



The Rhode Island

Shellfish Management Plan



Document Appendices

Version II, November 2014

Appendix 1.1 - SMP Technical Advisory Committee Members (by Chapter)

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None

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None

Chapter 10 – Summary of Recommendations

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None

Appendix 1.2 – Ocean State Aquaculture Association Vision Statement

The Ocean State Aquaculture Association envisions a vibrant multi-million dollar sustainable industry that produces nutritious seafood and provides green jobs in rural communities while improving ecosystem integrity.

Global aquaculture production is recognized by the UN’s FAO as the fastest growing form of agriculture in the world, providing half of the world’s seafood needs. Although the FAO projects that global seafood demand will double by 2015, global capture fisheries have leveled off at 90 million metric tons providing a compelling case for increased aquaculture production.

Thanks to enabling legislation pushed by state Rep. Eileen Naughton in 1995, Rhode Island’s aquaculture has enjoyed a renaissance. The landmark regulatory reform unleashed a dramatic 20 percent annual growth in oyster production and employment. By 2012 50 farms operating on a mere 173 acres directly employed 105 workers. In 2012 Rhode Island growers harvested nearly \$3 million in oysters, generating over \$9 million in economic activity.

Rhode Island is well positioned to continue this growth. We enjoy vast marine resources and continue to invest millions in improving water quality. Continued investment in aquaculture research will ensure that our university researchers have the facilities and resources to help our nascent industry flourish.

The aquaculture industry in Rhode Island has proven to be a viable and compatible use of the public-trust waters. Expanding aquaculture should be a state priority.

At the current rate of growth we envision a harvest exceeding \$10 million by 2020, providing over 300 direct jobs and generating millions in ancillary economic activity. Removing barriers to aquaculture expansion will turn this sustainable “green industry” into a major economic engine for the state.

ACTIONS NEEDED TO OVERCOME BARRIERS TO EXPANSION

- 1) Pass legislation defining “aquaculture *is* agriculture” and prioritizing aquaculture development in the Rhode Island’s economic development plan.
- 2) Consolidate duplicative regulatory authorities of the DEM and the CRMC.
- 3) Establish a regulatory framework allowing for the expanded use of uncertified waters for the cultivation and collection of shellfish seed.

OPPORTUNITIES FOR GROWTH

- Large-scale expansion of public-benefit aquaculture projects (ie. the oyster restoration and quahog nursery programs) for nutrient mitigation and expanded wild-harvest.

- Increased use of uncertified waters for cultivation of shellfish seed and seaweeds.
- Expansion of offshore shellfish farming opportunities including mussels, scallops and seaweeds with potential co-location in wind farms.
- Diversification to include a variety of shellfish species, seaweeds and finfish.
- Development of “Urban Aquaculture” (small-scale aquaponic production of fish for family consumption).

COOPERATIVE RESEARCH OPPORTUNITIES

- Develop pharmaceutical and bio-tech compounds from cultured marine organisms.
- Selectively breed families of shellfish that are resistant to disease and adapted to the pH and warmer waters predicted for the end of the century.
- Research contaminant levels in shellfish seed grown in uncertified waters.
- Identify opportunities for nutrient or carbon trading associated with the harvest of marine products and the bio-remediation of excess nutrients.
- Develop novel culture methods to minimize user conflicts and improve production efficiency.
- Improve methods to categorize existing uses of state waters.
- Develop innovative enforcement tools to monitor and protect growing and restoration areas.
- Develop tools to predict, monitor, mitigate and potentially control harmful algal blooms, *Vibrio* bacteria, shellfish parasites and other threats.
- Establish a long-term funding source for shellfish disease surveys.
- Expand the collaboration between farmers and regional culinary experts to create novel foods and to add value to our farmed seafood products.

Appendix 1.3 – SMP Vision, Goals, and objectives

SMP Vision

The shellfish that inhabit our waters are part of the social fabric of Rhode Island and are integral components of the marine ecosystem that provide food, recreation, income, employment, and other environmental, economic, social, and cultural benefits. In order to ensure the health and proper ecological functioning of the marine ecosystem and realize the socio-economic benefits associated with healthy shellfish populations, we shall seek to preserve, protect, manage, and when necessary, restore shellfish resources and essential habitats using the best available information and science. We shall also strive to employ sound governance to achieve fair, equitable, and safe access to shellfish resources and support the interests of those who harvest for personal use and enjoyment; those who participate in the commercial wild harvest fishery; those who engage in the aquaculture of shellfish species; those who rely upon the shellfish industry as a source of food, and those who recognize the importance of shellfish in our marine ecosystems.

SMP Goals (10 years)

1. **Honor, promote and enhance the existing shellfish resource and uses.** Shellfish offer a myriad of ecological services to Rhode Island state waters, jobs and business opportunities to its residents, and recreation for all. As such, actions should strive to maintain healthy populations of shellfish while honoring the current uses of Rhode Island's natural resources and promoting Rhode Island shellfish as a source of local, sustainable seafood.
2. **Contribute to a properly functioning ecosystem that is both ecologically sound and economically beneficial.** The prosperity of the shellfish industry depends on the health of our marine environment and the quality of the water that shellfish inhabit. It is therefore necessary to evaluate the current status and potential future changes to the natural resources, ecosystem conditions, and anthropogenic impacts on the marine environment and recommend actions to protect and, where necessary, restore our marine waters.
3. **Manage marine and shellfish resources for equitable and sustainable use.** Through both scientific research and practical knowledge, better understand the existing activities taking place in Rhode Island waters. Identify best management practices to support all shellfish activities for long-term sustainability while supporting compatible uses and minimizing user conflicts to ensure the equitable harvest of these marine resources.
4. **Enhance communication and improve upon the established framework for coordinated decision making between state and federal management agencies, industry, and other interested parties.** Engage management agencies, industry and other interested parties in the development of the shellfish management plan and implementation of recommendations to ensure that all concerns and appropriate legal requirements are integrated into the process. Coordination will allow for the sharing of information across all sectors, improve management, clearly establish roles and responsibilities of all parties and streamline the licensing and permitting process where appropriate.

SMP Objectives (2 years)

1. Document and increase our understanding of the current status of Rhode Island's natural resources and ecosystem conditions to help promote the health of our ecosystem and prosperity of the shellfish industry.
2. Identify the existing commercial, recreational, conservation uses of our state waters as a tool towards minimizing use conflicts.
3. Document the historical and current perspectives, memories, and narratives of Rhode Island's shellfish community in order to better understand, honor and promote the cultural importance of shellfish to the state.
4. Define principles for a comprehensive stock assessment program that guides management decisions for all managed shellfish species.
5. Maintain a viable, equitable industry while identifying value-added marketing opportunities.
6. Improve understanding of state, regional, and national economic aspects of the commercial, recreational, and restoration activities involving shellfish.
7. Improve the industry's and public's understanding of management decisions and processes.
8. Support existing and identify alternative mechanisms to appropriately facilitate coordination among decision-makers, industry and other stakeholders by clarify legal roles and responsibilities of state and federal agencies. .
9. Establish a Research Agenda that identifies knowledge gaps, proposes future research needs, recognizes potential funding sources, and discusses potential collaborative/partnership opportunities.
10. Identify sustainable sources of funding for implementing management plan recommendations.
11. Develop and implement a stakeholder supported shellfish management plan.

Rhode Island's Shellfish Heritage

AN ECOLOGICAL HISTORY



BY SARAH SCHUMANN · 2014

Coastal Resources Center
University of Rhode Island Coastal Institute
Rhode Island Sea Grant

About this Book



SHELLFISHING IS PART AND PARCEL OF THE Rhode Island way of life, and has been for centuries. Native Americans used the local quahog for food and trade and taught European colonists how and where to gather them in Narragansett Bay. Early twentieth century tourists left their hot New England cities in the summer for cooler Bay shores, taking part in clambakes and collecting shellfish on their own. And Rhode Islanders have steadfastly turned to shellfishing for year-round subsistence and income, with the science, art and lore of quahogging being handed down generation to generation.

Today, shellfishing—both the wild harvest (of quahogs, oysters, steamers, whelks, bay scallops and mussels) and aquaculture (of oysters and mussels)—remains an import-

ant part of Rhode Island's cultural and economic story.

Rhode Island's *Shellfish Heritage: An Ecological History* tells the story of shellfishing in Rhode Island from the earliest harvests to the challenges and opportunities facing industry and recreational harvesters alike.

This book documents the historical and current perspectives, memories, and narratives of Rhode Island's shellfish community in order to better understand honor and promote the cultural importance of shellfish to the state.

This book is published by the Coastal Resources Center, the Coastal Institute, and Rhode Island Sea Grant, all at the University of Rhode Island.

Content Highlights

A young boy with a blue baseball cap and blue patterned shorts is standing on a sandy beach. He is holding a small, dark, oval-shaped object, likely a clam, in his right hand. He has a slight smile and is looking towards the camera. In the background, the legs and feet of another person wearing orange shorts and white sneakers are visible, standing in the shallow water. The water is calm and reflects the light.

SARAH SCHUMANN, SHELLFISH HARVESTER and writer, has interviewed numerous harvesters and growers, as well as a wampum maker from the Narragansett Tribe, and combed through historic shellfishing reports, newspaper articles, and photographs to tell the story of Rhode Island's love affair with shellfishing—and some of the controversies that have erupted over “gravy trainers,” price fixing, pollution, and “quahog pirates.” Section highlights include:

- When Oysters Blanketed the Bay
- The Quahog Era's Embattled Start
- Heyday of the Independent Shellfisherman
- The Shellfish Supply Chain: Then and Now
- The Rebirth of Aquaculture

Appendix 2.2 – Issues Identified by Stakeholders

Note: This is a compiled list of all issues raised at the four scoping sessions held in 2013 – Aquaculture, Restoration, Wild Harvest, and Agency Scoping Sessions. These issues have not been prioritized or ordered.

1. Coordination between the DEM, CRMC, DOH, FDA, NOAA and other agencies; protocols for data sharing.
2. Create use maps – links with spatial management issue
3. Create a centralized website as part of comprehensive communication strategy with a new scope, to include: closure info, research, food/safety, habitat/resource, “rules”, marketing, PR, recreational harvest info, and much more.
4. Better signage for pollution closures.
5. Openness for changes in verbiage in the products of the Shellfish Management Plan - Not “will” or “shall” ... rather use, “may”.
6. Lack of recruitment (people) into shellfishing – there is no next generation.
7. Clarify goals of industry and management – reasonable time frame.
8. Funding for NRCS Program (utilizes commercial aquaculturist’s seed product)
9. Education component to demonstrate value/safety to the public (regarding restoration and oyster gardening).
10. Water quality – definitions and consistency in management; why closures, etc. – Better communication.
11. Reach down to K-12 in education.
12. Local community education of regulations and science.
13. Ensure industry and management share common goals – “are on the same page”; understand needs of management and industry concurrently when managing resources
14. Communication – fishermen send real-time observations to server or somehow keep track of their observations/ info seen on the water.
15. Aquaculture as agriculture – clarify, define.
16. Continued collaboration with Narragansett Bay Commission – does good monitoring element.
17. Communicate ongoing, existing, and needed research.
18. Understanding differing needs of inshore and offshore aquaculture- in and out of Narragansett Bay, i.e. ponds vs. bays.
19. Industry-based surveys.
20. Better communicating closures (possible GIS tool?)
21. DEM designated grow-out areas regarding aquaculture production – how are they determined? What do they mean?
22. Emphasize diversity in the sense that this is not a “quahog-centric” project.
23. Engage the general public – ensure public voice is heard – who? How?
24. Addressing diversity (multicultural aspect) of public.
25. Engage food distributors, dealers, towns, DOH etc.
26. Involve dealers more; dealers input into winter harvest schedules.
27. Need for a Recreational Harvest Scoping Session.
28. Knowledge transfer between generations.
29. Fishermen’s knowledge and expertise is considered AND compensated in this process – how?

30. Look at Puget Sound MP as example.
31. NOAA funding – How to interface with the National Shellfish Initiative.
32. Develop facility in Jerusalem to support aquaculture in the state (issue identified at Aquaculture Scoping Session – can pertain to restoration and/or wild harvest as well). Note: Need to explore possible uses for this facility first.
33. Role of shellfish in economic growth of RI)
34. Value of recreational shellfishing in RI (research)
35. Cost/ Benefit Analysis – Closed waters, use conflicts, best use of space (research)
36. Role of shellfish in ecotourism
37. Public-private seed hatchery for RI (issue identified at Aquaculture Scoping Session) Hatchery – to support restoration
38. Direct marketing of products
39. Address living wage
40. Value of species-specific fisheries (fisheries)
41. Cost/Benefit of doing shellfish stock relay out of restricted water.
42. There is a need to better understand the biological processes of our shellfish resources
43. Shellfish stock assessment at a reasonable scalar level (research).
44. Spatial management - What scale are we operating on? Treat different areas differently; areas with size classes that have little/no value – how to address.
45. Research, priority topics.
46. Seeding and transplants – MOU for seeding; how to maximize seeding biomass
47. Spawner sanctuaries - Identify spawner sanctuaries based on environmental characteristics. Sparse science concerning spawner sanctuaries and brood stocks; enhancement? (research)
48. Substrate enhancement – cultching
49. Maintain genetic diversity of shellfish stocks
50. Whelks in general; also not currently covered in biotoxin closures
51. Concerns about using wild stock for aquaculture
52. Develop baselines for the evaluation of restoration projects (research) – historic high as baseline? Is this realistic?
53. Minimum size issues (aquaculture)
54. Understand brood stock characteristics necessary to maintain stocks
55. Research to address whether working a shellfish area aerates the ground (research)
56. Market research for spider crabs
57. Can't rely on natural recruitment; manage like running a farm
58. Shellfish restoration for water quality purposes in closed waters (1 green vote. Note: Controversial, needs further discussion)
59. Link the restoration of water quality to habitat restoration and how this will improve the industry; link water quality to restoration efforts 1st – Note: need to have a separate category that identifies the anthropogenic effects in certain watersheds that have the potential for improvement resulting in expansion of fishable area in estuaries closed to shellfishing i.e. Green Hill and Narrow River as examples.)
60. Nitrogen reduction – impacts on shellfish resources
61. Effects of ocean acidification
62. What is effective restoration? What are the numbers?

63. Perpetual management for ecological health and sustainability
64. Hydrodynamics – part of siting spawner sanctuaries
65. Incorporation of hydrodynamic information (research)
66. Climate change (research) – how is climate-based ocean acidification occurring, etc.
67. Ecological impacts from aquaculture
68. Predator management – i.e. abundance of sea stars affecting shellfish, spider crab abundance (after lobster decline?). Can we use predator control to increase clam numbers? (research)
69. Consider shellfish as food, not just a resource, and all issues along with public health and food safety
70. Time/Temp *Vibrio* issues
71. Management of closures due to human health risks (research)
72. Upwellers in prohibited waters
73. Water quality in closed waters (ex. Narragansett Bay)
74. Sanitation due to effects from birds, i.e. cormorants and Canadian Geese – issue with water quality in Narragansett River watershed
75. Consistency of shellfish reporting and transport requirements
76. Harmful algal blooms
77. Management of invasive species
78. Build the capacity of state agencies to minimize risk
79. Consumer education, esp. those who are vulnerable health-wise
80. Issues of transplants, contamination, temperature “abuse”
81. Harvest to plate temperature changes and effective cooling procedures (research)
82. Time releasing of effluents (research)
83. Dredging and marinas
84. Enforcement – funding? Adequate enforcement (i.e. web cams, deputies, etc.) (Note: Mentioned this ties in with public health priorities)
85. Division of shellfish management areas – examine, re-evaluate. Review and justify management area and/or pollution closures (i.e. Green Hill Pond, Watch Hill)
86. Activities in conditional waters – how to appropriately go about this
87. Recreational shellfishing - Permanent closures, conflicts, restoration
88. Further development of Spatial Tools – EcoPath, EcoSpace, etc. (research)
89. Accessibility - recreational and commercial access to fishing areas
90. Connect with Local buyer initiatives
91. Need a vision for where we want to be
92. Sustainable funding source or disease monitoring survey work
93. Funding – identify how plan can be funded (all issues need a sustainable funding source)
94. Possibly explore creating new management structures
95. Organize existing Laws
96. Licensing issues – cost, regulations, due date, capacity, exit/entry ratios, ‘use it or lose it’
97. Identify spawner sanctuaries based on environmental characteristics
98. NSSP – reasonable rules? – with regard to restoration, ensure “best management” practices. Relationship between commercial harvesters and NSSP.
99. Limits of space for aquaculture
100. Climate change and Sea Level Rise - Anticipate changes to the environment

101. Development of “economic development zones”
102. Social carrying capacity
103. Biological carrying capacity
104. Organize existing laws
105. Consistency of health certifications
106. Preserve working waterfront access – marina’s pushing out commercial boats
107. Reclassify waters at federal level - \$30M+ is coming from restricted waters (specific to CT)
108. Identify possible ‘economic development zones’
109. Climate change (research)
110. Accessibility- most Right of Ways are gone – public access issues make recreational harvest challenging
111. Fair dockage prices
112. Identify opportunities for aquaculture with existing infrastructure – public/private
113. Fishermen input into management process, equal say, and continues into future management regulations and implementation – (Was discussed specific to conch fishery but applies across all species)
114. How does NOAA MSP Initiative tie into what we’re doing? – RI is part of this process; citizens aren’t informed but concerned
115. Need to think outside management boxes – give DEM tools to do more, manage independent of areas
116. Define what species to restore and to what levels
117. Think into the future of the SMP – other prospective species?
118. Oyster Gardening – great initiative
119. Treating aquaculture as agriculture – Right to Farm
120. Role of restoration and enhancement vs. “put & take”



State of Rhode Island and Providence Plantations
Department of Environmental Management
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Notice of Polluted Shellfishing Grounds May 2014

In accordance with the provisions of title 20, chapter 8.1 of the general laws of 1956, entitled "shellfish grounds", notice is hereby given that the water areas in Rhode Island overlying shellfish grounds herein described have been found to be in an unsatisfactory sanitary condition for the taking of shellfish for human consumption and are declared to be polluted areas. Persons taking shellfish from said waters will be prosecuted in accordance with the provisions of the aforementioned chapter.

Shellfishing Prohibited

The attached maps include a line that delineates the boundary (high tide mark) of the waters whose sanitary condition has been found to be suitable for the taking of shellfish ("approved"). Taking of shellfish is prohibited from any waters located on the landward side of the boundary (high tide mark) of waters listed as approved and the landward side of the boundary of waters listed as prohibited, conditional closure, seasonal closure or un-assessed, regardless of whether the specific waters are shown or noted as prohibited on the attached maps. At locations where the boundary line crosses over water, the boundary shall be a straight line connecting the high tide mark on either side of the water along the main shoreline.

Shellfishing Prohibited

Growing Area 1 – Upper Narragansett Bay

*GA1-3 Old Mill Creek in its entirety.

(see also: the conditional closures under Upper Narragansett Bay)

Growing Area 2 – Barrington, Palmer and Warren Rivers

GA2-1 All waters north and east of a line from the Rhode Island Department of Environmental Management range marker at Adams Point to the Rhode Island Department of Environmental Management range marker at Jacobs Point, including all waters of the Barrington River and Palmer River in their entirety.

Growing Area 3 – East Middle Bay
Bristol Harbor

GA3-1 Bristol Harbor, east of a line from the Rhode Island Department of Environmental Management range marker located on pole # 20 Poppasquash Road at the northernmost indentation of Bristol Harbor to the Rhode Island Department of Environmental Management range marker located on the northern extremity of Hog Island, and north of a line from the northern extremity of Hog Island to the Rhode Island Department of Environmental Management range marker located at the western extension of Low Lane (Latitude 41° 38.82000' N Longitude 71°16.07100' W) on Bristol Neck.

(see also: the seasonal closures GA3-2 under Bristol Harbor and GA3-5 under Potter Cove)

* map identification number corresponds with location on attached maps

OMSFCA Shellfish Map 2014-15

Mount Hope Bay and Vicinity

- GA3-3 Mount Hope Bay and vicinity south and west of the Rhode Island-Massachusetts state line to a line from the range marker located on the shoreline of Touisset Point to the range marker on Common Fence point that intersects with a line from Bristol Point to the Buoy R4 channel marker located on the southerly side of the Mount Hope Bay channel, including the waters north and east of a line from Bristol Point to the Hog Island Shoal Light, to the southwestern extremity of Arnold Point in Portsmouth, where a Rhode Island Department of Environmental Management range marker has been established, and north of a line in the Sakonnet River at the centerline of the Sakonnet Bridge in Portsmouth and Tiverton.

East Middle Bay

- GA3-4 The waters in the vicinity of Melville east of a line from Coggeshall Point southwesterly to the southeastern most point of Dyer Island and the area east of a line from the Rhode Island Department of Environmental Management range marker at Carr Point (Latitude 41°34.27167' N Longitude 71° 17.64167' W) northwesterly to the southeastern most point of Dyer Island Portsmouth.
- GA3-6 All waters of Barker Brook (a.k.a. Bloody Brook) in Portsmouth east of a line from the most southeastern landward corner of the Carnegie Abbey dock located to the north of the mouth and the Rhode Island Department of Environmental Management range marker (Latitude 41° 36.46020' N Longitude 71°16.39080' W) located approximately 250 feet south of the mouth of the brook.
- GA3-7 All waters of Nag Pond on Prudence Island.

Growing Area 4 – Sakonnet River

- GA4-1 That portion of the “Cove” in Portsmouth south of a line from the Rhode Island Department of Environmental Management range marker located on the southern end of Hummock Point (Latitude 41° 37.82500' N, Longitude 71° 13.15733' W) to the Rhode Island Department of Environmental Management range marker located at the eastern extremity of a point of land on the western shore of the cove.
- GA4-2 The Sakonnet River south and west of a line from the north-western most corner to the north-eastern most corner of the abutments of the former railroad bridge between Portsmouth and Tiverton and north of a line extending from the Rhode Island Department of Environmental Management painted marker on the south-western most corner of the Stone Bridge in Tiverton to the Rhode Island Department of Environmental Management range marker at the eastern-most extension of Morningside Lane in Portsmouth.
- GA4-3 All tidal waters of the “Gut” (so called), located at the north end of Nannaquaket Pond, north of the northern side of Rt. 77 (Main Road) in Tiverton.
- GA4-4 All waters of the Quaket River east of a line extending from the northwestern most point of Nannaquaket Neck to the Rhode Island Department of Environmental Management range marker located on pole #84 Main Road in Tiverton on the opposite shore in Tiverton and east to the eastern most side of the Nannaquaket Bridge in Tiverton.

- GA4-5 Sakonnet Harbor south of a line from the light at the end of the Sakonnet breakwater to a point of land near the end of Goodrich Lane on the eastern shore of the Harbor.
- GA4-6 All waters of Almy's Brook, the Mary C. Donovan Marsh and the tidally influenced waters of Nonquit Pond south of the dam located at Pond Bridge Road on the eastern shore of Little Compton and Tiverton.

Growing Area 5 – Kickemuit River

- GA5-1 The northern portion of the Kickemuit River north of a line from the Rhode Island Department of Environmental Management range marker located at the eastern extension of Patterson Avenue in the Laurel Park section of Warren to the flagpole on the opposite eastern shore on the property of #61 Asylum Road in Touisset.

Growing Area 6 – East Passage

- GA6-1 The waters of the East Passage, south of a line from the Rhode Island Department of Environmental Management range marker located approximately 900 feet south of Carr Point to buoy "Gr C" located at Fiske Rock, and north and east of an intersecting line from the Rhode Island Department of Environmental Management range marker located approximately 2,300 feet north of the rock jetty formerly known as the Blue Gold Pier opposite Vigilant Street in Middletown, to nun buoy "22".
- GA6-2 East Passage and Newport Harbor east of a line from range marker painted on the shoreline approximately 500 feet west of the monument flagpole located in Fort Adams State Park to the Rose Island light, east of a line from the Rose Island light to navy buoy "w" or "d" located at the southeast side of Gould Island, east of a line from navy buoy "w" or "d" located at the southeast side of Gould Island to buoy GR C at Fiske Rock, and south of a line from buoy GR C at Fiske Rock to the eastern (landward) end of the former dock site, located approximately 800 feet north of Green Lane.

Jamestown Area

- GA6-3 The waters on the east shore of Jamestown, in the vicinity of East Ferry and Taylor Point, west of a line from the house on the rocks located in The Dumplings through buoy C13, to buoy N2 located at the south end of Gould Island and south of an intersecting line from the northern most tip of Taylor Point to buoy R14 located off Coasters Harbor in Newport.

East Passage and Newport Harbor

- GA6-4 The waters within 500 feet of the firing pier at the U.S. Navy Torpedo Testing Station at the northern end of Gould Island.

Growing Area 7 – West Passage

- GA7-1 The waters in the vicinity of Quonset Point, south of a line from the northeastern end of the bulkhead at Quonset State Airport to nun buoy "10", west of a line from nun buoy "10" to nun buoy "8", north and west of the intersection of a line from nun buoy "8" to the northernmost tip of Fox Island, and north and east of a line from the southerly extension of 2nd Street of the Sauga Point area in North Kingstown to the western extremity of Sand Point on Jamestown.

Wickford Harbor and Vicinity

- GA7-2 That portion of Wickford Harbor west of a line from the northern extremity of Marker Point to the most southeast corner of the dock at the Wickford yacht Club, 165 Pleasant St to a Rhode Island Department of Environmental Management range marker—on the most southern point of Cornelius Island, and west of a line from the Rhode Island Department of Environmental Management range marker at the most western point of Cornelius Island to the Rhode Island Department of Environmental Management range marker on the southern extremity of Calf Neck, including Wickford and Mill Coves and their tributaries.

(see also: the seasonal closures (GA7-6) under Wickford Harbor)

West Passage

- GA7-3 Bissel Cove west of the line from the Rhode Island Department of Environmental Management range marker on the north shore of Bissel Cove in the vicinity of "The Homestead" so-called to the range marker on the southern shore of Bissel Cove.
- GA7-4 The waters within a 700 foot radius of the extension of South Ferry Road at the U.R.I. Bay Campus, including the E.P.A. dock located north of South Ferry Road and the G.S.O. dock located south of South Ferry Road.
- GA7-7 Fox Hill Pond in its entirety.
- GA7-8 All waters of Sheffield Cove in Jamestown south of a line from the range marker located at the western extension of Maple Avenue to the range marker located at the northernmost point of land on the opposite western shore at the "entrance" to the cove.

(see also: the seasonal closure (GA7-5) under Jamestown area)

Growing Area 7-2 – Pettaquamscutt River (Narrow River)

- GA7-2-1 All waters of the Narrow River, Pettaquamscutt Cove, and the Narrows in its entirety.

Growing Area 8 – Greenwich Bay

Greenwich Bay - Apponaug Cove and Bakers Creek

- GA8-1 All waters of Greenwich Bay in the area of Apponaug Cove including all waters of Bakers Creek north and west of a line from the Rhode Island Department of Environmental Management range marker located on the NECO Pole #6 at the end of Neptune Street in Chepiwanoxet to the Rhode Island Department of Environmental Management range marker located at the extension of Capron Farm Drive in Nausauket including Apponaug Cove, the northwest corner of Greenwich Bay and Marys Pond and Thatch Cove (so called) south of Arnold's Neck.

(see also: the conditional and seasonal closure under Greenwich Bay)

Greenwich Cove

- GA8-2 Greenwich Cove westerly and southerly of a line from the Department of Environmental Management range marker located on the northerly point of Long Point to the southerly point of Chepiwanoxet.

(see also: the conditional and seasonal closure under Greenwich Bay)

Brush Neck Cove

- GA8-3 All waters of Brush Neck Cove and Buttonwoods Cove north of a line from the easternmost point of Buttonwoods Neck in Buttonwoods, to the western extension of Strand Avenue at Oakland Beach.

(see also: the conditional and seasonal closure under Greenwich Bay)

Old Warwick Cove

- GA8-4 Old Warwick Cove, north of a line from the southeastern most riprap jetty at the entrance to Warwick Cove, located at the southeastern end of Oakland Beach to the southern (landward) end of Dorr's Dock on Warwick Neck.

(see also: the conditional and seasonal closure under Greenwich Bay)

Growing Area 9 – West Middle Bay

Allen Harbor and Little Allen Harbor

- GA9-1 Allen Harbor, west of a line from the Rhode Island Department of Environmental Management range marker on the southeastern most extremity of Calf Pasture Point, to Rhode Island Department of Environmental Management range marker on the northeastern most extremity of Spink Neck, including Allen Harbor, Little Allen Harbor, and the entrance channel in their entirety.
- GA9-2 The waters in the vicinity of Piers #1 and #2 at the Davisville depot that are south of a line from the northeast corner of Pier #2 (the more northerly pier at the Davisville depot) to nun buoy "14", north of a line from the Rhode Island Department of Environmental Management range marker located on the bulkhead at approximately 300 feet south of Pier #1 (the more southerly pier at the Davisville depot) to nun buoy "12", including all waters between the above described lines which are west of a line and the extension of a line from the northeastern end of the bulkhead at Quonset State Airport through nun buoy "16".
- GA9-3 Frys Pond in its entirety and all waters in so called Frys Cove west of a line from the most southern point of the wooden bulkhead at the southeast corner of the Quonset-Davisville Commerce Park to the inside north-west corner of the stone bulkhead containing the Quonset State Airport runways.
- GA9-4 Included in description of closure number GA7-1
- GA9-5 The waters of the Potowomut River west of a line from the Rhode Island Department of Environmental Management range marker located on Marsh Point on the northern shoreline to the Rhode Island Department of Environmental Management range marker located on Projac Point on the southern shore.

Growing Area 10 – Point Judith and Potters Pond

- GA10-1 Point Judith Pond north of a line from the Rhode Island Department of Environmental Management range marker located in Smelt Brook Cove to the Rhode Island Departmental Environment Management range marker located at the northwest tip of Pine Tree Point, including the northern portion of Smelt Brook Cove, Congdon Cove, the Narrows, Long Cove, Upper Pond, Silver Spring Cove, Stone Water Fence Cove, and the tidal portion of the Saugatucket River and all other tributaries north and east of this line.
- GA10-2 The waters of Champlin Cove located in Pt. Judith Pond, north of a line from the westernmost extension of Delray Drive to the easternmost extension of Flint Stone Road located on Harbor Island.
- GA10-3 The waters in the vicinity of Snug Harbor within 500 feet of shore from Gooseberry Road to High Point.
- GA10-4 Potter Pond channel east of a line across the western end of the Potter Pond entrance channel located approximately 500 feet west of Succotash Road and west of a line from a point of land on the northern shore of the channel approximately 700 feet east of Succotash Road to a point of land on the southern shore of the channel
- GA10-5 The waters in the vicinity of Galilee within 500 feet of the shore from the northern end of the breachway to the western side of the Great Island Road Bridge to the southwestern extension of Basin Road.
- GA10-6 The waters in the vicinity of Jerusalem within 500 feet of the shore from the northern end of the breachway to a point approximately 1,000 feet north of the state pier.

Growing Area 11NG –Ninigret and Green Hill Ponds

- GA11NG-1 All waters of Ninigret Pond, east of a line from the southeastern landward end of the CRMC Permitted Dock ID# 1647 located at 2 Pequot Drive to the southwest tip of Heather Island, and then from the southwest tip of Heather Island to the Department of Environmental Management range marker located at the end of Florence Avenue, and including Green Hill Pond in its entirety.

Growing Area 11QW – Quonochontaug and Winnapaug Ponds

- GA11QW-1 All tidal pond waters east of Weekapaug Road in the Winnapaug Pond area of Westerly.
- GA11QW-2 All waters of the small cove located at the extreme southwestern corner of Quonochontaug Pond (where the Weekapaug Yacht Club and mooring field are located), south and west of a line from the western range marker located at 41° 19.80600' N and 71° 44.93200' W and the eastern range marker located 41° 19.79200' N and 71° 44.88400' W at the entrance to the cove.

Growing Area 12 – Little Narragansett Bay

Pawcatuck River and Little Narragansett Bay

- GA12-1 All the waters of Little Narragansett Bay and the Pawcatuck River within the State of Rhode Island which are northeast of a line from the Rhode Island Department of Environmental Management pole (Latitude 41° 19.28333' N, Longitude 71° 52.78333' W) near the southeastern extremity of Sandy Point to a Rhode Island Department of Environmental Management pole (Latitude 41° 18.61667' N, Longitude 71° 52.65000' W) on the northern shoreline of Napatree Point, including all waters of the "Kitchen", so called and those waters northeast of the southwest shoreline of Sandy Point to the state line. Harvesters should refer to the above latitudes and longitudes for the closure line if poles are no longer present.

Growing Area 13 – Block Island

- GA13-2 All waters of Cormorant Cove in Great Salt Pond which are within 200 feet of the outlet of the tidal pond that discharges to the cove under Cormorant Cove Road.

Growing Area 14E – Offshore Pt. Judith / Narragansett to Westport

- GA14E-1 Castle Hill Cove in its entirety.
- GA14E-2 Easton's Bay north of a line from Tuckerman's Terrace in Middletown to the south-east extension of Narragansett Avenue in Newport meant to include "Forty Steps".

Growing Area 14W – Offshore Napatree Point to Point Judith / Narragansett Including Block Island

Rhode Island Sound

- GA14W-1 The waters in the vicinity of Scarborough which are within 5,600 feet of the marine outfall sewer located south of Scarborough beach and east of Fort Nathaniel Greene 41° 22.80000' N, 71° 28.23333' W.
- GA14W-2 The waters in the vicinity of Tucker's Dock which are within 4,000 feet of the marine outfall sewer located 41° 25.26667' N, 71° 27.13333' W.

New Shoreham (Block Island)

- GA14W-3 The waters in the vicinity of Pebbly Beach which are within 5,900 feet of the marine outfall sewer located 41° 10.03333' N, 71° 33.06667' W, including Old Harbor in its entirety.

Growing Area 15 – Seekonk River

- GA15-1 All waters of the Seekonk River and all its tributaries.

Growing Area 16 – Providence River

GA16-1 All waters of the Providence River north and west of a line from the Rhode Island Department of Environmental Management pole located on Conimicut Point (Latitude: 41° 43.04883' N, Longitude: 71° 21.46133' W) to the center of the Old Tower (Latitude: 41° 43.51320' N, Longitude: 71° 20.33460' W) at Nayatt Point including any tributaries north of this line.

(note: see GA1-4 and GA1-1 for additional closure areas in the Upper Narragansett Bay extension of the Providence River.)

Growing Area 17 – Mt. Hope Bay

GA17-2 Mount Hope Bay and vicinity south and west of the Rhode Island-Massachusetts state line to a line from the Rhode Island Department of Environmental Management range marker located on the shoreline of Touisset Point to the Rhode Island Department of Environmental Management range marker on Common Fence point that intersects with a line from Bristol Point to the Buoy R4 channel marker located on the southerly side of the Mount Hope Bay channel, including the waters north and east of a line from Bristol Point to the Hog Island Shoal Light, to the southwestern extremity of Arnold Point in Portsmouth, where a Rhode Island Department of Environmental Management range marker has been established, and north of a line in the Sakonnet River at the centerline of the Sakonnet Bridge in Portsmouth and Tiverton.


Seasonal Closures

Seasonal Closures begin at sunrise of the Saturday immediately prior to Memorial Day and ends at sunrise of the Tuesday immediately following Columbus Day Except as Noted.

in accordance with the provisions of chapter 20-8.1 of the general laws of 1956, as amended, entitled "shellfish grounds", notice is hereby given that the following areas have been found to be in an unsatisfactory sanitary condition for the taking of shellfish for human consumption and declared to be polluted areas during the period of each year extending from sunrise of the Saturday immediately prior to memorial day and ends at sunrise of the Tuesday immediately following Columbus Day. Persons taking shellfish from said waters during this period will be prosecuted in accordance with provisions of the aforementioned chapter.



Marina Facility Seasonal Closure

The  symbol on the attached maps indicates a seasonal closure of all waters within 25 feet of any in water structure for docking vessels (e.g. dock, piling, floating dock, etc.). These waters shall be closed to shellfish harvesting beginning at sunrise of the Saturday immediately prior to Memorial Day and ending at sunrise of the Tuesday immediately following Columbus Day. The specific marina facilities are listed below by growing area.

Growing Area 3 – East Middle Bay

Bristol Harbor

- GA3-2 Bristol Harbor, west of a line from the range marker located on pole # 20 Poppasquash Rd. at the northernmost indentation of Bristol Harbor to the Rhode Island Department of Environmental Management range marker located at the northernmost extremity of Hog Island and north of a line from the CRMC Permitted Dock # 419 located at 163 Poppasquash Road to the most north-western corner of the Rockwell Pier municipal parking lot in Bristol Harbor.

Potter Cove (Prudence Island)

- GA3-5 Potter Cove, northerly and westerly of a line from the Rhode Island Department of Environmental Management range marker established at the southwesterly extremity of Gull Point on Prudence Island to the southeast landward corner of the State of Rhode Island dock at the southern entrance to Potter Cove on the east shore of Prudence Island.

Growing Area 5 – Kickemuit River



All waters within 25 feet of any in water structure for docking vessels (e.g. dock, piling, floating dock, etc.) at the following marina facilities:

Marina Facility Name (As Currently Known)	Town	Water Body	Latitude	Longitude
Senn's Marina	Warren (Touisset)	Kickemuit River	41° 42.07860' N	71° 14.55900' W

Growing Area 7 – West Passage
Jamestown Area

- GA7-5 The waters on the west shore of Jamestown in the vicinity of West Ferry which are south and east of a line from the landward side of the northeast corner of the Fort Getty Pier to the south side of the mouth of Great Creek except those waters of Sheffield Cove south of a line from the range marker located at the western extension of Maple Avenue to the range marker located on the northernmost point of land on the opposite western shore at the “entrance” to the cove.

Wickford Harbor

- GA7-6 Wickford Harbor, west of Sauga Point breakwater and a line from the light at the southern end of the Sauga Point breakwater to the northern end of the Poplar Point breakwater and west of the Poplar Point breakwater.

Greenwich Bay

- GA8-7 In effect at sunrise of December 1 through sunrise of January 1 - All waters of Greenwich Bay south and east of the current prohibited areas of Greenwich Bay including Buttonwoods Cove, Brushneck Cove, Bakers Creek, Apponaug Cove, Mary's Creek, Greenwich Cove and all other coves and tributaries of Greenwich Bay and west of a line from the Rhode Island Department of Environmental Management range marker located on Pole #19 Beachwood Drive in Potowomut to the southeastern most riprap jetty at the entrance to Warwick Cove, located at the southeastern end of Oakland Beach.

(Note: Conditional closure GA8-6 in effect during this seasonal closure and conditional closure GA8-5 in effect at all other times)

Growing Area 10 - Point Judith and Potters Ponds



All waters within 25 feet of any in water structure for docking vessels (e.g. dock, piling, floating dock, etc.) at the following marina facilities:

Marina Facility Name (As Currently Known)	Town	Water Body	Latitude	Longitude
Champlin Cove/Palm Beach Ave	Narragansett	Point Judith Pond	41° 24.37990' N	71° 29.50326' W
Harbor Island Improvement Assn.	Narragansett	Point Judith Pond	41° 24.59210' N	71° 29.90400' W
Shoreline Realty	South Kingstown	Potters Pond	41° 23.07584' N	71° 31.62642' W
Goodwins	South Kingstown	Potters Pond Channel	41° 23.13362' N	71° 31.22372' W
Chappell	South Kingstown	Potters Pond	41° 23.18826' N	71° 31.69925' W

Growing Area 11NG – Ninigret – Green Hill Pond



All waters within 25 feet of any in water structure for docking vessels (e.g. dock, piling, floating dock, etc.) at the following marina facilities:

Marina Facility Name (As Currently Known)	Town	Latitude	Longitude
Lavins	Charlestown	41° 21.53767' N	-71° 41.34456' W
Ocean House Marina	Charlestown	41° 22.88361' N	-71° 38.65055' W
Fort Neck Association	Charlestown	41° 22.85334' N	-71° 38.98532' W
Tockwotten Cove Assn	Charlestown	41° 22.30230' N	-71° 38.23214' W
Pond Shore	Charlestown	41° 22.17024' N	-71° 38.50134' W

Growing Area 11QW – Quonochontaug and Winnapaug Ponds



All waters within 25 feet of any in water structure for docking vessels (e.g. dock, piling, floating dock, etc.) at the following marina facilities:

Marina Facility Name (As Currently Known)	Town	Latitude	Longitude
Weekapaug Fire District	Westerly	41° 19.97837' N	-71° 45.84465' W

Growing Area 13 – Block Island

GA13-1 Closure “A”: In effect at sunrise of the Saturday immediately prior to Memorial Day through sunrise of the last Saturday in June - the waters of Great Salt Pond south of a line from the northern most extremity of Cormorant Point to the western most extremity of Harris Point including all waters of Trims Pond and Harbor Pond.

Closure “B”: In effect at sunrise of the last Saturday in June through sunrise of the third Monday in September - all waters of Great Salt Pond, south of a line from the northern most extremity of Cormorant Point to the northern most landward dock located at the Block Island Club, including all waters of Trims Pond and Harbor Pond.

Closure “C”: In effect at sunrise of the third Monday in September through sunrise of the Tuesday immediately following Columbus Day - the waters of Great Salt Pond south of a line from the northern most extremity of Cormorant Point to the western most extremity of Harris Point, including all waters of Trims Pond and Harbor Pond.

*refer to local town of New Shoreham ordinances for additional management restrictions. For further information contact the Block Island Harbors department at 466-3204.

Conditional Closures

in accordance with the provisions of title 20, chapter 8.1 of the general laws of 1956, entitled "shellfish grounds", notice is hereby given that the water areas in Rhode Island overlying shellfish grounds herein described are from time to time found to be in an unsatisfactory sanitary condition for the taking of shellfish for human consumption and are declared to be polluted areas at those times. Persons taking shellfish from said waters during those times will be prosecuted in accordance with the provisions of the aforementioned chapter. The status of these areas can be obtained at any time by phoning the Division of Enforcement, Department of Environmental Management at 222-2900.

Growing Area 1 – Upper Narragansett Bay

GA1-1 Upper Narragansett Bay Conditional Area A:

north of a line from the southeast corner of the Rocky Point pier in Warwick to the southwest (landward) corner of the Colt State Park pier in Bristol, south of a line from the range marker at Adams Point in Barrington to the range marker at Jacobs Point in Warren, and south of a line from the Rhode Island Department of Environmental Management pole located on Conimicut Point (Latitude: 41° 43.48833' N, Longitude: 71° 21.46133' W) to the center of Conimicut Light (Latitude: 41° 43.02960' N, Longitude: 71° 20.70660' W), and a line to the center of the Old Tower at Nayatt Point (Latitude: 41° 43.51320' N, Longitude: 71° 20.33460' W).

GA1-2 Upper Narragansett Bay Conditional Area B:

north of a line from Warwick Point to the northern extremity of Providence Point on Prudence Island, north of a line from the northern extremity of Providence Point to the southern extremity of Poppasquash Point in Bristol, and south of a line from the southeast corner of the Rocky Point pier in Warwick to the southwest (landward) corner of the Colt State Park pier in Bristol.

GA1-4 Upper Narragansett Bay – Conimicut Triangle:

North of a line from the Rhode Island Department of Environmental Management pole located on Conimicut Point (Latitude: 41° 43' 2.93" N, Longitude: 71° 21' 27.68" W) to the center of the Conimicut Light (Latitude: 41° 43.02960' N, Longitude: 71° 20.70660' W), and a line from the center of Conimicut Light (Latitude: 41° 43.02960' N, Longitude: 71° 20.70660' W) to the center of the Old Tower (Latitude: 41° 43.51320' N, Longitude: 71° 20.33460' W) at Nayatt Point and south of a line from the Old Tower (Latitude: 41° 43.51320' N, Longitude: 71° 20.33460' W) at Nayatt Point to the Rhode Island Department of Environmental Management pole located on Conimicut Point (Latitude: 41° 43.48833' N, Longitude: 71° 21.46133' W), meaning to include any portion of the Providence River included within these boundaries.

Growing Area 5 – Kickemuit River
Kickemuit River and Mount Hope Bay vicinity

- GA5-4 All waters of the Kickemuit River and Mt. Hope Bay south of a line from the range marker at the eastern extension of Patterson Avenue in the Laurel Park section of Warren to the flagpole on the opposite eastern shore on the property of #61 Asylum Road in Touisset, and north and west of a line from Bristol Point to the Buoy “R4” channel marker located on the southerly side of the Mount Hope Bay channel, that intersects with a line from the Rhode Island Department of Environmental Management range marker located approximately midway on Touisset Point to the Rhode Island Department of Environmental Management range marker located on Common Fence Point in Portsmouth.

(See also 17-1 for that portion of the conditional closure included in the GA17 Mt Hope Bay Growing Area.)

Growing Area 8 – Greenwich Bay

- GA8-5 In effect only from sunrise January 1 to sunset November 1, the waters of Greenwich Bay, north and west of a line from the eastern extremity of Sandy Point in Warwick to the flag pole located at the Warwick Country Club on Warwick Neck, excluding Apponaug Cove and all tributaries north and west of a line from the Rhode Island Department of Environmental Management range marker located at the end of Neptune Street in Chepiwanoxet to the Rhode Island Department of Environmental Management range marker located at the extension of Capron Farm Drive in Nausauket, including Apponaug Cove, the northwest corner of Greenwich Bay and Mary’s Pond and Thatch Cove (so called) south of Arnold’s Neck, excluding all waters of Bakers Creek and those waters of Brush Neck and Buttonwoods Cove north of a line from the easternmost point of Buttonwoods Neck to the western extension of Strand Avenue at Oakland Beach, excluding Greenwich Cove westerly and southerly of a line from the Department of Environmental Management range marker located on Long Point to the southerly point of Chepiwanoxet and excluding Old Warwick Cove north of a line from the southeastern riprap jetty at the entrance to Warwick Cove located at the southeastern end of Oakland Beach to the southern (landward) end of the Dock located at the westerly extension of Randall Avenue on the so called Dorr’s Landing on Warwick Neck.
- GA8-6 In effect only from sunrise December 1 through sunrise January 1, all waters south and east of a line from the Rhode Island Department of Environmental Management range marker located on Pole #19 Beachwood Drive in Potowomut to the southeastern most riprap jetty at the entrance to Warwick Cove, located at the southeastern end of Oakland Beach excluding Old Warwick Cove north of a line from the southeastern riprap jetty at the entrance to Warwick Cove located at the southeastern end of Oakland Beach to the southern (landward) end of Dorr’s Dock on Warwick Neck and north and west of a line from the eastern extremity of Sandy Point in Warwick to the flag pole located at the Warwick Country Club on Warwick Neck.

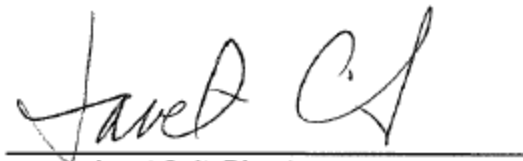
Growing Area 17 – Mount Hope Bay

GA17-1 All waters of the Kickemuit River and the Mount Hope Bay south of a line from the range marker at the eastern extension of Patterson Avenue in the Laurel Park section of Warren to the flagpole on the opposite eastern shore on the property of #61 Asylum Road in Touisset, and north and west of a line from Bristol Point to the Buoy "R4" channel marker located on the southerly side of the Mount Hope Bay channel, that intersects with a line from the Rhode Island Department of Environmental Management range marker located approximately midway on Touisset Point to the Rhode Island Department of Environmental Management range marker located on Common Fence Point in Portsmouth.

(See also 5-4 for that portion of the conditional closure included in the GA5 Kickemuit River Growing Area.)

Management Rules

***note: Certain fisheries management rules apply to shellfish harvesting. Specific hours for commercial and recreational harvesting of all shellfish have been established. For information regarding management restrictions, call the Division of Fish, Wildlife, and Estuarine Resources at (401) 423-1920, Monday through Friday.**



Janet Coit, Director
Department of Environmental Management

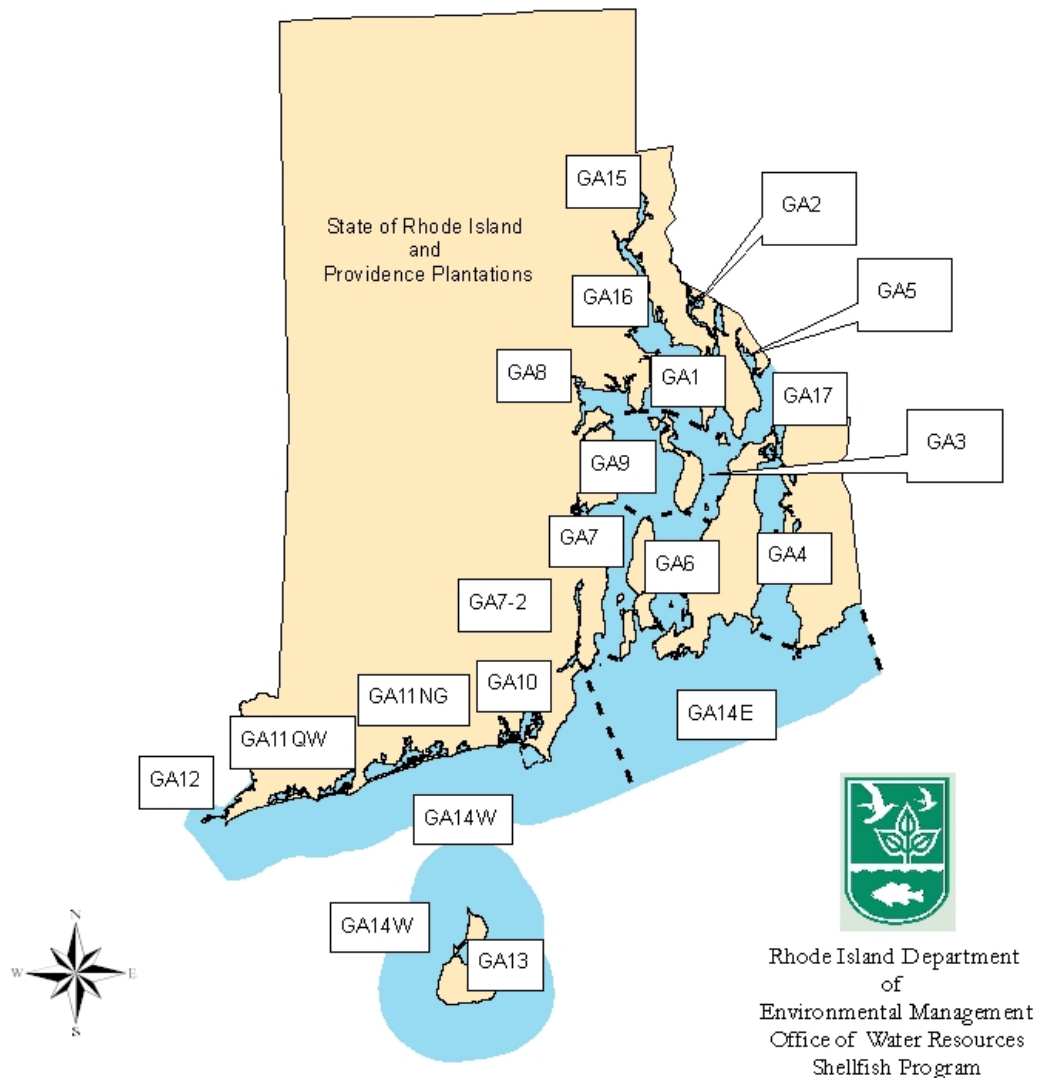
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Date

Shellfishing Classification Maps

Guide for Individual Growing Area (GA) Maps May 2014

The attached maps include a line that serves as the legal description of the boundary (high tide mark) of the waters whose sanitary condition has been found to be suitable for the taking of shellfish ("Approved"). Taking of shellfish is prohibited from any waters located on the landward side of the boundary (high tide mark) of waters listed as approved and the landward side of the waters listed as prohibited, conditional closure or seasonal closure, regardless of whether the specific waters are shown or noted as prohibited on the attached maps. At locations where the boundary line crosses over water, the boundary shall be a straight line connecting the high tide mark on either side of the water along the main shoreline.

The attached maps are provided as a general reference for the areas listed as prohibited, seasonal closure or conditional closure. Please refer to the preceding written legal description contained in this document entitled "Notice of Polluted Shellfishing Grounds May 2014" for the numbered shellfish closure areas shown on the following maps.



Shellfish Growing Area Classification Codes

— Growing Area Boundary



Upper Narragansett Bay Conditional Area - A



Upper Narragansett Bay Conditional Area - B



**Upper Narragansett Bay
Conditional Conimicut Triangle**



Approved



Seasonal Closure



Shellfishing Prohibited



Un-assessed - Shellfishing Prohibited

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

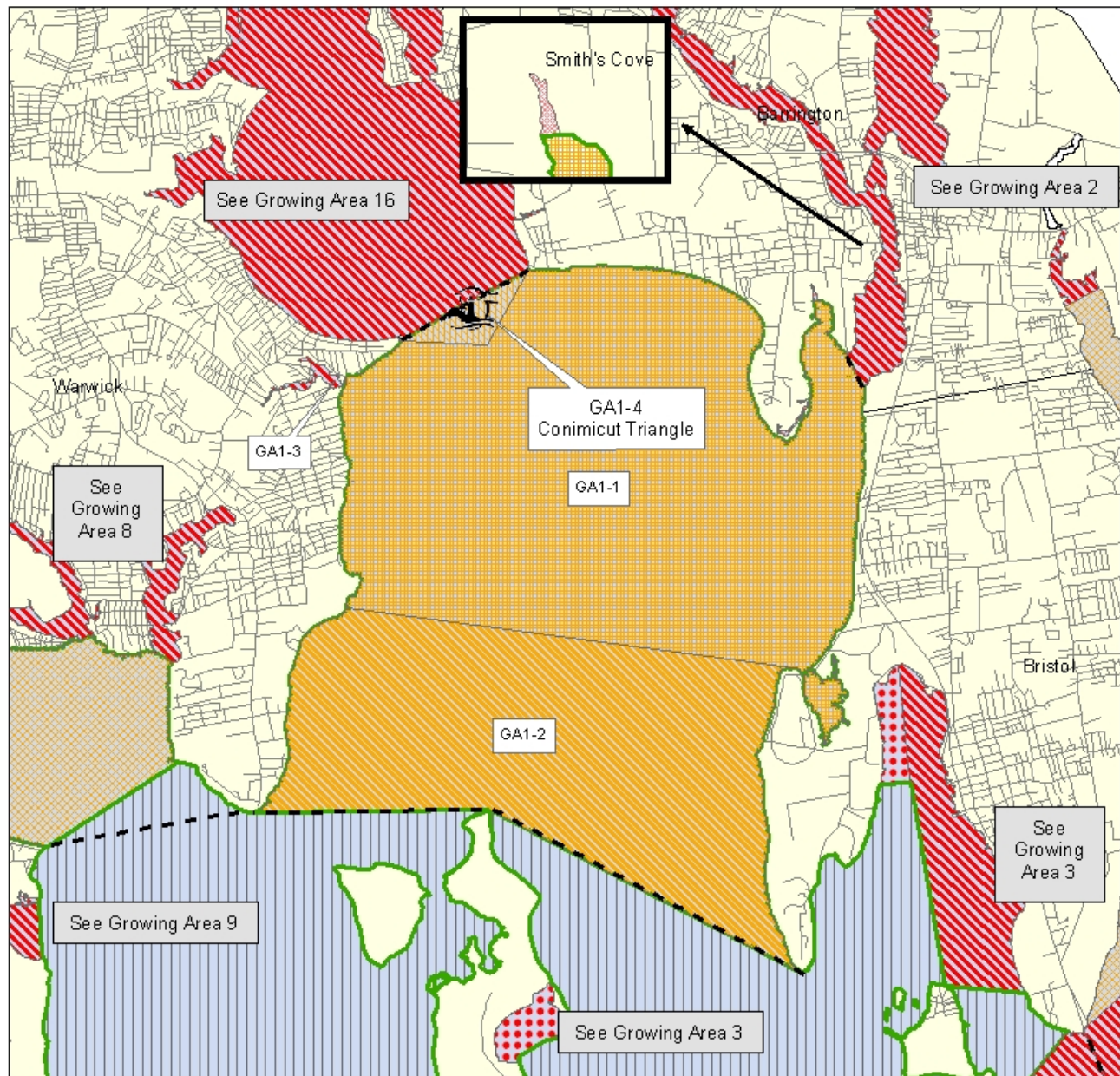


0 0.3 0.6 1.2 Miles



This map is provided only as a general reference for the areas listed as prohibited, seasonal closure or conditional closure in the publication entitled "Notice of Polluted Shellfishing Grounds May 2014". Please refer to that document for the complete legal description of the numbered shellfish closure areas shown here. This map also serves as the legal description for the areas open to shellfishing. Taking of shellfish is prohibited from any waters located on the landward side of the boundary line of waters listed as approved (high tide mark) and the landward side of the boundary line of waters listed as prohibited, conditional closure or seasonal closure, regardless of whether the specific waters are shown or noted as prohibited on the attached maps. At locations where the boundary line crosses water, the boundary shall be a straight line connecting the high tide mark on either side of the water along the main shoreline.

**Upper Narragansett Bay
Growing Area 1
May 2014 - May 2015**



Shellfish Growing Area Classification Codes



Approved



Upper Narragansett Bay Conditional Area - A



Shellfishing Prohibited



Upper Narragansett Bay
Conditional Area - Conimicut Triangle

-- Growing Area Boundary

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

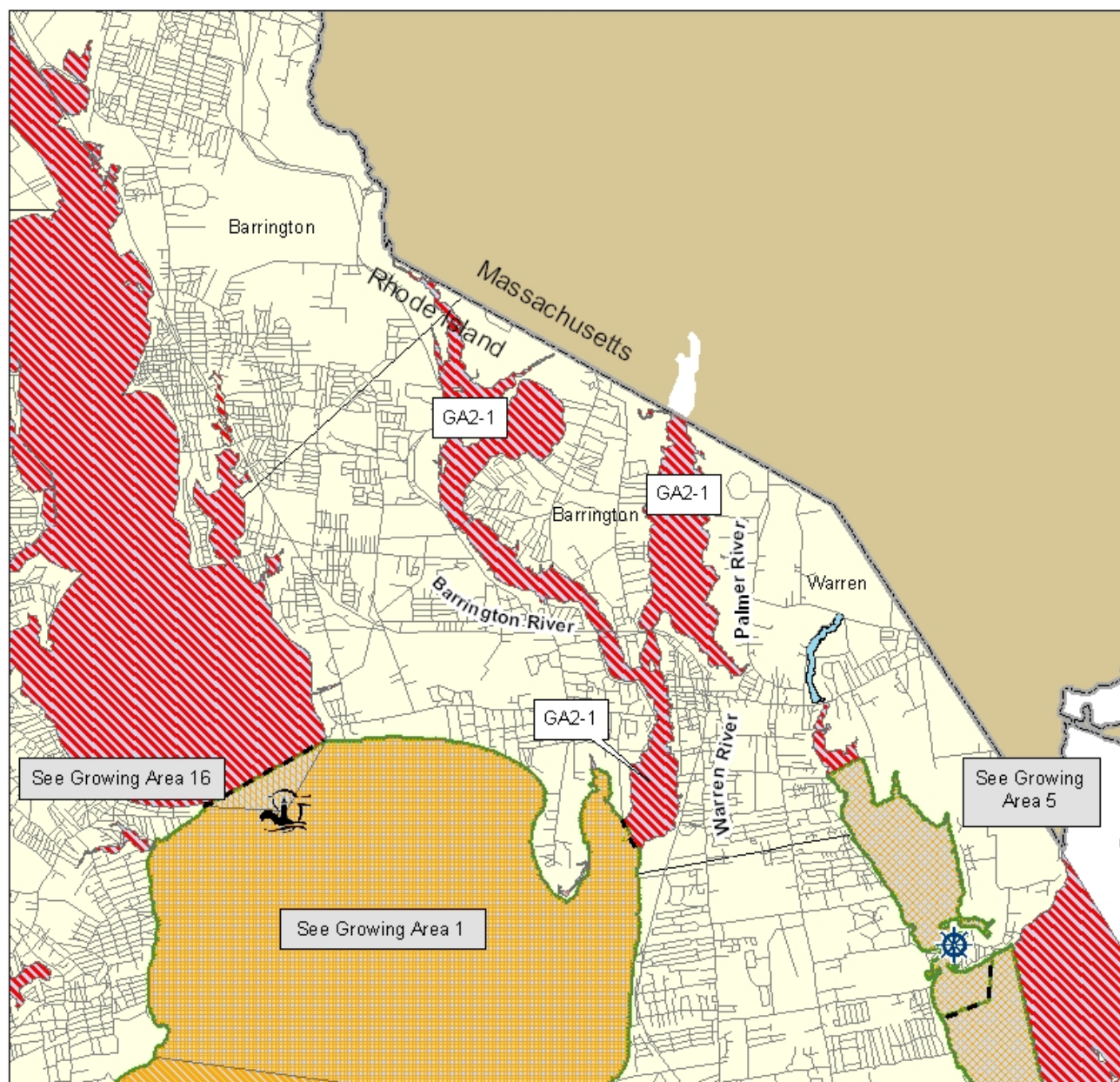


0 0.375 0.75 1.5 Miles



This map is provided only as a general reference for the areas listed as prohibited, seasonal closure or conditional closure in the publication entitled "Notice of Polluted Shellfishing Grounds May 2014". Please refer to that document for the complete legal description of the numbered shellfish closure areas shown here. This map also serves as the legal description for the areas open to shellfishing. Taking of shellfish is prohibited from any waters located on the landward side of the boundary line of waters listed as approved (high tide mark) and the landward side of the boundary line of waters listed as prohibited, conditional closure or seasonal closure, regardless of whether the specific waters are shown or noted as prohibited on the attached maps. At locations where the boundary line crosses water, the boundary shall be a straight line connecting the high tide mark on either side of the water along the main shoreline.

Barrington, Palmer and Warren Rivers Growing Area 2 May 2014 - May 2015



Shellfish Growing Area Classification Codes

- | | |
|---|---|
|  Approved |  Conditional Closure |
|  Seasonal Closure |  Upper Narragansett Bay Conditional Area - A |
|  Shellfishing Prohibited |  Upper Narragansett Bay Conditional Area - B |
|  Growing Area Boundary |  Unassessed - Shellfishing Prohibited |

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

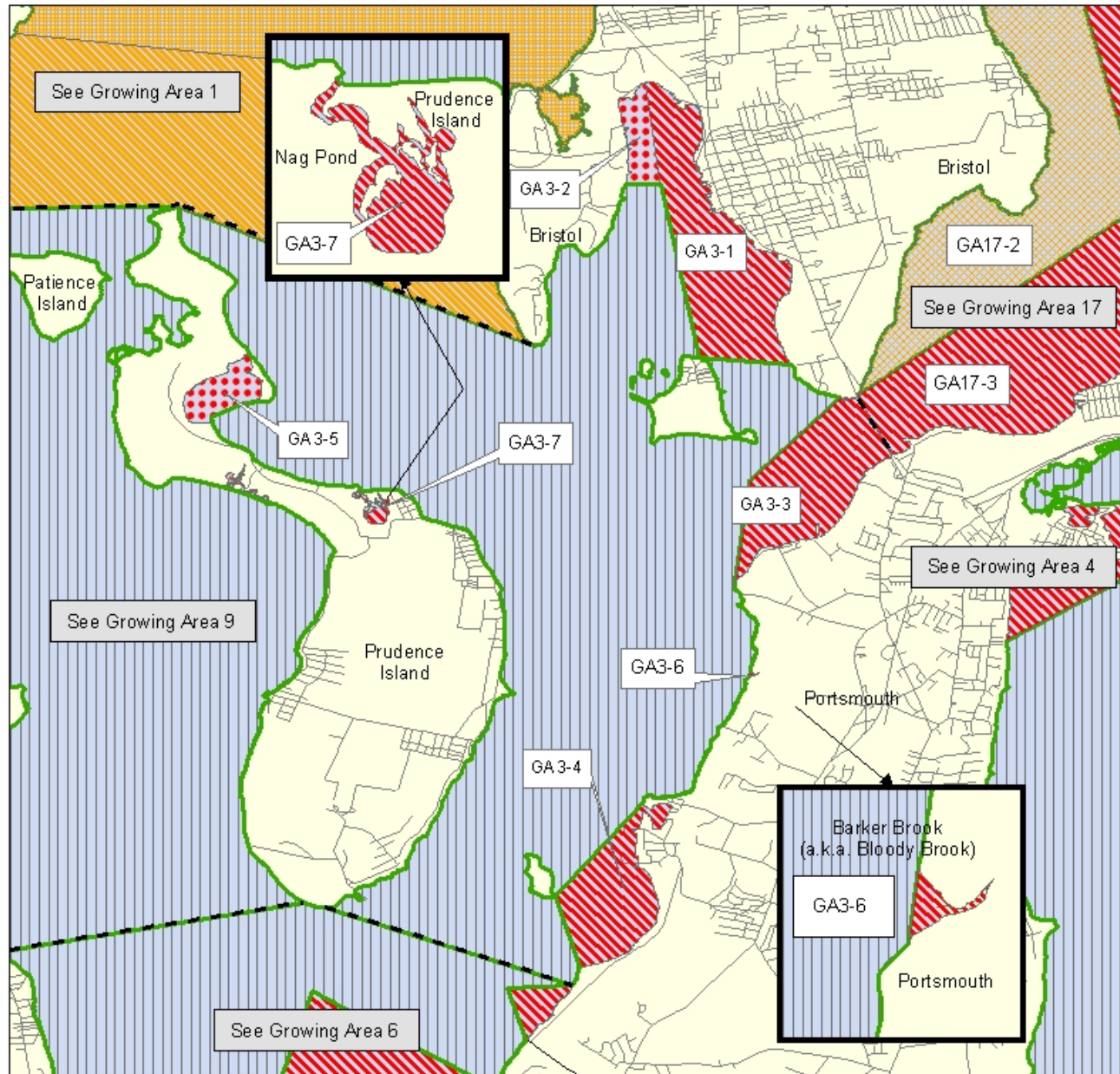


0 0.425 0.85 1.7 Miles



This map is provided only as a general reference for the areas listed as prohibited, seasonal closure or conditional closure in the publication entitled "Notice of Polluted Shellfishing Grounds May 2014". Please refer to that document for the complete legal description of the numbered shellfish closure areas shown here. This map also serves as the legal description for the areas open to shellfishing. Taking of shellfish is prohibited from any waters located on the landward side of the boundary line of waters listed as approved (high tide mark) and the landward side of the boundary line of waters listed as prohibited, conditional closure or seasonal closure, regardless of whether the specific waters are shown or noted as prohibited on the attached maps. At locations where the boundary line crosses water, the boundary shall be a straight line connecting the high tide mark on either side of the water along the main shoreline.

East Middle Bay Growing Area 3 May 2014 - May 2015



Shellfish Growing Area Classification Codes

- | | |
|---|---|
|  Approved |  Seasonal Closure |
|  Conditional Closure |  Un-assessed - Shellfishing Prohibited |
|  Shellfishing Prohibited |  Growing Area Boundary |

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

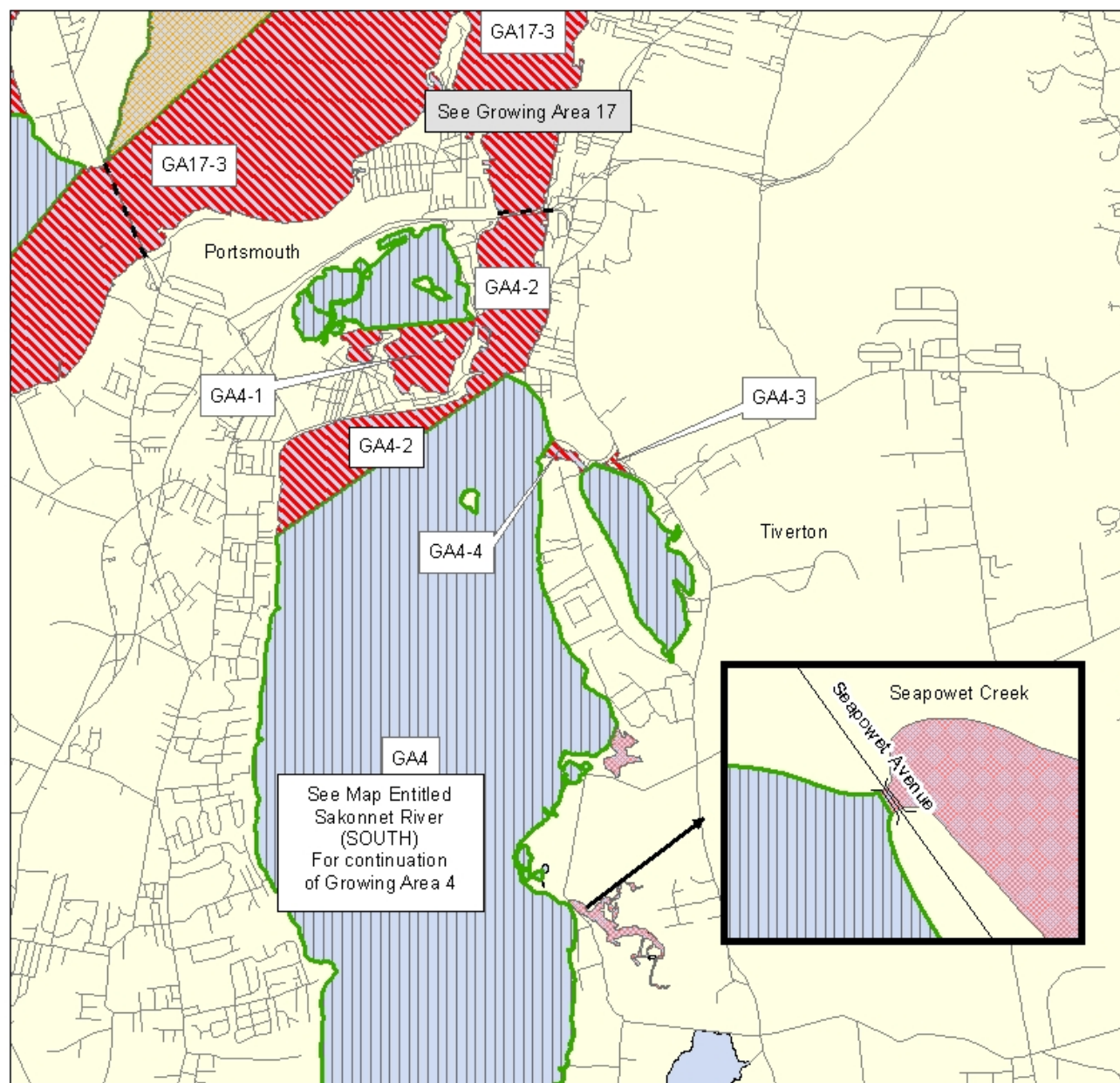


0 0.2 0.4 0.8 Miles



This map is provided only as a general reference for the areas listed as prohibited, seasonal closure or conditional closure in the publication entitled "Notice of Polluted Shellfishing Grounds May 2014". Please refer to that document for the complete legal description of the numbered shellfish closure areas shown here. This map also serves as the legal description for the areas open to shellfishing. Taking of shellfish is prohibited from any waters located on the landward side of the boundary line of waters listed as approved (high tide mark) and the landward side of the boundary line of waters listed as prohibited, conditional closure or seasonal closure, regardless of whether the specific waters are shown or noted as prohibited on the attached maps. At locations where the boundary line crosses water, the boundary shall be a straight line connecting the high tide mark on either side of the water along the main shoreline.

**Sakonnet River (NORTH)
Growing Area 4
May 2014 - May 2015**



Shellfish Growing Area Classification Codes



Approved



Un-assessed - Shellfishing Prohibited



Conditional Closure



Seasonal Closure



Growing Area Boundary



Shellfishing Prohibited

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

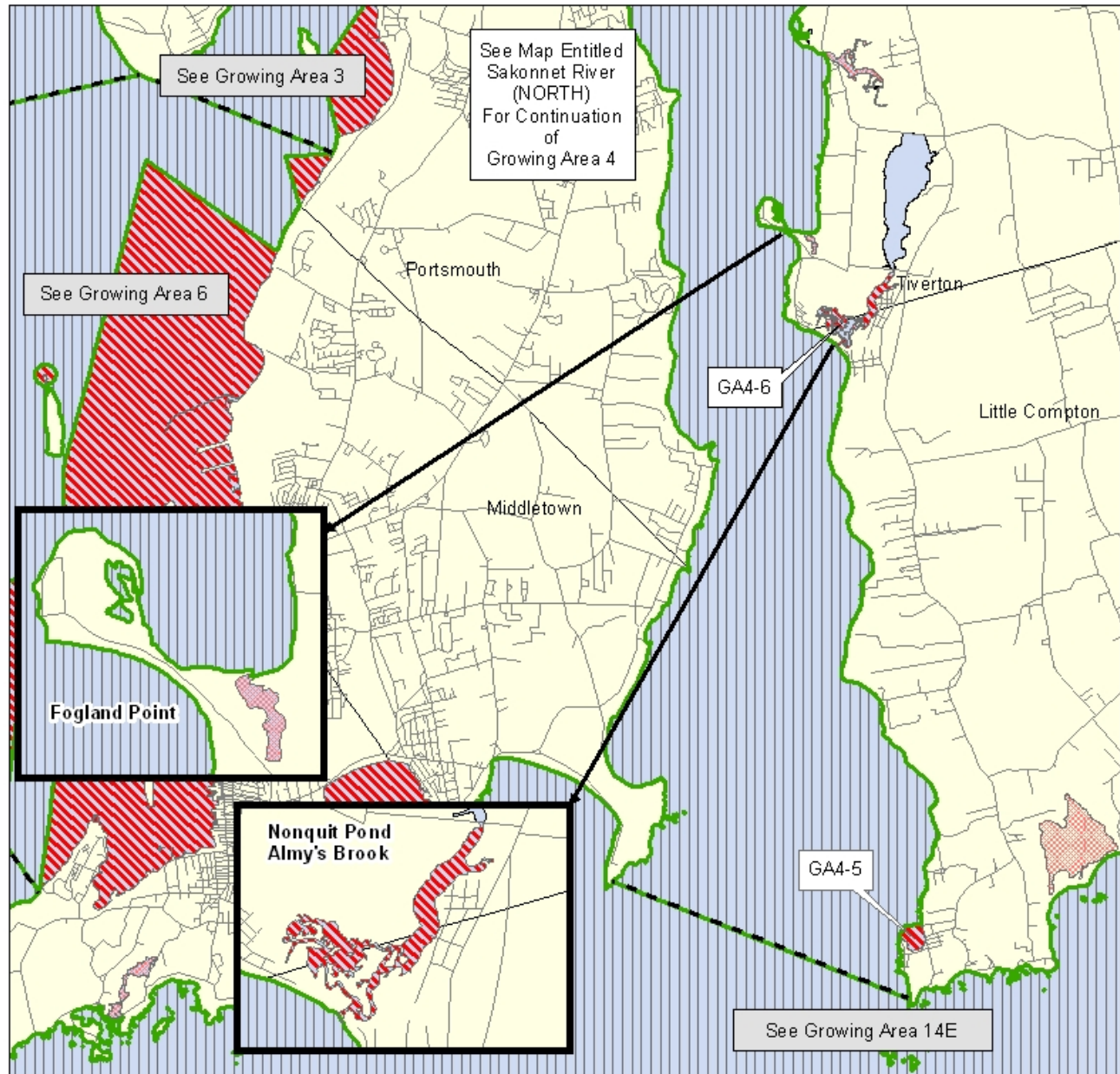


0 0.45 0.9 1.8 Miles



This map is provided only as a general reference for the areas listed as prohibited, seasonal closure or conditional closure in the publication entitled "Notice of Polluted Shellfishing Grounds May 2014". Please refer to that document for the complete legal description of the numbered shellfish closure areas shown here. This map also serves as the legal description for the areas open to shellfishing. Taking of shellfish is prohibited from any waters located on the landward side of the boundary line of waters listed as approved (high tide mark) and the landward side of the boundary line of waters listed as prohibited, conditional closure or seasonal closure, regardless of whether the specific waters are shown or noted as prohibited on the attached maps. At locations where the boundary line crosses water, the boundary shall be a straight line connecting the high tide mark on either side of the water along the main shoreline.

**Sakonnet River (SOUTH)
Growing Area 4
May 2014 - May 2015**



Shellfish Growing Area Classification Codes



Approved



Un-assessed - Shellfishing Prohibited



Conditional Closure



Seasonal Closure



Growing Area Boundary



Shellfishing Prohibited



Marina Facility Seasonal Closure

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

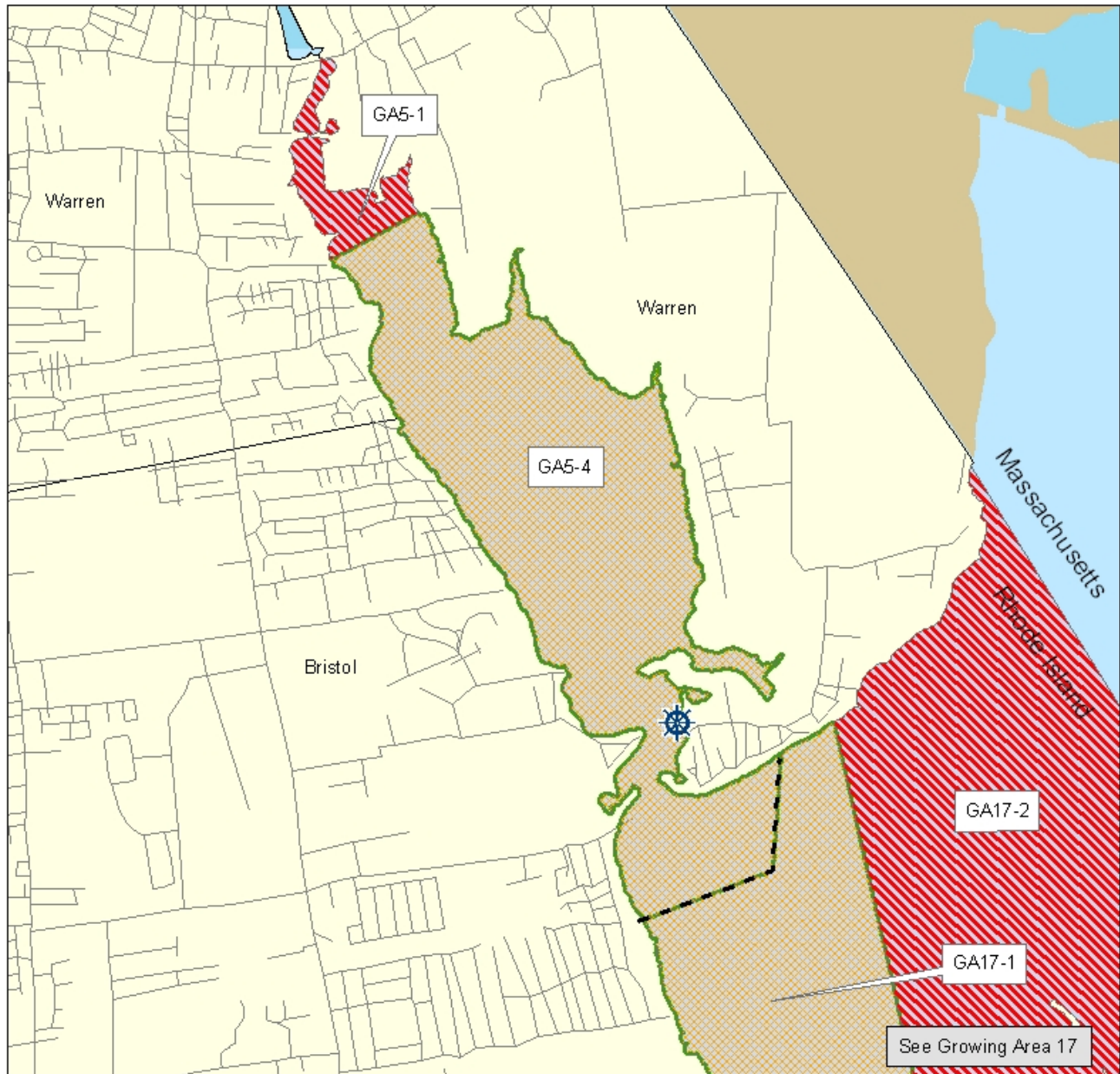


0 0.125 0.25 0.5 0.75 Miles



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**Kickemuit River
Growing Area 5
May 2014 - May 2015**



Shellfish Growing Area Classification Codes

- Growing Area Boundary
- Approved
- Shellfishing Prohibited
- Un-assessed - Shellfishing Prohibited
- Seasonal Closure

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

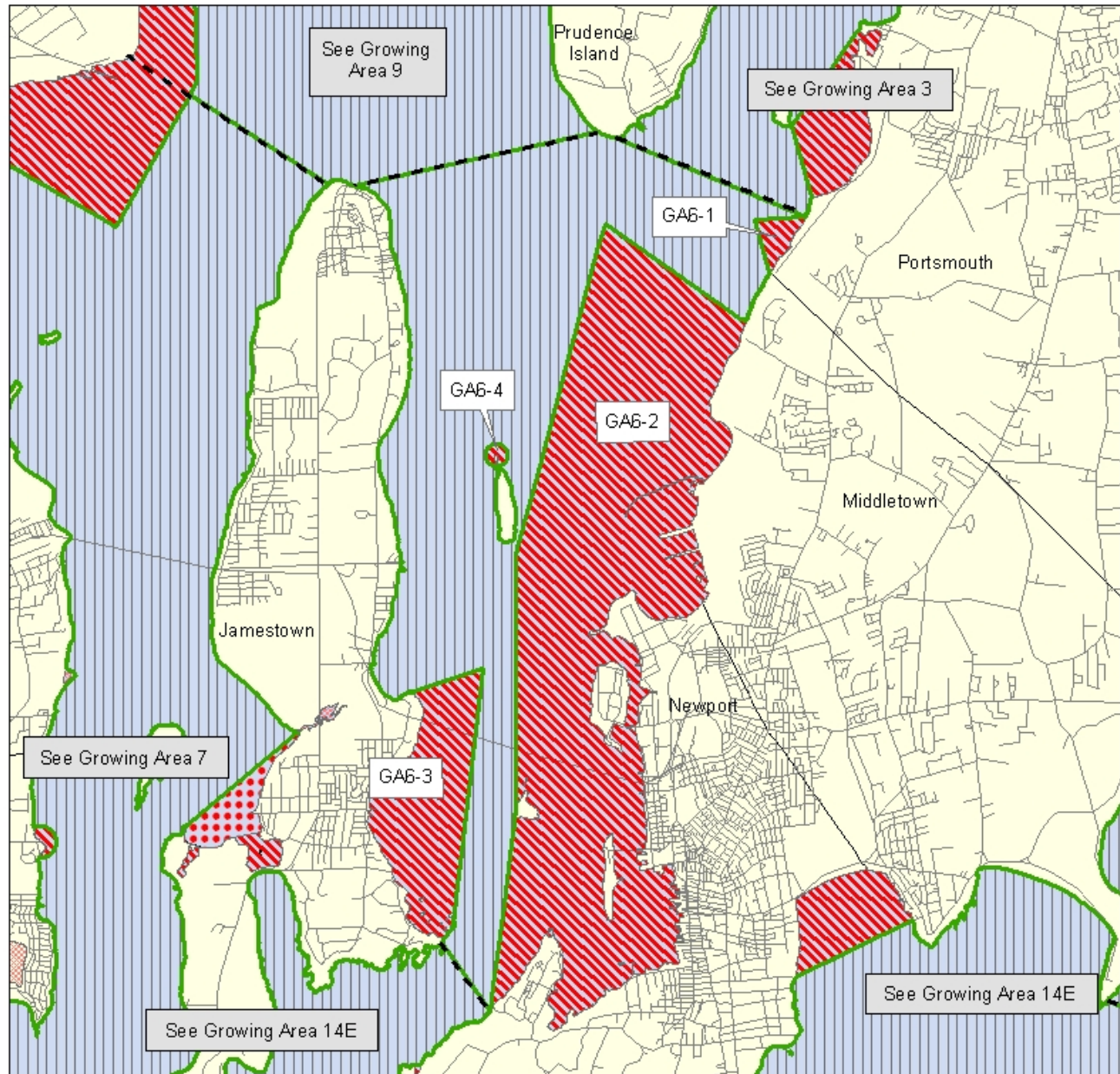


0 0.45 0.9 1.8 Miles



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East Passage Growing Area 6 May 2014 - May 2015



Shellfish Growing Area
Classification Codes

- Growing Area Boundary
-  Approved
-  Un-assessed - Shellfishing Prohibited
-  Seasonal Closure
-  Shellfishing Prohibited

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

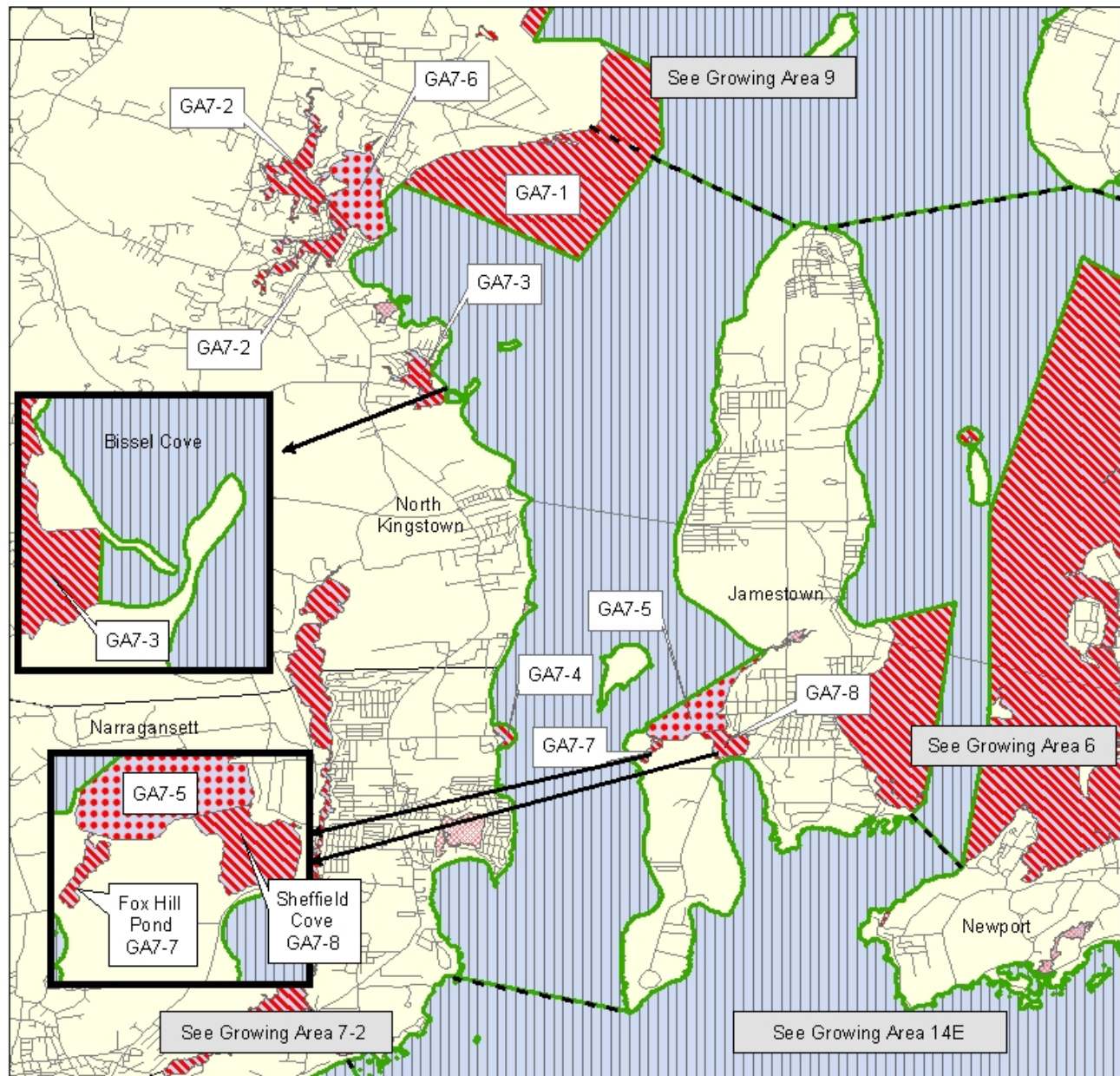


0 0.5 1 2 Miles



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**West Passage
Growing Area 7
May 2014 - May 2015**



Shellfish Growing Area Classification Codes



Approved



Shellfishing Prohibited



Growing Area Boundary



Un-assessed - Shellfishing Prohibited

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

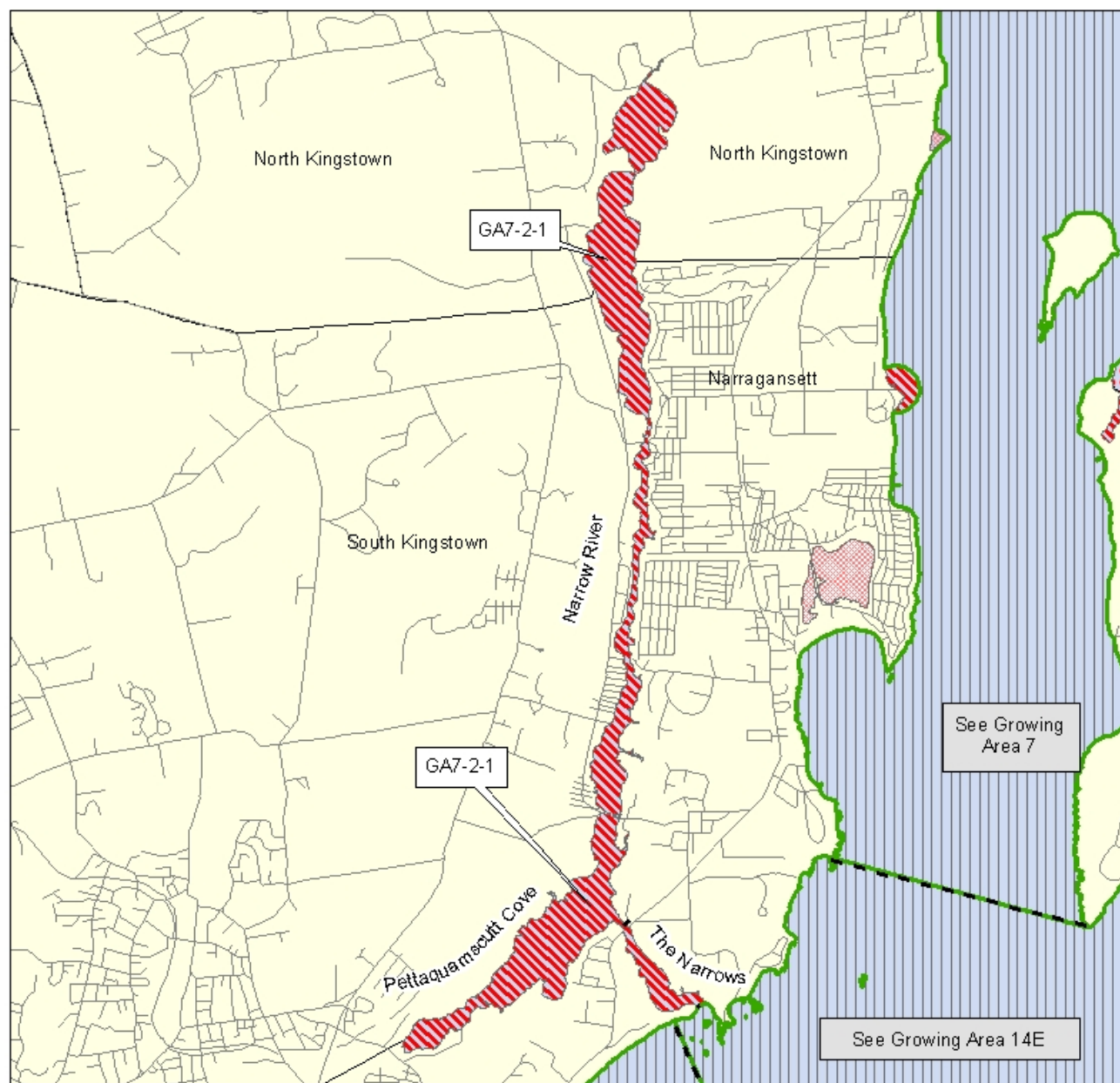


0 0.3 0.6 1.2 Miles



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**Pettaquamscutt River
(Narrow River)
Growing Area 7-2
May 2014 - May 2015**



Shellfish Growing Area Classification Codes

-  Approved
-  Shellfishing Prohibited
-  Growing Area Boundary
-  Conditional Closure
-  Greenwich Bay Seasonal Closure

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

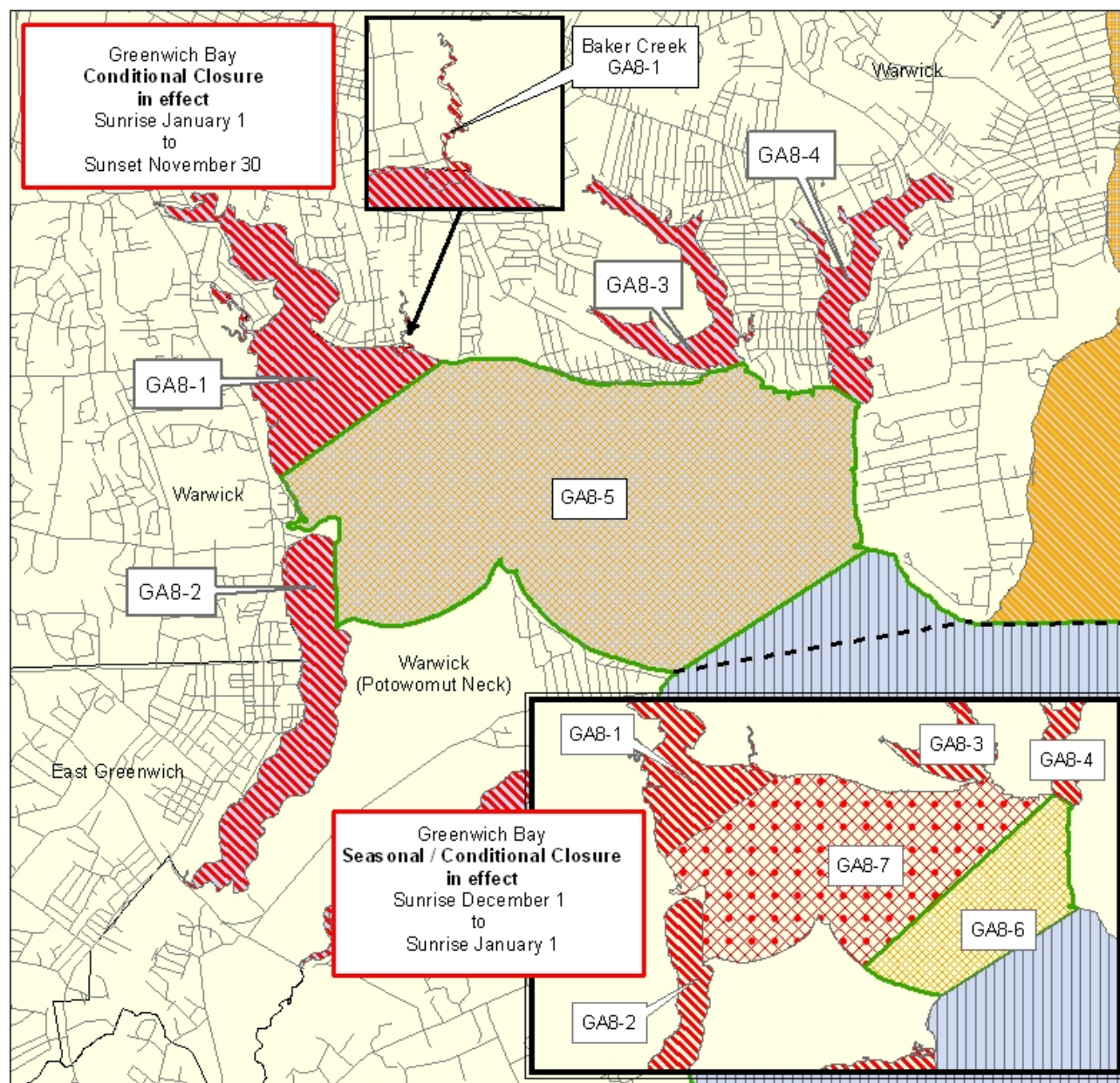


0 0.125 0.25 0.5 Miles











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Greenwich Bay Growing Area 8 May 2014 - May 2015



Shellfish Growing Area Classification Codes

-  Approved
-  Growing Area Boundary
-  Conditional Closure
-  Seasonal Closure
-  Upper Narragansett Bay Conditional Area - A
-  Shellfishing Prohibited
-  Upper Narragansett Bay Conditional Area - B
-  Un-assessed - Shellfishing Prohibited

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

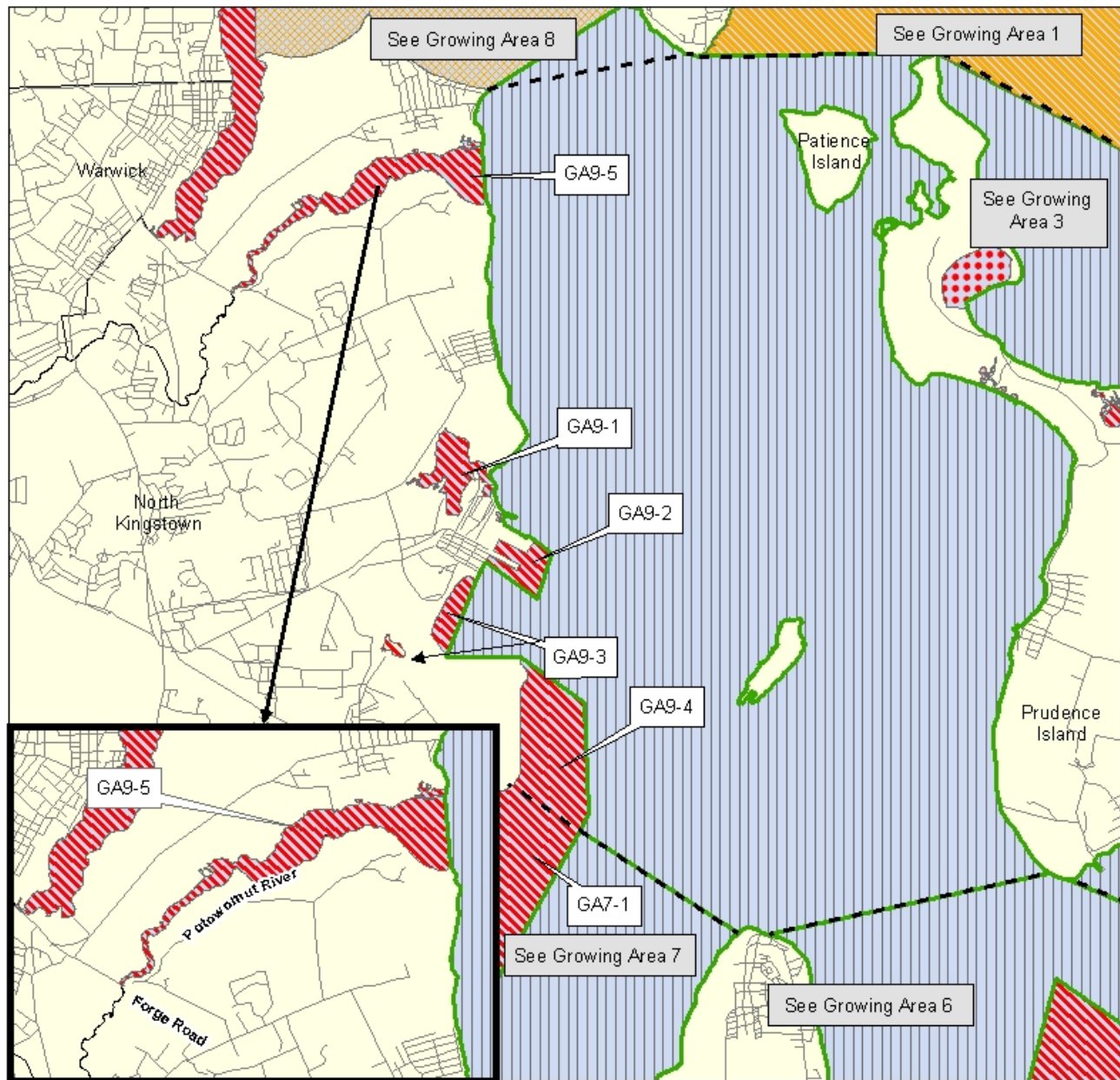


0 0.35 0.7 1.4
Miles








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West Middle Bay Growing Area 9 May 2014 - May 2015



Shellfish Growing Area Classification Codes

-  Growing Area Boundary
-  Approved
-  Shellfishing Prohibited
-  Un-assessed - Shellfishing Prohibited

 Marina Facility Seasonal Closure

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

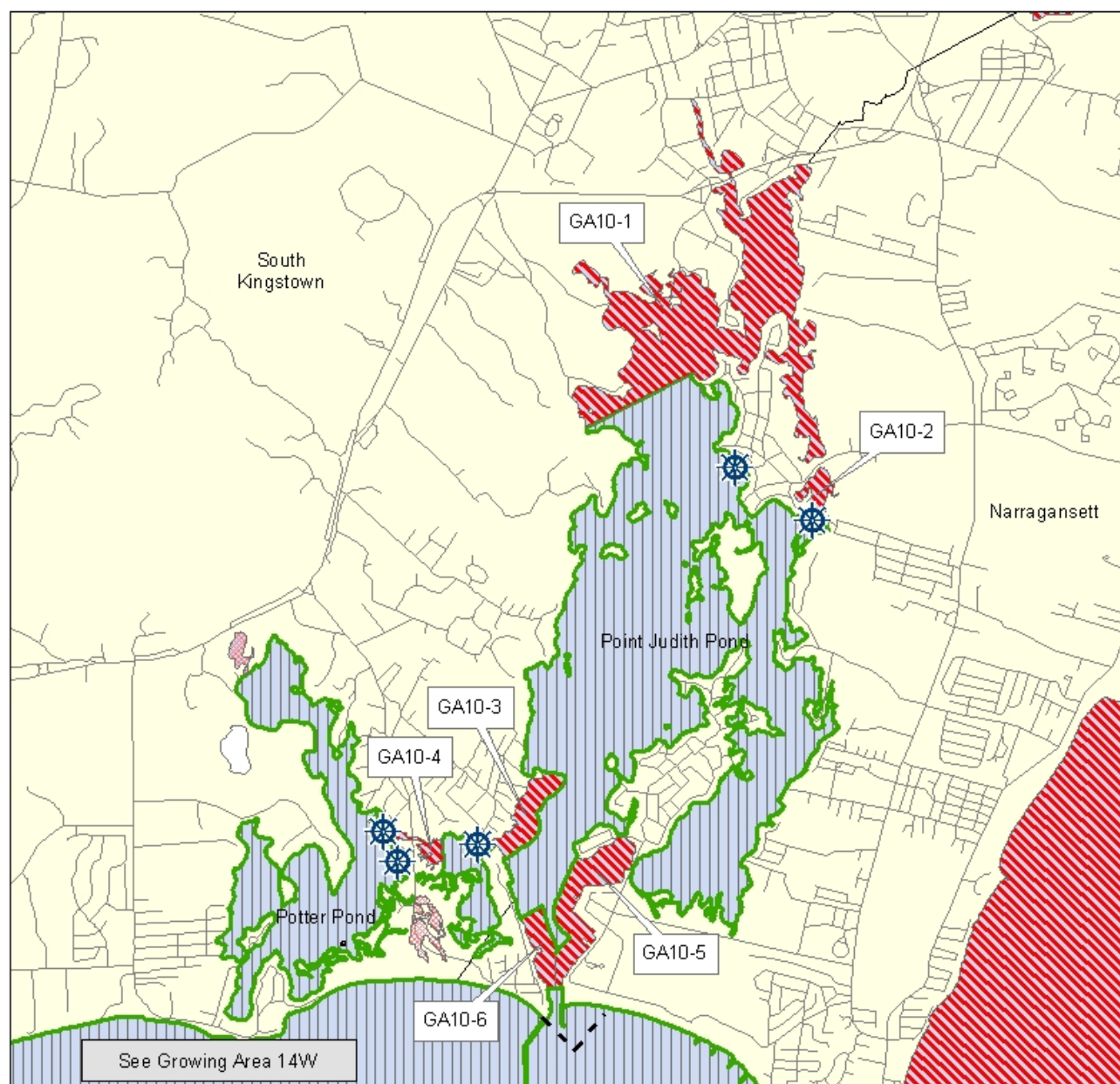


0 0.25 0.5 1 Miles



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Point Judith and Potter Ponds Growing Area 10 May 2014 - May 2015



Shellfish Growing Area Classification Codes

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program



--- Growing Area Boundary



Approved



Marina Facility Seasonal Closure



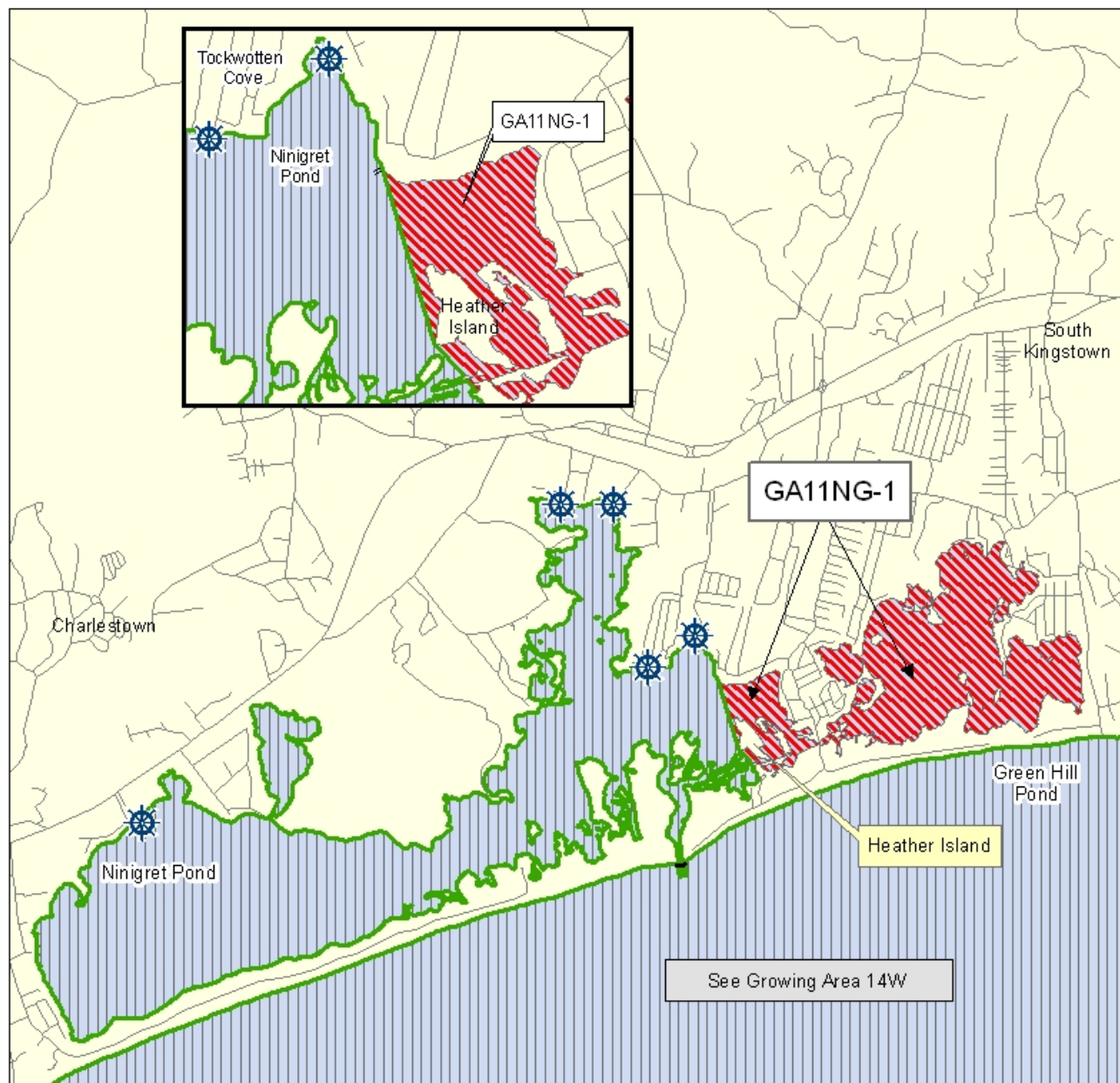
Shellfishing Prohibited

0 0.25 0.5 1 Miles



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Ninigret and Green Hill Ponds Growing Area 11NG May 2014 - May 2015



Shellfish Growing Area Classification Codes

Growing Area Boundary
 Approved
 Shellfishing Prohibited

N
 Marina Facility Seasonal Closure

Rhode Island Department
 of
 Environmental Management
 Office of Water Resources
 Shellfish Program



0 0.25 0.5 1 Miles






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Quonochontaug and Winnapaug Ponds Growing Area 11QW May 2014 - May 2015



Shellfish Growing Area Classification Codes

- Growing Area Boundary
-  Shellfishing Prohibited
-  Approved
-  Un-assessed - Shellfishing Prohibited

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

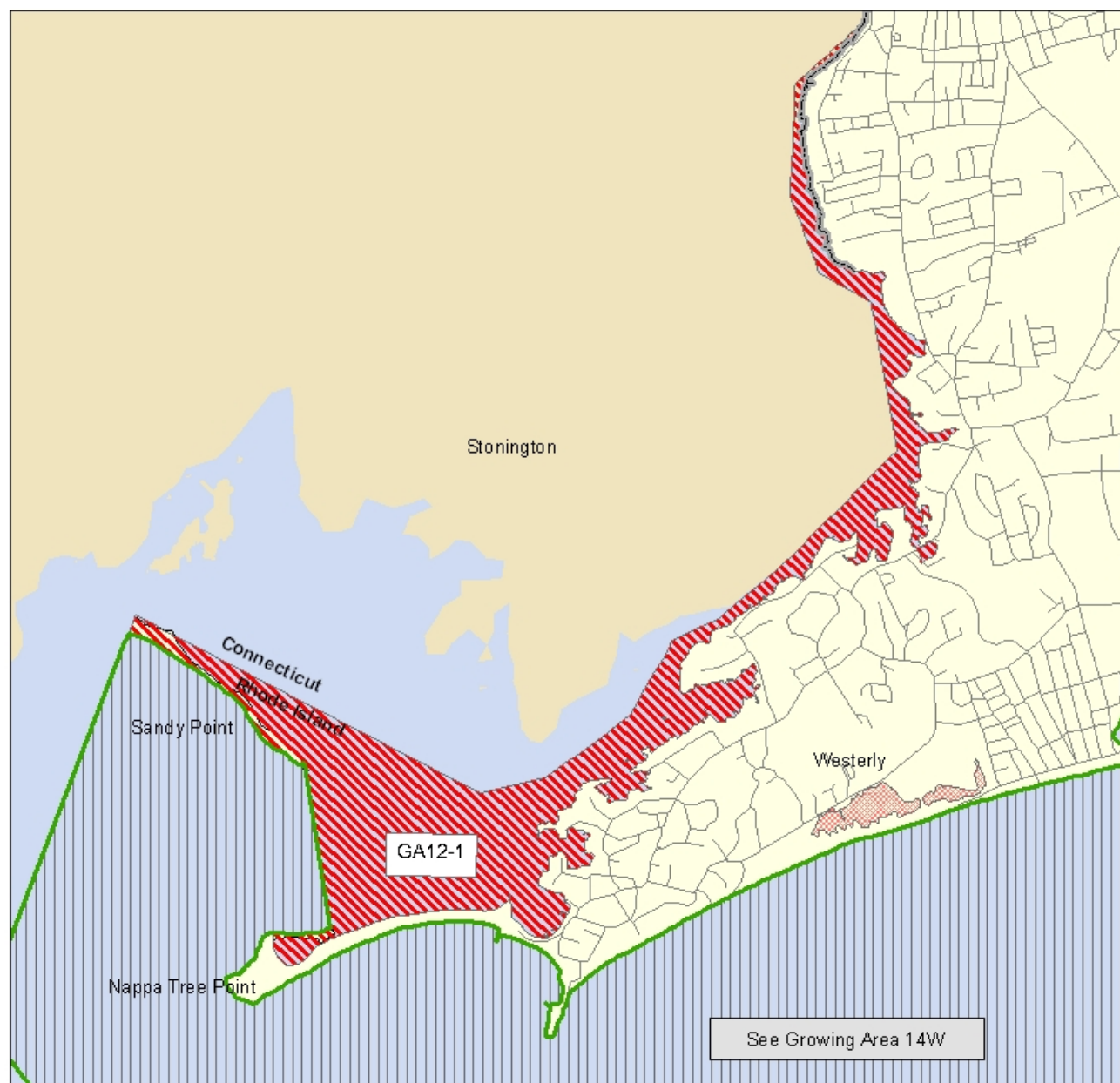


0 0.225 0.45 0.9 Miles



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Little Narragansett Bay Growing Area 12 May 2014 - May 2015



Shellfish Growing Area Classification Codes



Approved



Block Island Seasonal Closure A,C



Block Island Seasonal Closure B



Shellfishing Prohibited



Growing Area Boundary

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

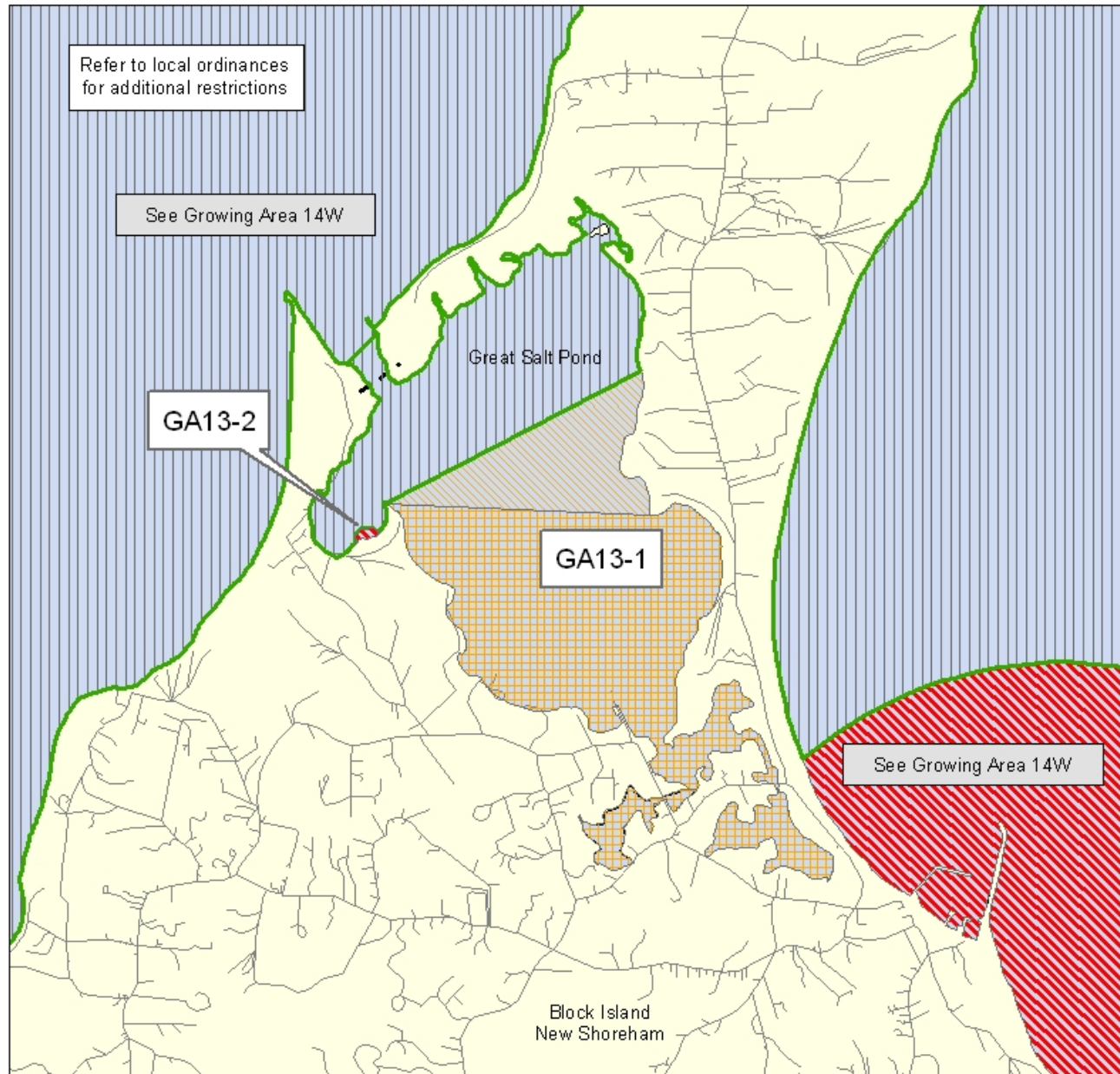


0 0.125 0.25 0.5 Miles



This map is provided only as a general reference for the areas listed as prohibited, seasonal closure or conditional closure in the publication entitled "Notice of Polluted Shellfishing Grounds May 2014". Please refer to that document for the complete legal description of the numbered shellfish closure areas shown here. This map also serves as the legal description for the areas open to shellfishing. Taking of shellfish is prohibited from any waters located on the landward side of the boundary line of waters listed as approved (high tide mark) and the landward side of the boundary line of waters listed as prohibited, conditional closure or seasonal closure, regardless of whether the specific waters are shown or noted as prohibited on the attached maps. At locations where the boundary line crosses water, the boundary shall be a straight line connecting the high tide mark on either side of the water along the main shoreline.

**Block Island
Growing Area 13
May 2014 - May 2015**



Shellfish Growing Area Classification Codes



Approved



Shellfishing Prohibited



Growing Area Boundary



Un-assessed - Shellfishing Prohibited



Marina Facility Seasonal Closure



Seasonal Closure

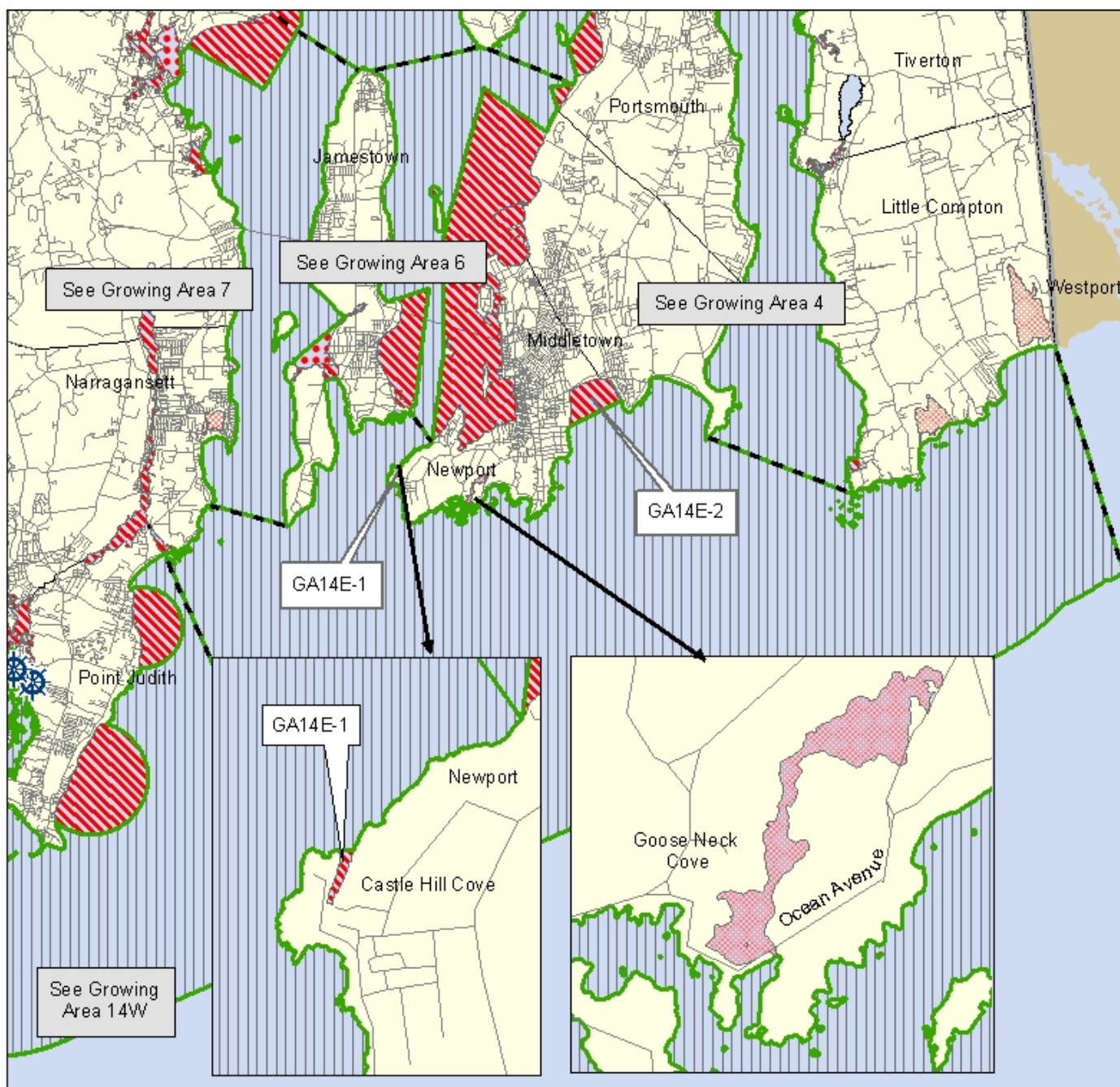
Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program



0 1 2 4 Miles



Offshore Point Judith (Narragansett) to Westport Growing Area 14E May 2014 - May 2015



Shellfish Growing Area Classification Codes



Approved



Shellfishing Prohibited



Growing Area Boundary



Seasonal Closure



Un-assessed - Shellfishing Prohibited



Marina Facility Seasonal Closure



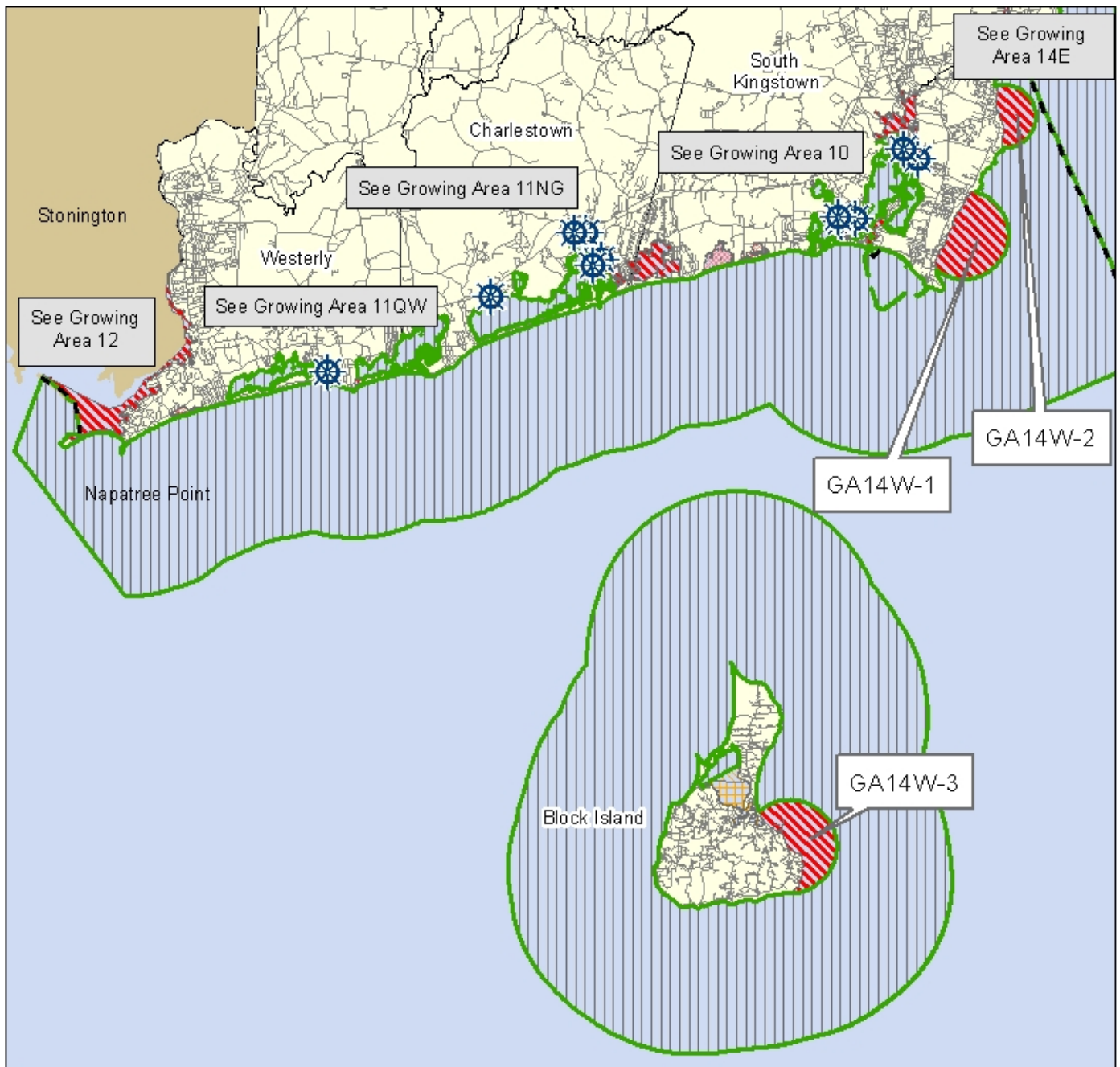
Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program



0 1.25 2.5 5 Miles

**Offshore
Napatree Point to
Point Judith (Narragansett)
Including
Offshore Block Island
Growing Area 14W
May 2014 - May 2015**

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Shellfish Growing Area Classification Codes



Shellfishing Prohibited



Growing Area Boundary

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

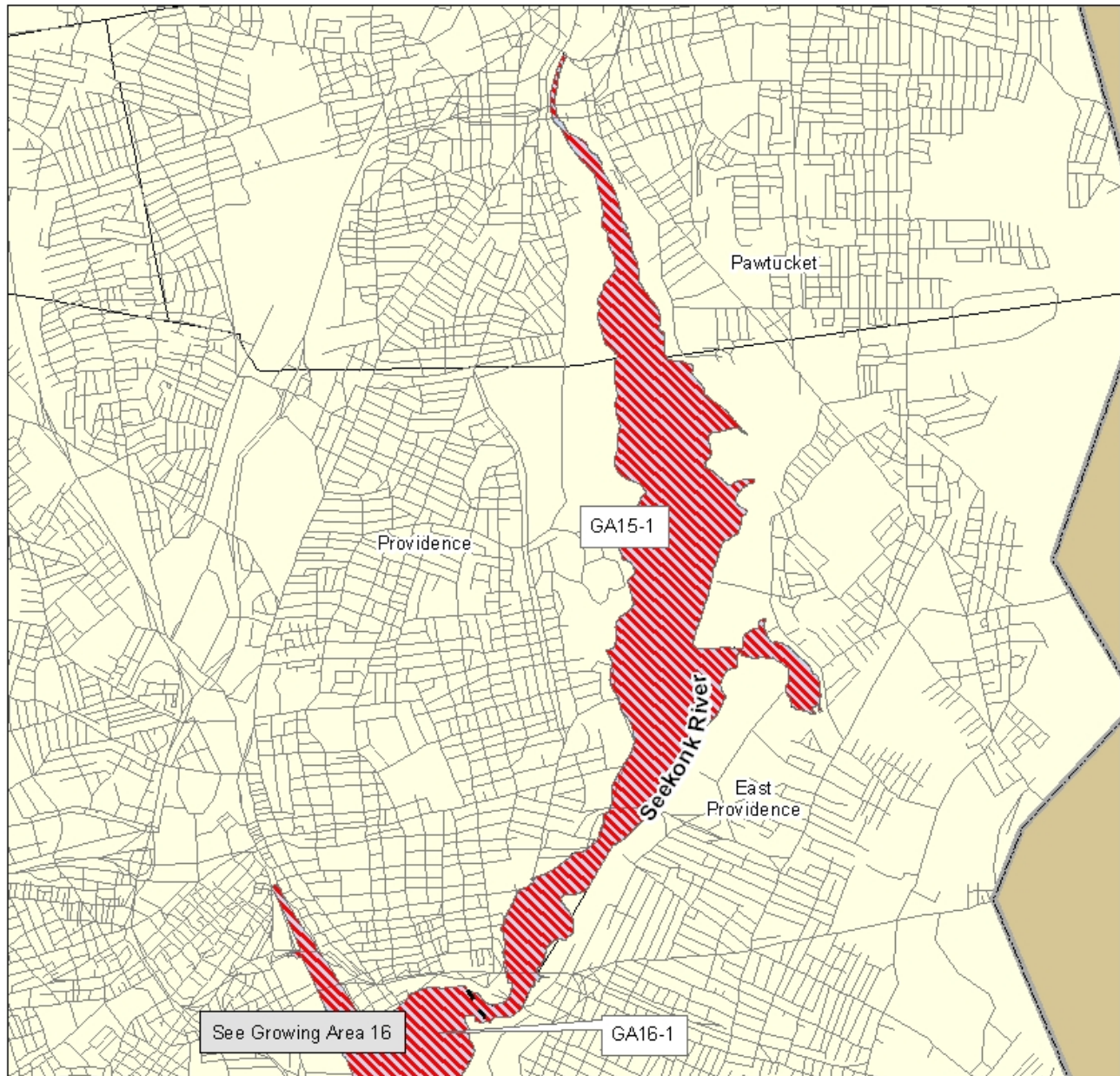


0 0.2 0.4 0.8 Miles





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**Seekonk River
Growing Area 15
May 2014 - May 2015**



Shellfish Growing Area Classification Codes

- Growing Area Boundary
-  Conditional Closure
-  Shellfishing Prohibited

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

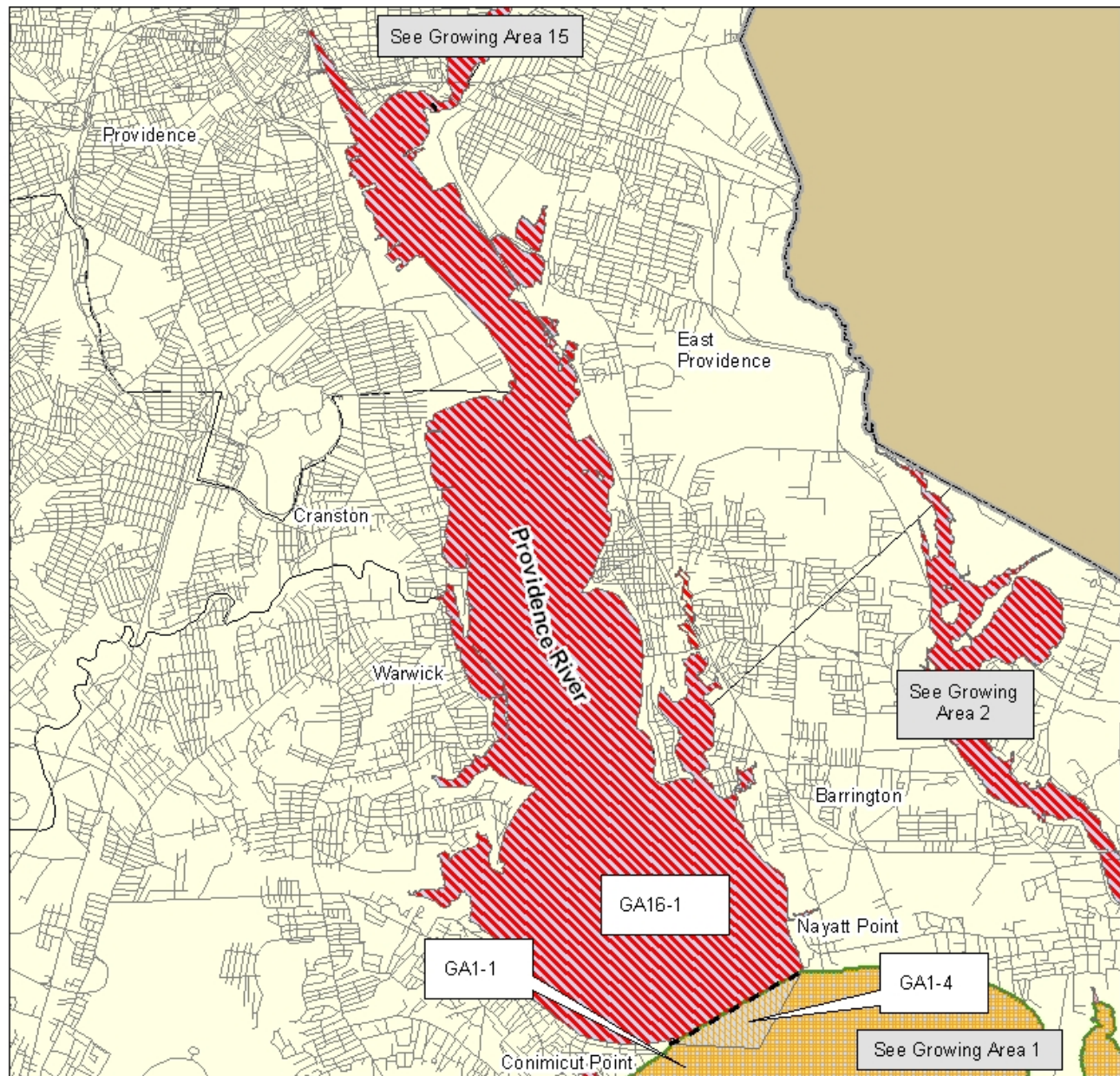


0 0.35 0.7 1.4 Miles



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**Providence River
Growing Area 16
May 2014 - May 2015**



Shellfish Growing Area Classification Codes

- | | |
|--|---|
|  Approved |  Shellfishing Prohibited |
|  Conditional Closure |  Seasonal Closure |
|  Upper Narragansett Bay |  Un-assessed - Shellfishing Prohibited |
|  Conditional Area - A |  Marina Facility Seasonal Closure |
|  Upper Narragansett Bay |  Growing Area Boundary |
|  Conditional Area - B | |

Rhode Island Department
of
Environmental Management
Office of Water Resources
Shellfish Program

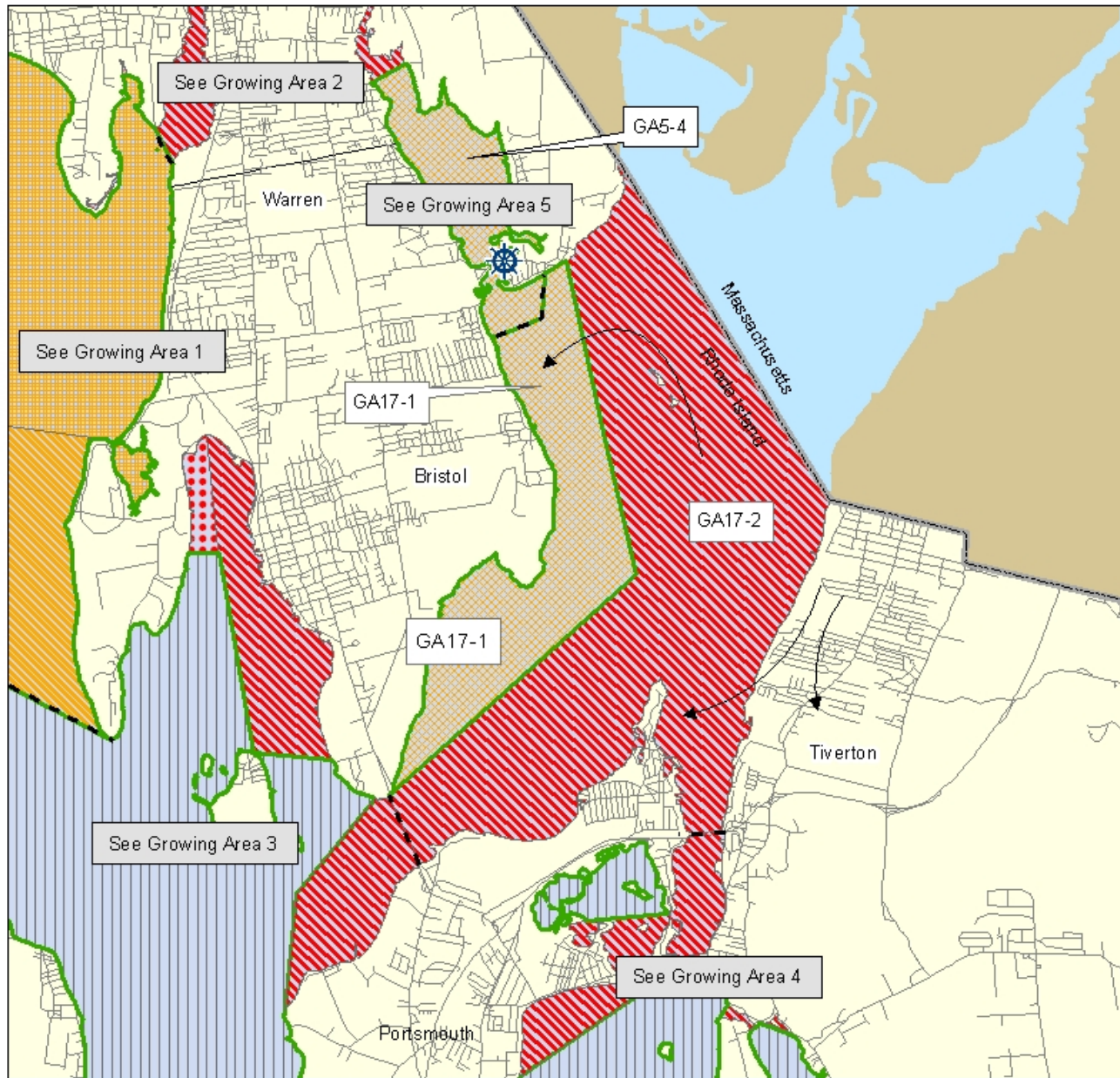


0 0.275 0.55 1.1 Miles



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Mt Hope Bay Growing Area 17 May 2014 - May 2015



SHELLFISH HARVESTERS' TIPS FOR SAFETY AND QUALITY

Rhode Island shellfish are quality products. Your cooperation with required and recommended practices helps protect the product and the industry.

WHAT IS THE ISSUE?

Disease-causing bacteria and viruses can be found in raw shellfish. Contamination can occur at any point in the food distribution system, including the point of harvest.



Since shellfish filter water for food, any bacteria or viruses in the water will be concentrated in the animal and can make it unsafe to eat. Remember, shellfish is considered ready-to-eat: Consumers may not cook it first --- a step that would kill bacteria.

WHAT DOES THIS MEAN TO ME?

Shellfish harvested from polluted waters and areas of sewage discharge have higher levels of disease-causing organisms. As harvesters, you already know which areas are closed to shellfishing. These waters are tested for certain bacteria and are only closed to protect human health.

WHAT MUST I DO?

Follow the regulations:

- Don't harvest from polluted waters. All harvesting is prohibited in closed areas.
- Don't discharge sewage into the water. Discharge from ANY vessel, commercial or recreational, into Rhode Island waters is prohibited.

These steps are necessary to protect public health, water quality, and the marine environment.

WHAT ELSE CAN I DO TO PROTECT THE PRODUCT AND IMPROVE QUALITY?

Practice good handling techniques:

- Store out of the sun, covered if possible
- Bring to the dealer as soon as possible for refrigeration.
- Protect shellfish from contamination. Store away from bilge water, fuel oil, and other chemicals.



Produced by Rhode Island Sea Grant and URI Cooperative Extension/Food Science and Nutrition for the Rhode Island Department of Environmental Management.





Water Quality Based Shellfish Closures

RI Shellfish Management Plan
Meeting
March 20, 2013

Angelo Liberti
Chief, Surface Water Protection
Office of Water Resources, RIDEM
222-4700 ext 7225 angelo.liberti@dem.ri.gov

Water Quality Goals

- The Office of Water Resources (OWR) implements RI Water Pollution Control Act and the Federal Clean Water Act (CWA).
- Estuarine Water Classifications
 - Class SA
 - These waters are designated for shellfish harvesting for direct human consumption, primary and secondary contact recreational activities, and fish and wildlife habitat.
 - Class SB
 - These waters are designated for primary and secondary contact recreational activities; shellfish harvesting for controlled relay and depuration; and fish and wildlife habitat.

Interstate Shellfish Commerce Authorities

- U. S. Food and Drug Administration (FDA), National Shellfish Sanitation Program (NSSP)
 - federal/state cooperative program to promote and improve sanitation of shellfish moving in interstate commerce
- Interstate Shellfish Sanitation Conference –
 - National organization of State regulatory officials, shellfish industry, FDA, NMFS and USEPA that provides a structure for participating in establishing updated regulatory guidelines and procedures. Following FDA concurrence adopted and published by NSSP.

Interstate Shellfish Commerce

- To participate in interstate shellfish commerce, states (i.e. Control Authorities) agree to follow the NSSP/ISSP Guide for the Control of Molluscan Shellfish (2009).

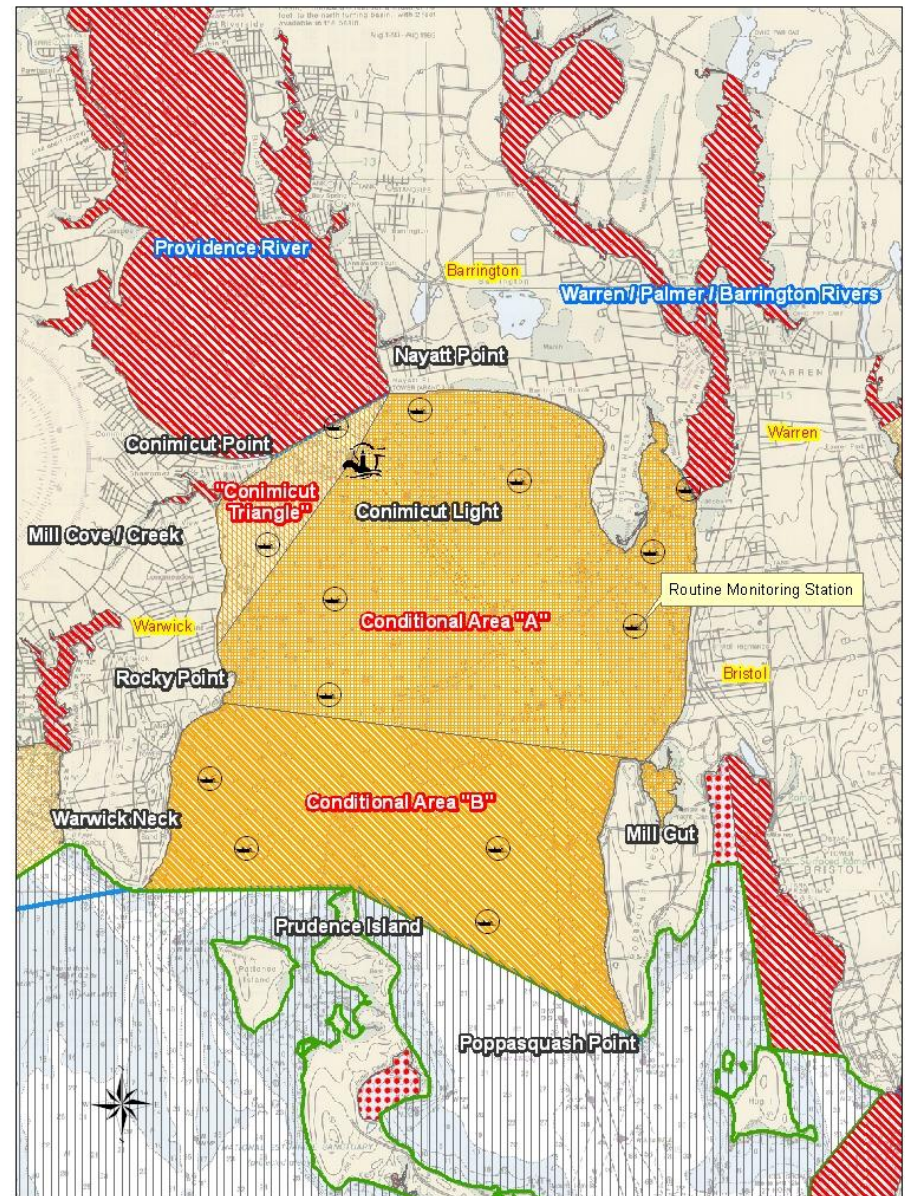
Major program areas:

- growing area classification
- Laboratory procedures
- Control/patrol of growing areas
- Storage, Transportation and Processing
- Shellfish aquaculture

ISSC Responsibilities

- Primary agencies - HEALTH and RIDEM
- Water Resources
 - Establish shellfish harvesting classifications for all estuarine waters
 - Conduct water quality monitoring
 - Annual review of water quality for compliance with NSSP Model Ordinance
 - Shoreline surveys
 - Conditional area management plans
 - Establish legal descriptions of all classified waters including supporting maps
 - Enact emergency closures
 - Review Aquaculture farm applications
 - Vessel no discharge zones – pump out facilities

Upper Narragansett
Bay
Growing Area 1
effective
May 2012



NSSP Harvesting Classification Requirements

- ISSC/NSSP require that harvesting is prohibited:
 - Within marinas
 - Near discharges from wastewater treatment facilities
 - Waters impacted by actual or potential sources of poisonous and deleterious substances
 - Waters where pollution impacts are not predictable
 - In response to emergencies and extreme rainfall events
 - If raw sewage from WWTF or large community sewer system must be closed for minimum of 7 days and until shellfish meats meet acceptable male specific bacteriophage levels.

Analysis of Shellfish Harvesting Areas.

- Waters potentially available for shellfish harvesting must be evaluated annually based on:
 - Water quality monitoring of fecal coliform levels (6-12 times a year) and harmful algae blooms (HABs)
 - Shoreline surveys to identify actual and potential pollution sources
 - 12 year, annual and 3 year intervals

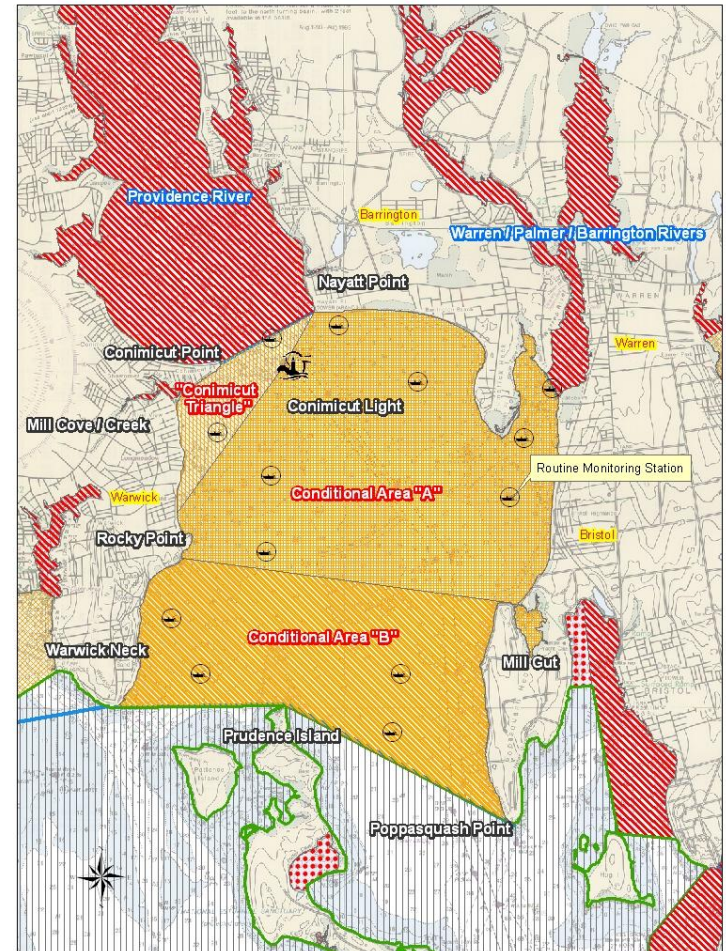
Fecal Coliform Sampling Program

- Conditional areas 12 times a year, approved 6 times.
- 178 stations sampled, 2,000 samples collected.
- Fecal Coliform Criteria
 - Geometric mean =14 MPN/100ml and
 - Conditional Areas 10% or less of samples ≤ 49
 - Approved areas 90th percentile ≤ 49

Growing Area 1

Upper Narragansett Bay

- **June 2006** NBC's Bucklin Point Wet Weather Facility. DEM revised bypass trigger (14.5 MG not counted)
- **November 2008** NBC's CSO Project Phase I completed.
- **2008 – 2010** – DEM sampling for early re-opening and evaluation of new closure criteria.
- **June 2011** RIDEM revises closure criteria.
- **June 2012** enlarge Conimicut Triangle due to water quality violations at station 8A



Growing Area 1 - Early Reopening

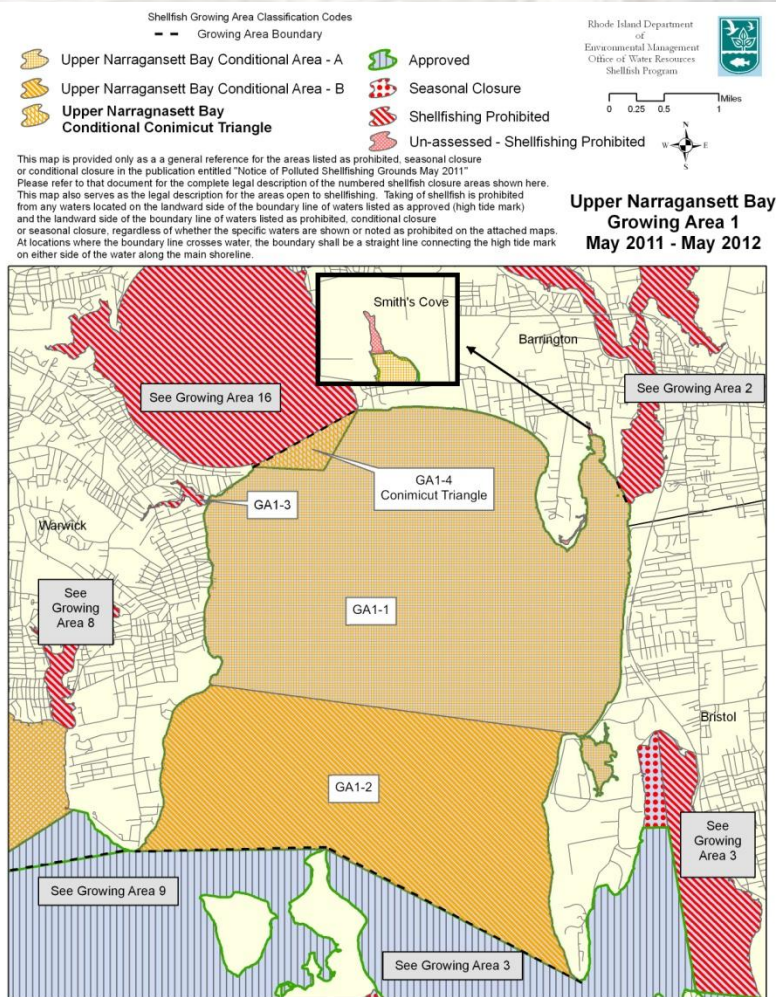
- In 2008 DEM received approval from FDA to implement post storm sampling and early reopen prior to 7 days if criteria met.

	Additional Harvesting Days	
	2009	2010
Area A	11	2
Area B	8	2

2011 Conditional Closure Criteria

- Conimicut Triangle
 - Closed for minimum of 7 days on either
 - 0.5" of rainfall or greater in a 24 hour time period
 - >0.5 MG of WWTF by-pass (14 MG Bucklin Pt. not counted)
- Area "A"
 - Closed for minimum of 7 days on either
 - 0.8" of rainfall or greater in a 24 hour time period
 - >0.5 mg of WWTF by-pass (14 MG Bucklin Pt. not counted)
- Area "B"
 - Closed for a minimum of 7 days on
 - 1.5" of rainfall or greater in a 24 hour time period

Why is Conimicut Triangle Criteria 0.5" not 0.8"?



Upper Narragansett Bay GA-1

Statistical analysis of 2010 sampling results using wet weather results between 0.5" and 0.8" less than 7 days following event (n=4) combined with dry weather most recent (n=11)

	Station ID	Geo Mean <14 fc/100ml	No more than 10% Greater than 49 fc/100ml (MPN 3 tube decimal dilution)
Conimicut Triangle	12	7.6	13.3
Area "A"	1	3.7	0.0
	4	3.3	0.0
	5C	3.0	0.0
	6A	2.9	0.0
	7	2.8	0.0
	8A	3.3	6.7
	10	3.0	0.0
	11A	4.3	0.0
Area "B"	2	2.5	0.0
	3C	2.4	0.0
total n = 15 all stations			

Why Wasn't Area A Closure Criteria Increased to 1.0" or more?

Days after	Rainfall Total	# of Stations >14 MPN/100ml	# of stations > 49
4	0.83	5	3
4	1.02	3	0

Why Are RI's Conditional Areas Closed for Seven Days?

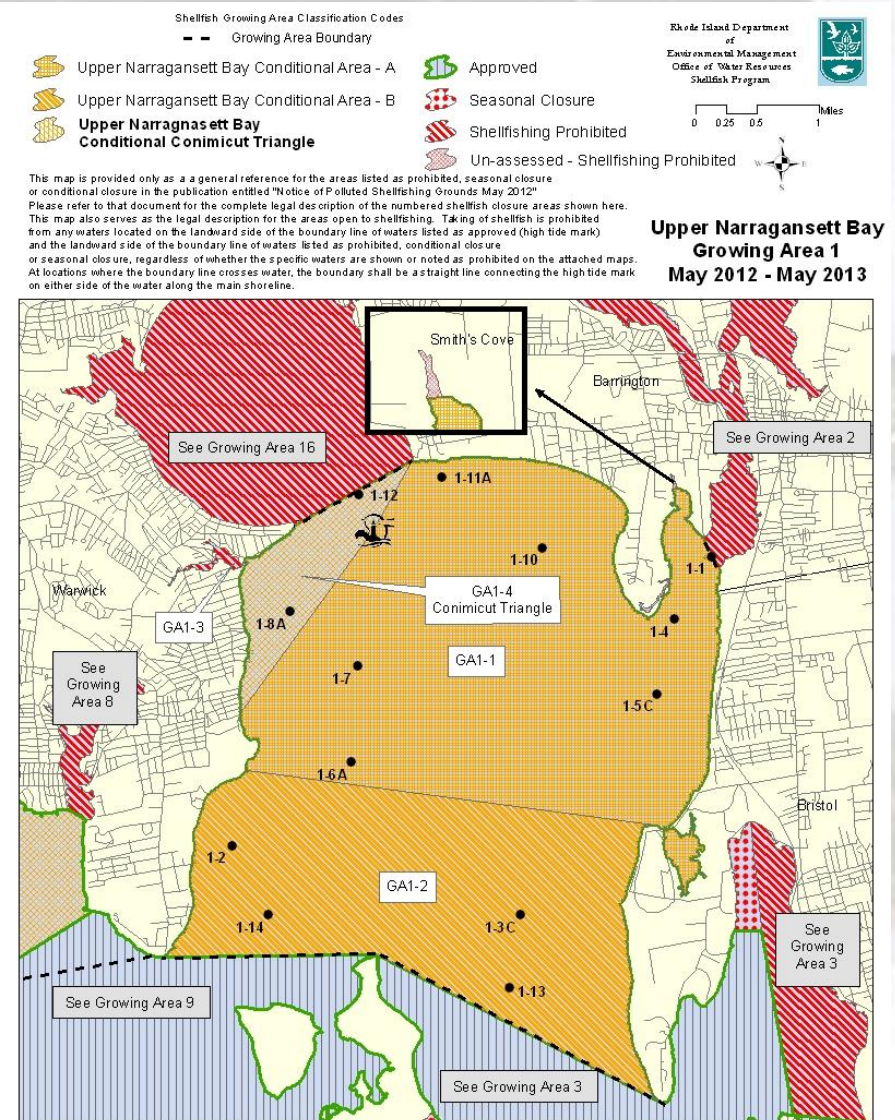
- NISSP/ISSC Model Ordinance requires that conditional areas be managed to ensure that
 - “Sufficient time has elapsed to allow the shellstock to reduce pathogens that might be present to acceptable levels. ***”(See Chapter IV, @03 C.2(c)(iii).
- MA and RI use two days from acceptable water quality for shellfish to reduce pathogens to acceptable levels (i.e. water quality must return to acceptable levels 5 days after closure criteria is met).
 - Data indicates that Area A and Greenwich Bay impacted for 5 days.
 - Additional data collection efforts in Area B underway.
 - FDA plans to assist MA and RI with evaluation of Fall River CSO Abatement in 2013

Why doesn't Area A open in less than 7 days?

- Existing closure: 7 days after rainfall of 0.8" to 3.0"; increased to 10 days after > 3.0".
- To establish period less than 7 days with 0.8" must know upper rainfall limit of new closure period (i.e. appropriate up to 3").
- Data collected less than 7 days after 0.8" is available for 4-6 storms (0.8"-1.5")
- To establish a 6 day closure for storms between 0.8 and 1.5" need compliance by four days after.
 - Four days after rainfall: 4 of the 7 stations violate standards (2 geo mean, 4 % no to exceed)

2012 Conimicut Triangle

- 2011 data at station 1-8A - more than 10% of samples exceed 49 MPN/100.
- June 2012 “Triangle” enlarged adding 462 acres to area closed at 0.5” of rainfall.



2012 Expansion of Conimicut Triangle

RIDEM SHELLFISH GROWING AREA MONITORING RESULTS

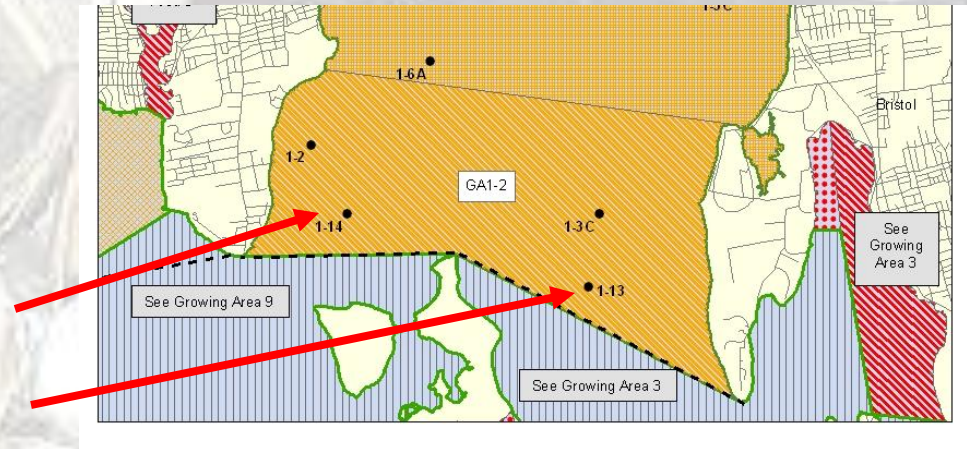
<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>FECAL-GEO</i>	
			<i>MEAN</i>	<i>%> 49</i>
GA1-2	CA	17	3.4	5.88
GA1-3C	CA	17	3.4	5.88
GA1-5C	CA	15	3.5	0.00
GA1-6A	CA	15	3.7	0.00
GA1-7	CA	15	3.6	0.00
GA1-8A	CA	15	7.4	13.33
GA1-10	CA	15	4.7	0.00
GA1-11A	CA	15	8.7	0.00
GA1-12	CA	15	9.7	6.67
GA1-1	CA	15	6.5	6.67
GA1-4	CA	15	2.2	6.67
GA1-13	CA	8	4.3	0.00
GA1-14	CA	8	2.8	0.00

Wednesday, February 15, 2012

CA – denotes conditional area

Future Analysis Of Growing Area 1

- DEM added sample stations to further evaluate potential changes to Area B.
- 
- The map shows a river flowing through a landscape with various land uses. A yellow grid is overlaid on the river and surrounding areas. Red arrows point to specific locations along the river, indicating sample stations. The map includes labels for 'Area A' and 'Area B'.

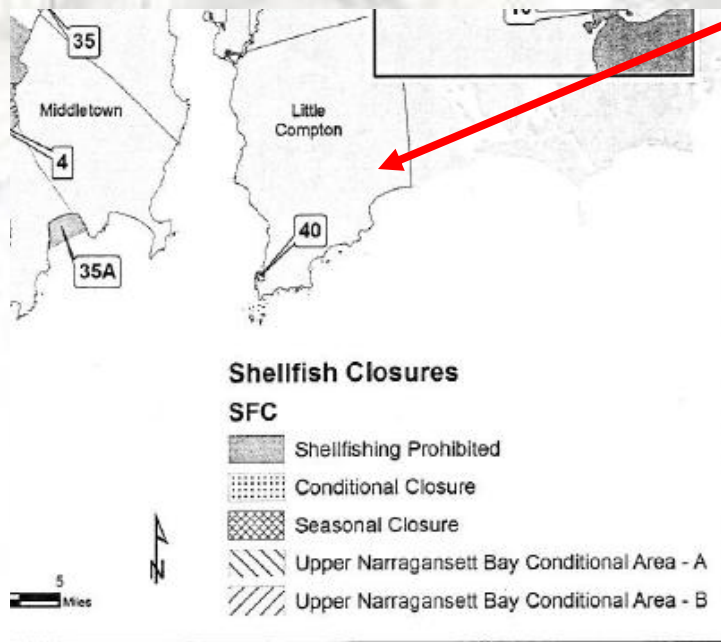


- Phase II of the NBC CSO Abatement Project Completion Required January 2015.
 - RIDEM will conduct additional monitoring to evaluate additional changes to closure criteria.

2007 Closure of Upland Waters

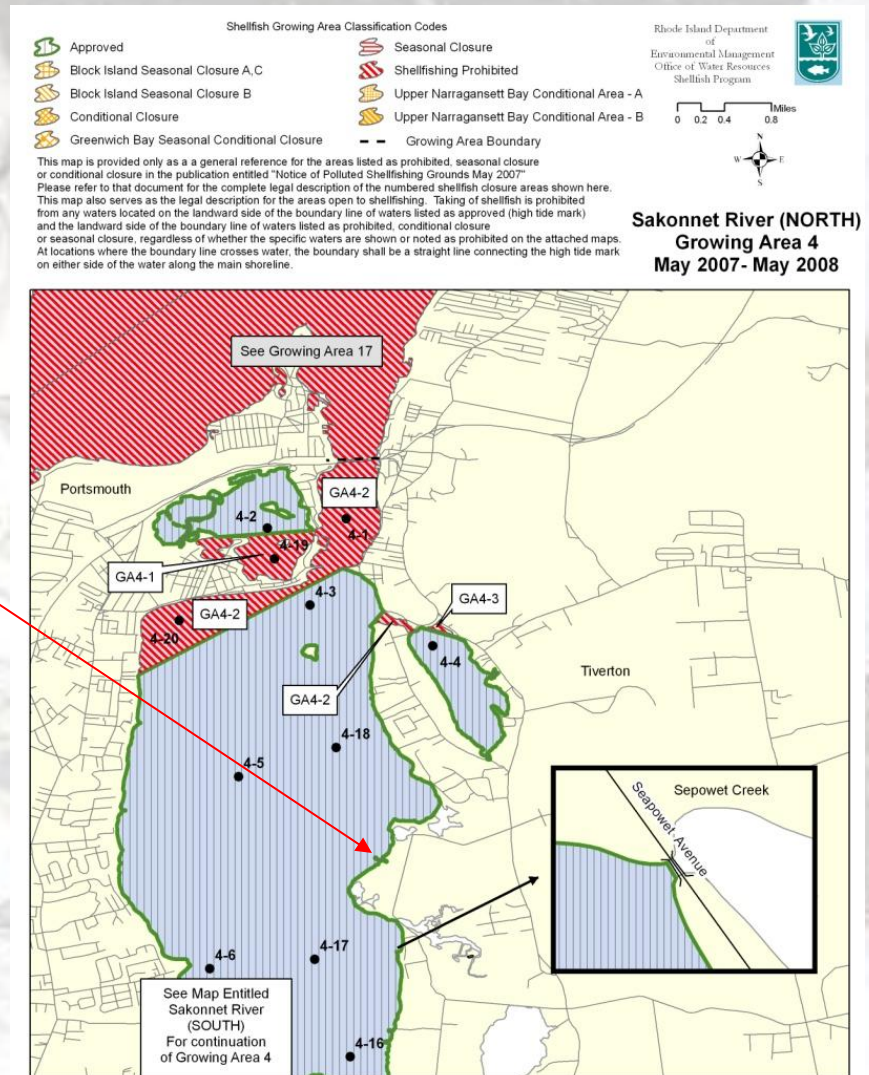
- 2007 FDA national retail study. FDA reported finding norovirus in oysters from RI dealer.
- HEALTH and DEM coordinated the response. Resulted in recall of oysters and revealed harvest of shellfish from un-assessed waters.

Quicksand Pond



How Unassessed Waters Were Identified (i.e. long green line)

- The landward limit of all assessed waters was established. New maps depict as a green line along the shore at the point where the high tide line would intersect across a tidal opening or embayment.



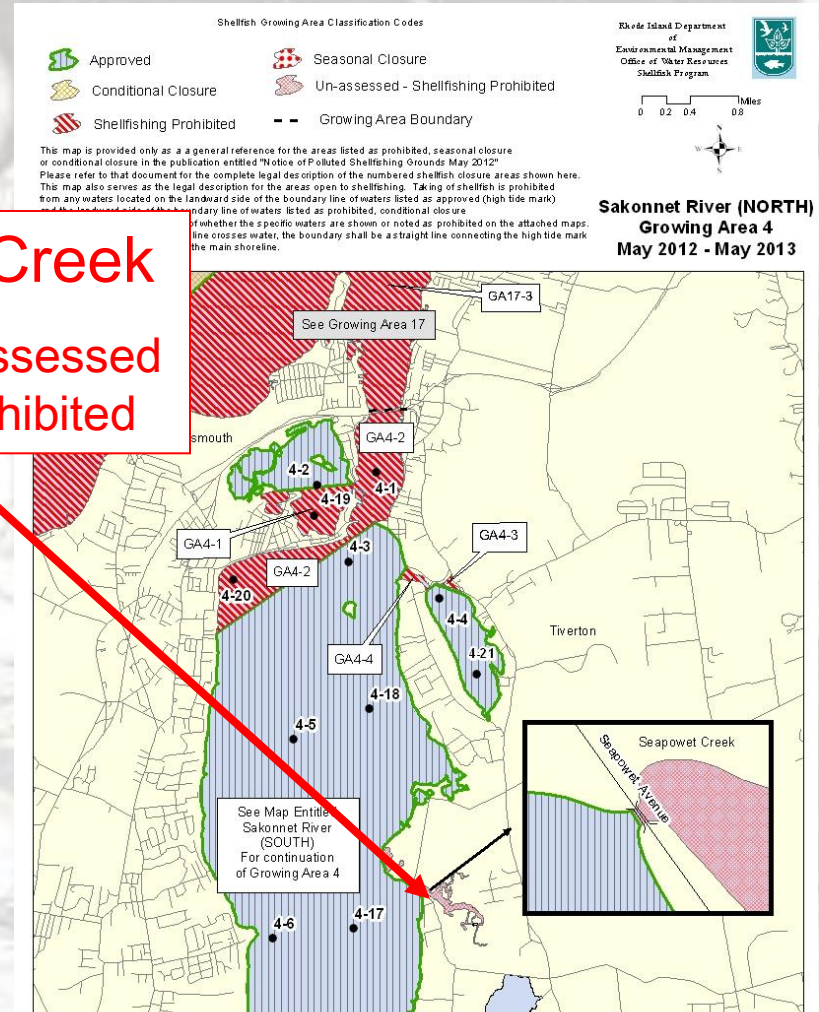
Monitoring To Assess Landward Areas

- Un assessed areas where shellfishing is a goal were prioritized for monitoring
 - East Bay Land Run
 - West Bay Land Run
 - Prudence Island Land Run
- Monitoring runs started in July of 2007 and is on-going.
 - Some areas re-classified as Prohibited due to sampling results
 - Areas with insufficient data, remain un-assessed (harvesting prohibited), and sampling ongoing.

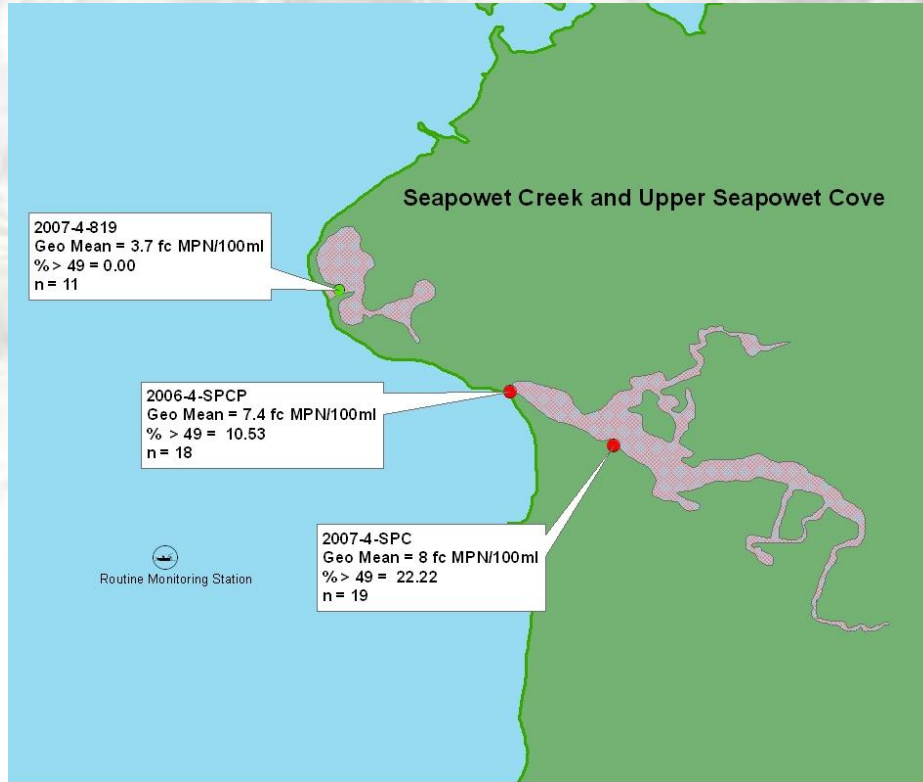
East Bay Land Run



Seapowet Creek
Currently Un-assessed
Therefore Prohibited

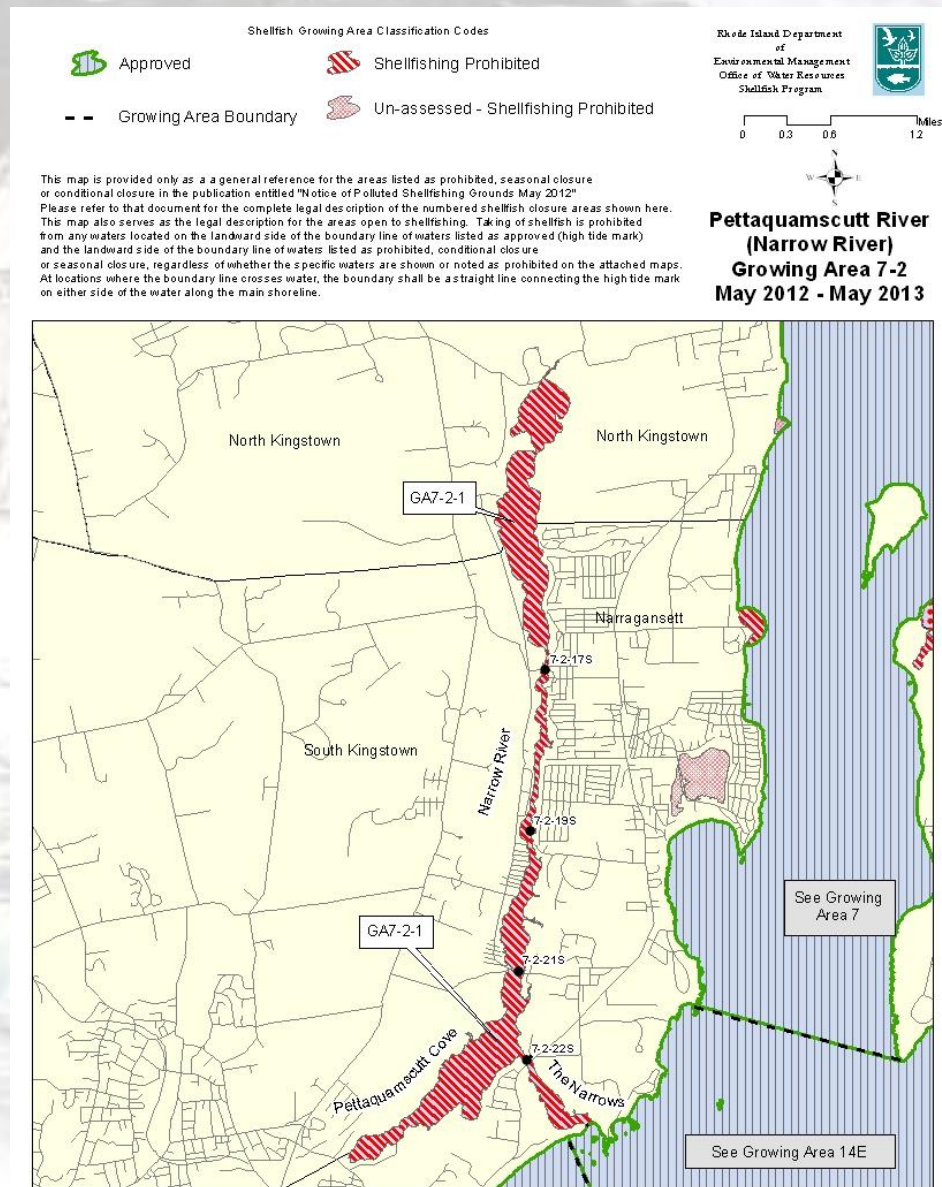


Seapowet Creek Data



Narrow River

- The Narrow River (Pettaquamscutt River) closed to shellfishing for more than 25 years (1986). Results did not support approval as a seasonal shellfish area.



Narrow River Sampling Results

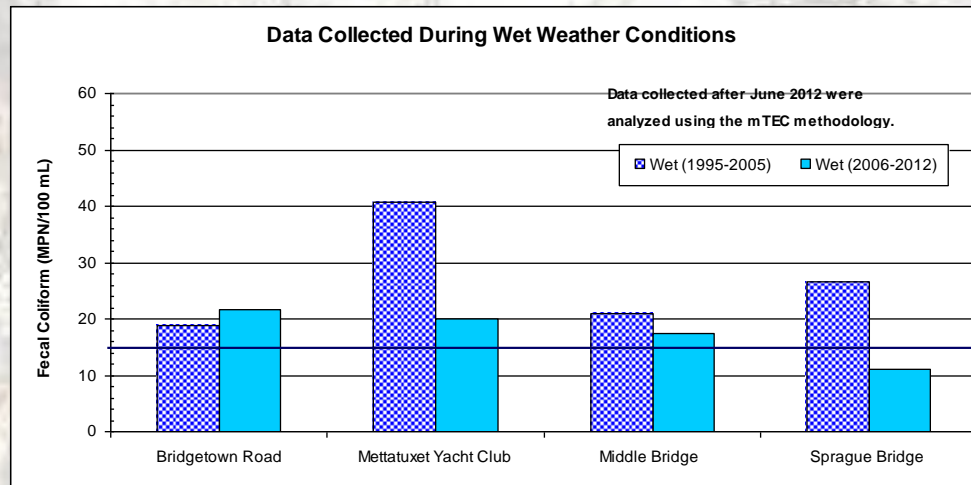
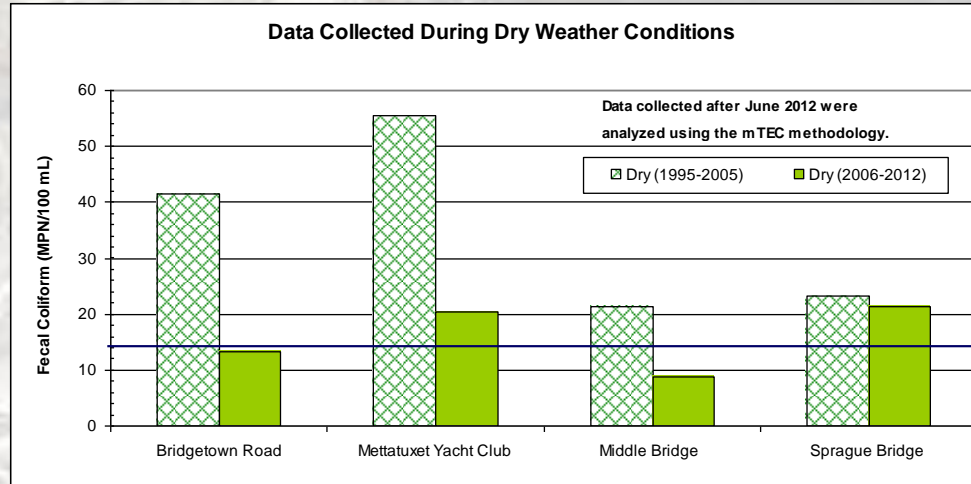
COMBINED WET AND DRY DATA

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>FECAL-GEO</i>		
			<i>MEAN</i>	<i>% > 49</i>	<i>90TH Percentile)</i>
GA72-17S	P	15	17.6	20.00	173.1
GA72-19S	P	15	19.3	20.00	168.9
GA72-21S	P	15	11.0	20.00	70.1
GA72-22S	P	15	12.6	26.67	96.6

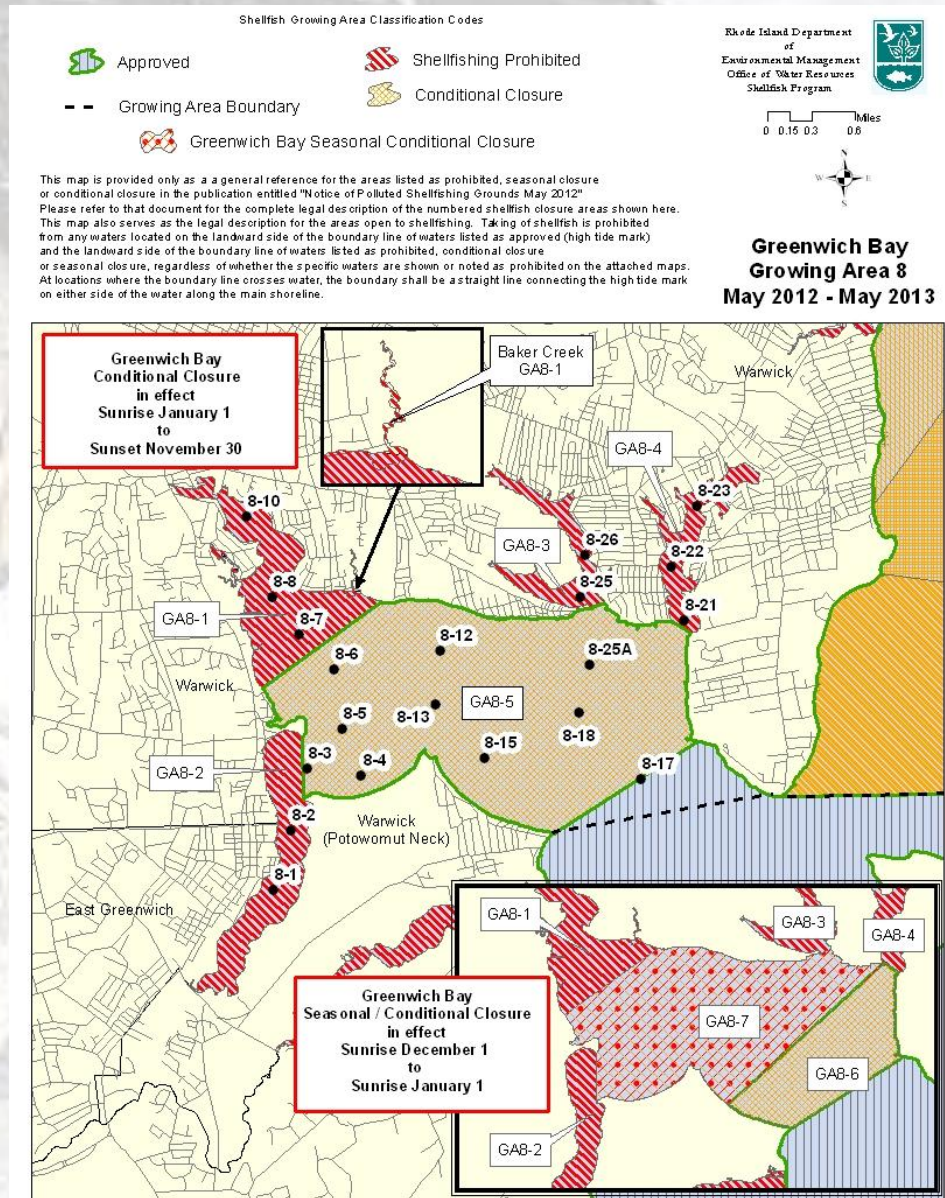
DRY WEATHER ONLY

<i>Station Name</i>	<i>Status</i>	<i>N</i>	<i>FECAL-GEO</i>		
			<i>MEAN</i>	<i>% > 49</i>	<i>90TH Percentile</i>
GA72-17S	P	15	16.6	20.00	155.9
GA72-19S	P	15	26.5	40.00	322.1
GA72-21S	P	15	9.1	26.67	80.2
GA72-22S	P	15	23.5	33.33	381.4

Narrow River - WQ improvement?



Greenwich Bay December Closure (May 2012)



GB 2012 with and without December Data

RIDEM SHELLFISH FECAL COLIFORM GROWING AREA MONITORING RESULTS

				Excluding December data (7/7/10 – 1/18/11)	
Station	Status	MEAN(14)	%> 49 (10%)	MEAN(14)	%> 49 (10%)
GA8-4	CA	3.5	0	2.8	0
GA8-5	CA	4.5	13.33	2.5	0
GA8-12	CA	3	0	2.6	0
GA8-13	CA	3.5	13.33	2.1	0
GA8-15	CA	2.2	0	2	0
GA8-17	CA	3.1	0	3	0
GA8-18	CA	2.6	0	2.4	0
GA8-25A	CA	3.1	0	2.3	0

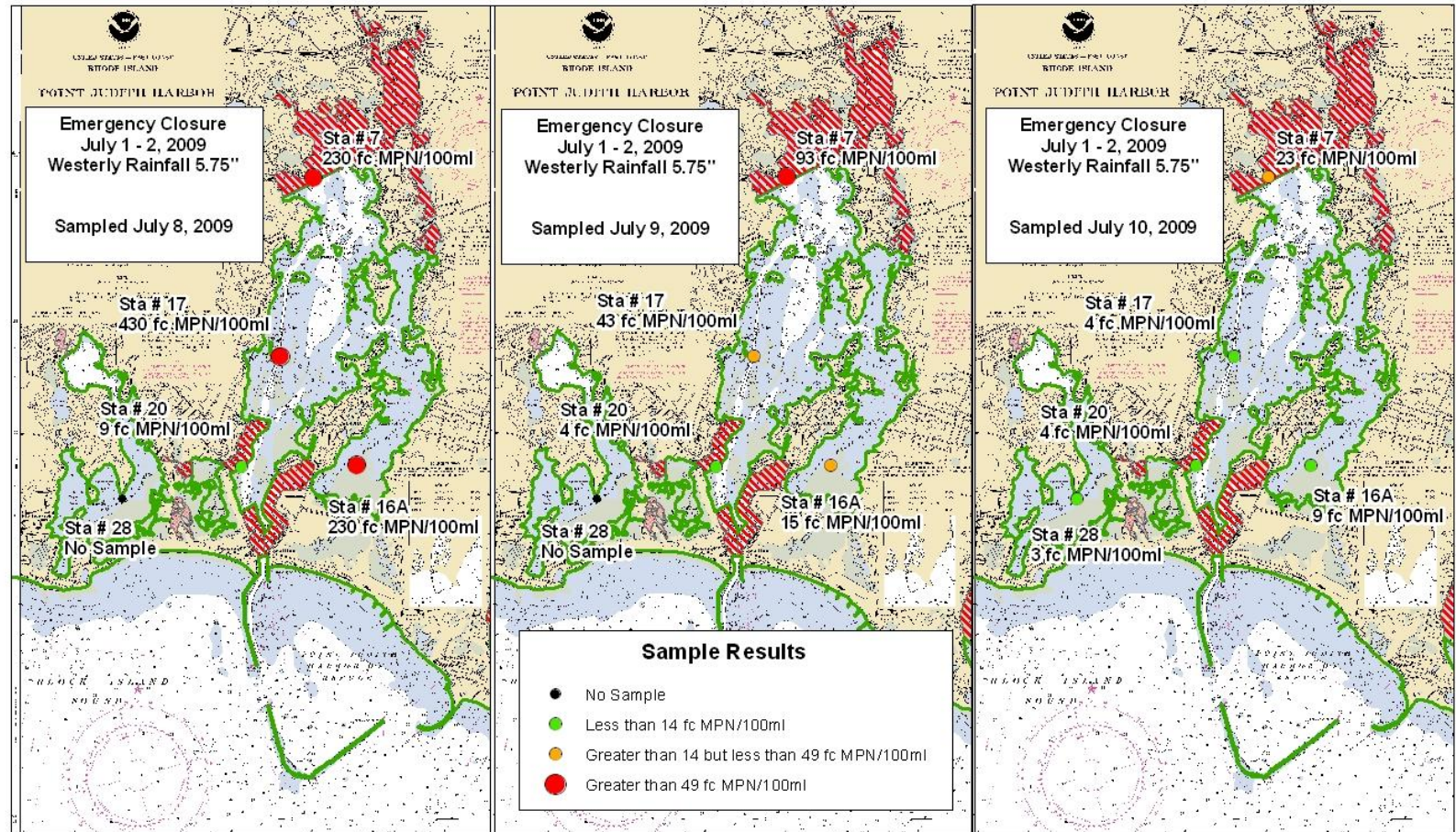
CA = Conditional Area

RIDEM SHELLFISH FECAL COLIFORM GROWING AREA MONITORING RESULTS

				December only data 2000 to present		Excluding December data (7/7/10 - 1/18/11)	
Station	Status	MEAN(14)	%> 49 (10%)	MEAN(14)	%> 49 (10%)	MEAN(14)	%> 49 (10%)
GA8-4	CA	3.5	0	13.9	9.09	2.8	0
GA8-5	CA	4.5	13.33	23.3	27.27	2.5	0
GA8-12	CA	3	0	18.5	27.27	2.6	0
GA8-13	CA	3.5	13.33	30.5	45.45	2.1	0
GA8-15	CA	2.2	0	5.5	9.09	2	0
GA8-17	CA	3.1	0	11.5	9.09	3	0
GA8-18	CA	2.6	0	12.9	9.09	2.4	0
GA8-25A	CA	3.1	0	18.8	14.29	2.3	0

CA = Conditional Area

Point Judith Pond Water Quality After Significant Rain Events



Appendix 6.1 – Rhode Island Commercial Fishing Infrastructure

Excerpt (Table 4.2) from the “*Rhode Island Commercial Fishing and Seafood Industries – The Development of an Industry Profile*” Final Report Summary, October 2011. Prepared by the Cornell Cooperative Extension Marine Program, Funding provided by the Commercial Fisheries Research Foundation through NOAA award #NA10NMF4720480.

Table 4.2: Rhode Island Commercial Fishing Industry Infrastructure
(A Current Inventory of Statewide Assets, Facilities, and Infrastructure Supporting Commercial Fishing)

Data/Information sources used were RIDEM (RI Seafood/Dealer list), RI Ports and Commercial Harbors 2010, Point Judith and Newport fact sheets (RIDEM), personal communications (Robert Carpenter, Larry Mouradjian and Terri Bisson (RIDEM).

TOWN/PORT	PUBLIC DOCKAGE/LAYDOWN AREAS & AVAILABE SERVICES (WATER, ELECTRIC, SECURITY)	FISH DEALERS/PROCESSORS and SPECIAL SERVICES	TRANSPORTATION, FUELING, and ICE SUPPLY	GEAR/ ELECTRONIC SUPPLY and OTHER SERVICES	VESSEL & EQUIPMENT SERVICES
Bristol	<ul style="list-style-type: none"> - 41 Slips with 2 additional piers providing berthing for comm. Fishing vessels - boat ramp with medium use by quahog boats - laydown acreage = .6 acres - security by full-time harbor master and US Coast Guard 	<ul style="list-style-type: none"> - 6 dealer/processors located in Bristol - cold storage/refrigerated trucks available 	<ul style="list-style-type: none"> - dealer/processor and/or common carrier truck transportation - fuel via area gas stations, truck delivery, and local marinas 	<ul style="list-style-type: none"> - marine electronics located at Herreschoff Pier 	<ul style="list-style-type: none"> - not available
East Greenwich	<ul style="list-style-type: none"> - approximately 40 slips considered commercial - limited offloading of shellfish - no laydown acreage - security by full-time harbor master 	<ul style="list-style-type: none"> - Rhode Island Clam is a dealer/wholesaler w/ 2 slips available for offloading, onsite laydown area - cold storage/refrigerated trucks available 	<ul style="list-style-type: none"> - dealer/processor and/or common carrier truck transportation - fuel via area gas stations, truck delivery, and local marinas - ice available through Rhode Island Clam 	<ul style="list-style-type: none"> - not available 	<ul style="list-style-type: none"> - Anderson's Boat Yard serves small commercial vessels
Little Compton	<ul style="list-style-type: none"> - 2 piers that provide berths for approximately 26 vessels - boat ramp and adjacent parking used by commercial fishermen for launching and gear transfer - security by full-time harbor master - water, electric are available on the piers - no laydown acreage available 	<ul style="list-style-type: none"> - 1 main fish dealer - ice house/refrigerated trucks and indoor fish weighing station available 	<ul style="list-style-type: none"> - dealer/processor and/or common carrier truck transportation from both piers - fuel via area gas stations, truck delivery, and local marinas - ice available through dealer/processor 	<ul style="list-style-type: none"> - not available 	<ul style="list-style-type: none"> - not available
Narragansett (Point Judith)	<ul style="list-style-type: none"> - 40 piers all for commercial berthing – 202 assigned slips (as of July 2011) see below for more detail - water and electric are available - RI DEM holds title over the port and maintains security along w/ US Coast Guard - some mooring sites are available - laydown acreage = 28.31 acres 	<ul style="list-style-type: none"> - 9 dealer/processors located in Narragansett - cold storage/refrigerated trucks available - The Pt. Judith pier connected to the Narragansett Town sewer system - Town Dock and Pt. Judith's Fishermen's Company have waste water treatment systems 	<ul style="list-style-type: none"> - dealer/processor and/or common carrier truck transportation - 2 fueling docks (Galilee Fuel) on site and fuel truck delivery - port dealer/processors supply ice. Additionally, many vessels have onboard ice making capability 	<ul style="list-style-type: none"> - Point Judith Electronics - Superior Trawl - Trawlworks 	<ul style="list-style-type: none"> - Rhode Island Engine Repair

TOWN/PORT	PUBLIC DOCKAGE/LAYDOWN AREAS & AVAILABE SERVICES (WATER, ELECTRIC, SECURITY)	FISH DEALERS/PROCESSORS and SPECIAL SERVICES	TRANSPORTATION, FUELING, and ICE SUPPLY	GEAR/ ELECTRONIC SUPPLY and OTHER SERVICES	VESSEL and EQUIPMENT SERVICES
Newport	<ul style="list-style-type: none"> - state pier #9 managed by RI DEM exclusive for commercial fishing, offers 700' of dock space w/ 3 acres of laydown area -37 assigned slips (as of July 2011) see below for more details -The slip fee is \$40 per linear foot - security by full-time harbor master -20x20 lobster holding facility used by commercial lobstermen -Long Wharf is city owned and designated for comm. fishing -Goat Island offers berthing for fishing vessels 	<ul style="list-style-type: none"> - 10 dealer/processors located in Newport (included Middletown) - cold storage/refrigerated trucks available 	<ul style="list-style-type: none"> - only access is local roads to interstate highway system - dealer/processor and/or common carrier truck transportation - fueling facilities on site or truck delivery - ice available through dealer/processor 	<ul style="list-style-type: none"> - not available 	<ul style="list-style-type: none"> - Newport Shipyard full service shipyard with some commercial clients
New Shoreham (Block Island)	<ul style="list-style-type: none"> - 1 wharf in Old Harbor dedicated to comm. fishermen provides offloading, berthing, and small laydown area - small cove in New Harbor used by lobster boats for mooring 	<ul style="list-style-type: none"> - 3 dealer/processors located on Block Island - cold storage/refrigerated trucks available 	<ul style="list-style-type: none"> - ferry to dealer/processor and or common carrier truck transportation - fuel via area gas stations, truck delivery, and local marinas - ice available through dealer/processor 	<ul style="list-style-type: none"> - not available 	<ul style="list-style-type: none"> - not available
North Kingston (Wickford/ Allen Harbor)	<ul style="list-style-type: none"> - 28 Berths solely for comm. fishing on Town Wharf -security by full-time harbor master and harbor commission - Gardiner's Wharf provides offloading 	<ul style="list-style-type: none"> - Gardiner's Wharf Seafood located on G.W. Wharf provides offloading - cold storage/refrigerated trucks available -A total of 7 dealer/processors 	<ul style="list-style-type: none"> -dealer/processor and/or common carrier truck transportation - fuel via area gas stations, truck delivery, and local marinas - ice available through dealer/processor 	<ul style="list-style-type: none"> - not available 	<ul style="list-style-type: none"> - Wickford Shipyard provides some commercial services including metal fabrication and welding
Portsmouth	<ul style="list-style-type: none"> - municipal boat ramp used by <u>shellfishermen</u> to launch boats and exchange gear - 8 piers, 1 wharf, and 320 berths - combination of limited commercial and recreation use - 4.75 acres of laydown area 	<ul style="list-style-type: none"> - 2 dealer/processors located in Portsmouth - cold storage/refrigerated trucks available 	<ul style="list-style-type: none"> - dealer/processor and/or common carrier truck transportation - fuel via area gas stations, truck delivery, and local marinas - ice available through dealer/processor 	<ul style="list-style-type: none"> - numerous businesses available including Cay Electronics, Custom Navigation Systems, and Life Raft and Survival Equipment, Inc. 	<ul style="list-style-type: none"> - lifts, cranes, workshops, and forklifts available for marine repair

TOWN/PORT	PUBLIC DOCKAGE/LAYDOWN AREAS & AVAILABE SERVICES (WATER, ELECTRIC, SECURITY)	FISH DEALERS/PROCESSORS and SPECIAL SERVICES	TRANSPORTATION, FUELING, and ICE SUPPLY	GEAR/ELECTRONIC SUPPLY and OTHER SERVICES	VESSEL and EQUIPMENT SERVICES
Providence	- full and part-time harbor master and receives monies from US Dept. of Homeland Security for port security	- 2 dealer/processors located in Providence - cold storage/refrigerated trucks available	- transportation includes rail reaching major US connections, interstate highway system, and sea - dealer/processor and/or common carrier truck transportation - fuel via area gas stations, truck delivery, & local marinas.	- not available	- Promet Marine Services Corp. provides sandblasting and painting, welding, mechanical, and electrical repair services to 98% of Rhode Island's fishing fleet
South Kingston	- two 35 ft. berths for commercial fishing - security by Waterfront Advisory Commission	- 12 dealer/processors located in South Kingston	- fuel via truck delivery, and local marinas	- not available	- not available
Tiverton	- security by Harbors & Coastal Waters Management Commission - there is some laydown acreage available	- 3 dealer/processors located in Tiverton - processing is available on pier 1 - cold storage/refrigerated trucks available	- dealer/processor and/or common carrier truck transportation - fuel via area gas stations, truck delivery, and local marinas - ice available through dealer/processor	- not available	- Quality Yachts does some commercial fishing vessel repair and provides some berths
Warren	- 40 to 45 quahog boats located on the docks and piers along the waterfront including Town Dock - Town Wharf has several larger fishing vessels and 2 large trawlers	- Blount Seafood processes clams & other seafood - 3 additional dealer/processors located in Warren - cold storage/refrigerated trucks available	- dealer/processor and/or common carrier truck transportation - fuel via truck delivery and local marinas	- not available	- Blount Boats repair, construction, fabrication, and machining - Ginalski Boatyard
Warwick 70% of R.I. shellfishermen Located here (150-200)	- city owned floating dock heavily used by comm. fishermen - pier adjacent to Town Landing has 20 berths exclusive for comm. fishing - 6 moorings off the Town Landing - boat ramp used heavily for launching and transferring gear	- 6 dealer/processors located in Warwick - cold storage/refrigerated trucks available	- dealer/processor supplied truck transportation and/or common carrier - fuel via area gas stations, truck delivery, and local marinas - Ray's Bait is a bait/fuel dock used by the shell fishing fleet - ice available through dealer/processor	- Ocean Marine	- not available

Appendix 5.2

Shellfish Management Plan Economic Scope of Work (SMP ESOW) Final Report

Demand and Market Interaction Analysis of Rhode Island Wild-Caught Shellfish

Submitted by

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May 30, 2014

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Abstract

As with any resource management schemes and regulations, their effectiveness is influenced by the market forces at work. Management of wild shellfish harvest has been conducted through a series of opening and closing of fishing areas aiming to protect the resource stock and, in the event of water quality concerns, to protect public health. However, these openings and closings inevitably influence the market, particularly the ex-vessel prices that harvesters receive. DEM has long recognized their management practices' impact on the market, but has been operating without a concrete understanding of how Rhode Island's shellfish market works. In light of the development of the Rhode Island Shellfish Management Plan, this study takes the first step in understanding and quantifying the market interactions of wild harvested shellfish products in the state. Specifically, we estimated how sensitive the ex-vessel prices are of shellfish products (three market categories for quahog, scallop, and whelk) with respect to the quantity landed, both of its own and other products. The analyses were conducted using the landings and value data from Statistical Atlantic Fisheries Information System (SAFIS). The study found that ex-vessel prices were responsive to the quantity landed but that it was less than proportional: A 1% increase in landing volume of a product will lead to less than 1% drop in price of that product. However, the scale of sensitivity varied across products: most sensitive was necks and least sensitive was cherrystones. For example, if the status quo is 100 counts of landing with ongoing ex-vessel price of \$0.15 per count, for cherrystone the landing needs to increase up to 139 counts (+39%) for the price to fall by a penny. For necks, on the other hand, the landing only needs to increase to 109 counts (+8.6%) to have the same price effect. The study also found that shellfish products included in this study were all substitutes to each other, meaning that if the landing volume of necks increases, the dealers' demand for cherrystone will drop. This suggests that consumers' demand (i.e., substitutive relation) is more dominant than potential complementarity of goods in processing or distribution through the supply chain. The study did not include two major shellfish products in Rhode Island, namely oysters and mussels, primarily due to the limited availability of market data at the granularity comparable to SAFIS data. Inclusion of these products is thus left for future research.

1. Introduction

Wild shellfish management in Rhode Island is undertaken by the RI Department of Environmental Management (DEM), based on advice and recommendations provided by the RI Marine Fisheries Council. The management is aimed to achieve, among other objectives, conserving naturally occurring shellfish populations in RI waters and managing public health outcomes due to, in part, water quality issues. However, it is important to recognize that any regulatory actions will have impacts on shellfish markets, particularly the ex-vessel price. And DEM clearly recognizes this: the opening and closing of fishing areas are controlled in part to meter the flow of product to the market such that prescribed biologically-safe total landings are spread across the fishing season as much as possible. If successful the products will be available throughout the season and the market price will be stabilized, which will benefit both the consumers and harvesters.

It is true that shellfish management authority as described in a series of statutory sections RIGL 20-6 focuses on protecting and managing the shellfish resource, and does not directly include “economic value of the shellfish to the fishers.” It is also true, however, that for any management scheme or regulation to be effective, policy must recognize the market forces at work when evaluating proposed intervention or regulation of shellfishing. This is because the regulations that affect the market price will, in return, influence the harvesters’ behavior and this will affect the status of the shellfish stocks. As such, ignoring the market force could not only nullify the management effectiveness but could backfire and lead to unintended adverse impact on the primary target of management—the stock of shellfish. In reality, achieving a steady flow of shellfish to the market is often disrupted due to the water quality and public health concern-related closures of fishing areas. This complicates the DEM’s effort in trying to stabilize the products flow and their market price.

The challenge for DEM is how to manage the opening and closing of fishing areas in a “sensible” manner, which is to minimize the price volatility. And because the price of a product is determined in a market reflecting all sorts of variables, including fluctuations in resource availability and consumer demand as well as the influence of other seafood products, understanding how these variables interact with one another and with managerial interventions is critical. This study is the first step towards a better understanding of how the management interacts with the market through economic analysis of the Rhode Island shellfish market, which is essential to guide and support shellfish management policies in Rhode Island.

2. Objectives for this study

As this is the first step towards understanding the ex-vessel market for wild-caught shellfish, this study will focus on the quahog and following two aspects of its market relationships:

- 1) The relationship between the price of quahog and its quantity landed;
- 2) The relationship between prices of quahog and other closely related products.

The first objective is directly related to the current situation where the opening and closing of an area triggers a large fluctuation of landing volume, affecting the ex-vessel price: for example, it could be the case that when an area opens, more quahogs are landed, causing the

market to flood, and the price of quahogs to decline. In particular, we will estimate the so-called “own price flexibility”, which measures the percentage change in price due to a percentage change in landed quantity (see Box 1). For quahogs, we conducted separate analyses for each market category (i.e., necks, cherrystone, and chowder).

In addition to its own landing volume, the price of quahog may be affected by the landing volume of other closely related products—this is what the second objective is set to analyze. The direction of the change in price, in part, depends on whether the relationship is complementary or substitutive. This is called “cross-price flexibility”, and for this study we chose to analyze this among the market categories for quahog plus scallops and whelk.²

Box 1: Price flexibility (Houck 1965)

For example, if an estimated own price flexibility is -0.3 it means that the price will drop by 0.3% as a result of 1% increase in landed volume. Since theoretically the price and quantity of a good move in an opposite direction, we would expect the own price flexibility to be some negative number.

If estimated cross-price flexibility for goods A and B is 0.2, it means that the price of good B will increase by 0.2% due to 1% increase in volume of good A. In this case, goods A and B are said to be complements.

If estimated cross-price flexibility for goods A and B is -0.2, it means that the price of good B will decrease by 0.2% due to 1% increase in volume of good A. In this case, goods A and B are said to be substitutes.

3. Data

3.1 Source

We obtained dealer-reported data, including trip-level landing from Statistical Atlantic Fisheries Information System (SAFIS). The data consists of daily landings of all the wild shellfish species harvested from open waters in Rhode Island from January 2007 to January 2013. It reports the quantity harvested and value, along with the unit of quantity used for trade (e.g., bushels, pounds, count). A total of 77 dealers reported their shellfish sales to DEM during this time period, of which only 13 or so dealers were consistently trading sizeable volume, whereas some of the other dealers operated seasonally.

For the landing and value data from other states, we sought to retrieve quahog price data from maritime States in the Eastern United States: Maine, New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Virginia, North Carolina, South Carolina, and Florida. However, we were only able to obtain access to data from Massachusetts, Connecticut, Virginia, and South Carolina. Of these states, Connecticut and South Carolina did not have sufficient data to be included in our analysis, and their presence in the quahog market was rather small to have measurable influence in the Rhode Island quahog market. Thus, we included data from Massachusetts and Virginia to represent the quahog markets from neighboring states.

SAFIS data for wild harvested shellfish in Rhode Island includes quahogs, scallops, oysters, mussels, soft shell clams, and whelk (Table 1). The data clearly shows that quahogs and scallops are the two main wild shellfish being landed in Rhode Island by volume. Soft shell

² Two other important shellfish available in Rhode Island are oysters and blue mussels. However, the majority of their production is attributed to aquaculture, which we were unable to obtain sufficient data to conduct the analysis. The inclusion of these important market products is therefore left for future study.

clams were significant, but its recent downward trend has been dramatic; in 2012, soft shell clams account for a mere 0.35% of total landing. Oyster and mussel landings are also small, but this is to be expected since SAFIS data only reflects wild harvest, while the majority of products of these species being marketed originate from aquaculture. Whelk is not a major species in volume, but is relatively consistent across years in our sample. Based on these observations, the species/products included in this study were quahogs (by market categories), scallops, and whelks.

3.2 Market categories

We inquired experts in commercial quahog shellfishing to determine the sensible market categories to include in this study. Of the four commonly cited market categories of quahog—little necks, top necks, cherrystone, and chowder—we decided to combine the little and top necks into one market category (Table 1). There are several reasons for this decision. First, both are mostly marketed as raw half shell products. Second, the distinction of these two categories is not precise and hence the onsite sorting is said to be performed loosely. Thus, numbers recorded in SAFIS for little necks and top necks may be quite inconsistent across different dealers. Cherrystones and chowders have distinct markets: the former is mostly consumed as cooked product, and the latter is mainly used to make chowders, as its name suggests. As such, these two categories were maintained as is.

The two scallop categories in the SAFIS data, sea scallop and bay scallop, were also combined (Table 1). The rationale behind this decision is that (a) bay scallops are less harvested compared to sea scallops, and (b) both are supplied as frozen eye product,³ thus combining the two will not affect the demand analysis in any significant way.

3.3 Price calculation and measurement unit conversion

Ex-vessel market prices for each product are the essential data for this study, but because SAFIS does not record the unit price paid by the dealer, we needed to calculate them. SAFIS does record the total amount paid by a dealer to fishers for each product, so if we also have the total volume purchased by a dealer we can compute the unit price by dividing the total value by total volume.

The problem was that SAFIS recorded the landing volume by various units, which differ across products and dealers. For example, quahogs were mainly traded on either a per-pound or per-count; and sea scallops were traded by either a per-pound or per-meat-pound. We used the unit conversion table provided by DEM (Table 2) to align all volume units to pounds.

We then computed the price per pound by dividing the reported total value by the converted total volume. With these daily prices that a dealer paid for each product, we calculated the market average daily price of a product by taking the weighted average of all the prices, using the volume as the weight.

4. Estimation method

³ The adductor muscles in scallops will grow in significant size and are usually called “eye”. In United States, the scallops are processed and only the adductor muscles are marketed.

The primary objective of data analysis is to obtain estimates of price flexibility. The theoretical definition of price flexibility is the measure of how sensitive the price for a good is to the change in the quantity demanded of that good (“own” price flexibility) or closely related goods (“cross” price flexibility). Formally, it is the percentage change in price due to a percentage change in quantity demanded:

$$\text{Price flexibility} = \frac{\Delta P/P}{\Delta Q/Q} = \frac{\Delta P}{\Delta Q} \cdot \frac{Q}{P}, \quad (1)$$

where Q and P denote quantity and price, respectively. Δ denotes “change.” When Q and P are of the same good, then the result is called own-price flexibility; if they are of different goods then the result is called cross-price flexibility (see Box 1 above).

Note that mathematically price flexibility is a reciprocal of price elasticity, thus one way to estimate price flexibility is by taking the inverse of estimated price elasticity. However, previous studies have shown that price flexibility is best estimated using the proper demand model that does not require computing price elasticity as an intermediate step (Huang 2005). As such, we will use the Inverse Almost Ideal Demand System (IAIDS) model based on Eales and Unnevehr (1988).

IAIDS model is an extension of the Almost Ideal Demand System (AIDS) model, which is one of the most widely-used and well-established demand models introduced by Deaton and Muellbauer (1980). As in AIDS model, the dependent variable for IAIDS model is the share of expenditure of a particular product in total expenditure for all products considered in the analysis. The “expenditure” here is equivalent to the total value reported in SAFIS data. We will call this term the “value share” for product i , which is defined as:⁴

$$\text{Value share } (w_i) = \frac{\text{Value}_i}{\sum_j \text{Value}_j},$$

where $\{i, j\}$ denotes the products, which include {necks, cherrystone, chowder, scallops, whelks}. For example, if the total amount paid to necks on May 1st was \$10K and the total amount paid to all products (including necks) on that same day was \$100K, then the value share for necks on May 1st is 0.1 (or 10%).

This value share was regressed against a set of control variables including own landing quantity and landed volume of the other related products, month and festive events (Thanksgiving and Christmas) dummy variables,⁵ and price of quahogs from other states (Massachusetts and Virginia). We also included the quantity harvested in the last time period to

Box 2: Demand or supply?

Generally, supply and demand are two different things. Shellfish harvested and landed by fishers are “supply.” However, measures such as price flexibility and the analyzing model IAIDS are all built on the concept of “demand.” One might thus naturally ask: Would this be a problem?

For our context here, it will not be a problem. First, “demand” in our context is that of dealers as we are focusing on the ex-vessel market. Second, fishers will not keep an inventory of unsold shellfish since they are extremely perishable. Thus, the supply (i.e. harvested volume) always equals the demand (i.e. dealers’ purchase), with ex-vessel price acting as an adjustment to clear the market.

⁴ In demand analysis literature this term is called “budget share.” We opted not to use this term to avoid any confusion stemming from the word “budget.”

⁵ These two events were included based on expert’s opinion.

incorporate any inertia in the market that might carry over from previous market transactions. Our full model can be written as:

$$w_{it} = \alpha_{it} + \sum_{j=1}^5 \gamma_{ij} \ln q_{jt} + \beta_i \sum_{j=1}^5 w_j \ln q_j + \sum_{m=2}^{12} \mu_{im} \text{Month}_m + \sum_{e=TG}^{Xmas} v_{ie} \text{Event}_e + \sum_{s=MA}^{VA} \rho_{is} \ln p_s + \sum_{j=1}^5 v_{ij} \ln q_{j,t-1} + \varepsilon_{it}. \quad (2)$$

Each product has its own regression equation, thus with five products (i.e., necks, cherrystone, chowder, scallop, whelk) we have five equations to estimate. Since we expect these five products/equations to influence each other in certain ways, we used an estimation method called Seemingly Unrelated Regressions (SUR). For more technical details of IAIDS model and estimation method, see the Appendix.

We tested for several alternative model specifications around equation (2). One aspect was whether to include the *Event* dummy variables for Thanksgiving and Christmas, since we already had November and December month dummy variables.⁶ Another issue was the Virginia quahog price, specifically the lack of observations reported in SAFIS data. There were many instances where the quantity landed was reported but without the total value, we were unable to calculate the unit value. Because of this, including Virginia prices as-is meant our regression was run on only 525 sample out of more than the 1,600 observations listed in the SAFIS data. Removing the Virginia price variable entirely from the analysis would help the sample size problem, but would be conceptually inappropriate, because we know there is a large clam production in Virginia, and it is conceivable that this production could influence the Rhode Island market. The compromise we employed was to replace the missing Virginia price values with the monthly average price reported by National Marine Fisheries Service (NMFS). This will allow us to keep the Virginia price variable and maintain the sample size of 1,598.⁷

Following the standard procedure, the decision on which estimation model to use was made based on the values of log likelihood and information criteria (both Akaike and Bayesian). We decided to keep the *Event* dummy variables as they added sufficient explanatory power. We also found that reducing the sample size down to 525 had a significant negative impact on our estimated results. As such, we will report two models—one with Virginia prices augmented with monthly average for missing values, and the one without Virginia prices altogether.

5. Results

5.1 Regression results

The coefficients in equation (2) were estimated using SUR, and their results are shown in Appendix Table A1. Table A1 panel (a) is the results without Virginia prices, and panel (b) is the one with Virginia prices. Overall the difference between the two models is negligible; in both

⁶ Dummy variable is a variable that takes the value of either 0 or 1 depending on how it is defined. For example, Thanksgiving dummy variable take the value of 1 during the week of thanksgiving and 0 otherwise. Its intent is to capture any “bump” in overall trend in shellfish market during this particular time of the year. Same concept applies for Christmas and month dummy variables.

⁷ While we had the total of more than 1,600 observations in our data, some of them had missing values for one or more variables included in the regression. Such observations are not included in the regression sample, hence its size is smaller than the total sample size.

models the key variables have the expected signs and are statistically significant. Statistics for the model's goodness of fit show that the model with Virginia prices is better. As such, we will focus our attention to the results with Virginia prices.

Our regression results show that value share of good i will increase when the quantity of that good increases, and the share will decrease when the quantity of other goods increase. This means, for example, that the value share of necks rises when the volume of necks increases, while the value share of necks decreases when the volume of chowder increases. We also found some seasonal variability patterns captured by month and event by dummy variables. Anecdotally, we have been told that the demand for quahogs rises during the holiday season in December, but depending on the timing of area closures, this high-season can spillover to January. The results for necks are consistent with this anecdote: any statistically significant month dummies have negative signs, indicating that the value share for necks during these months is lower compared to the share in January, and an estimate for December is statistically insignificant (i.e. not different from January). For chowder we see an increase in shares for the months of February through May, but decrease in shares in August through November compared to January's share.

5.2 Price flexibility estimates

Table 3 shows the estimated price flexibilities. The diagonal elements in bold represents the own-price flexibility, while off-diagonal elements represent the cross-price flexibilities (c.f., Box 1). Panel (a) is based on the regression model without Virginia prices, and panel (b) is from the model with Virginia prices. Once again, the differences between the two results are negligible, so we will focus on the results presented in panel (b) for the reason mentioned above.

Own price flexibilities ranged from -0.17 for cherrystones to -0.77 for necks. This means for cherrystones a 1% increase in landed volume will decrease its price by 0.17%. Or put it differently, suppose that with 100 counts of cherrystones landed the unit ex-vessel price is 15 cents. Then a 39% increase in landings, or 139 counts of cherrystones, will cause its price to drop by a penny. For necks with own price flexibility of -0.77, just an 8.6% increase in landing volume (e.g., 100 to 109 counts) is enough to drop its price by one cent from 15 cents/count (Box 3).

Our estimation results on price flexibility show that all species and products are found to be price inflexible,⁸ thus indicating that sufficiently large change in quantity is needed to cause the price to change. This is consistent with the anecdotes we heard from the industry that the price of quahogs usually varies within a relatively narrow range. Of course, even with a small change in price percentage-wise, the overall impact can still be significant if the change in quantity is large enough. We will come back to this point later.

Box 3: Impact calculation

Own price flexibility (OPF) is defined as

$$OPF = \frac{\% \text{ change in price}}{\% \text{ change in quantity}}.$$

The price change from \$0.15 to \$0.14 is equal to -6.7%. If the own price flexibility is -0.17 (as was the case for cherrystone), then the percentage change in quantity is:

$$\frac{-0.067}{-0.17} = 0.394,$$

or an increase by approximately 39%.

⁸ Own-price flexibility is between zero and -1, meaning that the price changes less than proportional to the change in quantity. This is referred as price being "inflexible."

Cross-price flexibility, which measures the percentage change in price of good i due to 1% change in the quantity of another good j , shows whether two goods are substitutes or complements to each other. Negative cross-price flexibility indicates that the goods are substitutive, and positive cross-price flexibility indicates that the goods are complementarity (Houck 1965) (also see Box 4). For example, the value in the first row and third column cell of Table 3(b) is -0.61, indicating that if the quantity of necks increases by 1%, the price of chowders will fall by 0.61%. This is because

if the landing volume of necks rises, dealers' appetite for chowder will decline because the two are substitutes, causing the market clearing price for chowders in the ex-vessel market to fall. Our results show that all products—not just necks and chowders—are substitutes to each other, which is not necessarily obvious (Box 4). Lastly, the magnitude of substitutive effect differs across the combinations of products; they range from as little as -0.01 between cherrystones and scallops or whelks to -0.65 between necks and cherrystones.

Box 4: Substitutive/complementarity goods

Substitutive goods are like “coffee and tea” and “tennis ball and golf ball,” while an example for complementarity goods would be “coffee and cream” and “tennis ball and tennis racket.”

From dealers' point of view, the two products (say necks and chowder) can either be substitutes or complements. These relations could arise either from consumer demand (i.e., substitute products) or through complementarities in processing or distribution through the supply chain by the dealers (Scheld et al, 2012). It is difficult to know *a priori* which relation is dominant.

6. Discussions

In light of the challenge that regulators face with regard to the economic impacts of opening and closing harvest areas, several interesting results were found from our analysis. First, on average the prices of these shellfish products are inflexible, indicating that prices do not respond vigorously to small and moderate changes in quantity landed. However, we must emphasize that this is an average and long-term impact; our estimates are not appropriate to predict the price change of a particular date, especially when there was a sudden and/or extremely large changes in landings. For example, during one of landing days in December the volume landed for chowders increased from 214 pounds on one day to 3,055 pounds the next day. This is an increase by 1,328%. Given the price flexibility estimate for chowders of -0.24, the estimated price change is a decline by 319% *if this change in volume is to persist and become as new equilibrium*. In reality according to the data we obtained, the price dropped from \$0.40/lb to \$0.31/lb, or 22.9% decline. Chowder volume came down soon after, indicating that the observed sharp increase in volume was an incidental shock and not a permanent shift in trend.

The point is that the day to day changes in price can be affected by so many factors including incidental and random noises (e.g. special events, weather conditions, dealer-specific incidents) that are impossible to predict with any level of precision. However, data analysis such as this one can provide longer term or average trends. What we have found is that while day to day changes in price due to areas opening and closing might be large, those large changes are most likely not going to persist and the whole system will eventually return to its longtime equilibrium, with potentially less-than-proportional change in its long-term average.

Another important finding is that the products and species of shellfish we considered were all substitutes to each other, rather than complements. This indicates that consumers'

demand (i.e. substitutive relation) is more dominant than potential complementarity of goods in processing or distribution through the supply chain. This means that if, for example, a loss due to an area closure where necks are predominantly harvested can be substituted by an increase in landings for other products/species. That said, the magnitude of impact varies among the products. For some products such as cherrystones and scallops, the impact may be almost negligible (but still non-zero), while for necks and cherrystones the impact may be greater and more impactful to the economy.

There are a few caveats in our analysis stemming from lack of data that need to be mentioned. First, our analysis did not include farmed oysters and mussels, despite their dominant presence in the shellfish market in the state and beyond and thus no doubt compete with the products analyzed here. This is due to the fact that SAFIS only records wild harvested species,⁹ and we neither had sufficient resources nor time to collect enough data from aquaculturists.

Second, we knew from interviewing industry experts that quantity traded and prices in neighboring states' markets could influence the Rhode Island market. It is for this reason that we included quahog prices from other states in our regression. While we would have liked to collect such data from all New England and Atlantic coastal states—and we attempted to do so—we were only able to obtain the data access permit from Massachusetts and Virginia. Resolving these two issues will be one of the subjects for future analysis.

Reference

- Deaton, Angus, and John Muellbauer. 1980. "An Almost Ideal Demand System." *The American Economic Review* 70 (3): 312–26.
- Eales, James S., and Laurian J. Unnevehr. 1988. "Demand for Beef and Chicken Products: Separability and Structural Change." *American Journal of Agricultural Economics* 70 (3): 521. doi:10.2307/1241490.
- Houck, James P. 1965. "The Relationship of Direct Price Flexibilities to Direct Price Elasticities." *Journal of Farm Economics* 47 (3): 789–92. doi:10.2307/1236288.
- Huang, Kuo S. 2005. "How Reliable Is It to Obtain Price Flexibilities from Inverting Price Elasticities?" In Providence, RI: American Agricultural Economics Association. <http://econpapers.repec.org/paper/agsaaea05/19335.htm>.
- Scheld, Andrew M., Christopher M. Anderson, and Hirotugu Uchida. 2012. "The Economic Effects of Catch Share Management: The Rhode Island Fluke Sector Pilot Program." *Marine Resource Economics* 27 (3): 203–28. doi:10.5950/0738-1360-27.3.203.

⁹ Some farmed shellfish data are recorded voluntarily, but it covers far too small of a portion of the entire market for farmed shellfish.

Table 1. Quantity landed for each shellfish species in Rhode Island

Species	Quantity (in 1,000s lbs)					
	2007	2008	2009	2010	2011	2012
Quahog	4,684	4,232	3,853	4,544	5,114	6,961
Necks	3,074	2,795	2,442	2,959	3,641	5,121
Cherrystone	161	208	187	201	188	268
Chowder	1,448	1,227	1222	1,387	1,283	1,571
Oyster	39	13	15	6	4	52
Mussel	0	0	682	626	205	0
Scallop	11,217	2,516	2,830	2,226	5,751	8,011
Soft Clam	1,292	708	490	698	183	41
Whelk	361	423	715	658	745	626
Total	17,592	7,890	8,583	8,761	12,000	15,690

Note: the sum of of necks, cherrystones, and chowders do not match the top row for quahogs due to rounding errors from unit conversions.

Table 2. Conversion factors used to convert different yield units to pound

Species	Market category	Conversion Factor		
		Count to pound	Meat pound to Pound	Bushels to Pound
Quahog				
	Little Neck	7	6.53	N/A
	Top Neck	4.5	6.54	N/A
	Cherrystone	5.75	6.55	N/A
	Chowder	2.5	6.56	N/A
Oyster		0.53	7.5	39.675
Mussel		0.05	3.33	60
Bay Scallop		N/A	9.375	46.875
Sea Scallop		N/A	8.33	N/A

Note: For quahogs, the quantity harvested is reported in count and the quantity is divided by the number given in the first column. For example, if the daily reported quantity of top necks is 100 counts, the quantity in terms of pounds is calculated by dividing reported quantity 100 by 4.5 (100/4.5) which is equal to 22.2 lbs. For scallops where the harvest is reported in meat pounds or bushels, then the quantity is multiplied by the factor given. N/A indicates that the harvest quantity of a species is not reported in that unit.

Table 3. Price Flexibility estimates (the percentage change in price due to 1% increase in quantity)

(a) From a model without Virginia price variables

Quantity (lbs)	Price				
	Necks	Cherrystone	Chowder	Scallops	Whelk
Necks	-0.77 (± 0.01)	-0.65 (± 0.04)	-0.60 (± 0.02)	-0.40 (± 0.04)	-0.19 (± 0.03)
Cherrystone	-0.02 (± 0.001)	-0.17 (± 0.03)	-0.03 (± 0.01)	-0.01 (± 0.003)	-0.01 (± 0.003)
Chowder	-0.08 (± 0.004)	-0.13 (± 0.04)	-0.24 (± 0.03)	-0.06 (± 0.01)	-0.03 (± 0.01)
Scallop	-0.10 (± 0.01)	-0.10 (± 0.02)	-0.11 (± 0.01)	-0.36 (± 0.03)	-0.07 (± 0.02)
Whelk	-0.05 (± 0.01)	-0.09 (± 0.02)	-0.06 (± 0.01)	-0.06 (± 0.02)	-0.65 (± 0.03)

(b) From a model with Virginia price variables

Quantity (lbs)	Price				
	Necks	Cherrystone	Chowder	Scallops	Whelk
Necks	-0.77 (± 0.01)	-0.65 (± 0.04)	-0.61 (± 0.02)	-0.40 (± 0.04)	-0.19 (± 0.04)
Cherrystone	-0.02 (± 0.001)	-0.17 (± 0.03)	-0.03 (± 0.01)	-0.01 (± 0.003)	-0.01 (± 0.003)
Chowder	-0.08 (± 0.004)	-0.13 (± 0.04)	-0.24 (± 0.03)	-0.06 (± 0.01)	-0.03 (± 0.01)
Scallop	-0.10 (± 0.01)	-0.10 (± 0.02)	-0.11 (± 0.01)	-0.36 (± 0.03)	-0.07 (± 0.02)
Whelk	-0.05 (± 0.01)	-0.09 (± 0.02)	-0.07 (± 0.01)	-0.07 (± 0.02)	-0.65 (± 0.03)

Note: All price flexibility estimates are statistically significant at the 1% level; standard deviation of the flexibility is given in parentheses. The numbers in bold represents the own-price flexibility; the rest represents cross price. For example, necks' own price flexibility is -0.77 (top-left corner cell), meaning that 1% increase in necks landing volume will decrease its price by 0.77%. Cross-price flexibility between necks and cherrystones of -0.65 (top row, second column) indicates that 1% increase in necks landing volume will decrease the price of cherrystones by 0.65%.

Appendix: Technical details of IAIDS model and estimation method

Almost Ideal Demand System (AIDS) model is based on the expenditure minimization concept of demand theory. Since its introduction by Deaton and Muellbauer (1980), AIDS is the model of choice by those studying consumer demand behavior because (a) it gives an arbitrary first-order approximation to any demand system, (b) the estimates can be aggregated to macro level, and (c) it has many desirable qualities of demand systems. It is also useful for computing own- and cross-price elasticities, is relatively straightforward, as is computing income elasticity from estimated coefficients.

However, as explained in the main text our interest is estimating the change in price due to the change in quantity (i.e., landed volume)—the price flexibility. While mathematically price flexibility is an inverse of price elasticity, previous studies have shown that price flexibility is best estimated using the proper demand model that does not require computing price elasticity as an intermediate step (Huang 2005). Specifically, we estimated price flexibilities straight from using the Inverse AIDS model (Eales and Unnevehr 1991).

The general form of IAIDS can be written as:

$$w_i = \alpha_i + \sum_{j=1}^I \gamma_{ij} \ln q_j + \beta_i \ln Q, \quad (A1)$$

where w_i is the value share of good i , q_j is the quantity of good j , Q is the quantity index,¹⁰ and α , β , and γ are parameters. We followed Thong (2012) in defining the quantity index as

$$\ln Q \equiv \sum_{j=1}^I w_j \ln q_j. \quad (A2)$$

Substituting equation (A2) into (A1), and noting that our data is a time series we add a t subscript to the resulting equation

$$w_{it} = \alpha_{it} + \sum_{j=1}^I \gamma_{ij} \ln q_{jt} + \beta_i \sum_{j=1}^I w_j \ln q_j. \quad (A3)$$

We then added other covariates to equation (A3) to control for factors other than the landing volume and quantity index that would affect the expenditure share (w_{it}). First, given that the shellfish demand will vary across different months and particular festive season, we included dummy variables for months ($Month_m$) and week of Thanksgiving and Christmas ($Event_e$). Second, market conditions from other states will also influence that of Rhode Island. To incorporate for this effect we included quahog prices from other states (p_s). While we sought to obtain this data from all neighboring states, in the end we were only able to gain access for Massachusetts and Virginia. Lastly, we included lagged quantity landed variable ($q_{j,t-1}$) to incorporate any inertia in the market that might carry over from previous market transaction. Including all these covariates yields our full model as described in equation (2) in the main text, to wit:

$$w_{it} = \alpha_{it} + \sum_{j=1}^5 \gamma_{ij} \ln q_{jt} + \beta_i \sum_{j=1}^5 w_j \ln q_j + \sum_{m=2}^{12} \mu_{im} Month_m + \sum_{e=TG}^{Xmas} \nu_{ie} Event_e + \sum_{s=MA}^{VA} \rho_{is} \ln p_s + \sum_{j=1}^5 \nu_{ij} \ln q_{j,t-1} + \varepsilon_{it}. \quad (A4)$$

¹⁰ Quantity index does not have a meaningful interpretation; it exists merely due to mathematical derivation of equation (A1).

Note that for month dummy variable January is set as the base month and is excluded from the estimated model to avoid collinearity with the constant term (α). For (A4) to be consistent with the demand theory¹¹ and that the sum of value shares must equal to 1, following restrictions are imposed on the parameters during the estimation:

Homogeneity: $\sum_{j=1}^5 \gamma_{ij} = 0$; Symmetry: $\gamma_{ij} = \gamma_{ji}$;

Summation: $\sum_{i=1}^5 \alpha_i = 1, \sum_{i=1}^5 \gamma_{ij} = 0, \sum_{i=1}^5 \beta_i = 0, \sum_{i=2}^5 \mu_{im} = 0,$
 $\sum_{i=1}^5 \nu_{ie} = 0, \sum_{i=1}^5 \rho_{is} = 0, \sum_{i=1}^5 \nu_{ij} = 0.$

Estimated results are then used to calculate the price flexibility. For own price flexibility of good i , denoted as φ_i , is

$$\varphi_i = -1 + \frac{\gamma_{ii} + \beta_i (w_i - \beta_i \ln Q)}{w_i}.$$

For cross-price flexibility between goods i and j , denoted φ_{ij} , is

$$\varphi_{ij} = \frac{\gamma_{ij} + \beta_i (w_j - \beta_j \ln Q)}{w_i}.$$

¹¹ These are (a) homogeneous of degree zero in prices and total expenditures taken together, and (b) Slutsky symmetry (Deaton and Muellbauer 1980).

Table A1. Full results of IAIDS model regression
(a) Without Virginia price variables

	Dependent variable: expenditure share for									
	Necks		Cherrystone		Chowder		Scallop		Whelk	
RI quantity										
Necks	0.15	***	-0.01	***	-0.05	***	-0.06	***	-0.03	***
	-0.003		-0.0004		-0.001		-0.002		0.002	
Cherrystone	-0.01	***	0.02	***	-0.002	***	-0.002	***	-0.002	***
	-0.0004		-0.0003		-0.0004		-0.0002		0.0002	
Chowder	-0.05	***	-0.002	***	0.07	***	-0.01	***	-0.01	***
	-0.001		-0.0004		-0.001		-0.001		0.001	
Scallop	-0.06	***	-0.002	***	-0.01	***	0.09	***	-0.01	***
	-0.002		-0.0002		-0.001		-0.002		0.001	
Whelk	-0.03	***	-0.002	***	-0.01	***	-0.01	***	0.05	***
	-0.002		-0.0002		-0.001		-0.001		0.002	
MA prices										
Necks	-0.004	*								
	-0.002									
Cherrystone			-0.0008	*						
			-0.0005							
Chowder					-0.003					
					-0.002					
Quantity index	-0.02	***	-0.003	***	-0.004	***	0.02	***	0.01	*
	-0.004		-0.0003		-0.001		-0.003		0.003	
Lagged quantity										
Necks	-0.01	***	-0.001	***	0.001		0.03	***	-0.01	***
	-0.005		-0.0004		-0.001		-0.004		0.004	
Cherrystone	0.01	***	0.0005		0.003	***	-0.01	***	-0.004	
	-0.004		-0.0003		-0.001		-0.004		0.004	
Chowder	0.01		0.001		-0.002		-0.01		-0.001	
	-0.01		-0.0004		-0.001		-0.01		0.01	
Scallop	0.01	***	0.001	***	0.002	***	-		-0.01	***
							0.00004			
	-0.002		-0.0002		-0.001		-0.002		0.002	
Whelk	-0.01	***	-0.001	***	-0.003	***	0.003	*	0.01	***
	-0.002		-0.0002		-0.001		-0.002		0.002	
Month dummy (base = January)										
February	-0.03	**	0.002	**	0.007	*	0.01		0.02	
	-0.01		-0.001		-0.004		-0.01		0.01	
March	-0.01		-0.001		0.008	**	-0.01		0.02	
	-0.01		-0.001		-0.003		-0.01		0.01	
April	0.04	***	0.001		0.02	***	-0.03	***	-0.03	**
	-0.01		-0.001		-0.003		-0.01		0.01	
May	-0.03	*	-0.0008		0.01	**	-0.01		-0.03	**
	-0.02		-0.001		-0.004		-0.01		0.02	

Table A1. Full results of IAIDS model regression

(a) Without Virginia price variables (cont)

	Dependent variable: expenditure share for				
	Necks	Cherrystone	Chowder	Scallop	Whelk
Month dummy (base = January)					
June	0.03	0.002	-0.002	-0.006	-0.02
	-0.02	-0.001	-0.004	0.02	0.02
July	0.06 ***	0.002	0.004	0.02	-0.09 ***
	-0.02	-0.001	-0.004	-0.01	0.02
August	0.07 ***	-0.001	-0.01 **	0.03 **	-0.09 ***
	-0.02	-0.001	-0.004	-0.01	0.01
September	0.07 ***	0.0002	-0.002	0.01	-0.08 ***
	-0.02	-0.001	-0.004	-0.01	0.01
October	-0.01	-0.002	-0.001 ***	0.004	0.02
	-0.02	-0.001	-0.004	-0.01	0.02
November	-0.03	-0.002	-0.01 **	-0.01	0.05 ***
	-0.02	-0.001	-0.01	-0.02	0.02
December	0.02	-0.002 *	-0.003	-0.01	-0.004
	-0.02	-0.001	-0.004	-0.02	0.02
Thanksgiving	-0.04	-0.002	-0.01	0.01	0.04 *
	-0.02	-0.002	-0.01	-0.02	0.02
Christmas	0.01	0.001	0.02 ***	0.01	-0.04 **
	-0.02	-0.002	-0.01	-0.02	0.02
Constant	0.39 ***	0.08 ***	0.12 ***	0.07 *	0.35 ***
	-0.04	-0.003	-0.01	-0.04	0.04
Observations	1,605	1,605	1,605	1,605	1,605
R ²	0.72	0.70	0.72	0.76	0.74

Note: for each variable, top row is the estimated coefficient and the bottom row is the standard error. Statistical significance is indicated as * (10%), ** (5%), and *** (1%).

Table A1. Full results of IAIDS model regression
(b) With Virginia price variables

	Dependent variable: expenditure share for					
	Necks	Cherrystone	Chowder	Scallop	Whelk	
RI quantity						
Necks	0.15 ***	-0.01 ***	-0.05 ***	-0.06 ***	-0.03 ***	
	-0.003	-0.0004	-0.001	-0.002	0.002	
Cherrystone	-0.01 ***	0.02 ***	-0.002 ***	-0.002 ***	-0.001 ***	
	-0.0004	-0.0003	-0.0004	-0.0002	0.0002	
Chowder	-0.05 ***	-0.002 ***	0.07 ***	-0.01 ***	-0.01 ***	
	-0.001	-0.0004	-0.001	-0.001	0.001	
Scallop	-0.06 ***	-0.002 ***	-0.01 ***	0.09 ***	-0.01 ***	
	-0.002	-0.0002	-0.001	-0.002	0.001	
Whelk	-0.03 ***	-0.002 ***	-0.01 ***	-0.01 ***	0.05 ***	
	-0.002	-0.0001	-0.001	-0.001	0.002	
MA prices						
Necks	-0.004 *					
	-0.002					
Cherrystone		-0.001				
		-0.001				
Chowder			-0.003			
			-0.002			
VA prices						
Neck	-0.002					
	-0.002					
Cherrystone		-0.001 **				
		-0.0002				
Chowder			-0.001			
			-0.002			
Quantity index	-0.02 ***	-0.003 ***	-0.004 ***	0.02 ***	0.01 *	
	-0.004	-0.0003	-0.001	-0.003	0.003	
Lagged quantity						
Necks	-0.01 ***	-0.001 ***	0.001	0.03 ***	-0.01 **	
	-0.005	-0.0004	-0.001	-0.004	0.004	
Cherrystone	0.01 ***	0.001	0.003 ***	-0.01 ***	-0.004	
	-0.004	-0.0003	-0.001	-0.004	0.004	
Chowder	0.01	0.001	-0.002	-0.01	-0.001	
	-0.01	-0.0004	-0.001	-0.01	0.01	
Scallop	0.01 ***	0.001 ***	0.002 ***	-	-0.01 ***	
	-0.002	-0.0002	-0.001	0.00001	0.002	
Whelk	-0.01 ***	-0.001 ***	-0.003 ***	0.003 *	0.01 ***	
	-0.002	-0.0002	-0.001	-0.002	0.002	
Month dummy (base = January)						
February	-0.03 **	0.002 *	0.01 *	0.01	0.02	

	-0.01	-0.001	-0.004	-0.01	0.01
Table A1. Full results of IAIDS model regression					
(b) With Virginia price variables (cont)					
	Dependent variable: expenditure share for				
	Necks	Cherrystone	Chowder	Scallop	Whelk
Month dummy (base = January)					
March	-0.01	-0.001	0.01 **	-0.01	0.02
	-0.01	-0.001	-0.003	-0.01	0.01
April	0.04 ***	0.001	0.02 ***	-0.03 ***	-0.03 **
	-0.01	-0.001	-0.004	-0.01	0.01
May	0.03 *	0.001	0.01 **	0.01	-0.03 **
	-0.02	-0.001	-0.004	-0.01	0.01
June	0.03	0.002	0.002	-0.01	-0.03
	-0.02	-0.001	-0.004	-0.02	0.02
July	0.06 ***	0.001	0.004	0.02	-0.09 ***
	-0.02	-0.001	-0.004	-0.01	0.01
August	0.07 ***	-0.002	-0.01 **	0.03 ***	-0.09 ***
	-0.02	-0.001	-0.004	-0.01	0.01
September	0.07 ***	0.00001	-0.002	0.01	-0.08 ***
	-0.02	-0.001	-0.004	-0.01	0.01
October	-0.01	-0.002	-0.01 ***	0.004	0.02
	-0.02	-0.001	-0.004	-0.01	0.02
November	-0.03 *	-0.002	-0.01 **	-0.01	0.05 ***
	-0.02	-0.001	-0.01	-0.02	0.02
December	0.02	-0.003 *	-0.003	-0.01	-0.01
	-0.02	-0.001	-0.004	-0.02	0.02
Thanksgiving	-0.03	-0.002	-0.01	0.01	0.03 *
	-0.02	-0.002	-0.01	-0.02	0.02
Christmas	0.01	0.001	0.02 ***	0.01	-0.04 **
	-0.02	-0.002	-0.01	-0.02	0.02
Constant	0.39 ***	0.08 ***	0.12 ***	0.07 *	0.36 ***
	-0.04	-0.003	-0.01	-0.04	0.04
Observations	1,598	1,598	1,598	1,598	1,598
R ²	0.72	0.70	0.72	0.76	0.74

Note: for each variable, top row is the estimated coefficient and the bottom row is the standard error. Statistical significance is indicated as * (10%), ** (5%), and *** (1%).

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Aquaculture of Marine Species in Rhode Island Waters



July 1, 2014

Supersedes and Replaces all Previous Versions

AUTHORITY: These regulations are adopted pursuant to Chapter 42-17.1 and Sections 20-1-2, 20-1-4, 20-1-5, 20-10-5c, and 20-10-12, and in accordance with Chapter 42-35, of the Rhode Island General Laws of 1956, as amended.

TATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

**Aquaculture of Marine Species in
Rhode Island Waters**

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STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Aquaculture of Marine Species in Rhode Island Waters

RULE 1 PURPOSE

The purpose of these regulations is to describe the permits, licensing, and conditions under which aquaculture shall be conducted in Rhode Island.

RULE 2 AUTHORITY

Chapter 42-17.1, and §§; 20-1-2; 20-1-4; 20-1-5; 20-10-5c; and 20-10-12, in accordance with Chapter 42-35 of the RIGL 1956, as amended.

RULE 3 ADMINISTRATIVE FINDINGS

These regulations acknowledge that aquaculture is a form of agriculture (RIGL 2-23-4) and that cultured crops are the property of the aquaculturist and are distinct from wild stocks. Cultured crops are therefore not subject to the statutory and regulatory restrictions governing the protection of wild stocks, except that the minimum size limit established for quahaugs, *Mercenaria mercenaria*, applies to all wild and cultured quahaugs (RIGL 20-10-13.1).

RULE 4 APPLICATION

The terms and provisions of these rules and regulations shall be liberally construed to permit the Department to effectuate the purposes of state law, goals, and policies.

RULE 5 DEFINITIONS

As used in these rules and regulations, the following words and phrases have the following meanings:

- 5.1 **“Adequately Iced”** means that the amount and application of the ice is sufficient to achieve temperature control. The water source for, the production of, and the handling of the ice must be approved by DOH for the intended use of cooling shellfish.

- 5.2 **"Approved waters, or, Approved shellfish growing areas"** mean waters of the state which have been classified by the RI Department of Environmental Management (DEM) Office of Water Resources as Approved Areas, fit for the taking of shellfish for human consumption on a regular basis, according to criteria established by the National Shellfish Sanitation Program (NSSP) Manual of Operations. These classifications may be subject to change as water quality conditions dictate.
- 5.3 **"Aquaculture"** means the cultivation, rearing, or propagation of aquatic plants or animals, hereinafter referred to as cultured crops, under natural or artificial conditions.
- 5.4 **"Aquaculture facility"** means any properly permitted aquaculture operation, either in upland areas or in the State's waters or submerged lands.
- 5.5 **"Aquaculture lease"** means the permitted area for which the Coastal Resources Management Council (CRMC) issues a lease in which aquaculture can be conducted. Leases are discretionary and granted for the express purpose of allowing aquaculture activities on the State's submerged lands or in the water column. Certain types of permitted activities, such as experimental aquaculture operations, may not require a lease.
- 5.6 **"Aquaculturist"** means the individual, firm, partnership, association, academic institution, municipality, or corporation conducting commercial, experimental or restoration aquaculture in Rhode Island.
- 5.7 **"Biosecurity Board"** means the board, within the Coastal Resources Management Council (CRMC), established pursuant to RIGL Section 20-10-1.1 and charged with assisting and advising the CRMC in carrying out the provisions of RIGL Chapter 20-10.
- 5.8 **"Conditionally Approved Areas"** mean any shellfish grounds underlying waters examined and found fit for the taking of shellfish for human consumption on an intermittent basis, declared by the director as conditionally approved waters pursuant to RIGL Sections 20-8.1-3 and 20-8.1-4. Such classification may be subject to change as water quality conditions dictate.
- 5.9 **"Container"** means any bag, sack, tote, or other receptacle used to hold and transport shellfish.
- 5.10 **"CRMC"** means the RI Coastal Resources Management Council.
- 5.11 **"Cultured crops"** mean aquatic or marine animals or plants: (i) that are in the location, water column or artificial conditions specified in a valid aquaculture permit issued pursuant to RIGL section 20-10-3 or that have been taken by the holder of such permit from the location, water column or artificial conditions specified in such permit, or (ii) that have been produced by

- 5.12 **"DEM"** means the RI Department of Environmental Management.
- 5.13 **"Designated sanitation area"** means an area designated by the Department in which aquaculturists must comply with more stringent temperature controls for harvested shellfish. These areas have been determined to be Winnapaug Pond, Quonochontaug Pond, Ninigret Pond, Potter Pond, Point Judith Pond, Island Park Cove (Spectacle Cove), Hog Island Cove and Great Salt Pond.
- 5.14 **"Director"** means the Director of the RI Department of Environmental Management.
- 5.15 **"DOH"** means the RI Department of Health.
- 5.16 **"Harvest"** means the act of removing any shellfish from the water for the purpose of human consumption, commencing when the first shellfish intended for human consumption is removed from the water on any given day.
- 5.17 **"Husbandry"** means any activity related to the cultivation and management of shellfish crops, including but not limited to grading, sorting, cleaning, or planting.
- 5.18 **"Mechanical Refrigeration"** means storage in a container that is approved by the Rhode Island Department of Health and capable of cooling to, and maintaining, an ambient temperature of 45°F or less.
- 5.19 **"Operational plan"** means a written plan, approved by DEM and DOH prior to its implementation, that includes, at a minimum: description of the design and activities of the aquaculture facility, specific location and boundaries of the aquaculture lease and facility, types and locations of structures (rafts, pens, tanks, etc.), species to be cultured, source of these organisms (i.e., wild or cultured), procedures to prevent contamination, program of sanitation and maintenance, description of the water source including details of water treatment, program to maintain water quality, maintenance of records, and how shell stock will be harvested.
- 5.20 **"Possession of aquaculture crops"** means the exercise of dominion or control over cultured crops commencing at the time at which a decision is made not to return the crops to the aquaculture lease or facility from which they were taken. This decision must be made at the first practical opportunity,

- 5.21 **"Possession of wild stocks"** means the exercise of dominion or control over wild stocks commencing at the time at which a decision is made not to return the resource to the immediate vicinity from which it was taken. This decision must be made at the first practical opportunity.
- 5.22 **"Resubmerge"** means, and is strictly limited to, reintroduction of shell stock into approved waters following the removal of such stock from approved waters for husbandry purposes.
- 5.23 **"Shading"** means to shelter by intercepting the direct rays of the sun to protect the shellfish from heat. Shading may be accomplished by any means that effectively protects the harvested shellfish from direct sunlight and prevents excessive heat build-up in the shaded area.
- 5.24 **"Shellfish seed"** means, for quahaugs, *Mercenaria mercenaria*, a shell size less than 20 mm (0.78"), and for oysters, *Crassostrea virginica* and *Ostrea edulis*, a shell size less than 32 mm (1.25"). All measurements are taken along the longest axis.
- 5.25 **"Spat collection"** means the use of apparatus (spat collectors) or cultch to attract or capture larval shellfish.
- 5.26 **"Temperature control"** means the use of ice or mechanical refrigeration, which is capable of lowering the temperature of the shellstock and maintaining it at 50°F or less.
- 5.27 **"Wild stock"** means natural resources, including aquatic or marine animals or plants, which grow within the waters of the state, and are not cultured in any way.

RULE 6 REGULATIONS

6.1 GENERAL PERMITTING REQUIREMENTS

- 6.1.1 Coastal Resources Management Council (CRMC) Assent -- An aquaculturist must apply for and receive a Coastal Resources Management Council (CRMC) Assent to conduct aquaculture as specified in RIGL Chapter 20-10. No application shall be approved by CRMC prior to the consideration of recommendations by the Department of Environmental Management (DEM) Director, who shall consult with and obtain input from appropriate divisions and offices within the department, and the Rhode Island Marine Fisheries Council. No application shall be approved by the CRMC prior to the issuance of a R.I. Pollutant Discharge

- 6.1.2 Aquaculture Permit-- An aquaculturist must apply for and obtain an Aquaculture Permit from the Director to conduct aquaculture as specified in RIGL Section 20-10-12. The application for an Aquaculture Permit must include an operational plan describing the species to be cultured, the methods to be used, the locations where the work will be done, and other provisions detailed in Rule 6.3 herein. The permit shall specify the conditions governing the taking, possession, sale, importation, and transportation of cultured crops utilized in the aquaculture lease or facility. The permit shall be automatically renewed January first annually, providing that proper annual reports of aquaculture activities conducted that year are filed with the Director, in a form prescribed by the Director, no later than December first of each year. Aquaculture Permits will be reviewed, modified if appropriate, and renewed by the Director.
- 6.1.3 Cultured Crops Exempt From Wild Stock Regulations -- Aquaculturists harvesting their cultured crops, in accordance with their CRMC Assent and DEM Aquaculture Permit, are exempt from the statutory and regulatory harvest restrictions governing wild stocks, including: seasons, catch or bag limits, minimum sizes, quotas, and methods of harvest. However, in no case may aquaculturists possess, import, transport or offer for sale for human consumption to any individual or entity cultured quahaugs, *Mercenaria mercenaria*, with a hinge width of less than one inch, unless specifically authorized to possess, import, transport, or sell legal quahaug seed.
- 6.1.4 Endemic Species limitation -- All species cultured at an aquaculture lease or facility must be specifically authorized via an approved DEM Aquaculture Permit. Under no circumstances are permits to be granted for species that are not endemic to Rhode Island without prior approval from the Director with the advice of the Biosecurity Board. Determination of what species are endemic to Rhode Island rests under the authority of the Director.

6.2 GEAR REQUIREMENTS

- 6.2.1 Marking -- All aquaculture apparatus must be marked as specified by the CRMC Assent. Said markings must be clearly visible and maintained at all times.
- 6.2.2 Maintenance and Removal -- The gear and its contents are the possession and responsibility of the aquaculturist, who shall be responsible for its maintenance and eventual removal. The aquaculturist may be required to post a performance bond in an amount specified by CRMC, to be used to return the site, including tidal waters, to the condition

6.3 GENERAL REQUIREMENTS

6.3.1 Operational Plan -- In accordance with the permitting requirements set forth in Rule 6.1 herein, the aquaculturist must submit a written Operational Plan to be reviewed and approved by DEM and maintained on file with the Division of Fish and Wildlife. Operational Plans will be made available for review and inspection by the U.S. Food and Drug Administration. The Operational Plan must be upgraded and resubmitted prior to any change(s) occurring in the aquaculture operation. Aquaculture shall be practiced only in strict compliance with the provisions of the approved Operational Plan. At a minimum, each Operational Plan shall include the following information: description of the design and activities of the aquaculture facility, specific location and boundaries of the aquaculture lease and facility, types and locations of structures (rafts, pens, tanks, etc.), species to be cultured, source of these organisms (i.e., wild or cultured), procedures to prevent contamination, program of sanitation and maintenance, description of the water source including details of water treatment, program to maintain water quality, maintenance of records, and how shell stock will be harvested.

6.3.2 Shipment/Importation -- The aquaculturist must notify the DEM Divisions of Law Enforcement and Fish and Wildlife in writing of every shipment of animals for culture entering this state, at least five working days prior to entry into the state, and each shipment must be accompanied by a certificate of disease inspection from a recognized laboratory appropriate to the species received. A copy of the certificate of disease inspection must be provided to the Division of Fish and Wildlife along with the written notice prior to the importation of any animals for culture. The Director, in consultation with the Biosecurity Board, may waive the requirement for a certificate of disease inspection, or set forth specific requirements governing shipments.

6.4 FINFISH CULTURE REQUIREMENTS -To be developed

6.5 ALGAE CULTURE REQUIREMENTS -To be developed

6.6 SHELLFISH CULTURE REQUIREMENTS

6.6.1 Importation of Shellfish Seed -- All shipments of undersized shellfish brought into Rhode Island for aquaculture operations must be labeled or tagged indicating the origin (operator/company name, license number and body of water), date of importation and destination.

- 6.6.2 Sale for Human Consumption -- In accordance with all DEM and Department of Health (DOH) regulations for the buying, trading, and selling of shellfish, only shellfish cultured in approved waters or within an approved land-based system meeting the water quality criteria for harvesting, may be sold for human consumption, and such sales may only be made to licensed RI dealers. All requirements for handling, tagging, use of shellfish containers, and temperature control, as set forth herein in Rules 6.7 through 6.9 inclusive, as well as all other applicable National Shellfish Sanitation Program and DOH standards, must be adhered to. The CRMC lease number will be listed as the harvest area for cultured shellfish. Aquaculturists must hold the appropriate DEM license to sell shellfish to a licensed RI dealer.
- 6.6.3 Taking or Possession of Wild Stock Shellfish by Aquaculturists-- Aquaculturists who also hold a commercial shellfishing or multipurpose license may not take or possess wild stock shellfish while they are in possession of cultured shellfish crops. Nor may an aquaculturist be in possession of wild stock shellfish while visiting his/her lease or tending his/her shellfish crops, unless they are a properly licensed shellfish dealer and the wild stock shellfish is properly tagged and being held in or at their dealer facility, buy boat, or wet storage operation.
- 6.6.4 Possession of Wild Undersized Shellfish -- Possession of undersized wild stock shellfish is not authorized under any circumstances.
- 6.6.5 Approved Waters-- Water quality at any site used for open water aquaculture or land-based aquaculture must meet the water quality criteria appropriate to the aquaculture activity as determined by the DEM Office of Water Resources.
- 6.6.6 Water Quality Changes -- Water quality and water quality classification of waters within the state are subject to change due to various environmental conditions. In some cases the aquaculturist shall be required to respond to these changes. DEM shall not assume any liability for any changes in classification and shall assume no liability to the aquaculturist for damages incurred due to such actions.
- 6.6.7 Shellfish Aquaculture in Conditionally Approved Growing Areas -- When a shellfish aquaculture lease is in a conditional area, and the area is in the closed status, the aquaculturist may not visit his/her lease to tend his/her shellfish crops, unless the aquaculturist has applied for and received permission from the director because of, and to the extent of, exigent circumstances. Under no circumstances may the aquaculturist harvest cultured stock when his/her lease is in a growing area that is in the closed status.

- 6.6.8 Transfer of Seed From Other Than Approved Waters -- Shellfish seed cultured in other than approved waters may be transferred, by the aquaculturist, to an approved aquaculture lease in approved waters in accordance with the terms of an approved operational plan, with DEM Division of Fish and Wildlife and Division of Law Enforcement notification. If more than 10 percent of the cultured shellfish within a lot or batch exceed the definition of seed (in the case of quahaugs, if any exceed 20 mm, and in the case of oysters, if any exceed 32 mm), they shall not be moved from other than approved waters to an approved growing area without prior permission of the DEM Director and the DOH.
- 6.6.9 Harvest Of Shellfish Transferred From Other Than Approved Waters As Seed-- An aquaculturist wishing to use seed that have been produced in other than approved waters must submit an operational plan to the Director detailing how he/she intends to track and document the growth and harvest of these shellfish. Aquaculturists must maintain accurate and complete records of all shellfish seed culture in other than approved waters and removal of such shellfish seed to approved waters including, but not limited to, source, numbers transferred, size composition, time/dates of transfer, harvest and sale of the shellfish. These records must be maintained for a minimum of two years and must be available for inspection by agents of the DOH, DEM Division of Law Enforcement, or DEM Division of Fish and Wildlife, upon request. If record keeping and tracking protocols are inadequate, then the aquaculturist must only use seed from approved waters. No shellfish may be harvested until they have spent at least twelve (12) months in approved waters.
- 6.6.9.1 Permitted Activities -- If an aquaculturist has a permit to raise shellfish in other than approved water, then it is assumed that all shellfish of that species sold by that aquaculturist have been in other than approved waters, unless the aquaculturist can demonstrate that all shellfish were removed from other than approved waters when seed.
- 6.6.9.2 Transplanting of Shellfish Exceeding Seed Size Limits -- No shellfish exceeding the seed size limits shall be transplanted from other than approved waters unless done so under the authority of the DEM Director and DOH Director according to the Memorandum of Agreement for conducting shellfish transplant/relay operations. Possession, culture and transportation of shellfish other than seed (as defined) from other than approved water is prohibited.
- 6.6.10 Collection of Wild Stock Shellfish Seed -- Collection of wild stock shellfish seed from other than approved waters is prohibited unless approved by the Director or his/her designee in a written authorization. If permission for wild stock seed collection is approved, the site, species and amount must

6.7 HANDLING OF SHELLFISH

- 6.7.1 General Requirements -- Shellfish aquaculturists shall conduct all activities and operations involving or relating to the possession and handling of shell stock so as to prevent contamination, deterioration and decomposition of such shell stock.
- 6.7.2 Containers -- Containers used for storing shell stock must be clean.
- 6.7.3 Vessels -- Vessel decks and storage bins used in the harvest or transport of shell stock shall be kept clean with potable water or water from the growing area in approved classification or the open status of conditional areas. Aquaculturists using a vessel to harvest and transport shell stock shall assure that said vessel is properly constructed, operated and maintained to prevent contamination, deterioration and decomposition of shell stock. Aquaculturists using a vessel to harvest and transport shell stock shall prevent bilge water from coming into contact with shell stock.
- 6.7.4 Bilge Water -- Aquaculturists using a vessel to harvest and transport shell stock shall provide such vessel with effective drainage to avoid contact between bilge water and shell stock. Aquaculturists using a vessel to harvest and transport shell stock shall locate bilge pumps so that discharge shall not contaminate shell stock.
- 6.7.5 Washing -- Shell stock shall be washed reasonably free of bottom sediments as soon after harvesting as possible. The harvester shall be primarily responsible for washing shell stock. If shell stock washing is not feasible at the time of harvest, the dealer shall assume this responsibility. Water used for washing shall be from a potable water source, or growing area in the approved classification or open status of the conditionally approved classification.
- 6.7.6 Waste Discharge Prohibited -- It is unlawful to discharge any sewage from a vessel into the waters of the state.

6.8 TAGGING OF SHELLFISH

- 6.8.1 Required Use of Tagged Containers -- Aquaculturists must place any and all shellfish taken by them (except those shellfish returned to the waters of

6.8.2 Tags--The harvester tag shall be durable, waterproof and sanctioned by the DOH. The tag shall contain the following indelible, legible information in the order specified below:

6.8.2.1 Aquaculturist's identification number as assigned by DEM;

6.8.2.2 Harvest commencement time and date;

6.8.2.3 The harvest location as identified by the CRMC Assent number;

6.8.2.4 Type (species) of shellfish;

6.8.2.5 Approximate quantity of shellfish; and

6.8.2.6 The following statement in bold capitalized type: **"THIS TAG IS REQUIRED TO BE ATTACHED UNTIL CONTAINER IS EMPTY OR IS RETAGGED AND THEREAFTER KEPT ON FILE FOR 90 DAYS"**

6.8.3 Commingling Prohibition and Tagging by Aquaculturists/Dealers -- Aquaculturists shall not place shell stock harvested from more than one growing area into the same container. When the aquaculturist is also a dealer, the aquaculturist has the option to tag the shell stock with a harvester tag or a dealer's tag meeting the requirements of the DOH regulations.

6.8.4 Bulk Tagging -- Bulk tagging of shell stock will be permitted under the following criteria:

6.8.4.1 When shell stock are harvested from one aquaculture lease site or facility on a single day, multiple containers may be utilized on a wrapped pallet, in a tote, in a net brailer, in a single boat, in a vehicle or other container, and the unit tagged with a single tag, provided that the tag specifies the number of individual containers in the unit or an estimate of the total weight, volume, or count; and

6.8.4.2 A written statement is provided that "All shell stock containers in the lot have the same harvest data and area of harvest."

6.9 TEMPERATURE CONTROL OF SHELLFISH

- 6.9.2 General Requirements -- Aquaculturists shall not allow shell stock to deteriorate or decompose from exposure to excessive temperature and shall deliver shell stock to a licensed dealer before such deterioration or decomposition occurs.
- 6.9.3 Harvest of Oysters annually from September 15 through June 30 inclusive -
 - The maximum allowable time between the harvest of shell stock and delivery to a dealer shall be eighteen hours. Possession of shell stock by anyone other than a licensed dealer in excess of eighteen (18) hours is prohibited. This maximum allowable time may be reduced by DEM, via emergency regulation, in certain harvest areas if environmental changes necessitate such adjustment.
- 6.9.4 Harvest of Oysters outside of designated sanitation areas annually from July 1 through September 14 inclusive.
 - 6.9.4.1 All oysters harvested shall be placed in mechanical refrigeration or adequately iced in a storage container within five (5) hours from the commencement of harvest until the shellfish are transferred to a licensed dealer within ten (10) hours.
 - 6.9.4.2 All harvested oysters shall be subject to shading immediately upon harvest.
 - 6.9.4.3 All oysters that are removed from the water for less than twelve (12) hours for husbandry purposes must be resubmerged for no less than forty-eight (48) hours before harvest.
 - 6.9.4.4 All oysters that are removed from the water for twelve (12) hours or greater for husbandry purposes must be resubmerged for no less than seven days (168 hours) before harvest.
 - 6.9.4.5 All oysters that are exposed to air drying must be resubmerged for no less than seven days (168 hours) before harvest.
- 6.9.5 Harvest of Oysters from within designated sanitation areas annually from July 1 through September 14 inclusive.
 - 6.9.5.1 In addition to the requirements of Rule 6.9.4 above, all oysters harvested from a designated sanitation area shall be harvested in compliance with one of the following requirements:
 - 6.9.5.1.1 Harvesters shall terminate all harvest activities and all harvested oysters must be transferred to a dealer or placed in mechanical

- 6.9.5.1.2 Oysters that are harvested after the times specified in Rule 6.9.5.1.1 must be delivered to a licensed dealer within two (2) hours of the commencement of harvest; or placed in mechanical refrigeration or adequately iced within two (2) hours of the commencement of harvest until the oysters are transferred to a licensed dealer.

RULE 7 GENERAL ENFORCEMENT AUTHORITIES

- 7.1 General -- The Director's authority to enforce aquaculture regulations and applicable statutes shall be the same as his or her enforcement powers over the free and common fisheries of the state, as provided for in RIGL Title 20 and Chapter 42-17.1.
- 7.2 Authority to Enter and Inspect -- The director shall have the authority to enter and inspect any and all areas subject to an aquaculture permit for the purposes of determining compliance with the terms and provisions of the CRMC assent or permit and DEM permit.
- 7.3 Violations -- Unless otherwise provided, violations of and/or noncompliance with the regulations set forth herein shall be prosecuted under the applicable sections of RIGL Chapter 20-10. In addition to other penalties provided by law or other rule or regulation, any licensed aquaculturist who violates the provisions of these rules or any order issued by the director shall be subject to suspension, revocation or denial of his/her license and/or permit in accordance with RIGL Sections 20-2-13, 20-10-16.1, and 42-17.1-2(s).

RULE 8 SEVERABILITY

If any provision of these Rules and Regulations, or the application thereof to any person or circumstances, is held invalid by a court of competent jurisdiction, the validity of the remainder of the Rules and Regulations shall not be affected thereby.

RULE 9 SUPERSEDED RULES AND REGULATIONS On the effective date of these rules and regulations, all previous rules and regulations, and any policies regarding the administration and enforcement of aquaculture shall be superseded. These rules and regulations shall supersede the Department of Environmental Management Regulation “***Aquaculture of Marine Species in Rhode Island Waters (June 21, 2002).***”

RULE 10. EFFECTIVE DATE

The foregoing “***Aquaculture of Marine Species in Rhode Island Waters***” after due notice and an opportunity for hearing, are hereby adopted and filed with Secretary of State this _____ day of _____, 2014 become effective twenty (20) days after filing, in accordance with the provisions of the General Laws of 1956, as amended, specifically Chapters 42-17.1 and 42-35 and 4-13.

Janet L. Coit _____
Director of the RI Department of Environmental Management
Notice given on: _____
Effective: _____

Appendix A – Public Voting Results on Most Important Issues Identified for the RI Shellfish Management Plan

All Issues/Votes combined

Key: AQSS = Aquaculture Scoping Session; WHSS = Wild Harvest Scoping Session; RSS = Restoration Scoping Session

➔ Water quality issues (42 total):

- Shellfish restoration for water quality purposes in closed waters (A:8, WH:2, R:13 = **23 total**)
- Definitions and consistency in management; why closures, etc – better communication (Issue identified at WHSS) (A:0, WH:7, R:2 = **9 total**)
- Water quality in closed waters (ex. Narragansett Bay) (A:0, WH:0, R:1 = **1 total**)
- Link the restoration of water quality to habitat restoration and how this will improve the industry; link water quality to restoration efforts 1st (A:0, WH:0, R:3 = **3 total**)
- Nitrogen reduction – impacts on shellfish resources (Issue identified at WHSS) (A:0, WH:4, R:2 = **6 total**)

➔ Coordination between agencies (DEM, CRMC, DOH, NOAA and other agencies); protocols for data sharing (A:11, WH:4 R:19 = **33 total**)

➔ Use conflicts (33 total):

- Create use maps – to address use conflicts, diggers to know where leases are located, etc. (A:27, WH:4 R:1 = **32 total**)
- Social carrying capacity (issue identified at AQSS) (A:1)

➔ Funding & Enforcement (27 total):

- Funding for NRCS Program (utilizes commercial aquaculturist's seed product) (A:2, WH:0, R:6 = **8 total**)
- NOAA funding – How to interface with the National Shellfish Initiative (Issue identified at RSS)
- Enforcement – funding? Also adequate enforcement (i.e. web cams, deputies, etc.) (A:0, WH:0, R:17 = **17 total**)
- Funding – identify how plan can be funded (all issues need a sustainable funding source) (A:0, WH:0, R:2 = **2 total**)
- Sustainable funding source or disease monitoring survey work (Issue identified at RSS)

➔ Seeding and transplants – MOU for seeding; how to maximize seeding biomass (A:2, WH:4, R:15) votes = **21 total**)

➔ Aquaculture as agriculture – clarify, define (A:13, WH:1, R:1 = **15 total**)

➔ Lack of recruitment (people) into shellfishing – there is no next generation (A:0, WH:13, R:0 = **13 total**); Knowledge transfer between generations (A:0, WH:2, R:0 = **2 total**) (Issue identified at WHSS)

➔ Identify spawner sanctuaries based on environmental characteristics (A:1, WH: 4, R:10 votes = **15 total**)

➔ Direct marketing of products (A:4, WH:10, R: 0 = **14 total**)

➔ Public Education (10 total):

- Education component to demonstrate value/safety to the public (regarding restoration and oyster gardening) (Issue identified at RSS) (A:0, WH:0, R:5 = **5 votes**)
- Reach down to K-12 in education (Issue identified at RSS) (A:0, WH:0, R:2 = **2 total**)
- Local community education of regulations and science (A:2, WH:0, R:1 = **3 total**)
- Communicate ongoing, existing, and needed research
- Engage the general public – ensure public voice is heard – who? How? (Issue identified at WHSS)

- Addressing diversity (multicultural aspect) of public (Issue identified at RSS)
 - Consumer education, esp. those who are vulnerable health-wise
 - How does NOAA MSP Initiative tie into what we're doing? – RI is part of this process; citizens aren't informed but concerned (Issue identified at RSS)
- ➔ Climate Change issues (10 total):
- Effects of ocean acidification (Issue identified at WHSS and before) (A:0, WH:4, R:2 = **6 total**)
 - Climate change (research) – how is climate-based ocean acidification occurring, etc. (elaborated in at RSS) (A:1, WH:1, R:1 = **3 total**)
 - Climate change and Sea Level Rise - Anticipate changes to the environment (A:1, WH:0, R:0 = **1 total**)
- ➔ Explanation/justification for rules (10 total):
- Review and justify management areas, pollution closures, spawner sanctuaries (examples include Green Hill Pond, Watch Hill) (Issue identified at WHSS) (WH:8)
 - Division of Shellfish Management Areas – examine, re-evaluate (A:1)
 - DEM designated grow-out areas regarding aquaculture production – how are they determined? What do they mean? (issue identified at AQSS)
 - Division of shellfish management areas – examine, re-evaluate (A:1, WH:0, R:0 = **1 total**)
- ➔ Predator management – i.e. abundance of sea stars affecting shellfish, spider crab abundance (after lobster decline?) Predation – can we use predator control to increase clam numbers? (research) (A:4, WH:6, R:0 = **10 total**)
- ➔ Cost/ Benefit Analysis – Closed waters, use conflicts, best use of space (research) (A:5, WH:0, R:4 = **9 total**)
- ➔ Shellfish stock assessment at a reasonable scalar level (research) (A:0, WH:8, R:1 = **9 total**)
- ➔ Licensing issues – cost, regulations, due date, capacity, exit/entry ratios, 'use it or lose it' (A:5, WH:2, R:2 = **9 total**)
- ➔ Maintain genetic diversity of shellfish stocks (A:7, WH:0, R:1 = **8 total**)
- ➔ Ecological impacts from aquaculture (issue identified at ASS) (A:6, WH:2, R:0 = **8 total**)
- ➔ Need a vision for where we want to be (issue identified at ASS) (A:7, WH:1, R:0 = **8 total**)
- ➔ Upwellers in prohibited waters (A:7, WH:0, R:1 = **8 total**)
- ➔ Management of Invasive Species (A:2, WH:2, R:3 = **7 total**)
- ➔ Ensure industry and management share common goals – “are on the same page”; understand needs of management and industry concurrently when managing resources (Issue identified at WHSS) (A:0, WH:5, R:1 = **6 total**)
- ➔ Develop facility in Jerusalem to support aquaculture in the state (issue identified at ASS – can pertain to restoration and/or wild harvest as well) (A:0, WH:0, R:6 = **6 total**)
- ➔ Disease resistance (issue identified at AQSS) (A:3, WH:0, R:3 = **6 votes**)
- ➔ Concerns about using wild stock for aquaculture (Issue identified at WHSS) (A:0, WH:5, R:1 = **6 total**)
- ➔ Role of shellfish in ecotourism (A:0, WH:1, R:4 = **5 total**)
- ➔ Substrate enhancement – clutching (A:0, WH:0, R:5 = **5 total**)

- ➔ NSSP – reasonable rules? – with regard to restoration, ensure “best management” practices (elaborated on at Restoration Scoping Session) Relationship between commercial harvesters and NSSP (A:4, WH:0, R:1 = 5 total)
- ➔ Develop baselines for the evaluation of restoration projects (research) – historic high as baseline? Is this realistic? (comment added at RSS) (A:1, WH:3, R:1 = 5 total)
- ➔ Time/Temp *Vibrio* issues (issue identified at AQSS) (A:5, WH:0, R:0 = 5 total)
- ➔ Communication regarding closures (4 total):
 - Better communicating closures (possible GIS tool?)
 - Better signage for pollution closures (Issue identified at WHSS) (A:0, WH:4, R:0 = 4 votes)
- ➔ Perpetual management for ecological health and sustainability (A:1, WH:2, R:2 = 4 total)
- ➔ Continued collaboration with Narragansett Bay Commission – does good monitoring element (A:3, WH:1, R:0 = 4 total)
- ➔ Public-private seed hatchery for RI (issue identified at ASS) - Hatchery – to support restoration (A:0, WH:0, R:4 = 4 total)
- ➔ Role of shellfish in economic growth of RI (A:4, WH:0, R:0 = 4 total)
- ➔ Management of closures due to human health risks (research) (A:0, WH:1, R:3 = 4 total)
- ➔ Consistency of shellfish reporting and transport requirements (A:4, WH:0, R:0 = 4 total)
- ➔ Harmful algal blooms (A:4, WH:0, R:0 = 4 total)
- ➔ Fishermen’s knowledge and expertise is considered AND compensated in this process – how? (Issue identified at WHSS) (A:0, WH:2, R:0 = 2 total). Fishermen input into management process, equal say, and continues into future management regulations and implementation - (Issue identified at WHSS, was discussed specific to conch fishery but applies across all species) (WH:2)
- ➔ Whelks in general; also not currently covered in biotoxin closures (issue identified at AQSS) (A:1, WH:1, R:1 = 3 total)
- ➔ Recreational shellfishing - Permanent closures, conflicts, restoration (A:1, WH:2, R:0 = 3 total)
- ➔ Involve dealers more; dealers input into winter harvest schedules (Issue identified at WHSS) (A:0, WH:2, R:0 = 2 total)
- ➔ What is effective restoration? What are the numbers? (A:0, WH:0, R:2 = 2 total)
- ➔ Development of “economic development zones” (A:1, WH:1, R:0 = 2 total)
- ➔ Activities in conditional waters – how to appropriately go about this (issue identified at AQSS) (A:2, WH:0, R:0 = 2 total)
- ➔ Hydrodynamics – part of siting spawner sanctuaries. Incorporation of hydrodynamic information research (A:0, WH:0, R:2 = 2 total)
- ➔ Organize existing Laws (A:0, WH:0, R:2 = 2 total)

- ➔ Limits of space for aquaculture (issue identified at ASS) (A:2, WH:0, R:0 = **2 total**)
- ➔ Access (2 total):
 - Accessibility - recreational and commercial access to fishing areas (A:0, WH:1, R:0 = **1 total**)
 - Accessibility- most Right of Ways are gone – public access issues make recreational harvest challenging (WH:1)
 - Preserve working waterfront access – marina’s pushing out commercial boats (Issue identified at RSS)
- ➔ Communication – fishermen send real-time observations to server or somehow keep track of their observations/ info seen on the water (Issue identified at WHSS) (A:0, WH:0, R:1 = **1 total**)
- ➔ Need for a Recreational harvest Scoping Session (Issue identified at WHSS); Value of recreational shellfishing in RI (research) (A:0, WH:0, R:1 = **1 total**)
- ➔ Address living wage (A:1, WH:0, R:0 = **1 total**)
- ➔ Possible explore creating new management structures (issue identified at AQSS) (A:0, WH:0, R:1 = **1 total**)
- ➔ Spatial management - What scale are we operating on? Treat different areas differently; areas with size classes that have little/no value – how to address (Issue identified at WHSS) (A:0, WH:0, R:1 = **1 total**)
- ➔ Minimum size issues (aquaculture) (A:1, WH:0, R:0 = **1 total**)
- ➔ Market research for spider crabs (Issue identified at WHSS) (A:0, WH:1, R:0 = **1 total**)
- ➔ Sanitation due to effects from birds, i.e. cormorants and Canadian Geese – issue with water quality in Narrow River watershed (A:0, WH:0, R:1 = **1 total**)
- ➔ Fair dockage prices (Issue identified at WHSS) (A:0, WH:1, R:0 = **1 total**)
- ➔ Issues of transplants, contamination, temperature “abuse” (A:0, WH:1, R:0 = **1 total**)
- ➔ Role of restoration and enhancement vs. “put & take” (A:0, WH:0, R:1 = **1 total**)
- ➔ Further development of Spatial Tools – EcoPath, EcoSpace, etc. (research) (A:1, WH:0, R:0 = **1 total**)
- ➔ Understanding differing needs of inshore and offshore aquaculture- in and out of Narragansett Bay, i.e. ponds vs. bays
- ➔ Industry-based surveys
- ➔ Openness for changes in verbiage in the products of the Shellfish Management Plan - Not “will” or “shall” ... rather use, “may” (issue identified at AQSS)
- ➔ Emphasize diversity in the sense that this is not a “quahog-centric” project (issue identified at AQSS)
- ➔ Engage food distributors, dealers, towns, DOH etc. (Issue identified at WHSS)
- ➔ Clarify goals of industry and management – reasonable time frame (Issue identified at WHSS)
- ➔ Look at Puget Sound MP as example (maybe Baird Symposium, invite them to speak?) (Issue identified at RSS)
- ➔ Value of species-specific fisheries (research)

- ➔ Cost/Benefit of doing shellfish stock relay out of restricted water (Issue identified at RSS)
- ➔ Understand brood stock characteristics necessary to maintain stocks
- ➔ Research to address whether working a shellfish area aerates the ground (research)
- ➔ Sparse science concerning spawner sanctuaries and brood stocks; enhancement? (research) (Issue identified at RSS)
- ➔ Can't rely on natural recruitment; manage like running a farm (Issue identified at RSS)
- ➔ Build the capacity of state agencies to minimize risk
- ➔ Harvest to plate temperature changes and effective cooling procedures (research)
- ➔ Time releasing of effluents (research)
- ➔ Dredging and marinas
- ➔ Biological carrying capacity (issue identified at AQSS)
- ➔ Organize existing laws
- ➔ Consistency of health certifications
- ➔ Reclassify waters at federal level - \$30M+ is coming from restricted waters (specific to CT) (elaborated on at RSS)
- ➔ Define what species to restore and to what levels (Issue identified at RSS)
- ➔ Think into the future of the SMP – other prospective species? (Issue identified at RSS)
- ➔ Oyster Gardening – great initiative (Issue identified at RSS)
- ➔ Need to think outside management boxes – give DEM tools to do more, manage independent of areas (Issue identified at RSS)
- ➔ Identify opportunities for aquaculture with existing infrastructure – public/private (issue identified at AQSS)

Appendix B - Voting Results from Agency Scoping Session, 2/27/13

State agency representatives were given the opportunity to vote on the 4 most important issues they thought should be addressed in the SMP. They were given 2 green dots and 2 blue dots. *Green dots = What issues are most important to you and your agency; Blue dots: What issues are important to the people of RI*

1) There is a need to improve shellfish management through increased sharing of information

- ➔ **Coordination between the DEM, CRMC, DOH, FDA, NOAA and other agencies; protocols for data sharing** (2 green and 2 blue votes)
- ➔ **Create use maps** (1 green vote) – **links with spatial management issue** (2 green and 2 blue votes)
- ➔ **Create a centralized website as part of comprehensive communication strategy with a new scope, to include: closure info, research, food/safety, habitat/resource, “rules”, marketing, PR, recreational harvest info, and much more.** (Issue identified at Agency Scoping session) (2 blue votes)
- ➔ **Better signage for pollution closures** (Issue identified at Wild Harvest Scoping Session) (1 blue vote)
- ➔ **Openness for changes in verbiage in the products of the Shellfish Management Plan - Not “will” or “shall” ... rather use, “may”** (issue identified at Aquaculture Scoping Session) (1 green vote – note: The vote indicated that you must use “will/shall” as this is regulatory in nature)
- ➔ **Lack of recruitment (people) into shellfishing – there is no next generation** (Issue identified at Wild Harvest Scoping Session) (1 blue vote)
- ➔ **Clarify goals of industry and management – reasonable time frame** (Issue identified at Wild Harvest Scoping Session) (1 green vote)
- ➔ Funding for NRCS Program (utilizes commercial aquaculturist’s seed product)
- ➔ Education component to demonstrate value/safety to the public (regarding restoration and oyster gardening)
- ➔ Water quality – definitions and consistency in management; why closures, etc – better communication (Issue identified at Wild Harvest Scoping Session)
- ➔ Reach down to K-12 in education
- ➔ Local community education of regulations and science
- ➔ Ensure industry and management share common goals – “are on the same page”; understand needs of management and industry concurrently when managing resources (Issue identified at Wild Harvest Scoping Session)
- ➔ Communication – fishermen send real-time observations to server or somehow keep track of their observations/ info seen on the water
- ➔ Aquaculture as agriculture – clarify, define
- ➔ Continued collaboration with Narragansett Bay Commission – does good monitoring element
- ➔ Communicate ongoing, existing, and needed research
- ➔ Understanding differing needs of inshore and offshore aquaculture- in and out of Narragansett Bay, i.e. ponds vs. bays

- ➔ Industry-based surveys
- ➔ Better communicating closures (possible GIS tool?)
- ➔ DEM designated grow-out areas regarding aquaculture production – how are they determined? What do they mean? (issue identified at Aquaculture Scoping Session)
- ➔ Emphasize diversity in the sense that this is not a “quahog-centric” project (issue identified at Aquaculture Scoping Session)
- ➔ Engage the general public – ensure public voice is heard – who? How? (Issue identified at Wild Harvest Scoping Session)
- ➔ Addressing diversity (multicultural aspect) of public (Issue identified at Restoration Scoping Session)
- ➔ Engage food distributors, dealers, towns, DOH etc. (Issue identified at Wild Harvest Scoping Session)
- ➔ Involve dealers more; dealers input into winter harvest schedules (Issue identified at Wild Harvest Scoping Session)
- ➔ Need for a Recreational Harvest Scoping Session (Issue identified at Wild Harvest Scoping Session)
- ➔ Knowledge transfer between generations (Issue identified at Wild Harvest Scoping Session)
- ➔ Fishermen’s knowledge and expertise is considered AND compensated in this process – how? (Issue identified at Wild Harvest Scoping Session)
- ➔ Look at Puget Sound MP as example (maybe Baird Symposium, invite them to speak?) (Issue identified at Restoration Scoping session)
- ➔ NOAA funding – How to interface with the National Shellfish Initiative (Issue identified at Restoration Scoping session)

2) **There is a need to identify the role economic valuation plays in shellfish management**

- ➔ **Develop facility in Jerusalem to support aquaculture in the state (issue identified at Aquaculture Scoping Session – can pertain to restoration and/or wild harvest as well)** (2 blue votes. *Note: Need to explore possible uses for this facility first*)
- ➔ **Role of shellfish in economic growth of RI** (2 blue votes)
- ➔ **Value of recreational shellfishing in RI (research)** (1 blue vote)
- ➔ Cost/ Benefit Analysis – Closed waters, use conflicts, best use of space (research)
- ➔ Role of shellfish in ecotourism
- ➔ Public-private seed hatchery for RI (issue identified at Aquaculture Scoping Session) Hatchery – to support restoration
- ➔ Direct marketing of products
- ➔ Address living wage
- ➔ Value of species-specific fisheries (fisheries)

- ➔ Cost/Benefit of doing shellfish stock relay out of restricted water (Issue identified at Restoration Scoping Session)

3) There is a need to better understand the biological processes of our shellfish resources

- ➔ **Shellfish stock assessment at a reasonable scalar level (research)** (4 green, 2 blue votes)
- ➔ **Spatial management - What scale are we operating on? Treat different areas differently; areas with size classes that have little/no value – how to address** (Issue identified at Wild harvest Scoping Session) (2 green, 2 blue votes).
- ➔ **Research, priority topics** (issue raised at Agency Scoping Session) (3 green votes)
- ➔ Seeding and transplants – MOU for seeding; how to maximize seeding biomass
- ➔ Identify spawner sanctuaries based on environmental characteristics
- ➔ Substrate enhancement – cultching
- ➔ Disease resistance (issue identified at Aquaculture Scoping Session)
- ➔ Maintain genetic diversity of shellfish stocks
- ➔ Whelks in general; also not currently covered in biotoxin closures (issue identified at Aquaculture Scoping Session)
- ➔ Concerns about using wild stock for aquaculture (Issue identified at Wild Harvest Scoping Session)
- ➔ Develop baselines for the evaluation of restoration projects (research) – historic high as baseline? Is this realistic? (comment added at Restoration Scoping Session)
- ➔ Minimum size issues (aquaculture)
- ➔ Understand brood stock characteristics necessary to maintain stocks
- ➔ Research to address whether working a shellfish area aerates the ground (research)
- ➔ Market research for spider crabs (Issue identified at Wild Harvest Scoping Session)
- ➔ Sparse science concerning spawner sanctuaries and brood stocks; enhancement? (research) (Issue identified at Restoration Scoping Session)
- ➔ Can't rely on natural recruitment; manage like running a farm (Issue identified at Restoration Scoping Session)

4) There is a need to understand the ecosystem-wide interactions with shellfish management

- ➔ **Shellfish restoration for water quality purposes in closed waters** (1 green vote. Note: Controversial, needs further discussion)
- ➔ **Link the restoration of water quality to habitat restoration and how this will improve the industry; link water quality to restoration efforts 1st** – (1 green vote. Note: Links with above issue; need to have a separate category that identifies the anthropogenic effects in certain watersheds that have the potential

for improvement resulting in expansion of fishable area in estuaries closed to shellfishing i.e. Green Hill and Narrow River as examples.)

- ➔ Management of Invasive Species
- ➔ Nitrogen reduction – impacts on shellfish resources (Issue identified at Wild Harvest Scoping Session)
- ➔ Effects of ocean acidification (Issue identified at Wild Harvest Scoping Session and before)
- ➔ What is effective restoration? What are the numbers?
- ➔ Perpetual management for ecological health and sustainability
- ➔ Hydrodynamics – part of siting spawner sanctuaries
- ➔ Incorporation of hydrodynamic information research)
- ➔ Climate change (research) – how is climate-based ocean acidification occurring, etc. (elaborated in at Restoration Scoping Session)
- ➔ Ecological impacts from aquaculture (issue identified at Aquaculture Scoping Session)
- ➔ Predator management – i.e. abundance of sea stars affecting shellfish, spider crab abundance (after lobster decline?)
- ➔ Predation – can we use predator control to increase clam numbers? (research)

5) There is a need to identify and minimize various risks to shellfish resources and mitigate those risks

- ➔ **Consider shellfish as food, not just a resource, and all issues along with public health and food safety** (Issues identified at Agency Scoping Session) *(3 blue votes)*
- ➔ **Time/Temp *Vibrio* issues** (issue identified at Aquaculture Scoping Session) *(2 green votes. Note: This topic includes many issues; need to engage dealers)*
- ➔ Management of closures due to human health risks (research)
- ➔ Upwellers in prohibited waters
- ➔ Water quality in closed waters (ex. Narragansett Bay)
- ➔ Sanitation due to effects from birds, i.e. cormorants and Canadian Geese – issue with water quality in Narrow River watershed
- ➔ Consistency of shellfish reporting and transport requirements
- ➔ Harmful algal blooms
- ➔ Management of invasive species
- ➔ Disease resistance (issue identified at Aquaculture Scoping Session)
- ➔ Build the capacity of state agencies to minimize risk
- ➔ Consumer education, esp. those who are vulnerable health-wise
- ➔ Issues of transplants, contamination, temperature “abuse”
- ➔ Harvest to plate temperature changes and effective cooling procedures (research)

- Time releasing of effluents (research)
- Dredging and marinas

6) **There is a need to examine and determine effectiveness of existing policy and investigate alternative strategies for improved management**

- **Enforcement – funding? Adequate enforcement (i.e. web cams, deputies, etc.)** (3 green and 3 blue votes. Note: Mentioned this ties in with public health priorities)
- **Division of shellfish management areas – examine, re-evaluate** (2 blue votes) **Review and justify management area and/or pollution closures (i.e. Green Hill Pond, Watch Hill)** (Issue identified at Wild Harvest Scoping Session) (1 green, 1 blue vote)
- **Nurseries/ Upwellers in prohibited waters** (1 green, 1 blue vote)
- **Activities in conditional waters – how to appropriately go about this** (issue identified at Aquaculture Scoping Session) (2 blue votes)
- **Recreational shellfishing - Permanent closures, conflicts, restoration** (1 blue vote)
- **Further development of Spatial Tools – EcoPath, EcoSpace, etc. (research)** (1 green vote)
- **Accessibility - recreational and commercial access to fishing areas** (1 blue vote)
- Connect with Local buyer initiatives (Issue identified at Agency Scoping Session)
- Seeding and transplants – MOU for seeding; how to maximize seeding biomass
- Funding – identify how plan can be funded (all issues need a sustainable funding source)
- Organize existing Laws
- Licensing issues – cost, regulations, due date, capacity, exit/entry ratios, ‘use it or lose it’
- Identify spawner sanctuaries based on environmental characteristics
- Possibly explore creating new management structures (issue identified at Aquaculture Scoping Session)
- Role of restoration and enhancement vs. “put & take”
- Treating aquaculture as agriculture – Right to Farm
- NSSP – reasonable rules? – with regard to restoration, ensure “best management” practices (elaborated on at Restoration Scoping Session) Relationship between commercial harvesters and NSSP
- Sustainable funding source or disease monitoring survey work (Issue identified at Restoration Scoping Session)
- Aquaculture as agriculture – clarify, define, Right to farm
- Need a vision for where we want to be (issue identified at Aquaculture Scoping Session)
- Limits of space for aquaculture (issue identified at Aquaculture Scoping Session)
- Climate change and Sea Level Rise - Anticipate changes to the environment
- Development of “economic development zones”
- Social carrying capacity (issue identified at Aquaculture Scoping Session)

- ➔ Biological carrying capacity (issue identified at Aquaculture Scoping Session)
- ➔ Organize existing laws
- ➔ Consistency of health certifications
- ➔ Preserve working waterfront access – marina’s pushing out commercial boats (Issue identified at Restoration Scoping Session)
- ➔ Reclassify waters at federal level - \$30M+ is coming from restricted waters (specific to CT) (elaborated on at Restoration Scoping Session)
- ➔ Identify possible ‘economic development zones’
- ➔ Climate change (research)
- ➔ Accessibility- most Right of Ways are gone – public access issues make recreational harvest challenging
- ➔ Fair dockage prices (Issue identified at Wild Harvest Scoping Session)
- ➔ Identify opportunities for aquaculture with existing infrastructure – public/private (issue identified at Aquaculture Scoping Session)
- ➔ Fishermen input into management process, equal say, and continues into future management regulations and implementation - (Issue identified at Wild Harvest Scoping Session, was discussed specific to conch fishery but applies across all species)
- ➔ How does NOAA MSP Initiative tie into what we’re doing? – RI is part of this process; citizens aren’t informed but concerned (Issue identified at Restoration Scoping Session)
- ➔ Need to think outside management boxes – give DEM tools to do more, manage independent of areas (Issue identified at Restoration Scoping Session)
- ➔ Define what species to restore and to what levels (Issue identified at Restoration Scoping Session)
- ➔ Think into the future of the SMP – other prospective species? (Issue identified at Restoration Scoping Session)
- ➔ Oyster Gardening – great initiative (Issue identified at Restoration Scoping Session)

Appendix C – The SMP Use Maps

1. **Identifying Use Conflicts** – The SMP process undertook the task of developing “use maps” to document and highlight the myriad of human uses and activities within Narragansett Bay and the coastal ponds. The effort was conducted in response to user-conflict concerns expressed by stakeholders. The goals of mapping human uses were to examine how the Bay and coastal ponds are used and by whom, and also to better understand utilization patterns and interactions. Furthermore, the effort aimed to enhance existing tools and resources available to state agencies to inform management decisions about water-related uses. Data used to inform these maps were collected at a series of ten stakeholder meetings held between January and May of 2013 where participants were asked to draw on paper maps to illustrate where and what activities they engage in. After all of the data was compiled, maps were scanned and brought into ESRI’s ArcGIS software where the data was digitized and organized into cohesive datasets. The resulting maps are available on the SMP website (www.rismp.org), in addition to this Appendix.
2. **Valuing Data** – While such use maps can be extremely beneficial, there are also challenges. For example, people may disagree on how an area is realistically being utilized or what activity is best suited to occur in an area. The use maps developed throughout the SMP contain information provided by stakeholders with the understanding that all information would be:
 - a. Incorporated into the maps
 - b. Treated as valued reflections of people’s interests and uses
 - c. Evaluated subject to the SMP public review process;
 - d. Gathered to document and identify generally how users value certain areas and what activities users engage in; and
 - e. In no way used to assign value of one activity over another or to restrict uses or activities.
3. **Incorporating Data into Management** – It is a goal of the SMP that the developed maps will be considered in and guide the state agencies decision-making processes, but how the information will be used is at the discretion of the managers/state agencies. Also, these maps are not intended to support or demonstrate a need to increase or reduce the occurrence of certain activities. Rather, the goal is to highlight the diverse uses of our waters and the importance of balancing uses and reaching compromises among user groups.

- a. **Data Gaps** – The SMP recognizes the maps are not a complete representation of how Rhode Island’s waters are used by the public. These maps reflect only data collected during ten publically announced stakeholder meetings. The bias towards shellfishing activity (commercial and recreational) is evident. The State’s aquaculture lease sites are not depicted on the final maps, but an interactive map with this data can be found online at the Northeast Ocean Data Portal website:
<http://www.northeastoceandata.org/maps/aquaculture/>.
 - b. Some activities that were illustrated on the maps have been left out of the final maps due to concerns that they are omnipresent and cannot be realistically portrayed in the use maps. These activities include boating, swimming, sailing, kayaking—all of which take place throughout our waters, particularly within the coastal ponds. One of the challenges is that there was no differentiation between boating and kayaking or between sailing and windsurfing. Future iterations and updates of the maps would benefit from these distinctions.
4. It is recognized that many people spent considerable time marking where on the maps they conduct these activities; it is a fundamental challenge in any use mapping exercise to correctly and fully display the level of uses in a realistic, equitable manner. In addition, these uses may change over time, both throughout the year and over successive years. Therefore it is important to continue to update and adapt these use maps in order to provide the most accurate, useful product for agencies to consider. The process of updating is time-intensive and requires many perspectives to be captured and recorded, however the investment is meaningful in its reflection of a useful and complete representation of uses on the water.

Appendix D - SMP-related Meetings and Events

Year	Date	Type of Event	Title	Location	# People in Attendance
2013	1/7/2013	Stakeholder Meeting	1st RI SMP Stakeholder meeting	Corless Auditorium	100
2013	2/27/2013	Meeting	RI Shellfish Agency Scoping Session	DEM Providence	30
2013	3/14/2013	Meeting	RI Shellfish Dealer Scoping Session	Warwick Library	8
2013	3/14/2013	Meeting	RI SMP Public Forum to Discuss Use Maps	Charlestown	10
2013	3/20/2013	Stakeholder Meeting	RI Shellfish Management Plan Stakeholder Meeting	Corless Auditorium	50
2013	4/10/2013	Stakeholder Meeting	Discussion of SMP Goals and Objectives	Coastal Institute	20
2013	4/11/2013	Stakeholder Meeting	Stakeholder Mapping Session: Recreational Activities	CRC	6
2013	4/24/2013	SMP Seminar	Seminar Series Lecture: You Are What You Eat—Health, Food Safety, and New Sanitation Requirements for Rhode Island Shellfish	Coastal Institute Auditorium	35
2013	5/6/2013	Stakeholder Meeting	Room Enough For Everyone? Addressing User Conflicts in Narragansett Bay and the Coastal Ponds	Coastal Institute Auditorium	40
2013	5/15/2013	Stakeholder Meeting	RI Shellfish Management Plan Stakeholder Mapping Meeting		
2013	6/13/2013	Meeting	Chart Chats: June Use Maps Meeting	Warwick Library	30
2013	7/23/2013	Event	Clamming 101 at Point Judith Pond	Point Judith Pond	
2013	8/16/2013	Event	Clamming 102 in Warwick	Warwick	
2013	8/22/2013	Event	Clamming 101 at Point Judith Pond	Point Judith Pond	
2013	9/13/2013	Event	Ocean Farming: Aquaculture in the RI Tour of Matunuck Oyster Farm	Matunuck	25
2013	9/17/2013	Stakeholder Meeting	Shellfish Licensing in RI	Coastal Institute	45
2013	9/19/2013	Event	Clamming 101 at North	North	30

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			Kingstown Town Beach	Kingstown Town Beach	
2013	10/8/2013	Stakeholder Meeting	Follow-up Discussion on Commercial Shellfish Licensing	Coastal Institute	20
2013	11/12/2013	Event	12th Annual Ronald C. Baird Sea Grant Science Symposium: The Future of Shellfish in Rhode Island	Warwcik	100
2013	2/7/2014	Meeting	The Shellfish Management Plan		
2014	3/26/2014	Meeting	Joint Coordinatiung Team-Ch.4 TAC meeing	Coastal Institue Large Conference room	25
2014	4/4/2014	Event	Rhode Island Seafood Challenge	Johnson and Whales University	100
2014	4/14/2014	Stakeholder Meeting	Where the Wild Quahogs Are: Looking at Quahog Larval Supply and Distribution in the Upper Narragansett Bay	Coastal Institue Auditorium	45
2013	4/14/2014	Stakeholder Meeting	Where the Wild Quahogs Are: Looking at Quahog Larval Supply and Distribution in the Upper Narragansett Bay	Corless Auditorium	35
2014	5/19/2014	Stakeholder Meeting	The Lay of the Land: Understanding Quahog Management in Rhode Island	Corless Auditorium	30
2014	6/12/2014	Event	Clamming Series: Learning to Dig Clams	North Kingstown Town Beach	25
2014	6/23/2014	Event	Summer Camp for Sophia University in Providence	Save The Bay	21
2014	6/27/2014	Event	Managing Rhode Island's Shellfish Resources	300 Tower St, Bristol	35
2014	7/11/2014	Event	Clamming Series: Learning to Dig Clams	Point Judith Pond	25
2014	7/15/2014	Event	Shellfish Hatchery and Upweller Tour	Roger Williams University	30
2014	8/12/2014	Event	Clamming Series: Learning to Dig Clams	Point Judith Pond	25

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2014	8/14/2014	Meeting	Review of all Aquaculture regulations/statutes with state agencies	Mosby Center, URI Bay Campus	10
2014	8/20/2014	Meeting	CRMC Semi-Annual Staff Retreat	Alton Jones Campus, URI, West Greenwich, RI	30
2014	9/29/2014	Stakeholder Meeting	Sharing the SMP Management Recommendations: Review and Next Steps	Corless Auditorium	
2014	11/17/2014	Event	SMP Celebration and Final Event	CI Building	

Appendix E: Press from SMP, 2013-2014

2013

- “Rhode Islanders digging this class on clamming” Providence Journal July 26th, 2013
<http://www.providencejournal.com/breaking-news/content/20130726-rhode-islanders-digging-this-class-on-clamming.ece>
- “Clam I Am”, Newport This Week September 19th, 2013
http://www.newportthisweek.com/news/2013-09-19/Opinion/Clam_I_Am.html
- “Money Watchers: Shellfish Management”, Turn to 10 October 7th, 2013
<http://www.turnto10.com/story/23630919/money-watchers-shellfish-management>
- “Diggin’ deep to sustain RI shellfish”, Warwick Beacon October 8th, 2013
http://www.warwickonline.com/stories/Diggin-deep-to-sustain-RI-%20shellfish.86132?category_id=4&town_id=1&sub_type=stories
- “Rhode Island Shellfish Management Plan in the works”, ABC 6 News October 21st, 2013, <http://www.abc6.com/story/23630675/rhode-island-shellfish-management-plan-in-the-works>
- “Shellfish is order of the day at R.I marine science symposium”, Providence Journal November 14th, 2013, <http://www.providencejournal.com/breaking-news/content/20130726-rhode-islanders-digging-this-class-on-clamming.ece>
- “Humble, Hard-Working Quahog Keeps R.I. Running”, Eco RI News November 18th, 2013, <http://www.ecori.org/aquaculture/2013/11/18/humble-hard-working-quahog-keeps-ri-running.html>

2014

- “DEM Announces New Commercial Fishing License Opportunities and Program Changes”, State of Rhode Island Department of Environmental Management January 28th, 2014, <http://www.dem.ri.gov/news/2014/pr/0128141.htm>

- “Taking Stock: Researchers seek better estimates, understand, or clams in Narragansett Bay”, National Oceanic and Atmospheric Administration February 28th, 2014
<http://seagrant.noaa.gov/News/FeatureStories/TabId/268/ArtMID/715/ArticleID/200/Taking-Stock-Researchers-seek-better-estimates-understanding-of-clams-in-Narragansett-Bay.aspx>
- “Fish managers set quotas for 2015”, Warwick Beacon August 4th, 2014
<http://warwickonline.com/stories/Fish-managers-set-quotas-for-2015,95862>
- “Beach Week: Learning to Clam”, WPRI August 19th, 2014
<http://wpri.com/2014/08/19/beach-week-learning-to-clam/>
- “Disease Management Plan for Aquaculture Created”, ecoRI August 29th, 2014
<http://www.ecori.org/aquaculture/2014/8/29/disease-management-plan-for-aquaculture-created.html>
- “Rhode Island Adopts Oyster Aquaculture Disease Management Plan”, The Fish Site September 8th, 2014, <http://www.thefishsite.com/fishnews/24052/rhode-island-adopts-oyster-aquaculture-disease-management-plan>



The Rhode Island Shellfish Management Plan Document Appendices