Enhanced Aquaculture Tech Memo

Presentation of Findings

February 6, 2017

Background of Demonstration Projects

- **Shellfish demonstrations in general are designed to:**
  - Evaluate the efficacy of oysters and quahogs in achieving reduced nitrogen concentrations within the Town's impaired waters;
  - Determine the most advantageous approaches for growing the quantities of shellfish prescribed to meet nitrogen removal goals; and
  - Develop realistic cost estimates for the preferred approaches to growing shellfish to meet nitrogen removal goals in specific waterbodies.
- **These demonstrations will help determine the role of shellfish in the overall strategy for reducing the nitrogen loads within the Town's impaired estuaries**
- **Enhanced Aquaculture Demonstration Project:**
  - First described in the shellfish component of the Orleans Consensus Agreement (2015)
  - Further discussed during the Town-sponsored June 2015 Shellfish Forum and documented in Phase I: Orleans Shellfish Operations and Program Expansion Plan dated June 2015
  - Included for consideration in the Draft Technical Memorandum on Site Characterization prepared by AECOM team (March 2016)
  - After a detailed peer review process, working with existing growers in Pleasant Bay was selected as one of four demonstration projects.

Purpose: Enhanced Aquaculture Demonstration Project

- **Two main goals:**
  - Determine the feasibility of working with Orleans's Pleasant Bay shellfish farmers to raise a portion of the shellfish biomass that is needed to meet the Town's TMDL-based nitrogen reduction targets
  - Present a specific set of implementation steps and costs for increasing the biomass of oysters grown by shellfish farmers in Pleasant Bay, above and beyond what is currently being harvested
- **The findings and proposed program options are presented in the Enhanced Aquaculture Draft Technical Memorandum**

Information Gathering for Demonstration Project

- **Questionnaire developed with Shellfish Working Group**
  - Distributed to growers in Pleasant Bay by Shellfish Constable
  - Seven of nine growers responded

- **Interviews with growers conducted to add to information from questionnaire**

- **Key constraints to increased production identified:**
  - Limitations on financial resources to purchase more oyster seed and the additional gear to grow the seed
  - Insufficient space on grants to install additional gear
  - Availability of a quality source of local seed
  - Labor required to control fouling and predations and other maintenance issues; and lack of suitable local labor pool
  - The near-retirement age of some grant holders

Information Gathering for Demonstration Project, ctd.

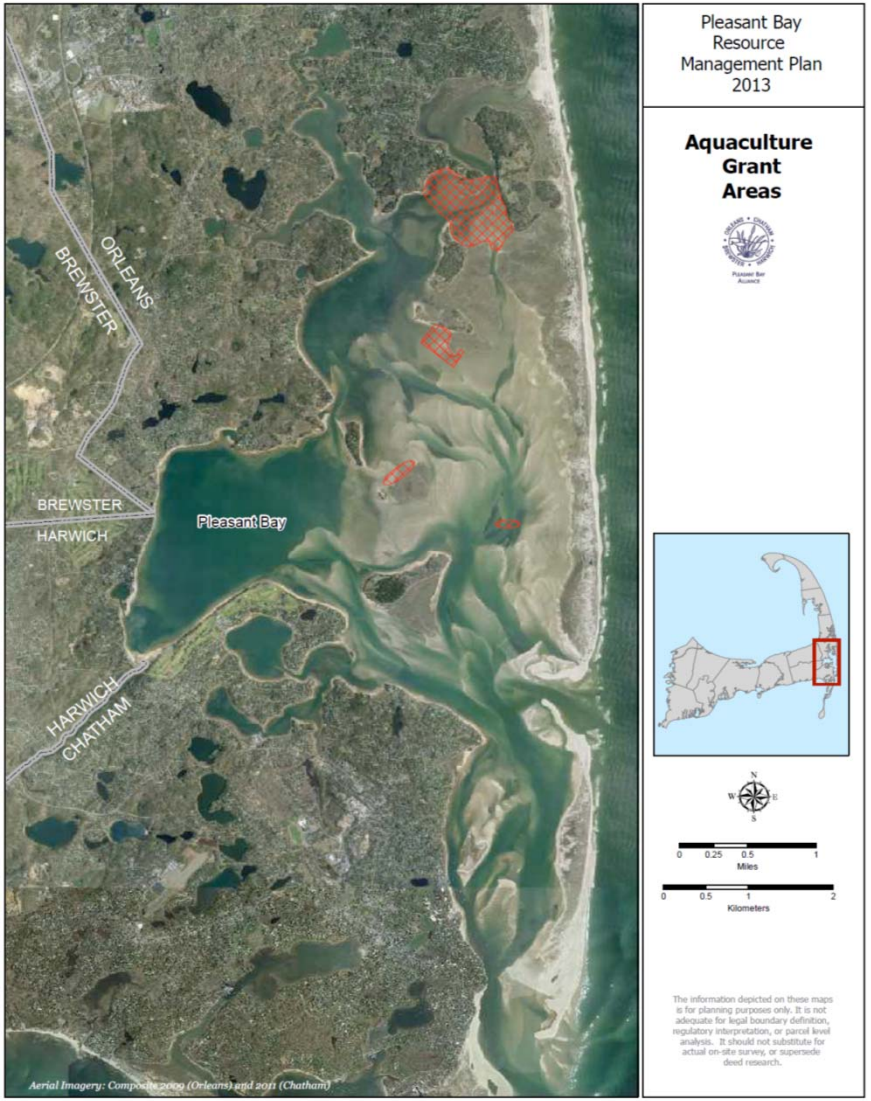
- **Other comments:**
  - Important to have a reliable local market for harvested oysters
  - Space at public landings may be insufficient if all operations expanded
  - Regular maintenance dredging should occur to maintain access to grant areas
  - Protection of naturally productive shellfish areas should be a priority
  - Planning should focus on native species and increase quahog propagation

Information Gathering for Demonstration Project, ctd.

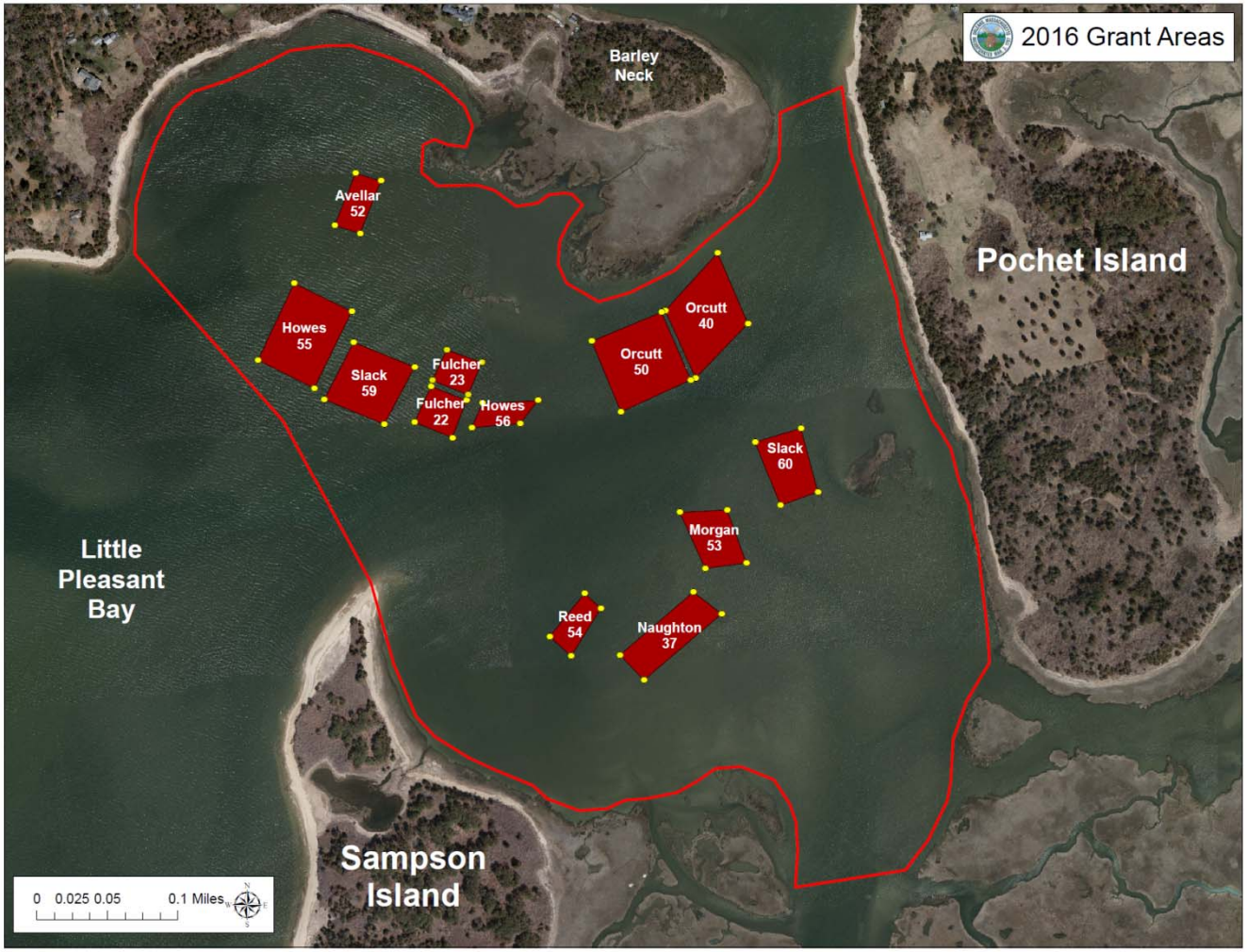
❖ **Relevant planning considerations:**

- The currently used aquaculture area can accommodate an expansion of the current grant areas to a maximum of two acres per grower, as allowed by the current Town shellfish regulations;
  - Four of these existing grants have already expanded to the two-acre per grower maximum size;
- From the perspective of water surface area, the currently used aquaculture area may be able to accommodate additional sites for gear-based aquaculture;
- There is a designated aquaculture area west of Hog Island as well as two other sites in Pleasant Bay which show additional water surface area for aquaculture as shown in the most recent Pleasant Bay Management Plan;
- To address biologic productivity, eelgrass, navigation, and other use issues, any additional areas potentially used for aquaculture will need to be laid out by the Town after a site evaluation and biologic assessment;
- There are twenty-five people currently on the waiting list for aquaculture grants in Pleasant Bay, although some letters of interest are over twenty years old, and;
- The Town needs to decide if and how to allocate any additional space that is available for aquaculture (based on both water surface area as well as biologic and other assessments) between this program and the existing waiting list for aquaculture grants.

Information Gathering for Demonstration Project, ctd.



Information Gathering for Demonstration Project



Main Features of Enhanced Aquaculture Program

- **The expected enhanced production per participating grower is an additional 150,000 oysters annually brought to market;**
  - If six growers participate, this almost doubles the number of harvest-size oysters being grown annually in Pleasant Bay;
- **Seed as well as the materials for gear needed to grow the seed is provided by the Town as an incentive;**
- **Growers provide an in-kind contribution in the form of the labor to assemble the gear and to cultivate and sell the oysters;**
- **Two additional financial cost-sharing options are presented;**
- **A floating bag system for gear is specified;**
- **This is a six-year Program for costing purposes so that the gear costs can be amortized over its lifetime;**
- **The additional growing space required will be determined by working with the Shellfish Constable and growers on a site-specific basis. Standard permitting requirements apply to providing additional growing area for this Program; and**
- **To ensure equitable treatment of all growers, providing the additional growing space can be achieved by creating individual project areas that are separate from current grants.**

Providing Additional Growing Space

❖ Project Areas

- Separate 20,000 square foot (~half-acre) areas per participating grower;
- Siting for nine areas feasible based on water surface area in Pleasant Bay Aquaculture Grant areas, possibly more;
- Biological assessments are one of the next steps;
- 2100 floating bags can fit with room to flip by boat; and
- At 350 oysters per bag, this accommodates 735,000 first-year oysters, and at 150 second-year oyster per bag, this accommodates 315,000 oysters.

❖ Including Waiting List in Program

- Likely less than 25 people; and
- Three approaches:

1. Hold to nine project areas and if any existing growers do not participate, offer to those on the waiting list
2. Increase the number of project areas and offer to those on the wait list, and oyster production targets and other aspects of program apply
3. Use any other space that is available for standard aquaculture grants

Providing Additional Growing Space

❖ Regulatory considerations

- Standard permitting of aquaculture license sites (grants) will apply, including biological survey;
- Current shellfish grants are limited to two acres per grower in Orleans;
- Some growers have already expanded their grant to two acres;
- Families can only hold one grant pursuant to Town aquaculture regulations; and
- Floating Gear cannot cover the greater of ten percent of a project area or 20,000 square feet, pursuant to the ACOE General Permit.

❖ Advantages to creating new project areas

- The current status of the Town's existing aquaculture grant system is maintained;
- All grant holders are treated equally; and
- Orleans's aquaculture regulations allow grants for educational purposes/experimental data that is useful to the Town but do not allow families to hold more than one grant.

Key Assumptions

Cost per 1,000 Oysters (~3 mm)	$ 12.75
Nitrogen Content (% of live weight)	0.49%
Starting Weight (g/Oyster)	0.2
Year 1 Ending Weight (g/Oyster)	20
Year 2 Ending Weight (g/Oyster)	60

	Year 1	Year 2
Mortality	35%	15%
Oysters/bag	350	150

Materials cost per bag	$ 13.30
Cost of spat bag for ~3 mm seed	$ 3.00

Financial Analysis

Total Program = 6 Years	Nominal 3 mm Seed		
Total Program: Number of Participating Growers	1	6	9
Market Oysters per Grower per Year	150,000	150,000	150,000
Total Program: Additional Gear on Water	1,952	11,713	17,569
Total Program: Market Oysters per Year	150,000	900,000	1,350,000
Total Program: Capital for Gear	$ 28,291	$ 169,745	$ 254,618
Total Program: Seed Cost	$ 17,308	$ 103,846	$ 155,769
Program Oversight	$ 5,040	$ 30,240	$ 45,360
Total Program Cost	$ 50,639	$ 303,831	$ 455,747
Total Program Cost less Grower Share (30% of Gear & Seed)	$ 36,959	$ 221,754	$ 332,631
Total Program Cost less Grower Share (50% of Gear & Seed)	$ 27,839	$ 167,036	$ 250,554
Town Expenditure, Year 1	$ 16,945	$ 101,672	$ 152,508
Town Expenditure, Year 2	$ 19,949	$ 119,692	$ 179,537
Town Expenditure, Year 3-5 (Seed & Oversight only)	$ 4,302	$ 25,809	$ 38,714
Town Expenditure, Year 6 (Oversight Only)	$ 840	$ 5,040	$ 7,560
Grower Expenditure, Year 1 + Year 2 @ 30% Cost Share	$ 10,564	$ 10,564	$ 10,564
Grower Expenditure, per Year 3-5 @ 30% Cost Share	$ 1,038	$ 1,038	$ 1,038
Grower Expenditure, Year 1 + Year 2 @ 50% Cost Share	$ 17,607	$ 17,607	$ 17,607
Grower Expenditure, per Year 3-5 @ 50% Cost Share	$ 1,731	$ 1,731	$ 1,731
Grower Annual Revenue, Year 2-6	$ 52,500	$ 52,500	$ 52,500
Total Program: Market Value of Oysters @$0.35	$ 262,500	$ 1,575,000	$ 2,362,500
Total Program: Market Value of Oysters @$0.55	$ 412,500	$ 2,475,000	$ 3,712,500
Annual N Removal in Market Oysters, kg	44	264	396
Annual N Removal in Other Shells (Mortality), kg	2	15	22
Annual N Removal by Denitrification, kg	44	264	396
Annual N Removal, All Pathways, kg	90	542	813
$/kg of N Removed, Market Oyster Only, No Cost Share	$ 230	$ 230	$ 230
$/kg of N Removed, All Pathways, No Cost Share	$ 112	$ 112	$ 112
Gross Revenues per kg Market Oyster N @$0.35	$ 1,194	$ 1,194	$ 1,194
Gross Revenues per kg Market Oyster N @$0.55	$ 1,877	$ 1,877	$ 1,877

Key Assumptions

Cost per 1,000 Oysters (~3 mm)	$ 12.75
Nitrogen Content (% of live weight)	0.49%
Starting Weight (g/Oyster)	0.2
Year 1 Ending Weight (g/Oyster)	20
Year 2 Ending Weight (g/Oyster)	60

	Year 1	Year 2
Mortality	35%	15%
Oysters/bag	350	150

Materials cost per bag	$ 13.30
Cost of spat bag for ~3 mm seed	$ 3.00

Next Steps

- **Discuss overall concepts**
- **Review assumptions for mortality, stocking density, floating bag density, costs**
- **Evaluate $/kg values and other benefits**
- **Review working with waiting list options and permitting for providing additional space**
- **Decide how to proceed**
  - Are there overriding considerations that warrant discontinuing this demonstration?
  - Are there recommendations for specific modifications to the draft program to be made?

Town of Orleans Massachusetts

Discussion