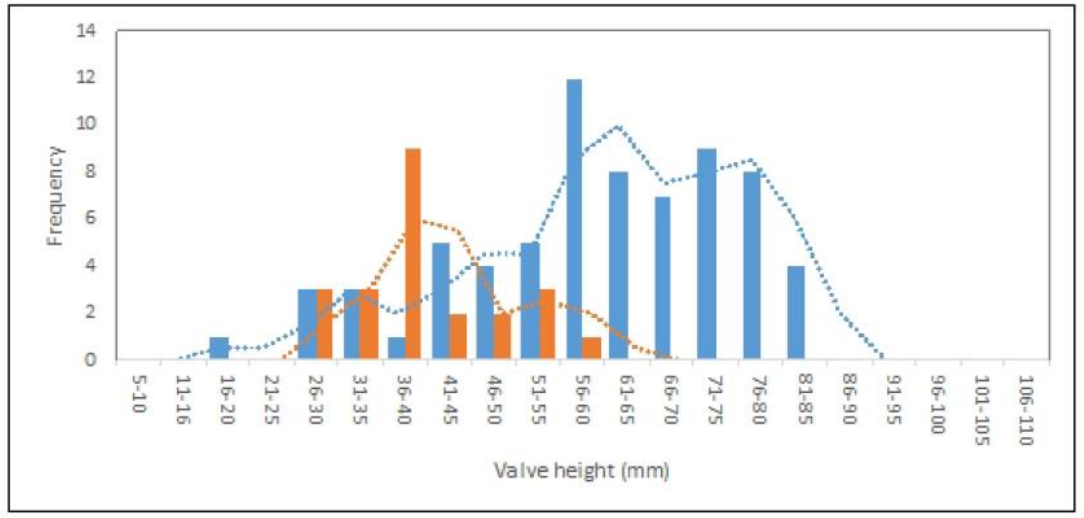


Figure 1. Length frequency of oysters from Bissel Cove reef S-2017.

Incorporation of Collaborative Research

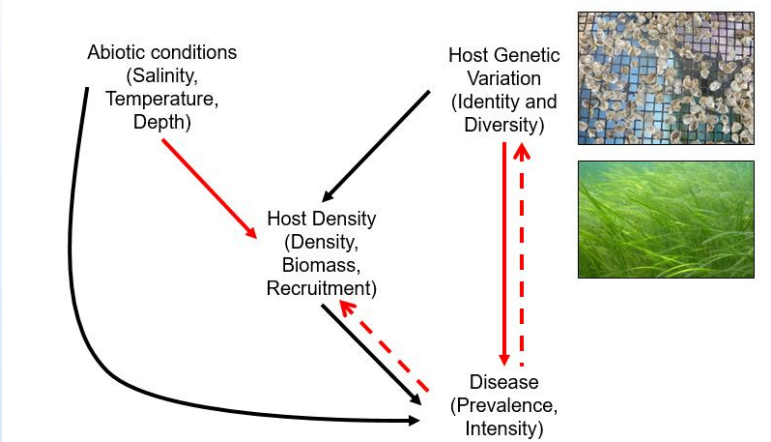
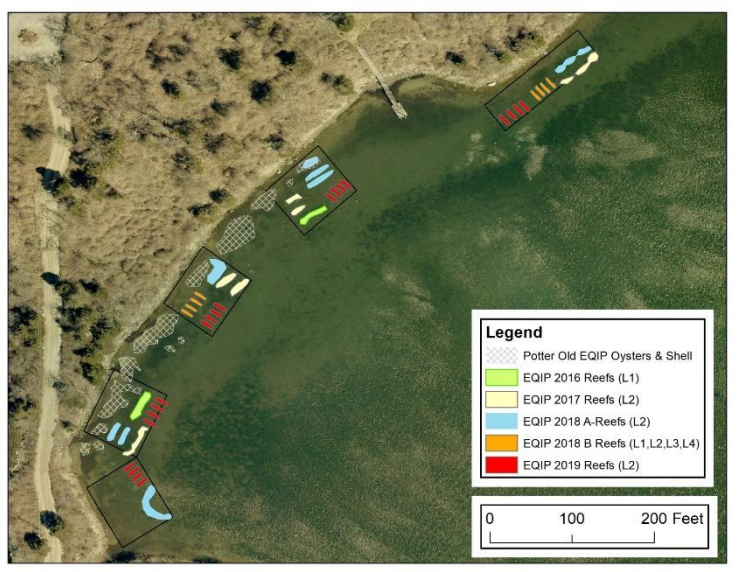


Figure credit: Dr. Randall Hughes, NEU

Examples:

1. Lead by Dr. Randall Hughes, Northeastern Univ. (NU) in collaboration Dr. Jon Grabowski NU, DEM, and aquaculturists
   - Field experiments testing
     - the performance (survival, growth, disease prevalence) of different linages of juvenile oysters alone and in a mixture
     - Effects of source identity, genetic diversity, and density on recruitment and disease prevalence

2. Lead by DEM
   - Assessing how factors such as reef height, orientation, seeding density affect growth, survival, and recruitment in different systems



Challenges to expanding and improving EQIP Oyster Restoration

- Needs:
  - Improve data for suitably models (e.g., Salinity, pH, circulation models coastal ponds, near-shore subaqueous soils in Narragansett Bay)
  - Improved spatial coverages of fishery and other uses in the RI waters (i.e., user conflicts)
- Action:
  - Short-term: continue to find suitable locations using existing data
  - Long-term:
    - Update and expand suitably models for all RI waters
    - Develop a Restoration and Enhancement Plan to identify spatially-specific goals, approaches, and restoration areas to ease permitting and long-term planning

Improving Results of EQIP Oyster Restoration

- Lack of recruitment and mortality on restored reefs limit sustainability of wild and restored oyster reefs
  - Actions:
    - Continue and seek funding to expand research to determine how the following factors affect recruitment: oyster stock/lineage, genetic diversity, reproductive condition, larval transport, and mortality post-settlement
    - Determine Preferred lineages for restoration, considering: survival, disease resistance, genetic diversity, reproductive condition, and link to recruitment
    - Require specific lineages for EQIP oyster restoration
    - Develop Seed Only Practices (for overseeding reefs)

- Long-term monitoring of sites after EQIP practices end
  - Action: find funding & mechanism to support long-term monitoring of EQIP sites

Questions & Discussion